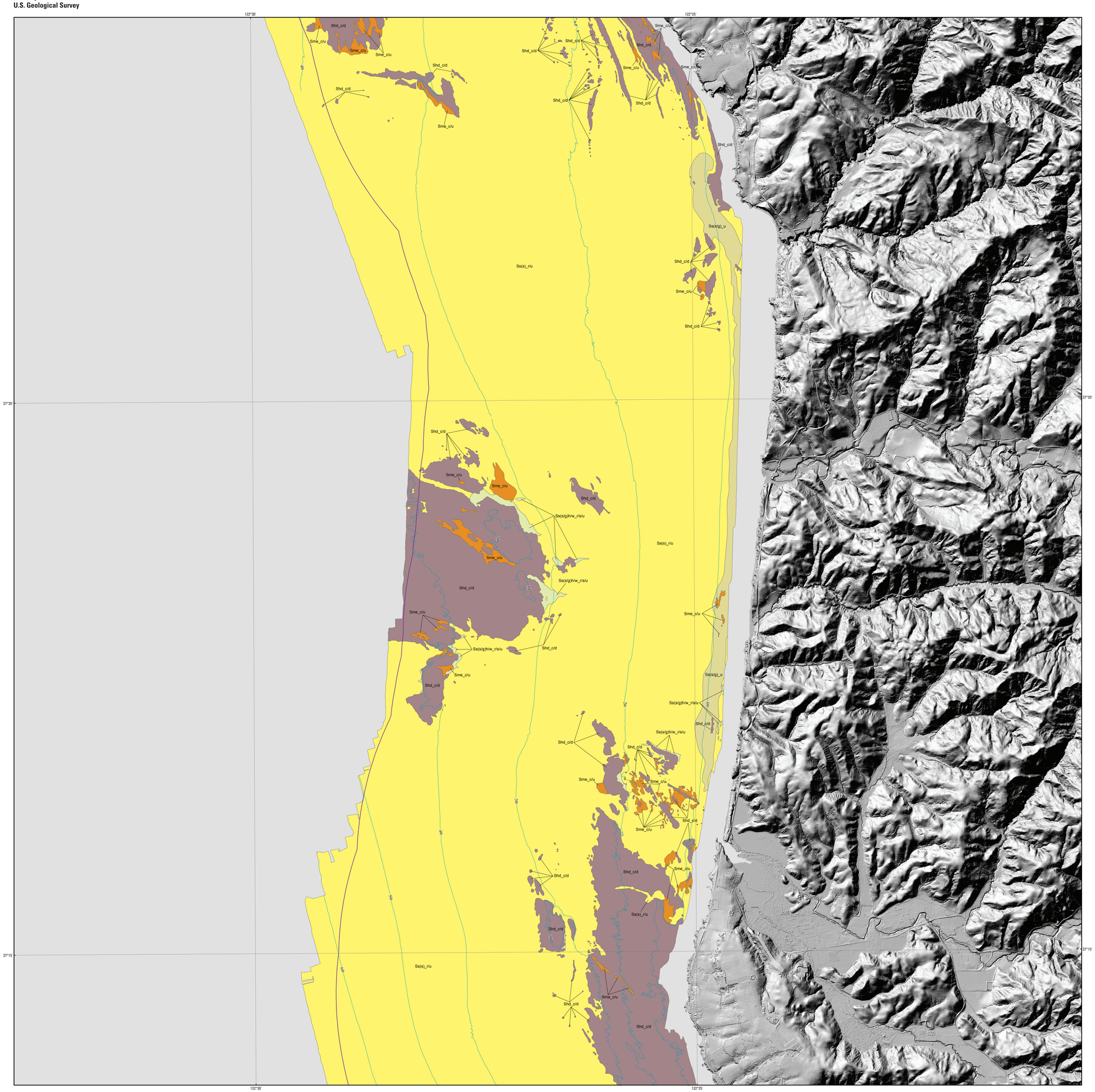
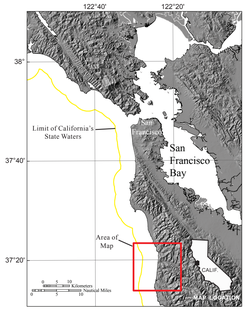
U.S. Department of the Interior
U.S. Geological Survey

Scientific Investigations Map 3306
Sheet 7 of 10
Pamphlet accompanies map





DESCRIPTION OF MAP UNITS

UNCONSOLIDATED CONTINENTAL SHELF SEDIMENTS

Ss(s)_r/u	Soft, unconsolidated, rippled sediment (sand)
Ss(s/g)_u	Soft, unconsolidated sediment (sand and gravel), on flat shelf
Ss(s/g)h/w_r/s/u	Soft, mobile sediment window that has unconsolidated, hummocky, and rippled sediment waves, overlying scoured lag pavement of sand and gravel (sorted bedforms)

MIXED SUBSTRATE ON CONTINENTAL SHELF

Sme_c/u	Mixed habitat of soft, unconsolidated sediment, overlying hard, consolidated sedimentary bedrock

HARD SUBSTRATE ON CONTINENTAL SHELF

Shd_c/d	Deformed and differentially eroded, consolidated sedimentary-bedrock outcrop

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

10 **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 San Gregorio 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 San Gregorio 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 usSEABED 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.

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-sonar 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 "mixed" induration (in other words, containing both rock and sediment). Broad, generally smooth areas of seafloor that lack sharp and angular edge characteristics are mapped as "sediment" and are further defined by various sedimentary features such as erosional scours 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 San Gregorio map area lies in an area of roughly north-south-trending, fairly straight coastline that extends from south of Half Moon Bay (north of the map area) to Pigeon Point (south of the map area); this part of the coast is open to the full force of the Pacific Ocean. Delineated on the map are five potential marine benthic habitat types, all of which are located on the continental shelf ("Shelf" megahabitat). The meso- and macrohabitats include "hard" deformed sedimentary-bedrock outcrops; a hard-soft "mixed" habitat type made up of flat, hard bedrock locally covered with soft, unconsolidated sediment; and dynamic features such as mobile sand sheets and associated scour depressions.

Most of the offshore part of the San Gregorio map area is located on the relatively flat and eroded continental shelf. Backscatter data show that the map area is dominated by "soft" sediment; however, the highly deformed and differentially eroded bedrock outcrops and their seafloor relief present the most spectacular backscatter imagery in this map area. These differentially eroded bedrock areas form the local relief and rugosity that make promising potential habitats for rockfish (*Sebastes* spp.). Sediment transport is primarily to the southeast, and sedimentary processes, which are quite active in the map area, produce the dynamic bedforms (primarily located along the periphery of hard bedrock exposures in the west-central part of the map area) that may be habitats for forage fish such as Pacific sand lance (*Ammodytes hexapterus*). In addition, erosion through shelf sediments down to a coarser lag has produced sediment-filled scour depressions that resemble "ripple scour depressions" of Cacchione and others (1984) and Phillips and others (2007), found mainly on the shelf in the northwestern and central parts of the map area.

Of the 107.75 km² in the map area, 14.44 km² (13.4 percent) is exposed hard bedrock, and 1.18 km² (1.1 percent) consists of sediment-covered bedrock, which is of the mixed hard-soft induration class. Soft, unconsolidated sediment covers a total of 92.13 km² (85.5 percent) in the map area.

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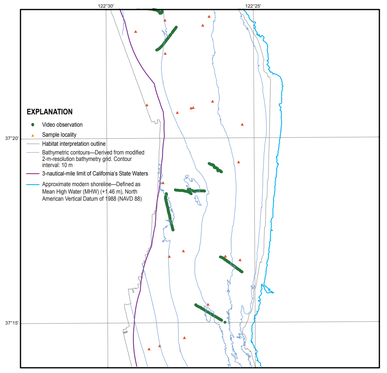

Figure 1. Map showing video-observation locations and sample localities for Offshore of San Gregorio map area.

Onshore elevation data collected by Photoscience in 2005 for U.S. Geological Survey and County of San Mateo, California's State Waters limit from NOAA Office of Coast Survey
Universal Transverse Mercator projection, Zone 10N

NOT INTENDED FOR NAVIGATIONAL USE

13 1/2°
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 2014

SCALE 1:24 000
1 1/2 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
BATHYMETRIC CONTOUR INTERVAL 10 METERS
ONE MILE = 0.869 NAUTICAL MILES

CALIF.
MAP LOCATION

Potential marine benthic habitats mapped by Charles A. Endris and H. Gary Greene, 2011. Bathymetric contours by Carrie K. Bretz, 2008
GIS database and digital cartography by Charles A. Endris and Mercedes D. Erdey
Edited by Taryn A. Lindquist
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Potential Marine Benthic Habitats, Offshore of San Gregorio Map Area, California

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