THE MID-PACIFIC EXPEDITION OF THE UNIVERSITY OF CALIFORNIA AND THE U. S. NAVY ELECTRONICS LABORATORY

Two vessels participated in the expedition to the Marshall Islands, the Scripps Institution vessel HORIZON and USNEL's EPCE(R)-857. A total of over 25,000 miles of continuously recorded soundings was made during the expedition. Soundings in the deepest water were obtained even under storm conditions. The submarine topography was found to be irregular over about 80 per cent of the area covered, the remaining 20 per cent being very flat. Indications are that the topography over much of this area could be of use to navigation provided adequate charts were available. Several large seamounts were discovered. Well-rounded rock fragments were found on flat-topped seamounts (guyots) between the Hawaiian Islands and the Marshalls. A series of detailed sounding lines were made across a NE-SW trending ridge which lies west and south of the Hawaiian chain. This ridge, tentatively called the Mid-Pacific Mountains, has peaks which rise to within 450 fathoms of the surface, and has a maximum relief of over 2,300 fathoms. Some of the seamounts had flat tops; dredgings yielding reef corals and shallow-water shells prove that these flat-topped areas were once in shallow water.

Seventy-five cores up to 24 feet long were obtained during the trip. Most of them were in deep water, the deepest being 3,200 fathoms. Many of the cores showed alternating layers of different types of sediment. Near the seamounts several of the cores contained sand and even gravel layers. In a majority of the deep-sea cores one or more volcanic ash layers occurred. In a number of places cores penetrated only a small amount of sediment before encountering rock. Some of this rock, which was badly weathered, was found in the bottom of the cores. Indications are that many centers of vulcanism have existed in the Pacific in relatively recent time and have produced lava and volcanic ash which cover the sea floor in many places.

Dredging and coring around Bikini and the adjacent Sylvania Seamount showed a great deal of hard bottom. Even at 2,500 fathoms on flat bottom east of Bikini, the corer brought up fragments of coral. Volcanic rock coated with more than 4 inches of manganese was found in all dredgings on the edges of Sylvania Seamount. Several large fragments of reef coral were obtained on the saddle near the base of Bikini atoll. In a core at 1,500 fathoms on the slope of Bikini volcanic rock was found below 5 inches of globigerina ooze. A photograph indicated ripple marks on Sylvania Seamount at a depth of 750 fathoms. These are the deepest ripples yet discovered.

Evidence that the sea floor is a zone of weathering was obtained not only by the discovery of the weathered rock, but also by chemical studies of the interstitial water in the sediments. These contained up to one hundred times as much SiO_2 as the overlying water, plus considerable free

ferric hydroxide, and had a much lower pH and higher oxidation potential than the overlying water. All of these findings indicate solution of the bottom materials.

Geophysical investigations, made by refraction shooting using both vessels, show that the total thickness of sediments east of Hawaii and the mainland varies between about 1,500 and 3,000 feet. The sediments showed an increase in thickness towards the equator. Two major discontinuities are found in sound velocity, one at the base of the sediment layer where the velocity increases to 6½ kilometers per second, and another at a depth of 4 to 6 kilometers where the velocity is close to 8 kilometers per second.

Investigations of the surface currents during the expedition showed that, contrary to previous ideas, the equatorial currents have considerable north-south components. Using the geomagnetic electrokinetograph (jog-log), velocities up to 2 knots were measured in the equatorial counter current.

Investigation of the deep scattering layer showed that there are actually a series of deep layers which vary in thickness, depth, and character of organisms producing the scattering. Also it was found that while some of the organisms producing the layer move to the surface in a diurnal cycle, others stay at great depths. During the daytime schools of organisms often appeared as "blurbs" on the echo sounding records at depths of 10 to 40 fathoms.