



In the strike zone? Tagdata provides a better understanding of dive and surface behavior of North Atlantic right whales in the western Mid-Atlantic

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Introduction & Methods

Understanding the overlap concerning dive and surface behavior of critically endangered North Atlantic right whales (NARWs) and a vessel's draft is critical to this species' survival. Ships transiting the western Mid-Atlantic have a maximum draft of approximately 15 meters (m) and pose a known threat to slow-moving whales. Since 2015, HDR researchers have been actively monitoring large whales in VA and NC waters through visual surveys, photo-ID, sUAS, and tagging techniques under the U.S. Navy's Marine Species Monitoring program. During 2021-2022, three yearling NARWs were tagged with Wildlife Computers SPLASH10-F-333 dive/location LIMPET-configured dart tags and one pregnant female was tagged with a CATS suction-cup diary/4K cam tag to provide information on habitat use in areas of increasing anthropogenic activity. A dive definition of greater than 2 m and longer than 2 minutes (min) was used in the analysis.

Results

- Combined (dart tagged whales only)
 - Dive depth range = 5.0–94.0 m, mean = 19.8 m, median = 17.0 m (s.d. = 11.24, c.v. = 0.57)
 - Dive duration range = 2.0–20.6 min, mean = 5.4 min, median = 4.7 min (s.d. = 2.8, c.v. = 0.52)
- Percentage of dive depth within a large vessel's draft 'strike zone' (< 14m) varied between whales (31.5%, 12.5%, 37.3%, and 100%)
- Surfacing durations averaged 3.1, 4.2, 4.6, and 5.8 min. Surfacing events comprised 33.8-60.2% of the total behavioral data hours collected
- Pregnant NARW 2605 (a.k.a. 'Smoke') spent 63% of her 10.3-hour tag-on time in the upper 2 m and 98% of her total time in the upper 10 m strike zone. No vocalizations were detected.

Right Whale Catalog ID	5042	5012	5132	2605
Age Class / Gender	Yearling/♀	Yearling/♂	Yearling/♂	Adult/♀
Tag Type	SPLASH10	SPLASH10	SPLASH10	CATS
Tag Duration	16.7 Days	1.7 Days	18.7 Days	10.3 hours
Dive Data Collected (hours)	225.7	12.3	132.5	4.1
Surface Data Collected (hours)	115.3	7.8	134.3	6.2
Total Dives Logged	2250	110	1770	66
Mean Dive Depth (m)	19.3	23.1	20.2	5.0
Mean Dive Duration (min)	6.0	6.7	4.5	3.8
Total Surfacing Logged	2250	111	1771	65
Mean Surface Duration (min)	3.1	4.2	4.6	5.8
Binned Dives				
% Dives Max Depth < 10m	9.9	12.5	1.3	89.3
% Dives Max Depth < 14m	31.5	12.5	37.3	100%
% Dives Max Depth > 14m	68.5	87.5	62.7	0.0%

Discussion

- Daily movements of all four whales suggest nearly all dives occurred while traveling, though a multi-day foraging event south of Martha's Vineyard at near-bottom depths in an area of other whales is presumed for whale 5042.
- The majority of dives for whales 5042, 5012, and 5132 had a mean dive depth that exceeded a large vessel's draft. However, dive depth should not be interpreted as the entire dive being 'outside of the strike zone'. Time spent at or near the surface combined with ascent and descent to the recorded dive depth add to the time individuals are at risk.
- All four NARWs spent considerable (33.8-60.2%) time in surface events where they are most vulnerable to ship strike. Pregnant female Smoke's total time spent near the surface, proximity to the coast, and silent behavior (making her undetectable by real-time monitoring buoys), suggest she is at an elevated strike risk with any size vessel.
- This study highlights the seasonal importance of this area for NARWs and the necessity of long-term monitoring. Tag data reduces knowledge gaps for NARW movement, dive, and surface behavior in the western Mid-Atlantic. Understanding how NARWs utilize these waters allows stakeholders and regulators to develop more meaningful mitigation measures and strategies aimed at long-term conservation of the species.
- All tag data has been shared with NOAA to improve ship-strike models.

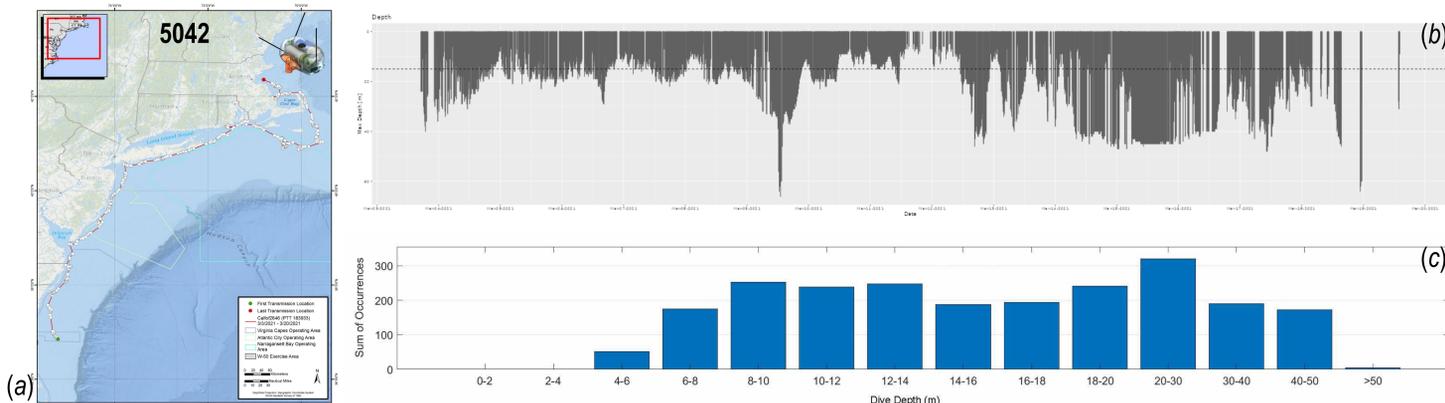


Figure 1. (a) Locations of tagged whale 5042; (b) Dive depth over days data collected, dotted line is 15 m ship draft; (c) Histogram of dive depth occurrences binned in meters.

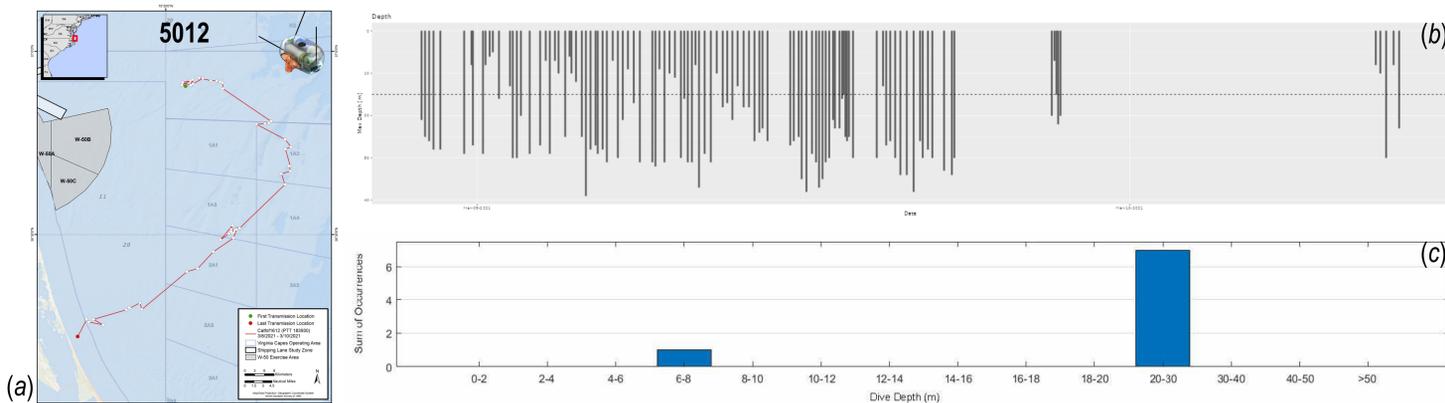


Figure 2. (a) Locations of tagged whale 5012; (b) Dive depth over days data collected, dotted line is 15 m ship draft; (c) Histogram of dive depth occurrences binned in meters.

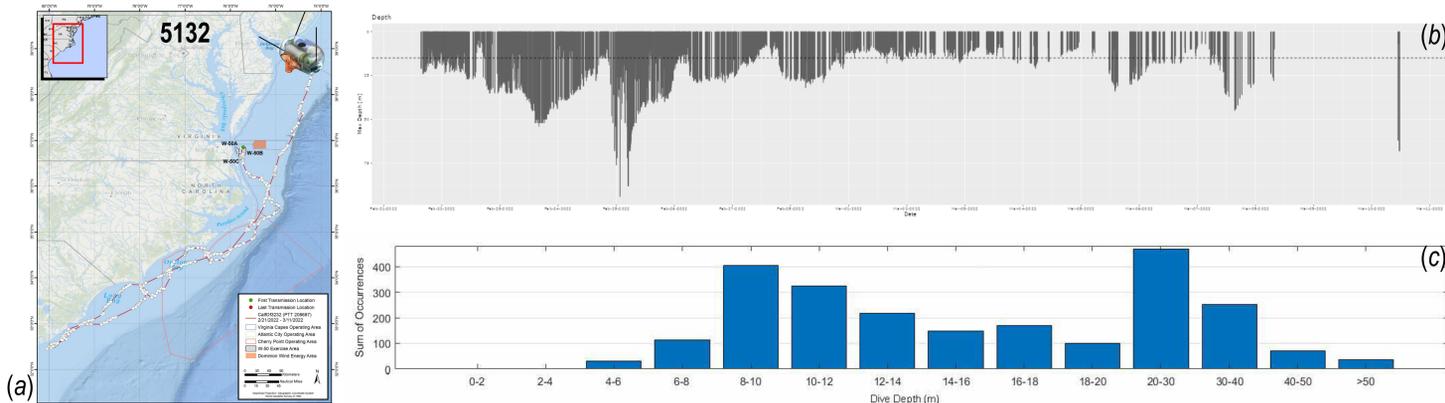


Figure 3. (a) Locations of tagged whale 5132; (b) Dive depth over days data collected, dotted line is 15 m ship draft; (c) Histogram of dive depth occurrences binned in meters.

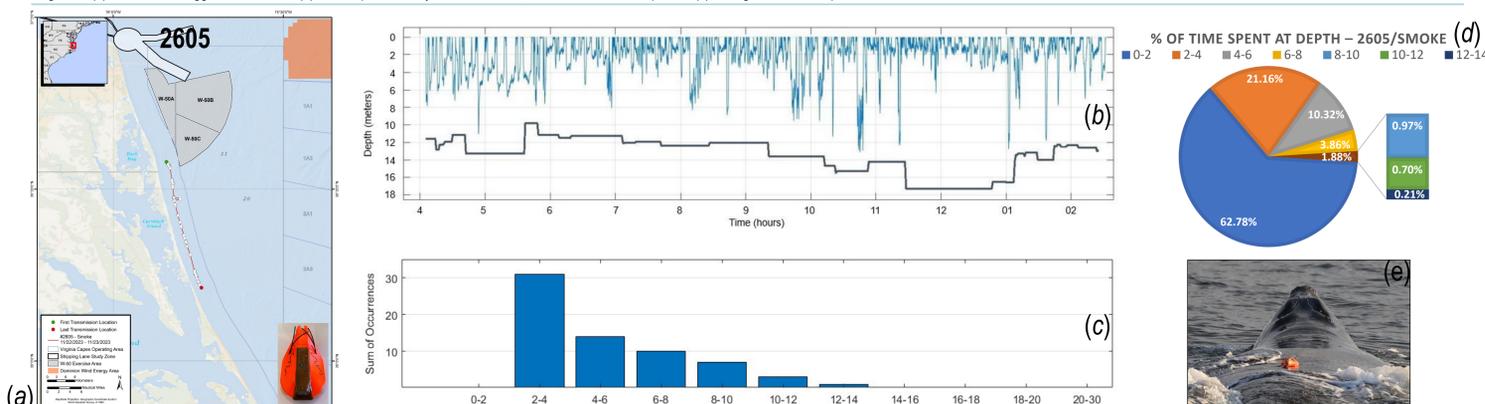


Figure 4. (a) Locations of tagged whale 2605 (a.k.a. 'Smoke'); (b) Dive depth over hours (4pm-2am EST) data collected, solid black line under dives represents seafloor; (c) Histogram of dive depth occurrences binned in meters; (d) % of time spent at depth (m) for whale 2605 only; (e) CATS tag on back of 2605.

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