U.S. Department of the Interior
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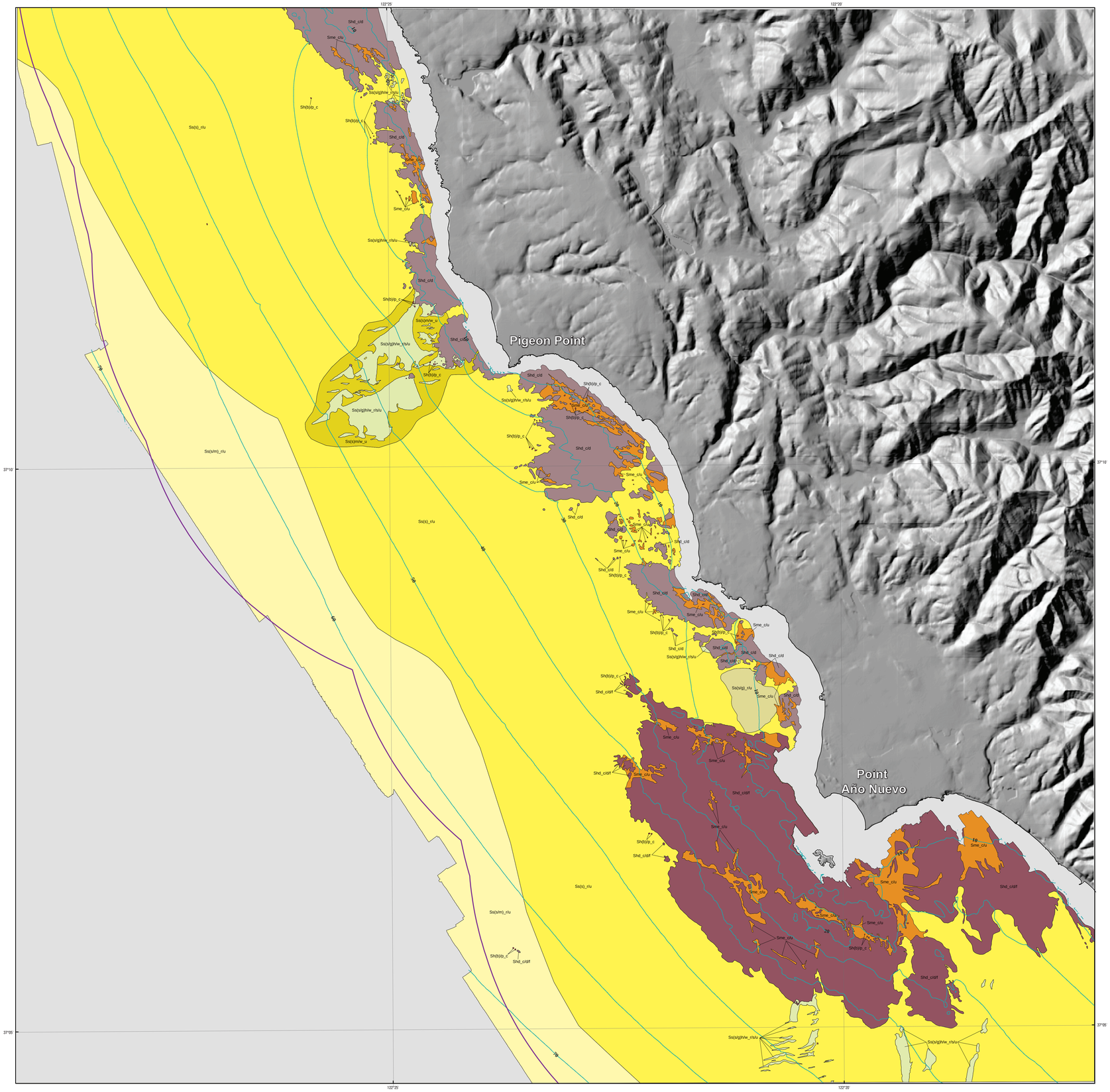
Open-File Report 2015–1232
Sheet 7 of 11
Pamphlet accompanies map



Onshore elevation data from California Coastal Conservancy (available from National Oceanic and Atmospheric Administration [NOAA] Coastal Service Center's Digital Coast at http://www.csc.noaa.gov/digitalcoast/data/coastallidar/) and from U.S. Geological Survey's National Elevation Dataset (available at http://ned.usgs.gov/). Offshore shaded-relief bathymetry from map on sheet 2, this report. California's State Waters limit from NOAA Office of Coast Survey.

Universal Transverse Mercator projection, Zone 10N

NOT INTENDED FOR NAVIGATIONAL USE

APPROXIMATE MEAN DECLINATION, 2015

SCALE 1:24 000

1 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

MAP LOCATION

Potential marine benthic habitats mapped by Bryan E. Dieter, Charles A. Endris, and H. Gary Greene, 2011. Bathymetric contours by Mercedes D. Erdey, 2014

GIS database and digital cartography by Mercedes D. Erdey and Bryan E. Dieter

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

By

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2015

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DESCRIPTION OF MAP UNITS

UNCONSOLIDATED CONTINENTAL SHELF SEDIMENTS

- Ss(s/m)_r/u — Soft, unconsolidated sediment (fine sand and mud), predominantly rippled
- Ss(s)_r/u — Soft, unconsolidated sediment (sand), predominantly rippled
- Ss(s)m/w_u — Unconsolidated, dynamic mound of soft sediment (sand)
- Ss(s/g)_r/u — Soft, unconsolidated rippled sediment (sand and gravel)
- Ss(s/g)h/w_r/s/u — Soft, mobile sediment window that has unconsolidated and rippled sediment waves, overlying scoured lag pavement of sand and gravel (sorted bedforms)

MIXED SUBSTRATE ON CONTINENTAL SHELF

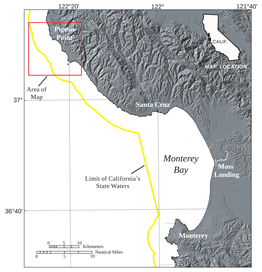
- Sme_c/u — Mixed habitat of soft, unconsolidated sediment, overlying hard, consolidated sedimentary bedrock

HARD SUBSTRATE ON CONTINENTAL SHELF

- Shd_c/d — Deformed and differentially eroded, consolidated sedimentary-bedrock outcrop
- Shd_c/d/f — Hard, consolidated sedimentary rock, boulders, or pinnacle
- Sh(b)/p_c — Hard, consolidated boulders or pinnacles of sedimentary rock; 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**
- 20 — **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 Pigeon Point 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 Pigeon Point 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 (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-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 the 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 Pigeon Point map area includes the nearshore and inner shelf areas from just north of Pigeon Point to Point Año Nuevo. Delineated on the map are 9 potential marine benthic habitat types, all of which are located on the continental shelf ("Shelf" megahabitat). The meso- and macrohabitats include soft unconsolidated sediment (5 habitat types) such as fine sand and mud, sand, and dynamic features such as mobile sand sheets, sediment waves, and rippled sediment depressions; mixed substrate (1 habitat type) such as soft sand and gravels overlying consolidated sedimentary bedrock and gravel pavement; and hard substrate (3 habitat types) such as deformed and differentially eroded bedrock, as well as pinnacles and boulders.

Acoustic-backscatter data (see sheet 3) show that most of the area is underlain by "soft" materials, consistent with the interpretation that unconsolidated sediments dominate habitat in the mapped area. Sedimentary processes are quite active and, thus, habitats are highly dynamic, with sediment transport primarily to the southeast. An extensive exposure of deformed and differentially eroded bedrock is found offshore of Point Año Nuevo, and it potentially provides good habitat for rockfish (*Sebastes* spp.).

Of the 134.34 km^2 on the continental shelf in the map area, soft, unconsolidated sediment is the dominant habitat type, covering 108.36 km^2 (80.7 percent). Hard rock covers 22.78 km^2 (17.0 percent), whereas 3.19 km^2 (2.4 percent) consists of mixed hard-soft substrate.

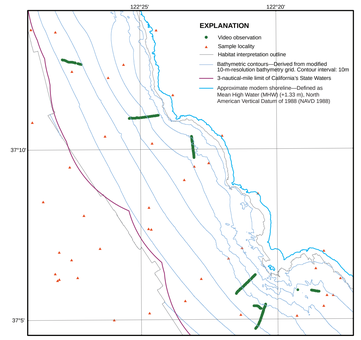


Figure 1. Map showing video-observation locations and sample localities for Offshore of Pigeon Point map area.

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