

PREPARED STATEMENT OF
ASSISTANT PROFESSOR MALIA AKUTAGAWA
WILLIAM S. RICHARDSON SCHOOL OF LAW
KA HULI AO CENTER FOR EXCELLENCE IN NATIVE HAWAIIAN LAW
HAWAI'INUIĀKEA SCHOOL OF HAWAIIAN KNOWLEDGE

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COMMITTEE ON INDIAN AFFAIRS
of the
UNITED STATES SENATE

on

IMPACTS OF ENVIRONMENTAL CHANGE ON TREATY RIGHTS, TRADITIONAL LIFESTYLES, AND
TRIBAL HOMELANDS

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Mr. Chairman, Mr. Vice Chairman, and distinguished Members of the Committee, thank you for the opportunity to testify. My name is Malia Akutagawa. I am a Native Hawaiian cultural, subsistence practitioner from the island of Molokai. I am also an Assistant Professor with the University of Hawai'i William S. Richardson School of Law – Ka Huli Ao Center for Excellence in Native Hawaiian Law and the Hawai'inuiākea School of Hawaiian Knowledge. I am part of Hui 'Āina Momona, a multidisciplinary team of scholars that focuses on educating students, conducting research and community outreach that develops leadership and mālama 'āina stewardship of natural and cultural resources from an informed, Native Hawaiian world view.

My testimony will focus on the effects of climate change on Native Hawaiians and our cultural practices. I have spent years observing natural phenomena as part of my upbringing as a fisherwoman, limu (seaweed) gatherer, and as a novice learner of lā'au lapa'au Hawaiian medicinal healing arts. I also founded a nonprofit, Sust 'āina ble Molokai, which upholds Hawaiian traditional pathways and compatible modern strategies for a sustainable future. I have also participated in the Native Hawaiian Symposium on Climate Change held in March of this year and the Papahānaumokuākea Marine National Monument Climate Change Workshop conducted in June. I have had an opportunity to hear from and speak to a number of indigenous cultural practitioners and resource managers as well as marine, terrestrial, and climate change scientists. I bring with me some of their observations and findings. I would also like to acknowledge my colleague Professor Maxine Burkett, Director of the Center for Island Climate Adaptation and Policy (ICAP), which has been instrumental in generating dialogue within the university, State government, and community on climate change and policy making. I am also grateful to cultural expert and ICAP Director of Strategic Partnerships Malia Nobrega who shared with me a wealth of resources, articles, and papers, and most of all her family's personal history as traditional saltmakers and the challenges they face in continuing their practices in the advent of rising sea levels.

In my testimony I would like to cover some of the major climate change variables affecting Hawai'i as evidenced by western scientific research and indigenous observations. These variables include:

- Rising air temperature
- Decreased rain fall and stream flow
- Increased rain intensity
- Rising of sea surface temperature and sea levels, and
- Ocean acidification

Surface Air Temperature & Impact to Upland Forests, Watershed Systems, Estuarine Environments, and Agriculture

Hawai'i has been experiencing a significant increase in air temperature over the past 30 years, at an average rate of 0.3°F per decade.¹ This warming trend is most pronounced at elevations above 2,600 feet with an average increase of .48°F increase per decade, which is faster than the global average.² As a result, reduced cloud cover along the mountain range and a marked reduction in rainfall has occurred. Hawai'i records indicate a decline of 15% in rainfall over the past 20 years which has led to less stream flow and a reduction in base flow from groundwater sources to maintain streams during dry periods.³

My personal observations and those of other Native Hawaiians in their natural island environments include:

- Sporadic occurrences of what used to be normal daily morning and evening rain showers.
- Streams that flowed year round or most of the time now flow only during heavy rains.
- The forests are drying out. Wildfires are more common and have been threatening the green, upper reaches of native forests to an extent that has not been witnessed before.⁴
- Beds of edible seaweed delicacies such as limu 'ele'ele and huluhuluwaena which favor freshwater seeps along the marine shoreline are dying out and their coverage area has become greatly reduced due to prolonged drought and reduction of spring water along the coastline. Areas rich in edible limu are becoming dominated by opportunistic, weedy, inedible seaweeds.
- The seasons are arriving late; sometimes a certain season lasts for a very short duration or is skipped altogether. There is also a tendency of seasons to mix, with unpredictable alternating cool and warm temperatures on any given day. The effect has been that fishing season has become protracted. Increased water chop, and decreased visibility from stormwater discharge make conditions unfavorable for fishing.

¹ Fletcher, Chip. "Hawai'i's Changing Climate Briefing Sheet 2012." *Department of Geology and Geophysics, School of Ocean and Earth Science and Technology, University of Hawai'i at Mānoa. University of Hawai'i Sea Grant College Program, Center for Island Climate Adaptation and Policy.*

² Fletcher, Chip. "Hawai'i's Changing Climate Briefing Sheet 2012."

³ Fletcher, Chip. "Hawai'i's Changing Climate Briefing Sheet 2012."

⁴ Crozier, Pomaika'i Kaniaupio. Comments at the Island Climate Adaptation and Policy's Native Hawaiian Symposium on Climate Change, March 22-23, 2012, O'ahu, Hawai'i.

- Molokai farmers and Hawaiian Homestead farming families all cited observations of prolonged drought conditions that have increased crop failure and left crops more vulnerable to pests and predation by feral ungulates seeking moisture and nutrition.⁵

Intense Rainstorms, Flash Flooding, Water Discharge & Siltation of Reefs and Ancient Fishponds

While rainfall overall has decreased, the amount of heavy rainfall has increased by an estimated 12% since 1958.⁶ More and more, these heavy rainstorms have been causing flash floods, mudslides, damage to roads and infrastructure. This phenomenon is also observed on Molokai. We have silt runoff from the mountains that choke our reefs. Heavy rains regularly cause mudslides, bring boulders down the mountain and block roads, and damage our bridges.

Hi'ilei Kawelo, operator of Paepae o Heeia Fishpond on the windward coast of O'ahu recounts her observations that there has been a decrease in trade wind showers and an increase in pulse flooding.⁷ During these heavy rain events, sediment and excess water washes into the pond and alters its biochemistry. This impacts her ability to provide a good environment for fish to grow. The strategy of our ancient kūpuna (ancestors) in fashioning these fishponds centuries ago was to create a micro-environment for herbivorous fish to thrive. The walewale, or productive waters, where fresh and salt water mix, provide ideal conditions for algal mats called micro-phyto benthos (MPB) to form along the pond bottom and feed mullet.⁸ The freshwater mixing with the sea serves as a cooling agent and helps to maintain optimal dissolved oxygen levels important to keeping fish alive and healthy.⁹

Rising Sea Level, Beach Loss, Exposure of `Native Hawaiian Burials, and Impacts to Traditional Salt-Making

Over the past century, sea level in Hawai'i rose at an estimated 0.6 inches per decade. The cumulative increase in sea level has led to coastal erosion and flooding, and damage to artificial drainage systems.¹⁰ Chronic coastal erosion affects beaches that were once stable. The average rate of beach loss island-wide is 1 foot per year.¹¹ 72% of Kaua'i's beaches are experiencing chronic erosion. In developed areas, the prevalence of seawall construction has led to beach loss. Seawalls on O'ahu have caused a 25% loss of beaches on that island.¹² It is expected that global warming will exacerbate and accelerate trends in sea level rise. Research models show that by the end of this century, global sea level may rise 3 or more feet above 1990 levels.¹³

⁵ Akutagawa, Malia, Lahela Han, Harmonee Williams, Emillia Noordhoek, *Sust 'āina ble Molokai – Molokai Agriculture Needs Assessment*, May 2012.

⁶ Fletcher, Chip. "Hawai'i's Changing Climate Briefing Sheet 2012."

⁷ Kawelo, Hi'ilei. Presentation at the Papahānaumokuākea Marine National Monument Climate Change Workshop, O'ahu, Hawai'i, June 12-14, 2012.

⁸ Kawelo, Hi'ilei. Presentation 2012.

⁹ Kawelo, Hi'ilei, Presentation 2012.

¹⁰ Fletcher, Chip. "Hawai'i's Changing Climate Briefing Sheet 2012."

¹¹ Fletcher, Chip. "Hawai'i's Changing Climate Briefing Sheet 2012."

¹² Fletcher, Chip. "Hawai'i's Changing Climate Briefing Sheet 2012."

¹³ Fletcher, Chip. "Hawai'i's Changing Climate Briefing Sheet 2012."

Low-lying islands in the South Pacific are already experiencing the full brunt of climate change in rising sea levels that have completely inundated islands, flooded homes, covered cemeteries, inundated areas important for agriculture and leaving people as refugees in their homeland, dependent on food and water drop-offs by other countries conducting humanitarian work.¹⁴

On Molokai, we are witnessing the exposure of iwi kupuna (ancestral burials) along eroded shorelines. As sea level continues to rise and beaches erode further, we will need to respectfully relocate iwi kupuna to higher ground.

Dr. Chip Fletcher of the University of Hawai'i has documented the impacts of climate change in the South Pacific islands. He has found that saltwater intrusion accompanies sea level rise and has compromised springs feeding low-lying agricultural areas.¹⁵ Families have been forced to abandon their taro fields which have been exposed to salt water. The aquifer has been damaged, limiting their ability to access drinking water.¹⁶ In time, areas in Hawai'i will be facing a similar situation. Taro is the staple crop of Native Hawaiians. Low lying taro fields throughout Hawai'i will be compromised as well with rising ocean waters.

Climate change has directly impacted Hanapēpē families who make salt for bartering and gifting.¹⁷ It also affects traditional lā'au lapa'au healing practices and ceremonial blessings (for new homes, buildings, boats, etc.) that utilize pa'akai (salt).¹⁸ Hawaiian families in the Hanapēpē region of Kaua'i Island have maintained for generations the traditional practice of sea salt making. In this area of Kaua'i there exists sea shelves and a system of lava tubes that carry ocean water inland and fill up puna (springs) designated specifically for salt making.¹⁹ Families clean and maintain these puna kai.²⁰ During the months of April to September, families harvest seawater from these puna and fashion out waikū and lo'i out of natural clay found in the area.²¹ These waikū and lo'i are a series of earthen troughs or basins shaped by hand and made impermeable to hold seawater harvested from the puna.²² The seawater is poured first into the waikū and then transferred to the lo'i for further drying and crystallization.²³ The Nobrega family who maintains this tradition obtains on average 75 buckets of salt per harvest and makes several harvests throughout the salt-making season.²⁴ Two years ago, however, families in Hanapēpē could not harvest any salt due to rising sea level that overflowed the puna and flooded the entire area utilized for salt-making.²⁵ Just a month ago in June, the Nobrega's were

¹⁴ *Miss South Pacific: Beauty and the Sea*. Directed by Mary Lambert. 2011. A documentary film depicting beauty pageant contestants throughout the South Pacific islands addressing the devastating effects of climate change in their homelands.

¹⁵ Fletcher, Chip. Presentation at the Island Climate Adaptation and Policy's Native Hawaiian Symposium on Climate Change, O'ahu, Hawai'i, March 22-23, 2012.

¹⁶ Fletcher, Chip. Presentation 2012.

¹⁷ Malia Nobrega, interview by Malia Akutagawa, July 10, 2012. O'ahu, Hawai'i.

¹⁸ Malia Nobrega, interview 2012.

¹⁹ Malia Nobrega, interview 2012.

²⁰ Malia Nobrega, interview 2012.

²¹ Malia Nobrega, interview 2012.

²² Malia Nobrega, interview 2012.

²³ Malia Nobrega, interview 2012.

²⁴ Malia Nobrega, interview 2012.

²⁵ Malia Nobrega, interview 2012.

able to make salt and harvest in July a total of 21 buckets.²⁶ This is the first time conditions have been optimal to make salt and the family is not sure when good conditions will occur again.²⁷

Rising Sea Surface Temperatures and Ocean Acidification

Regular surface water temperature readings reveal a 0.22°F increase per decade in Hawaiian waters. Scientists anticipate this figure to rise with global warming.²⁸ Rising temperatures will expose corals to bleaching events where they may permanently lose their symbiotic microalgae.²⁹ Elevated levels of carbon dioxide in the atmosphere caused by emission of greenhouse gases by industrialized nations and developing countries are absorbed by the ocean and alters its chemistry to more acid conditions that limit the availability of dissolved carbonate. This limitation impacts all shellfish, corals, calcareous algae, and marine plankton.³⁰ Ocean acidification has the potential to collapse entire fisheries worldwide. For the reef specifically, if they are unable to recover, fish who feed on coral lose their food source. Eventually the dead coral matrix disintegrates and habitat is lost to a number of marine species. This in turn impacts the health of our fisheries. For Native Hawaiians, it means the loss of food sources and the destruction of fishing grounds critical to traditional, subsistence.

Papahānaumokuākea Marine National Monument

The effects of climate change are being felt more immediately by the older, lower lying Northwest Hawaiian Islands that are collectively designated as the Papahānaumokuākea National Marine Monument. Observations of resource managers and scientists include the following.³¹

- The islands are disappearing beneath the ocean due to sea level rise
- More loss of habitat is anticipated due to sea level rise coupled with intense storm waves that move inland and take out nesting seabirds.
- Reduction of monk seal pupping areas and turtle nesting sites due to beach loss.
- Reduced oceanic productivity along the Hawaiian archipelago due to shifting current and atmospheric wind patterns that no longer promote upwelling of nutrients in Hawai'i. This will impact fisheries throughout the archipelago.

Endangered Species and Food Sources Important to Native Hawaiians

Several Native Hawaiians expert in understanding moon phases and cycles and the correlations with ideal planting and harvesting periods for various food crops; the reproductive cycles of plants and spawning periods of fish contributed valuable input on the ways climate change is

²⁶ Malia Nobrega, interview 2012.

²⁷ Malia Nobrega, interview 2012.

²⁸ Fletcher, Chip. "Hawai'i's Changing Climate Briefing Sheet 2012."

²⁹ Fletcher, Chip. "Hawai'i's Changing Climate Briefing Sheet 2012."

³⁰ Fletcher, Chip. "Hawai'i's Changing Climate Briefing Sheet 2012."

³¹ Presentations and Discussions at the Papahānaumokuākea Marine National Monument Climate Change Workshop, O'ahu, Hawai'i, June 12-14, 2012.

impacting these cycles. Hawaiian botanists, forest and watershed managers also contributed their knowledge of changes seen in the field.

Kalei Nu'uhiwa shared her knowledge of the spawning cycle of the manini fish coincident with the arrival of migrating humpback whales.³² Fertilized eggs of the manini are concealed from predators and develop into 'ōhua (newly hatched fry or fingerlings) nestled within the bubbles of whale spit. As the currents carry the whale spit to shore, the 'ōhua are released and find shelter along the shoreline and tidepools. This winter season, the whales were late in their migration to Hawai'i. This may have adversely impacted manini spawning and survival rates of their young.

Pomaika'i Kaniaupio Crozier who assists in the management of Pu'u Kukui Watershed Preserve and Ma Kai Conservation Areas on the island of Maui has observed that certain native plants within pristine, upland forests are flowering and seeding outside of their normal periods of reproduction.³³

Dr. Benton Keali'i Pang noted the Hawaiian people's cosmological, genealogical, archaeological, and educational connection to the Papahānaumokuākea (Northwest Hawaiian Islands).³⁴ Climate change is resulting in ecological extinctions and degradations. These in turn result in a loss of kinship and a degradation of culture -- a loss of or reduction in our ability to practice our culture, to learn from what our kūpuna (ancestors, elders) did.³⁵

Fishpond operator Hi'ilei Kawelo, speaks fondly of her *one hānau*, her birthplace, "The function of my place, my ahupua'a, is to produce food, and my function is to care for this place. As Hawaiians, we make connections through food and rely on our 'ike kūpuna, our ancestral knowledge, of gathering and preparing these foods."³⁶ The connection to place and our kuleana (responsibility) to care for our place is the essence of our culture. Climate change and environmental degradation impacts Native Hawaiians deeply because they alter our relationship to place, the foods, and the cultural practices that sustain us.

Recommendations

Increase Food Security. As we begin to look at climate change adaptation and resilience, the ability to produce our own food locally and strengthening Hawaii's food security will be key. Government should no longer take a blind eye to appropriating the use of prime agriculture lands for housing, luxury gentlemen estates, and commercial developments that incapacitate the islands from producing food for its citizens. The approval of projects financed

³² Nu'uhiwa, Kalei. Comments at the Island Climate Adaptation and Policy's Native Hawaiian Symposium on Climate Change, March 22-23, 2012, O'ahu, Hawai'i.

³³ Crozier, Pomaika'i Kaniaupio. Comments at the Island Climate Adaptation and Policy's Native Hawaiian Symposium on Climate Change, March 22-23, 2012, O'ahu, Hawai'i.

³⁴ Pang, Benton Keali'i. Presentation at the Papahānaumokuākea Marine National Monument Climate Change Workshop, O'ahu, Hawai'i, June 12-14, 2012.

³⁵ Pang, Benton Keali'i. Presentation 2012.

³⁶ Kawelo, Hi'ilei. Presentation at the Papahānaumokuākea Marine National Monument Climate Change Workshop, O'ahu, Hawai'i, June 12-14, 2012.

with federal dollars should provide express conditions that prime agricultural lands be spared from construction.

Federal and State laws and policies need to change to support small family farms that will in turn increase local self-sufficiency and resilience in all communities throughout Hawai'i. These small family farms also tend to preserve green space important to carbon sequestration and preserving the nutrients in the soil. Federal subsidies for corporate agriculture need to end, as they set false pricing that leaves the small farmer out of the equation and unable to make a living.

Federal funds and policies that encourage Hawai'i and other States to set aside more agriculture land for leases to small farmers should be adopted. Pressure must be applied to the State in discontinuing abusive practices that allow for leasing and sub-leasing of agriculture park lands to huge, biotech seed companies. These companies take away from Hawai'i's food security and destroy the life of the land through heavy application of chemical pesticides and fertilizers, monocropping, and exposing precious topsoil to wind and water erosion. These agricultural parks were created to benefit local, small farm operators; not for industrial agriculture companies.

Resilience to climate change also requires preservation of biodiversity in our food crops and supporting sustainable, ecological farming practices that grow several varieties of many different crops. In this way, farmers are more likely to avoid total crop failure and select for crop varieties that are more adaptive to climate change. Funding local community and indigenous initiatives on seed saving, collecting and propagating heritage seeds, and for us in Hawai'i the preservation and planting of canoe crops and the many varieties that our ancestors cultivated through centuries, will be critical to climate change resilience and adaptation.

Hawai'i's ancient fishponds are underutilized, yet pose a significant opportunity for food production. Government regulation at the federal, state, and county level has made the permitting process daunting and cost prohibitive to the average person. Informal processes should be explored further such as memoranda of agreement between government and Hawaiian groups seeking to restore these ponds for fish production. In this manner some of the environmentally protective measures around maintaining water quality would be followed, but not serve as a complete barrier to revitalizing our fishponds to produce food.

Reducing building of new homes and infrastructure within the coastal zone in preparation of sea level rise. Federally funded coastal zone management programs and counties implementing the law through the shoreline setback and Special Management Area regulations must also revisit their land use and permitting regulations around development of nearshore properties in light of sea level rise. Federal guidance on these issues and conditions to continued funding would help to encourage States like Hawai'i to adopt and implement a comprehensive climate change adaptation plan for coastal management.

A comprehensive plan has to be established that considers the use of eminent domain powers and a mechanism for land swaps for families living in areas that will become inundated by rising ocean levels within the next several decades. Something must be done now before many of our islanders become climate refugees.

Increase funding for the work of agencies at all levels of government as well as grants for NGOs, indigenous organizations, and educational institutions and programs that conduct reforestation work, watershed and marine management and restoration, fire suppression, invasive species removal, and endangered species and critical habitat preservation work. More work can be done to improve Hawai'i's forests and watersheds. Federal funding should support the work of agencies, NGOs, and other entities doing reforestation and watershed management work. With every effort made to preserve existing forests and watershed areas; supplemented by repair of areas that have become denuded through poor land management, we can help to attract more cloud cover and rain. These strategies address the need to strengthen the health of our bio and ecological systems to create greater climate resilience.

Often overlooked are the ways that urbanization contributes to water loss through modern culvert and drainage systems that transport water off the land and directly into the sea. This exposes the marine environment to chemical toxins as well as an overabundance of freshwater input during heavy rains. Much of this water can be harvested passively in urban landscapes through subtle earthworks (swale construction, terracing, permeable paving, etc.) that welcome and incorporate water into landscaping. Through continual soakage of rainwater into the land, recharge of groundwater at lower elevations and the creation of new spring lines are possible and would serve to mitigate the negative impacts of saltwater intrusion associated with rising sea levels.

A decrease in anthropogenic disturbance on natural ecosystems and a commitment to restorative work whether it be removing ungulates from damaging upland forests; engaging in responsible, sustainable ranching; or decreasing non-point source pollution discharge into the ocean, our fishponds, and reef -- these new, responsible practices will aid species and the natural systems in recovery and make them that much stronger to face the challenges that come with climate change.

Support the continued work of the Center for Island Climate Adaptation & Policy (ICAP). ICAP has been instrumental in bringing together the science, Native Hawaiian and other community stakeholders, and the legal experience to make policy recommendations that government and the public can act on today. Federal funding is needed to help ICAP continue its work for the benefit of our islands. As a result of the Native Hawaiian Symposium on Climate Change, ICAP is moving forward with recommendations to create a Kilo Honua (Earth Observers) Program that will outreach into Native Hawaiian communities and aide in discourse around climate change issues. The project will also entail an assessment of the issues and policies needed to respect, preserve and maintain Hawaiian traditional knowledge, innovations, and practices. It will highlight the importance of indigenous lifestyles to conservation and sustainable use of natural resources.

Papahānaumokuākea. We need to anticipate that in the years ahead birds, monk seals, and turtles may begin migration from the Northwest Hawaiian Islands to the main Hawaiian islands. We are already witnessing this with monk seals naturally relocating to the main Hawaiian islands. As their numbers increase in the main Hawaiian islands, there have been repeated and deliberate killings of monk seals by humans. It is suspected that fishermen are killing them due to an inaccurate perception that monk seals are competing for the same food source. Actions must be taken to educate the public and provide a place for these endangered Hawaiian species to co-exist peacefully with us. This may entail establishing natural reserves for various species

migrating to the main Hawaiian Islands and reducing artificial lighting along beaches important to turtle nesting.

Support Collaborative Governance Processes and the Work of the ‘Aha Kiole. The traditional Hawaiian ahupua‘a system of natural resource management was very effective in sustaining successive generations of our people and enhancing the land and sea to produce a surplus of food for the benefit of all life. Konohiki land managers were assigned to the care and management of ahupua‘a, land divisions typically marked along watershed contours that served to provide the population with access rights to resources from mountain to sea. Konohiki possessed an intimate knowledge of their particular ahupua‘a and made management decisions that were customized to their place. This was a form of adaptive management at its finest, where decisions could be made in real time to curtail overharvesting of fish; to ensure equal allocation of water resources; to assign labor fairly for the purpose of making the land and sea productive as well as share in collective harvests.

In recent years, the State of Hawai‘i has acknowledged the need to integrate Hawaiian traditional ecological knowledge in the management of natural resources. Last week, Hawai‘i Governor Neil Abercrombie signed into law House Bill 2806 establishing the ‘Aha Moku Advisory Committee under the State Department of Land and Natural Resources (DLNR). The ‘Aha Moku Advisory Committee was originally formed under Act 212 in 2007 to resurrect the Native Hawaiian traditional form of natural resource management and indigenous governance on all islands and to advise the State on Hawaiian ecological and best management practices. Some islands have been more successful than others in building indigenous leadership locally through the formation of ‘aha councils at the moku (district) and ahupua‘a (traditional land subdivisions within each moku) levels.

This process provides greater inroads for local and indigenous stakeholders to work effectively with government in the management and protection of natural resources critical to our way of life. It also returns to indigenous communities a right to care for and monitor their own resources and to have a seat at the table with government. The ‘aha councils will prove invaluable in the years ahead especially in a climate of uncertainty where decisions on the ground have to be made timely in response to sudden and unpredictable shifts observed in nature.

I would also urge Congressional support of initiatives like this that place native, indigenous stakeholders in positions of leadership to manage natural and cultural resources essential to their peoples’ well-being and traditional pathways.

Mahalo for this opportunity to present testimony.