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Marine Benthic Video Survey

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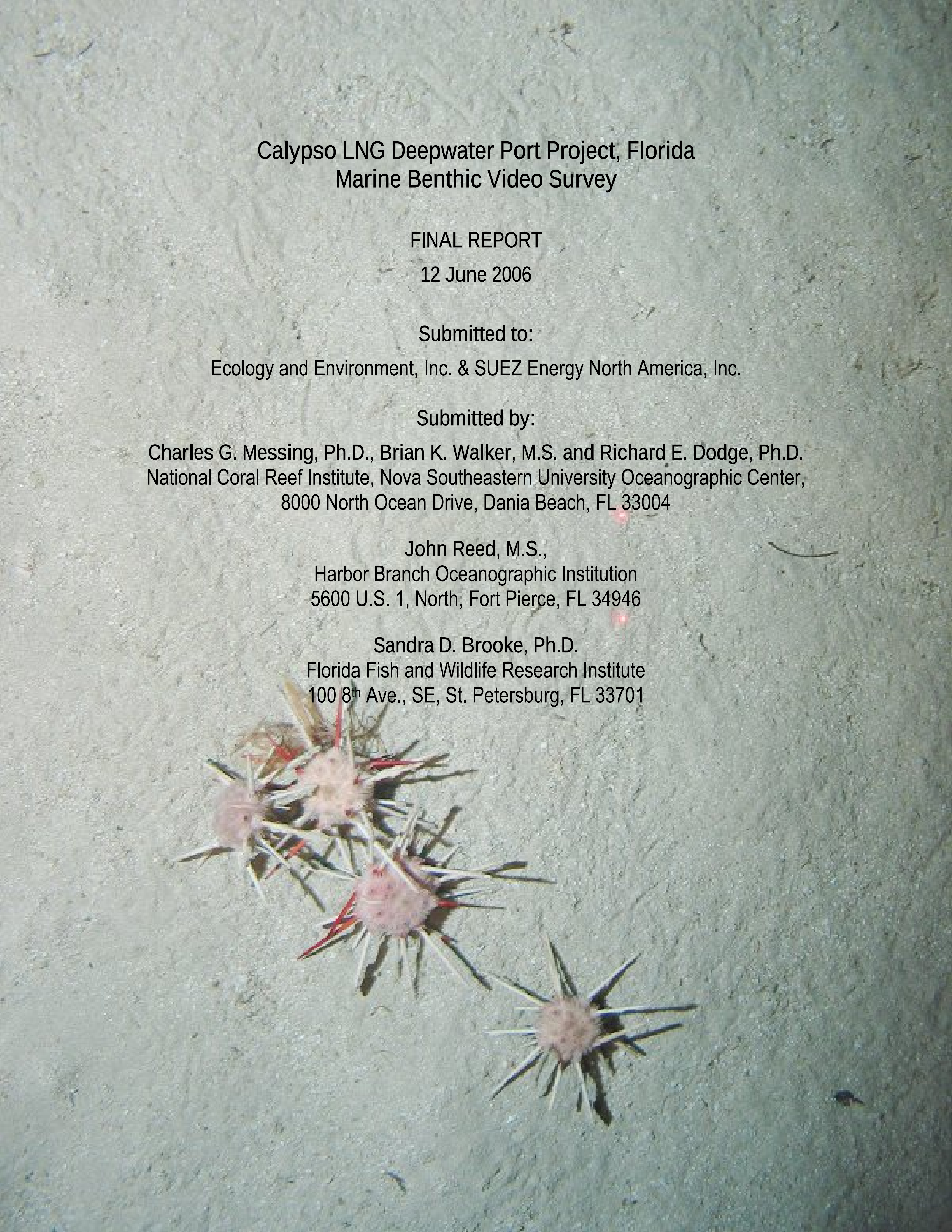

Calypso LNG Deepwater Port Project, Florida
Marine Benthic Video Survey

FINAL REPORT

12 June 2006

Submitted to:

Ecology and Environment, Inc. & SUEZ Energy North America, Inc.

Submitted by:

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III. EXECUTIVE SUMMARY

- The benthic video survey carried out for the *Calypso* Liquefied Natural Gas Deep Water Port Project (LNG DWP) examined ~52 nm of linear transects of the seafloor off Fort Lauderdale, FL, in and to the north of the geohazards survey area using the US Navy's Television Observed Nautical Grappling System (TONGS) remotely operated vehicle (ROV) conducted from 15 to 18 April 2006.

- Analyses of videographic and still photographic data revealed six habitat types:
  1) Sediment (obsolete rippled and flat bioturbated),
  2) Large-scale sediment features – large depressions and sand waves.
  3) Tilefish burrows – one great northern tilefish (*Lopholatilus chamaeleonticeps*), and a few burrows of probable blueline tilefish (*Caulolatilus microps*).
  4) Pennatulids – chiefly widely scattered colonies of a sea pen in >900 ft.
  2) Low-cover hard bottom – scattered clusters of rubble or small rocks, often in patches a few meters across, rarely in more extensive fields, and separated by expanses of sediment, occasionally accompanied by a few low-relief rocks up to 0.8 m across and rare veneered slabs or pavements to 1 m across.
  3) High-cover hard bottom – low- to moderate-relief characterized by phosphoritic limestone outcrops, pavement and slabs, each chiefly <2 m across, with varying amounts of rubble and small to large rocks, frequently in patches separated by expanses of sediment and intermixed with low-cover hard-bottom areas.

- The most abundant organisms on hard bottoms were a variety of sea anemones (Actiniaria), nephtheid soft corals (?*Capnella nigra*), zoanthids (colonial anemones) and echiuran spoon worms, accompanied by smaller numbers of primnoid and isidid octocorals, stylasterid lace corals, demosponges and hexactinellid glass sponges. The only stony corals observed were small solitary azooxanthellate cup corals (=2 cm) (except for two small branching colonies on the fuselage of a sunken airplane).The most common fish in this habitat was the blacktail codling, *Laemonema melanurum* (Moridae). Four large fishes (grouper or snapper) were seen in side cameras.

- A total of 869 still images were analyzed in eight still photographic series identified as having high biological interest (based on organism abundance and diversity, and extent of exposed hard substrate), ranging from 82 to 136 per series with a mean of 108.6 images per series. Coral Point Count (CPC)© software was used to code 50 points in each image. Hard substrates accounted for 17.10 to 95.32% of cover in these eight selected predominantly hard bottom areas. Percent coverage by all organisms combined (mobile and sessile) ranged from 1.01 to 9.00%.

- We also counted all organisms larger than 3-4 cm in the same image set. Area covered ranged from 52.12 to 182.04 m^2 per site. Total organism densities ranged from 3.85 to 10.80 m^{-2}, with sessile and semi-sessile habitat-forming groups (sponges and cnidarians) ranging from 3.15 to 6.49 m^{-2}. Sea anemones were the most abundant organisms at 5 of 8 sites, with zoanthids and echiurans most abundant in the other three. *Capnella nigra* ranked second through fourth. Maximum densities of dominant groups were echiurans (3.32 m^{-2}), zoanthids (2.86 m^{-2}), sea anemones (1.90 m^{-2}), nephtheids (1.22 m^{-2}), and total sponges (0.71 m^{-2}). No other group occurred at densities greater than 0.5 m^{-2}. Organisms treated as corals contributed at most 0.48 (gorgonians) and 0.45 colonies m^{-2} (stylasterids), both at site 8.

IV. INTRODUCTION

Calypso LNG, LLC, a subsidiary of SUEZ Energy North America, Inc., proposes to submit a Deepwater Port (DWP) application for a proposed offshore liquefied natural gas (LNG) import Deepwater Port terminal located approximately 10 miles northeast of Port Everglades, Broward County, Florida. This facility, the first LNG DWP proposed for construction within the exclusive economic zone (EEZ) off the southeastern Florida coast, would connect with a previously permitted submarine pipeline (the *Calypso Pipeline*) to transport regasified LNG from the DWP to the Florida Gas Transmission Pipeline. The DWP licensing process requires identification and characterization of benthic marine resources that may be impacted by project activities. Dodge et al. (2001) and Messing et al. (2003) carried out field biological surveys using scuba and remotely operated vehicles (ROVs) to identify bottom characteristics and benthic macrofaunal assemblages and habitats along the previously permitted *Calypso Pipeline* route from the shoreline to a depth of 183 m (600 ft). These surveys were conducted using methods consistent with the Florida Department of Environmental Protection Office of Intergovernmental Program's 2002 guidelines for offshore surveys of linear features (DEP 2002) and included both qualitative videographic and quantitative still photographic analyses. This report documents the results of the survey carried out by Nova Southeastern University to characterize the benthic habitats and resources of the area proposed for the Calypso DWP construction. This survey consists of 52 nm of videographic and quantitative still photographic transects within and adjacent to the proposed construction area—a parallelogram 7.4 nm by 7.0 nm between ~210 and 300 m depth (689-984 FSW).

A detailed geohazards survey carried out by INTEC Engineering Partnership, LTD, in March 2006 characterized the seafloor and shallow sub-seafloor geology of the study area using high-resolution multi-beam bathymetry, high-resolution sidescan sonar imagery, sub-bottom profiles and magnetometer data. Line spacing was based on 125% high-resolution bathymetry data and 200% sidescan sonar coverage. The resulting map depicted apparent variations in seafloor substrates, i.e., between hard bottoms and unconsolidated sediments, and provided the basis for designing the pattern of the benthic video and still photographic survey, which provided ground-truthing for the geohazards survey.

V. PURPOSE

The purpose of the benthic video survey is to locate, characterize, and determine the distribution of benthic marine communities in the area encompassed by the geohazards survey. Along with the geohazards survey, the benthic video survey will be used to determine a preferred location for the LNG DWP, and within that location to ascertain the best anchor and chain locations for avoiding or minimizing impacts to sensitive benthic habitats. Locations of suction anchors and chain lines are not yet known. This qualitative video and quantitative digital still photographic survey thus will locate, characterize, and determine the areas of benthic communities that may be vulnerable to impact from the proposed *Calypso* DWP Project. The results will be incorporated into a DWP application to be prepared for agency submission.

VI. STUDY AREA

A. Physical Environment

The southeastern Florida continental shelf is part of an extensive subsiding carbonate platform that includes the Florida peninsula and west Florida shelf. The survey area lies at the northern end of the Miami Terrace, a 120-km-long elongated outcrop of partially buried phosphoritic mid-Tertiary limestone that extends along southeastern Florida from Key Largo to Boca Raton at depths of ~200-400 m (Figure 1). Previous work along the proposed *Calypso Pipeline* route to the west of the study area revealed chiefly sediment substrates with areas of scattered limestone rubble and larger low-relief rocks (Messing et al. 2003). In 1970, Ballard and Uchupi (1971) traversed a portion of the study area using the submersible *Ben Franklin* (red line in Figure 1B). Within proposed DWP site depths, they reported a thin veneer of rippled sand grading first into an area of phosphoritic nodules in a carbonate sand matrix and then, with increasing depth to the east (below ~300 m), massive phosphoritic outcrops. The eastward terrace margin, which is best developed south-southeast of the study area, consists of slabs, pavements, ridges and scarps with up to ~90-m vertical relief (Kofoed & Malloy 1965, Uchupi 1966 1969, Uchupi & Emery 1967, Malloy & Hurley 1970, Neumann & Ball 1970). The study area lies under the Gulf Stream, or Florida Current, which flows northerly at speeds of 3 knots or greater, while the bottom current often reverses and may flow southerly at up to 1 knot.

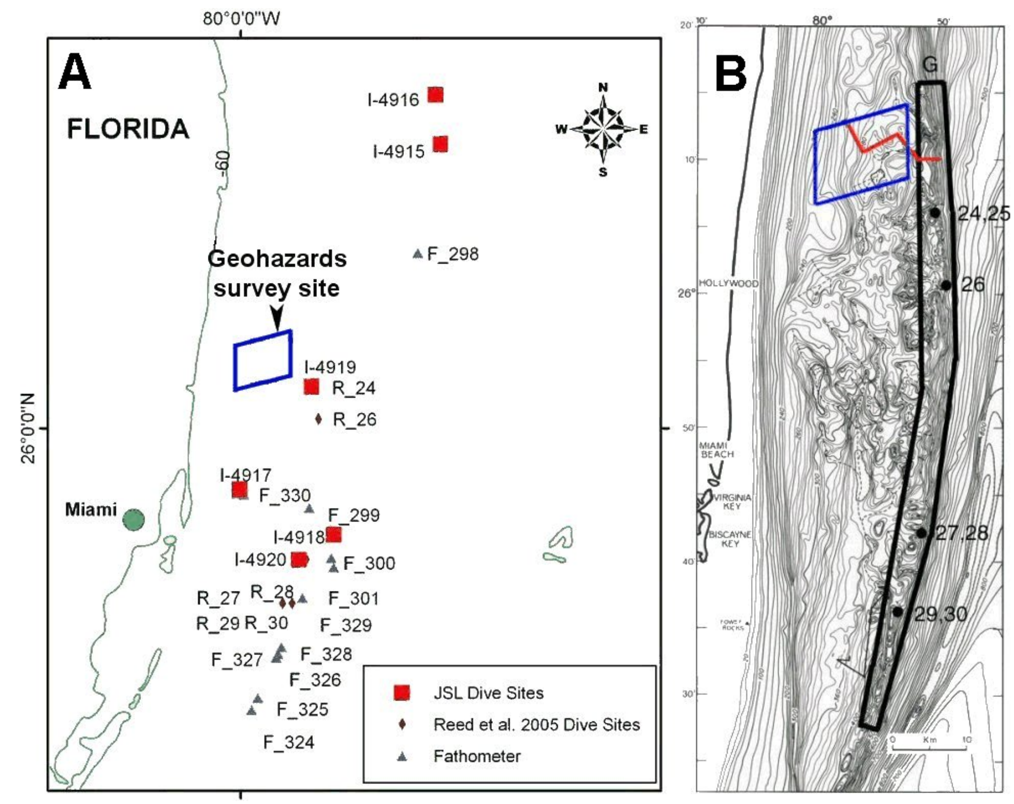

Figure 1. A. Location of geohazards survey site relative to submersible dives and fathometer transects completed by John Reed and others (Harbor Branch Oceanographic Institution, Ft. Pierce, FL). B. Map of the Miami Terrace (Malloy and Hurley 1970) with the steep Miami Escarpment outlined in black and the geohazards survey area in blue. Red line indicates track of *Ben Franklin* (Ballard and Uchupi 1971). Numbered dots are Reed et al. (2006) submersible sites.

B. Biological Environment

No prior detailed biological survey has taken place within the proposed DWP site. Ballard and Uchupi (1971) show two indistinct photographs of apparently barren phosphorite and sediment substrates (one with a wreckfish, *Polyprion americanus*). However, more recent submersible dives to the east and southeast of the proposed site along the upper Miami Terrace escarpment (Figure 1A) have observed rich benthic communities including sponges, octocorals and deep-water corals on exposed limestone substrates (C. Messing personal observations, Reed et al. 2006). The benthic macrofaunal assemblage on sediment substrates to the west of the study area is dominated by the sea star *Coronaster briareus*, cerianthid (burrowing) anemones, and decapod crustaceans (galatheids, *Cancer borealis*, *Bathynectes longispina*). Rubble and rock substrates may support hydroids, sabellid polychaetes, solitary corals and sea anemones. One anemone species (possibly *Actinauge longicornis*) typically occurs on small bits of rubble and in depressions on sediment where it anchors to a bolus of mud. Larger rocks are covered with a fine turf (possibly red algae or agglutinating foraminiferans) (Messing et al. 2003). One recent trawl collection within the depth range of the study area retrieved bamboo coral (Isididae) (C. Messing, personal observation).

VII. BACKGROUND INFORMATION

Geophysical and benthic video surveys of the permitted *Calypso Pipeline* route west of the proposed LNG DWP site area were conducted by RJ Brown and Nova Southeastern University under contract to Enron. The survey included sidescan sonar and magnetometer transects. A Geohazards Report was prepared by Mr. John Hoffman, Geoscience Earth & Marine Services (GEMS) for the route proposed by Enron.

The MMS (Gulf of Mexico OCS Region, NTL No. 99-G16) defines live-bottom areas as seagrass communities; those areas that contain biological assemblages consisting of sessile invertebrates living upon and attached to naturally occurring hard or rocky formations with rough, broken, or smooth topography, and areas where the lithotope favors the accumulation of turtles, fishes, or other fauna. Discussion with MMS indicates that sessile invertebrate assemblages to be documented include those on sediment (e.g., sea pens) as well as on hard bottom at densities of ≥ 1 m^{-2} over areas of at least several square meters.

The South Atlantic Fisheries Management Council (SAFMC), refers to hard bottom as a class of coral communities occurring in temperate, subtropical, and tropical regions (SAFMC 1998a). These communities lack the diversity, density and reef-building capabilities of other classes of coral communities, and are the most widespread of coral communities within the South Atlantic Bight (SAFMC 1998) to the north of the survey area. Hard bottom ranges from relatively flat low-relief surfaces (<0.5 m vertical relief) to several meters in relief. Hard bottom is sometimes referred to as live bottom due to the amount of living organisms attached to or inside these hard substrates. Note that in this context, coral includes non-accreting taxa such as octocorals and antipatharians (black corals) as well as stony corals and other taxa with solid calcareous skeletons.

The Southeast Area Monitoring and Assessment Program (SEAMAP) deep-water mapping project of the South Atlantic Fishery Management Council (SAFMC) is in the process of documenting deep-water, hard-bottom habitat from existing data throughout the South Atlantic Bight and Strait of Florida (Arendt et al. 2003). The SEAMAP bottom mapping workgroup has defined deep-water hard bottom as including the following subcategories of habitat types: coral, rock rubble, coral rubble, exposed hard pavement, thinly covered hard substrate, and artificial structures. In addition, a “Special Habitats” category includes the subcategories of canyons, tilefish burrows, consolidated mud, methane seeps, sinkholes and coral banks. Although the SAFMC has not yet completed the deep-water coral component of SAFMC Fishery Ecosystem Plan, they define deep-water corals as including Scleractinia (stony corals), Octocorallia (gorgonians), Stylasteridae (lace corals), and Antipatharia (black corals). Table 1 lists deep-water colony-forming corals capable of forming complex 3-dimensional habitats in 200-2000 m off the southeastern United States (Blake Plateau to Strait of Florida). Table 2 lists additional sessile organisms that could indicate hard-bottom substrates in the same region. Sponges (Phylum Porifera, Classes Demospongiae and Hexactinellida) are the primary non-cnidarian group that also may contribute substantially to the 3-dimensional complexity of deep-water hard-bottom communities.

Table 1. Deep-water colony-forming corals capable of forming complex 3-dimensional habitats in 200-2000 m off the southeastern United States (Blake Plateau to Strait of Florida). Common names are given in parentheses.

- Phylum Cnidaria
    - Subphylum Anthozoa
        - Class Octocorallia (soft corals, gorgonians, sea pens)
            - Order Alcyonacea 14 families
                - Family Coralliidae (precious corals)
                - Family Chrysogorgiidae (gold corals)
                - Family Isididae (bamboo corals)
                - Family Paragorgiidae (bubblegum corals)
                - Family Paramuriceidae
                - Family Plexauridae
                - Family Primnoidae
                - Family Ellisellidae
                - Family Gorgoniidae
        - Class Hexacorallia (stony corals, anemones, black corals)
            - Order Zoanthidea (colonial anemones)
                - Family Parazoanthidae (*Gerardia* sp.)
            - Order Antipatharia (black corals)
                - Family Antipathidae
                - Family Myriopathidae
                - Family Schizopathidae
                - Family Cladopathidae
                - Family Leiopathidae
            - Order Scleractinia (stony corals)
                - Family Oculinidae (*Madrepora oculata* & *M. carolinae*)
                - Family Caryophylliidae (*Lophelia pertusa*)
                - Family Dendrophylliidae (*Enallopsammia profunda*)
                - Family Pocilloporidae (*Madracis* spp.)
    - Subphylum Medusozoa
        - Class Hydrozoa
            - Order Filifera
                - Family Stylasteridae (lace corals)

Table 2. Sessile or semisessile organisms other than colonial corals that may indicate hard-bottom substrates in 200-2000 m off the southeastern United States (Blake Plateau to Strait of Florida).

- Phylum Porifera (sponges)
    - Class Hexactinellida (glass sponges)
        - Order Amphidiscosida
        - Order Lyssacinosida
        - Order Lychniscosida
        - Order Hexactinosida
    - Class Demospongiae
        - Order Astrophorida (5 families)
        - Order Spirophorida (1 family)

Order Lithistida (6 families)
Order Hadromerida (4 families)
Order Halichondrida (2 families)
Order Agelasida (1 family)
Order Axinellida (6 families)
Order Poecilosclerida (8 families)
Order Haplosclerida (5 families)
Order Dictyoceratida (2 families)
Order Dendroceratida (1 family)
Order Verongida (2 families)

Phylum Cnidaria
- Subphylum Medusozoa
  - Class Hydrozoa
    - Order Leptothecata (thecate hydroids)
- Subphylum Anthozoa
  - Class Octocorallia
    - Order Alcyonacea (soft corals)
      - Family Alcyoniidae
      - Family Nidaliidae
      - Family Nephtheidae
      - Family Anthothelidae
      - Family Spongiodermatidae
  - Class Hexacorallia
    - Order Scleractinia (solitary stony corals)
      - Family Caryophylliidae (e.g., *Paracyathus, Trochocyathus*)
      - Family Flabellidae (e.g., *Javania*)
      - Family Guyniidae (e.g., *Stenocyathus*)
      - Family Dendrophyliidae (e.g., *Balanophyllia, Bathypsammia*)
    - Order Zoanthidea (zoanthids, colonial anemones)
      - Several families
    - Order Actiniaria (sea anemones)
      - Numerous families in several orders

Sea pens (Order Pennatulacea) are colonial, often plume-like octocorals that, unlike most soft corals and gorgonians, typically anchor in unconsolidated sediments. However, like other octocorals, they are tall enough and may occur in great enough densities to generate complex 3-dimensional benthic habitat. They are included in the survey results.

The productivity of hard-bottom communities varies depending upon environmental and physical factors including but not limited to depth, current, light penetration, reef topography, habitat availability and location. Areas of hard-bottom provide cover and foraging areas for many fish and invertebrates, including several commercially important species. The importance of hard-bottom to fisheries stocks has been recognized, and the SAFMC has designated all natural and artificial hard-bottom as Essential Fish Habitat (EFH) and/or Habitat Area of Particular Concern (HAPC).

VIII. METHODS

A. Remotely Operated Vehicle (ROV)

The survey used the Television Observed Nautical Grappling System (TONGS), a deep-water heavy-lift underwater vehicle owned and operated by the Naval Surface Warfare Center, Carderock Division, South Florida Testing Facility (SFTF), Dania Beach, FL (Figure 2). TONGS has a 10,000-ft operating depth, 10,000-lb lift capability, and can operate in currents in excess of 5 kt within a 1-yd radius on the seafloor for prolonged periods. Underwater position is determined using an ultra-short baseline acoustic tracking system integrated into a differential global positioning system (DGPS), which provides highly-accurate (±1 yd) georeferenced bottom positions. TONGS is equipped with 4 color cameras, multiple underwater lights, dual-frequency imaging and search sonar, altimeter and depth sensor. Two cameras are mounted to a pan-and-tilt unit to provide variable camera orientation. TONGS also has two thrusters for orientation and minor positional changes (±30 ft). All control, data, and video are multiplexed thru a fiber-optic telemetry system to the surface, providing wide bandwidth and high-quality video (William Baxley, SFTF, personal communication). For this survey, TONGS was equipped with a Kongsberg OE-1373 high-resolution video camera, OE11242 Flashgun and OE14208 Digital stills camera, the latter provided with a pair of scaling lasers spaced 8 cm apart. The survey was carried out aboard the University of Miami's research vessel catamaran *F. G. Walton Smith* (length 96 ft, beam 40 ft, draft 5 ft 6 in, gross tonnage 97, speed 12 kt).

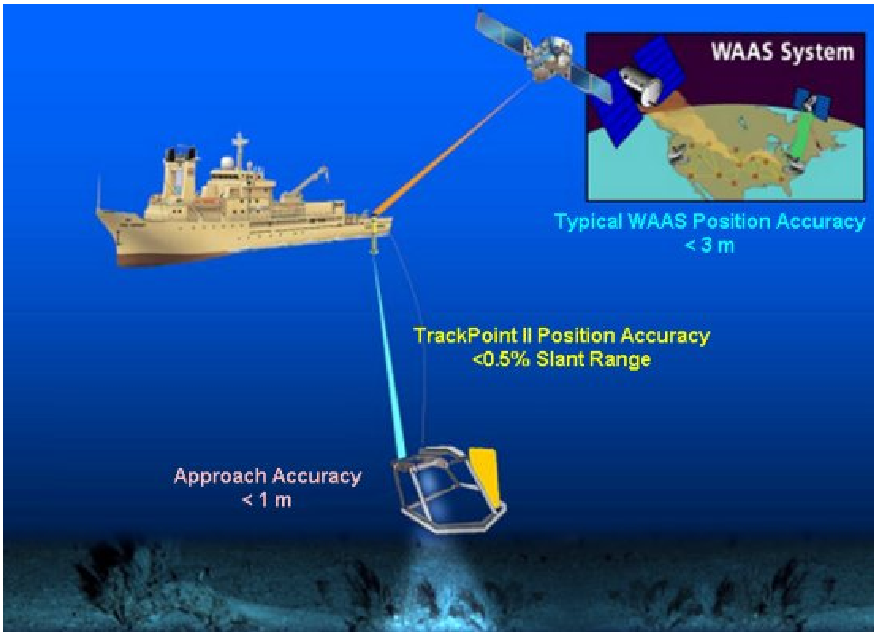

Figure 2. Television Observed Nautical Grappling System (TONGS).

B. Survey Pattern

The initially outlined transect pattern consisted of 5 major east-west survey lines ~7 nm long and ~1.5 nm apart in a proposed rectangular geohazards survey area. After the survey area was modified as a parallelogram, transects were oriented WSW-ENE and spaced as shown by Martin Morrison (INTEC Engineering) so that the 5-transect pattern would cover a larger area than strictly E-W lines and to transit as many of the apparent hard-bottom areas suggested by irregular topography in the geohazards sidescan map. Transects were numbered 1 to 5 beginning with the southernmost. We submitted this pattern for agency comment. Following examination of the geohazards sidescan imagery, which revealed extensive apparent hard-bottom along the southernmost EW1 transect, and discussions with agency representatives, this transect (and EW Tie1) was replaced by an alternative E-W transect (Optional Northern BVS Transect in Figure 4; subsequently renamed EW6) ~1 nm north of and parallel to EW5, just outside of the geohazards survey area, because sidescan imagery suggested that most of the northern margin of the survey area was unconsolidated substrate. This was connected to EW5 by Tie EW5 at the northeastern corner of the geohazards survey area.

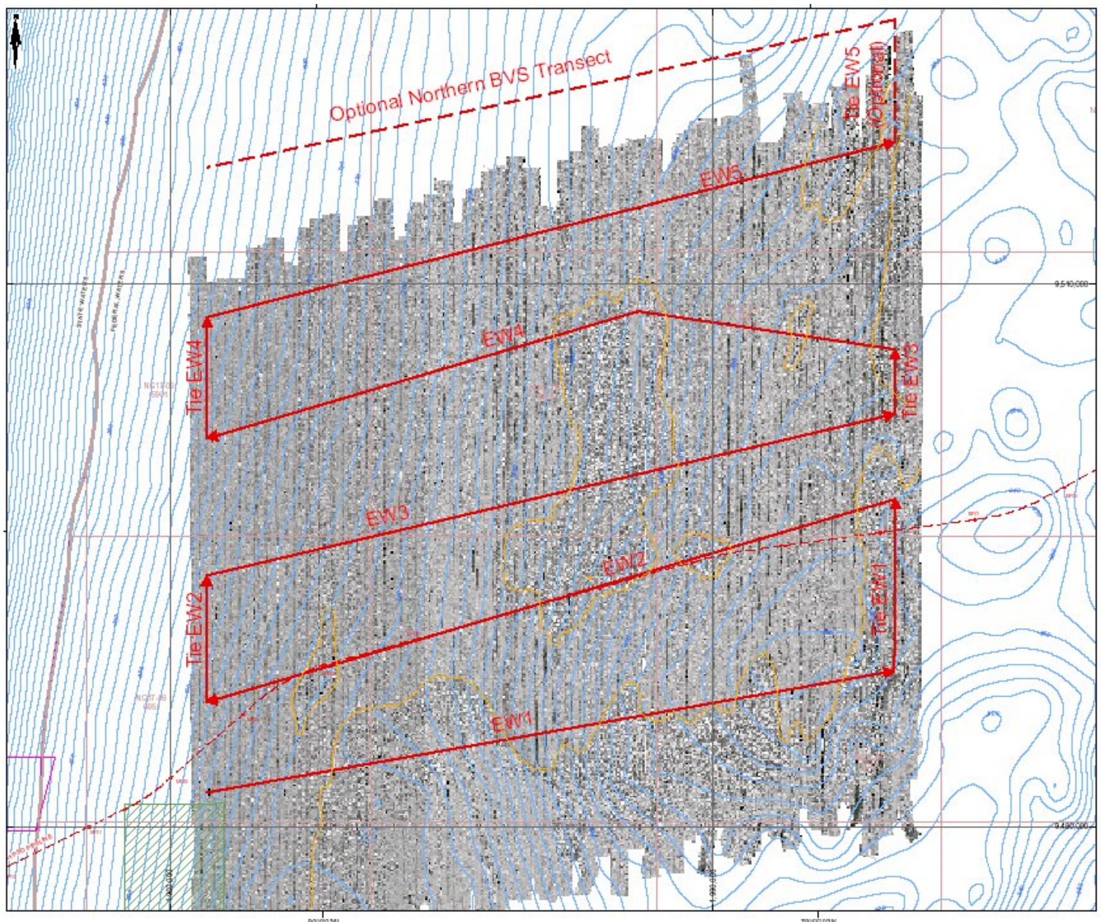

Figure 3. Planned transect pattern of 5 major E-W survey lines, each ~7.5 nm long, connected by shorter Tie lines.

Figure 4 shows the operational transect pattern as modified immediately before and added to during field operations. (It does not show the actual ROV path.) Transect EW2, which ran along the proposed *Calypso Pipeline* route for most of its length, was modified at its eastern and western ends to duplicate the entire proposed pipeline route within the geohazards survey area; this required a short southern extension to Transect Tie EW2 (green line in figure 4). During field operations, Tie EW5, between EW5 and EW6, was relocated ~a few hundred meters west of its original location in order to transit an area that preliminary sidescan imagery suggested might include a series of sinkholes or hard bottom. Subsequent analysis by INTEC has indicated that they are not sinkholes; they are treated here as large depressions. Also during field operations and with the agreement of Calypso LNG, LLC, a series of shorter interconnected transect lines were added to document the presence or absence of hard substrates north of the northeastern margin of the geohazards survey area (blue lines in figure 4). Table 3 lists the transects in the sequence they were surveyed with the numbered videotapes recorded during each.

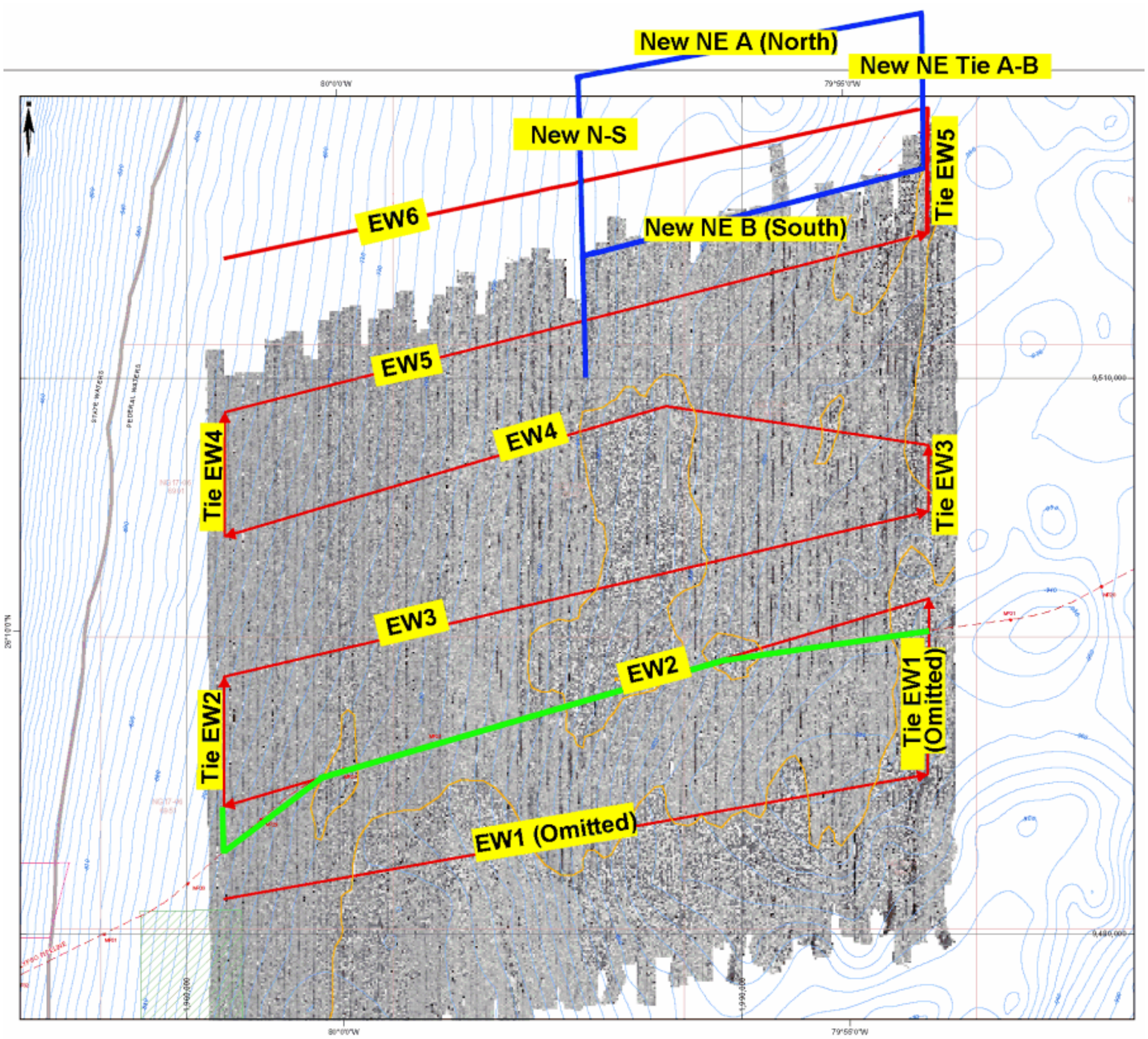

Figure 4. Operational transect pattern. Gray area represents seafloor topography based on a preliminary assessment of geohazards sidescan data. Orange contours outline areas of irregular topography initially interpreted as hard bottom. Transect EW2 was modified to duplicate the entire proposed pipeline route within the geohazards survey area (green line). Blue transect lines were added during field operations to document the presence or absence of hard substrates north of the northeastern margin of the geohazards survey area. Transects EW1 and Tie EW1 were omitted. Arrowheads indicate the planned survey direction; the actual survey was carried out in reverse (Table 3).

Table 3. Sequence in which transects were surveyed and tapes recorded. The eastern half of EW6 was repeated because the vessel drifted off course during the initial transit. See Figure 5 for survey pattern.

Sequence no.	Transect Name	Tapes recorded
1	EW6 (West half)	1-10
2	Tie EW5	11-13
3	EW5	14-19
4	Tie EW4	20-21
5	EW4	22-31(part)
6	Tie EW3	31(part)-32(part)
7	EW3	32(part)-41
8	Tie EW2	42-45
9	EW2	46-55
10	EW6 (East half)	56-59
11	New NE B (South)	60-63
12	New NE Tie A-B	64-66(part)
13	New NE A (North)	66(part)-69(part)
14	New N-S	69(part)-73

C. Data Collection

The survey was conducted pursuant to United States Department of the Interior Minerals Management Service (MMS) guidelines and regulations for assessment of impacts on marine resources and the Florida Fish and Wildlife Conservation Commission (FFWCC) “Guidelines for Conducting Offshore Benthic Surveys” as modified by discussions with MMS representative Gary Goeke. Proposed methods were outlined, adjusted and vetted by representatives of the following agencies during a meeting in West Palm Beach, FL, on 11 Apr 2006: U.S. Coast Guard, Army Corps of Engineers, Florida Department of Environmental Protection, Florida Fish and Wildlife Conservation Commission, Minerals Management Service and NOAA Fisheries.

Video was run continuously throughout the survey while the ROV was on the bottom (i.e., within 1-2 m of the seafloor. Still images (1-2 MB each) were taken at ~10-min intervals over sediment substrates. Over areas of biological interest on hard substrates, still images were taken repeatedly as soon as the strobe recycled and the ROV moved far enough to avoid overlapping exposures. Images were also taken of specific organisms on all substrates for identification purposes. We selected 8 sites for quantitative plan-view digital photography on the basis of their greater relief and apparent biological complexity and diversity relative to surrounding substrates. We planned to use ~100 images per site with satisfactory exposures for quantitative analyses, each series beginning on a habitat of high biological interest. However, in three cases, somewhat fewer than 100 images proved usable (99 at site 3, 97 at site 4 and 82 at site 5). At the other five sites, we analyzed more than 100 images (103 to 136; see table 5 below) so that each series ended with exposures showing habitats of biological interest, rather than ending with a series on empty sediment.

D. Data Analyses

Following the surveys, video data were reviewed in the laboratory to confirm organism identifications as far as possible and to define biological zones and benthic habitats. Original field transcripts were summarized to produce habitat descriptions and identify transitions between habitats. Quantitative digital photographs were processed in the laboratory, e.g., to eliminate out-of-focus images and to improve image contrast when necessary. We used Coral Point Count (CPC)©, a proprietary software developed by the National Coral Reef Institute at the Nova Southeastern University Oceanographic Center. With this software, the user selects a rectangular region of each digital image of the sea floor for analysis. In this case, the selected area encompassed the full area of each photograph. The user then projects a series of random points onto the selected area of the image and identifies the organism or bottom type at each point according to a pre-selected list of categories (e.g., rubble, sediment-veneered hard bottom, unidentified sponge, Ceriantharia, Primnoidae, *Aphrocallistes* sp.) available to the user via an on-screen menu.

Because the CPC software was developed for use in shallow-water habitats with high densities of organisms, the relatively low densities of benthic hard-bottom macrofauna anticipated in this study would have required an excessive number of random points, probably at least 100 per image, in order to accurately capture the diversity of organisms and reflect their densities and percent cover. As a result, following discussions with and agreement by agency representatives, images were subjected to a two-stage analysis. Each image was initially analyzed using CPC software for percent substrate cover (e.g., hard-bottom, sediment-veneered hard-bottom, sediment) with organisms identified to general category (e.g., sponge, cnidarian, echinoderm) at a density of 50 points per image. Each image was then re-examined and all organisms larger than 3-4 cm enumerated and identified as specifically as possible (e.g., *Capnella* ?*nigra*, *Phakellia* sp., Isididae, anemone sp. 1, unidentified hexactinellid). Numbers of encrusting and small colonial organisms (e.g., hydroids, zoanthids) were approximated. Small organisms (<3-4 cm; e.g., ophiuroids, solitary corals, chitons) recognizable in still images were ranked by relative abundance classes (i.e., few, common, abundant) and were not included in quantitative analyses. Image area was calculated by converting image length and width in pixels to centimeters based on the number of pixels equivalent to the 8-cm laser scale. Organism densities per square meter (m^{-2}) were calculated by extrapolating from the number of organisms in the image area. From the combination of videographic and still photographic data, we mapped habitat data onto ROV transect tracklines with attributes containing habitat classifications, substrate characteristics and important biological features. Because ROV-based habitat data closely tracked the distribution of bottom types generated by the refined geohazards sidescan and geophysical data, we used these latter to interpolate the boundaries of hard bottom, unconsolidated sediment substrate and large-scale sedimentary features between transect lines. Although we recognized a distinction between low- and high-cover hard-bottom habitats, we mapped all hard-bottom areas between transect lines as a single "higher-cover hard-bottom" habitat (red areas in Figure 5) because the complex patchy mosaic of low- and high-cover could not be interpolated between transect lines. North of the geohazards survey area, where no geophysical data was available, we generated GIS habitat polygons from ROV-based data to approximate the distributions of major habitat types (hatched areas in Figure 5). After analysis of each image, the data were saved into an Excel database for analyses of 1) raw percent composition and 2) percent composition per area for each quantitative photo site. Calculations excluded all points categorized as photo effects (i.e., shadow, laser).

E. Terminology

Seafloor habitats, e.g., hard bottom, soft bottom and live bottom are defined above. In most scientific publications, measurements are reported in metric units. However, in this report, parameters are reported in the units in which they were originally recorded (English or metric). For example, Mile Post units provided by INTEC Engineering are in statute miles and bathymetric charts give depth contours in feet. Distance over bottom was reported by the ROV and ship's crews in nautical miles. The depth readout overlay on the videotape is in feet, so that verbal and written indications of depth throughout field operations are in feet. However, vertical relief of bottom features, e.g., boulder, slab, was reported as low relief (<0.5 m) or moderate relief (0.5-1.0 m). No high-relief features (>1.0 m) were observed. These are relative terms and dependent on the size of features within an area. Estimates of size of benthic organisms and fishes are in centimeters, because the parallel scaling lasers on the ROV used by the observer to estimate size were 8 cm apart.

Conversion Table

1 meter = 3.28 feet	1 inch = 2.54 cm
1 statute mile = 5280 ft or 1609 m	1 nautical mile = 6076 ft or 1852 m
1 knot = 50 cm sec^{-1}	

F. Summary of Survey Protocols

1) An ROV equipped with high-quality video and still cameras surveyed a series of transect lines within and adjacent to the geohazards survey area totaling ~52 nm along the seafloor.
2) Underwater video images were viewed in real time on the support vessel by biologists familiar with the local deep-water fauna; images were collected and stored in digital format for analysis.
3) Series of still photographic images were taken concurrently with the video of hard-bottom assemblages of potential biological interest; photographs were also taken at intervals of soft-bottom habitats and of specific organisms for identification purposes.
4) Field notes and video images were reviewed and summarized to identify habitats and fauna; these summaries were compiled in GIS format and, with refined geohazards survey geophysical data, were used to produce a habitat map.
5) Series of still images were analyzed using Coral Point Count software to determine relative cover of hard versus unconsolidated substrates in eight areas of biological interest.
6) Areas were calculated for the same images and all organisms larger than 3-4 cm were enumerated; the resulting data were combined to produce density measurements of hard-bottom macrofauna in the eight areas of biological interest.

G. QA/QC

Decisions on all habitat identifications and transitions between habitats were finalized by the Principal Investigator following reviews of field transcripts, videotapes and DVDs copied from original videotapes. Identifications of organisms in photographs were made either by the P.I. or by graduate students trained by the P.I. Of the latter, those showing hard-bottom habitats with octocorals and sponges were reviewed by the P.I. for accuracy.

H. Personnel

Charles G. Messing – chief scientist, Nova Southeastern University (NSU)
John K. Reed – scientist, Harbor Branch Oceanographic Institution
Sandra D. Brooke – scientist, Florida Fish and Wildlife Research Institute
Bethany Basten – field assistant, NSU
Jessica Freeman – field assistant, NSU
Kirk Kilfoyle – field assistant, NSU

Brian Walker – GIS analyst, NSU
Vanessa Brinkhuis – photo analyst, NSU
David Portnoy – photo analyst, NSU

I. Itinerary

13 April 06 – Mobilization
14-17 April 06 – Field operations
18 April 06 – De-mobilization

IX. RESULTS

We identified six seafloor habitat categories. Figure 5 (and Appendix map 2) illustrates the distributional pattern of these habitats within the geohazards survey area and in the area to the north examined by ROV transects only. Unconsolidated sediment substrates recorded by video and still photography along ROV transects (lines and points) within the geohazards survey area correlate well with the smooth seafloor regions in the geohazards sidescan map. Similarly, hard-bottom substrates observed along ROV transects correlate well, with few exceptions, with areas of irregular topography in the geohazards sidescan map. As a result, smooth sidescan areas have been interpolated as unconsolidated sediment substrates, and most areas of irregular topography have been mapped as exposed high-cover hard bottoms. Exceptions—chiefly large-scale sedimentary features—are described below. North of the geohazards survey area, habitats have been interpolated as GIS polygons (hatched areas in Figure 5) from the patterns observed along the ROV transects. Although a continuum exists in exposed hard bottom from small bits of rubble <10 cm across isolated on unconsolidated sediment substrates to extensive areas of low- to moderate relief outcrops, boulders, slabs and pavements, we have followed SEAMAP guidelines in distinguishing two hard-bottom habitats based on a combination of the nature and extent of the exposed hard substrates and the associated attached macrofauna.

A. Fauna

1. Soft-bottom fauna

Appendix 1 lists all taxa identified on all substrates. Echinoderms, crustaceans and cnidarians dominate the macrofauna on unconsolidated sediment substrates, although many of the mobile forms also occur on low-relief hard bottoms. The commonest forms were the orange, multi-armed asteroid *Coronaster briareus* (Figure 6B), small galatheid crustaceans (squat lobsters) (Figure 6G), and a sea anemone tentatively identified as *Actinauge longicornis* (Figure 6A). This species lives on sediment substrates by surrounding a bolus of mud with its pedal disk; it also clings to hard substrates and is particularly common on scattered low-relief rubble and small outcrop exposures. Several unidentified species of burrowing anemones (Ceriantharia) were also observed but were never as common as recorded in the previous benthic video survey along the pipeline route to the west of the geohazards survey area (Messing et al. 2003). Chiefly isolated individuals of an unidentified pennatulid up to ~0.5 m tall were observed along the eastern portions of several transects at depths >900 ft (Figure 6F). A cidaroid urchin (?*Cidaris rugosa*) is common and widespread below 750 ft (Figure 6C), and ophiuroids were locally abundant ~~chiefly~~ below 850 ft (Figure 7D), with scattered individuals as shallow as 705 ft. Other echinoderms included several sea stars (probably including *Sclerasterias* sp. and *Astropecten* sp.) and the urchin *Echinus affinis* (Figure 6D). The small (<5 cm) symmetrical hermit crab *Pylocheles* sp. was sometimes common in deeper water (Figure 7A), and isolated typical paguroid hermit crabs were also occasionally observed. Widespread larger decapod crustaceans included the crabs *Bathynectes longispina* (Portunidae) (Figure 6E), *Cancer borealis* (Cancridae) and *Rochinia crassa* (Majidae).

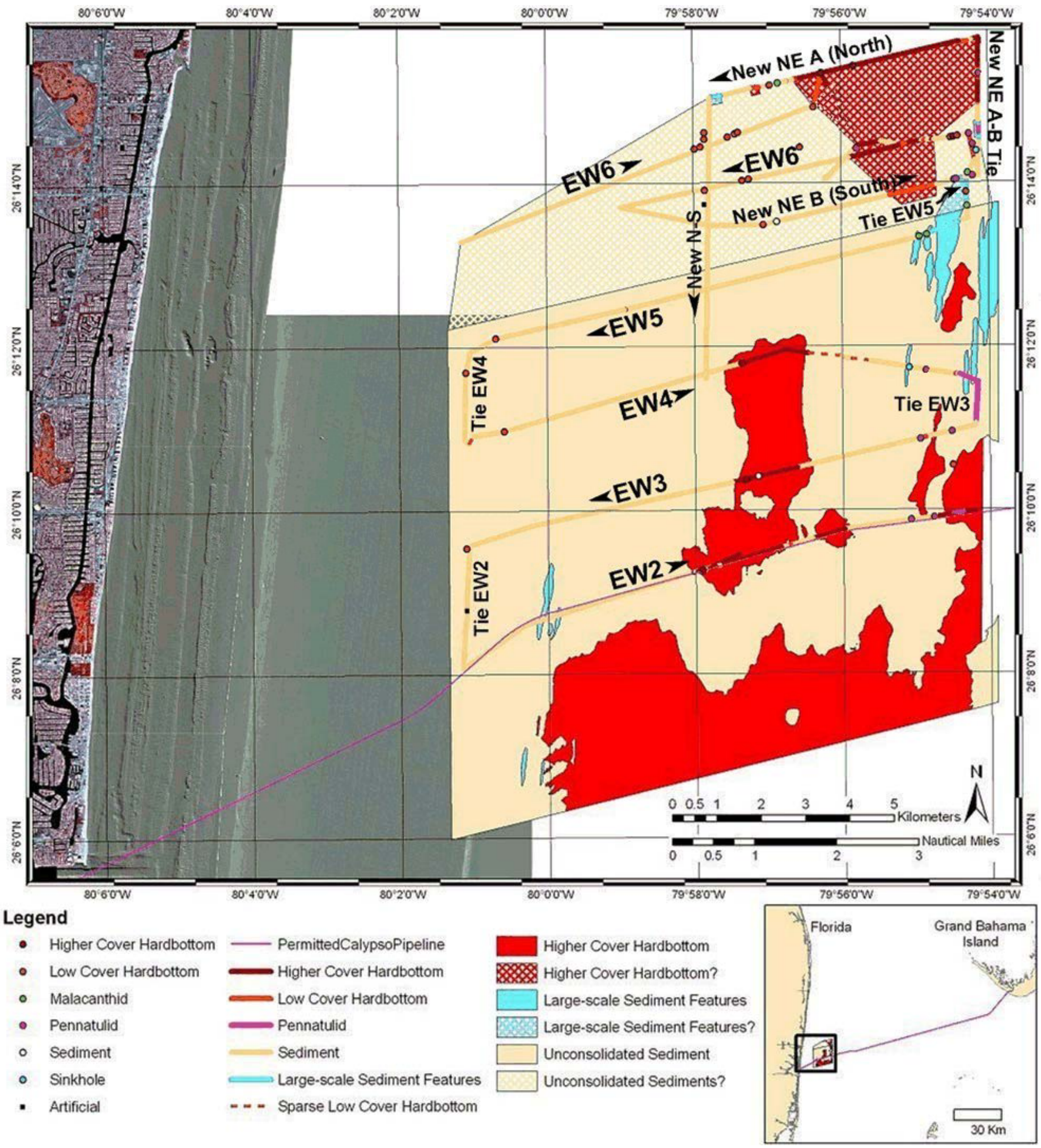

Figure 5. Benthic habitat map based on a combination of the benthic video survey along transect lines and refined sidescan data from the geohazards survey. Hatched GIS habitat polygons represent interpolations between transect lines north of the geohazards survey area. Arrowhead indicate the direction in which major transects were run. Transect EW6 was split due to sea conditions with the western half run west to east and the eastern half run east to west. Appendix 2 shows a larger version.

Flat sediment substrates were characterized by often dense populations of what appear to be numerous small slightly projecting tubes (perhaps sabellid polychaetes, which have been trawled in this general area)—described as "textured" in Messing et al. (2003). In the deeper, eastern portion of the study area, flat bottoms supported populations of unidentified "tufts"—either 1-2-cm bushy growths or 1-3-cm tall stalks with a cluster of fine radiating filaments that arise from the upper half of the stalk (Figure 7D, E). These organisms might represent worm tubes with epifauna or, perhaps, agglutinating foraminiferans, bryozoans or hydroids.

Fishes included the blind torpedo *Benthobatis marcida* (Narcinidae) (Figure 7B), Gulf Stream flounder *Citharichthys arctifrons* (Paralichthyidae) (Figure 7C), unidentified scorpionfishes (Scorpaenidae), at least one specie of skate (Rajidae), an armored searobin *Peristedion* sp. (Peristediidae), blueline tilefish *Caulolatilus microps* (chiefly burrows) (Malacanthidae), and a variety of small eels and small unidentified fishes (<8 cm long)(the latter possibly including shortnose greeneye, *Chlorophthalmus agassizi* [Chlorophthalmidae]). Two unidentified groupers were observed in the side cameras over open sediment, and one great northern tilefish *Lopholatilus chamaeleonticeps* (Malacanthidae) was observed adjacent to its burrow.

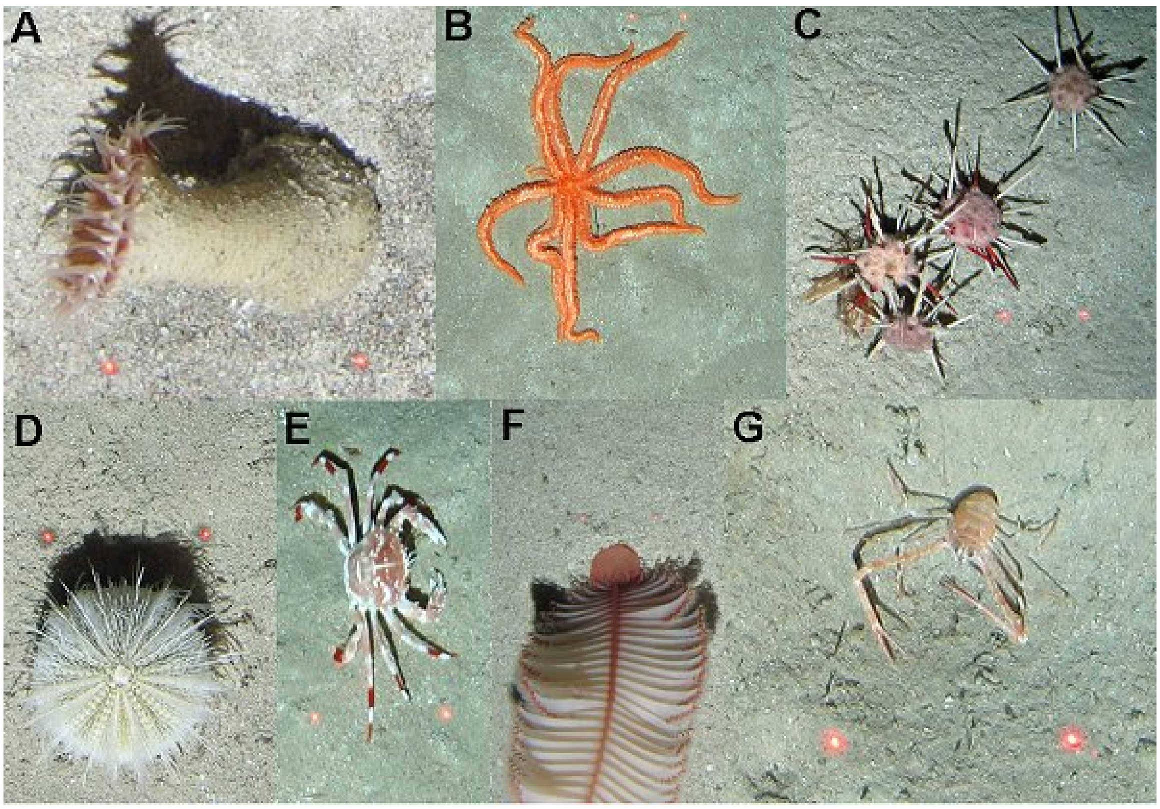

Figure 6. Representative macrofauna on sediment substrates. A.sea anemone ?*Actinauge longicornis* (Actiniaria), B. seastar *Coronaster briareus* (Asteroidea), C. pencil urchin ?*Cidaris rugosa* (Echinoidea), D. sea urchin *Echinus affinis* (Echinoidea), E. swimming crab *Bathynectes longispina* (Decapoda Brachyura), F. unidentified sea pen (Octocorallia Pennatulacea), G. galatheid squat lobster ?*Munida* sp. (Decapoda Anomura). Laser points are 8 cm apart; some have been relocated within the image to lie adjacent to the organism.

2. Hard-bottom fauna

A variety of sponges, including both hexactinellid glass sponges and demosponges, and cnidarians dominated the sessile fauna on hard substrates. Hexactinellids included *Aphrocallistes* sp. (Figure 8A), *Farrea* sp. (Figure 8D) and unidentified species. Demosponges included the fan sponge *Phakellia* sp. (Axinellidae), lithistid cup sponges (e.g., *Corallistes* sp.) (Figure 8F) and unidentified representatives of the families Pachastrellidae, Geodiidae and Petrosiidae (Figure 8F).

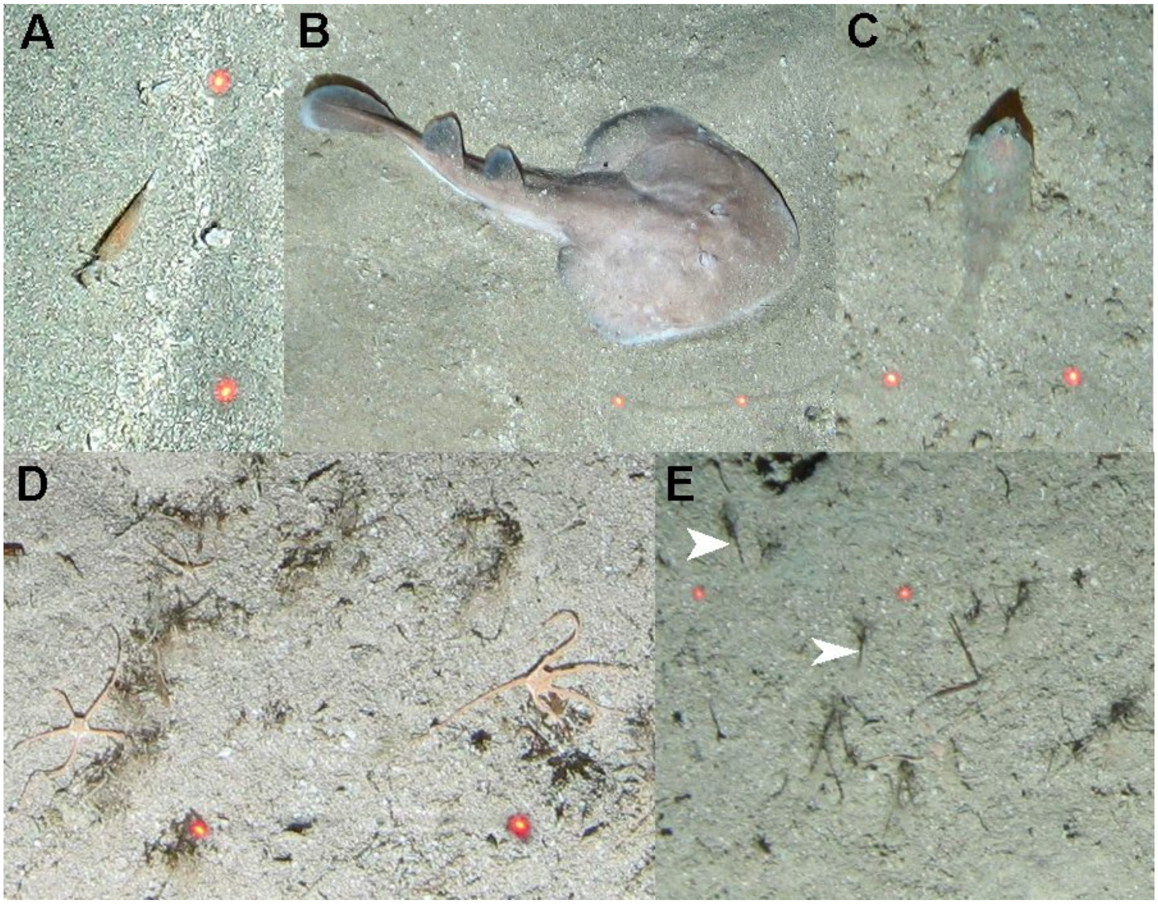

Figure 7. Additional representative macrofauna on sediment substrates. A. symmetrical hermit crab ?*Pylocheles* sp. (Decapoda Anomura), B. blind torpedo *Benthobatis marcida* (Chordata), C. Gulf Stream flounder *Citharichthys arctifrons* (Chordata), D. unidentified brittlestars (Ophiuroidea) with unidentified bushy “tufts,” E. unidentified stalked “tufts.”

A large pale pyriform geodiid was consistently the most massive sessile organism encountered (Figure 8C). Hydrozoan cnidarians were represented by a variety of small bushy or pinnate, chiefly thecate hydroids (Figure 8G) and a few small lace corals (Stylasteridae). Anthozoans included Actiniaria (sea anemones), Zoanthidea (zoanthids, colonial anemones), Antipatharia (black corals) and Octocorallia (soft corals, gorgonians, sea pens). The only stony corals observed were small solitary azooxanthellate cup corals (≤2 cm) (except for two small branching colonies on the fuselage of a sunken airplane). As noted above, the anemone ?*Actinauge longicornis* was particularly common on scattered low-relief rubble and small outcrop exposures (Figure 8H). In addition to ?*A. longicornis*, we observed the Venus flytrap anemone (Hormathiidae) (Figure 8D) and several unidentified taxa (e.g., white with a pink mouth, large pale with white clavate tentacle tips, large orange) (Figure 8D, F, G), which were common to abundant on high-cover hard substrates.

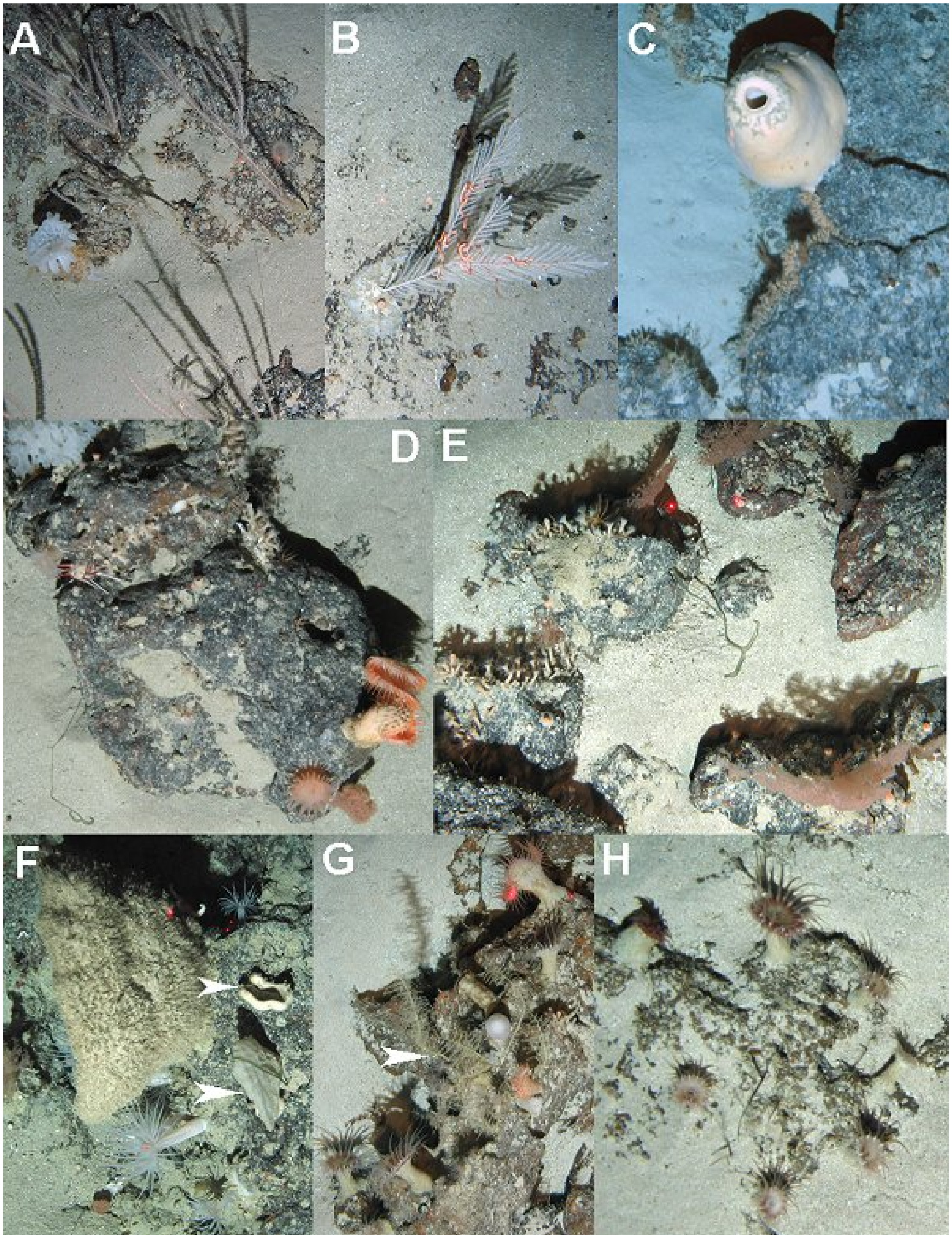

Figure 8. Representative hard-bottom invertebrates. A. bamboo corals *Isidella* sp. (Isididae) and glass sponge *Aphrocallistes* sp. (Hexactinellida), B. *Callogorgia americana* (Primnoidae) with asteroschematid ophiuroid, C. unidentified sponge (Geodiidae) and zoanthids, D. Venus flytrap anemone (Hormathiidae)(pair at lower right), glass sponge *Farrea* sp. (Hexactinellida) (top left), unidentified orange anemone and zoanthids, E. soft corals ?*Capnella nigra* (Nephtheidae)(lower right, top center), spoon worm (Echiura)(center) and zoanthids, F. lithistid cup sponge *Corallistes* sp. (top arrow), fan sponge *Phakellia* sp. (lower arrow) (Demospongiae), plate sponge (Pachastrellidae) (top left) and pink-mouthed anemones, G. unidentified hydroids (arrow) and anemones, H. anemones ?*Actinauge longicornis.*

Zoanthids included at least one species that formed thin encrusting sheets (to ~30 cm long) with projecting polyps, chiefly along edges of rocks and slabs (Figure 8E). Antipatharians were generally not common and most have not been identified. Field notes initially misidentified hydroids as antipatharians in some cases due to similar pinnate branching patterns of some taxa in both groups. A few spiral whip colonies of *Stichopathes luetkeni* were observed. Among octocorals, a small soft coral, probably *Capnella nigra*, was widespread on a variety of hard substrates (Figure 8E), including sediment-veneered pavement, scattered low-relief rubble, and larger irregular outcrops, blocks, slabs and pavements. The gorgonian fauna was dominated by a bamboo coral (Isididae, probably *Isidella* sp.)(Figure 8A) and a tall white sea plume (Primnoidae, probably *Callogorgia americana*) (Figure 8B). Colonies of these two organisms sometimes exceeded 50 cm in height and were typically the two tallest organisms encountered on hard substrates. Smaller fans belonging to the Paramuriceidae were uncommon. A species of spoon worm (Echiura, probably Bonellidae) often occurred in abundance, with its sausage-shaped body hidden below the seafloor, perhaps in a rock crevice, and its slender elongated Y-tipped greenish proboscis (up to ~1 m in length) along the sediment (Figure 8E).

Among the more mobile organisms, echinoderms included sea urchins and asteroids (other than *Coronaster briareus*) also found on sediment, abundant small reddish ophiuroids and a small psolid sea cucumber (Holothuroidea). Mollusks included occasional trochid gastropods (*Calliostoma* sp.) and chitons. Though not directly associated with hard substrates, antedonid crinoids (feather stars) and euryalous ophiuroids (snake stars, probably *Asteroschema* sp.) were observed clinging among branches of isidid and primnoid octocorals (Figure 8B).

The commonest fish typically associated with hard substrates was the blacktail codling *Laemonema melanurum* (Moridae) (Figure 9B). Others included an unidentified anthiine similar to the streamer bass *Hemanthias aureorubens* (Serranidae) (Figure 9C), blackbelly rosefish *Helicolenus dactylopterus* (Sebastidae) (Figure 9A), unidentified scorpionfishes (Figure 9D) and two larger fishes (30-60 cm)—one possibly a snowy grouper *Epinephelus niveatus* (Serranidae)—seen only in side cameras. *H.dactylopterus*, other scorpaenids, some small serranids and hakes (Phycidae) were seen in association with artificial substrates (airplane and boat wrecks).

B. Habitat categories

1. Sediment substrates – Unconsolidated mud or sand substrates. Most of the seafloor observed along the ROV transects (tan lines in Figure 5) consisted of obsolete (inactive) rippled muddy sand (Figure 10A) alternating with areas of flat bioturbated sediment characterized by scattered small low mounds, depressions and small tubes or tufts (Figure 10B), described above. In many areas, the rippled sediment formed low "platforms" elevated ~10-30 cm above flat bioturbated areas. This substrate correlates well with the smooth areas of the sidescan map (pale tan areas), described in the geohazards survey as low-reflectivity sandy bottom covered by a variety of sediment bedforms including mega-ripples, 3-dimensional sand waves, comet marks and sand ribbons. To the north of the geohazards survey area, sediment substrates observed along ROV transect lines have been extrapolated as unconsolidated sediment polygons. Orange dots in the habitat map each represent an individual bit of rubble, small rock (chiefly <30 cm across) or small (<1 m^2) low-relief patch of exposed hard bottom isolated on otherwise unconsolidated sediment substrates. Such islets of hard substrate are either barren of macrofauna or support small hydroid colonies or a species of sea anemone (?*Actinauge longicornis*) that also commonly anchors on unconsolidated substrates by surrounding a bolus of sediment with its pedal disk. None of these isolated hard substrates were large or extensive enough to qualify as hard-bottom habitat under agency guidelines.

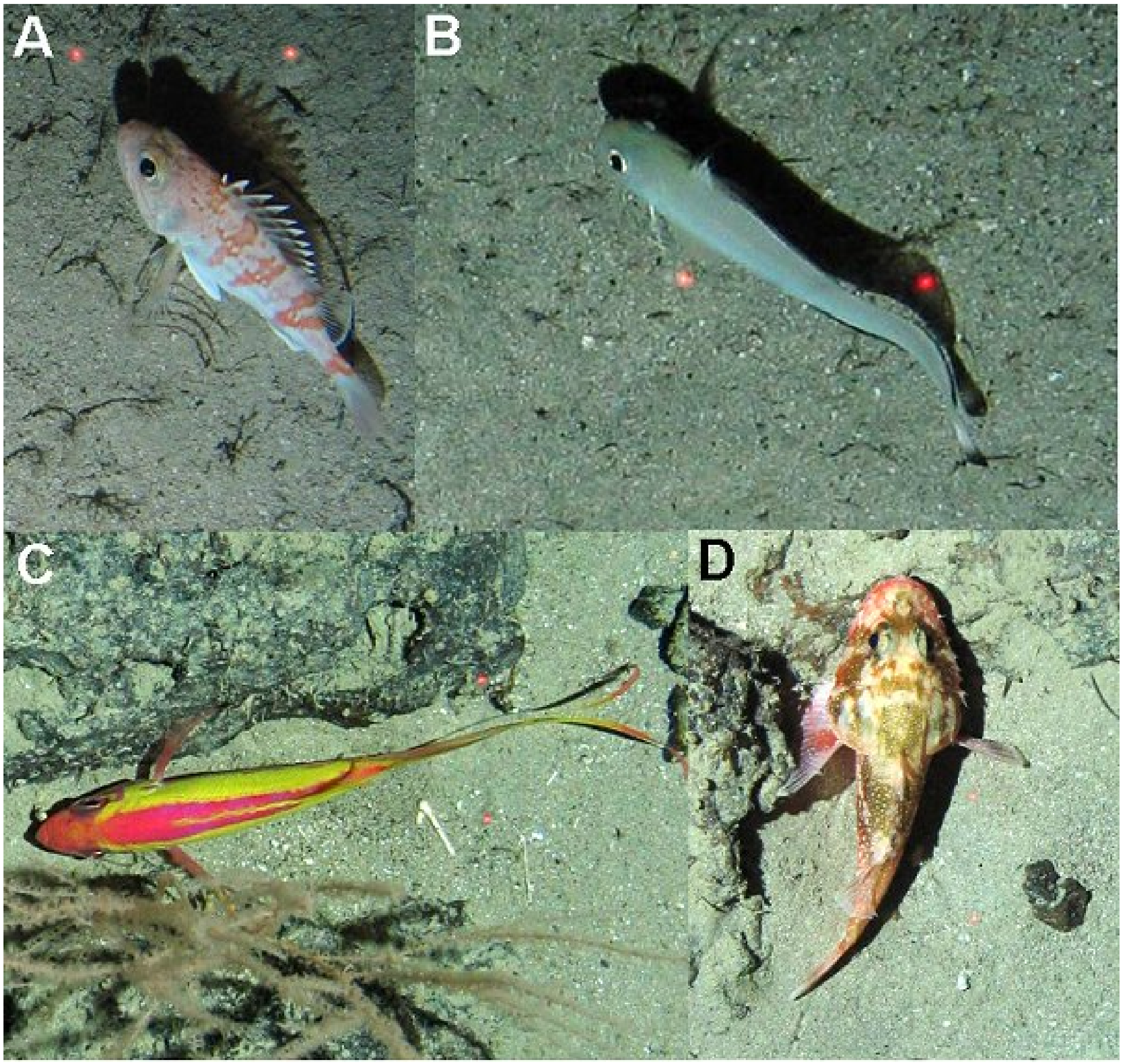

Figure 9. Fishes chiefly associated with hard-bottom substrates. A. blackbelly rosefish *Helicolenus dactylopterus* (Sebastidae), B. blacktailed lingcod *Laemonema melanurum* (Moridae), C. unidentified anthiine (Serranidae), D. unidentified scorpionfish (Scorpaenidae).

2. Large-scale sediment features – In the initial geohazards sidescan map, a few areas that appeared as irregular topography and were considered as possible hard substrate proved, in the refined geohazards data, to be areas of marine sands with complex sediment bedform patterns—large sand waves and conical erosional pits—and evidence of significant localized erosions (blue in Figure 5). ROV observations referred to often circular depressions ~6-30 m across with 20-30º slopes and vertical relief of up to 8 m. The majority lacked any exposure of hard substrates. However, depression slopes and floors in some cases revealed discontinuous areas of white, apparently consolidated clayey material and, rarely, rubble or a few larger rocks. Attached macrofauna were absent or limited to anemones that also occurred on sediment. The small narrow blue areas in the southwestern quadrant have been mapped as this habitat based on geohazards data. However, video observations transitting this habitat along transect EW2 (the pipeline route) revealed no features distinguishing it from the surrounding sediments.

3. Tilefish burrows – We observed about 7 burrows apparently excavated by the blueline tilefish, *Caulolatilus microps* (green dots in figure 5 and Appendix 2). Most were associated with the slopes of some of the large depressions in the northeastern quadrant of the survey area. We also observed a single great northern tilefish (*Lopholatilus chamaeleonticeps*) at its burrow.

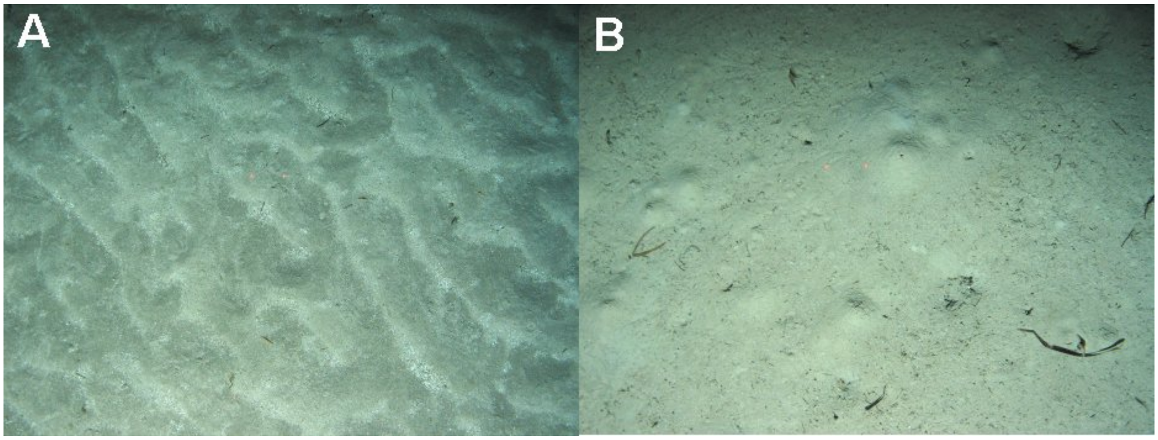

Figure 10. Representative unconsolidated sediment substrates. A. Obsolete rippled sediment, B. Flat textured bioturbated sediment.

4. Pennatulids – Observations of one or a few individuals (Figure 6F) have been mapped as purple dots in Figure 5. Most of Tie EW3 and the eastern end of EW4 have been mapped as continuous pennatulid habitat (purple line) to reflect the repeated appearance of these organisms. However, individuals were typically widely scattered with a maximum of two visible in the same video frame only once. Almost all specimens were observed in 930 ft or greater, with single records in 890 (possibly a different species) and 919 ft. We have not delineated a pennatulid habitat polygon because of their absence from the expected depth range along EW5 and EW6 and their restriction to the extreme east end of EW3.

5. Low-cover hard bottom – This habitat consisted of scattered clusters of rubble (to ~10 cm) or small rocks (chiefly to 30 cm), often in patches a few meters across, rarely in more extensive fields, and separated by expanses of sediment, occasionally accompanied by a few low-relief rocks up to 0.8 m across and rare veneered slabs or pavements to 1 m across (Figure 11A, C, E). Isolated individual bits of rubble or small rocks have been mapped as dots on otherwise unconsolidated sediments. In most cases, this substrate supports a low-richness fauna of anemones, zoanthids, nephtheid soft corals (probably *Capnella* sp.) and hydroids. A few areas supporting greater and more complex macrofaunal richness, e.g., isidid or primnoid octocorals and sponges, have been treated as high-cover hard bottom (see below) despite the relatively sparse available hard bottom. We have mapped no polygons encompassing this habitat because almost all fall as isolated occurrences on unconsolidated substrates or in patchy association with high-cover hard bottoms. A few transect sections mapped as dashed orange and tan lines in Figure 5 (e.g., part of EW4) represent exposures of low-cover hard bottom too abundant to map as individual points but too widely separated by areas of sediment to map as continuous hard bottom.

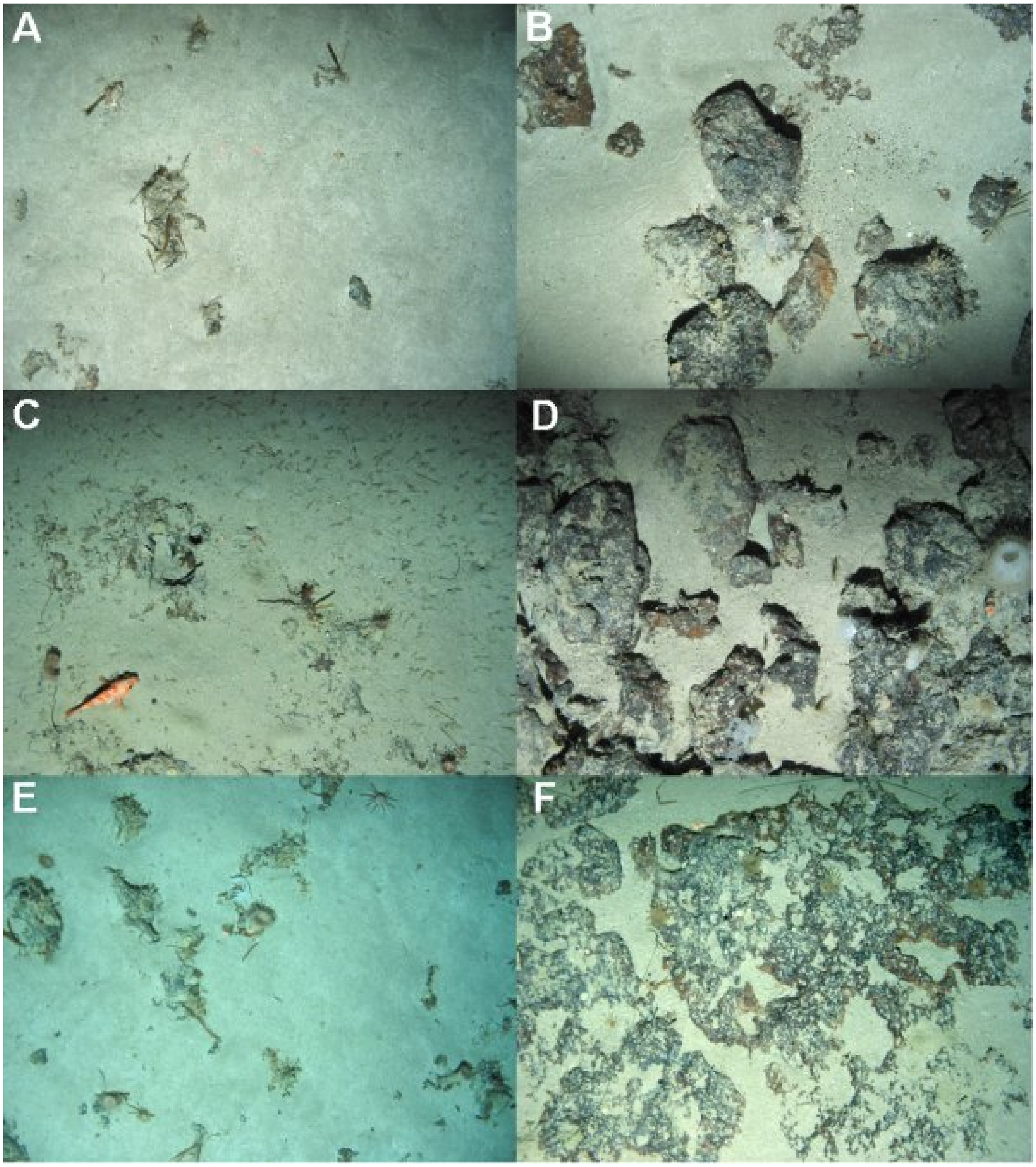

Figure 11. Representative low-cover (A, C, E) and high-cover (B, D, F) hard-bottom substrates.

6. High-cover hard bottom – This habitat consisted of low- to moderate-relief hard bottom characterized by phosphoritic limestone outcrops, pavement and slabs, each chiefly <2 m across (rarely to 3 m), with varying amounts of rubble and small to large rocks, frequently in patches separated by expanses of sediment and intermixed with low-cover hard-bottom areas of scattered rubble, small rocks and outcrops (Figure 11B, D, F). With the exceptions noted above, we have mapped all hard bottom identified in the geohazards survey as high-cover (red areas) because of the irregular, complex, often small-scale patchy variations in the distribution of low- versus high-cover habitats. The geohazards survey describes the irregular topography in the sidescan map as paleo-carbonate outcrops and phosphoritic gravel-boulder lag deposits interspersed

with a discontinuous sand veneer. The sand veneer observed as unconsolidated rippled or flat bioturbated sediment between or surrounding exposures is almost entirely too thick to support attached macrofauna.

C. Transect Habitat Summary

This section summarizes habitats observed along the ROV transects. Latitudes and longitudes are those used to map points at which habitats change in Figure 5, or to identify point locations of, for example, pennatulids, tilefish burrows or small isolated occurrences of hard bottom. With the exceptions of the most common benthic invertebrates (i.e., the asteroid *Coronaster briareus*, cidaroid echinoids, ophiuroids and galatheid crustaceans) and tilefish, mobile macrofaunal invertebrates (e.g., crabs) and fishes have not been included in the habitat summary, because the majority occur as widely scattered individuals throughout the survey area. Although small (<8-cm-long) unidentified fishes did tend to occur in larger numbers on hard bottoms, we did not quantify this tendency and observed only a handful of concentrations in which multiple individuals were visible in a single field of view.

<u>1. EW6 – West to East</u>
26º 13.292'N 80º 01.161'W to 26º 14.944'N, 79º 56.365'W, depth range 618-865 ft
From 618 to 667 ft, the substrate is flat bioturbated sediment (scattered small low mounds and depressions) with numerous small tubes. Obsolete rippled muddy sand appears in 667 ft and alternates with flat areas of bioturbated textured sediment to 865 ft. In some areas, the rippled sediment forms low waves elevated up to ~15 cm above the flat bioturbated areas. A few isolated small bits of rubble and a few small low-relief outcrops appear below ~800 ft. Dominant organisms on sediment are *Coronaster briareus*, cerianthid anemones,?*Actinauge longicornis* and galatheids. The first cidaroid appeared in 853 ft.

26º 14.603'N, 79º 57.438'W; depth 842 ft.
Excavation with a large (~0.8-m long) fish, probably a great northern tilefish, *Lopholatilus chamaeleonticeps*.

26º 14.944'N, 79º 56.365'W to 26º 14.524'N, 79º 54.735'W; depth range 845-896 ft
Substrates range from areas of widely scattered rubble (8-10 cm) to crowded chiefly low-relief outcrops, small to large rocks and rubble, separated by expanses of obsolete rippled sediment and flat bioturbated sediment as above. Some flat sediment areas support numerous fine (1-2-cm) tufts. One pennatulid was seen. We observed low- to moderate-relief phosphoritic outcrops, slabs and pavement to >1 m across at one locality (26º 14.458'N, 79º 55.215'W). Hard-substrate organisms include demosponges (e.g., *Phakellia* sp., Pachastrellidae), *A. longicornis*, Venus flytrap anemone (Hormathiidae), echiurans, Isididae (probably *Isidella* sp.), Nephtheidae, (?*Capnella nigra*) and unidentified gorgonians.

26º 14.524'N, 79º 54.735'W to 26º 14.548'N, 79º 54.518'W; depth range 895-900 ft
Obsolete rippled sediment alternating with weakly bioturbated sediment with small tubes. Dominant organisms are cidaroids and sometimes numerous active small ophiuroids.

26º 14.548'N, 79º 54.518'W to 26º 14.590'N, 79º 54.268'W; depth range 898-910 ft
The same unconsolidated sediment bottoms as above, including elevated low sand waves with obsolete rippled sediment, but with occasional scattered low-relief rocks, outcrops, a 1-m slab, an isolated 0.5-m boulder, and, at 26º 14.556'N, 79º 54.479, an isolated cluster of low boulders to 0.6 m across, <0.3 m high. Dominant organisms are cidaroids and ophiuroids, with some ?*Capnella nigra* on the one isolated cluster of low boulders. One pennatulid was observed (26º 14.590'N, 79º 54.268'W).

2. EW6 – East to West, Repeated portion of transect

26º 14.475'N, 79º 55.130'W to 26º 14.303'N, 79º 55.894'W; depth range 851-865 m
Rubble in rippled sediment becomes more crowded, with larger rocks 20-50 cm across, low pavement and slabs to 1.8 m across alternating with rippled sediment with sparse rubble and isolated rocks. Dominant fauna varies from sparse to numerous and includes sponges (*Phakellia* sp., *Aphrocallistes* sp., Pachastrellidae), numerous anemones, ?*Capnella nigra*, Isididae and occasional antipatharians up to 80 cm.

26º 14.303'N, 79º 55.894'W to 26º 13.712'N 79º 58.991'W; depth range 867-766 ft
Flat bioturbated sediment alternates with fine tubes and elevated obsolete rippled sediment. Hard substrates consist of a single 30-cm rock with an anemone, and an isolated flat barren outcrop ~0.75 m across. Dominant organisms include *C. briareus*, ?*A. longicornis*, galatheids, cidaroids and ophiuroids. The last cidaroid was seen in 860 ft.

3. Tie EW5 – North to South

26º 14.590'N, 79º 54.268'W to 26º 14.276'N, 79º 54.189'W; depth range 912-928 ft.
Obsolete rippled sediment alternates with flat sediment with small polychaete tubes. Hard substrates consist of ~5 very widely scattered small flat outcrops or small rocks <30 cm across. Dominant organisms include ?*A. longicornis*, ?*Capnella nigra* and cidaroids. Three pennatulids were observed at 26º 14.465'N, 79º 54.214'W in 928 ft.

26º 14.386'N, 79º 54.165'W; depth 927 ft.
Depression, ~8 ft vertical relief, diameter ~30 ft estimated from sonar. No hard substrates visible.

26º 14.276'N, 79º 54.189'W to 26º 14.069'N, 79º 54.300'W; depth range 927-934 ft
Alternating obsolete rippled sediment and flat sediment with one cluster of a few small 20-cm rocks and, at 26º 14.276'N, 79º 54.189'W, a cluster of rocks, flat slabs and low outcrops to 1.3 m across with many small fish. Hard substrates have anemones, ?*Capnella nigra* and cidaroids.

26º 14.113'N, 79º 54.285'W; depth 934 ft
Obsolete rippled sediment with a possible *Caulolatilus* tilefish (in side camera) and a cluster of anemones.

26º 14.069'N, 79º 54.300'W to 26º 13.708'N, 79º 54.297'W; depth range 927-948 ft
Series of large circular depressions ~30-100 ft across with sharp rims and 20-30° slopes; maximum vertical relief 930-948 ft; chiefly obsolete rippled sediment with areas of flat sediment with fine tubes; flat white outcrop or consolidated clayey sediment on floor of one depression. Organisms include clusters of anemones and a cerianthid.

26º 13.708'N, 79º 54.297'W to 26º 13.557'N, 79º 54.294'W; depth range 927-932 ft.
Alternating obsolete rippled and flat sediment with tubes. Organisms include ophiuroids and an asteroid. A possible tilefish burrow is visible in one side camera.

4. EW5 – East to West

26º 13.557'N, 79º 54.294'W to 26º 13.513'N, 79º 54.420'W; depth 927 ft
Obsolete rippled sediment.

26º 13.513’N, 79º 54.420’W to 26º 13.325’N, 79º 54.998’W; depth range 914-941 ft
Alternating obsolete rippled and flat sediment with tubes and some burrows. Large depressions with some exposed consolidated clay or barren white limestone in slopes; 20-40 ft across with a maximum vertical relief of 914-941 ft. Organisms on sediment include cidaroids and asteroids.

26º 13.359’N, 79º 54.846’W to 26º 13.336’N, 79º 54.950’W; depth range 914-941 ft
Two *Caulolatilus* tilefish burrows in slopes of depression.

26º 13.325’N, 79º 54.998’W to 26º 11.974’N, 80º 00.984’W; depth range 908-663 ft
Obsolete rippled sediment alternating with flat textured sediment with small tubes and weak bioturbation; a few isolated bits of rubble with no attached fauna; long low sand waves noted in 793-771 ft. Dominant organisms from 905-815 ft include *C. briareus*, asteroids, ophiuroids, cerianthids and galatheids. Shallower than this, the asteroids and ophiuroids disappear and are replaced by ?*A. longicornis*, which becomes more abundant toward the end of the transect.

<u>5. Tie EW4 – North to South</u>
26º 11.974’N, 80º 00.984’W to 26º 10.885’N, 80º 01.124’W; depth range 670-654 ft
Chiefly weakly bioturbated sediment with small cones and depressions. Hard substrates consist of a few isolated clusters of small bits of rubble <8 cm, and one 15-cm rock with anemones or hydroids. Dominant organisms on sediment are *C. briareus*, ?*A. longicornis*, cerianthids and galatheids.

<u>6. EW4 – West to East</u>
26º 10.885’N, 80º 01.124’W to 26º 10.823’N, 80º 01.065’W; depth range 665-670 ft
Sparsely bioturbated sediment.

26º 10.823’N, 80º 01.065’W to 26º 10.920’N, 80º 01.809’W; depth range 670-681 ft
Sparsely bioturbated sediment with isolated clusters or individual pieces of small low-relief rubble chiefly <10 cm, rarely to 20 cm and a single cluster of low-relief rocks & slabs ~ 3 m across with hydroids and anemones. *C. briareus* and galatheids are the commonest organisms on the sediment.

26º 10.920’N, 80º 01.809’W to 26º 11.801’N, 79º 57.360’W; depth range 699-829 ft
Flat, sparsely bioturbated sediment alternating with patches of rippled sediment. Dominant organisms are *C. briareus*, galatheids and ?*A. longicornis*.

26º 11.801’N, 79º 57.360’W to 26º 11.916’N, 79º 56.463’W, depth range 826-880 ft
Areas or clusters of low-relief tan to brown rubble, rocks, boulders, and veneered slabs; pavements to 2 m across separated by expanses of chiefly flat sediment with small tubes. Fauna includes the hexactinellid sponge *Aphrocallistes* sp., *Phakellia* sp., lithistid, pachastrellid and geodiid demosponges; isidid, primnoid (*Callogorgia americana*) and nephtheid (?*Capnella nigra*) octocorals, hydroids, anemones and echiurans. Organisms on sediment include *C. briareus* and cidaroids.

26º 11.916’N, 79º 56.463’W to 26º 11.819, 79º 55.619’W; depth range 883-934 ft.
Flat or rippled sediment with isolated clusters or individual small rocks and rubble, chiefly <20 cm, with an occasional rock or isolated flat slab to ~1 m. Organisms are chiefly anemones, ?*C. nigra*, echiurans and cidaroids, with a few small gorgonians and a sponge at one site.

26º 11.819'N, 79º 55.619'W to 26º 11.652'N, 79º 54.461'W; depth range 936-950 ft
Flat, sparsely bioturbated sediment with some areas of obsolete ripples. Organisms include anemones (including one on a single isolated bit of rubble) and abundant ophiuroids. Two organisms described as 50-cm-tall octocorals most likely represent pennatulids.

26º 11.738'N, 79º 55.099'W; depth range 943-954 ft
A large depression with tiny rocks and a few rocks up to 1 m across; maximum vertical relief 15 ft. Organisms are cidaroids and anemones.

26º 11.738'N, 79º 55.099'W to 26º 11.652'N, 79º 54.461'W, depth range 943-950 ft
Flat sediment with sparse bioturbation, few ripples. Organisms are ophiuroids, anemones, cidaroids. Two pennatulids 20 and 50 cm tall were observed on the sediment (only one visible on tape) at 26º 11.717'N, 79º 54.952'W in 943 ft.

26º 11.652'N, 79º 54.461'W to 26º 11.651'N, 79º 54.412'W; depth range 950-952 ft
A few isolated small rocks (5-30 cm) and few clusters of small rocks and low veneered slabs (to 0.75 m) with numerous ?*A. longicornis* and a flytrap anemone. ?*A. longicornis* was also observed on sediment; ophiuroids were less abundant than earlier.

26º 11.651'N, 79º 54.412'W to 26º 11.538'N, 79º 54.163'W; depth range 950-952 ft
Alternating slightly elevated sand waves with obsolete rippled sediment and flat areas of sediment with small tubes. Organisms include abundant ?*A. longicornis* on sediment, from 2-3 to 12 m^{-2} (with one on a single isolated rock); also galatheids and several pennatulids—up to 2 in one field of view, otherwise widely isolated; some were visible in the side-looking camera.

<u>7. Tie EW3 – North to South</u>
26º 11.555'N, 79º 54.166'W to 26º 11.052'N, 79º 54.194'W; depth range 952-959 ft.
Flat sediment with little bioturbation, some rippled sand waves. Organisms include numerous ?*A. longicornis*, up to 6-7 m^{-2}, and cidaroids. A total of 18 pennatulids were noted along this transect over a period of 33 min.

26º 11.052'N, 79º 54.194'W to 26º 11.019'N, 79º 54.216'W; depth range 963-964 ft
Sediment with a cidaroid to end of transect.

<u>8. EW3 – East to West</u>
26º 11.019'N, 79º 54.216'W to 26º 10.884'N, 79º 54.876'W; depth range 963-966 ft
Alternating flat and rippled sediment; occasional bioturbation with a possible veneered hardground in one area. Dominant organisms are anemones, cidaroids, ophiuroids, galatheids and, in one area, pennatulids (26º 10.957'N, 79º 54.521'W).

26º 10.884'N, 79º 54.876'W to 26º 10.871'N, 79º 54.932'W; depth range 966-968 ft
Scattered clusters of low-relief rocks and slabs a few meters across separated by expanses of sediment; rocks up to 0.8 m across & pavement 1.5 m across; mostly barren with little fauna. Organisms consist of a few anemones, a flytrap anemone, echiurans and cidaroids.

26º 10.871'N, 79º 54.932'W to 26º 10.544'N, 79º 54.508'W; depth range 963-896 ft

Alternating obsolete rippled sediment and flat, firm, textured (with tiny tufts, worm tubes) bioturbated (small mounds and depressions) sediment. Organisms include galatheids, asteroids, a few *C. briareus* and patches of abundant ophiuroids. Anemones were absent from much of this segment. One pennatulid was seen in a side camera (26º 10.867'N, 79º 54.948'W).

26º 10.544'N, 79º 54.508'W to 26º 10.521'N, 79º 56.617'W; depth range 896-889 ft.
Chiefly rippled sediment with a few scattered rocks, slabs and low-relief hard bottom with anemones.

26º 10.521'N, 79º 56.617'W to 26º 10.337'N, 79º 57.500'W; depth range 871 [initial depth not recorded; probably 889 ft] to 856 ft.
Low-relief rocky outcrops, scattered rocks & rubble, rubble fields, slabs up to 2 ft across and sediment-veneered pavements, separated by expanses of flat sediment with tiny tufts. Hard-bottom organisms include sponges (e.g., Pachastrellidae, Geodiidae, lithistids, *Phakellia* sp., cup sponges), octocorals (e.g., Isididae, Primnoidae, other unidentified gorgonians, and ?*C. nigra*), numerous anemones, flytrap anemone, an antipatharian, echiurans, cidaroids and asteroids.

26º 10.337'N, 79º 57.500'W to 26º 09.583'N, 80º 01.061'W; depth range 867-701 ft.
Sparsely bioturbated sediment with small tubes alternating with obsolete rippled sediment. Organisms include a few anemones, cerianthids, *C. briareus*, ophiuroids and galatheids.

26º 09.821'N, 80º 00.218'W; depth 734 ft.
The ship and ROV diverted from the transect to investigate a sonar return that proved to be a single engine (Grumman?) Avenger FT-87 with *Swiftia* sp. and other unidentified gorgonians, hydroids, flytrap anemone and two small branching coral colonies (noted as *Lophelia* on transcript, but depth probably too shallow).

9. Tie EW2 – North to South
26º 09.583'N, 80º 01.061 to 26º 08.606'N, 80º 00.309'W; depth range 701-752 ft.
Sparsely bioturbated sediment with mounds, depressions and clusters of small tubes; some debris with hydroids and a small cluster of <10-cm rubble (26º 09.547'N, 80º 01.104'W) in 692 ft; a small sailboat in 681 ft (26º 08.800'N, 80º 01.105'W) with numerous anemones on the adjacent substrate and anemones including some hormathiids on its hull. Several fishes around the wreck adjacent to the substrate were tentatively identified as tilefish but are most likely phycid hakes. Blackbelly rosefish (*Heliconlenus dactylopterus*) and some small serranids were also observed.

10. EW2 – West to East (Western portion)
26º 08.606'N, 80º 00.309'W to 26º 09.243'N, 79º 58.035'W; depth range 752-840 ft.
Flat bioturbated sediment (mounds, burrows) with small tubes and fine tufts alternating with raised areas of obsolete rippled sediment. Common macrofauna include *C. briareus*, ophiuroids and galatheids; cidaroid urchins appeared at 768 ft.

26º 09.243'N, 79º 58.035'W to 26º 09.462'N, 79º 57.414'W; depth range 840-847 ft.
Abundant to scattered 10-20-cm rubble, small and large rocks (rarely to 1 m), low-relief slabs and irregular outcrops separated by expanses of sediment. Hard-bottom organisms include sponges (e.g., *Aphrocallistes* sp., *Phakellia* sp.), hydroids, octocorals (Nephtheidae, Primnoidae, Isididae), anemones and echiurans. Organisms on sediment substrates include *Coronaster briareus* and at least one other asteroid species (perhaps *Sclerasterias* sp.). The transect was halted and the ROV lifted off bottom at 26º 09.462'N, 79º

57.414’W to proceed to the eastern end of EW2 and work back to the west because of deteriorating sea conditions.

<u>11. EW2 – East to West (Eastern portion)</u>
26º 09.978’N, 79º 54.193’W to 26º 09.899’N, 79º 54.811’W; depth range 925-970 ft
Rubble, rocks (8-30 cm), boulders, some slabs, pavement and veneered hard bottom; relief chiefly 1-2 ft (up to 3 ft); some expanses of sediment. Hard-bottom organisms include various sponges (e.g., hexactinellids, *Phakellia* sp., pachastrellids), flytrap anemone, Isididae, Primnoidae, numerous anemones and ?*C. nigra* on small rubble, and a spiral whip antipatharian (*Stichopathes luetkeni*). A few pennatulids were observed on sediment substrates between hard-bottom areas. We observed hard-bottom habitats along a small portion of this transect where the geohazards sidescan data showed smooth bottom.

26º 09.899’N, 79º 54.811’W to 26º 09.766’N, 79º 55.985’W; depth range 964-970 ft.
Obsolete rippled sediment with a few scattered pennatulids, anemones and one or two isolated bits of rubble (5-10 cm).

26º 09.766’N, 79º 55.985’W to 26º 09.677’N, 79º 56.289’W; depth range 939-912 ft.
Chiefly scattered low-relief hard bottom – rubble, 10-30-cm rocks and slabs separated by sediment expanses. Organisms include a few hexactinellid and other sponges, anemones, flytrap anemone, ?*C. nigra*, hydroids, one isidid octocoral and cidaroids.

26º 09.677’N, 79º 56.289’W to 26º 09.650’N, 79º 56.407’W; depth 914 ft.
Small area of more extensive hard bottom – low-relief pavement, with flytrap anemone, sponge, Isididae and cidaroid urchin.

26º 09.650’N, 79º 56.407’W to 26º 09.648’N, 79º 56.419’W; depth 916 ft.
Sediment bottom with a few small rocks.

26º 09.648’N, 79º 56.419’W to 26º 09.572’N, 79º 56.717’W; depth range 916-908 ft.
Flat sparsely bioturbated sediment with no ripples. Organisms include a few cidaroids and an asteroid.

26º 09.572’N, 79º 56.717’W to 26º 09.547’N, 79º 56.846’W; depth range 907-904 ft.
Flat sediment with tiny tufts, with two small isolated areas of hard bottom – a small area with low-relief rocks and slabs to 1 m across, and another with a few widely isolated small rocks & rubble. Organisms are restricted to anemones, hydroids and ?*C. nigra*. A large manmade object, possibly the hull of a small boat was noted off camera. Depths were not written down at the very end of this tape and the very beginning of the following tape, and the microphone had stopped working, which accounts for the gap in depth between this segment and the next.

26º 09.547’N, 79º 56.846’W to 26º 09.273’N, 79º 57.872’W; depth range 896-838 ft.
Low-relief, sediment-veneered irregular outcrops, slabs and pavements up to a few meters across and up to ~0.3 m high with 10-20-cm rubble, larger cobbles and small boulders, separated by expanses of sparsely bioturbated sediment with fine tufts. Organisms include pachastrellids sponges, anemones, hydroids, Isididae and Primnoidae.

26º 09.273’N, 79º 57.872’W to 26º 09.260’N, 79º 57.918’W; depth 845 ft.
Flat, sparsely bioturbated sediment.

12. New NE B (South) – West to East

26º 13.481'N, 79º 57.775'W to 26º 13.842'N, 79º 55.338'W; depth range 813-881 ft.
Flat textured sediment (worm tubes) with some bioturbation (mounds, depressions) alternating with raised rippled sand waves; ripples decline at 871 ft. Dominant macrofauna consists of *C. briareus* and galatheids with some ophiuroids. Two small isolated rocks (~15 and 30 cm) were observed with hydroids in one case and an anemone in another. The first cidaroid appeared in 867 ft.

26º 13.842'N, 79º 55.338'W to 26º 13.973'N, 79º 54.709'W; depth range 882-887 ft.
Scattered rubble and small rocks (5-30 cm) with hydroids, anemones, cidaroids and a cerianthid. This segment has been mapped as lying along the southernmost extent of the large hatched hard-bottom area in the northeastern corner of the study site. Although this area is categorized as low-cover hard bottom, whereas the two other transect segments that define this area (along EW6 and New NE A (North)) are high-cover hard bottom, the entire area is mapped with a single color because of the complex, patchy distributions of high- and low-cover habitats observed.

26º 13.973'N, 79º 54.709'W to 26º 14.08'N, 79º 54.142'W; 889-945 ft.
Flat sediment with worm-tube turf alternating with elevated areas of obsolete rippled, sparsely bioturbated sediment. A single depression, 13 ft deep, 30-40 ft across, with 20-30º slopes and rubble and debris on the bottom, was observed at 26º 14.032'N, 79º 54.442'W in 930 ft. Dominant organisms include anemones, ophiuroids, cidaroids. Four pennatulids were observed along this segment, one on the depression floor.

13. New NE Tie A-B – South to North

26º 14.161'N, 79º 54.152'W to 26º 14.543'N, 79º 54.126'W; depth range 928-932 ft.
Flat sediment with worm-tube turf alternating with elevated areas of obsolete rippled sparsely bioturbated sediment. Organisms include anemones, ophiuroids, asteroids, cidaroids, galatheids and a cerianthid.

26º 14.543'N, 79º 54.126'W to 26º 14.747'N, 79º 54.137'W; depth range 934-925 ft.
Series of at least several large depressions with maximum vertical relief of 11 ft with 20-30º slopes (diameters not recorded). The floors of some of these features exhibit what appears to be white consolidated clayey substrates that might also include recently exposed limestone. The field description refers to this area as rife with what appear to be karst topographic features and low- to moderate-relief sediment dunes. Organisms include anemones, cidaroids, asteroids and ophiuroids. Three widely separated pennatulids were also observed (26º 14.611'N, 79º 54.133'W to 26º 14.718'N, 79º 54.136'W).

26º 14.747'N, 79º 54.137'W to 26º 14.966'N, 79º 54.143'W; depth range 927-917 ft.
Raised rippled sand waves alternate with flat sediment. Organisms include cidaroids, ophiuroids and anemones. It was noted that the ship was having difficulty running along the transect backward with its bow facing into current, which caused slight deviations in course.

26º 14.966'N, 79º 54.143'W to 26º 14.992'N, 79º 54.140'W; depth range 917-905 ft.
Isolated clusters of largely barren small rocks to 30 cm across, or single small rocks in rippled or flat turfy sediment. Dominant organisms were anemones and cidaroids with one to a few octocorals (Isididae, Nephtheidae, Paramuriceidae).

26º 14.992'N, 79º 54.140'W to 26º 15.765'N, 79º 54.130'W; depth range 900-885 ft.

Rubble, rocks (10-30 cm), low-relief irregular outcrops, 1-2-ft slabs and veneered pavement to 50% cover of field of view, alternating with more scattered rocks and fields of 5-10-cm rubble and sometimes wide expanses of sediment. Hard-bottom organisms include hexactinellid sponges (e.g., *Aphrocallistes* sp.), demosponges (e.g., *Phakellia* sp., Pachastrellidae, Geodiidae), anemones, hydroids, octocorals (?*C. nigra*, unidentified gorgonians and sometimes numerous Isididae), antipatharians, and numerous echiurans. Organisms on sediment substrates include cidaroids and a few pennatulids.

<u>14. New NE A (North) – East to West</u>

26º 15.765'N, 79º 54.130'W to 26º 15.741'N, 79º 54.227'W; depth range 887-883 ft.
A field of scattered rubble and chiefly small low rocks and low-relief outcrops to 20-30 cm across with a few larger rocks to 0.5 m across and low-relief outcrops or pavements to ~1 m across. Organisms include rather sparse sponges (*Aphrocallistes* sp., *Phakellia* sp.), anemones, zoanthids, isidid octocorals, antipatharians and echiurans. Cidaroids are also present.

26º 15.741'N, 79º 54.227'W to 26º 15.723'N, 79º 54.282'W; 880-881 ft.
Flat or obsolete rippled sediment with no hard substrate. An antipatharian was recorded in the field notes but was not visible on the main camera, and there was no audio track.

26º 15.723'N, 79º 54.282'W, 26º 15.706'N, 79º 54.397'W; 878-876 ft.
Fields of sparse to abundant rubble chiefly <10 cm across, with occasional areas of larger rocks and low-relief slabs and outcrops to 0.75 m across. Dominant hard-bottom organisms are anemones and ?*C. nigra*, with sparse *Aphrocallistes* sp. and other hexactinellids, demosponges (Geodiidae), Isididae, antipatharians, echiurans and cidaroids.

26º 15.706'N, 79º 54.397'W to 26º 15.722'N, 79º 54.399'W
Ship standing by; a short gap exists between the end of the last segment and the beginning of the next.

26º 15.722'N, 79º 54.399'W to 26º 15.269'N, 79º 56.615'W; depth range 869-806 ft.
Large boulders, slabs, pavement, boulder field with smaller rocks (10-50 cm across), mixed with fields of sparse to abundant rubble. This area rises from a depth of 869 ft in the east to a minimum of 806 ft before sloping down again to 835 ft to the west. Hard-bottom organisms include hexactinellid sponges (e.g., *Aphrocallistes* sp.), demosponges (e.g., *Phakellia* sp., Pachastrellidae, Geodiidae), anemones, octocorals (e.g., ?*C. nigra*, Isididae and unidentified gorgonians), numerous antipatharians, echiurans and cidaroids.

26º 15.269'N, 79º 56.615'W to 26º 15.240'N, 79º 54.742'W; depth range 836-847 ft.
Isolated small rocks, scattered clusters of small rocks, a few up to 0.4 m, with an occasional veneered slab to 1 m across, and a field of rubble, on rippled sediment with some expanses of open sediment. Hard-bottom organisms include hexactinellids, anemones, Isididae, antipatharians; soft-bottom organisms include cidaroids, asteroids, ?*Actinauge longicornis* and *Coronaster briareus*.

26º 15.240'N, 79º 56.742'W to 26º 15.190'N, 79º 56.989'W; depth range 847-842 ft.
A series of large sand waves with 3-8-ft vertical relief, covered with obsolete ripples and interspersed with flat sediment areas with worm tubes. Some rocks 10-30 cm across were observed at the base of one sediment slope. Organisms are chiefly *C. briareus* and another asteroid (?*Sclerasterias* sp.) and cidaroids, with some ?*A. longicornis*. A single tilefish burrow was observed in 845 ft (26º 15.224'N, 79º 56.855'W).

26º 15.190'N, 79º 56.989'W to 26º 15.173'N, 79º 57.113'W; 845-842 ft.

Obsolete rippled sediment with an asteroid, small anemone and *C. briareus.*

26º 15.173'N, 79º 57.113'W to 26º 15.156'N, 79º 56.226'W; 840-836 ft.
Obsolete rippled sediment with widely scattered variously sized rocks to 1-m across, occasionally in loose clusters. Hard-bottom organisms include anemones, hormathiid anemones, nephtheids, hydroids, possible antipatharians. Organisms on sediment include *C. briareus*, anemones and galatheids.

26º 15.156'N, 79º 56.226'W to 26º 15.047'N, 79º 57.778'W; depth range 838-809 ft.
Rippled and sparsely bioturbated sediment, passing to rippled sand waves alternating with narrow strips of flat bioturbated sediment; a single flat rock was observed, as was a 7-ft deep depression in 829 ft (26º 15.071'N, 79º 56.630'W). Dominant organisms are *C. briareus* and other asteroids, galatheids and ?*A. longicornis*.

15. New N-S – North to South
26º 15.047'N, 79º 57.778'W to 26º 11.620'N, 79º 57.850'W; depth range 809-831 ft.
Chiefly low sand waves with obsolete rippled sediment alternating with flat bioturbated sediment with small mounds, small tubes and tufts. A few widely isolated small rocks or flat white outcrops to 1-m across. Some hard bottoms have anemones and hydroids. Soft bottom organisms include *C. briareus*, ?*Sclerasterias* sp., ?*A. longicornis*, galatheids and cerianthids. A fishing boat wreck was seen at 26º 13.740'N, 79º 57.851'W.

D. Quantitative Analyses – Percent cover by habitat (CPC Analysis)

Table 4 gives locations and times of quantitative still photographic series and image numbers exposed in each. Latitudes and longitudes indicate points at which each series began. Table YY gives numbers of frames and total numbers of points analyzed, and percentages of substrate types and major faunal groups per transect.

Table 4. Locations and times of quantitative still photographic series and numbers of images exposed in each. Latitudes and longitudes indicate points at which transects began.

Site no.	Transect	LatDM	LonDM	LatDD	LonDD	Image numbers	Date	Time
1	EW 6	26 14.448	79 55.787	26.24080000	-79.92978333	1610-1722	15-Apr-06	1546-1613
2	EW 4	26 11.801	79 57.360	26.19668333	-79.95600000	1814-1949	16-Apr-06	0703-0745
3	EW 3	26 10.544	79 54.508	26.17573333	-79.90846667	2045-2143	16-Apr-06	1322-1340
4	EW 3	26 10.414	79 57.148	26.17356667	-79.95246667	2144-2241	16-Apr-06	1340-1400
5	EW 2	26 09.243	79 58.035	26.15405000	-79.96725000	2330-2411	17-Apr-06	0200-0222
6	EW 2	26 09.978	79 54.193	26.16630000	-79.90321667	2412-2533	17-Apr-06	0354-0420
7	EW 2	26 09.766	79 55.985	26.16276667	-79.93308333	2538-2654	17-Apr-06	0516-0641
8	NE A-B Tie	26 14.992	79 54.140	26.24988333	-79.90233333	2771-2873	17-Apr-06	1948-2013

A total of 869 still images were analyzed at the eight sites, with 82-136 per site (mean of 108.6 images per series). Coral Point Count (CPC)© software was used to code 50 points in each image. As indicated in the methodology section, we analyzed organism abundances and densities in detail separately by counting all organisms 3-4 cm or larger per image (described below). Slight differences between expected and actual numbers of points for each series (e.g., 5649 points instead of 5650 at site 1 [113 images x 50 points per image]) were due to a few non-data points (shadows). Figure 12 illustrates percentage cover by photographic series (excluding photo effects such as reflections or glare, which accounted for no more than 0.06% of image area per site). No hard substrates derived from deep-sea corals were observed (e.g., coral rubble, dead standing or live coral). Soft substrates include obsolete rippled and flat bioturbated sediments. Hard substrates accounted for 17.10 to 95.32% of cover in the eight sites selected because of their high biological interest. Sites 1, 4, 5 and 6 were coded from field notes and video as chiefly high-cover hard bottom habitat, while sites 2, 3, 7 and 8 were coded as mixtures of high- and low-cover. However, analysis of quantitative still photographs indicates that sediment substrates account for 55-82% of bottom cover at sites 1-4, while hard substrates account for 58-95% of bottom cover at sites 5-8 (Table 5, Figure 12). The apparent discrepancy between video coding and quantitative still image analysis is due to the high variability and patchiness of exposed hard substrates at these sites. Extensive areas of hard bottom were frequently described as being separated by expanses of sediment—areas ranging from a few to over 10 m across. Habitats were also coded from video as high-cover if they supported substantial numbers or diversity of sessile macrofauna, particularly those contributing to complex 3-dimensional habitat (i.e., larger sponges, isidid and primnoid octocorals), regardless of the extent of exposed hard bottom. Only a very few observations were made of sediment-veneered hard bottom, that is, sediment substrates that betrayed the presence of buried hard bottom by the growth of sessile attached macrofauna (e.g., sponges, octocorals), and these fell within habitats otherwise described as hard bottom. Benthic macrofaunal organisms accounted for about 1-9% of cover, with anthozoans (0.71-4.09%) responsible for the most cover at all sites (though tied with echinoderms at site 2), followed by echinoderms, echiurans, hydrozoans and sponges (0.02-1.73%).

Table 5. CPC analysis of percentage substrate cover. Numbers of frames and total numbers of points analyzed, and percentages of substrate types and major faunal groups per photo series. All organisms were summed for graphic display in Figure 12 below. Figures in boldface highlight cells with non-zero values. Debris refers to non-indigenous materials, either natural or artificial (e.g., mats of *Sargassum* weed, plastic, aluminum cans, fishing line).

Site number **Transect number**	**1** **EW 6**	**2** **EW 4**	**3** **EW 3**	**4** **EW 3**	**5** **EW 2**	**6** **EW 2**	**7** **EW 2**	**8** **NE A-B Tie**
Number of frames	113	136	99	97	82	122	117	103
Total points	5649	6797	4949	4741	4098	5998	5798	5149
MAJOR CATEGORY (%)								
SOFT SUBSTRATE	**81.73**	**64.60**	**79.32**	**54.94**	**37.93**	**3.29**	**0.02**	**3.52**
HARD SUBSTRATE	**17.10**	**32.23**	**19.59**	**40.90**	**58.28**	**94.36**	**95.32**	**87.11**
DEBRIS	**0.11**	**0.37**	**0.02**	**0.53**	**1.17**	**0.15**	**0.79**	**0.31**
PORIFERA	**0.07**	**0.33**	**0.04**	**0.62**	**0.15**	**0.20**	**0.26**	**0.64**
ANTHOZOA	**0.79**	**0.80**	**0.71**	**1.51**	**1.29**	**1.47**	**1.59**	**4.09**
HYDROZOA	**0.02**	**0.07**	**0.04**	**0.21**	**0.29**	**0.20**	**0.85**	**0.78**
ECHINODERMATA	**0.13**	**0.80**	**0.10**	**0.40**	**0.10**	**0.05**	**0.09**	**1.73**
ECHIURA	**0.05**	**0.25**	**0.10**	**0.47**	**0.68**	**0.20**	**0.86**	**1.40**
CRUSTACEA	0.00	**0.01**	0.00	0.00	0.00	0.00	**0.07**	**0.04**
CHORDATA	0.00	**0.07**	**0.02**	**0.04**	**0.05**	**0.02**	**0.05**	**0.14**
UROCHORDATA	0.00	**0.01**	0.00	0.00	0.00	0.00	0.00	0.00
MOLLUSCA	0.00	0.00	0.00	**0.02**	0.00	0.00	0.00	**0.04**
ANNELIDA	0.00	**0.37**	0.00	**0.11**	0.00	0.00	**0.02**	0.00
UNIDENTIFIED	0.00	**0.06**	0.00	**0.21**	**0.05**	**0.07**	**0.09**	**0.14**
PHOTO EFFECT	0.00	0.00	**0.06**	**0.04**	0.00	0.00	0.00	**0.06**
[ORGANISMS TOTAL]	1.06	2.80	1.01	3.59	2.61	2.20	3.87	9.00
Sum	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

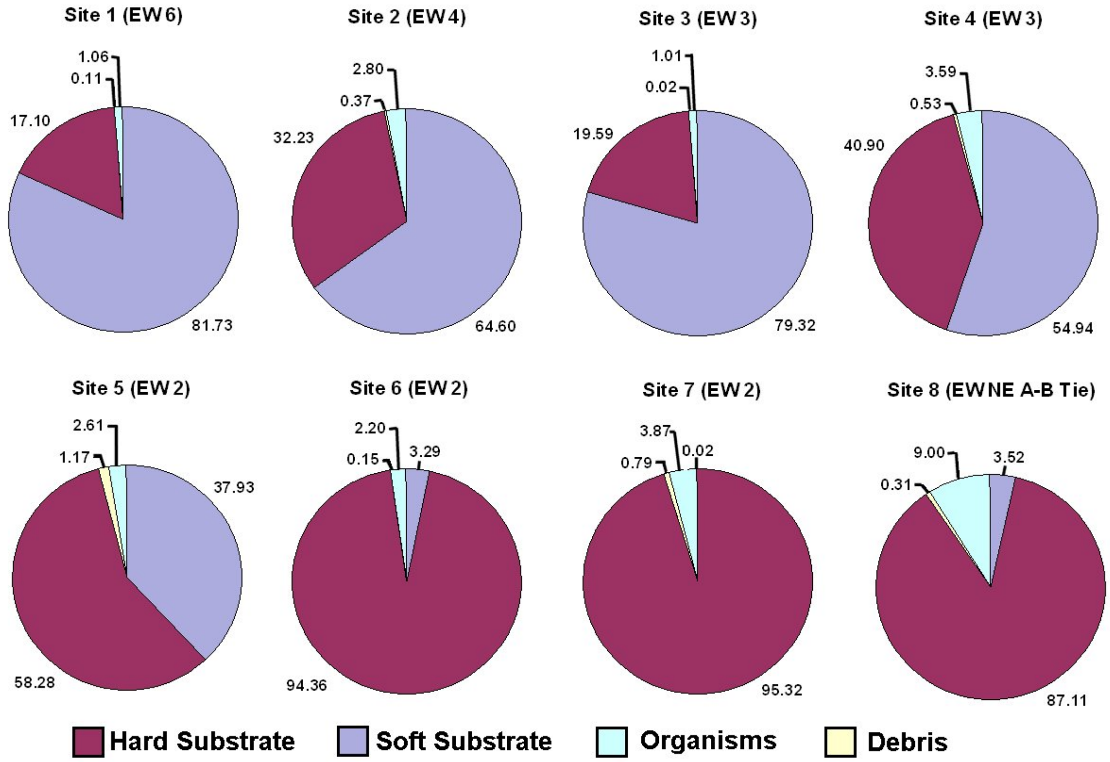

Figure 12. CPC analysis of percentage substrate cover. Percentage cover by photographic series excluding photo effects (e.g., reflections, glare), which accounted for no more than 0.06% of image area per site. The hard substrate category includes all forms of exposed limestone—rubble, larger rocks, solid outcrops and pavements.

E. Quantitative Analyses – Benthic Macrofaunal Abundance and Density

Table 6 ranks the most abundant groups at each site in order of decreasing density (individuals m^{-2}) using the densities of all organisms larger than ~3-4 cm in the 869 photographic images analyzed by CPC software for percent cover in the previous section. Sea anemones (Actiniaria) were the most abundant organisms per unit area in 5 of the 8 photo series, and ranked either second or third to zoanthids or echiurans at the other two. Echiurans ranked first twice and second three times; nephtheids (?*Capnella nigra*) ranked second once and third at four sites, and all sponges combined (the sum of hexactinellid, unidentified demosponge, *Phakellia* sp., pachastrellid and geodiid densities) ranked third at 2 sites and fourth at 5 others. Zoanthids occurred at high densities and in substantial numbers only at sites 1, 6 and 8. These ranks were extracted from densities in Tables 7-9 below. Table 7 gives counts, densities and percents of total density; Tables 8 and 9 break down these totals by sessile (e.g., sponges, octocorals) and semi-sessile (e.g., anemones, echiurans, crinoids) versus mobile organisms (e.g., echinoids, fishes), respectively. The separation recognizes the division between organisms that produce habitat (Table 7) and those that occupy it (Table 8). Though not cemented or attached to hard substrates, echiuran worms and cerianthid (burrowing) anemones have been included here (the former as mobile and the latter as semi-sessile) because both occur in association with hard substrates, perhaps using buried crevices as retreats (though some cerianthids also occur in sediments not associated with hard substrates). In cases in which smaller (~2 cm) specimens of typically larger sessile or semi-sessile taxa were easily recognizable (e.g.,

?*Capnella nigra*), they have also been included. The area covered at each site ranged from 52.12 to 182.04 m^2.

Table 6. Ranking of dominant groups by density at each of the eight still photographic sites. *Zoanthids had the same density as holothuroids at site 4. **Zoanthid densities ranked behind those of gorgonians and cerianthids at sites 5 and 7.

	1	2	3	4	5	6	7	8
Actiniaria	2	1	2	1	1	1	1	3
Echiura	5	4	1	2	2	3	2	1
Nephtheidae	4	2	3	3	3	5	3	4
Total Porifera	3	3	4	4	4	4	4	5
Zoanthidea	1	5	5	5*	7**	2	7**	2

Total organism densities (Table 7) exhibited a moderate range of variation, from 3.85 and 4.84 organisms m^{-2} at sites 6 and 5, respectively, through 5.36 (site 2), 5.48 (site 1), 6.24 (site 7) and 6.65 m^{-2} (site 4), to 10.23 (site 8) and 10.80 m^{-2} (site 3). However, total densities for sessile and semi-sessile habitat-forming groups (Table 8) ranged only from 3.15 (site 6) to 6.49 m^{-2} (site 8). These figures do not include hydroids, which could not be accurately counted in many cases due to their thin morphology, and solitary corals, most of which were <2 cm across and often could not be identified as living versus dead.

Maximum densities for the dominant groups were as follows: echiurans (3.32 m^{-2}, site 8), zoanthids (2.86 m^{-2}, site 8), sea anemones (1.90 m^{-2}, site 4), nephtheids (1.22 m^{-2}, site 2), and total sponges (0.71 m^{-2}, site 1). No other group occurred at densities greater than 0.5 m^{-2}. Organisms classified as corals in the broad sense and often producing complex 3-dimensional hard-bottom habitats contributed at most 0.48 (gorgonians) and 0.45 colonies m^{-2} (stylasterids), both at site 8. Elsewhere, these groups occurred at substantially lower densities: 0.08-0.27 m^{-2} for gorgonians, 0.06-0.17 m^{-2} for stylasterids. Maxima per frame were 20 nephtheids, 17 anemones, 9 zoanthids, 6 hexactinellids, 6 gorgonians (Isididae), and 19 demosponges, each in separate images. The latter was an unusual case of numerous tiny individuals; the frame with the second largest number of sponges had 10, and the great majority had fewer than 5, when any were present. The majority of hard-bottom images had no more than 1 or 2 of any group with few exceptions, e.g., most frames at site 8 included ≥3 zoanthid colonies.

Figure 13 shows the contributions of major taxonomic groups of sessile and semi-sessile, habitat-forming hard-bottom organisms (i.e., sponges and cnidarians) to the total density of these groups alone at each of the quantitative still photographic sites. Zoanthids dominate sites 1 (EW6, 39.92%) and 8 (NE Tie A-B, 46.65%), on the two northernmost transects, while sea anemones (Actiniaria) dominate the remaining sites (39.39-45.95%). Sponges (Porifera) contribute a relatively consistent proportion at all sites—9.74-16.12%-- while nephtheid soft corals vary somewhat more—11.24-28.23%. Gorgonians (chiefly Isididae with some Primnoidae and a few unidentified colonies) contribute no more than 7.78%.

Table 7. Counts and densities of individual organisms in CPC analysis images. Most individually recognizable taxa have been grouped by higher taxonomic grouping (e.g., Primnoidae and Isididae together under gorgonians). No. Sp. = number of specimens. Densities (D) were calculated as numbers of a taxonomic group in the total area of the photo series. % = percent contribution of each group to the total density of the site.

TAXON	SITE 1 (EW 6) Images 1610-1722			SITE 2 (EW 4) Images 1814-1929			SITE 3 (EW 3) Images 2045-2143			SITE 4 (EW 3) Images 2144-2241			SITE 5 (EW 2) Images 2330-2411			SITE 6 (EW 2) Images 2412-2533			SITE 7 (EW 2) Images 2538-2654			SITE 8 (NE A-B Tie) Images 2771-2873		
	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%
PORIFERA																								
Hexactinellida	70	0.59	10.74	28	0.19	3.59	17	0.24	4.11	3	0.06	0.86	15	0.12	2.41	25	0.14	3.57	27	0.16	2.64	61	0.45	4.38
Unid. Demospongiae	12	0.10	1.84	29	0.20	3.72	5	0.07	1.21	23	0.44	6.59	35	0.27	5.62	25	0.14	3.57	31	0.19	3.03	23	0.17	1.65
Phakellia sp.	2	0.02	0.31	14	0.10	1.80	2	0.03	0.48	2	0.04	0.57	2	0.02	0.32	17	0.09	2.43	3	0.02	0.29	4	0.03	0.29
Lithistids	0	0.00	0.00	6	0.04	0.77	0	0.00	0.00	3	0.06	0.86	0	0.00	0.00	0	0.00	0.29	0	0.00	0.00	0	0.00	0.00
Pachastrellidae	0	0.00	0.00	3	0.02	0.39	1	0.01	0.24	4	0.08	1.15	0	0.00	0.00	2	0.01	0.00	6	0.04	0.59	3	0.02	0.22
Geodiidae	0	0.00	0.00	0	0.00	0.00	3	0.04	0.72	1	0.02	0.29	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	2	0.01	0.14
CNIDARIA																								
Gorgonians	10	0.08	1.53	26	0.18	3.34	12	0.17	2.90	10	0.19	2.87	33	0.26	5.30	36	0.20	5.14	45	0.27	4.40	65	0.48	4.66
Nephtheidae	68	0.57	10.43	177	1.22	22.72	71	1.01	17.15	56	1.07	16.05	107	0.83	17.17	64	0.35	9.14	180	1.10	17.61	94	0.69	6.74
Pennatulacea	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	1	0.02	0.29	0	0.00	0.00	6	0.03	0.86	0	0.00	0.00	0	0.00	0.00
Actiniaria	94	0.79	14.42	275	1.89	35.30	103	1.46	24.88	99	1.90	28.37	199	1.55	31.94	261	1.43	37.29	271	1.66	26.52	96	0.70	6.89
Antipatharia	0	0.00	0.00	0	0.00	0.00	1	0.01	0.24	0	0.00	0.00	1	0.01	0.16	2	0.01	0.29	0	0.00	0.00	0	0.00	0.00
Zoanthidea	208	1.75	31.90	46	0.32	5.91	15	0.21	3.62	11	0.21	3.15	21	0.16	3.37	101	0.55	14.43	41	0.25	4.01	390	2.86	27.98
Ceriantharia	44	0.37	6.75	2	0.01	0.26	11	0.16	2.66	3	0.06	0.86	25	0.19	4.01	4	0.02	0.57	62	0.38	6.07	36	0.26	2.58
Stylasteridae	13	0.11	1.99	21	0.14	2.70	12	0.17	2.90	9	0.17	2.58	8	0.06	1.28	25	0.14	3.57	22	0.13	2.15	62	0.45	4.45
ECHINODERMATA																								
Asteroidea	2	0.02	0.31	3	0.02	0.39	3	0.04	0.72	6	0.12	1.72	5	0.04	0.80	2	0.01	0.29	6	0.04	0.59	3	0.02	0.22
Echinoidea	20	0.17	3.07	8	0.06	1.03	5	0.07	1.21	3	0.06	0.86	11	0.09	1.77	19	0.10	2.71	10	0.06	0.98	18	0.13	1.29
Holothuroidea	9	0.08	1.38	17	0.12	2.18	13	0.18	3.14	11	0.21	3.15	1	0.01	0.16	3	0.02	0.43	11	0.07	1.08	17	0.12	1.22
Crinoidea	4	0.03	0.61	6	0.04	0.77	0	0.00	0.00	0	0.00	0.00	2	0.02	0.32	1	0.01	0.14	8	0.05	0.78	6	0.04	0.43
ECHIURA																								
Echiura	46	0.39	7.06	79	0.54	10.14	121	1.72	29.23	91	1.75	26.07	141	1.10	22.63	80	0.44	11.43	259	1.58	25.34	453	3.32	32.50
CRUSTACEA																								
Galatheoidea	2	0.02	0.31	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	3	0.02	0.29	2	0.01	0.14
Paguroidea	12	0.10	1.84	5	0.03	0.64	3	0.04	0.72	0	0.00	0.00	2	0.02	0.32	2	0.01	0.29	2	0.01	0.20	17	0.12	1.22
Brachyura	1	0.01	0.15	3	0.02	0.39	1	0.01	0.24	0	0.00	0.00	0	0.00	0.00	1	0.01	0.14	3	0.02	0.29	0	0.00	0.00
Caridea	1	0.01	0.15	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
ANNELIDA																								
Polychaeta	25	0.21	3.83	6	0.04	0.77	4	0.06	0.97	2	0.04	0.57	5	0.04	0.80	2	0.01	0.29	2	0.01	0.20	26	0.19	1.87
MOLLUSCA																								
Gastropoda	3	0.03	0.46	1	0.01	0.13	2	0.03	0.48	6	0.12	1.72	0	0.00	0.00	2	0.01	0.29	3	0.02	0.29	0	0.00	0.00
Polyplacophora	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	1	0.02	0.29	0	0.00	0.00	3	0.02	0.43	2	0.01	0.20	4	0.03	0.29
CHORDATA																								
Laemonema	3	0.03	0.46	17	0.12	2.18	5	0.07	1.21	2	0.04	0.57	7	0.05	1.12	15	0.08	2.14	21	0.13	2.05	6	0.04	0.43
Scorpaenidae	0	0.00	0.00	5	0.03	0.64	2	0.03	0.48	1	0.02	0.29	3	0.02	0.48	2	0.01	0.29	4	0.02	0.39	3	0.02	0.22
Paralichthyidae	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Rajiformes	1	0.01	0.15	0	0.00	0.00	2	0.03	0.48	1	0.02	0.29	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	1	0.01	0.07
Other fish	2	0.02	0.31	2	0.01	0.26	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	2	0.01	0.14
TOTAL	**652**	**5.48**	**100.00**	**779**	**5.36**	**100.00**	**414**	**5.87**	**100.00**	**349**	**6.70**	**100.00**	**623**	**4.84**	**100.00**	**700**	**3.85**	**100.00**	**1022**	**6.24**	**100.00**	**1394**	**10.23**	**100.00**
TOTAL AREA (m^2)	**118.99**			**145.25**			**70.48**			**52.12**			**128.71**			**182.04**			**163.66**			**136.28**		

Table 8. Counts and densities of individual sessile and semisessile organisms in CPC analysis images. Holothuroids are suspension-feeding psolids. Polychaetes are sessile tube-dwellers (e.g., Sabellidae). See Table 7 above for explanation of taxonomy and abbreviations.

TAXON	SITE 1 (EW 6) Images 1610-1722 No. Sp.	D (m^{-2})	%	SITE 2 (EW 4) Images 1814-1929 No. Sp.	D (m^{-2})	%	SITE 3 (EW 3) Images 2045-2143 No. Sp.	D (m^{-2})	%	SITE 4 (EW 3) Images 2144-2241 No. Sp.	D (m^{-2})	%
PORIFERA												
Hexactinellida	70	0.59	12.52	28	0.19	4.27	17	0.24	6.30	3	0.06	1.26
Unid. Demospongiae	12	0.10	2.15	29	0.20	4.42	5	0.07	1.85	23	0.44	9.66
Phakellia sp.	2	0.02	0.36	14	0.10	2.13	2	0.03	0.74	2	0.04	0.84
Lithistida	0	0.00	0.00	6	0.04	0.91	0	0.00	0.00	3	0.06	1.26
Pachastrellidae	0	0.00	0.00	3	0.02	0.46	1	0.01	0.37	4	0.08	1.68
Geodiidae	0	0.00	0.00	0	0.00	0.00	3	0.04	1.11	1	0.02	0.42
CNIDARIA												
Gorgonians	10	0.08	1.79	26	0.18	3.96	12	0.17	4.44	10	0.19	4.20
Nephtheidae	68	0.57	12.16	177	1.22	26.98	71	1.01	26.30	56	1.07	23.53
Pennatulacea	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	1	0.02	0.42
Actiniaria	94	0.79	16.82	275	1.89	41.92	103	1.46	38.15	99	1.90	41.60
Antipatharia	0	0.00	0.00	0	0.00	0.00	1	0.01	0.37	0	0.00	0.00
Zoanthidea	208	1.75	37.21	46	0.32	7.01	15	0.21	5.56	11	0.21	4.62
Ceriantharia	44	0.37	7.87	2	0.01	0.30	11	0.16	4.07	3	0.06	1.26
Stylasteridae	13	0.11	2.33	21	0.14	3.20	12	0.17	4.44	9	0.17	3.78
ECHINODERMATA												
Holothuroidea	9	0.08	1.61	17	0.12	2.59	13	0.18	4.81	11	0.21	4.62
Crinoidea	4	0.03	0.72	6	0.04	0.91	0	0.00	0.00	0	0.00	0.00
ANNELIDA												
Polychaeta	25	0.21	4.47	6	0.04	0.91	4	0.06	1.48	2	0.04	0.84
TOTAL	**559**	**4.70**	**100.00**	**656**	**4.52**	**100.00**	**270**	**3.83**	**100.00**	**238**	**4.57**	**100.00**
TOTAL AREA (m^2)	**118.99**			**145.25**			**70.48**			**52.12**		

TAXON	SITE 5 (EW 2) Images 2330-2411 No. Sp.	D (m^{-2})	%	SITE 6 (EW 2) Images 2412-2533 No. Sp.	D (m^{-2})	%	SITE 7 (EW 2) Images 2538-2654 No. Sp.	D (m^{-2})	%	SITE 8 (NE A-B Tie) Images 2771-2873 No. Sp.	D (m^{-2})	%
PORIFERA												
Hexactinellida	15	0.12	3.30	25	0.14	4.36	27	0.16	3.81	61	0.45	6.89
Unid. Demospongiae	35	0.27	7.71	25	0.14	4.36	31	0.19	4.37	23	0.17	2.60
Phakellia sp.	2	0.02	0.44	17	0.09	2.96	3	0.02	0.42	4	0.03	0.45
Lithistida	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Pachastrellidae	0	0.00	0.00	2	0.01	0.35	6	0.04	0.85	3	0.02	0.34
Geodiidae	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	2	0.01	0.23
CNIDARIA												
Gorgonians	33	0.26	7.27	36	0.20	6.27	45	0.27	6.35	65	0.48	7.34
Nephtheidae	107	0.83	23.57	64	0.35	11.15	180	1.10	25.39	94	0.69	10.62
Pennatulacea	0	0.00	0.00	6	0.03	1.05	0	0.00	0.00	0	0.00	0.00
Actiniaria	199	1.55	43.83	261	1.43	45.47	271	1.66	38.22	96	0.70	10.85
Antipatharia	1	0.01	0.22	2	0.01	0.35	0	0.00	0.00	0	0.00	0.00
Zoanthidea	21	0.16	4.63	101	0.55	17.60	41	0.25	5.78	390	2.86	44.07
Ceriantharia	25	0.19	5.51	4	0.02	0.70	62	0.38	8.74	36	0.26	4.07
Stylasteridae	8	0.06	1.76	25	0.14	4.36	22	0.13	3.10	62	0.45	7.01
ECHINODERMATA												
Holothuroidea	1	0.01	0.22	3	0.02	0.52	11	0.07	1.55	17	0.12	1.92
Crinoidea	2	0.02	0.44	1	0.01	0.17	8	0.05	1.13	6	0.04	0.68
ANNELIDA												
Polychaeta	5	0.04	1.10	2	0.01	0.35	2	0.01	0.28	26	0.19	2.94
TOTAL	**454**	**3.53**	**100.00**	**574**	**3.15**	**100.00**	**709**	**4.33**	**100.00**	**885**	**6.49**	**100.00**
TOTAL AREA (m^2)	**128.71**			**182.04**			**163.66**			**136.28**		

Table 9. Counts and densities of individual mobile organisms in CPC analysis images. See Table 7 above for explanation of taxonomy and abbreviations.

TAXON	SITE 1 (EW 6) Images 1610-1722			SITE 2 (EW 4) Images 1814-1929			SITE 3 (EW 3) Images 2045-2143			SITE 4 (EW 3) Images 2144-2241			SITE 5 (EW 2) Images 2330-2411			SITE 6 (EW 2) Images 2412-2533			SITE 7 (EW 2) Images 2538-2654			SITE 8 (NE A-B Tie) Images 2771-2873		
	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%	No. Sp.	D (m^{-2})	%
ECHINODERMATA																								
Asteroidea	2	0.02	2.15	3	0.02	2.44	3	0.04	2.08	6	0.12	5.41	5	0.04	2.96	2	0.01	1.59	6	0.04	1.92	3	0.02	0.59
Echinoidea	20	0.17	21.51	8	0.06	6.50	5	0.07	3.47	3	0.06	2.70	11	0.09	6.51	19	0.10	15.08	10	0.06	3.19	18	0.13	3.54
CRUSTACEA																								
Galatheoidea	2	0.02	2.15	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	3	0.02	0.96	2	0.01	0.39
Paguroidea	12	0.10	12.90	5	0.03	4.07	3	0.04	2.08	0	0.00	0.00	2	0.02	1.18	2	0.01	1.59	2	0.01	0.64	17	0.12	3.34
Brachyura	1	0.01	1.08	3	0.02	2.44	1	0.01	0.69	0	0.00	0.00	0	0.00	0.00	1	0.01	0.79	3	0.02	0.96	0	0.00	0.00
Caridea	1	0.01	1.08	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
ECHIURA																								
Echiura	46	0.39	49.46	79	0.54	64.23	121	1.72	84.03	91	1.75	81.98	141	1.10	83.43	80	0.44	63.49	259	1.58	82.75	453	3.32	89.00
MOLLUSCA																								
Gastropoda	3	0.03	3.23	1	0.01	0.81	2	0.03	1.39	6	0.12	5.41	0	0.00	0.00	2	0.01	1.59	3	0.02	0.96	0	0.00	0.00
Polyplacophora	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	1	0.02	0.90	0	0.00	0.00	3	0.02	2.38	2	0.01	0.64	4	0.03	0.79
CHORDATA																								
Laemonema	3	0.03	3.23	17	0.12	13.82	5	0.07	3.47	2	0.04	1.80	7	0.05	4.14	15	0.08	11.90	21	0.13	6.71	6	0.04	1.18
Scorpaenidae	0	0.00	0.00	5	0.03	4.07	2	0.03	1.39	1	0.02	0.90	3	0.02	1.78	2	0.01	1.59	4	0.02	1.28	3	0.02	0.59
Paralichthyidae	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Rajiformes	1	0.01	1.08	0	0.00	0.00	2	0.03	1.39	1	0.02	0.90	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	1	0.01	0.20
Other fish	2	0.02	2.15	2	0.01	1.63	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	2	0.01	0.39
TOTAL	**93**	**0.78**	**100.00**	**123**	**0.85**	**100.00**	**144**	**2.04**	**100.00**	**111**	**2.13**	**100.00**	**169**	**1.31**	**100.00**	**126**	**0.69**	**100.00**	**313**	**1.91**	**100.00**	**509**	**3.74**	**100.00**
TOTAL AREA (m^2)	**118.99**			**145.25**			**70.48**			**52.12**			**128.71**			**182.04**			**163.66**			**136.28**		

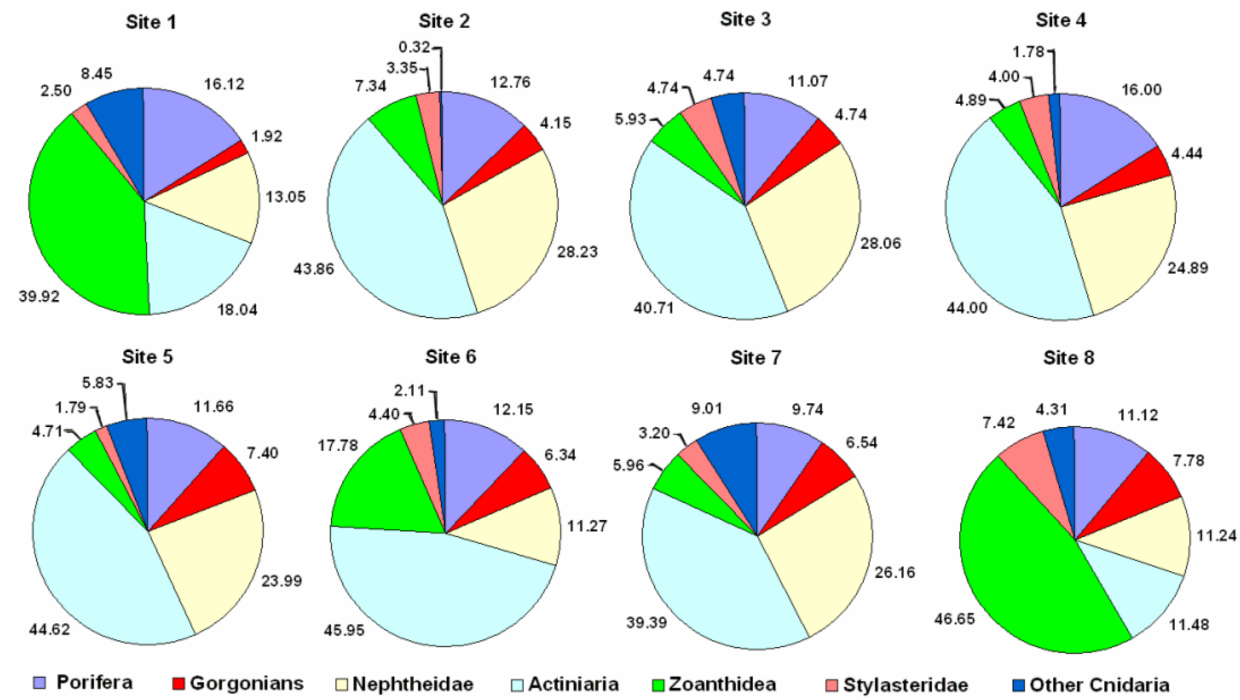

Figure 13. Contributions of major taxonomic groups to the total density of sessile and semi-sessile, habitat-forming, hard-bottom organisms at quantitative still photographic sites. Other cnidarians include antipatharians, pennatulids, cerianthids and stylasterids.

X. POTENTIAL IMPACTS

The FFWCC "Guidelines for Conducting Offshore Benthic Surveys" indicates that reports should "quantify the potential acreage of each substrate and habitat type that would be directly and indirectly impacted by the proposed projects." We have not incorporated such estimates for the following reasons. Calculations of the extent of turbidity clouds and potential burial of hard substrates by construction activities are dependent upon flow velocity and direction at the time of construction and are beyond the scope of work of this project. The areas of hard substrate identified and mapped during this survey consist of complex, irregularly-distributed combinations of high and low hard-cover habitats interspersed with expanses of sediment. Simple use of the geohazards sidescan data mapped as hard substrate will overestimate actual hard-bottom habitat acreage.

XI. LITERATURE CITED

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XII. APPENDICES

Appendix 1. List of taxa identified during the benthic video survey. Rare isolated species may not appear in habitat summaries or quantitative analyses.

Appendix 2. DWP benthic habitat map based on a combination of the benthic video survey along transect lines and refined sidescan data from the geohazards survey. Hatched GIS habitat polygons represent interpolations between transect lines north of the geohazards survey area. Arrowhead indicate the direction in which major transects were run. Transect EW6 was split due to sea conditions with the western half run west to east and the eastern half run east to west. [Appendix 2 DeepWaterPortHabitatMap.jpg]

Appendix 3. GIS database summary for habitat map. Latitudes and longitudes indicate beginning position for each habitat description. Points represent isolated observations (e.g., individual pieces of rubble or rock on otherwise sediment bottoms). Colors correspond to habitat lines, areas and polygons in the habitat map above. Rows outlined with heavy black borders represent alterations that will be included in the final version. [APPENDED. Also at Appendix 3 GIS database Summary.xls]

Appendix 4. GIS datafiles. [Appendix 4 DWP GIS Datafiles.zip]

Appendix 5. Benthic video survey ROV transect logs. Abbreviations of names, substrates and habitats have been expanded (e.g., cor to *Coronaster*, ob RS to obsolete rippled sediment). Highlighted cells indicate initial post-cruise habitat designations. Colors parallel those used in the habitat map (tan = low cover hard bottom, gold = high cover hard bottom, light blue = large-scale sediment features, lavender = pennatulids, green = tilefish burrow). Some were modified following review of videotapes. [APPENDED. Also at Appendix 5 ROV field notes all tapes.xls]

Appendix 1. List of taxa identified during the benthic video survey. Rare isolated species may not appear in habitat summaries or quantitative analyses.

Phylum Porifera (sponges)
- Class Hexactinellida (glass sponges)
  - Order Hexactinosida
    - Family Aphrocallistidae
      - *Aphrocallistes* sp.
    - Family Farreidae
      - ?*Farrea* sp.
  - Unidentified hexactinellids
- Class Demospongiae
  - Order Astrophorida
    - Family Geodiidae
      - Unidentified geodiid
    - Family Pachastrellidae
      - Unidentified pachastrellid
  - Order Lithistida
    - Family Corallistidae
      - *Coraliistes* sp.
    - Unidentified lithistids
  - Order Halochondrida
    - Family Axinellidae
      - *Phakellia* sp.
  - Order Haplosclerida
    - Family Petrosiidae
      - Unidentified petrosiid
  - Unidentified demosponges

Phylum Cnidaria
- Subphylum Anthozoa
  - Class Octocorallia (soft corals, gorgonians, sea pens)
    - Order Alcyonacea 14 families
      - Family Isididae (bamboo corals)
        - ?*Isidella* sp.
      - Family Paramuriceidae
        - *Swiftia* sp. (on airplane fuselage)
        - Unidentified paramuriceid
      - Family Primnoidae
        - *Callogorgia americana*
        - ?*Plumarella* sp.
      - Family Nephtheidae
        - ?*Capnella nigra*
    - Order Pennatulacea
      - Unidentified pennatulid
  - Class Hexacorallia (stony corals, anemones, black corals)
    - Order Actiniaria (sea anemones)
      - Family Hormathiidae
        - ?*Actinauge longicornis*
        - Unidentified hormathiid (Venus flytrap)

Anemone sp. 1
Anemone sp. 2
Anemone sp. 3
Anemone sp. 4
Anemone sp. 5
Order Zoanthidea (colonial anemones)
Unidentified zoanthids
Order Ceriantharia
Unidentified cerianthids
Order Antipatharia (black corals)
Family Antipathidae
Stichopathes luetkeni
Unidentified antipatharian(s)
Order Scleractinia (stony corals)
Unidentified solitary corals
Unidentified branching azooxanthellate coral (on airplane fuselage)
Subphylum Medusozoa
Class Hydrozoa
Order Filifera
Family Stylasteridae
Unidentified stylasterid
Unidentified athecate hydroid
Order Leptothecata
Unidentified plumularioid hydroids

Phylum Mollusca
Class Gastropoda
Subclass Prosobranchia
Family Trochidae
Calliostoma sp. (shells occupied by hermit crabs)
Family Volutidae
Scaphella sp. (shells occupied by hermit crabs)
Class Polyplacophora
Unidentified chiton
Class Cephalopoda
Order Sepiolida
Family Sepiolidae
Semirossia tenera

Phylum Annelida
Class Polychaeta
"Subclass" Canalipalpata
Family Sabellidae
Unidentified sabellids
Family Serpulidae
Unidentified serpulids

Phylum Echiura
Family ?Bonellidae
Unidentified echiuran

Phylum Arthropoda
- Subphylum Crustacea
  - Order Decapoda
    - Infraorder ?Caridea
      - Unidentified shrimp(s)
    - Infraorder Anomura
      - Family Galatheidae
        - ?*Munida* sp.
      - Family Chyrostylidae
        - ?*Eumunida picta*
      - Family Pylochelidae
        - Unidentified pylochelid
      - Family Paguridae
        - Unidentified pagurid(s)
    - Infraorder Brachyura
      - Family Cancridae
        - *Cancer borealis*
      - Family Portunidae
        - *Bathynectes longispina*
      - Family Pisidae
        - *Rochinia crassa*
      - Unidentified spider crab(s)
      - Unidentified crab(s)

Phylum Echinodermata
- Class Crinoidea
  - Order Comatulidia
    - Family Antedonidae
      - Unidentified antedonid
- Class Asteroidea
  - Order Forcipulata
    - Family Asteriidae
      - *Coronaster briareus*
      - ?*Sclerasterias* sp.
  - Order Paxillosida
    - Family Astropectinidae
      - ?*Astropecten nitidus*
    - Family Goniasteridae
      - Unidentified goniasterid
  - Unidentified asteroids
- Class Ophiuroidea
  - Order Phrynophiurida
    - Family Asteroschematidae
      - Unidentified asteroschematid
  - Order Ophiura
    - Family ?Ophiacanthidae

Unidentified ?ophiacanthid
Family ?Ophiuridae
Unidentified ?ophiurid
Class Echinoidea
Order Cidaroida
Family Cidaridae
?*Cidaris rugosa*
?*Stylocidaris* sp.
Order Echinoida
Family Echinidae
?*Echinus affinis*
Order Echinothurioida
Family Echinothuriidae
?*Araeosoma* sp.
Class Holothuroidea
Order Dendrochirotida
Family Psolidae
Unidentified psolid

Phylum Chordata
Subphylum Vertebrata
Class Chondrichthyes
Order Chimaeriformes
Unidentified chimaera
Order Rajiformes
Family Rajidae
Unidentified rajid
Family Torpedinidae
Benthobatis marcida
Order Carcharhiniformes
Family Scyliorhinidae
Galeus arae
Class Osteichthyes
Order Anguilliformes
Unidentified eel(s)
Order Scorpaeniformes
Family Scorpaenidae
Unidentified scorpaenid(s)
Family Sebastidae
Helicolenus dactylopterus
Order Pleuronectiformes
Family Paralichthyidae
?*Citharichthys arctifrons*
Order Gadiformes
Family Moridae
Laemonema melanurum
Family Phycidae

Unidentified phycid

Order Aulopiformes

Family Chlorophthalmidae

?*Chlorophthalmus agassizi*

Order Perciformes

Family Malacanthidae

Lopholatilus chamaeleonticeps

Caulolatilus ?*microps*

Family Serranidae

?*Epinephelus niveatus*

Unidentified anthiine

APPENDIX 3

Num	LatDM	LonDM	LatDD	LonDD	Transect	Tape No.	Habitat	TIME	DEPTH	POINT SITES	Photo Site	DESCRIPTION	FINAL PHOTO SITES
1	26 13.292	80 1.161	26.22056667	-80.01943333	EW6	1	Sediment	0642	618-651		N	Bioturbated textured sediment; ripples first appear in 667 ft; low ripples alternating with bioturbated sediment; Coronaster, ceriánthid, anemone	
15	26 14.42	79 57.987	26.24033333	-79.96645000	EW6	5	Low Cover Hard	1149	800	POINT	N	2 small rubble bits	
16	26 14.448	79 57.905	26.24080000	-79.96508333	EW6	5	Low Cover Hard	1155	804	POINT	N	Cluster of small rocks below edge of sand wave, nephthyids?, Coronaster	
19	26 14.563	79 57.537	26.24271667	-79.95895000	EW6	6	Low Cover Hard	1218	833	POINT	N	1 bit of rubble in depression	
20	26 14.603	79 57.438	26.24338333	-79.95730000	EW6	6	Malacanthid	1225	842	POINT	N	Small flat white outcrop w 1 anemone beyond edge of sand wave, otherwise barren; 0.8-M LONG ?GREAT NORTHERN TILEFISH WITH EXCAVATION	
21	26 14.623	79 57.392	26.24371667	-79.95653333	EW6	6	Low Cover Hard	1228	851	POINT	N	Small area of possible exposed hardbottom to one side in depression between rippled sand waves (possibly sargassum mat); slopes look like consolidated white clay; large fish off camera	
24	26 14.623	79 57.392	26.24371667	-79.95653333	EW6	7	Sediment	1310	853	POINT	N	**First cidaroid urchin**	
26	26 14.436	79 56.558	26.24060000	-79.94263333	EW6	7	Low Cover Hard	1351	860	POINT	N	Tiny rock in depression	
28	26 14.926	79 56.368	26.24876667	-79.93946667	EW6	8	Low Cover Hard	1408	856	POINT	N	Piece of black rubble in rippled sediment	
29	26 14.944	79 56.365	26.24906667	-79.93941667	EW6	8	Low Cover Hard	1408-1412	845-838		N	Scattered rubble, low rocks to 0.6 m almost barren; wide sediment areas; 1 low-relief outcrop to 1.5 m across; chiefly scattered rubble;	
30	26 15.34	79 56.261	26.25566667	-79.93768333	EW6	8	Higher Cover Hard	1413-1419	838-827		1st Photo series	Abundant rubble and small rocks, occas low outcrop to 1.2 m across with some broad areas of empty sediment, few taller rocks (moderate relief); numerous anemones, nephthyids, pachastrellids?, flytrap anemones, few octocorals, Aphrocallistes, hydroids?[too fast]	
	26 15.34	79 56.261			EW6	8	Higher Cover Hard	1413-1419	838-827	POINT		FIRST HEXACTINELLIDS	
31	26 15.142	79 56.151	26.25236667	-79.93585000	EW6	8	Sediment	1419	-		N	**STOP VIDEO TO RETURN TO TRANSECT; DO NOT INCLUDE FROM THIS WAYPOINT TO NEXT IN PLOTTED TRACK STARTING UP AGAIN SOUTH OF TRANSECT LINE**; Obsolete	
32	26 14.030	79 56.225	26.25236667	-79.93585000	EW6	8	Sediment	1521-1536	864-867		N	rippled sediment	
33	26 14.414	79 55.795	26.24023333	-79.92991667	EW6	8	Pennatulid	1535		POINT	N	Sea pen on rippled sediment	
34	26 14.448	79 55.787	26.24080000	-79.92978333	EW6	8	Higher Cover Hard	1536-1554	814-858		2nd Photo series	Begins as chiefly scattered rubble, small rocks & low-relief outcrops to 1. 6 m across, small to large rocks to ~0.3 m high, crowded outcrops & slabs to 1.5 m across, not quite to 0.5 m high (moderate relief) as well as rubble; anemones, flytrap anemones, gorgonians,	**Quant. Photo site 1**

												nephthyids, Isididae, demosponges (incl pachastrellid, geodiid), echiuran, cidaroids	
35	26 14.507	79 55.458	26.24178333	-79.92430000	EW6	8	Sediment	1555	-		N	Empty sediment, off transect	▼
36	26 14.458	79 55.215	26.24096667	-79.92025000	EW6	8	Higher Cover Hard	1604-1611	851-863		3rd Photo series	Low to moderate relief hardbottom, outcrops, slabs & pavement to +1 m across, and rocks; some areas of rippled sediment, moving to chiefly scattered rubble & 1-2-ft rocks with some crowded low-relief hardbottom; Isididae, nephthyids, gorgonians, anemones, flytrap anemone, pachastrellid, Phakellia, glass sponge, Aphrocallistes, echiurans	▼
38	26 14.507	79 54.907	26.24178333	-79.91511667	EW6	9	Sediment	1631-1640	890-896		N	Weakly rippled sediment	
39	26 14.51	79 54.871	26.24183333	-79.91451667	EW6	9	Low Cover Hard	1632-1635	895		N	Widely scattered rubble bits, 30-cm rock; anemones; zoanthids, cidaroids; passing to more abundant rubble 8-10 cm, 5% cover, then just a few cobbles to 30 cm widely separated on sediment; nephthyid	
41	26 14.516	79 54.826	26.24193333	-79.91376667	EW6	9	Sediment	1638-1642	896		N	Rippled or flat sediment with fine tufts	
42	26 14.522	79 54.769	26.24203333	-79.91281667	EW6	9	Higher Cover Hard	1643-1646	894-895		N	Rubble, scattered rocks & more crowded low-relief outcrops, veneered slab to 0. 6 m across, widely scattered rubble 8-15 cm; anemones, nephthyids, gorgonians, primnoid, cidaroids	
43	26 14.524	80 54.735	26.24206667	-80.91225000	EW6	9	Sediment	1646-1654	895-896		N	Rippled sediment alternating with smooth sediment with tubes	
46	26 14.548	79 54.518	26.24246667	-79.90863333	EW6	10	Low Cover Hard	1706	900	POINT	N	Flat sediment with some bioturbation, clusters of worm tubes, raised rippled sand waves; isolated flat 0.5-m boulder	
47	26 14.548	79 54.518	26.24246667	-79.90863333	EW6	10	Low Cover Hard	1708	900		N	Flat sediment; scattered low-relief rocks, outcrops, slab 1-m across; anemones, nephthyids, hydroid?	
48	26 14.552	79 54.494	26.24253333	-79.90823333	EW6	10	Sediment	1709	-		N	Rippled & flat sediment with tubes	
49	26 14.556	79 54.479	26.24260000	-79.90798333	EW6	10	Higher Cover Hard	1709	898	POINT	N	Isolated cluster of low boulders to 0.6 m across, <0.3 m high; nephthyids, anemones	
51	26 14.567	79 54.419	26.24278333	-79.90698333	EW6	10	Low Cover Hard	1713	899	POINT	N	Isolated small flat sediment-veneered outcrop; barren	
	26 14.59	79 54.268			EW6	10	Low Cover Hard			POINT		Small patch of outcrops	
	26 14.59	79 54.268			EW6	10	Pennatulid			POINT		Pennatulid on sediment	
	26 14.59	79 54.268			EW6	10	Sediment	1724	899-910		N	END OF EW6; Flat bioturbated sediment with small tubes alternating with obsolete rippled sediment	
52	26 14.59	79 54.268	26.24316667	-79.90446667	Tie EW5	11	Low Cover Hard	1724-1734	912-928			BEGIN TIE EW5 (ALTERNATE - 1/10 NM WEST OF PLANNED TRANSECT); Rippled alternating with flat sediment w/ polychaete tubes; ~5 very widely scattered small flat outcrops or small rocks <30 cm across [initially visible in side camera], anemone, nephthyid, cidaroid	
53	26 14.465	79 54.214	26.24108333	-79.90356667	Tie EW5	11	Pennatulid	1734-1736		POINT	N	3 Pennatulids on sediment (mass of sargassum)	
55	26 14.386	79 54.165	26.23976667	-79.90275000	Tie EW5	11	Depression	1741	927	POINT	N	large depression, sonar est. ~30 ft diameter; sediment slope	

58	26 14.276	79 54.189	26.23793333	-79.90315000	Tie EW5	11	Higher Cover Hard	1751	928		2 photos	Cluster of rocks, flat slabs & low outcrops to 1.3 m across; many small fish, nephthyids, anemones, cidaroid
59	26 14.273	79 54.192	26.23788333	-79.90320000	Tie EW5	11	Sediment	1755-1800	930-927		N	Flat and rippled sediment; anemones, cidaroids
60	26 14.113	79 54.285	26.23521667	-79.90475000	Tie EW5	12	Malacanthid	1805	934	POINT	N	Rippled sediment; possibly *Caulolatilus* [blueline?] tilefish [SIDE CAMERA]; cluster of anemones
61	26 14.069	79 54.3	26.23448333	-79.90500000	Tie EW5	12	Depression	1809-1835	927-948		N	5-6 depressions ~30-100 ft across, 20-30º slopes; sharp rims; chiefly rippled sediment, also areas of flat sediment with polychaete tubes; almost no exposed hard substrates
62	26 13.879	79 54.308	26.23131667	-79.90513333	Tie EW5	12	Low Cover Hard	1826	943	POINT	N	Flat white outcrop or consolidated sediment in bottom of one depression, with small fishes
63	26 13.879	79 54.308	26.23131667	-79.90513333	Tie EW5	12	Depression				N	Depression habitat continued
64	26 13.708	79 54.297	26.22846667	-79.90495000	Tie EW5	12	Malacanthid	1840	928	POINT	N	Alternating rippled & flat sediment with tubes; possible tilefish burrow [SIDE CAMERA]
65	26 13.75	79 54.299	26.22916667	-79.90498333	Tie EW5	13	Sediment	1840-1851	932		N	Flat sediment with low-relief ripples; ophiuroid, asteroids
66	26 13.557	079 54.294	26.22916667	-79.90498333	EW 5	14	Sediment	1854	927		N	END TIE EW5 - BEGIN EW 5; Rippled sediment
67	26 13.513	79 54.42	26.22521667	-79.90700000	EW 5	14	Depression	1857-1926	914-941		N	Depressions with exposed consolidated clay, obsolete ripples or smooth areas with tubes, some burrows, no attached fauna; 20-40 ft diam; max depth range 914-941 ft; cidaroid, asteroids
69	26 13.359	79 54.846	26.22265000	-79.91410000	EW 5	14	Malacanthid	1920-1923	914-941	POINT	N	*Caulolatilus* tilefish burrow in depression slopes
70	26 13.336	79 54.95	26.22226667	-79.91583333	EW 5	14	Malacanthid			POINT	N	*Caulolatilus* tilefish burrow in depression slopes
71	26 13.325	79 54.998	26.22226667	-79.91583333	EW 5	14	Sediment	1931	908		N	Alternating obsolete rippled sediment with flat textured sediment with small tubes; galatheids, anemones, Coronaster
	26 13.100	79 54.950			EW 5	15	Sediment	2016	881	POINT	N	**Last Cidaroid, 881 ft [CHECK LAT/LONG OF THIS DEPTH]**
76	26 12.459	79 58.933	26.20765000	-79.98221667	EW 5	17	Low Cover Hard	0110-0111	770		N	Sediment with depressions & few small bits of rubble 5- 15 cm; no attached fauna; galatheids
77	26 12.46	79 58.946	26.20766667	-79.98243333	EW 5	17	Sediment	0112-0124	770-759		N	Alternating obsolete rippled sediment with smooth sediment with small tubes & small mounds; some depressions & craters; galatheids, Coronaster, anemones, some ceriantids.
83	26 12.112	80 00.69	26.20186667	-80.01150000	EW 5	19	Low Cover Hard	0225	696	POINT	N	Same bottom; bit of rubble
84	26 12.112	80 00.69	26.20186667	-80.01150000	EW 5	19	Sediment	0225-0228	694-692		N	Rippled sediment disappearing; chiefly smoother sediment with small cones & depressions; Coronaster, anemones
	26 11.974	80 00.984			Tie EW4	20	Sediment	0250	663			END EW5, BEGIN Tie EW4; Sediment; no ripples; Coronaster, anemones
87	26 11.96	80 01.03	26.19933333	-80.01716667	Tie EW 4	20	Low Cover Hard	0251-0255	660-658		N	Sediment with few isolated clusters of small bits of rubble chiefly < 8cm, & 1 15-cm rock with anemones; Coronaster
88	26 11.96	80 01.03	26.19933333	-80.01716667	Tie EW 4	20	Sediment	0335-0345	654-660		N	Weakly bioturbated bottom - cones, depressions; anemones, Coronaster, cerianthids, 1 galatheid
89	26 11.702	80 01.105	26.19503333	-80.01841667	Tie EW 4	20	Low Cover Hard	0346	660		N	Small rubble piece with hydroid, another with anemone; Coronaster
90	26 11.696	80 01.105	26.19493333	-80.01841667	Tie EW 4	20	Sediment	0347-0404	660-665		N	Weakly bioturbated bottom - cones, crater; anemones, Coronaster,

												cerianthids	
	26 10.885	80 01.124			EW4		Sediment	0428-0430	665-670			END Tie EW4 - BEGIN EW4, sparsely bioturbated sediment	
93	26 10.823	80 01.065	26.18038333	-80.01775000	EW 4	22	Low Cover Hard	0431-0441	670-681		N	Isolated clusters or individual pieces of small low-relief rubble chiefly <10 cm, 2 to 20 cm; with hydroids, anemones, Coronaster. [0441] Cluster of low-relief rocks & slabs ~ 3 m across; individual slab ~ 1.3 m across; hydroids, anemones	
94	26 10.92	80 01.809	26.18200000	-80.03015000	EW 4	22	Sediment	0442-0450	681-699		N	Sparsely bioturbated sediment; anemones, Coronaster	
95	26 10.979	80 00.588	26.18298333	-80.00980000	EW 4	22	Low Cover Hard	0451	699	POINT	N	Possible small rock [or trash] with galatheid	
96	26 10.979	80 00.588	26.18298333	-80.00980000	EW 4	22	Sediment	0452-0503	699-710		N	Flat, sparsely bioturbated sediment with patches of rippled sediment; Coronaster, galatheids, anemones	
	26 11.801	79 57.36			EW4	26	Higher Cover Hard	0716-0756	842-867	POINT		FIRST HEXACTINELLIDS	
100	26 11.801	79 57.36	26.19668333	-79.95600000	EW 4	25	Higher Cover Hard	0702-0713	826-838		N	Phosphoritic rubble, rock outcrops, pavements and boulders in sediment; nephthyids, hydroids, anemones, Coronaster; passing to Aphrocallistes, hexactinellids, Phakellia, pachastrellids, Geodia, lithistids, Isididae, primnoid, nephthyids, anemones, echiurans	**Quant Photo Site 2**
	26 11.918	79 56.474			EW 4	27	Higher Cover Hard	0811	880	POINT		**First cidaroid urchin**	▼
103	26 11.916	79 56.463	26.19860000	-79.94105000	EW 4	27	Low Cover Hard	0811-0832	883-901		N	Flat or rippled sediment with isolated clusters or individual small rocks and rubble chiefly <20 cm, occas rock to 50 cm, rare flat slab to 1 m; chiefly anemones & nephthyids; echiurans, sponge, few small octocorals, cidaroids	▼
104	26 11.878	79 56. 072	26.19796667	-79.93333333	EW 4	27	Sediment	0832-0836	901-910		N	Flat or rippled sediment; 2 isolated rocks	
105	26 11.863	79 55.987	26.19771667	-79.93311667	EW 4	28	Low Cover Hard	0837-0839	910-912		N	Flat sediment with isolated individual rubble & small rocks or scattered clusters,anemones, nephthyids, echiurans, cidaroid	
106	26 11.853	79 55.948	26.19755000	-79.93246667	EW 4	28	Sediment	0839-0843	912-916		N	Sediment with little bioturbation	
107	26 11.846	79 55.885	26.19743333	-79.93141667	EW 4	28	Low Cover Hard	0843-0900	916- 934		N	Chiefly rippled sediment, some flat areas with tubes, with widely scattered, isolated rocks, a small veneered slab; 1 big rock a few ft across; anemones, nephthyids, echiurans, cidaroid	
108	26 11.819	79 55.619	26.19698333	-79.92698333	EW 4	28	Sediment	0903-0917	936-941		N	Sediment with little bioturbation; anemones, numerous ophiuroids	
110	26 11.738	79 55.099	26.19563333	-79.91831667	EW 4	29	Depression	0940-0942	954-943	POINT	N	Depression with tiny rocks scattered across surface as well as a few rocks up to 1 m across; ~15 ft max depth; cidaroids, anemones	
111	26 11.736	79 55.064	26.19560000	-79.91773333	EW 4	29	Sediment	0944-0958	943		N	Flat sediment with some bioturbation, few ripples; ophiuroids, anemones, cidaroids	
	26 11.717	79 54.952	**ADD TO MAP**		EW4	29	Pennatulid	0952	943	POINT		Pennatulid on sediment [TWO MENTIONED IN NOTES; ONE VISIBLE ON TAPE; NO AUDIO]	
113	26 11.652	79 54.461	26.19420000	-79.90768333	EW 4	30	Low Cover Hard	1036-1039	952-950		N	Few isolated small rocks (5-30 cm) & few clusters of small rocks & low veneered slabs (to 0.75 m) with numerous anemones, Flytrap anemone; anemones also on sediment	
114	26 11.65	79 54.432	26.19416667	-79.90720000	EW 4	30	Sediment				N	Sediment	

115	26 11.651	79 54.412	26.19418333	-79.90686667	EW 4	31	Pennatulid	1040-1056	950-952		N	Alternating raised rippled sand waves & flat sediment with tubes; galatheid, **several sea pens [**at most 2 in one field; otherwise widely isolated; some in side camera], abundant anemones on sediment, 2-3 up to 12 m^{-2}; 1 rock with anemone.	
	26 11.555	79 54.166			Tie EW 3	31	Pennatulid	1055	952			END EW 4 - BEGIN TIE EW 3; Flat sediment with little bioturbation, some ripples; numerous anemones, up to 6-7 m-2; cidaroids, sea pens	
119	26 11.052	79 54.194	26.18365000	-79.90360000	Tie EW 3	32	Sediment	1134			N	End sea pens; sediment to end of transect	
120	26 11.019	79 54.216	26.18365000	-79.90360000	EW 3	32	Sediment	1135-1150	964-963		N	BEGIN EW3; Alternating flat and rippled sediment; occasional bioturbation; anemones, cidaroids, ophiuroids, galatheids	
121	26 10.957	79 54.521	26.18261667	-79.90868333	EW 3	32	Pennatulid	1150	963	POINT	N	Flat or rippled sediment; possible veneer over hard substrate; sea pens, ophiuroid, cidaroid, anemone, galatheid	
124	26 10.884	79 54.876	26.18140000	-79.91460000	EW 3	33	Low Cover Hard	1207	966-968		N	Scattered clusters of low-relief rocks and slabs a few meters across separated by expanses of sediment; rocks up to 0.8 m across & pavement 1.5 m across; mostly barren with little fauna, few anemones, flytrap anemone, echiurans, cidaroids	
125	26 10.871	79 54.932	26.18118333	-79.91553333	EW 3	33	Sediment	1211	963		N	Rippled sediment; passing to flat textured bottom with tiny tufts and worm tubes, cones and depressions; either consolidated with a veneer of sediment with numerous depressions and cones or not completely consolidated; some areas of obsolete ripples; numerous ophiuroids, anemone	
126	26 10.867	79 54.948	26.18111667	-79.91580000	EW 3	33	Pennatulid	1212	964	POINT	N	Obsolete rippled sediment; sea pen in side camera	
130	26 10.544	79 54.508	26.17573333	-79.90846667	EW 3	34	Low Cover Hard	1324	896	POINT	N	Rock with anemone; possible outcrops to sides	**Quant. Photo Site 3**
131	26 10.544	79 54.508	26.17573333	-79.90846667	EW 3	34	Sediment	1324	894-889		N	Obsolete rippled sediment	▼
132	26 10.521	79 56.617	26.17535000	-79.94361667	EW 3	34	Low Cover Hard	1326-1328	889		N	Rock, few scattered slabs & low hardground with anemones	▼
133	26 10.521	79 56.617	26.17535000	-79.94361667	EW 3	35	Higher Cover Hard	1328	871-865		N	Low-relief rocky outcrops, scattered rocks & rubble; various sponges, pachastrellids, cup sponges, geodiid, Phakellia, Isididae, primnoids, other gorgonians, nephthyids, numerous anemones, antipatharian, echiurans, cidaroids, asteroids; separated by expanses of sediment	▼
134	26 10.414	79 57.148	26.17356667	-79.95246667	EW 3	35	Sediment	1358	865	POINT	N	Sediment; passing to flat sparsely bioturbated sediment with tufts; ophiuroids, asteroids, galatheids	**Quant. Photo Site 4**
	26 10.41	79 57.163			EW 3	35-36	Higher Cover Hard	1359-1730	871-856		Photos	More hard bottom; large octocoral, Phakellia, anemones, echiurans, flytrap anemone; scattered low-relief hardbottom - rubble & rubble fields, rocks, veneered pavement - separated by wide sediment expanses; sponges, lithistids, hexactinellids, pachastrellids, Isididae, primnoids, anemones; stylasterid; turfy sediment; some hard bottoms relatively barren	▼

	26 10.377	79 57.306			EW 3	36	Higher Cover Hard	1718-1730	856-867	POINT		LAST HEXACTINELLIDS	
	26 10.337	79 57.500			EW 3	36	Sediment	1730	867			Sparsely bioturbated sediment; ophiuroids, asteroids, galatheids	
	26 09.821	80 00.218			EW 3	40	Sediment	2015	734			Off transect; Avenger airplane with epifauna; hydroids, gorgonians, small corals	
146	26 09.583	80 01.061	26.16275000	-80.00458333	Tie EW 2	42	Sediment	2054-2055	701		N	END EW3; BEGIN TIE EW 2; Sparsely bioturbated sediment	
147	26 09.547	80 01.104	26.15911667	-80.01840000	Tie EW 2	42	Sediment	2057	698-692	POINT	N	Sparsely bioturbated sediment; debris with hydroids, small rubble cluster, <10-cm; anemones	
155	26 08.8	80 01.105	26.14666667	-80.01841667	Tie EW 2	43	**RE-MAP AS ARTIFICIAL**	2207	681	POINT	N	tilefish around sailboat wreck; no obvious burrows **NOT TILEFISH - OMIT AS TILEFISH POINT; RE-IDENTIFY AS ARTIFICIAL POINT**	
160	26 08.606	80 00.309	26.14666667	-80.01841667	EW 2	46	Sediment	2309-2340	732-752		N	END TIE EW2 - BEGIN EW2; Bioturbated sediment (mounds, depressions); cluster of polychaete tubes; Coronaster	
162	26 08.8	80 01.105	26.14666667	-80.01841667	EW 2	47	Sediment	2350-0029	761-777	POINT	N	Flat bioturbated sediment (mounds, burrows) with small tubes (textured) and fine growth alternating with raised areas of obsolete rippled sediment; Coronaster, galatheids, **first cidaroid at 768 ft**	
167	26 09.243	79 58.035	26.15405000	-79.96725000	EW 2	50	Higher Cover Hard	155	840-845		Photos	Scattered small & large rocks & slabs, small outcrop separated by expanses of sediment; hydroids, anemones, Aphrocallistes, sponge, primnoid, Isididae, asteroids	**Quant . Photo site 5**
	26 9.251	79 58.013			EW 2	50	Sediment	156	842			Flat sediment with fine tufts or tubes	
	26 9.261	79 57.966			EW 2	50	Higher Cover Hard	159	845			Scattered low relief flat slabs, outcrops & rocks on sediment, 1-m boulder; hydroids, anemones, hexactinellid	
	26 9.273	79 57.904			EW 2	50	Higher Cover Hard	202	845	POINT		FIRST HEXACTINELLID	
168	26 09.281	79 57.88	26.15468333	-79.96466667	EW 2	50	Sediment	203	847		N	Bioturbated sediment; Coronaster;asteroids	
	26 9.31	79 57.775			EW 2	50	Higher Cover Hard	208	847		Photos	Hardbottom - slabs, boulders, rubble -separated by areas of sediment; Coronaster, Phakellia, anemones, primnoids, nephthyids, Isididae, echiurans	
	26 9.462	79 57.414			EW 2	50	Higher Cover Hard	222	862			**MOVING TO EAST END OF EW 2 TO RUN BACK TO WEST - DO NOT INCLUDE GAP FROM THIS POINT TO NEXT IN SHIP'S TRACK**	
170	26 09.978	79 54.193	26.16630000	-79.90321667	EW 2	51	Higher Cover Hard	351	925		Photos	**RESUME TRANSECT**; 8-30-cm rocks, rubble, boulders, chiefly 1-2 ft relief (1 up to 3 ft); some slabs, pavement, veneered hardbottom, some expanses of sediment; hexactinellids,	**Quant. Photo site 6**
171	26 09.899	26 09.899	26.16498333	-79.91343333	EW 2	51	Pennatulid	0423-0432	968		N	Rippled sediment with few sea pens, anemones, 1-2 isolated 5-10 cm rubble	▼
172	26 09.899	79 54.806	26.16498333	-79.91343333	EW 2	51	Sediment	423	968		N	Rippled sediment w few anemones	
	26 09.874	79 55.083			EW 2	52	Pennatulid	436	964	POINT		Sea pen on rippled sediment	

													Quant. Photo site 7
175	26 09.766	79 55.985	26.16276667	-79.93308333	EW 2	53	Low Cover Hard	516	939-912		N	Hardbottom rocks, rubble & slabs with 10-30 cm rocks separated by sediment expanses; hexactinellids, anemones, flytrap anemone, nephthyids, hydroids, Isididae, cidaroids	
176	26 09.677	79 56.289	26.16128333	-79.93815000	EW 2	53	Higher Cover Hard	0531	912-914		N	Low-relief pavement, fly trap, sponge, Isididae, cidaroid	▼
177	26 09.65	79 56.407	26.16083333	-79.94011667	EW 2	53	Low Cover Hard	0536	916		N	Sediment with a few rocks	▼
178	26 09.648	79 56.419	26.16080000	-79.94031667	EW 2	53	Sediment	537	916-908		N	Sparsely bioturbated sediment; cidaroid, asteroid	▼
179	26 09.572	79 56.717	26.15953333	-79.94528333	EW 2	53	Low Cover Hard	548	907-905		N	Two isolated areas of hardbottom - 1 ft-rocks, larger slabs; few widely isolated small rocks & rubble; anemones; hydroid, nephthyid; **boat?**	▼
180	26 09.557	79 56.771	26.15928333	-79.94618333	EW 2	53	Sediment	0550	904		N	Sediment with tubes	▼
181	26 09.547	79 56.846	26.15911667	-79.94743333	EW 2	54	Higher Cover Hard	0554-0634	896-860		Photos	Low-relief hardbottom with sediment veneer, 10-20-cm rubble; cobbles, boulders, slabs, low rugged outcrops, separated by sediment expanses with tubes;	▼
182	26 09.547	79 56.846	26.15911667	-79.94743333	EW 2	54	Sediment	0633			N	Just past site where transect was stopped when heading East earlier; overlapping until hardbottom is cleared	▼
183	26 09.547	79 56.846	26.15911667	-79.94743333	EW 2	55	Higher Cover Hard	636	845-838		Photos	Large boulders with higher relief, slabs, outcropping pavement, 7-8 ft ledge; pachastrellid, anemones, hydroid, Isididae, primnoids.	▼
184	26 09.273	79 57.872	26.15455000	-79.96453333	EW 2	55	Sediment	0641			N	Sediment	▼
	26 09.260	79 57.918			EW 2	55	Sediment	0643	838			END EW 2	
185	26 14.475	79 55.13	26.24125000	-79.91883333	EW6 Rep	56	Low Cover Hard	0813-0817	854		Photos	BEGIN REPEAT OF EW6; rubble in rippled sediment, rocks to 20 cm, few 0.5-m slabs; anemones, nephthyids, cidaroids	
186	26 14.443	79 55.216	26.24071667	-79.92026667	EW6 Rep	56	Higher Cover Hard	0819-0846	851-865		N	Rubble with rocks more crowded & larger, 20-50 cm, with some low pavement to 1.8 m across, alternating with areas of rippled sediment with sparse rubble & isolated rocks; hard substrate epifauna varies from numerous to sparse	
187	26 14.303	79 55.894	26.23838333	-79.93156667	EW6 Rep	56	Sediment	0846-0853	865		N	Rippled & bioturbated sediment; cidaroids	
193	26 14.046	79 57.253	26.23410000	-79.95421667	EW6 Rep	58	Low Cover Hard	0941	851	POINT	N	30-cm rock with anemone	
194	26 14.046	79 57.253	26.23410000	-79.95421667	EW6 Rep	58	Sediment	0943	851	POINT	N	Bamboo coral??[NOT VISIBLE ON REVIEW OF TAPE; NO AUDIO]	
195	26 14.029	79 57.340	26.23410000	-79.95421667	EW6 Rep	58	Sediment	944	?	POINT	N	Isolated flat white outcrop ~75-cm across; barren	
	26 13.712	79 58.991			EW6 Rep	59	Sediment	1044	?		N	END EW6 Repeat; Bioturbated sediment alternating with patches of rippled sediment	
199	26 13.481	79 57.775	26.23410000	-79.95421667	New NE B (S)	60	Sediment	1455-1549	813-860		N	BEGIN NEW NE B (SOUTH) Flat textured sediment (worm tubes) with some bioturbation (mounds, depressions) alternating with raised rippled sand waves; Coronaster, galatheids	
200	26 13.489	79 57.061	26.22481667	-79.95101667	New NE B (S)	60	Low Cover Hard	1546-1547	860	POINT	N	Small rubble bit (~15-cm) in depression with anemone; galatheids	

201	26 13.489	79 57.061	26.22481667	-79.95101667	New NE B (S)	61	Sediment	1550-1553	862		N	Flat textured sediment (worm tubes) with some bioturbation (mounds, depressions) alternating with raised rippled sand waves; Coronaster, galatheids
202	26 13.527	79 56.878	26.22545000	-79.94796667	New NE B (S)	61	Low Cover Hard	1554-1557	862-863	POINT	N	Same bottom, one small rock 30-cm (2 other 5-cm bits); anemone, hydroids, galatheids, Coronaster
203	26 13.527	79 56.878	26.22545000	-79.94796667	New NE B (S)	61	Sediment	1558-1643	863-876	POINT	N	Flat textured sediment (worm tubes) with some bioturbation (mounds, depressions) alternating with raised rippled sand waves; Coronaster, galatheids; anemones, ophiuroids, 1 dark cerianthid, **1st cidaroid in 867 ft**; ripples declining at 871 ft
205	26 13.842	79 55.338	26.23070000	-79.92230000	New NE B (S)	62	Low Cover Hard	1710	882-887		Photos	Scattered rubble & rocks 5-30 cm; hydroids, anemones, cidaroids, cerianthid
206	26 13.973	79 54.709	26.23110000	-79.92081667	New NE B (S)	62	Sediment	1715-1723	889-896		N	Rippled sediment with sparse bioturbation; cidaroids, asteroid, ophiuroid; Flat sediment with worm tube turf alternating with elevated areas of rippled sand w sparse bioturbation; anemone, ophiuroid, cidaroid
209	26 14.027	79 54.47	26.23378333	-79.90783333	New NE B (S)	63	Pennatulid	1748		POINT	N	One small sea pen on rippled sediment
210	26 14.032	79 54.442	26.23386667	-79.90736667	New NE B (S)	63	Depression	1750	930-932		Photos	Depression with rubble on bottom; 13 ft deep (to 943 ft), 30-40 ft across, 20-30º slope; anemone; sea pen
211	26 14.033	79 54.438	26.23388333	-79.90730000	New NE B (S)	63	Pennatulid	1750		POINT	N	Sea pen on depression floor
212	26 14.055	79 54.329	26.23425000	-79.90548333	New NE B (S)	63	Sediment	1755	932-937		N	Out of depression; Rippled sediment with sparse bioturbation; passing to flat sediment with turf alternating with elevated areas of rippled sand; cidaroids, anemones, asteroid
213	26 14.078	79 54.223	26.23463333	-79.90371667	New NE B (S)	63	Pennatulid	1802	945	POINT	N	Sea pen; no ripples
	26 14.08	79 54.142			New NE B (S)	63	Sediment	1806	?		N	END NEW NE B (SOUTH); Flat sediment with worm tube turf alternating with elevated areas of rippled sand w sparse bioturbation
214	26 14.161	79 54.152	26.23463333	-79.90371667	New NE Tie A-B	64	Sediment	1816-1836	928		N	BEGIN NEW NE TIE A-B: Flat sediment with worm tube turf alternating with elevated areas of rippled sand w sparse bioturbation; anemone, ophiuroid, cidaroid; galatheid, cerianthid
216	26 14.543	79 54.126	26.24238333	-79.90210000	New NE Tie A-B	64	Depression	1856	932-925		N	Begin depressions, max. relief 11 ft (932-934 ft); consolidated clay or rock bottom; anemones, cidaroid, asteroid
217	26 14.611	79 54.133	26.24351667	-79.90221667	New NE Tie A-B	64	Pennatulid	1902-1911	934-925		N	Isolated sea pens
219	26 14.718	79 54.136	26.24530000	-79.90226667	New NE Tie A-B	65	Depression	1913	927		N	Rippled sediment w sparse bioturbation; area rife with karst topographic features and low/mid relief sediment dunes
220	26 14.747	79 54.137	26.24578333	-79.90228333	New NE Tie A-B	65	Sediment	1914-1930	927-917		N	End karst/depressions; Rippled sand waves alternating with flat sediment; cidaroids, anemones
221	26 14.966	79 54.143	26.24943333	-79.90238333	New NE Tie A-B	65	Low Cover Hard	1936	917-905		N	Isolated clusters of small rocks to 30 cm or single small rocks in sediment; anemones, cidaroids, Isididae, paramuriceid

	26 14.979	79 54.140			New NE Tie A-B	65	Sediment	1936	?		N	Rippled & flat turfy sediment	
222	26 14.992	79 54.14	26.24988333	-79.90233333	New NE Tie A-B	65	Higher Cover Hard	1937	900-890		Photo series	Rocks, rubble, low-relief irregular outcrops and veneered pavement to 50% rock cover, separated by wide expanses of sediment; cidaroids, anemone, nephthyid, antipatharians; few sea pens on sediment	**Quant. Photo site 8**
223	26 14.275	79 54.137	26.24988333	-79.90233333	New NE Tie A-B	65	Low Cover Hard	1953	890		N	Small isolated boulders[?]; anemone, pachastrellid, hexactinellids?	▼
224	26 15.297	79 54.139	26.24988333	-79.90233333	New NE Tie A-B	65	Higher Cover Hard	1954	885		Photo series	Solid pavement; antipatharian, anemone, Isididae, vase sponge off side	▼
225	26 15.378	79 54.136	26.24988333	-79.90233333	New NE Tie A-B	65	Low Cover Hard	1958-2000	885-892		N	Scattered rocks, 5-10-cm rubble field; cidaroids, Isididae, sponges, anemone, hydroids	▼
226	26 15.428	79 54.137	26.24988333	-79.90233333	New NE Tie A-B	65	Higher Cover Hard	2001-2006	890		Photo series	Rubble, outcrops, 10-30-cm boulders; 1-2-ft slabs; Aphrocallistes, hexactinellids, other sponges, hydroids, antipatharians, nephthyids, gorgonian, echiurans, cidaroids	▼
227	26 15.534	79 54.14	26.25890000	-79.90233333	New NE Tie A-B	66	Higher Cover Hard	2007-2014	885		Photo series	Rubble fileds, rocks, boulders up to 30 cm, veneered outcrops; Aphrocallistes, geodiid, pachastrellids, Phakellia, hexactinellids, nephthyids, numerous Isididae, gorgonians, antipatharians, numerous echiurans,	▼
	26 15.681	79 54.130			New NE Tie A-B	66	Higher Cover Hard	2014			Photo series	Rubble field, chiefly <15 cm, anemones, nephthyids	▼
	26 15.715	79 54.126			New NE Tie A-B	66	Higher Cover Hard	2016	889		Photo series	Veneered low-relief outcrops, pavements, rocks, alternating with expanses of sediment and fields of rubble; antipatharian, anemones, echiurans, pachastrellid etc.	▼
	26 15.765	79 54.13			New NE Tie A-B	66	Higher Cover Hard	2021				END NEW NE TIE A-B	▼
228	26 15.765	79 54.13	26.26275000	-79.90216667	New NE A (N)	66	Higher Cover Hard	2022-2027	885-883		N	BEGIN NEW NE A (NORTH)15-20-cm boulders to larger rocks; Aphrocallistes, hexactinellids, Phakellia, nephthyids, anemones, Isididae, antipatharians, echiurans, cidaroids	▼
229	26 15.741	79 54.227	26.26275000	-79.90216667	New NE A (N)	66	Sediment	2027	880-881		N	Flat or rippled sand; no hard substrate, antipatharian	
230	26 15.723	79 54.282	26.26275000	-79.90216667	New NE A (N)	66	Low Cover Hard	2031-2037	878-876		N	Fields of sparse to abundant rubble chiefly <10 cm with occasional areas of larger rocks, slabs & outcrops to 0.75 m, still very low relief; chiefly anemones, nephthyids, with sparse Aphrocallistes, geodiid, hexactinellids, Isididae, antipatharians, echiurans, cidaroids	
	26 15.706	79 54.397			New NE A (N)	66		2038				**STANDING BY; DO NOT INCLUDE GAP FROM THIS POINT TO NEXT IN SHIP'S TRACK**	
231	26 15.722	79 54.399	26.26275000	-79.90216667	New NE A (N)	66-68	Higher Cover Hard	2048-2242	867-858		N	Large boulders, slabs, pavement, boulder field with smaller rocks, mixed with fields of sparse to abundant rubble; Aphrocallistes, Phakellia, pachastrellids, geodiid, anemones, nephthyids, Isididae, gorgonians, numerous antipatharians, echiurans, cidaroids	
	26 15.428	79 55.829			New NE A (N)	68	Higher Cover Hard	2207	818	POINT		LAST HEXACTINELLID	

235	26 15.269	79 56.615	26.25448333	-79.94358333	New NE A (N)	68	Low Cover Hard	2243-2244	836-847		N	Isolated small rocks and scattered clusters of small rocks, a few up to 0.4 m, occas veneered slab to 1 m across, on rippled sediment; hexactinellid, anemone, Isididae, antipatharians, cidaroids, Coronaster
	26 15.267	79 54.622			New NE A (N)	68	Low Cover Hard	2243	836			
236	26 15.259	79 54.653	26.25431667	-79.91088333	New NE A (N)	68	Sediment	2245			N	Rippled or flat bioturbated sediment **OMIT - JUST A VERY LOCAL SEDIMENT AREA**
237	26 15.241	79 56.736	26.25401667	-79.94560000	New NE A (N)	68	Low Cover Hard	2250			N	Rubble field with isididae, anemones,
238	26 15.240	79 56.742	26.25400000	-79.94570000	New NE A (N)	68	Sediment	2250	847		N	Rippled sand waves (up to 8-ft vertical relief); interspersed with smooth areas with worm tubes
239	26 15.224	79 56.855	26.25373333	-79.94758333	New NE A (N)	68	Malacanthid	2255	845	POINT	N	Tilefish burrow; more little rubble
	26 15.224	79 56.855			New NE A (N)	68	Sediment	2256-2300	847	POINT		**Last cidaroids**
241	26 15.197	79 56.961	26.25328333	-79.94935000	New NE A (N)	68	Low Cover Hard	2301		POINT	N	Patch of 10-30-cm rubble at base of slope
242	26 15.196	79 56.965	26.25328333	-79.94935000	New NE A (N)	68	Sediment				N	Flat or rippled sediment
243	26 15.190	79 56.989	26.26566667	-79.94958333	New NE A (N)	69	Sediment	2302-2307	845-842		N	Rippled sediment; anemone, Coronaster
	26 15.173	79 57.113			New NE A (N)	69	Low Cover Hard	2308-2314	840-836			Obsolete rippled sediment with very widely scattered variously sized rocks to 1-m across; anemones, gorgonians, antipatharians, Coronaster
245	26 15.156	79 56.226	26.26566667	-79.94958333	New NE A (N)	69	Sediment	2315-2337	838-820		N	Rippled & sparsely bioturbated sediment; Coronaster
246	26 15.071	79 56.630	26.26566667	-79.94958333	New NE A (N)	69	Depression	2331	829		N	7-ft deep depression
	26 15.047	79 57.778			New NE A (N)	69	Sediment	2337	~820-809			END NEW NE A (NORTH); BEGIN NEW N-S; Rippled & sparsely bioturbated sediment; passing to rippled sand waves alternating with narrow strips of flat bioturbated sediment; one flat rock Coronaster, galatheids, anemone, asteroids
249	26 14.616	79 57.855	26.24360000	-79.96425000	New N-S	70	Low Cover Hard	7	808	POINT	N	Rock with anemone & hydroids, adjacent flat white rocks 1-m across w very few anemones
250	26 14.539	79 57.852	26.24231667	-79.96420000	New N-S	70	Low Cover Hard	12		POINT	N	Small 8-cm rock with anemones
251	26 13.912	79 57.85	26.23186667	-79.96416667	New N-S	70	Low Cover Hard	44	817	POINT	N	Flat rock, no fauna on it
253	26 13.74	79 57.851	26.22900000	-79.96418333	New N-S	71	Artificial	0115	822	POINT	photo 166	Fishing boat
255	26 11.62	79 57.850	26.19620000	-79.96413333	New N-S	73	Sediment	0244-0251	829-831		N	END OF NEW N-S; as previous - obsolete rippled sediment sand waves, advancing face is steep to north, run E-W, separated by areas of smooth bioturbated sediment with small mounds; Coronaster