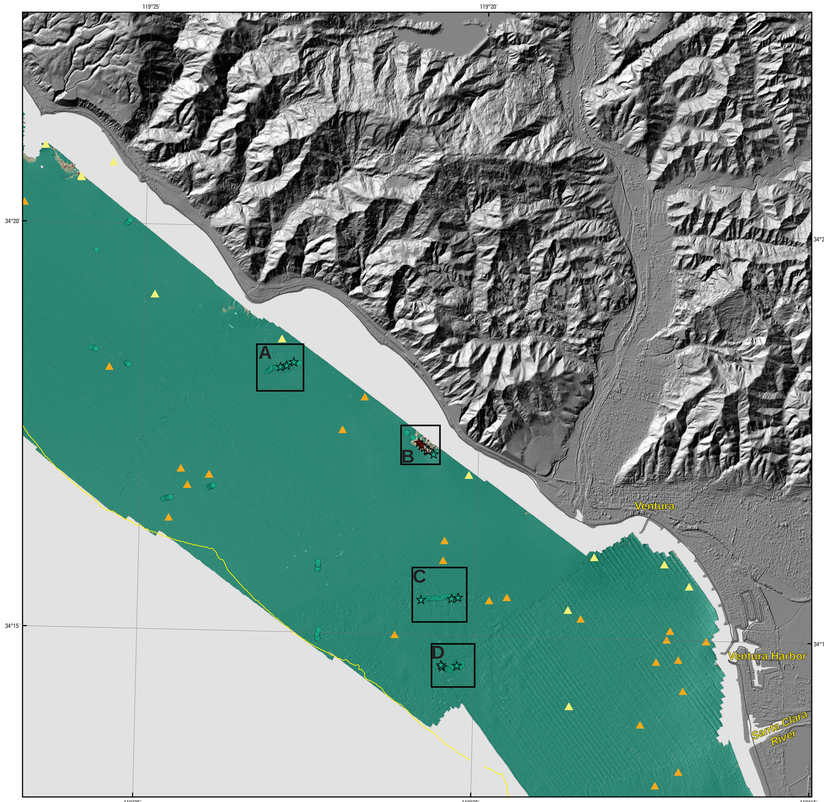


Onshore elevation data from NOAA Coastal Services Center (data collected by EarthData International in 2002-2003). Offshore shaded-relief bathymetry from map on sheet 2, this report. California's State Waters limit from NOAA Office of Coast Survey

Universal Transverse Mercator projection, Zone 11N

NOT INTENDED FOR NAVIGATIONAL USE

APPROXIMATE MEAN DECLINATION, 2013

SCALE 1:50 000

ONE MILE = 0.869 NAUTICAL MILES

MAP LOCATION

Seafloor-character map simplified from map on sheet 5, this report. Video observations recorded and digital still photographs taken in 2007-2008. Sample localities from usSEABED (Reid and others, 2006) and from Barnard and others (2009)

GIS database and digital cartography by Nadine E. Golden and Eleyne L. Phillips

Edited by Taryn A. Lindquist

Manuscript approved for publication March 11, 2013

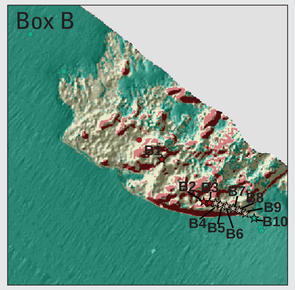


Figure 2A. Detailed view of seafloor character mapped 0.5 km offshore, approximately 4 km northwest of Ventura River mouth (see Box B, on map, for location), showing locations of periodic real-time video observations (dots) and digital still photographs (stars; see figs. 2B through 2K) from camera line CAM44, cruise S-1C-08-SC.

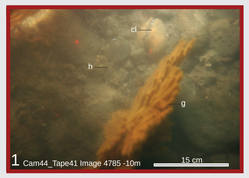


Figure 2B. Digital still photograph no. B1 (see fig. 2A for location). Cobbles in area of rock outcrop (water depth, 10 m). Abiotic complexity is moderate, biotic complexity is present, and biocover is high. Biocover includes gorgonian (g), hydroid (h), and clam (cl). Distance between lasers (red dots) is 15 cm.

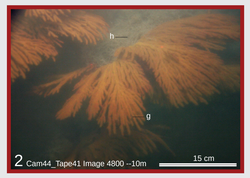


Figure 2C. Digital still photograph no. B2 (see fig. 2A for location). Rock patch (water depth, 10 m). Abiotic complexity is moderate, biotic complexity is present, and biocover is high. Biocover includes hydroid (h) and gorgonian (g). Distance between lasers (red dots) is 15 cm.

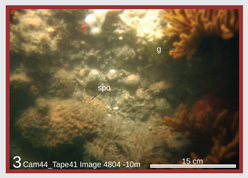


Figure 2D. Digital still photograph no. B3 (see fig. 2A for location). Cobbles and gravel in area of rock outcrop (water depth, 10 m). Abiotic complexity is moderate, biotic complexity is present, and biocover is high. Biocover includes sponge (spo) and gorgonian (g). Distance between lasers (red dots) is 15 cm.

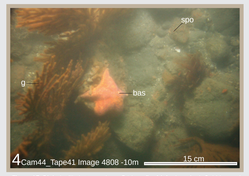


Figure 2E. Digital still photograph no. B4 (see fig. 2A for location). Cobbles and gravel with deposits of sand in area of rock outcrop (water depth, 10 m). Abiotic complexity is moderate, biotic complexity is present, and biocover is high. Biocover includes gorgonian (g), sponge (spo), and bat star (bas). Distance between lasers (red dots are just out of view in this image but are visible in previous video frame) is 15 cm.

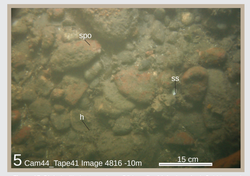


Figure 2F. Digital still photograph no. B5 (see fig. 2A for location). Cobbles and gravel with scattered shells in area of rock outcrop (water depth, 10 m). Abiotic complexity is low, biotic complexity is absent, and biocover is high. Biocover includes scattered shells (ss), sponge (spo), and hydroid (h). Distance between lasers (red dots are just out of view in this image but are visible in previous video frame) is 15 cm.

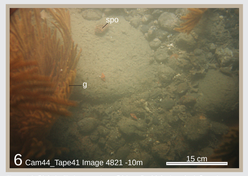


Figure 2G. Digital still photograph no. B6 (see fig. 2A for location). Gravel, cobbles, and boulders in area of rock outcrop (water depth, 10 m). Abiotic complexity is low, biotic complexity is present, and biocover is moderate. Biocover includes gorgonian (g) and sponge (spo). Distance between lasers (red dots are just out of view in this image but are visible in previous video frame) is 15 cm.

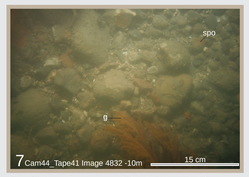


Figure 2H. Digital still photograph no. B7 (see fig. 2A for location). Cobbles and gravel in area of rock outcrop (water depth, 10 m). Abiotic complexity is low, biotic complexity is present, and biocover is moderate. Biocover includes gorgonian (g) and sponge (spo). Distance between lasers (red dots are just out of view in this image but are visible in previous video frame) is 15 cm.

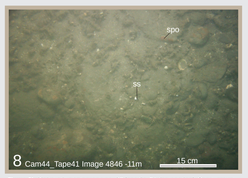


Figure 2I. Digital still photograph no. B8 (see fig. 2A for location). Sand, gravel, and cobbles with scattered shells in area of rock outcrop (water depth, 11 m). Abiotic complexity is low, biotic complexity is absent, and biocover is moderate. Biocover includes scattered shells (ss) and sponge (spo). Distance between lasers (red dots are just out of view in this image but are visible in previous video frame) is 15 cm.

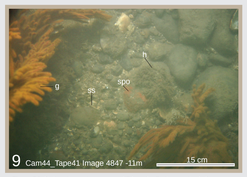


Figure 2J. Digital still photograph no. B9 (see fig. 2A for location). Boulders, cobbles, gravel, and scattered shells in area of rock outcrop (water depth, 11 m). Abiotic complexity is low, biotic complexity is present, and biocover is moderate. Biocover includes scattered shells (ss), gorgonian (g), hydroid (h), and sponge (spo). Distance between lasers (red dots are just out of view in this image but are visible in previous video frame) is 15 cm.

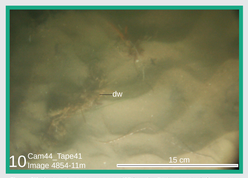
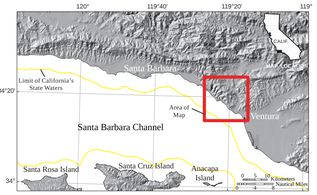


Figure 2K. Digital still photograph no. B10 (see fig. 2A for location). Sand with degraded ripples in confused, crossing pattern (water depth, 11 m). Abiotic complexity is low, biotic complexity is absent, and biocover is low. Biocover includes drift weed (dw). Distance between lasers (red dots are just out of view in this image but are visible in previous video frame) is 15 cm.



DISCUSSION

Between 2006 and 2010, the seafloor in the Offshore of Ventura map area in southern California was mapped by California State University, Monterey Bay (CSUMB), and the U.S. Geological Survey (USGS), using both multibeam echosounders and bathymetric sidescan-sonar units (see sheets 1, 2, 3). These mapping missions combined to collect bathymetry and acoustic-backscatter data from about the 10-m isobath to out beyond the 3-nautical-mile limit of California's State Waters. In order to characterize the bathymetry and acoustic-backscatter data into geologically and biologically useful information, the USGS ground-truth-surveyed the data by towing camera sleds (fig. 5) over specific locations throughout the map area.

The ground-truth-surveys occurred on two separate cruises over a two-year period. The camera sleds were towed 1 to 2 m over the seafloor, at speeds of between 1 and 2 nautical miles/hour. During the 2007 ground-truth cruise, a smaller USGS camera sled was used that housed two video cameras; one was forward looking, and the other was downward looking. The video was relayed in real time to the research vessel, where USGS and National Oceanic and Atmospheric Administration (NOAA) scientists recorded both the geologic and biologic character of the seafloor once every minute, using programmable keypads. During the 2008 ground-truth cruise, a larger camera sled was used that housed two video cameras (one forward looking, the other downward looking), a high-definition video camera, and an 8-megapixel digital still camera, which captured a digital still photograph once every 30 seconds. The location and directions of the camera-sled tracklines were chosen in order to visually inspect areas thought to represent the full range of bottom hardness and rugosity in the map area.

In the context of marine-fisheries management, benthic-habitat complexity can be divided into abiotic (geologic) and biotic (biologic) components. Benthic-habitat complexity refers to the visual classification of local abiotic and biotic vertical relief and structure that may provide potential refuge for both juvenile and adult forms of various species. Only abiotic attributes (primary- and secondary-substrate composition) were used in the production of the seafloor-character map on sheet 5. Classifications of primary and secondary substrate are based on the Wentworth scale of sediment grain-size categories, except that the granule and pebble sizes have been grouped together into a class called "gravel," and the clay and silt sizes have been grouped into a class called "mud." Primary and secondary substrate constitute greater than 50 and 20 percent of the seafloor during an observation, respectively.

This sheet contains a smaller, simplified (depth-zone symbology has been removed) version of the seafloor-character map (sheet 5), on which the camera-sled tracklines used to ground-truth the sonar data are indicated by aligned colored dots, each dot representing the location of a recorded observation. Primary- and secondary-substrate compositions are shown by differently colored dots. The map also shows the locations of the detailed views of seafloor character along some of the tracklines (Boxes A through D) that are highlighted on this sheet (figs. 1A through 4A, respectively). Also shown are locations of samples (triangles) from usSEABED (Reid and others, 2006) and by Barnard and others (2009) that were used to supplement the ground-truth surveys. The seafloor-character map shows that this area is mostly covered with sediment, except for two small outcroppings of rock in the nearshore region.

Each detailed view (figs. 1A through 4A) shows the locations of camera-sled tracklines (aligned colored dots), as well as of the photographs (colored stars) taken along the tracklines. These photographs, which are representative of the seafloor, are displayed with a description of the observed seafloor characteristics recorded by USGS and NOAA scientists (figs. 1B through 1D, 2B through 2K, 3B through 3D, 4B through 4D). Only primary and secondary substrate are reported, although individual photographs may show more substrate types. Organisms, when present, are labeled on the photographs.

Ground-truth surveys in the Offshore of Ventura map area include approximately 6.81 trackline kilometers of video and 308 still photographs, in addition to 213 seafloor observations of abiotic and biotic attributes. A visual estimate of slope also was recorded.

GLOSSARY

Rugosity—A GIS-derived characterization of seafloor roughness, calculated as the ratio of the three-dimensional surface area of seafloor to the two-dimensional planar-base area, for each cell in the bathymetry grid.

Backscatter intensity—The amplitude of the reflected sonar signal (see sheet 3) used to infer the hardness of the bottom, determined after sonar-data processing has removed (as much as possible) the effects of water depth, angle of reflection, and bottom roughness.

Biocomplexity—The assessment of the presence or absence of biological structures that have the potential of providing shelter for fauna, determined by estimating the scale, the amount, and the morphology of biological relief (as described by Tissot and others, 2006).

Biocover—The visual estimate of the proportion of biologic cover by encrusting organisms: high, greater than 50 percent; moderate, between 50 percent and 10 percent; low, less than 10 percent.

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Reid, J.A., Reid, J.M., Jenkins, C.J., Zimmerman, M., Williams, S.J., and Field, M.E., 2006, usSEABED—Pacific Coast (California, Oregon, Washington) offshore surficial-sediment data release: U.S. Geological Survey Data Series 182, available at http://pubs.usgs.gov/ds/2006/182/.

Tissot, B.N., Yoklavich, M.M., Love, M.S., York, K., and Amend, M., 2006, Benthic invertebrates that form habitat on deep banks off southern California, with special reference to deep sea coral: Fishery Bulletin, v. 104, p. 167–181.

EXPLANATION

Substrate class

Fine- to medium-grained smooth sediment—Low backscatter, low rugosity; typically mud to medium-grained sand; often rippled and (or) burrowed

Mixed smooth sediment and rock—Moderate to very high backscatter, low rugosity; typically coarse-grained sand, gravel, cobbles, and bedrock

Rock and boulder, rugose—High backscatter, high rugosity; typically boulders and rugose bedrock

Anthropogenic material—Related to development by humans

Location of real-time video observation and interpreted substrate class of seafloor

Fine- to medium-grained smooth sediment—Low backscatter, low rugosity; typically mud to medium-grained sand; often rippled and (or) burrowed

Mixed smooth sediment and rock—Moderate to very high backscatter, low rugosity; typically coarse-grained sand, gravel, cobbles, and bedrock

Rock and boulder, rugose—High backscatter, high rugosity; typically boulders and rugose bedrock

Location of digital still photograph and interpreted substrate class of seafloor

Fine- to medium-grained smooth sediment—Low backscatter, low rugosity; typically mud to medium-grained sand; often rippled and (or) burrowed

Mixed smooth sediment and rock—Moderate to very high backscatter, low rugosity; typically coarse-grained sand, gravel, cobbles, and bedrock

Rock and boulder, rugose—High backscatter, high rugosity; typically boulders and rugose bedrock

Interpreted substrate class depicted in digital still photograph—Indicated by colored frame around photograph (not shown on map; shown in figures only)

Fine- to medium-grained smooth sediment—Low backscatter, low rugosity; typically mud to medium-grained sand; often rippled and (or) burrowed

Mixed smooth sediment and rock—Moderate to very high backscatter, low rugosity; typically coarse-grained sand, gravel, cobbles, and bedrock

Rock and boulder, rugose—High backscatter, high rugosity; typically boulders and rugose bedrock

Sample localities

From usSEABED (Reid and others, 2006)

From Barnard and others (2009)

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

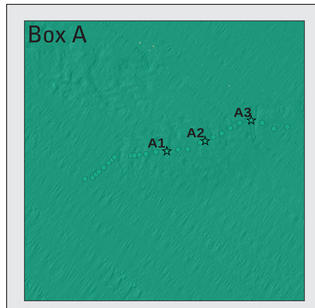

Figure 1A. Detailed view of seafloor character mapped 1.5 km offshore of Pitas Point, approximately 8 km northwest of Ventura River mouth (see Box A, on map, for location), showing locations of periodic real-time video observations (dots) and digital still photographs (stars; see figs. 1B through 1D), from camera line CAM45, cruise S-1C-08-SC.

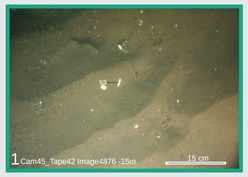

Figure 1B. Digital still photograph no. A1 (see fig. 1A for location). Fine to coarse sand with degraded wave ripples (water depth, 15 m). Abiotic complexity is low, biotic complexity is absent, and biocover is low. Biocover includes scattered shells (ss). Distance between lasers (red dots are just out of view in this image but are visible in previous video frame) is 15 cm.

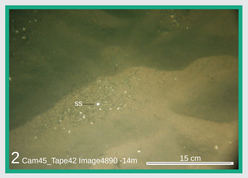

Figure 1C. Digital still photograph no. A2 (see fig. 1A for location). Fine to coarse sand with degraded wave ripples (water depth, 14 m). Abiotic complexity is low, biotic complexity is absent, and biocover is low. Biocover includes scattered shells (ss). Distance between lasers (red dots are just out of view in this image but are visible in previous video frame) is 15 cm.

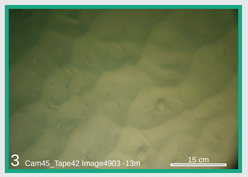

Figure 1D. Digital still photograph no. A3 (see fig. 1A for location). Fine sand with degraded sinuous wave ripples (water depth, 13 m). Abiotic complexity is low, biotic complexity is absent, and biocover is low. Distance between lasers (red dots are just out of view in this image but are visible in previous video frame) is 15 cm.

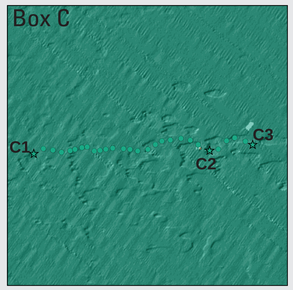

Figure 3A. Detailed view of seafloor character mapped southwest of Ventura, approximately 3 km offshore of Ventura River mouth (see Box C, on map, for location), showing locations of periodic real-time video observations (dots) and digital still photographs (stars; see figs. 3B through 3D) from camera line CAM43 cruise S-1C-08-SC.

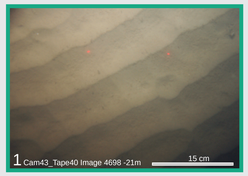

Figure 3B. Digital still photograph no. C1 (see fig. 3A for location). Fine sand with symmetrical and sharp-crested wave ripples (water depth, 21 m). Abiotic complexity is low, biotic complexity is absent, and biocover is low. Distance between lasers (red dots) is 15 cm.

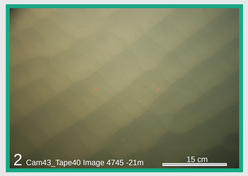

Figure 3C. Digital still photograph no. C2 (see fig. 3A for location). Fine sand with symmetrical and sharp-crested wave ripples (water depth, 21 m). Abiotic complexity is low, biotic complexity is absent, and biocover is low. Distance between lasers (red dots) is 15 cm.

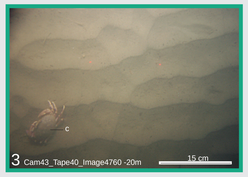

Figure 3D. Digital still photograph no. C3 (see fig. 3A for location). Fine sand with sinuous-crested wave ripples (water depth, 20 m). Abiotic complexity is low, biotic complexity is absent, and biocover is low. Biocover includes crab (c). Distance between lasers (red dots) is 15 cm.

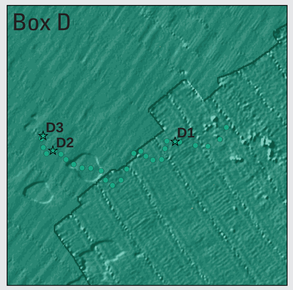

Figure 4A. Detailed view of seafloor character mapped southwest of Ventura, approximately 4.5 km offshore of Ventura River mouth (see Box D, on map, for location), showing locations of periodic real-time video observations (dots) and digital still photographs (stars; see figs. 4B through 4E) from camera line CAM70, cruise S-W1-09-SC.

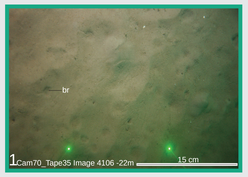

Figure 4B. Digital still photograph no. D1 (see fig. 4A for location). Mud and sand deposit with degraded ripple pattern (water depth, 22 m). Abiotic complexity is low, biotic complexity is absent, and biocover is low. Biocover includes burrows (br). Distance between lasers (green dots) is 15 cm.

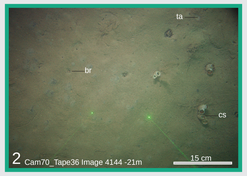

Figure 4C. Digital still photograph no. D2 (see fig. 4A for location). Mud and sand deposit with degraded ripple pattern (water depth, 21 m). Abiotic complexity is low, biotic complexity is absent, and biocover is low. Biocover includes burrows (br), clam siphon (cs), and tube anemone (ta). Distance between lasers (green dots) is 15 cm.

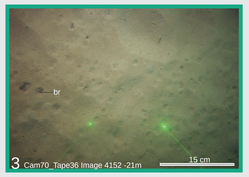

Figure 4D. Digital still photograph no. D3 (see fig. 4A for location). Relatively flat mud and sand deposit with degraded ripple pattern (water depth, 21 m). Abiotic complexity is low, biotic complexity is absent, and biocover is low. Biocover includes burrows (br). Distance between lasers (green dots) is 15 cm.

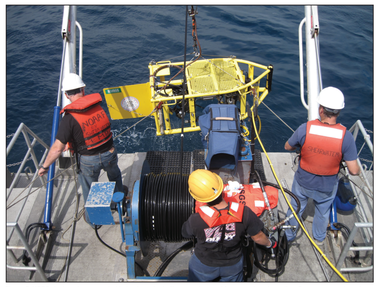

Figure 5. USGS-designed camera sled being launched off research vessel for ground-truth studies. Components onboard sled include four digital video camcorders, one 8-megapixel digital SLR camera, lasers for scale, and various strobe and video lights, as well as telemetry instrumentation that records depth, altitude, and compass heading.

Ground-Truth Studies, Offshore of Ventura Map Area, California

By
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