



# MARINE MAMMAL COMMISSION

1 June 2021

Mr. Samuel D. Rauch, III  
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National Marine Fisheries Service  
1315 East-West Highway  
Silver Spring, MD 20910-3225

Dear Mr. Rauch:

The Marine Mammal Commission (the Commission) recently reviewed the draft programmatic environmental impact statement (DPEIS) regarding the activities of the National Marine Fisheries Service's (NMFS) Marine Mammal Health and Stranding Response Program (MMHSRP). The Commission commends NMFS for its efforts, particularly including the various best practices, standards, criteria, and guidelines as Appendices for public review and comment. The review of the DPEIS has prompted us, rather than providing specific comments, to seek a broader discussion of MMHSRP's effectiveness in addressing current marine mammal stranding-related issues and its ability to address the purposes set forth in Title IV of the Marine Mammal Protection Act (the MMPA)<sup>1</sup>.

The Commission would like to use this opportunity to engage with NMFS on more long-term issues of interest than the MMHSRP DPEIS. Stranded marine mammals are very visible and of great interest to the public and to Congress. Data obtained through examining stranded animals would be valuable for evaluating the impacts of climate change on marine mammals. However, it is unclear how health information available from the last 25 years of concerted stranding response efforts could inform such an analysis or fully meet the first two purposes under Title IV of the MMPA<sup>1</sup>, as efforts to date by stranding network partners have tended to focus on immediate stranding response and the need for animal care rather than the health of marine mammal populations in the wild. For the MMHSRP to meet its mandates under Title IV and to be able to evaluate impacts of climate change on marine mammals, increased investment to support a robust program of biosurveillance and epidemiology is needed, while recognizing the immediate demands of animal care and welfare. Despite increased efforts for responding to unusual mortality events (UMEs), the causes of about 50 percent remain unclear. Investments in biosurveillance and epidemiology would help to better elucidate the causes of UMEs as well.

Considerable work has been done to evaluate and improve the MMHSRP over the years. The Commission is aware of a recent program review but has not yet been made aware of its

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<sup>1</sup> Under section 401(b), the purposes of the MMHSRP are to (1) facilitate the collection and dissemination of reference data on the health of marine mammals and health trends of marine mammal populations in the wild; (2) correlate the health of marine mammals and marine mammal populations, in the wild, with available data on physical, chemical, and biological environmental parameters; and (3) coordinate effective responses to unusual mortality events by establishing a process in the Department of Commerce in accordance with section 404.

Mr. Samuel D. Rauch, III  
1 June 2021  
Page 2

outcome. In the past, the Commission has been involved in other related reviews, including a review of the Working Group on Marine Mammal Unusual Mortality Events (WGMMUME; Gulland 2006), has funded a workshop on the potential for a National Marine Mammal Health Program<sup>2</sup>, and has provided a variety of recommendations, many of which are still applicable today. Our Commissioner, Dr. Frances Gulland, and one of our Scientific Advisors are leads on different subgroups of the WGMMUME team that is investigating the current gray whale UME, and Dr. Gulland chaired the WGMMUME for 6 years. Many of the Commission's staff have worked closely with staff of the MMHSRP over the years. The recent change in staffing structure with Dr. Teresa Rowles moving to a Senior Scientist role, the 25 years of collaborative experience and a number of reviews of various programs, draft novel program concepts, and associated recommendations suggest that now is a good time to engage and discuss the overall direction of MMHSRP.

In general, the Commission is concerned that the stranding data that have been and are being collected will not adequately inform NMFS how to address 21<sup>st</sup> century issues. Higher-level consideration of how best to conduct population-level health and disease surveillance (e.g., evaluating the impacts of climate change on disease spread, harmful algal blooms, prey shifts, etc.) is needed, as well as how to fund that surveillance. Funding generally is provided for basic rescue, response, rehabilitation, and release activities rather than surveillance and data analysis. In anticipation of passage of the John H. Prescott Marine Mammal Rescue and Response Grant Program bill and its allocation of greater resources for stranding and UME programs and the Health Monitoring and Analysis Platform (Health MAP), the Commission believes a discussion with NMFS on the future directions of the MMHSRP would be useful.

We appreciate your willingness to discuss these issues and look forward to the opportunity to meet with you soon.

Sincerely,



Peter O. Thomas, Ph.D.,  
Executive Director

cc: Catherine Marzin, Acting Director of the Office of Protected Resources  
Shannon Bettridge, Chief of the Marine Mammal and Sea Turtle Division  
Trevor Spradlin, Deputy Chief of the Marine Mammal and Sea Turtle Division  
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Sarah Wilkin, National Stranding and Emergency Response Coordinator

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<sup>2</sup> The resulting strategic plan is appended herein.

Mr. Samuel D. Rauch, III

1 June 2021

Page 3

## **Reference**

Gulland, F.M.D. 2006. Review of the marine mammal unusual mortality event response program of the National Marine Fisheries Service. NOAA Technical Memorandum NMFS-OPR-35, Silver Spring, Maryland. 32 pp.

# **Strategic Plan for a Coordinated National Marine Animal Health Program:**

## **Marine Mammals**

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# TABLE OF CONTENTS

INTRODUCTION .....	2
THE PROBLEM .....	3
DRIVERS OF A COORDINATED NATIONAL PROGRAM .....	4
PROGRAM VISION .....	6
PROGRAM NEEDS .....	7
PROGRAM GOAL .....	9
PROGRAM OBJECTIVES .....	9
PROGRAM IMPLEMENTATION .....	10
CITED REFERENCES .....	17

# Strategic Plan for a Coordinated National Marine Animal Health Program: Marine Mammals

## Introduction

The relationships among ecosystem processes and the health<sup>1</sup> of marine organisms are poorly understood, yet an understanding of these dynamics is essential for effective management of these species and the ecosystems that support them. In the United States, health of marine species is currently being investigated by multiple agencies, including the U. S. Department of Agriculture (Veterinary Services, USDA-APHIS\*, Center for Wildlife Research and National Veterinary Services Laboratory\*), the NOAA\* (National Marine Fisheries Service and National Ocean Service), the Centers for Disease Control, FDA\*, academic institutions, non-governmental organizations and the state and federal agencies responsible for management of different taxa, various ecosystems and specific stressors (NRC 2005, Hitchcock et al. 2007, Jones et al. 2008). Furthermore, different agencies are responsible for management of separate taxa (NOAA - cetaceans, pinnipeds, marine turtles, marine invertebrates, corals, marine and anadromous fish; USFWS\* - polar bears, sea otters, manatees, walrus, anadromous fish and sea/shore birds). There is increasing evidence for associations amongst health of marine and terrestrial wildlife and that of humans and domestic species, and for the interdependence amongst factors influencing their health and those altering ecosystems and hence host population dynamics. The interactions of multiple factors and complexity of these interactions make ecosystem health studies exceedingly difficult requiring new approaches and even more collaborations. This is even more so for marine organisms and ecosystems since little baseline information has been developed. For example, many of the emerging infectious diseases of humans originated from wildlife (Tryland 2000, Jones et al. 2008, Hunt et al. 2008), and increasing concern over the effects of ocean change on human health led to the passing of the Oceans and Human Health Act in 2004 (Sandifer et al. 2004), and to the publication of WHO/OIE/FAO\* strategic plan for One World One Health (FAO, OIE, WHO 2008).

<sup>1</sup>Health = Ability of an individual, population or ecosystem to maintain function and responsiveness to environmental change

Climate change will likely have both direct and indirect effects on marine animal health such as changing pathogen survival, disease transmission and host susceptibility by shifting food webs and altering habitats and distribution of organisms, increasing biotoxin producing algal blooms and acidification of the ocean. However in order to detect these changes, baseline data, currently lacking, are needed (Harvell et al. 2002, Burek et al. 2008,). Epizootics involving several pathogens have posed threats to marine animal populations worldwide, with the most extreme impact being species extinction (Fayer 2000, Kim et al. 2005). Thus the challenge is to have early warning systems and surveillance programs in place to identify and manage potential pathogens, diseases, toxins, pollutants, affects of climate change, acoustic pollution and injury proactively as they emerge and to develop new tools and techniques for understanding disease ecology in wildlife populations and ecosystems. There is currently no nationally coordinated consistent approach to the surveillance of marine animal health in the U.S. despite increased recognition of mortality events and disease outbreaks associated with pathogens, pollutants and biotoxins in many species. Furthermore, there is no designated laboratory for the analysis of marine animal samples on a routine basis, nor any analytic surge capacity for responding to unusual mortality events. This severely curtails assessment of the impacts of environmental change on marine animal health and populations, and prevents timely management actions.

\* NOAA: National Oceanic and Atmospheric Association, USGS: United States Geologic Survey, USFWS: United States Fish and Wildlife Service, USDA-APHIS: United States Department of Agriculture's Animal and Plant Health Inspection Service, FDA: United States Food and Drug Administration, WHO: World Health Organization, OIE: World Organization for Animal Health, FAO: Food and Agricultural Organization of the United Nations

<sup>2</sup>Ecosystem = Geographically specified system of organisms (including humans), the environment, and the processes that control its dynamics.

Ecosystem Based Management = Ecosystem approaches to management use integrated approaches to study and manage the resources of an entire ecosystem. This approach considers the cumulative impacts from various sources and the balance of conflicting uses. Using an ecosystem approach to manage aquatic resources includes multiple factors such as pollution, disease, coastal development, harvest pressure, predator/prey and other ecological interactions, and watershed management.

Modified from: NOAA's celebrating200years.noaa.gov/magazine/chesapeake\_fish\_mgmt/side1.html

A multi-disciplinary, nationally coordinated, and comprehensive approach to managing the health of marine animals is not only badly needed but is essential if effective ecosystem based management<sup>2</sup> of these species and their habitat is to be achieved. As health and disease issues affecting marine species

span multiple ecosystems, better coordination among management agencies and integration across multiple regions and nations is needed.

Here we present a plan for the development of a national marine mammal health program as the first component of a coordinated national marine animal health program. Other components of the program will include similar plans for turtles, marine invertebrates and marine birds. This program should be distinguished from, but integrated with, the already existing National Aquatic Animal Health Plan that primarily focuses on the health and management of aquaculture and natural fish populations ([http://www.aphis.usda.gov/animal\\_health/animal\\_dis\\_spec/aquaculture/naah\\_plan.shtml](http://www.aphis.usda.gov/animal_health/animal_dis_spec/aquaculture/naah_plan.shtml))

### **The Problem**

Although there are increasing reports of marine mammal die-offs and outbreaks of disease (Gulland and Hall, 2007) and the Marine Mammal Health and Stranding Response Act (MMHSRA) was passed in 1992, the United States has not coordinated a national interagency strategy for evaluating and monitoring marine mammal health in the context of the health of other organisms. Successful models for nationally coordinated health programs currently only exist for human health (public health professionals at state, local and national levels), domestic agricultural animals, few limited species of terrestrial wildlife, and specific pathogens of significance to the economy or to human health (such as Chronic Wasting Disease, Avian Influenza, Brucellosis). The lack of baseline biological data limits our ability to adequately monitor marine mammal individual, population and ecosystem health and a stagnant approach to modeling and surveillance limits our ability to identify causality for specific outbreaks or disease conditions. Furthermore, our ability to mitigate impacts of disease, toxins, pollutants, climate change, acoustic pollution and injury on marine mammals and effectively conserve these protected species is currently limited by our poor ability to monitor, model and interpret the connection between exposures and effects in complex systems.

NOAA established the Ecosystems Research Program in 2004 (Burgess et al. 2005) to enhance the integration between its ocean and coastal research programs, and to conduct applied research and development to provide stakeholders with scientific information and tools for implementing and evaluating ecosystem management. A review of the status of marine mammal research in 2003 (Reeves and Ragen 2004), concluded that a more coherent and comprehensive infrastructure was needed for investigating marine mammal health in a systematic, holistic manner. To accomplish this, the effort needs to include a multidisciplinary approach; improved diagnostic tools for assessing health, more robust modeling and assessment tools to link health indicators or disease to exposure factors; better distinction between natural and human-caused mortality; estimation of actual mortality by extrapolation from observed mortality; and an efficient, coordinated response mechanism for mass mortality events.

Furthermore, the U.S. Commission on Ocean Policy (USCOP 2004) stated that a sustained and appropriately funded response and analysis program could help management agencies, their partners and volunteers to respond to marine mammal strandings, identify causes, and recommend actions to prevent further deaths as marine mammal health is intimately intertwined with ecosystem health and human health.

Currently, numerous entities across the country work on some aspects of marine mammal health; however no single organization has the resources or level of coordination with others necessary to manage a comprehensive program. Thus, the lack of coordination and investment has resulted in slow progress in understanding ocean health and its relationships to health and sustainability of protected species.

As a result, there are growing calls for a national marine mammal health program due to

- An increase in frequency and severity of Unusual Mortality Events (UMEs) (Gulland, 2006)
- Increased public concern over UMEs (Harvell et al. 2004)
- Increased public attention to oceans and human health and the role of marine mammals and other marine species (Sandifer et al. 2004)
- Increasing NOAA and DOI\* data requirements under the MMPA\*, ESA\*, MSRA\* and NEPA\* (USCOP, 2004)
- NOAA's emphasis, and thus coordination with other agencies, on ecosystem based management (Burgess et al. 2005)
- National Academy reports on animal health, climate and health and emerging infectious diseases (Davis and Lederberg 2001, NRC 2005, The National Academies 2008)
- Increased recognition of the connection between animal health and human health, and the health of the ecosystems that support both (Strategic plan for One World One Health, FAO, OIE, WHO 2008)

These needs can only be met by an overarching and new approach that integrates ongoing efforts and promotes synergies among federal, state, and local governments, academia, NGOs\* and the private sector; translates scientific and technological advances into operational applications and information; establishes national goals and objectives for addressing high-priority issues; and engages the public in issues affecting marine mammal health.

## **Drivers of a Coordinated National Program**

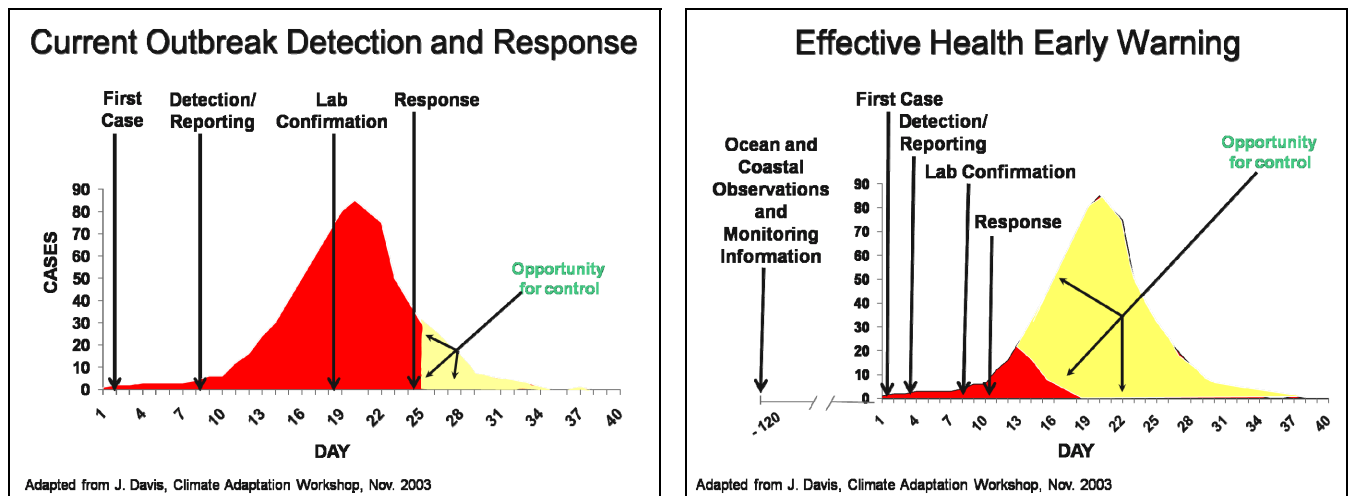
### *I. Effective Health Early Warning System*

The primary driver for a coordinated National Marine Mammal Health Program is to be proactive in the face of impacts on health such as emerging and/or catastrophic disease, biotoxin events, pollutants, climate change, acoustic pollution and injury, rather than reactionary, as currently occurs (Figure 1). This will enhance and evaluate mitigation measures of anthropogenic stressors, provide better response with early warnings and decrease time before effective response, and may reduce morbidity and mortality associated with disease outbreaks. An integrated program will also allow us to better prepare and prioritize and to better identify and evaluate stressed populations and regions.

\*DOI: United States Department of the Interior, MMPA: Marine Mammal Protection Act, ESA: Endangered Species Act, MSRA: Magnuson-Stevens Fishery Conservation and Management Reauthorization Act, NEPA: National Environmental Policy Act, NGO: Non Governmental Organization



**Figure 1:** Timeline for the opportunity of control following a disease outbreak with the current detection and response effort compared with an increased ability with an early warning system in place.



## II. Reduce Redundancy

Improved coordination of management actions will reduce duplication and conflicts, and enable full utilization of available resources from multiple disciplines and agencies.

## III. Policy (Statutory and Regulatory)

Many federal and coastal state agencies have responsibilities to manage marine mammals and resources, however few have a health monitoring component, and those that do are often not coordinated with other programs. To comply with current diverse regulations there is often overlap between agencies and their jurisdictions, especially when addressing pollution, collapse of fisheries and climate change for ecosystem based management. Thus, a national marine mammal health program is needed, and since healthy marine mammal populations require healthy marine organism populations all relevant agencies must be involved so that current statutory and regulatory functions can be met.

## IV. Research and Development

A coordinated research agenda is needed to identify the primary health concerns for marine mammals and the marine ecosystems that support them, develop the tools for assessing and mitigating health issues, and maximize the use of financial resources.

## V. General Public

Recently there has been an increase in public concern over marine mammal health (Gulland and Hall 2007). Such concerns have led to a national and international effort to merge or better coordinate wildlife health, domestic animal health and human health. These efforts have led to the National Academies of Sciences, Institute of Medicine, and federal agency re-evaluations of the current status and capabilities and plan for the future. As a result, in October 2008, WHO, OIE and FAO published their One World One Health strategy for animal health surveillance programs. Currently, there is an assumption that marine mammals are being adequately protected and that taxpayer funds are directed at maintaining necessary ecosystem services pertinent to marine mammal health. Such services include seafood safety, recreation (swimming, surfing, boating) and ecotourism (enjoyment of coastal visits, observation of marine mammals in their natural habitat).

## Program Vision

A National Marine Mammal Health Program is needed to improve the health of marine ecosystems in the face of increased pressures for development, climate change, and complex interactions between natural and anthropogenic stressors. These factors could have devastating effects especially to those species or systems with higher extinction risk. The mission for this program is to contribute significantly to the recovery of protected species through an ecosystem approach that includes understanding, preventing and controlling disease, injury, and disability. We will focus on health and disease of marine mammal populations by integrating existing programs and establishing new ones in areas which are not currently being addressed, but fully recognize that a functioning marine mammal health program requires a functioning integrated marine animal health program. The program will have four focus areas: animal studies (marine mammal ecology, biology, population dynamics, physiology), field studies (disease investigations, long term health surveillance, research, outbreak detection, disease discovery and response), methodology (sample collection, method development, quality assurance, sample banking), and informatics (information management, epidemiology, risk assessment, modeling).

To accomplish this, an alliance, the Cooperative Center for Marine Animal Health (CCMAH), must be formed involving all marine mammal science sectors, under which coordination of a National Marine Mammal Health Program would be managed, encouraging cooperation and coordination, and discouraging competition for funding and resources (Figure 2). The alliance would be composed of regional centers representing the eight regional marine ecosystems NOAA has delineated that represent geographically specified management areas based on ocean basins (NOAA 2004). These ecoregions include the Northeast US continental shelf, Southeast continental shelf, Gulf of Mexico, California current, Alaska ecosystem complex, Pacific Islands, Great Lakes, and the Caribbean ecosystem. The six marine regions off the United States will be represented by three regional centers: West Coast (Alaska to California, Hawaii), North East (coastal states from Maine to Virginia) and South East (N. Carolina to Georgia, Gulf States). Through these centers, the alliance will provide emergency response teams that can conduct investigations of die-offs and epizootics and integrate into national response plans, provide medical techniques and tools that are often unavailable to biologists in the field and develop a mechanism to pool diverse data. The information management will include regional, national and international databases to track health, diseases, contaminants, harmful algal blooms, and interface with population data and oceanographic data so that a more comprehensive understanding of the health of our oceans can be achieved. The alliance would provide funding for staff, equipment and competitive research for partners across the nation and be integrated in regional alliances of governors and ecoregions as established by NOAA. In addition, student training would be a part of the overall program, so that a larger pool of expertise in marine mammal health can be developed.

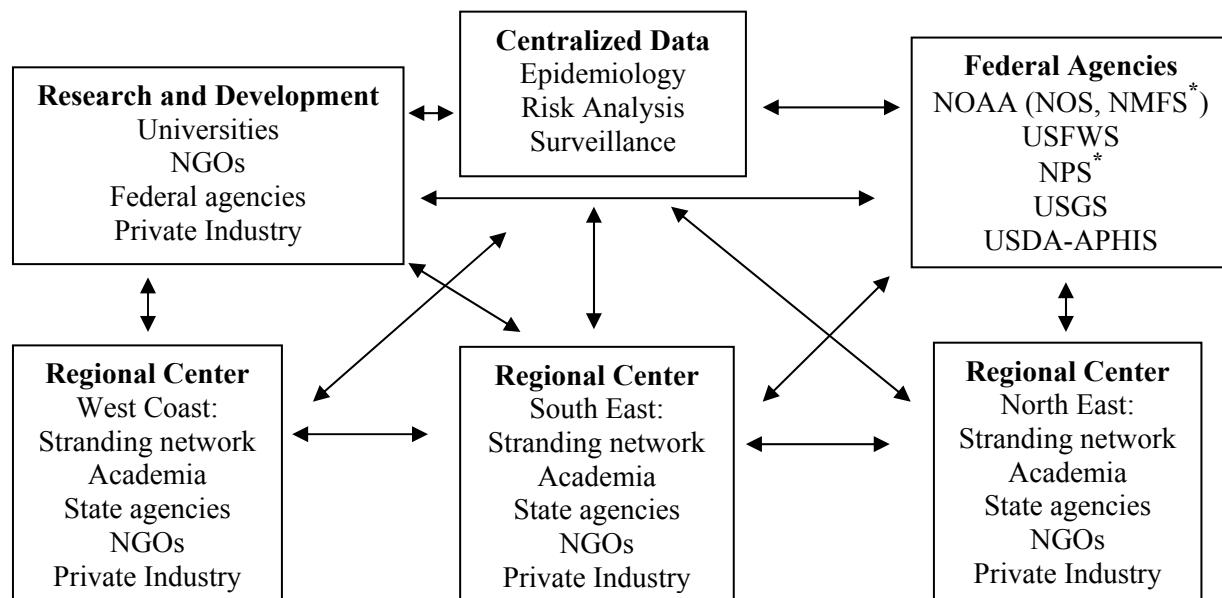
The core purpose for CCMAH will be to perform comprehensive planning, coordination and support for research on health of marine mammals and oversee management of the National Marine Mammal Health Program.

Specifically, for marine mammals, these tasks include:

- Monitor health of marine mammals and detect, evaluate and mitigate disease causes or contributions
- Coordinate and direct unusual mortality event (UME) response including appropriate preparedness integrated with the National Response Plan
- Focus on modeling of linkages and causal inferences between ecosystem condition and processes and health of vulnerable marine mammals

- Conduct research on remote sampling methodology, diagnostic tools, pathogenesis, epidemiology, modeling and prevention and mitigation methods.
- Investigate the use of marine mammals as indicators of overall ecosystem health and its potential effects on human health.
- Provide scientific advice on health and disease for protected species management
- Develop and maintain a sample and data archive on marine mammal health

**Figure 2:** Vision for the structure and flow of data of a coordinated National Marine Mammal Health Program managed under the Cooperative Center for Marine Animal Health for centralization of information, data management and analyses



### Program Needs

Users of the program will include

*Customers:* managers responsible for improving the condition of coastal ocean and freshwater ecosystems, including those within local, tribal, state and federal agencies and governments; agencies or companies that want to utilize the coasts and oceans for activities such as development and alternative energy sources.

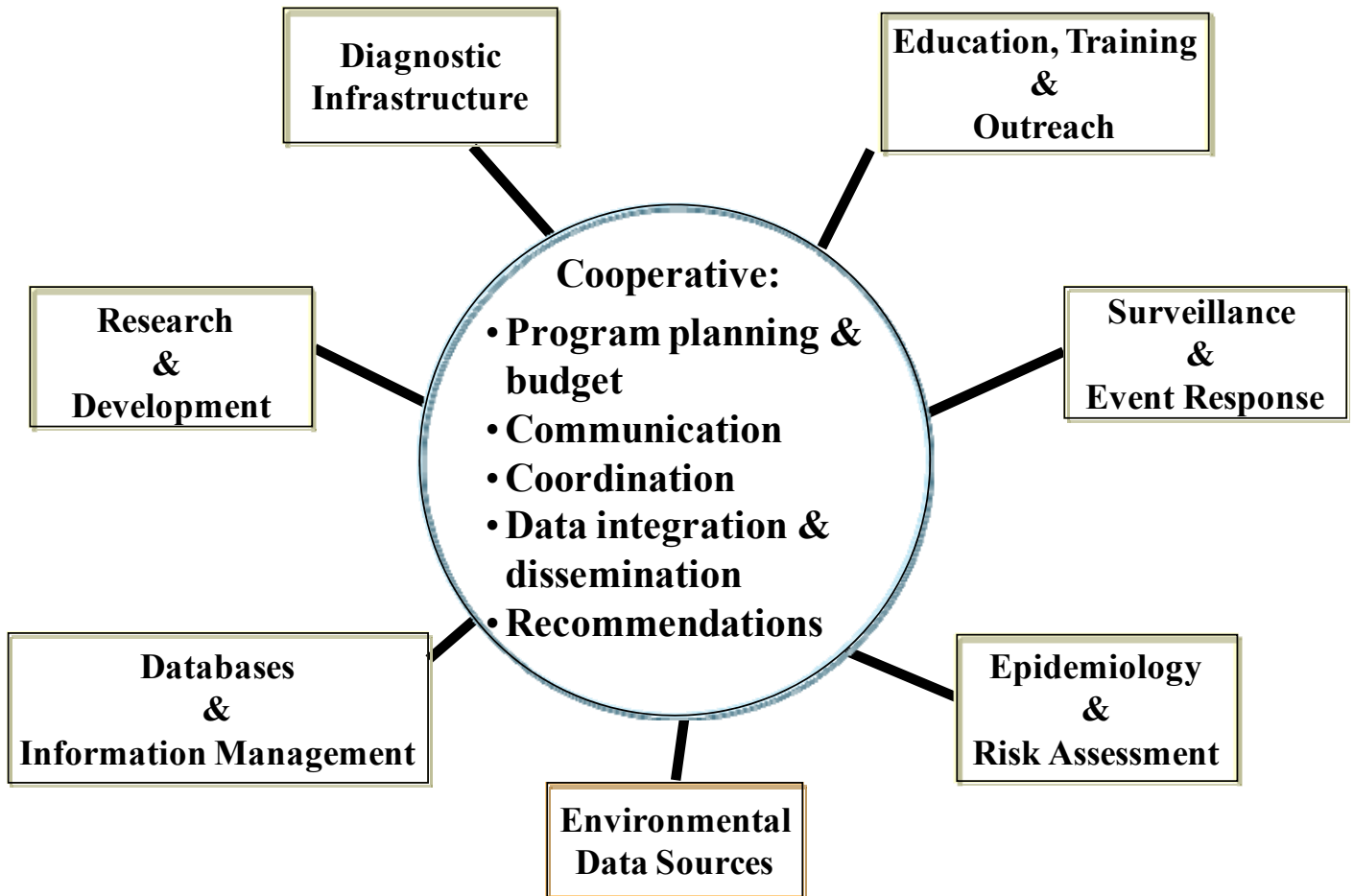
*Stakeholders:* universities, environmental groups, recreational and commercial groups, and the general public.

*Partners:* non-governmental organizations, marine mammal stranding network LOA\* holders, universities, professional organizations, and government agency scientists.

\* NOS: National Ocean Service, NMFS: National Marine Fisheries Service, NPS: National Park Service, LOA: Letter of Authorization

Program needs include (Figure 3)

**Figure 3:** Summary of the program needs for coordination National Marine Mammal Health Program activities managed under the Cooperative Center for Marine Animal Health



*Infrastructure:* The program should develop nationally consistent but regionally implemented centers to assess disease and health of marine mammal species.

*Oversight:* Build upon a memorandum of understanding (MOU) signed in 2005 between the National Ocean Service’s National Centers for Coastal Ocean Science (NCCOS) and the National Marine Fisheries Service’s Office of Protected Resources (OPR) to establish and operate a Cooperative Center for Marine Animal Health (CCMAH). This virtual Center could well be the ground upon which a more inclusive and effective CCMAH would be built and it should be expanded to include other federal agencies such as the Marine Mammals Management branch of the United States Fish and Wildlife Service. The center would support an overall ocean health program across line offices and agencies.

*Partners:* These should include agencies and organizations that perform health monitoring and emergency response, field studies, methods and diagnostic tools development and research, and

informatics, and will include federal agencies (e.g. NIST\*, USGS' National Wildlife Health Center), state agencies (e.g. FLFWCC\*, SCDNR\*), academia (e.g. Universities of Hawaii, Alaska, California, and others), private and non-governmental organizations (e.g. Sea World, Mote Marine Lab, The Marine Mammal Center, Alaska SeaLife Center, Hubbs-SeaWorld Research Institute, New England Aquarium) and non-U.S. based organizations (e.g. Sea Mammal Research Unit, Department of Fisheries and Oceans Canada)

*Funding:* Core funding from participating state and federal agencies should be matched with in-kind funds from participating private, academic and non-profit organizations. Matching may also be in the form of staff redirection and resources dedicated towards research and emergency response.

*National coordination of data and data management:* Centralization of data is imperative for effective implementation of a National Marine Mammal Health Program which is integrated with the Wildlife Disease Information Node (National Biological Information Infrastructure, <http://wildlifedisease.nbi.gov/>) and the Fish Information Services (<http://fis.com/>), and consistent with the other federal and international databases. Data that would be generated by this program are urgently needed by local, state managers and federal managers, researchers, and stakeholders, and must be made available and be easily accessible on a real time basis.

*Research and education (includes public, managers, policy makers):* Research and graduate student training are keys to a successful health and disease investigation and monitoring program. By sharing resources and scientific expertise across the country and in different facility types, the marine mammal community will have capabilities that are more effective, responsive, and sophisticated; and be able to better respond to management and policy needs. Additionally, advanced educational opportunities should be made available to participants.

### **Program Goal**

Develop an early warning system to detect changes and trends in marine mammal and ecosystem health to direct mitigation efforts for effective management of these species and the ecosystems that support them.

### **Program Objectives**

- 1) Establish an effective strategy for investigating health and disease surveillance
  - i. Develop data management and analysis capabilities to allow for risk assessment and causal inferences in disease ecology of these species
  - ii. Develop a real time diagnostic system
  - iii. Develop a sample archiving system
  - iv. Develop monitoring and modeling tools, sampling strategies and biomarkers
- 2) Develop a rapid response capability for catastrophic events affecting marine mammals that is consistent with the National Response Plan and can be tiered for local to national catastrophic events
- 3) Establish a mechanism for effective collaboration, training and communication about marine mammal health and disease using web based tools and technologies

\* NIST: The National Institute of Standards and Technology, FLFWCC: Florida Fish and Wildlife Conservation Commission, SCDNR: South Carolina Department of Natural Resources

- 4) Establish a centralized information system and mechanism to disseminate information as rapidly and transparently as possible
- 5) Develop a research strategy in support of the detection, evaluation and mitigation of new and reemerging diseases and the ecology of anthropogenic versus natural events in a changing world
- 6) Provide a mechanism for evaluation and dissemination of information on diseases that have significant implications for human health to the community at risk

### **Program Implementation**

The following steps need to be taken to build upon the current Marine Mammal Health and Stranding Response Program to better implement a coordinated National Marine Mammal Program managed under the Cooperative Center for Marine Animal Health

*1) Create a cooperative center that can coordinate, at a national level, marine mammal health research and response programs*

- 1) For coordinated programs to include all marine mammal species, the current Cooperative Center for Marine Animal Health (CCMAH), currently formed through an MOU between NCCOS and NMFS-OPR, must be expanded to include all federal agencies with jurisdiction, at minimum the USFWS (Marine Mammals Management), the USGS and the NPS.
  - i) Organize a meeting for the key program leads (NOS, NMFS-OPR, USFWS, USGS, NPS) to develop a joint marine mammal health program. This meeting should lead to a new MOU to include USFWS in the current agreement between the NCCOS and the NMFS-OPR to join and co-operate the CCMAH.
- 2) Create regional centers or “hubs” to coordinate with the national center
  - i) Initially three regional centers should to be created to represent the six marine ecoregions off the United States that NOAA has delineated:
    - West Coast representing the Alaska ecosystem complex, California current and Pacific Islands associated with the Northwest Fisheries Science Center (NWFSC) and the National Marine Mammal Laboratory (NMML) in Seattle WA and includes Alaska, Washington, Oregon, California and Hawaii;
    - North East representing the Northeast US continental shelf associated with Woods Hole Oceanographic Institution (WHOI) Woods Hole MA and includes coastal states from Maine to Virginia;
    - South East representing the Southeast continental shelf and Gulf of Mexico associated with the Hollings Marine Lab (HML) in Charleston SC and includes North Carolina, South Carolina, Georgia and the Gulf states.
  - ii) These hubs currently include a regional science center, a NOAA Center of Excellence for Oceans and Human Health and an Oceans and Human Health Trainee Program. Each regional center will have strong collaborative relationships with the NMFS regional science centers and NCCOS ecosystem science centers and be tightly linked to the OHHI\* Centers in Seattle and Charleston, as well as regional universities.

\* OHHI: Oceans and Human Health Initiative

iii) The number of regional centers will be increased as additional resources and infrastructure becomes available and eventually will include centers representing the Alaska ecosystem complex, Southeast continental shelf, Gulf of Mexico and Pacific Islands separately.

*II) Identify partners federally and by region and to include all marine animal science sectors*

- 1) Identify disciplines that need representation in the cooperative.
  - i) These should include: health monitoring and emergency response, field studies, method development, diagnostic tools, and informatics. Utilize national or international bodies of science including the Wildlife Disease Association, Society for Marine Mammology, International Association for Aquatic Animal Medicine and Association of Fish and Wildlife Agencies.
  
- 2) Identify key partners
  - i) Hold national and regional stakeholder meetings to identify state, federal and local agencies responsible for marine mammal species management and those with existing health programs, as well as non-governmental agencies and organizations and research institutions with marine mammal health and science focus with an interest in participating in the cooperative
  - ii) Ensure marine mammal health is on the agenda of NOAA stakeholder and Governors Alliance meetings, or is included as a part of these meetings as a subgroup.
  - iii) Hold meetings associated with scientific conferences to involve partners from all areas of expertise including field biologists, managers, and academia.
    - Meetings may be added to the agenda in the form of an evening session or as a pre or post conference workshop.
    - Venues should include: the Society for Marine Mammology's Biennial Conference, the International Wildlife Disease Association Conference, the Annual International Association for Aquatic Animal Medicine Meeting, the American Veterinary Medical Association's Annual Convention and the American Association of Veterinary Laboratory Diagnosticians Annual Meeting.
  
- 3) Currently potential partners include:
  - i) Health monitoring
    - Florida Fish and Wildlife Conservation Commission
    - North Slope Borough
    - National Marine Mammal Health and Stranding Program
    - The Marine Mammal Center
    - Woods Hole Oceanographic Institution
    - Alaska SeaLife Center
    - North Carolina State University
    - New England Aquarium
    - Regional Fish and Game Departments
  - ii) Emergency response
    - National Marine Mammal Health and Stranding Program
    - Regional stranding networks
  - iii) Field studies:
    - University of North Carolina, Wilmington
    - Florida College of Veterinary Medicine
    - Mote Marine Laboratory
    - National Marine Mammal Laboratory

- New England Aquarium
- Moss Landing Marine Laboratory
- iv) Methods, diagnostic tools and research
  - National Wildlife Health Center
  - University of California at Davis
  - Hollings Marine Laboratory
  - Centers for Disease Control and Prevention
  - United States Department of Agriculture's Animal and Plant Health Inspection Service
  - Northwest Fisheries Science Center
  - University of Florida at Gainesville
  - University of Georgia at Athens
  - Hubbs-SeaWorld Research Institute
- v) Informatics
  - University of California, Davis
  - Hollings Marine Laboratory

### *III) Organize and structure the Regional centers*

- 1) Through the regional stakeholder meetings and meetings held associated with scientific conferences, partners will be identified for each regional center
- 2) The current capacities and level of expertise must be determined for each region, including:
  - Disease/outbreak detection and response
  - Ability to investigate the effect of human interactions on marine species
  - Animal sampling
  - Necropsies
  - Diagnostics
  - Disease reporting
  - Research programs
- 3) Determine the future functions for each center:
  - i) Research program targeted towards regional priorities
  - ii) Funding through grants, cooperative agency agreements, contracts
  - iii) Coordinate use of available funds and pool regional resources
  - iv) Focus for each regional center will depend on the region's needs (ie. species, diseases, ecosystem type). Certain areas may be emphasized, but each should include surveillance, diagnostics, sample archive and access facility and procedures.
  - v) Access to or development of a dedicated diagnostic laboratory with regional capabilities where needed.
  - vi) Employ a regional coordinator for each region who will facilitate and coordinate activities in their region, nationally and with other regions. These positions require individuals with strong organizational and communication skills, and will be necessary to ensure a long term investment in the program and to achieve and maintain consistency.
- 4) Identify regional committees to guide the development of regional goals and the roles of all partners
  - i) Hold regional stakeholder meetings to identify representatives from all necessary partners – include regional state, federal agencies, NGO's, universities. These representatives from each



region will be tasked to develop the key needs for the region. This will set a framework for the roles and responsibilities for each region with the aim to decrease confusion and be more inclusive.

*IV) Develop marine mammal specific disease diagnostics and dedicated laboratories on both the east and west coasts for this purpose.*

- 1) Catalogue current diagnostics available in various diagnostic laboratories in North America with the capability to analyze marine mammal samples.
- 2) Develop two dedicated marine mammal disease diagnostic labs as exist for domestic and other wildlife species:
  - West Coast laboratory based at the University of California, Davis
  - East Coast laboratory at a site to be identified.
  - i) Each lab will focus diagnostics on regional species where appropriate and serve as a central clearance house for samples sent to other diagnostic labs as needed.
  - ii) Maintain consistency between the laboratories with quality assurance and quality control (QA/QC) programs for sample collection, analysis and storage
  - iii) National standardization of diagnostic tests, establishment of banks for control and testing materials and mechanism for distribution of and access to these materials.
  - iv) Develop specific diagnostic tests for marine mammals and transfer technologies from research institutions as available for use in diagnostics
  - v) Maintain the ability for surge capacity to be able to respond to unusual mortality events
- 3) Develop a national diagnostics submission form to be used by all collaborating laboratories to streamline sample submission.
  - i) This form will be available electronically and data associated with sample submission will automatically be entered into a database.
  - ii) A printable submission form will also be available for use in the field.
- 4) Develop a centralized database for specimen and result tracking.
  - i) Samples and associated information will be automatically entered into the database if the on-line submission option is used by submitters.
  - ii) The database will be centralized and allow for animals, specimens and results to be tracked.
- 5) Establish a list of additional diagnostic labs available for disease surveillance and with the ability for surge capacity when disease outbreaks and mortality events occur.
- 6) Identify key pathogens, diseases and events for routine surveillance and reporting, and develop a framework and mechanism under which reporting should occur
  - i) Ensure collection of suitable samples by establishing protocols for the investigation of specific events that are known to occur, developing disease or case definitions and descriptions similar to what those developed by Wildlife Disease Information Node for Chronic Wasting Disease.
  - ii) These should include, but not be limited to: domoic acid toxicosis, saxitoxin toxicosis, brevetoxicosis, leptospirosis, morbillivirus and influenza epidemics, acoustic related great whale strandings and human interactions.

## *V) Improve responses to unusual mortality events*

Currently efforts are fragmented and resources diffuse. Additionally, information collected through UME responses is limited due to data quality and the need for a centralized database to track both animals and disease and cause of mortality data. Unusual mortality event response is funded by NOAA. CCMAH's role should be to provide input and support response through the network associated with regional centers.

- 1) Improve the utility of the data collected through the UME response by
  - i) Expanding the National Stranding database to:
    - Include data on cause of death and disease investigations.
    - Integrate single stranding, mass stranding and UME stranding data into one real time searchable database with a method for rapid identification of these "group" events.
    - Develop data sharing protocols, consistent data standards and metadata standards, and agreements to facilitate collaborations and extensions of analyses.
    - Integrate geographic information system (GIS) analysis of events both spatially and temporally
  - ii) Integrate the marine animal health program with the stock assessment programs of the NMFS and population monitoring programs of the FWS and USGS, as well as other federal programs addressing environmental and climate variables impacting marine mammal health (e.g. the Ecology and Oceanography of Harmful Algal Blooms).
- 2) Improve the administrative process to facilitate more efficient responses by
  - i) Appointing a full time dedicated Executive Secretary to:
    - Track the administrative process.
    - Develop effective inter and intra-agency communication.
    - Facilitate communication between the working group and the field investigation team.
    - Act as an off-site coordinator.
  - ii) Improving communication between the NMFS Working Group on Marine Mammal Unusual Mortality Events (WGMMUME) and the on-site response coordinator (OSC) through weekly communication by dedicating one member of the Working Group as the liaison for each UME. This would provide the Working Group with real time information on the UME response and the OSC with moral and logistic support.
  - iii) Identify and train personnel in each region to respond to UMEs:
    - Develop permanent team members trained to be the OSC on emergency response and members of teams to be employed during responses to UMEs. These teams would consist of at least three people, from which would be drawn appropriate response teams for specific events, based on the existing abilities and needs of the local stranding networks.
    - Availability of team members would be accommodated through a retainer and NMFS would pay for all travel associated with the response. Teams are described in more detail below.
    - Develop a mechanism for personnel to monitor the event, perform data collection and data reporting in real time ie. submit information into a database that allows for real time entry and access
    - Facilitate monitoring (personnel, equipment, access to diagnostic labs) after the event and maintain the ability to access the data in real time

- 3) Enhance response logistics and resources of stranding network members by:
  - i) Regular training in necropsy techniques, sample collection, archiving and shipping to all network responders.
  - ii) Web-based training and information dissemination
  - iii) Stocking each region with supplies for emergency sampling of marine mammals.
  - iv) Identifying appropriate storage facilities in each response area.
  - v) Develop a permanent response team available to rapidly mobilize during a UME with a trained pathologist, research assistant and a data manager.
  - vi) Post response, sampling and shipping protocols to a website for easy access.Identify funds for carcass handling and disposal so that large whales can be towed ashore for examination then disposed of.
  
- 4) Develop the means to fund crucial aspects of a response that are currently not allowed, such as salary support for personnel dedicated to a UME, and for carcass disposal.

*VI) Develop and fund a research and surveillance plan to address diseases affecting marine mammals and factors predisposing marine mammal populations to mortality events.*

- 1) Identify research priorities nationally and regionally and identify research labs to conduct the work
  
- 2) Research should focus on marine mammal ecology, population dynamics, disease investigations, long term health monitoring, methods and tools development and informatics.
  - i) Research in this field is relatively new and primarily confined to a small group of specialists. To accommodate the growing demand for expertise in this field, expanded training of scientists and diagnosticians will be required.
  - ii) Advanced training opportunities must be provided to alliance participants on pertinent topics; including technology transfer, continuing education and specialized training in a cutting edge disciplines and techniques.
  - iii) Research to develop better methods to utilize remotely collected small samples for multiple analyses
  
- 3) National coordination of epidemiologic data and risk assessments performed regionally
  - i) Data collection must be standardized among all participants so that management of information can be centralized and utilized for monitoring health, population surveillance to detect new and emerging diseases, and to facilitate epidemiologic analyses and risk assessment to recommend strategies to prevent catastrophic events, and develop and advocate sound management policies.
  - ii) Data standards and consistent nomenclature with quality assurance and validated methods
  - iii) Data analyses should be tailored to address federal, regional and state management needs and provide a mechanism to provide the information to managers and policy makers.

*VII) Create infrastructure and communication mechanisms*

- 1) Develop guidelines for specimen collection, data collection and data tracking that are standardized nationally.
  - i) Provide regular training to members of the cooperative to ensure consistency for data collection, sample analysis and data analysis.

- 2) Develop a centralized national marine mammal health database to allow for long term health monitoring and disease surveillance that can be associated with population parameters.
  - i) This database should be integrated with those maintaining population assessment, specimen tracking and diagnostic testing, stranding and unusual mortality event databases.
  - ii) The database must be easily accessible for real-time data entry and tracking.
  
- 3) Develop and maintain mechanisms for data communication, eg. the virtual microscope, databases, video conferencing and workshops.

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