

75019

CRUISE REPORT

R/V ADVANCE II 75-6 and NEKTON BETA

12-16 September 1975

D. W. Folger  
U.S. Geological Survey  
Woods Hole, Mass. 02543

ADVANCE II 75-6

CONTENTS

Cruise Report

Dive Locations (Figure 1)

Data Collected (Table 1)

Cruise Summary (Chief Scientists Log)

Edited Tapes

ADVANCE II 75-6

CRUISE REPORT

Vessels: R/V ADVANCE II: Master: Jordan

DSRV NEKTON BETA: Pilots: Slater, Zahoran, O'Donnell

Cruise Number: ADVANCE II 75-6

Area: Georges Bank - USGS Stations 4501, 4502, 4503

Ports: Gloucester, Mass. to Cape May, New Jersey

Date: 12-16 September 1975

Personnel:

USGS: Folger, D.W. - Chief Scientist

Butman, B.

Morse, L.

Wieber, S.

Geary, D.

W.H.O.I.:

Farlow, J.

BENTHOS:

Minor, L.

Scientific and Navigation Equipment:

Bottom camera

Niskin bottles

Filtration apparatus

Shipek grab samplers

35 mm XBT cameras and television

Loran A

Loran C

Purpose: The cruise was conducted to make direct observations of geologic, hydrologic, and biologic phenomena at three sites located on Georges Bank. At each of the sites a railroad wheel had been set on a previous cruise. A vibrocore pipe was also to have been placed on the bottom prior to the submersible cruise; however, due to mechanical problems the pipes were not set until after the submersible cruise was completed. Of primary concern in the area are the magnitude, characteristics, and distribution of ripple marks on the bottom because these result from both oscillatory and uni-directional current motion. In addition, bottom currents were to be measured directly on the bottom during submersible dives, and distribution patterns and habits of benthic and epibenthic fauna assessed. Finally, we hoped to retrieve a string of four current meters that had been set close to one of the diving stations.

Data Acquired: Personnel involved in the cruise included USGS geologists, one Woods Hole Oceanographic Institution biologist, and a representative of the Benthos Corporation. During the dives they collected both color and black and white 35 mm photography and video tapes at each site. From the ship, when the submarine was not in the water, the scientific party collected 190 black and white bottom photographs taken with a Benthos submersible camera, 6 sediment grab samples, 6 suspended matter samples, and 43 bathythermograph profiles.

Preliminary Results: At Station 4503 observations from the submarine at a depth of about 80 meters revealed a bottom covered by asymmetrical ripple marks trending approximately southwest-northeast or west southwest-east northeast with the steep side to the southeast. These very tight ripple

marks have a wavelength of approximately 10-20 cm and wave heights of only 1-3 cm. They apparently were formed by water flow toward the southeast. Observed current motion, however, was nearly parallel to these ripples (approximately  $220^\circ$ ) at a velocity of approximately 3-4 cm per second. The bottom is covered mainly by fine to medium sand without much debris in it, with the exception of some small to large pieces of shell material. The thermocline is quite diffused and gradually declines from surface temperatures of approximately  $13-14^\circ$  to bottom temperatures of roughly  $10-11^\circ$ . Benthic organisms are common and include scallops, hermit crabs, sand dollars (most often red) sculpin or sea robins, and crabs. An occasional lobster was observed. Turbidity in the water column was generally quite high and visibility consequently restricted at the bottom. The railroad wheel was intact as was the cable to the surface buoy. There were some eelpout living close to the base of the railroad wheel.

In summary at Station 4503 the bottom shows clear evidence of strong unidirectional current motion. Current velocities during the time of the dives however were not particularly high. Organisms are fairly common and apparently are moving in around the railroad wheel.

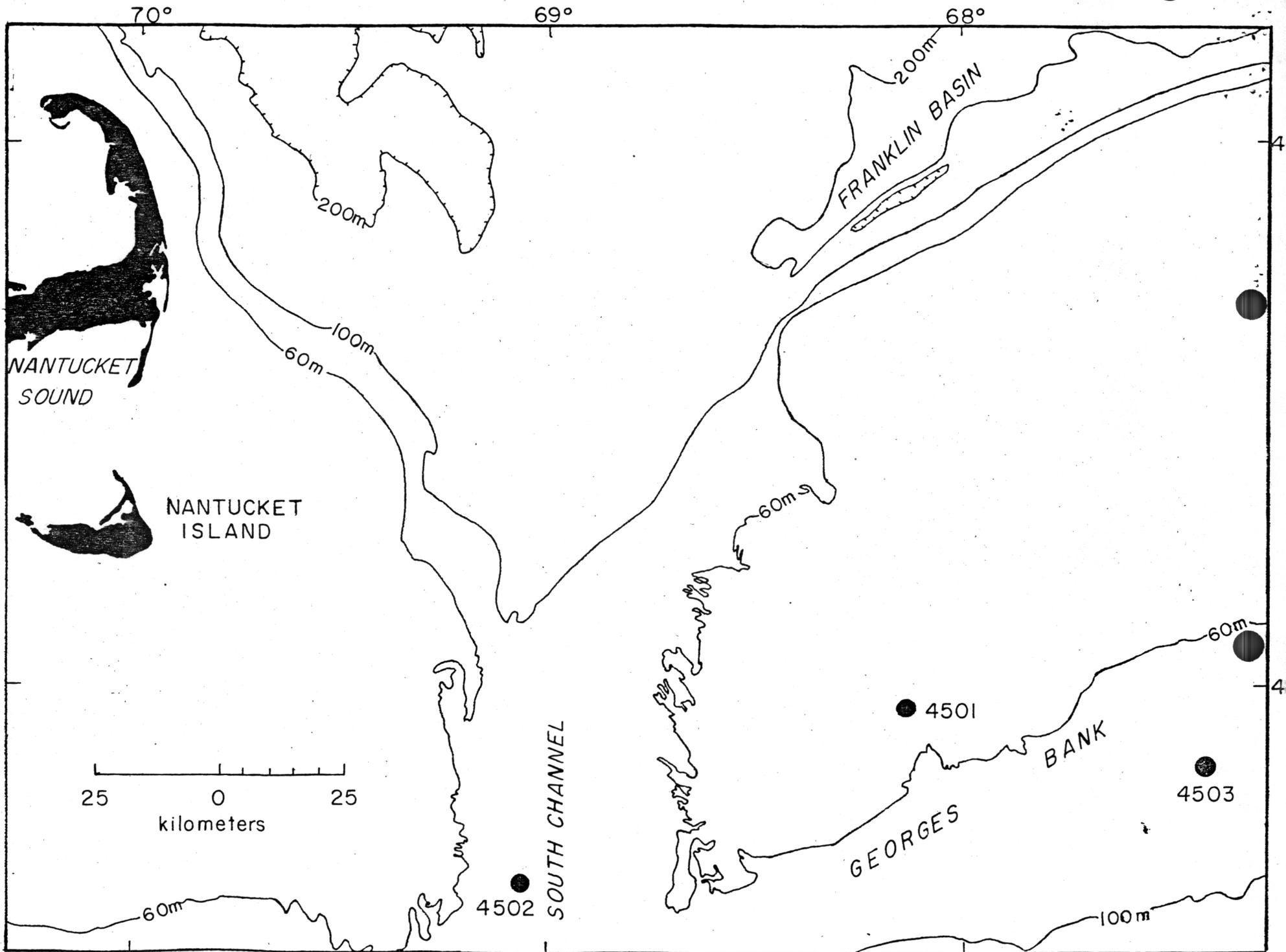
At Station 4501, where water depth is about 46 meters, observations were conducted only from the ship. These included one camera lowering, one Shipek grab, six XBT's, and one Niskin cast. The grab sample recovered medium grained, well sorted and well washed sand. The bottom photos revealed that the bottom was heavily ripple marked and current scoured. Bottom currents from the surface to the bottom were estimated at 4 knots.

Because of the high current velocities the submersible pilot considered diving to be too hazardous and hence no direct observations were made.

At Station 4502 in Great South Channel the most unique feature observed on the bottom was the wide distribution of gelatinous spheres, approximately pea-sized, that have tentatively been identified as tunicates. The spheres cover much or most of the bottom which comprises fine to very coarse sand with occasional gravel. Though current velocities were measured at 4-5 cm per second trending from north to south there was no evidence of ripple marks on the bottom. Possibly the layer of gelatinous material protects the bottom from the water motion and hence ripple marks do not develop. Common organisms at the bottom include hake, sea robins, scallops, crabs and anemones. In the water column the thermocline is very gradual and its actual depth is not clear; surface temperatures were generally 14° centigrade and dropped to approximately 10.9° centigrade on the bottom at roughly 70 meters depth. The water temperature information is based only on submarine observations because XBT data has not yet been processed. In summary, the area near Station 4502 reveals little evidence of ripple marks despite the fact that some of the material on the bottom is in the gravel size range.

Conclusions: Clearly, the observations made at three locations on Georges Bank indicate that bottom water flow is intense in the shallow areas and probably, during storms, as vigorous in the deeper areas. Thus sediment mobility is probably mostly a function of tidal currents that appear to be capable of eroding or moving sand waves of considerable size. The intensive

current regime throughout the whole water column is clearly capable of moving material along the bottom or anywhere in the water column for considerable distances. Thus the vigorous currents may be responsible for widespread dissemination of pollutants and may also be responsible for significant bottom instability due to the movement of large sand waves.



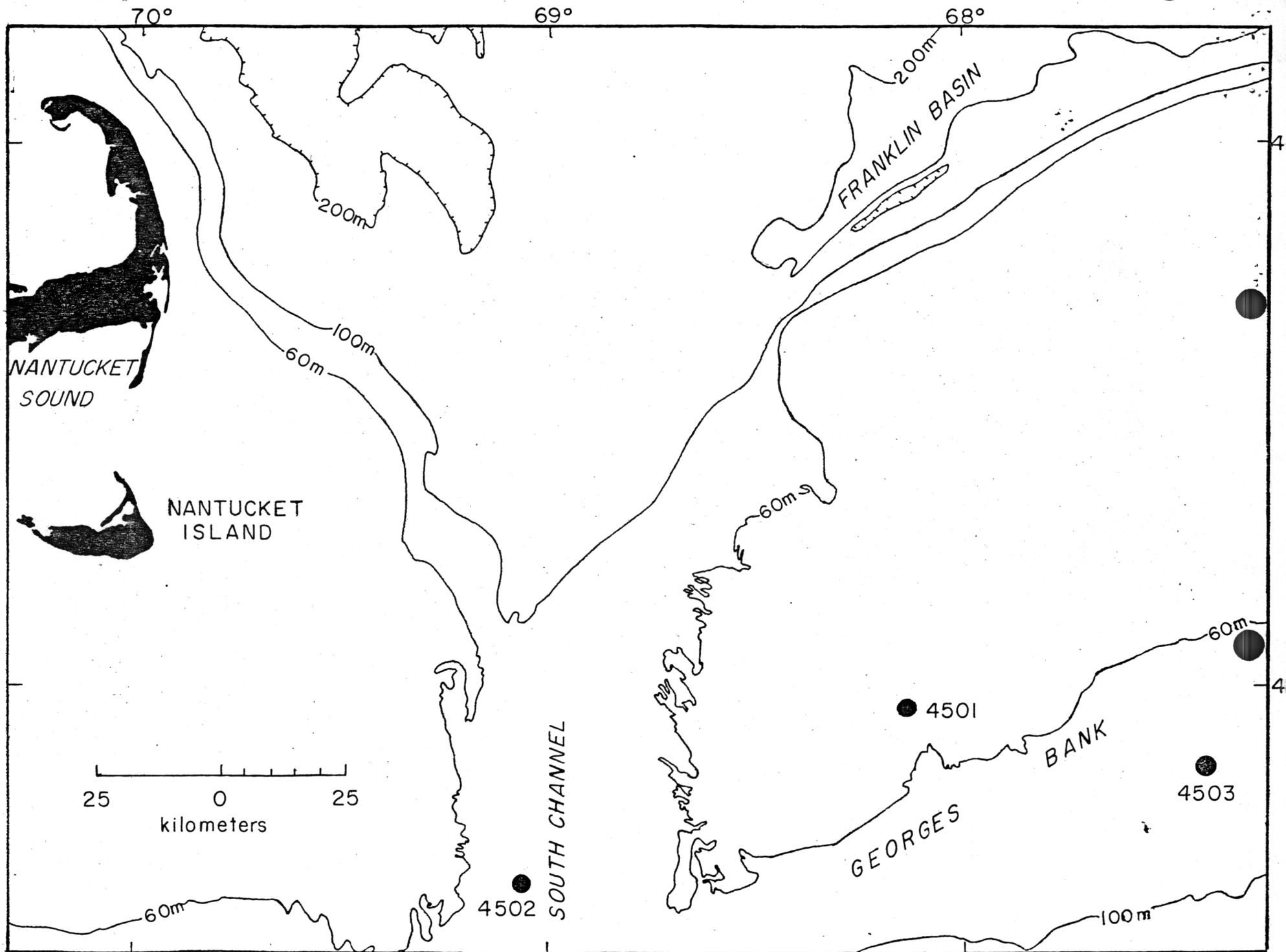


Table 1

Data Collected

Bottom photos from Advance II	190
Bottom photos from Nekton BETA	70
Sediment grab samples	6
Suspended matter samples	6
BT lowerings	43

STATIONS 3

GEORGES BANK

Chief Scientists Log ADVANCE II 75-6 - Nekton Beta

11 September - Depart Gloucester at 1830 for site 13 (Station 4503) on Georges Bank.

12 September 75 - Arrived on site 13 at 0930. All buoys intact. Launched dive #1 (#533) at 1050. Did not find railroad wheel due to gyro problem in submersible. Took television and 35 mm photos of the bottom. Ripple marks trend north-south, have a 20 centimeter wave length, and a 2 centimeter amplitude...obviously due to current motion. Concluded diving at 1300 due to rising sea and impending gale. Commenced grapneling for lost current meter array. Conducted two camera lowerings. collected one grab sample, and ran one XBT.

13 September 75 - Sea heavy from nearby gale; heavy rain and poor visibility. No diving possible. Ran two camera stations between the two large buoys set near the current meter array. Ran two XBTs. Weather moderated by nightfall. R/V FAY arrived on station at 1930 and commenced coring.

14 September 75 - R/V FAY unable to set reference pipes because of compressor breakdown; departed for Woods Hole at 0300. Commenced dive #2 (#534) at 0800. Located railroad wheel. Strobe for 35 mm photos malfunctioned but attained good TV coverage. Conducted dive #3 (#535), dive #4 (#536), and dive #5 (#537) to assess benthic faunal distribution and to search for lost current meter array. Despite thorough search for current meters they were not located. Departed station at about 1800 for site #8 (station 4501). Arrived on station at 2100. Conducted one camera lowering, one Shipek grab, six XBTs and one Niskin cast.

Photos and samples revealed heavily current scoured bottom covered by medium grained, well sorted quartz sand. Currents from surface to bottom estimated at 4 knots. Diving considered unfeasible; departed for site 4 (station 4502A).

15 September 75 - On site 4 about 0800. Buoy not observed. Located pinger and set a new buoy. Commenced dive #6 (#538) at about 0900. Railroad wheel found on dive less than 100 meters from buoy. Wheel tipped over probably due to setting problem as was expected. Surveyed the area; a coarse sand and gravel bottom is covered by gelatinous pea-sized spheres (Tunicates (?)). Conducted dive #7 (#539), dive #8 (#540), dive #9 (#541) to assess geology, biology, and hydrology. Attempted to set railroad wheel upright but failed because of gear malfunction. Concluded diving at 1600. Reset large buoy on pinger site. Location of the buoy 040° true (NE) from pinger location, probably not more than 200 meters. Conducted XBTs, one Niskin cast, and one camera lowering. Commenced steaming for Cape May at 1830.

16 September 75 - Steaming for Cape May collecting XBT data every ½ hour on the continental shelf and every hour on the continental slope. Arrived Cape May at 1730.