OCEANOGRAPHY

Mountain in the Sea

Big expedition by the U. S. Coast and Geodetic Survey locates northern boundary of rich underwater manganese deposit in Pacific and new underwater mountain in Caribbean.

IF A TIGHTLY CORKED bottle with a note inside comes bobbing ashore while you are vacationing at the beach this summer, it is possibly from the U. S. Coast and Geodetic Survey inviting you to help them solve the riddles of ocean currents.

One way that oceanographers study the flow of ocean currents is by pitching corked-up soda-pop bottles overboard with notes inside. The notes ask finders to record where the bottles were found and mail the enclosed cards back to headquarters.

So far this pop-bottle project sounds easy enough. It appears to be merely a job of putting franked postal cards and printed instructions inside the bottles, corking the bottles tightly, throwing them overboard at the right time and making a record of where each numbered bottle was cast to sea.

But it is not that easy. Even throwing these current drift bottles overboard has to be done scientifically.

A man who should know is Dr. Harris B. Stewart Jr., chief oceanographer with the U. S. Coast and Geodetic Survey in Washington, D. C. Dr. Stewart recently helped complete an historic oceanographic expedition that involved a ship run of 10,068 nautical miles from Seattle, Wash., to Norfolk, Va.

Drift Bottles Tossed Overboard

During this run, 4,706 current drift bottles were tossed overboard at intervals.

"There was great ritual before each bottle-tossing," Dr. Stewart reports. "First a pail was dipped into the ocean for a water sample. Then several drift bottles were put into the bucket to see how they would float. Each bottle then was given just the right ballast with fine sand. Then stoppers were clamped into place and the bottles pitched overboard."

The bottles could not simply be loaded, sealed and pitched overboard. They would ride too high in the water. Chances are that ocean breezes would blow these "high riders" so they would not drift along the true track of the current. If too much ballast were put in, the bottle, of course, would promptly sink. A standard sand ballast could not be used because the density of water changes with temperature. The warmer the water, the less buoyant it is. So bottles carrying the proper ballast for northern waters would promptly sink if pitched overboard in the tropics.

So each of the 4,706 bottles cast to sea got individual attention. But the results are expected to justify the care taken. Already more than 200 drift bottles have been found and their identifying cards mailed to the U. S. Coast and Geodetic Survey, Dr. Stewart said.

Most of these bottles were washed ashore along the Atlantic and Pacific coasts of the United States. But some reply cards have been mailed from Cuba.

The 79-day cruise of the Survey ship Explorer represents the biggest oceanographic undertaking of the Survey in 70 years, said Dr. Stewart. About 13 officers, 10 scientists and 72 crewmen participated. The cruise was historic in that 15 private and Government groups participated to make the trip as scientifically rewarding as possible.

Results will be trickling in for months, maybe years. But already some notable finds have been made:

1. The northern boundary of a rich underwater manganese deposit is believed to have been determined. The field of manganese nodules, rich in nickel and cobalt, was first reported by the Russian oceanographic ship Vityaz. The report said the surface of the ocean bottom about 450 miles west of Mexico was 80% to 100% covered with these nodules of manganese. A deep-sea camera, provided by the Navy Electronics Laboratory, San Diego, Calif., brought pictures back of this two-mile-deep potential ore deposit. The pictures showed the floor heavily dotted with fist-sized nodules. A coring device attached to the bottom of the camera brought back actual samples for assay.

2. A sort of underwater mountain was found and named Explorer Bank in honor of the Survey ship. The bank was discovered while echo soundings were being made in the Caribbean. Within 15 minutes,

DREDGING THE SEA—Survey workers hoist a large haul of rocks aboard the Explorer during night dredging operations. The ship recently made a 79-day research cruise, the largest oceanographic undertaking by the U. S. Coast and Geodetic Survey in 70 years.

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the water depth changed from 6,000 feet to 90 feet. This underwater mountain turned out to be 14 miles long and seven miles wide and a potential hazard to submarines.

A magnetometer dragged along behind the ship showed the bank probably has a core of volcanic rock in its center. There was official speculation that this might be a drowned atoll having a volcanic peak in its center and a coral lip around the edge. If it is an atoll, it will be the first found in the Caribbean, Dr. Stewart said. A firm conclusion will have to await the laborious working up of scientific data, he said.

3. The magnetometer, lent to the venture by the Scripps Institution of Oceanography in La Jolla, Calif., was towed for 7,662 miles. Results still must be interpreted, but by trip's end it was evident that the east coast of the U. S. is quite different magnetically from the west coast.

The expedition sought to bring back geological data on the Swan Islands for the U. S. Geological Survey, and specimens of Swan Islands animal, reptile and insect life for the National Zoological Park and Smithsonian Institution in Washington, D. C. In addition, the Explorer's captain, E. L. Jones. enumerated the Swan Islands population of 28 for the 1960 Census. Six of these were U. S. Weather Bureau personnel; the rest were natives. Three gave their birthplace as Honduras, the country which disputes U. S. possession of these two islands so near the Honduran coast.

Islands Looked Fuzzy

One thing the U. S. Coast and Geodetic Survey wanted to know was why its aerial photos of one of the two Swan Islands always seemed to show a "fuzzy" surface. Pictures taken at ground level on this trip showed a stubby undergrowth so dense as to be virtually impenetrable. From the air, this would look like a fuzzy mat.

The routine abroad the Explorer went on night and day from Feb. 2 to April 21. A net was dragged behind the ship all the way from San Diego to Panama to amass a continuous sampling record of surface plankton and small swimming fish along the way. Towed at 12 knots, it also caught the so-called "high speed" fish that can swim out of the way of slower nets, Dr. Stewart said.

This net had to be changed every three hours. Every hour a bathythermograph was lowered to get a temperature-versus-depth picture of the ocean down to 450 feet beneath the ship. Every two hours, ten drift bottles were heaved overboard. Every six hours, weather observations were reported to the U. S. Weather Bureau. Every 12 hours, a weather balloon was inflated with helium in the special "outhouse" built near the stern of the ship to protect the balloons from gusty winds. Except when within 100 miles of a land station, these balloons were launched to gather and radio back temperature, humidity, and pressure information to heights of 130,080 feet.

In addition, the magnetometer charted a continuous picture of the earth's magnetism along the ship's path from San Diego to Norfolk, and the profile of the ocean bottom was constantly monitored by echo sounding equipment.

In the Pacific Ocean, the ship stopped at 300-mile intervals to gather bottom sediment cores and water samples and temperatures at various depths ranging all the way down to the bottom. In the Caribbean and Atlantic the interval was stepped up to 100 miles.

All told, this one single oceanographic expedition served the U. S. Bureau of Commercial Fisheries, U. S. Weather Bureau, National Museum of the Smithsonian Institution, National Zoological Park, Bureau of the Census, Department of State, the U. S. Air Force, the U. S. Navy, U. S. Geological Survey, Post Office Department (which authorized cancellation of over 5,000 stamped envelopes at the Swan Islands for collectors), the U. S. Public Health Service (interested in sediment samples from the Panama Canal), the University of Miami's Marine Laboratory, the Scripps Institution of Oceanography, Oregon State College and the U. S. Coast and Geodetic Survey.

"This," said Dr. Stewart, referring to the number of cooperating groups, "represents a milestone in oceanographic research."

A final tally showed that among the accomplishments of this trip were: 684 bathythermograph observations; 750 oxygen analyses; 198 phosphate analyses; 54 nitrite analyses; 754 samples of ocean water taken for salinity analysis; 53 bottom sediment cores; eight cores for Public Health Service radioactivity studies; nine lowerings of the deep-sea camera to photograph the manganese field; 58 biological net tows; 15 biological dredge hauls; seven geological dredge hauls for rocks—in which what first appeared to be chunks of volcanic lava later turned out to be clinkers dumped overboard from old steam ships; 59 weather balloons released; 162 weather reports made; 10 skin-dives made; 89 rock samples collected; 18 live iguanas collected, and 12 small lizards collected—some without legs, possibly representing new species.

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Questions

ENTOMOLOGY—How many pounds of peanut butter and kepone are needed per acre to rid an area of fire ants? p. 377.

MEDICINE—Which ethnic group in Hawaii has more cases of skin cancer than any other? p. 371.

OCEANOGRAPHY—How big was the underwater mountain found in the Caribbean by a recent U. S. Coast and Geodetic Survey expedition? p. 379.

PHYSICS—What is the new material, found by three Los Alamos scientists, that appears to show the "Mossbauer effect"? p. 373.

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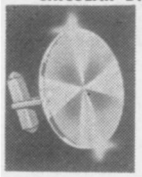

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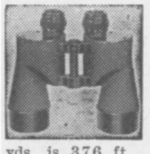

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