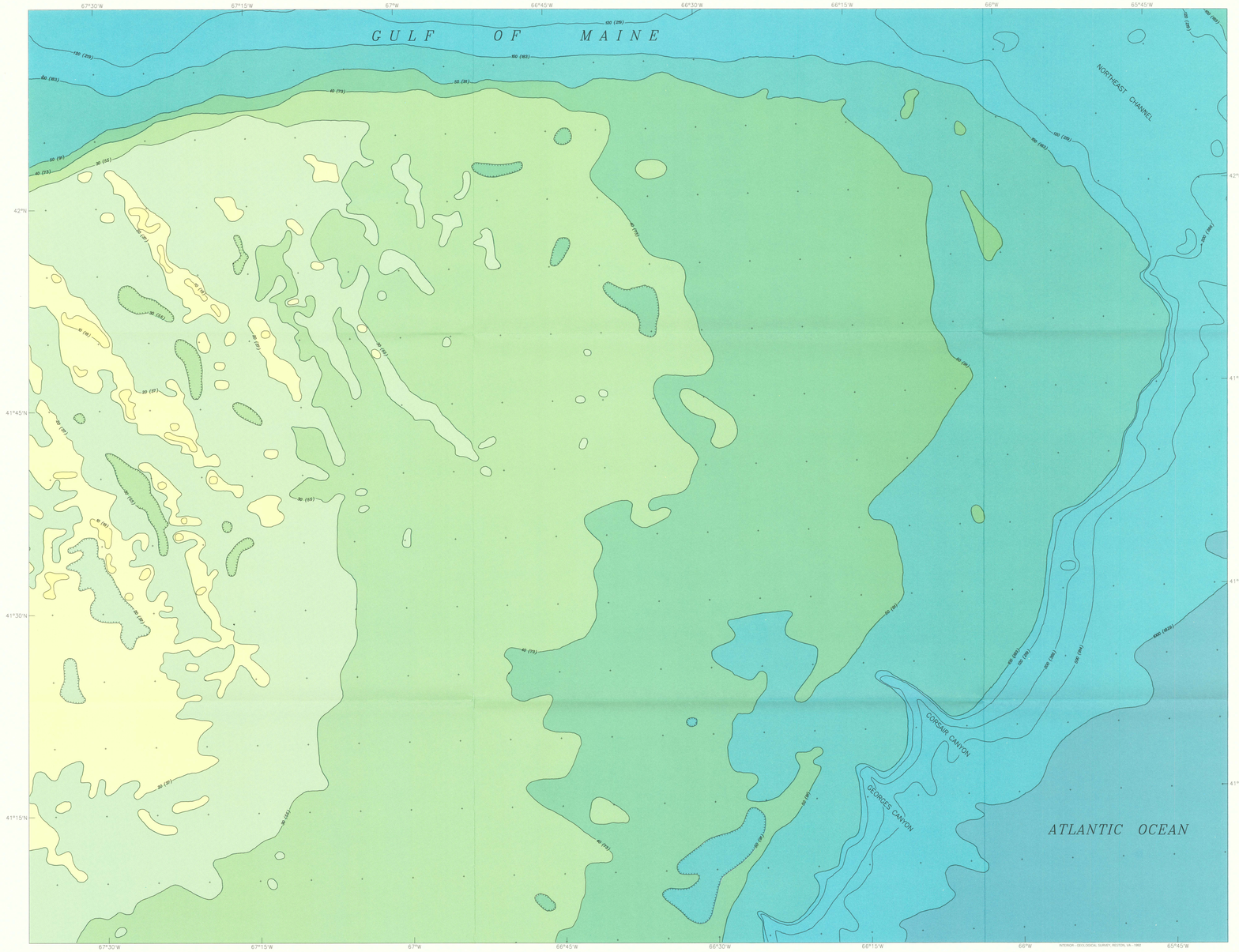
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the
NATIONAL MARINE FISHERIES SERVICE

MISCELLANEOUS INVESTIGATIONS SERIES
MAP I–2279–A



Universal Transverse Mercator projection
Central meridian 69° W.
Bathymetric base from Canadian Hydrographic Service Chart
LIC 8005, 1984, scale 1:300,000

SCALE 1: 250 000

10 0 10 20 NAUTICAL MILES
10 0 10 20 30 40 KILOMETERS

CONTOUR INTERVAL 10 FATHOMS (18 METERS) TO DEPTH OF 50 FATHOMS (91 METERS)
DEEPER CONTOUR INTERVALS ARE VARIABLE TO MAXIMUM DEPTH
DATUM: MEAN LOW WATER

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA.—1992

Manuscript approved for publication January 4, 1991

EXPLANATION

Bathymetric intervals in fathoms (meters)

- *10 (18)*
- *20 (37)*
- *30 (55)*
- *40 (73)*
- *50 (91)*
- *100 (183)*
- *1000 (1829)*

DISCUSSION

INTRODUCTION

This topographic map and perspective views of eastern Georges Bank are derived from a standard navigation chart published by the Canadian Hydrographic Service (CHS) in 1984. This data base was used because it locates sea-floor features with respect to both Loran-C and geographic coordinates, it emphasizes the major features and allows them to be shown clearly in perspective views, and it is widely used by the scientific community and the fishing industry. The map is a base for a series of maps of eastern Georges Bank (Valentine and Lough, 1991; Lough and others, 1992; Valentine and others, in press) that depict sediment texture, bedform distribution, bottom and surface current patterns, water temperature, fisheries habitats, and the distribution of marine organisms. It is intended that these maps be used in conjunction with the navigation chart. This map series is a result of a cooperative research effort between scientists of the U.S. Geological Survey and the National Marine Fisheries Service.

Depth contours and soundings on the CHS navigation chart were digitized by hand and converted to coordinates of latitude and longitude by means of MAPGEN computer software (Evenden and Botbol, 1985). This map depicts the original depth contours from the navigation chart. The perspective views (figs. 1–5) consist of computer-generated grids and contours calculated from the digitized data by means of Interactive Surface Modeling (ISM) computer software (Dynamic Graphics, Inc., 1988). Digital data from future topographic surveys of the sea floor can be easily incorporated into the data base for use on interpretive maps of the region.

TOPOGRAPHY

Georges Bank is a shallow continental shelf (Uchupi, 1968) that is separated from the New England and Nova Scotian land masses by the deeper waters of the Gulf of Maine and the Northeast Channel (see location map). The Gulf of Maine and Northeast Channel are depressions in the continental margin that were scoured by Pleistocene glaciers advancing southeastward from New England. Also as a result of glacial scouring, the sea floor on the northern and eastern edges of Georges Bank (figs. 2–4) is relatively smooth between depths of 30 and 100 fathoms (55 and 183 m), and, along the northern edge, is quite steep. By contrast, the southeastern margin of the bank (fig. 5) slopes gently to at least 50 fathoms (91 m), below which it is incised by a series of submarine canyons. The sea floor becomes markedly steeper near 100 fathoms (183 m), where the continental slope begins.

The surface of Georges Bank is covered by sand and gravel transported by glacial processes (Schlee, 1973). Following glacial retreat and a subsequent rise in sea level, erosional processes became the dominant influence on Georges Bank. Tidal and storm currents continue to remove sediment from the bank crest and to transport it northward into the Gulf of Maine and southward onto the deeper shelf and the continental slope. The overall effect of these currents is to lower the height of the bank crest and to reduce the size of the shoal areas.

Eastern Georges Bank ranges in depth from less than 10 fathoms (18 m) in the shoal areas to 100 fathoms (183 m) at its eastern end. Shoal topography is dominated by elongate sand ridges (figs. 1 and 2) that are present to depths of 30 fathoms (55 m). The ridges are formed by (and are aligned with) strong semidiurnal tidal currents (Moody and others, 1984). Their shapes clearly reflect the active erosion and transport of sediment on the bank. At present, these large ridges probably are relatively stationary; nevertheless they are sites of continual erosion and rebuilding that experience a net sediment loss. As the shoals lose sediment, they diminish in size, water depth increases, and bottom currents affecting the shoals decrease in velocity. This process, and the overall rise in sea level, has resulted in the striking contrast in sea-floor topography between the shoals in the west and the smoother sea floor to the east (fig. 6). The shoals display a distinctive ridge-and-trough topographic fabric that decays toward the east with increasing water depth. There, former sand ridge systems of this kind are represented by remnant, disconnected, elongate ridges of lower elevation. The 40-fathom (73-m) isobath displays broad lobes that are aligned with the modern shoal ridges, attesting to the former presence of shoals in this area. Farther east, deeper areas of the bank are more uniform in relief.

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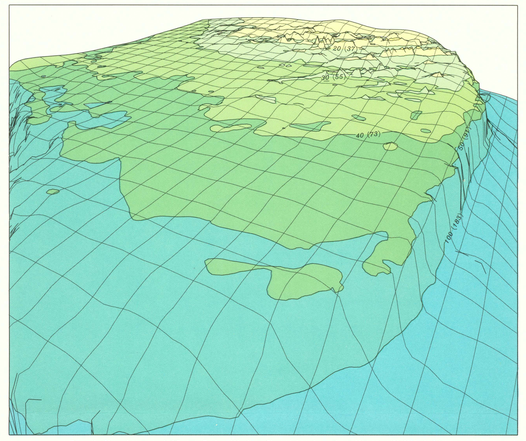


Figure 4.—View of eastern end of Georges Bank and Northeast Channel, from the northeast. Viewpoint 42°12' N., 65°36' W.; eyepoint elevation 268 m above sea level; distance to horizon 205 km; vertical exaggeration x100. Bathymetric contours are labelled in fathoms, followed by meters in parentheses.

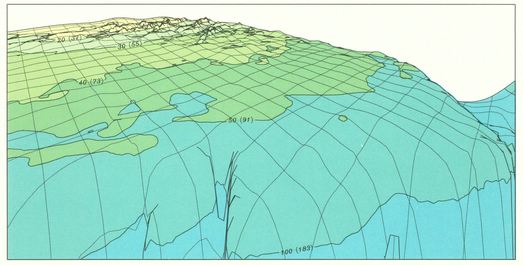


Figure 5.—View of eastern end of Georges Bank from the southeast, showing submarine canyons and Northeast Channel. Viewpoint 41°12' N., 65°48' W., eyepoint elevation 155 m above sea level; distance to horizon 160 km; vertical exaggeration x100. Bathymetric contours are labelled in fathoms, followed by meters in parentheses.

Figure 6.—Map of eastern Georges Bank showing shoal areas that display a ridge-and-trough topographic fabric of sharp relief; former sand-ridge systems of this kind are represented by remnant, disconnected, elongate shoals and mounds of lower elevation (yellow and green). To the east, deeper areas of the bank (blue) are more uniform in relief.

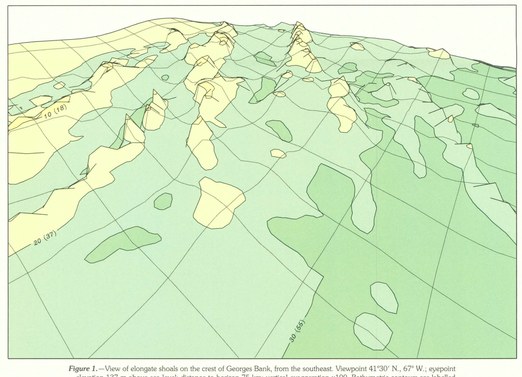


Figure 1.—View of elongate shoals on the crest of Georges Bank, from the southeast. Viewpoint 41°30' N., 67° W.; eyepoint elevation 137 m above sea level; distance to horizon 75 km; vertical exaggeration x100. Bathymetric contours are labelled in fathoms, followed by meters in parentheses.

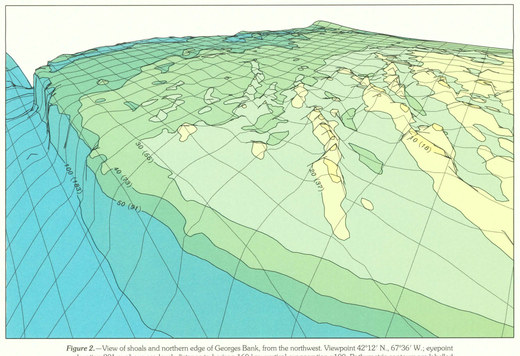


Figure 2.—View of shoals and northern edge of Georges Bank, from the northwest. Viewpoint 42°12' N., 67°36' W.; eyepoint elevation 201 m above sea level; distance to horizon 160 km; vertical exaggeration x100. Bathymetric contours are labelled in fathoms, followed by meters in parentheses.

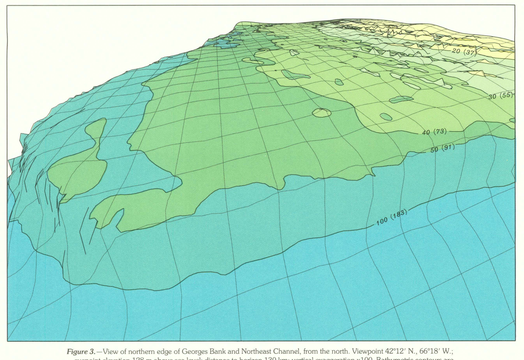
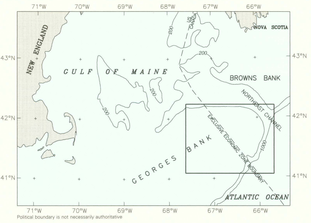


Figure 3.—View of northern edge of Georges Bank and Northeast Channel, from the north. Viewpoint 42°12' N., 66°18' W.; eyepoint elevation 128 m above sea level; distance to horizon 130 km; vertical exaggeration x100. Bathymetric contours are labelled in fathoms, followed by meters in parentheses.



Political boundary is not necessarily authoritative

Location map—Shows study area outlined. Bathymetric contours are in meters.

MAPS SHOWING THE SEA-FLOOR TOPOGRAPHY OF EASTERN GEORGES BANK

By

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1992

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