

New Hampshire Continental Shelf Geophysical Database: 2012-2013 NEWBEX Field Campaign – Seafloor Photographs and Sediment Data

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Introduction:

An approximately 4.5 km transect running from lower Portsmouth Harbor seaward onto the inner continental shelf was established to serve as the field site for the Newcastle Backscatter Experiment (NEWBEX) (Figure 1). Acoustic backscatter measurements were made along the transect to examine relationships between backscatter and seafloor properties (see Weber and Ward, 2015). This transect takes advantage of the diversity and heterogeneity of bottom types in lower Portsmouth Harbor and approach. In support of NEWBEX, a field campaign was undertaken to describe the sedimentologic characteristics of the seafloor along the transect. A total of five cruises were carried out approximately seasonally on November 26, 2012 and June 20, July 3, October 21, and December 17, 2013 (Figure 1).

Based on multibeam echosounder bathymetry (MBES), acoustic backscatter (from the NEWBEX acoustic work), sediment analysis, and video, the seafloor along the NEWBEX transect was subdivided into five major divisions representing different depositional environments including: Lower Portsmouth Harbor Channel Lag Deposits; Lower Portsmouth Harbor Sand Wave Field; Mouth Channel Lag Deposits; Inner Shelf Rippled Sands; and Heavily Vegetated Rocky Inner Shelf. Two transitional areas were also identified, one with a variable seafloor composition and one with bimodal sediments.

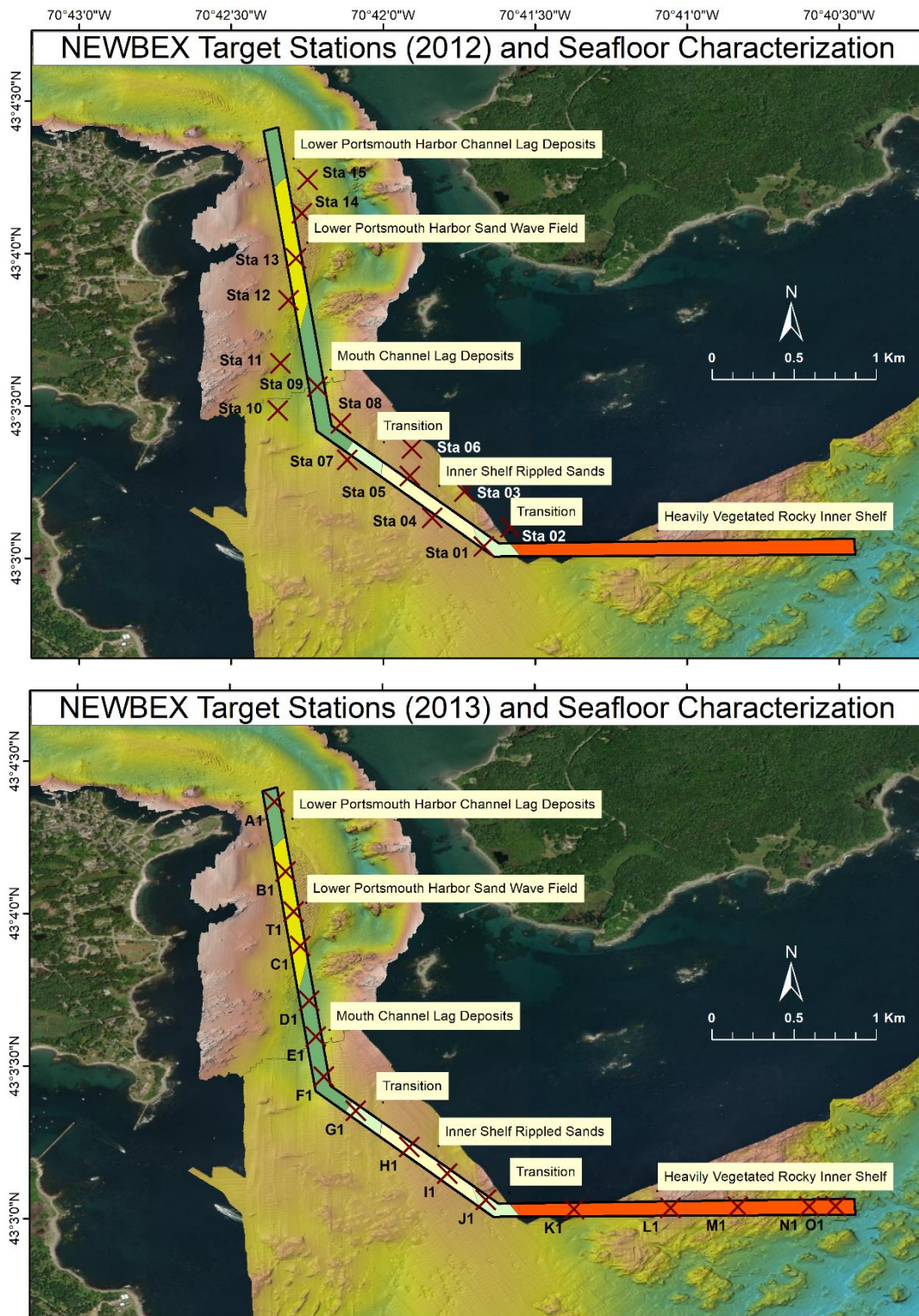


Figure 1. Station locations on the NEWBEX transect for the 2012 (top) and 2013 (bottom) field campaign. The "X"s mark target station locations. All bottom sediment samples and seafloor photographs are from near one of the stations. The actual sample positions were determined by the ship's navigation system and are provided in the metadata for each sample or photograph.

The "New Hampshire Continental Shelf Geophysical Database: 2012-2013 NEWBEX Field Campaign – Seafloor Photographs and Sediment Data" presented here was developed by the University of New Hampshire (UNH) Center for Coastal and Ocean Mapping/Joint Hydrographic Center (CCOM/JHC) as part of a series of databases for the continental shelf off New Hampshire. This database includes 770 seafloor photographs representing major seafloor types along and surrounding the transect, and grain size statistics and characterizations of 94 bottom sediment samples. Other important databases in this series includes the following.

- Ward, L.G., Morrison, R.C., and McAvoy, Z.S., 2021, New Hampshire Continental Shelf Historical Geophysical Database: 1971 to 2015 - Sediment Data. <https://dx.doi.org/10.34051/d/2021.3>
- Ward, L.G., Morrison, R.C., and McAvoy, Z.S., 2021, New Hampshire Continental Shelf Geophysical Database: 2016-2017 Field Campaign - Stations and Sediment Data. <https://dx.doi.org/10.34051/d/2021.2>
- Ward, L.G., Morrison, R.C., and McAvoy, Z.S., 2021, New Hampshire Continental Shelf Geophysical Database: 2016-2017 Field Campaign – Seafloor and Sample Photographs and Sediment Data. <https://dx.doi.org/10.34051/d/2021.1>
- Ward, L.G., Morrison, R.C., and McAvoy, Z.S., 2021, New Hampshire Continental Shelf Geophysical Database: 2016-2017 Field Campaign – Seafloor Photographs. <https://dx.doi.org/10.34051/d/2021.5>
- Ward, L.G., Morrison, R.C., McAvoy, Z.S., and Vallee-Anziani, M., 2021, New Hampshire Continental Shelf Geophysical Database: Vibracore Logs and Sediment Data. <https://dx.doi.org/10.34051/d/2021.4>
- Ward, L.G., Grizzle, R.E., and Morrison, R.C., 2021, New Hampshire Continental Shelf Geophysical Database: 2002-2005 Jeffreys Ledge Field Campaign – Seafloor Photographs and Sediment Data. <https://dx.doi.org/10.34051/d/2021.8>

Contents of the Database

Location maps of stations are provided for the cruise from late 2012 and the cruises from 2013 (Figure 1). These maps are also provided in Layout GeoTIFF format containing spatial reference information for the option to import and view in a GIS.

The photographs extracted from the seafloor videography are grouped by depositional environments running from the inner harbor to the inner shelf and include Lower Portsmouth Harbor Channel Lag Deposits, Lower Portsmouth Harbor Sand Wave Field, Mouth Channel Lag Deposits, Transitional Bimodal, Inner Shelf Rippled Sands, Transitional Variable, and Heavily Vegetated Rocky Inner Shelf. Examples of the seafloor photographs extracted from the video are shown in Figures 2, 3, and 4. Each group contains a Microsoft Excel file with metadata for each photograph, including station identification, geographic location (latitude and longitude), water depth, and the seafloor depositional environment.

Grain size data and statistics from 94 sediment samples are presented in the file "NEWBEX_Geophysical_Database_Grain_Size_Data", along with a data dictionary describing the fields and a description of the CMECS classifications (Coastal and Marine Ecological Classification Standard; FGDC, 2012).

A “single sample summary” for each station along the 2013 transect are included in PDF format in the folder “NEWBEX_Geophysical_Database_Station_Summaries”. These contain seafloor photographs where bottom samples were collected along with respective grain size data and statistics for samples collected during each cruise. An example is shown in Figure 5.

Field Methods, Camera System, and Grain Size Analysis:

Sampling for the data presented here was done from the *R/V Gulf Challenger*. Video of the seafloor was collected using the Optical Collection Suite (OCS) described by Pe’eri et al. (2013). The OCS consisted of a Delta Vision camera mounted in a frame that positioned the camera 0.4 m from the base and the seafloor when the camera was in the vertical position. The base was 0.3 by 0.3 m and displayed a 2 cm interval scale. Under ideal conditions this setup and camera has a 1.2 mm pixel resolution. The camera was connected to a 50 m high-quality coaxial cable with a strength member to a computer located on the sampling platform where the analog signal was converted to digital. The digitized video was recorded and processed using Microsoft Windows Movie Maker. Positioning was determined for the support vessel by capturing the differential GPS stream with a Furuno GP-37 Differential/WAAS on the *R/V Gulf Challenger*.

Seafloor video was acquired by lowering the camera by hand and allowing the frame to come to rest on the bottom. Subsequently, the camera was raised slightly off the seafloor while the support vessel was allowed to drift. The camera system was again lowered to the bottom at a new location a short distance away. This was repeated a minimum of four times at each station. At each location the camera system touched down, the GPS time was recorded by hand, and the location determined from the recorded GPS files. Stills or photos of the seafloor were made for each location using VirtualDub 1.4. Due to the video camera system being dragged by the current or the drifting of the boat, position accuracy of the bottom photographs was likely no better than 20 m.

Bottom sediment samples were obtained using a Shipek grab sampler. Almost all bottom sediment samplers (including the Shipek) have difficulty in obtaining pebble and cobble samples. In addition, a very large gravel sample is required for accurate size analysis. During this study as large of a sample as possible was obtained and analyzed. Nevertheless, for gravel samples it is important to note the size of the sample collected and processed and to keep in mind that the results may be skewed by not collecting a representative sample. A significant effort was put forth during this study to avoid this issue. All samples collected had an uncertainty positioning of <30 meters, and were likely on the order of 10 m.

Samples were analyzed with standard sieve and pipette analyses after Folk (1980). The sediment grain size classifications include: CMECS (Coastal and Marine Ecological Classification Standard; FGDC, 2012); Gradistat (Blot and Pye, 2001); and Wentworth (Wentworth, 1922; described in Folk, 1954, 1980). Statistics are based on the phi scale and include the graphic mean, sorting, skewness, and kurtosis (Folk, 1980).

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Wentworth, C., 1922, A scale of grade and class terms for clastic sediments: *The Journal of Geology*, v. 30, no. 5, pp. 377–392. Accessed May 2019, available online at <https://www.jstor.org/stable/30063207>

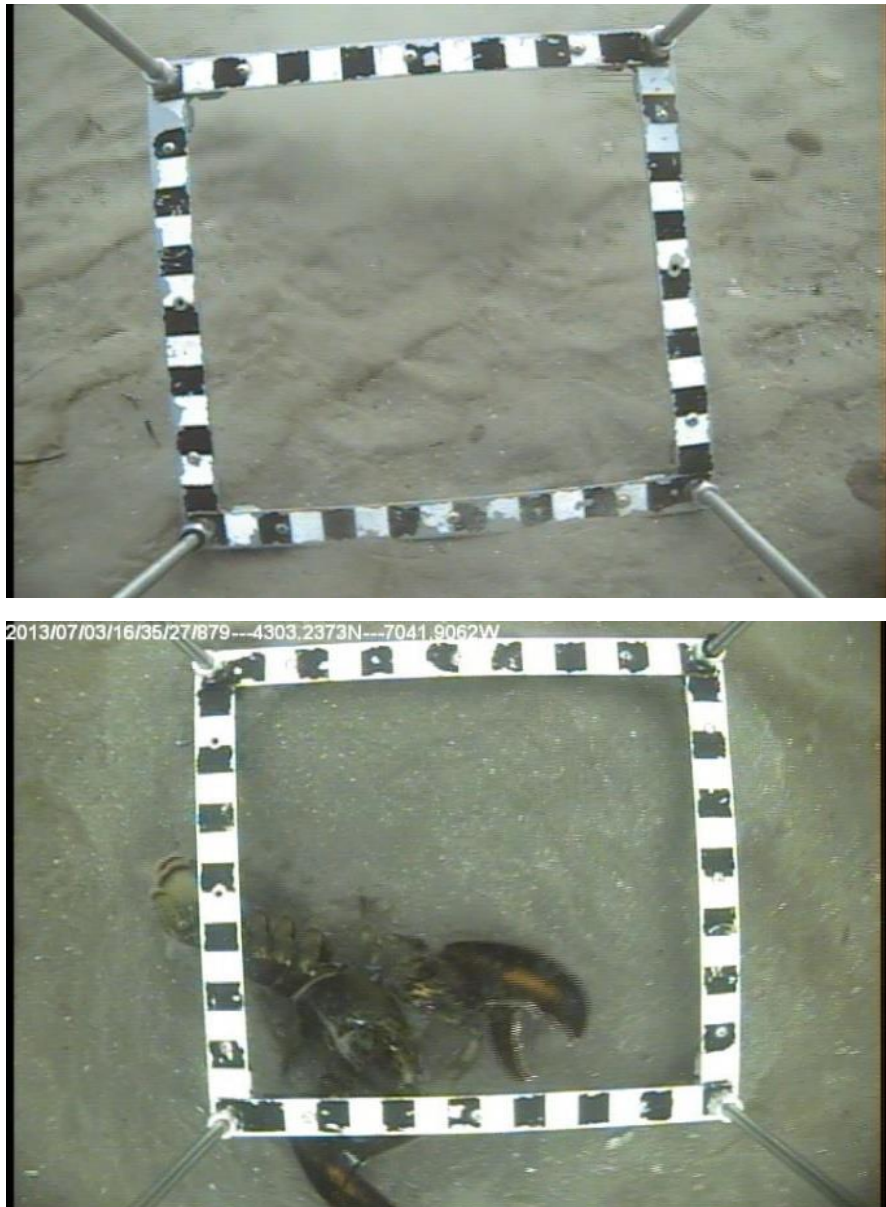


Figure 2. Photographs of the seafloor on the inner shelf rippled sands extracted from video from station H on October 21, 2013 (top) and July 3, 2013 (bottom). Note rippled sands in the top image.

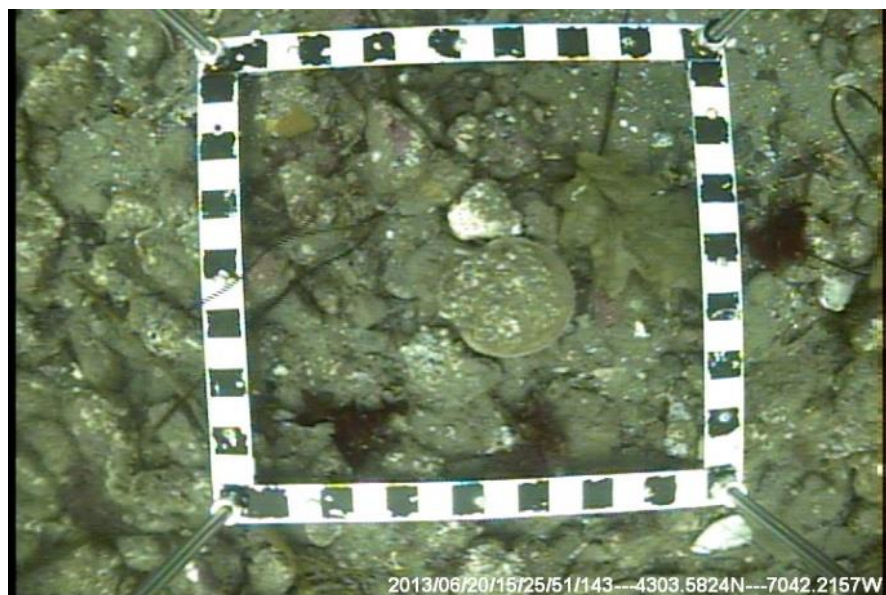
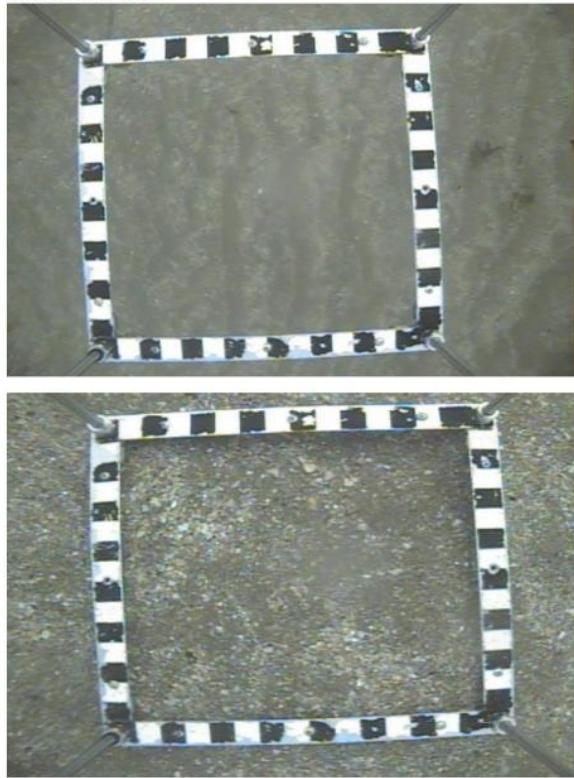


Figure 3. Photographs of channel lag deposits taken on June 20, 2013 in Portsmouth Harbor.



Figure 4. Photographs of heavily vegetated bedrock at station N (top) and station O (bottom) on June 20, 2013.

Seafloor images and grain size statistics for Station B1. The images were taken on October 21, 2013. Note camera is off the seafloor in the upper image.



Station B1	D20130708		D20131021		D20131217	
	Sample 01	Sample 02	Sample 01	Sample 02	Sample 01	Sample 02
Textural Group (Gradistat)	gs	slgs	gs	gs	gs	slgs
grms	grms	slgrms	grms	grms	grms	slgrms
Sediment Name (Folk 1954)	vfgrms	slgrms	vfgrms	vfgrms	vfgrms	slvfgrms
Sorting	MS	MWS	PS	PS	MS	MS
Modes	UM	UM	UM	UM	UM	UM
%G	5.8	1.0	7.2	7.8	5.1	4.7
%S	83.8	87.9	82.6	82.1	84.5	84.7
%M	0.5	0.3	0.2	0.4	0.4	0.6
Mean - phi	1.05	1.18	0.85	0.80	1.38	1.21
Mean - mm	0.48	0.44	0.68	0.64	0.38	0.43
Sortns - phi	0.88	0.64	1.02	1.08	0.88	0.81
Skewness	-0.379	-0.216	-3.387	-0.277	-0.453	-0.850
Kurtosis	1.123	1.148	0.988	0.948	1.857	1.328
D10 - phi	0.5	0.8	-0.8	0.8	0.1	0.3
D50 - phi	1.3	1.2	1.1	1.2	1.6	1.4
D90 - phi	2.0	1.9	1.9	2.0	2.2	2.1
D10 - microns	1,438.7	840.7	1,700.3	1,738.2	1,108.0	1,213.1
D50 - microns	413.0	426.7	474.6	448.6	384.1	378.9
D90 - microns	280.7	271.7	288.4	252.7	212.2	233.1
Total Sample Wt - gms	43.8	46.3	69.4	76.5	49.9	66.8
Size Distribution(phi) - % In Each Class						
-5.5	----	----	----	----	----	----
-5.0	----	----	----	----	----	----
-4.5	----	----	----	----	----	----
-4.0	----	----	----	----	----	----
-3.5	----	----	----	----	----	----
-3.0	----	----	----	----	0.4	----
-2.5	0.8	----	0.1	0.2	0.6	0.2
-2.0	0.7	0.9	1.3	1.1	0.8	0.8
-1.5	1.0	0.2	2.2	1.9	1.5	1.4
-1.0	3.2	0.7	3.5	4.3	1.8	2.4
-0.5	4.7	1.6	6.1	6.1	2.7	3.4
0.0	5.8	3.1	7.2	7.8	3.1	4.4
0.5	8.4	6.0	9.8	9.3	4.1	5.8
1.0	13.0	19.2	15.9	12.3	7.8	11.7
1.5	22.5	37.5	24.7	15.4	20.2	24.7
2.0	30.3	26.0	24.3	28.2	39.8	33.2
2.5	8.2	3.1	4.1	7.5	14.3	9.8
3.0	0.7	0.3	0.4	0.9	1.5	1.0
3.5	0.2	0.1	0.1	0.2	0.7	0.5
4.0+	0.1	0.0	0.1	0.1	0.2	0.2
4-sigma	0.5	0.3	0.2	0.4	0.4	0.6

Figure 5. Example of a single sample summary from Station B1 sampled and photographed on October 21, 2013.