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

Open-File Report 2015–1191
Sheet 4 of 10
Pamphlet accompanies map

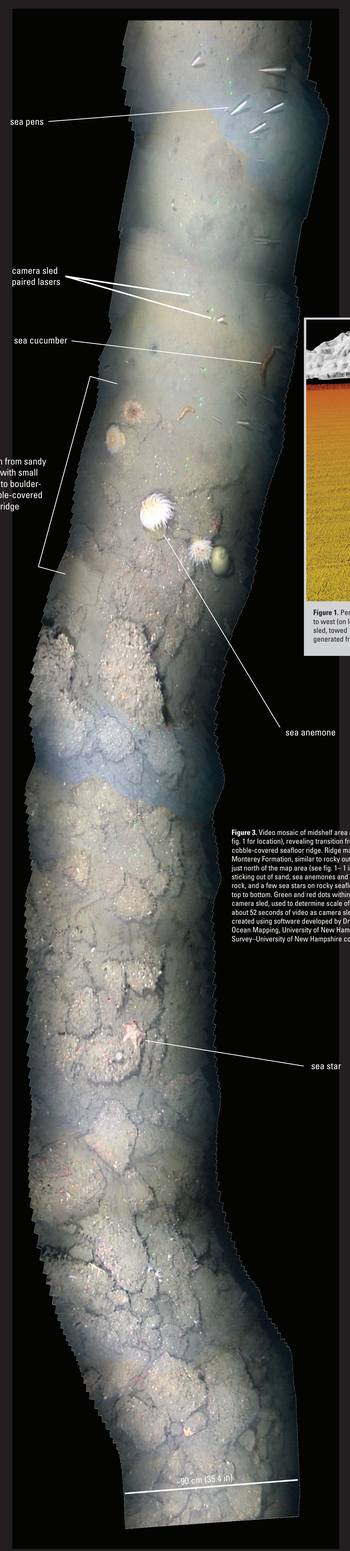


Figure 3. Video mosaic of midshelf area near California's State Waters limit (see fig. 1 for location), revealing transition from sandy seafloor to boulder- and cobble-covered seafloor ridge. Ridge mapped as the middle and upper Miocene Monterey Formation, similar to rocky outcrop that surrounds Año Nuevo Island just north of the map area (see fig. 1–1 in pamphlet). Image shows sea pens sticking out of sand, sea anemones and sea cucumbers at transition from sand to rock, and a few sea stars on rocky seafloor. Camera-sled tow direction is from top to bottom. Green and red dots within mosaic are from paired lasers on camera sled, used to determine scale of objects on seafloor. Mosaic made up of about 52 seconds of video as camera sled traveled over seafloor. 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.

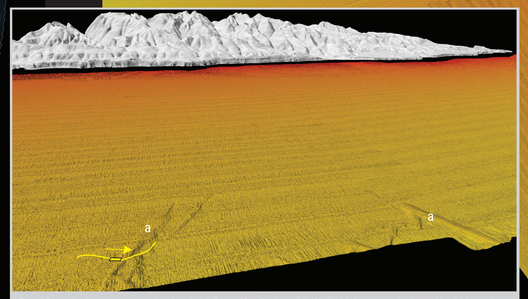


Figure 1. Perspective view to east-northeast of continental shelf offshore of Scott Creek, near limit of California's State Waters, showing two ridges (a) that trend east to west (on left) and northeast to southwest (on right) that have as much as 3 m of relief over surrounding featureless seafloor. Thin yellow line shows path of camera sled, towed 1 to 2 m above seafloor, that captured video and photographs; yellow arrow shows tow direction. Yellow rectangle shows location of video mosaic (fig. 3) generated from video captured over transition from featureless seafloor to ridge. Vertical exaggeration, 2x; distance across bottom of image, about 2 km.

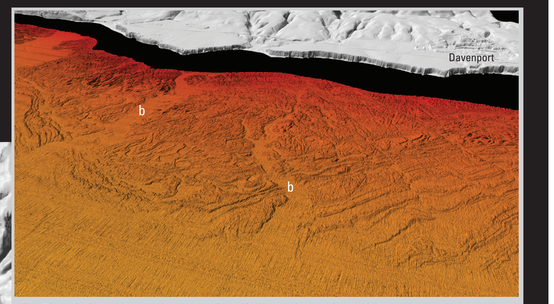
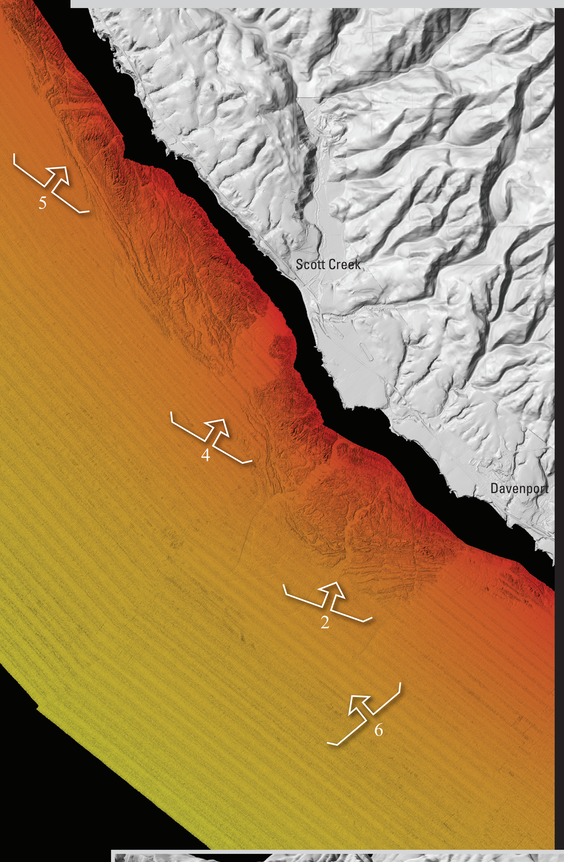


Figure 2. Perspective view to north-northeast of nearshore area offshore of Davenport, showing layered, folded, and fractured bedrock that dominates nearshore along this stretch of coastline. Rocky outcrop is mapped as the upper Miocene Santa Cruz Mudstone, composed of thin- to thick-bedded siliceous mudstone (see sheet 10 of this report). Narrow channels (b) in bedrock likely are pathways of modern shelf sediments moving offshore. Vertical exaggeration, 2x; distance across bottom of image, about 1.5 km.



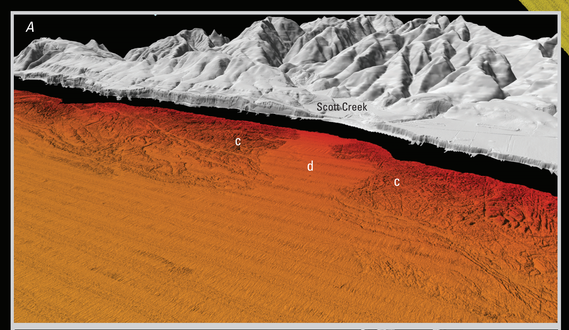


Figure 4. Perspective views to northeast over nearshore area offshore of mouth of Scott Creek, showing colored shaded-relief bathymetry (*A*) and acoustic-backscatter imagery (*B*). In acoustic-backscatter imagery, lighter tones indicate stronger backscatter intensity, suggesting rock or coarser grained sediment, whereas darker tones indicate weaker backscatter intensity, suggesting finer grained sediment. Views highlight rocky outcrop (c) exposed in nearshore north and south of Scott Creek, as well as featureless seafloor (d) directly offshore of creek. Acoustic-backscatter imagery reveals that featureless seafloor has lower backscatter intensity, suggesting that sediments have flowed out of Scott Creek and covered rocky outcrops. Ripple patterns in both bathymetry and acoustic-backscatter imagery are data-collection artifacts. Vertical exaggeration of perspective views, 2x; distance across bottom of both views, about 1.5 km.

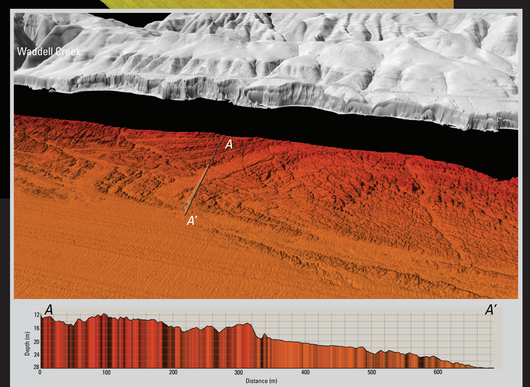


Figure 5. Perspective view to northeast over nearshore area between mouths of Waddell Creek and Scott Creek (just out of view on right side of image), showing bedrock outcrop, mapped as the upper Miocene Santa Cruz Formation (see sheet 10 of this report), directly offshore of steep cliffs along coastline. Bathymetric profile *A*–*A*′ transects bedrock that has moderate local relief, which ranges from flat-lying rock to faces as high as 5 m. Vertical exaggeration of perspective view, 2x; distance across bottom of image, about 1.2 km; vertical exaggeration of profile *A*–*A*′, about 5x.

DISCUSSION

Mapping California's State Waters has produced a vast amount of acoustic 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 Scott Creek map area.

The map view in the center of the sheet is similar to the colored shaded-relief bathymetry map of the Offshore of Scott Creek map area (see sheet 1 of this report). Numbered arrows show viewing directions of the perspective views on this sheet; the numbers indicate the figure number of the perspective view.

The perspective views and bathymetric profiles in figures 1, 2, 4, 5, and 6 show the colored shaded-relief bathymetry of the Offshore of Scott Creek map area, as viewed from different directions. These views highlight the diverse seafloor environments in this map area, which include extensive areas of featureless, sedimented seafloor, as well as layered, folded, and fractured bedrock.

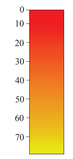
Video-mosaic images created from seafloor digital video (fig. 3) display the geologic (rock, sand, mud) and biologic complexity of the seafloor. Whereas photographs capture high-quality snapshots of a small area of the seafloor (see sheet 6 of this report), video mosaics can capture larger areas and, thus, can show transitional zones between different seafloor environments.

Draping the acoustic-backscatter imagery (see sheet 3 of this report) over the bathymetry data (fig. 4) highlights the relations between the backscatter intensity and the seafloor morphology. It also aids in seafloor habitat and geology interpretations, as well as mapping sediment-transport pathways.

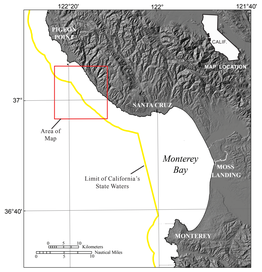
Block diagrams (fig. 6), which combine the bathymetry with seismic-reflection-profile data (see sheet 8 of this report), help reveal the stratigraphic and structural relations between the surface and subsurface.

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]



Map view. Colored shaded-relief bathymetry map of Offshore of Scott Creek map area, generated from multibeam-echosounder and bathymetric-sidescan data. Colors show depth: reds indicate shallower areas; yellows, deeper areas. Illumination azimuth is 300°, from 45° above horizon. Ripple patterns and parallel lines that are apparent within map area are data-collection and -processing artifacts. Lines at borders of some surveys are result of slight differences in depth, as measured by different mapping systems in different years. These various artifacts are made obvious by hillshading process. Numbered arrows show viewing directions of perspective views shown on this sheet; numbers correspond to figure numbers of views.

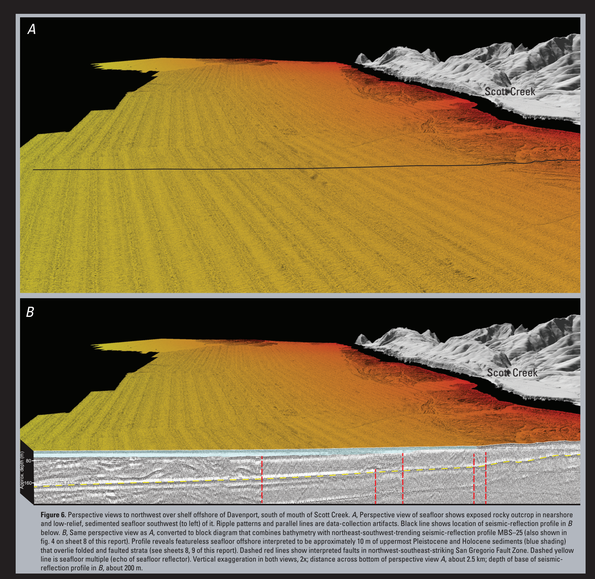


Figure 6. Perspective views to northwest over shelf offshore of Davenport, south of mouth of Scott Creek. *A*, Perspective view of seafloor shows exposed rocky outcrop in nearshore and low-relief, sedimented seafloor southwest (to left) of it. Ripple patterns and parallel lines are data-collection artifacts. Black line shows location of seismic-reflection profile in *B* below. *B*, Same perspective view as *A*, converted to block diagram that combines bathymetry with northeast-southwest-trending seismic-reflection profile MBS–25 (also shown in fig. 4 on sheet 8 of this report). Profile reveals featureless seafloor offshore interpreted to be approximately 10 m of uppermost Pleistocene and Holocene sediments (blue shading) that overlie folded and faulted strata (see sheets 8, 9 of this report). Dashed red lines show interpreted faults in northwest-southeast-striking San Gregorio Fault Zone. Dashed yellow line is seafloor multiple (echo of seafloor reflector). Vertical exaggeration in both views, 2x; distance across bottom of perspective view *A*, about 2.5 km; depth of base of seismic-reflection profile in *B*, about 200 m.

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 1, this report. California's State Waters limit from NOAA Office of Coast Survey

Universal Transverse Mercator projection, Zone 10N

NOT INTENDED FOR NAVIGATIONAL USE

MAP LOCATION

Data Integration and Visualization, Offshore of Scott Creek Map Area, California

By
Peter Dartnell

2015

Perspective views by Peter Dartnell, 2014. Video-mosaic image in figure 3 by Peter Dartnell, 2014, 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. Acoustic-backscatter imagery in figure 4 from map on sheet 3, this report. Bathymetric profile in figure 5 by Peter Dartnell, 2014. Seismic-reflection profile in figure 6 from sheet 8, this report

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

Manuscript approved for publication September 30, 2015

For sale by U.S. Geological Survey, Information Services, Box 25286, Federal Center, Denver, CO 80225, 1–888–ASK–USGS

Digital files available at http://dx.doi.org/10.3133/ofr20151191

Suggested Citation: Dartnell, P. 2015, Data integration and visualization, Offshore of Scott Creek map area, California, *sheet 4 in* Cochrane, G.R., Dartnell, P., Johnson, S.Y., Greene, H.G., Erdey, M.D., Dieter, B.E., Golden, N.E., Endris, C.A., Hartwell, S.R., Kvitek, R.G., Davenport, C.W., Watt, J.T., Krigsman, L.M., Richie, A.C., Sliter, R.W., Finlayson, D.P., and Maier, K.L. (U.S. Cochrane and S.A. Cochran, eds.), California State Waters Map Series—Offshore of Scott Creek, California: U.S. Geological Survey Open-File Report 2015–1191, pamphlet 40 p., 10 sheets, scale 1:24,000, http://dx.doi.org/10.3133/ofr20151191.

ISSN 2331-1258 (online)
http://dx.doi.org/10.3133/ofr20151191