REPORTS

Topography and Structure of Cashes Ledge, Gulf of Maine*≠

ELAZAR UCHUPI

Woods Hole Oceanographic Institution, Woods Hole, Mass.

The Gulf of Maine is a rectangular depression off New England with a mean depth of 150 metres and an area of 90,700 sq km. It is flanked on the seaward side by Georges Bank and the Scotian Shelf; Northeast Channel, located along the eastern margin of Georges Bank, is a deep water outlet from the Gulf. Geographically, the Gulf of Maine occupies a similar position to the relatively smooth and shallow continental shelf along the Atlantic coast further south, but topographically its floor is much more complex. It consists of 21 relatively deep basins trending northeasterly, northwesterly and easterly, separated by low swells, flat-topped banks and steep ridges.

The most prominent topographic high within the Gulf of Maine is Cashes Ledge, located 100 kilometres southeast of Portland (Figure 1). It is 57 kilometres long, 8 to 10 kilometres wide, and rises 100 metres above the general level of the floor of the Gulf. Ammen Basin flanks the ledge on the east and Cashes Basin flanks it on the west. Depth of water above the crest ranges from 40 to 60 metres except at Ammen Rock, where the ledge shoals to 9 metres. The side slopes are gentle but irregular, and in a few places have gradients more than 3°. The crest of the ridge is serrated and marked by short pinnacles 2 to 4 metres high (Figure 2).

Seismic Profiles

Continuous seismic profiles acorss Cashes Ledge were taken with a sparker. This instrument generates a sound-pulse train by the discharge of 10,500 joules from a brass electrode towed through the water. The acoustic pulses radiate into the water and are reflected off the bottom and from physical discontinuities below the sediment-water interface. These bottom and sub-bottom echoes are received at five hydrophones towed behind the ship, and the arrivals go through an amplifier and a variable passive-network filter. Signals within the selected frequency are then fed into a time correlation recorder (Alden Precision Graphic Recorder) on the ship for amplification and recording.

Seismic profiles in the vicinity of Cashes Ledge reveal a strong reflector that appears to crop out along the crest of the ledge (Figure 3). This reflecting horizon gradually deepens away from the ledge to a depth

*Manuscript received 12 May 1966.
≠Contribution No. 1650 of the Woods Hole Oceanographic Institution.

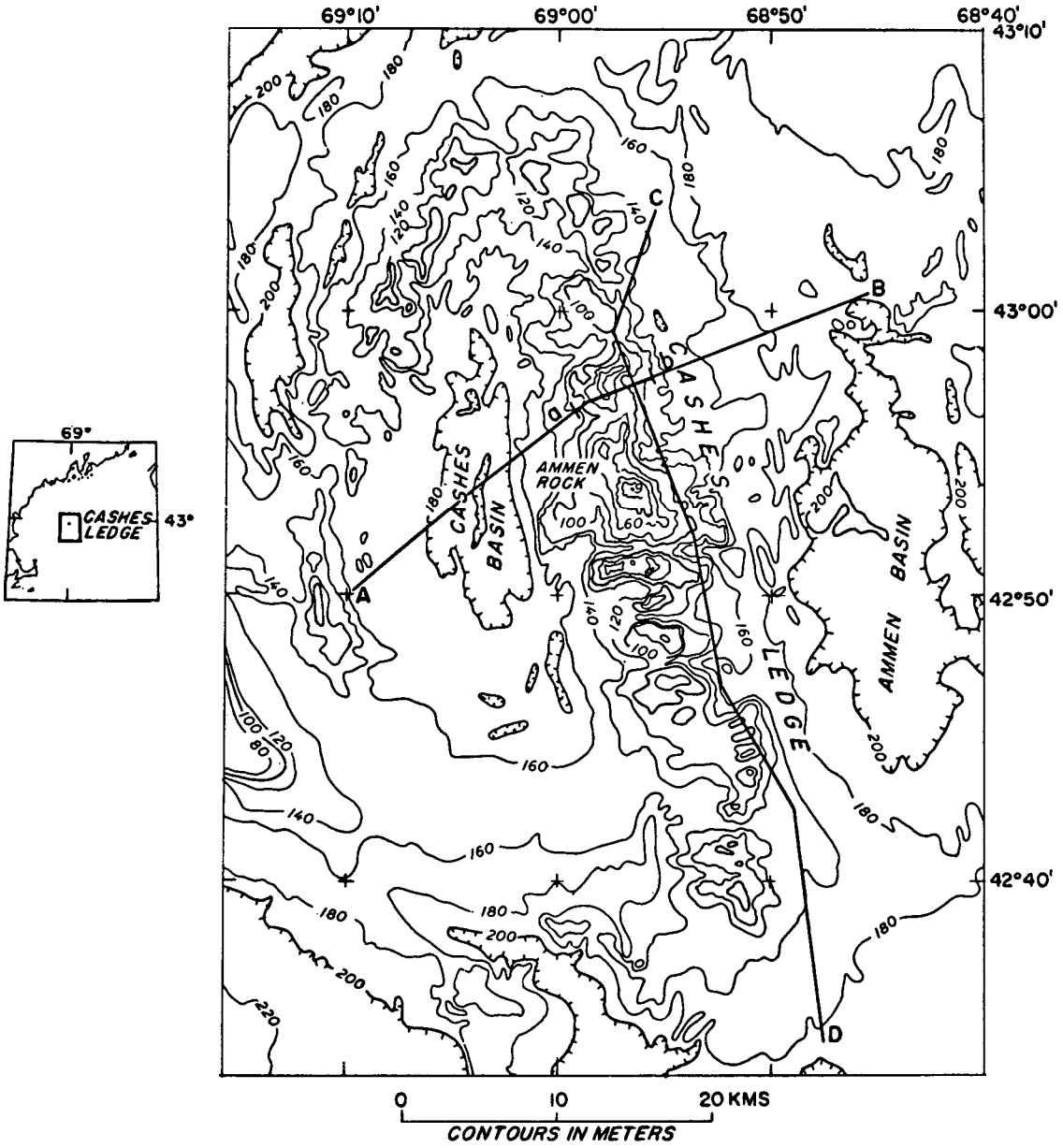

Figure 1. Bathymetric chart of Cashes Ledge. Contours are based on U.S. Coast and Geodetic Survey hydrographic surveys H-6564 and H-6566. Lines marked AB, CD and ab show the locations of the seismic and bottom profiles, shown in Figure 2 and Figure 3.

of 100 metres below the sediment-water interface at the foot of the ridge. It remains at essentially this depth throughout most of the Gulf of Maine. The discontinuity is believed to be the seaward extension of Paleozoic and younger rocks that crop out along the coast. A rock sample recovered near Ammen Rock (Figure 1) was described by TOULMIN (1957, p. 914) as peralkaline granite that closely resembles the Mesozoic intrusive rocks of New England which have been assigned to the White Mountain Plutonic-

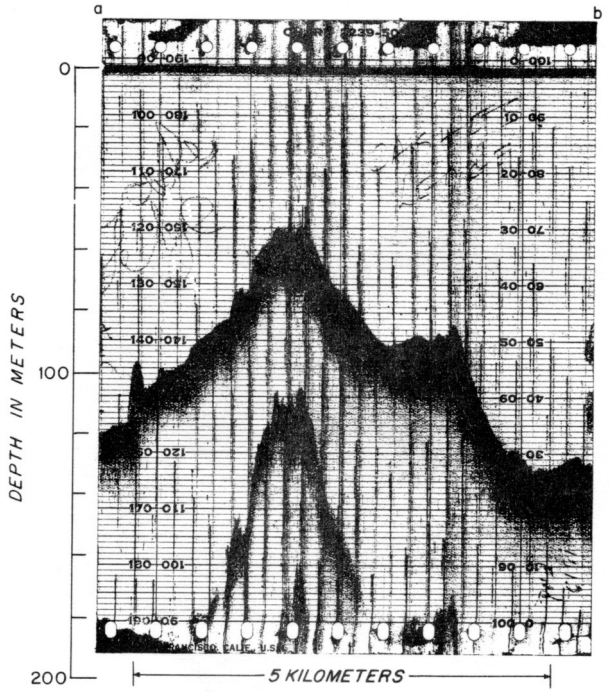

Figure 2. Bottom profile across Cashes Ledge. Location shown as line ab in Figure 1.

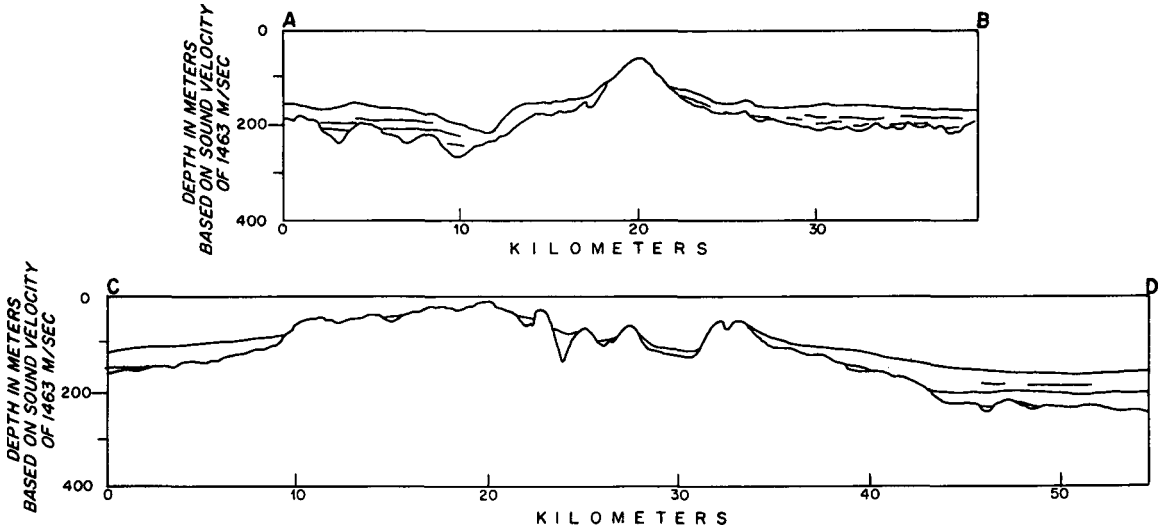

Figure 3. Seismic profiles across and along Cashes Ledge. Depths to the reflecting surfaces are based on the velocity calibration of the recorder used (1463 m/sec). Horizons below sediment-water interface represent discontinuities from which reflections were obtained. Locations of profiles are shown in Figure 1.

Volcanic Series. This sample and the results from the sparker suggest that the bulk of Cashes Ledge probably consists of granite. Relief of the ledge is probably due to resistance of this granite core to erosion.

The inferred Paleozoic and locally Mesozoic surface in the Gulf of Maine may be part of the Fall Zone Peneplain, which was drowned and mantled by a wedge of sediments to form the continental shelf and slope off eastern United States. Throughout most of the continental margin the prism of Mesozoic and Cenozoic sediment is hundreds to thousands of metres thick, but within the Gulf of Maine it is largely absent and its thickness exceeds 100 metres in only a few places. The relative thinness of the sedimentary apron atop the crystalline basement is believed to be due mainly to glacial erosion during the Pleistocene. Sediments eroded from the gulf must have been transported beyond the confines of the Gulf of Maine by way of Northeast Channel and deposited on the continental slope and continental rise: deposition seaward of Northeast Channel was so great that the continental slope drops only about 800 to 1000 metres before reaching the rise, in contrast to the slope off Georges Bank, which has a relief of 1900 metres. Degradation within the Gulf of Maine was so extensive that segments of the crystalline basement, as at Cashes Ledge, have been exposed.

Reference cited

TOULMIN, PETER, 1957, Notes on a peralkaline granite from Cashes Ledge, Gulf of Maine: Am. Mineralogist, v. 42, p. 912-915.

Sedimentation and Paleocurrents during Pennsylvanian Time in the Moncton Basin, New Brunswick*

H. W. VAN DE POLL

Mines Branch, New Brunswick Department of Natural Resources, Fredericton, N.B.

A study of paleocurrents, provenance and lithofacies distributions within the Pennsylvanian Petitcodiac Group of sedimentary rocks in the Moncton Basin was initiated by the NEW BRUNSWICK MINES BRANCH in 1965. This program is designed to gain a better understanding of the Carboniferous stratigraphy, tectonics and basin configurations, to aid an overall economic evaluation that will eventually cover all the Carboniferous rocks in the province.

---

*Manuscript received 17 May 1966.