

## Ecological Studies during Project Sealab II

A sand-bottom community at depth of 61 meters and the fauna attracted to "Sealab II" are investigated.

Thomas A. Clarke, Arthur O. Flechsig, Richard W. Grigg

During August, September, and October, 1965, the U.S. Navy's Special Projects Office and Office of Naval Research conducted Project Sealab II off La Jolla, California. The main purpose of the project was to evaluate the performance of men and equipment in a high-pressure, underwater environment (1). *Sealab II*, an underwater habitat, was placed on the bottom for 45 days. Three ten-man teams lived in *Sealab II* for about 2 weeks each. The men lived at ambient pressure for the entire period and had access to the surrounding water through an open entryway in the bottom of *Sealab II*.

We participated as divers, one of us on each team. Thus our observations cover the entire period during which *Sealab II* was on the bottom. During this time we studied the ecology of the sand bottom around the site and observed on a day-by-day basis the organisms attracted to the site. We recorded abundances, behavior, and food habits. Most of our observations were of areas adjacent to *Sealab II*, but we were also able to make several surveys of the sand bottom at locations well removed from the site. Thus we are able to compare the fauna attracted to *Sealab II* with the normal sand-bottom community. We believe this was the first opportunity biologists have had to conduct a continuous underwater study of marine organisms.

### Site and Environment

*Sealab II* was placed approximately 1400 meters from shore at a depth of 61 meters in a small, gently sloping valley (slope of 10 degrees) near the main axis of Scripps Submarine Canyon (Fig. 1). The bottom sediments at the site were silty-sand, and the bottom was essentially featureless, with only minor hummocks, 1 to 2 centimeters in vertical relief. Thirty-five meters northwest of *Sealab II*, the bottom steepened, and slightly beyond, at a depth of 76 meters, a vertical rock cliff dropped into a tributary of the main canyon. Other than the canyon walls, the nearest rocky bottom was 1500 meters away, near shore.

The largest object on the bottom was *Sealab II*, a cylinder 17.5 meters long, 3.7 meters in diameter, and 9.1 meters high at the central conning tower. The entire structure was painted white. There were 11 circular viewing ports 60 centimeters in diameter. These viewing ports permitted more or less constant monitoring of events occurring outside. Six of them were equipped with external 1000-watt incandescent lamps with reflectors. Various combinations of these external lights were on during the project. Less intense light from inside was visible through all the viewing ports.

Three other large objects were placed

on the bottom: the personnel transfer chamber, used to transport men to the surface under pressure; the benthic lab, which housed a communications transformer; and a power transformer. All were cylinders about 4 meters high and 2 meters in diameter and were colored orange. Only the transfer chamber was lighted. Slightly smaller objects in the assemblage included a wire-mesh fish cage, three underwater instrument stations, and an emergency breathing chamber.

*Sealab II* was lowered to the bottom on 26 August 1965. The following day the personnel transfer chamber and power transformer were lowered, and *Sealab II* was inspected by divers.

On 28 August, day 1, the first team of divers descended to *Sealab II*. Some of the viewing port covers were not removed until day 2, and few outside observations were made before day 3. The first team returned to the surface on 12 September. The second team was down from 12 September to 26 September; the third, from 26 September to 10 October, day 44. *Sealab II* and the other large structures were raised the following day. A brief dive was made to inspect the site 19 days later.

During the project the water temperature on the bottom ranged between 10° and 13°C. Visibility was often poor near the bottom, owing to suspended detritus and sediment stirred up by the activity of divers; it ranged from 0 to 10 meters. Wave surge was rarely noted, but it once reached a horizontal displacement of 20 centimeters. Speeds of persistent currents ranged from 0 to 30 centimeters per second but were usually less than 10 centimeters per second.

### Methods

Since the atmosphere in the living quarters was at ambient pressure, divers were able to work in the water for long

T. A. Clarke and R. W. Grigg are graduate students and A. O. Flechsig is an Associate Specialist in Oceanography at Scripps Institution of Oceanography, University of California, San Diego at La Jolla.