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January 27, 2016
SS16.02

Drones and Field Sampling Document Gray Seal Pups on Muskeget and Monomoy Islands

For several days this month, scientists are gathering in the largest gray seal pupping area in U.S. waters to study weaned gray seal pups, aided by images from an airplane and unmanned aircraft systems (UAS), commonly called drones. The researchers hope to gather data from these sites and other breeding sites in Maine to move a step closer to answering a nagging question – how many gray seals are there in Northeastern waters? – and expand their studies on the health of the animals.

The researchers, from NOAA Fisheries and a variety of federal, state, academic and private organizations, are working on Muskeget Island off Nantucket, the largest gray seal breeding and pupping colony in the U.S., and on the Monomoy National Wildlife Refuge, an island near Chatham on Cape Cod. Similar work was conducted in January 2015, when marine mammal researchers captured, tagged, sampled, and released 126 weaned gray seal pups on the two islands.

The aerial images will help document the number of pups on the breeding grounds as well as pup distribution. The images can also document adult seals, providing data on brand marks or entanglements. Biological samples collected from weaned pups will reveal information about stock health, gray seal ecology, and habitat use.

Mid-December to early February are prime pupping months for gray seals. Gray seal pups that have been weaned remain on the islands for several weeks until they molt or shed their white coat, known as lanugo, for a darker fur coat or pelage.

“This year some new elements have been added to the project,” said Kimberly Murray, coordinator of the seal research program at NOAA’s Northeast Fisheries Science Center (NEFSC) laboratory in Woods Hole, Mass. “We are using two types of unmanned aircraft systems, a fixed wing system and a hexacopter, to take images of the populations, along with traditional aerial surveys using two different camera angles on the NOAA Twin Otter aircraft. This approach provides four different views of the animals and should help us get a better estimate of gray seal abundance on the island and where the animals are in the pupping season process. It also allows us to evaluate the pros and cons of various technologies available to survey wildlife populations.”

Researchers are also expanding their health studies, with a focus this year on the seals at Monomoy. MIT researchers are conducting long-term studies of the influenza A virus, one of

three types of influenza viruses, in gray seals to understand the prevalence of the virus in the population and if it potentially affects other wildlife populations.

This year scientists are hoping to recapture and resample seals tagged within the season to learn more about the disease progression and transmission between animals, and why some animals are more susceptible than others.

“Our goal this year is to resample 50 percent of the animals, but it has not been done before and we don’t know if it is possible given all the challenges,” said Wendy Puryear of MIT, part of the Runstadler lab that is leading the project’s gray seal influenza work. Jonathan Runstadler’s Laboratory at MIT has been studying weaned gray seal pups on Muskeget Island each January since 2013. That year 99 pups were sampled, and 103 pups were sampled in January 2014. Sampling efforts expanded to Monomoy in January 2015, when 126 seal pups were sampled. The team has consistently found evidence of influenza A virus each year, though the specific subtype of virus has not yet been determined.

The seal team hopes to capture, tag and release between 100 and 150 unique, already weaned animals this year. As of January 20, the team had tagged 41 seals on Monomoy and 12 on Muskeget. Weather and schedules permitting, several more visits to collect samples at each location are planned before the end of the six week pupping season in early February.

The field work began January 7 with drone tests on Muskeget. Seal capture, flipper tagging and biological sampling work began January 15, along with aerial imagery. Further work was done on January 20, with more planned for several days at the end of January, weather permitting. Two types of drones are being used, one from Duke University and the other from NOAA. Both are operated at altitudes up to 400 feet.

“Duke’s fixed wing eBee is ideal for surveying a large area and estimating seal density, while NOAA’s hexacopter APH-22 is better at spot sampling and hovering over a location for more detailed study” said Julian Dale, lead UAS engineer at Duke University’s Unmanned Aircraft System’s group in Beaufort, North Carolina. “We will be assessing the accuracy of UAS seal counts in comparison to images from the Twin Otter, which flies much faster and at an altitude of 750 feet.”

The fixed wind eBee system collects two types of imagery. One is traditional color photography to compare to the NOAA Twin Otter camera images, and the other is infrared or thermal imagery to detect animals that are difficult to see or within dense concentrations of seals. The NOAA Twin Otter aircraft conducts aerial marine mammal surveys in the Northeast for the Northeast Fisheries Science Center. It is equipped for this project with its standard side camera as well as a bottom-mounted camera on loan from NOAA’s National Marine Mammal Laboratory for vertical images.

Images from NOAA’s APH-22 hexacopter will also be evaluated for their utility as a census tool or for studying other features of the population, such as entanglements. “This is the first time the APH-22 technology has been used to survey seal populations in the Northeast,” said Beth Josephson of the NEFSC, one of the APH-22 pilots. The group hopes to continue using drone technology to study characteristics of seal populations.

Stephanie Wood, a seal researcher in the NEFSC’s Protected Species Branch, will use the imagery to continue research on gray seal abundance in the Northeast. She is also using a

remote camera, made available by explore.org, to monitor births and behavior on Maine's Seal Island, the second largest gray seal pupping colony in the U.S. The goal is to develop a pup production model, which does not exist for the U.S. gray seal population.

"Sampling on one day during the six-week pupping season doesn't provide a full view of where the seals are in the pupping process," Wood said. "Pups born at the start of the season in mid-December won't be on the islands in late January or early February when other pups are born. Being able to collect samples and imagery several times over the course of the season will give us a much better sense of where in the pupping cycle our surveys occurred so we get a better estimate of total pup production."

Muskeget is a privately owned and uninhabited island six miles northwest of Nantucket. Monomoy National Wildlife Refuge is also a primary gray seal haul-out on the U.S. East Coast, although the number of pups born there is much lower than on Muskeget.

Gray seals and harbor seals are the most common seal species on Cape Cod and the Islands; gray seals are resident year-round while harbor seals are primarily seasonal residents, present from fall through early spring before migrating north in the summer.

Once captured by project researchers, each weaned gray seal pup is measured and weighed. Biological samples, including blood, mucous swabs, hair and skin, are taken for use in health assessments and for stable isotope, contaminant and genetic research. All seals are outfitted with numbered flipper tags for identification. Once the biological sampling and tagging work is completed, the seals are released. The entire process for each seal, from capture to release, usually takes about 20 minutes. Pups are captured on land; no captures are made in the water.

The scientific team for the 2016 gray seal pup studies comprises researchers from NOAA's Northeast Fisheries Science Center (NEFSC) and the National Marine Mammal Laboratory, Massachusetts Institute of Technology, Duke University, Mystic Aquarium, New England Aquarium, Marine Mammals of Maine, University of Connecticut, National Park Service, National Marine Life Center, Woods Hole Oceanographic Institution/Northwest Atlantic Seal Research Consortium, and the International Fund for Animal Welfare. Monomoy National Wildlife Refuge is operated by the U.S. Fish and Wildlife Service.

The team has a marine mammal scientific research permit issued by NOAA's National Marine Fisheries Service (#17670-03) to the Northeast Fisheries Science Center, and Monomoy National Wildlife Refuge special use permit (#16-MNY-01) to work on that island.

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Related links:

2015 Gray Seal Pup Study: http://www.nefsc.noaa.gov/press_release/pr2015/scispot/ss1501/
Influenza A in Marine Mammals Fact Sheet:

http://www.nefsc.noaa.gov/press_release/pr2015/scispot/ss1501/mmflu.pdf

Video from 2014 gray seal project on Muskeget:

<https://www.youtube.com/watch?v=JO13fnH1aQ8&feature=youtu.be>

Seal Research at the NEFSC: <http://www.nefsc.noaa.gov/psb/seals/>

"Seal Cam" on Maine's Seal Island: http://www.nefsc.noaa.gov/news/features/seal_island/

Duke University's Unmanned Systems Group: <http://superpod.ml.duke.edu/uas/>