Stony Brook University
School of Marine and Atmospheric Sciences

Marine Community Ecology
Peterson Lab

To: Christopher Sarro and Michael Evans
Ørsted
Sunrise Wind Export Cable Acoustic Telemetry Study

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Report on research efforts conducted during 2023 involving Ørsted Sunrise Wind acoustic telemetry deployments and elasmobranch tagging efforts off the south shore of Long Island, NY.

Receiver Deployments

The original array placement proposal consisted of 28 receivers placed in a 7 x 4 gridded VPS array covering a depth range from 30 to 60 feet along the cable path centerline (Figure 1). This array was paired with a gated array composed of 3 lines spaced 5 km apart, each representing a west approach, an east approach, and the centerline of the cable (Figure 2). Each line comprised 10 receivers, each spaced 1 km apart and placed at depths from 150 to 180 feet. After meeting with local stakeholders, we cooperatively decided to narrow our study area to encompass the VPS array within the boundaries of 50 ft water, thereby minimizing interactions with commercial trawlers while still collecting fine-scale behavioral data.

Receivers (n = 32) were deployed using ropeless technology (Acoustic Release Buoys) in an 8 x 4 gridded receiver array in July 2022 (Figure 3) to minimize risks to marine mammals and other protected species. Initial receiver range testing confirmed 90% detection success at 350 m. During spring 2023, 22 receivers (of the deployed 32) were downloaded, resulting in 10 receivers lost. Seven of the lost receivers were positioned on the northernmost row. As such, we decided to remove the northernmost row of receivers and 8th column of receivers, with the intention of reducing the array to a 7 x 3 array (n = 21), though, one receiver (R3C8) was redeployed in the 8th column. In total, 22 receivers were deployed in spring 2023. Eleven receivers were downloaded in fall 2023, resulting in 11 receivers lost. Receivers positioned in the 8th column were not redeployed. A total of 21 receivers were redeployed within the array during fall 2023 (Figure 3).

Our team participated in the Fathom Positioning training in September 2023 and are actively processing these data. Using elasmobranch detections, 14,696 positions were calculated for the first positioning time period (7/30/2022 to 12/23/2022) during the first receiver deployment. Additionally, we were able to calculate the positions for some of the lost receivers (Figure 4). The lost receiver's sync tags were consistently detected within the first positioning time period (Figure 4A); however, the position of several receivers was inconsistent within the time period (e.g., R1C5, R1C6, R1C8, R2C6; Figure 4B), suggesting movement within the array.

Elasmobranch Fishing Activity

Dusky shark (*Carcharhinus obscurus*)

During summer of 2023, 36 dusky sharks were caught on baited hook and line on the southern shore of Long Island, primarily around Fire Island and Moriches Reef (Figure 5). All individuals were released in good condition following surgical implantation of Innovasea V16 acoustic telemetry transmitters. Of the 36 dusky sharks, 16 were female (109.2 ± 3.4 cm; mean ± standard error; Figure 6) and 20 were male (112.2 ± 3.5 cm). In total, 61 dusky sharks were acoustically tagged and 32 individuals were detected at the Sunrise Wind array (n = 23,764 detections). Using these detections, 4,088 positions were calculated within the surrounding area by dusky sharks and space use was determined using minimum convex polygons for 7/30/2022 to 12/23/2022 (Figure 7).

Sandbar shark (*Carcharhinus plumbeus*)

During summer of 2023, 8 sandbar sharks were caught on baited hook and line on the southern shore of Long Island, primarily around Fire Island and Moriches Reef. All individuals were released in good condition following surgical implantation of Innovasea V16 acoustic telemetry transmitters. Of the 8 sandbar sharks, 2 were female (154.0 ± 13.0 cm) and 6 were male (139.8 ± 5.1 cm). In total, 14 sandbar sharks were acoustically tagged and 7 individuals were detected at the Sunrise Wind array (n = 1,807 detections). Using these detections, 44 positions were calculated within the surrounding area by sandbar sharks and space use was determined using minimum convex polygons for 7/30/2022 to 12/23/2022 (Figure 8).

Sand tiger shark (*Carcharias taurus*)

During summer of 2023, 19 sand tiger sharks were caught on baited hook and line on the southern shore of Long Island, primarily around Fire Island and Moriches Reef. All individuals were released in good condition following surgical implantation of Innovasea V16 acoustic telemetry transmitters. Of the 19 sand tiger sharks, 15 were female (186.0 ± 7.3 cm) and 4 were male (177.8 ± 22.7 cm). In total, 44 sand tiger sharks have been acoustically tagged and 24 individuals have been detected at the Sunrise Wind array (n = 63,001 detections). Using these detections, 10,564 positions were calculated within the surrounding area by sand tiger sharks and space use was determined using minimum convex polygons for 7/30/2022 to 12/23/2022 (Figure 9).

Smooth dogfish (*Mustelus canis*)

During spring and summer of 2023, a total of 25 smooth dogfish were caught via bottom trawl or on hook and line along the southern shore of Long Island, spreading from Fire Island to Shinnecock Artificial Reef. All individuals were released in good condition following surgical implantation of Innovasea V16 acoustic telemetry transmitters. Of the 25 smooth dogfish, 15 were female (104.1 ± 8.0 cm) and 10 were male (87.0 ± 2.5 cm). To date, 50 smooth dogfish have been acoustically tagged and 10 individuals have been detected at the Sunrise Wind array (n = 2,379 detections); however, no positions were calculated for smooth dogfish.

Winter skate (*Leucoraga ocellata*)

We were largely unsuccessful at tagging winter skate during 2023. As such, we intend to place greater emphasis on trawl efforts to tag more during 2024. To date, we have one winter skate acoustically tagged that was not detected at the Sunrise Wind array.

Additional Information

Between funding provided by Ørsted and the NYS DEC, the Peterson Lab now maintains a receiver network of 120+ receivers around Long Island, NY (Figure 10). Therefore, not only do the tagged elasmobranchs provide insight into space-use around areas designated for offshore wind farm development, but they will also allow us to understand large-scale movements (i.e., migration), and monitor use and connectivity among NY's artificial reefs.

Outreach and Communication

Using elasmobranch detections collected from the downloaded receivers, our team has given public outreach talks for the Nature Talk Series at Übergeek Brewing Company (Peterson) and Bridgehampton Natural History Museum's summer shark panel (Peterson and Scannell). While information pertaining to Ørsted-specific objectives were not discussed, analyzing these peripheral detections allowed our team to conduct outreach initiatives with the public and investigate analytical techniques at acoustic telemetry-focused conferences.

Future Objectives

Moving forward, our priority is to finish analyzing animal positions within the array for the entire deployment timeframe. Additionally, we plan to process the sensor data (depth and temperature) from the tagged animals to assess 3D positioning within the array. Finally, we are actively assessing spatial modeling techniques (e.g., dynamic Brownian bridge movement models) to determine the most suitable method for these data.

Occupational Hazards

Our team experienced no accidents or occupational hazards during 2023.

Figures

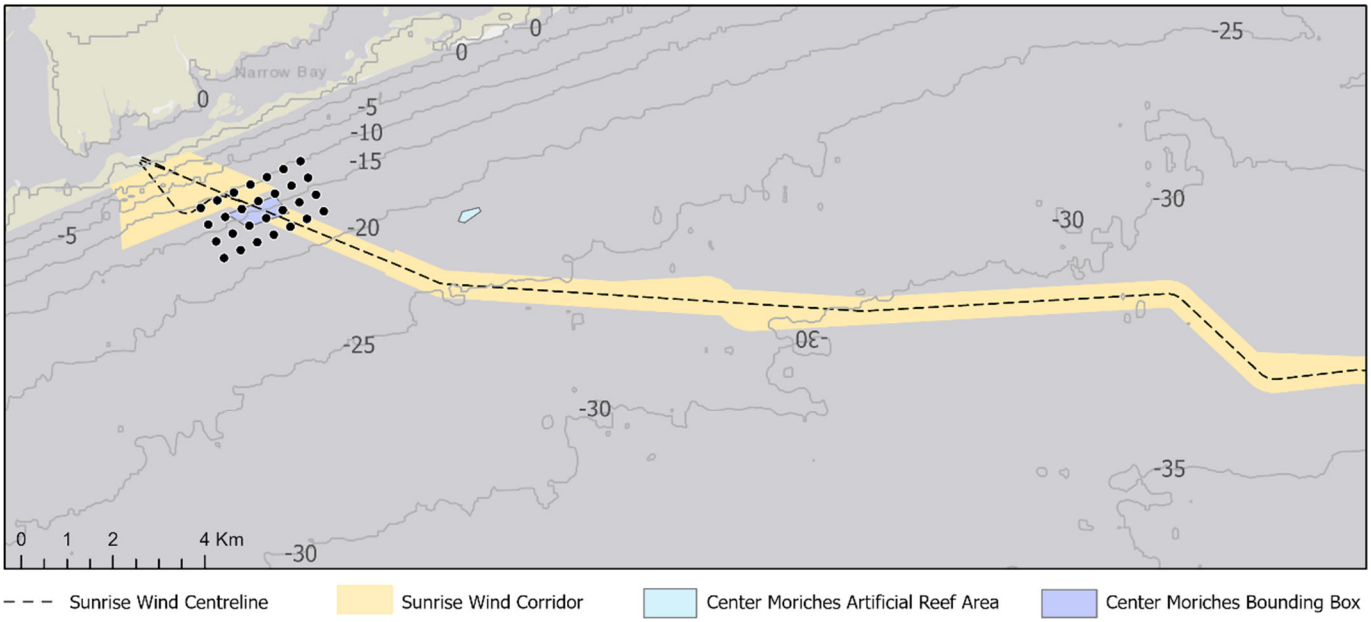

Figure 1: Original diagram of the near-shore, fine-scale positioning array. The array overlaps with the SRWEC route and includes four rows of seven receivers (28 receivers total) deployed approximately 400m apart to allow individual animals to be tracked with high spatial resolution. This array was slightly adjusted to have four rows of eight receivers (32 receivers total) following discussions with stakeholders.

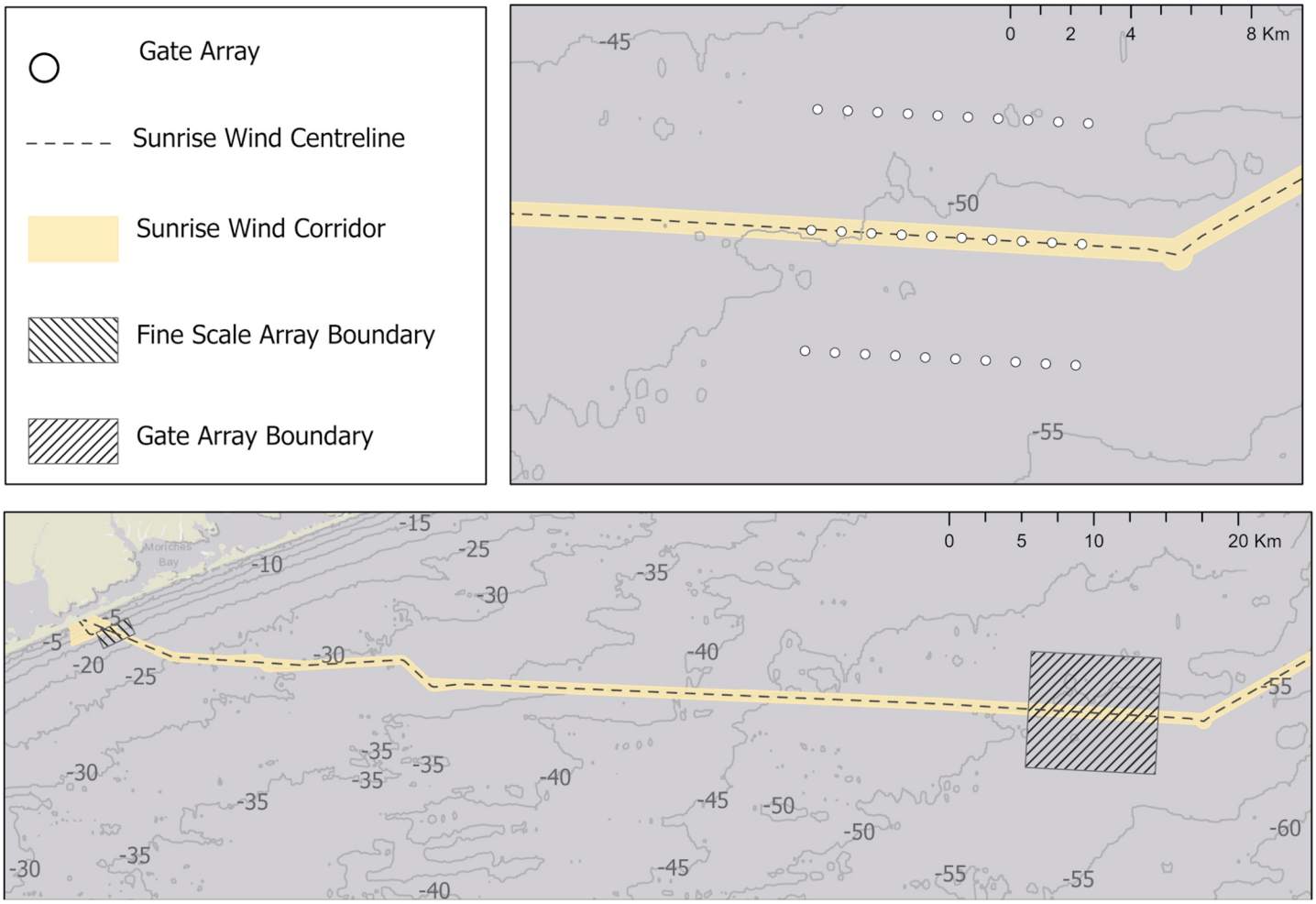

Figure 2: Diagram of the previous offshore receiver array that was renegotiated with local stakeholders to minimize undesired interactions with commercial trawlers.

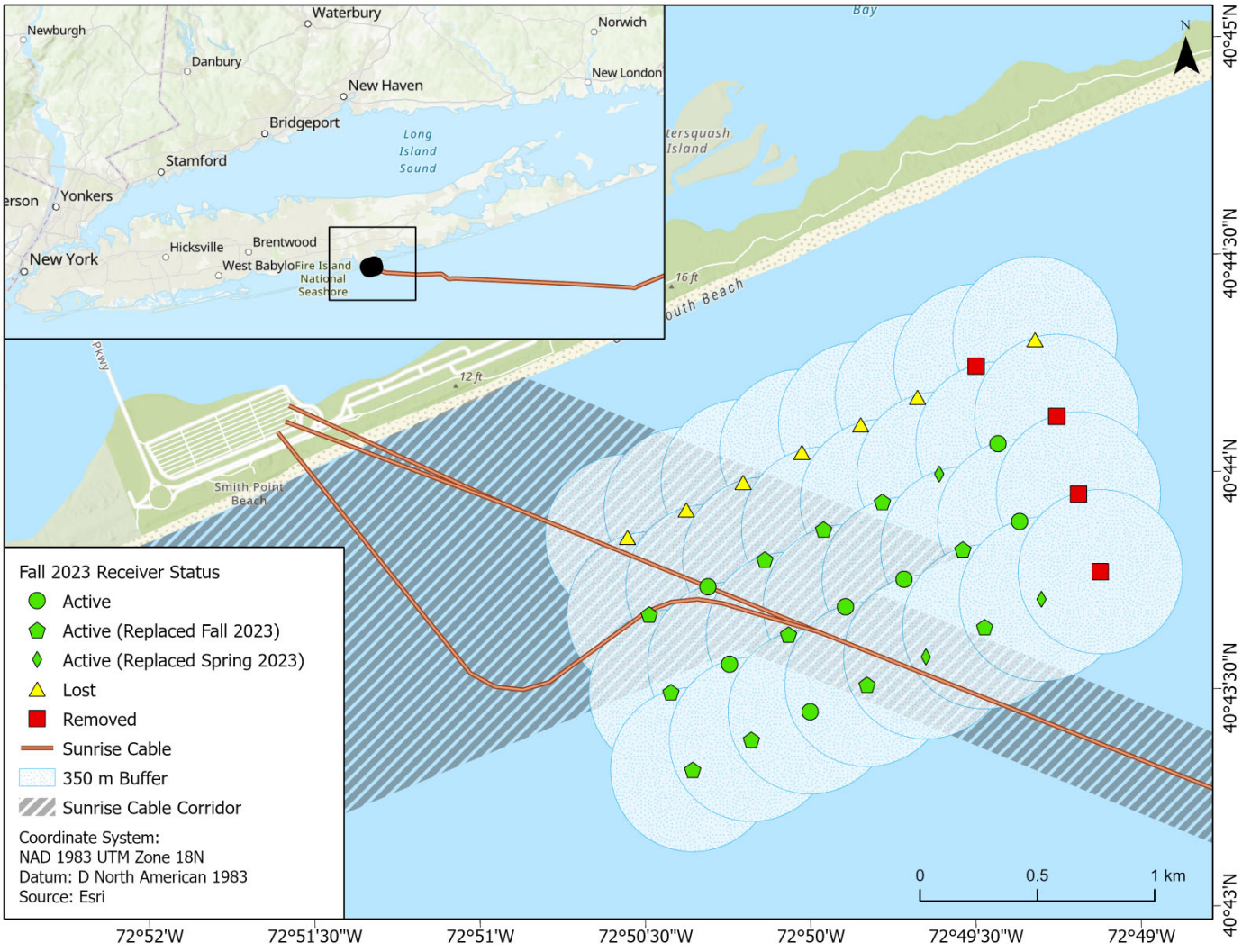

Figure 3: Sunrise wind receiver locations with the 90% detection success range (350 m). Receiver locations were collected immediately upon deployment. Colored symbology refers to status—green is active, red is removed, and yellow suggests the receivers were lost yet not replaced. Shape symbology of a pentagon, diamond or triangle suggest that a receiver was lost in that location, and therefore replaced with a new receiver. Both circle and square symbology suggest that no receivers were lost in the locations. The first row (northernmost) and 8th column (easternmost) were removed from the array, therefore leaving the 7 x 3 gridded array shown in green.

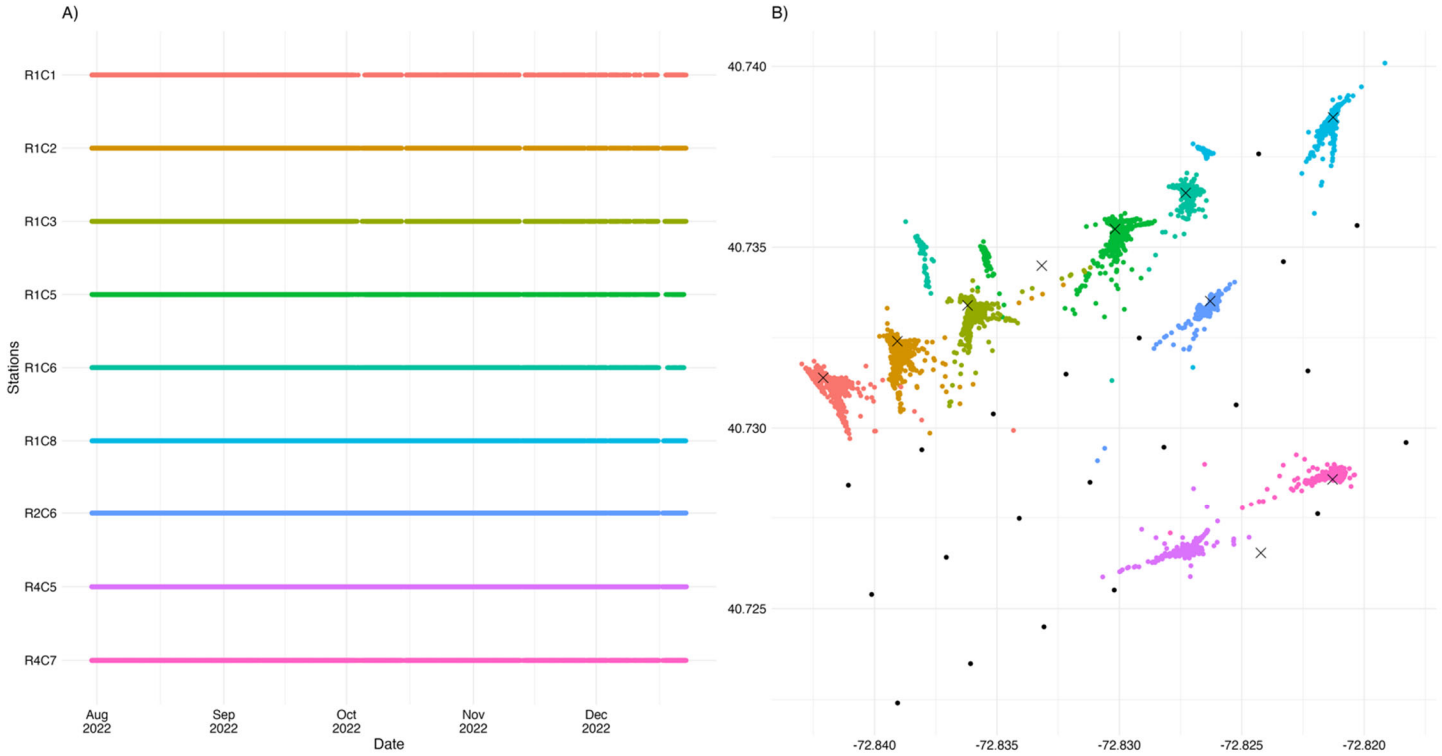

Figure 4: Reporting of A) detections by each receiver's internal sync tag over time within the first positioning time period (7/30/2022-12/23/2022), and B) the calculated positions by each receiver's internal sync tag. Colored symbology varies with station ID.

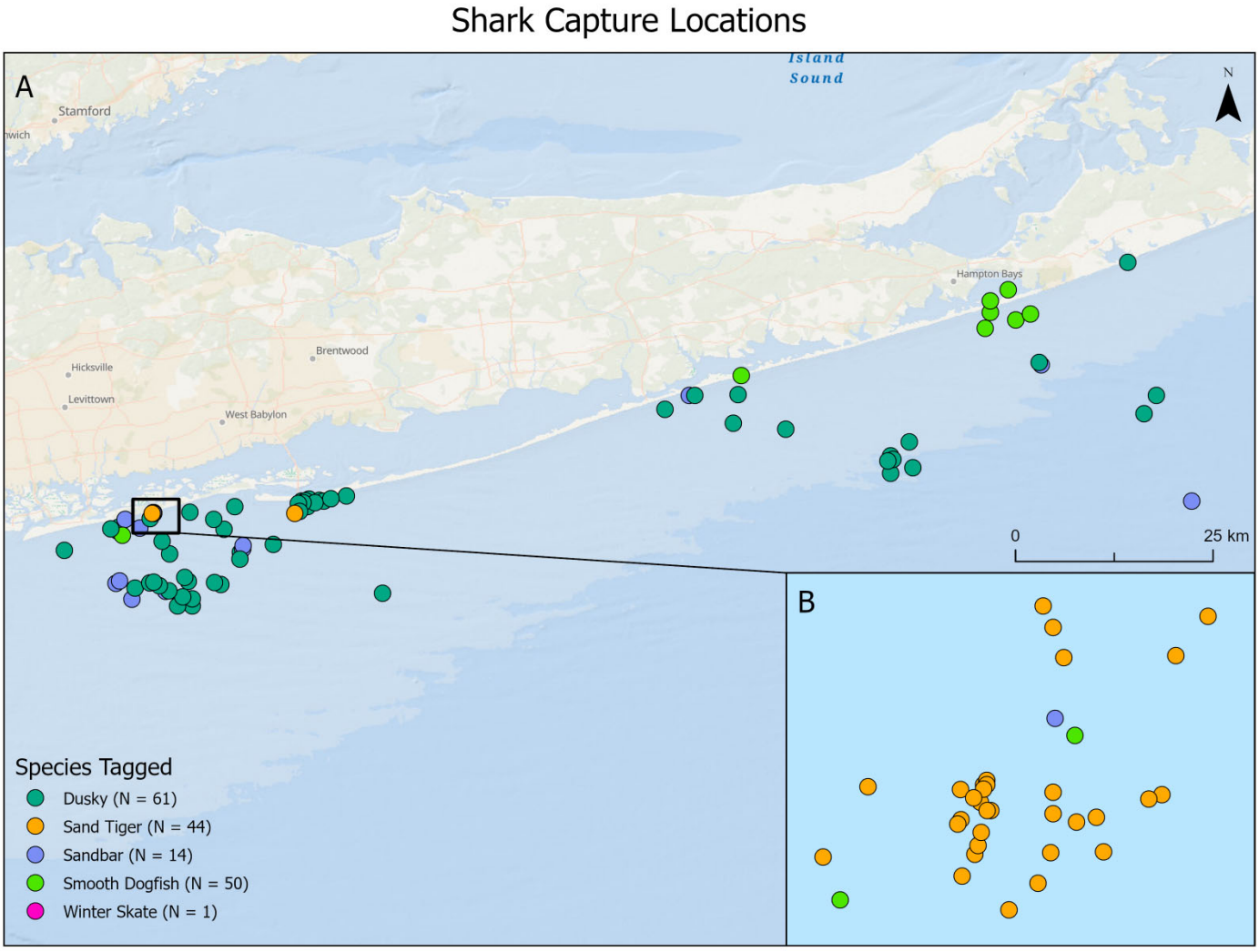

Figure 5: Capture locations for A) all tagged elasmobranchs and B) an inset map showing close proximity capture for sand tiger sharks. Fishing efforts primarily occurred outside of Fire Island, Moriches and Shinnecock Inlet.

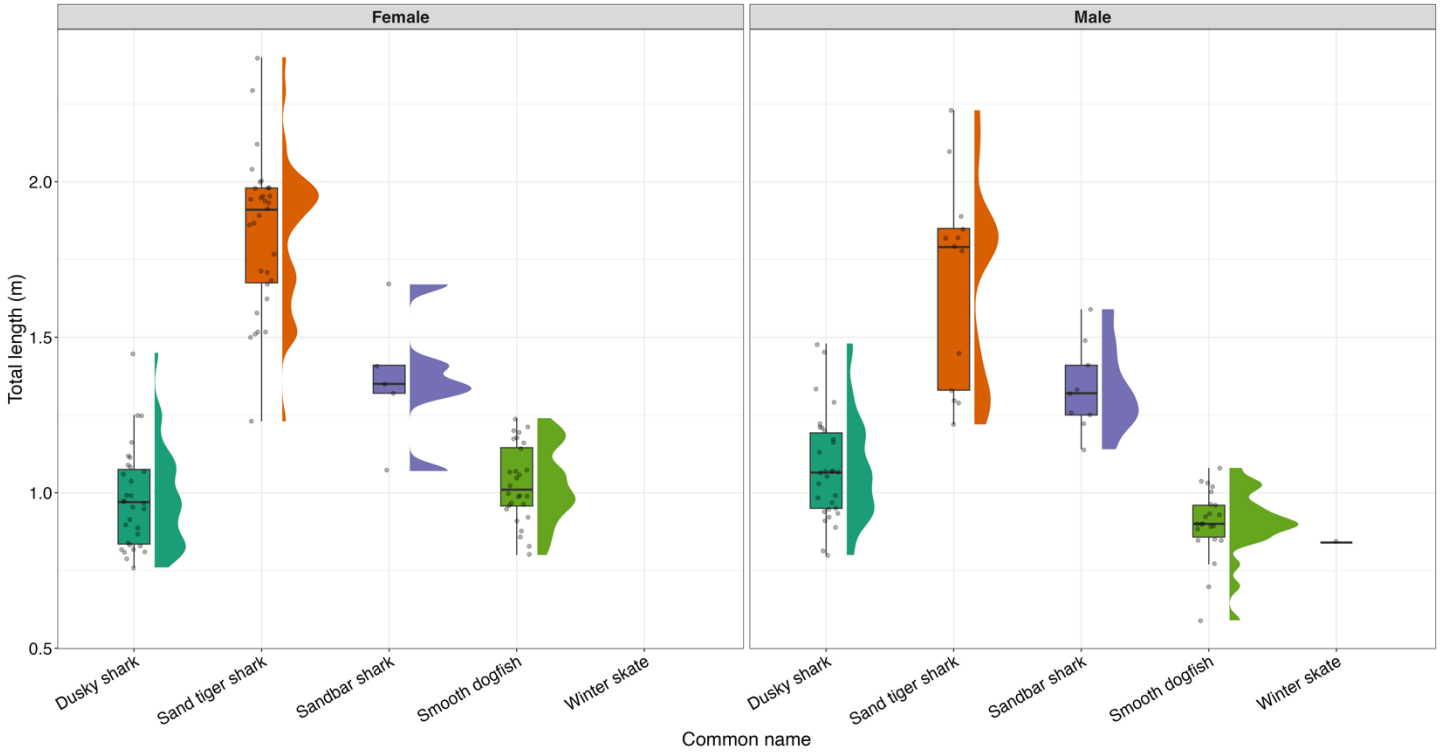

Figure 6: Size distributions of tagged animals by sex.

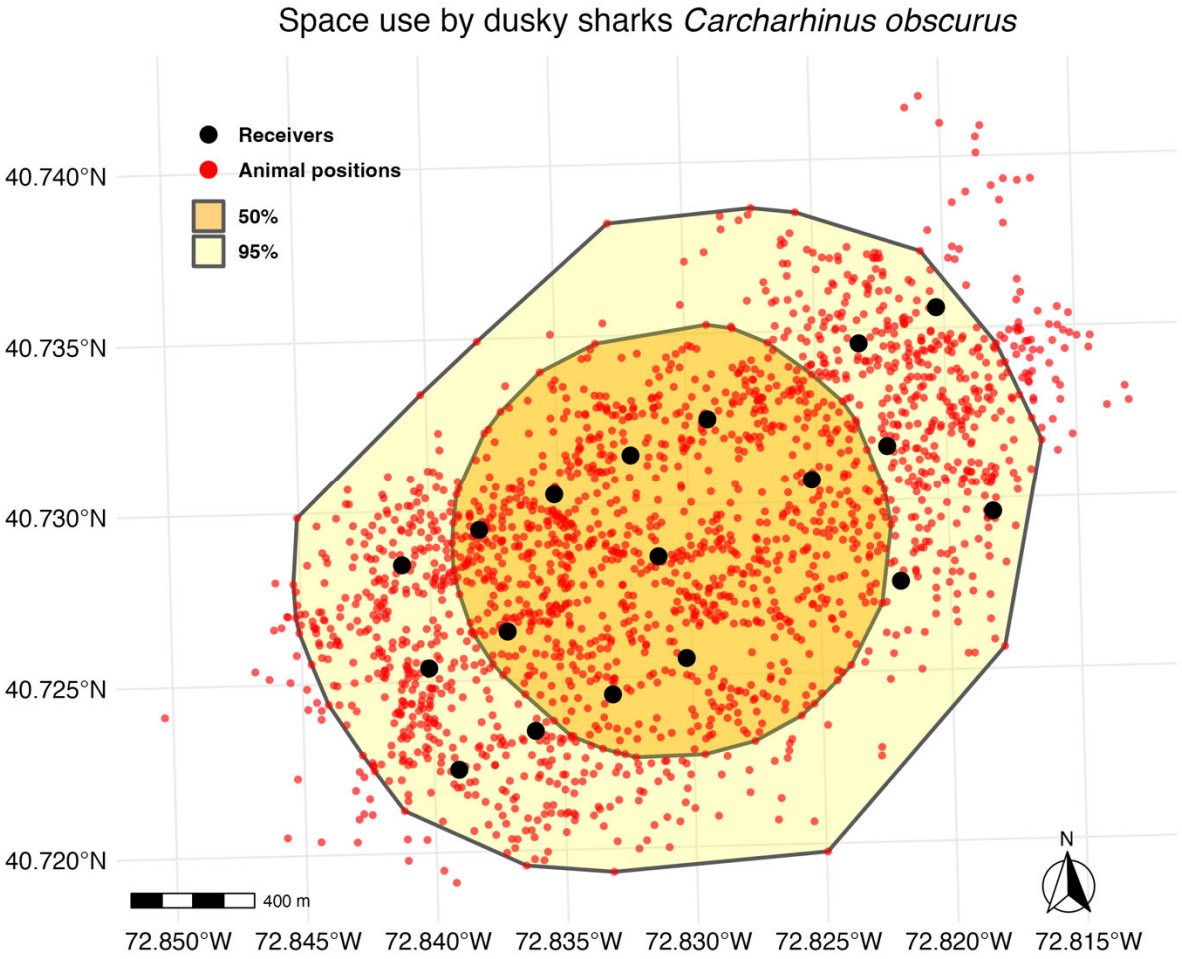

Figure 7: Space use around the Sunrise Wind Array by dusky sharks using minimum convex polygons. Red dots are the calculated animal positions using the Fathom Position software. Black dots refer to the downloaded receiver locations. The orange and yellow polygons suggest where the sharks spend 50% and 95% of their detected time, respectively. These positions and polygons are only calculated for 7/30/2022 to 12/23/2022.

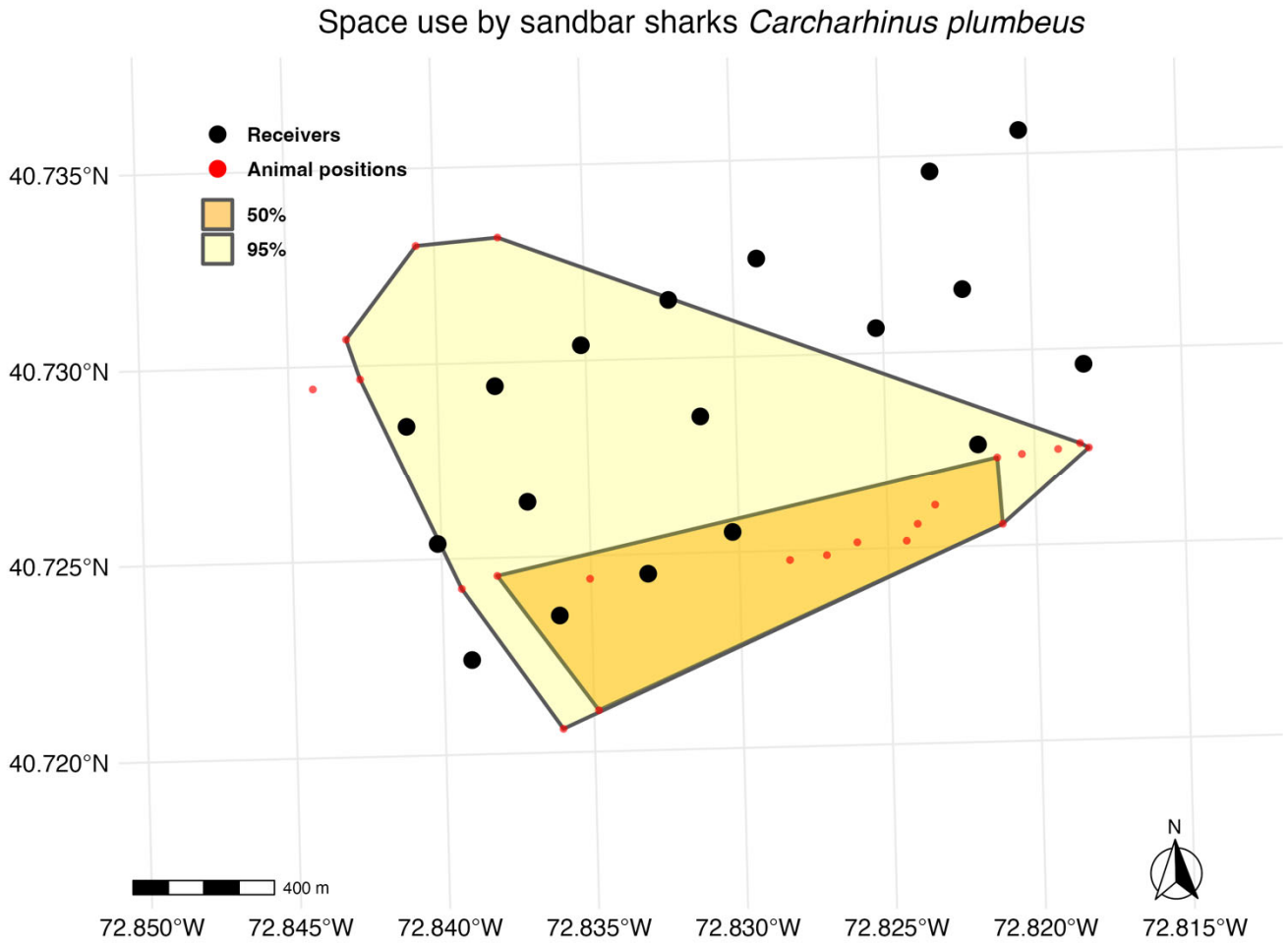

Figure 8: Space use around the Sunrise Wind Array by sandbar sharks using minimum convex polygons. Red dots are the calculated animal positions using the Fathom Position software. Black dots refer to the downloaded receiver locations. The orange and yellow polygons suggest where the sharks spend 50% and 95% of their detected time, respectively. These positions and polygons are only calculated for 7/30/2022 to 12/23/2022.

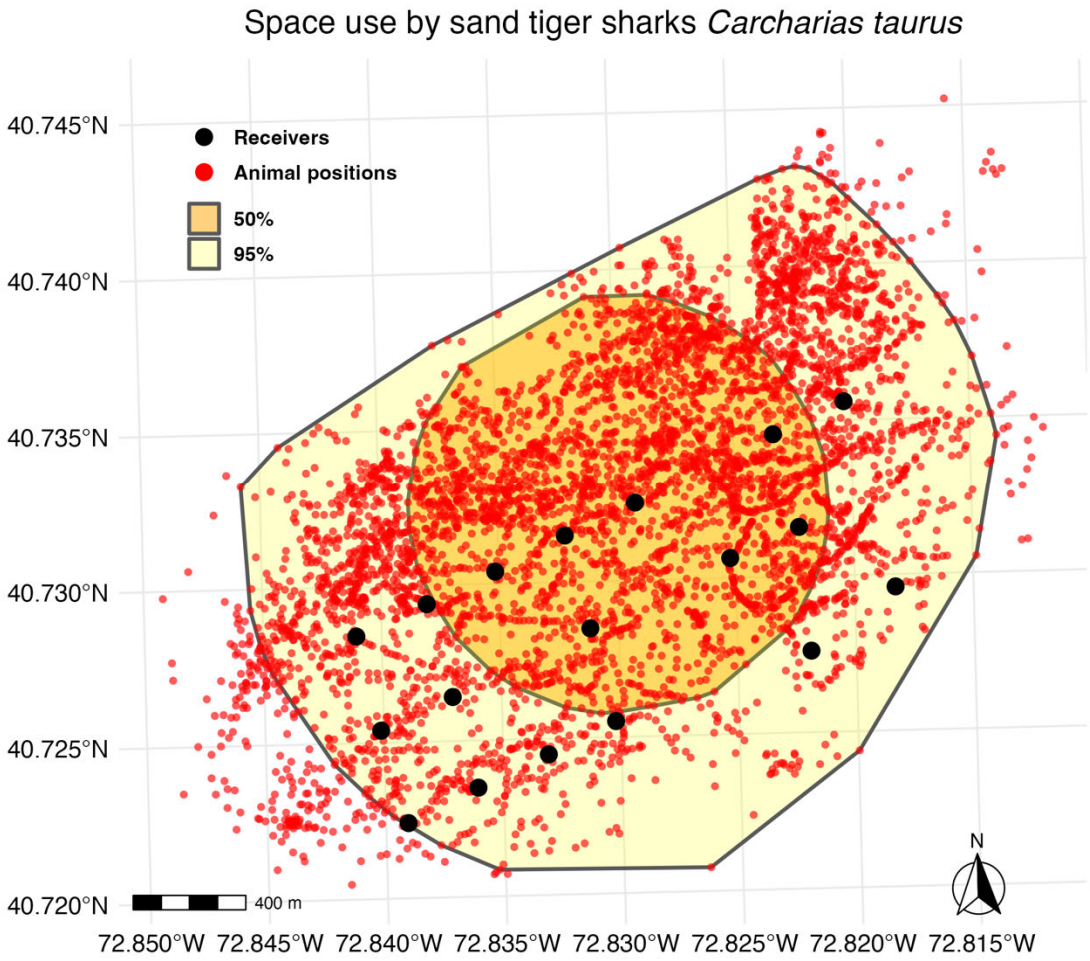

Figure 9: Space use around the Sunrise Wind Array by sand tiger sharks using minimum convex polygons. Red dots are the calculated animal positions using the Fathom Position software. Black dots refer to the downloaded receiver locations. The orange and yellow polygons suggest where the sharks spend 50% and 95% of their detected time, respectively. These positions and polygons are only calculated for 7/30/2022 to 12/23/2022

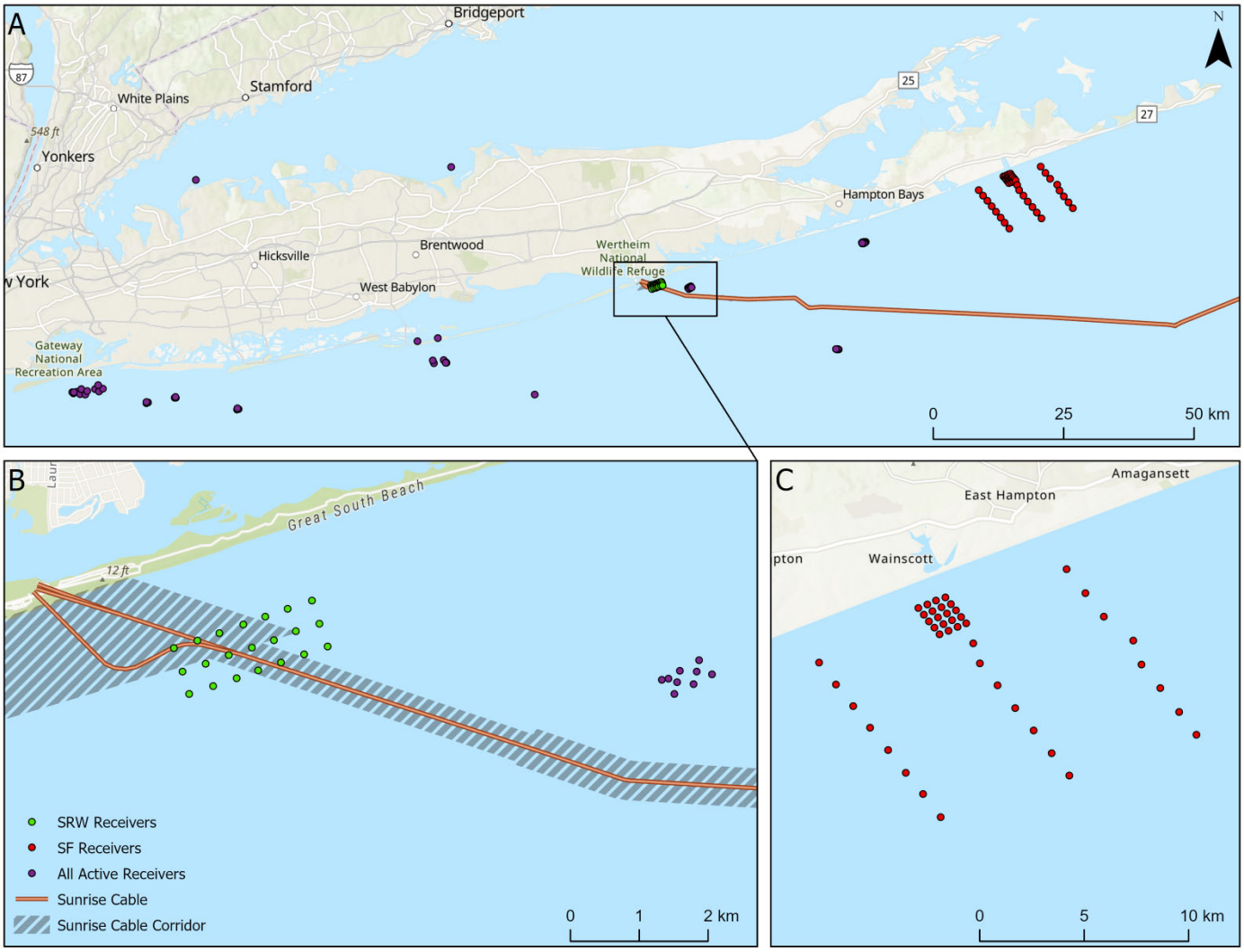

Figure 10: All receiver coverage around Long Island, NY maintained by Stony Brook University. Colored symbology shows receiver coverage for the Sunrise Wind project (green), South Fork (red) and artificial reef project (purple) maintained by the Peterson Lab.

1. **Annual Report:** Sunrise Wind Telemetry Project- Horseshoe Crab and Lobster

2. **Principle Investigator:** Matthew Sclafani[1]

   Project Partners: Robert Cerrato[2], Justin Bopp[1, 3]

   Contributing Technicians: Joe Costanzo [1], Stephen Havens [1], Kaitlin Morris [1], Jordan Russo[1]

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3. **Project Term:** January 2023 through December 2023

Introduction/Background

Cornell Cooperative Extension has been working with Stony Brook University to conduct a multi-year acoustic telemetry study to assess the potential impacts of the electromagnetic field (EMF) emitted by the Sunrise Wind Export Cable (SRWEC) on select migratory marine invertebrates. In collaboration with the Peterson Lab at Stony Brook University, a VEMCO VPS nearshore positional array was deployed in July 2022. This array was planned to be composed of 32 receivers and acoustic release buoys in an 8 x 4 pattern to reduce risks to local marine mammals, other protected species, and minimize interactions with commercial fisheries. Following the Spring 2023 download and subsequent issues recovering several receivers, the array was reduced from 32 receivers (four rows of eight) to 21 receivers (three rows of seven, Figure 1). There were 12 receivers recovered and downloaded in the fall of 2023. The positional array is designed to track the fine-scale movements of the targeted acoustically tagged fish and invertebrates, and to determine if there are any changes in behavior pre-and post-construction of the export cable.

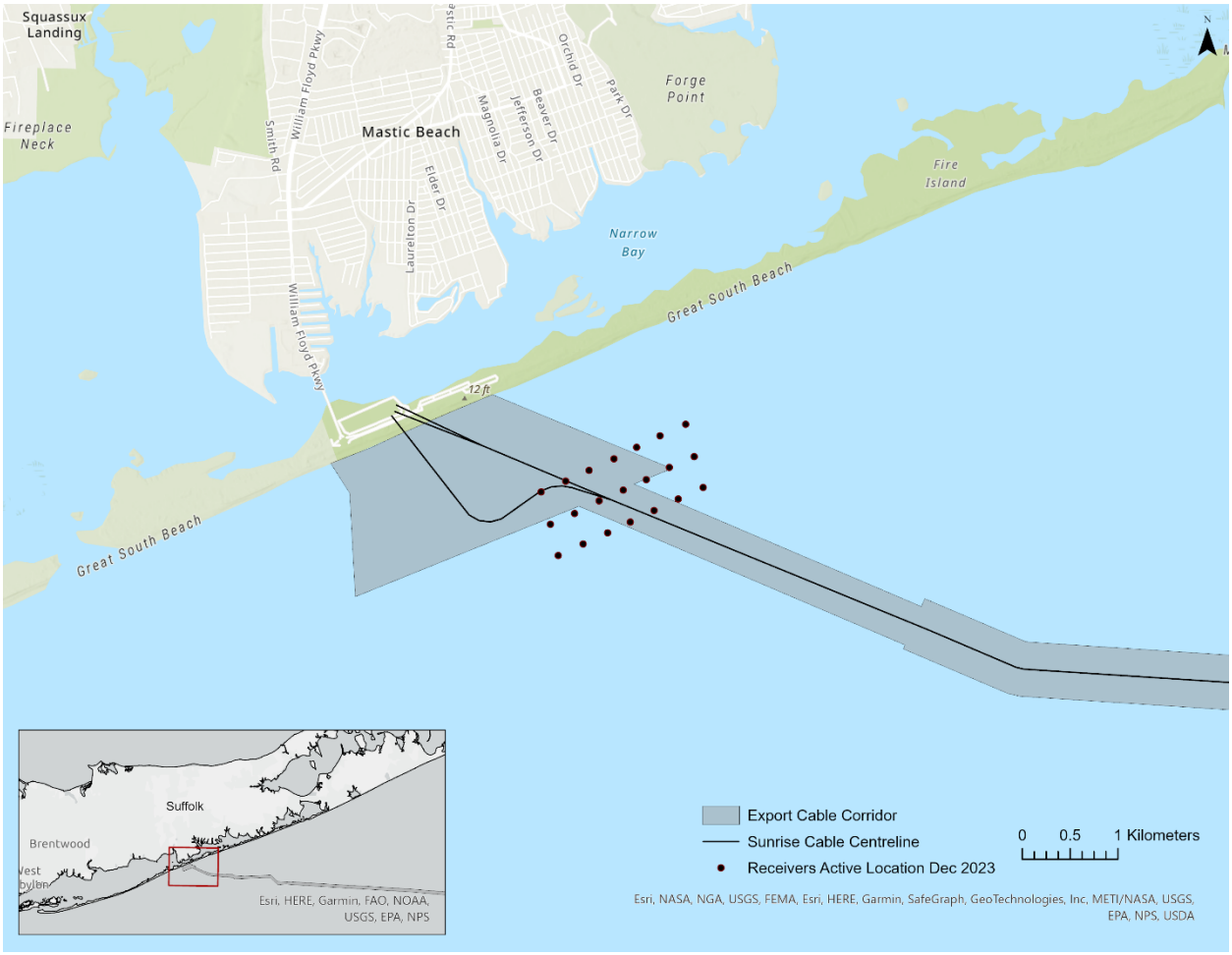


Figure 1. Active locations of the receivers as of December 15, 2023. The array overlaps the SRWEC to study fine-scale behavior of target species in relation to the potential effects of the electromagnetic field emitted.

Vessel Approval

CCE began the process of meeting Orsted's Health and Safety requirements and receiving approvals for the following vessels used on this research project: the R/V Karen/June and the R/V Scout. The vessels were inspected and later approved by Orsted after all safety requirements were fulfilled and all safety equipment was obtained.

Atlantic Horseshoe Crab Tagging Activity

From January to December of 2023, a total of 125 adult Atlantic Horseshoe Crabs were caught by hand at various locations within Moriches Bay (Figure 2). Of the 125 tagged horseshoe crabs, 66 were female (prosomal width 26.2 ± 2.16 cm) and 59 were male (prosomal width 21.4 ± 1.20 cm, Table 1, Figure 3). The horseshoe crabs were tagged with V16 (69kHz, 80/160 delay interval) acoustic telemetry transmitters following the established protocol by Brousseau et al. (Brousseau et al. 2004) utilizing a Velcro harness and Zap-a Gap CA+ superglue. They were subsequently released the same day and in healthy condition at the center of the Sunrise acoustic array. As of the end of September all 125 allotted tags were successfully attached, and crabs released in the center of the array. After the fall receiver download, of the 150 crabs tagged and released since the beginning of the project, all 150 were detected within the array.

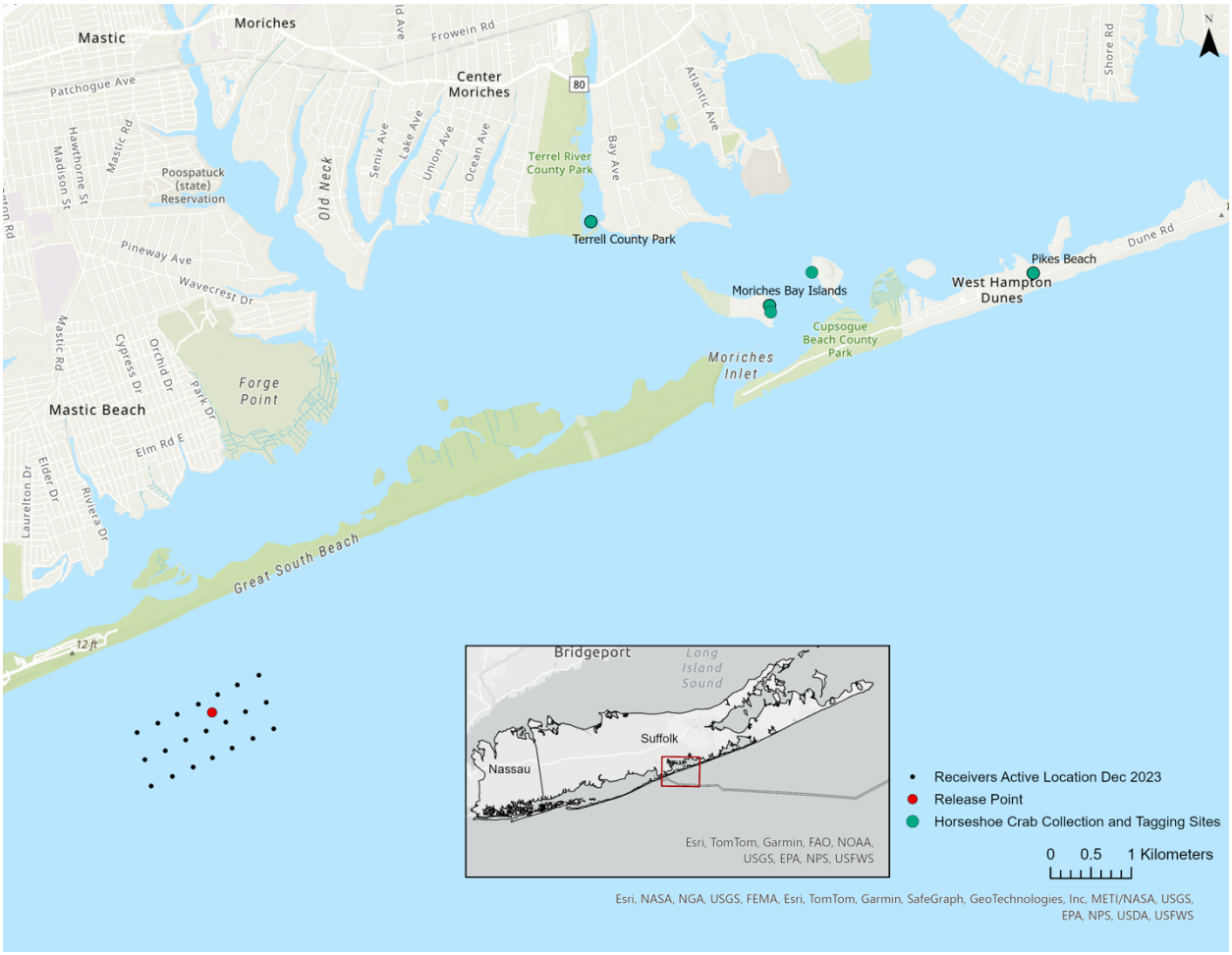


Figure 2. Diagram of the SRWEC fine-scale positional array in relation to the locations where horseshoe crabs were collected January to December 2023. The release location of tagged horseshoe crabs is in the center of the array (40.73050, -72.83018)

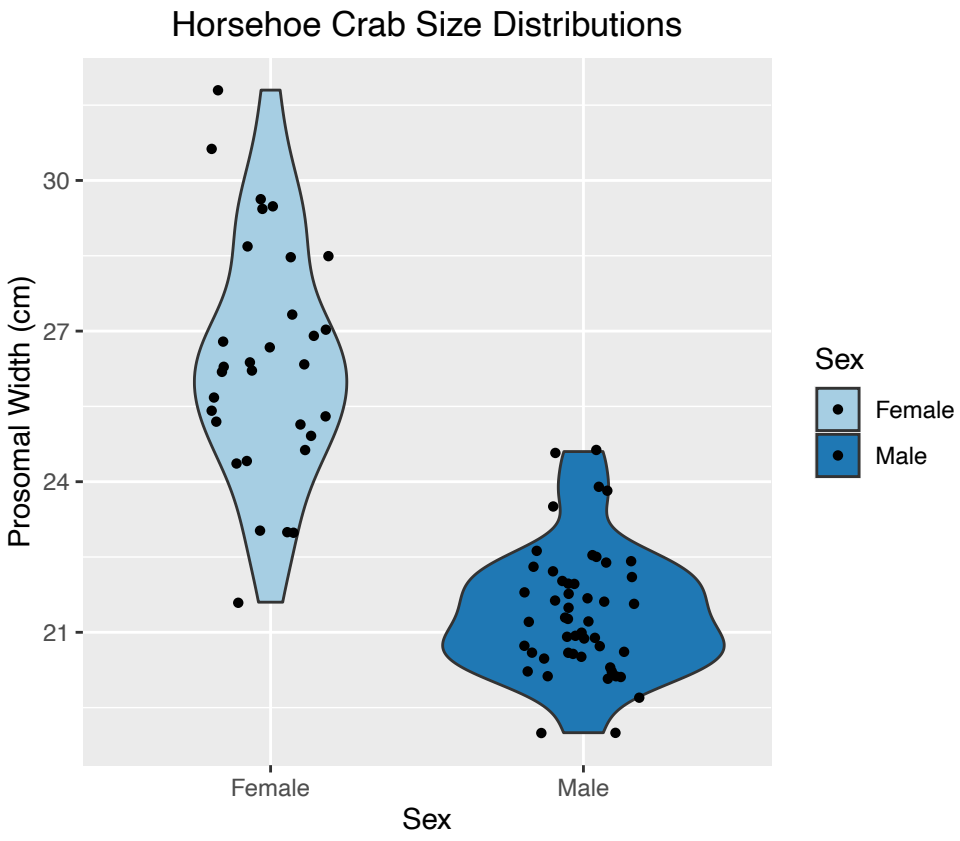


Figure 3. Size distribution of Atlantic horseshoe crab tagged from January to December 2023 for the Sunrise Wind Export Cable study. Female prosomal width 26.2 ± 2.16 cm. Male prosomal width 21.4 ± 1.20 cm

Table 1. Summary of Atlantic horseshoe crab tagged from January to December 2023 for the Sunrise Wind Export Cable study. Horseshoe crabs were caught by hand in Moriches Bay, tagged, and released in the center of the acoustic telemetry positioning array. Weight included any epibiont growth present on the carapace.

Date	Location	Acoustic Tag ID	Button Tag ID	Sex	Prosomal Width (cm)	Weight (kg)
6/7/23	Terrel County Park	A69-9001-55468	479175	Female	25.9	2.8
6/7/23	Terrel County Park	A69-9001-55469	479124	Female	27.3	2.96
6/7/23	Terrel County Park	A69-9001-55470	479173	Male	21.4	1.26
6/7/23	Terrel County Park	A69-9001-55471	513301	Male	21.4	1.28
6/7/23	Terrel County Park	A69-9001-55472	513302	Female	27.2	2.96
6/7/23	Terrel County Park	A69-9001-55473	513303	Male	22.4	1.44
6/7/23	Terrel County Park	A69-9001-55474	513305	Male	20.1	1.08
6/7/23	Terrel County Park	A69-9001-55475	513304	Male	20.5	0.82
6/7/23	Terrel County Park	A69-9001-55476	513306	Female	25.3	2.32
6/7/23	Terrel County Park	A69-9001-55477	513307	Male	20.2	1.2
6/7/23	Terrel County Park	A69-9001-55478	513308	Female	24.1	1.84
6/7/23	Terrel County Park	A69-9001-55479	513309	Male	21.6	1.02
6/7/23	Terrel County Park	A69-9001-55480	513310	Female	28.1	3.2
6/7/23	Terrel County Park	A69-9001-55481	513311	Female	30.7	4.48
6/7/23	Terrel County Park	A69-9001-55482	513312	Female	23.8	1.68
6/7/23	Terrel County Park	A69-9001-55483	513313	Male	21.7	1.18
6/7/23	Terrel County Park	A69-9001-55484	513314	Female	24.7	2.22
6/7/23	Terrel County Park	A69-9001-55485	513315	Female	29.2	2.48
6/29/23	Moriches Bay	A69-9001-55486	513326	Female	24.3	2.36
6/29/23	Moriches Bay	A69-9001-55487	510434	Female	26.5	2.8
6/29/23	Moriches Bay	A69-9001-55488	513327	Female	23.3	2.56
6/29/23	Moriches Bay	A69-9001-55489	513317	Female	26.9	3.58
6/29/23	Moriches Bay	A69-9001-55490	513325	Female	26.9	3.06
6/29/23	Moriches Bay	A69-9001-55491	513322	Female	25	2.48
6/29/23	Moriches Bay	A69-9001-55492	513321	Female	25.3	2.8
6/29/23	Moriches Bay	A69-9001-55493	513324	Female	25.4	2.3
6/29/23	Moriches Bay	A69-9001-55494	513323	Male	20.8	1.5
6/29/23	Moriches Bay	A69-9001-55495	513320	Female	26.9	3.1
6/29/23	Moriches Bay	A69-9001-55496	513316	Female	28.2	3.4
6/29/23	Moriches Bay	A69-9001-55497	513319	Female	25.7	2.48
6/29/23	Moriches Bay	A69-9001-55498	513318	Female	26.4	2.92
6/29/23	Moriches Bay	A69-9001-55499	513329	Female	24	2.38
6/29/23	Moriches Bay	A69-9001-55500	513328	Female	28.4	3.6
6/29/23	Moriches Bay	A69-9001-55501	513339	Female	29.8	3.9
6/29/23	Moriches Bay	A69-9001-55502	513340	Female	27.8	3.02
6/29/23	Moriches Bay	A69-9001-55503	513333	Female	24.6	2.34
6/29/23	Moriches Bay	A69-9001-55504	513334	Female	25.5	3.12
6/29/23	Moriches Bay	A69-9001-55505	513330	Female	26.4	2.58
6/29/23	Moriches Bay	A69-9001-55506	513337	Female	26.5	2.82
6/29/23	Moriches Bay	A69-9001-55507	513331	Female	27.9	3.04
6/29/23	Moriches Bay	A69-9001-55508	513332	Female	26.4	2.18
6/29/23	Moriches Bay	A69-9001-55509	513335	Female	23.9	2
6/29/23	Moriches Bay	A69-9001-55510	513336	Female	23	1.64
6/29/23	Moriches Bay	A69-9001-55511	513338	Female	22	1.6

7/5/23	Moriches Bay	A69-9001-55512	513341	Male	21	1.1
7/5/23	Moriches Bay	A69-9001-55513	513276	Male	21.3	1.1
7/5/23	Moriches Bay	A69-9001-55514	513282	Male	22.1	1.18
7/5/23	Moriches Bay	A69-9001-55515	513279	Male	22	1.44
7/5/23	Moriches Bay	A69-9001-55516	513281	Male	21.8	1.32
7/5/23	Moriches Bay	A69-9001-55517	513280	Male	20.9	0.98
7/5/23	Pikes Beach	A69-9001-52110	513277	Male	23.8	1.42
7/5/23	Pikes Beach	A69-9001-52111	513278	Male	22.6	1.14
7/5/23	Pikes Beach	A69-9001-52112	513283	Female	29.6	4.16
7/5/23	Pikes Beach	A69-9001-52113	513342	Male	20.9	1.06
7/5/23	Pikes Beach	A69-9001-52114	513285	Male	20.1	0.98
7/5/23	Pikes Beach	A69-9001-52115	513287	Male	21.6	1.18
7/5/23	Pikes Beach	A69-9001-52116	513292	Male	20.7	1.18
7/5/23	Pikes Beach	A69-9001-52117	513291	Male	20.2	0.94
7/5/23	Pikes Beach	A69-9001-52118	513290	Male	19.7	0.92
7/5/23	Pikes Beach	A69-9001-52119	513288	Male	20.9	1.16
7/5/23	Pikes Beach	A69-9001-52120	513286	Male	20.6	1.1
7/5/23	Pikes Beach	A69-9001-52121	513289	Male	20.2	0.94
7/5/23	Pikes Beach	A69-9001-52122	513284	Female	24.6	2.52
7/5/23	Pikes Beach	A69-9001-52123	513294	Male	21.7	1.3
7/5/23	Pikes Beach	A69-9001-52124	513297	Male	21.8	2.52
7/5/23	Pikes Beach	A69-9001-52125	513299	Female	26.9	3.02
7/5/23	Pikes Beach	A69-9001-52126	513345	Male	21.3	1.26
7/5/23	Pikes Beach	A69-9001-52127	513293	Male	23.9	1.88
7/5/23	Pikes Beach	A69-9001-52128	513344	Female	29.4	4.2
7/5/23	Pikes Beach	A69-9001-52129	513343	Female	24.9	2.72
7/5/23	Pikes Beach	A69-9001-52130	513295	Male	20.6	1.2
7/5/23	Pikes Beach	A69-9001-52131	513296	Male	21.6	1.56
7/5/23	Pikes Beach	A69-9001-52132	513300	Male	22	1.28
7/5/23	Pikes Beach	A69-9001-52133	513346	Male	19	0.9
7/5/23	Pikes Beach	A69-9001-52134	513298	Male	20.1	1
7/5/23	Pikes Beach	A69-9001-52135	458167	Male	20.6	1.26
7/5/23	Pikes Beach	A69-9001-52136	513347	Male	20.7	1.2
7/5/23	Pikes Beach	A69-9001-52137	513358	Male	22.5	1.29
7/5/23	Pikes Beach	A69-9001-52138	513349	Male	22.5	1.28
7/5/23	Pikes Beach	A69-9001-52139	513357	Male	24.6	1.7
7/5/23	Pikes Beach	A69-9001-52140	513354	Male	21.2	1.26
7/5/23	Pikes Beach	A69-9001-52141	513351	Male	22.2	1.16
7/5/23	Pikes Beach	A69-9001-52142	513350	Male	20.3	1.18
7/5/23	Pikes Beach	A69-9001-52143	513352	Male	20.1	0.92
7/5/23	Pikes Beach	A69-9001-52144	513353	Male	24.6	1.7
7/5/23	Pikes Beach	A69-9001-52145	513348	Male	21.2	1.04
7/5/23	Pikes Beach	A69-9001-52146	513356	Male	21.5	1.16
7/5/23	Pikes Beach	A69-9001-52147	513355	Male	20.6	1
7/6/23	Pikes Beach	A69-9001-52148	513359	Female	28.5	3.02
7/6/23	Pikes Beach	A69-9001-52149	513368	Male	20.5	0.86
7/6/23	Pikes Beach	A69-9001-52150	513367	Female	25.1	2.34
7/6/23	Pikes Beach	A69-9001-52151	513366	Male	22.4	1.44
7/6/23	Pikes Beach	A69-9001-52152	513363	Male	23.5	1.28
7/6/23	Pikes Beach	A69-9001-52153	513360	Male	22.4	1.36
7/6/23	Pikes Beach	A69-9001-52154	513364	Female	27	2.92
7/6/23	Pikes Beach	A69-9001-52155	513361	Female	25.4	2.06

7/6/23	Pikes Beach	A69-9001-52156	513365	Female	27.3	2.9
7/6/23	Pikes Beach	A69-9001-52157	513362	Female	28.5	3.82
7/6/23	Pikes Beach	A69-9001-52158	513369	Female	29.5	3.46
7/6/23	Pikes Beach	A69-9001-52159	513374	Female	26.8	2.1
7/6/23	Pikes Beach	A69-9001-52160	513375	Female	21.6	1.56
7/6/23	Pikes Beach	A69-9001-52161	513373	Female	26.3	2.36
7/6/23	Pikes Beach	A69-9001-52162	513377	Female	30.6	4.06
7/6/23	Pikes Beach	A69-9001-52163	513372	Female	23	1.6
7/6/23	Pikes Beach	A69-9001-52164	513370	Female	26.7	3.04
7/6/23	Pikes Beach	A69-9001-52165	513376	Male	22.3	1.42
7/6/23	Pikes Beach	A69-9001-52166	513371	Female	28.7	3.3
7/6/23	Pikes Beach	A69-9001-52167	513382	Female	31.8	4.44
7/6/23	Pikes Beach	A69-9001-52168	513381	Male	20.5	1.8
7/6/23	Pikes Beach	A69-9001-52169	513380	Female	26.2	2.22
7/6/23	Pikes Beach	A69-9001-52170	513379	Female	26.2	2.4
7/6/23	Pikes Beach	A69-9001-52171	513383	Female	24.4	1.84
7/6/23	Pikes Beach	A69-9001-52172	513378	Male	22	1.44
8/14/23	Moriches Bay	A69-9001-52173	488527	Male	20.1	0.8
8/14/23	Moriches Bay	A69-9001-52174	488526	Male	20.9	1.12
8/14/23	Moriches Bay	A69-9001-52175	488537	Female	25.7	2.48
8/14/23	Moriches Bay	A69-9001-52176	488533	Female	23	1.96
8/22/23	Moriches Bay	A69-9001-52177	478097	Female	23	2.5
8/22/23	Moriches Bay	A69-9001-52178	478105	Male	21.6	1.3
8/22/23	Moriches Bay	A69-9001-52179	477797	Female	26.4	2.18
8/23/23	Moriches Bay	A69-9001-52180	478319	Female	25.2	2.7
8/23/23	Moriches Bay	A69-9001-52181	477798	Female	26.3	3.08
8/23/23	Moriches Bay	A69-9001-52182	477799	Female	25.3	2.24
8/23/23	Moriches Bay	A69-9001-52183	477800	Male	19	0.98
8/23/23	Moriches Bay	A69-9001-52184	478046	Female	24.4	1.86

American Lobster Tagging Activity

From January through December of 2023, a total of 50 adult American lobsters were caught by conventional lobster traps at Hempstead Reef, Moriches Reef, and Fire Island Reef (Figure 4) with the aid of a lobsterman. Of the 50 tagged lobsters 25 were female (carapace length 92.4 ± 6.89 mm) and 25 were male (carapace length 102 ± 12.1 mm, Table 2, Figure 5). The lobsters were tagged with V13 (69kHz, 80/160 delay interval) acoustic telemetry transmitters following the established protocol by Brousseau et al. (Brousseau et al. 2004) utilizing a Velcro harness and Zap-a Gap CA+ superglue. They were subsequently released the same day and in healthy condition at the center of the Sunrise acoustic array (40.73050, -72.83018). After the fall receiver download, of 50 lobsters released, all 50 were detected on a receiver within the array. In late fall of 2023, a recreational lobsterman reported re-capturing three lobsters with tags on them at the Moriches Reef. However, he only relayed tag information (i.e. Tag IDs) for one of those lobsters. This lobster was detected within the array from early February until late May 2023, after which no more detections were observed in the study area.

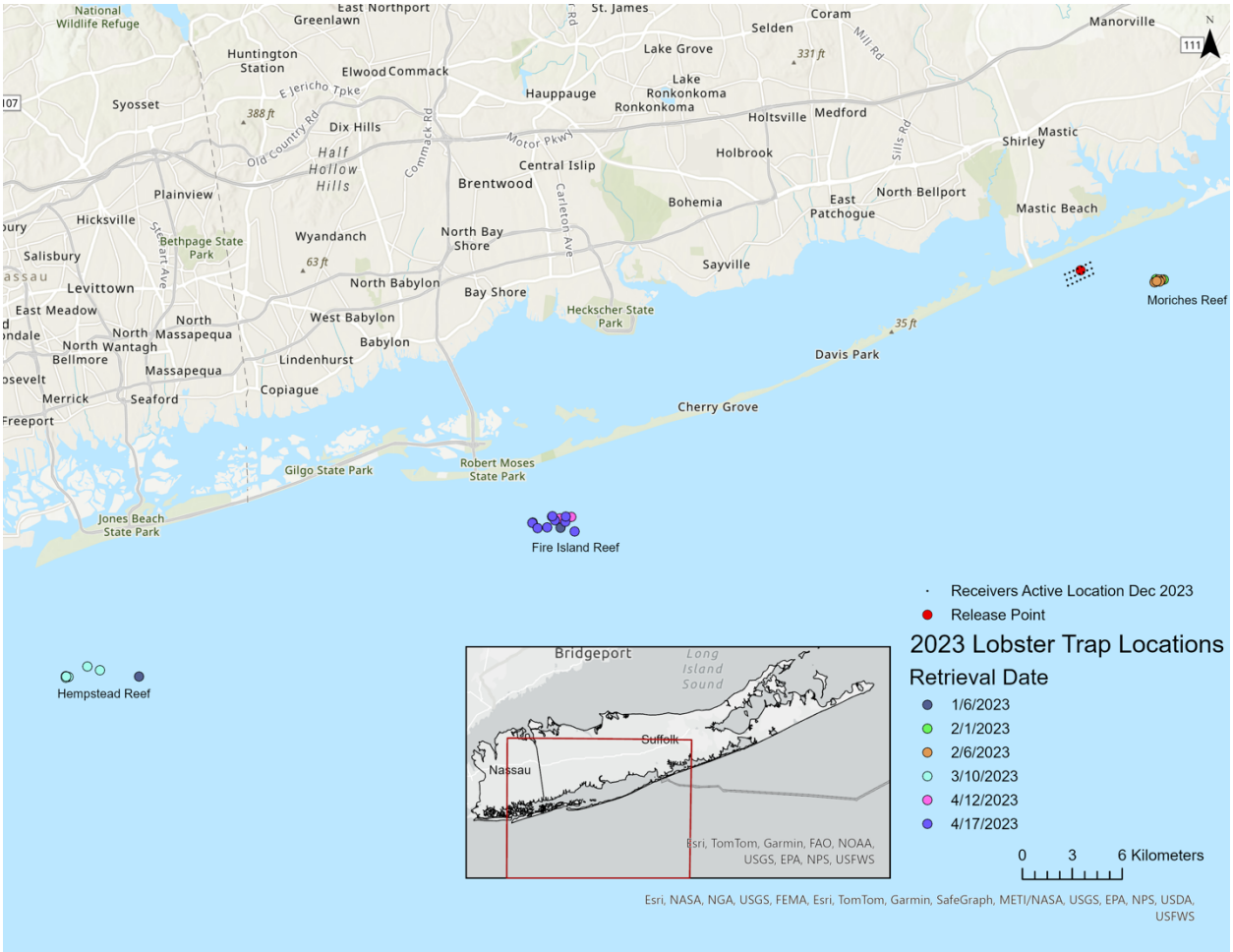


Figure 4. Diagram of the SRWEC fine-scale positional array in relation to the locations where lobster traps were set and retrieved from January to December 2023. The release location of tagged lobsters was in the center of the array (40.73050, -72.83018)

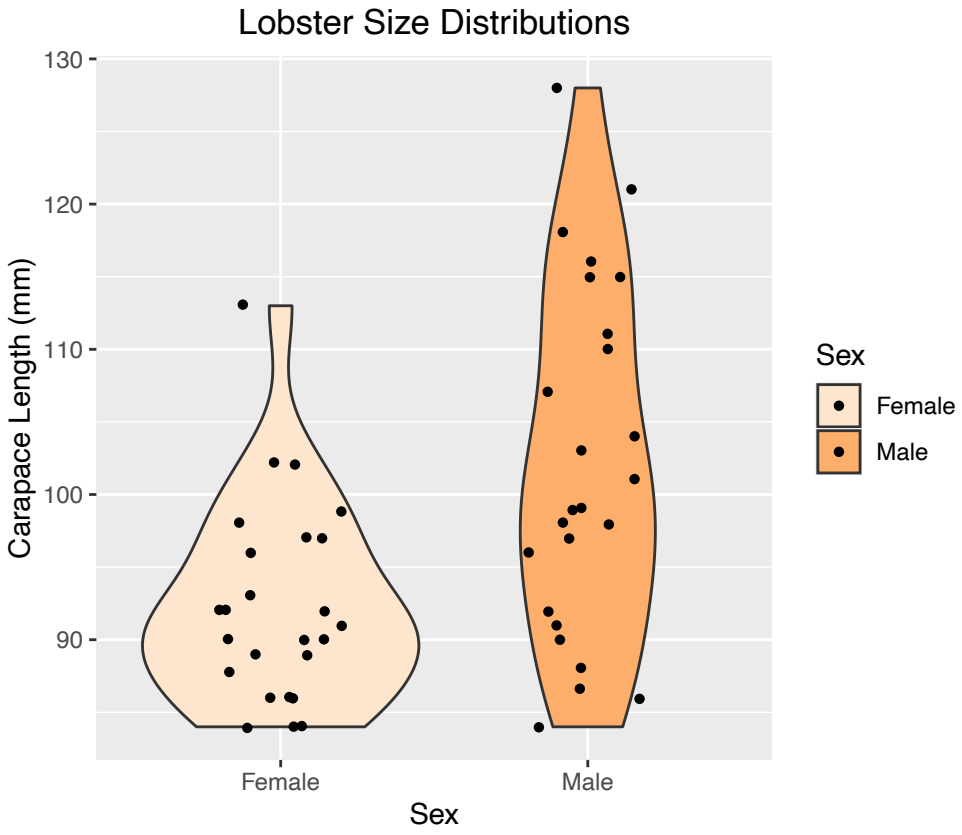


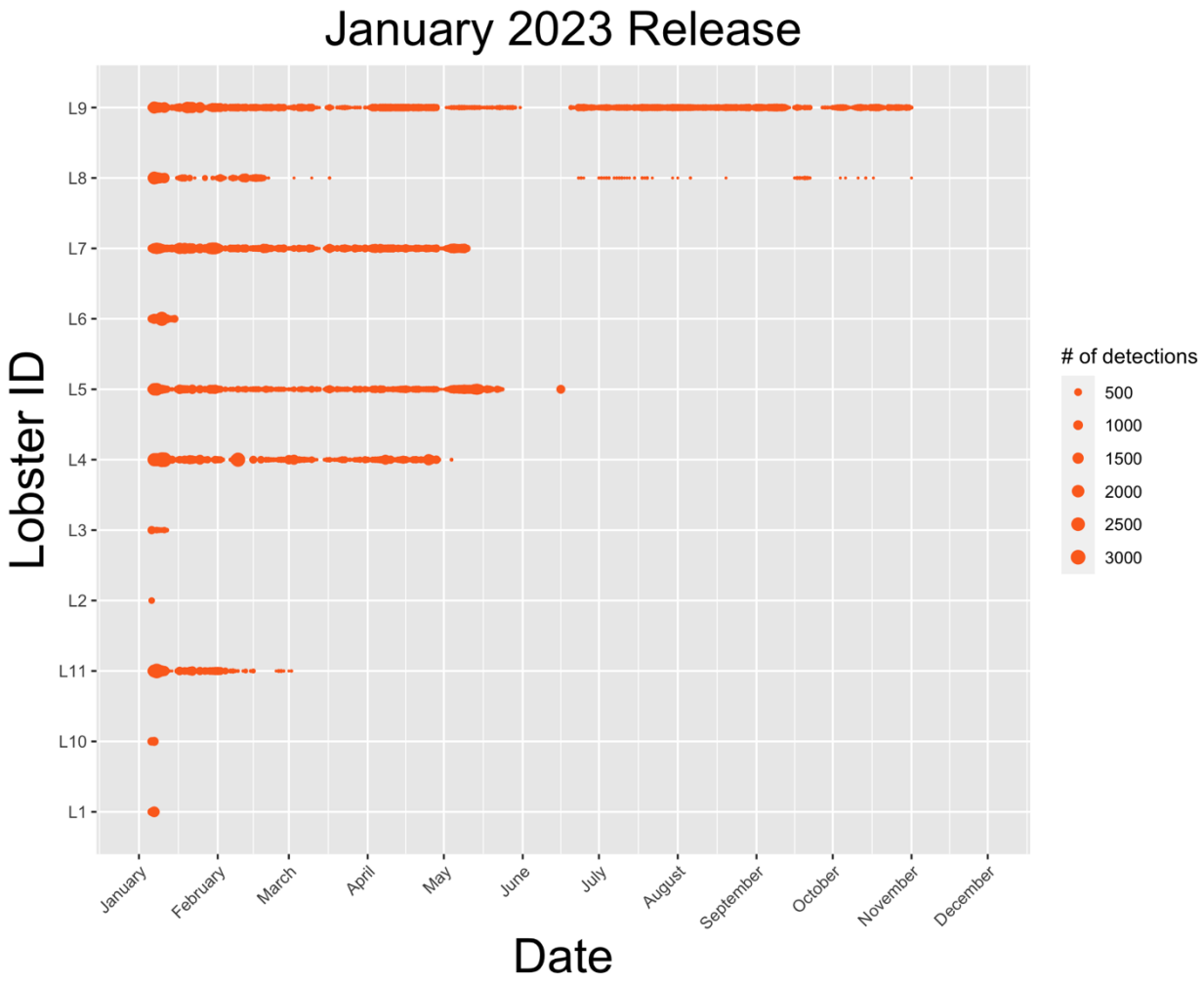
Figure 5. Size distribution of American lobsters tagged from January to December 2023 for the Sunrise Wind Export Cable study. Female carapace length 92.4 ± 6.89 mm. Male carapace length 102 ± 12.1 mm

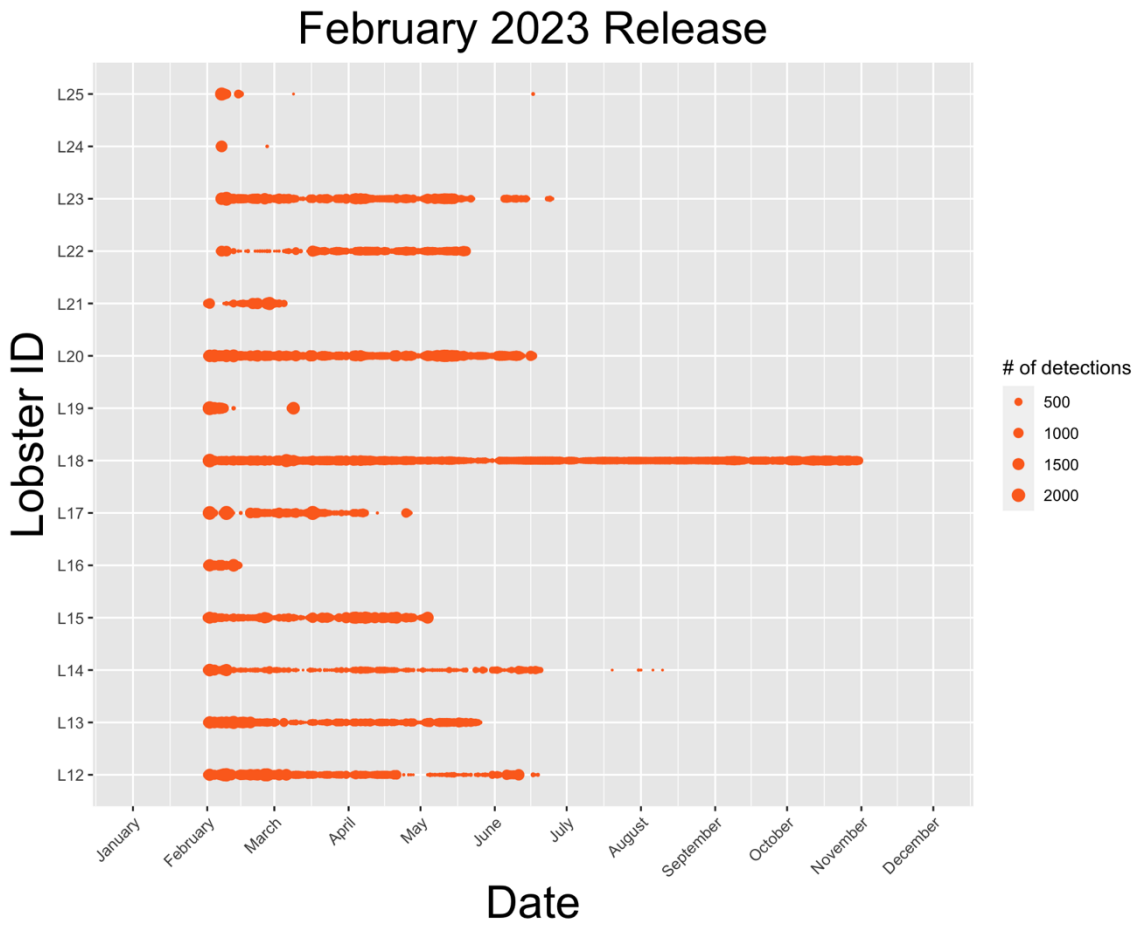
Table 2. Summary of American lobster tagged from January to December 2023 for the Sunrise Wind Export Cable study. Lobster were trapped at Hempstead, Moriches, and Fire Island Reef, tagged, and released in the center of the array

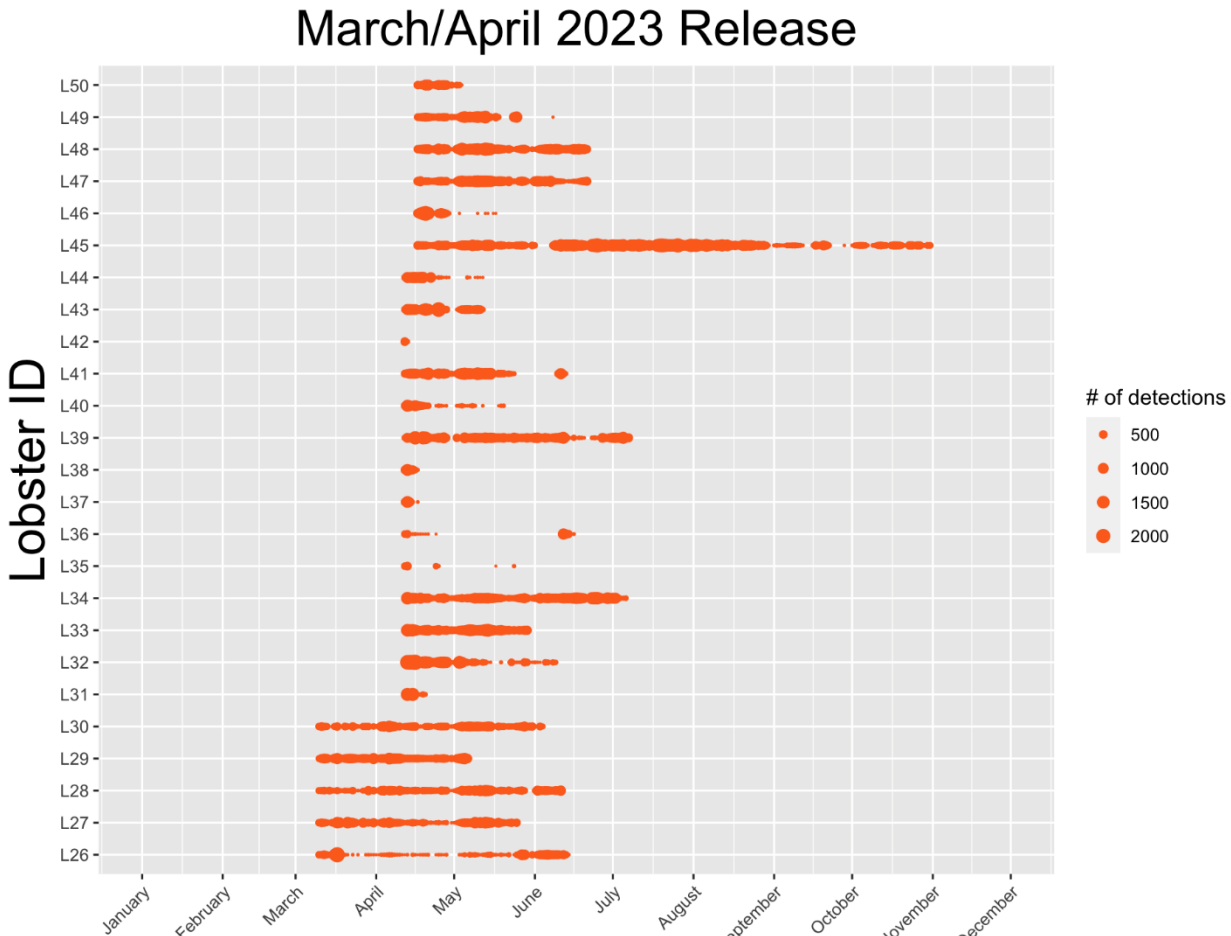
Date	Acoustic Tag ID	Floy Tag ID	Sex	Carapace Length (mm)	Weight (kg)
1/6/23	1537037	5	Female	98.0	0.8
1/6/23	1537038	3	Male	115.0	1.5
1/6/23	1537039	6	Female	98.8	0.8
1/6/23	1537041	7	Male	118.0	1.3
1/6/23	1537042	8	Female	102.2	0.9
1/6/23	1537043	9	Male	116.0	1.6
1/6/23	1537044	11	Female	87.7	0.6
1/6/23	1537046	12	Male	107.0	0.9
1/6/23	1537047	13	Female	89.0	0.5
1/6/23	1537048	14	Male	86.6	0.5
1/6/23	1537050	16	Male	86.0	0.6
2/1/23	1537040	18	Female	92.0	0.6
2/1/23	1537045	20	Male	121.0	1.5
2/1/23	1537049	28	Male	90.0	0.5
2/1/23	1537051	19	Male	98.0	0.7
2/1/23	1537052	21	Male	104.0	1.1
2/1/23	1537053	22	Male	115.0	1.4
2/1/23	1537054	25	Female	92.0	0.7
2/1/23	1537055	24	Female	92.0	0.7
2/1/23	1537056	26	Female	96.0	0.7
2/1/23	1537057	27	Female	97.0	0.7
2/6/23	1537058	29	Male	110.0	1.2
2/6/23	1537059	30	Female	93.0	0.6
2/6/23	1537060	31	Male	98.0	0.7
2/6/23	1537061	32	Female	102.0	0.9
3/10/23	1537062	33	Male	92.0	0.8
3/10/23	1537063	34	Male	97.0	0.8
3/10/23	1537064	35	Male	103.0	0.9
3/10/23	1537065	36	Female	90.0	0.8
3/10/23	1537066	37	Male	88.0	0.6
4/12/23	1537067	23	Male	128.0	1.7
4/12/23	1537068	39	Male	96.0	0.6
4/12/23	1537069	38	Male	99.0	0.7
4/12/23	1537070	40	Female	90.0	0.6
4/12/23	1537071	41	Male	101.0	0.8
4/12/23	1537072	42	Female	84.0	0.6
4/12/23	1537073	43	Female	113.0	1.2
4/12/23	1537074	44	Male	111.0	1.1
4/12/23	1537075	45	Male	91.0	0.8
4/12/23	1537076	46	Male	99.0	0.8
4/12/23	1537077	47	Female	90.0	0.7
4/12/23	1537078	48	Female	89.0	0.6
4/12/23	1537086	49	Female	84.0	0.5
4/12/23	1537080	50	Female	86.0	0.5
4/17/23	1537081	51	Female	86.0	0.5
4/17/23	1537082	52	Male	84.0	0.6
4/17/23	1537083	53	Female	84.0	0.5
4/17/23	1537084	54	Female	86.0	0.5
4/17/23	1537085	55	Female	91.0	0.6
4/17/23	1537079	56	Female	97.0	0.8

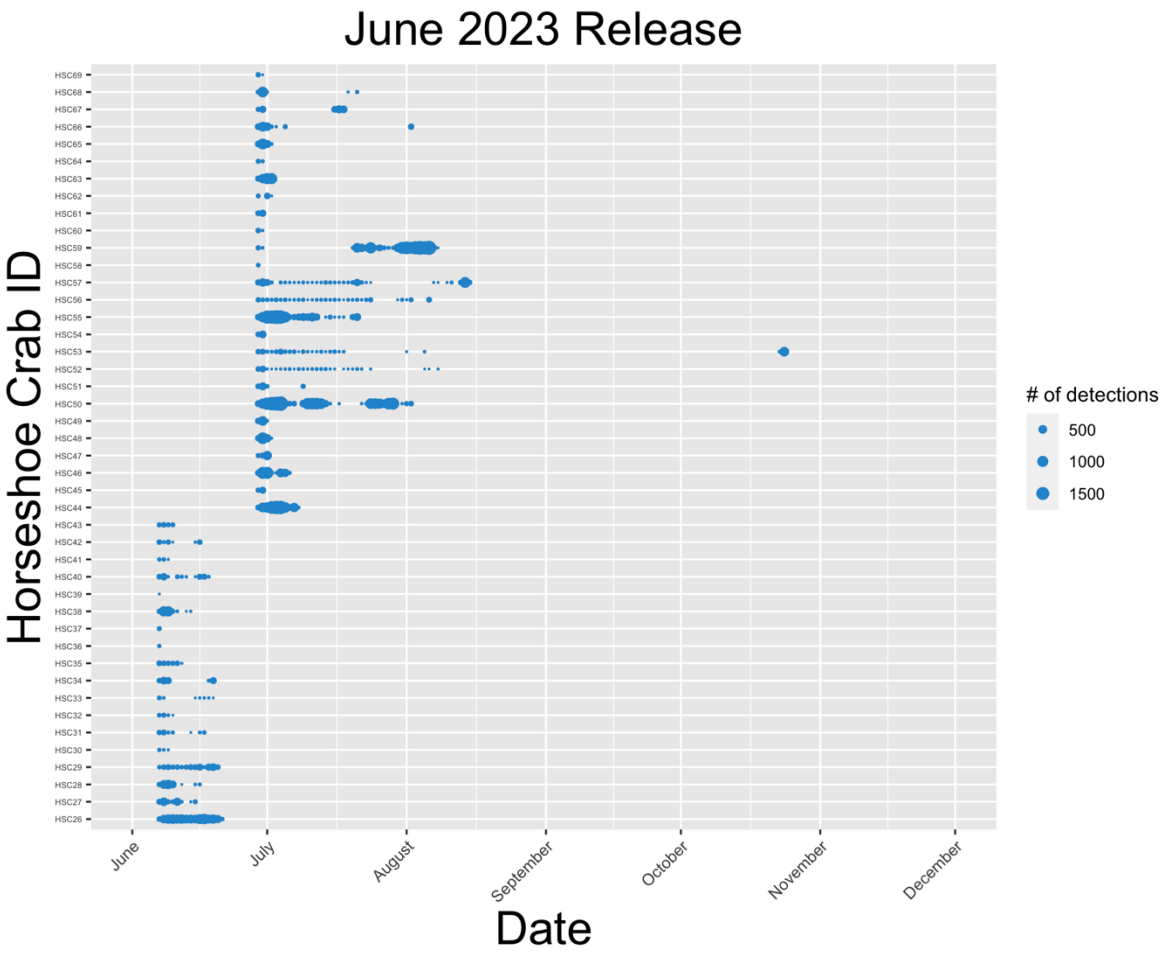
Brief Daily Detection Summary Plots

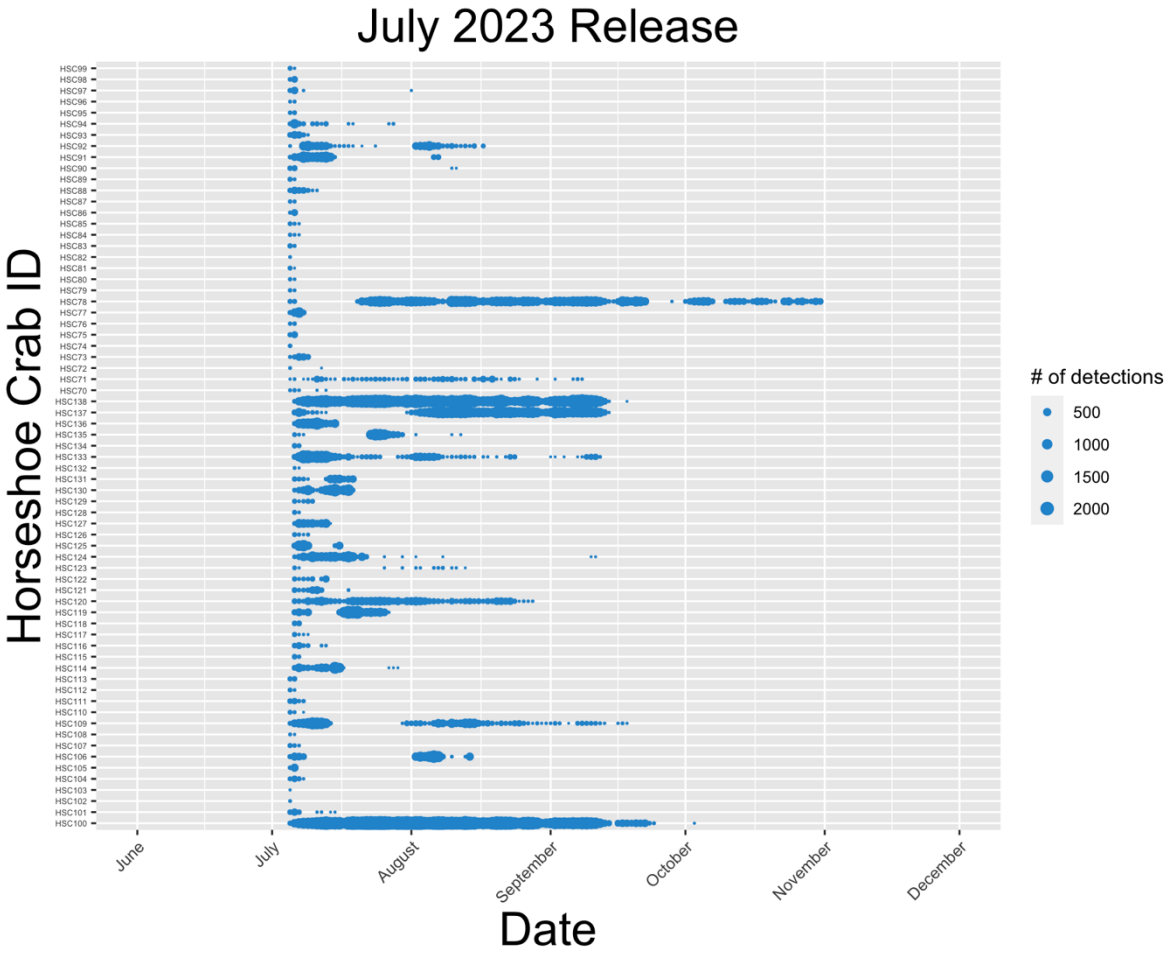
The following plots are daily detection summaries of all tagged animals for 2023, separated into the months they were released.




February 2023 Release
Lobster ID
L25
L24
L23
L22
L21
L20
L19
L18
L17
L16
L15
L14
L13
L12
January
February
March
April
May
June
July
August
September
October
November
December
Date
# of detections
500
1000
1500
2000


March/April 2023 Release
Lobster ID
L50
L49
L48
L47
L46
L45
L44
L43
L42
L41
L40
L39
L38
L37
L36
L35
L34
L33
L32
L31
L30
L29
L28
L27
L26
January
February
March
April
May
June
July
August
October
# of detections
500
1000
1500
2000


June 2023 Release
Horseshoe Crab ID
HSC69
HSC68
HSC67
HSC66
HSC65
HSC64
HSC63
HSC62
HSC61
HSC60
HSC59
HSC58
HSC57
HSC56
HSC55
HSC54
HSC53
HSC52
HSC51
HSC50
HSC49
HSC48
HSC47
HSC46
HSC45
HSC44
HSC43
HSC42
HSC41
HSC40
HSC39
HSC38
HSC37
HSC36
HSC35
HSC34
HSC33
HSC32
HSC31
HSC30
HSC29
HSC28
HSC27
HSC26
June
July
August
September
October
November
December
Date
# of detections
500
1000
1500


July 2023 Release
Horseshoe Crab ID
HSC99
HSC98
HSC97
HSC96
HSC95
HSC94
HSC93
HSC92
HSC91
HSC90
HSC89
HSC88
HSC87
HSC86
HSC85
HSC84
HSC83
HSC82
HSC81
HSC80
HSC79
HSC78
HSC77
HSC76
HSC75
HSC74
HSC73
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HSC71
HSC70
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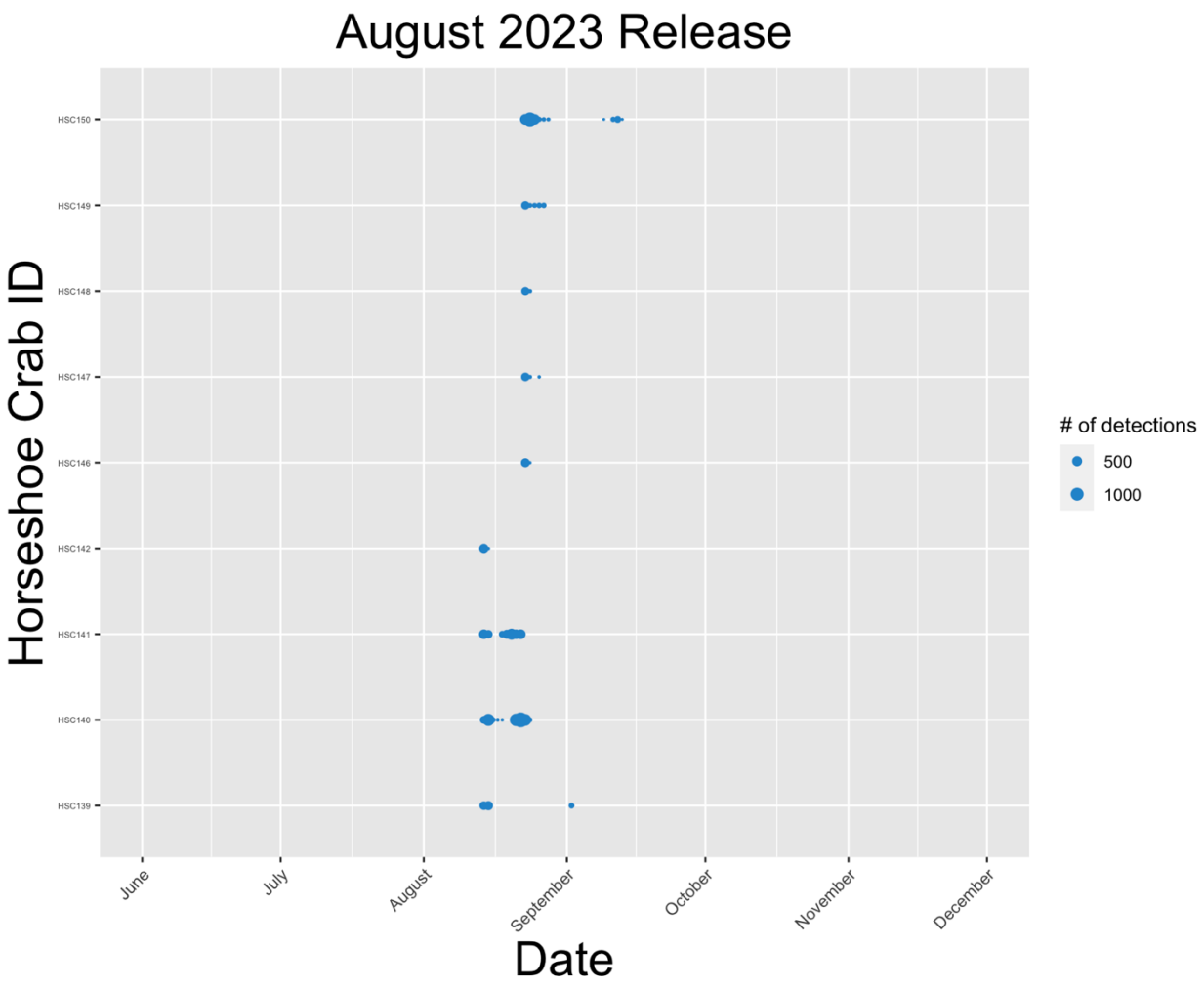
HSC134
HSC133
HSC132
HSC131
HSC130
HSC129
HSC128
HSC127
HSC126
HSC125
HSC124
HSC123
HSC122
HSC121
HSC120
HSC119
HSC118
HSC117
HSC116
HSC115
HSC114
HSC113
HSC112
HSC111
HSC110
HSC109
HSC108
HSC107
HSC106
HSC105
HSC104
HSC103
HSC102
HSC101
HSC100
June
July
August
September
October
November
December
Date
# of detections
500
1000
1500
2000


August 2023 Release
Horseshoe Crab ID
HSC150
HSC149
HSC148
HSC147
HSC146
HSC142
HSC141
HSC140
HSC139
June
July
August
September
October
November
December
Date
# of detections
500
1000

References

Brousseau, L.J., Sclafani, M., Smith, D.R. and Carter, D.B., 2004. Acoustic-tracking and radio-tracking of horseshoe crabs to assess spawning behavior and subtidal habitat use in Delaware Bay. North American Journal of Fisheries Management, 24(4), pp.1376-1384.

Photos of lobster and horseshoe crab tags used in this study.