

The Northwest Atlantic Seal Research Consortium



*Seals, Science and Management:
Where Research and Reason Meet*

April 27th 2018

SMAST, New Bedford, MA

Welcome!

The Northwest Atlantic Seal Research Consortium (NASRC) believes that healthy populations of all marine resources including fishes, seals, whales, and other species are important components of healthy marine ecosystems. We are committed to providing answers to questions about seal populations by using comprehensive research data and analysis.

The NASRC grew out of a series of workshops that included scientists, resource managers, and recreational fishermen to address issues and concerns related to seal populations along the New England coast.

Recent increases in local seal abundance have led to concerns about fisheries and other interactions between human and seal populations. The urgency of documenting, understanding, and mitigating these interactions has become more apparent, as has the need to improve our understanding of the ecological role of seals in the northeast United States. This encompasses issues such as: how they live, where they go, what they eat, their health and illnesses, and interactions with the world—including humans.

The focus of this meeting is “**Seals, Science and Management: Where Research and Reason Meet.**” Successful conservation efforts have resulted in rebounding populations of pinnipeds in the U.S., including seals in the Northwest Atlantic. Increasing numbers have brought many increasing challenges. This one-day meeting will incorporate formal scientific and informal/observational presentations, a panel discussion and a facilitated open community forum and synthesis. This meeting will build upon our previous efforts and prioritize discussion of rebounding pinniped populations and the management challenges they present including: cooperative research, measurements of recovery, multispecies predation models, how to better connect data, improve discourse and disseminate information.

To learn more about NASRC go to our website at nasrc.whoiedu

OR

Email us at sealresearch@whoiedu

Help Identify and Track Tagged and Uniquely Identifiable Marine Animals

Much of what we know about marine mammal migration and behavior is the result of keen observation by patient naturalists, fishermen, citizen scientists and researchers. In many cases, we learn through the imprecise science of serendipity whereby a matrix of possibilities results in a report: the right person in the right place at the right time knowing the right person to contact.

Have you seen a tag? A uniquely marked individual? An interesting behavior? Or maybe you are not quite sure what it is you saw? The Marine Animal Identification Network provides information on tagged animals (primarily seals) and a database of sightings. Learn about research on seals and other marine animals and participate in the process of learning about their travels.

Report tagged animals at: main.who.edu



Report Stranded Marine Animals to NOAA Marine Mammal

and Sea Turtle Stranding & Entanglement Hotline:

866-755-NOAA (6622)

Schedule

Time		Title	Presenter
8:30- 9:00	Registration		
9:00-9:10	Welcome		
9:10-10:00	Keynote Address	To ‘Like” or not to “Like”? Is that the questions about seals in a world of constantly changing use and social value?	Sean Hayes
10:00-10:15			
10:20-10:35		Stakeholder Views of Seals on Nantucket, MA: Lessons learned for coexistence	Jennifer Jackman
10:35-10:50		Insights to gray seal (<i>Halichoerus grypus</i>) foraging behavior in southern New England using stable isotopes and DNA bar-coding	Keith Hernandez
10:50-11:00			Kathy Zagzebski/ R. Williams
11:00-11:10		Mycoplasmata species isolated from respiratory tissue of phocids in the Gulf of Maine, 2011 - 2017	Katie Pugliares-Bonner
11:10-11:20		Annual health assessments at gray seal rookeries provide a window into the health of the regional population	Wendy Puryear
11:20-11:30		The Interspecific Interactions and Habitat Preferences of Harbor Seals (<i>Phoca vitulina concolor</i>) and Gray Seals (<i>Halichoerus grypus</i>) on Duck Island and Ledges, ME	Kadianne Tomassi
11:30-11:40		Monitoring harbor seal displacement by grey seals in the Western New York Bight	Paul Sie-swerda/ A. Kopelman
11:40-11:55		Gray seals (<i>Halichoerus grypus</i>) and Harbor Seals (<i>Phoca vitulina</i>) in the endless winter	Rob DiGiovanni
11:55-12:10		Thirty - four years watching seal haul out behavior in southern and downeast Maine	Gale McCullough
12:10-12:55	Lunch	Posters/Artwork	

Schedule

Time		Title	Presenter
12:55-1:10		An Overview of the Northeast Fisheries Science Center's Seal Research Program	Kimberly Murray
1:10-1:25		Genetic Diversity from Pre-bottleneck to Recovery in Sympatric Pinnipeds in the Northwest Atlantic	Sarah Vincze
1:25-1:35		Contrasting trends in gray seal (<i>Halichoerus grypus</i>) pup production throughout the increasing northwest Atlantic metapopulation	Stephanie Wood/N.den Heyer
1:35-1:45		First Successful Satellite Tag Deployment on Wild-Captured Harbor Seals in Virginia	Monica DeAngelis
1:45-1:55			Johanna Pederson/ S. Petrus
1:55-2:05		The Roles of an Incidental Take Biologist Developing standardized protocols for seal surveys to study the occurrence of entanglement in gray seals (<i>Halichoerus grypus atlantica</i>) and harbor seals (<i>Phoca vitulina vitulina</i>) at New England haul-outs.	Lisa Sette
2:05-2:15		Passive acoustic monitoring of white sharks reveals contrasting coastal migration and residency patterns off Cape Cod and beyond	Megan Winton
2:15-2:30		Who's got seals?	Jack Paar
2:30-2:45		Pinnipeds and Federal Policy: the good, the bad and the ugly	Sharon Young
2:45-3:00	Coffee		
3:00-3:10			Facilitator: Kristen Patchett
	Panel Introduction	"Seals, Science, and Management: Where Research and Reason Meet"	
3:10-4:30	Panel Discussion	The Elephant (seal) in the Room	
		Panel and NASRC Participants: Q&A	
	Panel Round Up	Recommendations	
	Valerie Rough Award		
4:50-5:00			
5:00-5:20	Open Conversation	NASRC: The Plan Ahead	
5:20- 5:30	Meeting Synthesis	Priorities, concerns, changing perceptions, future needs and directions	
		Post-Conference Gathering: Me and Ed's New Bedford, MA	

Poster

Species-specific detection of prey DNA in analyses of Western North Atlantic *Halichoerus grypus* (Gray Seal) diet

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The western North Atlantic gray seal (*Halichoerus grypus*) population has been markedly increasing in recent years, shifting the interactions of marine food webs in which they are involved. Methodological limitations complicate studies of pinniped foraging ecology – monkfish (*Lophius americanus*), winter skate (*Leucoraja ocellata*), and haddock (*Melanogrammus aeglefinus*) are three species which cannot or have not been detected with traditional otolith analysis of gray seal scat. Molecular scatology, a relatively nascent approach in comparison to traditional hard parts scatology, was utilized to detect the presence of the three target fish species in wild gray seal scats collected from Muskeget Island (N = 25) and Monomoy Island (N = 80) in Massachusetts, USA.

PCR detection assays were successfully developed for monkfish (detection threshold: 0.005 ± 0.008 ng/ μ L; N=10), winter skate (detection threshold: 0.005 ± 0.008 ng/ μ L; N=10), and haddock (detection threshold: 0.003 ± 0.006 ng/ μ L; N=10). Our methods were validated with the use of scat samples from gray seals that had consumed these species at the Aquarium of Niagara (Niagara, NY). Of the 105 wild scat samples tested, three were positively identified as containing monkfish DNA. One scat positively identified for winter skate, and one scat positively identified for haddock. Our results suggest that gray seals are unlikely to be consuming these commercially important fish species in sufficient quantities to negatively impact fish populations. Our approach can be utilized to track changes in diet over time, to detect differences in diet between locations, and to develop assays for other prey species of interest.

Presentations

Stakeholder views of seals on Nantucket, MA: Lessons learned for coexistence

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The conservation and management of marine resources requires an understanding of public attitudes and the engagement of multiple stakeholders. In the summer of 2016, Nantucket voters (N=350), anglers (N=125) and tourists (N=372) were surveyed about their beliefs, attitudes and experiences regarding seals. Questionnaires were administered by mail to voters and on-site to anglers and tourists. The survey found common ground in support for the eco-system as the top priority for seal management, support for marine mammal protections and seal rescue, and opposition to lethal management. Significant differences in beliefs about seal-fishery interactions were found among and within the three samples. Beliefs about the importance of seals to the ecosystem were the strongest predictor of seal tolerance and attitudes toward lethal management in the voter and angler samples. Analysis of the data by interest group affiliation further suggests that ecosystem messages and environmental messengers may have an important role to play in promoting coexistence with seals.

Insights to gray seal (*Halichoerus grypus*) foraging behavior in southern New England using stable isotopes and DNA barcoding

Hernandez, K. M.¹, Polito, M. J.¹, Bogomolni, A. L.², Sette, L.³, Puryear, W. B.⁴, Runstadler, J. A.⁴, Gast, R. J.²

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While it is acknowledged that marine mammals may impact fisheries, it is difficult to quantify for myriad reasons, thus, fundamental studies of diets and foraging behavior are critical to bridging this gap. While analysis of prey remains is the primary method for determining diet, alternative techniques, such as stable isotope and DNA-based analyses are being used to circumvent methodological shortcomings. We present results from several concurrent studies that use these techniques in conjunction with additional data sets to study aspects of gray seal foraging behavior. A multi-tissue investigation from live-captured adults in Chatham Harbor, MA, provided evidence for seasonal shifts in foraging behavior, possibly associated with different energetic demands around the molt. Longitudinal sampling of whiskers reveals that gray seals are individual specialists, dispelling a common assumption about their foraging behavior. Analysis of pup lanugo offers an opportunity to study female foraging behavior during pregnancy, a time when they are normally inaccessible to researchers. In addition to estimating female diet during this time, we can begin to investigate how maternal choices in foraging habitat and diet can impact the health and survival of the pup. We present preliminary data on the isotope values of seal scats and how diet estimation models based on this information differ from conventional hard parts analysis. We also present how molecular methods can complement this technique. These studies demonstrate how stable isotope and DNA analyses can complement existing data sets and expand upon our understanding of the role gray seals play in their ecosystem.

Megaesophagus in maternally dependent harbor seals (*Phoca vitulina*)

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At least three cases of idiopathic megaesophagus in maternally dependent harbor seals (*Phoca vitulina*) have been evaluated and treated at the National Marine Life Center. NMLC16-011PPv was rescued from Great Spruce Head, ME on May 24, 2016 by the College of the Atlantic's Allied Whale, NMLC16-019PPv was rescued from Rockland, ME on May 3, 2016 by Marine Mammals of Maine, and NMLC17-016PPv was rescued from Bucks Island, ME on May 25, 2017 by Marine Mammals of Maine. Animals were diagnosed with megaesophagus between one week and two months of admission. Similar cases have been reported at west coast stranding centers. The cause of this syndrome was not discovered, although most of the seals were exposed to or tested positive to Phocine Herpes Virus-1. Outcomes varied, from spontaneous resolution to a full blown veterinary dysautonomia-like complex that resulted in death or necessitated euthanasia.

Mycoplasma species isolated from respiratory tissue of phocids in the Gulf of Maine, 2011 - 2017

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To investigate the significance of *Mycoplasma* species in respiratory disease and mortality of New England phocids, 90 deceased seals that stranded in Maine, New Hampshire, and Massachusetts from 2011 – 2017 and were subsequently necropsied were sampled for histopathology, bacteria culture and identification, and virology. A variety of mycoplasmas (≥ 18 phylotypes) were identified from the upper and lower respiratory tissues of 39% of seals sampled. Most of the 16S rDNA sequences clustered with either GenBank KP292569 ($n = 16$) and JQ206215 ($n = 10$); AF304325 *Mycoplasma phocidae* ($n = 9$); or AF412983 *Mycoplasma lagogenitalium* ($n = 4$), AF412985 *Mycoplasma molare* ($n=2$), and JQ910955 *Mycoplasma sp.* 406 ($n=2$). Single instances of *Mycoplasma phocirhinis*, *Mycoplasma phocicerebrale*, or mammalian intestinal mycoplasmas also occurred. Harbor seal (*Phoca vitulina*) weanlings were the most affected species and age-class. All harp seals (*Pagophilus groenlandicus*) sampled were negative. *Mycoplasma* was cultured from respiratory tissue in only 8 of 21 cases diagnosed with bacterial respiratory disease as the primary or secondary cause of death. More than half of the mycoplasma-positive animals died from either trauma-associated sepsis, non-specific septicemia, encephalitis, or parasitic pneumonia. KP292569 is a human-linked novel strain with the first report identified in an Alaskan subsistence hunter with disseminated seal finger mycoplasmosis in 2015. The identification of this mycoplasma in 16 cases is suggestive of a novel and emerging pathogen in the NWA marine environment. Additionally, the identification of at least 15 additional phylotypes of mycoplasma in seals beyond what was previously reported was an unexpected and valuable finding.

Annual health assessments at gray seal rookeries provide a window into the health of the regional population

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We have conducted annual health assessments of northwest Atlantic gray seal pups during each pupping season since 2013. Each year, approximately 100 pups are tagged and screened for baseline measures of health, influenza, and additional biological measures. Sampling is conducted at Muskeget, Monomoy, and most recently Great Point, Nantucket. In 2018, we observed a sharp increase in influenza seroprevalence, ocular and nasal discharge, and notably thinner weanlings. Preliminary observations further suggest health differences even between rookeries. As these observations may reflect a larger regional health issue, it'll be important to continue close monitoring of the population and maintain communication throughout the seal research community.

The interspecific interactions and habitat preferences of Harbor Seals (*Phoca vitulina concolor*) and Gray Seals (*Halichoerus grypus*) on Duck Island and Ledges, ME

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Between May and August of 2011-2017, the Shoals Marine Lab Marine Mammal Internship Program conducted 20-30 shipboard photographic surveys each year at low tides at Duck Island and its surrounding ledges at the Isles of Shoals, Maine. This effort includes estimating local abundances of harbor and gray seals, recording ledge use of individuals, photo identification, and documenting entanglements and injuries. Both species have been observed to haul out on the same ledges, which can lead to aggressive interactions among the two species. Previous studies on Duck Island and surrounding ledges have shown that harbor seals prefer to haul out on large landing areas that are accessible to them at both high tide and low tide, while gray seals prefer rocky ledges only accessible at low tide. Gray seals and harbor seals appear to select for preferred habitats to haul-out, however, there have been shifts in ledge preference between the two species over time. Increasing gray seal numbers appear to be having an effect on harbor seal haul-out patterns.

Monitoring harbor seal displacement by grey seals in the Western New York Bight

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Over the last 12 years the seal population dispersed throughout the New York Bight has been increasing exponentially. Gotham Whale monitors local seal populations during annual seal watch trips aboard the 'American Princess' as part of their Natural History Cruise Program. Gotham Whale has been documenting photographs and recording seal statistics utilizing on board naturalist data sheets. Recent trends in sighting data favor the hypothesis that the Western New York Bight harbor seal (*Phoca vitulina*) population may eventually experience displacement by the influx of grey seals (*Halichoerus grypus*) resulting in a southern expansion of harbor seals along the Atlantic Coastline. A parallel shift between these two species has already been documented in New England Waters. The data collected will be used to corroborate this phocid phenomenon.

Gray seals (*Halichoerus grypus*) and Harbor Seals (*Phoca vitulina*) in the endless winter

DiGiovanni Jr., R.A., A. DePerte, H. Winslow, and K. Durham

Atlantic Marine Conservation Society, Hampton Bays, NY, USA

Seals have become more common in the waters around New York over the last three decades. The once rare occurrence that was relegated to the winter and spring months between November and April has changed to a year-round occurrence. Since the documented occurrence of 41 gray seals on Little Gull Island, in eastern Long Island Sound, back in March of 2007 the sightings have increased. This increase is observed in both number of animals and months the animals are observed. Sighting on Little Gull have been observed in numbers over 50 animals starting in October and have increased throughout the season recording over 500 animals on numerous occasions. During the summer of 2017 a seal watching industry began out of Greenport NY to observe seal on the eastern end of Long Island. These cruises starting in late June and ran through September observing five to ten animals on each trip. This marks the first consistent documentation of Gray seals in New York waters year-round. Here we will outline the Atlantic Marine Conservation Society's research plans to understand the occurrence of seals in New York and how they relate to the priorities set for the Mid-Atlantic and New England.

Thirty - four years watching seal haul out behavior in southern and downeast Maine

McCullough, G.

For over three decades (from 1980 – 2014), weather permitting , I made daily observations of the behavior of harbor seals hauling out on two separate ledges. They differed geographically, one in southern Maine and the other in downeast Maine (roughly 100 miles apart), in their exposure to the open ocean and in how they were used by the seals. In both places I focused on identifying individuals and following their life histories and site loyalty. From 1980 – 1988 I observed a group using Strawberry Island in Kennebunkport Maine. It was a low tide ledge facing the open ocean, it was used by seals year around though the numbers varied from season to season. I could recognize about 30 individuals and follow varying patterns of usage, some were seen at least once every month while others were seen only seasonally. Many individuals were present for the 8 years of the study. Only a few pups were raised there. From 1988 – 2014 my study in Young's Bay in Hancock Me provided an interesting contrast. It was a high tide ledge sheltered in Youngs Bay, it was used only seasonally from April through late August. Once again I could recognize about 30 individuals, some individuals also returned year after year (at least 3 for the 26 years I observed!) but site loyalty was much sparser than at Strawberry Island. In contrast to Kennebunkport ledges, many pups were born or raised on these Young's Bay ledges, most likely because it is so sheltered. The focus of my talk will be on the description of the two sites, and the contrast of their usage patterns. Then things I have learned from my focus on a few interesting individuals from each area. I recorded weather, numbers of animals, the attendance of individuals which might be useful. This data is slowly being entered in Anecdota and will be publicly available

An overview of the Northeast Fisheries Science Center's seal research program

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Meeting Marine Mammal Protection Act (MMPA) mandates to evaluate the status of pinniped stocks requires collection of data on ecological factors that regulate marine mammal population abundance and distribution. This knowledge helps inform management decisions on anthropogenic activities so that impacts to stock recovery are minimized. As the lead federal agency for recovering marine species under the MMPA, the National Oceanic and Atmospheric Administration (NOAA), Northeast Fisheries Science Center (NEFSC), conducts research on pinniped abundance, distribution, foraging ecology, and mortality from anthropogenic activities. Together with our research partners, we broaden the scope of our ecological research to include health assessments, disease ecology, genetics, and predator/prey dynamics. Here I present a broad overview of the NEFSC Seal Research Program, highlighting snapshots of various research activities currently being carried out by NEFSC staff. These include trends in gray (*Halichoerus grypus*) and harbor seal (*Phoca vitulina*) abundance, research and development activities within our Unmanned Aerial System (UAS) program, research into the diet composition of gray and harbor seals, and characteristics of pinniped-fisheries interactions over the past few decades. As part of the North Atlantic Seal Research Community, the NEFSC Seal Program aims to leverage its resources with the broader scientific community to better understand the ecology of pinnipeds, and ultimately, to improve the management of shared ocean resources.

Genetic diversity from pre-bottleneck to recovery in sympatric pinnipeds in the Northwest Atlantic

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**Presenting author*

Population increases over the past several decades provide natural settings to study post-bottleneck evolutionary processes in species undergoing recovery. We used parallel natural experiments of historical decline and subsequent recovery in two sympatric pinniped species in the Northwest Atlantic, the gray seal (*Halichoerus grypus atlantica*) and harbor seal (*Phoca vitulina vitulina*), to study the impact of demographic change on genetic diversity. We compared genetic diversity at the mitochondrial control region today (gray seal, N = 385; harbor seal, N = 94) to diversity in archaeological specimens (gray seal, N = 8; harbor seal, N = 20). The latter represent the populations approximately 300-1000 years ago, prior to regional hunts and bounties that drastically reduced population sizes in the late 1800s to mid-1900s. Overall, the genetic data are consistent with the historical presence of large, genetically diverse populations of pinnipeds prior to human exploitation, and suggest that gray seals were more dramatically impacted by historical bottlenecks than harbor seals in the Northwest Atlantic. Current diversity in both species is relatively high (haplotype diversity – gray seal, $h = 0.919$; harbor seal, $h = 0.748$); however, remaining differences in haplotype composition between pre-exploitation pinnipeds and today's populations reflect a lasting genetic signature of historical exploitation that is likely to persist into the future.

Contrasting trends in gray seal (*Halichoerus grypus*) pup production throughout the increasing northwest Atlantic metapopulation

den Heyer, C.E.¹, W.D. Bowen¹, J-F. Gosselin², M.O. Hammill², S.L.C. Lang¹, K. Murray⁴, G.B. Stenson³, and S.A. Wood⁵

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The northwest Atlantic subspecies of gray seal (*Halichoerus grypus grypus*) has been increasing for more than half century and establishing new breeding colonies in Canadian and US waters. In 2016, visual, oblique and vertical large-format, digital photographic surveys were conducted at all known breeding colonies in the northwest Atlantic. These surveys provided an estimate of total production in the northwest Atlantic of 110,000 pups. At 88,400 pups, Sable Island accounts for 80% of total pup production. The next largest breeding colony was Pictou Island (NS) in the Gulf of St. Lawrence with 4,600 pups. Despite a continued overall population increase, regional differences in pup production trends are evident. Production in the Gulf of St. Lawrence and along the eastern shore of Nova Scotia is roughly stable. Sable Island production has slowed to a rate of 5% per year, whereas colonies in southwest Nova Scotia and the northeastern US are increasing rapidly. In 2016, the Muskeget (MA) breeding colony produced 4,000 pups which made it the third largest breeding colony in the northwest Atlantic. With the continued growth of the Sable Island colony and the rapid growth in Canadian and US colonies in the Gulf of Maine and Nantucket Sound, the proportion of the population breeding in the Gulf of St. Lawrence continues to decline as the population re-establishes its former range. Gray seals have high site fidelity once they have recruited to a breeding colony, but young of the year show a wide dispersal that could contribute to high connectivity between breeding colonies.

First Successful Satellite Tag Deployment on Wild-Captured Harbor Seals in Virginia

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Virginia is one of the busiest hubs for naval activity on the East Coast of the United States and is also home to a variety of coastal activities. Harbor seals (*Phoca vitulina vitulina*) seasonally inhabit and transit through this area, and could be impacted by vessel traffic, in-water projects, military exercises, and other anthropogenic activities. The ability to track movements of animals is critical to understanding their distribution, habitat use, haul-out behavior, and other general life history parameters. In February 2018, we successfully captured seven harbor seals (5 females, 2 males) at a known haul out site in Northampton County, VA, marking the first time wild harbor seals were successfully tagged in the area. We deployed six SPOT tags, one SPLASH tag, and five VEMCO acoustic tags. Information collected from tag data would include: time spent hauled out and in-water, short- and long-distance movement patterns (all seven seals); and, dive profiles (one seal). Initial tracking data indicate a high degree of site fidelity to the capture location despite variability in the daily movement patterns and distance traveled of individual seals. This project collected biological samples for ongoing harbor seal health and diet assessments in the region. In recent weeks, several seals have left the capture location and are moving north toward New England breeding and molting areas. The information gathered from this and future tagging efforts will provide valuable baseline data needed for assessments of harbor seal movement, habitat use, and site fidelity along the northeast coast of the U.S.

The roles of an Incidental Take Biologist

Pedersen, J. and S. Petrus

Incidental Take Biologist Co-Leads, Fisheries Sampling Branch, NOAA Fisheries, Northeast Fisheries Science Center, East Falmouth, MA, USA

The National Marine Fisheries Service (NMFS) in correlation with the Fisheries Sampling Branch (FSB) contract out fisheries observers to collect data pertaining to commercial fishing trips. The Northeast Fisheries Observer Program (NEFOP) is funded to encompass a major delineation of observers to be in accordance with the Marine Mammal Protection Act (MMPA) to collect biological data and samples. Though NEFOP encompasses a majority of these samples collected, several programs such as the At Sea Monitoring Program (ASM), and Industry Funded Scallop (IFS) also contract observers in the Northeastern United States. During these trips, a major portion of an observer's duties is to collect biological samples, record injury, mortality, and sightings by means of photos, videos, and notes for marine mammal, turtles and sea birds. As incidental take biologists, managing and processing of data + samples collected from observers is the top priority. Connecting end-user scientists with samples and unbiased data allow for those within the scientific community to get an inside view to the fishing industry that may otherwise be difficult to access. Currently, pinnipeds interactions are a hotly contested point of discussion within the fishing industry. With the use of observer data in conjunction with necropsy reports and biological samples, scientists are able to fill in the gaps as well as come to new conclusions about this group of animals. In brief detail, the following will be discussed: how observers collect data at sea, sharing data with interested end-user scientists, participation in necropsy at Woods Hole Oceanographic Institute, and data pulls pertaining to pinniped takes.

Developing standardized protocols for seal surveys to study the occurrence of entanglement in gray seals (*Halichoerus grypus atlantica*) and harbor seals (*Phoca vitulina vitulina*) at New England haul-outs

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Entanglement in fishing gear and marine debris is a known source of injury and mortality in pinnipeds. Determining impact at both the individual and population level has proven to be difficult. To evaluate the extent of the issue, standardized protocols were developed to facilitate the collection of comparable data from different haul-out sites. Starting in the fall of 2007, the Center for Coastal Studies and the International Fund for Animal Welfare began directed surveys at multiple harbor seal (*Phoca vitulina vitulina*) and gray seal (*Halichoerus grypus atlantica*) haul-outs in southeastern Massachusetts. In 2008, surveys adapted with comparable methods commenced at the Isles of Shoals, Maine. These surveys allowed for standardized detection of “marked” animals with entanglements, unique pelage, brands, wounds, and algal coverage. From vessel, land-based and aerial platforms, sighting details and photographic data were collected and analyzed to determine entanglement occurrence and characterization (e.g. gear type, body location) at these locations. Ongoing analyses of these photographic data will help biologists determine entanglement prevalence and incidence at these survey sites, and will provide stakeholders with definitive information on severity and trends of pinniped entanglements. Working together with standardized protocols will enable fishers, managers, beach users, and biologists to help mitigate the entanglement problem going forward.

Passive acoustic monitoring of white sharks reveals contrasting coastal migration and residency patterns off Cape Cod and beyond

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Over the past decade, the coastal waters off Cape Cod have emerged as the only known aggregation site for the white shark in the western North Atlantic. The species' now-predictable summer presence has largely been attributed to the recovery of the local gray seal population, which has recolonized the protected beaches along Cape Cod. While many members of Cape Cod's coastal community have celebrated the white shark's return as a sign of a healthy ecosystem, the growing presence of a large apex predator in close proximity to popular swimming beaches has raised concerns regarding public safety. To gain a better understanding of white shark movements and habitat use off the coast of Cape Cod and beyond, the Massachusetts Shark Research Program has tagged 115 white sharks (ranging from 2.1 to 5.2 m total length) with coded acoustic transmitters since 2010. Data collected to date indicate that white sharks occur in coastal waters year-round, migrating seasonally from shelf waters along the northeastern United States (US) and Canada in the summer and fall to overwintering habitat off the southeastern US and the Gulf of Mexico. Multi-year monitoring of tagged sharks has also revealed a large degree of individual variation in coastal migration patterns, with some individuals exhibiting fidelity to certain sites over time and others exhibiting interannual shifts in seasonal core use areas. Knowledge of migration routes and the distribution of white sharks in the waters off Cape Cod can be used to help inform beach management and public safety practices as part of ongoing efforts to mitigate the potential for shark-human conflict.

Who's got seals?

Paar, J.

Environmental Protection Agency

NOAA, NMFS, WHOI, and the Provincetown Center for Coastal Studies, all “get” seals. Many groups, agencies, and coastal communities are working together with NASRC to understand the impact of seals in the coastal ecosystem as well as their value as sentinels of environmental health. Come hear about recent investigations and upcoming collaborations with the EPA New England Regional Laboratory using DNA-based methods to track fecal pollution to source organisms using distinct gastrointestinal microbiome fingerprints and proposed research to develop seal-specific fecal indicator polymerase chain reaction assays. Most importantly, EPA Biologist, Jack Paar, needs your help communicating your concerns back to the EPA. Help him by sharing your insights and perspective on how the EPA should “get” seals.

Pinnipeds and Federal Policy: the good, the bad and the ugly

Young, S.

Marine Issues Field Director. The Humane Society of the US

In the wake of the passage of the Marine Mammal Protection Act (MMPA) in 1972, previously decimated populations of seals and sea lions entered a recovery trajectory that has resulted in long-abandoned habitat being re-occupied and in range expansion on both coasts. In 1994, the MMPA was amended and, among other changes, Section 120 was inserted to allow individual pinnipeds on the west to be killed if deemed to be having a significant negative impact on ESA-listed salmonids. Since then, several hundred individually identifiable sea lions have been killed. But some say it didn't go far enough. Bills have been filed in both US House and Senate to dramatically expand the lethal management authority in the Pacific Northwest. No such lethal authority exists for the US east coast, yet some charge that growing seal populations in the Northeast are having adverse impacts on cod and other fish stocks. This presentation will summarize differences and similarities between the situations on both coasts and discuss the status of current and possible future legislation regarding pinniped management.

The 2018 NASRC meeting is being held with the generous support of:

Pacific Marine Mammal Center

Woods Hole Oceanographic Institution, Biology Department / Deputy Director and Vice President of Research

Atlantic Marine Conservation Society

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