10/10/77

SCRIPPS INSTITUTION OF OCEANOGRAPHY
UNIVERSITY OF CALIFORNIA, SAN DIEGO

Background for News Release
on
Indo-Pac Expedition

Geological and Geophysical Programs

In the Parece Vela Basin in the Philippine Sea, scientists, led by Dr. Shor, discovered a 1,200-sq.-km footprint-shaped basin north of Guam, with depths reaching 7 km, about 2 km deeper than previously recorded.

Dr. Shor said they also found a "better MOHOLE site," in the west Philippine Sea, where the distance from the sea surface to mantle is less than 9 km, a savings of more than 1 km over the previously proposed site north of Hawaii.

Project MOHOLE was a proposed NSF experiment to drill a hole through the earth's crust to sample the underlying mantle. The Hawaii site had been selected several years ago on the basis of surveys and a recommendation by Dr. Shor, but the project was later canceled.

Some of the Indo-Pac sea-feature discoveries were made possible through the use of a newly acquired multi-channel seismic reflection system that increases depth capability. The device employs a 2.5-km-long hydrophone streamer that "listens" for echoes from sound blasts as they bounce from layers of sediment in the sea floor, and automatically records the impulses on digital magnetic tape in a shipboard computer.

The scientists also employed other geophysical techniques, such as heat-flow, echo-sounding, gravity, seismic refraction, and bathymetric readings, and coring and dredging of sediment samples.

Much of the geological and geophysical work was for SEATAR, which is sponsored by IDOE, UNESCO's (UN Educational, Scientific, and Cultural Organization) Intergovernmental Oceanographic Commission, and the UN-funded Committee for the Coordination of Joint Prospecting for Mineral Resources in Asian Offshore Areas.

The committee, which is referred to as CCOP, a carry-over from a previous name for the committee, receives funds from the UN Development Program and is comprised of seven member countries from Asia: Indonesia, Japan, Malaysia, Singapore, and Thailand, and the republics of the Philippines and Korea.

Non-Asian countries providing technical support and assistance for CCOP programs are the United States, Australia, France, the Federal Republic of Germany, the Netherlands, the Union of Soviet Socialists Republics, and the United Kingdom.

During Indo-Pac, which represented the first field work for SEATAR, scientists and students from CCOP countries served with those of other countries as part of a marine-sciences-and-technology exchange program.

1,200 square kilometers = about 450 square nautical miles, or about 465 square miles
1 kilometer = about ½ mile (.62 miles); 7 kilometers = about 4½ miles;
9 kilometers = about 5½ miles; 2.5 kilometers = about 1½ miles

(more)

Dr. Shor said programs such as SEATAR are mutually beneficial. "These assist the developing countries by improving their technology and resource data and help 'keep the doors open' for oceanographic research in these waters."

Physical Oceanography Programs

In the central North Pacific, water samples were analyzed for amino-acid content for Dr. Jeffrey L. Bada's research related to the marine food chain, and Dr. Peter M. Williams studied marine life and fossil specimens for radioactive carbon-14, created by the 1961 and 1962 nuclear bomb tests.

Dr. Williams uses "hot" C-14 as a tracer for plotting the travel time of material through the food chain from the plants at the sea surface to various animals and eventual deposition on the sea floor.

Surveys of arsenic compounds in the seawater of this same region and while en route to San Diego by graduate student Meinrat O. Andreae of Dr. Edward D. Goldberg's group is expected to give insight into how biological activity can change these compounds and their distribution. They may also show how arsenic affects plant growth. Arsenic compounds are produced in nature and by society's activities.

Biological Programs

The system used in the recovery of the live amphipods from the central North Pacific Ocean utilized a 23x23x8-cm baited, pressure-retaining trap, which falls freely to the sea floor, captures the animals, and then jettisons its ballast and returns to the sea surface.

The system was repeatedly used, with most of the trapped specimens preserved for later study. Animals from one recovery were kept alive for 10 days to test the system's ability to feed nutrients and circulate water while maintaining deep-sea pressure and temperature.

Dr. Yayanos says this device can be used routinely for captures in the deep sea and will now make it possible for scientists to observe and experiment with live animals for insight into their behavior and life cycles. He plans to modify the aquarium to increase visibility of animals in the chamber and to mount an internal manipulator arm for experiments in regeneration of tissue.

Because of the possible space applications of Dr. Yayanos' work, it was initially funded by the National Aeronautics and Space Administration and is now supported by NSF and ERDA.

In another program at the same region and depths, members of Dr. Hessler's group tagged, and nearly two days later, recaptured the same amphipod, another first for deep-sea biological oceanography.

23x23x8 centimeters = 9x9x3 inches

This technique, which uses treated bait, will be especially valuable for estimating population densities and studying the migrations and digestive processes of deep-sea animals. Analysis of the gut content of the recaptured animal showed little digestion had taken place during the two-day period.

Dr. Yayanos says studies of the lipids in these animals may eventually lead to an ability to detect their locations and densities on the sea floor through a type of sonar system.

Another "first" from the central North Pacific was the capture of a rattail fish in a region in the very deep sea, about 1 km above the sea floor, that was previously thought to be of little biological interest.

Dr. Smith, who caught the 36-cm fish in a free-vehicle gill net at a depth of about 5,600 m, says there is no record of animals being captured from this "relatively unexplored" layer of the world's deep oceans that lies above the sea-floor communities.

"But," he says, "from indirect evidence, I have for some time believed that this layer may have large, previously unseen creatures, which could successfully elude trawling devices that send sound waves of warning as they move through the deep sea.

"This region, about 1-2 km above the sea floor, could be the domain of large squid and fishes that are strong enough to migrate up and down and recycle food from the sea floor." (Dr. Smith's studies center on the transfer of energy in the deep sea.)

He cited the capture last year of the unusual shark, dubbed "Megamouth," off Hawaii. The creature had small, needle-like teeth in a mouth lined with bioluminescent tissue. The animal became entangled in a sea-anchor parachute at a depth of about 150 m, where the bottom depth is about 4 km.

Earlier in the expedition, Dr. Yayanos led studies of the Mariana Trench near Guam. His and Dr. Hessler's groups captured many specimens from this area. Some of these were freeze-dried on board ship to evaluate this technique for preserving the bacteria within the amphipods.

Dr. Yayanos says, "Results of these deep-sea ecology programs will be helpful in advising governments regarding the dumping of waste materials in the deep ocean."

Another biological "first" was a continuous horizontal sampling of the plant and animal life in the upper layer of the sea for food-chain studies. This operation covered a total of more than 200 nautical miles and was led by Dr. Mullin. The program concentrated on three regions, the central North Pacific, the California Current, and the San Diego coast.

---

1 kilometer = about ½ mile (.62 miles); 36 centimeters = about 14 inches
5,600 meters = 5.6 kilometers = about 3½ miles
4 kilometers = about 2½ miles; 150 meters = about 500 feet
200 nautical miles = about 230 U.S. statute miles

(more)

Water was pumped through a special shipboard system that diverted the animals for manual processing and then automatically recorded the water's chlorophyll content and the longitude-latitude coordinates. This work is aimed at understanding the natural causes of variations in animal life.

# # #

(October 10, 1977)

Contact: Jackie Janke
Scripps Institution of Oceanography
La Jolla, California 92093