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CRUISE REPORT

Cruise: LuLu 31

Area: Nantucket Sound, Buzzards Bay, and Cape Cod Bay.

Personnel: Robert N. Oldale, USGS, in charge
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Time: March 12 (1233) to March 17 (1400), 1970

Itinerary: R/V LuLu left Woods Hole at 1233 for a 24 hour survey of Nantucket Sound. Seismic system working (1440). Completed survey of Nantucket Sound 13/3/70 (0839). Off Woods Hole to put visitors ashore. Underway (1204) resume survey of Vineyard sound. Begin survey of Buzzards Bay 13/3/70 (1300). Hauled gear and entered Cape Cod Canal (2141). Begin survey of Cape Cod Bay 14/3/70 (0116). Entered Provincetown Harbor (1525) to pick up ship's engineer. Stayed the night to get some rest. Leave Provincetown Harbor 15/3/70 (0840). Resumed survey (0911). Return to Provincetown Harbor (1800); air gun compressor break down. Repaired compressor and resumed survey 16/3/70 (1300). Hauled gear for Cape Cod Canal 17/3/70 (0520). Resumed survey of Buzzards Bay (0752). Entered Quicks Hole (1148) turned south to complete survey of Vineyard sound. Seas too rough to maintain ship's speed for profiling. Pulled gear and changed course for Woods Hole. Completed survey (1340).

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LuLu cruise 31 had two main objectives: 1) to test the capability of using the ship for scientific work (previously she has been used only as the tender for Alvin), and 2) to obtain geophysical data in Nantucket and Vineyard sounds, Buzzards Bay, and Cape Cod Bay. Profiling gear consisted of a compressor (2,000 psi), 10 cubic inch airgun, a single 200 element streamer, and a recording system that included a EPC Labs Inc. graphic recorder. The recorder was loaned by the company at no charge. The LuLu was also available at no cost to the project, as a test of seismic profiling from the ship was the main interest of WHOI's Ocean Engineering and Port Office departments. An electronic technician and two men to maintain and run the airgun compressor system were provided by the Ocean Engineering department.

Two major problems developed in the profiling system during the cruise. The coupling between the high-stage compressor and high-stage pressure tank failed three times. The first two times, during the survey of Cape Cod Bay, required considerable time to repair. The third failure occurred just as the cruise was completed. The failures indicate that a flexible coupling is necessary between the compressor and tank. The other failure in the system also occurred in Cape Cod Bay when the airgun broke loose from the fish. This was easily repaired and the airgun gave no further trouble. However, a stronger mount between the airgun and fish should be devised. Breaking of the seal retainer springs in the airgun, caused by a high repetition rate (2 to 4 sec.), that occurred on the fall cruise to the western Gulf of Maine did not occur on this cruise.

The scientific results of the cruise were good. The 10 cubic inch airgun and the time variable gain, a feature of the recorder, allowed recognition of basement in Nantucket Sound. The large airgun provided enough energy to penetrate the 100 to 300 meters of sediment and the time variable gain suppressed the multiples that usually mask the data. Throughout the cruise detail in the upper sediments (Holocene) was sacrificed to obtain good basement reflections. Originally a 3.5 kc echo sounding system was to be used to obtain this detail, but the system and a means for towing were not available at the time of sailing.

The basement morphology in Nantucket Sound can be recognized in the records. Several deep valleys were seen and the depth to basement appears to check reasonably with depths determined by land based refraction data. Several horizons can be seen above the basement and in some places deep valleys are cut into the sediments. Basement was easily recognized in Buzzards Bay where it was highly irregular. Several horizons can be recognized in the overlying sediments where basement is deep. The records from Cape Cod Bay showed flat lying sediments over a irregular basement. Several valleys were seen cut into the basement and in the sediments.

I would like to thank the WHOI Ocean Engineering group for providing the ship and for help in preparing the cruise, EPC Labs Inc. for the loan of the graphic recorder, and the crew of the LuLu for helping greatly to make the cruise successful.

Robert N. Oldale