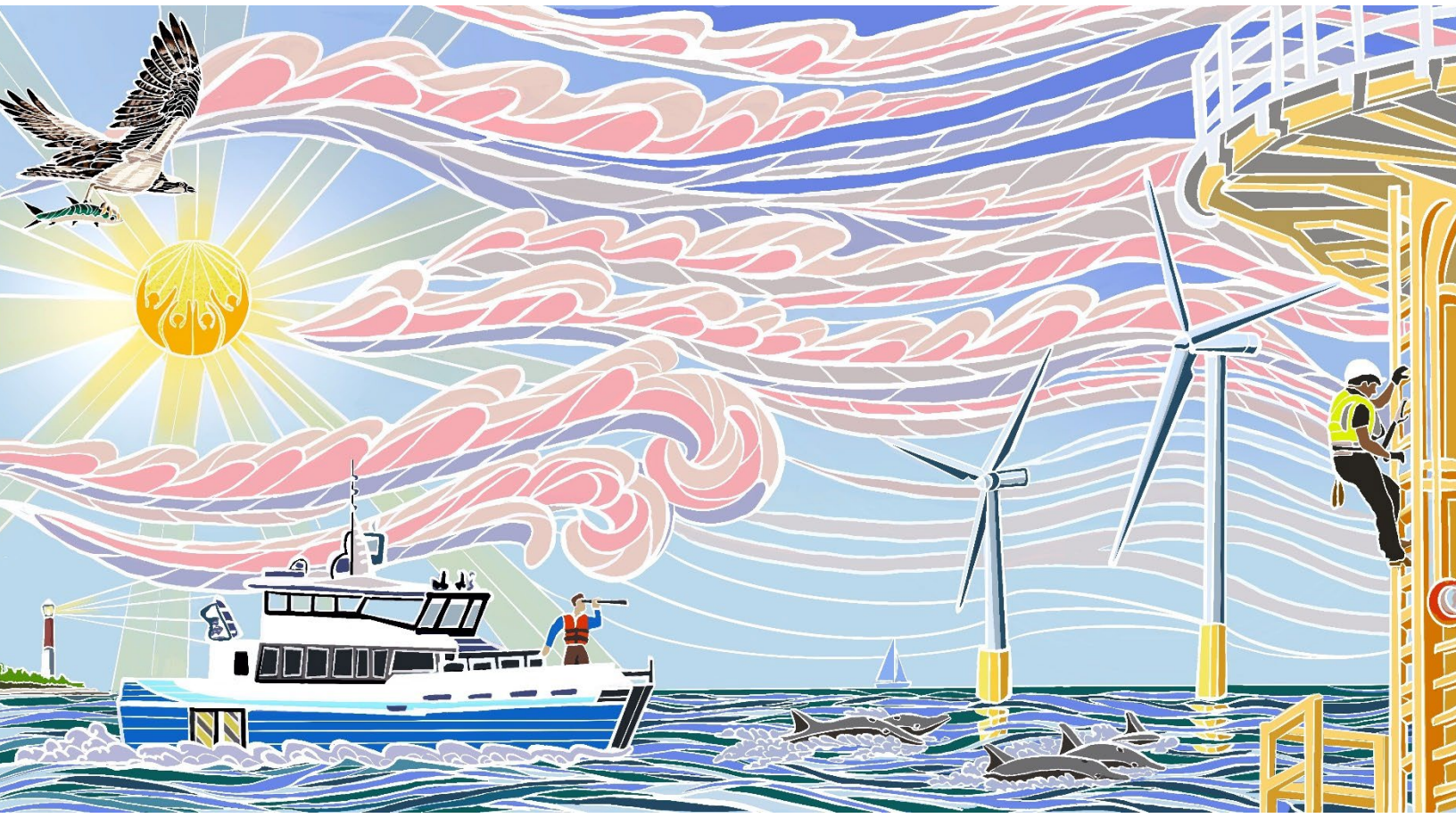

Appendix II-G1

Benthic Assessment Report

March 2024

Note: Atlantic Shores has updated the Project Design Envelope to include the following landfall sites: Monmouth Landfall Site, Asbury Landfall Site, Kingsley Landfall Site, Lemon Creek Landfall Site, Wolfe's Pond Landfall Site, and Fort Hamilton Landfall Site. The information included in this report demonstrates the completeness of Atlantic Shores' multi-year development efforts and should be considered representative for the Project. For additional information regarding the layout of the Project, please refer to COP Volume I Project Information, Sections 1.0 Introduction and 4.7 Landfall Sites, as well as Figure 1.1-2 Project Overview.

ATLANTIC SHORES NORTH 2023

Benthic Assessment Report

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Alicia Morandi	Version 2 Draft	25 January 2023
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Contents

Figures

Tables

Table of Abbreviations

ANOSIM	Analysis of Similarities
ASOW	Atlantic Shores Offshore Wind
ASTM	Standard Test Method for Particle-Size Analysis of Soils
BOEM	Bureau of Ocean Energy Management
BORIS	Behavioral Observation Research Interactive Software
C	Celsius
cm	Centimeters
CMECS	Coastal and Marine Ecological Classifications Standards
DDV	Drop Down Video
ECC	Export Cable Corridor
EDR	Environmental Design & Research
EFH	Essential Fish Habitat
EPA	United States Environmental Protection Agency
FGDC	Federal Geographic Data Committee
GPS	Global Positioning System
IA	Installation Area
kg	Kilogram
LA	Lease Area (OCS-0549)
LAR	Larrabee (now referred to as Monmouth)
LPTL	Lowest Practical Taxonomic Level
m	Meters
mg	Milligrams
MON	Monmouth Export Cable Corridor Samples
ND	Nondetectable

NEC/NECC	Northern Export Cable Corridor Samples
NLPTL	Next Lowest Practical Taxonomic Level
NMDS	Nonmetric Multidimensional Scaling
NMFS	National Marine Fisheries Service
OCS	Outer Continental Shelf; OCS-Lease Area 549
PEP	Project Execution Plan
SAP	Site Assessment Plan
SIMPER	Analysis of Similarity Percentages
SOI	Sites of Interest
SPI/PV	Sediment Profile Imaging and Plan View
TOC	Total Organic Carbon
TV	Towed Video Transect conducted by RPS
UID	Unidentified
USBL	Ultra-short Baseline
WTA	Lease Area (OCS-0549) video transects from 2021

1 INTRODUCTION

RPS was contracted by Environmental Design & Research (EDR) to synthesize a benthic sampling report for benthic survey activities completed from 2019 to 2022 associated with the development of Federal Lease Area OCS-A 0549 (hereafter, Lease Area) and the Northern Export Cable Corridor (NECC) offshore of New Jersey and New York for Atlantic Shores Offshore Wind, LLC (Atlantic Shores). Atlantic Shores is a 50/50 joint venture between EDF-RE Offshore Development, LLC (a wholly owned subsidiary of EDF Renewables, Inc. [EDF Renewables]) and Shell New Energies US LLC (Shell). This report compiles results from two prior reports/sampling events in the Lease Area (2019 and 2020). This report also includes additional sampling that occurred in 2022 for the project, which includes new survey results for the Northern ECC and a few additional sample sites in both the Lease Area and in Monmouth ECC.

In 2019, RPS was contracted by Terrasond to collect grab samples and drop-down video imagery in the Lease Area as part of a Site Assessment Plan (SAP). In 2020, grab sampling occurred along with sediment profile imagining/plan view imaging (SPI/PV) in July and September aboard the Fugro R/V Enterprise and R/V Westerly for offshore and nearshore sampling, respectively. RPS analyzed benthic grab data from within the Lease Area and along the Monmouth ECC and reviewed SPI/PV results provided by Integral Consulting, Inc. In 2021, RPS collected underwater video transects along with simultaneous still images for visual classification of the seafloor aboard the R/V Shearwater operated by Alpine Ocean Seismic Survey, Inc.

In 2022, Fugro collected benthic grab samples for sediment grain size analysis, TOC, and infaunal analysis along with SPI/PV imaging across the Atlantic Shores North project area, with a focus on new stations within the Northern ECC. In August of 2022, RPS collected underwater video transects with simultaneous still images at sites along the Northern ECC aboard the Fugro R/V Enterprise and R/V Westerly. Combined data from the grab samples, associated grab videos, and towed video were used in conjunction with remotely sensed geophysical and geotechnical (G&G) data, and SPI/PV images to characterize surficial sediment conditions and evaluate the benthic habitat within Atlantic Shores North project area. The Lease Area, Monmouth ECC, and Northern ECC project regions are shown in Figure 1-1.

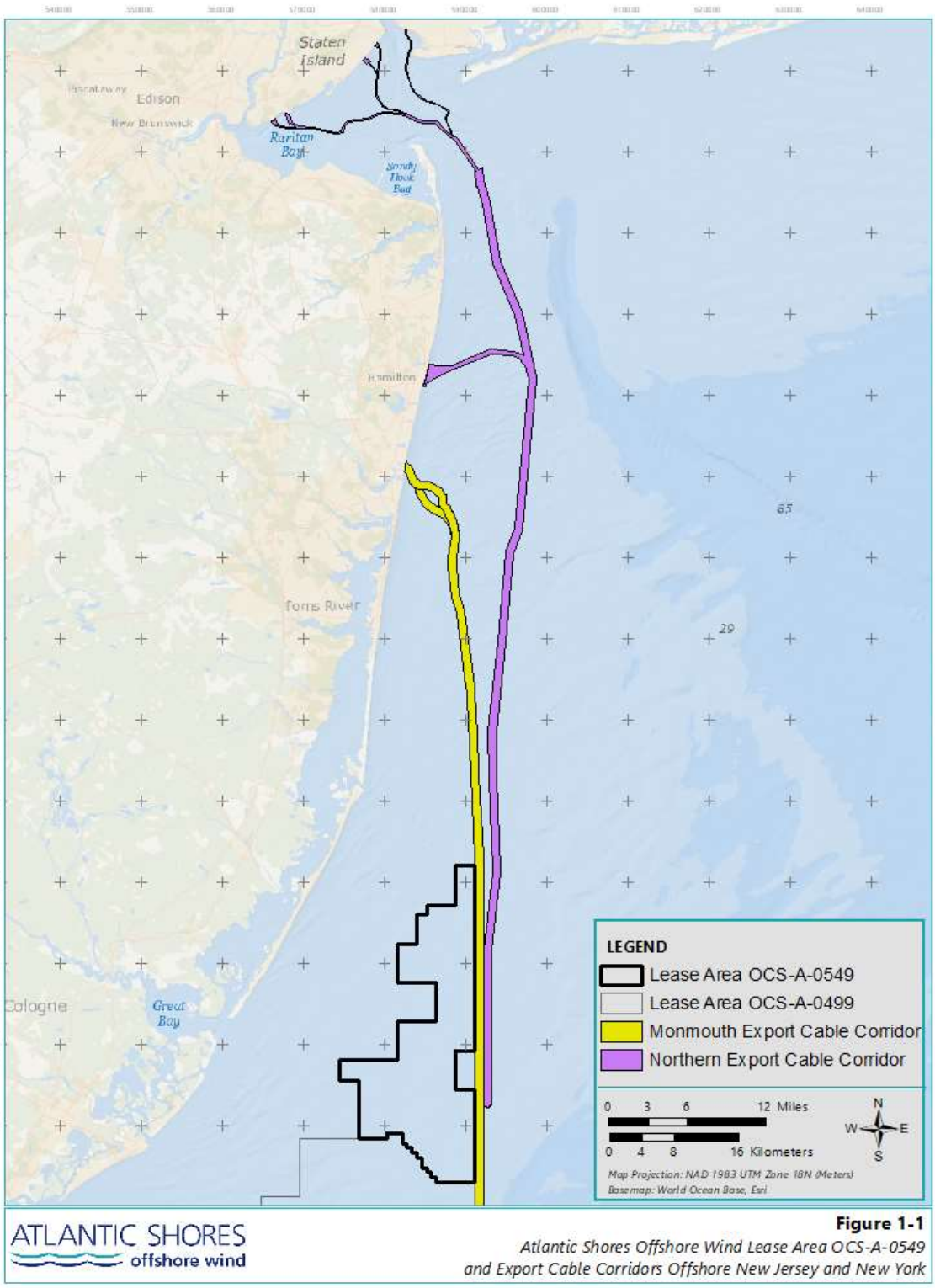


Figure 1-1. Atlantic Shores Offshore Wind Lease Area OCS-A-0549 and export cable corridors offshore New Jersey and New York.

Benthic habitat assessments identify the dominant substrates in the Lease Area and ECCs to establish a pre-construction baseline and characterize potentially sensitive or important seafloor areas that may serve as essential fish habitat (EFH). In accordance with Bureau of Ocean Energy Management (BOEM 2019) and National Marine Fisheries Service (NMFS 2020) guidelines, sampling protocols and the Coastal and Marine Ecological Classifications Standards (CMECS; FGDC 2012) were used to characterize the benthic environment. This report presents:

- a description of the benthic grab sampling methods;
- sediment grain size analysis results;
- benthic macroinvertebrate community analysis using summary statistics and metrics such as taxa richness, density, and community composition;
- CMECS substrate component classification of each sampling station or transect based on a review of video imagery and grain size results;
- Megafauna video review followed by CMECS substrate and biotic component classification of still images along video transects; and
- a summary of overall results, including a brief comparison to SPI/PV survey results at stations where grab samples were also collected.

2 METHODS

2.1 Sampling Design

In October 2019, drop-down video (DDV) was taken in conjunction with grab samples to aid in sample collection and visual habitat classification for the SAP. Two samples were taken from each Buoy Installation Area (IA) with eight additional grabs at Sites of Interest (SOI). Seven of the 16 total grab samples were collected within the Lease Area, so these 7 samples are analyzed herein (**Error! Reference source not found.**).

The benthic survey methods for the 2020 sampling campaign were selected to meet federal guidance including the BOEM 2019 benthic survey guidance and NMFS 2020 recommendations for mapping essential fish habitat. The design meets the required sampling density of about 1 sample per 2 km area on average with some sites variably spaced to target apparently different or interesting features/habitats based on G&G data. A pre-survey meeting with Atlantic Shores, BOEM, EDR-Epsilon, Fugro, NMFS and RPS was held to discuss the planned benthic survey methodology.[1] In July and September 2020, Fugro conducted benthic grab sampling at 44 sites within the Lease Area and 21 sites within the Monmouth ECC (**Error! Reference source not found.**). At each site, DDV was recorded and Fugro scientists reviewed the video in real-time, described the contents of the grab, and reviewed the video after the survey to make notes for visual analysis. RPS biologists also reviewed the DDV for confirmation of CMECS classification when gravel was present because lab sediment analyses did not discern shell from gravel, and to capture representative images.

In addition, Fugro and Integral collected SPI/PV data for 3 replicate samples at 62 sites to obtain high definition still images of the seafloor and the sediment-water interface. A total of 22 SPI/PV sites overlapped with 2020 grab sample sites (**Error! Reference source not found.**). Full results from the SPI/PV survey are described in a separate report (Appendix II-G2 of the COP), while the substrate classifications at the overlapping sites are briefly compared to grab sample results in this report (Section 3.1.5).

In June 2021, RPS collected underwater video in the Lease Area and along the Monmouth ECC, each approximately 250 m long. Continuous video and still images were collected simultaneously for post-processing visual classification of the seafloor, using CMECS standards (FGDC 2012). Sites were selected to target transition areas between habitat types and features of interest from the G&G analysis. Of the 52 transects, 43 transects were located within the Monmouth ECC and 9 transects were located within the Lease Area (see maps in Section 3.2).

[1] April 28th, 2020 Benthic Survey Plan Meeting

In May through July 2022, Fugro collected grab samples and GrabCam videos at 9 locations in the Lease Area, 12 locations in the Monmouth ECC, and 65 locations along the Northern ECC, including the New Jersey and New York landfall branches. A total of 157 SPI/PV sites were sampled within the Northern ECC (Figure 2-2, Figure 2-3, Figure 2-4). Full results from the SPI/PV survey are described in a separate report (Appendix II-G2 and II-G3 of the COP), while the substrate classifications in the Northern ECC are briefly compared to grab sample results in this report (Section 3.1.5). This report contains grab sample grain size analysis results for 65 sites and infaunal community analysis for 58 sites within the Northern ECC, as not all grabs were sent for infaunal taxonomic analysis.

In August 2022, RPS collected underwater video along the Northern ECC into Raritan Bay near the proposed landfall locations, with each transect 250 m long. Continuous video and still images were collected simultaneously for post-processing visual classification of the seafloor, using CMECS standards (FGDC 2012). Sites were selected to target transition areas between habitat types and features of interest from the G&G analysis. There were 68 transects collected with sufficient quality for analysis within the Northern ECC (see map in Section 3.2.3).

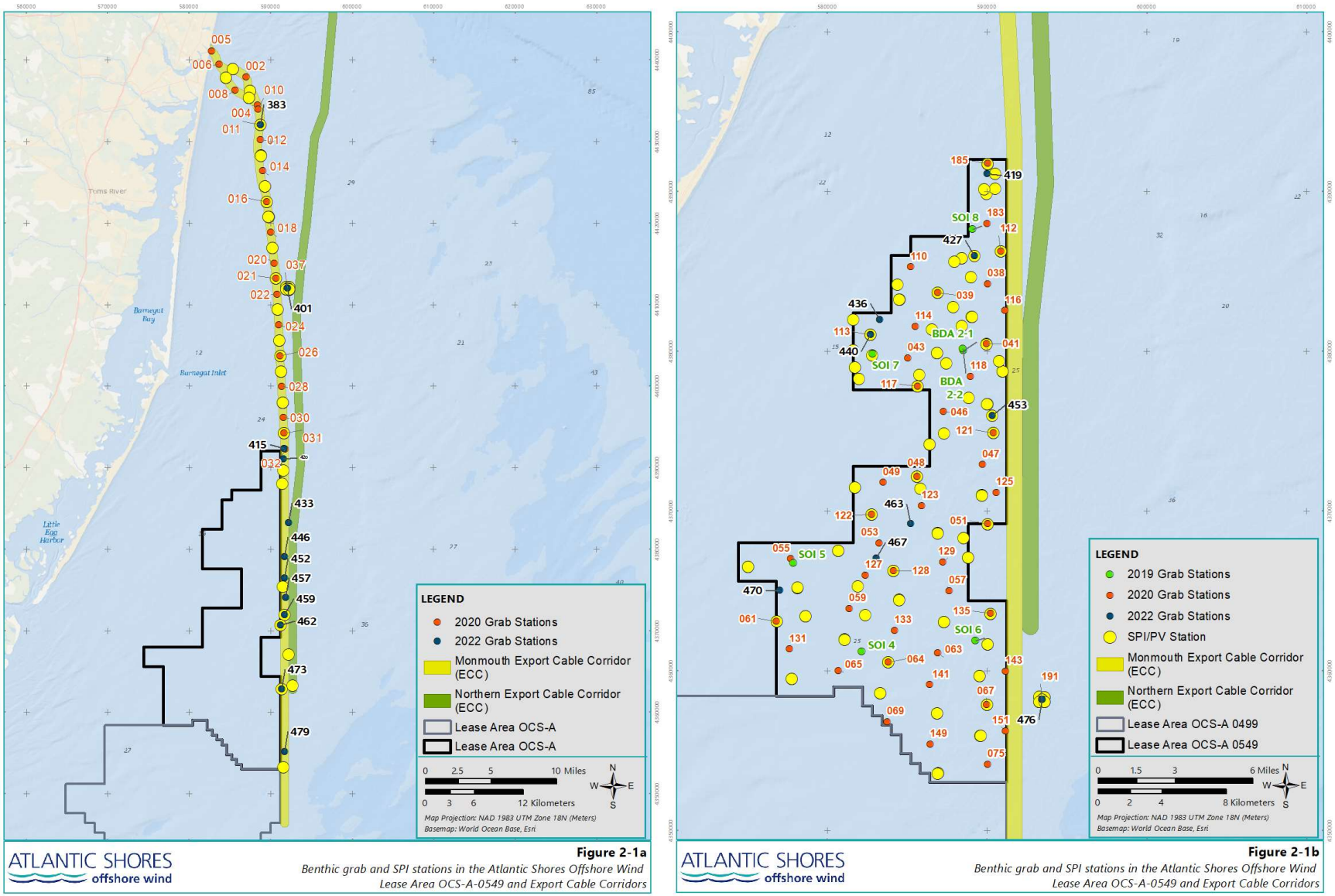


Figure 2-1. Benthic grab and SPI stations in the Monmouth ECC (a) andLease Area OCS-A-0549 (b) from surveys in 2019, 2020, and 2022.

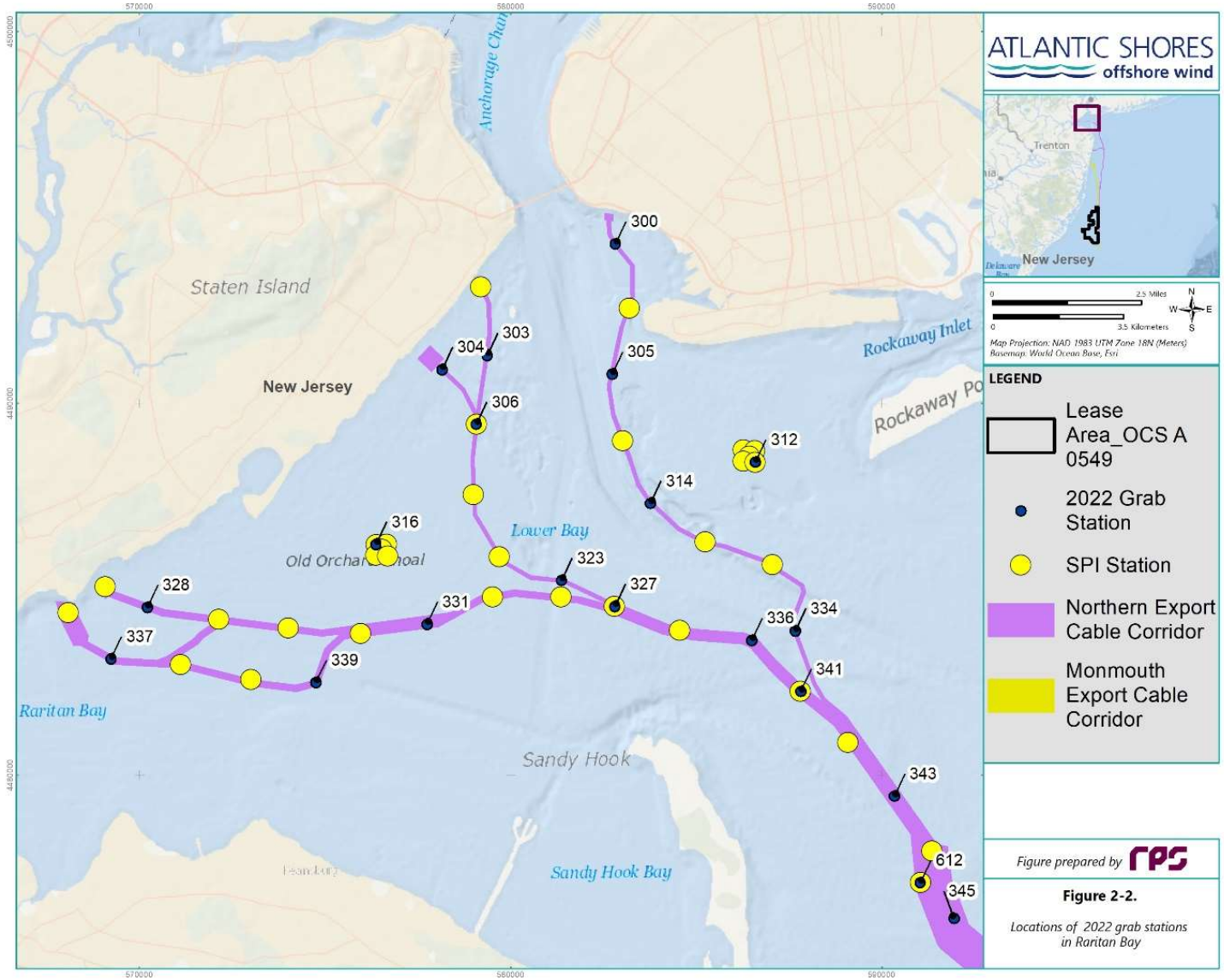


Figure 2-2. Benthic grab and SPI/PV stations in the Northern ECC collected during 2022 surveys in Raritan Bay.

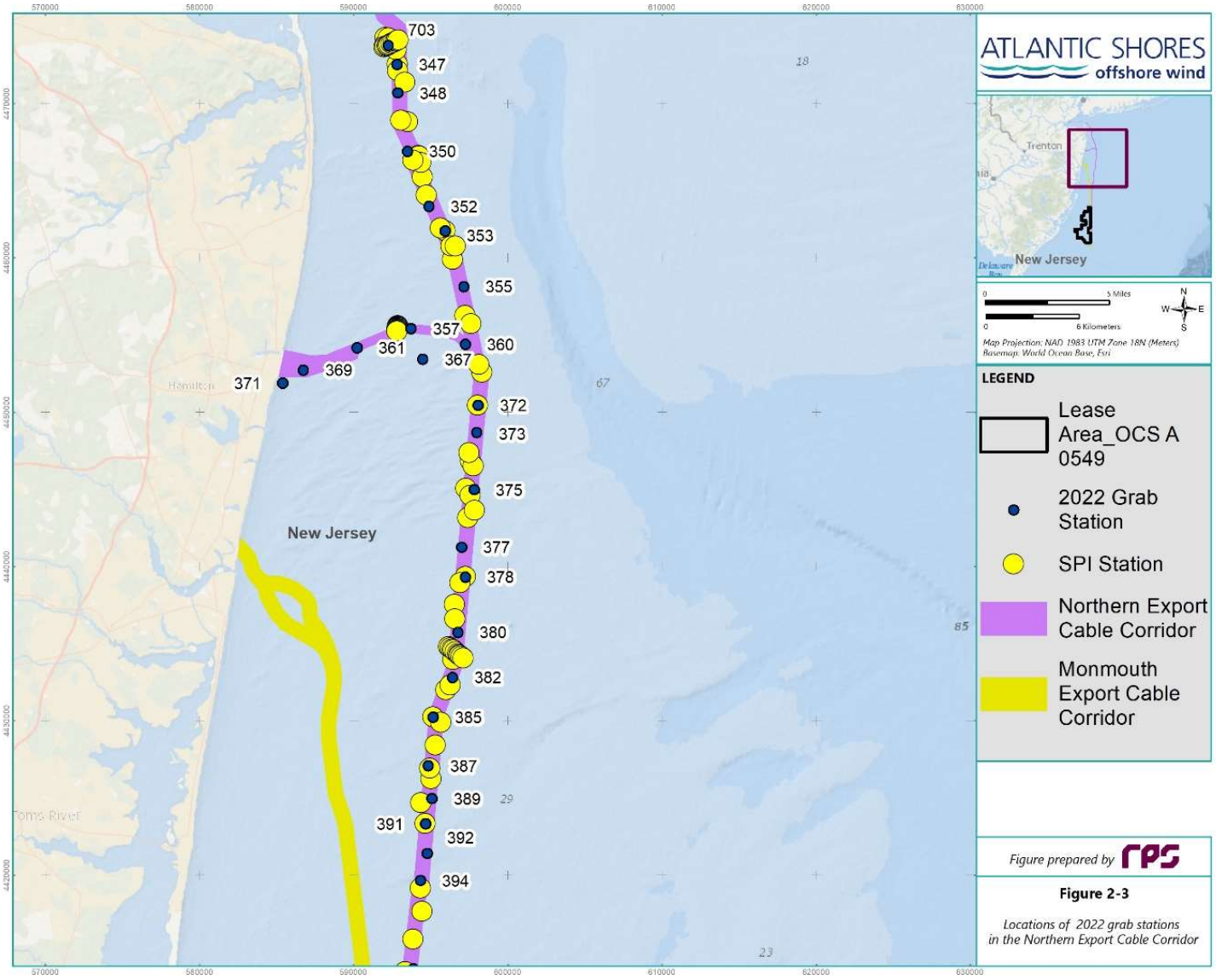


Figure 2-3. Benthic grab and SPI/PV stations in the Northern ECC collected during 2022 surveys.

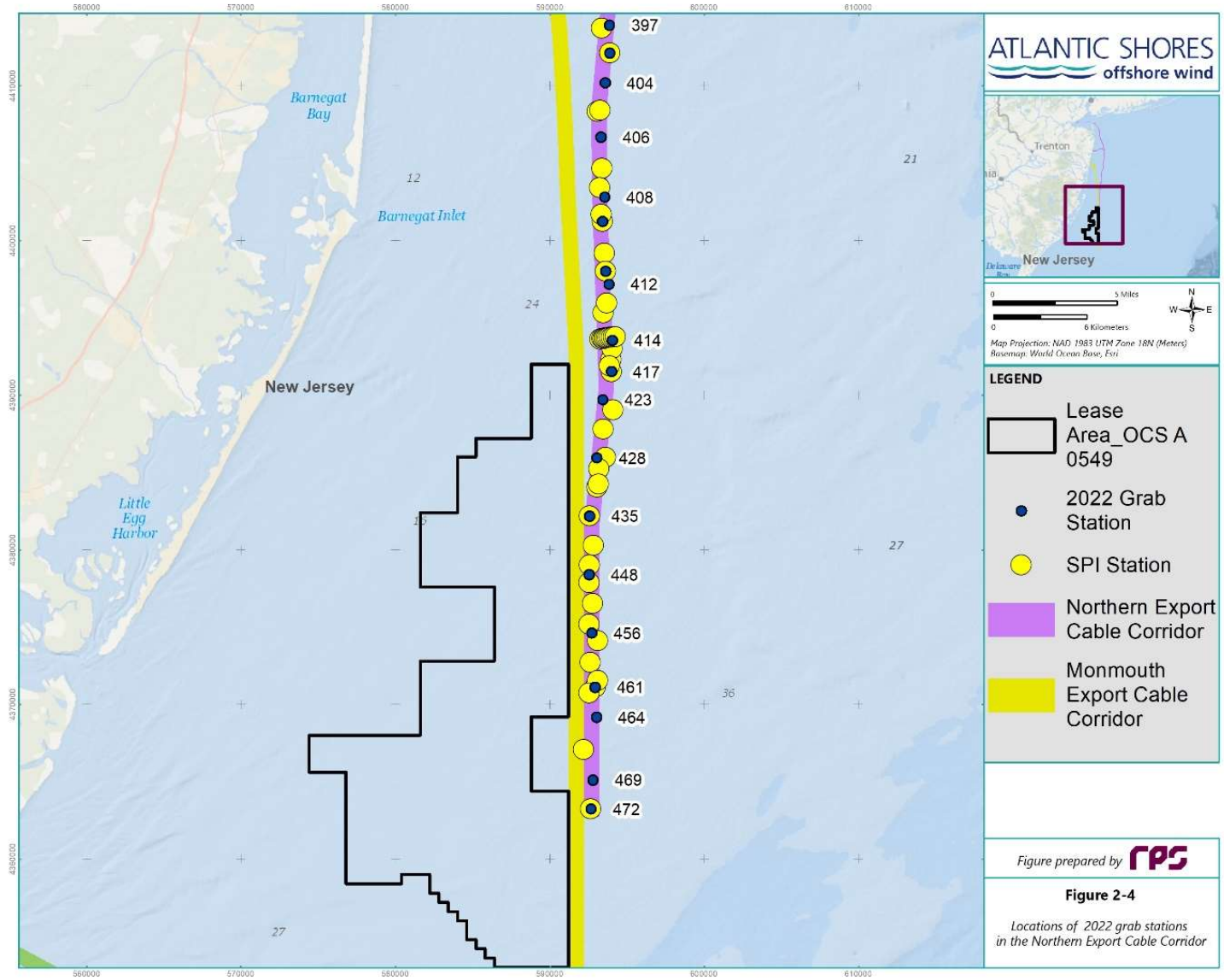


Figure 2-4. Benthic grab and SPI/PV stations in the Northern ECC collected during 2022 surveys near the Lease Area.

2.2 Grab Sampling

The type of sampler used to collect benthic grabs varied between 2019 and 2020. In 2019, benthic grab samples were acquired using an Ocean Instruments Salish Grab Standard SG-20 sampler with a sampling area of 0.10 square meters (m^2) that was divided in half during processing into 0.05 m^2 sections. This grab is a modified version of a standard Van Veen sampler with a stainless-steel weighted frame and release system with a penetration depth of up to 20 centimeters (cm). A real-time video camera was mounted to the frame. An altimeter, temperature probe, lights, and a parallel-mounted lasers (0.184 meters apart) were integrated with the video system. A virtual GPS node was placed just off the stern of the vessel where the A-frame was deployed to obtain GPS coordinates for each sample. The actual location on the seafloor at which the sample was taken may have differed from the GPS coordinates by a few meters.

In 2020, a Ted Young-modified double Van Veen grab sampler was used. This grab had a sampling area of 0.04 m^2 for each bucket and was configured with a DDV for real-time high-definition video footage of the seafloor conditions and grab operation at the time of sampling. An ultra-short baseline (USBL) beacon was fixed to the grab sampler to obtain global positioning system (GPS) coordinates in conjunction with a USBL system (Fugro 2020).

Sample processing steps remained the same or similar for 2019 and 2020 sampling events. Upon retrieval, the grab sampler was examined for sample acceptability. A sample was deemed acceptable if:

- Sample was more than 50% full;
- Sample was not over penetrated (i.e., not full to the top); and
- Surface structures were undisturbed and even (i.e., not slumped).

If a sample did not fulfil these requirements, the entire contents were returned to the water and another sample attempt was made. If three failed sample attempts occurred at one station, sampling moved on to the next station (no more than two fails occurred in any one sampling station). The results of each attempted grab were recorded in field notes.

Once an acceptable sample was obtained, the following steps were taken:

1. Overlying water was drained using a siphon;
2. A photograph was taken of the sample next to an identification label containing the sample identification number and a plastic ruler inserted to record sample depth;
3. Field notes included descriptions of physical features (apparent redox potential discontinuity depth, depth of penetration, sediment color, texture, odor, surface features) and surface macrofauna (e.g., longfin squid), which were then returned to the water.

Each bucket of the dual-bucket grab sampler used in 2020 was processed separately, just as each half of the single bucket sampler used in 2019 was processed separately. One bucket or half was processed for physical and chemical analysis of the sediment (sediment grain size and total organic carbon [TOC]), while the other was processed for macroinvertebrate species identification. The top 2 cm of one bucket or half were collected using a stainless-steel spoon for TOC lab analysis. Samples were kept cool (either on ice or refrigerated) while onboard. The remainder of that bucket or half was collected for sediment grain size analysis.

The entirety of the second grab bucket or second half was used for the identification of benthic macroinvertebrates at that station. The sample was loaded onto a processing table and the material was washed through a 0.5-millimeter (mm) sieve. Organisms, shell fragments, and other material remaining on the sieve were placed into a plastic container using a stainless-steel spoon and forceps as needed. The container was filled no more than one-half to two-thirds full with sample and seawater. If the quantity of sample exceeded this volume, it was placed in a second container. The samples were fixed/preserved with 10% buffered formalin solution by filling the remaining space within the bottle with solution. Samples were labelled, and containers were tightly sealed with tape and stored in a cooler at ambient temperature (not frozen or refrigerated). Prior to sieving the next sample, the sieve was cleaned by scrubbing with a stiff brush and backwashing with pressurized water.

We have assumed that a similar sampling protocol was followed during Fugro's 2022 grab survey.

2.2.1 Lab Analysis

2.2.1.1 Grain Size and TOC Analysis

In 2019 grain size and TOC samples were initially sent to Eurofin TestAmerica lab (5575 8th St E Tacoma, WA) then to Particle Technology Labs (555 Rogers Street, Downers Grove, IL) for completion of sediment analysis. Particle size was analyzed using ASTM D422-63 Standard Method for Particle-size Analysis of Soils (ASTM, 2007). The TOC content of sediment samples was analyzed using EPA Method 9060 with results reported in milligrams per kilogram (mg/kg) and percent (EPA, 1986).

Laser diffraction was then performed by Particle Technology Labs using the ISO 13320 Standard Method for Particle-size Analysis with a Malvern MasterSizer 3000 laser diffractor. Laser diffraction is a method of grain size analysis that involves passing a laser beam through sediment samples to accurately estimate the grain size distribution of the sediment sample. The principal theory that is used for the Malvern MasterSizer 3000 Laser Diffractor is the Mie Theory, which describes the relationship between scattered light angles and absorption to the relative volume of a particle. Particle Technology Labs then prepared a document that detailed the cumulative volume percentage of each grain size that was analyzed for each sediment sample.

While the majority of the sediment samples were made up of particle sizes that the laser diffraction method could register, larger particulates that exceeded the upper limit of the MasterSizer 3000 Laser Diffractor (3.5 mm) were still present in some samples. To characterize the relative volume percentages of these larger grains, wet sieving was required. The wet sieving was also performed by Particle Technology Labs and the results were then presented as cumulative volume percentages of each grain size.

The 2020 TOC samples were analyzed by TestAmerica (5755 8th Street, East Tacoma, WA). TOC content of sediment samples was determined using U.S. Environmental Protection Agency (EPA) Method 9060 with results reported in milligrams per kilogram (mg/kg). Moisture content was determined using Standard Method 2540G with results reported in percent.

In 2022 grain size samples were analyzed by GeoTesting Express (125 Nagog Park, Acton, MA) according to ASTM D6913/D7928 (sieve and hydrometer) to obtain particle size distributions by weight. Additional measurement steps were included to ensure results matched Wentworth Scale size bins and complied with CMECS recommendations.

2.2.1.2 Benthic Infauna Analysis

The benthic infauna analysis was conducted by EcoAnalysts for both 2019 and 2020 samples, according to the following steps:

1. Benthic infaunal samples were catalogued and verified against the Chain of Custody to ensure samples received match those listed in the shipment.
2. Samples were rinsed with freshwater to remove the formalin and transferred to 70 percent ethanol alcohol for sorting and storage.
3. Organisms were identified to the lowest practical taxonomic level (LPTL) (at least to Family) and counted by taxonomists using the most appropriate taxonomic references for the region (Bousfield, 1973; Cutler, 1994; Winston and Hayward, 2012).
4. Species classification and abundance were recorded in Project data sheets and summarized in both tabular and graphical formats.
5. Prior to performing the infaunal data analyses, the overall dataset was scanned for non-infaunal taxa (i.e., pelagic or planktonic organisms) that were excluded from all analyses; examples include chaetognaths, hyperiid amphipods, and decapod zoea/megalopae.
6. Calculations of abundance included all taxa occurring in each sample whether identified to species level or not.
7. Calculations based on species (diversity, evenness, and number of species) included only those taxa identified to species level.

2.2.2 Grab Video Post-Processing

Post-processing of 2019 and 2020 grab video data was conducted by RPS to provide:

- General characterization of substrate including bottom type, texture, micro-topography, and presence and approximate thickness (absent, light, moderate, or heavy) of sedimentation ("drape") covering hard substrates;
- Evidence of benthic activity by organisms (burrows, trails, biogenic reefs);
- Identification of epibenthic macroinvertebrates larger than 4 cm (decapod crustaceans, mollusks [including squid egg mops], echinoderms) and habitat;
- Presence/evidence and general characterization of submerged aquatic vegetation (macroalgae, sea grass);
- Identification of fish and fish habitat (where feasible) as classified by Auster (1998), which can provide back-compatibility with prior sampling depending on what has been previously done in the region and is easily applicable to Essential Fish Habitat determination;
- Identification of organisms to the lowest practical taxonomic level (at least to Family) using standard taxonomic keys for the geographic area;
- Evidence of fishing activity, such as trawl scars, pots, and working nets; and
- Presence of derelict fishing gear, military expended materials, shipwrecks, cultural artifacts, or other marine debris.

All DDV stills were classified according to CMECS (FGDC, 2012). The BOEM Benthic Habitat guidelines (BOEM, 2019) also require that the developer characterize the benthic community composition which includes documentation of abundance, diversity, percent cover, and community structure. The following were recorded when present and identifiable:

- Characterization and delineation of any submerged aquatic vegetation (seagrass or macro-algae) that occurs within the area of potential adverse effect;
- Characterization and delineation of any hard bottom gradients of low to high relief such as coral (heads/reefs), rock or clay outcroppings, or other shelter-forming features; and
- Identification of communities of sessile and slow-moving marine invertebrates (clams, quahog, mussels, polychaete worms, anemones, sponges, echinoderms) that may be within the area of potential adverse effect.

The video data were analyzed according to the following steps:

1. A single still image was analyzed from each site by selecting the first clear view of the seafloor at each grab site, with camera positioned approximately 46 cm above the seafloor.
2. The visible area of each still image was defined, measured, and reviewed for evidence of benthic species and activity, submerged aquatic vegetation (macroalgae, sea grass), fishing activity, derelict gear, military expended materials, shipwrecks, and other marine debris and presence/absence of these features were noted. In some instances of poor visibility, video was used in addition to still images to determine presence absence.
3. Selected stills were broadly characterized by texture, microtopography, presence/thickness of sedimentation over hard substrates (i.e., "drape"), and presence of

coral heads/reefs, rock outcroppings, other shelter features, or Essential Fish Habitat for NMFS-designated species in the region.

4. The biological component was defined to furthest extent possible for each station when analyzed in conjunction with the grain size and benthic community results according to the CMECS (FGDC, 2012).

For 2022 grab samples, Fugro provided GrabCam video notes, which can be reviewed in Appendix C.

2.2.3 Benthic Community Data Post-Processing

The benthic community analysis was based on the benthic macroinfauna laboratory data from Ecoanalysts. Macroinvertebrate community statistics were calculated using family (or next lowest taxonomic level possible based on LPTL). Abundance estimates in each sample were calculated using species and abundance estimates in each sample. In 2019 these values were reported as count per 0.05 m^2 grab sample (i.e., half of the grab sample processed for biological analysis), while in 2020 and 2022 these values were reported as count per 0.04 m^2. Community composition parameters included: total abundance, number of phyla, number of taxa, Margalef's Richness Index, Shannon Diversity Index, and Pielou's Index of Evenness for each station. Benthic macroinvertebrate taxonomic composition was assessed to characterize the high-level trends in community data. Community composition summaries included summaries of each station and of the entire survey aggregated at both phylum-level and LPTL.

Taxonomic richness, evenness, and diversity are common ecological parameters used to measure the overall biodiversity of a community or discrete unit. Taxonomic richness is the number of unique species or taxonomic groups represented in an area of interest. In this assessment, taxonomic richness was calculated using Margalef's Richness Index (Formula 1) for each station to acquire individual and average richness indices calculated using family or next lowest taxonomic practical taxonomic level (NLPTL) abundances.

Formula 1. Margalef's Richness Index (RI).

$$\mathrm{RI} = \frac{(\mathrm{S}-1)}{\ln(\mathrm{N})}$$

Where:

S= the number of species

n= the total number of individuals in the sample

Interpretation: The higher the index, the greater the species richness.

The diversity index for a community considers taxonomic richness and the proportion of each unique taxa. The Shannon Diversity Index (H'; Formula 2) was calculated using the number of each taxa (family or

NLPTL), the proportion of each taxa relative to the total number of individuals, and the sum of the proportions. This index was used to assess diversity of each station. The diversity index (H') increases with increasing taxonomic richness and evenness.

Formula 2. H'- Shannon Diversity Index.

$$H' = -\sum_{i=1}^{N} p_i \ln(p_i)$$

Where:

p_i is the proportion of individuals belonging to the with species in the dataset of interest

Interpretation: The greater the H', the greater the richness and evenness.

Evenness of a community refers to the similarity in abundances of different species comprising a community or sample. Pielou's Index of Evenness (J'; Formula 3) includes H' (Shannon-Weiner Diversity Index) in its calculation.

Formula 3. J'- Pielou's Index of Evenness.

$$J' = \frac{H'}{H_{Max}}$$

Where:

H' is the Shannon- Weiner Diversity Index

H_{Max} is the maximum possible value of H', where each species occurs in equal abundances.

Where: s = Number of species

Interpretation: J' is constrained between 0 and 1. The greater the value of J', the more evenness in the sample.

2.3 Towed Video Sampling

The 2021 towed video survey was conducted by RPS on the research vessel, R/V Shearwater operated by Alpine Ocean Seismic Survey, Inc. between June 4 and June 11, 2021. The camera sled was equipped with parallel-mounted lasers 2.5 centimeters (cm), altimeter, GoPro Hero 9, and a 4K camera with cable that transmitted real-time video to the vessel. An ultra-short baseline (USBL) beacon was fixed to the camera sled to obtain GPS coordinates in conjunction with a pole-mounted Sonardyne Mini Ranger 2 USBL

system. One geographic fix per second was recorded for the location of the video sled and tow point. The video sled was deployed from a starboard-mounted A-frame and lowered until positioned 0.5 to 1.0 meters (m) above the seafloor. The height of the camera above the seafloor varied along each transect due to differences in sediment type, vessel speed, swells, and visibility/high turbidity.

The 2022 towed video survey was conducted by RPS on the research vessels, R/V Westerly and R/V Enterprise operated by Fugro N.V. between August 18 and August 23, 2022. The camera sled was equipped with parallel-mounted lasers 2.5 centimeters (cm) apart (18.5 cm on back up sled), altimeter, GoPro Hero 9, and a 4K camera with cable that transmitted real-time video to the vessel. An ultra-short baseline (USBL) beacon was fixed to the camera sled to obtain GPS coordinates in conjunction with a pole-mounted Sonardyne Mini Ranger 2 USBL system. One geographic fix per second was recorded for the location of the video sled and tow point. The video sled was deployed from a stern-mounted A-frame and lowered until positioned 0.5 to 1.0 meters (m) above the seafloor. The height of the camera above the seafloor varied along each transect due to differences in sediment type, vessel speed, swells, and visibility/high turbidity.

Video transects approximately 250 m in length were recorded in accordance with procedures following BOEM's Guidelines for Providing Benthic Habitat Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585 (BOEM, 2019). Target vessel speed was 0.5 to 0.8 knots; however, due to local current conditions, tow speeds were occasionally recorded up to 3 knots. For the R/V Westerly, straight line transects were run; however due to operational concerns on the R/V Enterprise drift tows were conducted using a range ring approach, with the vessel passing through the midpoint of the range ring. The sled operator used a remote winch to raise and lower the towed camera sled as needed to maintain proximity to the seafloor. While recording, field notes were recorded containing transect information (date, time, station identifier [ID], depth, heading, and video file name) and observations of sediment/seafloor characteristics. Notes were made for the beginning and end of the transect as well as any changes in weather, visibility, substrate, or community. During recording, any potentially sensitive benthic habitats (e.g., exposed hard bottom, seagrass/kelp/algal beds, coral species) were noted, as per BOEM's guidelines (BOEM, 2019).

2.3.1 Megafauna Review

Both NMFS and BOEM guidelines recommend identifying sessile taxa of economic and/or ecologic value that are vulnerable to project impacts. Vulnerable taxa from these guidelines include sponges, anemones, bryozoans, hydrozoans, corals, tunicates, and bivalves. Additionally, the presence of macroalgae, epifauna, and/or infauna/emergent taxa should be noted. Under these guidelines, abundances of enumerable megafauna were recorded along with presence/absence of benthic biotic activity. The software, Behavioral Observation Research Interactive Software (BORIS) was used to record all towed video observations.

BORIS is an open-source event logging software for video/audio coding and live observations (Friard and Gamba 2016).

When a feature or species was identified, the reviewer recorded the time, rated video visibility at that time, categorized the bottom, and recorded the LPTL of the feature. Some features were enumerated whereas others were marked as present or absent and further quantified in the subsequent percent cover analysis (Section 2.3.2). The abundances of enumerable megafauna were recorded along with presence/absence of benthic biotic activity, submerged aquatic vegetation (macroalgae, sea grass), fishing activity, derelict gear, military expended materials, shipwrecks, coral heads/reefs, and other marine debris. Specifically, algae (macroalgae, submerged aquatic vegetation), bushy plant-like organisms (i.e., presumably hydrozoa or bryozoa but potentially macroalgae), eelgrass, blue mussels, oysters, slipper shells (*Crepidula fornicata*), sand dollars (*Echinarachnius parma*), sponges, shell-infused worm tubes, other worm tubes, encrusting organisms (i.e., encrusting tunicates, encrusting sponges, and northern star coral (*Astrangia poculata*)), were marked as present or absent while other qualifying features were enumerated. Most portions of the videos were reviewed multiple times using slower playback speeds and replay functions.

The Shannon-Weiner Diversity Index values were calculated for each video transect based on observations to level of phylum or family or NLPTL. The Shannon Diversity Index (H'; Section 2.2.3) was calculated to measure diversity of the biological communities at each station. A higher index value indicates the more diverse the species are within the habitat at that station. The index is affected by both the number of species and their evenness. An index value of 0 indicates only a single species is present in the biological community. The greater the H', the greater the richness and evenness. All analyses were implemented in the R v 4.0.5 statistical environment (https://www.r-project.org/). The Shannon Diversity Index was calculated in R using the vegan package (Oksanen et al., 2019) to measure the diversity across transects. All figures and tables within the results section for "Organisms and Features" were created in R and are based off the Megafauna Review data.

2.3.2 Percent Cover Analysis

For the percent cover analysis, high-resolution still images from the GoPro camera were analyzed for percent cover of different bottom types and biological communities. During the video tow, still images were captured every second and later subsampled at increments equivalent to approximately one image every 10 m distance based on the length of the transect, the frame rate, and duration of the individual video. Metadata were recorded for each still image including latitude and longitude, time, transect, and ID number. The quality of each image was assessed with a categorical scale of visibility from 0 to 4. Still images with quality scores of "moderate" (2 or greater) were considered passable for the percent cover analysis with seabed image processing software photoQuad (Trygonis and Sini, 2012), with preference given to selecting the highest scoring images. In total, 25 images were processed for each 250 m transect so that bottom habitat was classified every 10 m, on average. Each image was calibrated for scale using the reference

laser points and the area (cm^2) of the visible portion was recorded, with poorly lit or blurry edges of passing images excluded from the area of analysis.

To inform the classification of bottom habitat, 50 points were distributed uniformly across the visible portion of each passing still image using photoQuad (

Figure 2-5). Percent cover data were recorded as the number of points under which different substrate types were visible: boulder, cobble, pebble/granule, sand/mud, biogenic-origin shells/debris (see particle size definitions in Table 2-1). In cases where it was difficult to discern whether small particles were either gravel or shell (i.e., geologic or biogenic in origin), gravel was assigned as a default based on guidance in the CMECS standards (FGDC, 2012).

In addition, organisms or structures (i.e., biological elements or biotic components) were recorded if any of the 50 points landed on them in each image, including worms/tubes (e.g., tube structures, decorator worms), plant-like (e.g., macroalgae, vascular plants, UID bushy plant-like organisms), encrusting (e.g., sponges, corals, bryzoans, hydroids), and slow/sessile organisms (e.g., burrowing anemones, clams, mussels, sand dollars, urchins, sea stars, hermit crabs and other gastropods). Associated taxa are defined in CMECS as epifaunal predators that are capable of moving out of the boundary of the still image within one day (FGDC, 2012). These include Cancer crabs, horseshoes crabs, lobsters, moon snails, skates, and fish. These mobile organisms or evidence of their presence (e.g., egg cases) within the still were also recorded. These point counts approximated percent cover of each substrate type and biotic component visible in the still image. For the example image in (

Figure 2-5), 4 points landed on gravel particles (8% cover), 3 points landed on biogenic shell hash pieces (6% cover), 2 points landed on biotic components (4% cover), and the other 41 of the 50 uniformly-distributed points landed on sand/mud substrate (82% cover). Sand and mud substrate categories are lumped together because the particle sizes are too fine to discern by eye in video imagery.

All analyses were implemented in the R v 4.0.5 statistical environment (https://www.r-project.org/). All figures and tables within the results sections for “Percent Cover” were created in R and are based off the percent cover analysis data.

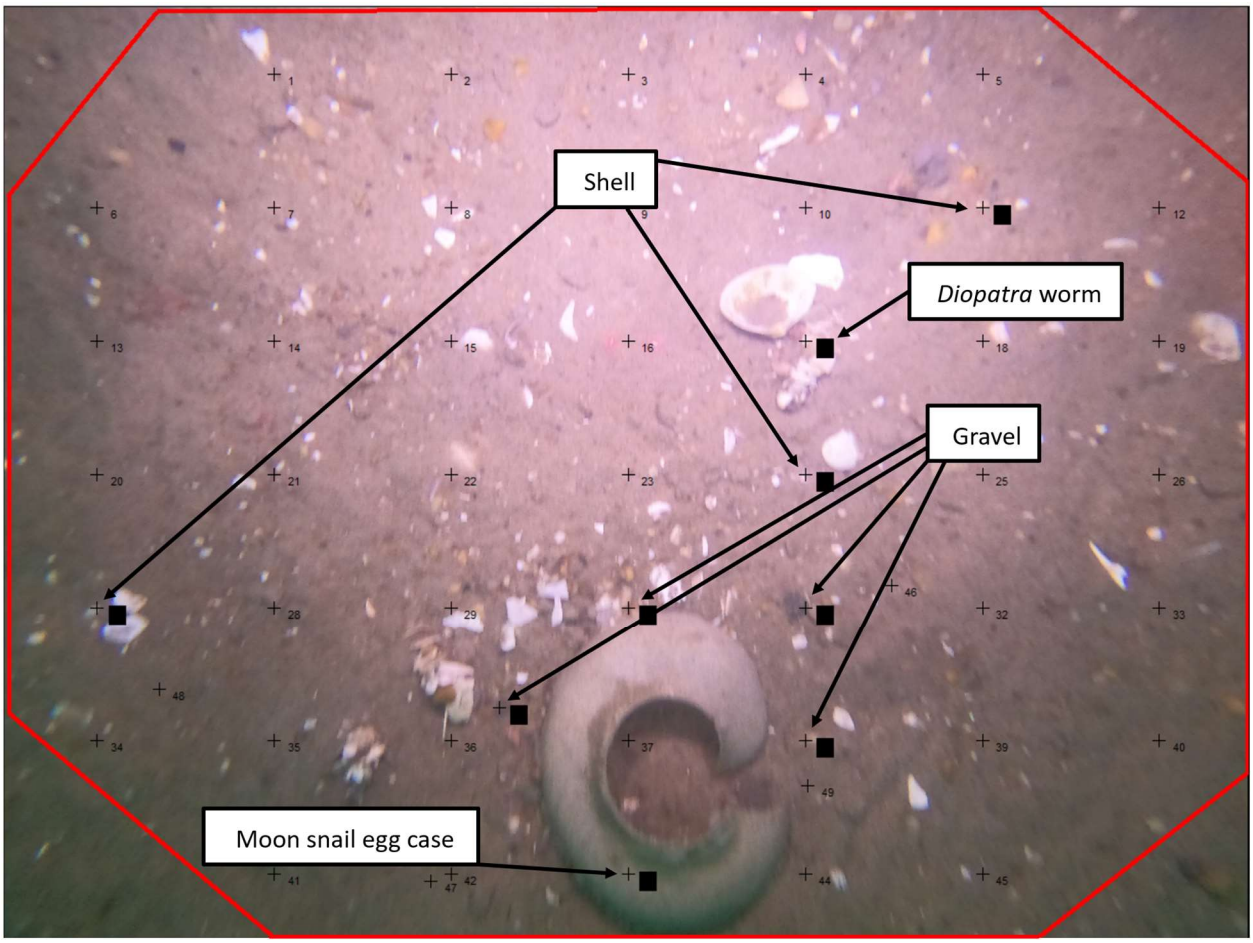


Figure 2-5. Example of the point count / percent cover procedure.

2.3.3 CMECS: Substrate Component

The percent cover of different substrates was used to assign the substrate classifications to the furthest extent possible under a NMFS-modified (NMFS, 2020) version of CMECS standards (FGDC, 2012). This system discerns substrate components by origin (e.g., geologic mineral, biogenic material, or anthropogenic material) and size groups, based primarily on the percent cover of coarse, gravel-sized particles (pebble/granule, cobble, and boulder) versus sand/mud (indistinguishable at this scale of video data), or the size category of shells (reef, rubble, and hash). When there was a substantial amount of biological element cover (also referred to as flora/fauna or biotic components throughout this report), the flora/fauna cover was removed from the total area to accurately determine the percent of visible substrate composing gravel, sand, shells, etc. After the main CMECS classification for the substrate component in each image was defined, a secondary or co-occurring substrate type was defined to provide further detail and delineate between habitats. For example, if the main CMECS classification defined the dominant substrate type as geologic origin, then the secondary CMECS classification would contain information about

substrates of biogenic or anthropogenic origin if they were also present. These classifications were assigned for the visible surface area of each image.

Table 2-1. CMECS geologic sediment size, biogenic or anthropogenic size, and percent cover categories (*from FGDC, 2012).

Geologic Sediment Category	Definition	Biogenic Anthro Category	Or Size Definition	Biogenic Cover Density	Adapted Definition*
Bedrock	> 4,096 mm	Reef	> 4,096 mm	Trace	≤ 2%
Boulder	256 – 4,096 mm	Rubble	64 – 4,096 mm	Sparse	> 2 – < 30%
Cobble	64 – 256 mm			Moderate	30 – < 70%
Pebble / Granule	2 – 64 mm	Hash	2 – 64 mm	Dense	70 – < 90%
Sand / Mud	< 2 mm	Sand or Bits	< 2 mm	Complete	≥ 90%

RPS coordinated with the Atlantic Shores G&G team to modify the Folk sediment triangle (Folk, 1954) used for their analyses so that the underlying substrate types they characterized would better align with the gravel size thresholds that define the substrate types in the CMECS hierarchy. Figure 2-6 illustrates the five substrate categories that were mapped from the G&G data and which of the CMECS substrate components identified by RPS fell within each tier. Not shown in the figure are images that were ultimately classified as biogenic shell substrate or biotic components, since they did not fall on the sediment scale.

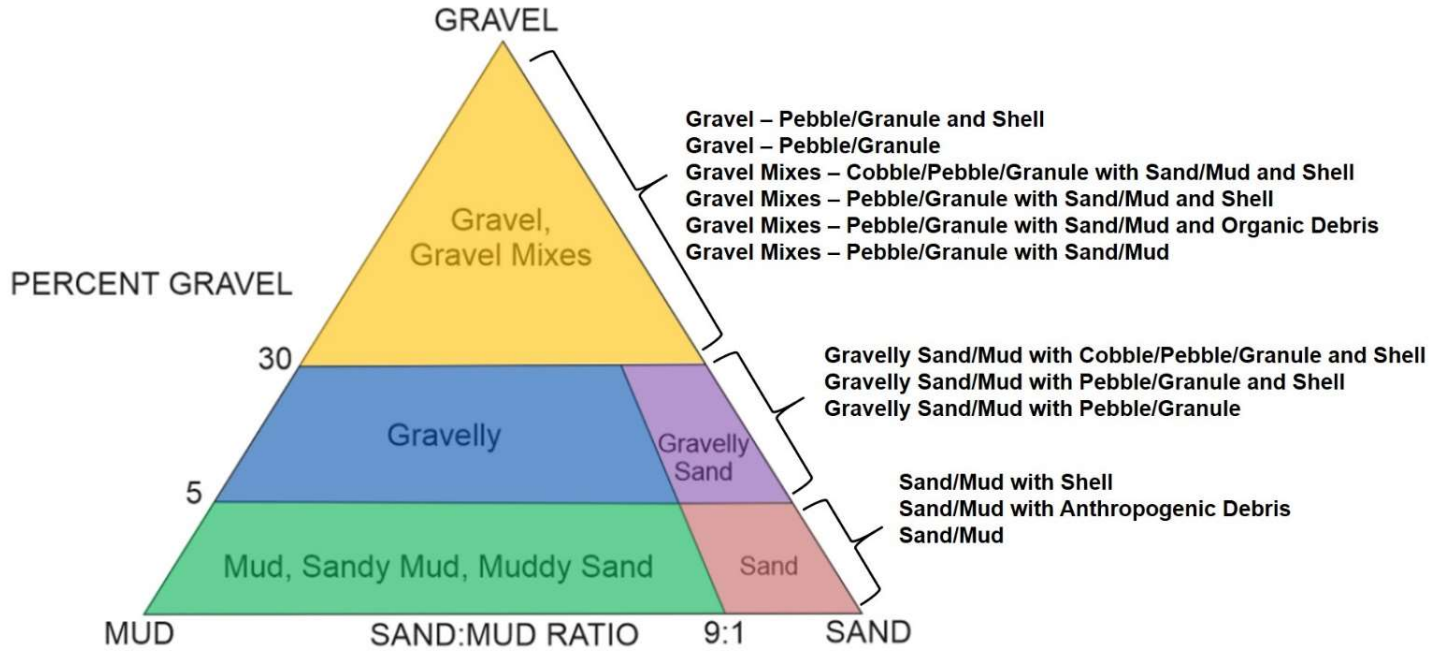


Figure 2-6. Modified Folk (1954) sediment grain size triangle showing the five G&G substrate classes and corresponding CMECS substrate categories based on the video data.

2.3.4 CMECS: Biotic Component

A CMECS biotic component classification was also assigned to each image that was analyzed during the percent cover analysis. The CMECS biotic component is a classification of living organisms of the seabed and water column together with the physical associations of various spatial scales (FGDC, 2012). The number of the 50 uniform points that fell on any biological element was recorded as either mobile megafauna or a biotic component organism. For images that contained an organism that defined one of the biotic component classes, individual counts of all organisms within the image were recorded, regardless of whether a point fell on it or not. The individual count data were used to create the biotic component classification, as that data was more representative of the entire community of organisms present in the image than the point count data was. For example, the points could miss all or most of the sand dollars within a still image, even if within that frame there were >30 sand dollars captured (Figure 2-7). Conversely, Figure 2-8, which has 30+ sand dollars, had 23 points land on sand dollars. Considering the above methodology, both Figure 2-7 and Figure 2-8 have the same biotic component classification as shown in Table 2-2.

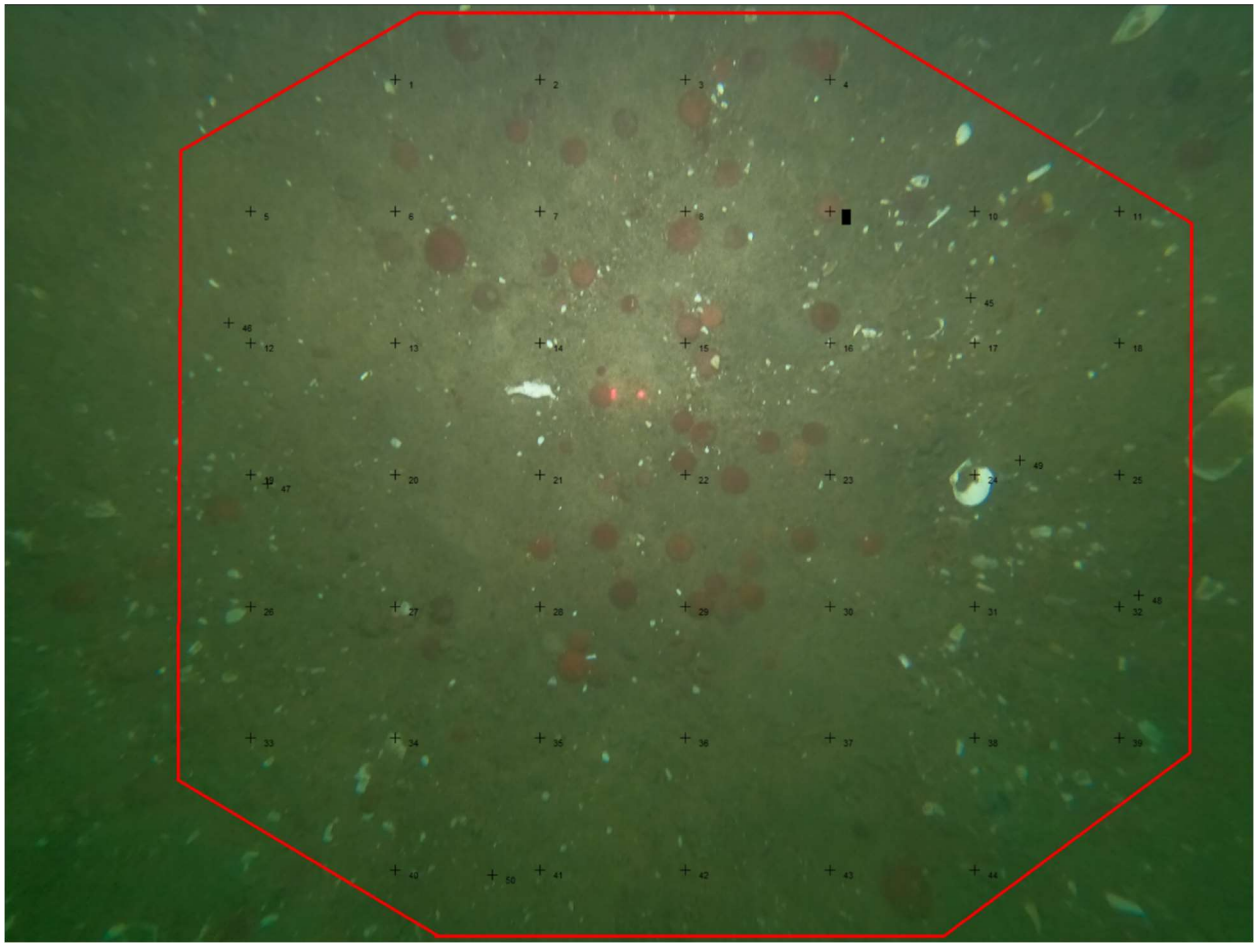


Figure 2-7. Example image showing 30+ sand dollars within the analyzed quadrat, with only one of the 50 uniform points landing on a sand dollar, lasers are spaced 2.5 cm apart.

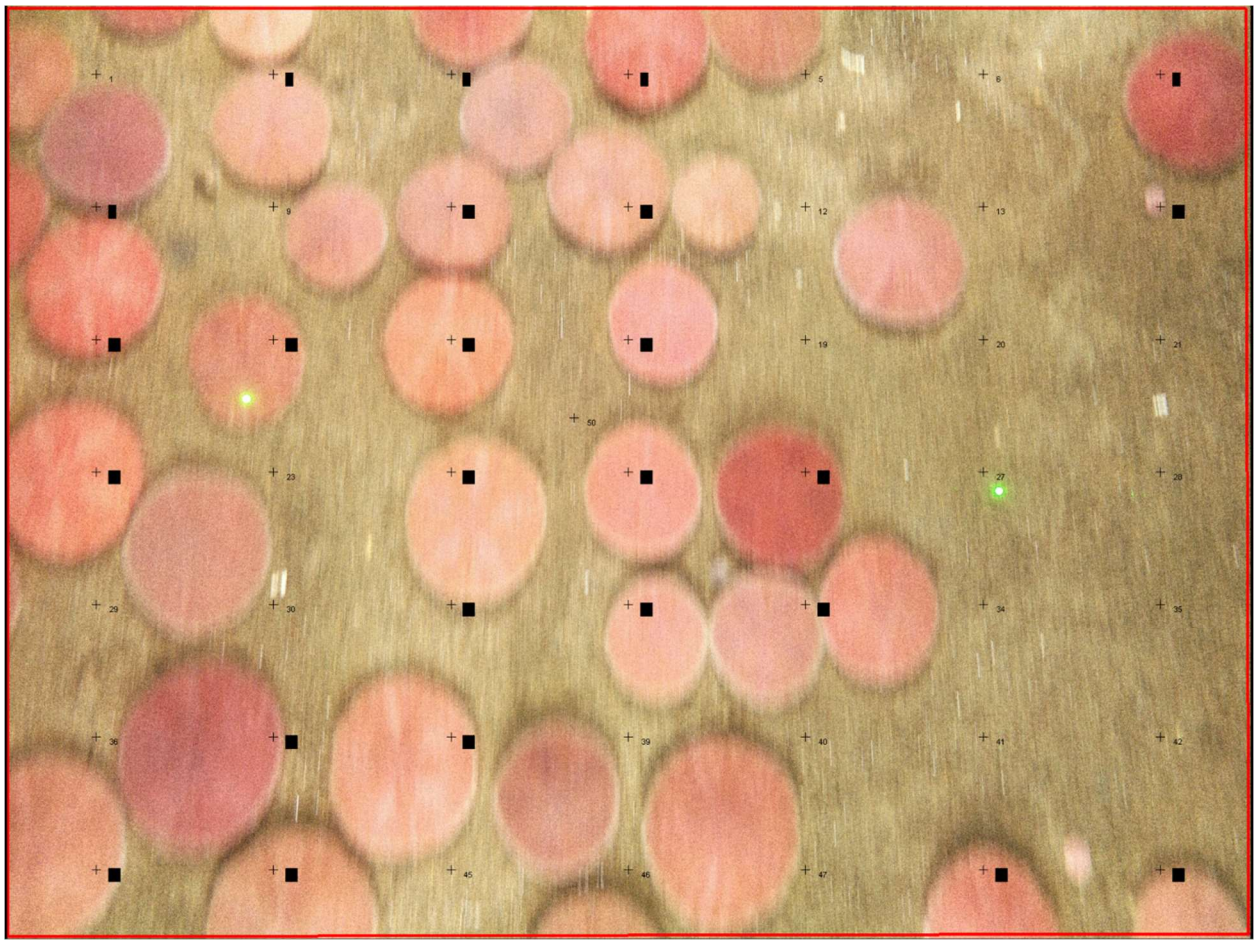


Figure 2-8. NEC-80_115451.800.jpg showing 30+ sand dollars within the analyzed quadrat, with 23 of the 50 uniform points landing on sand dollars, lasers are spaced 18.5 cm apart.

Table 2-2. Example Biotic Classification.

CMECS Grouping	CMECS Classification
Biotic Setting	Benthic Biota
Biotic Class	Faunal Bed
Biotic Subclass	Soft Sediment Fauna
Biotic Group	Sand Dollar Bed
Biotic Community	N/A (unable to identify taxonomy down to Genus)
Co-Occurring Biotic Element	None

According to an internal literature review, no one standard method for determining the CMECS biotic component class exists since the method can be modified to suit the needs of a project. Some studies used percent cover of each image or sampling area, while others used abundance to classify the biotic component. For the current survey, we followed methods used to process underwater video data from a

similar survey conducted within Narragansett Bay, RI (E. Moore, personal communication, 2019). The biotic component was classified for each still image rather than on a transect level in order to capture transition zones within the Offshore Project Area. The number of still images classified to each biotic component category was then summarized per transect in the results.

To assign a biotic component class, the most numerically dominant organism was identified to determine the Biotic Setting, Biotic Class, Biotic Subclass, Biotic Group, and Biotic Community of each image. Organisms were identified to the LPTL, with most images classified to Dominant Biotic Group within the CMECS hierarchy. Co-occurring biotic component groups were then listed in order of highest to lowest abundance, with just the second-most dominant group presented in the body of this report. Mobile megafauna (fish, crabs, sea stars, etc.) that could easily leave the seafloor area captured in an image within a day were listed as Associated Taxa. When there was a tie for numerical dominance within an image, the reviewer returned to the image and made a visual assessment of dominance based on surface area occupied by each organism.

All worm tubes observed were classified as the biotic component group Larger Tube-Building Fauna (>3 mm in diameter or > 30 mm in length), and identified during video review and the percent cover analysis as either Decorator Worms (*Diopatra* sp.) or UID Worm Tubes (Figure 2-9 and Figure 2-10). *Diopatra* Beds (i.e., decorator worm tubes) were identifiable in the video imagery, with shell hash often visible in the outer worm tube. UID Worm Tubes were considered potentially alive with white suspension feeding tendrils observed in some videos, however there were not any distinguishing features to further identify them. Inferred Fauna was defined as areas dominated by visible evidence of faunal activity, but where the fauna themselves are not currently present or evident (FGDC, 2012). Included in the Inferred Fauna Biotic Subclass were egg masses, fecal mounds, tracks/trails, and pelletized, fluid surface layers. Inferred Fauna was only classified as the dominant biotic component if there were no other organisms with two or more individuals present in the quadrat. If there were two or more individuals of the same species in the quadrat, then the relevant faunal bed biotic component classification was assigned as dominant, and Inferred Fauna was listed as a co-occurring biotic component. This modifier allowed us to prioritize the presence of living organisms over structures with unclear organism presence.

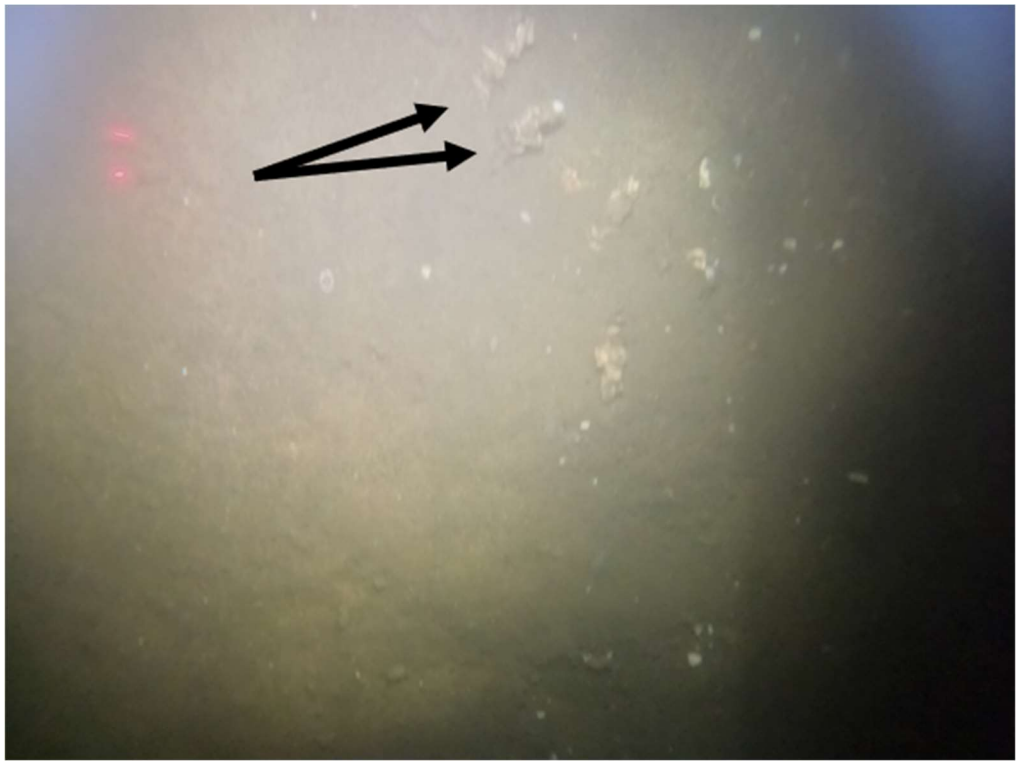


Figure 2-9. Decorator Worms (*Diopatra* sp.) observed in NEC-62.

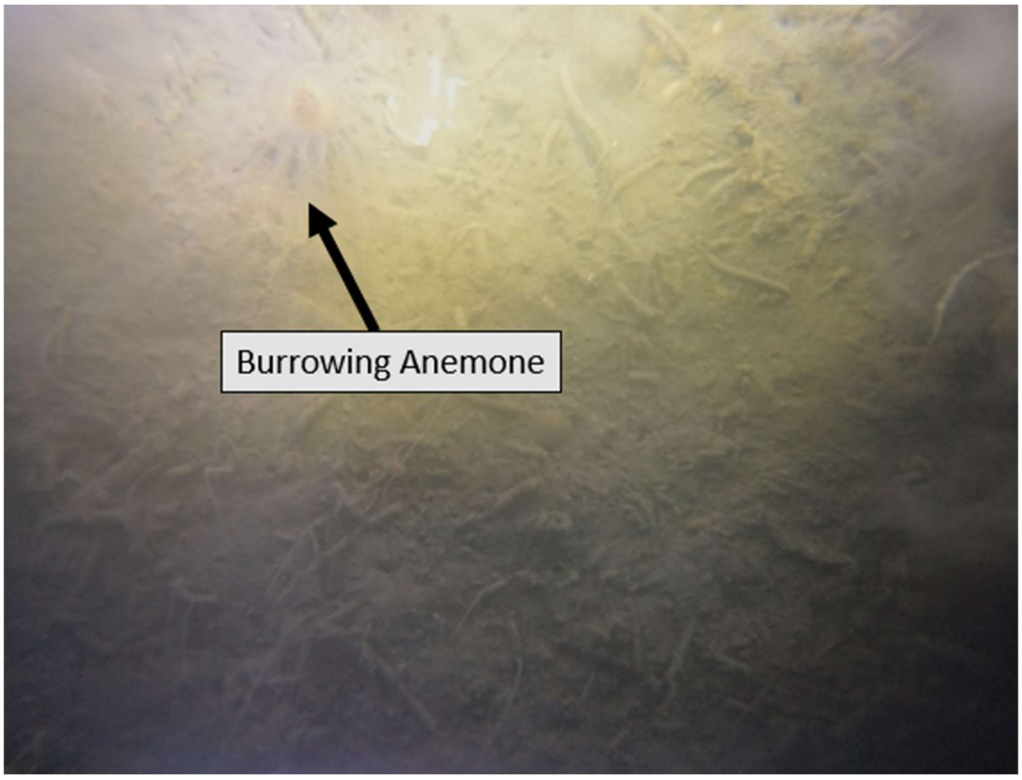


Figure 2-10. Burrowing Anemone and Larger Tube-Building Fauna (UID Worm Tubes) observed in NEC-53.

3 RESULTS

3.1 Grab Samples

The water depth and geographic locations of the seven grab sample stations collected within the Lease Area in 2019 are described in Table 3-1. Samples were either taken in buoy installation areas (IAs) or other sites of interest (SOI) that occurred within the Lease Area. Collection of sediment material was successful at all benthic grab stations. Grabs from two stations (SOI 7 and SOI 8) were not sampled for infauna.

The water depth and geographic locations of the 86 grab sample stations collected within the Monmouth ECC and Lease Area in both 2020 and 2022 are described in Table 3-2. Collection of sediment material was successful at all benthic grab stations except station LAR-20-003 due to the presence of large shells preventing sediment retrieval. In addition, three attempts were made at LAR-20-017, but none were successful at retrieving a passing sediment sample due to incomplete closure. One partial sample at this site contained fine sand with large clam rubble and sand dollars but did not contain enough intact surface sediment to send for grain size analysis. However, the partial samples were mixed and sent for macroinvertebrate analysis.

The water depth and geographic locations of the 65 grab sample stations collected within the Northern ECC in 2022 are described in Table 3-3. Representative images of the grab samples and DDV/GrabCam stills from 2019, 2020, and 2022 surveys are provided in Appendix A.

Table 3-1. 2019 grab sample station locations and characteristics in the Lease Area.

IA or SOI	Station	Date (UTC)	Time (UTC)	Latitude	Longitude	Sonar-Based Water Depth (m)	Temp (°C)	Penetration Depth (cm)	Infaunal Sample Volume (m^3)
IA2	1	13-Oct-19	2:06 PM	39° 33.9308' N	73° 58.1656' W	25.0	18.57	5.1	0.0015
IA2	2	13-Oct-19	2:35 PM	39° 33.9907' N	73° 58.1989' W	25.0	18.57	9.1	0.0042
SOI 4	-	13-Oct-19	6:43 PM	39° 23.7691' N	74° 2.7639' W	26.0	18.75	9.5	0.003
SOI 5	-	13-Oct-19	8:43 PM	39° 26.7895' N	74° 5.6972' W	21.0	18.40	11.5	0.003
SOI 6	-	13-Oct-19	6:39 PM	39° 24.1021' N	73° 57.8008' W	28.0	18.59	9.2	0.0036
SOI 7	-	13-Oct-19	10:48 PM	39° 33.8481' N	74° 2.1521' W	24.0	18.68	11.8	NA
SOI 8	-	14-Oct-19	12:07 AM	39° 38.0361' N	73° 57.7192' W	26.0	18.14	8.5	NA

Table 3-2. 2020 and 2022 Grab sample station locations and characteristics in the Monmouth ECC (MON) and Lease Area (LA).

Project Area	Sample	Date (UTC)	Time (UTC)	Latitude	Longitude	Water Depth (m)	Penetration Depth (cm)
MON	LAR-20-002	18-Jul-20	2:27 PM	40° 05' 11.507" N	73° 58' 48.214" W	24	9
MON	LAR-20-004	18-Jul-20	5:24 PM	40° 03' 19.796" N	73° 57' 49.295" W	22.1	8
MON	LAR-20-005	30-Jul-20	6:00 PM	40° 06' 57.468" N	74° 1' 43.932" W	5.2	8
MON	LAR-20-006	30-Jul-20	5:13 PM	40° 06' 4.193" N	74° 1' 7.240" W	14.8	7
MON	LAR-20-008	18-Jul-20	3:12 PM	40° 04' 21.122" N	73° 59' 44.552" W	23.2	9.5
MON	LAR-20-010	18-Jul-20	6:09 PM	40° 03' 3.694" N	73° 57' 46.320" W	22.9	8
MON	LAR-20-011	18-Jul-20	6:38 PM	40° 02' 2.587" N	73° 57' 36.510" W	22.2	9
MON	LAR-20-012	18-Jul-20	7:38 PM	40° 01' 1.242" N	73° 57' 37.441" W	22.1	9
MON	LAR-20-014	18-Jul-20	9:25 PM	39° 58' 58.173" N	73° 57' 25.881" W	21.4	8
MON	LAR-20-016	18-Jul-20	9:54 AM	39° 56' 55.940" N	73° 57' 7.578" W	21.2	7
MON	LAR-20-018	18-Jul-20	8:47 AM	39° 54' 53.285" N	73° 56' 48.398" W	21.6	9
MON	LAR-20-020	18-Jul-20	3:38 AM	39° 52' 50.546" N	73° 56' 31.626" W	21.4	8
MON	LAR-20-021	18-Jul-20	2:32 AM	39° 51' 49.791" N	73° 56' 24.537" W	21.7	8
MON	LAR-20-022	17-Jul-20	11:16 PM	39° 50' 46.908" N	73° 56' 19.834" W	22.2	8
MON	LAR-20-024	17-Jul-20	10:21 PM	39° 48' 44.232" N	73° 56' 13.001" W	23	9
MON	LAR-20-026	19-Jul-20	2:06 AM	39° 46' 41.926" N	73° 56' 7.711" W	23.3	8
MON	LAR-20-028	17-Jul-20	8:58 PM	39° 44' 38.709" N	73° 56' 0.950" W	23.8	8
MON	LAR-20-030	17-Jul-20	8:02 PM	39° 42' 35.754" N	73° 55' 55.154" W	24.7	9
MON	LAR-20-031	19-Jul-20	5:30 AM	39° 41' 33.793" N	73° 55' 51.887" W	23.9	9
MON	LAR-20-032	17-Jul-20	7:11 PM	39° 40' 31.119" N	73° 55' 49.050" W	25.5	9
MON	LAR-20-037	18-Jul-20	1:39 AM	39° 51' 10.772" N	73° 55' 24.782" W	22.1	8
MON	MON-22-383r	28-May-22	3:56 PM	40° 02' 02.566" N	73° 57' 35.417" W	22	6.5
MON	MON-22-401r	5-Jun-22	3:38 AM	39° 51' 10.040" N	73° 55' 25.147" W	22	9
MON	MON-22-415r	29-May-22	6:12 AM	39° 40' 33.028" N	73° 55' 52.813" W	25	6.5
MON	MON-22-420	29-May-22	8:14 AM	39° 39' 50.382" N	73° 55' 58.613" W	25	8.5
MON	MON-22-433	29-May-22	12:19 PM	39° 35' 36.175" N	73° 55' 35.072" W	27	6.5
MON	MON-22-446	29-May-22	4:49 PM	39° 33' 21.546" N	73° 55' 57.018" W	26	5
MON	MON-22-452	29-May-22	6:21 PM	39° 31' 57.187" N	73° 55' 58.210" W	25	8
MON	MON-22-457	29-May-22	8:19 PM	39° 30' 39.110" N	73° 55' 55.157" W	25	NA
MON	MON-22-459	6-Jun-22	11:25 PM	39° 29' 30.887" N	73° 56' 02.126" W	25	9

Project Area	Sample	Date (UTC)	Time (UTC)	Latitude	Longitude	Water Depth (m)	Penetration Depth (cm)
MON	MON-22-462	7-Jun-22	12:48 AM	39° 28' 50.326" N	73° 56' 21.239" W	25	8
MON	MON-22-473	30-May-22	6:17 AM	39° 24' 35.748" N	73° 56' 21.361" W	26	8.5
MON	MON-22-479	7-Jun-22	5:19 AM	39° 20' 27.550" N	73° 56' 09.265" W	27	7.5
LA	OCS-20-038	17-Jul-20	3:54 PM	39° 36' 10.822" N	73° 57' 5.516" W	25.8	8
LA	OCS-20-039	19-Jul-20	10:59 AM	39° 35' 54.259" N	73° 59' 16.512" W	24.8	8
LA	OCS-20-041	19-Jul-20	5:33 PM	39° 34' 9.011" N	73° 57' 10.012" W	24.2	9
LA	OCS-20-043	17-Jul-20	1:46 PM	39° 33' 42.091" N	74° 00' 37.476" W	23.0	8.5
LA	OCS-20-046	17-Jul-20	1:05 PM	39° 31' 52.033" N	73° 59' 4.465" W	23.7	8.2
LA	OCS-20-047	17-Jul-20	11:41 AM	39° 30' 3.547" N	73° 57' 23.332" W	24.9	8.5
LA	OCS-20-048	19-Jul-20	10:53 PM	39° 29' 41.261" N	74° 00' 15.414" W	25.1	9
LA	OCS-20-049	17-Jul-20	8:42 AM	39° 29' 29.872" N	74° 01' 44.525" W	22.9	8
LA	OCS-20-051	17-Jul-20	4:13 AM	39° 28' 3.284" N	73° 57' 12.572" W	23.0	7
LA	OCS-20-053	17-Jul-20	6:36 AM	39° 27' 26.508" N	74° 01' 57.206" W	25.2	7.2
LA	OCS-20-055	16-Jul-20	11:13 PM	39° 26' 56.479" N	74° 05' 49.575" W	21.3	8
LA	OCS-20-057	16-Jul-20	5:53 PM	39° 25' 48.571" N	73° 58' 55.144" W	22.8	8
LA	OCS-20-059	16-Jul-20	7:16 PM	39° 25' 14.266" N	74° 03' 17.719" W	25.1	7
LA	OCS-20-061	16-Jul-20	8:29 PM	39° 24' 50.008" N	74° 06' 28.403" W	21.7	7
LA	OCS-20-063	16-Jul-20	9:44 AM	39° 23' 42.242" N	73° 59' 26.920" W	24.2	7.5
LA	OCS-20-064	16-Jul-20	10:22 AM	39° 23' 25.108" N	74° 01' 37.334" W	23.7	7.5
LA	OCS-20-065	16-Jul-20	11:39 AM	39° 23' 8.259" N	74° 03' 47.779" W	24.1	9
LA	OCS-20-067	15-Jul-20	8:29 PM	39° 21' 56.629" N	73° 57' 20.426" W	27.4	9
LA	OCS-20-069	15-Jul-20	10:18 PM	39° 21' 23.759" N	74° 01' 40.637" W	25.5	8
LA	OCS-20-075	15-Jul-20	3:51 AM	39° 19' 55.075" N	73° 57' 18.867" W	27.0	9
LA	OCS-20-110	17-Jul-20	5:08 PM	39° 36' 46.632" N	74° 00' 26.503" W	23.6	7
LA	OCS-20-112	19-Jul-20	8:56 AM	39° 37' 16.671" N	73° 56' 29.165" W	24.3	8
LA	OCS-20-113	19-Jul-20	12:56 PM	39° 34' 30.958" N	74° 02' 14.507" W	22.3	8
LA	OCS-20-114	17-Jul-20	2:15 PM	39° 34' 45.715" N	74° 00' 16.166" W	24.1	8.7
LA	OCS-20-116	17-Jul-20	3:12 PM	39° 35' 15.837" N	73° 56' 20.655" W	25.7	7.1
LA	OCS-20-117	19-Jul-20	2:51 PM	39° 32' 44.588" N	74° 00' 12.102" W	24.8	9
LA	OCS-20-118	19-Jul-20	7:18 PM	39° 33' 2.825" N	73° 57' 52.343" W	24.5	8
LA	OCS-20-121	19-Jul-20	8:45 PM	39° 31' 8.198" N	73° 56' 54.728" W	24.1	9
LA	OCS-20-122	17-Jul-20	7:10 AM	39° 28' 24.493" N	74° 02' 16.121" W	23.1	8

Project Area	Sample	Date (UTC)	Time (UTC)	Latitude	Longitude	Water Depth (m)	Penetration Depth (cm)
LA	OCS-20-123	17-Jul-20	9:31 AM	39° 28' 41.697" N	74° 00' 4.681" W	24.7	7
LA	OCS-20-125	17-Jul-20	11:07 AM	39° 29' 6.859" N	73° 56' 48.259" W	25.3	8
LA	OCS-20-127	17-Jul-20	12:50 AM	39° 26' 22.044" N	74° 02' 34.234" W	25.2	9
LA	OCS-20-128	17-Jul-20	1:20 AM	39° 26' 30.189" N	74° 01' 20.928" W	25.3	9
LA	OCS-20-129	17-Jul-20	2:36 AM	39° 26' 47.159" N	73° 59' 10.063" W	23.3	9
LA	OCS-20-131	16-Jul-20	1:17 PM	39° 23' 53.412" N	74° 05' 55.043" W	21.0	8
LA	OCS-20-133	16-Jul-20	2:51 PM	39° 24' 28.665" N	74° 01' 19.693" W	24.6	8.5
LA	OCS-20-135	16-Jul-20	4:52 PM	39° 25' 1.166" N	73° 57' 8.045" W	25.9	8
LA	OCS-20-141	16-Jul-20	7:04 AM	39° 22' 38.342" N	73° 59' 48.892" W	25.5	9
LA	OCS-20-143	16-Jul-20	8:23 AM	39° 23' 3.464" N	73° 56' 29.509" W	28.3	9.5
LA	OCS-20-149	15-Jul-20	2:44 PM	39° 20' 36.848" N	73° 59' 48.514" W	28.7	7
LA	OCS-20-151	15-Jul-20	4:37 PM	39° 21' 2.465" N	73° 56' 31.493" W	27.2	8
LA	OCS-20-183	17-Jul-20	6:07 PM	39° 38' 13.184" N	73° 57' 4.627" W	25.1	9
LA	OCS-20-185	19-Jul-20	6:40 AM	39° 40' 15.188" N	73° 57' 0.733" W	24.3	8
LA	OCS-20-191	15-Jul-20	5:21 PM	39° 22' 5.695" N	73° 54' 56.238" W	28.4	7
LA	OCS-22-419	29-May-22	7:11	39° 39' 54.065" N	73° 57' 02.858" W	24	7.5
LA	OCS-22-427	6-Jun-22	8:51	39° 37' 07.512" N	73° 57' 38.686" W	25	9
LA	OCS-22-436	6-Jun-22	8:51	39° 35' 00.330" N	74° 01' 49.753" W	22	9
LA	OCS-22-440r	29-May-22	14:26	39° 34' 30.115" N	74° 02' 14.086" W	22	8.5
LA	OCS-22-453	29-May-22	14:58	39° 31' 43.291" N	73° 56' 57.134" W	25	8.5
LA	OCS-22-463	11-Jun-22	14:18	39° 28' 05.776" N	74° 00' 34.470" W	25	8.5
LA	OCS-22-467	29-May-22	21:46	39° 26' 55.766" N	74° 02' 05.831" W	25	9
LA	OCS-22-470	7-Jun-22	12:02	39° 25' 52.903" N	74° 06' 18.558" W	21	8.5
LA	OCS-22-476r	7-Jun-22	10:07	39° 22' 05.578" N	73° 54' 54.630" W	28	8.5

Table 3-3. 2022 grab sample station locations and characteristics in the Northern ECC (NECC).

Project Area	Sample	Date (UTC)	Time (UTC)	Latitude	Longitude	Water Depth (m)	Penetration Depth (cm)
NECC	NEC-22-300	10-Jul-22	2:46 PM	40° 35' 42.860" N	74° 01' 16.132" W	7.0	9
NECC	NEC-22-303	10-Jul-22	3:33 PM	40° 34' 06.896" N	74° 03' 44.877" W	4.0	9.5
NECC	NEC-22-304	10-Jul-22	4:24 PM	40° 33' 54.790" N	74° 04' 35.985" W	3.0	7
NECC	NEC-22-305	10-Jul-22	1:34 PM	40° 33' 49.542" N	74° 01' 21.835" W	8.0	9.5
NECC	NEC-22-306	10-Jul-22	5:36 PM	40° 33' 06.319" N	74° 03' 57.354" W	4.0	8.5
NECC	NEC-22-312	10-Jul-22	12:44 PM	40° 32' 31.134" N	73° 58' 39.069" W	4.0	8.5
NECC	NEC-22-314	10-Jul-22	12:08 PM	40° 31' 56.356" N	74° 00' 39.488" W	6.0	5
NECC	NEC-22-316	9-Jul-22	4:14 PM	40° 31' 22.852" N	74° 05' 53.626" W	5.0	8.5
NECC	NEC-22-323	9-Jul-22	6:25 PM	40° 30' 49.237" N	74° 02' 21.495" W	6.0	6
NECC	NEC-22-327	9-Jul-22	7:00 PM	40° 30' 26.254" N	74° 01' 21.075" W	6.0	8.5
NECC	NEC-22-328	9-Jul-22	3:51 PM	40° 30' 29.841" N	74° 10' 16.130" W	5.0	9
NECC	NEC-22-331	9-Jul-22	5:43 PM	40° 30' 12.844" N	74° 04' 56.308" W	6.0	9
NECC	NEC-22-334	9-Jul-22	8:16 PM	40° 30' 02.871" N	73° 57' 55.617" W	8.0	6.5
NECC	NEC-22-336	9-Jul-22	7:46 PM	40° 29' 55.401" N	73° 58' 45.430" W	7.0	6
NECC	NEC-22-337	9-Jul-22	3:07 PM	40° 29' 45.248" N	74° 10' 58.226" W	5.0	9.5
NECC	NEC-22-339	9-Jul-22	2:13 PM	40° 29' 23.305" N	74° 07' 04.405" W	9.0	9.5
NECC	NEC-22-341	27-May-22	3:09 AM	40° 29' 10.700" N	73° 57' 50.135" W	8.0	7
NECC	NEC-22-343	27-May-22	4:36 AM	40° 27' 38.800" N	73° 56' 04.312" W	12.0	6.5
NECC	NEC-22-345	27-May-22	8:22 AM	40° 25' 51.090" N	73° 54' 57.503" W	20.0	7.5
NECC	NEC-22-347	27-May-22	11:11 AM	40° 23' 53.174" N	73° 54' 21.994" W	21.0	9
NECC	NEC-22-348	27-May-22	1:51 PM	40° 22' 52.890" N	73° 54' 20.952" W	18.0	8.5
NECC	NEC-22-350	27-May-22	7:07 PM	40° 20' 50.331" N	73° 53' 56.726" W	17.0	6
NECC	NEC-22-352	27-May-22	11:31 PM	40° 18' 54.929" N	73° 52' 59.545" W	22.0	7
NECC	NEC-22-353	3-Jun-22	9:55 PM	40° 18' 02.182" N	73° 52' 16.093" W	23.0	6.5
NECC	NEC-22-355	28-May-22	1:35 AM	40° 16' 05.729" N	73° 51' 27.135" W	25.0	6
NECC	NEC-22-357	3-Jun-22	8:08 AM	40° 14' 37.832" N	73° 53' 53.484" W	22.0	8.5
NECC	NEC-22-360	4-Jun-22	1:21 AM	40° 14' 03.070" N	73° 51' 24.952" W	24.0	8.5
NECC	NEC-22-361	3-Jun-22	5:10 AM	40° 13' 59.469" N	73° 56' 22.300" W	19.0	7.5
NECC	NEC-22-367	3-Jun-22	7:23 PM	40° 13' 32.826" N	73° 53' 21.021" W	22.0	6.5
NECC	NEC-22-369	3-Jun-22	11:17 AM	40° 13' 14.041" N	73° 58' 50.188" W	14.0	8
NECC	NEC-22-371	3-Jun-22	12:28 PM	40° 12' 46.146" N	73° 59' 47.397" W	9.0	8.5
NECC	NEC-22-372	4-Jun-22	3:40 AM	40° 11' 55.240" N	73° 50' 52.538" W	23.0	8

Project Area	Sample	Date (UTC)	Time (UTC)	Latitude	Longitude	Water Depth (m)	Penetration Depth (cm)
NECC	NEC-22-373	28-May-22	3:45 AM	40° 10' 57.619" N	73° 50' 55.943" W	24.0	6.5
NECC	NEC-22-375	28-May-22	5:12 AM	40° 08' 57.832" N	73° 51' 06.817" W	27.0	7.5
NECC	NEC-22-377	28-May-22	10:47 AM	40° 06' 57.278" N	73° 51' 42.853" W	28.0	6.5
NECC	NEC-22-378	4-Jun-22	8:00 AM	40° 05' 55.072" N	73° 51' 33.071" W	25.0	8.5
NECC	NEC-22-380	28-May-22	12:39 PM	40° 03' 58.773" N	73° 51' 55.561" W	24.0	7.5
NECC	NEC-22-382	28-May-22	2:20 PM	40° 02' 24.171" N	73° 52' 10.308" W	24.0	6
NECC	NEC-22-385	4-Jun-22	12:50 PM	40° 01' 00.935" N	73° 53' 06.306" W	22.0	8
NECC	NEC-22-387	28-May-22	6:09 PM	39° 59' 18.976" N	73° 53' 20.071" W	22.0	8.9
NECC	NEC-22-389	28-May-22	7:00 PM	39° 58' 10.153" N	73° 53' 11.687" W	25.0	7.5
NECC	NEC-22-391	4-Jun-22	6:04 PM	39° 57' 16.981" N	73° 53' 31.163" W	24.0	n/a
NECC	NEC-22-392	28-May-22	8:08 PM	39° 56' 15.044" N	73° 53' 27.164" W	23.0	7
NECC	NEC-22-394	28-May-22	8:56 PM	39° 55' 18.134" N	73° 53' 46.158" W	26.0	9
NECC	NEC-22-397	28-May-22	10:01 PM	39° 52' 13.040" N	73° 54' 08.220" W	22.0	8
NECC	NEC-22-398	5-Jun-22	1:28 AM	39° 51' 14.232" N	73° 54' 08.395" W	24.0	8.5
NECC	NEC-22-404	28-May-22	11:15 PM	39° 50' 11.330" N	73° 54' 22.618" W	23.0	9
NECC	NEC-22-406	29-May-22	12:32 AM	39° 48' 17.837" N	73° 54' 35.456" W	24.0	8.5
NECC	NEC-22-408	29-May-22	2:09 AM	39° 46' 11.793" N	73° 54' 27.444" W	24.0	8
NECC	NEC-22-409	5-Jun-22	5:40 PM	39° 45' 20.757" N	73° 54' 34.434" W	25.0	9
NECC	NEC-22-412	29-May-22	3:39 AM	39° 43' 09.634" N	73° 54' 18.972" W	26.0	8
NECC	NEC-22-414	29-May-22	5:06 AM	39° 41' 11.270" N	73° 54' 12.115" W	26.0	8.5
NECC	NEC-22-417	6-Jun-22	12:46 AM	39° 40' 05.791" N	73° 54' 14.923" W	27.0	7
NECC	NEC-22-423	29-May-22	9:44 AM	39° 39' 07.058" N	73° 54' 39.128" W	27.0	7.5
NECC	NEC-22-428	29-May-22	11:09 AM	39° 37' 05.004" N	73° 54' 56.991" W	28.0	8
NECC	NEC-22-435	6-Jun-22	5:54 PM	39° 35' 03.667" N	73° 55' 19.066" W	26.0	8
NECC	NEC-22-448	29-May-22	5:27 PM	39° 33' 00.458" N	73° 55' 22.582" W	26.0	7
NECC	NEC-22-456	29-May-22	7:23 PM	39° 30' 57.384" N	73° 55' 16.301" W	25.0	9
NECC	NEC-22-461	30-May-22	3:48 PM	39° 29' 04.640" N	73° 55' 09.093" W	25.0	7.5
NECC	NEC-22-464	29-May-22	11:21 PM	39° 28' 01.504" N	73° 55' 07.652" W	27.0	6
NECC	NEC-22-469	30-May-22	12:42 AM	39° 25' 50.201" N	73° 55' 17.933" W	27.0	8.5
NECC	NEC-22-472	30-May-22	1:56 AM	39° 24' 48.668" N	73° 55' 24.897" W	29.0	7
NECC	NEC-22-569	12-Jun-22	10:42 PM	39° 43' 36.341" N	73° 54' 27.600" W	17.0	8
NECC	NEC-22-612	15-Jun-22	1:50 AM	40° 26' 22.406" N	73° 55' 35.520" W	n/a	6

Project Area	Sample	Date (UTC)	Time (UTC)	Latitude	Longitude	Water Depth (m)	Penetration Depth (cm)
NECC	NEC-22-703	15-Jun-22	5:13 AM	40° 24' 32.956" N	73° 54' 46.852" W	n/a	8.5

3.1.1 Lease Area Results

3.1.1.1 Grain Size Analysis

Samples collected in 2019 from the 7 grab stations in the Lease Area were generally sandy, comprised of 41 – 100% sand-sized particles with a mean across samples of 86% sand (Table 3-4 and Figure 3-1). Of these, 3 samples had ≥ 5% gravel with 1 sample comprised of ≥ 30% gravel (SOI 8; Table 3-4-4). Fine silt and clay particles (< 0.0625 mm) comprised ≤1% of each sample and was only present in SOI 8. Field notes from this campaign and photomicroscopy images of samples are included in the appendices to the original report that was part of the SAP for OCS-A 0499 (RPS, 2020a).

Samples collected in 2020 and 2022 from the 53 grab stations in the Lease Area were generally sandy, comprised of 22 – 100% sand-sized particles with a mean across samples of 87% sand (Table 3-5 and Figure 3-2). Of the 53 samples, 4 were comprised of ≥ 30% gravel (OCS-20-185, OCS-22-419, OCS-22-436, and OCS-22-467; Table 3-5), and 1 sample was comprised of ≥ 30% silt and clay (OCS-22-440r). The remaining 48 samples had gravel or silt/clay compositions of less than 30%. Across all samples, 27 had gravel compositions ≥ 5%. Two samples also had no gravel present at all (OCS-20-053 and OCS-20-113). Total gravel composition ranged from 0 – 70%. Across all samples, 10 were comprised of ≥ 5% silt/clay. A total of 11 sites had not silt/clay. Total silt/clay composition ranged from 0 – 34%.

Table 3-4. Grain size composition and total organic carbon content of 2019 grab samples.

IA or SOI	Gravel (%)	Very Coarse/ Coarse Sand (%)	Medium Sand (%)	Fine/Very Fine Sand (%)	Mud (%)	NMFS-modified CMECS	Total Organic Carbon (mg/kg)
IA 2, station 1	6	50	41	3	0	Gravelly Sand	Not Detected
IA 2, station 2	4	54	39	3	0	Very Coarse/ Coarse Sand	Not Detected
SOI 4	0	41	54	5	0	Medium Sand	Not Detected
SOI 5	1	70	28	1	0	Very Coarse/ Coarse Sand	Not Detected
SOI 6	1	58	39	2	0	Very Coarse/ Coarse Sand	Not Detected
SOI 7	27	30	36	7	0	Gravelly Sand	Not Detected
SOI 8	58	10	14	17	1	Sandy Gravel	Not Detected

Table 3-5. 2020 - 2022 Grain size composition and moisture content from grab samples in the Lease Area region.

Sample	% Boulder or Cobble (> 64 mm)	% Pebble or Granule (2 to < 64 mm)	% Very Course / Coarse Sand (0.5 to < 2 mm)	% Medium Sand (0.25 to < 0.5 mm)	% Fine / Very Fine Sand (0.0625 mm to < 0.25 mm)	% Silt / Clay (< 0.0625 mm)	Median Grain Size (mm)	% Moisture Content
OCS-20-038	0	1	34	58	6	1	0.4172	19.6
OCS-20-039	0	1	57	38	3	1	0.5909	16.9
OCS-20-041	0	7	37	50	6	0	0.462	15.4
OCS-20-043	0	2	39	52	5	2	0.4445	20.3
OCS-20-046	0	3	39	53	4	1	0.4481	15.7
OCS-20-047	0	1	21	67	8	3	0.3745	15.8
OCS-20-048	0	2	27	59	7	5	0.3904	19.0
OCS-20-049	0	6	47	43	3	1	0.5290	17.7
OCS-20-051	0	29	29	36	5	1	0.6657	17.0
OCS-20-053	0	0	18	71	11	0	0.3645	21.4
OCS-20-055	0	1	27	59	4	9	0.3855	100
OCS-20-057	0	1	41	54	4	0	0.4531	13.2
OCS-20-059	0	1	43	49	3	4	0.4575	15.2
OCS-20-061	0	1	53	42	2	2	0.5303	14.4
OCS-20-063	0	1	26	64	9	0	0.3886	21.0
OCS-20-064	0	6	47	42	3	2	0.5323	18.1
OCS-20-065	0	23	52	22	1	2	0.9446	7.7
OCS-20-067	0	7	50	39	3	1	0.5832	17.6
OCS-20-069	0	1	22	68	7	2	0.3812	21.5
OCS-20-075	0	10	41	45	3	1	0.5113	21.8
OCS-20-110	0	5	45	44	4	2	0.5024	20.6
OCS-20-112	0	4	24	59	10	3	0.3852	24.3
OCS-20-113	0	0	9	74	16	1	0.3402	15.6
OCS-20-114	0	5	53	39	2	1	0.5726	18.5
OCS-20-116	0	2	32	58	5	3	0.4133	20.9
OCS-20-117	0	6	29	53	6	6	0.4083	26.3
OCS-20-118	0	16	47	34	2	1	0.6957	18.5
OCS-20-121	0	7	44	44	5	0	0.5076	14.5
OCS-20-122	0	6	42	48	4	0	0.4869	10.6
OCS-20-123	0	11	39	43	4	3	0.4983	10.6
OCS-20-125	0	4	32	56	7	1	0.4217	19.6
OCS-20-127	0	8	19	36	29	8	0.3185	21.6
OCS-20-128	0	14	62	16	1	7	0.7538	7.8
OCS-20-129	0	4	44	46	5	1	0.4828	14.5
OCS-20-131	0	2	49	43	4	2	0.5101	21.2
OCS-20-133	0	2	30	62	6	0	0.4078	15.8
OCS-20-135	0	7	48	41	3	1	0.5584	16.8
OCS-20-141	0	3	36	56	5	0	0.4349	19.8
OCS-20-143	0	15	42	39	4	0	0.6212	18.2
OCS-20-149	0	5	45	44	5	1	0.4971	20.3
OCS-20-151	0	3	56	38	3	0	0.5860	15.2
OCS-20-183	0	10	38	45	6	1	0.4869	14.4
OCS-20-185	0	30	39	27	2	2	0.7666	16.5
OCS-20-191	0	1	22	63	14	0	0.3714	22.9
OCS-22-419	0	70	22	7	1	0	4.5643	N/A
OCS-22-427	0	27	36	26	4	7	0.9482	N/A
OCS-22-436	0	54	27	16	2	1	2.7640	N/A

Sample	% Boulder or Cobble (> 64 mm)	% Pebble or Granule (2 to < 64 mm)	% Very Course / Coarse Sand (0.5 to < 2 mm)	% Medium Sand (0.25 to < 0.5 mm)	% Fine / Very Fine Sand (0.0625 mm to < 0.25 mm)	% Silt / Clay (< 0.0625 mm)	Median Grain Size (mm)	% Moisture Content
OCS-22-440r	0	1	37	26	2	34	0.4008	N/A
OCS-22-453	0	2	19	60	8	11	0.3619	N/A
OCS-22-463	0	13	48	35	3	1	0.5890	N/A
OCS-22-467	0	59	18	4	0	19	3.1028	N/A
OCS-22-470	0	3	27	52	5	13	0.4211	N/A
OCS-22-476r	0	8	37	48	6	1	0.5390	N/A

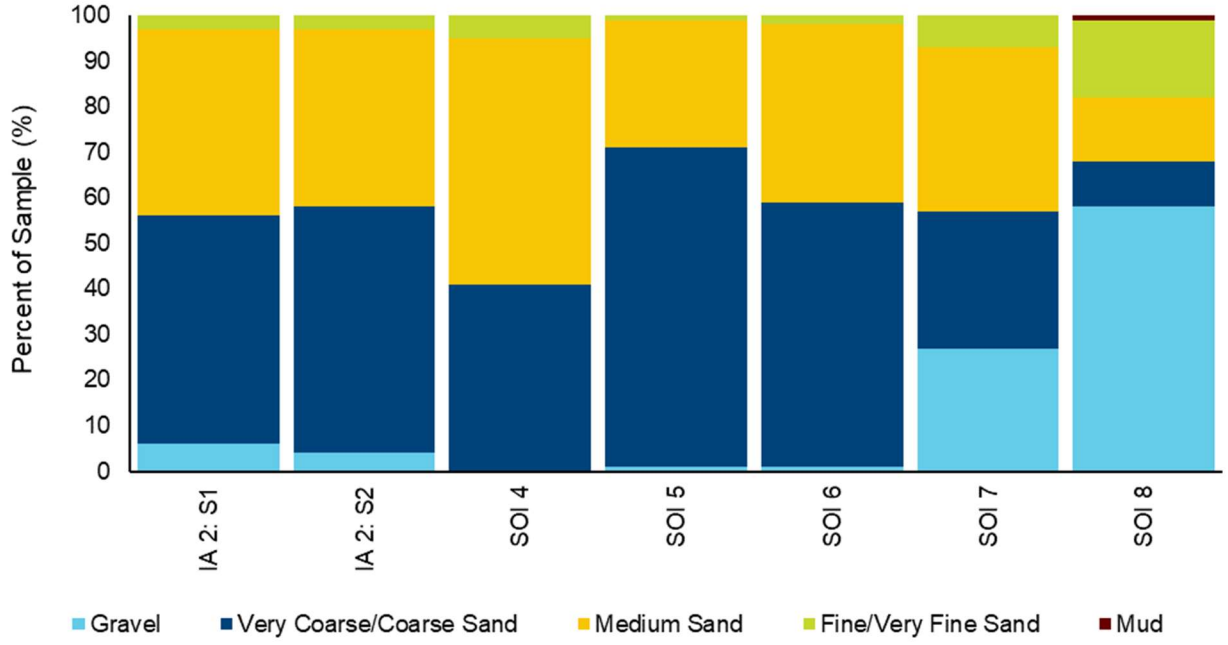


Figure 3-1. Grain size composition at each 2019 grab sample station in the Lease Area.

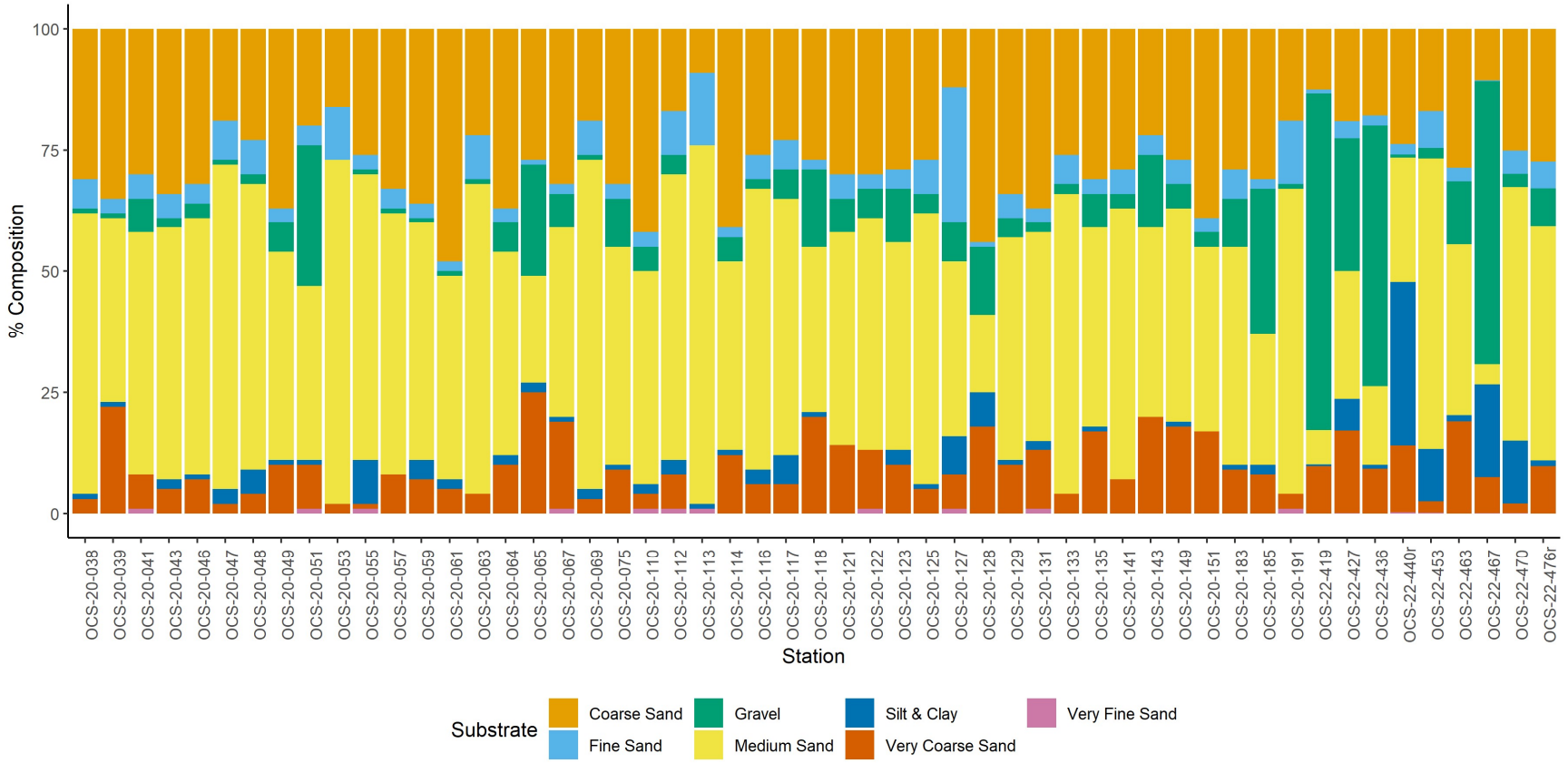


Figure 3-2. Grain size composition at each 2020 and 2022 grab sample station in the Lease Area[2]. 2022 samples begin at OCS-22-419. An "r" represents a replicate sample from 2022 taken at a station that was also sampled in 2020.

[2] Gravel includes boulder, cobble, pebble, and granule sediment size classes. Sand includes very coarse through very fine sand sediment size classes. Mud includes silt and clay sediment size classes.

3.1.1.2 Macroinvertebrate Community Composition

3.1.1.2.1 2019 Samples

5 of the 7 benthic grab samples collected in the 2019 survey were analyzed for infauna and yielded a total of 412 individual organisms from 7 unique phyla and 46 families or NLPTL (Table 3-6). The phyla Annelida and Arthropoda dominated the samples in both abundance and unique number of taxa, representing 74% of all organisms and 72% of all unique taxa. The infaunal community was dominated by polychaete worms, oligochaete worms, tanaids, and bivalves. Bivalves dominated the sampled molluscs, with 43 of the total 45 individuals sampled. No ocean quahog (*Artica islandica*) or Atlantic scallops (*Placopecten magellanicus*) were observed. 7 total individuals of a species of direct economic importance, the Atlantic surf clam (*Spisula solidissima*), were identified in IA 2, SOI 5, and SOI 6. The only Cnidarian sampled was a sea anemone (*Edwardsia elegans*), therefore no Scleractinian stony corals were present in any samples. In addition, no individuals from the phyla Chordata or Urochordata were sampled, so no invasive tunicates were observed.

Density within the benthic grab sites ranged from 49 organisms in SOI 5 to 106 organisms at SOI 4, with a mean density of 83 organisms per 0.05 m^2, averaged across all samples**.** Taxonomic richness ranged from 3.10 at IA 2 Station 1 to 4.11 at SOI 5 with a mean richness of 3.63 overall. Diversity was consistent between grab stations ranging from 1.45 at IA 2 Station 1 to 2.56 at SOI 5. Evenness ranged from 0.55 at station 1 in IA 2 to 0.90 at SOI 5 (Table 3-9, Figure 3-4).

Table 3-6. Phyla present in the five benthic grab samples collected in the Lease Area in 2019.

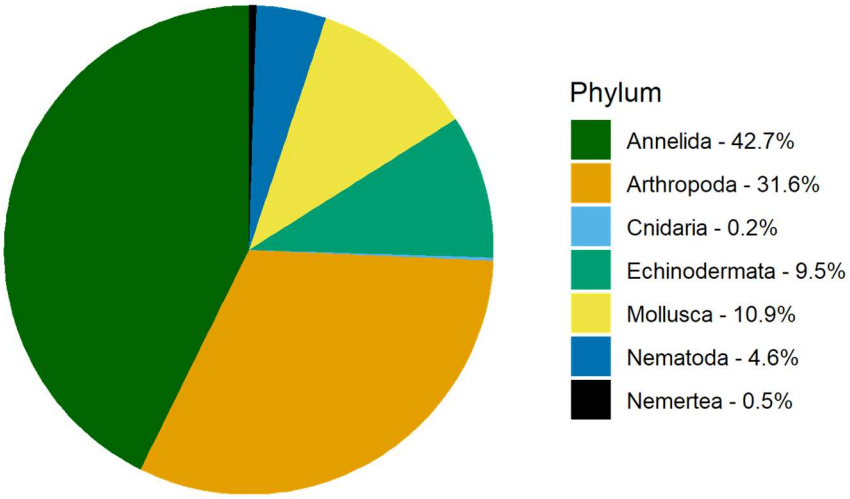
Phyla	Abundant Taxonomic Groups (common names)	Abundance[1]	Number of Unique Taxa (Lowest Practical Taxonomic Level)[1]
Annelida	Polychaete worms, oligochaete worms	176	19
Arthropoda	Amphipods, isopods, tanaids	130	14
Cnidaria	Sea anemone	1	1
Echinodermata	Sand dollar	39	2
Mollusca	Bivalves, sea snails	45	1
Nematoda	Nematodes	19	8
Nemertea	Ribbon worms	2	1
Total		412	46

[1] Reported as sum of all five 0.05 m^2 grab samples within the Lease Area

Table 3-7. Sample abundance (number of individuals per 0.05 m^2) of each Phylum present within each grab sample collected in the Lease Area in 2019.

Location	Annelida	Arthropoda	Chordata	Cnidaria	Echinodermata	Mollusca	Nematoda	Nemertea	Abundance
IA 2 station 1	46	10	0	1	1	7	0	1	67
IA 2 station 2	65	22	0	0	0	11	6	0	106
SOI 4	7	76	0	0	29	3	4	0	119
SOI 5	27	4	0	0	5	9	4	0	49
SOI 6	31	18	0	0	4	15	5	1	74

A.



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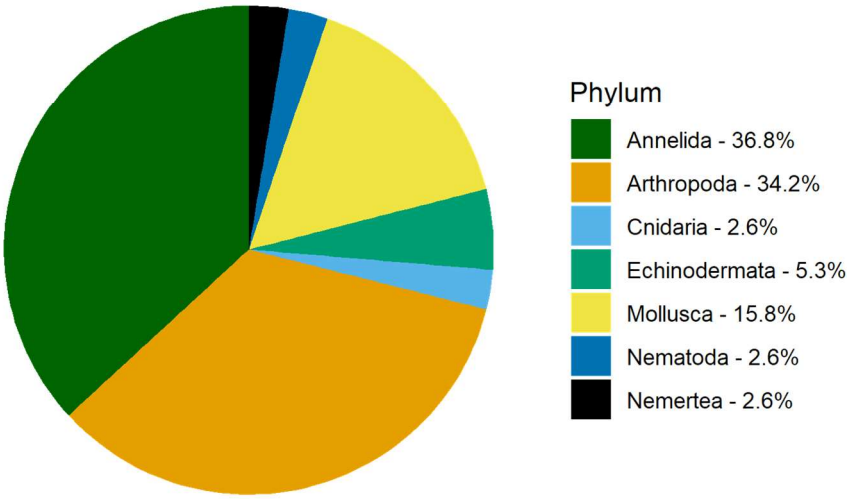


Figure 3-3. (A.) Proportional abundance and (B.) proportion of unique taxa (Family or NLPTL) for each phylum collected in 5 benthic grab samples in the Lease Area in 2019.

Table 3-8. Mean density and frequency of occurrence of each phyla and taxa (LPTL) across 5 samples collected in the Lease Area in 2019.

Phylum	Family or LPTL	Abundance Across All Samples	Mean Abundance per 0.05 m^2	Median Abundance per 0.05 m^2	Frequency of Occurrence
Annelida	Cirratulidae	3	0.6	1	3
	Glyceridae	10	2	0	2
	Goniadidae	10	2	0	2
	Lumbrineridae	1	0.2	0	1
	Magelonidae	1	0.2	0	1
	Nephtyidae	5	1	1	4
	Oligochaeta	35	7	0	2
	Opheliidae	3	0.6	0	1
	Paraonidae	1	0.2	0	1
	Phyllodocidae	2	0.4	0	2
	Polygordiidae	81	16.2	10	4
	Sigalionidae	11	2.2	1	4
	Sphaerodoridae	2	0.4	0	2
	Spionidae	11	2.2	2	4
Arthropoda	Ampeliscidae	1	0.2	0	1
	Anthuridae	1	0.2	0	1
	Aoridae	2	0.4	0	1
	Bodotriidae	1	0.2	0	1
	Chaetiliidae	1	0.2	0	1
	Cirolanidae	1	0.2	0	1
	Diastylidae	2	0.4	0	2
	Haustoriidae	2	0.4	0	2
	Oedicerotidae	2	0.4	0	2
	Phoxocephalidae	6	1.2	1	3
	Pontoporeiidae	3	0.6	0	2
	Tanaissuidae	72	14.4	16	4
	Unciolidae	36	7.2	0	2
Cnidaria	Edwardsiidae	1	0.2	0	1
Echinodermata	Echinarachniidae	6	1.2	1	3
	Echinoidea	33	6.6	3	3
Mollusca	Astartidae	6	1.2	0	2
	Mactridae	7	1.4	2	4
	Mytilidae	1	0.2	0	1
	Nassariidae	2	0.4	0	1
	Periplomatidae	23	4.6	4	5
	Tellinidae	6	1.2	0	2
Nematoda	Nematoda	19	3.8	4	4
Nemertea	Tubulanidae	2	0.4	0	2

Table 3-9. Community composition parameters calculated for each grab sample station and for each IA within the Lease Area.

Location	Density (# of individuals per 0.05 m^2)	Number of Unique Taxa	Richness	Diversity	Evenness
IA 2 station 1	66	16	3.10	1.45	0.55
IA 2 station 2	104	17	3.45	2.03	0.72
SOI 4	119	19	3.77	1.95	0.66
SOI 5	49	18	4.11	2.56	0.90
SOI 6	74	19	3.72	2.47	0.87

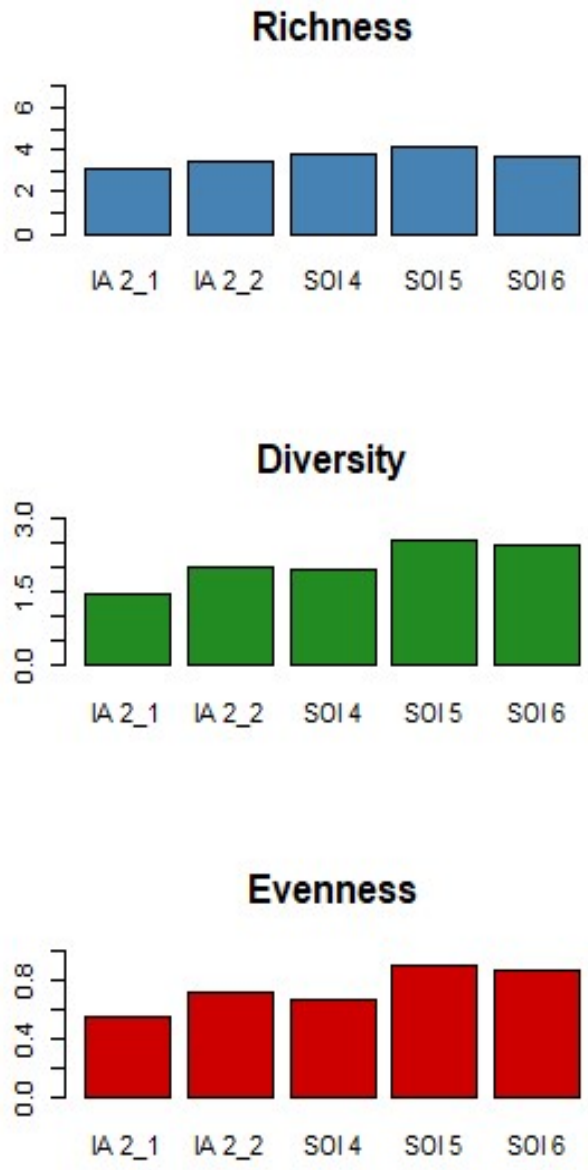


Figure 3-4. Richness (top) Diversity (middle) and Evenness (bottom) index values for each IA and SOI station within the Lease Area.

3.1.1.2.2 2020 and 2022 Samples

From the grab samples collected in 2020 and 2022 from the Lease Area, a total of 4,909 individual macrofaunal organisms were enumerated across all 49 0.04 m^2 samples. Note that there were fewer samples sent for infaunal taxonomic analysis from the 2022 grabs than there were sediment grain size samples, so the total samples analyzed for infauna across both years in the Lease Area was 49, while for grain size (Section 3.1.1.1) it was 53. Organisms identified from samples collected in the Lease Area were from 11 phyla, 90 families or LPTL, and 150 unique taxa identified to the LPTL. Nematodes were omitted from the infaunal analysis of 2020 and 2022 samples and were instead categorized as meiofauna. The

majority of unique taxa identified were from the Annelida (63 unique taxa), Arthropoda (38 unique taxa), and Mollusca (29 unique taxa) phyla. Sample abundance across the 49 benthic grab sites from the Lease Area ranged from 11 organisms in OCS-20-143 to 374 organisms in OCS-20-185 (Table 3-11). Bivalves dominated the sampled molluscs, with 570 of the total 683 individuals sampled. No ocean quahog (*Artica islandica*) or Atlantic scallops (*Placopecten magellanicus*) were observed. Within 29 of the samples, there was a total of 1117 individuals of a species of direct economic importance, the Atlantic surf clam (*Spisula solidissima*). The only Cnidarians sampled were sea anemones. Therefore, no Scleractinian stony corals were present in any samples. No invasive tunicates (*Ascidiella aspersa*, *Botrylloides violaceus*, *Botryllus schlosseri*, *Didemnum vexillum*, *Diplosoma listerianum*, or *Styela clava*) were confirmed present in the 2020 Lease Area samples; however, 22 individuals identified to the tunicate Class Ascidiacea were observed. Of these 22 individuals, 11 were further identified as *Bostrichobranchus pilularis*, but neither the class nor species are known to be invasive.

Mean density was 100 organisms per station from 18 families (or LPTL) on average across 49 sample stations in the Lease Area. The richness of organisms collected at each grab sample location ranged from 1.18 at OCS-20-185 to 5.57 at OCS-20-039 with a mean taxonomic richness across all grab samples collected in the Lease Area of 3.76. Average diversity across the individual grab samples was 2.13 with a range from 0.65 at OCS-20-185 to 2.82 at OCS-20-039. Evenness across the samples ranged from 0.31 at OCS-20-185 to 0.94 at OCS-20-151 with an average of 0.76. Richness, diversity, and evenness are unitless indices; however, higher values indicate greater amounts of richness, diversity, or evenness in each sample (Table 3-13, and Figure 3-7).

Table 3-10. Phyla present in the 49 benthic grab samples collected in the Lease Area in 2020 and 2022.

Phyla	Abundant Taxonomic Groups	Sample Abundance	Unique Taxa	Unique Family or LPTL
Annelida	Polychaete worms (segmented and bamboo worms)	1,787	63	26
Arthropoda	Amphipods, calanoid copepods, ostracods	1,940	38	25
Chordata	Tunicate	23	3	3
Cnidaria	Hydroid	2	1	1
Echinodermata	Sand dollars, sea cucumbers	425	4	4
Ectoprocta	Bryozoa	8	4	4
Foraminifera	Forams	3	1	1
Mollusca	Nut clams	683	29	19
Nemertea	Ribbon worms	33	4	4
Platyhelminthes	Flat worms	3	2	2
Sipuncula	Peanut worms	2	1	1
	Totals	**4,909**	**150**	**90**

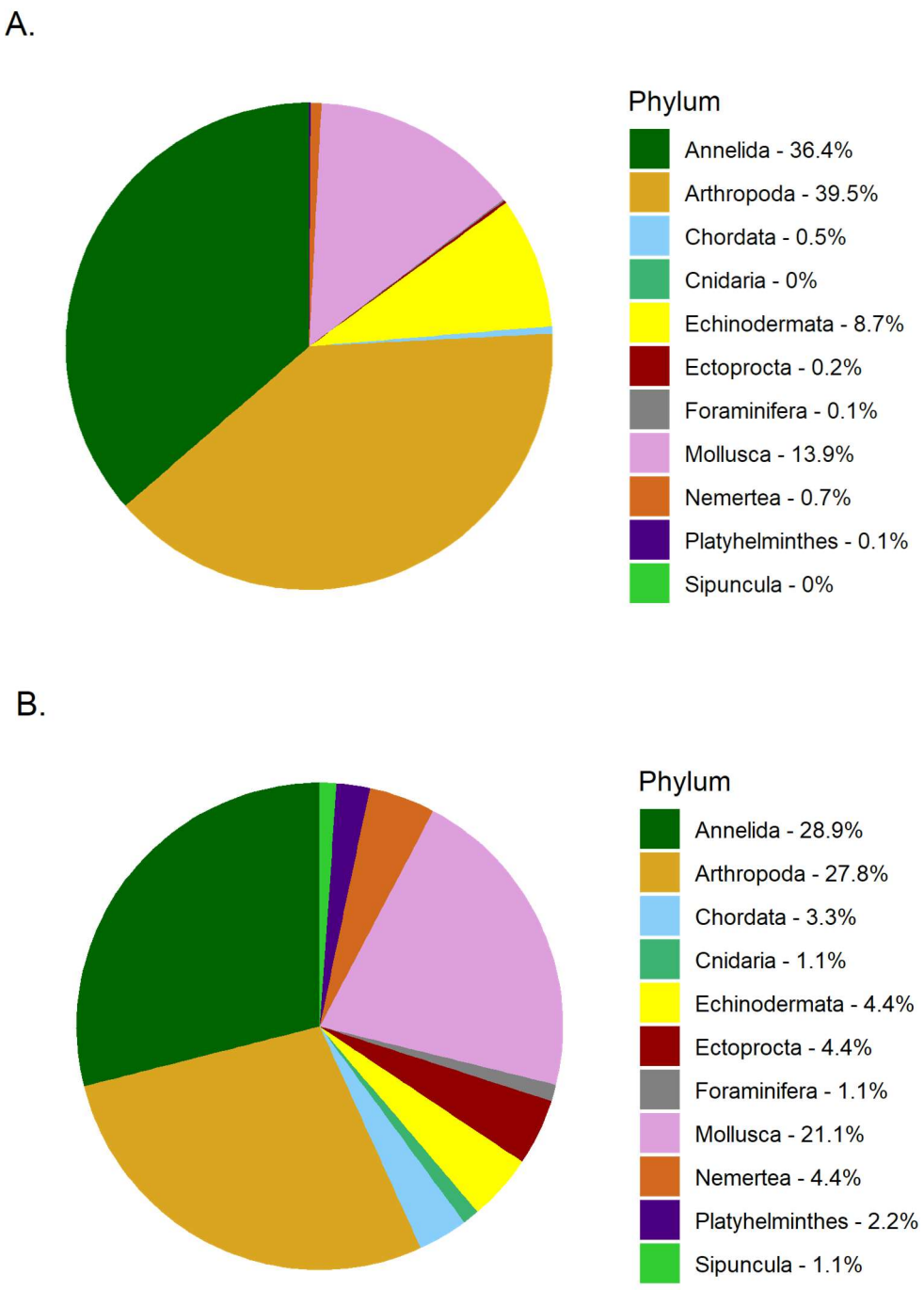


Figure 3-5. (A.) Proportional abundance and (B.) proportion of unique taxa (Family or LPTL) for each phylum collected in 49 benthic grab samples collected in the Lease Area in 2020 and 2022..

Table 3-11. Abundance of each Phylum counted within 49 grab samples collected in the Lease Area in 2020 and 2022 (continued on next page). Surfclam were collected at stations marked with an "*" in the Mollusca column.

Station	Annelida	Arthropoda	Chordata	Cnidaria	Echino-dermata	Ectoprocta	Forami-nifera	Mollusca	Nemertea	Platyhel-minthes	Sipuncula	Density (Abundance per 0.04 m^2)
OSC-20-038	8	67	0	0	17	0	0	9*	0	0	0	101
OSC-20-039	26	67	0	0	5	1	0	26*	2	0	0	127
OSC-20-041	6	32	0	0	56	1	0	12	0	0	0	107
OSC-20-043	7	39	0	0	8	0	0	42	1	0	0	97
OSC-20-046	6	25	0	0	10	0	0	8*	0	0	0	49
OSC-20-047	11	37	0	0	9	0	0	22	0	0	0	79
OSC-20-048	9	32	1	0	25	1	0	18*	0	0	0	86
OSC-20-049	16	32	1	0	4	0	0	20*	0	0	0	73
OSC-20-051	7	26	4	0	11	0	0	18*	0	0	0	66
OSC-20-053	36	52	0	0	0	2	0	10*	1	0	0	101
OSC-20-055	14	26	0	0	42	0	0	46	0	0	1	129
OSC-20-057	12	22	0	1	14	0	0	14*	0	0	0	63
OSC-20-059	22	38	1	0	16	0	0	17*	0	0	0	94
OSC-20-061	34	16	0	0	22	0	0	68*	0	0	0	140
OSC-20-063	14	13	3	0	1	0	0	4	0	0	0	35
OSC-20-064	18	53	0	0	2	0	0	30*	0	0	0	103
OSC-20-065	27	10	1	0	1	0	0	9*	0	0	0	48
OSC-20-067	37	7	0	0	8	0	0	17*	0	0	0	69
OSC-20-069	12	5	1	0	2	0	0	18	0	0	0	38
OSC-20-075	19	20	0	0	1	0	0	7	0	0	0	47
OSC-20-110	25	89	0	0	2	0	0	19	0	0	0	135
OSC-20-112	23	84	0	0	0	0	0	9	0	0	0	116
OSC-20-113	1	128	0	0	3	0	0	5*	3	0	0	140
OSC-20-114	24	65	0	0	5	2	0	19*	0	0	0	115
OSC-20-116	53	13	0	0	7	0	0	6	0	0	0	79
OSC-20-117	47	145	0	0	0	0	0	15	1	0	0	208
OSC-20-118	35	61	1	0	21	0	0	17*	0	0	0	135
OSC-20-121	12	28	1	0	26	0	0	5*	2	0	0	74
OSC-20-122	13	14	1	0	1	0	0	6*	0	0	0	35
OSC-20-123	6	19	0	0	3	0	0	4	1	0	0	33
OSC-20-125	15	13	0	0	4	0	0	10	0	0	0	42
OSC-20-127	85	111	0	0	0	0	0	6*	3	0	1	206
OSC-20-128	17	13	0	0	1	0	0	4*	1	0	0	36
OSC-20-129	26	38	0	0	37	0	0	19*	0	0	0	120
OSC-20-131	14	5	0	0	4	0	0	14	0	0	0	37
OSC-20-133	14	18	0	0	11	0	0	13*	0	0	0	56

Station	Annelida	Arthropoda	Chordata	Cnidaria	Echino-dermata	Ectoprocta	Forami-nifera	Mollusca	Nemertea	Platyhel-minthes	Sipuncula	Density (Abundance per 0.04 m^2)
OSC-20-135	11	6	0	1	7	0	0	10	0	0	0	35
OSC-20-141	23	9	0	0	9	0	0	9*	0	0	0	50
OSC-20-143	8	0	0	0	0	0	0	2	1	0	0	11
OSC-20-149	28	2	0	0	0	1	0	7	1	0	0	39
OSC-20-151	9	2	2	0	1	0	0	3	0	0	0	17
OSC-20-183	21	56	0	0	10	0	0	14*	2	0	0	103
OSC-20-185	32	342	0	0	0	0	0	0	0	0	0	374
OSC-20-191	6	3	6	0	16	0	3	9	0	0	0	43
OSC-22-419	247	15	0	0	0	0	0	2*	0	2	0	266
OSC-22-427	224	12	0	0	0	0	0	10	8	0	0	254
OSC-22-453	104	15	0	0	2	0	0	16	5	1	0	143
OSC-22-470	137	11	0	0	1	0	0	10*	1	0	0	160
OSC-22-476r	186	4	0	0	0	0	0	5*	0	0	0	195
Total	**1787**	**1940**	**23**	**2**	**425**	**8**	**3**	**683**	**33**	**3**	**2**	**4909**

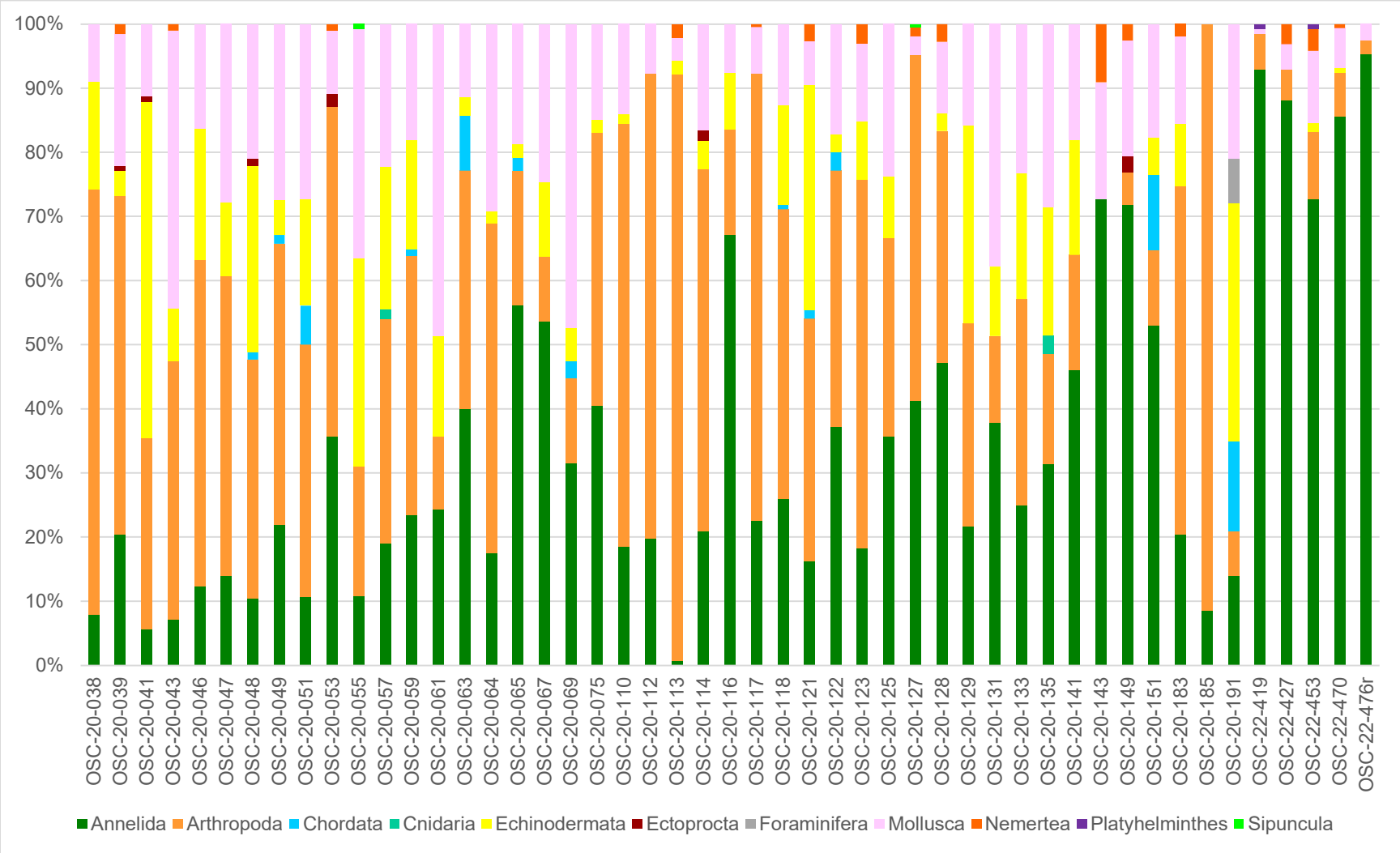


Figure 3-6. Percent composition of organisms in each grab represented phylum for the 49 benthic grab samples in the Lease Area in 2020 and 2022.

Table 3-12. Mean density and frequency of occurrence of each phyla and taxa (LPTL) across 49 samples collected in Lease Area in 2020 and 2022.

Phylum	Family or LPTL	Abundance	Mean Abundance per 0.04 m^2	Median Abundance per 0.04 m^2	Frequency of Occurrence
Annelida	Ampharetidae	2	0	0	2
	Ampharetinae	7	0.1	0	4
	Cirratulidae	14	0.3	0	5
	Dorvilleidae	8	0.2	0	3
	Glyceridae	213	4.3	1	30
	Goniadidae	272	5.6	2	35
	Lumbrineridae	114	2.3	1	32
	Magelonidae	2	0	0	1
	Maldanidae	3	0.1	0	3
	Nephtyidae	65	1.3	1	29
	Nereididae	24	0.5	0	3
	Oenonidae	2	0	0	2
	Oligochaeta	398	8.1	0	20
	Onuphidae	4	0.1	0	3
	Opheliidae	12	0.2	0	9
	Paraonidae	25	0.5	0	5
	Pholoidae	1	0	0	1
	Phyllodocidae	13	0.3	0	2
	Polygordiidae	253	5.2	0	5
	Polynoidae	11	0.2	0	4
	Scalibregmatidae	8	0.2	0	1
	Sigalionidae	172	3.5	3	36
	Sphaerodoridae	77	1.6	0	21
	Spionidae	54	1.1	0	10
	Syllidae	12	0.2	0	3
	Terebellidae	21	0.4	0	5
Arthropoda	Acari	15	0.3	0	12
	Ampeliscidae	505	10.3	0	14
	Aoridae	340	6.9	1	33
	Balanidae	6	0.1	0	2
	Bodotriidae	14	0.3	0	12
	Cancridae	13	0.3	0	7
	Caprellidae	8	0.2	0	3
	Chaetiliidae	29	0.6	0	19
	Cirolanidae	10	0.2	0	7
	Corophiidae	18	0.4	0	5
	Diastylidae	1	0	0	1
	Harpacticoida	6	0.1	0	6
	Haustoriidae	6	0.1	0	3
	Idoteidae	7	0.1	0	7
	Liljeborgiidae	8	0.2	0	4
Arthropoda	Lysianassidae	5	0.1	0	4
	Oedicerotidae	1	0	0	1
	Ostracoda	13	0.3	0	9
	Paguridae	40	0.8	0	16
	Phoxocephalidae	92	1.9	0	16
	Pinnotheridae	2	0	0	2
	Pontoporeiidae	10	0.2	0	8
	Synopiidae	4	0.1	0	3
	Tanaissuidae	597	12.2	6	37
	Unciolidae	190	3.9	0	9
Chordata	Ascidiacea	11	0.2	0	5
	Branchiostomatidae	1	0	0	1

Phylum	Family or LPTL	Abundance	Mean Abundance per 0.04 m^2	Median Abundance per 0.04 m^2	Frequency of Occurrence
	Molgulidae	11	0.2	0	6
Cnidaria	Actiniaria	2	0	0	2
Echinodermata	Echinarachniidae	89	1.8	1	30
	Echinoida	13	0.3	0	1
	Echinoidea	320	6.5	1	28
	Holothuroidea	3	0.1	0	3
Ectoprocta	Alcyonidiidae	2	0	0	2
	Electridae	2	0	0	2
	Hippothoidae	3	0.1	0	3
	Nolellidae	1	0	0	1
Foraminifera	Astrorhizidae	3	0.1	0	1
Mollusca	Astartidae	112	2.3	1	36
	Bivalvia	58	1.2	0	23
	Calyptraeidae	50	1	0	13
	Cardiidae	21	0.4	0	14
	Columbellidae	1	0	0	1
	Epitoniidae	1	0	0	1
	Gastropoda	21	0.4	0	10
	Mactridae	117	2.4	1	29
	Mytilidae	11	0.2	0	9
	Nassariidae	32	0.7	0	23
	Naticidae	8	0.2	0	7
	Nuculidae	9	0.2	0	6
	Pandoridae	3	0.1	0	3
	Pectinidae	2	0	0	1
	Periplomatidae	165	3.4	3	36
	Pharidae	3	0.1	0	3
	Solenidae	2	0	0	1
	Tellinidae	66	1.3	0	24
	Veneridae	1	0	0	1
Nemertea	Carinomidae	9	0.2	0	4
	Lineidae	5	0.1	0	4
Nemertea	Nemertea	15	0.3	0	7
	Tubulanidae	4	0.1	0	2
Platyhelminthes	Plehniidae	1	0	0	1
	Turbellaria	2	0	0	1
Sipuncula	Golfingiidae	2	0	0	2

Table 3-13. Community composition parameters calculated across 49 samples collected in Lease Area in 2020 and 2022.

Station	Density (abundance per 0.04 m^2)	Number of LPTLs	Number of Families (or LPTL)	Richness	Diversity	Evenness
OSC-20-038	101	16	16	3.25	1.99	0.72
OSC-20-039	127	30	28	5.57	2.82	0.85
OSC-20-041	107	25	24	4.92	1.83	0.58
OSC-20-043	97	14	14	2.84	1.97	0.75
OSC-20-046	49	13	13	3.08	1.85	0.72
OSC-20-047	79	19	16	3.43	2.18	0.79
OSC-20-048	86	24	23	4.94	2.4	0.77
OSC-20-049	73	18	16	3.5	2.04	0.74
OSC-20-051	66	21	18	4.06	2.59	0.9
OSC-20-053	101	25	24	4.98	2.58	0.81
OSC-20-055	129	24	23	4.53	2.47	0.79
OSC-20-057	63	17	15	3.38	2.15	0.79
OSC-20-059	94	23	21	4.4	2.32	0.76
OSC-20-061	140	26	26	5.06	2.62	0.8
OSC-20-063	35	12	11	2.81	1.96	0.82
OSC-20-064	103	20	18	3.67	1.92	0.67
OSC-20-065	48	16	15	3.62	2.37	0.88
OSC-20-067	69	26	21	4.72	2.65	0.87
OSC-20-069	38	16	16	4.12	2.45	0.88
OSC-20-075	47	16	16	3.9	2.37	0.85
OSC-20-110	135	23	20	3.87	2.28	0.76
OSC-20-112	116	18	16	3.16	1.75	0.63
OSC-20-113	140	11	11	2.02	0.95	0.4
OSC-20-114	115	20	20	4	2.21	0.74
OSC-20-116	79	15	13	2.75	2.04	0.8
OSC-20-117	208	30	26	4.68	2.32	0.71

Station	Density (abundance per 0.04 m^2)	Number of LPTLs	Number of Families (or LPTL)	Richness	Diversity	Evenness
OSC-20-118	135	29	27	5.3	2.38	0.72
OSC-20-121	74	23	22	4.88	2.21	0.71
OSC-20-122	35	16	15	3.94	2.39	0.88
OSC-20-123	33	14	13	3.43	2.14	0.83
OSC-20-125	42	16	15	3.75	2.47	0.91
OSC-20-127	206	19	18	3.19	1.75	0.6
OSC-20-128	36	11	11	2.79	2.05	0.86
OSC-20-129	120	25	23	4.6	2.36	0.75
OSC-20-131	37	13	13	3.32	2.39	0.93
OSC-20-133	56	17	16	3.73	2.41	0.87
OSC-20-135	35	15	14	3.66	2.34	0.89
OSC-20-141	50	14	14	3.32	2.29	0.87
OSC-20-143	11	7	6	2.09	1.54	0.86
OSC-20-149	39	14	12	3	2	0.8
OSC-20-151	17	10	9	2.82	2.07	0.94
OSC-20-183	103	20	19	3.88	2.3	0.78
OSC-20-185	374	10	8	1.18	0.65	0.31
OSC-20-191	43	15	15	3.72	2.17	0.8
OSC-22-419	266	19	18	3.04	1.72	0.59
OSC-22-427	254	30	26	4.51	2.21	0.68
OSC-22-453	143	30	28	5.44	2.49	0.75
OSC-22-470	160	26	22	4.14	1.62	0.52
OSC-22-476r	195	19	17	3.03	1.53	0.54

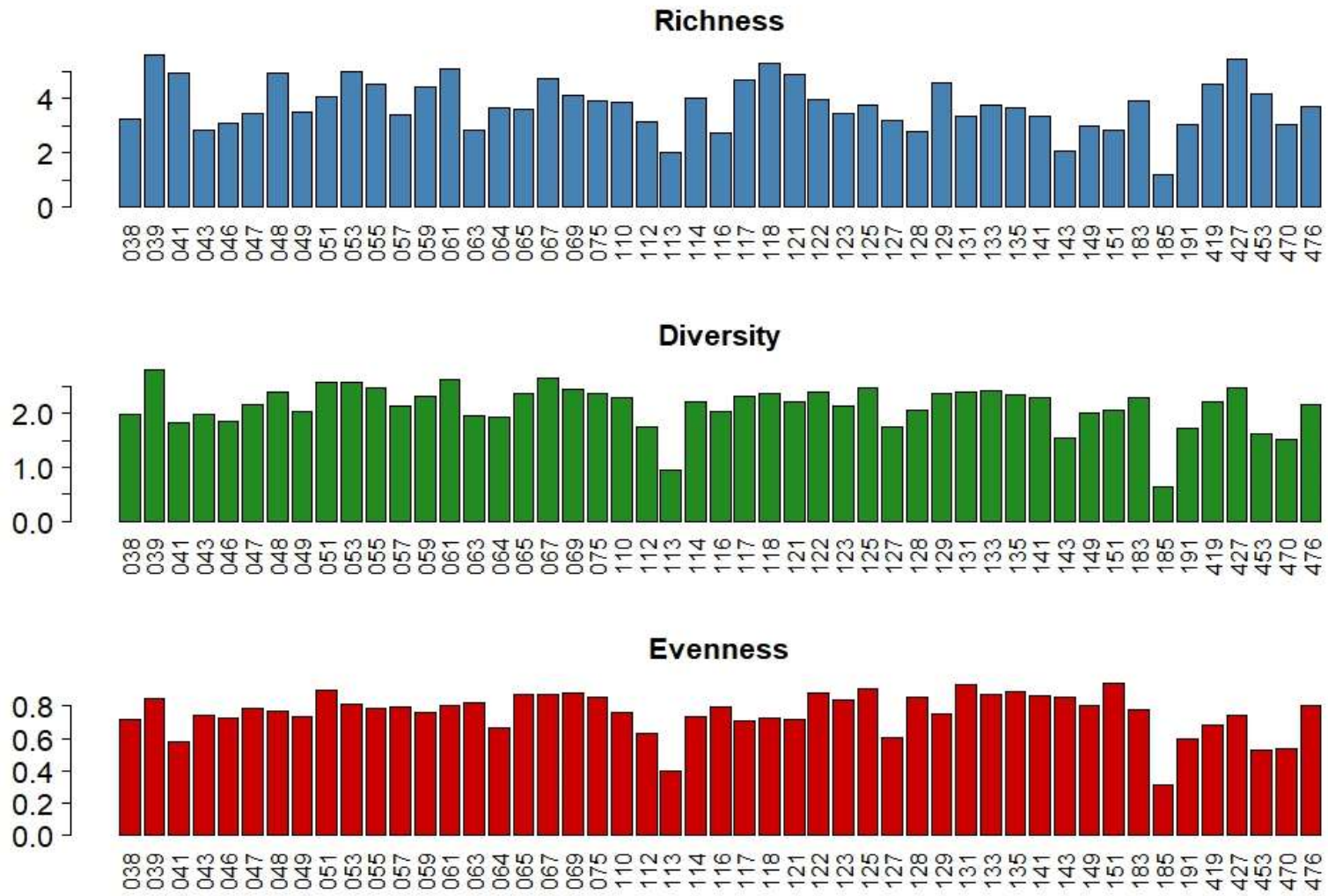


Figure 3-7. Ecological index values calculated for each sample station (x-axis) collected in the Lease Area

CMECS Classifications

CMECS classifications for each grab sample are displayed in Figures 3-8 and Table 3-14 for the Lease Area and mapped in Figure 3-9. Of the 60 grab samples in the Lease Area from 2019, 2020, and 2022, there is an equal representation of samples (30 each) that were classified as unconsolidated fine substrate (< 5% gravel) and unconsolidated coarse substrate (> 5% gravel); thus, samples collected in the Lease Area were evenly split between complex and soft bottom habitats. Gravelly Sand was the largest classification group with 25 of the 60 (42%) samples classified as Gravelly Sand (5 to 30% gravel). After Gravelly Sand, Medium Sand was the second largest classification group with 20 of the 60 samples (33%) classified to Medium Sand. No samples were classified as fine/very fine sand, mud, or any mud mixes.

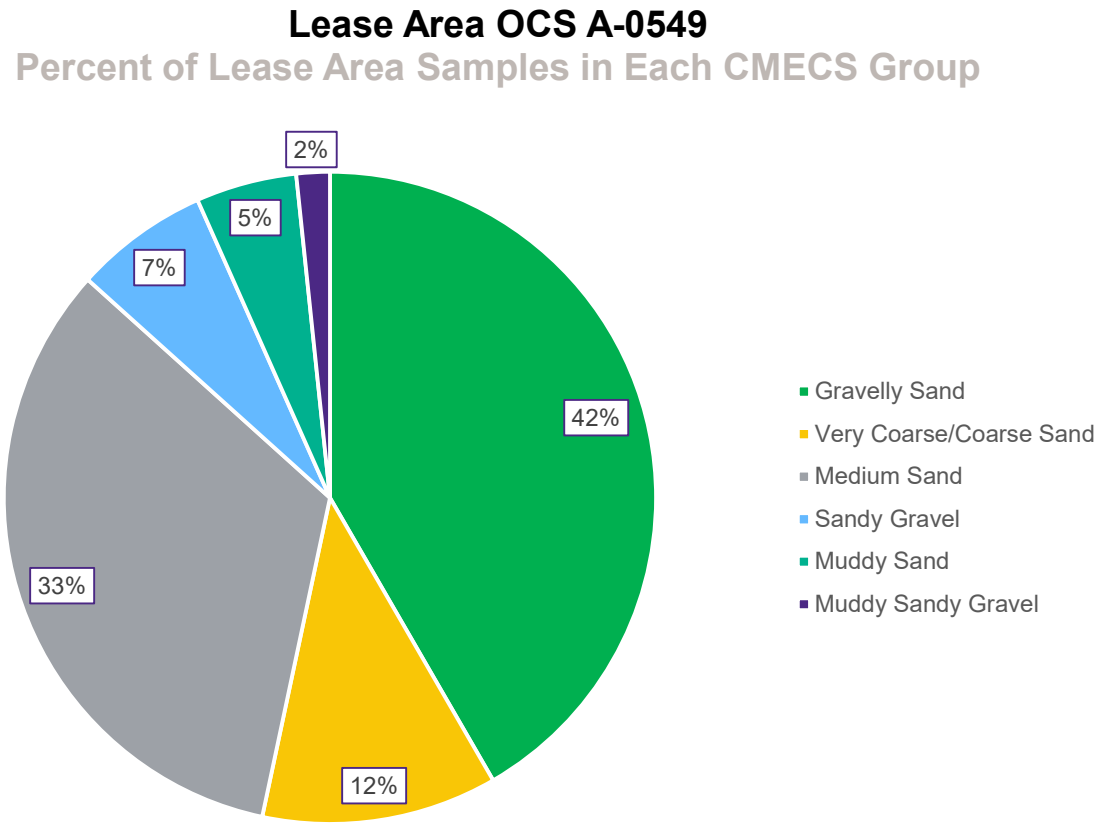


Figure 3-8. Percent of benthic grab samples in the Lease Area classified into CMECS geologic subgroups based on the laboratory grain size analysis for 2019, 2020, and 2022 data.

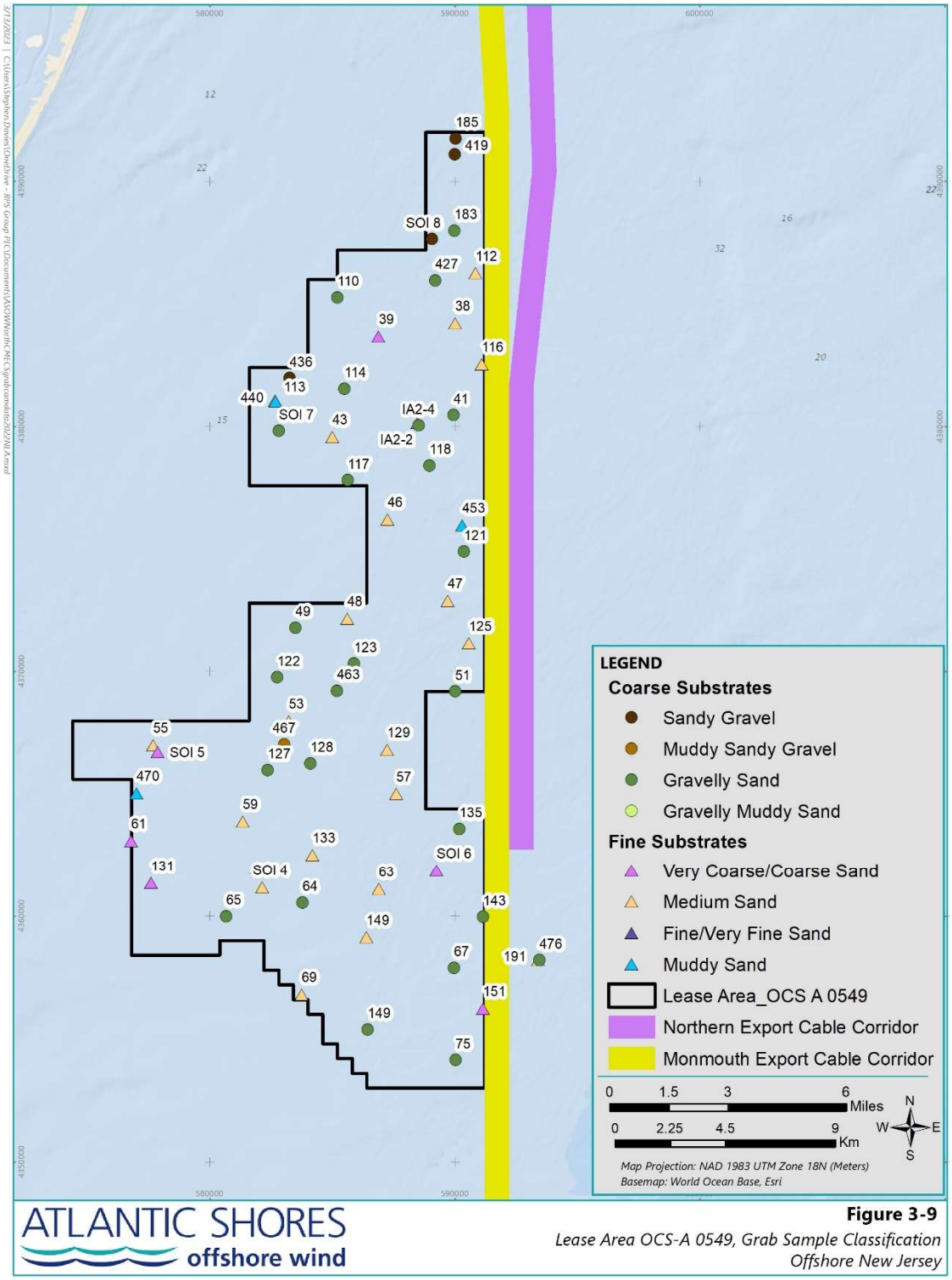
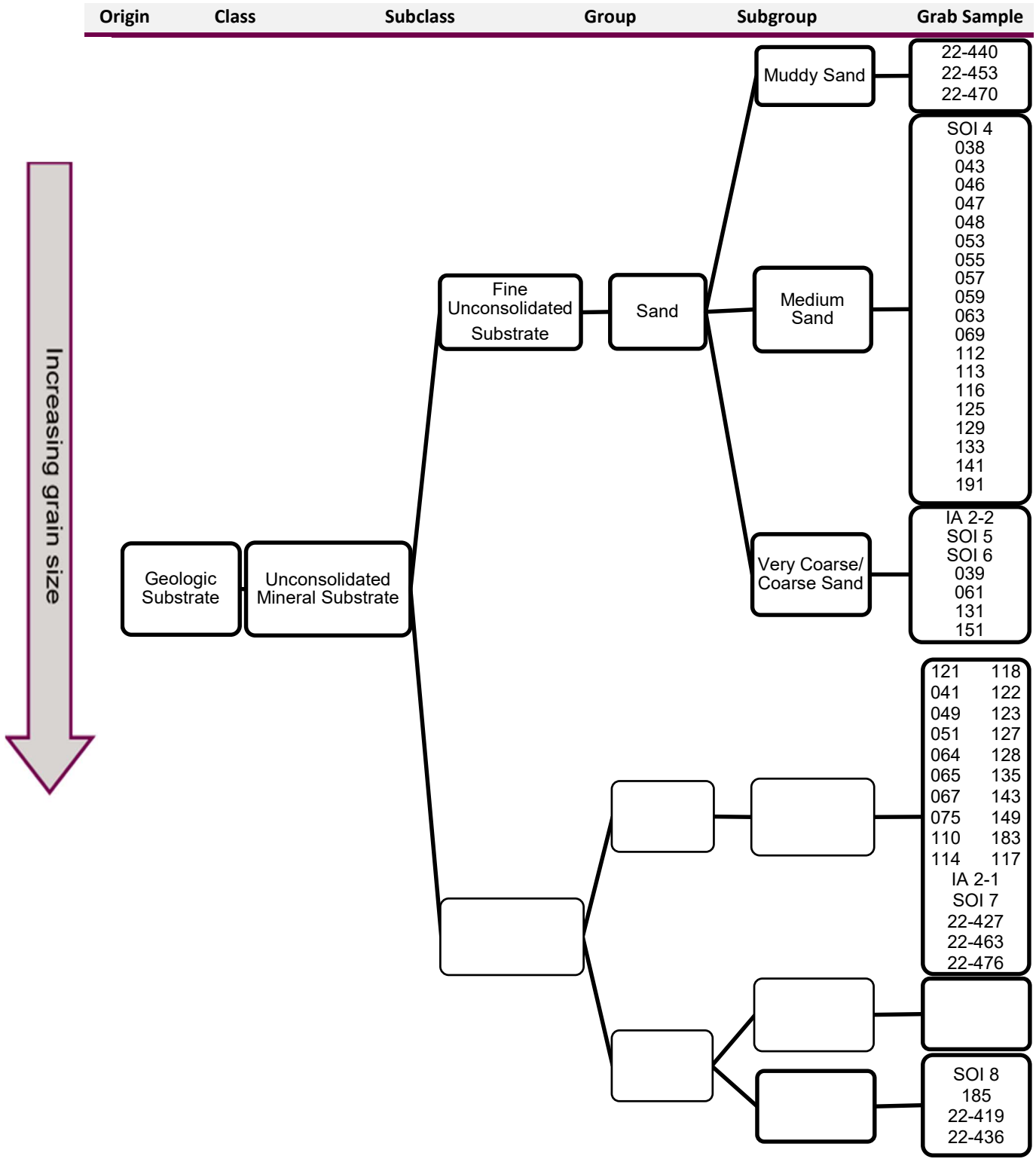


Figure 3-9. Benthic grab stations in the Atlantic Shores Offshore Wind Lease Area OCS-A-0549 and export cable corridors classified into CMECS geologic subgroups based on the laboratory grain size analysis.

Table 3-14. CMECS hierarchical classification of substrates collected at each grab sample within the Lease Area region in 2019, 2020, and 2022.



3.1.2 Monmouth ECC Results

3.1.2.1 Grain Size Analysis

Samples from 21 grab stations collected in 2020 and 12 samples from 2022 along the Monmouth ECC were generally sandy, comprised of 23 – 98% sand grains with a mean across samples of 79% (Table 3-15 and Figure 3-10). Of the 33 total samples, 5 consisted of ≥ 30% gravel (LAR-20-024, LAR-20-028, LAR-20-037, MON-22-401 and MON-22-415), and 1 consisted of ≥ 30% silt/clay (MON-22-462). The remaining 27 samples had gravel or silt/clay compositions of less than 30%. Across all samples, 22 had compositions of ≥5% gravel, while 4 sites (LAR-20-005, LAR-20-011, MON-22-433, and MON-22-452) contained no gravel. Gravel composition ranged from 0 – 76%. Across all samples, 8 had compositions of ≥5% silt/clay, while 3 sites (LAR-20-004, LAR-20-021, and LAR-20-030). Contained no silt/clay. Silt/clay composition ranged from 0 – 30%.

Table 3-15. Grain size composition and moisture content from 2020 and 2022 grab samples collected along the Monmouth ECC.

Sample*	% Boulder or Cobble (> 64 mm)	% Pebble or Granule (2 to < 64 mm)	% Very Course / Coarse Sand (0.5 to < 2 mm)	% Medium Sand (0.25 to < 0.5 mm)	% Fine / Very Fine Sand (0.0625 mm to < 0.25 mm)	% Silt / Clay (< 0.0625 mm)	Median Grain Size (mm)	% Moisture Content
LAR-20-002	0	6	8	26	40	20	0.2002	27.3
LAR-20-004	0	22	62	15	1	0	0.8614	16.6
LAR-20-005	0	0	1	8	86	5	0.1082	27.5
LAR-20-006	0	3	51	42	3	1	0.5403	20.6
LAR-20-008	0	16	11	8	51	14	0.1875	34.3
LAR-20-010	0	14	52	27	4	3	0.6471	14.3
LAR-20-011	0	0	5	45	46	4	0.2505	18.4
LAR-20-012	0	2	32	51	11	4	0.4013	13.6
LAR-20-014	0	25	52	16	3	4	0.8389	4.2
LAR-20-016	0	2	29	57	10	2	0.3972	22.2
LAR-20-018	0	27	51	19	2	1	1.2224	16.5
LAR-20-020	0	7	48	39	5	1	0.5484	23.2
LAR-20-021	0	4	66	27	3	0	0.6588	8.1
LAR-20-022	0	11	23	48	17	1	0.3969	13
LAR-20-024	0	76	17	4	2	1	2.9337	12.6
LAR-20-026	0	22	48	24	3	3	0.7179	16.6
LAR-20-028	0	33	25	35	5	2	0.6645	20.6
LAR-20-030	0	17	34	43	6	0	0.5127	21.5
LAR-20-031	0	5	50	38	5	2	0.5475	13
LAR-20-032	0	22	29	40	7	2	0.5204	19.3
LAR-20-037	0	52	22	15	6	5	2.2451	14.7
MON-22-383	0	5	50	34	10	1	0.5427	N/A
MON-22-401	0	44	23	14	13	6	1.0115	N/A
MON-22-415	0	71	22	5	1	1	4.6154	N/A

Sample*	% Boulder or Cobble (> 64 mm)	% Pebble or Granule (2 to < 64 mm)	% Very Course / Coarse Sand (0.5 to < 2 mm)	% Medium Sand (0.25 to < 0.5 mm)	% Fine / Very Fine Sand (0.0625 mm to < 0.25 mm)	% Silt / Clay (< 0.0625 mm)	Median Grain Size (mm)	% Moisture Content
MON-22-420	0	25	40	30	4	1	0.6768	N/A
MON-22-433	0	0	9	72	18	2	0.3206	N/A
MON-22-446	0	14	44	37	3	2	0.5803	N/A
MON-22-452	0	0	12	69	15	4	0.3347	N/A
MON-22-457	0	6	46	43	4	1	0.5122	N/A
MON-22-459	0	1	27	57	7	8	0.3992	N/A
MON-22-462	0	7	16	26	21	30	0.2462	N/A
MON-22-473	0	3	54	40	2	1	0.5400	N/A
MON-22-479	0	6	25	53	9	8	0.3954	N/A

*Note that Sample IDs for stations in the Monmouth ECC were originally identified with the acronym “LAR”.

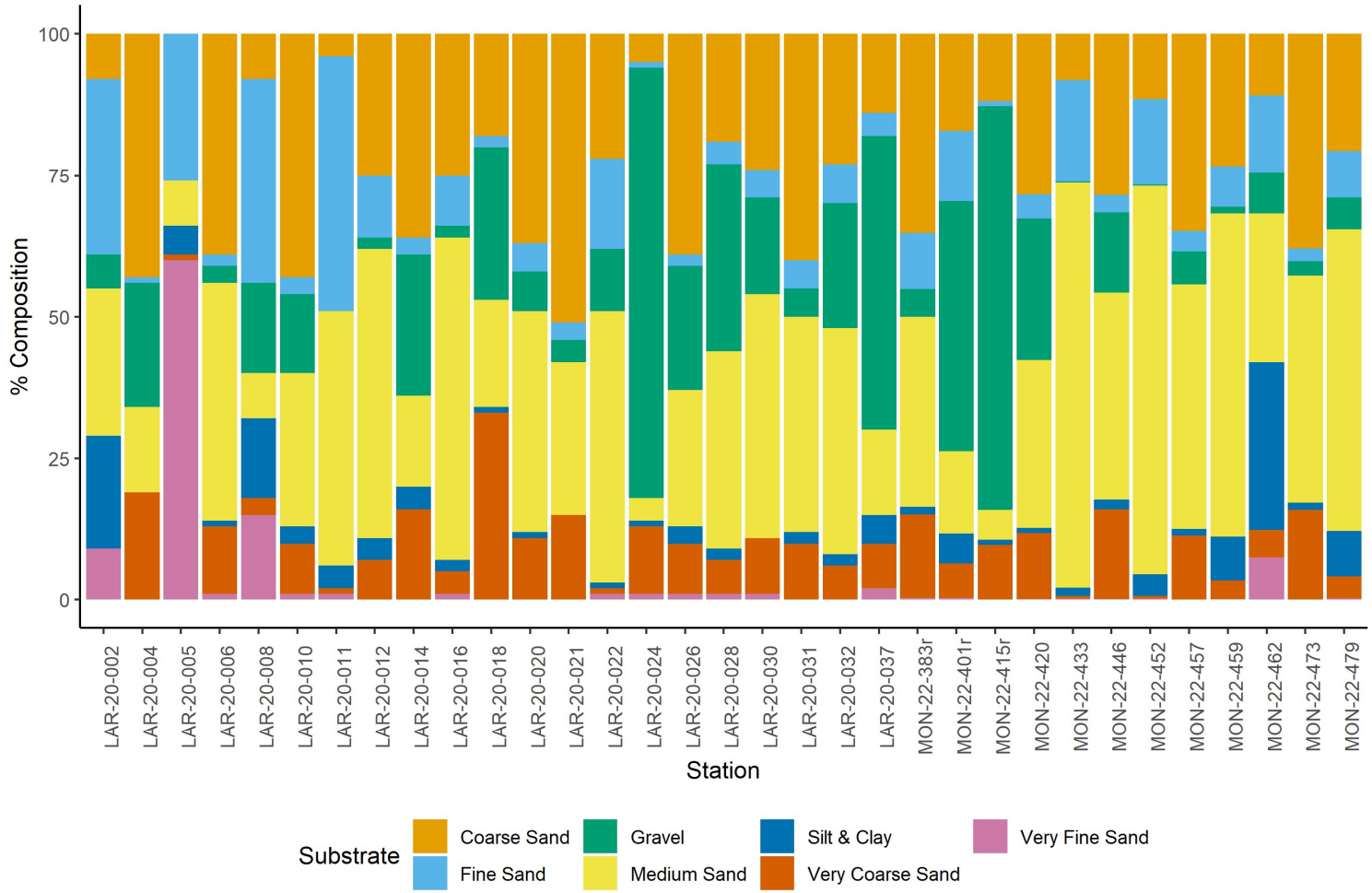


Figure 3-10. Grain size composition at each grab sample station along the Monmouth ECC[3]. All samples with LAR-20-XX were sampled in 2020, and MON-22-XX were sampled in 2022.

[3] Gravel includes boulder, cobble, pebble, and granule sediment size classes. Sand includes very coarse through very fine sand sediment size classes. Mud includes silt and clay sediment size classes.

3.1.2.2 Macroinvertebrate Community Composition

Of the 33 grab samples taken in the Monmouth ECC in 2020 and 2022, 29 samples were analyzed to determine macroinvertebrate community composition. Nematodes were omitted from this analysis as they were only enumerated in one set of samples. The grab samples yielded a total of 5,419 individual macrofaunal organisms (per all 29 0.04 m^2 grab samples). Organisms collected in the Monmouth ECC were from 10 phyla, 108 families or LPTL, and 185 unique taxa identified to the LPTL (Table 3-16). The majority of unique taxa identified were from the Annelida (83 unique taxa), Arthropoda (43 unique taxa), and Mollusca (37 unique taxa) phyla (Table 3-16).

The Cnidaria that were collected were sea anemones (Actiniaria and Ceriantharia) with no corals detected. One sea scallop was collected at LAR-20-037, and one ocean quahog was collected at LAR-20-002. Atlantic surfclam were collected at 17 sites for a total of 151 individuals. No invasive tunicates were confirmed present in the Monmouth ECC.

Density across the 29 infaunal samples ranged from 21 organisms in LAR-20-016 to 684 organisms in MON-22-420, with a mean of 187 organisms per station (Table 3-19). The percent composition of each sample by phyla is shown in Figure 3-12, and abundance of unique taxa is presented in Table 3-18Table 3-. The number of unique taxa represented in each sample ranged from 7 taxa at LAR-20-016 to 39 taxa at LAR-20-014 (Table 3-19). The richness of organisms collected at each grab sample location ranged from 1.97 at LAR-20-016 to 6.99 at LAR-20-014, with an average richness of 3.85. Average diversity across the individual grab samples was 2.01 with a range from 1.11 at MON-22-459 to 2.94 at LAR-20-014. Evenness across the samples ranged from 0.35 at MON-22-420 to 0.92 at LAR-20-031 with an average of 0.69 (Table 3-19 and Figure 3-13).

Table 3-16. Phyla present in the 29 benthic grab samples collected along the Monmouth ECC in 2020 and 2022.

Phyla	Abundant Taxonomic Groups (common names)	Density (Abundance per 0.04 m^2 samples)	Unique Taxa	Unique Families or LPTL
Annelida	Oligochaeta worms	2,906	83	31
Arthropoda	Amphipods	1,372	43	30
Chordata	Tunicate	3	2	2
Cnidaria	Hydroid	10	3	3
Echinodermata	Sea urchins, sea cucumbers	167	5	5
Ectoprocta	Bryozoa	8	5	5
Foraminifera	Forams	6	1	1
Mollusca	Nut clams, Atlantic surfclam	904	37	25
Nemertea	Ribbon worms	20	3	3
Sipuncula	Peanut worms	23	3	3
Totals		**5,419**	**185**	**108**

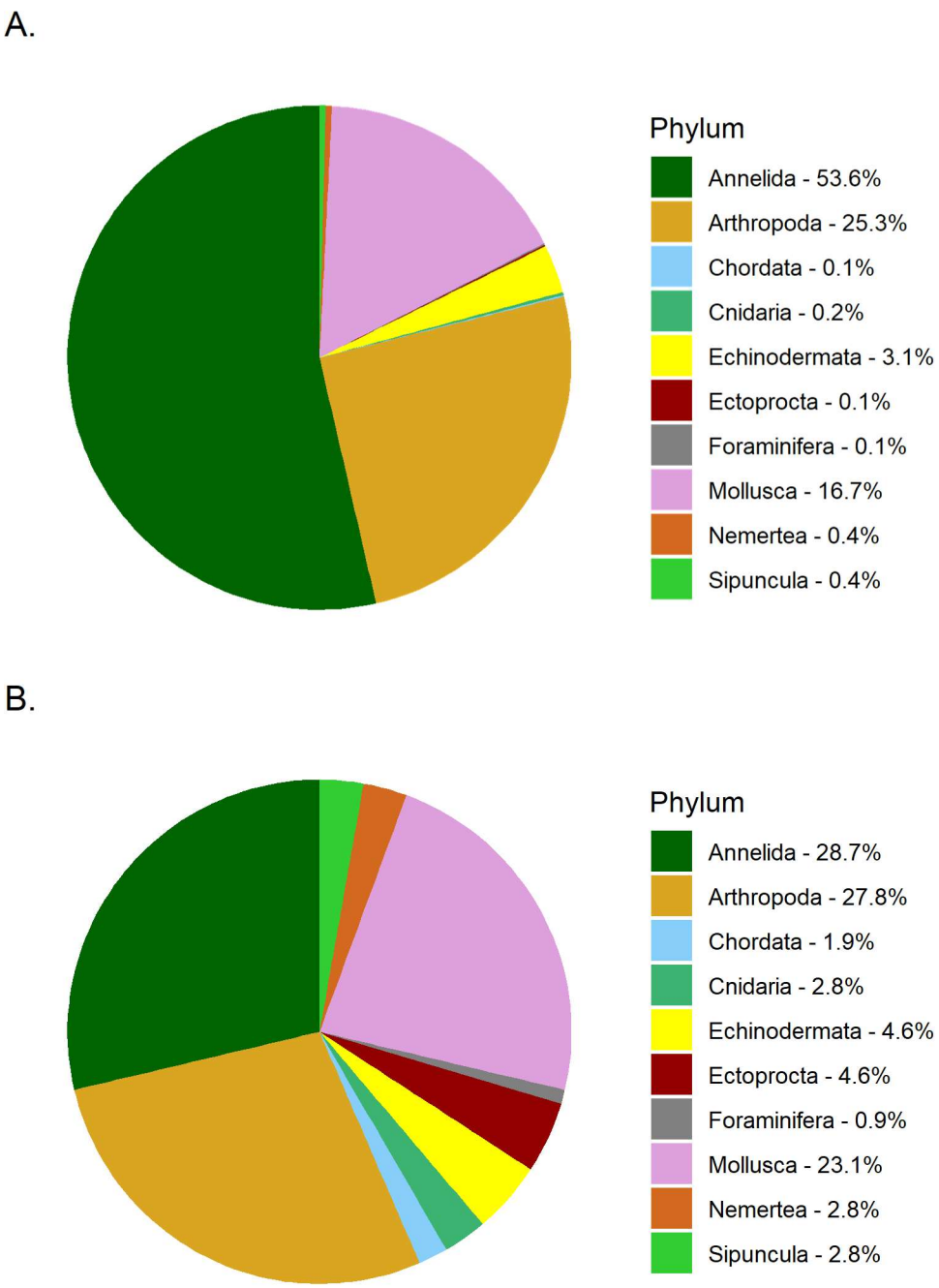


Figure 3-11. (A.) Proportional abundance and (B.) proportion of unique taxa (Family or LPTL) for each phylum collected in 2020 and 2022 benthic grab samples in the Monmouth ECC.

Table 3-17. Abundance of each Phylum counted within 29 grab samples collected along the Monmouth export cable corridor in 2020 and 2022. Atlantic surfclam were collected at stations marked with an "*" in the Mollusca column.

Station	Annelida	Arthropoda	Chordata	Cnidaria	Echino-dermata	Ectoprocta	Foraminifera	Mollusca	Nemertea	Sipuncula	Density (Abundance per 0.04 m^2)
LAR-20-002	23	60	0	0	0	0	0	298	1	0	382
LAR-20-004	34	6	0	1	3	0	0	6	0	0	50
LAR-20-005	2	26	0	0	0	0	0	35*	1	0	64
LAR-20-006	16	4	0	0	0	0	0	17*	0	0	37
LAR-20-008	83	89	0	0	0	0	0	82	0	0	254
LAR-20-010	7	26	0	0	3	0	0	3	0	0	39
LAR-20-011	17	100	0	0	0	0	0	5*	0	0	122
LAR-20-012	19	48	0	0	4	0	0	9*	1	0	81
LAR-20-014	68	21	1	2	12	0	0	23*	1	2	130
LAR-20-016	2	15	0	0	1	0	0	3	0	0	21
LAR-20-018	74	25	0	1	12	0	0	2	9	3	126
LAR-20-020	106	29	0	1	0	2	0	6*	0	0	144
LAR-20-021	48	236	2	0	23	2	0	48*	0	0	359
LAR-20-022	85	102	0	0	0	2	0	6	0	0	195
LAR-20-024	123	18	0	3	33	0	0	49*	0	8	234
LAR-20-026	27	39	0	1	0	0	0	10*	0	3	80
LAR-20-028	33	18	0	0	3	1	1	7*	0	0	63
LAR-20-030	31	43	0	0	4	0	0	33*	0	0	111

Station	Annelida	Arthropoda	Chordata	Cnidaria	Echino-dermata	Ectoprocta	Foraminifera	Mollusca	Nemertea	Sipuncula	Density (Abundance per 0.04 m^2)
LAR-20-031	12	17	0	0	3	0	3	14*	0	0	49
LAR-20-032	13	18	0	0	8	0	2	68*	0	0	109
LAR-20-037	29	231	0	0	1	1	0	21	1	7	291
MON-22-401r	537	47	0	0	2	0	0	80*	0	0	666
MON-22-420	629	27	0	1	8	0	0	19*	0	0	684
MON-22-433	17	85	0	0	15	0	0	10	0	0	127
MON-22-452	15	10	0	0	9	0	0	3	0	0	37
MON-22-457	88	15	0	0	10	0	0	18	0	0	131
MON-22-459	491	7	0	0	13	0	0	8	0	0	519
MON-22-462	143	9	0	0	0	0	0	11*	3	0	166
MON-22-473	134	1	0	0	0	0	0	10*	3	0	148
Total	**2906**	**1372**	**3**	**10**	**167**	**8**	**6**	**904**	**20**	**23**	**5419**

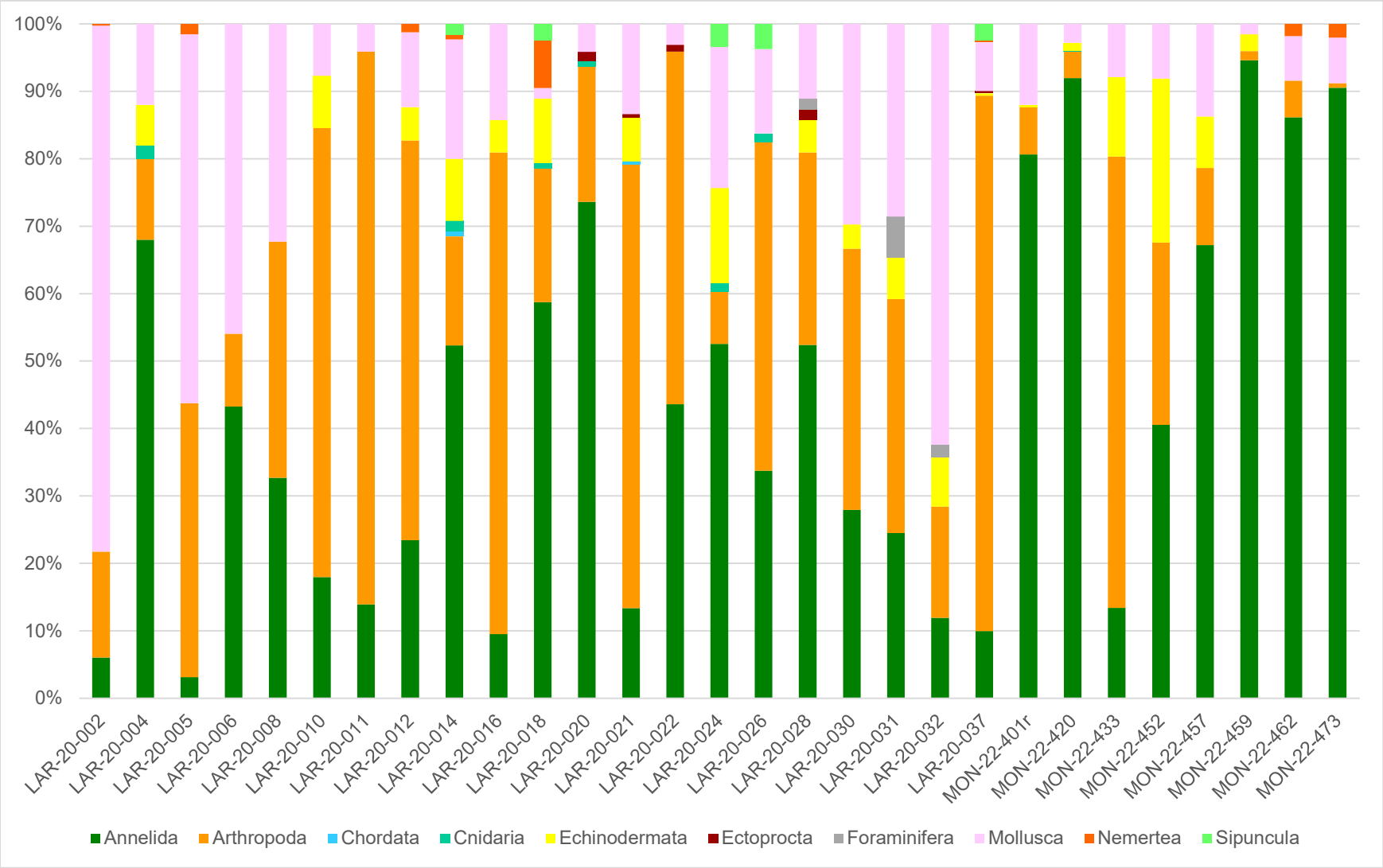


Figure 3-12. Percent composition of organisms in each represented phylum for the 21 benthic grab samples collected along the Monmouth export cable corridor.

Table 3-18. Mean density and frequency of occurrence of each phyla and taxa (LPTL) across all 29 samples collected along the Monmouth export cable corridor in 2020 and 2022.

Phylum	Family or LPTL	Abundance Across All Samples	Mean Abundance per 0.04 m^2	Median Abundance per 0.04 m^2	Frequency of Occurrence
Annelida	Ampharetidae	10	0.3	0	7
	Ampharetinae	8	0.3	0	1
	Cirratulidae	46	1.6	0	8
	Dorvilleidae	5	0.2	0	4
	Eunicidae	2	0.1	0	2
	Flabelligeridae	1	0	0	1
	Glyceridae	77	2.7	1	17
	Goniadidae	82	2.8	0	11
	Hesionidae	3	0.1	0	1
	Lumbrineridae	111	3.8	1	20
	Magelonidae	2	0.1	0	1
	Maldanidae	41	1.4	0	6
	Nephtyidae	50	1.7	1	16
	Oenonidae	5	0.2	0	2
	Oligochaeta	508	17.5	2	20
	Onuphidae	5	0.2	0	3
	Opheliidae	71	2.4	0	10
	Oweniidae	1	0	0	1
	Paraonidae	88	3	1	15
	Pholoidae	2	0.1	0	2
	Phyllodocidae	49	1.7	0	4
	Pilargidae	9	0.3	0	2
	Polygordiidae	1230	42.4	0	8
	Polynoidae	40	1.4	0	7
	Sabellariidae	1	0	0	1
	Scalibregmatidae	1	0	0	1
	Sigalionidae	128	4.4	2	20
	Sphaerodoridae	7	0.2	0	3
	Spionidae	278	9.6	0	13
	Syllidae	28	1	0	7
	Terebellidae	17	0.6	0	6
Arthropoda	Acari	1	0	0	1
	Ampeliscidae	283	9.8	0	10
	Aoridae	345	11.9	5	20
	Balanidae	1	0	0	1
	Bodotriidae	6	0.2	0	5
	Cancridae	10	0.3	0	6
	Caprellidae	1	0	0	1
	Caridea	1	0	0	1
	Chaetiliidae	9	0.3	0	4
	Cirolanidae	4	0.1	0	4
	Corophiidae	50	1.7	0	8
	Diastylidae	1	0	0	1
	Harpacticoida	3	0.1	0	2
	Haustoriidae	20	0.7	0	1
	Hyalellidae	1	0	0	1
	Idoteidae	6	0.2	0	4
	Isaeidae	1	0	0	1
	Ischyroceridae	1	0	0	1
	Majidae	2	0.1	0	2
	Oedicerotidae	2	0.1	0	1
	Ostracoda	53	1.8	0	7
	Paguridae	19	0.7	0	11
	Panopeidae	1	0	0	1
	Phoxocephalidae	35	1.2	0	9
	Podoceridae	2	0.1	0	1
	Pontogeneiidae	1	0	0	1
	Pontoporeiidae	4	0.1	0	3
	Tanaissuidae	162	5.6	1	20
	Unciolidae	342	11.8	0	11

Phylum	Family or LPTL	Abundance Across All Samples	Mean Abundance per 0.04 m^2	Median Abundance per 0.04 m^2	Frequency of Occurrence
Arthropoda	Upogebiidae	5	0.2	0	2
Chordata	Branchiostomatidae	1	0	0	1
	Styelidae	2	0.1	0	1
Cnidaria	Actiniaria	6	0.2	0	4
	Ceriantharia	1	0	0	1
	Edwardsiidae	3	0.1	0	2
Echinodermata	Echinarachniidae	63	2.2	1	17
	Echinoidea	60	2.1	0	11
	Holothuroidea	16	0.6	0	2
	Loveniidae	1	0	0	1
	Synaptidae	27	0.9	0	3
Ectoprocta	Alcyonidiidae	2	0.1	0	1
	Cribrilinidae	1	0	0	1
	Electridae	3	0.1	0	3
	Hippothoidae	1	0	0	1
	Schizoporellidae	1	0	0	1
Foraminifera	Astrorhizidae	6	0.2	0	3
Mollusca	Arcidae	1	0	0	1
	Arcticidae	1	0	0	1
	Astartidae	52	1.8	1	17
	Bivalvia	27	0.9	0	11
	Calyptraeidae	78	2.7	0	8
	Cardiidae	9	0.3	0	6
	Columbellidae	12	0.4	0	3
	Epitoniidae	2	0.1	0	2
	Gastropoda	5	0.2	0	3
	Lyonsiidae	4	0.1	0	3
	Mactridae	151	5.2	1	17
	Mytilidae	69	2.4	0	9
	Nassariidae	29	1	0	13
	Naticidae	2	0.1	0	2
	Nuculidae	320	11	0	8
	Pandoridae	11	0.4	0	8
	Pectinidae	3	0.1	0	2
	Periplomatidae	38	1.3	0	14
	Pharidae	13	0.4	0	4
	Pleurobranchidae	1	0	0	1
	Pyramidellidae	19	0.7	0	4
	Solenidae	6	0.2	0	2
	Tellinidae	28	1	0	8
	Veneridae	18	0.6	0	4
	Yoldiidae	5	0.2	0	2
Nemertea	Carinomidae	3	0.1	0	1
	Emplectonematidae	1	0	0	1
	Nemertea	16	0.6	0	6
Sipuncula	Golfingiidae	3	0.1	0	1
	Sipuncula	12	0.4	0	3
	Sipunculidae	8	0.3	0	1

Table 3-19. Community composition parameters calculated for each grab sample station along the Monmouth export cable corridor.

Station	Density (Abundance per 0.04 m^2)	Number of LPTLs	Number of Families (or LPTL)	Richness	Diversity	Evenness
LAR-20-002	382	34	29	4.71	1.6	0.48
LAR-20-004	50	15	15	3.58	2.28	0.84

Station	Density (Abundance per 0.04 m^2)	Number of LPTLs	Number of Families (or LPTL)	Richness	Diversity	Evenness
LAR-20-005	64	12	11	2.4	1.74	0.72
LAR-20-006	37	18	16	4.15	2.3	0.83
LAR-20-008	254	34	26	4.51	2.32	0.71
LAR-20-010	39	13	13	3.28	1.87	0.73
LAR-20-011	122	12	12	2.29	1.71	0.69
LAR-20-012	81	23	22	4.78	2.34	0.76
LAR-20-014	130	39	35	6.99	2.94	0.83
LAR-20-016	21	7	7	1.97	1.32	0.68
LAR-20-018	126	19	17	3.31	2.39	0.84
LAR-20-020	144	27	24	4.63	2.01	0.63
LAR-20-021	359	33	27	4.42	1.94	0.59
LAR-20-022	195	18	17	3.03	1.72	0.61
LAR-20-024	234	29	23	4.03	2.62	0.83
LAR-20-026	80	18	17	3.65	2.45	0.86
LAR-20-028	63	17	17	3.86	2.29	0.81
LAR-20-030	111	24	23	4.67	2.51	0.8
LAR-20-031	49	14	12	2.83	2.28	0.92
LAR-20-032	109	18	18	3.62	1.71	0.59
LAR-20-037	291	35	33	5.64	1.77	0.51
MON-22-401r	666	36	31	4.61	2.17	0.63
MON-22-420	684	32	27	3.98	1.15	0.35
MON-22-433	127	23	22	4.34	1.92	0.62
MON-22-452	37	12	11	2.77	2.04	0.85
MON-22-457	131	24	23	4.51	2.42	0.77
MON-22-459	519	17	15	2.24	1.11	0.41
MON-22-462	166	19	19	3.52	1.45	0.49
MON-22-473	148	20	18	3.4	1.96	0.68

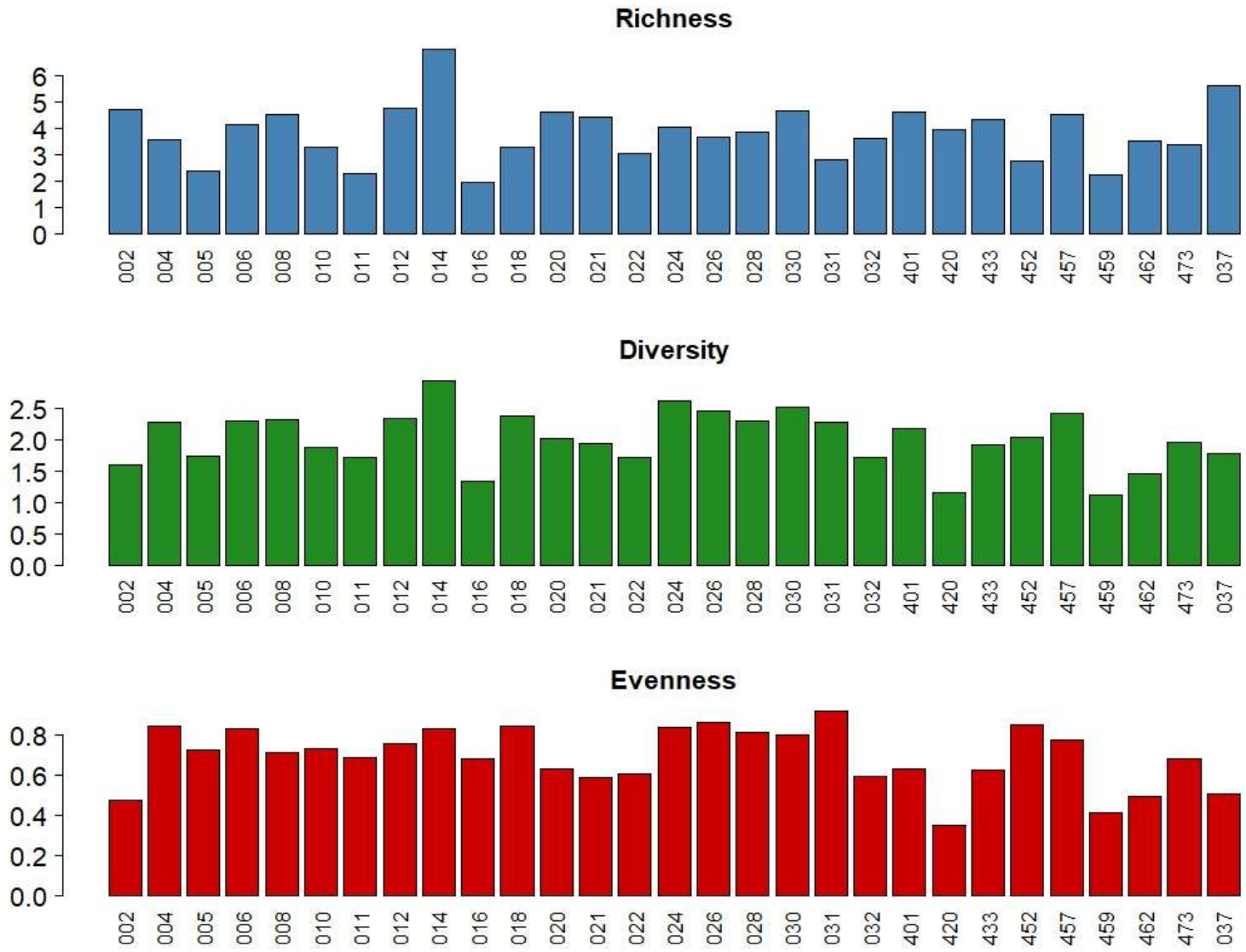


Figure 3-13. Ecological index values calculated for each sample station collected along the Monmouth export cable route in 2020 and 2022

3.1.2.3 CMECS Classifications

CMECS classifications for each grab sample are displayed in Figure 3-14 for the Monmouth ECC and mapped in Figure 3-15. Of the 33 grab samples in the Monmouth ECC from 2020 and 2022, the majority (66%) were classified as unconsolidated coarse substrate (i.e., complex habitat) and the remaining samples were classified as fine, medium, or coarse sand (i.e., soft bottom habitat). Of the samples collected in the Monmouth ECC, only 5 contained gravel mixes with a gravel content between 30% and less than 80% (i.e., Muddy Sandy Gravel and Sandy Gravel) and 17 contained between 5% and less than 30% gravel content (i.e., Gravelly Sand and Gravelly Muddy Sand). No samples were classified as mud, and only 4 samples were classified as gravelly muddy sand or muddy sandy gravel with ≥ 10% mud in the sand/mud component.

Substrate CMECS classification results for the Monmouth ECC are presented as a hierarchy in Table 3-20. The assigned CMECS classification and complex habitat designations are also included with the representative images of the grab bucket and associated imagery in Appendix A for ease of reference.

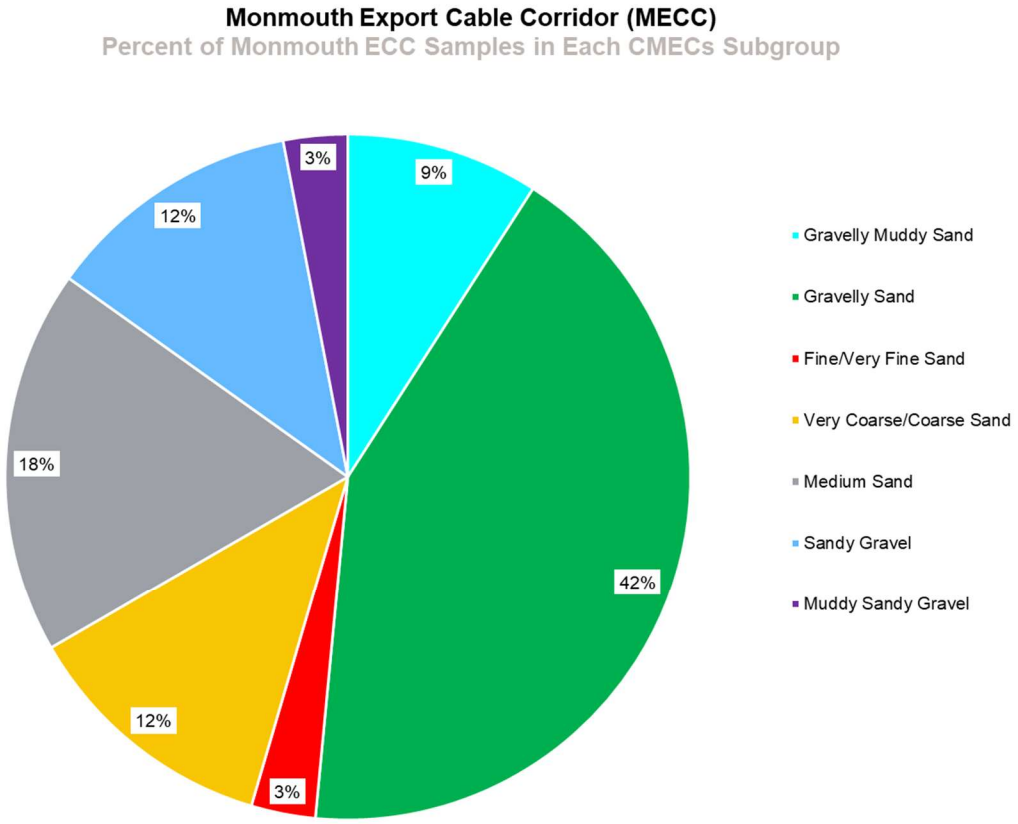


Figure 3-14. Percent of benthic grab samples in the Monmouth ECC project area classified into CMECS geologic subgroups based on the laboratory grain size analysis for 2020 data.

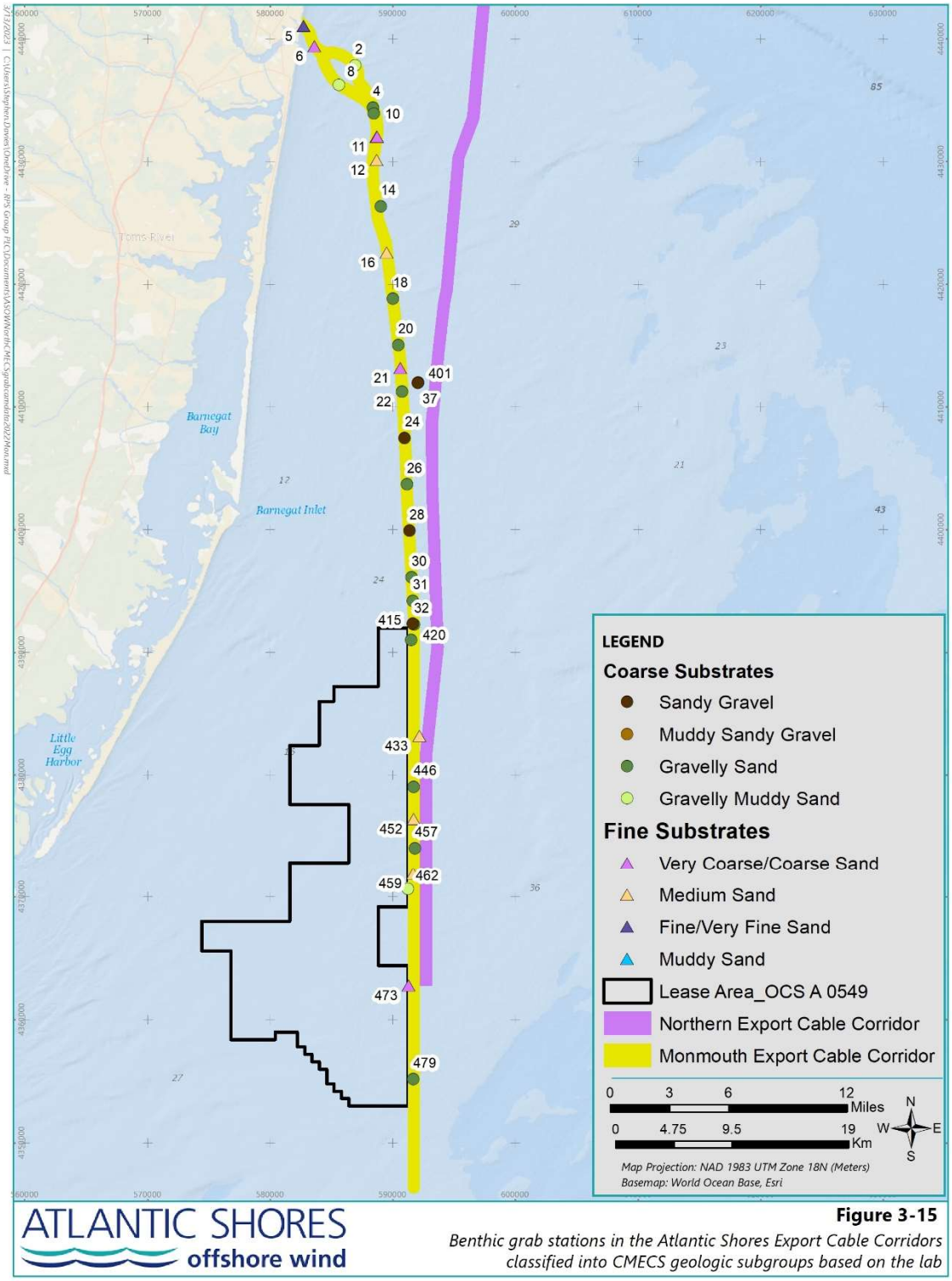
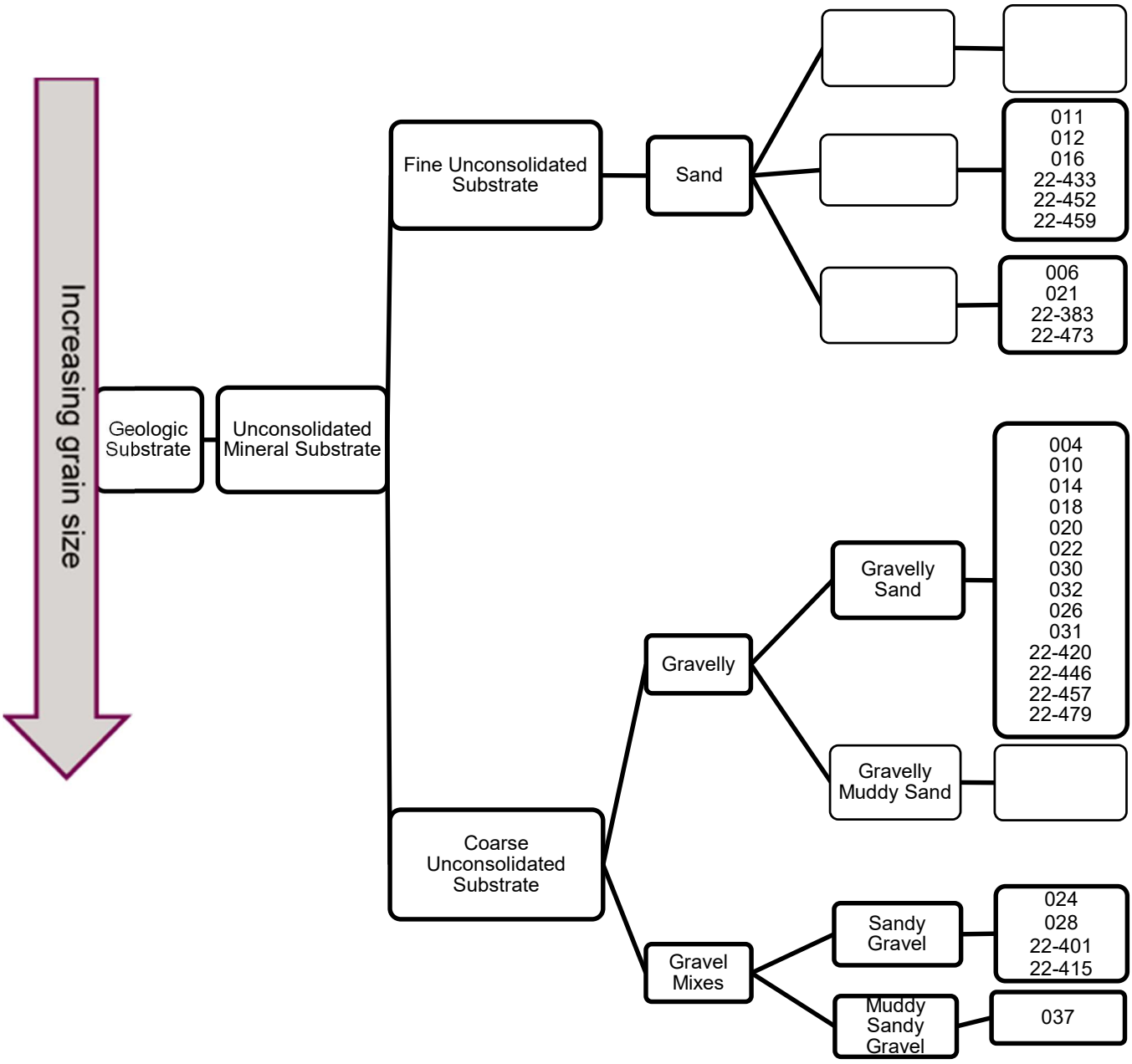


Figure 3-15. Benthic grab stations in the Monmouth Export Cable Corridor classified into CMECS geologic subgroups based on the laboratory grain size analysis.

Table 3-20. CMECS hierarchical classification of substrates collected at each grab sample within the Monmouth ECC in 2020 and 2022.

Origin	Class	Subclass	Group	Subgroup Modifier	Grab Sample



3.1.3 Northern ECC Results

3.1.3.1 Grain Size Analysis

Samples from 65 grab stations collected in 2022 along the Northern ECC were generally sandy, with more than half of samples (n=36) composed of ≥ 80% sand sized particles (range 12 – 99%; mean composition of sands across samples = 73%; Table 3-21 and Figure 3-16). Of the 65 samples, 17 consisted of ≥ 30% gravel and 6 consisted of ≥ 30% silt/clay. The remaining 42 samples had gravel or silt/clay compositions of less than 30%. Across all samples, 30 had compositions of ≥ 5% gravel, while 14 sites contained no gravel. 2 samples contained ≥ 80% gravel (NEC-22-382 and 406). Gravel composition ranged from 0 – 88%. Across all samples, 29 had compositions of ≥ 5% silt/clay, while 3 sites (NEC-22-406, NEC-22-378, and NEC-22-456) contained no silt/clay. 2 samples contained ≥ 80% silt/clay (NEC-22-300 and 306). Silt/clay composition ranged from 0 – 84%.

Table 3-21. Grain size composition and moisture content from 65 grab samples collected along the Northern ECC in 2022.

Sample	% Boulder or Cobble (> 64 mm)	% Pebble or Granule (2 to < 64 mm)	% Very Course / Coarse Sand (0.5 to < 2 mm)	% Medium Sand (0.25 to < 0.5 mm)	% Fine / Very Fine Sand (0.0625 mm to < 0.25 mm)	% Silt / Clay (< 0.0625 mm)	Median Grain Size (mm)	Total Organic Carbon Average (mg/kg)
NEC-22-300	0	0	1	0	15	84	0.0460	1.59
NEC-22-303	0	1	5	17	55	23	0.1373	0.76
NEC-22-304	0	4	17	47	24	7	0.3151	0.52
NEC-22-305	0	47	20	6	18	10	1.6654	3.76
NEC-22-306	0	2	5	2	9	83	0.0455	2.66
NEC-22-312	0	1	4	10	82	3	0.1863	0.05
NEC-22-314	0	1	9	66	19	5	0.3160	0.05
NEC-22-316	0	0	2	5	78	16	0.1214	0.65
NEC-22-323	0	4	12	43	37	5	0.2742	0.14
NEC-22-327	0	18	31	34	13	4	0.4798	0.74
NEC-22-328	0	1	2	4	69	25	0.0854	1.22
NEC-22-331	0	1	5	13	76	6	0.1741	0.28
NEC-22-334	0	0	1	54	43	3	0.2559	0.03
NEC-22-336	0	0	11	62	25	3	0.3070	0.03
NEC-22-337	0	2	8	6	29	56	0.0582	2.58
NEC-22-339	0	5	12	16	37	30	0.1235	1.38
NEC-22-341	0	3	91	5	0	1	0.9836	0.03
NEC-22-343	0	0	2	16	80	2	0.1807	0.07
NEC-22-345	0	32	30	22	15	2	0.7823	0.15
NEC-22-347	0	55	38	5	1	1	2.2949	0.09
NEC-22-348	0	0	10	64	24	2	0.3150	0.07
NEC-22-350	0	41	38	18	2	2	1.2379	0.08
NEC-22-352	0	3	23	64	9	2	0.3972	0.04

Sample	% Boulder or Cobble (> 64 mm)	% Pebble or Granule (2 to < 64 mm)	% Very Course / Coarse Sand (0.5 to < 2 mm)	% Medium Sand (0.25 to < 0.5 mm)	% Fine / Very Fine Sand (0.0625 mm to < 0.25 mm)	% Silt / Clay (< 0.0625 mm)	Median Grain Size (mm)	Total Organic Carbon Average (mg/kg)
NEC-22-353	0	9	37	41	5	8	0.4783	0.05
NEC-22-355	0	3	9	74	14	1	0.3753	0.11
NEC-22-357	0	0	26	61	5	9	0.4068	0.06
NEC-22-360	0	0	13	46	32	9	0.2803	0.06
NEC-22-361	0	54	26	11	1	8	2.2924	0.10
NEC-22-367	0	0	4	16	71	9	0.1827	0.09
NEC-22-369	0	0	4	72	15	9	0.3044	0.05
NEC-22-371	0	3	7	28	52	11	0.2033	0.11
NEC-22-372	0	1	49	35	7	8	0.4997	0.06
NEC-22-373	0	6	35	46	11	2	0.4551	0.07
NEC-22-375	0	1	40	40	17	2	0.4390	0.03
NEC-22-377	0	0	2	41	55	2	0.2362	0.05
NEC-22-378	0	63	6	26	5	0	7.0912	0.06
NEC-22-380	0	76	13	9	2	1	5.2045	0.03
NEC-22-382	0	81	10	3	5	1	5.6109	0.07
NEC-22-385	0	17	50	23	2	9	0.6375	0.06
NEC-22-387	0	0	26	59	13	2	0.3701	0.03
NEC-22-389	0	37	40	19	3	1	1.3617	0.04
NEC-22-391	0	30	32	22	3	13	0.6994	0.05
NEC-22-392	0	3	39	49	7	1	0.4603	0.01
NEC-22-394	0	61	32	4	2	1	2.7056	0.02
NEC-22-397	0	48	48	3	0	1	1.9267	ND (0.010)
NEC-22-398	0	1	11	61	19	8	0.3227	0.04
NEC-22-404	0	71	20	8	1	1	4.6072	0.03
NEC-22-406	0	88	8	4	1	0	6.0041	0.09
NEC-22-408	0	63	25	10	1	1	3.6715	0.01
NEC-22-409	0	0	38	24	19	19	0.3610	0.05
NEC-22-412	0	20	15	58	3	4	0.4133	ND (0.010)
NEC-22-414	0	9	13	66	11	1	0.3570	0.09
NEC-22-417	0	14	25	21	2	38	0.3944	0.04
NEC-22-423	0	5	59	33	2	1	0.5811	0.02
NEC-22-428	0	1	26	60	12	1	0.3788	0.01
NEC-22-435	0	4	40	43	6	8	0.4558	0.03
NEC-22-448	0	6	39	48	6	1	0.4690	0.04
NEC-22-456	0	3	37	54	6	0	0.4483	0.02
NEC-22-461	0	21	27	46	5	1	0.4819	0.01
NEC-22-464	0	2	3	19	19	58	0.0539	0.26
NEC-22-469	0	13	22	58	6	1	0.4161	0.02
NEC-22-472	0	9	44	44	3	1	0.5137	0.02
NEC-22-569	0	48	17	25	4	6	1.0595	0.07

Sample	% Boulder or Cobble (> 64 mm)	% Pebble or Granule (2 to < 64 mm)	% Very Course / Coarse Sand (0.5 to < 2 mm)	% Medium Sand (0.25 to < 0.5 mm)	% Fine / Very Fine Sand (0.0625 mm to < 0.25 mm)	% Silt / Clay (< 0.0625 mm)	Median Grain Size (mm)	Total Organic Carbon Average (mg/kg)
NEC-22-612	0	0	2	65	26	7	0.2446	0.09
NEC-22-703	0	32	40	18	3	8	0.9040	0.26

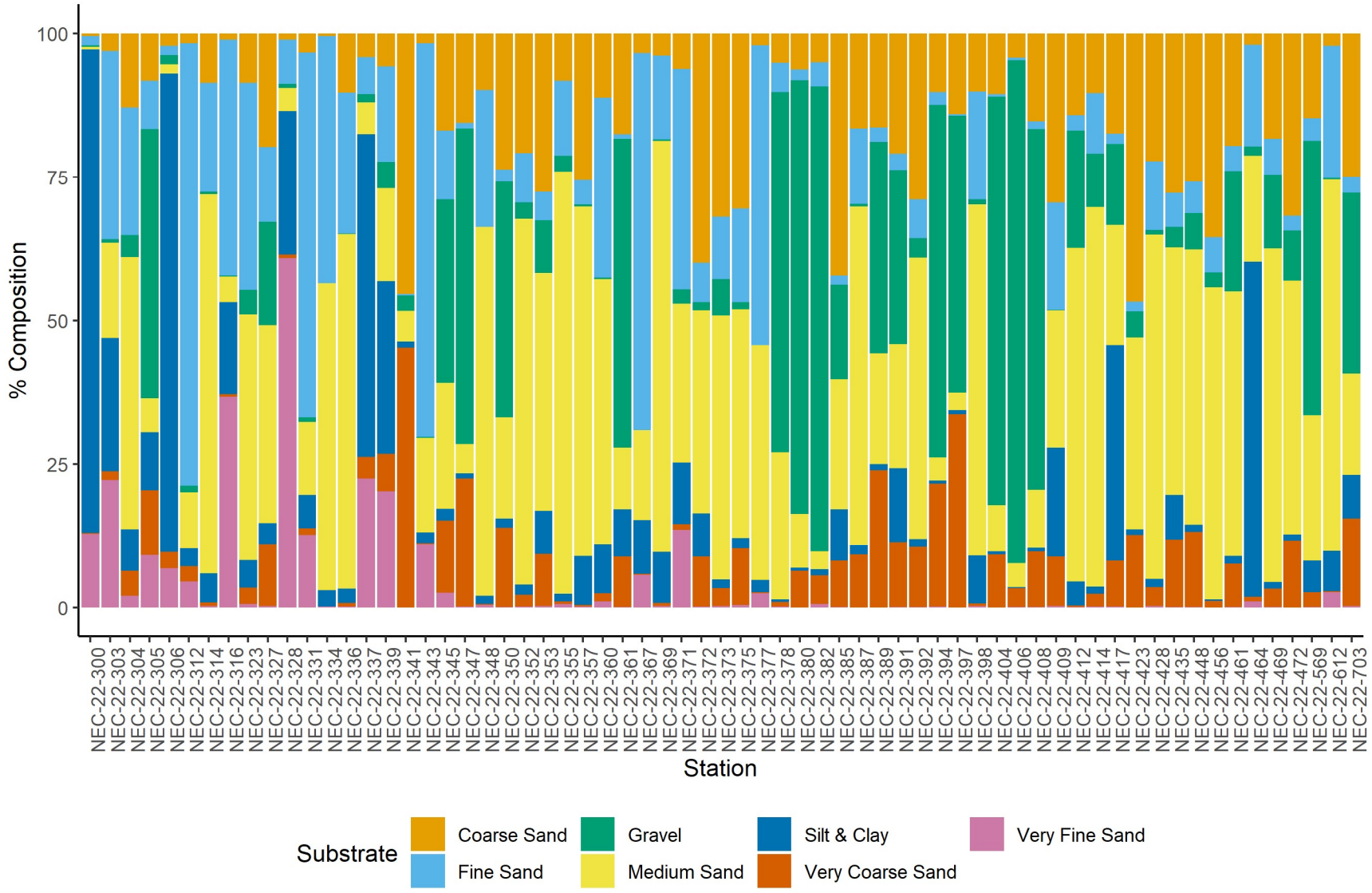


Figure 3-16. Grain size composition at each grab sample station along the Northern ECC.

3.1.3.2 Macroinvertebrate Community Composition

For the 65 grab samples collected in 2022 from the Northern ECC, 58 were further analyzed to determine macroinvertebrate community composition. A total of 21,954 individual macrofaunal organisms were enumerated across all 58 0.04 m^2 samples. Nematodes were omitted from this analysis. Organisms were collected from 9 phyla, 115 families or LPTL, and 231 unique taxa identified to the LPTL. Organisms from the phyla Annelida were most abundant across all samples, accounting for 77% of all identified organisms, and were identified in every sample collected. The majority of unique taxa identified were from the Annelida (103 unique taxa), Arthropoda (62 unique taxa), and Mollusca (43 unique taxa) phyla. Sample abundance across the 58 benthic grab sites from the Northern ECC in 2022 ranged from 23 organisms in NEC-22-367 to 2,346 organisms in NEC-22-300 (Table 3-23). Bivalves dominated the sampled molluscs, with 918 of the total 1224 individuals sampled. Ocean quahog (*Arctica islandica*) were found in 2 sites, for a total of 3 individuals. No Atlantic scallops (*Placopecten magellanicus*) were observed in the collected samples. the Atlantic surf clam (*Spisula solidissima*) was found in 28 sites, for a total of 114 individuals. No Scleractinian stony corals were present in any samples. No invasive tunicates (*Ascidiella aspersa*, *Botrylloides violaceus*, *Botryllus schlosseri*, *Didemnum vexillum*, *Diplosoma listerianum*, or *Styela clava*) were confirmed present in the 2022 samples.

Mean density was 379 organisms per station. The richness of organisms collected at each grab sample location ranged from 2.28 at NEC-22-341 to 5.45 at NEC-22-323 with a mean taxonomic richness across all grab samples collected in the Northern ECC of 3.74. Average diversity across the individual grab samples was 1.91 with a range from 0.57 at NEC-22-369 to 2.84 at NEC-22-327. Evenness across the samples ranged from 0.19 at NEC-22-369 to 0.95 at NEC-22-378 with an average of 0.63. Higher values indicate greater amounts of richness, diversity, or evenness in each sample (Table 3-25, and Figure 3-19).

Table 3-22. Phyla present in 58 benthic grab samples collected in the Northern ECC in 2022.

Phyla	Abundant Taxonomic Groups	Sample Abundance	Unique Taxa	Unique Family or LPTL
Annelida	Polychaete worms (segmented and bamboo worms)	16,791	103	33
Arthropoda	Amphipods, calanoid copepods, ostracods	3,486	62	33
Chordata	Tunicate	6	3	3
Cnidaria	Hydroid	10	5	4
Echinodermata	Sand dollars, sea cucumbers	222	6	5
Mollusca	Nut clams	1,224	43	29
Nemertea	Ribbon worms	200	6	5
Platyhelminthes	Flatworms	14	2	2
Sipuncula	Peanut worms	1	1	1
Totals		**21,954**	**231**	**115**

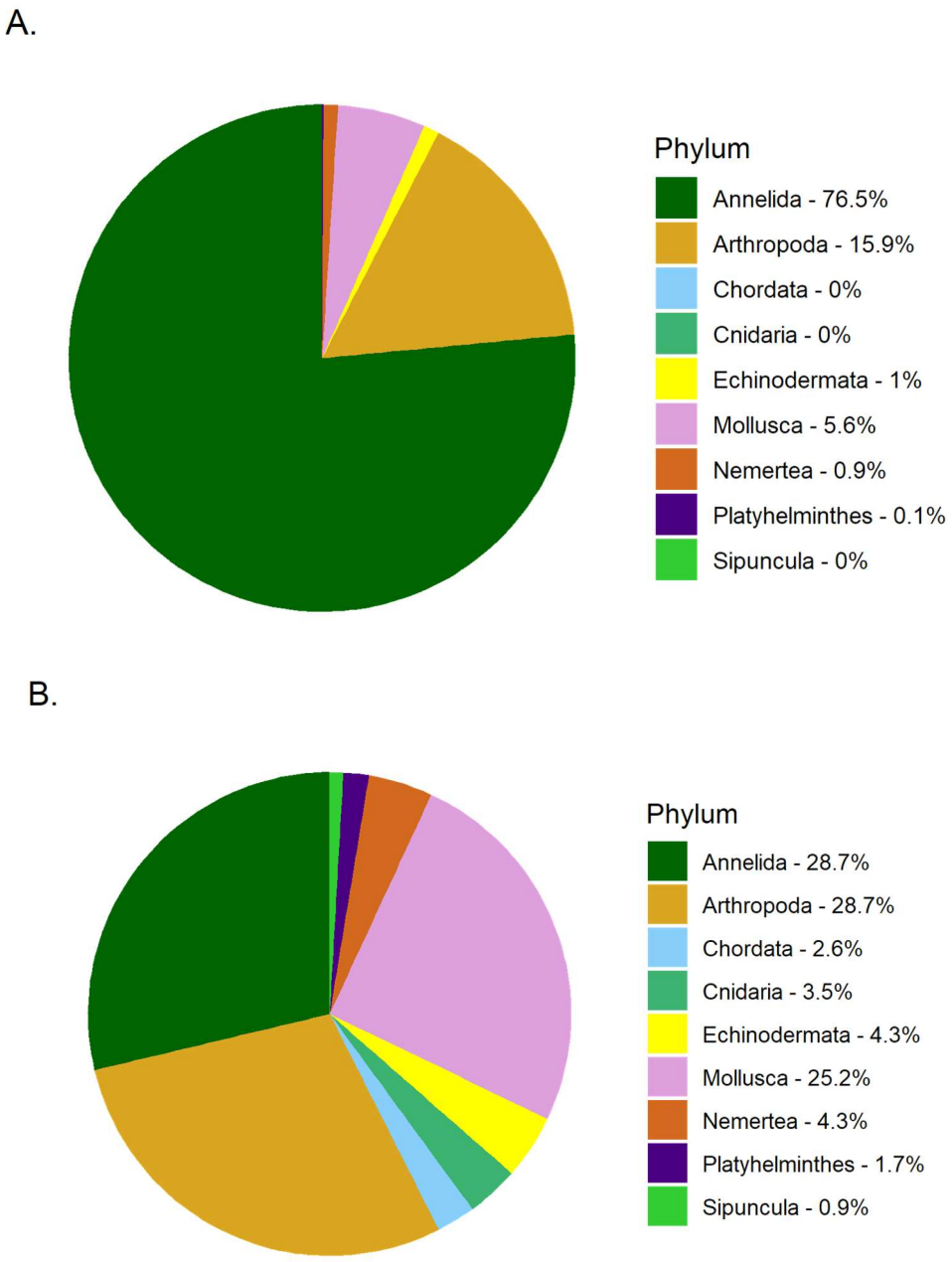


Figure 3-17. (A.) Proportional abundance and (B.) proportion of unique taxa (Family or LPTL) for each phylum collected in 58 benthic grab samples collected in the Northern ECC in 2022.

Table 3-23. Abundance of each Phylum counted within 58 grab samples collected in the Northern ECC in 2022 (continued on next page). Atlantic surfclam and/or ocean quahog were collected at stations marked with an "*" in the Mollusca column.

Station	Annelida	Arthropoda	Chordata	Cnidaria	Echinodermata	Mollusca	Nemertea	Platyhel-minthes	Sipuncula	Density (Abundance per 0.04 m^2)
NEC-22-300	2149	29	0	0	0	106	62	0	0	2346
NEC-22-303	838	43	0	0	0	25	2	0	0	908
NEC-22-304	914	12	0	0	0	19	0	0	0	945
NEC-22-305	531	118	0	0	0	8	0	0	0	657
NEC-22-306	272	9	0	0	0	243	1	0	0	525
NEC-22-312	18	213	0	0	0	2*	0	0	0	233
NEC-22-316	475	40	0	1	0	34	8	0	0	558
NEC-22-323	167	42	0	1	0	35*	0	0	0	245
NEC-22-327	598	140	0	0	0	125*	0	0	0	863
NEC-22-331	1304	44	0	0	0	5	1	0	0	1354
NEC-22-337	1265	112	0	2	0	20	2	0	0	1401
NEC-22-341	31	7	0	0	0	61*	25	0	0	124
NEC-22-343	24	55	0	0	1	80	2	0	0	162
NEC-22-345	574	19	0	0	0	11*	0	2	0	606
NEC-22-347	208	0	0	0	0	3*	5	0	0	216
NEC-22-348	66	577	0	0	13	7*	2	0	0	665

Station	Annelida	Arthropoda	Chordata	Cnidaria	Echinodermata	Mollusca	Nemertea	Platyhel-minthes	Sipuncula	Density (Abundance per 0.04 m^2)
NEC-22-350	431	20	0	0	0	28*	29	6	0	514
NEC-22-352	180	69	0	0	4	7*	3	1	0	264
NEC-22-353	439	122	4	0	2	13*	0	0	0	580
NEC-22-355	77	12	0	0	0	16*	1	0	0	106
NEC-22-357	122	20	0	0	12	2	14	3	0	173
NEC-22-360	40	25	0	0	62	8	1	0	0	136
NEC-22-361	248	15	0	2	1	17*	3	1	0	287
NEC-22-367	16	3	0	0	0	4	0	0	0	23
NEC-22-369	35	687	0	0	7	11*	1	0	0	741
NEC-22-371	65	16	0	0	0	60	0	0	0	141
NEC-22-372	141	42	0	0	25	25*	0	0	1	234
NEC-22-373	41	79	0	0	2	11*	1	0	0	134
NEC-22-375	746	17	0	0	0	35*	17	0	0	815
NEC-22-377	44	9	0	0	0	16*	1	0	0	70
NEC-22-378	14	20	1	0	1	5*	0	0	0	41
NEC-22-380	352	63	0	0	0	5	1	0	0	421
NEC-22-385	119	25	0	0	16	5*	1	0	0	166
NEC-22-387	42	70	0	0	0	1	0	0	0	113

Station	Annelida	Arthropoda	Chordata	Cnidaria	Echinodermata	Mollusca	Nemertea	Platyhel-minthes	Sipuncula	Density (Abundance per 0.04 m^2)
NEC-22-389	252	19	0	0	10	2	2	1	0	286
NEC-22-391	131	8	0	0	6	1*	2	0	0	148
NEC-22-392	34	42	0	0	3	0	0	0	0	79
NEC-22-397	66	1	1	1	0	0	0	0	0	69
NEC-22-398	27	122	0	0	6	9	4	0	0	168
NEC-22-404	80	10	0	0	1	2	2	0	0	95
NEC-22-406	142	4	0	0	0	6	1	0	0	153
NEC-22-408	300	26	0	0	0	6	2	0	0	334
NEC-22-409	301	134	0	1	11	10*	0	0	0	457
NEC-22-412	58	2	0	0	1	11*	0	0	0	72
NEC-22-414	140	40	0	0	2	11*	0	0	0	193
NEC-22-417	64	24	0	1	3	22*	2	0	0	116
NEC-22-423	457	19	0	0	4	3	0	0	0	483
NEC-22-428	249	59	0	0	7	4	0	0	0	319
NEC-22-435	60	29	0	0	6	0	0	0	0	95
NEC-22-448	78	2	0	0	2	0	0	0	0	82
NEC-22-456	162	15	0	0	6	5	0	0	0	188
NEC-22-461	103	12	0	1	6	5	0	0	0	127

Station	Annelida	Arthropoda	Chordata	Cnidaria	Echinodermata	Mollusca	Nemertea	Platyhel-minthes	Sipuncula	Density (Abundance per 0.04 m^2)
NEC-22-464	98	26	0	0	0	5	0	0	0	129
NEC-22-469	62	18	0	0	1	9*	0	0	0	90
NEC-22-472	86	13	0	0	1	13*	0	0	0	113
NEC-22-569	1033	17	0	0	0	11*	0	0	0	1061
NEC-22-612	19	7	0	0	0	19*	0	0	0	45
NEC-22-703	203	63	0	0	0	17	2	0	0	285
Total	**16791**	**3486**	**6**	**10**	**222**	**1224**	**200**	**14**	**1**	**21954**

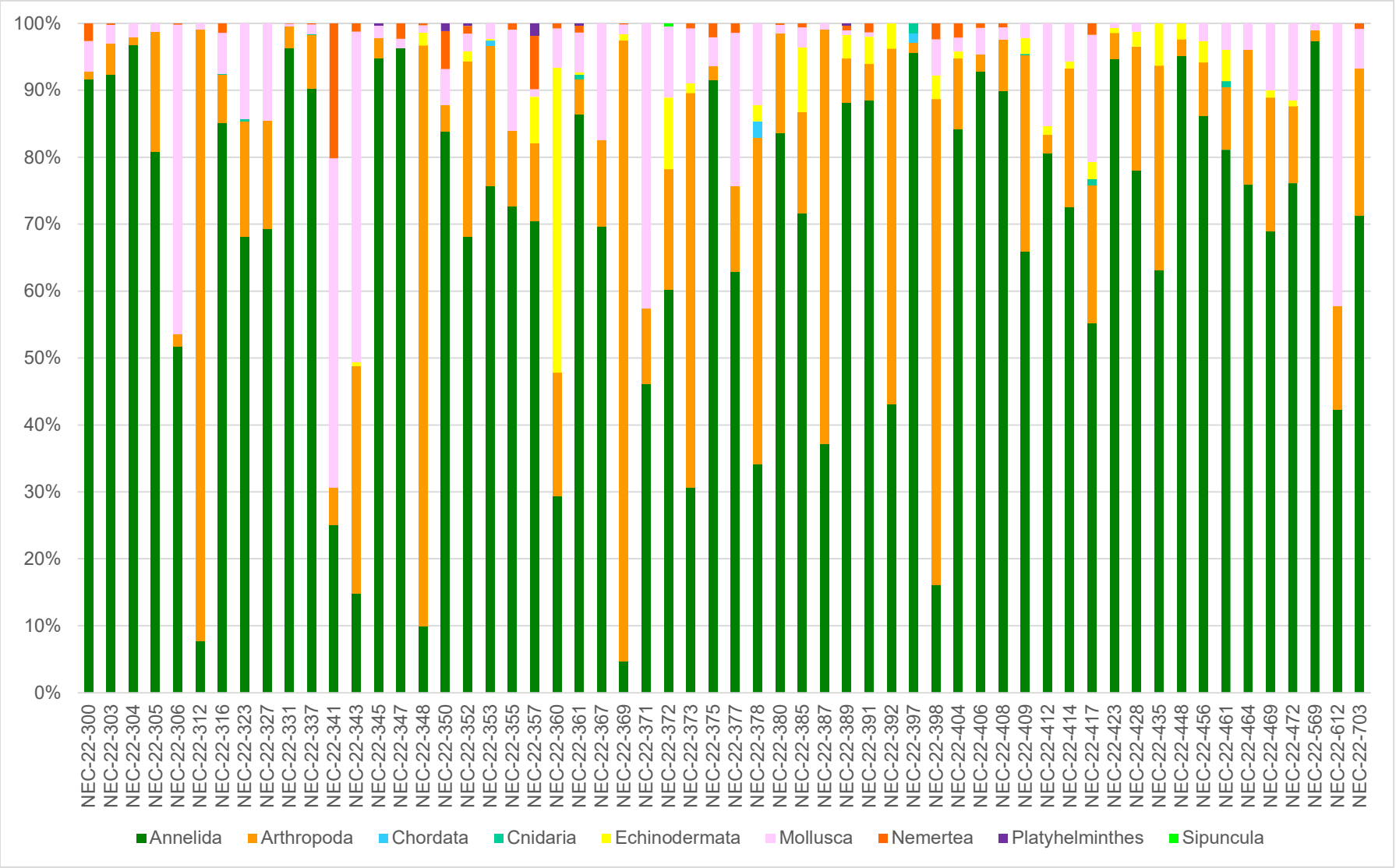


Figure 3-18. Percent composition of organisms in each grab represented phylum for the 58 benthic grab samples in the Northern ECC in 2022.

Table 3-24. Mean density and frequency of occurrence of each phyla and taxa (LPTL) across 58 samples collected in the Northern ECC in 2022.

Phylum	Family or LPTL	Abundance	Mean Abundance per 0.04 m^2	Median Abundance per 0.04 m^2	Frequency of Occurrence
Annelida	Ampharetidae	55	0.9	0	25
	Capitellidae	3458	59.6	0	19
	Chaetopteridae	30	0.5	0	6
	Cirratulidae	421	7.3	3.5	49
	Cossuridae	108	1.9	0	3
	Dorvilleidae	56	1	0	17
	Eunicidae	8	0.1	0	4
	Flabelligeridae	1	0	0	1
	Glyceridae	142	2.4	1	33
	Goniadidae	312	5.4	0.5	29
	Hesionidae	29	0.5	0	8
	Lumbrineridae	147	2.5	1	35
	Magelonidae	18	0.3	0	10
	Maldanidae	123	2.1	0	23
	Nephtyidae	175	3	2	42
	Nereididae	71	1.2	0	2
	Oenonidae	1	0	0	1
	Oligochaeta	4014	69.2	20.5	57
	Onuphidae	6	0.1	0	4
	Opheliidae	45	0.8	0	8
	Orbiniidae	23	0.4	0	10
	Paraonidae	467	8.1	3	41
	Phyllodocida	5	0.1	0	4
	Phyllodocidae	88	1.5	0	21
	Polygordiidae	3086	53.2	12	47
	Polynoidae	64	1.1	0	14
	Sabellidae	1	0	0	1
	Scalibregmatidae	2	0	0	2
	Sigalionidae	85	1.5	0	20
	Sphaerodoridae	34	0.6	0	13
	Spionidae	3009	51.9	1.5	35
	Syllidae	288	5	0.5	29
	Terebellidae	419	7.2	0	22
Arthropoda	Ampeliscidae	127	2.2	0	19
	Anthuridae	8	0.1	0	2
	Aoridae	305	5.3	1.5	36
	Argissidae	1	0	0	1
	Bodotriidae	11	0.2	0	7
	Cancridae	1	0	0	1
	Caprellidae	1	0	0	1
	Chaetiliidae	15	0.3	0	8
Arthropoda	Cirolanidae	3	0.1	0	3
	Corophiidae	83	1.4	0	11
	Crangonidae	20	0.3	0	9
	Diastylidae	10	0.2	0	7
	Gammaridae	2	0	0	1
	Haustoriidae	234	4	0	9
	Hyalellidae	1	0	0	1
	Idoteidae	19	0.3	0	8
	Ischyroceridae	46	0.8	0	5
	Isopoda	146	2.5	0	2
	Lysianassidae	12	0.2	0	4
	Majidae	2	0	0	1

Phylum	Family or LPTL	Abundance	Mean Abundance per 0.04 m^2	Median Abundance per 0.04 m^2	Frequency of Occurrence
	Melitidae	16	0.3	0	2
	Mysidae	42	0.7	0	7
	Oedicerotidae	13	0.2	0	9
	Paguridae	17	0.3	0	11
	Panopeidae	4	0.1	0	1
	Pariambidae	3	0.1	0	3
	Phoxocephalidae	161	2.8	0.5	29
	Podoceridae	2	0	0	1
	Pontoporeiidae	7	0.1	0	7
	Sphaeromatidae	1	0	0	1
	Stenothoidae	4	0.1	0	2
	Tanaissuidae	465	8	1	33
	Unciolidae	1704	29.4	1	33
Chordata	Ascidiacea	3	0.1	0	1
	Branchiostomatidae	2	0	0	2
	Molgulidae	1	0	0	1
Cnidaria	Actiniaria	1	0	0	1
	Ceriantharia	1	0	0	1
	Edwardsiidae	7	0.1	0	5
	Hydrozoa	1	0	0	1
Echinodermata	Echinarachniidae	187	3.2	0	21
	Echinoidea	29	0.5	0	14
	Loveniidae	1	0	0	1
	Phyllophoridae	1	0	0	1
	Synaptidae	4	0.1	0	4
Mollusca	Acteonidae	1	0	0	1
	Arcidae	1	0	0	1
	Arcticidae	3	0.1	0	2
	Astartidae	70	1.2	0	17
	Bivalvia	48	0.8	0	17
	Calyptraeidae	87	1.5	0	4
	Cardiidae	3	0.1	0	2
Mollusca	Crassatellidae	1	0	0	1
	Cylichnidae	85	1.5	0	4
	Epitoniidae	2	0	0	2
	Gastropoda	2	0	0	2
	Ischnochitonidae	1	0	0	1
	Lyonsiidae	4	0.1	0	4
	Mactridae	128	2.2	1	30
	Montacutidae	1	0	0	1
	Muricidae	1	0	0	1
	Myidae	1	0	0	1
	Mytilidae	192	3.3	0	12
	Nassariidae	39	0.7	0	26
	Naticidae	6	0.1	0	5
	Nuculidae	260	4.5	0	17
	Pandoridae	19	0.3	0	10
	Periplomatidae	13	0.2	0	3
	Pharidae	28	0.5	0	13
	Pyramidellidae	82	1.4	0	9
	Solenidae	25	0.4	0	8
	Tellinidae	77	1.3	0	24
	Veneridae	18	0.3	0	12
	Yoldiidae	26	0.4	0	5
Nemertea	Carinomidae	4	0.1	0	3
	Emplectonematidae	1	0	0	1

Phylum	Family or LPTL	Abundance	Mean Abundance per 0.04 m^2	Median Abundance per 0.04 m^2	Frequency of Occurrence
	Lineidae	7	0.1	0	6
	Nemertea	88	1.5	0	12
	Tubulanidae	100	1.7	0	14
Platyhelminthes	Plehniidae	1	0	0	1
	Turbellaria	13	0.2	0	6
Sipuncula	Sipuncula	1	0	0	1

Table 3-25. Community composition parameters calculated for 58 grab sample stations in the Northern ECC.

Station	Density (abundance per 0.04 m^2)	Number of LPTLs	Number of Families (or LPTL)	Richness	Diversity	Evenness
NEC-22-300	2346	33	28	3.48	1.57	0.47
NEC-22-303	908	37	30	4.26	1.64	0.48
NEC-22-304	945	25	21	2.92	1.31	0.43
NEC-22-305	657	27	20	2.93	1.98	0.66
NEC-22-306	525	22	20	3.03	1.83	0.61
NEC-22-312	233	20	14	2.38	0.84	0.32
NEC-22-316	558	37	30	4.59	1.78	0.52
NEC-22-323	245	38	31	5.45	2.15	0.63
NEC-22-327	863	52	37	5.33	2.84	0.79
NEC-22-331	1354	30	22	2.91	1.02	0.33
NEC-22-337	1401	27	24	3.17	1	0.31
NEC-22-341	124	12	12	2.28	1.72	0.69
NEC-22-343	162	25	23	4.32	2.27	0.72
NEC-22-345	606	36	28	4.21	1.67	0.5
NEC-22-347	216	23	19	3.35	2.12	0.72
NEC-22-348	665	22	20	2.92	0.73	0.24
NEC-22-350	514	32	30	4.65	2.06	0.61
NEC-22-352	264	30	23	3.95	2.16	0.69
NEC-22-353	580	36	31	4.71	1.65	0.48
NEC-22-355	106	28	25	5.15	2.42	0.75
NEC-22-357	173	29	23	4.27	2.17	0.69
NEC-22-360	136	28	24	4.68	2.18	0.69
NEC-22-361	287	34	29	4.95	2.32	0.69
NEC-22-367	23	12	10	2.87	2.08	0.9
NEC-22-369	741	21	19	2.72	0.57	0.19
NEC-22-371	141	23	21	4.04	2.37	0.78
NEC-22-372	234	29	25	4.4	2.46	0.76

Station	Density (abundance per 0.04 m^2)	Number of LPTLs	Number of Families (or LPTL)	Richness	Diversity	Evenness
NEC-22-373	134	15	15	2.86	2.03	0.75
NEC-22-375	815	39	28	4.03	1.4	0.42
NEC-22-377	70	25	23	5.18	2.62	0.84
NEC-22-378	41	18	17	4.31	2.7	0.95
NEC-22-380	421	23	19	2.98	1.45	0.49
NEC-22-385	166	28	24	4.5	2.51	0.79
NEC-22-387	113	16	16	3.17	1.71	0.62
NEC-22-389	286	23	22	3.71	1.85	0.6
NEC-22-391	148	16	16	3	1.87	0.68
NEC-22-392	79	14	13	2.75	1.84	0.72
NEC-22-397	69	17	14	3.07	2.02	0.76
NEC-22-398	168	23	23	4.29	1.97	0.63
NEC-22-404	95	24	20	4.17	2.52	0.84
NEC-22-406	153	22	18	3.38	2.14	0.74
NEC-22-408	334	26	22	3.61	1.96	0.63
NEC-22-409	457	26	23	3.59	1.84	0.59
NEC-22-412	72	15	13	2.81	2.18	0.85
NEC-22-414	193	36	29	5.32	2.64	0.78
NEC-22-417	116	27	26	5.26	2.49	0.76
NEC-22-423	483	23	19	2.91	0.97	0.33
NEC-22-428	319	25	23	3.82	1.64	0.52
NEC-22-435	95	14	12	2.42	1.7	0.68
NEC-22-448	82	14	13	2.72	1.62	0.63
NEC-22-456	188	24	21	3.82	1.77	0.58
NEC-22-461	127	21	17	3.3	1.86	0.66
NEC-22-464	129	14	13	2.47	1.58	0.62
NEC-22-469	90	20	17	3.56	2.44	0.86
NEC-22-472	113	20	18	3.6	1.92	0.66

Station	Density (abundance per 0.04 m^2)	Number of LPTLs	Number of Families (or LPTL)	Richness	Diversity	Evenness
NEC-22-569	1061	23	22	3.01	1.53	0.5
NEC-22-612	45	17	17	4.2	2.47	0.87
NEC-22-703	285	33	30	5.13	2.64	0.77

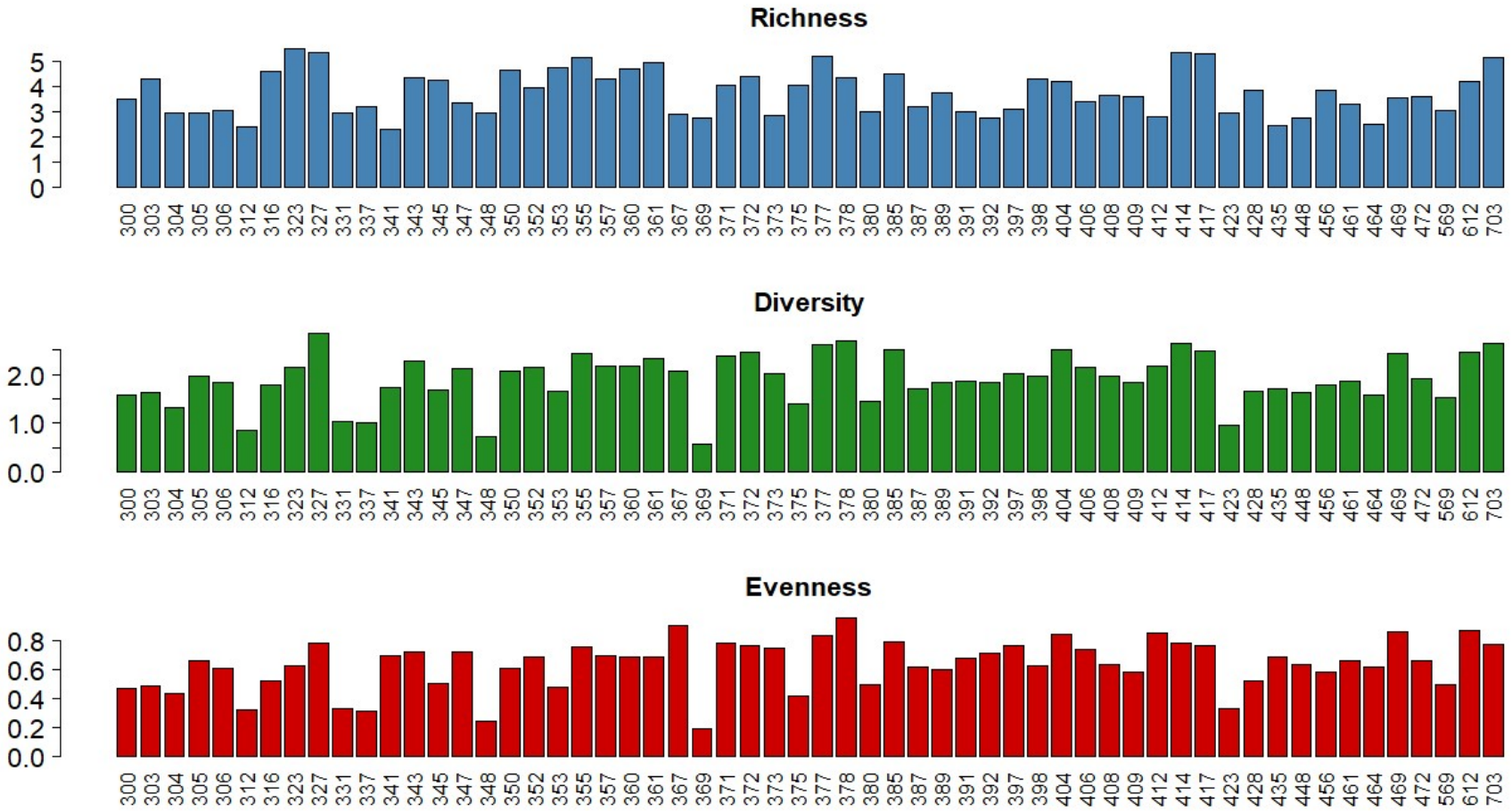


Figure 3-19. Ecological index values calculated for each sample station (x-axis) sampled in the Northern ECC in 2020 and 2022.

3.1.3.3 CMECS Classifications

CMECS classifications for each grab sample are displayed in

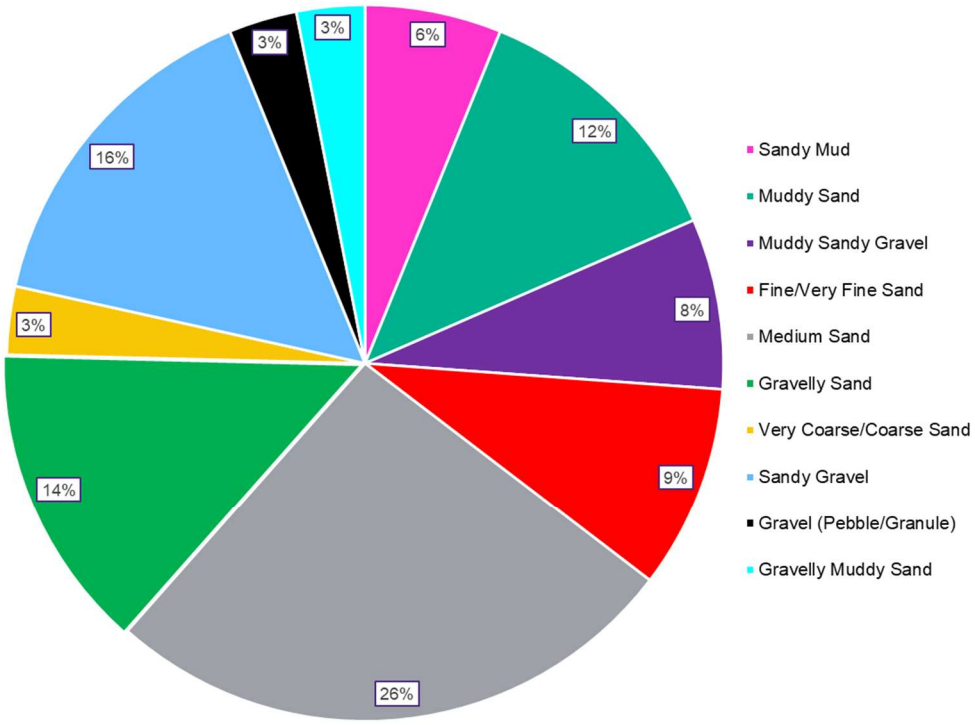


Figure 3-20 for the Northern ECC and mapped in Figure 3-21. Of the 65 grab samples in the Northern ECC from 2022, the majority (37 samples or 57%) were classified as fine unconsolidated substrate (i.e., soft bottom habitat) and the other 28 samples were classified as coarse unconsolidated substrate (i.e., complex habitat). Fifteen of these complex samples were gravel mixes that contained ≥ 30% gravel, while 2 were classified as pebble/granule gravel (≥ 80% gravel). No classifications included cobbles or boulders. The other 11 coarse substrate (≥ 5% gravel) samples were classified to the CMECS categories of gravelly sand and gravelly muddy sand. Of the fine substrate classifications (< 5% gravel), 25 samples were classified as fine, medium or coarse sands, 8 samples were classified as muddy sand (50% to < 90% sand and < 5% gravel), and 4 samples were classified as sandy mud (10% to < 50% sand and < 5% gravel).

Substrate CMECS classification results for the Northern ECC are presented as a hierarchy in Table 3-26. The assigned CMECS classification and complex habitat designations are also included with the representative images of the grab bucket and associated imagery in Appendix A for ease of reference.

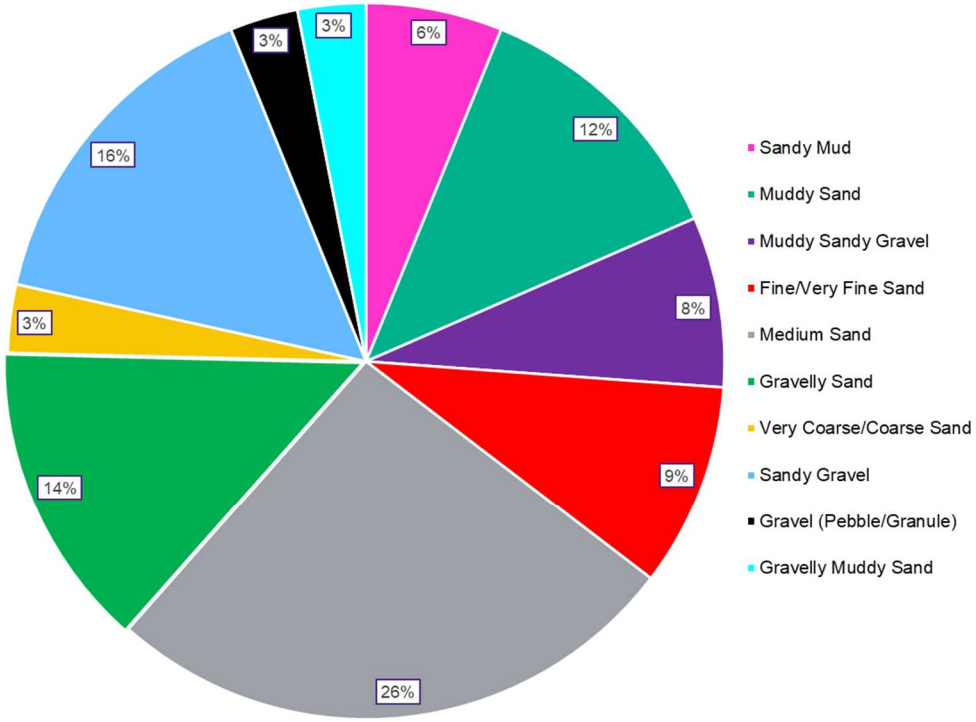


Figure 3-20. Percent of benthic grab samples in the Northern ECC classified into CMECS geologic subgroups based on the laboratory grain size analysis for the 2022 data (n = 65).

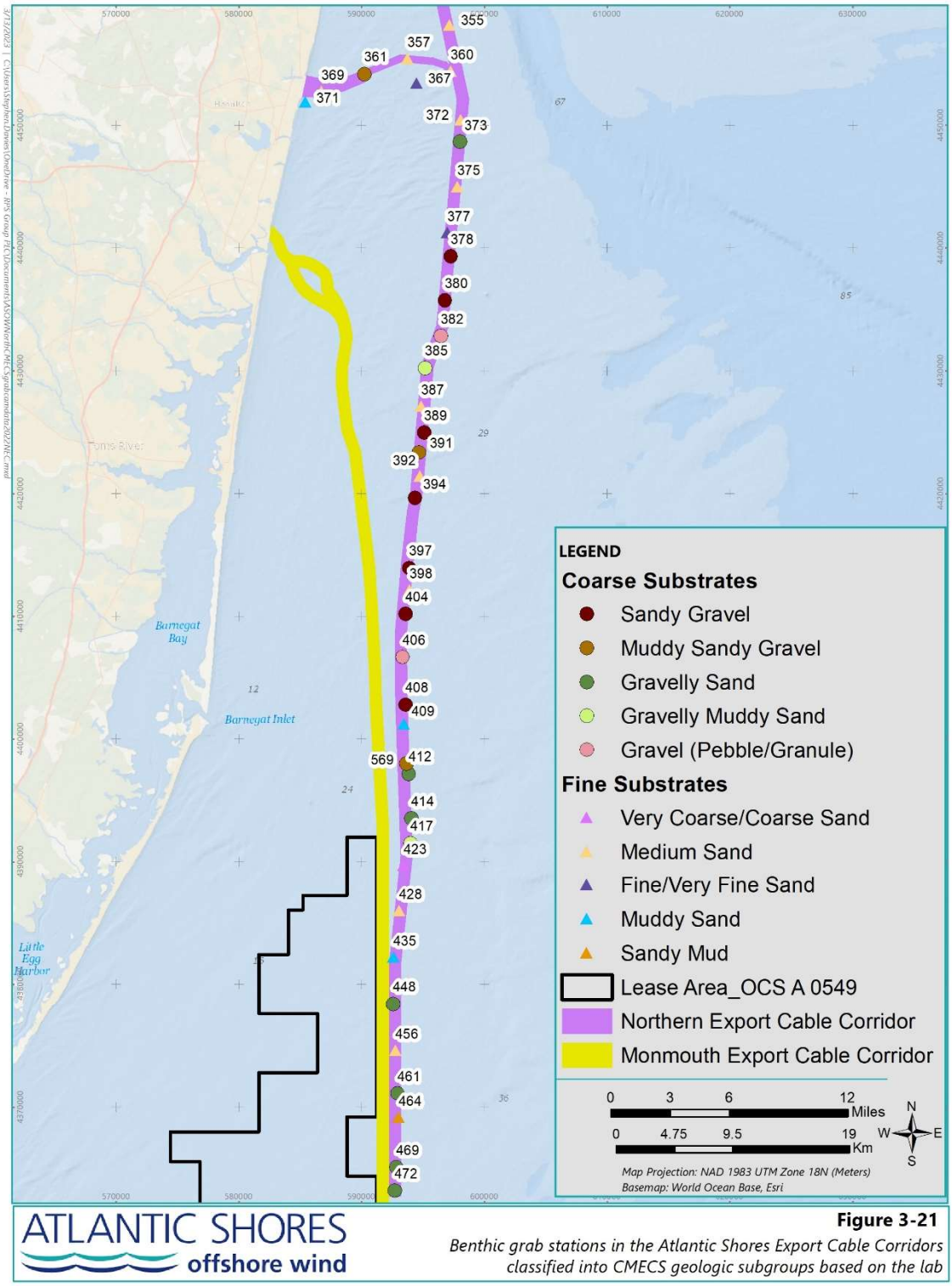
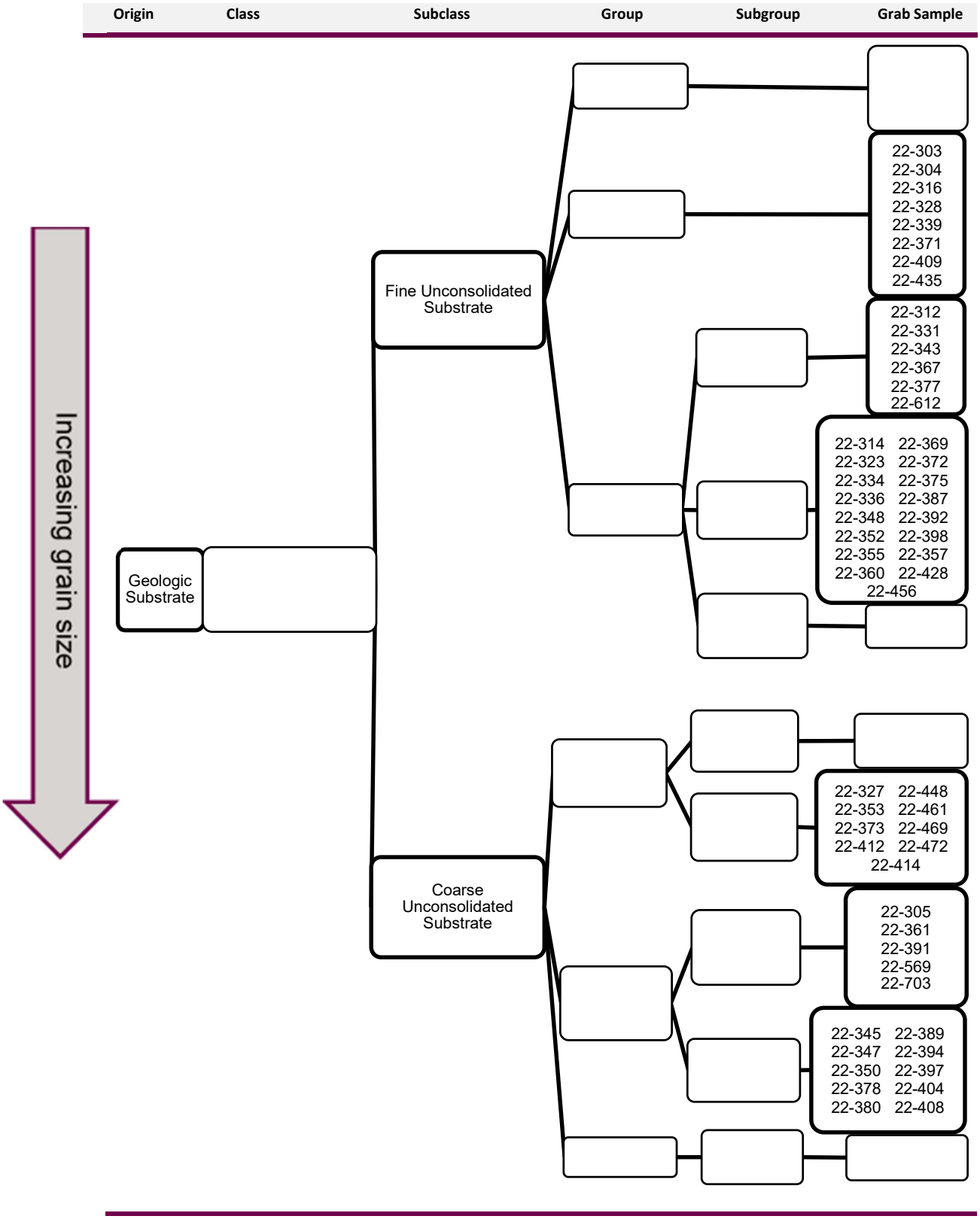


Figure 3-21. Benthic grab stations in the Northern Export Cable Corridor classified into CMECS geologic subgroups based on the laboratory grain size analysis.

Table 3-26. CMECS hierarchical classification of substrates collected at each grab sample within the Northern ECC in 2022.



3.1.4 Grab Associated Imagery

All DDV stills from 2019 were classified according to CMECS (FGDC, 2012). The BOEM Benthic Habitat guidelines (NMFS, 2020) also require that the developer characterize the benthic community composition which includes documentation of abundance, diversity, percent cover, and community structure. Characterization of any submerged aquatic vegetation (seagrass or macroalgae), corals, and boulders was done during video analysis. Of the 7 DDV samples within the Lease Area, no biotic benthic activity, submerged aquatic vegetation, evidence of fishing activity, or anthropogenic debris was observed. Shell aggregate was observed at IA 2 Station 2, and flat sand was observed at IA 2 Station 1 (Appendix B). Gravel with shell debris was observed at SOI 8, which matched its CMECS classification of sandy gravel from the grab sample sediment analysis.

In 2020, imagery was recorded with DDV affixed to the grab sampler operated by Fugro and images of the grab sample contents once on deck. According to Fugro's records, sand dollars were the most common benthic species observed with presence at 67 of the 121 sampling stations. Sea robins were the most commonly observed fish with presence at 32 sampling stations. Other observed species include crabs, hermit crabs, scallops, hakes, shrimp, squid, nudibranchs, anemones, sea stars, elasmobranch egg cases, and squid eggs. Presence of algae or plant-like animals (macroalgae, sea grass, hydrozoans) were recorded at four stations (LAR-20-021, LAR-20-031, LAR-20-037, OCS-20-185, **Error! Reference source not found.**). Presence of sand mounds or ripples were noted at 36 sample stations, with one occurrence (OCS-20-183) identified as possible evidence of fishing activity. No instances of derelict fishing gear, military expended materials, shipwrecks, or other anthropogenic debris were noted.

Overall, the geologic-origin substrate in most of the 2020 images was generally composed of sand that ranged in relief from flat to sand waves or mounds with 16 of the 21 MON ECC stations and 42 of the 44 Lease Area stations noted to contain some degree of shell debris. Shell debris can impact the classification of habitat because sediment grain size analyses will classify any gravel-sized shell debris as "gravel" component, which in the CMECS standards implies geologic origin. RPS reviewed the last 15 seconds of each DDV snippet to discern whether the gravel component of a grab sample may have contained substantial amounts of shell. Only one site in the Lease Area (OCS-20-151) appeared to have a large percent cover of shell debris near the grab sample location, but not large enough to conclude that the sample should have been classified as biogenic origin from shell cover rather than of geological origin. Thus, NMFS (2020) modified CMECS classifications were assigned to each grab sample station based primarily on laboratory analysis of sediment grain size, vs image analysis.

Summary tables of grab sample site locations and observations from imagery review for both 2019 and 2020 surveys are available in Appendix B, while field notes from Fugro's review of GrabCam footage from the 2020 and 2022 surveys are available in Appendix C.

3.1.5 SPI/PV Comparison

NMFS (2020) modified CMECS information was provided from both SPI and PV imagery for triplicate samples at each SPI/PV station (Integral 2020). Grab samples processed for grain size data were co-located with SPI/PV imagery at 22 overlapping stations throughout the Lease Area and the Monmouth ECC, enabling a comparison of CMECS substrate classifications between the sampling methods (see map in **Error! Reference source not found.**, Section 2.1).

When comparing CMECS substrate classifications at the substrate component group level, 6 of the 22 SPI classifications and 7 of the 22 PV classifications had at least one triplicate exactly match the CMECS classification according to the grab sample data. Overall, 18% (12/66) of SPI and 20% (13/66) of PV substrate subgroup classifications exactly matched the grab sample classification. As with the subgroup classifications, the group-level classifications from SPI and PV imagery tended to underestimate the gravel component compared to grab sample lab results. In addition to the complication of shell debris (not identified as such in lab results), this discrepancy may also be due to fine scale variability, as grab stations and SPI/PV stations did not occur in exactly the same location. Sample depth may also play a role in biasing the visual classifications, as grab samples reached penetration depths into the seafloor that certainly exceeded the surface assessment of PV images and likely extended a few centimeters beyond the typical SPI penetration depth. Overall, the SPI/PV CMECS substrate classifications were not very similar to the grab sample grain size classifications, matching only at 20% of sites, with most differences due to discrepancies in the identification of the gravel component.

In 2022, Fugro collected 157 SPI-PV samples within the Northern ECC that could be compared to the 65 benthic grab samples. The dominant CMECS substrate classification was medium sand for both benthic grab samples (26%) and SPI -PV (24%). Of the 157 SPI-PV samples there were 33% that were complex of biogenic substrate or >5% gravel, with 28 gravelly samples (18%), 20 gravel mix samples (13%), two pebble/granule samples (1%), and two biogenic substate samples of shell hash or *Crepidula* reef (1%). The 65 grab samples were of very similar sediment composition with 43% that were classified as complex of biogenic substrate or >5% gravel, with 11 gravelly samples (17%), 15 gravel mix samples (23%), and two pebble/granule samples (3%).

3.2 Towed Video

Video analysis results for the towed video transects are presented separately for each of the three regions surveyed. Specifically, 9 video transects were completed in the Lease Area and 43 transects were completed in the Monmouth ECC in 2021, while 89 transects were completed in the Northern ECC and Raritan Bay in 2022. All video transects were 250 m in length. Tables with full video reviewer notes summarizing each transect is available in Appendix D.

3.2.1 Lease Area Results

The characteristics and locations of the 9 underwater video transects taken within the Lease Area in 2021 are described in Table 3-27 and locations are shown in Figure 3-22. Note that these transects were assigned a station name that starts with WTA. Section 3.2.1.1 below describes presence and abundance of megafauna observed in video transects collected in the Lease Area. Abundance data are displayed in Table 3-28 with additional visualizations in Figure 3-23 through Figure 3-27. Images of representative megafauna are displayed in Figure 3-28 through Figure 3-30. Section 3.2.1.2 summarizes results of the point count analysis to quantify observed substrate along video transects. Area and composition of the substrate and flora and fauna observed for each transect are presented in Table 3-29, Table 3-30, and Figure 3-34. The CMECS classification results are presented in Section 3.2.1.3.

Table 3-27. Underwater video transect locations in the Lease Area from 2021.

Transect	Date (UTC)	Duration (min:sec)	Start Lat. (°N)	Start Long. (°W)	End Lat. (°N)	End Long. (°W)	# Analyzed Stills
WTA-21	6/5/2021	12:01	39°23’20.62289”	74°02’44.05363”	39°23’24.90506”	74°02’34.57361”	25
WTA-24	6/10/2021	15:45	39°24’56.55101”	73°58’40.12096”	39°24’48.12356”	73°58’40.25324”	25
WTA-25	6/5/2021	14:28	39°25’08.20832”	74°03’47.93692”	39°25’13.38409”	74°03’39.04284”	25
WTA-26	6/5/2021	16:04	39°26’34.83384”	74°01’20.54909”	39°26’26.43501”	74°01’20.56742”	25
WTA-28	6/5/2021	17:40	39°30’57.64948”	73°59’31.13325”	39°30’49.10409”	73°59’31.37546”	25
WTA-29	6/5/2021	19:38	39°31’01.94543”	73°58’11.62574”	39°30’53.67698”	73°58’11.69351”	25
WTA-30	6/5/2021	19:37	39°33’44.57739”	73°59’47.74042”	39°33’36.77087”	73°59’51.67952”	25
WTA-31	6/5/2021	18:13	39°35’07.09915”	73°57’34.84344”	39°34’59.39222”	73°57’38.90436”	25
WTA-32	6/6/2021	18:00	39°37’06.65868”	73°57’40.28934”	39°36’58.45024”	73°57’42.57396”	25

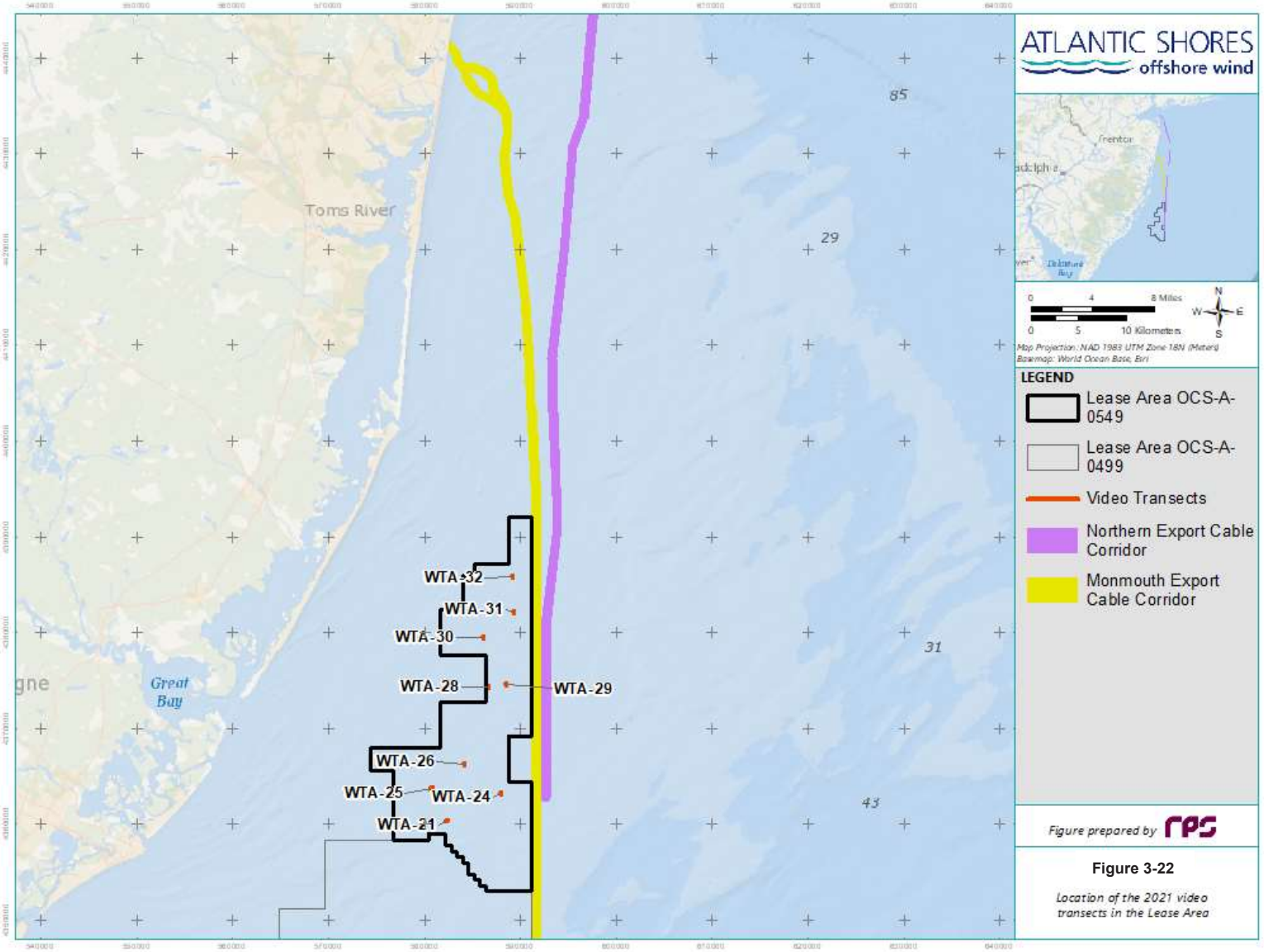


Figure 3-22

Location of the 2021 video transects in the Lease Area

Figure 3-22. Locations of the 2021 video transects in the Lease Area.

3.2.1.1 Organisms and Features

The abundances of enumerable organisms and features greater than 2.5 cm were recorded during the video review process within each of the Lease Area video transects. Organisms were identified in the videos to the LPTL. A total of 1,000 observations were made which included 997 identified organisms, 1 unidentified object, and 1 unidentified organism recorded within the 9 Lease Area video transects (Table 3-28). Organisms that were most numerous throughout the Lease Area included *Astarte* clams, sea robins, and skate egg cases comprising 61%, 18%, and 13% of all organisms, respectively. Of the 605 individual *Astarte* clams observed, 408 observations were made within transect WTA-24 which has the highest single transect abundance of any feature in the Lease Area.

Shannon diversity indices (Table 3-28) of communities of mobile megafauna varies from 0.3 (WTA-24) to 1.7 (WTA-29). The diversity index is affected by both the number of species and evenness and although WTA-24 contained 3 different megafauna, the low diversity index was represented by 408 *Astarte* clams, 25 sea robins, and 6 skate egg cases. The higher diversity index in WTA-29 was represented by the presence of 7 different megafauna and included 16 *Astarte* clams, 13 burrowing anemones, 12 sea robins, 10 moon snails, 10 skate egg cases, 4 moon snail egg cases, and a hermit crab.

Overall, the enumerated organisms in the Lease Area were comprised of five different phyla including Arthropoda, Chordata, Cnidaria, Echinodermata, and Mollusca (Figure 3-23). Eggs of phyla were broken out into corresponding taxonomic groupings. Phylum Mollusca had the highest percent composition of enumerated organisms, at 66.1% (64.1% adults and 2% eggs) and Phylum Echinodermata comprised the lowest percent composition at 0.3% (Figure 3-24). Within Phylum Chordata, three Orders were identified including Gadiformes, Rajiformes, and Scorpaeniformes (Figure 3-25). Order Scorpaeniformes had the highest percent composition of enumerated vertebrates at 57.8% while Order Gadiformes and Rajiformes comprised the lowest percent composition at 0.3%. Within enumerated invertebrates, six Classes were identified including Anthozoa, Asteroidea, Bivalvia, Echinoidea, Gastropoda, and Malacostraca (Figure 3-26). Class Bivalvia had the highest percent composition of enumerated invertebrates at 87.8% while Class Asteroidea comprised the lowest percent composition at 0.1%.

The presence or absence of other qualifying features (i.e., habitat features of note or species that were quantified by their percent cover of the seafloor rather than through enumeration [see Section 2.3.20 for full list] were recorded for the Lease Area video transects (Figure 3-27). Sand dollars, and decorator worms were marked as present within the Lease Area, while algae, bushy plant-like organisms, northern star coral, eelgrass, forage fish, blue mussels, eastern oysters, slipper shells, sponge, sponge/tunicate, and worm tubes were marked absent. Of the nine video transects, sand dollars had the highest transect presence and were observed in seven transects.

Throughout the Lease Area, there was no presence recorded of northern star coral, Atlantic surfclam, or ocean quahog. In Table 3-28, the abundance of anemones and bivalves are enumerated per transect within the Lease Area. Burrowing anemones were present in 3 transects (WTA-29, WTA-31 and WTA-32) and comprised 2% of all organisms observed in the Lease Area. Enumerated bivalves in the Lease Area were comprised of *Astarte* clams and sea scallops and comprised 61% and 0.2%, respectively. *Astarte* clams were present in all nine of the Lease Area transects and sea scallops were present in two transects (WTA-31 and WTA-32). No presence of invasive species was observed.

For representative images of observed species, see Figure 3-28, Figure 3-29, and Figure 3-30. For a complete taxonomy list of species observed, see Appendix E.

Table 3-28. Enumerated megafauna and other features observed during review of the Lease Area video transects.

Common Name	Lowest Taxonomic Level	21	24	25	26	28	29	30	31	32	Total
Vertebrate											
hake, unidentified	Gadidae	1									1
sea robin, northern	Prionotus carolinus	42	25	1	6	19	12	3	6	57	171
sea robin, unidentified	Prionotus					2		3		1	6
Skate	Rajidae									1	1
skate, egg case	Rajidae	2	6	58	13	11	10	23	1	3	127
Invertebrate											
anemone, burrowing	Anthozoa						13		2	2	17
Astarte	Astarte	1	408	41	14	5	16	109	8	3	605
crab, hermit	Pagurus	5		3		2	1			1	12
moon snail	Naticidae	8		4	5		10		5		32
moon snail, egg case	Naticidae	2			2	4	4	5		3	20
scallop, sea	Placopecten magellanicus								1	1	2
sea star, common or forbes	Asterias					1					1
sea urchin	Echinoidea									2	2
Other											
object, unidentified	object, unidentified		1								1
organism, unidentified	organism, unidentified					2					2
Total Organisms		61	439	107	40	44	66	143	23	74	997
Total Observations		61	440	107	40	46	66	143	23	74	1,000
Shannon's Diversity		1.0	0.3	1.0	1.3	1.5	1.7	0.8	1.5	0.9	-

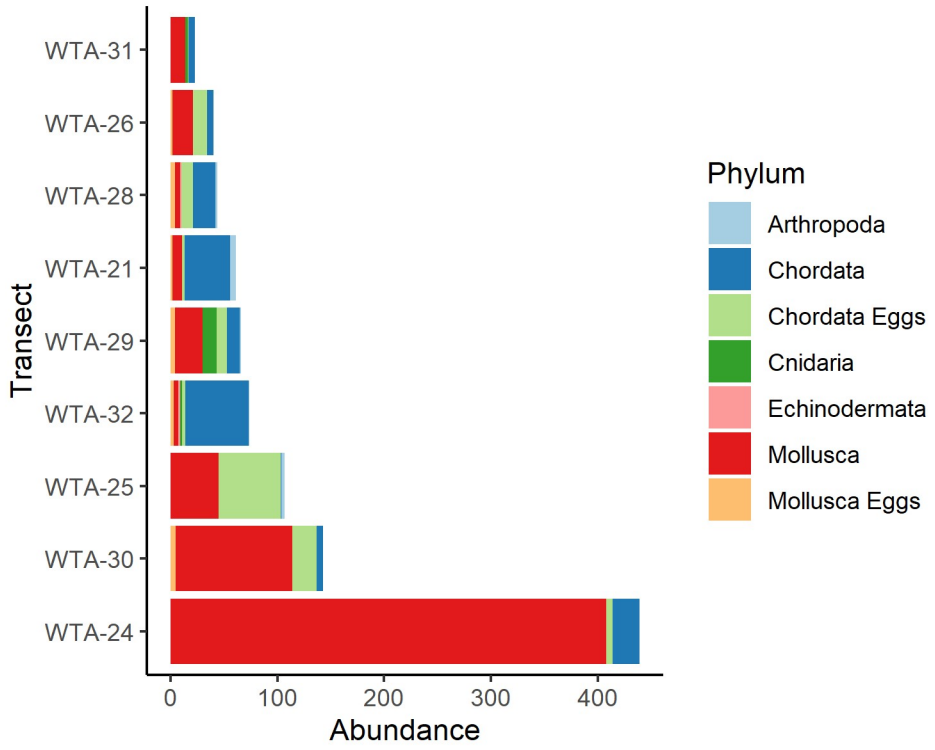


Figure 3-23. Distribution of enumerated organisms larger than 2.5 cm aggregated by phylum in each video transect within the Lease Area.

[1] Organisms not identified to the level of phylum were excluded. Eggs of phyla were broken out into corresponding taxonomic groupings.

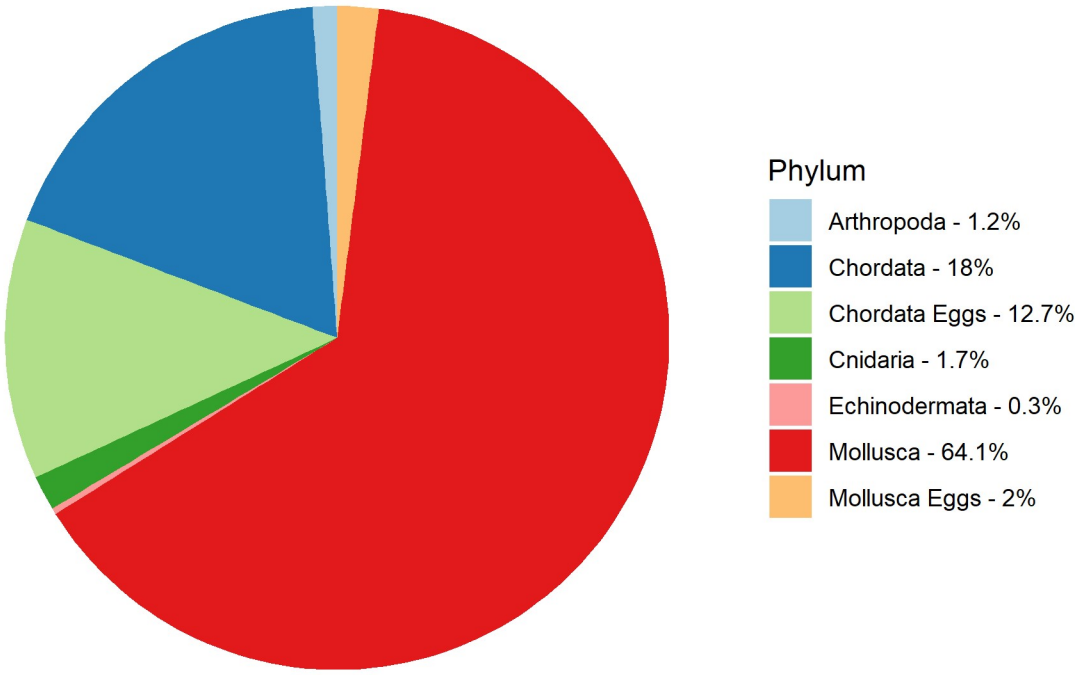


Figure 3-24. Percent composition of enumerated organisms larger than 2.5 cm aggregated by phyla in all video transects within the Lease Area.

[1] Organisms not identified to the level of phylum were excluded. Eggs of phyla were broken out into corresponding taxonomic groupings.

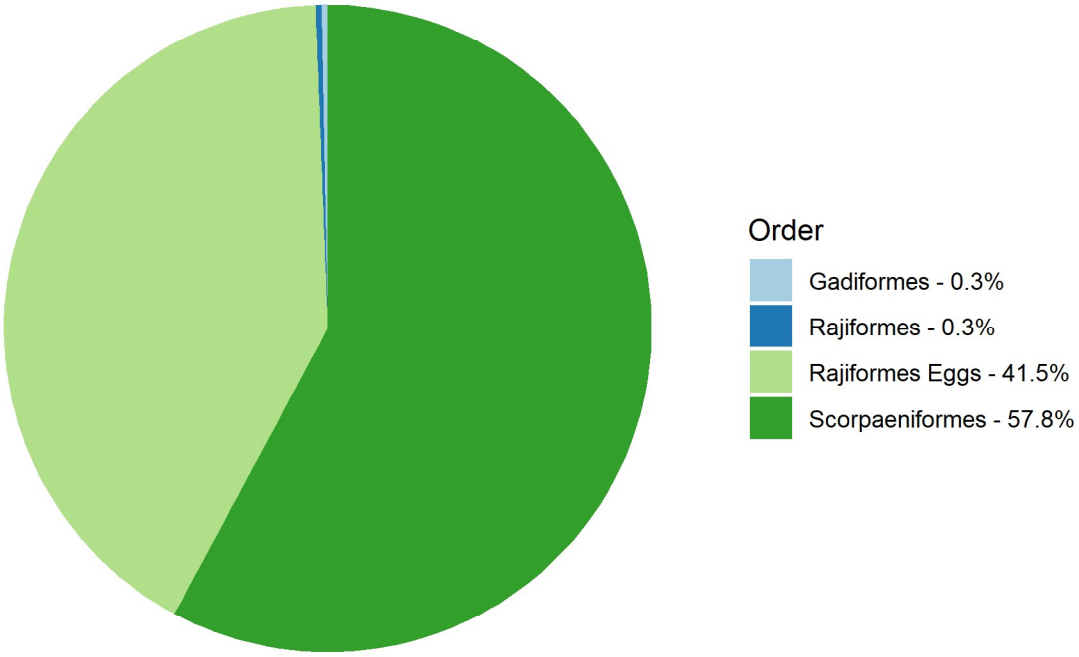


Figure 3-25. Percent composition of enumerated vertebrates (phylum Chordata) larger than 2.5 cm aggregated by taxonomic level “order” in all video transects within the Lease Area.

[1] Organisms not identified to the level of phylum were excluded. Eggs of phyla were broken out into corresponding taxonomic groupings.

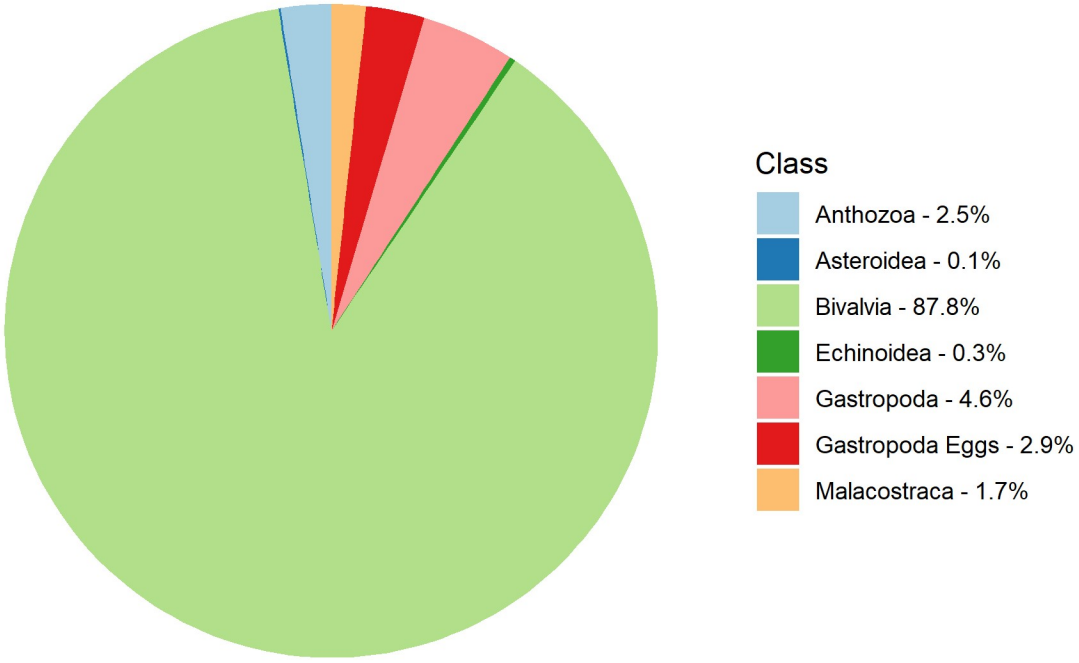


Figure 3-26. Percent composition of enumerated invertebrates larger than 2.5 cm aggregated by taxonomic level "class" in all video transects within the Lease Area.

[1] Organisms not identified to the level of phylum were excluded. Eggs of phyla were broken out into corresponding taxonomic groupings.

Figure 3-27. Presence (colored) or absence (white) of important features in each video transect within the Lease Area. These data only include features that were marked as present or absent during video review and not enumerated.

Figure 3-28. Northern Sea Robin (Pr*ionotus carolinus*) WTA-29.

Figure 3-29. Skate Egg Case (Rajidea).

Figure 3-30. Moon Snail (Naticidea) WTA-29.

3.2.1.2 Percent Cover

The following section summarizes the results of the percent cover analysis of still images collected from a dedicated stills camera at the same time as the underwater towed video collection in the Lease Area. A total of 331 m^2 of seafloor was analyzed via still images within the Lease Area. The geologic substrate group with the highest percent cover across all transects was fine sand/mud, composing 81% (266 m^2) of the surface area analyzed through still images for the transects. Transect WTA-28 and 32 each contained 92% sand/mud covering 41m^2 and 33m^2 with the smallest sand/mud cover occurring at transect WTA-30 (54% or 6 m^2). The transect with the highest area sampled, 67 m^2, was WTA-32 which mostly contained 78% sand/mud, 18% pebble/gravel and 4% biogenic shell substrate (Table 3-29).

No boulder or cobble-sized gravel were found in any of the transects in the Lease Area. Gravel cover (pebble/granule) composed > 5% of the substrate in 3 out of 9 transects. Transect WTA-30 had the highest percent of gravel cover at 27% (11 m^2), WTA-32 had 18% (12 m^2) and WTA-21 had 5.5% (1.6 m^2). Transect WTA-29 had no gravel present. The 5 remaining transects with observed gravel had 1.6% gravel coverage on average.

Biogenic shell cover was the second most abundant substrate type, occurring within all transects and accounting for 10.5% (35 m^2) of the substrate within the Lease Area transects. The highest biogenic shell coverage was found at transect WTA-29, which had 23% (8.7 m^2) coverage. Shell cover in the remaining transects ranged from > 4 - 18% coverage, with an average of 10%. WTA-32 had the lowest percentage of biogenic shell coverage (4%, >2.8 m^2) across all transects in the Lease Area.

No anthropogenic debris was found on the seafloor with the area analyzed in the Lease Area transects.

The total area of biological elements (i.e., presence or evidence of flora or fauna) sampled in the Lease Area only accounts for <1% (2.7 m^2) of the bottom cover (Table 3-30). Worm tube structures were classified as flora/fauna coverage rather than substrate. The most common elements were sand dollars and inferred fauna (tracks and trails and potential burrows), which made up 46% (1.3 m^2) and 38% (1.0 m^2) of the total flora/fauna, respectively. Other elements were infaunal structures (worm tubes) and mobile megafauna (sea robin, cancer/portunid crab).

Both NMFS and BOEM guidelines recommend identifying sessile taxa of both economic and/or ecologic value that are vulnerable to project impacts. Vulnerable taxa from these guidelines are inclusive of sponges, anemones, bryozoans, hydrozoans, corals, tunicates and bivalves. Additionally, the presence of macroalgae, epifauna, and/or infauna/emergent taxa should be noted. Under these guidelines, the percent coverage of different biological elements (i.e., flora/fauna) observed within still images were calculated for each transect. Throughout the Lease Area, there was no percent cover recorded for blue mussels, sea scallops, encrusting organisms (i.e., sponges, corals, or tunicates), or bushy plant-like organisms (Table 3-30). Burrowing anemones were present in WTA-31 and comprised 1% (0.04 m^2) of the total flora/fauna. *Astarte* clams were present in three transects (WTA-21, WTA-24, and WTA-31) and comprised 5% (0.13 m^2) of the total flora/fauna.

Table 3-29. Area and percent coverage of substrate type per total transect area summarized from still images taken from video transects in the Lease Area.

Transect	Total Area Analyzed (m^2)	Boulder (%)	Cobble (%)	Pebble/ Granule (%)	All Gravel Combined (%)	Fine Sand/Mud Substrate (%)	Biogenic Shell Cover (%)[1]	Organic Debris, Wood (%)	Anthro-pogenic Cover (%)[2]	Flora/Fauna Cover (%)[3]
WTA-21	29.33	0	0	5.54	5.54	81.94	12.24	0	0	0.28
WTA-24	27.21	0	0	0.5	0.5	88.83	9.04	0	0	1.63
WTA-25	19.83	0	0	4.63	4.63	84.4	6.24	0	0	4.73
WTA-26	29.77	0	0	2.21	2.21	82.95	14.5	0	0	0.34
WTA-28	44.59	0	0	0.17	0.17	92.51	7.17	0	0	0.14
WTA-29	37.87	0	0	0	0	77	22.75	0	0	0.25
WTA-30	40.35	0	0	27.09	27.09	54.21	18.49	0	0	0.21
WTA-31	35.35	0	0	0.66	0.66	92.92	4.39	0	0	2.03
WTA-32	67.18	0	0	17.97	17.97	77.6	4.16	0	0	0.28
Total Percentage in Lease Area (%)[4]	100	0	0	8.04	8.04	80.52	10.63	0	0	0.82
Total Area in Lease Area (m^2)[5]	331.48	0	0	26.65	26.65	266.9	35.22	0	0	2.71

[1] Biogenic shell cover includes fragments of shell or empty shell of once living organism.
[2] Anthropogenic material includes construction materials, metal, and trash.
[3] Biological elements (i.e., flora/fauna) includes: Astarte, infaunal structures, inferred fauna, mobile megafauna, and sand dollars.
[4] Total Percentage in the Lease Area (%) provides a summary of the total percent cover of each substrate type across all transects.

[5] Total Area in the Lease Area (m^2) provides a summary of the total area of each substrate type across all transects.

Table 3-30. Area and percent coverage of different biological elements (i.e., flora/fauna) observed within still images taken from each of the 9 video transects in the Lease Area.

Transect	Total Area (m^2)	Flora/ Fauna Area (m^2)	*Astarte* (%)	Blue Mussel (%)	Burrowing Anemone (%)	Bushy Plantlike Org (%)	Encrusting Orgs(%)	Hermit Crab (%)	Infaunal Structure (%)	Inferred Fauna (%)	Mobile Megafauna (%)	Sand Dollar (%)	Sea Scallop (%)	Urchin (%)
WTA-21	29.33	0.08	64.80	0	0	0	0	0	0	0	0	35.20	0	0
WTA-24	27.21	0.44	9.37	0	0	0	0	0	0	40.89	4.27	45.47	0	0
WTA-25	19.83	0.94	0	0	0	0	0	0	0	31.55	0	68.45	0	0
WTA-26	29.77	0.10	0	0	0	0	0	0	12.24	46.03	0	41.73	0	0
WTA-28	44.59	0.06	0	0	0	0	0	0	0	39.61	0	60.39	0	0
WTA-29	37.87	0.10	0	0	0	0	0	0	0	76.17	0	23.83	0	0
WTA-30	40.35	0.08	0	0	0	0	0	0	0	50	50	0	0	0
WTA-31	35.35	0.72	4.82	0	5.42	0	0	0	0	50.22	0	39.54	0	0
WTA-32	67.18	0.19	0	0	0	0	0	0	0	0	100	0	0	0
Total Flora/Fauna Percentage in Lease Area (%)[1]	0.82	100	4.79	0	1.43	0	0	0	0.45	37.68	9.12	46.36	0	0
Total Flora/ Fauna Area in Lease Area (m^2)[1]	331.48	2.71	0.13	0	0.04	0	0	0	0.01	1.02	0.25	1.26	0	0

[1] Total Flora/Fauna Percentage in the Lease Area (%) provides a summary of the total percent cover per each biological element type in the Flora/Fauna area.

[2] Total Area Flora/Fauna Area (m^2) provides a summary of the total area per each biological element type in the Flora/Fauna area.

3.2.1.3 CMECS Classifications

Across the nine transects in the Lease Area, 225 still images were assigned a CMECS classification. The number of still images classified as geologic origin, unconsolidated, fine substrate of sand/mud size (n=144) was far greater than any other CMECS group, composing 200 m^2 of the analyzed area (Table 3-31). The sand/mud CMECS group is not considered complex under the NMFS guidelines (NMFS, 2021); thus, 60% of the area analyzed in Lease Area transects was classified as soft bottom habitat (i.e., not complex).

Complex habitats include those with ≥ 5% of gravel-sized particles, those dominated by biogenic origin substrates, or those with a substantial amount of biological activity or presence. Habitats classified as gravel had ≥ 80% sediment particles of pebble/granule size and composed 0.3 m^2 of the Lease Area in one image within transect WTA-30 (Table 3-32, Figure 3-31). Gravel mixes of pebble/granule with sand/mud (< 80% and ≥ 30% gravel) were classified in 19 still images from two transects, with WTA-30 and WTA-32 containing 22 m^2 and 10 m^2 respectively. Gravelly sand/mud (< 30% and ≥ 5% gravel) was classified in 61 images across six transects, with a dominant gravel type of pebble/granule and no instances of cobble or boulder. Overall, only transects WTA-30 and WTA-32 had a majority of still images classified as gravel, gravel mixes, gravelly, or biogenic shell which are considered complex habitat by NMFS. Transect WTA-30 consisted of 21 of 25 passing stills (84%) classified as gravelly or coarser, and WTA-32 consisted of 24 of 25 passing stills (96%) classified as gravelly or coarser.

Biogenic origin substrates present in the Lease Area included shell hash, with pieces of shell between 2 and 64 mm in size, and shell rubble, with pieces or whole shells larger than 64 mm. Shell hash was classified as the main CMECS substrate group in zero images in the Lease Area. Areas where shells dominate the substrate as the main CMECS classification are considered complex habitat. Shells were also frequently co-occurring substrate types, classified as a secondary CMECS group in 217 (96%) of still images at various levels of cover density (Figure 3-32). All worm substrate was classified as biotic component and is represented as a flora/fauna (Table 3-29, Table 3-30), and further used in the CMECS biotic component classifications (Figure 3-34).

The area of the biological elements recorded in the percent cover analysis was summarized to approximate the density of flora/fauna cover for each still image along a transect. Greater densities of flora/fauna suggest presence of potentially more complex habitat due to greater biological activity (e.g., burrows, megafauna) or occurrence of additional structure in the environment (e.g., infaunal structures, encrusting organisms, algae). No images analyzed within the Lease Area contained moderate amounts of flora/fauna coverage (> 30%; Figure 3-33) with most images containing no flora/fauna (70%).

Representative images of CMECS substrate types are found in Figure 3-35 through Figure 3-41.

Table 3-31. The number of stills and the total area (m^2) classified to each combination of main CMECS substrate component and secondary/co-occurring substrate groups for each of the 9 video transects in the Lease Area. Abbreviations are as follows: S/M = Sand/Mud, B = Boulder, C = Cobble, and P/G = Pebble/Granule.

Main and Co-Occurring CMECS Substrate Group Combinations	Number of Stills Classified to Group	Percent of Stills Classified to Group (%)	Area of Stills Classified to Group (m^2)	Percent of Area Classified to Group (%)
Gravel - Pebble/Granule with Sparse Shell Hash	1	0.44	0.32	0.09
Gravel Mixes - Pebble/Granule & S/M with Moderate Shell Hash	1	0.44	2.68	0.81
Gravel Mixes - Pebble/Granule & S/M with Sparse Shell Hash	17	7.56	27.08	8.17
Gravel Mixes - Pebble/Granule & S/M with Sparse Shell Rubble	1	0.44	2.47	0.75
Gravelly Sand/Mud & P/G	4	1.78	8.67	2.62
Gravelly Sand/Mud with P/G with Moderate Shell Hash	1	0.44	1.17	0.35
Gravelly Sand/Mud with P/G with Sparse Shell Hash	48	21.33	66.48	20.06
Gravelly Sand/Mud with P/G with Sparse Shell Rubble	3	1.33	9.96	3.00
Gravelly Sand/Mud with P/G with Trace Shell Hash	5	2.22	12.62	3.81
Sand/Mud	4	1.78	4.67	1.41
Sand/Mud with Moderate Shell Hash	4	1.78	6.96	2.10
Sand/Mud with Sparse Shell Hash	132	58.67	176.46	53.23
Sand/Mud with Sparse Shell Rubble	1	0.44	3.82	1.15
Sand/Mud with Trace Shell Hash	3	1.33	8.13	2.45
Totals	225	100	331.48	100

Table 3-32. Area (m^2) classified to CMECS substrate component groups for each of the 9 video transects in the Lease Area. Abbreviations are as follows: S/M = Sand/Mud, B = Boulder, C = Cobble, and P/G = Pebble/Granule. All substrate groups except sand/mud are considered 'complex' habitat by NMFS (2021).

Transect	Biogenic Shell Rubble	Biogenic Shell Hash	Biotic Component Only	Gravel - Pebble/ Granule	Gravel Mixes – P/G with S/M	Gravelly Sand/Mud (with C, C/P/G, P/G)			Sand/ Mud
WTA-21	0	0	0	0	0	0	0	15.26	14.07
WTA-24	0	0	0	0	0	0	0	0	27.21
WTA-25	0	0	0	0	0	0	0	10.66	9.17
WTA-26	0	0	0	0	0	0	0	5.86	23.91
WTA-28	0	0	0	0	0	0	0	0	44.59
WTA-29	0	0	0	0	0	0	0	0	37.87
WTA-30	0	0	0	0.31	22.31	0	0	10.71	7.03
WTA-31	0	0	0	0	0	0	0	0.99	34.36
WTA-32	0	0	0	0	9.92	0	0	55.42	1.84
Total Area (m^2) per Main CMECS	0	0	0	0.31	32.23	0	0	98.90	200.05

Along with the percent cover analysis, all biological elements within a still were enumerated (as individuals, when applicable) to determine the dominant and co-occurring CMECS biotic component classifications and associated taxa for each still if applicable. Only the dominant biotic component is described in this report.

The total number of stills with each classification per transect is shown in Figure 3-34. Of the 225 still images analyzed from video data surveyed in the Lease Area, 143 still images were classified with a dominant biotic component. The most frequently classified biotic component in still images from the Lease Area transects was sand dollar beds, which was the classification for 86 stills in 7 transects. Sand dollar bed was also the most dominant biotic component in three transects, with all 25 stills in WTA-25 classified as sand dollar bed for the dominant biotic group. Transect WTA-29 was dominated by clam bed as the biotic component in 10 of the 25 stills, and the other five transects were dominated by no biotic component. The subclass of inferred fauna, which in the Lease Area included possibly older, unidentified infaunal structures and egg masses, was dominant in 11 stills across five transects. The burrowing anemones biotic component was not dominant in any stills within the Lease Area, and the *Diopatra* bed (i.e., decorator worm) biotic component was dominant in six stills across three transects. Of the 225 total stills analyzed across the video transects surveyed in the Lease Area, 82 stills had no dominant biological elements present. Sand dollar bed and no biotic component classifications accounted for 75% of all still images within the Lease Area.

The CMECS substrate and biotic component classifications for stills in each transect are mapped over benthic habitat polygons in figures provided in Appendix F and provided in an Excel database in Appendix G.

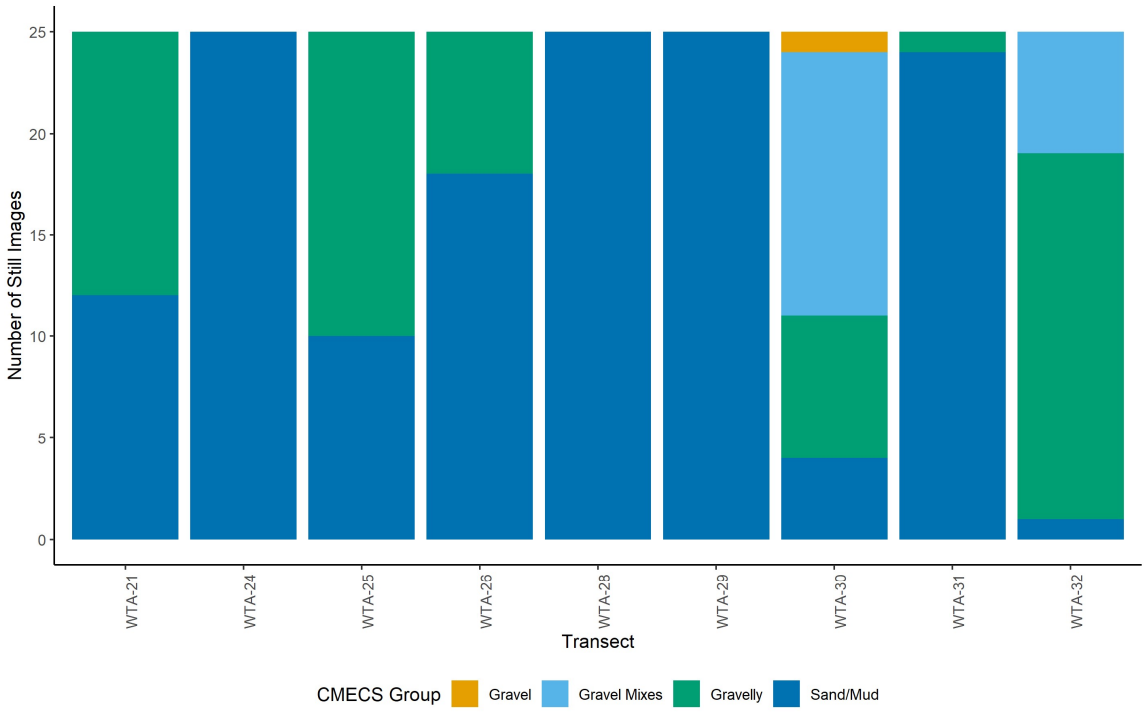


Figure 3-31. The number of still images classified to CMECS substrate component groups within each of Lease Area video transects.

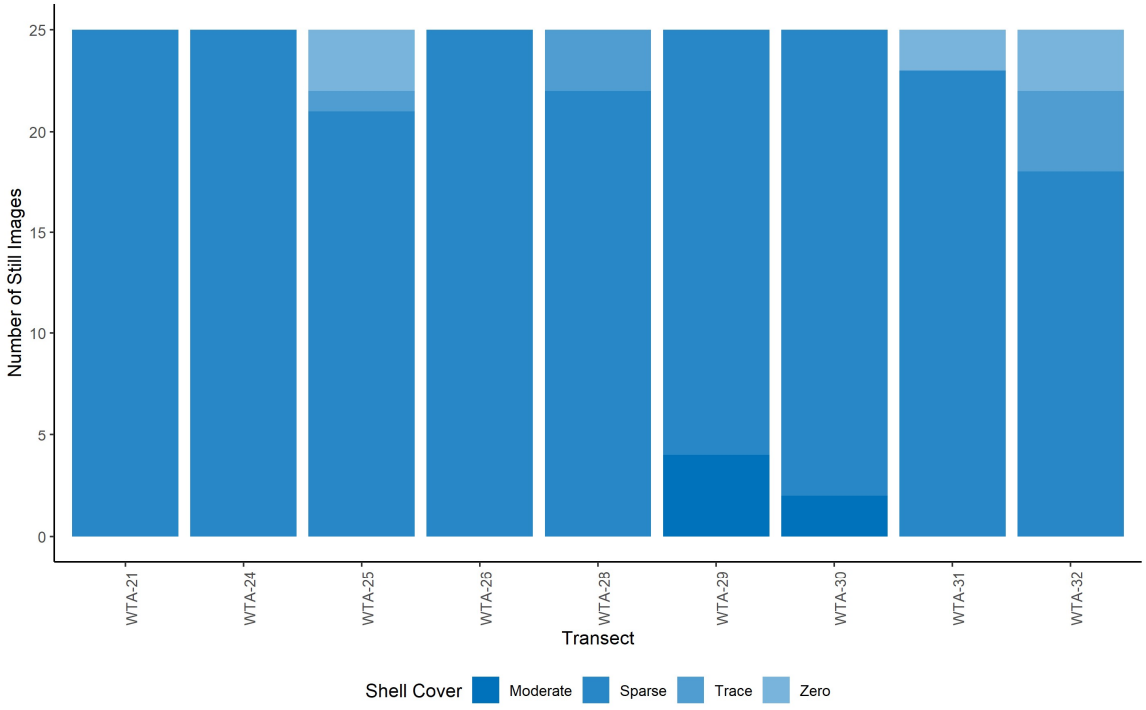


Figure 3-32. The number of still images classified to each shell cover density category within each of the Lease Area video transects. Trace is ≤ 2%, Sparse is > 2 to < 30%, Moderate is 30 to < 70%, Dense is 70 to < 90%, and Complete is 90 to 100% cover.

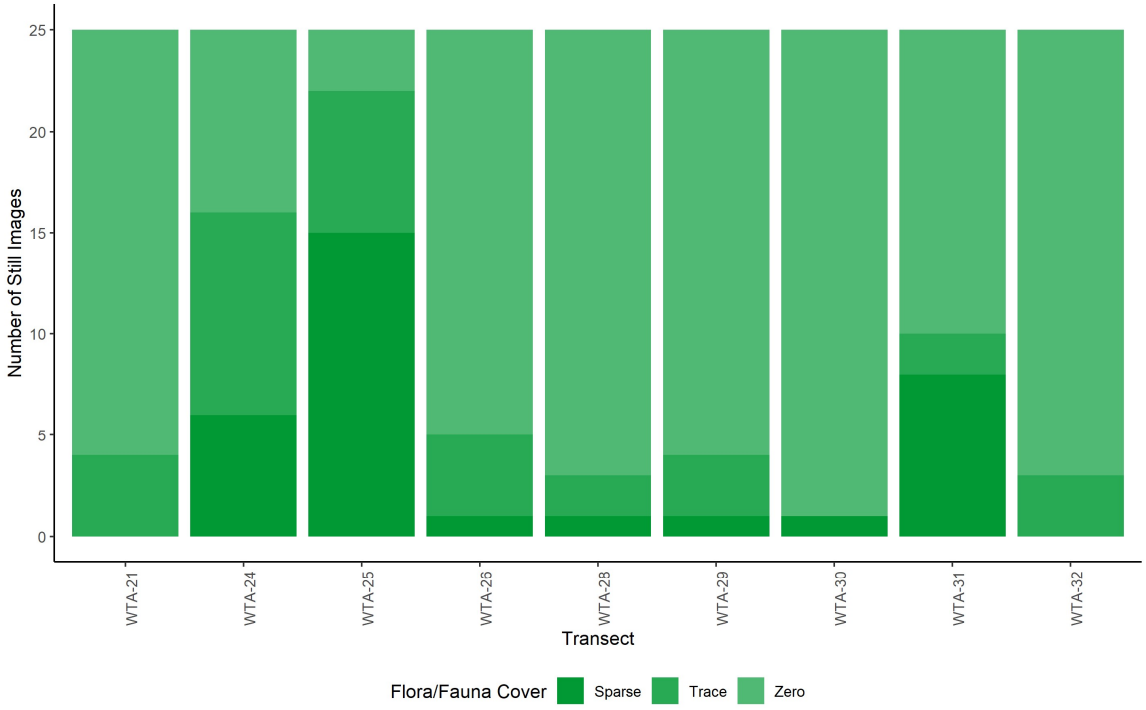


Figure 3-33. The number of still images classified to each flora/fauna density category within each of the Lease Area video transects. Trace is ≤ 2%, Sparse is > 2 to < 30%, Moderate is 30 to < 70%, Dense is 70 to < 90%, and Complete is 90 to 100% cover.

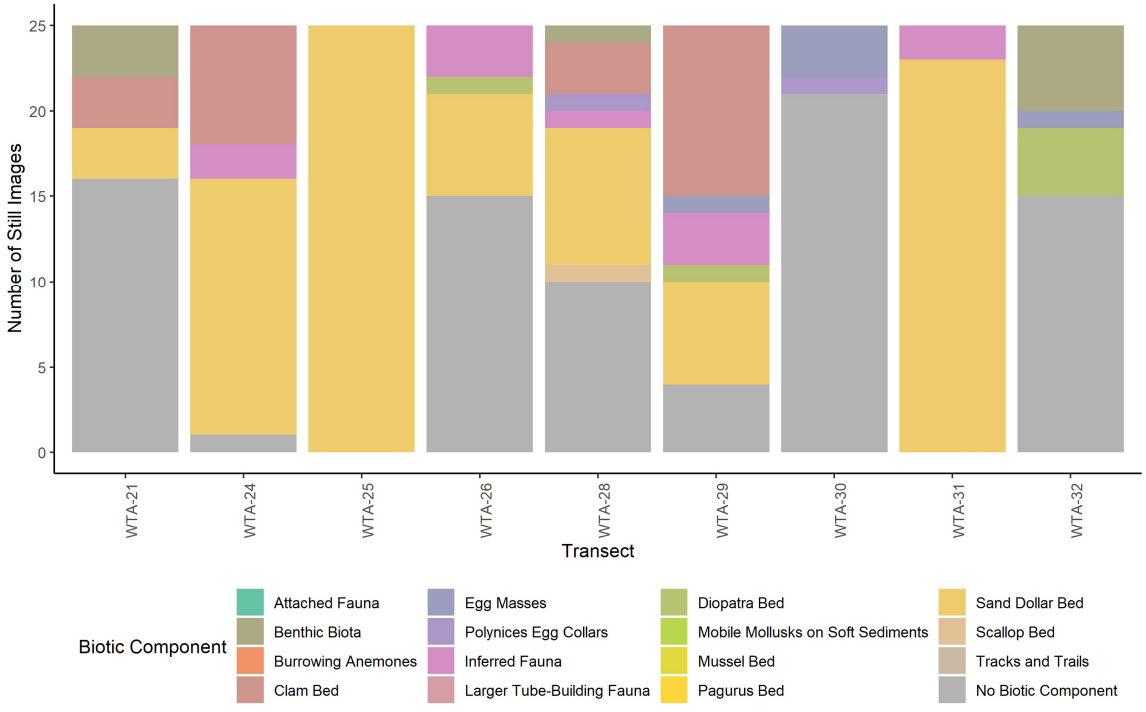


Figure 3-34. The number of still images classified to each CMECS dominant Biotic Component classification within each of the Lease Area video transects.

[1]Still images which were observed to contain no biota were classified as No Biotic Component. Attached Fauna is designated by encrusting organisms, Benthic Biota by associated taxa including fish, crabs and sea stars, Clam bed by *Astarte* clams, Egg masses by skate egg cases, Polynices Egg collars by moon snail egg cases, Inferred Fauna by Structure A, Larger tube-building fauna by Worm tube A, Worm tube C, Mobile mollusks on soft sediment by snails, Pagurus bed by hermit crabs and Tracks and trails by presumed animal tracks and trails.

Figure 3-35. Geologic Unconsolidated Fine Sand/Mud WTA-31_G0013474

Figure 3-36. Geologic Unconsolidated Fine Sand/Mud with Trace Shell Hash WTA-28_G0017967

Figure 3-37. Geologic Unconsolidated Fine Sand/Mud with Sparse Shell Hash WTA-21_G0013713

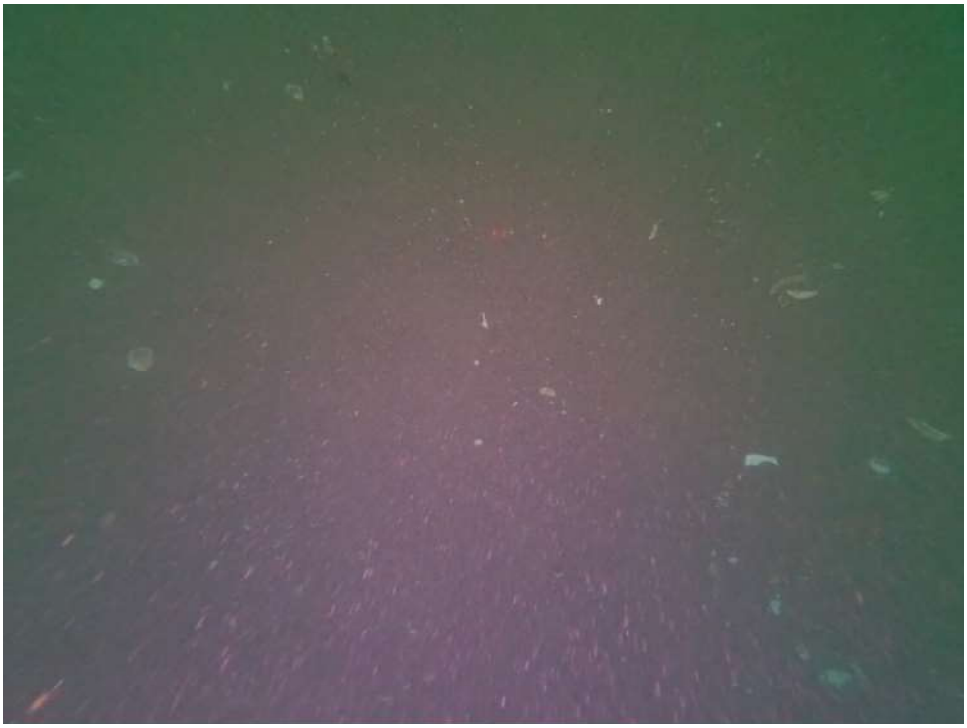


Figure 3-38. Geologic Unconsolidated Fine Sand/Mud with Sparse Shell Rubble WTA-28_G0017887

Figure 3-39. Geologic Unconsolidated Fine Sand/Mud with Moderate Shell Hash WTA-29_G0019980

Figure 3-40. Geologic Unconsolidated Gravel Mixes with Moderate Shell Hash WTA-30_G0011835

Figure 3-41. Geologic Gravelly Sand/Mud with Trace Shell Hash WTA-25_G0015878

3.2.2 Monmouth ECC Results

The characteristics and locations of the 43 underwater video transects taken within the Monmouth ECC in 2021 are described in Table 3-33and locations are shown in Figure 3-42. Note that at the time of the survey design, 6 sites in the more southern portion of the Monmouth ECC were given 'WTA' identifiers due to their locations. Despite the transect names, they are considered part of the Monmouth ECC so their data are presented in this section. Section 3.2.2.1 below describes presence and abundance of megafauna observed in video transects recorded in the Monmouth ECC. Abundance data are displayed in Table 3-34 with additional visualizations are displayed in Figure 3-43 through Figure 3-47. Images of representative megafauna are displayed from Figure 3-48 through Figure 3-62. Section 3.2.2.2 summarizes results of the point count analysis to quantify observed substrate along video transects. Area and composition of the substrate and flora/fauna observed for each transect are presented in Table 3-35, Table 3-36, and Figure 3-66. The CMECS classification results are presented in Section 3.2.2.3.

Table 3-33. Underwater video transect locations in the Monmouth ECC.

Transect	Date (UTC)	Recorded Duration (min:sec)	Start Latitude (°N)	Start Longitude (°W)	End Latitude (°N)	End Longitude (°W)	# Analyzed Stills
MON-35	6/6/2021	15:28	39°40'42.15745"	73°55'58.77932"	39°40'33.95317"	73°55'59.37229"	25
MON-36	6/6/2021	16:10	39°41'21.83890"	73°55'34.29386"	39°41'13.49337"	73°55'34.61612"	25
MON-37	6/6/2021	13:49	39°41'58.23040"	73°55'44.04984"	39°41'49.87148"	73°55'44.21701"	25
MON-38	6/6/2021	20:32	39°42'52.03751"	73°55'58.58576"	39°42'43.68473"	73°55'58.90227"	25
MON-39	6/6/2021	16:29	39°43'24.58015"	73°56'08.59742"	39°43'16.31343"	73°56'08.85346"	25
MON-40	6/6/2021	13:55	39°43'40.65699"	73°55'57.50798"	39°43'32.30436"	73°55'57.93209"	25
MON-41	6/6/2021	17:05	39°44'53.93293"	73°56'13.11361"	39°44'45.56563"	73°56'13.59502"	25
MON-42	6/6/2021	11:56	39°45'58.03802"	73°55'44.88091"	39°45'49.57791"	73°55'44.98857"	25
MON-43	6/6/2021	16:00	39°46'39.22691"	73°55'54.64133"	39°46'31.03735"	73°55'55.22585"	25
MON-44	6/6/2021	12:36	39°48'04.64267"	73°56'17.39378"	39°47'56.22351"	73°56'18.00241"	25
MON-45	6/6/2021	12:20	39°48'42.43323"	73°56'12.73350"	39°48'34.64713"	73°56'16.75933"	25
MON-46	6/6/2021	13:47	39°49'16.81550"	73°55'57.77932"	39°49'08.86295"	73°56'01.27998"	25

Transect	Date (UTC)	Recorded Duration (min:sec)	Start Latitude (°N)	Start Longitude (°W)	End Latitude (°N)	End Longitude (°W)	# Analyzed Stills
MON-47	6/6/2021	12:55	39°49'49.93118"	73°56'15.16922"	39°49'42.08417"	73°56'19.02265"	25
MON-48	6/6/2021	14:51	39°50'51.75630"	73°56'24.50144"	39°50'44.09189"	73°56'28.32921"	25
MON-49	6/6/2021	15:01	39°51'13.59400"	73°55'22.50986"	39°51'05.78901"	73°55'26.42416"	25
MON-50	6/8/2021	14:20	39°52'17.25233"	73°56'18.13260"	39°52'08.88439"	73°56'18.56025"	25
MON-51	6/8/2021	12:50	39°53'07.09165"	73°56'42.57040"	39°53'07.07648"	73°56'53.60299"	25
MON-52	6/7/2021	16:05	39°53'31.20796"	73°56'35.98291"	39°53'23.00093"	73°56'36.50768"	25
MON-53	6/7/2021	13:41	39°54'14.57023"	73°56'52.99194"	39°54'08.40960"	73°56'45.55672"	25
MON-54	6/7/2021	15:54	39°55'05.30041"	73°56'33.88607"	39°54'56.97038"	73°56'34.14100"	25
MON-55	6/7/2021	17:09	39°55'32.98352"	73°57'11.37125"	39°55'24.39386"	73°57'11.48751"	25
MON-56	6/7/2021	11:53	39°55'55.78667"	73°56'59.59259"	39°55'49.40568"	73°56'52.32515"	25
MON-57	6/7/2021	16:49	39°56'44.76944"	73°56'50.94057"	39°56'36.50064"	73°56'51.07015"	25
MON-58	6/7/2021	14:08	39°56'59.02123"	73°57'10.87563"	39°56'52.84060"	73°57'03.43812"	25
MON-59	6/7/2021	17:20	39°58'42.02981"	73°57'17.28649"	39°58'33.69677"	73°57'17.53553"	25
MON-60	6/7/2021	16:12	39°59'35.73706"	73°57'43.75638"	39°59'29.84652"	73°57'51.66040"	25
MON-61	6/7/2021	15:34	40°00'03.43087"	73°57'33.81665"	39°59'55.06847"	73°57'33.97768"	25
MON-62	6/7/2021	18:31	40°00'31.19452"	73°57'51.88254"	40°00'22.75171"	73°57'51.99922"	25
MON-63	6/7/2021	15:25	40°00'34.75651"	73°57'20.30842"	40°00'34.79399"	73°57'31.21507"	25
MON-64	6/7/2021	16:25	40°02'06.69696"	73°57'36.24367"	40°01'58.44484"	73°57'36.65535"	25
MON-65	6/7/2021	15:35	40°02'47.49161"	73°57'23.66007"	40°02'41.40976"	73°57'31.13492"	25
MON-67	6/7/2021	17:34	40°04'01.85891"	73°58'15.63802"	40°03'53.54416"	73°58'15.99114"	25
MON-68	6/7/2021	17:06	40°04'04.20439"	73°58'55.52964"	40°03'55.88576"	73°58'55.80790"	25
MON-69	6/7/2021	15:26	40°04'35.05915"	74°00'09.29830"	40°04'28.97107"	74°00'02.10178"	25
MON-70	6/7/2021	13:56	40°05'12.64220"	73°58'50.59509"	40°05'06.65214"	73°58'43.35655"	25
MON-71	6/7/2021	15:45	40°05'47.30125"	73°59'58.84753"	40°05'41.19593"	73°59'51.71872"	25
MON-72	6/7/2021	14:51	40°06'12.64183"	74°01'00.17367"	40°06'06.50630"	74°00'52.86758"	25
WTA-17	6/10/2021	14:40	39°15'55.82975"	73°56'11.83708"	39°16'04.24404"	73°56'11.71098"	25
WTA-22	6/10/2021	14:20	39°22'05.63761"	73°56'08.87913"	39°21'57.34904"	73°56'09.12162"	25
WTA-23	6/10/2021	14:30	39°22'09.80328"	73°54'56.20355"	39°22'01.43460"	73°54'56.17231"	25
WTA-27	6/10/2021	16:39	39°28'08.05400"	73°56'19.34616"	39°27'59.68453"	73°56'19.54796"	25
WTA-33	6/6/2021	15:50	39°38'24.31022"	73°55'59.20691"	39°38'16.37557"	73°56'02.00532"	25
WTA-34	6/6/2021	17:13	39°40'16.08513"	73°55'31.98454"	39°40'07.91756"	73°55'34.41247"	25

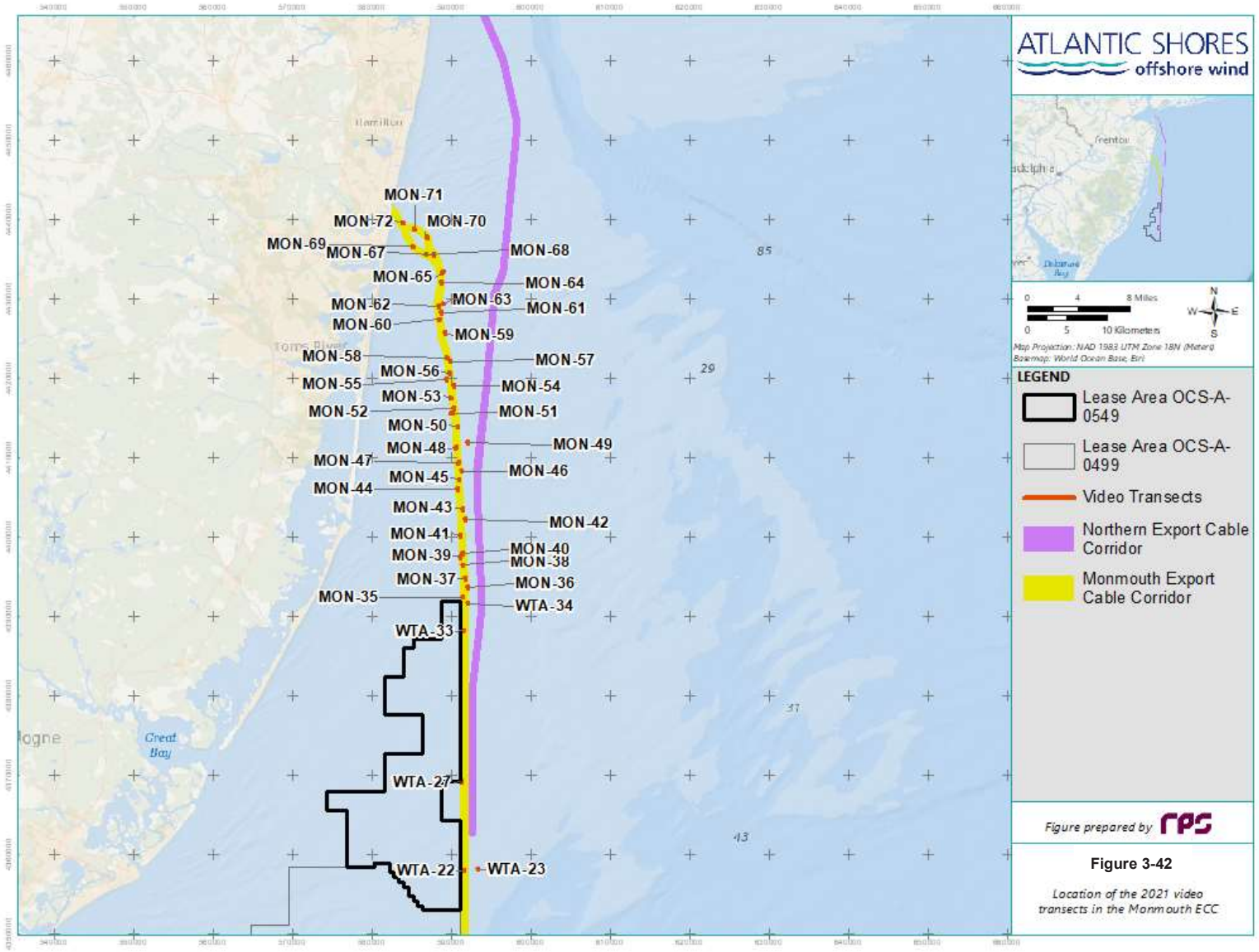


Figure 3-42. Locations of the 2021 video transects in the Monmouth ECC.

3.2.2.1 Organisms and Features

The abundances of enumerable organisms and features greater than 2.5 cm were recorded during the video review process within each of the Monmouth ECC video transects. Organisms were identified in the videos to the LPTL. A total of 6,897 observations were made which included 6,879 identified organisms, 7 unidentified objects, 4 anthropogenic objects, and 7 unidentified organisms recorded within the 43 Monmouth ECC transects (Table 3-34). The most numerous organisms were burrowing anemones, sea robins and sea scallops, composing 57%, 11%, and 9% of all organisms, respectively. Of the 3,907 individual burrowing anemones observed, 1,007 were observed within transect MON-69, which was the highest single transect abundance of any organism. This transect was located at the northernmost part of the Monmouth ECC, in relatively nearshore waters.

Shannon diversity index values of communities of mobile megafauna varied from 0.2 (MON-68 and MON-70) to 1.8 (MON-35, MON-49, MON-54 and MON-61). Although MON-68 contained 6 different megafauna, the index is affected by both the number of species and their evenness led to low diversity. The low diversity index was driven by the presence of 497 burrowing anemones compared to 11 skate egg cases, 9 sea robins, 2 moon snail egg cases, 1 *Cancer* crab, and 1 Portunid crab. Similar to MON-68, MON-70 had a low diversity value and contained 9 different fauna dominated by the presence of 750 burrowing anemones in addition to 11 cancer crabs, 2 moon snail egg cases, 3 sea robins, 5 skate egg cases, 1 American lobster, 1 unidentified crab, and 1 skate. The higher diversity value in MON-61 was the result of by 9 different fauna including 23 sea scallops, 16 skate egg cases, 10 moon snail egg cases, 9 sea robins 6 cancer crabs, 5 burrowing anemones, 2 sea urchins, 1 sea star, and 1 winter flounder. Similarly, MON-54 had a diversity value of 1.8 and comprised 9 different megafauna including 29 skate egg cases, 26 moon snail egg cases, 24 sea robins, 23 burrowing anemones, 15 sea scallops, 6 cancer crabs, 1 sea urchin, 1 skate, and 1 hake. MON-49 also had a diversity value of 1.8 comprising 9 different megafauna including 23 sea scallops, 14 sea robins, 11 skate egg cases, 8 burrowing anemones, 5 moon snail egg cases, 2 sea stars, 2 sea urchins, 1 cancer crab, and 1 hermit crab. Lastly, MON-35 had a diversity value of 1.8 comprising 10 different megafauna including 29 sea robins, 22 burrowing anemones, 12 *Astarte* clams, 6 moon snail egg cases, 4 sea scallops, 2 hermit crabs, 1 cancer crab, and 1 unidentified crab.

Overall, the enumerated organisms in the Monmouth ECC were composed of five different phyla including Arthropoda, Chordata, Cnidaria, Echinodermata, and Mollusca (Figure 3-43). Observed eggs were classified into corresponding taxonomic groupings but specifically noted to be eggs. Phylum Cnidaria had the highest percent composition of enumerated organisms at 57% and phylum Echindodermata composed the lowest percent composition at 1% (Figure 3-43) of all observations. Within phylum Chordata, five taxonomic orders were identified including Gadiformes, Perciformes, Pleuronectiformes, Rajiformes, and Scorpaeniformes (Figure 3-43). Order Scorpaeniformes had the highest percent composition of enumerated vertebrates composing 54% while order Pleuronectiformes composed the lowest percent composition at 0.4%. Enumerated vertebrates not identified to the level of order composed 5% of the total.

Within enumerated invertebrates, seven taxonomic classes were identified including Anthozoa, Asteroidea, Bivalvia, Cephalopoda, Echinoidea, Gastropoda, and Malacostraca (Figure 3-46). Class Anthozoa had the highest percent composition of enumerated invertebrates at 72% while class Cephalopoda composed the lowest percent composition at 0.4% and was represent by a squid egg mop. Enumerated invertebrates not identified to the level of class composed 0.02% of total invertebrates.

The presence or absence of other qualifying features (i.e., habitat features of note or species that were quantified by their percent cover of the seafloor rather than through enumeration [see Section 2.3.2 for full list]) were recorded for the Monmouth ECC video transects (Figure 3-47). Bushy plant-like organisms, blue mussels, sand dollars, slipper shells, sponge, sponge/tunicate, decorator worms, and worm tubes were marked as present within the Monmouth ECC, while algae, northern star coral, eelgrass, forage fish, and eastern oysters were marked absent. Of the 43 video transects in the Monmouth ECC, sand dollars had the highest transect presence and were observed in 33 transects.

Throughout the Monmouth ECC, there was no presence recorded of northern star coral or ocean quahog. Transect MON-67 had one observed and enumerated Atlantic surf clam. In Table 3-36 abundances of the Atlantic sea scallop were enumerated and observed in 29 transects (MON-35 through MON-49, MON-51, MON-53 through MON-62, MON-64, MON-69, and WTA-33) composing 9% of all organisms. Additional bivalves in the Monmouth ECC were *Astarte* clams and blue mussels. *Astarte* clams were enumerated and observed in 19 transects (MON-35 through MON 38, MON-40, MON-42, MON-43, MON-45, MON-47, MON-48, MON-50, MON-51, MON-56, MON-59, MON-63, WTA-22, WTA-23, WTA-27, and WTA-33) composing 3% of all organisms. In Figure 3-47, blue mussels were marked as present in 16 transects (MON-42 through MON-44, MON-48, MON-49, MON-51, MON-54 through MON-62, and MON-64) ranging from dispersed individuals to beds.

The unidentified sponge/tunicate/other feature is defined by the presence of encrusting amorphous organisms. This feature was marked as present in 18 video transects within the Monmouth ECC. In 6 transects (MON-36, MON-44, MON-47, MON-55, MON-62, MON-65) it was noted that there was observed encrusting organisms growing on skate egg cases and in MON-49, MON-50, MON-55, MON-56, MON-57, MON-60, MON-63, MON-69, MON-70 had instances of encrusting organisms on shells and larger substrates. Transect MON-58 had the presence of a red/orange encrusting organism. The bushy plant-like organism category is defined by the presence of algae and plant-like organisms with dendritic growth characteristics. This feature was marked as present in 12 video transects (MON-40, MON-41, MON-49, MON-53, MON-56, MON-57, MON-58, MON-60, MON-61, MON-62, MON-69, MON-71) with notes that there was presence of bryozoans mainly occurring on shell rubble and gravel-sized particles. In Table 3-36, abundances of anemones are enumerated per transect. Burrowing anemones were present in 36 transects and composed nearly 57% of all organisms enumerated in the Monmouth ECC. Burrowing anemones were the most abundant in transects MON-67 through MON-71, ranging from 354-1,007 individuals. No presence of invasive species was observed.

For representative images of observed species and features, see Figure 3-48 through Figure 3-62. For a complete taxonomy list of species observed, see Appendix E.

Table 3-34. Enumerated megafauna and other features observed in the Monmouth ECC video transects.

Common Name	Lowest Taxonomic Level	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Vertebrate																	
fish, unidentified	Chordata				1												
fish, unidentified (bony)	Teleostei																
flatfish, unidentified	Teleostei	1															
flounder, fourspot	*Hippoglossina oblongus*																
flounder, southern	*Paralichthys lethostigma*	1															
flounder, unidentified	Pleuronectiformes																
flounder, winter	*Pseudopleuronectes americanus*																
hake, red, white, or spotted	*Urophycis*																
hake, spotted	*Urophycis regia*																
hake, unidentified	Gadidae																
roundfish, unidentified	Teleostei																
sea bass, black	*Centropristis striata*		1				1								1		
sea robin, northern	*Prionotus carolinus*	29	26	45		30	19	34		11	8	17		3	7	14	12
sea robin, striped	*Prionotus*							1		1							
sea robin, unidentified	*Prionotus*				29		2		7	6			7				1
skate	Rajidae			2		2									1		
skate, clearnose	*Raja eglanteria*																
skate, egg case	Rajidae Eggs	3	9	9		2	2	3	20	9	41		36	7	3	11	
skate, little or winter	*Leucoraja*		1	1				1									
Invertebrate																	
anemone, burrowing	Anthozoa	22	14	21	2	83	75	2	2	3	11	11	21		27	8	24
Astarte	Astarte	12	3	5	2		1		2	1		1		1	2		3
clam, surf	*Spisula solidissima*																
crab, blue	*Callinectes sapidus*																
crab, cancer	Cancer	1						20		215	9				3	1	
crab, hermit	Pagurus	2	2	1			3	1		3			1		1	1	
crab, portunid	Portunidae				1												
crab, spider	*Libnia*												2				
crab, unidentified	Decapoda	1		2						1			1				
lobster, American	*Homarus americanus*																
mollusc, unidentified	Mollusca																
moon snail	Naticidae		1	1													
moon snail, egg case	Naticidae Eggs	6	6	3	4	3	1	2	3	12	4	1	4		3	5	1
scallop, sea	*Placopecten magellanicus*	4	1	89	16	17	98	1	2	1	5	1	1	1	34	23	
sea star, common or forbes	*Asterias*				1					10					1	2	
sea star, unidentified	Asteroidea			1	2	1											
sea urchin	Echinoidea					1		6		23					1	2	
squid, egg mop	Cephalopoda							1									
whelk, unidentified	Melongenidae																
Other																	
object, unidentified	object, unidentified																
organism, unidentified	organism, unidentified		1		1	1					1						
debris, anthropogenic	debris, anthropogenic																
Total Organisms (Confirmed)	**Total Organisms (Confirmed)**	**82**	**64**	**180**	**58**	**139**	**202**	**72**	**36**	**296**	**78**	**31**	**73**	**12**	**84**	**67**	**41**
Total Observations	**Total Observations**	**82**	**65**	**180**	**59**	**140**	**202**	**72**	**36**	**296**	**79**	**31**	**73**	**12**	**84**	**67**	**41**
Shannon's Diversity		**1.8**	**1.8**	**1.5**	**1.5**	**1.2**	**1.1**	**1.5**	**1.3**	**1.1**	**1.5**	**1.0**	**1.4**	**1.1**	**1.7**	**1.8**	**1.0**

Common Name	Lowest Taxonomic Level	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	67
Vertebrate																	
fish, unidentified	Chordata								1								
fish, unidentified (bony)	Teleostei																
flatfish, unidentified	Teleostei																
flounder, fourspot	*Hippoglossina oblongus*																
flounder, southern	*Paralichthys lethostigma*																
flounder, unidentified	*Pleuronectiformes*																
flounder, winter	*Pseudopleuronectes americanus*											1					
hake, red, white, or spotted	*Urophycis*				1												
hake, spotted	*Urophycis regia*																
hake, unidentified	Gadidae																
roundfish, unidentified	Teleostei																
sea bass, black	*Centropristis striata*							2	1					1			
sea robin, northern	*Prionotus carolinus*		7	12	17	20	12	16	9		8	9	27		14	8	
sea robin, striped	*Prionotus*																
sea robin, unidentified	*Prionotus*	16	20		7			1		9	2			17		6	9
skate	Rajidae				1												
skate, clearnose	*Raja eglanteria*	1															
skate, egg case	Rajidae Eggs	8	20	2	29	3	1	4	16	6	7	16	66	20	23	5	21
skate, little or winter	*Leucoraja*																
Invertebrate																	
anemone, burrowing	Anthozoa	13	1	25	23	31	14	252	14	26	21	5			52	47	354
Astarte	Astarte	6					2			1				3			
clam, surf	*Spisula solidissima*																1
crab, blue	*Callinectes sapidus*	1												1			
crab, cancer	*Cancer*		1	1	6	15	3	13	33		3	6		1		1	2
crab, hermit	Pagurus		6			1					1						
crab, portunid	Portunidae																
crab, spider	*Libnia*		1					1					1				
crab, unidentified	Decapoda						1		1						1		
lobster, American	*Homarus americanus*																
mollusc, unidentified	Mollusca																
moon snail	Naticidae												1				
moon snail, egg case	Naticidae Eggs	4	2	1	26	14	6	2	10	4	10	10	6	6	2	1	
scallop, sea	*Placopecten magellanicus*	1		6	15	22	27	48	4	1	30	23	150		1		
sea star, common or forbes	Asterias			1				1				1		1	1		
sea star, unidentified	Asteroidea																
sea urchin	Echinoidea	1			1			2			2	2	1		1		
squid, egg mop	Cephalopoda																1
whelk, unidentified	Melongenidae																
Other																	
object, unidentified	object, unidentified												2				
organism, unidentified	organism, unidentified					1	1										
debris, anthropogenic	debris, anthropogenic															1	2
Total Organisms (Confirmed)	**Total Organisms (Confirmed)**	**51**	**58**	**48**	**126**	**106**	**66**	**342**	**89**	**47**	**84**	**73**	**252**	**50**	**95**	**68**	**388**
Total Observations	**Total Observations**	**51**	**58**	**48**	**126**	**107**	**67**	**342**	**89**	**47**	**84**	**73**	**254**	**50**	**95**	**69**	**390**
Shannon's Diversity		**1.8**	**1.3**	**1.3**	**1.8**	**1.7**	**1.7**	**1.0**	**1.7**	**1.3**	**1.7**	**1.8**	**1.1**	**1.5**	**1.2**	**1.0**	**0.4**

Common Name	Lowest Taxonomic Level	68	69	70	71	72	17[1]	22[1]	23[1]	27[1]	33[1]	34[1]	Total
Vertebrate													
fish, unidentified	Chordata												2
fish, unidentified (bony)	Teleostei								1				1
flatfish, unidentified	Teleostei												1
flounder, fourspot	*Hippoglossina oblongus*								1				1
flounder, southern	*Paralichthys lethostigma*												1
flounder, unidentified	Pleuronectiformes				3								3
flounder, winter	*Pseudopleuronectes americanus*												1
hake, red, white, or spotted	*Urophycis*				44								45
hake, spotted	*Urophycis regia*				6	1							7
hake, unidentified	Gadidae					17							17
roundfish, unidentified	Teleostei		61			1							62
sea bass, black	*Centropristis striata*							1					8
sea robin, northern	*Prionotus carolinus*		1	3	1		13	34	20	64	52		602
sea robin, striped	*Prionotus*												2
sea robin, unidentified	*Prionotus*	9		1			3					21	173
skate	Rajidae			1				1					8
skate, clearnose	*Raja eglanteria*					2							3
skate, egg case	Rajidae Eggs	11	3	5			28	5	24	5	17	12	512
skate, little or winter	*Leucoraja*												3
Invertebrate													
anemone, burrowing	Anthozoa	497	1007	750	426	8				4	11		3907
Astarte	Astarte							8	132	2	1		188
clam, surf	*Spisula solidissima*												1
crab, blue	*Callinectes sapidus*												2
crab, cancer	*Cancer*	1	46	11	1	1							394
crab, hermit	Pagurus				1	2					1		27
crab, portunid	Portunidae	1											2
crab, spider	*Libnia*		1		1								7
crab, unidentified	Decapoda			1		1							10
lobster, American	*Homarus americanus*		1	1									2
mollusc, unidentified	Mollusca						1						1
moon snail	Naticidae					1		1			3		8
moon snail, egg case	Naticidae Eggs	2		2		6		2			4	3	181
scallop, sea	*Placopecten magellanicus*		3								1		626
sea star, common or forbes	*Asterias*												19
sea star, unidentified	Asteroidea											1	5
sea urchin	Echinoidea		1										44
squid, egg mop	Cephalopoda												2
whelk, unidentified	Melongenidae									1			1
Other													
object, unidentified	object, unidentified										1		7
organism, unidentified	organism, unidentified		2						1	2			7
debris, anthropogenic	debris, anthropogenic		1										4
Total Organisms (Confirmed)	**Total Organisms (Confirmed)**	**521**	**1124**	**775**	**483**	**40**	**45**	**52**	**178**	**76**	**90**	**37**	**6879**
Total Observations	**Total Observations**	**521**	**1127**	**775**	**483**	**40**	**45**	**52**	**179**	**78**	**91**	**37**	**6897**
Shannon's Diversity		**0.2**	**0.5**	**0.2**	**0.4**	**1.6**	**0.8**	**1.1**	**0.8**	**0.7**	**1.3**	**1.0**	

[1]Counts per Monmouth Transect (WTA Stations)

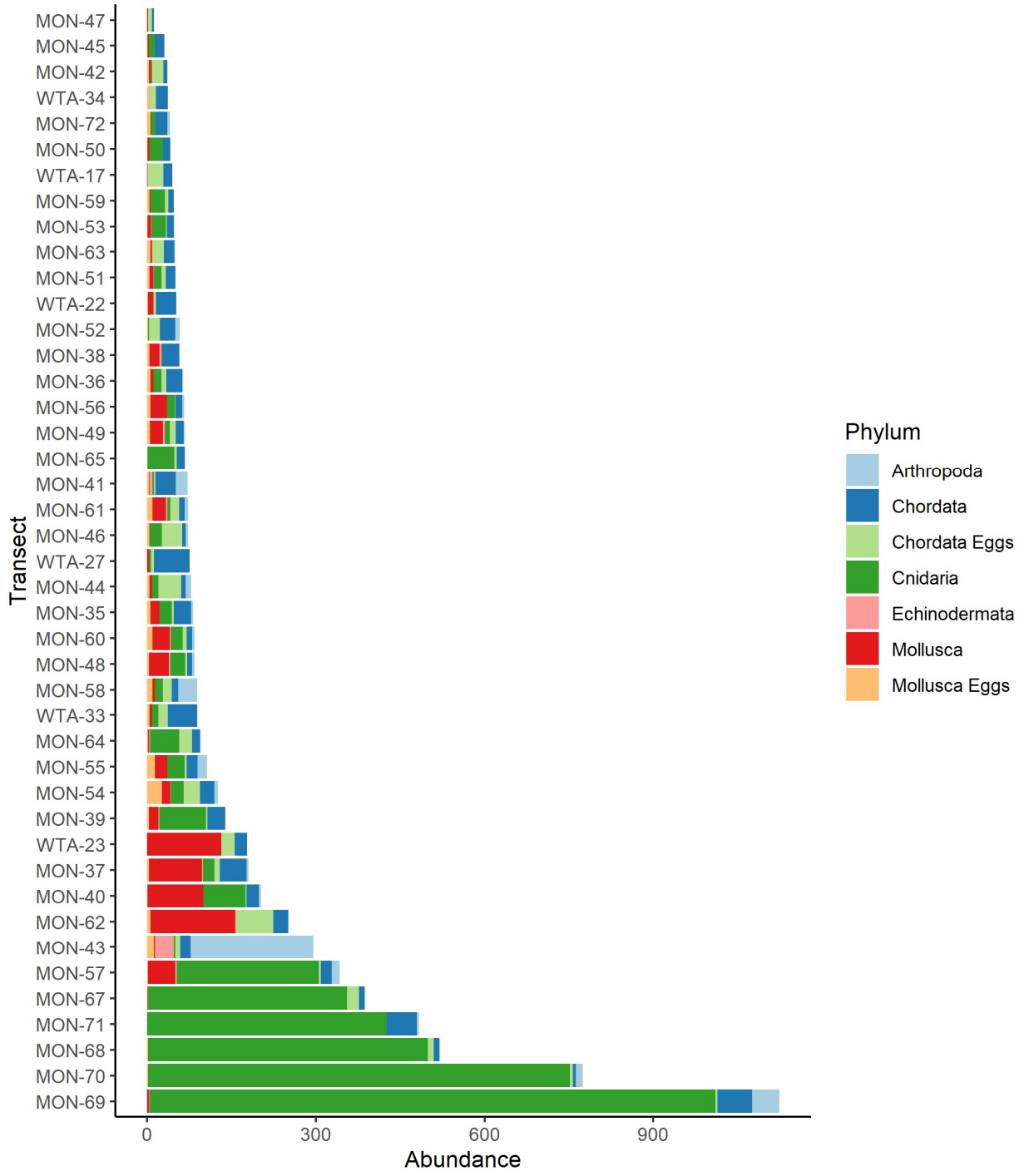


Figure 3-43. Distribution of enumerated organisms larger than 2.5 cm aggregated by phylum within the Monmouth ECC.

[1] Organisms not identified to the level of phylum or smaller than 2.5 cm were excluded. Eggs were broken out into corresponding taxonomic groupings. See text for complete explanation of which species were quantified by enumeration versus by percent of bottom cover.

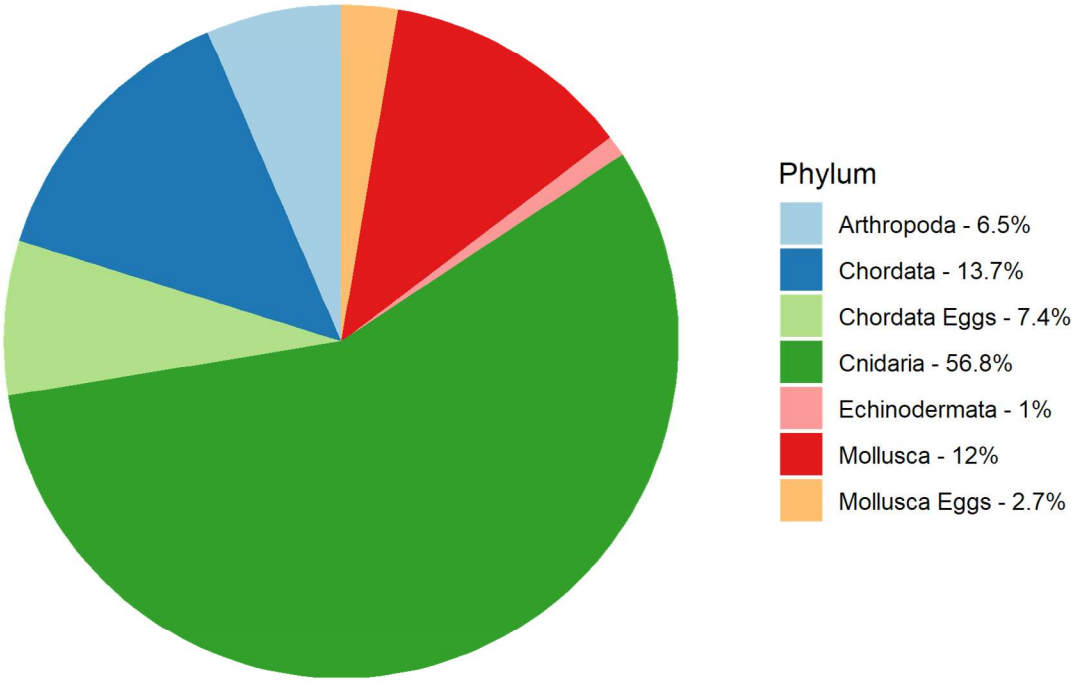


Figure 3-44. Percent composition of enumerated organisms larger than 2.5 cm aggregated by phylum within the Monmouth ECC.

[1] Organisms not identified to the level of phylum or smaller than 2.5 cm were excluded. Eggs were broken out into corresponding taxonomic groupings.

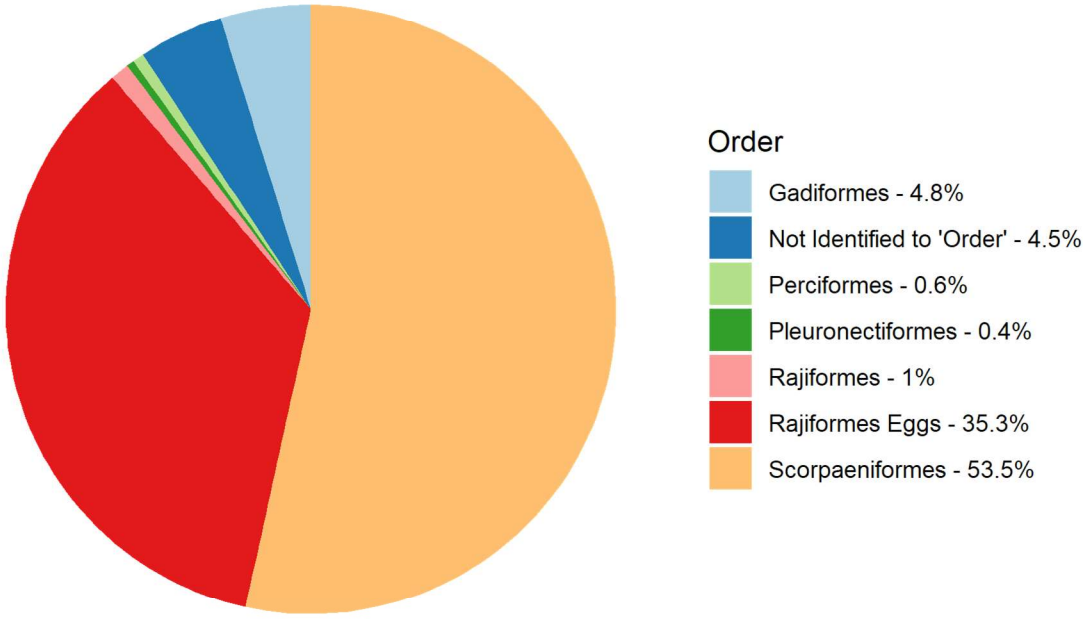


Figure 3-45. Percent composition of enumerated vertebrates (phylum Chordata) larger than 2.5 cm aggregated by taxonomic order within the Monmouth ECC.

1 Organisms not identified as phylum “Chordata” or smaller than 2.5 cm were excluded. Eggs were broken out into corresponding taxonomic groupings.

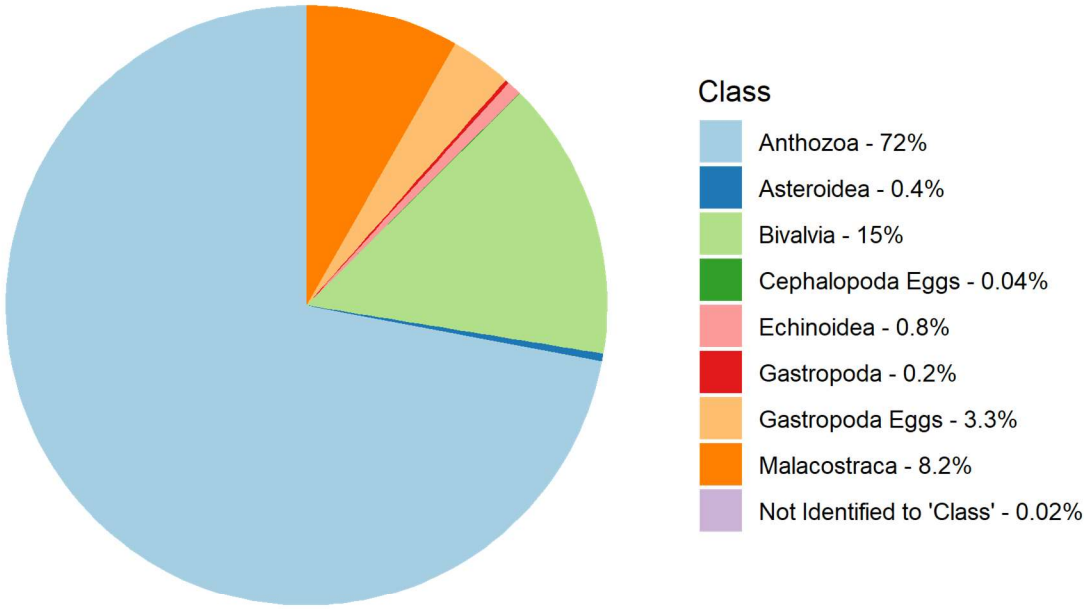


Figure 3-46. Percent composition of enumerated invertebrates larger than 2.5 cm aggregated by taxonomic level "class" in all video transects within the Monmouth ECC.

1 Organisms not identified to the level of phylum or smaller than 2.5 cm were excluded. Eggs were broken out into corresponding taxonomic groupings.

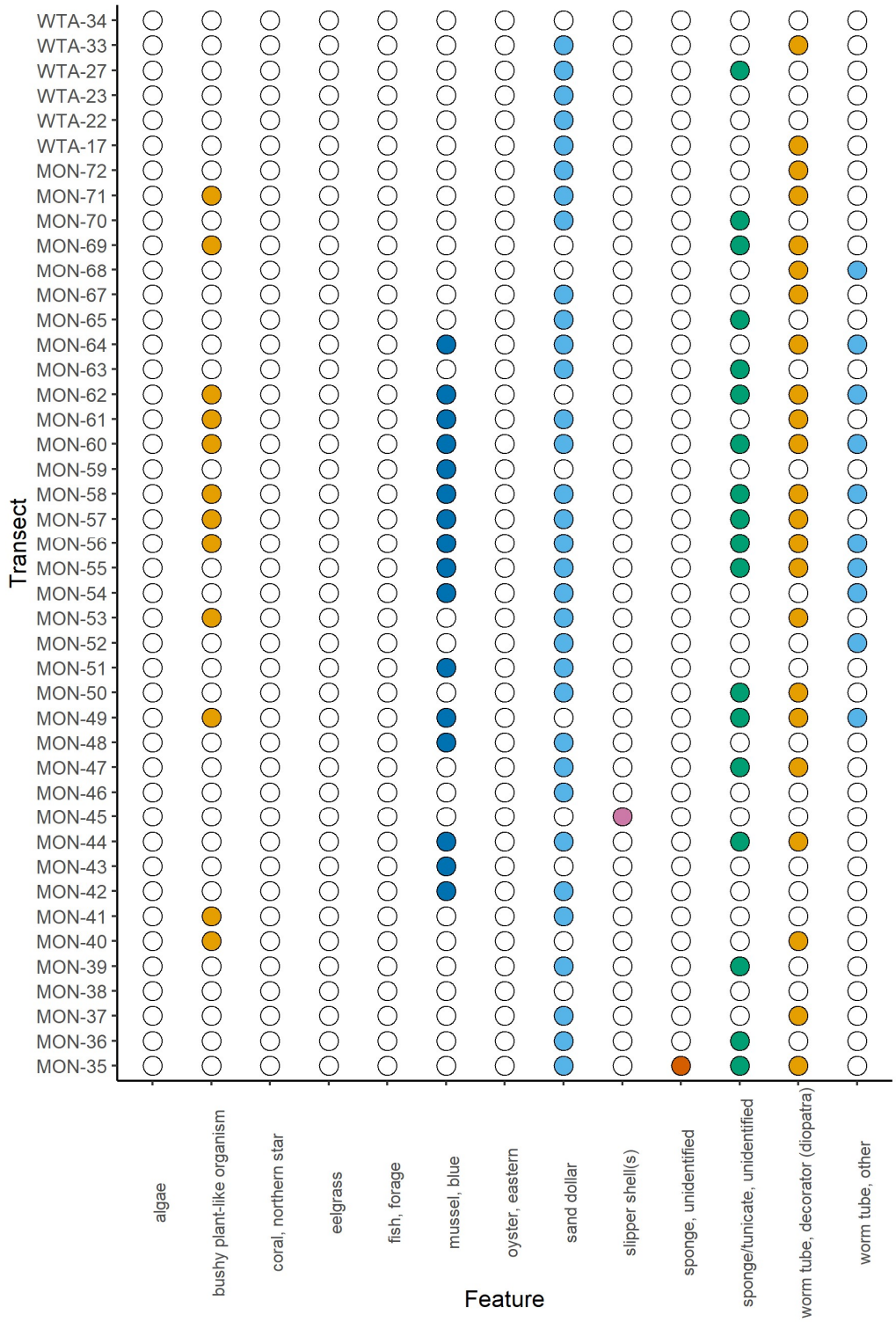


Figure 3-47. Presence (colored) or absence (white) of important features in each video transect within the Monmouth ECC. These data only include features that were marked as present or absent during video review and not enumerated.

Figure 3-48. Sea Scallops (*Placopecten magellanicus*) MON-40

Figure 3-49. Small Snail Cluster

Figure 3-50. Clearnose Skate (*Raja eglanteria*) MON-54

Figure 3-51. Black Sea Bass (*Centropristis striata*) MON-54

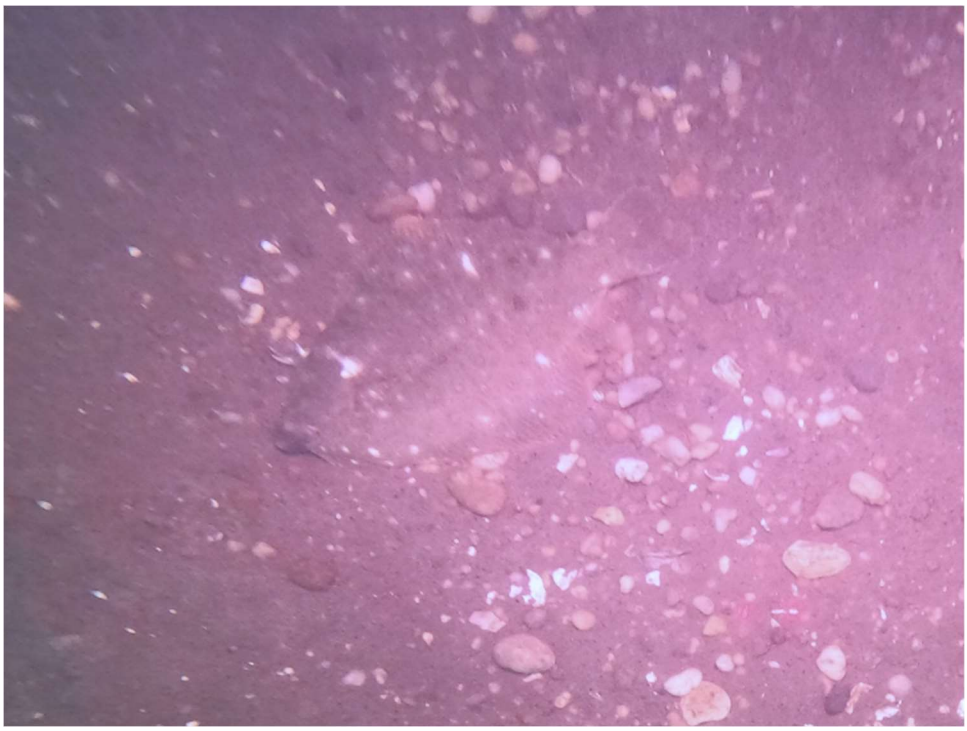


Figure 3-52. Winter Flounder (*Pseudodpleuronectes americanus*) MON-61

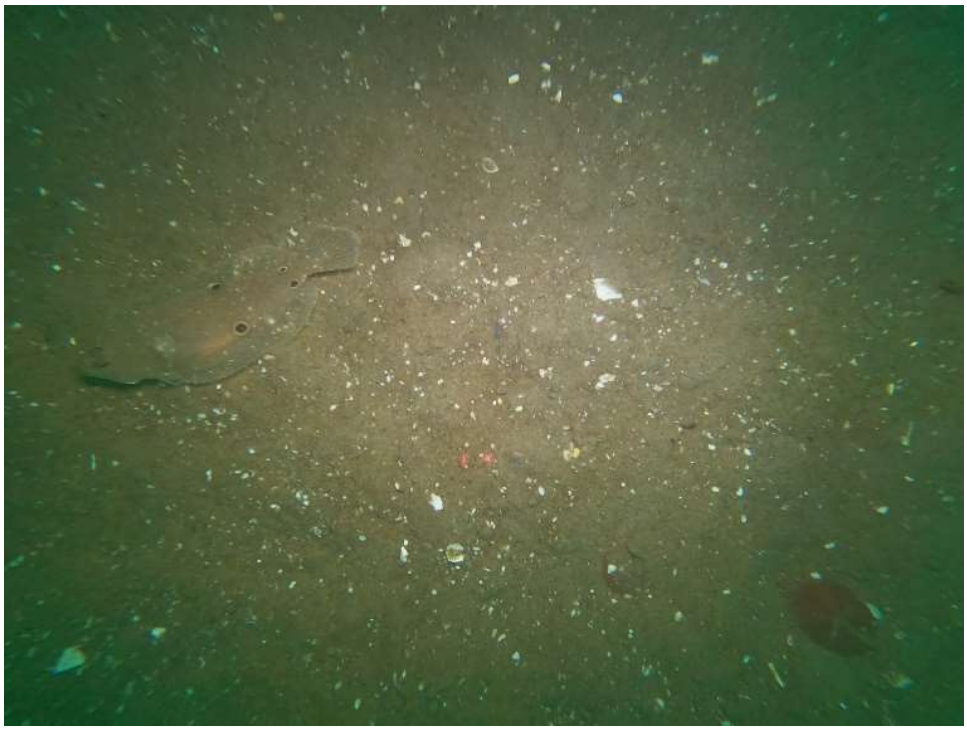


Figure 3-53. Fourspot Flounder (Hippoglossina oblonga) WTA-23_G0016911

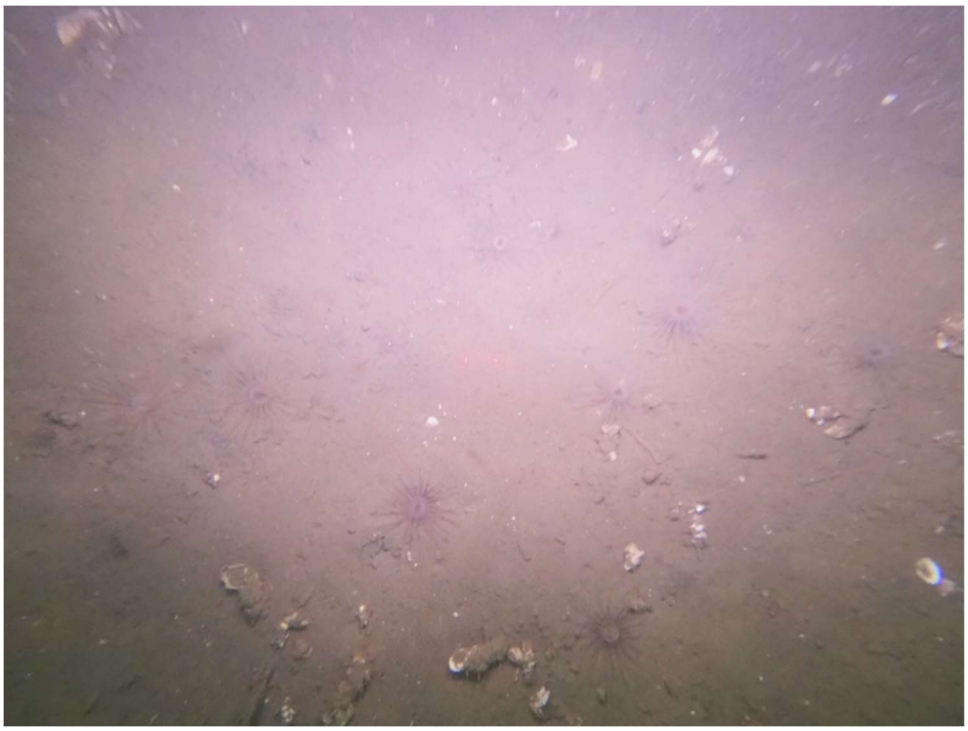


Figure 3-54. Burrowing Anemones (likely Northern cerianthid) with Decorator Worm Tubes (Diopatra) MON-69

Figure 3-55. Spider Crab (*Libinia emarginata*) MON-69

Figure 3-56. American Lobster (Homarus americanus) in burrow MON-69A_G0024082

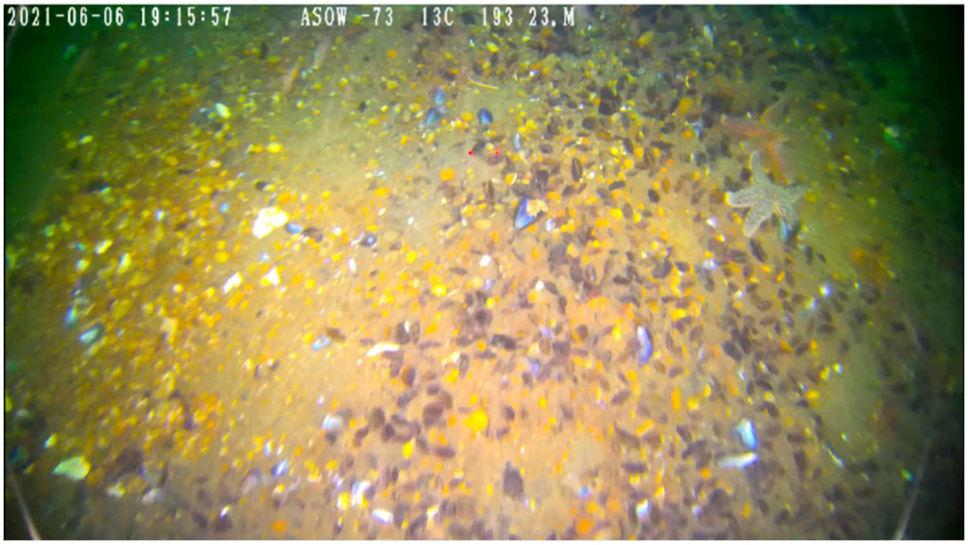


Figure 3-57. Common or Forbes Sea Star and Blue Mussels MON-43

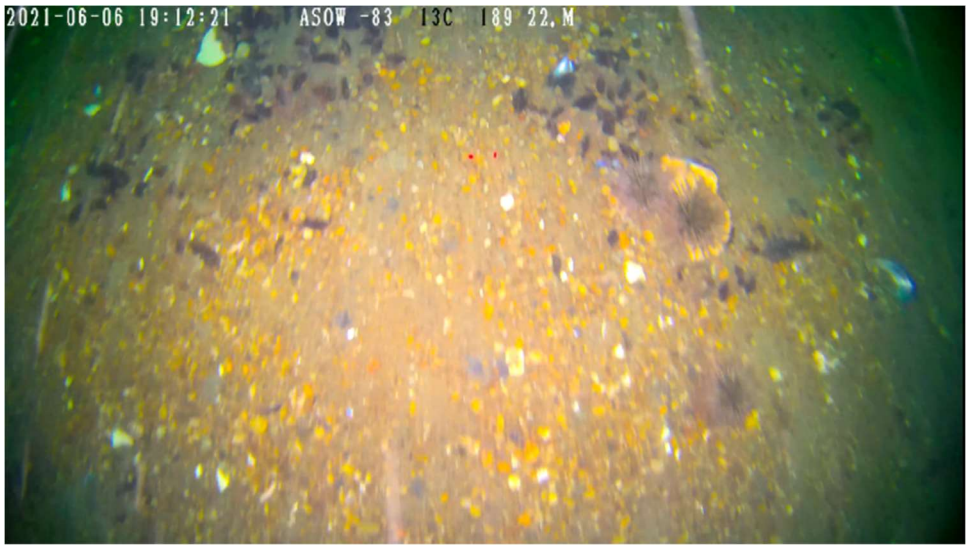


Figure 3-58. Sea Urchins and Blue Mussels MON-43

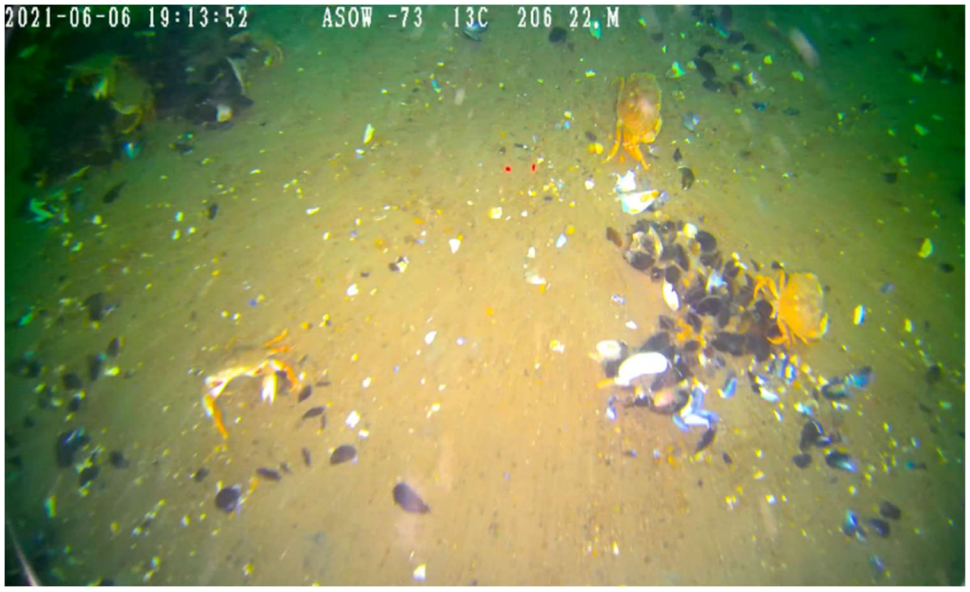


Figure 3-59. Cancer Crabs and Blue Mussesls MON-43

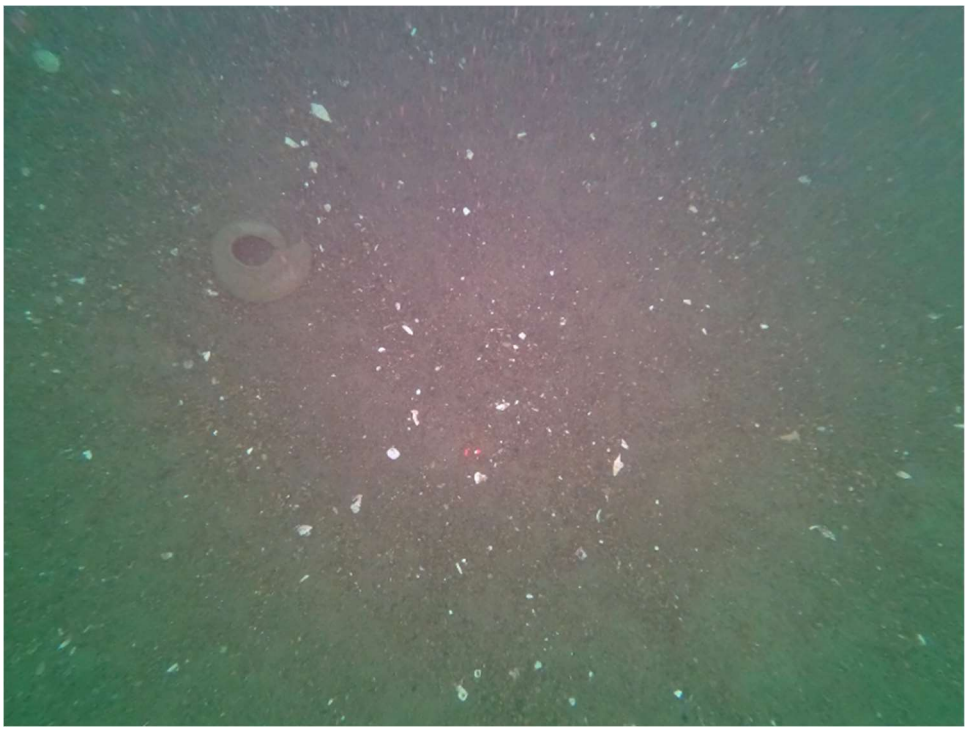


Figure 3-60. Moon Snail Egg Case (Naticidae) MON-38

Figure 3-61. Squid Egg Mop MON-67

Figure 3-62. Anthropogenic debris (possible rope) MON-72

3.2.2.2 Percent Cover

The following section summarizes the results of the percent cover analysis of still images collected from a dedicated stills camera at the same time as the underwater towed video collection in the Monmouth ECC. A total of 1,044 m^2 of seafloor was analyzed by still images in the Monmouth ECC (Table 3-35). The substrate group with the highest percent cover was sand/mud, composing 73% (763 m^2) of the surface area analyzed through still images of the transects. Transect MON-71 had the highest sand/mud coverage at 98% (15 m^2), while MON-43 had the lowest sand/mud cover at 13% (4 m^2). Ten transects had greater than 90% sand/mud coverage, and MON-35, MON-36, MON-46, MON-47, and MON-65 had >15 m^2 of sand/mud classified. Transect MON-43 had the highest area sampled in the region (55 m^2), composed of 70% gravel (pebble/granule), 13% sand/mud, and 4% biogenic shell.

Gravel cover (cobble and pebble/granule sizes) had the second highest percent cover composing 18% (187 m^2) of the surface area analyzed through still images of the transects. Gravel cover composed ≥ 5% of the substrate in 28 out of 43 transects. Three transects had greater than 50% gravel coverage: MON-43 (70%, 23 m^2), MON-62 (58%, 14 m^2), and MON-38 (52%, 18 m^2). Transects MON-71 and MON-68 had no gravel present in the analyzed area. Less than 0.01% of all gravel within the MON transects was cobble sized (> 64 mm to 256 mm) and cobbles were only counted in 6 images across 3 transects: MON-44, MON-55, and MON-9. No boulder-sized substrates were observed.

Biogenic shell cover accounted for 7% (71 m^2) of the total surveyed area and was present in all 43 transects ranging from 21% coverage (6 m^2) in WTA-17 to 0.25% coverage (0.04 m^2) in MON-71. Across all Monmouth ECC transects, the average biogenic shell coverage was 5% (1.2 m^2) per transect. Additionally, substrate was observed from organic woody debris sources in transect MON-54 accounting for 0.09% (0.017 m^2) of the bottom cover and anthropogenic debris appearing to be rope was observed in MON-72 accounting for 1% (< 0.01 m^2) of the area (Figure 3-62).

The total area of biological elements (i.e., presence or evidence of flora or fauna) sampled in the Monmouth ECC was 22 m^2 and accounted for 2% of the bottom cover (Table 3-35). The most common element was inferred fauna, accounting for 29% (7 m^2) of the total flora/fauna observed. Other common biological elements included blue mussels (22% 5m^2), sand dollars (21%, 5 m^2), infaunal structures (15%, 3 m^2), mobile megafauna (6%, 1 m^2), burrowing anemones (4%, 1 m^2), and sea scallops (1%, 0.2 m^2). Mobile megafauna included sea robin, and cancer/portunid crabs. *Astarte*, bushy plantlike organisms, encrusting organisms, hermit crabs, and urchins composed the remainder of the flora/fauna coverage. There were no observations of eelgrass or algae in the Monmouth ECC (Table 3-36).

Both NMFS and BOEM guidelines recommend identifying sessile taxa of both economic and ecologic value that are vulnerable to project impacts. Vulnerable taxa from these guidelines are inclusive of sponges, anemones, bryozoans, hydrozoans, corals, tunicates, and bivalves. Additionally, the presence of macroalgae, epifauna, and/or infauna/emergent taxa should be noted. Under these guidelines, the percent cover of different biological elements (i.e., flora/fauna) observed within still images were calculated for each transect. Throughout the Monmouth ECC, bivalves recorded include *Astarte*, Atlantic sea scallops, and blue mussels which covered 0.1 m^2, 0.2 m^2, and 4.9 m^2 of the surveyed transects, respectively (Table 3-36). Additionally, burrowing anemones, bushy plant-like organisms and encrusting organisms accounted for 0.9 m^2, 0.02 m^2, and 0.09 m^2 of bottom cover in the transects, respectively (Table 3-36). Approximately 2% (22 m^2) of the Monmouth ECC transects contained flora/fauna, and 44% of the flora/fauna cover was identified as infaunal structures (likely polychaete worm tubes, 15%) and inferred fauna (tracks, burrows, or possibly older evidence of infaunal structures, 29%). These categories may be considered emergent taxa or structures that add complexity to the seafloor.

Table 3-35. Area and percent coverage of substrate type per total transect area summarized from still images within the Monmouth ECC.

Transect	Area Analyzed (m^2)	Boulder (%)	Cobble (%)	Pebble/ Granule (%)	All Gravel Combined (%)	Sand/Mud Substrate (%)	Shell Cover (%)[1]	Woody debris (%)	Anthropo-genic (%)[2]	Flora/Fauna Cover (%)[3]
MON-35	36.83	0	0	1.09	1.09	96.23	2.56	0	0	0.12
MON-36	28.33	0	0	2.86	2.86	92.53	4.32	0	0	0.28
MON-37	27.29	0	0	13.41	13.41	73.73	6.54	0	0	6.32
MON-38	35.42	0	0	51.93	51.93	41.6	5.95	0	0	0.52
MON-39	38.34	0	0	12.07	12.07	81.85	5.29	0	0	0.79
MON-40	33.64	0	0	27.78	27.78	68.03	4.16	0	0	0.03
MON-41	40.33	0	0	27.09	27.09	67.86	4.64	0	0	0.40
MON-42	37.64	0	0	10.26	10.26	82.99	6.63	0	0	0.12
MON-43	32.59	0	0	69.92	69.92	12.87	4.19	0	0	13.02
MON-44	22.26	0	0.07	15.89	15.96	71.76	10.3	0	0	1.98
MON-45	18.88	0	0	48.25	48.25	46.74	4.96	0	0	0.05
MON-46	20.9	0	0	5.17	5.17	90.72	2.43	0	0	1.68
MON-47	22.25	0	0	3.23	3.23	91.91	4.23	0	0	0.64
MON-48	31.74	0	0	26.01	26.01	66.57	6.76	0	0	0.66
MON-49	17.24	0	0	26.35	26.35	62.99	10.08	0	0	0.57
MON-50	18.74	0	0	0.71	0.71	88.33	3.49	0	0	7.47
MON-51	29.11	0	0	31.55	31.55	58.83	7.40	0	0	2.22
MON-52	15.62	0	0	5.98	5.98	81.43	11.37	0	0	1.21
MON-53	20.24	0	0	19.96	19.96	65.24	13.35	0	0	1.44
MON-54	18.55	0	0	16.16	16.16	75.38	3.78	0.09	0	4.59
MON-55	14.23	0	0.22	15.53	15.75	79.84	2.65	0	0	1.76
MON-56	16.97	0	0	34.48	34.48	58.69	2.05	0	0	4.79
MON-57	19.85	0	0	35.53	35.53	59.38	4.50	0	0	0.59
MON-58	19.46	0	0	28.49	28.49	63.9	3.41	0	0	4.21
MON-59	20.76	0	0	43.14	43.14	49.04	3.15	0	0	4.66
MON-60	21.99	0	0	21.86	21.86	68.07	6.05	0	0	4.02
MON-61	19.49	0	0	19.33	19.33	69.90	9.08	0	0	1.69
MON-62	23.14	0	0	58.36	58.36	35.32	5.30	0	0	1.03
MON-63	30.37	0	0	23.11	23.11	72.67	3.70	0	0	0.51
MON-64	13.88	0	0	17.13	17.13	77.08	4.56	0	0	1.22
MON-65	27.92	0	0	3.20	3.2	92.12	4.40	0	0	0.27
MON-67	14.67	0	0	0.35	0.35	92.55	7.05	0	0	0.05
MON-68	8.19	0	0	0	0	95.86	3.31	0	0	0.83
MON-69	15.47	0	0.10	6.66	6.76	85.54	4.93	0	0	2.77
MON-70	10.62	0	0	1.43	1.43	92.27	3.84	0	0	2.46
MON-71	15.15	0	0	0	0	97.99	0.25	0	0	1.76
MON-72	8.29	0	0	4.83	4.83	90.60	1.52	0	1.30	1.75
WTA-17	29.84	0	0	0.85	0.85	75.36	20.8	0	0	2.99
WTA-22	51.21	0	0	0.17	0.17	79.34	20.44	0	0	0.06
WTA-23	32.23	0	0	0	0	83.32	13.40	0	0	3.27
WTA-27	23.37	0	0	0.16	0.16	84.84	14.32	0	0	0.68
WTA-33	23.24	0	0	6.30	6.30	79.57	4.48	0	0	9.65
WTA-34	37.6	0	0	5.55	5.55	89.89	2.88	0	0	1.68
Total Percent MON (%)[4]	**100**	**0**	**<0.01**	**17.90**	**17.90**	**73.11**	**6.81**	**<0.01**	**<0.01**	**2.15**

Transect	Area Analyzed (m^2)	Boulder (%)	Cobble (%)	Pebble/ Granule (%)	All Gravel Combined (%)	Sand/Mud Substrate (%)	Shell Cover (%)[1]	Woody debris (%)	Anthropo-genic (%)[2]	Flora/Fauna Cover (%)[3]
Total Area in MON (m^2)[5]	1043.87	0	0.06	186.89	186.95	763.22	71.12	0.02	0.11	22.45

[1] Biogenic shell cover includes fragments of shell or empty shell of once living organism.

[2] Anthropogenic material includes construction materials, metal, and trash. Rope was present in one transect.

[3] Biological elements (i.e. flora/fauna) includes blue mussel, sand dollars, infaunal structures, mobile megafauna, and inferred fauna.

[4] Total Percentage in MON (%) provides a summary of the total percent cover of each substrate type across all transects.

[5] Total Area in MON (m^2) provides a summary of the total area of each substrate type across all transects.

Table 3-36. Area and percent coverage of different biological elements (i.e., flora/fauna) observed within still images from the 43 video transects in the Monmouth ECC.

Transect	Flora/ Fauna Area (m^2)	Astarte (%)	Blue Mussel (%)	Burrowing Anemone (%)	Bushy Plantlike Org (%)	Encrusting Org (%)	Hermit Crab (%)	Infaunal Structure (%)	Inferred Fauna (%)	Mobile Megafauna (%)	Sand Dollar (%)	Sea Scallop (%)	Urchin (%)
MON-35	0.04	0	0	0	0	0	0	0	0	52.72	47.28	0	0
MON-36	0.08	0	0	0	0	0	0	20.91	0	57.51	21.58	0	0
MON-37	1.72	0.12	0	0	0	0	0	0	94.61	3.35	0	1.92	0
MON-38	0.18	0.00	0	0	0	12.22	0	30.26	0	30.63	0	26.89	0
MON-39	0.30	0	0	2.53	0	9.53	0	2.53	17.80	56.78	0	10.82	0
MON-40	0.01	0	0	0	0	0	0	0	0	100	0	0	0
MON-41	0.16	0	0	0	0	0	0	0	0	100	0	0	0
MON-42	0.05	0	0	65.68	0	0	0	17.16	17.16	0	0	0	0
MON-43	4.24	0	91.78	0	0	0	0	0	0	6.99	0	0	1.22
MON-44	0.44	0	25.81	0	0	0	4	40.86	6.90	17.65	5.13	0	0
MON-45	0.01	0	0	100	0	0	0	0	0	0	0.00	0	0
MON-46	0.35	0	0	2.61	0	0	0	22.81	1.52	0	73.05	0	0
MON-47	0.14	0	0	0	0	0	0	0	0	0	100	0	0
MON-48	0.21	0	0	0	0	0	0	13.72	0	12.03	74.25	0	0
MON-49	0.10	0	0	0	0	0	0	51.59	36.54	11.87	0	0	0
MON-50	1.40	0.99	0	0.78	0	0	0	3.00	0	0	95.23	0	0
MON-51	0.65	0	0	0	0	0	0	8.83	19.17	6.75	65.26	0	0
MON-52	0.19	0	0	0	0	0	0	84.68	0	0	15.32	0	0
MON-53	0.29	0	0	0	0	0	0	80.98	0	0	19.02	0	0
MON-54	0.85	1.38	2.74	0.74	0	3.82	0	0	20.70	1.86	68.77	0	0
MON-55	0.25	0	23.68	1.48	0	1.48	0	4.69	6.94	11.27	50.47	0	0
MON-56	0.81	0	1.49	0.58	0	0	0	90.12	0	2.19	5.61	0	0
MON-57	0.12	0	52.64	24.30	0	0	0	0	0	23.06	0	0	0
MON-58	0.82	0	70.05	0	0	0	0	11.90	3.84	3.88	10.33	0	0
MON-59	0.97	0	0	0	0	0	0	42.04	37.91	0	18.82	1.23	0
MON-60	0.88	0	1.14	0	0	0	0	88.19	0.00	0	7.67	3.00	0
MON-61	0.33	0	33.00	0	0	0	0	31.32	20.78	0	12.23	2.66	0
MON-62	0.24	0	0	0	0	0	0	37.05	16.10	17.56	0	29.28	0
MON-63	0.15	0	17.60	0	7.33	0	0	0	35.41	39.67	0	0	0
MON-64	0.17	0	0	16.89	0	0	0	10.91	72.20	0	0	0	0
MON-65	0.08	0	0	0	0	0	0	0	67.72	0	32.28	0	0
MON-67	0.01	0	0	60.03	0	0	0	0	0	39.97	0	0	0
MON-68	0.07	0	0	12.42	6.06	0	0	11.12	70.40	0	0	0	0
MON-69	0.43	0	0	88.57	0	0	0	8.28	0	3.15	0	0	0
MON-70	0.26	0	0	65.18	1.64	0	0	19.22	4.93	9.03	0	0	0
MON-71	0.27	0	0	89.86	0	0	0	10.14	0	0.00	0	0	0
MON-72	0.15	0	0	0	0	0	0	18.25	63.89	17.86	0	0	0
WTA-17	0.83	0	0	0	0	0	0	2.51	3.96	4.09	89.44	0	0
WTA-22	0.03	0	0	0	0	0	0	0	0	0	100	0	0
WTA-23	1.06	2.30	0	0	0	0	2.08	2.05	74.63	3.81	15.14	0	0
WTA-27	0.16	30.99	0	0	0	0	0	0	0	0	69.01	0	0
WTA-33	2.24	0	0	0	0	0	0	2.03	95.66	2.32	0	0	0
WTA-34	0.63	0	0	0	0	0	0	4.01	95.99	0	0	0	0
Total F/F Percentage MON (%)[1]	**100**	**0.44**	**21.78**	**4.19**	**0.09**	**0.40**	**0.18**	**15.23**	**29.13**	**6.24**	**20.81**	**1.02**	**0.22**
Total F/F Area MON (m^2)[2]	**22.45**	**0.10**	**4.89**	**0.94**	**0.02**	**0.09**	**0.04**	**3.42**	**6.54**	**1.40**	**4.67**	**0.23**	**0.05**

[1] Total Flora/Fauna Percentage in MON (%) provides a summary of the total percent cover per each biological element type in the Flora/Fauna area.

[2] Total Area in MON (m^2) provides a summary of the total area per each biological element type in the Flora/Fauna area.

3.2.2.3 CMECS Classifications

Across the 43 transects in the Monmouth ECC, 1,075 still images were assigned a CMECS classification. The number of still images classified as geologic origin, unconsolidated, fine substrate of sand/mud size (< 2 mm, n=564) was far greater than any other CMECS group, comprising 544 m^2 of the analyzed area (Table 3-38, Figure 3-63). The sand/mud CMECS group is not considered complex under the NMFS guidelines (NMFS, 2021); thus, 52% of the area analyzed in the Monmouth ECC was classified as soft bottom habitat (i.e., not complex).

Complex habitats include areas with ≥ 5% of gravel-sized particles, dominated by biogenic origin substrates, or areas with a substantial amount of biological activity or presence. Under the NMFS guidelines (NMFS, 2021), 48% of the video survey area analyzed in the Monmouth ECC is considered complex. Habitats classified as gravel, which have ≥ 80% sediment particles of pebble/granule or cobble size, occurred in 76 m^2 of the Monmouth ECC area in 83 images across 15 transects (Table 3-38). Gravel mixes of pebble/granule with sand/mud (< 80% and ≥ 30% gravel) occurred in 190 m^2 of the Monmouth ECC area in 193 still images across 30 transects, with MON-38, MON-40, and MON-41 containing the most by area (27 m^2, 17 m^2 and 16 m^2, respectively). Gravelly sand/mud (< 30% and ≥ 5% gravel) occurred in 233 m^2 of the Monmouth ECC area in 235 images across 39 transects. Small cobbles (around 75 – 80 mm size) were observed within gravel mix substrates or gravelly sand/mud in 3 m^2 of the surveyed Monmouth ECC area.

Biogenic origin substrates present within the Monmouth ECC include shell hash with fragments of shell between 2 and 64 mm in size, and shell rubble with fragments or whole shells that are larger than 64 mm. There were no still images processed within the 43 transects surveyed along the Monmouth ECC that contained substrates dominated by shell hash or shell rubble. However, shells were a frequent co-occurring substrate type, classified as a secondary CMECS group in 1,026 (95%) still images at various levels of cover density over 71 m^2 of the Monmouth ECC area (Figure 3-64, Table 3-37). Additionally, anthropogenic substrate was classified as a co-occurring substrate type in one still image, and organic substrate was classified as a co-occurring substrate type with sparse shell hash in one still image.

The area of the biological elements recorded in the percent cover analysis was summarized to approximate the density of flora/fauna cover for each still image along a transect. Greater densities of flora/fauna suggest presence of potentially more complex habitat due to greater biological activity (e.g., burrows, megafauna) or occurrence of additional structure in the environment (e.g., infaunal structures, encrusting organisms, algae). Seventeen still images analyzed within the Monmouth ECC contained moderate amounts of flora/fauna coverage (> 30%; Figure 3-65) with 715 still images containing zero flora/fauna coverage.

Representative images of CMECS substrate types are in Figure 3-67 through Figure 3-74.

Table 3-37. The number of stills and the total area (m^2) classified to each CMECS substrate group combination for each of the 43 video transects in the Monmouth ECC.

Main and Co-Occurring CMECS Substrate Group Combinations	Number of Stills Classified to Group	Percent of Stills Classified to Group (%)	Area of Stills Classified to Group (m^2)	Percent of Area Classified to Group (%)
Gravel – P/G	13	1.21	9.38	0.90
Gravel – P/G with Moderate Shell Hash	1	0.09	0.49	0.05
Gravel – P/G with Sparse Shell Hash	45	4.19	41.83	4.01
Gravel – P/G with Sparse Shell Rubble	4	0.37	3.52	0.34
Gravel – P/G with Trace Shell Hash	20	1.86	20.86	2.00
Gravel Mixes – (C+P/G & S/M) with Sparse Shell Hash	2	0.19	1.07	0.10
Gravel Mixes – (C+P/G & S/M) with Trace Shell Hash	2	0.19	1.07	0.10
Gravel Mixes – P/G & S/M	25	2.33	22.60	2.17
Gravel Mixes – (P/G & S/M) with Sparse Shell Hash	135	12.56	139.58	13.37
Gravel Mixes – (P/G & S/M) with Sparse Shell Hash Organic Substrate	1	0.09	0.80	0.08
Gravel Mixes – (P/G & S/M) with Sparse Shell Rubble	7	0.65	6.46	0.62
Gravel Mixes – (P/G & S/M) with Trace Shell Hash	20	1.86	17.17	1.64
Gravel Mixes – (P/G & S/M) with Trace Shell Rubble	1	0.09	2.12	0.20
Gravelly – (S/M & C+P/G) with Sparse Shell Hash	1	0.09	0.20	0.02
Gravelly – (S/M & C+P/G) with Sparse Shell Rubble	1	0.09	0.77	0.07
Gravelly – S/M & P/G	30	2.79	27.42	2.63
Gravelly – (S/M & P/G) with Moderate Shell Hash	4	0.37	4.99	0.48
Gravelly – (S/M & P/G) with Sparse Shell Hash	163	15.16	160.73	15.40
Gravelly – (S/M & P/G) with Sparse Shell Rubble	6	0.56	8.01	0.77
Gravelly – (S/M & P/G) with Trace Shell Hash	29	2.70	28.43	2.72
Gravelly – (S/M & P/G) with Trace Shell Rubble	1	0.09	2.18	0.21
S/M	160	14.88	124.87	11.96
S/M with Moderate Shell Hash	9	0.84	12.39	1.19
S/M with Sparse Anthropogenic Substrate	1	0.09	0.77	0.07
S/M with Sparse Shell Hash	325	30.23	335.31	32.12
S/M with Sparse Shell Rubble	11	1.02	9.10	0.87
S/M with Trace Shell Hash	56	5.21	58.58	5.61
S/M with Trace Shell Rubble	2	0.19	3.16	0.30
Totals	**1075**	**100**	**1043.86**	**100**

[1]Abbreviations are as follows: S/M = Sand/Mud, B = Boulder, C = Cobble, and P/G = Pebble/Granule.

Table 3-38. Area (m^2) classified to each CMECS substrate component type for transects in the Monmouth ECC.

Transect	Shell Rubble	Shell Hash	Biotic Component	Gravel P/G	Gravel Mixes P/G + S/M	Gravel Mixes C/P/G + S/M	Gravelly Sand/Mud (with C,	C/P/G,	P/G)	Sand/Mud
MON-35	0	0	0	0	0.91	0	0	0	1.10	34.82
MON-36	0	0	0	0	0.83	0	0	0	3.32	24.18
MON-37	0	0	0	0	5.32	0	0	0	7.57	14.40
MON-38	0	0	0	4.53	27.11	0	0	0	3.79	0
MON-39	0	0	0	0	10.05	0	0	0	5.10	23.19
MON-40	0	0	0	0	16.53	0	0	0	13.73	3.37
MON-41	0	0	0	0	15.71	0	0	0	24.61	0
MON-42	0	0	0	0	2.54	0	0	0	15.16	19.95
MON-43	0	0	0	20.78	9.18	0	0	0	2.63	0
MON-44	0	0	0	1.77	2.91	0	0	0.77	4.24	12.57
MON-45	0	0	0	7.38	1.73	0	0	0	8.41	1.37
MON-46	0	0	0	0	0.68	0	0	0	6.04	14.18
MON-47	0	0	0	0	0	0	0	0	6.14	16.11
MON-48	0	0	0	0	18.00	0	0	0	2.99	10.75
MON-49	0	0	0	0	7.46	0	0	0	7.89	1.90
MON-50	0	0	0	0	0	0	0	0	1.00	17.73
MON-51	0	0	0	9.56	0.75	0	0	0	4.06	14.73
MON-52	0	0	0	0	0	0	0	0	7.17	8.44
MON-53	0	0	0	1.19	5.07	0	0	0	10.40	3.58
MON-54	0	0	0	0	5.01	0	0	0	3.01	10.53
MON-55	0	0	0	0.42	1.89	1.56	0	0	0.30	10.06
MON-56	0	0	0	1.29	7.64	0	0	0	6.59	1.45
MON-57	0	0	0	1.34	10.15	0	0	0	5.77	2.59
MON-58	0	0	0	1.03	8.45	0	0	0	0.87	9.11
MON-59	0	0	0	9.08	1.60	0	0	0	1.89	8.19
MON-60	0	0	0	0.87	7.93	0	0	0	4.44	8.74
MON-61	0	0	0	0.70	5.65	0	0	0	5.85	7.29
MON-62	0	0	0	14.46	1.62	0	0	0	0.70	6.36
MON-63	0	0	0	1.67	7.67	0	0	0	15.42	5.61
MON-64	0	0	0	0	3.09	0	0	0	9.48	1.31
MON-65	0	0	0	0	0	0	0	0	6.13	21.78
MON-67	0	0	0	0	0	0	0	0	0.16	14.51
MON-68	0	0	0	0	0	0	0	0	0	8.19
MON-69	0	0	0	0	0.57	0.57	0	0.20	3.91	10.22
MON-70	0	0	0	0	0	0	0	0	1.47	9.15
MON-71	0	0	0	0	0	0	0	0	0	15.15
MON-72	0	0	0	0	0.22	0	0	0	1.91	6.16
WTA-17	0	0	0	0	0	0	0	0	2.56	27.27
WTA-22	0	0	0	0	0	0	0	0	1.11	50.11
WTA-23	0	0	0	0	0	0	0	0	0	32.23
WTA-27	0	0	0	0	0	0	0	0	0	23.37
WTA-33	0	0	0	0	2.44	0	0	0	4.27	16.52
WTA-34	0	0	0	0	0	0	0	0	20.59	17.01
Total Area (m^2)	**0**	**0**	**0**	**76.07**	**188.71**	**2.13**	**0**	**0.97**	**231.78**	**544.18**

[1]Abbreviations are as follows: S/M = Sand/Mud, B = Boulder, C = Cobble, and P/G = Pebble/Granule. All substrate groups except sand/mud are considered 'complex' habitat by NMFS (2021).

Along with the percent cover analysis, all biological elements within a still were enumerated (as individuals, when applicable) to determine the dominant and co-occurring CMECS biotic component classifications and associated taxa for each still if applicable. Only the dominant biotic component is described in this report. The total number of stills with each classification per transect is shown in Figure 3-63. Of the 1,075 still images analyzed from video data surveyed in the Monmouth ECC, 633 still images were classified with a dominant biotic component. The most frequently classified biotic component in still images from the Monmouth ECC transects was sand dollar beds, which was the classification for 197 stills in 27 transects. Sand dollar bed was also the most dominant biotic component in 16 transects, with all 25 stills in MON-50 classified as sand dollar bed for the dominant biotic group, and large proportion of stills classified in MON-46, WTA-17, and WTA-23. The subclass of inferred fauna, which in the Monmouth ECC included 70% possibly older, unidentified infaunal structures and 29% egg masses, was dominant in 53 stills across 17 transects and was classified in a large proportion of stills in MON-37, WTA-33, and WTA-34. The burrowing anemones biotic component was dominant in 85 stills across 21 transects, with a large proportion of stills classified in MON-68, MON-69, MON-70, and MON-71. The *Diopatra* bed (i.e., decorator worm) biotic component was dominant in 61 stills across 24 transects, with relatively large proportions of stills classified in MON-26, MON-67, and MON-72. Of the 1,075 total stills analyzed across the video transects surveyed in the Monmouth ECC, 442 stills had no dominant biological elements present, with MON-45 and MON-47 particularly sparse (Figure 3-66).

The CMECS substrate and biotic component classifications for stills in each transect are mapped over benthic habitat polygons in figures provided in Appendix F and provided in an Excel database in Appendix G.

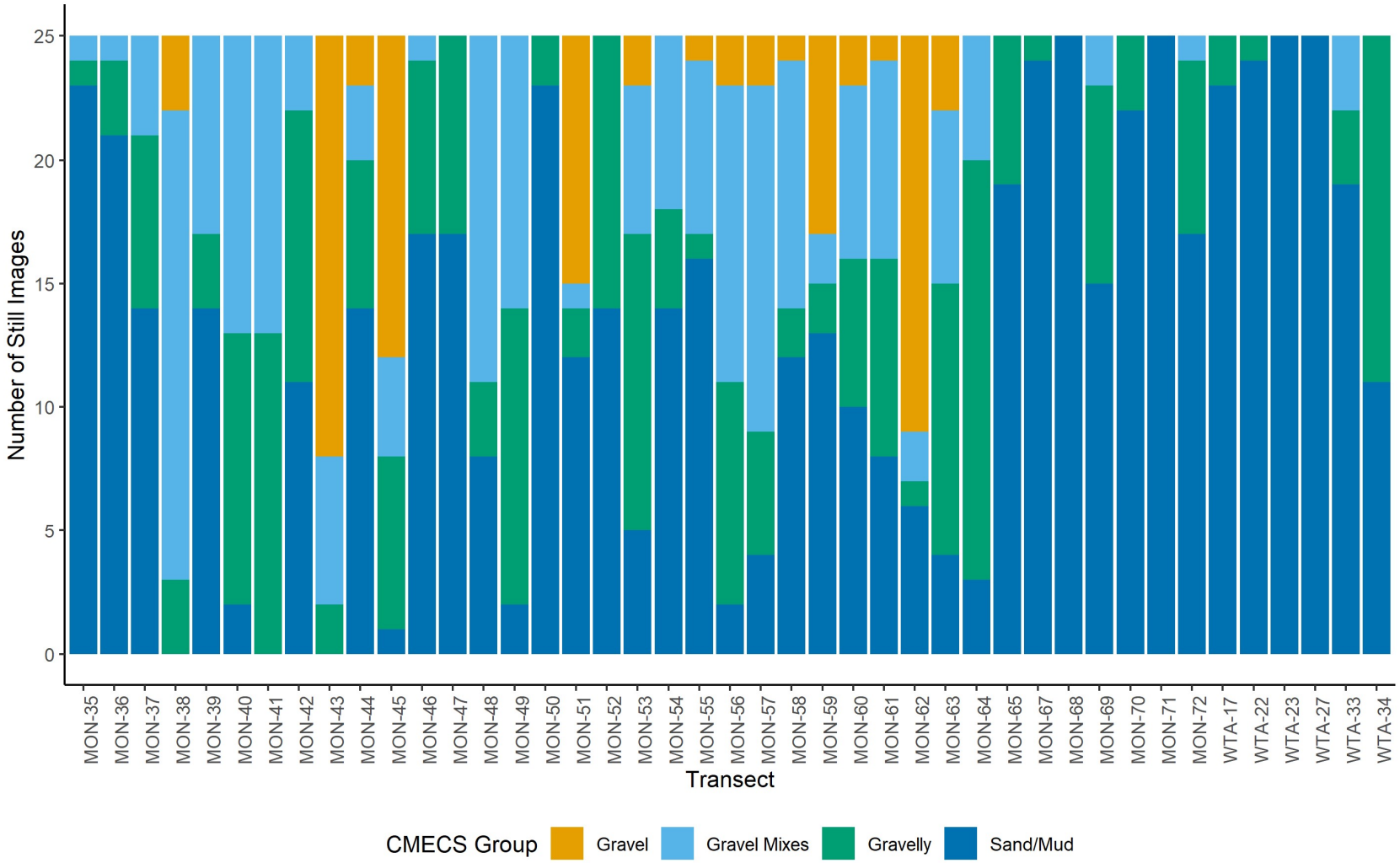


Figure 3-63. The number of still images classified to CMECS substrate component groups within the Monmouth ECC video transects.

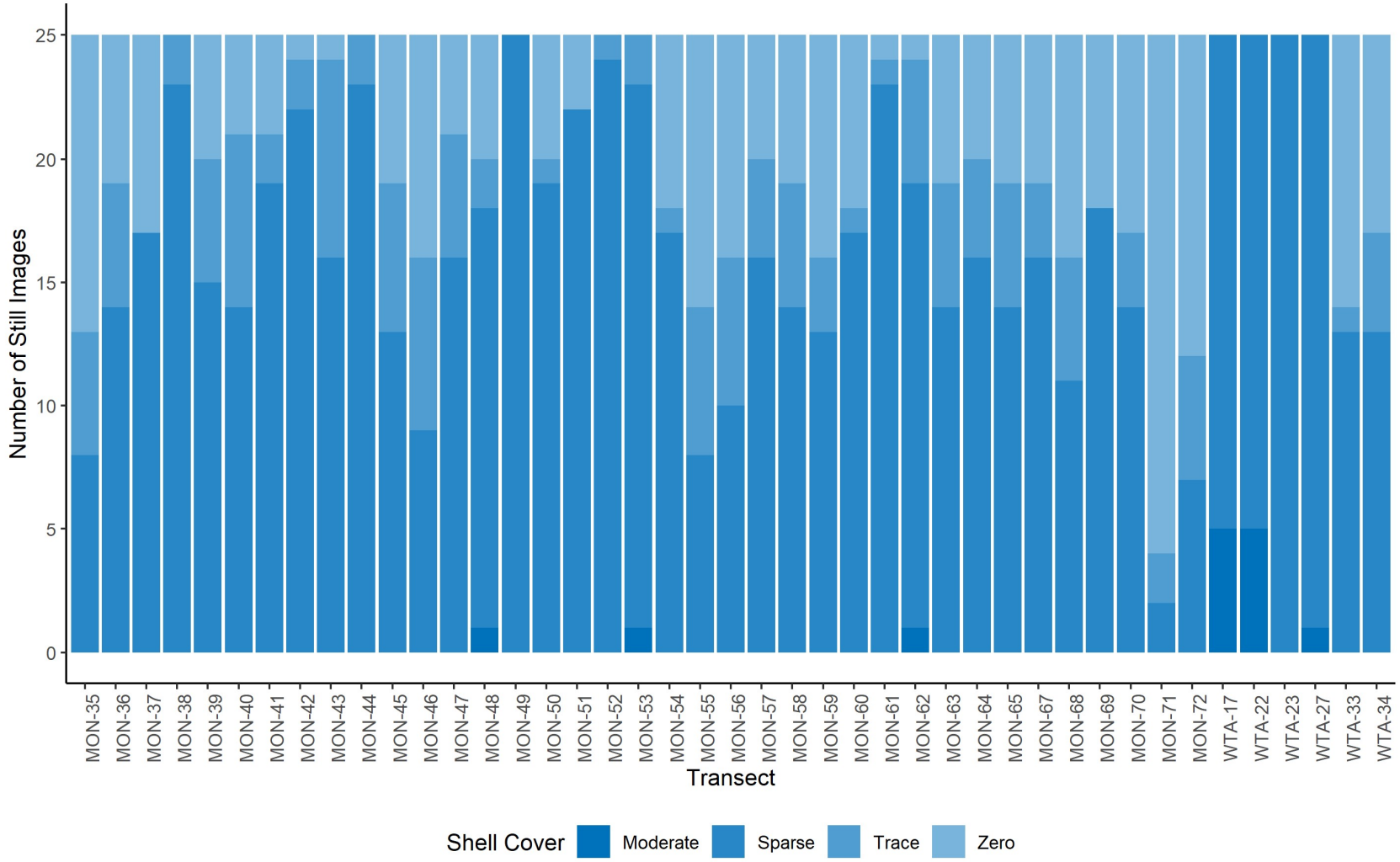


Figure 3-64. The number of still images classified to each shell cover density category within the Monmouth ECC video transects. Trace is ≤ 2%, Sparse is > 2 to < 30%, Moderate is 30 to < 70%, Dense is 70 to < 90%, and Complete is 90 to 100% cover.

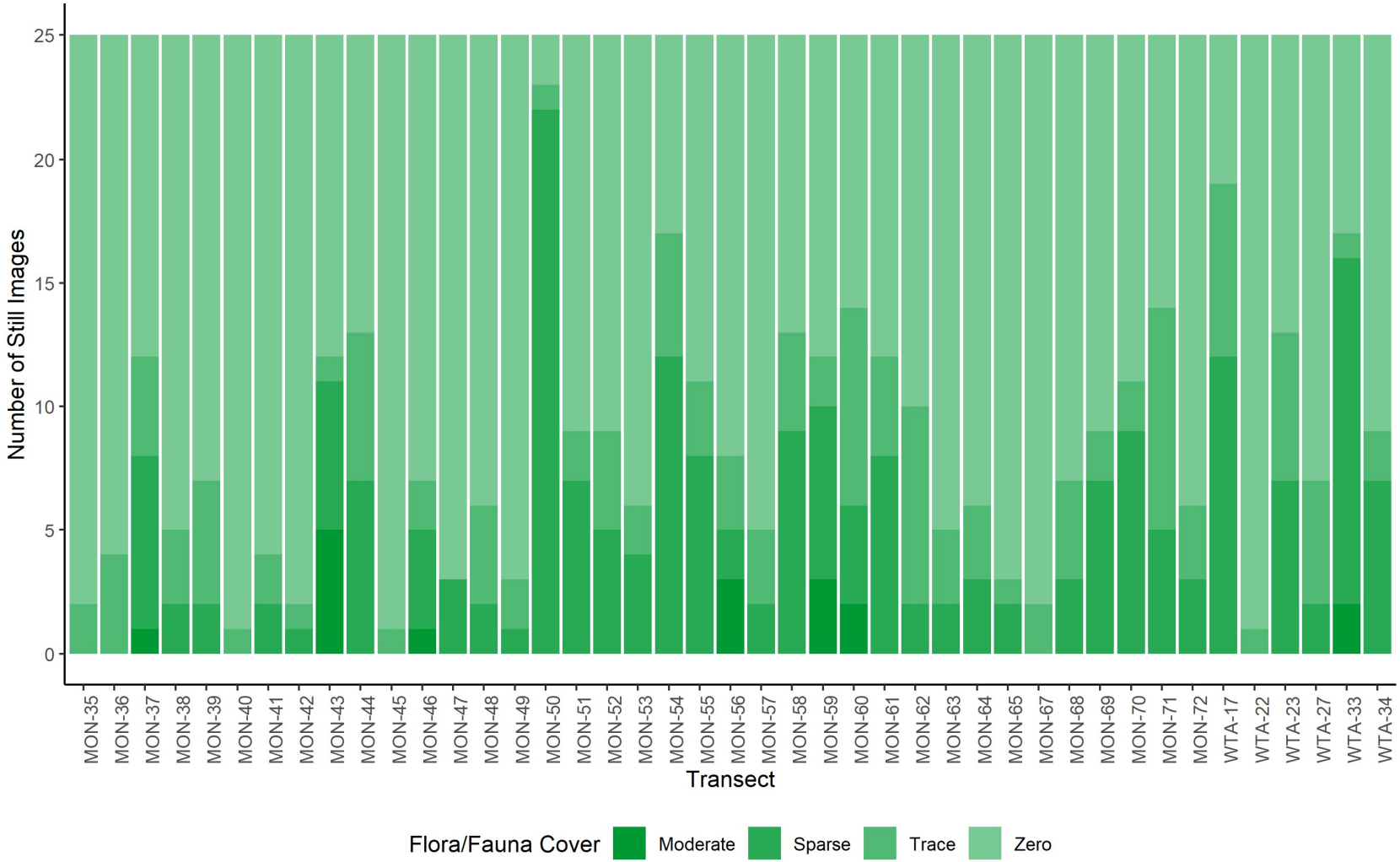


Figure 3-65. The number of still images classified to each flora/fauna density category within the Monmouth ECC video transects. Trace is ≤ 2%, Sparse is > 2 to < 30%, Moderate is 30 to < 70%, Dense is 70 to < 90%, and Complete is 90 to 100% cover.

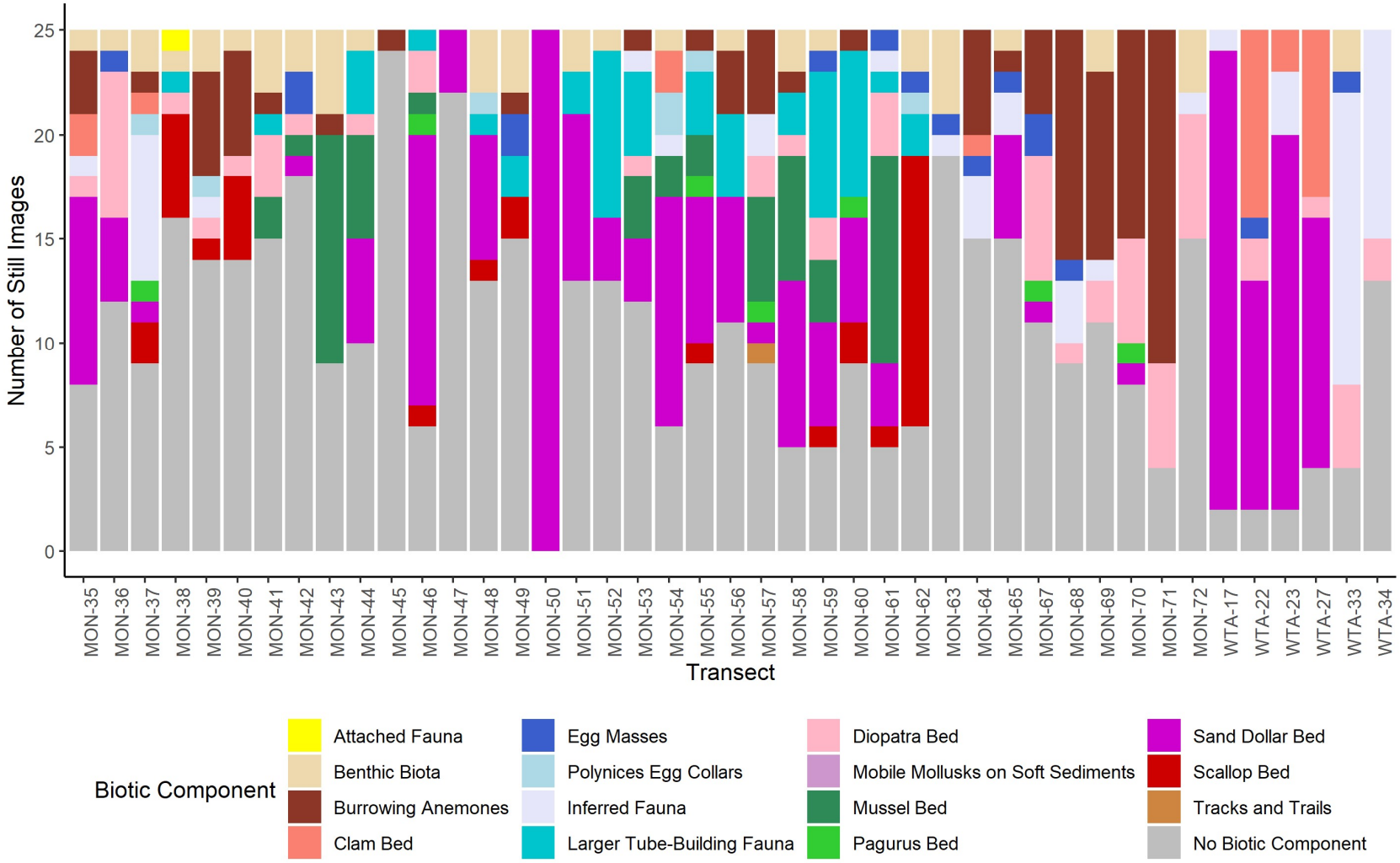


Figure 3-66. The number of still images assigned to CMECS biotic component classifications within the Monmouth ECC video transects.

[1]Still images which were observed to contain no biota were classified as No Biotic Component. Attached Fauna is designated by encrusting organisms, Benthic Biota by associated taxa including fish, crabs and sea stars, Clam bed by *Astarte* clams, Egg masses by skate egg cases, Polynices Egg collars by moon snail egg cases, Inferred Fauna by Structure A, Larger tube-building fauna by Worm tube A, Worm tube C, Mobile mollusks on soft sediment by snails, Pagurus bed by hermit crabs and Tracks and trails by presumed animal tracks and trails.

Figure 3-67. Geologic Unconsolidated Flat Sand/Mud MON-72_G0020072

Figure 3-68. Geologic Unconsolidated Sand/mud Trace Shell Hash MON-67_G0017073

Figure 3-69. Geologic Unconsolidated Sand/mud Sparse Shell Hash MON-37_G0011925

Figure 3-70. Geologic Unconsolidated Sand/mud Sparse Shell Rubble MON-55_G0012175

Figure 3-71. Geologic Gravelly Sand/Mud with Trace Shell Hash WTA-34_G0018028

Figure 3-72. Gravelly Sand/Mud & Pebble/Granule with Moderate Shell Hash MON-48_G0016410

Figure 3-73. Gravel (Pebble/Granule) with Moderate Shell Hash MON-62_G0012168

Figure 3-74. Larger Tube-Building Fauna MON-60_G0014911

3.2.3 Northern ECC Results

The characteristics and locations of the 89 underwater video transects taken within the NECC in 2022 are described in Table 3-39 and locations are shown in Figure 3-75. Of the 89 locations chosen, there were 68 towed video transects that yielded sufficient video quality for analysis. Section 3.2.3.1 below describes presence and abundance of megafauna observed in video transects recorded in the Northern ECC. Abundance data are displayed in Table 3-40 with additional visualizations displayed in Figure 3-77 through Figure 3-81. Images of representative megafauna are displayed from Figure 3-82 through Figure 3-92. Section 3.2.3.2 summarizes results of the point count analysis to quantify observed substrate along video transects. Area and composition of the substrate and flora/fauna observed for each transect are presented in Table 3-41, Table 3-42 and Figure 3-97. The CMECS classification results are presented in Section 3.2.3.3.

Table 3-39. Underwater video transect locations in the Northern ECC.

Transect	Date (UTC)	Recorded Duration (min:sec)	Start Latitude (°N)	Start Longitude (°W)	End Latitude (°N)	End Longitude (°W)	# Analyzed Stills*
NEC-01	8/19/2022	07:34	40°29'42.594"	74°10'52.055"	40°29'47.290"	74°11'02.346"	0
NEC-02	8/19/2022	07:24	40°29'52.544"	74°11'13.814"	40°29'56.994"	74°11'23.229"	0
NEC-03	8/19/2022	05:21	40°30'34.782"	74°10'44.290"	40°30'42.125"	74°10'38.917"	0
NEC-04	8/19/2022	06:05	40°30'23.305"	74°09'51.955"	40°30'20.674"	74°09'41.319"	0
NEC-05	8/19/2022	08:01	40°30'16.437"	74°09'00.752"	40°30'14.395"	74°08'50.088"	0
NEC-06	8/18/2022	06:50	40°30'08.713"	74°08'05.050"	40°30'13.876"	74°07'54.734"	0
NEC-07	8/20/2022	06:38	40°30'04.867"	74°05'54.617"	40°30'09.779"	74°06'04.132"	25
NEC-08	8/19/2022	05:59	40°29'40.369"	74°09'48.245"	40°29'40.488"	74°09'59.217"	0
NEC-09	8/19/2022	05:36	40°31'30.910"	74°03'47.499"	40°31'37.153"	74°03'54.812"	0
NEC-10	8/19/2022	05:45	40°32'55.554"	74°03'56.808"	40°32'47.810"	74°04'01.572"	0
NEC-11	8/19/2022	07:07	40°33'54.667"	74°04'37.894"	40°33'49.206"	74°04'29.372"	0
NEC-12	8/20/2022	06:21	40°33'38.563"	74°03'47.723"	40°33'30.164"	74°03'49.566"	0
NEC-13	8/20/2022	07:47	40°33'50.308"	74°03'49.112"	40°33'41.995"	74°03'52.141"	25
NEC-14	8/19/2022	06:32	40°34'27.485"	74°03'42.507"	40°34'19.110"	74°03'40.247"	0
NEC-15	8/19/2022	05:56	40°35'53.240"	74°01'25.181"	40°35'45.921"	74°01'19.675"	0
NEC-16	8/19/2022	05:07	40°34'40.483"	74°01'04.189"	40°34'32.402"	74°01'07.235"	25
NEC-17	8/19/2022	06:56	40°32'29.975"	74°01'00.830"	40°32'21.837"	74°00'57.578"	25
NEC-18	8/18/2022	05:52	40°30'21.326"	74°01'17.828"	40°30'27.572"	74°01'25.510"	23
NEC-19	8/18/2022	04:07	40°30'51.306"	73°58'04.226"	40°30'56.606"	73°58'13.395"	24
NEC-20	8/20/2022	04:57	40°29'33.910"	73°58'21.443"	40°29'40.599"	73°58'28.514"	25
NEC-21	8/18/2022	05:03	40°29'39.135"	73°57'42.813"	40°29'47.578"	73°57'46.750"	25
NEC-22	8/18/2022	06:09	40°28'39.961"	73°57'04.716"	40°28'48.412"	73°57'04.126"	0
NEC-23	8/18/2022	05:57	40°27'30.799"	73°56'04.199"	40°27'39.254"	73°56'00.850"	26
NEC-24	8/18/2022	06:16	40°26'41.305"	73°55'21.202"	40°26'49.981"	73°55'17.859"	25
NEC-25	8/18/2022	04:47	40°29'22.867"	74°08'22.626"	40°29'26.329"	74°08'32.931"	0
NEC-26	8/20/2022	07:38	40°30'41.028"	74°03'14.753"	40°30'36.007"	74°03'24.048"	25

Transect	Date (UTC)	Recorded Duration (min:sec)	Start Latitude (°N)	Start Longitude (°W)	End Latitude (°N)	End Longitude (°W)	# Analyzed Stills*
NEC-27	8/20/2022	06:04	40°31'10.727"	73°58'59.060"	40°31'18.762"	73°59'04.255"	24
NEC-28	8/18/2022	06:31	40°28'23.127"	73°56'43.754"	40°28'24.377"	73°56'54.583"	25
NEC-29	8/18/2022	06:34	40°29'35.279"	74°06'58.056"	40°29'27.169"	74°07'01.992"	0
NEC-30	8/19/2022	05:44	40°34'05.732"	74°03'41.783"	40°33'59.269"	74°03'49.121"	25
NEC-31	8/19/2022	06:34	40°33'11.406"	74°03'53.363"	40°33'05.547"	74°04'01.102"	0
NEC-32	8/19/2022	11:58	40°31'50.597"	74°00'35.816"	40°31'48.739"	74°00'24.780"	27
NEC-33	8/18/2022	04:18	40°29'20.592"	73°58'10.263"	40°29'19.137"	73°57'59.128"	0
NEC-34	8/18/2022	04:40	40°27'06.629"	73°55'49.040"	40°27'09.618"	73°55'37.926"	26
NEC-35	8/18/2022	06:19	40°30'40.211"	74°01'56.605"	40°30'33.931"	74°02'04.545"	25
NEC-36	8/19/2022	07:38	40°33'41.094"	74°04'14.193"	40°33'32.695"	74°04'12.073"	0
NEC-37	8/19/2022	06:47	40°35'28.162"	74°00'53.173"	40°35'23.048"	74°01'02.109"	24
NEC-38	8/19/2022	05:31	40°33'02.842"	74°01'20.384"	40°32'58.157"	74°01'11.026"	0
NEC-39	8/20/2022	09:01	40°30'03.226"	73°57'57.798"	40°30'11.965"	73°57'56.619"	24
NEC-40	8/20/2022	05:18	40°30'07.846"	73°59'57.507"	40°30'04.477"	74°00'07.610"	26
NEC-41	8/20/2022	05:52	40°30'10.509"	74°04'46.404"	40°30'13.939"	74°04'56.737"	21
NEC-42	8/20/2022	06:00	40°29'18.465"	74°07'44.035"	40°29'22.092"	74°07'54.143"	0
NEC-43	8/19/2022	05:54	40°30'09.869"	74°07'29.415"	40°30'08.005"	74°07'40.116"	24
NEC-44	8/20/2022	05:42	40°30'32.053"	74°03'50.944"	40°30'30.377"	74°04'01.784"	27
NEC-45	8/23/2022	08:55	40°25'15.384"	73°55'06.744"	40°25'22.332"	73°55'02.820"	25
NEC-46	8/23/2022	09:02	40°25'55.020"	73°55'04.224"	40°26'02.220"	73°55'02.064"	25
NEC-47	8/23/2022	14:12	40°26'15.792"	73°55'30.504"	40°26'23.424"	73°55'29.676"	24
NEC-48	8/23/2022	05:15	40°25'39.648"	73°55'00.444"	40°25'47.676"	73°54'59.760"	23
NEC-49	8/23/2022	08:46	40°24'35.712"	73°54'59.328"	40°24'42.732"	73°54'54.144"	25
NEC-50	8/23/2022	11:46	40°23'59.460"	73°54'41.220"	40°24'04.644"	73°54'36.072"	25
NEC-51	8/23/2022	13:59	40°23'09.024"	73°54'10.872"	40°23'16.980"	73°54'12.960"	25
NEC-52	8/23/2022	09:38	40°25'23.124"	73°54'48.996"	40°25'28.884"	73°54'41.904"	26
NEC-53	8/23/2022	13:59	40°22'02.172"	73°53'54.672"	40°22'10.092"	73°53'54.600"	21
NEC-54	8/23/2022	10:43	40°22'27.156"	73°53'48.876"	40°22'34.824"	73°53'48.084"	25
NEC-55	8/23/2022	07:41	40°20'59.784"	73°53'56.616"	40°21'07.488"	73°53'54.780"	25
NEC-56	8/23/2022	05:52	40°20'34.008"	73°53'57.372"	40°20'35.664"	73°54'07.884"	18
NEC-57	8/23/2022	07:10	40°20'00.348"	73°53'14.388"	40°20'08.340"	73°53'16.152"	24
NEC-58	8/23/2022	06:39	40°20'18.240"	73°53'23.676"	40°20'26.016"	73°53'21.912"	16
NEC-59	8/23/2022	06:28	40°19'33.240"	73°52'49.872"	40°19'39.972"	73°52'55.740"	25
NEC-60	8/23/2022	06:14	40°18'56.700"	73°52'35.832"	40°19'04.728"	73°52'36.876"	27
NEC-61	8/23/2022	08:44	40°26'38.076"	73°54'55.152"	40°26'46.068"	73°54'53.568"	24
NEC-62	8/23/2022	06:30	40°18'05.940"	73°52'25.716"	40°18'14.148"	73°52'25.860"	26
NEC-63	8/23/2022	06:40	40°17'33.072"	73°52'17.580"	40°17'40.200"	73°52'21.792"	25
NEC-64	8/22/2022	07:00	40°17'09.708"	73°51'56.304"	40°17'15.432"	73°52'05.916"	27
NEC-65	8/22/2022	06:24	40°16'50.268"	73°51'34.164"	40°16'58.476"	73°51'37.008"	25
NEC-66	8/22/2022	07:37	40°16'15.708"	73°51'26.172"	40°16'22.548"	73°51'21.060"	25
NEC-67	8/22/2022	06:48	40°15'46.440"	73°51'46.332"	40°15'54.108"	73°51'50.112"	25

Transect	Date (UTC)	Recorded Duration (min:sec)	Start Latitude (°N)	Start Longitude (°W)	End Latitude (°N)	End Longitude (°W)	# Analyzed Stills*
NEC-68	8/22/2022	06:31	40°15'25.380"	73°51'31.680"	40°15'28.944"	73°51'38.664"	24
NEC-69	8/23/2022	06:03	40°26'04.632"	73°55'24.852"	40°26'00.672"	73°55'32.160"	26
NEC-70	8/22/2022	06:25	40°14'45.564"	73°51'16.488"	40°14'51.720"	73°51'09.432"	25
NEC-71	8/22/2022	09:31	40°14'15.684"	73°51'20.556"	40°14'23.244"	73°51'18.432"	28
NEC-72	8/22/2022	07:24	40°13'45.624"	73°50'53.052"	40°13'52.752"	73°50'48.516"	25
NEC-73	8/22/2022	11:01	40°13'56.784"	73°51'17.208"	40°13'49.692"	73°51'18.576"	25
NEC-74	8/22/2022	06:52	40°12'31.356"	73°50'51.108"	40°12'39.636"	73°50'51.180"	25
NEC-75	8/22/2022	08:20	40°12'06.876"	73°50'45.636"	40°12'14.112"	73°50'41.244"	26
NEC-76	8/22/2022	08:22	40°11'15.144"	73°51'01.836"	40°11'21.804"	73°50'56.220"	26
NEC-77	8/22/2022	08:10	40°10'09.984"	73°50'53.376"	40°10'18.228"	73°50'50.208"	25
NEC-78	8/22/2022	07:30	40°10'19.272"	73°51'20.052"	40°10'14.844"	73°51'28.980"	24
NEC-79	8/22/2022	06:38	40°09'22.068"	73°51'04.392"	40°09'30.132"	73°51'03.852"	25
NEC-80	8/22/2022	12:34	40°08'20.796"	73°51'01.224"	40°08'28.788"	73°51'05.940"	27
NEC-81	8/22/2022	22:18	40°07'30.072"	73°51'11.052"	40°07'37.452"	73°51'11.484"	35
NEC-82	8/22/2022	31:14	40°07'56.208"	73°51'42.804"	40°08'04.056"	73°51'46.224"	28
NEC-83	8/22/2022	24:33	40°06'50.148"	73°51'14.472"	40°06'53.064"	73°51'24.912"	28
NEC-84	8/22/2022	13:25	40°06'29.808"	73°51'48.492"	40°06'36.288"	73°51'54.828"	26
NEC-85	8/22/2022	16:15	40°05'30.912"	73°51'53.892"	40°05'37.572"	73°52'00.732"	26
NEC-86	8/22/2022	18:14	40°03'52.056"	73°51'40.788"	40°03'59.040"	73°51'47.340"	26
NEC-87	8/22/2022	13:48	40°03'25.272"	73°51'44.064"	40°03'32.940"	73°51'49.176"	25
NEC-88	8/22/2022	13:58	40°02'44.448"	73°52'12.252"	40°02'50.748"	73°52'22.152"	29
NEC-89	8/23/2022	12:06	40°24'50.508"	73°54'29.304"	40°24'57.816"	73°54'24.336"	25

* Zero analyzed stills mean that transect was successfully collected but once reviewed in detail was deemed not sufficiently clear or of high enough image quality to analyze.

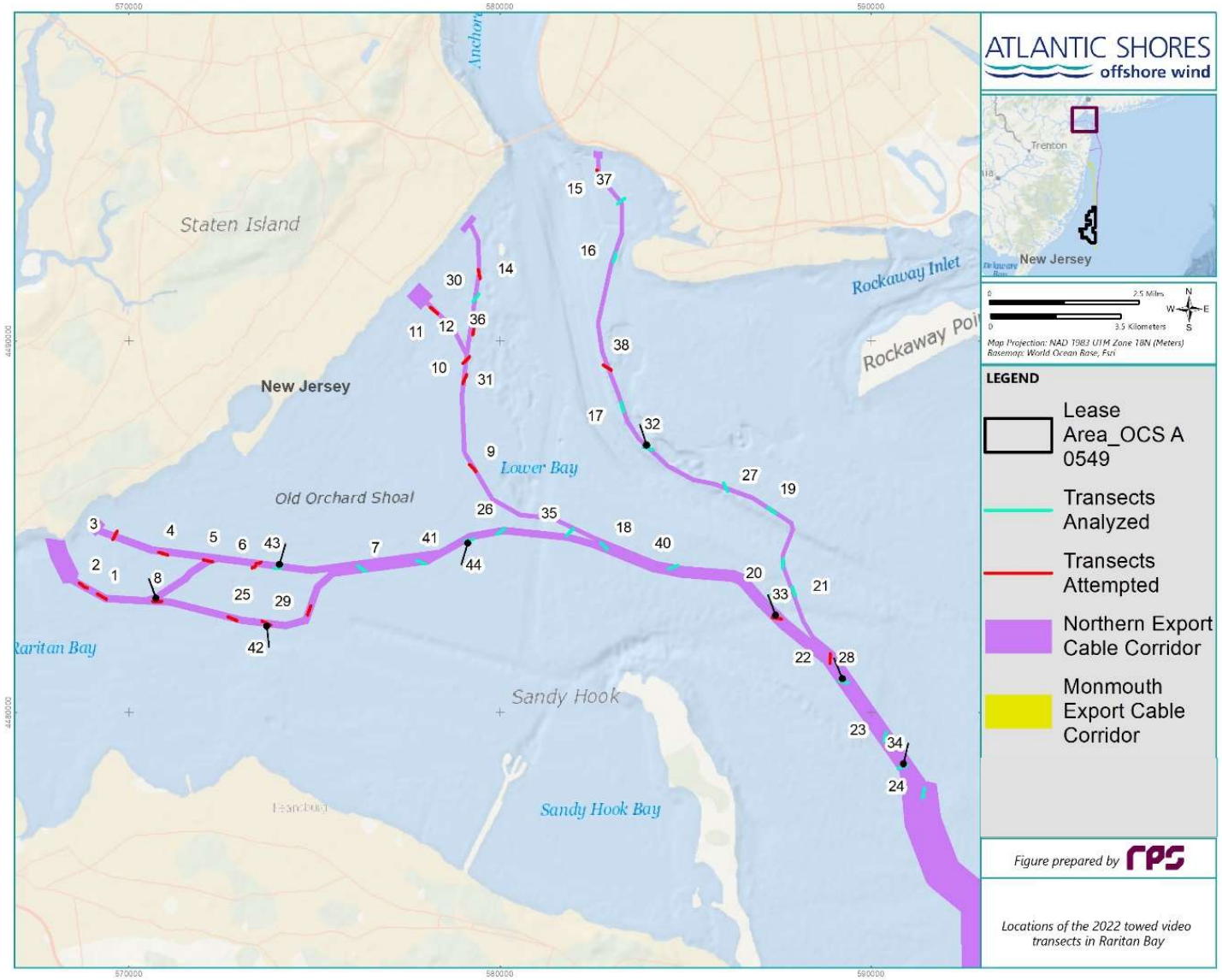


Figure 3-75. Locations of the 2022 video transects in the Northern ECC and near landfall locations in Raritan Bay.

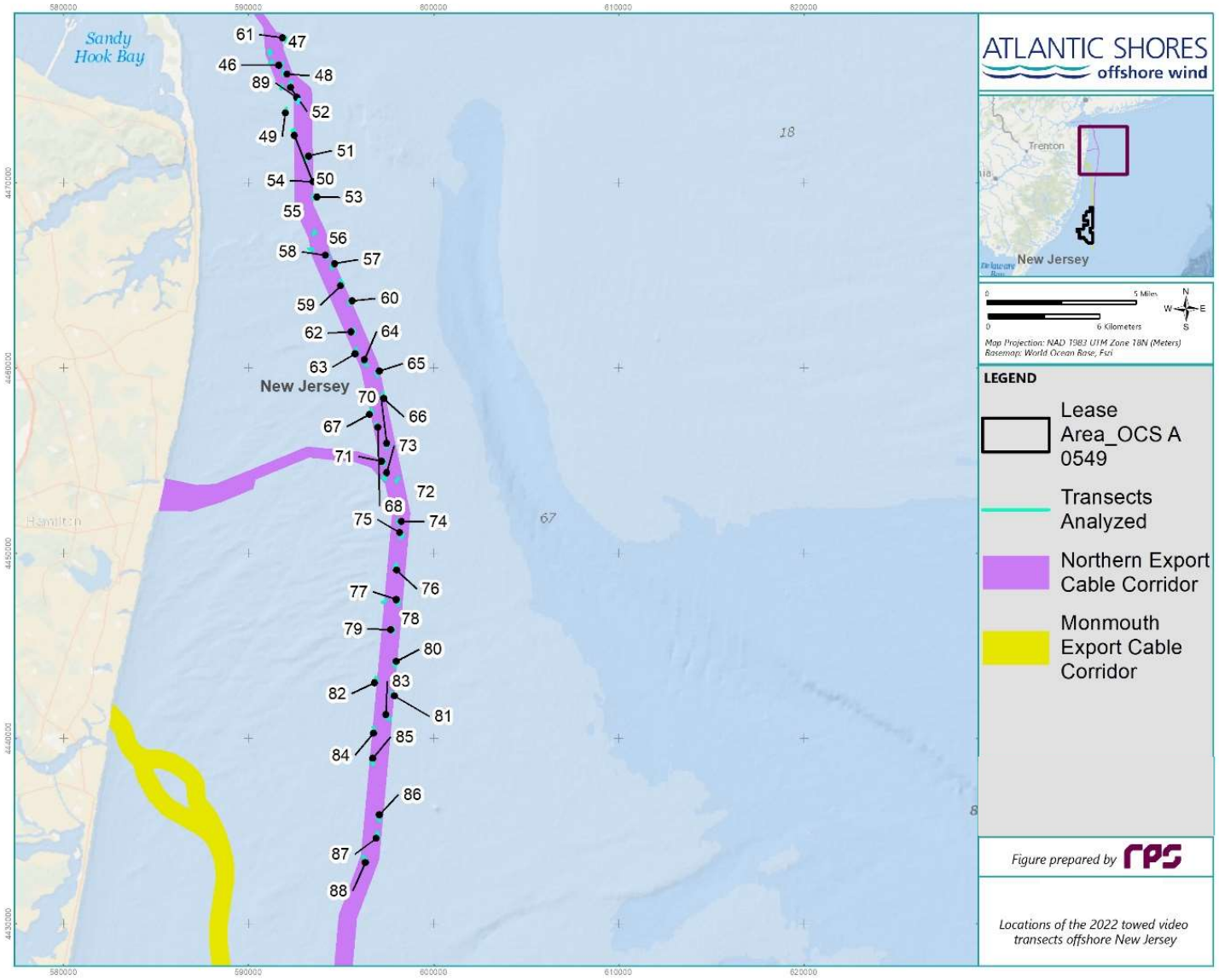


Figure 3-76. Locations of the 2022 video transects in the Northern ECC offshore New Jersey.

3.2.3.1 Organisms and Features

The abundances of enumerable organisms and features greater than 2.5 cm were recorded during the video review process within each of the Northern ECC video transects. Organisms were identified in the videos to the LPTL. A total of 1,676 observations were made which included 1658 identified organisms, 7 unidentified objects, 9 anthropogenic objects, and 2 fishing gear debris observations recorded within the 68 Northern ECC transects with sufficient video quality for analysis (Table 3-40). Burrowing anemones, northern sea robins, skate egg cases, and common or Forbes sea stars were the most numerous, composing 32%, 14%, 11%, and 9% of all organisms, respectively. Within transect NEC-53, 163 of the 537 individual burrowing anemones were recorded, which was the highest single transect abundance of any organism.

Shannon diversity index values of communities of mobile megafauna varied from 0.0 (NEC-18, NEC-35, NEC-39, NEC-40, NEC-41, and NEC-75) to 2.2 (NEC-83 and NEC-87). The low diversity index in NEC-18, NEC-35, NEC-39, NEC-40, NEC-41, and NEC-75 was driven by the presence of only one type of organism in each of those transects. The higher diversity value in NEC-83 was a result of having 14 different observed fauna which included 22 northern sea robins, 10 skate egg cases, 9 burrowing anemones, 8 *Astarte* clams, 6 Actinarian anemones, 5 sea scallops, 3 razor clams, 3 sea pens, 2 surfclam, 2 unidentified whelks, and 1 observation each of a Portunid crab, common or Forbes sea star, mantis shrimp, and an unidentified arthropod. Similarly, NEC-87 had a diversity value of 2.2 and comprised 15 different megafauna which included 12 northern sea robins, 9 sea scallops, 2 observations each of skate egg cases, surfclam, hermit crabs, common or Forbes sea stars, sea urchins, and 1 observation each of an unidentified fish, scup, black sea bass, Actinarian anemone, *Astarte* clam, *Cancer* crab, moon snail, and sea pen.

Overall, the enumerated organisms in the Northern ECC were composed of five different phyla which included Arthropoda, Chordata, Cnidaria, Echinodermata, and Mollusca (Figure 3-77). Observed eggs were classified into corresponding taxonomic groupings but specifically noted to be eggs. Phylum Cnidaria had the highest percent composition of enumerated organisms at 33.6% while phylum Arthropoda had the lowest percent composition at 4.8% of all observations (

Figure 3-78). Within phylum Chordata, five taxonomic orders were identified which included Anguilliformes, Perciformes, Pleuronectiformes, Rajiformes, and Scorpaeniformes (Figure 3-79). Order Scorpaeniformes composed the highest percent composition of enumerated vertebrates at 43% while order Pleuronectiformes composed the lowest percent composition at 0.2%. Enumerated vertebrates not identified to the level of order composed 11.7% of the total. Within enumerated invertebrates, eight taxonomic classes were identified including Anthozoa, Asteroidea, Bivalvia, Cephalopoda, Echinoidea, Gastropoda, Holothuroidea, and Malacostraca (Figure 3-80). Class Anthozoa composed the highest percent composition of enumerated invertebrates at 50.5% while class Holothuroidea composed the lowest

percent composition at 0.2% and was represented by 2 observations of an unidentified sea cucumber. Enumerated invertebrates not identified to the level of class composed 2.3% of total invertebrate observations.

The presence or absence of other qualifying features (i.e., habitat features of note or species that were quantified by their percent cover of the seafloor rather than through enumeration [see Section 2.3.2. for full list]) were recorded for the Northern ECC video transects (Figure 3-81). Algae, bushy plant-like organisms, northern star coral, solitary hydroids, blue mussel, sand dollars, slipper shells, sulfur sponge, unidentified sponges, unidentified sponge/tunicates, invasive tunicates, unidentified worms, decorator worms, and worm tubes were marked as present within the Northern ECC, while eelgrass, forage fish, and eastern oysters were marked absent. Of the 68 video transects in the Northern ECC, sand dollars had the highest transect presence and were observed in 34 transects.

Northern star coral was found to be present in 13 out of 68 transects while no presence of ocean quahog was recorded throughout the Northern ECC. Abundances of surf clam and sea scallop were enumerated in Table 3-42. Surf clam was observed in 17 transects (NEC-19, 23, 27, 32, 44, 46, 50, 51, 60, 62, 69, 70, 72, 74, 83, 87, 88) composing 2% of all recorded organisms. Sea scallop was observed in 8 transects (NEC-19, 21, 78, 82, 83, 86, 87, 88) and composed 2% of the total megafauna. Additional bivalves in the Northern ECC that were observed and enumerated were the *Astarte* and razor clams. *Astarte* clams were recorded in 16 transects (NEC-13, 23, 27, 32, 44, 46, 51, 71, 72, 79, 81, 82, 83, 85, 86, 87) composing 3% of all organisms while razor clams were found in 15 transects (NEC-13, 26, 32, 44, 46, 50, 51, 62, 66, 67, 72, 74, 76, 83, 85) and made up 2% of total organism counts. In Figure 3-81, blue mussels were marked as present in 10 transects (NEC-16, 17, 19, 24, 27, 28, 32, 61, 68, 78) ranging from small clusters to beds.

The unidentified sponge and unidentified sponge/tunicate features are defined by the presence of encrusting amorphous organisms. These features were marked as present in 11 (NEC-17, 18, 19, 32, 34, 40, 46, 52, 55, 65, 68) and 19 (NEC-17, 23, 27, 32, 35, 44, 46, 48, 50, 52, 62, 67, 68, 69, 71, 72, 74, 83, 89) video transects, respectively, within the Northern ECC. Transects NEC-17, NEC-52, NEC-55, NEC-56, NEC-61, and NEC-81 recorded the presence of the sulfur sponge, *Cliona celata*. The bushy plant-like organism category is defined by the presence of algae and plant-like organisms with dendritic growth characteristics. This feature was marked as present in 22 video transects (NEC-07, 13, 16, 17, 18, 21, 27, 32, 35, 37, 46, 48, 52, 54, 59, 61, 65, 66, 74, 82, 85, 89). Invasive tunicate species of the genus *Didemnum* and *Botrylloides* were found to be present in two transects, NEC-52 and NEC-56. Indicators of other habitat-building taxa present in the Northern ECC included the *Diopatra* or decorator worm tubes found in seven transects (NEC-7, 24, 35, 47, 53, 81, 82) and worm tubes of other polychaete species that were present in two transects, NEC-53 and NEC-89 (Figure 3-81).

For representative images of observed species and features, see Figure 3-82 through Figure 3-93. For a complete taxonomy list of species observed, see Appendix E.

Table 3-40. Enumerated megafauna and other features observed in the Northern ECC video transects.

Common Name	Lowest Taxonomic Level	7	13	16	17	18	19	20	21	23	24	26	27
Vertebrate													
eel, unidentified	Anguilliformes											1	
fish, unidentified	Chordata												
flounder, summer	*Paralichthys dentatus*										1		
pinfish	*Lagodon rhomboides*										1		
scup	*Stenotomus chrysops*												
sea bass, black	*Centropristis striata*												
sea robin, northern	*Prionotus carolinus*						1			1	6		
sea robin, unidentified	*Prionotus*												
sheepshead	*Archosargus probatocephalus*												
skate	Rajidae												
skate, clearnose	*Raja eglanteria*												
skate, egg case	Rajidae												2
skate, little	*Leucoraja erinacea*												
skate, little or winter	*Leucoraja*												
skate, winter	*Leucoraja ocellata*												
Invertebrate													
anemone, burrowing	Anthozoa										2		
anenome	Actinaria												1
arthropod, unidentified	Arthropoda								2	1			
astarte	*Astarte*		1							2			6
clam, razor	*Ensis leei*		1									1	
clam, surf	*Spisula solidissima*						2			2			1
crab, blue	*Callinectes sapidus*												
crab, cancer	*Cancer*												2
crab, hermit	*Pagurus*											1	
crab, lady	*Ovalipes ocellatus*												
crab, portunid	Portunidae												
crab, spider	*Libnia*					1							1
lobster, American	*Homarus americanus*		1		1								
mollusc, unidentified	Mollusca												
moon snail	Naticidae											1	
moon snail, egg case	Naticidae									1	5		1
scallop, sea	*Placopecten magellanicus*						1		1				
sea cucumber, unidentified	Holothuroidea												
sea pen	Pennatulacea												1
sea star, common or forbes	*Asterias*				1								
sea star, gray	*Ludia clathrata*												
sea star, unidentified	Asteroidea												1
sea urchin	Echinoidea				14						1		
shrimp, mantis	*Squilla empusa*												
squid, unidentified	Cephalopoda										1		
whelk, unidentified	Melongenidae												
Other													
object, unidentified	object, unidentified												
debris, anthropogenic	debris, anthropogenic												
debris, fishing gear	debris, fishing gear			1									
Total Organisms (Confirmed)	**Total Organisms (Confirmed)**	**0**	**3**	**0**	**16**	**1**	**4**	**0**	**3**	**7**	**17**	**4**	**16**
Total Observations	**Total Observations**	**0**	**3**	**1**	**16**	**1**	**4**	**0**	**3**	**7**	**17**	**4**	**16**
Shannon's Diversity		**NA**	**1.1**	**NA**	**0.5**	**0.0**	**1.0**	**NA**	**0.6**	**1.5**	**1.6**	**1.4**	**1.9**

Common Name	Lowest Taxonomic Level	28	30	32	34	35	37	39	40	41	43	44	45
Vertebrate													
eel, unidentified	Anguilliformes												
fish, unidentified	Chordata			15	3								1
flounder, summer	*Paralichthys dentatus*												
pinfish	*Lagodon rhomboides*												
scup	*Stenotomus chrysops*												
sea bass, black	*Centropristis striata*									1			
sea robin, northern	*Prionotus carolinus*			1	1						1		
sea robin, unidentified	*Prionotus*												
sheepshead	*Archosargus probatocephalus*												
skate	Rajidae												
skate, clearnose	*Raja eglanteria*												1
skate, egg case	Rajidae								1				
skate, little	*Leucoraja erinacea*				2								
skate, little or winter	*Leucoraja*												
skate, winter	*Leucoraja ocellata*												
Invertebrate													
anemone, burrowing	Anthozoa												35
anenome	Actinaria												
arthropod, unidentified	Arthropoda			2	1								
astarte	*Astarte*			6								4	
clam, razor	*Ensis leei*			1								8	
clam, surf	*Spisula solidissima*			9								3	
crab, blue	*Callinectes sapidus*												
crab, cancer	*Cancer*			1									
crab, hermit	*Pagurus*							2					
crab, lady	*Ovalipes ocellatus*												
crab, portunid	Portunidae												
crab, spider	*Libnia*					2					2		
lobster, American	*Homarus americanus*												
mollusc, unidentified	Mollusca												
moon snail	Naticidae			1									2
moon snail, egg case	Naticidae												1
scallop, sea	*Placopecten magellanicus*												
sea cucumber, unidentified	Holothuroidea												
sea pen	Pennatulacea			1									
sea star, common or forbes	*Asterias*												
sea star, gray	*Ludia clathrata*												
sea star, unidentified	Asteroidea												
sea urchin	Echinoidea			9									1
shrimp, mantis	*Squilla empusa*												
squid, unidentified	Cephalopoda			1									
whelk, unidentified	Melongenidae												
Other													
object, unidentified	object, unidentified			1						1			
debris, anthropogenic	debris, anthropogenic			3									
debris, fishing gear	debris, fishing gear												
Total Organisms (Confirmed)	**Total Organisms (Confirmed)**	**0**	**0**	**47**	**7**	**2**	**0**	**2**	**1**	**1**	**3**	**15**	**41**
Total Observations	**Total Observations**	**0**	**0**	**51**	**7**	**2**	**0**	**2**	**1**	**2**	**3**	**15**	**41**
Shannon's Diversity		**NA**	**NA**	**1.9**	**1.3**	**0.0**	**NA**	**0.0**	**0.0**	**0.0**	**0.6**	**1.0**	**0.6**

Common Name	Lowest Taxonomic Level	46	47	48	49	50	51	52	53	54	55	56	57
Vertebrate													
eel, unidentified	Anguilliformes					1				1			
fish, unidentified	Chordata	3		1		3	2	1		2	1		
flounder, summer	*Paralichthys dentatus*												
pinfish	*Lagodon rhomboides*												
scup	*Stenotomus chrysops*												
sea bass, black	*Centropristis striata*				2	1		2	2		2	1	
sea robin, northern	*Prionotus carolinus*		1		5	2	8		4	3	1	1	3
sea robin, unidentified	*Prionotus*								3				
sheepshead	*Archosargus probatocephalus*												
skate	Rajidae							1			1		
skate, clearnose	*Raja eglanteria*					1	1						
skate, egg case	Rajidae												
skate, little	*Leucoraja erinacea*												
skate, little or winter	*Leucoraja*					1							
skate, winter	*Leucoraja ocellata*				2								
Invertebrate													
anemone, burrowing	Anthozoa		73		27	23		37	163	29			
anenome	Actinaria	3											
arthropod, unidentified	Arthropoda						2			2	4		1
astarte	*Astarte*	5					1						
clam, razor	*Ensis leei*	1				1	3						
clam, surf	*Spisula solidissima*	1				2	1						
crab, blue	*Callinectes sapidus*												
crab, cancer	*Cancer*							2			4		
crab, hermit	*Pagurus*	2							1				
crab, lady	*Ovalipes ocellatus*												
crab, portunid	Portunidae												
crab, spider	*Libnia*										1		
lobster, American	*Homarus americanus*	1											
mollusc, unidentified	Mollusca												1
moon snail	Naticidae	2											
moon snail, egg case	Naticidae		9	1		1							
scallop, sea	*Placopecten magellanicus*												
sea cucumber, unidentified	Holothuroidea								1				
sea pen	Pennatulacea												
sea star, common or forbes	*Asterias*			1									
sea star, gray	*Ludia clathrata*												
sea star, unidentified	Asteroidea										1		
sea urchin	Echinoidea			17		2	1						
shrimp, mantis	*Squilla empusa*												
squid, unidentified	Cephalopoda												
whelk, unidentified	Melongenidae									1			
Other													
object, unidentified	object, unidentified												
debris, anthropogenic	debris, anthropogenic	1								1			
debris, fishing gear	debris, fishing gear												
Total Organisms (Confirmed)	**Total Organisms (Confirmed)**	**18**	**83**	**20**	**36**	**38**	**19**	**43**	**174**	**38**	**15**	**2**	**5**
Total Observations	**Total Observations**	**19**	**83**	**20**	**36**	**38**	**19**	**43**	**174**	**39**	**15**	**2**	**5**
Shannon's Diversity		**1.9**	**0.4**	**0.6**	**0.8**	**1.5**	**1.7**	**0.6**	**0.3**	**0.9**	**1.9**	**0.7**	**1.0**

Common Name	Lowest Taxonomic Level	58	59	60	61	62	63	64	65	66	67	68	69
Vertebrate													
eel, unidentified	Anguilliformes												
fish, unidentified	Chordata			2	1					2	1	1	1
flounder, summer	*Paralichthys dentatus*												
pinfish	*Lagodon rhomboides*												
scup	*Stenotomus chrysops*												
sea bass, black	*Centropristis striata*			2	24						1		
sea robin, northern	*Prionotus carolinus*			4			5	1	1	2	3	3	
sea robin, unidentified	*Prionotus*							1					
sheepshead	*Archosargus probatocephalus*												
skate	Rajidae												
skate, clearnose	*Raja eglanteria*				2								
skate, egg case	Rajidae											43	
skate, little	*Leucoraja erinacea*												
skate, little or winter	*Leucoraja*			1									1
skate, winter	*Leucoraja ocellata*												
Invertebrate													
anemone, burrowing	Anthozoa	3	3	4		1	1	1	4	6			
anenome	Actinaria												
arthropod, unidentified	Arthropoda						1				1		1
astarte	*Astarte*												
clam, razor	*Ensis leei*					1				1	1		
clam, surf	*Spisula solidissima*			2		1							1
crab, blue	*Callinectes sapidus*												
crab, cancer	*Cancer*	5	1					1					
crab, hermit	*Pagurus*												
crab, lady	*Ovalipes ocellatus*												
crab, portunid	Portunidae												
crab, spider	*Libnia*												
lobster, American	*Homarus americanus*												
mollusc, unidentified	Mollusca												
moon snail	Naticidae												
moon snail, egg case	Naticidae			2						1			
scallop, sea	*Placopecten magellanicus*												
sea cucumber, unidentified	Holothuroidea				1								
sea pen	Pennatulacea												
sea star, common or forbes	*Asterias*				108					1			
sea star, gray	*Ludia clathrata*												
sea star, unidentified	Asteroidea							2				16	
sea urchin	Echinoidea										3		1
shrimp, mantis	*Squilla empusa*												
squid, unidentified	Cephalopoda												
whelk, unidentified	Melongenidae												
Other													
object, unidentified	object, unidentified												
debris, anthropogenic	debris, anthropogenic												
debris, fishing gear	debris, fishing gear												
Total Organisms (Confirmed)	**Total Organisms (Confirmed)**	**8**	**4**	**17**	**136**	**3**	**7**	**6**	**5**	**13**	**10**	**63**	**5**
Total Observations	**Total Observations**	**8**	**4**	**17**	**136**	**3**	**7**	**6**	**5**	**13**	**10**	**63**	**5**
Shannon's Diversity		**0.7**	**0.6**	**1.9**	**0.6**	**1.1**	**0.8**	**1.6**	**0.5**	**1.5**	**1.6**	**0.8**	**1.5**

Common Name	Lowest Taxonomic Level	70	71	72	73	74	75	76	77	78	79	80	81
Vertebrate													
eel, unidentified	Anguilliformes												
fish, unidentified	Chordata		6	1	9	3		3		1			
flounder, summer	*Paralichthys dentatus*												
pinfish	*Lagodon rhomboides*												
scup	*Stenotomus chrysops*												
sea bass, black	*Centropristis striata*		3										
sea robin, northern	*Prionotus carolinus*		1	2	2	9	2	6	2	5	25	2	23
sea robin, unidentified	*Prionotus*												2
sheepshead	*Archosargus probatocephalus*												1
skate	Rajidae												
skate, clearnose	*Raja eglanteria*												
skate, egg case	Rajidae	5		3	1	1			8	16		1	30
skate, little	*Leucoraja erinacea*												
skate, little or winter	*Leucoraja*												
skate, winter	*Leucoraja ocellata*												1
Invertebrate													
anemone, burrowing	Anthozoa			2	10								5
anenome	Actinaria												
arthropod, unidentified	Arthropoda			1	1			3					
astarte	*Astarte*		1	1							1		2
clam, razor	*Ensis leei*			1		1		3					
clam, surf	*Spisula solidissima*	1		5		5							
crab, blue	*Callinectes sapidus*											1	
crab, cancer	*Cancer*							1				2	
crab, hermit	*Pagurus*		2		1			2					
crab, lady	*Ovalipes ocellatus*												1
crab, portunid	Portunidae							1					
crab, spider	*Libnia*												
lobster, American	*Homarus americanus*												
mollusc, unidentified	Mollusca												
moon snail	Naticidae												
moon snail, egg case	Naticidae					1		4	1				
scallop, sea	*Placopecten magellanicus*									7			
sea cucumber, unidentified	Holothuroidea												
sea pen	Pennatulacea				1								
sea star, common or forbes	*Asterias*				1	1		1				1	2
sea star, gray	*Ludia clathrata*												
sea star, unidentified	Asteroidea			1					1				
sea urchin	Echinoidea				2	1				11			
shrimp, mantis	*Squilla empusa*												
squid, unidentified	Cephalopoda										1		3
whelk, unidentified	Melongenidae					1							
Other													
object, unidentified	object, unidentified								1				1
debris, anthropogenic	debris, anthropogenic		2	1									
debris, fishing gear	debris, fishing gear		1										
Total Organisms (Confirmed)	**Total Organisms (Confirmed)**	**6**	**13**	**17**	**28**	**23**	**2**	**24**	**12**	**40**	**27**	**7**	**70**
Total Observations	**Total Observations**	**6**	**16**	**18**	**28**	**23**	**2**	**24**	**13**	**40**	**27**	**7**	**71**
Shannon's Diversity		**0.5**	**1.4**	**2**	**1.7**	**1.8**	**0.0**	**2.0**	**1.0**	**1.4**	**0.3**	**1.5**	**1.5**

Common Name	Lowest Taxonomic Level	82	83	84	85	86	87	88	89	Total
Vertebrate										
eel, unidentified	Anguilliformes									3
fish, unidentified	Chordata				1		1			65
flounder, summer	*Paralichthys dentatus*									1
pinfish	*Lagodon rhomboides*									1
scup	*Stenotomus chrysops*						1			1
sea bass, black	*Centropristis striata*	1				1	1		3	47
sea robin, northern	*Prionotus carolinus*	21	22	5	20	6	12	9	1	233
sea robin, unidentified	*Prionotus*									6
sheepshead	*Archosargus probatocephalus*									1
skate	Rajidae									2
skate, clearnose	*Raja eglanteria*								1	6
skate, egg case	Rajidae	32	10	2	9	10	2	2		178
skate, little	*Leucoraja erinacea*									2
skate, little or winter	*Leucoraja*									3
skate, winter	*Leucoraja ocellata*								4	7
Invertebrate										
anemone, burrowing	Anthozoa	10	9	2					87	537
anenome	Actinaria		6				1	1		12
arthropod, unidentified	Arthropoda		1							24
astarte	*Astarte*	1	8		5	5	1			50
clam, razor	*Ensis leei*		3		3					30
clam, surf	*Spisula solidissima*		2				2	1		41
crab, blue	*Callinectes sapidus*									1
crab, cancer	*Cancer*	5					1			25
crab, hermit	*Pagurus*				1		2			14
crab, lady	*Ovalipes ocellatus*									1
crab, portunid	Portunidae		1					2		4
crab, spider	*Libnia*									7
lobster, American	*Homarus americanus*									3
mollusc, unidentified	Mollusca									1
moon snail	Naticidae						1			7
moon snail, egg case	Naticidae	1		1						30
scallop, sea	*Placopecten magellanicus*	3	5			1	9	1		28
sea cucumber, unidentified	Holothuroidea									2
sea pen	Pennatulacea		3				1			7
sea star, common or forbes	*Asterias*	2	1	1	14	12	2	5		154
sea star, gray	*Ludia clathrata*				2					2
sea star, unidentified	Asteroidea				1	3				26
sea urchin	Echinoidea	4		4	5		2	5		83
shrimp, mantis	*Squilla empusa*		1							1
squid, unidentified	Cephalopoda			1	1					8
whelk, unidentified	Melongenidae		2							4
Other										
object, unidentified	object, unidentified	2							1	7
debris, anthropogenic	debris, anthropogenic		1							9
debris, fishing gear	debris, fishing gear									2
Total Organisms (Confirmed)	**Total Organisms (Confirmed)**	**80**	**74**	**16**	**62**	**38**	**39**	**26**	**96**	**1658**
Total Observations	**Total Observations**	**82**	**75**	**16**	**62**	**38**	**39**	**26**	**97**	**1676**
Shannon's Diversity		**1.7**	**2.2**	**1.7**	**1.9**	**1.7**	**2.2**	**1.8**	**0.4**	

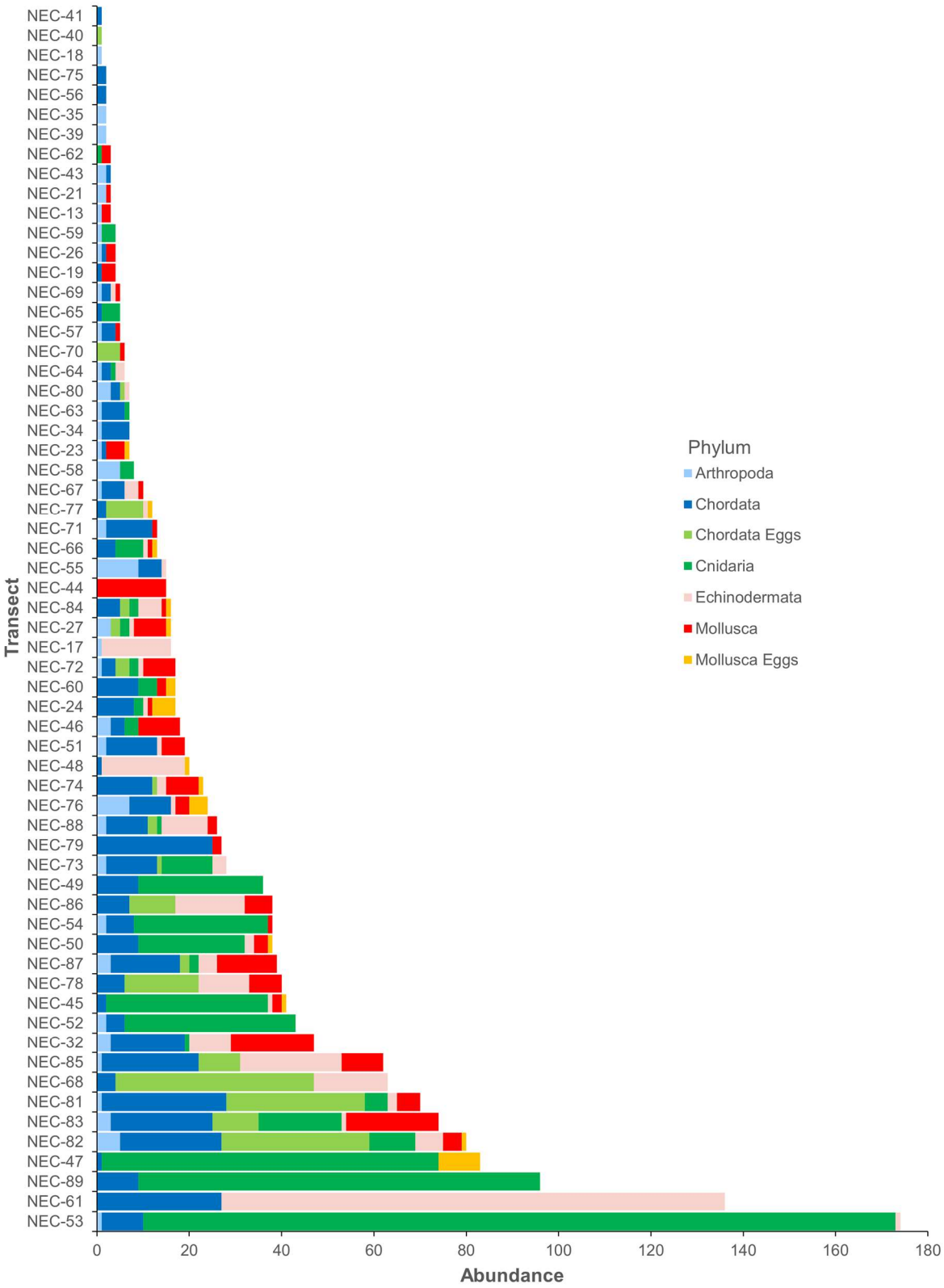


Figure 3-77. Distribution of enumerated organisms larger than 2.5 cm aggregated by phylum within the Northern ECC.

[1] Organisms not identified to the level of phylum or smaller than 2.5 cm were excluded. Eggs were broken out into corresponding taxonomic groupings. See text for complete explanation of which species were quantified by enumeration versus by percent of bottom cover.

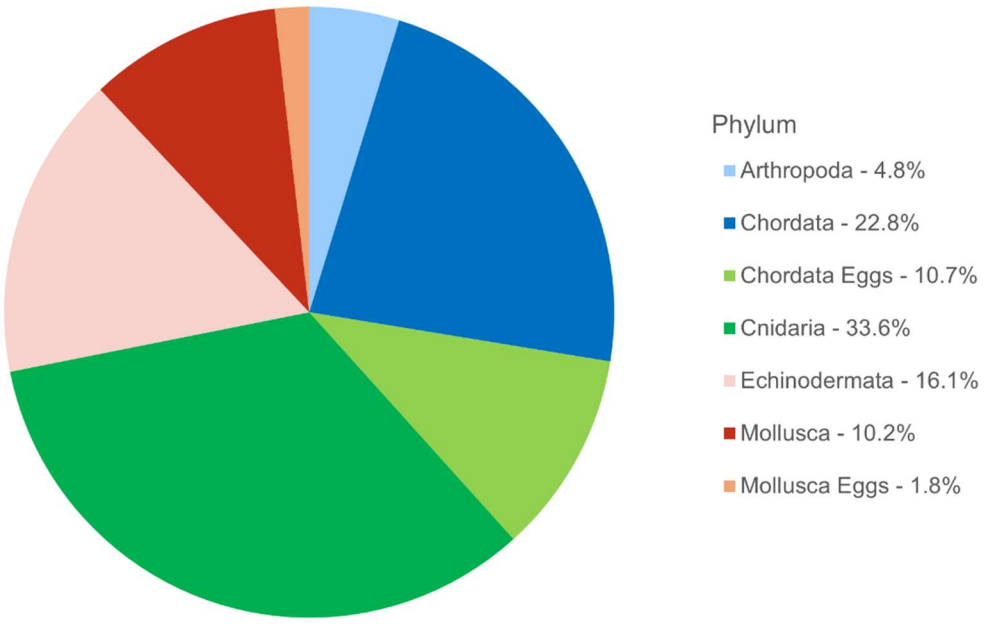


Figure 3-78. Percent composition of enumerated organisms larger than 2.5 cm aggregated by phylum within the Northern ECC.

[1] Organisms not identified to the level of phylum or smaller than 2.5 cm were excluded. Eggs were broken out into corresponding taxonomic groupings.

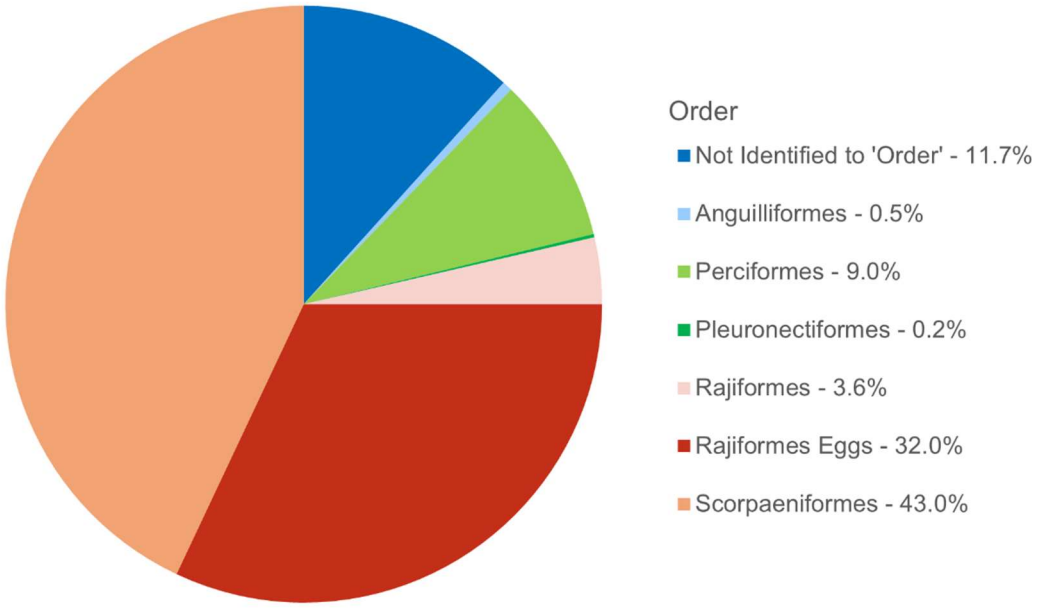


Figure 3-79. Percent composition of enumerated vertebrates (phylum Chordata) larger than 2.5 cm aggregated by order within the Northern ECC.

[1] Organisms not identified as phylum “Chordata” or smaller than 2.5 cm were excluded. Eggs were broken out into corresponding taxonomic groupings.

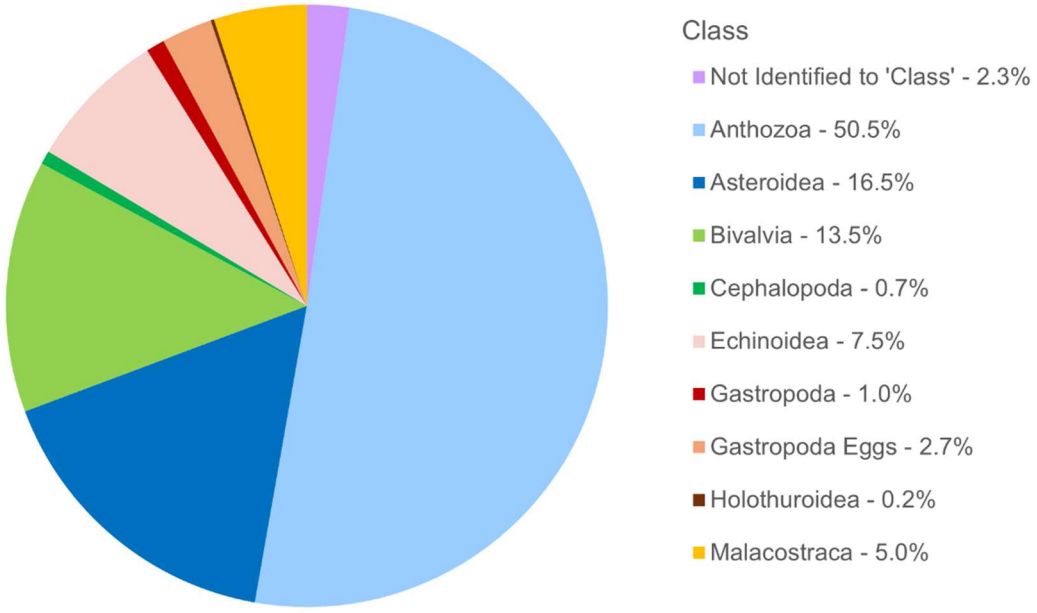


Figure 3-80. Percent composition of enumerated invertebrates larger than 2.5 cm aggregated by class within the Northern ECC.

[1] Organisms not identified to the level of class or smaller than 2.5 cm were excluded. Eggs were broken out into corresponding taxonomic groupings.

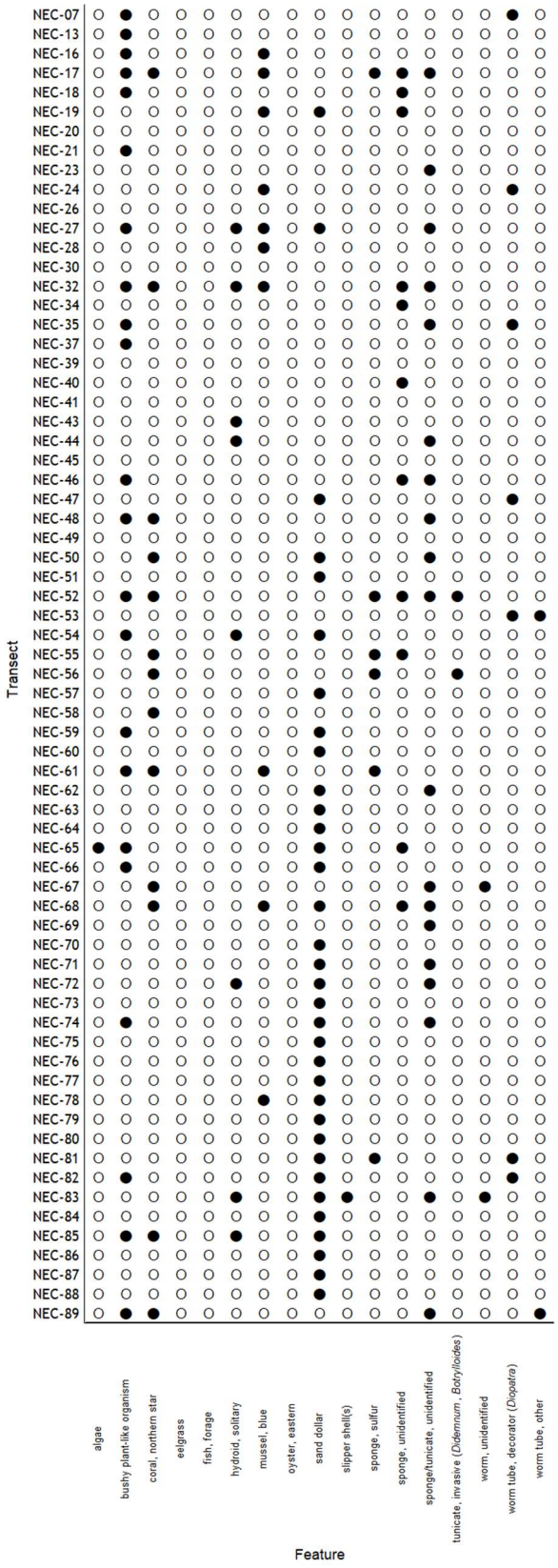


Figure 3-81. Presence (black) or absence (white) of important features in each analyzed video transect within the Northern ECC. These data only include features that were marked as present or absent during video review and not enumerated.

Figure 3-82. Northern sea robin (*Prionotus carolinus*) NEC-82

Figure 3-83. Black sea bass (*Centropristis striata*) NEC-82

Figure 3-84. Clearnose Skate (*Raja eglanteria*) NEC-89

Figure 3-85. Skate egg case cluster NEC-81

Figure 3-86. Unidentified squid NEC-81

Figure 3-87. Common or Forbes sea star (*Asterias* sp.) and sand dollars NEC-85

Figure 3-88. Spider Crab (*Libinia emarginata*) NEC-55

Figure 3-89. Decorator Worm Tubes (*Diopatra*) and sand dollars NEC-81

Figure 3-90. Blue Mussel bed NEC-32

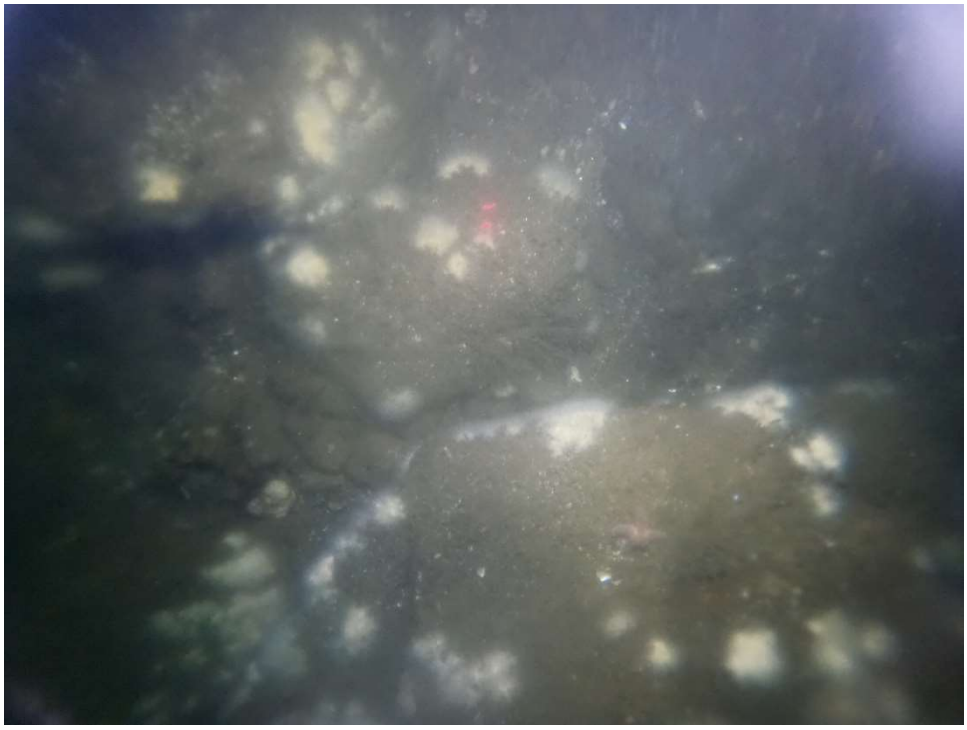


Figure 3-91. Northern star coral colonies NEC-61

Figure 3-92. Sea urchins and orange sheath tunicates NEC-32

Figure 3-93. Anthropogenic debris NEC-71

3.2.3.2 Percent Cover

The following section summarizes the results of the percent cover analysis of still images collected during the underwater towed video survey of the Northern ECC using a dedicated stills camera. A total of 730 m^2 of seafloor was analyzed by still images in the Northern ECC (Table 3-41). The substrate group with the highest percent cover was sand/mud, composing 74% (541 m^2) of the total transect area analyzed through still images. Transect NEC-28 had the highest sand/mud coverage at 99.95%, while NEC-17 had the lowest sand/mud cover at 25%. Twenty transects had greater than 90% sand/mud coverage, accounting for 146 m^2 of sand/mud in the Northern ECC. Transects NEC-55, 65, and 79 had the largest areas classified as sand/mud at >20 m^2. Transect NEC-55 had the highest area sampled in the region (43.5 m^2) and was composed of 59% sand/mud, 22% gravel, 15% biogenic shell, and 5% flora/fauna.

Gravel cover (boulder, cobble, and pebble/granule sizes) composed 9% (67 m^2) of the total area analyzed through transect still images. Gravel cover composed ≥ 5% of the substrate in 28 out of 68 transects with three transects having greater than 30% gravel coverage: NEC-56 (47%, 5.5 m^2), NEC-80 (45%, 3.7 m^2), and NEC-87 (39%, 7.1 m^2). Sixteen transects had no gravel present in the analyzed area. Boulders (256 mm to < 4,096 mm) and cobbles (> 64 mm to 256 mm) each accounted for less than 1% of all substrate types recorded within the Northern ECC transects. Boulders were observed in 35 images across 8 transects with a majority occurring in NEC-55 while cobbles were seen in 91 images across 17 transects.

Biogenic shell cover accounted for 9% (66 m^2) of the total surveyed area and was present in all transects except for NEC-37. In the 67 transects biogenic shell cover was present, coverage ranged from 0.05% in NEC-28 to 56.5% in NEC-17. Across all Northern ECC transects, the average biogenic shell coverage was 8.6% per transect. Additionally, substrate from organic woody debris sources was observed in transects NEC-16 and NEC-51 accounting for 0.01% (0.12 m^2) of the total bottom cover analyzed. Lastly, anthropogenic debris was observed in NEC-69 and NEC-76, appearing as wood in NEC-69 and plastic trash in NEC-76, accounting for <0.01% (0.02 m^2) of the total area (Figure 3-62).

The total area of biological elements (i.e., presence or evidence of flora or fauna) sampled in the Northern ECC was 55 m^2 and accounted for 8% of the bottom cover (Table 3-41). The most common biological elements (Table 3-42) were sand dollars accounting for 49% (27 m^2) of the total flora/fauna observed, hydroids (26%, 15 m^2), and blue mussels (4%, 8 m^2). Other biological elements encountered included the northern star coral (4%, 2 m^2) and invasive tunicates –a grouping with both the carpet sea squirt, *Didemnum vexillum*, and orange-sheath tunicate, *Botrylloides violaceus* (2%, 1 m^2). Biological elements making up 1% or less of the flora/fauna cover included burrowing anemones, gastropods (moon snails, oyster drills, UID small sea snails), hermit crabs, encrusting organisms (sponges, UID tunicates, and UID encrusting organisms), infaunal structures (worm tubes), inferred fauna (skate and moon snail egg cases), sea scallops, sea stars, urchins, and mobile megafauna. The mobile megafauna category included observations

of the sea robin, black sea bass, clearnose skate, and cancer/portunid crabs. There were no observations of eelgrass or algae in the Northern ECC.

Both NMFS and BOEM guidelines recommend identifying sessile taxa of both economic and ecologic value that are vulnerable to project impacts. Vulnerable taxa from these guidelines include sponges, anemones, bryozoans, hydrozoans, corals, tunicates, and bivalves. Additionally, the presence of macroalgae, epifauna, and/or infauna/emergent taxa should be noted. Under these guidelines, the percent cover of different biological elements (i.e., flora/fauna) observed within still images were calculated for each transect. The Northern ECC was characterized by boulder fields in several transects. Most transects with boulders (NEC-17, 46, 48, 52, 55, 56, 61, 67, 68, 69, and 89) had complex habitats of northern star coral, invasive tunicates, hydroids, and sponges. Combined, these complex habitats accounted for 18.7 m^2 or 34% of the total area with flora/fauna cover. These categories may be considered emergent taxa or structures that add complexity to the seafloor.

Table 3-41. Area and percent coverage of substrate type per total transect area summarized from still images within the Northern ECC.

Transect	Area Analyzed (m^2)	Boulder (%)	Cobble (%)	Pebble/ Granule (%)	All Gravel Combined (%)	Sand/Mud Substrate (%)	Shell Cover (%)[1]	Woody debris (%)	Anthropo-genic (%)[2]	Flora/Fauna Cover (%)[3]
NEC-07	2.77	0	0	0.32	0.32	95.28	4.28	0	0	0.13
NEC-13	1.25	0	0.97	0.9	1.87	72.92	20.53	0	0	4.68
NEC-16	6.78	0	0.77	7.74	8.51	41.09	48.1	0.09	0	2.21
NEC-17	6.3	0.23	0.7	8.54	9.47	25.17	56.48	0	0	8.88
NEC-18	2.92	0	0	1.44	1.44	75.24	23.33	0	0	0
NEC-19	15.78	0	0	7.55	7.55	80.35	12.09	0	0	0
NEC-20	4.57	0	0	0	0	99.63	0.37	0	0	0
NEC-21	16.56	0	0	3.79	3.79	38.73	17.88	0	0	39.6
NEC-23	6.83	0	0	10.88	10.88	86.65	2.25	0	0	0.22
NEC-24	14.45	0	0	4.19	4.19	92.34	2.93	0	0	0.54
NEC-26	1.8	0	0	10.8	10.8	87.78	1.35	0	0	0.08
NEC-27	7	0	0	0	0	94.97	4.7	0	0	0.33
NEC-28	8.07	0	0	0	0	99.95	0.05	0	0	0
NEC-30	5.45	0	0	0	0	89.29	10.71	0	0	0
NEC-32	11.17	3.36	4.2	1.69	9.25	53.54	26.79	0	0	10.42
NEC-34	3.78	0	0	0.51	0.51	93.38	2.55	0	0	3.56
NEC-35	5.2	0	0	0	0	93.68	3.83	0	0	2.48
NEC-37	2.48	0	0	0	0	76.35	0	0	0	23.65
NEC-39	5.75	0	0	4.2	4.2	88.74	6.87	0	0	0.19
NEC-40	5.57	0	0	0	0	98.31	1.69	0	0	0
NEC-41	1.44	0	0	0	0	99.72	0.28	0	0	0
NEC-43	3.65	0	0	0	0	97.68	2.32	0	0	0
NEC-44	3.59	0	0	0.13	0.13	98.21	1.54	0	0	0.12
NEC-45	7.83	0	0	1.95	1.95	95.74	1.7	0	0	0.62
NEC-46	6.9	1.24	3.62	14.62	19.48	68.81	7.28	0	0	4.43
NEC-47	5.46	0	0	0.08	0.08	96.69	0.81	0	0	2.42
NEC-48	16.18	0	0.45	2.66	3.11	39.99	8.12	0	0	48.78
NEC-49	14.27	0	0	4.19	4.19	77.46	16.95	0	0	1.4
NEC-50	11.4	0	0	5.17	5.17	78.19	16.4	0	0	0.23
NEC-51	11.1	0	0	5.17	5.17	73.12	19.35	1	0	1.36
NEC-52	17.04	3.27	2.86	1.6	7.73	57.74	5.7	0	0	28.82
NEC-53	5.09	0	0	0.44	0.44	89.5	3.21	0	0	6.85
NEC-54	5.66	0	0	0.17	0.17	97.07	2.48	0	0	0.27
NEC-55	43.54	9.34	4.47	8.25	22.06	58.56	14.74	0	0	4.64
NEC-56	11.7	0	2.52	44.6	47.12	40.77	5.33	0	0	6.78
NEC-57	7.67	0	0	0.53	0.53	93.74	3.06	0	0	2.66
NEC-58	2.74	0	0	0	0	99.54	0.46	0	0	0
NEC-59	10.59	0	0	4.49	4.49	84.43	10.52	0	0	0.56
NEC-60	13.92	0	0	3.32	3.32	86.56	8.59	0	0	1.53
NEC-61	14.8	2.65	5.19	13.31	21.15	63.01	13.2	0	0	2.64
NEC-62	19.39	0	0	0	0	98.08	1.84	0	0	0.08
NEC-63	15.96	0	0	13.98	13.98	76.72	9.02	0	0	0.28
NEC-64	15.57	0	0	0.97	0.97	78.21	10.85	0	0	9.97
NEC-65	23.41	0	0	5.44	5.44	87.53	6.95	0	0	0.07
NEC-66	14.57	0	0.13	7.99	8.12	82.39	9.42	0	0	0.07
NEC-67	15.43	0	0.09	3.19	3.29	81.35	13.69	0	0	1.67

Transect	Area Analyzed (m^2)	Boulder (%)	Cobble (%)	Pebble/ Granule (%)	All Gravel Combined (%)	Sand/Mud Substrate (%)	Shell Cover (%)[1]	Woody debris (%)	Anthropo-genic (%)[2]	Flora/Fauna Cover (%)[3]
NEC-68	6.68	0	0	9.3	9.3	81.67	6.06	0	0	2.97
NEC-69	15.77	5.02	2.01	9.32	16.35	72.71	6.82	0	0.05	4.07
NEC-70	11.71	0	0	0	0	91.93	1.77	0	0	6.3
NEC-71	9.41	0	0	0	0	86.58	1.94	0	0	11.48
NEC-72	8.63	0	0	0.64	0.64	77.39	7.17	0	0	14.79
NEC-73	4.44	0	0	3.56	3.56	87.17	2.66	0	0	6.61
NEC-74	14.09	0	0	0.17	0.17	82.99	3.16	0	0	13.68
NEC-75	16.34	0	0	0	0	86.25	1.76	0	0	12
NEC-76	18.02	0	0	1.82	1.82	59.14	10.11	0	0.08	28.86
NEC-77	15.56	0	0	0.03	0.03	80.59	2.77	0	0	16.62
NEC-78	14.56	0	0	26.08	26.08	56.71	7.3	0	0	9.9
NEC-79	22.33	0	0	0	0	96.13	1.25	0	0	2.62
NEC-80	8.2	0	0	45.14	45.14	43.66	3.94	0	0	7.27
NEC-81	9.6	0	0	0	0	92.68	1.36	0	0	5.96
NEC-82	9.95	0	0	11.37	11.37	74.9	10.38	0	0	3.36
NEC-83	12.8	0	0.07	25.34	25.41	67.49	6.3	0	0	0.8
NEC-84	8.86	0	0.09	18.74	18.83	62.09	17.88	0	0	1.19
NEC-85	12.76	0	0	27.12	27.12	51.53	18.25	0	0	3.11
NEC-86	14.6	0	0	6.26	6.26	58.87	4.94	0	0	29.93
NEC-87	18.19	0	0.84	38.42	39.26	45.35	15.4	0	0	0
NEC-88	14.61	0	0	10.8	10.8	70.44	7.37	0	0	11.38
NEC-89	9.64	0.32	0.64	13.7	14.66	78.64	3.95	0	0	2.76
Total Percent NEC (%)[4]	**100**	**0.86**	**0.68**	**7.69**	**9.24**	**74.09**	**9.06**	**0.01**	**<0.01**	**7.59**
Total Area in NEC (m^2)[5]	**730.14**	**6.31**	**4.98**	**56.13**	**67.43**	**540.98**	**66.18**	**0.12**	**0.02**	**55.42**

[1] Biogenic shell cover includes fragments of shell or empty shell of once living organism.

[2] Anthropogenic material includes construction materials, metal, and trash. Rope was present in one transect.

[3] Biological elements (i.e. flora/fauna) includes blue mussel, sand dollars, infaunal structures, mobile megafauna, and inferred fauna.

[4] Total Percentage in NEC (%) provides a summary of the total percent cover of each substrate type across all transects.

[5] Total Area in NEC (m^2) provides a summary of the total area of each substrate type across all transects.

Table 3-42. Area and percent coverage of different biological elements (i.e., flora/fauna) observed within still images from the 68 video transects in the Northern ECC.

Transect	Flora/ Fauna Area (m^2)	Blue Mussel (%)	Burrowing Anemone (%)	Gastropod (%)	Hermit Crab(%)	Encrusting Org (%)	Hydroid(%)	Infaunal Structures (%)	Inferred Fauna (%)	Invasive Tunciate (%)	Mobile Megafauna (%)	Northern Star Coral (%)	Sand Dollar (%)	Sea Scallop (%)	Sea Star (%)	Urchin (%)
NEC-07	0.004	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0
NEC-13	0.059	0	0	0	0	0	99.60	0	0	0	0	0	0	0	0	0
NEC-16	0.150	99.95	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEC-17	0.559	1.92	2.38	0	0	0	93.68	0	0	0	0	0	0.99	0	0	1.08
NEC-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEC-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEC-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEC-21	6.558	99.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEC-23	0.015	0	0	36.19	0	0	63.84	0	0	0	0	0	0	0	0	0
NEC-24	0.078	0	0	0	0	0	0	59.95	0	0	39.76	0	0	0	0	0
NEC-26	0.001	0	0	0	0	0	0	100.00	0	0	0	0	0	0	0	0
NEC-27	0.023	100.43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEC-28	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEC-30	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEC-32	1.164	64.60	0	0	0	14.44	1.75	0	0	18.45	0	0	0	0	0	0.80
NEC-34	0.135	0	0	0	0	0	62.99	5.29	0	0	31.48	0	0	0	0	0
NEC-35	0.129	0	0	0	0	10.82	59.73	29.61	0	0	0	0	0	0	0	0
NEC-37	0.587	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0
NEC-39	0.011	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0
NEC-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEC-41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEC-43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEC-44	0.004	0	0	35.85	0	0	0	0	0	0	0	0	64.20	0	0	0
NEC-45	0.049	0	67.10	0	0	0	25.04	0	7.45	0	0	0	0.0	0	0	0
NEC-46	0.306	0	2.75	0	0	0	85.87	0	0	0	6.07	5.34	0.0	0	0	0
NEC-47	0.132	0	11.99	0	0	0	0	20.90	0	0	65.18	0	1.96	0	0	0
NEC-48	7.893	0	0	0	0	1.31	90.26	0	0	6.06	0	1.84	0	0	0.19	0.33
NEC-49	0.200	0	2.40	0	0	0	0	0	0	0	97.25	0	0	0	0	0
NEC-50	0.026	0	28.87	0	0	0	0	0	0	0	39.43	0	0	0	0	31.68
NEC-51	0.151	0	0	0	0	0	0	0	0	0	10.17	0	89.74	0	0	0
NEC-52	4.911	0	0.37	0	0	2.01	92.13	0	0	0	0	5.34	0	0	0	0.16
NEC-53	0.349	0	0	0	0	0	2.44	95.83	0	0	1.86	0	0	0	0	0
NEC-54	0.015	0	44.50	0	0	0	0	55.53	0	0	0.00	0	0	0	0	0
NEC-55	2.020	0	0	0	0	0.70	4.31	0	0.92	15.09	1.97	65.55	9.84	0	1.67	0
NEC-56	0.793	0	0	0	0	0	93.49	0	0	0	1.75	4.72	0	0	0	0
NEC-57	0.204	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0
NEC-58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEC-59	0.059	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0
NEC-60	0.213	0	0	0	0	0	0	0	0	0	0	0	99.86	0	0	0
NEC-61	0.391	3	0	0	0	0	12.61	0	0	31.08	7.27	32.78	0	0	12.92	0
NEC-62	0.015	0	0	0	0	0	0	100.03	0	0	0	0	0	0	0	0
NEC-63	0.045	0	0	0	0	0	0	0	0	0	73.38	0	26.42	0	0	0
NEC-64	1.552	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0
NEC-65	0.017	0	0	0	43.16	0	0	0	0	0	0	0	56.85	0	0	0
NEC-66	0.010	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0
NEC-67	0.258	0	0	0	0	10.60	89.59	0	0	0	0	0	0	0	0	0
NEC-68	0.198	0	0	0	0	0	48.20	0	3.10	0	0	3.10	45.39	0	0	0
NEC-69	0.642	0	0	0	0.76	9.30	1.82	3.51	0	19.68	0	64.85	0	0	0	0
NEC-70	0.738	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0
NEC-71	1.080	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0
NEC-72	1.276	0	0	0	0	0	0	0	0	0	0	0	99.98	0	0	0
NEC-73	0.293	0	1	0	0	0	1.20	0	0	0	0	0	97.45	0	0	0

Transect	Flora/ Fauna Area (m^2)	Blue Mussel (%)	Burrowing Anemone (%)	Gastropod (%)	Hermit Crab(%)	Encrusting Org (%)	Hydroid(%)	Infaunal Structures (%)	Inferred Fauna (%)	Invasive Tunciate (%)	Mobile Megafauna (%)	Northern Star Coral (%)	Sand Dollar (%)	Sea Scallop (%)	Sea Star (%)	Urchin (%)
NEC-74	1.928	0	0	0	0	0	0	0	0	0	0	0	99.96	0	0	0
NEC-75	1.961	0	0	0	0	0	0	0	0	0	0	0	99.96	0	0	0
NEC-76	5.201	0	0	0	0	0	0	0.37	0	0	0	0	99.65	0	0	0
NEC-77	2.586	0	0	0	0	0	0	0.0	1.48	0	0	0	98.52	0	0	0
NEC-78	1.441	0	0	0	0	0	0	1.64	1.82	0	0	0	89.69	4.71	0	2.18
NEC-79	0.585	0	0	0	0	0	0	0	0	0	17.60	0	82.44	0	0	0
NEC-80	0.596	0	0	0	0	0	0	0	0	0	1.33	0	98.62	0	0	0
NEC-81	0.572	0	0	0	0	0	0	0	0	0	2.41	0	97.52	0	0	0
NEC-82	0.331	0	0	0	0	0	0	0	0	0	4.95	0	95.05	0	0	0
NEC-83	0.102	0	12.37	54.61	0	20.66	0	0	0	0	12.37	0	0	0	0	0
NEC-84	0.105	0	46.90	0	0	0	3.69	0	0	0	8.40	0	0	7.52	26.39	7.05
NEC-85	0.397	0	0	0	0	0	0	0	0	0	4.31	0	94.25	0	1.48	0
NEC-86	4.370	0	0	0.20	0	0	0.13	0	0.29	0	0.35	0	98.86	0	0.19	0
NEC-87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NEC-88	1.663	0	0	0	0	0	0	0	0	0	2.84	0	97.16	0	0	0
NEC-89	0.266	0	37.60	0	0	0	30.89	25.16	0	0	0	6.37	0	0	0	0
Total F/F Percent NEC (%)[1]	**100**	4.00	0.49	0.13	0.04	**0.91**	26.36	1.10	0.19	2.25	1.37	4.25	48.79	0.14	0.25	0.17
Total F/F Area NEC (m^2)[2]	**55.41**	7.51	0.27	0.07	0.02	**0.51**	14.61	0.61	0.11	1.25	0.76	2.35	27.04	0.08	0.14	0.10

[1] Total Flora/Fauna Percent in NEC (%) provides a summary of the total percent cover per each biological element type in the Flora/Fauna area.

[2] Total Area in NEC (m^2) provides a summary of the total area per each biological element type in the Flora/Fauna area.

3.2.3.3 CMECS Classifications

Across the 68 transects in the Northern ECC, 1,682 still images were assigned a CMECS classification. The number of still images classified as geologic origin, unconsolidated, fine substrate of sand/mud size (< 2 mm, n=1,180) was far greater than any other CMECS group, comprising 466 m^2 of the analyzed area (Table 3-43, Figure 3-94). The sand/mud CMECS group is not considered complex under the NMFS guidelines (NMFS, 2021); thus, 70% of the area analyzed in the Northern ECC was classified as soft bottom habitat (i.e., not complex).

Complex habitats include areas with ≥ 5% of gravel-sized particles, dominated by biogenic origin substrates, or areas with a substantial amount of biological activity or presence. Under the NMFS guidelines (NMFS, 2021), 36% of the video survey area analyzed in the Northern ECC is considered complex. Habitats classified as gravel, which have ≥ 80% sediment particles of pebble/granule or cobble size, occurred in 13.5 m^2 of the Northern ECC area in 39 images across 13 transects (Table 3-43). Gravel mixes of pebble/granule with sand/mud (< 80% and ≥ 30% gravel) occurred in 95.4 m^2 of the Northern ECC area in 162 still images across 32 transects. Gravelly sand/mud (< 30% and ≥ 5% gravel) occurred in 140.3 m^2 of the Northern ECC area in 253 images across 8 transects.

Biogenic origin substrates present within the Northern ECC include shell hash with fragments of shell between 2 and 64 mm in size, shell rubble with fragments or whole shells that are larger than 64 mm, and images with biotic component only CMECS classifications. There were 48 still images across 8 transects surveyed along the Northern ECC that contained biogenic substrates, which covered over 15.1 m2 of the Northern ECC. Shells were also a frequent co-occurring substrate type, classified as a secondary CMECS group in 1,135 (67%) still images at various levels of cover density over 553 m^2 of the Northern ECC area (Figure 3-95, Table 3-43). Additionally, anthropogenic substrate was classified as a co-occurring substrate type in two still images.

The area of the biological elements recorded in the percent cover analysis was summarized to approximate the density of flora/fauna cover for each still image along a transect. Greater densities of flora/fauna suggest presence of potentially more complex habitat due to greater biological activity (e.g., burrows, megafauna) or occurrence of additional structure in the environment (e.g., infaunal structures, encrusting organisms, algae). There were 111 still images analyzed within the Northern ECC that contained moderate to complete amounts of flora/fauna coverage (> 30%; Figure 3-96) with 1,050 still images containing zero flora/fauna coverage.

Representative images of CMECS substrate types are in Figure 3-98 through Figure 3-105.

Table 3-43. The number of stills and the total area (m^2) classified to each CMECS substrate group combination for each of the 68 video transects in the Northern ECC.

Main and Co-Occurring CMECS Substrate Group Combinations	Number of Stills Classified to Group	Percent of Stills Classified to Group (%)	Area of Stills Classified to Group (m^2)	Percent of Area Classified to Group (%)
Biotic Component Only	2	0.12	0.45	0.06
Shell Hash – Gravel Mixes (B+C & S/M)	1	0.06	0.33	0.05
Shell Hash – Gravel Mixes (C+P/G & S/M)	3	0.18	0.77	0.11
Shell Hash – Gravel Mixes (P/G & S/M)	6	0.36	1.63	0.22
Shell Hash – Gravelly (S/M & P/G)	8	0.48	2.55	0.35
Shell Hash – Gravelly (S/M & C+P/G)	2	0.12	0.55	0.08
Shell Hash – Gravel (P/G)	1	0.06	0.21	0.03
Shell Hash – S/M	20	1.19	7.27	1.00
Shell Hash	2	0.12	0.45	0.06
Shell Rubble – S/M	2	0.12	0.60	0.08
Shell Rubble – Gravel Mixes (P/G & S/M)	1	0.06	0.24	0.03
Gravel – B & C	1	0.06	0.47	0.06
Gravel – B & C & P/G with shell hash	2	0.12	0.89	0.12
Gravel – C & P/G	1	0.06	0.98	0.13
Gravel – C & P/G with shell hash	3	0.18	0.95	0.13
Gravel - (P/G)	9	0.54	2.75	0.38

Main and Co-Occurring CMECS Substrate Group Combinations	Number of Stills Classified to Group	Percent of Stills Classified to Group (%)	Area of Stills Classified to Group (m^2)	Percent of Area Classified to Group (%)
Gravel - (P/G) with shell hash	22	1.31	7.11	0.97
Gravel - (P/G) with shell rubble	1	0.06	0.36	0.05
Gravel Mixes - S/M & C	1	0.06	0.45	0.06
Gravel Mixes – (B & S/M) with shell hash	1	0.06	0.28	0.04
Gravel Mixes - (B+C & S/M) with shell hash	1	0.06	2.33	0.32
Gravel Mixes – B+C+P/G & S/M	2	0.12	2.43	0.33
Gravel Mixes – (B+C+P/G & S/M) with shell hash	14	0.83	15.80	2.16
Gravel Mixes – B+P/G & S/M	1	0.06	0.58	0.08
Gravel Mixes – (B+P/G & S/M) with shell hash	1	0.06	2.27	0.31
Gravel Mixes – C+P/G & S/M	1	0.06	0.24	0.03
Gravel Mixes – (C+P/G & S/M) with shell hash	20	1.19	11.05	1.51
Gravel Mixes – (C+P/G & S/M) with shell rubble	7	0.42	5.68	0.78
Gravel Mixes – P/G & S/M	2	0.12	1.26	0.17
Gravel Mixes – (P/G & S/M) with shell hash	102	6.06	48.91	6.70
Gravel Mixes – (P/G & S/M) with shell rubble	9	0.54	4.15	0.57
Gravelly – S/M & B+C+P/G	1	0.06	0.77	0.11
Gravelly – (S/M & B+C+P/G) with shell hash	1	0.06	1.32	0.18
Gravelly – (S/M & B+C) with shell hash	3	0.18	8.01	1.10
Gravelly – (S/M & B+C) with shell rubble	1	0.06	0.24	0.03
Gravelly – (S/M & B+P/G) with shell hash	2	0.12	3.04	0.42
Gravelly – S/M & B	1	0.06	1.01	0.14
Gravelly – (S/M & B) with shell hash	2	0.12	3.87	0.53
Gravelly - (S/M & C) with shell hash	4	0.24	2.53	0.35
Gravelly – (S/M & C+P/G) with shell hash	19	1.13	9.63	1.32
Gravelly – (S/M & C+P/G) with shell rubble	1	0.06	1.08	0.15
Gravelly – S/M & P/G	5	0.30	1.95	0.27
Gravelly – (S/M & P/G) with shell hash	193	11.47	94.63	12.96
Gravelly – (S/M & P/G) with shell rubble	19	1.13	11.84	1.62
Gravelly – (S/M & P/G) with shell hash and trace anthropogenic substrate	1	0.06	0.39	0.05
S/M	474	28.18	149.35	20.45
S/M with shell hash	672	39.95	294.97	40.40
S/M with shell rubble	33	1.96	20.83	2.85
S/M with shell hash and trace anthropogenic substrate	1	0.06	0.69	0.09
Totals	**1682**	**100**	**730.14**	**100**

[1]Abbreviations are as follows: S/M = Sand/Mud, B = Boulder, C = Cobble, and P/G = Pebble/Granule.

Along with the percent cover analysis, all biological elements within a still were enumerated (as individuals, when applicable) to determine the dominant and co-occurring CMECS biotic component classifications and associated taxa for each still if applicable. Only the dominant biotic component is described in this report. The total number of stills with each classification per transect is shown in Figure 3-94. Of the 1,682 still images analyzed from video data surveyed in the Northern ECC, 804 still images were classified with a dominant biotic component. The most frequently classified dominant biotic component in still images from the Northern ECC transects was sand dollar beds, which was the classification for 443 stills in 31 transects. The second most classified dominant biotic component was the diverse colonizers classification. The diverse colonizers classification describes areas dominated by highly varied and diverse communities of mixed fauna that have attached to biotic or abiotic hard substrate. The common colonizing taxa for the Northern ECC included hydroids, northern star coral, boring sponge, sulphur sponge, and invasive tunicates. These taxa typically co-occurred in areas dominated by boulder substrate. NEC-21 was the only transect with the CMECS reef classification. NEC-21 was characterized by a boulder field followed by a dense aggregation of mussels reaching the abundance categorization of a reef. The entire transect was characterized by mussels in various abundances. The burrowing anemones biotic component was dominant in 60 stills across 19 transects, with a large proportion of stills classified in NEC-45, NEC-54 and NEC-84. The *Diopatra* bed (i.e., decorator worm) biotic component was dominant in 24 stills across 9 transects, with relatively large proportions of stills classified in NEC-23, NEC-35, and NEC-47. Of the 1,682 total stills analyzed across the video transects surveyed in the Northern ECC, 878 stills had no dominant biological elements present, with NEC-19, NEC-20, NEC-28, NEC-30, NEC-40, NEC-41, and NEC-43 have zero presence of biotic components (Figure 3-66).

The CMECS substrate and biotic component classifications for stills in each transect are mapped over benthic habitat polygons in figures provided in Appendix F and provided in an Excel database in Appendix G.

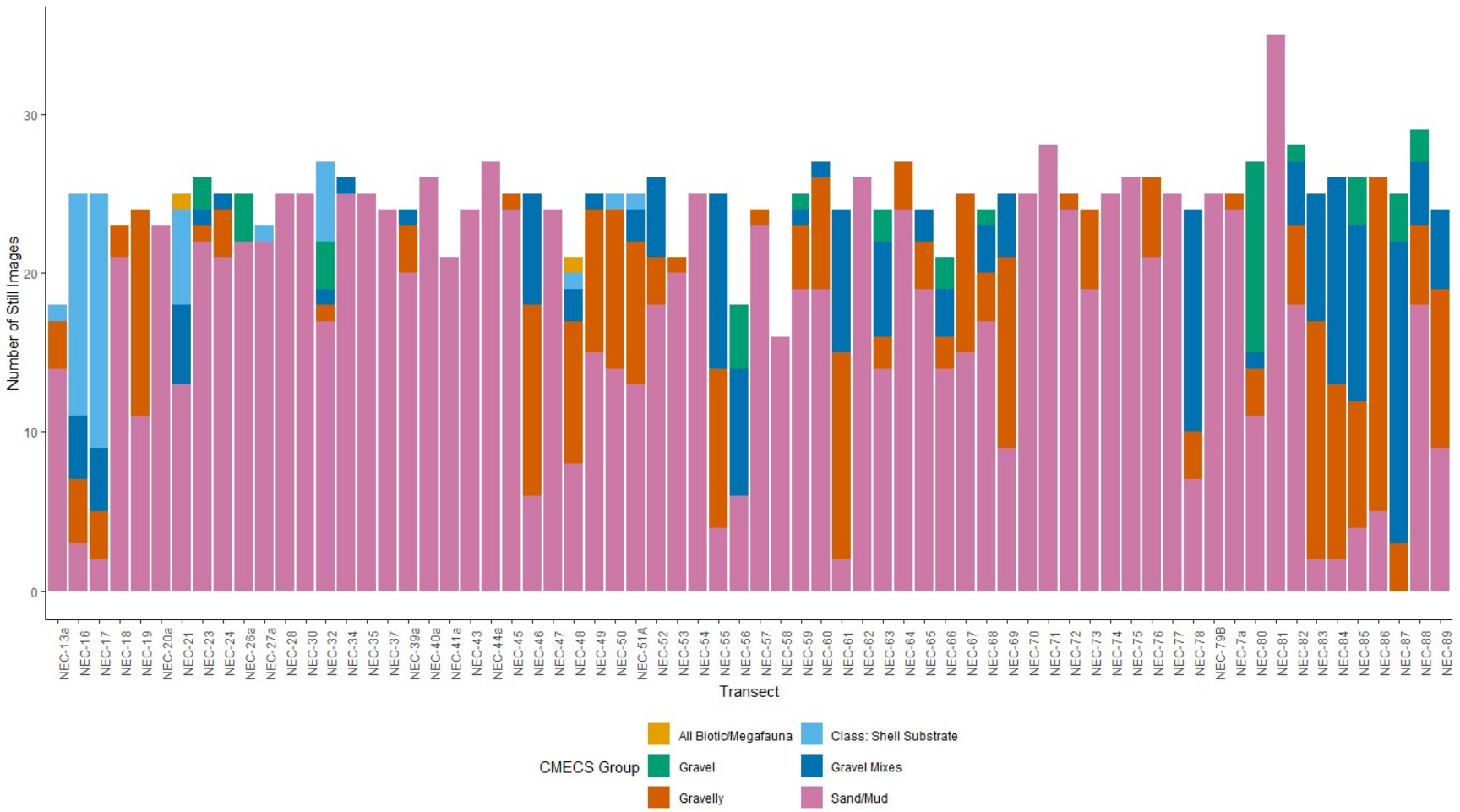


Figure 3-94. The number of still images classified to CMECS substrate component groups within the Northern ECC video transects.

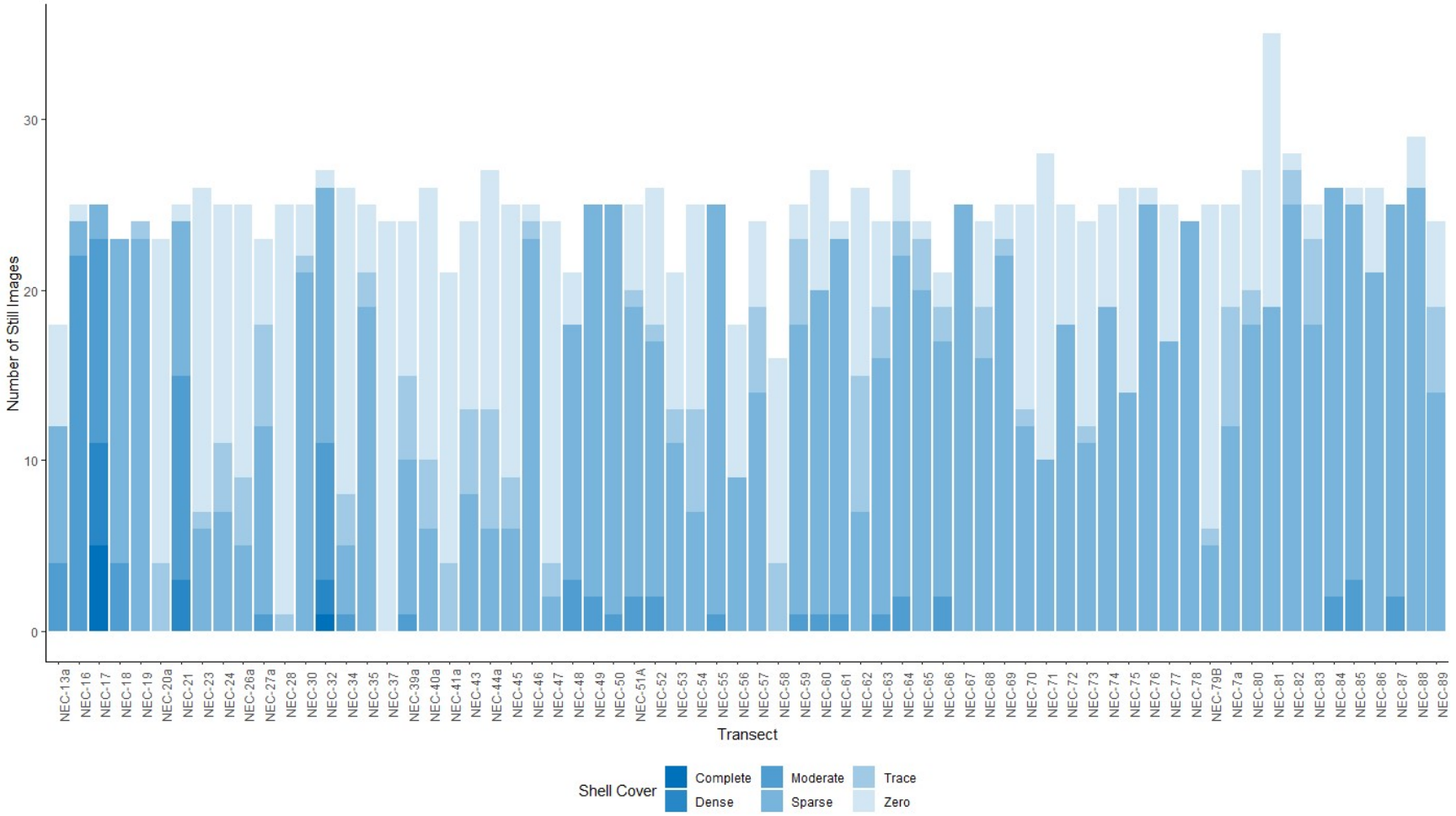


Figure 3-95. The number of still images classified to each shell cover density category within the Northern ECC video transects. Trace is ≤ 2%, Sparse is > 2 to < 30%, Moderate is 30 to < 70%, Dense is 70 to < 90%, and Complete is 90 to 100% cover.

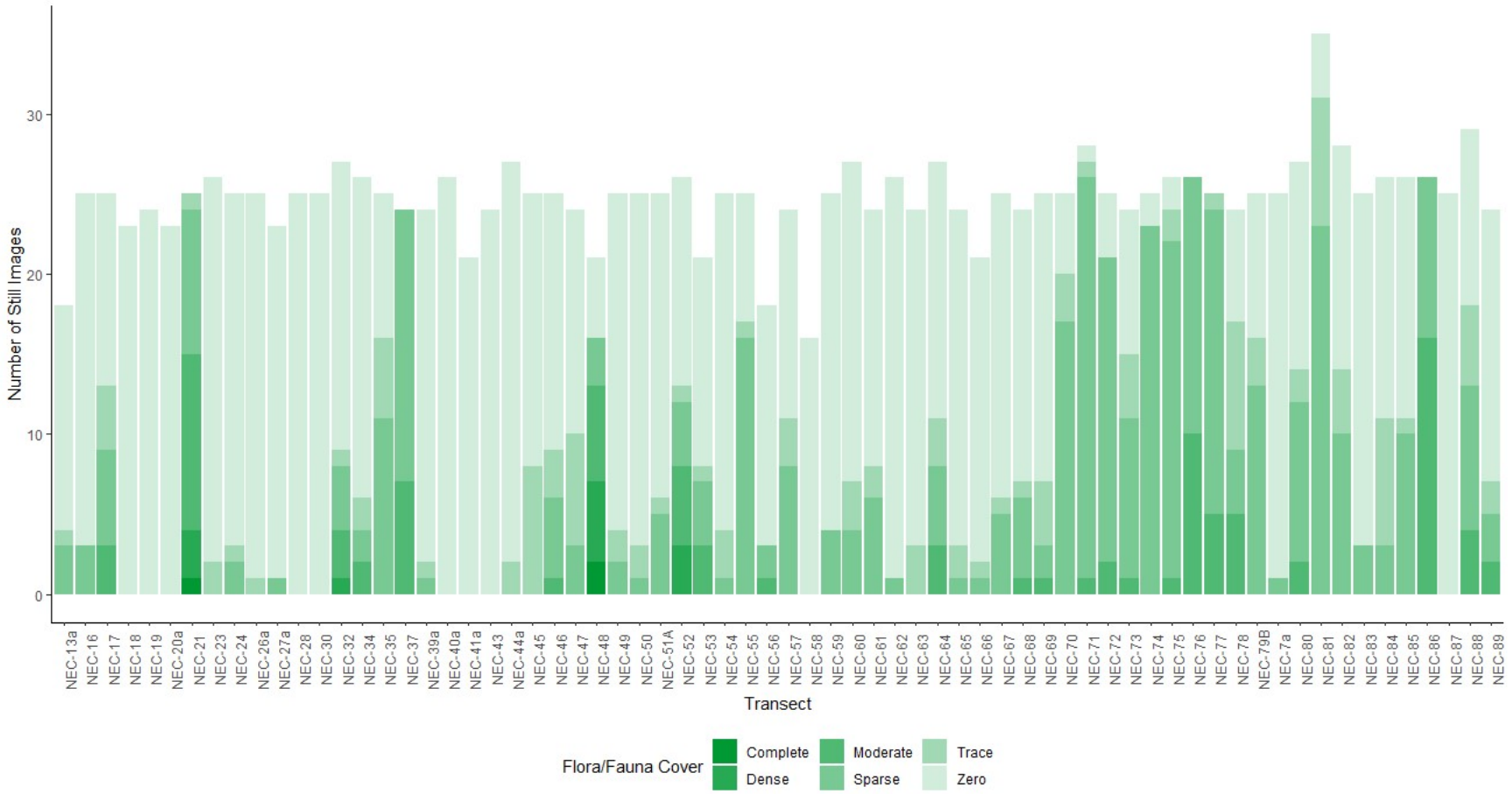


Figure 3-96. The number of still images classified to each flora/fauna density category within the Northern ECC video transects. Trace is ≤ 2%, Sparse is > 2 to < 30%, Moderate is 30 to < 70%, Dense is 70 to < 90%, and Complete is 90 to 100% cover.

Figure 3-97. The number of still images assigned to CMECS biotic component classifications within the Northern ECC video transects[1].

[1]Still images which were observed to contain no biota were classified as No Biotic Component. Diverse Colonizers is designated by encrusting organisms such as sponges, northern star coral, tunicates and hydroids. Benthic Biota by associated taxa including fish, crabs and sea stars, Clam bed by *Astarte* clams and Atlantic surfclam, Egg masses by skate egg cases, Polynices Egg collars by moon snail egg cases, Inferred Fauna by burrows, Pagurus bed by hermit crabs and Tracks and trails by presumed animal tracks and trails.

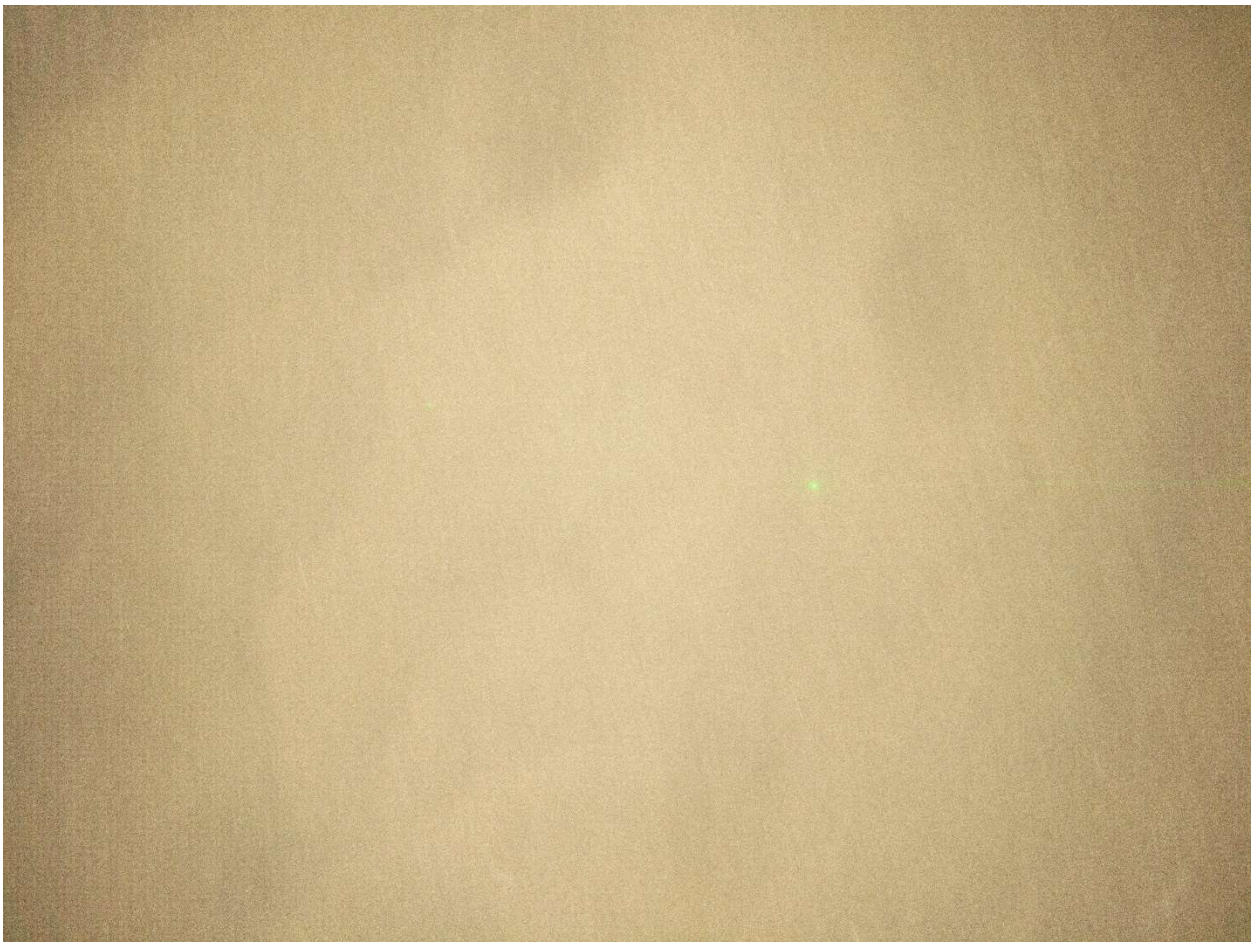


Figure 3-98. Geologic Unconsolidated Flat Sand/Mud NEC-20a_120935.873

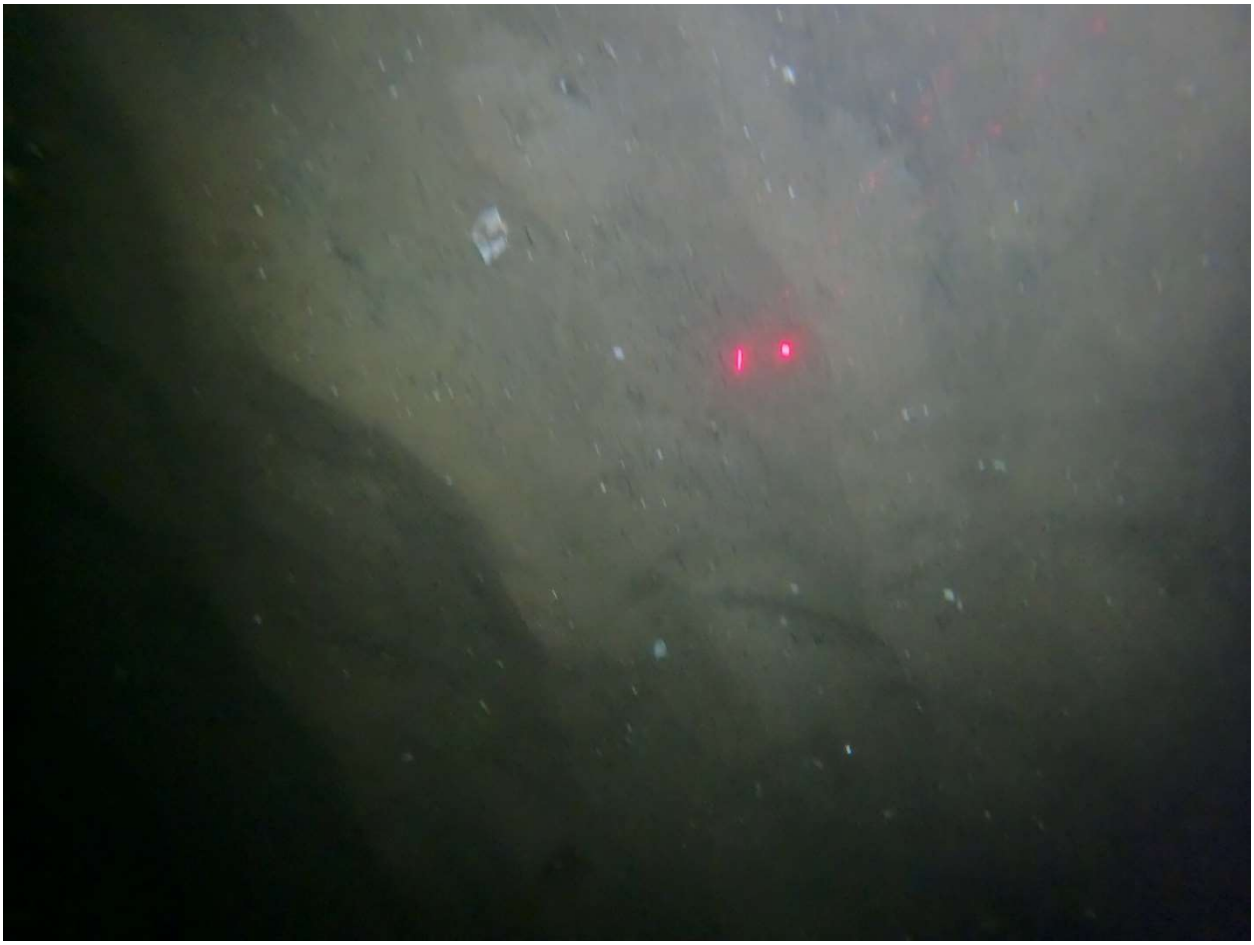


Figure 3-99. Geologic Unconsolidated Sand/mud Trace Shell Hash NEC-24_G0013111

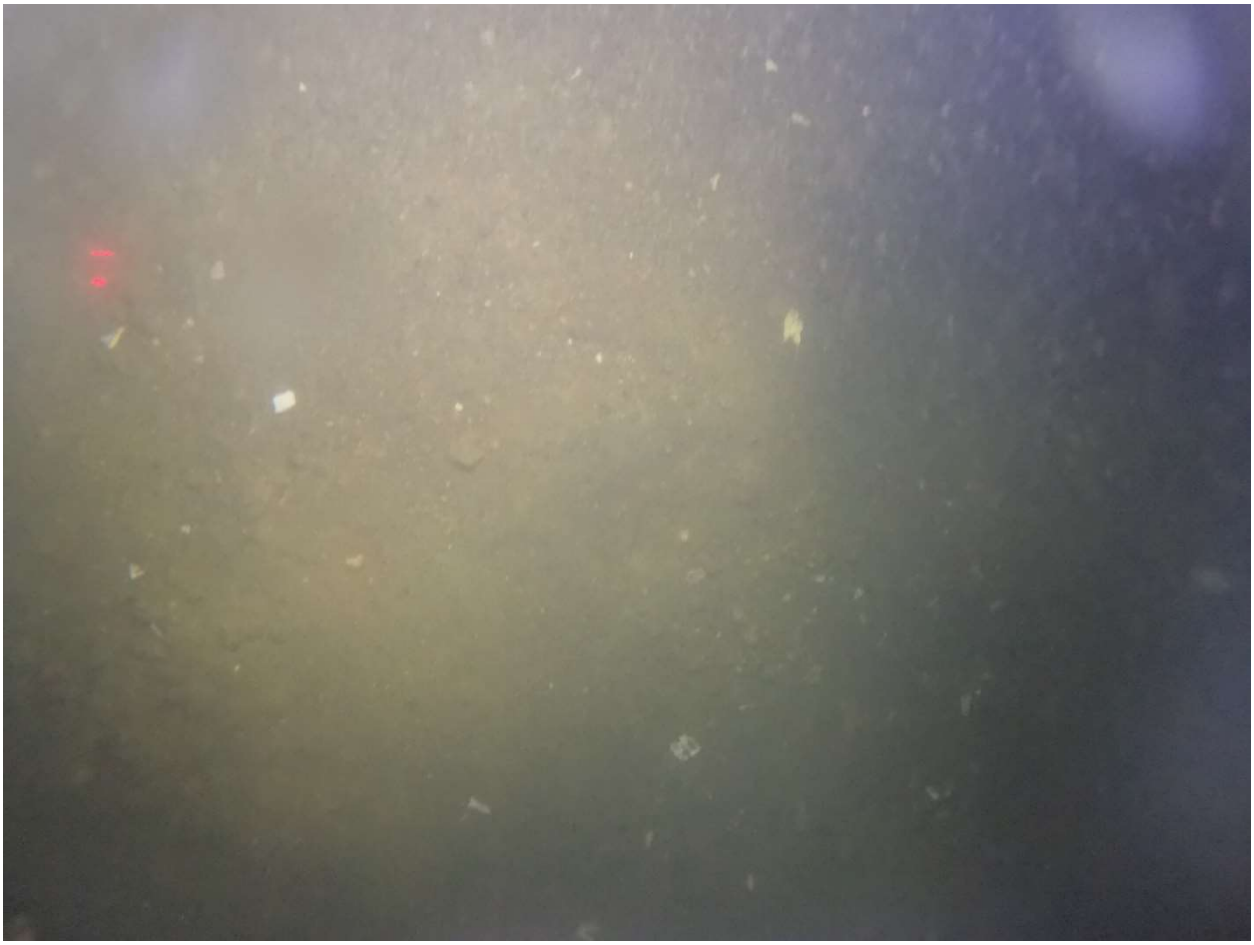


Figure 3-100. Geologic Unconsolidated Sand/mud Sparse Shell Hash NEC-50_G0070538

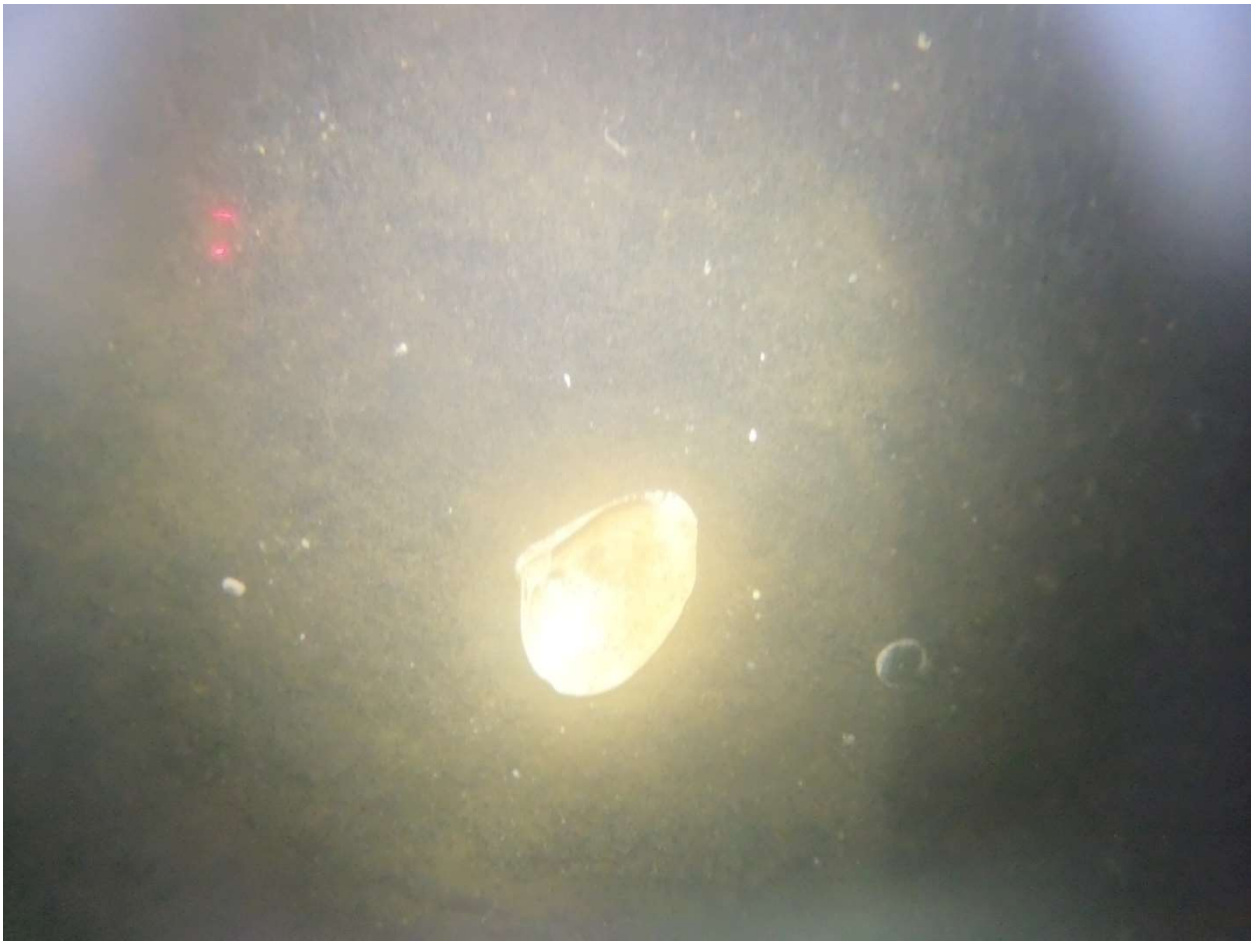


Figure 3-101. Geologic Unconsolidated Sand/mud Trace Shell Rubble NEC-64_G0023739

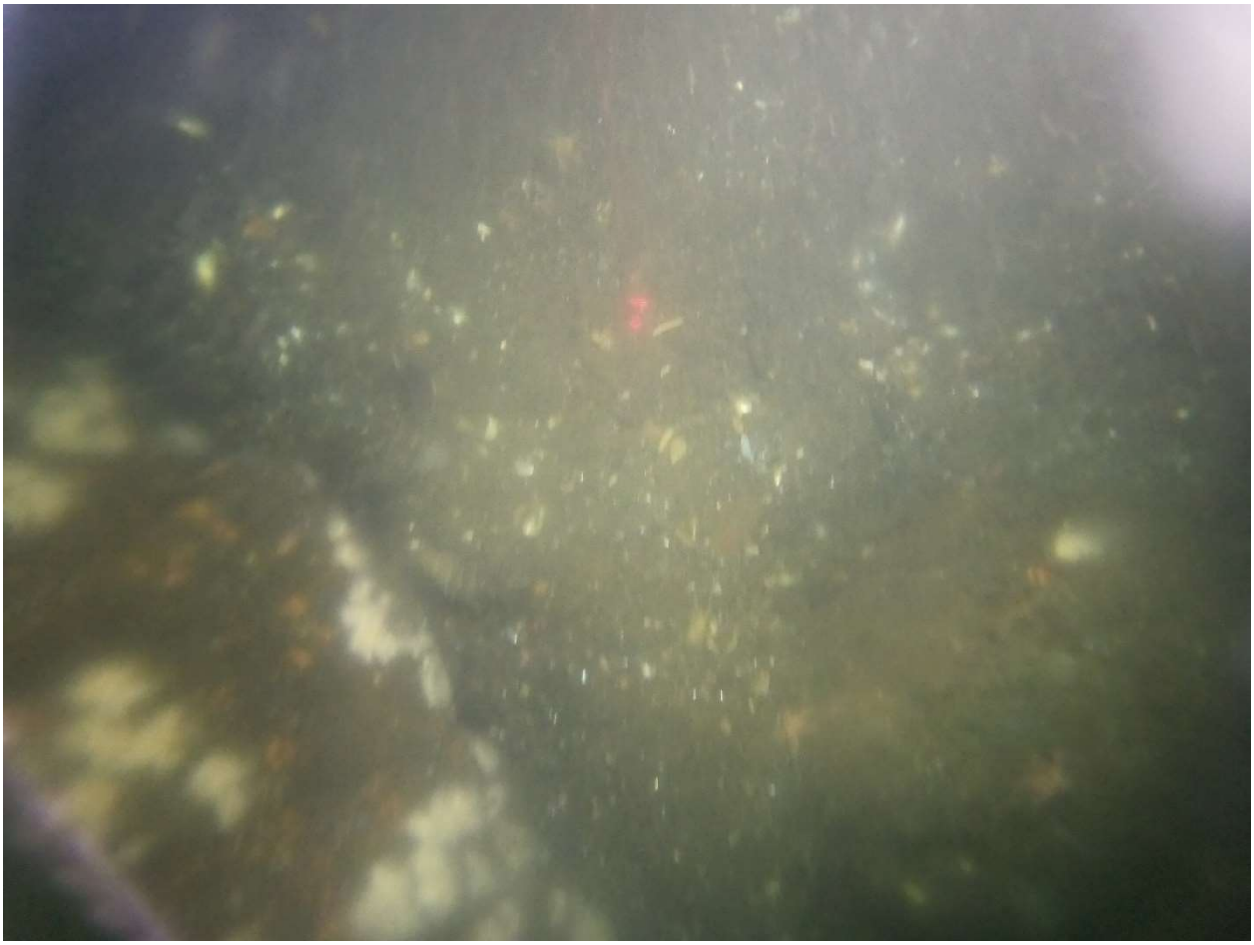


Figure 3-102. Geologic Gravelly (-B) Sand/Mud with Trace Shell Hash NEC-61_G0141319

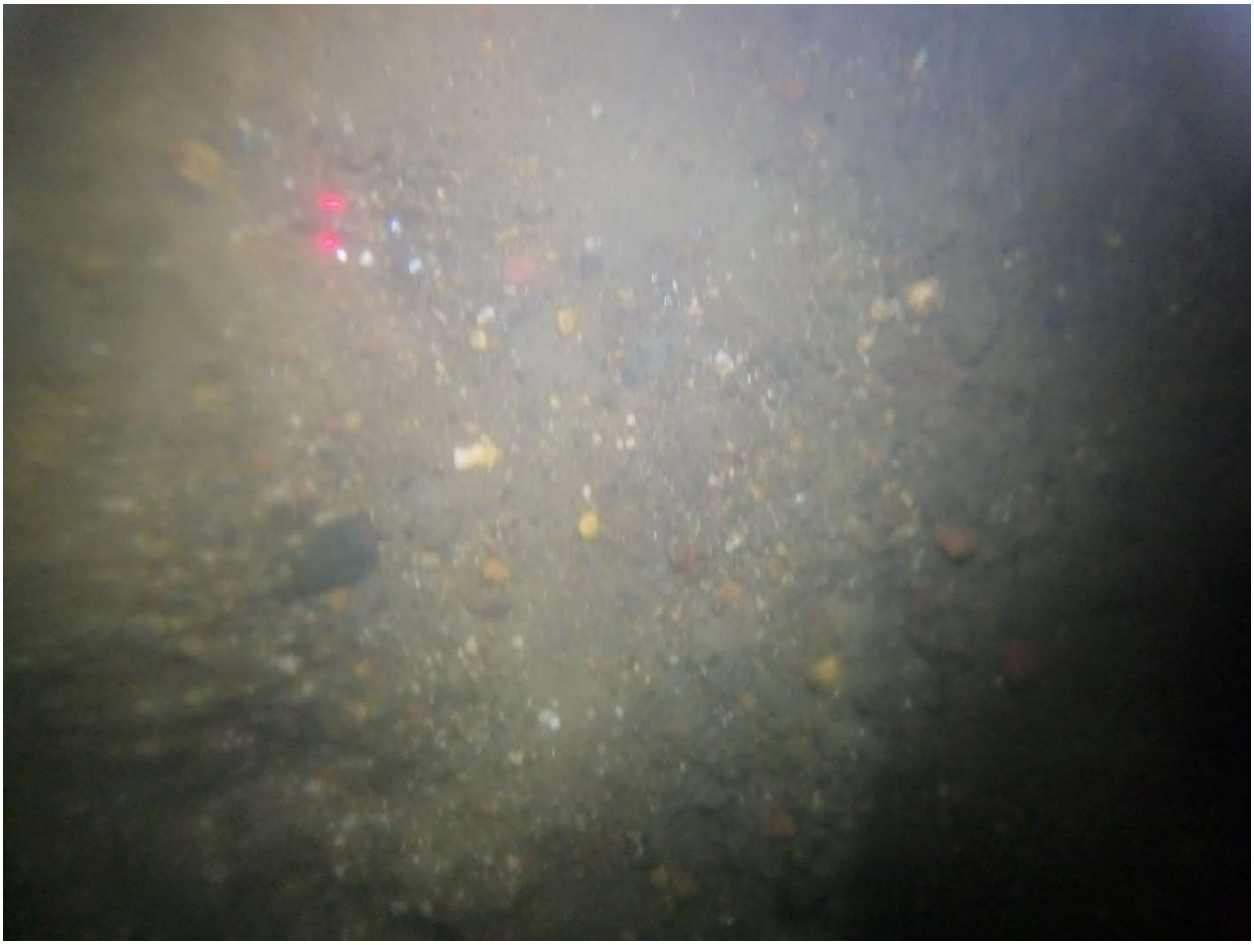


Figure 3-103. Gravelly Sand/Mud & Pebble/Granule with Moderate Shell Hash NEC-61_G0141165

Figure 3-104. Gravel (Pebble/Granule) with Sparse Shell Hash NEC-80_2022-08-22 - 115753.027

Figure 3-105. Biotic Component Only- Mussel Reef NEC-21_G0063945

4 SUMMARY

Grab Sample Results

CMECS is a hierarchical system with thresholds based primarily on the percent and composition of gravel to identify substrates that may be considered “complex” by NMFS for the purposes of essential fish habitat mapping. Exactly half of the grab samples in the Lease Area were classified as geologic origin, unconsolidated fine substrate (not complex), with 50% of samples across 2019, 2020 and 2022 containing ≤ 5% gravel. Most of the grab samples in the Northern ECC were also classified as geologic origin, unconsolidated fine substrate (not complex), with 57% of samples collected in 2022 contained ≤ 5% gravel. In the Monmouth ECC there were generally coarser sediments with only 33% samples classified as unconsolidated fine substrate. In the Lease Area, 50% percent of grab samples were classified as geologic origin, unconsolidated coarse substrates with ≥ 5% gravel, which are considered complex habitat under the NMFS (2020) guidelines. Similarly, in the NECC, 28 of the 65 sites or 43% of the sites were considered complex habitat. Gravelly Sand sites were particularly numerous and occurred throughout both the Lease Area and Monmouth ECC regions while Sandy Gravel and Medium Sand sites were the most numerous classifications in the Northern ECC. The Lease Area had the lowest percentage of samples (7%) that were comprised of coarse substrates defined by a threshold of 30% or more of gravel while the Monmouth ECC contained an intermediate amount at 15% and the Northern ECC showed the highest percentage at 26%. The Monmouth ECC and the Lease Area both contained 5 higher gravel threshold grab sample sites (Muddy Sandy Gravel and Sandy Gravel) and the Northern ECC contained 17 higher gravel threshold grab sample sites (Muddy Sandy Gravel, Sandy Gravel, and Pebble/Granule). All 27 of these sites are considered complex as they are more likely to represent valuable fish habitat.

Mean density of identified invertebrates was highest in samples collected along the Northern ECC, with 379 organisms per sample on average. This number is significantly higher than the density of organisms in the Lease Area (100 organisms in 2020/2022 samples combined) and in the Monmouth ECC (187 organisms in 2020/2022 samples combined). This disparity is being driven by the large numbers of annelids found in the Northern ECC samples. The annelids most common in the Northern ECC were identified as belonging to the oligocheata subclass. the capitellidae family and the polygordiidae family of polychaetes were the two most abundant families encountered. In the three project regions, organisms from the phyla annelida, arthropoda, and mollusca were represented by the largest numbers of unique taxa, respectfully. Bivalves were the most common mollusk class in each project region. Atlantic surfclam were found in all three project areas. Ocean quahog occurred only in the Monmouth ECC and the Northern ECC. Atlantic sea scallops were only encountered in the Monmouth ECC. Average taxonomic diversity and evenness were found to be highest in the Lease Area 2020 and 2022 samples, with a value of 2.13 and 0.76 respectively. Average species richness was found to be highest in the Monmouth ECC samples, with a value of 3.85. No scleractinian stony corals or invasive tunicates were encountered in the Lease Area or the Monmouth ECC,

but both northern star coral and invasive tunicate *Didemnum* spp. were both present within the Northern ECC.

Towed Video Results

Megafauna review of 2021 video transects showed differences in organisms observed between Lease Area and Monmouth ECC transects. From the nine transects within the Lease Area, the Phylum Mollusca had the highest percent composition of organisms (66%), which was largely *Astarte* clams. Phylum Cnidaria was the dominant group of the 44 transects within the Monmouth ECC, with 57% of the organisms observed being burrowing anemones. In the Northern ECC transects surveyed in 2022, the burrowing anemone was also found to be the organism with the highest frequency of occurrence accounting for 32% of all enumerated megafauna. A higher percentage of chordate and chordate eggs were also observed combining to comprise 34% of all phyla recorded. Though counts remained sporadic, more observations of surf clam were made in the Northern ECC compared to both the Lease Area and Monmouth ECC while ocean quahog remained absent in all three survey areas. In the Northern ECC sea scallops only comprised 2% of all recorded megafauna compared to 9% in the Monmouth ECC. Northern star corals and invasive tunicates were notable features present in the Northern ECC that were absent in both the Lease Area and Monmouth ECC.

Percent cover analysis of point counts of still images along the video transects showed that 81% of the 331 m^2 of seafloor within the Lease Area was classified as sand/mud. Shell was the second most abundant substrate in the Lease Area at 11% of the analyzed area. No boulders or cobble-sized gravel were found in any of the transects in the Lease Area. In the Monmouth ECC, 73% of 1,044 m^2 of seafloor analyzed in the still images was classified as sand/mud. Gravel was second most abundant classification at 18%, followed by 7% shell. Three transects had > 50% gravel coverage, so overall the Monmouth ECC had more prominent gravel habitat than the Lease Area. No boulders were encountered, but a small number of cobble-sized gravels were present. In the Northern ECC, 74% of the 730 m^2 of seafloor analyzed in the still images was classified as sand/mud. Gravel and biogenic shell were the second most abundant classifications representing 9% of stills each. While no transects had > 50% gravel coverage, three transects (TV-56, 80, 87) all had > 30% gravel, therefore the Northern ECC sits in the middle of the Monmouth ECC and Lease area for having more prominent gravel habitat. 74% of the area analyzed in the Northern ECC was classified as soft bottom habitat (i.e., not complex).

CMECS substrate classifications were made for each still image analyzed, and the majority of the Northern ECC (70%), Lease Area stills (60%) and the Monmouth ECC stills (52%) were classified as geologic origin, unconsolidated fine substrate, sand/mud. In the Lease Area, the next most frequently assigned CMECS classification was Gravelly Sand, while in the Monmouth ECC, the next most frequently assigned classification was Gravel Mixes. Overall, the transects from the Monmouth ECC contained more gravels than the Lease Area.

Flora/fauna only accounted for < 1% (< 3 m^2) of the bottom cover analyzed in the Lease Area. There was no percent cover recorded for species of particular interest, such as blue mussels, sea scallops, encrusting organisms, and bushy plant-like organisms. Burrowing anemones and *Astarte* clams occurred in one and three transects, respectively. Sand dollar beds were the most common CMECS biotic component classification within the Lease Area transects, followed by clam beds and inferred fauna.

Approximately 2% (22 m^2) of the area analyzed from Monmouth ECC transects contained flora/fauna, and 44% of the flora/fauna cover was identified as infaunal structures (likely polychaete worm tubes) and inferred fauna (tracks, burrows, or possibly older evidence of infaunal structures). These categories may be considered emergent taxa or structures that add complexity to the seafloor. In addition, the Monmouth ECC contained larger amounts of bivalves, including *Astarte* clams, Atlantic sea scallops, and blue mussels, which covered approximately 5 m^2 of the bottom area analyzed. Burrowing anemones, bushy plant-like organisms, and encrusting organisms were also encountered in the Monmouth ECC. The most frequently occurring CMECS biotic component classification in still images from the Monmouth ECC transects was sand dollar beds, followed by burrowing anemones and inferred fauna.

The Northern ECC transects were characterized with the greatest amount of flora/fauna cover at ~8% (55 m^2). The most common biotic component identified (55% of flora/fauna coverage) were sand dollar beds, occurring in 443 images across 31 transects. Several transects were characterized by intermittent solitary boulders and boulder fields. Most of the boulders encountered were covered in attached diverse colonizers such as northern star coral, invasive tunicates (*Didemnum* and orange sheath tunicate), hydroids, boring sponge, and sulphur sponge. Diverse colonizers accounted for 20% of the biotic component classifications across 23 transects. While most diverse colonizers co-occurred with boulders, gravelly areas with dense shell hash, were characterized by hydroids. One transect (NEC-21) was characterized by mussel beds and mussel reefs. The most frequently occurring biotic component classifications in the Northern ECC transects were sand dollar beds, diverse colonizers, and burrowing anemones.

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Appendix A
Representative Grab Sampler and Underwater Images with Associated CMECS Classifications

2019 Samples

Below are images of 2019 grab samples prior to processing, along with CMECS classifications (Substrate & Biological modifier). The field of view was calculated based on the distance between lasers. No still images are included for SOI 5 and SOI 6.

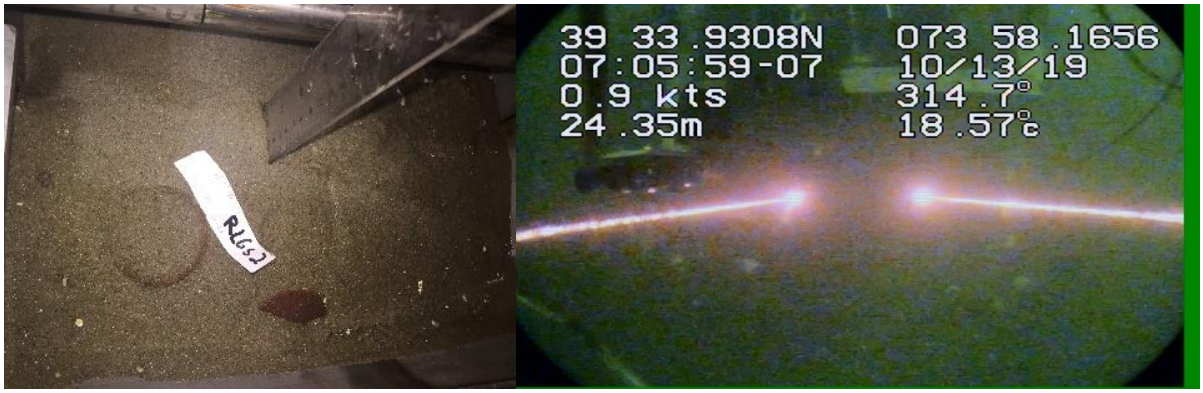

Figure A-1. IA2 Station 1: Left image: Grab sample, CMECS: Gravelly Sand & Trace Clam Hash. Right image: Seafloor image, taken from 0.46 m above the seafloor; field of view: 2,445 cm^2.

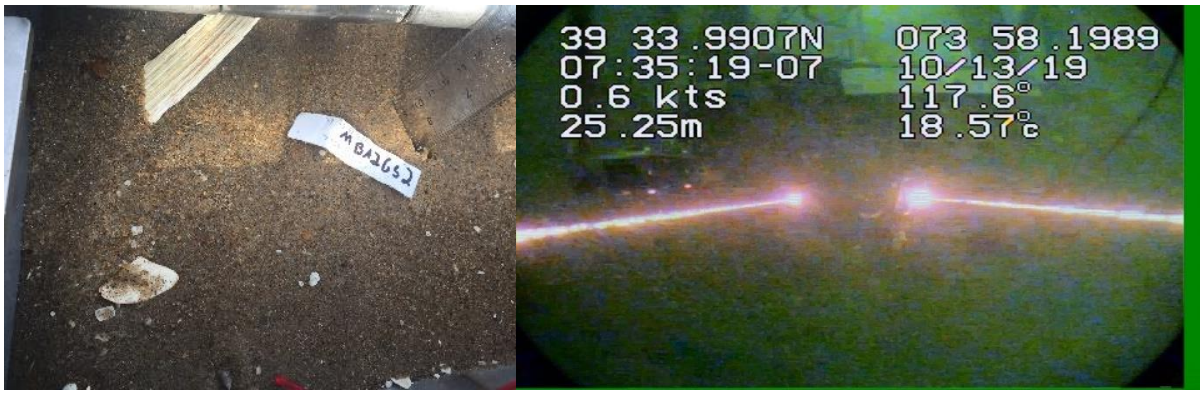

Figure A-2. IA2 Station 2: Left image: Grab sample, CMECS Very Coarse/Coarse Sand & Sparse Clam Hash. Right image: Seafloor image, taken from 0.46 m above the seafloor; field of view: 2,223 cm^2.

Figure A-3. SOI4: Left image: Grab sample, CMECS Medium Sand & Trace Clam Hash. Right image: Seafloor image, taken from 0.46 m above the seafloor; field of view: 1,393 cm^2.


(no still image)

Figure A-4. SOI5: Left image: Grab sample, CMECS Very Coarse/Coarse Sand & Trace Clam Hash. Right image: no image.


(no still image)

Figure A-5. SOI6: Left image: Grab sample, CMECS Very Coarse/Coarse Sand & Trace Clam Hash. Right image: no image.

Figure A-6. SOI7: Left image: Grab sample, CMECS Gravelly Sand & Trace Clam Hash. Right image: Seafloor image, taken from 0.46 m above the seafloor; field of view: 0 cm^2.

Figure A-7. SOI8: Left image: Grab sample, CMECS Sandy Gravel & Sparse Clam Hash. Right image: Seafloor image, taken from 0.46 m above the seafloor; field of view: 1,293 cm^2.

2020 Samples

Below are images of 2020 grab samples immediately after recovery/draining (left image) and the still image from the grab sampler prior to benthic sample collection (right image). NMFS Modified CMECS (2020) classification and NMFS Complex Habitat designation reported below images (if in substrate category with ≥30% gravel). Note that parallel-mounted lasers are 0.208 m apart in the representative images displayed here.

Figure A-8. LAR-20-002: Left image: Grab sample, CMECS: Gravelly Muddy Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-9. LAR-20-004 Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

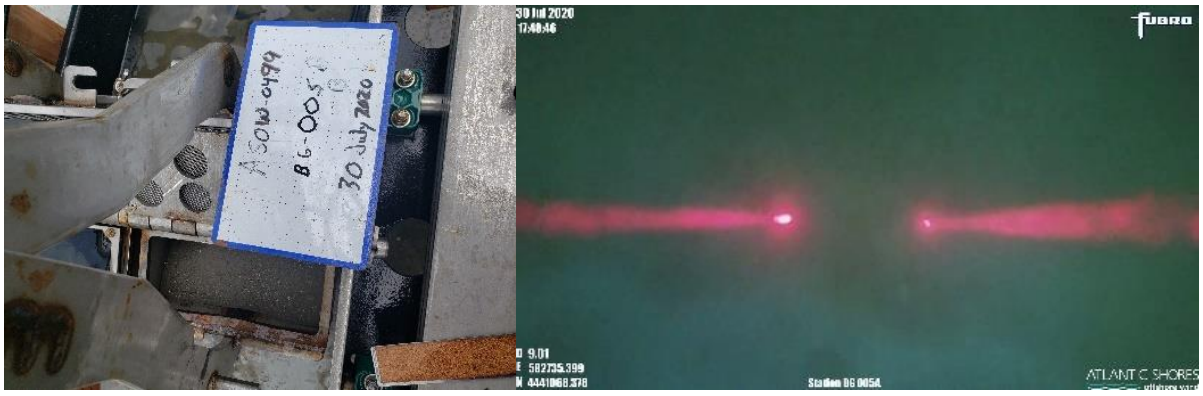

Figure A-10. LAR-20-005 Left image: Grab sample, CMECS: Fine/very fine Sand. Right image: Seafloor image, complex habitat: no, poor visibility.

(No grab video provided)

Figure A-11. LAR-20-006 Left image: Grab sample, CMECS: Very Coarse/Coarse Sand. Right image: none, complex habitat: no.

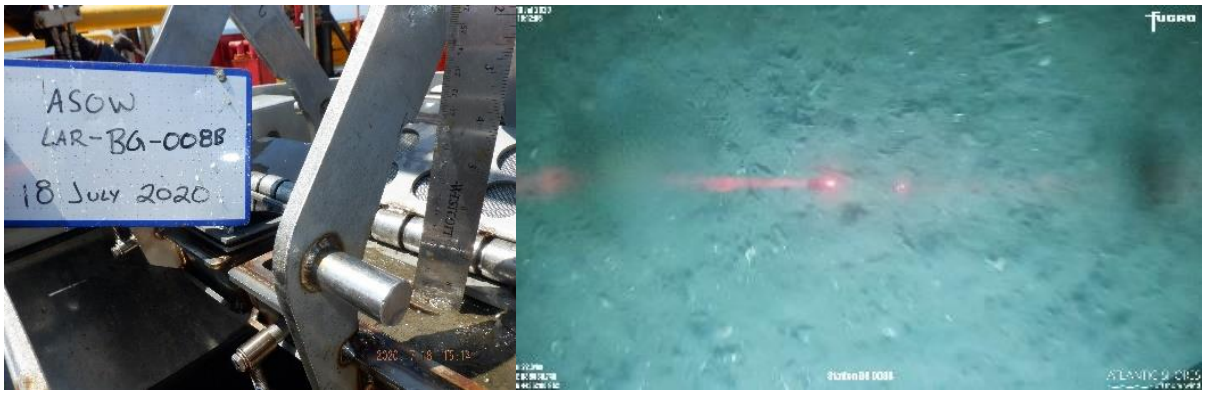

Figure A-12. LAR-20-008 Left image: Grab sample, CMECS: Gravelly Muddy Sand. Right image: Seafloor image, complex habitat: yes.

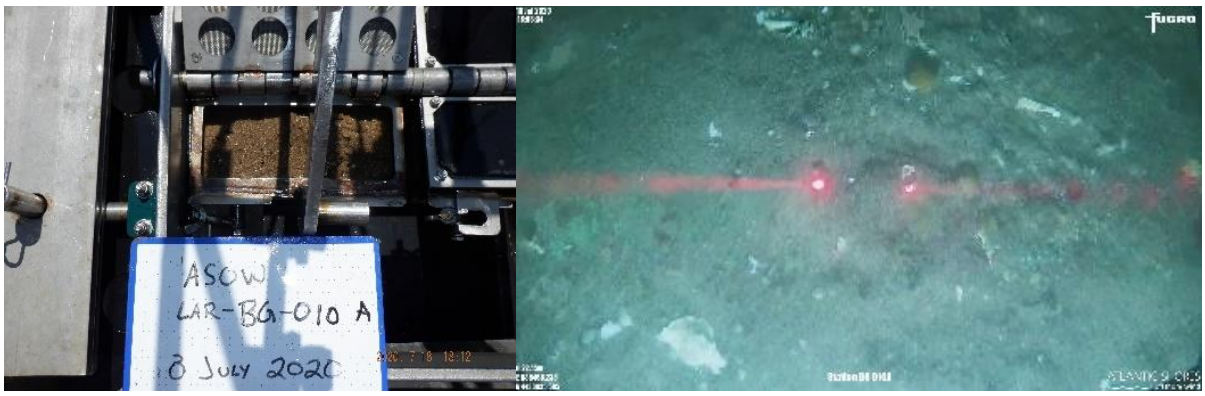

Figure A-13. LAR-20-010 Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

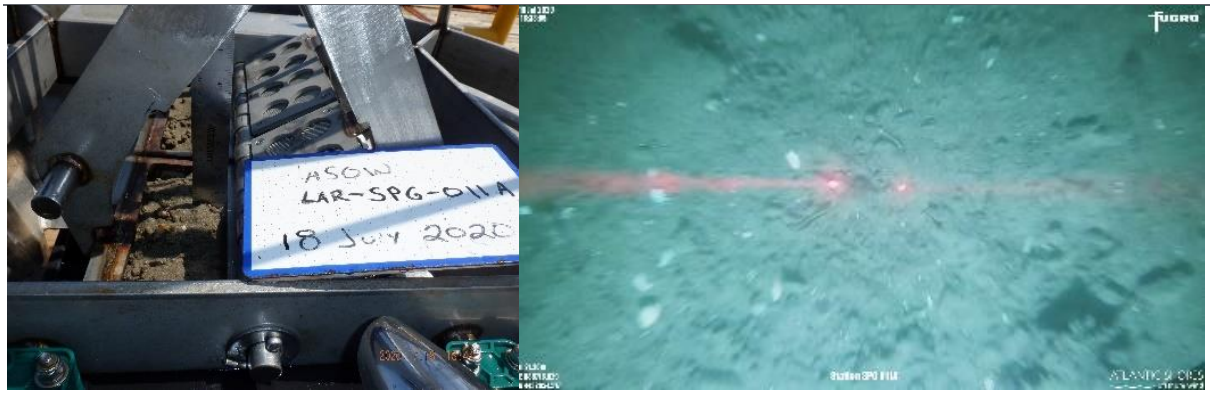

Figure A-14. LAR-20-011 Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-15. LAR-20-012 Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-16. LAR-20-014 Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

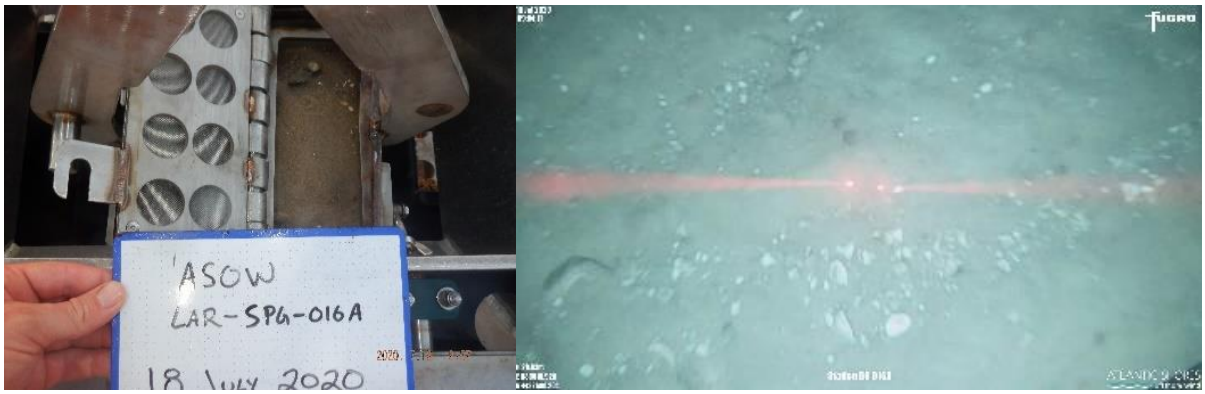

Figure A-17. LAR-20-016 Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-18. LAR-20-018 Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-19. LAR-20-020 Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

(No grab video provided)

Figure A-20. LAR-20-021 Left image: Grab sample, CMECS: Very Coarse/Coarse Sand. Right image: No image, complex habitat: no.

(No grab video provided)

Figure A-21. LAR-20-022 Left image: Grab sample, CMECS: Gravelly Sand. Right image: No image, complex habitat: yes.

Figure A-22. LAR-20-024 Left image: Grab sample, CMECS: Sandy Gravel. Right image: Seafloor image, complex habitat: yes.

Figure A-23. LAR-20-026 Left image: Grab sample, CMECS: Gravelly Sand. Right image: No image, complex habitat: yes.

Figure A-24. LAR-20-028 Left image: Grab sample, CMECS: Sandy Gravel. Right image: Seafloor image, complex habitat: yes.

Figure A-25. LAR-20-030 Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-26. LAR-20-031 Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

(No grab video provided)

Figure A-27. LAR-20-032 Left image: Grab sample, CMECS: Gravelly Sand. Right image: No image, complex habitat: yes.

Figure A-28. LAR-20-037 Left image: Grab sample, CMECS: Muddy Sandy Gravel. Right image: Seafloor image, complex habitat: yes.

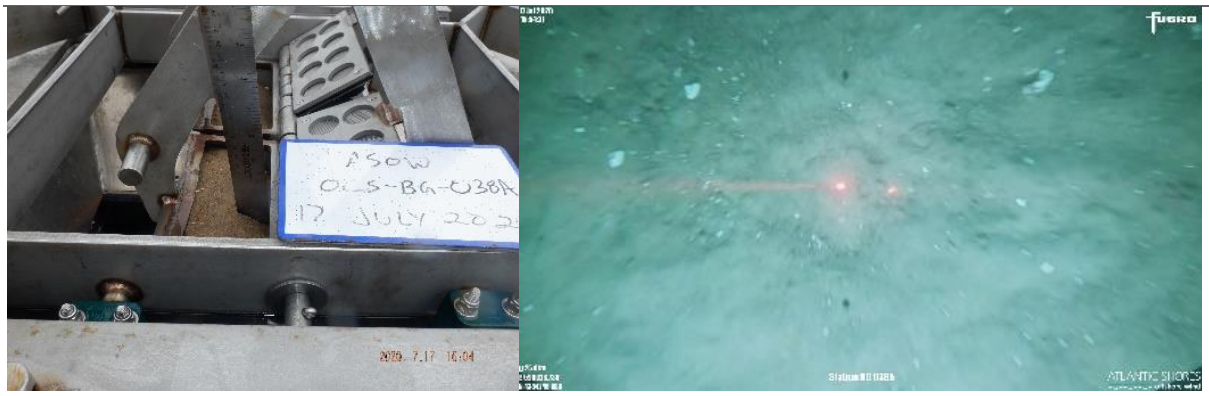

Figure A-29. OCS-20-038 Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-30. OCS-20-039 Left image: Grab sample, CMECS: Very Coarse/Coarse Sand. Right image: Seafloor image, complex habitat: no.

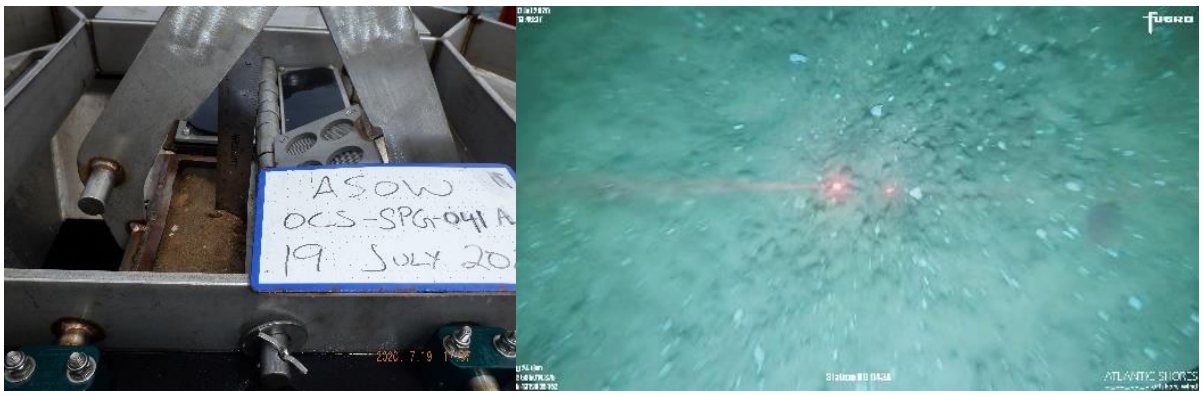

Figure A-31. OCS20-041 Left image: Grab sample, CMECS: Very Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-32. OCS-20-043 Left image: Grab sample, CMECS: Very Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-33. OCS-20-046 Left image: Grab sample, CMECS: Very Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-34. OCS-20-047 Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-35. OCS-20-048 Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-36. OCS-20-049 Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-37. OCS-20-051 Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

(No grab video provided)

Figure A-38. OCS-20-053 Left image: Grab sample, CMECS: Medium Sand. Right image: No image, complex habitat: no.

Figure A-39. OCS-20-055 Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-40. OCS-20-057 Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-41. OCS-20-059 Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-42. OCS20-061 Left image: Grab sample, CMECS: Very Coarse/Coarse Sand. Right image: Seafloor image, complex habitat: no.

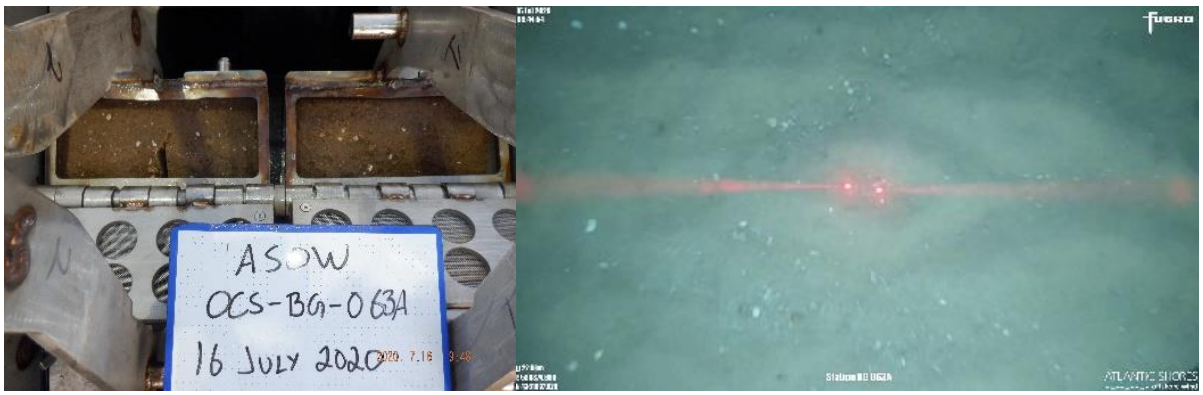

Figure A-43. OCS-20-063 Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-44. OCS-20-064 Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-45. OCS-20-065 Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

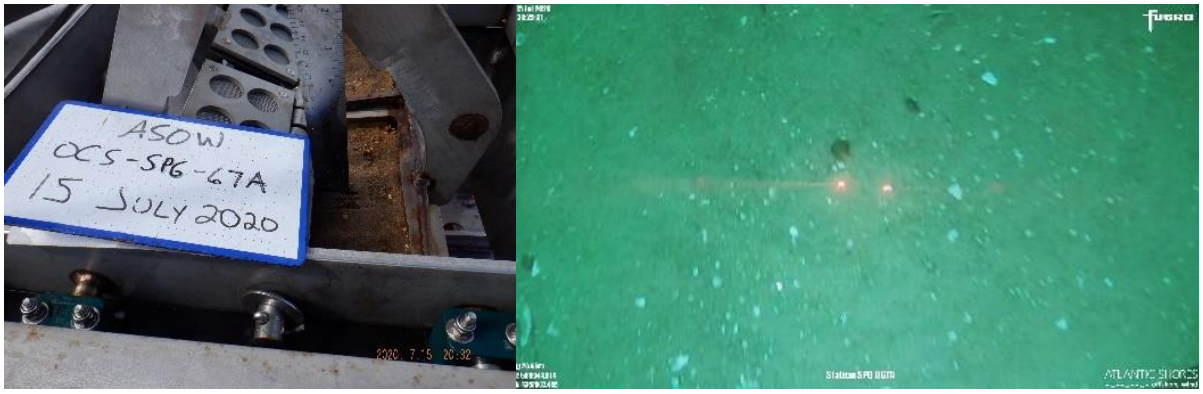

Figure A-46. OCS-20-067 Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

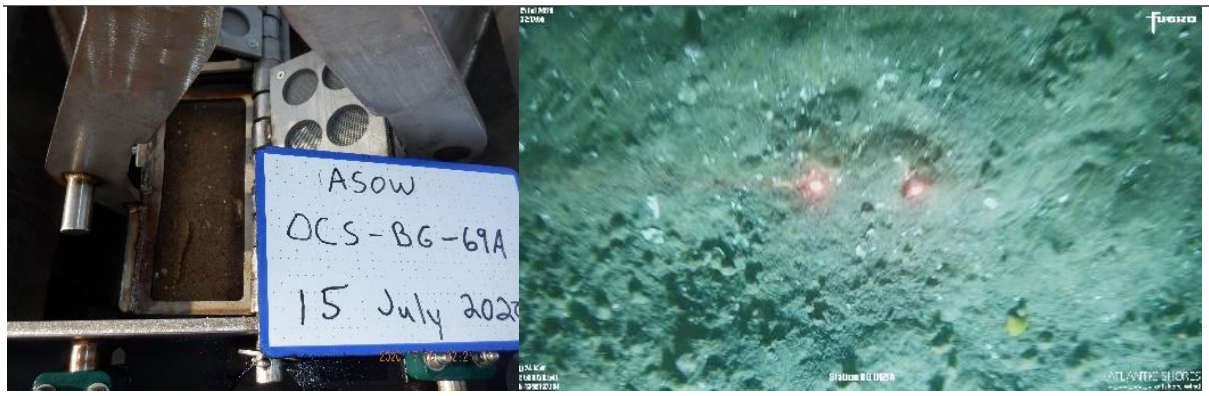

Figure A-47. OCS-20-069: Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-48. OCS-20-075: Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-49. OCS-20-110: Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-50. OCS-20-112: Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-51. OCS-20-113: Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-52. OCS-20-114: Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-53. OCS-20-116: Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-54. OCS-20-117: Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-55. OCS-20-118: Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-56. OCS-20-121: Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

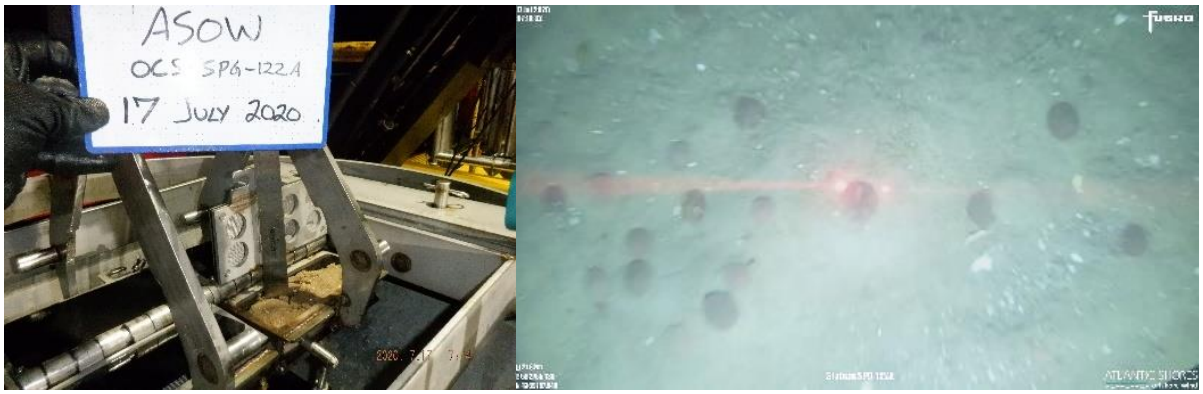

Figure A-57. OCS-20-122: Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-58. OCS-20-123: Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-59. OCS-20-125: Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-60. OCS-20-127: Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

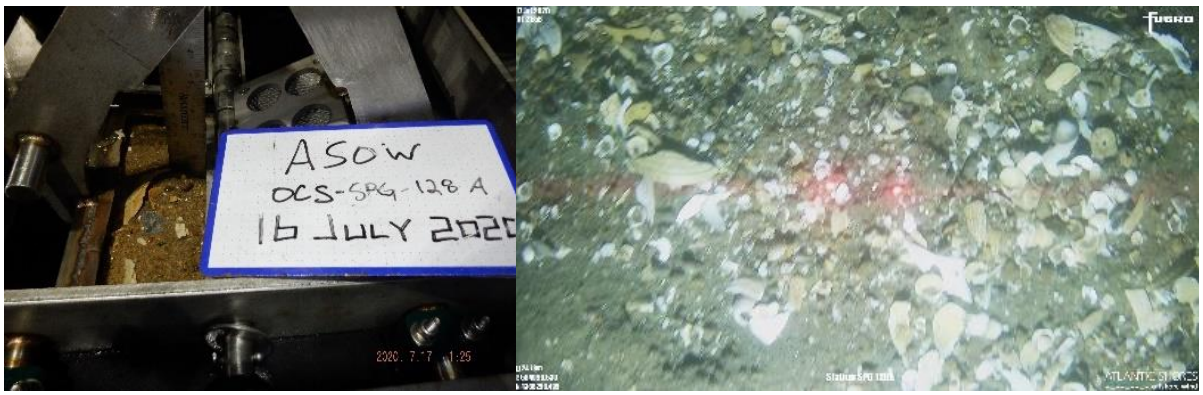

Figure A-61. OCS-20-128: Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

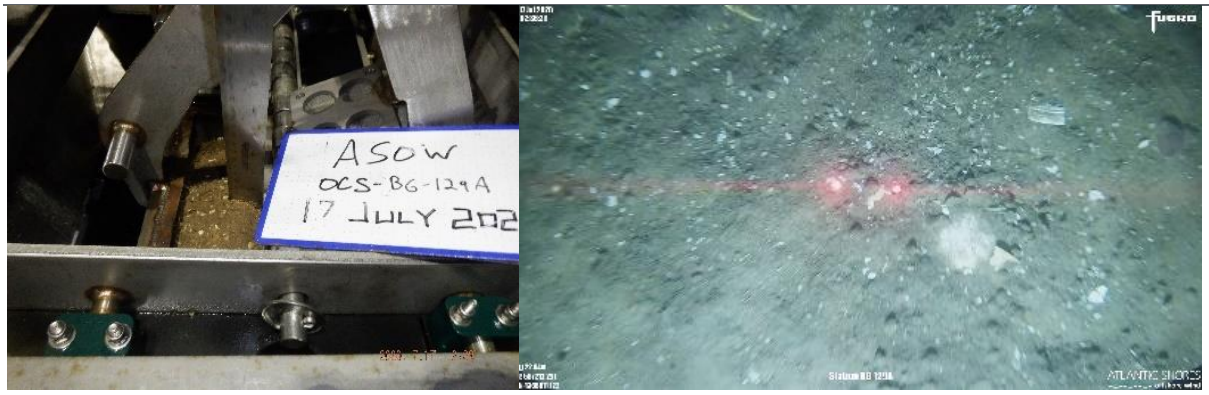

Figure A-62. OCS-20-129: Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-63. OCS-20-31: Left image: Grab sample, CMECS: Very Coarse/Coarse Sand. Right image: Seafloor image, complex habitat: no.

Figure A-64. OCS-20-33: Left image: Grab sample, CMECS: Very Coarse/Coarse Sand. Right image: Seafloor image, complex habitat: no.

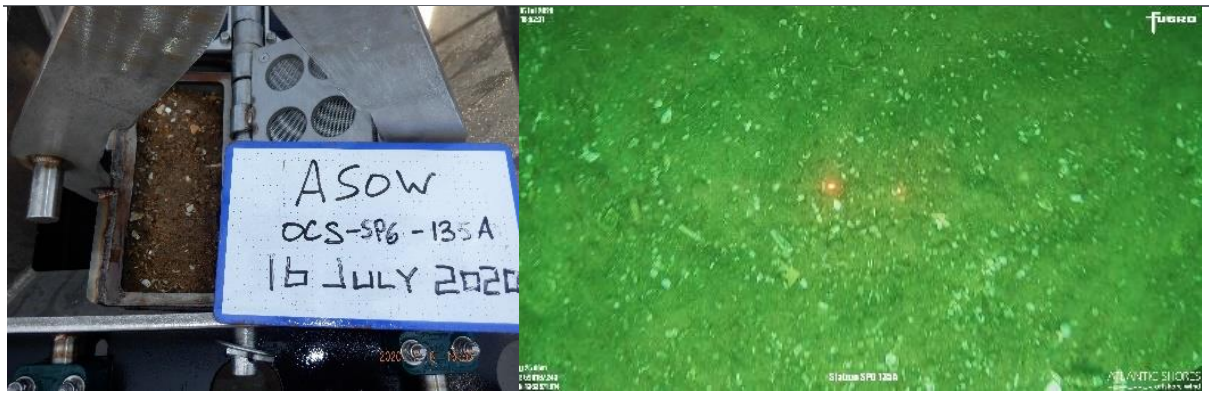

Figure A-65. Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-66. OCS-20-41: Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Figure A-67. OCS-20-43: Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

Figure A-68. OCS-20-49: Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

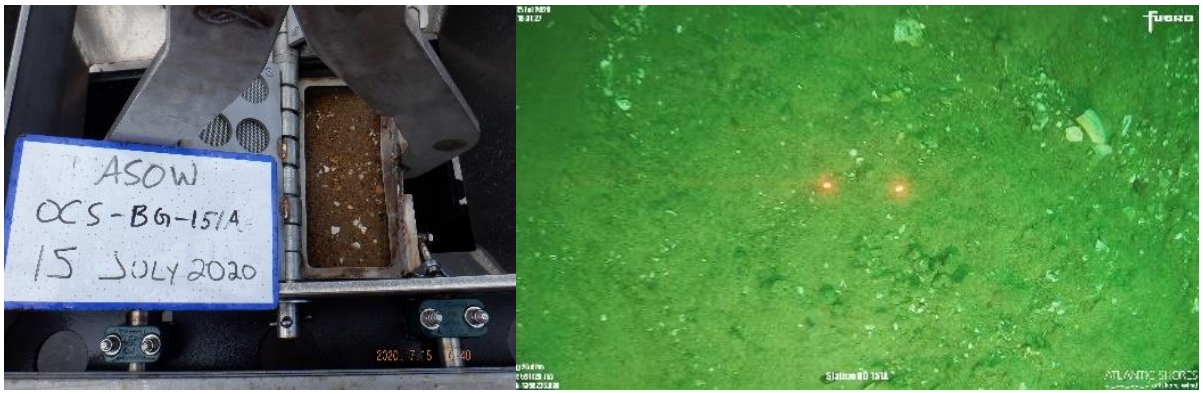

Figure A-69. OCS-20-151: Left image: Grab sample, CMECS: Very Coarse/Coarse Sand. Right image: Seafloor image, complex habitat: no.

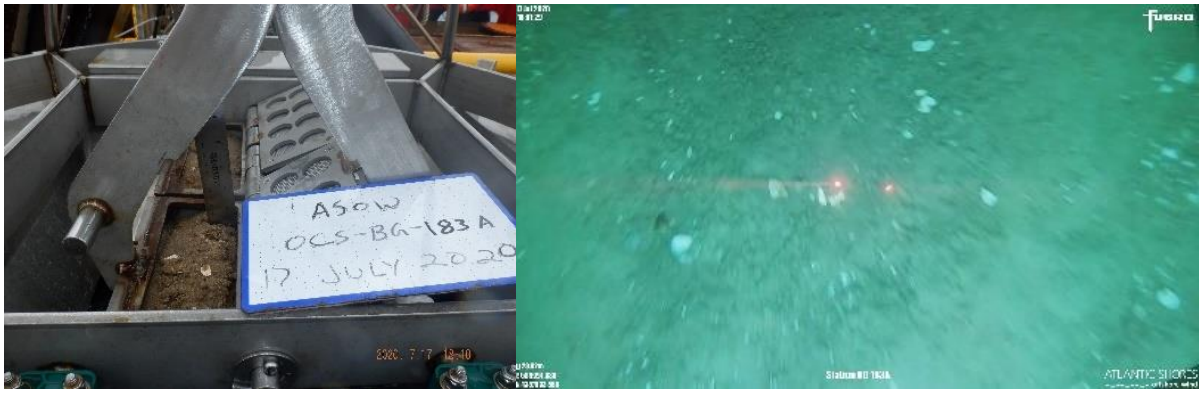

Figure A-70. OCS-20-183: Left image: Grab sample, CMECS: Gravelly Sand. Right image: Seafloor image, complex habitat: yes.

(No grab video provided)

Figure A-71. OCS-20-185: Left image: Grab sample, CMECS: Sandy Gravel. Right image: No image, complex habitat: yes.

Figure A-72. OCS-20-191: Left image: Grab sample, CMECS: Medium Sand. Right image: Seafloor image, complex habitat: no.

Appendix B
Grab Sample Site Locations and Key Findings from Imagery Review

2019 Samples

Table B-1. 2019 Grab sample site locations and characteristics. Coordinates are North American Datum of 1983 (NAD 83), EPSG 4269. SOI 7 had limited coverage due to high turbidity. Still images at SOI 5, SOI 6, and SOI 7 were not adequate for identifying habitat types and the presence of other features of interest.

IA or SOI	Sample	Latitude (°N)	Longitude (°W)	NMFS-modified CMECS	General Charcterization	Biotic Benthic Activity	Epibenthic Macroinvertebrates and Fishes	Macroinvertebrate and Fish Habitat	Aquatic Vegetation	Evidence of Fishing Activity	Anthropogenic Debris
IA 2 Station 1	LAR-20-002	39° 33.9308' N	73° 58.1656' W	Gravelly Sand	Despite high turbidity, some sparse shell hash was observed on light-colored sand. Video analysis aided in determining presence/absence of features.	None detected	None detected	Flat Sand	None detected	None detected	None detected
IA 2 Station 2	LAR-20-004	39° 33.9907' N	73° 58.1989' W	Very Coarse/ Coarse Sand	Despite high turbidity, some sparse shell hash was observed on light-colored sand. Video analysis aided in determining presence/absence of features.	None detected	None detected	Shell Aggregate	None detected	None detected	None detected
SOI 4	LAR-20-005	39° 23.7691' N	74° 2.7639' W	Medium Sand	Sandy with trace shell debris	None detected	None detected	None detected	None detected	None detected	None detected
SOI 5	LAR-20-006	39° 26.7895' N	74° 5.6972' W	Very Coarse/ Coarse Sand	NA	NA	NA	NA	NA	NA	NA
SOI 6	LAR-20-008	39° 24.1021' N	73° 57.8008' W	Very Coarse/ Coarse Sand	NA	NA	NA	NA	NA	NA	NA
SOI 7	LAR-20-010	39° 33.8481' N	74° 2.1521' W	Gravelly Sand	NA	NA	NA	NA	NA	NA	NA
SOI 8	LAR-20-011	39° 38.0361' N	73° 57.7192' W	Sandy Gravel	Gravel with shell debris	None detected	None detected	None detected	None detected	None detected	None detected

2020 Samples

Table B-2. 2020 and 2022 Grab sample site locations and CMECS classifications based on laboratory grain size analysis, with summarized notes based on visual analysis. Geoform = sand waves (SW), ripples (R), or mounds (M). Shell = whole shell (S), fragment (SF), or hash (SH). Other features include aquatic vegetation, anthropogenic debris, or evidence of fishing activity. Samples are marked "yes" for potentially complex habitat if they are in a NMFS CMECS substrate category with ≥ 30% gravel.

Project Area	Sample	Latitude (°N)	Longitude (°W)	NMFS CMECS	Megafauna Noted	Geoform (SW/R/M)	Shell (S/SF/SH)	Other Features	Potentially Complex Habitat
MON	LAR-20-002	40° 5' 11.507" N	73° 58' 48.214" W	Gravelly Muddy Sand	hermit crabs, crab, anemone		SH		yes
MON	LAR-20-004	40° 3' 19.796" N	73° 57' 49.295" W	Gravelly Sand			SF		yes
MON	LAR-20-005	40° 6' 57.468" N	74° 1' 43.932" W	Fine/Very Fine Sand					
MON	LAR-20-006	40° 6' 4.193" N	74° 1' 7.240" W	Very Coarse/Coarse Sand					
MON	LAR-20-008	40° 4' 21.122" N	73° 59' 44.552" W	Gravelly Muddy Sand	hermit crabs, crab		SF	macroinvertebrate tubes	yes
MON	LAR-20-010	40° 3' 3.694" N	73° 57' 46.320" W	Gravelly Sand	anemone, sand dollars				yes
MON	LAR-20-011	40° 2' 2.587" N	73° 57' 36.510" W	Medium Sand					
MON	LAR-20-012	40° 1' 1.242" N	73° 57' 37.441" W	Medium Sand					
MON	LAR-20-014	39° 58' 58.173" N	73° 57' 25.881" W	Gravelly Sand					yes
MON	LAR-20-016	39° 56' 55.940" N	73° 57' 7.578" W	Medium Sand	sand dollars, sea robin	SW			
MON	LAR-20-018	39° 54' 53.285" N	73° 56' 48.398" W	Gravelly Sand	crab	SW	SF		yes
MON	LAR-20-020	39° 52' 50.546" N	73° 56' 31.626" W	Gravelly Sand	crab				yes
MON	LAR-20-021	39° 51' 49.791" N	73° 56' 24.537" W	Very Coarse/Coarse Sand	sand dollars	R		vegetation	
MON	LAR-20-022	39° 50' 46.908" N	73° 56' 19.834" W	Gravelly Sand	skate, sea robin				yes
MON	LAR-20-024	39° 48' 44.232" N	73° 56' 13.001" W	Sandy Gravel	sea scallop	R			yes

Project Area	Sample	Latitude (°N)	Longitude (°W)	NMFS CMECS	Megafauna Noted	Geoform (SW/R/M)	Shell (S/SF/SH)	Other Features	Potentially Complex Habitat
MON	LAR-20-026	39° 46' 41.926" N	73° 56' 7.711" W	Gravelly Sand	sea robins	R			yes
MON	LAR-20-028	39° 44' 38.709" N	73° 56' 0.950" W	Sandy Gravel	sea star		SF		yes
MON	LAR-20-030	39° 42' 35.754" N	73° 55' 55.154" W	Gravelly Sand	Atlantic surfclam	R	S		yes
MON	LAR-20-031	39° 41' 33.793" N	73° 55' 51.887" W	Gravelly Sand	squid, sea robin	SW	SF	vegetation	yes
MON	LAR-20-032	39° 40' 31.119" N	73° 55' 49.050" W	Gravelly Sand	crab	SW			yes
MON	LAR-20-037	39° 51' 10.772" N	73° 55' 24.782" W	Muddy Sandy Gravel	bay scallop, mussel, urchin, sea robin, skate egg			vegetation	yes
MON	MON-22-383	40° 02' 02.611" N	73° 57' 35.433" W	Very Coarse/Coarse Sand	Sand dollars, fish	R	SF		
MON	MON-22-401	39° 51' 09.811" N	73° 55' 24.594" W	Sandy Gravel	Sea robins, crabs (cancer), shrimp, decorator worm, *Astarte* clams, gastropod egg cases	R	SF	Tracks + trails, tubes	yes
MON	MON-22-415	39° 40' 33.057" N	73° 55' 52.354" W	Sandy Gravel	Sea robins, sand dollars, skate egg case, skate	R	SF		yes
MON	MON-22-420	39° 39' 50.128" N	73° 55' 58.485" W	Gravelly Sand	Sand dollars, decorator worm	R	SF		yes
MON	MON-22-433	39° 35' 36.332" N	73° 55' 34.923" W	Medium Sand	Sand dollars, decorator worm		SF	Tube worms present	
MON	MON-22-446	39° 33' 21.672" N	73° 55' 57.319" W	Gravelly Sand	Sand dollars	R	SF		yes
MON	MON-22-452	39° 31' 57.320" N	73° 55' 57.913" W	Medium Sand	Sand dollars, snail		SF	Amphipod tracks	
MON	MON-22-457	39° 30' 39.190" N	73° 55' 55.386" W	Gravelly Sand	Sand dollars, *Astarte* clam	R	SF		yes
MON	MON-22-459	39° 29' 30.904" N	73° 56' 02.197" W	Medium Sand	*Astarte* clams, sand dollars, starfish		SF		
MON	MON-22-462	39° 28' 49.911" N	73° 56' 21.106" W	Gravelly Muddy Sand	Sea robin, juvenile flounder		SF		yes

Project Area	Sample	Latitude (°N)	Longitude (°W)	NMFS CMECS	Megafauna Noted	Geoform (SW/R/M)	Shell (S/SF/SH)	Other Features	Potentially Complex Habitat
MON	MON-22-473	39° 24' 35.748" N	73° 56' 21.361" W	Very Coarse/Coarse Sand	Sea robin, sand dollars		SF		
MON	MON-22-479	39° 20' 27.228" N	73° 56' 09.318" W	Gravelly Sand	Sand dollars, decorator worm, hermit crab, sea robin	R	SF		yes
LA	OCS-20-038	39° 36' 10.822" N	73° 57' 5.516" W	Medium Sand	sand dollars, sea star		SF		
LA	OCS-20-039	39° 35' 54.259" N	73° 59' 16.512" W	Very Coarse/Coarse Sand					
LA	OCS-20-041	39° 34' 9.011" N	73° 57' 10.012" W	Gravelly Sand	skate egg		SF		yes
LA	OCS-20-043	39° 33' 42.091" N	74° 0' 37.476" W	Medium Sand	sand dollars, sea star, sea robin	SW	SF		
LA	OCS-20-046	39° 31' 52.033" N	73° 59' 4.465" W	Medium Sand	sand dollars, sea robin, hermit crab		SH		
LA	OCS-20-047	39° 30' 3.547" N	73° 57' 23.332" W	Medium Sand	hermit crab, sand dollars		SF		
LA	OCS-20-048	39° 29' 41.261" N	74° 0' 15.414" W	Medium Sand			SF		
LA	OCS-20-049	39° 29' 29.872" N	74° 1' 44.525" W	Gravelly Sand	sand dollars, sea robin				yes
LA	OCS-20-051	39° 28' 3.284" N	73° 57' 12.572" W	Gravelly Sand	sand dollar, hermit crab		SF		yes
LA	OCS-20-053	39° 27' 26.508" N	74° 1' 57.206" W	Medium Sand	crab, sand dollar, sea robin				
LA	OCS-20-055	39° 26' 56.479" N	74° 5' 49.575" W	Medium Sand	sand dollars, sea robin	R			
LA	OCS-20-057	39° 25' 48.571" N	73° 58' 55.144" W	Medium Sand	sand dollars	R			
LA	OCS-20-059	39° 25' 14.266" N	74° 3' 17.719" W	Medium Sand	sand dollars, sea robin, skate egg		SF		
LA	OCS-20-061	39° 24' 50.008" N	74° 6' 28.403" W	Very Coarse/Coarse Sand	sand dollars, moon snail egg case		SF		
LA	OCS-20-063	39° 23' 42.242" N	73° 59' 26.920" W	Medium Sand	sand dollars, crab, sea robin	SW	SF		
LA	OCS-20-064	39° 23' 25.108" N	74° 1' 37.334" W	Gravelly Sand	crab, sand dollars	SW	SF		yes

Project Area	Sample	Latitude (°N)	Longitude (°W)	NMFS CMECS	Megafauna Noted	Geoform (SW/R/M)	Shell (S/SF/SH)	Other Features	Potentially Complex Habitat
LA	OCS-20-065	39° 23' 8.259" N	74° 3' 47.779" W	Gravelly Sand					yes
LA	OCS-20-067	39° 21' 56.629" N	73° 57' 20.426" W	Gravelly Sand	sand dollars		SF		yes
LA	OCS-20-069	39° 21' 23.759" N	74° 1' 40.637" W	Medium Sand	sand dollars		SF	macroinvertebrate tubes	
LA	OCS-20-075	39° 19' 55.075" N	73° 57' 18.867" W	Gravelly Sand	sand dollars, jelly fish				yes
LA	OCS-20-110	39° 36' 46.632" N	74° 0' 26.503" W	Gravelly Sand		R	SF		yes
LA	OCS-20-112	39° 37' 16.671" N	73° 56' 29.165" W	Medium Sand	sea robins, crab, skate	M	S		
LA	OCS-20-113	39° 34' 30.958" N	74° 2' 14.507" W	Medium Sand	sand dollars, hermit crab, crabs, sea robin	M			
LA	OCS-20-114	39° 34' 45.715" N	74° 0' 16.166" W	Gravelly Sand	sand dollar, sea robin		SH		yes
LA	OCS-20-116	39° 35' 15.837" N	73° 56' 20.655" W	Medium Sand					
LA	OCS-20-117	39° 32' 44.588" N	74° 0' 12.102" W	Gravelly Sand	hermit crab, sea robin, crab	M	SH		yes
LA	OCS-20-118	39° 33' 2.825" N	73° 57' 52.343" W	Gravelly Sand	sea robin, sea star		S		yes
LA	OCS-20-121	39° 31' 8.198" N	73° 56' 54.728" W	Gravelly Sand	sand dollars		SF		yes
LA	OCS-20-122	39° 28' 24.493" N	74° 2' 16.121" W	Gravelly Sand	sand dollars		SF		yes
LA	OCS-20-123	39° 28' 41.697" N	74° 0' 4.681" W	Gravelly Sand	sand dollar, crab, sea robin	SW			yes
LA	OCS-20-125	39° 29' 6.859" N	73° 56' 48.259" W	Medium Sand	hermit crab, sand dollars, sea robins	SW	SH		
LA	OCS-20-127	39° 26' 22.044" N	74° 2' 34.234" W	Gravelly Sand	skate egg				yes
LA	OCS-20-128	39° 26' 30.189" N	74° 1' 20.928" W	Gravelly Sand	sea robins		SF		yes
LA	OCS-20-129	39° 26' 47.159" N	73° 59' 10.063" W	Medium Sand	sand dollars		SF		
LA	OCS-20-131	39° 23' 53.412" N	74° 5' 55.043" W	Very Coarse/Coarse Sand	sand dollars, fish, sea robins		SF		

Project Area	Sample	Latitude (°N)	Longitude (°W)	NMFS CMECS	Megafauna Noted	Geoform (SW/R/M)	Shell (S/SF/SH)	Other Features	Potentially Complex Habitat
LA	OCS-20-133	39° 24' 28.665" N	74° 1' 19.693" W	Medium Sand	sand dollars, sea robin		SF		
LA	OCS-20-135	39° 25' 1.166" N	73° 57' 8.045" W	Gravelly Sand	sand dollars		SF		yes
LA	OCS-20-141	39° 22' 38.342" N	73° 59' 48.892" W	Medium Sand	sand dollar, shrimp, squid	R	S		
LA	OCS-20-143	39° 23' 3.464" N	73° 56' 29.509" W	Gravelly Sand	sand dollars, fish, sea robin		S		yes
LA	OCS-20-149	39° 20' 36.848" N	73° 59' 48.514" W	Gravelly Sand					yes
LA	OCS-20-151	39° 21' 2.465" N	73° 56' 31.493" W	Very Coarse/Coarse Sand	sand dollars				
LA	OCS-20-183	39° 38' 13.184" N	73° 57' 4.627" W	Gravelly Sand			SF	Potential trawl/dredge marks	yes
LA	OCS-20-185	39° 40' 15.188" N	73° 57' 0.733" W	Sandy Gravel	sea robin, crab, skate egg	M	SF	vegetation	yes
LA	OCS-20-191	39° 22' 5.695" N	73° 54' 56.238" W	Medium Sand	sea star, sand dollars		SF		
LA	OCS-22-419	39° 39' 53.701" N	73° 57' 03.049" W	Sandy Gravel	Sea robin, gastropod egg cases	R	SF		yes
LA	OCS-22-427	39° 37' 07.687" N	73° 57' 39.151" W	Gravelly Sand	Sea robins, crabs (cancer), decorator worm, *Astarte* clam, gastropod egg cases, shrimp	R	SF		yes
LA	OCS-22-436	39° 35' 00.802" N	74° 01' 49.414" W	Sandy Gravel	Amphipod, skate egg cases	R	SF	tube worm present	yes
LA	OCS-22-440r	39° 34' 30.354" N	74° 02' 13.938" W	Muddy Sand	Sand dollars, gastrodpod egg case, sea grape tunicate, hermit crab, decorator worms	R	SF	Burrows present	
LA	OCS-22-453	39° 31' 43.591" N	73° 56' 57.637" W	Gravelly Sand	Sand dollars	R	SF		yes
LA	OCS-22-463	39° 28' 06.056" N	74° 00' 34.417" W	Muddy Sandy Gravel	Sand dollar, snail		SF		

Project Area	Sample	Latitude (°N)	Longitude (°W)	NMFS CMECS	Megafauna Noted	Geoform (SW/R/M)	Shell (S/SF/SH)	Other Features	Potentially Complex Habitat
LA	OCS-22-467	39° 26' 55.237" N	74° 02' 06.247" W	Muddy Sand		R	SF	Granules and pebbles present. Tube worms present	
LA	OCS-22-470	39° 25' 52.991" N	74° 06' 18.535" W	Muddy Sand	Sand dollars	R			
LA	OCS-22-476r	39° 22' 05.635" N	73° 54' 55.213" W	Gravelly Sand	Snail, skate eggs		SF	Tracks and trails	yes

Appendix C
Fugro Field and GrabCam Video Notes

Table C-1. Field and GrabCam video notes of 2020 as provided directly by Fugro, unedited.

Project Area	Station	Field Preliminary Visual Grain Description (Wentworth Scale)	Surface Features or Macrofauna	GrabCam Video Notes
MON	LAR-20-002	VERY FINE SAND, COARSE SILT, COARSE SAND, GRANULE	VERY FINE SAND WITH HERMIT CRABS, NUMEROUS WORMSAND CASINGS	CASINGS, ANENOME, CRUSHED SELLS HASH, CRAB
MON	LAR-20-004	MEDIUM+COARSE SAND WITH GRAVEL +SHELL	SAND WITH SHELL FRAGMENTS, FEW VISIBLE	GRAVEL ON SAND, SHELL FRAGMENTS, BUBBLES ON LENS
MON	LAR-20-005	mostly fine and very fine sand, some coarse sand and silt	smooth fine sand	HIGH TURBIDITY
MON	LAR-20-006	coarse and medium sand with gravel	sand	VISIBILITY OK, FAST DRIFT OUTSIDE THE CIRCLE BEFORE MOVING BACK INTO IT
MON	LAR-20-008	FINE SILT COARSE SILT, COARSE SAND, GRANULE, PEBBLE	COARSE SILT, NUMEROUS WORM CASINGS, HERMIT CRABS, WORMS	WORM CASINGS, CRAB, SHELL FRAGMENTS, FINE SAND
MON	LAR-20-010	MEDIUM+COARSE SAND	SAND, DIAPATRA	ANEMONE, SAND, SAND DOLLARS

Project Area	Station	Field Preliminary Visual Grain Description (Wentworth Scale)	Surface Features or Macrofauna	GrabCam Video Notes
MON	LAR-20-011	FINE+MEDIUM SAND	WARM TUBE BIOTURBATION	BIOTURBATION, SAND, NUDIBRANCH 18:37:00
MON	LAR-20-012	MEDIUM, COARSE, VERY COARSE SAND	SAND, FEW VISIBLE	GRAVEL ROWS ON SAND
MON	LAR-20-014	COARSE AND VERY COARSE SAND WITHPEBBLES	PEBBLES ON SAND, FEW VISIBLE	QUICK, SAND+ GRAVEL
MON	LAR-20-016	MEDIUM SAND, PEBBLES	FINE TO MEDIUM SAND, CLAM SHELLS, SAND DOLLARS	SEA ROBIN, MOUNDS OF SAND AND PEBBLES, TRANSITION TO SAND WAVES, CRAB
MON	LAR-20-018	COARSE SAND, VERY COARSE SAND, GRANULE, PEBBLE	COARSE SAND, SEA SLUG	CRAB, SAND WAVES, PEBBLES, DHELL FRAGMENTS, SEA ROBIN
MON	LAR-20-020	MEDIUM, COARSE SAND	SAND, LARGE DIAXION WARM, HALF CRAB	ONLY GRAB
MON	LAR-20-021	MEDIUM, COARSE SAND WITH FEW SHELL FRAGMENTS	SAND, CHESTNUT ASTANT	SAND DOLLARS, SAND RIPPLES, SEA WED 2:32:48
MON	LAR-20-022	FINE, MEDIUM, COARSE SAND	SAND "TUBES", NUDIBRANCH?	SKATE, SAND "MOUNDS", SEA ROBIN "WALKING", SKATE EGG
MON	LAR-20-024	GRANULES, MEDIUM COARSE SAND	SANDY GRAVEL, FEW WARMS	SAND RAWS-LARGE, SCALLLLOP, 22:20:40 BLACK MASS, START SAND-GRAVEL

Project Area	Station	Field Preliminary Visual Grain Description (Wentworth Scale)	Surface Features or Macrofauna	GrabCam Video Notes
MON	LAR-20-026	MEDIUM+COARSE SAND WITH GRAVEL	SAND WITH FEW GRAVEL, LITTLE VISIBLE	GRAVEL BETWEEN RIDGES, ONLY ONE LASER (LEFT), SEA ROBINS
MON	LAR-20-028	MEDIUM TO VERY COARSE SAND WITH GRAVEL	SAND+GRAVEL	INCREASING GRAVEL, SHELL FRAGMENTS, STARFISH
MON	LAR-20-030	MEDIUM TO VERY COARSE SAND, GRAVEL	FEW SHELL FRAGMENTS, SAND, GRAVEL (GRAVELLY SAND), SUNFCLAM	SHELL/GRAVEL IN RIPPLES
MON	LAR-20-031	FINE SAND PEBBLES, COARSE SAND	DINE SAND, SHELL, SNAIL, WORM	SAND WAVES, PEBBLES, SQUID, SEA ROBIN, SEAWEED ON CLAM, SHELL FRAGMENTS
MON	LAR-20-032	MEDIUM, COARSE, VERY COARSE SAND WITH GRAVEL	SAND WITH GRAVEL, FEW VISIBLE	CRAB UNDER CLAM SHELL 19:10:10, GRAVEL WAVES
MON	LAR-20-037	SILT, FINE SAND, MEDIUM SAND, COARSE SAND, GRAVEL	GRAVEL SAND, BAY SCALLOP, SKATE EGG, MUSSEL (IN OTHER BUCKET)	GRAVEL, URCHIN 1:36:42, SEA ROBIN, SKATE EGG, SEAWEED 1:38:09, SCALLOP
LA	OCS-20-038	MEDIUM, COARSE, VERY COARSE SAND	SAND, SAND DOLLARS, FEW VISIBLE	SAND, SHELL FRAGMENTS, STARFISH, CLAMS
LA	OCS-20-039	VERY COARSE SAND, COARSE SAND, MEDIUM SAND, PEBBLES	COARSE SAND, WORM, WORM CASINGS, CLAM, HERMIT CRAB	ONLY GRAB

Project Area	Station	Field Preliminary Visual Grain Description (Wentworth Scale)	Surface Features or Macrofauna	GrabCam Video Notes
LA	OCS-20-041	MEDIUM+COARSE SAND	SAND, SOME BIOTURBATION, CHESTNUT ASTANT, FEW OTHER VISIBLE	SAND, SKATE EGG, BIOTURBATION, SHELL FRAGMENTS
LA	OCS-20-043	MEDIUM TO COARSE SAND	SAND, SHELL, WORMS, SAND DOLLAR	SAND DOLLARS, SAND WAVES, SHELL FRAGMENTS, STAR FISH, SEA ROBIN, WORM CASING
LA	OCS-20-046	MEDIUM TO VERY COARSE SAND	SAND, SHELLS, SAND DOLLAR, HERMIT CRAB	SAND WAVES (SLIGHT) SHELL HASH, SAND DOLLARS, SEA ROBIN
LA	OCS-20-047	FINE - COARSE SAND, PEBBLE	FINE SAND, SAND DOLLAR, SHELL FRAGMENT, HERMIT CRAB,	SAND, SAND DOLLARS, SHELL FRAGMENTS; HASH, SEA ROBIN, CLAMS WORM CASINGS
LA	OCS-20-048	COARSE SAND	SAND, FEW VISIBLE	SAND, FRAGMENTS IN ROWS
LA	OCS-20-049	COARSE TO VERY COARSE SAND	COARSE SAND, SAND DOLLARS	SAND WORMS, SHELL, SAND DOLLARS, SEA ROBIN, SHARK EGGS
LA	OCS-20-051	MADIUM SAND, VERY COARSE SAND, PEBBLES, GRANULE	SAND, PEBBLES, SHELL, HERMIT CRAB	SHELL FRAGMENTS, SAND DOLLAR, PLANT LIFE (04:11) WORM CASING
LA	OCS-20-053	FINE TO MEDIUM SAND, CLAY	WORM CASINGS, SHELL, SAND	CRAB, SAND DOLLAR, SEA ROBIN, MOUND OF SAND (6:35) (6:32 SACIL?)

Project Area	Station	Field Preliminary Visual Grain Description (Wentworth Scale)	Surface Features or Macrofauna	GrabCam Video Notes
LA	OCS-20-055	MEDIUM+COARSE SAND WITH SHELL FRAGMENTS	SAND, SAND DOLLARS, DIAXIOS WARM	SAND RIPPLES, SAND DOLLARS
LA	OCS-20-057	MEDIUM, COARSE, VERY COARSE SAND WITH SHELL FRAGMENTS	SAND, CLAM, SAND DOLLARS	SAND RIPPLES, SAND DOLLARS
LA	OCS-20-059	MEDIUM, COARSE, VERY COARSE SAND	MIXED SAND, CLAM, SAND DOLLARS	SEA ROBIN, SKATE EGG, SHELL FRAGMENTS
LA	OCS-20-061	MEDIUM, COARSE, VERY COARSE SAND	SAND, SAND DOLLARS	SAND DOLLARS, SHELL FRAGMENTS
LA	OCS-20-063	FINE TO COARSE SAND	SAND, SHELLS, CLAMS	CRAB, SAND WAVES, SHELL FRAGMENTS, SAND DOLLARS, SEA ROBIN
LA	OCS-20-064	VERY COARSE SAND TO GRANULE	SAND, SHELLS, WORM, CLAM	SAND WAVES, SHELL FRAGMENTS, CRAB, SAND DOLLARS
LA	OCS-20-065	COARSE TO GRANULE SAND	SAND, SHELLS, NO INFAUNA, EMPTY CLAM SHELLS	ONLY GRAB
LA	OCS-20-067	MEDIUM, COARSE, VERY COARSE SAND, SHELL FRAGMENTS, FEW GRAVEL	SHELL FRAGMENTS + SAND, CLAM	SAND, SAND DOLLARS, CLAMS ON SURFACE
LA	OCS-20-069	MEDIUM+COARSE SAND WITH SHELL FRAGMENTS	SAND, CLAM	SAND DOLLARS

Project Area	Station	Field Preliminary Visual Grain Description (Wentworth Scale)	Surface Features or Macrofauna	GrabCam Video Notes
LA	OCS-20-075	VERY COARSE SAND COARSE SAND WITH SHELL FRAGMENTS	SHELL FRAGMENTS AND SAND DOLLARS	JELLY FISH 03:50 SAND, SAND DOLLARS
LA	OCS-20-110	MEDIUM, COARSE, VERY COARSE SAND, FEW GRAVEL+SHELL FRAGMENTS	SAND, SHELL FRAGMENTS, WARM	SAND, SHELL FRAGMENTS, SAND RIPPLES
LA	OCS-20-112	FINE SAND, COARSE SILT, COARSE SAND	SAND, WORMS, SNAILS	SEA ROBIN, SAND MOUNDS, SHELL HASH AND FRAGMENTS, CRAB, RAY
LA	OCS-20-113	FINE SAND, MEDIUM SAND	FINE SAND, WORMS, SAND DOLLARS, HERMIT CRAB, CLAM	CRABS, SAND MOUND, SEA ROBIN SAND DOLLAR
LA	OCS-20-114	MEDIUM TO COARSE SAND	MEDIUM SAND, CLAM, SHELL FRAGMENTS, WORM CAISING, BOTTOM CROWLING "BUG"	SAND DOLLAR, CLAMS, SHELL HASH, SEA ROBIN, SHARK EGG
LA	OCS-20-116	MEDIUM TO COARSE SAND, FEW PEBBLES	SAND, SHELL FRAGMENTS, PEBBLES, NONE INFAUNA	ONLY GRAB
LA	OCS-20-117	FINE SILT, MEDIUM SILT, FINE SAND, COARSE SAND, GRANULE	FINE SAND, SHELLS, HERMIT CRAB, WORM CASINGS, CLAM	SAND MOUNDS, SHELL HASH, SHELL, FRAGMENTS, SEA ROBIN, WORM, CLAM, WORM CASING, CRAB

Project Area	Station	Field Preliminary Visual Grain Description (Wentworth Scale)	Surface Features or Macrofauna	GrabCam Video Notes
LA	OCS-20-118	MEDIUM TO VERY COARSE SAND, GRANULES	SAND+GRANULES, FEW VISIBLE	LOTS OF SHELL, CHESTNUT CLAMS+SEA ROBIN, BIOTURBATION, STARFISH
LA	OCS-20-121	MEDIUM+COARSE SAND, FEW VERY COARSE SAND+GRANULE	SAND, JUVENILE SAND DOLLAR, SAND DOLLAR	SHELL FRAGMENTS + SAND
LA	OCS-20-122	FINE TO COARSE SAND	SAND, SHELL FRAGMENTS, WORM, CLAM, SAND DOLLAR	SAND DOLLARS, WORM CASINGS, SHELL FRAGMENTS, LARGE CLAMS
LA	OCS-20-123	FINE TO COARSE SAND	FINE SAND, SHELLS, SAND DONLLAR, CLAM	SAND WAVES, SHELL, SAND DOLLARS, MOUNDS OF SAND, CRAB, SEA ROBIN
LA	OCS-20-125	FINE, MEDIUM, COARSE SAND	HERMITE CRAB, FINE SAND, SAND, SHELL FRAGMENTS, WORM, SAND DOLLAR	SAN DOLLARS, SHELL HOSH, SAND WAVES, CLAMS, SEA ROBIN SHARK EGGS
LA	OCS-20-127	CLAY, FINE, MEDIUM, COARSE, VERY COARSE AND GRANULE, PEBBLE WITH SHELL FRAGMENTS	CLAY BALLS (FEW), SKATE EGG	SAND, NO SAND DOLLARS-SOUTH-EAST, WORM TUBES 00:46:22-MIDDLE, CLAY BALLS 00:47:11-NORTHWEST
LA	OCS-20-128	MEDIUM, COARSE, VERY COARSE SAND, GRANULE, PEBBLE, MANY SHELL FRAGMENTS	MANY SHELL FRAGMENTS, PEBBLES, FEW VISIBLE IN AMOUNT OF MATERIAL	DISTURBED, MANY SHELL FRAGMENTS, SEA ROBINS

Project Area	Station	Field Preliminary Visual Grain Description (Wentworth Scale)	Surface Features or Macrofauna	GrabCam Video Notes
LA	OCS-20-129	MEDIUM, COARSE, VERY COARSE SAND WITH SHELL FRAGMENTS	SAND, SHELL FRAGMENTS, FEWER SAND DOLLARS	SAND, SAND DOLLARS, SHELL HASH, LITTLE BROWN CLAMS-CHESTNUT ASTARTE
LA	OCS-20-131	COARSE TO FIND SAND	SAND DOLLARS, FINE SAND, FISH, CLAM	SAND DOLLARS, SHELL FRAGMENTS, SEA ROBINS
LA	OCS-20-133	FINE TO COARSE SAND	SAND, SHELLS, SAND DOLLARS, CLAMS	SAND, SHELL FRAGMENTS, SAND DOLLARS, SEA ROBIN
LA	OCS-20-135	MEDIUM, COARSE, VERY COARSE SAND WITH SHELL FRAGMENTS	SAND, SHELL FRAGMENTS, CLAM	SAND, SAND DOLLARS
LA	OCS-20-141	MEDIUM TO COARSE SAND	SAND, SHELL FRAGMENTS, CLAMS	SAND, SHELLS, SAND DOLLAR, SHRIMP,SQUID, SAND RIPPLES
LA	OCS-20-143	GRANULE, VERY COARSE, FINE	SAND, SHELLS, WRORM	SHELLS, SHELL FRAGMENT, SAND DOLLARS, FISH, SEA ROBIN, SHARK EGGS
LA	OCS-20-149	VERY COARSE TO GRANULE SAND	GRANULE SAND WITH SHELL FRAGMENTS,CLAMS	SAND, SHELL FRAGMENT (EXTENSIVE)
LA	OCS-20-151	MEDIUM COARSE SAND WITH SHELL FRAGMENTS	SAND, SHELL FRAGMENTS, CLAM	SAND, SAND DOLLARS

Project Area	Station	Field Preliminary Visual Grain Description (Wentworth Scale)	Surface Features or Macrofauna	GrabCam Video Notes
LA	OCS-20-183	MEDIUM, COARSE, VERY COARSE WITH FEW GRAVEL+SHELL FRAGMENTS	UNCONSOLIDATED, RECENTLY PERTURBED SAND, FEW WARMS, CHESTNUT ASTANT	TRAWL MOUNDS, SHELL FRAGMENTS
LA	OCS-20-185	FINE SAND, MEDIUM SAND, COARSE SAND, PEBBLE	SAND AND PEBBLE, NO INFAUNA, LOTS OF PEBBLES AND SHELL FRAGMENTS	SEA ROBIN, PEBBLES WITH MOUNDS OF SAND, SHELL FRAGMENTS, CRAB, SEA WEED, SKATE EGG
LA	OCS-20-191	MEDIUM + COARSE SAND WITH SHELL FRAGMENTS	FEW SHELL FRAGMENTS	STARFISH, SAND DOLLARS

Table C-2. Field and GrabCam video notes for 2022 sampling as provided directly by Fugro, unedited.

Sample	NMFS CMECS	Video Observations Epifauana	Video Observations Macroflora	Video Observations Geologic Bedforms	Video Observations Bioturbation	Other Video Observations
NEC-22-300	Sandy Mud	Hermit crabs	None Obs.	None Obs.	Tracks and trails	Very turbid, low visibility
NEC-22-303	Muddy Sand	None Obs.	None Obs.	None Obs.	Tracks and trails	Very turbid, low visibility
NEC-22-304	Muddy Sand	None Obs.	None Obs.	None Obs.	Tracks and trails	Very turbid, low visibility
NEC-22-305	Muddy Sandy Gravel	Clusters of Blue Mussels	None Obs.	Shell hash	None Obs.	None Obs.
NEC-22-306	Sandy Mud	None Obs.	None Obs.	None Obs.	None Obs.	Exceptionally turbid, very low visibility

Sample	NMFS CMECS	Video Observations Epifauana	Video Observations Macroflora	Video Observations Geologic Bedforms	Video Observations Bioturbation	Other Video Observations
NEC-22-312	Fine/Very Fine Sand	Clusters of blue mussels	None Obs.	Sand ripples	tracks and trails	Very turbid, low visibility
NEC-22-314	Medium Sand	Clusters of Blue Mussels	None Obs.	None Obs.	Tracks and trails	Very turbid, low visibility
NEC-22-316	Muddy Sand	Some tubes	None Obs.	Sand/mud ripples	some tubes	Exceptionally turbid, very low visibility
NEC-22-323	Medium Sand	None Obs.	None Obs.	Sand ripples	None Obs.	Exceptionally turbid, very low visibility
NEC-22-327	Gravelly Sand	Blue mussels	None Obs.	Sand ripples	None Obs.	Very turbid, low visibility
NEC-22-328	Muddy Sand	Amphipod tubes	None Obs.	None Obs.	Tubes	Very turbid, low visibility
NEC-22-331	Fine/Very Fine Sand	None Obs.	None Obs.	Sand ripples	None Obs.	Very turbid, low visibility
NEC-22-334	Medium Sand	Hermit crabs	None Obs.	Sand ripples	None Obs.	Very turbid, low visibility
NEC-22-336	Medium Sand	None Obs.	None Obs.	Sand ripples	None Obs.	Exceptionally turbid, very low visibility
NEC-22-337	Sandy Mud	None Obs.	None Obs.	None Obs.	None Obs.	Exceptionally turbid, very low visibility
NEC-22-339	Muddy Sand	None Obs.	None Obs.	Sand ripples	None Obs.	Exceptionally turbid, very low visibility
NEC-22-341	Very Coarse/Coarse Sand	None Obs.	None Obs.	Sandy bottom	Shell fragments	Low bottom visibility. Very short video due to unintentional bottom contact.
NEC-22-343	Fine/Very Fine Sand	None Obs.	None Obs.	Sand, shell fragments, ripples	None	Very turbid, low visibility
NEC-22-345	Sandy Gravel	None Obs.	None Obs.	Sand ripples	Shell fragments	Exceptionally turbid, very low visibility
NEC-22-347	Sandy Gravel	None Obs.	None Obs.	None Obs.	None Obs.	Shells, sandy bottom. Very turbid, moderate heave. Short video due to unintentional bottom contact.
NEC-22-348	Medium Sand	Diopatra tubes,	None Obs.	Sand ripples	None Obs.	Short video, very low visibility

Sample	NMFS CMECS	Video Observations Epifauana	Video Observations Macroflora	Video Observations Geologic Bedforms	Video Observations Bioturbation	Other Video Observations
NEC-22-350	Sandy Gravel	None Obs.	None Obs.	Sand ripples	None Obs.	Shell fragments/hash; low visibility
NEC-22-352	Medium Sand	Shell fragments, abundant sand dollars, sponge	None Obs.	Sandy bottom, no ripples	None Obs.	Shell fragment, sand dollars
NEC-22-353	Gravelly Sand	Sand dollars, fish, sea robin	None Obs.	Sand, shell fragments	None Obs.	Low visibility at the bottom
NEC-22-355	Medium Sand	Sand dollars abundant	None Obs.	None Obs.	None Obs.	None
NEC-22-357	Medium Sand	Very high density of sand dollars, Diopatra tubes, sea robin (08:04:05, 08:04:15), spider crab (08:07:35)	None Obs.	Sandy, rare shell fragments, no bedforms	Tracks/trails	None
NEC-22-360	Medium Sand	Sand dollars, hermit crab, flounder (01:16:25, 01:18:20)	None Obs.	Sand, shell fragments	None Obs.	None
NEC-22-361	Muddy Sandy Gravel	None Obs.	None Obs.	Gravelly, pebbly, sandy, with shell fragments	None Obs.	See other videos for further details
NEC-22-367	Fine/Very Fine Sand	Occasional sand dollars	None Obs.	Sand, shell fragments	None Obs.	Low visibility at the bottom, short video, unintentional bottom impact
NEC-22-369	Medium Sand	Diopatra tubes, rare sand dollars, gastropod egg case (11:14:15, 11:16:40)	None Obs.	Sandy, scattered shell fragments, small wavelength ripples	None Obs.	None
NEC-22-371	Muddy Sand	Diopatra tubes, tubes	None Obs.	Sand ripples, scattered shell fragments	Tracks/ trails	USBL depth incorrect(displayed on video overlay, but pole not down)

Sample	NMFS CMECS	Video Observations Epifauana	Video Observations Macroflora	Video Observations Geologic Bedforms	Video Observations Bioturbation	Other Video Observations
NEC-22-372	Medium Sand	Sand dollars, starfish, flounder (03:37:06, 03:37:30)	None Obs.	Sand, shell fragments	Burrows	None
NEC-22-373	Gravelly Sand	Sand dollars abundant	None Obs.	sand, shell fragments, sand ripples	None Obs.	None
NEC-22-375	Medium Sand	Sand dollars	None Obs.	Ripples	None Obs.	sandy, shell fragments
NEC-22-377	Fine/Very Fine Sand	Sand dollars, sea robin (10:44:20), skate egg case(10:45:20), Diopatra	None Obs.	Sandy, no ripples	Tracks+trails, burrows	Vessel rolling, heaving in swell
NEC-22-378	Sandy Gravel	Sand dollars, snails, burrowing anemone (07:58:55), squid (07:59:10)	None Obs.	Sandy, gravelly, with shell fragments	Track/trails, some burrows	None
NEC-22-380	Sandy Gravel	Sea Robin (12:39:30)	None Obs.	Ripples - coarse-grained particles in troughs between ripple crests	None Obs.	Video logged without station name (ASOW None) at start and up to 12:38 (station name turned on at 12 38 - 380)
NEC-22-382	Pebble/Granule (report pavement composition)	Gravelly	None Obs.	None Obs.	Tubes/small burrows evident on surface of grab	3rd attempt, partial sample
NEC-22-385	Gravelly Muddy Sand	Numerous sand dollars, gastropod egg case (22:46:55), possible hydroids (12:48:55), seastar (12:49:35)	None Obs.	Sandy, broad low relief ripples, gravel and shell fragments in troughs, scattered cobbles	Tracks and trails	Duplicate TOC and GSA samples
NEC-22-387	Medium Sand	Sand dollars on ripple ridges, skate egg(17:57:30)	None Obs.	Sand, shell fragments, ripples, shell fragments in ripple troughs	None Obs.	None
NEC-22-389	Sandy Gravel	Sand dollars	None Obs.	Ripples with shell fragments and pebbles in troughs	None Obs.	None
NEC-22-391	Muddy Sandy Gravel	Sand dollar, 2 skates (17:59:03)	Plant (17:58:35)	Sand, shell fragments, ripples, pebbles	None Obs.	None

Sample	NMFS CMECS	Video Observations Epifauana	Video Observations Macroflora	Video Observations Geologic Bedforms	Video Observations Bioturbation	Other Video Observations
NEC-22-392	Medium Sand	Sand dollars	None Obs.	Ripples, shell fragments	None Obs.	None
NEC-22-394	Sandy Gravel	1 worm on grab surface	None Obs.	Ripples	None Obs.	None
NEC-22-397	Sandy Gravel	None Obs.	None Obs.	Sand ripples, shell fragments, pebbles	None Obs.	None
NEC-22-398	Medium Sand	Sand dollars, sea robin (01:26:05), hermit crab	None Obs.	Sand, shell fragments	Burrows, tracks	Duplicate GSA and TOC samples taken
NEC-22-404	Sandy Gravel	Fish (23:10 on video)	None Obs.	None Obs.	None Obs.	High turbidity, low visibility
NEC-22-406	Pebble/Granule (report pavement composition)	1-2 cm shrimp on grab surface	None Obs.	None Obs.	Clusters of sandy mounds with burrows on grab surface	Very long period swell, large heave. Additional ~1 min of video taken at bottom after grab; heave caused grab to strike seabed unintentionally.
NEC-22-408	Sandy Gravel	Sea robin ((02:03:50)	None Obs.	None Obs.	None Obs.	None
NEC-22-409	Muddy Sand	Sand dollars, sea robin, hermit crab	None Obs.	Sand, shell fragments, pebbles, ripples	Burrow, worm tubes, worm	None
NEC-22-412	Gravelly Sand	Sand dollars, worm tubes, skate (03:35)	None Obs.	Sand, shell fragments, less pebbles	Worm tubes	video note for drop A is very good
NEC-22-414	Gravelly Sand	Sea robins (05:05:37)	None Obs.	Sandy, shelly seafloor	Yes	Tubes on the surface of grab; long polychaete coming out the bottom of the grab. Few burrows on surface
NEC-22-417	Gravelly Muddy Sand	Sand dollars, fish	None Obs.	Sand, shell fragments	Tracks, trails	None
NEC-22-423	Very Coarse/Coarse Sand	Numerous sand dollars, star fish (09:43:50)	None Obs.	Sandy, gravelly, shell fragments in low ripple troughs	None Obs.	None
NEC-22-428	Medium Sand	Numerous sand dollars, fish (11:05:00), worm tubes, Diopatra (common)	None Obs.	Sandy with shell fragments, subtle ripples	Some Tracks+trails	Amphipod on surface of grab, sand dollars, snail, tubes, shell fragments, small hermit crab
NEC-22-435	Muddy Sand	Sand dollars, skate egg, sea robin	None Obs.	Sand, shell fragments	Track, worm tubes	None
NEC-22-448	Gravelly Sand	Sand dollars	None Obs.	Sand, ripples, shell fragments	None Obs.	Visibility is better

Sample	NMFS CMECS	Video Observations Epifauana	Video Observations Macroflora	Video Observations Geologic Bedforms	Video Observations Bioturbation	Other Video Observations
NEC-22-456	Medium Sand	Sand dollars	None Obs.	Sand, shell fragments, small ripples	None Obs.	Duplicate TOC and GSA samples
NEC-22-461	Gravelly Sand	Sand dollars; moon snail (15:47:00)	None Obs.	Sandy, shell fragments	Tracks and trails	Video seems washed out (too much ambient light?)
NEC-22-464	Sandy Mud	No sand dollars	None Obs.	Sand, shell fragments (dense)	Diopatra mounds and tubes on grab surface, worm tubes, worm burrows in sieve	Murky
NEC-22-469	Gravelly Sand	Sand dollars, sea robin 00:36:30, moon snail 00:36:45	None Obs.	Sand, shell fragments (dense)	Burrows, tracks (00:35:45)	None
NEC-22-472	Gravelly Sand	Sand dollars	None Obs.	Sand, shell fragments, ripples	Diopatra mounds (?)	None
NEC-22-569	Muddy Sandy Gravel	Sea robin (22:40:40).	None Obs.	Sandy bottom with shell fragments, pebbles	Abundant suspected worm tubes	Video and photo cards have incorrect sample number (586)
NEC-22-612	Fine/Very Fine Sand	Anemone (01:44:15). Hermit crab	None Obs.	Sandy bottom with ripples	Burrows	None Obs.
NEC-22-703	Muddy Sandy Gravel	None Obs.	None Obs.	None Obs.	None Obs.	Construction debris visible in video
MON-22-383	Sand	Numerous sand dollars, fish (15:55:10)	None Obs.	Sand ripples, shell fragments in troughs	None Obs.	None
MON-22-401r	Gravel/Gravel Mixes	Sea robin (8:44:00), 2 sea robins (08:45:35), crab (08:46:30), 2 sea robins (08:48:10), crab and small shrimp (08:49:30), Diopatra, Astatrte bivalves, scattered gastropod egg cases	None Obs.	Coarse sand, shell fragments and gatropods in ripple troughs	Tracks+trailes, tubes (patchy cluster)	None
MON-22-415r	Gravel/Gravel Mixes	06:07:40 sea robin, 06:07:59 sea robin, sand dollar, 06:10:50 skate egg case, 06:11:10 sea robin, 06:12:03 skate	None Obs.	Sandy, shelly, sand ripples with shells in the troughs, some gravel	None Obs.	Only one bucket filled, other lost due to Spisula shell in jaws
MON-22-420	Gravelly	Numerous sand dollars, Diopatra	None Obs.	Sand ripples, shell fragments in	None Obs.	Duplicate sample (TOC & GSA 2 each)

Sample	NMFS CMECS	Video Observations Epifauana	Video Observations Macroflora	Video Observations Geologic Bedforms	Video Observations Bioturbation	Other Video Observations
				troughs, granules and pebbles		
MON-22-433	Sand	Numerous sand dollars, some Diopatra, tubes	None Obs.	Sandy seafloor, shell fragments, no bedform	None Obs.	Numerous sand dollars on surface of grab, few worm tubes
MON-22-446	Gravelly	Sand dollars 16:42:00	None Obs.	Sand, shell fragments, gravels, ripples	Burrows 16:41:15	None
MON-22-452	Sand	Sand dollars, amphipod tracks (18:16:10), snail (18:14, 18:16:50)	None Obs.	Sand , shell fragments	None Obs.	Surface photo,ruler depth, and seive has wrong label tag in the photos (says 422)
MON-22-457	Gravelly Sand	sand dollars	None Obs.	shell fragments, sand, ripples	None Obs.	None
MON-22-459	Sand	Sand dollars, starfish	None Obs.	Sand, shell fragments	None Obs.	None
MON-22-462	Gravelly	Sea robin, baby flounder (00:43:45)	None Obs.	Sand, shell fragments	Worm tubes	Medium coarse sand upper 3-4cm, underlain by gray clay
MON-22-473	Sand	Sea robin (06:17:25), sand dollars	None Obs.	Sandy with shell fragments	None Obs.	None
MON-22-479	Gravelly	Sand dollars, Diopatra, hermit crab (05:16:20), sea robin(05:17:30, 05:18:30)	None Obs.	small scale ripples (dimpled), sandy, scattered shell fragments	None Obs.	Relatively large heave on video
OCS-22-419	Gravel/Gravel Mixes	Sea robin(07:07:25 /07:08:25), gastropod egg case (07:09:55)	None Obs.	Sandy gravels with shell fragments, ripples	None Obs.	None
OCS-22-427	Gravel/Gravel Mixes	Sea robin (08:44:00), 2 sea robins (08:45:35), crab (08:46:30), 2 sea robins (08:48:10), Diopatra, Astarte bivalve, scattered gastropod egg cases, crab and small shrimp	None Obs.	Coarse sand, shell fragments and gatropods in ripple troughs	Tracks+trails, tubes (patchy clusters)	None
OCS-22-436	Gravel/Gravel Mixes	Skate egg cases (14:22:30), 2xskate egg cases (14:25:45)	None Obs.	Small ripples, sand, shell fragments aligned in ripple troughs	None Obs.	Very coarse sand, amphipod on surface, one tube on surface with some fine-grained sand
OCS-22-440r	Mud	Numerous sand dollars, Diopatra, egg case	None Obs.	Sandy, very small scale ripples,	Burrows	None

Sample	NMFS CMECS	Video Observations Epifauana	Video Observations Macroflora	Video Observations Geologic Bedforms	Video Observations Bioturbation	Other Video Observations
		(gastropod) 14:55:54, sea grape (tunicate), hermit crab		scattered shell fragments		
OCS-22-453	Mud	None observed - short video only	None Obs.	Sandy with shell fragments, low/subtle ripples	None Obs.	None
OCS-22-463	Gravelly	Sand dollar, snail	None Obs.	Sand, shell fragments	None Obs.	None
OCS-22-467	Gravel/Gravel Mixes	None observed, but video quality poor	None Obs.	Sandy, rippled, with granules/pebbles and small fragments in trough	None Obs.	Poor visibility, heave - overall poor quality video
OCS-22-470	Mud	Occasional sand dollars, otherwise no epifauna noted	None Obs.	small scale ripples (dimpled), sandy, scattered shell fragments	None Obs.	Relatively poor visibility, camera heaving
OCS-22-476r	Gravelly Sand	Sand dollars,; skate egg case 08:47:50	None Obs.	Sandy with shell fragments	Tracks and trails	None

Appendix D
RPS Underwater Video Review Notes

Table D-1. Video reviewer notes while analyzing transects taken in 2021 from the Lease Area (LA)/(WTA) and Monmouth ECC (MON).

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
WTA-21	Video was mostly clear, with limited visibility as the sled moved up and away from the bottom.	None observed	Northern sea robins were by far the most abundant organism. Moon snails, hermit crabs, and a sparse / patchy covering of sand dollars also present.	Sand	-
WTA-24	Good visibility, not very green at all and decent amount of marine snow when flying high off bottom. Steady tow speed.	None present	Sand dollars and astarte throughout, some sea robins.	Flat sand/mud with shell hash, trace	-
WTA-25	Slight green tint at height, somewhat obscured by marine snow.	-	numerous sand dollars	Flat sand with scattered shells and shell hash.	-
WTA-26	Good speed and closeness to bottom.	none noted	abundant sand dollars, sea robins	Sand with trace shell hash	Astarte clams (many under size)
WTA-28	Good visibility	nothing major visible	sea robins with many small astartes	Mostly sand/silt with clusters of shells scattered.	-
WTA-29	Video was mostly clear, with limited visibility has the sled moved up and away from the bottom.	None observed	Moon snails, hermit crabs, and a sparse / patchy covering of sand dollars also present.	Sand/silt with dense clam shells present in clusters starting at the half-way point.	-
WTA-30	Slight green tint at height, heavy marine snow.	-	Hermit crabs below size cutoff. Many astarte clams.	Sand/silt with scattered shells	-
WTA-31	Good speed, and closeness to bottom, lots of marine snow.	none noted		Mostly sand/silt with clusters of shells scattered.	Astarte clams (many under size)
WTA-32	Good visibility	nothing major visible	Northern sea robins and skate egg cases were most common. One sand dollar and one possibly living sea scallop were observed with astartes scattered throughout.	Mostly sand/silt with clusters of shells scattered.	-

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
MON-35	Decent visibility with a lot of up/down in beginning, green visibility, flying high off the bottom often. At 14:18:29 or last minute and a half a transition zone from sand to shell/gravel/sand mix with neither dominant.	Trace present	-	Flat sand with trace shell hash, last minute and a half and an even mix of shell/gravel/sand.	-
MON-36	Good visibility	Nothing major, a few small patches of encrusting orgs on some skate egg cases visible.	A few other fishes were observed. Astartes were scattered throughout often below the size threshold with one possibly living sea scallop.	Sand with sparse-moderate shell hash in patches with some areas of sparse-moderate pebbles especially near the end.	-
MON-37	Video was mostly clear, with limited visibility as the sled moved up and away from the bottom.	None observed	Northern sea robins and sea scallops were most abundant organisms. Patchy covering of burrowing anemones also present.	Flat medium coarse sand with moderate shell hash throughout.	-
MON-38	Slight green tint at height, decent visibility with little snow.	-	sea robins, scallops, burrowing anemones	-	-
MON-39	Good speed, and proximity to bottom.	none noted	burrowing anemones, sea robins and scallops	Sand with sparse to moderate shells and shell hash.	Astarte clams (many under size)
MON-40	Good visibility	A few small patches of bushy plant-like organisms on various hard substrate.	Many juvenile sea scallops mostly smaller than 5 cm diameter along with sea robins and burrowing anemones.	Sand with sparse-moderate shell hash in patches and sparse-moderate pebbles.	-
MON-41	Video was mostly clear, with limited visibility as the sled moved up and away from the bottom.	None observed	Northern sea robin and cancer crabs were most commonly observed organisms. Squid egg mop also present.	Pebble granule with fine sand and shell hash throughout the transect. Density of pebble/granule sediments fluctuates but typically appears to be dominant grain size.	-
MON-42	Slight green tint at height, moderate visibility with moderate snow.	-	-	Flat sand/mud transition to patches of pebble, coarser grain sediment with clam shell hash.	-
MON-43	Good visibility	none noted	Significant mussel beds for the last 1/3 of the	Gravel with sparse to moderate sand and sparse shell hash for	-

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
			transect with cancer crabs, sea stars, and sea urchins feeding in and around the beds.	most of the transect with some sand patches about 3/4 of the way through. The last 1/3 of the video were expansive mussel beds on top of sand and gravel.	
MON-44	Good visibility	A few small patches of encrusting orgs on skate egg cases and one large seemingly colonial organism.	Many sand dollars at first. small clumps of mussels scattered throughout with skate egg cases, sea robins, cancer crabs and a few other species.	Sand to muddy sand with clumps of moderate pebbles and shell hash. Some patches of dense gravel near the center of the transect begin a transition to primarily pebble bottom for much of the remainder of the transect.	-
MON-45	Video quality was low and position in the water column moved up and down with many impacts with the sea floor in the video.	None observed	Northern sea robins and burrowing anemones most common organisms observed.	Pebble granule with fine sand and shell hash in the first half of the transect, switching to gravelly sand in the second half.	-
MON-46	Slight green tint, moderate to poor visibility, moderate snow.	-	sand dollars abundant	Flat sand/mud transition to shell hash and coarser grained sediment.	Small burrows/ worm tube holes sporadically throughout.
MON-47	Decent clarity, turbid and hard to see bottom when camera is higher in the water column, difficult to distinguish pebble/granule when camera raises passed a certain threshold.	Instances of encrusting organisms on skate egg cases and shell rubble.	sea scallops, sea robins	Sand, shell hash and rubble, pebble-granule. Goes through distinct transitions sand to pebble-granule to biogenic.	-
MON-48	Good visibility	nothing major visible	Many sand dollars in some sand patches often with burrowing anemones. A fair number of juvenile scallops near the beginning of the transect. Skate egg cases and cancer crabs also present.	Pebble with patches of sand for the first half of the transect then alternating sand and pebble patches.	-
MON-49	Moderate visibility	A few encrusting organisms and bushy plant-like organisms attached	Juvenile sea scallops and northern sea robins were common. A.small patch of small	Pebble/granule arranged in waves with some sand in between the dense patches.	-

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
		to large shells and gravel in a few instances but overall were not common.	amphipod/worm tubes also appeared near the beginning.		
MON-50	Good clarity good height above bottom for most of transect, good speed.	instances of encrusting organisms, maybe some small plant-like bryozoans	dense sand dollars, sea robins, anemones	sand, shell hash and rubble, pebble-granule	-
MON-51	Better than most, decent turbidity in some areas.	-	Sand dollars initially sparse but becoming numerous.	very soft sand/mud transition to coarser grained substrate	small burrows/ worm tube holes sporadically throughout
MON-52	Moderate turbidity throughout water column with varying amounts of marine snow. There were a few instances in which the camera became out of focus and was lifted too far from the bottom.	N/A	Sand dollars were present throughout the transect. Astarte present but <2.5 cm. Hermit crabs present, some were <2.5 cm. Sea robins present throughout entire transect. Tube worm structures were present throughout transect.	The beginning of the transect the bottom substrate is sparse shell hash and flat sand/mud. As the transect continues, the bottom transitions to moderate shell hash and contains pieces of shell rubble composed of clam and mussel shells. Throughout the rest of the transect, the bottom substrate transitions between flat sand/mud with sparse-moderate shell hash to moderate shell hash with pieces of shell rubble. Tube worm structures were present along the substrate.	Instances where pieces of shell rubble appear to be dissolving.
MON-53	Good visibility	One clump of bushy plant-like that is possibly algae.	Some sea robins and burrowing anemones with patches of sand dollars.	Primarily sand/mud with patches of moderate shell hash and gravel in troughs or small sand waves. The sand/mud component seemed to become finer as the transect went on.	-
MON-54	Mild turbidity throughout transect with varying amounts of marine snow. There were several instances in which the camera	N/A	Sand dollars were present throughout the transect. Several observations of clumped marine	Transition zones present. From flat sand/mud with sand dollars, sparse shell hash/ rubble, to patches of pebble/cobble with shell hash/rubble in between	-

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
	became out of focus and was lifted too far from the bottom.		mussels along the seafloor. The density of blue mussels increased towards the end of the transect. A sea urchin was observed on a surf clam shell. Sea scallops and burrowing anemones were present, some were <2.5 cm.	flat sand/mud with shell hash. Large pebbles/cobbles and shell rubble appear to accumulate together. The pebble/cobbles and shells accumulate together appearing to create transitional zones with sand, pebbles and shell hash between them.	
MON-55	Good visibility	Nothing major, a few small patches of encrusting orgs on mussels (esp. barnacles) and some skate egg cases visible.	Many sand dollars. Bivalves were common with small clumps of blue mussels and some juvenile sea scallops present. Some cancer crabs also present foraging around mussel clumps and scattered sea robins and skate egg cases.	Patches of sand/mud between gravel at first then shortly thereafter sand/mud for a while then some more gravel before fine sediment covered in tube structures followed by gravelly sand waves then mostly fine sediment.	-
MON-56	Good clarity good height above bottom for most of transect, good speed.	Instances of encrusting organisms on shell rubble.	scallops, mussels, sea robins, sand dollars, anemones, decorator worms	Pebble/granule dominant to see a change to sand/shell hash uptick in sand dollars and burrowing anemones and decorator worms at this point, then patches of gravel, pebble cobble patches more frequent. Small burrows throughout the transect, can only see when camera is on bottom.	-
MON-57	Good visibility	Some small encrusting and bushy plant-like organisms present on larger substrate, most less than a few cm but 1 cluster was about 5-7 cm tall.	Relatively high abundance of mobile megafauna, juvenile sea scallops, burrowing anemones, and some sand dollars scattered throughout the beginning.	Gravel or sand with patches of dense gravel/shell hash at first. 1 boulder, fine sediment in between shells/gravel, then transitions to mostly fine sand/mud then back to similar habitat to the beginning.	-

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
MON-58	Good clarity good height above bottom, fast	bottom is covered in a reddish/orange fluff	sea robins, crabs, lots of mussels	Flat sand with shell hash and rubble, then more pebble/granule.	-
MON-59	Slight green tint, glitchy	-	Small patches of mussel shells but none which are clearly alive, transition to numerous sand dollars.	Primarily pebble substrate which makes it difficult to detect astarte and other shell species. Hard transition to sand.	Quite a few seemingly empty burrows for anemones.
MON-60	Good visibility	A few encrusting organisms and bushy plant-like organisms attached to large shells and gravel in a few instances but overall were quite rare.	A variety of mobile and immobile organisms with notable presence of juvenile sea scallops and some small clumps of blue mussels. Sand dollars didn't appear until the second half of the transect.	Alternating patches of sand with sparse shell hash and sparse gravel, pebble/cobble, and fine sand/mud with relief/burrows and tube structures apparently made from sediment. The last few minutes of the transect transitioned into sand waves with pebble/granule troughs.	-
MON-61	Good visibility	bushy plant-like organism	Scattered small clumps of blue mussels, some juvenile sea scallops and a few species of fish present. Some cancer crabs visible feeding on the blue mussel clumps.	Sand waves with moderate-dense pebble-granule and moderate shell hash in the troughs in the troughs at first then gravel with shell hash middle onward.	-
MON-62	Good clarity, low turbidity, good speed	Instances of encrusting organisms on skate egg cases.	sea scallops	Switches from sand with shell hash and pebble/cobble habitat, to sand to pebble/granule.	-
MON-63	Decent visibility	Some worm-like gray material on clam shells.	-	Changes from pebble/granule to alternating sand with pebble "striping".	Strange clay/concrete-like material.
MON-64	Decent clarity, low visibility in the middle, camera flying high at some points.	Instances of encrusting organisms.	sea robins, burrowing anemone	Heterogenous sand, shell hash, shell rubble, pebble-granule, fairly mixed at points or spaced out.	-
MON-65	Good to moderate visibility at the beginning and end with poorer visibility in the middle.	Nothing major, a few small patches of encrusting orgs on some skate egg cases visible.	Some areas with sand dollars and others of burrowing anemones. Some sea robins and	Pebble/Granule with shell hash and shell rubble mix, lots of pebble/granule with mussel and clam shell rubble mix throughout.	One small piece of what appeared to be human-cut wood.

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
			other megafauna present.		
MON-67	Mild turbidity in the water column with varying amounts of marine snow. Throughout the transect, the Video camera was lifted too far from the bottom causing the bottom to be out of focus at times. Other occurrences of glitching throughout the video.	N/A	Burrowing anemones are the dominant organism along the entire transect. One sand dollar Present at the beginning of the transect. Sea robins were present as well as skate egg cases. A squid egg mass was present on the bottom substrate in the beginning. Hermit crabs present < 2.5cm. Tube worm structures (shelly and non shelly) were present throughout the entire transect.	*no comment*	When camera was close to bottom, it appears many burrowing Anemones are buried in sediment. Observations of sedimentation over tentacles and mouth of anemone. Some anemones have tentacles pulled in and the organism is closed up. Sparse sand dollar skeletons along bottom but no alive sand dollars present. UID object present in two instances, hypotheses are rope in both occurrences.
MON-68	Decent visibility, some up and down	-	worm tubes present	Sand/Silt	-
MON-69	Moderate visibility	A few encrusting organisms and bushy plant-like organisms attached to large shells in a few spots.	Burrowing anemones dominated the fauna with many cancer crabs.	Sand	-
MON-70	Poor visibility at first transitioning to moderate visibility once out of the fine sediment habitat.	Encrusting sponge or tunicate present on object next to lobster and some smaller organisms on larger shells.	Many burrowing anemones and some cancer crabs. Presumably many anemones were missed during times of low	Sand waves to flat sand/mud with sparse shell hash.	-

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
			visibility at the beginning of the transect. There were also many below the minimum size threshold. A few sand dollars considerable numbers of decorator worm tubes were present later on.		
MON-71	Decent clarity, more turbid/cloudy than other transects, when camera gets high becomes difficult to see bottom.	Some instances of bryozoans.	Hundreds of burrowing anemones stayed consistently high throughout ~100 per minute, many hake most likely spotted.	Fine silt with Scattered shells, shell hash and scattered cobble/boulders.	-
MON-72	Green tint, low visibility, high turbidity	-	Sand dollars in low abundance (dark disc-like shapes), shell worm tubes throughout, some small hermit crabs.	Flat sand/mud with shell hash, sparse	-

Table D-2. Video reviewer notes while analyzing transects taken in 2022 from the Northern ECC (NEC).

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
NEC-07	Moderate visibility, good speed, sometimes too close to bottom	Not many encrusting organisms	bushy plantlike organisms and Diopatra throughout the transect	sand with trace/sparse shellhash some shell rubble	-
NEC-13	Low visibility, rough conditions, very turbid can't see bottom very often.	unclear	razor clam, American lobster, jellyfish, Astarte	shell hash and shell rubble, rocks, much unclear due to low visibility	-
NEC-16	Somewhat fast, good clarity, good height above bottom for most of transect	Complex bottom, likely encrusting organisms blanketing bottom	Blue mussel beds throughout transect with bushy plantlike organisms (bryozoans)	Dense shellhash/rubble with pebble/granule pavement throughout entire transect. Relatively flat no boulder relief.	Fishing gear, rope and net
NEC-17	Good clarity good height above bottom for most of transect, good speed.	Many different instances of encrusting organisms, sponges, tunicates, coral, and UID	Bryozoans/hydrozoans, blue mussels, 1 American lobster, coral, sponge	The first 1/4 to 1/2 of transect was homogenously complex, with shell hash/rubble, boulders, cobble, and pebble/granule, carpets of	-

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
				byrozoans/hydrozoans over mussel beds and shells. After halfway, no more boulders, and gives way to heterogenous habitat of pebble/granule and shellhash/rubble and sand, becomes patchy with areas of mostly sand towards the end.	
NEC-18	Good visibility, slightly fast	Possible northern star coral on large boulder	spider crab	Moderate clam shell hash with sand/mud, some mussel shell mixed in	-
NEC-19	Green but good visibility.	Sponge	Some bright orange UID sponge, mussel beds	Gravel with mussel shells mixed with sand/mud	Fast video, blurry and difficult to ID or classify mussels as living or not. Some were flat with the opposite hinge also flat, so think most are just shell but some living beds documented.
NEC-20	low visibility, very turbid. Cannot discern any details.	unknown	jellyfish	unclear	general presence of jellyfish throughout
NEC-21	poor visibility, too blurry to discern some details	possible encrusting organism on sparse boulders. Bushy, plant-like organism	unclear	Bushy plant-like organisms. Sand/mud with sparse to moderate shell hash and rubble. Sparse boulders	-
NEC-23	Overall moderate visibility due to speed, very 'snowy' in top half of image	yes, adolescent surf clams on sporadic boulder patch	jellyfish, surf clam, moon snail egg, Astarte, northern sea robin	sand with ripples and uneven surface, shellhash and pebble-granules. Sparse boulders	-
NEC-24	Good clarity good height above bottom for most of transect, some areas too fast, and too close to bottom.	Encrusting organisms on sporadic boulder patches during transect, most less than 2.5 cm	Diopatra, 1 summer flounder, 1 pinfish, 1 squid, northern sea robin some anemones	sand with ripples trace to sparse shellhash and some areas of shellhash and pebble/granule, boulder/cobble patches at 12:57:42, 13:01:08, 13:01:09, 13:01:11, 13:01:41, and 13:02:53.	-
NEC-26	low visibility due to high turbidity and camera speed	unclear	hermit crab, moon snail, razor clam, possible UID eel	appears to be hilly sand with trace shell hash throughout	hermit crabs <4cm

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
NEC-27	Too fast for most of transect	blue mussels and possible other UID encrusting organism	surf clam, blue mussel, jellyfish, sand dollar, Astarte, hydroid, spider crab, cancer crab, anemone, skate egg case, moon snail egg case,	First half, heavy presence of blue mussels, substrate beneath unclear. Second half, mostly sand with sparse shell hash and pebble-granule	-
NEC-28	Lights were not on, transect was dark, but not much turbidity could still see bottom, and had good speed	Could not see encrusting organisms	blue mussels	Flat sand, with trace to sparse shellhash throughout the transect	-
NEC-30	Little to zero visibility, too fast and turbid	unknown	unknown	unclear	Fast video, too blurry and difficult to discern megafauna or substrate specifics
NEC-32	moderate visibility, low at times	Many different instances of encrusting organisms, sponges, tunicates, coral, and UID	Mussel beds throughout (not always high enough res. to determine if alive), Some D. vexillium tunicate, possible/likely presence of A. poculata, sea urchins, bushy plantlike organism throughout (arguably some sea pens but hard to differentiate), astarte, surf clams	rocks and some boulders, sand, shell hash	Some D. vexillium tunicate, possible/likely presence of A. poculata, a lot of mussels (not always high enough res. to determine if alive), sea urchins, bushy plantlike organism throughout (arguably some sea pens but hard to differentiate), Astarte, surf clams
NEC-34	Overall poor visibility due to speed and image clarity	possible encrusting organism but video too fast to discern if white encrusting organism, or shell	Skate, northern sea robin, UID fish	Sand/mud with sparse to moderate shell hash and rubble. Some sparse gravel.	This video is too fast to ID biological components in first 10-15s of transect
NEC-35	Fast in the beginning, turbidity, overall poor visibility	sparse bryozoans/hydrozoans, Diopatra	Diopatra	flat sand with trace/sparse shellhash	-
NEC-37	Very turbid conditions, speed was fast, can see bottom	many instances of bushy plantlike	bushy plantlike organisms, most likely	Flat sand with trace/sparse shell hash	-

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
		organisms, could not distinguish encrusting organisms	some type of worm tube as well <4 cm		
NEC-39	Turbid above a certain height, able to see bottom when below the turbidity level, decent speed	Very few if any encrusting organisms, transect was largely sand/shellhash	sparse to moderate blue mussels towards the end, 1 northern sea robin	Majority of transect was flat sand and trace/sparse shellhash, towards end became more complex with sparse/moderate mussel cover, and patchy dense aggregations of shellhash/rubble	-
NEC-40	Good clarity good height above bottom for most of transect, good speed	Not many encrusting organisms	one skate egg, and sponge	Flat sand with shellhash	-
NEC-41	Decent visibility, close to bottom but still slightly turbid as hard to see some fish.	-	black sea bass	Sand with sparse shell	Some razor clam shells
NEC-43	low visibility, very turbid. Cannot discern any details.	unknown	spider crabs, sea robin	unclear	-
NEC-44	low visibility, some turbidity, cannot see bottom very well	Very few if any encrusting organisms, transect was largely sand/shellhash	hydroids, variety of clams	mostly flat sand and shell hash	-
NEC-45	Good visibility, good speed	none	burrowing anemones, UID fish, sea urchin, clearnose skate, moon snail egg case, moon snail, jellyfish	sand, shell hash, pebble-granule	-
NEC-46	Moderate to low visibility. Blurry resolution but ok since mostly mud/sad & shell hash	What appears to be A. poculata and orange sheath tunicate on sparce boulders	several "bushy plantlike orgs" but may be anemones, lobster	sand/mud and shell hash, sparce boulders	At 10:03:33 may be anthropogenic debris but may be a large organism. Flagged as unidentified fish for later review
NEC-47	Moderate visibility, improves halfway through, good height above bottom, decent speed	Some instances of byrozoans/hydrozoans near Diopatra	burrowing anemones, moon snail egg collars, Diopatra clumps	flat sand with sparse shellhash, areas of pebble/granule/moderate shellhash	-
NEC-48	Moderate to low visibility. Too high for majority of transect	northern star coral, likely C. celata and D. vexillum as well	UID fish, sea urchins	frequent rocks and boulders, shell hash and pebble-granule throughout	Transect ends at 8:39:43 rather than 8:40:01 as

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
					indicated in spreadsheet
NEC-49	good visibility, good speed and height above bottom	some encrusting organisms on cobble	black sea bass, sea robin, skate	flat sand with sparse/moderate shellhash, heterogenous habitat type with pebble-granule/cobble patches	-
NEC-50	good visibility, good heigh above bottom for most of transect, good speed	possible northern star coral and UID encrusting tunicate	many anemone, razor clam, UID fish, clearnose skate, little or winter skate, sea robin, UID eel, black sea bass, sand dollar	hilly landscape, sand with shellhash, and some pebble-granules. Sparse boulders	Many anemones <4cm. Video stops at 05:54:27 and jumps to 05:56:05
NEC-51	good visibility, but blurry/streaky at times, good speed	none	sand dollars, northern sea robin, lobster, jellyfish, clams, clearnose skate, UID fish, and arthropod	sand, shell hash, pebbles, sparse boulders	some anemones <4cm
NEC-52	Good visibility, good speed and height above bottom	Many instances of encrusting organisms on boulders	skate, sea robin, northern star coral, bushy plorgs, sponge, black sea bass, UID fish	Flat sand with sparse/trace shellhash punctuated by large boulder fields.	-
NEC-53	Good visibility when near bottom, turbid when higher off bottom, good speed, decent visibility overall	Many tube worms, and epifauna on bottom	tube worm structures, sea robins, black sea bass, many burrowing anemones	flat sand with trace/sparse shellhash, anemones and worm tube structures are ubiquitous throughout the component, high degree of biotic components to substrate type	-
NEC-54	low visibility, turbid and often too far from bottom to discern details	none	burrowing anemone, northern sea robin, sand dollars, UID fish, UID arthropod	sand with trace shellhash and trace pebble-granule throughout	-
NEC-55	Good visibility when near bottom, turbid when higher off bottom, good speed, decent visibility overall	northern star coral, sponges, and UID encrusting organisms on boulders	black sea bass, northern star coral, skate, crab	flat sand, intermittent boulder fields with northern star coral and hydrozoans, moderate shellhash	-
NEC-56	Turbid, decent visibility when close to bottom, good speed	northern star coral and encrusting sponge on boulders	northern sea robin, black sea bass, crabs	flat sand, with shellhash and pebble/granule and cobble. small boulder patches dispersed throughout the transect	-
NEC-57	Low visibility, turbid and can't see bottom often	none	sand dollar, jellyfish, UID mollusc, UID	sand with trace shellhash and trace pebble-granule throughout	Blurry, difficult to ID or classify

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
			arthropod, northern sea robins		molluscs. NEC-57 video ends at 01:48:52, NEC-57 Remainder video starts at 01:50:21.
NEC-58	Turbid, but decent visibility when close to bottom	northern star coral on boulders	cancer crabs	flat sand with spare/trace shellhash, with a few boulders interspersed throughout the transect	-
NEC-59	Low visibility due to high turbidity, can see bottom when beneath turbidity layer	not many encrusting organisms	sea robin, anemones, sand dollars	flat sand with shellhash and worm tubes	-
NEC-60	Low visibility due to high turbidity and camera too high at times	none	sand dollars throughout, anemone, northern sea robin, black sea bass, jellyfish, surf clam, skate, moon snail egg case	sand/mud, some shell hash and sparce pebble-granule	-
NEC-61	Good clarity, good height above bottom, good speed	sponges, bushy plantlike organisms, northern star coral	black sea bass and sea stars	Large boulder patches throughout, sand, cobble, shell hash and rubble, and pebble-granule, complex habitat	-
NEC-62	Low visibility, too high at times to discern details	possible encrusting tunicate but unclear	sand dollars, jellyfish, razor clams, burrowing anemone	most flat sand, trace shellhash and pebble-granules throughout	Video stops at 0:29:00 and jumps to 0:30:35
NEC-63	Good visibility, too high at times to discern details	none	UID arthropod, sand dollars, burrowing anemones, northern sea robins, jellyfish, anemone	sand, shell hash, pebble-granule	-
NEC-64	decent to low visibility, too turbid when flying high, good speed	possible encrusting organisms on shells	sea robin, sea star, anemones, sand dollars throughout	flat sand with trace/sparse shellhash	-
NEC-65	decent to low visibility, too turbid when flying high, good speed	Encrusting organisms (bryozoans) on shell rubble	anemones, sea robin	flat sand with shellhash, and shell rubble with bryozoans on some pieces of rubble	-
NEC-66	Low visibility, too high at times to discern details	none	burrowing anemones, northern sea robin, moon snail egg case, UID fish, sea star	sand, shell hash, pebble-granule, sparce boulders	-

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
NEC-67	low visibility, too fast and high turbidity cause low visibility	sponge, northern star coral, possible orange sheath tunicate (possibly)	UID worms, black sea bass, UID arthropod, northern sea robin, sea urchins	sand with shell hash and pebbles and boulders throughout	Overall low visibility on video. UID worm at 22:16:58 and 22:16:20
NEC-68	moderate visibility good speed	encrusting organisms on boulders, coral and bryozoans	sea stars, anemones, sea robins	Mainly flat sand with trace/sparse shellhash sporadic boulders, end of transect has a small boulder field.	-
NEC-69	Moderate visibility, good speed	possible encrusting organism on sparse boulders	surf clam, some Astarte <4cm, skate, UID fish	sand with shell hash and rubble. Sparce gravel, boulders.	-
NEC-70	Good clarity, good height above bottom, good speed	None observed	Sand dollars throughout, very dense aggregations of sand dollars in the beginning and middle of transect, diminishes to one or two sand dollars every few feet towards end. skate egg cases	Sand with shell hash and rubble	-
NEC-71	Good visibility for first 3/4 of transect, good speed and height above bottom	yes, UID encrusting organism	jellyfish, UID fish, black sea bass, hermit crabs, Astarte, northern sea robin	sand, trace shell hash in first 1/3 of transect, shell hash and pebble granule for last 2/3 of transect.	anthropogenic debris and fishing debris
NEC-72	Good visibility, green, good speed and height above bottom for most of transect	possible encrusting organisms on sparse boulders	jellyfish, skate egg, UID fish, northern sea robin, UID arthropod, sand dollars, Astarte, variety of clams	sand and mud, shell hash throughout, some pebble-granule	-
NEC-73	Moderate visibility, high turbidity causing blurriness.	none	jelly fish, burrowing anemones, sand dollars, UID fish, sea robins, sea urchins	sand, shell hash, sparse pebble-granule	Camera turned off at 18:18:22, remainder video starts at 20:19:56 (time in between missing)
NEC-74	Moderate visibility, good height above bottom, good speed, green	yes, UID encrusting organism	sand dollars throughout, jellyfish, bushy plantlike orgs, whelk, UID fish, northern sea robin, surf clam, moon snail eggs case, skate egg case,	sand with ripples, moderate shell hash throughout, trace pebble-granule, bushy plant-like org consistent cover throughout	-

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
			razor clam, sea urchin, common sea star		
NEC-75	Good clarity, good height above bottom, good speed, green	none observed	Sand dollars throughout, 2 northern sea robins	Flat sand with trace/sparce shell hash/rubble	Camera turned off at 18:53:37
NEC-76	Moderate visibility, good height for most of transect but blurry so several "unknown" designations	possible encrusting organisms, however unclear due to blurriness	sand dollars throughout, northern sea robins, jellyfish, moon snails, UID fish, variety of crabs	sand/mud, shell has, sparce peddles/rubble	-
NEC-77	Decent visibility, good height above bottom, and speed	Encrusting organisms on skate eggs	skate egg cases, moon snail egg cases, sand dollars, sea robins	flat sand with trace/sparse shellhash with sand dollars throughout	-
NEC-78	decent clarity, some turbidity, decent speed	Instances of encrusting organisms	sea urchins, sea robins, squid, anemone	flat sand with sparse/moderate shellhash and pebble/granule substrate	-
NEC-79	Good clarity good height above bottom for most of transect, good speed.	No	Sand dollars throughout, sea robins	flat sand with trace/sparse shell hash, sand dollars	-
NEC-80	Good clarity good height above bottom for most of transect, good speed.	Instances of encrusting organisms on some of the skate eggs encountered, no macroflora encountered	Sand dollars throughout, however, decrease over pebble/granule substrates, burrowing anemones, northern sea robin, skate, small sea scallops, squid	Flat sand with trace/sparse shell hash transition to pebble/granule	-
NEC-81	Good clarity good height above bottom for most of transect, good speed.	Instances of encrusting organisms on some of the skate eggs encountered, no macroflora encountered	decorator worms, sand dollars, northern sea robins, Astarte clams, squid, skate, and one potential sheepshead fish	Flat sand, with trace to sparse shellhash throughout the transect	-
NEC-82	Good visibility, good height above bottom, good speed	Some encrusting organisms on skate eggs	sea robins, cancer crabs, anemones,	Heterogenous habitat, instances of pebble/granule dominant habitats and sand dominated habitats	-
NEC-83	High clarity and definition, good speed	little UID encrusting organisms	northern sea robin, Astarte, jellyfish, anemone, jellyfish, sea scallop, sea pen, razor clam, mantis shrimp, skate eggs case, UID worm, UID whelk, Portunid crab	flat sand with heavy pebble-granule, some rocks, some shell hash	light anthropogenic debris, possibly Crepidula

Transect	Videography	Encrusting Organisms/Macroflora	Organisms	Substrate	Other
NEC-84	Low light, flying slightly too high at times	-	Burrowing anemones, sea urchins, and northern sea robin throughout	gravel and shell mix, mostly complex. End of transect becomes sandy	-
NEC-85	Good visibility, too far from bottom at times to discern details, but otherwise good.	None	sand dollars, throughout, sea stars, northern sea robin, skate egg case, sea urchins, Astarte, squid, hermit crab, clams,	sand and pebble-granules throughout	At 08:11:20 "jellyfish" noted, however it appears to be a Salp, also some burrowed Astarte <4cm
NEC-86	Very slow tow speed, drifting sideways	-	Consistent sand dollars	Gravelly sand and shell mix	-
NEC-87	moderate visibility, good clarity where visible	none observed	Sand dollars throughout, however, decrease over pebble/granule substrates, urchins, anemones, northern sea robin, skate eggs, small sea scallops, sea stars	sand, shell hash, pebbles	-
NEC-88	Moderate visibility, turbid but can see bottom, good speed.	None observed	sand dollars throughout, northern sea robin, Astarte clams and hermit crabs (<10 each) but <4cm, Skate eggs, 4-5 urchins, 1 anemone, jelly fish	sand, shell hash	-
NEC-89	good visibility, when close to bottom, good speed	northern star coral, sponges, and UID encrusting organisms on boulders	skate, black sea bass, northern sea robin	flat sand with shellhash, pebble granule, two distinct sections of boulders, bushy plantlike organisms throughout, many biogenic/biotic substrate components, potential worm tubes/organisms throughout	-

Appendix E
Megafauna Review Full Taxonomy List

Table E-1. Species taxonomy from 2022 and 2021 underwater video review.

Common Name	Phylum	Class	Order	Family	Genus	Species	Lowest Taxonomic Level
worm, Polychaete	Annelida	Polychaeta	-	-	-	-	Polychaeta
worm, unidentified	Annelida	Polychaeta	-	-	-	-	Polychaeta
worm tube, decorator (diopatra)	Annelida	Polychaeta	-	-	-	-	Polychaeta
worm tube, other	Annelida	Polychaeta	-	-	-	-	Polychaeta
arthropod, unidentified	Arthropoda	-	-	-	-	-	Arthropoda
crab, unidentified	Arthropoda	Malacostraca	Decapoda	-	-	-	Decapoda
crab, cancer	Arthropoda	Malacostraca	Decapoda	Cancridae	Cancer	-	Cancer
crab, spider	Arthropoda	Malacostraca	Decapoda	Epialtidae	Libnia	-	Libnia
lobster, American	Arthropoda	Malacostraca	Decapoda	Nephropidae	Homarus	americanus	Homarus americanus
crab, hermit	Arthropoda	Malacostraca	Decapoda	Paguridae	Pagurus	-	Pagurus
crab, portunid	Arthropoda	Malacostraca	Decapoda	Portunidae	-	-	Portunidae
crab, blue	Arthropoda	Malacostraca	Decapoda	Portunidae	Callinectes	sapidus	Callinectes sapidus
crab, lady	Arthropoda	Malacostraca	Decapoda	Portunidae	Ovalipes	ocellatus	Ovalipes ocellatus
shrimp, mantis	Arthropoda	Malacostraca	Stomatopoda	Squillidae	Squilla	empusa	Squilla empusa
fish, unidentified	Chordata	-	-	-	-	-	Chordata
flatfish, unidentified	Chordata	-	-	-	-	-	Teleostei
skate, egg case	Chordata	Chondrichthyes	Rajiformes	Rajidae	-	-	Rajidae
skate	Chordata	Chondrichthyes	Rajiformes	Rajidae	-	-	Rajidae
skate, little or winter	Chordata	Chondrichthyes	Rajiformes	Rajidae	Leucoraja	-	Leucoraja
skate, little	Chordata	Chondrichthyes	Rajiformes	Rajidae	Leucoraja	erinacea	Leucoraja erinacea
skate, winter	Chordata	Chondrichthyes	Rajiformes	Rajidae	Leucoraja	ocellata	Leucoraja ocellata
skate, clearnose	Chordata	Chondrichthyes	Rajiformes	Rajidae	Raja	eglanteria	Raja eglanteria
fish, forage	Chordata	Teleostei	-	-	-	-	Teleostei
fish, unidentified (bony)	Chordata	Teleostei	-	-	-	-	Teleostei
roundfish, unidentified	Chordata	Teleostei	-	-	-	-	Teleostei
eel, unidentified	Chordata	Teleostei	Anguilliformes	-	-	-	Anguilliformes

Common Name	Phylum	Class	Order	Family	Genus	Species	Lowest Taxonomic Level
lizardfish, inshore	Chordata	Teleostei	Aulopiformes	Synodontidae	Synodus	foetens	Synodus foetens
hake, unidentified	Chordata	Teleostei	Gadiformes	Gadidae	-	-	Gadidae
hake, red, white, or spotted	Chordata	Teleostei	Gadiformes	Gadidae	Urophycis	-	Urophycis
hake, spotted	Chordata	Teleostei	Gadiformes	Gadidae	Urophycis	regia	Urophycis regia
sea bass, black	Chordata	Teleostei	Perciformes	Serranidae	Centropristis	striata	Centropristis striata
pinfish	Chordata	Teleostei	Perciformes	Sparidae	Lagodon	rhomboides	Lagodon rhomboides
scup	Chordata	Teleostei	Perciformes	Sparidae	Stenotomus	chrysops	Stenotomus chrysops
sheepshead	Chordata	Teleostei	Perciformes	Sparidae	Archosargus	probatocephalus	Archosargus probatocephalus
flounder, unidentified	Chordata	Teleostei	Pleuronectiformes	-	-	-	Pleuronectiformes
flounder, fourspot	Chordata	Teleostei	Pleuronectiformes	Paralichthyidae	Paralichthys	oblonga	Hippoglossina oblongus
flounder, summer	Chordata	Teleostei	Pleuronectiformes	Paralichthyidae	Paralichthys	dentatus	Paralichthys dentatus
flounder, winter	Chordata	Teleostei	Pleuronectiformes	Pleuronectidae	Pseudopleuronectes	americanus	Pseudopleuronectes americanus
flounder, windowpane	Chordata	Teleostei	Pleuronectiformes	Scopthalmidae	Scopthalmus	aquosas	Scopthalmus aquosas
sea robin, northern	Chordata	Teleostei	Scorpaeniformes	Triglidae	Prionotus	carolinus	Prionotus carolinus
sea robin, unidentified	Chordata	Teleostei	Scorpaeniformes	Triglidae	Prionotus	-	Prionotus
sea robin, striped	Chordata	Teleostei	Scorpaeniformes	Triglidae	Prionotus	evolans	Prionotus
anemone, burrowing	Cnidaria	Anthozoa	-	-	-	-	Anthozoa
anemone	Cnidaria	Anthozoa	Actinaria	-	-	-	Actinaria
sea pen	Cnidaria	Anthozoa	Pennatulacea				Pennatulacea
coral, northern star	Cnidaria	Anthozoa	Scleractinia	Rhizangiidae	Astrangia	poculata	Astrangia poculata
sea star, unidentified	Echinodermata	Asteroidea	-	-	-	-	Asteroidea
sea star, common or forbes	Echinodermata	Asteroidea	Forcipulatida	Asteriidae	Asterias	-	Asterias
sea star, gray	Echinodermata	Asteroidea	Paxillosida	Luidiidae	Ludia	clathrata	Ludia clathrata
sea urchin	Echinodermata	Echinoidea	-	-	-	-	Echinoidea
sand dollar	Echinodermata	Echinoidea	Clypeasteroida	Echinarachniidae	Echinarachnius	parma	Echinarachnius parma
sea cucumber, unidentified	Echinodermata	Holothuroidea	-	-	-	-	Holothuroidea
mollusc, unidentified	Mollusca	-	-	-	-	-	Mollusca

Common Name	Phylum	Class	Order	Family	Genus	Species	Lowest Taxonomic Level
mussel, blue	Mollusca	Bivalvia	Mytiloida	Mytilidae	Mytilus	edulis	Mytilus edulis
scallop, sea	Mollusca	Bivalvia	Ostreoida	Pectinidae	Placopecten	magellanicus	Placopecten magellanicus
astarte	Mollusca	Bivalvia	Veneroida	Astartidae	Astarte	-	Astarte
clam, surf	Mollusca	Bivalvia	Veneroida	Mactridae	Spisula	solidissima	Spisula solidissima
clam, razor	Mollusca	Bivalvia	Adapedonta	Pharidae	Ensis	leei	Ensis leei
squid, unidentified	Mollusca	Cephalopoda	-	-	-	-	Cephalopoda
squid, egg mop	Mollusca	Cephalopoda	-	-	-	-	Cephalopoda
whelk, channeled or knobbed	Mollusca	Gastropoda	Neogastropoda	Melongenidae	-	-	Melongenidae
whelk, unidentified	Mollusca	Gastropoda	Neogastropoda	Melongenidae	-	-	Melongenidae
slipper shell(s)	Mollusca	Gastropoda	Neotaenioglossa	Calyptraeidae	Crepidula	fornicata	Crepidula fornicata
moon snail	Mollusca	Gastropoda	Neotaenioglossa	Naticidae	-	-	Naticidae
moon snail, egg case	Mollusca	Gastropoda	Neotaenioglossa	Naticidae	-	-	Naticidae
sponge, unidentified	Porifera	-	-	-	-	-	Porifera
sponge, sulfur	Porifera	Demospongiae	Hadromerida	Clionaidae	Cliona	celata	Cliona celata

Appendix F
Maps of CMECS Classifications of Still Images from Video Survey

See associated PDF file.

Appendix G
Database of CMECS Classifications of Still Images from Video Survey

See associated Excel file.

Appendix H
Additional Megafauna Still Images from Video Survey

Figure H- 1 Northern Sea Robin (*Prionotus carolinus*) in WTA 21

Figure H- 2 Northern Sea Robins in WTA 22

Figure H- 3 Northern Sea Robins in WTA 22

Figure H- 4 Skate sp. in WTA 22

Figure H- 5: Northern Sea Robin in WTA 24

Figure H- 6 Northern Sea Robins in WTA 24

Figure H- 7 Northern Sea Robin in WTA 24

Figure H- 8 Moon Snail (Naticidea) in WTA 25

Figure H- 9 Northern Sea Robin in WTA 26

Figure H- 10 Northern Sea Robin in WTA 28

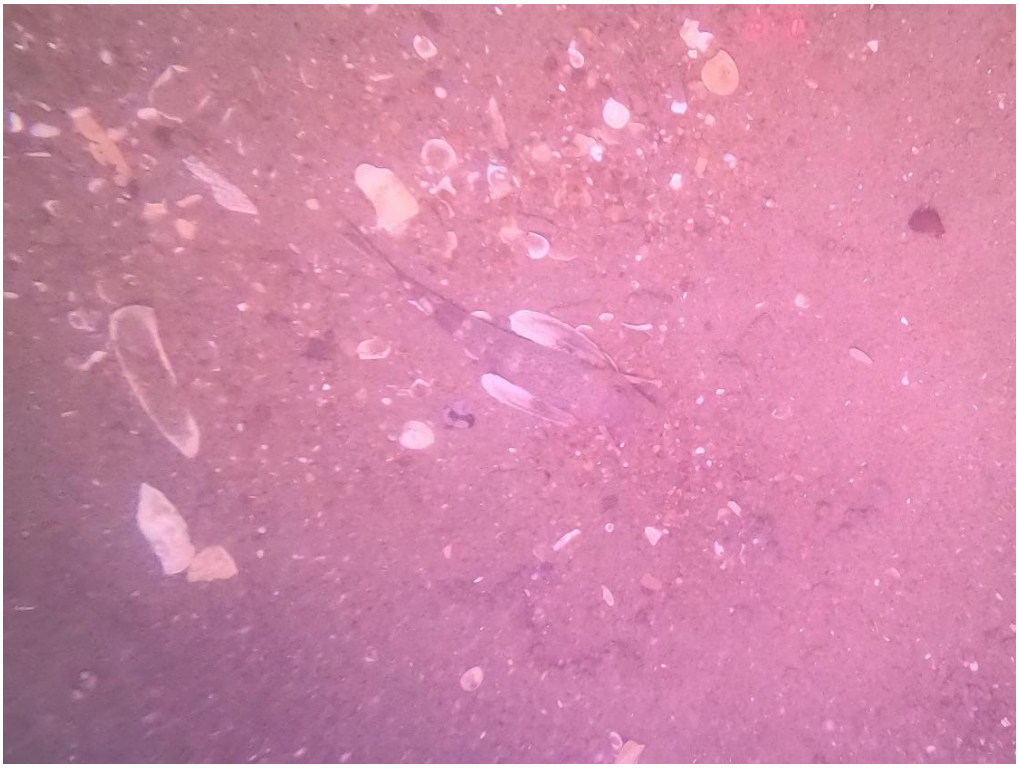

Figure H- 11 Northern Sea Robin in WTA 28

Figure H- 12 Skate sp. in WTA 32

Figure H- 13 Northern Sea Robin in WTA 32

Figure H- 14 Skate sp. In WTA 32

Figure H- 15 Northern Sea Robins in WTA 32

Figure H- 16 Black Sea Bass in NEC 52

Figure H- 17 Clearnose Skate in NEC 56

Figure H- 18 Little or Winter Skate in NEC 81

Figure H- 19 Skate egg cases in NEC 81

Figure H- 20 Summer Flounder in NEC 24

Figure H- 21 Pinfish in NEC 24

Figure H- 22 American Lobster in NEC 17

Figure H- 23 Cancer Crab in NEC 55

Figure H- 24 Hermit Crab in NEC 80

Figure H- 25 Hermit Crab in NEC 18

Figure H- 26 Unidentified Squid in NEC 80