PILINA — MĀLAMA — ʻĀINA MOMONA
A COMMUNITY-DRIVEN MONITORING PROGRAM TO UNDERSTAND HEALTH AND
WELL-BEING OF PEOPLE AND PLACE IN HĀʻENA, KAUAʻI.

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Dedication and Acknowledgements

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Abstract

Indigenous communities assess health and well-being holistically because they view people, place, and resources as interconnected. Contrary to this, centralized governance systems use monitoring tools of selected resources rather than connecting across to ecosystems and human well-being. In Hawaiʻi, there is a shift towards community-based fisheries management. However, communities are struggling to balance their ways of understanding resource health under the governing standards of scientific rigor, and monitoring expectations. Lack of integrative monitoring that addresses resource health is a critical gap in community-based management. The purpose of this project was to develop a community-driven monitoring program in Hāʻena, Kauaʻi. I used a Community-based Participatory Research approach of mixed methods such as focus groups, coastal monitoring, and seasonal observations. The results of this project offer a process in a holistic understanding of resource health, integration of knowledge systems, building relationships and community collaboration towards *ʻāina momona*, a thriving people and place.

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List of Acronyms and Abbreviations

CBSFA – Community-Based Subsistence Fishing Area
CBMRM – Community-Based Marine Resource Management
CBPR – Community-Based Participatory Research
CMMA– Community-Managed Marine Area
CMT – Customary Marine Tenure
CRAMP – Coral Reef Assessment Monitoring Program
DLNR – Department of Land and Natural Resources
DAR – Division of Aquatic Resources
FMAs – Fishery Managed Areas
HCSN – Hawai'i Community Stewardship Network
IEK – Indigenous Ecological Knowledge
KCC – Kaua'i Community College
KPCS – Kawaikini Public Charter School
KUA – Kua'āina Ulu 'Auamo
LEK – Local Ecological Knowledge
MLCDs – Marine Life Conservation Districts
MMAs – Marine Managed Areas
MPAs – Marine Protected Areas
NKA – Nā Kilo 'Āina
NMOP – Nā Maka o Papahānaumokuākea
NPN – Nā Pua No'eau
NOAA – National Oceanic and Atmospheric Administration
OPIHI – Our Project in Hawai'i's Intertidal
ORA – 'Opihi Rapid Assessment
PIPES – Pacific Internship Program for Exploring Sciences
RCUH - Research Corporation of University of Hawai'i
TEK – Traditional Ecological Knowledge
TNC – The Nature Conservancy

Pilina – Mālama –ʻĀina Momona Moʻolelo

A wise woman once told me that our degrees should be for the communities that we serve now and into the future. This is my journey towards a Master's degree for the community of Hāʻena, Kauaʻi.

My journey begins with PILINA. I started off as something similar to a "bag girl" when going fishing with the Uncles. Just sit back and learn, watch, observe, KILO, listen. Don't ask stupid questions. Just follow uncle's footsteps. Watch his technique. Learn the marine life cycles and patterns, and learn the history and place names of the Hāʻena.

MĀLAMA: Then, once you learn about the people, the place, the depth and intricacies of pilina, the practices and values. How will you mālama based upon these relationships? After starting off as the bag girl who sat back and observed, it then becomes the task of putting these values, relationships and teachings into practice, and making sure that the right tools and steps are used to properly mālama.

ʻĀINA MOMONA: Finally, after observing, building pilina, learning about Hāʻena values and place-based knowledge, and integrating different methods. How does this all lead to ʻāina momona? ʻĀina Momona is about addressing community health and well-being on a holistic scale. From being just the bag girl to a wahine lawaiʻa with the task to cast a wide net that feeds a community.

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I. Introduction

The goal of this project was to establish a community-driven monitoring program in Hāʻena, Kauaʻi based on holistic understandings of resource health and abundance, integration of different knowledge systems, and building meaningful relationships and community collaboration. Hāʻena, Kauaʻi is the third community in Hawaiʻi designated as a Community-Based Subsistence Fishing Area (CBSFA), and is the first community to officially adopt an administrative rules package endorsed by the State of Hawaiʻi. CBSFAs "reaffirm and protect fishing practices customarily and traditionally exercised for purposes of Native Hawaiian subsistence, culture and religion" (Vaughan & Vitousek 2013; Higuchi 2008). CBSFA is one model of contemporary resource management in Hawaiʻi that empowers communities to create co-management rules for nearshore fisheries based on traditional practices and knowledge of the area (Friedlander *et al.* 2013). The monitoring program developed through this research was grounded in traditional values and knowledge, and built on local collaborative partnerships to support the Hāʻena community's goal towards becoming self-reliant stewards of their place.

My thesis is organized into three major sections *Pilina, Mālama* and *ʻĀina Momona*. I have included *moʻolelo* (stories) between each section to share a personal reflection of my journey throughout this project. Following each *moʻolelo,* I share the methods and results for each section. Lastly, I will end with a final discussion to re-visit my research questions and answers from the three sections.

1.1 Indigenous and Western Knowledge Systems

Indigenous knowledge systems are founded on place-based interactions and intimate relationships that are shaped by a cultural group's beliefs, practices, past knowledge and experience (Gegeo & Gegeo 2001, Naniʻole & Meyer 1998). Indigenous communities use their bodies and senses as conduits of intelligence to internalize conscious observations because they understand that there is no separation between them and the natural world (Berkes *et al.* 2000, Gegeo & Gegeo 2001, Naniʻole & Meyer 1998, Olivera 2014). Indigenous epistemology is the process through which a cultural group creates and constructs knowledge to shape thinking and behavior (Gegeo & Gegeo 2001). Local ecological knowledge (LEK), (also known as traditional or indigenous ecological knowledge) is a knowledge-practice-belief system that is transmitted through intergenerational knowledge (McMillen *et al.* 2014, Drew 2004, Berkes *et al.* 2000).

These cross-generational worldviews and reciprocal relationships are essential to morals, values, and survival in indigenous communities (Poepoe *et al.* 2007, Berkes *et al.* 2000).

Western science, also referred to as institutional science, is a globally accepted knowledge system that uses empirical evidence, quantitative data collection and scientific measurements (He 2012, Spellerberg 2005). Environmental management institutions and government agencies rely on western science because it uses cost-effective, repeatable, and transferable methods. These methods produce quantitative data for responding to changes in the environment and promoting policy change (Aswani 2011, Dale and Armitage 2011, Roberts 1998). In marine systems, fish biomass and benthic cover are common measures of nearshore ecosystem health. However, benthic monitoring has been criticized because it is costly, time consuming, requires specific scientific knowledge, and is not congruent with the interest of resource users and the needs of resource managers (Leopold *et al.* 2009). Quantifying fisheries health generally includes a two-part approach involving fishery-dependent (e.g. information about the fishery such as catch rates) and fishery-independent methods (e.g. in-water assessments or remote imaging). Underwater visual survey methods involve belt transects, stationary point counts, and timed swims (Murphy & Jenkins 2010) designed to collect data of species diversity, distribution, and biomass.

Integrating both traditional and western knowledge systems into monitoring marine resources can build holistic long-term qualitative and quantitative data sets, and empower a community to improve marine resource management (Tremblay *et al.* 2008, Moller *et al.* 2004). A recent meta-analysis of environmental conditions and socioeconomic drivers of global coral reef fish biomass revealed that strong socio-cultural institutions such as customary marine tenure, high levels of local engagement, and high dependence on marine resources enhances resilience to mitigate against fisheries decline (Cinner *et al.* 2016). When the community is dependent on natural and cultural resources not solely for recreation or commerce, but for subsistence and the continuation of culture, they can play a major role in driving bottom-up solutions.

1.2 Oceania Contemporary Marine Management

The indigenous people of Oceania have traditionally managed resources in a place-based manner, but now find themselves under a centralized governance system. In response to ineffective top-down governance, there is a growing movement for restoration of community-based marine resource management (CBMRM) and customary marine tenure (CMT). CBMRM and CMT are pathways towards self-determination that allow indigenous people to control their own activities on traditional nearshore fishing grounds (Aswani 2011, Johannes 2002). As an example, the island nation of Fiji led the development and implementation of a vast network of locally-managed marine areas (LMMA). Non-governmental organizations (NGOs) and government ministries work with communities to support bottom-up management that promotes productive ecosystems, healthy communities, and abundant marine resources (Tawake & Tuivanuvou 2004). Some of the success of the Fiji LMMA is attributed to community support for the adaptive management system and the long-term commitment of co-management partners (Weeks & Jupiter 2013).

Other approaches used throughout Oceania, have included spatial marine management as a complex tool designed to meet biodiversity and fishery management goals (Christie & White 2007). Marine Protected Areas (MPAs) is a type of spatial management that can include partial or full closures, rotational and seasonal areas, gear and/or species restrictions, and customary/ community managed areas (Halpern 2014, Jokiel *et al.* 2011, Johannes 2002,). They are most effective in restoring fish biomass when they are no-take, well enforced, more than ten years old, larger than 100 km^2, and isolated by deep water or sand (Edgar *et al.* 2014). However, MPA networks require further research to address both ecological and socio-economic needs (White *et al.* 2006). Customary tenure and management are important components of creating an effective MPA including other key factors (Cinner *et al.* 2016, Edger *et al.* 2014). Jupiter *et al.* (2012) suggested that management outcomes in the Pacific Islands can be strengthened through: building on foundations of customary management practice and social networks, decentralizing management, empowering communities to plan and implement, and extending local frameworks into national governance.

1.3 Integration of Indigenous and Western Knowledge

Integration of indigenous and western knowledge enhances local level management, responds to large-scale environmental changes, and increases social-ecological resilience (Gratani *et al.* 2011, Berkes *et al.* 2007). LEK has been successful when incorporated into monitoring programs because it provides historical and contemporary baselines, recognizes and interprets change, and builds local community capacity (Thorton & Scheer 2012). This is especially important in communities where LEK is still perpetuated because it strengthens cultural values and allows local communities a greater political voice for informing new management regimes (Silvano & Jorgensen 2008, Wilson *et al.* 2006). Indigenous ecological knowledge provides baseline documentation, and integration of western tools that can build on the existing body of knowledge to help detect changes in the environment (Pattengill-Semmens & Semmens 2003). Pacific Islanders have been using traditional knowledge to practice what is now called community-based monitoring (Johannes 2002).

Community-based monitoring (CBM) and citizen science can play an important role in integrating knowledge systems, improving conservation science, and enhancing natural resource management (McKinley *et al.* 2016, Bjorkman Nyqvist & Svensson 2007). CBM is a monitoring approach that involves local stakeholders to design, collect data, and interpret the results of their monitoring program (Dickinson *et al.* 2010, Danielsen *et al.* 2009). Citizen science is another monitoring approach that is similar to CBM but includes any willing volunteers, non-local community members, tourists and visitors to collect data (Conrad & Hilchey 2011). In citizen science projects, scientists usually design the monitoring program whereas CBM projects allow local communities to incorporate traditional knowledge (Thorton & Scheer 2012, Danielsen *et al.* 2009). However, there is still a lack of recognition, respect, and translation of indigenous knowledge and science in ways that are comprehensible for decision makers (Gratani *et al.* 2011, Berkes *et al.* 2007, Mazzocchi 2006).

Monitoring systems that integrate indigenous and western knowledge are rare and still embedded in scientific methods and approaches (Thornton & Scheer 2012, Conrad & Hilchey 2011, Dickinson *et al.* 2010, Danielsen *et al.* 2009,). This lack of recognition and respect is apparent in the language of peer review articles where researchers describe their CBM projects. For example, Fijian community members were referred to as "non-experts" when compared to "expert" scientific researchers after being trained in fish monitoring for over a decade. The study

concluded that if community members were well trained then they could provide reliable information for large and "conspicuous" fish (Hassell *et al.* 2013). CBM and citizen science has been criticized for producing low data precision and accuracy, with much time investment in training to ensure reliable data (Hill and Wilkinson 2004).

1.4 Hawaiian Values and Knowledge System

The traditional worldviews of Native Hawaiians are similar to those of other indigenous peoples through perceiving health of a place as a reflection of the health and practices of its people, and vice versa (Poepoe *et al.* 2007, McGregor *et al.* 1998). Hawaiian intellect is not separate from the body because the body is a conduit of knowledge that internalizes and memorizes inter-generationally (Olivera 2014, Naniʻole & Meyer 1998). Olivera (2014) describes this as Ancestral Sense Abilities and identifies eight different senses that are the foundation of Hawaiian knowledge systems: 1) *Listening* to the audible clues of our surroundings and the teachings of *kūpuna* (elders). 2) *Taste* grounded in the place recalls certain events. 3) *Touch* recognizes textures and to feel intimate relationships through physical contact. 4) *Smell* is connected to a place that triggers memories, ancestral knowledge and awareness of surroundings. 5) *Naʻau (gut)* is instinct and intuition that emanate internally from the knowledge base you are born with between ancestor and descendant. 6) *Kulāiwi (native land, homeland)* is a profound connection to the place of your ancestors where a deeper responsibility is recognized. 7) *Au ʻĀpaʻapaʻa (ancestral timekeeping)* is timeless observation and in-depth relationships to the environment. 8) *Moʻo (succession)* honors the lineage and succession of generational knowledge (Olivera 2014).

Health is measured spiritually, culturally, mentally, and physically because this enables Native Hawaiians to function in the spaces around them (McGregor *et al.* 1998, Naniʻole and Meyer 1998). When these relationships and ways of knowing are put into practice, proper behavior becomes a responsibility and expectation in guiding the way of life, which evolves overtime to a specific place (Andrade 2008, Poepoe *et al.* 2007). Reciprocal relationships are essential for maintaining balance of healthy lands, oceans, and people. Traditional management was focused on small-scale fisheries that were managed according to place and resource abundance by a hierarchy of *aliʻi* (chiefs), *konohiki* (resource managers), and *makaʻāinana* (commoners) (Friedlander *et al.* 2013). However, there were times where bottom-up governance

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was practiced when *maka'āinana* rebelled against self-serving actions of their chiefs (Malo 1951).

Poepoe *et al.* (2007) describes three reciprocal and spiritual relationships that are fundamental in the Hawaiian culture. ***People-Land Relationships*** refers to human interconnectedness to all life forms of the universe through webs of reciprocity and familial relationship (Andrade 2008). *"The 'āina serves as the basis for family and community cohesion and continuity, well-being and spirituality, customs and practices, indigenous rights and traditional economics (subsistence)"* (McGregor *et al.* 1998). One example of People-Land relationships in Hawai'i is the Kumulipo, which is a cosmological chant about the creation of life that originated from the coral polyp to eventually mankind (Beckwith 1951). The Kumulipo is a treasured recollection of Hawaiian worldviews, thus reinforcing and recognizing that people are descendants of the natural world and we are servants to the *'āina*.

People-People Relationships are the core of social and educational units in Hawaiian society (McGregor *et al.* 1998). The *konohiki* system is one example of stewardship and social roles to facilitate a subsistent lifestyle within an *ahupua'a*, land division usually extending from the uplands to the sea (Pukui & Elbert 1986). The land and ocean resources were held in trust by *ali'i*, and the *konohiki* (head of *ahupua'a* division) coordinated stewardship and harvest rights on behalf of the *ali'i*, and the *maka'āinana* worked the land (Titcomb 1972). Within the *ahupua'a*, resources were shared and exchanged, and everyone had a contributing role to this complex social system (Vaughan & Vitousek 2013, McGregor 2007, Kirch 1989).

People-Ancestors Relationships can be manifested in numerous forms to capture and reinforce the importance of these relationships. Some examples are physical structures, *mo'olelo* (histories), *pule* (prayers), *ho'okupu* (offerings), *mele* (songs), *oli* (chants), and *'ōlelo no'eau* (Hawaiian proverbs) (Jokiel *et al.* 2011). Another example of these manifestations is *ko'a* (fishing shrines) built along the coastline as physical representations to encourage congregation of *i'a* (fish or food) and productivity; a site for fishers to make offerings and to pray for protection and success; and to acknowledge *Kū'ula Kai*, god of fishing, along with his wife *Hina* and their son *'Ai'ai* (Manu & Kawaharada 2006). These three types of relationships, people-land, people-people relationships, and people-ancestors, reinforce their role in perpetuating Hawaiian values and knowledge as a means of holistic livelihood.

1.5 Hawai'i's Contemporary Management

Large human population, pollution, land development, and overfishing pose major threats to Hawai'i's coastal ecosystems (Friedlander *et al.* 2013). Anthropogenic impact is responsible for substantial habitat degradation and resource exploitation especially in areas that are easy to access and in close proximity to urban areas. Areas of high human disturbance are correlated with a decline in resource fish species except when there are physical barriers that limits access (Williams *et al.* 2008). Currently, the State of Hawai'i struggles to effectively manage coral reef ecosystems and fisheries due to limited resources and low compliance and enforcement (Friedlander *et al.* 2013, Tissot *et al.* 2009, Friedlander *et al.* 2005). The State of Hawai'i's marine rules and regulations include species-specific minimum size limits, gear restrictions, bag limits, and spatial closures with varying levels of marine protection (Friedlander *et al.* 2013). Most management tools are blanket regulations that are uniform across the Hawaiian Archipelago and do not account for smaller-scale variation occurring at the local level.

In response to the degrading health of coral reef ecosystems and fisheries, there has been a shift towards co-management between local communities and the State of Hawai'i to manage cultural and natural resources (Jokiel *et al.* 2011). Community-managed marine areas (CMMAs) is a general term used to describe co-managed areas where regulations range from no-take marine protections to limited gear types or species-specific bans. CMMAs are most effective in protecting standing fish stocks when the location is remote and access is limited (Edgar *et al.* 2014). Low human population and extreme ocean conditions are factors that correlate with higher fish biomass and diversity (Friedlander *et al.* 2013). However, many local communities in Hawai'i need more legal and scientific support to address the degradation of fisheries health and strengthen community management efforts.

1.6 Integration and Community-Based Monitoring in Hawai'i

Monitoring of resource health and abundance is a key area of need for Hawai'i communities, but fisheries are inherently challenging to monitor. The health of global fisheries stocks is difficult to assess because of the complexity of fisheries and data limitations. Furthermore, the State of Hawai'i is under-resourced and has limited capacity to monitor in only a small subset of locations statewide (Jokiel *et al.* 2011). Hawai'i's Division of Aquatic

Resources (DAR) currently uses a western scientific set of monitoring methods to assess health and abundance of marine resources. DAR fish surveys are conducted a minimum of 3-4 times a year, and benthic/ coral disease surveys are conducted once every three years (Williams *et al.* 2006). In 2004, the Research Corporation of the University of Hawaiʻi (RCUH) and DAR published a guidebook of different community-based pilot programs and monitoring methods to encourage communities to conduct biological and social monitoring efforts. On Hawaiʻi Island, Kapoho and Miloliʻi community members began Reef and Coastal Watch programs to monitor coral, fish, invertebrates, algae, water quality and human use patterns (Flanders 2004). In Moʻomomi, Molokaʻi, the community group, Hui Mālama o Moʻomomi, works to incorporate traditional knowledge and processes that draw on elements of a *konohiki* system to cultivate community and government support for place-based management (Poepoe *et al.* 2007). Hui Mālama o Moʻomomi developed their own moon and spawning seasonal calendar to increase awareness and consciousness of place, perpetuate traditional processes of collecting knowledge, and encourage proper behavior (code of fishing conduct) between their community and resources (Poepoe *et al.* 2007, Friedlander *et al.* 2002).

Without a traditional management system and broader public support for MPAs, CMMAs allow communities to take leadership roles in forging monitoring programs that can fill data gaps. When developing monitoring programs, communities need to consider what tools are feasible to utilize based on their needs, time, and intimate understanding of place and people. Schemmel *et al.* (2016) collaborated with local communities through a research partnership to integrate fishermen knowledge, fishing practices, and quantitative monitoring of reproductive seasonality for 27 coastal resource fish species. This approach provided a practical and informative way for communities to understand place-specific seasonal spawning of fishes. By creating baseline knowledge of spatial and temporal variation in reproductive activity across Hawaiʻi, the information reiterated the need for highly localized place-based management for effectively managing coastal fisheries. The study also showed that monitoring gonad indices accurately represents spawning behavior compared to examining gonads under the microscope. These types of research partnerships can equip communities with the information and methods to enhance place-based resource management. Local knowledge has been praised and utilized to integrate traditional ways of understanding resource health into contemporary management

systems. However, local knowledge also continues to be challenged and held to standards of scientific rigor and management expectations (Friedlander 2004).

Research Questions:

1. What is the role of relationships in building capacity for a community-driven monitoring program?

2. How does the selected monitoring approaches help to better understand the natural trends, cycles, and productivity of Hā'ena's coastline?

3. How can a community-driven monitoring program integrate different knowledge systems?

4. What can we learn from this process of establishing a community-driven monitoring program to support community-based resource management throughout Hawai'i and the Pacific?

2. Background

2.1 Study Site: Hā'ena, Halele'a, Kaua'i

Hā'ena is an *ahupua'a* in the *moku* (district) of Halele'a on the northwest side of Kaua'i (Figure 1). The north coast of Kaua'i is a naturally dynamic coastline comprised of numerous freshwater inputs from rivers and groundwater, storms, tsunamis and winter ocean swells (Hoeke *et al.* 2013, Goodell 2015, Hā'ena CBSFA Management Plan 2016). Limahuli and Mānoa valley are both within the ahupua'a of Hā'ena, and receives about 203 – 254 cm of rain annually (Juvik 1998). The *ahupua'a* is approximately 5.5 km long from Naue to Hanakapi'ai. Hā'ena is located in a remote part of Kaua'i, situated at the end of Kūhiō Highway.

Hā'ena is a *wahi pana* (storied place) filled with important cultural sites that are maintained and perpetuated by the native Hawaiian community (Andrade 2008). Some of those cultural sites include Ke Ahu a Laka, which is a *heiau* (temple) dedicated to hula; and Makana, the mountain peak where *'ōahi* (firebrands) ceremonies took place. Evidence of human settlement and subsistence is believed to have been sometime before 1,000 A.D. (Andrade 2008). During a 1900 Census, there were seven households in Hā'ena with Native Hawaiian descent. Demographic changes to Hā'ena began in the early 1900s with construction of Hawai'i Route 560, which provided access to Hā'ena. In the 1930s, a large portion of Hā'ena's land was dedicated to *kalo* (taro, *Colocasia esculenta*) production, which then turned into pasturelands for

pipi (cattle). In 1946 and 1957, Hāʻena was severely impacted by two tsunamis that devastated agriculture, native plants, fishponds, fisheries, and homes thus displacing many families. Overtime, Hāʻena became an ideal destination for tourism, vacation rentals, and film productions. In 2007, a Hawaiʻi Tourism Authority State Park Visitor Survey estimated 708,400 people visited Hāʻena State Park that year (Hāʻena CBSFA Management Plan 2016). Today, a few families with genealogical ties to Hāʻena have maintained their original properties regardless of the tourism and vacation rental influx.
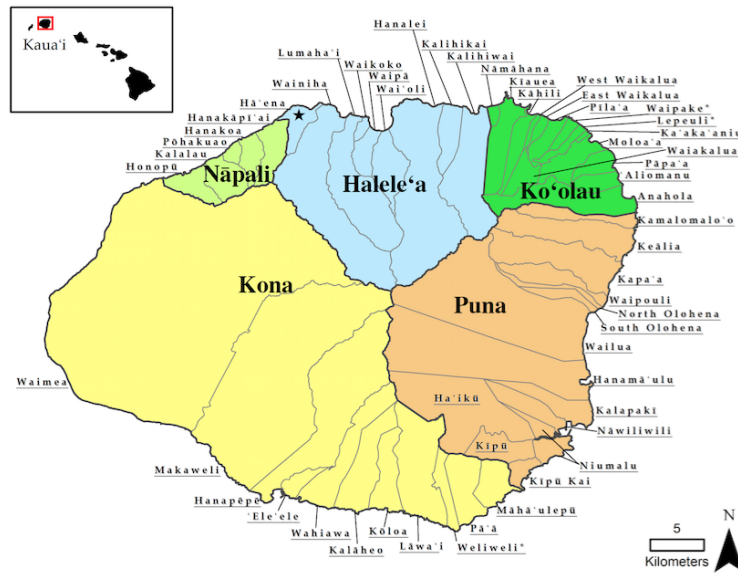
Figure 1. The Hāʻena ahupuaʻa boundary on the north shore of Kauaʻi in the *moku* (district) of Haleleʻa (Winter & Lucas, 2016).

2.2 Hāʻena Customary Values

Andrade (2008) refers to Hāʻena as, "*He ʻĀina Momona*," a place of fertile, rich, abundant resources, and a thriving subsistent community that takes care of this place. In 1999, descendants of Hui Kūʻai ʻĀina o Hāʻena (a land-holding cooperative established in the late 19th Century) formed a 501©3 non-profit organization, Hui Makaʻāinana o Makana with their mission and vision to *"protect and maintain the ʻāina and wisdom of our kūpuna in Hāʻena, Kauaʻi." Makaʻāinana* means the eyes or workers of a place and the *Hui* provides a means for community members to exercise their rights and responsibility as *makaʻāinana* to care and come together for their place. Many of the values have been instilled in them across generations and set the foundation for the work they do and the way they carry themselves.

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Seven customary values and norms (Figure 2) specific to the Hāʻena community were identified through primary source documents from 1840 – 2010 such as: 19ᵗʰ century *moʻolelo*, early written constitutions, studies of case law in Hawaiʻi and oral history of *kūpuna* (Vaughan *et al.* 2016). Table 1 expands on these values by highlighting supporting quotes from extensive interviews conducted in Hāʻena (Vaughan *et al.* 2016, Andrade 2008, Maly & Maly 2003).
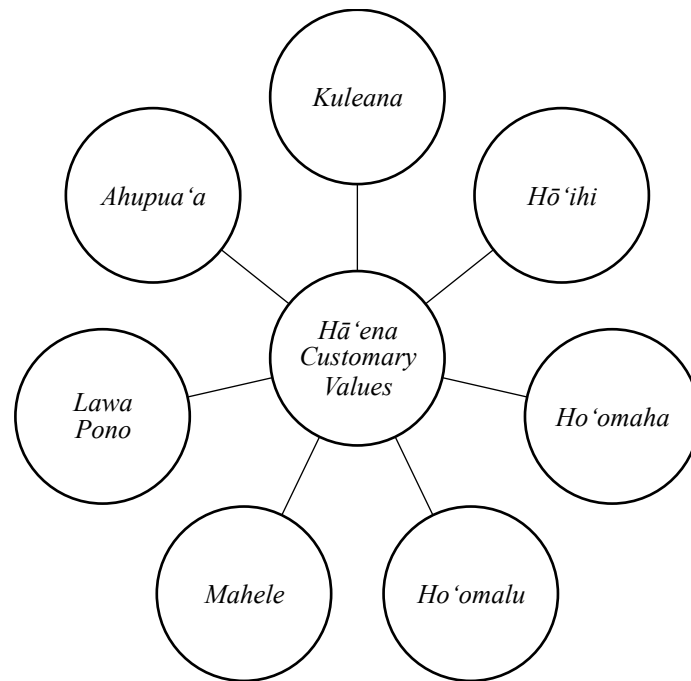
Figure 2. The seven customary values and norms for Hāʻena, Kauaʻi.

Table 1. Hāʻena customary values definitions and supporting quotes.

Value	Definition (Vaughan *et al.* 2016)	Supporting Quotes
Ahupuaʻa	Mountain to sea; integrated management	*"Hāʻena was one ahupuaʻa…we never went beyond Hāʻena. The fish we ate came all from down here. Only Hāʻena. My father never went beyond his place. But others come…because they know what was proper behavior when you live in an ahupuaʻa...nobody else would come in to fish without permission…"* (Hāʻena *Kupuna*, Andrade 2008)

Kuleana	Rights based on responsibilities	*"...they would say 'Hukilau'. We would drop everything and run down to the beach. And all the families had a specific responsibility..."* (Hāʻena *Kupuna*, Maly & Maly 2003). *"...it was her responsibility to go up into Mānoa Valley and pick all the herbs that needed to be picked, to make the food to feed the stone..."* (Hāʻena *Kupuna*, Maly & Maly, 2003).
Hōʻihi	Respect resources as beings, give thanks, respect sacred places	*"My mother was Hawaiian, she taught us to respect the land and the sea. Not to kapulu the kahawai and the kai. When we go up to the mountain, we must respect, don't kapulu the place."* (Hāʻena *Kupuna*, Maly & Maly 2003) *"That's why I say everybody is my family, because you know you just have to respect them like that."* (Hāʻena *Kupuna*, Maly & Maly 2003)
Hoʻomaha	Rotate, let areas rest, flexibility	*"...Grandpa did not fish certain places and he told all the uncles, 'Don't go fish over here for certain months out of the year.' And sure enough, they don't fish, and when they go back, AH! The iʻa stay home again."* (Hāʻena fisherman, Vaughan *et al.* 2016)
Hoʻomalu	Protection, shelter, minimize disturbance	*"...her father instructing her not to walk along the shoreline of a nursery lagoon...instead they walked 100 yards up the beach in the trees..."* (Hāʻena community member, Vaughan *et al.* 2016)
Mahele	Share catch, reciprocal relationships, catch builds community	*"... the reason he was such a successful fisherman, according to kūpuna living today, was that (he) always gave his catch to the community until everyone had more than enough to eat and to dry..."* (Andrade 2008)
Lawa Pono	Take only what you need, limit harvest	*"...Not the kind, you go for kill. Nah, in fact in my life we never did that. Because we always cautious. You know you have to leave some back. So you always get. And this place was always like that."* (Hāʻena fisherman, Andrade 2008)

These relationships and foundational values of the Hāʻena families and community are perpetuated in the way they care for their place. Hui Makaʻāinana o Makana, was built on the premise that it did not matter who owned the land, but rather the most important thing was continual access to care for and harvest biocultural resources so that the traditional diet of fish and *poi* (cooked and mashed taro) would be perpetuated by the families of Hāʻena. In this regard, the Hāʻena community had to navigate engaging different divisions within the Department of Land and Natural Resources (DLNR) in a multipronged approach. One element of this approach

was entering into a curatorship agreement with the State Park Division to manage the traditional *loʻi* (wetland taro field) within the Hāʻena State Park boundaries (Hāʻena CBSFA Management Plan 2016). In 2006, the Hāʻena community's efforts broadened from the *loʻi* to their nearby fisheries. In another prong of this approach, the community and local partnerships successfully lobbied the Hawaiʻi State Legislature for designation as a Community-based Subsistence Fishing Area (CBSFA) and adopted an administrative rules package under DAR in 2016 (Hāʻena CBSFA Management Plan 2016). These two novel efforts to co-manage the *loʻi* and the fishery increases the potential for families of Hāʻena to perpetuate sustainable traditional resource management and feed themselves with their traditional diet. Now that the Hāʻena CBSFA is in place, it needs to be monitored to understand how new rules affect the health of coastal ecosystems. Effective monitoring in Hāʻena can inform adaptive management and maximize the success of community management efforts.

2.3 Management and Monitoring in Hāʻena, Kauaʻi

CBSFAs in Hawaiʻi are an example of place-based management to improve marine resource health by allowing communities to collaborate with the state and create locally-appropriate management approaches (Levine & Richmond 2014, Friedlander *et al.* 2013). Ideally, these CMMAs are based on holistic ecosystem approaches that address both terrestrial and marine ecosystems. Hāʻena's seven customary values are reflected in the communities CBSFA rules package and management recommendations, which were informed by customary fishing practices of Hāʻena (Vaughan *et al.* 2016). The Hāʻena CBSFA designation (Figure 3) includes a no-take *ʻopihi* (limpet, *Cellana* spp.) rest zone, a *puʻuhonua* (place of refuge) to protect critical nursery habitat for juvenile fishes and fishing gear restrictions such as prohibiting spear guns, limiting night fishing to particular gear types, and requiring the use of stick and hand only for gathering certain species (Hāʻena CBSFA Management Plan 2016).
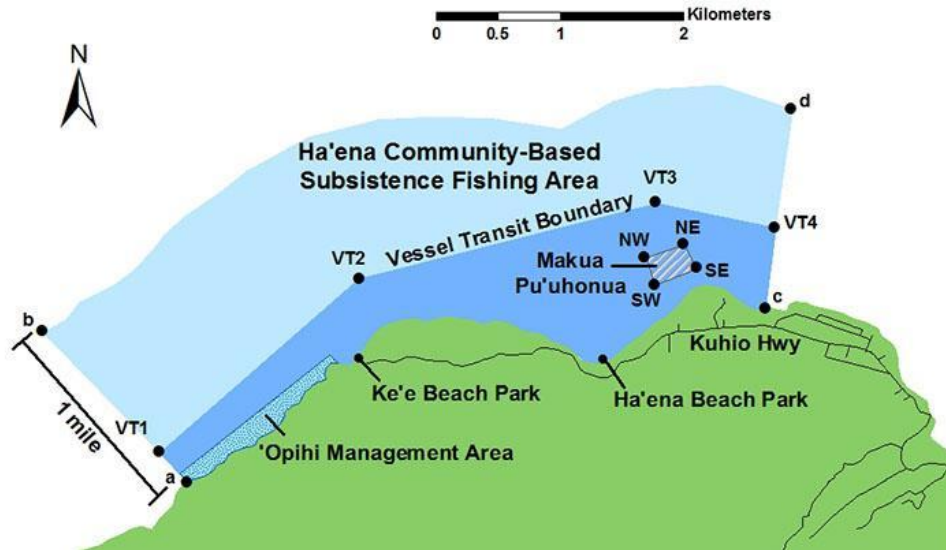
Figure 3. A map of the Hāʻena CBSFA designation.

During the 20-plus year process of working towards a CBSFA, the community collaborated with non-governmental organizations, researchers, and state agencies to conduct biological and social studies. In 1999, the Hawaiʻi Coral Reef Assessment and Monitoring Program (CRAMP) established long-term monitoring sites at Hāʻena to assess the status of coral reef communities as part of a statewide effort (Jokiel *et al.* 2004, Friedlander *et al.* 2003). In 2004, CRAMP again examined coral reef health, percent coral cover, and species presence/absence (Hāʻena CBSFA Management Plan 2016). These CRAMP studies continue today by a team of researchers from the University of Hawaiʻi at Mānoa to assist with CBSFA monitoring efforts (Rodgers *et al.* 2015). In September 2008, rapid assessments of benthic communities were conducted on Hāʻena's nearshore reefs with the help of Hāʻena community members, Hawaiʻi Community Stewardship Network (HCSN) and the National Oceanic and Atmospheric Administration (NOAA). In 2010, SWCA Environmental Consultants compiled a report on Hāʻena's marine natural resources and recreation and recreation assessment (Hāʻena CBSFA Management Plan 2016). Between 2007-09 additional studies included an assessment of benthic and fish communities, reef and recreation mapping, human use surveys, and a catch-per-unit effort survey (Vaughan & Vitousek 2013, Jokiel *et al.* 2004, Friedlander *et al.* 2003).

3. Pilina – Mālama – ʻĀina Momona Framework

This research builds upon past studies of resource health in Hāʻena to work with the community to build a monitoring program, which can be used to assess present day states of abundance and future changes in health. *Pilina - Mālama - ʻĀina Momona* is a three-part framework developed by Nā Maka o Papahānaumokuākea (NMOP) as the foundational process of this project (Figure 4). In the context of this framework, *Pilina* (Andrade 2011) is a strong foundation of intimate relationships to place, people and resources. The relationship also redefines how we perceive health and balance with the world around us to initiate the evolution of how we, as a whole, manage our marine resources and our island homes (Andrade 2014). This then drives the way people *Mālama* (Andrade 2011), which means to take care (care for or tend), interact and behave, and function in a place. These actions and steps support the community's goal of striving towards *ʻĀina Momona,* an overflowing abundance, health and wellness of people, place and resources (Andrade 2011). I utitlized this framework because it supported an indigenous value of maintaining healthy *pilina* that honors the entire community of place, people, and resources. This next section will break down each part of the *Pilina – Mālama - ʻĀina Momona* framework.
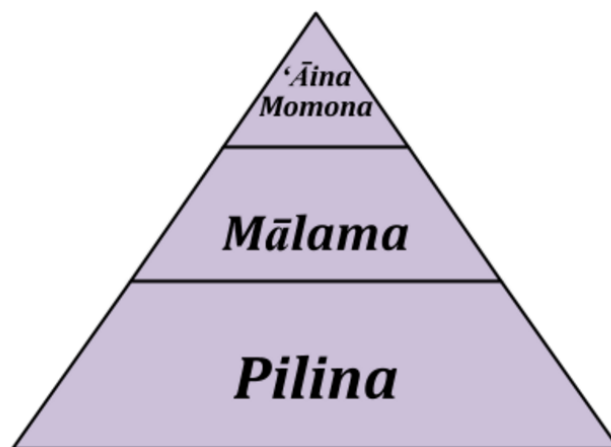
Figure 4. The *Pilina – Mālama - ʻĀina Momona* framework of this project

Pilina Moʻolelo

"*Who you? Where you from?" Trying to answer all her questions but she cuts me off so she can talk…."Do you have a sickle," she asks. "No. But I can go get one," I eagerly reply.*
"Go get one then!" I sprint up the hill to Limahuli Gardens, out of breath I yell, "Kawika! I need a sickle! I just met an Aunty down at the loʻi and she wants me to get a sickle!" Kawika laughs, tells me where to grab one and make sure to bring it back. I sprint back down the hill and clumsily step into the loʻi that she is already working in. Just before my foot touches the mud she yells, "NO NO NO NO. I DON'T NEED HELP IN HERE. YOU GO TO THAT ONE DOWN THERE."
She points to the loʻi at the polar opposite end of the Hui Makaʻāinana o Makana curatorship property. I reach the loʻi that has pukamoi weeds as tall as me. I take a big gulp and begin working. Hours go by in the hot summer sun. I look over at her every once and awhile, and she is still working. No water breaks. No snack breaks. I try to keep up, keep going and going to what feels like 5 hours, but was probably only 2 hours. Finally I am hanging by a thread, dehydrated, and tummy growling as she walks over to me laughing, "Ok stop already…you work too hard. Pau for the day."
Later on the next day my advisor picks me up for a check-in meeting.
"How's it going so far?" she asks. "Well I met one of the Aunties yesterday, she worked me hard in the loʻi," I reply with exhaustion.
"WHAT! You worked with Aunty in the taro patch? That must mean she really likes you because that never happens!"
Apparently the first community member I met, is by far the toughest one out there.

4. PILINA

4.1 Pilina Methods

The foundational and critical first step in the *Pilina –Mālama - ʻĀina Momona* framework was to address the following research question: ***What is the role of relationships in building capacity for a community-driven monitoring program?***

4.1.1 Establishing Relationships

I was first introduced to Hui Makaʻāinana o Makana during my undergraduate studies at University of Hawaiʻi at Hilo (UH Hilo) in a marine science course co-taught by Dr. Misaki Takabayashi and Pelika Andrade called Kūʻula. The Kūʻula course focused on the integration and application of western and traditional knowledge systems in natural resource management. Kūʻula was my first introduction to Nā Maka o Papahānaumokuākea[1] and Pilinakai[2]. In March 2014, our class visited Hāʻena, Kauaʻi, where we met the community and learned about their CBSFA efforts. I was inspired by their undertaking and happened to be applying for UH Mānoa's graduate program in Natural Resource and Environmental Management (NREM) the

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[1] Nā Maka o Papahānaumokuākea (NMP) is a non-profit 501(c)3 working to provide services to our Hawaii communities addressing health and wellness within families, communities, and place (natural resources). Founded in 2008, NMP has been developing programs focused on investing in our communities and the next generation to lay a foundation for change paving the way to redefining health, wellness, and productivity. Most issues we face today are rooted in the misbehavior of people and the values, or lack of, we collectively share today. NMP focuses on addressing people to shift our behaviors, our values and our relationships and including people in healing the natural world around us. NMP strongly believes that the health of our environment is reflected in our people and the health of our people are reflected in our environment and it is a journey we must all take together.

[2] Pilinakai goes beyond the constraints set by Western Science to include and be founded in the core values and relationship of indigenous people to place. Pilinakai is redefining how we perceive health and balance with the world around us to initiate the evolution of how we, as a whole, manage our marine resources and our island homes. Strongly rooted in a traditional relationship to place, Pilinakai monitors our ever-changing landscape through multiple lenses collecting a breadth of information to better understand the natural cycles within our communities, allowing these cycles to define appropriate activities and interactions that ensure a healthy, sustainable environment that can continue to "feed" our people; mind, body and soul. Pilinakai is redefining what questions we ask and also redefines how we choose to heal our islands as Native Hawaiians, as Fishermen, as community members, as western scientists, and as members of our environment. Pilinakai's vision pushes past the intent to simply create indigenous managers but feels it more important to provision our people with responsible ocean dwellers who will continue to care for our islands through traditional relationships utilizing multiple knowledge systems to address cultural needs (Andrade 2011).

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following Fall 2014. After being accepted into NREM, I enrolled as a summer intern with Pacific Internship Program for Exploring Sciences (PIPES), and initiated a summer project to return to Hāʻena under the mentoring of Dr. Mehana Vaughan and Dr. Kawika Winter. The intent of the summer internship project was to build relationships with community members and learn more about their management efforts to ensure that my Master's thesis project would develop into something useful and applicable to the Hāʻena community. In March 2016, Hui Makaʻāinana o Makana hired me as their program coordinator to continue the work I was doing through my graduate studies, and to continue building relationships and educational programs.

4.1.2 Participant Observation

Participant observation is a qualitative process that enables a researcher to learn about the natural setting and activities of the people and place of a particular study (Kawulich 2005). For this project, my participant observation consisted of informal and formal ways of observing and immersing myself in working with the community that first summer, and then through monthly trips to Kauaʻi. This occurred from June 2014 to December 2016.

During the period of my study, I participated in many of the activities of the community including community workdays, *Holoholo* (fishing trips), cleaning fish, cooking, fundraising at local fairs, and hosting visiting groups. I made personal house visits to *kūpuna* (elders) and other community members, conducted mapping exercises of the coast with *lawaiʻa* (fishermen), took field notes, and kept a journal as I got to know the community. Through my position with Hui Makaʻāinana o Makana, I helped coordinate and facilitate education and community groups who visited Hāʻena, including Kawaikini Public Charter School (KPCS). My work with the 5th-6th grade *kumu* (teacher) supported student engagement and supported monthly monitoring activities as well as student learning about Hāʻena in their studies. KPCS students came to Hāʻena once a month to participate in fish and *ʻopihi* (limpets) studies as well as rebuilding of *imu kai* (fish houses).

4.1.3 Participatory Mapping

Participatory mapping is an interactive approach for individual or group activities particularly in qualitative research (Emmel 2008). This tangible feature complements and adds to

the conventional verbal interview. The participatory mapping approach was selected because it is an important tool that is analyzed and understood based upon the meanings and interpretations of the participants. This was essential to the monitoring program because it allowed more in-depth conversations with fishermen about specific ecological information to better understand the Hā'ena coastline. It is important to note that the sensitive information shared in this activity was possible because of the trust and relationships built at the start of the project.

The process began by creating a list of culturally significant marine resources in Hā'ena compiled from various resources such as internal documents, a scientific report (Goodell 2015), a book (Andrade 2008), oral history interviews (Maly & Maly 2003), community meetings, and focus groups (Pascua *et al.* 2016). With this foundational knowledge I engaged five expert fishermen from Hā'ena in the participatory mapping of culturally important marine taxa on the Hā'ena coastline. Each fisherman was given ten stickers and was asked each sticker on any species from the list that was most important to them. Participants were not limited to a certain taxa, but could choose their top ten from any of the three columns on the list: finfish, invertebrates, and algae. The list was then reduced to the top five *i'a* (fish), top three other *i'a* (invertebrates including crabs, limpets, octopus, etc.), and top three *limu* (macroalgae). Next, on a large format (97 x 66 cm) coastline map of Hā'ena (Figure 5), fishermen were given additional stickers and asked to place two stickers next to a location on the coastline that they look for these selected species. After they marked locations for priority taxa, the reef flats (the back reef or zone that is closest to the shore), with the most stickers were identified as priority areas within the 5.5 km coastline.
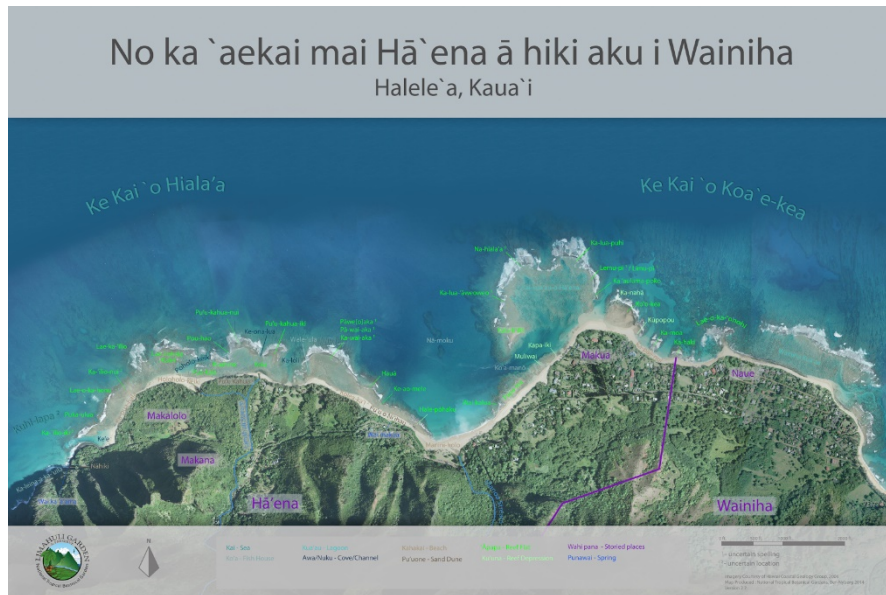
Figure 5. A map of the Hāʻena coastline's place names—including reefs, channels, lagoons, etc.—which was created through a collaboration between Hui Makaʻāinana o Makana and Limahuli Garden and Preserve.

4.1.4 Community-Based Participatory Research

Community-Based Participatory Research (CBPR) is a philosophical and ethical orientation towards research, rather than a specific method (Castleden *et al.* 2015). In CBPR, problems are addressed by integrating the social and cultural dynamics of a community to design projects that improve the overall health and well-being of community members (Minkler & Wallerstein 2011). Community members are collaborative partners involved in every step of the research process from problem identification, research design, data collection and analysis, dissemination of results, and implementation of recommendations (Castleden *et al.* 2015). This same CBPR process was used during the course of my study in Hāʻena, and the community was involved in every step from the very beginning. My work was developed based on community concerns in regards to their fishery's health and their goals towards CBSFA. This effort was meant to be an *ʻohana* (family) and community-based monitoring program that encourages all ages and interested participants. At least ten of the consistent participants came directly from the non-profit organization, Hui Makaʻāinana o Makana.

Snowball sampling is a common chain referral sampling method used in qualitative sociological research (Biernack & Waldorf 1981) where participants suggest other participants. I used this method to reach out to other Hāʻena community members, beyond those who are

actively involved with the Hui Maka'āinana o Makana, but who were interested in participating in the marine monitoring program.

4.2 Pilina Results

4.2.1 Relationships are the Pathway to Abundance

During this two-year project, I learned about the relationships of community members to place, and through witnessing the depth of these connections, I developed personal relationships to the people and place (Table 2). I took over 30 trips from O'ahu to Kaua'i over the course of the project ranging from weekends to the entire summer (3.5 months). During those trips, I attended over 25 community workdays held by Hui Maka'āinana o Makana every first and third Saturday of each month. Community workdays also included participating in the Waipā Foundation's Thursday *poi* days. Waipā is another *ahupua'a* in Halele'a where north shore community members and elders come together to make *poi.* This is a significant event for building relationships through preparing and providing traditional staple food that is affordable and accessible to community members and elders. This is another tie into addressing health and wellness, and supportive partnerships for the Hā'ena community as Hui Maka'āinana o Makana provides *kalo* weekly to this event. The partnerships formed with education programs and institutions were key to more active community engagement and the integration of different knowledge systems and tools. Kawaikini Public Charter School (KPCS) participated in monthly monitoring activities that ranged from fish gonad studies to *'opihi* rapid assessments. Professors from Kaua'i Community College (KCC) expressed their interest in future research support and collaboration after multiple presentations at their campus and field trips to Hui Maka'āinana o Makana's curatorship property.

Table 2. An overview of the relationships built and time invested from 2014 – 2016.

Building Relationships & Partnerships (2014 –2016)	
30+ trips to Kaua'i	**10 Partnerships formed:**
25+ Community Workdays	Hui Maka'āinana o Makana
10+ Waipā Poi Days	Limahuli Garden and Preserve
20+ House visits	Waipā Foundation
10+ Informal map talk-story	Nā Maka o Papahānaumokuākea
15+ Field trips with Kawaikini Public Charter School	Division of Aquatic Resources
	Ocean Safety and Lifeguard Division
	Kaua'i Community College
	Nā Pua No'eau
	Kua'āina 'Ulu 'Auamo
	Kawaikini Public Charter School

Through these activities and time invested in understanding the community, I developed a model (Figure 6) that reflected my journey in establishing *pilina*. This is a model based on my experience with the Hā'ena community, which may be helpful to consider in other settings. Several Hawaiian concepts were important considerations in my process of connecting to people, place, and resources. These include *launa*, *ho'olako*, and *noho a kupa i kou alo*.
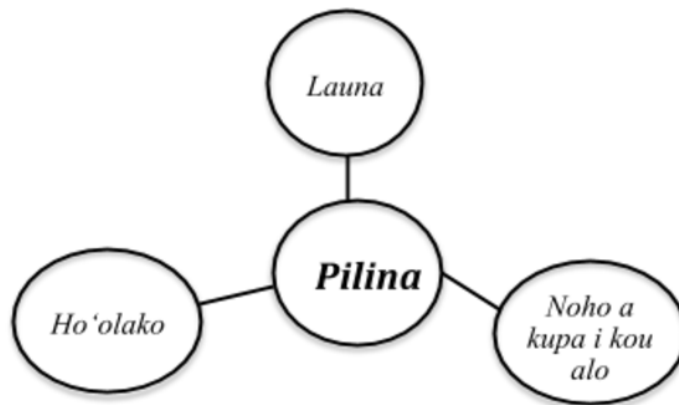
Figure 6. The three parts of *pilina* established throughout this project.

Launa: *Friendly, sociable; to associate with, meet with, fraternize with, visit, be sociable* (Pukui & Elbert 1986). I incorporated this concept into my relationship building by attending community workdays and events, making personal house visits, attending birthday parties, etc. This is because, "the most valuable gift you can give is your time" (Andrade 2014). Taking the

time to consistently show presence around the people and places that you work is valuable to building and maintaining relationships and trust.

Ho'olako: to supply, equip, provide, furnish, enrich (Pukui & Elbert 1986).
I incorporated this concept into my relationship building by providing support to the community with their ongoing events and activities. For example, I gave personal testimony during the CBSFA public hearings, assisted with visiting school groups, visited *kūpuna* in the hospital, and helped with community fundraisers and functions. Showing up was absolutely necessary to establish relationships as the foundation of this approach. This created a support system and allowed me to express my deep personal investment and commitment to Hā'ena.

Noho a kupa i kou alo: to have stayed and become accustomed to your presence.
This last part is about **living** among the community to be able to recognize faces, names, family connections, and they in turn recognize me; and through that build trust and comfort to be able to establish and grow reciprocal relationships. It was through these 30+ trips and living with the families that they started to see me as more than a researcher. Because I took the time to *launa* and *ho'olako*, I became acquainted, and accustomed to the people and places in Hā'ena, and was then accepted as a part of their families.

4.2.2 Documenting Hā'ena Local Ecological Knowledge (LEK)

The results of the participant observations and establishing a deeper level of trust with the Hā'ena community allowed us to gather sensitive local ecological knowledge of the place. At the beginning of developing the project, we created a list of species present at particular reefs in Hā'ena (described above in section 4.1.3). However, the community requested that this information not be shared outside of Halele'a. For the purpose of this thesis, I was granted permission to share LEK of ocean conditions (Table 3) and specific names of marine species tied to the Hā'ena community (Table 4-5). This traditional knowledge still exists and is perpetuated through daily conversations and practices in the community.

Table 3. Specific names for ocean conditions in Hāʻena.

Name of Ocean Condition	Description
Maʻila or *Māʻila*	Clear, glassy, flat
Malia	Clear, shiny, no wind
Mimiki	Choppy
Nalu	Rough waves

Table 4. Specific growth stage names for fishes based on Hāʻena local knowledge. Endemic species and sub-species are listed in bold.

Hawaiian name (general)	Hāʻena fish growth stage names	Common name (specific)	Taxa
Manini	Piaia Manini	Convict Tang	*Acanthurus triostegus sandvicensis*
Akule	Halalū (10-18cm) Maʻau (25cm) Akule	Bigeye Scad	*Selar crumenophthalmus*
Kūmū	ʻAhuluhulu (finger size) Kūmū	Whitesaddle Goatfish	*Parupeneus porphyreus*
Kala	Pakalakala Kala	Bluespine Unicornfish	*Naso unicornis*
Nenue	Panuenue Nenue Lele	Chub, Rudder or Pilot Fish	*Kyphosus* spp. *Kyphosus vaigiensis*

4.2.3 Key Species and Location

The result of the participatory mapping exercise was identifying the most immediate species that the fishermen were interested in focusing on for the monitoring program. The fishermen rated *kala, limu kohu, moi, āholehole, nenue, akule* and *ʻopihi* as priority species (Table 5). As a result of the participatory mapping, specific *ʻāpapa* (reef flats) were identified to focus on for the *Holoholo* logs.

Table 5. List of culturally significant taxa.

RATING	I'a (Finfish)	I'a (Inverts)	Limu (Macroalgae)
5	Kala		Kohu
4	Moi/ Palamoi Āholehole Nenue Akule	ʻOpihi	
3	Manini/ Piaia		
2	Mullet/ ʻAmaʻama Oama/ Weke ʻŌio Uhu	Wana Ula	
< 1	ʻĀweoweo Uwouwo Papio/ Ulua ʻOʻopu/ Hinana Kūmū Awa Palani	Heʻe Ina Kūpeʻe Loli Hāwaʻe	Peʻepeʻe ʻEleʻele Kala Lipoa Pahapaha/ pālahalaha Manauea Wāwae ʻiole

4.2.4 Community Concerns and Interest

As I built relationships with the community and participated in their activities, emergent themes of concerns and interests became clear. These themes were further discussed when the community members shared their specific concerns for their *ahupuaʻa* (Table 6). These concerns and interests then guided the objectives and tools selected for the community-driven monitoring program, which will be discussed in the *Mālama* section.

Table 6. Community concerns and interest in marine monitoring and management.

Community Concerns	Community Interest
• Human impacts (tourism, sunscreen, ocean users, etc.) • Fisherman impacts (misbehavior, overfishing, etc.) • Management that reflects appropriate harvesting seasons • Water quality (cesspools, septic) • *Limu* (macroalgae) population/ health • Changes in natural cycles of species • *Mauka* to *makai* influences and changes	• Spawning seasons specific to Hāʻena • Native and invasive *limu* health and abundance • Use of more traditional fishing methods • Coral health • How much fish is coming out of fisheries & what species • More involvement and opportunities for the next generation • Better awareness, education & outreach for the community • Connecting fish cycles to moon phases • *Nenue* (Chub) spawning seasons

4.3 Discussion

The key takeaway learned from prioritizing *pilina* at the foundation and forefront of this project is that investing in community relationships and values builds trust. Building, honoring and maintaining strong relationships takes time, constant communication and engagement. Showing an investment and commitment from the beginning of the project opened up a deeper dimension of conversations and knowledge shared. Another key takeaway was the importance of building capacity through local partnerships and resources that the community felt comfortable with. New partnerships were formed with organizations that learned about the vision of the community and this project and wanted to contribute more towards the future of the program. For example, KCC started to bring their classes out to get involved with the monitoring program and offer additional research support. All results will be discussed collectively in the *Pilina - Mālama - ʻĀina Momona* Discussion section.

Mālama Moʻolelo

While sitting with the aunties and uncles, and waiting to start Saturday community workday, I begin to think about all the data I should be gathering. It feels like a constant struggle to balance the demands of my project while wanting to participate in the workday with everyone. I stick around to give hugs and kisses, and catch up with everyone since I haven't seen them in a while and since I only get to come to Kauaʻi one week a month. But I feel like I have to hurry and get in the water to catch the right tide and conditions before it gets too rough.

Finally, I make it down to the ocean by myself. Conditions look rough, but the cloud of project demands hanging over my head seem much more rough. I jump in the water and snorkel along the shoreline. Then all of a sudden, the ocean turns cold and dark, and my naʻau senses that something is wrong. I start to feel the rough ocean conditions push me. I pop my head out of the water and realize that I got sucked out into a channel with 6ft. waves breaking on top of me, and an undertow pulling me. I try not to panic, but I know that I am in trouble. I start to have flashbacks of the stories that the aunties and uncles have shared about a beloved fisherman who got sucked out to sea and never returned. Is this the channel? Or am I in the other channel, Poholokeiki, a name that directly translates to the taking of a keiki. I start to enter an out-of-body experience. I see the beloved fisherman, Uncle Kalei, and I'm talking to him. He said everything is going to be okay, but sometimes we gotta learn lessons the hard way. I come back to reality, and see my Hāʻena lifeguard friends running out toward me and shouting my name. Good 'ol Emily with her red Nā Kilo ʻĀina shirt doing her usual monitoring. They know me so well already. Just before he reaches me, I swim out of the channel, catch a wave, and throw myself onto the ʻāpapa. Its either taking the chance of going straight onto the reef or getting sucked down the Nā Pali coast all the way to Kalalau.

"Emily! Are you okay?"

"I am so sorry! I don't know what I was thinking."

"Don't be sorry! Main thing you are ok, its rough today!" I catch my breath on the beach and look up to see all the "NO SWIMMING" beach signs out, which I didn't see because I went through a different beach access. But also because I didn't do the most important thing, kilo first.

All those moments of getting caught up in feeling like I needed to gather data. It was then that I realized the monitoring program is not about the data and not about just myself doing the monitoring. I get back to the community workday looking pale and still in shock. I tell one of the aunties what just happened. In a matter of 10 minutes, everyone knows, and I feel the eyes of several uncles staring at me with a concerned look. They approach me and embrace me as tears fall down my face. "Baby don't you ever do that again, we can't lose you."

Mahalo ke akua and mahalo Uncle Kalei for the important lesson and for giving me another chance.

5. MĀLAMA

The long-term objective of this project was to create a place-based monitoring program to confront the need to integrate both traditional knowledge systems and western monitoring tools that balance the time, ability, and priorities within the community. One of the greatest challenges of creating a lasting community-driven monitoring program can be balancing the needs of local communities with the State's needs and scientific rigor. The goal of this research was not to rush into creating a monitoring regime and agenda for the community, and then expecting them to use it. Often times, monitoring approaches do not consider whether tools are feasible and meaningful to the community's resource management vision.

Another consideration for place-specific monitoring programs is the diversity found in different geographic locations. Not all *moku* (districts) should be managed the same due to differences in geography, human population and access. Local level monitoring is vital to adapting nearshore fisheries management in Hawaiʻi. Inter-island channels may act as barriers that limit gene flow of marine species, underscoring the need for locally-appropriate management by island units (Toonen *et al.* 2011). Friedlander *et al.* (2013) conducted a meta-analysis of reef fish data in Hawaiʻi and found that *moku* described approximately 63% of the variation observed in fish biomass and assemblage.

This *Mālama* section explores monitoring tools that build on the foundation of *pilina*. The following research questions relating to *mālama* are: ***How do the selected monitoring approaches help us to better understand the natural trends, cycles and productivity of the Hāʻena coastline? How can a community-driven monitoring program integrate different knowledge systems?***

5.1. Mālama Methods

5.1.1 Hāʻena Community-driven Marine Monitoring Program

The Hāʻena community-driven marine monitoring program objectives and toolkit (Table 7) were developed, implemented and refined through engaging in the relationships formed by the community as well as through CBPR, focus groups, surveys and participatory mapping. The objectives of the monitoring program are:

1. To help record TEK of marine species in Hāʻena.

2. To document *mauka* (upland) and *makai* (seaward) relationships specific to Hāʻena.

3. To survey abundance of important marine species by incorporating Hāʻena fishermen's ways of *kilo* (observation).

4. To track *ʻopihi* distribution, spawning seasons and reproductive cycles.

5. To understand *limu* distribution at significant harvesting sites.

6. To learn and teach other integrative monitoring methods.

These objectives were based upon the community's interest, concerns, and local ecological knowledge (as discussed in the *Pilina* section). The methods used in the monitoring program were built upon the partnerships formed throughout this project, and again to reflect the community's overall goal of being better stewards of their place. Through these partnerships and community interests, educational workshops were held to share different monitoring tools and how they can be implemented in Hāʻena.

Table 7. An overview table of the community-driven monitoring program toolkit.

Method	Developed by	Purpose	Community Interest	Participants	Frequency
Huli ʻIa (to turn over, explore, search*)*	Nā Maka o Papahānaumokuākea	Holistic and place-based documentation on observations of sky, land, sea, and people.	Hāʻena CBSFA goal: "…recognizes and respond to connection between land and sea…"	Hui Makaʻāinana o Makana, Limahuli Garden and Preserve, and Hāʻena Lifeguards	Monthly
Holoholo (fishing) logs	Emily Cadiz and Dr. Kawika Winter	To document fish species, abundance, size and location at specific reefs.	Track catch from the fishery	Hui Makaʻāinana o Makana	After *Holoholo* (fishing)
Gonad Kit	Schemmel *et al.* 2016	To record spawning seasons of culturally significant fishes.	Track spawning seasons specific to Hāʻena and compare to current DLNR State regulations.	Hui Makaʻāinana o Makana	Monthly
ʻOpihi (limpet) Rapid Assessment	Bird (2006)	Document *ʻopihi* distribution and reproductive cycles.	Support *ʻopihi* restoration area in Hāʻena's CBSFA regulations.	Hui Makaʻāinana o Makana and Kawaikini Public Charter School	Quarterly

5.1.1a *Huli ʻIa* (to turn over, explore)

Description: *Huli 'Ia* was a method developed by the non-profit organization, Nā Maka o Papahānaumokuākea, and is a discussion piece to better understand place-based monthly changes from the *lani* (sky/atmosphere), *honua* (earth/ground), *kai* (ocean), and *wai* (freshwater). The Hā'ena community has a grounded knowledge of what used to happen ecologically during each month/season, therefore *Huli 'Ia* is meant to bring back traditional understanding of place through *kilo* (observation) and identifying relationships between environmental indicators from *mauka* (upland) to *makai* (seaward) (McMillen *et al.* 2013). Given that everyone observes things differently, this was a way for everyone to share personal observations, and initiate better awareness of observations. Documentation contributed to the larger monitoring goals for Hā'ena and can show community awareness of environmental changes to successfully manage their resources. This also gives the community a chance to strengthen the traditional practice of *kilo*.

Methods: A facilitator went through each item on the list (from *lani* to *kai*), and took notes on the group discussion relative to changes for that month. This was conducted once a month during the Hui Maka'āinana o Makana's Saturday workdays, as well as with the Limahuli Garden and Preserve staff and the Hā'ena lifeguards.

5.1.1b *Holoholo* (Fishing) Logs

Description: These logs were provided to the fishermen as a way to document their observations after *Holoholo* (fishing). Hui Maka'āinana o Makana members are primarily throw/cast net and surround-net fishermen. They can identify fish species, abundance, and general size class from watching above the water. The *Holoholo* logs datasheet was developed as a way for fishermen to capture these skills and ways of *kilo*.

Methods: Fishermen were encouraged to fill out the datasheets every time they went *Holoholo* and were collected from fishermen monthly.

5.1.1c Fish Gonad Kit (Gonad-somatic Index)

Description: The fish gonad kit was created as a way for communities to examine spawning seasons and reproductive biology to track spawning seasons for their fisheries in support of place-based management efforts (Schemmel *et al.* 2016). An understanding of marine species from a place-based perspective is important because new research is showing that fish

spawn at different times not only statewide, but from *moku* and even *ahupua'a* (Schemmel *et al.* 2016). The gonad kit was made to help track fish gonad-somatic indices (GSI) and empower communities to take part in their own data collection. This can be compared to the DLNR state regulations and the community's traditional knowledge of spawning seasons in their nearshore fisheries.

Methods: Documentation of fish GSI were conducted monthly from the catch of fishermen in Hui Maka'āinana o Makana. One person or several people could conduct this monitoring method. It was helpful to have a community member who could assist with recording information. Information was collected on the date, time of capture, location, number of individuals caught, age of person recording, etc. The fish fork length was measured and then weighed to the nearest 0.1 kg. The fish was then slit along the abdomen just anterior of the anus to remove the internal organs, including the gonads. Once the gonads were located, they were gently removed with tweezers and were weighed to the nearest 0.01 g.

5.1.1d *'Opihi* Rapid Assessment (ORA)

Description: The goal of this method was to understand *'opihi* distribution and reproductive life cycles to promote better harvest and management practices (Bird, 2006).

Methods: Participants had their own vertical transect within the intertidal zone from the lowest *'opihi* on the rocks. Each transect was an *anana* or arms-width apart from each other, and participants lined up side-by-side. Participants were given a hand-size ruler with three markings on it representing the three different *'opihi* size classes: 0-1 cm (size class A); 1-3 cm (size class B-C); >3 cm (size class D). In each *anana* transect, participants counted the number of *'opihi* found in each size class. Participants overlapped each other after their transect was completed for a total distance of 30 m.

5.1.1e Additional monitoring options

Other marine monitoring methods were considered as potential options to include in the monitoring program. Our Project in Hawai'i's Intertidal (OPIHI) is a *limu* monitoring project developed through Hawai'i Sea Grant and UH Mānoa Curriculum Research and Development Group to document *limu* distribution and abundance across Hawai'i. This project engaged local

Marine Science teachers (6th – 12th grade) to teach this curriculum in the classroom and take students to the intertidal zones to monitor *limu* health. *Lawaiʻa* journals were also used as another form of documentation for fishermen. These journals were established as part of a project in Moʻomomi Bay, Molokaʻi as a way for fishermen to record observations (Poepoe *et al.* 2007). These have been adapted into mini notebooks to take into the field and record observations based on lunar cycles (Schemmel *et al.* 2016).

5.2. Mālama Results

This study demonstrated the continuation of the framework for establishing a community-driven monitoring toolkit designed by the expertise and values of the community. The long-term goal of the monitoring program prioritized the introduction of monitoring tools with an emphasis on training. This was the preliminary planning process of creating a monitoring program where the community could be less reliant on outside researchers and produce data that improves their efforts within the CBSFA. I should emphasize that data collection was not the top priority because the priority was given to establishing the program. These data represent the preliminary findings based on a few trainings. After carefully identifying potential monitoring tools, data collection will become more robust and a higher priority but never above *pilina*. The *Pilina – Mālama - ʻĀina Momona* framework prioritizes relationship building, community capacity, and collaborative partnerships to establish and implement monitoring approaches that address the larger goal of community health and well-being.

5.2.1. Community Evaluation of Monitoring Program

A final evaluation and focus group was conducted with ten core community members who were involved in the monitoring program from the beginning and participated in each of the monitoring tools. Community members evaluated each monitoring tool by scoring 1 (low) - 5 (high) (Table 8) and gave additional feedback during discussion (Table 9).

Table 8. Community evaluation of each monitoring tool.

Monitoring Tool	Group Average Rating (out of 5)	Total Number of Surveys	Feedback
Huli ʻIa	4.5	23	Hui Makaʻāinana o Makana, Limahuli Garden and Preserve, and Hāʻena Lifeguards preferred this method because it is very inclusive of everyone's observations. Each group feels that they can continue this method if they take turns facilitating and recording.
Holoholo Logs	4.5	5	Hui Makaʻāinana o Makana favored this method because it builds on their ways of *kilo.* They feel that they need to be better about recording and documenting.
Fish Gonad Kit	4.3	17	Hui Makaʻāinana o Makana preferred this method, but felt it can be tedious. For the data-recording portion, the community agreed that it works well with partners or getting the *keiki* involved. The community would be interested in hiring someone to help with the data analysis portion of this method.
ʻOpihi Rapid Assessment	3.6	4	Hui Makaʻāinana o Makana liked this method but would like more practice, repetition and external support from Nā Maka o Papahānaumokuākea to organize and led this monitoring effort. The community would also like to continue engaging Kawaikini Public Charter School students in this monitoring method.

The community rated the monitoring tools as a 4.5 out of 5 (Table 8). During the final discussion, community members shared their experience, likes, dislikes and next steps for the monitoring program (Table 9). In summary, community members felt that these tools have influenced the way they observe and fish, and that this monitoring program reflects their overall goals of being better stewards of Hāʻena (Figure 7). Despite challenges of funding and time commitment, they shared that the monitoring program succeeded in its vision to build community capacity and expand a wider reach into their community on holistic approaches of health and well-being.
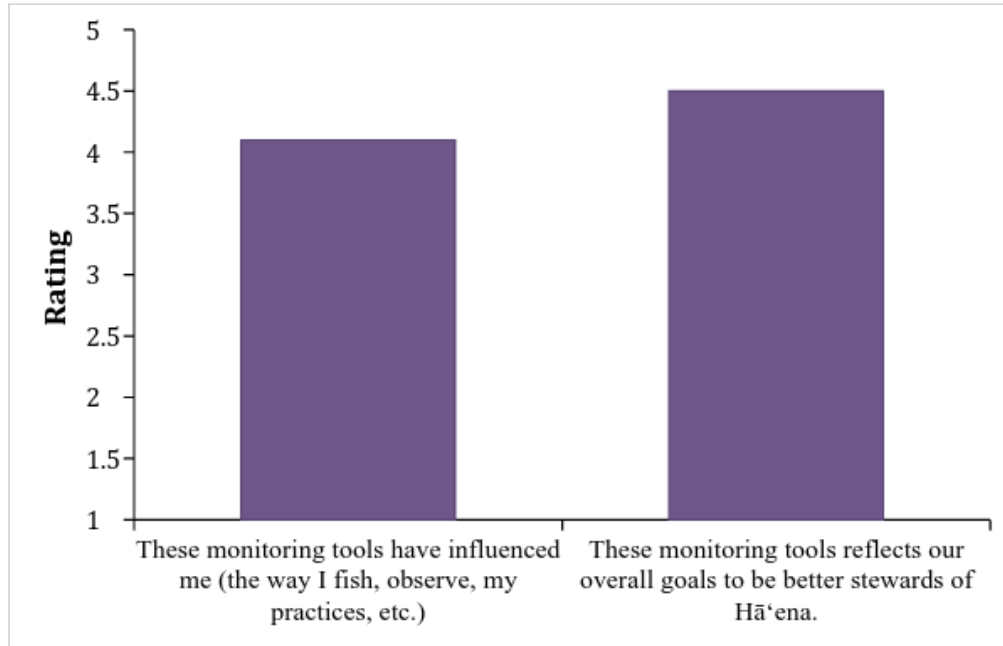
Figure 7. Evaluation of general perceptions of monitoring tools.

Table 9. Community feedback on overall monitoring program.

Likes	Challenges	Next Steps
• Learning new studies and methods • Greater awareness • Going through all the steps • Holistic approach • Data collection and organization • Building and mending relationships inside and outside of the community • Clarifying any misunderstandings and misconceptions	• Self- discipline to monitor and record routinely • Consistency • Time commitment • Funding	• Present data findings to the north shore (Haleleʻa) community • Share with other communities in Kauaʻi • In-depth gonad study • More practical – step by step • Quarterly monitoring weekends • Funding and paid positions • External support based on these partnerships • Include the monitoring program in Hui Makaʻāinana o Makana's 5-year strategic plan

5.2.1a *Huli ʻIa* Results

Huli ʻIa was the most transferrable tool because it included different expertise and resources within the Hāʻena community. It facilitated collaborative observations and discussions from up *mauka* with the Limahuli Garden and Preserve staff, to *makai* observations with Hui Makaʻāinana o Makana and the Hāʻena Lifeguards. *Huli ʻIa* is a holistic template that can

include findings from the *'opihi*, fish and other monitoring data as additional layers within *Huli 'Ia*. It is a simple method that generated great conversation with the group, and encouraged everyone to be more aware of their observations. *Huli 'Ia* was the most used monitoring tool because it is inclusive of everyone's ways of observing. It is continuative and brings people together to have these observations and conversations. In the future, it would help to assign someone as the facilitator and to set up a program for community members to download and store photos.

5.2.1b *Holoholo* Logs Results

This monitoring tool was designed to build off the skills of our Hāʻena fishermen and was developed with numerous trial runs. Fishermen liked how this datasheet reflects their ways of observation. However, asking community members to consistently record this information is always a challenge. We tried different ways to record this information such as individual datasheets and personalized folders to keep in their vehicles. Community members recommended that maybe building a marine monitoring station at the front entrance/ exit of the curatorship property to turn in monitoring data.

5.2.1c Fish Gonad Results

N*enue* (*Kyphosus* spp.) and *āholehole* (*Kuhlia* spp.) were the dominant fishes caught by Hui Makaʻāinana o Makana, and throw-net (cast net) fishing yielded the highest number of fishes (Figure 8). Sampling was dependent on volunteer fishermen, and was therefore not evenly distributed across months. Future sampling efforts should focus on *nenue* and *āholehole*, since they were the most commonly caught, with the goal of developing recommendations for better management of these taxa. For example, defining peak spawning seasons is critical for protecting important reproductive periods and identifying the size at sexual reproduction can help inform minimum size limits. A better understanding of size-dependent reproductive output can help inform discussions about management strategies such as slot limits. This allows harvest above reproductive size but limits harvest of large individuals that contribute disproportionately to the health of the stock limits.
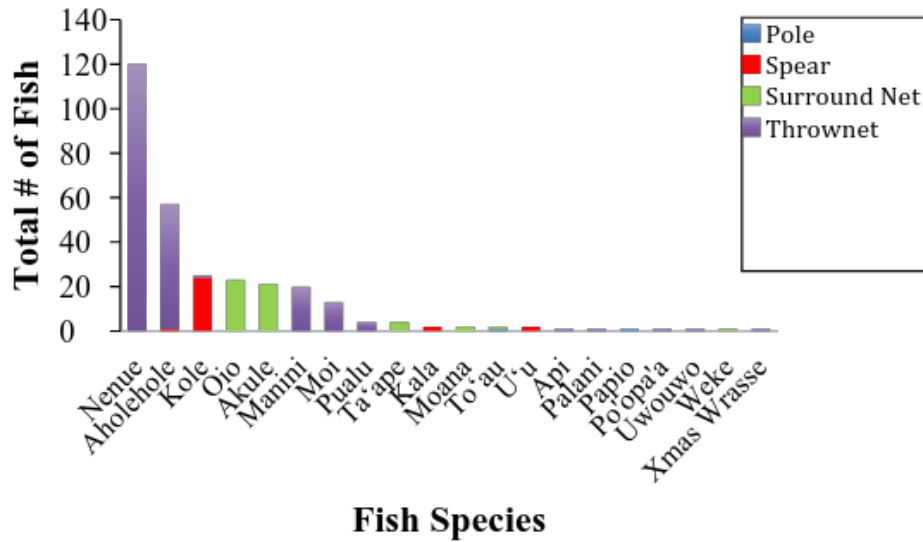
Figure 8. Total fish species caught compared to harvest method.

Voluntary catch data showed that *nenue (40%)* and *āholehole (19%)* were the dominant fishes caught primarily by throw-net (Figure 9). Throw-net was the fishing method that yielded the highest number of fishes and caught ten out of twenty species in the catch. The method that produced the second highest number of fishes was surround net (Figure 8). Since catch data was recorded on a volunteer basis, this data is influenced by the methods most commonly reported. More fishermen need to be engaged to gain a wider representation of fishing effort. More engagement of other fishermen can increase the capacity of Hui Makaʻāinana o Makana to obtain the fishes they are interested in monitoring monthly. Despite the small sample size, this pilot study identified the dominant species caught and can provide an example of species to pursue in future seasonal spawning studies.
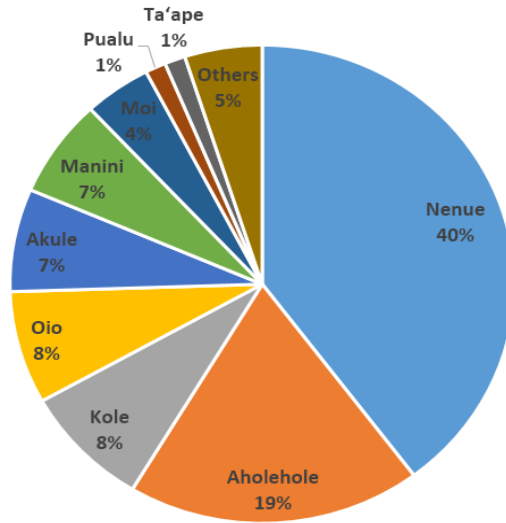
Figure 9. Percentage of the number of fish caught by species. The grouped named, "Others" (5%), represent fish species that individually comprised less than one percent of the total catch.

5.2.1d *'Opihi* Rapid Assessment Results

The community agreed that they would like to continue with external support from NMOP and KPCS in continuing these surveys quarterly rather than monthly. The community and KPCS conducted these surveys for a total of three times depending on time and number of participants (Table 10). Across all three surveys, *'opihi* size class B-C (1-3 cm), or the sub-adult size class, was significantly more abundant relative to the other size classes (Figure 10).
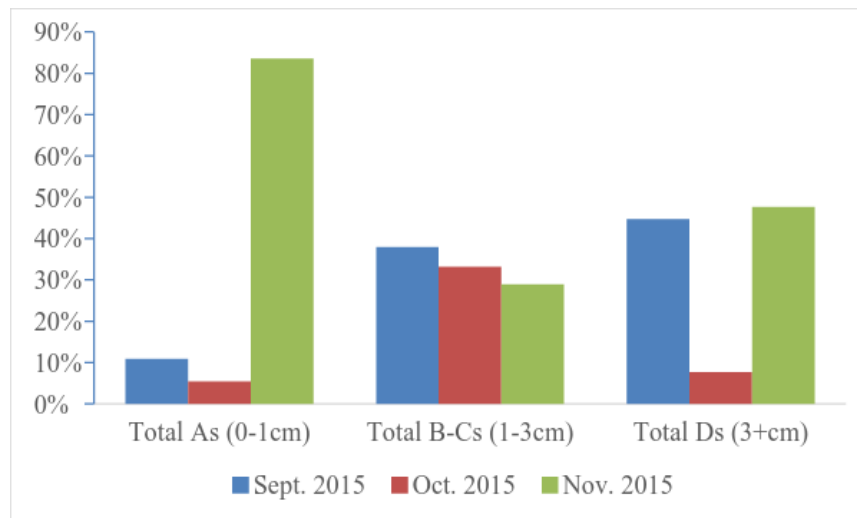
Figure 10. Percentage of *'opihi* by size class from three consecutive months of surveying.

Table 10. *'Opihi* Rapid Assessment data collection information.

Date	Total Participants	Participants	Total transects *(anana)*	Total *'opihi* counted
9/5/15	10	Hui Maka'āinana o Makana Hā'ena lifeguard NMOP	48	726
10/5/15	3	College/ graduate students	54	576
11/14/15	24	KPCS (5th-6th graders)	55	673

5.2.1e Results of Additional Monitoring Options

Several other monitoring options were explored during the two-year monitoring program such as: timed swims, *Imu kai* (fish houses), *limu* monitoring, and *lawai'a* journals (Table 11). Timed swims were conducted ~20 times by myself and whenever a snorkel partner was available. However, ocean conditions in Hā'ena are often too treacherous for an individual to conduct this method alone. Community members expressed interest in reaching out to spearfish divers in Hā'ena to assist with this method, or to rotate snorkeling pairs to record monthly observations. The community is interested in using snorkel observations as a component of *Huli'Ia,* by documenting dominant trends and characteristics happening in that particular month rather than tracking specific species presence and absence. *Imu Kai* was a Hā'ena fishing practice where fish houses were built close to the shoreline so that *kūpuna* would not have to travel far to catch fish. The community is interested in continuing to perpetuate this practice as a *makai* educational activity for community members, kids, and visiting groups to participate in.

I experimented with the Our Project in Hawai'i's Intertidal (OPIHI) *limu* monitoring method with KPCS 3rd – 6th graders; once in the classroom teaching the OPIHI curriculum, followed by a trial run on Hā'ena's reef flats. However, ocean conditions were too rough to conduct the method. Overall the KPCS students were interested in the method but needed more time and practice. Hui Maka'āinana o Makana is interested in starting *limu* monitoring but would prefer a method that highlighted their knowledge of specific *limu* patches rather than a random sampling method. *Lawai'a* journals were given to community members as another tool to document observations, catch records and spawning seasons. Community members agree that the self-discipline to document observations and catch is something they will continue to work on.

Table 11. Additional monitoring options that were explored.

Tool	Number of times attempted	Overall feedback
Timed swims	~20	This method was only conducted individually or when a snorkeling partner was available. Overall, the community was not particularly interested in this type of monitoring method. However, there have been discussions about getting Hāʻena spearfish divers involved.
Imu Kai (fish house)	3	This method ended up being an educational activity that the community wants to continue with educational groups and Kawaikini Public Charter School.
OPIHI *Limu* Monitoring	2	This method was not able to fully develop during the course of this project due to ocean conditions and difficulty of method. Community members are interested in a different *limu* monitoring methods that build off their knowledge and practices of gathering from particular *limu* patches.
Lawaiʻa Journals	N/A	This was used as another tool for fishermen to experiment which way they prefer to document observations, catch record and spawning seasons.

5.3 Discussion

The key takeaway that we learned in the *mālama* section of the project was the importance of building a process that was community-driven rather than data driven. This also taught us the challenges of balancing community knowledge and scientific sampling. For example, when experimenting with *limu* monitoring methods, we struggled to engage in random sampling when community members already have an in-depth knowledge of specific *limu* patches. This again reiterated the importance of acknowledging different ways of knowing. Another key takeaway was being practical about the time, steps and process it takes to teach and learn new methods. Some of the methods used require a steep learning curve. However, we should still account for behavioral changes as a learning curve. Getting community participation to record and report their catch was a significant transformation.

Another important lesson was *ma ka hana ka ʻike*, by doing one learns. Many of the steps of this project were learned through trial and error. Community member expressed that more

consistency and repetition are key factors to improve the monitoring program. Overall, developing a monitoring program that prioritized community interests and concerns helped build capacity. It is important to ensure that everyone has a role and feels included in the process.

'Āina Momona Moʻolelo

Amidst all the craziness at our Nā Kilo ʻĀina camp, I take a quiet moment by myself. I look around and see over 92 people at the camp. Almost all of the 30 original Hāʻena families represented, as well as families from South, West and East side of Kauaʻi, and our extended families and partnerships across the State of Hawaiʻi. Kids are laughing and running around, families are conversing and enjoying each others company. The rain and mud everywhere has us all huddled under one big tent together, which brings a nice element to our camp. I feel an overwhelming sense of warmth, and not from the campfire, but a warmth from the inside of my body. All that hard work has paid off for this very moment. Three years of building relationships and developing this program, to come to this moment. This camp was truly the culmination of everything. But what I also realized was that this camp was not only the result of the project, but it was the greatest giveback I could ever give to a community who has given me so much. Throughout the weekend, and even weeks after the camp families and keiki would not stop talking about how monumental the camp was for their ʻohana and community. But really, that was my thank you to them, for giving me more than what I could have ever imagined from this project. What started off as a thesis project, turned into a lifelong commitment to a community.

6. ʻĀINA MOMONA

ʻĀina Momona, the final layer of this framework, emerged from implementing the right tools to *Mālama*, which were initially developed on understanding *Pilina*. The final research questions addressed in this section is, ***What can we learn from this process in order to support community-based resource management throughout Hawaiʻi and the Pacific?***

6.1. ʻĀina Momona Methods

6.1.1 Na Kilo ʻĀina (NKA) Camp

Hui Makaʻāinana o Makana and other community partners have held *lawaiʻa ʻohana* camps (LOC) in the past few years to engage and educate community members and *keiki* (children) about *pono* (proper) fishing practices and different fishing methods. The LOC was an initiative of Conservation International Hawaii to provide "13 communities on six islands with opportunities for more than 2,000 participants to learn responsible fishing techniques and engage in natural resource management" (Conservation International 2016). NMOP established NKA camps as a broad picture to refocus the activities and community to train ourselves as observers and watchers that are supportive of the natural productivity of place. NMOP has been facilitating these camps and activities in Hawaiʻi for five years and has expanded partnerships with communities and other Pacific Islanders. The NKA camp model was selected because it is a key component of the *Pilina - Mālama - ʻĀina Momona* framework that focuses on relationships, partnerships, and a holistic understanding of community health and well-being. The NKA camp's mission is to:

> "broaden and expand the understanding of place and find ways in which we can continually contribute to the health and wellness of Hāʻena. NKA camp strengthens relationships to place by supporting responsible ocean dwellers/user who will continue to care for our islands. Participants will strengthen the *Kilo* or observation skills through various workshops to better understand the moods and characteristics of Hāʻena to achieve a state of *ʻĀina Momona*."

NKA refers to the watchers and observers of our sustenance. *Kilo* were extremely conscious of the activities of their environment, they were people who lived among the community, and were

looked to for advice and direction because they possessed an intimate understanding of cycles and characteristics of place (Andrade 2014). They were relied on for guidance when communities would work together to sustain *'āina*. *'Āina* refers to our source of sustenance, as the places and things that feed us. These are comprised of our lands, oceans, and elements to contribute to our overall health (physically, spiritually, emotionally, and mentally). NKA represent the strengthening of community watchers and observers who understand the needs of people and place, and provide direction to ensure that *'āina* sustains us into the future.

In partnership with NMOP through the NKA initiative, Hui Maka'āinana o Makana was able to add another layer of activities and engagement to deepen relationships, understanding, and broader visioning within the Hā'ena community. This four-day camp was held at the Hui Maka'āinana o Makana property within the Hā'ena State Park, served a total of ~92 participants, and used multiple local partnerships and community resources statewide (Table 12).

Table 12. An overview of the four-day Na Kilo 'Āina camp schedule and partners.

Thurs. 7/14	Fri. 7/15	Sat. 7/16	Sun. 7/17
Introduction and Ice Breakers Hui Maka'āinana o Makana & NMOP	**Sea Urchin Activity** Hui Maka'āinana o Makana & NMOP	**Fish ID & Gonads** NMOP	**He'e** (Octopus *sp.*) **Activity** Hui Maka'āinana o Makana
Limahuli *Mauka* Excursion Limahuli Garden and Preserve Staff	*Limu* **Activity** KUA	**Plankton Tows** KCC	**Coral Activity** DAR
Coastline walk Hui Maka'āinana o Makana	**Exploratory snorkeling** NMOP	**Limu Press** KUA	*Ipuheke* (double gourd) **Teamwork Activity** NPN
Swim Test Ocean Safety & Lifeguard Division	**Define your community** NMOP	*Lo'i* **Activity** Hui Maka'āinana o Makana	
Hawaiian Food Workshop Hui Maka'āinana o Makana	**Net Activity** Hui Maka'āinana o Makana	*Mo'olelo* **Activity Talk-Story** Hui Maka'āinana o Makana	
Mo'olelo **Activity Talk-Story** Hui Maka'āinana o Makana	*Mo'olelo* **Activity Talk-Story** Hui Maka'āinana o Makana		

6.2. 'Āina Momona Results

6.2.1 NKA Camp Results

The NKA camp was a culmination of relationships, partnerships and activities that had been cultivated through Hui Maka'āinana o Makana's efforts, and during this Masters project (see earlier section on *Pilina*). The NKA camp had a total of 92 participants, 46% *keiki* (children) aged two – 17 years old; 49% *makua* (parents/adult), between the ages of 25 – 65 years old; and 5% *kūpuna* (66+ years old). At the closing of the NKA camp, 60 participants from *keiki* to *kūpuna* were asked to share their favorite part of the camp. Responses were documented and coded after the camp into the following categories: coming together (19%), learning about species (20%), connecting to place (21%), knowledge exchange (23%), and *launa* (sociable; to associate with) (17%) (Figure 11). Key themes were derived from the participants' quotes and described in Table 13.
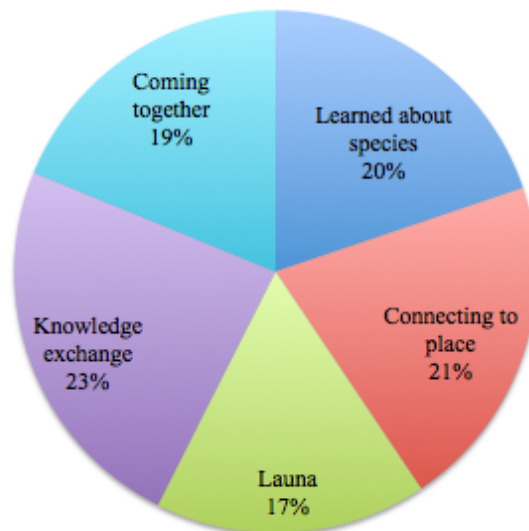

Figure 11. Key Takeaway themes from the Na Kilo 'Āina Camp (n=60).

Table 13. Key themes and supporting quotes from the NKA camp.

Key Themes	Supporting Quotes
Learning about species (i.e. Gonad studies, *limu* identification, and fish species)	*"...the kids learned 10 limu names and remembered them the next day!" (KUA Limu Hui Representative)*

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Connecting to place (i.e. anything to do with a link or relationship to Hāʻena)	*"Growing up, Kēʻē was our playground, everything to us, walking the coast...We have a physical and spiritual connection, for them, the cultural and mental connection they have is more than we ever will. They are the future stewards." (Hanalei Resident and parent)*
Launa (i.e. spending time at the beach, snorkeling, hanging out, singing, meeting new people, etc.)	*"It was great ... even I loosened up and talked to the kids and hung out with them and felt open to teaching them stuff."(Kīlauea Kupuna)*
Knowledge exchange (i.e. Generational learning, sharing stories, passing traditions, etc.)	*"I was lucky to have my grandparents here and learn these things from them. So parents, do that with your kids, take what you learn here and keep it going with them. Keiki you are so lucky, we never had this (camp)."(Kīlauea Resident with Hāʻena lineage)*
Coming together as one (i.e. *ʻOhana* - Family, Teamwork, *Hoʻoponopono* - mental cleansing to revise)	*"This was a good example of what the 30 families tried to do years ago. Come together and get along and find the best interest of this place."(Wailua parent with Hāʻena lineage)* *"...the importance of forgiving each other and creating an atmosphere for everyone to come. Everyone is so busy nowadays and we never know when your last day is going to be."(Kīlauea Resident with Hāʻena lineage)* *This place can be like a Marae in New Zealand. This is the start of building a marae, for the people of a community. A place to learn from each other, to share our thoughts, even if it means conflicts, we may not always agree, also a place for hoʻoponopono. This is only the beginning."(Wailua Resident with Hāʻena lineage)*

6.3 Discussion

Some key takeaway lessons on how to support *ʻĀina Momona* and community-based resource management is that it needs to be derived from a specific place. It is a process that takes time to nurture and build relationships, and move at the pace of the community. The community should always be in the driver's seat of these efforts because they know their place and people the best, and because they are invested for the long-run. This may be useful in guiding similar efforts in other places though all places and communities are distinct and should adapt to their unique needs.

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7. *Pilina – Mālama - ʻĀina Momona Discussion*

Here I discuss the outcomes and findings of this thesis guided by my four research questions within the *Pilina –Mālama –ʻĀina Momona* framework (Figure 12).
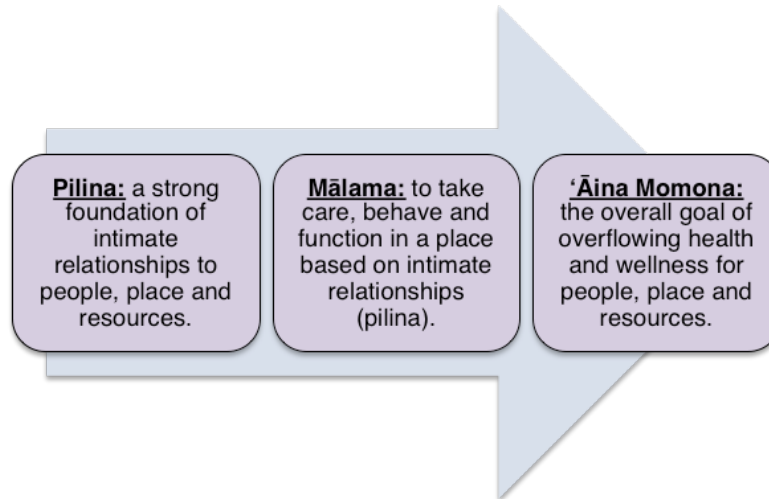

Figure 12. The process of the *Pilina - Mālama - ʻĀina Momona* framework.

7.1. What is the role of relationships in building capacity for a community-driven monitoring program?

Other researchers have pointed out that relationships between people, natural systems (place), and ancestors have been recognized and perpetuated by indigenous communities for generations (Poepoe *et al.* 2007, Gegeo & Gegeo 2001). They are built on values, which then guide our attitudes, beliefs, and actions (Stevenson & Tissot 2013). In indigenous communities, people value social relationships as pathways to maintain momentum towards improving resource management (Tipa & Panelli 2009). The results of my research in Hāʻena indicate that the same is true for the community of that place. While there has been extensive research conducted in Hāʻena, there have not been many projects that the community felt were founded in value systems and relationships.

> *"For this type of work, it takes an external, neutral person to make this happen for our communities, and to have a local student with the same Hawaiian values. Without this, this would have never happened or would have been delayed." (Hāʻena Community Member)*

Allowing time for relationships and partnerships to grow is essential when working with communities, especially for those that begin as a researcher (Burnette & Sanders 2014,

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Burnette *et al.* 2011, Smith 1999). This is necessary because there have been past experiences and history of mistrust and appropriation of knowledge between research institutions and indigenous communities (Burnette & Sanders 2014, Tipa & Panelli 2009, Smith 1999). Throughout the course of this project, we learned about the amount of time and investment it takes to build relationships, trust, and reciprocity to address community needs. This process entailed an extensive effort of over two years and 30 trips to Kaua'i in order to build an intimate understanding of place and establish strong *pilina* with the community.

Utilizing local collaborative partnerships is another essential step towards changing the way we view and interact with our resources and each other. We were able to extend the reach of this research to invest in future generations through building *pilina* with educational institutions and state personnel. Other partnerships provided additional support to conduct monitoring such as the staff of Limahuli Garden and Preserve observing *mauka* resources, and the Ocean Safety and Lifeguard Division participating in *makai* observations while on duty. Community members were the core participants and leaders in shaping monitoring efforts, while these partners provided additional support and outside resources. Other studies suggest that collaborative partnerships are essential to building community capacity towards co-management (Wamukota *et al.* 2011). The diversity of partners allowed for the integration of different worldviews and knowledge systems (Tipa & Panelli 2009). Many perspectives are essential to community-based research because managing natural resources takes a collective effort of encouraging best practices and enhancing community well-being. The results indicate that relationships are vital to building capacity for a community-driven monitoring program.

Developing trust and building capacity requires constant community engagement and communication through multiple means including e-mail, texts, phone conversations, face-to-face meetings, and house visits to keep everyone on the same page and moving forward together. Community members' willingness to share confidential place-based knowledge of the Hā'ena coastline with me, someone who came into Hā'ena as an outside researcher, was a testament to the level of comfort the community felt in trusting the project intentions. These conversations and knowledge shared also strengthened the community's relationship to place because it allowed us to dive deeper into LEK documentation.

7.2. – 7.3 How can a community-driven monitoring program integrate different knowledge systems? How do these monitoring approaches help us to better understand the natural trends, cycles and productivity of the Hāʻena coastline?

"Being down here in this place brings back stories. Reminiscing about memories and telling stories of the abundance of resources...being in the place brings stories back to life."
(Hāʻena community member)

Prioritizing local knowledge as the foundation of a community-driven monitoring program is a step towards effective integration of different knowledge systems. Citizen science approaches are not sufficient enough to support community-based management. In citizen science, community members are part of the data collection process, but their values and knowledge are not driving the monitoring approaches (Thornton and Scheer 2012, Conrad & Hilchey 2011, Dickinson *et al.* 2010, Danielsen *et al.* 2009). Empowering indigenous knowledge systems is necessary in contemporary management because it is a knowledge system that is built upon generations of intimate interactions between people and place (Naniʻole & Meyer 1998). The results of this project showed that integrating different knowledge systems into a community-driven monitoring program can be achieved when it is grounded in local community knowledge and other knowledge systems serve as additional support. In this study, we learned the importance of creating a space for place-based and local community expertise. This was crucial in not only integrating knowledge systems, but also towards building community capacity and cooperation for the monitoring program. For example, the *Holoholo* logs served as a great tool because it captures and acknowledges the Hāʻena fishermen's ways of observing fish health and abundance. The *Holoholo* logs gather similar information to what a belt transect swim and fishing catch-per-unit effort (CPUE) would entail.

Facilitating ways to encourage integration by making everyone feel included in the bigger picture. All knowledge systems are valuable and should be included in resource monitoring regimes. Although different worldviews exist, their conceptual and operational principles intersect in many ways, creating opportunities for integration (Thornton & Scheer 2012, Cinner & Aswani 2007, Roberts 1998). Projects that include integration and community-based approaches have the ability to transform people – place relationships, increase community social-ecological resilience, and improve decision-making in natural resource management (Newman *et al.* 2016). For example, the Fish Gonad Kit was a useful tool because the local

fishermen felt that it coincided with their overall interest in better understanding fish spawning seasons. In another example, the ORA contributed to the Hā'ena community's interest in *'opihi* distribution and population especially since they designated a *'opihi* no-take zone in their current CBSFA rules package.

There is a necessary balance between community knowledge and scientific sampling protocols to support healthy ecosystems and community capacity for monitoring. In general, scientific methods usually base their experimental design on random, stratified, probability or multistage sampling. However, what happens when there are community members with in-depth knowledge of their place and know exactly which reef to go to for particular species? For example, the OPIHI *limu* monitoring method required random sampling, however Hā'ena community members have specific reefs that they gather *limu* from. In another example, for the *Holoholo* logs, we tried to come up with a consistent path that all participants would walk when monitoring. But every fisherman walks a different path according to fish locations and other factors. Therefore, getting a consistent method was not reasonable.

Be flexible and let the place tell you. Throughout this process of understanding holistic systems, we also have to be flexible to what monitoring approaches work best for the place and community members. Some monitoring tools (quadrats, transects, etc.) are not easy to use for certain coastlines and seasons, and are not comfortable for community members who understand resource health from a different perspective. Research has proven that management should not be a "one-size-fits-all" model (Friedlander *et al.* 2013), but neither should resource monitoring regimes. For example, the OPIHI *limu* monitoring method was difficult to conduct at particular reefs in Hā'ena due to strong currents and tides.

Collective monitoring approaches are essential to understanding holistic health of the Hā'ena ecosystem. The monitoring approaches used in this project helped build our understanding of resource health because the toolkit focused on a holistic system from *mauka* to *makai*, and not just species specific. *Huli 'Ia* was rated one of the preferred methods in our monitoring program because it was inclusive of different ecosystem observations and perspectives, and it highlighted seasonal productivity within the Hā'ena watershed. Documenting and accounting for these shifts and changes within the ecosystems is crucial in the face of climate change and other environmental issues (Berkes & Ross 2013, Berkes *et al.* 2007). Overall, more time is needed to assess the natural trends, cycles and productivity of the Hā'ena

coastline. Just as indigenous knowledge implies, this knowledge and commitment is multigenerational, and not just during the course of a two-year Master's thesis.

7.4. What can we learn from this process in order to support community-based resource management throughout Hawai'i and the Pacific?

Communities are trying to address more than biological health but cultural and social health of their people and place. At the beginning of the project, I was focused on facilitating a marine monitoring program for the community. But overtime, I learned about the community's vision, which was far beyond a monitoring program but more substantial foresight like building community capacity, providing jobs for community members and multigenerational learning. This realization came when I was hired as a program coordinator for Hui Maka'āinana o Makana because it broadened the scope of my work to incorporate these larger community goals and visions. The community's reflections at the end of the NKA camp (Figure 12 and Table 13), reinforces that they have a more holistic vision of health and wellness for their people and place, which is our perception of *'āina momona* (Figure 13).
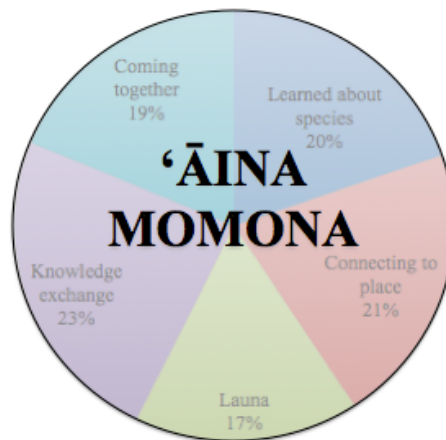
Figure 13. The reflections from the NKA camp encompass *'Āina Momona*.

This is because indigenous communities have broader goals and visions for their people and place, and prioritizes cultural and social health (McGregor *et al.* 1998, Nani'ole and Meyer 1998). Traditional knowledge and social-ecological systems provide key insights into understanding environmental variability and the inter-connectedness between natural and social resilience to major disturbances (McMillen *et al.* 2014). In the face of climate change and increasing human impact, there is a need for proper behavior built on cultural, spiritual, and

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social values to ensure productivity for future generations (Jokiel *et al.* 2011). Taking a place-based approach is important to collectively observe cycles and seasons that in turn, guide the development of effective resource management. Integrating knowledge systems to monitor and manage resources is challenging. However, the outcomes are informative and build a powerful platform for co-management that addresses cultural and ecological goals of healthy people and place.

 Communities are operating on long-term visioning and multigenerational foresight. Community timeframes and deadlines are very different than State agencies and other entities. Therefore, we need to be mindful of people's time and project timelines, especially for projects that aim for community involvement. Most of the community members involved in this project have one and/or multiple full-time jobs. Therefore, being realistic about people's time and commitment is very important. One recommendation is to secure financial support and incentives to create jobs for community members to execute place-based projects that include monitoring resource health. In addition, **it is crucial that community members are in the driver's seat of these efforts for their place.** The CBPR method was a great example of including the community throughout the entire process. As well as holding focus groups and community visioning early on in the project to ensure that community values, needs and priorities are reflected and moving in that direction.

8. Conclusion

The goal of this project was to establish a community-driven monitoring program in Hāʻena, Kauaʻi based on holistic local understandings of resource health and abundance. This project explored the role of relationships within a community-driven program that used various monitoring approaches to help understand Hāʻena's shoreline, the integration of knowledge systems, and lessons learned along the process to support future work throughout Hawaiʻi and the Pacific.

Through the development and implementation of this project, there were many lessons to consider in balancing the needs of our natural resources (fisheries) with the needs and capacity of the community. Navigating through the layers of community, values, knowledge systems, monitoring resources, etc. was indeed a challenge in making this project not only about establishing a monitoring program, but also being inclusive of establishing and/or strengthening a community. This was achieved through consciously building meaningful relationships between our people, place and resources, and integrating different knowledge systems and tools to broaden the scope and understanding of natural trends, cycles, and productivity. Although the monitoring program will continue to evolve to meet the needs of the community, this project has created a pathway for Hāʻena and others to follow and learn from in our collective journey towards *ʻāina momona.*

8.1 Meaningful Relationships

Hawaiian values guide the way people live and function as it is based on the understanding that people and place are connected and there is no separation between various components within these relationships. Community, driven by this understanding of connectivity, are holistic in their planning and considerations as people, place and resources are all interconnected and highly dependent on each other when it comes to health, wellness and productivity. This is why meaningful relationships are at the foundation of the *Pilina – Mālama - ʻĀina Momona* framework and crucial to this project. The focus on building and investing in meaningful relationships as a first step within this framework, guides the development of tools and approaches that reflect Hawaiian values and relationships to ensure that actions and future steps move towards *ʻāina momona. ʻO ke kahua ma mua, ma hope ke kūkulu,* is a Hawaiian

proverb saying that one must have a strong foundation first, and then you can build upon it. The foundation of meaningful relationships for this project has been established, tended, and has set a platform to build upon.

8.2 Integration of Indigenous and Western Knowledge Systems

He lawaiʻa no ke kai papaʻu, he pokole ke aho,
he lawaiʻa no ke kai hohonu, he loa ke aho.
A fisherman of the shallow seas uses only a short line
A fisherman of the deep seas uses a long line.
(Pukui and Elbert 1986)

This Hawaiian proverb can refer to a fisherman that uses the right tools for what he is trying to catch; sometimes you need a short line, and sometimes you need a long line, but all are different methods to reach what you are aiming for. This idea supports the inclusion of different knowledge systems and how they can all be utilized to accomplish various goals. Prioritizing and integrating multiple sources of knowledge as key components of community-driven monitoring programs is important towards establishing a successful community-based monitoring program. There are multiple ways of knowing, such as institutional/western knowledge, local knowledge and indigenous knowledge. Therefore, being inclusive of these knowledge systems helps to empower and build capacity within a community to support healthy and productive ecosystems. Utilizing and integrating these multiple knowledge systems is crucial to changing and strengthening relationships, which ultimately changes the way we view, care for, and interact with our resources and each other; the way we *mālama*.

8.3 Contemporary marine management in Oceania

Community-driven resource management efforts can be likened to a canoe, a salient metaphor across Oceania. The community steers and the partnerships come in as support in paddling towards the greater goal and destination. It is crucial that community members remain at the forefront of these efforts for their place because they are operating on long-term visioning and multigenerational foresight. Community-driven efforts are a step towards community empowerment, trusting in our knowledge systems, productive collaborative relationships, and the integration between traditional and western management and monitoring. Communities are

trying to address more than biological health but cultural and social health for their people and place. As stated in the quote by Gus Speth, U.S. Environmental Lawyer:

> *"I used to think the top environmental problems were biodiversity loss, ecosystem collapse and climate change…I thought that with 30 years of good science we could address those problems. But I was wrong. The top environmental problems are selfishness, greed and apathy…and to deal with those we need a spiritual and cultural transformation…and we scientists don't know how to do that."*

Addressing these problems is a behavior change that needs to happen through a cultural and spiritual awakening for all. A key aspect of this approach is thinking holistic health, and holistic ways of addressing it. We need to look beyond the boxes that we are compartmentalized into. It takes a collaborative effort that requires many hands, many perspectives, and many tools. This project can be used as an example to build off of in other communities across the Pacific as it was developed on the very foundation of indigenous values. This project can help to encourage a shift and transformation in community-based resource management to address holistic community health and well-being.

8.4 Pipi holo kaʻao…

As we move forward into management and conversations of health, wellness and productivity, it is important that our actions are inclusive of these values, relationships and knowledge that are reflective of the communities they represent. Their knowledge and engagement is an important and necessary component in building community health and well-being, and is an integral role in the discussions and decisions being made. Within the planning and implementation of management strategies and initiatives, our actions should reflect the *pilina* (meaningful relationships*)*, as they drive *mālama* (how we care for), with the intent and final destination of *ʻāina momona* (healthy and productive communities).

He ʻāina ʻai kēia, he ʻāina momona, a he ʻāina ākea no hoʻi[3].
This is a place that feeds us, a rich and productive place, an expansive place…a place of the people (Andrade 2014).

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[3] Ka Lahui Hawaii. Buke 1. Helu 39. 1. National Sepatemaba 23, 1875. 23 September 1875.

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10. Appendix

10.1 Glossary (Pukui & Elbert 1986)

Ahupua'a: land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap of stones surmounted by an image of a pig or because a pig or other tribute was laid on the altar as tax to the chief.

Au 'āpa'apa'a: ancestral timekeeping

'Āina: land, earth; *'ai*, to eat; that which feeds

'ākule / akule: big-eyed or goggle-eyes scad fish (*Trachurops crumenophthalmus*)

'Āpapa: stratum, flat, especially a coral flat

'Aumakua: family or personal gods, deified ancestors who might assume the shape of sharks, owls, hawks, 'elepaio, 'iwi, mudhens, octopuses, eels, etc.

'Ō'io: Ladyfish, bonefish (*Albula vulpes*)

'Ohana: family, relative, kin group; related

'Opelu: Mackerel scad (*Decapterus pinnulatus* and D. *maruadsi*)

'Ōpio: youth, juvenile; youngster, young

Anana: fathom; formerly the distance between tips of longest fingers of a man, measured with arms extended on each side

'Ike hānau: instinct

'Ike kūpuna: ancestral knowledge

He'e: Octopus, (*Polypus* sp.), commonly known as squid

Hō'ihi: sacred; to treat with reverence or respect

Ho'olako: to supply, equip, provide, furnish, enrich

Ho'omaha: to rest

Ho'omalu: to bring under the care and protection of; to protect

Ho'oponopono: to correct, mental cleansing: family conferences in which relationships were set right through a prayer, discussion, confession, repentance, and mutual restitution and forgiveness

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Holoholo: to go for a walk, ride, or sail; to go out for pleasure, stroll, promenade; a net into which fish run after being frightened; to fish with this net; to go fishing

Honua: land, earth, world

Hukilau: a seine; to fish with the seine; to pull ropes (lau)

Iʻa: fish or any marine animal

Imu Kai: Fish house

Ipuheke: double gourd

Kahawai: stream, creek, river

Kai: sea, sea water; area near the sea, seaside, lowlands; tide, current in the sea

Kaiāulu: community, neighborhood, village

Kalo: Taro (*Colocasia esculenta*), a kind of aroid cultivated since ancient times for food, spreading widely from the tropics of the Old World

Kapu: taboo, prohibition; special privilege or exemption from ordinary taboo; sacredness; prohibited, forbidden; sacred, holy, consecrated; no trespassing, keep out

Kapulu: careless, slovenly, unclean, gross, slipshod, untidy, disgusting, unkempt

Keiki: child, offspring, descendant

Kilo: to watch closely, spy, examine, look around, observe forecast

Kulāiwi: native land, homeland.

Kuleana: right, privilege, concern, responsibility, title, business, property, estate, portion, jurisdiction, authority, liability, interest, claim, ownership, tenure, affair, province; reason, cause, function, justification; small piece of property, as within an ahupuaʻa

Kumu: bottom, base, foundation basis, title (as to land), main stalk of a tree, handle, root (in arithmetic); basic; hereditary, fundamental; teacher, tutor, manual, primer, model, pattern; beginning, source, origin, reason, cause, goal, justification, motive, grounds, purpose, objective.

Kūpuna / kupuna: grandparent, ancestor, relative or close friend of the grandparent's generation, grandaunt, granduncle

Laʻi: Ti leaf

Lani: sky, heaven; heavenly, spiritual

Launa: friendly, sociable; to associate with, meet with, fraternize with, visit, be sociable

Lawa: enough, sufficient, ample; to have enough, be satisfied

Lawaiʻa: fisherman; fishing technique; to fish, to catch fish

Lei: garland, wreath; necklace of flowers, leaves, shells, ivory, feathers, or paper, given as a symbol of affection

Limu: a general name for all kinds of plants living under water, both fresh and salt, also algae growing in damp place in the air, as on the ground, on rocks, and on other plants (alga, lichen, moss, seaweed)

Limu kohu: a soft, succulent, small seaweed (*Asparagopsis taxiformis*), with densely branches furry tops that are tan, pink, or dark red, arising from a creeping stem-like portion; one of the best-liked edible seaweeds, prepared in balls for market

Loʻi kalo: taro (*Colocasia esculenta*), patches

Mahele: portion, division, section, zone, lot, piece, quota

Makua: parent, any relative of the parents' generation; a reef name in Hāʻena

Mālama: to take care of, tend, attend, care for, preserve, protect, beware, save, maintain; to keep or observe as a taboo; to conduct, as a service; to serve, honor, as God; care, preservation, support, fidelity, loyalty, custodian, caretaker, keeper

Malihini: stranger, foreigner, newcomer, tourist, guest, company; one unfamiliar with a place or custom.

Menehune: legendary race of small people who worked at night, building fish ponds, roads, temples, etc.

Moʻo: succession, series, especially a genealogical line, lineage.

Moʻopuna: grandchild; great-niece or –nephew; relatives two generations later; whether blood or adopted; descendant; posterity

Moku: district, island, islet, section

Naʻau: intestines, bowels, gut; mind, heart, affections; of the heart or mind; mood, temper, feelings

Nenue: Chub fish, also known as rudder or pilot fish (*Kyphosus bigibbus*, *K. vaigiensis*)

Piko: navel, navel sting, umbilical cord; summit or top of a hill or mountain

Poi: the Hawaiian staff of life, made from cooked taro corms

Pūlehu: to broil placed on hot embers

Wai: water, liquid, stream, river

Phrases / Sayings
Noho a kupa i kou alo: to have stayed and become accustomed to your presence

Lawa Pono: to take just enough

10.2 Preliminary Data

10.2.1. Gonad-somatic Study Findings
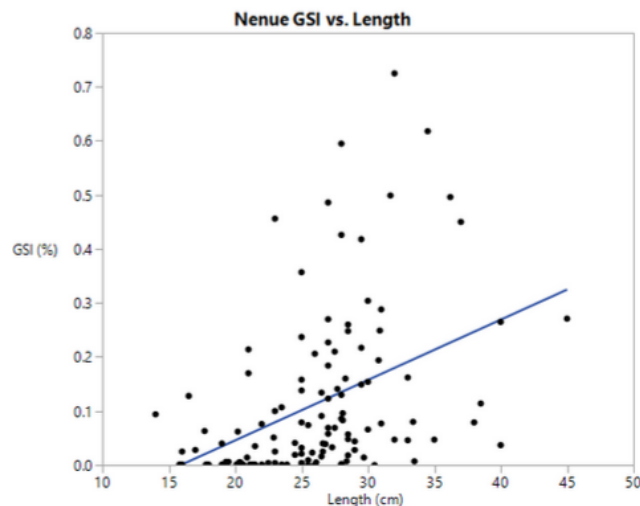
Figure 14. Preliminary results of Gonad-somatic Indices collected from nenue *(*Kyphosus *spp.)*
catches.

Understanding GSI helps the community to determine the relationship between size of fish and reproductive output (Figure 1). Though not statistically analyzed, this suggests that future research could focus on collecting more data on *nenue* (*Kyphosus* spp.) and use statistical approaches to identify what sizes are most reproductive and how much more reproductive are larger-sized fish compared to smaller sizes. Because sample sizes varied by date, I grouped the dates into seasons of Fall (Sept-Nov), Spring (March) and Summer (May-June).
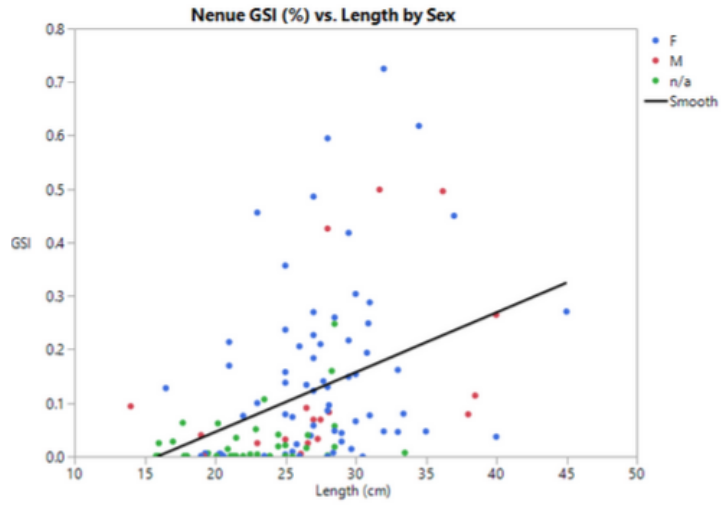
Figure 15.Preliminary results of Gonad-somatic Indices collected from nenue *(*Kyphosus *spp.)*
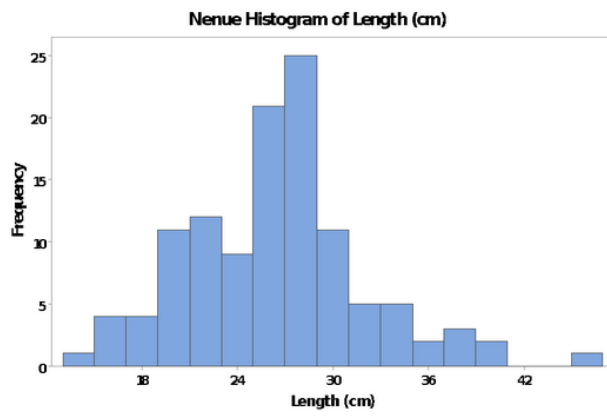*catches by gender.*

Figure 16. Histogram displaying the size distribution of nenue *used in the GSI study.*
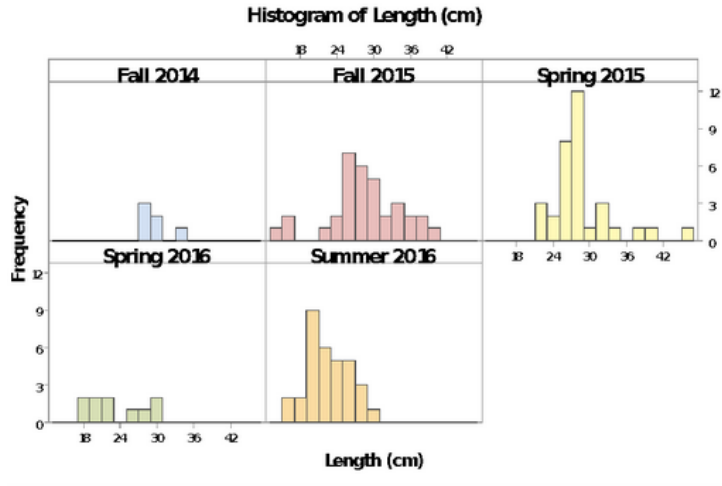
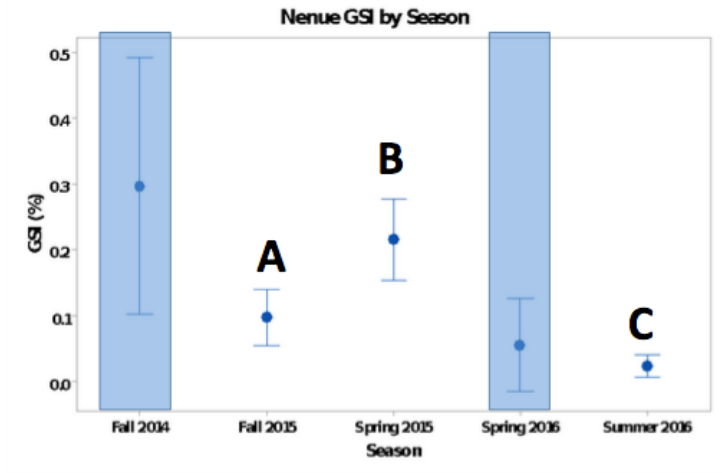*Figure 17. Histogram displaying the size distribution of* nenue *used in the GSI study by season.*

Figure 18. Average GSI of nenue *caught by season.*

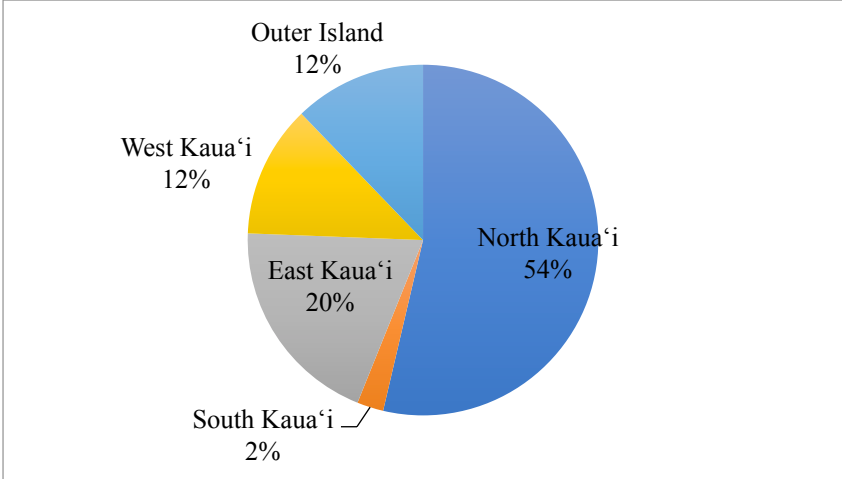10.2.2. Na Kilo ʻĀina Camp Keiki Demographics

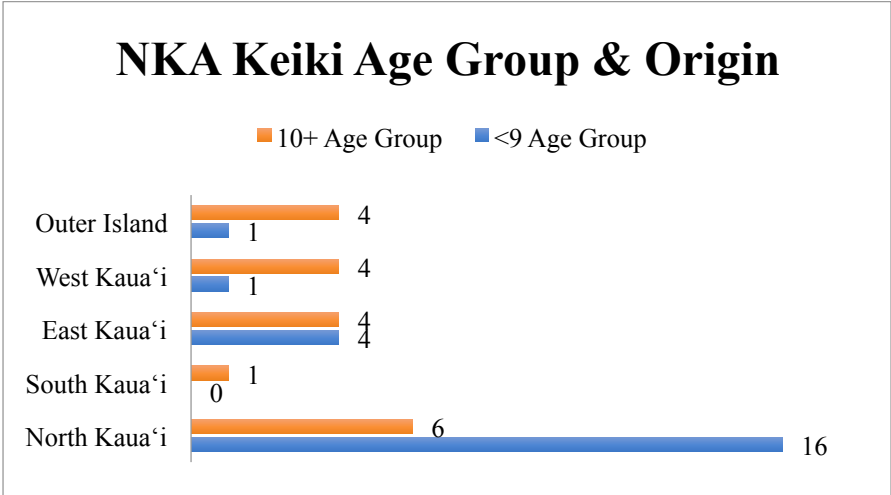*Figure 19. Total percentage of kids at Na Kilo ʻĀina Camp (n=41).*

Figure 20. Age and geographical representation of NKA keiki participants.

10.2.3 Na Kilo ʻĀina Keiki Evaluation

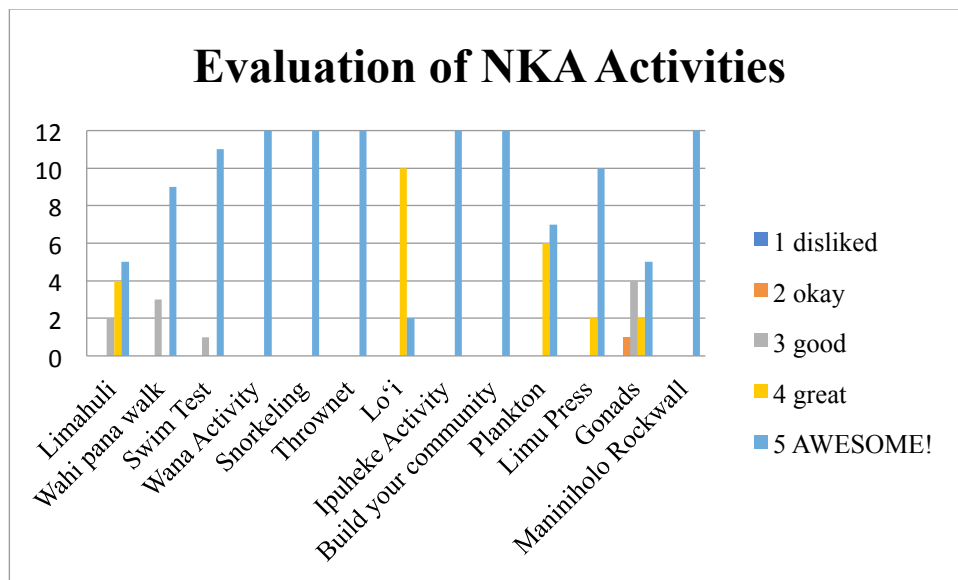### 10.2.4 *Na Kilo ʻĀina ʻŌpio* Evaluation

Figure 21. Keiki evaluations of NKA camp activities (n=12; ages 10 – 14).

10.2.5 NKA Camp Quotes

"Learning more and more about each and every one of you, how special everybody is when we come down here and what we can do together. Its going to take hard work, and the things I learn and my aloha here, wherever I go, when I go to other islands, I do ʻem over there, represent hāʻena to the fullest always."(Hāʻena Community Member)

"Getting to participate in things I wish for my baby. How to throw net, things I've always wanted to learn but felt shy. Seeing the keiki learning, I think what's holding me back?   Uncle Pres showed me how to throw "a little bit beyond a banana!" (DAR Representative)

"Awesome program… the mana from everyone today (during the Maniniholo rock wall activity) was unreal… I been working on that wall for 6 months everyday… I don't know if its making me stronger or weaker… but today was awesome. Baby… after this program, its on, its on, this program is ON!"(Hāʻena resident and Community member)