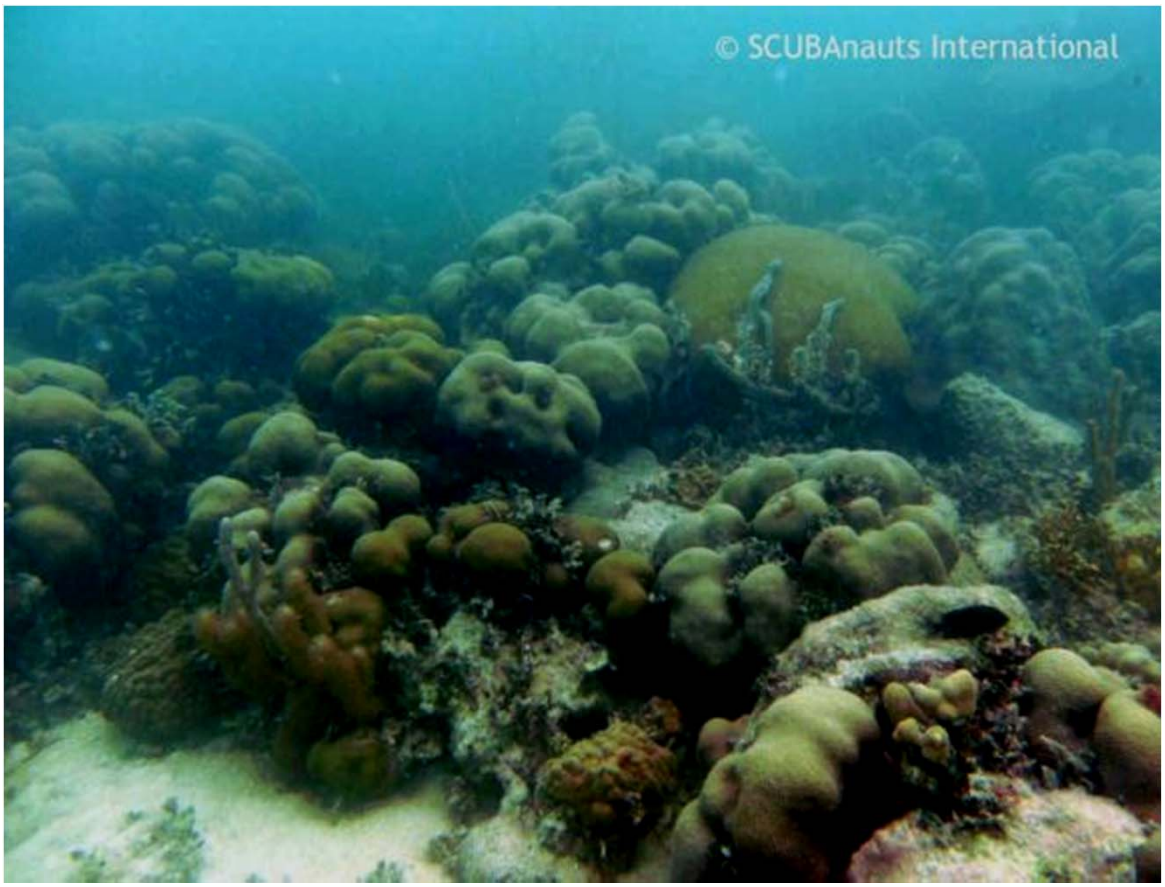
Coastal and Marine Ecological Classification Standard (CMECS) Unit Gallery

June 2012

The following pages present example images to illustrate how a scene might be classified using the different settings, components, and modifiers of the CMECS system. The images are intended to show practitioners ecological units at various spatial scales but primarily those of normal unassisted human observation. These data are communicated in the form of high-resolution still images, but in many cases the images do not provide the resolution necessary to reveal some details important for full classification under a given component, thus, many of the scenes are classified only to the level of detail allowed by the image. The photographs are provided to show examples from several CMECS components, and so are not grouped in any specific order.

A general location map is included to provide geographic context and, where appropriate, an aerial image, bathymetric map, or supplemental photo is added to show the geomorphologic features where the site is found or add detail.

Florida Keys, FL; USA



Underwater still photograph s of coral reef area in shallow clear water. Field of view in the mid-range is approximately 10 meters. This reef has some vertical relief and is dominated by mound corals.

General location map

CMECS Classification

Biogeographic Setting:
- Realm: Tropical Atlantic
- Province: Tropical Northwestern Atlantic
- Ecoregion: Floridian

Aquatic Setting:
- System: Marine
- Subsystem: Nearshore
- Tidal Zone: Subtidal

Water Column Component:
- Water Column Layer: Marine Nearshore Lower Water Column
- Salinity Regime: Euhaline Water
- Temperature Regime: Warm Water

Geoform Component:
- Tectonic Setting: Passive Continental Margin
- Physiographic Setting: Barrier Reef
- Geoform Origin: Biological
- Level 1 Geoform: Shallow/Mesophotic Coral Reef
- Level 1 Geoform Type: Undifferentiated
- Level 2 Geoform: Shallow/Mesophotic Coral Reef
- Level 2 Geoform Type: Patch Coral Reef

Substrate Component:
- Substrate Origin: Biogenic Substrate
- Substrate Class: Coral Substrate
- Substrate Subclass: Coral Reef Substrate
- Modifier: Layering: Sand Veneer

Biotic Component
- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Reef Biota
- Biotic Subclass: Shallow and Mesophotic Coral Reef Biota
- Biotic Group: Massive Coral Reef
- Biotic Community: Massive *Montastraea* Reef

Narragansett Bay, RI; USA

Low-altitude, aerial oblique photograph of small river entering Narragansett Bay. The field of view in the mid-range is approximately 250 meters. The image shows two types of aquatic vegetation bed in the cove and in deeper water.

General location map

CMECS Classification

Biogeographic Setting:

- Realm: Temperate North Atlantic
- Province: Cold Temperate Northwest Atlantic
- Ecoregion: Virginian

Aquatic Setting:

- System: Estuarine
- Subsystem: Coastal
- Tidal Zone: Subtidal Zone

Water Column Component:

- Water Column Layer: Estuarine Coastal Upper Water Column
- Salinity Regime: Upper Polyhaline Water
- Temperature Regime: Moderate Water

Geoform Component:

- Tectonic Setting: Passive Continental Margin
- Physiographic Setting: Embayment/Bay
- Geoform Origin: Geologic
- Level 1 Geoform: Cove
- Level 1 Geoform Type: Mainland Cove

Substrate Component:

- Substrate Origin: Geologic Substrate
- Substrate Class: Unconsolidated Mineral Substrate
- Substrate Subclass: Fine Unconsolidated Substrate
- Substrate Group: Sandy Mud

Biotic Component

- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Aquatic Vegetation Bed
- Biotic Subclass: Benthic Macroalgae
- Biotic Group: Filamentous Algal Bed
- Biotic Community: *Aghardiella* Communities
- Co-occurring Element: Sheet Algal Bed: *Ulva* Communities

Punta Cana; Dominican Republic

Underwater still photograph of shipwreck in tropical clear-water environment. Field of view in the mid-ground is approximately 10 meters.

General location map

CMECS Classification

Biogeographic Setting:
- Realm: Tropical Atlantic
- Province: Tropical Northwestern Atlantic
- Ecoregion: Greater Antilles

Aquatic Setting:
- System: Marine
- Subsystem: Nearshore
- Tidal Zone: Subtidal

Water Column Component:
- Water Column Layer: Marine Nearshore Lower Water Column
- Salinity Regime: Euhaline Water
- Temperature Regime: Very Warm

Geoform Component:
- Tectonic Setting: Passive Continental Margin
- Physiographic Setting: Continental/Island Shore Complex
- Geoform Origin: Geological/Anthropogenic
- Level 1 Geoform: Shoal
- Level 2 Geoform: Wreck

Substrate Component:
- Substrate Origin: Anthropogenic Substrate
- Substrate Class: Metal
- Substrate Subclass: Metal Reef Substrate

Biotic Component
- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Aquatic Vegetation Bed
- Biotic Subclass: Benthic Macroalgae
- Biotic Group: Leathery/Leafy Algal Bed
- Associated Taxa: Sergeant Majors (*Abudefduf saxatilis*)

Long Beach Harbor, CA; USA

Sediment profile image in soft bottom environment. Field of view is 15 centimeters.

General location map

CMECS Classification

Biogeographic Setting:
- Realm: Temperate Northern Pacific
- Province: Cold Temperate Northeast Pacific
- Ecoregion: Southern California Bight

Aquatic Setting:
- System: Marine
- Subsystem: Nearshore
- Tidal Zone: Subtidal

Water Column Component:
- Water Column Layer: Marine Nearshore Lower Water Column
- Salinity Regime: Euhaline Water
- Temperature Regime: Slightly Cold Water

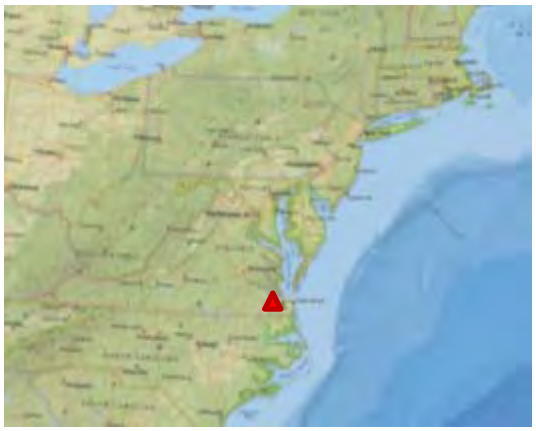
Geoform Component:
- Tectonic Setting: Convergent Active Continental Margin
- Physiographic Setting: Continental/Island Shore Complex
- Geoform Origin: Anthropogenic
- Level 1 Geoform: Harbor

Substrate Component:
- Substrate Origin: Geologic Substrate
- Substrate Class: Unconsolidated Mineral Substrate
- Substrate Subclass: Fine Unconsolidated Substrate
- Substrate Group: Sandy Mud

Biotic Component
- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Faunal Bed
- Biotic Subclass: Soft Sediment Fauna
- Biotic Group: Larger Deep-Burrowing Fauna
- Co-occurring Element: Small Surface-Burrowing Fauna

York River, VA; USA

Terrestrial photograph of tidal creek in emergent marsh captured at low tide. Field of view in foreground is approx. 15 meters. The dominant vegetation in this scene is smooth cordgrass.



General location map

CMECS Classification

Biogeographic Setting:
- Realm: Temperate North Atlantic
- Province: Cold Temperate Northwest Atlantic
- Ecoregion: Virginian

Aquatic Setting:
- System: Estuarine
- Subsystem: Coastal
- Tidal Zone: Intertidal

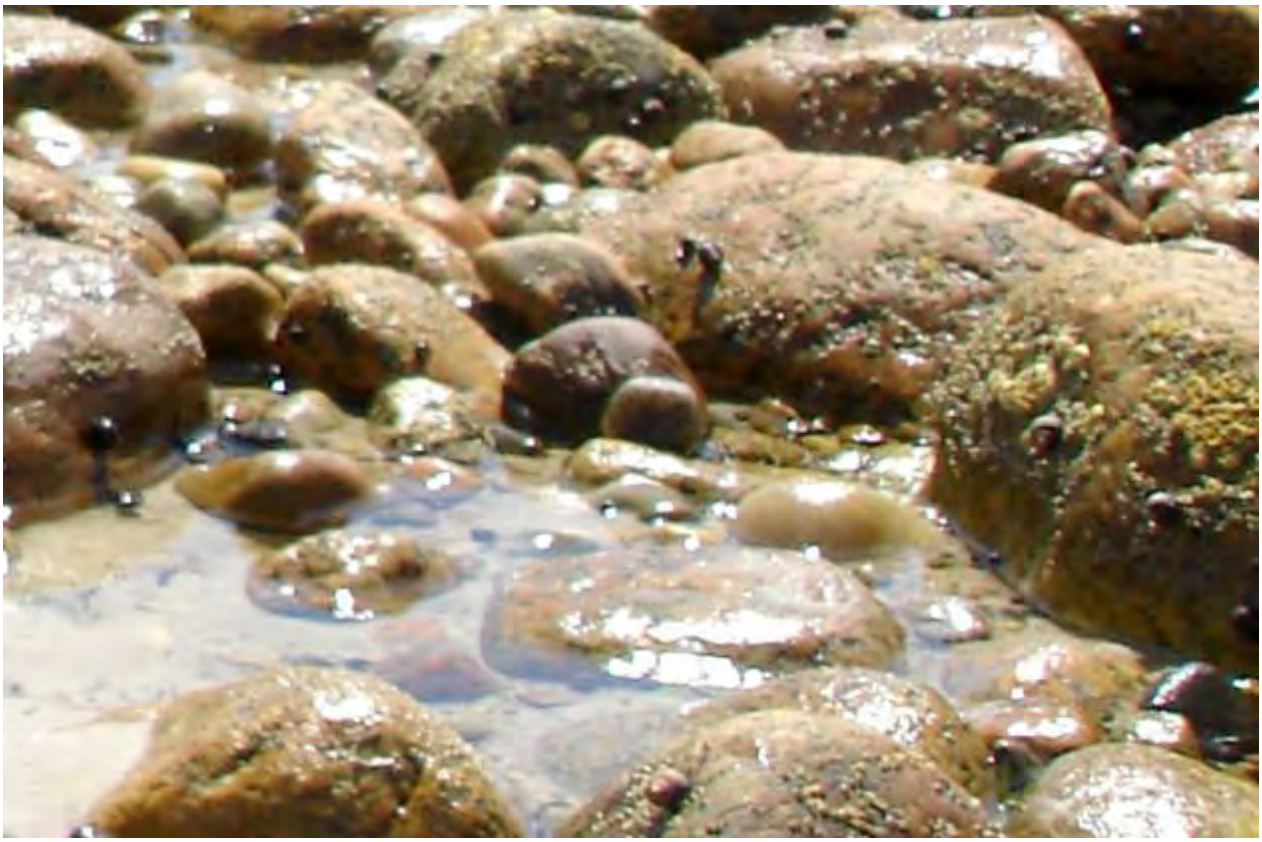
Water Column Component:
- Water Column Layer: Estuarine Tidal Riverine Coastal Upper Water Column
- Salinity Regime: Lower Polyhaline Water
- Temperature Regime: Moderate Water

Geoform Component:
- Tectonic Setting: Passive Continental Margin
- Physiographic Setting: Riverine Estuary
- Geoform Origin: Geologic
- Level 1 Geoform: Marsh Platform
- Level 2 Geoform: Channel
- Level 2 Geoform Type: Tidal Creek

Substrate Component:
- Substrate Origin: Geologic Substrate
- Substrate Class: Unconsolidated Mineral Substrate
- Substrate Subclass: Fine Unconsolidated Substrate
- Substrate Group: Muddy Sand

Biotic Component
- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Emergent Wetland
- Biotic Subclass: Emergent Tidal Marsh
- Biotic Group: Low and Intermediate Salt Marsh
- Biotic Community: *Spartina alterniflora* Virginian Zone Herbaceous Vegetation

Buzzards Bay, MA; USA



Close-up terrestrial photograph of cobbles along a rock shoreline in the intertidal zone. Some barnacles attached to the rocks are visible. The field of view is approx. 1.5 meters.

General location map

CMECS Classification

Biogeographic Setting:

- Realm: Temperate North Atlantic
- Province: Cold Temperate Northwest Atlantic
- Ecoregion: Virginian

Aquatic Setting:

- System: Estuarine
- Subsystem: Coastal
- Tidal Zone: Intertidal

Water Column Component:

- Water Column Layer: Estuarine Coastal Upper Water Column
- Salinity Regime: Upper Polyhaline Water
- Temperature Regime: Slightly Cold Water

Geoform Component:

- Tectonic Setting: Passive Continental Margin
- Physiographic Setting: Embayment/Bay
- Geoform Origin: Geologic
- Level 1 Geoform: Cove
- Level 1 Geoform Type: Mainland Cove
- Level 2 Geoform: Beach
- Level 2 Geoform Type: Wave Dominated Beach

Substrate Component:

- Substrate Origin: Geologic Substrate
- Substrate Class: Unconsolidated Mineral Substrate
- Substrate Subclass: Coarse Unconsolidated Substrate
- Substrate Group: Gravel
- Substrate Subgroup: Cobble
- Co-occurring Element: Sand (< 20%)

Biotic Component

- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Faunal Bed
- Biotic Subclass: Attached Fauna
- Biotic Group: Barnacles
- Biotic Community: KG7 *balanus balanoides* Communities
- Co-occurring Element: Mobile Gastropods: *Littorina littorea*.

Slide 14

KG7 Delete Extra space

Kathy Goodin, 6/14/2012

Long Island Sound, NY; USA

Terrestrial photograph of a vegetated mussel reef overlying a pebble/gravel beach at low tide. The field of view in foreground is approx. 2.5 meters. The dominant biota consist of Atlantic blue mussel and smooth cordgrass.

General location map

Aerial photo showing site in sheltered bay.

CMECS Classification

Biogeographic Setting:

- Realm: Temperate Northern Atlantic
- Province: Cold Temperate Northwest Atlantic
- Ecoregion: Virginian

Aquatic Setting:

- System: Estuarine
- Subsystem: Coastal
- Tidal Zone: Intertidal

Water Column Component: N/A

Geoform Component:

- Tectonic Setting: Passive Continental Margin
- Physiographic Setting: Continental Shore Complex
- Geoform Origin: Geologic
- Level 1 Geoform: Beach
- Level 2 Geoform: Beach
- Level 2 Geoform Type: Pocket Beach

Substrate Component:

- Substrate Origin: Geologic Substrate
- Substrate Class: Unconsolidated Mineral Substrate
- Substrate Subclass: Coarse Unconsolidated Substrate
- Substrate Group: Gravel
- Substrate Subgroup: Pebble
- Co-Occurring Element: Coarse Sand

Biotic Component

- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Reef Biota
- Biotic Subclass: Mollusk Reef Biota
- Biotic Group: Mussel Reef
- Biotic Community: *Mytilus* Communities
- Co-Occurring Element: *Spartina alterniflora/Distichlis spicata* Tidal Herbaceous Wetland Vegetation

California Coast; USA

Underwater still photograph of a kelp forest in nearshore waters. The field of view in mid-range is approximately 10 meters.

General location map

CMECS Classification

Biogeographic Setting:
- Realm: Temperate Northern Pacific
- Province: Cold Temperate Northeast Pacific
- Ecoregion: Northern California

Aquatic Setting:
- System: Marine
- Subsystem: Nearshore
- Tidal Zone: Subtidal

Water Column Component:
- Water Column Layer: Marine Nearshore Upper Water Column
- Salinity Regime: Upper Euhaline Water
- Temperature Regime: Cold Water

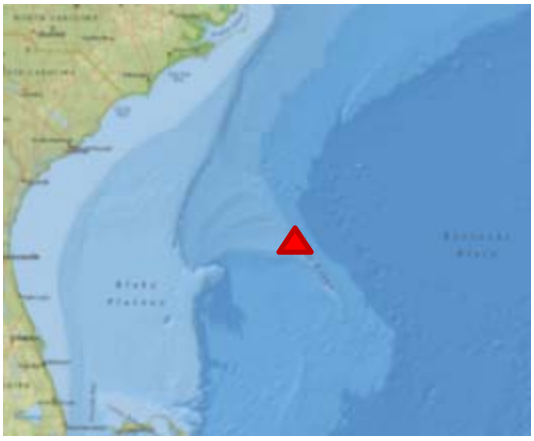
Geoform Component:
- Tectonic Setting: Convergent Active Continental Margin
- Physiographic Setting: Bight
- Geoform Origin: Geologic
- Level 1 Geoform: Rock Outcrop
- Level 1 Geoform Type: Undifferentiated

Substrate Component:
- Substrate Origin: Geologic Substrate
- Substrate Class: Rock Substrate
- Substrate Subclass: Bedrock
- Substrate Group: N/A
- Substrate Subgroup: N/A

Biotic Component
- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Aquatic Vegetation Bed
- Biotic Subclass: Benthic Macroalgae
- Biotic Group: Canopy-Forming Algal Bed
- Biotic Community: *Macrocystis* Communities

Blake Ridge, South Atlantic Bight

Underwater videography scene of bacterial mats (white) on smooth unconsolidated sediment. The two red dots are calibration lights for the video system and are fixed at 10 cm apart (image courtesy of NOAA Office of Ocean Exploration).



General location map

CMECS Classification

Biogeographic Setting:
- Realm: Temperate North Atlantic
- Province: Warm Temperate Northwest Atlantic
- Ecoregion: Carolinian

Aquatic Setting:
- System: Marine
- Subsystem: Oceanic
- Tidal Zone: Subtidal

Water Column Component:
- Water Column Layer: Marine Oceanic Mesopelagic Layer
- Salinity Regime: Euhaline
- Temperature Regime: Cold

Geoform Component:
- Tectonic Setting: Passive Continental Margin
- Physiographic Setting: Continental Slope
- Geoform Origin: Geologic
- Level 1 Geoform: Diapir
- Level 1 Geoform Type: Undifferentiated
- Level 2 Geoform: Ridge
- Level 2 Geoform Type: Undifferentiated

Substrate Component:
- Substrate Origin: Geologic Substrate
- Substrate Class: Unconsolidated Mineral Substrate
- Substrate Subclass: Fine Unconsolidated Substrate
- Substrate Group: Mud
- Substrate Subgroup: Silt

Biotic Component
- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Microbial Communities
- Biotic Subclass: Mat/Film-Forming Microbes
- Biotic Group: Bacterial Mat/Film

Capers Island, SC; USA

Terrestrial photograph of a “boneyard” beach at low tide. The large woody debris in this scene is generally fixed in position and consists of dead live oak, cabbage palm, and loblolly pine trunks. The trunks serve as substrate for barnacles and some macroalgae, although their position high in the intertidal make further colonization difficult. Boneyards form on eroding island shores as the ocean cuts into adjacent maritime forests. The field of view in mid-range is approximately 20 meters.

General location map

Aerial photo showing site at edge of maritime forest

CMECS Classification

Biogeographic Setting:
- Realm: Temperate North Atlantic
- Province: Warm Temperate Northwest Atlantic
- Ecoregion: Carolinian

Aquatic Setting:
- System: Marine
- Subsystem: Nearshore
- Tidal Zone: Supratidal

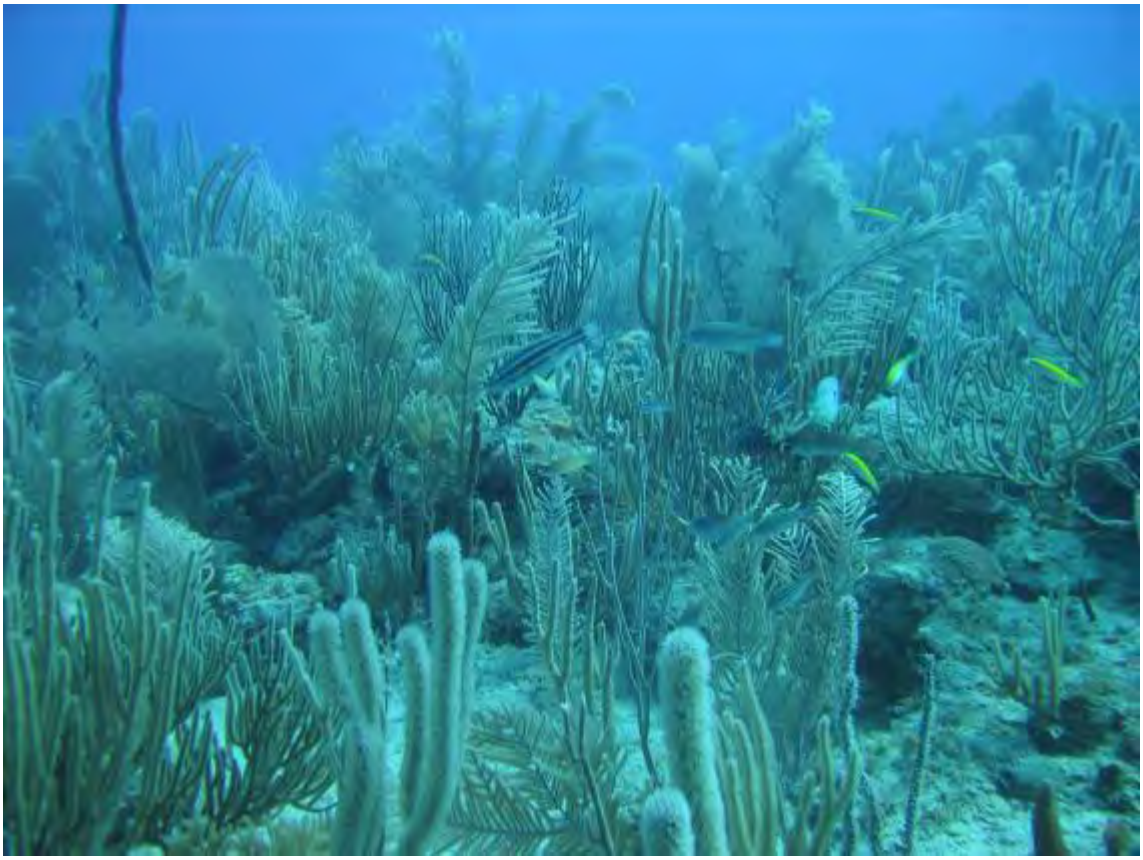
Water Column Component: N/A

Geoform Component:
- Tectonic Setting: Passive Continental Margin
- Physiographic Setting: Island Shore Complex
- Geoform Origin: Geologic
- Level 1 Geoform: Beach
- Level 1 Geoform Type: Barrier Beach
- Level 2 Geoform: Beach
- Level 2 Geoform Type: Barrier Beach

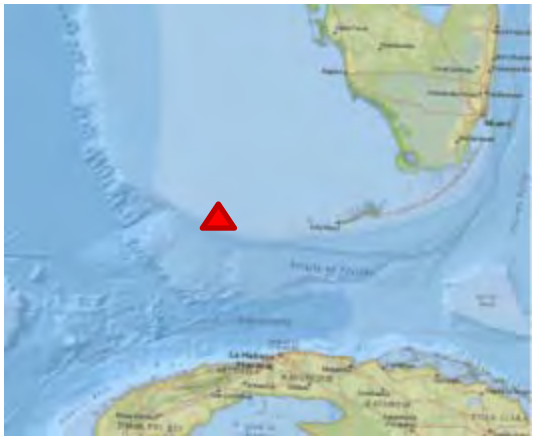
Substrate Component:
- Substrate Origin: Biogenic Substrate
- Substrate Class: Organic Substrate
- Substrate Subclass: Organic Debris
- Substrate Group: Woody Debris
- Substrate Subgroup: Very Coarse Woody Debris
- Co-Occurring Element: Fine Sand

Biotic Component
- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Faunal Bed
- Biotic Subclass: Attached Fauna
- Biotic Group: Barnacles
- Biotic Community: *Balanus* Communities

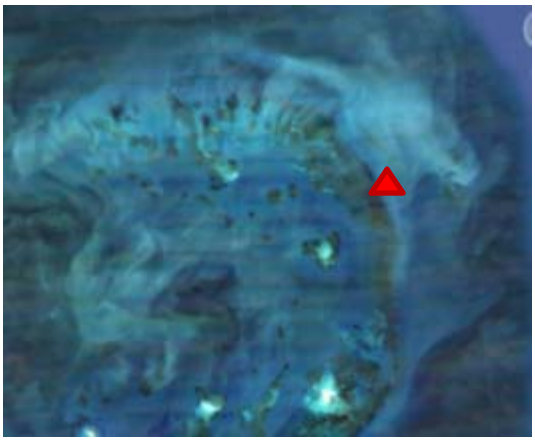
Dry Tortugas, FL; USA



Underwater still photograph of a mixed stand of soft corals, sponges, and gorgonians colonizing former stony coral reef. Field of view in foreground is approx. 4 meters.



General location map



Aerial photo showing site at edge of Tortugas platform

CMECS Classification

Biogeographic Setting:
- Realm: Tropical Atlantic
- Province: Tropical Northwestern Atlantic
- Ecoregion: Floridian

Aquatic Setting:
- System: Marine
- Subsystem: Nearshore
- Tidal Zone: Subtidal

Water Column Component:
- Water Column Layer: Marine Nearshore Lower Water Column
- Salinity Regime: Euhaline
- Temperature Regime: Warm

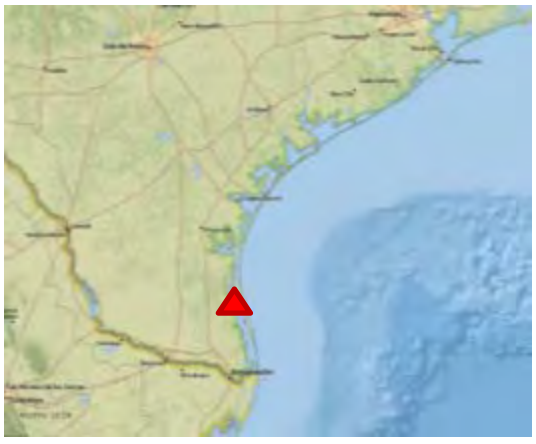
Geoform Component:
- Tectonic Setting: Passive Continental Margin
- Physiographic Setting: Ocean Bank/Plateau
- Geoform Origin: Biologic
- Level 1 Geoform: Shallow/Mesophotic Coral Reef
- Level 1 Geoform Type: Aggregate Coral Reef
- Level 2 Geoform: Shallow/Mesophotic Coral Reef
- Level 2 Geoform Type: Aggregate Coral Reef

Substrate Component:
- Substrate Origin: Biogenic Substrate
- Substrate Class: Coral Substrate
- Substrate Subclass: Coral Reef Substrate

Biotic Component
- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Reef Biota
- Biotic Subclass: Coral Reef Biota
- Biotic Group: Colonized Shallow/Mesophotic Reef
- Biotic Community: Coral Garden Reef

Lower Laguna Madre, TX; USA

Terrestrial photograph of a panne during slightly wet conditions caused by higher than normal wind-driven tides. The field of view in the foreground is approximately 8 meters.



General location map

Aerial photo showing white *Panne* areas.

CMECS Classification

Biogeographic Setting:

- Realm: Temperate North Atlantic
- Province: Warm Temperate Northwest Atlantic
- Ecoregion: Northern Gulf of Mexico

Aquatic Setting:

- System: Estuarine
- Subsystem: Coastal
- Tidal Zone: Supratidal

Water Column Component: N/A

Geoform Component:

- Tectonic Setting: Passive Continental Margin
- Physiographic Setting: Lagoonal Estuary
- Geoform Origin: Geologic
- Level 1 Geoform: Lagoon
- Level 1 Geoform Type: Undifferentiated
- Level 2 Geoform: Panne
- Level 2 Geoform Type: Undifferentiated

Substrate Component:

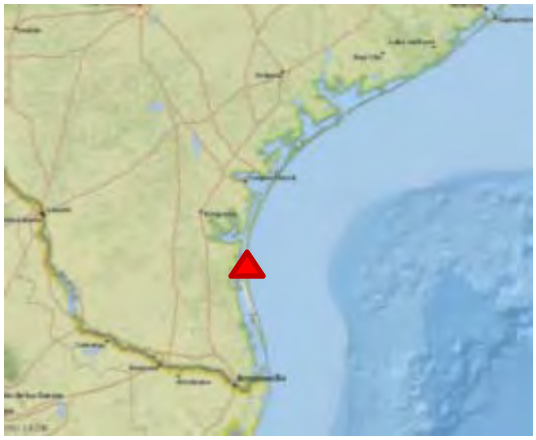
- Substrate Origin: Geologic Substrate
- Substrate Class: Unconsolidated Mineral Substrate
- Substrate Subclass: Fine Unconsolidated Substrate
- Substrate Group: Mud
- Substrate Subgroup: Clay
-

Biotic Component

- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Faunal Bed
- Biotic Subclass: Soft-Sediment Biota
- Biotic Group: Oligozoic Biota

Upper Laguna Madre, TX; USA

Terrestrial photograph of a worm reef captured at low water. Worm reefs form around a nucleus of hard material, in this case an abandoned anchor chain. This reef itself has some red algae present. The field of view in foreground is approx. 2.5 meters. This particular reef was formed by serpulid worms.



General location map

CMECS Classification

Biogeographic Setting:

- Realm: Temperate North Atlantic
- Province: Warm Temperate Northwest Atlantic
- Ecoregion: Northern Gulf of Mexico

Aquatic Setting:

- System: Estuarine
- Subsystem: Coastal
- Tidal Zone: Intertidal

Water Column Component: N/A

Geoform Component:

- Tectonic Setting: Passive Continental Margin
- Physiographic Setting: Lagoonal Estuary
- Geoform Origin: Geologic
- Level 1 Geoform: Lagoon
- Level 1 Geoform Type: Undifferentiated

Substrate Component:

- Substrate Origin: Biogenic Substrate
- Substrate Class: Worm Substrate
- Substrate Subclass: Serpulid Substrate
- Substrate Group: Serpulid Reef Substrate

Biotic Component

- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Reef Biota
- Biotic Subclass: Worm Reef Biota
- Biotic Group: Sepulid Reef
- Co-Occurring Element: Filamentous Algae Biotic Group

Hempstead Bay, NY; USA

Terrestrial photograph of small cove captured at low tide. Most of the scene is dominated by Atlantic blue mussel reef. In some areas green macroalgae has colonized the reef. These mussels are fully consolidated and thus would be considered a reef as opposed to a bed in which case they would be in loose aggregations. In this setting the mussels form the dominant biota but also serve as substrate.

General location map

CMECS Classification

Biogeographic Setting:

- Realm: Temperate North Atlantic
- Province: Warm Temperate Northwest Atlantic
- Ecoregion: Virginian

Aquatic Setting:

- System: Estuarine
- Subsystem: Coastal
- Tidal Zone: Intertidal

Water Column Component: N/A

Geoform Component:

- Tectonic Setting: Passive Continental Margin
- Physiographic Setting: Continental/Island Shore Complex
- Geoform Origin: Biologic
- Level 1 Geoform: Flat
- Level 1 Geoform Type: Tidal Flat
- Level 2 Geoform: Mollusk Reef
- Level 2 Geoform Type: Undifferentiated

Substrate Component:

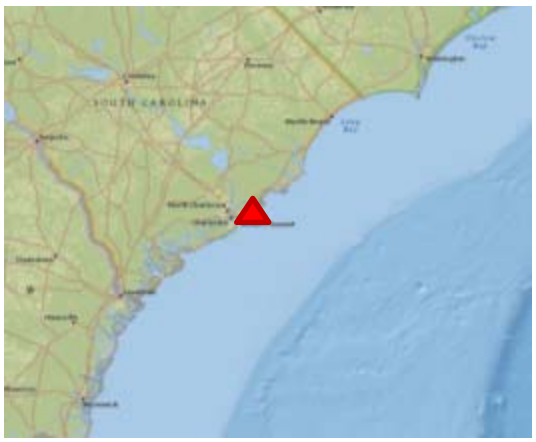
- Substrate Origin: Biogenic Substrate
- Substrate Class: Shell Substrate
- Substrate Subclass: Shell Reef Substrate
- Substrate Group: Mussel Reef Substrate

Biotic Component

- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Reef Biota
- Biotic Subclass: Mollusk Reef Biota
- Biotic Group: Mussel Reef
- Biotic Community: *Mytilus* Reef
- Co-occurring Element: *Ulva lactuca* Communities

Gray's Sound, SC; USA

Terrestrial photograph of tidal flat, captured at low tide, with many oyster patch reefs present. The extensive flats between reefs consists of highly organic silt substrate locally known as pluff mud. The foreground consists mostly of dead shell with more standing live shell visible farther away. Dominant biota here are eastern oyster. The field of view in foreground is approx. 10 meters.



General location map

Aerial image showing numerous patch reefs on intertidal flats.

CMECS Classification

Biogeographic Setting:

- Realm: Temperate North Atlantic
- Province: Warm Temperate Northwest Atlantic
- Ecoregion: Carolinian

Aquatic Setting:

- System: Marine
- Subsystem: Nearshore
- Tidal Zone: Intertidal
-

Water Column Component: N/A

Geoform Component:

- Tectonic Setting: Passive Continental Margin
- Physiographic Setting: Embayment/Bay
- Geoform Origin: Biologic
- Level 1 Geoform: Flat
- Level 1 Geoform Type: Tidal Flat
- Level 2 Geoform: Mollusk Reef
- Level 2 Geoform Type: Patch Mollusk Reef

Substrate Component:

- Substrate Origin: Biogenic Substrate
- Substrate Class: Shell Substrate
- Substrate Subclass: Shell Reef Substrate
- Substrate Group: Oyster Reef Substrate

Biotic Component

- Biotic Setting: Benthic/Attached Biota
- Biotic Class: Reef Biota
- Biotic Subclass: Mollusk Reef Biota
- Biotic Group: Oyster Reef
- Biotic Community: *Crassostrea* Communities