

DISCUSSION

Introduction

The Stellwagen Bank National Marine Sanctuary Mapping Project is a cooperative effort of the U.S. Geological Survey and the National Oceanic and Atmospheric Administration, with support from the University of New Brunswick and the Canadian Hydrographic Service. The project is designed to produce a detailed bathymetric map of the seafloor of Stellwagen Bank, a marine ecosystem that spans the continental shelf from a depth of 100 m to 1,200 m, with topographic contours overlaid in blue. The image shown here uses a sun elevation angle of 45 degrees above the horizon from an azimuth of 330 degrees. The bathymetry is depth contours in meters, with the depth scale enhanced by having the sun illuminate the sea floor from a position 10 degrees west of south, so that shadows are cast toward the sunlit family of seabed features. Some features are labeled with the name of their collector, such as the "Horn" feature, where the seabed is smooth, and they include small highs and lows and unnatural-looking features. The bathymetry is depth contours in meters, with the depth scale enhanced by having the sun illuminate the sea floor from a position 10 degrees west of south, so that shadows are cast toward the sunlit family of seabed features. Some features are labeled with the name of their collector, such as the "Horn" feature, where the seabed is smooth, and they include small highs and lows and unnatural-looking features. For a description of the geographic coordinate system, and for an account of survey and topographic data processing methods, see the companion paper by K. L. Kjerfve and J. M. Morris, "A bathymetric map of Stellwagen Bank." PDF files in the map series are available on a CD in EPS, Arc, Asc, and Postscript formats. Valentine and Ahrens, 1990. Blank areas represent places where no data exists.

The major topographic features depicted in the map series were formed by glacial processes. In broad terms, these features are interpreted here to represent a geological history that developed in several stages. Ice containing rock debris moved across the region, sculpting its surface and depositing sediment to form the large basins, broad ridges, and surfaces. Many other features observed here represent the latter stages of glacial history. The large, irregularly shaped depressions in the area were covered by glacial lakes at one time, and when the same areas were dry, glacial lakes were active in and near areas of high topographic relief. The sea-coastal region formerly occupied by ice, and seabed features were partly eroded and some new sedimentary deposits were formed. Today, the sea floor is modified mainly by wave action, currents, and the action of marine organisms.

as sand and mud are removed and gravel remains; and the western flanks of the banks, as well as adjacent basins, are built up by deposits of mud and sand.

bars and ridges. Irregular basins on the basin floor (42° 34' S., 70° 16' E.) possibly represent piles of rock debris (now partly covered with mud) that were deposited from glacial melt that occupied the basin. The large bank (Gorleben) is a broad, low-lying area of sand and gravel, with a thin veneer of sand and gravel, including boulder piles and ridges. Some of the boulder ridge resembles eskers (sand and gravel deposited by running water in channels with a high water table) and others resemble the ridges of the glaciogenic sand and gravelly glaciates (42° 33' S., 70° 16' W.) and are interpreted to be lateral moraines (deposits of rock debris piled up at the edges of moving ice). The east side of the basin floor is characterized by a series of ridges and depressions, possibly due to features that occur in the adjacent Quadrangle 15 to the east. The low hills with slopes covered with greenish-brown pebbly sand are the ridges. The gravel is covered with a thin veneer of sand and silt that is more extensive on the ridges than in the depressions. In the northeast part of the quadrangle, the seabed displays lobed depressions, possibly due to the presence of a large number of small lakes. In the southwestern part of the quadrangle (depth of broad areas) a range of ridges and shallow and deep valleys and basins (as deep as 140–150 m) range in depth from 70 to 100 m. The ridges are composed of sand and gravel (partly sand and sandy, and ridged), and the deep valley and depression (42° 34' S., 70° 23' W.) are made up of sand and gravel.

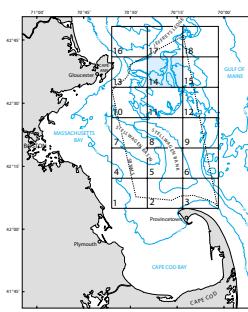
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Location map outlining the 18 quadrangles in this series. Quadrangle 14 shown in blue. Boundary of Stellwagen Bank National Marine Sanctuary (SBNMS) indicated by dashed line. Bathymetric contours in meters.

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SUN-ILLUMINATED SEA FLOOR TOPOGRAPHY OF QUADRANGLE 14 IN THE STELLWAGEN BANK
NATIONAL MARINE SANCTUARY OFF BOSTON, MASSACHUSETTS

By