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Papahānaumokuākea: Integrating Culture in the Design and Management of one of the World's Largest Marine Protected Areas

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ABSTRACT

Papahānaumokuākea Marine National Monument is one of the world's largest marine protected areas and was designated the first mixed conservation site in the United States due to its natural and cultural importance. It is also the world's first cultural seascape, being recognized for its continuing connections to indigenous people. As the westernmost place in the Hawaiian universe, many believe these islands and seas are the pathway that Native Hawaiians travel after death, returning to pō (night; realm of the gods). This intimate kinship has profound implications for contemporary management. Current management emphasizes integration of science, policy, cultural knowledge, traditions, and practices to create successful management strategies appropriate for both natural and cultural resources. This management is based on Native Hawaiian values and practices that incorporate observation and understanding of the natural world, indigenous principles and philosophies, cultural norms, community relationships, and unique epistemologies deeply imbedded in and formed by relationships of people with place. A cornerstone of this effort has been the direct involvement of cultural practitioners in policy, management, education, and research. This biocultural approach has led to more effective management of the monument and serves as a model for conservation around the world.

KEYWORDS

biocultural approach; customary knowledge; Hawaiian values; indigenous management; large-scale marine protected areas

Introduction

Today we face an unprecedented combination of pressures that threaten the health of both social and ecological systems across the entire planet (Pretty 2011; Rapport and Maffi

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2011). Marine ecosystems are declining worldwide at an alarming rate and the footprint of modern human impacts stretches to nearly every corner of the globe (Worm et al. 2006; Halpern et al. 2008; Swartz et al. 2010). Despite these declines, the ocean has historically played an important role in maintaining a strong sense of global maritime heritage and ensuring human survival. Much of the value people place on the ocean has generally only been understood in the context of coastal areas and their resources. Remote ocean areas are some of the last vestiges of what intact functioning ecosystems once looked like, and thus provide baselines for comparisons with more exploited locations (Knowlton and Jackson 2008).

These large-scale, remote ocean areas are some of the most important locations for modern conservation and protection, both within national boundaries and on the high seas. Often these spaces are recognized solely for their high ecological value, however they should also be valued and appreciated for their cultural heritage and importance (Wilhelm et al. 2014). These open ocean areas are often characterized as remote and unpopulated, yet they still embody important cultural connections and life sustaining services to oceanic peoples. These cultural connections are invaluable in fully understanding the resources and essential components in shaping effective management. They also provide important support for conservation, education, and historical data collection that benefits both ecological and cultural protection (Berkes, Colding, and Folke 2000; Aswani et al. 2012; Berkes 2009).

The global effort to integrate indigenous knowledge and values with environmental management is continually growing (Berkes et al. 2000). The most influential forum for defining the role of indigenous knowledge in the management and conservation of biodiversity is within the United Nations system, particularly the Working Group on Indigenous Populations and the Convention on Biological Diversity (CBD, Mauro and Hardison 2000). The CBD recognizes the close and traditional dependence of indigenous and local communities on biological resources and the benefits derived from the use of traditional knowledge, innovations and practices. The International Union for the Conservation of Nature (IUCN) advocates for a Rights-Based Approach to Conservation, which promotes the realization of conservation with justice, recognizing that activities and projects related to conservation can have positive or negative impacts on human rights, while the exercise of certain human rights can reinforce and act in synergy with conservation goals (Greiber et al. 2009). Despite terrestrial ecosystems having been the primary focus, there has been increasing attention paid to both the natural and cultural heritage value of remote ocean areas, resulting in a movement towards increased protection for these regions (Freestone et al. 2013; Wilhelm et al. 2014).

Some of the most important work concerning the natural and cultural heritage value of remote ocean areas is occurring in the Hawaiian Archipelago, which stretches nearly 2000 km and consists of the high, volcanic inhabited main Hawaiian Islands (MHI) to the southeast, and the small, mostly low-lying atolls and cays of the Northwestern Hawaiian Islands (NWHI), (Figure 1). In the remote NWHI there has been an effort over the past fifteen years to develop an integrated approach to management of this large-scale marine protected area—one that is built on a foundation of traditional Hawaiian values and integrates culture into education, access, research, policy, and management. The objectives of this paper are to document the biocultural approach that was undertaken in the creation, management and expansion of one of the world's largest marine protected area (Papahānaumokuākea Marine National Monument) and how this can serve as a model for conservation around the world.

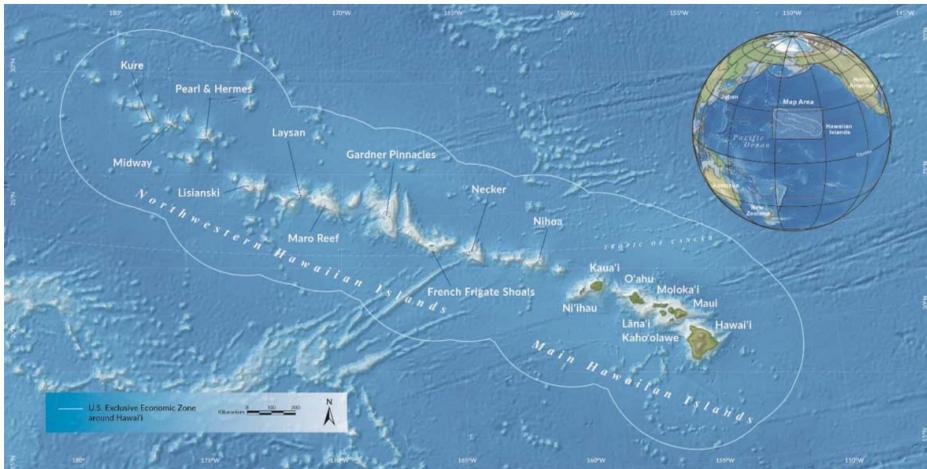


Figure 1. The Hawaiian Archipelago and associated bathymetry.

Importance of the ocean to Pacific islanders

Throughout history, the ocean has provided pathways for human migration, transportation, and survival (Hurles et al. 2003; Manning and Timmer 2013). Long before Europeans sailed out of sight of land, Polynesian navigators were voyaging thousands of kilometers across the vast Pacific (Finney 1977). For Pacific cultures, the ocean serves as a pathway of connection to each other, and is essential to cultural preservation today (Finney 1993).

Polynesian societies share many of the same cosmologies, genealogies, and oral histories, originating from the wayfinders who migrated over expansive distances of the Pacific to inhabit practically every corner of this region (Finney 1977; Howe 2007). The traditional practice and art of wayfinding relied upon observations of the natural environment such as the sun, moon, and stars, which rise and set in predictable star lines; as well as cloud clusters and their movement, wind direction, and ocean swells (Kyselka 1987). Using increasingly sophisticated maritime strategies, navigational skills, and voyaging technology, relationships between distant islands were built, which were maintained for hundreds of years (Allen 1996; Rollet 2002). While multiple lines of evidence (e.g. linguistics, physical anthropology, archaeology, ethnography, DNA studies, etc.) paint a complex picture of colonization and settlement from west to east, it's clear that all these people derive from a common oceanic history. The result was a shared regional identity that was best exemplified in the voyaging alliance and socio-political union of island chiefs that spanned different remote islands groups in Polynesia.

The ocean played a key role for Native Hawaiians not only for the resources it provided, but also for physical and spiritual sustenance in their everyday lives (Andrade 2008; Oliveira 2014; Handy and Pukui 1958). The ocean as a cultural seascape is vital to Native Hawaiians' identity and being, and is an essential dimension to their cognitive understanding of the world (Lewis 1972; Kyselka 1987). It is imbued with cultural meaning that continues to connect the Hawaiian people in a genealogical web of ecological kinship (Oliveira 2014).

Hawaiians and people from throughout the Pacific traditionally obtained much of their protein from the sea and depended on fishing for their survival (Johannes 1978). Long before

western societies recognized the limits of the ocean's productivity, these people understood the need to avoid food depletion, motivating them to acquire a sophisticated understanding of the factors that cause limitations and fluctuations in marine resources (Ruddle 1996; Johannes 1998). They developed ingenious social and cultural controls on fishing and aquaculture technologies that fostered sustainable use of marine resources (Poepoe et al. 2007; Kikuchi 1973; Kikiloi 2003).

The historical significance of the NWHI

In Hawaiian traditions, the NWHI are considered a sacred place that is important to Hawaiian history and its cultural origins. This region had cosmological significance tied to the early stories of the creation of gods and man, effectively shaping the social political development of Hawai'i (Kikiloi 2012). The Hawaiian creation chant, the Kumulipo (source of deep darkness), recounts how this region is conceptualized as a place of primordial darkness from which life springs and spirits return after death (Kikiloi 2010). It describes the Hawaiian world as being comprised of two realms: pō, a place of deep darkness reserved for the gods and spirits, and ao, the realm of light where the living resides. Native Hawaiians considered the NWHI as pō, a spiritual region that facilitated the journey spirits took upon death and the process of deification in the afterlife. In Hawaiian culture, the Tropic of Cancer is referred to as ke ala polohiwa a Kāne (the dark shining path of Kāne [god of procreation]), and was considered the border between pō and ao (Beckwith 1951; Pukui, Haertig, and Lee 1972). It marked the beginning of travels into this region of pō and supernatural islands called 'āina akua (deified islands) (Kikiloi 2010; Figure 2).

The island of Mokumanamana is situated in the center of the Hawaiian Islands chain and it was believed to be in a unique position on the northern Tropic, acting as an axis point between the world of the supernatural and the living. This island is dominated by 34 individual heiau (temples), sites that were used for ritual purposes (Kikiloi 2012; Freestone et al 2013; Guth 2013). Ancient chiefs would access this region as a rite of passage to commemorate the source of their mana, birthright, and authority (spiritual power derived by

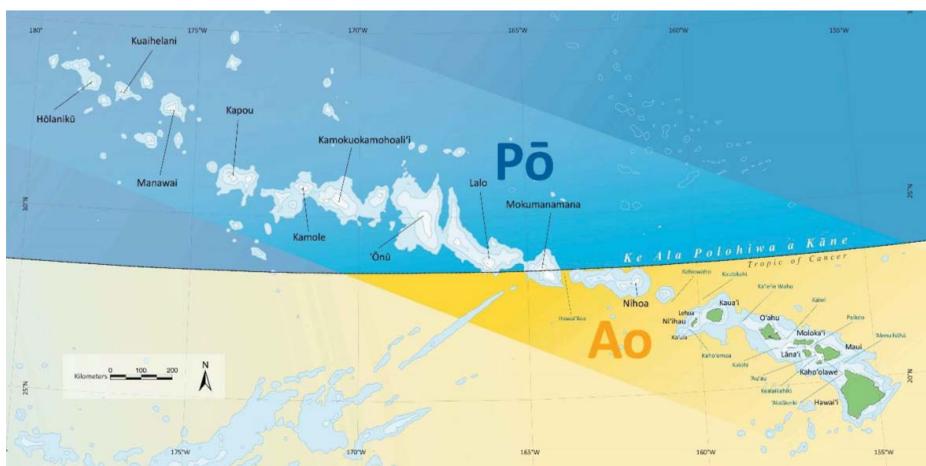


Figure 2. Ke Ala Polohiwa a Kāne was the border between pō (spirit realm) and ao (living realm, Kikiloi 2010, 2012).

ancestral gods). Nihoa Island, with over 89 cultural sites that range from habitation, religious, and agricultural, was developed in conjunction as a remote elite outpost for recurrent staging and use of Mokumanamana and its temples. The occupation and use of these islands represents one of the earliest signs of Hawaiian religious activity. For over four hundred years (ca. A.D. 1400–1815), Mokumanamana, along with Nihoa, became a ritual center of power, supported by an extensive voyaging interaction sphere that helped to support long-term occupation of the islands (Kikiloi 2012).

After Western contact, the Hawaiian Islands formed into the Kingdom of Hawai'i, an independent and sovereign nation. Despite there being little known about the NWHI, a few Hawaiian ali'i (royalty) traveled to these remote islands to see them with their own eyes. During the 1800s, there were a number of expeditions initiated by Hawaiian ali'i to visit these islands and bring them under Hawaiian political authority and control. Several of the islands were formally annexed by the Hawaiian government during the 19th century (Yamase 1982; Mackenzie and Kaiama 2003). In 1893, the Hawaiian Kingdom was overthrown by the Provisional Government, which annexed the entire chain of islands and reefs of the NWHI (Yamase 1982; Mackenzie and Kaiama 2003). In 1897, Native Hawaiians contested the treaty of annexation with the United States, but it was hastily passed as a joint resolution in 1898. In 1900, the Organic Act passed and the islands gained admission to the U.S. as a Territory, and later Statehood in 1959.

The modern era of NWHI use is characterized by exploitation and little understanding of the ecological importance of the area. In the late 1800s and early 1900s, the NWHI were exploited and ravished by seal hunters, whalers, feather hunters, pearl divers, and guano miners. Seals, sea turtles, seabirds, sharks, and whales were slaughtered in mass (Rauzon 2001; Kittinger et al. 2011). In 1824 the ship *Gambia* took > 1,500 seals, and the ship *Ada* (1882) reported taking 103 sea turtles in just three days (Cobb 1902). Alien and exotic plants and insects drastically changed the unique ecosystems by destroying or out-competing many of the endemic native species. In 1894, entrepreneurs from a rabbit canning industry released rabbits that devoured nearly all the vegetation on some islands. In the early part of the 20th century, Japanese feather hunters slaughtered millions of seabirds (Table 1).

Conservation efforts for the NWHI

Modern conservation of the NWHI began in 1909 with the creation of the Hawaiian Islands National Wildlife Refuge to safeguard nesting seabird colonies from overexploitation (Executive Order 1019). However, dedicated efforts to protect marine resources and Native Hawaiian cultural heritage did not begin until nearly a century later. In response to calls from Native Hawaiian fishermen and cultural practitioners, President Clinton established the NWHI Coral Reef Ecosystem Reserve (NWHI CRER), and in 2001 the process to designate a National Marine Sanctuary (Executive Orders 13178 and 13196) was initiated. The State of Hawai'i also recognized the significance of the NWHI when it established the Northwestern Hawaiian Islands State Marine Refuge in 2005. In 2006, President GW Bush established the NWHI Marine National Monument (NWHI MNM) under the authority of the Antiquities Act of 1906 (16 U.S.C. 431). Subsequently renamed the Papahānaumokuākea Marine National Monument (PMNM), it is the single largest conservation area under the U.S. flag. Again, Native Hawaiians played key leadership roles in the public process to design, establish, and manage the monument.

Table 1. Timeline of historical events for the Northwestern Hawaiian Islands.

A.D. 800–1000	Arrival of first Polynesians to Hawai'i
A.D. 1300	End of inter-archipelago voyaging in Polynesia. Coincides with voyaging exploration of NWHI.
A.D. 1425	First settlement of Hawaiians traveling to NWHI and early signs of formalized religion system.
A.D. 1450–1650	Intensified period of Hawaiian voyaging and occupation of Nihoa and Mokumanamana motivated by construction of heiau (temple) sites
A.D. 1780's-1850's	European exploration and commercial harvest of whales, seals, turtles, sharks, sea cucumbers, and pearl oysters.
A.D. 1810	The Hawaiian Islands unified under the Kamehameha Monarchy
A.D. 1815	End of pre-contact Hawaiian voyaging network to NWHI. Smaller voyaging efforts continued by communities from Ni'ihau, Kaua'i, and O'ahu into 1900s.
A.D. 1822	Queen Ka'ahumanu travels to Nihoa and claims it under the Kamehameha Monarchy.
A.D. 1840	Hawaii transforms from absolute monarchy to constitutional monarchy.
A.D. 1842–1843	Hawai'i recognized as independent nation, securing declarations from major world powers.
A.D. 1857	King Kamehameha III claims Laysan, Lisianski, and Pearl & Hermes for the Kingdom of Hawai'i.
A.D. 1859	Midway Atoll discovered by Captain Brooks of the Hawaiian Bark Gambia, but claims possession for the U.S.
A.D. 1886	King Kalākaua claims Kure Atoll under the Kingdom of Hawai'i
A.D. 1893	Kingdom of Hawai'i overthrown by Provisional Government backed by U.S. Military
A.D. 1890–1909	Guano, seabirds, feathers, and eggs taken by companies under lease and illegal Japanese pirating raids
A.D. 1894–1895	Necker (Mokumanamana) and French Frigate Shoals secured post-overthrow to prepare for U.S. annexation.
A.D. 1898	Annexation of Hawai'i, including NWHI, Johnston Island (Kalama), and Palmyra Island, through U.S. resolution.

Strong cultural components were immediately intertwined with the creation and management of PMNM. The naming of PMNM itself drew inspiration from ancient Hawaiian traditions and the original island names documented by early native elders (Kaiāikawaha 1835; Nogelmeir 1995). Papahānaumokuākea represented the union of the names Papahānaumoku and [W]ākea who are known in Hawaiian traditions as “Earth mother” and “Sky Father.” The merging of these names acknowledged the critical role these two ancestors played in the symbolic “birthing” of the entire archipelago in Hawaiian creation stories, emphasizing the continuity between the past and the present. “Papa,” means “foundational earth,” representing the numerous low, flat islands that stretch towards the northwest. Hānau means “to birth” and moku means “island”. Ākea means “expanse of space,” representing the surrounding ocean. The naming PMNM as Papahānaumokuākea, helped to sustain a Hawaiian cultural identity for this region and reemphasized the importance of the genealogical connection between people and nature as the foundation of Hawaiian tradition.

The 2010 inscription of Papahānaumokuākea as a World Heritage site by the United Nations' Educational, Scientific and Cultural Organization (UNESCO) identified it as the first mixed site in the United States because of its outstanding universal value for both its natural and cultural heritage (Abdulla, Obura, and Bertzky 2013). The designation also recognized Papahānaumokuākea as the world's first cultural seascape owing to its continuing connections to living indigenous people. As with prior national designations, first as the NWHI CRER, then as PMNM, direct engagement by Native Hawaiians in the nomination process, design, and advocacy were essential.

In 2016, PMNM was in the global spotlight because of the local movement to expand its boundaries to become one of the largest marine conservation areas in the world, encompassing 1,508,870 km² (Figure 3). The Expand Papahānaumokuākea coalition comprised a diverse community-driven effort that included kupuna (elders), fishermen, educators, cultural practitioners, non-profits, community groups, scientists, religious organizations,

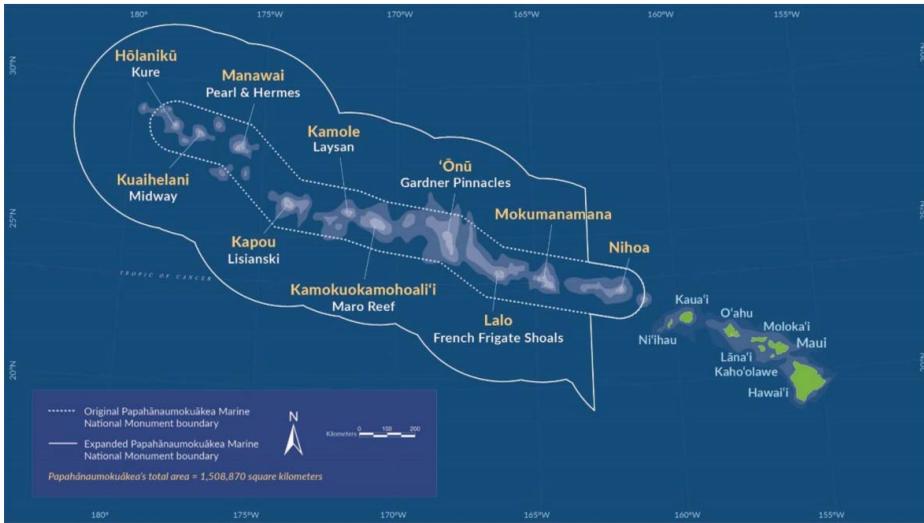


Figure 3. The Hawaiian Archipelago including the Papahānaumokuākea Marine National Monument (PMNM) boundaries. Hawaiian names in yellow, common English names in white. Original PMNM boundary shown as dotted white line, expanded boundary appears as solid white line.

veterans, keiki (children), and many others across Hawai‘i, and beyond that requested the President to use the Antiquities Act to expand protection for PMNM.

A traditional understanding of the ocean as a cultural seascape was essential to understanding the need for expansion of Papahānaumokuākea. One of the key points in advocating for expansion included protection of the open ocean and seamounts, since the entire ecosystem has biocultural value. For Native Hawaiians, this meant the responsibility to protect and guard these resources as part of their ancestry across the entire archipelago.

The push for expansion began in early 2016, when Native Hawaiian leaders requested that President Obama expand PMNM out to the 200 nmi Exclusive Economic Zone (EEZ). Then the NWHI MNM Native Hawaiian Cultural Working Group invited the White House Council for Environmental Quality to begin public hearings with key stakeholder groups on a community-developed proposal that would expand PMNM out to the EEZ, except for waters surrounding Ni‘ihau and Kaua‘i. This exclusion was to protect historical fishing access for these communities. They also requested that the Office of Hawaiian Affairs (OHA) be designated as a co-trustee of PMNM. On August 26, 2016, President Obama signed a proclamation expanding PMNM, making it the largest protected area on the planet within a single national jurisdiction. The expansion of PMNM allowed for the broadest regional and holistic protection of the entire seascape, and protected against any extractive, commercial, or industrial activities that are incompatible with a Hawaiian cultural worldview. This increased protection is even more essential because it is the only intact cultural voyaging seascape left in the archipelago.

Governance structure and management

The governance arrangement for the Monument represents a new model in US marine protected area management. The management structure of PMNM identifies two federal

agencies (National Oceanographic Atmospheric Administration (NOAA) through the Department of Commerce, and the U.S. Fish and Wildlife Service (FWS) through the Department of Interior), the Department of Land and Natural Resources for the State of Hawai'i, and more recently OHA, as co-trustees. All four of these agencies and organizations are working collaboratively to provide strategic guidance and comprehensive management for PMNM.

This recent elevation of OHA to co-trustee was an important victory for the Hawaiian community, which sent a clear message that Native Hawaiians have unique social and political status in these islands. OHA is the only institution mandated to improve the well-being of the Native Hawaiians. It was appropriately identified as a monument co-trustee because of: (1) its existing role as a co-manager since 2008; (2) its history of support for Native Hawaiian cultural initiatives; and (3) its ability to engage and connect the Hawaiian community with management decisions.

A cornerstone of PMNM has been the direct involvement of Native Hawaiian cultural practitioners in policy, management, and research through an advisory body called the Native Hawaiian Cultural Working Group (CWG). This group was initially formed under the NWHI CRER in 2000 under the Reserve Advisory Council (RAC) to address issues and topics regarding access, research, education, and management of the reserve. Under the current Monument governance structure, the group now reports directly to the Monument Management Boards (through OHA), ensuring that Native Hawaiian input is incorporated into all management actions. The advisory group was instrumental in helping to create the name Papahānaumokuākea. The body of members consists of broad representation from all islands, including respected Hawaiian kūpuna (elders), researchers, educators, advocates, and cultural practitioners. Its guidance has become invaluable, as these individuals have the strongest historical ties to this remote region.

The creation of NWHI CRER established the RAC, consisting of 15 voting and 10 non-voting members. Within the RAC charter, 20% of the voting seats were reserved for Native Hawaiians, including one seat dedicated to a Native Hawaiian elder, with experience and knowledge regarding subsistence, cultural, religious, and other activities in the NWHI. The RAC played an important role in helping to shape input regarding protection of the marine resources in reserve waters. In addition, the Monument management structure supports three positions (one in NOAA; two in OHA) dedicated towards helping achieve Native Hawaiian programmatic goals.

Integrated policies, plans, and protections

The highest level of language regarding Hawaiian cultural significance of Papahānaumokuākea is codified in Presidential Proclamation 8031, which created PMNM. This proclamation states that “this area has great cultural significance to Native Hawaiians and a connection to early Polynesian culture worthy of protection and understanding.” The more recent Presidential Proclamation 9478 that led to Monument expansion states that this region “constitutes a sacred, cultural, physical, and spiritual place for the Native Hawaiian community.” These important statements help establish the framework for cultural integration being a priority for management in the region.

The PMNM vision and mission also sets the direction for prioritizing cultural integrity, along with biodiversity, as management goals. The vision of PMNM is “to forever protect

and perpetuate ecosystems health and diversity and Native Hawaiian cultural significance of Papahānaumokuākea.” The mission takes it a step further by identifying culture as a core priority of protection – “to carry out seamless integrated management to ensure ecological integrity and achieve strong, long-term protection and perpetuation of NWHI ecosystems, Native Hawaiian culture, and heritage resources for current and future generations.” These themes are closely aligned with the management theme promoted in the World Heritage application stating that Papahānaumokuākea is a place where “nature and culture are one.”

PMNM has also supported the creation of a management plan dedicated entirely to Native Hawaiian initiatives, focused on how management agencies can understand and support cultural uses of and access to Papahānaumokuākea. The Native Hawaiian Research Plan is intended to help direct funding and programmatic development for Papahānaumokuākea over the next three to five years. The Plan acknowledges approaches that engage all human senses into data acquisition. These approaches weave humankind into the fabric of nature and see purposeful relationships among all things, and values the spiritual and emotional, along with the physical and intellectual. This approach supports and respects a broad spectrum of methods for observation and knowledge acquisition (Table 2). The Monument management board began collaborating with the PMNM Native Hawaiian CWG to gather feedback from Native Hawaiians to help shape the plan’s development. It also solicited advice from Native Hawaiians across the archipelago to get even broader input. Cultural objectives are incorporated in the site’s overall 15-year management plan, a milestone achievement for the administering agencies (PMNM 2008). Regulations governing the region were developed using Hawaiian terms and definitions to set permit criteria.

Protection of Native Hawaiian practices and subsistence use is also a priority outlined in policy. The Proclamation that designated the NWHI as a MNM has critical language that protects cultural values and activities in the region. It states that permissible activities include those that “support or advance the perpetuation of traditional knowledge and ancestral connections of Native Hawaiians to the Northwestern Hawaiian Islands.” The original NWHI CRER goals and objectives, as well as those of the PMNM also reinforce this position. Native Hawaiian practices means cultural activities conducted for the purposes of perpetuating traditional knowledge, caring for and protecting the environment, and strengthening cultural

Table 2. Guiding principles for considering Native Hawaiian cultural resources in the management of PMNM (Native Hawaiian Plan for PMNM, in prep.).

All natural resources are cultural resources
Reciprocity is fundamental to the sustainability of human relationships with the surrounding world
Hawaiian language is fundamental to Hawaiian knowledge; Hawaiian knowledge is fundamental to understanding, utilizing, and protecting Hawaiian cultural resources
Diversity in Hawaiian cultural perspective, knowledge, and tradition is important and should be nurtured.
Hawaiian inquiry methods utilize all senses and are often interpreted through a mix of intellectual, emotional, and spiritual functions.
Important factors that support rigor in Hawaiian inquiry and cultural practice are time (both specific time and the long-term duration of time), place (specific place that aligns with broader purpose), and observer (his/her familial and knowledge genealogies, the levels of skill and knowledge s/he has attained, and his/her intentions)
Mastery in a cultural practice is indicative of one’s suitability to access PMNM for the purposes of perpetuating said practice.
Human resources directly impact capacity to manage cultural resources.
The cultural skills and knowledge of a resource manager (and the proficiency with which he/she applies them) directly impacts the natural/cultural resources for which he/she is responsible.

and spiritual connections to the NWHI that have demonstrable benefits to the Native Hawaiian community. This may include, but is not limited to, the non-commercial use of Monument resources for direct personal consumption while in the Monument.

Hawaiian cultural practices, research, & integration efforts

Papahānaumokuākea is a place where efforts towards perpetuating cultural practices and the pursuit of traditional ecological knowledge are paramount. As the only intact cultural voyaging seascape in the Hawaiian Islands, it is one of the few places where traditional wayfinding can be conducted successfully. Ecosystem integrity is essential as it allows for a holistic understanding of the natural rhythms and processes that drive the cultural seascape. This setting greatly enhances apprentice navigators' holistic understanding of the land, sky, and sea. Voyaging traditions in the NWHI were maintained well into the 20th century by families from Kaua'i and Ni'ihau for subsistence practices demonstrating the longevity of this practice surviving in the region (Tava and Keale 1989; Maly and Maly 2003).

In recent years, there has been a resurgence of Native Hawaiian cultural practitioners voyaging to the NWHI for cultural practices and to conduct research. In the early years of the NWHI CRER (2000–2005), there were only three Hawaiian practices access permits issued. These early trips however were the most critical because they happened during a period of cultural rediscovery to this region. The most noteworthy trips occurred in 2003 and 2005, when voyaging canoes took Hawaiian cultural practitioners to the islands of Nihoa and Mokumanamana to track the summer solstice and the changing of the seasons for ceremonial purposes. In 2004, the traditional voyaging canoe Hōkūle'a sailed ~ 2000 km to the most distant end of the archipelago to visit Kure Atoll as part of a statewide educational initiative called "Navigating Change." These efforts strengthened cultural ties of Native Hawaiians to PMNM and enhanced the public's awareness of the cultural value of the region.

After establishment of PMNM in 2006, Hawaiian cultural practices increased markedly, with at least 8 ongoing cultural initiatives occurring on 27 separate expeditions. These permitted activities helped contribute towards the active management of PMNM and were closely aligned to its goals. These activities ranged from: a) traditional voyaging navigator apprenticeship and training; b) integrated cultural and scientific ecosystem monitoring; c) cultural observations of natural cycles and seasonal changes to document traditional ecological knowledge; d) archaeological and cultural resource research that helped to document, assess, and protect Hawaiian cultural sites; e) resource gathering; and f) utilization of the place as a living classroom for university courses on language and cultural studies (PMNM 2009; PMNM 2015).

Integration of science and culture into research is also being developed in PMNM. One example is the production of one of the first climate vulnerability assessments that incorporates indigenous perspectives (Table 3, Wagner and Polhemus 2016). Results from this assessment warned that impacts of climate change could potentially impair Hawaiians' ability to experience ancestral connections to the natural environment. Climate change could potentially alter weather patterns, ocean currents, ecosystems, and species composition and availability, resulting in traditional ecological knowledge and weather forecasting becoming less meaningful, or even misleading. Traditional voyaging, as one of the primary cultural training activities in the Monument, could also be significantly affected. Alternatively, an unintended consequence could be that climate change could stimulate further reconnection

Table 3. Impacts and opportunities of climate change on PMNM's cultural resources (Wagner and Polhemus 2016).

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- More frequent or intense storms could damage archeological and sacred sites on Nihoa and Mokumanamana; intensified rainfall and sea-level rise could uncover or submerge ancestral bones (*iwi kupuna*)
 - Ecological extinctions and degradation resulting from climate change may increasingly impact Native Hawaiians' ability to care for their ancestors
 - Ecological extinctions and degradation resulting from climate change are likely to reduce the opportunities for Native Hawaiians to experience kinship with all things
 - Ocean acidification and other changes in climate variables and marine ecosystems are likely to impact species of significance to Native Hawaiians
 - Changes in weather, currents, ecosystems, and species may reduce the ability of Native Hawaiians to experience their ancestors or to experience the NWHI as their ancestors did
 - Changes in weather, currents, ecosystems, and species, may erode the accuracy and meaningfulness of centuries of accumulated traditional knowledge
 - Warmer temperatures may create disrupt outdoor ceremonies and protocols
 - The importance of Papahānaumokuākea as a sacred place in Hawaiian cosmology is unlikely to be affected by climate change, because this status comes from Hawaiian oral traditions and geological history, which will not be altered by changing environmental conditions
-

with Native Hawaiian traditional knowledge, since understanding the range of natural variability is something that has been observed by Hawaiians over centuries (see Turner and Clifton 2009). The exact impacts of climate change are uncertain but changes to this unique and nearly pristine ecosystem can affect both natural and cultural values of the Monument.

Management activities in Papahānaumokuākea are bridging a historical divide between traditional and scientific resource management approaches that has persisted in Hawai'i for over a century. The creation of cross-functional teams for granting access privileges has been an important accomplishment towards integration- one that acknowledges the landscapes, seascapes, and all living things as bio-cultural resources. Originally, biological monitors from federal management agencies were assigned to access trips to ensure that natural resources were protected. More recently, cultural monitors were assigned to biological access so that cultural values and dimensions of management were also addressed. It is now common for western scientists to join Native Hawaiian practitioners on expeditions aboard traditional voyaging canoes. Likewise, Native Hawaiian cultural specialists join scientific studies of terrestrial resources, intertidal zones, and monk seals, helping to teach and lead these researchers in cultural protocols. This integration has allowed for a greater understanding and cohesion of both culture and science in the management of PMNM.

Education and public engagement

Education and public engagement is also a priority in the management of PMNM, and several steps have been taken toward integrating culture into educational and outreach efforts. One of the largest of these efforts has been "Navigating Change," an education and outreach partnership created in 2001 among NOAA, FWS, the State of Hawai'i, the Polynesian Voyaging Society (PVS), Bernice Pauahi Bishop Museum, and other groups. This initiative includes classroom curricula and multimedia materials, and utilizes Native Hawaiian voyaging practices and cultural values to engage students and the public to care for the environment. The NWHI is used as a learning model to teach about ecological health and inspire communities and programs to be better stewards of the MHI. Together, the collective partners have coordinated voyages by the Hōkūle'a to the NWHI, and connected them to local educational outreach efforts through video links to public classrooms.

The Mokupāpapa Discovery Center in Hilo, Hawai'i Island has been another major effort towards education and outreach. The Center was established in 2003 in conjunction with NWHI CRER to interpret the natural science, culture, and history of the NWHI. Since Monument creation in 2006 and its World Heritage Site inscription in 2010, Native Hawaiian values and histories have been integrated into the exhibits and displays. Both English and 'ōlelo Hawai'i (Hawaiian language) signage are present and strengthened by bilingual docents. Since most people will never visit these remote islands, the facility serves to “bring the place to the people” and create greater public awareness of the region and ocean conservation issues. Mokupāpapa features a 13,000 l saltwater aquarium, interactive educational exhibits, lifesize models of NWHI wildlife, and artwork inspired by the NWHI and Hawaiian culture.

A number of important partnerships have been established between Papahānaumokuākea and the University of Hawai'i (UH) system to establish university accredited courses. In 2002, The NWHI CRER funded the Kamakakūokalani Center for Hawaiian Studies at UH Mānoa to conduct cultural research, produce an information video, and create a Hawaiian Studies NWHI course framed in a Hawaiian perspective. The Monument, in collaboration with UH Hilo's Hawaiian Language and Marine Science programs, developed two courses related to research that enabled students to travel to the NWHI as part of the class. Papahānaumokuākea offers a vast, sacred, and protected classroom, which cannot be recreated or modeled anywhere else on earth. More field courses to PMNM are currently being planned, which is consistent with current educational studies that shown that Native Hawaiian learning continues to be most productive when done experientially (Tibbetts 2006).

Educational efforts towards creating a cultural database of information for the region has also been initiated. The Bishop Museum, with the support of the NWHI CRER, conducted an early project to help inventory archival collections in some of the main Hawai'i repositories for cultural materials related to the NWHI. They developed an online annotated bibliography of cultural resources and a comprehensive database. The database included holdings available in the Bishop Museum's Library and Archives, the libraries at UH Mānoa, and the State of Hawai'i Archives, all of which are valuable repositories to researchers and others interested in the NWHI.

The global impact to LSMPAs and marine protection

When Papahānaumokuākea was established, it was a groundbreaking idea that management of a large-scale protected area could recognize both natural resources and cultural resources (Wiener and Wagner 2013). Papahānaumokuākea's successful co-management structure and incorporation of Native Hawaiian values in its creation and management serves as a model for other conservation areas around the world. Since the establishment of Papahānaumokuākea, a number of nations have established large-scale MPAs (LSMPAs > 100,000 km²), and many have integrated traditional knowledge and cultural values into these processes (Toonen et al. 2013).

Cooperation, alliances, and sharing of information have been essential to the success of LSMPA networks, as many of the existing LSMPAs consist of remote islands in the Pacific, and thus are connected by common history, culture, and ancestry (Wilhelm et al. 2014; Friedlander et al. 2016). The similarities and connections between these islands make it important to further common ties across national jurisdictions and share lessons learned to

Table 4. Examples of cultural integration into different dimensions of management for Papahānaumokuākea Marine National Monument.

Areas of innovation	Cultural integration examples
Governance and management structure	<ul style="list-style-type: none"> • Native Hawaiian elevation to PMNM Trusteeship (2016) • Native Hawaiian representation in PMNM Co-Management (2008) • Native Hawaiian CWG advisory body (2000–2006, 2006–2017) • NWHI CWG RAC Representatives (2000–2017) • Three positions dedicated to Native Hawaiian programmatic goals (1 NOAA; 2 OHA)
Integrated policies, plans, and protections	<ul style="list-style-type: none"> • Proclamation/EO Language • Mission of the Monument • Native Hawaiian Plan/ Monument Plan • Explicit Protection of NH Rights
Cultural practices and research	<ul style="list-style-type: none"> • Increased support for Native Hawaiian integrated research with scientists, cultural access, cultural research, subsistence practices, voyaging training, and cultural ceremonies • Integrated Research Efforts- example Climate Change Vulnerability study • Development of Biological/Cultural Monitors for cross functional teams during access
Education and public engagement	<ul style="list-style-type: none"> • Outreach to Local schools and organizations • Development of Discovery Center • Collaborative partnerships with orgs and universities • Development of University courses that Integrated perspectives to learning about biocultural resources. • Development of database for cultural information

NH = Native Hawaiian.

achieve long-term sustainability. Collaborations among LSMPAs in the Pacific include bilateral agreements, learning exchanges, as well as research, monitoring, and enforcement activities (Friedlander et al. 2016). An example of this collaboration was the creation of the Pacific Oceanscape Initiative in 2009, a network endorsed by 23 Pacific Island nations to conserve and sustainably manage this vast region.

The distinctive challenges faced by LSMPAs led to the creation of Big Ocean: A network of large-scale marine managed areas, established in 2010 to improve global marine conservation efforts by sharing information, expertise, and resources among managers of the world's largest MPAs (<http://www.bigoceanmanagers.org/>). In addition, the IUCN LSMPA Task Force was also developed and has recently created best practice guidelines for the design and management of LSMPAs, with explicit guidance on the inclusion of cultural values, traditional knowledge, recognition of sacred areas, and indigenous community empowerment in LSMPA management (<http://bigoceanmanagers.org/large-scalemarine-protected-area-guide/>)

LSMPAs provide unique opportunities to protect cultural seascapes and help perpetuate long practiced oceanic traditions (Wiener and Wagner 2013; Gaymer et al. 2014). While cultural heritage is not always an obvious objective in the establishment of LSMPAs, inclusion of cultural values helps garner public support throughout the process, particularly in Oceania, where the connection to the sea is so great (Wilhelm et al. 2014; Friedlander et al. 2016).

Conclusions

Papahānaumokuākea is a model of how culture can play an essential role in marine protection of large-scale ocean areas. It is a vast cultural seascape for Native Hawaiians that

provides a genealogical connection to their ancestral environment. This connection is supported by Hawaiian cosmology, traditional knowledge, their political ties to the region, and a long history of navigational, spiritual, and other uses that customarily continue. This bio-cultural approach has increased our understanding of the physical, spiritual, and intellectual functions and role of places to people, shaping access requirements, best management practices, and required pre-access training. The success of this work has begun to demonstrate the broad application and relevance of traditions and practices to conservation science, education, policy, and law today.

PMNM provides concrete examples of how cultural knowledge is integrated across four dimensions: (1) governance and management structure, (2) policies, plans, and protections; (3) cultural practices and research; and (4) education (Table 4). At the highest levels of governance, management, and policies, true integration is happening as culture and Native Hawaiians are interwoven into the framework of how PMNM makes decisions and the direction it is undertaking. Daily operations, such as cultural practices, research, and education are often happening in parallel to biological and marine conservation efforts.

The global impact of Papahānaumokuākea is evident in the influence it has had in the movement to establish LSMPAs around the world. The establishment and success of LSMPA networks is an important success, one that is predicated on shared indigenous values, knowledge, and practices in management. The recent expansion of Paphānaumokuākea has highlighted the significant role Native Hawaiians as indigenous people can have in marine protection, and demonstrates the essential contribution that traditional culture can make towards global ocean conservation.

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