

DESCRIPTION OF MAP UNITS

UNCONSOLIDATED CONTINENTAL SHELF SEDIMENTS

- Se(s)my_u Soft, unconsolidated, delta sediment (fine silt and mud)
- Se(s)l_ru Soft, unconsolidated sediment (sand), predominantly rippled
- Se(s)g_u Soft, unconsolidated sediment (sand or gravel)
- Se(s)g_hsu Soft, hummocky and current-scoured, unconsolidated sediment (course sand and gravel)
- Se(s)ghw_rsu Soft, mobile sediment window with unconsolidated and rippled sediment waves overlying scoured lag pavement of sand and gravel (sorted bedforms)
- Se(s)ghm_hsu Soft, linear ridges of current-scoured unconsolidated sediment (sand and gravel)
- Se(s)gm_hsu Soft, hummocky and current-scoured, unconsolidated sediment (sand and mud)
- Se(s)m_ru Soft, unconsolidated sediment (sand and mud), predominantly rippled
- Se(s)mmw_u Soft, unconsolidated, dynamic mound of sediment (sand and mud)
- Se(s)ms_u Soft, scarp of unconsolidated sediment (sand/mud)
- Se(s)mw_ru Soft, sediment waves in unconsolidated rippled sediment (sand and mud)

MIXED SUBSTRATE ON CONTINENTAL SHELF

- Sme_cru Mixed habitat, soft, unconsolidated sediment locally covering hard, consolidated sedimentary bedrock
- Sme_gu Mixed habitat, soft, unconsolidated sediment locally covering hard granite bedrock

HARD SUBSTRATE ON CONTINENTAL SHELF

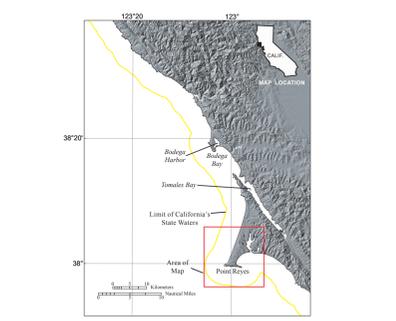
- Shd_cofr Hard, faulted, fractured, differentially eroded, and deformed sedimentary bedrock
- Shdvp_g Hard, granite boulder or pinnacle
- Shdvp_c Hard, consolidated sedimentary rock, boulder, or pinnacle
- Shd_g Hard, granite rock exposure; may contain unconsolidated sediment (sand) in crevices and cracks

ANTHROPOGENIC FEATURES ON CONTINENTAL SHELF

- Smm_g? Mixed habitat of sediment-covered hard mounds comprised of unidentified material, possibly marine debris (inferred)

EXPLANATION OF MAP SYMBOLS

- Contact
- Area of "no data"—Areas near shoreline not mapped owing to insufficient high-resolution seafloor mapping data; areas beyond 3-nautical-mile limit of California's State Waters were not mapped as part of California Seafloor Mapping Program
- 3-nautical-mile limit of California's State Waters
- Bathymetric contour (in meters)—Derived from modified 2-m-resolution bathymetry grid. Contour interval: 10 m



DISCUSSION

This map shows "potential" marine benthic habitats in the Offshore of Point Reyes map area. Marine benthic habitats represent a particular type of substrate, geomorphology, seafloor process, or any other attribute that may provide a habitat for a specific species or an assemblage of organisms. Such maps are based largely on seafloor geology, and this map integrates seafloor geology (sheet 10) with information depicted on several other thematic maps of the Offshore of Point Reyes map area: high-resolution bathymetry (sheet 1), shaded-relief imagery (sheet 2), backscatter (sheet 3), seafloor character (sheet 5), and ground-truth information (sheet 6). This map also uses information from the uSEAHED bottom-sampling compilation by Reid and others (2006). The combination of remotely observed data (for example, multibeam bathymetry and backscatter, seismic-reflection profiles) and directly observed data (for example, camera transects, sediment samples) translates to higher confidence in the ability to interpret broad areas of the seafloor (fig. 1).

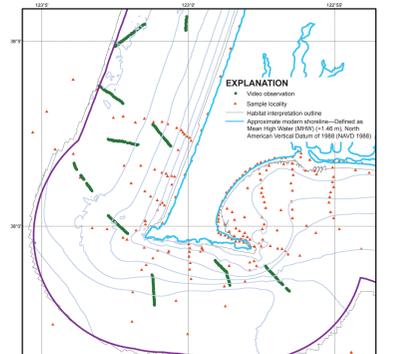
To avoid any possible misunderstanding of the term "habitat," the term "potential habitat" (as defined by Greene and others, 2005) is used herein to describe a set of distinct seafloor conditions that in the future may qualify as an "actual habitat." Once habitat associations of a species are determined, they can be used to create maps that depict actual habitats, which then need to be confirmed by "ground-truth" surveying using in situ observations, video, and/or photographic documentation.

Marine benthic habitats are classified using the Benthic Marine Potential Habitat Classification Scheme, a mapping-attribute code developed by Greene and others (1999, 2007). In this map series, habitat-classification codes are based on the deepwater habitat-characterization scheme developed by Greene and others (1999), which was created to not only easily distinguish marine benthic habitats but also to facilitate ease of use and queries within GIS and database programs. The code, which is summarized in chapter 6 in the accompanying pamphlet, is derived from several categories of the Benthic Marine Potential Habitat Classification Scheme (Greene and others, 1999, 2007), and it can be subdivided on the basis of the spatial scale of the data.

High-resolution, multibeam-soundar data, converted to bathymetric depth grids (seafloor digital elevation models; sheet 1), are essential to development of the habitat map, as is shaded-relief imagery (sheet 2), which allows for visualization of seafloor terrain and provides a foundation for interpretation of submarine landforms. Areas of seafloor bedrock exposures are identified by their common sharp edges and high relative relief; these may be contiguous outcrops, isolated parts of outcrop protruding through sediment cover (pinnacles or knobs), or isolated boulders.

Backscatter maps (sheet 3) also are essential for developing potential benthic habitat maps. High backscatter is further indication of "hard" bottom, consistent with interpretation as rock or coarse sediment. In many locations, areas within or around a rocky feature appear to be covered by a thin veneer of sediment, identified on the habitat map as "mound" (in other words, containing both rock and sediment). Broad, generally smooth areas of the seafloor that lack sharp and angular characteristics are mapped as "sediment" and are further defined by various sedimentary features such as erosional scars and depressions, as well as depositional features such as dunes, mounds, or sand waves. Low backscatter, indicative of a "soft" bottom, also significantly aids identification and classification of sedimentary habitats.

The Offshore of Point Reyes map area contains 18 potential marine benthic habitat types covering 182.40 km², all of which are located on the continental shelf ("Shelf" megahabitat). These include unconsolidated continental shelf sediments (11 habitat types), mixed substrate on the continental shelf (2 habitat types), hard substrate on the continental shelf (4 habitat types), and anthropogenic features (1 habitat type). The predominant habitat type by area is soft, unconsolidated sediment, which covers 170.72 km² (93.6 percent). Exposed hard bedrock covers 10.02 km² (5.5 percent), sediment-covered bedrock, which is the mixed hard-soft induration class, covers 1.16 km² (0.6 percent), and unidentified, sediment-covered anthropogenic features, possibly related to marine debris, cover 0.5 km² (0.3 percent). Rock outcrops and rubble are considered the primary habitat types for rockfish and lingcod (Cass and others, 1990; Love and others, 2002), both of which are recreationally and commercially important species. In addition, the anthropogenic features may provide additional good potential habitat for rockfish.



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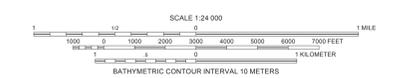
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Onshore elevation data from NOAA Coastal Service Center's Digital Coast (available at <http://coast.noaa.gov/digitalcoast/>) and from U.S. Geological Survey's National Elevation Dataset (available at <http://ned.usgs.gov/>). California's State Waters limit from NOAA Office of Coast Survey.

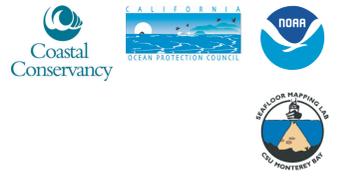


Potential marine benthic habitats mapped by H. Gary Greene, Charles A. Endris, and Bryan E. Dieter, 2012-2013. Bathymetric contours by Mercedes D. Erdey, 2013. GIS database and digital cartography by Charles A. Endris and Erik N. Lowe. Manuscript approved for publication June 8, 2015.

Potential Marine Benthic Habitats, Offshore of Point Reyes Map Area, California

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