AEON April 2025 Cruise Report
R/V Connecticut
4-12 April 2025
Groton, CT to Groton, CT

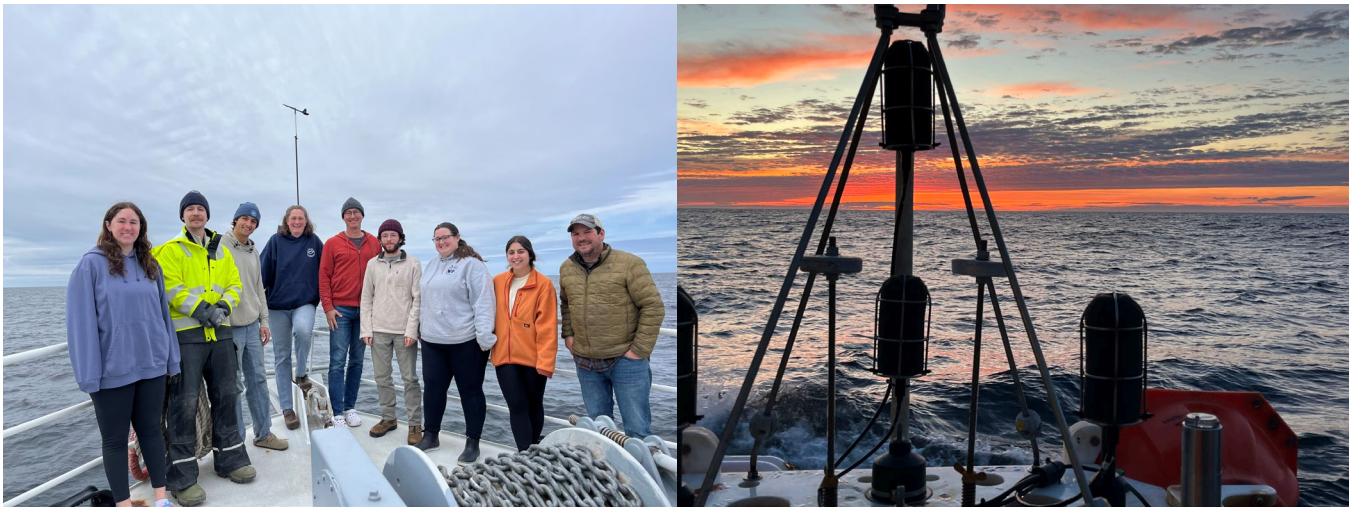

Photo credit: Jennifer Miksis-Olds

AEON: Chief Scientist Jennifer Miksis-Olds (UNH), Daryll Carlson (UNH), Emma VerGow (UNH), Anthony Lyons (UNH), Paige Tortorice (Stony Brook), Alex Gross (JASCO), Mike Rosen (Close Focus), Jake Harrington (JASCO), Dean Hernandez (Stony Brook)

Cruise Summary

This cruise report covers annual fieldwork in support of the Acoustic and Environmental Observation Network (AEON) bottom landers in the Gulf of Maine as part of ongoing research under Office of Naval Research Award N00014-23-1-2767 "Gulf of Maine Regional Acoustic Network". The AEON landers collect acoustical and environmental data at 5 locations (3 in US waters and 2 in Canadian waters). The Canadian field effort was conducted in compliance with *Canadian Foreign Scientific Research License (344152)* covering the time period Mar 31 – May 31, 2025. The fieldwork took place from 4-12 April 2025 aboard the RV Connecticut This effort serviced the 3 US waters lander sites and 2 landers in Canadian waters (Figure 1).

The objectives for the research cruise efforts were to recover bottom landers at 5 sites (Table 1), re-deploy 5 landers at the same sites, collect CTD profiles to characterize hydrographic conditions at the sites, conduct net sampling to collect biological specimens at each site, and conduct fine-scale (roughly 5 n.mi by 5 n.mi) multi-frequency acoustic surveys at each site. We were able to successfully recover 4 landers at sites AEON 1 NEC, AEON 2 ECS, AEON 3 GEB, and AEON 5 WIB in April 2025. The AEON4 JOB lander confirmed release on both acoustic releases but did not surface. An ROV recovery effort will be launched to recover this lander at a later date. New landers were deployed at all 5 locations.

AEON site naming conventions are: NEC=Northeast Channel, ECS=Eastern Coastal Shelf, GEB=Georges Basin, JOB=Jordan Basin, WIB=Wilkinson Basin (Figure 1). All the AEON site number identifiers are being retained, as these site numbers are identified in ONR environmental paperwork and approvals. The 3-letter geographical site information has been added to each site.

Station	Lat	Long	Country
AEON1 NEC	42.30	-65.98	Canada
AEON2 ECS	42.84	-66.73	Canada
AEON3 GEB	42.62	-68.14	US
AEON4 JOB	43.81	-67.68	US
AEON5 WIB	42.87	-70.06	US

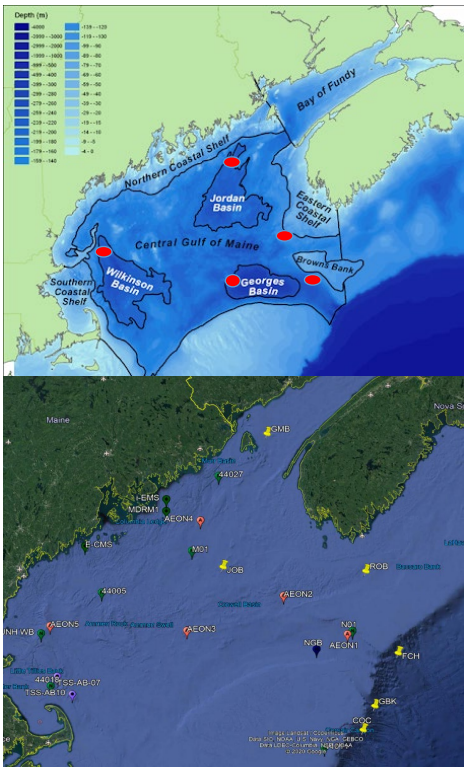

Figure 1. AEON lander locations. Image in the top right shows the AEON locations in reference to local basins and bathymetry. Image in the bottom right shows AEON locations in relation to other sampling platforms that do not include acoustics.

Table 1. Summary of sampling that occurred at each site location during the Apr 2025 research cruises.

Site	Lander Recovered	Lander Deployed	CTD casts	Ring net tows	Fine-Scale Acoustic Survey
AEON 1 **NEC**	Yes	Yes	2	1	Yes
AEON 2 **ECS**	Yes	Yes	2	1	Incomplete
AEON 3 **GEB**	Yes	Yes	2	1	Yes
AEON 4 **JOB**	No	Yes	2	1	No
AEON 5 **WIB**	Yes	Yes	1	1	Yes

Ocean Bottom Landers

At four sites, landers were successfully recovered, and new landers were deployed. At the fifth station, the lander was not successfully recovered, but a fresh lander was deployed to avoid any time series gaps. (Table 2). Lander deployment was performed via the knuckle crane and quick release. The lander was lifted and suspended over the starboard of the vessel and then lowered into the water. Once the lander was fully submerged, the quick release was triggered, and the lander dropped. For each station, range measurements to the acoustic releases were taken at the four cardinal points around the lander approximately 500 m from the deployment site to calculate a more precise lander position on the seafloor. This was followed by a 1 km Closest Point of Approach (CPA) transect in the E-W direction through the N cardinal point. At AEON1, the lander did not surface upon arrival on 2025-April-10. The lander surfaced 2025-April-12 and was retrieved by a different vessel on 2025-April-15. At AEON4 the lander did not surface upon arrival on 2025-April-10 and remains on the bottom.

During recovery, upon arrival at each station, the lander was first communicated with via the acoustic releases and range was established. If the range was acceptable, the landers were released from the anchor. Once the lander was spotted on the surface, the vessel approached the lander on the starboard side and was hooked via a snap hook line that led into the knuckle crane winch. Once this connection was made, snap hooks tied to taglines were also secured to the uprights on the lander to assist in controlling the lander as it was retrieved. The lander was then brought on board over the starboard side and secured for transit.

Table 2. Table: Lander deployment locations, depth and estimated bottom locations

Site		Deployment Location		Estimated Location		Estimated Depth (m)	Drop Date	Time (UTC)
	Notation	Latitude N	Longitude W	Latitude N	Longitude W			
AEON1	Decimal degrees	42.30365	-65.98818	42.30399	-65.98869	239	2025-April-10	21:18
	Degrees decimal minutes	42° 18.219’	65° 59.291’	42° 18.239’	65° 59.321’			
	Degrees minutes seconds	42° 18’ 13.14”	65° 59’ 17.46”	42° 18’ 14.36”	65° 59’ 19.28”			
AEON2	Decimal degrees	42.84090	-66.73125	42.84088	-66.73098	228	2025-April-10	06:55
	Degrees decimal minutes	42° 50.454’	66° 43.875	42° 50.453’	66° 43.859’			
	Degrees minutes seconds	42° 50’ 27.24”	66° 43’ 52.50”	42° 50’ 27.17”	66° 43’ 51.53”			
AEON3	Decimal degrees	42.62183	-68.14872	42.62188	-68.14868	196	2025-April-07	12:40
	Degrees decimal minutes	42° 37.310’	68° 08.923’	42° 37.313’	68° 08.921’			
	Degrees minutes seconds	42° 37’ 18.60”	68° 8’ 55.38”	42° 37’ 18.77”	68° 8’ 55.25”			
AEON4	Decimal degrees	43.80622	-67.67987	43.80639	-67.68005	223	2025-April-06	20:01
	Degrees decimal minutes	43° 48.373’	67° 40.792’	43° 48.383’	67° 40.803’			
	Degrees minutes seconds	43° 48’ 22.38”	67° 40’ 47.52”	43° 48’ 22.00”	67° 40’ 48.18”			
AEON5	Decimal degrees	42.86637	-70.06360	42.86620	-70.06354	136	2025-April-05	12:25
	Degrees decimal minutes	42° 51.982’	70° 03.816’	42° 51.972’	70° 03.812’			
	Degrees minutes seconds	42° 51’ 58.92”	70° 3’ 48.96”	42° 51’ 58.32”	70° 3’ 48.74”			

Net Sampling

A 50 cm diameter (333 micron mesh) ring net was used to sample the zooplankton populations at all five (AEON5 WIB, AEON3 GEB, AEON4 JOB, AEON2 ECS, and AEON1 NEC) sites (Figure 2, Table 1). A vertical haul from 100 m depth was conducted with typical wire-angles of ~ 10-20^{o} during the haul so the max depth sampled was likely slightly less than 100 m. Samples were preserved on deck in a buffered seawater formalin solution and will be analyzed (identification and enumeration of taxa) post-cruise. The dominant organism in all samples were copepods (various species), although amphipods, gelatinous zooplankton (mostly salps), and krill were also present in most samples. There was also a lot of algae collected from each tow.

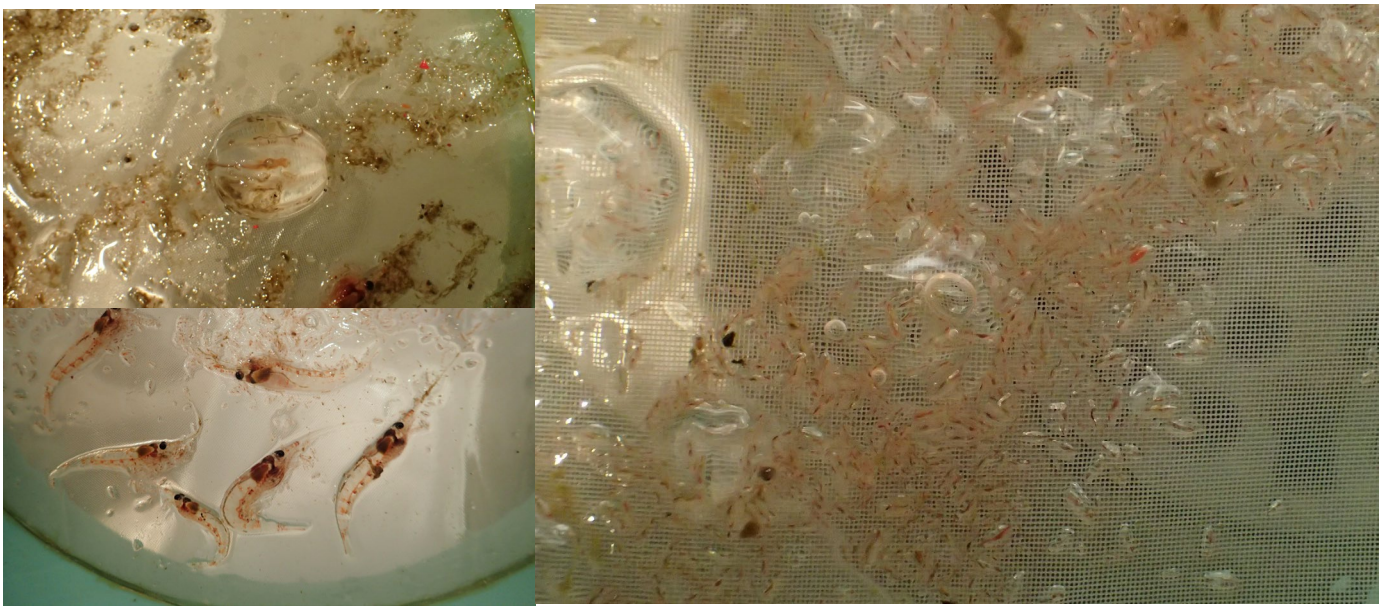

Figure 2. Stony Brook students Paige Tortorice and Dean Hernandez processed the net samples after a collection. A variety of organisms were seen in the tows. Small copepods (various species, right) were the dominant organism in all tows. Gelatinous zooplankton such as salps and ctenophores (top left), were also present. Krill (bottom left) were also seen in all of the tows except at one site (JOB).

CTD Sampling

An RBR concerto CTD was deployed to a depth of 100 m at all five of the sites (Table 1), although similar to the ring net, wind and currents often resulted in a 10-20^{o} wire angle on the deployment. At four of the sites (AEON3 GEB, AEON4 JOB, AEON1 ECS, and AEON2 NEC), a second deployment was done to about 10-15 m above the bottom depth to get a picture of what the full water column looked like. Both the CTD and the ring net were deployed off the same winch line with a 200 lb clump weight to try to ensure that the instruments would be pulled straight down.

Fine-Scale Acoustic Survey

The fishery echosounder transducer was deployed through the moonpool / instrument well of the vessel. Due to size constraints of the well, only a single transducer was deployed– however the

transducer contained both a 38 kHz and 200 kHz single-beam narrowband system operated by a Simrad ES60 GPT transceiver. By using the fixed mount in the instrument well, the system could be operated during transits to/from stations, although at those ship speeds noise was an issue. The depth of the transducers was approximately 2 m below the sea surface. A GPS feed from the vessel provided geographic position information and the echosounder and data acquisition hardware were set-up inside the ship's dry lab.

Four Fine Scale Acoustic Surveys (FSAS) were conducted during the April cruise. Surveys were completed in a 5 km x 5 km grid. FSAS at two sites (AEON5 WIB and AEON1 NEC) consisted of 5 parallel transect lines each 5 km long. The FSAS at site AEON3 GEB consisted of 3 parallel transect lines each 5 km long, due to time constraints. The FSAS at site AEON 2 ECS was an incomplete survey. Survey speeds were ~ 4-5 kts, and the sea state was generally good throughout the survey (waves 1-2 ft). Scattering aggregations of both zooplankton (likely crustaceans such as copepods or krill, Figure 2) as well as near-bottom fish (Figure 3) were observed during the survey. Due to weather conditions, an FSAS was not able to be completed at site AEON4 JOB.

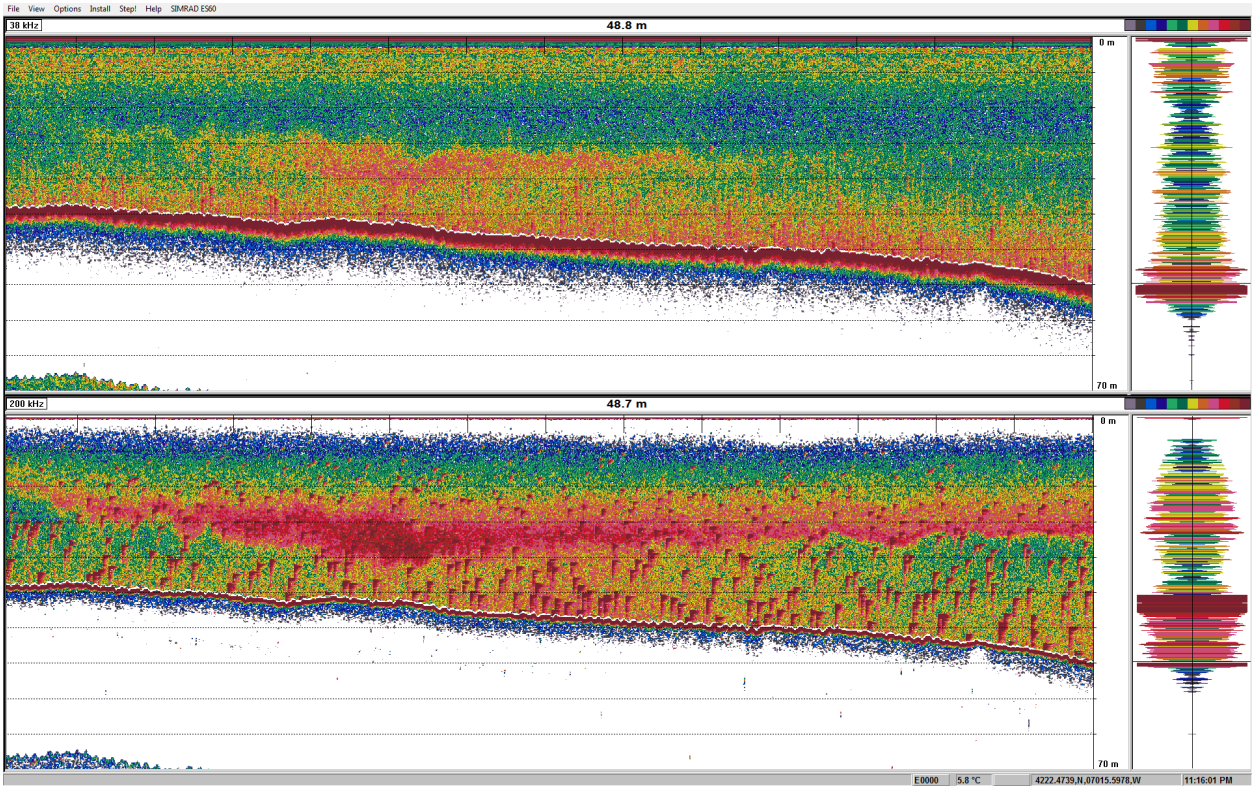

Figure 2. Screenshot of the 38 (top) and 200 (bottom) kHz echogram during the transit from Connecticut to AEON5 WIB on 04 April 2025. The 200 kHz frequency shows a strong midwater zooplankton aggregation, which you can also faintly see on the 38 kHz frequency. The consistent red-colored triangle shapes on the 200 kHz echogram are noise due to the ship's transducer that will get turned off during FSAS.

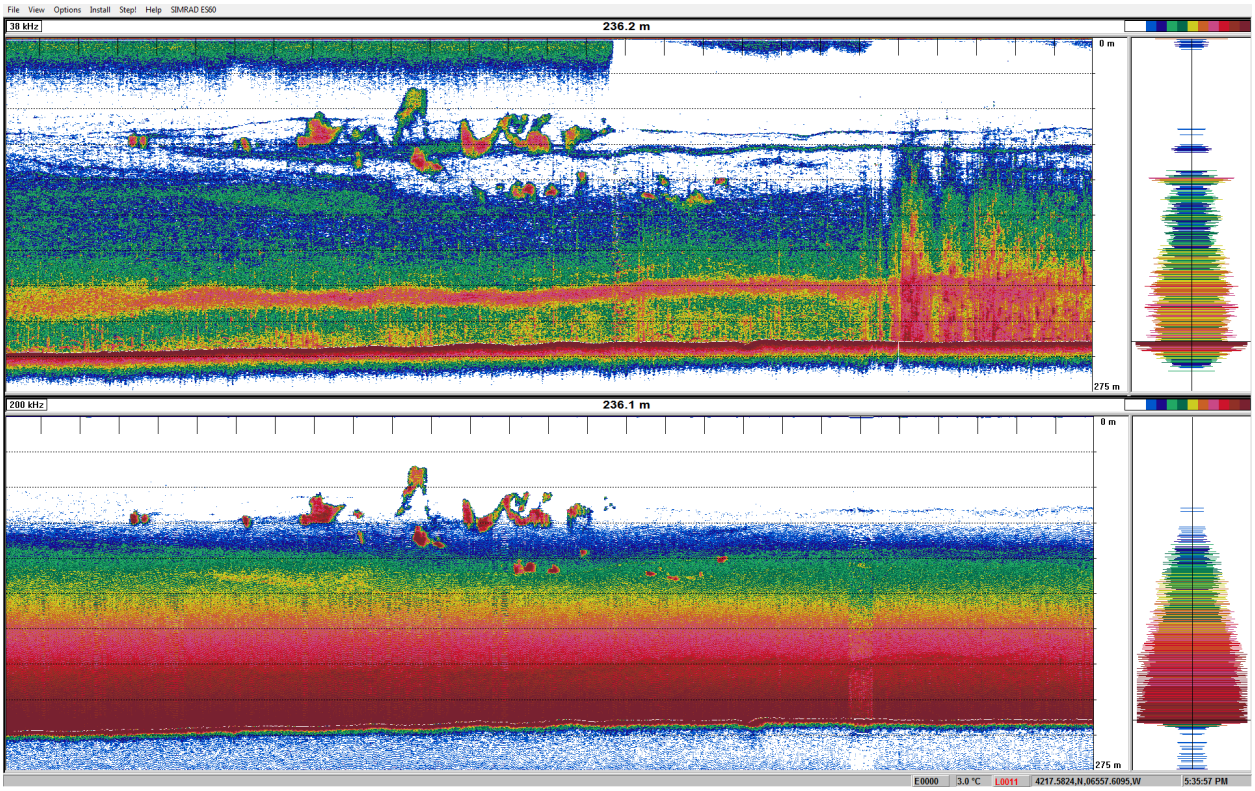

Figure 3. Screenshot of the 38 (top) and 200 (bottom) kHz echogram during line 2 of the Fine Scale Acoustic Survey (FSAS) at site AEON1 NEC on 10 April 2025. Strong signals seen on both the 38 and 200 kHz right near the upper left are fish, most likely herring. You can also see a near-bottom layer off the bottom on the 38 kHz.