



SUMMARY OF DATA
FROM
NOAA WORKSHOP ON
THE NORTHWESTERN HAWAIIAN ISLANDS:
INFORMATION NEEDS FOR CONSERVATION AND
MANAGEMENT

Compiled by Stephanie Fried, Ph.D.
and Katie McHugh, Lokey Fellow, Environmental Defense
May 2004



e

ENVIRONMENTAL DEFENSE

finding the ways that work

SUMMARY OF DATA

FROM

NOAA WORKSHOP ON THE NORTHWESTERN HAWAIIAN ISLANDS:

INFORMATION NEEDS FOR CONSERVATION AND MANAGEMENT

Compiled by **Stephanie Fried, Ph.D.**
and **Katie McHugh, Lokey Fellow, Environmental Defense**
May 2004

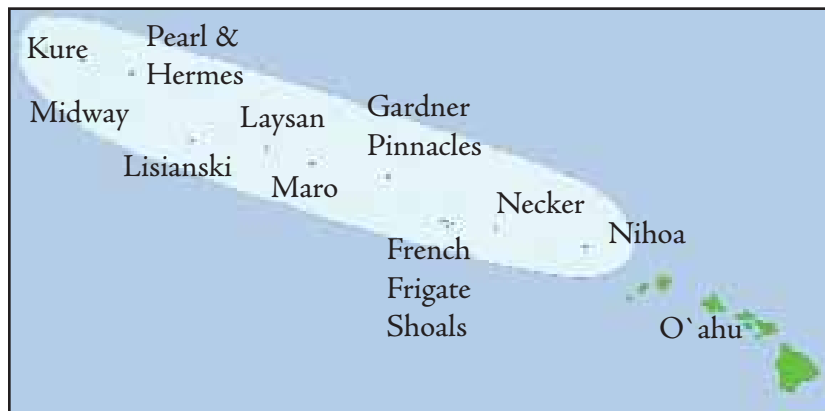
TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
I. POTENTIAL THREATS TO THE NORTHWESTERN HAWAIIAN ISLANDS	6
II. MANAGEMENT STEPS AND INITIATIVES IDENTIFIED BY SCIENTISTS	12
III. AREAS OF SCIENTIFIC UNCERTAINTY/ LACK OF DATA	19
APPENDIX A: SAMPLE WORK SHEETS	25
APPENDIX B: PARTICIPANTS	29

Stephanie Fried
Environmental Defense
P.O. Box 520, Waimanalo, Hawai'i 96795
sfried@environmentaldefense.org.

Katie McHugh
katie.mchugh@stanfordalumni.org.

Northwestern Hawaiian Islands



Cover: A highly endangered Hawaiian monk seal and pup in the Northwestern Hawaiian Islands.

EXECUTIVE SUMMARY

In May 2003, over 100 scientists met in Honolulu, at the invitation of the National Oceanic and Atmospheric Administration's National Marine Sanctuary Program, to identify research priorities for the management of the NWHI. The scientists were divided into workgroups, or "break-out groups" and tasked with identifying crucial data and research needs for conservation and management. Each workgroup then documented the results of their assessments on forms made available by NOAA. The completed forms were posted on the internet in their entirety.¹ (See Appendix A for samples of the data forms.) This summary is based on the raw data collected by NOAA and recorded on the data forms filled out by scientists in each of the workgroups.

Three major themes emerged from the workshop: (1)

the identification of potential threats to NWHI ecosystem integrity; (2) key management initiatives identified by scientists for conservation management; and (3) areas of scientific uncertainty or lack of data.

Threats to NWHI ecosystem integrity.

Scientists identified human activities and vessel traffic as some of the most significant threats to the NWHI, including:

■ **Acute and chronic impacts** on NWHI marine and terrestrial ecosystems, potentially leading to irreversible "phase shifts" in ecosystem composition, changes in species diversity, spatial distribution, age/size structure of populations, and changes in genetic structure over time,

¹: <http://www.hawaiiireef.noaa.gov/workshop/workshopdocuments.html>



Hawaiian monk seals at French Frigate Shoals.

directly associated with legal and illegal commercial and recreational fishing (including the aquarium fish trade), research, tourism (including ecotourism, cruise ship activities, interaction with endangered and threatened species), educational activities, vessel transit (including cruise ships and cargo vessels), monitoring activities, Reserve management (i.e. removal of marine debris from corals), and military exercises;

■ **Vessel impacts**, including marine debris, noise, light (impact on birds), anchor damage, accidental or purposeful waste disposal (garbage, sewage, grey water/black water, ballast water, oil spills, spills or dumping of other hazardous materials, fishing gear/lead weights, plastics, toxics), lost ordinance, localized contaminants, habitat alteration, alien species introduction, potential increase in cyanobacteria associated with wrecks.

■ **Research impacts** - ecological disturbance, invasive sampling, construction of facilities, anchoring, moving, removing marine or terrestrial species, disruption of predator/prey relations, habitat degradation, lobster trapping, impacts on historical/archaeological resources.

■ **Fishery impacts** (legal and illegal) - fishing gear impacts, the direct threat to ecosystem integrity from



removal of target and non-target (bycatch) species, impacts on forage base, competition and habitat relationships, impacts from catch-and-release fisheries (leading to increased morbidity/mortality of apex predators), potential for unauthorized fishing.

■ **Accidental and purposeful introduction of alien/invasive Species** (animals, plants, microorganisms) - associated with vessel traffic/human access to reefs and terrestrial ecosystems carried by vessels, sea planes, divers/dive operations; introductions by individuals landing legally/illegal-ly at island sites (including researchers, managers, tourists - seeds carried on clothing, etc.); lack of specific vessel/gear sterilization techniques; shipwrecks.

■ **Marine debris** - impacts on organisms (entanglements, ingestibles, habitat destruction - i.e. destruction of benthic substrate in "shallow" water - and ecosystem disruption); as a mechanism for introduction and distribution of alien species (i.e. via pelagic plastics, nets, etc.)

■ **Inadequate cultural resource protection.**

■ **Significant cumulative impacts** from various combinations of the above threats; and from combinations of the above threats with natural stressors, including oceanographic/atmospheric events, climate change,



Scientists search for clues behind the death of this young emaciated Hawaiian monk seal.

including loss of terrestrial habitat.

- **Lack of data** on NWHI ecosystem structure, interrelationships, and function.

Key management needs identified by scientists included:

- **Enforcement**, surveillance, vessel monitoring, establishment of a permitting system, inspection, reporting requirements, prevention of violations, analysis of patterns of violations, and updated maps and charts, reflecting Reserve Preservation Area boundaries.

- The need for a coordinated system to track types, sources, frequencies, intensities, distribution, and **cumulative impacts of vessel activities** in the NWHI, including illegal activities.

- Improved **coordination** between agencies, scientists, stakeholders.

- Long term monitoring, emergency response planning, development of standards appropriate for conservation management, risk assessment and issue prioritization

- **Ensuring Native Hawaiian participation** in conservation management.

Areas of scientific uncertainty, lack of data.

Scientists described the lack of the most elementary data on NWHI marine ecosystem structure and function, including a lack of:

- Baseline information on economically and/or ecologically important species and their populations (leading to "shifting baseline" phenomena): life history, density, distribution, patterns of larval and adult dispersal and



Scientists highlighted the lack of knowledge about the impact of removing prey species from this little-known ecosystem. In the photo above, first published in the Honolulu Weekly, this highly endangered monk seal's stomach held at least seven lobsters.

recruitment, growth rates, reproductive rates;

- Baseline information on marine ecosystems: tides, currents, natural ecosystem characteristics, habitat diversity required by different life stages and species; key ecological requirements of species and their associated habitats;

- Information on trophic structure/community structure/predator-prey relations

- Identification of vulnerable species - endemic, rare, listed (endangered, threatened, migratory), apex predators (fish, cetaceans, birds, etc.), sensitive species (range limited due to temperature, salinity, light, contaminants, or life history characteristics);

- Biogeography, including connectivity between islands (for exploited species, endemics, etc.), habitat relationships

- Natural stressors

- Lack of understanding of causes of mortality in wildlife populations and of habitat requirements that may limit recovery of endangered/threatened species

- Information on loss of terrestrial habitat used by protected species for reproduction and impact of this loss on marine ecosystems (i.e. predation on turtle hatchlings, loss of ground cover on reef ecosystems, etc.)

Each section below contains presents issues, crucial data gaps, and research needs that were identified by the workgroups. The citations are grouped under headings titled, "Potential threats to the NWHI," "Key management needs identified by scientists," and "Areas of scientific uncertainty."

I. POTENTIAL THREATS TO THE NORTHWESTERN HAWAIIAN ISLANDS

All data are compiled from workgroup ("Breakout Group") forms completed at the NWHI Science Workshop in Honolulu, May 2003.

Workgroup/Breakout Group Topics: Commercial and Recreational Uses (ComRec); Cultural Heritage (Culture); Damage Assessment, Response, and Restoration (Damage); Habitat Delineation (Habitat); History and Archaeology (Hist/Arch); Living Marine Resources (LMR); Oceanographic Regime (Ocean); Stress on Living Resources (Stress); Threatened, Endangered, and Terrestrial Resources (Threatened)



Remnants of lobster trap from the shallow lagoon of Pearl and Hermes Atoll, 2000. Jim Maragos/USFWS.

Below are general categories of threats identified by scientists, followed by citations from the data sheets of the workgroup meetings, compiled by NOAA, and posted on the internet. The list conforms to the following format: Impact (# of groups discussing impact)

- Workgroup citation 1: issue/need/strategy/etc; (Name of workgroup, issue number from workgroup data form.)
- Workgroup citation 2: issue/need/strategy/etc; (Name of workgroup, issue number from workgroup data form.)

General Human Use (6 of 9 groups)

- Human visitation (terrestrial or shallow water areas) (Damage, Issue 12)
- Evaluate the impact of humans on the ecosystem (LMR, Issue 25)
- Impacts of socio-economic activities in NWHI and relation to MHI (ComRec, Issue 2)

- Acute anthropogenic effects (Ocean, Issue 7)
- Chronic anthropogenic effects (Ocean, Issue 6)
- Human impacts (Threatened, Issue 3)
- Human impacts on the ecosystem (Threatened, Need 3.5)
- Human impacts on native species

- (Threatened, Need 3.6)
- Assess anthropogenic effects that exacerbate natural impacts (Stress, Issue 7.4)
- Impacts associated with human activities occurring in NWHI (Threatened, Strategy 6)
- Prevent or minimize impacts to NWHI from existing and future human activities by type (Threatened, Strategy 7)
- Assess potential impacts of human activities by type. Need to assess potential impacts of human activities, including research, education, management, and commercial activities (Threatened, Strategy 8)
- Summarize existing relevant information on known impacts of identified types of human activities; assess impacts of specific activities, e.g. cruise ship voyages, marine debris removal, field camps, vessel source pollution, as needed (Threatened, Strategy 8)

Research Activities (6 of 9 groups)

- Threats to habitats - Research activities (Habitat, Need 11.9)
- Adverse effects of natural science research/restoration on historical/archaeological resources (Hist/Arch, Issue 19)
- Ecological disturbance to excavate at study sites (Hist/Arch, Issue 12)
- Evaluation of secondary impacts of research on marine living resources (LMR, Issue 22)
- Impacts of research activities (group listed activities that may have an impact, including facilities/structures, collections, anchoring, etc. - see Stresses by Issue, pg 3) (Stress, Issue 6, Need 6.2, 6.3)
- Impacts of research (ComRec, Strategy 5)
- Research should continue to include assessment of its own impacts (ComRec, Strategy 1)
- Management and research impacts (Habitat, Strategy 3)
- Impacts of research studies on habitat degradation are also important, especially for fishery (lobster) that involves trapping. Are research impacts severe and/or justification given lack of commercial fishery? (Habitat, Strategy 4)
- Cumulative impacts of research efforts in NWHI need to be assessed prior to recommending a research agenda (Habitat, Strategy 6)
- Field personnel need to be made aware of potential adverse effects on historical/archaeological resources (Hist/Arch, Strategy 2)
- Marine science surveys . . . need to consider any potential effects to historical/archeological resources (Hist/Arch, Strategy 3)
- Impacts of research need to be evaluated (Stress, Strategy 4)
- Impacts of the research need to be considered (Stress, Strategy 5)



In 1998, the lobster and longlining vessel Paradise Queen II was shipwrecked and abandoned at Kure Atoll, carrying 11,000 gallons of diesel fuel, 500 gallons of hydraulic fluids and oil, 1,040 plastic lobster traps, 11 miles of lobster pot mainline, and thousands of large lead weights.

- Assessing impact of habitat monitoring on habitat and populations (Threatened, Strategy 2)
- Impact - food habit studies are invasive and disruptive (Threatened, Strategy 3)
- Field activities must be reviewed to avoid or minimize impacts (Threatened, Strategy 8)
- Inventory and tracking of known invasive species. Potential impacts of doing this - human disturbance/activity related issues but nothing else (Threatened, Strategy 13)
- Impacts - collection of predators for food habits

would disrupt community (Threatened, Strategy 15)
Need to evaluate potential impacts of introduction on new locations (translocation of critically endangered species to reduce extinction potential) (Threatened, Strategy 17)

Vessel Traffic/Cruise Ships/Tourism/Military operations (5 of 9 groups)

- Threat assessment of vessel traffic impacts (e.g. cruise ships, fishing, aquarium trade) (ComRec, Issue 9)
- Impact of vessels, including transiting vessel impacts such as cruise ships. Possible categories of vessel activity types include fishing (commercial, recreational, and illegal), research and monitoring, management (e.g. marine debris), educational, ecotourism, cruise ships, misc commercial (e.g. cargo ships) (Stress, Strategy 7)
- Vessel impacts include debris, physical disturbance (garbage, sewage, noise, light, emissions), lost cargo (commercial vessels), lost ordnance (DOD), localized contaminants or enrichment (derelict/grounded) (Stress, Strategy 7)
- Need to assure that sufficient measures are in place to prevent or mitigate impacts to NWHI from vessel impacts related to various types of activities occurring, or likely to occur in the NWHI. Vessel groundings and

physical impacts of vessels was given highest rank of concern by the group (Stress, Strategy 8)

- Military operations (Damage, Issue 11)
- Threats to habitats - military activities (Habitat, Need 11.6)
- Past and future recreational use (consumptive and non-consumptive) understanding scale and impacts (ComRec, Issue 8)
- Analysis of impacts of recreational consumptive and nonconsumptive uses (ComRec, Need 8.2)
- Threats to habitats - Tourism, particularly cruise ships (locations and activities) (Habitat, Need 11.4)
- Recreational uses (consumptive and non-consumptive) - to define potential recreational demand for activities in the NWHI and the impacts (ecological, social, and economic) of different levels of use (ComRec, Strategy 6)

Vessel traffic and operations (lights, discharges of pollution, alien species, anchor damage, etc.) (Damage, Issue 5)

■ Characterize threats from vessels and activities (e.g. human presence, research, effluents, species introductions) (ComRec, Need 9.2)

■ Threats to habitats - vessel traffic and activities (Habitat, Need 11.1)

■ Vessel groundings (non oil-spill impacts) (Damage, Issue 2)

■ Threats to habitats - vessel groundings (Habitat, Need 11.3)

■ Environmental threat from Heritage vessels (Hist/Arch, Issue 16)

■ Impacts of vessels, including transiting vessels such as cruise ships (group also listed impacts, including groundings, bilge discharge, garbage, anchor impacts, sewage, ballast waste, biofouling, light, fuel, noise, etc. - see Stresses by Issue, pg 2-3) (Stress, Issue 2, Need 2.1, 2.2)

■ Vessel activity - there is currently limited monitoring of vessel activity in the NWHI and activity will likely increase in the future (analysis of threats posed by vessel activity; both point source and cumulative impacts in ecosystem context) (ComRec , Strategy 7)

■ Vessel Activity - lack of knowledge of number, type, and impacts of vessels transiting, visiting, and working in NWHI (Damage, Strategy 5)



■ Activities conducted and planned in NWHI have unknown impacts on the unique and specialized habitats and ecosystems in the NWHI. It is impossible to know the extent of the impacts without good baseline data...Objective: to protect the unique and specialized habitats and ecosystems from damage due to vessel activities and the operations associated with these activities (Damage, Strategy 6)

■ Grounded vessels and toxics - threats to habitat. Unknown distribution and quantity of toxics in NWHI and ecosystem impacts. Potential contaminant introduction from existing grounded vessels and risk from future groundings. Habitat alteration due to grounded vessels (e.g. cyanobacteria and alien species) (Habitat, Strategy 3)

■ Maps of threats to habitats - vessel traffic associated with research, commercial or recreational activities (including cruise ships and tourism) that may lead to groundings, introduction of alien species, pollution, debris, and general habitat alteration (Habitat, Strategy 5)

Fishing Impacts (5 of 9 groups)

■ Impacts of fishing gear

(ComRec, Need 9.5)

■ All gear impacts (commercial and research) (Damage, Issue 10)

■ Threats to habitats - Fishing activities (Habitat, Need 11.7)

■ Define and quantify impacts caused by extraction (LMR, Need 3.7)

■ Impacts of fishing, legal and illegal (group listed different fisheries - see Stresses by Issue, pg. 1) (Stress, Issue 4)

■ Habitat and community impacts caused by various fishing (e.g. anchor damage, interactions with endangered and threatened species, by-catch) (Stress, Need 4.3)

■ Direct and indirect fishing effects (ecosystem-level effects of fishing are poorly understood and difficult to quantify, management decisions are not always science-based, which can result in depleted stocks; direct and indirect impacts of fishing gear) - includes poaching, recreational, catch and release (ComRec, Strategy 8)

■ Fishery effects on habitat. NWHI fisheries have the

potential for significant adverse direct (operational) gear impacts, and ecosystem impacts. Fisheries related vessels are addressed in other strategy. (Habitat, Strategy 4)

- Ecosystem effects of existing fisheries. Habitat impacts from fishing gear. Includes - changes in species diversity and spatial distribution and structure; age/size structure of populations; changes in genetic structure over time; impacts on bycatch (Stress, Strategy 12)

- Effects of existing fisheries on non-protected species (Stress, Strategy 13)

- Fishing - protected species interactions...effects of fishing activities on protected species. (direct interactions and indirect impacts on forage base, competition and habitat relationships) (Stress, Strategy 14)

- Fishing - potential for and level of unauthorized fishing (Stress, Strategy 15)

Alien/Invasive Species (4 of 9 groups)

- Alien species - terrestrial and marine (Damage, Issue 9)

- Evaluate threats posed by aquatic nuisance species, including those in MHI, including understanding of vectors (LMR, Issue 1)

- Invasive species (Threatened, Issue 7)

- Impacts of invasive species on the ecosystem (Threatened, Need 7.7)

- Impacts of invasive species on native species (Threatened, Need 7.8)

- Impacts of terrestrial and marine alien or invasive species (group also listed possible sources and vectors, see Stresses by Issue, pg. 1) (Stress, Issue 5)

- Determine ecosystem consequences of various types of alien and invasive species (Stress, Need 5.3)

- Alien species and invasives (Damage, Strategy 4)

- Invasives prevention - there needs to be an assessment of risk of introduction of marine organisms (animals, plants, microorganisms) into the waters of the NWHI (e.g. invasives carried by vessels, sea planes, and

diver/diver operations coming in to the Reserve under permit) (Stress, Strategy 3)

- Invasives - Prevention of Introductions by people landing legally at island sites (researchers, managers, tourists). Alien species are disrupting native ecosystems. (Stress, Strategy 4)

- The risk of introduction by alien marine organisms (animals, plants, microbes) by unplanned, unpermitted activities needs to be addressed (Stress, Strategy 5)

- Trespassers cause an unknown amount of uncontrolled introduction of aliens in marine and terrestrial environments of the NWHI (Stress, Strategy 6)

- Invasive species - methods of control/eradication. Upon introduction of an IS, how do you eradicate or mitigate impact and restore native ecosystems to prevent further invasions? Impacts on wildlife could be substantial and should be assessed (Threatened, Strategy 11)

- Impact of IS on native species; impact of IS on ecosystems (Threatened, Strategy 12)

- Inventory and tracking of known invasive species.

Potential impacts of doing this - human disturbance/activity related issues but nothing else (Threatened, Strategy 13)

- Identification of source and vector and prevention of entry of invasive species. Need to keep native populations healthy to help prevent non-natives (Threatened, Strategy 14)



On June 5, 2000, the longline fishing vessel Swordman I, carrying 70 miles of longline, 500 pounds of fishhooks, and about 10,000 gallons of diesel fuel, was shipwrecked and abandoned on the eastern fringe of Pearl and Hermes Reef, home to Hawaiian monk seals, sea turtles, spinner dolphins and the highest number fish species in the Northwestern Hawaiian Islands. Longlining has been prohibited within 50 miles of the islands since 1991. NOAA photo.

Natural Oceanographic/ Atmospheric/Climate Change (5 of 9 groups)

- Extreme oceanographic atmospheric events (Damage, Issue 7)

- Effects of episodic natural effects (Ocean, Issue 8)

- Natural Stressors and Climate Change (group listed many types see Stresses by Issue, pg 1-2) (Stress, Issue 7)

- Natural stresses and climate change - information on natural stressors and climate change is inadequate to assess their impacts on NWHI marine and terrestrial living resources and the habitats on which they depend (Stress, Strategy 1)

- Natural stressors and climate change- insufficient info available on natural loss of terrestrial habitat used by protected species for reproduction and the impact of this on tropical marine systems (Stress, Strategy 2)

- Recovery of critically endangered species: determination of predation rates on turtle nestlings. Lack of understanding of the population effect of predation on green turtle hatchlings (Threatened, Strategy 15)

- Anthropogenic caused habitat shift (Damage, Issue 6)

- Climate change influences on key processes (e.g. coral growth) (LMR, Issue 19)

- Impacts of climate change (Ocean, Issue 5)

- Natural Stressors and Climate Change (group listed many types see Stresses by Issue, pg 1-2) (Stress, Issue 7)

- Natural stresses and climate change - information on natural stressors and climate change is inadequate to assess their impacts on NWHI marine and terrestrial living resources and the habitats on which they depend (Stress, Strategy 1)

Marine Debris (4 of 9 groups)

- Source and mitigation of marine debris (ComRec, Need 9.8)

- Marine debris impacts- habitat damage (Damage, Issue 3)

- Marine debris impacts - organisms (entanglements, ingestibles, and habitat) (Damage, Issue 4)

- Threats to habitats - marine debris (Habitat, Need 11.5)

- Debris impacts, including fishing and non-fishing debris (group listed potential sources, see Stress by Issue, pg 2) (Stress, Issue 3, Need 3.1 and 3.2)

- Marine Debris - limited ability to understand, prevent, and mitigate the impacts of marine debris on the NWHI ecosystem (ComRec, Strategy 2)

- Marine debris - entangles marine organisms; destroys benthic substrate in "shallow" water; may be a mechanism for the introduction and distribution of alien species; entire ecosystem impacts. (Damage, Strategy 1)

- Marine debris in the NWHI destroys reef habitat, entangles endangered species, and may act as a vector for the invasion of alien species (Damage, Strategy 2)

- Marine debris - ingestible - certain types of marine debris in NWHI are frequently ingested by wildlife resulting in some mortality (Damage, Strategy 3)

- Marine Debris - threats to habitat. Marine debris can lead to habitat destruction and ecosystem disruption. Entangles, suffocates, and interferes with protected species. (Habitat, Strategy 2)

- Marine debris has been identified as perhaps the biggest existing anthropogenic impact on shallow-water NWHI ecosystems (Habitat, Strategy 2)

- Marine debris impacts wildlife and habitat in the NWHI (Stress, Strategy 9)

- Evaluate the impacts of debris on wildlife and habitat. Some impacts are well documented but overall impact is poorly understood... Understand the impacts of debris and its removal on organisms and habitats (Stress, Strategy 10)

- Debris that is causing impacts needs to be prevented or removed (Stress, Strategy 11)

Hazardous Materials/Pollution (3 of 9 groups)

- Oil sources (terrestrial and marine) (Damage, Issue 1)

- All sources of hazmat (non-oil) (Damage, Issue 8)

- Threats to habitats - toxics, hazardous waste, unexploded ordnance (Habitat, Need 11.2)

- Grounded vessels and toxics - threats to habitat. Unknown distribution and quantity of toxics in NWHI and ecosystem impacts. Potential contaminant introduction from existing grounded vessels and risk from future groundings. (Habitat, Strategy 3)

- Identify sources and effects of contaminants on wildlife (and habitats) in NWHI (Stress, Strategy 16)

- Effects of contaminant clean up methods on wildlife (physical and chemical) (Stress, Strategy 16)

Wildlife Health and Disease (3 of 9 groups)

- Disease threats and vectors (LMR, Issue 20)

- Wildlife health, including diseases (group listed stresses including contaminants, microorganisms, oil spills, trauma, toxic blooms, parasites, See Stresses by Issue, pg. 1) (Stress, Issue 1)

- Identify threat posed by cumulative effects (Stress, Need 1.4)

- Identify sources and effects of contaminants on

wildlife (and habitats) in NWHI (Stress, Strategy 16)

- Effects of contaminant clean up methods on wildlife (physical and chemical) (Stress, Strategy 16)

- Identify effects and sources of infectious diseases in wildlife (Stress, Strategy 17)

- Evaluate sources and effects of natural toxins on wildlife (Stress, Strategy 18)

- Detecting changes/causes in background mortality of target species...significant findings (e.g. lead in Laysan albatross, longline take of albatross, turtles, sharks) (Threatened, Strategy 4)

- Assessing impact of invasive diseases on flora and fauna. Lack of info on impact and presence of invasive pathogens on native terrestrial and marine flora/fauna and methods to manage it (Threatened, Strategy 10)

- Example: Laysan ducks are infected with a parasite that causes significant pathology. Trying to translocate ducks and not the parasite will take considerable investigations that infected ducks can be identified and treated (Threatened, Strategy 10)



Inadequate Cultural Resource Protection (2 of 9 groups)

- Natural resource managers may not have sensitivity to cultural heritage issues, and that lack of understanding leads to uninformed management decisions. (Culture, Strategy 1)

- Natural and cultural heritage resources management are seen as

separate and unrelated. As a result cultural heritage resources are often neglected or not considered (Culture, Strategy 3)

- Field personnel need to be made aware of potential adverse effects on historical/archaeological resources (History, Strategy 2)

- Marine science surveys . . . need to consider any potential effects to historical/archeological resources (History, Strategy 3)

Lack of Basic Scientific Data (all groups)

All of the groups identified the significant lack of basic scientific data regarding the NWHI ecosystem as a major problem. (See Areas of Scientific Uncertainty)

II. MANAGEMENT STEPS AND INITIATIVES IDENTIFIED BY SCIENTISTS

All data are compiled from workgroup ("Breakout Group") forms completed at the NWHI Science Workshop in Honolulu, May 2003.

Workgroup/Breakout Group Topics: Commercial and Recreational Uses (ComRec); Cultural Heritage (Culture); Damage Assessment, Response, and Restoration (Damage); Habitat Delineation (Habitat); History and Archaeology (Hist/Arch); Living Marine Resources (LMR); Oceanographic Regime (Ocean); Stress on Living Resources (Stress); Threatened, Endangered, and Terrestrial Resources (Threatened)

Below are general categories of threats identified by scientists, followed by citations from the data sheets of the workgroup meetings, compiled by NOAA, and posted on the internet. The list conforms to the following format: Management need (# of groups discussing management need)

- Workgroup citation 1: issue/need/strategy/etc; (Name of workgroup, issue number from workgroup data form.)

- Workgroup citation 2: issue/need/strategy/etc; (Name of workgroup, issue number from workgroup data form.)

Improved Enforcement, Surveillance (including VMS and inspections), Analysis and Prevention of Violations in NWHI (7 of 9 groups)

- Monitoring and enforcement of existing fisheries (ComRec, Issue 15)
- Analysis of records of fishing violations in NWHI (ComRec, Need 15.4)
- Analysis of violations in NWHI and other regions (ComRec, Need 9.3)
- Development of enforcement regulations (Damage, Need 3.9)
- Enforce! (Hist/Arch, Strategy 4)
- Mapping to support management needs: e.g. RPA boundaries (Habitat, Need 2.2 and Issue 7)
- Surveillance technology for enforcement (Habitat,

Need 11.8)

- Preservation/protection/enforcement (lack of management presence) (Hist/Arch, Issue 2)

- Review of enforcement needs vs. capabilities (Hist/Arch, Need 2.6)

- Evaluate (MPA) enforcement (viability, clarity of boundaries, commitment, resources) (LMR, Need 21.5)

- Vessel Impacts - Identify and evaluate prevention and mitigation methods, including penalty schedule based on habitat valuation (Stress, Need 2.3)

- Need to enforce MARPOL! (ComRec, Strategy 2)

- Until there is demonstrable enforcement of closed areas in NWHI, research can not be expected to reveal differences between "closed" and "open" areas (ComRec, Strategy 5)

- Vessel and Activity Monitoring - float plan requirement for all vessels, VMS or other technology, observers, permits, analysis of past violations by operators requesting permits, monitor permit compliance (ComRec, Strategy 7)

- Monitoring, enforcement, response (Habitat, Strategy 5)

- Cost-effectiveness of enforcement methods (ComRec, Need 15.6)

- Inventory of assets/resources to protect historical/archaeological resources. Initiate the process of efficient preservation and protection and enforcement of management goals with the NWHI. Identification of partners, develop framework for protection, preservation, enforcement management plan, integrate objectives with overall goal of protection the NWHI (includes water craft, remote sensing, satellite technology, radar). (Hist/Arch, Strategy 7)

- Prevention of Alien introductions due to inadvertent or unplanned and unpermitted vessels or objects/debris. Develop and improve early detection and rapid response to introduction from unplanned vessels and debris groundings. (Stress, Strategy 5)

- Invasives prevention by detection of trespassing. Methods for remote detection and tracking of entry into the reserve...to reduce the rates of trespassing and facilitate enforcement. (Stress, Strategy 6)

- Prevention and mitigation of vessel impacts, including penalty schedule based on habitat valuation. Identify

or develop as needed measures such as conditions to be attached to permit...(Stress, Strategy 8)

- Prevent or mitigate damage to NWHI from impacts related to vessel activities, through surveillance, enforcement of permit conditions, regulations, education and outreach, and other measures, as needed. This strategy should include measures to prevent or mitigate single and cumulative impacts of vessel activities in NWHI through a coordinated state/federal partnership for management, protection, and enforcement. (Stress, Strategy 8)

- Monitoring and surveillance of potential unauthorized fishing activities. (Stress, Strategy 15)

- Monitoring and enforcement of existing fisheries (ComRec, Issue 15)

- Vessel traffic and activity reporting requirements (ComRec, Need 15.1)

- Vessel traffic and activity report requirements (type, location, time) (ComRec, Need 9.1)

- Vessel activity (number, frequency, destination, anchorage and identification of vessels, cargo, discharges, missions, no of people) (Damage, Need 5.1)

- Ship traffic and source quantities (reporting) (Damage, Need 5.7)

- Vessel traffic monitoring (location, activity) by VMS, observers, etc. (ComRec, Need 15.2)

- Surveillance technology for enforcement (Habitat, Need 11.8)

- Evaluation of "technology" available to track visitation (Hist/Arch, Need 2.5)

- Inventory of human activity by time/location (Threatened, Need 3.1)

- Vessel and Activity Monitoring - float plan requirement for all vessels, VMS or other technology, observers, permits, analysis of past violations by operators requesting permits, monitor permit compliance, reporting requirements (ComRec, Strategy 7)

- Vessel surveillance system to provide data on ship numbers, traffic patterns, and ship-board or ship-based activities (Damage, Strategy 5)

- Unified permitting system to provide data on research and use activities, personnel numbers, cargo, and limit negative impacts of shipboard and resource use operations, especially discharges, anchorages, and ecosystem disruption (Damage, Strategy 5)

- Vessel activity - provide centralized data collection and management (Damage, Strategy 5)

- Characterize and map vessel activity (Habitat,

Strategy 5)

- Monitoring, enforcement, response (Habitat, Strategy 5)

- Should not allow activities that can't be monitored (Habitat, Strategy 5)

- ID people/agencies/ institutions that access the NWHI. Develop information and outreach educational material for all potential users that is tied to the permitting process. (Hist/Arch, Strategy 4)

- Develop and implement procedures to effectively prevent transfers and introductions of marine aliens. Development of rigid inspection protocols. (Stress, Strategy 3)

- Invasives prevention by detection of trespassing. Methods for remote detection and tracking of entry into the reserve...to reduce the rates of trespassing and facilitate enforcement. (Stress, Strategy 6)

- There is a need for coordinated management of NWHI vessel activities to prevent or minimize impacts associated with these activities. Need a coordinated system for tracking the types, sources, frequencies, intensities, distribution, and cumulative effects of vessel activities in the NWHI including illegal activities. (Stress, Strategy 7)

- Implement land, sea, and air/satellite based surveillance, permitting and notification systems, and associated database reporting system, as needed to systematically monitor and report vessel activity by type in the NWHI. (Stress, Strategy 7)

- Strategy should also include voluntary self-reporting wherever possible and data QA and verification efforts. (Stress, Strategy 7)

- Prevention and mitigation of vessel impacts...Identify or develop as needed measures such as conditions to be attached to permits; protocols to be followed; education and outreach materials for user communities. (Stress, Strategy 8)

- Prevent or mitigate damage to NWHI from impacts related to vessel activities, through surveillance, enforcement of permit conditions, regulations, education and outreach, and other measures, as needed. (Stress, Strategy 8)

- Monitoring and surveillance of potential unauthorized fishing activities. (Stress, Strategy 15)

- Inventory and track human activity by time/location. Need a database and reporting system to inventory and track human activities in the NWHI by type, location, and duration. (Threatened, Strategy 6)

- There is a need to identify and implement effective measures for prevention and mitigation of potential impacts from human activities in NWHI... by identifying needed permit conditions, inspections, guidelines, education and outreach by agencies. (Threatened, Strategy 7)

- Assess potential impacts of human activities by type...results of this project should be reflected in guidelines and permit conditions attached by agencies acting on permit applications, and educational and outreach to parties not requiring permits. (Threatened, Strategy 8)

- Methods of preventing introductions (e.g. permit conditions, education/outreach). (Threatened, Strategy 14)

Improved coordination between agencies, scientists, stakeholders, etc.

(6 of 9 groups)

- There is a need for coordinated management of NWHI vessel activities to prevent or minimize impacts associated with these activities. Need a coordinated system for tracking the types, sources, frequencies, intensities, distribution, and cumulative effects of vessel activities in the NWHI including illegal activities. (Stress, Strategy 7)

- Prevent or mitigate damage to NWHI from impacts related to vessel activities, through surveillance, enforcement of permit conditions, regulations, education and outreach, and other measures, as needed. This strategy should include measures to prevent or mitigate single and cumulative impacts of vessel activities in NWHI through a coordinated state/federal partnership for management, protection, and enforcement. (Stress, Strategy 8)

- Coordination of mapping efforts/survey efforts (Habitat, Issue 6)

- Integrate community to define mapping priorities (Habitat, Need 2.1)

- Coordination of Native Hawaiian issues across multiple jurisdictions (e.g. terrestrial/USFWS) (Culture, Need 16.5)

- Fusion of science with existing fisheries (onboard observers, better collection and analysis of fishery data, characterization of catch) (ComRec, Issue 5)

- Lack of coordination between natural scientists and social scientists in surveys, mapping (Hist/Arch, Issue 10)

- Identify potential for cross-disciplinary training of survey personnel. (Hist/Arch, Need 10.3)

- Combine cultural practices with scientific research - Design model project for cooperation between ocean research and traditional practices (TEK) (Culture, Strategy 2)

- Designing a process and creating information resources needed to understand and initiate interdisciplinary management of NWHI (cultural and natural resources management (Culture, Strategy 3)

- Coordination - Develop a process to ensure organizations coordinate on inventorying available data (Habitat, Strategy 7)

- Coordination - critical strategy to ensure comprehensive conservation and protection of the NWHI (Habitat, Strategy 7)

- Perform analyses to assess gaps and identify opportunities for collaboration (Habitat, Strategy 7)

- Mapping to support management needs: need to map priority areas within NWHI and ensure maximum possible coordination among management/ conservation agencies (Habitat, Strategy 8)

- Infrastructure - Habitat data synthesis - Develop an active technical liaison assistance and training program to seek out data sources from agencies, etc. and help them set up standardized data acquisition methods as well as converting old data to a common format and offering training in its use (made available easily) (Habitat, Strategy 11)

- Create a database that reviews and compiles data, studies, articles, assessments of the area. Inter-agency agreements will be necessary. Formation of a working group with a coordinator. Goal is easily accessible product, preferably with each product georeferenced to the location of the study. Make database available to everyone. Goal is to have it widely used (Habitat, Strategy 13)

- Coordinating mapping activities for priority species identified by management needs (Habitat, Strategy 14)

- Pre-mission interdisciplinary training. To ensure that natural science field personnel are aware of potential adverse effects their activities may have on historic and archaeological resources just as social science field personnel must be aware of their potential impacts on natural resources. Develop training workshop and materials. Enhances coordination between social science and natural science personnel and fields (Hist/Arch, Strategy 2)

- Marine science surveys need to consider agency responsibilities towards historic/archaeological surveys in

any survey mission to the NWHI; also need to consider any potential effects to historical/archaeological resources. To resolve the issue that responsibilities for hist/arch surveys are included and related resources are treated appropriately (Hist/Arch, Strategy 3)

- Develop cooperative agreements with all users and governing bodies (Hist/Arch, Strategy 4)

- Develop function models that allow us to predict outcomes and identify gaps in understanding. Use pre-existing data from literature, newly acquired field data, and relevant data from other programs to develop a functional model of ecosystem function and relationships. (LMR, Strategy 8)

- Develop a cooperative program with agencies collecting data on natural environmental variability - main recommendation is to have a separate workshop on this topic to bring together existing information and identify gaps in information, then develop strategies. (Stress, Strategy 1)

Long Term Monitoring (7 of 9 groups)

- Long term monitoring of populations and fisheries (ComRec, Need 12.4)

- Alien species - terrestrial and marine - long term monitoring (Damage, Need 9.6)

- Long term oceanographic monitoring (Damage, Need 7.1)

- Long term monitoring of natural and human-caused variation at relevant spatial and temporal scales (LMR, Issue 10)

- MPA design and evaluation, including goals and design criteria, monitoring, and using hydrodynamic models for decisions about locations and sizes (LMR, Issue 21)

- Evaluate effectiveness - MPA (e.g. pre-designation baseline, reference comparisons, time-series monitoring, well designed studies of cause and effect) (LMR, Need 21.8)

- Long term monitoring of physical and biological indicators (Ocean, Need 5.2 and Need 8.1)

- Long term demographic data (Threatened, Need 2.1)

- Long term physical/environmental data (Threatened, Need 2.4)

- Ongoing monitoring must be question driven (ComRec, Strategy 5)

- Regular Surveys - Establish program for periodic benthic biological community and habitat surveys - sur-

veys include benthic inventories, fish, habitat characterization (Habitat, Strategy 12)

- Design an effective management oriented monitoring program for NWHI. No one existing monitoring program has been identified as ideal for management needs - a program design effort is needed. (LMR, Strategy 9)

- Have a workshop to review and describe monitoring program for NOWRAMP 2003 and beyond. (LMR, Strategy 9)

- Develop a comprehensive ocean observing system at varying scales to characterize the NWHI environments; drive or force hydrodynamic, climate, and coupled hydrodynamic and ecosystem models; establish and evaluate MPAs, plan response activities (HAZMAT); evaluate stock structure endemism and recruitment. (Ocean, Strategy 3)

- Long term monitoring of biological and physical indicators. (Ocean, Strategy 4)

- Criteria for selecting species to monitor - tractability, economics, known or suspected ecologic importance, protected/threatened species, sensitive/opportunistic indicators of change, water column (phytoplankton), taxonomic and trophic representative species, functional diversity. (Ocean, Strategy 4)

- Development of mitigation methods for marine debris...Monitor effectiveness of mitigation. (Stress, Strategy 11)

- Monitor indicators of ecosystem health. (Stress, Strategy 12)

- Initiate long-term demographic studies on indicator species; identify indicator species and which parameters to monitor for each indicator species (Threatened, Strategy 5)

- Need continual (invasives) monitoring/tracking. (Threatened, Strategy 13)

- Long term monitoring of introduced populations (translocation of critically endangered species to reduce extinction potential) (Threatened, Strategy 17)

Issue Prioritization, Risk Assessment, and Development of Management Goals and Objectives (6 of 9 groups)

- MPAs should preserve one of the world's most unique marine ecosystems, which is dominated by apex predators and has a high proportion of endemic species and communities that may serve critical ecosystem func-

tions. (LMR, Strategy 4)

■ MPA design - Goal Definition. Goals must be well-defined prior to the creation of MPAs. NWHI is one of the last intact coral reef systems on earth and we need the most effective management possible. We need to determine the types of MPAs needed, where they will be located, and what their boundaries will be. Define goals for creation of MPAs for biodiversity conservation, threatened and endangered species protection, fisheries rehabilitation, fisheries enhancement, and habitat rehabilitation. Use MPAs to better manage the NWHI. (LMR, Strategy 2)

■ There is a need to target resources based on maximum benefits to organisms and the ecosystem. (Stress, Strategy 11)

■ Ranking relative risks of invasives (Threatened, Strategy 12)

■ Lobster fishery closure, clarification of executive order (ComRec, Issue 10)

■ Ranking of priorities (preservation, protection, enforcement - lack of management presence) (Hist/Arch, Need 2.4)

■ Define risks associated with management decisions (ComRec, Need 7.5 and Need 3.5)

■ Evaluation of probable impacts of management decisions prior to implementation (ComRec, Issue 14)

■ Direct and indirect fishing effects - management decisions are not always science-based, which can result in depleted stocks (ComRec, Strategy 8)

■ Natural Stressors and climate change. Investigate impacts and mitigate problems as appropriate after a complete evaluation of the management alternatives are considered and evaluated. (Stress, Strategy 2)

■ There is a need to continue on-going research activities that investigate interactions, rates, and effects of fishing activities on protected species. (Stress, Strategy 14)

■ Integrate community to define mapping priorities (Habitat, Need 2.1)

■ Define management objectives for development of ecosystem models (LMR, Need 3.16)

■ MPA design and evaluation, including goals and design criteria, monitoring, and using hydrodynamic models for decisions about locations and sizes (LMR, Issue 21)

■ Define goals for MPAs (biodiversity conservation, fisheries rehabilitation, threatened and endangered species protection, habitat rehabilitation, fisheries enhancement, etc.) (LMR, Need 21.1)

■ Prevent and mitigate marine debris in a cost effective manner; focus efforts by degree of impact (ComRec, Strategy 2)

■ Use management priorities to identify environmental threats and their likely impacts on the environment, then select metrics and design sampling programs to allow the detection and distinction between anthropogenic and natural change. (LMR, Strategy 9)

■ Define biological mapping need - e.g. lobsters, pelagics, bottom fisheries, endemic, invasive, sensitive areas, temporal variability (Habitat, Strategy 6)

■ Identify priority sites for mapping, monitoring, and management (Habitat, Strategy 9)

■ Identify areas of particular concern including areas impacted by any event (Habitat, Strategy 12)

■ Identify representative areas (Habitat, Strategy 12)

■ Mapping areas of ecological significance, coordinating mapping activities for priority species identified by management needs (Habitat, Strategy 14)

■ Need to refine areas of greatest importance based on all existing information, i.e. fishermen, scientific literature (Habitat, Strategy 14)

■ Prioritize species list to represent selective habitats, e.g. bottomfish, reef fish, monk seals, turtles (Habitat, Strategy 14)

Updated Maps and Charts (5 of 9 groups)

■ Mapping to support management needs: RPA boundaries; need to map priority areas within NWHI and ensure maximum possible coordination among management/ conservation agencies. Reserve requires maps immediately (Habitat, Strategy 8)

■ RPA boundaries published on nautical charts (Habitat, Strategy 8)

■ Collect and publish data on RPA boundaries (Habitat, Strategy 8)

■ Map delineating jurisdictional boundaries (ComRec, Need 15.5)

■ Updated accurate charts (Damage, Need 5.5)

■ Integrate community to define mapping priorities (Habitat, Need 2.1)

■ Mapping to refine EFH designation for existing FMPs (Habitat, Need 2.3)

■ Mapping of sensitive areas (e.g. erosion, coral bleaching) (Habitat, Need 2.6)

■ Mapping of invasive species for removal and restoration (Habitat, Need 2.4)

■ Mapping of biodiversity, particularly endemics

(Habitat, Need 2.5)

- Mapping living resource distributions (Habitat, Issue 8)
- Pelagic habitat mapping (Habitat, Issue 14)
- Mapping of marine-terrestrial interactions (Habitat, Issue 3)
- Generate habitat maps (including abiotic and biotic features) (LMR, Need 21.7)
- Good maps to delineate protected areas so that regs can be enforced (ComRec, Strategy 7)
- Existing habitat maps and ESI maps are limited in their management utility. New data and maps are needed at finer resolution to clearly delineate areas that are unique, sensitive, active research, or subject to high traffic and potential disruption (Damage, Strategy 6)
- Integrate data from research and historical fishery to develop maps of effort, gear type, and target species, and integrate with habitat data (Habitat, Strategy 4)
- Need good charts of areas visited (Habitat, Strategy 5)
- Need to develop maps of organisms (both endemic and invasive) and associated habitats to support EFH, sensitive areas, and other management and scientific needs (Habitat, Strategy 6)
- Define biological mapping need - e.g. lobsters, pelagics, bottom fisheries, endemic, invasive, sensitive areas, temporal variability (Habitat, Strategy 6)
- Refine management boundaries (Habitat, Strategy 9)
- Mapping areas of ecological significance, coordinating mapping activities for priority species identified by management needs (Habitat, Strategy 14)
- Develop a GIS database of distributions, habitat associations, and genetic characteristics of selected species, throughout the archipelago. (LMR, Strategy 5)
- Develop GIS database for invasives. (Threatened, Strategy 13)

Development of standards appropriate for conservation management and protection of ecosystem integrity (4 of 9 groups)

- Research should be responsible to management needs with testable hypotheses and benchmarks (LMR, Issue 27)
- Research should continue to include assessment of

its own impacts (ComRec, Strategy 1)

- Clarify acceptable vessel operations and practices (Damage, Strategy 5)
- Best management practices for ship ops (protocols for managing light, discharges, wildlife interactions, etc.) (Damage, Need 5.3)
- Marine Debris removal (lines and nets) - remove debris with minimal damage to coral reef habitat in an environmentally sound manner (removed by divers and placed on a ship for transport out of NWHI) (Damage, Strategy 2)
- Marine Debris - ingestible - removal of debris in pelagic environment as well as land (Damage, Strategy 3)
- Best management practices for fuel and chemicals (Habitat, Strategy 3)
- Develop best management practices (Habitat, Strategy 5)
- Using maps to design sampling schemes for monitoring programs (Habitat, Strategy 9)
- Develop standards for habitat classification (Habitat, Strategy 9)
- Infrastructure - Habitat data synthesis - Develop an active technical liaison assistance and training program to seek out data sources from agencies, etc. and help them set up standardized data acquisition methods as well as converting old data to a common format and offering training in its use (made available easily) (Habitat, Strategy 11)
- Establish standards for data collection, inventory, mapping, field methods (Habitat, Strategy 2)
- Standardize habitat characterizations - both the names of habitat types and georeference coordinates (Habitat, Strategy 13)

Emergency Response and Contingency Planning (4 of 9 groups)

- Monitoring, enforcement, response (Habitat, Strategy 5)
- Prevention of Alien introductions due to inadvertent or unplanned and unpermitted vessels or objects/debris. Develop and improve early detection and rapid response to introduction from unplanned vessels and debris groundings. (Stress, Strategy 5)
- Contingency plan development (Ocean, Need 7.2)
- Develop a comprehensive ocean observing system at varying scales to characterize the NWHI environments...plan response activities (HAZMAT)... (Ocean,

Strategy 3)

- Compile data on catastrophic natural events and develop a data reference base. Also develop criteria for future data collection should an event occur. (Ocean, Strategy 5)

- Need for funding for rapid response emergency action plans to investigate unusual mortalities including having proper logistics in place for timely response. (Threatened, Strategy 10)

- Need an emergency action plan ("rapid response") to deal with sudden occurrence of invasives (e.g. ship grounding/rat introduction or sudden appearance of a very invasive plant species). This should be in the form of a multi-agency protocol. (Threatened, Strategy 11)

Ensure Native Hawaiian Participation in Conservation Management (3 of 9 groups)

- Ensure Native Hawaiian issues will be part of management/action plan (Culture, Issue 16)

- Identify existing cultural and traditional knowledge through stakeholder input (LMR, Need 21.6)

- Social scientist training for natural resource managers - to enhance understanding of Native Hawaiian issues, resources, and practices and develop a network of contacts (Culture, Strategy 1)

- Identification of Native Hawaiian issues and Definition of terms such as values, rights, responsibilities, etc...to get representative participation of the NH community in determining relevant issues, how they will be addressed, and who will represent them in the process (Culture, Strategy 4)

- Ensure that Native Hawaiians are fully engaged in the decision-making process (Culture, Strategy 5)

- Conduct workshop to discuss what others have done to include native peoples, for example Maori/NZ; Canada, Greenland, Alaska, Pacific NW - starting point of a definition of what "full participation in the process" means (Culture, Strategy 7)

- Identification of key stakeholders and solicitation of comments re: archaeological resources. Secure broad participatory representation in historical/archaeological resource component of mgt. plan process. (Hist/Arch, Strategy 6)

Creation and Development of Education/Outreach materials (3 of 9

groups)

- Prevention and mitigation of vessel impacts...Identify or develop as needed measures such as conditions to be attached to permits; protocols to be followed; education and outreach materials for user communities. (Stress, Strategy 8)

- Prevent or mitigate damage to NWHI from impacts related to vessel activities, through surveillance, enforcement of permit conditions, regulations, education and outreach, and other measures, as needed. (Stress, Strategy 8)

- There is a need to identify and implement effective measures for prevention and mitigation of potential impacts from human activities in NWHI... by identifying needed permit conditions, inspections, guidelines, education and outreach by agencies. (Threatened, Strategy 7)

- Assess potential impacts of human activities by type...results of this project should be reflected in guidelines and permit conditions attached by agencies acting on permit applications, and educational and outreach to parties not requiring permits. (Threatened, Strategy 8)

- Public interpretation and education (Hist/Arch, Issue 15)

- Identify outreach audience and venues/opportunities and appropriate partners (Hist/Arch, Need 15.1 and Need 15.5)

- Develop information and outreach educational material for all potential users that is tied to the permitting process (Hist/Arch, Strategy 4)

- Need to create educational outreach program and curriculum to raise awareness about the history and archaeology of the NWHI. Gather existing oral histories, historical accounts, data collected for past investigations/expeditions and publications to create educational materials and curriculum standards. (includes multi-disciplinary K-12 curriculum, bilingual exhibits, web site, adult, public, target group outreach) (Hist/Arch, Strategy 5)

- Develop a working definition for invasive species and alien species; develop field identification materials for each taxon (Threatened, Strategy 13)

- Methods of preventing introductions (e.g. permit conditions, education/outreach). (Threatened, Strategy 14)

III: AREAS OF SCIENTIFIC UNCERTAINTY/ LACK OF DATA

All data are compiled from workgroup ("Breakout Group") forms completed at the NWHI Science Workshop in Honolulu, May 2003.

Workgroup/Breakout Group Topics: Commercial and Recreational Uses (ComRec); Cultural Heritage (Culture); Damage Assessment, Response, and Restoration (Damage); Habitat Delineation (Habitat); History and Archaeology (Hist/Arch); Living Marine Resources (LMR); Oceanographic Regime (Ocean); Stress on Living Resources (Stress); Threatened, Endangered, and Terrestrial Resources (Threatened)

Below are general categories of threats identified by scientists, followed by citations from the data sheets of the workgroup meetings, compiled by NOAA, and posted on the internet. The list conforms to the following format: Data need (# of groups discussing need)

■ Workgroup citation 1: issue/need/strategy/etc; (Name of workgroup, issue number from workgroup data form.)

■ Workgroup citation 2: issue/need/strategy/etc; (Name of workgroup, issue number from workgroup data form.)

Lack of Basic Data (8 of 9 groups)

■ Lack of population and trophic structure information of economic and ecologically important species (Com/Rec, Issue 12)

■ Incomplete information on natural ecosystem characteristics (Com/Rec, Issue 4)

■ Baseline data for habitat monitoring (Habitat, Issue 13)

■ Shifting baseline (Habitat, Need 13.7)

■ Biogeography, including connectivity within NWHI and between the NWHI and MHI, including a focus on exploited species and endemics (LMR, Issue 2)

■ We do not understand habitat requirements that may limit recovery of endangered and threatened species in the NWHI (Threatened, Strategy 9)

■ Insufficient information on species, their life history, population and community structure, all of which is needed to understand the ecosystem, how it functions and how to manage it effectively (ComRec, Strategy 1)

■ Need to understand trophic interactions and demographic parameters of target and other key species, response of stock to fishing pressure, characterize catch (including poaching), and characterize direct and indirect impacts of fishing gear (ComRec 8)

■ Basic assessment (taxonomy) including habitat relationships (LMR, Issue 4)

■ Relationship between monk seal populations and community dynamics of monk seal prey species (LMR, Issue 4)

■ Wildlife health, including diseases (Stress, Issue 1)

■ Establish a baseline for types, prevalence, morbidity and mortality (Stress, Issue 1, Need1)

■ Patterns of larval juvenile and adult dispersal and recruitment, including ontogenetic movement patterns and behavior. Population genetic structure. Habitat diversity required by all stages and species/habitat affinities (LMR, Strategy 3)

■ Characterize types of natural stressors, their baselines and temporal and spatial variations (Stress, Issue 7, Need 1)

■ Basic assessment of LMR. The number of coral, invertebrate, algae, fungi, etc (terrestrial and marine) species are unknown in the NWHI, especially in deep water. To promote biodiversity and insure adequate management and protection of species, proper species identification (especially endemics) and species ranges are necessary (LMR, Strategy 6)

■ Long term monitoring of biological and physical indicators. Insufficient/incomplete information on biological and physical attributes to establish baselines to monitor temporal change and to provide input for coordinated and structured ecosystem models (Ocean, Strategy 4)

■ Lack of understanding of causes of mortality in wildlife populations of the NWHI...need to gain a better understanding of changes in mortality and impact on wildlife populations (Threatened, Strategy 4)

■ Recovery of critically endangered species: translocation methods. Population of several species at single sites, vulnerable to catastrophic/stochastic loss - need populations at multiple sites (Threatened, Strategy 17)

■ Need baseline for areas/times affected; assessment of habitat sensitivity (e.g. carrying capacity) (Habitat, Strategy 5)

- The paucity of basic information on infectious diseases on wildlife in NWHI. (Stress, Strategy 15)

- Need historic data (Habitat, Strategy 9)

- Inventory of historic/archeological resources. Lack of complete inventory of resources for management and research purposes. This strategy is critical to all related presentation strategies and issues. The resources inventory is the "core" for other issues such as preservation schemes, protection issues, management approaches (Hist/Arch, Strategy 1)

- Are MPAs effective in meeting the goal for which they were established? Baseline study, determination of response variable, determine levels of use (LMR, Strategy 12)

- Develop baseline to monitor temporal changes and to provide inputs for coordinated and structured ecosystem model (Ocean, Strategy 4)

- Identify indicator species and determine the effects of natural changes upon them; maintain long term monitoring to assess natural stresses (Stress, Strategy 1)

- Info on natural stressors and climate change is inadequate to assess their impacts on NWHI marine and terrestrial living resources and the habitats on which they depend (Stress, Strategy 1)

- Baseline inventories of NWHI fauna and flora; protection of activity and traffic; specific sterilization and detection techniques; pathway studies, biology of dispersal (Stress, Strategy 1)

- Data on regional climate, oceanographic, existing and future. (Threatened, Strategy 1)

- Baseline georeferenced habitat data in impacted areas (Damage, Issue 5, Need 2; Issue 3, Need 11)

- Distribution, type, amount, sources and effects of different toxics (Habitat, Strategy 3)

- At present there is no information on ocean pH to assess ocean acidification as a general phenomenon and at specific reef sites (Stress, Strategy 1)

- Lack of basic information on sources and effects of contaminants on wildlife in the NWHI. (Stress, Strategy 15)

- Lack of data access (Habitat, Strategy 11)

- Due to the remote nature/expansive nature of NWHI preservation/protection/enforcement is difficult. NWHI CRER must find effective methods of preservation/protection (Hist/Arch, Strategy 7)

- Establish baseline information on key species and their populations as a rational basis for conservation and management (ComRec, Strategy 1)

- Understanding fishery data relative to marine protected areas; relative response to short and long-term natural perturbations and/or change; info about the impacts of catch and release (ComRec 8)

- Need to understand species interactions and dynamics to better manage and conserve the community and ultimately the ecosystem (ComRec, Strategy 3)

- Insufficient information on population structure and dynamics which are needed to make proper judgments in resource management (ComRec, Strategy 4)

- Endangered species and habitat delineation - it is impossible to know the extent of the impacts without good baseline data. (Damage, Strategy 5)

- It is difficult to mitigate harm and manage operation without some measure of sensitivity of habitats and ecosystems to disruption (Damage, Strategy 5)

- Distribution of endangered, protected and rare species near events (grounded vessels and toxics) (Habitat, Strategy 3)

- In order to describe variability and impacts of specific events, changes in natural system, we need to monitor long-term; and update baseline habitat data (Habitat, Strategy 12)

- Inventory of existing habitat data - do we have an adequate baseline of habitat data? Need to know previous studies on habitat, where, when, how done, who did them. Can we identify gaps in the data? Identify where to duplicate efforts and where not to duplicate metadata (Habitat, Strategy 13)

- Habitat data - metadata development, conversion of data (digitizing), data quality assessment, bibliography (Habitat, Strategy 13)

- Identify habitats that are ecologically significant (Habitat, Strategy 14)

- Identify species of particular concern (aquarium, fisheries, protected, rare, endemic) and fill gaps in life history, emphasize ontogenetic shifts, movement data (Habitat, Strategy 14)

- Mining LMR data - existing data sets contain valuable information that hasn't been processed or evaluated. Extracting information on LMR's from existing data. LMR priority list, post-processed data (georeferenced, condensed), synthesis of data (reports of distribution and abundance); defined list of gaps in data (Habitat, Strategy 15)

- Patterns and scales of connectivity. Effective management requires understanding the mechanisms and processes of connectivity along and within the archipelago

go. Patterns and temporal and spatial scales of movements and dispersal of representative species (LMR, Strategy 1)

- Data on key species, basic life history, habitat use, function roles, prey data, oceanographic and climate data, extraction data (LMR, Strategy 8)

- MPA design - Goal definition. What is to be protected? Identify stakeholders. Why are they to be protected? Existing conditions vs. long-range objectives. Relevant laws and regulations (LMR, Strategy 2)

- MPA design - Connectivity. How are populations in the NWHI replenished and how are they connected to each other and to the MHI? Identify sources and sinks. To identify MPA that would be source/sinks for recruitment, determine temporal change in these, identify sporadic events that induce unusual recruitment events; facilitate choosing several large vs. many small MPAs, identify MPA that would be resilient to natural anthropogenic stressors, evaluate connective between FFS and Johnston Atoll (LMR, Strategy 3)

- MPA design. Key biological considerations. MPA design requires information on biological and ecological requirements of species and their associated habitats (LMR, Strategy 4)

- Identify vulnerable species: endemic, rare, listed (endangered, threatened, migratory) apex predators (fish, cetaceans, seals, birds) sensitive (limited range due to temp, salinity, light, contaminants, or due to life history characterizes (LMR, Strategy 4)

- There is a need to compile existing data on functional roles and identify gaps. Acquire existing data on key species, basic life history, habitat use, function roles, and especially prey data (LMR, Strategy 10)

- Estimates of biological variables (e.g. density, distribution, growth, reproductive rates, tides, currents (Ocean, Strategy 4)

- Insufficient information available on natural loss of terrestrial habitat used by protected species for reproduction and on the impact of this on tropical marine systems (Stress, Strategy 1)

- Need to understand the effects of existing fisheries on non-protected species. Stock assessments (regular ecosystem monitoring, cameras bait stations, submersibles); reproduction rates, growth rates, natural mortality, recruitment, genetic stock structure, population structure (Stress, Strategy 13)

- Quantify the interaction between fisheries and protected species. Quantify direct interaction rates between

protected species and fisheries to determine level of fishing that can be allowed without adversely affecting/impacting protected species populations.

Development of ecosystem models to determine indirect impact of exiting fisheries (e.g. forage base, competition and habitat relationships) (Stress, Strategy 13)

- Ability to detect changes in physical environmental data (Threatened, Strategy 1)

- Ability to detect long term changes in habitat (Threatened, Strategy 2)

- Understanding which features of which habitats are important to each species (Threatened, Strategy 2)

- Need to replicate previous food habit studies and analyze existing data (Threatened, Strategy 3)

- Detecting change in background mortality of target species (Threatened, Strategy 4)

- Lack of long-term demographic c data for many species in the NWHI (Threatened, Strategy 5)

- Need to initiate long-term demographic studies on indicated species, (Threatened, Strategy 5)

- We do not understand habitat requirements that a may limit recovery of endangered and threatened species in the NWHI (Threatened, Strategy 9)

- Assess impact of invasive diseases on flora and fauna (Threatened, Strategy 10)

- Determination of predation rates on turtle nestlings. Lack of understanding of the population effect on predation on green turtle hatchlings (Threatened, Strategy 15)

Alien Species Data (3 of 9 groups)

- Need to develop a threat-ranking system of marine organism, alien or invasive; (Damage, Strategy 4)

- There is a need for an extensive literature review and expert opinion for targeted species currently present in Hawaii or that may be accidentally or intentionally introduced (Damage, Strategy 4)

- There needs to be an assessment of risk of introduction of marine organisms (animals, plants, microorganisms) into the waters of the NWHI (e.g. invasives carried by vessels, sea planes and diver/diver operations coming to the Reserve under permit) (Stress, Strategy 3)

- Type and number of visits to each island historically and predicted; nature of activities and gear type (documented inter-island movement); kingdom specific sterilization methods (invasives prevention) (Stress, Strategy 4)

- Inventory of organisms on all grounded vessels and debris, as well as arrival location should be monitored;

baseline inventories of native communities (Stress, Strategy 5)

- Methods of eradication/control invasive species (Threatened, Strategy 11)

Vessel Activity Data (4 of 9 groups)

- Information about vessel activity, analysis of threats posed by vessel activity and violations of existing laws and regulations (ComRec, Strategy 7)

- Number of vessels, frequency of trips, destinations, anchorages, cargo, discharges, mission, number of people carried, remote vessel ID, operations and impacts both direct and secondary (e.g. gray water, light attraction to turtles subject to predation) (Damage, Strategy 4)

- Extent of habitat alteration due to groundings. (Habitat, Strategy 3)

- Baseline of habitats, sensitivity of habitats to groundings (Habitat, Strategy 3)

- Vessel traffic - where, what when, why? Where are vessels going? When, frequency, duration of visit? What purpose, what activities associated with vessel presence? (Habitat, Strategy 5)

- What are secondary activities associated with vessel traffic (e.g. support facilities) and what are their effects? (Habitat, Strategy 5)

- Negative impacts from known existing cruise ship activities (Habitat, Strategy 5)

- Methods of remote detection and tracking of entry into the reserve; history of marine enforcement in the area Type and number of visits to each island historically and predicted; nature of activities and gear type (documented inter-island movement); kingdom specific sterilization methods (invasives prevention) (Stress, Strategy 5)

- Need a coordinated system for tracking the types, source, frequencies, intensities, distribution and cumulative effects of vessel activities in the NWHI, including illegal activities. (Stress, Strategy 7)

- Need information required to prevent or mitigate illegal activities through enforcement and other actions Type and number of visits to each island historically and predicted; nature of activities and gear type (documented inter-island movement); kingdom specific sterilization methods (invasives prevention) (Stress, Strategy 8)

Fisheries Data (4 of 9 groups)

- Need for fishery independent data (ComRec,

Strategy 5)

- The level of unauthorized removal of fishery resources is not known. Review past information, assessment of potential for unauthorized fishing stock assessment as needed. Characterize the potential for and level of unauthorized fishing in the NWHI. (Stress, Strategy 15)

- Fishery effects on habitat - stock assessment, including structure, biomass, natural variability, and ecological relationship of target stocks; gears used and habitat impacts; bycatch; what target species? Where are the impacts? Habitat delineation for target species between 20 and 600 meters (Habitat, Strategy 4)

- Fisheries dependent data log (Oceanographic, Strategy 2)

- What are the ecosystem-wide effects of existing fisheries? Trophic interactions and relationships, habitat impacts from fishing gear (identify and quantify), community structure (Stress, Strategy 12)

Cultural, Community, Social, and Governance Data (3 of 9 groups)

- Understanding of Native Hawaiian issues, resources and practices (Cultural, Strategy 1)

- Review of other groups integrating social science in natural resources management and existing government policies and laws (Cultural, Strategy 3)

- Need to identify key community leaders who are already involved in the process to determine who else would be involved for full participation by and full representation of all Native Hawaiian communities (Cultural, Strategy 5)

- Learn from others - information about how other institutions, agencies, states and nations have implemented involvement of native peoples, to benefit from the experiences, successes and failure of others (Cultural, Strategy 7)

- Need to understand boundary/jurisdictions for management agencies in NWHI (History, Strategy 3)

- There is a need to identify potential stakeholders and solicit their input on historical preservation issues (Hist/Arch, Strategy 6)

- Need for a common understanding of historic preservation terms among participating agencies and stakeholders (Hist/Arch, Strategy 8)

- Past and future recreational use (consumptive and non-consumptive); understanding scale and impacts

(ComRec, Issue 8)

- What was and is the relationship of native Hawaiians to NWHI? (Culture, Issue 1)

- Identifying historic and cultural activity; targeted archeological surveys (Culture, Issue 8)

Marine Debris Data (4 of 9 groups)

- Marine debris - understanding and quantification of impacts of various types of marine debris - some may be less harmful than others or have species-specific impacts. Sources (where, when, who, why, how) and trajectories. Effective method to detect, prevent and mitigate marine debris (e.g.) incentives, mechanisms. Understanding accumulation rate to devise optimal mitigation strategies (ComRec, Strategy 2)

- Marine debris - rates of accumulation, type and amount of debris, water depth, oceanographic data; wave-derived circulation patterns, fate of marine debris in lagoons (Damage, Strategy 1)

- Fate of debris in lagoon (Damage, Strategy 1)

- There is a need to characterize what impact marine debris has in the NWHI. Does it act as a vector for introducing alien species.? Does the debris facilitate changes in the habitat? (Damage, Strategy 2)

- Distribution of marine debris accumulation in NWHI, accumulation rates, identify sources of debris and types of debris, access impacts on species and ecosystems, identify debris at sea (Habitat, Strategy 2)

- Type and number of visits to each island historically and predicted; nature of activities and gear type (documented inter-island movement); kingdom specific sterilization methods (invasives prevention) (Stress, Strategy 9)

- We need to know the amounts, distributions, and sources of marine debris to mitigate impacts. Amounts of debris by type and location, an identification of sources and transport mechanisms (e.g. currents, vessels, etc) (Stress, Strategy 9)

- Evaluate the effect of debris on wildlife and habitat... overall impact is poorly understood. Appropriate mitigation requires knowledge of impacts and cost/benefit of debris removal (Stress, Strategy 10)

- What types of debris impacts different types of organism and habitats in what ways (models)? What are the consequences of debris removal to organisms and habitats? (Stress, Strategy 10)

Maps/Models/Monitoring/Charts/GIS (5 of 9 groups)

- Georeferenced habitat data at a fine resolution especially in high traffic areas. Inventory of endemic and alien species. Maps of measures of ecosystems habitat sensitivity. Estimates of recovery rates. Ranking/analysis of threats by source and by affected habitat.(Damage, Strategy)

- Need data to make maps - identify existing sources of data, defining limitations of data sources, develop and implement a plan to collect new data of diverse types and create a seamless product with common projecting addressing the resource management issues. (Habitat, Strategy 1)

- Need good charts of areas visited - map habitats and asses sensitivity and set carrying capacity (Habitat, Strategy 5)

- Habitat maps - bathymetry, bottom characterization, optical an other; collect organisms habitat characterization info, depth regime prioritization (Habitat, Strategy 6)

- Significance of maps - need to know spatially and temporally, what and where the problems and resources are, and where the boundaries should be (Habitat, Strategy 9)

- Need accurate and meaningful maps. How do the various mapping technologies agree? Confirmation of data obtained by remote sensing (Habitat, Strategy 10)

- Water depths and the habitat present is extremely useful for management purposes. The goal is to collect that information as quickly, comprehensively and accurately as possible. Groundtruthing the data is necessary (Habitat, Strategy 10)

- Ocean current pattern data, productivity and models (LMR, Strategy 3)

- Species spatial distributions and endemism hotspots; habitat associations; trophic interactions, life history characteristics, stress resistance/resilience characteristics, small scale movement patterns (LMR, Strategy 4)

- Describe biogeographical patterns for selected taxa (LMR, Strategy 5)

- Acquisition of existing data for functional relationship models. Identify relevant data sources (i.e. time series) on oceanographic/climate forcing and extractive (e.g. fishing) and on-extractive activities in our systems (LMR, Strategy 7)

■ Integrate oceanographic/climate/extraction data, life history data and spatial/temporal/biological data and identify correlations and explanatory factors (LMR, Strategy 7)

■ Development of functional relationship models. Need to understand the system in order to attempt to predict outcomes. Gaps in our knowledge on which to concentrate efforts (LMR, Strategy 8)

■ Design an effective management oriented monitoring program for NWHI. Adequate sample size and frequency; key taxa and indicator species; power of design to detect change; management goals to identify metrics; then implement monitoring (LMR, Strategy 4)

■ Defining a model of functional roles requires the selection of key species, then identification of spatial and temporal variation with respect to distribution of these species and their predators and prey (LMR, Strategy 10)

■ Determination of spatial and temporal distribution of predators and prey. Conduct field work to supplement existing data and fill in gaps relative to info needs (LMR, Strategy 4)

■ Hydrodynamic models - in order to understand the physical chemical and biological processes of the NWHI. Connectivity of the biological resources among, and between islands, banks and atolls, archipelago wide. Climate variability, hazard mitigation (Ocean, Strategy 1)

■ Tools for understand and predicting climate change, coral bleaching, larval recruitment and dispersal, couple ecosystem models, primary production (Oceanographic, Strategy 1)

■ Long-term monitoring for biological and physical indicators (Ocean, Strategy 4)

APPENDIX A: SAMPLE WORK SHEETS

Topic: Commercial and Recreational Uses

ComRec - 7

Title: Vessel and activity monitoring

Information Need ID #s: 9.1-9.3 15.1 15.2 15.5 15.6

Problem Statement

There is currently limited monitoring of vessel activity in the NWHI. Vessel activity will likely increase in the future.

Information Requirement

- Information about vessel activity
- Analysis of threats posed by vessel activity
- Historical information on vessel activity and violations of existing laws and regulations
- Develop and assess methods available to monitor vessel activity and address adverse impacts
- Monitor permit compliance

Type of Strategy

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> Field Based
<input checked="" type="checkbox"/> Characterization
<input checked="" type="checkbox"/> Monitoring
<input type="checkbox"/> Research
<input type="checkbox"/> Other | <input checked="" type="checkbox"/> Analysis/Synthesis
<input type="checkbox"/> Characterization
<input type="checkbox"/> Monitoring
<input type="checkbox"/> Research
<input type="checkbox"/> Other | <input checked="" type="checkbox"/> Institutional
<input checked="" type="checkbox"/> Partnerships
<input checked="" type="checkbox"/> Agreements
<input checked="" type="checkbox"/> Funding
<input checked="" type="checkbox"/> Other |
|---|--|--|

Objectives

Summary

Geography: (Check all that apply)

- NW Cen SE Reefs Banks Pelagic Islands Other

Time in Field

- Days
 Weeks
 Months
 Years

Existing Information Available

Type	Where	Time Period	Collector	Availability
Relevant Institutions and Roles				
Institution	Role			

Support Technologies Required (equipment, vessels, other support)

Estimated Costs (\$K per year)

- 0-50 50-100 100-250 250-500 500-750 750-1M 1M-1.5M 1.5M-2M 2M+

Estimated Time Required (years to complete work)

- 1 2 3 4 5 5+

Additional Comments/Information

- Estimated range of costs - "LOTS", Estimated time required - "Ongoing".
1. Activity - Fleet plan requirement for all vessels, VMS or other technology, observers, permits.
 2. Threats - Both point source and cumulative impacts in ecosystem context and relative to natural perturbations.
 3. Historical analysis - Analysis of past violations by sponsors requesting permits, investigate whether certain activities are associated with certain adverse impacts.
 4. Methods - Good maps to delineate protected areas so that regs can be enforced, reporting requirements, fleet plan for all vessels.

Topic: Damage Assessment, Response, and Restoration

Damage - 5

Title: Vessel Activity

Information Need ID #s(s): 5.1 5.3 5.7

Problem Statement

Lack of knowledge of number, type, and impacts of vessels transiting, visiting, and working in NMW-L.

Information Requirement

Number of vessels, frequency of trips, destinations, anchorages, camps, discharges, mission, number of people carried, remote vessel ID, operations and impacts both direct and secondary (ex. gray water, light attraction to turtles subject to predation.)

Type of Strategy

Field Based

- Characterization
- Monitoring
- Research
- Other

Analysis/Synthesis

- Characterization
- Monitoring
- Research
- Other

Institutional

- Partnerships
- Agreements
- Funding
- Other

Objectives

Getter information on vessel activity and impacts within NMW-L resource. Provide controlled data collection and management. Clarify acceptable operations and practices.

Summary

Two strategies are proposed:

First - a surveillance system to provide data on ship numbers, traffic patterns, and ship-board or ship-based activities.

Second - a surfnet permitting system to provide data on research and recreation, personnel numbers, usage, and limit negative impacts of shipboard and resource use operations, especially discharges, anchorages and ecosystem disruption.

Geography (Check all that apply)

NW Cen SE Reefs Banks Pelagic Islands Other

Time in Field

- Days *info except for pseudo-satellite surveillance* _____
- Weeks
- Months
- Years

Existing Information Available

Type	Where	Time Period	Collector	Availability
sat surveillance				

Relevant Institutions and Roles

Institution	Role
State of Hawaii	
DDE - PWS	
NMMA - NMFS, NMSP, NCO, NOAA Corps, DRR	
US Coast Guard	

Support Technologies Required (equipment, vessels, other support)

Satellites for surveillance
Ship-based VMS
Databases (servers) for data collection and management

Estimated Costs (\$K per year)

0-50 50-100 100-250 250-500 500-750 750-1M 1M-1.5M 1.5M-2M 2M+

Estimated Time Required (years to complete work)

1 2 3 4 5 5+

Additional Comments/Information

Existing info available. Fragmented and split amongst multiple agencies. Not computed or analyzed by any single person or agency. No controlled data gathering or facility.

Costs and implementation of these strategies would include staff.

1 year time requirement is for implementation. The project would be ongoing.

500-750 K - for startup costs only. Would expect 100-250K for maintenance of such a program.

Topic:

Title: Priority Areas and Coordination

Information Need ID #(s):

Problem Statement

Mapping to support management needs: RPA boundaries.
Need to map priority areas within NWHI, and ensure maximum possible coordination among mngt/conservation agencies.

Information Requirement

RPA boundaries published on nautical charts

Type of Strategy

- | | | |
|--|--|---|
| <input checked="" type="checkbox"/> Field Based
<input type="checkbox"/> Characterization
<input type="checkbox"/> Monitoring
<input type="checkbox"/> Research
<input checked="" type="checkbox"/> Other <input type="text" value="Physical mapping"/> | <input checked="" type="checkbox"/> Analysis/Synthesis
<input type="checkbox"/> Characterization
<input type="checkbox"/> Monitoring
<input type="checkbox"/> Research
<input type="checkbox"/> Other | <input checked="" type="checkbox"/> Institutional
<input type="checkbox"/> Partnerships
<input type="checkbox"/> Agreements
<input checked="" type="checkbox"/> Funding
<input type="checkbox"/> Other |
|--|--|---|

Objectives

Collect and publish data on RPAs boundaries

Summary

Geography (Check all that apply)

- NW Cen SE Reefs Banks Pelagic Islands Other

Time in Field

- Days
 Weeks
 Months
 Years

Existing Information Available

Type	Where	Time Period	Collector	Avails
------	-------	-------------	-----------	--------

Relevant Institutions and Roles

Institution	Role
-------------	------

Support Technologies Required (equipment, vessels, other support)

Estimated Costs (\$K per year)

- 0-50 50-100 100-250 250-500 500-750 750-1M 1M-1.5M 1.5M-2M 2M +

Estimated Time Required (years to complete work)

- 1 2 3 4 5 5+

Additional Comments/Information

Estimated time required: Request has been in place for two years.
 EO cannot be enforced without RPA boundaries published in maps.
 Time from to produce boundary maps - Reserve requires maps immediately.

Topic: Stressors on Living Resources

Stressor - 8

Title: Prevention and Mitigation of Vessel Impacts, Including Penalty Schedules Based on Habitat Violation

Information Need ID (ANI): 2.2

Problem Statement

Need to ensure that sufficient measures are in place to prevent or mitigate impacts to NWHI from vessel impacts related to various types of activities occurring, or likely to occur, in the NWHI.

Information Requirement

Identify or develop as needed measures such as conditions to be attached to permits, protocols to be followed, education and outreach materials for user communities.

Identify information required to prevent or mitigate illegal activities through enforcement and other actions.

Type of Strategy

- | | | |
|--|--|---|
| <input checked="" type="checkbox"/> Field Based | <input checked="" type="checkbox"/> Analytical/Synthetic | <input checked="" type="checkbox"/> Institutional |
| <input checked="" type="checkbox"/> Characterization | <input checked="" type="checkbox"/> Characterization | <input checked="" type="checkbox"/> Partnerships |
| <input checked="" type="checkbox"/> Monitoring | <input checked="" type="checkbox"/> Monitoring | <input checked="" type="checkbox"/> Agreements |
| <input checked="" type="checkbox"/> Research | <input checked="" type="checkbox"/> Outreach | <input checked="" type="checkbox"/> Funding |
| <input type="checkbox"/> Other | <input type="checkbox"/> Other | <input type="checkbox"/> Other |

Objectives

Prevent or mitigate damage to NWHI from impacts related to vessel activities, through surveillance, enforcement of permit conditions, regulations, education and outreach, and other measures, as needed.

Summary

This strategy should include measures to prevent or mitigate single and cumulative impacts of vessel activities in NWHI through a coordinated state/federal partnership for management, protection, and enforcement.

Geographic: (Check all that apply)

- All NW CA HI IL IA IN MD ME MI MN MO MS MT NC ND NY OH OK OR PA RI SC SD TN TX VA VT WA WI WY Other

Time in Field

- Days
 Weeks
 Months
 Years *Outgoing*

Existing Information Available

Topic	Where	Time Period	Collector	Availability
Permit conditions			USFWS	Available
Permit conditions and regulations			USMC	Available
Permit conditions and regulations			NMSP	Workshop planned
			Dept. Fish and Wildlife	
			NMFS	
			USCG	
			NASA	

Relevant Institutions and Roles

Institution	Role
US FWS	Controls some aspects of vessel activities via permits
US Coast Guard	Regulations and enforcement
NMFS	Permits, regulations re: commercial fishing
NMMA/NMSP	Model regs, penalty schedules
State of Hawaii	Permits, regulations for state waters
NMHC Coral Reef Ecosystem Reserve	Permits, notification, regs, penalty schedules
USCG	As required to implement NMMA LLS

Support Technologies Required (equipment, vessels, other support)

Enforcement vessel(s), records
Methods for preventing, mitigating biofouling of vessel hulls
Rapid response system for vessel groundings
Database for permit tracking
Interagency coordination and use of all (including permits) surveillance methods and tools

Estimated Costs (\$ per year)

- 0-50 50-100 100-250 250-500 500-750 750-1M 1M-1.5M 1.5M-2M 2M+

Estimated Time Required (years to complete work)

- 1 2 3 4 5 5+

Additional Comments/Information

- Two year development, ongoing management and updating
- Different measures are required, depending on type of vessel activities and governmental jurisdictions involved.
- Vessel groundings and physical impacts of vessels may place highest rank of concern by group.

APPENDIX B: PARTICIPANTS

Oceanographic Regime

Rusty Brainard NOAA/NMFS Coral Reef Eco. Inv.
 Pat Caldwell NOAA/NESDIS/NODC Hawaii Liaison
 Andy Collins NWHICRER National Marine Sanctuary Program
 Ed DeMartini NMFS Honolulu Lab
 Rick Grigg UH - SOEST - Oceanography
 Ron Hoeke NMFS Honolulu Lab - CREI
 David Itano UH - SOEST - JIMAR
 Todd Jacobs - facilitator NOAA National Marine Sanctuary Program
 Jarad Makaiau WPRFMC
 Jill Meyer NOAA Pacific Services Center
 Ed Myers NOAA/OAR/NURP
 Donald Potts UC Sant Cruz - Ocean Sciences
 Noriko Shoji NOAA Detailee to Office of Sen. Inouye
 Christine Taylor - recorder NOAA National Marine Sanctuary Program

Habitat Delineation

Joe Chojnacki NMFS-CREI
 Fenny Cox UH HI Institute of Marine Biology
 Matt Dunlap NMFS-CREI
 Alan Everson NOAA Fisheries - PIAO
 Stephanie Fried Environmental Defense
 Walter Ikehara HI Dept. of Land and Natural Resources
 Darcee Killpack NOAA/NOS Pacific Services Center
 Joyce Miller NMFS-CREI
 Bob Moffitt NMFS Honolulu Lab
 Mark Monaco - facilitator NOAA/NOS Biogeography Program
 David Moe Nelson - recorder NOAA/NOS Biogeography Program
 Jerry Mills NOAA/NOS Office of Coast Survey
 Michael Parke NOAA Fisheries - PIFSC
 Frank Parrish NMFS Honolulu Lab
 Noelani Puniwai Hawaii Natural Heritage Program
 Tim Ragen Marine Mammal Commission
 Steve Rohmann NOAA/NOS Special Projects
 Ron Salz US Fish and Wildlife Service
 Daria Siciliano Univ. California - Santa Cruz
 Cha Smith KAHEA
 John Smith UH Hawaii Undersea Research Laboratory
 Rick Stumpf NOAA/NOS Ctr for Coastal Monitoring and Assessment
 Edward Timoney F/V Laysan

Threatened, Endangered, and Terrestrial Resources

George Balazs NMFS Honolulu Lab
 Sean Corson - recorder NWHICRER/National Marine

Sanctuary Program
 Beth Flint USFWS
 Bill Gilmartin NWHI Reserve Advisory Council
 David Helweg USGS Pac. Is. Eco. Res. Ctr.
 Linda Paul Hawaii Audubon Soc.
 Peter Pyle Oceanic Society/Pt. Reyes Bird Obs.
 Dave Raney Sierra Club
 Mitchell Tarrt - facilitator NOAA National Marine Sanctuary Program
 Ethan Shiinoki HI DLNR - Dept. of Forestry and Wildlife
 Terry Work USGS

Cultural Heritage

Charly Alexander-facilitator NOAA National Marine Sanctuary Program
 Kaliko Amona NWHICRER/National Marine Sanctuary Program
 Athline Clark HI/DLNR
 Nancy Daschbach Fagatele Bay NMS/National Marine Sanctuary Pgm
 Bob Dieli US Fish and Wildlife Service
 Ben Finney Univ. of HI
 Suzanne Finney Univ. of Hawaii
 Kathy Frost Univ. of Alaska
 Rob Hommon National Park Service
 Kekuewa Kikiloa Univ. of Hawaii
 Susan Lebo Bishop Museum
 Fred McGee US Air Force archaeologist
 Moani Pai-recorder NWHICRER/National Marine Sanctuary Program
 Matt Russell National Park Service
 Bruce Terrell NOAA National Marine Sanctuary Program
 Hans VanTilburg NWHICRER/National Marine Sanctuary Program
 Aulani Wilhelm NWHICRER/National Marine Sanctuary Program

Stresses on Living Resources

Isabella Abbott UH - Botany
 Greta Aeby Hawaii DLNR/DAR
 Bud Antonelis NOAA/NMFS Honolulu Lab
 Jason Baker NOAA/NMFS Honolulu Lab
 George Balazs NOAA/NMFS Honolulu Lab
 Larry Basch UH/National Park Service
 Joe Chojnacki NOAA/NMFS Coral Reef Eco. Inv.
 Malia Chow - recorder NWHICRER National Marine Sanctuary Program
 Steve Coles Bishop Museum

David Coleman UH - Leeward Community College
 Fenny Cox UH- SOEST HIMB
 Mary Donahue UH - Sea Grant
 Lu Eldredge Bishop Museum
 Alan Everson NOAA/NMFS - PIAO
 Beth Flint USFWS
 Steve Gittings - facilitator NOAA National Marine
 Sanctuary Program
 Scott Godwin Bishop Museum
 David Helweg USGS Pac. Is. Eco. Res. Ctr.
 Leszczek Karczmarski Texas A&M Univ.
 Charles Littnan
 Chris Lowe Cal. State Univ. - Long Beach
 Lloyd Lowry U.S. Marine Mammal Commission
 Jarad Makaiau WPRFMC
 Jim Maragos USFWS
 Bruce Mundy NOAA/NMFS Honolulu Lab
 Ed Myers NOAA/OAR/NURP
 Don Potts UC Santa Cruz - Ocean Sciences
 Noelani Puniwai UH - Nat. Her. Prog.
 Peter Pyle Oceanic Society/Pt. Reyes Bird Obs.
 Dave Raney Sierra Club
 Robert Schroeder NOAA/NMFS Coral Reef Eco. Inv.
 Daria Siciliano UC Santa Cruz - Ocean Sciences
 Rick Stumpf NOAA/NOS Ctr for Coastal Monitoring
 and Assessment
 Peter Vroom NOAA/NMFS Coral Reef Eco. Inv.
 LeeAnn Woodward USFWS

Commercial and Recreational Uses

Chuck Birkeland USGS/UH - Zoology
 Ed DeMartini NOAA Fisheries (PIFSC)
 Gerard Dinardo NMFS Honolulu Lab
 Stephanie Fried Environmental Defense
 Alan Friedlander NOAA/NOS and Oceanic Institute
 Kathy Frost Univ. Alaska - Marine Science
 Bill Gilmartin Hawaii Wildlife Fund
 Rick Grigg UH-Oceanography
 Marcia Hamilton WPRFMC
 Tom Hourigan NOAA Fisheries (Habitat Cons.)
 Walter Ikehara DLNR/DAR
 David Itano UH-JIMAR
 Paul Dazell WPRFMC
 Bob Moffitt NMFS Honolulu Lab
 Mark Monaco - facilitator NOAA/NOS Biogeography
 Program
 David Moe Nelson - recorder NOAA/NOS
 Biogeography Program
 Frank Parrish NMFS Honolulu Lab
 James D. Parrish USGS/ UH Coop. Fish. Res. Unit
 Linda Paul Hawaii Audubon
 Tim Ragen Marine Mammal Commission
 Cha Smith KAHEA

Timm Timoney NWHI Fisherman

Damage Assessment, Response, & Restoration

Rusty Brainard NOAA/NMFS Coral Reef Eco. Inv.
 Pat Caldwell NOAA/NESDIS/NODC Hawaii Liaison
 Sean Corson NWHICRER National Marine Sanctuary
 Program
 Matt Dunlap NOAA/NMFS Coral Reef Eco. Inv.
 Tim Gerrodette NOAA/NMFS/SW Fisheries Science
 Center
 Dave Gulko HI Dept. of Land and Natural Resources
 Todd Jacobs - facilitator NOAA National Marine
 Sanctuary Program
 Megan Moews
 Jill Meyer NOAA/NOS Off. of Response and
 Restoration
 Michael Parke NMFS Honolulu Lab
 Steve Rohmann NOAA/NOS Special Projects Office
 Ethan Shiinoki HI DLNR - Dept. of Forestry and
 Wildlife
 John Smith UH - SOEST - HURL
 Christine Taylor - recorder NOAA National Marine
 Sanctuary Program

History and Archaeology

Charly Alexander - facilitator NOAA National Marine
 Sanctuary Program
 Kaliko Amona NWHICRER National Marine
 Sanctuary Program
 Athline Clark HI Dept. of Land and Natural Resources
 Paul Cleghorn Bishop Museum
 Sara Collins DLNR-SHPD
 Bob Dieli US Fish and Wildlife Service
 Ben Finney Univ. of Hawaii
 Suzanne Finney Univ. of Hawaii Anthropology
 Vicky Holt Takamine 'Ilio'ulaokalani
 Rob Hommon National Park Service
 Jeff Kuwabara NWHICRER National Marine
 Sanctuary Program
 Susan Lebo Bishop Museum
 Fred McGee US Air Force
 Moani Pai - recorder NWHICRER National Marine
 Sanctuary Program
 Matt Russell National Park Service - SRC
 Ron Salz US Fish and Wildlife Service
 Bruce Terrell NOAA National Marine Sanctuary
 Program
 Hans VanTilburg NWHICRER National Marine
 Sanctuary Program