Reports

Submergence of the New Jersey Coast

Abstract. *A series of five radiocarbon dates obtained from samples taken along the base of the lagoon between the Brigantine City Barrier and the mainland indicates a rate of submergence of 3 meters per millennium between 6000 and 2600 years before the present. During the last 2600 years the average submergence has slowed down to only 1.2 to 1.4 meters per millennium; the general picture of a rapid rise and the subsequent slackening is in agreement with results published for the New England area.*

Brigantine City is one of several barriers that line the southern New Jersey coast; it is separated from the mainland by broad lagoons composed of marshes, shallow bays, and mud flats. A study of the sediments and surface features of the lagoon that lies between the Brigantine City Barrier and the mainland has established its developmental history (*1*). This wedge of sediments, underlain by the sands and gravels of the gently sloping coastal plain, records the last 13 m of New Jersey coastal submergence with no indication of any strong sea-level oscillation. However, the stratigraphy is indicative of a change in the submergence rate.

The sands and gravels forming the basement of the lagoon are covered over most of their area by a layer of swamp and brackish marsh peat which is overlain by intertidal peat or mudflat deposits. Although the basement material is very porous and groundwater level was closely determined by sea level, extensive probing and coring was undertaken to locate peat that formed at about mean high tide. Such peat was formed by species that transgressed the mainland immediately ahead of the rising sea. All peat deposits suspected to be intertidal, or formed locally under conditions different from those correlated with submergence of the area, were by-passed.

To avoid the influence of peat compaction, samples were taken from the first formed peat directly overlying the sandy basement surface. As compaction of the basement sands is probably negligible, the ages and depths of these samples should establish a curve of relative sea-level rise. The samples were taken with a coring device that remains closed until it is in coring position and the upper end of each radiocarbon core was discarded as protection against contamination. Four samples, Y-1331, Y-1281, Y-1282, and Y-1283, were taken from the Brigantine National Wildlife Reserve. Sample Y-1284 was taken from Brigantine City.

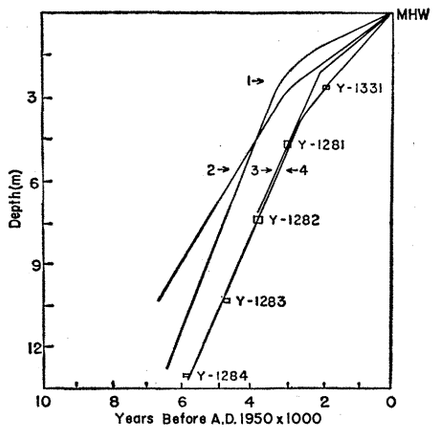

Fig. 1. Submergence of the New Jersey Coast (curve 4) compared with the submergence of Plum Point, Massachusetts (curve 1); Clinton, Connecticut (curve 2), and Barnstable, Massachusetts (curve 3). Curves 1, 2, and 3 are constructed from data published by McIntire and Morgan (*2*); Bloom and Stuiver (*3*); and Redfield and Rubin (*4*). MHW, mean high water.

1) Y-1331. Site: 39°29′07″ N, 74°25′33″ W, 180 m southeast of the mainland above a steep basement slope. Depth: 2.5 to 2.7 m below present level of mean high tide. Age: 1890 ± 40 years.

2) Y-1281. Site: 39°28′59″ N, 74°25′28″ W, 275 m southeast of the mainland above a steep basement slope. Depth: 4.6 to 4.8 m below present level of mean high tide. Age: 3000 ± 90 years.

3) Y-1282. Site: 39°28′44″ N, 74°25′08″ W, 990 m southeast of the mainland above a gentle basement slope. Depth: 7.3 to 7.5 m below present level of mean high tide. Age: 3830 ± 100 years.

4) Y-1283. Site: 39°27′16″ N, 74°24′19″ W, 3573 m southeast of the mainland above a very gentle basement slope. Depth: 10.2 to 10.4 m below present level of mean high tide.

5) Y-1284. Site: 39°25′34″ N, 74°23′24″ W, 6480 m southeast of the mainland above a very gentle basement slope. Depth: 12.95 to 13.05 m below present level of mean high tide. Age: 5890 ± 100 years.

For the radiocarbon analysis, CO_2 was used as a counting gas in proportional quartz counters. The standard radiocarbon half life of 5568 years was used for the calculation of the ages. The reference year of zero age is A.D. 1950. A comparison between the results from the New Jersey coast (curve 4) and those of New England areas is made in Fig. 1.

All areas show a rapid submergence until 2000 to 3000 years ago and a much reduced submergence rate from that time to the present. If one agrees with the hypothesis that sea level has been stable for the last 3000 years, one has to conclude that the whole New England and New Jersey area has been subjected to a considerable amount of crustal subsidence. Differential warping between different localities could account for some of the differences between the curves, for example, the higher position of curves 1 and 2 with regard to curves 3 and 4 and the differences in rates of submergence between curve 2 and the others. On the other hand, different sampling techniques are applied at different localities and might be responsible for part of the differences. Whether the period between 2000 and 3000 years before 1950 marked a reduction in the eustatic rise or a cessation of it, or whether an even more complex tectonic-eustatic relationship took control of coastal submergence from that point will not be discussed here (*5*).

MINZE STUIVER
JOSEPH J. DADDARIO
Geochronometric Laboratory, Yale University, New Haven, Connecticut

References and Notes

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3. A. L. Bloom and M. Stuiver, *Science* **139**, 332 (1963).
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5. The Geochronometric Laboratory, Yale University, is supported by the National Science Foundation under grants G-19080 and GP 1307.

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