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North Atlantic Right Whale (*Eubalaena glacialis*) Passive Acoustic Detections Report: November 2023 – June 2024

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NOAA Southeast Fisheries Science Center

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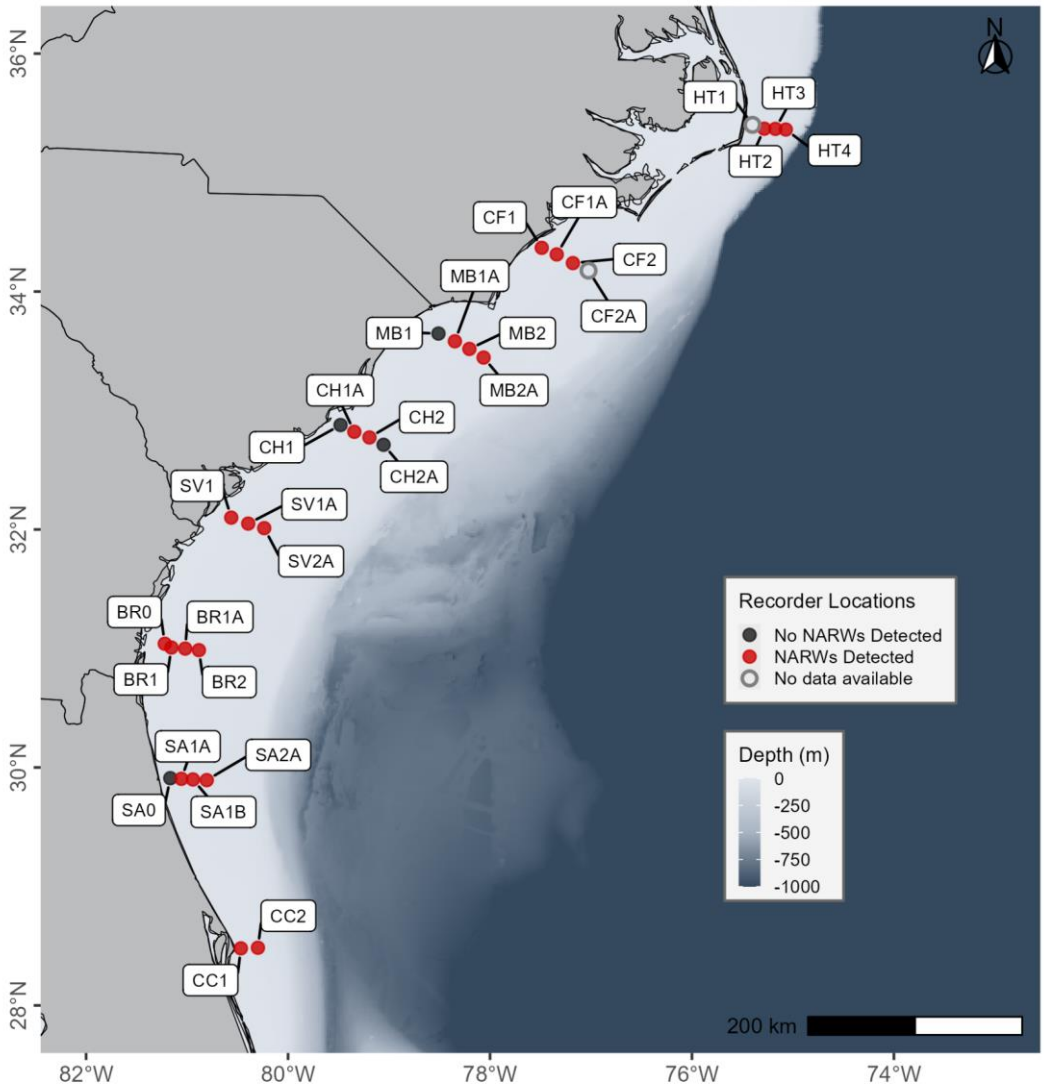


Figure 1. Map of acoustic recorder locations.

INTRODUCTION

The North Atlantic right whale (*Eubalaena glacialis*) is an endangered baleen whale that primarily occupies coastal and shelf waters of the western North Atlantic Ocean, and has a population size of around 380 individuals (Linden, 2025). In these urban waters, North Atlantic right whales are especially at risk for collisions with vessels and entanglement in fishing gear (Moore *et al.*,

2021). Their distribution has been shifting in recent years (Davis *et al.*, 2017), and improved knowledge of the full extent of their calving grounds and location of their migration route is needed to minimize interactions with human activities. Long-term moored passive acoustic monitoring is an efficient and effective tool for monitoring rare whale presence to understand distribution and occurrence patterns. Right whales produce a variety of acoustic signals, including stereotyped, frequency modulated upsweep calls (upcalls), gunshot calls, variable calls, and moans (Parks *et al*., 2005, Parks *et al*., 2019a), which can be identified to species level by trained analysts. To further explore the seasonal movements and distribution of migrating and calving right whales and the soundscapes they inhabit, we deployed long-term passive acoustic recorders at 29 coastal sites from North Carolina to Florida and evaluated recordings for the presence of North Atlantic right whale upcalls.

METHODS

During the 2023 - 2024 winter calving season, over the period from 8 November 2023 to 5 June 2024, 29 moored autonomous recording units were deployed in coastal waters from North Carolina to Florida, with 2 - 4 sites per line (Figure 1, Table 1). Moorings consisted of a SoundTrap ST600 STD long-term recorder tethered 3 m above the seafloor, flotation, a Vemco VR2AR acoustic release, and ballast weights (Appendix). The ST600 recorders are factory calibrated at 250 Hz, have a sensitivity of -177dB re 1 µPa/V ± 3 dB with a full bandwidth frequency range between 20 Hz - 60 kHz, and can record continuously for up to 6 months. During the study period, all ST600s were set to record continuously to 60-minute files at a 24 kHz sample rate, with high pre-amp gain, and no high pass filter. SoundTraps were programmed in SoundTrap Host software version v4.0.15 (Ocean Instruments, 2023). Prior to deployment, SoundTraps from each line were time-synchronized with 10 impulses to aid in time alignment. The VR2AR acoustic release and Vemco tag receiver was programmed to opportunistically record nearby acoustic tags transmitting at 69 kHz using VUE software version v2.12.5 (Innovasea, 2022).

Following retrieval, acoustic data were offloaded from microSD cards, decompressed from sud to wav files, decimated to 2 kHz, and reviewed for quality control. To automatically detect and classify tonal signals, such as those produced by baleen whales, the automated Low Frequency Detection and Classification System (LFDCS; Baumgartner & Mussoline, 2011) was run. LFDCS created a conditioned spectrogram with 512 FFT at a 75% overlap, 3.9 Hz resolution per bin and 64 ms timestep, and then detected tonal signals and created pitch tracks. The tonal pitch tracks were classified into call types based on a pre-existing call library (gom9) for right whale upcalls, and manually validated for true upcalls by trained analysts. Other right whale call types (Parks *et al.*, 2005) were not classified by LFDCS and are not used in this analysis.

RESULTS

Of the 29 recorders, 27 were successfully recovered with good quality recordings. One of the 27 recorders, at site SA0, stopped recording after only 2 months. (Table 1, Figure 1).

North Atlantic right whale acoustic presence by month (Table 1) and week (Figure 2) is summarized for the 27 sites over the 6-month deployment period. Over the entire recording period at each site, North Atlantic right whale daily acoustic presence ranged between 0.5 and 34% across all sites where right whales were marked acoustically present, with highest daily acoustic present at site HT2. North Atlantic right whales were not marked acoustically present at sites MB1, CH1, CH2A, and SA0 (which only had 2 months of recordings). Right whales are considered present at a site if three true upcall detections are found in one day. These results indicate minimum right whale presence. A specific date range may contain few or no detections; this does not mean right whales were not present. Passive acoustic monitoring can only determine presence of vocally-active individuals calling within detection range of a recorder. Silent animals, or those calling beyond the range of the recorders, are not represented.

The results presented here represent preliminary analyses. More detailed analyses of call types and total calls per day are in progress. Call detections of low-frequency calls such as those from baleen whales are highly dependent on sound propagation conditions and noise. The data used for this study will be archived at NOAA National Centers for Environmental Information (NCEI).

Table 1: Deployment details and number of days with North Atlantic right whale upcall presence / number of total recording days per month from November 2023 through June 2024. Months with no recording effort are indicated by -/-.

Site Name	Recording Dates	11-23	12-23	01-24	02-24	03-24	04-24	05-24	06-24	Days Present / Effort
HT2	12/09/23 - 05/29/24	-/-	13/23	24/31	20/29	1/31	0/30	0/29	-/-	58/173
HT3	12/08/23 - 05/28/24	-/-	4/24	23/31	15/29	2/31	0/30	0/28	-/-	44/173
HT4	12/07/23 - 06/05/24	-/-	2/25	15/30	11/29	3/31	0/30	0/31	0/5	31/181
CF1	11/08/23 - 05/11/24	0/23	1/31	1/31	1/29	0/31	0/30	0/11	-/-	3/186
CF1A	11/08/23 - 05/15/24	0/23	1/31	0/31	0/29	0/31	0/30	0/15	-/-	1/190
CF2	11/08/23 - 05/11/24	5/23	2/31	3/31	5/29	0/31	0/30	0/11	-/-	15/186
MB1	12/01/23 - 05/31/24	-/-	0/31	0/31	0/29	0/31	0/30	0/31	-/-	0/183
MB1A	12/01/23 - 05/27/24	-/-	0/31	1/31	5/29	0/31	0/30	0/27	-/-	6/179
MB2	12/08/23 - 05/28/24	-/-	0/24	0/31	2/29	0/31	0/30	0/28	-/-	2/173
MB2A	12/08/23 - 05/20/24	-/-	0/24	2/31	1/29	0/31	0/30	0/20	-/-	3/165
CH1	11/30/23 - 05/31/24	0/1	0/31	0/31	0/29	0/31	0/30	0/31	-/-	0/184
CH1A	11/30/23 - 05/31/24	0/1	1/31	3/31	4/29	1/31	0/30	0/31	-/-	9/184
CH2	11/30/23 - 06/02/24	0/1	0/31	0/31	1/29	0/31	0/30	0/31	0/2	1/186
CH2A	11/30/23 - 05/28/24	0/1	0/31	0/31	0/29	0/31	0/30	0/28	-/-	0/181
SV1	11/29/23 - 06/01/24	0/2	4/31	4/31	5/29	0/31	0/30	1/31	0/1	14/186
SV1A	11/28/23 - 06/02/24	0/3	2/31	4/31	4/29	1/31	0/30	0/31	0/2	11/188
SV2A	11/28/23 - 05/31/24	0/3	1/31	2/31	2/29	0/31	0/30	0/31	-/-	5/186
BR0	11/10/23 - 05/27/24	4/21	8/31	14/31	11/29	0/31	0/30	0/27	-/-	37/200
BR1	11/10/23 - 05/29/24	4/21	9/31	13/31	5/29	0/31	0/30	0/29	-/-	31/202
BR1A	11/09/23 - 05/25/24	2/22	8/31	9/31	8/29	0/31	0/30	0/25	-/-	27/199
BR2	11/08/23 - 05/15/24	0/23	4/31	5/31	5/29	1/31	0/30	0/15	-/-	15/190
SA0	11/10/23 - 01/03/24	0/21	0/31	0/3	-/-	-/-	-/-	-/-	-/-	0/55
SA1A	11/10/23 - 05/09/24	0/21	0/31	1/31	0/29	3/31	0/30	0/9	-/-	4/182
SA1B	11/10/23 - 05/05/24	0/21	0/31	0/31	4/29	1/31	0/30	0/5	-/-	5/178
SA2A	11/10/23 - 04/27/24	0/21	1/31	0/31	1/29	0/31	0/27	-/-	-/-	2/170
CC1	11/11/23 - 05/03/24	0/20	0/31	0/31	1/29	0/31	0/30	0/3	-/-	1/175
CC2	11/11/23 - 05/16/24	1/20	0/31	0/31	2/29	0/31	0/30	0/16	-/-	3/188

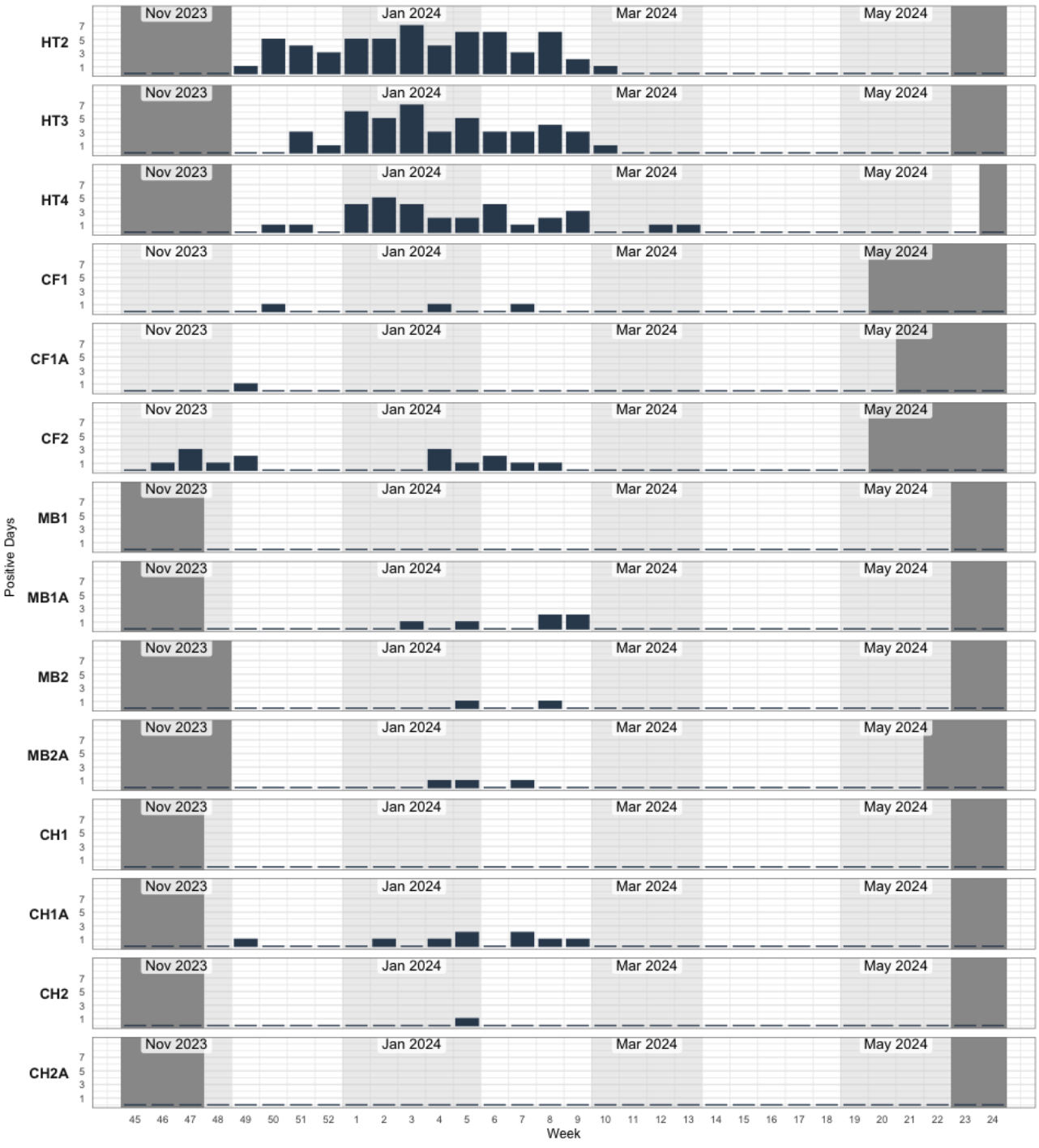
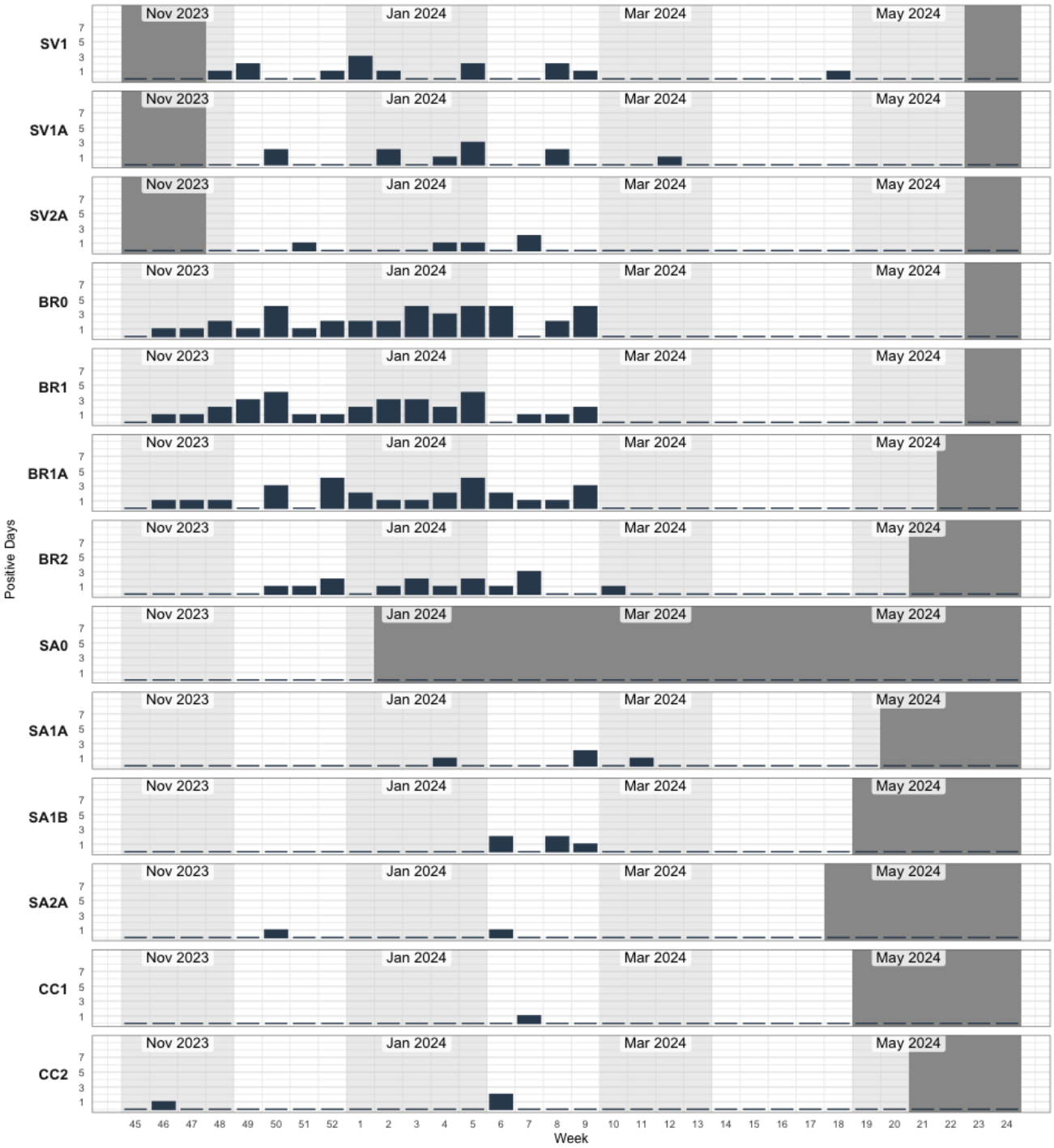


Figure 2: Daily presence of North Atlantic right whale upcalls per week per site over the 8 November 2023 to 5 June 2024 deployment period. Grey and white shading indicates months, with November, January, March, and May in grey and December, February, April, and June in white. Dark gray blocks indicate periods without recording effort.

Figure 2. (continued)



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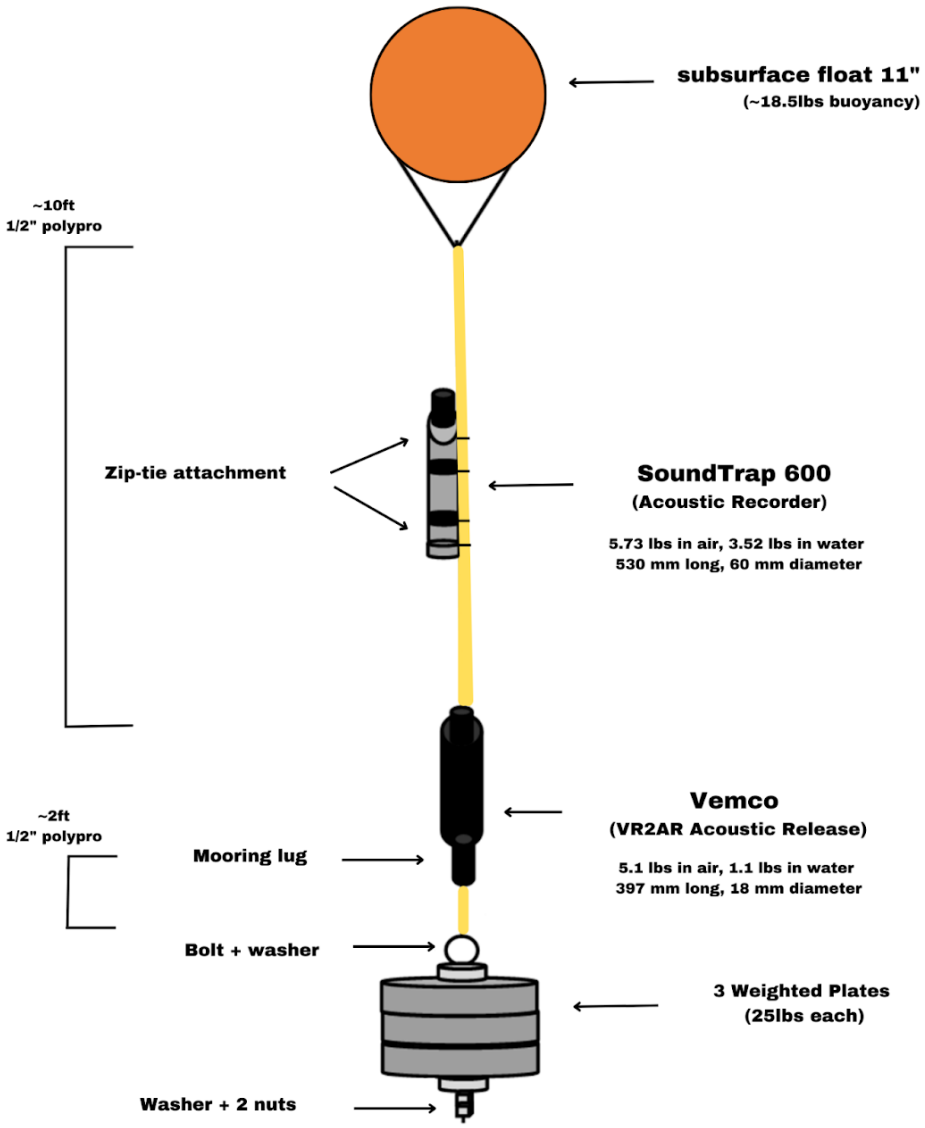
Appendix


subsurface float 11"
(~18.5lbs buoyancy)
~10ft
1/2" polypro
Zip-tie attachment
SoundTrap 600
(Acoustic Recorder)
5.73 lbs in air, 3.52 lbs in water
530 mm long, 60 mm diameter
Vemco
(VR2AR Acoustic Release)
5.1 lbs in air, 1.1 lbs in water
397 mm long, 18 mm diameter
~2ft
1/2" polypro
Mooring lug
Bolt + washer
3 Weighted Plates
(25lbs each)
Washer + 2 nuts