Hoʻolālā i ka mahiiʻa o kēia mua aku
Visioning the future of Aquaculture in Hawaiʻi

June 21-23, 2011
University of Hawaiʻi - Mānoa Ballroom

TABLE OF CONTENTS

Acknowledgements

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Executive Summary

The University of Hawai‘i Aquaculture Program and the National Oceanic and Atmospheric Administration’s (NOAA) Hawaiian Islands Humpback Whale National Marine Sanctuary (sanctuary) co-hosted "Ho‘olālā i ka mahii‘a o kēia mua aku", a workshop focused on visioning the future of aquaculture in Hawai‘i. The workshop offered an opportunity to bring diverse stakeholders together to facilitate a dialogue on issues regarding aquaculture in Hawai‘i and to build relationships to promote future collaborations. Topics of discussion included food safety and security - sustaining local communities by enhancing locally produced and consumed foods; stimulating job creation while conserving natural and cultural resources, existing and future aquaculture projects, considerations for project siting and national aquaculture policies.

A Workshop Advisory Team (WAT) was formed to plan the workshop and was comprised of cultural advisors, community and stakeholder representatives, and state and federal agency representatives. The WAT identified a workshop process, content, and potential participants. The workshop was the first of a series of planned discussions and brought together cultural and fishpond practitioners, community members, farmers, business and food industry representatives, subject matter experts, state and federal agency representatives and marine resource managers.

The first day of the workshop was an information-sharing day open to the public. The format included presentations and panel discussions with opportunities for questions and answers. Presentations were provided on topics including:

- Historical context of aquaculture in Hawai‘i
- Current aquaculture activities in Hawai‘i
- A national perspective of aquaculture
- The role of the Department of Land and Natural Resources in the oversight of aquaculture in the State of Hawai‘i.

Panel discussions included: Native Hawaiian aquaculture practices; today’s open ocean aquaculture; and cultural and environmental considerations in aquaculture practices.

The remaining two days of the workshop focused on identifying common ground among the diverse participants to stimulate value-based discussions among multiple stakeholder groups. The remainder of the workshop focused on the Appreciative Inquiry (AI) strategic planning process for invited participants. Appreciate Inquiry is a process that identifies areas of common ground within a diverse group and is highly effective in stimulating discussions based on shared values among multiple stakeholders through a series of iterative and interactive sessions.

The "Ho‘olālā i ka mahii‘a o kēia mua aku" workshop provided an opportunity for diverse stakeholders to expand participation in aquaculture-related conversations that involve cultural, community, economic, and natural resource interests. By utilizing the Appreciate Inquiry strategic planning process, facilitators worked with participants to identify commonalities and shared values that promote relationship building and allow for future collaborations. Discussions served to share and increase participants knowledge of a variety of issues including food safety and security - sustaining local communities by enhancing locally produced and consumed foods;

stimulating job creation while conserving natural and cultural resources, existing and future aquaculture projects, considerations for project siting and national aquaculture policies. Additionally, it was recognized that although the workshop was an important step in visioning the future of aquaculture in Hawai‘i, ongoing discussions will have to include additional communities and stakeholder representatives to engage others in the process. To that end, fishpond revitalization and restoration were recognized as an important issue for many participants and there was agreement that a follow-up workshop should be planned for fishpond practitioners and agencies to discuss obstacles and challenges to fishpond restoration. This workshop will serve as an important venue to continue sharing knowledge and experiences relative to engaging community members to provide input in considering the future of aquaculture in Hawai‘i.

This report provides an account of "Ho‘olālā i ka mahii‘a o kēia mua aku" workshop, a historical context and information on current aquaculture activities in Hawai‘i, and supplemental information regarding aquaculture projects globally. The intent of the report is to provide transparency and share information more broadly with those who did not participate in the workshop.

INTRODUCTION

Over the last several years aquaculture has emerged as a national topic of discussion. In 2009, President Obama charged the Interagency Ocean Policy Task Force with developing recommendations to enhance our ability to maintain healthy, resilient, and sustainable oceans, coasts, and Great Lakes resources for the benefit of present and future generations. The Task Force noted the need to balance competing uses, including traditional, new, and expanding uses (e.g., energy, aquaculture), minimize impacts on coastal and ocean ecosystems, ensure sustainable uses under reasonable changes in environmental conditions, and minimize costs. Additionally, on June 9, 2011, both the National Oceanic and Atmospheric Administration (NOAA) and the Department of Commerce released national policies to enable the development of sustainable marine aquaculture that consider broader social and economic goals.

On June 21-23, 2011, the University of Hawai‘i Aquaculture Program and NOAA’s Hawaiian Islands Humpback Whale National Marine Sanctuary (sanctuary) co-hosted "Ho‘olālā i ka mahii‘a o kēia mua aku", a workshop that focused on visioning the future of aquaculture in Hawai‘i. The workshop provided an open forum and opportunities for community members and stakeholder representatives to increase participation and build upon previous discussions that involved NOAA representatives. Aquaculture was also defined broadly to include Hawaiian fishponds as they are an important component of aquaculture in Hawai‘i.

The workshop was the first of its kind in the state and brought together cultural and fishpond practitioners, community members, farmers, business and food industry representatives, subject matter experts, state and federal agency representatives and marine resource managers (see Appendix II and III for a list of invited organizations and participants). Topics of discussion at the workshop included sustaining local communities by enhancing locally produced and consumed foods; stimulating job creation while conserving natural and cultural resources; existing and future aquaculture projects; considerations for project siting; and national aquaculture policies. Two topics that were identified by participants and the subject of much discussion included aquaculture activities and the Hawaiian Islands Humpback Whale National Marine Sanctuary and the role of aquaculture in increasing food safety and security in Hawai‘i.

Planning for the workshop began in January 2011 with the formation of a Workshop Advisory Team (WAT) comprised of cultural advisors, and representatives from the community and state and federal agencies including the University of Hawai‘i Aquaculture Program; NOAA, Hawaiian Islands Humpback Whale National Marine Sanctuary; NOAA, Office of National Marine Sanctuaries Pacific Islands Region; Sanctuary Advisory Council Fishing Representative; NOAA, National Marine Fisheries Service; State Department of Agriculture, Aquaculture and Livestock Support Services; Kamakakūokalani Center for Hawaiian Studies; Ao’ao O Na Loko i‘a O Maui; Department of Land and Natural Resources, Office of Conservation and Coastal Lands.

The Workshop Advisory Team (WAT) held four multi-hour planning sessions between January and June 2011. WAT members on the Island of O‘ahu met face-to-face at the University of Hawai‘i joined by members on neighboring islands via the internet meeting technology, Go-To-Meeting, and conference calls. In between planning sessions, communications continued via e-

mail between meetings. The WAT developed the agenda, identified potential participants and also met post-workshop to review the draft workshop report and identify additional opportunities to continue and expand stakeholder discussions to implement workshop recommendations.

The workshop began with an information-sharing day open to the public. Presentations were provided on topics including: a historical context of aquaculture in Hawai‘i; current aquaculture activities in Hawai‘i; hunger, food security, and aquaculture; the national perspective of aquaculture; and the role of the Department of Land and Natural Resources in the oversight of aquaculture in the State of Hawai‘i. The presentations were followed by panel discussions on: Native Hawaiian aquaculture practices – history, experiences, and the future of fishponds; today’s open ocean aquaculture – perspectives and experiences from industry; cultural and environmental considerations in aquaculture practices – research and monitoring; and modeling potential sites to support nearshore marine aquaculture on Hawai‘i Island.

The Appreciative Inquiry (AI) strategic planning process was utilized in this workshop because it focuses on possibilities and opportunities rather than problems. The important assumption underlying AI is that every living system has a core of strengths (“positive core”) that can be tapped into to provide a sustainable source of positive energy to nurture personal and organizational change. A basic principle of AI is that whatever a group focuses on (i.e., inquires about), tends to grow and expand. So when that group searches for what is working well, they can create more successes in their system. Days two and three consisted of a series of small and large group sessions focusing on what is working well.

This report provides a summary of "Hoʻolālā i ka mahiiʻa o kēia mua aku", a workshop that focused on visioning the future of aquaculture in Hawai‘i. A historical context as well as information on current aquaculture activities in Hawai‘i is also included. Additionally, supplemental information regarding the status of aquaculture projects globally is provided.

Day one, June 21, 2011: Information-Sharing Day Open to the Public – Presenter Abstracts:

Historical Context of Aquaculture in Hawai‘i – Dr. Carlos Andrade, Director, Kamakakūokalani Center for Hawaiian Studies, University of Hawai‘i

Aquaculture in Hawai‘i is no new phenomenon. Centuries before the advent of Europeans in Oceania, Native Hawaiians had developed and practiced a form of aquaculture known nowhere else in the Pacific, and possibly the entire world. One only needs to survey the great number of loko i‘a (fishponds) that still remain (both inactive and in service) to recognize that the indigenous people of Hawai‘i were highly skilled engineers in order to successfully construct the extensive stone work which bounded these fish producing structures. In addition, they were highly skilled biologists/zoologists as indicated by examining the system of diverse and numerous fish species they were able to produce and cultivate for many generations of people inhabiting ahupua‘a (watersheds) containing these fishponds.

These fishponds were so highly valued as a resource of food production that any land that had a fishpond within its boundaries was known as an “‘āina momona”, a “fat” or “sweet” land. Wise leaders (ali‘i) including the Mō‘ī (paramount ali‘i) encouraged their people to build, maintain and support loko i‘a in order to supplement the sea food resources that were found in the deeper ocean fisheries and the individual ahupua‘a fisheries that the people had access to for their subsistence. The loko i‘a was only one component in a diversified but well integrated food production system utilizing assets ranging from the top of the mountains and extending well out into the deep sea. The loko i‘a, located at the confluence of land and sea, provided fish and other forms of food when the sea was inaccessible as during stormy periods as well as when land based food sources faltered. All that fed and nourished the Hawaiian people was identified as ‘āina (that which feeds) and encompassed all resources of land, sea and air. The loko i‘a, a prime example of aquaculture at its best, was the “crown jewel” in the traditional indigenous Hawaiian system of food production.

Current Aquaculture Activities in Hawai‘i – Todd Low, Department of Agriculture, Aquaculture and Livestock Support Services, State of Hawai‘i

Aquaculture activities vary greatly within state and federal waters off the coasts of the Hawaiian Islands. A recent study has identified roughly seventy operations occurring within the state. Although Hawai‘i is a large consumer of seafood, it still relies heavily on imports. Thus, there is a need to increase productivity and reduce the current fish and seafood trade deficit that exists. In many places of the world, there is a dire need for nutritional food. In many past traditional cultures, a good leader was determined by whether he could provide food for his people; this idea still holds true as many people around the world are in desperate need for access to food today. The Aquaculture and Livestock Support Services (ALSS) within the Department of Agriculture of Hawai‘i is primarily concerned with product health, herd concerns, and land and water constraints. As a consequence, ALSS is focusing more effort to dealing with aquaculture-related activities since production peaked in 2008 with most occurring on the Big Island. Specifically, algae harvesting has proven to be of major prevalence as a particular type of aquaculture.

Hunger, Food Security, and Aquaculture - Dr. Tetsuzan Benny Ron, Aquaculture Program Coordinator, University of Hawai‘i (presentation with accompanying video on hunger)

Put Food First - Every day nearly 1 billion people go to bed hungry. Rising and volatile food prices are causing pain and suffering for poor people around the world, driving 44 million people into extreme poverty in recent months. Solutions need to be identified to ensure everyone has enough nutritious food now and in the years to come. How many hungry people are there in the world and where do most of them live? What effect does it have on their minds and bodies and what can we do to help them? The video that accompanies this talk is about hunger in our world and its effect on many humans. At present, there are close to 10 billion people in the world who do not eat enough to be healthy. That means one in every seven people on Earth goes to bed hungry each night. Rising food prices pushed an additional 44 million people into hunger between June 2010 and February 2011 when they soared to their highest level ever. While the number of hungry people has risen, as a percentage of the world population, hunger has actually fallen from 33 per cent of the population in 1969 to just over 15 per cent of the population in 2010. Well over half of the world's hungry people – some 578 million people – live in Asia and the Pacific Region. Africa accounts for just over one quarter of the world's hungry population. Hunger is number one on the list of the world's top 10 health risks. It kills more people every year than AIDS, malaria, and tuberculosis combined. A third of all deaths in children under the age of five in developing countries are linked to malnutrition. The first 1,000 days of a child's life, from pregnancy through age two, are the critical window in which to tackle malnutrition. A proper diet in this period can protect them from the mental and physical stunting that can result from malnutrition. It costs just $0.25 per day to provide a child with all of the vitamins and nutrients he or she needs to grow up healthy. Malnourished mothers often give birth to underweight babies who are 20 percent more likely to die before the age of five. Up to 17 million children are born underweight every year. By 2050, climate change and erratic weather patterns will have pushed another 24 million children into hunger. Almost half of these children will live in Sub-Saharan Africa.

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs without resorting to emergency food supplies, scavenging, stealing, or other coping strategies. The United States is one of the largest seafood markets in the world and has attracted increasing volumes of imports. In 2007, over 80% of the U.S. supply of seafood was imported, including increasing volumes of imported aquaculture products. Hawai‘i is heavily dependent on imported food to feed its residents, with an estimated eighty-five to ninety percent of the food consumed in the state imported; Hawai‘i residents spend an estimated $3,700,000,000 annually on food. If some of the dollars spent on imported foods were invested in locally produced foods, it would yield multiple benefits to the economy of Hawai‘i. A recent publication by the University of Hawai‘i, College of Tropical Agriculture and Human Resources, and the State Department of Agriculture, evaluates the economic multiplier effects of increasing food self-sufficiency in the economy of Hawai‘i. Assuming that eighty-five per cent of the food consumed in Hawai‘i is imported, $3,100,000,000 is leaving the State to support agribusinesses elsewhere around the world.

The Hawaiian Nation, before the arrival of Captain Cook, numbered about 1 million people, were able to supply all their needs without the cargo ships and without the need to fly food in via airplanes. The potential to grow food in general, via aquaculture in particular, exist in Hawai‘i. Now, it is our responsibility for our future generations to lay down the foundation for future food security and food safety.

The National Perspective of Aquaculture – Alan Everson, Pacific Islands Region, Habitat Conservation Division, National Marine Fisheries Service

On June 9th, 2011, NOAA came out with a marine aquaculture policy to address the future of aquaculture within the United States. Although NOAA's role primarily remains in federal waters (waters beyond 3 nautical miles in Hawai‘i), the national policy on aquaculture will act as a guidance document for states that are developing their own plans. The implementation of aquaculture policies is important as aquaculture is an integral component of our country's infrastructure as well as a major factor contributing to the restoration of coastal and marine habitats. The Department of Commerce (DOC) and NOAA strongly advocate sustainable aquaculture practices to spur domestic growth and production. The policies from each agency represent input from over 500 stakeholders who voiced their opinions during a public comment period. A growing aquaculture industry will create jobs and help to decrease the continued reliance of the US on imports and establish domestic aquaculture as a major contributor to food security. At the same time, practices must be conducted in a responsible manner to minimize any adverse effects on natural resources. Thus, best available science and management practices are needed for aquaculture to be compatible with the many other uses of our country's oceans.

The Role of the Department of Land and Natural Resources in the Oversight of Aquaculture in the State of Hawai‘i – Sam Lemmo, Office of Conservation and Coastal Lands, Department of Land and Natural Resources, State of Hawai‘i

In addition to scientific data, many moral and economic factors play a part when dealing with food shortages. Aquaculture is seen as an option to help alleviate hunger-related issues. The Department of Land and Natural Resources (DLNR) needs to look at the bigger picture of resource management and social and economic reality while considering both ecological and cultural factors when processing applications for and managing open ocean aquaculture projects. The DLNR has a history of managing fish farms, but open ocean aquaculture is a relatively new industry in the state, so it will be greeted with skepticism. However, open ocean aquaculture may be able to help address the issues of rising fish prices and food scarcity in Hawai‘i and help us achieve a higher level of food security and self sufficiency. A lack of funding to support DLNR resource management efforts as well, as the burdensome and redundant regulatory framework add to the challenges for Open Ocean Fish farming coupled with the ever rising demand for public and commercial competition for resource uses throughout the State of Hawai‘i. The DLNR is still determined to create self-sufficiency regarding food security and energy independence for Hawai‘i. Improvements to resource development and utilization are some of DLNR's main goals. First and foremost, in addition to efficient resource utilization, the natural beauty and aesthetic qualities of Hawai‘i must be preserved, promoted, and protected, despite these competing uses. As a result, the DLNR works

to identify any possible impacts associated with open ocean aquaculture. Currently, two open ocean aquaculture facilities are operating in Hawai‘i. Several other projects are in the research and development stage. The management programs of the DLNR strive to protect and assure access to the natural resources of Hawai‘i by the general public prior to commercial use considerations, and ecological functions are primal. As a result, there is a rigorous permitting process that commercial projects must follow to ensure any impacts to cultural and natural resources are minimized throughout the course of development.

Native Hawaiian Aquaculture Practices:

Hi‘ilei Kawelo – Paepae o He‘eia

Traditional Hawaiian aquaculture practices differ greatly compared to open ocean aquaculture. There is a rich history behind fishpond establishments and the earliest aquaculture systems, based on historical evidence. Hi‘ilei Kawelo and many others have spent time and effort to restore the He‘eia Fishpond. “Kū Hou Kuapā,” meaning “let the wall rise again” emphasizes the importance of restoration. The kuapā, or fishpond wall, is the primary element that keeps the fishpond operational without compromising water quality or degrading nearby habitat. Some fishponds are able to produce 200 pounds of fish per acre, per year. Unfortunately, fishponds similar to He‘eia fishpond have felt the effects of an ever-growing human population and a subsequent demand for resource exploitation through various means. By restoring the kuapā and managing He‘eia fishpond, water quality and fish production are kept at an optimal range that is sustainable and can meet local food demands. Outreach and education programs are also beneficial outcomes to restoring abandoned fishponds. On the contrary, mismanaged fishponds can have negative impacts on the local ecosystems. For example, if fishponds are not managed properly, invasive species could move into the area. This could result in a reduction of naturally occurring species.

Walter Ritte – Hawai‘i Learning Center, Moloka‘i

Over and above effective fishpond management, it is important to know where you are and have an understanding of what kind of mentality the people of the land have if aquaculture is to have any positive impact on the community. Before Hawai‘i can act as an international distributor and supplier of fish, it must be able to provide for those who call Hawai‘i home. Much of the wellbeing of the people of Hawai‘i depends on the status and wellbeing of their fisheries. Strong cultural ties between Hawaiians and fishing practices exist. Visions of aquaculture vary greatly, so there must be a balance between modern business and traditional Hawaiian values to avoid conflict. There are many stakeholders and individuals involved with aquaculture and fishery management, hence there must be compromise through collaboration.

Today's Open Ocean Aquaculture:

Randy Cates – Cates International

In Hawai‘i, open ocean aquaculture is a fairly new practice compared to the practice of traditional Hawaiian fishponds. There is great certainty about open ocean aquaculture and wild Hawaiian fisheries alone will not be able to keep up with increasing local food demands. Fishpond restoration and open ocean aquaculture practices should work together to accommodate the changing markets and diets of the people of Hawai‘i. At the same time, environmental implications need to be taken into consideration. Access to healthy and nutritious food remains a problem not only in Hawai‘i, but other parts of the world. Once open ocean aquaculture practices have been developed in a sustainable manner, techniques and knowledge unique to Hawai‘i can be applied to different areas of the world. Hawai‘i has already provided assistance elsewhere. Self-sufficiency must remain one of the top goals for Hawai‘i. Not only is it important to gather new information, but it is even more important how that information is used. Technological innovation is a key aspect of open ocean aquaculture in order to ensure the deployed cages/pens are properly constructed and located in an optimal location. Without innovative techniques and methods to effectively harvest fish, open ocean aquaculture would not be able to maximize production while making certain environmental protection is not overlooked. Currently, only two open ocean aquaculture operations exist off of the shores of Hawai‘i. Thus, growth of the industry is slow and proposed projects are examined in a meticulous fashion.

Bill Spencer – Hawai‘i Oceanic Technologies Inc.

Developing clean and sustainable technologies for aquaculture must be a priority. In countries such as the US and China where seafood is a major component of people's diets, fisheries are being depleted at an increasing rate. It is anticipated that current farmed seafood production of 62 million metric tons must double in thirty years in order to keep up with the rising demand. Hawai‘i Oceanic Technologies has developed the Oceansphere™. Farming primarily ahi (tuna), the Oceansphere™ is capable of holding up to 2,000,000 pounds (1,000 tons) of tuna. The company's permitted 250 acre lease site off of North Kohala can hold up to twelve Oceanspheres and produce 6,000 tons of seafood annually. The Oceansphere was designed with environmental responsibility as the ultimate objective. It is intended for use in the open ocean, far from shorelines, where fleets of Oceanspheres in proximity to a tender ship with command and control, feed mill and crew to manage seafood production. A challenge is developing such new technologies is the permitting process. The permitting process for open ocean aquaculture operations is long and arduous and can take several years. Depending on the location of the project, the entire process typically involves a number of scoping meetings, an environmental impact statement, cultural impact statement, multiple site surveys and hearings with respective landlords, Conservation District Use permit, National Pollutant Discharge Elimination System permit, Section 10 permit, Federal Consistency Review permit, and a number of public comment and review periods. Risk mitigation is a fundamental part of open ocean aquaculture development prior to project implementation.

Neil Sims – Kona Blue Water Farms (submitted video)

In 2004, Kona Blue Water Farms obtained the permits for a 90 acre open ocean farm site, situated 2,600 feet off of Kona's coast. The company raises Kona Kampachi® from hatch to harvest. A sushi-grade Hawaiian yellowtail, the operation uses wild native fish as a broodstock. Furthermore, genetically modified or non-native species to the area should not be used for open ocean aquaculture. Established aquaculture operations in Hawai'i use only native fish species, eliminating the chance of genetic issues with any possible escapees. A major concern with siting of aquaculture projects is how they will fit in with existing ocean users. National aquaculture policies stress the importance of ecosystem compatibility. The health, production, and resilience of various ecosystems that lie adjacent to aquaculture structures should not be negatively affected. Experience to date at the Kona farm site affirms that there is no measureable environmental impact from the operation, beyond the immediate area of the net pens.

Cultural and Environmental Considerations in Aquaculture Practices:

Michael Parke – Pacific Islands Fisheries Science Center

Aquaculture is a global industry. Right now, the United States is a major consumer of aquaculture products – the US imports 84% of the country's seafood and half of that is from aquaculture – yet the US is a minor producer. U.S. aquaculture (freshwater and marine) supplies about 5% of the U.S. seafood supply and U.S. marine aquaculture less than 1.5%. The United States imports significant volumes of marine aquaculture products from these and other countries, resulting in an annual seafood trade deficit of well over $9 billion. Additional domestic seafood production will reduce the nation's dependence on imports.

The largest single sector of the U.S. marine aquaculture industry is molluscan shellfish culture (oysters, clams, mussels), which accounts for about two-thirds of total U.S. marine aquaculture production, followed by salmon (about 25 percent) and shrimp (about 10 percent). Current production takes place mainly on land, in ponds, and in coastal waters under state jurisdiction.

As well as studying the biological aspects of aquaculture operations, the Pacific Islands Fisheries Science Center (PIFSC) will analyze the potential economic, social, cultural, and legal considerations of aquaculture production. For instance, a socio-economic study is looking at market demand for aquaculture products versus wild-caught fish. The PIFSC is also developing a GIS-based site assessment tool to assist managers, regulators, researchers, entrepreneurs, and other individuals involved with evaluating open ocean aquaculture opportunities and applications. Geographic information system (GIS) will be used to provide data and analysis capabilities to assist the decision-making process. By creating a GIS data service for practitioners, the PIFSC will provide a resource to facilitate better and transparent decisions related to aquaculture siting.

Suzanne Shriner – Pono Aquaculture Alliance

An environmental advocacy group, Pono Aquaculture Alliance is a collaboration of non-governmental organizations in Hawai‘i. Visioning the future of aquaculture is no easy task. Aquaculture practices raise concern for potential biological pollution, habitat and environmental damage, inefficiency, safety, and user conflicts. Therefore, a transparent and open process is needed to gain the trust and support of local communities, many of which are dependent on the ocean. Independent studies highlight changes to the ecosystem from wastes. Fish raised for export do not support sustainability. Pono Aquaculture has taken a strong stance against the use of chemicals, antibiotics, and genetically modified feed in Hawai‘i’s Public Trust waters.

Chris Ostrander – Pacific Islands Ocean Observing System

The Pacific Islands Ocean Observing System (PacIOOS) acts as a regional observing program. Data acquired by PacIOOS is useful to any ocean resource user. Information is transferred to users that may aid them in decision-making processes. Due to the ocean’s dynamic nature, it is continuously changing. The PacIOOS measures values that represent the variability within areas of the Pacific Ocean. Factors observed include tides, winds, weather conditions, currents, beach safety, and water quality. Through numerical modeling, marine operations and ecosystem information can be analyzed. Through maintaining records and keeping track of ocean conditions, the PacIOOS helps to ensure a clean ocean and resilient coastal zone. Real-time data and information continues to be gathered through the use of remote underwater vehicles and other advanced technologies.

Modeling Potential Sites to Support Nearshore Marine Aquaculture on Hawai‘i Island – Noelani Puniwai, University of Hawai‘i Hilo

Modeling is a key component of coastal zone management. Without the ability to replicate potential projects, the decision-making process to implement a plan would be even more difficult. Modeling, through the gathering of technical, GIS, and oceanographic data, enables all who are involved to understand the potential risks and gains that can come out of a project. Models have been created to examine aquaculture systems such as caged aquaculture, line culture, intertidal bottom culture, terrestrial ponds, and Hawaiian fishponds. Project areas are generally situated in waters that are no more than 200 hundred meters deep and within three nautical miles from the shoreline. Potential aquaculture sites are represented by hexagon-shaped areas accounting for 100 hectares. In addition to identifying potential boundaries, many other biophysical and zoning constraints need to be considered. Factors such as salinity, turbidity, wave height, substrate type, type of coast, fishery designated areas, shipping lanes, and other constraints all have an impact on proposed sites.

Days two and three, June 22-23, 2011: Invited Appreciative Inquiry Strategic Planning Process:

Day two began with an explanation of the Appreciate Inquiry Strategic Planning Process and an opportunity for participants to ask questions. The ground rules for days two and three of the workshop were discussed and agreed to by the participants. Participants were then asked to express their expectations for the workshop and what would be necessary for the workshop to be considered a success. An introduction to the process included a review of the agenda and the principles of Appreciative Inquiry.

The group determines what is working well by having participants conduct interviews in pairs where they share highlight or success stories and personal visions for the future. Common themes are identified from these interviews and they become the foundation upon which the rest of the planning is conducted. By getting the group to focus on the vision for aquaculture in Hawai‘i, narrow self-interest was minimized and more common ground was identified. All small group break-out sessions were followed-up by a report-out to the larger group to share the information. ***Please see Appendix I, which contains the "Group Memory," of all the small and large group sessions***.

APPRECIATIVE INTERVIEWS (*See Appendix IV for a copy of the Appreciative Inquiry Interview*)**:**

Participants broke into pairs to conduct an Appreciative Inquiry Interview. The interview was composed of three questions dealing with **(1)** highpoint or positive experiences (highpoint stories); **(2)** visions of the future: creating an epidemic of positive change; and **(3)** changes or transformations that would have to occur to achieve the desired vision for ocean-based aquaculture in the future. Partners then gathered into small groups where they share each other's highpoint stories. The small groups then discussed common themes identified in the interviews. Small groups then reported-out to the larger group to share information and identify common themes that the larger group shared as a whole (*See Appendix I, the "Group Memory" that captured input provided by participants*).

Common themes identified from (1) highpoint stories, include, among others:

- Balance and Restoration - Any changes should be appropriate to the place
- Stewardship and responsibility with Hawaiian values
- Access to locally provided healthy fish
- Sharing the ocean with ohana (family), wildlife, and other organisms

Common themes identified from (2) visions of the future, include, among others:

- Feed Hawai‘i
- System integration and efficiency
- Commitment to future generations through education and jobs
- Interdependency and holistic approach
- Systems that are compatible with the environment and place (place-based knowledge)

- Community control/self-determination

Common themes identified from (3) changes or transformations, include, among others:

- Transforming and changing education so these issues are integrated early on
- Research and education - aquaculture in general as well as impacts and benefits
- Acknowledging fishponds and not treating them as relics of the past
- I ka wa ma mua I ka wa ma hope (Literal translation - In the time in front, in the time in back. In Hawaiian thinking, the past is referred to as the time in front and the future is referred to as the time in back. The Hawaiian people believed strongly that our past guides our future. We can see our past, but our future is uncertain. Much like walking backwards, we can see where we've been, but we need to be careful because we cannot see where we are going).
- Prioritize fishpond re-development – streamline permitting process and re-evaluate legislation
- Regulatory system that's transparent, streamlined, and intelligible
- Outreach to communities on available options for building relationships with government and business
- Business and government behave as part of a community not outside of it

The purpose of the exercise was to enable participants that represented various stakeholder groups to identify and focus on shared commonalities, instead of differences, from the beginning of the strategic planning process.

DISCOVERING AND ARTICULATING AQUACULTURE'S "POSITIVE CORE": WHEN ARE WE AT OUR BEST AND WHY?

Participants were asked to keep in mind the common themes that were identified in the previous discussion and broke out into small groups. In small groups, participants discussed and identified "root causes of success," i.e. factors that could cause, create, or support successful aquaculture in Hawai'i. Similar root causes of success were then clustered by theme. Small groups then reported-out to the larger group to share information and identify common themes that the larger group shared as a whole.

Themes of root causes of success for aquaculture in Hawai'i:

- Location
- Expertise: fishponds and open ocean aquaculture
- Infrastructure (physical and social)
- Funding and research and development
- Motivation and need/demand
- Natural conditions
- Knowledge: environmental, technical, and historical
- Expertise: research institutions and entrepreneurs and ways to connect them
- Successful examples: regulations, restoration, and production
- Traditional practices/infrastructure

- Pristine waters (fresh, brackish, and salt)
- Close-knot community – allows for collaboration
- Knowledgeable community encompassing traditional and research-based components

VALUES: LARGE GROUP PRIORTIZES AQUACULTURE'S CORE VALUES: The values that you have shape the work that you do. In a large group exercise, participants identified and discussed the values that they considered to be important to aquaculture in Hawai‘i. Like items were clustered together and participants voted to indicate the values that they considered to be of highest priority. Each participant could vote up to five times. The top six values identified by the group are listed below.

Top six values important to aquaculture identified by workshop participants:

- Accountability, responsibility
- Sustainability (Aloha ‘Āina, Hawai‘i, pono - traditional way)
- Hawai‘i seafood self-sufficiency
- Reasonableness, consistency, integrity, honesty
- Patience, Ho‘omanawanui
- Safe, responsible, precautionary principal

UNDERLYING ASSUMPTIONS/BEHAVIORS: Given the values that you have, you develop underlying assumptions about how the world operates. These assumptions determine how you behave and expect others to behave. At this point in the process, participants divided into small groups to discuss and identify behaviors that demonstrate the **top six values** important to aquaculture listed above. Only behaviors that each member of the small group could support were kept on the list. Small groups then reported-out to the larger group to share behaviors that were identified. Only behaviors that each member of the large group could support were kept on the list. Examples of behaviors that demonstrate the top six values important to aquaculture are listed below.

Examples of behaviors that demonstrate the top six values important to aquaculture identified by workshop participants:

Accountability & Responsibility

- We will ho‘o ma‘a (embrace, respect, integrate and become intimately familiar) into the broader community through constant/consistent engagement in and beyond the “process”
- Projects proponents engage in a truly honest assessments of risks and have plans to respond/repair/or abandon if/as needed
    - And share with the community
- Think and act in a local and global context and accept role of Hawai‘i as a national/global/local model for sustainability

Sustainability, Aloha ʻĀina, Pono, Hawaiʻi, Kuleana (Responsibility)

- Use of ocean resources should benefit communities without compromising resources for future generations
- Kuleana to place: Hawaiʻi—Address local needs first because we need to be the beneficiaries. Aquaculture should address seafood needs for Hawaiʻi first.
- Ocean aquaculture projects that are permitted and have leases will abide by the conditions and requirements of the permits and leases

Hawaiʻi Seafood Self-Sufficiency

- We are committed to support and work toward responsible aquaculture in Hawaiʻi
- Seek clarifications and factual information – need more knowledge
- Address risks (i.e. doing something vs. nothing) and concerns – hunger, environment, food security

Reasonableness, Consistency, Honesty and Integrity

- Participate in future discussion and workshops
- Work towards agreement
- State your true actions and intentions regardless of your audience

Patience, Hoʻomanawanui

- Allowing more time wherever its needed
- Take time to enjoy the moment, appreciate successes
- We will be guided by long term impact considerations to the resources being used

Safe Responsible Precautionary Principle

- If something happens that is unforeseen take responsibility, acknowledge and address (already required in permitting)
- Seek better ways to solicit representative perspectives/input
    - Innovative methods for community input
- There needs to be an adequate research and development phase for each new technology system that has not been tested before.

STRATEGIC ISSUES IDENTIFIED: In the large group, participants were asked to identify strategic issues that would move forward to small group discussions. Participants wrote their strategic issues on a half sheet of paper or "snow card." All issues were reviewed by the larger group and merged under common themes: Loko iʻa (fishponds); Learning from the past; Aquaculture in the sanctuary; food sustainability and safety; Roles in aquaculture; and Offshore aquaculture.

Loko iʻa (fishponds): Participants were interested in identifying the major hurdles to Loko iʻa restoration and discussing solutions. There was also interest in discussing how to get fishponds back into production. Fishpond restoration was discussed as a key in maintaining food production systems that represent traditional Hawaiian knowledge, including ecological engineering, as well as contribute to future food security efforts for the state. A workshop for Hui Mālama Loko iʻa to address permitting hurdles to support fishpond revitalization and

restoration is being planned for 2012-2013. For that reason, participants decided to focus discussions on other issues for the remainder of the workshop.

Learning from the Past: Participants highlighted the need to learn from the past, the sense of place that exists in Hawai‘i, and lessons that could be learned from the Kumulipo (the Hawaiian Creation Chant).

Aquaculture in the Sanctuary: Participants wanted more information on aquaculture in the Hawaiian Islands Humpback Whale National Marine Sanctuary and the role of the sanctuary management in the review and approval process for aquaculture projects within sanctuary boundaries.

Food Sustainability and Safety: Participants agreed that safety issues related to fish farming, fish feed, species raised, aquaculture that benefits local communities, seafood consumption in Hawai‘i, and food sustainability should be given a high priority.

Roles in Aquaculture: Participants expressed the need to include additional stakeholders and increase participation of Native Hawaiians in aquaculture development and management.

Offshore Aquaculture: Participants expressed interest in further discussions of how offshore aquaculture could be expanded responsibly, pros and cons of aquaculture, community point of view, industrial aquaculture, specifics of open ocean aquaculture operations, and economic development. Additionally, there was also interest in the most current science, experience, and interactions with cage aquaculture.

Participants agreed to focus on two topics for the remaining time of the workshop and broke into two smaller groups for discussion. The topics included (1) Food sustainability and safety; and (2) Aquaculture in the sanctuary (refer to the Group Memory for the list of topics discussed). Following the smaller group discussions, all participants gathered together to report out and share information.

Food Sustainability and Safety: Discussions focused on the need to ensure food security in Hawai‘i by providing for the needs of today without compromising the needs of future generations and producing food that is culturally, ecologically, and environmentally sustainable. Topics discussed included, among others, the role of fishponds; the need to produce fish for local markets; selection of fish (herbivore vs. carnivore) and other cultured species; types of feed; invasive species concerns and comparing different types of aquaculture and knowledge bases.

Aquaculture in the Sanctuary: Discussions highlighted the benefits of aquaculture and the need to support responsible aquaculture that does not degrade the environment. There was considerable discussion on research needs and the need for monitoring projects to mitigate any potential impacts such as the possibility of whale entanglement. Other consideration included the physical space required for open ocean aquaculture projects and possible loss of whale habitat. The physical compatibility of potential projects and social suitability was a point of discussion along with considerations for siting projects and conveying why a particular location was selected. Finally, there was agreement that sanctuary staff, industry representatives, and

community members continue their involvement with multiple stakeholder groups on aquaculture-related issues.

Workshop Summary

The "Hoʻolālā i ka mahiiʻa o kēia mua aku" workshop provided an opportunity for diverse stakeholders to expand participation in aquaculture-related conversations that involve cultural, community, economic, and natural resource interests. While workshop participants identified several strategic issues related to aquaculture in Hawaiʻi, there was the recognition this was only the first step and that further meetings among the participants should continue and be expanded to include other stakeholders. It was the expectation among the participants that this workshop will provide a foundation to launch additional discussions that will lead to key actions and strategies that can be implemented to address these strategic issues.

APPENDIX I

Group Memory
Hoʻolālā i ka mahiiʻa o kēia mua aku
Visioning the Future of Aquaculture in Hawaii Workshop
June 21-23, 2011
University of Hawaiʻi - Mānoa Ballroom

June 21, 2011 – Information Sharing – Day 1 – Open to the public

Facilitated by Donna Ching

Welcome and Opening Remarks

Dr. Gary Ostrander – Vice Chancellor for Research & Graduate Education, University of Hawaiʻi
Welcome remarks

Dr. Tetsuzan Benny Ron, Aquaculture Program Coordinator, University of Hawaiʻi
Role of University and the aquaculture community

Dr. Malia Chow, Superintendent, Hawaiian Islands Humpback Whale National Marine Sanctuary
Background on sanctuary's history relating to aquaculture and overview of Management Plan Review

Morning Presentations

Historical Context of Aquaculture in Hawaiʻi
Dr. Carlos Andrade, Director, Kamakakūokalani Center for Hawaiian Studies, University of Hawaiʻi

Current Aquaculture Activities in Hawaiʻi
Todd Low, Department of Agriculture, Aquaculture and Livestock Support Services, State of Hawaiʻi and Dr. Tetsuzan Benny Ron, Aquaculture Program Coordinator, University of Hawaiʻi

The National Perspective of Aquaculture
Alan Everson, Pacific Islands Region, Habitat Conservation Division, National Marine Fisheries Service

The Role of the Department of Land and Natural Resources in the Oversight of Aquaculture in the State of Hawaiʻi
Sam Lemmo, Office of Conservation and Coastal Lands, Department of Land and Natural Resources, State of Hawaiʻi

Afternoon Panels - Discussions

Native Hawaiian Aquaculture Practices

- Walter Ritte – Hawai‘i Learning Center, Moloka‘i
- Hi‘ilei Kawelo – Paepae o He‘eia

Today’s Open Ocean Aquaculture

- Neil Sims – Kona Blue Water Farms (submitted video)
- Randy Cates – Cates International
- Bill Spencer – Hawai‘i Oceanic Technologies Inc., Hawai‘i Venture Capital Association

Cultural and Environmental Considerations in Aquaculture Practices

- Michael Parke – Pacific Islands Fisheries Science Center
- Suzanne Shriner – Pono Aquaculture
- Chris Ostrander – Pacific Islands Ocean Observing System (PAC-IOOS)

Afternoon Presentation

Modeling Potential Sites to Support Nearshore Marine Aquaculture on Hawai‘i Island
Noelani Puniwai, University of Hawai‘i Hilo

What did you learn on day 1 that has made an impact on your thinking?

- People can treat each other with respect despite different opinions
- There is a need for transparency
- I need to educate myself more on different points of view
- People should learn about and use new techniques
- Don’t have enough fresh water, limitation is something we can solve
- We’re regulating ourselves out of our livelihoods
- Sharp divide between what we do in natural environment and what we do for ourselves
- The process to get permits is overwhelming and long (e.g. 5 years)

Group Memory
Hoʻolālā i ka mahiiʻa o kēia mua aku
Visioning the Future of Aquaculture in Hawaii Workshop
June 21-23, 2011
University of Hawaiʻi - Mānoa Ballroom

June 22 & 23, 2011 – Appreciative Inquiry Strategic Planning Process – Day 2 – Invited Workshop Participants Only

Facilitated by Donna Ching

INTRODUCTIONS, EXPECTATIONS, GROUND RULES

A. APPRECIATIVE INQUIRY AND MODEL EXPLAINED

1. The rationale for using Appreciative Inquiry is presented. All components of the model and their relationship to each other are explained
2. The group is given an opportunity to ask questions about this process and how it relates to the strategic planning process.

B. GROUND RULES

- Be creative! Work toward future solutions/aspirations with our valuable time
- Conflict is OK as long as we are respectful of each other
- Silence means agreement
- Everyone gets a turn first, then repeats are taken
- Cell phones off or on silent mode, take all calls/texting outside
- You are personally responsible for:
    - making sure everyone has an equal opportunity to express their ideas (i.e., adhere to time suggestions
    - actively listening
    - keeping an open mind and maintaining a positive attitude
    - keeping side conversations to a minimum
    - switch seats during breaks

C. EXPECTATIONS FOR SUCCESS

1. What is going to have to happen at the retreat to enable you to feel it was a success?

- Find out what info people would like to include in informational support system
- Listen. Would like to see community input taken into account
- Get down to real agreements/disagreements
- Hoʻohui- come together
- Come to an agreement to continue effort
- Come up with vision for aquaculture for this century
- Identify common ground to keep moving forward
- Listen to what each side/party has to say
- Do our jobs better- uphold mandates (i.e. state/us)

- Have clear vision. Ensure clean, healthy environment while providing seafood for Hawai‘i
- Figure out what’s going on and how it deals with aquaculture management
- Work out something where it will be easier for both parties to get along
- Get things on the table and past the fluff
- Have a voice in the ongoing conversation about aquaculture
- Bridge divisions between non-governmental organizations (NGO’s) and corporate entities and find common ground
- Hope to find agreement while softening footprint on ocean
- Sort out facts so job can be done better (re: federal mandates)
- Meet and get to know people involved in the process. Determine what role sanctuary will play regarding aquaculture
- Meaningful discussions about aquaculture in sanctuary
- Get more truth and understanding of issues, not just the top surface

INTRODUCTION TO PROCESS

ENVIRONMENTAL SCAN

JURISDICTIONS

1. State
- Any issue related to use of state waters for aquaculture goes through a consultation and permitting process with the Department of Land and Natural Resources and other state agencies.

2. Federal
- Any issues relating to fishing (current definition of fishing includes aquaculture) in federal waters goes through a consultation process with the Western Pacific Fisheries Management Council (WESPAC). WESPAC is an advisory council and provides management recommendations to the National Oceanic and Atmospheric Administration (NOAA) Fisheries who makes the final decisions related to fisheries.

I. APPRECIATIVE INTERVIEWS

A. DISCOVERING THE RESOURCES IN OUR AQUACULTURE COMMUNITY

– High Point Stories –

Participants were asked to tell their partner’s high point story i.e., an experience that stands out for them. Partners got into small groups of 6 and found common themes of the high point stories. Then, all small groups got together and determined which themes multiple groups shared. *(Appreciative Interview questions can be found in Appendix 2)*

Group #1:
- Love and Respect for the ocean

- Value system that recognizes the symbiotic relationship
- Integration/synergy
- Recycling & Reusing - not wasting
- Balance and Restoration - make appropriate to place/sense of place
- Share the ocean (with all ohana/wildlife/organism)

Group #2:
- The ocean is there for you…constant underlying support
- The ocean itself is fluid, boundaries are political not natural
- We are part of an ecosystem and this needs to be acknowledged
- Safe food on the table
- Need knowledge about the ocean, moon plays a big part in fishing
- We need safe food, plenty food, to come from the ocean
- There's the "right" way and the right way
- Leadership and responsibility
- Need and desire for fishponds to be utilized and restored
- Remembering and learning from the past
- Availability and access to safe, healthy food
- Appreciate access to locally provided healthy fish
- Importance of local practical knowledge and doing things the right way (need space to allow for practice of knowledge)
- Commitment of leadership to cooperate

Group #3:
(Letters reflect clusters of similar topics)
- Grown up near ocean (B)
- Hawaiian values (A)
    - Way of life part of the people
    - Ahupua'a
    - Stewardship/responsibility
- Connection with 'āina- kept families fed/observations (A)
- 'Aumakua-family guardians (A)
- Ocean as food source (A)
- Spiritual rejuvenation (B)
- Ocean= part of Hawaiian people (A)
    - Symbiosis with environment
- Observation-based ecological knowledge—i.e "naturalists" vs. "scientists" (C)

<u>Story High Points: Common Themes (summary of report-outs from all small groups):</u>

# of groups with similar theme
- Balance and restoration. IF changes, should be appropriate to place (3)

- Stewardship and responsibility with Hawaiian values (3)
- Appreciate access to locally provided healthy fish (2)
- Share ocean with ohana, wildlife, organisms (2)
- Spiritual rejuvenation, ‘aumakua, ocean’s spiritual impact
- Commitment of leadership to cooperate

B. DISCOVERING THE RESOURCES IN OUR AQUACULTURE COMMUNITY

– Visions of the Future –

Small groups determined the common themes from the visions participants had for the future. Then, all small groups got together and determined which themes multiple groups shared. *(Appreciative Interview questions can be found in Appendix 2)*

Group #1:
- Systems that are compatible with the environment/place
- Restoring fishponds
- Energy sustainability/ self-reliant/ independence/ self determination
- System integration and efficiency
- Food Self sufficiency

Group #2:
(This group chose to highlight main topics with an asterisk and link similar topics underneath it)
- *Feed Hawai‘i
- *Revitalize fish ponds
    - Connecting fish ponds with the industry and partnerships
    - Commitment of the industry to partner with fish ponds to voluntarily partner
- Streamline process
- Use knowledge from the past
- *Interdependency, holistic approach
- *Commitment to future generations (Education/jobs)
- Concerns: the food that is being fed to aquaculture fish
- Concerns: strings attached to “partnerships”

Group #3:
(Letters reflect clusters of similar topics)
- Local Hawaiian fishpond re-development (B)
- Self sufficiency—local sources of feed, less reliance on imported feeds, herbivorous fish, reuse of byproducts (B)

- Community control – no regulation of persons own interaction with water, loko i‘a (C)
- More listening, integration (A)
- Feeding the community – move toward local production/feed security (B)
- Organic/Natural feeds
- Permitting/monitoring are consistent/regular (C)
- Community based regulatory process (C)
- Better integration between community and business (A)
- Food security (B)
- Make sure community needs/commercial operation are understand, keep conversations (A)
- Jobs, support local markets
- Consistency. Integrated marine spatial planning - have appropriate areas for aquaculture (C)
- Working within the capacity of the ecosystem (C)

Visions of the Future: Common Themes (summary of report-outs from all small groups):

	# of groups with similar theme
• Feed Hawai‘i	(3)
• Local Feed (not imported)…use byproducts	
• System integration and efficiency	(3)
• Restoring Fishponds	(3)
• Ensure community needs and commercial operators are partnering by understanding each other through communication	
• Commitment to future generations through educations/jobs	(3)
• Interdependency and holistic approach	(3)
• Systems that are compatible with environment and place	
• (place based knowledge)	(3)
• Community control/ Self-determination	(2)

C. DISCOVERING THE RESOURCES IN OUR AQUACULTURE COMMUNITY

– Changes or Transformations –

Small groups determined the common themes from the changes and transformations participants suggested toachieve their desired future. Then, all small groups got together and determined which themes multiple groups shared.

(Appreciative Interview questions can be found in Appendix 2)

Group #1:

- Research and development
- More effort to work with communities
- More factual info to judge alternatives for government and community
- Transforming and changing education in integrating these issues in education
- I ka wa ma mua - I ka wa ma hope—to move forward we have to look at the past

Group #2:

(This group chose to highlight main topics with an asterisk and link similar topics underneath it)

- *Research, education, outreach to understand effects of and connectivity of systems -> need information to decide what to do
    - Education to the community of aquaculture in general (all of it) and its impacts and benefits
- *Transparency
    - Regulatory system: intelligible, transparent, streamlined
- *Acknowledging fishponds, not treating them as relics, not in past tense
- Commitment of industry to voluntarily partner with fishponds
- *Research and development for aquaculture industry
- Concerns: time when to feed fish, when slack current is there
- Concerns: tangled regulatory framework

Group #3:

(Letters reflect clusters of similar topics)

- Business and government behave as part of community-not outsiders (A)
- Outreach to community re: options for building relationships with business and government (A)
- Prioritize fish pond re-development (C)
    - Streamline permitting process
    - Re-evaluate legislation's intent
    - Create legislation to allow Hawaiians/local companies to cultivate fish ponds (similar to gathering rights)
- Keep conversations going (A)
    - Taking meetings into communities (A)
- Consistent: Transparent permit process that everybody understands (A)
    - Implicit obligations become explicit for community consultation
- Vertical resource management local permitting (B)
    - Consider traditional watershed in Integrated Marine Spatial Planning

<u>Changes & Transformations: Common Themes (summary of report-outs from all small groups):</u>

# of groups with similar theme

- Transforming and changing education so these issues are integrated early on (3)
- Research, education: aquaculture in general as well as impacts and benefits (3)
- Acknowledging fishponds, not treating them as relics of the past (3)
- I ka wa ma mua I ka wa ma hope (3)

- Prioritize fishpond re-development (2)
    - Streamline permitting process
    - Re-evaluate legislation
- Regulatory system that's transparent, streamlined and intelligible (2)
- Outreach to communities on available options for building relationships with government and business (2)
- Business and government behave as part of the community not outside of it (2)
- Research and development
- More factual info to judge alternatives for government, communities and decision makers
- Vertical (ahupua'a) resource management considering traditional watersheds (ahupua'a) in marine spatial planning

II. DISCOVERING AND ARTICULATING AQUACULTURE'S "POSITIVE CORE": WHEN ARE WE AT OUR BEST AND WHY?

Keeping the common themes from previous discussions in mind, participants got into small groups and identified all the factors that cause, create or support success. Similar items were clustered together and if time allowed, the top five clusters from each list were ranked. Then, all small groups got together and shared their lists.

Group #1:
(Letters reflect clusters of similar topics)
Mentioned Root Causes of Success

- Ocean Resources (A)
- Hawai'i exclusive economic zone (C_2)
- Expertise (experience> 800 years) in fishponds and open ocean aquaculture (B)
- Long tradition of aquaculture and marine resource management (B)
- Icy cold deep sea water (A)
    - Sea water pipes at OTEC, Fish pond walls (B, C_1)
- Pro Open Ocean Aquaculture policy in place (C_2)
- Need and desire for fresh fish (C_2)
- Hidden knowledge that no one knows about (B)
- Warm+clear surface water (A)
- People have more intimate relationship to ocean than elsewhere and appreciation where food comes from (A, B)
- Specialized expertise (B)
- Process for open ocean leasing (C_2)
- Supportive government policy (C_2)
- Proven history of public and private and government relationship -> unique in U.S (C_2, D)
- Location, location, location (A)
- Local, local, local (A)
- Quality of labor—unique to Hawai'i (A, B, C)
- Military (D)

Top Chosen Root Causes of Success:

- Location (A)
- Expertise (B)
- Infrastructure (C)
    - Physical (C_1)
    - Social (C_2)
- Funding & Research and Development (D)

Group #2:
(Letters reflect clusters of similar topics)
Mentioned Root Causes of Success

- Research (e.g. Pac Aqua Hilo, Oceanic Institute, University of Hawai‘i, Anuenue) (A)
- Time (to figure things out) no need to rush process and Space [natural resource wealth, right conditions, habitat] (not constrained, e.g. inlets, fjords) opportunity to get it right (E)
- Need and demand for local fish (e.g. import 90% of fish) (B)
- History (e.g. fish consuming people) (B)
- Native Technique—fishponds, it supports the need and can evolve (C)
- We have examples of successful restoration and production (offshore too) (D)
- University of Hawai‘i: can connect knowledge and other institutions (past, cultural, technology, place, including language)* tools that can be used for future success (A)
- Knowledge of environment – room for learning, opportunities to listen and adapt with changing environment (C)
- We have successful regulations existing (D)
- Need and demand for good living wage jobs (B)
- Local Entrepreneurs and investors (E)
- Motivation and opportunity to provide for ourselves due to geographic isolation (B)

Top Chosen Root Causes of Success

- Motivation and need/demand (B)
- Natural Conditions (F)
- Knowledge: environmental and technological and historical (C)
- Expertise: research institutions and ways to connect them (also entrepreneurs) (A,E)
- Successful examples: regulations, restoration and production (D)

Group #3:
(Letters reflect clusters of similar topics)

Mentioned Root Causes of Success

- Pristine water: desirable for aquaculture, clean and natural state, oceanic, warm and calm (G)
- Cultural/spiritual value of ocean (B)
- Open ocean permit ability (H)
- Great appreciation for seafood (I)
- Second most productive local food production system- ahupuaʻa (E)
- Community that has understanding of ocean and built in knowledge base (B)
- Traditional practices/History (A)
- Strong knowledge base based on: research and traditional knowledge (D)
- 2500 miles from anywhere… isolation is motivation (F)
- Physical infrastructure in place (A)
- Understanding of sustainability (E)
- Cultural tradition of Hoʻoponopono (C)
- Living in close proximity (J)
    - Authorities in same area
    - Political becomes personal- relationships
    - Forum of collaboration

Top Chosen Root Causes of Success

1. Traditional practices/infrastructure
2. Pristine waters (fresh, brackish and salt)
3. Close-knit community- allows for collaboration
4. Cultural/spiritual value of ocean
5. Knowledgeable community that encompasses traditional and research based components

III. VALUES

A. LARGE GROUP PRIORITIZES AQUACULTURE'S CORE VALUES

1. The values you have drive the work you do. What are your most important organization-related values? Like items have been clustered together and participants voted to indicate the values of highest priority. Each participant had up to five votes.

	Votes
Accountability, responsibility	21
Sustainability (Aloha ʻĀina, Hawaiʻi, pono - traditional way)	21
Hawaiʻi seafood self-sufficiency	14
Reasonableness, consistency, integrity, honesty	14
Patience, Hoʻomanawanui	14

Safe, responsible, precautionary principal	12
Communication, transparency	8
Acceptance, consideration, tolerance	6
Innovation	6
Sharing, cooperation, collaboration, co-creation	6
Compassion, charity	1
Civility, community	1
Measured risk (vs. allowable risk)	1
Future, trust, hope, faith	0

2. Discussion of Core Values
   - Innovation: Deep, desert ocean, there's nothing there
   - Patience, Hoʻomanawanui: Too big, too fast, community can't keep up, should be something we practice
   - Sustainability (Aloha ʻĀina, Hawaiʻi, pono - traditional way): Aloha ʻāina encompasses sustainability, bottom line is the ʻāina
   - Safe, responsible, precautionary principal: Looking at risk responsibly, assigns responsibility before you do the risk behavior
   - Accountability, responsibility: Honor and value of your words (King Kamehameha anecdote)
   - Innovation: Problem-solving, trial and error are important strategies when innovating
   - Safe, responsible, precautionary principal & Innovation: Can co-exist by creating strategies to deal with risk
   - Innovation: Adaptive management, continuous improvement
   - Hawaiʻi seafood self-sufficiency: We value feeding Hawaiʻi
   - Reasonableness, consistency, integrity, honesty: All are necessary in our discussions with facts to put forward

B. UNDERLYING ASSUMPTIONS/BEHAVIORS

1. Given the values you have, you develop underlying assumptions about how the world operates. These assumptions determine how you behave and how you expect others to behave.

   At this point in the process, participants divided into 6 small groups representing each of the priority value clusters and they defined behaviors indicative of that cluster. Each group was told to make sure that the behaviors listed were concrete (i.e. behaviors that can be seen) and that each member of the small group could live with and support each behavior. If a member of the group could not live with one of the behaviors, the group would initially try to wordsmith the statement to make it acceptable. If this effort was not successful, the behavior was struck from the list.

When the larger group reconvened, the lists were shared and members of the larger group were asked to indicate their agreement for all items on each of the lists. As with the small groups, if a member of the large group could not live with one of the behaviors, the group would initially try to wordsmith the statement to make it acceptable. If this effort was not successful, the behavior was struck from the list. The final lists below represent behaviors everyone in the room could live with and support (i.e. this is how they will behave in the future and expect others in this group to do the same). The working lists with all the behaviors listed are in the appendix.

Accountability & Responsibility

- Do as you say
- We will hoʻo maʻa (embrace, respect, integrate and become intimately familiar) into the broader community through constant/consistent engagement in and beyond the "process"
- We will act in a way that reflects our being part of the community
- We will help each other understand the process and how to participate and provide input
- Project proponents share risk assessment with community members
- Community needs to be accountable by providing input and participating in the process
- Continuously communicate with interested parties
- If there are unintended consequences, make a genuine, earnest effort to mitigate/remediate the situation
- Accept responsibility if mistakes are made. Admit when you make a mistake
- Projects proponents engage in a truly honest assessments of risks and have plans to respond/repair/or abandon if/as needed
    - And share with the community
- Think and act in a local and global context and accept role of Hawaiʻi as a national/global/local model for sustainability
- Present and use data in unbiased and unloaded manner—don't compare cage effluents to New York City sewage

Sustainability, Aloha ʻĀina, Pono, Hawaiʻi, Kuleana

- Use of ocean resources should benefit communities without compromising resources for future generations
- Kuleana to place: Hawaiʻi—Address local needs first because we need to be the beneficiaries. Aquaculture should address seafood needs for Hawaiʻi first.
- Accept the challenge set by traditional aquaculturists to integrate existing natural resources into projects (i.e. ecological engineering such as loko iʻa kalo)
- As aquaculturists, we will honor Article 12 section 7 of our state constitution and Hawaiʻi revised statutes 7-1 by seeking the advice and consent of Native Hawaiians
- To protect our resources we will find alternatives to the use of antibiotics, growth hormones, toxic therapeutics, genetically modified organisms

- Ocean aquaculture projects that are permitted and have leases will abide by the conditions and requirements of the permits and leases
- Federal and state agencies will enforce the permit and lease requirements for ocean aquaculture projects that have permits and leases
- We will support and assist the restoration of the fisheries of Hawai‘i by i.e. increasing stock enhancement, addressing the acidification of reefs, supportive of protective kapu’s

Hawai‘i Seafood Self-Sufficiency

- ‘Āina Momona
- Ideal: local production
- Conduct research in economic feasibility, market research, species selection
- We are committed to support and work toward responsible aquaculture in Hawai‘i
- Create an industry that works toward reasonable prices
- Maintain health benefits
- Government support not just earmarks, competitive grants
- Seek clarifications and factual information – need more knowledge
- Address risks (i.e doing something vs. nothing) and concerns – hunger, environment, food security
- Components of self-sufficiency
- Open Ocean Aquaculture
- Near shore reef
- Fishponds

Reasonableness, Consistency, Honesty and Integrity

- Present true facts
- Comply with all steps of the regulatory process
- Share environmental protocols
- No propaganda
- No distortion of the truth to further your own cause
- Participate in future discussion and workshops
- Work towards agreement
- Openly facing, discussing, and resolving contradictions
- State your true actions and intentions regardless of your audience

Patience, Ho‘omanawanui

- Persistence of effort
- Allowing more time wherever its needed
- Take time to enjoy the moment, appreciate successes
- We will be guided by long term impact considerations to the resources being used

Safe Responsible Precautionary Principle

- More conservative decision making – adaptive mitigation
- If something happens that is unforeseen take responsibility, acknowledge and address (already required in permitting)

- Seek better ways to solicit representative perspectives/input
    - innovative methods for community input
- Open ocean aquaculture is public trust land and use for Aquaculture affects every aspect of society
- Higher standards of environmental quality control for purveyors (e.g. 3rd party monitoring)
- In absence of proof the burden of responsibility is on purveyor—goal is responsible innovation
- There needs to be an adequate research and development phase for each new technology system that has not been tested before.
- Assess information needs: ecological carrying capacity

IV. STRATEGIC ISSUES

Participants were asked to identify strategic issues by writing on snow cards the topics they were interested in discussing as a group. The group then discussed and agreed on common themes that encompassed all the issues.

Loko iʻa

- What are the major hurdles to loko iʻa restoration and how do we remove them??
- How can we get loko iʻa working again?? (i.e permits)
- Ecological engineering

Learning from the Past

- Learn from past
- Sense of place
- Kumulipo

Aquaculture in the Sanctuary

- Aquaculture in Sanctuary
- Current relationship of state co-manager and federal co-manager in review and approval of aquaculture projects in the sanctuary. Proposed changes?
- Working towards a result

Food Sustainability & Safety

- Safety on what fish we eat that comes from fish farming
- Strive for protection in whatever we do to be sure that the fish we eat from fish farms are safe
- Fish feed/Species
- Seafood for Hawaiʻi consumption (safe, healthy)
- Subsidize/support local serving aquaculture
- Food Sustainability

Roles in Aquaculture

- Roles in Aquaculture - Development and Management
- Role of Native Hawaiians

Offshore Aquaculture

- How can we expand offshore aquaculture responsibly?
- Pros and cons of aquaculture
- Community's view of aquaculture
- Discuss the current state of the science and experience with interactions with cage aquaculture
- Industrial aquaculture
- Economic development (business ecosystem cluster, Silicon Valley, Hollywood)
- Specifics in open ocean aquaculture operations

As a group, participants agreed to focus discussions on two topics: (1) food sustainability and safety, and (2) aquaculture in the sanctuary for the remainder of the workshop. Following the breakout discussions, participants reconvened to report out.

A. FOOD SUSTAINABILITY AND SAFETY

Fish Feed

- Alternative species- from moi and kahala
  - Need more diversity- feed biggest problem (cost/source/environmental impacts)
  - Therefore self sustaining population
- More efficient, cleaner food (herbivore vs. carnivore)
- When fishponds produce their own feed then fishponds need less inputs from outside
- The quality and quantity of freshwater impacts our ability to grow quality fish
- Open ocean "desert" needs input
- Other food sources e.g. invasive algae (i.e. of the genus *Gracillaria/Salicornia*) or other local feed source
- Comparing different systems regular knowledge of what (amount of food) we need…every action has consequences so determine balance/food safety issues/ etc.
- Consumption of food and how much fresh water, salt water, in fish pond aquaculture in is needed to find needs
- Fish ponds are the best way to provide fish but will not provide enough fish to feed community
- Hawai‘i needs more $ for research for feed to local fish species
- Should not be market driving the palate—not conducive for Hawai‘i
  - What is realistic??
- In Hawai‘i grow abundance, safety measures, calculate
- 3 types of sustainability
  - Eco (won't be done if not money)
  - Environment
  - Cultural
- Currently (now) sustainability discussed economically
- Has to be economically viable
- Example of herbivory
  - Calculation of inputs of grain for tilapia- herbivore
  - Local example: aholehole-not enough info

- Local palate considered, don't change palate
- Fishpond by itself not provide enough for all, but best b/c nutrients from land-biomass
- Why not use invasive species for feed research need to create technology
- Committed to cultivating native species
- Ali'i marketing raises prices (prices local out of market)
- Use money spent on imports to drive change for local food productions
- Everyday fish- reef fish, netting
- Sustainability doesn't equal carnivores – need cheap and abundant seafood
- Consumer expectation mixed culture…can you make choices for them??
- Sustainability-providing for today's needs without compromising the needs of future generations
- Lifestyle has been to "use" resources
- If you produce fish, either carnivore or herbivore, is only for our consumption NO EXPORT
    - Food sovereignty – the right to access food
    - Accessible food= sustainable
- Where does tourism/military fit??
- Buyer vs. Provider viewpoint
- Urban desert- access to fresher food, the right types—Not McDonalds
- Variety of tastes, restrict others?
- Outside market should not determine what happens in Hawai'i
- Need independence for native foods (conducive species) to merge back to Hawai'i. Other variables should not taint what our palette is
- Grow Hawai'i plants/animals as much as we can-local species and diversified to extent possible to take care of Hawai'i's needs
- Need survey on food consumers- Native Hawaiians sustain themselves
    - Where it comes from, how much?

- Sustainability specific to aquaculture
    - Accessible, independent of imports, grown within capacity of local ecosystems
    - Contaminants from land in fish
    - Fish offshore, uncontaminated environment—only have to monitor feed

Sustainability

- Provide for today's needs without compromising the needs of future generations
- Needs inexpensive/wholesome/abundant seafood
- Accessible, independent of imports, grown within capacity of local ecosystems
- 3 types
    - Economic
    - Environmental
    - Cultural

Food Safety/Sustainability

- What is a safe fish? What does it look like? Fishing methods: contaminates environment
- An organic fish – struggle for label

B. AQUACULTURE IN THE SANCTUARY

<u>Concerns for fixed and unfixed aquaculture in the sanctuary</u>
Unresolved issues

1. Potential entanglements (take of animals)
   - Major concern of sanctuary
   - Historical data suggests negligible risk (40 years of history)
   - Overlap in oversight in current permitting process
   - There is global documentation about entanglements
   - Entanglements were found to be unlikely-based on design – research based on Barbaros Celikkol
   - Netting technology is changing
   - <u>Actions:</u> Humpback whale protections working group could address/investigate [gather & verify data to educate for sanctuary staff] entanglement concern (humpback whales and other marine mammals)

2. Occupied space = loss of habitat
   - If aquaculture would be placed within the sanctuary, would the displaced space be added to the sanctuary?
   - Re-evaluate the sanctuary boundaries: appropriate based on population of whales and appropriate for aquaculture
   - Occupied space⇔ loss of habitat (potential for behavioral change)
   - Temporary (ex: cruise ships) vs. permanent (ex: cages) occupied space
   - Difficult to measure impact interactions
   - Anecdotal observations: whales not attracted to cages
   - Shared responsibility to protect
   - Who has burden of proof? (need to prove that there's not impact)
     - Decision was group coming in
   - Whales utilize flat bottom as resting area, but habitat is not limited to bottom
   - Permanent structure affects loss of physical habitat
   - Change of behavior
   - What can be done to mitigate impact: design, operation, location of farm?
     - This question comes after initial question: would this issue stop decision to allow aquaculture?
   - Would the occupied space / loss of habitat issues stop the decision to stop aquaculture? *
     - Would be considered as two factors of the decision? Monitoring before placing structure helps to answer the question of potential impact. Conditions might change over time⇨ flexible and adaptive management
   - Suitability, within sanctuary
     - What factors need to be considered
   - Siting: complex process

    - Value in Noelani's data but components were missing (ex: fresh water)
    - Need for humpback whale info (1993-2003): existing data = snapshot
    - Every other year (check)
    - Just whales seen on surface
- Known population has increased since 2003
- Don't know extent of where they go now
- Temporal requirements for baseline data: practical? (10 years…)
- Key = we need more information
- Thoughts on aquaculture in sanctuary
    - Issues of compatibility?
    - Studies like Noelani would be useful (on every island)
    - Dilemma: best real estate, push back "sanctuary would not be a sanctuary"
- Appropriateness= site-specific
- Unacceptable just because of the use of space?
- Factor: density of user conflicts?*
    - Need access to commercial harbor
    - Topography, currents
    - Surface conditions
    - NOTE: industry input is important in evaluating siting
    - Company's responsibility to explain community why siting was chosen
- Preferred sites in deeper water and further out
    - Other opinion: shallow water and further in
- Data (Noelani's) could be used as a tool
- With funding, baseline study ⇨ siting evaluation tool (Noelani Puniwai) but valuable for first scan, but large scale evaluation (large hexagons)
- Which area within sanctuary would be suitable?
    - Input from industry, but also additional data needed (such as GIS data)
- Physical (compatible component) and social (suitable component) properties of site
    - 2 different things
- Aquaculture one issue to consider during management plan review process
    - Workshop to get input
    - Working group as well
- Out of sight, out of mind: need support from people, should come closer to where the people are (nearshore)
- Disconnect is a mistake. Need to connect benefits of aquaculture to the people
- What are important considerations from a community standpoint?*
- Sanctuaries: place-based, dictated by community. One of the priorities = allow potential for island-specific
- Sanctuary is willing to listen to community's input and bring technology resources to the table
- Concern if state doesn't allow aquaculture
- We agreed that we all have a voice and are looking forward
- Co-managed by the state: There are larger authorities and is really possible to make it different in different areas?
- Public input is available on sanctuary website

- Aquaculture could be considered in all state waters (presentation from Sam)
- Sanctuary briefed governor and chair of Department of Land and Natural Resources
    - Aware of management plan review process and want a lot of community input
- Sanctuary will consult with community and stakeholders
- Problems with management of sanctuary advisory council in past years
- Concern if head of aquaculture working group is not neutral
- Mariculture was created by Hawaiians to have enough food
- We came to agreement that aquaculture is really important to Hawai‘i
- Can we find balance in the sanctuary
    - We commit to support responsible aquaculture, but we wont accept impacts which degrade the environment
- Action: Consider resurrecting aquaculture working group on advisory council?

3. Water quality
4. Benthics
5. Siting
6. Attraction, aggregating, aversion
7. User conflicts
8. Habitat degradation

V. WORKSHOP ACTION ITEMS AND FOLLOW-UP

1. Organize group memory and give to participants by July 15 for review and comments
2. Day 1 all presentations and videos [if permissions is granted by presenters] will be available on Aquaculture Hub
3. Group memory will also be available to the public (sanctuary website and Aquaculture Hub website)
4. There will also be a more synthesized workshop report
5. Briefings to sanctuary advisory council, congressional offices, national aquaculture program
6. The sanctuary advisory council will be consulted regarding resurrecting aquaculture working group
7. Sea Grant, sanctuary, state and aquaculture industry will support convening a workshop for Hui Mālama Loko I‘a to address permitting hurdles to support fishpond revitalization and restoration
    - Options: programmatic permit
    - State doesn’t have programmatic permit process for Environmental Assessment/Environmental Impact Statement, but doesn’t mean cannot do it
    - Concept: running start through Master Conservation District User permit, Environmental Assessment⇨streamline for single fishponds

8. Benny/ Aquaculture Program/University of Hawai‘i could host further workshops, let him know
9. Find ways to put research money into more species (local species) that were ignored

VI. EVALUATION

Day 1

(Positive) +

- Keeping track of time and on schedule
- Multiple breaks
- Plenty of time for questions

(Changes) Δ

- Everyone should speak into microphone
- Bring people closer together
- Not focusing on problem-solving
- Define the goal of this meeting
- When agenda goes to Aquaculture Hub, include all speakers and background

Day 2-3

(Positive) +

- Small groups
- Day 3= End
- Beginning of longer process
- People had enough time to say what they had to say
- Visioning discussion identified commonality
- Many voices can talk to each other (despite maybe not getting along)

(Changes) Δ

- Need to localize presentations (Blue Economy Video)
- More seafood industry (restaurant, wholesalers)
- Find strategy to attract and keep different voices
- 3 days = long commitment
- Shorter focused one-day sessions (different timing)
- Participants from neighbor islands difficult
- Content didn’t attract participation from industry representatives (first day = key)
- Day 3 content should have been day 1
- Confusion, unclear about focus, need clarity, direct questions
- Participants had no input about the process

- Process too long, days are too long
- Avoiding conflict sometimes stops flow of things
- Suggestion: make scenario and ask opinions based on people's expertise

WALL SAFE

- Make sure $ from open ocean leases are put back into aquaculture development (i.e fishpond restoration)
- Encourage federal state government to support necessary infrastructure for fishpond restoration

APPENDIX II

PARTICIPATION

Day 1

Participants:

Carlos Andrade - *Kamakakūokalani Center for Hawaiian Studies, University of Hawai'i*
Shawn Arilas - *University of Hawai'i College of Tropical Agriculture and Human Resources, NREM*
Michael Asato
Rosemary Bak
Brian Boltz - *farmer*
Any Brinker - *KYA Sustainability Studio*
Michael Cain - *Department of Land and Natural Resources*
Randy Cates - *Cates International*
Malia Chow - *National Oceanic and Atmospheric Administration (NOAA), Hawaiian Islands Humpback Whale National Marine Sanctuary*
Stuart Coleman - *Surfrider Foundation*
John Corbin - *Hawai'i Aquaculture and Aquaponics Association*
Natalie Cash - *Olomana Gardens*
Kelly Davidson - *JIMAR/ National Oceanic and Atmospheric Administration (NOAA) Pacific Islands Fisheries Science Center*
Joshua DeMello - *Western Pacific Regional Fishery Management Council*
Ken Egana
Alan Everson - *National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service*
Bradley "Kai" Fox - *University of Hawai'i College of Tropical Agriculture and Human Resources (CTAHR)*
Gordon Grau - *University of Hawai'i Sea Grant*
Leo Guzman - *Olomana Gardens*
Richard Hernandez - *University of Hawai'i*
Jon Hookano - *University of Hawai'i Manoa Aquaculture Student*
Gary Hooser - *Department of Health, Office of Environmental Quality Control*
Thomas Iwai, Jr. - *Island Aquaculture and Aquaponics*
Melissa Iwamoto - *Department of Business, Economic Development, and Tourism: Office of Planning - Coastal Zone Management Program*
John Kaneko - *Hawai'i Seafood Council*
Juanita Kawanoto Brown - *ECDPH - Environmental Caucus*
Hi'ilei Kawelo - *Paepae o He'eia*
Kevin Killeen - *Olomana Gardens*
Cheng S. Lee - *CTSA*
Sam Lemmo - *Department of Land and Natural Resources, Office of Conservation and Coastal Lands*
Todd Low - *Department of Agriculture, Aquaculture and Livestock Support Services*
Eric Martinson - *Oceanic Institute*

Marnie Meyer - *Department of Business, Economic Development, and Tourism: Office of Planning - Coastal Zone Management Program*
Paula Morelli - *University of Hawai'i School of Social Work*
Glen Natch - *Olomana Gardens*
Leo Ohai - *O'ahu Fisherman*
Jamaica Osorio
Chris Ostrander - *School of Ocean and Earth Science and Technology*
Gary Ostrander - *University of Hawai'i Vice-Chancellor for Research & Graduate Education*
Minling Pan - *National Oceanic and Atmospheric Administration (NOAA)*
Michael Parke - *National Oceanic and Atmospheric Administration (NOAA), Pacific Islands Fisheries Science Center*
Noelani Puniwai - *University of Hawai'i at Hilo*
Loretta Ritte - *National Oceanic and Atmospheric Administration (NOAA) Monk Seal Com. Liaison*
Walter Ritte - *Hawaiian Learning Center*
Benny Ron - *University of Hawai'i Aquaculture Program*
Jason Sabado - *Olomana Gardens*
Stuart Scott - *Transition O'ahu*
Suzanne Shriner - *Pono Aquaculture Alliance/Food and Water Watch*
Napali Souza - *Ka Huli Ao Center for Excellence in Native Hawaiian Law*
Bill Spencer - *Hawai'i Oceanic Technologies Inc.*
Brooks Takenaka - *United Fishing Agency*
William Tam - *Department of Land and Natural Resources*
Take Tomson - *National Oceanic and Atmospheric Administration (NOAA), Office of Law Enforcement*
Wes Wada
Kehau Watson - *Sanctuary Advisory Council*
Olivia Wimson - *Olomana Gardens*
Alec Wong - *Department of Health, Clean Water Branch*
David Walfish
Tami Yamashita

Facilitator:
Donna Ching

Sanctuary Staff Facilitators and Notetakers:
Brenda Asuncion, Nadilyn Ignacio, Fiona Langenberger, Joseph Paulin, Micki Ream, Justin Viezbicke, Paul Wong

Hollings Scholars:
Nikki Bruno, Collin Crecco (Recorder)

Department of Business, Economic Development and Tourism, Office of Planning - Coastal Zone Management Program Staff:
Marnie Meyer and Melissa Iwamoto

Day 2

Participants:

Carlos Andrade - *Kamakakūokalani Center for Hawaiian Studies, University of Hawai'i*
Michael Asato
Melanie Bondera - *The Kohala Center*
Randy Cates - *Cates International*
Malia Chow - *National Oceanic and Atmospheric Administration (NOAA), Hawaiian Islands Humpback Whale National Marine Sanctuary*
John Corbin - *Hawai'i Aquaculture and Aquaponics Association*
Joshua DeMello - *Western Pacific Regional Fishery Management Council*
Alan Everson - *National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service*
Gordon Grau - *University of Hawai'i Sea Grant*
Sol Kahoʻohalahala - *Lana'i Sanctuary Advisory Council Representative*
Hiʻilei Kawelo - *Paepae o He'eia*
Sam Lemmo - *Department of Land and Natural Resources, Office of Conservation and Coastal Lands*
Todd Low - *Department of Agriculture, Aquaculture and Livestock Support Services*
Leo Ohai - *O'ahu Fisherman*
Jamaica Osorio
Chris Ostrander - *School of Ocean and Earth Science and Technology*
Michael Parke - *National Oceanic and Atmospheric Administration (NOAA), Pacific Islands Fisheries Science Center*
Loretta Ritte - *National Oceanic and Atmospheric Administration (NOAA) Monk Seal Com. Liaison*
Walter Ritte - *Hawaiian Learning Center*
Benny Ron - *University of Hawai'i Aquaculture Program*
Suzanne Shriner - *Pono Aquaculture Alliance/Food and Water Watch*
Neil Sims - *Kona Blue Water Farms*

Facilitators:

Donna Ching, Brenda Asuncion, Melissa Iwamoto, Marnie Meyer, Joseph Paulin, Benny Ron, Paul Wong

Recorders:

Nikki Bruno (Hollings Scholar), Collin Crecco (Hollings Scholar), Nadilyn Ignacio, Fiona Langenberger, Micki Ream, Justin Viezbicke

Sanctuary Staff:

Brenda Asuncion, Nadilyn Ignacio, Fiona Langenberger, Joseph Paulin, Micki Ream, Justin Viezbicke, Paul Wong

Department of Business, Economic Development and Tourism, Office of Planning - Coastal Zone Management Program Staff:

Marnie Meyer and Melissa Iwamoto

Day 3

Participants:

Carlos Andrade - *Kamakakūokalani Center for Hawaiian Studies, University of Hawai'i*
Michael Asato
Randy Cates - *Cates International*
Malia Chow - *National Oceanic and Atmospheric Administration (NOAA), Hawaiian Islands Humpback Whale National Marine Sanctuary*
John Corbin - *Hawai'i Aquaculture and Aquaponics Association*
Joshua DeMello - *Western Pacific Regional Fishery Management Council*
Alan Everson – *National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service*
Gordon Grau - *University of Hawai'i Sea Grant*
Melissa Iwamoto - *Department of Business, Economic Development, and Tourism: Office of Planning - Coastal Zone Management Program*
Sol Kaho'ohalahala - *Lana'i Sanctuary Advisory Council Representative*
Hi'ilei Kawelo - *Paepae o He'eia*
Sam Lemmo - *Department of Land and Natural Resources, Office of Conservation and Coastal Lands*
Todd Low - *Department of Agriculture, Aquaculture and Livestock Support Services*
Marnie Meyer - *Department of Business, Economic Development, and Tourism: Office of Planning—Coastal Zone Management Program*
Leo Ohai - *O'ahu Fisherman*
Loretta Ritte - *National Oceanic and Atmospheric Administration (NOAA) Monk Seal Com. Liaison*
Walter Ritte - *Hawaiian Learning Center*
Benny Ron - *University of Hawai'i Aquaculture Program*
Suzanne Shriner - *Pono Aquaculture Alliance/Food and Water Watch*
Neil Sims - *Kona Blue Water Farms*

Facilitators:

Donna Ching, Brenda Asuncion, Melissa Iwamoto, Marnie Meyer, Joseph Paulin, Benny Ron, Paul Wong

Recorders:

Nikki Bruno (Hollings Scholar), Collin Crecco (Hollings Scholar), Nadilyn Ignacio, Fiona Langenberger, Micki Ream, Justin Viezbicke

Sanctuary Staff:

Brenda Asuncion, Nadilyn Ignacio, Fiona Langenberger, Joseph Paulin, Micki Ream, Justin Viezbicke, Paul Wong

Department of Business, Economic Development and Tourism, Office of Planning - Coastal Zone Management Program Staff:

Marnie Meyer and Melissa Iwamoto

APPENDIX III

Organizations Invited to Participate

Alan Wong's Restaurant
Ao'ao O Na Loko Ia O Maui
Cates International
Deep Blue Research LLC
Department of Business Economic Development and Tourism, Office of Planning, Coastal Zone Management
Department of Land and Natural Resources, Office of Conservation and Coastal Lands
Hawai‘i Aquaculture and Aquaponics Association
Hawai‘i Institute of Marine Biology
Hawai‘i Oceanic Technologies Inc.
Hawai‘i Seafood Council
Hawai‘i Venture Capital Association
Hawaiian Learning Center
Hukilau Foods
KAHEA – The Hawai‘i Environmental Alliance
Ka Huli Ao Center for Excellence in Native Hawaiian Law
Kamakakūokalani Center for Hawaiian Studies, University of Hawai‘i
Kona Blue Water Farms
Kona Iki Trollers
Malama Hawai‘i
Maui Cooperative Fishing Association
Maui Fresh Fish
National Oceanic and Atmospheric Administration (NOAA), Hawaiian Islands Humpback Whale National Marine Sanctuary
National Oceanic and Atmospheric Administration (NOAA) Monk Seal Com. Liaison
National Oceanic and Atmospheric Administration (NOAA), Pacific Islands Fisheries Science Center
Oceanic Institute
Office of Environmental Quality Control
Office of Hawaiian Affairs
Pacific Islands Fisheries Group
Paepae o He'eia
Pono Aquaculture Alliance
POP Fishing
Hawaiian Islands Humpback Whale National Marine Sanctuary Advisory Council Representatives
School of Ocean and Earth Science and Technology at the University of Hawai‘i
State of Hawai‘i Department of Health, Clean Water Branch
State of Hawai‘i Department of Land and Natural Resources
Surfrider Foundation
Tamashiro Market
The Kohala Center

The Nature Conservancy
United Fishing Agency
United States Army Corps of Engineers
United States Coast Guard
University of Hawai‘i Aquaculture Program
University of Hawai‘i at Hilo
University of Hawai'I Office of the Vice-Chancellor for Research & Graduate Education
University of Hawai‘i Sea Grant
Waialua Boat Club
Waianae Boat Fishing Club
West Hawai'i Fisheries Council
Western Pacific Fishery Management Council

APPENDIX IV

Appreciative Inquiry Interview (15 minutes each)
Discovery: Articulating the Positive Core of the Ocean of Hawai‘i

Question 1: High point or positive experience.
Each of you has a different relationship with or depends on the ocean in Hawai‘i – some as marine resource managers, cultural practitioners, fishers, fishpond practitioners, community leaders, farmers, commercial operators, business representatives, non-government organizations, educators, scientists, subject matter experts, regulators, state and federal agency representatives, local restaurant and grocery store representatives and residents of Hawai‘i. We'd like you to reflect on one of your most positive experiences where the ocean provided for and sustained you – a time when you felt most alive, most engaged, or really proud?

- Tell a story that describes this experience.
- What made it a positive experience / high point for you?
- What was it about the situation; the ocean and/or the people involved that allowed you to have that positive experience?

Question 2: Visions of the future: creating "an epidemic of positive change". Tonight when you go to sleep, you have a deep, deep sleep and wake up 10 years later. It is now 2021. While asleep, major positive changes happened. You notice that ocean-based aquaculture in Hawai‘i has become what you hoped it would be – the way you believe it ought to be. It is exciting for you to see. Describe what you see happening – things that are new, different, or the same, but even better. Talk about what is going on in the year 2021 that exemplifies the ocean-based aquaculture you have always hoped for and dreamed of for Hawai‘i.

Question 3: In summary now: What three changes or transformations would have to occur within the next 10 years to enable us to achieve the vision you articulated for ocean-based aquaculture **in Hawai‘i** in 2021?

APPENDIX V

AGENDA

Tuesday, June 21, 2011 – Information Sharing – Day 1 Open to the Public

8:00 – 9:00 am Registration and Coffee

9:00 – 12:00 pm **Welcome and Opening Remarks**

Pule

Dr. Gary Ostrander – Vice Chancellor for Research & Graduate Education, University of Hawai‘i

Introductions

Dr. Tetsuzan Benny Ron, Aquaculture Program Coordinator, University of Hawai‘i

Dr. Malia Chow, Superintendent, Hawaiian Islands Humpback Whale National Marine Sanctuary

Morning Presentations

Historical Context of Aquaculture in Hawai‘i – **Dr. Carlos Andrade**, Director, Kamakakūokalani Center for Hawaiian Studies, University of Hawai‘i

Current Aquaculture Activities in Hawai‘i – **Todd Low**, Department of Agriculture, Aquaculture and Livestock Support Services, State of Hawai‘i and **Dr. Tetsuzan Benny Ron**, Aquaculture Program Coordinator, University of Hawai‘i

The National Perspective of Aquaculture – **Alan Everson**, Pacific Islands Region, Habitat Conservation Division, National Marine Fisheries Service

The Role of the Department of Land and Natural Resources in the Oversight of Aquaculture in the State of Hawai‘i – **Sam Lemmo**, Office of Conservation and Coastal Lands, Department of Land and Natural Resources, State of Hawai‘i

12:00 – 1:00 pm **Lunch** (On Your Own)

1:00 – 5:00 pm **Afternoon Panels - Discussions**

Native Hawaiian Aquaculture Practices

- Walter Ritte – Hawai‘i Learning Center, Moloka‘i
- Hi‘ilei Kawelo – Paepae o He‘eia

Today’s Open Ocean Aquaculture

- Neil Sims – Kona Blue Water Farms (submitted video)
- Randy Cates – Cates International
- Bill Spencer – Hawai‘i Oceanic Technologies Inc., Hawai‘i Venture Capital Association

Cultural and Environmental Considerations in Aquaculture Practices

- Michael Parke – Pacific Islands Fisheries Science Center
- Suzanne Shriner – Pono Aquaculture
- Chris Ostrander – Pacific Islands Ocean Observing System (PAC-IOOS)

Presentation: *Modeling Potential Sites to Support Nearshore Marine Aquaculture on Hawai‘i Island* - Noelani Puniwai, University of Hawai‘i Hilo

Facilitated Discussion: What did you learn on day 1 that has made an impact on your thinking?

5:00 pm **Pau**

Wednesday, June 22, 2011 – Appreciative Inquiry Strategic Planning Process – Days 2-3 Invited Workshop Participants Only

8:00 – 8:30 am	**Registration and Coffee**
	Pule
	Introductions, Expectations, Ground Rules
	Introduction to Process
	Environmental Scan Identify External: Trends, Stakeholders, Competitors, Collaborators
	Break
	Appreciative Interviews High Point Stories, Visions of the Future, Changes or Transformations
	Discovering the Resources in Our Aquaculture Community Small Group Discussion on Interviews
	Report Out – Common Themes Identified for Aquaculture High Point Stories, Visions of the Future, Changes or Transformations
12:00 – 12:45 pm	**Lunch** (On Your Own)
12:45 pm	Discovering and Articulating Aquaculture's "Positive Core": When are we at our best and why? Small Group Discussion Report Out
	Values Large Group Prioritizes Aquaculture's Core Values Break Small Groups Generate Behaviors for Core Values
	Evaluation
5:00 pm	**Pau**

Thursday, June 23, 2011 – Days 3 Invited Workshop Participants Only

7:30 – 8:00	**Registration and Coffee**
8:00 am	Pule
	Summary of Day 2
	Values Small Groups Generate Behaviors for Core Values *(continued)* Report Out Small Group and Large Group discussion Agreement of Values
	Identify Strategic Issues for afternoon discussions
12:00 – 1:00 pm	**Lunch** (On Your Own)
1:00 pm	**Strategic Issues:** Participants identify which issues to discuss and break into two groups. • Food Sustainability and Safety • Aquaculture in the Sanctuary
	Large Group report out and discussion
	Workshop Action Items & Follow up
	Evaluation
4:30 pm	**Pau**

APPENDIX VI

Traditional Aquaculture in Hawai‘i

Traditional Hawaiian Fishponds were a major factor in the ability for Hawaiians to be self-sustaining for nearly two thousand years in food production in the middle of the vast pacific. The Native Hawaiian system of resource management, which in recent times is broadly described through the concept of the ahupua‘a land division system, embraced agricultural watersheds and estuarine environments as well as oceanic environments. This system was fundamentally upheld by the concept of mālama ‘āina (caring for land) in spiritual obligation to the akua (Gods). Prior to Western contact in 1778, aquaculture, agriculture, and animal-rearing provided the only source of provisions in a subsistence and barter economy, and aquaculture was a significant use of upland as well as coastal lands over centuries. Historians have stated that aquaculture practices were identified on O‘ahu prior to the 13th century (Costa-Pierce 1987), and many historians believe Hawai‘i to be the birthplace of mariculture—seawater farming. According to an extensive statewide inventory, there were 488 fishponds throughout the Hawaiian Islands (DHM Planners and BPBM, 1989 and 1990). Towards the 19th century, the introduction of market-driven economic activities (e.g., sandalwood and whaling) resulted in many fishponds being left unmanaged, and the land tenure changes of the Great Mahele of 1848 and the Kuleana Act of 1850 even further disconnected Native Hawaiians from the lands which were formerly intimate aspects of their social and spiritual perspectives (Farber 1997).

There are seven styles of ponds identified, and they can be inland freshwater ponds, or brackish or saltwater ponds along the coastline. Loko kuapā is the type of fishpond that most people recognize, and these ponds were the largest and most common along shorelines (Farber 1997). Loko kuapā (Figure 1) are regarded as the most significant aquaculture accomplishment (Costa-Pierce 1987) due to the inclusion of mākāhā (openings in the wall with grates across) interspersed throughout the kuapā (fishpond wall), which was usually made of coral or volcanic rock. The presence of particularly large fishponds within the ahupua‘a system required great collaboration and thus reflected not only the productivity of the natural environment, but also the communal productivity of the people, and the power and ability of the ali‘i (chiefs) to unify the communities of the area. Fishponds act as self-sustaining ecosystems with primarily natural recruitment from wild stocks, and thus require minimal human interference for them to function properly. Coralline algae secretions were even used in some instances to act as a natural glue to hold the kuapā upright.

In addition to the use of fishponds for food production, there were also kapu (restrictions) for marine resources, according to a Hawaiian newspaper published in the early 1920’s (SGCP 1923), area-specific kapu kept fish stocks at an optimal range that was both

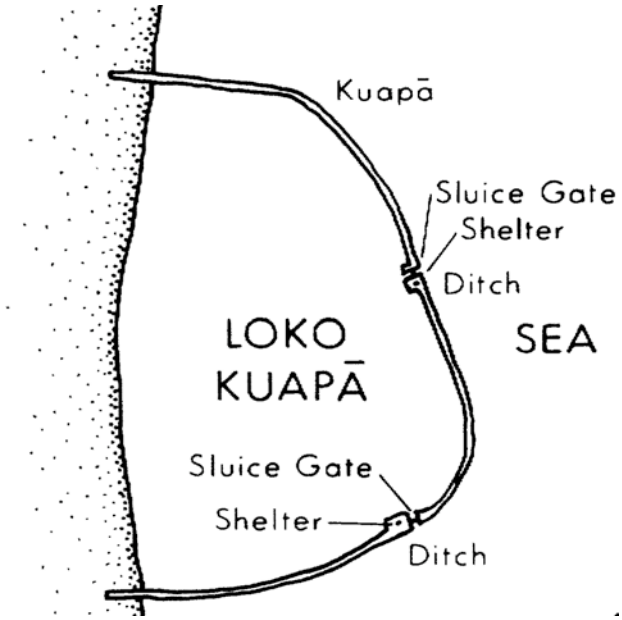

Figure 1: Hawaiian loko kuapā fishpond (Costa-Pierce 1987)

conducive to the fish population and native fishermen. These restrictions were set forth during known spawning periods for certain fish species. In order to ensure the kapu were effective, extensive knowledge of spawning seasons and resiliency of fish species had to be acquired through generations of observation. During spawning seasons the only acceptable way to harvest protected species was through fishponds. Consequently, fishponds promote sustainable harvesting practices as well as provide ample time for the fish to mature and reach a sustainable harvest size. It was believed that kapu were implemented by distinct gods and therefore, violations could result in penalties as extreme as death, but the kapu system was symbolically abolished in 1819.

Today traditional Hawaiian fishponds are being recognized as valuable ancient tools that can provide lessons in establishing sustainable food security for the State of Hawai‘i. These fishponds along with a healthy reef system provided the major portion of the protein needed in the Hawaiian diet of nearly a million people. The Hawaiians depended on centuries of keen observations and intimate relationships with the elements and resources of the environment in order to develop their integrated sustainable food production systems called an ahupua’a. The fishponds were and are an integral part of that system. The fishponds represent ecological engineering that leaves an almost invisible carbon footprint in a sustainable food production system.

Traditional Hawaiian fishponds can help feed the world, not by raising the fish and selling it to them, but by teaching people how to build and use these simple, sustainable proven methods in their country. A lot is still to be learned about the fine points of managing these ponds, their productive capabilities, and their diverse uses such as restocking the reefs of Hawai‘i. Traditional fishponds need to be identified and their natural companion resources (springs, rivers and taro loi that feeds nutrients and creates the brackish ecosystem needed to naturally feed the herbivores grown in the ponds) protected.

With few exceptions, fishponds are currently not an integral part of most communities. They are certainly not major contributors to the overall food production and consumption system in Hawai‘i. Although restoration efforts have cumulatively occurred for over a century (Figure 2), past momentum has been cyclical in nature because the initiatives of different generations have faded due to economic, environmental, and regulatory issues (Farber 1997). Since fishponds exist within the current framework of public lands and private ownership rather than complete communal responsibility, it has become obvious that community advocacy is often insufficient for restoration processes to be successful. Looking to the future, fishpond supporters have realized that it requires thoughtful planning and committed implementation from all relevant parties, which includes fishpond owners and communities as well as governmental and regulatory entities. Ultimately, it is essential that fishponds be woven back into the understanding of sustainable food production in order for the current revitalization movement to have permanent success. Additionally, the value of fishponds extends past their ability to provide physical sustenance because they offer the opportunity to understand and, more importantly, implement Hawaiian knowledge and practices.

Figure 2: He‘eia Fispond on O‘ahu

APPENDIX VII

Global Context of Aquaculture:

According to the United Nations Food and Agriculture Organization (FAO), most capture fisheries are either fully exploited or have been overfished. As the demand for seafood around the world continues to grow; governments, industry, and consumers are increasingly looking to aquaculture (the farming of aquatic organisms including fish, mollusks, crustaceans and plants) to fill the gap between wild fisheries and the demand for seafood. As a result, aquaculture has been growing at an annual rate of about nine percent worldwide and by some estimates now produces nearly half of the fish and seafood eaten. Aquaculture is also playing a growing role in efforts to restore and maintain depleted stocks of wild fish and other aquatic organisms.

The United States is a net importer of seafood with a current seafood trade deficit of approximately $10 billion. Approximately 40 percent of the seafood imported into the U.S. is farm raised, mostly consisting of salmon and shrimp. The U.S. produces aquaculture products worth about $1 billion annually. The Department of Commerce has called for the development of a domestic industry worth $5 billion by 2025. Although current U.S. production is dominated by pond-raised catfish, technological advances in recent decades have led to a dramatic increase in the production of farmed salmon. Several other marine finfish species are raised in small amounts in U.S. waters and research is being conducted on several more. Marine species (mostly salmon, bivalve mollusks, and shrimp), now constitute about 10 per cent of domestic production, but contribute 20 percent of the value of the crop. The growth of aquaculture has come with some environmental impacts, particularly as technology has opened new areas to aquaculture and allowed for increasingly intensive farming methods. Environmental effects from aquaculture include water pollution, introduction of nonnative species, genetic effects on wild populations of fish and shellfish from escapes of farmed animals or their gametes. There have also been concerns raised about the increasing use of wild forage fish for aquaculture feeds.

Historically, the culture of marine species has been done in situ in coastal waters. However, the dramatic increase in coastal development in the United States in recent decades, clean water and suitable sites for coastal aquaculture are at a premium. As a result, many experts see open ocean waters as the most likely venue for any major expansion of U.S. marine aquaculture. The Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) has developed legislation to expedite the establishment of aquaculture in U.S. marine waters under federal jurisdiction (generally 3 to 200 nautical miles offshore). This legislation was introduced in the U.S. Senate in June of 2005. Sustainable development of aquaculture requires that its environmental impacts be addressed effectively, particularly if as predicted by many experts, a large proportion of the future growth in aquaculture is through in situ culture in marine waters. Most marine waters in the United States and around the world are part of the public domain. Public policy makers are faced with difficult decisions about how to balance the potential benefits of aquaculture to the nation's economy and food supply with its effects on the environment, particularly where aquaculture may affect the health of marine ecosystems and other uses of the nation's ocean space and resources.

APPENDIX VIII

Open Ocean Aquaculture in Hawai‘i:

Open ocean aquaculture (also known as mariculture or cage culture) involves the production of fish in floating pens or submerged cages (Figure 3). A typical system includes a land-based hatchery or other source of juvenile fish coupled with pens or cages placed in the ocean. The juvenile fish are fed and allowed to "grow out" to a size suitable for harvest, sale and consumption.

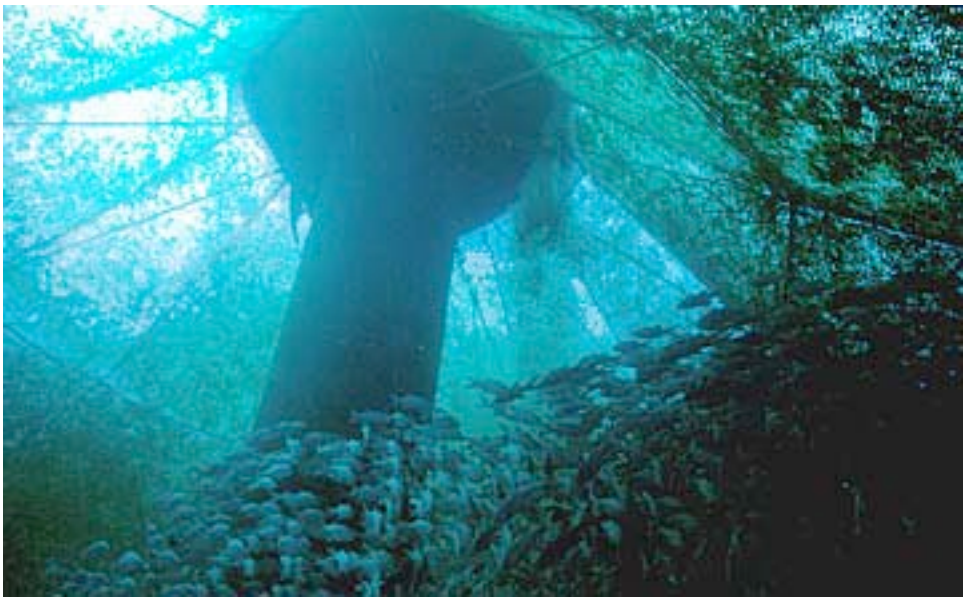

Figure 3: Fish in submerged aquaculture cage.

Open ocean aquaculture has gained popularity in Hawai‘i for the production of fish protein. Two open ocean aquaculture facilities are currently in operation in Hawaiian waters with one located within the sanctuary. Additional projects have been proposed both within and adjacent to sanctuary boundaries. As the open ocean aquaculture industry in Hawai‘i continues to grow, the sanctuary, in collaboration with state agencies, continues to closely monitor whether facilities, both existing and proposed, can effectively minimize, or ideally prevent, interactions with humpback whales.

All proposed open ocean aquaculture projects to date have been proposed within state waters (within five kilometers or three nautical miles from shore). Considering the oceanographic characteristics of the Hawaiian archipelago, it is likely that most future projects will also be proposed in state waters. Hawai‘i state law requires project developers to obtain a conservation district use permit and an associated open ocean lease from the State Department of Land and Natural Resources. The Hawaiian Islands Humpback Whale National Marine Sanctuary consults with industry representatives, and state and federal permitting agencies to minimize any potential threats that this growing industry may pose to sanctuary resources. Any party that wishes to engage in offshore aquaculture within state marine waters must obtain a series of permits and

authorizations from both federal and state agencies, including the U.S. Army Corps of Engineers, the Hawai‘i Department of Health, and the Department of Land and Natural Resources.

There has been limited research and monitoring related to interactions between humpback whales and aquaculture activities in Hawai‘i as this ocean use is relatively new. Therefore, although open ocean aquaculture structures will displace humpback whales from their habitat, the extent of adverse impacts on humpback whales in Hawai‘i is not clear at this time. Due to the relatively low number of existing aquaculture facilities in Hawai‘i, this activity currently does not appear to pose a major threat to humpback whales in the Hawaiian Islands. However, as experienced elsewhere in the world, concerns over possible increases in aquaculture activities in the future have been raised.

APPENDIX IX

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