McMASTER

CRUISE REPORT

TR-051

R/V TRIDENT - Cruise 51

June 28 - July 8, 1968

McMASTER

Introduction: Geological and ocean engineering studies were undertaken south of Long Island, New York, Rhode Island, and southeastern Massachusetts in an area roughly defined by lats. 41°25' - 39°50'N and longs. 70°50' - 72°W. (Fig. 1). The first leg of this cruise, directed by Dr. Foster Middleton, Chairman Ocean Engineering Department, URI, was devoted to studies of the sound signal developed by towed air guns under varying conditions. The second leg was concerned primarily with seismic reflection profiling on the continental shelf south of Block Island and Rhode Island Sounds with some practical training in launching and retrieving of a deep-sea corer in depths of 400 - 1000 m.

Deep appreciation is expressed to the Captain, Mates, Chief Engineer and crew for their interest, cooperation, and assistance getting the oceanographic work of this cruise accomplished.

Schedule:

Leg 1: 28 June - 1200, depart Narragansett, R. I.
29 June - 2030, arrive Narragansett, R. I.

Leg 2: 29 June - 2350, depart Narragansett, R. I.
8 July - 1430, arrive Narragansett, R. I.

Scientific Party:

Leg 1: Dr. F. Middleton, Ocean Engineering, URI
A. Barrett, Grad. Student, O.E., URI
G. Eller, " " " "
L. Smith, " " " "
H. Ryder, Sanders Associates, Inc.
A. Buddington, Oceanographic Specialist
W. Dillon, Grad. Student, GSO
T. Kennard, Oceanographic Specialist
Dr. R. McMaster, Scientific Leader
H. Zimmerman, Grad. Student, GSO

Leg 2: A. Ashraf, Research Assistant, GSO
M. Barros, Grad. Student, GSO
A. Buddington, Oceanographic Specialist
W. Dillon, Grad. Student, GSO
T. Kennard, Oceanographic Specialist
Dr. R. McMaster, Scientific Leader
R. Sexton, Oceanographic Specialist
H. Zimmerman, Grad. Student, GSO

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Work Data:

29 Seismic profiles - 1447 km
Piston cores - 4

Program and Preliminary Results:

Ocean Engineering. Studies of the sound signal generated by an array of three 10 in^3 Bolt Associates air guns, spaced 10 meters apart and towed at a constant depth below the surface, were undertaken at two general locations. The first was approximately 8 km west of Block Island in 30 - 36 m of water and the second location near lat. 40°42'N and long. 71°41.5'W in depths of 66 - 69 m. Data were collected by an oyster hydrophone mounted on the forward air gun head, the ship's towed hydrophone array (roughly at the surface) and an LC-32 hydrophone located approximately 20 m below the air gun array. Hydrophone data were recorded on a 7 channel Sanborn shipboard tape recorder. At each location, the testing procedure was to fire the three guns singly or in all possible combinations at several firing rates and record the sound signals from the various hydrophones as the ship moved along at about 4 k. At the second location, south of Block Island, a AN/SSQ-28 sonobuoy with its hydrophone located 27 m below the surface, was set afloat and the sound sources were moved away and then toward the sonobuoy, passing as close as 16 m from a maximum distance of 5 km. In this operation, continuous data were recorded utilizing various firing combinations. Although no specific conclusions can be drawn at this time, several points are noteworthy: (1) the air gun array although combersome in this test is seaworthy at speeds of 4 k and could be designed to facilitate handling and towing, (2) multiple firing of the guns in parallel introduces significantly more acoustic energy into the water, (3) simultaneous firing of guns 1 and 3 (20 m spacing) appeared to produce a cleaner output wave form (less complex) and seemed to accentuate the lower frequencies, and (4) future tests should vary the depth at which the gun array is towed in order to investigate constructive interference of the sound output so that the optimum towing depth can be ascertained.

Geology. A previous seismic reflection investigation in Block Island and Rhode Island Sounds has shown the presence of a number of deep and seaward trending buried channels leading from Narragansett Bay and Long Island Sound. The present program was designed to trace these buried valleys of the Coastal Plain and Fall Zone surface (basement) seaward of the inner shelf sounds by seismic profiling along lines which parallel the coast in an offshore direction. These lines up to 80 km long, spaced from 3 to 16 km apart, extended to the shelf edge in the vicinity of Block Delta and Canyon.

A preliminary study of the profiles indicates that the deep buried channels are restricted to the confines of the inner shelf sounds possibly reflecting the extent of ice scouring during the Pleistocene epoch. No striking channels were apparent on the Fall Zone surface (?) beneath the Coastal Plain formations. This finding may be related to the distinctly more regular surface (lowest reflector) under these formations which could indicate a change of the age and type of rock downdip. Shallow buried valleys can be generally traced across the shelf from Block Island Sound, Narragansett Bay, and Buzzards Bay. These channels appear to be directed toward Block Delta and Canyon.

A training exercise in rigging, launching, and retrieving our newly purchased deep-sea corer was conducted in order to familiarize the geologists and ship's crew in this type of operation. As a result a number of changes were made in the handling procedure. Block Canyon was chosen for this exercise because of the desirability of checking previous visual observations of the sediment cover by W. Dillon in Deepstar 4000. Four cores, 3 to 5 m in length, from the axis and canyon walls, reveal that the sediment is composed mostly of dense, light gray, silty clay with an oxidized and winnowed surface layer which is in accord with the previous visual description.

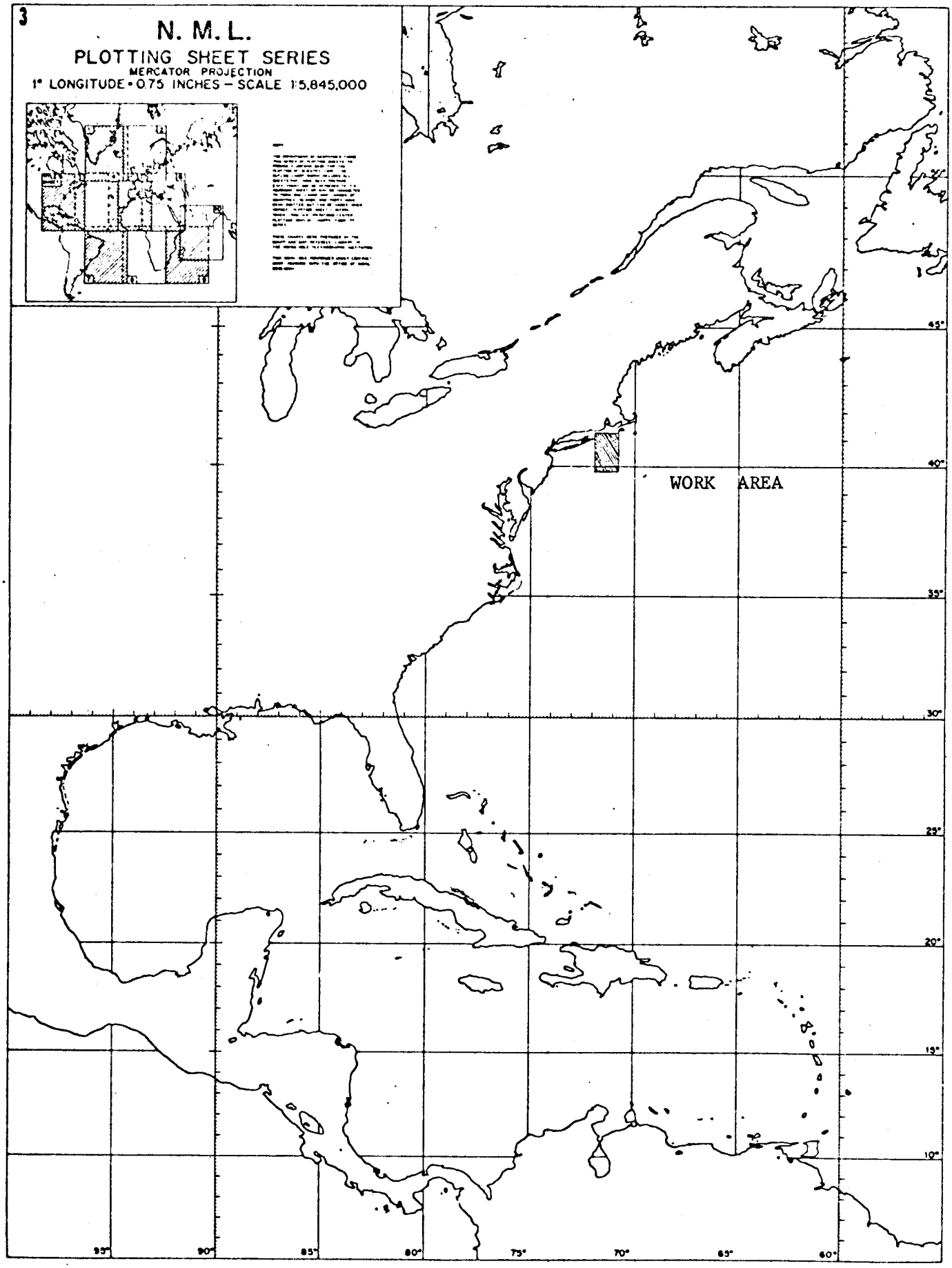

Figure 1 - Cruise 51, Work Area off Long Island, Rhode Island and Southeastern Massachusetts