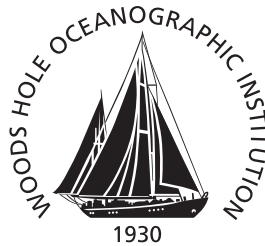


Woods Hole Oceanographic Institution



Seals and Ecosystem Health - Meeting Report of the Northwest Atlantic Seal Research Consortium



by

Anna L. Bass, Andrea Bogomolni, Greg Early,
Owen C. Nichols, Kristen Patchett

Woods Hole Oceanographic Institution
Woods Hole, MA 02543

May 2015

Technical Report

Funding was provided by the Woods Hole Oceanographic Institution Marine Mammal Center and
the US Marine Mammal Commission

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Mark Hahn, Chair

Department of Biology

Seals and Ecosystem Health: Meeting Report of the Northwest Atlantic Seal Research Consortium



May 1st and 2nd 2015
Salem State University, Salem MA

MEETING GENEROUSLY SPONSORED BY:

THE WILLIAM H. BATES CENTER FOR PUBLIC AFFAIRS, POLITICAL SCIENCE DEPARTMENT AND
BIOLOGY DEPARTMENT, SALEM STATE UNIVERSITY

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THE WOODS HOLE OCEANOGRAPHIC INSTITUTION
MARINE MAMMAL CENTER

AND

THE U.S. MARINE MAMMAL COMMISSION

Report written by:

Anna L. Bass, University of New England
Andrea Bogomolni, Woods Hole Oceanographic Institution
Greg Early, Integrated Statistics
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Kristen Patchett, International Fund for Animal Welfare

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INTRODUCTION

Since 2009, a series of workshops and meetings, supported by the Woods Hole Oceanographic Institution's Marine Mammal Center (WHOI MMC), have successfully facilitated conversations between various stakeholders on seal issues. One of the primary objectives of the first meeting was to bring together representatives of key interest groups from the United States and Canada to increase sharing of information and perspectives that describe relevant issues and related complexities. This meeting focused discussion on the challenges presented by seal populations off the northeast U.S. coast and Atlantic Canada and improved communication among stakeholders. In addition, the collective group initiated the process of developing tools to address the most pressing issues related to seals.

A second smaller meeting held in 2011, supported by the WHOI MMC and hosted by the Provincetown Center for Coastal Studies (PCCS), facilitated discussion of seal issues among stakeholders such as fishermen, scientists and managers. The format also encouraged stakeholder discussion of integrative research that could address concerns surrounding seal/human interactions and seal life history. From ideas presented at the 2010 meeting and input from attendees at this second meeting, the Marine Animal Identification Network (MAIN) was conceived and collaborative research on fisheries and seals was initiated. Technical reports for these two meetings were peer reviewed and all reports are archived at <http://nasrc.who.edu/about>.

An important primary objective of both meetings was to establish an entity that could aid in the generation of collaborations, and open discussions and long-term communication on seal research and priorities in the northeast region. Our primary objective has become a reality with the creation of the Northwest Atlantic Seal Research Consortium (NASRC) in 2013, and the development of the MAIN (<http://main.who.edu/>).

Since the creation of the consortium, NASRC has participated in outreach and educational activities, including interviews in radio and various news media, as well as scientific conferences and school presentations. NASRC has also provided expertise for a local gray seal symposium and enabled collaborative science with large-scale participation in harbor and gray seal tagging studies. In addition to MAIN, specific products of the consortium include a highly referenced study on the effect of seal haul out locations on public health and water quality. The consortium also organized a SeaSketch webinar to increase exposure to new technologies useful in ocean planning and research.

In April 2013 a small organizational meeting of 30 participants was held at Cummings School of Veterinary Medicine at Tufts University in North Grafton, MA. The primary focus of this meeting was on defining research priorities and forming committees for each of the defined research priority areas.

The meeting was characterized by active participation of attendees and entailed further discussions on animal-human conflict. Significant discussions on the structure and function of NASRC as a consortium and as a community were also conducted. Following this meeting, a workshop on public relations and media outreach was held at WHOI. This workshop focused on the composition of “talking points” and outreach material. The half day workshop resulted in a “frequently asked questions” section, which was vetted by consortium participants and posted to the NASRC website. As a consequence, a better sense of how to address media given the various stakeholders represented in the consortium was developed.

Surveys submitted by attendees after all meetings indicated that these meetings were beneficial to the extended research and management communities. We continued with the suggested format of a two-day meeting that included a panel discussion with invited speakers and an open call for community presentations. With the support of the WHOI Marine Mammal Center, the U.S. Marine Mammal Commission, Salem State University and NASRC participants, this two-day meeting was held May 1-2, 2015 at Salem State University. The central theme for the 2015 meeting, the ecological role of seals, was addressed in multiple contexts, including predator/prey relationships, ecosystem engineering, epidemiology, and the role of seals as sentinels of ecosystem health.

NASRC is committed to facilitating communication and collaborations among a diverse group of stakeholders that want to understand the ecological role of seals. Our goals are to address key priority issues identified by stakeholders, to facilitate outreach and education opportunities, and to provide platforms for open discussion. The steering committee of NASRC can be reached at sealresearch@whoi.edu and the listserv for NASRC can be contacted at: <http://mailman.whoi.edu/mailman/listinfo/nasrc>. Let us hear from you.

We look forward to future meetings and fulfilling the mission of NASRC.

Your NASRC steering committee,

Andrea Bogomolni, Chair
Rob Di Giovanni, Vice-Chair
Kristen Patchett, Secretary
Anna L. Bass, Treasurer
Greg Early
Keith Matassa
Owen C. Nichols
Lisa Sette
Stephanie Wood-La Fond

MEETING SUMMARY

On May 1 and 2, 2015, over 75 people attended the Northwest Atlantic Seal Research Consortium's first official biennial scientific meeting, "Seals and Ecosystem Health", at Salem State University in Salem, Massachusetts. Two keynote speakers, Drs. Pdraig Duignan and Peter Corkeron, presented overviews of the relationships between marine mammals and their ecosystems. These two presentations, "Seals and Ecosystem Health" and "Marine mammals and ecosystem functioning: what can recovering seal populations teach us?" covered various aspects of pathobiology and trophodynamics. The first day of the meeting featured 16 oral and two poster presentations, covering a diverse range of topics. The second day began with the presentation of the inaugural Valerie Rough Career Achievement Award to Dr. Gordon Waring and ended with a panel discussion entitled, "Addressing Perception vs. Reality: How Data (or Lack of Data) Affects Public Perceptions and Management Decisions."

The two-day meeting featured a diverse array of topics representing the state of the science, state of the ecosystem, and the state of our understanding of the ecosystem. Despite the diversity of topics, there were many common themes, many of which represented important underlying concepts, data gaps and future directions. Ecosystems include complex and often cryptic interactions between components, with cumulative and synergistic effects on animals and their environment. Ecological studies therefore need to be conducted at the appropriate spatiotemporal scale and resolution. As we strive to understand the ecological role of seals in the Northwest Atlantic, seals can be considered as sentinels of ecosystem health.

Several of the presentations and the panel discussion highlighted the diverse and evolving perspectives with which society views seals, a view that is often biased by the backgrounds of human individuals. Diverse opinions necessitate engagement of stakeholders and the public, and societal objectives need to be defined in order to effect science-based natural resource management at an ecosystem level. Scientific studies of the ecological role of seals need to be multi-disciplinary and collaborative in order to deconstruct complex and large-scale problems. Collaborations need to include fishermen and other experts in disciplines outside of traditional marine science, including behavioral ecology and social science.

The meeting presentations highlighted the value of existing data and ongoing research efforts, including long-term population monitoring, tagging and photo-identification, stranding response, and rehabilitation facilities. The importance of observational effort was recognized as a critical component in detecting mortality events, documenting population processes in remote locations and cryptic species interactions.

Research priorities identified included development of molecular tools for study of diet and disease, population dynamics studies (demographics and trends), telemetry-based investigations of spatiotemporal distribution, and model- and field-based ecosystem-level studies.

Participants identified several future directions for NASRC, including:

- Continued facilitation of collaborative, multidisciplinary research
- Increased efforts in data sharing, management and presentation
- Expanded outreach, education and stakeholder engagement
- Standardized data collection protocols
- Development and application of new technologies
- Maintain student involvement

PANEL DISCUSSION RECOMMENDATIONS

The following recommendations were generated from a panel-facilitated discussion entitled Addressing perception vs. reality: how data (or lack of data) affects public perceptions and management decisions.

- Formally define the message(s) of NASRC and not allow opinions or media to define the message.
- Repeat the message(s) in sound bites, rather than long statements.
- Generate and facilitate research on the perception of seals by the general public through the use of more human dimension surveys.
- Promote positive stories, e.g. instead of focusing primarily on the fishery question, highlight the significant population rebound after extirpation for gray seals in the southern Gulf of Maine and Cape Cod region.
- Conduct comparisons to other regions where seals occur, focusing on seals and ecosystem health topics such as the ecological role of seals and potentially as an ecosystem engineer.
- Develop curriculum on seals for schools thereby providing more reliable information on seals.
- Non-governmental organization scientists need to conduct and promote seal science.
- Utilize social media to disseminate information on seals and ecosystem health.
- Define research priorities collaboratively.
- Appoint a committee to review progress since 2009.
- Engage **all** stakeholders of the consortium.
- Develop a strategic research plan.
- Develop mechanisms that facilitate open and clear communication.
- Use research to redirect conversations

FUTURE STRATEGY FOR NASRC

In May 2009, WHOI hosted a two-day meeting to describe and discuss issues surrounding changes to seal populations in the Northeast. The primary goals of the meeting were to identify issues, formulate strategies, suggest tools for addressing issues and build community among stakeholders and researchers. A common theme throughout this and subsequent meetings was a significant interest in continuing useful dialogue and communication among stakeholders.

The list of issues, problems and needs was long at the first meeting and has only continued to grow. One requirement that has consistently been identified as important is the need for ongoing communication, networking and dialogue. To this end, NASRC, a group that included organizers of the first several meetings, was established to formally and consistently support science that addressed issues identified at previous meetings.

This most recent meeting once again pointed out the importance of ongoing collaboration and communication to address both old and new issues and ongoing challenges. There were presentations of both short and long-term studies as well as information sharing on larger scale issues like ecosystem health and how seal research can support this. A workshop on the second day focused on the importance and difficulty of presenting scientific information and how necessary this information is to the support of relevant management strategy development.

In the future, it seems that there will continue to be a long list of issues and problems, some of which may change either shape or priority, but likely not dissipate. While some issues may be addressed with short-term solutions or effort, it is clear that an important dimension surrounding these issues is the application of sound and consistent scientific effort.

The first meeting was partly inspired by the fact that there had been no comprehensive meeting on the subject for nearly a decade. Not only did the first meeting address that immediate need, but also highlighted the fact that no single meeting or study would likely provide the type of information needed to tackle many of the problems identified.

An example can be seen in language from the most recent 2014 Stock Assessment Reports for Harbor and Gray seals¹.

¹ Waring GT, Josephson E, Maze-Foley K, Rosel, PE, editors. 2015. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2014. NOAA Tech Memo NMFS NE 231; 361 pp.

From the section: *Harbor seal- Western Atlantic Stock*

“The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and long survey interval. For example, the power to detect a precipitous decline in abundance (i.e., 50% decrease in 15 years) with estimates of low precision (e.g., $CV > 0.30$) remains below 80% ($\alpha = 0.30$) unless surveys are conducted on an annual basis (Taylor et al. 2007).”

So while a single count is useful, repeated and consistent counts are necessary to determine population trajectory and trends. Without proper sampling, major changes can go undetected.

Similarly from the section: *Gray Seal - Western Atlantic Stock*

“Gray seal abundance is likely increasing in the U.S. Atlantic Exclusive Economic Zone (EEZ), but the rate of increase is unknown.”

“The level of human-caused mortality and serious injury in the U.S. Atlantic EEZ is unknown, but believed to be very low relative to the total stock size.”

Again, not only is there a need for absolute population information – but also a continuing program of data collection.

The need for ongoing, organized research efforts has been a running theme at all meetings. Ultimately this need for ongoing and organized efforts to support, enhance and identify research needs led to NASRC’s creation. In addition, the importance of an organized and continuing framework for sustained collaborations that can support efforts to study and manage seal populations in the northwest Atlantic is also evident from the contributions by NASRC and their members. While past meetings have identified priority areas and useful tools for research and communication, there remains a greater need of a financed framework to support ongoing programs of research.

Undoubtedly, there will be both emerging and continuing issues. Critical progress in addressing these issues is better approached through an approach that coordinates research and distributes information among stakeholders. NASRC is committed to providing this central clearinghouse that facilitates communication among stakeholders, supports research and disseminates information regarding seals and human interactions with these animals.

Based on input from consortium members at previous meetings this coordinated approach would be most successful if the following attributes are included:

- As populations of both seals and people expand, established issues in one area will likely become emergent issues in others. As seal populations expand southward, Cape Cod, MA, issues will likely become Long Island, NY, issues. To this end, it may be helpful to host meetings to raise awareness of issues, problems and concerns in areas that are on the edges of range expansion.
- Create a regular series of meetings, forums and workshops to address emergent issues.
- Create research plans for ongoing research and ongoing information dissemination and transfer.
- Establish a strategy for communicating the science behind the seal questions with clear and consistent messages about the importance of science in managing issues.

ACKNOWLEDGEMENTS

We would like to first extend many thanks and gratitude to Dr. Jennifer Jackman for her significant assistance in the logistics and planning involved in the 2015 meeting at Salem State University. Many thanks to Kathy Zagzebski, Anja MacDonald, Laura Sirak and Lauren Bamford for taking comprehensive notes. We extend special thanks to our panelists and keynote speakers for their willingness to participate. We also extend special thanks to all attendees of this meeting because their participation makes this consortium possible. We look forward to the continued dialogue among all members of the consortium that furthers the study of seals and ecosystem health in the northwest Atlantic.

APPENDIX A. WORKSHOP AGENDA

Time	Event/Title	Presenter
8:00-9:00	Registration	
9:00-9:30	Welcome	NASRC
9:30-10:30	Keynote Address: Seals and ecosystem health	Duignan, P.
10:30-10:45	Coffee Break (Sponsored by Salem State Univ. Bio Depart.)	
10:45-11:00	North Atlantic gray seals (<i>Halichoerus grypus</i>) may be an underappreciated reservoir host for Influenza A Virus	Puryear, W.
11:00-11:15	Muskeget: Raw, restless, relentless island	Snow, C.
11:15-11:30	Weanlings, natural mortalities and presentation of disease (or "Weanlings don't suck")	Williams, S. R.
11:30-11:45	A parasite-pinniped-fisheries interaction: Codworm (<i>Pseudoterranova</i>) in Atlantic cod (<i>Gadus morhua</i>) in the Gulf of Maine	Bamford, L.
11:45-12:00	Whalenet	Williamson, M.
12:00-1:00	Lunch Break	
1:00-1:15	Gray seal occurrence and human interaction observations at the Chatham Fish Pier	Harry, C.T.
1:15-1:30	Regional pinniped education and outreach strategy	Garron, M.
1:30-1:45	Preliminary observations on habitat use, residency, and site fidelity of white sharks in the coastal waters of Cape Cod, MA.	Skomal, G.
1:45-2:00	Seal and canid interactions in SE Massachusetts	Lentell, B.
2:00-2:15	Long term study on the feeding ecology of northeast U.S. Atlantic harbor seals (<i>Phoca vitulina concolor</i>)	Wenzel, F.
2:15-2:30	Characterizing bite marks for the identification of depredation sources in the Northeast sink-gillnet fishery	Sirak, L.
2:30-2:45	Two decades of aerial surveys and satellite tracking of harbor seal (<i>Phoca vitulina</i>) and gray seal (<i>Halichoerus grypus</i>) in Southern New England, Connecticut and New York Waters	Di Giovanni, R.
2:45-3:10	Coffee Break	
3:10-3:25	Conflicts in coastal coexistence: A qualitative investigation of seals and fisheries interactions on Cape Cod	Pereira, K.
3:25-3:40	Case study of Cape Cod: Seals and stakeholders	MacDonald, A.
3:40-3:55	Suitability of Mount Desert Rock, Maine for gray seal (<i>Halichoerus grypus</i>) parturition	Frowine, R.
3:55-4:10	Exploring seal sense as inspiration for technology development	Murphy, C.
4:10-4:30	Summary	NASRC

Day 2 Schedule

Time	Event/Title	Presenter
9:00-9:15	Announcements	
9:15-9:30	Valerie Rough Award	Di Giovanni, R., Nichols, O.C. Bogomolni, A.
9:30-10:30	Keynote Address: Marine mammals and ecosystem functioning: what can recovering seal populations teach us?	Corkeron, P.
10:30-10:45	Coffee Break	
11:00-11:15	Panel Discussion: Addressing perception vs. reality: how data (or lack of data) affects public perceptions and management decisions.	Patchett, K. Facilitator
11:15-11:30	Introduction to panelists	Jackman, J., Reeves, C., Waring, G., Corkeron, P.
11:30-12:30	Lunch Break	
12:30-3:00	Panel questions and discussion	
3:00-3:15	Coffee Break	
3:15-3:45	Panel round-up	
3:45-5:00	Meeting Synthesis: Priorities, concerns, changing perceptions, future needs and directions	Nichols, O.C., Bogomolni, A.

APPENDIX B. ABSTRACTS (ALPHABETICAL ORDER)

Poster Presentations

The Wounded Seal Project: Mount Desert Rock, Maine

Bolus, O., G. Shears, R. Seton, and S. Todd

Allied Whale, College of the Atlantic, Bar Harbor, ME

College of the Atlantic has been monitoring seal populations at Mount Desert Rock (MDR), in the Gulf of Maine since 1974. Grey seals (*Halichoerus grypus*) and harbor seals (*Phoca vitulina*) inhabit MDR seasonally. Seal counts are conducted each field season and are part of the daily protocol at low tide (for example, in 2014 average number of seals hauled out = 608; range = 262 - 750 individuals). In 2013, we began to standardize assessments of individual seals with noticeable wounds, injuries, abnormalities, and entanglements as part of our daily data collection protocols. Types of lesions observed included: abrasions, punctures, perforations, jagged lacerations, linear lacerations, entanglements, and “pelt missing.” All injured animals were photo-identified, and two general categories were created to group the seals by age class, “adult” or “pup”. In 2013, we observed 16 seals (9 adults, 7 pups) with 7 lesion types. The most common type of injury seen in both adults and pups were linear lacerations of varying lengths (estimated 1 - 15 cm). In 2014 we conservatively identified 58 animals with lesions, four of which were confirmed entanglements. Other lesions presented as possible ship strike (skeg/propeller) or shark predation events. We plan to continue our survey and build a longitudinal database of serious injury to pinnipeds that haul-out at MDR in an effort to better assess human impact to this population.

Monitoring harbor and gray seal populations of the Isles of Shoals, ME through survey and photographic mark-recapture

Hilmer, A.¹, L. Bamford¹, M. Fisher¹, A. Mandon¹, S. Walsh¹, E. McCourt¹, A. Bogomolni^{2,3}, W. Bemis¹, R. Hadock-Seeley¹, J. Coyer¹, and J. Seavey¹

¹ Shoals Marine Laboratory, Cornell University and the University of New Hampshire, Durham, NH

² Woods Hole Oceanographic Institution, Woods Hole, MA

³ University of Connecticut, Department of Pathobiology and Veterinary Science Storrs, CT

Pinniped populations in the Gulf of Maine have been increasing from numbers near zero since the passage of the Marine Mammal Protection Act in 1972. Duck Island and its surrounding ledges in the Isles of Shoals, ME are ideal study sites to monitor rebounding populations of harbor seals, *Phoca vitulina*, and gray seals, *Halichoerus grypus*, due to the relative isolation from humans and the rocky substrate. Surveys were conducted over the summer between 2011 and 2014 Island to in order to assess the abundance of both species, to monitor population health by recording instances of disease and human interaction (e.g. entanglements) and to identify individuals through patterns, scars, and other distinctive features using photo-ID mark-recapture. Results obtained over survey years suggest that abundance counts are much higher overall than expected (based on aerial surveys completed by

Gilbert et. al.). The presence of tagged harbor seals observed from New Jersey, Maine, and Canada suggest that Duck Island may be an important gathering location. Sighting of previously attached tags suggests that further identification of individuals could be possible from this site over long-term assessments and distinct pelage patterns on the neck, head and chest clearly distinguished individual gray seals and allowed for re-identification between years. Entanglement and unique pathologies were notable in both harbor and gray seals during this time. Photographic mark-recapture is a good technique for re-identifying and tracking individuals and could be used on a larger scale to determine movement patterns and site fidelity.

Oral Presentations

A Parasite-Pinniped-Fisheries Interaction: Codworm (*Pseudoterranova*) in Atlantic Cod (*Gadus morhua*) in the Gulf of Maine

Bamford¹, L.A., C. Byron¹, A.L. Bass¹, and G. Waring²

¹ University of New England, Biddeford, ME

² NOAA Fisheries, Northeast Fisheries Science Center, Woods Hole, MA

Codworm or sealworm (*Pseudoterranova* species complex) is a nematode marine parasite of many different species of invertebrates, fish, and seals. In the North Atlantic, the gray seal (*Halichoerus grypus*) and harbor seal (*Phoca vitulina*) are the most significant definitive seal hosts of codworm, while many commercial fish species such as Atlantic cod (*Gadus morhua*) are reported as intermediate hosts. Despite the issues that infection of commercial fish with codworm larvae presents to the fishing industry and the public health sector, no studies of the ecology of codworm have specifically targeted the Gulf of Maine (GOM). It is likely that the southern limit of this parasite has not been characterized. The present study aims to determine the range of codworm in the GOM by assessing its prevalence and abundance in Atlantic cod and to determine the relationship between prevalence and abundance of codworm in Atlantic cod and proximity to major seal haul out sites. This will be accomplished through morphological identification of nematode worms collected from whole fish samples of Atlantic cod throughout the GOM. This study will serve as a baseline for future management of codworm in fisheries in this region.

Two decades of Aerial surveys and Satellite tracking of harbor seal (*Phoca vitulina*) and gray seal (*Halichoerus grypus*) in Southern New England, Connecticut and New York Waters

DiGiovanni Jr., R.A., K.F. Durham, A.M. DePerte, and V. Sherlock

Riverhead Foundation for Marine Research and Preservation, Riverhead, NY

The number of seals observed in southern New England, Connecticut and New York has increased over the last two decades. These changes have been documented through the increase in stranding numbers and dedicated aerial, ship based and land based surveys. The Riverhead Foundation for Marine Research and Preservation (RFMRP) will present data on aerial surveys conducted since 2001.

These surveys initially focused on late fall through early spring (November through May). As reports to the New York State Stranding Program began to observe an increase in strandings in September, June and July the RFMRP began expanding their aerial survey window to include those months. The RFMRP has conducted 77 aerial surveys of seal haul-out sites around Long Island NY, Fishers Island, Block Island and Connecticut Shore. These surveys have documented the increase in harbor seals (*Phoca vitulina*) in New York waters along with the reintroduction of gray seals (*Halichoerus grypus*) reported in 2005 on Great Gull Island in eastern Long Island Sound. Since this initial observation of 29 gray seals on Great Gull Island they have moved to Little Gull Island just east of Great Gull. Recent aerial survey count of gray seals on Little Gull Island has increased to 538 animals observed on March 25, 2014. Since October of 2005, the RFMRP have satellite tagged sixty pinnipeds rehabilitated and released in New York waters. These animals include twenty-four male and eight female gray Seals (*H. grypus*) (n=32), including one adult male. Twenty-eight harbor seals (*P. vitulina*), nineteen males and nine females were tagged and released since August of 2005 by the RFMRP. The longest tag deployment was 263 days for gray seals and 214 days for harbor seals. Tagging data for both species revealed animal movements from the waters around Long Island NY (where they were released) to known haul-out sites in the Gulf of Maine and off Nova Scotia. These animals were tracked using wildlife computers, SPOT (position only tags) and Splash (Satellite linked time depth recorders) tags.

Suitability of Mount Desert Rock, Maine for grey seal (*Halichoerus grypus*) parturition

Frowine, R.A. and K. Ono

University of New England, Biddeford, ME

As the northwest Atlantic grey seal (*Halichoerus grypus*) population continues to increase, breeding sites are becoming crowded. Therefore, the seals will establish new breeding sites and also occupy more haul-out sites year round. Daily grey seal counts from Mount Desert Rock, ME (MDR) collected during portions of the winter seasons 2012-2014 were used in conjunction with behavioral observations and meteorological/oceanographic data to assess MDR's potential to become a regular breeding site. Only one or two pups were born on MDR during winter observation periods and adult usage patterns are dissimilar to those observed on breeding sites. On MDR, adult numbers increase gradually until late January and remain high which contrasts with breeding sites where numbers increase rapidly in December then decrease starting mid January. Adult seals also exhibited lower levels of aggression than on breeding sites. Meteorologically, MDR is similar to grey seal breeding sites; however, the low elevation and offshore location increase the likelihood of washover, and make it less than ideal for pupping. Understanding how the interactions between the growing grey seal population and its environment affect habitat choice may help us predict areas suitable for future gray seal breeding and may help managers focus future management efforts.

Regional Pinniped Education and Outreach Strategy

Garron¹, M., A. Rosner¹ and G. Waring²

¹ NOAA Fisheries Service, Greater Atlantic Regional Fisheries Office, Gloucester, MA

² NOAA Northeast Fisheries Science Center, Woods Hole, MA

Constituents and partners have raised concerns and questions regarding pinniped population, distribution, human impacts and interactions, as well as habitat use across the region to NOAA Fisheries Service. Concerns are being raised at a more frequent occurrence with underlining urgency for NOAA to address perceived problems. NOAA's Greater Atlantic Regional Fisheries Office (GARFO) and the Northeast Fisheries Science Center (NEFSC) recognize the need for a comprehensive approach to address pinniped concerns by providing information to the general public, regional stakeholders and external partners to accurately portray what we know about pinniped populations and being transparent about what we do not, and managing expectations. GARFO is undergoing a strategic planning process for pinniped education and outreach on a regional scale. GARFO is working closely with the NEFSC to develop consistent messaging based on the best available scientific information, identify methods and tools to distribute information internally and externally, and to develop a strategy to consult with federal, state, and local agencies and external partners engaged in pinniped research and resource management.

Gray seal occurrence and human interaction observations at the Chatham Fish Pier

Gilbert, K., C.T. Harry, K. Rose, M. Niemeyer, K. Patchett, B. Sharp, J. Hoppe, M. O'Reilly, N. Hunter, M. Madden, T. Johnson, B. Brennan, and N. DiMartino

International Fund for Animal Welfare, Marine Mammal Rescue & Research Program, Yarmouth Port, MA

The Chatham Fish Pier in Chatham, Massachusetts serves as an offload site for commercial fishermen and has become a popular tourist attraction for viewing fishing boats unload their catch. Over the years, there have been increased sightings of gray seals (*Halichoerus grypus*) occupying the area around the fish pier. They are routinely observed around the pier area during times when fishing vessels are present and unloading. During many of these instances, seals are provisioned either incidentally when decks are being cleaned or intentionally by tossing or hand feeding. In order to better quantify the extent of these interactions, IFAW Marine Mammal Rescue & Research conducted pilot surveys at the fish pier during the summer of 2014 to document both intentional and incidental provisioning of seals as well as other human interactions including entanglement sightings, harassment, and injuries. Additional goals of the project were to determine specific animal demographics, establish any specific behavioral patterns, and identify returning individuals. From the initial surveys, 13 individual animals were identified and observed in close proximity to or interacting with humans at the pier, including two chronically entangled animals. This initial study revealed that some individuals return to the fish pier habitually. Additionally, survey results indicated that various offloading vessels were observed provisioning and interacting with seals. The overall goal for this pilot

survey is to establish a working baseline of the levels for human interaction that routinely occur at the Chatham Fish Pier. Ultimately, we hope the results of this study will be a catalyst for an education and outreach campaign at the pier and other similar locations as well as to promote compliance with the Marine Mammal Protection Act.

Seal and Canid Interactions in SE Massachusetts

Lentell, B.¹, A. Bogomolni¹, K. Moore², and M. Moore^{1,2}

¹Woods Hole Oceanographic Institution, Woods Hole, MA

²International Fund for Animal Welfare, Yarmouth Port, MA

A number of interactions have been documented between phocid seals and canids, within the coverage area monitored by the International Fund for Animal Welfare (IFAW formerly Cape Cod Stranding Network) in southeastern Massachusetts, USA. These observations and interactions include anecdotal and photo documentation of interactions, post mortem evaluation of beach attack sites, and necropsy. Interactions have been between wild canids, domestic canids and 4 species of seals: gray seals (*Halichoerus grypus*), harbor seals (*Phoca vitulina*), harp seals (*Phoca groenlandica*), and hooded seals (*Cristata cristata*). The majority of interactions were between seals and eastern coyotes (*Canis latrans*). An increase in the documentation of these events stems from increased awareness, increased stranding response effort and likely a real increase in the number of interactions. These interactions have resulted in both injury and death of seals involved. Gross observations indicate that the canid attacks are increasing in frequency and severity. We will discuss the seal species involved, geographical distribution of interactions, seasonality, extent and severity of wounds, and patterns, such as the majority of attacks seen in winter breeding months, and the majority of the attacks documented on a single phocid species. In addition, we investigate the possible impacts to both seal and canid populations, focusing on the potential introduction or spread of disease between the terrestrial and marine populations, particularly in light of the morbillivirus outbreaks in the northeast U.S. region seal populations. These interactions strengthen the importance of marine mammal stranding response organizations in monitoring long term trends in both individual and populations' level health

Cape Cod and the Seals: A Stakeholder Interview- Master Thesis

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The increasing and federally protected seal population around Cape Cod has gained the attention of both the media and public. Various stakeholders have joined the conversation around the question asked by the media: Are there now too many seals? Who are these stakeholders involved in the debate? Why is there a conflict between their interests? And what efforts have been and should be taken to find a solution in the ongoing debate? The thesis tries to find answers to these questions by focusing on results from 16 stakeholder interviews.

Exploring seal senses as inspiration for technology development

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Pinnipeds have the most highly specialized vibrissae (whiskers) of all mammals. They can utilize their vibrissal system for the detection and tracking of underwater hydrodynamic disturbances generated by swimming prey and conspecifics, with fine discrimination of features such as size, shape, and moving direction. Their hydrodynamic detection abilities are unparalleled among animal systems and surpass that of any current sensor technology. The specialized morphology of seal whiskers may explain the spectacular hydrodynamic detection abilities of these animals. We investigate the aspects of vibrissal structure that enable this ability to extract complex information from the environment by utilizing laser vibrometry, high-speed videography, computed tomography (CT) scanning, and computational fluid modeling. By examining how evolution has shaped these biological sensors and applying this knowledge to the design and optimization of artificial sensors, we can enable advancements in oceanographic technology.

Conflicts in Coastal Coexistence: A Qualitative Investigation of Seals and Fisheries Interactions on Cape Cod

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Since the 1700's, Cape Cod has been home to a strong and multi-faceted fishing industry. The passage of the Marine Mammal Protection Act of 1972 (MMPA) and its subsequent implementation helped to generate a marked resurgence in marine mammals, especially pinnipeds and the species that prey on them. Competition over resources between the active fishing industry and thriving marine wildlife populations has become apparent. Many previous reports discuss the dangers that fishing industries pose to seals, and the costs that seals impose on fisheries. We examined this conflict from the fisheries perspective by conducting semi-structured interviews with 13 Cape Cod fishermen in autumn 2014. Participants were asked open-ended questions about their interactions with and views on seals, as well as more general aspects of fisheries management. While reporting few direct interactions with seals, these diverse stakeholders showed mixed emotions regarding the current level of protection for seal population and its impacts on a struggling seafood industry. Overwhelmingly, respondents asserted that a lack of effective commercial fisheries management and a poor fit between the MMPA and current levels of marine mammal populations are harming the Cape Cod fisheries. This study suggests an urgent need for policy makers who develop and implement management strategies for marine mammals and commercial fisheries to reconnect with individuals who are in the field to

help devise better solutions to concerns about depleting fish stocks and overabundant predator species.

North Atlantic grey seals (*Halichoerus grypus*) may be an underappreciated reservoir host for Influenza A Virus

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Influenza A virus (IAV) outbreaks in marine mammals have happened repeatedly in the North Atlantic, and multiple unusual mortality events (UME) have been specifically documented in New England. However it has remained unclear as to whether infections are a spillover dead-end event, or if seals act as a reservoir host where influenza can circulate, be maintained, and potentially undergo reassortment and/or mammalian adaptation. During the January breeding seasons of 2013, 2014, and 2015 we undertook IAV surveillance of weaned grey seal pups on Muskeget and Monomoy Islands. During each year approximately 100 weaned pups were tagged and sampled to obtain blood and rectal, nasal, and conjunctival swabs. We detected an overall viral prevalence in the pups of 10.5% and seroprevalence of 17.8%, and identified conjunctival and nasal samples as the best sources for shed virus. These prevalence levels are on par with those seen in wild avian reservoirs. Seropositive samples were further tested against a panel of influenza subtypes in order to ascertain the most probable of 16 subtypes circulating in the North Atlantic grey seal population. Sera show a surprisingly broad reactivity, suggesting that the animals are permissive to multiple IAV subtypes. However the strongest reactions are against H1N1 (seasonal human influenza), seal H3N8 (isolated from harbor seals during the 2011 UME), and H13 and H16 (previously thought of as gull specific). Taken together, these data support the possibility of grey seals as a natural reservoir host for IAV and underscore the importance of ongoing studies to better define IAV infection within this population.

Characterizing bite marks for the identification of depredation sources in the Northeast sink-gillnet fishery

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Gray seals (*Halichoerus grypus*) and harbor seals (*Phoca vitulina*) are often taken as bycatch in sink-gillnet fisheries in New England and are believed to consume and damage fish in gillnets. As seal populations increase, interactions with fisheries are also likely to increase, affecting both seal stocks and the New England fishing industry. There is some controversy among fishermen and scientists concerning the identification of sources of depredation (e.g. seal vs. spiny dogfish (*Squalus acanthias*)). Characteristics of seal and spiny dogfish bites were identified using both foam imprints from

skulls/jaws and bites by captive animals in the soft tissue of fish. Measurements from bite imprints and damaged fish were used to develop a protocol for identifying damage in the field. In general, dogfish bites were half-circular or half-oval in shape with a bite ratio (bite length/bite width) less than 0.6, whereas seal bites were rectangular or trapezoidal with a bite ratio greater than 1. The application of this protocol was tested using depredation data from a commercial gill-net fishing vessels targeting skate in New England waters June – August 2014. In this small-scale study, dogfish bites were identified as the damage source more frequently than seal bites. This inexpensive, quick, and practical protocol can be used on a larger scale to further understand depredation by seals and dogfish throughout New England. Once sources of depredation are identified, mitigation methods can be developed to more effectively exclude certain predators.

Preliminary observations on habitat use, residency, and site fidelity of white sharks in the coastal waters of Cape Cod, MA.

Skomal, G.B. and J. Chisholm

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Despite its well-established presence in the North Atlantic, the white shark, *Carcharodon carcharias*, is not considered an abundant species and efforts to study its life history and ecology have been hampered by the inability of researchers to predictably encounter these sharks. However, increasing pinniped populations are now attracting white sharks to the coastal waters of Massachusetts, thereby providing research opportunities. From 2009-2014, we tagged 41 white sharks off the eastern coast of Cape Cod with multi-year acoustic transmitters to examine fine-scale movements, habitat use, site fidelity, residency, and feeding behavior. The sharks, which ranged from 2.4-5.5m total length (mean = 4.0 m), were tagged in close proximity to gray seals, *Halichoerus grypus*. In this presentation, we present our findings to date, which suggest that white sharks exhibit seasonal site-fidelity to the coastal waters of Cape Cod, returning over multiple years to feed on gray seals.

Long term study on the feeding ecology of northeast U.S. Atlantic harbor seals (*Phoca vitulina concolor*)

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We analyzed the stomach contents of 237 harbor seals (*Phoca vitulina concolor*) that had been incidentally killed in commercial fisheries off the northeast United States from 1994 to 2014. Most seals were captured in the near-shore waters of the western Gulf of Maine, near Cape Ann, Massachusetts and New Hampshire, and 28 (12.3%) were captured/killed off southern New England.

More than 50% of the seals, were 0-3 months of age, and were captured/killed in sink gillnets, during June (2.95%), July (33.8%) and August (19%) total 55.7%. The average length of these harbor seals was 94.4 cm (range 72-151 cm); only twenty-seven seals were larger than 107 cm, including 4 sub-adult or adult harbor seals greater than 145 cm. Over thirty species of prey were identified. In total 8022 otoliths were recovered (range 0-214; avg. 33.3 otoliths per stomach), and there were 16 empty stomachs. Silver hake (*Merluccius bilinearis*), Acadian redfish (*Sebastes fasciatus*), and red/white hake (*Urophycis chuss/tenuis*) and Atlantic herring, (*Clupea harengus*) were the most abundant prey species, making up 48.86, 13.76, 12.96 and 3.89 percent (total 79.47 %) of the fishes from the stomachs, respectively. Analysis of the Frequency of Occurrence (FO) and percentage of total prey samples (%N); as well as differences between southern New England vs. Gulf of Maine predator-prey relationships will be discussed.

Weanlings, natural mortalities, and presentation of disease (or “Weanlings Don’t Suck”)

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Like many species, the greatest level of natural mortality in seals occurs after weaning but before reaching maturity. In phocids in the Northwest Atlantic, this includes “weanlings,” “yearlings,” and sub-adults. In a seal rehabilitation setting, the admission of weanling harbor seals from July to November represents the highest level of mortality. These animals are born in May or June, and are approximately two to six months old. Time in a rehabilitation facility can be very short, with death sometimes occurring within 24 hours of admission. In order to understand the implications to clinical rehabilitation cases as well as the significance to the wild population, we have started a systematic investigation into weanling seal mortalities at the National Marine Life Center (NMLC). Often referred to as “natural mortality,” this attrition is not uniform. There is a complex interplay of behavior, natural and human influenced accidents, and diseases. Parasites, bacteria, and viruses play critical roles as this predictable wave of morbidity and mortality that continues to shape the evolution of phocids. As a NOAA-approved marine mammal rehabilitation center, the NMLC is responsible for identifying disease and treating diseased and injured seals, and for preventing suffering wherever possible. If seals can be returned to a state of good health and would reasonably be expected to survive reintroduction into the wild while posing little risk to the wild population, we apply for release authorization from NOAA Fisheries. We are cognizant of the significance of returning animals that some would say have been “selected against.” We are also wary of the over-interpretation of this concept as an effort to write off a large number of animals and generally discourage rehabilitation and wild release of seals. Further, a number of the seals admitted show evidence of possible anthropomorphic injury. We are focusing on the root causes of mortality and clinical predictability of successful rehabilitation, but more work is necessary before individuals can be accurately assessed for survivability by any single parameter. By incorporating the clinical presentation and course with gross necropsy, histopathology, and parasitology, we are able to monitor natural and artificial causes of disease, injury, and death, and thus selective pressures on wild phocids. In our first two seasons, we have identified injuries with abscess

leading to septic shock, lungworm infection with pulmonary failure, nasal congestion obstructive lung disease and emphysema associated with nasal mites, and an acute fatal viral syndrome consistent with phocine herpes virus-1. We will present some case studies, methodologies, and findings from the weanling cases admitted to the NMLC that did not survive in 2014.

WhaleNet: twenty years of satellite tagging

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No Abstract

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APPENDIX E. POST MEETING SURVEY RESULTS

Overall, how would you rate the two-day meeting/workshop format?						
Answer Choices	# Responses					
Too Short	0	0.00%				
Short	1	3.45%				
OK	28	96.55%				
Long	0	0.00%				
Too Long	0	0.00%				
Total	29					
Our first day consisted entirely of short (15 minute) presentations. Would you prefer longer (but fewer) talks?						
Answer Choices	# Responses					
Yes	2	6.90%				
No	27	93.10%				
Total	29					
What is your opinion of the overall group size...						
	too small	just right	too large			
of the talks. (n=29)	14.29%	85.71%	0.00%			
of the panel session. (n=19)	26.32%	73.68%	0.00%			
How would you rate the overall quality of the presentations?						
	low	med low	medium	med high	high	Total
Keynotes	0.00%	0.00%	11.53%	34.62%	53.85%	26
Oral Presentations	0.00%	0.00%	17.86%	57.14%	25.00%	28
Posters	0.00%	5.26%	52.63%	31.58%	10.53%	19

APPENDIX E (CONTINUED). POST MEETING SURVEY RESULTS

Suggest a topic for a meeting or workshop
MEETING TOPIC SUGGESTION
Changes in population health
Media training
Biology of the pinniped species typically seen
More health, one health, seals as environmental indicators
Seals and their role in the ecosystem
Diet
Seal management policy
Outreach
Research needs and how to fund them
Gaps in research...what questions are most important?
How do we get more fishermen participation?
Stakeholder inclusion and communication
Human-pinniped interactions
WORKSHOP TOPIC SUGGESTION
Disease surveillance - proper samples to collect and when and who to send to
Seals and their role in the ecosystem
Developing the "message" we want to send
Anesthetic management of seals
Collecting/organizing educational materials
Field techniques: restraint, blood collection, tagging, biopsies, sedation, etc.
OTHER SUGGESTIONS
Everyone seems to have their research goals in line and running smoothly, but it seems like management of seals is up for debate; like people are expecting that with booming populations the government will step in to make action. It would be nice to have some closure to that debate - something like, seals are here to stay (or not?) and here is how you can cope (or not).

APPENDIX E (CONTINUED). POST MEETING SURVEY RESULTS

Please Rate the Quality of the Following						
	low	medlow	medium	medhigh	high	Total
Salem State location	7.14%	7.14%	35.71%	32.14%	17.87%	28
Accommodations	4.55%	4.55%	45.45%	27.27%	18.18%	22
Meeting/discussion room(s)	0.00%	7.14%	35.71%	53.57%	3.58%	28
Food/breaks	0.00%	0.00%	8.00%	52.00%	40.00%	25
On-line Registration Payment (BluePay)	0.00%	0.00%	8.00%	52.00%	40.00%	25
How often would you like to see similar meetings/workshops?						
Answer Choices	Responses	Total				
6 mos	7.41%	2				
1 year	70.37%	19				
18 mos	11.11%	3				
2 years	22.22%	6				
Do you consider the registration cost ...						
Answer Choices	Responses	Total				
Too low	7.41%	2				
OK	88.89%	24				
Too expensive	3.70%	1				
Where would you like to see similar meetings/workshops?						
Answer Choices	Responses	Total				
Eastern Canada	7.41%	2				
Northern NE	18.52%	5				
Cape Cod	59.26%	16				
Southern NE	40.74%	11				
New York (Long Island)	14.81%	4				
No preference	14.81%	4				

APPENDIX E (CONTINUED). POST MEETING SURVEY RESULTS

Other suggestions/comments: Have you implemented past priorities or recommendations made at these meetings into your work/research? Started new collaborations from these meetings? If so, what project, priorities or collaborations are you addressing?
I would like to see a summary of what the action items are following the meeting with proposed ways to actively address issues/topics. I've attend almost all of the meetings but feel as if the same needs/desires for the local seal population/stake holders are brought up each year but it is unclear what progress has been made to address those concerns. I'd like to see more directives given out to participating NASRC members as well as a way to track our progress
This was a great workshop for my contingent - I hope that we can maintain productive conversations about this topic in the future. Seals and all of the research that we do merits some attention, and it's a great forum to bring a high variety of people together. - - - My apologies for blanks - I left some blank that I did not feel at liberty to answer. I would have liked to stay for the second day, but my schedule just didn't allow.
This was a very pertinent workshop that brought together different entities involved in pinniped work, both professionals and lay people alike. I will be utilizing connections made there, as well as incorporating the information into our practices and protocols. Thanks for a great workshop!
A group is emerging to collaborate on human dimensions research on seals.
yes
This was my first meeting but I found it very useful in building new collaborations!
Through my research I have collaborated with fishermen and other scientists to work on identifying depredation sources
Possibly starting some collaborations from this meeting - thanks!

APPENDIX F. EDITED TRANSCRIPT OF PANEL DISCUSSION.

Addressing Perception vs. Reality: How data (or lack of data) affects public perceptions and management decisions.

Panelists: Peter Corkeron (PC), Chris Reeves (CR), Gordon Waring (GW), Jennifer Jackman (JJ)

Facilitator: Kristen Patchett (KP)

Panel objective: To closely examine data, perceptions and attitudes about seals in the NE and suggest information that would be most useful for understanding and managing seal related issues and how that information could be put to best use.

Structure of the panel: With changes to seal populations have come changes in human/seal interactions. As advocates for science we would like to develop ways to use science to better understand seal populations and the issues surrounding them. While we have focused mainly on the seal side of issues in previous meetings we would like to broaden the dimensions of the discussion to incorporate representatives from media and social sciences to include human aspects to a discussion of human seal interactions.

Seal biology – summary of what is known about seal populations – is there a difference between species?

Ecosystem – summary of the role of seals generally in the ecosystem – what is the role of predators generally in terrestrial or marine systems? (Hervieux, D., et al. Managing wolves (*Canis lupus*) to recover threatened woodland caribou (*Rangifer tarandus caribou*) in Alberta. Canadian Journal of Zoology 92.12 (2014): 1029-1037.)

Media – summary of how are seals perceived by the media and has this changed? (Alexander, S.M. & M.S. Quinn. Portrayal of interactions between humans and coyotes (*Canis latrans*): Content analysis of Canadian print media (1998-2010). Cities and the Environment (CATE) 4.1 (2012): 9.)

Ethics - “Animals have their place, but are experienced as “out of place”- and often problematic-when they are perceived to transgress spaces designated for human habitation.” (Jerolmack, C. How Pigeons Became Rats: The Cultural-Spatial Logic of Problem Animals. (2008): 72-94.) How might increasing human seal interaction affect attitudes? How can these interactions be reframed? (Peterson, M.N, et al. Rearticulating the myth of human–wildlife conflict. Conservation Letters 3.2 (2010): 74-82.)

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

Psychology – summary of how we process ideas - how might this differ between people relying on scientific data and those using experience based information (heuristics vs. algorithms) (Edward L. Glaeser & Cass R. Sunstein, Does More Speech Correct Falsehoods? (2014). J. Legal Stud.43: 65) - (Attitude polarization) Will more data fix the problem?

Introduction:

Objectives of the panel discussion:

- Interesting, lively and respectful discussion
- Opportunity to share ideas or ask questions.
- Examine data, perceptions, and attitudes about seals in the NE.
- Suggest information that would be most useful for understand and managing seal issues.

KP: It is all about our perceptions. We hold on to our beliefs and believe our biases to be true and sometimes we are confronted with facts but we are not acknowledging them. Sometimes it is about framing: how is a message framed leads to how we perceive it. Panel will discuss seal issues in the context of their areas of expertise. Periodic questions and comment period with participants.

Question 1: In conversations and media reports, we often hear terms such as “exploding population”, “over abundant”, “too many seals”, “the seal problem”. From your perspective, comment on this kind of terminology. Do they accurately reflect the issues? How does this terminology affect public perception and attitudes?

-How you say it affects everything. Terms are used deliberately (e.g., White sharks) to obtain specific emotional reactions. Comparing west coast vs. east coast – less seals here, seems like they are missing from the ecosystem from a west coast perspective, but in Northeast perspective “seals are booming”

- People are interviewed for expertise...If you say that the headlines are sensational, how can we de-sensationalize the interviews?

- Have a collective discussion to determine which terms will address core values. Can frame topics in a positive or motivating way. Terminology is also dependent on audience. “Dear scientists...” When talking to reporters – if there is more than one and in a sentence, stop sentence. They are looking for sound bites. Keep it short and to a single thought.

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

- Opinions are socially constructed. Variety of perceptions of “too many” or “too few” and what the problem is. Slanted news articles are strategic framing. No human dimension research on perceptions on seals (we have some for fisheries as we saw yesterday) on the Cape. Role of emotions, how do people react to different species. We need to be concerned about fishing issues and opinions, but need to look at other constituents as well (tourists, locals, etc).

- Perception of stakeholders determine if it’s considered explosion. Seals are more visible than whales, which also affects perspectives. We don’t have “control” over populations and we don’t have a target number we are going to. Science will not change stakeholders opinions – they want to get rid of the problem (not solve the problem).

- Do we add to this problem?

- We don’t know what the optimal sustainable size is, so we don’t know if we have reached our goal (as NOAA). Message is also the problem.

- Can see humpbacks from shore, and now 20 to 30 times humpbacks of the past. Humpbacks have similar population increase, yet no one sees that as a bad thing. Depends on how it affects people, (For example, slowing down public transport for marine mammals in Sydney is affecting people, but no one views it as a “problem”). Media only care about “good stories”.

- Scientists are like the keepers of information. You can steer a conversation with reporter. Conflict is focused on and reported, but that is not the only interesting part of the story.

- We introduced a comprehensive plan for Monomoy. We decided to do a media day (Cape Cod Times, Chronicle). We brought them to the refuge and so they could see what we did. We got terrific and great articles about that. And they had a little article and it was a video of Monomoy that they shot last year. There is a lot you can use, so much positive interaction with media and about the seals to separate it from the controversy.

- So you are saying to be more proactive, not only reactive.

- Focus on their ecological role, seals version of *Wolves Change Rivers*?

- People feel separate from nature, and focusing on conflict maintains that separation, but we are always interacting. We are in a new era now that seals are coming back, and we are using more resources, and the question become what will happen to this system? Now the view is changing that we are part of the ecosystem.

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

-The framing of the questions of the media is really to sell the paper. How do we turn this discussion? Is this an issue of Cape Cod or the whole USA? How would we frame it as a group?

- Look at it from a national point: fishermen subsidies, overfishing, etc. Try to get more attention to how it connects to the rest of the nation. Great human aspects to this – putting a human face to a story sells a lot more papers than data.

- Do sharks add to the problem? Or steer it away?

- This spins it from a problem towards more nature in general. People love sharks. Shark week is like super bowl for ocean sciences – adding sharks add to a more system thinking.

- There are other species that are out there eating fish. Why are seals getting the brunt of the blame for declining fish stocks?

- People don't like seals. For example, in Scotland, there is a Salmon run, people love the dolphins that come to feed there but not the seals. There are places in the world where people do not like whales or other marine mammals (Japan, Norway, etc), but for most of the world the perception of marine mammals have shifted from "usefuls" to "lovelies." It does not take that much to get people cranky about seals.

- In terms of white sharks, the seals are "the problem" because they are bringing in the sharks.

- The interesting thing about sharks and social media is that people are in love with sharks, whereas media still frame it in terms of attacks and negative.

- We have all been misquoted. Seals are really visible, while whales are not. They are blamed because they are seen. How do we, as a group with managers and outreach, help inform the media and TELL the story, not necessarily change it. There is conflict, but how can we make the story more informative.

- Almost every country has a law allowing for removal of "problem" seals. The negative idea is embedded in many areas.

- Most do not have that removal. Norway, Denmark, Iceland do, but most others do not. Not quite as simple as that.

(debate about countries that allow removal)

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

- Focus on other stuff besides fisheries interactions. Strandings could be called “Seal CSI”. Use “sentinel species”, help introduce seals as helpers instead of hindrance. A constructive narrative focus might help. If you are painting a picture of scientist working with nature to prevent disease, those are great keywords to throw out.

Question 2: Is there evidence of improved ecosystem health in areas where there are large pinniped populations? Are these stories we should look more into and shared?

- Yes, elephant seals story could be useful – feeding deep, defecating high

- How can we get these issues/stories out there? We are constantly hearing the negatives, but how can we move forward with more positive stories that are based on facts.

-Talk to people who are publishing – say that there is preliminary evidence of seal scat helping to fertilize ecosystems. Could make a good story with quotes.

- Story of hippos in Africa where they wiped them out since they were hurting people. When they removed them, system completely crashed since it was dependent on hippo poo. We are not media people, we are peer-reviewed people. It’s a matter of getting together and writing stories for classrooms that bring these things up as a positive in terms of seals. Why don’t we say those things?

- Really good NPR stuff on whale poo – it’s a great topic. “Poop rocks.”. The NGO community has more freedom to explain role of marine mammals in the ecosystem. And it seems that it is a shame that there is no scientist in the NGO community working on it to drive this conversation. NGOs are in a much better position to drive these conversations.

- Agreed, excellent suggestion.

- These presentations on the importance of seals need to be outside of the seal consortium.

- You can use the consortium to come up with the message we want to put out to the public.

- Coming up with a direction of research. ??

- NGOs can include forums and such to include scientists to help explain importance of seals.

- do you feel like you are constrained in what you can and cannot say?

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

- No. My job is to do the science and to keep right whales alive. People like David Lavigne (IFAW) used to drive this side of the conversation and made significant contributions to it... and I don't see that conversation in the NGO community anymore.

- Hypothetically, if we had to do a sound bite on a radio right now, what would we like to say?

- Systems thinking is becoming popular. Maybe frame seals as ecosystem engineers and discuss the trophic cascades affecting carbon budgets. Since the seal community is so diverse in terms of study, big ideas take a while to congeal since we are not working together and communicating constantly. By adding up affects/studies we have a different picture of how it's affecting the atmosphere. Charismatic animals affecting air that we breathe.

- There are always stories about seal poo causing beach closures, could this be the response to that story? Say that they are contributing in another way?

- Yes this would balance it, but you need to tell it as a story, such as – we thought poop was causing closures and problems, but scientists have found that it is important in this way. The story is also partly the job of the reporter.

- In response to what do you do? What research do we need to understand ecological role of the seals in the environment, because we could not say anything right now since we do not know. We need to have the data to back up our stories, but should not tell the story with the data.

- And despite the water quality study there are still people believing that they are polluting the water. Where do we go from here, how do we change this perception of the "seal problem(??)"?

- There are people for whom it won't matter what you say, it won't change their opinions. In terms of water quality, there are many other factors that affect the water quality, so were the people who brought up water quality the ones complaining about seals before? Is this data just further deepening opinions?

- The whole negativity thing about the seals and water quality... the press jumps right on it, looking for answers.

- The scientific work is important, but you can't say that it is the "truth." We say we found evidence, but it might be different. Those reporters want facts, something to write about. When they go to other stakeholders, those stakeholders often use sentences that state facts, whether or not they are true ("I saw the seal eating this fish!").

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- People look at science as a body of facts, not as the shifting thing that it is. Just say that science supports this now. Don't give the data, just give the answer you have. And don't add a bunch of qualifiers to that. People see this as scientists disagreeing or not being sure. People need to be trained to learn that scientists arguing is a good thing.
- What responsibility do the media have in getting information and putting stories out there?
- Climate change: people are afraid to teach about it because we think more people are climate deniers than supporters. Most people think we are causing it and should do something about it, but are afraid to talk about it. We do not live in a world where we have equal representations in terms of public opinion (we don't have ½ deniers and supporters, but there is equal representation in the press).
- There are sources out there that are clearly wrong. How can we fix this?
- Go bigger, find a larger media source.
- Who's responsible for finding this media?
- Should be a conversation here, but a priority.
- The media will get two people, and rate them equally when they are usually not.
- Disproportional representation
- Smart people are interested in seeing their interests and using it to their advantage. Naive to think the media is dumb. Smart people are playing the game, Book called *Merchants of Doubt*,
- NOAA does press releases during seal releases and such, they are in a positive light for seals.
- Are press releases the way to go or other methods?
- No, you need a constant presence in social media with information that is given to them in an understandable way.
- Yes, social media is great but there are no positive outputs from that (e.g. spike in membership) and we often have to edit page due to derogatory things. Is social media a positive thing for us?
- This meeting would be an interesting thing to have on there. We really need to tell the story rather than write papers?

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- Paper published about using social media to fund research. (shark research funded through taking people out for shark tagging)
- There are many sensational articles on social media saying “scientists say” that are often crap, how can we counteract this.
- Pseudo science is still engaging people in thinking about science. Generations growing up are more social media savvy and can usually tell the difference.
- Scope of research is very broad, how can we prioritize research. We have heard it is how many are there? Is this the priority? What are others? How can we do it?
- Yes, it is a priority for NOAA and stakeholders. The way our research has been going is through collaboration, and the partnership is what sets the priorities. Having a good estimate of population is important, but maybe not most important.
- How do we address the stakeholders that ask for it?
- I don’t think the number we give them will change their opinions. They will think there are still too many and it is still a problem.
- People don’t know how to frame numbers, so if we are giving a number, we need to put it in perspective using historical perspectives.
- Please do this when talking to the media.
- When the scientists say we don’t have a number or the number is not the most important question, is the perception that we are hiding something?
- Not saying not to give them all of the data?, but perspective is crucial.
- Have a more holistic context when reporting, are you saying there are not research priorities? And they just happen as we come together? Collectively what are the priorities?
- When we came together in 2009, that was a big thing we wanted to do - have a list of priorities. We put out technical report that shows priorities in terms of topics. There are so many priorities out there and the federal agency cannot answer all of them. We need the NGOs and other people to get these priorities and questions answers.

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

- In terms of numbers, at Tufts meeting they wanted to make the number a priority. Time and effort and funding are issues. When we say 60,000 seal on Cape Cod is a lot, but if its 60,000 seals from NY and Cape Cod going to Canada, it is not as much.
- Not enough money is going towards seals because they are a healthy robust population, but maybe that's why we need to spend money on them since there are now interactions happening. What are some out of the box ways in which to fund a project?
- Thinking outside the seal box would help. Use tagging information on seals in terms of oceanographic ideas/studies.
- How many of the questions raised in 2009 have been satisfactorily answered? Some don't feel a lot of progress has been made. Maybe there should be a sub committee to work on this. People want answers, we need to know why they want an answer, and we need to understand what the answers mean. We know why we don't know, but general public does not understand that.
- In terms of research priorities, it is dependent on agency and managers. There are diverse needs. We have tried to bring a bunch of them together to identify big ones, but they are different for each group.
- As a consortium, we came up with data gaps. But through collaboration we have found that depredation, population work, and disease work is happening. But now we need to take that work and publish it in scientific literature, social media, and outreach. As a small group of people we are doing a lot of things.
- In terms of numbers, we have published numbers. We are not hiding it – published in PLOS One. The question of “how many is too much” is a social construct and it changes depending on location.
- Very different from US in MMPA, we need to get to OSP.
- MMPA also says marine mammals should be active components of marine ecosystems, which is not the case in other countries. This turns the entire rationale around.
- If we gave them a bunch of numbers, what would they choose as too many?
- Some stakeholders have discussed amending the MMPA. What do the data tell us about the efficacy of seal culls in other regions? If the MMPA were amended and a seal cull were allowed, what do you think that would look like? Would it help with the recovery of fish stocks? How many would have to be culled to positively impact fish stocks? What would the repercussions of a cull be to seal populations, to the ecosystem, and to the public?

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

- Individual takes in the Pacific for salmon fisheries – they are not seeing any changes.
- That is in terms of nuisance animals not broad scale culls.
- Local organization on Nantucket want to identify the gray seals as nuisance animals.
- No progress on that, but on the west coast the issue was that they were eating endangered fish.
- If we were to cull, what would that look like (refocusing to the question).
- We already did this historically and fisheries collapsed due to human activity.
- New book *Environmental History of Cape Cod* that talks about that.
- Slide of crash of harbor seal populations in Europe from presentation – it did not help the fisheries. Another example, Mediterranean monk seal population – there is call for cull and there are only ~500 of them.
- There are a series of articles by conservation biologists that look at removing animals impacts the populations and can create more issues. The values of public have changed to be more naturalistic.
- To take utilitarian example, Bison on cattle grazing land and there is a perception that the bison take too much grass. When student looking out there, they saw a lot of rabbit poo, so what was responsible for taking out grass cover? Cattle was first, rabbits next, and bison third. None of cattle ranchers thought the rabbits were responsible for anything. The reason there are rabbits is due to cull of coyotes. You can look at this in the terrestrial environment because its track-able. We just can't do this kind of analysis in a marine environment. It's not possible.
- The perception is that when you cull, all the resources are then directly available to fishery.
- There is evidence of decrease in gray seal populations were responsible for increase fish stocks (in Canada?).
- There is one stock of Cod that are being affected by gray seals. Harp seals and cod. Looking at bottom up top down processes affected cod. Models show that it is really bottom up availability of capelin and not at all by harp seal predation. There is evidence in one specific setting that the seals are a problem.
- I think it's a problem that there are papers out there that show that culls are effective, confusing in the literature for scientists.

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

- Ecosystem modeling (AFS) - concept of scale. When you look at finer scale, you may see effects, but when we zoom out to water basin there might not be affects. Models are also sensitive to diet data, seasonality, and are heuristic in order to identify where we need to look and get more data. It shows these models are not very robust and that there is a lot more to the story.

- Playing the devil's advocate, I don't care about the ocean basin, I care about the place that I fish. This is a perception that we need to consider.

- In terms of coyotes – lots of media in Canada re: wolves being culled. In the wolves that remain in the populations – their numbers are increased since they cull the alphas and the younger ones are breeding. Social structures are changed, disrupting population and increasing stress. Could culling gray seals just result in increased populations by changing social structure?

- Allowing hunting could improve tolerance, which is not always the case.

- This is a matter of perspective of where you are. You could get rid of seals in one place but they could be somewhere else. Its not just perception but perspective.

- Is there something we can do to express this?

- Should we have a discussion on Nantucket. Seal Abatement Coalition, made up of people who like to fish on the tip, where people came from all over the world to fish there. It's located on a Nantucket refuge that is difficult to keep ranger presence there. When seal populations built up, we put symbolic fencing up to protect the seals from the people, and now birds are there as well. When people are outside of the area fishing, seals will take fish and the seals will come out of the water towards the fish. There are 5 miles of beach that could be fished on, but it's not the "tip". There needs to be a balance for protecting wildlife and people who want to use the area. I tell the people that you have the ability to go anywhere, but these animals don't have anywhere else they can go. This past year there have been a lot of people going beyond the fencing. Civil disobedience is growing. It is hard to have sympathy for people when they have other options.

- Do you think it would help to get media attention around land use and birds? This is the kind of things locals can take pride in and might help trespassing.

- One problem, seals showing up where fish are and how would cull help this? They just don't want the seals there, not necessarily dead.

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

- Even if a cull were allowed, it would NOT be allowed on the refuge. Now it is multifaceted with birds and seal. The SAC are willing to be more than just emotional about that, they want to see changes in the management of refuge.
- Devil's advocate: They cull coyotes on refuges, why can't we do that for seals? How do we address this concern?
- We have predator management at Monomoy and will kill coyotes only if they are in certain places at certain times to protect endangered species. It's a habitat management and it is a separate issue. We do not kill coyotes when endangered species are not there.
- Devil's advocate again, Muskeget vole is an endangered species, should we cull seals to protect them?
- The Muskeget vole is not federally endangered, it is an endemic species and may have a state listing, but is not federally.
- We started this with the pinniped problem, it's not necessarily a cull, we just don't want them there. It's not going to solve the problem to cull. There are points being used to stoke this problem.
- We need to be careful that we are not fighting two separate issues, ecosystem issues that we use culls for are not the same as operational impacts. They need to be separated and dealt with independently. We can debate about ecosystem science, but when operational issues happen they are something we can deal with.
- The public is never going to go for killing seals. There will not be support for that change to MMPA. Advertising will make this clear very quickly.
- Are there any pinniped management efforts that have been shown to increase fisheries stocks or catches or resolve other conflicts or habitat use issues?
- Small scale in southeast Alaska – which would apply to southern new England fishing outfitters – fish for salmon, haul lines out after seeing sea lion and turn into a naturalist tour instead since they will not catch it. There are people who have retired to go to that point in Nantucket, and this will not work for them. We need to teach new ways in regards to recreational fishing.
- This would also not reinforce the seals behavior of stealing fish.

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- Our use patterns may need to change – conflicts with wolves and lions in eastern Africa. The cattle ranchers now teach cattle to avoid the predators. They now have less predation since they are smarter (using tracking of wolves as well).

- There are a number of success stories. For example, elephant seals took over wind surfing area, and surfers turned into a “friends of elephant seals” and educated people about them, resulted in booming tourism. Volunteers out there educating don’t get paid, but the town makes a living on it. We talk about Nantucket tackle shops closing, but this is a success story in terms of seals coming back. We should turn this into a tourist attraction.

Question 3: Do you think that seals have intrinsic value? Is there value to seals just because they are there.

- It is deeply rooted in the world psyche not to let animals go extinct. When you have an example, especially when cute, there is value in the story. The perception may not be changing on local scale

- There are people who are not happy with seals.

- We hear more about the negatives.

- People are bad at self-promoting – there were reasons for protection and now it has happened and we should voice those reasons.

- What about intrinsic value to the ecosystem.

- People haven’t really looked at this yet, large predators have an impact and we need to make these connections.

- Meeting in Norway where someone said people like having humpbacks around and that they are just “lovelies”, and now what we are learning that they are also “usefuls”, not only lovelies. We are now seeing these animals have a worth that we hadn’t thought of before. And where will this go next? Images of hundreds feeding together will show interesting finds. We need to have these species come back before we can find out their ecological significance. In many instances we are seeing these connections for the first time.

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

- Story of opportunity, these are species that have been exploited. We probably would not have seen these relationships if we had not exploited them. We have a smaller scale to look for these relationships with making it easier.
- Stakeholders have asked about the MMPA. Gray seals are not endangered or threatened, so why are they still fully protected?
- We were protecting them from us.
- The MMPA was not the ESA, it was not just for their numbers but because of their intrinsic value.
- Back in late 60s early 70s, there were two marine efforts (whales and coral reefs). Here we have MMPA and a way of studying and looking at them that have changed everything. That came about because of chance and good luck and because of the view that we need to do something about these things. My sense is that they are good things. We did a good job with the MMPA because it was more than just we need to save them from extinction; it was more that they should be a part of the marine ecosystem.
- Some stakeholders equate seals to deer. What about if the same concept was approached as with deer? What's the difference between a deer and a seal?
- I don't know that we are not at a point where we could harvest seals. In terms of deer, we need to manage the population if we want to have song birds because the deer would eat a lot of the vegetation that songbirds need. Most people hunt for the deer to eat it. We are predators and we usually forget since we can go to the store, but we are predators. My changed opinion was about hunting. Most people eat what they hunt, so this is different since it's used as an ecosystem management tool. I'm not opposed to hunting seals, but why? Are they going to eat it? Use the pelts? Is it going to be for a reason? There are reasons to manage sustainably
- Pollutants in seals, PCBs
- They are hunted in Canada
- I lived in Newfoundland and they are hunted to consume, for subsistence. You can buy pelts and seal boots in Newfoundland, Labrador.
- The deer in the east are high because there are not as many predators, so we hunt them to keep in check. But seals are part of the food chain, white sharks eat them, so it is a different situation completely. In Canada, it was small communities that needed them to eat and use pelts, but large scale

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

hunts are really fisheries related and not for need. They are trying to make markets for seal markets (in Europe/Asia). But this is driven by government, not economics.

- Seal hunts in Canada are driven by economics also, there are no other economically sustainable things to do. Not that they couldn't invest in other things but they use it economics for "justification".
- Canada also has oil now – Norwegian Koreno (?) is buying pelts and whole hunt in Canada is funded by Norway, this is an artificially sustained fishery.

Open to the floor for other questions/topics

- Coming back to seals as sentinels, plenty of talk about feces from marine mammals boosting ecosystem. But there is also human feces entering the ocean, so seals are recipients of all this fecal material and are indicators of how we pollute the environments, which will eventually come back to us through food. If that contamination is getting into shellfish, we are also at risk. We should promote seals more as sentinels.

Question 4: We talked a lot about impacts seals have on humans but what about the impacts of humans on seals? We kind of have a cull through entanglements.

- We tried to get grant money to do "seals as sentinels", but they would not look at it because of the phrase "seals as sentinels of ocean health".
- What about funding? Where do we get this from? We have more failures than successes. Wendy has been doing a lot of work to get people together to get these questions answered. You need to take the collaborative approach and use another issue above the seal question you want to answer.
- Fisheries remove about 1,000 gray seals each year, so there is already an unofficial cull.
- Is there value to tagging these animals and we need to find out what is important. I do not support the ad hoc questioning; we need to focus on the seals.
- The group needs to develop a strategic plan for moving forward with objectives.
- It is perception, that there is another audience we need to convey our mission, objectives, and why it's important. We need to get our own messaging right, but we also need to convey it to funders as well as stakeholders.
- Having a precise message will help, and putting it out in the public and show that we need to do more research will also help. We can drive the need through the public to generate funding.

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

- Wondering if there is outreach with congressional representatives? Other organizations have reached out, but this is something members of congress should hear from us. They are hearing from fishermen, but what are they hearing from us?
- They are hearing from stranding communities, but that is a different conversation.
- I think they are hearing the pinniped problem issue but not from our side, we need to say we see it as more of a success story and not a problem. They are only hearing from one side of the table.
- Regarding seal deterrents: researchers have found something that induces a startle response that might be helpful (Götz, T. & V. M. Janik. 2011. Repeated elicitation of the acoustic startle reflex leads to sensitisation in subsequent avoidance behaviour and induces fear conditioning. BMC Neuroscience 12: 30.)
- IFAW is testing this technology for herding dolphins from dangerous areas to prevent strandings – Dolphin Acoustic Deterrent.
- Different than pinger or seal scarer, it does something in their brain.
- Seal apparently have immediate reaction to it and do not habituate to it.
- If people don't want them at that point, this could help remove the seals from that place. Could solve the culling suggestion if we can remove them with deterrents.
- Fascinating dynamic, since MMPA allows a cull based on the numbers. But if we use this device, we would be reducing depredation, but also probably the bycatch, which would not help reduce the population. Why would they want to fund something to mitigate issue if it won't reduce population?
- There are other operational issues besides just the bycatch.
- In terms of the Great Point, Nantucket issue, are they going to the area because there was no human use of that space for a period of time, and are we changing their distribution because of our use of the mainland? We need to think of these concepts of how we affect the distribution as opposed to how they are affecting us.

Panel Wrap up:

- Review of recommendations and final comments from panelists
- Collective discussion of what our message should be.

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

- What's happening with seal populations – we need to frame it the right way so it's not negative towards any one user group. Seems simple, but probably harder to do than we are thinking.
- Speak in sound bites for the press, rather than long statements that might get chopped into pieces you were not trying to get across.
- Need research on the general public's feelings about seals.
- Comparing to other regions would also be important.
- Need to promote the positive stories/aspects, especially in terms of getting into media. Seal marketing agent – need to make a “Seals change Ocean” video and for it to go viral
- Develop curriculum to bring into schools – Need to sit down to have curriculum showing same messaging
- Protected species branch has education, NOAA education has curriculum, extensive, books, CDs, etc
- I think it is really important to include seals in lessons for students since they are the next generation. If we can change the perceptions at this age it will help down the road. But we also need to incorporate seals into more than just a “seal” lesson – use them as examples for other lessons.
- We all have pieces, we need to centralize that
- It also needs to be accessible, since teachers usually search for a lesson and if it's not right there it won't get used – I would volunteer to compile lessons
- New England science meetings
- Bring back NGO scientists
- Don't qualify when discussing findings with general public/media
- Electronic interviews will wait until you say something you want, print will make it up anyway
- We can come up with talking points that are more concrete “entanglements kill this many animals”, “in the past it has been lethal”
- For journalists, the rule is don't use quotes if you can say it better yourself – so if you're not clear they will reword it

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

- Do not ignore question, but still have the message you want to say

- Read *Merchants with Doubt*

- Twitter, Facebook, social media

- Look through resources for using social media to promote research and funding

- Was not initially used since not sustainable, takes too much time

- Invite/inform press/media to meetings

- Could have made this a Facebook story

- Could be bad too – Inuit’s in the Arctic found out about belugas from press, not science and did not want scientists back

- Research priorities defined collaboratively

- Committee (sub) to assess progress of priorities to date

- May need to step back and look at the issues we had in 2009, see where progress has been made, help assess other priorities. Same questions are still being asked.

- Poll stakeholders as to what number is “too many”

- More human dimensions surveys of public opinion

- Asking may be more inflammatory than hopeful

- Creating talking points surrounding culling

- Very important to steer conversation away from culling

- We need to determine if the other groups really want culling, but if they are we still need to discuss it

- Chase Gruber’s masters thesis on perceptions

- Need to have these talking points to be able to have that conversation

- Having combined opinions is difficult in terms of talking points

APPENDIX F (CONTINUED). EDITED TRANSCRIPT OF PANEL DISCUSSION.

- The group only exists in a sense of who is here, we are engaging on this topic so we need to have talking points
- It is our responsibility to bring the other stakeholders views to the table, even if they are not here right now they are still part of the conversation
- As a consortium, there are many social surveys and scientific studies out there, we can at least put some of those out there (bibliography) on the website
- Rules for participation, how much influence do a few members with different opinions steer the group? We don't want any perspectives to be left out. We are a non-existent group that just allow the conversation to take place
- By not excluding anyone, we can get more opinions
- Strategic plan for research!!

Final thoughts from the panel:

Peter Corkeron: We had Gary Stenson visiting lab from DFO Canada, they have excellent work on foraging ecology and population numbers, focused on the seals are eating too many fish question, they found harp seals are not affecting them. We know it was overfishing that killed the cod. If we want to make the same mistakes Canada made, count me out. They are still being asked to disprove things they have shown to be true.

Chris Reeves: Don't underestimate the power of good communication. We are motivated by our emotions and given the large impact we have on the ecosystems, our emotions are the only ones that could change the world. Think through what you want to get done and how to motivate the public through clearer communication.

Gordon Waring: Recovery of gray seals is a great success story. If we focus on the fishery question we will never really learn more about seals, which is still interesting. We need to use new technologies and not just say seals are the problem.

Jennifer Jackman: Agree with not just focusing on one specific stakeholder crowd. *Cape Cod: An Environmental History of a Fragile Ecosystem* – John T Cumbler

Use research to redirect the issues.

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16. Abstract (Limit: 200 words) On May 1 and 2, 2015, over 75 people attended the Northwest Atlantic Seal Research Consortium's first official biennial two day scientific meeting, "Seals and Ecosystem Health", at Salem State University in Salem, Massachusetts. The focus of the meeting was addressed by two keynote presentations: "Seals and Ecosystem Health" and "Marine mammals and ecosystem functioning: what can recovering seal populations teach us?" The first day of the meeting featured 16 oral and two poster presentations, covering a diverse range of topics highlighting the important underlying concepts, data gaps and future directions. Following the theme of the meeting, attendees discussed the nature of ecosystems, acknowledging the complex and often cryptic interactions between components, with cumulative and synergistic effects on animals and their environment. As our understanding of the ecological role of seals in the Northwest Atlantic grows, the cumulative interactions increase our recognition of seals as sentinels of ecosystem health. Meeting presentations highlighted the value of existing data and ongoing research efforts, including long-term population monitoring, tagging and photo-identification, stranding response, and rehabilitation facilities. The importance of observational effort was recognized as a critical component in detecting mortality events, documenting population processes in remote locations and cryptic species interactions. Research priorities identified included development of molecular tools for study of diet and disease, population dynamics studies (demographics and trends), telemetry-based investigations of spatiotemporal distribution, and model- and field-based ecosystem-level studies. Several of the presentations and the panel discussion, "Addressing Perception vs. Reality: How data (or lack of data) affects public perceptions and management decisions," highlighted the diverse and evolving perspectives with which society views seals, perspectives that are often biased by the backgrounds of individual humans. Diverse opinions necessitate engagement of stakeholders and the public, and societal objectives need to be defined in order to effect science-based natural resource management at an ecosystem level. At the closing of the meeting, recommendations from the panel discussion and for the overall goals of NASRC were discussed.			
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