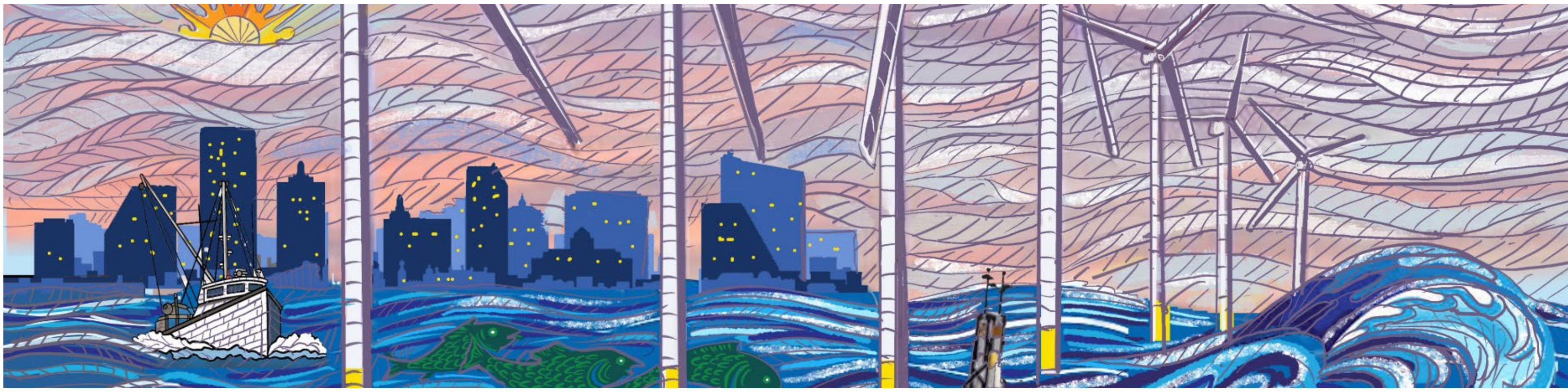

Appendix II-G3

Towed Video Report

May 2024

ATLANTIC SHORES OFFSHORE WIND PROJECT

Towed Video Report – Final

Prepared by:

RPS Ocean Science

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Atlantic Shores Offshore Wind and EDR

21-P-214262 Atlantic Shores Towed Video Report
Final V3
December 11, 2021

Contents

Figures

Tables

ACRONYM LIST

ANOSIM	Analysis of Similarities
ATL ECC	Atlantic Export Cable Corridor
BOEM	Bureau of Ocean Energy Management
CFR	Code of Federal Regulations
CMECS	Coastal and Marine Ecological Classifications Standards
ECC	Export Cable Corridor
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
GPS	Global Positioning System
LPTL	Lowest Practical Taxonomic Level
m	Meter
mg/kg	Milligrams per Kilogram
mm	Millimeter
MON ECC	Monmouth Export Cable Corridor
NMFS	National Marine Fisheries Services
NJWEA	New Jersey Wind Energy Area
NLPTL	Next-lowest Practical Taxonomic Level
OCS	Outer Continental Shelf
O&M	Operations and Maintenance
USBL	Ultra-short Baseline
UTC	Coordinated Universal Time
WTA	Wind Turbine Area

1 INTRODUCTION

RPS was contracted by Atlantic Shores Offshore Wind, LLC (Atlantic Shores) to collect, process, analyze, and compile benthic data collected with a towed video sled in the export cable corridors (ECCs) and wind turbine area (WTA) associated with Atlantic Shores' Lease Area OCS-A 0499, offshore of New Jersey. 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). Atlantic Shores is submitting a Construction and Operations Plan (COP) to the Bureau of Ocean Energy Management (BOEM) for the development of two offshore wind energy generation projects (Project 1 and Project 2) within the southern portion of Lease Area OCS-A 0499 (the Lease Area).

Atlantic Shores' Lease Area is located on the OCS within the New Jersey Wind Energy Area (NJWEA), which was identified by BOEM as suitable for offshore renewable energy development through a multi-year, public environmental review process. The Projects will be located in an approximately 102,124-acre (413.3-square kilometer [km^2]) WTA located in the southern portion of the Lease Area. Project 1 is located in the western 54,175 acres (219.2 km^2) of the WTA, and Project 2 is located in the eastern 31,847 acres (128.9 km^2) of the WTA, with a 16,102-acre (65.2-km^2) Overlap Area that could be used by either Project 1 or Project 2. In addition to the WTA, the Projects will include two offshore ECCs within federal and New Jersey state waters as well as two onshore interconnection cable routes, two onshore substation and/or converter station sites, and a proposed operations and maintenance facility in New Jersey. The Offshore Project Area includes the WTA and the ECCs.

RPS conducted video surveys in the WTA and in the Monmouth and Atlantic ECCs (sites labelled MON or ATL [Figure 1-1]). The analyses presented in this document will support interpretation of geophysical data to characterize surficial sediment conditions and classify the benthic habitat according to the Coastal and Marine Ecological Classifications Standards (CMECS; FGDC, 2012). In addition, the video imagery provided biological data about emergent epifauna and the presence or absence of potentially sensitive species as recommended in recent guidance for mapping Essential Fish Habitat (EFH) from National Marine Fisheries Service (NMFS, 2021), for inclusion in permitting documentation required by Bureau of Ocean Energy Management (BOEM). This report provides:

- Details of the towed video sled sampling methods, results, and analysis;
- A description of benthic habitat and community observed in the video data collected; and
- CMECS classifications of each still image based on the video results.

The 2021 planned video transect lines were based on results from prior survey campaigns, including acoustic imaging, benthic grab sampling, and sediment profile imaging/plan view (SPI/PV) sampling.

Transect sites were selected to capture features and substrates of interest to fulfill NMFS recommendations for mapping EFH. The goal of these benthic video transects was to provide data on the epifaunal and demersal biological communities and ground truth the previous surveys by targeting transition zones between substrate types in maps based on preliminary geophysical and geotechnical data. The towed video survey goals and methods were broadly discussed in a meeting on April 19, 2021 with NMFS and BOEM which focused on Atlantic Shores' overall benthic sampling strategy. Atlantic Shores responded to comments made regarding that call by NMFS and submitted a comment and response matrix on June 4, 2021, at which time a copy of the Towed Video Survey Plan was also provided to NMFS and BOEM. There was an additional discussion with NMFS and BOEM on June 29, 2021 after the towed video survey had been completed..

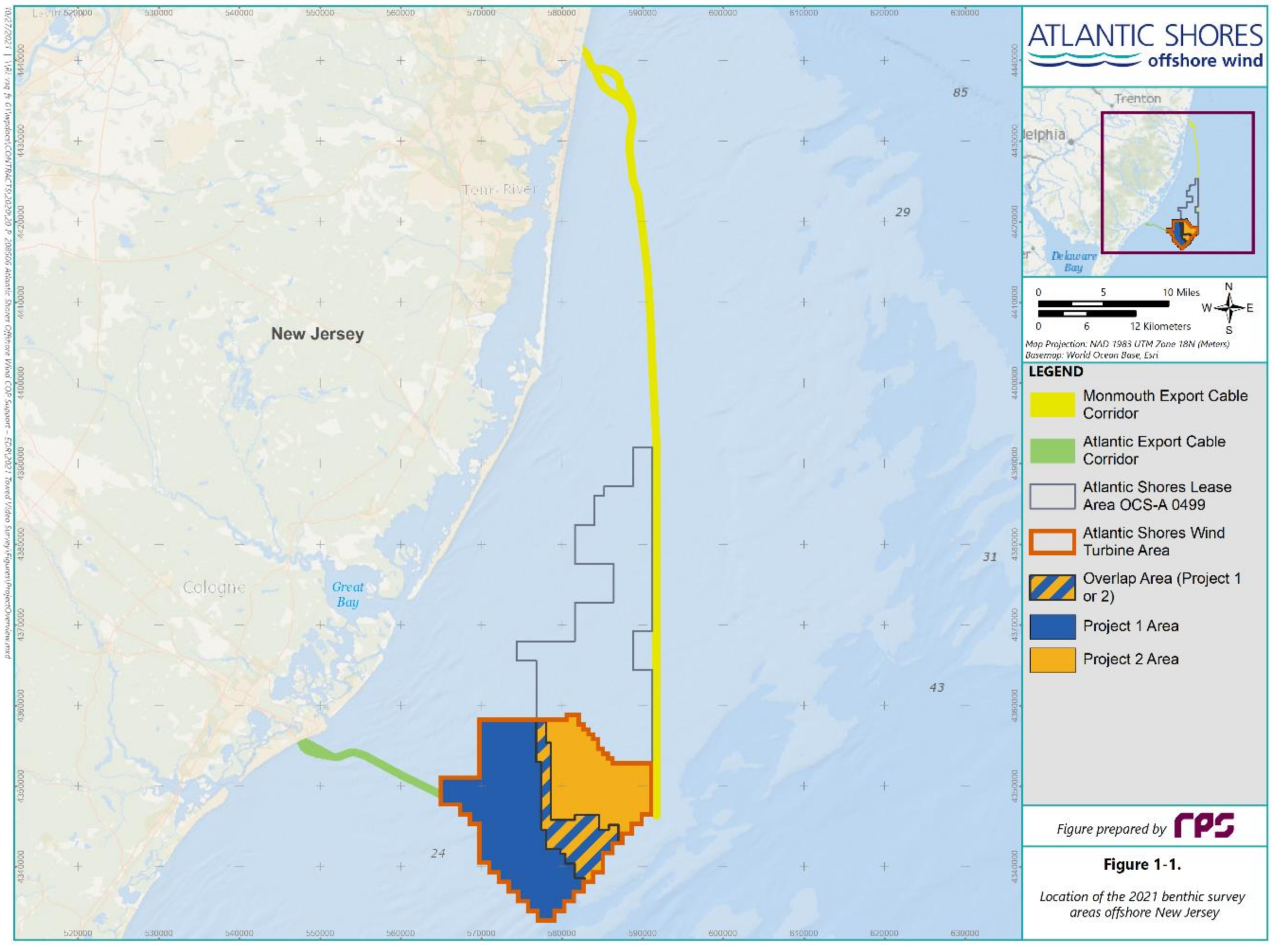


Figure 1-1. Overview map of the Atlantic Shores Lease Area.

2 TOWED VIDEO FIELD SURVEY

Underwater video transects were taken along with still images for visual classification of the seafloor in June of 2021. The survey was completed 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) apart, 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.

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. 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 idenitifer [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).

3 DATA POST-PROCESSING

3.1 Objectives

Post-processing and analysis of video transect data were conducted by RPS to provide:

- Evidence of benthic activity by organisms (burrows, trails, infaunal structures);
- Identification of epibenthic macroinvertebrates and benthic habitat types;
- Presence and general characterization of submerged aquatic vegetation (macroalgae, seagrass);
- Identification of organisms to the lowest practical taxonomic level (generally, to Order or 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 anthropogenic marine debris.

In addition to reviewing each video in its entirety to meet the objectives above, videos were also split into still images that were classified via percent cover analyses into NMFS-modified CMECS substrate and biotic component types (FGDC, 2012; NMFS, 2021). The CMECS substrate component focuses closely on details of grain size and composition to describe benthic habitats and is used to define complex and potentially valuable fish habitats. The BOEM Benthic Habitat Survey 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 in percent cover calculations from still images when present and identifiable:

- Characterization and delineation of any submerged aquatic vegetation (seagrass or macroalgae);
- 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
- Identification of communities of sessile and slow-moving marine invertebrates (clams, mussels, polychaete worms, anemones, sponges, echinoderms) that may be within the Offshore Project Area; and
- Biological community details that compose the CMECS biotic component.

3.2 Methods

Transect videos were reviewed and analyzed in two separate steps. First, each video was reviewed in its entirety and any notable seafloor features or epifaunal/benthic/demersal species greater than 2.5 cm in size (equal to the distance between the scaling laser points) were recorded. Second, a percent cover analysis was conducted on still images to assign substate and biotic component CMECS classifications to individual points along each transect.

3.2.1 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.

When a feature or species was identified, the reviewer recorded the time, rated video visibility at that time, categorized the bottom, and recorded the lowest practical taxonomic level (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 3.2.2). 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 within the Offshore Project Area includes the WTA and the ECCs based on observations to level of phylum or family or NLPTL. The Shannon Diversity Index (H'; Formula 1) was calculated using the number of taxa in a community (richness), the proportional abundance of each taxa relative to the total number of individuals (equitability), and the sum of the proportions. The index was used 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. The index is computed as:

Formula 1. H' Shannon Diversity Index

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

Where:

The proportion of species $_i$ relative to the total number of species (p_i) is calculated, and then multiplied by the natural logarithm of the proportion ($\ln(p_i)$).

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 the Offshore Project Area by transect. All figures and tables within the results section for "Organisms and Features" were created in R and are based off the Megafauna Review data.

3.2.2 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 3-1). 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 3-1). 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 3-1), 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.

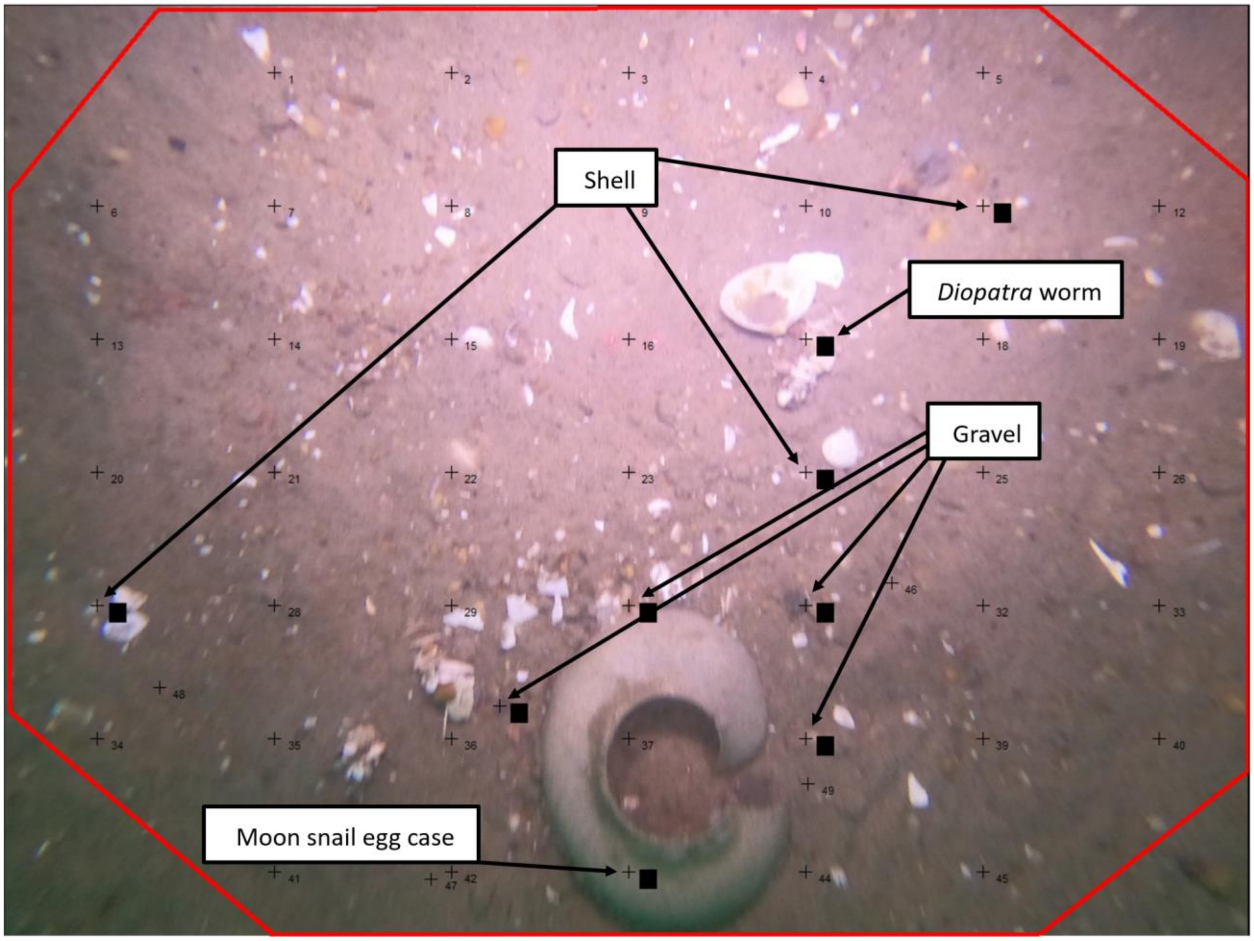


Figure 3-1. Example of the point count / percent cover procedure for image MON-42_G0018981.

3.2.3 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, 2021) 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 3-1. CMECS geologic sediment size, biogenic or anthropogenic size, and percent cover categories (*from FGDC, 2012).

Geologic Sediment Category	Definition	Biogenic or Anthro Size Category	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 geophysical and geotechnical (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 3-2 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. The CMECS classifications of each still image are shown mapped over the underlying G&G data for each transect in Appendix D.

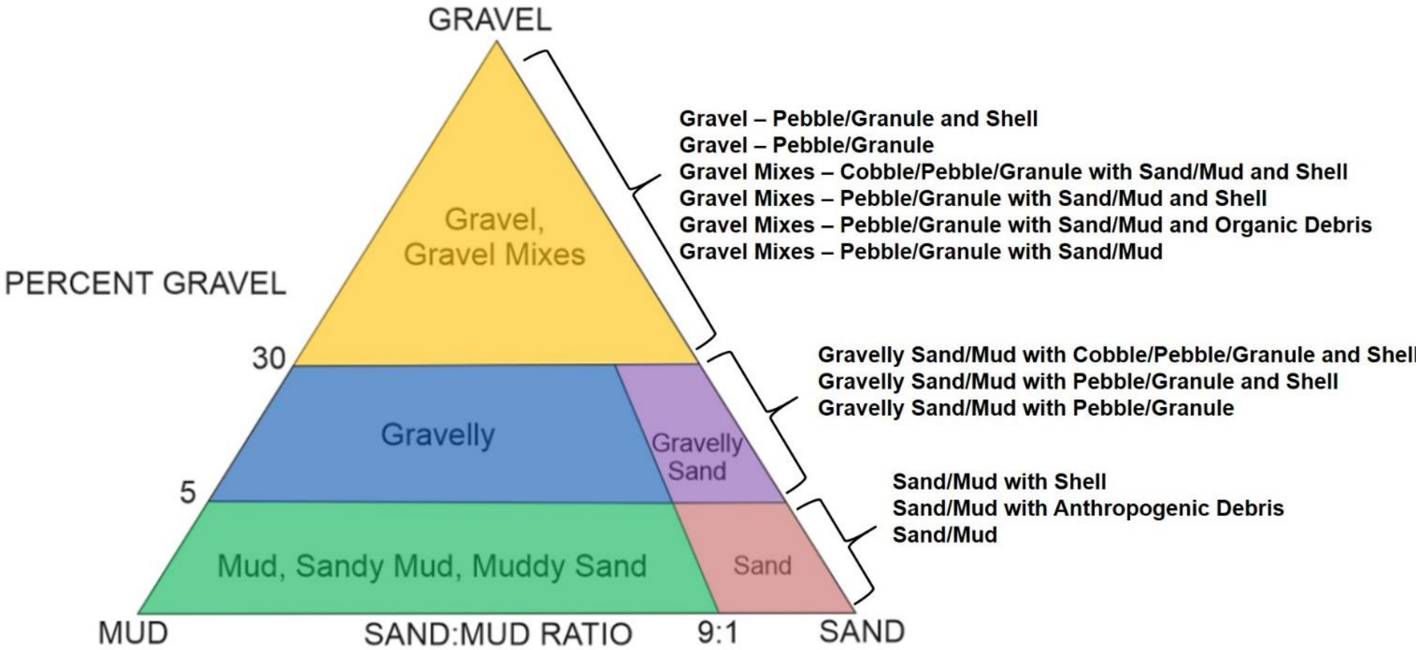


Figure 3-2. Modified Folk (1954) sediment grain size triangle showing the five G&G substrate classes and corresponding CMECS substrate categories based on the video data.

3.2.4 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 >20 sand dollars captured (Figure 3-).

According to an internal literature review, no standard method for determining the CMECS biotic component class currently exists since it can be modified in various ways 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 (Figure 4-10, **Error! Reference source not found.** ,Figure 4-20, Figure 4-30).

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 Lowest Practical Level (LPL), 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, and all classifications visible in Appendix B. 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 (Table 3-3).

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 Worm Tube A, Worm Tube B, or Worm Tube C (Table 3-2). Worm Tubes A and B are likely to be Polychaete worms, but Worm Tube C could be made from organisms in a different taxonomic order. Dioptera Beds (i.e., decorator worm tubes) were also identifiable in the video imagery. 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, pelletized, fluid surface layers, and an infaunal structure we identified as Structure A. It was not apparent whether these structures contained a living worm or organism, so we created a modified rule for assigning Inferred Fauna as a dominant biotic component classification when Structure A was the most prominent feature in an image. 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.

Table 3-2. Representative images of larger tube-building fauna and inferred fauna.

Larger Tube-Building Fauna (Worm Tube A, likely Polychaete) ATL-02_G0016758	
Larger Tube-Building Fauna (Worm Tube B, likely Polychaete) MON-64	

Larger Tube-Building Fauna (Worm Tube C) MON-60_G0014896	
Inferred Fauna (Structure A) ATL-05_G0012834	

Larger Tube-Building Fauna (*Diopatra* Bed) ATL-01_G0015333	

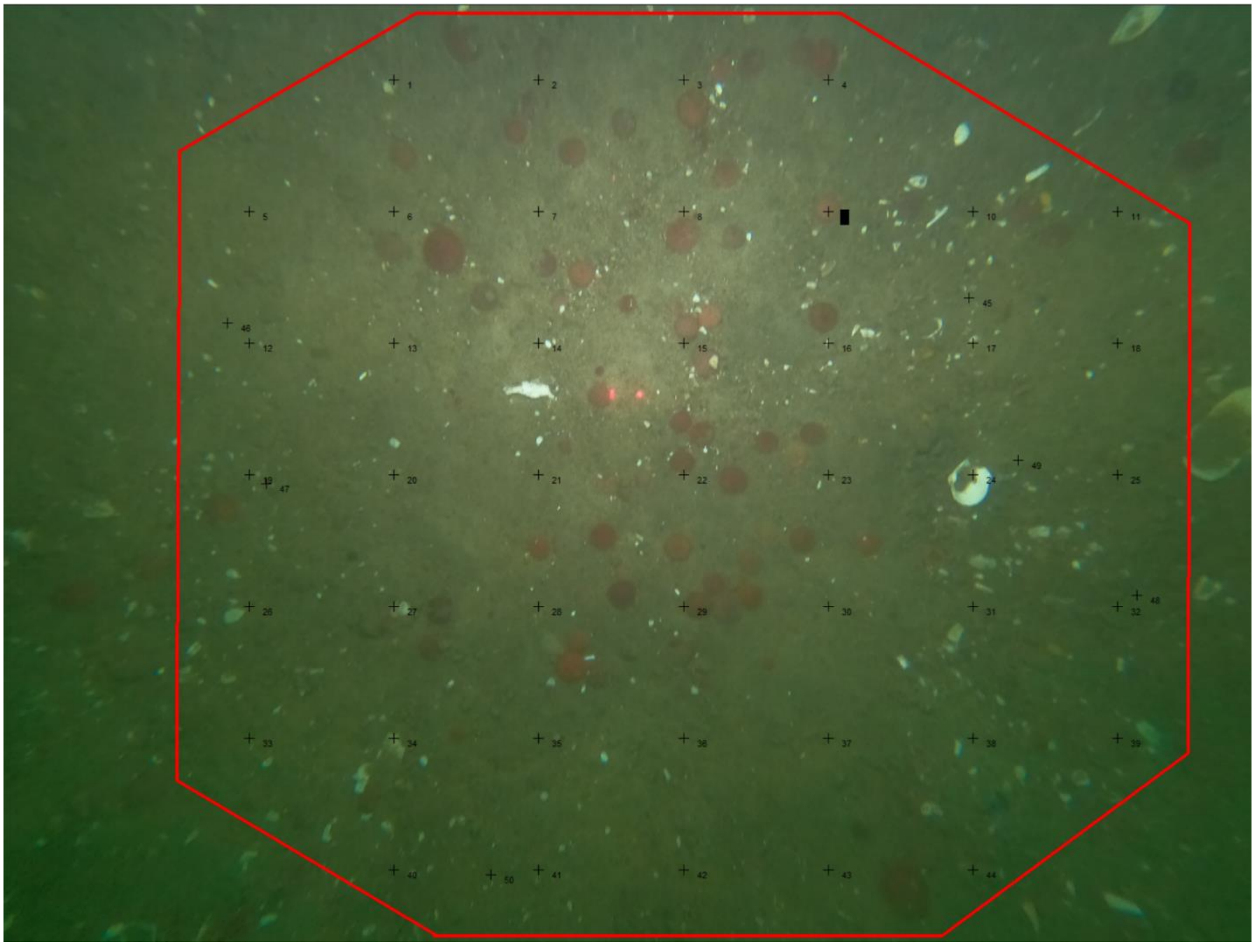


Figure 3-3. MON-50_G0018199 showing 30+ sand dollars within the analyzed quadrat, with only one of the 50 uniform points landing on a sand dollar.

Table 3-3. Example Biotic Classification for MON-50_G0018199.

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

4 RESULTS

Video analysis results for the 62 transects are presented separately for each of the three regions sampled. Specifically, 13 video transects were completed in the WTA (or 14 where WTA-MAG1 is counted as 2 transects), 43 transects were completed in the Monmouth ECC (MON), and 6 transects were completed in the Atlantic ECC (ATL). All video transects were 250 m in length except for WTA-MAG1 which was 500 m. Note that the results for WTA-MAG1 were portrayed in two halves (WTA-MAG-A and WTA-MAG-B) in many figures and were not standardized by transect length to avoid partial organism counts and assumptions about homogeneity between the two parts. Results for each analysis are presented seperately for the three regions.

4.1 Wind Turbine Area

The characteristics and locations of the 14 underwater video transects within the WTA are described in Table 4-1 and locations are shown in

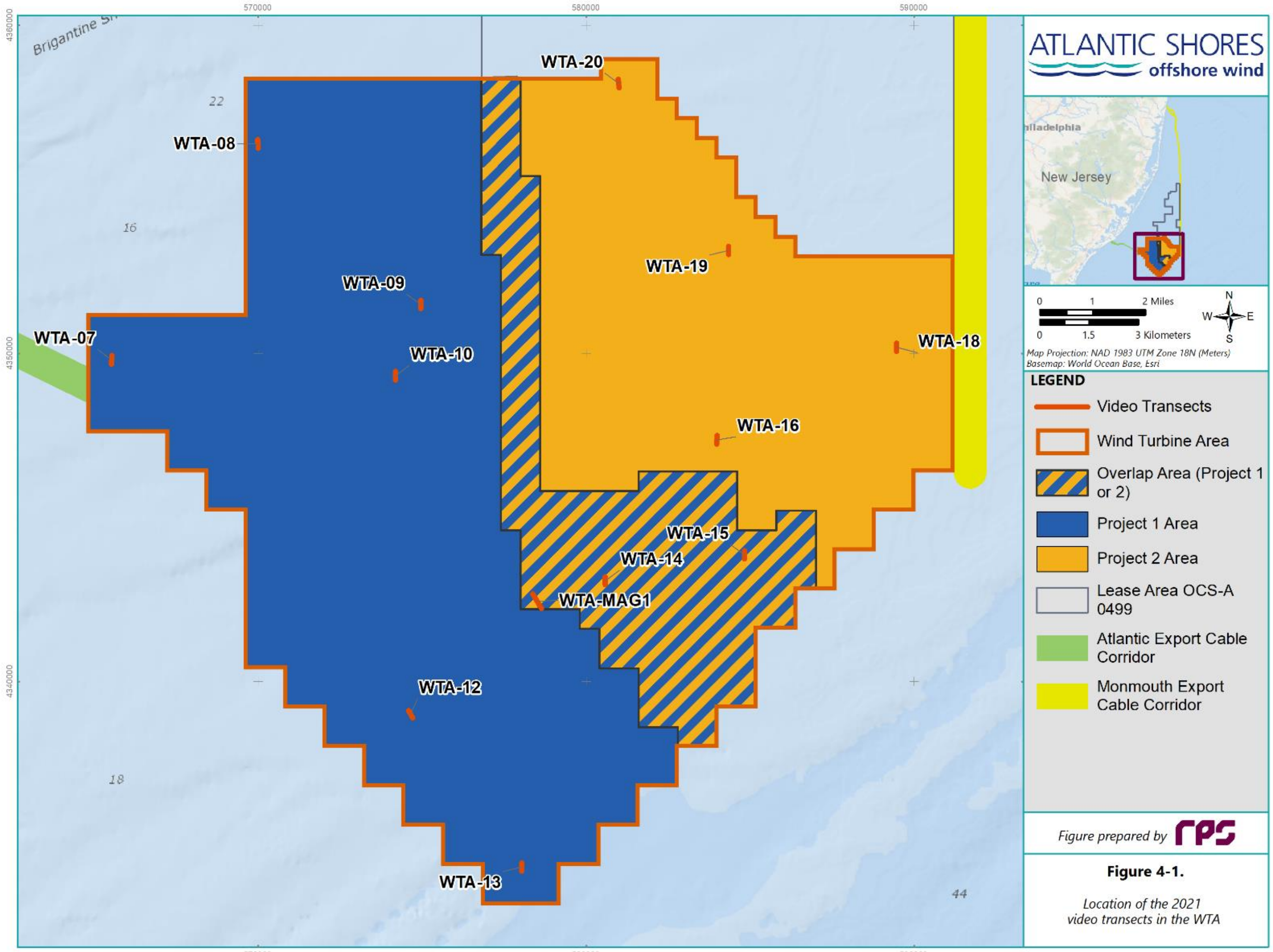


Figure 4-1. Section 4.1.1 below describes presence and abundance of megafauna observed in video transects collected in the WTA. Abundance data are displayed in Table 4-2 with additional visualizations in Figure 4-2 through Figure 4-6. Images of representative megafauna are displayed in Table 4-3. Section 4.1.2 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 4-4,

Table 4-5, and Figure 4-10. The CMECS classification results are presented in Section 4.1.3.

Table 4-1. Underwater video transect locations in the WTA.

Transect	Date (UTC)	Duration (min:sec)	Start Lat. (°N)	Start Long. (°W)	End Lat. (°N)	End Long. (°W)	# Analyzed Stills
WTA-07	6/10/2021	16:20	39°17’38.10803”	74°14’24.04728”	39°17’46.71743”	74°14’23.72640”	25
WTA-08	6/10/2021	13:50	39°21’10.47771”	74°11’15.29441”	39°21’18.78664”	74°11’15.38635”	25
WTA-09	6/8/2021	19:08	39°18’38.60459”	74°07’50.06355”	39°18’30.38993”	74°07’50.15600”	25
WTA-10	6/8/2021	15:35	39°17’28.36390”	74°08’23.17379”	39°17’20.08359”	74°08’23.18419”	25
WTA-12	6/9/2021	14:30	39°11’45.89109”	74°08’05.16597”	39°11’53.22516”	74°08’10.54681”	25
WTA-13	6/9/2021	15:09	39°09’21.40652”	74°05’48.28143”	39°09’13.37260”	74°05’48.54964”	25
WTA-14	6/9/2021	17:29	39°14’03.42992”	74°03’58.79063”	39°13’55.36626”	74°03’58.90973”	25
WTA-15	6/9/2021	17:30	39°14’27.77621”	74°01’01.45167”	39°14’19.47828”	74°01’01.58978”	25
WTA-16	6/9/2021	18:05	39°16’21.68425”	74°01’34.89113”	39°16’13.46379”	74°01’35.04951”	25
WTA-18	6/10/2021	15:41	39°17’42.99400”	73°57’45.51041”	39°17’51.29377”	73°57’45.31962”	25
WTA-19	6/10/2021	15:59	39°19’20.52206”	74°01’17.48789”	39°19’28.96705”	74°01’17.37062”	25
WTA-20	6/5/2021	13:42	39°22’15.14573”	74°03’35.69388”	39°22’06.84611”	74°03’34.71976”	25
WTA-MAG-A	6/9/2021	27:00	39°13’47.01570”	74°05’30.87521”	39°13’39.89302”	74°05’25.80944”	20
WTA-MAG-B			39°13’39.89302”	74°05’25.80944”	39°13’32.73277”	74°05’20.57349”	27

[1] WTA-MAG1 transect was split into WTA-MAG-A and WTA-MAGB.

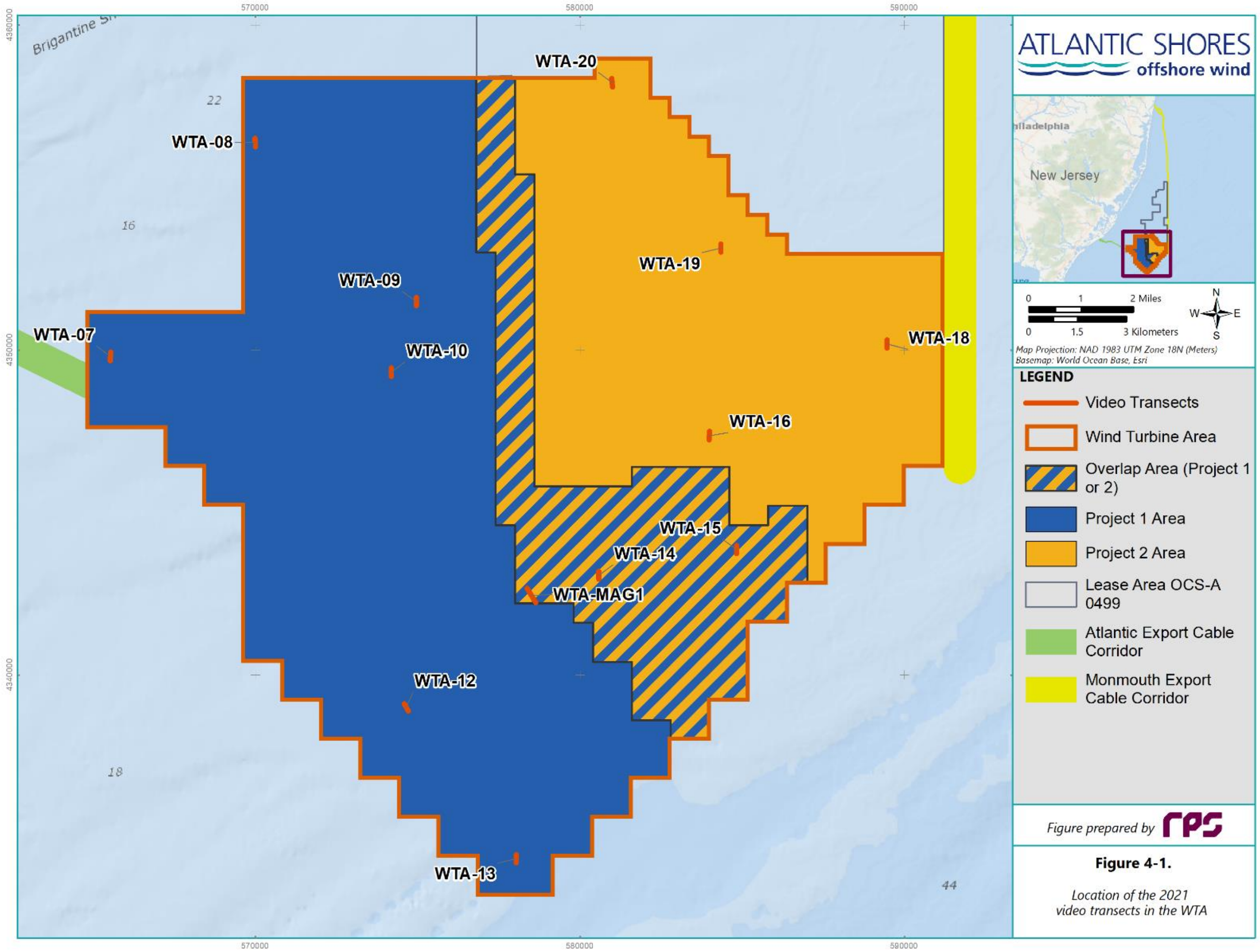


Figure 4-1. Locations of the 2021 video transects in the Wind Turbine Area.

4.1.1 WTA 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 WTA video transects, including WTA-MAG1 which was split into WTA-MAG-A and WTA-MAG-B for data analysis purposes. Counting WTA-MAG-A and WTA-MAG-B seperately, there were a total of 14 transects in the WTA. Organisms were identified in the videos to the LPTL. A total of 524 observations were made which included 518 identified organisms, 3 unidentified objects, and 3 unidentified organisms recorded within the WTA transects (Table 4-2). Organisms that were most numerous throughout the WTA included skate egg cases and sea robins composing 43% and 32% of all organisms, respectively. Of the 225 individual skate egg cases observed, 77 observations were made within transect WTA-10, which had the highest single transect abundance of any feature in the WTA.

Shannon diversity index values of communities of mobile megafauna varied from 0 (WTA-08) to 1.5 (WTA-12; Table 4-2). The low diversity value in the WTA-08 was represented by the presence of a single species, a moon snail, and a moon snail egg case. The highest diversity value in WTA-12 was driven by the presence of 6 different megafauna including 8 sea robins, 6 moon snails, 4 hermit crabs, 2 astarte clams, and a single observation of a sea star and unidentified mollusk. Of the 14 transects, 7 transects had a diversity value at or above 1.0, with an average of 0.9. The diversity index is affected by both the number of species and evenness so although WTA-10 had the greatest number of total organisms, skate egg cases dominated the 7 species observed, so the transect has a lower diversity value than a similar transect that with 8 different megafauna observed (e.g., WTA-09).

Overall, the enumerated organisms in the WTA were composed of 5 different phyla including Arthropoda, Chordata, Cnidaria, Echinodermata, and Mollusca (Figure 4-2, and Figure 4-3). Observed eggs were classified into corresponding taxonomic groupings but specifically noted to be eggs. Phylum Chordata had the highest percent composition of enumerated organisms, at 81% (38% adults and 43% skate egg cases) and Phylum Echinodermata composed the lowest percent composition at 0.4% (Figure 4-3). Within Phylum Chordata, 5 Orders were identified including Gadiformes, Perciformes, Pleuronectiformes, Rajiformes, and Scorpaeniformes (Figure 4-4). Order Scorpaeniformes had the highest percent composition of enumerated vertebrates composing 45% of the total while Perciformes, Pleuronectiformes, and Rajiformes composed the lowest percent composition at 0.2%. When including Rajiformes eggs, the percent composition is brought up to 54%. Enumerated vertebrates not identified to the level of Order composed 0.5% of the total.

Within enumerated invertebrates, 5 taxonomic classes were identified including Anthozoa, Asteroidea, Bivalvia, Gastropoda, and Malacostraca (Figure 4-5). Class Malacostraca had the highest percent composition of enumerated invertebrates at 28%, while class Asteroidea composed the lowest percent composition at 2%. With eggs included, class Gastropoda makes up 40% of the composition. Invertebrates that were not identified to the level of class composed 1% of enumerated 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 3.2.1 for full list]) were recorded for the WTA video transects (Figure 4-6). Bushy plant-like organisms, sand dollars, sponge/tunicate, decorator worms, and worm tubes were all marked as present within the WTA, while algae, northern star coral, eelgrass, forage fish, blue mussels, sponge, eastern oysters, and slipper shells were marked absent. Of the 14 video transects in the WTA, sand dollars had the highest transect presence and were observed in all except transect WTA-20.

Throughout the WTA, there was no presence recorded of northern star coral, Atlantic surfclam, ocean quahog, or Atlantic sea scallop (Table 4-2). Bivalves in the WTA were composed of astarte clams and composed 4% of observed organisms. Astarte clams were present in 5 transects (WTA-07, WTA-10, WTA-12, WTA-16, and WTA-19). In Figure 4-6, the unidentified sponge/tunicate/other feature is defined by the presence of encrusting amorphous organisms. This feature was marked as present in 6 video transects within the WTA. In 6 transects (WTA-20, WTA-19, WTA-18, WTA-14, WTA-10 and WTA-09) it was noted that there was observed encrusting organisms growing on skate egg cases and in WTA-09 an encrusting organism was also present on a bivalve shell. Transect WTA-19 was noted to possibly contain a small patch of encrusting bryozoan and in WTA-18 the presence of encrusting sponge on a bivalve shell was noted. 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 2 video transects (WTA-07 and WTA-10) and noted that these could be the presence of a bryozoan. Burrowing anemones were present in 5 WTA transects (WTA-10, WTA-13, WTA-20, WTA-MAG-A and WTA-MAG-B) and composed 2% of all organisms observed in the WTA. There were no noted observations of potential invasive species.

For representative images of observed species, see Table 4-3, for complete reviewer notes see Appendix A, and for complete taxonomy of enumerated megafauna see Appendix C.

Table 4-2. Enumerated megafauna and other features observed in the WTA.

Common Name	Lowest Taxonomic Level	Counts Per WTA Transect														
		7	8	9	10	12	13	14	15	16	18	19	20	MAG-A	MAG-B	Total
Vertebrate																
fish, unidentified	Chordata														1	1
flounder, unidentified	Pleuronectiformes							1								1
hake, silver	*Merluccius bilinearis*										2					2
roundfish, unidentified	Teleostei											1				1
sea bass, black	*Centropristis striata*														1	1
sea robin, northern	*Prionotus carolinus*			31	13	1	3	14	17	8	15	9	2	15	39	167
sea robin, unidentified	Prionotus			1		7	9			6						23
skate	Rajidae													1		1
skate, egg case	Rajidae Eggs			14	77		7	6		44	35	8	30	3	1	225
Invertebrate																
anemone, burrowing	Anthozoa				1		2						1	3	1	8
astarte	Astarte	6			5	2				2		5				20
crab, cancer	*Cancer*				1		1								1	3
crab, hermit	Pagurus	1		9		4	2	1		1	2		1	1		22
crab, spider	Libnia			2												2
mollusc, unidentified	Mollusca					1										1
moon snail	Naticidae	2	2	1	3	6			1				2			17
moon snail, egg case	Naticidae	7	4		1				3					2	4	21
scallop, sea	*Placopecten magellanicus*			1		1										2
sea star, common or forbes	*Asterias*				1		2						1	3	1	8
Other																
object, unidentified	object, unidentified	1					2									3
organism, unidentified	organism, unidentified	1		1					1							3
Total Organisms		**16**	**6**	**59**	**101**	**22**	**24**	**22**	**21**	**61**	**54**	**23**	**36**	**25**	**48**	**518**
Total Observations		**18**	**6**	**60**	**101**	**22**	**26**	**22**	**22**	**61**	**54**	**23**	**36**	**25**	**48**	**524**
Shannon's Diversity		**1.2**	**0.0**	**1.3**	**0.8**	**1.5**	**1.4**	**0.9**	**0.7**	**0.8**	**1.0**	**1.2**	**0.7**	**1.2**	**0.8**	**-**

[1]WTA-MAG1 transect was split into WTA-MAG-A and WTA-MAG-B.

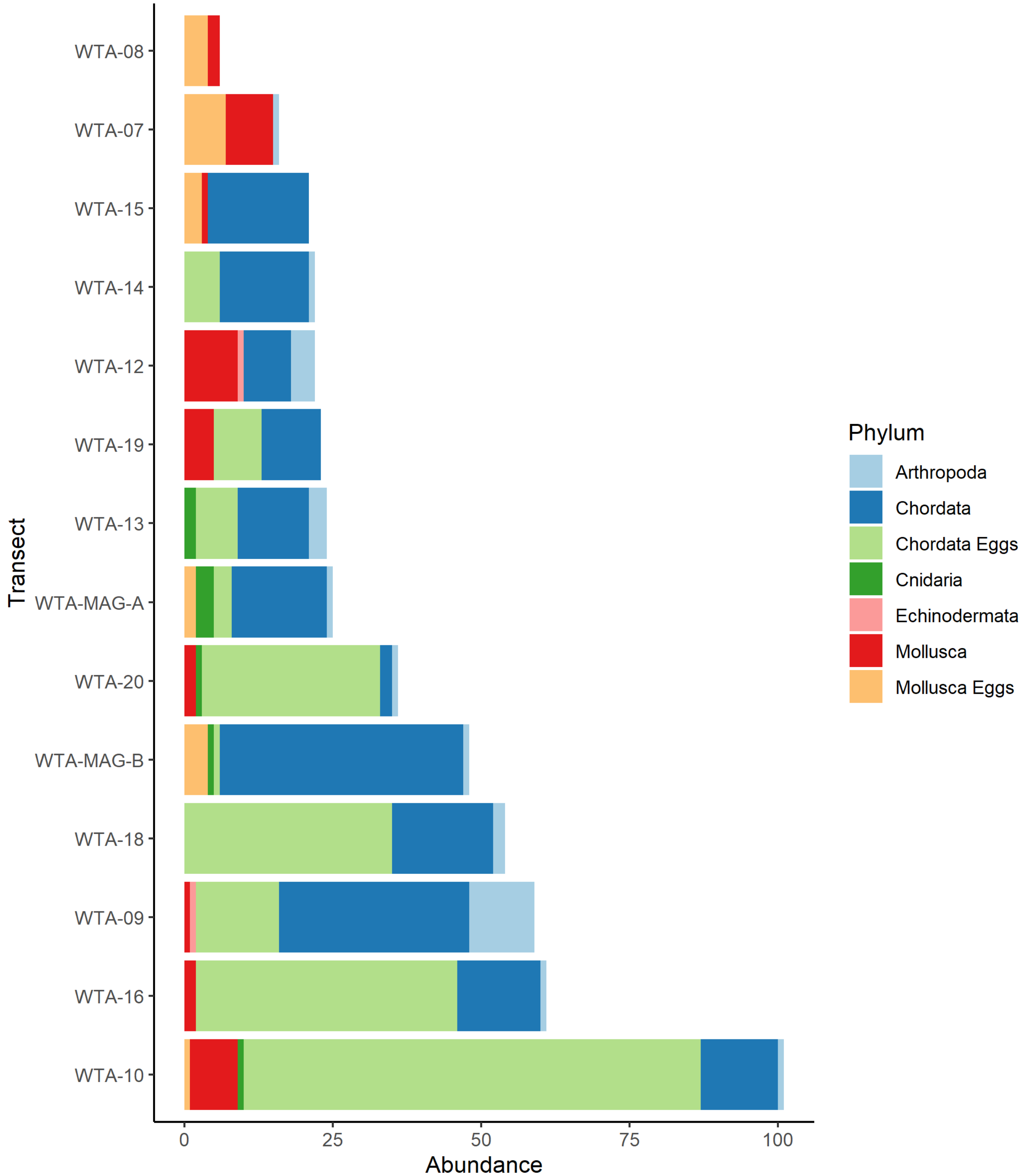


Figure 4-2. Distribution of enumerated organisms by phylum within the WTA.

Notes: 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. The WTA-MAG1 transect was split into WTA-MAG-A and WTA-MAG-B.

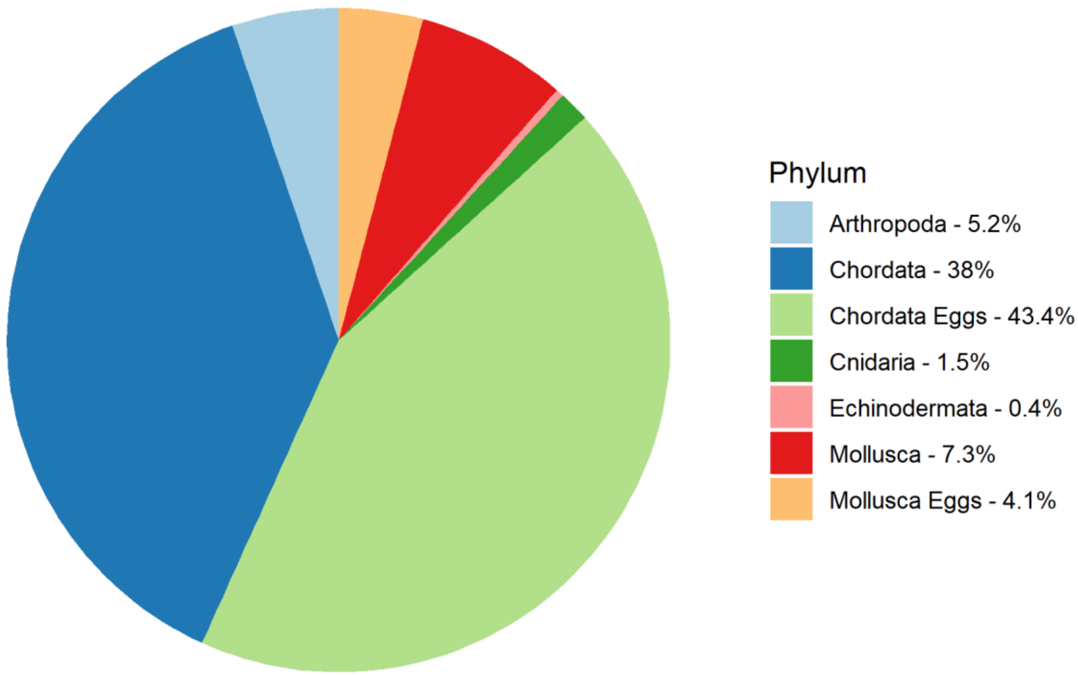


Figure 4-3. Percent composition of enumerated organisms by phylum within the WTA.

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

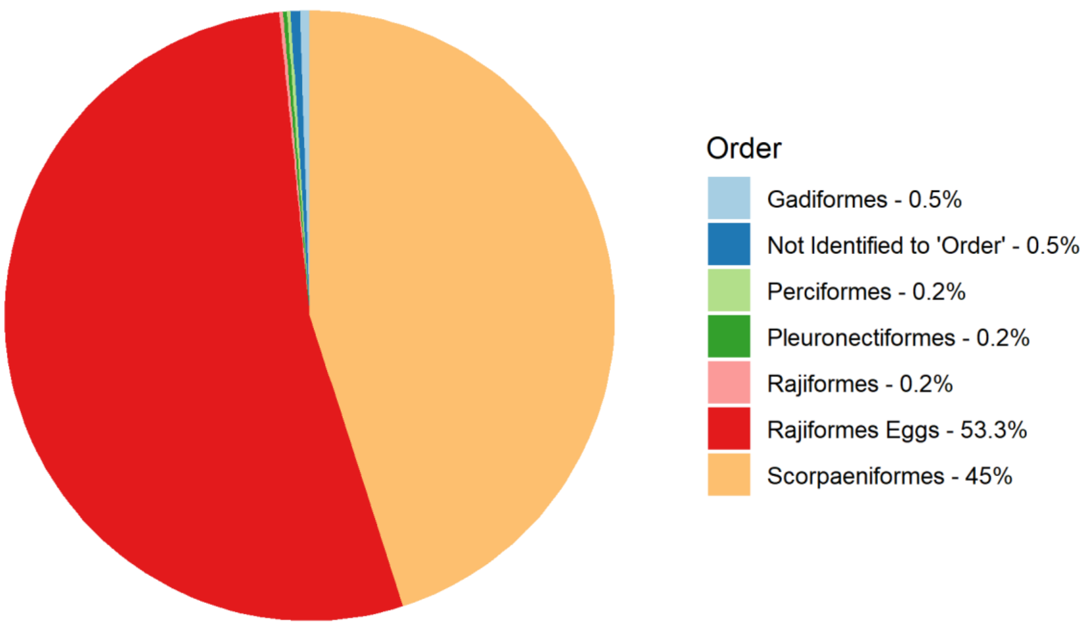


Figure 4-4. Percent composition of enumerated vertebrates by taxonomic order within the WTA.

Notes: Organisms not identified as phylum "Chordata" or smaller than 2.5 cm were excluded. Eggs were broken out into corresponding taxonomic groupings.

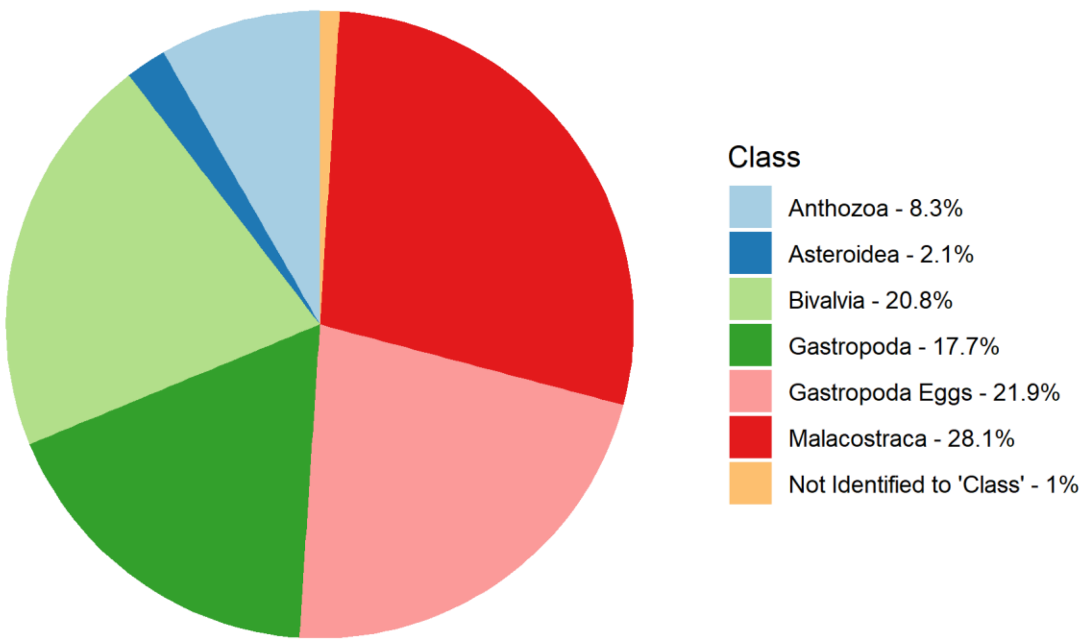


Figure 4-5. Percent composition of enumerated invertebrates by taxonomic class within the WTA.

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

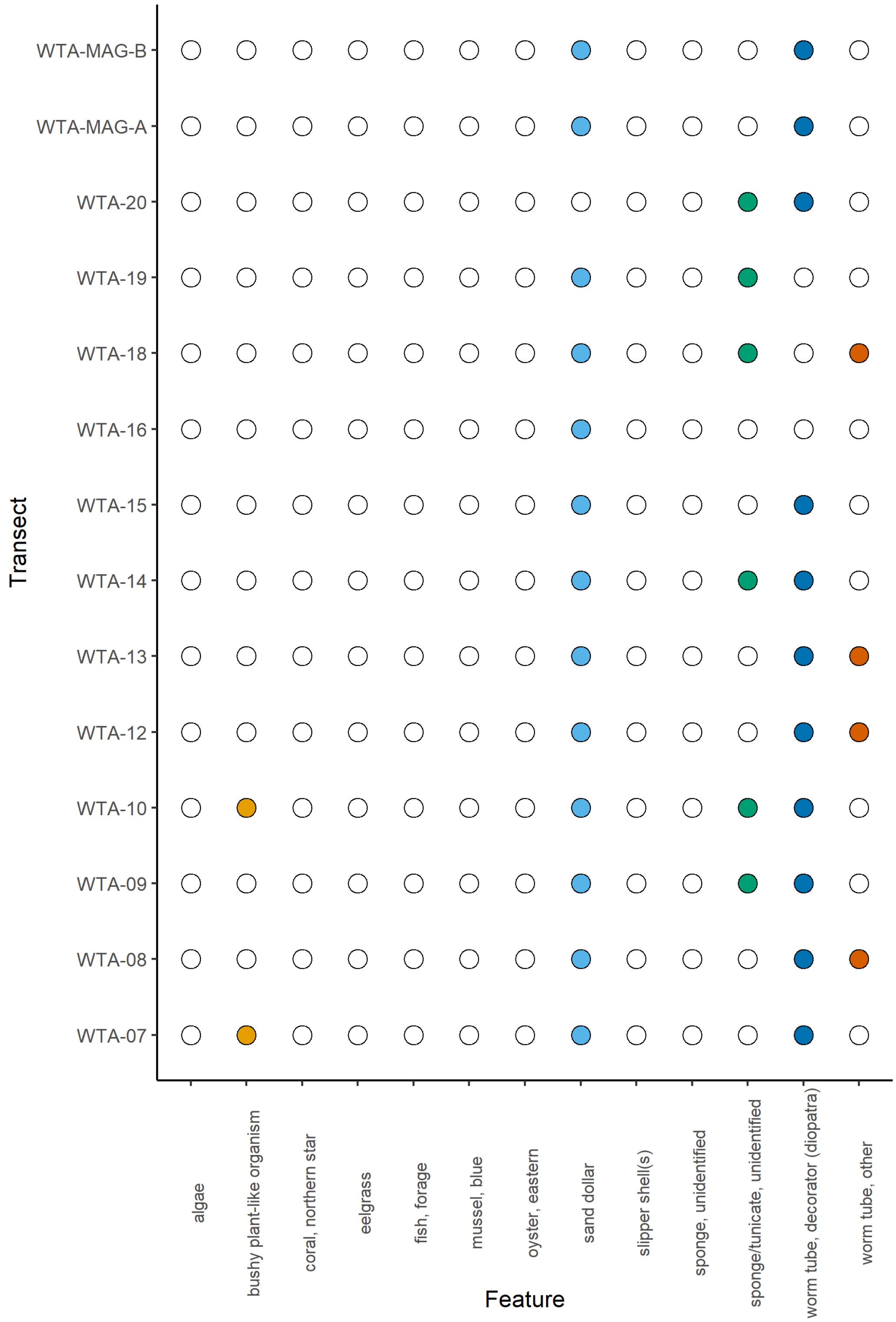


Figure 4-6. Presence (colored) or absence (white) of observed features within the WTA.

Notes: These data only include features that were marked as present or absent during video review and were not enumerated. The WTA-MAG1 transect was split into WTA-MAG-A and WTA-MAG-B.

Table 4-3. Representative images of megafauna and features observed in the WTA.

Notes: Still image number provided where available. Screenshots from video will not have a still number.

Northern Sea Robin (*Prionotus carolinus*) WTA-19	
Skate Egg Cases (Rajidae) WTA-09_G0019663	

Moon Snail (Naticidae) WTA-12_G0015264	

4.1.2 WTA 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 WTA. A total of 380 m^2 of seafloor was analyzed in the WTA region (Table 4-4). The geologic substrate group with the highest percent cover across all transects was sand/mud, composing 82% (474 m^2) of the surface area analyzed through still images for the transects. Transect WTA-07 contained 97% (42 m^2) sand/mud cover, with the smallest sand/mud cover occurring at transect WTA-10 (36% or 6 m^2). The transect with the highest area sampled, 63 m^2, was WTA-20 which mostly contained 51% sand/mud, 6% gravel (pebble/granule) and 43% biogenic shell substrate (Table 4-4).

No boulder or cobble-sized gravel were found in any of the transects in the WTA. Gravel particles of pebble/granule size (> 2 mm to < 64 mm) composed ≥ 5% of the substrate in only 4 out of 20 transects. Transect WTA-10 had the highest percent of gravel cover at 58% (9 m^2), while WTA-33 had 6% (1.5 m^2). There were five transects which had no gravel present (WTA-12, WTA-15, WTA-18, WTA-19, and WTA-23). The 13 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 5% (68 m^2) of the substrate within the WTA transects. The highest biogenic shell coverage was found at transect WTA-20, which had 43% (27 m^2) coverage. Shell cover in the remaining transects ranged from >1-20% coverage, with an average of 7%. WTA-12 had the lowest percentage of biogenic shell coverage (> 1 %, > 0.2 m^2) across all transects in the WTA. No anthropogenic debris was found on the seafloor with the area analyzed in the WTA transects.

The total area of biological elements (i.e., presence or evidence of flora or fauna) sampled in the WTA only accounts for 3% (16 m^2) of the bottom cover (

Table 4-5). Worm tube structures were classified as flora/fauna cover rather than substrate. The most common elements were inferred fauna (tracks and trails, egg masses, and degraded burrows) and sand dollars, which made up 55% and 39% of the total flora/fauna, respectively, and accounted for approximately 10.7 m^2 of the bottom cover. 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 cover of different biological elements (i.e., flora/fauna) observed within still images were calculated for each transect. Throughout the WTA there was zero percent cover recorded for blue mussels, sea scallops and encrusting organisms (

Table 4-5). Astarte clams were present in two transects (WTA-23 and WTA-27) and composed 0.5% (0.07 m^2) of the total flora/fauna. Bushy plant-like organisms were present in one transect, WTA-18, and composed >0.2% (0.02 m^2) of the total flora/fauna in the surveyed transects. Approximately 3% (11 m^2) of the WTA transects contained flora/fauna, and over half (59%) of all of the flora/fauna cover was identified as infaunal structures (likely polychaete worm tubes, 4%) and inferred fauna (tracks, burrows, or possibly older evidence of infaunal structures, 55%). These categories may be considered emergent taxa or structures that add complexity to the seafloor

Table 4-4. Area and percent coverage of substrate type per total transect area summarized from still images within the WTA.

Transect	Total Area Analyzed (m^2)	Percent of Area – Gravel Substrates				Sand/mud Substrate (%)	Biogenic Shell Cover (%)[1]	Organic Debris, Wood (%)	Anthropo-genic Cover (%)[2]	Flora/Fauna Cover (%)[3]
		Boulder (%)	Cobble (%)	Pebble/ Granule (%)	All Gravel Combined (%)					
WTA-07	43.95	0	0	1.14	1.14	96.61	2.25	0	0	0
WTA-08	19.08	0	0	0.91	0.91	93.61	2.47	0	0	3.01
WTA-09	17	0	0	3.36	3.36	82.73	11.29	0	0	2.62
WTA-10	15.86	0	0	57.92	57.92	35.58	5.64	0	0	0.86
WTA-12	24.48	0	0	0	0	72.72	0.75	0	0	26.53
WTA-13	20.24	0	0	0.79	0.79	94.46	2.85	0	0	1.90
WTA-14	30.86	0	0	0.11	0.11	92.61	4.59	0	0	2.69
WTA-15	46.27	0	0	0	0	93.76	3.83	0	0	2.41
WTA-16	21.05	0	0	1.04	1.04	91.06	5.50	0	0	2.40
WTA-18	19.25	0	0	0	0	94.96	4.18	0	0	0.86
WTA-19	14.38	0	0	0	0	83.07	13.24	0	0	3.69
WTA-20	63.15	0	0	5.65	5.65	51.51	42.79	0	0	0.06
WTA-MAG-A	23.08	0	0	0.29	0.29	92.86	6.78	0	0	0.07
WTA-MAG-B	21.3	0	0	0.30	0.30	94.25	4.86	0	0	0.59
Total Percentage in WTA (%)[4]	**100**	**0**	**0**	**3.83**	**3.83**	**82.20**	**10.98**	**0**	**0**	**2.99**
Total Area in WTA (m^2)[5]	**379.93**	**0**	**0**	**14.54**	**14.54**	**312.32**	**41.71**	**0**	**0**	**11.36**

[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 WTA (%) provides a summary of the total percent cover of each substrate type across all transects.
[5] Total Area in WTA (m^2) provides a summary of the total area of each substrate type across all transects.
[6] WTA-MAG1 transect was split into WTA-MAG-A and WTA-MAG-B.

Table 4-5. Area and percent coverage of different biological elements (i.e., flora/fauna) observed within still images taken from the 14 video transects in the WTA.

Transect	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-07	0	0	0	0	0	0	0	0	0	0	0	0	0
WTA-08	0.57	0	0	0	0	0	0	0	74.91	0	25.09	0	0
WTA-09	0.41	0	0	0	0	0	1.19	81.16	15.96	0	1.68	0	0
WTA-10	0.14	0	0	0	0	0	0	0	75.22	24.78	0	0	0
WTA-12	6.49	0	0	0	0	0	0	0	69.44	0	30.56	0	0
WTA-13	0.39	0	0	0	0	0	5.88	0	1.81	5.69	86.61	0	0
WTA-14	0.83	0	0	0	0	0	0	11.06	0	3.45	85.49	0	0
WTA-15	1.11	0	0	0	0	0	0	0	16.30	0	83.70	0	0
WTA-16	0.51	0	0	0	0	0	0	0	97.38	0	2.62	0	0
WTA-18	0.17	0	0	0	12.45	0	0	13.59	0	0	73.96	0	0
WTA-19	0.53	0	0	0	0	0	1.46	0	61.38	1.63	35.53	0	0
WTA-20	0.04	0	0	0	0	0	0	0	100	0	0	0	0
WTA-MAGA	0.02	0	0	0	0	0	0	0	0	0	100	0	0
WTA-MAGB	0.12	0	0	0	0	0	0	0	88.39	11.61	0	0	0
Total F/F Percentage in WTA (%)[1]	**100**	**0**	**0**	**0**	**0.18**	**0**	**0.26**	**3.96**	**55.12**	**0.97**	**39.17**	**0**	**0**
Total F/F Area in WTA (m^2)[1]	**11.36**	**0**	**0**	**0**	**0.02**	**0**	**0.03**	**0.45**	**6.26**	**0.11**	**4.45**	**0**	**0**

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

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

[3] WTA-MAG1 transect was split into WTA-MAGA and WTA-MAGB.

4.1.3 WTA CMECS Classifications

Across the 14 transects (counting WTA-MAG1 as two parts) in the WTA, 347 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=283) was far greater than any other CMECS group, composing 295 m^2 of the analyzed area (1Abbreviations are as follows: S/M = Sand/Mud, B = Boulder, C = Cobble, and P/G = Pebble/Granule

Table 4-7). The sand/mud CMECS group is not considered complex under the NMFS guidelines (NMFS, 2021); thus, 82% of the area analyzed within WTA transects was classified as soft bottom habitat / not complex.

Complex habitats include those with ≥ 5% of gravel-sized particles, 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 4 m^2 of the WTA area in 6 images that were all within transect WTA-10 (Table 4-6, 1Abbreviations are as follows: S/M = Sand/Mud, B = Boulder, C = Cobble, and P/G = Pebble/Granule

Table 4-7, Figure 4-7). Gravel mixes of pebble/granule with sand/mud (< 80% and ≥ 30% gravel) were found in 2 transects (WTA-09, and WTA-10) and classified in 18 still images, composing of 10 m^2. Transect WTA-10 contained the most gravel mix habitat (10 m^2).

Gravelly sand/mud (< 30% and ≥ 5% gravel) was classified in 52 images for a total of 48 m^2 across 7 transects, with a gravel type of pebble/granule and no instances of cobble or boulder. Overall, only transects WTA-10 and WTA-20 had a majority of still images classified as gravel, gravel mixes, gravelly, or biogenic shell which are considered complex habitat by NMFS. In WTA-10 all 25 passing stills (100%) were classified as gravelly or coarser, and WTA-20 consisted of 14 gravelly images and 8 biogenic shell images for a total of 22 of 25 passing stills (88%) classified as complex.

Biogenic origin substrates present in the WTA 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 only 8 images from transect WTA-20, but shells were also frequent as co-occurring substrate types, classified as a secondary CMECS classification in 273 (79%) still images at various levels of cover density and composing 42 m^2 of the WTA area overall (Figure 4-8). All worm substrate was classified as biotic component and are represented in the flora/fauna areas (Table 4-4,

Table 4-5) and further used in the CMECS biotic component classifications (Figure 4-10).

CMECS substrate components classifications for stills in each transect are mapped over benthic habitat polygons in figures provided in Appendix D. Many transects align with the benthic habitat polygons provided, except in the case of WTA-19 where all stills were classified as sand/mud while the habitat polygons showed the transect as gravelly sand (Appendix D).

The area of the biological elements recorded in the percent cover analysis approximated 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). Only 11 images analyzed within the WTA composed moderate amounts of flora/fauna coverage (> 30% coverage; Figure 4-9), with most images (56%) containing zero flora/fauna cover.

Representative images of CMECS substrate types are shown in Table 4-8.

Table 4-6. The number of stills and the total area (m^2) classified to each CMECS substrate group combination for each of the 14 video transects in the WTA.

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 (%)
Biogenic Shell Hash with Moderate Gravelly (S/M & P/G)	6	1.73	15.35	4.04
Biogenic Shell Hash with Moderate S/M	2	0.58	7.25	1.91
Gravel – P/G with Sparse Shell Hash	6	1.73	4.41	1.16
Gravel Mixes – P/G & S/M with Sparse Shell Hash	15	4.32	9.01	2.37
Gravel Mixes – P/G & S/M with Trace Shell Hash	3	0.86	1.21	0.32
Gravelly S/M & P/G	1	0.29	0.45	0.12
Gravelly S/M & P/G with Moderate Shell Hash	10	2.88	24.90	6.55
Gravelly S/M & P/G with Sparse Shell Hash	18	5.19	19.05	5.01
Gravelly S/M & P/G with Sparse Shell Rubble	1	0.29	0.70	0.19
Gravelly S/M & P/G with Trace Shell Hash	2	0.58	2.54	0.67
S/M	65	18.73	61.52	16.19
S/M with Moderate Shell Hash	4	1.15	8.35	2.20
S/M with Sparse Shell Hash	176	50.72	177.59	46.74
S/M with Sparse Shell Rubble	1	0.29	0.69	0.18
S/M with Trace Shell Hash	37	10.66	46.92	12.35
Totals	**347**	**100**	**379.93**	**100**

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

Table 4-7. Area (m^2) classified to each CMECS substrate component type for transects in the WTA.

Transect	Shell Rubble	Shell Hash	Biotic Component	Gravel P/G	Gravel Mixes P/G + S/M	Gravelly Sand/Mud			Sand/Mud
						+ C	+ C/P/G	+ P/G	
WTA-07	0	0	0	0	0	0	0	3.89	40.06
WTA-08	0	0	0	0	0	0	0	1.74	17.35
WTA-09	0	0	0	0	0.25	0	0	5.35	11.40
WTA-10	0	0	0	4.41	9.97	0	0	1.47	0
WTA-12	0	0	0	0	0	0	0	0	24.48
WTA-13	0	0	0	0	0	0	0	1.56	18.68
WTA-14	0	0	0	0	0	0	0	0	30.86
WTA-15	0	0	0	0	0	0	0	0	46.27
WTA-16	0	0	0	0	0	0	0	0.91	20.14
WTA-18	0	0	0	0	0	0	0	0	19.25
WTA-19	0	0	0	0	0	0	0	0	14.38
WTA-20	0	22.60	0	0	0	0	0	32.71	7.84
WTA-MAGA	0	0	0	0	0	0	0	0	23.08
WTA-MAGB	0	0	0	0	0	0	0	0	21.30
Total Area (m^2)	**0**	**22.60**	**0**	**4.41**	**10.22**	**0**	**0**	**47.63**	**295.07**

[1] WTA-MAG1 transect was split into WTA-MAG-A and WTA-MAG-B.

[2]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 counted (as individuals, when applicable) to determine the dominant and co-occurring biotic component classifications and associated taxa for each still. Only the dominant biotic component is described in the report, see the accompanying spreadsheet for all co-occurring classifications and associated taxa (Appendix B).

The total number of stills with each classification per transect is shown in Figure 4-10. Of the 347 stills analyzed from video data surveyed from the WTA, 123 stills had no biological elements and therefore no biotic component classification, with WTA-07 and WTA-20 particularly sparse. Sand dollar bed was the most common biotic component classification in the WTA, dominating in 155 stills and occurring as the dominant biotic component in 8 of the 14 transects. Sand dollar beds were the dominant biotic group in every analyzed still in transects WTA-12 and WTA-15, and nearly all in WTA-13 and WTA-14 (Figure 4-10). The benthic biota classification was assigned to 5 stills that only had associated taxa present, such as fish, Cancer crabs or sea stars. The subclass of inferred fauna, which in the WTA included 69% possibly older, unidentified infaunal structures and 31% egg masses, was also common and occurred as the dominant biotic component in 27 still images, with most occurring in WTA-08, WTA-16, and WTA-18.

The CMECS substrate and biotic component classifications for stills in each transect are mapped over benthic habitat polygons in figures provided in Appendix D.

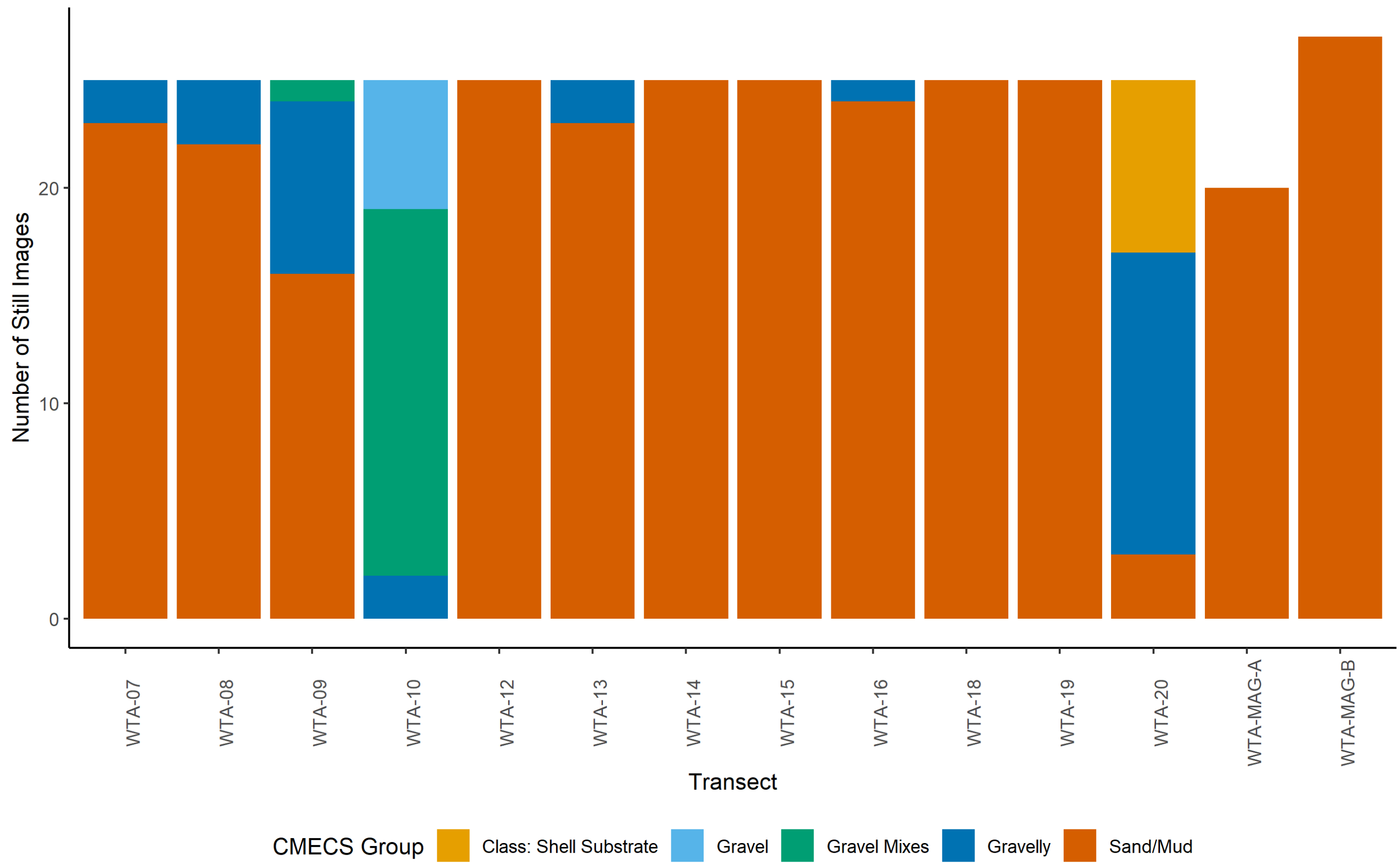


Figure 4-7. The number of still images classified to CMECS substrate component groups within the WTA video transects.
Note: The WTA-MAG1 transect was split into WTA-MAG-A and WTA-MAG-B.

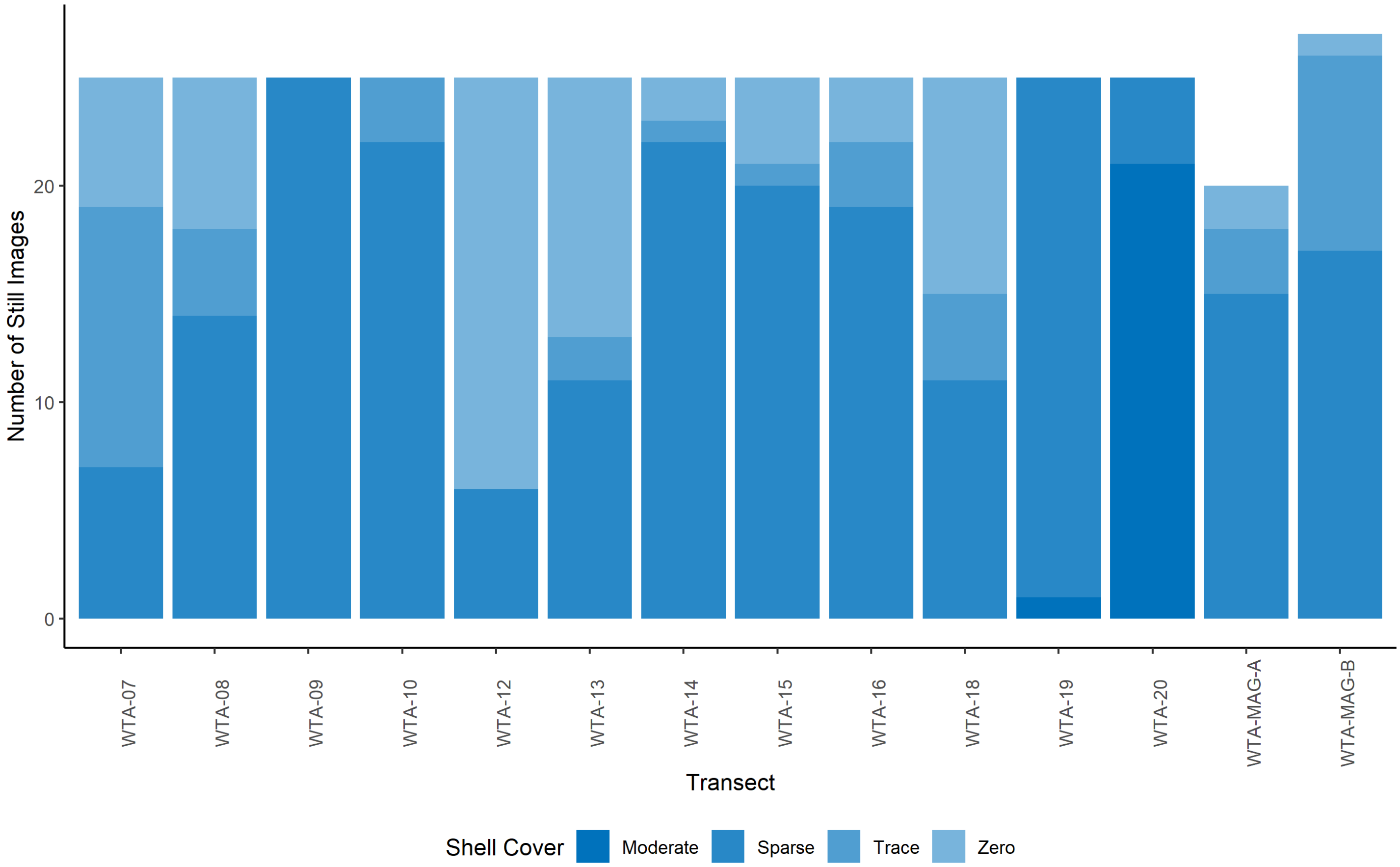


Figure 4-8. The number of still images classified to each shell cover density category within the WTA video transects.

Notes: 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. The WTA-MAG1 transect was split into WTA-MAG-A and WTA-MAG-B.

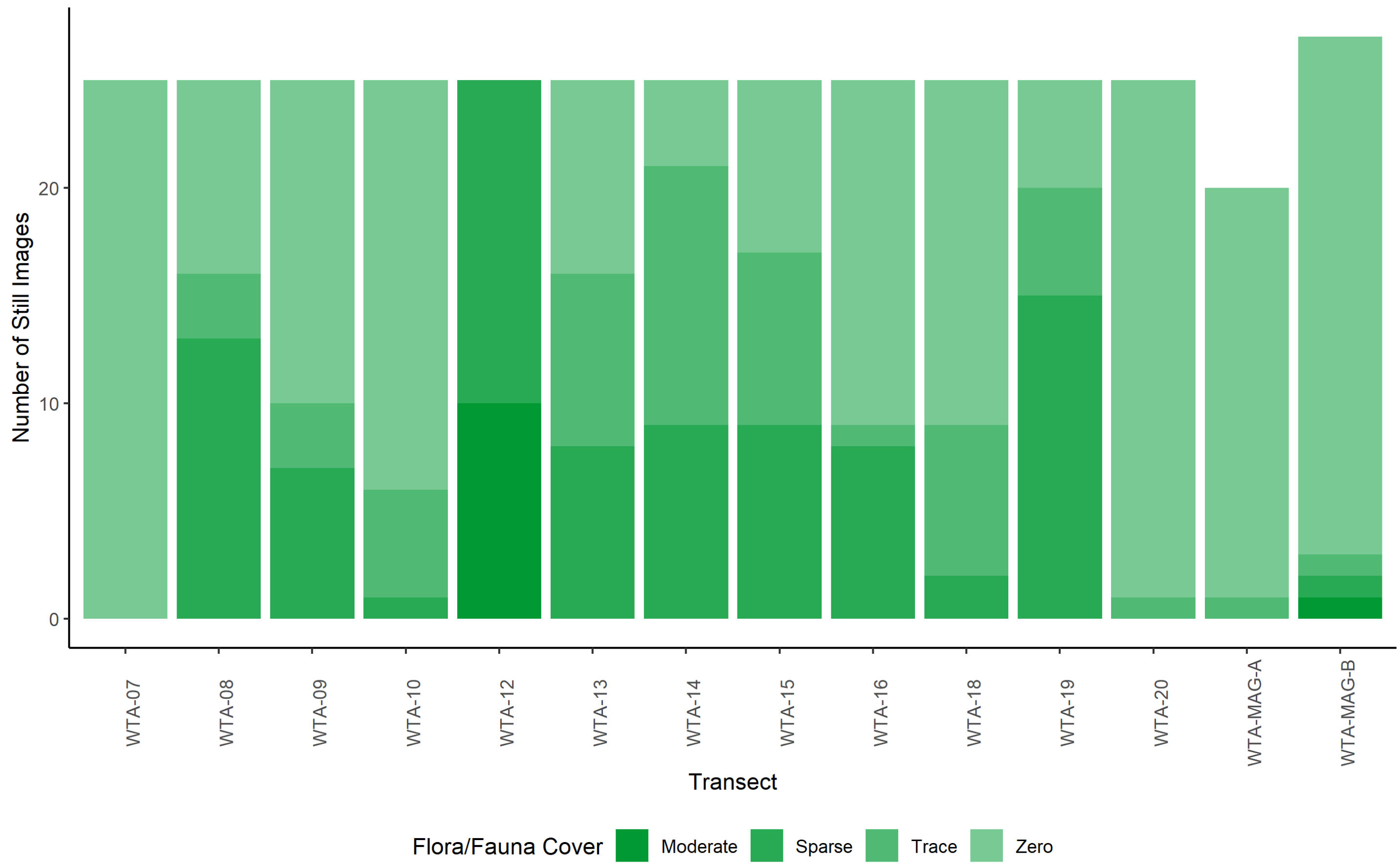


Figure 4-9. The number of still images classified to each flora/fauna density category within the WTA video transects.
Notes: Trace is ≤ 2%, Sparse is > 2 to < 30%, Moderate is 30 to < 70%, Dense is 70 to < 90%, and Complete is 90 to 100% cover. The WTA-MAG1 transect was split into WTA-MAG-A and WTA-MAG-B.

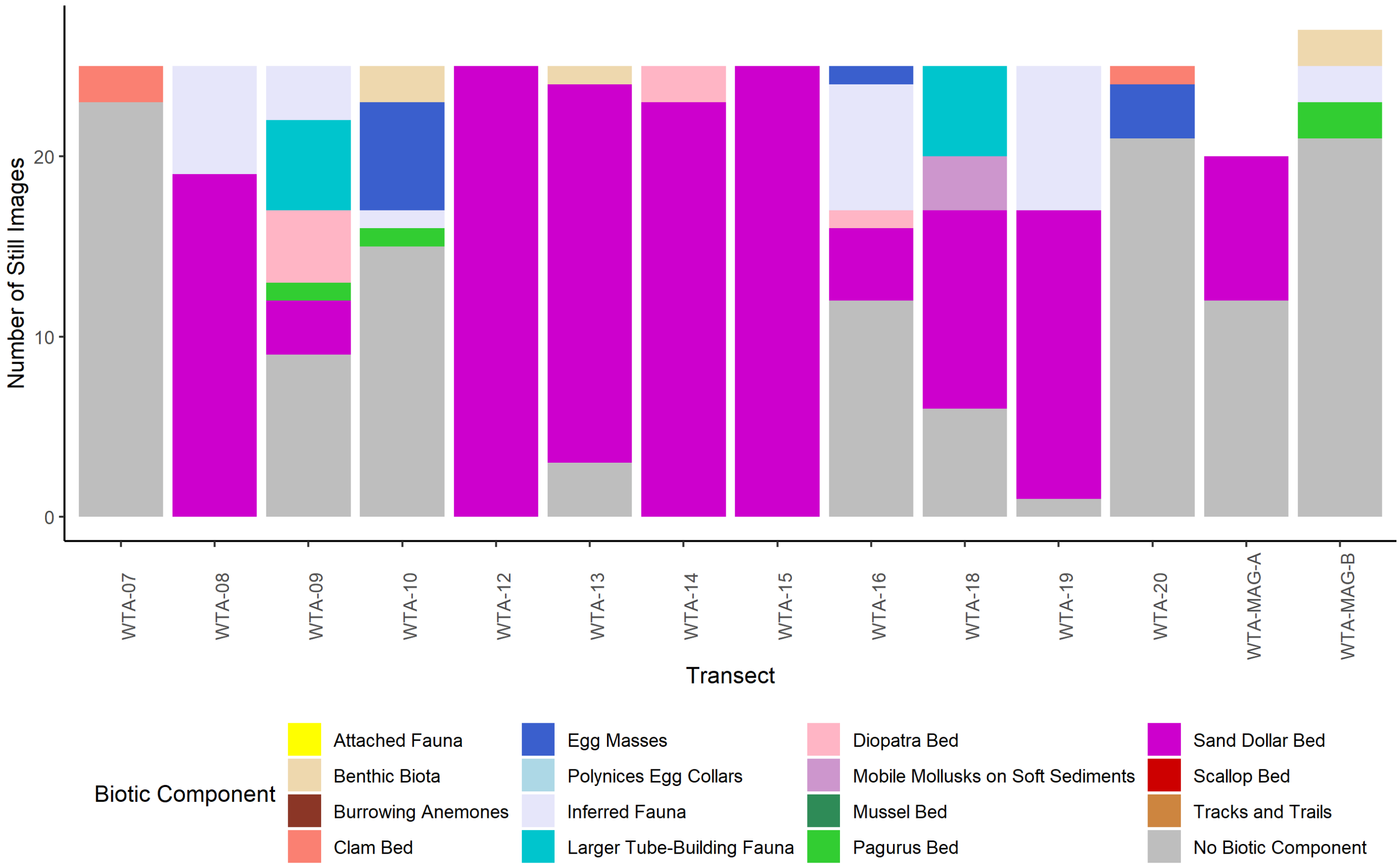
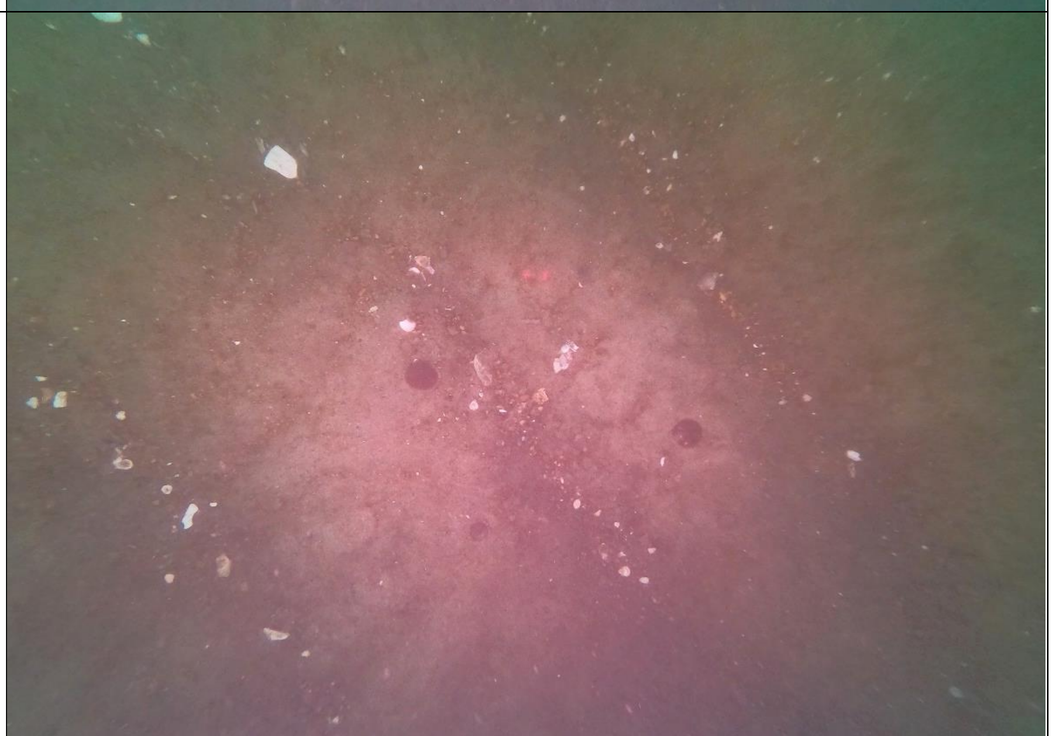


Figure 4-10. The number of still images assigned to CMECS biotic component classifications within the WTA video transects.

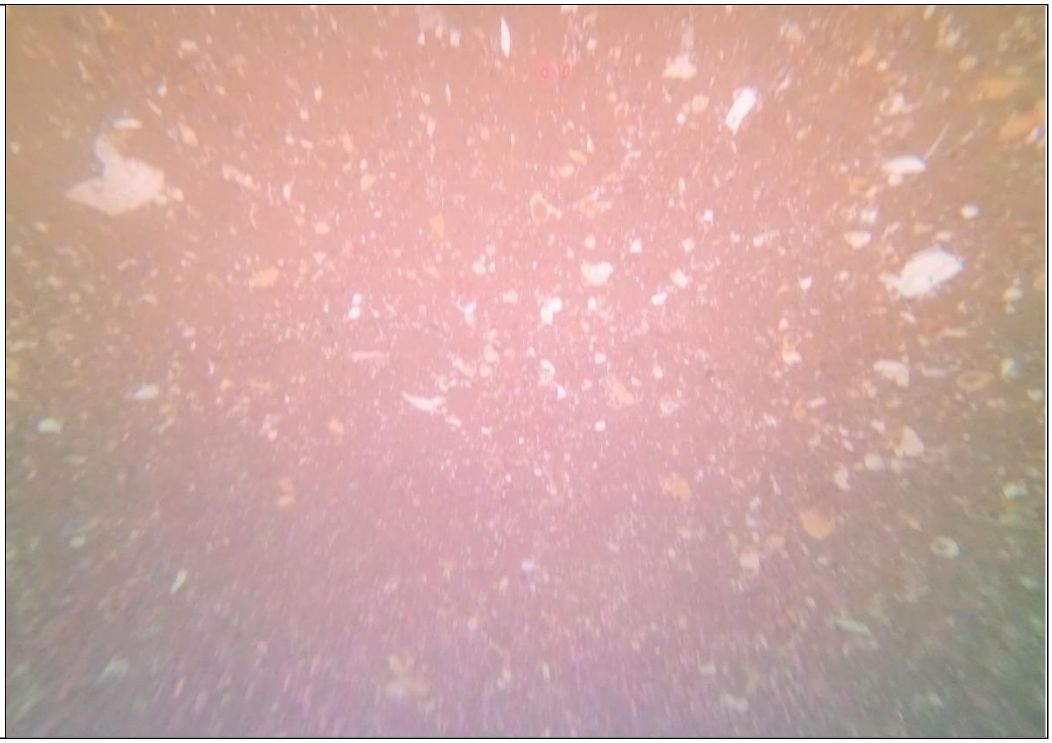
Notes: Still images which were observed to contain no biota were classified as No Biotic Component. Attached Fauna is designated by encrusting organisms, Benthic Biota by associated taxa including fish, crabs and sea stars, Clam bed by Astarte clams, Egg masses by skate egg cases, Polynices Egg collars 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. The WTA-MAG1 transect was split into WTA-MAG-A and WTA-MAG-B.

Table 4-8. Representative images of CMEC substrate types observed in the WTA.
Notes: Still image number provided where available. Screenshots from video will not have a still number.

Geologic Unconsolidated Sand/mud WTA-07A_G0013413	
Geologic Unconsolidated Sand/mud with Trace Shell Hash WTA-08A_G0012550	

Geologic Unconsolidated Sand/mud with Sparse Shell Hash WTA-09_G0020060	
Geologic Unconsolidated Sand/mud with Sparse Shell Rubble WTA-08A_G0012466	

Geologic Unconsolidated Sand/mud with Moderate Shell Hash WTA-20_G0012771	
Geologic Unconsolidated Gravel Mixes (Pebble/Granule with Sand/Mud) with Sparse Shell Hash WTA-09_G0020024	

Biogenic Shell Substrate with Moderate Gravelly Sand/Mud with Pebble/Granule WTA-20_G0012695	

4.2 Monmouth Export Cable Corridor

The characteristics and locations of the 43 underwater video transects within the MON ECC are described in Table 4-9 and locations are shown in

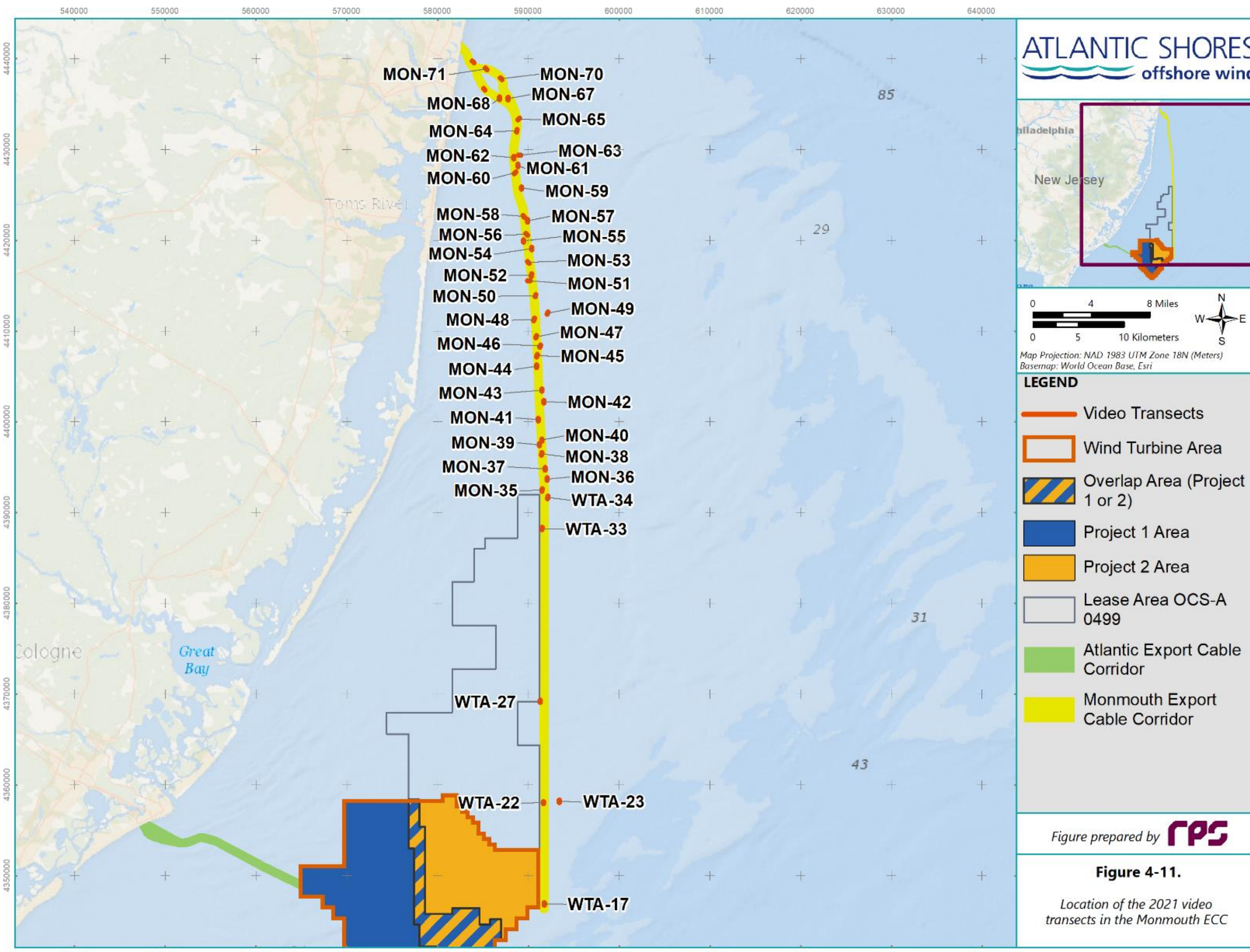


Figure 4-11.

Location of the 2021 video transects in the Monmouth ECC

Figure 4-11. Note that at the time of the survey design, 6 sites in the more southern portion of the MON ECC were given 'WTA' identifiers due to their locations. Despite the transect names, they are still considered part of the MON ECC so their data are presented in this section. Section 4.2.1 below describes presence and abundance of megafauna observed in video transects recorded in the MON ECC. Abundance data are displayed in Table 4-10. with additional visualizations are displayed in Figure 4-12 through Figure 4-16. Images of representative megafauna are displayed in Table 4-11. Section 4.2.2 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 4-12, Table 4-13, and Figure 4-20. The CMECS classification results are presented in Section 4.2.3.

Table 4-9. Underwater video transect locations in the MON 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
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

Transect	Date (UTC)	Recorded Duration (min:sec)	Start Latitude (°N)	Start Longitude (°W)	End Latitude (°N)	End Longitude (°W)	# Analyzed Stills
WTA-34	6/6/2021	17:13	39°40'16.08513"	73°55'31.98454"	39°40'07.91756"	73°55'34.41247"	25

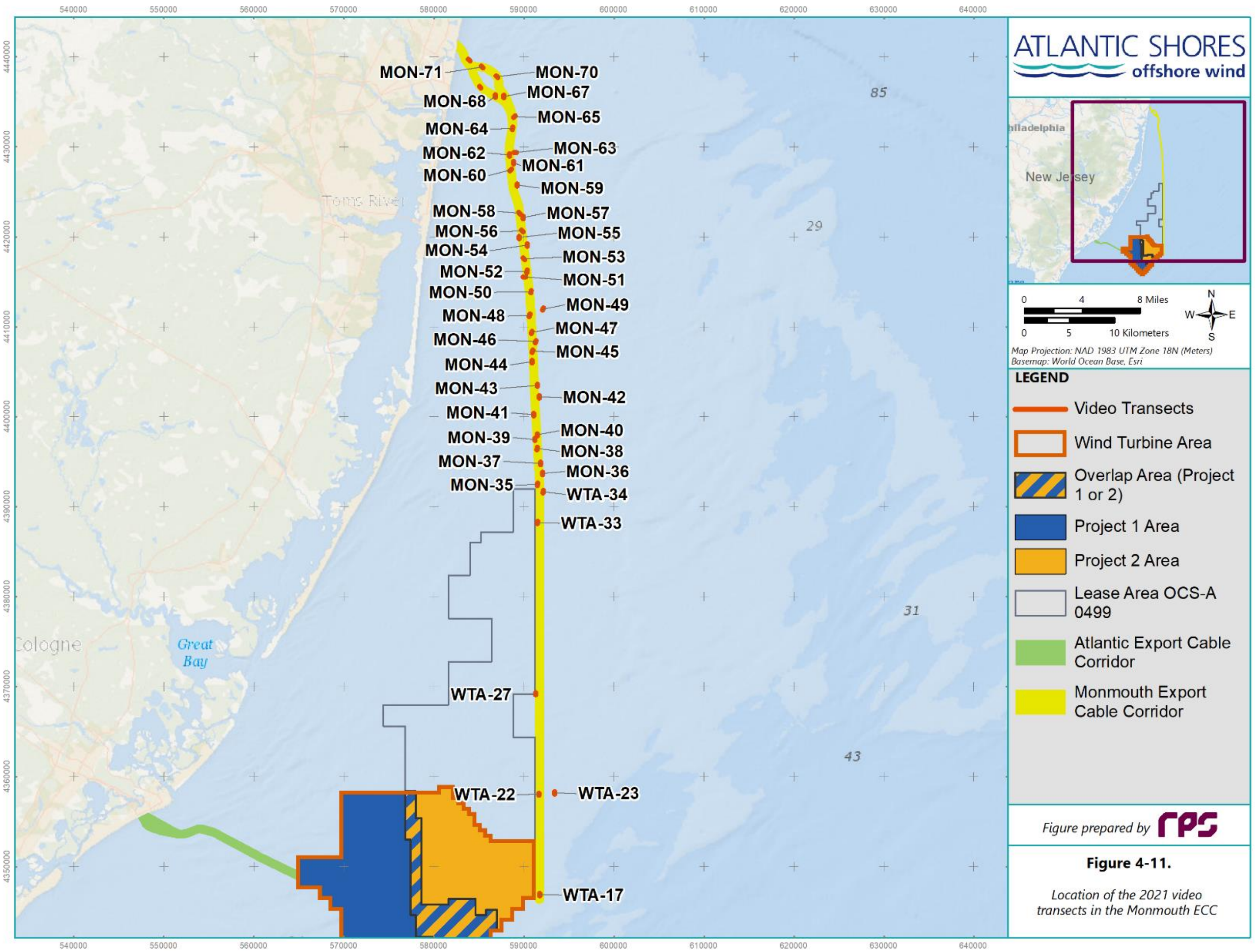


Figure 4-11. Locations of the 2021 video transects in the MON ECC.

4.2.1 MON 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 MON 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 MON ECC transects (Table 4-10). 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 MON 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;

Table 4-10). 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 1unidentified crab.

Overall, the enumerated organisms in the MON ECC were composed of 5 different phyla including Arthropoda, Chordata, Cnidaria, Echinodermata, and Mollusca (Figure 4-12). 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 4-13) of all observations. Within phylum Chordata, 5 taxonomic orders were identified including Gadiformes, Perciformes, Pleuronectiformes, Rajiformes, and Scorpaeniformes (Figure 4-14). 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, 7 taxonomic classes were identified including Anthozoa, Asteroidea, Bivalvia, Cephalopoda, Echinoidea, Gastropoda, and Malacostraca (Figure 4-15). 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 3.2.1. for full list]) were recorded for the MON video transects (Figure 4-16). Bushy plant-like organisms, blue mussels, sand dollars, slipper shells, sponge, sponge/tunicate, decorator worms, and worm tubes were marked as present within the MON ECC, while algae, northern star coral, eelgrass, forage fish, and eastern oysters were marked absent. Of the 43 video transects in the MON ECC, sand dollars had the highest transect presence and were observed in 33 transects.

Throughout the MON 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 4-10 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 MON 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 4-16, 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 MON 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 4-10, abundances of anemones are enumerated per transect. Burrowing anemones were present in 36 transects and composed nearly 57% of all organisms enumerated in the MON 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, see Table 4-11, for complete reviewer notes see Appendix A, and for complete taxonomy of enumerated megafauna see Appendix C.

Table 4-10

Table 4-10. Enumerated megafauna and other features observed in the MON ECC.

Common Name	Lowest Taxonomic Level	Counts Per MON Transect															
		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**	**1.5**	**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**	**1.5**

Common Name	Lowest Taxonomic Level	Counts Per MON Transect															
		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		**1.7**	**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**

Common Name	Lowest Taxonomic Level	Counts per MON Transect					Counts per MON Transect (WTA labels)						
		68	69	70	71	72	17	22	23	27	33	34	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**	**0.2**	**1.6**	**0.8**	**1.1**	**0.8**	**0.7**	**1.3**	**1.0**

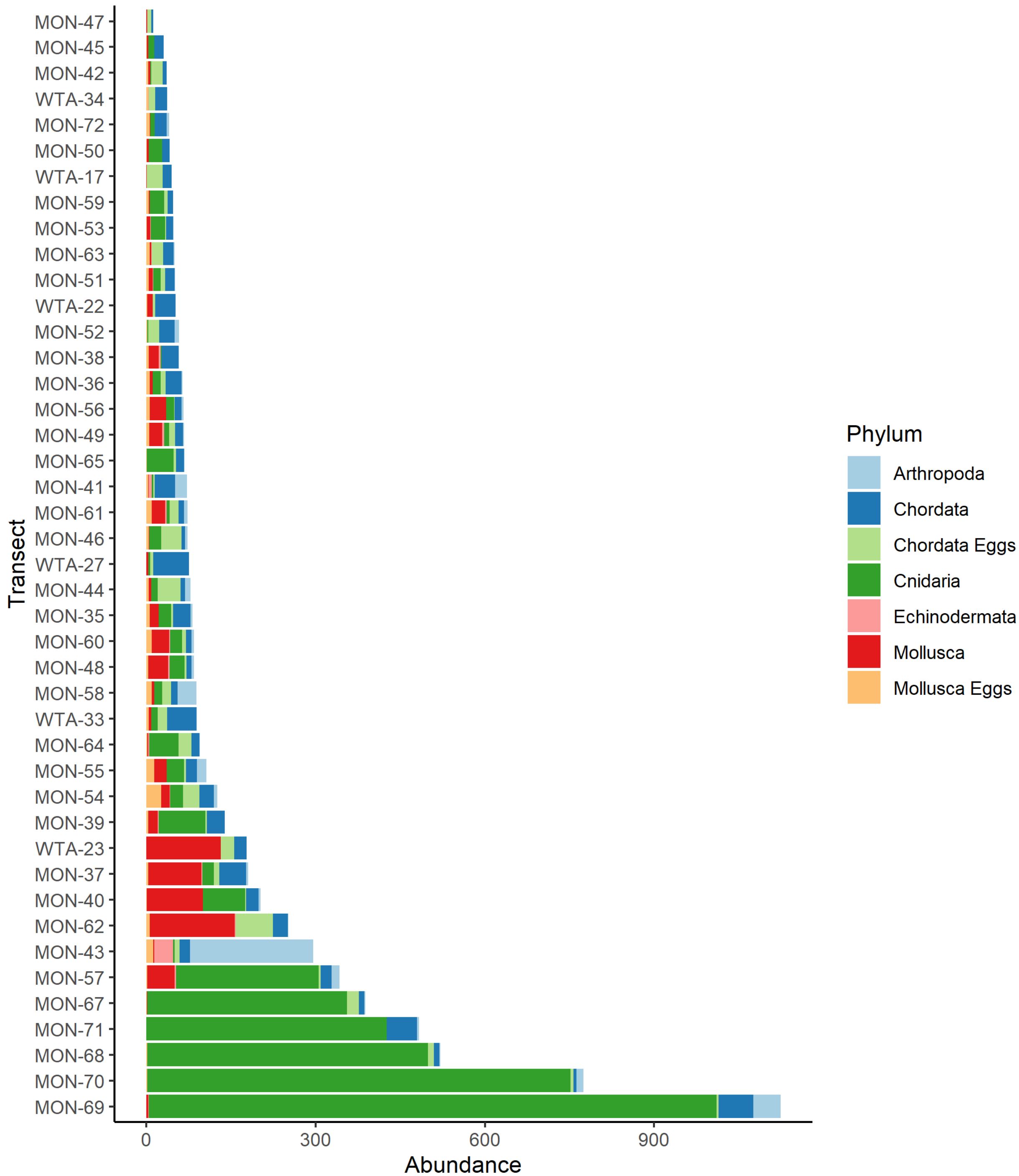


Figure 4-12. Distribution of enumerated organisms by phylum within the MON ECC.

Notes: 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.

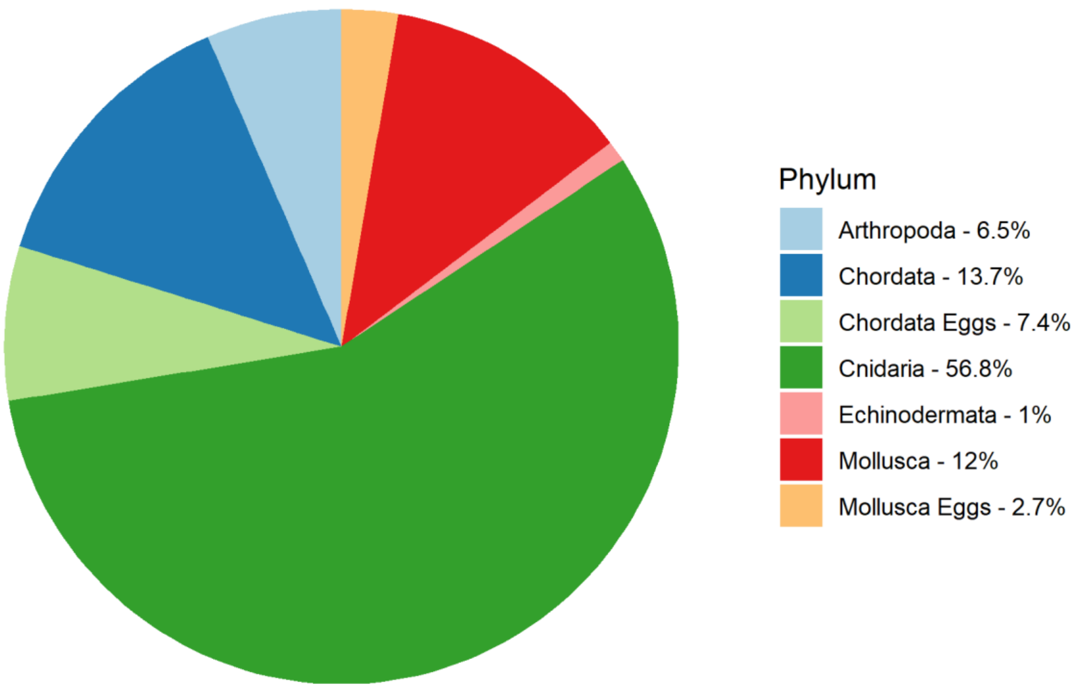


Figure 4-13. Percent composition of enumerated organisms by phylum within the MON ECC.

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

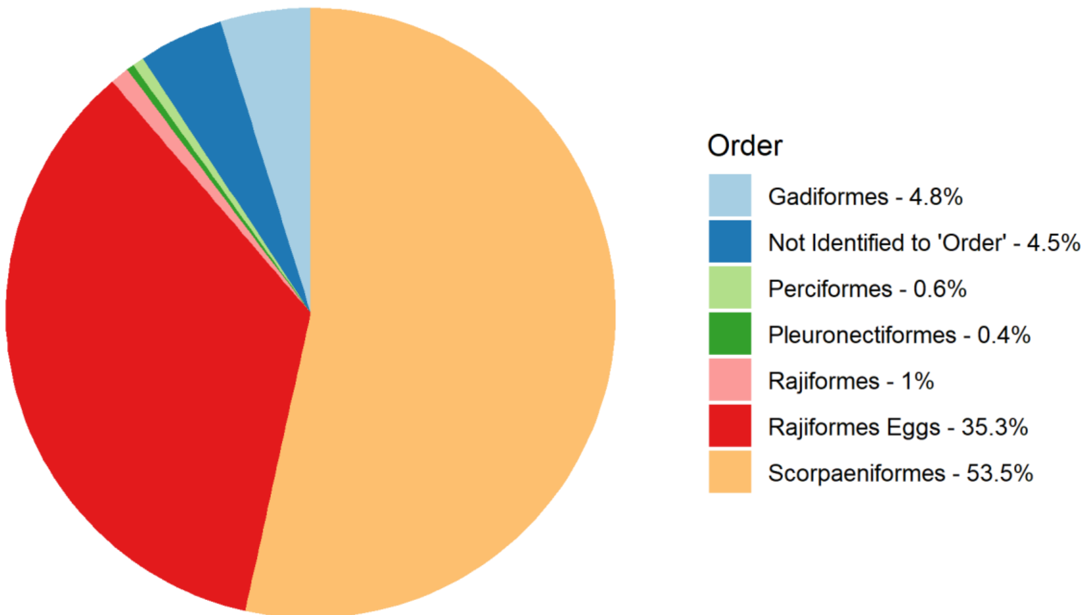


Figure 4-14. Percent composition of enumerated vertebrates by taxonomic order within the MON ECC.

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

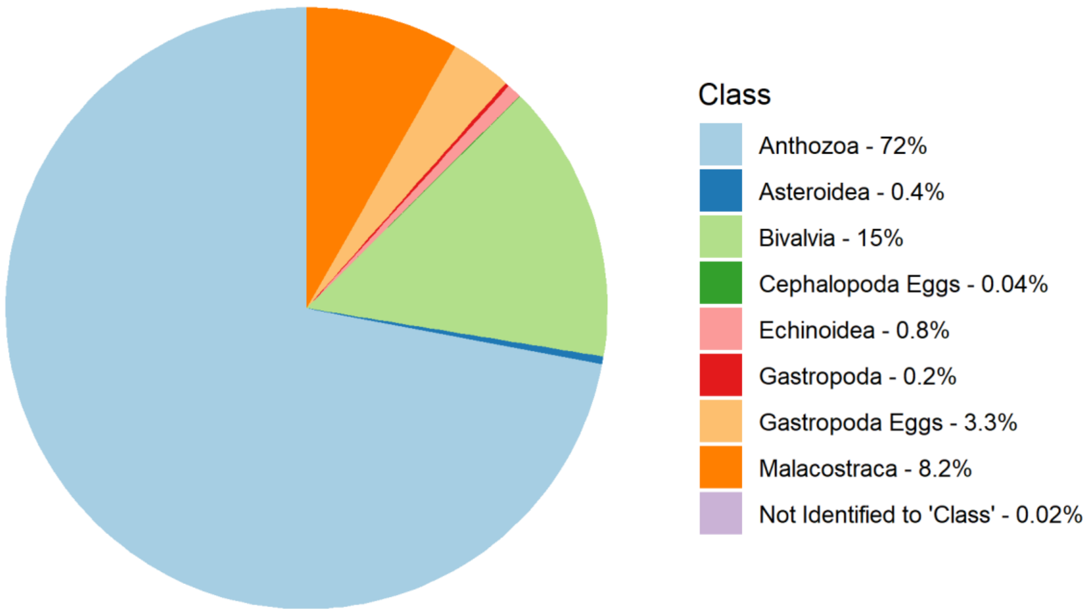


Figure 4-15. Percent composition of enumerated invertebrates by taxonomic class within the MON ECC.

[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.

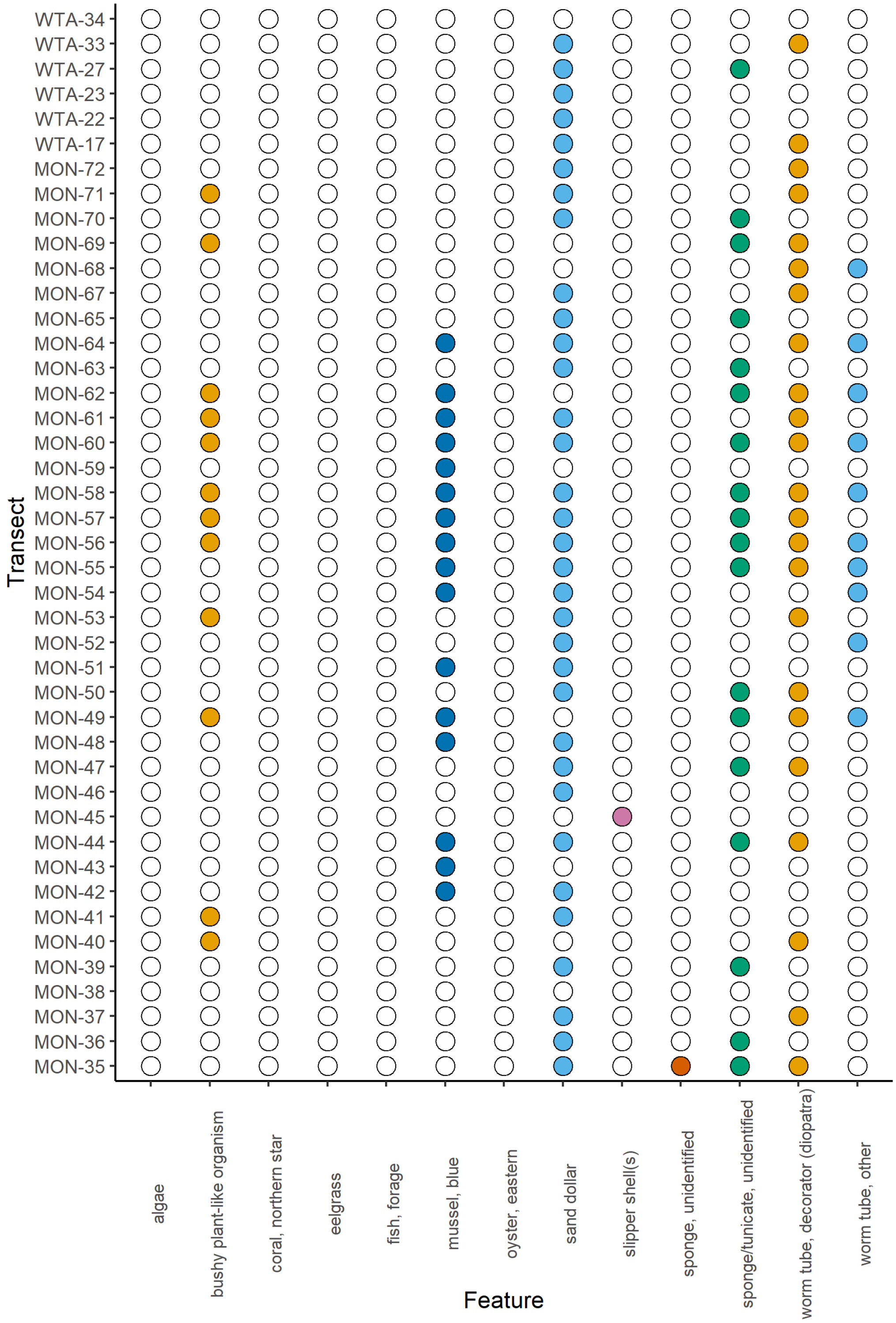
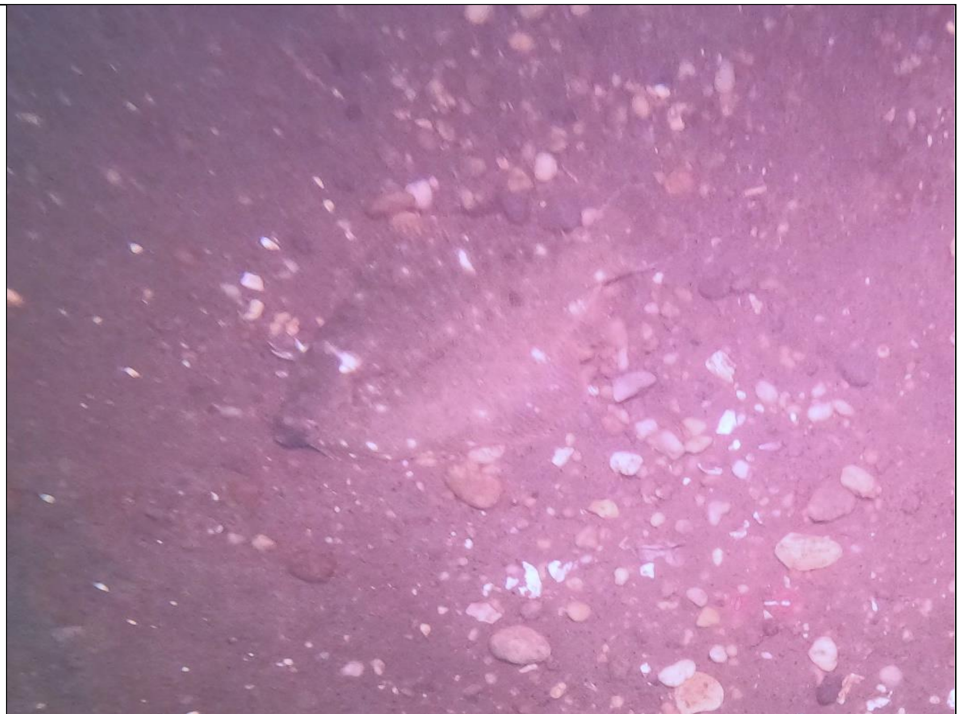
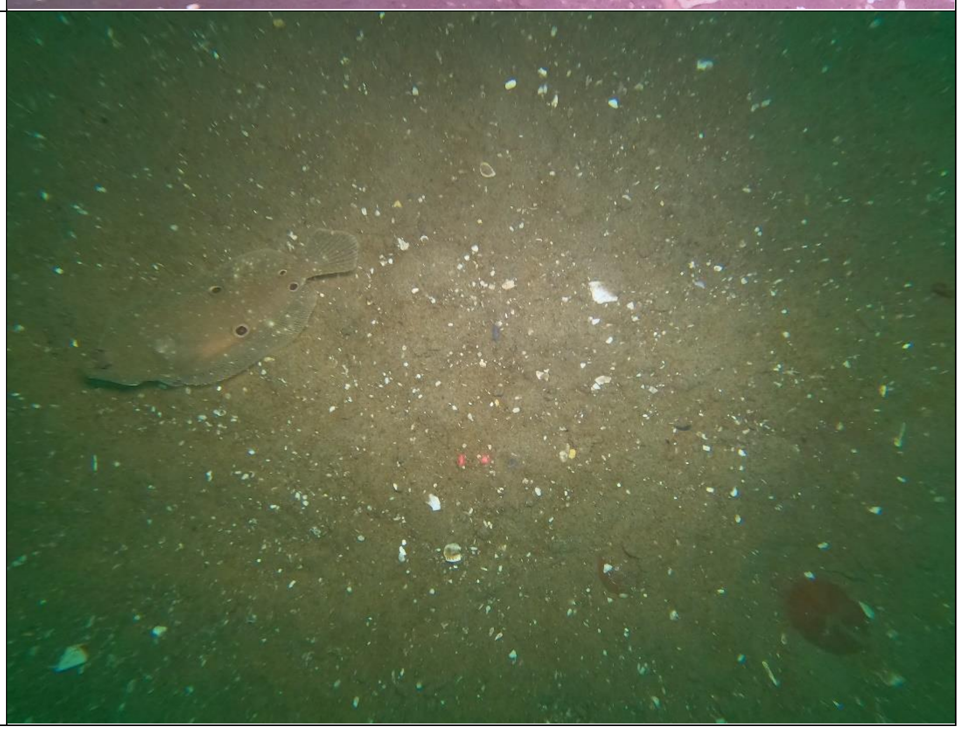


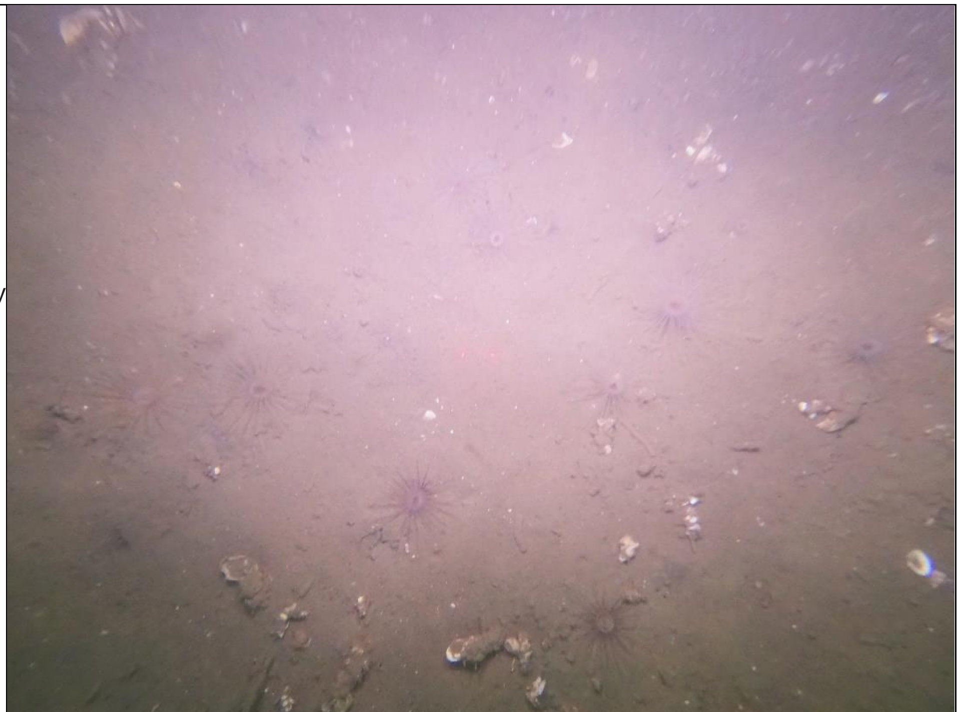
Figure 4-16. Presence (colored) or absence (white) of observed features within the MON ECC.
Notes: These data only include features that were marked as present or absent during video review and were not enumerated.

Table 4-11. Representative images of megafauna and features observed in the MON ECC.
Notes: Still image number provided where available. Screenshots from video will not have a still number.

Sea Scallops (*Placopecten magellanicus*) MON-40	
Small Snail cluster MON-40	

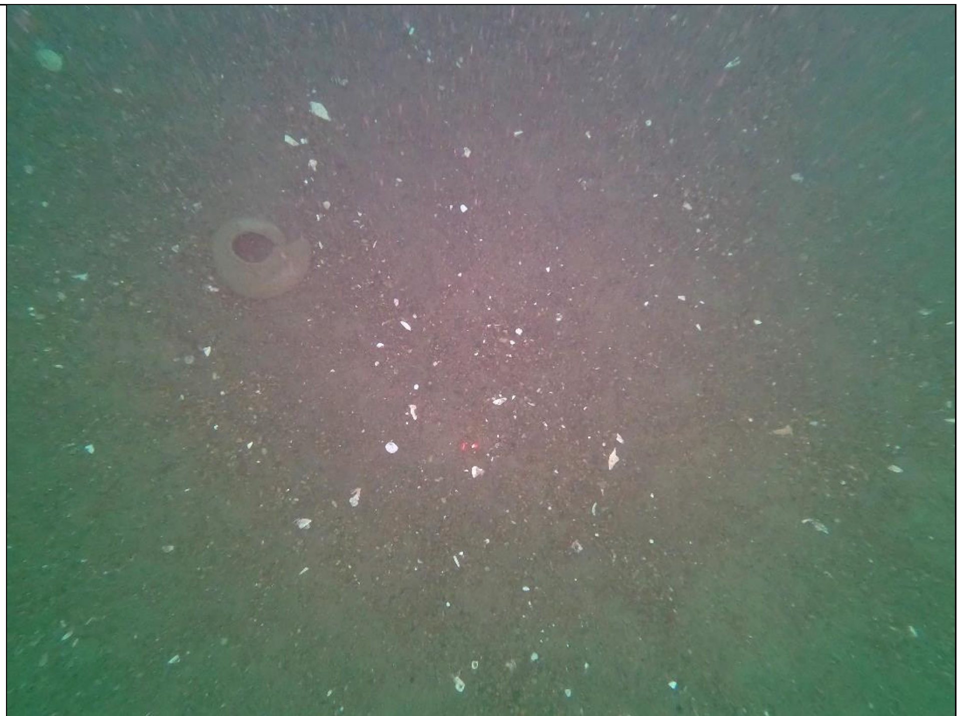
Clearnose Skate (*Raja eglanteria*) MON-54	
Black Sea Bass (*Centropristis striata*) MON-54	

Winter Flounder (*Pseudodpleuronectes americanus*) MON-61	
Fourspot Flounder (*Hippoglossina oblonga*) WTA-23_G0016911	

Burrowing Anemones (likely Northern cerianthid) with Decorator Worm Tubes (*Diopatra*) MON-69	
Spider Crab (*Libinia emarginata*) MON-69	

American Lobster (*Homarus americanus*) in burrow MON-69A_G0024082	
Common or Forbes Sea Star MON-43	

Sea Urchins MON-43	
Cancer Crabs and Blue Mussesls MON-43	

Moon Snail Egg Case (Naticidae) MON-38	
Squid Egg Mop MON-67	

Anthropogenic debris (possible rope) MON-72	

4.2.2 MON 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 MON ECC. A total of 1,044 m^2 of seafloor was analyzed in the MON ECC (Table 4-12). 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 MON transects, the average biogenic shell coverage was 5% and covered an average 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 substrate and anthropogenic debris appearing to be rope was observed in MON-72 accounting for 1% (< 0.01 m^2) of the substrate (Table 4-11).

The total area of biological elements (i.e., presence or evidence of flora or fauna) sampled in the MON ECC was 22 m^2 and accounted for 2% of the bottom cover (Table 4-12). 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 MON ECC (Table 4-13).

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 MON 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 4-13). 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 4-13). Approximately 2% (22 m^2) of the MON 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 4-12. Area and percent coverage of substrate type per total transect area summarized from still images within the MON ECC.

Transect	Total Area Analyzed (m^2)	Percent of Area – Gravel Substrates				Sand/mud Substrate (%)	Biogenic Shell Cover (%)[1]	Organic Debris, Wood (%)	Anthro-pogenic Cover (%)[2]	Flora/ Fauna Cover (%)[3]
		Boulder (%)	Cobble (%)	Pebble/ Granule (%)	All Gravel Combined (%)					
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

Transect	Total Area Analyzed (m^2)	Percent of Area – Gravel Substrates				Sand/mud Substrate (%)	Biogenic Shell Cover (%)[1]	Organic Debris, Wood (%)	Anthro-pogenic Cover (%)[2]	Flora/ Fauna Cover (%)[3]
		Boulder (%)	Cobble (%)	Pebble/ Granule (%)	All Gravel Combined (%)					
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**
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 4-13. Area and percent coverage of different biological elements (i.e., flora/fauna) observed within still images from the 43 video transects in the MON 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.

4.2.3 MON CMECS Classifications

Across the 43 transects in the MON 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, composing 544 m^2 of the analyzed area (Table 4-15, Figure 4-17). The sand/mud CMECS group is not considered complex under the NMFS guidelines (NMFS, 2021); thus, 52% of the area analyzed in the MON ECC was classified as soft bottom habitat / 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 MON 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 MON ECC area in 83 images across 15 transects (Table 4-14). Gravel mixes of pebble/granule with sand/mud (< 80% and ≥ 30% gravel) occurred in 190 m^2 of the MON 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 MON 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 MON ECC area.

Biogenic origin substrates present within the MON 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 MON 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 MON ECC area (Table 4-14, Figure 4-18). Additionally, anthropogenic substrate was classified as a co-occurring substrate type in 1 still image, and organic substrate was classified as a co-occurring substrate type with sparse shell hash in 1 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 MON ECC contained moderate amounts of flora/fauna coverage (> 30%; Figure 4-19) with 715 still images containing zero flora/fauna coverage.

Representative images of CMECS substrate types are in Table 4-16.

Table 4-14. The number of stills and the total area (m2) classified to each CMECS substrate group combination for each of the 43 video transects in the MON 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 4-15. Area (m^2) classified to each CMECS substrate component type for transects in the MON 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			Sand/Mud
							+ C	+ C/P/G	+ P/G	
MON-35	0	0	0	0	0.91	0	0	0	1.10	34.82

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			Sand/Mud
							+ C	+ C/P/G	+ P/G	
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 biotic component classifications and associated taxa for each still if applicable. Only the dominant biotic component is described in this report, see accompanying spreadsheet for all co-occurring classifications and associated taxa (Appendix B).

The total number of stills with each classification per transect is shown in Figure 4-20. Of the 1,075 still images analyzed from video data surveyed in the MON ECC, 633 still images were classified with a dominant biotic component. The most frequently classified biotic component in still images from the MON ECC transects was sand dollar beds, which occurred in 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 MON 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 MON ECC, 442 stills had no dominant biological elements present, with MON-45 and MON-47 particularly sparse (Figure 4-20).

The CMECS substrate and biotic component classifications for stills in each transect are mapped over benthic habitat polygons in figures provided in Appendix D.

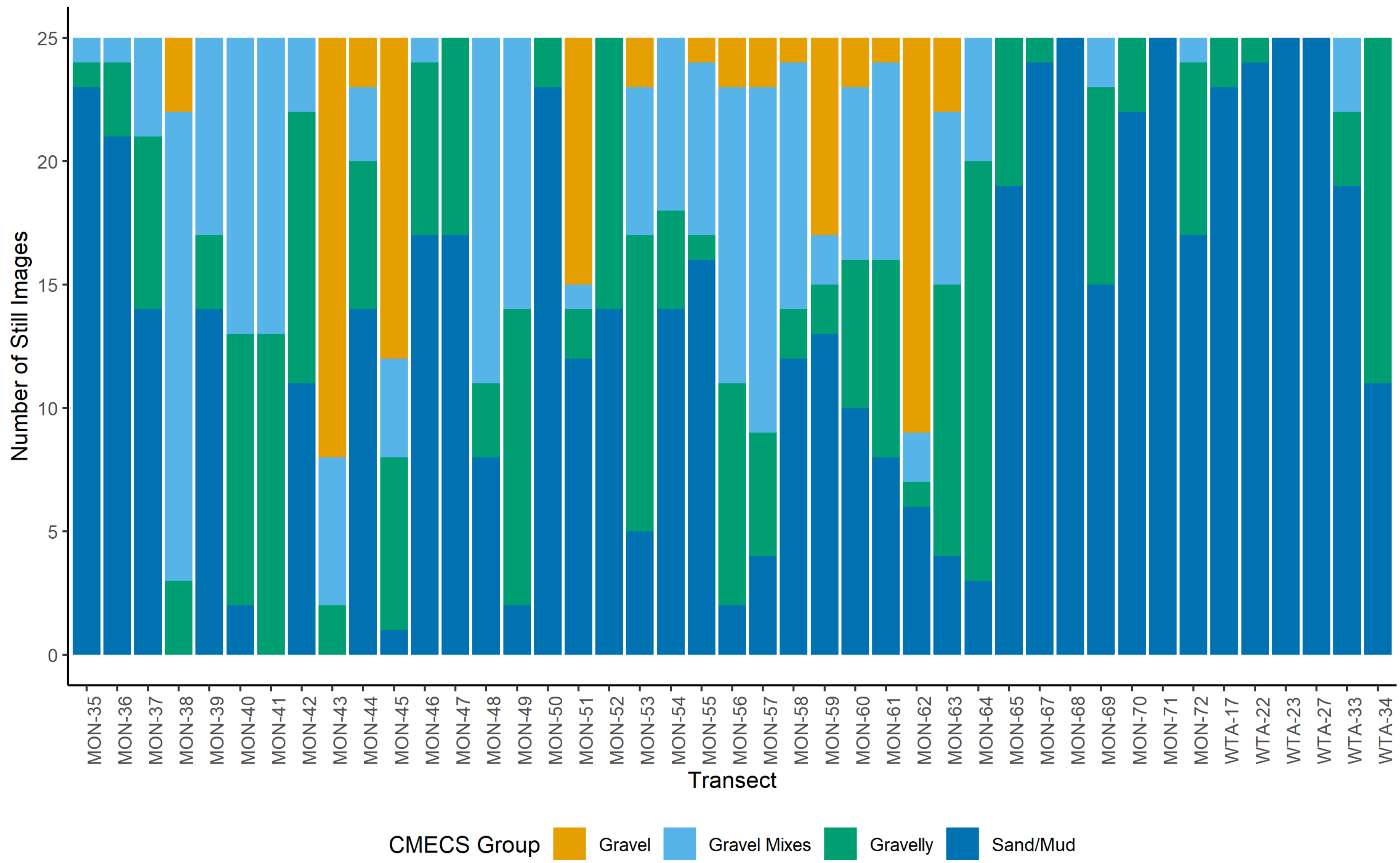


Figure 4-17. The number of still images classified to CMECS substrate component groups within the MON ECC video transects.

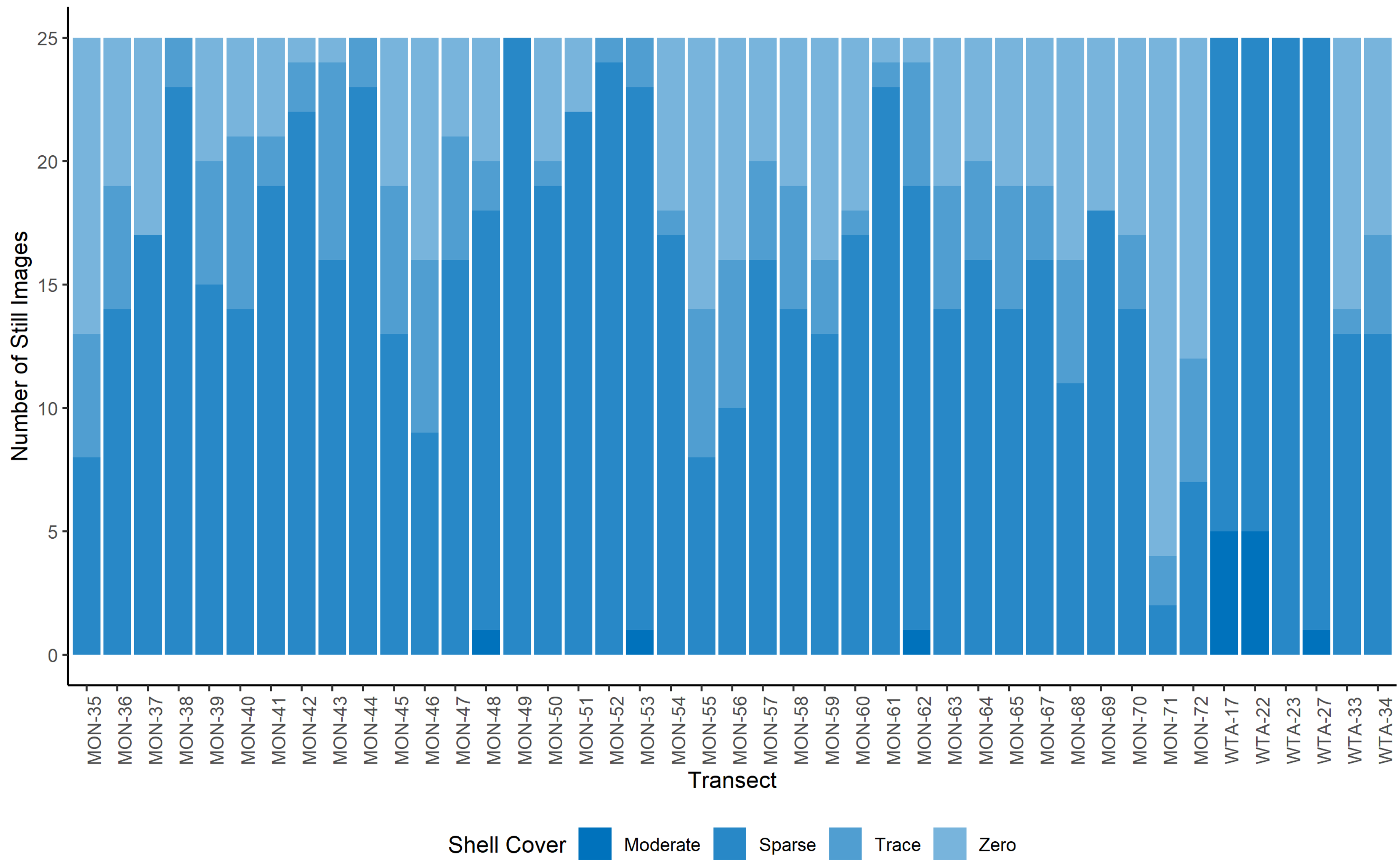


Figure 4-18. The number of still images classified to each shell cover density category within the MON ECC video transects.
Notes: Trace is ≤ 2%, Sparse is > 2 to < 30%, Moderate is 30 to < 70%, Dense is 70 to < 90%, and Complete is 90 to 100% cover.

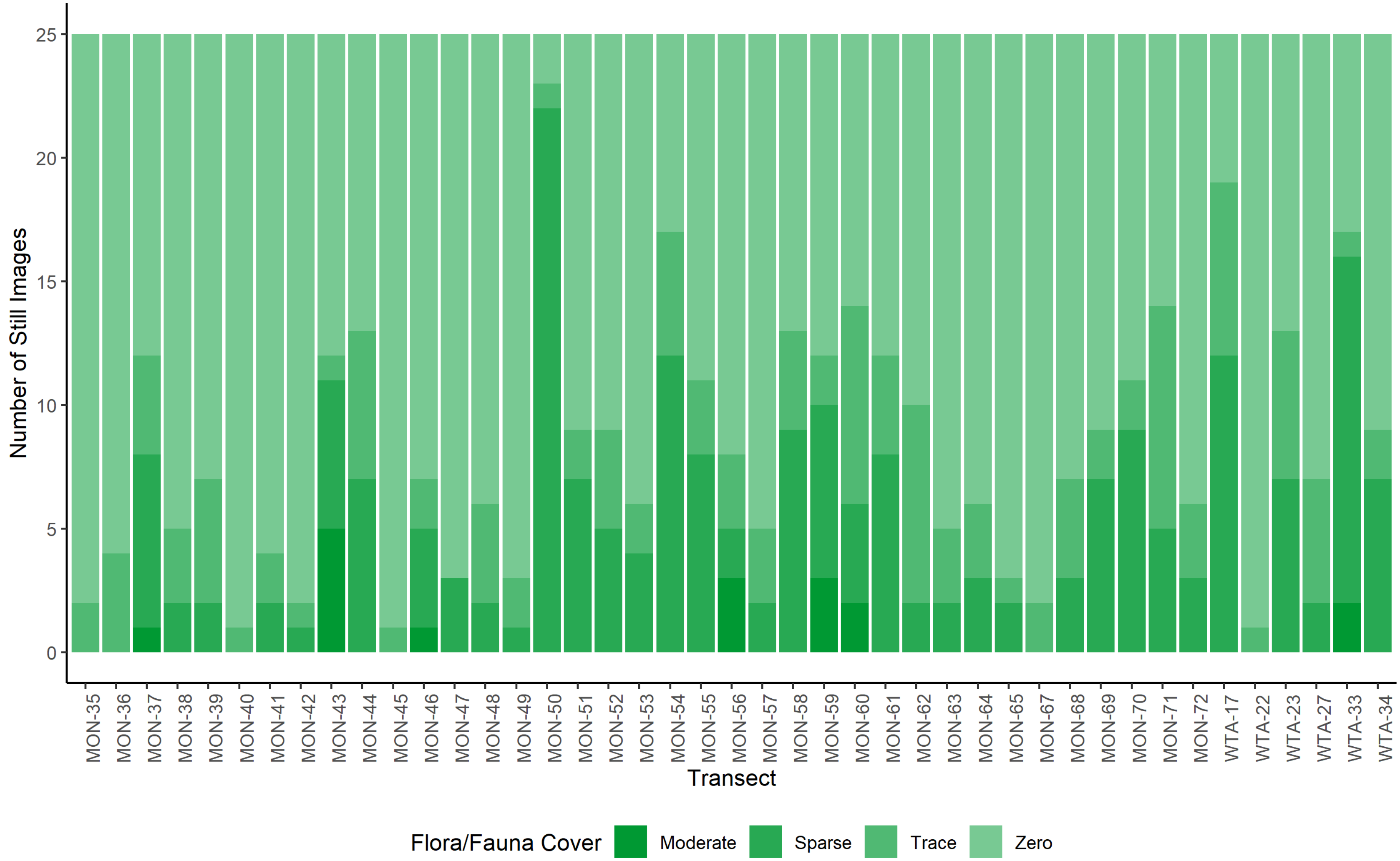


Figure 4-19. The number of still images classified to each flora/fauna density category within the MON ECC video transects.
Notes: Trace is ≤ 2%, Sparse is > 2 to < 30%, Moderate is 30 to < 70%, Dense is 70 to < 90%, and Complete is 90 to 100% cover.

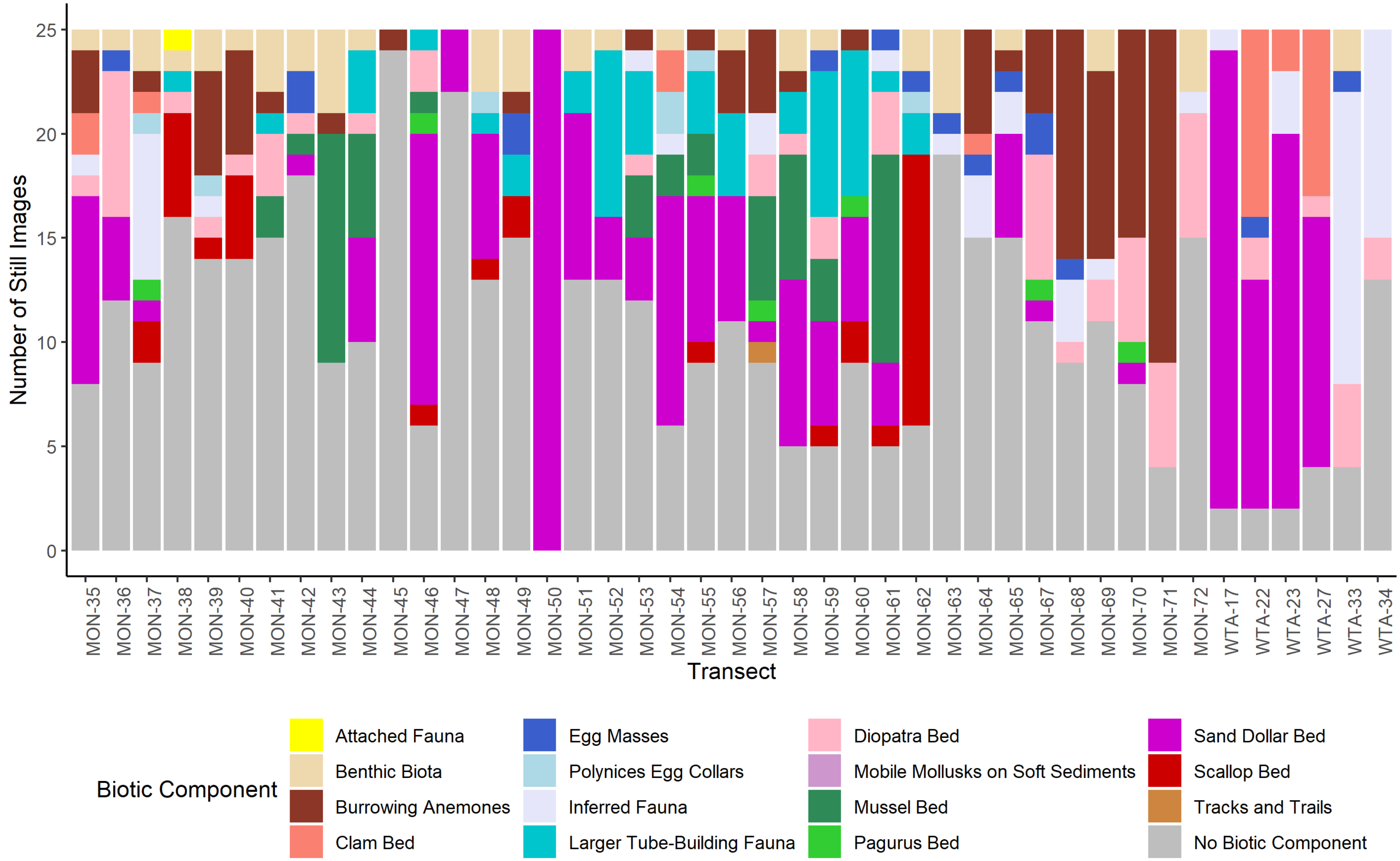
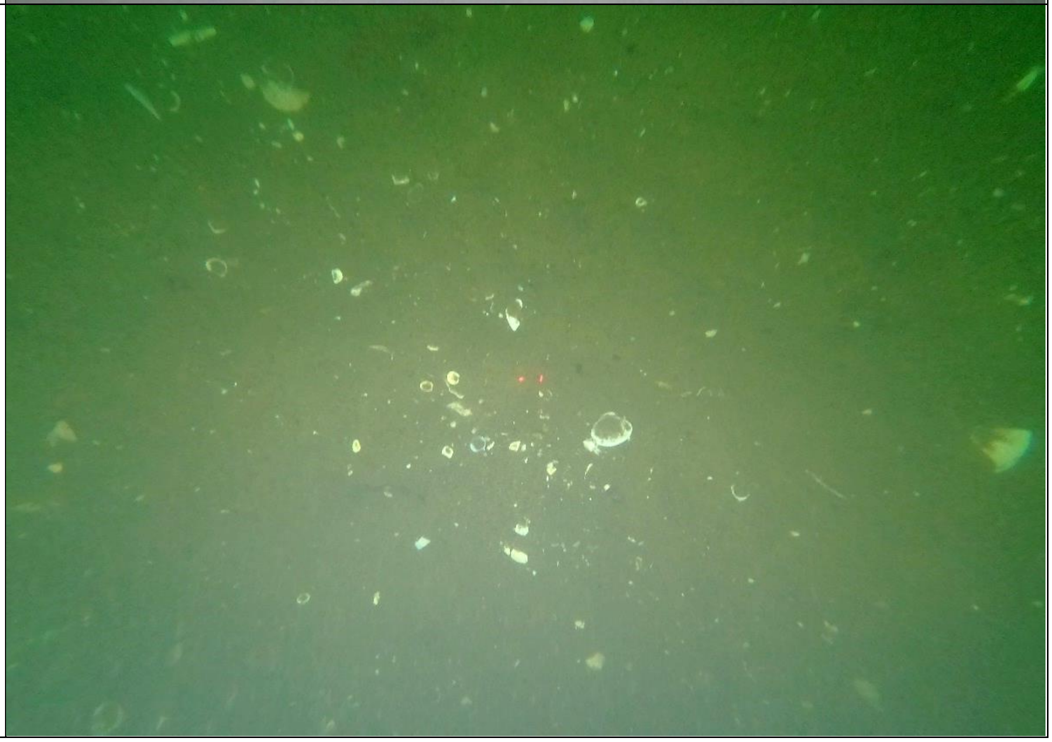


Figure 4-20. The number of still images assigned to CMECS biotic component classifications within the MON ECC video transects.

[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.

Table 4-16. Representative images of CMEC substrate types observed in the MON ECC.

Notes: Still image number provided where available. Screenshots from video will not have a still number.

Geologic Unconsolidated Flat Sand/Mud MON-72_G0020072	
Geologic Unconsolidated Sand/mud Trace Shell Hash MON-67_G0017073	

Geologic Unconsolidated Sand/mud Sparse Shell Hash MON-37_G0011925	
Geologic Unconsolidated Sand/mud Sparse Shell Rubble MON-55_G0012175	

Geologic Gravelly Sand/Mud with Trace Shell Hash WTA-34_G0018028	
Gravelly Sand/Mud & Pebble/Granule with Moderate Shell Hash MON-48_G0016410	

Gravel (Pebble/Granule) with Moderate Shell Hash MON-62_G0012168	
Larger Tube-Building Fauna MON-60_G0014911	

4.3 Atlantic Export Cable Corridor

The characteristics and locations of the 6 underwater video transects within the Atlantic ECC are described in Table 4-17 and locations are shown in Figure 4-21. Section 4.3.1 below describes presence and abundance of megafauna observed in video transects collected in the Atlantic ECC. Abundance data are displayed in Table 4-18 with additional visualizations in Figure 4-22 through Figure 4-26. Images of representative megafauna are displayed in Table 4-19. Section 4.3.2 summarizes results of the point count analysis to quantify observed substrate along video transects. Area and composition of the substrate and flora and fauna for each transect are presented in Table 4-20, Table 4-20, and Figure 4-29. The CMECS classification results are presented in Section 4.3.3.

Table 4-17. Underwater video transect locations in the ATL ECC.

Transect	Date (UTC)	Recorded Duration (min:sec)	Start Latitude (°N)	Start Longitude (°W)	End Latitude (°N)	End Longitude (°W)	# Analyzed Stills
ATL-01	6/9/2021	17:20	39°20’12.52174”	74°25’22.56827”	39°20’05.18655”	74°25’26.02450”	25
ATL-02	6/9/2021	17:56	39°19’46.51935”	74°22’55.87968”	39°19’39.15453”	74°22’50.76661”	25
ATL-03	6/9/2021	15:35	39°19’00.09580”	74°20’20.57253”	39°19’14.65119”	74°16’46.78926”	25
ATL-04	6/9/2021	15:00	39°18’38.69188”	74°17’50.37759”	39°18’31.54222”	74°17’45.15244”	25
ATL-05	6/8/2021	14:44	39°19’22.97409”	74°16’46.71611”	39°19’14.65119”	74°16’46.78926”	25
ATL-06	6/9/2021	14:59	39°17’28.84796”	74°15’25.42807”	39°17’21.52460”	74°15’20.18028”	25

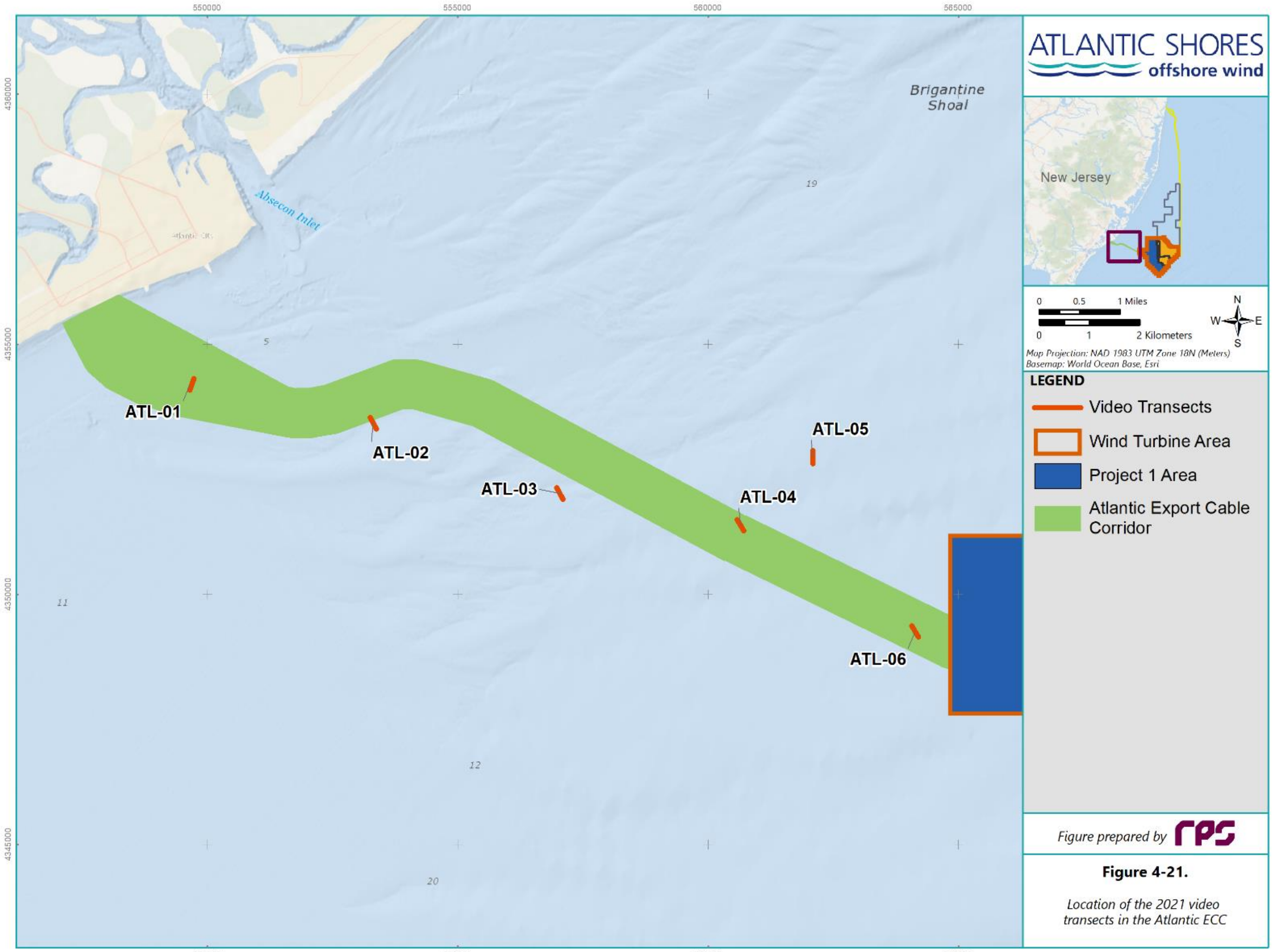


Figure 4-21. Locations of the 2021 video transects in the Atlantic ECC region.

4.3.1 ATL 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 ATL video transects. Organisms were identified in the videos to the LPTL. A total of 84 observations were made which included 80 identified organisms, 1 unidentified object, 1 anthropogenic debris of fishing gear, and 1 unidentified organism were recorded within the 6 ATL video transects (Table 4-18). The most numerous organisms were moon snail egg cases and hermit crabs, composing 50% and 18% of all organisms, respectively. Moon snail egg cases were present in each of the 6 ATL transects.

Shannon diversity index values of communities of mobile megafauna varied from 0 (ATL-01) to 1.70 (ATL-02; Table 4-18). The low diversity index in ATL-01 was due to the presence of only a single moon snail egg case. A higher diversity value in ATL-02 was the result of the presence of 6 different megafauna including 5 hake, 2 hermit crabs, 1 moon snail egg case, 1 blue crab, 1 burrowing anemone, and 1 roundfish.

Overall, the enumerated organisms in the ATL were composed of 4 different phyla including Arthropoda, Chordata, Cnidaria, and Mollusca (Figure 4-22). Observed eggs were classified into corresponding taxonomic groupings but specifically noted to be eggs. Phylum Mollusca had the highest percent composition of enumerated organisms at 58% (8% adults, 50% eggs) and phylum Cnidaria composed the lowest percent composition at 3% (Figure 4-23). Within phylum Chordata, 5 taxonomic orders were identified including Aulopiformes, Gadiformes, Pleuronectiformes, Rajiformes, and Scorpaeniformes (Figure 4-24). Order Gadiformes had the highest percent composition of enumerated vertebrates composing 38% while Aulopiformes and Scorpaeniformes composed the lowest percent composition at 6%. Enumerated vertebrates not identified to the level of order composed 13%.

Within the enumerated invertebrates, 4 taxonomic classes were identified including Anthozoa, Bivalvia, Gastropoda, and Malacostraca (Figure 4-25). Class Gastropoda had the highest percent composition as 67% (5% adults, 62% eggs) while class Bivalvia composed the lowest percent composition at 2%. Invertebrates that were not identified to the level of class composed 3% of enumerated 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 3.2.1. for full list] were recorded for the ATL video transects (Figure 4-26). Bushy plant-like organisms, blue mussels, sand dollars, sponge/tunicate, decorator worms, and worm tubes were all marked as present within the ATL, while algae, northern star coral, eelgrass, forage fish, eastern oyster, and slipper shells were marked absent. Of the 6 video transects in the ATL ECC, decorator worms had the highest transect presence and were observed in 5 transects.

Throughout the ATL, there was no presence recorded of northern star coral, Atlantic surfclam, Atlantic sea scallop, or ocean quahog. There was one enumerated and observed astarte clams in ATL-05 composing

1% of total organisms. In Figure 4-26, the unidentified sponge/tunicate/other feature is defined by the presence of encrusting amorphous organisms. This feature was marked as present in 1 video transect (ATL-03). 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 was as present in ATL-03. ATL-02 was the only transect in the entire area that had instances of complete coverage by an infaunal structure, polychaete worm tubes. No presence of invasive species was observed.

For representative images of observed species, see Table 4-19, for complete reviewer notes see Appendix A, and for complete taxonomy of enumerated megafauna see Appendix C.

Table 4-18. Enumerated megafauna and other features observed in the ATL ECC.

Common Name	Lowest Taxonomic Level	Counts Per ATL Transect						
		1	2	3	4	5	6	Total
Vertebrate								
flounder, summer	*Paralichthys dentatus*			1				1
flounder, unidentified	Pleuronectiformes			1	1			2
flounder, windowpane	*Scopthalmus aquosas*			1				1
hake, red, white, or spotted	*Urophycis*					1		1
hake, unidentified	Gadidae		5					5
lizardfish, inshore	*Synodus foetens*					1		1
roundfish, unidentified	Teleostei		1	1				2
sea robin, northern	*Prionotus carolinus*						1	1
skate	Rajidae						1	1
skate, egg case	Rajidae				1			1
Invertebrate								
anemone, burrowing	Anthozoa		1	1				2
astarte	Astarte					1		1
crab, blue	*Callinectes sapidus*		1					1
crab, hermit	Pagurus		2	7	4		1	14
crab, unidentified	Decapoda					1		1
mollusc, unidentified	Mollusca						2	2
moon snail	Naticidae				1			1
moon snail, egg case	Naticidae	1	1	8	8	10	12	40
whelk, channeled or knobbed	Melongenidae			1				1
whelk, unidentified	Melongenidae						1	1
Other								
debris, anthropogenic (fishing gear)	debris, anthropogenic (fishing gear)				1			1
object, unidentified	object, unidentified				1			1
organism, unidentified	organism, unidentified		1		1			2
Total Organisms		**1**	**11**	**21**	**15**	**14**	**18**	**80**
Total Observations		**1**	**12**	**21**	**18**	**14**	**18**	**84**
Shannon's Diversity		**0**	**1.7**	**1.6**	**1.5**	**1.0**	**1.2**	**-**

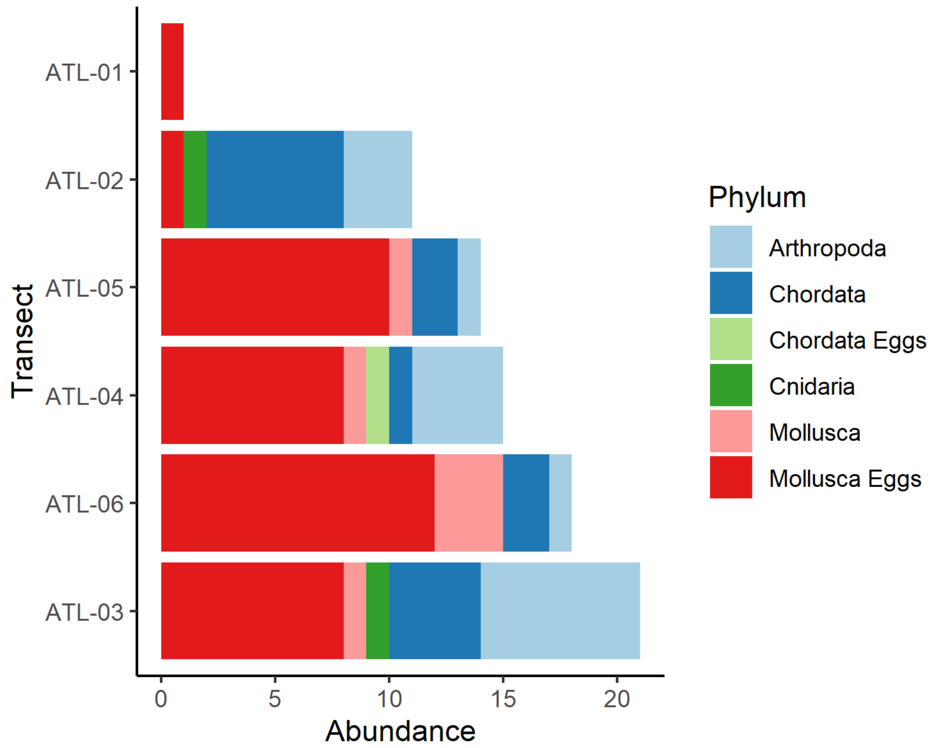


Figure 4-22. Distribution of enumerated organisms by phylum within the ATL ECC.

Notes: 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.

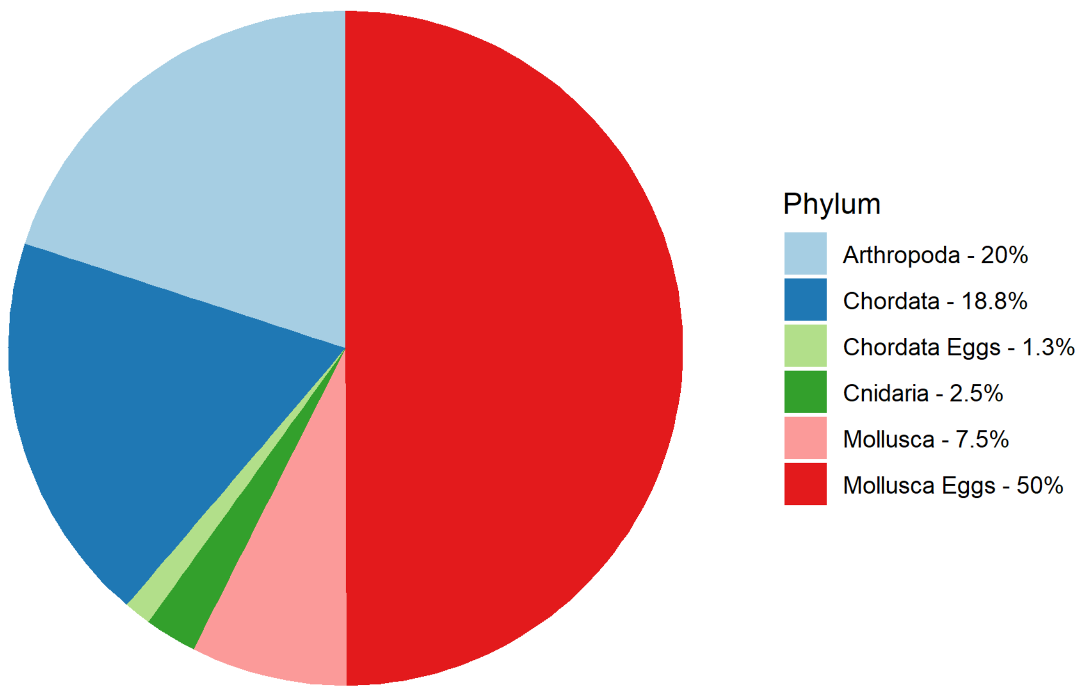


Figure 4-23. Percent composition of enumerated organisms by phylum within the ATL ECC.

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

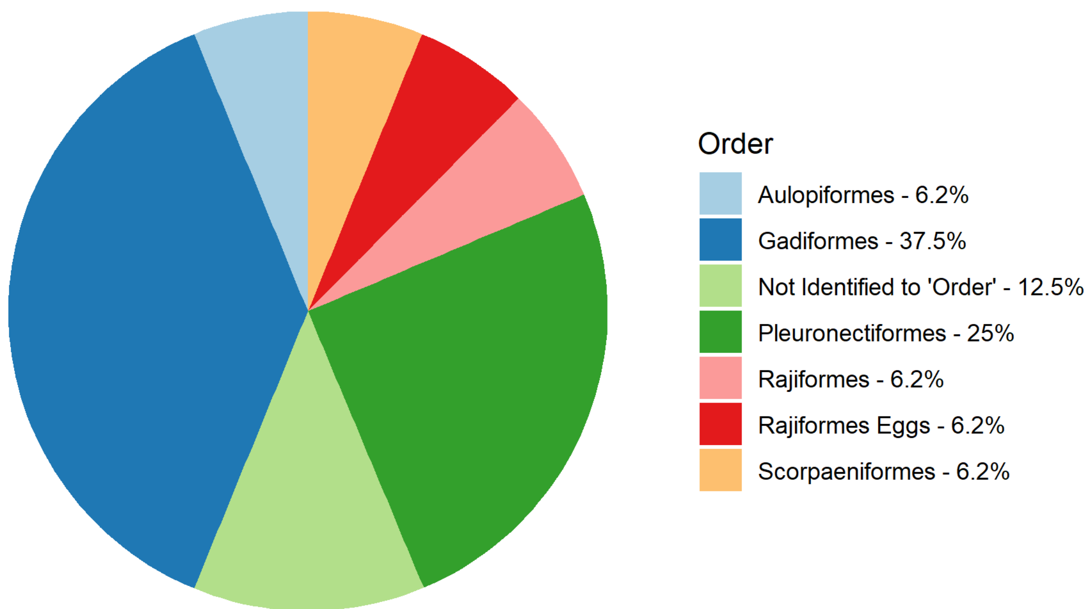


Figure 4-24. Percent composition of enumerated vertebrates by taxonomic order within the ATL ECC.
[1] Organisms not identified as phylum “Chordata” or smaller than 2.5 cm were excluded. Eggs were broken out into corresponding taxonomic groupings.

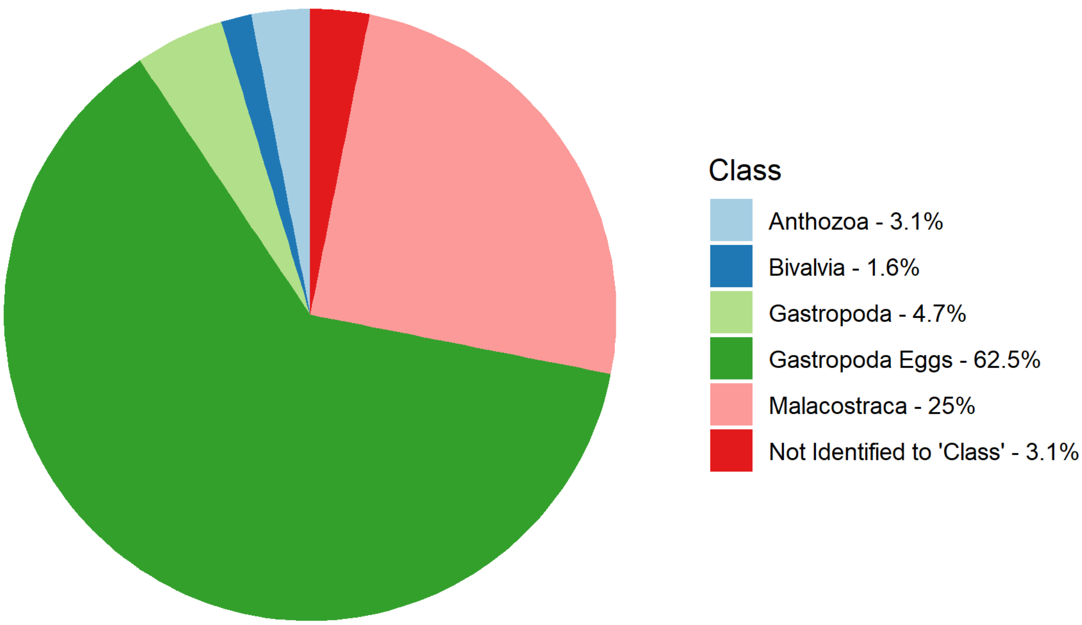


Figure 4-25. Percent composition of enumerated invertebrates by taxonomic class within the ATL ECC.
[1] Organisms not identified to the level of phylum or smaller than 2.5 cm were excluded. Eggs were broken out into corresponding taxonomic groupings.

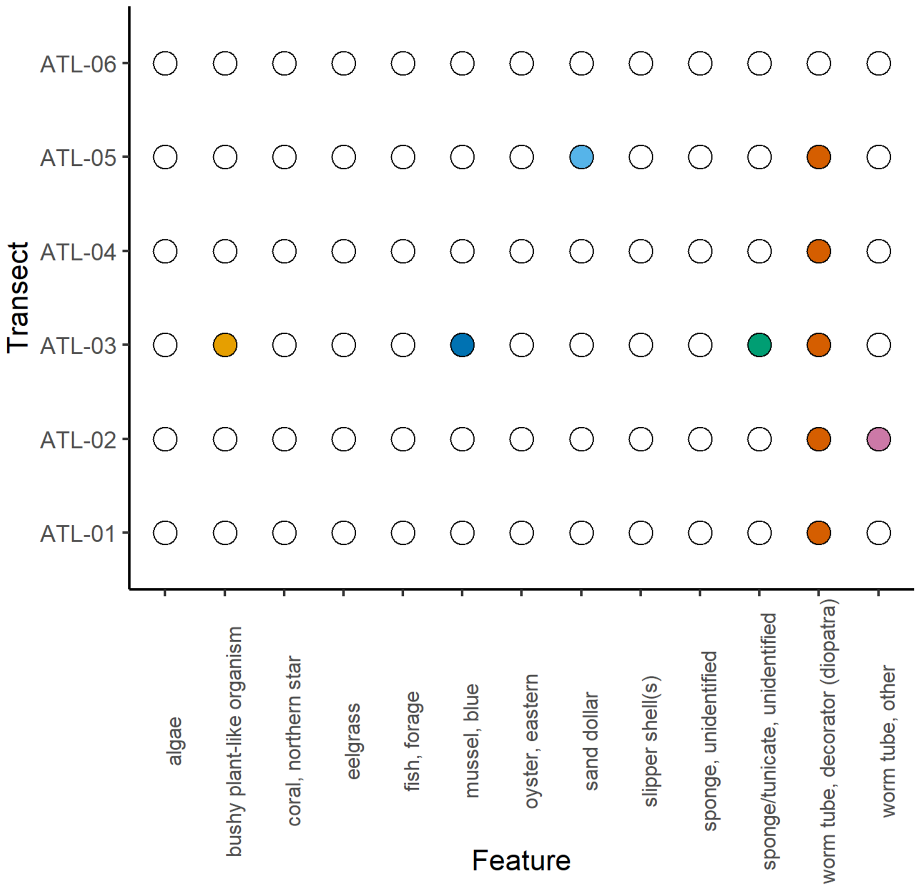


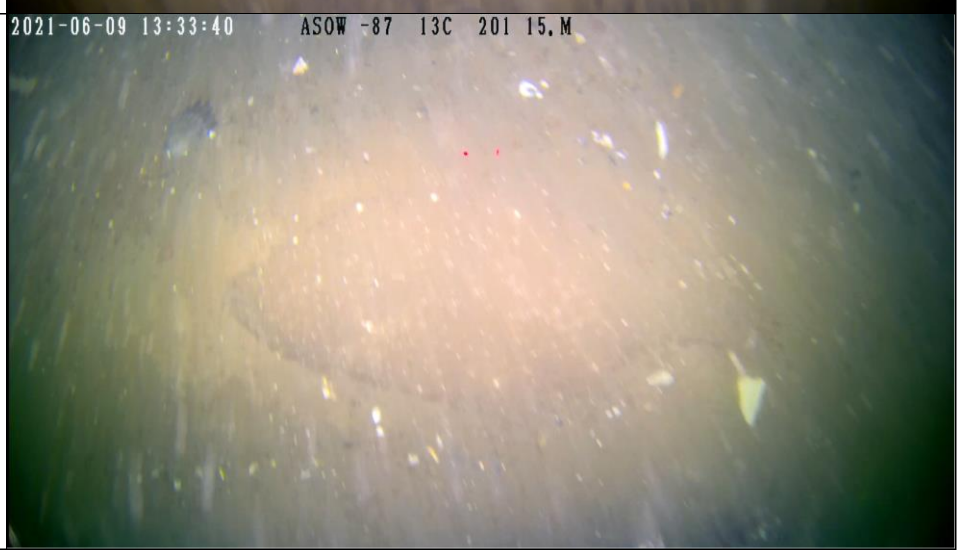
Figure 4-26. Presence (colored) or absence (white) of observed features within the Atlantic ECC.

Notes: These data only include features that were marked as present or absent during video review and were not enumerated.

Table 4-19. Representative images of megafauna and features observed in the ATL ECC.
Notes: Still image number provided where available. Screenshots from video will not have a still number.

Decorator worm tubes (*Diopatra*) ATL-01A_G0014953	
Polychaete worm tubes ATL-02_G0016978	

Hermit Crab ATL-03_G0018251	
Sand Dollar ATL-05_G0012418	

Moon Snail Egg Collar ATL-03	
Blue Crab (*Callinectes sapidus*) ATL-02	
Summer Flounder (*Paralichthys dentatus*) ATL-03	

Windowpane Flounder (*Scophthalmus aquosus*) ATL-03	
Knobbed or Channeled Whelk ATL-03	
Northern Sea Robin (*Prionotus carolinus*) ATL-06	

Anthropogenic Debris (rope) ATL-04	

4.3.2 ATL 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 ATL ECC. A total of 74 m^2 of seafloor was analyzed in the ATL region (Table 4-20). The substrate group with the highest percent cover across all transects was sand/mud, composing 80% (59 m^2) of the surface area analyzed through still images for the transects. Transects ATL-01 and ATL-03 had the highest sand/mud coverage, both above 95%, but with varying spatial area covered within the imagery, with 5 m^2 for ATL-01 and 11 m^2 for ATL-03. Transect ATL-06 had the greatest area sampled in the region (23 m^2) and was composed of 81% sand/mud, 15% gravel, and 4% biogenic shell coverage.

No boulder or cobble-sized gravel were found in any of the transects in the ATL ECC. Gravel particles of pebble/granule size (> 2 mm to < 64 mm) composed ≥ 5% of the substrate in 2 out of 6 transects, with the highest spatial coverage of gravel occurring at ATL-06 (15%; 3 m^2). Three of the transects in the ATL had no gravel present. No boulder or cobble were found in any of the transects, and pebble/granule gravel substrate accounted for 6% (4 m^2) of all substrate types classified across the transects.

Biogenic shell substrate accounted for 3% (2 m^2) of the substrate within the ATL transects. The percent of shell cover was highest at transect ATL-06 (4%, >1 m^2). There was no substrate observed from anthropogenic sources.

The total area of biological elements (i.e., presence or evidence of flora or fauna) sampled in the ATL varied greatly between transects, from the highest coverage at ATL-02 (74%, 8 m^2), to no coverage at transects ATL-04, and ATL-06. In total flora/fauna accounted for 12% (9 m^2) of the bottom type in ATL transects (Table 4-20). The most common element was infaunal structures, mainly larger polychaete worm tubes, composing 89% of the total flora/fauna and accounting for 8 m^2 of the bottom cover. The second most common element was inferred fauna covering 1 m^2 and 10% of the total flora/fauna area. The only other biotic components observed in the ATL were hermit crabs and sand dollars. There were no observations of bivalves, fish, eelgrass, or algae in the ATL.

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 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 area and percent coverage of different biological elements (flora/fauna) observed within still images were calculated for each transect. Throughout the ATL there was no percent cover recorded for blue mussels, sea scallops, astarte clams, burrowing anemones, encrusting organisms, or bushy plant-like organisms (Table 4-21). Approximately 13% (9 m^2) of the ATL ECC transects contained flora/fauna, and nearly all of the flora/fauna cover was identified as infaunal structures (likely polychaete worm tubes, 89%) and inferred fauna (tracks, burrows, or possibly older evidence of infaunal structures, 10%). These categories may be considered emergent taxa or structures that add complexity to the seafloor.

Table 4-20. Area and percent coverage of substrate type per total transect area summarized from still images within the ATL ECC.

Transect	Total Area Analyzed (m^2)	Percent of Area – Gravel Substrates				Sand/mud Substrate (%)	Biogenic Shell Cover (%)[1]	Organic Debris, Wood (%)	Anthropogenic Cover (%)[2]	Flora/Fauna Cover (%)[3]
		Boulder (%)	Cobble (%)	Pebble/Granule (%)	All Gravel Combined (%)					
ATL-01	5.37	0	0	0	0	95.79	0.17	0	0	4.04
ATL-02	10.68	0	0	0	0	24.84	0.51	0	0	74.64
ATL-03	11.78	0	0	0.76	0.76	96.31	2.45	0	0	0.49
ATL-04	9.30	0	0	9.95	9.95	87.22	2.82	0	0	0
ATL-05	16.37	0	0	0	0	91.21	2.79	0	0	5.99
ATL-06	20.32	0	0	15.40	15.40	80.87	3.73	0	0	0
Total Percentage in ATL (%)[4]	**100**	**0**	**0**	**5.61**	**5.61**	**79.41**	**2.48**	**0**	**0**	**12.49**
Total Area in ATL (m^2)[5]	**73.82**	**0**	**0**	**4.14**	**4.14**	**58.62**	**1.83**	**0**	**0**	**9.22**

[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 infaunal structures, hermit crabs, and sand dollars.
[4] Total Percentage in ATL (%) provides a summary of the total percent cover of each substrate type across all transects.
[5] Total Area in ATL (m^2) provides a summary of the total area of each substrate type across all transects.

Table 4-21. Area and percent coverage of different biological elements (i.e., flora/fauna) observed within still images from the 6 video transects in the ATL 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 (%)
ATL-01	0.22	0	0	0	0	0	0	100	0	0	0	0	0
ATL-02	7.97	0	0	0	0	0	0	100	0	0	0	0	0
ATL-03	0.06	0	0	0	0	0	31.36	68.64	0	0	0	0	0
ATL-04	0.00	0	0	0	0	0	0	0	0	0	0	0	0
ATL-05	0.98	0	0	0	0	0	0	0	98.55	0	1.45	0	0
ATL-06	0.00	0	0	0	0	0	0	0	0	0	0	0	0
Total F/F Percentage in ATL (%)[1]	**100**	**0**	**0**	**0**	**0**	**0**	**0.19**	**89.21**	**10.48**	**0**	**0.15**	**0**	**0**
Total F/F Area in ATL (m^2)[2]	**9.23**	**0**	**0**	**0**	**0**	**0**	**0.02**	**8.22**	**0.97**	**0**	**0.01**	**0**	**0**

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

4.3.3 ATL CMECS Classifications

Across the 6 transects in the ATL, 150 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=104) was far greater than any other CMECS group, composing 45 m^2 of the analyzed area (Table 4-6, Figure 4-27). The sand/mud CMECS group is not considered complex under the NMFS guidelines (NMFS, 2021); thus, 69% of the area analyzed in the ATL ECC was classified as soft bottom habitat / not complex .

Complex habitats include those with ≥ 5% of gravel-sized particles, 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 none of the ATL area as no images fit this criteria (Table 4-22). Gravel mixes of pebble/granule with sand/mud (< 80% and ≥ 30% gravel) were classified in three still images from two transects, with ATL-04 and ATL-06 containing the most by area (0.3 m^2 and 1.6 m^2, respectively). Gravelly sand/mud (< 30% and ≥ 5% gravel) was classified in 40 images across three transects, with a dominant gravel type of pebble/granule and no instances of cobble or boulder. Overall, only transects ATL-04 and ATL-06 had a majority of still images classified as gravel, gravel mixes, gravelly, or biogenic shell which are considered complex habitat by NMFS. Transect ATL-04 consisted of 17 of 25 passing stills (68%) classified as gravelly or coarser, and ATL-06 consisted of all 25 passing stills (100%) classified as gravelly or coarser.

Biogenic origin substrates present in the ATL include shell hash, with pieces of shell between 2 and 64 mm size, and shell rubble, with pieces or whole shells larger than 64 mm. There were no images classified as shell hash, and shell rubble was classified as the main CMECS substrate group in only one image from transect ATL-02. These areas where shells dominate the substrate as the main CMECS classification are considered complex habitat. Shells were not frequent as co-occurring substrate types in the ATL ECC and composed < 2 m^2 of area in the ATL (Table 4-22 and Figure 4-28).

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). Twenty-one images analyzed within the ATL composed moderate or greater amounts of flora/fauna coverage (> 30%; Figure 4-9) and many images (58%) contained zero. There were also two images within ATL-02 that exhibited complete flora/fauna coverage, where Larger Tube-Building Fauna beds dominated the image.

Representative images of CMECS substrate types are in Table 4-24.

Table 4-22. The number of stills and the total area (m^2) classified to each CMECS substrate group combination for each of the 6 video transects in the ATL 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	1.33	0.77	1.05
Biogenic Shell Rubble	1	0.67	0.48	0.65
Gravel Mixes - Pebble/Granule and S/M with Sparse Shell Hash	2	1.33	1.64	2.22
Gravel Mixes - Pebble/Granule and S/M with Trace Shell Hash	1	0.67	0.27	0.36
Gravelly Sand/Mud and P/G	11	7.33	7.65	10.37
Gravelly Sand/Mud and P/G with Sparse Shell Hash	17	11.33	11.96	16.21
Gravelly Sand/Mud and P/G with Sparse Shell Rubble	1	0.67	0.33	0.45
Gravelly Sand/Mud and P/G with Trace Shell Hash	11	7.33	5.31	7.19
Sand/Mud	56	37.33	21.23	28.76
Sand/Mud with Sparse Shell Hash	33	22.00	15.71	21.29
Sand/Mud with Sparse Shell Rubble	3	2.00	1.07	1.45
Sand/Mud with Trace Shell Hash	12	8.00	7.40	10.03
Totals	**150**	**100**	**73.82**	**100**

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

Table 4-23. Area (m^2) classified to each CMECS substrate component type for transects in the ATL ECC.

Transect	Shell Rubble	Shell Hash	Biotic Component	Gravel P/G	Gravel Mixes P/G + S/M	Gravelly Sand/Mud			Sand/Mud
						+ C	+ C/P/G	+ P/G	
ATL-01	0	0	0	0	0	0	0	0	5.37
ATL-02	0.48	0	0.77	0	0	0	0	0	9.43
ATL-03	0	0	0	0	0	0	0	0.45	11.32
ATL-04	0	0	0	0	0.27	0	0	6.12	2.92
ATL-05	0	0	0	0	0	0	0	0	16.37
ATL-06	0	0	0	0	1.64	0	0	18.68	0
Total Area (m^2)	**0.48**	**0**	**0.77**	**0**	**1.91**	**0**	**0**	**25.25**	**45.41**

[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 counted (as individuals, when applicable) to determine the dominant and co-occurring biotic component classifications and associated taxa for each still. Only the dominant biotic component is described in the report, see accompanying spreadsheet for all co-occurring classifications and associated taxa (Appendix B).

A total of 150 stills were classified within the ATL transects. Of those, 62 stills had no biological elements and therefore no biotic component classification. Every transect within the ATL region lacked biological diversity, with only approximately two different biotic component classifications assigned per transect. The biotic community, Diopatra bed, and the broader biotic group, larger tube-building fauna were the most common classification with 29 and 22 stills respectively (Figure 4-30). The subclass of inferred fauna (which in the ATL ECC included entirely older, unidentified infaunal structures in ATL-05) and Pagurus bed (hermit crabs) were also relatively common classifications with 15 or more stills. The larger tube-building fauna (likely Polychaete worms) were most present in ATL-02.

The CMECS substrate and biotic component classifications for stills in each transect are mapped over benthic habitat polygons in figures provided in Appendix D.

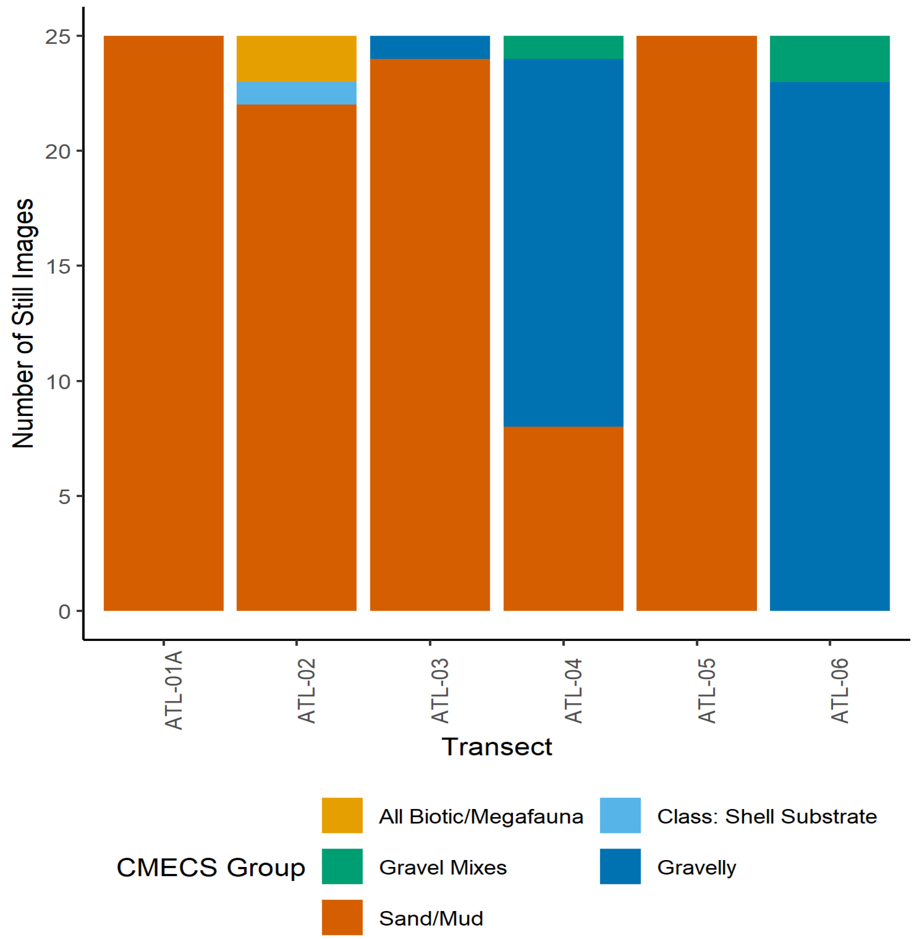


Figure 4-27. The number of still images classified to CMECS substrate component groups within the ATL ECC video transects.

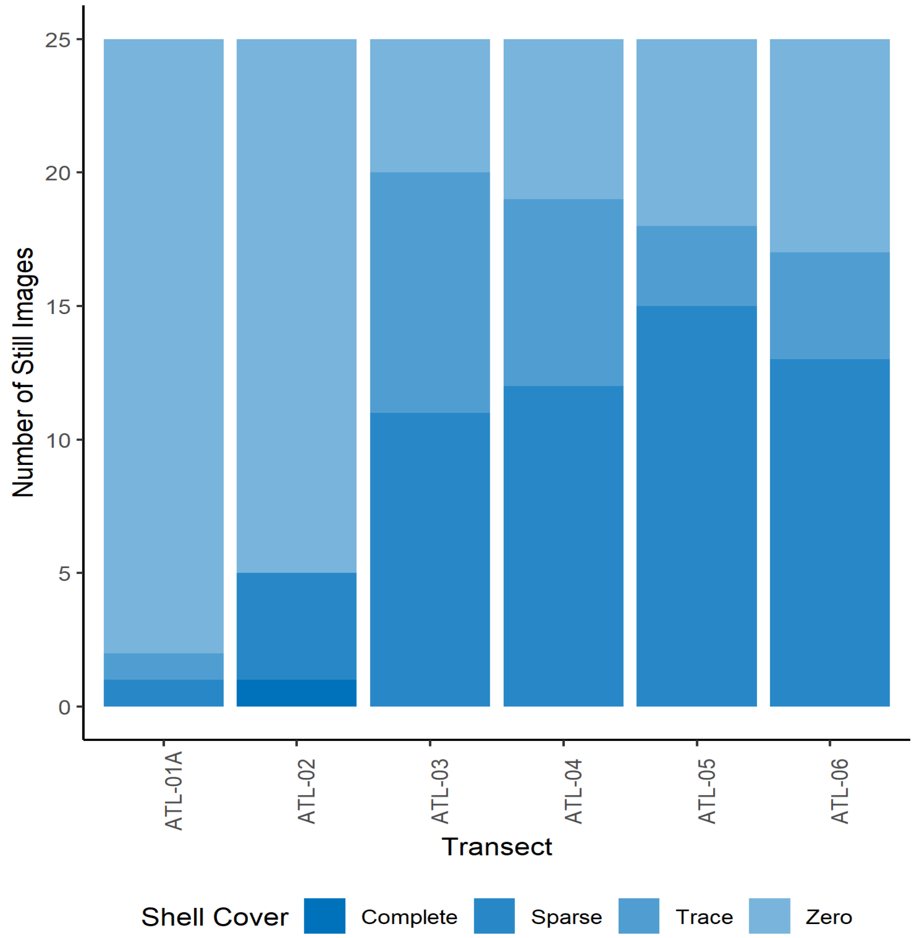


Figure 4-28. The number of still images classified to each shell cover density category within the ATL ECC video transects.
Notes: Trace is ≤ 2%, Sparse is > 2 to < 30%, Moderate is 30 to < 70%, Dense is 70 to < 90%, and Complete is 90 to 100% cover.

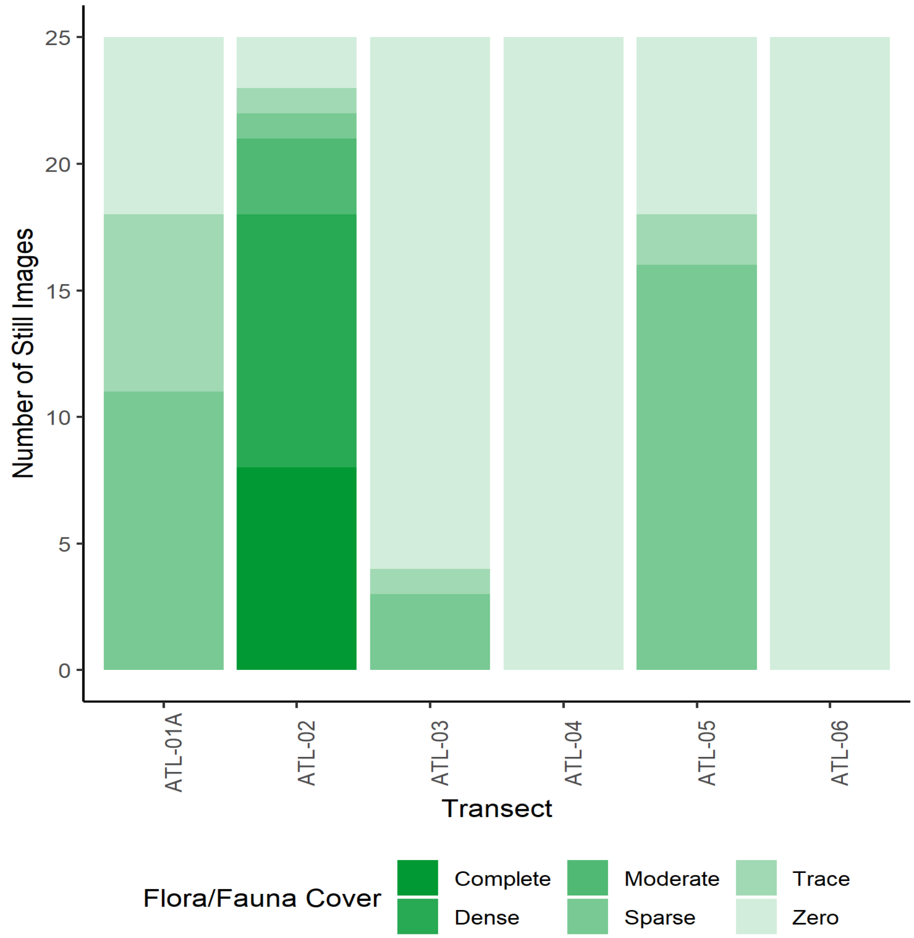


Figure 4-29. The number of still images classified to each flora/fauna density category within the ATL ECC video transects.
Notes: Trace is ≤ 2%, Sparse is > 2 to < 30%, Moderate is 30 to < 70%, Dense is 70 to < 90%, and Complete is 90 to 100% cover.

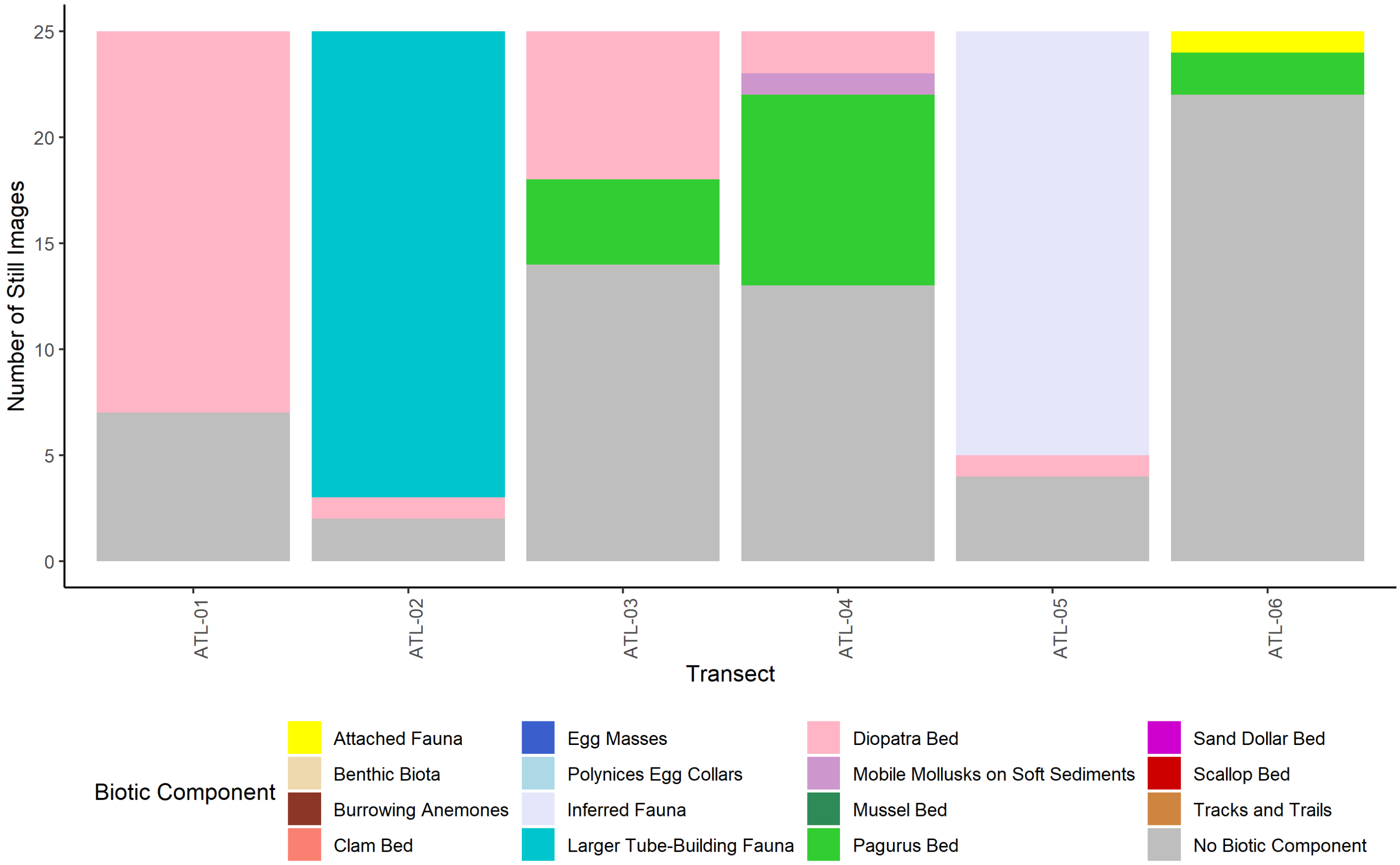


Figure 4-30. The number of still images assigned to CMECS biotic component classifications within the ATL ECC video transects.

[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.

Table 4-24. Representative images of CMEC substrate types observed in the ATL ECC.

Notes: Still image number provided where available. Screenshots from video will not have a still number..

Geologic Unconsolidated Flat Sand/Mud ATL-03_G0018791	
Geologic Unconsolidated Sand/mud with Trace Shell Hash ATL-03_G0018781	

Geologic Unconsolidated Sand/mud Sparse Shell Hash ATL-05_G0012266	
Geologic Unconsolidated Sand/mud Sparse Shell Rubble ATL-04_G0020031	

Larger Tube-Building Fauna ATL-02_G0016648	

5 SUMMARY

RPS was contracted to collect, process, analyze, and compile benthic data collected with a towed video sled in the ECCs and WTA associated with Atlantic Shores' Lease Area OCS-A 0499, offshore of New Jersey. The WTA contains of two offshore wind energy generation projects (Project 1 and Project 2) within the southern portion of the Lease Area OCS-A 0499. In addition to the WTA, the Projects will include two offshore ECCs within federal and New Jersey state waters as well as two onshore interconnection cable routes, two onshore substation and/or converter station sites, and a proposed operations and maintenance facility in New Jersey.

5.1 Biological Features

In total, 15,750 m of video transects were surveyed to classify seafloor habitats and document species presence in the Offshore Project Area: 14 video transects were completed in the WTA (counting WTA-MAG as two transects; WTA-MAG-A and WTA-MAG-B), 43 transects in the MON ECC, and 6 transects in the ATL ECC. The 4k resolution underwater video was reviewed for notable seafloor features or epifaunal/benthic/demersal species greater than 2.5 cm. Approximately 19 hours of video from all transects were reviewed and a total of 7,505 organisms or features were recorded. Of these, 7,495 organisms across 5 phyla were identified. The majority of organisms observed were invertebrates including astarte clams and burrowing anemones which accounted for 55% of organisms counted in the video review. Amongst vertebrates, sea robins were the most common with 968 observations accounting for 13% of organisms counted in the video review.

5.2 Percent Cover and CMECS Classifications

In addition to underwater video, 5k resolution still images were taken along each video transect and were analyzed for percent cover to assign substrate and biotic component CMECS classifications to individual points along each transect. The seafloor areas identified per main cover types within each region during the point count analysis are summarized in Table 5-1. The cover types identified include sand/mud (particles < 2 mm in size), gravel (particles ≥ 2 mm), shells (hash or rubble sizes), anthropogenic or organic materials, or flora/fauna cover. The summed areas of still images classified to the major CMECS substrate groupings within each region are presented in Table 5-2. The CMECS groups include sand/mud (images containing < 5% gravel), gravelly sand (image containing ≥ 5 to < 30% gravel), gravel mixes (images containing ≥ 30 to < 80% gravel), gravel substrates (images containing ≥ 80% gravel), biogenic shell substrates (images in which shell substrates are dominant), and biotic component only (images in which no substrate is visible, just flora/fauna cover). The percentages of analyzed area within each region considered soft bottom habitat (i.e., sand/mud), complex habitat (i.e., gravel or biogenic shell), or flora/fauna are summarized in **Error! Reference source not found.**. Note that 25% of the total seafloor area analyzed for percent cover in this study was from transects located in the WTA, 75% was in the MON ECC, and 5% was in the ATL. Regions were not surveyed equally because the frequent habitat transitions and potentially complex areas in the MON ECC were targeted by design.

Table 5-1. Summary of areas (m^2) calculated during the point count analysis by cover type for each region.

Region	Area Analyzed per Region (m^2)	Sand/Mud Particles (m^2)	Gravel Particles (m^2)	Shell Particles (m^2)	Anthropogenic or Organic (m^2)	Flora/Fauna (m^2)
WTA	379.93	312.32	14.54	41.71	0	11.36
MON ECC	1,043.87	763.22	186.95	71.12	0.13	22.45
ATL ECC	73.82	58.63	4.14	1.83	0	9.22
Total Area Analyzed (m^2)	**1,497.62**	**1,134.17**	**205.63**	**114.66**	**0.13**	**43.03**

Table 5-2. Summary of the areas (m^2) of still images classified to CMECS substrate groups for each region.

Region	Sand/Mud Substrates (< 5% gravel)	Gravelly Sand Substrates (≥ 5 to < 30%)	Gravel Mix Substrates (≥ 30 to < 80%)	Gravel Substrates (≥ 80% gravel)	Biogenic Shell Substrates	Biotic Component Only
WTA	295.09	47.63	10.22	4.41	22.6	0
MON ECC	544.18	232.75	190.84	76.07	0	0
ATL ECC	45.41	25.25	1.91	0	0.48	0.77
Total Area Classified (m^2)	**884.68**	**305.63**	**202.97**	**80.48**	**23.08**	**0.77**

The CMECS hierarchical system classification thresholds are based on the percent and composition of sediment particles. The proportion of CMECS gravel particles (≥ 2 mm) is used by NMFS to identify habitats that may be considered "complex" for the purposes of mapping EFH or areas containing potentially important or sensitive biological communities. In addition to gravel, areas dominated by biogenic cover (e.g., shells) are also considered complex. The percent of the area analyzed in each region composed of soft bottom habitat, complex habitat, and biological features is presented in Table 5-3 based on both the point count analysis, which provides the actual percent cover of different substrate types on a finer scale, and based on the CMECS classifications applied to each still image as a whole. Soft bottom habitat is summarized as the percent of the area covered by particles of sand/mud size (< 2 mm) in the point count analysis, and as the area of the still images classified to the sand/mud CMECS group. Complex habitat is summarized as the percent of the area covered by particles of gravel size (≥ 2 mm) or biogenic substrates (i.e., shell) in the point count analysis, and as the area of the still images classified to the gravelly sand, gravel mix, gravels, or biogenic shell CMECS groups. Biological cover is summarized as the percent of the area covered by flora/fauna in the point count analysis, and as the area of the still images with no visible substrate that could be classified only by the biotic component (Table 5-3). All three summary tables informed the regional summary paragraphs below.

Table 5-3. Summary of the percent of the surveyed areas within each region classified as soft bottom, complex habitat, or biological cover.

Region	% Based on Point Count Analysis of Stills			% Based on CMECS Classifications of Stills		
	Soft Bottom	Complex	Biological	Soft Bottom	Complex	Biological
WTA	82	15	3	78	22	0
MON ECC	73	25	2	52	48	0
ATL ECC	79	8	13	62	37	1
Overall Percentage (%)	**76**	**21**	**3**	**59**	**41**	**< 1**

Wind Turbine Area

For the WTA, a total of 347 still images from 14 video transects (splitting WTA-MAG1) with a combined area of 380 m^2 were analyzed for CMECS substrate component classification using point count methods. Across the 14 transects, 283 still images were classified as geologic origin, unconsolidated, fine substrate of sand/mud sized particles. Based on the point count analysis, 82% of the area analyzed within WTA transects contained sand/mud (i.e., soft bottom habitat) and 15% contained gravel-sized particles or shells (i.e., complex habitat). Based on CMECS substrate groups, 78% of the surveyed area in the WTA was classified as soft bottom habitat and 22% as complex habitat. Over a quarter of the complex habitat in the WTA was classified as such based on biogenic shell cover.

Flora/fauna covered 3% of the area analyzed in the WTA. Sand dollar beds were the most common biotic component classification, occurring in 8 of the 14 transects, and were the dominant biotic group in every analyzed still in WTA-12 and WTA-15. Inferred fauna (about 30% skate eggs and 70% older unidentified infaunal structures) were also common and occurred as the dominant biotic component in 27 still images analyzed. No images in the WTA were classified solely by the biotic component (i.e., had complete flora/fauna cover).

Monmouth ECC

For the MON ECC, a total of 1,075 still images with a combined area of 1,043 m^2 were analyzed for CMECS substrate component classification using point count methods. Across the 43 transects, 564 still images were classified as geologic origin, unconsolidated, fine substrate of sand/mud sized particles. Based on the point count analysis, 73% of the area analyzed within MON ECC transects contained sand/mud (i.e., soft bottom habitat) and 25% contained gravel-sized particles or shells (i.e., complex habitat). Based on CMECS substrate groups, 52% of the surveyed area in the WTA was classified as soft bottom habitat and 48% as complex habitat. This big difference in area between summary methods highlights that about half of the complex habitat in the MON ECC is classified as gravelly sand, which actually contains relatively sparse amounts of gravel-sized particles (< 30%). The MON ECC was the most heterogenous area surveyed with 28 unique CMECS categories assigned, and the only region where substantial amounts of gravel mixes and gravel classifications were assigned (18% and 7% of the CMECS classified areas, respectively).

Flora/fauna covered 2% of the area analyzed in the MON ECC. As in the WTA, the dominant biotic component classification was sand dollar beds across the MON ECC. However, inferred fauna, burrowing anemones, and decorator worm (*Diopatra* sp.) beds were also the dominant biotic component in many still images. Some transects in the MON ECC had relatively sparse biological cover, with 41% of images analyzed containing no biological elements.

Atlantic ECC

For the ATL ECC, a total of 150 still images with a combined area of 74 m^2 were analyzed for CMECS substrate component classification using point count methods. Across the 6 transects, 104 still images were classified as geologic origin, unconsolidated, fine substrate of sand/mud sized particles. Based on the point count analysis, 79% of the area analyzed within ATL ECC transects contained sand/mud (i.e., soft bottom habitat) and 8% contained gravel-sized particles or shells (i.e., complex habitat). Based on CMECS substrate groups, 62% of the surveyed area in the ATL ECC was classified as soft bottom habitat and 37% as complex habitat. Nearly all of the complex habitat in the ATL ECC is classified as gravelly sand (< 30% gravel). Small amounts of gravel mixes and biogenic shell substrates were classified for the remaining complex habitats (3% and < 1%, respectively).

Flora/fauna covered 13% of the area analyzed in the ATL ECC. The ATL ECC was also the only region that had portions of a transect completely dominated by flora/fauna coverage (1%), where larger tube-building fauna beds, likely containing Polychaete worms, dominated the image. Decorator worm beds, inferred fauna, and hermit crab beds were also common biotic component classifications in the ATL ECC.

Overall

Overall, the surveyed portions of the Offshore Project Area were dominated by soft bottom sand/mud substrates (59%), with 41% of the surveyed area classified as complex habitats: 20% gravelly sand, 19% gravel mixes or gravels, and less than 2% biogenic shell or biological cover. Most of the gravel mixes and gravels occurred in the MON ECC, while nearly all of the biogenic shell cover occurred in the WTA. Gravelly sand was spread throughout all three regions. These data agree with prior work by Guida et al. (2017) that established that the New Jersey Wind Energy Area is mostly sandy with some gravelly sand in the north and central areas, and muddy sand in the south. The WTA contains fairly homogenous habitat types composed of sand/mud, with interspersed gravelly sand/mud and biogenic shell cover, and generally contains biotic components described as soft sediment faunal beds of sand dollars and inferred fauna. The ATL ECC and the MON ECC are both more heterogenous regions with greater amounts of complex habitats based on CMECS still image classifications.

6 REFERENCES

Bureau of Ocean Energy Management (BOEM). 2019. Guidelines for Providing Benthic Habitat Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585. June 2019. BOEM Office of Renewable Energy Programs, US Department of the Interior. 9 pp.

Federal Geographic Data Committee (FGDC). 2012. Coastal and Marine Ecological Classification Standard, June 2012. FGDC-STD-018-2012. 353 pp.

Folk, R.L., 1954, The distinction between grain size and mineral composition in sedimentary-rock nomenclature: The Journal of Geology, v. 62, no. 4, p. 344–359.

Guida, V., A. Drohan, H. Welch, J. McHenry, D. Johnson, V. Kentner, J. Brink, D. Timmons, E. Estela-Gomez. 2017. Habitat Mapping and Assessment of Northeast Wind Energy Areas. Sterling, VA: US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2017-088. 312 p.

National Marine Fisheries Service (NMFS). 2021. Recommendations for Mapping Fish Habitat. NMFS GARFO Habitat Conservation and Ecosystem Services Division. March 2021. 22 pp.

Oksanen, J., Blanchet, F. G., Friendly, M., Kindt, R., Legendre, P., McGlinn, D., Minchin, P.R., O'Hara, R. B., Simpson, G. L., Solymos, P., Henry, M., Stevens, H., Szoecs, E., and Wagner, H. 2019. vegan: Community Ecology Package. R package version 2.5-6. https://CRAN.R-project.org/package=vegan

R Core Team. 2020. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

Trygonis, V., Sini, M. 2012. photoQuad: a dedicated seabed image processing software, and a comparative error analysis of four photoquadrat methods. Journal of Experimental Marine Biology and Ecology 424-425, 99-108. doi:10.1016/j.jembe.2012.04.018

U.S. Environmental Protection Agency (EPA). 2004. Method 9060A Total Organic Carbon. SW-846: Hazardous Waste Test Methods, 5 pp.

APPENDIX A: VIDEO REVIEWER NOTES

APPENDIX B: CMECS CLASSIFICATIONS FOR STILL IMAGES

Provided digital copy of Excel file.

APPENDIX C: FULL SPECIES TAXONOMY LIST

APPENDIX D: MAPS OF CMECS CLASSIFICATIONS OF STILL IMAGES