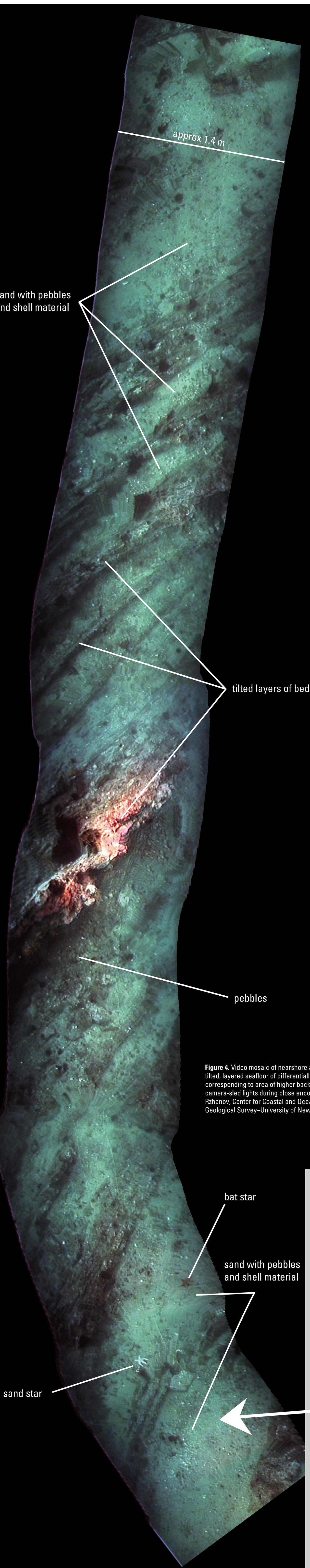


Figure 4. Video mosaic of nearshore area northwest of Coal Oil Point (see fig. 5 for location), which reveals tilted, layered seafloor of differentially eroded bedrock interspersed with sand, pebbles, and shell material, corresponding to area of higher backscatter intensity. Red-colored rock is taller ridge illuminated by camera-sled lights during close encounter. Video mosaic created using software developed by Dr. Yuri Rzhanov, Center for Coastal and Ocean Mapping, University of New Hampshire, through joint U.S. Geological Survey–University of New Hampshire cooperative agreement.

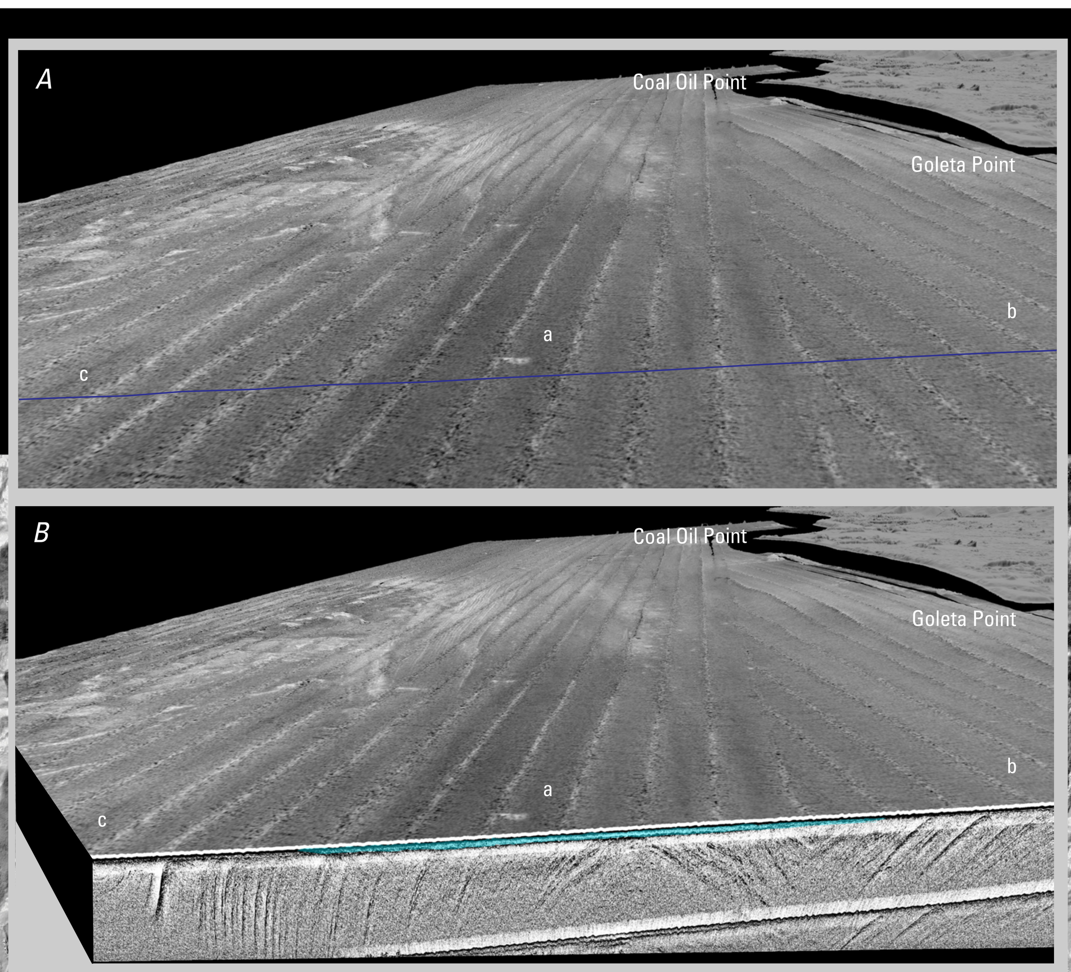


Figure 1. Perspective views to west over relatively smooth midshelf east of Coal Oil Point and Goleta Point, showing acoustic-backscatter imagery (see sheet 3, this report); lighter tones indicate stronger backscatter intensity, possibly from rock or coarse-grained sand, and darker tones indicate weaker backscatter intensity, possibly from finer sediments (see sheet 3, this report). Linear, east-west-trending lines are data-collection artifacts. *A*, Perspective view showing slightly lower backscatter intensity in midshelf area (a) compared to that in nearshore (b) and outer shelf (c) areas. Dark-blue line shows location of seismic-reflection profile in *B* below. *B*, Same perspective view as *A*, converted to block diagram that combines backscatter imagery with part of north-south-trending seismic-reflection profile SBC–124 from Sliter and others (2008; see also, fig. 5 on sheet 8). Block diagram reveals folded strata in subsurface that have no detectable sediment cover in nearshore and outer shelf areas in this part of profile. A few meters of sediment (blue shading) covers folded bedrock in midshelf, corresponding to area of slightly lower backscatter intensity. Vertical exaggeration of perspective view (*A*), 2x; distance across bottom of perspective view (*A*), about 2 km; depth of seismic-reflection profile (*B*) at deepest point (lower right corner), about 120 m below sea level.

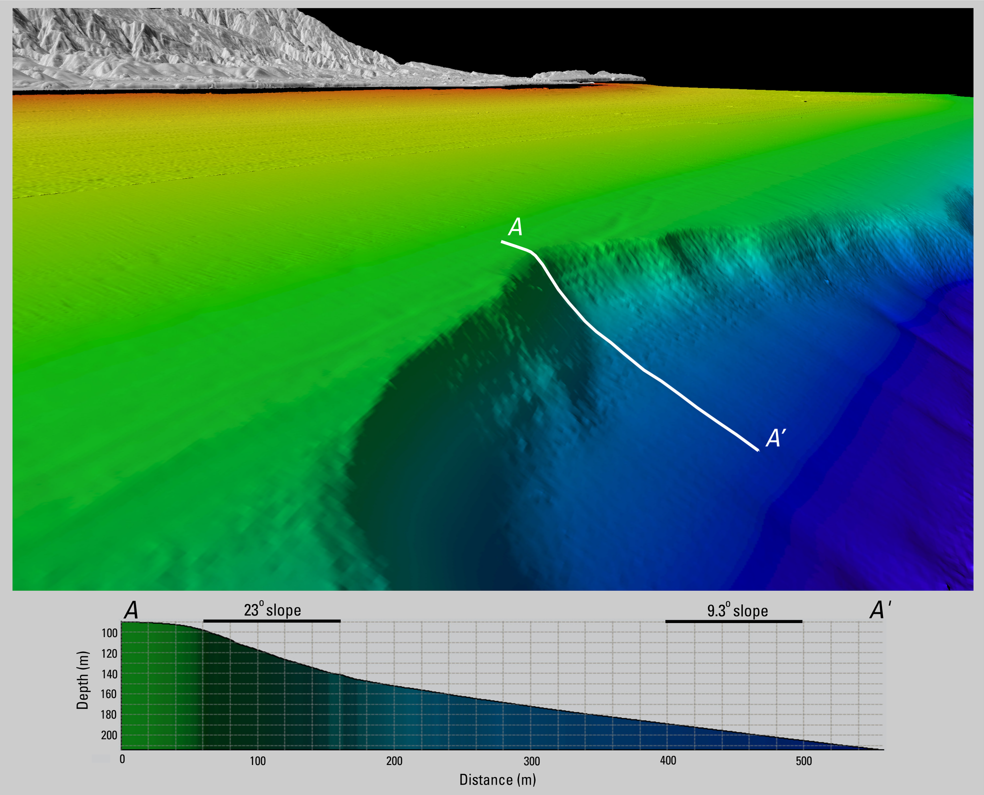


Figure 2. Perspective view to northeast over headwall of submarine Goleta landslide complex (Fisher and others, 2005). Bathymetric profile *A–A′* reveals that headwall of landslide has average slope of 23°, whereas lower part has average slope of about 9.3°. Vertical exaggeration, 2x; distance across bottom of image, about 800 m.

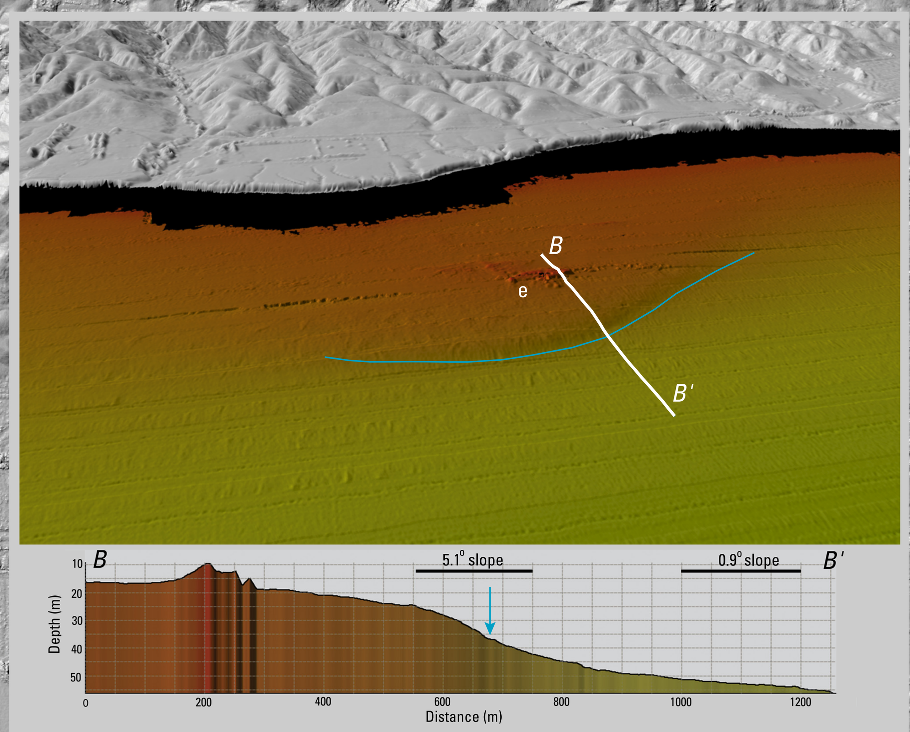
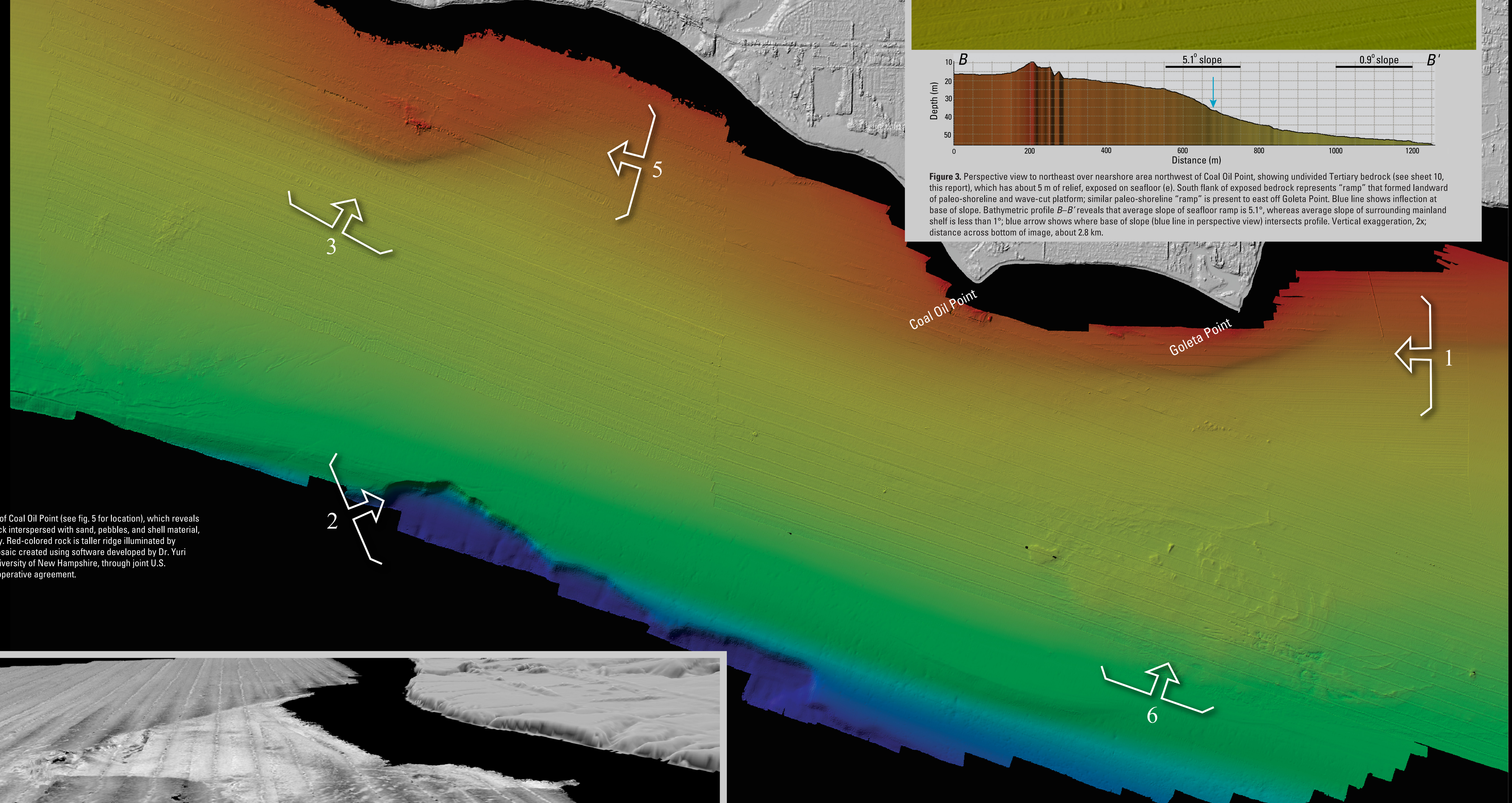


Figure 3. Perspective view to northeast over nearshore area northwest of Coal Oil Point, showing undivided Tertiary bedrock (see sheet 10, this report), which has about 5 m of relief, exposed on seafloor (e). South flank of exposed bedrock represents "ramp" that formed landward of paleo-shoreline and wave-cut platform; similar paleo-shoreline "ramp" is present to east off Goleta Point. Blue line shows inflection at base of slope. Bathymetric profile *B–B′* reveals that average slope of seafloor ramp is 5.1°, whereas average slope of surrounding mainland shelf is less than 1°; blue arrow shows where base of slope (blue line in perspective view) intersects profile. Vertical exaggeration, 2x; distance across bottom of image, about 2.8 km.



Map view. Colored shaded-relief bathymetry map of Offshore of Coal Oil Point map area, generated from multibeam-echosounder and bathymetric-sidescan data. Colors show depth: reds and oranges indicate shallower areas; dark blues and purples, deeper areas. Illumination azimuth is 300°, from 45° above horizon. Numbered arrows show viewing directions of perspective views shown on this sheet; numbers correspond to figure numbers of views.

Figure 5. Perspective view to west over nearshore area northwest of Coal Oil Point, showing acoustic-backscatter imagery (see sheet 3, this report) and its complex pattern of high and low backscatter intensities; lighter tones indicate higher backscatter intensity, and darker tones indicate lower backscatter intensity. Linear, east-west-trending lines are data-collection artifacts. Area of higher backscatter intensity in foreground (d), mapped as undifferentiated Miocene and Pliocene bedrock (see sheet 10, this report), has relatively sharp boundary with areas of lower backscatter intensities. Thin yellow line in perspective view shows path of camera sled, towed 1 to 2 m over seafloor, that captured video and photographs; yellow arrow shows tow direction. Yellow rectangle shows location of video mosaic (fig. 4) generated from video captured over area of higher backscatter intensity. Vertical exaggeration, 2x; distance across bottom, about 1 km.

DISCUSSION

Mapping California's State Waters has produced a vast amount of acoustical and visual data, including bathymetry, acoustic backscatter, seismic-reflection profiles, and seafloor video and photography. These data are used by researchers to develop maps, reports, and other tools to assist in the coastal and marine spatial-planning capability of coastal-zone managers and other stakeholders. Seafloor-character, habitat, and geologic maps may be used for fisheries management, for designation of Marine Protected Areas, for monitoring of environmental change such as sea-level-rise impacts, for prediction of sediment and contaminant budgets and transport, and for assessment of earthquake and tsunami hazards. To achieve these goals, it is helpful to integrate the different datasets and then view the results in three-dimensional representations such as those displayed on this data integration and visualization sheet for the Offshore of Coal Oil Point map area.

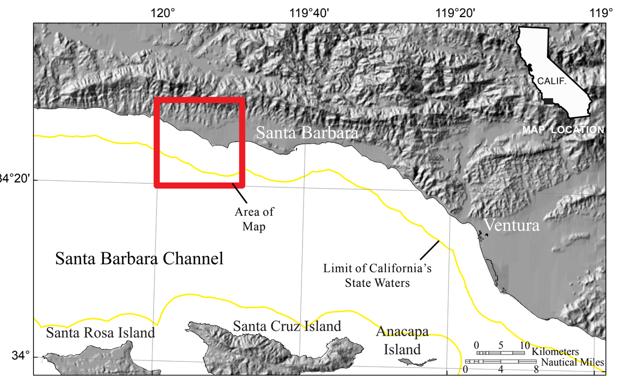
The map view in the center of the sheet is similar to the colored shaded-relief bathymetry map of the Offshore of Coal Oil Point map area (see sheet 1 of this report). Numbered arrows show viewing directions of the perspective views on this sheet (figs. 1, 2, 3, 5, 6); the numbers indicate the figure number of the perspective view.

The perspective views and bathymetric profiles in figures 2, 3, and 6 show the colored shaded-relief bathymetry of the Offshore of Coal Oil Point map area, as viewed from different directions. These views show a few examples of the complex shelf morphology in this map area, as well as the head of the submarine Goleta landslide complex.

Draping the acoustic-backscatter imagery (see sheet 3 of this report) over the bathymetry data (figs. 1, 5, 6) highlights the relations between the backscatter intensity and the seafloor morphology, as well as any anthropogenic influences on the seafloor.

Video-mosaic images created from seafloor digital video (fig. 4) display the geologic (rock, sand, and mud) and biologic complexity of the seafloor. Whereas photographs capture high-quality snapshots of a small area of the seafloor, video mosaics can capture larger areas and, thus, can show transitional zones between different seafloor environments.

Block diagrams (fig. 1), which combine the acoustic-backscatter imagery with seismic-reflection-profile data (see sheet 8 of this report), help reveal the stratigraphic and structural relations between the surface and subsurface.



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Dartnell, P., Conrad, J.E., Stanley, R.G., and Cochrane, G.R., 2010, Onshore and offshore geologic map of the Coal Oil Point area, southern California: U.S. Geological Survey Scientific Investigations Map 3124, scale 1:24,000, pamphlet 18 p., available at http://pubs.usgs.gov/sim/3124/.

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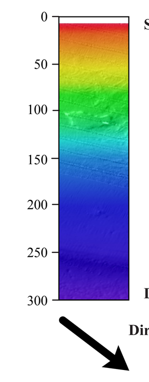
Sliter, R.W., Triezenberg, P.J., Hart, P.E., Draut, A.E., Normark, W.R., and Conrad, J.E., 2008, High-resolution chirp and mini-sparker seismic-reflection data from the southern California continental shelf—Gaviota to Mugu Canyon: U.S. Geological Survey Open-File Report 2008–1246, available at http://pubs.usgs.gov/of/2008/1246/.

EXPLANATION

Depth (in meters) and illumination (bright areas are illuminated, facing false sun; dark areas are in shadow, facing away from false sun)



Direction of illumination from false sun—Position of false sun is at 300° azimuth, 45° above horizon [arrow included in explanation for illustration purposes only; not shown on map]

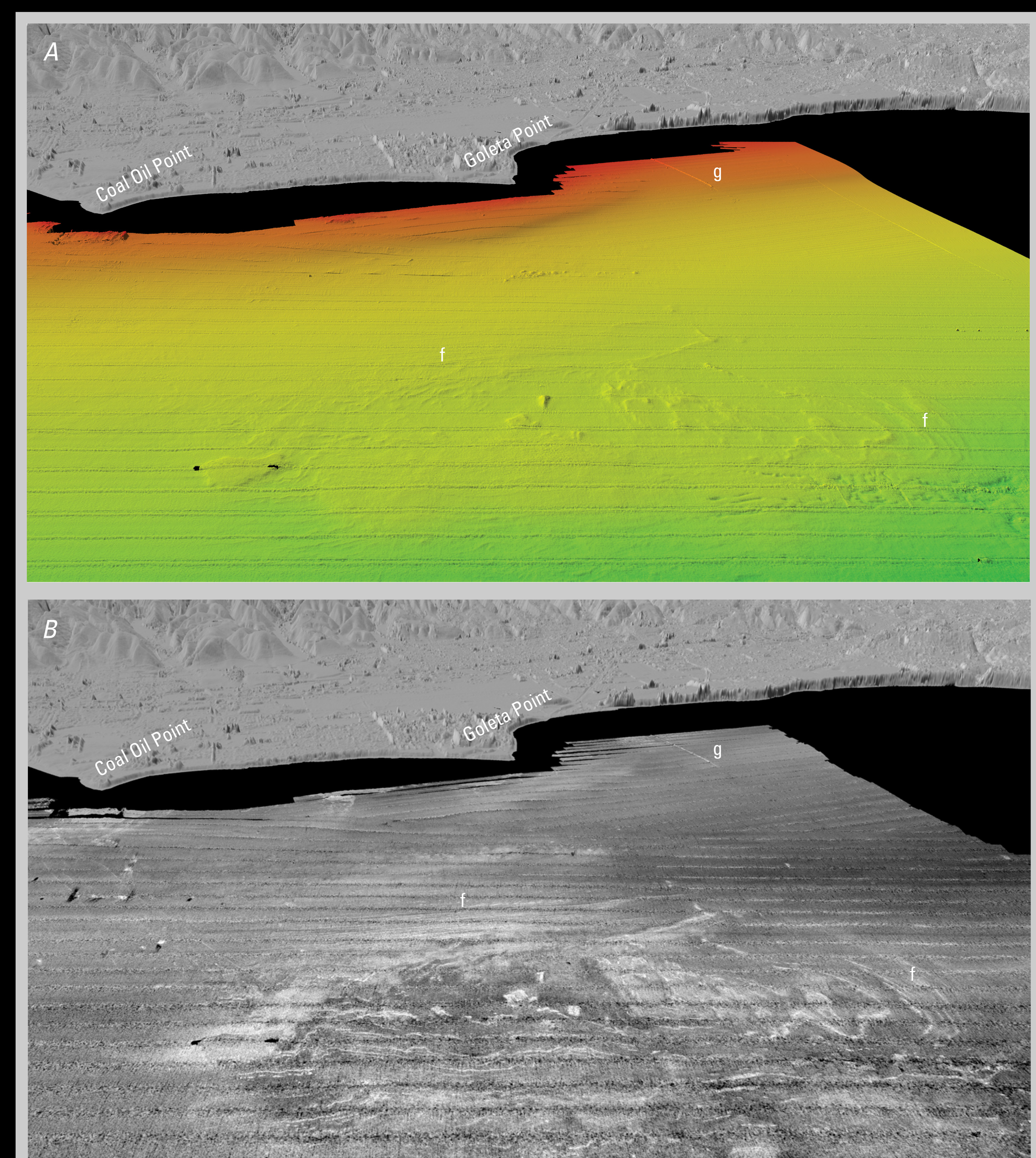
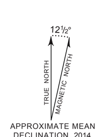


Figure 6. Perspective views to northeast over midshelf area offshore of Coal Oil Point and Goleta Point, showing colored shaded-relief bathymetry (*A*) and acoustic-backscatter imagery (*B*). Views show rough seafloor composed of folded marine sedimentary rocks, which include rocks of the Miocene and Pliocene Monterey and Sisquoc Formations and also younger strata (Dartnell and others, 2010). Narrow, continuous ridges (f), which have 1 m of relief and higher backscatter intensity, are as much as 1.5 km long. Natural hydrocarbon seeps are common throughout this area. Outfall pipe (g) is seen west of Goleta Point. Vertical exaggeration, 4x; distance across bottom, about 4 km.

Onshore elevation data from NOAA Coastal Services Center (data collected by EarthData International in 2002-2003). Offshore shaded-relief bathymetry from map on sheet 1, this report
Universal Transverse Mercator projection, Zone 11N
NOT INTENDED FOR NAVIGATIONAL USE



Data Integration and Visualization, Offshore of Coal Oil Point Map Area, California

By
Peter Dartnell
2014

Perspective views by Peter Dartnell, 2012. Acoustic-backscatter imagery in figures 1, 5, and 6 from map on sheet 3, this report. Seismic-reflection profile in figure 1 from sheet 8, this report. Bathymetric profiles in figures 2 and 3 by Peter Dartnell, 2012. Video-mosaic image in figure 4 by Peter Dartnell, 2010, using software developed by Dr. Yuri Rzhanov, Center for Coastal and Ocean Mapping, University of New Hampshire, through joint U.S. Geological Survey–University of New Hampshire cooperative agreement.
GIS database and digital cartography by Nadine E. Golden and Eleyne L. Phillips
Edited by Taryn A. Lindquist
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