

Harbor Seal Monitoring Along the U.S. East Coast 2022-2023 Field Season



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1. INTRODUCTION

The telemetry and survey studies managed by the Naval Undersea Warfare Center, Division Newport (NUWCDIVNPT) was initiated in winter 2021 to collect data on harbor seals (*Phoca vitulina*) and gray seals (*Halichoerus grypus*) along the U.S. East Coast. The purpose of this field season's research was to collect baseline data to inform a proposed pinniped behavioral response study and continue long-term pinniped surveys, specifically in the Navy OPAREAS along the northwestern Atlantic coast. A summary of the data collected in previous field seasons can be found in DeAngelis (2023).

1.1 BACKGROUND

The United States (U.S.) Navy is responsible for compliance with a suite of federal environmental and natural resources laws and regulations that apply to the marine environment, including the Marine Mammal Protection Act and the National Environmental Policy Act. The U.S. Navy complies with these and other laws during routine training and testing events, pier side construction, and range clearance and maintenance operations. In addition, the Navy is required to prepare and implement Integrated Natural Resources Management Plans for each military installation. As such, it is critical for the Navy to have a clear understanding of the protected marine resources in the areas where it operates.

The occurrence of marine mammals in southern New England and the Mid-Atlantic has increased considerably since the early 2000s. This increase in observations of pinnipeds was first observed in Marine Mammal and Sea Turtle stranding records. The harbor seal is widely distributed in the shallow coastal waters of the Northern Hemisphere and are commonly found along the U.S. East Coast (Maine to Virginia) and along the west coast of North America (from Mexico to the Bering Sea). Gray seals are found in coastal waters throughout the North Atlantic Ocean, often sharing habitat with harbor seals. A preliminary evaluation of movement data from tagged harbor seals collected between 2018 and 2022 (Ampela et al. 2021; DeAngelis 2023) indicate that harbor seals along the U.S. East Coast seasonally inhabit and transit through OPAREAS and could be impacted by military activities, specifically in the northwest Atlantic, as pinnipeds may be vulnerable to a variety of noise sources both nearshore and offshore. Currently, windfarms are developing rapidly along the U.S. Northwest Atlantic continental shelf. Thus, there is a pressing need to understand potential impacts to species like the harbor seal or gray seal, particularly if windfarms modify behavior or shift distribution into non-traditional areas that may overlap with Navy or other anthropogenic activities.

Impacts from anthropogenic activities range from displacement behavior (Russell et al. 2016) to injury or death, as well as indirect impacts through the long-term alteration of habitat that may be positive (e.g., increased foraging opportunities) or negative (loss of habitat) (Thompson et al. 2020). Additionally, anthropogenic noise is of increasing concern, particularly for animals like pinnipeds that rely on shallow coastal habitats and foraging opportunities, as they may be vulnerable to a variety of noise sources both inshore and offshore and their hearing may be impaired by high-amplitude impulsive anthropogenic sounds. Since evidence of these kinds of effects on seals remain limited, research is needed on the behaviors of seals before, during, and after exposure to anthropogenic activities.

Most pinniped populations are monitored over wide areas of distribution which offers a broad picture of population numbers and fluctuations in distribution of a species. Site specific monitoring allows for more detailed monitoring of parameters of seal biology including abundance, social structure, activity budgets, timing of pupping, location and habitat of pupping areas, pup development and dispersal, site disturbance, etc. This type of monitoring is ideally carried out as a continuous series, leading to a better understanding of "stable" or "normal" seal behavioral parameters. For example, monitoring efforts have documented harbor seals modifying their daily and seasonal haul out patterns in response to human

activity. They tend to prefer quiet, unpopulated areas and often exhibit a strong fight or flight response when disturbed (Nicholson 2000). It is known that seal behavior depends not only on hearing sensitivity, but also on many individual animal characteristics (e.g., age, sex, experience, genetics, disposition, etc.) and on the context (e.g., seasons, water depth, distance from shore, solitary or in a group setting, foraging, etc.). Thus, characterizing a pinniped behavioral response is very complex.

Since 2018, the National Marine Fisheries' (NMFS) Northeast Fisheries Science Center, the Naval Undersea Warfare Center (NUWC) Division Newport, the Atlantic Marine Conservation Society (AMSEAS), and Marine Mammals of Maine (MMoME), have partnered to capture and satellite tag harbor seals to study their movements and health status. To date, telemetry data has been collected on 23 harbor seals (2018-2022) (Table 4-1). Based on this telemetry work the movements of harbor seals overlaps with Navy Operation Areas or OPAREAS (VACAPES to the Boston OPAREAs)¹, two of the Navy's Living Marine Resources priority geographic regions in the Atlantic, and established and proposed windfarm areas. The information gained from studying harbor seal site fidelity and movement would not only provide information specific to harbor seals, but could also substitute for a lack of information for other marine species that are more difficult to research, but may also occupy similar ranges. A summary of the data collected in previous field seasons can be found in DeAngelis (2023).

2. 2022-2023 FIELD SEASON

The aim of the 2022-2023 field season was to continue to obtain data to measure baseline behavior to understand the physical or biotic factors that influence the movement and foraging tactics of harbor and gray seals; the amount of time seals spend in specific areas, particularly in Navy OPAREAS. The tasks included: 1) Aerial surveys to document harbor and gray seal haul outs in the Narragansett Bay OPAREA (from New York to Rhode Island); 2) Ground and remote camera surveys; 3) Deployment of satellite tags on harbor seals during the late fall through early spring; and, 4) Analysis of satellite tag data collected from tags deployed on pinnipeds, authorized under the NMFS research permit (NMFS permit # 21719).

2.1 CAPTURE/TAGGING WITH SATELLITE TELEMETRY TAGS

NUWC DIVNPT, as a PI and only Navy researcher (M. DeAngelis) listed under the NMFS permit (current permit #26939) to capture and tag pinnipeds on the East Coast of the U.S., did travel to support a 12-day capture and tagging effort in Virginia organized by Naval Facilities Engineering Systems Command Atlantic (NAVFAC LANT). No animals were successfully tagged during this effort. The preparation, travel, and participation in the Virginia effort did effect the ability of the core team members from NUWC DIVNPT, AMSEAS, MMoMe, and NMFS to conduct capture/tagging in other locations along the U.S. East Coast. That, in combination with weather postponements during the remaining limited opportunities, resulted in zero harbor seals tagged during the 2022-2023 season.

While conducting analyses of harbor seal tag data from previously tagged animals (for a summary see DeAngelis 2023), we discovered that there were significant gaps in the data that were downloaded from satellite telemetry devices. After a significant review using R and MatLab and in subsequent discussions between researchers and the tag manufacturer, we determined that the factory settings on the tags needed to be changed as well as some other parameters. All tags that NUWC DIVNPT had in their possession were sent back to Wildlife Computers, Inc. to be reset with the new tag configurations and the battery life was also evaluated. If tags showed signs of battery fatigue a new battery was installed by the manufacturer. Of note, the SPLASH tags with FastLoc[®] technology were set to retain as much

¹ Seals were tagged with either SPLASH or SPOT tags.

battery life as possible as well as collect duplicative data (discovered upon analysis). In reviewing all tag data collected since 2018, it was determined that very few tags actually appeared to decrease in performance due to issues with the battery, although this does remain a concern. The new settings should decrease the data gaps but still retain battery life.

Select tag data was also shared with the Canadian Department of Fisheries and Oceans (DFO) in 2023 to provide them with a different set of data for comparative purposes. They were evaluating the results of from their model that was used to estimate a haul out factor for harbor seals. Their findings were presented to the Canadian government and modifications to their current management strategy may be warranted and shift to a more seasonal and geographically-based management strategy, not just seasonal. This collaboration between the U.S. (NUWC DIVNPT and NMFS) with DFO will continue as we each develop models to evaluate pinniped satellite tag data.

2.2 AERIAL SURVEYS

Aerial surveys were conducted January, March, and August 2023. Since harbor and gray seals appear to be leaving their natal sites in Maine earlier, an aerial survey was conducted in August to determine how soon they arrive in locations south of Maine. No harbor seals were observed at known haul out sites in any areas south of Maine during August. Gray seals were observed at certain locations, where they are known to haul out year round; however, the total number of animals observed was considerably lower than counts conducted during peak season.

These surveys flew at 600 feet and surveyed islands and any ledges or rocky areas where seals could haul out. The following haul out sites were surveyed: Moriches Bay, Shinnecock Bay, Montauk Point, Great Gull Island, Little Gull Island, Plum Island, Fort Tyler, Gardner's Island, and Sag Harbor, New York; and Block Island and Narragansett Bay, Rhode Island. Table 2-1 provides the number of animals observed at each haul out site for each aerial survey conducted in 2023.

On each of the aerial survey days observers were deployed to land-based haul out sites, in Narragansett Bay only, to take ground counts to then compare with counts taken from the aerial survey photographs. This offered insight into the total number of animals actually hauled out on a site versus what is visible from a land-based vantage point and the number of animals potentially missed using one survey technique versus another.

2.3 IN-PERSON OBSERVATIONS AND REMOTE CAMERAS

Similar to previous field seasons (DeAngelis 2023), there were three remote cameras set up at Naval Station Newport (NAVSTA) to monitor the harbor seal haul out located just offshore (Figure 3-1). One camera took pictures at 10 minute intervals and the two cellular-enabled cameras took motion-activated pictures. Half-way through the season, one of the cellular cameras failed and was replaced with an identical camera and setup. An extremely rare weather event occurred causing rain water to enter into the cameras and all three were dismantled, dried, and replaced back at NAVSTA. However, by April, the quality of images coming from the cameras appeared compromised. All three were removed before the end of the season.

Photos are manually reviewed to estimate the number of seals hauled out, duration of haul out, presence/absence, and note any other factors that could influence seal behavior. In-person observations were conducted primarily on the predicted low tide as that is when the maximum amount of habitat is available for haul out. We combined the in-person observations with the remote camera counts to determine peak number of animals across the field seasons (Figure 2-2). In general, harbor seal peak

numbers occur in March and then begin to rapidly dwindle in April. As we have seen from the tag data, April is when harbor seals depart their southerly haul out sites to return northward to Maine for pupping, breeding, and molting. Recently windfarm construction activity has begun with an increase in boat activity transporting equipment through Narragansett Bay. Harbor seals are exhibiting an increase in vigilant behavior and frequency of flushing events. The duration of haul out appears to also have changed, but not enough data has been collected at this time to determine whether this is significant.

Table 2-1. Summary of Seal Counts and Means for Aerial Surveys Conducted During the 2023 Field Season

<i>Site</i>	<i>Flight Date</i>	<i>Pv Total on Haul out</i>	<i>Hg Total on Haul out</i>	<i>Total # Seals at Site</i>	<i>Flight Date</i>	<i>Pv Total on Haul out</i>	<i>Hg Total on Haul out</i>	<i>Total # Seals at Site</i>	<i>Flight Date</i>	<i>Pv Total on Haul out</i>	<i>Hg Total on Haul out</i>	<i>Total # Seals at Site</i>
Moriches Bay	1/18/2023	155		155	3/22/2023	198		198	8/26/2023			
Shinnecock Bay	1/18/2023	85		85	3/22/2023	125		125	8/26/2023			
Montauk Point	1/18/2023			0	3/22/2023	8		8	8/26/2023			
Block Island	1/18/2023	15		15	3/22/2023	3	13	14	8/26/2023			
Sakonnet Point	1/18/2023			W	3/22/2023	64		64	8/26/2023			
Sachuest Point	1/18/2023			W	3/22/2023				8/26/2023			
Gooseberry Island	1/18/2023			W	3/22/2023				8/26/2023			
Brenton Point	1/18/2023			W	3/22/2023				8/26/2023			
The Dumplings	1/18/2023			0	3/22/2023				8/26/2023			
N of Pt. Judith	1/18/2023			W	3/22/2023	NE	NE		8/26/2023			
Rose Island (Citing Rock)	1/18/2023			W	3/22/2023	60		60	8/26/2023			
Naval Station Newport	1/18/2023			W	3/22/2023	47		47	8/26/2023			
Dyer Island	1/18/2023			0	3/22/2023	13		13	8/26/2023			

<i>Site</i>	<i>Flight Date</i>	<i>Pv Total on Haul out</i>	<i>Hg Total on Haul out</i>	<i>Total # Seals at Site</i>	<i>Flight Date</i>	<i>Pv Total on Haul out</i>	<i>Hg Total on Haul out</i>	<i>Total # Seals at Site</i>	<i>Flight Date</i>	<i>Pv Total on Haul out</i>	<i>Hg Total on Haul out</i>	<i>Total # Seals at Site</i>
T-wharf	1/18/2023	6		6	3/22/2023	35		35	8/26/2023			
South of Prudence Island	1/18/2023			W	3/22/2023	70		70	8/26/2023			
Between Patience Island/Prudence Island	1/18/2023			W	3/22/2023				8/26/2023			
Hog Island	1/18/2023			W	3/22/2023				8/26/2023			
Usher Cove	1/18/2023	2		2	3/22/2023	6		6	8/26/2023			
Church Cove	1/18/2023			0	3/22/2023	40		40	8/26/2023			
Spar Island	1/18/2023			0	3/22/2023	NE		NE	8/26/2023			
Rumstick Point	1/18/2023			0	3/22/2023				8/26/2023			
Field's Point	1/18/2023			0	3/22/2023	NE	NE		8/26/2023			
Barren Ledge	1/18/2023			0	3/22/2023	5	5		8/26/2023			
Rocky Point	1/18/2023			0	3/22/2023	16		16	8/26/2023			
Sally Rock	1/18/2023			0	3/22/2023				8/26/2023			
Providence Point	1/18/2023			W	3/22/2023	8		8	8/26/2023			
Bear Point	1/18/2023			0	3/22/2023				8/26/2023			
Hope Island	1/18/2023	15		20	3/22/2023	57		57	8/26/2023			

<i>Site</i>	<i>Flight Date</i>	<i>Pv Total on Haul out</i>	<i>Hg Total on Haul out</i>	<i>Total # Seals at Site</i>	<i>Flight Date</i>	<i>Pv Total on Haul out</i>	<i>Hg Total on Haul out</i>	<i>Total # Seals at Site</i>	<i>Flight Date</i>	<i>Pv Total on Haul out</i>	<i>Hg Total on Haul out</i>	<i>Total # Seals at Site</i>
Cold Spring Rock	1/18/2023			0	3/22/2023	18		18	8/26/2023			
Rome Point	1/18/2023			W	3/22/2023	140		140	8/26/2023			
Green Point	1/18/2023			0	3/22/2023				8/26/2023			
Connecticut Shore North	1/18/2023	0	0	0	3/22/2023	70	0	70	8/26/2023			
Western Dumpling	1/18/2023	14		14	3/22/2023	12	0	12	8/26/2023			
Middle Dumpling	1/18/2023	4		4	3/22/2023	8	1	9	8/26/2023			
East Dumpling	1/18/2023	0	0	0	3/22/2023	4	0	4	8/26/2023			
Fisher's Island	1/18/2023	262	0	262	3/22/2023	486	0	486	8/26/2023			
Great Gull Island	1/18/2023	24	14	38	3/22/2023	0	25	25	8/26/2023		3	3
Little Gull Island	1/18/2023	0	240	240	3/22/2023	0	440	440	8/26/2023		50	50
Plum Island	1/18/2023	350	0	350	3/22/2023	235	0	235	8/26/2023			
Fort Tyler-Gardiner's Point Island	1/18/2023	0	0	0	3/22/2023	0	0	0	8/26/2023		15	15
Gardiner's Island	1/18/2023	50	0	50	3/22/2023	78	0	78	8/26/2023			

<i>Site</i>	<i>Flight Date</i>	<i>Pv Total on Haul out</i>	<i>Hg Total on Haul out</i>	<i>Total # Seals at Site</i>	<i>Flight Date</i>	<i>Pv Total on Haul out</i>	<i>Hg Total on Haul out</i>	<i>Total # Seals at Site</i>	<i>Flight Date</i>	<i>Pv Total on Haul out</i>	<i>Hg Total on Haul out</i>	<i>Total # Seals at Site</i>
Sag Harbor	1/18/2023	6	0	6	3/22/2023	10	0	10	8/26/2023			
Total	1/18/2023	988	254	1247	3/22/2023	484	0	2288	8/26/2023	0	68	68

Pv = harbor seal; Hg = gray seal; NE = no estimate; W=Weather

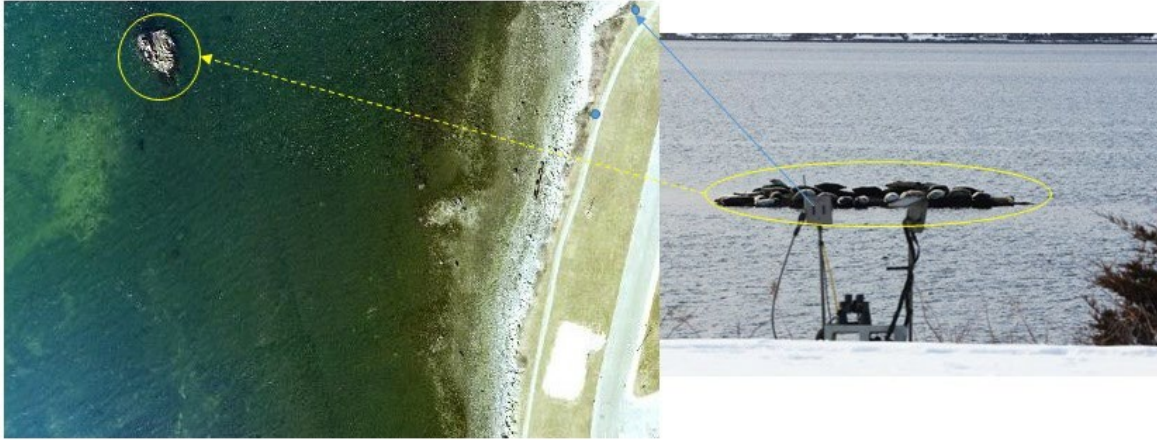


Figure 2-1. Camera set up at Naval Station Newport and Harbor Seal Haul Out

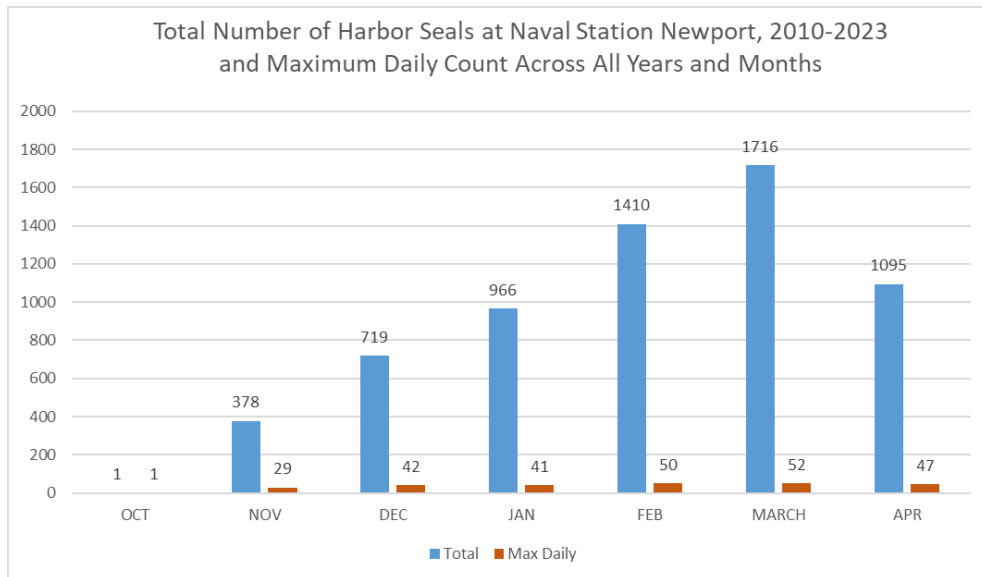


Figure 2-2. Total number of harbor seals at the at Naval Station Newport haul out site from 2010-2023 from October-April. Includes maximum daily count across all years for each month

References

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