Report of the Protected Resources Science Investment Plan Workshop

Edited by:
Michael Simpkins and Mridula Srinivasan

With contributions from (listed alphabetically):
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I.   Executive Summary

The NMFS Office of Science and Technology and protected resources leadership convened a Protected Resources Science Investment Plan (PRSIP) workshop during 27-29 November 2012. The workshop was intended as a first step in developing a new process for better targeting NOAA's protected resources science programs toward meeting management needs and better communicating the value of protected resources science to decision makers.

The workshop began with an initial assessment by both NOAA and our federal partners of management needs for protected resources science. Following the presentations, the NMFS Protected Species Economists Working Group presented several case studies to demonstrate the role economics plays in protected resources science and management. The case studies demonstrated the advantages of a better understanding of the economic linkages with protected resources research and management and also highlighted analytical tools that can improve protected resources science planning efforts.

Information from the Day 1 presentations, as well as responses to the previously distributed workshop questionnaire, were used to inform Day 2-3 discussions that identified the initial framework of a process to (a) identify science needs for protected resources science, (b) prioritize those needs and the science needed to inform them, and then (c) carry out near-term planning based on available budgets, (d) develop longer-term investment strategies for high-priority science that cannot be conducted under available budgets, and (e) produce a communications plan to better convey the value of protected resources science activities to decision makers . That process was tentatively titled *"Protected Resources Science Investment and Planning Process (PRSIPP)"* and will be developed and implemented over the course of the next few years.   Elements of the process will be tested, improved, and applied as feasible in the short-term. Continued engagement and solicitation of feedback from internal and external partners will occur as the process is refined and implemented.

II.   Introduction

NMFS science leadership is pursuing the development of a "Next Generation Plan" for protected resources science. In 2004, NMFS produced a Stock Assessment Improvement Plan

or SAIP (Merrick et al. 2004[1]) for protected resources, which laid out the agency's mandates and the scientific effort and costs associated with achieving those mandates. Changing times, new challenges, and budgetary outlook call for a fresh and forward looking approach to plan protected resources science activities across the agency. In particular, NMFS intends to look closely at what the current needs are for protected resources science and develop effective strategies for meeting those needs both now, under current budget constraints, and in the future. We also are focused on improving our communication to decision makers of the value of protected resources science. To achieve these objectives, a NMFS Protected Resources Science Investment Plan (PRSIP) workshop was held at the Waterview Conference Center, Arlington, Virginia during 27-29 November 2012 (see agenda and participants in Appendices 1 and 2).

Prior to the workshop, we solicited input from external federal partners and NMFS managers and regulators regarding their critical needs for protected resources science products (questionnaire provided in Appendix 4). In response, on Day 1 of the workshop, our federal partners gave presentations on their identified critical needs. We also presented a synopsis of the critical needs identified by several offices in NMFS. This was followed by a series of presentations on protected resources economics, focused on ways in which economic analyses can support regulatory actions, assess the value of protected resources science, and provide additional support for improved protected resources management. Day 2 was devoted to internal discussions on how to better target our science enterprise to meet both internal and external needs. Those discussions continued into the morning of Day 3, which also included presentations and discussion exploring how to best portray/convey to decision makers the value of protected resources science in the context of the needs expressed by internal and external stakeholders.

The workshop was a significant first step toward developing a next-generation plan, improving communication, and front-loading the science needed to respond to external and internal management needs. This workshop is the first in a series of workshops and meetings proposed to develop a new path for advocating and strengthening protected resources science within and outside the agency. The focus of this workshop was marine mammals and sea turtles, but we recognize the wide array of diverse taxa such as fish, invertebrates, and marine plants that constitute 'protected' resources within NMFS jurisdiction. Our plan is to address these 'other' taxa in future meetings and workshops and as we develop and implement our next-generation framework for protected resources science.

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[1] : NMFS. 2004. A requirements plan for improving the understanding of U.S. protected marine species. Report of the NOAA Fisheries National Task Force for Improving Marine Mammal and Turtle Stock Assessments. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-F/SPO-63.

III.   Information needs

The workshop was opened by welcoming remarks from workshop co-chair, John Bengtson, NOAA Director of Policy, Sally Yozell, and NMFS Science Advisor for Stock Assessments, Rick Methot. This was followed by a series of presentations by NOAA and external federal partners regarding their critical needs for protected resources science products. These presentations are summarized in Appendix 3. Presentations were informed by a questionnaire (Appendix 4) that was sent prior to the workshop to internal NOAA offices and external federal partners to solicit input regarding protected resources science needs. Additional work is required to improve and refine our needs assessment methods as well as to reach out more broadly and gather input from the full range of interested federal stakeholders.

Although the information received through the questionnaire responses, presentations, and subsequent discussions did not represent a comprehensive needs assessment, it did highlight some common themes.

External federal partners recognized NMFS as the expert agency with respect to protected resources science (for the species under NMFS' jurisdiction), and they rely on NOAA to provide scientific input for their decisions. More specifically, several common information needs were identified:

- Improve baseline data on protected resources and characterize remaining uncertainty,
- Improve site-specific biological information (sites and species of interest likely vary among stakeholders),
- Enhance information on impacts of human activities (e.g., oil spills and anthropogenic noise) and cumulative effects,
- Develop criteria and thresholds for impact assessment,
- Investigate ways to reduce and mitigate anthropogenic threats,
- Monitor to determine whether management actions succeed and are effective, and
- Develop and use advanced technologies.

In addition to the specific information needs that were identified as common across many stakeholders, the presentations and following discussions raised several issues to be considered. Workshop participants discussed which target objectives should be the main drivers of protected resources science priorities and messaging, including such objectives as protecting species and understanding ecosystems (conservation/stewardship), providing economic or subsistence benefits (economic), and addressing any political or litigation concerns (political/legal). They also pointed to data sufficiency and quality standards,

wondering how much would be "good enough" (e.g., how good the data and analytical results must be, how recent, etc.) to meet decision makers needs. Procedurally, participants discussed what could be done to better meet target objectives and what better mechanisms could be used to engage federal partners to identify their priorities. All of these themes were recorded and discussed during the remaining days of the workshop, though many require additional discussion and work.

IV.   Economic Linkages

NMFS economists provided a series of presentations on how economics and other human dimensions are a part of protected resources science. Several case studies were presented to demonstrate the role economics plays in protected resources science (and management). The three broad areas include (a) regulatory support, (b) value of information, and (c) improving or enhancing protected resource management (see summaries in Appendix 3). With respect to regulatory support, the benefit-cost-analysis (BCA) framework allows us to evaluate "net" societal tradeoffs. For example, in the case of Critical Habitat designation for the Cook Inlet beluga whale (NMFS 2010), the direct cost of constraining the pollock fishery was compared to benefits that accrue to society by not allowing this activity to destroy or adversely modify an essential habitat feature of the critical habitat. With respect to valuation of protected resources science, one presentation evaluated the trade-off between the cost of additional research and the benefit to the fishing industry of reduced uncertainty, which would allow less restrictive fishing constraints. Another presentation assessed the non-market value of protected resources using survey techniques to derive how much the public would be willing to pay to recover a given endangered or threatened species. Other presentations focused more broadly on ways in which economic analyses can inform other protected resources science as well as management decisions. A case study was presented on how direct conservation payments from high seas fisheries that interact with turtles are used to finance nesting site protection. Another case study highlighted how ESA protection constraining US fisheries can have a spillover effect by enabling increased fishing by foreign countries with poorer mitigation requirements, which can then result in a negative impact on the species originally targeted for protection.

The discussion following the presentations was lively. NOAA Chief Economist Linwood Pendleton helped launch the discussion with two overarching questions:

(1) What social science do we need to make better protected resources management decisions?

(2) What are the benefits of protected resources science and new technology?

The discussion highlighted a few important concepts, including (a) the need to consider ancillary benefits of protected resources science and management decisions on other species, other ecosystem services, and economic activities (see also appendix summary), and (b) the need to more broadly evaluate what social science research is required to improve protected resources management decisions.

V.   Draft Outline of Protected Resources Science Investment and Planning Process Document

A key product of the workshop is a general framework for a new process to carry out near-term planning based on available budgets and to develop longer-term investment strategies for high-priority protected resources science that cannot be conducted under available budgets. That process will be based on working with internal and external federal partners to identify management needs, followed by prioritizing those needs and the science required to inform them. Additional work is necessary to more fully develop the framework. The first step identified was to develop a strawman process document for further discussion. Workshop participants developed a draft outline for that document, which is provided here:

A. Introduction

   1. Identify audience for plan (NMFS Leadership Council, Centers, Regional Offices)

   2. Focus on marine mammals and turtles for initial PRSIPP – other species later (scalable)

   3. Given ESA mandates and status of species and threats, protected resources issues are likely to increase in scope and severity through time, and scientific information will be critical to managing those issues effectively

   4. Ensure collection of baseline data and focus on understanding uncertainty

B. How to identify information needs

   1. Identify "clients," how to engage/coordinate with federal partners

   2. How best to ask decision makers for their priority needs

C. How to set priorities

   1. Scientific information and analysis: How much? How good? How recent?

   2. Urgency

3. Prioritization tools

4. Funding needs: NOAA, Non-NOAA

5. Performance metrics

6. Address reality that there are very few truly discretionary funds within protected resources science; how to implement priorities within constraints of budget and budget guidance

D. Science (tools and actions) to implement priorities

1. New tools, advanced technology, economics

2. Develop/maintain science capacity

3. Types of projects to produce information

E. Messaging

I. Identify audience

II. Messaging strategies: NOAA/Non-NOAA

VI. Messaging

On Day 3 of the workshop, internal participants discussed ways to better convey the value of protected resources science to the various individuals and organizations that make decisions regarding resource allocation to protected resources science. To inform that discussion, several presentations were provided by staff from the NOAA Office of Legislative Affairs, NMFS Office of Management and Budget, and NMFS Office of Communication (see Appendix 5 for summaries of presentations). In addition, staff involved in planning and budgeting from the NMFS Office of Program Planning and Integration, NOAA Office of Management and Budget, and NMFS Office of Protected Resources and Office of Science and Technology participated to provide helpful context.

One key point raised was that different audiences require different messages, but several common themes are readily apparent. In particular, it was clear that the value of protected resources science must be conveyed in language that is easily understood and resonates with the targeted audience. A key messaging element is to establish clear links between science and management goals and articulate the conservation and socioeconomic impacts of specific

management decisions (and quality of science available to inform those decisions). Another essential component of any message or statement is to share positive examples where improved protected resources science has led to improved management decisions that have enabled or enhanced industrial, recreational, or other activities. Workshop participants felt that these approaches to messaging were entirely consistent with the proposed Protected Resources Science Investment and Planning Process, which is designed to make strong links between science and management needs. Participants also noted the consistency between the discussion of messaging and the topics discussed during the Day 1 session of protected resources economics.

VII.   Workshop Action Items

As the workshop wrapped up, participants identified a series of key follow-up action items, which are listed here:

- Produce draft workshop report for steering committee (mid-January 2013),
- Finish and distribute workshop report,
  Follow up– share workshop recommendations and report with NMFS and NOAA Leadership, likely including short briefing on one of the Science Board calls (February 2013 and following),
- Establish structure for PRSIPP development and begin drafting strawman – Produce strawman or annotated outline for review at next Protected Resources Leadership meeting (April 2013),
- Tie into NMFS/NOAA budgeting processes as possible – at least in terms of messaging,
- Identification of prioritization tools to consider for use in PRSIPP,
- Consider engaging facilitator for PRSIPP development,
- Seek help with internal communication of PRSIPP report/needs, and
- Develop protected resources communication plan.

VIII.   Acknowledgments

Sincere thanks to workshop steering committee members and support staff (Robyn Angliss, Lisa Ballance, John Bengtson, Shannon Bettridge, Kathryn Bisack, Nicole LeBoeuf, Keith Mullin, Frank Parrish, Jeremy Rusin, Paul Richards, Erin Seney, Michael Simpkins, Dale Squires, and Mridula Srinivasan) for spending countless hours on the phone and email to share ideas and plan this event. Special thanks to John Bengtson and Michael Simpkins (Workshop Co-chairs) for their tireless efforts to lead and guide discussions during the workshop and to Mridula Srinivasan for facilitating workshop planning and coordinating logistics. Thanks also to all the rapporteurs and other NMFS staff who helped with workshop logistics and worked behind the scenes. Last, a special nod to all the workshop participants for their invaluable contributions before, during, and after the workshop. Participant feedback and continued engagement will greatly advance post-workshop efforts and help with implementing workshop recommendations.

Appendix 1 – Agenda

Protected Resources Science Investment Plan Workshop

Waterview Conference Center, Archimedes Room 23rd Floor, Arlington, VA

27-29 November 2012

John Bengtson and Michael Simpkins, Co-Chairs

Day 1 – Protected Resources Science Needs Assessment

8:30-9:00   *Arrival, coffee*

9:00-10:00   Welcome and NMFS PR Science Needs Overview

> ***John Bengtson**, Workshop Co-Chair and Director of the National Marine Mammal Laboratory*
>
> ***Sally Yozell**, NOAA Director of Policy*
>
> ***Rick Methot**, NOAA Science Advisor for Stock Assessments*
>
> ***Nicole LeBoeuf**, Chief, Marine Mammal and Sea Turtle Conservation Division, NMFS Office of Protected Resources*
>
> ***Steve Gittings**, Science Coordinator, NOS National Marine Sanctuaries*
>
> *Program*

10:00-10:30   CetMap Presentation – Quality of marine mammal population abundance/density data throughout US waters, ***Jason Gedamke**, NMFS Office of Science and Technology*

10:30-11:00   *Break*

11:00-12:00   External Protected Resources Science Needs

Presentations by external federal partners:

> **Brian Hooker**, *Bureau of Ocean Energy Management, Office of Renewable Energy Programs*
>
> **Deborah Epperson**, *Bureau of Safety and Environmental Enforcement*
>
> **Meghan Massaua**, *Department of Energy, Office of Energy Efficiency and Renewable Energy, Wind and Water Power Program*
>
> **Bob Gisiner**, *US Navy, Chief of Naval Operations (OPNAV) Energy and Environmental Readiness Division*
>
> **David Hogan**, *Department of State, Office of Marine Conservation*
>
> **Dennis Heinnemann**, *Marine Mammal Commission*

12:00-13:00   *Lunch*

13:00-15:00   External Protected Resources Science Needs – Continue presentations by external federal partners

Followed by informal comments by other external partners and discussion

15:00-15:30   *Break*

15:30-17:00   Linking Protected Resources Science and Economics

> **Kathryn Bisack**, *NMFS, Northeast Fisheries Science Center*
>
> **Sarah Malloy**, *NMFS, Pacific Islands Fisheries Science Center*
>
> **Kristy Wallmo**, *NMFS, Office of Science and Technology*

17:00   Closing

Day 2 – Protected Resources Science Planning – Linking to Needs

Discussing the needs identified on Day 1 and how they relate to protected resources science planning - and how we might change our approach to more clearly link our protected resources science planning to those needs.

8:30-9:00   *Coffee*

9:00-10:15   Day 1 Reflections (Discussion)

10:15-10:30   *Break*

10:30-12:00   How well do our current protected resources science programs address the identified needs?

12:00-13:00   *Lunch*

13:00-14:45   Research needed to fill gaps between current protected resources science and needs

14:45-15:00   *Break*

15:00-16:30   How to set priorities among identified needs

16:30-17:30   Identification of "actionable ideas" or "next steps" to pursue

Day 3 – Protected Resources Science Messaging

Day 3 focuses on messaging (for lack of a better term) - with discussions regarding how best to portray/convey the value of protected resources science to decision makers

8:30-9:00   *Coffee*

9:00-10:45   Day 2 Reflections (Additional discussion as needed)

10:45-11:00   *Break*

11:00-12:30   Communication presentations followed by Q&A

> **Tanya Dobryzinski**, *NOAA Office of Legislative and Intergovernmental Affairs*

> **Dana Flower Lake**, *NMFS Office of Management and Budget*

> **Rebecca Ferro**, *NMFS Office of Communications*

12:30-13:30   *Lunch*

13:30-14:30   Identifying components of effective messages

14:30-14:45   *Break*

14:45-15:45   Strategies for conveying messages to different audiences

15:45-16:00   *Break*

16:00-17:00   Identification of next steps for development of Protected Resources Science Investment Plan and/or Next Generation Protected Resources Science Plan

17:00   *Closing*

Appendix 2 – Participant List

1.   *Lisa Ballance, NMFS Southwest Fisheries Science Center*

2.   *John Bengtson, National Marine Mammal Laboratory, Alaska Fisheries Science Center (Workshop co-chair)*

3.   *Shannon Bettridge, NMFS Office of Protected Resources*

4.   *Kathryn Bisack, NMFS Northeast Fisheries Science Center*

5.   *Mary Boatman, Bureau of Ocean Energy Management*

6.   *Stephen Brown, NMFS Office of Science and Technology*

7.   *Megan Butterworth, Bureau of Ocean and Energy Management*

8.   *David Detlor, NMFS Office of Science and Technology*

9.   *Joe Desfosse, NMFS Office of Sustainable Fisheries*

10. *Dena Dickerson, Army Corps of Engineers*

11. *Tanya Dobrzynski, NOAA Office of Legislative and Intergovernmental Affairs*

12. *Laura Engleby, NMFS Southeast Regional Office*

13. *Deborah Epperson, Bureau of Safety and Environmental Enforcement*

14. *Tina Fahy, NMFS Southwest Regional Office*

15. *Rebecca Ferro, NMFS Office of Communications*

16. *Dana Flower Lake, NMFS Office of Management and Budget*

17. *Mike Ford, NMFS Northwest Fisheries Science Center*

18. *Jason Gedamke, NMFS Office of Science and Technology*

19. *Steve Gittings, National Ocean Service, National Marine Sanctuaries Program*

20. *Bob Gisiner, U.S. Navy*

21. *Eric Hanson, NOAA Budget Office*

22.	*Dennis Heinemann, Marine Mammal Commission*

23.	*David Hogan, Department of State*

24.	*Brian Hooker, Bureau of Ocean Energy Management*

25.	*Shawna Karlson, NMFS Office of Management and Budget*

26.	*Nicole LeBoeuf, NMFS Office of Protected Resources*

27.	*Jennifer Lechuga, NOAA Office of Program Planning and Integration*

28.	*Sarah Malloy, NMFS Pacific Islands Fisheries Science Center*

29.	*Meghan Massaua, Department of Energy*

30.	*Brad McKittrick, U.S. Coast Guard*

31.	*Rick Methot, NOAA Science Advisor for Stock Assessments*

32.	*Hassan Moustahfid, U.S. Integrated Ocean Observing Systems (IOOS)*

33.	*Beth Norton, NOAA Healthy Oceans Goal, Office of Sustainable Fisheries*

34.	*Frank Parrish, NMFS Pacific Islands Fisheries Science Center*

35.	*Michael Payne, NMFS Office of Protected Resources*

36.	*Debbie Payton, National Ocean Service, Office of Response and Restoration*

37.	*Linwood Pendleton, NOAA Chief Economist*

38.	*Earl Possardt, U.S. Fish and Wildlife Service*

39.	*Deborah Crouse, U.S. Fish and Wildlife Service*

40.	*James Price, Bureau of Ocean Energy Management*

41.	*Paul Richards, NMFS Southeast Fisheries Science Center*

42.	*Teri Rowles, NMFS Office of Protected Resources*

43.	*Marc Santoro, NMFS Office of Management and Budget*

44.	*Barbara Schroeder, NMFS Office of Protected Resources*

45.	*Erin Seney, NMFS Office of Science and Technology*

*46.	Michael Simpkins, NMFS Northeast Fisheries Science Center (Workshop Co-chair)*

*47.	Sunny Snider, NMFS Office of Protected Resources*

*48.	Angela Somma, NMFS Office of Protected Resources*

*49.	Mridula Srinivasan, NMFS Office of Science and Technology (Workshop Coordinator)*

*50.	Frank Stone, U.S. Navy*

*51.	Alecia Van Atta, NMFS Pacific Islands Regional Office*

*52.	Kristy Wallmo, NMFS Office of Science and Technology*

*53.	Phil Williams, NMFS Office of Protected Resources*

*54.	Kathleen Wynter, NMFS Office of Science and Technology*

*55.	Sally Yozell, NOAA Director of Policy*

Appendix 3 – Summary of Day 1 Presentations

Sally Yozell, NOAA Director of Policy

Sally noted the need to plan for mid- and long term science needs and the importance of leveraging available resources to deal with constrained budgets. She indicated that prior experience shows that sound science is fundamental to success in industry and used the example of information used to change shipping lanes to reduce the number of ship strikes on North Atlantic right whales. Other areas of emphasis mentioned included bycatch mitigation, mapping distribution of noise, and AMAPPS (Atlantic Marine Assessment Program for Protected Species) collaborations between FWS, NMFS, BOEM and the US Navy. She offered an example from the Pacific, where a spatial decision support system provides an online system for tracking densities of marine mammals, and indicated that future monitoring should incorporate passive acoustic monitoring and other advanced technology to improve understanding of protected species populations. She also indicated that there is a need to move beyond the single-species approach to conservation and management and called for organizations to work together to address coastal marine planning, ecosystem science and climate change. She also stressed that the integration of economics and social science in planning will gain buy-in with constituents and that understanding and prioritizing science activities earlier in the management process is important.

Rick Methot, NOAA Science Advisor for Stock Assessments

Rick began by noting that stock assessments are at the nexus of managing fish stocks and protected species. He indicated that stock assessments for fish are not as explicitly required in the Magnuson-Stevens Act as they are for marine mammals within the MMPA. Still, he noted that the call for science in the Magnuson-Stevens Act is very strong because fisheries stock assessments based on the best available science are used to determine allowable catch. With respect to protected species, such as marine mammals, Rick remarked that the focus is on calculating potential biological removal levels, and for that, we need basic information on populations, including biological parameters, removal levels, and the abundance of populations over time. He noted that many fish assessments are driven by tracking relative trends of abundance because the abundance data are not available.

He reminded the group that out of 230 fish stocks, only 132 have adequate associated assessments, but that advanced technology can improve our information and improve

efficiency in collecting information. He also stated that habitat data are being included in fish stock assessments to improve our understanding, as are ecosystem and climate-related influences – all of which improve NMFS' forecasting capabilities. He indicated that stock assessments should use a cross section of disciplines – traditional fisheries data, quantitative analyses, biology, ecology, and technology to collect information. He pointed out that integrated ecosystem assessments combine all of these specializations to provide ecosystem models for fisheries, protected species, and coastal zone management. He characterized stock assessments as tactical analyses from within a much broader suite of ecosystem analyses and noted that, where gaps in information are identified and can be filled, doing so will improve our overall assessments.

Nicole LeBoeuf, Chief, Marine Mammal and Sea Turtle Conservation Division, NMFS Office of Protected Resources

Nicole reported a summary of the results of the questionnaire provided in advance of the workshop regarding protected resources science investment needs, reiterating NOAA's overall mission and the kinds of decisions that require protected resources science information. Her summary included responses from five NMFS offices and three science centers. She indicated that the protected resources science needs were attributed largely to established mandates including the ESA and MMPA and that, in most cases, were crisis-driven and/or single species focused. She noted that respondents indicated considerable overlap in current data needs and potentially in their data holdings. She further relayed that new protected resources are an emerging issue and we have a lot less information on them relative to marine mammals and sea turtles. Nicole noted that baseline data are needed for many species for which there is insufficient funding to support such work and that we need to use existing funds consistent with the purpose for which they were appropriated for.

Nicole described some of the consequences and risks associated with limited or insufficient protected resources science information and provided an example where a wide range of information is needed to make a single management decision (e.g., false killer whale ESA listing). She indicated that in all cases there is a need for dialogue between scientists and managers to make sure needs are met and that protected resources science activities are responsive to statutory requirements. Nicole also noted that there were a range of issues for consideration that came up during her discussions with marine mammal and sea turtle managers within NMFS. Some of the key issues include:

- Finite (perhaps shrinking) funding,
- Need to better convey value of protected resources science,

- Identification of overlap in the federal government's data needs (need to have a systematic conversation),
- Need for information associated with other protected resources (e.g., corals),
- Areas of growing urgency (e.g., baseline, impact, and spill response in Arctic),
- More robust consideration of cumulative impacts of human activities,
- Striking an appropriate balance between cost-effective collaborations to fulfill shared mandates and using one agency's resources to fulfill the needs of another, and
- Need for a more robust internal conversation about protected resources science needs and how to prioritize among them.

Steve Gittings, Science Coordinator, National Ocean Service (NOS) National Marine Sanctuaries Program

Steve provided an overview of the National Ocean Service's National Marine Sanctuaries Program (NMSP), which manages 14 marine sanctuary units across the country. He noted that each of them has recently completed a science needs assessment (results available online by sanctuary), and that their science needs are multi-disciplinary with activities that overlap with NMFS protected resources science needs. Overarching priorities included: communicating science requirements, engaging NOS science capabilities, working better with other NOAA programs, facilitating partnerships, and addressing spatial planning. Key species of interest include whales, turtles, fish, pinnipeds, corals, whale sharks, and manta rays. Some key issues include vessel strikes, marine debris, anthropogenic noise (e.g., the impacts of air guns on manta rays), oil spill response, ecosystem connectivity, and spawning aggregations. An example of ongoing research includes cetacean tagging studies to examine behavior and installation of listening buoys to provide real-time status of whale presence relative to ship traffic.

Steve relayed the sanctuaries' priorities for future research including: characterization of the acoustic environment, oil spill response (e.g., alternative oil removal methods, among other things), investigations related to pre-approval of chemicals, (e.g., toxicity, mixing depths and dispersal of oil dispersants), and impacts to vulnerable species (e.g., corals and whale sharks) relative to different conditions. He also noted the need for additional information regarding the connectivity of humpback whale populations and for characterizing critical habitat for spawning fish aggregations. Steve described several opportunities for NMFS and NMSP to work together, including the use of the Sanctuaries Program's small boat fleet and its remote-sensing UAVs, as

well as potential collaborations on sentinel sites and site evaluation of existing sanctuaries and potential new sites.

Jason Gedamke, NMFS Office of Science and Technology

Jason provided an overview of a recent NOAA led effort to develop tools to map anthropogenic noise and cetacean density and distribution in U.S. waters, and how these tools might be used as a means to identify science needs and gaps. He described how anthropogenic noise is known to be increasing in some measured locations, and that the low frequencies of sound most prevalent from human activity travel long distances underwater. He noted that these two data- and product-driven working groups (the Underwater Sound-field Mapping Working Group and the Cetacean Density and Distribution Mapping Working Group) were convened in January 2011, and delivered initial products (see http://cetsound.noaa.gov/index.html) at a public symposium in May 2012. Jason described the SoundMap tool, which models chronic, cumulative sound from multiple source types in a region or up to ocean basin scale. He also described the CetMap tool and data availability matrix, which provide a single location to identify available regional species specific cetacean density and distribution data and to assess its quality. CetMap uses a hierarchical system for determining information quality similar to that of the US Navy. Finally he noted that this project has been primarily supported by the Navy, NOAA, BOEM, with additional support from Dokumentes des Meeres and the Marine Mammal Commission.

Brian Hooker, Office of Renewable Energy, Bureau of Ocean and Energy and Management (BOEM)

Brian Hooker started by noting that his role is focused on the lease of the outer continental shelf areas for wind energy development in the Atlantic Outer Continental Shelf. Potential lease areas are initially identified by looking for suitable locations that fall in gaps of other human uses (e.g., shipping, defense, fishing, and federally protected areas) by intergovernmental task forces. Endangered Species Act Section 7 consultations are conducted regarding proposed activities including geological and geophysical surveys, marine pile driving, electromagnetic fields from cables, and other environmental impacts associated with tower construction and operation. Brian noted that BOEM has an environmental studies program that supports regional scale studies. These studies are often driven by publicly voiced, ESA-listed single species concerns. Brian also noted that regional scale economic impacts are a primary concern

for BOEM as individual lease holders will not be evaluating regional scale impacts but rather project-specific impacts.

Brian also described sound source verification surveys conducted with partners within BOEM, noting that the primary need they address is to identify the critical issues associated with ESA and MMPA consultations. He indicated that guidelines have been developed for renewable energy site characterization surveys, and that they are currently out for review with key federal partners. In response to the question regarding show stoppers, he answered that authorizations can be halted for a lack of information regarding the North Atlantic right whale because it is an endangered species. He was also asked about the level of precision needed to meet the needs for a consultation and answered that the level of precision would be determined by the consulting agency and may be partly driven by stakeholder concerns.

Deborah Epperson, Bureau of Safety and Environmental Enforcement (BSEE)

Deborah explained that the Minerals Management Service was reorganized into BOEM and BSEE last year to oversee the regulation of offshore energy. She specifically noted that all ESA consultations are jointly conducted by BOEM and BSEE except for decommissioning of structures, which is done only by BSEE. She indicated that, in the Gulf of Mexico, seismic activity is occurring at any given time. As a result, detailed protected species population information is needed to assess impacts to protected species (ESA and MMPA). Both survey activities and routine operations are being considered by BOEM and BSEE to address cumulative impacts. She noted that BOEM and BSEE have a five-year planning document describing where there will be leasing activity in the future, as well as a three-year studies planning process. The BOEM studies program provides information to support decision-making as well as ESA Section 7 consultation requirements. She characterized this process as an opportunity to see what BOEM is proposing and to look for ways to leverage funding across organizations, particularly given that many of the studies supported are multi-year projects. She noted that many studies occur prior to any leasing decisions (baseline data collection), and that is more common in frontier areas.

Other points Deborah raised included that BOEM may have the funds but not the expertise or the vessels to collect protected species information, that BSEE holds annual national science advisory meetings and this year's meeting is in New Orleans, and that BSEE's information needs are driven by the ESA (e.g., sperm whales in the Gulf relative to seismic activity). She noted that there is a social science group in BOEM that receives funding and looks to external partners to conduct the research. With respect to how research priorities are set, Deborah indicated that

regular dialogue with NMFS on topics, such as noise and dispersants, can drive science activities in addition to ideas generated in the consultation process.

Meghan Massaua, Department of Energy (DOE)

Meghan gave a presentation on DOE's Wind and Water Power Program's protected species research needs. She noted that the sustainable site determination and operation of offshore wind and ocean energy facilities will require baseline data on protected species, risk analysis, development and implementation of monitoring methodologies and technologies, and impact analyses. She also indicated that information needed to assist in mitigating impacts, including data on the magnitude and likelihood of potential environmental impacts is very limited. She reminded the group that DOE is a research and development agency not a regulatory agency, but noted that DOE still has to meet NEPA requirements.

For NEPA and other regulatory requirements, resource agencies need a range of protected species information, including:

- Baseline information on species distribution and abundance;
- Data on behavior, habitat use, and dive depth;
- Predictive models of species distribution, abundance, and behavior;
- Risk models that predict impact based on behavior, exposure, and degree of hazard;
- Proven and practical monitoring methods; and
- Evaluation of the impacts of both construction and operation.

Meghan noted that DOE prioritizes collecting this information based upon what developers ask for and that questions range from small, device-specific needs to broad movement and ecological information. Meghan indicated that DOE is currently collecting information at a pilot scale with a view to the future when full scale operations are installed. Meghan noted that technology readiness varies by technology type, which influences the need for research in the short and long term. On average, offshore wind projects will move to commercial scale in 2-5 years, tidal energy projects will move to commercial scale in 5-10 years, and wave energy projects will move to commercial scale in 5-10 years. Technologies that are on longer time frames include the development of ocean current energy off of Florida (5- 10 years to move to commercial scale) and ocean thermal energy conversion (commercial scale is more than 10 years out). She noted that an absence of protected species data will result in suboptimal site selection, ineffective monitoring of regime shifts, lack of meta-analysis, lack of data comparability, and an increase in the costs and length of the permitting process for individual

projects. She relayed that in FY13, DOE is looking to collaborate with NOAA and BOEM on environmental projects related to wave and tidal energy, as well as offshore wind.

Bob Gisiner, US Navy, Chief of Naval Operations Environmental Readiness Division

Bob began his presentation by indicating that the Navy and NMFS exchange information regarding protected species science via several formal and informal channels. Navy staff and contractors interact regularly with NMFS staff at Headquarters, Science Centers, and Regional Offices, and there is a relatively long history of funds transferred from Navy programs to NMFS to address specific data and scientific research needs.

Navy data are often geographically-focused around its operational areas and are collected on a smaller geographical scale than that relevant to NMFS. Specific current protected resources data needs include:

- Extensive information on North Atlantic right whales (all seasons, all areas),
- Protected resources information from near shore areas,
- Identification of rare but resident species vs. vagrants or unusual sightings,
- Data to support improved risk criteria for pile driving, especially vibratory pile driving, and
- More active participation in support of models or methodologies for determining the biological significance and/or population consequences of statutory risk metrics like MMPA takes.

Bob also provided his opinions regarding NOAA's protected species science, including that:

- NOAA needs are not always Navy needs and vice versa and that stakeholders should not be asked to shoulder more than their "fair share". Funding contributions should be based on relative environmental impact and not on organizational budgets.
- NOAA investment in protected species science is not commensurate with its regulatory emphasis (e.g., there is little or no NOAA investment in issues such as anthropogenic noise and its impacts on protected species).

Bob also identified what he considers NOAA's priority protected species science needs:

- An increased investment in new analytical tools and long-term funding of those in use,
- A more active role in building and applying the science behind risk issues (such as underwater sound),

- An increase in regulatory guidance (policy and guidance should be based on best available science rather than policy and guidance being based on historical precedent),
- Greater investment in tagging, passive acoustic monitoring, and photo-ID as alternatives to costly ship-based surveys, and
- Updated risk guidance.

Bob called upon NOAA to have more active participation in community-wide standards of practice development, noting that as the amount and quality of data originating outside NOAA increases, community-wide standards of practice for data collection, data quality assessment, and suitability of data for synthesis are needed. He further recommended the use of a multi-stakeholder process for identifying biologically important areas and for reconciling current and planned human uses with the biological consequences of various human activities. He also advocated for data generated by Navy contracts to reside in publicly accessible locations (e.g., OBIS SEAMAP).

Dave Hogan, Dept of State (DOS)

Dave indicated that while DOS has no financial resources to bring to the table, it has critical protected resource science needs to carry out its mandate to work with other governments to conserve and manage living marine resources internationally. He provided two case studies to illustrate DOS' science needs – the shrimp-sea turtle issue and the tuna-dolphin issue. In the former, Dave noted that shrimp imports are restricted based on a requirement to control sea turtle bycatch and that NMFS science has played a huge role in advising DOS policy. In particular, he stressed that DOS' foreign policy talking points are based on the best available science, and when the United States doesn't have the science we need, we lose credibility. In the latter case, he recalled that the closure of the U.S. tuna purse seine fishery in the Eastern Tropical Pacific (ETP) was based on NMFS information regarding high dolphin bycatch. Today, international fleets adhere to dolphin mortality limits, which are based on NMFS dolphin abundance surveys. He noted that every lapse in an abundance survey decreases the precision of trends assessment and increases the tension for DOS when dealing with its international partners. DOS has had a difficult time addressing foreign criticism given that NMFS has not conducted ETP dolphin abundance surveys since 2006.

Dennis Heinemann, Marine Mammal Commission (MMC)

The MMC was created by Section 202 of MMPA in 1972 for the purpose of reviewing agency efforts related to marine mammal protection, research programs, and permit applications. Dennis noted that the MMC promotes research needed for marine mammal protection and conservation and advises the Secretary of Commerce, as necessary. He explained that the MMC's perspective is non-regulatory and non-managerial and rather focuses on oversight and review, with the MMC providing advice and recommendations regarding the global impacts on marine mammals of a broad scope of human activities across federal agencies. He explained that the MMC sets its priorities based on the requirements of the MMPA and ESA, as well as the MSA and NEPA. Some of their ongoing priority activities include conducting a global assessment of conservation issues and measures to address them, survey and synthesis of NMFS regional research priorities, a review of stock assessment reports, and a survey of research and conservation funding.

Some of the issues the MMC is grappling with include how and where to apply limited resources (funding and infrastructure) and how to deal with region-specific differences in funding, as well as consideration of which species should obtain the most funding (e.g., those at imminent risk of extinction, those in chronic decline, those with high degree of uncertainty regarding their status, or those with strong interactions with human activities). Dennis noted that basic status information is often inadequate (e.g., abundance, trends, stock structure, and population growth rate) and that ecological details are often unknown (e.g., the impact of human activities, actual entanglement or ship-strike rates, climate disruption vulnerability, trophodynamics, and movements). He noted that the MMC has identified the most significant threats to marine mammal populations as: direct and indirect fishery interactions, climate disruption, anthropogenic sound, energy development, disease, shipping, harmful algal blooms, contaminants, aquaculture, and coastal development. Information gaps include: the impacts of Arctic sea ice loss, trend data for ice seals, as well as information on the distribution, movements and risk profile for North Pacific right whale. He reiterated the need to understand the causes of chronic declines in marine mammal stocks.

The MMC has identified a variety of likely consequences if MMC priorities are not met, including:

- Inadequate protection against disasters,
- Failure to prevent extirpation/extinction,
- Failure to protect subsistence food supplies,
- Incomplete anticipation of climate disruption,
- Failure to detect declining populations/health,

- Failure to recover depleted populations, and
- Failure to achieve the zero mortality rate goal.

The MMC recommended that NMFS focus its efforts on activities which are threat-/risk-based, take an agency-wide approach to prioritizing information needs and protection measures, consider time-frame specific approaches, and look for ways to restore and grow funding for these activities.

Informal Comments by Other External and Internal Partners

Debbie Payton, National Ocean Service, Office of Response and Restoration

Debbie noted that there are "go to" experts within NMFS that provide advice regarding specific protected resources, but there are few documents or data sources for background information on effects to protected species impacted by oil spills.

She also indicated that, in some cases, there are no baseline data for protected species impacted by oil spills. For a number of species, we have insufficient information to determine sub-lethal and/or life stage-specific impacts. Debbie also noted that, in most cases, spill responders would benefit from an understanding of biological indicators that can be used to assess impact and that they lack any understanding of the long term uncertainty and variability in the existing data. She relayed a need to determine best management practices for spill response relative to protected species for a range of response options (e.g., skimming, burning, noise, day/night activities, manual shoreline cleanup via front end loaders, etc.). While best practice options may be region specific, they should be shared among regions to try and get some national consensus. She emphasized the importance of the NMFS scientific knowledge about protected species and its value to developing spill response plans, responding to spills, and conducting damage assessments.

Dena Dickerson, Army Corps of Engineers

Dena indicated that the dredging community has made great strides in minimizing impact with sea turtles, but at great cost. Conversely, she indicated that there have been very few advances with in-water sea turtle datasets and instead the Corps relies on biological opinions and/or sea turtle nesting data in its analyses. Generally, she indicated that the Corps was handicapped by a lack of information regarding sea turtle distribution when determining when dredges can operate in nearshore waters. Of specific concern is the limited available data on non-adult

female sea turtle life history stages, particularly in nearshore waters, leaving the Corps to extrapolate from nesting beach data rather than from in-water information. Without this information there can be large increases in dredging costs, in project duration, and/or in impact to sea turtles. Earl Possardt from the USFWS indicated that many of the turtle information gaps are addressed in the recovery plans and suggested referencing those to develop sea turtle science priorities.

Hassan Moustahfid, Interagency Ocean Observing Systems (IOOS)

There is an ongoing effort by the Biological Integration and Observation Task Team (BIO-TT) to improve the availability of observations of site-specific biological variables and to identify and prioritize additional cross-cutting federal agency biological and ecosystem observation needs. To accomplish this, the BIO-TT will collaborate with the IOOS Program Office, the Regional Associations and other federal interagency working groups as needed.

Linking Protected Resources Science and Economics (NMFS)

Kathryn Bisack (Northeast Fisheries Science Center), Sarah Malloy (Pacific Islands Fisheries Science Center), and Kristy Wallmo (Office of Science and Technology) presented. Other members of the Protected Species Economists Working Group that provided input to the presentations include Dale Squires (Southwest Fisheries Science Center), Mark Plummer (Northwest Fisheries Science Center), and Lew Queirolo (Alaska Fisheries Science Center).

Kathryn provided an overview of how economics and other human dimensions are a part of protected resources science. Several case studies were presented to demonstrate the role economics plays in protected resources science (and management). The three broad areas include: 1) regulatory support; 2) value of information; and 3) improving protected resource management.

Regulatory Support:

Economists provide *regulatory support* under three Acts. The Regulatory Impact Review (RIR) is conducted in accordance with EO12866 where the objective is to measure changes in economic welfare, efficiency and equity in order to understand how society, as a whole, will be affected by a regulatory action. A benefit-cost- analysis (BCA) framework allows us to evaluate "net" societal tradeoffs. The Regulatory Flexibility Analysis provides an analysis that describes the

potential adverse economic effect of the rule on "small entities" (small businesses, organizations, etc). Economic support is also provided under section 4(b)(2) of the ESA.

> *Case 1: Critical Habitat Designation (CHD) for the Cook Inlet Beluga Whale (CIBW).* The city and surrounding area contains more that 50% of Alaska's total population. Therefore, the stock assessment and CHD have a critical influence on the economic, ecological, cultural and political attributes of the region, and the balance of the state. If an essential habitat feature (EHF) of the CIBW CHD, such as the Cook Inlet Chinook salmon, is being harmed in the Pelagic Trawl Pollock fisheries for example, the direct cost of constraining the Pollock fishery could be assessed and then compared to benefits that accrue to society by not allowing this activity to destroy or adversely modify the CH. The BCA framework is intended to comprehensively identify and assess all such trade-offs. However, there are numerous types of economic benefits (recreation, fishing, wildlife viewing, subsistence fishing, education, etc.) that may accrue to residents living near the Cook Inlet beluga whale proposed CH and to citizens throughout the US (See NMFS 2010 for details). In a separate case study below, Kristy Wallmo presented research on estimating economic benefit for protected resources. In general, CHD required all three economic analyses: RIR (EO12866), RFA, and 4(b)(2).

Value of Information:

Central to the "*value of information*" (VOI) analysis is identification of links between scientific information and management decisions. More "relevant" information is (likely) more valuable to both managers and to society in general. In this case, scientific information has value because it triggers management decisions that affect the state of the world. This value is greater when the links between information (e.g., higher precision of survey estimates), management decisions (e.g., lower PBR), and the state of the world (e.g., fleet profits) are stronger. The value is also greater when the affected elements of the state of the world are of higher value (e.g., higher value fisheries) or when the impacts on those elements are greater.

> *Case 2: The value of improving harbor porpoise abundance surveys and bycatch estimates (Bisack and Magnusson, in review).* Stock assessments provide information that is of value to public sector management (government) and the private fishing sector; however, collecting the data to support assessments is costly and may be subject to inconsistent funding levels. Higher funding can result in higher precision ("better" information) and a higher PBR (management decision). The fishery responds to changes in PBR by changing the amount and location of fishing effort (Bisack 2008). These changes are accompanied by change in the value (profitability) of fishing, which therefore determines (in part) the value of the higher precision surveys. A change in

PBR affects the "state of the world." In this case, the empirical net benefit analysis suggests the private sector (gillnet fleet) may consider contributing to the funding of scientific data collection for marine mammals to allow for a higher PBR value for harbor porpoise. The net benefits also illustrate changes in the value of information over a range of PBR values, which could inform budget decisions with regard to stock assessments.

Enhancing PR Management Decisions

Case 3: Cost-effective sea turtle conservation. A key ingredient to sea turtle recovery includes protecting the nesting population. Direct conservation payments from high seas fisheries that interact with turtles are used to finance nesting site protection. The cost ratio of saving one adult equivalent (ADE) leatherback turtle at sea compared to investing in nesting habitat conservation to "produce" one ADE is 100 to 1. The International Seafood Sustainability Foundation annually collects $1 per ton of longline-caught tunas from Bumble Bee, Chicken-of-the-Sea, and Starkist. Funds are allocated 25% to Atlantic, Indian Ocean, Western Pacific, and Eastern Pacific Oceans. Nesting site protection yields the greatest conservation bang for the buck and leaves profits in the fishery to finance conservation (Gjertsen 2011; Dutton et. al. 2010).

Case 4: Economic benefits and cost of ESA/Transboundary Species Management: Transfer Effects. Sarah Malloy provided an overview of spillover effects (also known as transfer effects) due to US ESA regulations that only affect the domestic portion of a mixed international/domestic fishery, using sea turtle bycatch in the Hawaii longline fishery for swordfish as an example (Chan and Pan 2012; Rausser et. al. 2009). In this case, there was a negative relationship between the domestic and international fishing effort, such that when US fishing decreased, foreign fishing increased. US consumption of swordfish switched from the preferred US swordfish production to foreign swordfish production because domestic production was restricted for sea turtle protection. Higher turtle bycatch rates are observed in some foreign fisheries due to less regulation such as requirements for the use of circle hooks. Therefore, reducing domestic fishing to reduce domestic turtle bycatch could have the effect of increasing total turtle bycatch due to increased foreign fishing.

Kristy Wallmo gave an example of protected resources valuation research wherein estimates of the non-market value of protected species were derived using stated preference methods (Wallmo and Lew 2012; Walmo and Lew 2011). Stated preference methods are used to estimate values for goods and services not traded in the marketplace. They estimated nonmarket values for threatened and endangered species – 3 sea turtles, 5 marine mammals, 5

fish, and 2 invertebrates. Results show most U.S. households would be willing to pay ~$40-80 per year to recover a protected species. This was converted to a net present value of approximately $2.5-4 billion per species. Such an approach could play a role in future priority setting, cost-benefit analysis of alternative recovery strategies, tradeoff assessments in spatial planning, and budget justifications. For example, estimating the economic benefits of protected species that do not have a market value is necessary in order for NMFS to conduct a comprehensive BCA under EO12866.   Estimating and including economic benefits of protected species in a BCA may allow NMFS to consider the value of protected species when choosing alternatives that maximize net national benefits.

NOAA Chief Economist Linwood Pendleton helped launch the discussion following the economic presentation with two overarching questions:

Question 1: What social science do we need to make better protected resources management decisions?

> Dr. Pendleton asked us to also consider the ancillary benefits of different approaches to protected resources science and management. For example, how do other parts of the ecosystem benefit from protected resources management actions? How are other ecosystem services affected? For example, taking action to reduce ship speeds to protect whales may also help protect other species, may have benefits with respect to noise, air quality, etc., and may reduce conflicts with recreational activities. Dr. Pendleton also pointed out direct economic impacts to consider beyond those to the immediately regulated party, such as charter boat revenues, jobs, businesses, etc. He asked us to consider what are the true net costs of protecting species? He also suggested that when setting priorities for protected resources science investments, we consider the cost effectiveness of NOAA's different protected resources investments and whether we can deploy our resources more effectively. He also suggested that this broader scope of economic analyses could be part of Integrated Ecosystem Assessments.

Question 2: What are the benefits of protected resources science and new technology?

> Dr. Pendleton pointed out that new science and technology may permit an increase in economic activity for restricted activity. He also noted that reducing uncertainty allows for improved planning, which in turn saves money.

Some key points that were raised during the ensuing discussion include:

- When protected species are conserved, there are ecosystem benefits beyond the species. Integrated ecosystem assessments may be one way of including these benefits in broader analyses.
- If the individual or group that pays for protected resources management is different from who benefits from that management, then there is no policy linkage for the cost-benefit analysis to work. We must first identify and inform constituents who are impacted by protected resources management before we will be able to make meaningful progress.
- We have not applied similar cost-benefit approaches to our own prioritization of science (e.g., which is better, hiring an adequate stock assessor and using the extra money for surveys, or hiring a great stock assessor but having no money for surveys?).

Literature Cited

Bisack, K. 2008. Integrating porpoise and cod management: a comparison of closures, DAS and ITQs. Marine Resource Economics, 23: 361–378.

Bisack, K. and G. Magnusson. *In Review*. The value of improving harbor porpoise abundance surveys and bycatch estimates.

Chan, H. L. and M. Pan. 2012. Spillover effects of environmental regulation for sea turtle protection: the case of the Hawaii shallow-set longline fishery. U.S. Dep. Commer., NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-30, 38p. + Appendices.

Dutton, P., D. Squires, and M. Ahmed (editors). 2011. Conservation of Pacific sea turtles. Honolulu: University of Hawaii Press, 2011. 496p.

Gjertsen, H. 2011. Can we improve our conservation bang for the buck? Cost effectiveness of alternative leatherback turtle conservation strategies. Chapter 4 in Conservation of Pacific sea turtles, P. Dutton, D. Squires, and M. Ahmed (editors), 60-84.

NMFS (National Marine Fisheries Service). 2010. Final RIR/4(b)(2) Preparatory Assessment/FRFA for the Critical Habitat Designation of Cook Inlet Beluga Whale. NMFS Service, Alaska Region, Division of Protection Resources. 267p.

Rausser, G. C., S.F. Hamilton, M. Kovach, and R. Stifter. 2009. Unintended consequences: The spillover effects of common property regulations. Marine Policy, 33: 24-39.

Wallmo, K. and D., Lew. 2012. The value of recovering threatened and endangered marine species: a choice experiment approach. Conservation Biology, 26(5): 830–839.

Wallmo, K. and D., Lew. 2011. Valuing improvements to threatened and endangered marine species: an application of stated preference choice experiments. Journal of Environmental Management, 92(7): 1793-801.

Appendix 4 – Information Needs Questionnaire

With respect to management and regulatory decisions that your agency will be required to make concerning marine mammals and turtles during the next five years (2013-2018):

 1. What specific problems or challenges associated with marine mammals and turtles are you facing now or expecting to face through 2018? Please specify the geographic scope (where?), temporal scope (when?), and taxonomic scope (which species, species groups, or stocks?). A prioritized list (in decreasing order of urgency/importance) would be helpful but is not necessary.

2. What management or regulatory decisions do you make that require marine mammal and turtle scientific information that is currently unavailable?

3. Which statutes (including which sections and subsections) are most relevant in defining your information needs associated with marine mammals and turtles?

4. In the next five years, do you foresee any scientific information gaps with respect to marine mammals and turtles that represent potential "show stoppers" (i.e., that could block progress on regulatory or management actions unless the needed information is available)?

5. How do you determine what marine mammal and turtle information is most important for achieving your mission? Do you have a prioritization scheme or criteria for what needs take precedence over others?

6. How do you evaluate the extent to which the "best available" scientific information is adequate to support your management and regulatory decisions sufficiently to withstand legal or political challenges?

7. How is social science (economics or anthropology) information being used to support your regulatory decision process?

8. What are the consequences to your mission (and the U.S. economy, if applicable) if adequate scientific information on marine mammals and turtles is unavailable to support the management and regulatory decisions in which you are involved?

Appendix 5 – Summary of Day 3 Presentations

Tanya Dobrzynksi, NOAA Office of Legislative and Intergovernmental Affairs

Tanya provided an overview of current topics of interest within Congress and examples of NOAA issues that have resonated in the past, items that have been less well received, and some topics that may be of interest in the next few years. Common themes among NMFS-related items that have been well-received on the Hill are that they have had a clear link to ESA recovery objectives and/or MSA requirements; clear, tangible, and/or easy to quantify results; positive economic benefits; partnerships with other entities, including states; and use of cost-effective practices as possible (e.g., advanced sampling technologies). Common characteristics of less successful NMFS topics include concepts that are difficult to explain, and thus understand; results or impacts that are hard to quantify; unclear linkage to management objectives; and lack of Congressional interest in the context of the overall budget picture.

Tanya recommended that protected species science "messaging" should:

- Make clear links between science needs and management goals;
- Make a connection between funding level and efficiency of consultation and permit processing;
- Make links between species conservation and positive economic impacts and jobs creation, as appropriate;
- Make links to specific ancillary benefits of species protection;
- Describe level of stakeholder involvement, partnerships, and leveraging opportunities; and
- Have specific examples and experts available for briefings.

Upcoming topics of interest to Congress may include new and recent species listings; protected species as indicators of human health concerns; testing of new protected species-safe gears; examples of intermediate successes of species recovery efforts; and examples of how new scientific information has led to decreased mitigation costs or consultation time.

Dana Flower Lake, NMFS Office of Management and Budget

Dana discussed effective approaches for communicating a program's or activity's needs and value to Executive Branch decision-making bodies (e.g., NMFS, NOAA, DOC, and OMB). She emphasized that messages should be specific and in "plain English," and they should discuss the benefits of an activity, reasons for its need, and relevance to the general public. An effective

message will convey the importance of protected species science to those for whom it may not be a priority and will describe what is currently being done (if anything) and how it is funded, the needs of all users, and anticipated outcomes or impacts of the specific activities. Communication with different audiences can be enhanced by working with NMFS Communications and External Affairs staff, making sure science needs align with NMFS and NMFS planning documents, and ensuring that NMFS planning and budget staff fully understand a given program and relevant issues.

Rebecca Ferro, NMFS Office of Communications

Rebecca provided an overview of the resources available within NMFS to communicate with internal and external stakeholders. The NMFS Office of Communications works closely with NMFS Legislative Affairs, External Affairs, Headquarters program leads, and the Regional Communications Council and uses a variety of media tools (e.g., intranet, public agency website, YouTube, Facebook, and Twitter). The Office has drafted a national science communications policy, which focuses on infusing science messaging into the agency's communication activities and identifying gaps in science communication capacity. The FY13 science communication strategy seeks to fine-tune internal communications, enhance strategic communications with Congress on national priority issues, promote science behind management, and ensure consistent messaging on agency priorities. The office is actively looking for video opportunities and photos, and one of its 2013 events will be Endangered Species Act Day in May. Other suggestions for improving communication were to ensure that External Affairs is aware of relevant protected species stakeholders and ensuring that science messaging is incorporated into high-profile issues (e.g., a mass standing event).