

# Mid-Atlantic Marine Mammal Aerial Survey Effort

## 2023–2024

*ANNUAL PROGRESS REPORT*



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*PREPARED BY*

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### **Cover Photo Credits:**

North Atlantic right whale (*Eubalaena glacialis*) #3241, with a CATS (Customized Animal Tracking Solution) suction cup tag, observed near the shelf break off Virginia Beach, Virginia, in May 2024 during an offshore tandem vessel-aerial survey; photographed by Jess Ozog (HDR Inc.), taken under National Marine Fisheries Service Scientific Research Permit Number 21482, issued to Dan Engelhaupt (HDR Inc.).

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Science  Stewardship  Protection

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## Acronyms and Abbreviations

Azura	Azura Consulting LLC
BSS	Beaufort sea state
CATS	Customized Animal Tracking Solution
CMARI	Clearwater Marine Aquarium Research Institute
DMON	Digital Acoustic Monitoring
DTAG	Digital Acoustic Recording Tag
DMA	Dynamic Management Area
ID	Identification Number
km	kilometer(s)
m	meter(s)
min	minute(s)
nm	nautical mile(s)
NARW	North Atlantic right whale
OPAREA	Operating Area
photo-ID	photo-identification
SMA	Seasonal Management Area
UNCW	University of North Carolina Wilmington
U.S.	United States
UME	Unusual Mortality Event
VACAPES	Virginia Capes



# 1. Introduction

The coastal and offshore waters off Virginia are regularly used by the United States (U.S.) Navy for training and testing activities, specifically the Virginia Capes (VACAPES) Operating Area (OPAREA). HDR Inc. started the Mid-Atlantic Humpback Whale Monitoring Project in 2015, which focused on monitoring the occurrence, habitat use, and behavior of humpback whales (*Megaptera novaeangliae*) within these nearshore areas, including the W-50 Mine Neutralization Exercise region, through opportunistic vessel surveys ([Aschettino et al. 2025a](#)). While humpback whales were the priority species during the earlier years of the project, focus has shifted during recent years to include other baleen whale species, including critically endangered North Atlantic right (NARW; *Eubalaena glacialis*), endangered fin (*Balaenoptera physalus*), and sei (*Balaenoptera borealis*) whales, as well as minke whales (*Balaenoptera acutorostrata*). Starting in 2020, the project evolved into the Mid-Atlantic Nearshore and Mid-Shelf Baleen Whale Monitoring Project as efforts expanded to include these additional species and extended farther into the mid-shelf waters off Virginia. Little information exists on how NARWs use the Mid-Atlantic, which was previously considered primarily a migratory corridor as the whales travel between their feeding and calving grounds. To help fill this data gap, the project has shifted priority to NARW occurrence and behavior in the Mid-Atlantic ([Aschettino et al. 2023](#), [2024a](#); [A. Engelhaupt et al. 2023](#); [D. Engelhaupt et al. 2023](#)).

During the first year of the Mid-Atlantic Humpback Whale Monitoring Project, offshore vessel surveys were also conducted focusing on outer continental shelf cetaceans, and the dedicated Offshore Cetacean Study began in 2016 ([Engelhaupt et al. 2025](#)). These surveys focus on deep-diving cetaceans, primarily sperm (*Physeter macrocephalus*) and beaked (*Ziphius cavirostris*, *Mesoplodon* spp.) whales.

Dedicated, systematic marine mammal aerial surveys have previously been conducted throughout VACAPES. The Virginia Aquarium & Marine Science Center Foundation, Inc. and the University of North Carolina Wilmington (UNCW) conducted aerial line-transect surveys within the VACAPES continental shelf region from 2016 to 2017 ([Mallette et al. 2017](#)). Offshore aerial line-transect surveys were flown near Norfolk Canyon by UNCW from 2015 to 2017 ([McAlarney et al. 2016](#), [2017](#), [2018](#)) and by HDR Inc. from 2018 to 2019 ([Cotter 2019](#)). HDR Inc. researchers recorded their first NARW sightings during these surveys in April 2018 ([Cotter 2019](#)). Dedicated systematic aerial survey coverage has not been conducted in VACAPES since these surveys ended in August 2019.

Both the Mid-Atlantic Nearshore and Mid-Shelf Baleen Whale Monitoring Project and Offshore Cetacean Study aim to provide baseline occurrence and ecological information to the U.S. Navy regarding how marine mammals use the VACAPES OPAREA. These projects aim to answer questions regarding the baseline ecology, behavior, movement patterns, and site fidelity of marine mammals that may be exposed to U.S. Navy training and testing exercises. HDR Inc. researchers use a variety of vessel-based methodologies, including photo-identification (photo-ID), biopsy sampling, drones, satellite-linked telemetry tags, and digital archival tags (Digital Acoustic Recording Tags [DTAGs] and Customized Animal Tracking Solution [CATS]). To better assist the vessel team with these efforts and in locating target species, non-systematic aerial

surveys were implemented beginning in March 2021 ([Aschettino et al. 2023](#)). Aerial survey effort increased beginning in the 2022/23 season, with eight surveys flown ([Aschettino et al. 2024b](#)). While surveys were primarily associated with locating NARWs, some aerial surveys were also flown in tandem with Offshore Cetacean Study field work. This report details the coverage and sightings from aerial surveys flown during the 2023/24 field season in coordination with vessel field work for both projects. See the individual project technical reports for more details on each. ([Aschettino et al. 2025a](#), [Engelhaupt et al. 2025](#)).

## 2. Methods

Researchers from HDR Inc. and Naval Facilities Engineering Systems Command Atlantic flew periodic aerial surveys in association with nearshore, mid-shelf, and offshore vessel surveys ([Aschettino et al. 2025a](#), [Engelhaupt et al. 2025](#)). A set of 12 tracklines was established to cover the primary study area (**Figure 1**). Nearshore/mid-shelf tracklines typically ran from shore out to 45 nautical miles (nm), and offshore tracklines extended out past the shelf break approximately 70 nm from shore. The distance from shore covered along the transect lines varied within each flight and between surveys, subject to airspace restrictions, and was primarily driven by areas with suitable weather conditions for the vessel team to operate. Optimal viewing conditions were Beaufort sea state (BSS) of 3 or lower, and tracklines were typically shortened or altered mid-flight if BSS reached 4 to 5. Near real-time acoustic detections of NARWs on the [Cape Charles Digital Acoustic Monitoring \(DMON\) buoy](#) within the northern portion of the study area and/or on the [Norfolk DMON buoy](#) within the southern portion of the study area were also used during survey flight planning when determining where to prioritize coverage. Other researchers also had intermittent coverage within this study area during peak NARW season, including Clearwater Marine Aquarium Research Institute (CMARI; November to April; CMARI 2024) and Azura Consulting LLC (Azura; January to March; Whitt 2023, 2024) (**Figure 1**). HDR Inc. researchers leveraged sightings from these aerial platforms whenever possible.

Survey flights conducted by HDR Inc. originated from Signature Flight Support at Norfolk International Airport in Norfolk, Virginia. Anthem Commercial Air Services (Jacksonville, Florida) flew all flights in a Cessna 337 Skymaster (**Figure 2**) with two pilots and two observers (positioned at the left and right windows in the rear seats of the aircraft). Surveys were flown at 305-meter (m) altitude and 100-knot (185 kilometer [km]/hour) speed. Observers continuously scanned the trackline and used an inclinometer to obtain a vertical angle to a sighting when a detection was made within the observer's field of view. Survey data were collected on an Apple® iPad using COMPASS ([Richlen et al. 2019](#)). The plane would break from the trackline when a sighting of interest was made to allow for photos and additional data collection. Photographs were taken with a Canon 7D Mark II and Canon 100- to 400-millimeter zoom lens of all baleen whale sightings when feasible and were used to verify species and identify individuals. Photographs of NARWs were provided to our Florida Fish and Wildlife Conservation Commission colleagues for near real-time photo-ID assistance to determine if an individual NARW was a tagging candidate for the vessel field team. The aircraft used during the 2023/24 season was not equipped with photo windows, and observers were required to shoot through plexiglass, which diminished the quality and sharpness of all photographs. All baleen whale

sightings were relayed to the vessel team in real time; when a NARW was observed, the plane would stay with the sighting and circle until the vessel team was on site. Once the vessel team was on site, the plane would circle a larger area around the original sighting to see if other NARWs were present before resuming tracklines. Post-survey, all surveyed tracklines and NARW sightings were uploaded and shared on [WhaleMap](#) ([Johnson et al. 2021](#)).

### 3. Results

Thirteen aerial surveys were flown during the 2023/24 field season, covering 10,875 km of trackline with more than 55 hours of survey effort (**Table 1, Figure 3**). The first aerial survey of the 2023/24 field season occurred on 15 December 2023, and the last survey occurred on 26 May 2024. The survey on 15 January 2024 was aborted due to poor visibility and high sea state conditions. In total, 40 sightings of baleen whales occurred, including 8 NARW sightings composed of 13 individuals, 12 fin whale sightings composed of 17 individuals, 15 humpback whale sightings composed of 22 individuals, and 5 minke whale sightings composed of 5 individuals (**Table 2**) (see [Aschettino et al. 2025a](#), [2025b](#) for additional details on baleen whale sightings and photo-ID). Of these sightings, two were recorded as multi-species and both were comprised of fin and humpback whales. The NARW sighting on 30 March 2024 was the carcass of adult female #1950 (**Table 2**) ([NOAA 2025a](#)). Additionally, 1 individual sperm whale sighting and 1 *Kogia* spp. sighting composed of 3 individuals occurred during aerial surveys that extended out to deeper waters past the shelf break in association with offshore vessel surveys ([Engelhaupt et al. 2025](#)) (**Table 3**). Sightings of dolphins, including bottlenose (*Tursiops* sp.), common (*Delphinus delphis*), striped (*Stenella coeruleoalba*), and Risso's (*Grampus griseus*), as well as pilot whales (*Globicephala* sp.), basking sharks (*Cetorhinus maximus*), and ocean sunfish (*Mola mola*), occurred during aerial surveys but were not always recorded, and therefore, are not reported on further here.

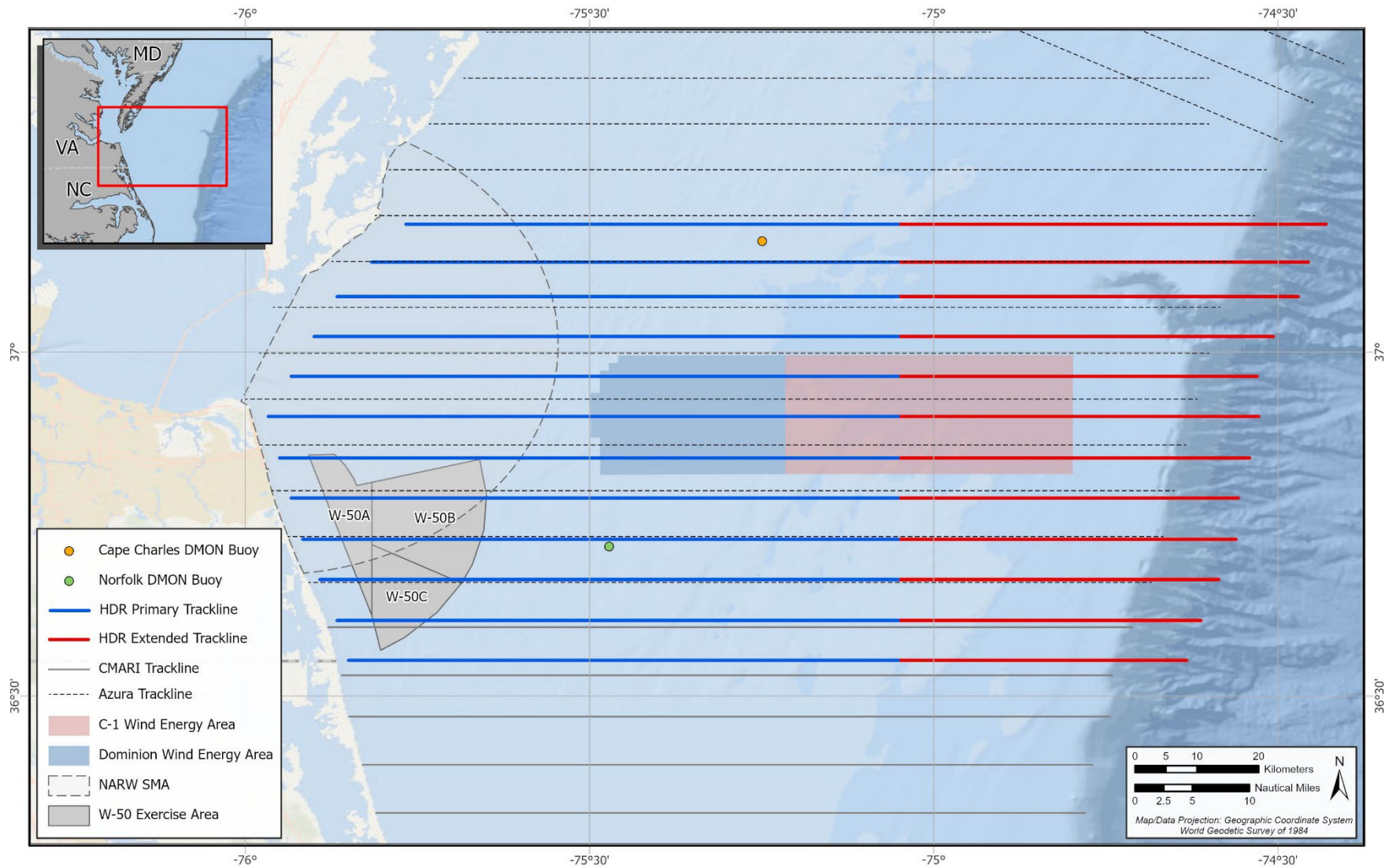


Figure 1. Aerial tracklines for HDR (blue and red), Azura (dashed), and CMARI (dark gray).



**Figure 2.** Primary survey aircraft (Cessna 337 Skymaster; Anthem Commercial Air Services).

**Table 1.** Summary of aerial survey effort off Virginia Beach, Virginia, for the 2023/24 field season.

Date	# of flights	Survey time (min)	Distance surveyed (km)	Area surveyed	Total # of sightings
12/15/2023	1	285	956	Nearshore/Mid-shelf	1
12/16/2023	1	299	1,016	Nearshore/Mid-shelf	1
1/3/2024	1	304	990	Nearshore/Mid-shelf	2
1/15/2024*	1	58	198	Nearshore/Mid-shelf	0
1/23/2024	1	286	890	Nearshore/Mid-shelf	3
2/2/2024	1	288	1,006	Nearshore/Mid-shelf	1
3/1/2024	1	306	991	Mid-shelf/Offshore	4
3/13/2024	2	458	1,485	Nearshore/Mid-shelf/Offshore	3
3/14/2024	1	350	1,122	Nearshore/Mid-shelf/Offshore	7
3/30/2024	1	292	1,022	Nearshore/Mid-shelf	3
5/25/2024	1	168	505	Offshore	15
5/26/2024	1	220	695	Nearshore/Mid-shelf	0
<b>Totals</b>	<b>13</b>	<b>3,313</b>	<b>10,875</b>	<b>—</b>	<b>40</b>

Key: min = minute(s)

\* Flight aborted due to weather

**Table 2. Summary of baleen whale sightings off Virginia Beach, Virginia, for the 2023/24 field season.**

Date	# sightings Eg	# individuals Eg	Eg ID #/Name	# sightings Bp	# individuals Bp	# sightings Mn	# individuals Mn	# sightings Ba	# individuals Ba
12/15/2023	0	0	—	0	0	1	1	0	0
12/16/2023	1	1	Unknown	0	0	0	0	0	0
1/3/2024	0	0	—	0	0	1	2	1	1
1/15/2024	0	0	—	0	0	0	0	0	0
1/23/2024	1	2	#2440/Shackleton; #3623/Bongo	0	0	1	1	1	1
2/2/2024	1	2	#1419; #2470/Killick	0	0	0	0	0	0
3/1/2024	0	0	—	2	2	2	2	0	0
3/13/2024	0	0	—	2	4	2	4	0	0
3/14/2024	0	0	—	0	0	5	5	1	1
3/30/2024	1	1	#1950 carcass	1	1	0	0	1	1
5/25/2024	4	7	#1050; #2920/Peter Rabbit; #3101/Harmonia; #3241; #3391; #3908/Zero; #4610	7	10	3	7	1	1
5/26/2024	0	0	—	0	0	0	0	0	0
<b>Totals</b>	<b>8</b>	<b>13</b>	<b>—</b>	<b>12</b>	<b>17</b>	<b>15</b>	<b>22</b>	<b>5</b>	<b>5</b>

Key: Ba = *Balaenoptera acutorostrata* (minke whale); Bp = *Balaenoptera physalus* (fin whale); Eg = *Eubalaena glacialis* (right whale); ID = identification number;  
Mn = *Megaptera novaeangliae* (humpback whale)

**Table 3. Summary of toothed whale sightings off Virginia Beach, Virginia, for the 2023/24 field season.**

Date	# sightings Pm	# individuals Pm	# sightings K spp.	# individuals K spp.
3/13/2024	1	1	0	0
3/14/2024	0	0	1	3
<b>Totals</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>3</b>

Key: K spp. = *Kogia* spp.; Pm = *Physeter macrocephalus* (sperm whale)

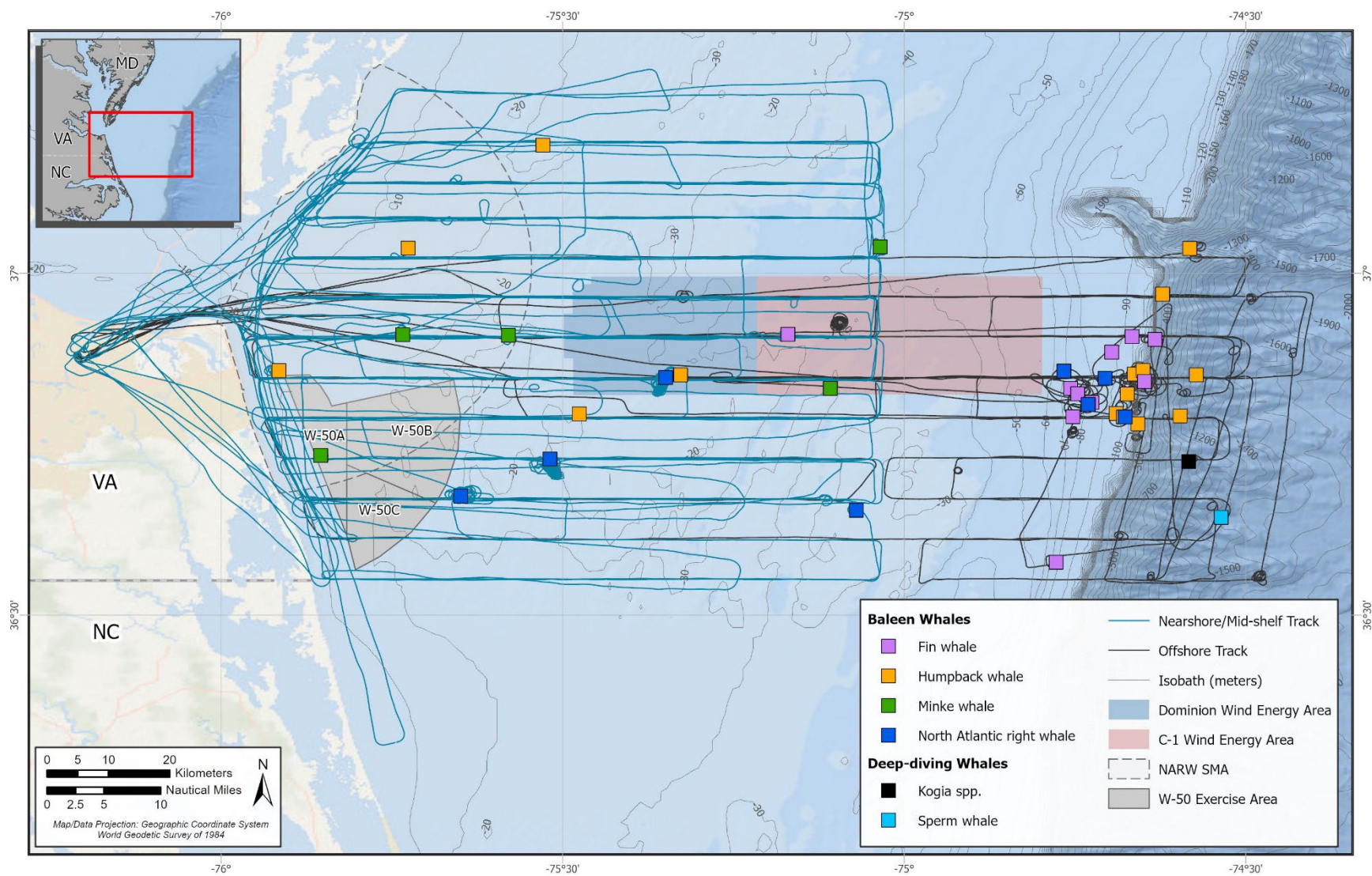


Figure 3. Aerial survey tracks (teal and gray), with locations of all North Atlantic right ( $n = 8$ ), fin ( $n = 12$ ), humpback ( $n = 15$ ), minke ( $n = 5$ ), *Kogia* spp. ( $n = 1$ ), and sperm ( $n = 1$ ) whale sightings for the 2023/24 field season.

## 4. Discussion

The addition of aerial surveys to complement vessel surveys for the Mid-Atlantic Baleen Whale Monitoring Project and Offshore Cetacean Study have proven extremely beneficial by 1) providing greater coverage of the study area; 2) locating and identifying individuals and aggregations of critically endangered NARWs; and 3) working with the vessel team to maximize sighting opportunities and photo-ID, photogrammetry, and tagging efforts. The plane's ability to survey the wider area in the vicinity of an initial NARW sighting has yielded additional sightings while the vessel team's efforts are focused on a target individual. Aerial photographs of NARWs are the most beneficial for identification purposes and are useful for our colleagues that provide near real-time photo-ID assistance, which in turn helps determine if an individual NARW is a tagging candidate and ultimately directs the vessel team's efforts. In addition, the aerial team's perspective allows for NARW behavioral observations that may not be obvious from the vessel, such as subsurface and social behaviors. During recent field seasons, sightings of NARWs have ranged from singles to groups of 14 individuals, including whales of both genders and all age classes, engaged in various behaviors, including traveling, socializing, and feeding ([Aschettino et al. 2023](#), [2024a](#), [2024b](#), [2025b](#); [A. Engelhaupt et al. 2023](#), [2025](#)). Overall, these efforts have begun to fill critical data gaps in NARW habitat use and distribution and highlight the importance of the Mid-Atlantic as more than just a migratory corridor.

The waters off Virginia and the mouth of the Chesapeake Bay are used extensively for commercial shipping, both recreational and commercial fishing, wind energy development, and U.S. Navy training exercises. From 1 November to 30 April, an NARW Seasonal Management Area (SMA) is in place from the mouth of the Chesapeake Bay out to 37 km from shore ([NOAA 2025b](#)). Within the SMA, a 10-knot vessel speed restriction is in place for vessels of 65 feet (19.8 m) or longer; however, the majority of NARW sightings during the 2022/23 season ([Aschettino et al. 2024b](#)) and all during the 2023/24 season occurred outside the SMA, indicating that current conservation measures do not offer sufficient protection within the region (**Figure 3**). When a group of three or more NARWs is visually detected, a Dynamic Management Area (DMA) is created ([NOAA 2025b](#)). Within a DMA, mariners are encouraged to reduce speed to 10-knots while transiting through the area or to avoid the area altogether. However, unlike SMAs, DMA speed restrictions are voluntary and do not guarantee additional protection to whales within the area. During the 2023/24 field season, one HDR Inc. aerial sighting, comprised of 4 NARWs, triggered a DMA offshore of Virginia near the shelf break.

Since 2017, an Unusual Mortality Event (UME) has been ongoing for NARWs due to increased cases of mortality, serious injury, and morbidity, of which most are attributed to fishing gear entanglements or vessel strikes ([NOAA 2025c](#)). The initial sighting of the carcass of adult female NARW #1950 by the HDR aerial team on 30 March 2024 was a significant finding for the UME. It is estimated that there are only about 70 reproductively active females remaining in the NARW population ([Linden 2024](#)) and the loss of one has significant impacts on population recovery. In addition, NARW #1950 was a mother from the 2024 calving season and had a dependent calf, which was not relocated in the vicinity of the carcass. The calf was last seen in February 2024 on the calving grounds ([NOAA 2025a](#)). NOAA released a statement on the

necropsy indicating that “preliminary findings included catastrophic injuries with a dislocation of the whale’s spine and fractures to all vertebrae in the lower back. These findings are consistent with blunt force trauma from a vessel strike prior to death” (NOAA 2025a). This finding, coupled with the fact that most NARW sightings from our aerial and vessel surveys over the past two field seasons occurred outside of the SMA (Aschettino et al. 2024b, 2025a; Engelhaupt et al. 2025), further emphasize the vulnerability of NARWs to vessel strikes in the Mid-Atlantic.

Aerial surveys during the 2024/25 field season will continue to coordinate efforts with the vessel team to maximize additional opportunities to deploy satellite-linked telemetry and digital archival tags on baleen and deep-diving whales withing the VACAPES OPAREA. For additional details on the Mid-Atlantic Nearshore and Mid-Shelf Baleen Whale Monitoring Project, see Aschettino et al. (2025a); on baleen whale photo-ID, see Aschettino et al. (2025b); and on the Offshore Cetacean Study, see Engelhaupt et al. (2025).

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