Maritime Sediments, Vol. 4, No. 3, December, 1968, pp. 106-107.

Marine Geological Investigation of the Wilmington Submarine Canyon Area*

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A long-term Smithsonian Institution-U. S. Coast Guard program to detail the sediment and water mass properties and movement has been initiated in the vicinity of Wilmington Canyon on the Atlantic outer continental margin (Fig. 1). The area under study covers about 10, 000 km^2 and extends from depths of about 100 to 4000 m. The four USCGS ROCKAWAY cruises thus far taken in this area have afforded a unique opportunity to monitor the outermost shelf, canyon head incised therein, canyon proper, adjacent slope, and rise-environments which are poorly known in the area of study.

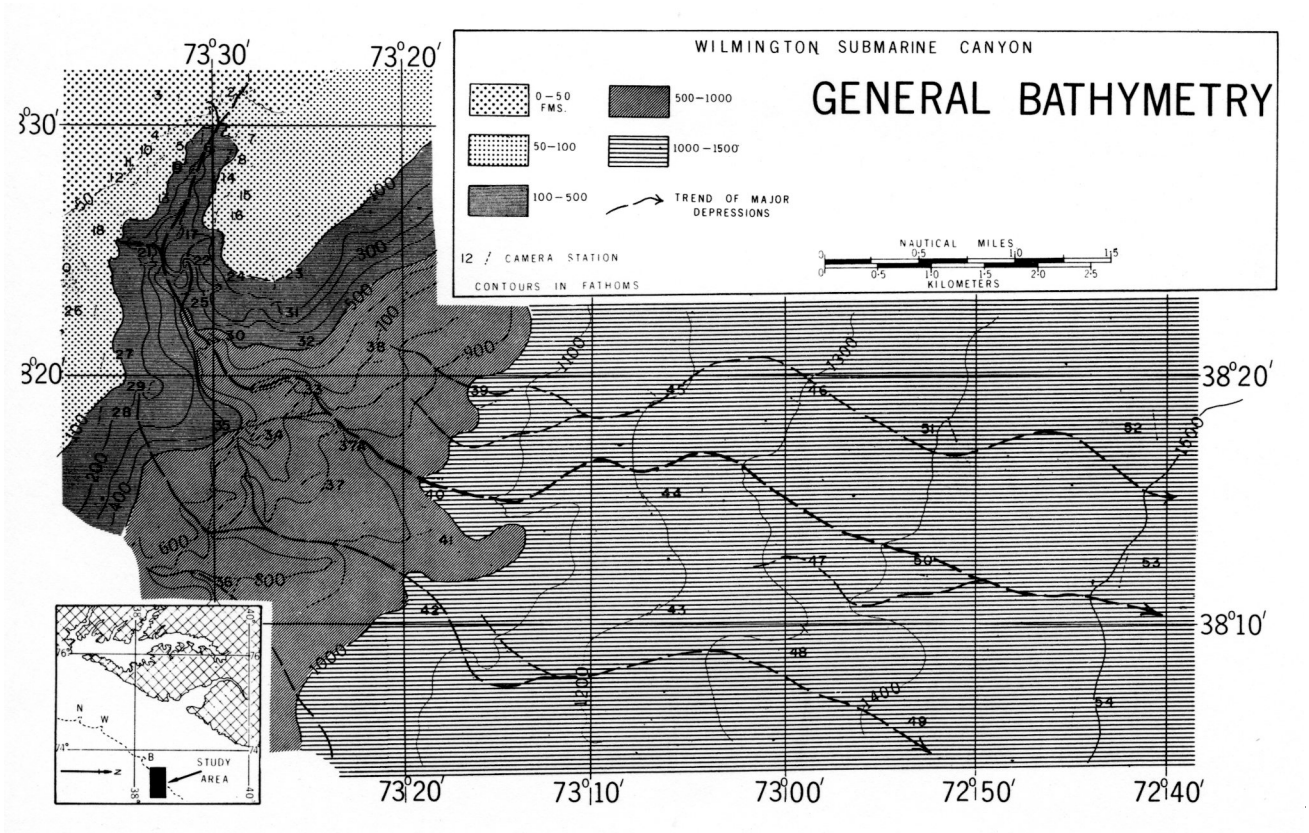

Fig. 1 - Chart showing area under study in the joint Smithsonian Institution - U.S. Coast Guard program.

*Manuscript received February 20, 1969.

The first cruise (Nov. 1967) provided continuous bottom and subbottom profiles. These PESR and Sparker records, profiles collected on subsequent cruises, and LORAN-C navigational fixes obtained every 6 minutes were used to prepare a detailed chart of the area. Stratigraphy and structure of the underlying pre-Holocene sediments are presently being interpreted. Distribution of sediment and biota were mapped (Stanley and Kelling, in press) on the basis of: (a) photographs obtained at 54 camera stations (December 1967), (b) grab and dredge samples collected (May 1968), and (c) direct observations made with underwater television (July 1968). More than 20 hours of video tape made during six days of observations were obtained in the canyon head to a depth of 400 metres. Thirty free-fall cores were recovered during the four cruises. Continuous surface salinity-temperature records and STD profiles are being analyzed by staff of the Naval Oceanographic Office. Important features of this type of approach have been the active incorporation of recovered data to the planning of subsequent cruises in the sequence and on-the-spot control and hypothesis-testing made possible with equipment like camera and television, considerably less expensive than submersibles.

Preliminary information on recent sediment movement on the outer shelf and spill-over into the canyon head has been outlined (Stanley and Kelling, 1968b). The picture obtained indicates that the sedimentation pattern in this region is much more active than suggested in earlier studies. Bottom current activity has been detected on the outer shelf, as well as in the canyon and on the upper rise (possible evidence of geostrophic current). Intra-basinal sedimentation is also important: sediments are shed off Nyckel Ridge, which bounds the canyon, by bottom current activity and slumping (Stanley and Kelling, 1968a). Planned cruises in the same area are aimed at gathering information on (a) the nature and origin of clays and other fine particulate matter presently prograding on the slope, (b) the transport processes responsible for the mechanical transfer of sediments seaward, and (c) the role of organisms in modifying sediment properties in the canyon and slope.

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