The United States of America's
Nomination of

Papahānaumokuākea

Marine National Monument

for Inscription
on the World Heritage List

January 2009

Mālamalama ka lā nui a Kāne puka i Haʻehaʻe

ʻApakau ke kukuna i ka ʻilo kai o nā kai ʻewalu

He ʻike makawalu ka wā e ʻano ʻi nei,

ʻO nā au walu o Kānaloa Haunawela noho i ka moana nui

He Huʻakai ka makani o Lehua ʻau i ke kai

Kūʻonoʻono ka lua o Kūhaimoana i ke kapa ʻehukai o Kaʻula

ʻO Kū i ka loulu, ulu aʻe ke aloha no Nihoa moku manu

Manu o kū i ka ʻāhui, he alakaʻi na ka lāhui

ʻO Hinapūkoʻa

ʻO Hinapūhalakoʻa

ʻO Hina kupukupu

ʻO Hinaikamalama

Hua ka ʻōhua, luʻu ke koholā

Aloha kahi limu kala, kiaʻi ʻia e ka ʻākala noho i uka

Hānau ka peʻa, puka ka peʻapeʻa i ke kai

He ʻīnaʻi ka ʻina, ʻono i ka huna o ka paʻakai

Manomano ka ʻike liʻu o ka houpō o Kanaloa

Koikoʻi lua hoʻi no ka lehulehu, ʻo kuʻu luhi ia

Hanohano wale ka ʻāina kūpuna, ʻo nā moku lēʻia

No Papahānaumokuākea lā he inoa

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Photo credits in text
Cover and Layout: Garcia and Associates, Rad Smith

Papahānaumokuākea Marine National Monument
6600 Kalaniana'ole Highway, Suite 300 - Honolulu, Hawai'i - USA 96825

State of Hawai'i, National Oceanic and Atmospheric Administration, Office of Hawaiian Affairs, and U.S. Fish and Wildlife Service. 2008. Nomination of Papahānaumokuākea Marine National Monument for Inscription on the World Heritage List. Honolulu, Hawai'i. 280 pages

EXECUTIVE CHAMBERS

HONOLULU

LINDA LINGLE
GOVERNOR

December 5, 2008

The Honorable Dirk Kempthorne, Secretary
United States Department of Interior
Washington, DC 20240

Dear Mr. Secretary:

It is with great honor that the State of Hawaii recommends that the Papahānaumokuākea Marine National Monument be nominated as a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage site. The nomination of this site has been a key goal of my administration and I enthusiastically support it. Covering a vast area in one of the world's most isolated archipelagos, the protected islands and atolls of Papahānaumokuākea offer a unique seascape dotted with islets that are rich in ecological, geological and cultural heritage. Hawaii recognizes the significance of Papahānaumokuākea's consideration as a mixed natural and cultural site with an associative cultural landscape administered under provisions of the Convention Concerning the Protection of the World Cultural and Natural Heritage (Convention).

On June 15, 2006, President George W. Bush issued Presidential Proclamation 8031 establishing the Northwestern Hawaiian Islands Marine National Monument under the authority of the Antiquities Act of 1906 (AA)(16 U.S.C. 431). The site was later renamed by Presidential Proclamation 8112 as the Papahānaumokuākea Marine National Monument to reflect its Native Hawaiian cultural significance. The Monument protects natural, cultural and historic resources encompassed within an area of approximately 139,793 square miles (362,075 square kilometers) around the Northwestern Hawaiian Islands, a place that has seen increasing levels of protection since 1909.

In recognition of the obligation under Article 5 of the Convention, and in coordination with the federal Co-Trustees, the National Oceanic and Atmospheric Administration and the U.S. Fish and Wildlife Service, Hawaii shall, insofar as possible, take all appropriate measures including legal, scientific, technical, and administrative, necessary for the protection, conservation, and preservation of the outstanding universal value of the Monument and its resources. This obligation is satisfied through the protective measures taken in the President's Proclamations, State and federal implementing regulations, and the management plan.

Hawaii fully supports the United States' efforts to nominate Papahānaumokuākea Marine National Monument to the UNESCO World Heritage List, and offers any needed assistance to ensure the nomination successfully navigates the approval process through the U.S. and UNESCO.

Sincerely,

LINDA LINGLE

UNITED STATES DEPARTMENT OF COMMERCE
The Under Secretary of Commerce
for Oceans and Atmosphere
Washington, D.C. 20230

DEC - 5 2008

The Honorable Dirk Kempthorne
Secretary
U.S. Department of the Interior
Washington, D.C. 20240

Dear Mr. Secretary:

It is with great enthusiasm that the National Oceanic and Atmospheric Administration (NOAA) recommends the Papahānaumokuākea Marine National Monument be nominated as a United Nations Educational, Scientific, and Cultural Organization (UNESCO) World Heritage site. Covering a vast area in one of the world's most isolated archipelagos, the protected islands and atolls of Papahānaumokuākea offer a unique seascape dotted with islets rich in ecological, geological, and cultural heritage. NOAA recognizes the honor of Papahānaumokuākea's consideration as a mixed natural and cultural site with an associative cultural landscape administered under provisions of the Convention Concerning the Protection of the World Cultural and Natural Heritage (Convention).

On June 15, 2006, President George W. Bush issued Presidential Proclamation 8031 establishing the Northwestern Hawaiian Islands Marine National Monument under the authority of the Antiquities Act of 1906 (AA)(16 U.S.C. 431). The site was later renamed by Presidential Proclamation 8112 as the Papahānaumokuākea Marine National Monument to reflect its Native Hawaiian cultural significance. The Monument protects natural, cultural, and historic resources encompassed within an area of approximately 139,793 square miles around the Northwestern Hawaiian Islands, a place that has been given increasing levels of protection since 1909.

In recognition of the obligation under Article 5 of the Convention, and in coordination with its Co-Trustees; the State of Hawaii, the U.S. Fish and Wildlife Service, and NOAA, shall take all appropriate measures including legal, scientific, technical, and administrative necessary for the protection, conservation, and preservation of the outstanding universal value of the Monument and its resources. This obligation is satisfied through the protective measures taken in the President's Proclamations, implementing regulations, and the management plan.

NOAA supports the United States' efforts to nominate Papahānaumokuākea Marine National Monument to the UNESCO World Heritage List, and offers any needed assistance to ensure the nomination successfully navigates the approval process through the United States and UNESCO.

Sincerely,

William J. Brennan, Ph.D.
Acting Under Secretary of Commerce
for Oceans and Atmosphere

THE ADMINISTRATOR

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington, D.C. 20240

December 5, 2008

Honorable Dirk Kempthorne
Secretary, U.S. Department of the Interior
Washington, DC 20240

Dear Mr. Secretary:

The U.S. Fish and Wildlife Service (Service) heartily endorses the nomination of Papahānaumokuākea Marine National Monument as a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage site. As recognized both by President Theodore Roosevelt some 100 years ago and by President George W. Bush in 2006, these remote islets, reefs, and waters offer a wealth of natural, cultural, and historic resources that truly deserve not only national but international acknowledgment. It is an honor for the Service to support consideration of Papahānaumokuākea as a mixed natural and cultural site with an associative cultural landscape administered under provisions of the Convention Concerning the Protection of the World Cultural and Natural Heritage (Convention).

Numerous natural treasures of international significance are found within Papahānaumokuākea, including the clearest illustration of "hotspot" island progression in the world, the largest tropical seabird rookery in the world, numerous threatened and endangered species, literally thousands of endemic species found nowhere else in the world, and one of the few remaining predator-dominated coral reef ecosystems in the world. Equally significant are Papahānaumokuākea's cultural resources, including unique archaeological sites on Nihoa and Mokumanamana, the strong association of the seascape with the cosmology and oral traditions of Native Hawaiians, and its continuing opportunities to allow Native Hawaiian practitioners to perpetuate customary practices such as wayfinding.

In recognition of the obligation under Article 5 of the Convention, and in coordination with its Co-Trustees, the State of Hawai'i and the National Oceanic and Atmospheric Administration, the U.S. Fish and Wildlife Service will, insofar as possible, take all appropriate measures including legal, scientific, technical, and administrative, necessary for the protection, conservation, and preservation of the outstanding universal value of the Monument and its resources. This obligation will continue to be met through the protective measures required by the National Wildlife Refuge System for the two National Wildlife Refuges within Monument boundaries and by the Presidential Proclamation establishing Papahānaumokuākea Marine National Monument, its implementing regulations, and its management plan.

Thank you for your efforts to recognize this unique natural and cultural treasure. If we can provide any further assistance during the nomination's consideration by the United States and UNESCO, please contact Barry W. Stieglitz, Project Leader, Hawaiian and Pacific Islands NWRC at (808) 792-9540.

Sincerely,

Kenneth Stansell

DIRECTOR

TAKE PRIDE IN AMERICA

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ACRONYMS AND ABBREVIATIONS

AAUS	American Academy of Underwater Sciences
ATBA	Areas to be Avoided
BRAC	Base Realignment and Closure
CFR	Code of Federal Regulations
COPPS	Community Oriented Policing and Problem Solving
CoRIS	NOAA Coral Reef Information System
CPUE	Catch-per-unit-effort
CRED	PIFCS Coral Reef Ecosystem Division
CRER	Coral Reef Ecosystem Reserve
DLNR	State of Hawai'i Department of Land and Natural Resources
DOC	U.S. Department of Commerce
DOD	U.S. Department of Defense
DOI	U.S. Department of the Interior
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FAD	Fish Aggregation Device
FWS	U.S. Fish and Wildlife Service
FFS	French Frigate Shoals
GIS	Geographic Information System
HAR	Hawaii Administrative Rule
HAZWOPR	Hazardous Waste Operations and Emergency Response
HIMB	Hawai'i Institute of Marine Biology
HINWR	Hawaiian Islands National Wildlife Refuge
HRS	Hawaii Revised Statutes
HURL	Hawai'i Undersea Research Lab
ICC	Interagency Coordinating Committee
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
LORAN	Long Range Aids to Navigation
MARPOL	International Convention for the Prevention of Pollution from Ships
MBTA	Migratory Bird Treaty Act
MHI	Main Hawaiian Islands
MMB	Monument Management Board
MMPA	Marine Mammal Protection Act
MMP	Monument Management Plan
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NCCOS	National Center for Coastal Ocean Science
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
NRDA	Natural Resource Damage Assessment
NRSP	Natural Resources Science Plan
NWHI	Northwestern Hawaiian Islands
NWR	National Wildlife Refuge
OHA	Office of Hawaiian Affairs
OLE	Office of Law Enforcement
ONMS	Office of National Marine Sanctuaries
OPA	Oil Pollution Act
PCB	Polychlorinated Biphenyls
PIFSC	NMFS Pacific Islands Fisheries Science Center
PISCO	Partnership for Interdisciplinary Studies of Coastal Oceans
PMNM	Papahānaumokuākea Marine National Monument
PSSA	Particularly Sensitive Sea Area
RAC	Reserve Advisory Council
ROP	Reserve Operations Plan
R/V	Research Vessel
SCUBA	Self-Contained Underwater Breathing Apparatus
SEB	Senior Executive Board
SHIELDS	Sanctuaries Hazardous Incident Emergency Logistics Database System
SMA	Special Management Area
SOU	Special Ocean Use
SPA	Special Preservation Area
SST	Scientific Support Team
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UXO	Unexploded Ordnance
USCG	United States Coast Guard
VMS	Vessel Monitoring System

Harlequin Crab
(Photo: Susan Middleton & David Liittschwager)

Papahānaumokuākea

Marine National Monument

No Papahānaumokuākea

Mālamalama ka lā nui a Kāne puka i Haʻehaʻe
ʻApakau ke kukuna i ka ʻili kai o nā kai ʻewalu
He ʻike makawalu kaʻu e ʻanoʻi nei,
ʻO nā au walu o Kanaloa Haunawela noho i ka moana nui
He Huʻakai ka makani o Lehua ʻau i ke kai
Kūʻonoʻono ka lua o Kūhaimoana i ke kapa ʻehukai o Kaʻula
ʻO Kū i ka loulu, ulu aʻe ke aloha no Nihoa moku manu
Manu o kū i ka ʻāhui, he alakaʻi na ka lāhui
ʻO Hinapūkoʻa
ʻO Hinapūhalakoʻa
ʻO Hina kupukupu
ʻO Hinaikamalama
Hua ka ʻōhua, luʻu ke koholā
Aloha kahi limu kala, kiaʻi ʻia e ka ʻākala noho i uka
Hānau ka peʻa, puka ka peʻapeʻa i ke kai
He ʻīnaʻi ka ʻina, ʻono i ka huna o ka paʻakai
Manomano ka ʻike liʻu o ka houpō o Kanaloa
Koikoʻi lua hoʻi no ka lehulehu, ʻo kuʻu luhi ia
Hanohano wale ka ʻāina kūpuna, ʻo nā moku lēʻia
No Papahānaumokuākea lā he inoa

- Na Kainani Kahaunaele a me Halealoha Ayau

The sunrise of Kāne at Haʻehaʻe shines bright
The rays of the sun spread throughout Hawaiʻi
I yearn for the deep knowledge
The knowledge of Kanaloa who lives in the ocean
The Huʻakai wind is of Lehua that swims in the sea
Rich is the pit of Kūhaimoana in the seaspray of Kaʻula
Kū is of the loulu (endemic fan palm) and our respect grows for Nihoa, isle of birds
Manu o kū (white tern) flies in a bunch and leads the nation
The multiple forms of Hina of coral and moon
The ʻōhua (juvenile wrasse, tang, unicorn, parrot fish) spawns, the whale dives
Love for the limu kala (Sargassum seaweed), whose land counterpart is the ʻākala (Hawaiian raspberry)
The peʻa (Hawaiian bat) gives birth to the peʻapeʻa (starfish) in the sea
The ʻina (endemic sea urchin) is the seasoning, delicious with salt
The deep knowledge of our Kūpuna lies in the depths
Extremely important for us to grasp, it is my passion
Honored of the land of my ancestors, the abundant islands
A name song for Papahānaumokuākea

- by Kainani Kahaunaele and Halealoha Ayau

Cultural practitioners Kainani Kahaunaele and Halealoha Ayau made a gift of this *mele* (name song), *No Papahānaumokuākea*, to the Papahānaumokuākea Marine National Monument in November 2007. This *mele* celebrates Papahānaumokuākea's outstanding natural, historical, and cultural resources, and exemplifies the way in which the site's natural and cultural significances are intertwined. When chanted, such as in opening public meetings, the *mele* is offered in honor of and to give thanks to the place and to the *kūpuna* (elders). An audio recording of practitioners chanting the mele, *No Papahānaumokuākea*, is included (see Appendix P).

Executive Summary

Country

United States of America.

State, Province, or Region

Papahānaumokuākea Marine National Monument is comprised of lands and waters under the management, control and jurisdiction of the United States of America, and also includes lands and waters of the State of Hawai'i.

Name of Property

"Papahānaumokuākea Marine National Monument"

Papahānaumokuākea (pronounced Pa-pa-HAH-nou-mo-koo-AH-keh-ah) comes from an ancient Hawaiian traditional chant concerning the genealogy and formation of the Hawaiian Islands. An explanation of the meaning and process for naming Papahānaumokuākea is found at the beginning of Section 2.a.

Geographical Coordinates (See Figure 1.1a)

The center point for the geographic coordinates is:
N 25°20′56.652″ W 170°8″44.952″

The outer boundaries include:
N 22°53′35.016″ W 161°2′9.456″
N 28°37′41.196″ W 179°14′43.764″

Nesting Great Frigatebirds ('Iwa) and aquamarine lagoons link the land and sea in this vast seascape
(Photo: James Watt)

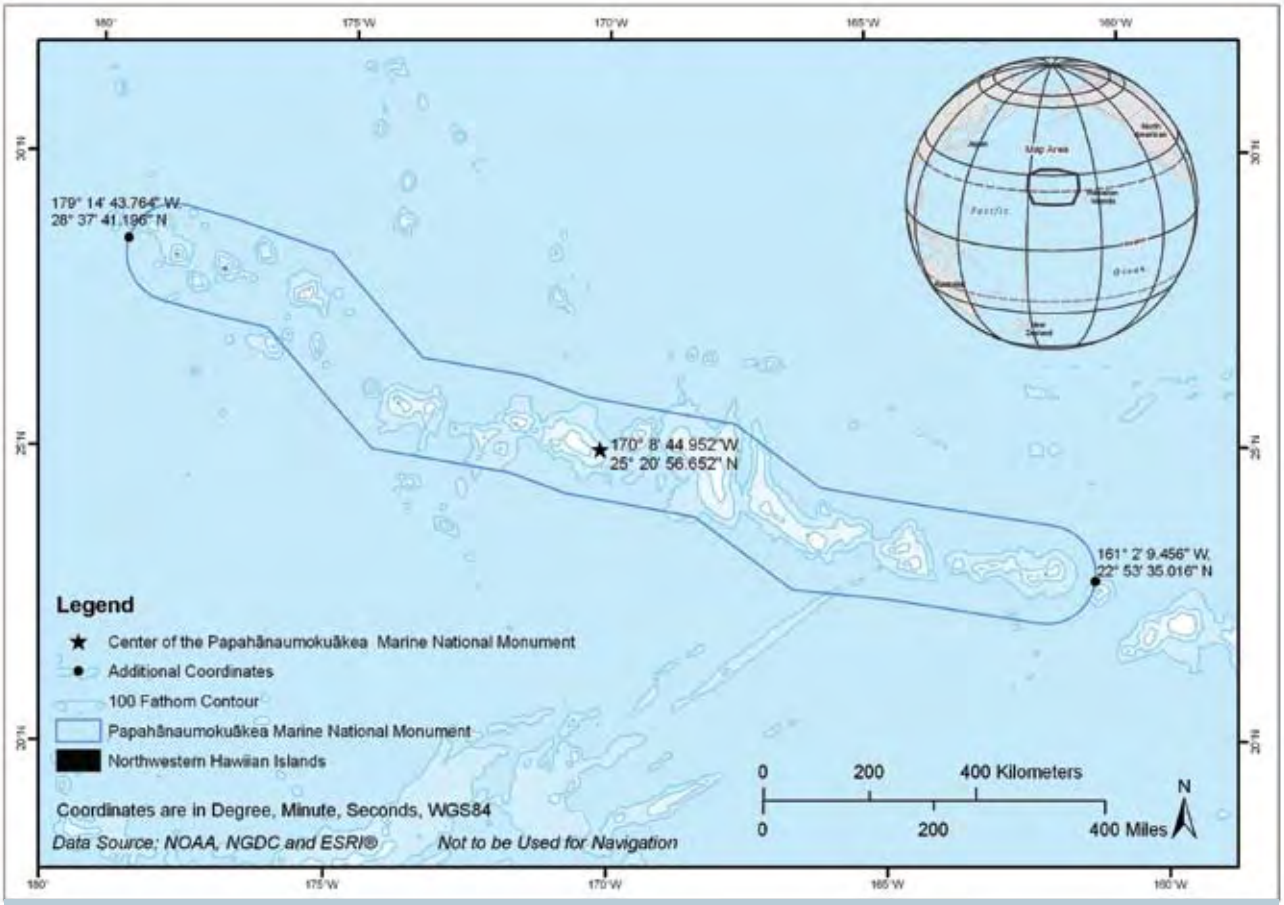
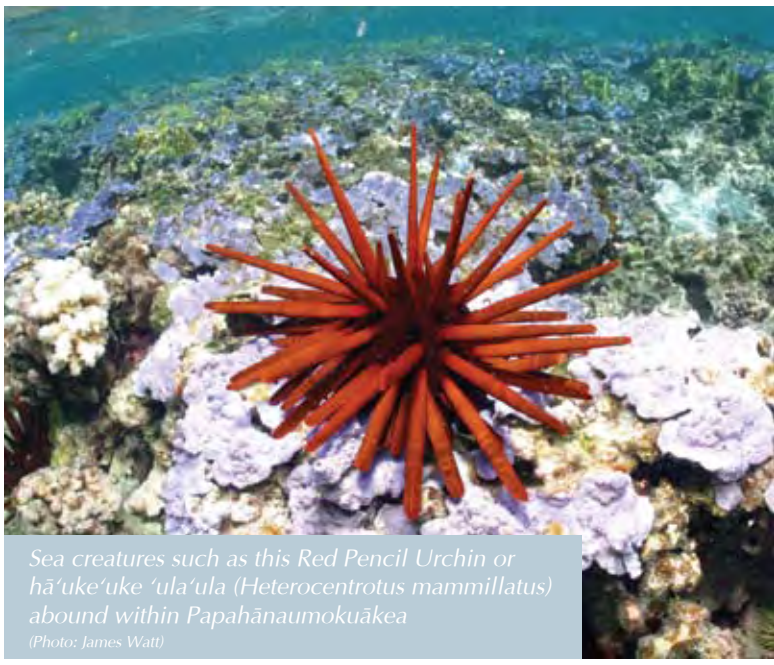


Figure 1.1a *Proposed Nominated Area: Papahānaumokuākea Marine National Monument geographic coordinates*

3

Textual Description of the Boundaries of the Nominated Property

Papahānaumokuākea is situated in the northwestern portion of the Hawaiian Archipelago, located northwest of the Island of Kaua'i. It encompasses an area of approximately 36,207,499 hectares (362,075 square kilometers or 139,797 square miles). Spanning a distance of approximately 1,931 kilometers (1,200 miles or 1,041 nautical miles), the region, 185 kilometers wide (115 miles or 100 nautical miles), is dotted with small islands, islets, reefs, shoals, submerged banks, and atolls that extend from subtropical latitudes to near the northern limit of coral reef development (see Figure 1.2).



Sea creatures such as this Red Pencil Urchin or hā'uke'uke 'ula'ula (Heterocentrotus mammillatus) abound within Papahānaumokuākea
(Photo: James Watt)

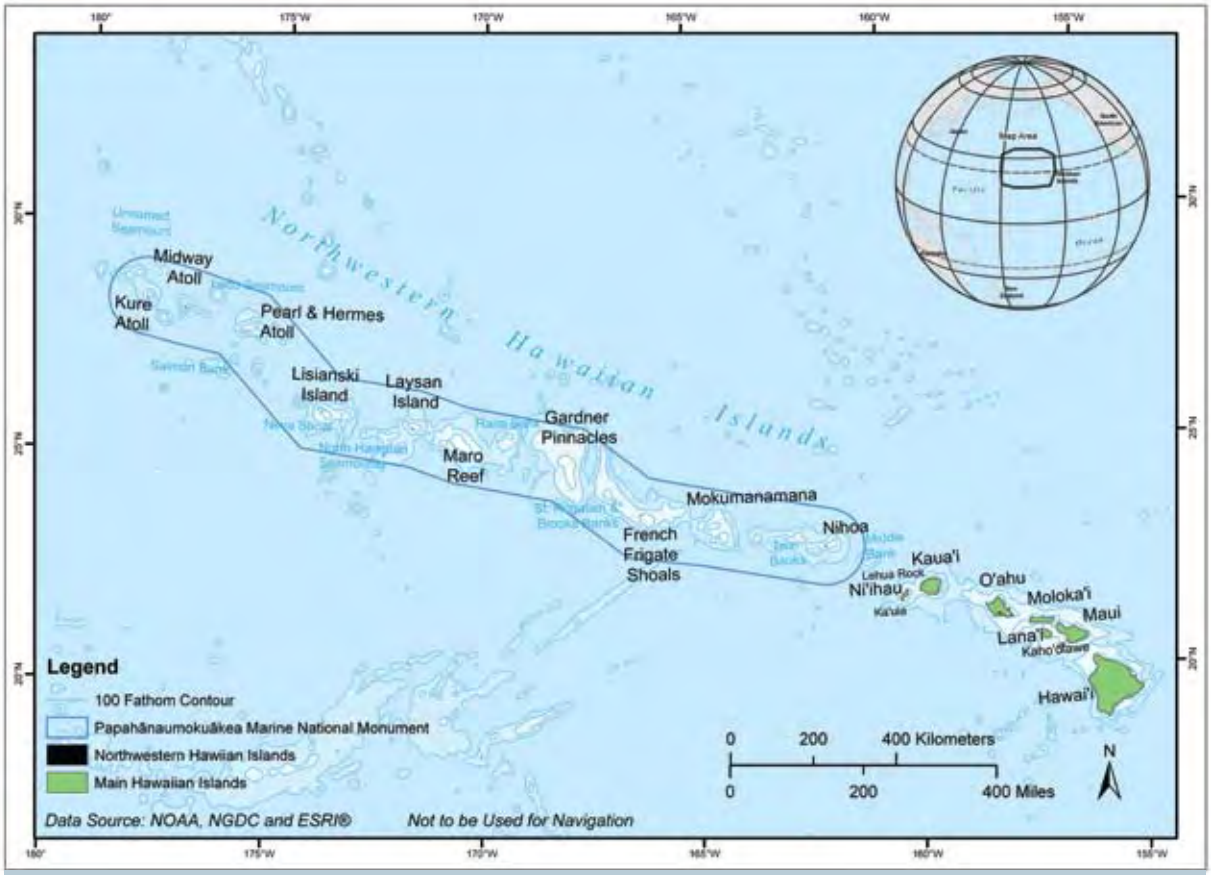
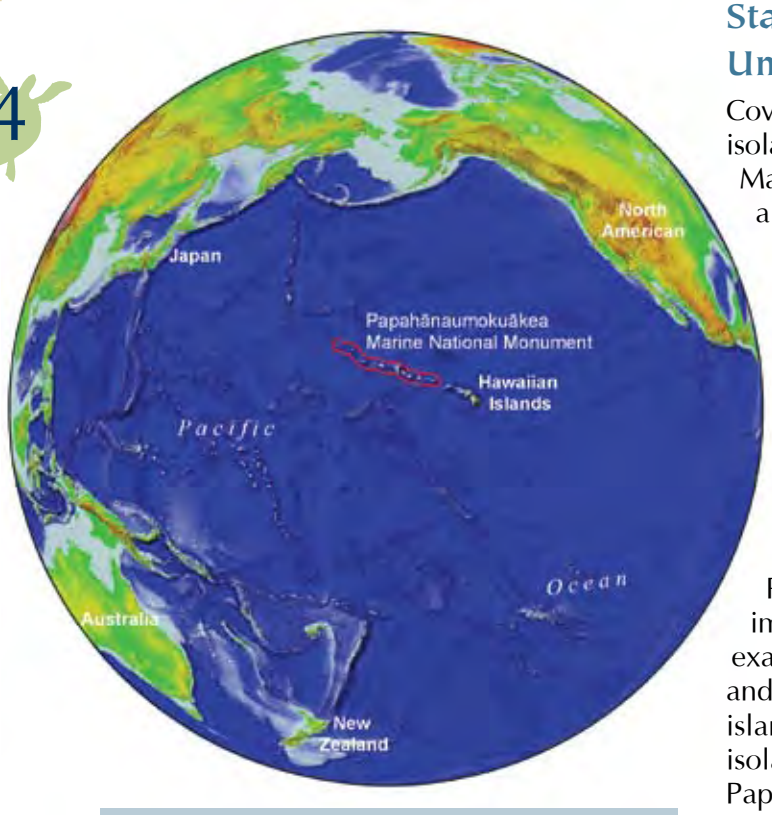


Figure 1.2 *Proposed Nominated Area: Papahānaumokuākea Marine National Monument overview*



Location of proposed nominated property in the Pacific Ocean

Statement of Outstanding Universal Value

Covering a vast area in one of the world's most isolated archipelagos, Papahānaumokuākea Marine National Monument encompasses a significant expanse of low-lying islands and atolls, predator dominated coral reef ecosystems, and marine and terrestrial flora and fauna that show significant patterns of enhanced speciation with numerous endemic and endangered species. It is a unique seascape, rich in ecological, geological and cultural heritage.

The islands and atolls of Papahānaumokuākea comprise an important prototype and outstanding example of ongoing geologic processes and the clearest illustration of 'hotspot' island progression in the world. The sheer isolation of these islands and waters causes Papahānaumokuākea to function as an intact miniature evolutionary universe. It contains innumerable excellent examples

of ecological and biological evolutionary processes (such as dramatic examples of adaptive radiation) that continue undisturbed, resulting in very high rates of endemism. The region provides a crucially important habitat for the conservation of many endangered or threatened species of global concern. Papahānaumokuākea is also a sacred cultural landscape, a region of deep cosmological and traditional significance to the living Native Hawaiian culture that contains a host of intact and significant archaeological sites. The entire region provides a largely undisturbed ancestral environment, whose preservation both illuminates and embodies the Hawaiian concept of the literal and spiritual kinship of all things in the natural world, including man, and represents the site where life originates and the place where spirits return after death.

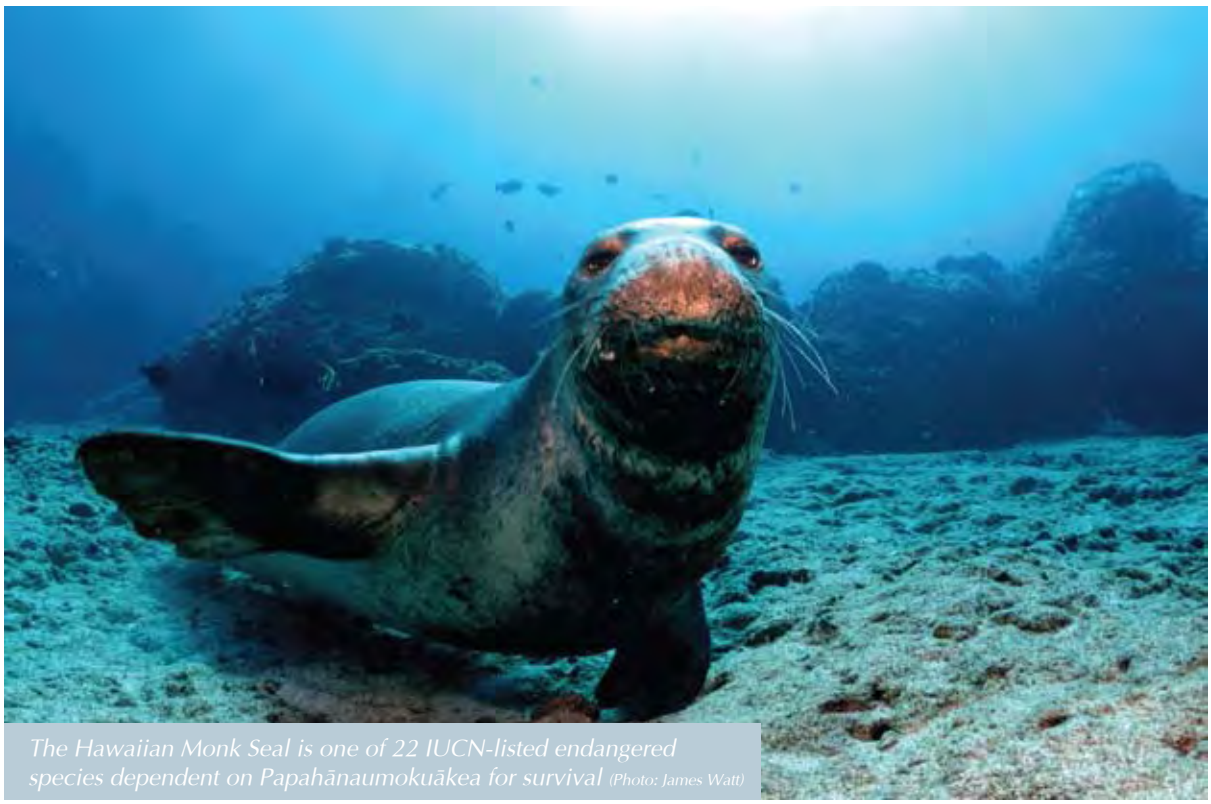
Native Hawaiian people consider Papahānaumokuākea as one of Hawai'i's last-remaining places of abundance, or 'āina momona (Photo: James Watt)

Criteria Under Which Property is Nominated

Papahānaumokuākea is nominated for inscription to the World Heritage List as a mixed site for its natural and cultural values and as an associative cultural landscape under the following criteria:

Criterion iii: "to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization, which is living or which has disappeared"

Papahānaumokuākea's remarkable archaeology and significant ritual sites (*heiau*) bear exceptional testimony to the shared historical origins of all Polynesian societies, and to the growth and expression



The Hawaiian Monk Seal is one of 22 IUCN-listed endangered species dependent on Papahānaumokuākea for survival (Photo: James Watt)

Over 90% of the threatened Green Turtle nestings in Hawai'i occur within Papahānaumokuākea (Photo: James Watt)

of a culture that evolved from the last and most difficult wave of cross-Pacific Polynesian migration. As the only Mystery Islands (once-inhabited but now abandoned outposts at the farthest reaches of Polynesian migration) that continue a cultural association with their indigenous people, the islands of Nihoa and Mokumanamana can reveal much about cultural resilience in a changing environment.

Criterion vi: "to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance"

Papahānaumokuākea, as an associative cultural landscape, represents core elements of Native Hawaiian cosmology and tradition. The islands northwest of the Tropic of Cancer are believed to lie within the region of primordial darkness from which life originates and to which it returns. For a culture that considers nature and civilization to be part of a genealogical whole, Papahānaumokuākea offers a "place of abundance" to reconnect with an ancestral environment, and its seas are also a traditional and contemporary testing ground for the revitalized art of Polynesian wayfinding.

Criterion viii: "be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features"

The string of islands in Papahānaumokuākea, 1,931 kilometers long, comprise a classic, important and unparalleled example of later stages of island and atoll evolution. The archipelago has provided some of the most compelling confirmation of current theories of global plate tectonic movements.

Criterion ix: "be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals"

Papahānaumokuākea is a spectacular example of evolution in isolation, which results in enhanced speciation and a phenomenally high degree of endemism in both the marine and terrestrial flora and fauna. The coral reef ecosystems of Papahānaumokuākea also represent one of the world's last apex predator dominated ecosystems, a community structure characteristic of coral reefs prior to significant human exploitation.

Criterion x: "contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation"

The region is home to, and a crucial refuge for, many endangered, threatened, and endemic species, including critically endangered marine mammal, bird, and plant species for whom it is the last or only refuge anywhere on earth. Papahānaumokuākea is also the largest tropical seabird rookery in the world.

Integrity

Papahānaumokuākea is a pristine marine ecosystem, which allows biological and ecological processes and systems to continue undisturbed, to a degree seen in few other places on earth. It includes all key areas and ecosystems that are needed to maintain ecological integrity and the long-term conservation of its unique diversity. Papahānaumokuākea is also a complete and intact cultural and maritime landscape that is in continuous use by its cultural

(Photo: James Watt)

(Photo: Rob Shallenberger)

Laysan Albatross (below) and Masked Boobies (above), members of the largest tropical seabird rookery in the world

Schooling lauwiliwili, the endemic Milletseed Butterflyfish (Chaetodon miliaris) (Photo: James Watt)

descendants, Native Hawaiians. Its densely scattered, well-preserved and varied archaeological sites have been subject to very few human disturbances.

Authenticity

The authenticity of Papahānaumokuākea lies in the continuing strong association of the landscape with the cosmology and oral traditions of Native Hawaiians, the embodiment of an ancestrally pristine and spiritually meaningful marine environment, and the perpetuation of customary practices such as wayfinding.

Requirements for Protection and Management

Papahānaumokuākea is protected by a significant federal and state legal regime, including an extensive management plan; enforcement, surveillance, and monitoring activities; and severe restrictions on access. Tourism is restricted to limited numbers at only one site, on Midway Atoll. The area is managed to provide opportunity for significant input and advice from key stakeholders and has a long history of public engagement.

Name and Contact Information of Official Local Institute/Agency

Papahānaumokuākea Marine
National Monument
6600 Kalaniana'ole Highway
Suite 300
Honolulu, HI 96825
USA

Telephone: (001) 808-397-2660
Fax: (001) 808-397-2662
E-mail: hawaiireef@noaa.gov
Web address: www.papahanaumokuakea.gov

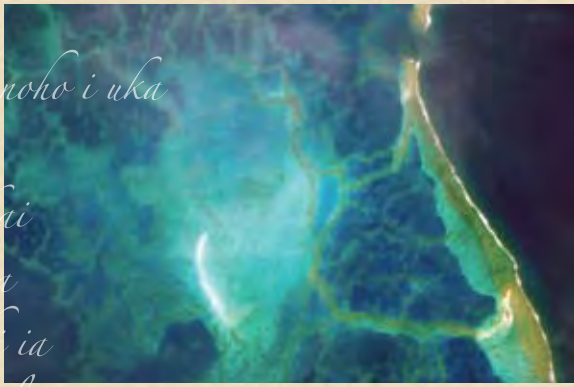
Chief, Office of International Affairs
National Park Service
U.S. Department of the Interior
1201 Eye Street NW (0050)
Washington, D.C. 20005
USA

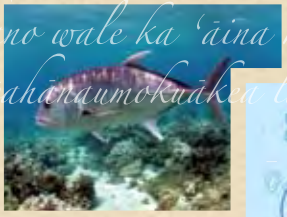
Telephone: (001) 202-354-1800

1.

Malamalama ka lā nui a Kāne puka i Hu'ena e
Apakau ke kukuna i ka 'ili kai o nā kai 'ewalu
He 'ike makawalu ka'u e 'ano'i nei,
'O nā au walu o Kanaloa Haunawela noho i ka moana nui
He Hu'akai ka makani o Lehua 'au i ke kai
Ku'ono'ono ka lua o Kuhaimoana i ke kapa 'ehukai o Ka'ula
'O Kū i ka loulu, ulu a'e ke aloha no Nihoa moku manu
Manu o ku i ka 'āhui, he alaka'i na ka lāhui
'O Hinapūko'a
'O Hinapuhalako'a
'O Hina kupukupu
'O Hinaikamalama
Hua ka 'ōhua, lu'u ke kohola
Aloha kahi limu kala, kia'i 'ia e ka 'ākala noho i uka
Hānau ka pe'a, puka ka pe'ape'a i ke kai
He 'ina'i ka 'ina, 'ono i ka huna o ke ka'akai
Manomano ka 'ike li'u o ka houpo o Kanaloa
Koiko'i lua ho'i no ka lehulehu, 'o ku'u luhi ia
Hanohano wale ka 'āina kupuna, 'o na moku le'ia
No Papahānaumokuākea lā he inoa

– Na Kajnani Kahaunaele a me Halealoha





Identification of the Property

1. Identification of the Property


(Photo: James Watt)

1.a Country

United States of America.

1.b State, Province or Region

Papahānaumokuākea Marine National Monument is comprised of lands and waters under the management, control and jurisdiction of the United States of America, and also includes lands and waters of the State of Hawai'i.

1.c Name of Property

"Papahānaumokuākea Marine National Monument"

Papahānaumokuākea (pronounced Pa-pa HAH-nou-mo-koo-AH-keh-ah) comes from an ancient Hawaiian traditional chant concerning the genealogy and formation of the Hawaiian Islands, and a deep honoring of the dualisms of life. An explanation of the meaning and process for naming the property is found at the beginning of Section 2.a.

Popular and Historic Names

Table1.1: Other popular or historic place names for the property
The Northwestern Hawaiian Islands (NWHI)
The Kūpuna (Elder) Islands
The Leeward Islands
Nā Moku Manamana
Nā Moku Papapa

Throughout this document, several placenames are used. In general, "Papahānaumokuākea" sufficiently refers to the place, although the terms "Northwestern Hawaiian Islands" or "NWHI" are used when referencing biogeography or when quoting publications employing these placenames. When referring to management authorities and the like, this document applies the term "the Monument".

Names of Individual Islands/Reefs/Shoals

Table 1.2: Names of individual islands, reefs, shoals (from SE to NW) (* indicates primary name used today)	
Native Hawaiian Name(s)	**English Name(s)**
*Nihoa, Moku Manu	Nihoa Island, Bird Island
*Mokumanamana	Necker Island
Kānemiloha'i, Mokupāpapa	*French Frigate Shoals
Pūhāhonu	*Gardner Pinnacles
Ko'anako'a, Nalukākala	*Maro Reef
Kauō	*Laysan Island, Moller Island
Papa'āpoho	*Lisianksi Island
Holoikauaua	*Pearl and Hermes Atoll
Pihemanu	*Midway Atoll, Brook Island, Middlebrook Islands
Mokupāpapa, Kānemiloha'i	*Kure Atoll

*For a more detailed treatment of these names, an explanation of their history and meaning, please see Section 2

1.d Geographical Coordinates to the Nearest Second

The geographic center point for Papahānaumokuākea is:

N 25°20′56.652″ W 170°8″44.952″

The geographic coordinates are listed below. All are depicted on Figure 1.1:

N 22°53′35.016″ W 161°2′9.456″
N 22°14′22.740″ W 162°5′53.736″
N 23°52′49.512″ W 161°44′32.748″
N 22°57′25.092″ W 166°36′0.000″
N 24°12′41.868″ W 168°22 51.024″
N 25°47′5.892″ W 167°36′43.200″
N 24°36′17.892″ W 170°47′34.836″
N 24°40′55.092″ W 166°3′21.600″
N 26°14′15.342″ W 170°23′2.580″
N 24°56′14.244″ W 171°50′11.436″
N 26° 35′ 5.892″ W 171°30′50.436″
N 26°50′53.592″ W 173°30′47.556″
N 25°16′37.092″ W 174°24′50.436″
N 27°14′45.960″ W 176°29′52.620″
N 28°34′55.092″ W 175°19′44.436″
N 27°35′52.188″ W 178°29′54.384″
N 29°14′26.124″ W 178°8′46.932″
N 28°37′41.196″ W 179°14′43.764″

1.e Maps Showing the Boundaries and Management of the Nominated Property

(i) Bathymetric Map

Please see Appendix A for a map of the property printed on a National Oceanic and Atmospheric Administration (NOAA) nautical chart, which also includes bathymetric references.

(ii) Location Map

Please refer to Figures 1.2 and 1.3, for an overview map and management area map, respectively.

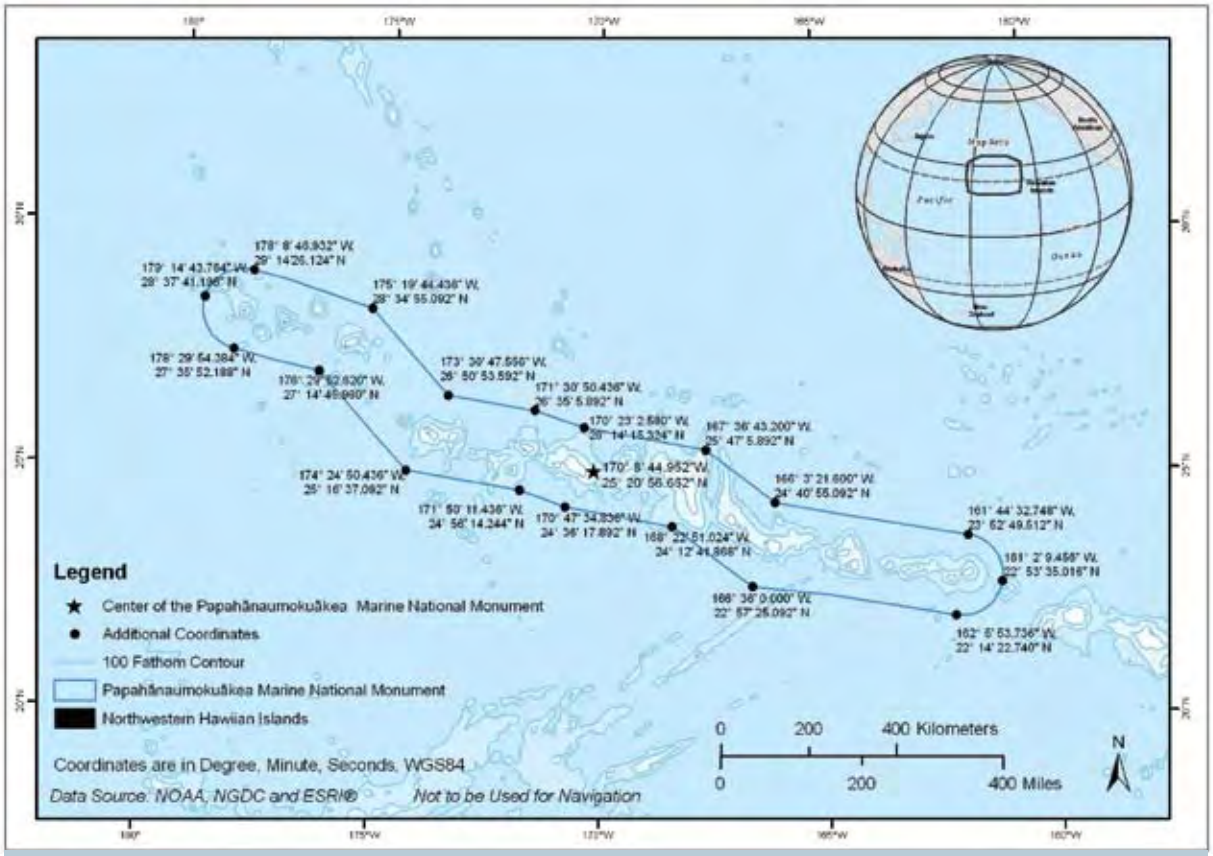


Figure 1.1b Proposed nominated area: Papahānaumokuākea Marine National Monument geographic coordinates (inclusive)

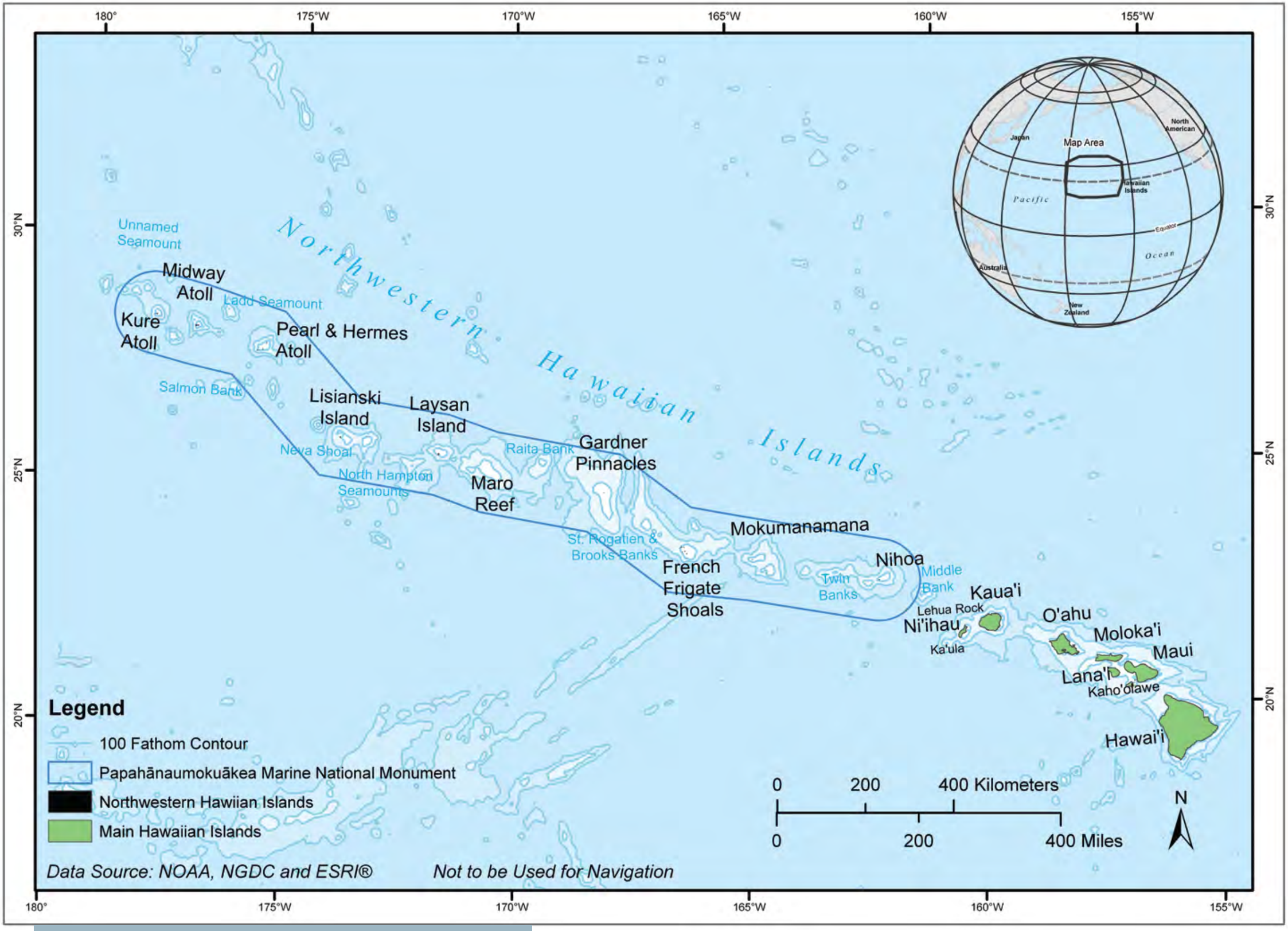


Figure 1.2: *Proposed nominated area: Papahānaumokuākea Marine National Monument overview*

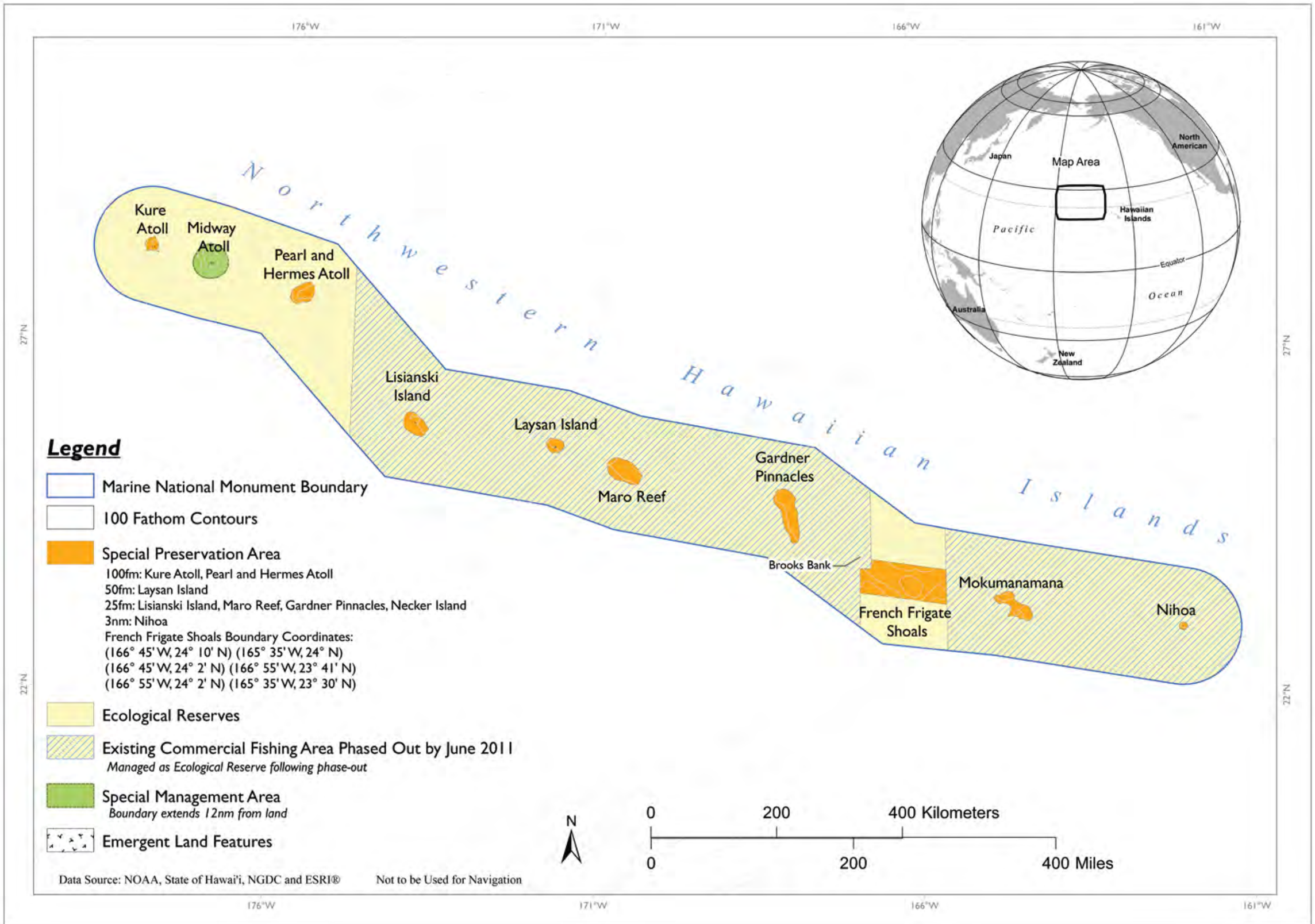


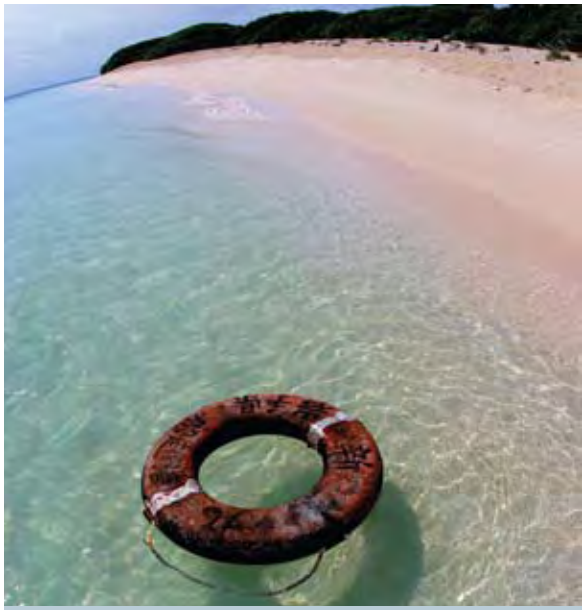
Figure 1.3: *Management area of Papahānaumokuākea*

(iii) Other Maps and Buffer Zone Discussion

Upon review of the Report of the International Expert Meeting on World Heritage and Buffer Zones, WHC-08/32.COM/7.1 (22 May 2008), and the underlying Operational Guideline paragraphs 103-107 and Recommendation 11.b., it has been determined that a Buffer Zone is not necessary for the conservation of the natural and cultural heritage of outstanding universal value in Papahānaumokuākea Marine National Monument. Papahānaumokuākea has one of the largest marine protected area boundaries in the world. The areas around the boundary of Papahānaumokuākea do not contain any land or land-based sources of pollution.

One potential threat to the natural and cultural heritage in the area surrounding the boundary of Papahānaumokuākea would be from vessel traffic. This threat has been addressed in protective measures authorized by the International Maritime Organization (IMO).

Papahānaumokuākea's boundary is approximately 50 nm from the coral reefs. There are six (6) Areas to Be Avoided (ATBA) that have been adopted by the IMO to protect eight of the coral reef areas of the NWHI from ship traffic. Each of the ATBAs extends



Life ring from a passing vessel. Threats from vessel traffic include objects washed overboard while in transit (Photo: James Watt)

Remains of the Kaiyo Maru No. 25 shipwreck on Laysan Island (Photo: James Watt)

out 50 nm (92.6 km) from the center of the islands or atolls, to keep ships well away from the coral reef ecosystem and resources.

Additionally, the IMO has designated Papahānaumokuākea Marine National Monument as a Particularly Sensitive Sea Area (PSSA). The PSSA boundary coincides exactly with the boundary of Papahānaumokuākea. An IMO authorized recommendatory ship reporting area has also been established. This ship reporting area is a band 10 nautical miles (18.5 km) wide, surrounding the Papahānaumokuākea Marine National Monument boundary and PSSA. This reporting requirement reminds vessels of the existence of this area and its navigational hazards well before they enter the boundary of Papahānaumokuākea and PSSA. The ship reporting system is mandatory for ships 300 gross tons and greater, fishing vessels, and for all vessels, in the event of a developing emergency situation, that are in transit through the reporting area. In addition, Papahānaumokuākea's boundary, management plan and regulations were originally developed to protect monk seals, sea turtles, and seabirds from fishing operations.

In sum, the boundary of Papahānaumokuākea and PSSA, along with the management plan and regulations, provide adequate protection of the natural and cultural heritage in Papahānaumokuākea. Figure 1.4 below provides details on the PSSA boundary designated by IMO, and defines the six Areas to be Avoided (ATBAs).

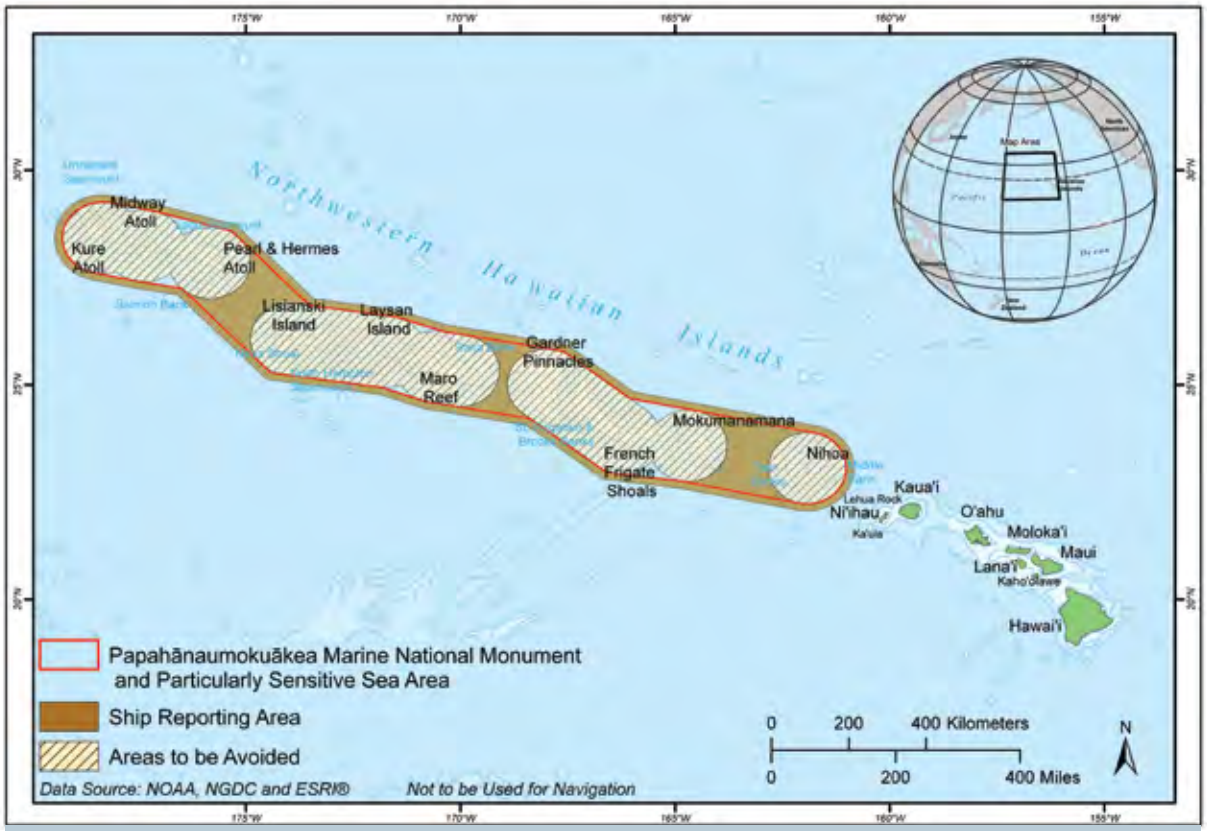


Figure 1.4 *Proposed nominated area: Papahānaumokuākea Marine National Monument and Particularly Sensitive Sea Area (PSSA)*

1.f Area of Nominated Property

The area of the nominated property is 36,207,499 hectares. No buffer zone is proposed for inscription. The area and perimeter of the property are also expressed in various formats below:

Table 1.3: *Papahānaumokuākea Marine National Monument perimeter estimates*

	Statute Miles	Kilometers	Nautical Miles
Length	1,200	1,931	1,041
Width	115	185	100

The following table describes the total area of the property and also details how little of the property is actually terrestrial versus marine.

Table 1.4: *Area of lands and waters in Papahānaumokuākea Marine National Monument*

Area in question	Sq. Stat. Mi	Sq. Km	Acres	Hectares
Marine waters	139,792	362,061	89,467,228	36,206,099
Emergent land	5	14	3,459	1,400
Total Area	139,797	362,075	89,470,688	36,207,499

President George W. Bush signs Proclamation 8031 at the White House, joined by Mrs. Laura Bush and (left to right) Hawai'i congressional delegates U.S. Rep. Neil Abercrombie, U.S. Rep. Ed Case, U.S. Sen. Daniel Akaka; U.S. Commerce Secretary Carlos Gutierrez; Hawai'i Gov. Linda Lingle; filmmaker Jean-Michel Cousteau; oceanographer Dr. Sylvia Earle and U.S. Interior Secretary Dirk Kempthorne. White House photo by Eric Draper.

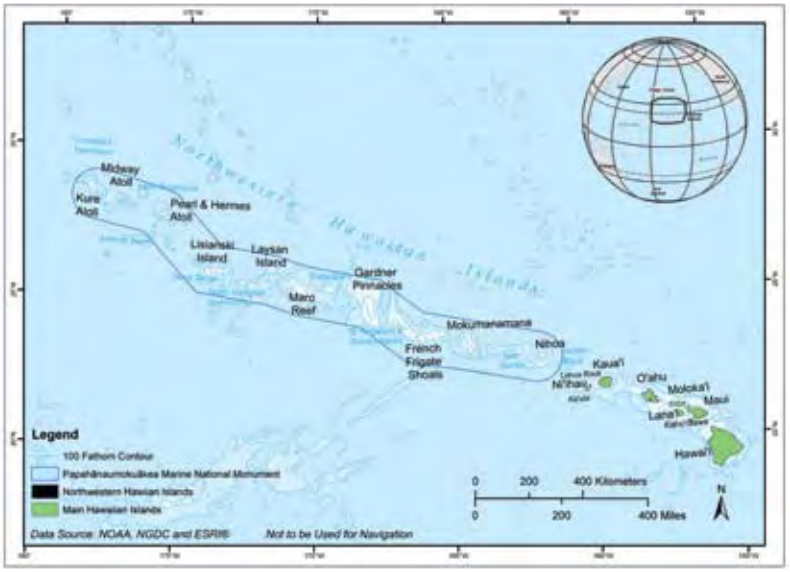
A HISTORIC MOMENT:
ESTABLISHING A MARINE NATIONAL MONUMENT

On June 15, 2006, President George W. Bush made conservation history when he signed Presidential Proclamation 8031 creating the largest fully protected marine conservation area on the planet in the Northwestern Hawaiian Islands. By applying the authority of the Antiquities Act, which gives the President discretion to declare objects or places of scientific or historic interest a national monument, he created the Northwestern Hawaiian Islands Marine National Monument.

A Historic Moment

"Our duty is to use the land and seas wisely, or sometimes not use them at all. Good stewardship of the environment is not just a personal responsibility, it is a public value," said the President in his proclamation speech explaining why it was necessary to close off such a large area for the sake of conservation.

The region is so vast that if laid atop the continental United States it would cover the approximate distance from Las Vegas, NV to Dallas, TX.



"To put this area in context, this national monument is more than 100 times larger than Yosemite National Park, larger than 46 of our 50 states, and more than seven times larger than all our national marine sanctuaries combined. This is a big deal."

~ President George W. Bush

Support for the protection and preservation of the Northwestern Hawaiian Islands was overwhelming, with more than 52,000 public comments submitted during the 5 years of the proposed national marine sanctuary designation process, the majority in favor of strong protection. This public sentiment was part of what inspired the President to issue the Proclamation.

By creating a marine national monument President Bush immediately granted the waters of the Northwestern Hawaiian Islands our nation's highest form of marine environmental protection. "The Northwestern Hawaiian Islands are a beautiful place," he said, "and with the designation of the Northwestern Hawaiian Islands Marine National Monument, we are making a choice that will leave a precious legacy."

Overview of the Proclamation

The President's proclamation creating the Northwestern Hawaiian Islands Marine National Monument has given nearly 140,000 square miles of land and ocean our nation's highest form of marine environmental protection. It honors our commitment to be good stewards of America's natural resources, shows what cooperative conservation can accomplish, and creates a new opportunity for ocean education and research for decades to come. The national monument will:

- Prohibit unauthorized access to the monument;
- Provide for carefully regulated educational and scientific activities;
- Preserve access for Native Hawaiian cultural activities;
- Enhance visitation in a special area around Midway Atoll;
- Phase out commercial fishing over a 5 year period; and
- Ban other types of resource extraction and dumping of waste.

Protection was effective immediately and includes requiring permits for access into the monument. Permits may be issued for activities related to research, education, conservation and management, Native Hawaiian practices, non-extractive special ocean uses, and recreation. Protections also include the prohibition of commercial and recreational harvest of precious coral, crustaceans and coral reef species in monument waters; the prohibition of oil, gas and mineral exploration and extraction anywhere in the monument; the prohibition of waste dumping; and the phase out of commercial fishing in monument waters over a 5-year period.

A Hawaiian Monk Seal, 'ilioholoikauaua, (Monachus schauinslandi) sleeps the day away at Pearl and Hermes Atoll. Photo: James Watt.

Lipspot Moray Eel weaving in limu (seaweed)
(Photo: Susan Middleton and David Liittschwager)

Introduction

Mālamalama ka lā nui a Kāne puka i Haʻehaʻe
ʻApakau ke kukuna i ka ʻili kai o nā kai ʻewalu
He ʻike makawalu kaʻu e ʻanoʻi nei,
ʻO nā au walu o Kanaloa Haunawela noho i ka moana nui
He Huʻakai ka makani o Lehua ʻau i ke kai
Kūʻonoʻono ka lua o Kūhaimoana i ke kapa ʻehukai o Kaʻula
ʻO Kū i ka loulu, ulu aʻe ke aloha no Nihoa moku manu
Manu o kū i ka ʻahui, he alakaʻi na ka lāhui
ʻO Hinapūkoʻa
ʻO Hinapuhalakoʻa
ʻO Hina kupukupu
ʻO Hinaikamalama
Hua ka ʻōhua, luʻu ke koholā
Aloha kahi limu kala, kiaʻi ʻia e ka ʻākala noho i uka
Hānau ka peʻa, paka ka peʻapeʻa i ke kai
He ʻīnaʻi ka ʻina, ʻono i ka huna o ka paʻakai
Manomano ka ʻike liʻu o ka houpo o Kanaloa
[illegible] ka lehulehu, ʻo kuʻu [illegible] ia
Hanohano wale ka ʻāina kūpuna, ʻo nā moku lēʻia
No Papahānaumokuākea lā he inoa

– Na Kainani Kahaunaele a me Halealoha

Native Hawaiian Culture and Papahānaumokuākea

Native Hawaiian Culture and Papahānaumokuākea

"You only know where you are on the ocean by memorizing where you came from."

– ***Nainoa Thompson,*** *Master Hawaiian Navigator*

Sailing to Papahānaumokuākea

The vast seascapes and tiny islands of Papahānaumokuākea, found uninhabited or abandoned at the time of Western contact in the 18th century, represent the outer limits of the story of Pacific voyaging and settlement—an epic migration that began more than 6,000 years ago, when groups of seafarers left the islands of Southeast Asia and voyaged east into the Pacific Ocean. By 1200 BC, their descendents had reached the islands of Tonga and Sāmoa in the mid-Pacific, now known as western Polynesia. Navigating using only natural signs and knowledge as they journeyed across vast expanses of open ocean, over the next two millennia these Pacific voyagers would explore and populate a 10-million-square-mile area of the Pacific bounded by the points of the Polynesian Triangle: Hawai'i in the north, tiny Rapa Nui (Easter Island) in the South, and the islands of Aotearoa (New Zealand) in the southwest. It was one of the greatest human migrations ever undertaken. Polynesia ("many islands") now comprises an area strongly related in culture, in landscapes and in seascapes, yet abounding in distinct cultural heritages uniquely adapted to the environment of each place.

Polynesian voyagers arrived in the isolated Hawaiian Archipelago around 300 AD. They found islands with fertile soils, abundant water, and reefs rich with marine life. In relative isolation from their ancestral origins, the Native Hawaiian culture evolved into a culture finely attuned to its immediate and unique natural surroundings. They created agricultural terraces along the hillsides; extensive water paddies for their staple food, *kalo* (taro), in the valleys; fishponds over the shallow reefs; and sustainable nearshore and pelagic fisheries management.

Where resources and land are obviously limited, as on an island, highly skilled resource management often evolves out of necessity. Native Hawaiians developed complex resource management systems and specialized skill sets to ensure that the fertile soils and rich reef and pelagic environments they found could be sustained for future generations. Traditional, sustainable practices, such as the Hawaiian system of *ahupua'a* (land divisions inclusive of the deep sea through mountain peaks), utilized seasonal patterns in weather and their effects on species abundance and distribution, ecological zonation, and land-sea connectivity to manage resources effectively. The foundation of this culture was a nuanced awareness of, and responsive intimacy with, the patterns and processes of their specific natural environment.

Native Hawaiians explored and settled the archipelago, inhabiting the main Hawaiian Islands and venturing into the region to the northwest, now known as Papahānaumokuākea. This chain of far-flung islands and atolls, and the waters surrounding them, continue to be respected as a sacred zone, a place containing the boundary between Ao, the world of light and

the living, and Pō, the world of the gods and spirits, of primordial darkness, from which all life comes and to which it returns after death.

Papahānaumokuākea is as much a spiritual as a physical geography, rooted deep in Native Hawaiian creation and settlement stories. Many oral traditions say that Native Hawaiians are genealogically related not only to the living creatures that make up the land and ocean ecosystems, but to the islands and atolls themselves. In relatively recent times, the islands of Papahānaumokuākea have become known as the Kūpuna (Revered Elders or Ancestors) Islands, in part because they are geologically older than the main Hawaiian Islands, and because, according to Hawaiian oral tradition, these islands themselves are ancestors to Native Hawaiians. Thus, Hawaiians not only look to their Kūpuna Islands for *ʻike* (knowledge), but they also have a deeply embedded *kuleana* (privilege and responsibility) to care for their *kūpuna*. Each island is a teacher; each island has its own, unique message to impart.

Where Nature and Culture Are One

The most famous Hawaiian creation chant, the Kumulipo, tells of the birth of the world from the darkness of Pō, beginning with the simplest known form of life, the coral polyp, and progressing to the more complex forms (see Appendix B for more text from the Kumulipo). As time passes, life begins to be created in sibling pairs, a land creature or plant for every sea creature or plant. These twins almost always share similar names; they are often also linked in real-life cycles, with one blooming on land as the other becomes fertile or abundant in the sea.

O ke au i kāhuli wela ka honua	At the time when the earth became hot
O ke au i kahuli lole ka lani	At the time when the heavens turned about
O ke au i Kūkaʻiaka ka lā	At the time when the sun was darkened
E hoʻomālamalama i ka mālama	To cause the moon to shine
O ke au o Makaliʻi ka pō	The time of the rise of the Pleiades
O ka walewale hoʻokumu honua ʻia	The slime, this was the source of the earth
O ke kumu o ka lipo, i lipo ai	The source of the darkness that made darkness
O ke kumu o ka Pō, i pō ai	The source of the Pō that made night
O ka lipolipo, o ka lipolipo	The intense darkness, the deep darkness
O ka lipo o ka lā, o ka lipo o ka pō	Darkness of the sun, darkness of the night
Pō wale ho-ʻi	Nothing but night
Hānau ka pō	The night gave birth

– From the beginning of the Kumulipo: A Hawaiian Creation Chant

Hānau ka Manauea noho i kai	Born was the *Manauea* moss living in the sea
Kiaʻi ʻia e ke Kalo-manauea noho i uka	Guarded by the *Manauea* taro plant living on land
He pō uheʻe i ka wāwā…	Darkness slips into light...
Hānau ka Puakī noho i kai	Born was the *Puakī* seaweed living in the sea
Kiaʻi ʻia e ka Lauaki noho i uka	Guarded by the *ʻAki ʻaki* rush living on land
He pō uheʻe i ka wāwā…	Darkness slips into light

The intense observation of the complex kinship of all things in the natural world, on which Hawaiians depend for their physical sustenance and voyaging prowess, is also coded into the Hawaiian creation story. The strong interweaving of these natural elements are the roots of the Hawaiian culture, language and spiritual understanding.

Papahānaumokuākea is an expansive Hawaiian natural and cultural seascape, encompassing both land and sea, in which these relationships are vibrant and largely unfettered by human development. It is an immense associative cultural seascape – a Hawaiian place where man is, as in the Kumulipo, the little brother of the land and sea. And it is a place where Hawaiians can go to immerse themselves in this foundational understanding, ensuring the continuity of the generational bond and commitment to this sacred place.

Today, Papahānaumokuākea's pristine habitats are valued in part because they are a baseline for what a marine environment would look like without human exploitation. For Native Hawaiians, Papahānaumokuākea is a baseline for the culture. Nihoa and Mokumanamana, the two islands closest to the main Hawaiian Islands, possess intact archaeological sites that illuminate shared Polynesian origins and distinctive adaptations to the archipelago; it is also a last remaining "place of abundance" for oceanic apex predators and migratory birds, where a uniquely Hawaiian natural world continues in its entirety.

Biologists speak of Papahānaumokuākea's ecosystem, dominated by apex predators, as a rare benchmark for an intact marine system. Native Hawaiians experience this as a natural environment that hews to ancestral behaviors, rhythms, and proportions, where the ecological and spiritual links have not been frayed or broken. Native Hawaiians who have been to Papahānaumokuākea note that *ulua*, or hunting jackfish, behave more boldly in Papahānaumokuākea than they do in the main Hawaiian Islands. Along with sharks, they own the waters. They attack birds sitting on – and flying immediately above – the water, and will look swimmers directly in the eye in the form of a challenge to one's ability in, and responsibility to, those waters.

These and other natural encounters can often be considered *hōʻailona*, natural signs communicated by ancestors and gods who manifest themselves in nature. These signs occur most clearly in a place like Papahānaumokuākea, where nature has not been subjugated. Atmospheric activities, too, such as rainbows, rain, wind and cloud formations, can express either godly or ancestral approval of proposed actions in this sacred place or provide warning. (When a group of Native Hawaiian cultural practitioners voyaged from Kauaʻi in the main Hawaiian Islands to Mokumanamana—an island of paramount spiritual importance—in Papahānaumokuākea for the summer solstice in 2007, they reported having seen clouds in very unusual formations: "They appear

almost human in form and resemble people walking toward the Northwest. These cloud formations are all signs that help the expedition members prepare mentally, physically and spiritually for the journey. (Tsuha 2007).

Today, we praise Papahānaumokuākea's high rates of marine endemism in a world where ecological diversity is imperiled. For Native Hawaiians, each endemic species occupies an induplicable place in the spiritual as well as physical universe. It is not only a member of the family of nature, but a path to meaning and understanding. When a species is lost, that understanding is lost forever.

Native Hawaiian resource management, which relies heavily on the interconnectedness of land and sea (and is reflected in spiritual and artistic works such as the Kumulipo) informs the current management of the Papahānaumokuākea Marine National Monument. Across the globe, very few natural sites, however well protected, blend the management of terrestrial, marine, and cultural resources in this way. In an age that realizes that our planet is small and our resources finite, Native Hawaiian cultural knowledge, as seen through the current management of Papahānaumokuākea, can provide a fine example. The dualistic pairing of land and sea organisms in the Kumulipo maintains "the theme of survival, urgency for life and preservation of the species with procreation and evolution as the sinew…. The dichotomy of land-ocean pairing strengthened the notation for procreation and survival of the species" (Kanahele, 1997).

The Native Hawaiian relationship to Papahānaumokuākea has evolved along with the living Hawaiian culture, but Papahānaumokuākea continues to be considered a sacred region, and its people have maintained a vital connection with it. William Ailā, a member of the Papahānaumokuākea Native Hawaiian Cultural Working Group, says, "Access to the Northwestern Hawaiian Islands allows Hawaiians to make connections with the land, the ocean, the fish, the sharks, the monk seals – and the spirits and our ancestors that are still there. The Monument region is not strictly a scientific laboratory; it's a place that has its own life force."

Navigating Into the Future

Ancient Polynesians navigated by the art of wayfinding, using natural observations often missed by modern sailors, such as the stars, ocean swells, clouds, sun, seabirds and reflections in the sky of distant, aquamarine waters in atolls. Today, after 600 years without traditional inter-archipelagic voyaging, there is a Pacific-wide resurgence of the ancient art and skill of wayfinding (non-instrument navigation), spurred by the journeys of *Hōkūleʻa*, an 18-meter, double-hulled sailing canoe built in Hawaiʻi to test the voyaging capabilities of such canoes and their navigators.

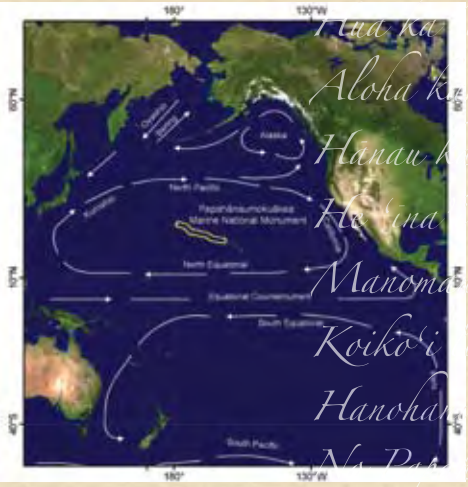
As in generations past, the contemporary apprentice Hawaiian wayfinder's first open-ocean training ground takes them from the main Hawaiian Islands into Papahānaumokuākea, the Kūpuna Islands. A Native Hawaiian saying, "*Nānā i ke kumu*," means "Look to the source." It contains a subtle double meaning: while *kumu* means source, it also means teacher. This saying offers insight into the important role that *kūpuna*, who are also teachers, play in traditional Hawaiian society. Hawaiians are exhorted to turn to their *kūpuna* for knowledge, and to in turn respect and care for those *kūpuna*, as we must all learn from Papahānaumokuākea and respect and care for this unique place.

Papahānaumokuākea is a truly mixed site, where not only nature and culture are one, but where two seemingly opposite ways of thinking—spiritual and scientific, indigenous and western—can learn to coexist, to find common cause, to witness and care for the earth, and to navigate into the future.

Calf Cowry or leho
(Photo: Susan Middleton & David Liittschwager)

2.

Malamalama ka lā nui a Kāne puka i Hāʻeuʻe
Apakau ke kukuna i ka ʻili kai o nā kai ʻewalu
He ʻike makawalu kaʻu e ʻanoʻi nei,
ʻO nā au walu o Kanaloa Haunawela noho i ka moana nui
He Huʻakai ka makani o Lehua ʻau i ke kai
Kūʻonoʻono ka lua o Kuhaimoana i ke kapa ʻehukai o Kaʻula
ʻO Kū i ka loulu, ulu aʻe ke aloha no Nihoa moku manu
Manu o kū i ka ʻahui, he alakaʻi na ka lahui
ʻO Hinapukoʻa
ʻO Hinapuhalakoʻa
ʻO Hina kupukupu
ʻO Hinaikamalama
Puna ka [illegible]ehua, luʻu ke koholā
Aloha kahi limu kala, kiaʻi ʻia e ka ʻākalu [illegible] uka
Hānau kā peʻa, puka ka peʻapeʻa i ke kai
He ʻina [illegible] ka ʻina, ʻono i ka huna o ka paʻakai
Manomano ka ʻike liʻu o ka houpō o Kanaloa
Koikoʻi [illegible] o kaʻu lahi ia
Hanohano [illegible] ʻaina kupuna, o nā moku leʻia
Na Pua [illegible] laʻe inoa
Na Kaunani Kahaunaele a me Halealoha



Description and History of Property

2. Description and History of the Property

2.a Description of the Property

Introduction

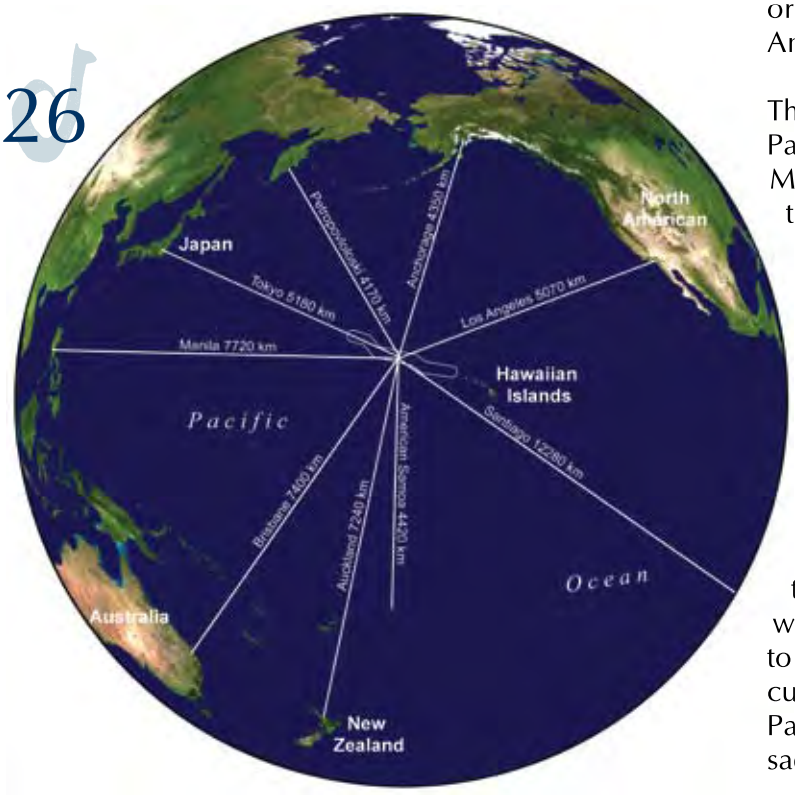
As one of the world's largest protected marine areas, Papahānaumokuākea Marine National Monument includes a vast area of the Pacific. Extending for a distance of roughly 1,930 kilometers by 185 kilometers, the property covers an area of approximately 362,075 square kilometers (140,000 square miles) (see Section 1 for maps of the property.) At both the regional and global levels, Papahānaumokuākea is a rich natural and cultural reserve of outstanding spiritual, scientific, conservation and aesthetic value. As a nomination for a mixed natural-cultural World Heritage site, this section addresses the property's natural and cultural aspects in turn.

Threatened Green Turtles basking on East Island, French Frigate Shoals (Photo: George Balazs)

Papahānaumokuākea Marine National Monument is located between approximately 22° N and 30° N latitude and 161° W and 180° W longitude within the north central Pacific Ocean. When overlain on the continental United States, this property would cover the distance from Washington, D.C. to the midwest, or within Europe, the distance from Amsterdam to Moscow.

The islands and atolls of Papahānaumokuākea Marine National Monument constitute the northwestern three quarters of the one of the world's longest and most remote island chains. This expansive stretch of islands is referred to as the Northwestern Hawaiian Islands (NWHI), in past decades as the Leeward or Kūpuna Islands (Islands of the Revered Elders or Ancestors), and now as Papahānaumokuākea (see box). The area has played and continues to play a significant role in the culture and traditions of Native Hawaiians. From the time of the first Polynesian voyagers who peopled the Hawaiian Archipelago to the present renaissance of Hawaiian culture, Native Hawaiians have considered Papahānaumokuākea a profoundly sacred place.

Significant archaeological sites, strong oral traditions, and the living culture's continuing



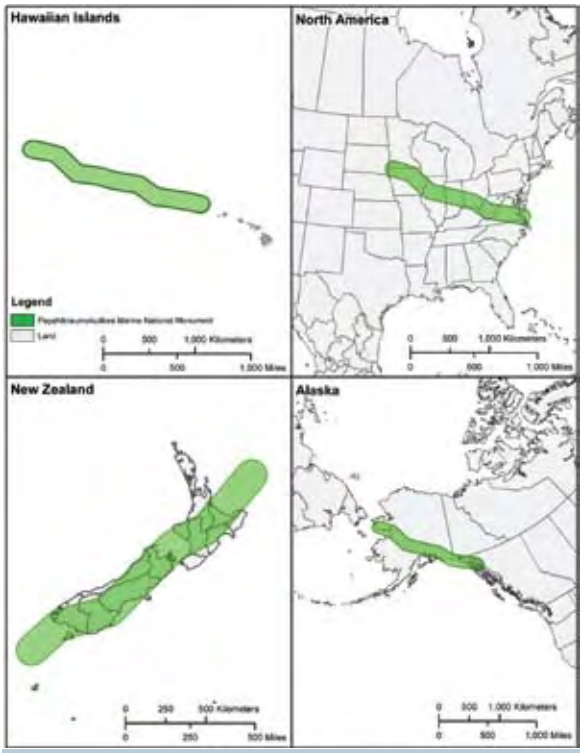
Papahānaumokuākea Marine National Monument's distance from major metropolitan areas

association with the region confirm a deep relationship between the Hawaiian people and Papahānaumokuākea. Today, the region's exceptional natural integrity is fundamental to the perpetuation of the Hawaiian culture; Papahānaumokuākea is known as one of the last "places of abundance," where Native Hawaiians can interact with and experience an intact and abundant natural world similar to the world of their ancestors. All archipelagic wildlife are regarded as ancestors to Native Hawaiians (Malo 1951); the region itself is revered as the place from where spirits come and to which they return after death. The geological and natural life forms defined in this section are inhabitants of the NWHI and referred to in the Kumulipo, a genealogical *oli* (chant) that frames the evolution of life from the simplest of creatures to the most complex. In the Native Hawaiian worldview, the interface between natural and cultural resources is seamless. Hence, Papahānaumokuākea is a longstanding site of outstanding associative value to the living Hawaiian culture, and ultimately the global community.

Hānau Moku – The Birth of the Islands

Birth—creation—is a central pillar of traditional cultures across the globe. In Native Hawaiian culture, human life comes not only from two biological parents, but from a complex spiritual and literal genealogy that ties humans with a bond of kinship to everything else, both living and non-living, in the natural world. Pō, the primordial female darkness from which all life springs and to which it returns after death, is seen as giving birth to the world, its natural components, all of the Hawaiian gods, and humans. The union of her progeny, Kumulipo and Pō'ele, gives rise to all the creatures of the world, beginning in the oceans with the coral polyp—a genealogy that, like current theories of evolution, starts with the simplest known life form and moves to the more complex.

Native Hawaiians view the rising of magma from deep within the earth as the birthing of the islands—the physical manifestation of the union between the earth mother,



Papahānaumokuākea Marine National Monument superimposed over other land masses

Papahānaumoku (literally, "goddess who gives birth to the islands"), and the sky father, Wākea. The symbolism of this union is also the foundation for the name of the property: Papahānaumokuākea.

In the Native Hawaiian culture, *kūpuna* (elders, or ancestors) are accorded reverence and respect, and are looked to as teachers by right of their greater experience. Native Hawaiians consider the islands of Papahānaumokuākea (also called the Kūpuna Islands in recent times) to be their *kūpuna*. Each island is a teacher, and each island has its own unique story and message. As the younger generation, humans are tasked to *mālama* (care for) the *kūpuna*. It is also humankind's *kuleana* (responsibility) to take the time to listen to their wisdom.

The following box describes how the property received its name. Native Hawaiian practitioners undertook a deliberative and thoughtful process to give the region a name reflective of both its natural and cultural heritage, as well as its future as a vast and sacred protected place.

The Naming of Papahānaumokuākea

Native Hawaiian artist Solomon Enos renders deities Papa and Wakea's creation of the Hawaiian Islands
http://www.solomonenosgallery.com/

For Native Hawaiians, place names are an important way to preserve information about an area's geology, its history, natural and supernatural phenomenon specific to it, or its uses by gods and men. As a place changes over time, so may its name. Historically, Native Hawaiians referred to the Northwestern Hawaiian Islands as Nā Moku Manamana (Branching Islands), Nā Moku Papapa (Flat Islands) and nā papa kahakukea o Lono (the low white-marked isles of Lono (one of the four principal Hawaiian gods)) (Kepā Maly 2 November 2008, personal communication; Fornander 1918). In recent times, Native Hawaiians have called the isles of this region the Kūpuna (Revered Elder) Islands.

The name Papahānaumokuākea was given to the region by a group of Native Hawaiian cultural practitioners and *kūpuna* when the area was designated as a federal monument. The name specifically relates to one of the stories contained within the Kumulipo: the *mo'olelo* which tells the story of Papahānaumoku (a mother figure who is personified in the earth) and Wākea (a father figure who is personified in the expansive sky). These two figures, either together or separately, are responsible for the creation or birthing of the entire archipelago, and they are the most recognized ancestors of the Native Hawaiian people (Beckwith 1951, Malo 1951, Fornander 1918). The name Papahānaumokuākea is reflective of the region's natural and cultural heritage and its future as a vast, sacred, protected and procreative place.

The preservation of these names, together, as Papahānaumokuākea, strengthens Hawai'i's cultural foundation and grounds Hawaiians to an important part of their historical past. Taken apart, "Papa" (earth mother), "hānau" (birth), "moku" (small island or land division), and "ākea" (wide) bespeak a fertile woman giving birth to a wide stretch of islands beneath a benevolent sky, the dramatic imagery of which is on full display in the region.

Papahānaumokuākea describes a hope for regeneration, which Hawaiians hope to see not only in their Kūpuna Islands, but in the main Hawaiian Islands and their culture as well. Papahānaumokuākea is a name that will encourage abundance and energize the continued procreative forces of earth, sea and sky. It reminds everyone that spiritual inspiration supports the physical world. Papahānaumokuākea will help to continue life for everything that procreates and gives birth; it is a continuum and everything that is part and parcel of Native Hawaiians' home world, the Hawaiian Archipelago.

Dr. Pualani Kanahele at the podium during the cultural bestowing of the NWHI's new placename, Papahānaumokuākea (Photo: PMNM)

Natural Processes and Systems in Papahānaumokuākea

Geology

Beginning 250 kilometers northwest of the main Hawaiian Island of Ni'ihau, the ten islands and atolls of this Pacific chain extend for 1,931 kilometers. None of the included islands is more than five square kilometers in size, and all but four have an average mean height less than ten meters above sea level. As a group, these islands represent a classic geomorphological sequence, consisting of highly eroded high islands, near-atolls with volcanic pinnacles jutting from surrounding lagoons, true ring-shaped atolls with roughly circular rims and central lagoons, and secondarily raised atolls, one of which has an interior hypersaline lake. In addition, more than 30 submerged ancillary banks and seamounts have been discovered around these islands.

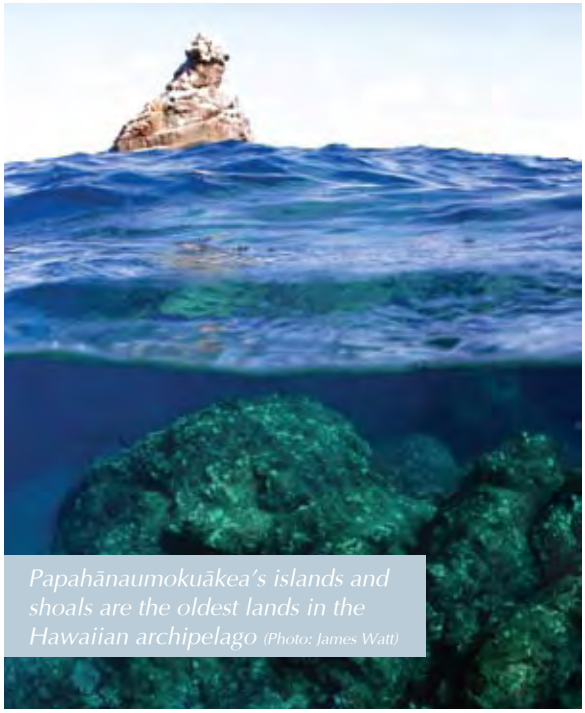
Hawaiian - Emperor Seamount Chain

The geological progression along the Hawaiian Ridge continues northwestward beyond the last emergent island, Kure Atoll, as a chain of submerged platforms that makes a sudden northward bend to become the Emperor Seamounts, which extend across the entire North Pacific to the base of the Kamchatka Peninsula in Russia. This unbroken chain of progressively more senescent volcanic structures essentially tracks the movement of the Pacific tectonic plate over the past 80 million years, and has provided some of soundest evidence upon which current theories of hotspot-mediated island formation and global plate tectonic movements have been based.

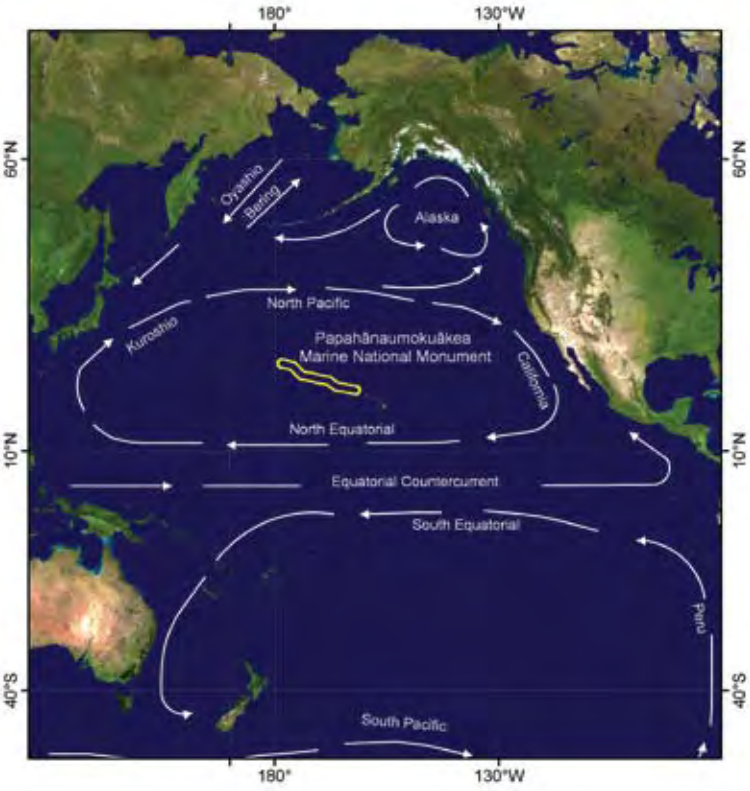
Formed millions of years ago, these islands were created by a deep-sea volcanic "hotspot" now located south of the island of Hawai'i, which formed a sequential series of underwater shield volcanoes that became islands as they rose above the ocean's surface. These once-lofty islands have been transported northwest by the movements of the Pacific Plate to their current locations (Dalrymple et al. 1974). Due to the pervasive and unrelenting forces of subsidence and erosion, all that remains today are small patches of ancient land, shoals and reefs that lie where significant mountains once loomed. Nowhere else in the world is this progression illustrated in such an unambiguous and linear fashion. Papahānaumokuākea also includes a unique example of an atoll at the critical "Darwin Point," the northernmost threshold for coral reef existence. Kure Atoll is the northernmost coral reef in the world, and has reached the latitude at which coral growth rates, which decrease in cooler temperatures, are matched by the rate of subsidence of the island.

Oceanography

Among the dominant natural controls over the ecosystems of Papahānaumokuākea Marine National Monument are climatic and oceanographic forces. The area lies at the northern edge of the oligotrophic tropical Pacific, near the 18 °C sea surface isotherm, a major ecological transition zone in the northern Pacific. This boundary, also known as the "Transition Zone Chlorophyll Front," varies in position both seasonally and annually, and periodically moves across the property boundary surrounding the northern atolls of Kure and Midway. This, in turn, influences overall ocean productivity, and the resultant recruitment success of many species such as Hawaiian Monk Seals and ocean-feeding seabirds (Polovina et al. 2008; Baker, Polovina and Howell 2007). The northernmost atolls are also in a position where they are occasionally affected by an episodic eastward extension of the Western Pacific warm pool, which can lead to higher summer ocean temperatures at Kure than are found in the more "tropical" waters of the main Hawaiian Islands further to the south. This can cause greater temperature fluxes that can in turn influence the home ranges and diversity of many species. This interplay of oceanography and climate is not fully understood, but adds a level of dynamics not seen in most other tropical atoll ecosystems and is a useful natural laboratory for understanding phenomena such as periodic coral bleaching and the effects of the Pacific Decadal Oscillation, El Niño and La Niña ocean circulation patterns.



Papahānaumokuākea's islands and shoals are the oldest lands in the Hawaiian archipelago (Photo: James Watt)



Major circulation patterns of the Pacific Ocean

Ocean currents, waves, temperature, nutrients, and other oceanographic parameters and conditions influence ecosystem composition, structure, and function in Papahānaumokuākea on both temporal and spatial scales. Spatial variability in oceanographic conditions ranges from a localized temperature regime that may affect a small portion of a reef to a temperature regime that influences Papahānaumokuākea as a whole. Temporal variability in ocean conditions may range from hourly and daily changes to seasonal, annual, or decadal cycles in nutrient inputs, sea level heights, current patterns, and other large-scale

Papahānaumokuākea encompasses intact reef and pelagic ecosystems (Photo: PMNM)

oceanographic processes (Polovina et al. 1994). Currents play an important role in the dispersal and recruitment of marine life in Papahānaumokuākea on both scales.

Surface currents in the NWHI are highly variable in both speed and direction (Firing and Brainard 2006), with long-term average surface flow being from east to west in response to the prevailing northeast trade wind conditions. The direction of surface water flow also accounts for certain unusual biogeographic relationships between Papahānaumokuākea and other allochthonous areas, such as Johnston Atoll to the south (Grigg 1981), as well as patterns of endemism, population structure, and density of reef fish within the archipelago itself (DeMartini and Friedlander 2006) (Figure 2.1). The highly variable nature of the surface currents is due in large part to eddies created by local island effects on large-scale circulation. The distribution of corals and other shallow-water organisms is also influenced by exposure to ocean waves. The size and strength of ocean wave events have annual, interannual, and decadal time scales. Annual extratropical storms (storms that originate outside of tropical latitudes) create high waves during the winter, greatly affecting marine and terrestrial areas, as the elevation of a large portion of terrestrial habitat is less than the height of some of the waves that pass through.

Tinker's Butterflyfish (Chaetodon tinkeri) is found at Johnston Atoll and in the Hawaiian Islands; illustrating the oceanographic and biodiversity links between the two regions. (Photo: L.A. Rocha, HIMB)

Natural Habitats

Papahānaumokuākea also supports a diverse and unique array of both marine and terrestrial flora and fauna. With a spectrum of elevations ranging from abyssal ocean basins at depths of more than 4,600 meters below sea level to rugged hill slopes and cliff tops on Nihoa and Mokumanamana at elevations up to 275 meters above sea level, the property represents a complete holistic cross section of a Pacific archipelagic ecosystem. Habitats encompassed within the property include deep pelagic basins, submarine escarpments, deep and shallow coral reefs, shallow lagoons, littoral shores, dunes, and dry grasslands and shrublands. Twenty-five percent of the nearly 7,000 known marine species found in the region are found nowhere else on earth, and a significant number of the terrestrial plants, birds and insects are endemic. Papahānaumokuākea also provides habitat for 23 plant and animal species formally listed under the Endangered Species Act (ESA) as threatened and endangered. Papahānaumokuākea's isolation from continental land masses and minimal human footprint allow the study of natural habitats and ecosystem dynamics, including the response to climatic variability and global climate change, in a relatively undisturbed setting. The protective measures in place contain the necessary elements to support the key ecological processes that are essential for the long-term conservation of the ecosystems and the biological diversity they contain throughout Papahānaumokuākea.

The terrestrial and marine habitats of the Northwestern Hawaiian Islands are integrally linked, particularly on the atolls. It is through the synergistic process of terrestrial erosion and coral growth that atolls are formed. The islands of an atoll are a part of the reef. Shallow-water habitats range from exposed boulders and large underwater banks formed from the basaltic remnants of former high islands at Nihoa, Mokumanamana and Gardner Pinnacles, to the extensive coral reef habitats in the protected lagoons of the atolls. The shallow-water habitat includes intricate and reticulated reefs that form a complex network of reef crest, back reef, patch reef, and lagoons with high coral cover. Outer reef habitat is exposed to much higher wave energy and includes fore-reef and reef slope environments with spur and groove channels and varying percentages of coral cover directly related to wave exposure.

The total land area of the NWHI is extremely small at 1,400 hectares, but crucially important for the survival of both marine and terrestrial species, many that spend part or most of the year at sea and come ashore to breed, nest or pup such as turtles, seabirds and monk seals. All the low islands are mostly arid with no fresh water resources, except during seasonal rains. Nihoa, Mokumanamana and Laysan have small fresh water seeps. Only the higher and larger islands of Nihoa, Laysan, Lisianski, and Midway support year-round vegetation; many of the smaller and lower islands are periodically overwashed by seawater.

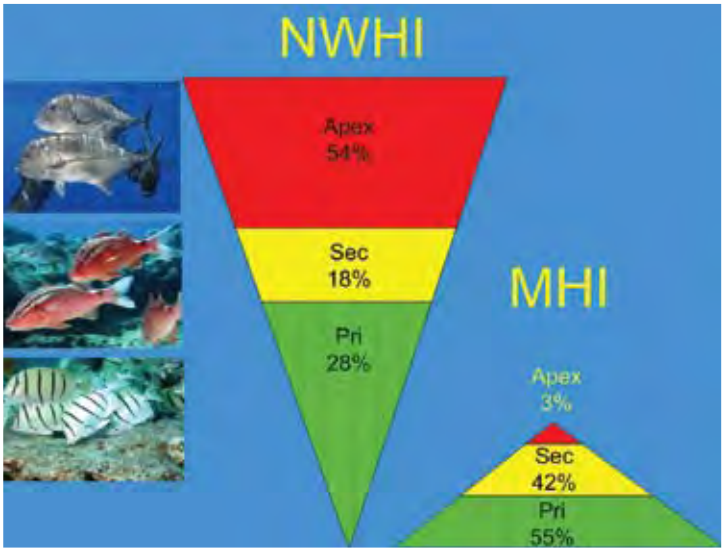


Figure 2.1a: *Biomass comparisons between the Northwestern Hawaiian Islands (NWHI) and the main Hawaiian Islands (MHI) by trophic group. (Apex = apex predators, Sec = secondary consumers, Pri = primary consumers)*
(Photo: James Watt, Figure: Alan Friedlander)

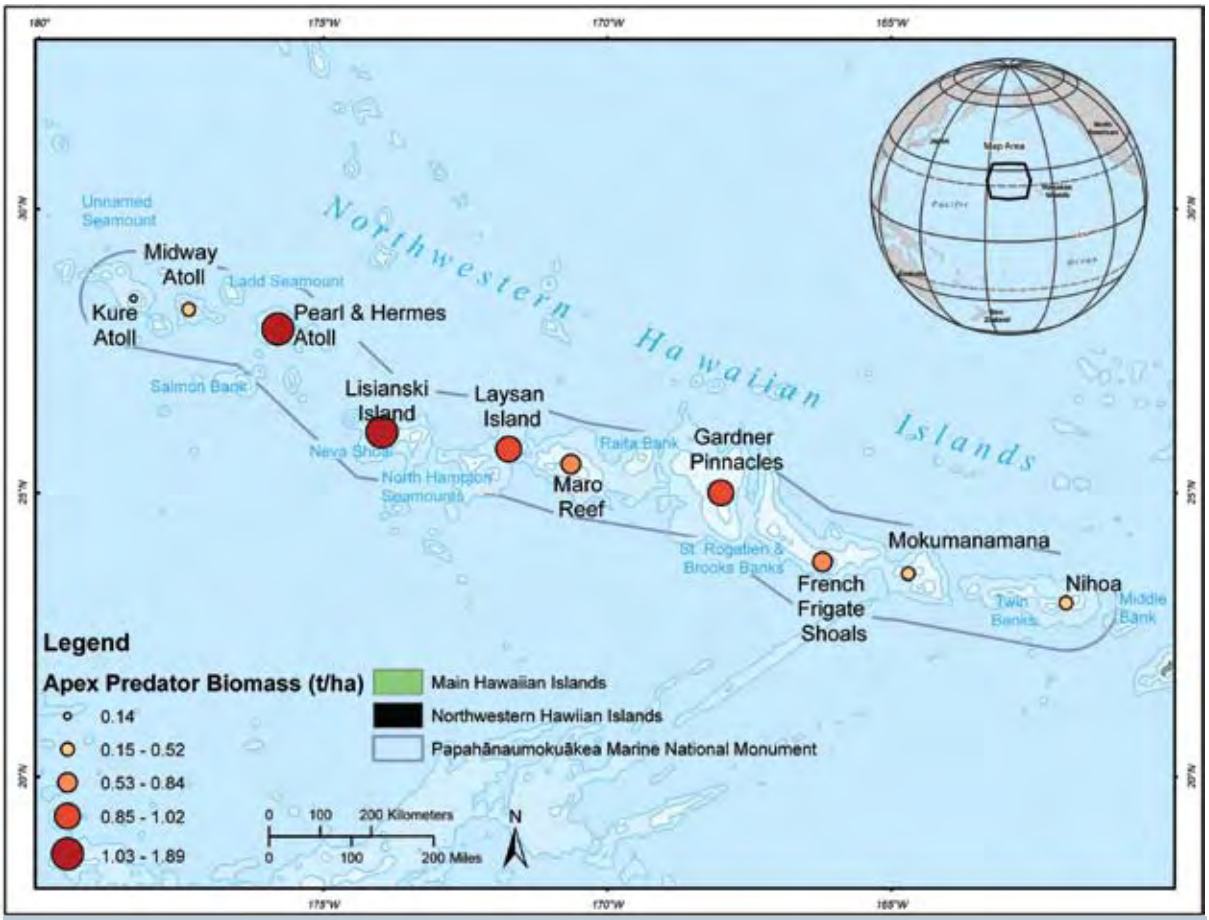


Figure 2.1b: *Geographic pattern of apex predator biomass density (tons/ha) in the NWHI (data from surveys conducted 2000-2002).*

Top Predator Dominated Ecosystem

The shallow marine component of the property is nearly pristine, and has been described as a "top predator dominated ecosystem," an increasingly rare phenomenon in the world's oceans (Friedlander and DeMartini 2002). Recent research suggests that the global oceans have lost more than 90% of large predatory fishes (Meyers and Worm 2003). Large, predatory fish such as sharks, Giant Trevally, and groupers that are heavily depleted by fishing and therefore rarely seen in populated areas of the world are extremely abundant in the waters of Papahānaumokuākea. With low fishing pressure and physical isolation from human impacts, the average biomass of fish in Papahānaumokuākea is three times greater than in the main Hawaiian Islands. More than 54% of the total biomass consists of apex predators such as large jacks or trevally, sharks and other species (Figures 2.1a and 2.1b).

Marine Endemism

Papahānaumokuākea is characterized by a high degree of endemism in reef fish species, particularly at the northern end of the chain, with endemics comprising over 50% of the population in terms of numerical abundance (DeMartini and Friedlander 2004) (Figure 2.2). Endemism of corals is also high, with 30% of species being found only in the Hawaiian Archipelago. These endemics also account for 37%–53% of visible stony corals found in Papahānaumokuākea in all shallow reef areas surveyed (Friedlander et al. 2005). Fifteen of the 17 endemic species are in the genera Montipora, Porites, or Pocillopora. Due to Papahānaumokuākea's remoteness, studies of small benthic or cryptic species are sparse, but with the inception of National Monument status, there have been increased efforts to document these groups. Preliminary faunal inventories indicate that many constituent species remain undocumented, and even new coral species are still being discovered

Endemic Sea Life

This tailored attunement of species to a specific place is called endemism. No other coral reefs of similar size and expanse on the planet have a higher rate of endemism than Hawaii's.

Saddle Wrasse
hīnālea lauwili,
Thalassoma duperreyi

Chocolate Chip Sea Cucumber
loli, *Holothuria* sp.

Hawaiian Monk Seal
ʻĪlioholoikauaua,
Monachus schauinslandi

Bandit Angelfish
Apolemichthys arcuatus

The downside of Hawaii's endemism is that there is no replacement pool should our corals and marine life perish. This vulnerability underscores one of nature's hard-won lessons: that the rarest of creatures are sometimes the most valuable.

Masked Angelfish
(female above, male below)
Genicanthus personatus

Banded Spiny Lobster
ula, ula poni, ula hiwa,
Panulirus marginatus

Species photos © David Littschwager and Susan Middleton

Papahānaumokuākea contains countless endemics, and is home to many rare, threatened and endangered species, including 22 IUCN Red-Listed species, many for whom it is the last or only refuge anywhere on earth.

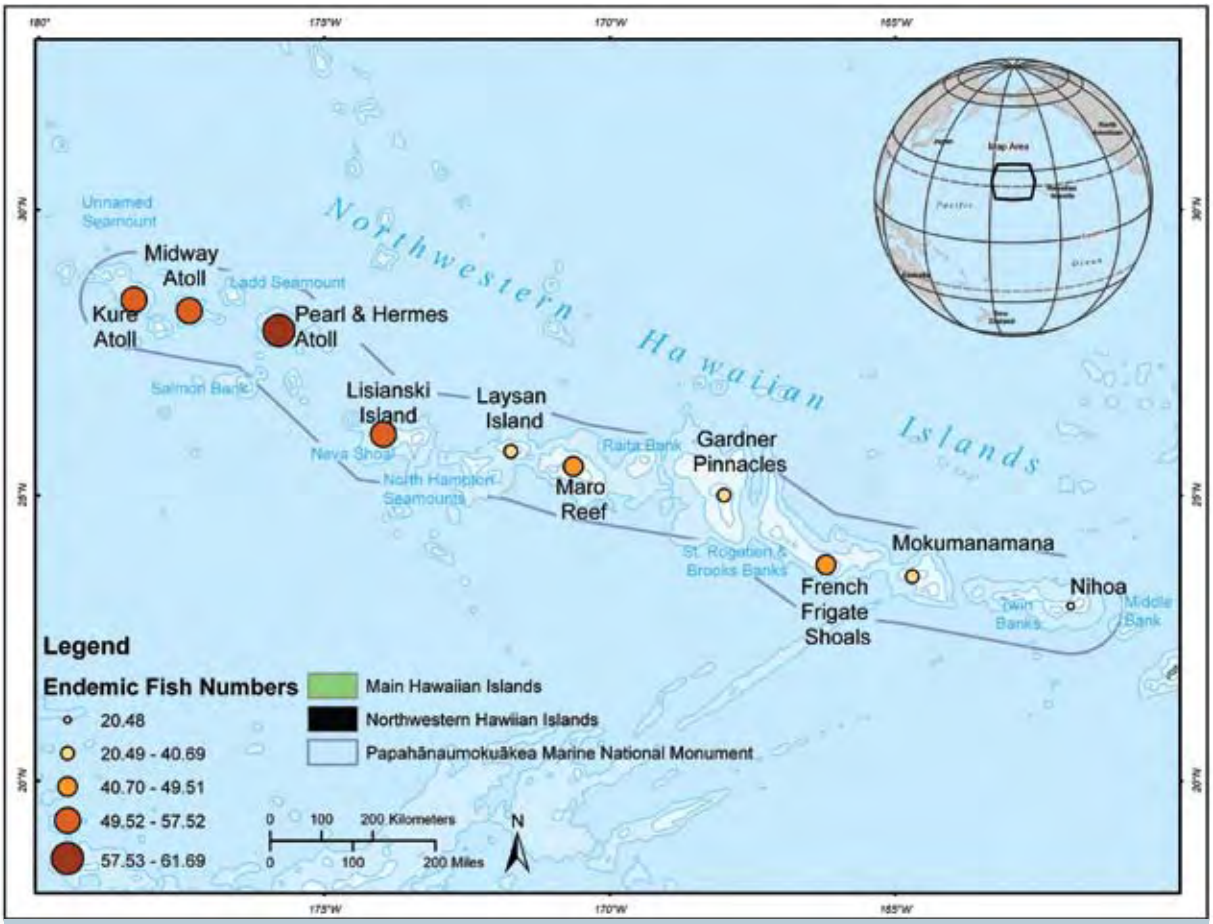


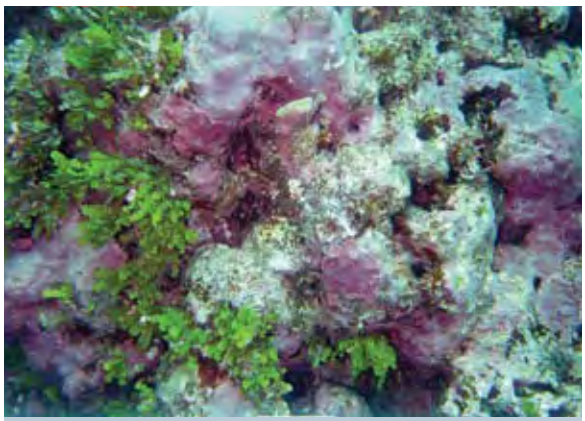
Figure 2.2: *Percent fish endemism at each of ten emergent Papahānaumokuākea reefs (data from surveys conducted 2000–2002)*

(Waddell and Clarke 2008). Given this, it is expected that the marine species lists of Papahānaumokuākea will continue to expand as improving funding, technology and research tools allow exploration and documentation of the region's reefs.

Marine and Bird Life in Papahānaumokuākea

Algae

The marine algal flora in Papahānaumokuākea are diverse and abundant, although community dynamics are poorly understood. There are 353 species of macroalgae and two seagrass species known in Papahānaumokuākea (McDermid and Abbott 2006). Large numbers of Indo-Pacific algal species have been documented here that are not present in the main Hawaiian Islands, such as the green calcareous alga (*Halimeda velasquezii*). The species composition of the macroalgae community is relatively similar throughout Papahānaumokuākea, with representatives of the Chlorophyta, Rhodophyta, Phaeophyta, branched coralline, crustose coralline, Cyanophyta, and turf algae occurring in varying combinations, with green algae having the largest biomass and area coverage (Vroom and Page 2006). Green algae in the genus Halimeda, which contributes greatly to sand formation, was found in more than 70%



Healthy native algal species abound in Papahānaumokuākea (Photo: Amy Baco-Taylor)

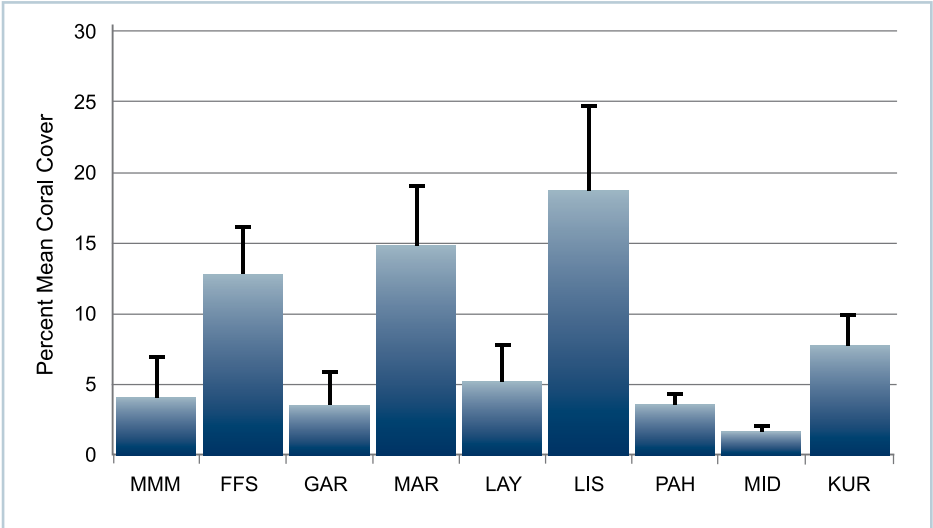


Figure 2.3: *Mean coral cover (+/- SE) by site, within Papahānaumokuākea. Data are derived from PIFSC–CRED towed diver surveys in 2003*

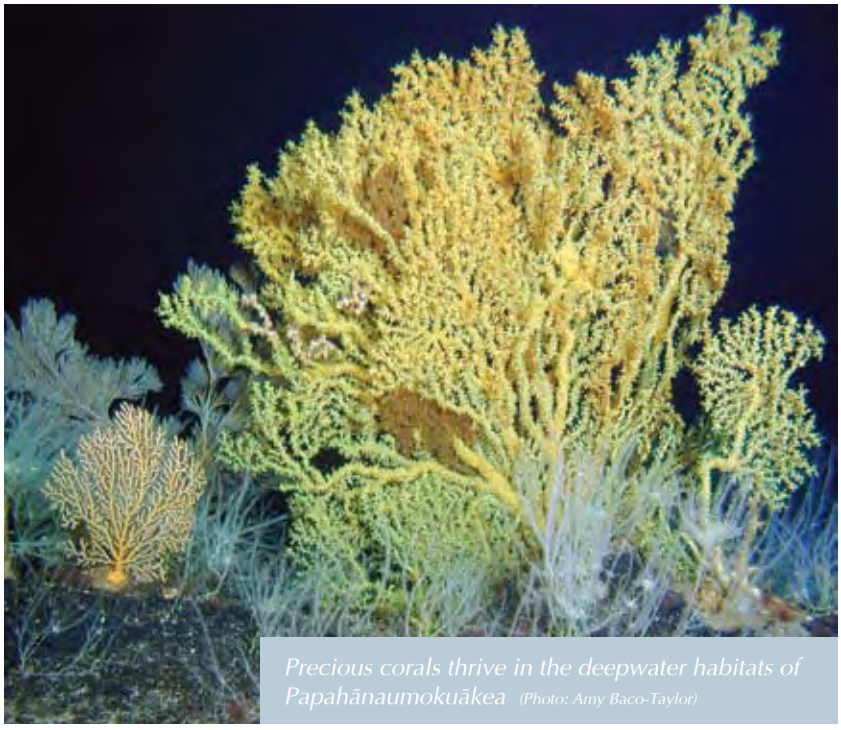
of all quadrates during area-wide surveys in 2004 (Vroom and Page 2006). An island-specific checklist of the nonvascular plants of Papahānaumokuākea can be found in Eldredge (2002). In contrast to the main Hawaiian Islands, where alien species and invasive algae have overgrown many coral reefs, the reefs of Papahānaumokuākea are largely free of alien algae, and high natural herbivory results in natural algal assemblages.

Corals

Fifty-seven species of stony corals are known in the shallow subtropical waters (depths of less than 33 meters) of Papahānaumokuākea, with an additional 28 species that are currently either undetermined or undescribed (Miller et al. 2004, 2006; Waddell and Clarke 2008). Despite Papahānaumokuākea's high latitudes (which makes coral growth progressively more difficult), a similar number of species of coral have been reported for the NWHI as the main Hawaiian Islands, with 59 recorded species (Friedlander et al. 2005).

Live coral cover is highest in the middle of the chain, with Lisianski Island and Maro Reef having 59.3% and 64.1% of their respective available substrate covered with living corals (Maragos et al. 2004) (Figure 2.3). Coral cover varies significantly across Papahānaumokuākea from these high rates at Maro and at Lisianski to minimal coverage at most of the other reef sites. Coral species richness is also highest in the middle of the chain, reaching a maximum of 41 reported coral species at French Frigate Shoals (Maragos et al. 2004).

Stony corals are less abundant and diverse at the northern end of the archipelago (Kure, Midway, and Pearl and Hermes), and off the exposed basalt islands to the southeast (Nihoa, Mokumanamana, La Pérouse, and Gardner) (Figure 2.4). At these sites, soft corals such as Sinularia and Palythoa are more abundant. Table coral in the genus Acropora is not found anywhere in the main



Precious corals thrive in the deepwater habitats of Papahānaumokuākea (Photo: Amy Baco-Taylor)

Hawaiian Islands, but seven species are recorded for Mokumanamana, Gardner, Pearl and Hermes, Neva, French Frigate Shoals, Maro, and Laysan, with the highest number of species and colonies at French Frigate Shoals. These colonies of coral may have been established from larvae traveling in currents or eddies from Johnston Atoll, 724.2 kilometers to the south (Grigg 1981; Maragos and Jokiel 1986).

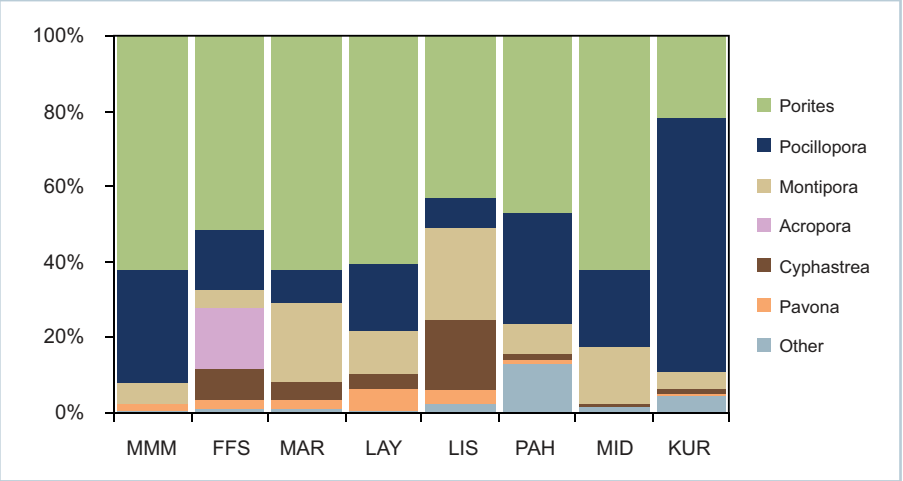
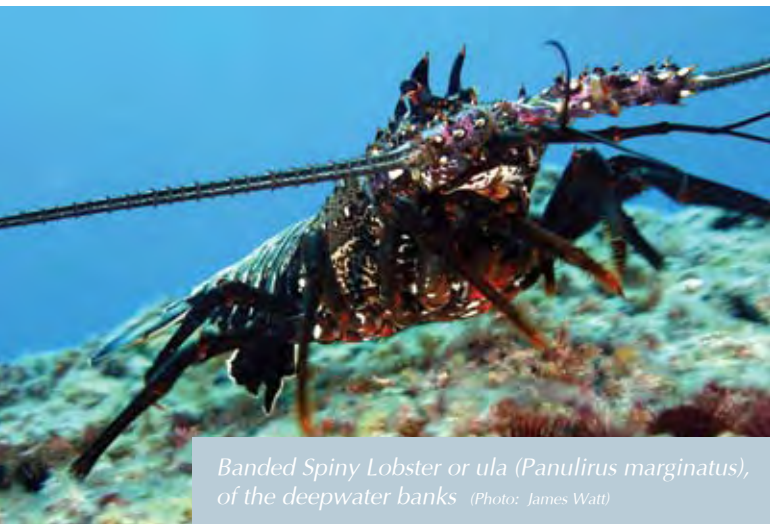


Figure 2.4: *Relative abundance of coral taxa genera throughout Papahānaumokuākea* (Data are derived from colony counts within belt transects during 2006 surveys)

Benthic shallow-water invertebrates

With the exception of coral and lobster species, the marine invertebrates of Papahānaumokuākea are very poorly known. Only two comprehensive collections of these groups of animals were conducted prior to 2000: the 1902 *Albatross* Expedition, in which the collected organisms were deposited at the Smithsonian Institution, and the 1923 *Tanager* Expedition, in which the collection was deposited at the Bishop Museum. In 2000, the NWHI Reef Assessment and Monitoring Program was established, and it continues to the present to assess the biota of all ten emergent reef areas and shallow waters (<20 meters) in Papahānaumokuākea (Friedlander et al. 2005). While this work is ongoing, a number of new species have already been recorded for Hawai'i, some of which may turn out to be endemic to Papahānaumokuākea (DeFelice et al. 2002).

Other-worldly texture of mushroom corals; shown here, Fungia scutaria (Photo: James Watt)



Banded Spiny Lobster or ula (Panulirus marginatus), of the deepwater banks (Photo: James Watt)

By 2005, a total of 838 species from 12 orders had been identified. Many species are still being worked on by taxonomic experts around the world and have yet to be identified (Friedlander et al. 2005). In 2006, a Census of Marine Life research expedition explored the biodiversity of small, understudied, or lesser known invertebrate, algal, and microbial species at French Frigate Shoals. Although thorough taxonomic identifications and molecular analyses of the samples collected will take many years to complete, preliminary findings suggest that approximately 2,300 unique morphospecies were collected and photographed during the 16 days of sampling (Fig 2.5). An estimated 30–50 collected specimens are thought to be species new to science, including new species of crabs, corals, sea cucumbers, sea squirts, worms, sea stars, snails and clams. From this expedition, well over a hundred new species records, including

sponges, corals, anemones, flatworms, segmented worms, hermit crabs, crabs, sea slugs, bivalves, gastropods, octopus, sea cucumbers, sea stars, and sea squirts, will likely be identified for French Frigate Shoals. Relatively high diversity was found for sponges, bryozoans, eulimid gastropods, hermit crabs, echinoderms, and ascidians, but other invertebrates, including corallimorph anemones, galatheid squat lobsters, porcellanid crabs, pea crabs, and coral barnacles, had strikingly low diversity or were absent. Interestingly, about one third of all invertebrate morphospecies collected were either found only once or found at only one site. A possible new family of ascidian (sea squirt) for Papahānaumokuākea, Mogulidae, was collected. Likewise, a new species of coral that could not even be identified to family level was found and photographed. An estimated 48 new species records of Opisthobranch mollusks for French Frigate Shoals were collected, 27 of which appear to be new records for Papahānaumokuākea.

A Stocky Hawkfish or po'o pa'a (Cirrhitus pinnulatus) peers from Kure Atoll's reefs (Photo: James Watt)

Reef fish

The extreme isolation of Papahānaumokuākea and its distance from the diverse fish population centers of the Western Pacific contribute to a lower fish species richness relative to other sites (Mac et al. 1998). A total of 258 species have been documented from Midway Atoll (Randall et al. 1993). Total species richness observed on surveys show a positive linear relationship with the total area of reef in shallow waters, a relationship that is consistent with most theories of island biogeography and likely reflects the greater diversity of habitats at larger islands or atolls (Waddell and Clarke 2008). Although part of one continuous chain, fish assemblages differ among reef types. The three true atolls (Kure, Midway and Pearl and Hermes) as well as the partial atoll French Frigate Shoals, contain fish assemblages that are different from the basalt islands of Mokumanamana, Gardner Pinnacles and Nihoa. In addition to fish species differing with various island types, species also differ among latitudinal gradients. Many species of wrasses and damselfish exhibit a higher latitudinal bias; they are found significantly more often at northern sites (Kure and Midway Atolls) than at more southern locations.

Papahānaumokuākea's long-term protection from fishing pressure has resulted in high standing stocks of fish that are more than 260% greater than the main Hawaiian Islands. As mentioned above, the fish community of the coral reef ecosystem of

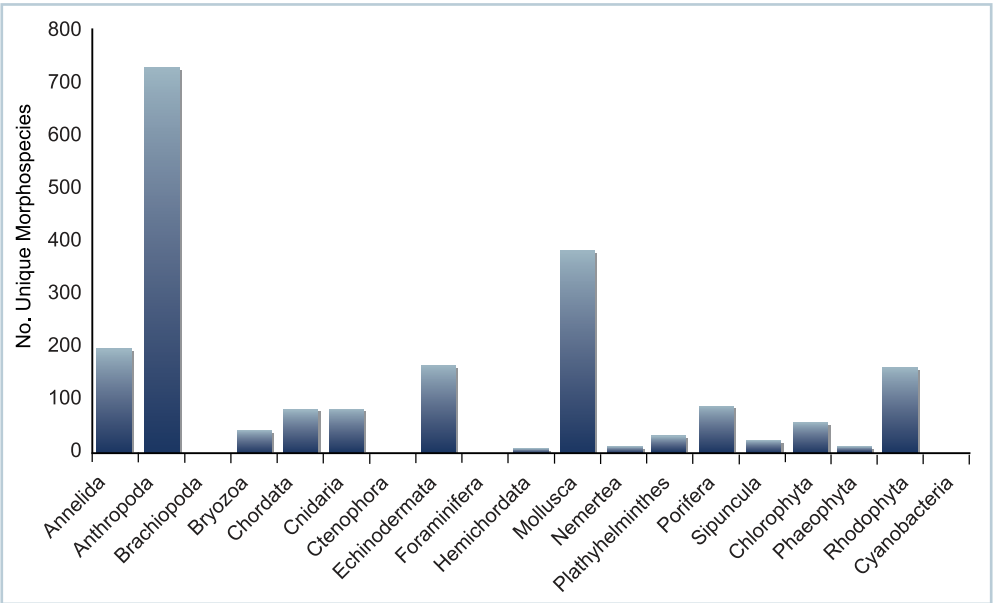


Figure 2.5: *Unique morphospecies collected at FFS by phylum in 2006 surveys*

Papahānaumokuākea also shows a very different structure than the main Hawaiian Islands and most other places in the world. The shallow-reef fish community is remarkable in the abundance and size of fish in the highest trophic levels. Apex predator biomass on forereef habitats in Papahānaumokuākea is 1.3 metric tons per hectare, compared to less than 0.05 metric tons per hectare on fore-reef habitats in the main Hawaiian Islands (Fig 2.6).

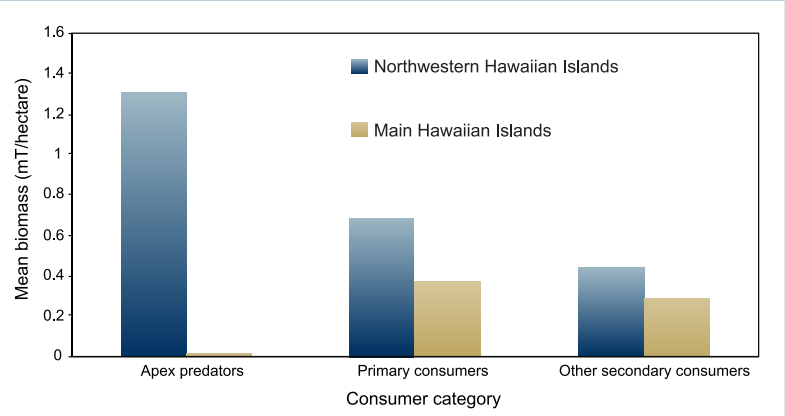


Figure 2.6: *Comparison of biomass in major trophic guilds between the Northwestern Hawaiian Islands and the main Hawaiian Islands*
(Source: Friedlander and DeMartini 2002 Data are derived from colony counts within belt transects during 2006 surveys)

Areas with the highest apex predator biomass include Pearl and Hermes Atoll, followed by Lisianski and Laysan Islands.

Biota of deeper bank habitats

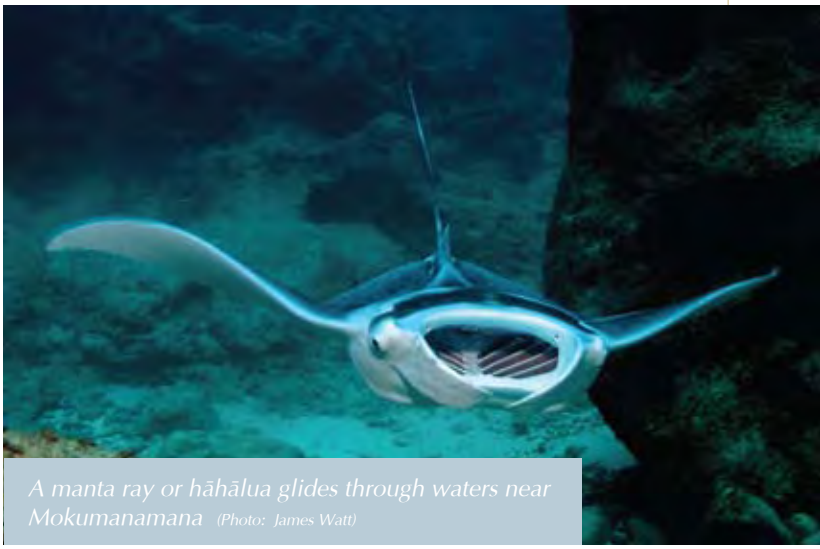
The property also contains a significant component of deeper waters that surround the island platforms, an ecosystem type typically lacking in most of the world's marine reserves. There are at least 15 banks at depths of 30 to 400 meters within Papahānaumokuākea, providing important habitat for bottomfish and lobster species, although only a few of these banks have been studied in any detail (Kelley and Ikehara 2006). These waters represent critical deepwater foraging grounds for Hawaiian Monk Seals (Parrish et al. 2002), important habitat for bottomfish and lobster species, and a spatial refuge for pelagic fishes such as tunas and their allies, which have been declared overfished in other regions throughout the world (Myers and Worm 2003). Surveys using deep-diving submersibles have established the presence of deepwater precious coral beds at depths of 365–406 meters; these include ancient gold corals whose growth rate is now estimated to be only a few centimeters every hundred years, and whose ages may exceed 2,500 years (Roark et al. 2006). At depths below 500 meters, a diverse community of octocorals and sponges flourishes; these deepwater sessile animals prefer hard substrates devoid of sediments (Baco-Taylor et al. 2006). Deeper still, the abyssal depths of Papahānaumokuākea, while harboring limited biomass, are home to numerous scantily documented fishes and invertebrates, many with remarkable adaptations to this extreme environment.

Biota of pelagic habitats

Most of Papahānaumokuākea can be considered pelagic, or deep-water, habitat. The estimated area of all parts of Papahānaumokuākea with depths greater than 1,000 fathoms (1.8 kilometers) is 304,000 square kilometers (Miller et al. 2006). The deep waters are important insofar as they support an offshore mesopelagic boundary community (Benoit-Bird et al. 2002), a thick layer of pelagic organisms that rests in the deep ocean (400–700 meters) during the day, then migrates up to shallower depths (surface to 400 meters) at night, providing a critical source of nutrition for open-ocean fishes, seabirds and marine mammals. These organisms that inhabit the upper layers of the mesopelagic zone have been surveyed at French Frigate Shoals, Lisianski, Pearl and Hermes, Midway, and Kure using echosounding technology (Lammers et al. 2006). This work confirmed the presence of a community of vertical migrators, consisting of fish, squid, and shrimp. This

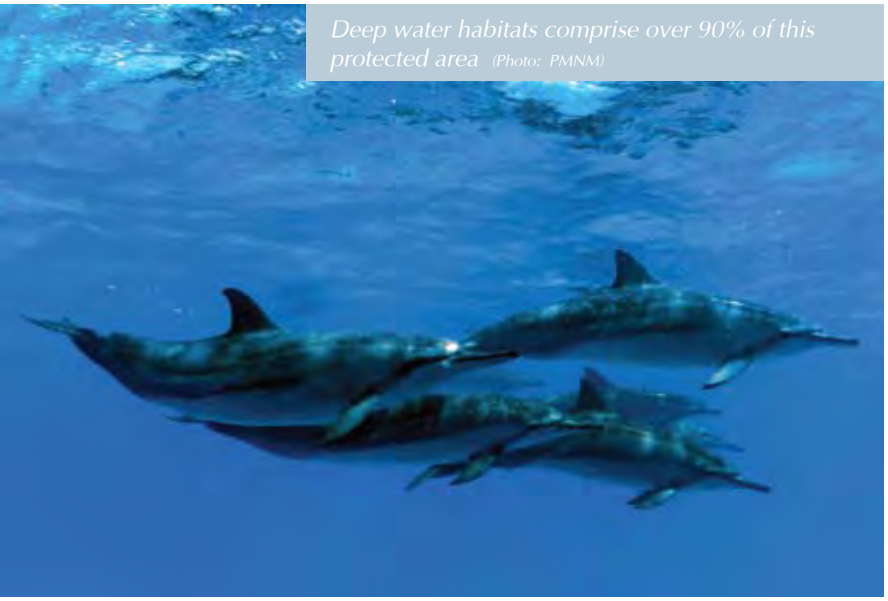

(Photo: PMNM)

temporal variability in the structure of the biotic community is important to understand as the spatial patterns are studied. Mesopelagic fishes, in particular, are important prey for bigeye tuna, which tend to live at greater depths than the other tuna species. Overall, the fauna of Papahānaumokuākea's waters below standard SCUBA diving depths remains minimally surveyed and documented, representing an enormous opportunity for future scientific research in a system largely undisturbed by trawling or other forms of resource extraction.



A manta ray or hāhālua glides through waters near Mokumanamana (Photo: James Watt)

The estimated millions of seabirds breeding in Papahānaumokuākea also depend on this pelagic habitat. They are primarily pelagic feeders that obtain the fish and squid they consume by associating with schools of large open-water predatory fish such as tuna and billfish (Fefer et al. 1984, Au and Pitman 1986). These fish—Yellowfin Tuna (*Thunnus albacares*), Skipjack Tuna (*Katsuwonus pelamis*), Mahimahi (*Coryphaena hippurus*), Wahoo (*Acanthocybium solandri*), Rainbow Runner (*Elagatis bipinnulatus*), Broadbilled Swordfish (*Xiphias gladius*), and Blue Marlin (*Makaira indica*)—are apex predators of a food web existing primarily in the epipelagic zone and found within the waters of Papahānaumokuākea. While both the predatory fish and the birds are capable of foraging throughout their pelagic ranges (which encompass the entire property and tropical Pacific Ocean), the birds are most successful at feeding their young when they can find schools of predatory fish within easy commuting range of the breeding colonies (Ashmole 1963; Feare 1976; Flint 1991). Recently fledged birds, inexperienced in this complex and demanding style of foraging, rely on abundant and local food resources to survive while they learn to locate and capture prey.



Deep water habitats comprise over 90% of this protected area (Photo: PMNM)

Marine mammals

The marine and littoral ecosystems of the property are designated critical habitat for the Hawaiian Monk Seal, the world's second most endangered pinniped. Only 1,200–1,400 individuals exist, and models predict that the population will fall below 1,000 individuals within the next five years. While a few Hawaiian Monk Seals co-exist with humans in the main Hawaiian Islands, the great majority of the population lives among the remote islands and atolls of Papahānaumokuākea Marine National Monument. Their range generally consists of the islands, banks and marine corridors within Papahānaumokuākea, although individual animals may be found beyond this extensive area, sometimes farther than 90 kilometers from shore.

Studies of the movements and diving patterns of 147 Hawaiian Monk Seals in Papahānaumokuākea (consisting of 41 adult males, 35 adult females, 29 juvenile males, 15

Hawaiian Monk Seals and Green Turtles cohabitating on the beaches of Papahānaumokuākea (Photo: George Balazs)

juvenile females, 12 weaned male pups, and 15 weaned female pups) using satellite-linked depth recorders have determined that Monk Seal foraging range covers an area of approximately 48,156 square kilometers, or almost 14% of the total area of Papahānaumokuākea. Seals forage extensively at or near their breeding sites and breeding subpopulations, and haulout sites; 95% forage within 12 km of these sites. Several banks located northwest of Kure Atoll represent the northern extent of the monk seal foraging range (Stewart 2004a). (Recent research conducted with submersibles and remotely operated vehicles by NOAA's Office of Ocean Exploration has identified these areas as important habitat for precious corals (NOAA 2003).) The main terrestrial habitat requirements include haulout areas for pupping, nursing, molting and resting. These are primarily sandy beaches, but virtually all substrates are used at various islands in Papahānaumokuākea.

The waters of Papahānaumokuākea are also home to more than 20 cetacean species, six of them federally and internationally recognized as endangered, although comparatively little is known about the distributions and ecologies of these whales and dolphins. Recent research by Johnston and others (2007) reveals that Papahānaumokuākea also may host many more humpback whales than originally thought.

More than 450 Green Turtle nesting sites have been documented in Papahānaumokuākea (Photo: James Watt)

Marine reptiles

In addition to the important habitat for marine mammals within Papahānaumokuākea, the islands and atolls are also crucial breeding, nesting, and basking habitat for the Hawaiian population of Green Turtles. More than 450 nesting sites have been observed in Papahānaumokuākea, incorporating over 90% of the total nesting area for Green Turtles. The five species of sea turtles that occur in the NWHI are the Loggerhead (*Caretta carretta*), the Green (*Chelonia mydas*), the Olive Ridley (*Lepidochelys olivacea*), the Leatherback (*Dermochelys coriacea*), and the Hawksbill (*Eretmochelys imbricata*) (Figure 2.7). Section 4 provides additional information on population trends for these species, especially the Green Turtle.

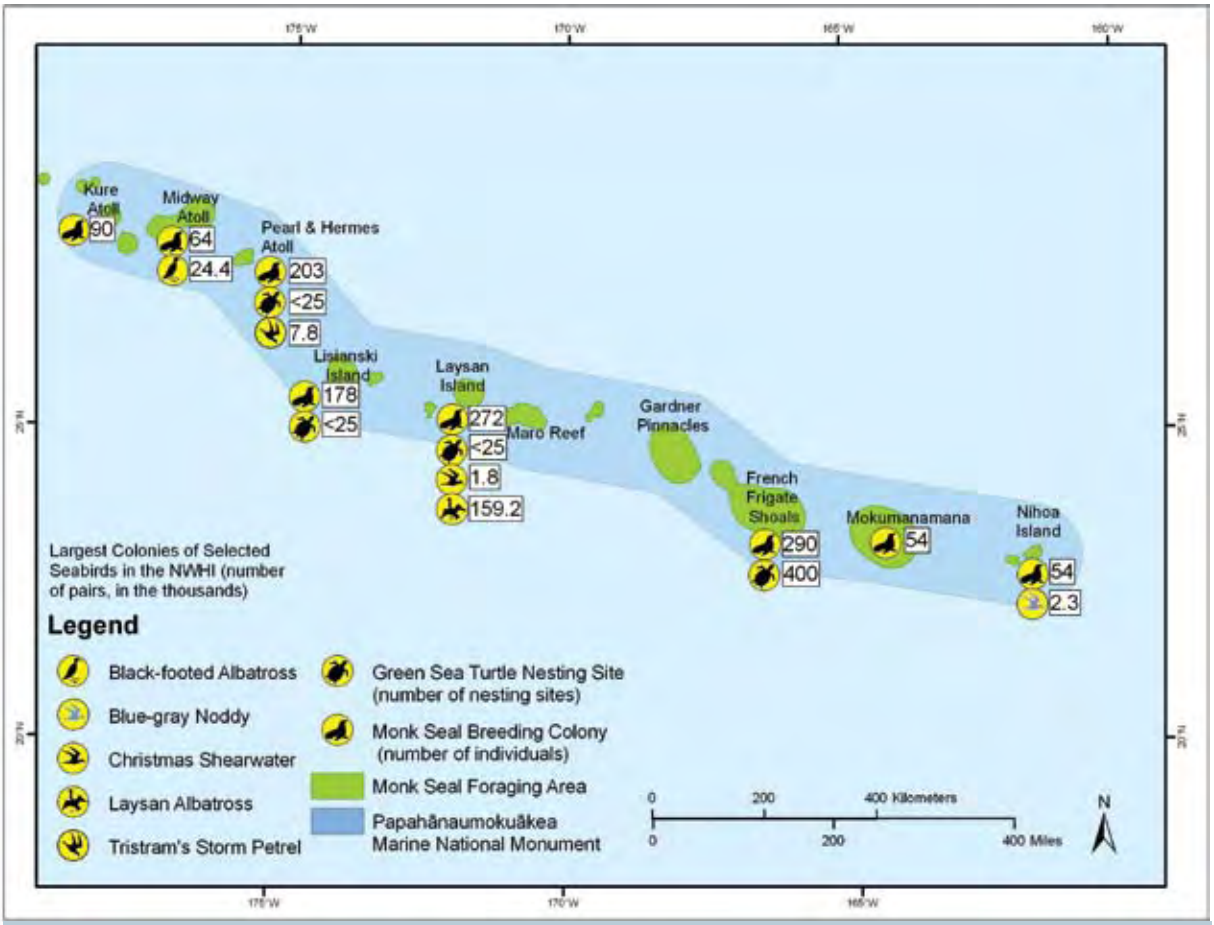
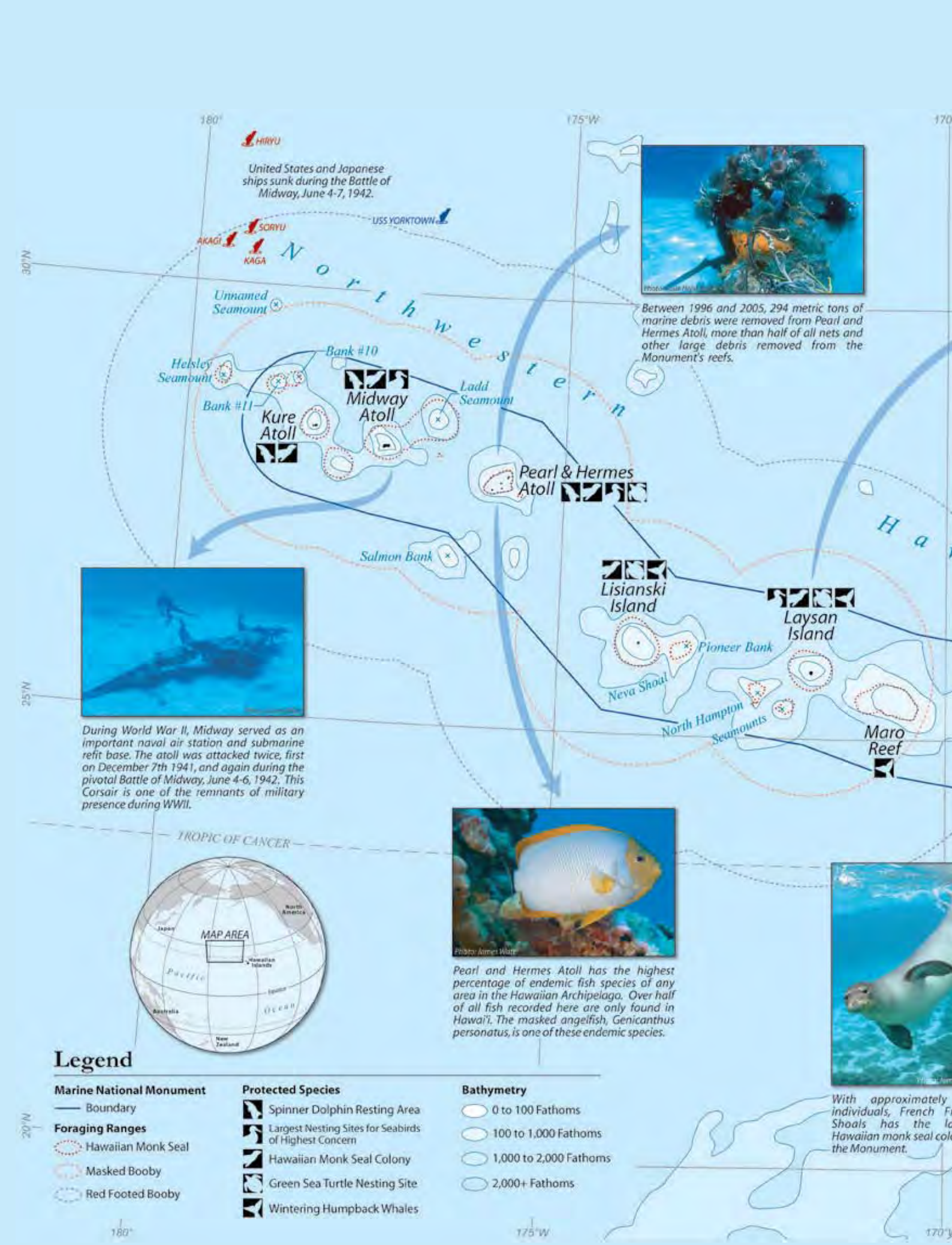


Figure 2.7: *Population sizes and nesting sites of rare seabird species, Green Turtles and Hawaiian Monk Seals in the Pacific Island region* (Sources: Stewart 2004a; Balazs and Ellis 2000; Kushlan et al. 2002; Fefer et al. 1984)

Seabirds

In addition to the purely terrestrial biota, more than 14 million seabirds rely on the tiny islets in the chain, 5.5 million of which nest annually. This includes 99% of the world's Laysan Albatrosses (listed as vulnerable by the International Union for Conservation of Nature (IUCN), 98% of the world's Black-footed Albatrosses (listed as endangered by the IUCN), and important populations of the Short-tailed Albatross (listed as endangered by the IUCN). The small islands and atolls of the property thus form a major portion of the current total tropical seabird nesting habitat of the United States as a whole. Eleven of the 21 species were classified as highly imperiled or of high conservation concern at the broad scale of the North American Waterbird Conservation Plan (eastern north Pacific, western north Atlantic, and Caribbean) (Table 2.1). At the regional scale (Pacific Islands), six species were included in these highest-concern categories: Laysan, Black-footed, and Short-tailed Albatrosses; Christmas Shearwater; Tristram's Storm-Petrel; and Blue-gray Noddy. The importance of Papahānaumokuākea to seabirds is further discussed in Section 3.

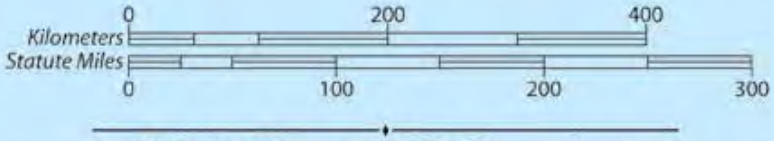
Papahānaumokuākea protects colonies of global significance for 14 million seabirds, representing 21 species (Photo: James Watt)


180°
175°W
170
30°N
25°N
20°N
HIRYU
United States and Japanese ships sunk during the Battle of Midway, June 4-7, 1942.
USS YORKTOWN
SORYU
AKAGI
KAGA
Northwestern
Unnamed Seamount
Bank #10
Helsley Seamount
Bank #11
Kure Atoll
Midway Atoll
Ladd Seamount
Pearl & Hermes Atoll
Salmon Bank
Lisianski Island
Laysan Island
Pioneer Bank
Neva Shoal
North Hampton Seamounts
Maro Reef
Ha
TROPIC OF CANCER
MAP AREA
North America
Japan
Hawaiian Islands
Pacific
Equator
Ocean
Australia
New Zealand
Between 1996 and 2005, 294 metric tons of marine debris were removed from Pearl and Hermes Atoll, more than half of all nets and other large debris removed from the Monument's reefs.
During World War II, Midway served as an important naval air station and submarine refit base. The atoll was attacked twice, first on December 7th 1941, and again during the pivotal Battle of Midway, June 4-6, 1942. This Corsair is one of the remnants of military presence during WWII.
Photo by: James Watt
Pearl and Hermes Atoll has the highest percentage of endemic fish species of any area in the Hawaiian Archipelago. Over half of all fish recorded here are only found in Hawai'i. The masked angelfish, Genicanthus personatus, is one of these endemic species.
With approximately individuals, French F Shoals has the la Hawaiian monk seal col the Monument.
Legend
Marine National Monument
Boundary
Foraging Ranges
Hawaiian Monk Seal
Masked Booby
Red Footed Booby
Protected Species
Spinner Dolphin Resting Area
Largest Nesting Sites for Seabirds of Highest Concern
Hawaiian Monk Seal Colony
Green Sea Turtle Nesting Site
Wintering Humpback Whales
Bathymetry
0 to 100 Fathoms
100 to 1,000 Fathoms
1,000 to 2,000 Fathoms
2,000+ Fathoms

PAPAHĀNAUMOKUĀKEA
MARINE NATIONAL MONUMENT

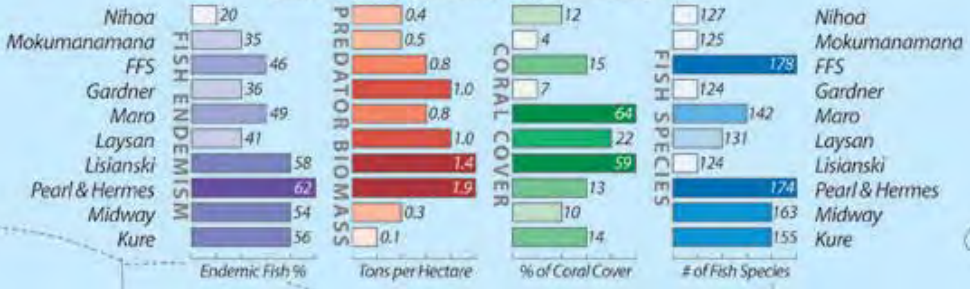
Over 14 million seabirds nest in the Monument and many forage in the waters surrounding the breeding colonies. Laysan Island has the greatest diversity of bird species in the Monument.

Produced by NOAA's National Marine Sanctuaries Program



Relative Biogeographic Comparison

Data Classified as Quantiles; Friedlander and Wedding, 2006



Raita Bank

French Frigate Shoals

Mokumanamana (Necker Island)

Gardner Pinnacles

St. Rogatien & Brooks Banks

Twin Banks

Middle Bank

Nihoa Island

Kaua'i

Lehua Rock

Ni'ihau

Ka'ula Rock

Over 90% of all green sea turtle nesting in the Hawaiian Archipelago occurs at French Frigate Shoals.

A large number of archaeological features on the islands of Nihoa and Mokumanamana attest to early Native Hawaiian presence in the region. Both islands are on the National Register of Historic Places.

Table 2.1: Seabird species known to breed in Papahānaumokuākea Marine National Monument (FWS data)1

Common Name	Species	Estimated Number of Breeding Birds
Black-footed Albatross	*Phoebastria nigripes*	111,800
Laysan Albatross	*Phoebastria immutabilis*	1,234,000
Bonin Petrel	*Pterodroma hypoleuca*	630,000
Bulwer's Petrel	*Bulweria bulwerii*	180,000
Wedge-tailed Shearwater	*Puffinus pacificus*	450,000
Christmas Shearwater	*Puffinus nativitatis*	5,400
Tristram's Storm-Petrel	*Oceanodroma tristrami*	11,000
Red-tailed Tropicbird	*Phaethon rubricauda*	18,400
White-tailed Tropicbird	*Phaethon lepturus*	8
Masked Booby	*Sula lepturus*	3,400
Red-footed Booby	*Sula sula*	15,800
Brown Booby	*Sula leucogaster*	800
Great Frigatebird	*Fregata minor*	19,800
Little Tern	*Sternula albifrons*	20
Gray-backed Tern	*Onychoprion lunatus*	86,000
Sooty Tern	*Onychoprion fuscatus*	3,000,000
Blue-gray Noddy	*Procelsterna cerulean*	7,000
Brown Noddy	*Anous stolidus*	150,000
Black Noddy	*Anous minutus*	26,000
White Tern	*Gygis alba*	22,000
Total		**5,971,428**

1 - Laysan and Black-footed Albatrosses, Christmas Shearwater, Tristram's Storm-Petrel, and Blue-gray Noddy are on the Birds of Conservation Concern list for the Hawaiian Bird Conservation Region; Black-footed Albatrosses are on the national list.

Shorebirds

Forty-seven species of shorebirds have been recorded in Papahānaumokuākea. Most of these are classified as infrequent visitors or transients, but Papahānaumokuākea does support regionally significant populations of four migrants: Pacific Golden-Plovers (*Pluvialis fulva*), Bristle-thighed Curlews (*Numenius tahitiensis*), Wandering Tattlers (*Tringa incana*), and Ruddy Turnstones (*Arenaria interpres*). Most of these birds arrive in July and August and return to the Arctic to breed in May, but some of the younger individuals may skip breeding their first summer and remain in Papahānaumokuākea. While there, these species use all the habitats available for foraging and sometimes concentrate in large numbers in the hypersaline lake at Laysan and in the artificial water catchment pond on Sand Island at Midway Atoll. The rat-free islands of Papahānaumokuākea provide important wintering sites for the rare Bristle-thighed Curlew, because they are flightless during molt and require predator-free sites. This species and Pacific Golden-Plovers are listed as species of high conservation concern in the National and Regional Shorebird Conservation Plans (Engilis and Naughton 2004) and are designated Birds of Conservation Concern by the FWS at the regional and national scale (FWS 2002).

Bristle-thighed Curlews or kioea are listed as species of high conservation concern (Photo: James Watt)

The worldwide population of Laysan Ducks (Anas laysanensis) lives within Papahānaumokuākea
(Photo: Jimmy Breeden)

Terrestrial Life in Papahānaumokuākea

Terrestrial biota

In contrast to the marine systems of Papahānaumokuākea, the terrestrial area of the property is comparatively small, but supports significant endemic biodiversity. This includes 145 species of endemic arthropods, six species of endangered endemic plants, including an endemic palm, and four species of endemic birds, including remarkably isolated species such as the Nihoa Finch, Nihoa Millerbird, Laysan Finch, and Laysan Duck, one of the world's rarest ducks. Three of these species (Nihoa Finch, Nihoa Millerbird, and Laysan Duck) are deemed critically endangered by IUCN, and the Laysan Finch is listed as vulnerable. In addition, millions of seabirds use the area for breeding and foraging, and numerous shorebird species overwinter on the islands or transit through during their migrations to the north and south. At least six species of terrestrial plants found only in the region are listed under the U.S. Endangered Species Act, some so rare that due to the difficulty of surveying these remote islands, they have not been documented for many years. IUCN lists *Cenchrus agrimonioides* var. *laysanensis* from Laysan as extinct, though biologists hold hope that it may still exist. *Amaranthus brownii*, endemic to Nihoa, is deemed critically endangered by IUCN, while *Pritchardia remota* is considered endangered. Although still poorly documented, the terrestrial invertebrate fauna shows significant patterns of precinctive speciation, with endemic species described from Nihoa, Mokumanamana, French Frigate Shoals, Laysan, Lisianski, Pearl and Hermes, and Kure.

Terrestrial invertebrates

The native terrestrial arthropods and land snail communities of Papahānaumokuākea are the least-well-studied of the animal groups (Table 2.2), but are perhaps the most seriously affected by human activities and introductions. In particular, the many species of ants that have accidentally reached all the islands of the archipelago except Gardner Pinnacles have had enormous effects on these native terrestrial invertebrates. The entomofauna of Papahānaumokuākea includes some groups of insects that demonstrate dramatic adaptive radiations. One such group is the seedbugs, specifically the genus *Nysius*, which shows the complete range of feeding types: from host-specific plant feeders, to diverse plant hosts, to omnivorous feeding, and finally to predator/scavengers. It is a rare occurrence to find herbivory and carnivory occurring within the same genus. Nowhere else in the world is there a lineage like the Hawaiian *Nysius* in which to explore the evolution of carnivory in Heteroptera. Some of these species are single-island endemics and of particular conservation concern because of their limited ranges.

Table 2.2: *Number of terrestrial arthropod species in Papahānaumokuākea summarized by order and island*
(Source: Nishida 1998; Nishida 2001)

Terrestrial Arthropod Species	Nihoa	Mokuma-namana	French Frigate Shoals	Gardner Pinnacles	Laysan Island	Lisianski Island	Pearl and Hermes	Mid-way Atoll	Kure Atoll
Anthropoda	**221**	**84**	**108**	**11**	**234**	**59**	**109**	**507**	**155**
Arachnida	42	10	10	4	34	6	16	85	35
Insecta	174	69	94	7	195	49	87	412	115
Chilopoda	2	2	1		1		1	1	2
Anostraca					1				
Isopoda	3	3	3		3	3	5	9	3
Amphipoda						1			

Terrestrial plants

The land plants of Papahānaumokuākea are typically salt-tolerant and drought-resistant species of the beach strand and coastal scrub. The number of native species found at each site is positively correlated with island size but negatively influenced by the number of alien species occurring at the site (Table 2.3). The three sites with airstrips and a longer history of year-round human habitation have much larger populations of alien species of land plants. At least three species of Papahānaumokuākea endemic plants (*Achyranthes atollensis*, *Phyllostegia variabilis*, and *Pritchardia* species, all of Laysan Island) are believed to have gone extinct since European contact. Other native species and genera have found refuge in areas of Papahānaumokuākea where rats were never introduced, and now occur at much greater densities than they do in the main Hawaiian Islands (e.g., *Pritchardia remota* and *Sesbania tomentosa*, commonly known as *ʻōhai*).

At least six species of terrestrial plants found only in the region are listed under the U.S. Endangered Species Act.

Table 2.3: *Biogeographic description of land plants of Papahānaumokuākea Marine National Monument (number of species that have been observed at each site in previous 20 years)*

Island	Emergent Land Area (ha)	Island endemic	Indigenous to Hawai'i and other Pacific Islands	Alien	Total no. of Species
Nihoa	69	3	14	3	20
Mokumanamana	19	0	5	0	5
French Frigate Shoals	38	0	10	27	37
Gardner Pinnacles	2	0	1	0	1
Laysan Island	414	1	22	11	34
Lisianski Island	148	0	15	5	20
Pearl and Hermes Atoll	39	0	15	10	25
Midway Atoll	592	0	14	249	263
Kure Atoll	89	0	12	36	48

New Species Discovery

As further described in Section 3, the rates of marine endemism in Papahānaumokuākea are unparalleled in the Pacific and most of the world. In addition, the sheer mass of apex predators in the marine system is simply not seen in areas subject to higher levels of human impact. Overall, the property represents one of the last unspoiled marine wilderness areas remaining on the planet, and virtually every scientific exploration to the area is a voyage of discovery. In the course of one three-week research cruise in the fall of 2006, conducted as part of the global Census of Marine Life project, more than 100 cryptic species new to science were discovered at French Frigate Shoals alone. Many more such voyages are necessary in order to gain a more comprehensive understanding of insular patterns of speciation and endemism within Papahānaumokuākea as a whole, but even the data in hand strongly support international recognition of this unique ecosystem.

The endangered ʻohau, or Sesbania tomentosa (Photo: Barbara Maxfield)

Papahānaumokuākea exemplifies how nature and culture are one (Photo: James Watt)

Papahānaumokuākea's Associative Cultural Landscape

This section describes Papahānaumokuākea's Native Hawaiian cultural heritage, specifically the elements that make the property a significant associative cultural landscape.

The World of Gods and Spirits

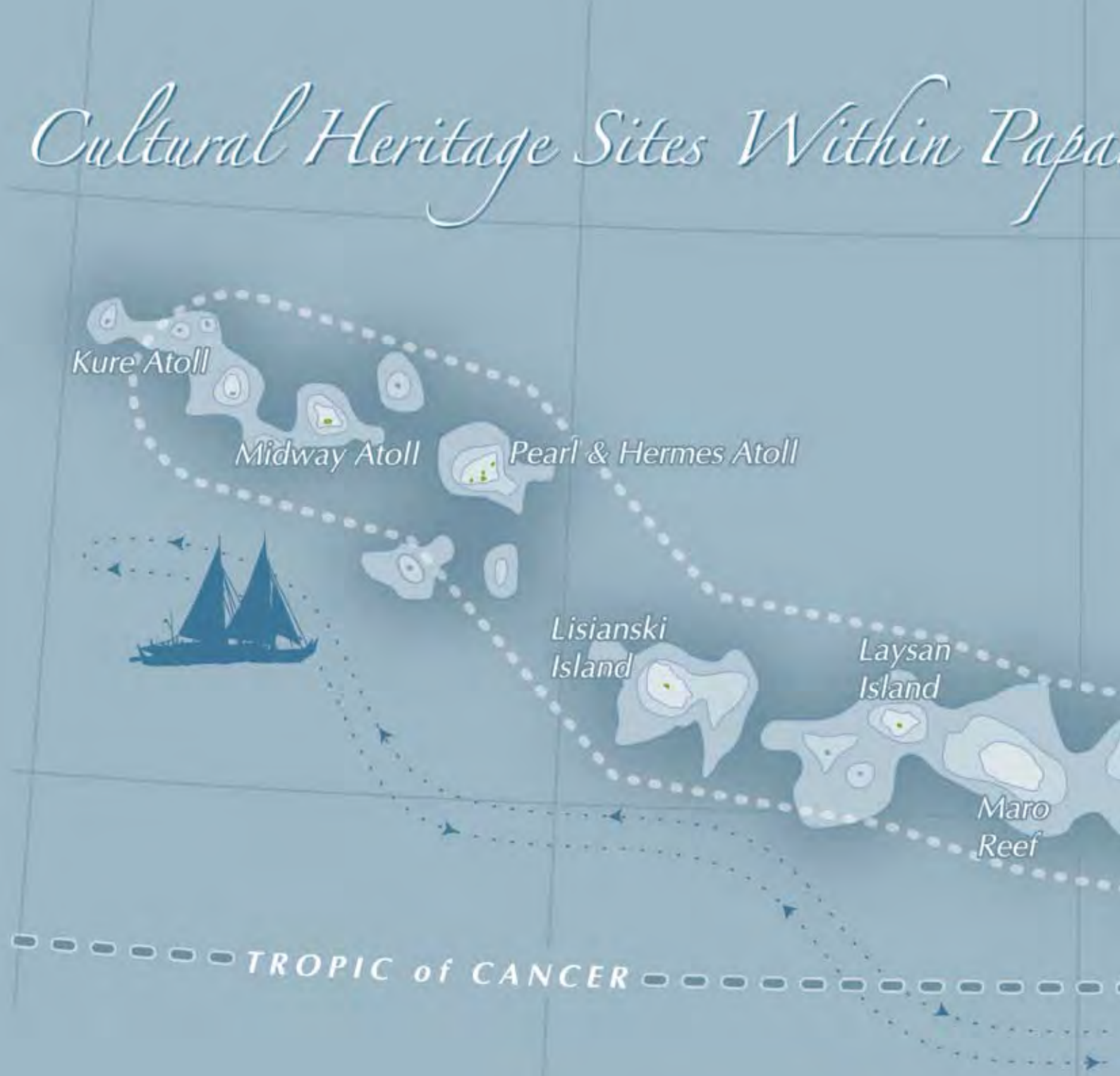
Papahānaumokuākea is a sacred area, which contains the boundary Pō, a place of darkness that is reserved for their many revered gods and ancestral spirits. The best-known genealogical and creation chant of Hawai'i, the Kumulipo, describes the Hawaiian universe as being comprised of two worlds: Pō and Ao, the realm of light where Native Hawaiians and the rest of Hawai'i's living creatures reside. Native Hawaiians believe that Mokumanamana, in southeastern Papahānaumokuākea, represents the boundary between these two worlds.

Hawaiians know the waters of the tropics as the safest for navigation, and they mark the sacredness of that multi-dimensional realm with celestial gods. The sun's path, which Hawaiians mark as the sequential points on the horizon at which it rises and sets throughout the year, is bordered by the points at which it travels furthest north (*Ke ala nui polohiwa a Kāne* – The long, black shining road of Kāne) and furthest south (*Ke ala nui polohiwa a Kanaloa* – The long, black shining road of Kanaloa). These two gods are considered major gods of Tahiti, Tuamotu, O'ahu and Kaua'i (Lilikalā Kame'eleihiwa 22 November 2008, personal communication). The boundary of Kāne crosses Mokumanamana ("island of great spiritual power").

The name *Ke ala nui polohiwa a Kāne* refers to death, or the westward road of the ancestral spirits. Native Hawaiians believe that when a person's physical body dies, their spirit travels to *leina*, or portals found on each island. If the individual had lived a *pono* (righteous) life, they would be transported from the *leina* westward to Pō (Beckwith 1970). This spirit realm is represented by the islands and surrounding waters to the northwest of the island of Mokumanamana.

Most of Mokumanamana's *heiau* (shrines) follow the crest of the island, tracking the sun, and it is believed that the solar solstice hits the carefully placed upright stones of these *heiau* at a significant angle (Pualani Kanahele 2 July 2008, personal communication). This line of massive stones may be a physical manifestation of the celestial and spiritual significance of this island as a representation of a crossing between Pō and Ao. "The stone heiau are clues left behind by our ancestors, and are so precious because we don't know everything the ancestors knew, with their superior understanding of direction and the stars" (Lilikalā Kame'eleihiwa 21 November, 2008, personal communication).

Cultural Heritage Sites Within Papa



Partly because Mokumanamana is crossed by the Tropic of Cancer, it is considered the sacred boundary between Pō and Ao.

Tropic of Cancer - Ke ala nui polohiwa a Kane - The long black shining road of Kane.

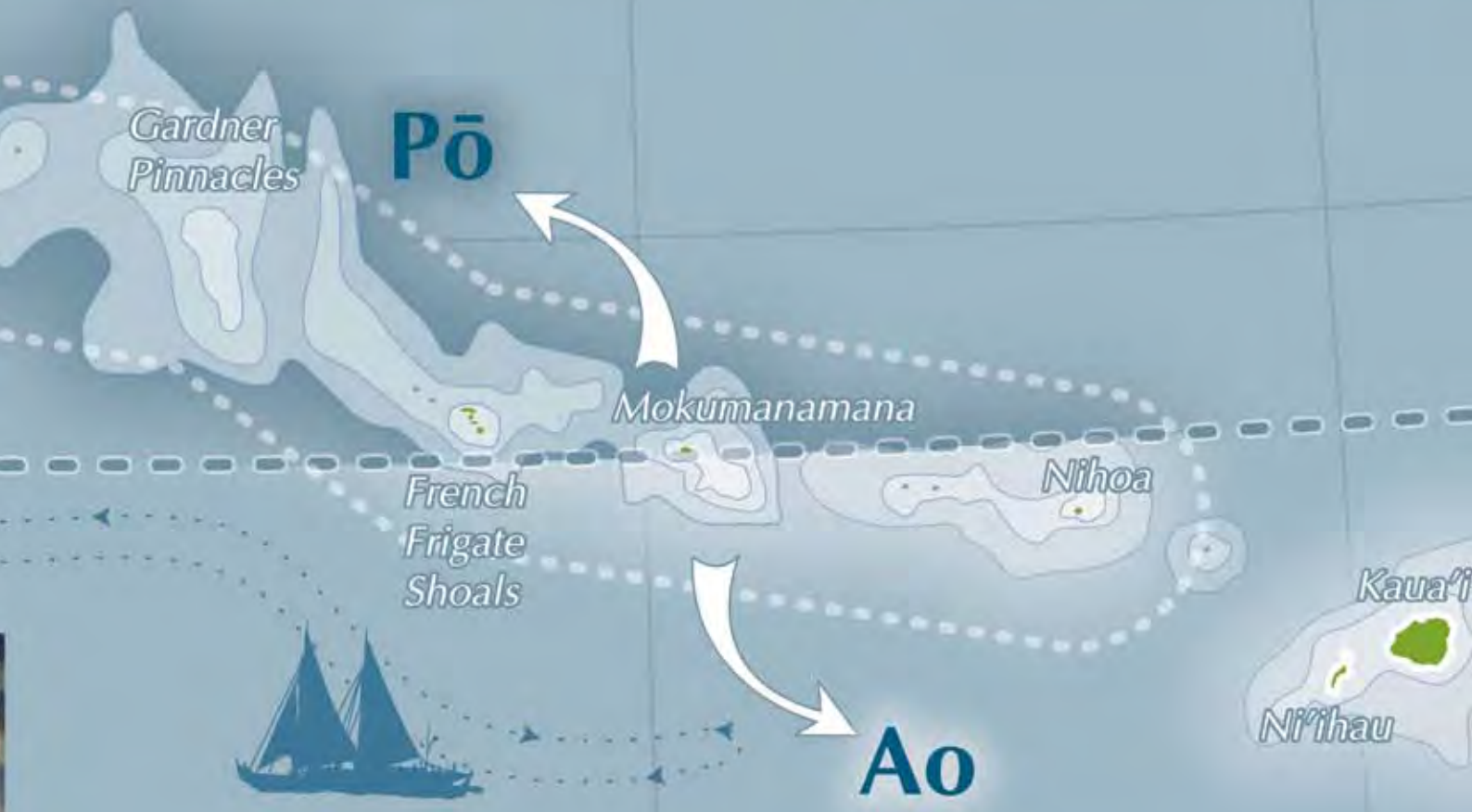
Papahānaumokuākea Marine National Monument Boundary

Voyagers from mythical, ancient, and modern times have traversed Papahānaumokuākea's seascape, as recounted in myriad oral traditions

hānaumokuākea

Upright stones are oriented to sun's angle on the summer solstice. Spanning the length of Mokumanamana's kua (spine, crest), the upright stones are part of the highest concentration of ceremonial sites in the archipelago.

Pre-contact native Hawaiian archaeological sites at Nihoa.



Mokumanamana, with its many *heiau*, is believed to play a critical role in Native Hawaiian rituals because of its position on the Tropic of Cancer. Native Hawaiians believe that a person's shadow is the physical manifestation of their spirit, and therefore, that a person has the most *mana* (spiritual power) when they have no shadow, such as at midday, because the spirit is considered to be united with the body. This is the time when rituals and prayers are conducted, as priests are at the peak of their spiritual powers. Nowhere else in Hawai'i does the sun hang overhead longer than on the summer solstice at Mokumanamana. It is believed that Mokumanamana is an important and powerful place to hold ceremonies, because on the summer solstice, a priest's shadow remains united with his or her body—and the priest's power remains concentrated—for the longest period at any time of the year, anywhere in the archipelago.

As the boundary between Pō and Ao, Mokumanamana today serves as a critical place for ongoing Native Hawaiian cultural research into celestial movements, particularly during major solar events. In 2007, renowned Native Hawaiian cultural practitioner and researcher Pualani Kanahele and a group of cultural practitioners called Ha'ae Wale Ka Hānauna Lolo visited Mokumanamana to study the relationship between the island's heiau and the path of the sun during the summer solstice.

Another famous Hawaiian *mo'olelo* (story, historical narrative) tells the story of how a family of important gods and goddesses followed the sun's path in an easterly direction, down the island chain. Pele, the fire or volcano goddess, accompanied by her sister Hi'iaka, sailed from Kahiki (Tahiti) to the Northwestern Hawaiian Islands, continuing on to Lehua and the main Hawaiian Islands, all the way down the archipelago until she found her current home in the active volcano of Kīlauea, on Hawai'i Island.

The migration *mo'olelo* of Pele and Hi'iaka, two sisters from Tahiti, tells of them first landing in the NWHI on an island named Mokupāpapa,"some point northwest of Hawai'i, along that line of islets, reefs, and shoals which tail off from Hawai'i as does the train of a comet from its nucleus" (Emerson trans. 1915). Pele left her brother Kānemiloha'i on Mokupāpapa, with instructions to build it up for habitation because it was not much more than a reef. Pele and Hi'iaka sailed southeast from Mokupāpapa, landing at Nihoa, where they briefly left another brother.

These gods are considered to be part of a volcano clan that traveled overseas and underground, creating the volcanic hotspots of Hawai'i and following the sun's path, to the east (Pualani Kanahele 2 July 2008, personal communication).

Hawaiian Voyaging and Wayfinding (Non-instrument Navigation)

Today, Papahānaumokuākea's cultural landscape, dominated by the ocean, plays a critical role in two major living traditions of Native Hawaiians: Hawaiian voyaging and wayfinding. The voyaging route between Kaua'i (in the main Hawaiian Islands) and Nihoa and Mokumanamana is used today as the best training ground for apprentices of Hawaiian wayfinding, non-instrument navigation, before undertaking a long, open-ocean voyage beyond the archipelago.

At Papahānaumokuākea, an array of attributes unique in the archipelago makes

Ka huaka'i a Pele

…'O Nihoa ka 'āina a mōkou i pae mua aku ai
Lele a'e nei mākou, kau i uka o Nihoa
'O ka hana nō a ko'u pōki'i, a Kāneapua,
'O ka ho'oili i ka ihu o ka wa'a a nou i ke kai
Waiho anei 'o Kamohoali'i iā Kāneapua i uka o Nihoa
No'iau ka hoe a Kamohoali'i
A pae i ka 'āina i kapa 'ia 'o Lehua….

Migration of Pele

…Nihoa is the island on which we first landed
We climbed upward until the top of Nihoa
The fault of my younger brother, Kāneapua,
Weighing the prow of the canoe until it beat into the waves
Kamohoali'i left Kāneapua on land at Nihoa
Skillful was the steering of Kamohoali'i
Until we landed on the island named Lehua….

the area "the ideal training platform" for novice Hawaiian wayfinders (Nainoa Thompson 4 October 2008, personal communication). Apprentice navigators are challenged to sail to Nihoa from Lehua, a small, crescent-shaped island near Kaua'i and Ni'ihau. Oral histories document that this navigational test was used in generations past; it is an ideal route for a novice navigator to prove new skills in reading the celestial and ocean environment (Maly 2003). The navigator must find an island that cannot be seen on the horizon, but is still within a relatively short sail from the safety and provisions of a larger island. Oral tradition tells that in fair weather, canoes would sail first from Kaua'i to Lehua, which is known as a navigational "pointer" to Nihoa.

On Nihoa, there is no artificial lighting to aid the apprentice navigator, and the island's small physical size (0.68 square kilometers) and low-lying nature (the highest point measures 275 meters) require astute observations of the sun, stars, swells, seabirds and the Hawaiian wayfinder's other signposts of navigation. Today, novice Hawaiian wayfinders are considered qualified to attempt to navigate a canoe on long-distance, trans-Pacific sails after they have successfully guided a voyage from Kaua'i to Nihoa. Once the voyages to Nihoa, and then Mokumanamana, have been made, the islands themselves contain archaeological sites that continue to be used to educate apprentice navigators and allow for direct communication with the elements and the gods who are personified in those elements (Pualani Kanahele 2 July 2008, personal communication).

Even apart from apprentice sails, Papahānaumokuākea is a major destination for traditional voyaging. Traditional double-hulled Hawaiian voyaging canoes have traveled throughout Papahānaumokuākea in recent years. In 2004, *Hōkūle'a* sailed from the main Hawaiian Islands to

Language and Writing

Until relatively recently, Native Hawaiian culture relied exclusively on oral traditions (*oli* (chant); *mele* (song); *mo'olelo* (story); *mo'okū'auhau* (genealogy); and *hula* (dance)) to transmit knowledge. When reading and writing were introduced to Hawai'i after Western contact, Native Hawaiians took to them quickly, and by the 1860s—less than a century later—the Native Hawaiian community was almost universally literate (Silva 2004). As a result, many oral traditions were documented and preserved in books, journals and newspapers; however, many more were either lost or continued to be transmitted only orally, to trusted recipients, in accordance with Hawaiian custom. This application relies on oral sources—first-hand accounts of widely respected Hawaiian cultural practitioners, who are considered reputable sources of information in the Hawaiian culture—as well as on academic and historic references.

Throughout this document Hawaiian words are written with appropriate diacritical marks and defined in English. As with other languages that employ diacritical marks, such as French and Spanish, the Hawaiian language uses them as part of the alphabet and the language. Words can have very different meanings when diacriticals are missing or misplaced. (For example, *kau* means "your," while *ka'u* means "mine;" *onaona* means "fragrant, sweet-smelling scent," while *'ona'ona* means "drunk.") The *kahakō* (macron) represents an emphasized or stressed vowel sound in a Hawaiian word, as exemplified by the word, *kūpuna* (revered elders, ancestors), as differentiated from *kupuna* (a singular elder or ancestor). The *'okina* (glottal stop), which indicates a consonant sound produced by closing and suddenly opening the glottis, occurs in many Pacific languages, and can be reproduced in English by saying any word that begins with a vowel, such as "open" or "above." It is represented by the symbol ', as in the word Hawai'i.

Hawaiian Wayfinding (non-instrument navigation)

The ancient and modern training grounds for Hawaiian wayfinding (non-instrument navigation)
(Photo: Polynesian Voyaging Society)

Kure Atoll, the farthest edge of the former Hawaiian Kingdom, and back. Moreover, the *ʻOhana Waʻa* (family of canoes) serve as the traditional vehicles that deliver cultural practitioners to Nihoa and Mokumanamana for religious ceremonies. In two separate voyages in 2003 and 2005, *Hōkūleʻa* and *Hōkūalakaʻi* brought the cultural group Nā Kupuʻeu Paemoku to Nihoa and Mokumanamana for ceremonial purposes.

Oral traditions reveal this seascape's place in Hawaiʻi's legendary voyaging traditions. *Kūpuna* (elders) from Niʻihau and Kauaʻi Islands (which are closest to Papahānaumokuākea and the people of which have traditionally had the most access to and relationship with the islands to the northwest) have shared knowledge passed down through generations about a voyaging "route" to Tahiti (Maly 2003). Although trans-Pacific voyaging is thought to have ceased in the 15th century (Kirch and Kahn 2007), some Niʻihau traditions state that Nihoa and/or Mokumanamana served as an embarkation and debarkation point for these voyages (Maly 2003). Traditions from Hawaiʻi Island support this,

Hawaiian wayfinding evolved from the system of non-instrument navigation used by Polynesians to routinely make long voyages across thousands of miles of open-ocean. Between 3,000 and 4,000 years ago—millennia before open-ocean sailing was undertaken elsewhere in the world—ancestors of the Native Hawaiians developed the world's first blue-water sailing technology, engineering sophisticated ocean-going vessels capable of ranging thousands of miles over open-ocean, and creating a reliable navigational system based on observations of the natural world. Navigators voyaged based on a lifetime of studying the motion, rising and setting of specific stars; the weather and times of travel; wildlife species (which congregate at particular positions); the directions of swells on the ocean; the colors of the sea and sky (clouds cluster and reflect at the locations of some islands); and the angles for approaching harbors. From the first peopling of the Hawaiian Archipelago through the 15th century, wayfinding enabled regular contact and trade between Hawaiʻi and Oceania.

All but lost for several generations, Hawaiian wayfinding has undergone a revival in recent decades, led by Nainoa Thompson, the first Hawaiian master wayfinder to navigate across the Pacific in several centuries. Thompson has developed a system of wayfinding, or non-instrument navigation, that synthesizes traditional principles of ancient Pacific navigation and modern scientific knowledge. Hawaiian wayfinding has contributed to a revival of traditional voyaging arts across Polynesia; it is now being taught in schools throughout Hawaiʻi and the Pacific. This science, art, and skill uses a plethora of environmental cues to navigate without instruments:

Master navigator Nainoa Thompson (left) instructing in the art and science of wayfinding.
(Photo: Polynesian Voyaging Society)

The sun: The points on the horizon where the sun rises and sets represent the main guide for navigators without instruments. Says Thompson: "Sunrise is the most important part of the day. At sunrise you start to look at the shape of the ocean—the character of the sea. You memorize where the wind is coming from. The wind generates the swells. You determine the direction of the swells, and when the sun gets too high, you steer by them. And then at sunset we repeat the observations. The sun goes down—you look at the shape of the waves. Did the wind change? Did the swell pattern change?"

The stars: "The star compass is the basic mental construct for navigation," says Thompson. "We have Hawaiian names for the houses of the stars—the places where they come out of the ocean and go back into the ocean….If you can identify the stars, and if you have memorized where they come up and go down, you can find your direction. The star compass is also used to read the flight path of birds and the direction of waves. It does everything."

Ocean swells: On cloudy days or nights, when the sun and stars are not visible, an expert navigator (perhaps lying in the bow of the canoe) can sense up to five unique swell patterns at once. Listening to the patterns of waves slapping against the hull, and sensing the pitch and roll of the canoe, helps navigators to determine direction.

Seamarks: Navigators also rely on seamarks, which have been called "signposts in the ocean" for an experienced navigator: Seamarks, or distinctive natural occurrences that occur at predictable places along a sea route, are found along routes between islands and indicate to the navigator that he is at a certain point along his route. Examples of Pacific seamarks include a region where flying fish leaped in pairs, a zone of innumerable jellyfish, an area of numerous terns, and an area of sharks and numerous red-tailed tropic birds.

The moon, the planets, winds, landmarks, and north and south pointers are other aspects of the sky and sea that Hawaiian wayfinders use to set up a voyage strategy, hold a canoe's course while tracking position during the voyage, and finally find land after reaching the vicinity of the destination.

Hōkūle'a in the main Hawaiian Islands
(Photo: Polynesian Voyaging Society)

Papahānaumokuākea, the training grounds for ancient and modern Hawaiian wayfinders

suggesting that in recent centuries, Niʻihau and Kauaʻi were particularly known for deep-sea voyaging wisdom (ibid.). The late *kupuna* Eddie Kaʻanāʻanā spoke of Native Hawaiians voyaging from Hawaiʻi Island to join family members in Niʻihau to sail from there to Papahānaumokuākea. His family told him that they did this to fish and to *holo moana*—to train to gain navigational knowledge (ibid.).

Place of Abundance

Papahānaumokuākea's nearly pristine marine natural resources (e.g., a predator-dominated ecosystem, high levels of endemism, crystalline waters, and unharvested marine resources) are of deep cultural significance to Native Hawaiian people. Since nature and culture are considered to be one and the same, the protection of one of the last nearly pristine, natural, marine ecosystems in the archipelago is seen as akin to preserving the living culture. Also, absent a human population center (and in distinct contrast to the degraded state of most of the main Hawaiian Island ecosystems), Papahānaumokuākea is relatively free of anthropogenic impacts, and remains one of the only places where Native Hawaiian practitioners have direct access to the living manifestation of oral traditions and can gain insights into the traditional relationships between man and nature.

For example, the apex predators that dominate the region's nearly pristine marine ecosystem are seen by Native Hawaiians through a spiritual and cultural lens. Sharks are the most common *ʻaumakua* (family guardian spirit) of fishing families; often honored as protectors of entire island districts; and represent the physical form of such highly revered gods as Kamohoaliʻi, who guided his sister Pele through Papahānaumokuākea when she arrived in Hawaiʻi, and Kūhaimoana, who lives in the waters between Nihoa and Kaʻula, near Niʻihau (Beckwith 1970). Jacks are known to be larger, more abundant and to behave much more boldly in Papahānaumokuākea than they do in the main Hawaiian Islands. For Native Hawaiians, the visible dominance of these predators has a resonant spiritual significance.

Native Hawaiian practitioners today say that Papahānaumokuākea represents one of Hawaiʻi's last-remaining *ʻāina momona*, or "places of abundance" (Mahina Duarte 19 November 2008, personal communication), a point reiterated repeatedly across the state in focus groups facilitated by Monument managers. It is also one of the preeminent locations for experiencing and

Native Hawaiian people call it one of the "last-remaining places of abundance", or ʻāina momona (Photos: James Watt)

understanding *hōʻailona* (signs, omens in nature) that occur in pristine environments. In addition, because environmental change occurred so quickly and profoundly in the main Hawaiian Islands' marine ecosystems, Papahānaumokuākea serves, for Native Hawaiians, as a "standard" (i.e., a pristine ecosystem akin to those their ancestors experienced) to contextualize and help traditional management skills evolve to modern-day settings.

Papahānaumokuākea's Archaeological Resources

Nihoa and Mokumanamana feature an array of Native Hawaiian archaeological sites unique among known sites in the Hawaiian archipelago and Polynesia. Both islands are listed on the National Register of Historic Places (see Appendix C), and feature archaeological landscapes containing original materials that largely have not been subject to the anthropogenic disturbances (invasive species, development, etc.) that have commonly occurred at sites found in the main Hawaiian Islands. In addition, the view planes of the islands' religious sites—an element that is particularly critical in Hawaiian culture—are also undisturbed, an extremely rare condition in Hawai'i, where development has altered most traditional Native Hawaiian religious sites and their surrounding environments.

The few radiocarbon dates from cultural materials found on Nihoa and Mokumanamana have been imprecise at best, estimating human colonization of the islands between 1000 and 1700 AD (Ckeghorn 1988). Oral traditions, historical ship logs and archaeological research point to periods of continuous activity in these islands for at least the past thousand years.

All documented Native Hawaiian archaeological sites in Papahānaumokuākea are on Nihoa and Mokumanamana, although a basalt artifact was found on Lisianski Island in 1991, and research on the region has not yet been completed (Kekuewa Kikiloi 2008, personal communication). Although interest is not lacking, Papahānaumokuākea's isolation and regulatory protections mean that a scant 18 days of archaeological characterization of Mokumanamana's sites have been conducted between 1923 and the present. This is a meager baseline in comparison with most known archaeological sites. The first archaeological study of Nihoa, conducted by Kenneth P. Emory of the Bishop Museum in 1923 and 1924 (Emory 1928), remains its

Nihoa's cultural sites and objects. Clockwise: shrine, residential site, terrace, religious site, and a rock bowl (Photos: Kehau Souza)

Residential sites, burial sites, shelter caves and agricultural terraces of Nihoa (Photos: David Boynton)

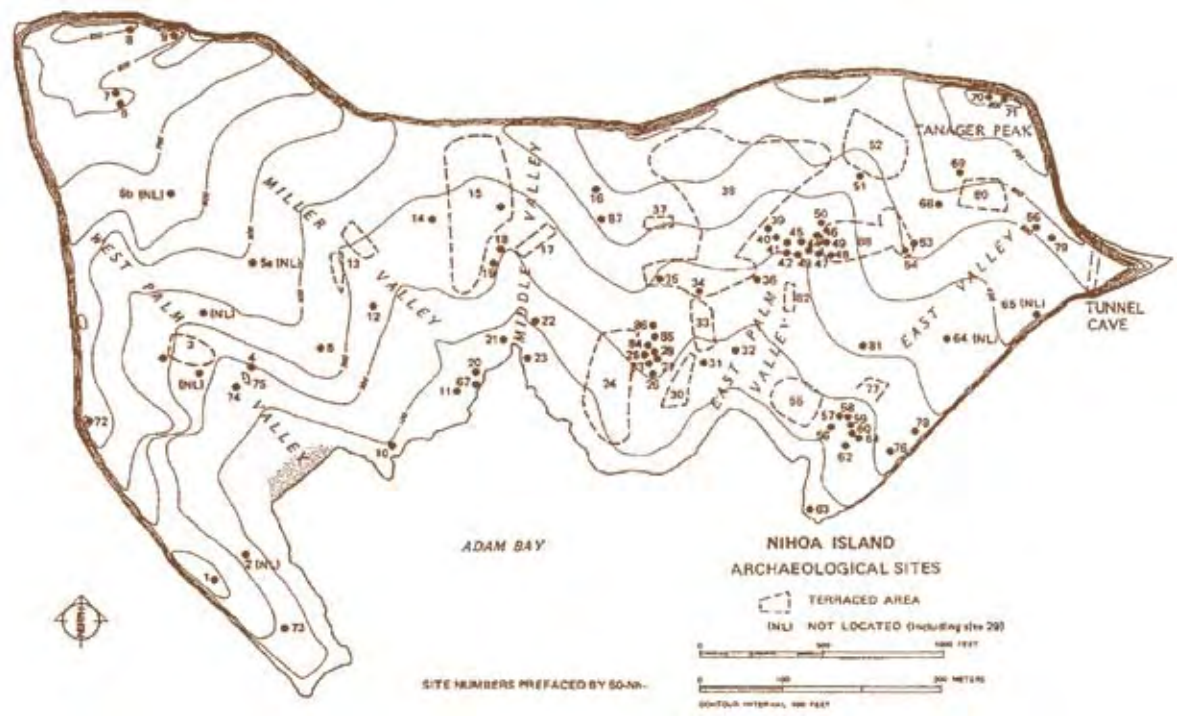
most thorough. Emory recorded 66 of the now 89 known sites and collected approximately 130 artifacts that continue to be stored at Bishop Museum (see online database at http://www2.bishopmuseum.org/nwhiobjects/index.asp). Expeditions in the 1980s (Cleghorn), 1990s (Irwin), and 2000s (Graves, Kikiloi, Raymond) along with interviews with Native Hawaiian practitioners (e.g., Maly 2003), have contributed to site characterization and interpretation.

There are 89 identified archaeological sites on Nihoa and 52 on Mokumanamana, making them some the densest scatters of prehistoric structural sites in Hawai'i. Nihoa and Mokumanamana hold 45 *heiau* (shrines) between them. These *heiau* are made of well-paved terraces and platforms with single, large, upright stones or, more commonly, rows of uprights. The two islands also feature rare, intact archaeological landscapes of a variety of ancient site types, including residential sites, habitation terraces for dryland agriculture and a plethora of ceremonial complexes. Survey and excavation have recovered other types of material culture, including exceptionally detailed stone human-like figures; evidence of cooking, food preparation and storage, manufacture of stone tools and fishing gear; evidence of subsistence activities such as fishing and collecting other marine resources, and cultivating dryland crops such as sweet potato; and ritual activities, including burial of the dead. For example, Bowl Cave, the largest shelter on Mokumanamana, yielded artifacts that included bowls, adzes, fishing sinkers, an awl, a chisel and hammerstone, and a bit of *wiliwili*, the lightest Hawaiian wood, which was often used for building outriggers on Hawaiian canoes.

Nihoa's archaeological sites

It is posited that Native Hawaiians lived on Nihoa for a 700-year period, between 1000 and 1700 AD (Cleghorn 1988).

Exceptionally well-made terraces believed to be habitation sites feature dry-laid stone masonry walls, with one (Site 41) measuring some 8.5 meters long by 5.5 meters wide, and reaching 2.4 meters in height. Over 8.4 hectares—or 13% of Nihoa's landscape—is covered by agricultural terraces cut into rock slopes and carefully faced with stone walls. The island's inhabitants captured rainwater in catchments and from seeps in the three main valleys (Evenhuis and Eldredge 2004). These agricultural systems and the available potable water from seeps and rain collection may have sustained a population of up to 100 people (Cleghorn 1988)(Table 2.4). The residents



quarried local rocks to build landing areas for their canoes, enclosures, shelters, tools and containers.

Nihoa's residential and agricultural sites are joined by burials, ceremonial terraces, platform foundations, and many rock shelters, which also may have served as habitation sites, transformed by constructing walls, one (Site 58) as high as three meters, to create shelter from the harsh sea winds and storms. Artifacts recovered from Nihoa include finished and unfinished stone adzes, hammerstones, grindstones, finished and unfinished stone bowls, a bone fishhook, bone awls, and stone fishing weights (Cleghorn 1988).

Table 2.4: *Nihoa: Archaeological sites (see above) and postulated functions (from Cleghorn 1988)*

Site no.	Postulated function	Site no.	Postulated function	Site no.	Postulated function	Site no.	Postulated function
50-Nh-1	Shrine	50-Nh-45	Habitation	-23	Habitation	-67	Habitation
-2	Burial cave	-46	Agriculture	-24	Agriculture	-68	Agriculture
-3	Agriculture	-47	Habitation	-25	Habitation	-69	Habitation
-4	Habitation	-48	Habitation	-26	Habitation	-70	Unknown
-5	Shelter	-49	Unknown	-27	Habitation	-71	Habitation (?)
-6	Shrine	-50	Shrine	-28	Habitation	-72	Unknown
-7	Water catchment	-51	Shrine	-29	Unknown	-73	Unknown
-8	Shrine	-52	Agriculture	-30	Agriculture	-74	Agriculture
-9	Shrine	-53	Unknown	-31	Agriculture	-75	Agriculture
-10	Shrine	-54	Unknown	-32	Habitation	-76	Unknown
-11	Shrine	-55	Agriculture	-33	Agriculture	-77	Agriculture
-12	Habitation	-56	Habitation	-34	Habitation	-78	Unknown
-13	Agriculture	-57	Habitation	-35	Agriculture	-79	Habitation
-14	Agriculture	-58	Habitation	-36	Agriculture	-80	Agriculture
-15	Agriculture	-59	Habitation	-37	Agriculture	-81	Unknown
-16	Agriculture	-60	Habitation	-38	Agriculture	-82	Agriculture
-17	Agriculture	-61	Habitation	-39	Agriculture	-83	Agriculture
-18	Habitation	-62	Unknown	-40	Habitation	-84	Shelter
-19	Habitation	-63	Shrine	-41	Habitation	-85	Shelter (?)
-20	Shrine	-64	Unknown	-42	Habitation	-86	Unknown
-21	Shrine	-65	Burial cave	-43	Habitation	-87	Habitation
-22	Shrine	-66	Habitation	-44	Habitation	-88	Agriculture

Mokumanamana's upright stones are arranged to the orientation of the summer solstice sun (Photo: Andy Collins)

Mokumanamana's archaeological sites

Featuring original and intact materials, Mokumanamana was never inhabited but served regularly and continuously as a ritual site and place of worship. With 52 known archaeological sites, Mokumanamana does not appear to have supported a permanent population. Instead, the island seems to have served a primarily religious function, as 33 ceremonial shrines (basaltic uprights, believed to be celestially oriented, rising from stone altars), span the *kua* (spine) or mountain crest of the island. These meticulously laid out shrines at Mokumanamana's ridge top are accentuated with exceptionally well-fitted stone pavings and upright stones, possibly representing the gods and ancestors in alignments; these sites served and continue to serve as impressive ritual points on the landscape.

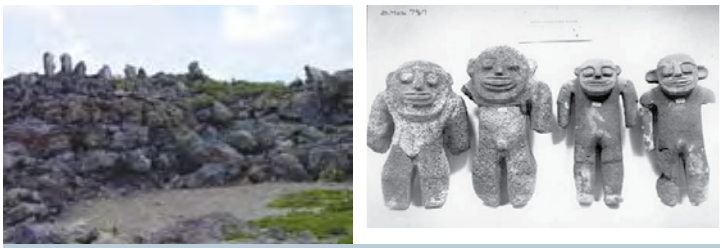
With a nearly 2:1 ratio to other archaeological site types on the island, the ceremonial sites on Mokumanamana represent what is believed to be the highest concentration of *heiau* (shrines) in the entire archipelago (Emory 1928). These heiau vary slightly in design, but generally feature rectangular platforms, courts and upright stones. One of the largest of these ceremonial sites (Site 1) measures 18.6 meters by 8.2 meters, with about 11 uprights stones of what are believed to be the original 19 still standing. Emory notes that the largest basaltic upright on the island was about 1.2 meters, with the average being 0.76 meters in height.

The *heiau* at Nihoa and Mokumanamana share common attributes with very few structures found in the main Hawaiian Islands; only at Mauna Kea on Hawai'i Island, and Haleakalā on Maui, were similar shrines found. These *heiau* are unique traditional Hawaiian architectural forms of stone masonry work and resemble those of inland Tahiti (called marae) and similar structures in the Marquesas (Emory 1928). They are some of the best preserved early temple designs in Hawai'i, and have played a critical role in understanding Hawai'i's strong cultural affiliation with Tahiti and the Marquesas, and Native Hawaiians' role in the migratory history and human colonization of the Pacific (Cleghorn 1988).

Stone figurines (*ki'i*) found at Mokumanamana provide another intriguing archaeological link between Hawaiians and Eastern Polynesian cultures. *Ki'i*, ranging from 20 to 45 centimeters tall, were found with a design and manner of carving that Emory believed posed a direct link to similar statues found in the Marquesas Islands. They have moon faces and large, male genitals. All of them were removed from the island by the Annexation Party in 1894, making it difficult to further study the archaeological links between Hawaiians and other Polynesians in situ (Table 2.5).

Nihoa and Mokumanamana: Two "Mystery Islands in the Pacific"

The archaeology of Nihoa and Mokumanamana is even more remarkable in the context of their geographical isolation, the limited resources of the islands, and the



Mokumanamana's ceremonial structures (left) and stone male images (right) (Photos: Kikiloi and Emory, respectively)

constant sea voyaging to and from the main Hawaiian Islands required to establish and sustain these human presences.

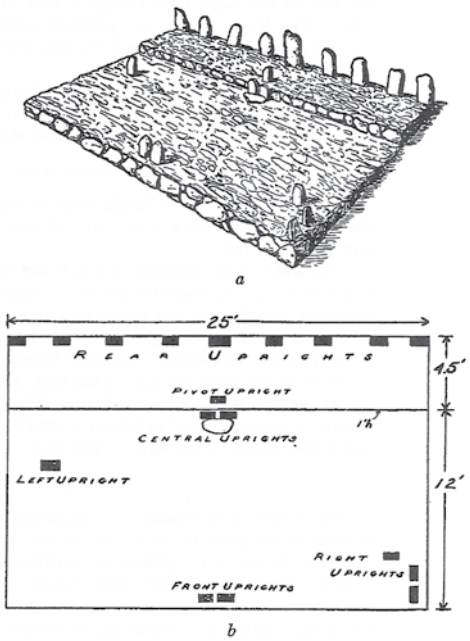
Nihoa and Mokumanamana are "Mystery Islands," a term used by archaeologists to describe islands scattered throughout the Pacific Ocean that exhibit signs of human settlement, but were mysteriously found abandoned by the time of Western contact (Kirch 1988; Irwin 1992). Mystery Islands share similar characteristics, such as stark isolation, limited marine and terrestrial resources, poorly developed soils, unpredictable weather patterns, and small geographic size (Kirch 1988a). Nihoa and Mokumanamana are the only Mystery Islands still associated with descendants of an original culture that continues to use and have strong ties to the islands' oral and physical traditions as well as their natural and cultural resources.

The archaeology and natural environments of these islands are providing integral insights into the timing and extent of human migration across the Pacific Ocean, the

Table 2.5: Mokumanamana: Archaeological sites (see above) and postulated functions (from Cleghorn 1988)

Site no.	Postulated function	Site no.	Postulated function
50-Nk-1	Shrine	50-Nk-27	Shrine
-2	Shrine	-28	Shrine
-3	Shrine	-29	Shrine
-4	Habitation	-30	Shrine
-5	Shrine	-31	Shrine
-6	Shrine	-32	Shrine
-7	Shrine	-33	Shrine
-8	Shrine	-34	Shrine
-9	Shrine	-35	Habitation
-10	Shrine	-36	Habitation
-11	Shrine	-37	Unknown
-12	Shrine	-38	Unknown
-13	Shrine	-39	Unknown
-14	Shrine	-40	Habitation
-15	Shrine	-41	Habitation
-16	Shrine	-42	Unknown
-17	Shrine	-43	Unknown
-18	Shrine	-44	Unknown
-19	Shrine	-45	Unknown
-20	Shrine	-46	Habitation
-21	Shrine	-47	Unknown
-22	Shrine	-48	Habitation
-23	Shrine	-49	Unknown
-24	Shrine	-50	Habitation
-25	Shrine	-51	Unknown
-26	Shrine	-52	Habitation

Sketch showing the typical arrangements and most common dimensions of the heiau on Mokumanamana (from Emory 1928)



a

b

adaptation and evolution of Polynesian cultures to their individual environments, and the contribution of Polynesian voyaging skills and deep-sea canoe technology to this last and most difficult wave of human migrations in the Pacific (Howe 2006).

The Mystery Islands include Nihoa and Mokumanamana; Pitcairn and Henderson of the Pitcairn group; Howland, Manra, Orona, Kanton, Phoenix, Enderbury and McKean in the Phoenix Islands; Washington, Fanning, Christmas, Caroline, Flint and Malden in the Line Islands; Palmerston and Suwarrow in the Cook Islands; Raoul in the Kermadec Islands; Rose in Sāmoa; and Norfolk Island, among others (Di Piazza and Pearthree 2004; Irwin 1992). Nihoa and Mokumanamana are among the smallest Mystery Islands in terms of size, along with Suwarrow, Rose and McKean.

Pathways of shorebirds etched in sand (Photo: James Watt)

Individual Island Descriptions

The following section contains brief descriptions of the individual islands within Papahānaumokuākea Marine National Monument, and their salient physical, biological, cultural and archaeological characteristics. The most commonly used name for each island is given first, with alternative names provided parenthetically. It should be noted that for the islands beyond Mokumanamana (Necker), the Hawaiian names provided are not yet in use on many modern maps. The Hawaiian placenames for Papahānaumokuākea's islands and atolls derive from diverse historic sources (for instance, from ancient chants, historic newspapers, and others). Table 2.6 summarizes the emergent and shallow reef areas on each island; further information is provided in the island-by-island descriptions.

Table 2.6: *Island-by-island comparisons of land and reef areas (hectares)*

Island	Emergent Land	Reef Area <10 fathoms
Nihoa	69	55
Mokumanamana	19	213
French Frigate Shoals	38	46,921
Gardner Pinnacles	2	34
Maro Reef	1	18,762
Laysan Island	414	2,367
Lisianski Island	148	20,270
Pearl & Hermes Atoll	39	40,336
Midway Atoll	592	8,000
Kure Atoll	89	6,791

Nihoa

23º03'N, 161º56'W

"*He pu'u kolo i Nihoa.*" ("Crawling up the cliffs of Nihoa.") This traditional Hawaiian saying is a compliment to one who perseveres in a challenging situation (Pukui 1997). Nihoa has many craggy cliffs, and the rough surf in winter makes landing there even more difficult than during the trade wind swells of summer. Hawaiian names often have multiple connotations; "Nihoa" means jagged" or "toothed," and probably refers to the island's profile, which resembles a tooth.

Nihoa is located approximately 250 kilometers northwest of Ni'ihau, the closest of the main Hawaiian Islands. Measuring roughly 0.69 square kilometers, this island is the largest emergent volcanic island within Papahānaumokuākea and the tallest, reaching an elevation of 275 meters at Miller Peak. It is also Papahānaumokuākea's geologically youngest island, with an age calculated at 7.3 million years (Clague 1996), only a little older than Ni'ihau.

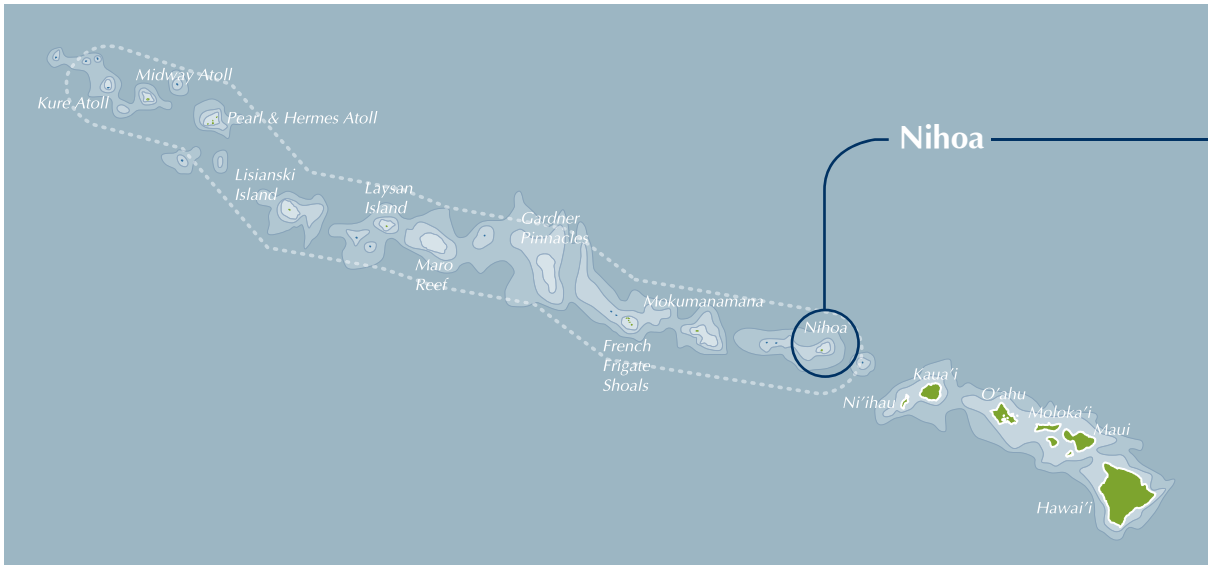
Nihoa is a deeply eroded remnant of a once-large volcano, and the large basaltic shelf of which it is a part stretches 28.9 kilometers in a northeast-southwest direction and averages between 34 and 66 meters deep (NOAA 2003). The island's two prominent peaks and steep, fortress-like sea cliffs are clearly visible from a distance. Its northern face is a sheer cliff made up of successive layers of basaltic lava, within which numerous volcanic dikes are visible. From its high northern cliffs, the island declines southward, with an average slope of 23º (Johnson 2004).

(Photos: David Boynton)

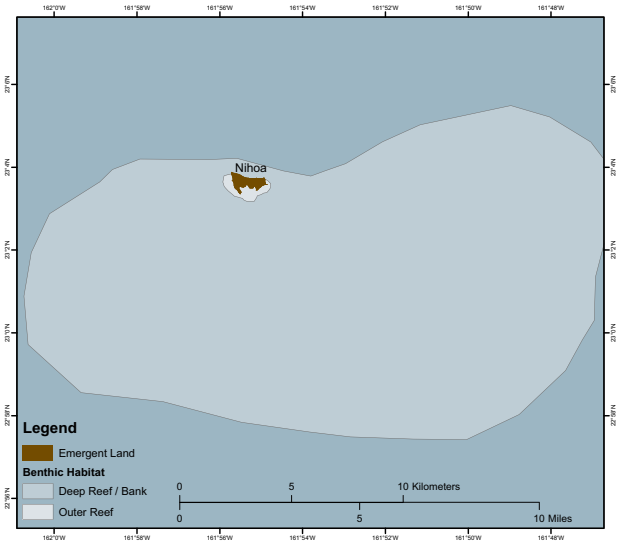
On Nihoa's stark landscape, the endemic Nihoa Finch resides among ancient heiau (temple) and 13th c. residential sites

(Photo: James Watt)

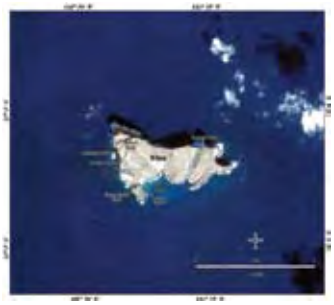
The island's surrounding submerged reef habitat totals approximately 575 square kilometers and is a combination of uncolonized hard bottom, macroalgae, pavement with sand channels and live coral, and uncolonized volcanic rock (NOAA 2003), supporting at least 127 species of reef fish and 17 species of corals.



Nihoa: benthic habitat, bathymetry and satellite imagery




(Photo: James Wait)



Another historical name for Nihoa is Moku Manu, or "Bird Island." Nihoa's seabird colony boasts one of the largest populations of Tristram's Storm-Petrel, Bulwer's Petrel, and Blue-gray Noddies in the Hawaiian Islands. The avifauna of the island includes two endemic passerine birds: the Nihoa Finch (*Telespiza ultima*) and the Nihoa Millerbird (*Acrocephalus familiarus kingii*), both listed as endangered under the federal ESA.

The island is a unique example of a lowland native coastal community, resembling lowland communities that once occurred commonly on the main Hawaiian Islands but are now almost completely eliminated due to the pressures of human population (Wagner et al. 1990). The island's vegetation can be classified as part coastal mixed community (*Sida* mixed shrub and grassland) and coastal dry shrubland dominated by *ʻilima* (*Sida fallax*), *ʻāweoweo* (*Chenopodium oahuense*), and *ʻōhai* (*Sesbania tomentosa*). The island supports 21 native plant species, including three endemics: a palm or *loulu* (*Pritchardia remota*), an amaranth (*Amaranthus brownii*), and an herb (*Schiedea verticillata*) (Wagner et al. 1999). The arthropod fauna of the island includes 33 species of mites, three species of spiders, and 182 species of insects, 17 of which are endemic, including a katydid (*Banza nihoa*), a giant tree cricket (*Thaumatogryllus conantae*), two species of seed bugs (*Nysius nihoae* and *Nysius suffusus*), and a trapdoor spider (*Nihoa mahina*) (Evenhuis and Eldredge 2004).

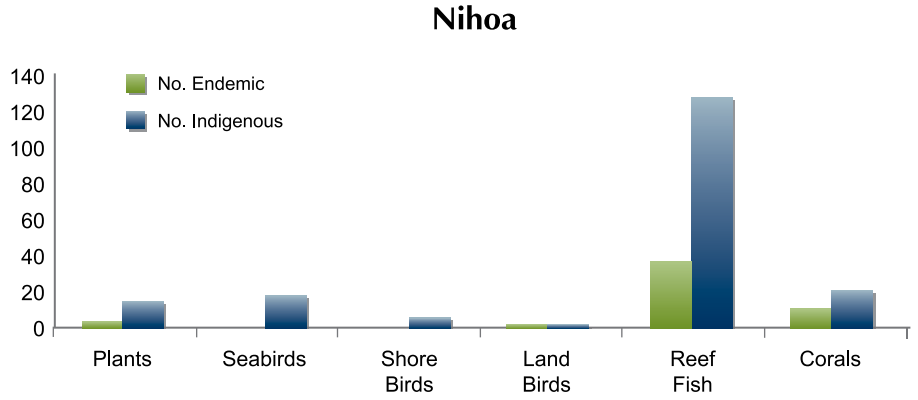
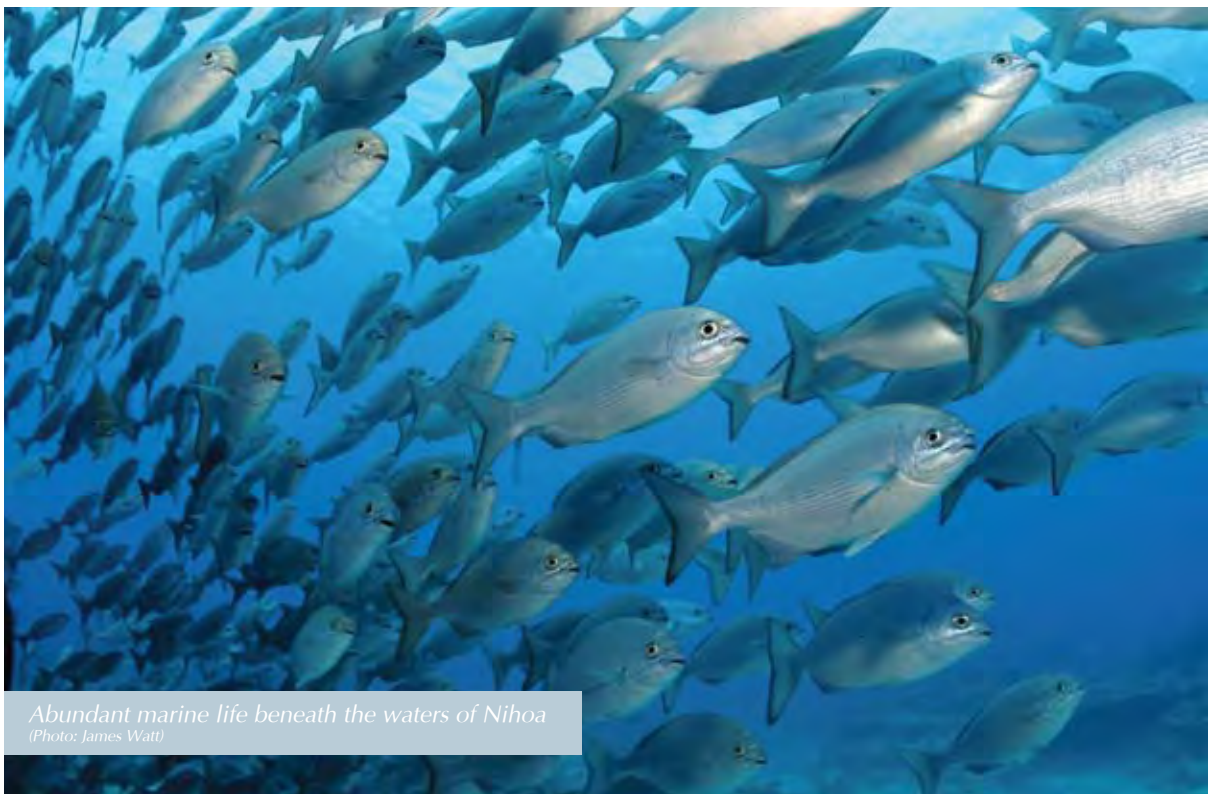


Figure 2.8: *Number of endemic and indigenous species at Nihoa*

As was noted previously, Nihoa exhibits clear evidence of habitation in prehistoric times. Sites thought to date between the 13th and15th centuries include 25 to 35 house terraces, 15 ceremonial structures, burial caves, bluff shelters, and agricultural terraces. Numerous artifacts found on Nihoa establish a close relationship with Native Hawaiian culture in the main Hawaiian Islands, and to the first settlers of Hawai'i who sailed through the Pacific on large voyaging canoes. Nihoa also has a rich cultural heritage, with at least 89 known *wahi kūpuna* (ancestral sites) constructed by the pre-contact Hawaiians who inhabited the island for approximately 700 years (until 1700 AD); the island is listed on the National Register of Historic Places. This island also has significant soil development for agriculture along with constructed terraces, which suggests investment in agricultural food production. As many as 100 people are estimated to have lived on Nihoa at one time, but the relative shortage of fresh water was likely a limiting factor (Cleghorn 1988). Because fresh water and food could be found there, Nihoa may have been a good place for voyagers to stop and resupply their canoes.



Abundant marine life beneath the waters of Nihoa
(Photo: James Watt)

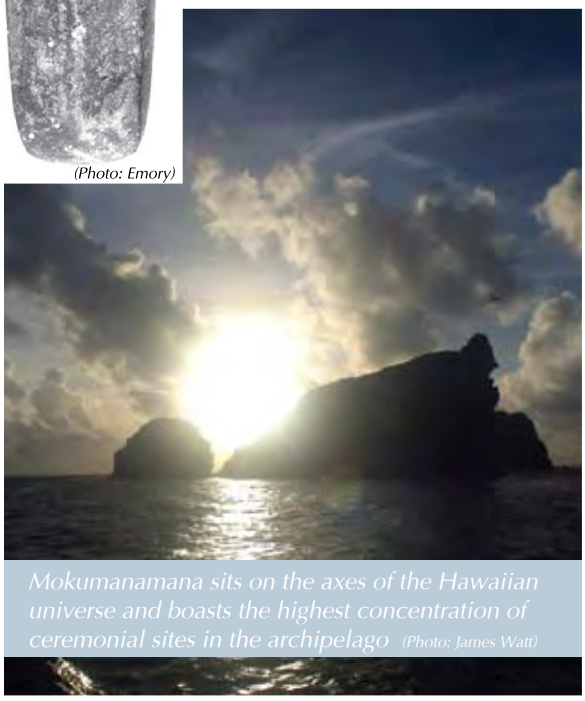
Mokumanamana
(Necker Island)
23°35′N, 164°42′W

Mokumanamana is often translated as a branching or pinnacled island, which is an apt description, but many people who have studied its high density of religious and cultural sites suggest that the repetition of the word "*mana*" (spiritual power) after the word "*moku*" (island) is likely to be even more significant, and related to the 33 shrines on the island that follow the *kua* (spine) of the island, and that the Hawaiian axes of life and death cross directly over Mokumanamana. On Mokumanamana, a total of 52 archaeological sites have been documented, including the 33 ceremonial features, the highest density of religious sites found anywhere in the Hawaiian archipelago.

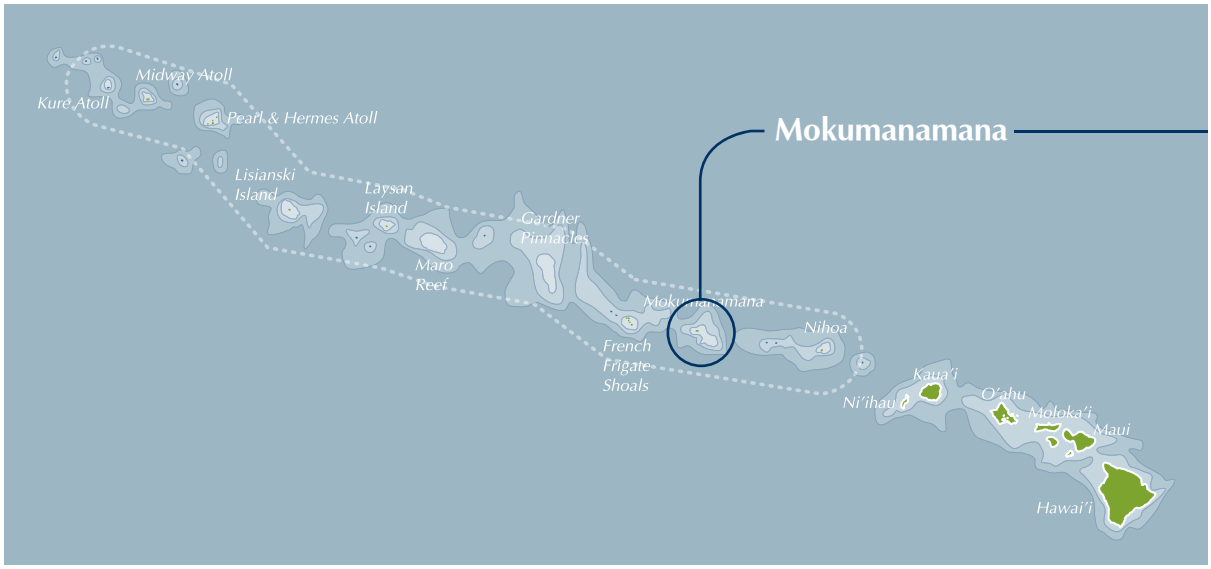
Mokumanamana is a dry volcanic island shaped like a fishhook, and includes approximately 0.19 square kilometers of land. Geologists believe the island, with an estimated age of 10.6 million years, was once the size of O'ahu in the main Hawaiian Islands, and attained a maximum elevation of 1,036 meters (Clague 1996); millennia of erosion have left its highest point, at Summit Hill, now only 84 meters above sea level. Wave action has eroded the remainder of the original island into a submerged shelf approximately 64 kilometers long and 24 kilometers wide.

(Photo: Emory)

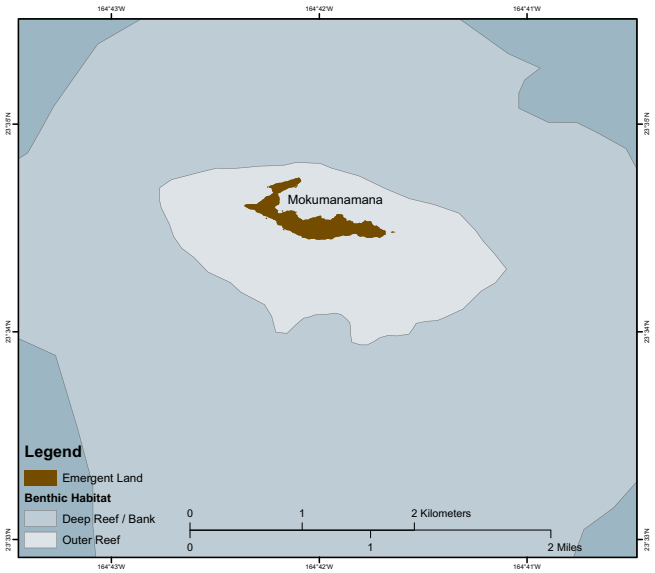

(Photo: US FWS)

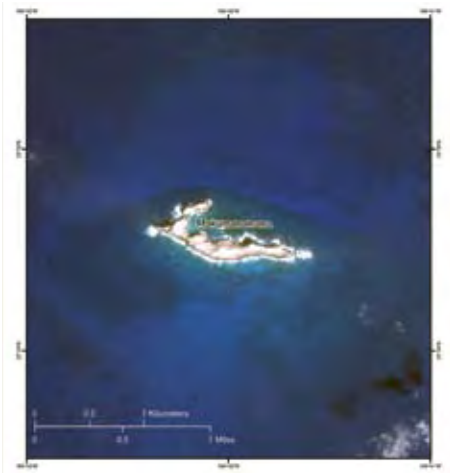

Mokumanamana sits on the axes of the Hawaiian universe and boasts the highest concentration of ceremonial sites in the archipelago (Photo: James Watt)

While this shelf supports more than 1,538 square kilometers of coral reef habitat (which, in turn, support 125 reef fish species and 18 coral species), severe wave action and currents in the exposed areas tend to inhibit coral growth. The bank provides excellent habitat for spiny lobsters (*Panulirus marginatus*) and slipper lobsters



Mokumanamana: benthic habitat, bathymetry and satellite imagery





(*Scyllarides squammosus*), especially in areas of variable intermediate relief (Parrish and Polovina 1994).

Because of its limited size, Mokumanamana supports only five indigenous plant species and no land birds, but does harbor three species of mites, two species of spiders, and 70 species of insects, of which 11 are endemic. These include a large weevil (*Rhycogonus biformis*), two species of seed bugs (*Nysius neckerensis* and *Nysius chenopodii*), and a trapdoor spider (*Nihoa hawaiiensis*) (Evenhuis and Eldredge 2004). Sixteen species of seabirds breed here, including the Black Noddy (*Anous minutus*), which historically was called the Necker Island Tern.

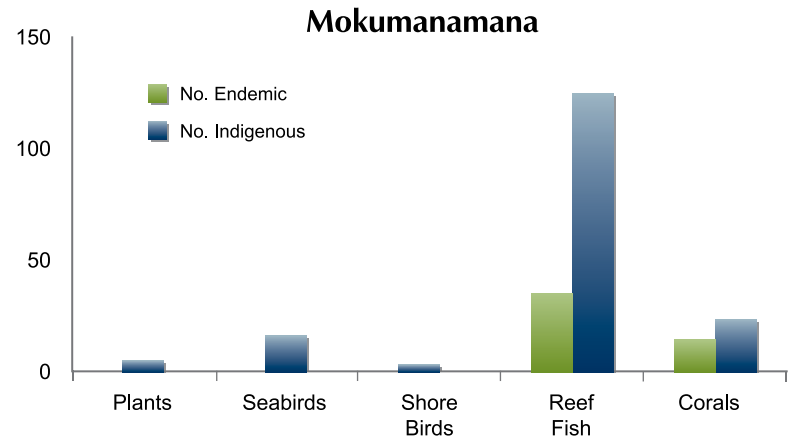


Figure 2.9: *Number of endemic and indigenous species at Mokumanamana*

Mokumanamana also occupies a special place in the Native Hawaiian world-view. It bears 33 *heiau* (ceremonial sites) with standing stones that stretch the length of the island's central spine, suggesting that it was visited by Native Hawaiians for spiritual and navigational purposes. It is believed that Mokumanamana played a central role in Hawaiian ceremonial rites and practices a thousand years ago because it is directly in line (23° 34.5′ N latitude) with the rising and setting of the equinoctial sun along the Tropic of Cancer. Mokumanamana, like Nihoa, shows clear evidence of prehistoric Hawaiian visitation. With its numerous religious sites and no evidence of long-term settlement, the island appears to have been used primarily for worship by visitors from other Hawaiian Islands. Mokumanamana's ceremonial sites, which contain upright stone features, share similarities with sites found on Mauna Loa and Mauna Kea, on Hawai'i Island, and on Haleakalā, on Maui. These ceremonial sites also closely resemble Tahitian temples, possibly establishing a link between this site and early Polynesian culture, as Emory first noted (1928). Moreover, Emory pointed out that the carved basalt human figurines found here exhibit similarities to those found in the Marquesas. Emory considered the sites of Mokumanamana to be a "pure sample of the culture prevailing in Hawai'i before the thirteenth century." Despite its dense concentration of religious sites, Mokumanamana is considered too small and dry to have supported human inhabitants for any length of time. Mokumanamana also is listed on the National Register of Historic Places as an Island Archaeological District.

Mokumanamana's wide banks support large pelagic fauna (Photos: James Watt)

French Frigate Shoals
(Kānemilohaʻa and Mokupāpapa)

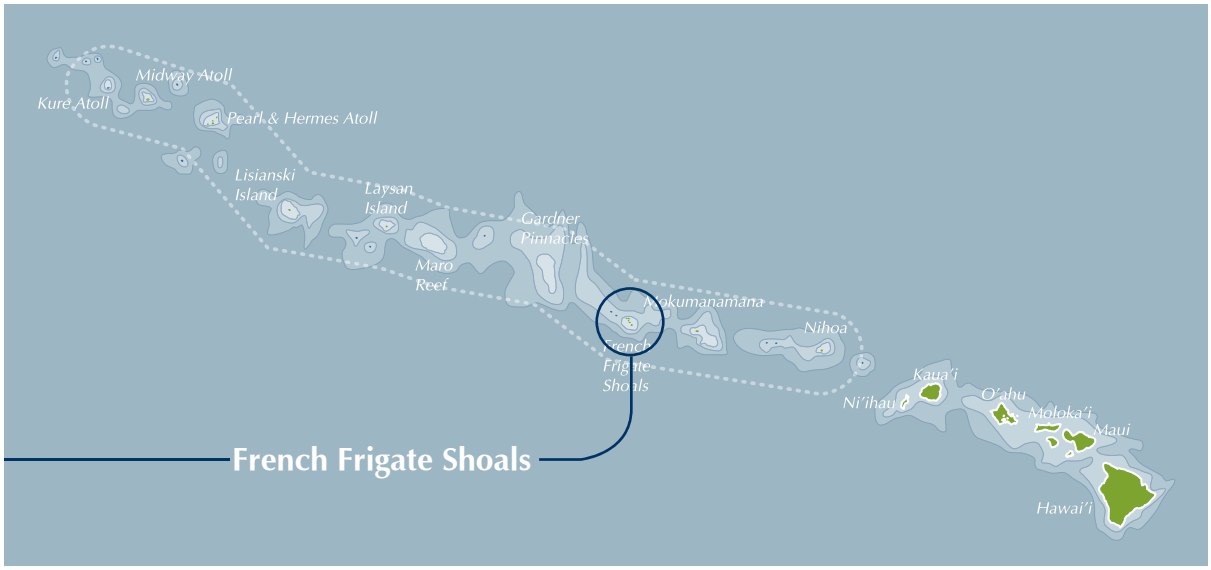
23º145'N, 166º10'W

The first atoll to the northwest of the main Hawaiian Islands, Kānemilohaʻi is also the midpoint of the archipelago and the largest coral reef area in Hawaiʻi. On this low, flat area, the volcano goddess Pele is said to have left one of her brothers, Kānemilohaʻi, as a guardian during her first journey to Hawaiʻi from Kahiki (Tahiti). Pele continued down the archipelago until finally settling in Kīlauea, Hawaiʻi Island, where she is said to reside today (Beckwith 1970).

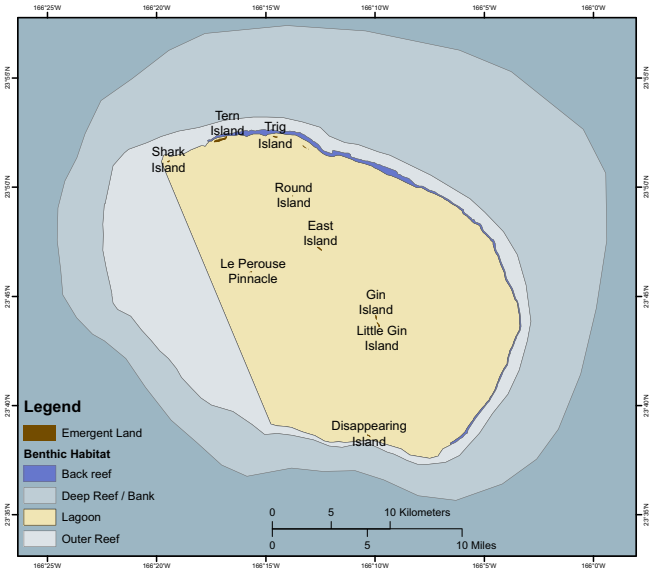
Neither French Frigate Shoals, nor any of the other islands further to the northwest, bear Native Hawaiian archaeological sites, although there is plentiful evidence in oral traditions and historical documents (see Section 2.a) that Native Hawaiians not only knew of the islands and atolls beyond Mokumanamana, but created *moʻolelo* (stories, oral histories) that wove them into their foundational creation stories.

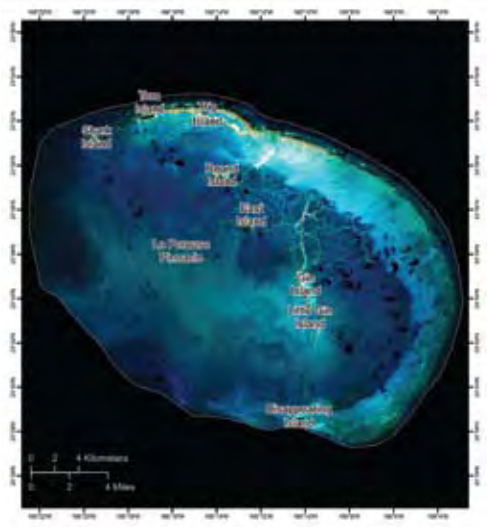
French Frigate Shoals is the largest atoll in the chain, taking the form of an 18-mile-long (28.9 kilometers) crescent. It is estimated to be 12.3 million years old (Clague 1996). The shoals consist of 0.38 square kilometers of total emergent land, surrounded by approximately 931 square kilometers of coral reef habitat, with a combination of sand, rubble, uncolonized hard bottom, and crustose coralline algae in the windward and exposed lagoon areas, and patch and linear coral reefs in more sheltered areas (NOAA 2003b). Tern Island in the atoll is the site of a FWS field station, which occupies a former U.S. Coast Guard Long-Range Aids to Navigation (LORAN) station that closed in 1979.

Pennant Banner Fish, Leopard Blenny, and Great Frigatebird of French Frigate Shoals (Photos: James Watt)



French Frigate Shoals: benthic habitat, bathymetry and satellite imagery





Within Papahānaumokuākea, French Frigate Shoals is the center of diversity for corals (more than 41 species, including the genus Acropora, which is all but absent elsewhere in Hawai'i) and reef fishes (178 species). A relatively deep (25 to 30 meters) coral reef at this atoll has been recently discovered to function as a spawning site for the Giant Trevally, *Caranx ignobilis* (Meyer et al. 2007), an important finding in relation to the population dynamics of top predators.

The lagoon is also unusual in that it contains two exposed volcanic pinnacles representing the last vestiges of the high

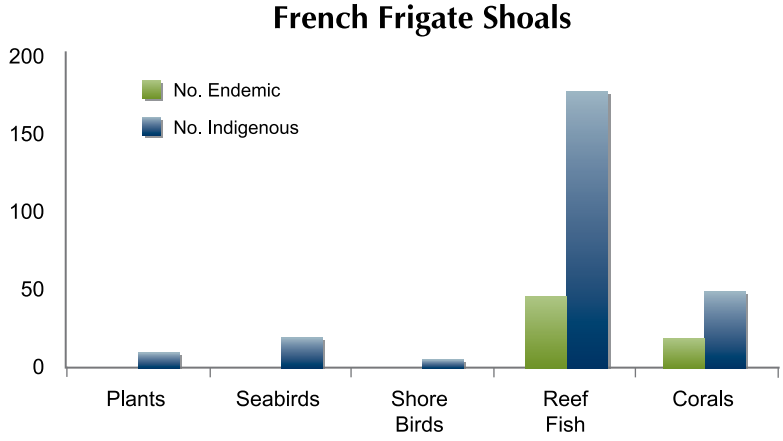


Figure 2.10: *Number of endemic and indigenous species at French Frigate Shoals*

island from which the atoll was derived, as well as nine low, sandy islets. The sand islets are small, and can shift position, disappear and reappear with seasonal changes. In 1923, the *Tanager* Expedition mapped 16 islets (Amerson 1971). In 1963, Whaleskate was a vegetated island of 0.068 square kilometers (Amerson 1971); by 1998, it had completely disappeared (Antonelis et al. 2006). These islets provide crucial habitat for the world's largest breeding colony of the imperiled Hawaiian Monk Seal, which is listed as endangered under the ESA and is also internationally recognized as critically endangered by IUCN. The atoll's sandy islets also provide nesting sites for 90% of the threatened Green Turtle population breeding in the Hawaiian Archipelago. In addition, 19 of Hawai'i's 22 breeding seabird species are found on French Frigate Shoals, giving it the highest species richness of breeding seabirds within Papahānaumokuākea. The dry coastal shrublands of the larger islets within the atoll also support an endemic seed bug (*Nysius frigatensis*), a moth (*Agrotis kerri*), and a mite (*Phauloppia bryani*) (Usinger 1942; Nishida 2002).

Underwater vista of French Frigate Shoals (Photo: James Watt)

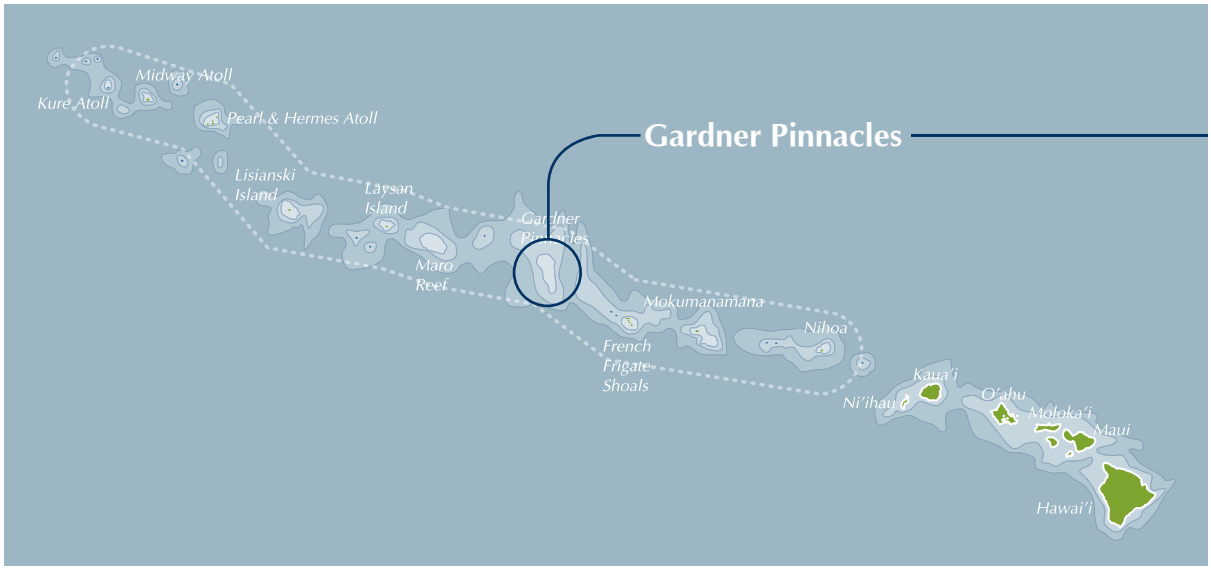
Gardner Pinnacles
(Pūhāhonu)

25°02′N, 168°05′W

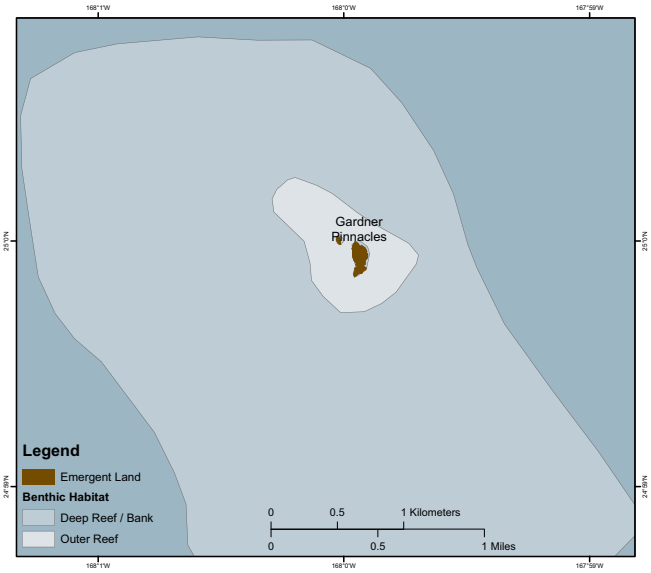
"He pūkoʻa kū no ka moana." ("A large rock standing in the sea.") This traditional Hawaiian saying describes someone who is stubborn, unchangeable, or determined. It is also a suitable description for Pūhāhonu (surfacing of a sea turtle for air/breath), which looks a bit like a turtle's beak coming up for air.

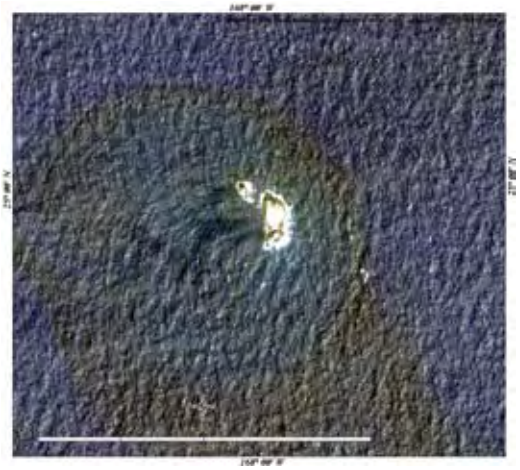
Gardner Pinnacles' two emergent volcanic peaks are estimated to be 15.8 million years in age (Clague 1996). These are the oldest high islands in the Hawaiian chain. In scale, these pinnacles are small, the largest reaching only 55 meters high, with a diameter of approximately 180 meters. Because of their limited size, they support only a single species of land plant (*Portulaca lutea*) and a few terrestrial arthropod species, but they are an excellent, rat-free habitat for seabirds, which roost and breed there (Clapp 1972). Guano from at least 12 subtropical seabird species gives the peaks a "frosted" appearance. Landings and terrestrial surveys rarely take place due to the difficulty of getting ashore under all but the calmest ocean conditions.

Gardner Pinnacles, the oldest high islands in the Hawaiian Archipelago
(Photos: James Watt)



Gardner Pinnacles: benthic habitat, bathymetry and satellite imagery





These remnant volcanic pinnacles are surrounded by approximately 2,425 square kilometers of coral reef habitat, most of which is in waters of greater than 20 meters in depth, harboring 124 reef fish species and 27 species of corals. The intertidal bases of the pinnacles are studded with large populations of ‘opihi, endemic Hawaiian limpets that have been seriously depleted by overharvesting elsewhere in the main Hawaiian Islands.

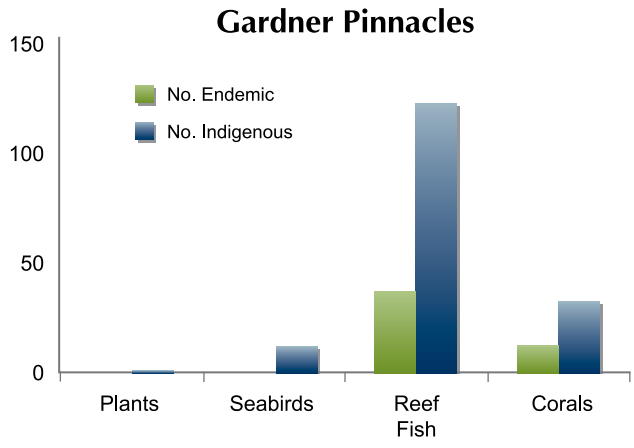
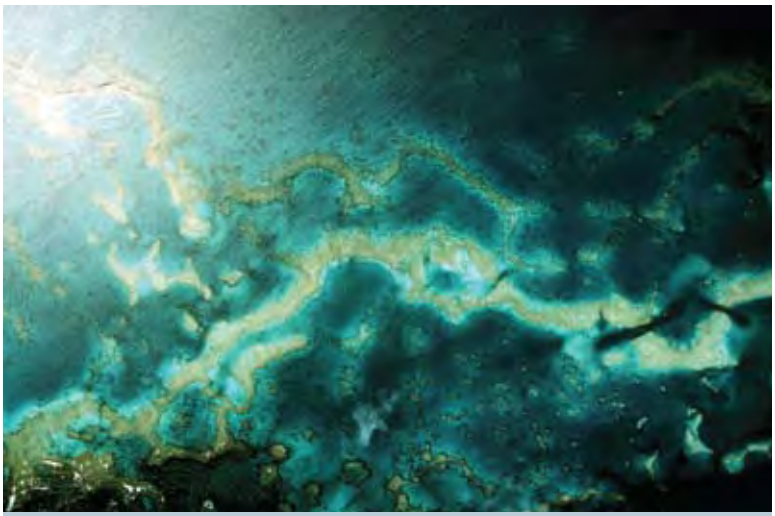


Figure 2.11: *Number of endemic and indigenous species at Gardner Pinnacles*

Maro Reef
(Koʻanakoʻa and Nalukākala)
25°22′N, 170°35′W

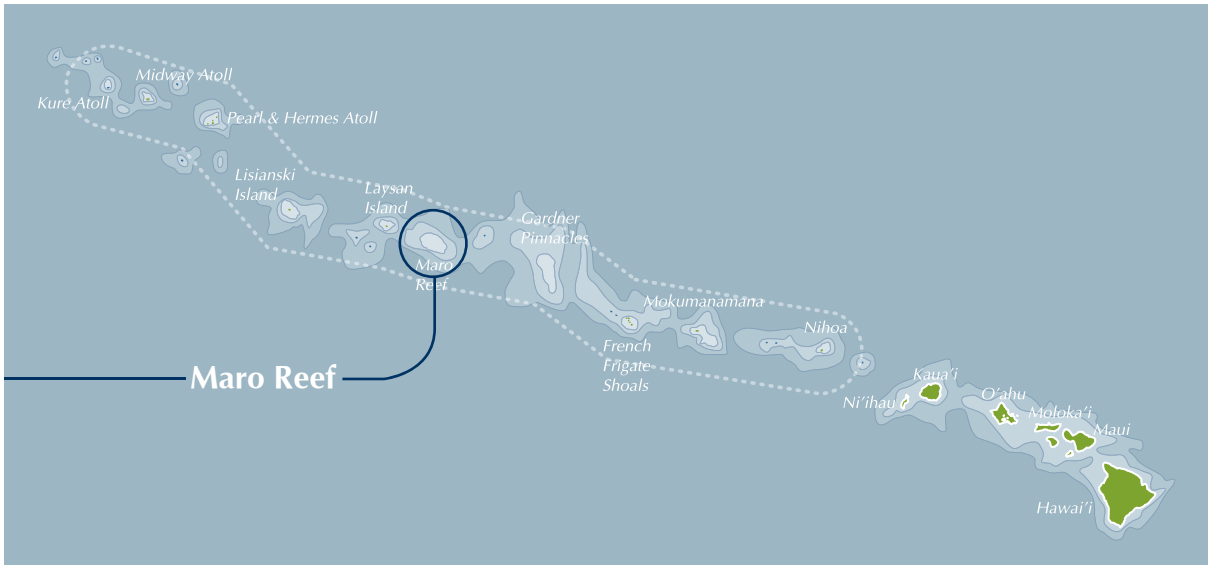

(Photo: James Watt)

The name Koʻanakoʻa literally means the settlement of coral, referring to Maro's expansive coral reefs. Another name for Maro, Nalukākala, describes surf that arrives in combers, such as the surf that froths over shallow reefs.

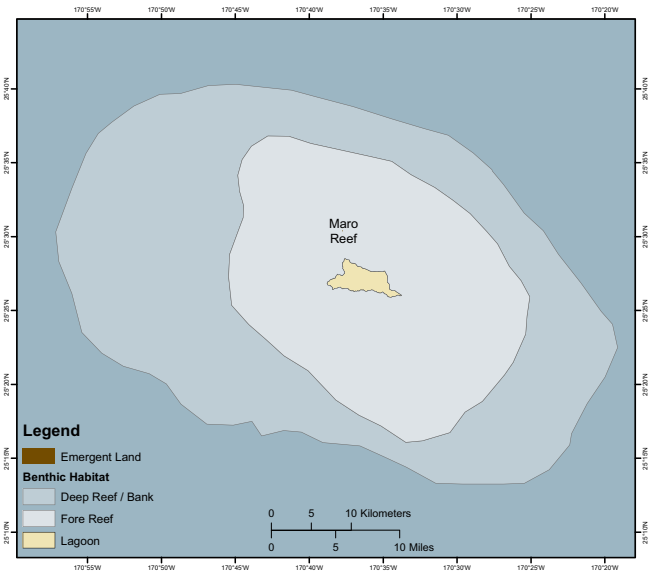

Maro Reef's sealife abounds with traditionally important fish, like the ulua (jacks) (Photo: USFWS)

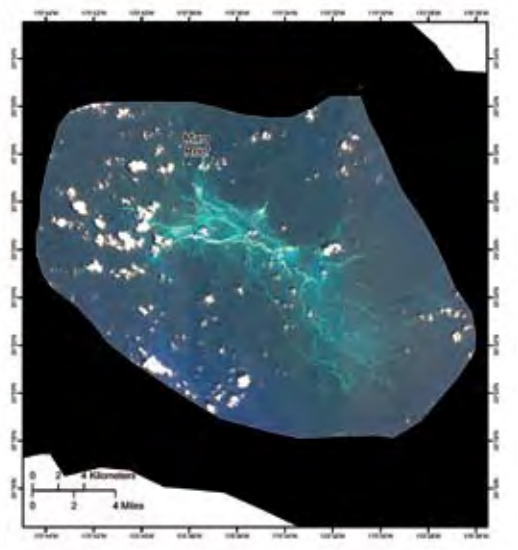
Maro Reef is a submerged open atoll, 19.7 million years old (Clague 1996). At very low tide, only a small coral rubble outcrop of a former island breaks above the surface; as a result, Maro supports no terrestrial biota. The shallow-water reef system, however, is extensive; covering nearly 2,023 square kilometers, Maro is the largest coral reef in Papahānaumokuākea. It is also one of the chain's most ecologically rich shallow-water marine ecosystems, with 64.1% coral cover over the entire area (which is among the highest coral-cover percentage observed in Papahānaumokuākea) (Maragos et al. 2004).

The documented marine biota at Maro Reef includes 37 species of corals and 142 species of reef fish, with endemic fish abundance making up half of all those recorded here. Maro's reefs are intricate and reticulated, forming a complex network of reef crests, patch reefs, and lagoons. Deepwater channels with irregular bottoms occur between these shallow reef structures, but navigation through them is difficult and hazardous. Cover types range from unconsolidated, with 10% or less macroalgae cover, to areas with greater than 10% coral or crustose coralline algae (NOAA 2003). Because the outermost reefs absorb the

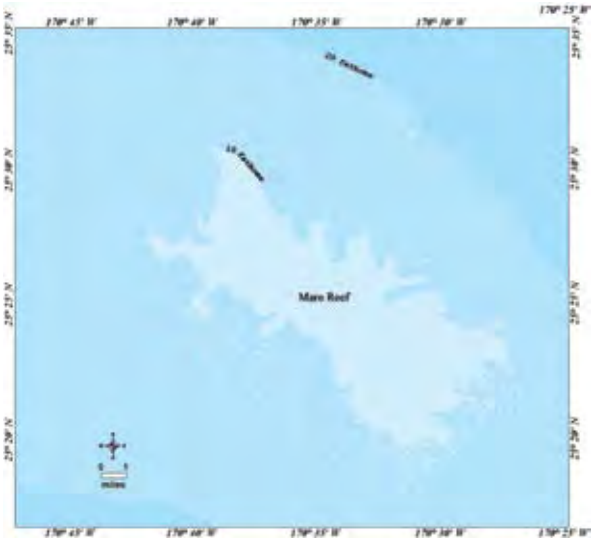


Maro Reef: benthic habitat, bathymetry and satellite imagery





majority of the energy from the open ocean swells, the innermost reticulated reefs and aggregated patch reefs are sheltered and have the characteristics of a true lagoon. This platform's structural complexity means that its shallow reefs are still poorly charted and largely unexplored.



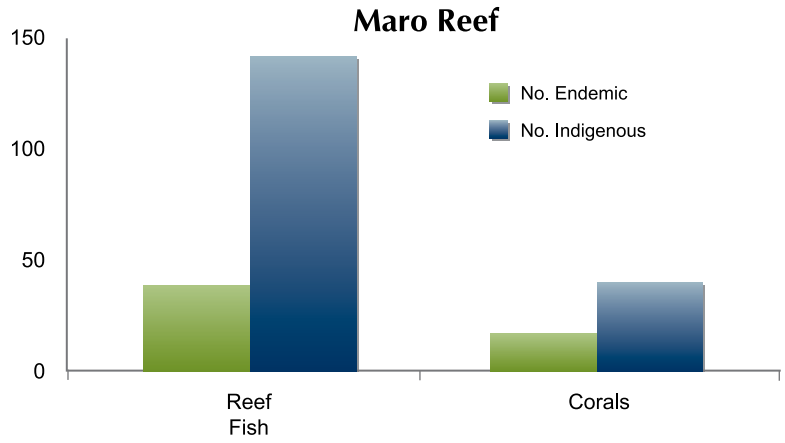


Figure 2.12: *Number of endemic and indigenous species at Maro Reef*

Laysan Island
(Kauō)

25°46′N, 171°45′W

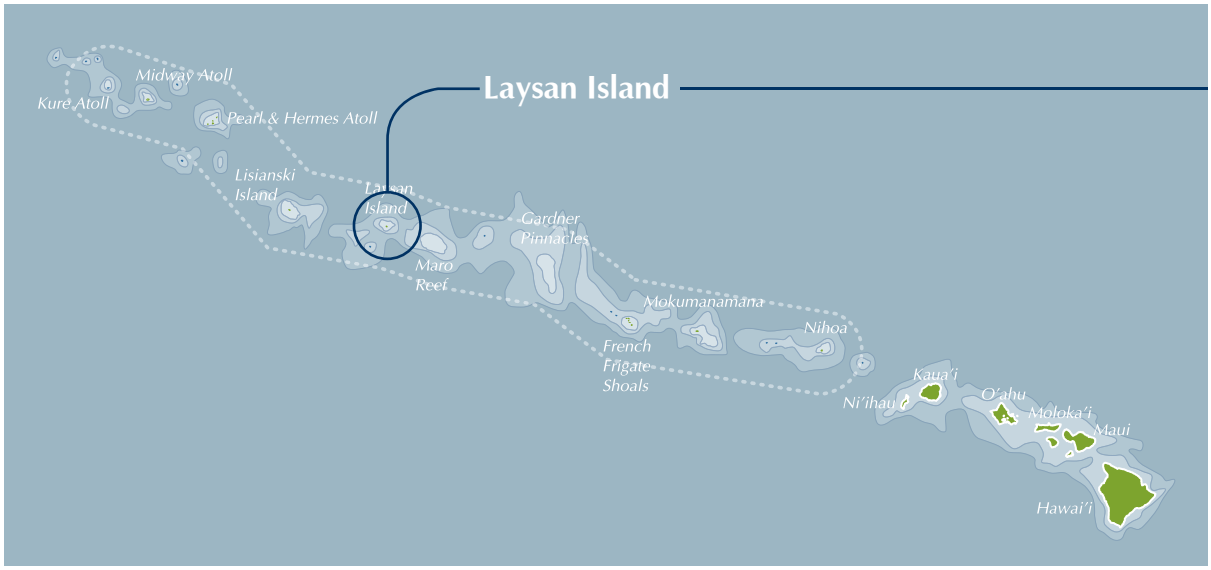
Kauō (egg) describes both the shape of this island, and perhaps also refers to the abundant seabirds that nest here.

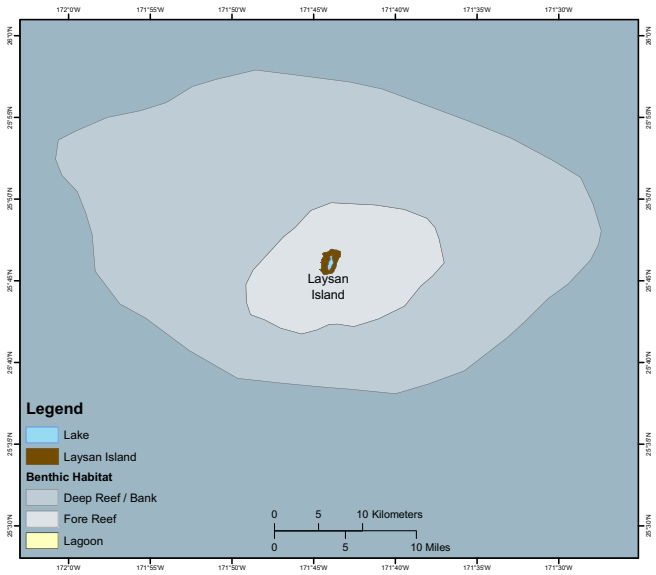
Laysan is a raised atoll, estimated to be 20.7 million years old (Clague 1996), with a maximum elevation of approximately 15 meters above sea level. It represents the second-largest island in Papahānaumokuākea, with a land area of approximately 4.1 square kilometers, surrounded by close to 405 square kilometers of coral reef.

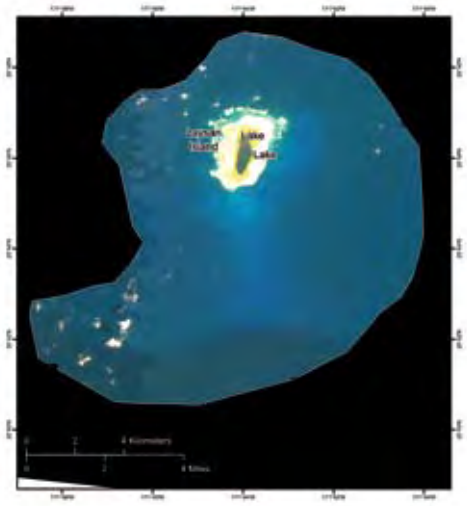
Most of the reef area at Laysan lies in deeper waters, with a small, shallow-water reef area in a bay off the southwest side of the island. The reef system as a whole supports 131 species of reef fishes and 27 species of corals.

Laysan is also home to a semi-permanent FWS field camp to support wildlife monitoring and habitat restoration. The island's ring of sandy dunes surrounds a 40-hectare hypersaline interior lake, a feature unique within the Hawaiian Archipelago and rare within the Pacific as a whole. Because of its average elevation of about 12 meters, Laysan is well vegetated, supporting at least 30 species of flowering plants. The original flora included five endemic subspecies prior to human contact (Athens et al. 2007), many of which were driven to extinction by the misguided introduction of rabbits in 1902 during the guano mining era (Ely and Clapp 1973). The plant community is divided into five different associations arrayed in concentric rings around the interior hypersaline lake: (1) coastal shrubs, (2) interior bunchgrass, (3) vines, (4) interior

Laysan's namesakes, the Laysan Duck and the Laysan Finch, grace this atoll's shores (Photos: James Watt)







Laysan Island: benthic habitat, bathymetry and satellite imagery

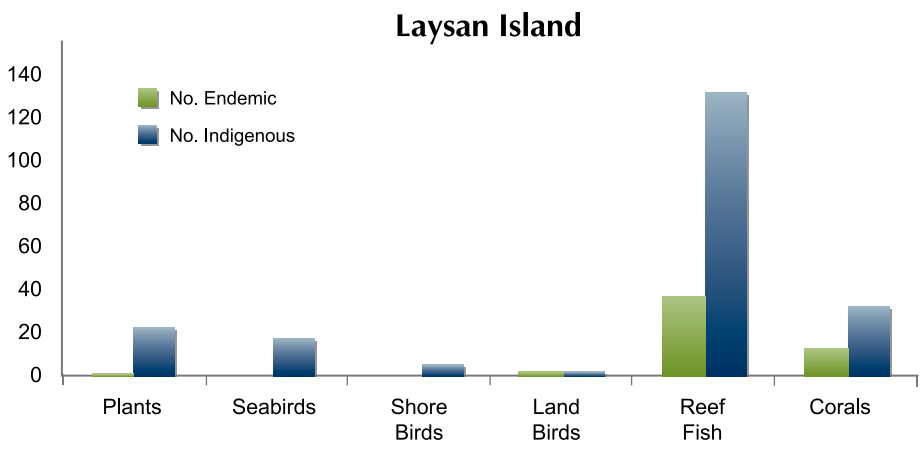


Figure 2.13: *Number of endemic and indigenous species at Laysan Island*

shrubs, and (5) wetland vegetation (Newman 1988). The island also previously harbored five endemic birds, of which two, the Laysan Finch (*Telespiza cantans*) and the Laysan Duck (*Anas laysanensis*), still survive (Pratt et al. 1987). In addition, approximately two million seabirds nest here, including boobies, frigatebirds, terns, shearwaters, noddies, and the world's second-largest Black-footed and Laysan Albatross colonies.

The island also supports a relatively rich arthropod fauna, including a large endemic weevil (*Rhyncogonus bryani*), four endemic moths, an endemic wasp, and three endemic mites. A successful 12-year eradication project to remove the invasive sandbur Cenchrus echinatus, a plant that had displaced native vegetation over 30% of the island, has been completed, and an active ecological restoration project is underway to bring back a number of other plants and animals that were lost after the introduction of rabbits (Morin and Conant 1998).

Aquamarine waters lap the shores of Laysan Island
(Photo: James Watt)

Lisianski Island
(Papa'āpoho)
26°04'N, 173°58'W

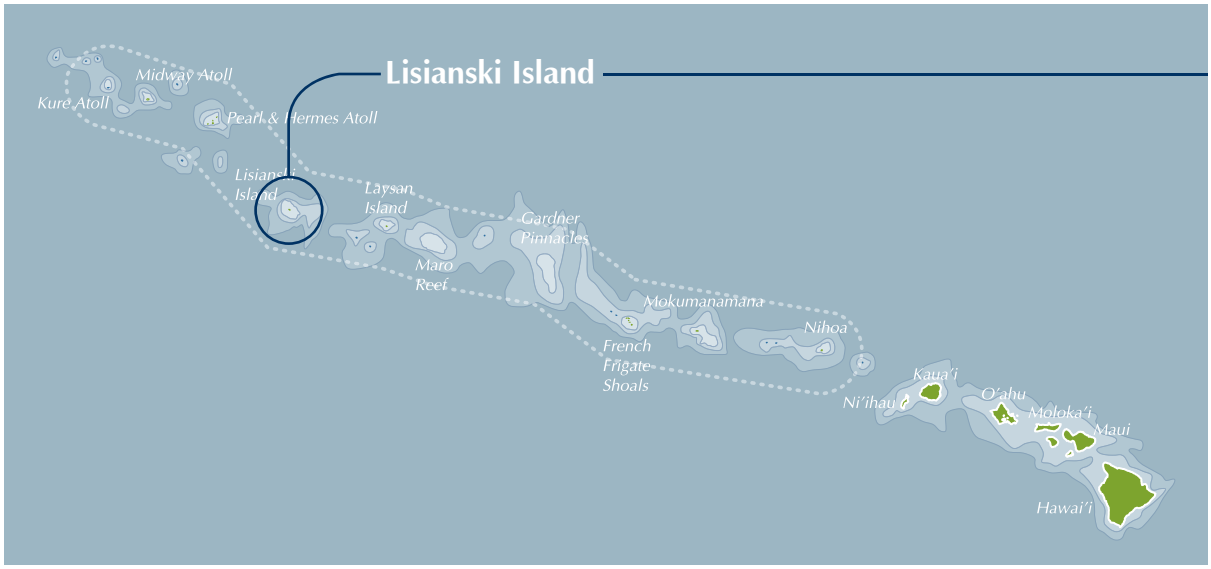
"Papa'āpoho" describes a flat area with a depression or hollow, which is exactly how the raised atoll of Papa'āpoho (or Lisianski) is shaped. This 23.4-million-year-old island (Clague 1996), about 1.9 kilometers across, consists of an elevated rim surrounding a broad central depression, although unlike Laysan it does not enclose an interior saline lake. With approximately 1.6 square kilometers of emergent land, it is the third largest island within Papahānaumokuākea.

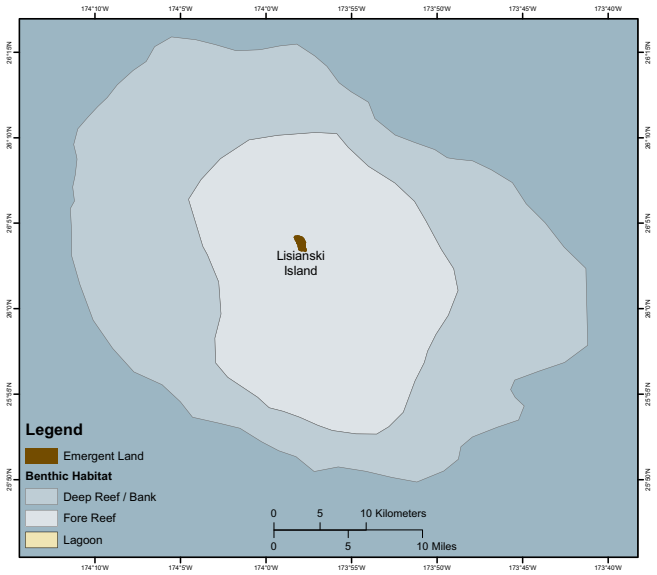
The coral cover on the platform around the island, called Neva Shoal, is extensive, totaling over 1,174 square kilometers with an average of almost 60% cover of the substrate. There are 24 coral species at Lisianski, and 124 species of reef fish, with fish species abundances endemic to the Hawaiian Archipelago making up 58% of all those recorded here.

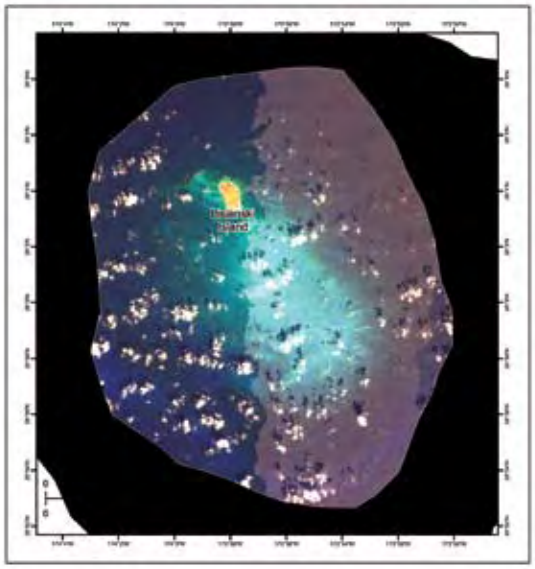
Lisianski suffered ecological perturbations similar to those on Laysan due to guano mining and the release of rabbits in 1903 (Tomich 1986). It supports no endemic land plant or bird species, although it does harbor an endemic seed bug (*Nysius fullawayi flavus*) and an endemic moth (*Helicoverpa minuta*) (Usinger 1942; Nishida 2002). The island also hosts large Bonin Petrel and Sooty Tern colonies, as well as a variety of other seabirds. Lisianski also has the only grove of


(Photo: Rob Shallenberger)


Lisianski Island is a popular breeding ground for Hawaiian Monk Seals (Photo: James Watt)







Lisianski Island: benthic habitat, bathymetry and satellite imagery

Pisonia grandis trees in the entire Hawaiian Archipelago; this tree is dispersed by seabirds and is favored as a nesting site for many tree-nesting seabird species

As part of a biological and paleontological study in the summer of 1990, an archaeologist conducted excavations and investigated the possibility of early Native Hawaiian occupation of Lisianski. Although wave action on the island had scoured any potential evidence of previous human habitation within the shoreline, the archaeologist did find "an unmodified fine-grained basalt flake as well as a polished granite pebble" that were foreign to the island (Ziegler 1990). Study continues on that material evidence, and a more thorough examination of the island has yet to occur.

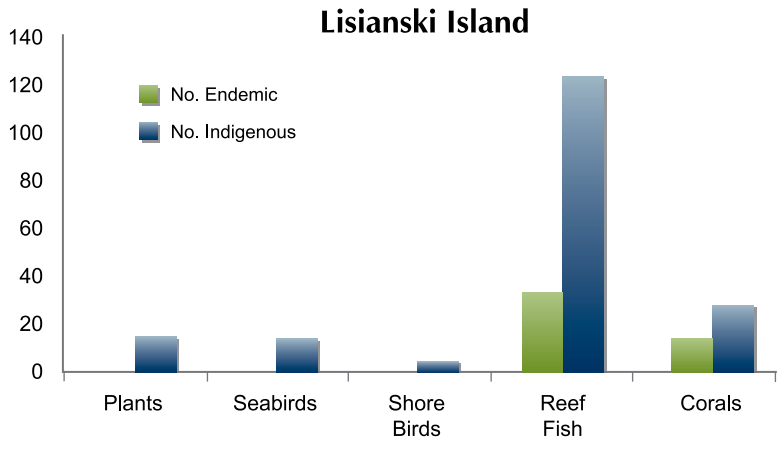


Figure 2.14: *Number of endemic and indigenous species at Lisianski Island*

Pearl & Hermes Atoll
(Holoikauaua)

27°50′N, 175°50′W

(Photo: James Watt)

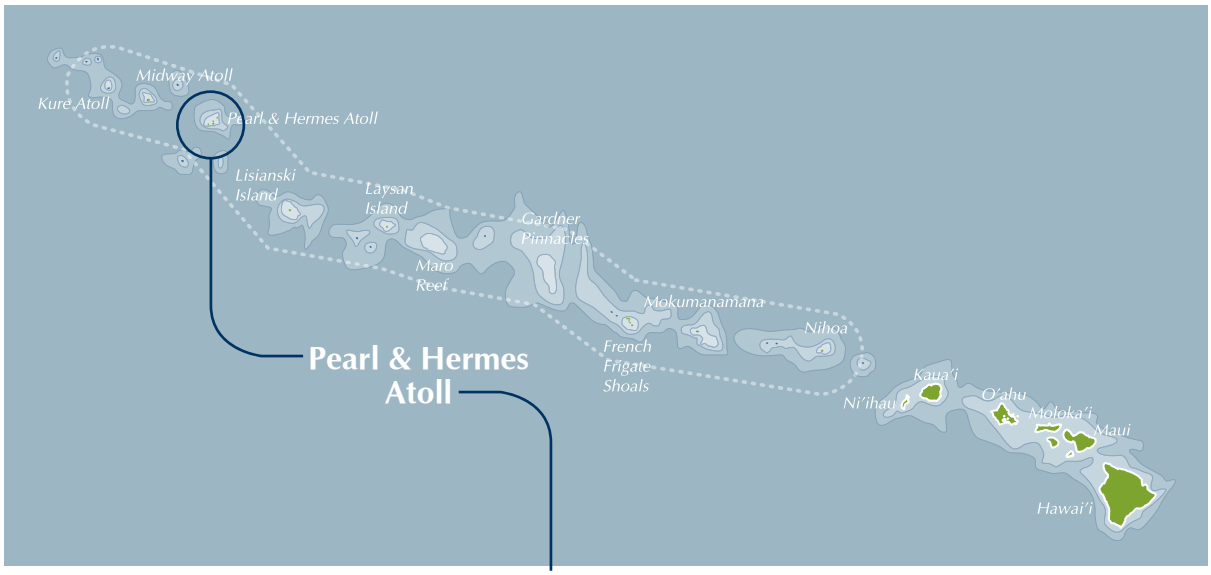
Pearl and Hermes Atoll contains the highest percentage of endemic fish species in the archipelago. Shown here: a school of Hawaiian Squirrelfish (ʻalaʻihi).

(Photo: US FWS)

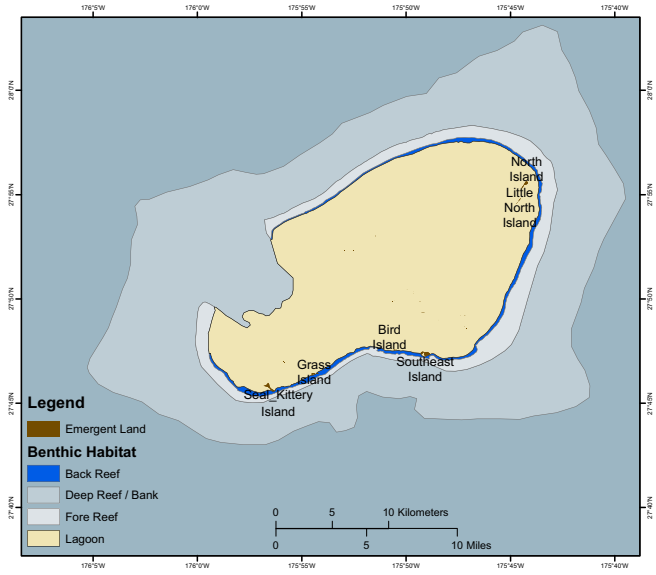
The name Holoikauaua celebrates the Hawaiian Monk Seals that haul out and rest here. Holoikauaua relates to the word ʻīlioholoikauaua, which refers to a seal and literally means "the quadruped running in the rough seas."

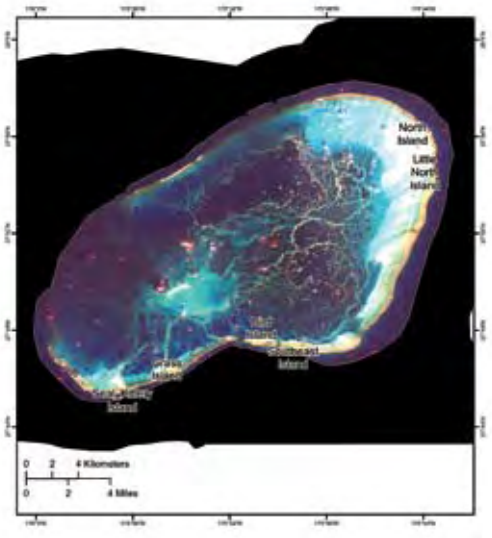
Pearl and Hermes Atoll is a large atoll with several small islets. It covers 0.39 square kilometers of land and is surrounded by over 1,214 square kilometers of coral reef habitat. The atoll has an estimated age of 26.8 million years (Clague 1996) and in its entirety is more than 32 kilometers across and 19.3 kilometers wide, with dunes rising well above sea level. Unlike Lisianski and Laysan to the southeast, Pearl and Hermes Atoll is a true atoll, fringed with shoals, permanent emergent islands, and ephemeral sandy islets. These features provide vital dry land for Monk Seals, Green Turtles, and a multitude of seabirds, with 16 species breeding here. The islets are periodically washed over when winter storms pass through the area.
The atoll boasts the highest rate of reef fish endemism in the Hawaiian Archipelago; endemic species represent 62% of the numerical density of reef fish present at Pearl and Hermes Atoll. Coral species richness is high as well, with 33 species present. The atoll also supports the second largest population of Hawaiian Monk Seals in the archipelago.

The permanent islands with higher dunes also support an endemic subspecies of native seed bug (*Nysius fullawayi* ssp. *infuscatus*) (Usinger 1942). Pearl and Hermes also hosts a small population of endangered Laysan Finches that were translocated here in the 1960s.



Pearl and Hermes Atoll: benthic habitat, bathymetry and satellite imagery





Reef scene from Pearl and Hermes Atoll
(Photo: James Watt)

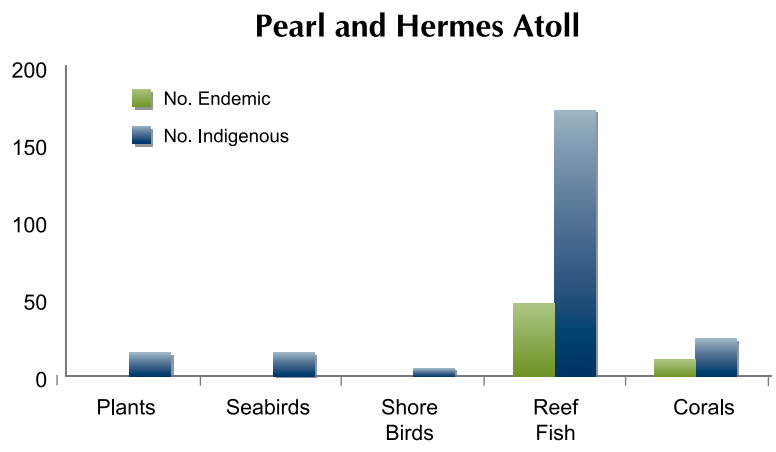


Figure 2.15: *Number of endemic and indigenous species at Pearl & Hermes Atoll*

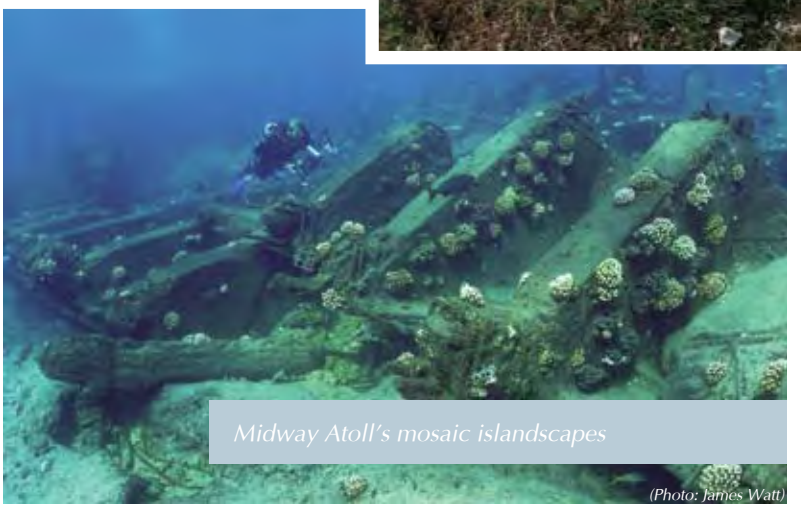
Midway Atoll
(Pihemanu, Brook Island, and Middlebrook Islands)

27°50'N, 175°50'W


(Photo: US FWS)

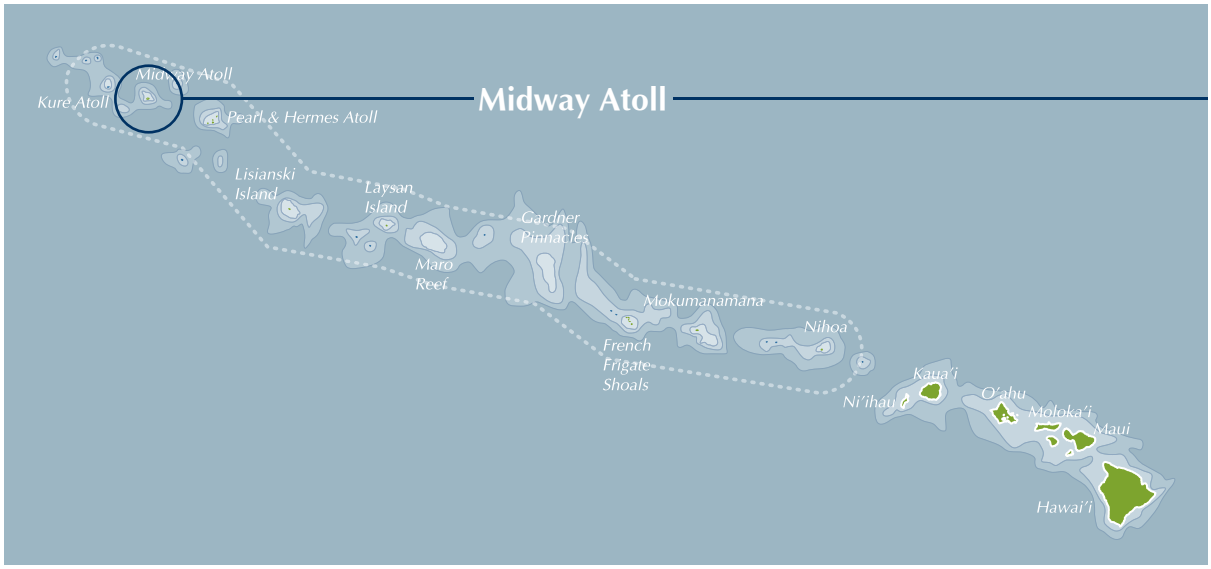
Midway Atoll's Hawaiian name, Pihemanu, evokes the loud din of birds that one hears on this atoll.

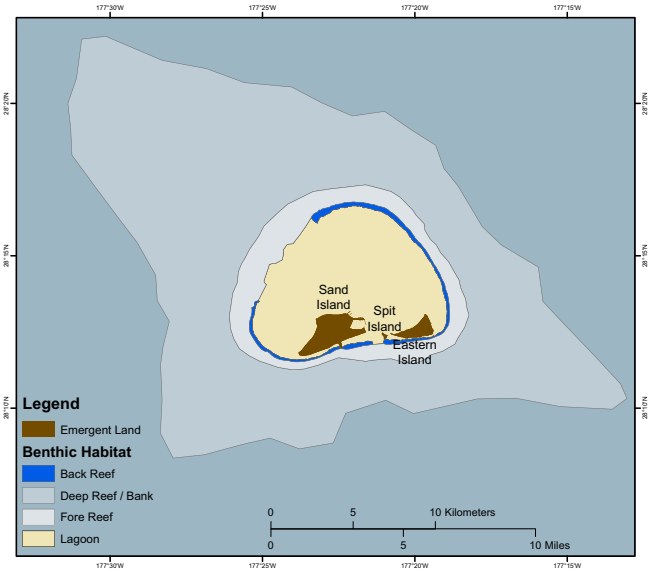
Midway Atoll consists of three sandy islets: Sand (4.56 square kilometers), Eastern (1.36 square kilometers), and Spit (0.05 square kilometers) for a total of 5.97 square kilometers in terrestrial area. These islets lie within a large, elliptical barrier reef measuring approximately 8 kilometers in diameter. The atoll, which is 28.7 million years old (Clague 1996), is surrounded by more than 356 square kilometers of coral reefs. In 1965, the U.S. Geological Survey tested Darwin's theory of atoll formation by drilling test bores at Midway, and hit solid basaltic rock 55 meters beneath Sand Island and 378 meters beneath the northern reef (Ladd et al 1967).

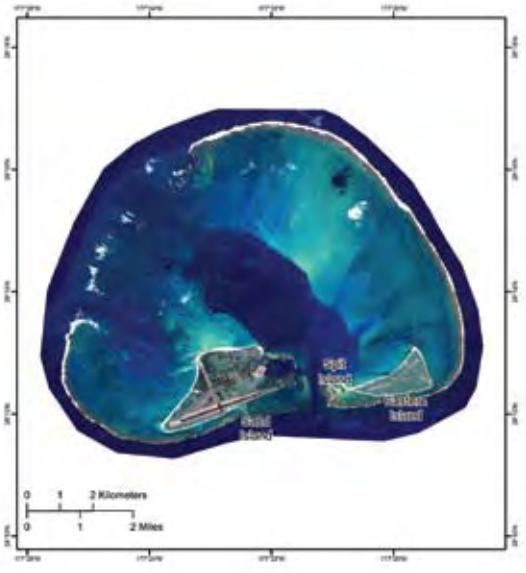

Midway Atoll's mosaic islandscapes
(Photo: James Watt)

Numerous patch reefs dot the sandy-bottomed lagoon, supporting 163 species of reef fishes and 16 species of corals.

Although Midway's native vegetation and entomofauna have been greatly altered by more than a century of human occupation, the island boasts the largest nesting colonies of Laysan and Black-footed Albatrosses in the world, forming the largest combined colony of albatrosses on the planet. The Navy, FWS, and U.S. Department of Agriculture-Wildlife Services (USDA Wildlife Services) successfully eradicated rats from Midway in the 1990s, and







Midway Atoll: benthic habitat, bathymetry and satellite imagery

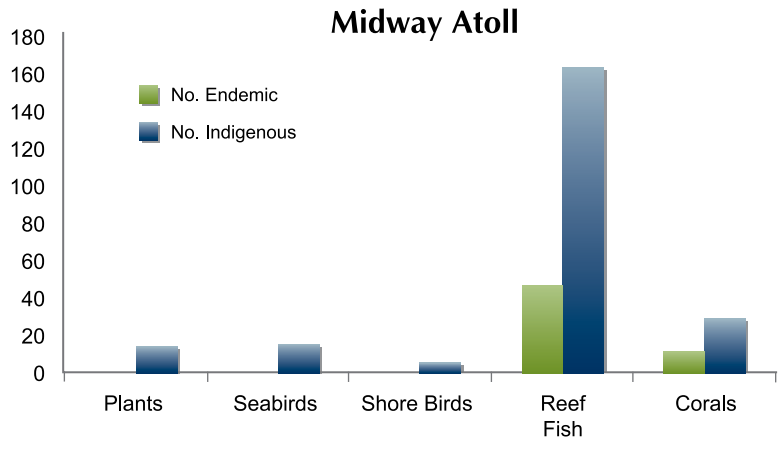
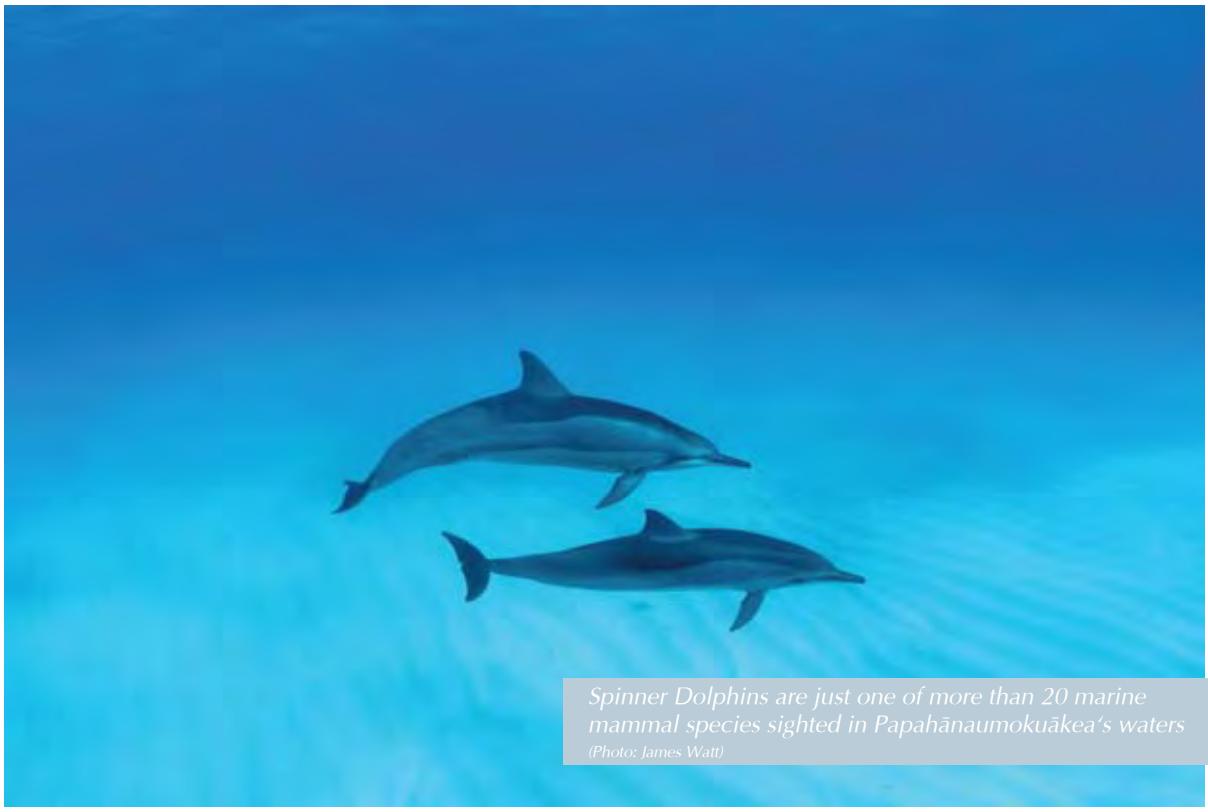


Figure 2.16: *Number of endemic and indigenous species at Midway Atoll*

invasive ironwood trees have been entirely removed from Eastern Island. Currently the cover on all of the islands at Midway is approximately 30% paved or structures, 23% grass and forbs, 18% woodland, 7% sand and bare ground, 22% shrublands, and <0.23% wetland. A translocated population of Laysan Ducks is supported by the introduced insect community at Midway, and a large program of invasive weed eradication and native plant propagation is ongoing.

Canaries introduced in 1910 still breed among the historic buildings that housed the beginning of cable communications across the Pacific in the early 20th century. The atoll and surrounding seas were also the site of a pivotal battle of World War II; Midway was also an active Navy installation during the Cold War.



Spinner Dolphins are just one of more than 20 marine mammal species sighted in Papahānaumokuākea's waters
(Photo: James Watt)

Kure Atoll
(Mokupāpapa and Kānemilohaʻi)

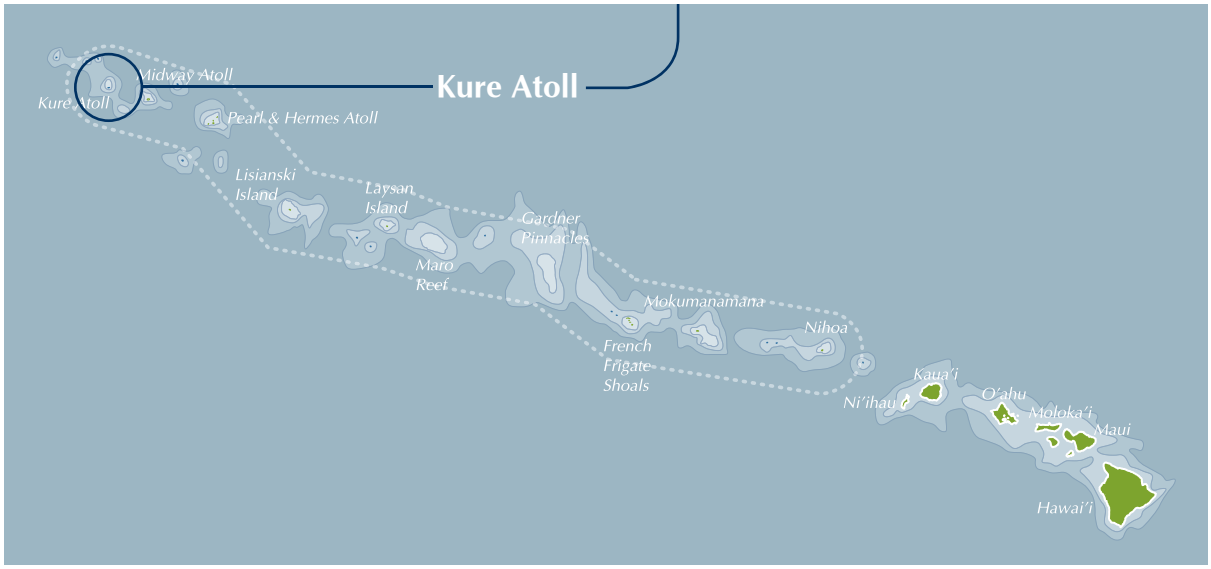
23º03'N, 161º56'W

Mokupāpapa literally means flat island, and the name was ascribed to Kure Atoll by officials of the Hawaiian Kingdom in the 19th century, when King David Kalākaua disbursed an official envoy to the atoll to take "formal possession" of it. At the time, Kure was known in the kingdom as Ocean Island, but Hawaiian Kingdom officials indicated that Kure was "known to ancient Hawaiians, named by them Moku Papapa and recognized as part of the Hawaiian Domain" (Department of Hawaiian and Pacific Studies, Bishop Museum 2002).

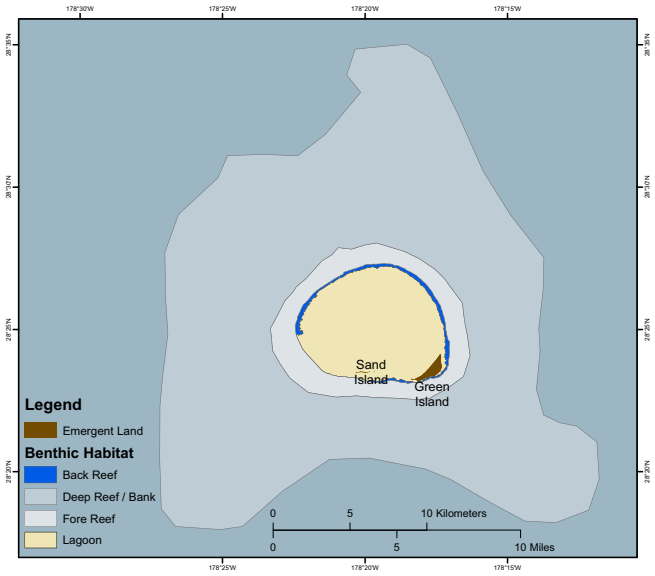
Kure Atoll is the most northwestern island in the Hawaiian chain and occupies a singular position at the "Darwin Point": the northern extent of coral reef development, beyond which coral growth cannot keep pace with the rate of geological subsidence. At present, Kure's coral is still growing slightly faster than the island is subsiding, keeping the atoll above sea level. North of Kure, however, where growth rates are even slower, the drowned Emperor Seamounts foretell the future of Kure and all of the Hawaiian Archipelago. As Kure Atoll continues its slow migration atop the Pacific Plate and moves into slightly cooler waters, it too will cease to maintain sufficient coral growth, and will eventually slip below the surface.

This 29.8 million year old atoll (Clague 1996) is nearly circular, with a reef 10 kilometers in diameter enclosing a lagoon with two islets comprising over 0.89 square kilometers of emergent land, flanked by almost 324 square kilometers of coral reef habitat. The outer reef forms a nearly complete circular barrier around the lagoon, with the exception of passages to the southwest, and the associated marine habitats support 155 species of reef fishes and 27 species of coral. Abundance of fish species endemic to the Hawaiian Archipelago compose 56% of all fish abundance recorded here.

Kure Atoll, the northernmost island in the chain, sits at the Darwin Point (Photo: James Watt)



Kure Atoll: benthic habitat, bathymetry and satellite imagery



Of the two enclosed islets, the only permanent land is found on crescent-shaped Green Island, which rises to 6 meters above sea level and is located near the fringing reef in the southeastern quadrant of the lagoon. In addition to harboring an apparently endemic mite (*Hemicheyletia granula*), the atoll is also an important albatross breeding site, and the lagoon supports a population of Spinner Dolphins (*Stenella longirostris*).

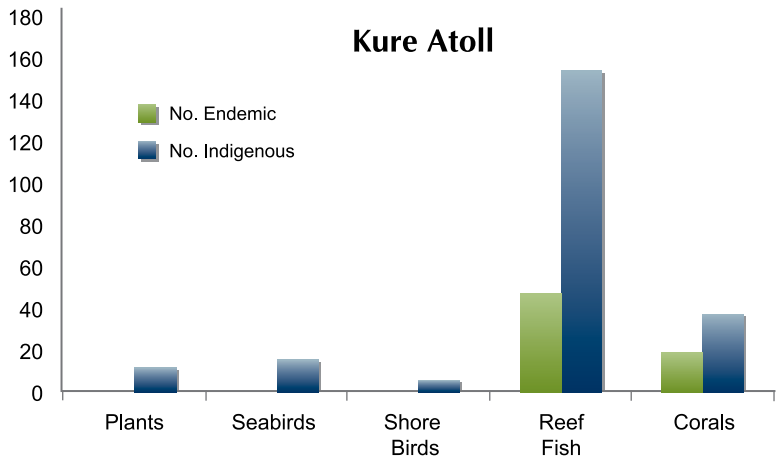
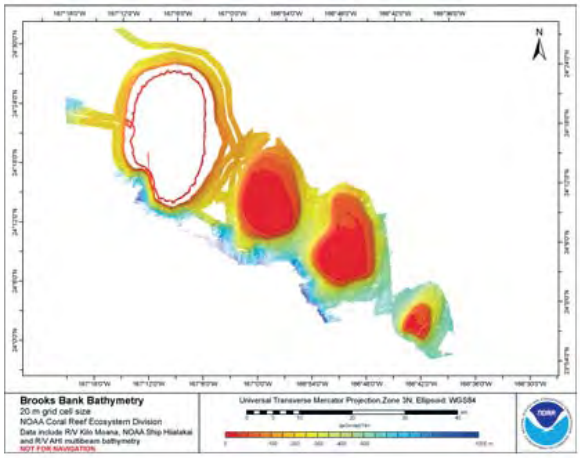


Figure 2.17: *Number of endemic and indigenous species at Kure Atoll*

Banks and Seamounts

Approximately 30 submerged banks lie within Papahānaumokuākea (Miller et al. 2004). Deepwater banks and seamounts are one of Papahānaumokuākea's least-studied environments. Recent use of shipboard mapping technologies, submersibles, and remotely operated vehicles, however, has provided valuable information to characterize the physical and biological components of these ecosystems. Multibeam mapping expeditions have revealed dramatic geologic features, including knife-edge rift zones, seafloor calderas, sea-level terraces, submarine canyons, underwater landslide scars and debris fields, and previously unmapped seamounts (Smith et al. 2003; Smith et al. 2004).



Bathymetric mapping of an underwater seamount


(Photo: Amy Baco-Taylor)

Submersible surveys on South Pioneer Ridge (Pioneer Bank) and at two unnamed seamounts, one east of Laysan Island and the other east of Mokumanamana, have revealed the presence of various substrate types, deposited when these geologic features were at sea level (Smith et al. 2004). In some areas, dense communities of corals (ahermatypic) and sponges at depths approaching 1,000 fathoms (1,830 meters) obscure the underlying substratum. The deepwater marine plants of the area are a mixture of tropical species, species with cold-temperature affinities, and species with disjunctive distributions, suggesting alternative biogeographical patterns and dispersal routes from the main Hawaiian Islands (McDermid and Abbott 2006).

All of these banks provide prime habitats for bottomfish and other associated fish species that are important food sources for Hawaiian Monk Seals. Such banks also support populations of Spiny and Slipper Lobsters, and colonies of precious gold, pink, and black corals that have been heavily disturbed in much of the remainder of the Pacific by the use of physically damaging harvest methods, such as trawling. These deep-living corals are unique in that they reside below the depth where enough light penetrates for photosynthesis, and derive their energy from the capture of plankton and small, organic particles from the water column with their tentacles, rather than relying on the symbiotic dinoflagellate algae, known as zooxanthellae, that virtually all shallow-water reef-building corals harbor in their cells.

A deepwater submersible prepares to dive
(Photo: James Watt)

2.b History and Development of the Property

The human history of Papahānaumokuākea can be divided into two historical periods: Native Hawaiian history before Western contact (~300–1778 AD); and post-contact history (1778–present), including the Hawaiian Renaissance of the late 20th century to the present.

Native Hawaiian History Before Western Contact

The Polynesian settlement of the Pacific Ocean began around 300 BC, when the first seafarers set off from Sāmoa and Tonga to explore the waters around them. Over the next 1,300 years, these voyagers would employ a sophisticated, non-instrument navigational system as they journeyed across the ocean, establishing their presence across a more than 10-million-square-mile triangle of the Pacific. They founded settlements on Aotearoa (New Zealand) in the west, on Rapa Nui (Easter Island) in the east, Hawai'i in the north, and on hundreds of islands in between (Howe 2006). The epic journeys to these far-flung points were the last wave of migration in the Pacific, and represented the apex of Polynesian voyaging and navigation skills.

More than 1,500 years ago, Polynesian voyagers arrived in the Hawaiian Archipelago, the Polynesian Triangle's northernmost point, where they found islands filled with abundant natural resources. Over the next millennia, Native Hawaiians, the descendents of the first Polynesians who discovered Hawai'i, made the islands into a landscape that sustained both man and nature, creating agricultural terraces along the hillsides and extensive water paddies for their staple food, *kalo* (taro), in the valleys, constructing fishponds over the shallow reefs, and managing sustainable nearshore and pelagic fisheries.

While the majority of the populace lived in the main Hawaiian Islands (the eight volcanic islands from Hawai'i Island in the south to Ni'ihau in the north), the islands and atolls of Papahānaumokuākea were both considered deeply sacred and visited regularly for cultural and subsistence resources. On Nihoa, Native Hawaiians established permanent and semi-permanent habitation sites, agricultural terraces, and burial grounds. It is believed that Hawaiians on Nihoa fished, raised crops, and staged the construction of sacred ritual sites on Mokumanamana. *Kūpuna* (elders) on Kaua'i and Ni'ihau say that their families visited Nihoa and Mokumanamana for weeks to months at a time, throughout the period of Western Contact, although after the United States' annexation of Hawai'i, much of this happened in secret (Maly 2003).

Papahānaumokuākea as a primary training ground for apprentice navigators, and Nihoa, Mokumanamana and French Frigate Shoals served as resource gathering places, as evidenced in Native Hawaiian oral histories and the journals of Captain James Cook. One of Captain Cook's crewmembers, David Samwell, reported that while near Ni'ihau, they planned to "set sail in the morning for Mokoopapappa [sic], a small, low Island uninhabited which the Indians tell us lies to the Westward of us at a distance of a day's sail from here, where there are plenty of Turtle" (Beaglehole 1967).

Papahānaumokuākea in the Post-Contact Era

When Europeans arrived in the Hawaiian Archipelago in the late 18th century, they found a thriving society of between 250,000 and one million Native Hawaiians (Stannard 1989), with a distinct culture and complex social and religious systems. Papahānaumokuākea was very much a part of Native Hawaiian geography and life; Captain James Cook's crews encountered a Native Hawaiian canoe returning from the Northwest Hawaiian Islands with a vessel full of seabirds and turtles. Some of the highest-ranking Native Hawaiian chiefs of the 19th century, including Queen Ka'ahumanu, King Kamehameha IV, King David Kalākaua and Queen Lydia Lili'uokalani, visited Nihoa to reconnect with the island.

In 1898, five years after Queen Lili'uokalani was overthrown by the self-

proclaimed Provisional Government of Hawai'i, the archipelago (which included Papahānaumokuākea) was collectively acquired by the United States through a domestic resolution called the "Newlands Resolution."

Through *mele* (song), *moʻolelo* (story), *oli* (chant), *hula* (dance), *moʻokūʻauhau* (genealogy) and archaeological resources, Hawaiians maintained continuous ties to the islands to the northwest. Using these cultural resources, Native Hawaiians recount the travels of seafaring ancestors between Papahānaumokuākea and the main Hawaiian Islands. Archival resources written in the Hawaiian language have played an important role in providing this documentation, through a large body of information published more than a hundred years ago in local newspapers (e.g., Kaunamano 1862; Manu 1899; Wise 1924). More recent ethnological studies have highlighted the continuity of Native Hawaiian traditional practices and histories in the Northwestern Hawaiian Islands. Only a fraction of these have been recorded, and many more exist only in memories and life histories.

Starting in the 1960s and 1970s, a scant lifetime after American annexation, Native Hawaiians launched a movement of resistance to Western assimilation by looking to their *kūpuna* (revered elders and ancestors) and other sources to reclaim their language, music, *hula* (traditional Hawaiian dance) and history. Part of this renaissance included the strengthening of bonds with sacred places and a return of traditional skills and knowledge to the center of cultural life; Papahānaumokuākea has played a pivotal role in both of these movements.

Native Hawaiians and Papahānaumokuākea in the Modern Era

The *ea* (sovereignty and life), as well as the *kuleana* (responsibility), for the entire Hawaiian archipelago continues to exist in the central beliefs of many present-day Native Hawaiians—a perspective formally recognized by the U.S. Apology Resolution (U.S. Public Law 103-150), a joint resolution of Congress signed by President Clinton in 1993. The Apology Resolution states, in part, that "The Congress … apologizes to Native Hawaiians on behalf of the people of the United States for the overthrow of the Kingdom of Hawaii on January 17, 1893 with the participation of agents and citizens of the United States, and the deprivation of the rights of Native Hawaiians to self-determination;…" (see Appendix D for full text of the Apology Resolution).

In 1997, an organization called Hui Mālama I Nā Kūpuna O Hawai'i Nei repatriated sets of human remains to Nihoa that had been collected by archaeologists in the 1924–1925 Bishop Museum *Tanager* Expeditions (Ayau and Tengan 2002). Hui Mālama seeks to return the *mana* (life-force, spirit, and power) of the *kūpuna* (ancestors) to existing and future Native Hawaiian life.

Aboard the Hōkūleʻa, Hawaiian wayfinders navigate this seascape as their ancestors did 2,000 years ago
(Photo: Naʻalehu Anthony)

The Hōkūleʻa, a modern-day replica of ancient double hulled sailing canoes, approaches Nihoa in 2005 (Photo: Naʻalehu Anthony)

This repatriation set the stage for a reawakened relationship between Native Hawaiians and the NWHI in 2000, when President Clinton signed the Executive Orders creating the NWHI Coral Reef Ecosystem Reserve. With new channels of access possible, the cultural group Nā Kupuʻeu Paemoku traveled to Nihoa on the traditional double-hulled voyaging canoe *Hōkūleʻa* in 2003 to conduct traditional ceremonies. The following year, in 2004, *Hōkūleʻa* sailed more than 1,200 miles (1,931 km) to the most distant end of the archipelago, visiting Kure Atoll as part of a statewide educational initiative called "Navigating Change." Concurrently, the *ʻOhana Waʻa* (literally, family of canoes – an organization representing the Hawaiian voyaging community and their seven canoes, inclusive of those currently sailing and those under construction) recognized that the ancient sailing route between Kauaʻi and Nihoa was still an appropriate training route for the next generation of Native Hawaiians interested in reestablishing the traditional system of navigation practiced by their ancestors.

In 2005, Nā Kupuʻeu Paemoku again sailed to Papahānaumokuākea, this time to Mokumanamana, where they conducted protocol ceremonies on the summer solstice. During the 2007 solstice, as a follow-up to the 2005 access, the Hawaiian cultural group Haʻae Wale Hānauna Lolo ventured to Nihoa and Mokumanamana to conduct its own cultural research initiatives and to better understand the relationships between the *wahi kūpuna* (ancestral places) and the northern pathway-of-the-sun.

i eline f Event :
Official Hawaiian presence in NWHI following Western Contact

1822

Queen Kaʻahumanu travels to Nihoa and claims it under the Kamehameha Monarchy.

1856

Nihoa is reaffirmed as part of the existing territory of Hawaiʻi by authority of Alexander Liholiho, Kamehameha IV.

1857

King Kamehameha IV voyages to Nihoa. He instructs Captain Paty on the *Manuokawai* to verify the existence of other lands in the northwest. Paty travels to Nihoa, Mokumanamana, Gardner, Laysan, Lisianski, and Pearl and Hermes.

1857

The islands of Laysan and Lisianski are declared as new territory under the domain of the Kingdom.

1885

Princess Lydia Liliʻuokalani and a scientific expedition visits Nihoa on the ship *Iwalani*.

1886

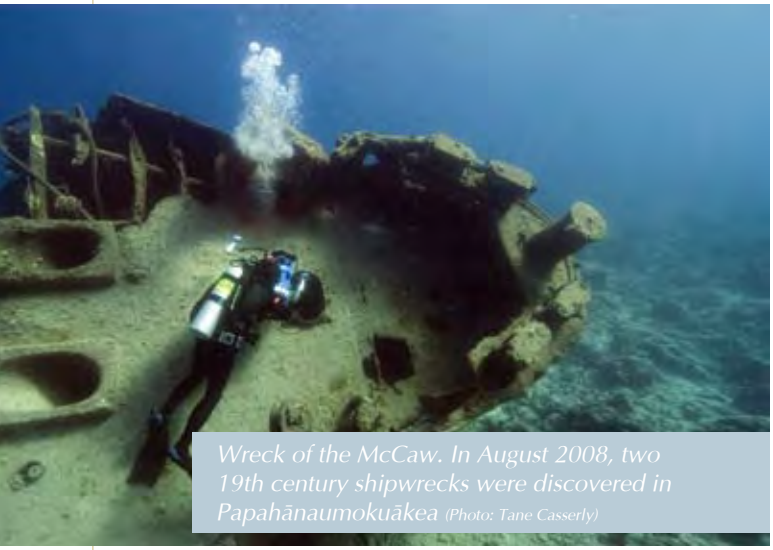
King David Kalākaua, through Special Commissioner Colonel James Harbottle-Boyd, claims possession of Kure Atoll (Ocean Island).

1893

The Hawaiian government is overthrown by the Provisional government, with the assistance of Minister John L. Stevens and the U. S. military.

1898

The archipelago, inclusive of the Northwestern Hawaiian Islands, are collectively ceded to the United States through a domestic resolution, called the "New Lands Resolution."



Wreck of the McCaw. In August 2008, two 19th century shipwrecks were discovered in Papahānaumokuākea (Photo: Tane Casserly)

Reestablishing ceremonies and practices in Papahānaumokuākea "complete[s] the cycles we have in all of our stories," says Pualani Kanaka'ole Kanahele, a *kumu* (teacher of cultural practices) and leader of Ha'ae Wale Hānauna Lolo.

Maritime Heritage and Maritime Archaeology

The Hawaiian Islands have a rich maritime history; specific remnants of this are preserved in Papahānaumokuākea Marine National Monument. Following Captain James Cook's first encounter with Hawai'i, the presence of European and American vessels at the main Hawaiian Islands slowly began to increase, and early European voyages of discovery included several encounters with the Northwestern Hawaiian Islands. The French navigator Jean François de Galaup, Comte de La Pérouse (Cook's contemporary) made brief surveys of Mokumanamana and French Frigate Shoals in 1787. Russian navigators such as Urey Lisianski also conducted surveying expeditions in this portion of the Pacific in 1805. In the mid 19th century, American surveying efforts by N.C. Brooks (1859), Lieutenant John Brooke (1859), and Captain William Reynolds (1867) added to the growing body of knowledge on the area.

Western whalers, in their early search for productive areas, encountered the low and uncharted atolls on their passages westward from Honolulu and Lahaina, Maui to the whale-rich seas off Japan, the Japan Grounds, which extended from Japan eastward to Kure Atoll (Richards 1999). Several of the islands, therefore, received their Western names from the early landings and/or shipwrecks of these Pacific whalers. Midway was originally sighted by Captain Daggett of the New Bedford whaler *Oscar* in 1839. Laysan was reportedly discovered by the American whaling ship *Lyra* prior to 1828. Pearl and Hermes Reef is named for the twin wrecks of the British whalers *Pearl* and *Hermes* in 1822. Gardner Pinnacles was named by Captain Allen on the Nantucket whaler *Maro* in 1820, the same year the ship came across Maro Reef. Whaling, which decimated marine mammal populations worldwide, carried with it major ramifications in terms of oceanic discovery, cultural contact, economic development, and political expansion.

Seafaring activity in the Hawaiian Islands quickly became culturally mixed. Hawaiian chiefs purchased and operated numerous schooners and brigs, and Native Hawaiians found employment on a wide range of sailing vessels. Many were well aware of the evolving whaling industry, and were recruited and served on board whaling ships. It is estimated that 500 Hawaiian sailors shipped out annually onboard Western whalers during the peak of the Pacific whaling era, between 1840 and 1860 (Chappell 1997: 180).

There are ten known whaling shipwrecks in the Northwestern Hawaiian Islands (see Appendix E). Five of these shipwreck sites (*Pearl* 1822, *Hermes* 1822, *Parker* 1842, *Gledstones* 1837, and an unidentified 19th century whaler) have been documented by field survey. These are the earliest wrecks yet found in Hawaiian waters, and provide a rare archaeological glimpse into this period of whaling in the Pacific. Whaling shipwrecks are an example of the international importance of this region in the early 19th century, when whale oil fueled the cities of the Industrial Era, and drove ships halfway around the globe in search of this invaluable resource.

The U.S. Guano Act of 1856, which enabled commercial claims to many remote and

uninhabited islands in the Pacific, heralded the hunt for mineral resources. Several of the Northwestern Hawaiian Islands were leased by private companies for guano extraction. The local development of facilities supporting these activities was most significant on Laysan Island, where a small community existed from the 1890s through the early 20th century. Guano works among the atolls necessitated supply ships and passage for contract laborers, increasing local vessel traffic in the region.

The U.S. Navy's interest in Midway destined the atoll to play a distinctive role in history. Captain William Reynolds of the USS *Lackawanna* took formal possession for the U.S. in August 1867, making Midway Atoll the first islands annexed beyond the West Coast. The harbor had been erroneously described as similar to Honolulu, both roomy and safe, and the low Sand and Eastern Islands as "productive for agriculture." These were unrealistic claims at best, but early in the age of steam navigation, the U.S. sought transpacific coaling stations and the establishment of commercial links to East Asia. The effort was not without a cost, as the USS *Saginaw*, a Civil War–era gunboat, was lost at nearby Kure Atoll in 1870. The Midway Islands were the first fruits of Secretary of State William Seward's expansionist policies, and grew in political importance during the American period.

The islands were not the only focus of activity. Commercial fishing in the waters surrounding the islands of Papahānaumokuākea began with the arrival of large sailing vessels that hailed from ports around the world. These vessels left the reefs and shoals with cargoes of shark meat, fins and oil, turtle shells and oil, and sea cucumbers. Commercial harvesting of tuna, bottomfish, lobsters, and other marine animals in the region continued through the 20th century.

Throughout this period, Papahānaumokuākea presented significant hazards to shipping because of the low, inconspicuous nature of the islands, which makes their shoals and reefs difficult to detect from the water,

Cavernous cauldrons indicate this shipwreck was likely a historic whaling vessel (Photo: Tane Casserly)

and their often incorrect location on marine charts. This, combined with the increase in commercial activities over time, has made Papahānaumokuākea into a veritable graveyard of maritime disaster in the 19th century. Fortunately, the frequent proximity of sandy "desert" islands, not barren at all but rich in terms of marine mammals, seabirds, and ocean resources, granted castaways the opportunity for survival. Many tales of shipwreck in these islands present similar themes: unexpected groundings on low coral atolls, difficult survival on turtles, seals, fish and bird eggs, and construction of craft from debris for rescue voyages eastwards back to the main Hawaiian Islands. Also, not surprisingly, several commercial outfits in the main Hawaiian Islands sent local schooners on "wrecking" or salvage cruises to the northwestern atolls.

Currently, 60 known shipwreck sites are known in Papahānaumokuākea, the earliest dating back to 1822. Combined with known aircraft losses, there are a total of 127 potential maritime resource sites, giving Papahānaumokuākea a significant and basically undisturbed marine archaeological legacy. These submerged historical resource sites are international in scope and represent a cross-section of the many cultures that engaged in Pacific seafaring history. Twenty-five of these sites have been confirmed by field survey. Because maritime archaeology is such a new field of research in Papahānaumokuākea, discoveries of new shipwreck sites in this region occur frequently. Each new survey of the area yields further important information to add to the inventory and assessment of shipwreck sites in this area.

Fertile grounds for maritime archaeology (Photo: James Watt)

In fall 2002, for example, a multi-agency research expedition that included a small team of maritime archaeologists conducted the first systematic survey for maritime cultural resources in the distant portion of the archipelago. The study area encompassed the islands and atolls stretching from Nihoa in the south to Kure in the north. In 2003, maritime archaeologists conducted a survey of selected sites at Kure and Midway Atolls. The 2003 work featured the discovery of the wreck site of the USS *Saginaw*, lost at Kure Atoll in 1870. In 2005, the maritime archaeology team focused on documenting the 19th century whaling shipwreck sites at Pearl and Hermes Atoll and Kure Atoll. Non-invasive survey of three wrecks, the British whalers *Pearl* and *Hermes* (which sank in 1822), and the American whaler *Parker* (which sank in 1842), were initiated. Further follow-up surveys were conducted to the newly discovered whalers in 2006, and a yet-to-be-identified site known as the "Oshima" wreck. In 2007, the maritime archaeology team discovered the 1917 wreck of the four-masted schooner *Churchill*, lost under mysterious circumstances while in transit with copra (dried coconut meat) from Tonga to Seattle, Washington. Very little maritime archaeological work has been conducted in atoll environments, and pelagic whaling vessels in an archaeological context are a rare discovery; for global comparison, only two shipwreck sites, both located in Australia, yield similar information to the shipwreck sites in Papahānaumokuākea. In late summer 2008, two additional shipwrecks were discovered, the *Gledstones* (which was lost in 1837) and an unidentified 19th century whaler.

The American period

The Kingdom of Hawai'i was officially annexed by the U.S. in 1898. Claims to the Northwestern Hawaiian Islands, substantiated by the former Kingdom, were transferred (except Midway) to the Territory of Hawai'i. Statehood for the Territory occurred in 1959, following World War II and subsequent large-scale social, political, and economic transformations in the Pacific.

Hawai'i and the Northwestern Hawaiian Islands played a crucial role in global communications. In 1903, a transpacific submarine cable was completed via Honolulu, Midway, and Guam. Residence at Midway also meant an increasing awareness of the area by the American government. Illegal poaching in the remote archipelago prompted the first U.S. Marine presence at Midway, and in 1909 President Theodore Roosevelt declared the whole area (with the exception of Midway) the Hawaiian Islands Reservation, for the protection of seabirds.

A textured ecological, cultural, and historic islandscape (Photo: James Watt)

With the first "round-the-world" cable message sent by President Roosevelt on July 4, 1903, and the subsequent construction of the Pan American Airways facilities (see Midway Atoll overview, below), Midway became a crucial connection for the Pacific region and the world. The U.S. Navy's interest in the strategic location of Midway centered on its use as a seaplane base, and in 1940, construction of the naval air station at Midway was begun. Growing infrastructure at Midway reflected its strategic importance as a trans-Pacific communication and transportation hub.

World War II had a dramatic impact on the region. Tern Island at French Frigate Shoals was initially developed as a naval facility for staging aircraft. Besides the naval air station at Midway, the Navy also built a major submarine refit and repairs base. Together, these areas comprised a vital center for submarine, surface fleet, and aviation operations. In fact, the Hawaiian Sea Frontier forces stationed patrol vessels at most of the islands and atolls.

Midway Atoll itself was the focus of one of the most important naval battles in the war's Pacific theater. In June 1942, the Japanese Imperial Navy attempted the invasion of the atoll. Ultimately, four Japanese aircraft carriers and one American carrier were sunk, and hundreds of aircraft shot down. The Imperial Japanese Navy was forced to withdraw. This was a watershed moment in the Pacific; had the invasion succeeded, America's line of defense would have retreated to the West Coast. The majority of the sea battle took place between 160 to 300 kilometers to the north of the atoll, but an intense air fight was waged directly over and around the atoll itself (see Midway Atoll overview, below). Numerous Japanese and American planes splashed down into the waters surrounding Midway, and many of these sites are now war graves. At least 67 naval aircraft are recorded as being lost in the vicinity of the Northwestern Hawaiian Islands. These submerged aircraft reflect the important aviation legacy of Midway and the surrounding region.

Midway Atoll today is designated as a National Memorial to the Battle of Midway. Nine defensive structures related to the Battle of Midway were designated as a National Historic Landmark in 1986. Numerous other structures are eligible for placement on the National Register of Historic Places.

Overview of Each Island – History and Development of the Property

Nihoa – 23º03'N, 161º56'W
The islands of Papahānaumokuākea, particularly in its southeastern portion, were used through the time of James Cook's expeditions by Native Hawaiians as seasonal dwelling sites for fishing, turtle harvest and feather gathering. Nihoa and Mokumanamana are thought to have been utilized by Native Hawaiians periodically until well into the Western era, with voyages continuing, in

Schools of Convict Tangs or manini thrive in Papahānaumokuākea (Photo: James Watt)

secret, into the 20th century for the gathering of turtles, fish, bird feathers and eggs (Tava and Keale 1989; Maly 2003).

In 1789, Captain Douglas of the *Iphegenia* was the first Westerner to visit Nihoa. Several Hawaiian aliʻi (royalty) journeyed to Nihoa in the next century. In 1822, Hawaiian Queen Kaʻahumanu visited the island with her husband, King Kaumualiʻi, chief of Kauaʻi. They rediscovered historic evidence of prior habitation, as the Queen had learned from *oli* (chant) and *mele* (song) passed down through the generations (Rauzon 2001). King Kamehameha IV, or Alexander Liholiho, formally annexed Nihoa for the Hawaiian Kingdom in 1857 (Paty in Emory 1928). In 1885, Queen Liliʻuokalani and her 200-person entourage landed on Nihoa, to study the palms, wildlife and artifacts on the island (Bishop in Emory 1928).

Mokumanamana (Necker Island) – 23º35'N, 164º42'W
Mokumanamana was documented by La Pérouse in 1786. Captain John Paty claimed Mokumanamana for the Kingdom of Hawaiʻi in 1857, per the request of King Kamehameha IV, and that claim was later contested, with the island being annexed again by Hawaiʻi's Provisional Government in 1894. The British once sought to lease the island as a communications cable relay station, but the idea was quashed by the American Congress. More recently, the island was used by the military for bombing practice.

French Frigate Shoals (Kānemilohaʻi) – 23º145'N, 166º10'W
French Frigate Shoals was first encountered by Europeans when La Pérouse, sailing with the frigates *Boussole* and *Astrolabe* nearly ran aground there in 1876. Military activities during World War II resulted in significant alterations to the atoll, with Tern Island being largely dredged up and formed into the shape of a runway to serve as a refueling stop for planes en route to Midway. The original seawall, runway, and some structures remain. The U.S. Coast Guard occupied Tern and East Islands from 1944 until the 1970s and ran a LORAN station, evidence of which still remains.

The U.S. Fish and Wildlife Service has maintained a field station at Tern Island since 1978, staffed by two permanent employees and a handful of volunteers. National Marine Fisheries Service also maintains staff on the island in support of Hawaiian Monk Seal and Hawaiʻi Green Turtle projects.

Gardner Pinnacles (Pūhāhonu) – 25º02'N, 168º05'W
Gardner Pinnacles was given its Western name by Captain Allen on the Nantucket whaler Maro, who encountered the island in 1820. The land area of this island is not large, and the two rocky pinnacles that project above the water are difficult to land on. As a result, there is no record or evidence of any previous human activity.

Maro Reef (Koʻanakoʻa) – 25º22'N, 170º35'W
Captain Allen of the *Maro* first charted Maro Reef in 1820, when he recognized the danger of the area and steered clear of it. The reefs and shoals of Maro Reef are so extensive and vast, that it is thought that this area was generally avoided by mariners. There are at least six recorded shipwreck losses at Maro Reef, beginning in 1852.

Hawaiian Morwong, common in Papahānaumokuākea
(Photo: James Watt)

Laysan Island (Kauō) – 25º46'N, 171º45'W
On May 1, 1857, Captain John Paty of the Hawaiian schooner *Manuokawai* landed on Laysan and annexed it to the Hawaiian Kingdom. During his visit, Captain Paty commented on the great number of albatross nests and guano deposits on the island. Scientific expeditions to Laysan continued in 1859, with Lieutenant J.M. Brook's visit aboard the *Fenimore Cooper* to collect soundings, positions and physiographic data to make a chart of the island for the United States Hydrographic Office.

In 1890, Laysan was leased by the Hawaiian Kingdom to the North Pacific Phosphate and Fertilizer Company for a period of 20 years. Guano mining and digging occurred on Laysan from 1892 to 1904, when the supply was exhausted. This period saw the construction of several buildings, including a lighthouse and a small railroad, which supported this trade; between 100 and 125 tons of guano could be shipped from Laysan per day (Ely and Clapp 1973). Today, the only obvious terrestrial remnants of this operation on Laysan are guano piles, pieces of rail, and human grave sites. Large 19th century anchors, which may have served as moorings for the guano landing, lie submerged near the shore.

By 1900, Japanese feather poachers began raids on Papahānaumokuākea, slaughtering thousands of albatross and other birds for their plumage. This prompted President Theodore Roosevelt to issue Executive Order No. 1019 on February 3, 1909 to set aside all the islets and reefs from Nihoa to Kure (except Midway) as the Hawaiian Islands Reservation. In April 1923, Laysan was visited by the U.S.S. *Tanager* in what became known as the *Tanager* Expedition. The objective of this mission was to make scientific observations and collections of the flora and fauna in the NWHI for the U.S. Bureau of Biological Survey (Bryan 1978). The party of explorers established a camp on shore for one month, and made detailed records and collected specimens of the various forms of life on Laysan (Macintyre 1996). The previous guano business venture had also introduced rabbits to the island to augment the food supply in 1903. The rabbits' unchecked herbivory and breeding resulted in the almost complete de-vegetation of the island. In 1923, the scientists of the *Tanager* Expedition successfully eradicated the last rabbit, but not in time to prevent the extinction of at least three native land birds and an unknown number of plants and terrestrial invertebrates.

Since 1991, FWS has operated a semi-permanent field camp on Laysan, with efforts focused on eradicating invasive plant species and restoring native habitats. Active restoration in the form of control and eradication of introduced mammals, insects, and plants is occurring at several islands in Papahānaumokuākea. The most comprehensive of these restorations is occurring at Laysan Island. The plant community present today is descended from either the surviving seed bank, adventive species that have re-colonized, or plantings in the decades following the guano business venture. Of the 27 plant species documented in early observations and three more discovered in recent pollen cores of Laysan Lake, 18 still grow at Laysan, along with 11 species of alien plants. A 12 year effort to eradicate the invasive grass *Cenchrus echinatus* has succeeded, though biologists remain vigilant should any seeds resprout. Efforts to restore the plant community to its pre-contact state are proceeding, with a year-round camp where staff are propagating and out-planting eight species (five for re-introduction and three for enhancement of existing small populations). All replanting is conducted using the original species or closest relatives from similar habitats. Replanted plants are started from carefully processed seeds to prevent accidental introductions of fungus and insects. To date, two of six previously extirpated species are reproducing independently, and another two have been out-planted and have survived at least one annual cycle.

Efforts to fill the ecological niche of the extinct Laysan Millerbird (*Acrocephalus familaris familaris*) will be carried out using birds from the only remaining Millerbird population within Papahānaumokuākea (at Nihoa; *Acrocephalus familaris kingi*) as soon as the habitat is judged ready to support the species at Laysan Island. Similar restoration efforts are also occurring at Midway and French Frigate Shoals, and are planned for other terrestrial sites in the archipelago.

Numerous researchers have worked on Laysan, including biologists from the U.S. Geological Survey. They have established an additional population of the endangered Laysan Duck at Midway Atoll.

Lisianksi Island (Papa'āpoho) - 26º04'N, 173º58'W
Lisianski gained its Western name in 1805 when the Russian exploring ship *Neva* grounded on the reef. Under the command of Captain Urey Lisianski, the *Neva* was sailing from Sitka to Macao to meet the *Nadeshda*, her sister ship, on Russia's first circumnavigation of the world (Clapp). The ship was re-floated, but was once again driven into a reef, and the crew began repairs on the battered ship during a break in the weather (Bryan 1978).

Early expeditions to Lisianski include a visit by Captain Benjamin Morrel, Jr., of the ship *Tartar*, who wrote about the inland bird rookeries, Green Turtles, sea-elephants (probably Hawaiian Monk Seals) on the beach, and the lack of any fresh water (Clapp and Wirtz 1975). Captain John Paty arrived at Lisianski in 1857 to take possession of the island for the Hawaiian Kingdom and estimate the amount of guano there (ibid.). Lisianski was later visited by the bark *Gambia*, the schooner *Ada* (which collected sharks, turtles, and sea cucumbers), and the schooner *Kaalokai*, which was hired for an ornithological survey of Lisianski (Bryan 1978). Evidence shows that little guano mining took place at Lisianski, though several Japanese feather poachers raided the island in the early 1900s (Bryan 1978). The first scientific visit to Lisianski occurred in 1928 by the *Moller*, an exploring vessel under the command of Captain Stanikowitch. The team made observations of the island and collected several species of birds, and their records comprise the first list of bird species on Lisianski (Clapp and Wirtz 1975).

Pearl and Hermes Atoll (Holoikauaua) - 27º50'N, 175º50'W
Pearl and Hermes Atoll derives its Western name from the two British whaling ships, the *Pearl* and the *Hermes*, that wrecked on the reef on April 24, 1822 while sailing in consort to the newly discovered Japan whaling grounds. One of the carpenters on board the Hermes, James Robinson, supervised the building on the beach of a small 30-ton schooner they named *Deliverance*. Though most of the crew elected to board the passing ship *Earl of Morby*, Robinson and 11 others took possession of the nearly finished *Deliverance*, sailed her back to Honolulu, and eventually sold her there for $2,000. The remains of the *Pearl* and the *Hermes*, the oldest wrecks in Hawai'i, were discovered in 2004. National Historic Register nominations are in process.

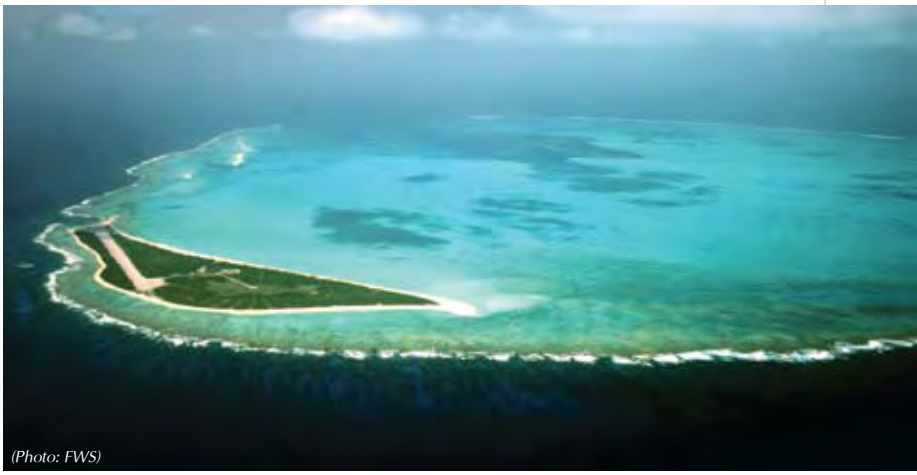
Following a few scientific expeditions to Pearl and Hermes Atoll in the early 1900s, the atoll was home to a short-lived pearl fishery after pearl oysters were discovered in the lagoon in the 1920s. Military activity occurred at the atoll in the mid 1930s and continued through the end of the Battle of Midway (Amerson et al. 1974).

Each summer for nearly two decades, personnel from the U.S. Fish and Wildlife Service and National Marine Fisheries Service have established temporary field camps at Pearl and Hermes to monitor bird and Hawaiian Monk Seal populations. Neither permanent structures nor year-round human activities occur on these islands.


This 3-inch gun on Midway's Eastern Island defended the atoll during the Battle of Midway (Photo: Pete Leary)

Midway Atoll (Pihemanu, Brook Island and Middlebrook Islands) – 28º15'N, 177º20'W
Of all of the islands within Papahānaumokuākea Marine National

Monument, Midway Atoll has been most affected by human activity.


(Photo: FWS)

In 1903, the Commercial Pacific Cable Company established Midway as a link in the first around-the-world communications cable. The employees of the Midway Cable Station built five concrete buildings, cultivated a garden with imported soil, and planted ironwood trees, which then spread around the island, as wind breaks.

In 1935, Pan American Airways constructed a base for its amphibious "flying boats" at Midway. The facility included tourist and employee amenities such as a hotel, a solar hot water system, tennis courts, baseball fields, and a golf course.

In 1941, as World War II raged in Europe, the United States commissioned the Naval Air Station Midway. The military expanded the harbor and developed a seaplane landing basin. They constructed runways on Eastern Island, several defensive batteries, and the infrastructure to support a few thousand military personnel. December 7, 1941, saw not only the famous attack on Pearl Harbor, but also one on strategically important Midway. Japanese destroyers shelled Sand Island for two hours, damaging several buildings, including the seaplane hangar and power plant.

On June 4, 1942, more than one hundred Japanese planes zoomed toward Midway as American military aircraft, PT boats, and anti-aircraft batteries tried to slow their progress. Japanese bombs blasted the seaplane hangar, torpedo and bomb-sighting building, Navy mess hall, administration offices, brig, and other buildings, and damaged several more on Sand Island. On Eastern Island, bombs hit the mess hall, power plant, gasoline lines, sick bay, command post, post exchange, engineering tents and runways. Dark smoke rose from blazing oil tanks. The 17-minute attack left the buildings of Midway Atoll in ruins.

Meanwhile, a massive sea and air battle raged 480 km north of Midway Atoll. The U.S. Navy sank four Japanese aircraft carriers and shot down 292 planes. The Japanese defeat in the Battle of Midway has been called the "turning point of World War II in the Pacific" (Allen 1950: 63 in Yoklavich 1993: 29)

After World War II, the military base at Midway continued to support American military presence in the Pacific until 1993, when the Naval Air Facility was closed. From 1983 to 1997, the Navy and FWS conducted a massive cleanup of Midway Atoll. All the buildings and structures from Eastern Island have been removed. On Sand Island, most of the Cold War–era buildings, 106 underground storage tanks, 15 large above-ground tanks, connecting pipelines, subsurface petroleum, PCB, and DDT-contaminated soil, and large amounts of metal debris were removed. Rats were eradicated.

Today, the FWS maintains a small staff and volunteer program on Midway. They work to remove invasive vegetation, plant native vegetation, collect marine debris, monitor wildlife populations, provide educational activities for visitors, restore historic structures, and clean up contaminants. Midway is not unlike a very small town in its needs for electricity, food service, sewage treatment, and communication. A FWS contractor with 60 employees provides infrastructure support on the island. An airport on Sand Island serves the needs of staff, visitors, and as an emergency diversion site for trans-Pacific commercial aircraft.

Kure Atoll (Mokupāpapa, Kānemilohaʻi, Ocean Island and Cure) – 23º03'N, 161º56'W

Historical records contain references to contact with Kure Atoll in 1799 by Captain

Don J. Zipiani of the Spanish vessel *Senhora del Pilar*, who named the island Patrocinio (Woodward 1972). In 1804, the ship *Ocean* arrived at the island, and its captain named the island "Ocean Island" (Bryan 1967). In 1835, Admiral Krusenstern of the Russian Navy stated that Captain Kure, a Russian navigator, landed on the atoll and named it Kure. The exact date when Kure visited the atoll is not known.

Kure Atoll has seen a history of several shipwrecks and scientific expeditions. Following the wreck of the British collier *Dunnottar Castle* in 1886, King Kalākaua, the Hawaiian Monarch, dispatched the *Waialeale* to rescue the crew and take possession of the island. On September 20, 1886, Colonel James H. Boyd of the Waialeale took formal possession of Kure, naming the island Mokupāpapa (Bryan 1978). The U.S. Government acquired Kure as part of the Territory of Hawai'i on July 7, 1898, and in February 1909, Kure Atoll became part of the Hawaiian Islands Reservation when President Theodore Roosevelt signed Executive Order No. 1019 (Bryan 1978). Kure Atoll was under control of the U.S. Navy between 1936 and 1952, after which it was turned back over to the Territorial Government of Hawai'i (Woodward 1972).

Monitoring the extent of coral bleaching in Papahānaumokuākea (Photo: James Watt)

Unlike Midway and French Frigate Shoals, Kure Atoll was not modified during World War II. The U.S. Navy did install a radar reflector in 1955, and opened large areas for albatross in 1959, but no other alterations were made to the island until the U.S. Coast Guard established a LORAN (Long Range Aids to Navigation) station on Green Island, commissioned on March 17, 1961 (Woodward 1972). Promising to protect the flora and fauna on Kure Atoll, the Coast Guard leased Green Island from the Hawaiian Commissioner of Public Lands. Kure was chosen because its isolation enabled clear electronic transmissions for navigational purposes without interference (Gibbs 1977). The Coast Guard built a 1,220-meter runway and a 190-meter-high LORAN tower, along with several structures that included a barracks, a signal/power building, a transmitter building, a pump house, and seven fuel tanks (Woodward 1972). The Coast Guard maintained the station until 1992.

In 1993, the State of Hawai'i Department of Land and Natural Resources, Division of Forestry and Wildlife (DLNR/DOFAW) worked with the Coast Guard to demolish the majority of the buildings on the island. Only one small brick house, a storage shed, a water tank, and the runway remain on Green Island. DLNR/DOFAW manages Kure Atoll as a State Wildlife/Seabird Sanctuary. Since 1994, DOFAW has set up an annual field camp on the island to monitor seabird populations, conduct habitat restoration, monitor Hawaiian Monk Seals and remove the marine debris from the shoreline and coral reefs. National Marine Fisheries Service has an annual field camp each summer on Kure Atoll to monitor Hawaiian Monk Seals. For the past five years, researchers have also been monitoring a resident population of *nai'a* (Hawaiian spinner dolphins) in the atoll.

History of Research in Papahānaumokuākea

Assessment, monitoring and mapping of the flora and fauna in the Northwestern Hawaiian Islands began nearly a century

ago as exploratory research voyages set sail primarily to collect data and specimens for cataloging purposes. These Western scientific voyages began with the R/V *Albatross* expedition in 1902. The scientific expedition, conducted by the U.S. Fish Commission, visited what were then referred to as the "Leeward Islands," including what is now known as Nihoa, Laysan and Midway. The expedition purpose was mainly to collect samples from the deeper waters around the Hawaiian Islands, and to document newly discovered species of deep-water fishes and invertebrates. In addition to the marine studies, the crew conducted terrestrial explorations, documenting key species as well as collecting photographs of many now-extinct species such as the flightless Laysan Rail.

Following the *Albatross* expedition, the next notable scientific voyage was the R/V *Tanager* expedition of 1923–1924. While technically the second phase of exploration (the first by post-contact Native Hawaiians), the *Tanager* was perhaps the first voyage driven entirely by scientific inquiry. Archaeologists and biologists documented archaeological sites and conducted numerous types of surveys all the way to the western edge of the NWHI. Perhaps of most importance was the *Tanager's* documentation of human impact to terrestrial systems. While on Laysan, scientists witnessed the extinction of the endemic Laysan *'apapane* (Hawaiian honeycreeper, with crimson body and black wings and tail (*Himatione sanguinea freethi*)) when the three remaining birds died during a storm. They also recorded the vast changes in vegetation and birdlife that had taken place over the previous 20 to 30 years. During this period, mining for guano, the introduction of rabbits, and the harvest of seals and birds took an enormous toll on the island ecosystem. Of the 27 species of plant life that were originally documented before these extraction activities, only four remained in 1923 (Grigg 2006). In addition to documenting ecological change, archaeologists at Nihoa and Mokumanamana discovered extensive artifacts and ruins, some of which are unlike any known from the main Hawaiian Islands.

Shipboard analysis of coral health (Photo: James Watt)

Historical scientific expeditions, such as the Rothschild and Schauinsland expeditions of the late 1890s, the *Albatross* in 1902, and the *Tanager* in 1923 and 1924, briefly explored the islands in the pursuit of scientific knowledge. However, their activities were generally limited to species inventories and the collection of large numbers of specimens. For example, the 1896 Schaunsland expedition collected at least 271 skins of 25 bird species, whereas J. J. Williams' trip in 1892–1893 yielded "several barrels of stuffed birds."

From 1963 through 1969, numerous voyages were made to the NWHI as part of the Pacific Ocean Biological Survey Program (POBSP) and the Smithsonian Institution. A number of biologists took part in ten trips to French Frigate Shoals, where numerous specimens were collected and data were gathered. The main goals of this program were to

Pristine Papahānaumokuākea reef with numerous Acropora coral colonies, a species extremely rare in the main Hawaiian Islands (Photo: James Watt)

learn what plants and animals occurred on the islands, the seasonal variations in abundance and reproductive activities, and the distribution and population of the pelagic birds of that area. During this project, more than 10 million square kilometers of the central Pacific Ocean were surveyed, and numerous publications were released in the Smithsonian's *Atoll Research Bulletin*.

Following the vast POBSP studies of the 1960s, the Tripartite NWHI Fishery Investigation expeditions in the mid 1970s aimed to establish information baselines on the flora and fauna in the area. These expeditions were unique in that three major agencies (National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the Hawai'i Division of Fish and Game) actively collaborated to create an integrated research program in the NWHI. This collaboration provided a unique opportunity to document the relationships between species and assess the effects of commercial fishing and other activities on the region's ecosystems. This endeavor also launched the first intensive marine-based research expedition. Although the Tripartite expeditions laid the groundwork for management plans covering a variety of resources, much of the research of these expeditions was geared toward resource assessment, with a primary focus on commercially important species.

In the late 20th century, scientific research efforts underwent a paradigm shift, becoming more focused on knowledge and conservation of the natural ecosystems. This shift stemmed from the recognition that increased technology and human populations have created significant pressures on ocean ecosystems. In 2000, the State of Hawai'i, U.S. Fish and Wildlife Service, NOAA and several research institutions launched the NWHI Reef Assessment and Monitoring Program (NOWRAMP) to characterize and monitor coral reefs and establish a baseline for comparison and to facilitate monitoring temporal changes in the ecosystem. In addition to this group, NOAA has also initiated a comprehensive mapping effort using satellite imagery, multibeam sonar, and other remote sensing techniques to provide detailed characterizations of benthic habitats.

Several NOAA vessels have been commissioned primarily to support the research and mapping activities in the area that has become known as Papahānaumokuākea, and as a result multiple scientific projects have been initiated in the region. These activities range from basic monitoring of various species and environments to technologically advanced studies incorporating the latest scientific tools such as genetic analyses, satellite tagging, and deep water submersibles. More recent scientific voyages to Papahānaumokuākea Marine National Monument are far less extractive, and are of extraordinary benefit to the preservation and protection of the area's natural resources. These cruises generally take tiny biopsies of corals, or collect feathers or scat from the beaches, and using modern laboratory techniques, have produced important information on key management issues such as population connectivity. Papahānaumokuākea is one of the world's largest marine protected areas; an enhanced understanding

Volunteers participate in the annual Midway Atoll National Wildlife Refuge albatross count. Each active nest is marked as it is counted
(Photo: Roy Lowe)

Laysan Duck

Papahānaumokuākea Marine National Monument is home to one of the world's rarest ducks, *Anas laysanensis*, commonly known as the Laysan Duck. Having the most restricted range of any duck species worldwide, the remaining Laysan Ducks have been relegated to a single naturally occurring population on one island in the Northwest Hawaiian Islands. The species was extirpated from most other islands of the Hawaiian Archipelago after the arrival of the first humans approximately 1,500 years ago. Bones of the Laysan Duck have been found on the islands of Hawai'i, Maui, Moloka'i, O'ahu, Kaua'i and Lisianski. Total estimated population sizes on Laysan Island have ranged from seven to 688 adult birds in the past century, while a recent population estimate cites 459 adults. Viability models for species with small populations and high isolation predict a high risk of extinction due to catastrophic, environmental, genetic, and/or demographic stochasticity. As a result, the Laysan Duck is the subject of intensive active management, research and restoration actions.

The recovery of the Laysan Duck focuses on the following actions: 1) management to reduce risks to the Laysan Island population; 2) protection and enhancement of suitable habitat; and 3) actions to reduce or eliminate threats sufficient to allow successful reestablishment of additional wild populations.

Activities to increase the longevity of this species in recent years have focused on translocations to establish the species on additional islands and atolls within Papahānaumokuākea. Midway Atoll, part of the National Wildlife Refuge System, was chosen as the most promising site for initial translocations. Eighteen months of extensive habitat restoration and modification were required to prepare for the arrival of the ducks. Refuge staff and volunteers excavated nine shallow freshwater seeps, removed non-native plants, planted native vegetation to provide cover, forage and nesting habitat and constructed 16 holding aviaries to provide for a "soft-release" of the translocated ducks.

Within three years, and while overcoming the challenges of working in the most remote island system in the world, these teams have successfully established breeding populations of Laysan Ducks on two different islands of Midway Atoll, and are now at work preparing for the translocation and establishment of a third population on yet another island. The creation of additional breeding populations has greatly reduced the likelihood of extinction of the Laysan Duck, and the team's continuing efforts toward further reintroducing the species, expanding its range and increasing its population size has set the species on the road to recovery.

An endangered Laysan Duck nurtures its newly hatched brood on Midway Atoll National Wildlife Refuge. The Laysan Duck, Anas laysanensis, is one of the rarest ducks in the world (Photo: Jimmy Breeden)

of this place through management-driven research continues to benefit the understanding of ecosystem management and interpretation.

Overall, the most recent scientific expeditions to the NWHI are not unlike the voyages undertaken at the turn of the century. As in initial expeditions, the primary focus of research in recent and forthcoming expeditions is of comprehensive data collection, and with the technology now available, new discoveries. To advance scientific understanding of the region, Papahānaumokuākea is working toward synthesis of all the various data and modeling programs to allow an in-depth understanding of the area and the processes on which the health of the region depends. With the wealth of new information being collected each year, this information can be utilized to combine and synthesize the vast ranges of information from various agencies and institutions, and from them, develop a new management paradigm.

Management in the Modern Era

Due to its remote location, the property has suffered relatively few major human perturbations. During the 19th and 20th centuries, the NWHI faced many extractive uses as Honolulu became an important port in the Pacific, and provided a convenient jumping-off point. Extractive activities included whaling, hunting of monk seals and birds, and fishing for shark, turtle, sea cucumbers, and pearl oysters. Terrestrially, several of the islands were leased for guano extraction, and feathers and albatross eggs were collected. The most significant activities of this nature occurred on Laysan and Lisianski Islands and Midway Atoll. All of these activities ceased by the early 20th century, when American President Theodore Roosevelt acknowledged the need to protect the region's birds, setting aside the islets and reefs of the Northwestern Hawaiian Islands (except Midway Atoll) as the Hawaiian Islands Reservation. Since then, numerous efforts have been made to eradicate alien species, and to protect, preserve, maintain and, where appropriate, restore natural communities, including habitats, populations, native species, and ecological processes as a public trust for current and future generations.

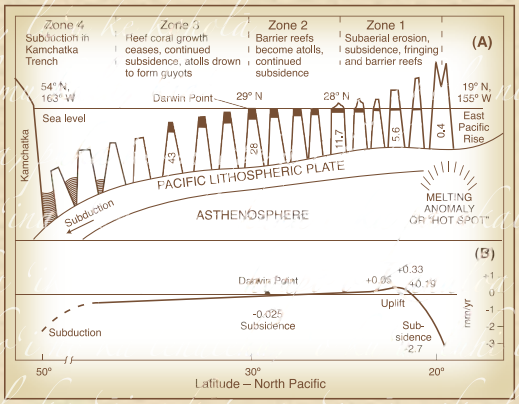
The lands and the waters of Papahānaumokuākea have always been remote, and therefore not heavily accessed. Thus, use of the natural resources of the property was historically minimal and sporadic. In recent years, human access to the property has been primarily limited to commercial fishing, conservation and management, and research activities. At times, longline, crustacean and bottomfish fisheries have operated in Papahānaumokuākea. However, even before the designation of the National Monument, only the bottomfish fishery continued to operate under a limited-entry system. This fishery continues to operate in Papahānaumokuākea, limited to no more than eight permitted vessels that are capped in terms of catch. All commercial fishing will cease in 2011, as per terms of Presidential Proclamation 8031.

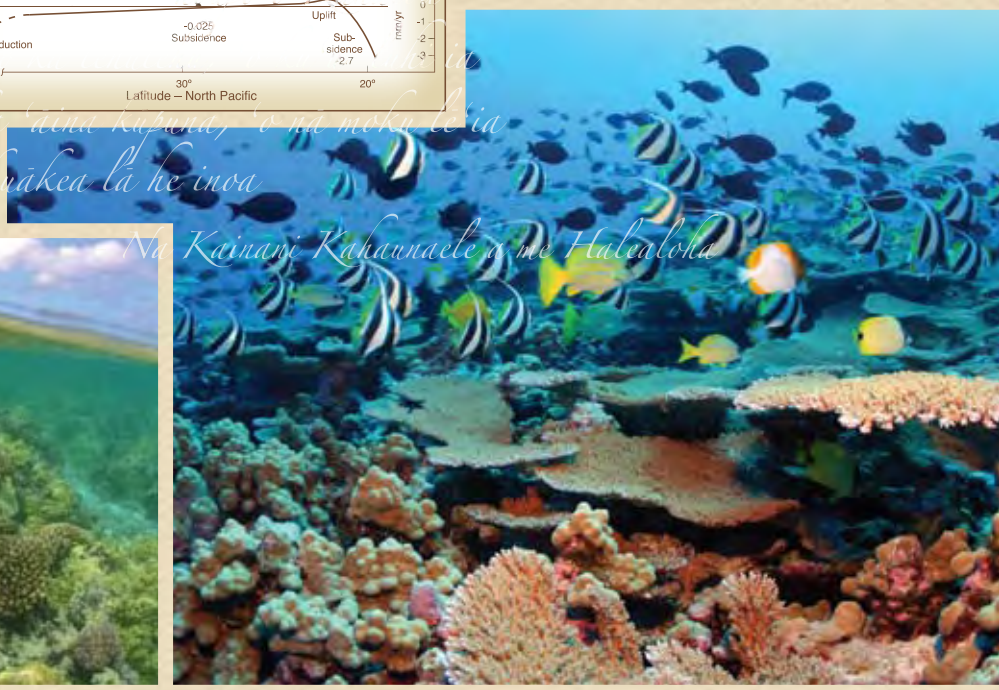
Current management strategies result in careful scrutiny of activities within the property, with particular attention to cumulative impacts. This oversight ensures that any potential negative human impact to the natural resources of Papahānaumokuākea will be negligible.

Management and conservation activities that take place within Papahānaumokuākea Marine National Monument undergo the same rigorous review and permitting process as scientific activities. Examples of management and conservation activities include the continuation of a decade-long effort to remove marine debris from the coral reefs and beaches of the property, alien plant species removal projects on several islands, and restoration of native plant and animal species.

3.

Mahamalama ka lā nui a Kāne puka i Hā'ena e
Apakau ke kukana i ka 'ili kai o nā kai 'ewalu
He 'ike makawalu ka'u e 'ano'i nei,
'O nā au walu o Kanaloa Haunawela noho i ka moana nui
He Hu'akai ka makani o Lehua 'au i ke kai
Ku'ono'ono ka lua o Kūhaimoana i ke kapa 'chukai o Ka'ula
'O Ku i ka lolu, ulu a'e ke aloha no Nihoa moku manu
Manu o ku i ka 'ahui, he alaka'i na ka lahui
'O Hinapūko'a
'O Hinapuhaluko'a
'O Hina kupukupu
'O Hinaikamalama
Hua ka 'ōhua
Aloha kahi lō
He 'ina i ka
Manomano ka
Koiko'i lua
Hanohano wale ka 'āina kupuna 'o nā moku 'ē'ia
No Papahānaumokuākea lā he inoa
Na Kainani Kahaunaele a me Halealoha





Justification for Inscription on the World Heritage List

3. Justification for Inscription on the World Heritage List

Papahānaumokuākea Marine National Monument is nominated as a mixed cultural and natural heritage site with a cultural landscape under criteria (iii), (vi), (viii), (ix) and (x).

Pale anemone crab (Photo: Susan Middleton & David Liittschwager)

3.a Criteria Under Which Inscription Is Proposed

Criterion iii: to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization, which is living or which has disappeared.

Peopling of Polynesia and the marae-ahu-heiau Ritual System

All Polynesian cultures have a shared history and descend from an Ancestral Polynesian Culture, which developed in a Western Polynesian homeland sometime in the mid-later first millennium BC (Green 1986; Kirch 1984; Kirch and Green 1987, 2001). As Polynesians voyaged and settled the remote parts of Eastern Polynesia from this Western homeland, isolation led to marked social change, particularly after inter-archipelago long-distance voyaging ceased in the 15th century.

The *marae-ahu-heiau* complex found throughout Eastern Polynesia refers to ceremonial sites, often monumental in size, where individuals and communities had structured relationships with the ancestors and gods and where socio-political rites were carried out (Green 1993). There is growing evidence that ritual sites were also used for astronomical reckoning in order to link the lunar calendar with the agricultural calendar and seasonal festivals (Kirch 2004a, 2004b). The *marae-ahu-heiau* ritual architecture found throughout Eastern Polynesia has a court – either a pavement or an enclosure, with representations of the gods (upright stones, sculptures, etc.) and an *ahu* (altar). That these types of religious sites throughout Eastern Polynesia have a shared morphology and use demonstrates the common ancestry of all Eastern Polynesian religions and religious architecture.

The 45 shrines of Nihoa and Mokumanamana, built sometime between

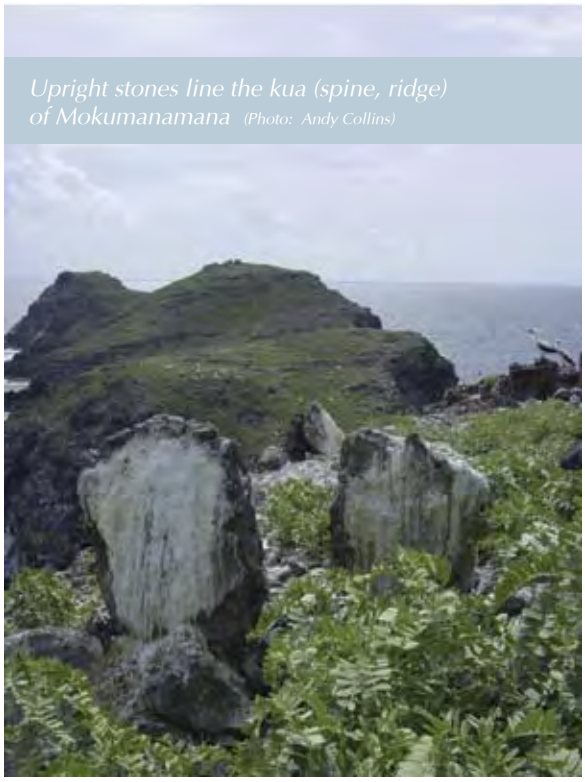
"The Last Frontier: The Pacific Islands were the most difficult and therefore the last places on earth to be reached by humans. With that settlement, humankind finally reached the end of the habitable world."

– ***K. R. Howe***, *in Vaka Moana ("Ocean Sailing Canoes"): Voyages of the Ancestors, the Discovery and Settlement of the Pacific. Hawai'i is the most isolated archipelago in the world, and one of the last two, if not the last, Pacific island chains to be reached by humans.*

1000 and 1700 AD consist of well-paved terraces and platforms with single uprights or more commonly, rows of uprights. In the Hawaiian Archipelago, they show rare shared connections to other Eastern Polynesia cultures that use lines of uprights to represent the gods, namely the Society Islands and Tuamotu Islands of Central Eastern Polynesia (Green 1996; Emory 1928). They are the only *heiau* in the Hawaiian Archipelago, apart from a few exceptions found in remote high-altitude zones (Mauna Kea and Haleakalā), that incorporate these elements. The Papahānaumokuākea ceremonial sites demonstrate both the common ancestry for all Eastern Polynesian religions and ritual architecture (Graves and Sweeney 1993), as well as the diversity in religious architecture that developed as socio-political institutions diverged through time and Eastern Polynesian cultures became more isolated and regionally focused after 1450 AD.

Other facets of the material culture in Papahānaumokuākea clearly demonstrate cultural affinities to Central Eastern Polynesia. These include exceptionally detailed stone figures that lack counterparts in stone or wood figures found in Hawai'i (Cleghorn 1988), but resemble sculpted *ki'i* (god figures) recovered from the Marquesas Islands in Central Eastern Polynesia (Chavaillon and Olivier 2007). The layout of temples at Nihoa and Mokumanamana is hypothesized to relate to the observations of celestial phenomena used to coordinate the lunar and agricultural calendars, similar to ritual sites documented in both Mangareva (Central Eastern Polynesia) (Kirch 2004a; McCoy 2008) and elsewhere in Hawai'i (Kirch 2004a; McCoy 2008). Thus, the archaeological landscapes of Nihoa and Mokumanamana demonstrate ties to earlier ancestral cultures to the West, yet aspects of their form and layout also provide exceptional examples of how the Native Hawaiian culture evolved, adapted and changed in its relative isolation. The Papahānaumokuākea cultural and marine landscape has importance on a world-wide scale as a rare undisturbed example of the long-term history of settlement, evolution and change in the Oceanic Island region.

Papahānaumokuākea, a place of outstanding movements on the sea. Shown here, the traditional Hawaiian voyaging canoe, Hōkūle'a, returning to the main Hawaiian Islands (Photo: Monte Costa)



Upright stones line the kua (spine, ridge) of Mokumanamana (Photo: Andy Collins)

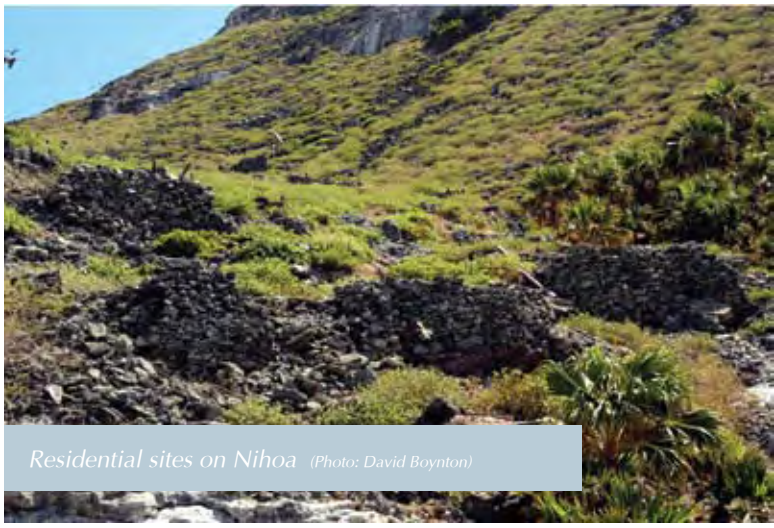
Intact Cultural-Marine Landscape

Skill in voyaging enabled not only discovery, but also continued use of remote regions that lacked basic resources for sustenance. Despite a dearth of fresh water, these islands were important residential and ceremonial sites for a resilient pre-contact Hawaiian community. Nihoa and Mokumanamana feature rare, intact archaeological landscapes of residential sites, agricultural terraces, and ceremonial complexes from settlements where Native Hawaiians resided between 1000-1700 AD (Cleghorn 1988). A diverse range of ancient site types are well represented, including habitation terraces and rock shelters, some of substantial size and expert architecture, extensive terraces for dryland agriculture, and a plethora of shrines and *heiau/marae* for ritual activities. Survey and excavation have recovered artifacts suggesting that a range of activities were carried out by pre-contact Native Hawaiians on these islands. These include daily domestic activities (cooking, food preparation and storage, manufacture of stone tools and fishing gear), subsistence activities (fishing and collecting marine resources, cultivating dryland crops), and ritual activities (including burial of the dead). Native Hawaiians presently use the area as a navigational testing ground and to perform varied rituals in the ceremonial landscape.

The lack of intensive use or development in Papahānaumokuākea has left these archaeological landscapes in remarkably pristine condition. In pre-contact Hawai'i, settlements extended from the coast to the interior island regions in generally pie-shaped patterns termed *ahupua'a*, which encompassed resources of both the land and the ocean (Kirch 1985). Most cultural landscapes within the Hawaiian Islands, particularly those situated near the coast, have been detrimentally affected by modern development. Papahānaumokuākea is arguably the only place in the Hawaiian Islands with a fully intact pre-contact archaeological landscape where the full suite of site types are preserved, coupled with a near to pristine natural marine environment. As such, it represents an exceptional treasure to the worldwide community and to descendant Native Hawaiians who continue to have a living cultural connection with these land and sea resources.

Mystery Islands and Adaptations to Remote Island Environments

Papahānaumokuākea is particularly significant in this context because Nihoa and Mokumanamana are both "Mystery Islands" – the once-inhabited but now abandoned outposts at the farthest reaches of Polynesian migration – which have been integral in describing how Polynesia



Residential sites on Nihoa (Photo: David Boynton)

Papahānaumokuākea "... completes the cycles we have in all of our stories. We always have these cycles in our stories... the sun rising at Kumukahi [Hawai'i Island] and then setting way over in the West [Papahānaumokuākea]."

– ***Pualani Kanaka'ole Kanahele*** *during the re-commencement of the ancient Summer Solstice voyage to Mokumanamana. She says of the significance of cultural practitioners visiting Papahānaumokuākea: "We're completing the cycle of the sun. And then the new cycles begin.... When we go back to Hawai'i, we begin the cycle of rebirth all over again."*

was purposefully (rather than accidentally peopled, as was suggested earlier in the 20th century). Archaeological studies have been highly influential in understanding how sustained inter-archipelago and

The islands and atolls in Papahānaumokuākea represent minute wayfinding targets in the vast Pacific Ocean (Photo: PMNM)

inter-island voyaging were required to sustain human life on Polynesian Mystery Islands (Diamond 2005; Weisler 1994, 1995, 1997, 2002). As Weisler (1996: 627) notes, "so-called Mystery Islands," with their marginal ecological conditions and isolation taxed the capabilities of Polynesian colonization to the physical and social limits. They document not only how Polynesians settled marginal places with minimal resources but offer an example of a remarkable achievement in the history of human life: how humans adapted to some of the most isolated and extreme living conditions on earth.

In archaeological or anthropological terms, Nihoa and Mokumanamana have a fully "transported" and human modified landscape, with the remains of hundreds of stone masonry features and earthen and rubble fill terraces. Despite these islands' remote character and marginal resources (e.g., lack of fresh water, materials for building, food, anchorages) deep-sea sailing canoes and wayfinding expertise transported people and resources from the main Hawaiian Islands to these Mystery Islands. Such efforts are thought to have been expended because of Mokumanamana's spiritual significance as the boundary between the realm of the living and the realm of the afterlife.

Other Polynesian Mystery Islands have seen archaeological research and have intact prehistoric archaeological remains (Henderson-Pitcairn; the Phoenix-Line Islands, Norfolk Islands, and the Kermadecs). However, among these, those in Papahānaumokuākea stand apart from the rest. They not only have the highest density of ritual and ceremonial sites among the Mystery Islands, but they have unique ritual sites documenting both the evolution of Polynesian societies and their shared past connections to ancestral cultures in the West. They are also, significantly, the only Mystery Islands with a living descendant community that currently uses and has strong ties to the islands' cultural and natural resources.

"It is the edge of the Hawaiian universe..."

– ***Halealoha Ayau****, Hawaiian cultural practitioner on why Papahānaumokuākea is a place of such fundamental importance to the Native Hawaiian people and culture."*

Criterion vi: to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance.

Native Hawaiian culture continues to evolve in great part through the perpetuation of a rich oral tradition. Genealogies and cultural meanings are still passed down through *oli* (chant) and *mele* (song), as are histories, natural resource management knowledge, philosophies, and medicinal and spiritual knowledge. Papahānaumokuākea is the spiritual, physical, or practical site of a host of traditions that are central to Native Hawaiian culture and understanding.

The World of Gods and Spirits

Papahānaumokuākea is considered a sacred area, from which Native Hawaiians believe all life springs, and to which spirits return after death. The longest recorded traditional Hawaiian chant, the Kumulipo (source of deep darkness), recounts how all life forms came and evolved out of the primordial darkness, called Pō.

Unlike the Maori *iwi* (tribes) of *Aotearoa* (New Zealand), Native Hawaiian genealogies in their homeland do not begin with the naming of the canoe on which their ancestors arrived, but instead establish a familial relationship with the creation of the land they inhabit, the Hawaiian Islands. Oral histories of the generations of Hawaiians extend back more than 900 generations, linking all Hawaiians to Wākea (sky father) and Papa (earth mother), to the first living creatures of land and sea, and to the elements themselves (Kame'eleihiwa 2007).

Blowing a conch shell and chanting, Hawaiian practitioners greet their ancestors (kūpuna), give thanks, and ask their permission to land on Nihoa and Mokumanamana (Photo: Na'alehu Anthony)

The Kumulipo tells of the births of the universe's first life forms, considered to be gods by Native Hawaiians, beginning with the deep darkness of night and the coral polyp, continuing with emergence of the archipelago's various plants and animals, and ending with the birth of Native Hawaiians.

The Kumulipo describes the Hawaiian universe as being comprised of two worlds: Pō, the deep darkness reserved for gods and spirits, and Ao, the realm of light where the living reside. Native Hawaiians believe that Mokumanamana represents the boundary between these two worlds. In astronomical terms, this boundary crosses the Tropic of Cancer, which runs across Mokumanamana.

Native Hawaiians also believe that when people die, their spirits travel to portals, called *leina* in Hawaiian, located on each main Hawaiian Island. From these portals, spirits embark on a journey out of Ao, and into the west, to Pō. Once again, this spirit realm of Pō is represented by the islands and their surrounding waters located to the northwest of Mokumanamana.

As the boundary between Pō and Ao, Mokumanamana today serves as a critical place for ongoing Native Hawaiian cultural research into the significance of celestial movements, particularly during major solar events such as the summer solstice. Native Hawaiian tradition holds that a person's shadow is the physical manifestation of their spirit. Therefore, Hawaiian ceremonies are held during periods of the day when the shadow cannot be seen, and power is therefore concentrated in the body: the transitions at dusk and dawn, and at noon. The sun hangs overhead the longest on the summer solstice, June 21, along the Tropic of Cancer, making Mokumanamana a powerful place to hold summer solstice ceremonies.

In 2007, renowned Native Hawaiian cultural practitioner and researcher Pualani Kanahele and a group of cultural practitioners called *Ha'ae Wale Hānauna Lolo* visited Mokumanamana to study the relationship between the island's *heiau*, or shrines, and the path of the sun during the summer solstice. Native Hawaiian cultural researchers are committed to continuing this research, as well as to conducting other studies, on both Nihoa and Mokumanamana. These research opportunities are important to the maintenance and continued growth of strong bonds between Native Hawaiians and the Northwestern Hawaiian Islands.

In addition, Native Hawaiians rely on access to Nihoa and Mokumanamana to conduct ceremonial rites associated with the deities connected with these places, such as Kāne, the god of life and fresh water, and Kanaloa, the god of the deep ocean.

One of the The Last-Remaining Places of Abundance (ʻĀina Momona)

The natural integrity of Papahānaumokuākea is exceptional. In a Pacific and Hawaiian context, this integrity is of paramount cultural importance, particularly in comparison to the largely degraded terrestrial and marine ecosystems in the main Hawaiian Islands. Terrestrial, and particularly marine environments, that remain relatively lightly affected by humans, with high rates of endemism and life that is unique to the Hawaiian Archipelago, are crucial to an indigenous understanding of the important relationships between ocean and land; between living things in a unique, fragile and induplicable ecosystem; and particularly between humankind and the natural world. These understandings, central to the Native Hawaiian world-view, are passed down through oral histories and traditions, but require a living, physical manifestation to have more than abstract or historical meaning. Papahānaumokuākea serves a critical function today for Native Hawaiians who are seeking ways to not only reconnect and expand their cultural practices, but also ways to improve degraded natural environments in the main Hawaiian Islands, to which their cultural practices are intrinsically linked.

A Green Turtle or honu glides above Acropora (Table Coral)
(Photo: James Watt)

Papahānaumokuākea provides Native Hawaiians and the broader public a region to observe and learn from that is nearly pristine and unspoiled. This example can teach valuable lessons in conservation that can be applied to the archipelago's main islands (see Section 2.a) and beyond, to other places that seek to integrate indigenous knowledge of sustainable management practices with current Western paradigms of conservation. In particular, islands such as Nihoa and Mokumanamana offer examples of how the ancestors of Native Hawaiians implemented their traditional knowledge to sustain their presence on remote islands with fragile environments.

In this living classroom, Hawaiian practitioners are learning by comparison about how their environments in the main Hawaiian Islands have been altered. For example, on the July 2008 Educators of Oceania research cruise to Papahānaumokuākea, Hawaiian practitioners conducted surveys of reef habitat to help determine traditional Hawaiian indicators of change to the main Hawaiian Islands' reefs. Papahānaumokuākea also provides the potential to be an inspirational example of how to integrate indigenous and Western management practices, providing a model for other culturally and ecologically invaluable properties (see Section 5).

Hawaiian Voyaging and Wayfinding (Non-Instrument Navigation)

Today, Papahānaumokuākea serves a critical role in two significant, living, Native Hawaiian traditions: voyaging and wayfinding. The voyaging route between Kaua'i and Nihoa is used today, as it has been for generations, as a major training and testing ground for novice navigators studying modern Hawaiian wayfinding aboard traditional, double-hulled Hawaiian voyaging canoes.

This route is the only one from the main Hawaiian Islands where neither the launching point nor the target destination is visible for an extended period during the course of the voyage, thereby offering a close simulation of a long-distance voyage without the added

One of Hawai'i's last-remaining places of abundance: intact coral reef ecosystems, plentiful wildlife, and viewscapes unchanged for centuries (Photos: James Watt)

Just as in ancient times, Papahānaumokuākea is the proving ground today for apprentice Hawaiian wayfinders (non-instrument navigators) (Photo: PVS)

dangers of testing endurance. It is also the only voyaging route that offers this simulation while being close enough to the main Hawaiian Islands to ensure safety and access to provisions. These characteristics make this route "the ideal training platform" for novice Hawaiian wayfinders, according to Nainoa Thompson, Master Hawaiian Navigator. Today, novice Hawaiian wayfinders are considered ready to attempt navigation of a long-distance voyage after they have successfully guided a voyage from Kaua'i to Nihoa, with a possible additional leg to Mokumanamana. The roundtrip from Kaua'i to Mokumanamana can be completed within four days, compared to a 30-day, one-way voyage from Hawai'i to Tahiti (Kālepa Babayan 18 June 2008, personal communication; Dennis Chun 19 June 2008, personal communication; and Nainoa Thompson 4 October 2008, personal communication).

The connection between Native Hawaiian voyaging and Papahānaumokuākea is not limited to the training of navigators. Traditional, double-hulled Hawaiian voyaging canoes have traveled throughout Papahānaumokuākea in recent years. In 2004, *Hōkūle'a* sailed from Kaua'i all the way to Kure Atoll and back as part of the educational "Navigating Change" voyage (see Section 2.b). Moreover, the five existing and two under-construction Hawaiian voyaging canoes will continue to serve as the traditional vessels to deliver cultural practitioners to Nihoa and Mokumanamana for religious ceremonies. The use of traditional canoes offers an opportunity to maintain a level of cultural integrity that is appropriate for these ceremonies. In two separate voyages in 2003 and 2005, the voyaging canoes *Hōkūle'a* and *Hōkūalaka'i* brought the cultural protocol group *Nā Kupu'eu Paemoku* to Nihoa and Mokumanamana for ceremonial purposes.

Criterion viii: to be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features

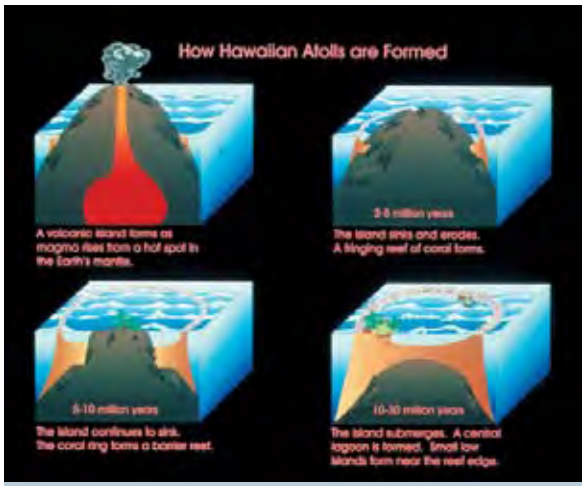
The 1,931 kilometer long string of islands, atolls, and banks in Papahānaumokuākea Marine National Monument form a major portion of the Hawaiian-Emperor Archipelago, the world's longest and oldest volcanic chain (Grigg 1997), and an unparalleled example of sequential volcanic hotspot island formation and evolution. Each of the islands in the Hawaiian-Emperor Archipelago began as a submarine volcano on the ocean floor. This volcanic "hot spot," currently located near the island of Hawai'i, the southernmost Hawaiian Island, has been active for at least 80 million years. Gradual tectonic movement of the Pacific plate to the northwest carries each emerging island slowly away from the hotspot, creating a chain of volcanic islands.

Remote and low-lying Nihoa and Mokumanamana help wayfinders simulate trans-Pacific voyaging - while within safe reach of port (Photo: Na'alehu Anthony)

Papahānaumokuākea's islands, atolls and associated submerged banks comprise a classic geomorphologic sequence illustrating what can happen in an island's middle and late age—with eroded high islands, near-atolls with volcanic pinnacles jutting from surrounding lagoons, true ring-shaped atolls with circular rims and central lagoons, secondarily raised atolls, and submerged banks, rich with marine life, where islands once stood.

Coral reef and then atoll formation proceed in parallel with an island's formation and senescence. When a submarine volcano rising from a seafloor hotspot reaches the level of the photic zone, where sunlight is present, coral reefs begin to form. As the islands are transported by plate motion to the north and northwest, these reefs continue to grow around the island margin, and the islands themselves are moved off the hotspot and begin to erode and subside. Eventually the volcanic core disappears altogether, and the classic ring-shaped atoll is left behind.

Papahānaumokuākea encompasses the northernmost three-quarters of the Hawaiian Archipelago. The oldest of these, Kure, is estimated to be ~27 million years old, whereas Nihoa, the youngest within Papahānaumokuākea, is estimated to be 7.2 million years old, and is the closest to the active volcanic hotspot at Kīlauea in the main Hawaiian Islands,



Model of Hawaiian atoll formation
(Patti Gallagher-Jones/FWS)

(Rubin 2001). Nowhere else in the world is this progression illustrated in such an unambiguous and linear fashion (Figure 3.1).

As one moves up the Northwestern Hawaiian chain from southeast to northwest, the islands clearly and dramatically illustrate the stages in the volcanic island growth cycle, containing all stages of island/atoll/seamount progression. At Papahānaumokuākea's relatively younger southwestern end, Nihoa and Mokumanamana are volcanic in nature, the eroded peaks of much larger islands that are mostly subsided and now form the basis for large banks that ring the emergent land. Moving northwest, French Frigate Shoals represents a site where only La Pérouse Pinnacle, a steep-sided basalt sea stack, still exists above sea level in the middle of the original volcano that forms the foundation for the surrounding atoll. Gardner Pinnacles are steep basalt sea stacks surrounded by an extensive bank, where coral growth did not keep pace with the island's subsidence. Moving further northwest, one encounters islands that are true atolls, rings of coral reef that outline what were once large land masses, long since eroded. Drilling projects on Midway in the late 1960s confirmed that these islands were built above the sea by lava flows that were subsequently weathered and partially truncated

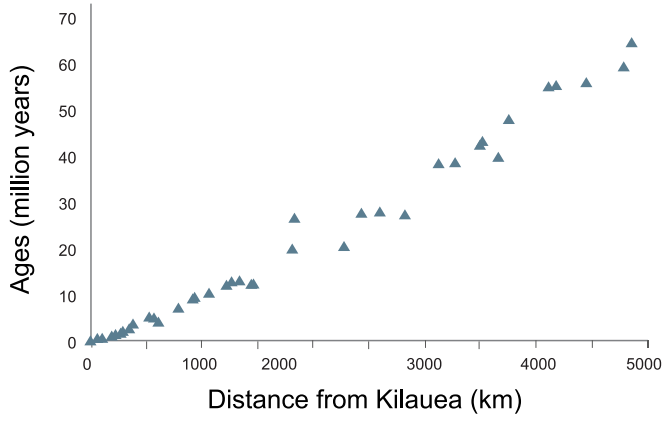
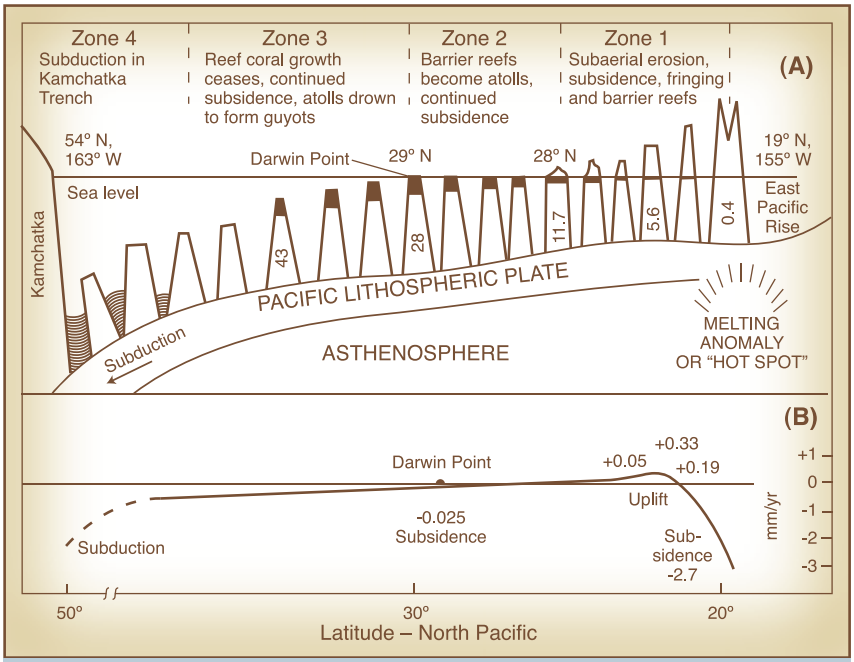


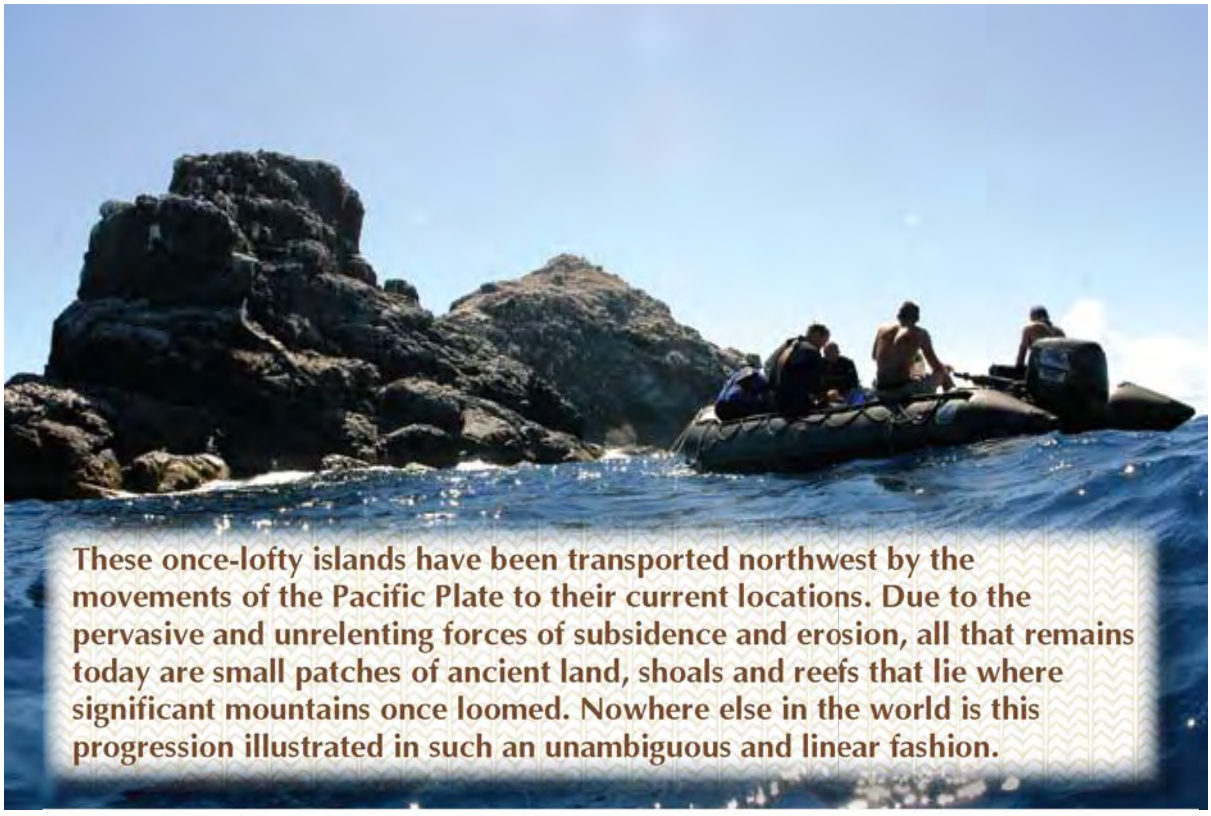
Figure 3.1: *Age of volcanoes within the Hawaiian Archipelago*
(Data: Clague and Dalrymple (1987))

in pre-Miocene time, submerged and covered by successive layers of limestone left behind from coral growth (Ladd et al. 1976).

Papahānaumokuākea includes a unique example of an atoll at the critical "Darwin Point," the northernmost threshold for coral reef existence (Grigg 1982). Kure Atoll is the northernmost coral reef in the world and has reached the latitude at which coral growth rates, which decrease in cooler temperatures, are matched by the rate of subsidence of the island. North of the Darwin Point, reefs can no longer grow fast enough to counteract subsidence, and along with the underlying platforms become seamounts and guyots that eventually disappear into the ocean depths at the northern end of the Hawaiian-Emperor chain (Grigg 1997). Papahānaumokuākea includes 30 submerged banks and guyots, and many of these may already be too deep to re-emerge at sea level through coral growth.



Model of volcanic island growth progression, from island to atoll to seamount
(Richard Grigg)



Masked Angelfish
(Photo: Susan Middleton & David Liittschwager)

Criterion ix: to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals

Landscapes and seascapes that have evolved and continue to progress largely without man's interference are increasingly rare. Due to the remote and nearly undisturbed nature of the ecosystem at Papahānaumokuākea, ecological and biological processes are continuing much as they have since these lands first rose from the seafloor and then moved with the Pacific plate to the North.

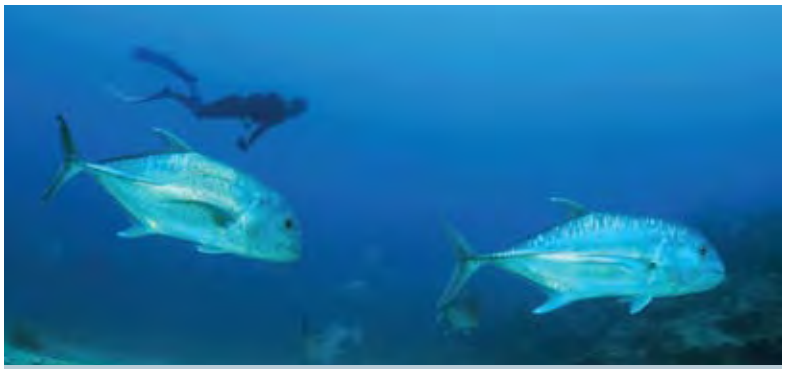
At 1,400 hectares, the total land area of Papahānaumokuākea is extremely small, but is crucially important for the survival of both marine and terrestrial species, many that spend part or most of the year at sea and come ashore to breed or nest; these include turtles, monk seals, and seabirds.

The interdependence among these species is exemplified by such interactions as large schools of pelagic tuna driving the smaller bait fish to the surface, where they are preyed upon by thousands of seabirds who rely on these apex predators for a key food source.

Marine Endemism

Of the ~7,000 marine species found in Papahānaumokuākea Marine National Monument, over one quarter are found nowhere else on the planet. This high degree of endemism represents the highest reef fish endemism rates in the Pacific (20%–63% by area). It is also a spectacular example of evolution in isolation, which results in speciation and a high degree of endemism. The rate of endemism within coral reef fishes increases as one moves northwest up the island chain, with endemics in the far northwest comprising over 50% of the population in terms of numerical abundance. For example, at Nihoa, just 20% of numerical abundance of the 127 fish species are endemic, whereas

at the northern three atolls of Pearl and Hermes, Midway and Kure, the rates of abundance of endemism among fish species are as high as 62%, 54%, and 56%, respectively (DeMartini and Friedlander 2004) (Figure 3.2).



Apex predators abound within Papahānaumokuākea's waters (Photo: James Watt)

Oceanic islands are unique, and on each island, evolution frequently follows a different course, often with remarkable results. In some cases, there is as much diversity between islands in the property as there is among the islands as a whole; some genera of corals only occur in a few of the atolls and nowhere else in Hawai'i.

Over the course of the past five years, field expeditions to Papahānaumokuākea have collected numerous samples of marine plants and animals that were not previously described, or are new records for a site. On an expedition of discovery and baseline data collection in 2000, more than seven new and different species of sponges were discovered at Pearl and Hermes Atoll (Maragos and Gulko 2002). In 2006, during the Census of Marine Life (CoML) expedition, more than one hundred new cryptic species were collected. Recent surveys of corals, including those conducted during the census at French Frigate Shoals, reveal that as many as 40% of the coral species are endemic, with most still yet to be described.

Top Predator Dominated Ecosystem

Papahānaumokuākea's coral reef ecosystem represents one of the world's last remaining top predator dominated systems, a rare and intact community structure characteristic of coral reefs prior to human exploitation. The coral reef ecosystem is diverse and healthy, and supports an abundance of wide-ranging top predators such as sharks and jacks. These apex predators represent 54% of the biomass in Papahānaumokuākea, compared with 3% of the biomass in the main Hawaiian Islands—the latter number being consistent with human-populated regions worldwide (Figure 3.3).

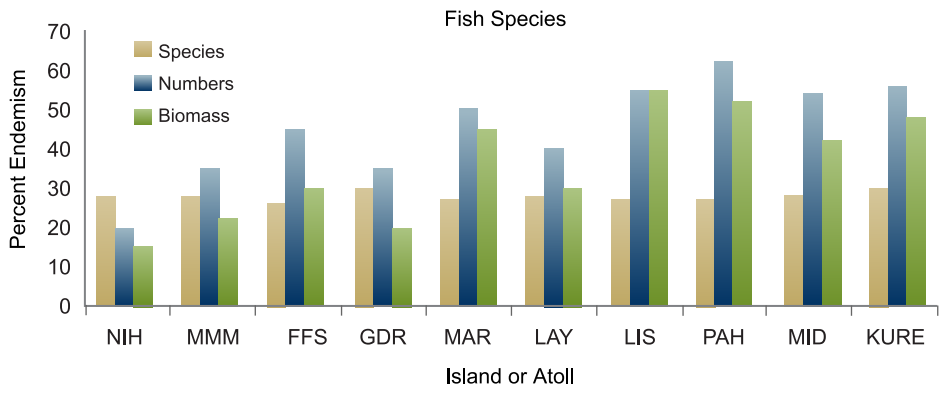


Figure 3.2: *Various measures of percent endemism (based on species occurrence, and on numerical and biomass densities) at each of 10 Papahānaumokuākea islands and atolls, illustrating patterns of endemism with latitude* (from DeMartini and Friedlander 2004)

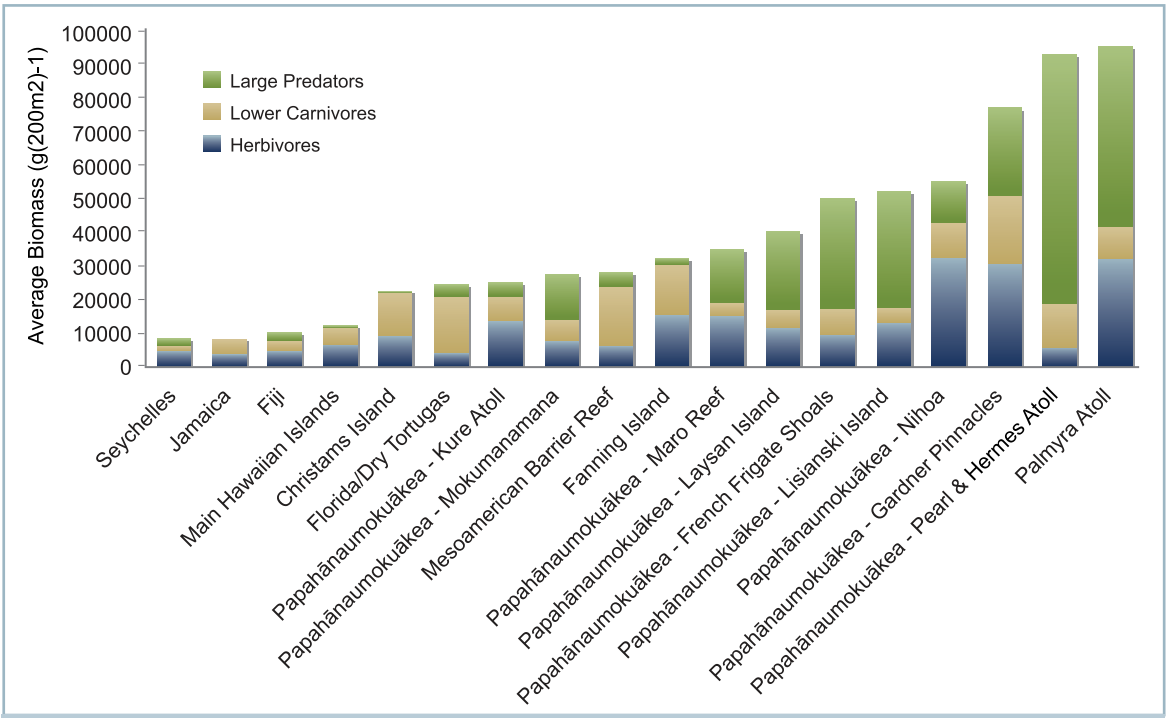


Figure 3.3: *Comparative biomass of large predators, lower carnivores, and herbivores among coral reef ecosystems of the world*

Terrestrial Endemism

The terrestrial area of Papahānaumokuākea is comparatively small, but it is a critically important component of the ecosystem. More than 14 million seabirds nest, rest and breed on the tiny islets in the chain, including 99% of the world's Laysan Albatrosses (listed as vulnerable by IUCN) and 98% of the world's Black-footed Albatrosses (listed as endangered by IUCN).

The extinct Laysan Honeycreeper, and the extant Nihoa Finch and Laysan Finch, are all members of the family Drepanididae, the Hawaiian honeycreepers, a family that underwent one of the world's most spectacular avian radiations from a single ancestral species. This remarkable proliferation of species from a single ancestral type is often compared to the evolutionary radiation of Darwin's finches on the Galapagos Islands.

The Nihoa Finch is one of three remaining endemic honeycreeper species in Papahānaumokuākea
(Photo: Dave Boynton)

Representatives in many other taxa of plants and animals that have undergone similar radiations also occur in Papahānaumokuākea. The endangered fan palm, *Pritchardia remota*, found only on Nihoa, is most closely related to three endangered *Pritchardia* species found in remote areas of the main Hawaiian Islands. The entomofauna of Papahānaumokuākea also includes some groups of insects that demonstrate dramatic adaptive radiations. One such group is the seed bugs, specifically the genus *Nysius*, which shows the complete range of feeding types: from host-specific plant feeders, to diverse plant hosts, to omnivorous feeding, and finally to predator/scavengers. It is a rare occurrence to find herbivorous and carnivorous seed bugs within the same genus. Nowhere else in the world is there a lineage like the Hawaiian *Nysius*, which exemplifies evolution of carnivory in Heteroptera.

Criterion x: contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

The terrestrial and marine habitats of Papahānaumokuākea are crucial for the survival of many threatened species, several of which are found on only one island, or have limited ranges. Some of these species are of particular conservation concern because of their limited ranges. IUCN recently named the unprotected Emperor Seamounts, the northernmost part of the Hawaiian-Emperor Archipelago, as first on its list of "High Seas Gems"—"areas of concentrated abundance or diversity, rarity, naturalness, or vulnerability." Papahānaumokuākea, the protected neighboring section of this archipelago, shares these qualities.

Largest Tropical Seabird Rookery in the World

Papahānaumokuākea is home to more than 14 million birds living seasonally in what is collectively the largest tropical seabird rookery in the world. Twenty-one species of tropical and subtropical seabirds breed in Papahānaumokuākea. Virtually all of the world's entire populations of Laysan Albatross and Black-footed Albatross live there (see Table 3.1), as well as populations of global significance of Red-tailed Tropicbirds, Bonin Petrels, Tristram's Storm-Petrels, and White Terns.

Refuge for Rare Species

Many species of plants and animals still exist in Papahānaumokuākea that once occurred in the main Hawaiian Islands (as evidenced by their presence in the fossil record), but could not survive after the arrival of humans and their commensal mammals. In all, there are 23 species found in the property that are listed under the U.S.

Most reef systems around the world have seen a dramatic reduction of large predatory fish, and this is disturbing, since healthy populations of predator species are a good indicator of an ecosystem's overall health. When predator populations are greatly reduced by fishing and other human activities, the normal structure of the reef community is disrupted.

More than half the weight (biomass) of all fish on NWHI coral reefs consists of large top-level predators like sharks and jacks. In contrast, only 3 percent of the fish biomass on main Hawaiian Islands reefs is composed of these predatory fish, several of which are highly prized food and game fishes. It is likely that this difference results from human impacts such as fishing and habitat loss from shoreline development. These activities, largely absent in the NWHI, make it one of the last places on Earth where scientists can study the ecology of a coral reef ecosystem without large-scale human disturbance. Such studies provide new insights into how Hawaiian coral reef ecosystems function, and the impacts of removing large predators.

Galapagos sharks (Carcharhinus galapagenesis) (top) and Giant Trevally (Caranx ignobilis) (bottom) are a few of the abundant top level predators in Papahānaumokuākea waters
(Photos: James Watt)

Critical seabird refuge and rookery (Photo: FWS)

Endangered Species Act, and there are undoubtedly many more that might be eligible for listing, especially in the case of terrestrial arthropods (Evenhuis and Eldridge 2004). Additionally, Papahānaumokuākea is home to 22 IUCN Red-Listed species. Furthermore, Papahānaumokuākea contains countless endemics, often species that have ranges limited to a single island. Four endangered endemic land birds are found in the property, and nowhere else in the world. The critically endangered Laysan Duck was once more widespread around the Hawaiian Archipelago but now occurs in only two places: 1) a small, relict population on Laysan Island where it breeds and forages around Laysan's unusual hypersaline lake; and 2) in a recently translocated population at Midway Atoll.

Habitat for Numerous Species of Global Significance

Papahānaumokuākea is the most important habitat for in-situ conservation of a number of endangered species (Table 3.1).

Table 3.1: *IUCN Red-Listed species found within Papahānamokuākea*

Species	IUCN Red List Status
Hawaiian Monk Seal	Critically Endangered
Laysan Albatross	Vulnerable
Black-footed Albatross	Endangered
Nihoa Finch	Critically Endangered
Nihoa Millerbird	Critically Endangered
Laysan Finch	Vulnerable
Laysan Duck	Critically Endangered
Green Turtle	Endangered
Hawksbill Turtle	Critically Endangered
Olive Ridley Turtle	Vulnerable
Leatherback Turtle	Critically Endangered
Loggerhead Turtle	Endangered
Nihoa Banza Conehead Katydid	Vulnerable
Pritchardia remota	Endangered
Amaranthus brownii	Critically Endangered
Giant Grouper	Vulnerable
Blue Whale	Endangered
Fin Whale	Endangered
Humpback Whale	Least Concern
North Pacific Right Whale	Endangered
Sei Whale	Endangered
Sperm Whale	Vulnerable

Marine

Hawaiian Monk Seals are found only in Hawai'i, with the main breeding subpopulations located throughout the NWHI and a small but growing population in the main Hawaiian Islands. This population represents one of only two monk seal populations remaining anywhere, as the monk seals of the Caribbean are extinct and the populations of the Mediterranean monk seals are perilously low, at below 350 individuals. In 1988, the National Marine Fisheries Service designated critical habitat for the Hawaiian Monk Seal from shore to 20 fathoms around every island, atoll, and bank of Papahānaumokuākea, except Sand Island at Midway Atoll. This habitat includes "all beach areas, sand spits and islets, inner reef waters, and ocean waters" (50 CFR Part 226).

The property also provides nearly the entire nesting habitat for the threatened Hawaiian Green Turtle. On the undisturbed beaches of these remote atolls, both male and female turtles come ashore to bask on the beach in broad daylight, a behavior no longer seen in most


(Photo: James Watt)

other parts of the world. The critically endangered Hawksbill and Leatherback turtles, and the endangered Olive Ridley and Loggerhead turtles, are also found in Papahānaumokuākea. In addition, the waters of Papahānaumokuākea are home to more than 20 cetacean species, six of them federally and/or internationally recognized as endangered. Recent research by Johnston et al. (2007) indicates that Papahānaumokuākea contains two-thirds of the humpback whale wintering habitat in the Hawaiian Archipelago. This study documented for the first time breeding and calving activity of humpback whales within Papahānaumokuākea.

Critical habitat of the endangered Hawaiian Monk Seal, found only in Hawai'i (Photo: James Watt)

Altogether, besides the 23 identified endangered species (U.S. ESA) found within the property, there are also hundreds, if not thousands, of endemic species. Papahānaumokuākea is the last or only home for these creatures, and they require continued protection to assure their existence.

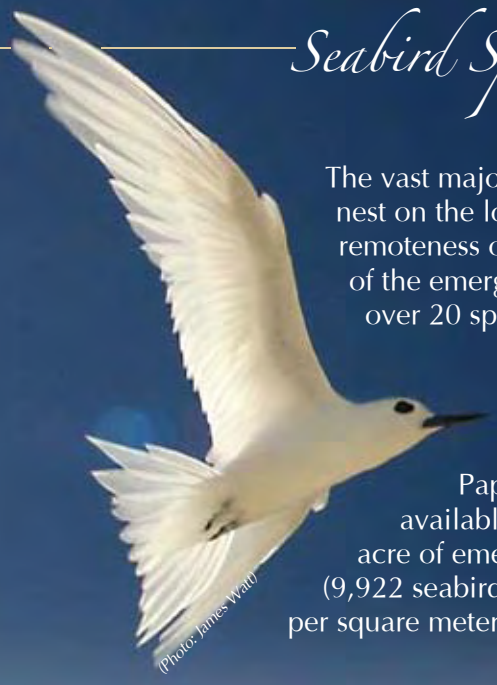
Terrestrial

The terrestrial area of Papahānaumokuākea is very small compared to its marine area, and only the larger and higher islands are of sufficient size to support significant and diverse plant biota. All islands are dry, with minimal fresh water resources. Remarkably, given these limitations, the terrestrial areas of Papahānaumokuākea also support significant endemism. All the islands and atolls of Papahānaumokuākea except Gardner Pinnacles, Maro Reef and Midway support endemic species that are specific to their respective islands. This includes at least 145 species of endemic arthropods, six species of endangered endemic plants (including an endemic palm), and four species of endemic birds, including remarkably isolated species such as the Nihoa Finch, Nihoa Millerbird, Laysan Finch, and the Laysan Duck, one of the world's rarest ducks. Three of these species (Nihoa Finch, Nihoa Millerbird, and Laysan Duck) are deemed critically endangered by the IUCN (Table 3.1), and the Laysan Finch is listed as vulnerable. In addition, as mentioned previously, millions of seabirds use the area for breeding and foraging, and as a transit corridor for migrations to the north and south.

At least six species of terrestrial plants found only in the region are listed under the U.S Endangered Species Act, some so rare that because of the difficulty of surveying these remote islands, they have not been documented for many years. The IUCN lists *Cenchrus agrimonioides* var. *laysanensis* from Laysan as extinct, though biologists hold hope that it may still exist. As noted in Table 3.1, *Amaranthus brownii*, endemic to Nihoa, is deemed critically endangered by the IUCN, while *Pritchardia remota* is considered endangered. Although it has yet to be documented thoroughly, the terrestrial invertebrate fauna shows significant patterns of clear precinctive speciation, with endemic species described from Nihoa, Mokumanamana, French Frigate Shoals, Laysan, Lisianski, Pearl and Hermes, and Kure.

The endangered endemic loulu palm, Prichardia remota, (inset) is one of six endemic terrestrial plants of the region listed as endangered (Inset photo: Alex Wegmann Lower photo: James Watt)

Seabird Species


(Photo: James Watt)

The vast majority of breeding seabirds in the Hawaiian Archipelago nest on the low sandy islands and atolls of the NWHI. Due to the remoteness of the area, seabirds are by far the most dominant animals of the emergent lands. Approximately 14 million seabirds comprising over 20 species use the NWHI as their primary nesting site. As a result, the NWHI is considered one of the largest and most important assemblages of tropical seabirds in the world.

When the sheer numbers of seabirds present in the Papahānaumokuākea are compared to the total landmass available, it is apparent how populous these seabirds are, as every acre of emergent land, on average, contains more than 4,015 seabirds (9,922 seabirds per hectare), which equates to approximately 1 seabird per square meter.

The following list represents the diversity of breeding seabird species:

Black-footed Albatross	*Phoebastria nigripes*
Laysan Albatross	*Phoebastria immutabilis*
Bonin Petrel	*Pterodroma hypoleuca*
Bulwer's Petrel	*Bulweria bulwerii*
Wedge-tailed Shearwater	*Puffinus pacificus*
Christmas Shearwater	*Puffinus nativitatis*
Tristam's Storm-Petrel	*Oceanodroma tristrami*
Red-tailed Tropicbird	*Phaethon rubricauda*
White-tailed Tropicbird	*Phaethon lepturus*
Masked Booby	*Sula lepturus*
Red-footed Booby	*Sula sula*
Brown Booby	*Sula leucogaster*
Great Frigatebird	*Fregata minor*
Little Tern	*Sternula albifrons*
Gray-backed Tern	*Onychoprion lunatus*
Sooty Tern	*Onychoprion fuscatus*
White Tern	*Gygis alba*
Blue-gray Noddy	*Procelsterna cerulean*
Brown Noddy	*Anous stolidus*
Black Noddy	*Anous minutes*

Greater than 98 percent of the world's Laysan and Black-footed Albatrosses nest in the islands and atolls of the NWHI. Papahānaumokuākea also supports several other colonies of global significance, such as the Bonin Petrel, Christmas Shearwater, Tristram's Storm-Petrel, and the Gray-backed Tern.

Conservation of these seabird species is a high priority for the Monument, as 11 of the 21 species recorded inside Papahānaumokuākea boundaries have been classified as highly imperiled or of high conservation concern at the broad scale of the North American Waterbird Conservation Plan.

3.b Statement of Outstanding Universal Value

Covering a vast area in one of the world's most isolated archipelagos, Papahānaumokuākea Marine National Monument encompasses a significant expanse of low-laying islands and atolls, predator dominated coral reef ecosystems, and marine and terrestrial flora and fauna that show significant patterns of enhanced speciation with numerous endemic and endangered species. It is a unique seascape, rich in ecological, geological and cultural heritage.

The islands and atolls of Papahānaumokuākea comprise an important prototype and outstanding example of ongoing geologic processes and the clearest illustration of 'hotspot' island progression in the world. The sheer isolation of these islands and waters causes Papahānaumokuākea to function as an intact miniature evolutionary universe. It contains innumerable excellent examples of ecological and biological evolutionary processes (such as dramatic examples of adaptive radiation) that continue undisturbed, resulting in very high rates of endemism. The region provides a crucially important habitat for the conservation of many endangered or threatened species of global concern. Papahānaumokuākea is also a sacred cultural landscape, a region of deep cosmological and traditional significance to the living Native Hawaiian culture that contains a host of intact and significant archaeological sites. The entire region provides a largely undisturbed ancestral environment, whose preservation both illuminates and embodies the Hawaiian concept of the literal and spiritual kinship of all things in the natural world, including man, and represents the site where life originates and the place where spirits return after death.

Criterion iii: Papahānaumokuākea's remarkable archaeology and significant ritual sites (heiau) bear exceptional testimony to the shared historical origins of all Polynesian societies, and to the growth and expression of a culture that evolved from the last and most difficult wave of cross-Pacific Polynesian migration. As the only Mystery Islands (once-inhabited but now abandoned outposts at the farthest reaches of Polynesian migration) that continue a cultural association with their indigenous people, the islands of Nihoa and Mokumanamana can reveal much about cultural resilience in a changing environment.

Criterion vi: Papahānaumokuākea, as an associative cultural landscape, represents core elements of Native Hawaiian cosmology


(Photo: Andy Collins)

and tradition. The islands northwest of the Tropic of Cancer are believed to lie within the region of primordial darkness from which life originates and to which it returns. For a culture that considers nature and civilization to be part of a genealogical whole, Papahānaumokuākea offers a "place of abundance" to reconnect with an ancestral environment, and its seas are also a traditional and contemporary testing ground for the revitalized art of Polynesian wayfinding.

Criterion viii: The string of islands in Papahānaumokuākea, 1,931 kilometers long, comprise a classic, important and unparalleled example of later stages of island and atoll evolution. The archipelago has provided some of the most compelling confirmation of current theories of global plate tectonic movements.

Criterion ix: Papahānaumokuākea is a spectacular example of evolution in isolation, which results in enhanced speciation and a phenomenally high degree of endemism in both the marine and terrestrial flora and fauna. The coral reef ecosystems of Papahānaumokuākea also represent one of the world's last apex predator dominated ecosystems, a community structure characteristic of coral reefs prior to significant human exploitation.

Criterion x: The region is home to, and a crucial refuge for, many endangered, threatened, and endemic species, including critically endangered marine mammal, bird, and plant species for whom it is the last or only refuge anywhere on earth. Papahānaumokuākea is also the largest tropical seabird rookery in the world.

Integrity
Papahānaumokuākea is a nearly pristine marine ecosystem, which allows biological and ecological processes and systems to continue undisturbed, to a degree seen in few other places on earth. It includes all key areas and ecosystems that are needed to maintain ecological integrity and the long-term conservation of its unique diversity. Papahānaumokuākea is also a complete and intact cultural and maritime landscape that is in continuous use by its cultural descendants, Native Hawaiians. Its densely scattered, well-preserved and varied archaeological sites have been subject to very few human disturbances.

Authenticity
The authenticity of Papahānaumokuākea lies in the continuing strong association of the landscape with the cosmology and oral traditions of Native Hawaiians, the embodiment of an ancestrally pristine and spiritually meaningful marine environment, and the perpetuation of customary practices such as wayfinding.

Requirements for protection and management
Papahānaumokuākea is protected by a significant federal and state legal regime, including an extensive management plan; enforcement, surveillance, and monitoring activities; and severe restrictions on access. Tourism is restricted to limited numbers at only one site, on Midway Atoll. The area is managed to provide opportunity for significant input and advice from key stakeholders and has a long history of public engagement.


(Photo: James Watt)

3.c Comparative Analysis

The inscription of Papahānaumokuākea Marine National Monument would contribute to a balanced and representative World Heritage List. While oceans comprise 70% of the earth's surface, the World Heritage List represents relatively few coastal, marine and small island natural sites. The World Heritage Marine Programme identified that out of the 800-plus sites inscribed on the World Heritage List, only about 4% have significant marine components. Significant marine sites with an associative cultural landscape are currently absent from the List. None of the approximately 30 tropical World Heritage sites, and none of the 25 mixed World Heritage sites, represents an associative cultural landscape with marine components, although several sites are currently being proposed.

Lobe coral (Porites lobata) at Lisianski Island
(Photo: James Watt)

As recognized by the UNESCO World Heritage Global Strategy (Paragraphs 54-58 of the Operational Guidelines, 2005), natural and mixed sites are priorities for future inscription in the World Heritage List. In addition, in 2007, IUCN identified a gap in the World Heritage List's representation of sites in the Pacific, relating to marine systems, as well as cultural landscapes (IUCN 2007). The recent ICOMOS Thematic Study, "Cultural Landscapes of the Pacific Islands" explores cultural landscapes of the Pacific as rich in associative value and a priority for future site inscription. This study identifies "movement of peoples" and "storied places that explain origin and development" as particularly strong themes in the Pacific region. Papahānaumokuākea is discussed as an example of a site that would meet this description (Smith and Jones 2007). In concert with IUCN and ICOMOS, The World Heritage: Pacific 2009 Programme reflects a concerted effort to encourage and facilitate the inscription of more Pacific sites, stating that despite

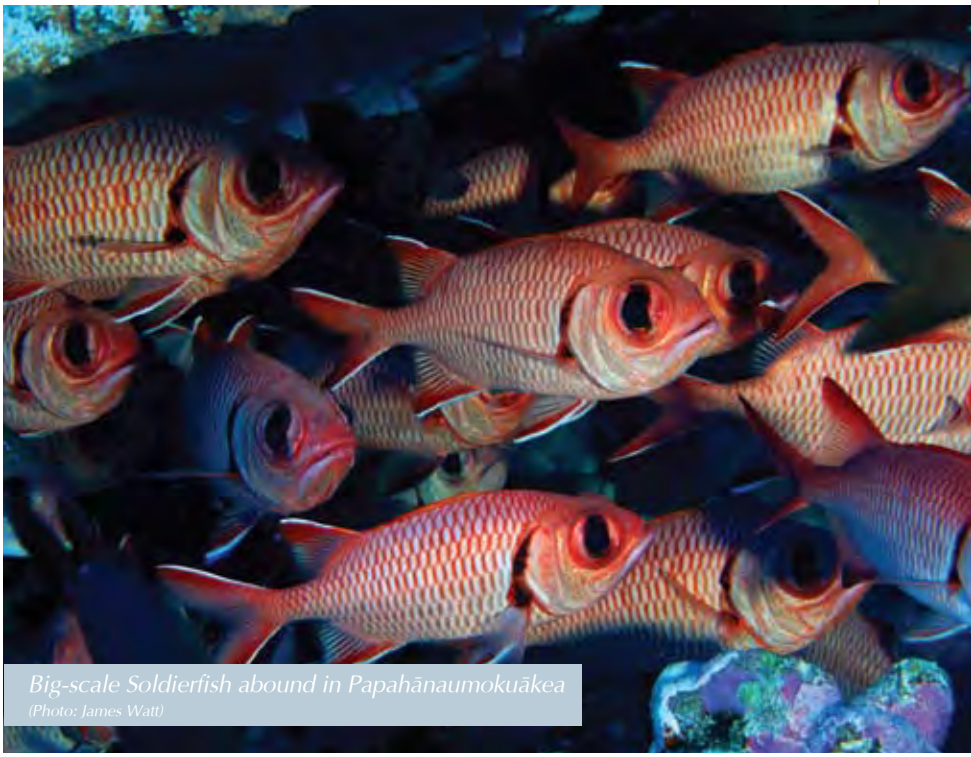
> "extraordinary cultural and biological diversity and richness, the Pacific is the most under-represented sub-region."

Natural

Global Comparison of World Heritage sites - Biology

The majority of sites with tropical marine components on the World Heritage List are managed for their terrestrial biodiversity, rather than their marine component (Hillary et al. 2003). Of the more than 400 atolls and reef islets in the world, only three have been inscribed as World Heritage sites: East Rennell, Aldabra, and Atol da Roca, which are all raised atolls. World Heritage sites that include marine and/or cultural components (New Caledonia Lagoons, Galapagos, Great Barrier Reef, Cocos Island, the Gulf of California, Hawai'i Volcanoes National Park, Tongariro National Park, Tubbataha Reef in the Philippines) have been successfully established by only a few nations in Oceania, and no World Heritage sites currently include coral reef components of the central deep Pacific.

The most logical natural comparison in the World Heritage portfolio is the Galapagos Islands, another isolated Pacific archipelago with a marine component. Although the Galapagos Islands are in the Pacific, they do not share Papahānaumokuākea's Polynesian cultural history and association; its variety of natural features and habitats (among them, true atolls, low reef islands, seamounts, and banks), and its superlative illustration of geologic island evolutionary history.



Big-scale Soldierfish abound in Papahānaumokuākea
(Photo: James Watt)

Papahānaumokuākea's expansive and intact top predator dominated ecosystem is one of the last remaining representations of world's oceans and reefs prior to significant human exploitation. Several World Heritage marine sites (Cocos Island, Galapagos, the Great Barrier Reef, Lagoons of New Caledonia, Malapelo, and Tubbataha) also have remnant apex predator components, but in these areas, the top predators are mostly sharks (rather than the diversity found at Papahānaumokuākea). Furthermore, their marine ecosystems are not exclusively top predator dominated (Figure 3.3). At Papahānaumokuākea, apex predators such as jacks, groupers and sharks remain more than half the biomass, in contrast to the 3% top-predator biomass in the main Hawaiian Islands and human-populated regions worldwide. Large predatory fish (giant trevally and grouper), which are heavily over-harvested worldwide, are still abundant and dominant in Papahānaumokuākea's nearly pristine marine ecosystem.

Comparative richness and endemism - marine

The Indo-Pacific region contains the world's richest assemblage of reef fishes and marine invertebrates. Most of this biota, however, is inadequately sampled and most have yet to be taxonomically characterized. In regard to making comparisons of marine biota among various sites in the Indo-Pacific region, reliable data is available primarily for reef fishes, shallow water corals (occurring at depths of less than 30 meters), and marine mollusks. These groups have been relatively well sampled across the region, leading to confidence that the comparative data derived from them is accurate. They are also used by major conservation organizations such as Conservation International as focal groups for rapid assessment surveys and conservation prioritization.

Reef Fish: Papahānaumokuākea leads the list of the top 10 "hotspots" for reef fish endemism within the Pacific and Indian Oceans (Allen 2007). Although many World Heritage marine sites exhibit fairly high levels of endemism (Coiba National Park, East Rennell, Galapagos, Lagoons of New Caledonia, and Malapelo are all good examples), within these sites, the vast majority of species are widespread throughout the region due to their planktonic mode of larval dispersal. Only in a few peripheral and isolated areas of the Indo-Pacific, such as the Red Sea, the Marquesas Islands, and the Hawaiian Islands, are significant concentrations of locally endemic species encountered.

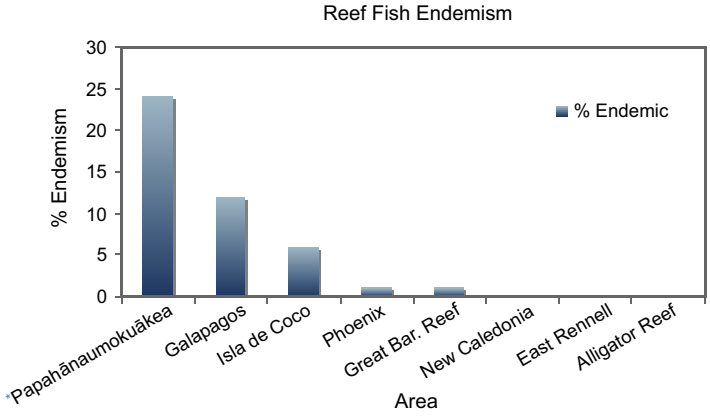


Figure 3.5: *Comparison of World Heritage Site reef fish endemism rates* (Source: PMNM)

These peripheral areas of highly concentrated endemism are in turn priority candidates for the highest level of biodiversity conservation efforts due to the globally unique composition of their marine biota. In comparison to other protected sites in more equatorial settings, or in closer proximity to large islands or continental coastlines, the overall species richness of Papahānaumokuākea may not seem exceptional. At present, 250 species of reef fishes are recorded from Papahānaumokuākea, compared to 88 at Rapanui, 310 in the Cocos Islands, 449 in the Galapagos Islands, 463 in northwest Madagascar, 518 in the Phoenix Islands, 852 in Samoa, and 1,500 on the Great Barrier Reef of Australia (Randall et al. 1977; Allen 2003; Allen 2007). However, when compared to these other sites, the rate of species endemism in Papahānaumokuākea is much higher at 23%, compared to 6% in the Cocos Islands, 19% at Easter Island, 12% in the Galapagos Islands, and 1% in both the Phoenix Islands and on the Great Barrier Reef of Australia (Allen 2007) (Figures 3.4 and 3.5).

Papahānaumokuākea's endemic fishes comprise more than 50% of Papahānaumokuākea's population in terms of numerical abundance, and represent 23% of the number of species (Figure 3.5). (As described earlier in this section, endemism rates vary on individual island and reef scale, with a general trend for a higher rate of endemism toward the northwest, farther from human population centers.)

These high rates of endemism at both archipelago and individual atoll level serve to emphasize the unique composition of the Papahānaumokuākea reef fish biota (Figure 3.5).

Coral: In regard to scleractinian coral species richness, Papahānaumokuākea supports 57 documented species in shallow waters less than 30 meters deep (Maragos, 1995), compared to 23 species at Coiba Island in Coiba National Park, a World Heritage site off western Panama, 127 species in the Society Islands, 130 species in the Phoenix Islands, 230 species in Fiji, 320 species in New Caledonia, 323 species in northwest Madagascar, and 400 species on the Great Barrier Reef of Australia, all of which are more equatorial in location (Bennett 1971; Chevalier 1973; Maté 2003; Turak 2005). However, as with reef fishes, the lower richness total is offset by a very high rate of local endemism (Figure 3.6). Recent surveys of corals reveal that that as many as 40% of the coral species are endemic, with most still yet to be described (Maragos 2008).

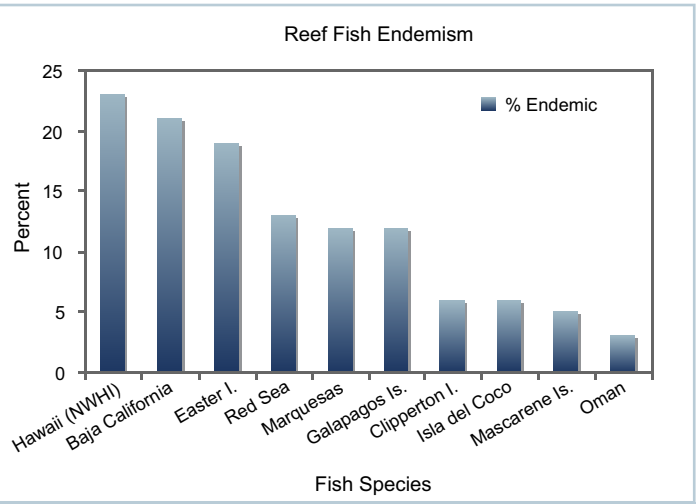


Figure 3.4: *Top 10 coral reef hotspots, based on percentage of endemic reef fishes of the total fish fauna* (Source: PMNM)

Algae: The reefs of Papahānaumokuākea are also notable in that much of their structure is composed of crustose coralline algae rather than hermatypic corals. Species inventories of such coralline algae are in an incipient phase, but promise to reveal high species richness totals and similarly high rates of local endemism. (For example, the Great Barrier Reef of Australia supports 500 species of marine algae in addition to its 400 species of corals, and the same ratio in New Caledonia is 320 coral species to 336 algal species (Garrigue and Tsuda 1988).) Such algae-to-coral species ratios are likely be even higher in an archipelago such as the NWHI that lies near the Darwin Point. Therefore, in evaluating the overall richness of the coral reef composition in Papahānaumokuākea, this unique mix of structural components must also be taken into account and further highlights the globally unique natural environment of the area.

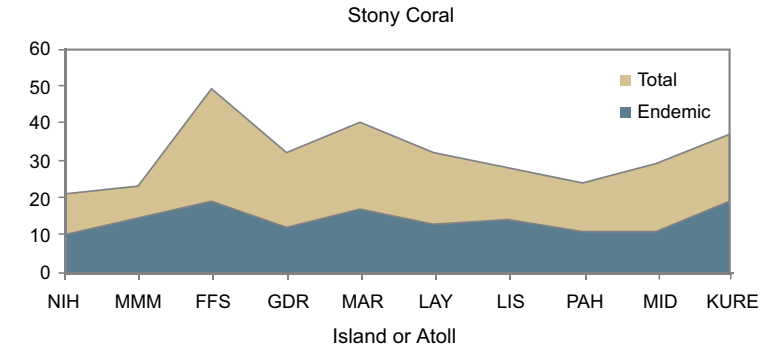
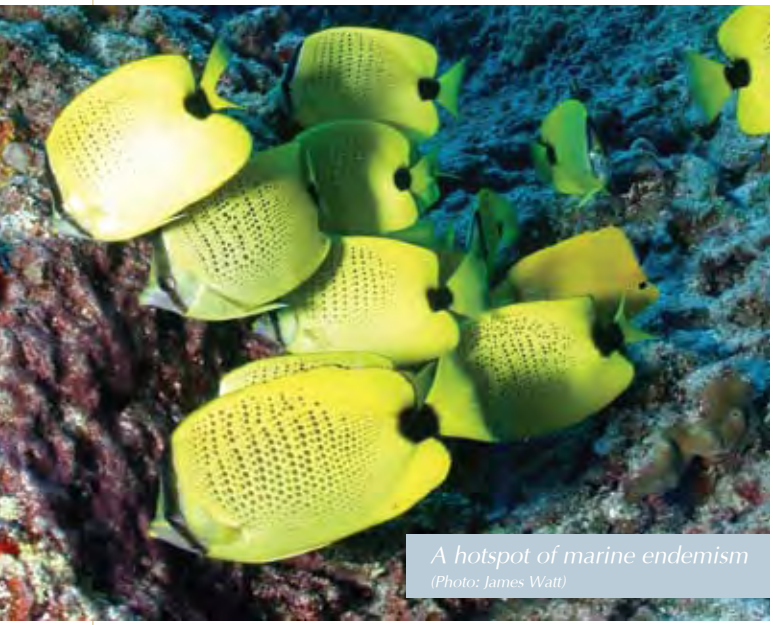


Figure 3.6: *Total and endemic species of stony coral in Papahānaumokuākea by location* (Source: PMNM)

Invertebrates: Among shallow-water marine invertebrates, 838 species representing 12 orders are currently documented from Papahānaumokuākea; however, endemism rates within most of this assemblage have not yet been established. Comparative species richness data for such marine invertebrates on a Pacific-wide basis is far less comprehensive than that for reef fishes or corals, and assessments of endemism nearly absent. As such, only limited comparisons can be made with other areas, and are, to some extent, misleading since the available data comes from larger, older islands in closer proximity to continental source areas. In regard to marine mollusks, Papahānaumokuākea supports 378 species, compared to 453 at Coibá, 525 in northwestern Madagascar, 643 in eastern New Guinea, 802 in New Caledonia and 4,000 on the Great Barrier Reef of Australia (Bennett 1971; Perez and Vasquez 2000; Laboute and Richer de Forges 2004; Wells 2005). Asteriods in Papahānaumokuākea total 11 species, compared to 54 in New Caledonia; for echinoderms, the comparative totals are 26 species in Papahānaumokuākea and 43 in New Caledonia; for ophiuroids, the comparative totals are 21 in Papahānaumokuākea versus 57 in New Caledonia; and for holothuroideans, the totals are 17 Papahānaumokuākea species versus 55 New Caledonian species (Laboute and Richer de Forges 2004). As with reef fishes and scleractinian corals discussed previously, the overall richness numbers must be balanced with the realization that a high proportion of the Papahānaumokuākea taxa, having evolved in relative isolation, are locally endemic and the ecosystem is therefore unique. In marine mollusks, this endemism rate is 20% for the overall fauna; certain groups such as the Turrinae (turrid shells) have endemism rates approaching 60% (Kay 1979).

Of shallow water marine invertebrates, 838 species representing 12 orders are documented in Papahānaumokuākea (Photo: James Watt)



A hotspot of marine endemism
(Photo: James Watt)

Comparative richness and endemism - terrestrial

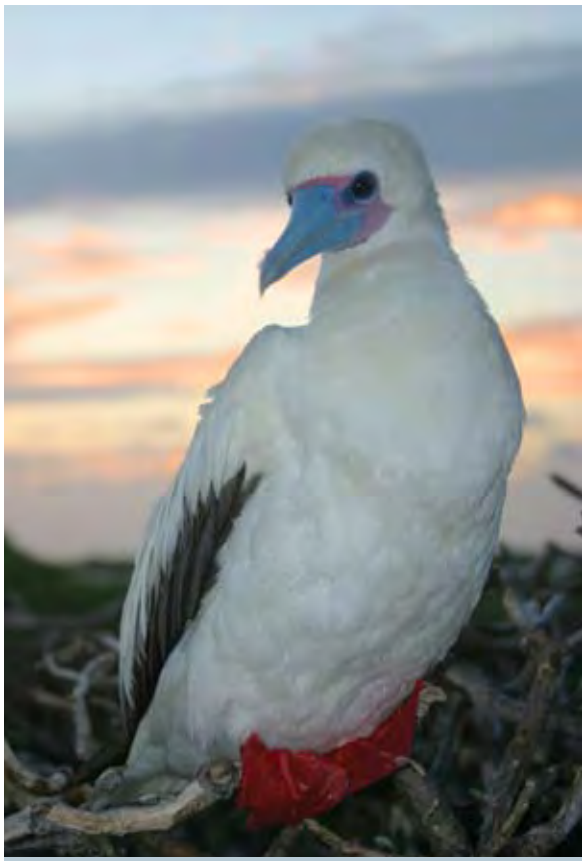
Endemism rates for terrestrial fauna in the islands of Papahānaumokuākea are also high, with numerous single-island endemics. These include four species of land birds, four endemic plant species, at least 35 endemic species of insects, spiders and mites, and six species of endemic land snails. This concentration of terrestrial endemism is exceptional in the context of the insular Pacific as a whole, east of the Tonga Trench, where most isolated atoll chains support a relatively limited biota composed of widespread, dispersive generalists. For example, across the 153 atolls comprising the Marshall, Gilbert, Line, Phoenix, and Tuamotu archipelagos of the central Pacific, there are only four endemic bird species (BirdLife International 1988). Therefore, on an endemic-species-per-island basis, the rate of bird endemism in Papahānaumokuākea is 20 times higher than in the vast archipelagos that lie to the south and southwest.

Papahānaumokuākea is home to one of the largest and most important assemblages of tropical seabirds in the world, with more than fourteen million birds representing 21 species. More than 95% of the world's populations of Laysan and Black-footed Albatross nest here, and Bonin Petrel, Tristram's Storm-Petrel, Red-tailed Tropicbird, and White Tern have all settled Papahānaumokuākea in colonies of global significance. In fact, BirdLife International has indicated that a total 17 seabird species trigger global International Bird Areas criteria in the Northwestern Hawaiian Islands (i.e., 17 species are present in globally significant numbers). These include: Gray-backed Tern; Sooty Tern; Brown, Black and Blue-gray Noddies; White Tern; Red-tailed Tropicbird; Masked Booby; Red-footed Booby; Great Frigatebird; Bonin Petrel; Bulwer's Petrel; Wedge-tailed Shearwater; Christmas Shearwater; Black-footed Albatross; Laysan Albatross; and Tristram's Storm-Petrel (Ben Lascelles, Marine IBA Officer, BirdLife International, 2008).

In total numbers and biodiversity of tropical seabirds, this is greater than the community of marine birds in the Phoenix Islands Protected Area that is also being proposed for nomination. There are also similarities to other, more high-latitude, sites already holding World Heritage status. The presence of one of the world's largest albatross breeding colonies of any species (Laysan Albatross, Midway Atoll) invites comparison with World Heritage sites such as Heard Island, Macquarie Island, Gough Island, and the New Zealand Subantarctic Islands, all of which are important colonies for several species of Southern hemisphere albatrosses.

Other similarities between these World Heritage sites in the subantarctic are the presence of intact seabird communities representing species exhibiting the range of foraging and nesting behaviors appropriate

Many new species still to be discovered
(Photo: James Watt)



Red-footed Booby in the sunset of French Frigate Shoals (Photo: James Watt)

for the ecosystem. The subantarctic seabird communities are characterized by higher species diversity than found anywhere in the tropics, which may reflect the very different ecological situation there of higher primary productivity and more habitat options allowing for benthic and littoral foraging guilds not observed in typical tropical seabird communities. That complete seabird communities persist at all the sites described above demonstrates another common element between these sites: the absence or relatively recent human introduction of terrestrial mammals such as rats. Henderson Island (23ºS latitude in the Pacific) is a World Heritage site of enormous importance to four beleaguered species of gadfly petrels (Genus Pterodroma) that have been extirpated by rats from most of the other islands in the world on which they nest. In the north, Papahānaumokuākea provides some of the last safe havens for another gadfly petrel species, the Bonin Petrel, as well as other small petrels that cannot coexist with introduced mammals.

Papahānaumokuākea provides the vast majority of breeding, nesting and foraging habitat for the endemic Hawaiian monk seal (*Monachus schauinslandi*), one of the last two remaining species of monk seals on the planet. The fully protected beach, near shore, and deep bank ecosystems of Papahānaumokuākea provide essential habitat for this IUCN-listed critically endangered species. In contrast, the Mediterranean monk seal (*Monachus monachus*) which once ranged throughout the Mediterranean Sea and Black Sea, has declined in numbers to fewer than 350 remaining individuals, and is currently fully protected in only a small portion of its former range.

Global Comparison of Physical Characteristics of Reef Archipelagos - Geology

Comparison of Pacific, Indian and Atlantic archipelagos

The world's three deep oceans with tropical components (Pacific, Indian, and Atlantic) support approximately 84 island archipelagos that fall within the latitudes of 30 º North and South; half of these (58) are in the Pacific Ocean.

Pacific Ocean: Of the Pacific archipelagos, 28 are: 1) derived from volcanoes associated with a continental shelf, 2) located on continental slopes, 3) greatly influenced or modified by subduction at deep ocean trenches near continental margins, or 4) large islands of continental origin. Nine archipelagos in the Pacific consist entirely of ancient low-reef islands and atolls in the stable central Pacific: Line, Tuamotu, Tokelau, Gilbert, Marshall, Tuvalu, Yap, Phoenix, and Ha'apai. These archipelagos are situated in an area of the central Pacific that lacks hotspots and significant seismic activity. An additional five of the remaining 30 archipelagos consist of only a single island (Minami Torishima (Marcus), Niue, Nauru, Kosrae, and Rapanui), and are not comparable to the Hawaiian Islands. The remaining Pacific archipelagos were formed by the action of oceanic hotspots on the deep ocean floor; however none of these are as ancient or as vast as the Hawaiian Islands. Papahānaumokuākea also contains a clear,

linear illustration of all the different stages of atoll formation and decay, from high islands to submerged seamounts. Additionally, the northwestern end of the Hawaiian Archipelago within Papahānaumokuākea exhibits high levels of endemism of species associated with coral reefs. As mentioned earlier, Papahānaumokuākea is part of the Hawaiian-Emperor Archipelago, recently included as one of just ten sites in a new publication from IUCN promoting "High Seas Gems: Hidden Treasures of our Blue Earth."

Indian Ocean: Of the ten tropical and subtropical archipelagos in the Indian Ocean, only two (Chagos and Mascarene archipelagos) were formed from seismic activity associated with the mid-ocean ridge or by deep-sea trench subduction zones. Only the Chagos Archipelago is of comparable magnitude, but it was created by geological processes vastly different from those of Papahānaumokuākea. In total, none of the Indian Ocean groups exhibit comparable habitats and origins, and only a few species are common to both sub-regions.

Atlantic Ocean: Of the ten island archipelagos within 30 º N and S latitudes in the Atlantic Ocean proper, nine are associated with seismic origin on the Mid-Atlantic Ridge, or are of continental shelf origin. Although corals are present at some of these locales, only the Florida Keys–Dry Tortugas support viable coral reef habitat. None share any of the Pacific reef–associated species and only a few share Pacific reef-associated genera. The two large Caribbean archipelagos bordering the Atlantic (Greater and Lesser Antilles) are under the jurisdiction of dozens of separate governments. All but a few islands are heavily populated, and are strongly influenced by adjacent continents and associated geological composition, trenches, volcanic eruptions, uplifting, and other tectonic activities. All of the coral reef ecosystems there are relatively new, and formed from geological processes occurring in the Miocene, three million years ago. (By comparison, Kure Atoll was formed about 27 million years ago.)

In summary, there is very little basis on which to make comparisons of Papahānaumokuākea with Atlantic-Caribbean archipelagos, or with other archipelagos in the deep Pacific Ocean. Even within the northeast central Pacific, the Papahānaumokuākea reef-associated fauna is significantly different from those of its closest neighbors to the south, based on comparisons of coral-associated communities.

View of the main Hawaiian Islands from space
(Photo: NASA)

Comparative volcanic hotspot archipelago formation

The linear archipelagos of the insular Pacific have been hypothesized to represent island chains that formed sequentially above relatively fixed hotspot plumes as the Pacific Plate moved northward and then northwestward from the Late Cretaceous to the present day (Wilson 1963, 1965; Morgan 1971, 1972). As a result, the eastern Pacific in

particular contains a set of northwest-to-southeast trending island groups that record the geological signatures of these plate-hotspot interactions. The most prominent of these are the Hawaiian, Society, Marquesas and Austral chains, all of which have been well-investigated geologically.

Hawaiian Islands: Among the archipelagos listed above, the Hawaiian Archipelago provides by far the best-delineated and least interrupted illustration of a hotspot process in action. From the newest eruptive volcanic seamount at Lō'ihi, south of the island of Hawai'i, to the nearly senescent atoll of Kure in the northwest, the Hawaiian Archipelago exemplifies the entire 30 million year span of the progression and erosion sequence associated with the lifespan of hotspot-associated islands within an archipelago (Clague 1996). Geologically significant portions of this sequence have been well documented within Papahānaumokuākea. This area includes mature high islands in the final stages of post-shield erosion (Nihoa, Mokumanamana), incipient atolls with only remnant bedrock pinnacles (French Frigate Shoals, Gardner Pinnacles), mostly submerged atolls (Maro Reef), approximately 30 drowned banks, secondarily raised atolls (Laysan, Lisianski), and true atolls (Pearl and Hermes, Midway). The oldest representative (Kure Atoll) lies at the "Darwin Point," where further atoll formation is precluded by progressively cooler sea temperatures that do not allow enough upward growth of coral to keep pace with downward isostatic island subsidence. As such, the area provides the world's foremost illustration of the entire process of hotspot island formation and subsidence. Papahānaumokuākea, in particular, exemplifies the later stages of this process, including examples of the type of senescence that follows atoll formation.

Society Islands: Other major hotspot-associated island chains in the eastern Pacific region possess similar underlying geological dynamics and island age progressions (Dupuy et al. 1989), but the overall patterns are less clearly and explicitly displayed. In the Society Islands, for instance, there has been an apparent lateral "bleed" of magma into fracture zones that run perpendicular to the main axis of the hotspot trace (Guillou et al. 2005). This has resulted in the formation of island pairs of roughly similar age to either side of the putative underlying hotspot track (Bora Bora–Tupai, Raiatea–Tahaa, Maiao–Moorea). In addition, the Society Island chain exhibits a significant half-million-year hiatus in its central sector, with no extant islands lying between Huahine (2.4 My) and Maiao (1.9 My). As compared to the intact and constant geological illustration visible with the Hawaiian Archipelago, it represents a much more complicated and less definitive example of the general hotspot-associated island chain pattern.

Marquesas Islands: The Marquesas Islands, another hotspot-associated island chain, also provide an imperfect example of process and pattern, due to the irregular age progression among the constituent islands. Although there is a general age progression from older to younger islands, running from Eiao (7.5 My) in the northwest to Fatu Hiva (1.4 My) in the southeast, several islands in the middle of the chain have yielded isotopic dates that span much of the apparent age of the archipelago as a whole. For instance, the lavas of Ua Pou have erupted over a period of four million years, from 5.6–1.6 My (Duncan et al., 1986), and those of Hiva Oa over a period of nearly 900,000 years, from 2.47–1.59 My (Woodhead, 1992), confounding the predicted age progression. One possible explanation for this is that the hotspot trace moved across an old, inactive subduction zone, which, in a manner somewhat analogous to the Society Islands system, allowed magma to "bleed" upward through a zone of crustal weakness for anomalously long periods of time during the formation of the two aforementioned islands. Whatever the underlying cause, the age progression anomalies in the Marquesas render them a far less compelling illustration of the hotspot pattern than is seen in the Hawaiian Archipelago.

Austral Islands: The Austral Islands provide the system most closely comparable to Papahānaumokuākea. The age progression along the length of the Austral Islands

Archipelago is linear and progressive, from Rimatara (21 My) in the northwest to the currently active MacDonald seamount in the southeast (Barsczus and Liotard 1985). The constituent islands were formed from single, discrete volcanoes, uncomplicated by lateral magmatic migration along other regional structures. The islands of the Australs, however, are small and limited in number, and the chain possess no true atolls. In addition, Dupuy (1988) has questioned whether the current chain is the product of only a single hotspot, given the wide range of radiometric dates from Rurutu and Tubuai (Liotard and Barsczus 1989; Maury et al. 1994). The relatively long duration of volcanism at these islands may once again be due to the transgression of a fracture zone across the hotspot trace, similar to the situation in the Society Islands. Therefore, the Austral Islands are not as unequivocally illustrative of the overall process of hotspot island formation, erosion, and senescence, as is Papahānaumokuākea, and in addition do not show the many different, and related, stages of atoll formation from high islands to submerged seamounts.

Within the Pacific Plate as a whole, approximately twenty-five linear volcanic chains of putative hotspot origin have been recognized. Clouard and Bonneville (2005) compiled 1,685 published radiometric ages for 290 of the volcanic islands contained within these archipelagos in order to determine whether such linear island groupings were likely to be of true hotspot origin. These authors concluded that "Among the twenty-five volcanic chains for which ages are available, almost all show inconsistencies with the classical fixed-hotspot theory, and more inconsistencies appear as information on ages become available. These inconsistencies include wrong rate of progression (e.g., Pukapuka ridge), a trend incompatible with Pacific absolute plate motion (e.g., Marquesas Islands), lack of an active hotspot for each of the oldest chains except Louisville and Hawai'i and even for a younger chain (e.g., Austral Islands), occurrence of several volcanic stages on the same seamount (e.g., Sāmoa Islands), no age progression at all (e.g., Northwest Pacific seamounts) with clusters of intraplate volcanism (e.g., Line Islands), and geographical distribution of seamounts away from the proposed hotspot track (e.g., Tarava and Musicians seamounts)." The only volcanic chains for which radiometric dating was unequivocally consistent with the hotspot formation hypothesis were the Austral Islands, Easter Island, the Foundation Seamounts, the Louisville chain, the Pitcairn Islands, the Society Islands, and the Hawaiian-Emperor chain. As noted above, all of these except the Louisville, Austral, and Hawai'i chains lack an active hotspot. Among the latter three chains, none of the Louisville volcanoes are currently above sea-level, although forty of them were emergent islands at some time in the past (Lonsdale 1988), and the Austral Islands present previously noted anomalies in terms of radiometric dating on Rurutu and Tubuai. Thus, even when considered in the context of the entire Pacific, the Hawaiian Archipelago still emerges as the prime exemplar of the hotspot archipelago model, with a particularly well preserved age progression within Papahānaumokuākea in the archipelago's older northwestern sector.

Global Comparison of Islands, Atolls and Reefs – Summary

Almost 75% of the planet's islands and atolls are found in the Pacific Ocean. Volcanic islands, low reef islands, and atolls in the deep tropical Pacific Ocean basin span a distance of more than 14,800 km from Palau in the far western Pacific to French Polynesia in the southeastern Pacific (Bryan 1953; Wiens 1962; Maragos and Holthus 1995; Maragos et al. 1996; National Geographic 1999). Over this broad expanse of the globe, only the Hawaiian Archipelago is recognized as a distinct large marine ecosystem (LME). In the rest of Pacific, the areas in the southeast, central, northwest, and southwest do not have similar distinction, but are recognized as separate geographical provinces with biologically related systems (Maragos et al. 2008).

As noted previously, of the numerous islands, atolls, and archipelagos in the Pacific, the islands of the Galapagos Archipelago invite the closest comparison of biological fauna, yet these islands do not share the natural, cultural or historical relationship of Papahānaumokuākea. Both are distinctive examples of irreplaceable locales. The only other Pacific areas that have been afforded significant levels of protection are a few of the islands and reefs within the jurisdiction of Palau and the uninhabited atolls and low reef islands of the Phoenix Islands Protected Area within the central Pacific, which were recently designated by the Government of Kiribati as one of the largest marine protected areas in the world.

Other World Heritage properties that are close comparisons to Papahānaumokuākea, both in terms of magnitude and as marine sites, are Tubbataha Reef in the Philippines, the Great Barrier Reef of Australia, the lagoons of New Caledonia, and the Belize Barrier Reef. However, these properties are comprised of the fringing reefs of large continental areas, rather than isolated island chains, and they are affected by their proximity to their respective continental shelves and slopes of Australia and Central America. Because of this close proximity, these sites are subject to stressors such as pesticides and nutrients from agriculture, as well as runoff and sedimentation stemming from their adjacent large continental land mass.

Papahānaumokuākea, as a largely uninhabited and untrafficked sector of the world's most isolated archipelago, is not subject to any of the stressors associated with fringing continental reefs. In addition, the Great Barrier Reef and the Belize Barrier Reef, due to their proximity to other land masses, tend to contain a marine fauna that is representative of the region in general, in contrast to the specialized and highly endemic fauna found in Papahānaumokuākea. The Great Barrier Reef Marine Park Authority allows regulated tourism in over 99% of the Park. This lies in stark contrast to Papahānaumokuākea, where entry is prohibited except by permit, and limited recreation is permitted only at Midway Atoll, representing a very small portion of the area as a whole.

Isolation from continental land masses and population centers protects Papahānaumokuākea's reefs (Photo: James Watt)

Cultural

Comparison To Other World Heritage Sites

The current World Heritage List contains some 60 sites of cultural landscapes inscribed for spiritual, social, and/or historical value associated with a place. Listed in Table 3.2 are the World Heritage sites most comparable to Papahānaumokuākea because their cultural heritage either is prevailingly cosmological, relates to more intangible than tangible cultural heritage, or is a site in the Pacific region.

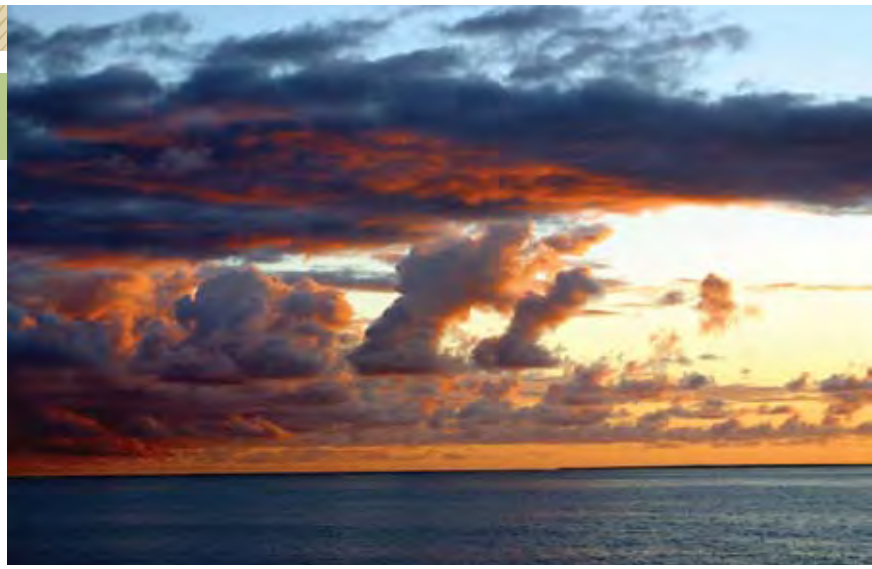


Table 3.2: *Comparable World Heritage Sites to Papahānaumokuākea and summary of their cultural significance*

Site	Year	Criteria	Summary of Site's Heritage
Tongariro National Park (New Zealand)	1993	vi	Mountains of cultural and religious significance for the Maori people symbolize the spiritual links between this community and its environment. The park has active and extinct volcanoes, a diverse range of ecosystems and spectacular landscapes.
Rio Abiseo National Park (Peru)	1990, 1992	iii	Pre-Inca mini-caves, and 36 previously unknown archaeological sites at altitudes between 2,500 and 4,000 meters. Located in rainforests characteristic of this region of the Andes. High level of endemism among the fauna and flora found in the park.
uKhahlamba Drakensberg Park (South Africa)	2000	i, iii	Diversity of habitats protects a high level of endemic and globally threatened species, especially birds and plants. Caves and rock-shelters with the largest and most concentrated group of paintings in Africa south of the Sahara, made by the San people over a period of 4,000 years. The rock paintings represent the spiritual life of the now extinct San people.
Pyrénées – Mont Perdu (Spain, France)	1997	iii, iv, v	Mountainous, pastoral landscape reflecting an agricultural way of life that was once widespread in the upland regions of Europe but now survives only in this part of the Pyrénées. Past European society, landscape of villages, farms, fields, upland pastures and mountain roads. Human settlement since 40,000 -10,000 BC. Mt. Perdu unifies Heavens and Earth. Interaction between nature and culture; land belongs to local communities.
Ibiza, Biodiversity and Culture (Spain)	1999	ii, iii, iv	Phoenician port of the Phoenician-Carthaginian period, exemplifies the important role played by Mediterranean economy in protohistory. Renaissance military architecture, a profound influence on the development of fortifications in the Spanish settlements of the New World.
Laponian Area (Sweden)	1996	iii, v	The Arctic Circle region of northern Sweden is the home of the Saami, or Lapp people. It is the largest area in the world (and one of the last) with an ancestral way of life based on the seasonal movement of livestock… huge herds of reindeer [led] towards the mountains through a natural landscape [of] glacial moraines and changing water courses.

Table 3.2 (continued): *Comparable World Heritage Sites to Papahānaumokuākea and summary of their cultural significance*

Site	Year	Criteria	
Ohrid Region (The former Yugoslav Republic of Macedonia)	1980	i, iii, iv	Situated on the shores of Lake Ohrid, the town of Ohrid is one of the oldest human settlements in Europe. Built mainly between the 7th and 19th centuries, it has the oldest Slav monastery (St Pantelejmon) and more than 800 Byzantine-style icons dating from the 11th to the end of the 14th century. After those of the Tretiakov Gallery in Moscow, this is considered to be the most important collection of icons in the world.
Gōreme National Park and the Rock Sites of Cappadocia (Turkey)	1985	i, iii, v	Capadocian Monasticism village, convent. Rock-hewn sanctuaries that provide unique evidence of Byzantine art in the post-Iconoclastic period. Dwellings, troglodyte villages and underground towns – the remains of a traditional human habitat dating back to the 4th century – can also be seen there.
Hierapolis-Pamukkale (Turkey)	1988	iii, iv	Springs in a cliff almost 200 m high feed calcite-laden waters at Pamukkale (Cotton Palace). Mineral forests, petrified waterfalls and a series of terraced basins. Late 2nd century BC kings of Pergamon established the thermal spa of Hierapolis. Ruins of the baths, temples and other Greek monuments.
St. Kilda, Hebrides Islands (United Kingdom of Great Britain and Northern Ireland)	1986, 2004, 2005	ii, v	Volcanic archipelago, one of the biggest sanctuaries of wildlife and marine life in the North Atlantic. Bronze Age Christian artifacts from the 10th C and evidence of Viking invasions.
Le Morne Cultural Landscape (Mauritius)	2008	iii, vi	A natural fortress, the rugged mountain that juts into the Indian Ocean in the southwest of Mauritius was used as a shelter by runaway slaves (maroons) through the 18th and early years of the 19th centuries. A symbol of the slaves' fight for freedom, their suffering, and their sacrifice.
Uluru-Kata Tjuta National Park (Australia)	1994	v, vi	Spectacular geological formations that dominate the vast red sandy plain of central Australia. Uluru, an immense monolith, and Kata Tjuta, rock domes located west of Uluru, form part of the traditional belief system of one of the oldest human societies in the world. Traditionally owned by the Anangu Aboriginal people.
Chief Roi Mata's Domain (Vanuatu)	2008	iii, v, vi	Closely associated with oral traditions surrounding the last paramount chief of Vanuatu, this site includes Chief Roi Mata's residence, the site of his death, and his mass burial site. Representative of Pacific chiefly systems.

Table 3.2 describes comparable sites and summarizes these sites' heritage and/or importance to the associated culture, while Table 3.3 demonstrates what Papahānaumokuākea offers to the World Heritage List in comparison with these sites. Papahānaumokuākea represents both a seascape and a sacred site associated with a living indigenous culture. Of World Heritage cultural and mixed sites comparable to Papahānaumokuākea, none represents all these qualities, as Table 3.3 illustrates.

Agricultural terraces of Nihoa (Photo: David Boynton)

Table 3.3: Comparison of Papahānaumokuākea to relevant cultural landscape World Heritage Sites Green-colored cells illustrate similarities, while tan represents dissimilarities.

Site	Living Culture	Marine Cultural Components	Sacred Site
Papahānaumokuākea Marine National Monument (Proposed, U.S.A.)	Yes	Yes	Yes
Tongariro National Park (New Zealand)	Yes	No	Yes
Rio Abiseo National Park (Peru)	No	No	No
uKhahlamba Drakensberg Park (South Africa)	No	No	Yes
Pyrénées – Mont Perdu (Spain, France)	Yes	No	Yes
Ibiza (Spain)	No	Yes	No
Laponian Area (Sweden)	Yes	No	No
Ohrid Region (Macedonia)	No	No	Yes
Goreme National Park and the Rock Sites of Cappadocia (Turkey)	No	No	Yes
Hierapolis-Pamukkale (Turkey)	No	No	Yes
St. Kilda, Hebrides Islands (U.K.)	No	No	No
Le Morne Cultural Landscape (Mauritius)	Yes	No	No
Uluru-Kata Tjuta National Park (Australia)	Yes	No	Yes
Chief Roi Mata's Domain (Vanuatu)	Yes	No	Yes

In terms of sacred sites that are inscribed on the World Heritage List, Papahānaumokuākea is most closely comparable to Tongariro, Uluru-Kata Tjuta, and Kakadu national parks. The cultures associated with each of these three sites are considered indigenous to their lands: the Native Hawaiian, the Maori, the Anangu and the several Aboriginal peoples of Kakadu. All three places are crisscrossed by ancient oral traditions and pathways of the gods of the indigenous peoples of each place.

Like Papahānaumokuākea, the mountains and volcanoes in the heart of Tongariro National Park have cultural and religious significance for an indigenous people, the Maori, and symbolize the spiritual links between the community and its natural environment. Additionally, Tongariro is considered the place from whence life originated and to which spirits return after death, as is Papahānaumokuākea in the Hawaiian belief system. The Maori and Native Hawaiian cultures are both the results of the last wave of Pacific migration to outlying points on the Pacific triangle. Both sites have strong cultural and spiritual ties, but they also, due in part to the distance between them and the geography and topography of both of their homelands, host cultures that evolved very differently. Because the Maori of Tongariro are not a voyaging *iwi* (tribe), Papahānaumokuākea would be the only World Heritage site that preserves and perpetuates the invaluable wayfinding and seafaring culture of Polynesia as well as the distinctive Hawaiian culture.

Uluru-Kata Tjuta National Park's singular geology – in the form of the world's largest, natural monolith and other red rock formations, and its sacredness to Australia's aboriginal Anangu people – parallel Papahānaumokuākea's striking example of island and atoll geologic evolution and its sacredness to Native Hawaiians. However, the Anangu continue to live, hunt and gather in Uluru-Kata Tjuta, unlike Native Hawaiians in Papahānaumokuākea, and the two cultures and their respective landscapes (one landlocked and one largely ocean) are quite divergent.

Moreover, the two sites differ greatly in their controls on access.

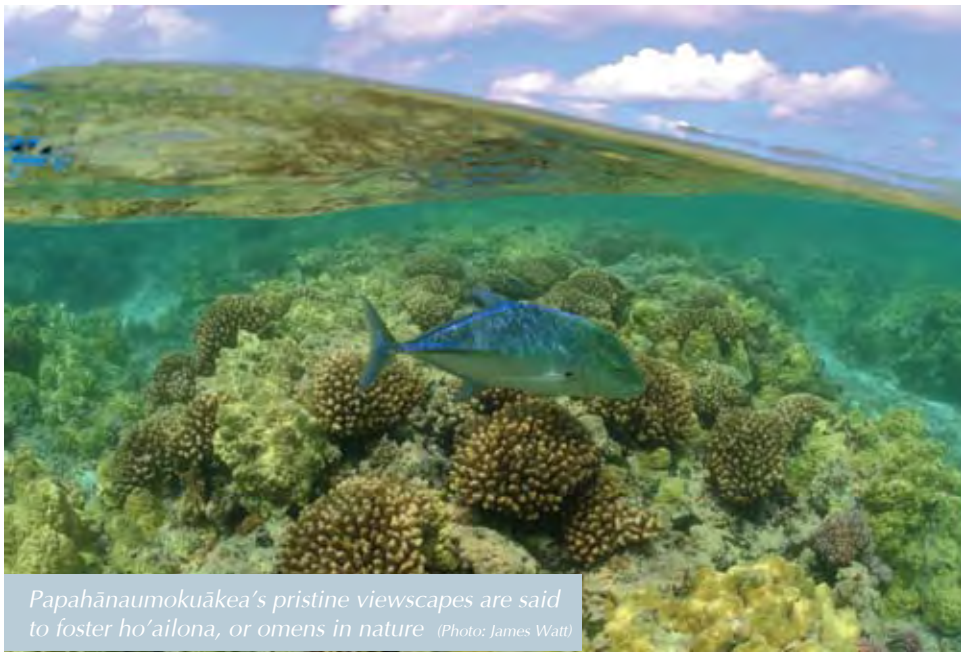
Nonetheless, Uluru-Kata Tjuta and Kakadu national parks, both in Australia, are comparable Pacific region mixed sites whose natural features include both unique examples of either geology or a complex variety of ecosystems and are sites that are part of the traditional belief systems of the Aboriginal people representing a way of life. The Anangu of Uluru-Kata Tjuta expressed their cultural link to their landscape much as Native Hawaiians express their strong link to Papahānaumokuākea: the cultural landscape includes the interaction and co-evolution of the people with the place, and the natural resources of the place are inherently cultural resources via the indigenous peoples' genealogical, spiritual and cultural associations with them. Indigenous connections to individual environments are almost universal, but their particular expression is always unique; neither of these Australian mixed sites includes a voyaging, island, or seascape component, nor the Native Hawaiian expression of their relationship with a unique ecosystem. These indigenous Australian and Hawaiian sites are very different expressions of the way nature, culture, and spiritual belief have intertwined in the Pacific.

Comparison to Hawai'i Volcanoes National Park

The State of Hawai'i contains one other World Heritage site: Hawai'i Volcanoes National Park (HAVO). While there are undoubtedly significant cultural associations between the Native Hawaiian people and this site, HAVO's inscription is for its geological phenomena only, and not for any cultural criteria. Kīlauea, Hawai'i's most active volcano protected in HAVO, is also an extremely sacred place for Native Hawaiians, comparable perhaps to Mauna Kea, Haleakalā, and Papahānaumokuākea – all of which are places of the gods *(nā akua)*. In addition, the migration story of the fire goddess Pele connects Papahānaumokuākea and Kīlauea; Hawaiian mythology tells that the goddess first arrived in the Hawaiian Archipelago in the Northwestern Hawaiian Islands and then traveled southward through the island chain until finally settling in Kīlauea, her current home. (This highlights the possibility of a serial nomination inscribing HAVO for cultural criteria in the future.) Kīlauea has deep cultural significance to Native Hawaiians, but it does not include a cultural seascape, nor is it inscribed for its archaeology.

Comparison to Other Places Significant to Living Indigenous Cultures

As noted throughout this application, Papahānaumokuākea is the sacred realm of Pō, the place where life originated and the place to which spirits return after death. No other location in the Hawaiian Archipelago serves in this capacity. The islands in the archipelago located southeast of Mokumanamana represent Ao, the world where the living reside. While each of the main Hawaiian Islands have *leina* (leaping off points, from whence spirits travel to the afterlife), no place serves as the final destination for these traveling spirits, other than the region to the northwest, beyond Mokumanamana.



Papahānaumokuākea's pristine viewscapes are said to foster ho'ailona, or omens in nature (Photo: James Watt)

Sea urchins, called "wana" in the Hawaiian language, are both a delicacy and storied in ancient myths (Photo: James Watt)

The concept of Pō and Ao is pan-Polynesian. It is found, for example, in the traditions of New Zealand, Tahiti and Tuamoto (Best 1976; Henry 1928; Stimson 1933; Walker 1990). All of these cultures consider Pō to be a dark place of origin, and Ao to be a place of daylight and humans. While the demarcation between these points is relatively clear in Native Hawaiian culture, such is not as obviously the case in other cultures (Stimson 1933).

Regionally, Tongariro National Park, as stated earlier, inspires a similar level of reverence for the Maori tribe Ngati Tuwaretoa. They believe that life began in Tongariro and that spirits return there, much as Native Hawaiians believe occurs in Pō, within Papahānaumokuākea.

Globally, Polynesian seascapes tell a unique story of astounding voyaging and settling abilities; the sea looms large in mythic and practical landscapes across the Pacific region. To many Polynesian cultures, the sea is as legible, as filled with distinct zones, resources, histories, and stories, as the land. As quoted in the December 2007 ICOMOS Thematic Study by Anita Smith and Kevin L. Jones, "Cultural Landscapes of the Pacific Islands":

"through senses, lore, observation, technology, skill, mythology and myriad other ways, the ocean of the Micronesians [and other Pacific Island peoples] was and in some cases still is an utterly knowable place in its form and texture and its link with the guiding heavens connecting the strange place that is always beyond the knowable world, the horizon where spirits below meet the spirits above. This is a seascape traversed by known seaways a place of paths that linked communities" (Rainbird in Smith and Jones 2007: 61-62).

The natural attributes that made this complex, multidimensional, ocean-dominated world were both practical and metaphysical. The Polynesian universe "comprised not only land surfaces, but the surrounding ocean as far as they could traverse and exploit it, the underworld with its fire-controlling and earth-shaking denizens, and the heavens above with their hierarchies of powerful gods and named stars and constellations that people could count on to guide their way across the seas. [Polynesians'] world was anything but tiny" (Hau'ofa 1994: 152).

A vast Pacific seascape whose natural integrity and spiritual significance has been preserved over time, such as Papahānaumokuākea, is invaluable both to the culture it supports and to a global understanding of an alternative, closely symbiotic model between nature and mankind. Because Native Hawaiian culture continues to thrive, Papahānaumokuākea is not only a window to the past, but a foundational classroom for a living culture that still reveres the place and the traditional activities that can, and do, continue to occur only there.

Throngs of fish in Papahānaumokuākea's seascape (Photo: James Watt)

Comparison to Other Places of Abundance

The site's marine ecosystems are unquestionably the most pristine in the Hawaiian Archipelago, as explored in detail in the Natural Resources Comparative Analysis (above). In Native Hawaiian terms, Papahānaumokuākea's pristine cultural landscape is considered an *'āina momona* (place of abundance). Across the Hawaiian Archipelago, marine ecosystems experienced extraordinarily lopsided anthropogenic impacts: the main Hawaiian Islands' oceans have been severely impacted, while the seas of Papahānaumokuākea still abound with endemic reef fish, apex predators, seabirds, and turtles.

On a global scale, the natural comparative analysis clearly states that Papahānaumokuākea is a rare predator dominated ecosystem, possesses some of the highest rates of endemism for marine and terrestrial species in the world, and that the region is home to one of the largest and most important assemblages of breeding tropical seabirds in the world. While there are other comparatively pristine environments in the Pacific, such as the Phoenix Islands and Kingman Reef, Papahānaumokuākea provides an unspoiled environment that most closely resembles what ancestral Native Hawaiians interacted with on a daily basis and to which many of their current cultural practices are most closely linked. Papahānaumokuākea is the only place where Native Hawaiian cultural practices (wayfinding, celestial protocol) can occur in such a pristine natural place, and among *wahi kūpuna* (archaeological, cultural sites) of such integrity.

Because oral traditions are Native Hawaiians' baseline for the status of their ancestors' environment, being able to compare past stories with present circumstances in a nearly pristine environment is invaluable. Cultural baselines and interpretations can provide clues to solving problems for which western scientific baselines are relatively recent. Traditional knowledge based on cultural resiliency can only help to manage this place and others similar to it.

Seabirds in Papahānaumokuākea help guide navigators to land and are valued as endangered species (Photo: Ocean Futures Society)

Comparison to Other Voyaging Nations

Across the Pacific, low-lying, small islands and atolls have been used as navigational tests for apprentice navigators preparing to undertake long, open-ocean voyages. For example, people of Satawal, Lamotrek and Polowat in the Central Caroline Islands use the uninhabited island of West Fayu as a test for apprentice navigators to see if they have mastered navigational lessons. The 55-mile crossing from Satawal to West Fayu continues to be used today to see if a navigator is able to take on the responsibility of navigating a voyaging canoe to the tiny island's fishery, which continues to supply the people of Satawal (Woodward et al. 1998).

In Hawai'i, these islands are Nihoa and Mokumanamana, which are the only places in the archipelago that closely mimic open-ocean conditions without the attendant dangers. This

"The voyage from Kaua'i-Ni'ihau to Nihoa is the final step in the training for young navigators before they can go deep-sea. The leg represents the ultimate test. It's a one- to two-day voyage that requires every discipline employed in long-distance voyage, except extreme fatigue. It's the ideal training platform."

– Nainoa Thompson, Hawaiian master navigator

Marae shrines on Nihoa (Photo: Kekuewa Kikiloi)

navigational testing path from Kaua'i to Nihoa, and on to Mokumanamana, is the only one available to Native Hawaiians today.

Many other voyaging nations and cultures, from Vikings to Greeks to Tahitians to Maori, continue to use models of traditional voyaging vessels to conduct cultural ceremony, much as Native Hawaiians do in Papahānaumokuākea and elsewhere. For Native Hawaiians, who continue to chart tens of thousands of miles on voyaging canoes, navigational knowledge is often place-specific, and the integral training can only be done in home waters, where novice navigators can apply some of their life experience in environmental observations and associations. Moreover, the cultural ceremonies and protocol associated with Nihoa, Mokumanamana and the other atolls up the chain, can only happen off of those shores where appropriate respect can be paid to their ancestors, in their particular spiritual, natural and geological manifestations.

Comparison to Other Mystery Islands

Mystery Islands are remote islands with extreme environments that exhibit evidence of Polynesian settlement but were abandoned by the time of Western contact. There are at least 25 of these islands: Nihoa and Mokumanamana in Hawai'i; Pitcairn and Henderson of the Pitcairn group; Howland in the Phoenix Islands; Washington, Fanning and Christmas in the Northern Line Islands and Malden in the central group; Palmerston and Suwarrow in the Cook Islands; the sub-tropical islands of the Kermadecs, and Norfolk Island (Irwin 1992). Mystery Islands have world-wide significance. Understanding in a regional context how increasingly isolated communities on smaller remote islands, such as Nihoa and Mokumanamana or Pitcairn and Henderson, were able to remain connected to larger high islands with more diverse resources, such as the main Hawaiian Islands or Mangareva, has significance to other regions such as the Mediterranean, where inter-island communication was an essential activity in the past to ensure the movements of goods and people to sustain life on both the isolated islands and the relevant mainlands (see DiPiazza and Pearthree 2001a, b; Rolett 2002; Weisler 1997; and see Cherry 1985 for the Mediterranean).

Nihoa and Mokumanamana are distinctive within the Mystery Island group in a number of ways. Other Mystery Islands in Eastern Polynesia have intact settlement landscapes, but none has the high density and intact preservation of ritual sites that Nihoa and Mokumanamana possess, nor do they have the marae shrines that exhibit the adaptation of Eastern Polynesian culture. Nihoa and Mokumanamana are also unique among Mystery Islands for the maintenance of a living cultural connection.

Comparison to Other Archaeological Sites

Listed on the National Register of Historic Places, Nihoa and Mokumanamana possess a combined 141 archaeological sites, making them some of the densest scatters of prehistoric structural sites in Hawai'i. In addition, these islands feature archaeological landscapes that contain original materials that largely have not been subject to the anthropogenic disturbances (invasive species, development, etc.) very common among the main Hawaiian Island sites. The view planes of the islands' religious sites – an element that is critical in Hawaiian culture – are also undisturbed, an extremely rare condition in Hawai'i, where telescopes, coastal and urban development, and diverted freshwater, among other things, have adversely altered most religious sites and their surrounding environments. Moreover, the stone upright sites on Nihoa and Mokumanamana are a rare style of *heiau* in the Hawaiian Archipelago,

otherwise found only atop the extinct volcanoes of Mauna Kea on Hawai'i Island, and at the top of Haleakalā on Maui.

As a whole, Papahānaumokuākea plays a critical role in understanding the nature of Polynesian migration and settlement in the Pacific. All of the islands of Papahānaumokuākea were either empty at the time of first Western contact or abandoned, having been occupied some time prior (Kirch 1988a). All of the islands of Papahānaumokuākea are small, geographically isolated, and lacking sufficient resources to allow self-sustainability or demographic stability (in initial and later stages of colonization). These environmental limitations are thought to be the main reasons why interaction was so vital to these regions (Irwin 1990, 1992: 174-180).

3.d Integrity and Authenticity

Cultural

Cultural Authenticity

Papahānaumokuākea continues to be considered a spiritual place of the gods for Native Hawaiians and is valued for its pristine wilderness of terrestrial and marine habitats. As noted above, oral histories and archaeology indicate the extensive length of time that Native Hawaiians have experienced and respected Papahānaumokuākea. Oral histories provide interpretations of still existing natural resources and phenomena in terms of ancestral voyages and origin stories specific to Papahānaumokuākea. The concepts of the reciprocity exchange of *hānai a 'ai* (to care for and eat from) and "*nānā i ke kumu*" ("look to the source") also help to express the *kuleana* (privilege and responsibility) for Native Hawaiians to protect, honor and give back to Papahānaumokuākea, its natural resources, and its spiritual significance.

There is a continuing, centuries-old Hawaiian protocol of protecting these sites and offering gifts to the place and spirits, as part of the reciprocal nature of the Native Hawaiian culture. Since the time of European contact with the islands, the region has continued to mainly be used for resource harvesting and perpetuation of cultural and religious traditions by Native Hawaiians.

Papahānaumokuākea continues to be a preeminent location for experiencing and understanding seascape (inclusive of the islands connected by the sea) *hō'ailona* (signs, omens in nature) that occur in pristine environments. These *hō'ailona* often come to Native Hawaiians via the natural forms taken by their ancestors who have pertinent advice to give them from the spiritual world. They come in many potential forms, such as encounters with sharks or giant trevally; cloud forms rising in welcoming or foreboding shapes over sacred sites; the ocean suddenly making a distinctive color or surface change that bespeaks a warning or a benevolent presence; a normally high-soaring bird skimming the ocean surface and flying directly toward a person, etc. Many believe that anyone, if they are open to the experience and appropriately inspired by the situation and location, can receive *hō'ailona*. In Papahānaumokuākea, because of its pristine beauty and direct, unimpeded links to Native Hawaiians' spiritual, historical and ancestral origins, these *hō'ailona* are distinct, regular and available for the culturally and spiritually aware mind to interpret and understand. It is partly because of these experiences that Native Hawaiians value the

Mokumanamana's upright stones silhouetted by the sunset. The upright stones line the 'spine' of the island and are oriented to the movements of the sun across the year (Photo: Kekuewa Kikiloi)

unparalleled opportunities provided by the islands, atolls, reefs, ocean and atmosphere of Papahānaumokuākea to not only reconnect with and learn from their past, but better prepare for their future.

Native Hawaiian knowledge and practice

The authenticity of Papahānaumokuākea's significant role in Native Hawaiian culture stems from several lines of evidence:

(1) Oral traditions – Native Hawaiian customs have been passed down over multitudes of generations through oral traditions, including *moʻolelo* (stories), *mele* (songs), place names and *moʻokūʻauhau* (genealogies);

(2) Historical record – after Western contact, scholars both Native Hawaiian and non-Native recorded a wide range of Hawaiian traditions in journals, books and Hawaiian language newspapers and periodicals, dozens of which were published between 1834 and 1948;

(3) Existing community knowledge – modern day oral history projects conducted over the years with *kūpuna* have also preserved many Native Hawaiian traditions.

Specific examples of evidence from the historical record and oral history projects that document the Native Hawaiian people's close relationship to Papahānaumokuākea can be found below in the discussion on authenticity. These include verbatim quotes from 18th and 19th century newspapers and periodicals, reports of the Board of Genealogy of Hawaiian Chiefs, the Bishop Museum on-line Mele Index, oral histories, traditional stories, early explorer's journals (including Captain James Cook's), and manuscripts of *mele* (song), *oli* (chant), and *pule* (prayer).

Many oral traditions about the NWHI recount voyages through these islands, from the times of antiquity to present day. As recorded in oral histories, Native Hawaiians and their gods have traveled up and down Papahānaumokuākea throughout the past two millennia. Cultural practitioner William Ailā says that part of the reason Papahānaumokuākea is so revered and cherished by Native Hawaiians is "because many different navigators came through. Pele from the north. Others from Kahaoʻolawe. Others from Niʻihau. Many different groups came here, settled here, on many different courses and canoes...Many of us have connections through our genealogies, or who used to fish up there. It's about us, and our connection to our ancestors who also looked at the same stars, who also voyaged to this place" (William Ailā 18 June 2008, personal communication).

The migration *moʻolelo* (story) about Pele, the revered volcano goddess, lists the many islands she visited as she traveled from her home in Tahiti to the Hawaiian Archipelago. As Pele is one of the most important Hawaiian gods, a host of different stories describe her arrival in the Hawaiian Islands, with several mentioning her plan to travel to Mokumanamana and her actual visit to Nihoa (Beckwith 1951; Westervelt 1916).

The name Papahānaumokuākea itself pays tribute to the two gods who are most widely attributed to the parenting of the Hawaiian Islands and the Native Hawaiian people: Papahānaumoku, the goddess of the earth, and Wākea, the god of the sky. Descriptions of their union are found in such sources as the epic creation chant the Kumulipo, below, as well as a number of other published materials, many dating back to the 19th century (Kaiaikawaha 1835; Malo 1839; Kamakau 1865; Fornander 1918). For example, in his 1839 book *Moʻolelo Hawaiʻi*, Hawaiian scholar David Malo noted that all Native Hawaiians, commoners and chiefs alike, were descended from Papa and Wākea. In 1835, another Hawaiian scholar, named Kaiaikawaha, documented a version of the Papa and Wākea creation story that lists the birth of a number of islands after Nihoa. The names provided may be the ancient names of the Northwestern Hawaiian Islands.

Eia na aina i hanau mai ai maloko mai o ke kanaka i puka mai ai. O Papahanau moku ka wahine o ka Hanau – Akea ke kane, moe laua, ko ka laua keiki, a hanau mai ka laua hiapo he pohaku o Kahikiku, oia ka mua,

hanau mai kona hope o Kahikimoe,
o kona hope o Kahikiikeapaapanuu,
o kona hope o Kahikiikeapaapalani,
o kona hope o Kahaula,
o kona hope o Puula,
o kona hope o Puukanukanu,
o kona hope o Waiauau,
o kona hope o Waiakaka,
o kona hope o Waialea,
o kona hope o Aleauli,
o kona hope Aleakea,
o kona hope o Kahaula,
o kona hope o Kapili,
o kona hope o Kamuku,
o kona hope o Kamukuikahahane,
o kona hope o Ulunui,
o kona hope o Melemele,
o kona hope o Hakulauai,
o kona hope o Polapola,
o kona hope Hawaiiku,
o kona hope o Hawaiiliiliakanaka,
o kona hope o Hawaii,
o kona hope o Maui,
o kona hope o Kanaloa,
o kona hope o Nanai,
o kona hope o Molokai,
o kona hope o Oahu,
o kona hope o Kauai,
o kona hope o Niihau,
o kona hope o Molokai,
o kona hope o Oahu,
o kona hope o Kauai,
o kona hope o Niihau,
o kona hope o Kaula,
o kona hope o Mokupapapa,
o kona hope o Nihoa,
o kona hope o Haena,
o kona hope o Haenaku,
o kona hope o Hanamoe,
o kona hope o Haenaala,
o kona hope o Haenaae,
o kona hope o Haenamauhoalalaiahiki,
o kona hope o Laloiho,
o kona hope o Laloae,
o kona hope o Lalohele,
o kona hope Lalokona,
o kona hope o Lalohoaniani,

Here are the lands that were born from which the people emerged. Papahānaumoku the mother of birthing – Wākea the husband, they mated, and their children were begotten, and born was their first child a rock named Kahikikū, he was the first,

born next was ***Kahikimoe [Tahiti]****,*
born next was Kahikiikeʻāpaapanuʻu,
born next was Kahikiikeʻāpaapalani,
born next was Puʻulā,
born next was Puʻukanukanu,
born next was Waiʻauʻau,
born next was Waiakāka,
born next was Waialeʻa,
born next was Aleʻauli,
born next was Aleʻakea,
born next was Kahaʻula,
born next was Kapili,
born next was Kamuku,
born next was Kamukuikahahane,
born next was Ulunui,
born next was Melemele,
born next was Hakulauai,
born next was ***Polapola [Bora Bora]****,*
born next was Hawaiʻikū,
born next was Hawaiʻimoe,
born next was Hawaiʻiala,
born next was Hawaiʻikapakūkehoa,
born next was Hawaiʻiliʻiliʻiakānaka,
born next was ***Hawaiʻi****,*
born next was ***Maui****,*
born next was ***Kanaloa*** *[Kahoʻolawe],*
born next was ***Nānaʻi [Lānaʻi]****,*
born next was ***Molokaʻi****,*
born next was ***Oʻahu****,*
born next was ***Kauaʻi****,*
born next was ***Niʻihau****,*
born next was Kaʻula,
born next was Mokupapapa,
born next was Nihoa,
born next was Hā ʻena,
born next was Hāʻenakū
born next was Hā(ʻe)namoe,
born next was Hāʻenaala,
born next was Hāʻenaaʻe,
born next was Hāʻenamauhoalālāiahiki,
born next was Laloiho,
born next was Laloaʻe,
born next was Lalohele,
born next was Lalokona,
born next was Laloho'ānini,
born next was Kamole,

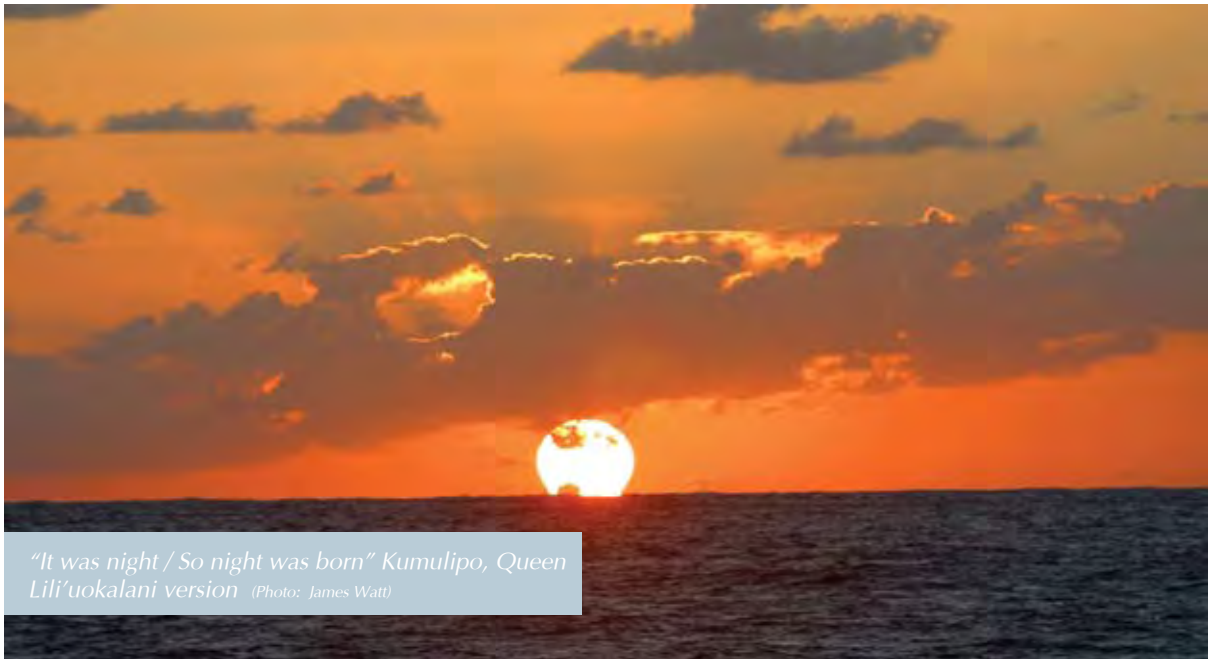
o kona hope o Kamole, o kona hope o Manawainui, o kona hope o Manawailani, o kona hope o Manawaihiki, o kona hope o Kuaihelani, o kona hope Holaniku. Oia na keiki moku i hanau mai ai.	*born next was Kapou,* *born next was Kapouheʻeua,* *born next was Kapouheʻelani,* *born next was Manawainui,* *born next was Manawailani,* *born next was Manawaihiki,* *born next was Kuaihelani,* *born next was Hōlanikū.* *These are the islands that were born.*

Excerpt and translation provided by Kekuewa Kikiloi.

About 50 Hawaiian language newspapers and periodicals were published between 1834 and 1948. This body of archival literature has provided, and will continue to provide, invaluable documentation regarding Native Hawaiian traditions in the Northwestern Hawaiian Islands. For example, the six-part serial "He wahi Kaao no Mokulehua," printed in the Hawaiian language newspaper "Ka Hoku O Ka Pakipika" in 1861 through 1862 relays a story of a man named Mokulehua who visits the islands west of Nihoa and Mokumanamana. The story provides a list of places he visited, with names that may be ancient, forgotten names for islands in Papahānaumokuākea.

The predominant Native Hawaiian creation story, the Kumulipo, exemplifies the fundamental importance of Papahānaumokuākea to the Hawaiian belief system. At more than 2,000 lines long, the Kumulipo was first chanted to honor the 18th century chief Kalaninuiʻīamamao, and has been passed down through the generations of the highest ranking Native Hawaiian chiefs. Multiple interpretations exist surrounding the exact translations, and multiple editions were written in the 19th century. King David Kalākaua commissioned the publication of a version of the chant as a pamphlet in 1889, and his sister, Queen Liliʻuokalani, later translated it into English.

The Kumulipo (source of deep darkness) tells the history of how all life forms came and evolved from the region of Pō, in Papahānaumokuākea, beginning with the coral polyp – the building block for all life. Through a series of eight more *wā* (stages), came the various life forms of the earth, culminating with the birth of man.



"It was night / So night was born" Kumulipo, Queen Liliʻuokalani version (Photo: James Watt)

After Western contact with the Hawaiian Archipelago, which brought with it Western customs and viewpoints, the region continued to be important to the evolving Hawaiian culture. Some of the highest-ranking Hawaiian royalty of the 19th century visited the Northwestern Hawaiian Islands, including Queen Kaʻahumanu, King Kamehameha IV, and King David Kalākaua (Department of Hawaiian and Pacific Studies, Bishop Museum 2002). In 1822, Queen Kaʻahumanu visited Nihoa, which was said to be the source of Kauaʻiʻs life-giving rain, with her husband, King Kaumualiʻi, chief of Kauaʻi. They rediscovered historic evidence of prior habitation, as the Queen had learned from *oli* (chant) and *mele* (song) passed down through the generations (Rauzon 2001). King Kamehameha IV (Alexander Liholiho) formally annexed Nihoa for the Hawaiian Kingdom in 1857, starting the process of formally claiming most of the NWHI. In 1885, Queen Liliʻuokalani and her two-hundred-person entourage landed on Nihoa to study the palms, wildlife and artifacts on the island (Bishop, in Emory 1928).

Recent efforts to document the oral histories of today's Native Hawaiian *kūpuna* provide further evidence of the Native Hawaiian people's continuous relationship with Papahānaumokuākea. In 2003, Kepā Maly produced a comprehensive oral history project that contained excerpts from 130 interviews he conducted with Native Hawaiian *kūpuna* over 28 years. Maly's interviews with Kāwika Kapahulehua, a late kupuna from Niʻihau and first captain of *Hōkūleʻa*, revealed that the people from this island continued to voyage to Papahānaumokuākea into at least the late 19th century to fish and gather other resources. In addition, Rerioterai Tava and Moses Keale documented additional connections between the Niʻihau people and Nihoa in the 1989 book "Niʻihau: The Traditions of an Hawaiian Island." They recorded Niʻihau traditions that indicate families from the island voyaged to Nihoa to fish and collect leaves, wood and grass for cordage. The connection between Niʻihau and Nihoa is so well preserved that the people of the island still remember the exact time of year and type of wind that was used to sail from Niʻihau to Nihoa (Maly 2003; Tava and Keale 1989). Moreover, Native Hawaiian commercial fishermen continued to access the Northwestern Hawaiian Islands throughout the 20th century (Maly 2003), and apprentice traditional wayfinders continue to be tested by the navigational practical exam of "pulling Nihoa from the sea" (Nainoa Thompson 4 October 2008, personal communication).

Cultural Integrity

Archaeological sites

The archaeological sites on both Nihoa and Mokumanamana retain their original designs, materials, and workmanship. Their settings on remote islands in the expansive Pacific Ocean distinguish the sites from any others in Hawaiʻi and in the world. In such remote settings, the sites remain virtually untouched, and human disturbance is minimal. In comparison, all known sites in the main Hawaiian Islands have been negatively affected by some combination of land use change, invasive species, cattle ranching, feral ungulates, and other anthropogenic disturbances.

Though impacted by the ravages of wind, rain, sea spray and time, as well as natural disturbances by nesting birds and overgrowth by endemic plants, the cultural sites on Nihoa and Mokumanamana retain many of their original attributes in a setting free from most human disturbances. The majority of the sites on both islands that are known to have existed are still there, and are in good condition and in their original locations. No buildings or other unrelated elements have affected the visual or metaphysical planes of these sites. Furthermore, under multiple layers of protections (each site has been protected within the Hawaiian Islands National Wildlife Refuge since 1909, has been listed on the National Register of Historic Places as Island Archaeological Districts since 1988, and is now protected within Papahānaumokuākea Marine National Monument), their integrity will be preserved to the full extent of federal and state authority.

These almost untouched cultural sites show little to no anthropogenic change since the time of their building and use. On Nihoa, some of the sites have slightly

deteriorated in the form of wall collapse; however the degree of deterioration does not detract from the overall integrity of the archaeological sites. Thirteen of the sites have been impacted by archaeological excavations carried out in the 1920s. On Mokumanamana, some of the sites are slightly deteriorated, and four sites have been impacted from what may be bomb craters, probably a result of practice bombing during World War II. Fortunately, based on prior, thorough documentation of the sites, current archaeologists recognize that these impacts are isolated and minimal, particularly because the island is so dense with archaeology; more than 40 sites have not been integrally compromised.

Papahānaumokuākea preserves a significant part of the natural ecosystem—with preserved viewplanes and no noise pollution—in which Native Hawaiian forbearers practiced their culture for hundreds of years. In being one of the last remaining places of abundance, or *ʻāina momona*, Papahānaumokuākea has become critical to the maintenance of specific traditional Native Hawaiian knowledge and practices.

Repairs: To date, no repairs have been made on the archaeological sites on Nihoa and Mokumanamana. Current regulatory measures ensure that repairs would be performed using culturally appropriate techniques and protocols to honor the sites.

Natural

Natural Integrity

As detailed throughout this application, the integrity of Papahānaumokuākea's marine environment is nearly pristine, with minimal disturbances. Though some terrestrial environments still bear the imprints of mankind, they also showcase the resiliency of many native species and the potential for restoration through human endeavors. The property includes all the key areas and ecosystems necessary to maintain its ecological integrity and the long-term conservation of its remarkable and unique terrestrial and marine diversity, and it is of sufficient size to maintain associated biological and ecological processes. The property still displays intact ecosystems, with a significant number and diversity of apex predators. The in situ conservation of numbers of endangered species is sustained through active management and restoration of their habitats.

Marine biota

While the vast majority of marine biota is thriving within Papahānaumokuākea, there is one species that is of great concern. Even after years of conservation and active management and recovery efforts, the Hawaiian Monk Seal population remains in decline. The current decline is thought not to be mainly human induced, but instead due to alterations in the environment, and habitat loss of preferred breeding grounds from global climate change and sea level rise. For the past two decades a concerted effort has been made to save the Hawaiian Monk Seal. Multiple federal and state entities, along with nongovernmental organizations, private sector entities, and countless individuals in local communities have worked to recover the species. These efforts have not been sufficient to prevent the continued decline in the species, however without these efforts, the situation would likely be much worse. Several key actions are currently underway to address current and potential threats to the Hawaiian Monk Seal in attempts to alter the trajectory of the population and move the species towards recovery. A detailed Recovery Plan has been established and is being implemented through several management strategies and activities and is detailed in Section 5.

Another concern for the marine sector of Papahānaumokuākea is the presence of invasive species. There are a total of 11 documented alien marine invertebrate, fish and algal species in the NWHI, with the highest concentrations occurring in the harbor at Midway Atoll. Although there are a limited number of marine alien species present, none thus far have caused significant disruptions to the surrounding ecosystem. While the remoteness and relative inaccessibility of the NWHI has helped to prevent the introduction of some

alien species to the area, these islands are vulnerable to introductions through a variety of activities. Therefore, stringent regulations and protocols are in effect to reduce the chance of alien species introductions (see Section 5).

Other threats to the marine ecosystem are further detailed in Section 4, and are mainly a result of broader influences originating outside of the boundaries of Papahānaumokuākea that eventually affects shallow water resources. Most notable among these are stresses resulting from marine debris and large-scale environmental effects such as climate change and ocean acidification. While preliminary studies have not shown significant effects thus far to shallow water marine communities, continued research is necessary to understand how the marine and terrestrial ecosystems will respond to these large-scale events.

Terrestrial biota

As noted in Section 2.b "History of Development", the terrestrial ecosystems of the Northwestern Hawaiian Islands suffered significant perturbations at the turn of the last century and again during World War II. However, over the last fifty years, the focus has been on recovery and restoration of the previously altered environments. While the history of human impact and alteration of the islands was at one time significant, the actual impact footprint is minimal compared to most other places on earth. Several species of endemic plants and animals are in fact thriving. Development activities have been limited to small-scale conversions of abandoned Coast Guard buildings at French Frigate Shoals and Kure Atoll following the closure and removal of many of the of Navy and Coast Guard facilities. Development at Midway Atoll has been restricted as well; plans are underway to remodel existing facilities to accommodate the new Visitor Services program (see MMP Volume IV).

Preventing the importation and establishment of alien invasive species, removing those already at the site, and restoring species lost to previous alien introductions are the biggest challenges of terrestrial stewardship in Papahānaumokuākea. There have been several intentional and non-intentional anthropogenic introductions of non-native plants and animals since the islands and atolls of Papahānaumokuākea were first discovered by humans. As many as 125

Centuries of isolation have ensured the natural integrity of Papahānaumokuākea's reefs
(Photo: James Watt)

species of alien insects and spiders have been found on these islands, and some of them, particularly ants, are extremely destructive. Discussions on the impacts of non-native animals and plants are presented in greater detail in Section 4.

Significant efforts are underway to restore native biota on several of the islands and multiple recovery plans are in place for a variety of species including seabirds, shorebirds and plants. The following list highlights some of the terrestrial restoration and remediation efforts:

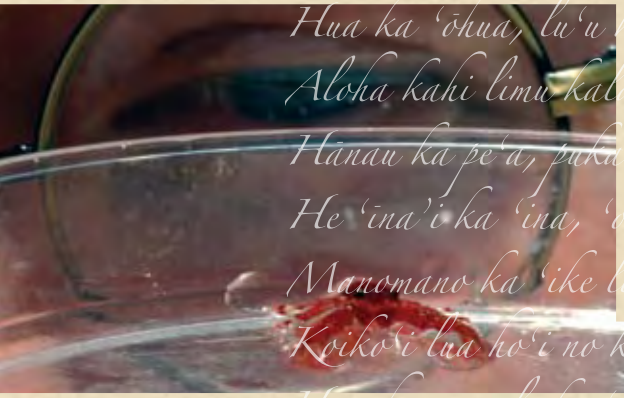
- Rats and rabbits, introduced to some of the islands centuries ago, were responsible for significant impacts to the terrestrial environment. Through intensive eradication efforts by multiple state and federal entities, all rats and rabbits have been successfully removed from the NWHI.
- A 12-year eradication project at Laysan Island successfully removed an invasive sandbur. Active restoration is underway and has reestablished a number of other plants and animals that were lost after the introduction of rabbits.
- Contaminants causing the mortality of endangered Laysan finches were identified and removed from Laysan Island beaches.
- Clean-up and remediation efforts have been undertaken by the Navy and Coast Guard at Midway Atoll, Kure Atoll and French Frigate Shoals.
- Invasive ironwood trees have been successfully eradicated from Eastern Island (Midway Atoll).
- Intensive invasive weed eradication, native plant restoration, and propagation programs are ongoing at Midway and Kure Atolls.
- Multiple species are recovering and thriving (see Section 4 for details of specific species trends).

In addition to these efforts, strict protocols are in place to combat further introduction of alien species. Section 5 further discusses the numerous protective management and regulatory measures currently in place to protect this remote and special region.

Through concerted efforts to address current and potential threats to the Hawaiian Monk Seal, biologists hope to move the species toward recovery (Photo: James Watt)

4.

Malamalama ka lā nui a Kāne puka i Haʻeha e
Apakau ke kakuna i ka ʻili kai o nā kai ʻewalu
He ʻike makawalu kaʻu e ʻanoʻi nei,
ʻO nā au walu o Kanaloa Haunawela noho i ka moana nui
He Huʻakai ka makani o Lehua ʻau i ke kai
Kuʻonoʻono ka lua o Kuhaimoana i ke kapa ʻehukai o Kaʻula
ʻO Kū i ka loulu, ulu aʻe ke aloha no Nihoa moku manu
Manu o ku i ka ʻahui, he alakaʻi na ka lahui
ʻO Hinapūkoʻa
ʻO Hinapuhalakoʻa
ʻO Hina kupukupu
ʻO Hinaikamalama
Hua ka ʻōhua, luʻu ke kohola
Aloha kahi limu kala, kiaʻi ʻia e ka ʻākala noho i uka
Hānau ka peʻa, puka ka pe ape ʻu i ke
He ʻinaʻi ka ʻina, ʻo [illegible] o kaʻpaʻaka
Manomano ka ʻike [illegible] ka nohpo o Kanaloa
Koikoʻi lua hoʻi no ka [illegible]ulehu, ʻo kuʻu luhi ia
Hanohano wale kaʻāina kupuna, ʻo nā moku leʻia
No Papahānaumokuākea lā he inoa






- Na Kainani Kahaunaele a me Halealoha

State of Conservation and Factors Affecting the Property

4. State of Conservation and Factors Affecting the Property

Sand Anemone or 'okole (Photo: Susan Middleton & David Liittschwager)

4.a Present State of Conservation of the Property

The state of conservation of the property is excellent, both in terms of the physical condition of the resources, as well as the conservation and regulatory measures in place to maintain it. In addition to stringent conservation laws, the preservation of the property is maintained and assured through detailed and thorough management plans, on-site restoration and monitoring activities, and associated practices described in Section 5.

As detailed in Sections 2, 3 and 5, several factors contribute to the property's exceptional state of conservation. These factors include:

1. The extreme isolation of Papahānaumokuākea Marine National Monument. The sheer size and remoteness of the area, situated in the north-central portion of the world's largest ocean, thousands of miles from any continental land mass or heavy human population pressures, has ensured that human-based impacts have been relatively few, and the biological, historic and cultural resources of this site are well preserved.

Undisturbed terrestrial and marine habitat of Papahānaumokuākea (Photo: James Watt)

2. Regulatory protections and management initiatives. These are in place to protect ecosystem function and ensure reef resilience and resistance in the face of potential threats from global climate change or other climatic events.

3. Numerous species recovery and restoration plans. These are in place and are being actively implemented.

4. Emergency response and restoration plans. These are either in place or in development for human health and safety, and in response to unanticipated natural and anthropogenic events.

5. Commitment in policy and precedence to incorporating Native Hawaiian traditional knowledge, practice, and values into the management of the site.

6. Conducting, supporting and facilitating Native Hawaiian cultural and historic research relating to the area.

7. Providing access for Native Hawaiian cultural practices at Papahānaumokuākea.

8. Engaging the Native Hawaiian community in the management of Papahānaumokuākea.

9. Restricted public access via permitting systems and vessel monitoring and notification systems.

10. Rigorous quarantine requirements for all activities in Papahānaumokuākea to reduce introduction of alien species.

11. A phase-out of all commercial fishing by 2011, with current fishing limited to only eight active vessels fishing for deep-water species.

Natural

Species trends

More than 7,000 documented species are found within Papahānaumokuākea Marine National Monument and the vast majority of them are thriving. As outlined in Section 2, the property's coral reefs are considered nearly pristine and there is a very low

Papahānaumokuākea is home to a large number of threatened and endangered species (Photo: James Watt)

incidence of invasive species (Friedlander et al. 2005). Green Turtles are considered to be a resounding success story, with the number of females nesting at French Frigate Shoals rising steadily over the past 30 years (Balazs and Chaloupka 2004). Populations of most bird species are considered to be stable or increasing, based on intensive monitoring on three islands (FWS 2005).

As noted in Sections 2 and 3, Papahānaumokuākea is home to a large number of endangered species. Managing such species can be difficult, because they often have small population sizes, low genetic diversity, and other inherent traits that add to the complexity of their management. To properly account for these factors, considerable research on population stability and dynamics is required. Fortunately, a great deal of ongoing work devoted to such endangered species is being conducted within the property.

While the extreme geographic isolation and lack of direct human impacts is beneficial for the organisms of Papahānaumokuākea, it has historically limited the amount and diversity of scientific inquiry. As highlighted in Section 2.b, "History and Development of the Property", scientific expeditions have been patchy and topic-focused. Periods of exploration in the 1900s and 1920s generated the first views of species assemblages and structures, both above and below water. In the 1960s, research focused primarily on commercially important species, and until early 2000, the majority of scientific work conducted in the marine waters of the NWHI related to commercial fishery targets or rare and endangered species. Only in the last few years has research been expanded to the community- and ecosystem-based levels, incorporating monitoring of non-commercially important species such as smaller reef fish and invertebrates. With the federal and state protections that have been instituted since 2000, exploration and inquiry to quantify and track the status of all species in Papahānaumokuākea's waters have surged. As a result, species trend information will continue to grow for most major taxa.

The following provide examples of some of the species trend data currently available for groups of particular significance.

Algae: Increased efforts have been devoted to quantifying algal abundances and diversity in Papahānaumokuākea in recent years, with impressive results. Comprehensive algal sampling from 2000–2002 at French Frigate Shoals resulted in a 380% increase in the

Pristine coral reef habitat (Photo: James Watt)

numbers of species known from the region, with four of these species not previously found in the Hawaiian Archipelago (Vroom et al. 2005). As a result of recent investigations, Papahānaumokuākea has been documented to contain the highest percent cover of macroalgal species and lowest percent cover of living coral as compared with other geographic locations. This is likely due to the subtropical location of Papahānaumokuākea, which exposes reef communities to large seasonal variations in water temperature and current patterns as compared to other, more tropical, coral reef locations.

New species are often documented on research cruises (Photo: James Watt)

Corals: The abundance of shallow water corals of Papahānaumokuākea varies greatly between islands or atolls, but has remained fairly consistent in time (Figure 4.1). As noted previously, most locations contain relatively low coral cover with the exception of Maro Reef and Lisianski Island/Neva Shoals. In addition to percent cover, coral colony size–frequency distributions can provide important insight into characteristics of reef communities. Size–frequency distributions of all corals in belt transects throughout Papahānaumokuākea in 2003, 2004 and 2006 indicate generally similar distributions in all three survey years, suggesting stability in the complexity of the structural framework that provides shelter to many species of reef inhabitants (Waddell and Clarke 2008).

Scientists are still encountering new records of species or even new species on a continual basis. One expedition in 2006 yielded 11 new records of corals in Papahānaumokuākea. Although 57 species of corals have been documented in the property, many species occur at such low frequencies that they are not encountered in surveys. Thus, relatively few coral species numerically dominate in Papahānaumokuākea's waters. Overall, three genera dominate the shallow water reef areas (Section 2, Figure 2.4). Given this, it is expected that the coral species list for Papahānaumokuākea will continue to expand as improving technology and research tools allow exploration and documentation of the generally unknown deeper reefs of the site.

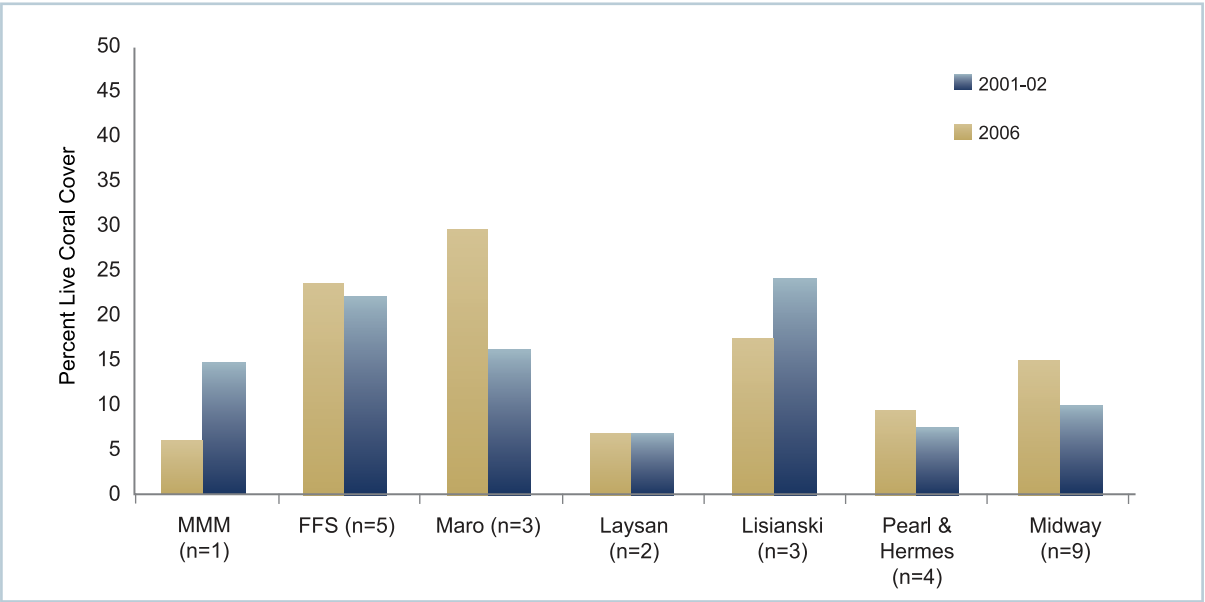


Figure 4.1: *Mean coral cover at permanent transects by location* (Source: Maragos and Veit, USFWS unpublished data)

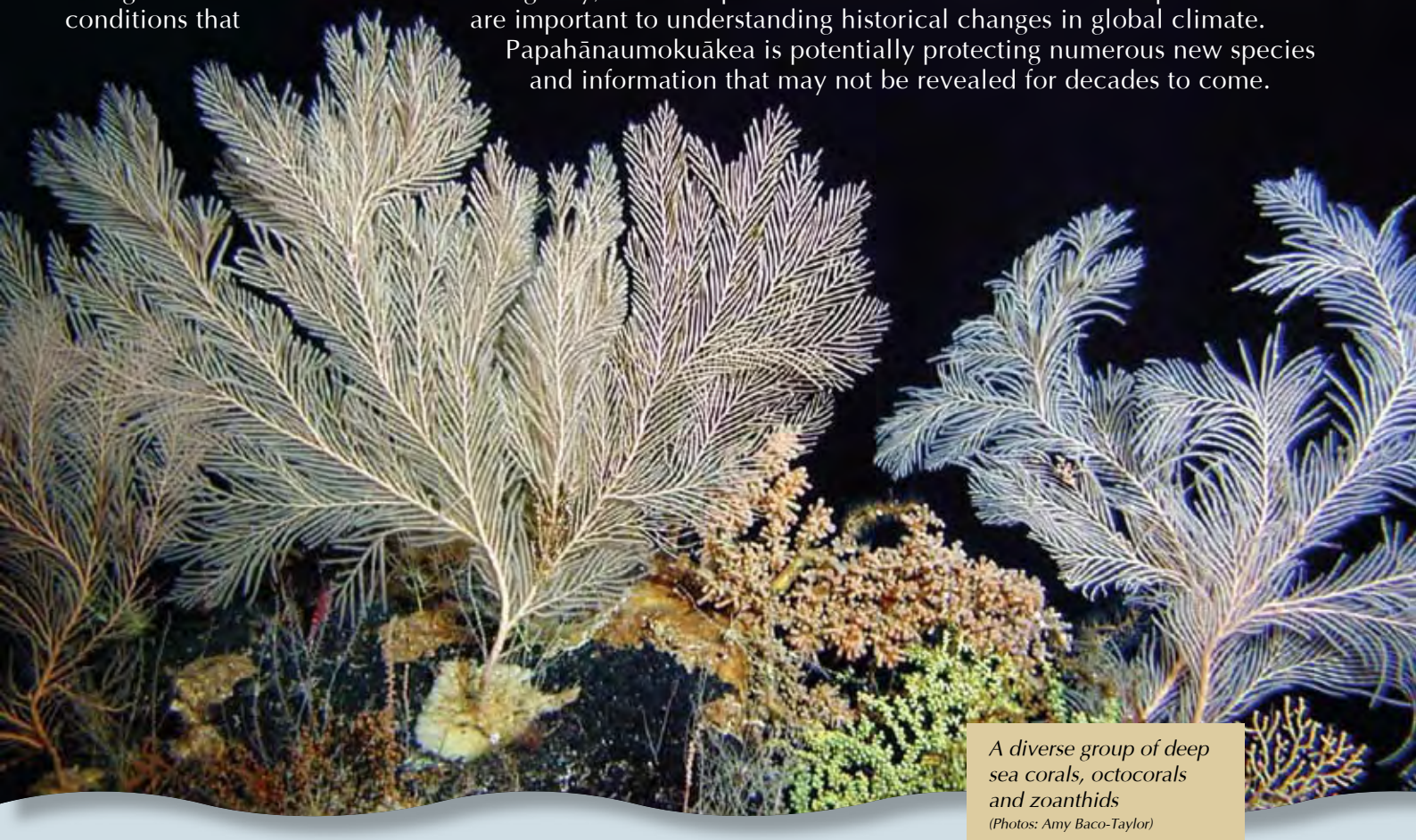
Exploring the Unknown – Diving Deep Into Papahānaumokuākea Waters

While the islands and atolls of the NWHI are known for their spectacular shallow water coral reefs, the majority of marine habitats residing within Papahānaumokuākea are largely unexplored. Deepwater habitats comprise over 90% of Papahānaumokuākea's area, yet are virtually unknown.

Deepwater portions of Papahānaumokuākea are thriving with organisms uniquely suited to deepwater survival; in recent years, researchers have found entire reefs complete with fish and crustaceans at depths of more than 5,000 feet. Since these areas occur in depths well below the limitations of SCUBA diving, managers and scientists have needed to find more advanced ways to explore the deepwater ecosystems. One such way is through the use of submersibles.

Each trip to the deep waters of Papahānaumokuākea brings records of mysterious new organisms and sheds light on the complexity and diversity of life in the deep. In 2007 scientists from the Hawaii Undersea Research Laboratory (HURL) set out to explore new research sites in Papahānaumokuākea, discovering multiple new deepwater coral and sponge beds in depths of 3,000 to 6,000 feet. During this voyage, the team discovered several new species, including a few so unusual that they may end up representing not only new species, but possibly a new genus. Scientists on this voyage also wanted to get a closer look at deep-sea coral communities. Unlike the corals of shallow waters, very little is known about the biology, ages, and growth rates of deepwater corals. Scientists have estimated that some living deepwater corals date back at least 10,000 years and can grow to more than 25 feet.

The dynamics of these deepwater ecosystems are only beginning to be revealed. Scientists have observed large numbers of commercially important but increasingly rare groupers and redfish among the sheltering structures of deep-sea coral reefs. These reefs may also hold insights to global threats, such as climate change. Because of their longevity, some deep-sea corals can serve as archives of past climate conditions that are important to understanding historical changes in global climate. Papahānaumokuākea is potentially protecting numerous new species and information that may not be revealed for decades to come.



A diverse group of deep sea corals, octocorals and zoanthids
(Photos: Amy Baco-Taylor)

Fishes: Fish assemblages have been examined on an annual basis from 2000 onward, and monitoring data indicates that biomass of fishes of each trophic group (planktivores, secondary consumers, primary consumers and apex predators) have remained stable (Figure 4.2). A majority of the permanent monitoring sites are in the lagoon and backreef locations where sites can be sampled on a more regular basis than forereef locations that are more vulnerable to weather and surf conditions. Inventories of apex predators account for 55% of the biomass of fishes in forereef locations. However, most of the large predators reside outside the reef, which means that apex predator densities at these permanent sites are underestimated (Friedlander and DeMartini 2002).

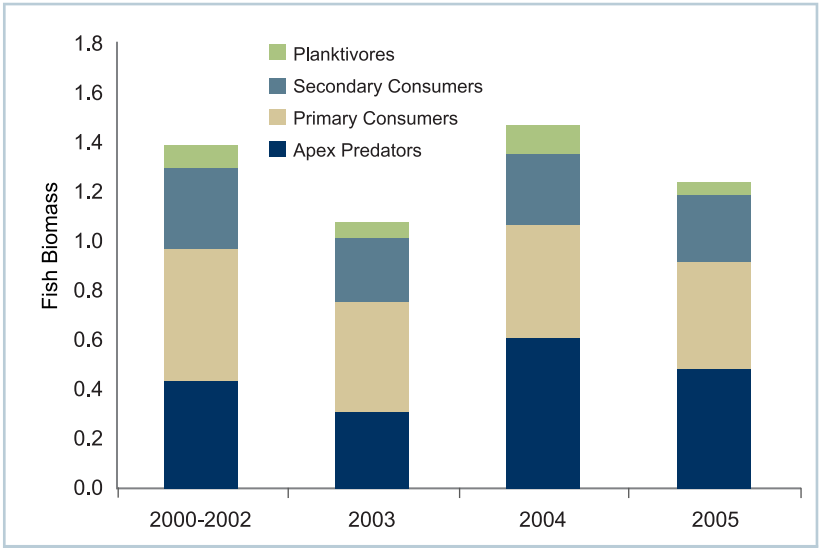
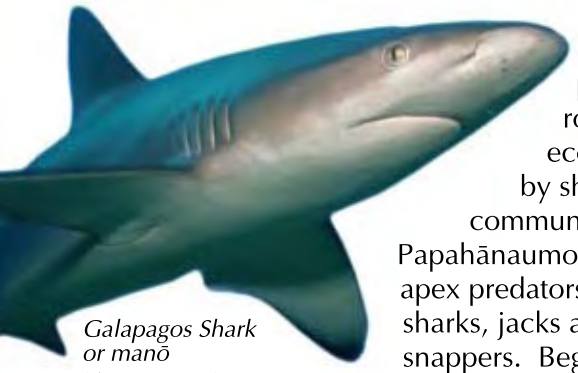


Figure 4.2: *Fish biomass in (t ha^{-1})[ln (x-1)] and trophic guilds from 2000–2005* (Source: PIFSC-CRED, unpublished data)

Japanese Angelfish (Centropyge interrupta)
(Photo: James Watt)



Galapagos Shark or manō
(Photo: James Watt)

Top predators play important roles in ecosystems by shaping communities. At Papahānaumokuākea, the apex predators consist of sharks, jacks and large snappers. Beginning in 2005, researchers electronically tagged multiple Gray Reef Sharks, Galapagos Sharks, Tiger Sharks, Whitetip Reef Sharks, Green Jobfish and Giant Trevally to determine where and how far each species travels. Results indicate that most individuals of most species remain at their home atolls or islands. The only predator observed routinely moving among islands was the Tiger Shark, which not only moved between islands in Papahānaumokuākea but also between Papahānaumokuākea and the main Hawaiian Islands (MHI). The other sharks move extensively within atolls, but patterns and frequency of movement vary among species. The Giant Trevally and Green Jobfish (*Caranx ignobilis* and *Aprion virescens*) showed distinct, rhythmic patterns of movement with diel, tidal, and seasonal components (Meyer et al. 2007a, b).

Reptiles: Five species of sea turtles occur in the waters of Papahānaumokuākea, and all are listed under the federal Endangered Species Act. Only one of these species, the Green Turtle (*Chelonia mydas*), utilizes the shores of Papahānaumokuākea to bask and breed, with over 90% of the Green Turtle population in Hawai'i nesting at French Frigate Shoals. Monitoring of this species has taken place for the past 30 years, documenting a steady recovery of Green Turtles from their depleted state in the 1970s (Figure 4.3).

Marine mammals: The waters of Papahānaumokuākea are home to over 20 cetacean species, six of which are recognized as endangered and depleted under the U.S. Endangered Species Act and the U.S. Marine Mammal Protection Act. Papahānaumokuākea also hosts the largest population of one of the last two remaining species of monk seals in the world.

The Hawaiian Monk Seal is the only endangered pinniped occurring entirely within United States waters. The monk seal population is estimated to be approximately 1,200 individuals, a decrease of approximately 60% since the 1950s (Antonelis et al. 2006) (Figure 4.4).

Green Turtle or honu hatchling
(Photo: Susan Middleton & David Liittschwager)

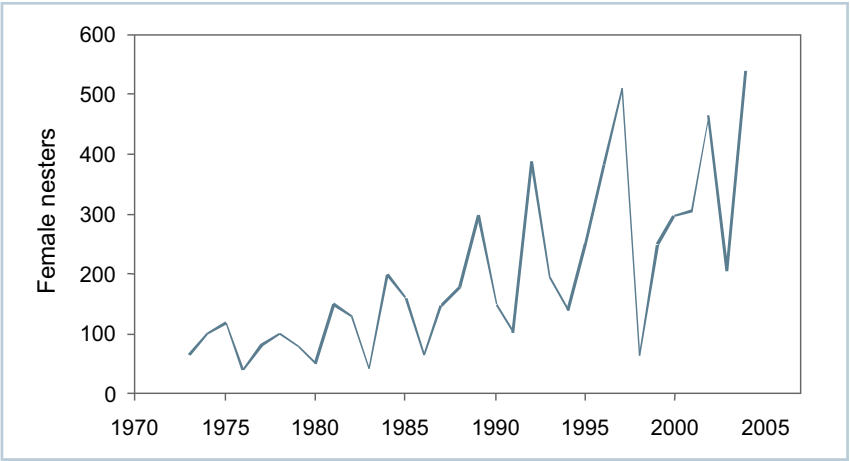


Figure 4.3: *Long-term trend in the abundance of female nesting Green Turtles at French Frigate Shoals* (Source: Balazs and Chaloupka 2004a)

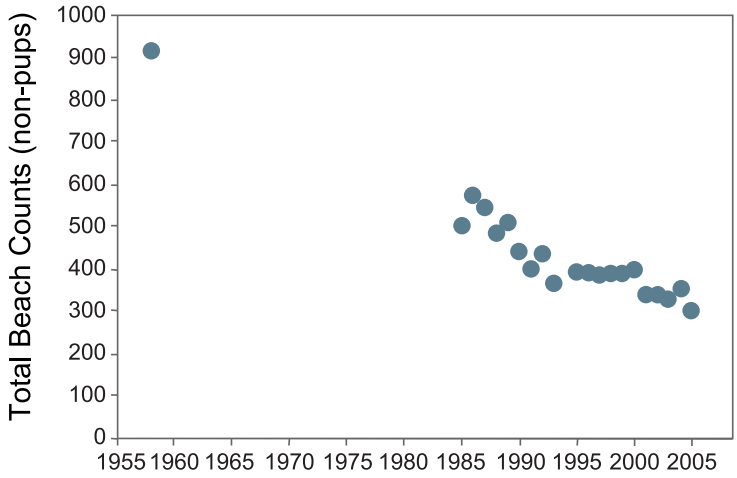


Figure 4.4: *Historical trend in non-pup beach counts of Hawaiian Monk Seals at the six main reproductive subpopulations*
(Source: Antonelis et al. 2006, updated by Baker, PIFSC)

Hawaiian Monk Seal (Monachus schauinslandi) basking (Photo: James Watt)

Even with significant conservation measures in place, in recent years, monk seal numbers have been declining at five of eight breeding sites in Papahānaumokuākea Marine National Monument (Figures 4.4, 4.5). Hawaiian Monk Seals are the last hope for the continuation of monk seals globally, and considerable efforts have been made over the last two decades to manage, study, and promote recovery of this species. A Hawaiian Monk Seal recovery plan was recently released, building on the conservation and restoration efforts already in effect.

Between 1996 and 2002, the movements and diving patterns of 147 Hawaiian Monk Seals in the NWHI (consisting of a mix of male and female adults, juveniles, and pups) were monitored with satellite-linked depth recorders. Overall findings of these studies include the following:

- Monk seal foraging range covers an area of approximately 48, 156 square kilometers, or almost 14% of the total area of Papahānaumokuākea.
- Seals forage extensively at or near their breeding sites and breeding subpopulations and haulout (basking) sites (95% within 12 km of these sites), except at French Frigate Shoals, where foraging distances were demonstrated to be greater.
- The highest concentration of monk seal activity in Papahānaumokuākea is focused on French Frigate Shoals and surrounding banks.
- Seals move along specific corridors to travel between breeding sites and haulout sites. These corridors are closely associated with the NWHI submarine ridge. Seals likely forage along these corridors around subsurface features like reefs, banks, and seamounts.

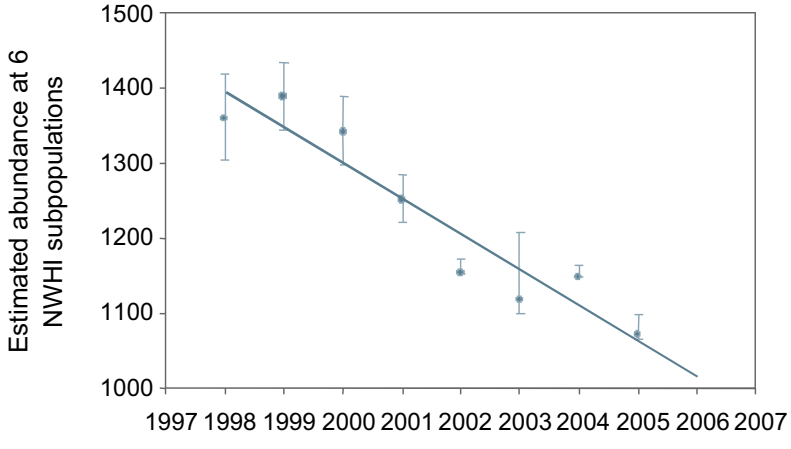


Figure 4.5: *Estimated abundance of monk seals at six breeding sites*

Seabirds: Seabird colonies in Papahānaumokuākea constitute one of the largest and most important assemblages of tropical seabirds in the world, with 14 million birds representing 21 species (Naughton and Flint 2004). Six of the seabird species residing in Papahānaumokuākea have been classified in the highest concern categories of the North American Waterbird Conservation Plan. More than 98% of the world's Laysan and Black-footed Albatrosses nest here. Population trends have been monitored in the NWHI for decades and are stable or increasing for most species, although there is concern for a few, especially the albatrosses (Table 4.1). Monitoring has revealed periodic reductions in reproductive success for two species of albatross, but these reproductive variations appear to be correlated with El Niño weather events; reproductive success is stable for non-El Niño years (Seki 2004).

Table 4.1: *Overview of seabird monitoring efforts. Gray boxes indicate species and sites that have not been surveyed since 1984. Brown boxes indicate an apparent increase of greater than 25% since 1984, and green a greater than 25% apparent decrease. Blue boxes indicate little change, and purple boxes represent new records for that species at that location. White boxes indicate that the species was not found at that location.*
(Source: FWS, unpublished data)

Species	KUR	MID	PHR	LIS	LAY	GAR	FFS	MMM	NIH
Black-footed Albatross									
Laysan Albatross									
Bonin Petrel									
Bulwer's Petrel									
Wedge-tailed Shearwater									
Christmas Shearwater									
Tristram's Shearwater									
White-tailed Tropicbird									
Red-tailed Tropicbird									
Masked Booby									
Brown Booby									
Red-footed Booby									
Great Frigatebird									
Little Tern									
Gray-backed Tern									
Sooty Tern									
Blue Noddy									
Brown Noddy									
Black Noddy									
White Tern									

Pre-contact Native Hawaiian archaeological sites at Nihoa (Photo: David Boynton)

Cultural

The state of conservation of physical elements of the cultural property (archaeological and cultural sites) is exceptional, both in terms of the physical condition of the resources and the conservation measures in place to maintain them. Native Hawaiian access to the site for the perpetuation of Native Hawaiian use and practices is vibrant and currently in an active period of growth. Conservation measures in place to perpetuate and protect Native Hawaiian practices and culture within Papahānaumokuākea as well as to integrate traditional Hawaiian management practices with Western ones are supported by the vision, goals, strategies and activities of Papahānaumokuākea Marine National Monument.

Native Hawaiian Archaeological Sites

Strong protection measures, both ancient and modern, as well as the archipelago's remoteness from human populations, mean that the historic sites on Nihoa and Mokumanamana are in an excellent state of preservation. The Northwestern Hawaiian Islands have long been revered by Native Hawaiians as a sacred place, and its recent federal and state legal protections have formalized, in the modern age, a triple bond among the islands, Native Hawaiian culture and the general public. The greatest threats to these sites have been from natural processes such as erosion and succession by native flora and fauna. Some disturbance occurs from burrowing birds and encroachment from root systems of loulu palms, and general exposure to the harsh natural elements.

The condition of Nihoa's and Mokumanamana's archaeological and ceremonial sites benefits greatly from the islands' impediments to access: a prohibitively remote location, rugged terrain with few safe areas for landing, a stringent permitting process for access, and a several-day journey by boat. All provisions, food, water and shelter must be brought from the main Hawaiian Islands. The islands themselves are exposed to the elements, especially Mokumanamana, where the terrain consists mostly of steep, jagged cliffs, often pummeled by gusting winds. According to the archaeologists who have visited the site most recently (Anan Raymond 7 August 2008, personal communication), this explains why the cumulative on-island time in archaeological research totals only 18 days over an 80-year period, including all archaeological research, from the first studies in 1928 (Emory 1928) through the most recent five-day expedition in July 2008 (Kikiloi and Raymond 2008).

Regulated access to Nihoa and Mokumanamana is allowed for small groups of cultural and spiritual practitioners for cultural ceremonies. These practices ensure continuity in the Native Hawaiian connection to Papahānaumokuākea; they also form the basis of the creation of a cultural protocol for all visitors to these islands.

Even with the existing level of preservation, both the U.S. Fish and Wildlife Service and the State Historic Preservation Division are considering a coordinated stabilization project for the archaeological sites in East Palm Valley, Nihoa, to prevent future loss or damage to those sites. East Palm Valley contains residential features and

large, ceremonial features, one of which is comprised of five terraces (Site 50), and another feature with a large terrace platform holding many uprights and a cairn (Site 51). Extensive bird burrowing is disrupting many of the sites, interior surfaces and deposits, and perimeter and retaining walls. Uprooted, dead loulu palms have also upended portions of the surfaces (Site 43). All the uprights of one ceremonial feature in the Valley were removed by a previous expedition (Emory 1928), blurring the perimeter boundaries (Site 45). Potential stabilization sites include many of the terraces in East Palm Valley, in part because data has already been recovered from them, and their front retaining walls are showing significant collapse. The State Historic Preservation Division requires that any stabilization projects be done without the removal of cultural artifacts (see Nihoa Island Archaeological Sites).

Status of Native Hawaiian Access and Perpetuation of Practices in Papahānaumokuākea

Native Hawaiians have a spiritual and practical connection to Papahānaumokuākea that began with the creation story of the Hawaiian people; that connection has persisted in various forms through the present day. Physical remnants of *wahi kupuna* (ancestral places), Hawaiian language archival and oral resources, and historical accounts provide evidence of the various past uses of the NWHI and surrounding oceans by Native Hawaiians (Kaunamano 1862 in *Hoku a ka Pakipika*; Manu 1899 in *Ka Loea Kalaiaina*; Wise 1923 in *Nupepa Kuokoa*). Evidence indicates that Nihoa and Mokumanamana served as a home and a place of worship for at least a 700-year period (Cleghorn 1988) (see also Section 2). However, by the time of Western European contact with the Hawaiian Islands, the majority of the Hawaiian population knew the region only by repute, as relatively few individuals traveled to these remote islands and had seen them with their own eyes, except families from the northwesternmost main Hawaiian Islands of Kaua‘i and Ni‘ihau (Maly 2003),

Stone terraces at Nihoa (Photo: Monte Costa)

which are geographically closest to the Northwestern Hawaiian Islands. Yet, oral traditions maintaining the people’s connection to Papahānaumokuākea persisted. The oral transmission of knowledge and practice has ensured threads of continuity in Hawaiian people’s cultural connection to the NWHI, even in periods when access was more limited than in the past. Despite the waning and waxing of actual access to the NWHI, the islands continuously remained in oral tradition. “We always have these cycles in our stories. The sun rising at Kumukahi (Hawai‘i Island) and then setting way over in the West. And this [Papahānaumokuākea] is the West,” says Pualani Kanaka‘ole Kanahele, one of the foremost Native Hawaiian cultural practitioners, during a Solstice Ceremony at Mokumanamana in 2004. Today, Native Hawaiians remain deeply connected to the NWHI on genealogical, cultural, and spiritual levels. These connections are reinforced by Hawaiian wayfinding efforts, the resurgence of Solstice Voyages, and in other efforts to reinforce bonds between the people and the place.

In 2003, *Hōkūle‘a* became the first voyaging canoe to visit Nihoa in many years. Its navigators and cultural practitioners aboard voyaged for one express purpose: “We made that trip to let our ancestors know that we didn’t forget them, and to apologize to our ancestors for having been away so long” (Wilhelm 2008, personal communication).

Today, Native Hawaiian practices and activities within Papahānaumokuākea are vibrant, and are experiencing a

period of rapid growth. Highlights of significant Native Hawaiian activities at Papahānaumokuākea since 1997 include these events:

- In 1997, an organization called Hui Mālama i Nā Kūpuna o Hawai'i Nei repatriated to Nihoa sets of human remains that had been collected by archaeologists in the 1924–1925 Bishop Museum Tanager Expeditions (Ayau and Tengan 2002).

- In 2003, a cultural protocol group, Nā Kupu'eu Paemoku, traveled to Nihoa on the voyaging canoe *Hōkūle'a* to conduct traditional ceremonies.

- In 2004, *Hōkūle'a* sailed more than 1,900 kilometers to the most distant end of the island chain to visit Kure Atoll as part of a statewide educational initiative called "Navigating Change." The crew officially began their voyage into Papahānaumokuākea by performing cultural protocols at Nihoa. From there, they sailed up the chain, stopping to help remove invasive species and marine debris from the various atolls, pay their respects to each Kupuna Island, and document for school children and resource managers a basis of comparison of the health of the main Hawaiian Islands' coastal and reef ecosystems.

- In 2005, Nā Kupu'eu Paemoku continued their cultural progress and sailed to Mokumanamana to conduct protocol ceremonies on the summer solstice.

- Nihoa serves as a present-day navigational test for traditional, voyaging wayfinders. The 'Ohana Wa'a (family of Hawaiian voyaging canoes) has begun testing apprentice navigators by determining if they can sail, without instrumentation, to Nihoa from Lehua, a small, 215-meter-high, crescent-shaped island near Kaua'i and Ni'ihau.

- Kekuewa Kikiloi (Ph.D. dissertation, University of Hawai'i at Mānoa) continues to conduct archaeological research at Papahānaumokuākea, studying the historic and cultural sites on Nihoa and Mokumanamana.

Presidential Proclamation 8031, which established the Papahānaumokuākea Marine National Monument, recognizes that the NWHI have great cultural significance to Native Hawaiians and provides a means to

The Hawaiian sailing canoe Hōkūle'a navigating using traditional wayfinding methods (Photo: Monte Costa)

promote access to Papahānaumokuākea for cultural purposes by establishing a permit category specifically to allow Native Hawaiian practices. The Proclamation defines these practices as cultural activities conducted for the purposes of perpetuating traditional knowledge, caring for and protecting the environment, and strengthening cultural and spiritual connections to Papahānaumokuākea that have demonstrable benefits to the Native Hawaiian community. This may include, but is not limited to, the non-commercial use of Papahānaumokuākea resources for direct personal consumption while in the property.

The Monument Management Plan (MMP) implements the Proclamation and further outlines current and future planning, administrative and field activities to enhance the natural, cultural and historic resources in Papahānaumokuākea over a 15-year period. The Vision, Mission and two of the Goals outlined in the MMP reinforce the need to protect Native Hawaiian cultural access and recognize the cultural significance of Papahānaumokuākea to Native Hawaiians.

Monument Vision: "To forever protect and perpetuate ecosystem health and diversity and Native Hawaiian cultural significance of Papahānaumokuākea."

Monument Mission: "Carry out seamless integrated management to ensure ecological integrity and achieve strong, long-term protection and perpetuation of NWHI ecosystems, Native Hawaiian culture and heritage resources for current and future generations."

The following goals and strategies are excerpted from the Monument Management Plan, and are numbered accordingly.

Goal 6: "Support Native Hawaiian practices consistent with long-term conservation and protection."

Goal 7: "Identify, interpret and protect Monument historic and cultural resources."

Traditional Hawaiian blessing prior to conducting research in Papahānaumokuākea (Photo: Ann Bell)

Several strategies and activities in the MMP support access to Papahānaumokuākea for Native Hawaiian use and practices. Specifically, the MMP contains a Native Hawaiian Cultural and History Action Plan with a desired outcome to:

"Increase understanding and appreciation of Native Hawaiian histories and cultural practices related to Papahānaumokuākea Marine National Monument and effectively manage cultural resources for their cultural, educational, and scientific value."

Several strategies are specifically targeted at ensuring Native Hawaiian cultural access is promoted:

Strategy 2: Conduct, support, and facilitate Native Hawaiian cultural access and research of the NWHI over the life of the plan.

Activity 2.1: Continue to compile information and conduct new cultural and historical research about the NWHI.

Activity 2.2: Support Native Hawaiian cultural research needs.

Activity 2.3: Facilitate cultural field research and cultural education opportunities annually.

Activity 2.4: Convene a Native Hawaiian nomenclature working group.

Activity 2.5: Incorporate cultural resources information into the Monument Information Management System.

BRINGING THE PLACE TO THE PEOPLE
NAVIGATING CHANGE

Painting by Hilo Artist, Layne Luna. This mural covers one large wall at Mokupāpapa Discovery Center for Hawai'i's Remote Coral Reefs, in Hilo, Hawai'i.

"No longer do we seek only the knowledge of how to voyage between islands. We seek lessons to carry home to our children - ways to inspire the present generation to love and preserve our Earth as a sanctuary for those who will inherit it."

— Nainoa Thompson,
Navigator, *Hōkūle'a*

Navigator Nainoa Thompson at Pearl and Hermes Atoll. Photo: NOAA.

Kamehameha School students explore NWHI through interactive exhibits at Mokupāpapa Discovery Center in Hilo. Photos: James Watt.

Mokupāpapa Discovery Center for Hawai'i's Remote Coral Reefs, in Hilo, Hawai'i. Photo: NOAA.

Geologically the oldest in the Hawaiian chain, the Northwestern Hawaiian Islands (NWHI) offer a glimpse back in time to when the lands and waters were healthy and teeming with life. These still-wild ecosystems contain powerful lessons for those of us in the main Hawaiian Islands who are witnessing the decline of our finite island resources. They teach us the importance of caring for the natural world on which our lives and livelihoods depend, and they give us a living model to guide restoration efforts. The Hawaiian Archipelago is one of the few places in the world where large-scale comparisons of impacted and un-impacted reef and island ecosystems of similar species and geography can be made.

The new national monument creates a new opportunity for ocean education and research for decades to come. Successful ocean stewardship depends on informed policy makers and an informed public.

– President George W. Bush

But the remoteness of this vast ocean region presents special challenges as to how these lessons can be shared. With access strictly limited, most people are unable to experience the place directly. Thus, the monument and its partners have created a spectrum of educational and experiential opportunities that indirectly connect people with the NWHI and its biological, historical and cultural wonders – in effect, "bringing the place to the people," rather than the people to the place.

The monument's educational initiatives include distance learning, presentations and events promoting ocean conservation, teacher workshops, and the Mokupāpapa Discovery Center for Hawai'i's Remote Coral Reefs in Hilo. In addition, a few educators each year are able to participate in expeditions to the region and subsequently share their experience with their students and communities. Articles and lesson plans from the past few years can be found at: **www.hawaiianatolls.org**

In 2001, the NWHI co-trustees, Bishop Museum, the Polynesian Voyaging Society and a host of other community and government agencies joined forces to form the Navigating Change educational partnership. Inspired by the vision of the late Pinky Thompson and his son Nainoa, the partnership built an educational program that extends Hōkūle'a journeys to the NWHI into schools statewide. These classroom voyages of discovery challenge students to change their values, attitudes and behaviors, and encourage them to get actively involved in community efforts to mālama and restore the marine and terrestrial environments where they live.

The Hawai'i Maritime Center, next to Aloha Tower, also hosts an interactive Navigating Change exhibit where visitors can role-play being a scientist exploring the NWHI on a research cruise.

To learn more about Navigating Change curriculum or up-coming teacher workshops, visit: www.navigatingchange.org

Navigating Change™
Northwestern Hawaiian Islands

Polynesian Voyaging Society
Bishop Museum
U.S. Fish and Wildlife Service
National Fish and Wildlife Foundation
National Oceanic and Atmospheric Administration
Hawai'i State Department of Land and Natural Resources
Hawai'i State Department of Education
University of Hawai'i Mānoa
Harold K. L. Castle Foundation

Activity 2.6: Continue to facilitate Native Hawaiian cultural accesses.

Activity 2.7: Establish agreements with local universities and museums to address possible curation, research, use, return, and repatriation of collections.

Strategy 4: Plan, develop, and implement a Monument Cultural Resources Program over the life of the plan

Activity 4.1: Prepare a Cultural Resources Program Plan.

Activity 4.2: Develop and implement specific preservation and access plans, as appropriate, to protect cultural sites and collections at Nihoa and Mokumanamana.

Activity 4.3: Initiate implementation of the Monument Cultural Resources Program.

Active and meaningful engagement between the Native Hawaiian community and the management of Papahānaumokuākea preceded its establishment as a monument. Since that time, programs engaging the Native Hawaiian community and supporting Native Hawaiian practices have expanded, and new collaborations continue to be established. Native Hawaiian programmatic areas continue to progress and are accentuated by new efforts to meet MMP goals.

Native Hawaiian Cultural Working Group

The Executive Order that designated the NWHI Coral Reef Ecosystem Reserve (the Reserve) in 2000 required that Native Hawaiians, among others, provide advice regarding management of the Reserve and ensuring the continuance of Native Hawaiian practices. It did so through provisions allowing for "culturally significant, noncommercial subsistence, cultural, and religious uses" in the Reserve by Native Hawaiians, and set aside three voting seats on the Reserve Advisory Council for Native Hawaiians. During its first five years of operation, the Advisory Council established a Native Hawaiian Cultural Working Group, which broadened the inclusion of Native Hawaiians in the operations of the Reserve and in planning for a proposed National Marine Sanctuary.

Mokupāpapa Discovery Center in Hilo, Hawaii
(Photo: PMNM)

The Monument Management Board (MMB) includes representation by the Office of Hawaiian Affairs (OHA). Currently, OHA is the only State agency with a statutory mandate to advocate for Native Hawaiians and to assess the policies and practices of other agencies' impacts on Native Hawaiians. OHA, on behalf of the MMB, will continue to convene the Native Hawaiian Cultural Working Group to obtain advice and guidance from Native Hawaiian cultural experts, including *kūpuna* (respected elders) and practitioners, on all Monument actions affecting Native Hawaiians and cultural resources at Papahānaumokuākea. Over time, the MMB may develop other mechanisms to bring together Native Hawaiians to participate in Papahānaumokuākea's activities and management.

The Native Hawaiian Cultural Working Group provides guidance to the MMB through OHA. This group provided Papahānaumokuākea with its name and has offered support on permit review and the continuing development of permit conditions and cultural protocols as it relates to Native Hawaiian practices. The incorporation of Native Hawaiian culture into Monument management will gain the long-term support of, and greater understanding from, the host culture of the Hawaiian Archipelago.

4.b Factors Affecting the Property

(i) Development Pressures

There are no development pressures affecting the property, nor are any anticipated in the future. The site's remoteness, along with stringent conservation laws and robust management practices ensure that development pressures are not a factor in the property's future. Presidential Proclamation 8031 specifically forbids activities such as mining or other extractive practices. In addition, with very limited exceptions, the federal regulations for Papahānaumokuākea prohibit anyone from removing, moving, taking, harvesting, possessing, injuring, disturbing or damaging any of its living or nonliving resources, or attempting any of these actions unless authorized by a Monument permit (50 CFR § 404.7(a)). Modification of existing facilities (e.g., on Midway's Sand Island or Tern Island in French Frigate Shoals) occurs in strict compliance with refuge laws and regulations, applicable historic regulations, and National Environmental Policy Act requirements. The natural, cultural and historic resources of the property are well protected.

Over 586 tons of marine debris have been removed from Papahānaumokuākea over the last 10 years
(Photo: CRED, NOAA)

All improvements planned for Midway Atoll in the Midway Atoll Conceptual Site Plan (Volume IV of Monument Management Plan) will be made in existing structures or built on the footprints of existing structures. Any designs for new structures will utilize new sustainable technologies to set an environmentally responsible development standard regarding the inhabited areas of Papahānaumokuākea. Additionally, within the Monument Management Plan outlines are presented for further support of field camps at French Frigate Shoals and Kure Atoll to aid in the monitoring of seabirds, sea turtles and monk seals.

(Photo: Susan Middleton & David Liittschwager)

(ii) Environmental Pressures

Marine pollution

The major form of marine pollution both inside and outside of Papahānaumokuākea Marine National Monument boundaries is marine debris. As with many marine ecosystems around the world, marine debris is a constant threat to certain components of the ecosystems of Papahānaumokuākea (Selkoe et al. 2008). Although no commercial or recreational fishing is permitted in Papahānaumokuākea's waters, derelict fishing nets and gear, plastics and other ocean-borne debris are concentrated by ocean currents and wash up on the reefs and beaches of the property. Entanglement in marine debris has been identified as a major threat to the endangered Hawaiian Monk Seal; debris entanglement also threatens sea turtles, seabirds, cetaceans and coral reef organisms. An ongoing multi-agency marine debris clean-up program has removed more than 586 tons of debris from the property in the past ten years (Figure 4.6).

Fishing elsewhere in the Pacific has the potential to harm Papahānaumokuākea's highly migratory marine species, such as tuna, sharks, seabirds, and marine mammals that may otherwise forage or travel outside of the Papahānaumokuākea's protective boundaries.

Birds are also harmed by debris. Smaller types of marine debris made of plastic, such

as disposable lighters, bottle caps, and other fragments, are ingested by adult albatrosses, shearwaters, and other seabirds when they feed at sea (Fry et al. 1987). These objects are subsequently fed to chicks and can cause direct and indirect injuries, often resulting in the death of young albatrosses. Additionally, this debris may increase the birds' exposure to and ingestion of organochlorine contaminants from plastic surfaces (Carpenter and Smith 1972).

Terrestrial pollution

Past uses have contributed to significant modification and contamination throughout the region, especially at French Frigate Shoals, Midway Atoll, and Kure Atoll. Contamination at all these sites includes offshore and onshore contaminated debris such as batteries (lead and mercury), transformers with PCBs, capacitors and barrels. Debris washing ashore is another source of contamination on the islands. Studies have shown that soil can constitute up to 30% of the material a bird consumes, and hence soil contamination from the above substances is a substantial threat to the bird populations (Hui and Beyer 1998; Beyer et al. 1994). Lead-based paints on the former naval buildings at Midway can affect nearby albatross chicks; chicks that ingest paint chips have been found to have blood lead concentrations that cause immunological, neurological, and renal impairments, significantly decreasing their chances of survival. A significant effort is underway to remove the lead paint and to monitor the contaminated sites.

Marine debris are an ever-present threat for both terrestrial and marine species (Photo: James Watt)

Uncharacterized, unlined landfills remain on some of these islands. Kure Atoll and French Frigate Shoals both have point sources of PCBs due to former U.S. Coast Guard LORAN stations. While the Coast Guard has mounted cleanup actions at both sites, elevated levels of contamination remain in island soils, nearshore sediment, and biota. Additional continued landfills were left behind by the Navy on Midway Atoll. In response to these threats, emergency response mechanisms and ongoing cleanup and restoration activities will be maintained and enhanced.

Alien species

The waters surrounding Papahānaumokuākea are nearly pristine. A total of 11 marine alien fish, invertebrates and algal species have been recorded in the NWHI (Table 4.2). Alien species may be introduced accidentally, such as with vessel discharge, marine debris, or aquaculture, or intentionally, as in the case of a few species of snappers, grouper and algal species.

The magnitude of the problem of marine invasive species is far greater in the MHI than the NWHI. Efforts to control the accelerated introduction of alien species in the NWHI will focus on transport

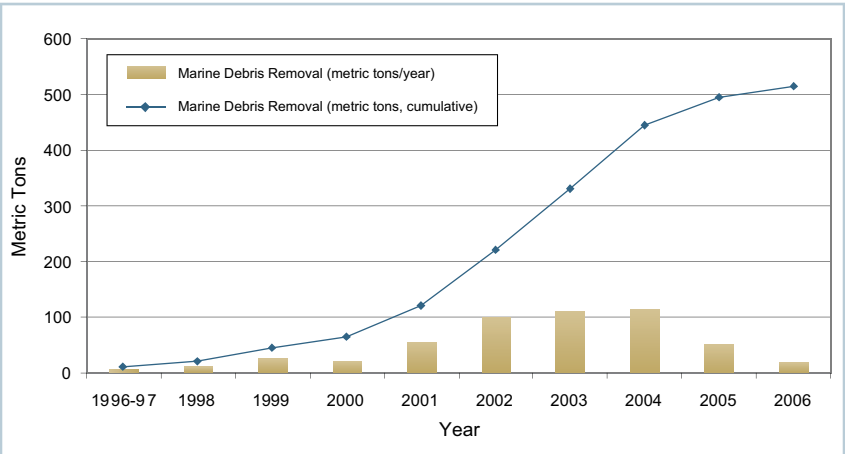


Figure 4.6: *Quantity of marine debris removal in Papahānaumokuākea*
(Source: PIFSC-CRED unpublished data

Reef Assessment and Monitoring Program team preparing for rapid ecological assessments
(Photo: James Watt)

mechanisms, such as marine debris, ships' hulls, and the discharge of bilge water from vessels originating from the main Hawaiian Islands and other ports. Existing Monument regulations and permitting requirements greatly reduce the chance of new introductions (for complete details see Appendix F, Appendix K Volume 1).

However, several of the islands and atolls of Papahānaumokuākea have been, in the past, heavily inundated by terrestrial alien species. Both Midway Atoll and Laysan Island have incurred multiple introductions, many of which transformed the landscapes. Some of the most invasive introductions were intentional, such as vegetation, rats, and rabbits that caused extensive damage. To date, rats and rabbits have been successfully exterminated in Papahānaumokuākea, but various other alien species still plague the inhabited islands and atolls. The number of alien land plants in Papahānaumokuākea varies from only three introduced at Nihoa, to 249 introduced at Midway Atoll. Numerous efforts have been made to eradicate and restore the emergent lands to their native conditions, particularly at Laysan Island and Midway Atoll. Other management and restoration efforts are undertaken annually during the late spring through mid-fall field season. To prevent further importation of invasive plants, animals or insects, mandatory quarantine protocols are enforced for any visitors to all the islands of Papahānaumokuākea, with the exception of Midway Atoll and French Frigate Shoals. These protocols require the use of new or island-specific gear at each site and treatments such as cleaning, using insecticide, and freezing to minimize the transport of potential invasive species to the islands. For a full listing of terrestrial protocols, see Appendix F.

Climate change

Climate change poses a threat to all coral reef ecosystems throughout the world, and the Papahānaumokuākea Marine National Monument is no exception. The increase in average global temperatures, sea-level rise and change in chemical concentrations in the world's oceans are typically cited as the results of global climate change. Regional predictions for the North Central Pacific Gyre area within the next 15 years are for surface temperature increases of 0.5 to 1.0 degrees Celsius, which is a smaller increase than that predicted for the Arctic and Northern hemisphere continental areas. Elevated sea surface temperatures such as those projected can lead to coral bleaching events, when corals expel their symbiotic algae and become white, or bleached. This

Ta'ape (Lutjanus kasmirus), a lutjanid snapper introduced in the main Hawaiian Islands in the 1950s, has spread to the waters of Papahānaumokuākea
(Photo: James Watt)

Table 4.2: Marine alien species in Papahānaumokuākea

Species	Taxa	Native Range	Present Status in Papahānaumokuākea[2]	Mechanism of Introduction
Hypnea musciformis	Algae	Unknown; Cosmopolitan	Not Established; in drift only (MAR)	Intentional introduction to main Hawaiian Islands (documented)
Diadumene lineata	Anemone	Asia	Unknown; on derelict net only (PAH)	Derelict fishing net debris (documented)
Pennaria disticha	Hydroid	Unknown; Cosmopolitan	Established (PAH, LAY, LIS, KUR, MID)	Fouling on ship hulls (hypothesized)
Balanus reticulatus	Barnacle	Atlantic	Established (FFS)	Fouling on ship hulls (hypothesized)
Balanus venustus	Barnacle	Atlantic and Caribbean	Not Established; on vessel hull only (MID)	Fouling on ship hulls (documented)
Chthamalus proteus	Barnacle	Caribbean	Established (MID)	Fouling on ship hulls (hypothesized)
Amathia distans	Bryozoan	Unknown; Cosmopolitan	Established (MID)	Fouling on ship hulls (hypothesized)
Schizoporella errata	Bryozoan	Unknown; Cosmopolitan	Established (MID)	Fouling on ship hulls (hypothesized)
Lutjanus kasmira	Fish	Indo-Pacific	Established (NIH, MMM, FFS, MAR, LAY, and MID)	Intentional introduction to Main Hawaiian Islands (documented)
Cephalopholis argus	Fish	Indo-Pacific	Established (NIH, MMM, FFS)	Intentional introduction to Main Hawaiian Islands (documented)
Lutjanus fulvus	Fish	Indo-Pacific	Established (NIH and FFS)	Intentional introduction to Main Hawaiian Islands (documented)
Cnemidocarpa irene	Tunicate	Indo-Pacific	Established (FFS)	Fouling on ship hulls (hypothesized)
Polycarpa aurita	Tunicate	Indo-Pacific and Western Atlantic	Established (FFS)	Fouling on ship hulls (hypothesized)

Notes:
1 Zabin et al. 2003, Godwin 2002, DeFelice et al. 2002, Godwin 2000, DeFelice et al. 1998, McDermid (pers. com.)
2 NIH=Nihoa, MMM=Mokumanamana, FFS=French Frigate Shoals, MAR=Maro, PAH=Pearl and Hermes, LAY=Laysan Island, LIS=Lisianski Island, MID=Midway, KUR=Kure Atoll

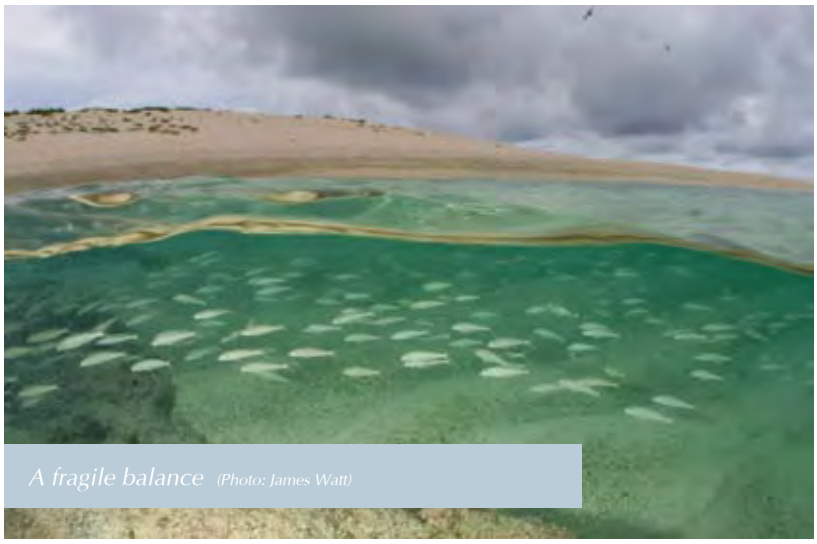
phenomenon, which has already been observed in Papahānaumokuākea (Aeby et al. 2003; Kenyon and Brainard 2006), generally leads to partial or total mortality of the bleached coral and increases corals' susceptibilities to various diseases.

Ocean acidification, resulting from elevated CO2 levels that occur in conjunction with climate change, would have multiple impacts to coral reef ecosystems, including decreased abundance of aragonite (a major building block for coral reefs) and the dissolution of coral substrate and structures (Vitousek 1994). These effects lead to pronounced decreases in coral growth rates (Hoegh-Guldberg 2005; Henderson 2006). Ocean acidification does not only affect submerged reefs; it would similarly affect the carbonate-based island atolls, further expediting the natural subsidence of these islands and atolls.

Additionally, sea-level rise poses a significant threat to the terrestrial ecosystem. Recent modeling scenarios indicate that between 5% and 69% of some terrestrial habitats in Papahānaumokuākea could be lost due to rising sea levels by the year 2100 (Baker et al. 2006). Sea-level rise is likely to have a significantly deleterious effect on Hawaiian Monk Seal pupping sites, Green Turtle nesting areas

and Laysan Finch habitat, in addition to numerous other endangered and endemic species (Selkoe et al. 2008).

It should be noted that these environmental pressures are global in nature, and arise predominantly outside the boundaries of the property. The property includes all the key areas and ecosystems to maintain its ecological integrity, and is of sufficient size to maintain associated biological and ecological processes to assure resilience in the face of effects from climate change.



A fragile balance (Photo: James Watt)

The possibility of cultural resilience, and managing for social-ecological resilience, in the face of global climate change has received increasing attention from academics, managers, and communities worldwide (e.g., MEA 2005) and has become a major topic in the science and management of coral reefs (Hughes et al. 2005). The coupled social-ecological resilience of Papahānaumokuākea remains an area of great concern. Engaging with traditional ecological knowledge and local ecological knowledge is increasingly considered integral to enhancing and managing for resilience (Berkes et al. 2003; Davis & Wagner 2003; Folke 2006).

Traditional Native Hawaiian knowledge and practice can provide a rich example of resilience in the face of extreme environmental and socio-cultural change. To address these current concerns, Monument staff are working to interweave multiple forms of knowledge into the management of Papahānaumokuākea, as exemplified by the MMP vision, goals and strategies described in preceding sections. For example, Monument staff and Native Hawaiian practitioners hosted a workshop for Hawai'i-based coral reef managers entitled "Response to Climate Change (RtCC)." This five-day workshop, based on one designed by the Great Barrier Reef Marine Park Authority, was re-designed to incorporate traditional Native Hawaiian knowledge into modern reef management practices.

Diseases

The incidence of diseases affecting marine organisms is increasing globally, but the factors contributing to disease outbreaks remain poorly known. The overall average prevalence of coral disease is quite low in the NWHI as compared to other coral reef areas (Aeby 2006, Friedlander et al. 2005). Most diseases are presumed to be caused by anthropogenic impacts. Hence, the nearly pristine nature of the coral reefs of the NWHI provides a unique opportunity to document baseline levels of disease in coral reefs (Aeby 2006). Recent studies have begun to document these disease baselines in corals and other associated marine animals such as fish and sea turtles. With documented cases of disease in the NWHI, protocols have been developed and are now incorporated in all permitted activities (see Appendix F for complete details).

Transportation hazards and groundings

Hazards to shipping and other forms of maritime traffic such as shallow submerged reefs and shoals are inherent in the NWHI. The region is exposed to open-ocean weather and sea conditions year-round, punctuated by severe storm and wave events in winter. Hence vessel groundings and the release of fuel, cargo, and other items would pose real threats to the NWHI (Selkoe et al. 2008). Likewise, aircraft landing at Midway Atoll or Tern Island pose certain risks to


(Photo: James Watt)

wildlife and other resources, including bird strikes, introduction of alien species, aircraft crashes, and fuel spills. Certain management practices, such as requiring night landings and runway sweeps during albatross season at Midway, as well as alien species inspections, minimize these risks.

Historically, there have been numerous spills and shipwrecks in the property, and a few in more recent times. In April 2008, a designation by the International Maritime Organization (IMO), declared the waters of Papahānaumokuākea a "Particularly Sensitive Sea Area" (PSSA), implemented a mandatory ship reporting system and expanded and consolidated existing Areas To Be Avoided (ATBA) into four larger ATBAs. The designation puts into effect internationally recognized measures designed to protect marine resources of ecological or cultural significance from damage by ships, while helping keep mariners safe (see Sections 1.e, 5.a and 5.b). While accidents may still happen, careful permitting procedures, restrictions on entry to Papahānaumokuākea Marine National Monument, vast improvements in nautical charts, and vessel safety regulations now in place should keep this threat to a minimum.

Military presence

Activities and exercises of the Armed Forces (including those of the United States Coast Guard) are conducted occasionally within Papahānaumokuākea's boundaries. Navy vessels conduct training and participate in testing activities in the Hawai'i Range Complex (area encompasses North Central Pacific, within which Papahānaumokuākea lies). These activities are described and analyzed in detail in the Hawai'i Range Complex Final Environmental Impact Statement (May 2008). In addition, vessels that support missile defense tests occasionally operate in Papahānaumokuākea's waters.

Although Presidential Proclamation 8031 exempts activities and exercises of the Armed Forces from the Proclamation's prohibitions, all activities must be consistent with applicable laws. The Proclamation further states that "All activities and exercises of the Armed Forces shall be carried out in a manner that avoids, to the extent practicable and consistent with operational requirements, adverse impacts on the monument resources and qualities. In the event of threatened or actual destruction of, loss of, or injury to a monument resource or quality resulting from an incident, including but not limited to spills and groundings, caused by a component of the Department of Defense or the USCG, the cognizant component shall promptly coordinate with the Secretaries for the purpose of taking appropriate actions to respond to and to mitigate the harm, and if possible, restore or replace the monument resource or quality."

These terms establish strong requirements to avoid adverse impacts to Papahānaumokuākea resources, if practicable and consistent with operational requirements, and require prompt coordination with the federal Co-Trustees if a resource loss or injury


3-inch gun, a remnant of the Battle of Midway
(Photo: Michael Lusk, FWS)

occurs or is threatened. Furthermore, the military must adhere to all other applicable laws and regulations such as the Endangered Species Act, the Marine Mammal Protection Act, the National Wildlife Refuge System Administration Act, the National Historic Preservation Act, and the Migratory Bird Treaty Act.

The Monument Management Board (MMB) is working with representatives of the military to develop a consultation process prior to undertaking activities in Papahānaumokuākea, which will ensure that the resources and qualities of the property are not harmed.

Native Hawaiian archaeological sites

Ecological damage to Native Hawaiian archaeological sites to date is limited to that caused by burrowing birds and the root systems of loulu palms. A balance in preserving all of these natural and archaeological resources will be found. Any restoration undertaken should be planned and carried out with consideration to indigenous knowledge and approaches.

The living cultural connection to Papahānaumokuakea

Nature and culture are inseparable in the Native Hawaiian worldview. Thus, to Native Hawaiians, factors affecting the site's natural resources also affect the living cultural association to the site.

In addition, a variety of socioeconomic, political, and other factors have the potential to negatively impact the living cultural association between Native Hawaiians and Papahānaumokuākea. Some of these potential negative effects are exogenous (e.g., global economy; a decline in cultural transmission). However, the MMP has been proactive in its efforts to foster and enhance Native Hawaiian relationships to Papahānaumokuākea, addressing issues like Native Hawaiian access and the ability to practice culture, conduct research and meaningfully engage in Monument management. These activities are addressed thoroughly in Section 4.a, above, and the MMP (see Appendix K, Supporting Materials).

(iii) Natural Disasters and Risk Preparedness

Tropical storms and hurricanes are natural hazards that may occur at Papahānaumokuākea. However, only three hurricanes have approached the land masses in the property in the last fifty years. In 1959, Hurricane Patsy passed between Kure and Midway atolls. The last recorded hurricane affecting Papahānaumokuākea was Nele, which passed near Gardner Pinnacles in 1985. Damage from these rare events is likely to affect each of the islands differently, depending on the nature and severity of the event.

It is possible that the property could be adversely affected by a tsunami such as that experienced in Southeast Asia in 2004. Sea level measurement stations have been established at Midway and French Frigate Shoals as part of the Pacific Tsunami Warning Center's network. These stations provide information during tsunami events to help track the size and paths of tsunamis generated in the Pacific. At least six major tsunamis have affected the main Hawaiian Islands in the past sixty years. Of these six, four were generated in Alaska, one in Chile, and one near the southern coast of Hawai'i Island. In addition to damages caused by terrestrial inundation, tsunamis could also result in broken coral reef structures, as well as damage by sedimentation and piling of debris. As the marine ecosystem has evolved with periodic disturbance by tsunamis and seasonally high wave energy events, its capacity to recover fully from tsunamis and other wave events would be expected.

Contingency plans for dealing with disasters

The U.S. Fish and Wildlife Service (FWS) has various contingency plans for dealing with disasters. There are emergency plans and protocols for staff at Laysan, French Frigate Shoals, and Midway, in case of tsunami or hurricane (FWS 2007; FWS 2006) (see Appendix N). A full plan for Midway is laid out in the Midway Atoll NWR Facility Response Plan, (FWS 1999) (see Appendix N). For general emergency response at Midway, there is a Midway

Airport Emergency Response Plan; Appendix I of the Henderson Field Airport Certification Manual; November 30, 2006. On Laysan, an engineered hurricane shelter is provided for refuge in case of a hurricane. The FWS has also drafted a Rat Spill Contingency Plan (FWS 2000), outlining response protocols to be followed in the event of a ship grounding and subsequent introduction of rats to any of the islands or atolls.

The National Marine Fisheries Service (NMFS) also has extensive emergency plans for its operations conducted within the property (see Appendix N). Plans exist to provide support and guidance in the event of a medical emergency or severe weather event. Field personnel are trained in wilderness first aid and the use of emergency equipment in case of a medical emergency, hurricane, or tsunami. Through satellite phone/email communication with NMFS personnel in Honolulu as well as cooperating agencies (U.S. Coast Guard, Health Force Partners, FWS, DLNR) field personnel would work to determine the best course of action depending on the situation and location.

(iv) Visitor/tourism Pressures

The MMP contains a long-term visitor services plan, which in accordance with Presidential Proclamation 8031 allows recreational visitors only on Midway Atoll. Numbers of overnight visitors are limited to no more than 50 at any one time. The availability of transportation to Midway means that visitation levels are actually much lower than the maximum number allowed. Flights to Midway are infrequent and occur usually no more than once per week on a small, chartered plane. Visitor


(Photo: FWS)


(Photo: James Watt)

programs are closely monitored to ensure they are causing no adverse effects. The property's managers have the ability to wholly control access by visitors through the permitting process. Midway's visitor program, which allows the public to learn about and experience this unique ecosystem, is expected to only bring benefits to Papahānaumokuākea.

In addition to provision for overnight visitors, it is equally important to allow day visitors to come to Midway Atoll—considered the window to Papahānaumokuākea. All visitors learn about and experience its unique wildlife and historic resources, as well as the natural and cultural resources of Papahānaumokuākea and its importance to Native Hawaiians. Day visits via larger aircraft or small passenger vessel allow a broader range of visitors, including World War II veterans and their families, many of whom have close direct ties with the atoll and who might otherwise have difficulty getting to Midway. The number of larger day visits of 50-800 people to Midway is limited to no more than three per year, with no more than 400 people ashore at any one time. In the past, Midway has hosted numerous large groups, numbering from 250 to 1,800 visitors each. However, the largest groups

taxed the ability to provide the high-quality visitor experience desired. Because groups are limited to existing roads and trails and are typically divided into smaller groups for walking tours, no negative impacts from these visits have been documented. Visitors remain in areas where albatrosses are already acclimated to human presence, and they are restricted from any area where Hawaiian Monk Seals or Green Turtles may be present.

These visits have had a strong positive effect on Midway's guests, with many expressing their commitment to maintaining such special wildlife habitats, doing their part to reduce threats to wildlife, and their appreciation for those who valiantly fought the Battle of Midway. All groups must meet all Monument findings and requirements as specified in Presidential Proclamation 8031 and its implementing regulations at 50 CFR 404.11, including obtaining the appropriate (usually Special Ocean Use) Monument permit. In addition, passenger vessels and aircraft must meet specific Refuge requirements (see Section 5).

(v) Number of Inhabitants Within the Property and the Buffer Zone

Only three sites within Papahānaumokuākea are inhabited year-round and these are Midway Atoll, Laysan Island and Tern Island within French Frigate Shoals. The Laysan Island site is a temporary field camp with tents and other non-permanent structures that house staff and volunteers for up to 12 months at a time (see Table 4.3 for island-by-island occupancy details). Midway Atoll houses FWS staff and volunteers as well as up to 50 contract workers who manage the daily operations at this site. At Tern Island, French Frigate Shoals, a permanent facility houses a small (2-6) permanent staff. In addition to the permanent staff, a few NOAA biologists are stationed there each summer to undertake population assessments for Hawaiian Monk Seals and Green Turtles.

Annual field camps to undertake population assessments and restoration activities have been set up for several years at Kure Atoll, Pearl and Hermes Atoll and Lisianski Island. The temporary field camps range in size from two to six staff and volunteers for up to six months during the late spring to early fall. The number of camps and personnel is subject to annual funding allocations and opportunities for access to these remote locations. See Appendix O for complete details on island-by-island staffing numbers.

Specifically:

Number of inhabitants within the property and buffer zone

Estimated population located within:

Area of nominated property: 130 (permanent and seasonal staff)

Buffer zone: N/A

Total: 130

Year: 2008

Table 4.3: Anticipated staff on each island/atoll under the Monument Management Plan

	Kure Atoll	Midway Atoll	Pearl and Hermes	Lisianski Island	Laysan Island	French Frigate Shoals	Nihoa	Total
Permanent Staff	0	75	0	0	4	6	0	85
Seasonal Staff	6	20	3	3	3	6	4	45
Total:	**6**	**95**	**3**	**3**	**7**	**12**	**4**	**130**

5.

Malamalama ka la nue a Kane puka i Ha'eha'e
'Apakau ke kukuna i ka 'ili kai o nā kai 'ewalu
He 'ike makawalu ka'u e 'ano'i nei,
'O nā au walu o Kanaloa Hauna wela noho i ka moana nui
He Hu'akai ka makani o Lehua 'au i ke kai
Ku'ono'ono ka lua o Kūhaimoana i ke kapa 'ehukai o Ka'ula
'O Kū i ka loulu, ulu a'e ke aloha no Nihoa moku manu
Manu o ku i ka 'āhui, he alaka'i na ka lahui
'O Hinapūko'a
'O Hinapuhaluko'a
'O Hina kupukupu
'O Hinaikamalama
Hua ka 'ohua, lu'u ke kohola
Aloha kahi limu kala, kia'i 'ia e ka 'ākala noho i uka
Hānau ka pe'a, puka ka pe'ape'a i ke kai
He 'ina'i ka 'ina, 'ai o i ka huna o ka pa'akai
Manomano ka 'ike li'u o ka houpo o Kanaloa
Koiko'i lua ho'i no ka lehulehu, 'o ka 'u luki ia
Hanohano wale k[illegible]na, 'o [illegible]a
No Papahānaumo[illegible]inoa
Na Kainani Ka[illegible]a me Halealoha

Protection and Management

5. Protection and Management

Wedge-tailed Shearwater or ʻuaʻu kani
(Photo: Susan Middleton & David Liittschwager)

5.a Ownership

All of the Papahānaumokuākea Marine National Monument property is owned or controlled by the Governments of the United States and the State of Hawai'i. Pursuant to Presidential Proclamations 8031 of June 15, 2006 and 8112 of February 28, 2007, applicable laws and agreements, the U.S. Department of Commerce through the National Oceanic and Atmospheric Administration (NOAA), the U.S. Department of the Interior through the U.S. Fish and Wildlife Service (FWS), and the State of Hawai'i are the government entities with legal authority, jurisdiction or control of Papahānaumokuākea. These three government entities are the Co-Trustees of the public interest. There is no private ownership of the Papahānaumokuākea Marine National Monument property.

Representatives of the Papahānaumokuākea Marine National Monument Co-Trustees:

Governor of the State of Hawai'i
Executive Chambers
State Capitol
Honolulu, Hawai'i 96813
USA

Director
U.S. Fish and Wildlife Service
1849 C Street N.W. (3256 MIB)
Washington, D.C. 20240
USA

Under Secretary of Commerce for Oceans and Atmosphere
U. S. Department of Commerce and
Administrator of National Oceanic and Atmospheric Administration
1401 Constitution Avenue, N.W.
[HCHB 6217]
Washington, D.C. 20230
USA

Traditional or Customary Ownership

In 1893, the Kingdom of Hawai'i, which included most of the Northwestern Hawaiian Islands, was overthrown with the involvement of certain United States officials and others. Some involved in the overthrow and others went on to create a provisional government and then the Republic of Hawai'i, which assumed control of approximately 1.8 million acres of crown, government, and public lands of the Kingdom of Hawai'i, including certain submerged and fast lands of the Northwestern Hawaiian Islands. Upon its annexation, the Republic ceded these lands to the United States in 1900. A majority of these lands were again ceded, this time to the State of Hawai'i, upon statehood in 1959.

Under the terms of the statute admitting Hawai'i as a state in 1959, the federal government granted title to Hawai'i to most of the previously ceded lands and mandated that these ceded lands be held by Hawai'i in public trust. In accordance with the Hawaii Organic Act of April 30, 1900, c 339, 31 Stat 141, and the Hawaii Admission Act of March 18, 1959, Pub L 86-3, 73 Stat 4, most of the islands of the Hawaiian Archipelago that were part of the Territory of Hawai'i became part of the State of Hawai'i as part of the public land trust. Hawai'i's lands continue to hold a considerable amount of legal, historical, and sentimental significance to Native Hawaiians. Pursuant to Section 5(f) of the Hawaii Admission Act, one purpose for which the ceded lands are held in trust by the State is "for the betterment of the conditions of native Hawaiians."

The Native Hawaiian community has expressed a strong interest in participating in management decisions affecting Papahānaumokuākea. Respecting Native Hawaiian traditions and values and providing an effective degree of participation in the protection and stewardship of the area will provide an opportunity for Native Hawaiians to maintain ancestral connections to Papahānaumokuākea.

Representative Management Body

The State of Hawai'i, FWS, and NOAA (collectively, the Co-Trustees) carry out coordinated management for the long-term comprehensive conservation and protection of the property. The representative body that manages, coordinates, plans and monitors activities within Papahānaumokuākea Marine National Monument is known as the Monument Management Board:

Monument Management Board
Papahānaumokuākea Marine
National Monument
6600 Kalaniana'ole Highway, Suite 300
Honolulu, Hawai'i 96825
USA

The functional relationships among the Co-Trustees to coordinate management actions in Papahānaumokuākea are established and defined by a Memorandum of Agreement (MOA) that the Co-Trustees executed on December 8, 2006.

Per the MOA, policy guidance is provided by a Senior Executive Board, consisting of three senior level designees representing the Co-Trustees. In addition, the seven-member Monument Management Board coordinates management of the Papahānaumokuākea Marine National Monument at the field level, and includes designees from NOAA's Office of National Marine Sanctuaries and National Marine Fisheries Service, FWS's National Wildlife Refuge Program and Pacific Islands Fish and Wildlife Office, the State of Hawai'i Department of Land and Natural Resources' (DLNR) Division of Aquatic Resources and Division of Forestry and Wildlife, and the Office of Hawaiian Affairs. Together, the Senior Executive Board and the Monument Management Board represent the combined policy and field-level management authority of the Co-Trustees, acting on behalf of the State of Hawai'i and the United States.

Restrictions on Public Access

Presidential Proclamation 8031, which established Papahānaumokuākea Marine National Monument, as well as federal regulations promulgated by the U.S. Departments of the Interior and Commerce to implement the provisions of the Proclamation, prohibit entering the property unless permission has been granted by the Co-Trustees via a rigorous permit or notification system to manage activities that may affect Papahānaumokuākea's resources.

Any domestic vessel or persons passing through Papahānaumokuākea without interruption must notify an official designated by the Secretaries of Commerce and Interior at least 72 hours, but no longer than one month, prior to the entry date. Notification of departure from Papahānaumokuākea must be provided within 12 hours of leaving. Any vessel granted permission to enter and engage in activities within Papahānaumokuākea is required to have a vessel monitoring system (VMS).

As under international law, rights of navigation are respected, but regulated.

A field party approaches their work site
(Photo: James Watt)


(Photo: State of Hawai'i Archives)

In this case, the regulation of access to Papahānaumokuākea by vessels has been reviewed and approved through processes of the International Maritime Organization (IMO). The IMO is a specialized agency of the United Nations responsible for measures to improve the safety and security of international shipping and protect the marine environment from threats associated with international shipping. Within the IMO, the Marine Environmental Protection Committee (MEPC) and the Maritime Safety Committee (MSC) have agreed that Papahānaumokuākea Marine National Monument be designated as a Particularly Sensitive Sea Area (PSSA).

The PSSA is complemented by the associated IMO protective measures of voluntary Areas To Be Avoided (ATBAs) and a ship reporting system (SRS). See Section 5.b for additional details.

There are, of course, the standard exceptions for official access that are necessary for certain emergency conditions, law enforcement purposes, and activities of the Armed Forces of the United States.

All Papahānaumokuākea prohibitions and restrictions are prescribed consistent with international law. The restrictions apply against foreign vessels and nationals within the territory and territorial sea, unless the application interferes with their international right of innocent passage. No prohibitions or restrictions are applied or enforced against a person who is not a citizen, national, or resident alien of the United States (including foreign flag vessels) outside of the 12-nautical-mile territorial sea unless in accordance with international law.

Consistent with international law, the U.S. has proclaimed a 12 nautical mile territorial sea, a 24-nautical-mile contiguous zone, and a 200-nautical-mile Exclusive Economic Zone (EEZ). Foreign states are thus notified that U.S. laws regulating the exploration and exploitation of marine resources, such as oil and fisheries, also apply within the 200-nautical-mile EEZ/ continental shelf. While it does not own the EEZ/continental shelf beyond its territorial sea, as a coastal state- the U.S. does have the necessary jurisdiction, authority and control over the resources and activities for long-term protection and management of Papahānaumokuākea resources as established under the Antiquities Act and other applicable laws.

In complement to federal law, Hawai'i State law administers the only public meeting process for permitting a limited access to Papahānaumokuākea areas and waters under state jurisdiction. Under the MOA, the Co-Trustees jointly issue permits for access and activities in Papahānaumokuākea.

5.b Protective Designations

Over the past century, the NWHI have been the focus of various conservation efforts by the United States, receiving increasing protections that have culminated in Proclamation 8031, which created Papahānaumokuākea Marine National Monument. In 1903, U.S. President Theodore Roosevelt sent in U.S. Marines to stop the slaughter of seabirds at Midway Atoll. In 1909, the remaining islets and reefs of the NWHI were placed within the Hawaiian Islands Reservation. And in 1940, the Reservation became the Hawaiian Islands National Wildlife Refuge through Presidential Proclamation 2416.

Within the last ten years, state and federal government have made the highest possible commitment to the long-term protection of this area, with the establishment and the designation of the area first as the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve under Presidential Executive Orders 13178 in 2000 and 13196 in 2001; the full protection of all State of Hawai'i waters in the Northwestern Hawaiian Islands upon creation of the Northwestern Hawaiian Islands Marine Refuge

Table 5.1: *Protections in Papahānaumokuākea Marine National Monument*
All commercial fishing eliminated as of 2011
All extractive activities restricted
Access only by permit or notification
No mining, drilling or exploring for oil or gas
No anchoring on coral
Tourism limited only to Midway Atoll
Vessel monitoring system required for all vessels permitted to enter Papahānaumokuākea
No use of explosives, poisons, or electrical charges
No introduction of non-indigenous species
Discharge or disposition of any materials prohibited or severely restricted
Quarantine protocols for moving between islands, access, disease, introduced species and organism sampling applied to all activities
Rigorous permit review system in place for approval of all activities
International Maritime Organization Particularly Sensitive Seas Area designation
Specific laws to protect endangered species, cultural and historic resources
Hull inspections and rat-free certification required for all vessels permitted to enter Papahānaumokuākea
Numerous general and specific permit conditions for all permitted activities

in 2005; and the creation of the Monument under Presidential Proclamation 8031 in 2006. The Co-Trustees are committed to preserving the ecological integrity of Papahānaumokuākea and perpetuation of the NWHI ecosystems, Native Hawaiian culture, and other historic resources. Table 5.1 summarizes many of the protections in Papahānaumokuākea.

In addition to the numerous overlays of protection designated within Papahānaumokuākea through the Hawaiian Islands National Wildlife Refuge, the Midway Atoll National Wildlife Refuge, the Battle of Midway National Memorial, the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, the Hawai'i State Seabird Sanctuary at Kure Atoll, and the Northwestern Hawaiian Islands Marine Refuge, the numerous laws detailed below are all in effect and enforced to ensure compliance. See Appendices G-J for full documents of measures listed below.

International Legal Measures

1. Areas to be Avoided "In the Region of the North-West Hawaiian Islands" (International Maritime Organization, 1981)
Areas to Be Avoided (ATBAs) are navigation measures approved by the International Maritime Organization (IMO). The IMO is the United Nations organization that promotes cooperation among governments and the international shipping industry to improve maritime safety and to prevent marine pollution. In 1981, six voluntary ATBAs were adopted by IMO to protect eight of the coral reef areas of the NWHI. Each of the ATBAs extend out 50 nautical miles from the islands to keep ships well away from the vibrant and integrated coral reef ecosystem and sensitive ecological resources. The ATBAs not only prevent groundings and oil spills, they also provide emergency response teams more time to mount a response to any maritime emergency developing outside of the ATBAs.

Reef fish at French Frigate Shoals (Photo: James Watt)

2. Papahānaumokuākea Marine National Monument designation as a Particularly Sensitive Sea Area (PSSA) by the International Maritime Organization (IMO), (April 3, 2008)
A PSSA is an area recognized by the IMO as requiring special protection because of its significance for recognized ecological, socioeconomic or scientific attributes which may be vulnerable to damage from international shipping activities. An area approved as a Particularly Sensitive Sea Area has specific measures that may be used to control the maritime activities, including routing measures, strict application of MARPOL discharge and equipment requirements for ships, such as oil tankers; and installation of Vessel Traffic Services (VTS).

The IMO's designation as a PSSA gives international recognition to the significance of the waters, coral and other resources of Papahānaumokuākea. The PSSA is complemented by associated IMO protective measures as voluntary Areas To Be Avoided (ATBAs) and a mandatory ship reporting system. The protective measures include amendments to the six existing Areas To Be Avoided (ATBAs), which were adopted by the IMO in 1981, and the adoption of additional ATBAs around Kure Atoll and Midway Atoll as well as three other areas between islands. The action expanded and consolidated the areas into four enlarged ATBAs. The ship reporting system, whose boundary extends an additional 10 nautical miles seaward of the PSSA/Papahānaumokuākea boundary, is mandatory for all ships 300 gross tonnage or greater that are going to or coming from a U.S. port or place, as well as for vessels involved in a developing emergency. Under the system, vessels are required to notify the U.S. when they cross into and out of the reporting area, including when they enter or exit an environmentally sensitive ATBA. The ship reporting area and related measures adopted by IMO provide additional notice to mariners of the significance and vulnerability of resources in Papahānaumokuākea, as well as potential hazards to navigation in the area, such as shallow coral reefs. The reporting requirements do not apply to sovereign immune vessels.

Federal Legal Measures Specific to Papahānaumokuākea and the Northwestern Hawaiian Islands

3. Executive Order 1019 – Hawaiian Islands Reservation (February 3, 1909)
Through this Executive Order, President Theodore Roosevelt set aside the islets and reefs of the Northwestern Hawaiian Islands (except for Midway Atoll) as a preserve and breeding ground for native birds. The order made it unlawful for any person to hunt, trap, capture, willfully disturb or kill any bird of any kind whatever, or take the eggs of such birds within the Hawaiian Islands Reservation. The reservation became known as the Hawaiian Islands National Wildlife Refuge on July 25, 1940, through Presidential Proclamation 2416.

4. Executive Order 13022 – Administration of the Midway Islands, 61 FR 56875 (October 31, 1996)
Midway Atoll National Wildlife Refuge was created on April 22, 1988, as an "overlay" national wildlife refuge through a cooperative agreement with the U.S. Navy. Executive Order 13022 transferred jurisdiction and control over the atoll to the U.S. Fish and Wildlife Service. It required the atoll to be managed for the following purposes:

(1) maintaining and restoring natural biological diversity within the refuge;

(2) providing for the conservation and management of fish and wildlife and their habitats within the refuge;

(3) fulfilling the international treaty obligations of the United States with respect to fish and wildlife;

(4) providing opportunities for scientific research, environmental education, and compatible wildlife dependent recreational activities; and

(5) in a manner compatible with refuge purposes, recognizing and maintaining the historic significance of the Midway Islands.

5. Department of the Interior Secretary's Order 3217 – Battle of Midway National Memorial (September 13, 2000)
Congress provided the Secretary of the Interior the authority to designate Midway Atoll National Wildlife Refuge as the Battle of Midway National Memorial in Section 126 of Public Law 106-113, the Consolidated Appropriations Act for Fiscal Year 2000.

6. Executive Order 13178 - Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, 65 FR 76903 (December 4, 2000)
On December 4, 2000, the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve (Reserve) was created by Executive Order 13178. The Reserve encompasses an area of the marine waters and submerged lands of the Northwestern Hawaiian Islands extending approximately 1200 nautical miles long (2,222.4 km) and 100 nautical miles (185.2 km) in width. As part of the establishment of the Reserve, Executive Order 13178 contains conservation measures that restrict some activities throughout the Reserve, and establishes Reserve Preservation Areas around certain islands, atolls, and banks where all consumptive or extractive uses are prohibited.

7. Executive Order 13196 - Final Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, 66 FR 7395 (January 18, 2001)
On January 18, 2001, the process and establishment of the Reserve was finalized by issuance of Executive Order 13196. This Executive Order modified Executive Order 13178 by revising certain conservation measures and making permanent the Reserve Preservation Areas, with modifications. With this action, the establishment of the Reserve, including conservation measures and permanent Reserve Preservation Areas, was completed. The Reserve's outer boundary is essentially the same as the Papahānaumokuākea boundary. The Reserve prohibited certain activities that could harm natural and cultural resources and established preservation areas to provide additional protection in designated zones.

8. Presidential Proclamation 8031 of June 15, 2006, 71 FR 36443 (June 26, 2006)
Presidential Proclamation 8031 of June 15, 2006 establishing the Northwestern Hawaiian Islands Marine National Monument, by regulations at 71 FR 36443 (June 26, 2006); as amended by Presidential Proclamation 8112) (codified at 50 CFR Part 404) (2006) and under the authority of February 28, 2007, 72 FR 10031 (March 6, 2007)16 U.S.C. 431 et seq.; 16 U.S.C. 460k-3; 16 U.S.C. 1801 et seq.; 16 U.S.C. 742f, 16 U.S.C. 742l, and 16 U.S.C. 668dd-ee; 16 U.S.C. 1361 et seq.; 16 U.S.C. 1531 et seq., Pub. L. No. 106-513, Sec. 6(g) (2000);

The Northwestern Hawaiian Islands Marine National Monument was established on June 15, 2006, by Presidential Proclamation 8031 under the authority of the Antiquities Act. The Proclamation reserves approximately 139,793 square miles of emergent and submerged lands and waters of the Northwestern Hawaiian Islands from all forms of entry, location, selection, sale or leasing or other disposition under public land laws. Presidential Proclamation 8112, dated February 28, 2007, amended Proclamation 8031 to give the property a Native Hawaiian name, Papahānaumokuākea, which was developed by Native Hawaiians.

There are numerous prohibitions against exploitation of Papahānaumokuākea resources and introduction of non-native species as well as restrictions on activities that may impact or injure area resources. See Table 5.1 at the end of this section.

9. Northwestern Hawaiian Islands Marine National Monument codifying regulations, 50 CFR Part 404 (2006)
Federal regulations codifying the provisions of Proclamation 8031 were published on August 29, 2006 (50 CFR Part 404). The regulations generally prohibit exploitation or extractive use of natural, historical and cultural resources. With exceptions for law enforcement, emergency personnel, armed forces, and uninterrupted passage, access to Papahānaumokuākea is restricted to persons who have applied for and received permits to conduct approved activities. Commercial fishing is prohibited except for a small commercial fishery consisting of eight boats that will be allowed to continue fishing in certain areas of Papahānaumokuākea until June 2011. Thereafter, commercial fishing

will be completely prohibited. Limited fishing for Native Hawaiian cultural reasons and sustenance fishing for bottomfish and pelagic species in certain areas of Papahānaumokuākea may be authorized by permit.

10. Northwestern Hawaiian Islands Marine National Monument regulations implementing IMO PSSA Mandatory Ship Reporting System, 50 CFR Part 404 (2008)
Federal regulations implementing the IMO mandatory ship reporting system were published on December 3, 2008. The regulations amend the Monument reporting requirements at 50 CFR 404.4 to be consistent with and to implement the IMO ship reporting system as follows. The regulations establish a reporting area around the Monument that extends outward ten nautical miles from the Monument boundary but that excludes the ATBA's within the Monument. Vessel passing through the Monument without interruption must notify the United States by e-mail upon crossing into the Reporting Area and again upon exiting the Reporting Area. The notification must provide specific information regarding the vessel, its location, etc., and must be sent in a reporting format that is consistent with the reporting system adopted by IMO. Vessels that do not have e-mail capability remain subject to current regulations that require notification by various means (telephone, fax, e-mail) at least 72 hours but not more than one month before passing through the Monument without interruption. The ship reporting requirements do not apply to sovereign immune vessels including vessels of the United States Armed Forces (and the United States Coast Guard) but voluntary participation in the reporting system is recommended for all vessels.

General Federal Legal Measures Applicable to Papahānaumokuākea Resources

11. Antiquities Act of 1906, 16 U.S.C. § 431, *et seq.*
The Antiquities Act of 1906 was the first general federal preservation law in the United States and provides protection for archaeological, historic or scientifically interesting resources on lands owned or controlled by the federal government.

White Tern or manu o Kū
(Photos: Susan Middleton & David Liittschwager)

The Act authorizes the President to declare by proclamation such resources to be national monuments, and may reserve parcels of land for the proper care and management of such resources.

The Act provides criminal penalties for unlawful appropriation, excavation, injury or destruction of certain monument resources including but not limited to coral and cultural resources. It also provides authority for regulations and a permit system at each monument site created.

12. Migratory Bird Treaty Act of 1918, as amended, 16 U.S.C. §§703-712
This statute makes it unlawful to pursue, hunt, take, capture, kill or sell parts of live or dead migratory birds, giving equal and full protection to bird parts, such as feathers, eggs and nests. This law originally implemented a convention between the United States and Great Britain (for Canada). Later, the United States entered into similar agreements with Canada, Mexico, Japan, and Russia to protect migratory birds.

More than 800 species are currently on the list of protected migratory birds, some of which currently migrate to or through Papahānaumokuākea.

13. Historic Sites, Buildings, Objects and Antiquities Act of 1935, 16 U.S.C. §§461-462, 464-467
The Historic Sites Act declares it a national policy to preserve historic sites and objects of national significance and provides procedures for designation, administration and protection of such sites.

National Historic Landmarks, such as the World War II facilities designated on Midway Atoll on May 28, 1987, are named under the authority of this act.

14. Fish and Wildlife Act of 1956, as amended, 16 U.S.C. § 742f
The Fish and Wildlife Act establishes a comprehensive national fish, shellfish and wildlife resources policy with emphasis on the commercial fishing industry but also with a direction to administer the Act with regard to the inherent right of every citizen and resident to fish for pleasure, enjoyment and betterment and to maintain and increase public opportunities for recreational use of fish and wildlife resources. Among other things, it directs a program of continuing research, extension, and information services on fish and wildlife matters, both domestically and internationally.

15. National Historic Preservation Act (NHPA) of 1966, 16 U.S.C. § 470 *et seq.*
The National Historic Preservation Act is intended to preserve historical and archaeological sites in the United States. Among other things, the act requires Federal agencies to evaluate the impact of all federally funded or permitted projects through a process known as Section 106 Review.

Section 106 of the NHPA is of particular importance since it requires Federal agencies to take into account the effects of their undertakings on historic properties. It also provides a process whereby representatives of Native Hawaiian organizations are afforded opportunity to comment on federal undertakings that may adversely affect Native Hawaiian historic properties.

16. National Wildlife Refuge System Administration Act of 1966, as amended, 16 U.S.C. § 668dd-ee
The National Wildlife Refuge System Administration Act of 1966, together with the Refuge Recreation Act of 1962, provides the principal management authority for the Midway Atoll and the Hawaiian Islands National Wildlife Refuges. The refuges are managed in order to conserve and enhance their fish, wildlife and plant resources and habitats. Islands, reefs and atolls administered as part of these refuges include Nihoa, Mokumanamana (Necker), French Frigate Shoals, Gardner Pinnacles, Maro Reef, Laysan Island, Lisianski Island, Pearl and Hermes Atoll, and Midway Atoll.

17. Refuge Recreation Act of 1962, as ammended, 16 U.S.C. § 460k-460k-4
The Refuge Recreation Act authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use, when such uses do not interfere with the area's primary purposes. It provides for public use fees and permits, and penalties for violation of regulations. It also authorizes the acceptance of donations of funds and real and personal property to assist in carrying out its purposes. Enforcement provisions were amended in 1978 and 1984 to make violations misdemeanors in accordance with the uniform sentencing provisions of 18 U.S.C. §§3551-3586.

This Act applies in the two National Wildlife Refuges within Papahānaumokuākea: the Hawaiian Islands National Wildlife Refuge extending from Nihoa to Pearl and Hermes Atoll, and Midway Atoll National Wildlife Refuge.

18. Coastal Zone Management Act of 1972, 16 U.S.C. § 1451, *et seq.*
In an effort to encourage states to better manage coastal areas, Congress enacted the Coastal Zone Management Act (CZMA). CZMA

The Hawaiian Monk Seal (Monachus schauinslandi) and its critical habitat are protected by various federal laws (Photo: Susan Middleton & David Liittschwager)

Laysan Ducks
(Photo: James Watt)

provides grants to states that develop and implement federally approved coastal zone management plans. It also allows states with approved plans the right to review Federal actions to ensure they are consistent with those plans, and it authorizes the National Estuarine Research Reserve System. Hawai'i's coastal zone management program was approved in 1977 (Chapter 205A, Hawai'i Revised Statutes).

19. Marine Mammal Protection Act of 1972, 16 U.S.C. § 1361, *et seq.*
The Marine Mammal Protection Act makes it unlawful to harass, hunt, capture or kill any marine mammal in waters or on lands under the jurisdiction of the United States.

The Act applies to all marine mammals in Papahānaumokuākea, including all species of seals, dolphins and whales, thus some species enjoy protections in addition to those under the Endangered Species Act.

20. Endangered Species Act of 1973, as amended, 16 U.S.C. § 1531, *et seq.*
The Endangered Species Act was enacted in 1973 to provide protection for critically imperiled species from extinction. It provides for the conservation of species of fish, wildlife, and plants identified by NOAA or FWS as threatened or endangered species. The species listing is based on a number of factors including the scientific and other information available on the species and the ecosystems upon which they depend. Activities prohibited by the Act include harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing or collecting, any species officially listed as endangered or threatened, or attempting any of these activities.

Animals in Papahānaumokuākea that are currently protected under the Act include the Hawaiian Monk Seal, sea turtles, great whales, Short-tailed Albatross, and four species of land birds—the Nihoa Finch, Nihoa Millerbird, Laysan Finch, and the Laysan Duck. In addition, six plant species found in Papahānaumokuākea are listed as endangered species. In 1988, the waters surrounding each of the islands and atolls in Papahānaumokuākea (except Sand Island, Midway Atoll) to a depth of 20 fathoms were designated as critical habitat for the Hawaiian Monk Seal.

21. Magnuson-Stevens Fishery Conservation and Management Act of 1976, 16 U.S.C. § 1801, *et seq.*
The Magnuson-Stevens Fishery Conservation and Management Act was enacted in 1976 and is the primary legal authority for the United States to manage fish stocks within federal waters out to the limit of the 200 nautical mile exclusive economic zone.

Eight commercial fishing boats are allowed to continue to fish for bottomfish and associated pelagic species in certain areas of Papahānaumokuākea until June 2011. The on-going fishing activities of these boats are regulated under the Magnuson-Stevens Act to prevent overfishing and to maintain the sustainability of the fish stocks.

22. Fish and Wildlife Improvement Act of 1978, as amended (16 U.S.C. § 742l)
The Fish and Wildlife Improvement Act authorizes the Secretaries of the Interior and Commerce to establish, conduct and assist with national training programs for State fish and wildlife law enforcement personnel. It also authorized funding for research and development of new or improved methods to support fish and wildlife law enforcement. The law also provides authority to the Secretaries to enter into law enforcement cooperative agreements with State or other Federal agencies.

23. Archaeological Resources Protection Act (ARPA) of 1979, 16 U.S.C. § 470aa-mm
The Archaeological Resources Protection Act was enacted to strengthen federal law prohibiting the looting and unwanted recovery

Papahānaumokuākea contains over 120 sunken vessels and aircraft (Photo: James Watt)

of archaeological resources from federal public lands. A main focus of ARPA is the regulation of legitimate archaeological investigation in accordance with professional archaeological standards for research, conservation and curation. The Act also strengthened the enforcement of penalties against those who loot or vandalize archaeological resources that exist under the Antiquities Act.

24. Abandoned Shipwreck Act (ASA) of 1987, 43 U.S.C. §§ 2101-2106
The Abandoned Shipwreck Act is a United States law meant to protect historic shipwrecks from treasure hunters and salvagers by transferring the title of the wreck to the state whose waters it lies in.

The ASA protects abandoned shipwrecks on the submerged lands of Hawai'i including those State submerged lands within the boundaries of Papahānaumokuākea. Abandoned shipwrecks on state submerged lands are owned and controlled by the State but jointly managed as a Papahānaumokuākea resource.

25. Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, 25 U.S.C. §3001 *et seq.*
NAGPRA provides a process for museums and Federal agencies to return certain Native American cultural items, such as human remains, funerary artifacts, sacred objects and objects of cultural patrimony, to lineal descendants and culturally affiliated Indian tribes and Native Hawaiian organizations. It also includes provisions for intentional and inadvertent discoveries of such cultural items, and penalties for noncompliance and illegal trafficking.

26. Sunken Military Craft Act (SMCA) of 2004, Public Law 108-375
The Sunken Military Craft Act provides for the protection of sunken U.S. military ship and aircraft wherever they are located; protection of sensitive archaeological artifacts and historical information; codification of existing case law, which supports federal ownership of sunken U.S. military ship and aircraft wrecks; provides a mechanism for permitting and civil enforcement to prevent unauthorized disturbance; and encourages the Secretary of State, in consultation with the Secretary of Defense, to enter into bilateral and multilateral agreements with foreign countries for the protection of sunken military craft. It does not affect salvage of commercial merchant shipwrecks, recreational diving, commercial fishing, or the laying of submarine cables; and does not relate to the routine operation of ships.

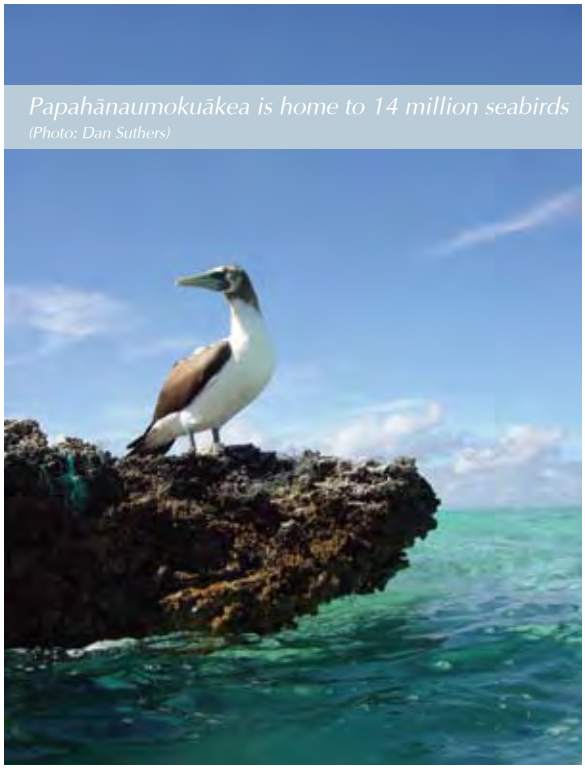
A diver surveys the site of sunken WWII Corsair aircraft (Photo: James Watt)

27. National Environmental Policy Act of 1969, 42 U.S.C. 4321 *et seq.*
NEPA requires federal agencies that are proposing a major action significantly affecting the quality of the human environment to prepare a detailed environmental impact statement (EIS) describing the impacts of the proposed action. NEPA provides a mandate and a framework for federal agencies to consider all reasonably foreseeable environmental effects of their proposed actions and to involve and inform the public in the decisionmaking process.

State Legal Measures

28. Hawaii Organic Act of April 30, 1900, c339, 31 Stat. 141 Section 2; and Hawaii Admission Act of March 18, 1959, Pub. L. 86-3, 73 Stat. 4 Section 2
The Organic Act of April 30, 1900 established the Territory of Hawai'i, transferring sovereignty over the Hawaiian Islands from the Republic of Hawai'i to the United States of America. The constitution and statutory law of the Republic of Hawai'i were adopted in the Organic Act as the laws of Hawai'i.

The Admission Act of March 18, 1959 (Admission Act) admitted Hawai'i to the Union of the United States of America, and established statehood status for Hawai'i on an equal footing with the other states. Upon admission, most of the Northwestern Hawaiian Islands that were part of the Territory of Hawai'i became part of the State of Hawai'i.


Papahānaumokuākea is home to 14 million seabirds
(Photo: Dan Suthers)

29. Constitution of the State of Hawai'i, Article XI, Sections 1, 2, 6, and 9; and Article XII, Section 7
The Constitution of the State of Hawai'i, Article XI, Section 1, entitled "Conservation, Control and Development of Resources," provides that "the State and its political subdivisions shall conserve and protect Hawaii's natural beauty and all natural resources," and also provides that "all public natural resources are held in trust by the State for the benefit of the people."

Article XI, Section 2, establishes the management authority of one or more executive boards or commissions to manage natural resources including public lands set aside for conservation purposes.
Article XI, Section 6, establishes the State's authority to manage and control "marine, seabed and other resources within the boundaries of the State, including the archipelagic waters of the State…."

Article XI, Section 9, provides that "each person has the right to a clean and healthful environment, as defined by laws relating to environmental quality, …."

Article XII, Section 7 provides that the State shall "protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupua'a tenants who are descendants of native Hawaiians" "subject to the right of the State to regulate such rights."

30. Hawaii Revised Statutes (HRS): Title 1 - Chapter 6E; Title 10 - Chapter 128D; Title 12 - Chapters 171, 183C, 183D, 187A, 188, 190, 195D, 200; Title 13 – Chapter 205A; Title 19 - Chapters 339, 342D, 343;

HRS Chapter 6E – Historic Preservation. Establishes the State's Historic Preservation Division, and declares the intent to preserve, restore and maintain historic and cultural

Leopard Blenny or pōʻo kauila
(Photo: Susan Middleton & David Liittschwager)

property through stewardship and trusteeship for future generations; claims state ownership to all historic, cultural and burial sites within its jurisdiction; establishes civil, administrative, and criminal (misdemeanor) penalties for violations of this chapter.

HRS Chapter 128D – Environmental Response Law. Creates a duty to report a release of a hazardous substance from a vessel; authorizes an appropriate state response to protect the public health, safety, and the environment. Civil penalties and injunctive relief may be sought for violations of this chapter. Knowing releases may be prosecuted as a Class C felony.

HRS Chapter 171 – Public Lands, Management and Disposition of. Establishes state authority for management of public lands, including preventing illegal activities and trespass. Administrative penalties may be sought for violations of this chapter. On July 7, 2008, Act 215 was signed into law, increasing the per day fines for encroachments upon public lands to $1,000 per day for a first offense. Fines for prohibited use or activity on of public lands were also significantly increased, from $500 per day, to $5,000 per violation for a first violation. Repeat offenders may be liable for up to $20,000 per violation and additional $4,000 per day after notice is given if the violation persists.

HRS Chapter 183C – Conservation District. Recognizes the importance to conserve, protect, and preserve important natural resources, including fragile natural ecosystems, through appropriate management and use. All submerged lands in state territorial waters are zoned in the conservation district. Administrative fines and costs are available for violations of this chapter. On July 7, 2008, Act 217 was signed into law revising Chapter 183C, HRS. It increased fines assessed from up to $2,000 per violation, to up to $15,000 per violation, and the possibility of fines of up to $15,000 per day after notice is given and the violation persists.

HRS Chapter 183D – Wildlife. Gives DLNR authority for the management and administration of wildlife and wildlife resources of the state, including the establishment and maintenance of wildlife sanctuaries, forest reserves, and natural area reserves. Prohibits the taking or injury of wild birds. Criminal violations may be prosecuted as petty misdemeanors or misdemeanors. Administrative penalties are also applicable.

HRS Chapter 187A – Aquatic Resources. Allows the state to adopt regulations for the conservation and management of aquatic life in any area as appropriate, and encourages cooperation between DLNR and other governmental authorities; prevents or controls the introduction of alien aquatic organisms via handling of ballast water discharges. Criminal violations may be prosecuted as petty misdemeanors. Administrative penalties are also available under this chapter.

HRS Chapter 188 – Fishing Rights and Regulations. Regulates or prohibits the use or possession of certain types of fishing gear or methods. Section 188-37 was formerly used to regulate commercial fisheries in the Northwestern Hawaiian Islands by license and permit. Section 188-53, HRS, gives DLNR authority to establish such areas as the Northwestern Hawaiian Islands Marine Refuge (under Chapter 60.5, Hawaii Administrative Rules) for the purposes of managing, preserving, protecting, and conserving marine life. Criminal violations of this chapter are petty misdemeanors, with certain exceptions prosecuted as felonies.

HRS Chapter 190 – Marine Life Conservation Program. By this chapter, all marine waters of the State are marine life conservation areas administered by the State. Authorizes rules governing the take of marine resources such as fish, invertebrates, and algae. Violations of this chapter are petty misdemeanors.

HRS Chapter 195D – Conservation of Aquatic Life, Wildlife, and Land Plants. The Hawai'i State counterpart to the Endangered Species Act of 1973, but affords additional safeguards through determinations that certain indigenous species believed to need protection, may be additionally listed as threatened or endangered. Provides for separate state administrative enforcement and criminal misdemeanor penalty proceedings for violations.

HRS Chapter 200 – Ocean Recreation and Coastal Areas Program. Allows certain derelict, abandoned, or vessels aground to be immediately removed from state waters under certain conditions such as when posing an imminent danger to life or property. In addition to administrative penalties, certain violations of this chapter may be prosecuted as a misdemeanor.

HRS Chapter 205A – Coastal Zone Management. Creates a comprehensive and coordinated approach to regulation of development in coastal special management areas; including shoreline setback; and managing marine and coastal resource issues including recreation, historic preservation, scenic and open space preservation, protection of ocean ecosystems, reduction of coastal hazards, and beach protection. Civil fines may be available for violations of this chapter.

HRS Chapter 339 – Litter Control. Prohibits the disposal of refuse or waste material into the waters of the State. Infractions of this chapter may be prosecuted as violations.

HRS Chapter 342D – Water Pollution. Prohibits discharge of a water pollutant into state waters. Violations of this chapter may result in imposition of fines. Knowing violations may be criminally prosecuted as a Class C felony.

HRS Chapter 343 – Environmental Impact Statements. Provides for a state environmental review process, including proposed land uses within the conservation district or shoreline area defined by section 205A-41, HRS, or for certain uses of state funds.

31. Hawaii Administrative Rules (HAR): Title 11 - Chapters 54, 55, 60.1, 200; Title 13 - Chapters 5, 60.5, 75, 76, 124, 125, 221, 275, 277, 280, and 300

HAR Chapter 54 – Water Quality Standards. Creates state water quality standards including the policy mandate that where high quality waters constitute an outstanding national resource, such as waters of national and state parks and wildlife refuges and waters of exceptional or ecological significance, that water quality shall be maintained and protected. Section 11-54-7, HAR, classifies all beaches of the Northwestern Hawaiian Islands to be protected as "Class I" water areas.

HAR Chapter 55 – Water Pollution Control. Further elaborates water pollution discharge prohibitions defined under § 342D-50, HRS, and under NPDES permit criteria issued under this chapter.

HAR Chapter 60.1 – Air Pollution Control. Creates air quality emission standards; prohibitions against activities by any person causing air pollution also apply to any public body

HAR Chapter 200 – Environmental Impact Statement Rules. Provides agencies and persons with procedures, specifications of contents of environmental assessments and environmental impact statements, and criteria and definitions of statewide application.

HAR Chapter 5 – Conservation District. Regulates land uses in the conservation district (submerged lands are zoned in the conservation district) for the purpose of conserving, protecting, and preserving important natural resources of the State through appropriate management and use to promote their long-term sustainability. Any placement or erection of any solid material on land is a land use if that material remains on the land more than 14 days, or causes a permanent change in the land area on which it occurs.

HAR Chapter 60.5 – Northwestern Hawaiian Islands Marine Refuge. Creates the State of Hawai'i's Northwestern Hawaiian Islands Marine Refuge; requires a permit for access, and creates a fully protected zone to the extent of the State's jurisdiction.

HAR Chapter 75 – Rules Regulating the Possession and Use of Certain Fishing Gear. Regulates the use of certain fishing gear and methods, including a prohibition of use of poisonous substances, explosives, electrofishing devices, and firearms.

HAR Chapter 76 – Non-indigenous Aquatic Species. Protects against introduction of non-indigenous aquatic species by requiring ballast water management practices for shipping vessels

HAR Chapter 124 – Indigenous Wildlife, Endangered and Threatened Wildlife, and Introduced Wild Birds. Promotes conservation, management, protection, and enhancement of indigenous wildlife; and management of introduced wild birds.

HAR Chapter 125 – Rules Regulating Wildlife Sanctuaries. Establishes a Hawai'i State Seabird Sanctuary on various offshore islands in the main Hawaiian Islands as well as at Kure Atoll, to conserve, manage, and protect indigenous wildlife in sanctuaries.

HAR Chapter 221 – Unencumbered Public Lands. Regulates public activities on unencumbered public lands.

HAR Chapter 275 – Rules Governing Procedures for Historic Preservation Review for Governmental Projects Covered Under Sections 6E-7 and 6E-8, HRS. Requires historic properties to be evaluated and classified for potential impacts, mitigation, and conservation through a review process.

HAR Chapter 277 – Rules Governing Requirements for Archaeological Site Preservation and Development. Creates standards for preservation of historic property or cultural sites.

HAR Chapter 280 – Rules Governing General Procedures for Inadvertent Discoveries of Historic Properties During a Project Covered by the Historic Preservation Review Process. Provides rules for inventory, assessment, and potential mitigation upon inadvertent discovery of historical property.

HAR Chapter 300 – Rules of Practice and Procedure Relating to Burial Sites and Human Remains. Is the Hawai'i counterpart to the federal Native American Graves Protection and Repatriation Act, and it sets out the rules relating to burial sites and human remains.

Traditional Customs that Safeguard the Property

Under the Proclamation, the implementing regulations, and Monument Management Board policy, cultural and historic resources receive the same stringent protection as do the natural resources within Papahānaumokuākea. To Native Hawaiians, natural resources are cultural resources, and they are genealogically linked to those natural resources, including all of the Hawaiian Islands in the archipelago. Thus, the area must be treated with appropriate reverence and honor.

Under Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470f, the Co-Trustees must consult with the State Historic Preservation Division, the Office of Hawaiian Affairs (OHA) and other Native Hawaiian organizations and individuals to avoid or minimize adverse impacts to historic properties that may arise from permitted and management activities. In addition, the Co-Trustees, OHA and other Native Hawaiian organizations and individuals will help ensure that Native Hawaiians have appropriate access to natural and cultural Papahānaumokuākea resources to continue practices that are important for the preservation and perpetuation of Native Hawaiian culture.

The Office of Hawaiian Affairs facilitates the Native Hawaiian Cultural Working Group, which provides input into Papahānaumokuākea management, permits and activities. Within the Monument Management Plan, two action plans are devoted to Native Hawaiian participation in management and access to the resources of Papahānaumokuākea.

Cultural Research Cruise

From the Blog: Papahānaumokuākea Marine Educators and Cultural Practitioners Cruise, July 23rd, 2008
by Andy Collins

In celebration of International Year of the Reef, Papahānumokuākea Marine National Monument took ten educators from across Oceania to the Northwestern Hawaiian Islands. Along with Oceania's educators, several Native Hawaiian cultural practitioners were offered berths on the cruise to conduct cultural research. Below are blog entries written by cruise participants that were published *Honolulu Advertiser*, and online at http://hawaiianatolls.org.

The Waters of the NWHI Prove Very Refreshing

By expedition member Craig McGrogan (Australia)

[On] an expedition to Papahānaumokuākea Marine National Monument (PMNM)… a stimulating mix of marine educators, from throughout Oceania, coupled with the expansive waters of PMNM are ideal conditions in which to take a step back and reflect on my position and responsibilities as a Marine Educator.

I'm reminded that no matter how far apart the different islands we represent may be throughout Oceania, we have in common the same concerns and issues facing us in our field of marine education. From overfishing to declining water quality, these are challenges all coral reef managers are facing, and we as educators are tasked with communicating to others as we raise awareness and hopefully stimulate positive behavioral changes.

It is enriching for all to learn how different regions of our Pacific community are responding to these challenges, allowing us all to compare our own approach and the sort of messages (themes) we are communicating through our education and conservation work. Take, for instance, subsistence agriculture in Palau using composting techniques passed down from one generation to the next, not only to nourish crops, but to retain water and reduce soil erosion at times of high rainfall. A simple, yet effective means of improving crop production, whilst reducing nutrient and sediment run-off into coastal waters.

The use of fish ponds, a form of traditional aquaculture in Hawai'i, is yet another example of how coastal communities are able to enhance subsistence food production in an environmentally sustainable way. By introducing such cross-cultural awareness and appreciation into our individual educational activities, we will in turn be able to offer a far richer learning experience.

We are all linked by the very ocean that separates us, no matter how far apart our countries may be. Strengthening these connections within the group that we are, on this expedition to the NWHI, will prove a valuable first step towards developing a collaborative network of marine educators throughout Oceania.

Practitioners hoped relationships built across Oceania would better enable management of the Pacific's fragile ecosystems.

Nai'a Watson, expedition member and Monument staff, and Uncle Mervin Dudoit from Moloka'i

My Treasured of Memories of the National Monument

By expedition member Fatima Sauafea-Le'au

The purpose of the expedition is "to build a network of marine educators across Oceania committed to forwarding the goals of marine conservation and in inspiring future generations to be better stewards of their natural resources". The expedition to the national monument… reached its purpose. The most inspiring moments that I have witnessed in the national monument are the snorkeling activities… I swam around looking at live corals in Shark Island and saw a huge green turtle sitting on the sand looking at me as if she is saying "I got here first…find your own spot". It is just so amazing to swim in the water with fish that come up close to your face. I will always remember too the hiking up Nihoa. When our group reached the top of the plateau…. It was such a beautiful site to watch the birds flying all over.

This expedition has been an exciting and once in a lifetime opportunity for me. I have learned so much from the expedition and I have also built a network of friends that, I hope, we will continue on our journey in sharing and exchange of our knowledge and ideas to conserve, protect and manage our resources for the future generations of the Pacific Islands.

(Photo: James Watt)

Marine educators and cultural practitioners after snorkeling in the Monument.

Our Kupuna Islands

By expedition member Legario "Hank" Eharis

The Northwestern Hawaiian Islands is definitely remote, yet still a part of the Hawaiian people; they signify connections to the beliefs and cultural ties to the land and seas. When I first set foot upon the island of Nihoa, there came an overwhelming feeling of peacefulness. It was like being away from home for a very long time and suddenly you're home and everyone is sad but yet happy to see you again. Awesome feeling! You look around and fish rise to the surface of the water; monk seals come up to greet you; birds hover in your presence.

My most memorable moments will be the diving at the many off-shore reefs, in the coral lagoons, and to see the abundance of fish species still in a natural, pristine habitats, diving in the blue waters off of Mokumanamana and Mokupāpapa Atolls. I'm at a loss for words of the vast open blue planet I am just beginning to experience and see.

I have learned a lot from the different teachers and educators from throughout Oceania. There are similarities we encounter in the fight to better our land and ocean resources and in how to take care and promote malama ka aina, malama i ke kai (caring for the land, caring for the ocean). Hopefully this expedition will allow the doors to be open for more practitioners, educators and maka'ainana (people of the land–Hawaiians) to see and experience our Kupuna Islands.

5.c Implementation of Protective Measures

Permitting System

One of the means by which the integrity of this property is upheld is through the restriction of access to only those who can demonstrate a convincing need to enter. Access to Papahānaumokuākea Marine National Monument is regulated through a rigorous permitting system, and permits are limited to activities that fall under the following permit types:

- **Research:** for activities designed to enhance the understanding of Papahānaumokuākea's resources and activities and improve resource management decision-making.
- **Conservation and Management:** for activities that make up the general management of Papahānaumokuākea, such as field station operations and marine debris removal.
- **Education:** for activities that further the educational value of Papahānaumokuākea.

Establishing reef monitoring sites (Photo: James Watt)

- **Native Hawaiian Practices:** for activities that constitute Native Hawaiian cultural practices.
- **Special Ocean Use:** for activities related to commercial ocean uses that generate revenue or profits, including ecotourism and documentary filmmaking, which have a net benefit to Papahānaumokuākea.
- **Recreation (Midway only):** for all recreational activities.

Review of all permit applications is thorough, conducted by members of all State and Federal agencies involved. The Co-Trustees are required to determine that issuing the requested permit is compatible with the findings of Presidential Proclamation 8031 to ensure the conservation and management of the natural, historic and cultural resources of Papahānaumokuākea. To be granted a permit for access to the site, the proposed activities must be found by the Co-Trustees to be compatible with the stringent requirements codifying Presidential Proclamation 8031 and the federal and state regulations for Papahānaumokuākea Marine National Monument (referred to below as the Monument, as taken from the Proclamation):

a. The activity can be conducted with adequate safeguards for the resources and ecological integrity of the Monument;

b. The activity will be conducted in a manner compatible with the management direction of Presidential Proclamation 8031, considering the extent to which the conduct of the activity may diminish or enhance Monument resources, qualities, and ecological integrity, any indirect, secondary, or cumulative effects of the activity, and the duration of such effects;

c. There is no practicable alternative to conducting the activity within the Monument;

d. The end value of the activity outweighs its adverse impacts on Monument resources, qualities, and ecological integrity;

e. The duration of the activity is no longer than necessary to achieve its stated purpose;

f. The applicant is qualified to conduct and complete the activity and mitigate any potential impacts resulting from its conduct;

g. The applicant has adequate financial resources available to conduct and complete the activity and mitigate any potential impacts resulting from its conduct;

h. The methods and procedures proposed by the applicant are appropriate to achieve the proposed activity's goals in relation to their impacts to Monument resources, qualities, and ecological integrity;

i. The applicant's vessel has been outfitted with a mobile transceiver unit approved by OLE and complies with the requirements of Presidential Proclamation 8031; and

j. There are no other factors that would make the issuance of a permit for the activity inappropriate.

In addition to meeting the findings of the Proclamation, each activity is reviewed to ensure that it is both biologically sound and culturally appropriate,

As a matter of policy, permit applications are sent to a select group of Native Hawaiian cultural experts and are also reviewed by the Office of Hawaiian Affairs (OHA) to determine if the activity will have any detrimental impacts to the culture. In addition, under Section 106 of the National Historic Preservation Act (NHPA), the Co-Trustees coordinate and consult with the State Historic Preservation Division, and seek input from OHA and other representatives of Native Hawaiian organizations to avoid or minimize the adverse impacts to historic properties that may arise from permitted activities.

Before the designation of Papahānaumokuākea, separate permits were issued by each agency; currently, all Papahānaumokuākea permits are jointly issued as single unified permits and are signed by all three Co-Trustee agency designees. Each agency, as laid out in the Proclamation establishing Papahānaumokuākea, retains its sphere of jurisdiction, responsibility and expertise. Each brings different knowledge and strengths to this process. They work together on many aspects of the management process. Throughout this process however, each partner agency continues to carry out its statutory and enforcement responsibilities. Even where one of the MMB member agencies has primary responsibility, input from the other agencies is presumed as part of overall management.

Permit requirements and protocols

In addition to the required review of each activity to ensure that it meets the findings of the Proclamation and is both biologically sound and culturally appropriate, there are several permit requirements and protocols that must be complied with.

Cultural: All permittees are required to participate in a Native Hawaiian cultural briefing prior to departure for Papahānaumokuākea. They are also encouraged to provide opportunities for cultural monitors and practitioners to accompany them in the property.

Vessels: All permitted vessels must undergo a hull inspection, and hull cleaning if necessary, prior to entering Papahānaumokuākea. In addition, all vessels must be certified as rat-free. All vessels must also be equipped with an approved Vessel Monitoring System (VMS) for tracking purposes.

Gear and Supplies: All tenders, dive gear, clothes, and even food that will be eaten ashore must undergo additional quarantine requirements before entering all areas except Midway Atoll and French Frigate Shoals. The protocols are intended both for activities at a single site and for moving between sites within Papahānaumokuākea. See Appendix F for the full protocols regarding the special conditions and rules for moving between islands and atolls and packing for field camps, as well as for disease and introduced species prevention for permitted activities in the marine environment.

Day 3: Images from the Nihoa Expedition

From the Blog of the Marine Educators and Cultural Practitioners Cruise to PMNM, July 2008. Published online and in the newspaper, The Honolulu Advertiser.

Nihoa's sea cliffs are hundreds of feet high, with the highest point approaching 900 feet.

Frontal view of Nihoa just prior to access as the crew of the NOAA ship *Hi'ialakai* prepares to take the educators ashore. Expedition members are first loaded into safe boats, then lowered into the water and finally driven to meet an even smaller zodiac boat that will take them to shore at Nihoa.

Once on Nihoa, the group is lead by Kekuewa Kikiloi, a Ph.D. candidate in archaeology who has done the most recent research and study of the archaeological sites on both Nihoa and Mokumanamana. Kikiloi prepped the group with detailed instructions and then asked the ancestors for permission to enter with an *oli*, or chant.

The groups accessed the island in two small groups to minimize disturbance to the birds and cultural sites. Each group hiked in single file, again to minimize disturbance. The initial part of the trail was very steep; the group had to work as a team to ensure everyone's safety.

About half-way up the Middle Valley trail, Kikiloi spoke to the group

Biological Samples: Commonly collected samples (coral, fish, invertebrates, etc.) are subject to protocols developed to ensure the proper handling, storage, and transport of biological samples within Papahānaumokuākea. See Appendix F for the full protocol regarding general storage and transport for scientific collection in Papahānaumokuākea.

A major factor in the development of these requirements and protocols is the fact that the islands and atolls of Papahānaumokuākea provide habitat for many rare, endemic plants and animals. Many of these species are formally listed as endangered under the Endangered Species Act and/or by the IUCN. Endemic plants and insects, and the predators they support, are especially vulnerable to the introduction of competing or consuming species. Such introductions may cause the extinction of island endemics or even the destruction of entire island ecological communities. The protocols listed above detail the rigorous policies and procedures that must be strictly adhered to when access to particular islands and atolls is given. Restrictions are included on the movement of not only personnel, but all materials, vessels, dive and monitoring equipment, camping and terrestrial supplies, and food to these islands and atolls. For example, all cloth items (clothes, camera straps, hats, shoes, under garments, etc.) must be purchased new and frozen for 48 hours prior to going ashore at any of the islands and atolls, except Midway. All dive gear must be soaked in an approved solution at the end of each day. Transport protocols include the collection of samples and their disposition.

Enforcement and Resources

NOAA and FWS both have law enforcement officials who investigate violations of Papahānaumokuākea resources or quality. Both these agencies work in partnership cooperatively with the State of Hawai'i Division of Conservation and Resources Enforcement within the Department of Land and Natural Resources to investigate and cite parties who have violated Papahānaumokuākea regulations. Systems to monitor both domestic and international

maritime traffic have been implemented. NOAA works in concert with the U.S. Coast Guard (USCG) to monitor all vessel activity in Papahānaumokuākea and to track movement via the required VMS. The USCG regularly sends ships and planes to patrol and monitor activity in the area.

Staff are in Papahānaumokuākea year-round at three sites: Midway Atoll, French Frigate Shoals, and at a field camp at Laysan Island. In addition, field camps are staffed for at least six months of the year at other locations such as Kure Atoll. This presence also ensures that any unauthorized vessel or activity near these islands will be observed promptly and reported, as each of these islands are equipped with communications technology.

Additional innovative enforcement technology and programs are being considered in the Monument Management Plan. In the past two years, the USCG and NOAA-Fisheries OLE have taken swift action on alleged fishing violations, resulting in over $100,000 in combined fines.

Adequate resources are available to ensure the property is protected. Resources are available from both the Federal government of the United States and the government of the State of Hawai'i. In addition, myriad government agencies can and do provide additional resources, both in financial terms and in-kind services.

5.d Existing Plans

All plans related to the conservation and management of Papahānaumokuākea Marine National Monument are developed by the Co-Trustees. The islands of Papahānaumokuākea that are part of the State of Hawai'i remain under the jurisdiction of the City and County of Honolulu; however, no current municipal plans address the property.

Please refer to Section 5.e "Monument Management Plan" regarding preparation of the management plan for the property.

The following list provides an overview of some of the existing plans for resource

about the many agricultural terraces located on this particular side of the island. As a group, they have not yet been mapped in detail.

The group continues to hike in single file to the top of the ridge crest above Middle Valley.

This picture does not fully convey the feeling of thousands of birds flying overhead, but it provides an opportunity to understand just how many birds call this small rocky island home.

An immature great frigate bird rests in its nest amongst the thick *'ilima* bushes that cover the entire island.

In the foreground is an agricultural terrace. In the background is "Dogs Head Peak" a name given by the Tanninger expedition (1923-1924); atop this peak sits the largest *heiau*, or ceremonial temple, on the island. Kikiloi said that as many as 40 coral heads often a key feature of ceremonial sites–were found there.

A group shot of the first access group.

After two-hours on-island the group headed back to the landing area for pick up by the zodiac.

July 16th, 2008 by Andy Collins, photographs by Nai'a Watson

management in Papahānaumokuākea that demonstrate the breadth and depth of protective plans already in operation (see Appendix L for full documents). As discussed in Section 5.b "Protective Designations", a range of applicable protective laws and current management strategies already provide comprehensive and long lasting protective measures for the property. These plans were in existence prior to designation of Papahānaumokuākea; many are site- or species-specific. The Monument Management Plan is a comprehensive, overarching approach to management which incorporates, by reference or action plan, all of these plans. For example, the actions and strategies of the Threatened and Endangered Species Action Plan incorporate many of the activities outlined in each of the stand-alone species recovery plans listed below.

Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve Operations Plan
This plan was written to guide the operations within the NWHI Coral Reef Ecosystem Reserve. It was the basis for the day-to-day management decisions during the first five years of reserve operation. All components of this plan that were not already implemented were incorporated into the Monument Management Plan. The NOAA Office of National Marine Sanctuaries was the lead agency for this plan.

Visitor Services Plan for Midway Atoll
This plan documents approved recreational activities at Midway Atoll and identifies the structure of the visitor services program managed by the U.S. Fish and Wildlife Service, the lead Co-Trustee agency. The plan also addresses activities that honor and interpret World War II history as recognized by the Battle of Midway National Memorial. It discusses operational limitations, biological constraints and partnership opportunities beyond Midway Atoll. A key feature of the plan is that it limits the total number of overnight visitors to 50 people per night for 2009 and beyond.

Hawaiian Islands National Wildlife Refuge Master Plan
Since its approval in 1986, this plan has guided the management of the Hawaiian Islands National Wildlife Refuge. It places primary emphasis on protecting and enhancing refuge wildlife resources, particularly threatened and endangered species. It also includes a strategy to evaluate and nominate, if appropriate, lands and waters of the refuge for status as a World Heritage site. Primary responsibility for implementation of the plan is with the FWS as the lead agency.

Fish and Wildlife Service Draft Laysan Island Ecosystem Restoration Plan
In 1998, the draft Laysan Restoration Plan was developed in response to a need for coordinated ecosystem restoration that takes an integrated approach to managing the island's entire biota rather than a species-by-species approach. It includes recommendations that are helping FWS attain the following objectives:

(1) Stabilize the present ecosystem by preventing any new introductions.

(2) Recreate as nearly as possible the Laysan Island ecosystem that was present prior to major human caused habitat modification during the 1890s and early1900s.

(3) Whenever possible, eliminate nonnative species, prioritizing those that cause obvious or significant ecosystem alterations.

(4) Replant or reintroduce native species that are were extirpated from Laysan.

(5) Establish regular comprehensive ecosystem monitoring, so that any nonnative introductions or declines in native species will be detected early enough for management to react in a cost-effective manner.

Fish and Wildlife Service Regional Seabird Conservation Plan, Pacific Region
The purpose of the Pacific Region's Regional Seabird Conservation Plan is to identify the Fish and Wildlife Service's priorities for seabird management, monitoring, research, outreach, planning and coordination. The plan includes a review of seabird resources and habitats, a description of issues and

threats, and a summary of current management, monitoring and outreach efforts. All species are prioritized by conservation concern at the regional scale, and recommendations for conservation actions are identified and prioritized. Papahānaumokuākea populations of five species discussed in the plan are considered globally significant, including two listed as vulnerable by the IUCN.

From the tiniest flatworm to grandest coral-scape, the colors of Papahānaumokuākea are unforgettable
(Photo: James Watt)

Fish and Wildlife Service Contingency Plans for Disasters – Covering the Pacific Remote Island National Wildlife Refuge Complex
The purpose of this document is to establish communications procedures and delegation of authority procedures for emergency situations that may affect the safety of the staff or operation of the Pacific Remote Islands National Wildlife Refuge Complex.

National Marine Fisheries Service - Final Environmental Impact Statement: Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region
NOAA first implemented a federal bottomfish fishery management plan in the early 1980s, and has since added several amendments to the plan. The management regime for the waters around the property have been divided into the Hoʻomalu zone (area west of 165º 00′ W longitude) and the Mau zone (area between 161º 20′ W longitude and 165º 00′ W longitude); a limited-entry fishery has been established to carefully manage and control fishing effort. Additional restrictions, including limits on vessel size, have also limited fishing pressure within the property. A total of 17 fishery permits were authorized under the limited-entry program for the two management zones, but only eight of these fishery permits were still in effect when the Proclamation was issued on June 15, 2006. No additional permits will be issued before the fishery is phased out in 2011.

Fish and Wildlife Service - Prehistoric Cultural Resources and Management Plan for Nihoa and Necker Islands, Hawai'i
This plan outlines management strategies for the cultural resources of the islands of Nihoa and Mokumanamana.

Hawai'i's Comprehensive Wildlife Conservation Strategy (CWCS)
Hawai'i's CWCS is a comprehensive review on the status of the full range of the State's native species, both terrestrial and aquatic. In addition to identifying major threats, it also presents strategies for long-term conservation of these species and their habitats. The mission of this strategy is to guide conservation efforts across the State, including the Northwestern Hawaiian Islands, to ensure protection of Hawai'i's wide range of native wildlife and the diverse habitats that support them. Congress requires states to develop such strategies as an eligibility condition for state wildlife grants.

State of Hawai'i Aquatic Invasive Species Management Plan
The goal of this plan is to minimize the harmful ecological, economic and human health impacts of aquatic invasive species through the prevention and management of their introduction, expansion, and dispersal into, within, and from Hawai'i. To accomplish this goal, the plan identifies seven objectives (ranging from collaboration and prevention, to research and policy) as well as associated strategies for each.

Various Species Recovery Plans
Pursuant to the Endangered Species Act, recovery plans for numerous species within the property have been developed by FWS and the National Marine Fisheries Service. A recovery plan develops goals, objectives, criteria, and actions needed for protecting and enhancing rare and endangered species populations. The plans provide for the conservation of species at risk of extinction throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend. Summaries of the various recovery plans are outlined below (see Appendix M for full recovery plans).

Hawaiian Monk Seal: As a species, the Hawaiian Monk Seal is in crisis. The population remains in a grave decline that has lasted 20 years; only about 1,200 monk seals remain. Modeling predicts that the total monk seal population will fall below 1,000 animals by the year 2012. Actions to date have not been sufficient to result in a recovering population. Most of the total world population of Hawaiian Monk Seals breeds and forages inside Papahānaumokuākea. A recent revision of the recovery plan for the Hawaiian Monk Seal provides guidance for the lead agency in this recovery program, NOAA Fisheries. The Hawaiian Monk Seal Recovery Plan details the ways in which the MMB can facilitate and support those efforts (NOAA Fisheries 2007).

Cetaceans: In the NWHI, sighting and acoustic recordings of baleen whales as well as toothed whales and dolphins have been documented. Five species of baleen whales listed as "endangered" under the Endangered Species Act of 1973, and as "depleted" under the Marine Mammal Protection Act of 1972, have been sighted or heard in Papahānaumokuākea. In addition to these five, the endangered sperm whale and at least 18 other non-ESA listed species are found in Papahānaumokuākea. It has now been documented that humpback whales are calving in the eastern portion of the property (Johnston et al. 2007). Recovery actions for this listed species are summarized in the final recovery plan for the humpback whale, *Megaptera novaeangliae* (NOAA Fisheries 1991). Draft recovery plans are available for the fin whale and sperm whale (NOAA Fisheries 2006a, 2006b), and a final plan is available for the recovery of the blue whale (NOAA Fisheries 1998).

Marine Turtles: The marine turtles known to occur in Papahānaumokuākea are the Hawaiian population of the Green, Hawksbill, Loggerhead, and Leatherback turtles. While there are no records of the endangered Olive Ridley Turtle within Papahānaumokuākea waters, their wide distribution throughout the tropical Pacific makes it likely that they do also occur there. Green and Loggerhead turtles are listed as threatened species; the Hawksbill and Leatherback turtles are classified as endangered species. Recovery plans are in place for each of these species in the Pacific and five-year reviews were jointly published in 2007 (NOAA Fisheries and FWS 1998a; 1998b; 1998c; 1998d; 1998e; 2007). Nesting habitat loss, the harvesting of eggs and turtles for commercial and subsistence purposes, and fishery interactions have caused sea turtle populations to decline across the Pacific. About 90% of the Green Turtles in the Hawaiian Islands are known to nest in the NWHI, the majority on a few islets at French Frigate Shoals (Balazs and Chaloupka 2003).

Birds: Five bird species in Papahānaumokuākea are afforded protection under the Endangered Species Act. Three species are passerines: the Laysan Finch, found on Laysan Island and Pearl and Hermes Atoll, and the Nihoa Finch and the Nihoa Millerbird, which are endemic to Nihoa. Research, recovery, and management for these species takes into consideration the recommendations of the Northwestern Hawaiian Islands Passerines Recovery Plan (FWS 1984) and ongoing input from species experts. Numerous sites were evaluated and ranked for translocation of these species to establish additional populations; this information and some recommendations for proceeding with translocation were provided recently by Morin and Conant

(2007). This plan is implemented by FWS.

The Laysan Duck has the most restricted range of any duck species and is especially vulnerable to extinction because of its small population size (fewer than 800 individuals) and extremely limited range. In 2004 and 2005, 42 Laysan Ducks were translocated to Midway Atoll NWR, where their population has grown to 200 birds (Reynolds et al. 2007).

The Short-tailed Albatross was first observed at Midway Atoll between 1936 and 1941. Since then, between one and three individuals have been observed every year in Papahānaumokuākea. While the Short-tailed Albatross primarily breeds on Torishima, an island owned and administered by Japan, the *Short-tailed Albatross Draft Recovery Plan* (FWS 2005) provides suggestions for ways in which Monument staff can facilitate recovery of this species.

A Laysan Albatross chick peeks out from under its parent (Photo: FWS)

Plants: Six plant species known historically from the NWHI are listed as endangered. Three plant taxa have probably always been rare and restricted to Nihoa, although one species, the loulu or fan palm, also occurred on Laysan Island. *Mariscus pennatiformis* ssp. *bryanii* is known only from Laysan Island. *Cenchrus agrimonioides* var. *laysanensis* was historically known from Laysan Island and Midway and Kure Atolls, but has not been seen there since about 1980 (O'Connor 1999; HBMP database 2007). A recovery plan for three species found only at Nihoa (the Nihoa fan palm, *Schiedea verticillata*, and *Amaranthus brownii*) was finalized in 1998 (FWS 1998). Recovery actions for the other three species (*Cenchrus agrimonioides, Mariscus pennatiformis*, and *Sesbania tomentosa* or *'ohai*) are described in the *Recovery Plan for the Multi-Island Plants (FWS 1999).*

5.e Monument Management Plan

The Co-Trustees have developed a joint agency Monument Management Plan to serve as the guiding document for coordinated conservation and management actions in Papahānaumokuākea over the next 15 years. The final plan will be released in late 2008. The Monument Management Plan focuses on coordinated management across Co-Trustee agencies and addresses issues such as conservation, research, monitoring, enforcement, education, Native Hawaiian practices, cultural resources, permitting and field operations. As it was developed, the Monument Management Plan incorporated many of the plans that had been previously developed to guide current management actions within the NWHI. These plans are listed in Section 5.d.

The Monument Management Plan is organized into three sections:

Section 1, the introduction, describes Papahānaumokuākea's setting and the current status and condition of the ecosystem and cultural resources based on existing scientific and historic knowledge. It also describes known anthropogenic stressors that affect Papahānaumokuākea's resources or may do so in the future.

Section 2, the management framework, includes key elements to move toward an ecosystem approach to management. The framework comprises the following elements:

- The legal and policy basis leading to the establishment of Papahānaumokuākea
- Vision, mission and guiding principles that provide an overarching policy direction for Papahānaumokuākea
- Goals to guide the implementation of specific action plans to address priority management needs
- Institutional arrangements for management among the Co-Trustees and other stakeholders
- Regulations and zoning to manage human activities and threats
- Concepts and direction to move toward a coordinated ecosystem approach to management

Section 3 presents action plans to address six priority management needs over a 15-year planning horizon. These priority management needs are:


(Photo: James Watt)

- Understanding and interpreting NWHI resources
- Conserving wildlife and their habitats
- Reducing threats to Papahānaumokuākea's resources
- Managing human activities
- Facilitating coordination
- Achieving effective operations

Each action plan consists of multiple strategies and activities to address one or more priority management needs and achieve a desired outcome. Performance measures will be developed to evaluate implementation of the Monument Management Plan. Papahānaumokuākea regulations and other policy and operating instruments are provided in the Appendices, along with references.

The Vision, Mission, Guiding Principles, and Goals for Managing Papahānaumokuākea Marine National Monument

The Papahānaumokuākea Marine National Monument vision, mission and guiding principles establish the overarching policy direction and guidance for Papahānaumokuākea's management (see Table 5.2). The vision describes the long-term management desire of the Co-Trustees to maintain the ecosystem health and diversity and Native Hawaiian cultural significance of Papahānaumokuākea in perpetuity. The mission establishes the need for integrated management in order to ensure ecological integrity and achieve strong, long-term protection and perpetuation of NWHI ecosystems, Native Hawaiian culture, and heritage resources for current and future generations. The guiding principles provide direction for making informed decisions about human activities consistent with the vision and mission for Papahānaumokuākea. The goals are the unifying elements of successful property management. They identify and focus management priorities, resolve issues, and link to the public interest in preserving and caring for the historic and scientific objects within Papahānaumokuākea.

Table 5.2: Monument vision, mission, guiding principles, and goals

Vision

To forever protect and perpetuate ecosystem health and diversity and Native Hawaiian cultural significance of Papahānaumokuākea.

Mission

Carry out seamless integrated management to ensure ecological integrity and achieve strong, long-term protection and perpetuation of NWHI ecosystems, Native Hawaiian culture, and heritage resources for current and future generations.

Guiding Principles

Papahānaumokuākea shall be managed in a manner that—

- Is consistent with the Vision and Mission;
- Recognizes that the resources of the NWHI are administrated by the Co-Trustees for the benefit of present and future generations;
- Affirms that the NWHI and its wildlife are important, unique, and irreplaceable;
- Honors the significance of the region for Native Hawaiians;
- Honors the historic importance of the region;
- Incorporates best practices, scientific principles, traditional knowledge, and an adaptive management approach;
- Errs on the side of resource protection when there is uncertainty in available information on the impacts of an activity;
- Enhances public appreciation of the unique character and environment of the NWHI;
- Authorizes only uses consistent with Presidential Proclamation 8031 and applicable laws;
- Coordinates with federal, state, and local governments, Native Hawaiians, relevant organizations, and the public; and
- Carries out effective outreach, monitoring, and enforcement to promote compliance.

Goals

Goal 1: Protect, preserve, maintain, and where appropriate restore the physical environment and the natural biological communities and their associated biodiversity, habitats, populations, native species, and ecological integrity.

Goal 2: Support, promote, and coordinate research, ecosystem characterization, and monitoring that increases understanding of the NWHI, improves management decision-making, and is consistent with conservation and protection..

Goal 3: Manage and only allow human activities consistent with Proclamation 8031 to maintain ecological integrity and prevent or minimize negative impacts for long-term protection.

Goal 4: Provide for cooperative conservation including community involvement that achieves effective property operations and ecosystem-based management.

Goal 5: Enhance public understanding, appreciation, and support for protection of the natural, cultural, and historic resources.

Goal 6: Support Native Hawaiian practices consistent with long-term conservation and protection.

Goal 7: Identify, interpret, and protect Papahānaumokuākea's historic and cultural resources.

Goal 8: Offer visitors opportunities at Midway Atoll to discover and appreciate the wildlife and beauty of the NWHI, enhance conservation, and honor its unique human history.

Toward ecosystem-based management

An ecosystem approach to management for Papahānaumokuākea requires that multiple steps be implemented in a comprehensive and coordinated way. The Papahānaumokuākea Marine National Monument approach is unique in that it includes:

- Ecosystem level planning;
- Cross-jurisdictional management goals;
- Co-management;
- Adaptive management;
- Marine zoning;
- Habitat restoration;
- Incorporation of traditional knowledge; and
- Long-term ocean and coastal observing, monitoring and research.

Effective management plan implementation

The Monument Management Plan has recently been finalized. A key component of overall management effectiveness will be a review and updating of the plan every five years, as described below. In addition, an entire action plan is devoted specifically to developing measures of effectiveness across all Papahānaumokuākea activities. Additional activities to assess the health of the resources of Papahānaumokuākea are outlined in Section 6 "Monitoring".

Monument Management Plan development and review

The management plan will be reviewed every five years. The review represents an essential element of the adaptive management process and includes public involvement, characterization of issues, and review and evaluation of action plans.

The Monument Management Plan was developed based on the current state of knowledge regarding the most appropriate management measures. These management measures consist of regulations and action plans to govern the first five years of Papahānaumokuākea management, and project activities over a 15-year time frame where appropriate. Action plans will be implemented, and where regulations apply, enforced, through interagency collaborative mechanisms based on the jurisdiction of each government agency. After five years, the Monument Management Plan will be reviewed, incorporating lessons learned and new data and information from monitoring, ecosystem science, and traditional knowledge, along with a comprehensive evaluation to develop or refine management strategies and actions.

Achieving effective property operations

A key priority management need in the management plan focuses on property operations, including central and field operations, information management, and overall program evaluation. Central and field operations are essential to support action plans to address all other priority management needs. Monument staff and facilities provide essential operational capacity for effective collaboration between the MMB and other stakeholders. Operational effectiveness will be evaluated and improved through an adaptive management process that captures lessons learned and transforms them into action.

The Co-Trustees are committed to developing management plan performance measures, which fall into three categories: annual benchmarking, management capacity assessment and outcome assessment.

Annual benchmarking measures will be used to determine whether activities have occurred as planned. Management capacity assessment measures will be used every two to three years to determine the adequacy of implementation mechanisms and processes, including interagency coordination and stakeholder and community participation. Outcome assessment measures will be used every four to five years to evaluate the impacts of management actions on the resources and ecosystem status.

5.f Sources and Levels of Finance

The primary sources of funding for the property come from the Co-Trustee agencies. Budgets are appropriated annually from the U.S. Congress or the State of Hawai'i Legislature to the federal

and state administrations. NOAA's Office of National Marine Sanctuaries annual operating budget for the Monument is approximately $7.1 million. FWS has an annual Monument budget of approximately $6.8 million, including operations and deferred maintenance funds, roughly half of which administers contracts (including a portion of airport operations) at Midway Atoll. The Federal Aviation Administration also finances a portion of the airport management at Midway Atoll. While the State of Hawai'i does not have a budget that is solely devoted to the Monument, they allocate nearly $462,000 of staff and resources annually with in-kind services. NOAA-Fisheries also does not have a budget that is solely devoted to the Monument, but allocates considerable funds to protected species restoration, monitoring and protection through the Hawaiian Monk Seal programs, programs for turtles, marine debris removal, and coral reef monitoring. The combined funding for these NOAA-Fisheries programs is $11 million annually.

In addition to the Co-Trustee agencies, numerous other agencies provide added resources to support the management of Papahānaumokuākea. NOAA's Office of Law Enforcement and FWS' refuge law enforcement staff both support enforcement actions in Papahānaumokuākea. The USCG regularly patrols the area with ships and planes; these assets cost on average $5,600/hour for patrols and/or emergency response. The Hawai'i Undersea Research Lab of the University of Hawai'i has a deep diving submersible and remotely operated vehicles that are used to assess deep ocean resources in Papahānaumokuākea. Funding for these efforts comes from numerous sources, including National Science Foundation grants, NOAA's Ocean Exploration Program and NOAA's Undersea Research Center. The Hawai'i Institute of Marine Biology of the University of Hawai'i has received an annual appropriation in the last four years, ranging from$1.2–$2.5 million to assist in characterizing, understanding and assessing connectivity between islands and throughout the Hawaiian Archipelago. Additional resources have been allocated by various entities to document and find many of the maritime heritage resources within Papahānaumokuākea. These funds come from both government and private sources. The total financial allocation to manage, restore and enforce the property's resources is difficult to quantify exactly, but ranges from about $34 million to more than $50 million annually.

While the funding to manage Papahānaumokuākea is adequate, recent cuts have diminished the Co-Trustees' ability to address the threat of marine debris. In addition, funding for the restoration and annual population assessments of an iconic Papahānaumokuākea species, the Hawaiian Monk Seal, has decreased in the past few years, raising additional concerns about the ability of the management agencies to halt the decline of this critically endangered species.

5.g Expertise and Training

Staff expertise and training in conservation and management is extensive and often complex. The FWS and NOAA establish strict eligibility requirements for their scientific and management positions. Current staff have extensive experience in wildlife biology and fish and wildlife management, or policy; some are recognized worldwide as experts in their field. In addition to this expertise, the FWS operates the National Conservation Training Center in Shepherdstown, West Virginia, where training courses in a wide range of sciences, technologies and management are offered. NOAA has laboratories and training programs around the country. Many staff are members of professional organizations and have close contact with their peers in other agencies and organizations, often far beyond the boundaries of the United States. All are highly educated; most possess at least a bachelor's degree from an accredited University.

Coordination with other agencies for training is ongoing and undertaken frequently, depending on the discipline. All field staff from the agencies are trained together in wilderness first aid, small vessel operations, and other emergency response protocols. NOAA ship operations are on par with military efficiency levels, and all officers are part of a quasi-military corps. Emergency response

for oil and vessel events is coordinated via the USCG area command, and all agencies participate in these exercises.

The USCG has developed area contingency plans for response to oil spills and vessel groundings throughout Papahānaumokuākea. Because of the extensive infrastructure found at Midway Atoll National Wildlife Refuge, FWS has also developed several Midway-specific contingency plans, including an Emergency Spill Response Plan, Spill Prevention and Control Countermeasure Plan, and an Airport Emergency Action Plan. A team made up of staff from each Co-Trustee agency works together to train and develop response plans for both anticipated and unanticipated events. This includes evacuation protocols for emergencies and weather, as well as for response to natural events such as disease outbreaks. While not all response plans have been developed, many are called for and outlined in the Monument Management Plan.

Education and outreach staff are trained in communications techniques; many of the education staff are former teachers. Papahānaumokuākea Marine National Monument staff are also reaching out to colleagues in other marine protected areas, such as the Great Barrier Reef Marine Park Authority in Australia, to gain knowledge from their management experiences. Conferences such as Our Sea of Islands, held in November 2006, allow for sharing of experiences across the Pacific.

Monument staff have contributed resources as well as logistical and technical support to projects that have helped to bring the majesty of this coral reef and Pacific island area to a broad audience. Films such as Ocean Futures' "Voyage to Kure," BBC and National Geographic features, and Susan Middleton and David Liittschwager's photographic works in *National Geographic* and their book *Archipelago* are several examples. Monument managers, research and education staff, and field support personnel were instrumental in assisting in the production of these visual journeys, and continue to support projects like these, that reach a broad audience.

Multiple staff have expertise in Native Hawaiian cultural resource management and practices. Within NOAA, there is a team that works explicitly on Native Hawaiian traditional knowledge and management as it pertains to Papahānaumokuākea. Several staff work exclusively with Native Hawaiian cultural research and constituency relations, and multiple staff are Native Hawaiian practitioners themselves. Additionally, the December 2006 Memorandum of Agreement for Promoting Coordinated Management of the Northwestern Hawaiian Islands Marine National Monument (agreement) provided for the inclusion of the Office of Hawaiian Affairs into the Monument management process to provide a voice for Native Hawaiians and their cultural rights and practices. Through this Agreement and as described in the MMP, the Co-Trustees will undertake coordinated, integrated management to achieve strong, long-term protection and perpetuation of NWHI ecosystems, Native Hawaiian traditional and customary cultural and religious practices, and heritage resources for current and future generations.

5.h Visitor Facilities and Statistics

One of the management principles of Papahānaumokuākea Marine National Monument is to bring the place to the people rather than the people to the place. As provided in the Presidential Proclamation establishing Papahānaumokuākea, Midway Atoll is the only place where the public is welcomed to learn about and experience this remote island ecosystem, and hopefully to return home with a newfound knowledge of how their actions far from these shores can affect Papahānaumokuākea's resources.

Visitation at Midway Atoll is managed under a Visitor Services Plan incorporated into the overall Monument Management Plan. It provides for a very small-scale

program, with no more than 50 overnight visitors present at any one time. Currently, that number is much lower based on limited transportation availability to the atoll (see Table 5.3).

Visitors are housed in a converted U.S. Navy Bachelor Officers' Quarters; 24 rooms are currently available. In the future, one of the historic officers' houses may also be converted to accommodate visitors. All meals are served in the Clipper House restaurant. A small food and supply store and a separate gift shop are available. Transportation is almost entirely by bicycle or on foot, although a limited number of golf carts are available to visitors.

In addition to overnight visitors, Midway occasionally hosts larger groups for less than a day, generally to commemorate the Battle of Midway. These visitors are offered guided walking tours along existing roadways with interpretive programs at specific historic or wildlife stops. The management plan and Midway Visitor Services Plan limit such larger day visits to three per year.

At Midway Atoll, a small visitor center interprets natural and historic resources, and visitors participate in a mandatory orientation session that furthers their knowledge about Papahānaumokuākea resources and their importance to Native Hawaiian culture. Several guided tours are offered by FWS staff. Guided tours focus on refuge management, historic resources, restoration activities, and biological resources. Other visitor facilities include a road/trail system throughout Sand Island, a "trail" along the historic runways of Eastern Island, a theater, library, gymnasium, bowling alley and small community center. In the future, a new museum and expanded interpretive programs are planned. Many of the current visitors come to Midway with a guided tour operator, providing additional programs and information for guests.

The Midway visitor services plan and all proposed visitor experiences meet all seven criteria for sustainable tourism proposed by the World Heritage Alliance.

Visitation at Midway Atoll over the past several years is as follows:

Table 5.3: Visitation at Midway Atoll, 2005 - present

Fiscal Year	Visitor Count
2005	610
2006	250
2007	1,861*
2008 (to date)	310

*This number is due largely to a 1-day event to commemorate the 65th anniversary of the Battle of Midway.

Other than Midway Atoll, Papahānaumokuākea is closed to public visitation, although occasionally small groups of educators, documentary filmmakers, or government officials visit some of the islands under permit.

5.i Property Promotion and Presentation

As outlined in the Monument Management Plan, the Co-Trustees plan to continue and strengthen their outreach, interpretation and educational efforts in the coming years. Educational programs such as Navigating Change focus not just on Papahānaumokuākea's natural, cultural and historic resources, but on raising awareness and motivating students to change their attitudes and behaviors to better care for all of Hawai'i's land and ocean resources. Workshops on Midway Atoll for teachers and other community leaders and educators offer participants the opportunity to experience Papahānaumokuākea and bring it back to their students and lifetime learners. Colleges, universities and private organizations also have the opportunity to conduct college-level classes or informal educational camps on Midway Atoll to bring Papahānaumokuākea to life for students.

As stated earlier, to limit impact on the property's resources, among other goals, promotion and presentation of Papahānaumokuākea largely brings the place to the people rather than the people to the place.

Our Sea of Islands:

A Regional Forum for Oceania on Marine Managed Areas and World Heritage

29 January – 2 February, 2007
Honolulu, Hawai'i

The forum, organized by Papahānaumokuākea Marine National Monument and the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Centre, together with their partners, provided an opportunity for Pacific island leaders to work together for better marine and heritage conservation.

More than 100 delegates from over 20 Pacific nations, including the United States, Solomon Islands, Cook Islands, Fiji, Sāmoa and the Federated States of Micronesia came together to enhance natural and cultural heritage and management of marine managed areas (MMAs). The Our Sea of Islands Forum was the first opportunity in over a decade for people across Oceania to meet and discuss the diversity of types, scales, approaches and status of MMA development and management across the region. Participants valued this opportunity for dialogue as an interconnected Oceania and recognized the need to work together to protect our ocean home.

The Pacific Ocean spans more than one-third of the Earth's surface and is known for its vast marine resources, high biological diversity and diverse cultural heritage. The islands of Oceania are connected by common history, culture and ancestry: indigenous Oceanic cultures and traditions, their proud history of distant ocean navigators who utilized the wind, sea and stars to maintain regional connections over centuries, and their rich heritage in natural resource stewardship, management practices and knowledge.

Oceania has demonstrated global leadership in their commitment to marine conservation and the sustainable use of marine resources. Approximately 25% of the world's marine protected areas are located in Oceania, and all the jurisdictions in Oceania have established MMAs, particularly using community-based and traditional approaches. The three largest MMAs in the world are in Oceania: Australia's well-known Great Barrier Reef Marine Park, the Phoenix Islands Protected Area (PIPA) in Kiribati, and NWHI Papahānaumokuākea Marine National Monument.

Participants at the Forum identified and recognized critical needs, gaps and opportunities that must be addressed to sustain Oceania's people and environment. Outcomes focused in six key areas of marine area management - progress and status in MMA development, customary practices, surveillance and enforcement, science to inform management, conservation finance, and the application of the World Heritage Convention.

The participants affirmed that traditional knowledge and management practices are integral to the maintenance, development and management of MMAs in Oceania. This principle underpins all of the commendations, proposed participant actions and recommendations to governments and organizations by the Our Sea of Islands Forum.

Our Sea of Islands participants came from over 20 Pacific nations (Photo: Papahāanaumokuāakea Marine National Monument)

Telepresence

As technologies develop, telepresence is one way to vividly bring the place to the people. Underwater video cameras, real-time video transmission, virtual field trips, formal distance learning, Web site interfaces, etc., offer many promising options for the creation of educational programs about this remote area.

Mokupāpapa: Discovery Center

In the main Hawaiian Islands, Hilo's Mokupāpapa: Discovery Center for Hawai'i's Remote Coral Reefs interprets the natural science, culture and history of the Northwestern Hawaiian Islands and surrounding marine environment. More than 200,000 people have learned about the wonders of Papahānaumokuākea through the Center, including thousands of students and community groups. Since opening, the Center has hosted at least 60,000 visitors and 3,500 schoolchildren per year. In addition to school visitations during the school year, Mokupāpapa: Discovery Center offers a week-long summer course to more than 7,000 students each summer. Monument staff also participate in community events and forums to share their knowledge of the region's resources.

Information Kiosks

Cooperative arrangements have been made with other facilities to host displays about the reefs and resources of the Papahānaumokuākea Marine National Monument. These include an aquarium display at the Waikīkī Aquarium on coral reef resources, as well as displays at the Hawai'i Maritime Center depicting life on a field camp and on a research vessel in Papahānaumokuākea. Additional interpretive displays are planned in concert with the new Visitor and Interpretive Center on Maui at the Hawaiian Islands Humpback Whale National Marine Sanctuary offices. Additional collaborative interpretive projects are being considered at other sites around the state.

Film and Internet

The Co-Trustees also work with commercial and nonprofit filmmakers to develop documentaries and news programs that reach audiences around the world. A new Papahānaumokuākea Web site (papahanaumokuakea.gov) has been developed to provide a virtual visit to the region. Additional informative materials are prepared and distributed as needed.

Teacher at Sea Program

Since 2001, the Papahānaumokuākea Co-Trustees, along with a host of educational partners, have facilitated field-based educational experiences for teachers and other educators within the Northwestern Hawaiian Islands. These experiences have ranged from educator-at-sea voyages aboard NOAA research vessels to island- and atoll-based field trips. From 2001 to 2008, more than 70 educators have experienced Papahānaumokuākea's relatively pristine environments and cultural treasures, from flourishing coral reefs to sacred Native Hawaiian archaeological sites. Through blogging and online journaling to video podcasting and teleconferencing with classrooms, Papahānaumokuākea has provided mechanisms for these individuals to share their personal experiences with the world. Every year, a new cadre of ambassadors returns home with personal experience of Papahānaumokuākea and the skills to share this knowledge widely with those who can benefit from it most.

School Curriculum: Navigating Change

In addition to the interpretive programs and documentaries, one of the key programs of Papahānaumokuākea is Navigating Change, an educational program offered to schoolchildren throughout the state, which predates the inception of the property. At this program's core is *Hōkūle'a*, a modern-day reincarnation of a double-hulled sailing vessel that has been instrumental in the accomplishment of superlative modern-day feats of navigation, using science built upon a foundation of ancestral knowledge. In 2001, *Hōkūle'a's* navigator, Nainoa

Thompson, envisioned sailing *Hōkūleʻa*, a replica of an ancient Polynesian voyaging canoe, among the wild and protected Northwestern Hawaiian Islands. Calling his idea "Navigating Change," he wrote that he wanted to "bring the beauty of the Earth's rare wildlife to living rooms and classrooms to create an awareness of the difference between where nature is protected and what happens when it is not."

Navigating Change is currently made possible by a partnership of private and government organizations called the Navigating Change Educational Partnership (NCEP). Through environmental education that utilizes place-based stewardship components, it continues to focus on influencing attitudes and behaviors to understand, protect and care for all our islands and ocean resources. The NCEP includes: the Polynesian Voyaging Society, the Hawaiʻi Department of Land and Natural Resources, the U.S. Fish and Wildlife Service, NOAA, Bishop Museum, University of Hawaiʻi at Manoa, and the Pacific American Foundation. This group partners with many others, including the Hawaiʻi Department of Education, to bring the curriculum to the teachers and into the classrooms.

Beginning in 2001, pre-voyage preparation for this program involved a statewide "warm-up" sail and a week-long summer workshop that engaged over 200 teachers in workshops throughout the state on the basic principles of Navigating Change. During the 18-day voyage in May 2004 to the NWHI, NCEP acted as "mission control," connecting 1,800 students and 80 classrooms across America and the Pacific with the vessel's crew for an hour-ling satellite link-up. Through these teleconferences, students participated in the excitement of voyaging. Teachers could extend that experience into the everyday classroom using a Teacher's Guide to Navigating Change curriculum, with carefully designed interfacing DVD modules and video clips.

More than 300 teachers, principals, and administrators (including participation by family members) have attended full-day workshops—reaching an estimated 4,000 students in the State of Hawaiʻi. Workshops often interface with cultural components (for instance, an opportunity to sail on a voyaging canoe). In addition, over 50 teachers have provided feedback and encouragement by continuing to contact the NCEP through e-mails and by sharing their project work and examples of how their students have been positively influenced by the program.

In August 2005, seven teachers who were previously involved in developing and field testing the Navigating Change Teacher's Guide were chosen to sail on a NOAA ship to explore and produce lessons about the Northwestern Hawaiian Islands.

The current focus for Navigating Change is the Ahupuaʻa Alliance Program, a year long strategy to help students, teachers, nonprofit organizations, private businesses and government agencies focus on specific place-based learning sites. A field site that safely provides rich learning activities (including an opportunity to conduct stewardship activities) will be developed or enhanced in each *ahupuaʻa* (a traditional Hawaiian land division, which usually runs from the deep sea to the mountaintops) with members of the local community.

Participation at Conferences and Events

An important part of promotion of the property is the participation of Monument staff at various conference, workshops, and events. A sample of recent events attended includes:

Our Sea of Islands: A Regional Forum for Oceania on Marine Managed Areas and World Heritage, January 29–February 2, 2007. Our Sea of Islands brought together participants from over 20 countries, states and territories around the Pacific and was co-sponsored by NOAA, the Department of Interior, and UNESCO World Heritage Programme. Its purpose was to highlight current efforts to protect important marine areas in Oceania, to share and expand technical expertise, and to develop balanced management practices by incorporating science and customary marine management techniques. The forum was also an

opportunity to build upon and collaborate with ongoing marine managed area networks across Oceania. Of the forum's multiple specific outcomes and recommended actions, the one most significant and relevant to this section is the need to integrate customary resource management into national and regional marine management policies.

Traditional Ecological Knowledge Workshop, Kona, Hawai'i Island. August 21–24, 2008 (Prior to the 2008 U.S. Coral Reef Task Force Meeting). Addressing concerns about the erosion of traditional ecological knowledge (TEK) and its transfer to younger generations, Monument staff hosted a Traditional Ecological Knowledge Workshop prior to the 2008 U.S. Coral Reef Task Force Meeting. This inter-agency and cross-cultural learning exchange hosted participants from six countries, including 30 traditional practitioners and youth from their communities across the Pacific. Responding directly to the forum's recommended actions, the TEK workshop aimed to promote and strengthen traditional knowledge and customary practices in Oceania, foster the intergenerational transfer of traditional knowledge and customary marine management practices, and share lessons about the importance of incorporating traditional knowledge into modern management at the 2008 U.S. Coral Reef Task Force Meeting in Kona, Hawai'i Island. Additionally, each community represented at the TEK Workshop received a "TEK Toolkit," including digital cameras and voice recorders, and instruction on how to (1) collect oral histories relevant to traditional marine management, and (2) instructions on the incorporation of TEK into marine management.

U.S. Coral Reef Task Force Meeting, 2008. At the 2008 U.S. Coral Reef Task Force Meeting, Monument staff worked to foster broader engagement between coral reef management and TEK. In particular, a Native Hawaiian practitioner presented a video of outcomes from the TEK Workshop (which had been held the week before). The objective was to inspire marine managers from across the United States and partner nations to more fully incorporate TEK into marine management policies and regulations.

Pristine Papahānaumokuākea reef with numerous Acropora coral colonies, a species extremely rare in the main Hawaiian Islands (Photo: James Watt)

Response to Climate Change Workshop, Kāne'ohe, Hawai'i September 2–5, 2008. The Co-Trustees hosted the fourth-ever Response to Climate Change (RtCC) workshop in September 2008. It discussed implications for climate change on coral reefs and practical steps reef managers can undertake to build resiliency and reduce the threat of global climate change. The curriculum was customized to provide information specifically relevant to Pacific reefs, including the vital role traditional ecological knowledge can play in managing Hawai'i's reefs. The workshop sought to build a bridge between Western science and traditional management approaches, as well as supporting resiliency and management efforts. RtCC participants included cultural practitioners, marine managers, scientists and academics.

National Institute of Water and Atmosphere (New Zealand) and National Oceanic and Atmospheric Administration (U.S.A.) exchange, July 2008. Aiming to foster direct relationships with other indigenous peoples of the Pacific, the National Oceanic and Atmospheric Administration hosted an information exchange with indigenous representatives from the National Institute of Water and Atmosphere (New Zealand) in July 2008. During this exchange, managers focused on indigenous management framework tools for managing marine resources.

Presentation of Research to the Public

As is discussed in Sections 2 and 4, research in Papahānaumokuākea has been ongoing for a number of years. Since the 1970s, one of the key aspects of this research has been to provide data to inform management decisions. In the mid 1970s through the mid 1980s, the Tripartite NWHI Fishery Expeditions resulted in significant new findings and the hosting of two major scientific symposia where results were presented to researchers, representatives of management agencies, and the general public. In addition, two publications from these symposia were produced, which collectively presented the results of more than 50 peer-reviewed papers documenting the scientific findings to date. The documents were the 1980 and 1984 Proceedings of the Symposium on Status of Resource Investigations in the Northwestern Hawaiian Islands, both published by the University of Hawai'i (UH) Sea Grant College Program.

Patterned after the first two successful symposia held in the 1980s, a third symposium was held in Honolulu, Hawai'i during November 2004, under the joint sponsorship of NOAA's Pacific Islands Fisheries Science Center, NOAA's National Ocean Service, the U.S. Fish and Wildlife Service, the Western Pacific Fishery Management Council, and the State of Hawai'i's Department of Land and Natural Resources. The Symposium covered a range of scientific themes, including the history of research and management in the NWHI; protected species; fish, shellfish, and fisheries; oceanography and mapping; and ecology and environmental impacts. The symposium was attended by more than 300 representatives from research institutions, agencies and the public at large. The proceedings of the Northwestern Hawaiian Islands Third Scientific Symposium are published in the Atoll Research Bulletin No. 543, issued by the Smithsonian Institution's National Museum of Natural History.

Reef Assessment and Monitoring Program Team preparing for Rapid Ecological Assessments
(Photo: James Watt)

Additional emerging findings from studies undertaken by the University of Hawai'i's Hawai'i Institute of Marine Biology, NOAA and others have been presented each year since 2006 at an annual mini-symposium held in conjunction with the Hawai'i Conservation Conference, which is attended by up to 300 participants. In addition, NOAA's Pacific Islands Fisheries Science Center (PIFSC), the Hawai'i Institute of Marine Biology (HIMB), and Papahānaumokuākea Marine National Monument host a Semi-Annual Northwestern Hawaiian Islands Joint Symposium and have been doing so for the past few years. Overall, significant efforts have been undertaken to bring the science to the managers and to inform the general public on the state of conservation and the health of the resources in Papahānaumokuākea.

Programs and Events Engaging the Native Hawaiian Community

Engaging the Native Hawaiian community in Papahānaumokuākea management is a priority for the Co-Trustees. Success in this effort will promote long-term support and greater understanding from the host culture of the Hawaiian Archipelago. In addition to seeking input from the Native Hawaiian Cultural Working Group, some of the ways in which Papahānaumokuākea engages with the Native Hawaiian Community include:

Aloha 'Āina: Cultural resilience and cultural connectivity. An array of research and outreach activities with Native Hawaiian communities, the Aloha 'Āina

(Love of the Place) programs involve Monument staff working to assess the needs of, and to facilitate, a Native Hawaiian Research Plan looking at questions common to all. "It's simple, really," says Mahina Paishon-Duarte, cultural practitioner and Monument liaison to Native Hawaiian communities. "It's helping people to remember their love for the place." This series of programs engages in multiple activities, which include securing research berths for cultural practitioners; facilitating collaborations between Native Hawaiian practitioners and scientists at the University of Hawai'i's Hawai'i Institute of Marine Biology; ensuring that communities from each of the main Hawaiian Islands are involved in the discussion; and that lessons learned are shared throughout communities. Program directions stem from roundtable discussions in Native Hawaiian communities on Moloka'i, Maui, Hawai'i Island, O'ahu, and Kaua'i, which were facilitated by Monument staff and help to ensure that major Papahānaumokuākea program areas (e.g., the Native Hawaiian Research Plan) address questions and concerns shared with Native Hawaiian communities across the state.

Native Hawaiian Cultural Research Plan. Preliminary development of the Native Hawaiian Cultural Research Plan (NHCRP) is being fostered by Native Hawaiian community roundtable discussions and initial results from the Native Hawaiian Cultural Research programs (2008). The vision for the NHCRP is stated in the Monument Management Plan. A formal workshop to begin the NHCRP's development is planned for the fall/winter of 2008.

Ongoing information exchange between Native Hawaiian program leaders and academia, governmental and/or marine management agencies, the public and others. For several years, Native Hawaiian practitioners working for the Monument (e.g., in the position of Native Hawaiian programs and outreach) have been engaged in a wide variety of collaborations with governmental, academic, non-governmental, and community organizations, and other entities in Hawai'i. Other collaborative exchanges include giving presentations about TEK and social-ecological resilience. Future plans include expanding the existing partnership with the Hawai'i Institute of Marine Biology to establish a traditional knowledge internship program, in which Native Hawaiian youth (e.g., college students) apply for paid internships to spend time in traditional communities and learn traditional ecological knowledge and practices from elders.

5.j Staffing Levels

The level of training and staff expertise required is significant, complex, and difficult to adequately describe. Each of the Co-Trustees and many of the partner agencies, such as the law enforcement offices or USCG, have their own training programs, many that span multiple years. A basic description of the primary agency roles is outlined here and many of the specific tasks are further described in the Monument Management Plan (Appendix K).

For the National Oceanic and Atmospheric Administration (NOAA), day-to-day management of Papahānaumokuākea at the field level is through the Office of the National Marine Sanctuaries (ONMS) and the National Marine Fisheries Service Pacific Islands Regional Office (PIRO). The NOAA-ONMS Papahānaumokuākea Superintendent operates out of the central office in Honolulu, with support from 25 additional staff to implement programs in policy, research, permits, education and outreach, and information management. NOAA-ONMS also has four full-time staff in the office on the Island of Hawai'i in the main Hawaiian Islands to manage the Mokupāpapa Discovery Center. PIRO staff include a full-time Management Officer and a policy specialist, both based in Honolulu. NOAA-ONMS have four-full time contractors dedicated to the development of the centralized Monument Information Management System, which will standardize and make available data necessary for the effective management of Papahānaumokuākea.

For the U.S. Fish and Wildlife Service, Papahānaumokuākea is managed both from Honolulu, Hawai'i, and onsite at Tern Island in French Frigate Shoals, Laysan Island, and Midway Atoll.

The FWS Papahānaumokuākea Superintendent is based in Honolulu, along with a permits manager, logistics coordinator, and administrative staff. Midway Atoll staffing includes a Refuge Manager, Deputy Refuge Manager, wildlife biologists, a visitor services manager, interpretive ranger, law enforcement ranger, and equipment operator. In addition, FWS contracts with a private entity to operate the infrastructure of the island, including airport operation, medical facilities, food preparation, electrical generation and distribution, water system, sewage system, etc. This company has approximately 50 workers on Midway, fully trained in their particular skill. In addition, upon first arriving on Midway, they receive a full orientation about working on a National Wildlife Refuge and within Papahānaumokuākea Marine National Monument.

Staffing at French Frigate Shoals consists of a Refuge Manager and Assistant Refuge Manager. Biological science technicians and volunteers are also stationed at French Frigate Shoals and Laysan Island.

The State of Hawai'i staff is mainly located in Honolulu, however, field staff are on site at Kure Atoll each summer for an extended period of time (up to six months). The State Papahānaumokuākea Superintendent is based in Honolulu, along with a permits coordinator, a research coordinator, policy specialists and administrative staff. The Kure Atoll Field Manager is based part of the year in Honolulu and part of the year on site at Kure Atoll. A team of two to three volunteers works alongside the Kure Atoll Manager during the field season to manage activities at the site.

As previously indicated, all field staff from each agency undergo rigorous training in wilderness first aid, small vessel operations and other safety procedures to ensure that they are well equipped to handle emergencies in remote field sites. All researchers and crew on all agency vessels must engage in emergency response training on every voyage into Papahānaumokuākea. Coordination of oil and other hazardous material response procedures and simulated response activities are scheduled regularly by the USCG. All agencies are required to follow standard operating procedures for diving, operation of heavy equipment, food handling, hazardous materials handling and disposition, and the like as required by national and state occupational health and safety regulations. All persons entering Papahānaumokuākea are also required to attend a briefing in which the important cultural significance and consideration of protocols is discussed. Similarly, any activities that occur on the most sensitive sites usually require accompaniment by a staff member from one of the agencies who is trained in both the biological and cultural considerations of the site.

Jeweled Anemone Crab or unauna
(Photo: Susan Middleton & David Liittschwager)

6.

Mālamalama ka lā nui a Kāne puka i Haʻehaʻe
ʻApakau ke kukuna i ka ʻili kai o nā kai ʻewalu
He ʻike makawalu kaʻu e ʻanoʻi nei,
ʻO nā au walu o Kanaloa Haunawela noho i ka moana nui
He Huʻakai ka makani o Lehua ʻau i ke kai
Kūʻonoʻono ka lua o Kūhaimoana i ke kapa ʻehukai o Kaʻula
ʻO Kū i ka loulu, ulu aʻe ke aloha no Nihoa moku manu
Manu o kū i ka ʻāhui, he alakaʻi na ka lāhui
ʻO Hinapūkoʻa
ʻO Hinapuhalakoʻa
ʻO Hina kupukupu
ʻO Hinaikamalama
Hua ka ʻōhua, luʻu ke koholā
Aloha kahi limu kala, kiaʻi ʻia e ka ʻākala noho i uka
Hānau ka peʻa, puka ka peʻapeʻa i ke kai
He ʻīnaʻi k[illegible] ʻono i ka hana o ka paʻakai
Manomano ka ʻike liʻu o ka houpo o Kanaloa
Koikoʻi lua hoʻi no ka lehulehu, ʻo kuʻu luhi ia
Hanohano wale ka [illegible] kūʻauna, ʻo ia moku leʻia
No Papahānaumokuākea lā he inoa

- Na Kainani Kahaunaele a me Halealoha

Monitoring

6. Monitoring


(Photo: James Watt)

6.a Key Indicators for Measuring State of Conservation

As detailed in previous sections, Papahānaumokuākea is unrivaled in its combination of high levels of endemism, overall intact ecosystems, and cultural significance. As a result, the conservation of Papahānaumokuākea's natural and cultural resources is paramount and a guiding principle of its vision: to forever protect and perpetuate the ecosystem health and diversity and Native Hawaiian cultural significance of Papahānaumokuākea.

Within Papahānaumokuākea's spacious boundaries, there is phenomenal variation in both landscapes and associated biota. Both the region's wide latitudinal span and the long geologic succession of islands and atolls create diverse terrestrial habitats and result in a multitude of ecological niches. This geologic succession has also given rise to abundant and diverse marine habitats, from shallow atoll lagoons to submerged seamounts. A central priority of Papahānaumokuākea Marine National Monument is to protect, maintain and preserve this rare ecological integrity as well as ecosystem health and function.

Another management priority of the Monument is to support Native Hawaiian practices and protect cultural resources. The monitoring efforts listed in Table 6.1 strive to deduce key components of the environmental conservation goals while also ensuring the long-term mission of supporting Native Hawaiian cultural practices and resources.

Table 6.1a: Indicators of Conservation for Naural Resources

Indicator	Parameter Group	Parameters	Periodicity	Location of Records
Marine Ecosystem Monitoring	Algae	Endemism Community composition Abundance and diversity Alien, invasive species	Annual	DLNR, NOAA, FWS
	Corals	Endemism Community composition Abundance and diversity Disease	Annual	DLNR, NOAA, FWS, HIMB
	Deepwater Corals	Abundance and diversity	Annual	NOAA, HURL
	Shallow Water Invertebrates	Endemism Community composition Abundance and diversity Alien, invasive species Lobster monitoring	Annual	NOAA, FWS
	Fish	Endemism Community composition Abundance and diversity Biomass Alien, invasive species Movement patterns	Annual	DLNR, NOAA, FWS, HIMB

Table 6.1a (continued): Indicators of Conservation for Naural Resources

Indicator	Parameter Group	Parameters	Periodicity	Location of Records
Marine Ecosystem Monitoring	Oceanography	Water quality Rainfall Wave height Chlorophyll a, b Dissolved oxygen Sea level change	Annual	NOAA, FWS, UH
		Temperature (water and air) Salinity Wind velocity	Real-time	NOAA
		Ambient sounds	Continuous	NOAA
Threatened, Endangered and Protected Species Monitoring	Reptiles	Turtle nesting	Seasonal (May-October)	FWS, NOAA
	Monk Seals	Population assessments Reproductive success Survivorship	Seasonal (May-October)	FWS, NOAA
	Seabirds	Survivorship Reproductive success Abundance Breeding pairs Movement patterns	Seasonal (May-October)	FWS, NOAA, DLNR
	Cetaceans	Population assessments Accoustic recordings	Seasonal Continuous	FWS, NOAA, DLNR
Terrestrial Ecosystem Monitoring	Terrestrial Birds	Abundance Survivorship	Seasonal (May-October)	FWS
	Terrestrial Plants	Endemism Species composition Abundance and distribution Alien, invasive species	Seasonal (May-October)	FWS
	Terrestrial Invertebrates	Endemism Species composition Distribution and abundance of ants Distribution and abundance of Grey Bird Locust	Annual	FWS
Threat Assessment Monitoring	Marine Debris	Accumulation rates Composition Alien, invasive species	Annual	FWS, DLNR, NOAA, UH, USGS
	Alien Species	Distribution and abundance	Annual	FWS, DLNR, NOAA, UH, USGS
	Disease	Distribution and abundance Prevalence Lethality	Annual	FWS, DLNR, NOAA, UH, USGS
	Human Impacts	Restrict access Review permitted activities Cumulative impacts	Continuous	PMNM Office
	Climate Change	Sea level change Water chemistry Sea surface temperature	Annual	NOAA, FWS, UH

Table 6.1b: Indicators of Conservation for Cultural Resources

Indicator	Parameter Group	Parameters	Periodicity	Location of Records
Public understanding of Native Hawaiian cultural significance to Papahānaumokuākea is increasing	Appreciation and understanding of local values and beliefs about the site	Perceptions of the intrinsic and/or non-market value of Papahānaumokuākea to the continuity of the Native Hawaiian culture	Annual	PMNM Office
		Appreciation of Native Hawaiian cultural, historical and cosmological relationship to Papahānaumokuākea by (1) Native Hawaiian community and (2) broader community	Annual	PMNM Office
	Outreach and education about the importance of natural integrity to cultural protection	Number of permittees educated	Annual	PMNM Office
		Trends in broader community's values about natural and cultural importance of the site	Annual	PMNM Office
	Distribution of formal knowledge about cultural research in PMNM to the community, including (a) the Native Hawaiian community, and (b) where culturally appropriate, the broader community	Measuring the degree of community's awareness about activities of, and information generated by, Native Hawaiian cultural practitioners in PMNM	Annual	PMNM Office
		Facilitating interactions between Native Hawaiian practitioners, Western scientists, resource managers (including Monument staff) and broader community	Annual	PMNM Office
	Outreach & education about Native Hawaiian sea-uses in Papahānaumokuākea	Visitor numbers to Mokupāpapa Interpretive Center; Number of classrooms utilizing Navigating Change curriculum and/or other curricula relating to PMNM's natural and cultural resources	Annual	PMNM Office
Native Hawaiian stakeholder engagement with Papahānaumokuākea	Cultural practitioners' access to the site	Number of berths provided to cultural practitioners by PMNM to access and practice in Papahānaumokuākea; When appropriate, type of cultural access to the PMNM and demographics of individuals participating in cultural access in PMNM (e.g., gender, age, island of origin)	Annual	PMNM Office, OHA Office
	PMNM's commitment to fostering cultural research and practices in Papahānaumokuākea	Programs, research and partnerships between Papahānaumokuākea managers and Native Hawaiian community (kind, type, outreach), and evaluation thereof (impact on broader community, values and beliefs about site)	Annual	PMNM Office, OHA Office
		Native Hawaiian cultural research needs identified and prioritized	Annual	PMNM Office, OHA Office

Table 6.1b (continued): Indicators of Conservation for Cultural Resources

Indicator	Parameter Group	Parameters	Periodicity	Location of Records
Native Hawaiian stakeholder engagement with Papahānaumokuākea	Engagement of Native Hawaiian traditional knowledge and practices in the management of Papahānaumokuākea	Degree and type of integration of Native Hawaiian management practices with Western scientific practices in PMNM	Annual	PMNM Office
		Intereractions between Monument staff and Native Hawaiian Cultural Working Group	Annual	PMNM Office
		Interactions between Monument staff and broader Native Hawaiian community regarding integrated traditional-Western scientific management of the site	Annual	PMNM Office
		Continued review of all PMNM use permits by Native Hawaiian cultural practitioners	Annual	PMNM Office
		Number of PMNM permits reviewed by Native Hawaiian practitioners	Annual	PMNM Office
		Protections enacted by Native Hawaiian review of permits	Annual	PMNM Office
	Access to site by Hawaiian wayfinders	Number of wayfinding trips allowed in Papahānaumokuākea	Annual	PMNM Office
		If applicable, number and reason for restrictions of wayfinding in Papahānaumokuākea	Annual	PMNM Office
Review of human impacts on the cultural resources.	Integrity of archaeological sites on Nihoa and Mokumanamana	Tracking and evaluating Section 106 consultations (consultation process required under National Historic Preservation act, in the event of use of Nihoa or Mokumanamana)	Annual	PMNM Office, OHA Office

While the natural and cultural resources in Papahānaumokuākea exist in a nearly pristine environment, and are thus removed from major pressures of extensive human population, they are not entirely threat-free. As a result, it is just as important to monitor the threats to Papahānaumokuākea as it is to monitor the state of its natural and cultural resources. Detailed in Section 4.b, the most worrisome threats to resources originate outside the boundaries of Papahānaumokuākea. Marine debris consistently washes up on the reefs and shores of these islands and atolls. On par with these external threats are the imposing effects of climate change, namely sea-level rise, ocean acidification and sea surface temperature increases. It is therefore imperative to monitor both the natural and cultural resources as well as the threats facing these resources on a frequent basis.

6.b Administrative Arrangements for Monitoring Property

Prior to the inception of Papahānaumokuākea, the State of Hawai'i, U.S. Fish and Wildlife and NOAA managed separate jurisdictions in the waters and lands of the NWHI and were responsible for their respective monitoring programs. Since Papahānaumokuākea's designation, the Co-Trustees collectively have administered Papahānaumokuākea Marine National Monument. Each Co-Trustee has maintained their respective monitoring and research regimes but now works in a coordinated fashion to facilitate overall management efforts. The comprehensive Monument Management Plan (MMP), which directs and guides all monitoring efforts in

Table 6.2: Relationship Between Management and Monitoring

Monument Management Goals	Indicators	Criterion
Protect, preserve, maintain, and where appropriate, restore the physical environment and natural biological communities and their associated biodiversity, habitats, populations, native species, and ecological integrity.	Marine Ecosystem Monitoring	ix, x
	Threatened and Endangered Species Monitoring	x
	Terrestrial Ecosystem Monitoring	ix, x
	Threat Assessment Monitoring	viii, ix, x
Support, promote, and coordinate research, ecosystem characterization, and monitoring that increases understanding of the NWHI, improves management decisionmaking, and is consistent with conservation and protection.	Marine Ecosystem Monitoring	ix, x
	Threatened and Endangered Species Monitoring	x
	Terrestrial Ecosystem Monitoring	ix, x
	Threat Assessment Monitoring	viii, ix, x
Manage and only allow human activities consistent with Proclamation 8031 to maintain ecological integrity and prevent or minimize negative impacts for long-term protection.	Threat Assessment Monitoring	viii, ix, x
Provide for cooperative conservation including community involvement that achieves effective Monument operations and ecosystem-based management.	Marine Ecosystem Monitoring	ix, x
	Threatened and Endangered Species Monitoring	x
	Terrestrial Ecosystem Monitoring	ix, x
	Threat Assessment Monitoring	viii, ix, x
Enhance public understanding, appreciation, and support for protection of the natural, cultural and historic resources.	Increased public understanding of Papahānaumokuākea's cultural significance to Hawaiians	iii, vi
Support Native Hawaiian practices consistent with long-term conservation and protection.	Maintain or increase Native Hawaiian engagement	iii, vi
Identify, interpret, and protect Monument historic and cultural resources.	Review of human impacts on cultural resources	iii, vi

Papahānaumokuākea, encompasses all of the respective agencies' goals to manage and conserve Papahānaumokuākea resources. Table 6.2 illustrates how the MMP will facilitate World Heritage monitoring efforts to ensure a responsible and lasting monitoring program.

Examples of enhanced management facilitation include the establishment of a unified permitting process to restrict access and ensure sound research and activities in Papahānaumokuākea. In addition, plans are underway for the creation of a centralized Monument Information Management System which will standardize all monitoring data for managers to evaluate Papahānaumokuākea's resources in a true ecosystem-based fashion. Proprietary cultural information, however, will be housed in the Office of Hawaiian Affairs' Wahi Pana Database to offer additional protections that federal and state executive branch agencies are unable to provide.

The overall management and protection of Papahānaumokuākea is under the administrative authority of the following three agencies:

United States Fish and Wildlife Service
300 Ala Moana Blvd., Room 5-231
Honolulu, HI 96850
USA

National Oceanic and Atmospheric Administration
6600 Kalaniana'ole Hwy, Suite 300
Honolulu, HI 96825
USA

State of Hawai'i, Department of Land and Natural Resources
1151 Punchbowl St, Room 130
Honolulu, HI 96813
USA

These three agencies, both independently and on a collaborative basis, have had management responsibility for monitoring resources in Papahānaumokuākea for decades (and in two cases, nearly a century). Much of the monitoring effort has been carried out by these agencies' various subsidiaries and partners, and credit must be given to the following organizations and institutions for their contributions to the enhancement of knowledge of natural and cultural resources found in Papahānaumokuākea:

- Bishop Museum
- Joint Institute for Marine and Atmospheric Research
- Hawai'i Institute of Marine Biology
- Hawai'i Undersea Research Laboratory
- NOAA National Marine Fisheries Service
- NOAA Coral Reef Conservation Program
- NOAA/National Marine Fisheries Science/Pacific Islands Fishery Science Center
- NOAA National Ocean Service/National Center for Coastal Ocean Science
- The Oceanic Institute
- Office of Hawaiian Affairs
- Smithsonian Institution
- State of Hawai'i Division of Aquatic Resources
- United States Geological Survey
- University of Hawai'i

6.c Results of Previous Reporting Exercises

The following list, arranged in reverse chronological order, represents a compilation of status reports for the NWHI derived from monitoring data. In the past century, hundreds of scientific papers have been published incorporating data collected in the NWHI, but this list has been restricted to only those published documents that clearly depict the status and trends of monitoring data in the NWHI.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Sanctuary Program. 2008. Papahānaumokuākea Marine National Monument condition report 2008. Silver Spring, MD. 41 pp.

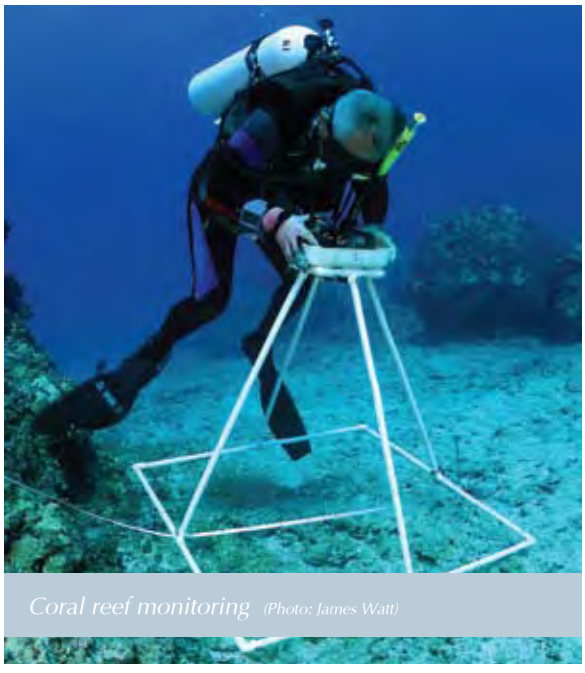
Waddell, J.E. and A.M. Clarke, eds. 2008. (NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team) The state of coral reef ecosystems of the United States and Pacific Freely Associated States: 2008. NOAA Technical Memorandum NOS NCCOS 73. Silver Spring, MD. 569 pp.

Athens, J.S., J.V. Ward, and D.W. Blinn. 2007. Vegetation history of Laysan Island, Northwestern Hawaiian Islands. Pacific Science 61: 17–37.

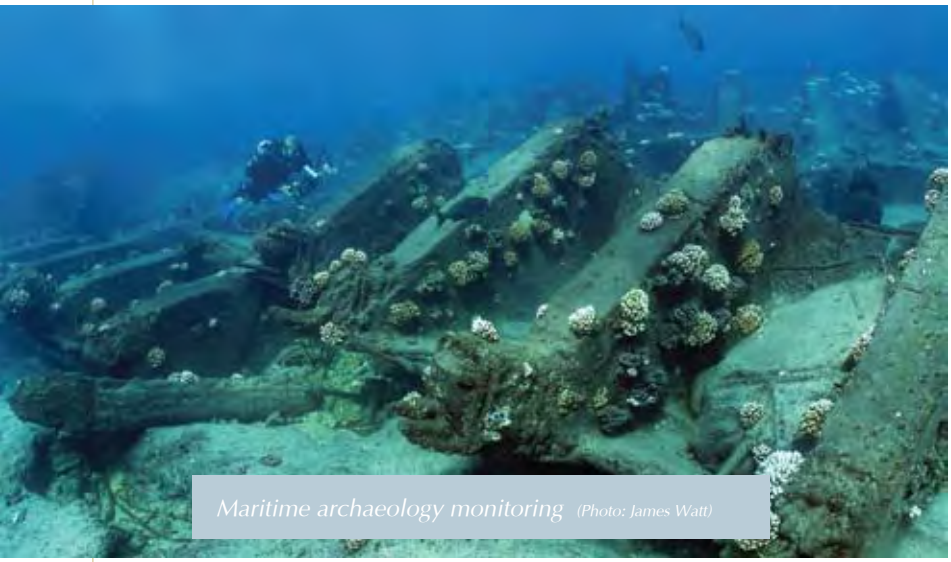
Dameron, O.J., M. Parke, M.A. Albins, and R. Brainard. 2007. Marine debris accumulation in the Northwestern Hawaiian Islands. Marine Pollution Bulletin 54: 423–433.

Morishige, C., M.J. Donohue, E. Flint, C. Swenson, and C. Woolaway. 2007. Factors affecting marine debris deposition at French Frigate Shoals, Northwestern Hawaiian Islands Marine National Monument, 1990–2006. Marine Pollution Bulletin 54: 1162–1169.

NOAA Fisheries. 1999–2007 Stock assessment reports: Hawaiian Monk Seal (*Monachus schauinslandi*). Available: www.nmfs.noaa.gov/pr/sars/species.htm#phocids



Coral reef monitoring (Photo: James Watt)



Maritime archaeology monitoring (Photo: James Watt)

Antonelis, G.A., J.D. Baker, T.C. Johanos, R.C. Braun, A.L. Harting. 2006. Hawaiian Monk Seals (*Monachus schauinslandi*): Status and conservation issues. In: Macintyre, I.G., ed., Northwestern Hawaiian Islands third scientific symposium. Atoll Research Bulletin 543: 75–101.

Citta, J., M.H. Reynolds, and N.E. Seavy (USGS Pacific Island Ecosystems Research Center). 2006. Seabird monitoring assessment for Hawaii and the Pacific Islands. Rept. to U.S. Fish and Wildlife Service, Migratory Birds and Habitat Programs, Portland, Oregon.

Keenan, E.E., R.E. Brainard, and L.V. Basch. 2006. Historical and present status of the pearl oyster, *Pinctada margaritifera*, at Pearl and Hermes Atoll, Northwestern Hawaiian Islands. Atoll Research Bulletin 543: 333–344.

Firing, J. and R.E. Brainard. 2006. Ten years of shipboard ADCP measurements along the Northwestern Hawaiian Islands. Atoll Research Bulletin 543: 347–364.

National Oceanic and Atmospheric Administration. 2006. State of the Reserve: Northwestern Hawaiian Islands coral reef ecosystem reserve 2000–2005. Silver Spring, MD. 41pp.

Vroom, P.S. and K.N. Page. 2006. Relative abundance of macroalgae (RAM) on Northwestern Hawaiian Island reefs. Atoll Research Bulletin 543: 533–548.

Waddell, J.E. ed. 2005. (NOAA/ NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team) The State of coral reef ecosystems of the United States and Pacific Freely Associated States: 2005. NOAA Technical Memorandum NOS NCCOS 11. Silver Spring, MD. 522 pp.

Balazs, G.H. and M. Chaloupka. 2004a. Thirty-year recovery trend in the once depleted Hawaiian Green Sea Turtle stock. Biological Conservation 117: 491–498.

Maragos, J., D. Potts, G. Aeby, D. Gulko, J. Kenyon, D. Siciliano, and D. VanRavenswaay. 2004. 2000–2002 rapid ecological assessment of corals on the shallow reefs of the Northwestern Hawaiian Islands. Part 1: Species and distribution. Pacific Science 58(2): 211–230.

Wilkinson, C. ed. 2004. Status of coral reefs of the world: 2004. Volume 2. Australian Institute of Marine Science, Townsville, Queensland AUS. 301pp.

Boland, R.C., and M. Donohue. 2003. Marine debris accumulation in the nearshore marine habitat of the endangered Hawaiian monk seal, *Monachus schauinslandi* 1999–2001. Marine Pollution Bulletin 46(11): 1385–1394.

Bishop Museum. 2002. Hawaiian terrestrial arthropod checklist, 4th Edition. Bishop Museum Technical Report 22., Bishop Museum Press, Honolulu. pp i–iv, 1–313.

DeFelice, R.C. D. Minton, and L.S. Godwin. 2002. U.S. Fish and Wildlife Service. Records of shallow-water marine invertebrates from French Frigate Shoals, Northwestern Hawaiian Islands, with a note on non-indigenous species. Technical Report No. 23. Contribution No. 2002–01 to the Hawai'i Biological Survey Bishop Museum, Honolulu.

Eldredge, L.G. 2002. Literature review and cultural, geological, and biological history for the Northwestern Hawaiian Islands coral reef ecosystem reserve. Contribution to the Hawaii Biological Survey No. 2002–026. Bishop Museum, Honolulu, HI.

Maragos J. and D. Gulko eds. 2002. U.S. Fish and Wildlife Service and the Hawai'i Department of Land and Natural Resources. Coral reef ecosystems of the Northwestern Hawaiian Islands: Interim results emphasizing the 2000 surveys.

Wilkinson, C. ed. 2002. Status of coral reefs of the world: 2002. Australian Institute of Marine Science, Townsville, Queensland AUS. 388 pp.

Starr, F. K. Martz, and L. Loope. 2001. Department of Land and Natural Resources, Division of Forestry and Wildlife. Botanical inventory of Kure Atoll.

United States Fish and Wildlife Service (USFWS). 2001. NOWRAMP 2000 Terrestrial arthropod report. Honolulu, HI.

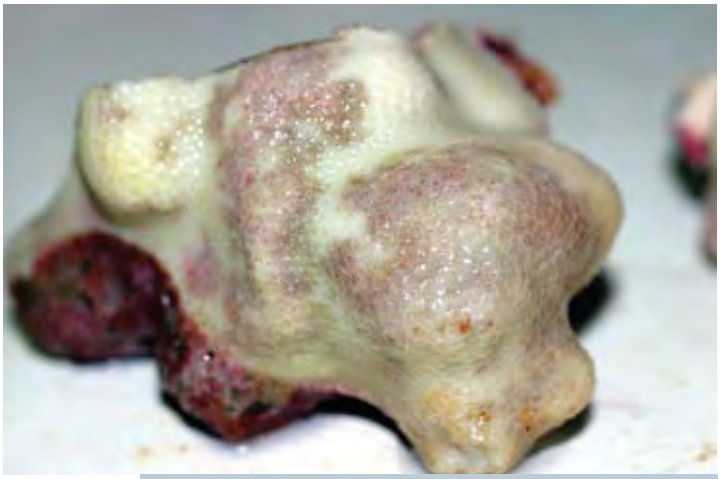
Wilkinson, C. ed. 2000. Status of coral reefs of the world: 2000. Australian Institute of Marine Science, Cape Ferguson, Queensland, AUS. 363 pp.

Starr, F. and K. Martz. 1999. Midway Atoll National Wildlife Refuge. Botanical survey of Midway Atoll. 1999 Update. Prepared for USFWS.

DeFelice, R.C. S.L. Coles, D. Muir, and L.G. Eldredge, 1998. Investigation of the marine communities of Midway Harbor and adjacent lagoon, Midway Atoll, Northwestern Hawaiian Islands. Hawai'i Biological Survey Contribution No. 1998-014. Bishop Museum, Honolulu.

Nishida, G. 1998. Hawaii Biological Survey, Bishop Museum. Midway terrestrial arthropod survey, Final Report prepared for USFWS.

Hope, B., S. Scantolini, E. Titus, and J. Cotter. 1997. Distribution patterns of polychlorinated biphenyl congeners in water, sediment and biota from Midway Atoll (North Pacific Ocean). Marine Pollution Bulletin 34(7): 548–563.



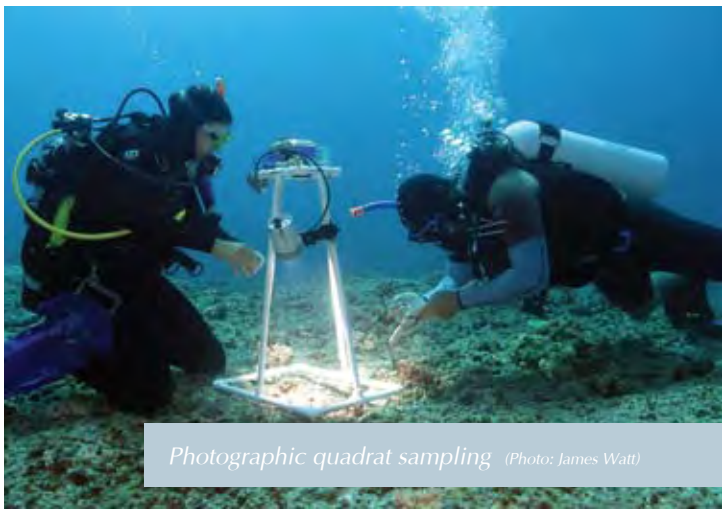
Diseased coral (Photo: PMNM)

Cleghorn, P. 1988. The settlement and abandonment of two Hawaiian outposts: Nihoa and Necker. In: *Bishop Museum Occasional Papers* 28: 35–49. Bishop Museum Press, Honolulu.

Newman, A.L. 1988. Mapping and monitoring vegetation change on Laysan Island (dissertation). University of Hawai'i. Available from: University of Hawai'i Geography Department.

Riley, T.J. 1982. U.S. Fish and Wildlife Service, Honolulu, Hawai'i. Report of a reconnaissance of archaeological sites on Nihoa Island, Hawai'i, June 1980. Department of Anthropology, University of Hawai'i Manuscript #031882 (Project 286). Honolulu, HI.

Clapp, R. B., and E. Kridler. 1977. The natural history of Necker Island, Northwestern Hawaiian Islands. Atoll Research Bulletin 207: 1–147.



Photographic quadrat sampling (Photo: James Watt)

Monitoring such an expansive archipelago requires all eyes on the resource - including those of our underwater cousins (Photos: James Watt, lower left: FWS)

Amerson, A.B. Jr., R.C. Clapp, and W.O. Wirtz, II. 1974. The natural history of Pearl and Hermes Reef, Northwestern Hawaiian Islands. Atoll Research Bulletin 174: 1–306.

Ely, C.A. and R.B. Clapp. 1973. The natural history of Laysan Island, Northwestern Hawaiian Islands. Atoll Research Bulletin 171: 1–361.

Clapp, R.B. 1972. The natural history of Gardner Pinnacles, Northwestern Hawaiian Islands. Atoll Research Bulletin 163: 1–25.

Woodward, P.W. 1972. The natural history of Kure Atoll, Northwestern Hawaiian Islands. Atoll Research Bulletin 164: 1–318.

Amerson, A.B. 1971. The natural history of French Frigate Shoals, Northwestern Hawaiian Islands. Atoll Research Bulletin 150: 1–383.

Emory, K. 1928. The archaeology of Nihoa and Necker Islands. Bishop Museum Bulletin 53. Bishop Museum Press, Honolulu.

7.

Malamalama ka lā nui a Kāne puka i Haʻeha ʻe
ʻApakau ke kakuna i ka ʻili kai o nā kai ʻewalu
He ʻike makawalu kaʻu e ʻanoʻi nei,
ʻO nā au walu o Kanaloa Haunawela noho i ka moana nui
He Huʻakai ka makani o Lehua ʻau i ke kai
Kuʻonoʻono ka lua o Kuhaimoana i ke kapa ʻehukai o Kaʻula
ʻO Kū i ka loulu, ulu aʻe ke aloha no Nihoa moku manu
Manu o ku i ka ʻāhui, he alakaʻi na ka lahui
ʻO Hinapukoʻa
ʻO Hinapuhalukoʻa
ʻO Hina kupukupu
ʻO Hinaikamalama

Documentation

7. Documentation


(Photo: James Watt)

7.a Photographs, Image Inventory and Other Audiovisual Materials

Table 7.1: Image inventory and authorization

Id. No.	Format	Caption	Date	Photographer / Director of the video	Copyright owner (if different than photographer/ director of video)	Contact details: copyright owner	Non-exclusive cession of rights
Birds 1	JPEG	French Frigate Shoals - Red Footed Boobie Sunset	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Birds 2	JPEG	Kure - Laysan Albatross	2005	NOAA		Andy.Collins@ NOAA.gov	Y
Birds 3	JPEG	Laysan - Great frigatebird	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Birds 4	JPEG	Laysan - Laysan Duck	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Birds 5	TIF	Midway Atoll - White Tern Chick	2007	Sandra Hall	USFWS	Barbara_ Maxfield@fws.gov	Y
Cetaceans 1	JPEG	Humpback Whale Mother and Calf	2007	Doug Perrine	HIHWNMS	Naomi.Mcintosh@ NOAA.gov	2
Cetaceans 2	JPEG	Leaping Dolphin	2005	Andy Collins	NOAA	Andy.Collins@ NOAA.gov	Y
Cetaceans 3	JPEG	Midway - Spinner Dolphin bottom view	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Coral & Invertebrates 1	JPEG	French Frigate Shoals - Acropora Coral	2007	JE Maragos	USFWS	Barbara_ Maxfield@fws.gov	Y
Coral & Invertebrates 2	JPEG	French Frigate Shoals - Table coral	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Coral & Invertebrates 3	JPEG	Hertwigia Sponge	2007	NOWRAMP	NOAA	Andy.Collins@ NOAA.gov	Y
Coral & Invertebrates 4	JPEG	Kure - Triton Trumpet	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Coral & Invertebrates 5	JPEG	Kure-Banded Spiny Lobster	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1

Table 7.1 (continued): Image inventory and authorization

Id. No.	Format	Caption	Date	Photographer / Director of the video	Copyright owner (if different than photographer/ director of video)	Contact details: copyright owner	Non-exclusive cession of rights
Coral & Invertebrates 6	JPEG	Laysan - Spanish Dancer	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Coral & Invertebrates 7	JPEG	Midway - *Padina australis*	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Coral & Invertebrates 8	JPEG	Midway - Red Pencil Urchin	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Coral & Invertebrates 9	JPEG	Midway- Divided Flatworm	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Fish 1	JPEG	French Frigate Shoal - Hawaiian Squirrel Fish	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Fish 2	JPEG	French Frigate Shoals - Blackside Hawkfish	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Fish 3	JPEG	French Frigate Shoals - Milletseed Butterfly Fish	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Fish 4	JPEG	Kure - Giant Trevally (Ulua)	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Fish 5	JPEG	Midway - Bluestripe Snapper	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Fish 6	JPEG	Midway - Potters Angelfish	2002	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Fish 7	JPEG	Midway - Scorpionfish	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Fish 8	JPEG	Midway - Spectacled Parrot Fish	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Fish 9	JPEG	Pearl & Hermes Atoll - Stout Moray	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Fish 10	JPEG	Yellow Goatfish	2007	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Hawaiian Monk Seals 1	JPEG	Gardner Pinnacles - Monk Seal	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Hawaiian Monk Seals 2	JPEG	Lisianski -Young Monk Seal	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Hawaiian Monk Seals 3	JPEG	Midway Atoll - Hawaiian Monk Seal and Pup	2007	Rob Shallenberger	USFWS	Barbara_ Maxfield@fws.gov	3

Table 7.1 (continued): Image inventory and authorization

Id. No.	Format	Caption	Date	Photographer / Director of the video	Copyright owner (if different than photographer/ director of video)	Contact details: copyright owner	Non-exclusive cession of rights
Historic Events 1	JPEG	Battle of Midway Atoll Memorial on Sand Island	2007	Rob Shallenberger	USFWS	Barbara_ Maxfield@fws.gov	3
Historic Events 2	JPEG	Laysan - Guano Dig, 1890	2007	Bishop Museum		Bishop Museum Archives 808-848-4182	4
Historic Events 3	JPEG	Midway - Commercial Pacific Cable Company 1923	2007	Bishop Museum		Bishop Museum Archives 808-848.4182	4
Historic Events 4	JPEG	Midway - World War II Gun	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Historic Events 5	JPEG	Midway Atoll - Battle of Midway Memorial Sand Island	2007	Barbara Maxfield	USFWS	Barbara_ Maxfield@fws.gov	Y
Historic Events 6	JPEG	Midway Atoll - Historic ARMCO Hut	2007	USFWS		Barbara_ Maxfield@fws.gov	Y
Historic Events 7	JPEG	Midway Atoll - World War II Antiaircraft Gun on Eastern Island	2007	Michael Lusk	USFWS	Barbara_ Maxfield@fws.gov	Y
Historic Events 8	JPEG	Mokumanamana Island - Heiau Model	2007	Bishop Museum Press	Bishop Museum	Bishop Museum Archives 808-848.4182	4
Historic Events 9	JPEG	Necker island 1923	2007	Bishop Museum		Bishop Museum Archives 808-848.4182	4
Historic Events 10	JPEG	Nihoa – Map of Archaeological Sites	2007	Paul Cleghorn	USFWS	kekikilo@ksbe.edu	Y
Historic Events 11	JPEG	Postwar Fishing	2007	Bishop Museum		Bishop Museum Archives 808-848.4182	4
Historic Events 12	JPEG	World War II Pillbox on Midway Atoll South Beach Sand Island	2007	Barbara Maxfield	USFWS	Barbara_ Maxfield@fws.gov	Y
Human Interaction 1	JPEG	Coral Surveys	2007	J.E. Maragos	USFWS	Barbara_ Maxfield@fws.gov	Y
Human Interaction 2	JPEG	Diving Amongst the Coral 2003	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Human Interaction 3	JPEG	Midway Debris Clean Up	2003	Greg	NOAA	Andy.Collins@NOAA.gov	Y
Human Interaction 4	JPEG	Midway Atoll Planting Naupaka	2007	Rob Shallenberger	USFWS	Barbara_ Maxfield@fws.gov	3
Human Interaction 5	JPEG	Monk Seal Entanglement	2004	Ray Boland	NOAA	Andy.Collins@NOAA.gov	Y

Table 7.1 (continued): Image inventory and authorization

Id. No.	Format	Caption	Date	Photographer / Director of the video	Copyright owner (if different than photographer/ director of video)	Contact details: copyright owner	Non-exclusive cession of rights
Human Interaction 6	JPEG	Working Amongst Albatross	2005	NOAA		Andy.Collins@NOAA.gov	Y
Land/Aerial Shots 1	JPEG	French Frigate Shoals, Old Seawall	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Land/Aerial Shots 2	JPEG	Gardner Pinnacles	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Land/Aerial Shots 3	JPEG	Kure - Green Island	2005	Rob Shallenberger	USFWS	Barbara_Maxfield@fws.gov	3
Land/Aerial Shots 4	JPEG	Laysan - Shallows	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Land/Aerial Shots 5	JPEG	Mokuanamana - Uprights	2005	Andy Collins	NOAA	Andy.Collins@NOAA.gov	Y
Land/Aerial Shots 6	JPEG	Mokumanamana	2005	Andy Collins	NOAA	Andy.Collins@NOAA.gov	Y
Land/Aerial Shots 7	JPEG	Nihoa	2007	Hawaii DLNR	Hawaii DLNR	Athline.M.Clarke@hawaii.edu	Y
Map/ Satellite Image 1	JPEG	NWHI atop U.S.	2005	NOAA		Andy.Collins@NOAA.gov	Y
Map/ Satellite Image 2	JPEG	Laysan Island	2007	Rob Shallenberger	USFWS	Barbara_Maxfield@fws.gov	3
Sharks & Rays 1	JPEG	Gray Reef Shark	2007	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Sharks & Rays 2	JPEG	Maro-Galapagos Shark	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Sharks & Rays 3	JPEG	Mokumanamana – Manta Ray	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Sharks & Rays 4	JPEG	Spotted Eagle Ray	2007	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Ships & Ship Wrecks 1	JPEG	Hōkūleʻa	2004	NWHI	NOAA	Andy.Collins@NOAA.gov	Y
Ships & Ship Wrecks 2	JPEG	Kure - Houei Maru Wreck	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Ships & Ship Wrecks 3	JPEG	Kure Atoll - Dunnottar Castle Wreckage	2007	NOAA & ONMS		Andy.Collins@NOAA.gov	Y
Ships & Ship Wrecks 4	JPEG	Midway - Carrolton Ship Wreck	2007	NOAA & ONMS		Andy.Collins@NOAA.gov	Y

Table 7.1 (continued): Image inventory and authorization

Id. No.	Format	Caption	Date	Photographer / Director of the video	Copyright owner (if different than photographer/ director of video)	Contact details: copyright owner	Non-exclusive cession of rights
Ships & Ship Wrecks 5	JPEG	Midway Atoll - Brooks filming USS Macawa	2007	NOAA & ONMS		Andy.Collins@NOAA.gov	Y
Ships & Ship Wrecks 6	JPEG	MV Rapture	2005	NWHI	NOAA	Andy.Collins@NOAA.gov	Y
Ships & Ship Wrecks 7	JPEG	Pearl & Hermes Atoll - Archaeologists' Film Team	2007	NOAA & ONMS		Andy.Collins@NOAA.gov	Y
Ships & Ship Wrecks 8	JPEG	Pearl & Hermes Atoll - Casserley and Gleason Mapping Whaling Shipwreck	2007	NOAA & ONMS		Andy.Collins@NOAA.gov	Y
Turtles 1	JPEG	French Frigate Shoals - Green Sea Turtles	2007	G. Ludwig	USFWS	Barbara_Maxfield@fws.gov	Y
Turtles 2	JPEG	Turtle Face	2007	Rob Shallenberger	USFWS	Barbara_Maxfield@fws.gov	3
Vegetation 1	JPEG	Lisianski - Naupaka	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Vegetation 2	JPEG	Lisianski - Tree heliotrope 2	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Vegetation 3	JPEG	Mokumanamana (Necker Island) – Ihi (*Portulaca lutea*)	2005	James Watt	Sue Watt	Sue@Seapics 808-329-4253	1
Vegetation 4	JPEG	Nihoa - East Palm Valley Sites	2007	Kekuewa Kikiloi		kekikilo@ksbe.edu	Y
Video 1		Safe Haven North-western Hawaiian Islands Coral Reef Ecosystem Reserve	2006	Ocean Futures Society		contact@oceanfutures.org	5
Video 2		Papahānau-mokuākea Marine National Monument B-Roll Footage	2006	PMNM		Andy.Collins@NOAA.gov	Y
Video 3		Following the Sun, Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve	2005	PMNM		Andy.Collins@NOAA.gov	Y

1 – Unrestricted non-commercial, not for sale rights only. For commerical use, contact Sue@Seapics.com

2 – Unrestricted non-commercial, not for sale rights only.

3 – Unrestricted non-commercial, not for sale rights only. For commerical use, contact rshallenberger@TNC.org

4 – Contact Bishop Museum Archives (808-848-4182) regarding use

5 – Most footage copyright Ocean Futures Society and KQED San Francisco. Although NOAA retains unrestricted non-commercial use, it is not in the public domain.

7.b Texts Relating to Protective Designation, Copies of Property Management Plans and Extracts of Other Plans Relevant to the Property

The property is protected under a myriad of designations, including international, national and state legal measures. All of these protective measures are outlined as excerpts or links and can be found in Section 5 and the Appendices. Copies of the National Historic Register applications and links to or summaries of management plans and conservation polices to manage the site are also found in the Appendices.

List of Appendices

Appendix A. NOAA Chart of Papahānaumokuākea

Appendix B. Selected Text from the Kumulipo: A Hawaiian Creation Chant (Beckwith ed. 1951)

Appendix C. National Historic Registers for Nihoa and Necker (Mokumanamana) Islands in Papahānaumokuākea

- *Necker Island Archaeological District.* National Register of Historic Places Inventory - Nomination Form for Federal Properties
- *Nihoa Island Archaeological District.* National Register of Historic Places Inventory - Nomination Form for Federal Properties

Appendix D. U.S. Congress Apology to Native Hawaiians on behalf of the United States for the overthrow of the Kingdom of Hawaii (U.S. Public Law 103-150. 103rd Congress Joint Resolution 19, 1993)

Appendix E. Summary of Submerged Historic Resources of Papahānaumokuākea

Appendix F. Operational Protocols and Best Management Practices for Papahānaumokuākea

- Papahānaumokuākea Marine National Monument Special Conditions & Rules for Moving Between Islands & Atolls and Packing for Field Camps
- Disease and Introduced Species Prevention Protocol for Permitted Activities in the Marine Environment
- Remote Islands Special Conditions and Rules for Marine Quarantine in Papahānaumokuākea Marine National Monument
- Precautions for Minimizing Human Impacts on Endangered Land Birds in Papahānaumokuākea Marine National Monument
- General Storage and Transport Protocol for Scientific Collection in Papahānaumokuākea Marine National Monument
- Papahānaumokuākea Marine National Monument National Marine Fisheries Service Best Management Practices
- Best Practices for Minimizing the Impact of Artificial Light on Sea Turtles
- Special Conditions & Rules for Small Boat Operations at Tern Island

Appendix G. International Legal Measures for Papahānaumokuākea

- Designation as a Particularly Sensitive Sea Area by the International Maritime Organization (adopted April 3, 2008)
- Areas to be Avoided "In the Region of the North-West Hawaiian Islands"
- Ship Reporting System for the Papahānaumokuākea Marine National Monument Particularly Sensitive Sea Area (PSSA)

Appendix H. Federal Legal Measures Specific to Papahānaumokuākea and the Northwestern Hawaiian Islands

- Executive Order 1019 – Hawaiian Islands Reservation (February 3, 1909)
- Executive Order 13022 – Administration of the Midway Islands, 61 FR 56875 (October 31, 1996)

- Department of the Interior Secretary's Order 3217 – Battle of Midway National Memorial, (September 13, 2000)
- Executive Order 13178 – Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, 65 FR 76903 (December 4, 2000)
- Executive Order 13196 – Final Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, 66 FR 7395 (January 18, 2001)
- Presidential Proclamation 8031 of June 15, 2006 establishing the Northwestern Hawaiian Islands Marine National Monument, by regulations at 71 FR 36443 (June 26, 2006); as amended by Presidential Proclamation 8112) (codified at 50 CFR Part 404)
- Northwestern Hawaiian Islands Marine National Monument codifying regulations, 50 CFR Part 404 (2006). Federal regulations codifying the provisions of Proclamation 8031 were published on August 29, 2006 (50 CFR Part 404)
- Domestic implementation of mandatory ship reporting measures associated with international PSSA designation including regulations and management plan amending the Areas to be Avoided "In the Region of the North-West Hawaiian Islands" initially established in 1981. Federal Register: December 3, 2008 (Vol. 73, No. 233 [Pages 73592-73605])

Appendix I. General Federal Legal Measures Applicable to Papahānaumokuākea Resources

- Antiquities Act of 1906, 16 U.S.C. § 431, *et seq.*
- Migratory Bird Treaty Act of 1918, as amended, 16 U.S.C. 703-712
- Historic Sites, Buildings and Antiquities Act, 16 U.S.C. §461-462. 464-467
- Fish and Wildlife Act of 1956, 16 U.S.C. § 742f
- National Historic Preservation Act (NHPA) of 1966, 16 U.S.C. § 470-470b, 470c-470n
- National Wildlife Refuge System Administration Act of 1966, as amended, 16 U.S.C. §§ 668dd-ee
- Refuge Recreation Act, 16 U.S.C. § 460k-3
- Coastal Zone Management Act, 16 U.S.C. § 1451, *et seq.*
- Marine Mammal Protection Act of 1972, 16 U.S.C. § 1361, *et seq.*
- Endangered Species Act of 1973, as amended, 16 U.S.C. § 1531, *et seq.*
- Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. § 1801, *et seq.*
- Fish and Wildlife Improvement Act of 1978, 16 U.S.C. § 742l
- National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. §§ 668dd-ee
- Archaeological Resources Protection Act (ARPA) of 1979, 16 U.S.C. § 470aa-mm
- Abandoned Shipwreck Act (ASA) of 1988, 43 U.S.C. § 2101-2100
- Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, 25 U.S.C. 3001 *et seq.*
- Sunken Military Craft Act (SMCA) of 2004, Public Law 108-375

Appendix J. State of Hawai'i Legal Measures Applicable to Papahānaumokuākea and Resources

- Hawaii Organic Act of April 30, 1900, c339, 31 Stat. 141 Section 2
- Hawaii Admission Act of March 18, 1959, Pub. L. 86-3, 73 Stat. 4 Section 2
- Constitution of the State of Hawai'i, Article XI, Sections 1, 2, 6, and 9; and Article XII, Section 7
- Hawaii Revised Statutes Title 1 – Chapter 6E, Sections 6E-1 and 6E-7; Title 12, Chapter 171, Section 171-3, Chapter 183D, Section 183D-4, Chapter 187A, Section 187A-8, Chapter 188, Sections 188-37 and 188-53
- Hawaii Administrative Rules Title 13, Chapter 60.5, Chapter 125, Chapters 275-284, and Chapter 300

Appendix K. Papahānaumokuākea Monument Management Plan. U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration and Hawai'i Department of Land and Natural Resources. December, 2008

- Vol. 1. Papahānaumokuākea Monument Management Action Plans
- Vol. 2. Papahānaumokuākea Environmental Assessment
- Vol. 3. Appendices. Supporting Documents and References
- Vol. 4. Midway Atoll Conceptual Site Plan
- Vol. 5. Response to Comments

Appendix L. Existing Property Management Plans

- Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve Operations Plan
- Visitor Services Plan for Midway Atoll National Wildlife Refuge and the Battle of Midway National Memorial and the Papahānaumokuākea Marine National Monument's Midway Atoll Special Management Area
- Hawaiian Islands National Wildlife Refuge Master Plan
- Fish and Wildlife Service Draft Laysan Island Ecosystem Restoration Plan
- Fish and Wildlife Service Regional Seabird Conservation Plan, Pacific Region
- Final Environmental Impact Analysis on the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region
- Prehistoric Cultural Resources and Management Plan for Nihoa and Necker Islands, Hawai'i
- Hawai'i's Comprehensive Wildlife Conservation Strategy
- Hawai'i Aquatic Invasive Species Management Plan

Appendix M. Species Recovery Plans for United States Federally Endangered and Threatened Species Applicable to Papahānaumokuākea

- Recovery Plans for the Hawaiian Monk Seal, the Humpback Whale and Blue Whale
- Recovery Plans for the Green and Loggerhead Sea Turtles, Hawksbill and Leatherback Turtles
- Recovery Plan for the Northwestern Hawaiian Islands Passerines
- Draft Revised Recovery Plan for the Laysan Duck
- Draft Recovery Plan for the Short-Tailed Albatross
- Hawaiian Dark-Rumped Petrel/Newell's Manx Shearwater Recovery Plan
- Recovery Plan for Three Plant Species on Nihoa Island
- Recovery Plan for the Multi-Island Plants

Appendix N. Emergency Response and Contingency Plans for Papahānaumokuākea

- US Fish and Wildlife Service Continuity of Operations Plan
- US Fish and Wildlife Service Tsunami Warning/Watch Preparedness Protocol
- National Marine Fisheries Communications – Emergencies
- Contingency Plan for Hawaiian Monk Seal Unusual Mortality Events

Appendix O. Assessment of Staffing Levels and Field Requirements for Management of Papahānaumokuākea

- Requirements Document. Report to Office National Marine Sanctuaries–NOAA. Honolulu, Hawai'i. Choi, F. and Associates, 2007

Appendix P. Property Promotion and Presentation Materials for Papahānaumokuākea

- A Citizens' Guide to the Monument
- Cultural Significance and Historical Background. Handout for visitors to Midway Island NWR
- Northwestern Hawaiian Islands Coral Reef Ecosystem: A National Treasure. Fact Sheet
- Northwestern Hawaiian Islands: A Resource Guide

- A Whale of a Journey – Poster of Whaling Shipwrecks of the Papahānaumokuākea Marine National Monument

Planning Updates and Online Newsletters

http://www.papahanaumokuakea.gov management/mp_updates.html

- Ka Palapala Hoʻomaopopo: Papahānaumokuākea Planning Update 1 – Summer 2007
- Ka Palapala Hoʻomaopopo: The Informative Letter: Papahānaumokuākea – February and April 2008

Educational Materials

- A Teachers Curriculum Guide to Navigating Change http://www.hawaiianatolls.org/research/NavChange2002/index.php

Videos and Documentaries

- Safe Haven
- Following the Sun. Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve
- Virtual Tours of Papahānaumokuākea Islands http://papahanaumokuakea.gov/visit/welcome.html
- Mokupapapa Discovery Center for Hawaii's Remote Coral Reefs http://papahanaumokuakea.gov/education/center.html
- No Papahānaumokuākea

7.c Form and Date of Most Recent Records or Inventory of Property

Recent records include results from a wide array of research and monitoring studies, surveys and inventories of bathymetrical, ecological, archaeological and cultural resources in Papahānaumokuākea. These are available in the form of published scientific articles, management plans, reports, databases and maps. Many are referenced below in the Reference List, or are included in the Appendices.

The most recent scientific literature, data sets and key management documents for Papahānaumokuākea are accessible through NOAA's extensive CoRIS (Coral Reef Information System) online library (http://coris.noaa.gov/data/portals/nwhi.html#7); mapping products are available through NOAA's nautical charts service (http://www.nauticalcharts.noaa.gov/ and http://www.oceangrafix.com/o.g/Charts/HI_PI/NOAA-Nautical-Charts.html); summaries of coral reef monitoring data are available through the NOAA Biogeography Branch (http://ccma.nos.noaa.gov/stateofthereefs). Updated information on management of Papahānaumokuākea is made available on the Monument web site (www.papahanaumokuakea.gov).

7.d Locations of Inventory, Records and Archives are Held

Papahānaumokuākea Co-trustee Agencies:

1) United States Fish and Wildlife Service,
300 Ala Moana Blvd., Room 5-231
Honolulu, Hawaii 96850.
USA

2) National Oceanic and Atmospheric Administration
6600 Kalaniana'ole Highway, Suite 300
Honolulu, HI 96825.
USA

3) Hawai'i Department of Land and Natural Resources
1151 Punchbowl Street, Room 330,
Honolulu, HI 96813.
USA

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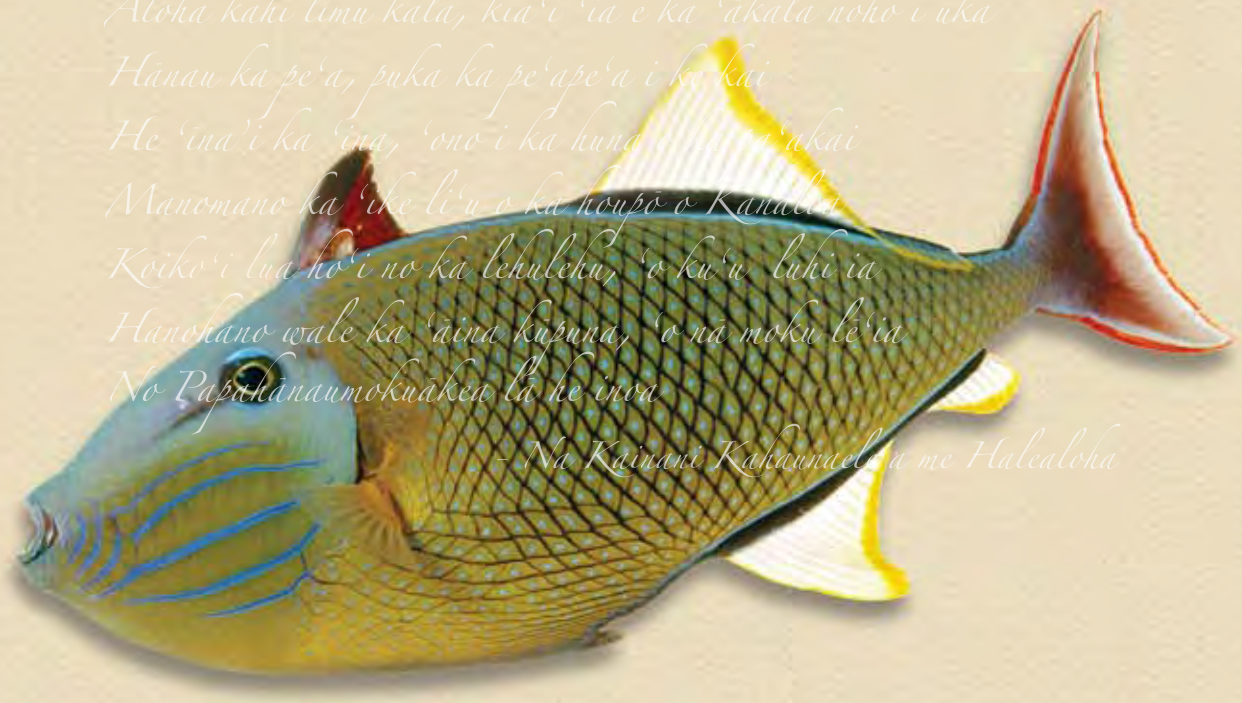
8.

Mālowalowa ka lā ma ka Kaʻe puka i Haʻena ʻe
Apakau ke kukuna i kaʻili kūe o na kai ʻewalu
He ʻike makawalu kaʻu e ʻanoʻi nei,
ʻO na au walu o Kanaloa Haunawela noho i ka moana nui
He Huʻakai ka makani o Lehua ʻau i ke kai
Kūʻonoʻono ka lua o Kuhaimoana i ke kapa ʻehukai o Kaʻula
ʻO Kū i ka loulu, ulu aʻe ke aloha no Nihoa moku manu
Manu o kū i ka ʻāhui, he alakaʻi na ka lāhui
ʻO Hinapukoʻa
ʻO Hinapuhalakoʻa
ʻO Hina kupukupu
ʻO Hinaikamalama
Hua ka ʻōhua, luʻu ke kohola
Aloha kahi limu kala, kiaʻi ʻia e ka ʻākala noho i uka
Hanau ka peʻa, puka ka peʻapeʻa i ke kai
He ʻinaʻi ka ʻina, ʻono i ka hunakai i ka huʻakai
Manomano ka ʻihe liʻu o ka nonō o Kanaloa
Koikoʻi lua hoʻi no ka lehulehu, ʻo kuʻu luhi ia
Hanohano wale ka ʻāina kupuna, ʻo nā moku leʻia
No Papahānaumokuākea lā he inoa

– Na Kainani Kahaunaele a me Halealoha



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8. Contact Information of Responsible Authorities

Crosshatch Triggerfish or humuhumu
(Photo: Susan Middleton & David Liittschwager)

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8.c Other Local Institutions

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U.S. Fish and Wildlife Service

National Marine Fisheries Service/NOAA

8.d Official Web Address

www.Papahanaumokuakea.gov

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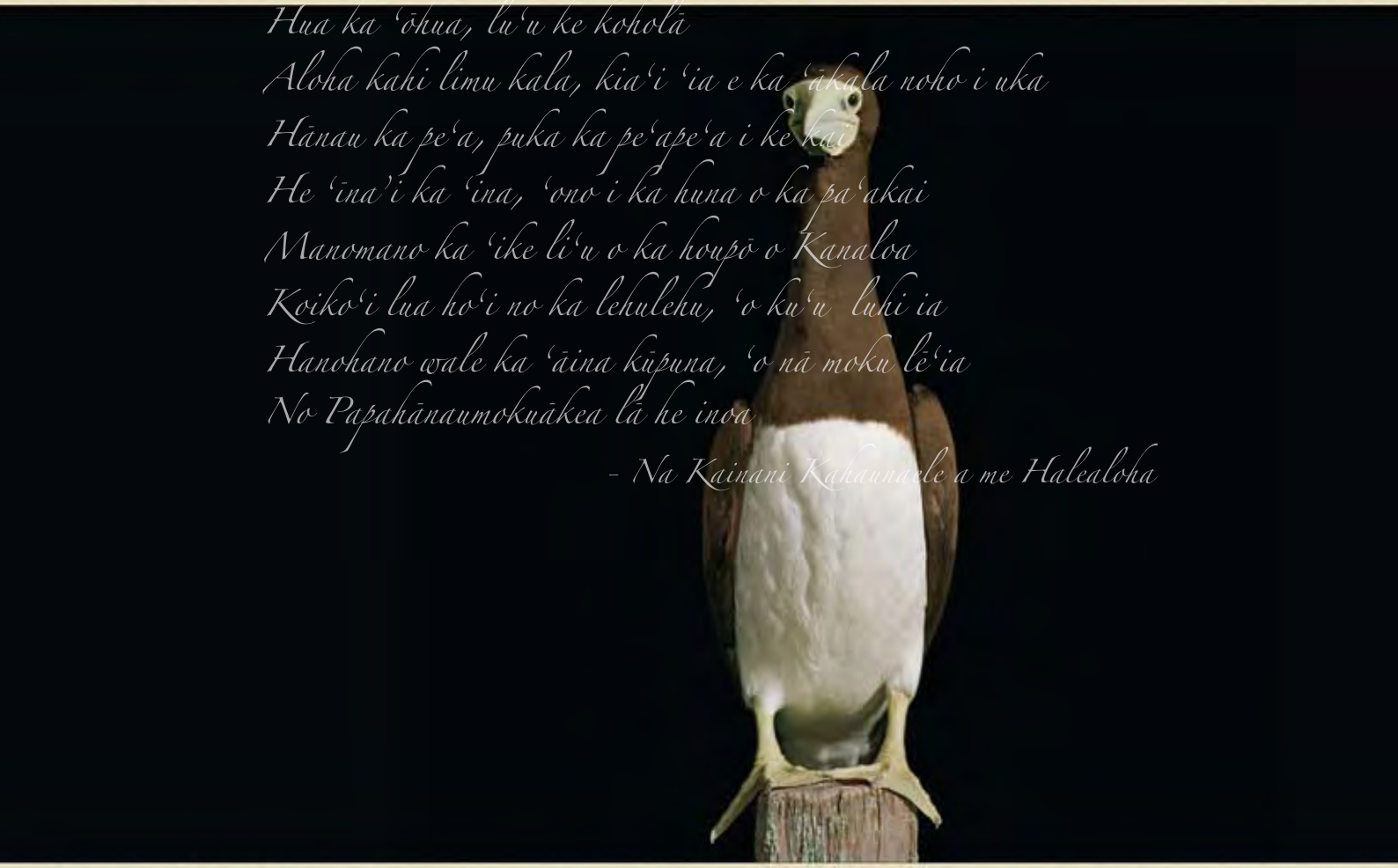
Stout Moray or puhi
(Photo: Susan Middleton & David Liittschwager)

White Tern or manu o Kū
(Photo: Susan Middleton & David Liittschwager)

9.

Malamalama kā lā nui a Kāne puka i Hā'eha'e
'Apakau kē kukuna i ka 'ili kūi o nā kai 'ewalu
He 'ike makawalu ka'u e 'ano'i nei,
'O nā au walu o Kanaloa Haunawela noho i ka moana nui
He Hu'akai kā makani o Lehua 'au i ke kai
Ku'ono'ono ka lua o Kūhaimoana i ke kapa 'ehukai o Ka'ula
'O Kū i ka loulu, ulu a'e ke aloha no Nihoa moku manu
Manu o ku i kā 'ahui, he alaka'i na ka lahui
'O Hinapūko'a
'O Hinapuhaluko'a
'O Hina kupukupu
'O Hinaikamalama
Hua ka 'ōhua, lu'u ke koholā
Aloha kahi limu kala, kia'i 'ia e ka 'ākala noho i uka
Hānau ka pe'a, puka ka pe'ape'a i ke kai
He 'ina'i ka 'ina, 'ono i ka huna o ka pa'akai
Manomano ka 'ike li'u o ka houpō o Kanaloa
Koiko'i lua ho'i no ka lehulehu, 'o ku'u luhi ia
Hanohano wale ka 'āina kūpuna, 'o nā moku lē'ia
No Papahānaumokuākea lā he inoa

- Na Kainani Kahaunaele a me Halealoha



Signature on Behalf of the State Party

9. Signature on Behalf of the State Party

Section 9. Signature on Behalf of the State Party

Lyle Laverty
Assistant Secretary
Fish and Wildlife and Parks
U.S. Department of the Interior

Date

Portuguese Man-of-War or pa'imalua
(Photo: Susan Middleton & David Liittschwager)

GLOSSARY

Abiotic: Pertaining to the non-living components of the environment.

Abyssal (zone): Relating to the bottom waters of oceans, usually below 1000 m.

Adaptive management: The process of adjusting management actions and/or directions as new and better information emerges about the ecosystem

Adaptive reuse: A process that changes a disused or ineffective item into a new item that can be used for a different purpose.

Alien species (exotic, nonnative): With respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem.

Anthropogenic: Caused by humans.

Apex predator: A species (e.g., fish) at the top of the food chain.

Appropriate Use (NWR): A proposed or existing use on a refuge that meets the criteria in 603 FW 1.

Aquaculture: Cultivation of aquatic organisms under controlled or semi-controlled conditions.

Archipelago: A group or cluster of islands.

Ballast water: Any water and associated sediments used to manipulate the trim and stability of a vessel

Bathymetry: Study and mapping (benthic mapping) of seafloor elevations and the variations of water depth; the topography of the seafloor.

Battle of Midway: A naval battle in the Pacific Theater of World War II. It took place from June 4, 1942 to June 7, 1942, approximately one month after the Battle of the Coral Sea, about five months after the Japanese capture of Wake Island, and six months after the Empire of Japan's attack on Pearl Harbor that had led to a formal state of war between the United States and Japan.

Benthic habitat: Of the seafloor, or pertaining to organisms living on or in the seafloor.

Biodiversity: Defined as the number of different organisms or species that inhabit a given ecosystem or the earth overall. It can also refer to the variability within species and among species living on the earth or in a particular community. Many ecologists also include the interaction of species the environment when describing biodiversity. All biodiversity has its origins in the different combinations of genetic material (DNA) and how this is expressed in different organisms.

Biogeographical: Of relating to or involved with biogeography, a branch of biology that deals with the geographical distribution of animals and plants.

Biological community: A naturally occurring assemblage of plants and animals that live in the same environment and are mutually sustaining and interdependent.

Biological inventory or Biodiversity inventory: Catalog of all biota in a given area. Inventories of large clades (a clade is a related group with a common ancestor) of organisms that are likely to contain many undescribed species or otherwise require major revision to complete their taxonomy.

Biomass: The total weight of all the living organisms, or some designated group of living organisms, in a given area.

Bioprospecting: Search for new chemicals compounds, genes and their products in living things that will have some value to people.

Biota: All the organisms, including animals, plants, fungi and microorganisms, living components of an ecosystem.

Biotic: Pertaining to any aspect of life, especially to characteristics of entire populations or ecosystems.

Bishop Museum: Founded in 1889, the Bishop Museum is the largest museum in Hawai'i and the premier natural and cultural history institution in the Pacific, recognized throughout the world for its cultural collections, research projects, consulting services and public educational programs. It also has one of the largest natural history specimen collections in the world.

Board of Land and Natural Resources: An appointed Board of the State of Hawai'i composed of seven members, one from each land district and two at large, and the Chairperson, the executive head of the Department. Members are nominated and, with the consent of the Senate, appointed by the Governor for a 4-year term. The BLNR convenes twice monthly to review and take action on department submittals, including Monument permits.

Bottomfish species: means bottomfish management unit species as defined at 50 CFR 660.12.

Bottomfishing: Fishing for bottomfish species using hook-and-line method of fishing where weighted and baited lines are lowered and raised with electric, hydraulic, or hand-powered reels.

Calderas: A crater whose diameter is many times that of the volcanic vent because of the collapse of subsidence of the central part of a volcano or because of explosions of extraordinary violence.

Catch-per-unit-effort (CPUE): The average number of fish caught in a discrete amount of time.

Categorical Exclusion: A category of actions that the agency has determined does not individually or cumulatively have a significant effect on the quality of the human environment.

Ciguatera toxin: Toxins produced by a marine microalgae called *Gambierdiscus toxicus*. These toxins become progressively concentrated as they move up the food chain from small fish to large fish that eat them, and reach particularly high concentrations in large predatory tropical reef fish.

Co-Trustees: U.S. Department of Commerce, through the National Oceanic and Atmospheric Administration, the Department of the Interior through the Fish and Wildlife Service, and the State of Hawai'i.

Commercial Fishing: Fishing in which the fish harvested, either in whole or in part, and are intended to enter commerce through sale, barter or trade.

Compatible use: A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the national wildlife refuge.

Comprehensive Conservation Plan: A document that describes the desired future conditions of the refuge, and provides long-range guidance and management direction for the refuge manager to accomplish the purposes of the refuge, contribute to the mission of the System, and to meet other relevant mandates.

Coral bleaching: When zooxanthellae, symbiotic algae that live in coral tissue, leave the coral as a result of thermal and other types of stress.

Crustacean: A member of the phylum Crustacea, such as a crab, shrimp, or lobster.

Cultural literacy: The art and understanding of the intangible meanings and emotions conveyed through a particular written cultural language.

Cultural resources: Any resources whether they are tangible or intangible such as stories, people, structures, or artifacts that identifies a certain native people's culture inherent in the way they live and practice their traditions.

Cumulative effects (NEPA): Cumulative impact of the direct and indirect effects of the proposed action and its alternatives when added to the aggregate effects of past, present, and reasonably foreseeable future actions.

Customary rights: Rights customarily and traditionally exercised for subsistence, cultural, and religious purposes and possessed by ahupua'a tenants who are descendants of Native Hawaiians who inhabited the Hawaiian Islands prior to 1778.

Derelict: Abandoned, especially by the owner or occupant; forgotten unused.

Direct effects (NEPA): Effects caused by the action and occurring at the same time and place.

Distance-learning: Education initiated on-site at a remote location offered to others often times providing two way communication through audio and/or video technology links.

Ecological: Of, or having to do with, the environments of living things or with the pattern of relations between living things and their environments.

Ecological impacts: The effect that a human-caused or natural activity has on living organisms and their environment.

Ecological Reserve: An area of the Monument consisting of contiguous, diverse habitats that provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life, and also to protect and preserve natural assemblages of habitats and species within areas representing a broad diversity of resources and habitats found within the monument.

Ecosystem: A geographically specified system of organisms (including humans), the environment, and the processes that control its dynamics.

Ecosystem Health: A condition in which structure and functions allow the desired maintenance over time of biological diversity, biotic integrity, and ecological processes.

Ecosystem Integrity: A condition determined to be characteristic of an ecosystem that has the ability to maintain its function, structure, and abundance of natural biological communities, including rates of change in response to natural environmental variation.

Ecosystem Services: the natural processes by which the environment produces resources. Common examples are water, timber, and habitat for fisheries, and pollination of native and agricultural plants.

Ecosystem-based management approach: Management that carefully considers impacts to all species and trophic interactions, including maintenance of biological communities and the protection of natural habitats, populations and ecological processes. The approach emphasizes the inherent value of ecosystems and recognizes the importance of species interactions and conservation of habitats, and only permits resource utilization in a manner that is consistent with the Monument's primary goal of resource protection.

Ecotourism: Travel to natural areas to foster environmental and cultural understanding, and appreciation and conservation. The Proclamation defines Ocean-Based Ecotourism as a class of fee-for-service activities that involves visiting the Monument for study, enjoyment, or volunteer assistance for purposes of conservation and management.

Effects (Impacts): As defined by NEPA (direct, indirect, cumulative): Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial.

El Niño: A climatic phenomenon characterized by a large scale weakening of the trade winds and warming of the surface layers in the eastern and central equatorial Pacific Ocean. El Niño events occur irregularly at intervals of 2-7 years, although the average is about once every 3-4 years. and typically last 12-18 months. During El Niño, unusually high atmospheric sea level pressures develop in the western tropical Pacific and Indian Ocean regions, and unusually low sea level pressures

develop in the southeastern tropical Pacific. Southern Oscillation tendencies for unusually low pressures west of the date line and high pressures east of the date line have also been linked to periods of anomalously cold equatorial Pacific sea surface temperatures sometimes referred to as **La Niña**.

Endangered species: An animal or plant species in danger of extinction throughout all or a significant portion of its range.

Endemic: Referring to species native to and confined to a particular region, thus often having a comparatively restricted distribution.

Environmental Assessment (EA): A concise public document, prepared in compliance with the National Environmental Policy Act, that briefly discusses the purpose and need for an action, alternatives to such action, and provides sufficient evidence and analysis of impacts to determine whether to prepare an environmental impact statement or finding of no significant impact.

Environmental Impact Statement (EIS): Documentation that assesses the impacts of major Federal actions significantly affecting the quality of the human environment as required by section 102(2)(C) of NEPA.

Exclusive Economic Zone (EEZ): A zone contiguous to the territorial sea, including zones contiguous to the territorial sea of the United States, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands (to the extent consistent with the Covenant and the United Nations Trusteeship Agreement), and United States overseas Territories and possessions extending to a distance of 200 nautical miles from the baseline from which the breadth of the territorial sea is measured.

Fathom: A unit of length equal to 1.8m (6ft) used to measure water depth.

Field camp (camp): In this document refers to both seasonal camps that are placed on Lisianski, Pearl and Hermes, Kure, and Nihoa; and one permanent camp at Laysan Island. Seasonal camps are established for specific activities such as monk seal research. The Laysan Island camp is staffed year-round to work on restoration of the island. Camps depend on tents, import all water, and have very limited communications and physical access.

Field station: In this document is used to refer to permanent infrastructures on Tern Island or Midway Atoll. These stations have buildings, water-making abilities, greater power sources, advanced communication, and regular access by boat and aircraft.

Fishery: The act, process, or season of taking fish or other sea products for sale or consumption.

Friends of Midway Atoll NWR: Association whose mission is "[t]o support the Midway Atoll National Wildlife Refuge in its efforts to preserve, protect and restore the biological diversity and historic resources of Midway Atoll, while providing opportunity for wildlife-dependent recreation, education and scientific research."

Geographic Information System (GIS): A system of spatially referenced information, including computer programs that acquire, store, manipulate, analyze, and display spatial data.

Geomorphologic: Relating to geomorphology, a science that deals with land and submarine relief features of the earth's surface.

Hazardous material: A substance or material that is capable of posing an unreasonable risk to health and safety or property when transported in commerce and has been designated as hazardous under the federal Hazardous Materials Transportation Law (49 USC 5103).

Hazardous Waste: The Resource Conservation and Recovery Act (RCRA) specifically defines a hazardous waste as a solid waste (or combination of wastes) that, due to its quantity, concentration, physical, chemical, or infectious characteristics, can cause or significantly contribute to an increase in mortality. RCRA further defines a hazardous waste as one that can increase serious,

irreversible, or incapacitating reversible illness or pose a hazard to human health or the environment when improperly treated, stored, disposed of, or otherwise managed.

***Hi'ialakai*:** NOAA research vessel. Hi'ialakai means embracing pathways to the sea in the Hawaiian language.

Hōkūle'a: a traditional Hawaiian double hulled voyaging canoe recreated by the Polynesian Voyaging Society in the 1970s which signified a rebirth of ancient voyaging and navigation and a new cultural renaissance period in Hawaiian history. [*Hōkūle'a* is Hawaiian for star of gladness].

Hypersaline: Salinity well in excess of that of seawater; found in enclosed water bodies.

Impacts: See **Effects**

Indirect effects (NEPA): Those are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

In situ [Latin]: In place

In-reach: Purposefully communicating to personnel working within your agency, or Co-Trustees.

Indigenous (species): Existing within a historical ecological range, usually within a balanced system of coevolved organisms.

Infrastructure: In this document refers to physical buildings and structures, roads, and utility and communications systems.

Interagency: Involving two or more public or government agencies.

Introduced Species:
1. A species (including, but not limited to, any of its biological matter capable of propagation) that is nonnative to the ecosystem(s) protected by the Monument; or
2. Any organism into which genetic matter from another species has been transferred in order that the host organism acquires the genetic traits of the transferred genes.

"Introduction" means the intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity.

Invasive species: A nonindigenous species that may threaten the diversity or abundance of native species or the ecological stability and or uses of infested waters and the introduction of which into an ecosystem may cause harm to the economy, environment, human health, recreation, or public welfare.

Invertebrates: Any animal that is not a vertebrate, that is, whose nerve cord is not enclosed in a backbone of bony segments.

Island-specific: Pertains to a specific island of the Monument and may not be translated to other islands.

Knowledge-base: Information and ideas acquired through pre-existing experiences and cumulative education.

La Niña: see **El Niño**

Larval: An immature stage of any invertebrate animal that differs dramatically in appearance from the adult.

Lead-based paint: paint that contains high levels of lead, generally found in houses and apartments built before 1978, when the federal government banned it from housing.

Longline Protected Species Zone: The area in the Northwestern Hawaiian Islands where longline fishing is prohibited, described as within a 50 nm radius from the geographic centers of Nihoa Island, Mokumanamana, French Frigate Shoals, Gardner Pinnacles, Maro Reef, Laysan Island, Lisianski Island, Pearl and Hermes Atoll, Midway Atoll, and Kure Atoll.

Management Zones: Special Preservation Areas, Ecological Reserves, and the Midway Atoll Special Management Area (SMA) as defined in Monument regulations (50 CFR 404).

Marine debris: Any persistent solid material and contents that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment.

Maritime: Of or relating to navigation or commerce on the sea.

Memorandum of Agreement or Understanding (MOA/U): A nonbinding agreement between state or federal agencies, or divisions within an agency, that delineates tasks, jurisdiction, standard operating procedures or other matters which the agencies or units are duly authorized and directed to conduct.

Meta-population: A subdivided population of a single species.

Midway Atoll Special Management Area: The area of the monument surrounding Midway Atoll out to a distance of 12 nautical miles, established for the enhanced management, protection, and preservation of Monument wildlife and historical resources.

Migratory bird: Birds that are listed in Title 50 of the Code of Federal Regulations, Section 10.13.

Mitigate (mitigation): To make less severe. An action or series of actions that offset the environmental impact, or reduce the severity or consequences. Usually done by sequestering or reducing contact thereby reducing risk or by compensating, enhancing, or restoring areas adversely affected.

Mobile transceiver unit: A vessel monitoring system or VMS device installed on board a vessel that is used for vessel monitoring and transmitting the vessel's position as required by Presidential Proclamation 8031.

Monument Management Board (MMB): The MOA established a locally based Monument Management Board (MMB) to guide field level coordination. The seven-member MMB includes representation of the Co-Trustee agencies and the Office of Hawaiian Affairs.

Monument Regulations: Initial regulations prescribed by the Presidential Proclamation 8031 completed jointly by the FWS and NOAA on August 29, 2006 (71 FR 51134). Monument regulations, codified under 50 CFR Part 404, establish the scope and purpose, boundary, definitions, prohibitions, marine zones, and regulated activities for managing the Monument.

National Historic Landmark: Nationally significant historic places designated by the Secretary of the Interior possessing exceptional value or quality in illustrating or interpreting the heritage of the United States.

National Historic Properties: Properties listed in, or eligible for listing in the National Register of Historic Places (National Historic Preservation Act of 1966, as amended; implementing regulation for evaluation and determination of eligibility are in 36 CFR 60). "National Register of Historic Places."

National Marine Sanctuary Foundation: A private, nonprofit, 501(c)(3) tax-exempt organization created to assist the federally managed National Marine Sanctuary Program with education and outreach programs designed to preserve, protect, and promote meaningful opportunities for public interaction with the nation's marine sanctuaries.

National Monument: An area on lands owned or controlled by the Government of the United States designated by the President of the United States under the Antiquities Act of 1906, to recognize historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest.

National Register of Historic Places: The Nation's official list of cultural resources worthy of preservation. Authorized under the National Historic Preservation Act of 1966, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources.

National Wildlife Refuge System: All lands, waters, and interests therein administered by the U.S. Fish and Wildlife Service as wildlife

refuges, wildlife ranges, wildlife management areas, waterfowl production areas, and other areas for the protection and conservation of fish, wildlife, and plant resources.

Native Hawaiian: Any individual who is a descendent of the aboriginal people who, prior to 1778, occupied and exercised sovereignty in the area that now constitutes the State of Hawai'i.

Native Hawaiian practices: Cultural activities conducted for the purposes of perpetuating traditional knowledge, caring for and protecting the environment, and strengthening cultural and spiritual connections to the Northwestern Hawaiian Islands that have demonstrable benefits to the Native Hawaiian community. This may include, but is not limited to, the noncommercial use of monument resources for direct personal consumption while in the Monument.

Native species: A species (plant or animal) within its natural range or natural zone of dispersal without human aid.

Natural variability: Uncertainties that stem from inherent or assumed randomness and unpredictability in the natural world.

Northwestern Hawaiian Islands (NWHI): Beginning 155 miles (249.4 kilometers) from the main Hawaiian Island of Kaua'i, the 10 islands and atolls of this chain that extend for 1,200 miles (1,931 kilometers) to Kure Atoll. In past decades, also known as the Leeward or Kūpuna Islands, and now as Papahānaumokuākea.

NOWRAMP or NWHIRAMP: The Northwestern Hawaiian Islands Coral Reef Assessment and Monitoring Program, which began in 2000, to rapidly evaluate and map the shallow water reef habitats in the NWHI.

Oceania: Collective name for the islands scattered throughout most of the Pacific Ocean.

Oceanographic: Of or relating to oceanography, a science that deals with the ocean and its phenomena.

Outreach: The act of communicating activities and conceptual ideas to public audiences outside the administering agency/agencies and actively involving them in Monument activities.

Pacific Rim: includes the countries that lie along the Pacific Ocean, plus the island countries of the Pacific.

Passage without interruption: A vessel passing through waters within the Monument boundary without stopping anywhere within the boundary of the Monument.

Pelagic: Referring to the open ocean.

Pelagic species: From the Proclamation: Pelagic Species means Pacific Pelagic Management Unit Species as defined at 50 CFR 660.12.

Permit: As used in the Monument Management Plan, authorization by the Co-Trustees to conduct an activity within the Monument that: (i) is research designed to further understanding of monument resources and qualities; (ii) will further the educational value of the monument; (iii) will assist in the conservation and management of the monument; (iv) will allow Native Hawaiian practices; (v) will allow a special ocean use; or (vi) will allow recreational activities.

Petrels: Any of numerous seabirds constituting the families Procellariidae and Hydrobatidae.

Polynesian Voyaging Society (PVS): A society founded in 1973 to research how Polynesian seafarers discovered and settled on the islands in the Pacific Ocean before European explorers arrived in the 16th century.

Pono: [Hawaiian] Appropriate, correct, and deemed necessary by traditional standards in the Hawaiian culture.

Precautionary approach: In the decision-making process, if there is a reasonable suspicion of harm, this approach urges a full evaluation of available alternatives for the purpose of preventing or minimizing harm. When consequences are uncertain, managers

err on the side of caution thereby giving the benefit of the doubt to nature, public health, and community well-being.

Predator-dominated marine ecosystem: Reef ecosystems that have relatively greater abundance of large fish, such as sharks and jacks and fewer smaller fish that graze on the coral and algae.

Presidential Proclamation 8031: Establishment of the Northwestern Hawaiian Islands Marine National Monument, A Proclamation by the President of the United States of America, June 15, 2006. (also **Proclamation**, **Presidential Proclamation** and **Proclamation 8031**)

Productivity: Rate of energy fixation or storage per unit time; not to be confused with production.

Prohibitions: Actions prohibited by authority of law.

Recreational Activity: For the purposes of the Monument, an activity conducted for personal enjoyment that does not result in the extraction of Monument resources and that does not involve a fee-for-service transaction. This includes, but is not limited to, wildlife viewing, SCUBA diving, snorkeling, and boating.

Remediation: Rehabilitation of a section of the environment that has been polluted or degraded from a sustainable (self-repairing) state.

Repatriation: The transfer of legal interest in and physical custody of Native American cultural items to lineal descendants, culturally affiliated Indian tribes, and Native Hawaiian organizations.

Resiliency: The ability of an ecosystem to recover from, or adjust to, stress or change.

SCUBA: A self-contained underwater breathing apparatus and includes, but is not limited to, open circuit and rebreather technology.

Seamount: Submerged volcanic mountain rising above the deep-seafloor.

Secretaries: For the Monument, collectively refers to the Secretary of Commerce and the Secretary of the Interior

Sessile invertebrates: Organism being attached to a substrate.

Shoal: Elevation of the sea bottom comprising any material except rock or coral (in which case it is a reef) and which may endanger surface navigation.

Socioeconomic: Relating to or involving a combination of social and economic factors.

Spawning: The direct release of sex cells into the water for reproduction.

Special Ocean Use: An activity or use of the Monument that is engaged in to generate revenue or profits for one or more of the persons associated with the activity or use, and does not destroy, cause the loss of, or injure monument resources. This includes ocean-based ecotourism and other activities such as educational and research activities that are engaged in to generate revenue, but does not include commercial fishing for bottomfish or pelagic species conducted pursuant to a valid permit issued by NOAA.

Special Preservation Area (SPA): Discrete, biologically important areas of the Monument within which uses are subject to conditions, restrictions, and prohibitions, including but not limited to access restrictions. SPAs are used to avoid concentrations of uses that could result in declines in species populations or habitat, to reduce conflicts between uses, to protect areas that are critical for sustaining important marine species or habitats, or to provide opportunities for scientific research.

Stakeholder: Any and all interested parties; an organization, governmental entity, or individual that has a stake in, or may be impacted by, a given approach to environmental regulation or other agency action.

Submersible: A research submarine, designed for manned or remote operation at great depths.

Substrate: The material making up the base on which an organism lives or to which it is attached.

Substratum: The bottom of the bay, the soils of the bay bottom. May also refer to any surface that allows for the colonization of marine life.

Sustenance Fishing: For the Monument, sustenance fishing means fishing for bottomfish or pelagic species in which all catch is consumed within the Monument, and that is incidental to an activity permitted.

Symbiotic: Situation in which two dissimilar organisms live together in close association.

Temporary Structure (Non Permanent): A structure with no permanent foundation that is easy to assemble, dismantle, and transport and is removed from a site between periods of actual use except as specifically permitted otherwise.

Terrestrial species: Plants and animals living on land.

Threatened species: Any species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Topographic: General elevation pattern of the land surface or the ocean bottom.

Traditional knowledge: A way of knowing and learning that is acquired through expressions of dance or other forms of art, orally, or thru actual hands-on experiences passed down from generation to generation.

Trolling: Fishing using one or more lines with hooks or lures attached and drawn through the water behind a moving vessel.

Trophic: Relating to nutrition; the position of an organism in a food chain or food pyramid.

Unexploded Ordnance (UXO): Munitions that contain explosive components. In the Monument, refers to lost or abandoned military items.

Unified Ocean Governance: An integrated ecosystem-based management approach using an overall governance framework of shared principles and authority, clear communications and protocols.

Unusual Mortality Events: Criteria used to determine if mortalities seen in the Hawaiian Monk Seal are significantly abnormal to indicate an underlying vector. Criteria include: a marked increase in the magnitude of strandings is occurring when compared with prior records; animals are stranding at a time of the year when strandings are unusual; an increase in strandings is occurring in a very localized area; the species, age, or sex composition of the stranded animals is different; stranded animals exhibit similar or unusual pathologic findings, or the general physical condition; mortality is accompanied by unusual behavior patterns; and critically endangered species are stranding.

Vessel Monitoring System (VMS): Means a vessel monitoring system or mobile transceiver unit approved by the NOAA Office for Law Enforcement for use on vessels permitted to access the Monument in accordance with the Proclamation and 50 CFR 404. The hardware and software used by vessels to track and transmit their positions to a receiver in a remote location.

Wayfinding: Noninstrument navigation. Wayfinding involves navigating on the open ocean without sextant, compass, clock, radio reports, or satellites reports. The wayfinder depends on observations of the stars, the sun, the ocean swells, and other signs of nature for clues to direction and location of a vessel at sea.

Zooxanthellae: A group of dinoflagellates living symbiotically in association with one of a variety of invertebrate groups and found in corals and other marine organisms.

LINE ART GLOSSARY

Hawaiian Green Turtle (*Chelonia mydas*), or *honu.* The islands and atolls of Papahānaumokuākea encompass over 90% of the total nesting area for the Hawaiian population of the Green Turtle.

***Makau*, or the Hawaiian fishhook**, has been used by expert Hawaiian fishers since ancient times. A wide range of fishing activities occurred in the Hawaiian Islands in antiquity, as evidenced by the presence of one-, two-, and multiple piece fishhooks.

***Ulua*, or the Giant Trevally (*Caranx ignobilis*)**, represents one of the abundant and wide-ranging apex predators of Papahānaumokuākea's coral reef ecosystems. These predator-dominated systems are characteristic of reefs prior to human exploitation, a concept embodied in the Hawaiian term *ʻāina momona* (place of abundance).

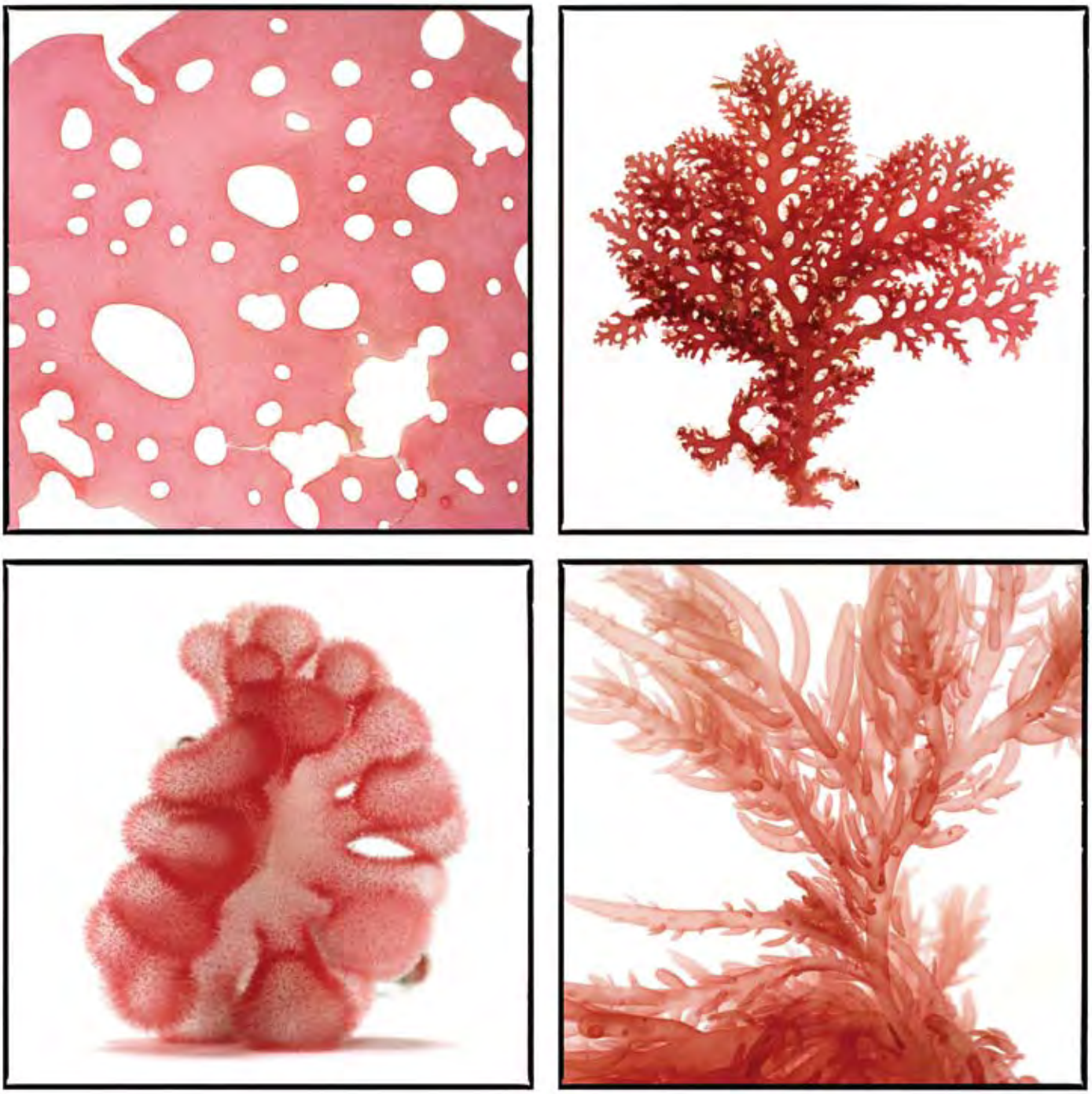
Galapagos sharks (*Carcharhinus galapagenesis*), are significant both ecologically and culturally. Sharks, *manō*, are the most common *ʻaumakua* (family guardian spirits) of fishing families, and represent the physical form of such highly revered gods as Kamohoaliʻi, who guided his sister Pele through Papahānaumokuākea (Beckwith 1970).

Representation of Papahānaumokuākea's several species of **terns** Papahānaumokuākea protects colonies of global significance for 14 million seabirds, representing 21 species. It is the largest tropical seabird rookery in the world.

Representation of the **traditional Hawaiian voyaging canoe**, *Hōkūleʻa*. As in generations past, the contemporary apprentice wayfinder's first open-ocean training ground takes them into Papahānaumokuākea.

Native Hawaiian practitioners utilize **conch shells** in cultural protocol. For instance, by blowing a conch shell and chanting, Native Hawaiian practitioners greet their ancestors (*kūpuna*), give thanks, and ask their permission to land on Nihoa and Mokumanamana.

Crab, or *pāpaʻi,* represent the benthic shallow-water invertebrates of Papahānaumokuākea, many of which are just being identified and dozens are species new to science. Many invertebrates, such as *pāpaʻi*, are important for subsistence and cultural activities, and today, in bridging traditional and Western practices in the management of Papahānaumokuākea.



Red Algae
(Photo: Susan Middleton & David Liittschwager)

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ction in
atka

Zone 3
Reef coral growth ceases, continued subsidence, atolls drown to form guyots

Zone 2
Barrier reefs become atolls, continued subsidence

N,
° W

Darwin Point

29° N

28

a level

43

28

PACIFIC LITHOSPHERIC PLAT

Subduction

ASTHENOSPHERE

Darwin Point

-0.025
Subsidence

ubduction

30°

Latitude – North Pacific