EXPLORATION OF THE "VEMA" SEAMOUNT

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The Vema Seamount was discovered by the Oceanographic Research Vessel *Vema*, owned by the Lamont Geological Observatory of the Columbia University of New York, whilst she was on a cruise in the South Atlantic in 1957. Its position was reported to be Latitude 31°31′8 S, Longitude 8°16′ E.

As far as our knowledge of the bed in that area of the South East Atlantic goes this is an isolated table-topped mountain, rising up from the abyssal plain from a depth of 2 700 fathoms to within a few fathoms of the surface. From traverses so far made over the seamount, the base appears to be circular and approximately 35 miles in diameter.

Ever since the discovery of this unique underwater feature South African oceanographers have been endeavouring to obtain a suitable ship to take them the 500 miles from Cape Town to explore its summit. It is unique because it is probably the only seamount known which rises from the deep ocean basin to a level sufficiently near the surface of the sea to allow effective sunlight penetration, and for direct study by scuba divers using normal equipment.

Being in the vicinity of the fabulously rich diamondiferous area of the South West African Coast marine diamond miners dreamt of rich pipes from which diamonds could be scooped out by the bucketful. Many were the theories as to the nature of the top of this seamountain.

Then came the great day when the Director of the Marine Diamond Corporation in South Africa, Mr. Sam COLLINS, proposed to send one of the company's prospecting vessels to spend four or five days over the seamount, and he invited interested oceanographers to accompany the vessel as his guests. The cruise was to be one where the prospecting equipment known as the air-lift dredge would be used to obtain samples of anything loose on the top of the peak, and this operation could be combined with the work carried out by the oceanographers using various methods in order to obtain data concerning the geological structure of the feature and to gather samples of fauna and flora in the area. One of the main tasks, and certainly the first, was to carry out a survey of the top of the peak so that the exploration could be systematically planned.

Unfortunately the vessel was inadequately equipped to carry out an altogether comprehensive study of the seamount, because in the first place

the echo-sounder could record to the maximum of only 280 fathoms (i.e. 1/10th of the height of the mountain) and secondly no suitable winch and associated derrick were available for hydrological observations.

Planning conferences were held to draw up a detailed programme in order to ensure that as much oceanographic study as possible would be carried out during the vessel's limited stay in the area. The least depth had been reported to be 19 fathoms, thus provision was made for a strong team of skin divers to carry out a visual survey of the bottom in depths where such operations could be safely carried out. So that there would be medical assistance readily available in the event of a mishap during diving operations, a South African Medical Officer trained in the field of free diving accompanied the team, having a portable decompression chamber as part of his equipment.

On 9th November, 1964, the expedition sailed from Cape Town in the marine diamond prospecting vessel *Emerson K,* a converted Admiralty salvage tug.

FIG. 1. — The *Emerson K.*

As project leader of " Operation Vema ", Professor E. S. W. SIMPSON, Professor of Geology, and Director of the Oceanographic Institute at the University of Cape Town, headed a team of scientists and technicians which included a marine biologist and a technician from the Division of Sea Fisheries, an assistant hydrographic surveyor from the Naval Hydrographic Surveying Ship *Natal,* two geologists, a geophysicist and a specialist in geomagnetism.

Arriving in the reported position of the seamount at dawn on 12th November, 1964, the summit was soon located and a floating survey beacon was moored in 20 fathoms. By starring out from this beacon and fixing the vessel's position by radar ranges and bearings a hydrographic survey of the peak on a scale of 1/25 000 was carried out to the limit of the echo-sounder recorder, i.e. 280 fathoms. From these soundings a contoured map of the summit, with isobaths at 10-fathom intervals, was drawn to enable the scientists to plan their programme of observations, and so that the prospecting team could position the vessel at various sites in order to obtain adequate coverage of the whole area which could be reached by the air-lift dredge which had an operational depth of approximately 35 fathoms.

The survey revealed that the summit is a relatively flat plateau, at a depth of between 30 and 40 fathoms, extending four miles in both an East/West and a North/South direction but more in the form of a T than circular. This plateau was given the name of Emerson K plateau. At its western end, in Latitude 31°37′8 S, Longitude 8°07′ E, a small peak rises to within 14 fathoms of the surface. This feature was given the name of Collins Peak in recognition of the generous contribution made by Mr. Sam COLLINS towards the exploration of this seamount. Collins Peak is extremely rugged, and it is therefore possible that there may be less water than 14 fathoms. The divers did not have time to locate the highest part of this pinnacle, which being well covered with kelp could not be easily explored.

A photographic reduction of the hydrographic survey chart and of the topographical map of the summit which was drawn on the spot are given in Figures 2 and 3.

The consistent depth of the Emerson K plateau, together with the discovery on it of rounded boulders and pebbles, suggests strongly that it is a wave-cut plateau which probably corresponds to an eustatically lowered sea level during the Pleistocene.

The air-lift dredge brought up about a ton of bottom samples. Further specimens of bedrock *in situ* were collected by the scuba divers who reached a depth of over 200 feet. Much of the rock is dark brown tuffaceous agglomerate of volcanic ash, many samples being rounded, and all probably of basaltic composition. A few fragments of rounded boulders of black amygdaloidal basalt were dredged south of Collins Peak.

Other than these rock samples, great quantities of rounded calcareous accretions up to 3″ in diameter were recovered. Many of the calcareous nodules surround a small rounded pebble of decomposed or unaltered tuffaceous agglomerate.

It is evident that the Vema Seamount structure is entirely volcanic, composed mainly of volcanic ash, produced possibly by explosive disintegration of congealing basaltic lava on contact with seawater. (SIMPSON).

It must be remembered that this isolated peak rises directly from the abyssal plain yet reaches the zone of light penetration. There is no direct connection with the mainland of Africa 500 miles to the east, nor with the nearest island group of Tristan da Cunha to the south-west, and St. Helena Bay to the north-west, both a thousand-odd miles away. Therefore, the biological exploration of this small area was bound to prove most interesting, fascinating and rewarding.

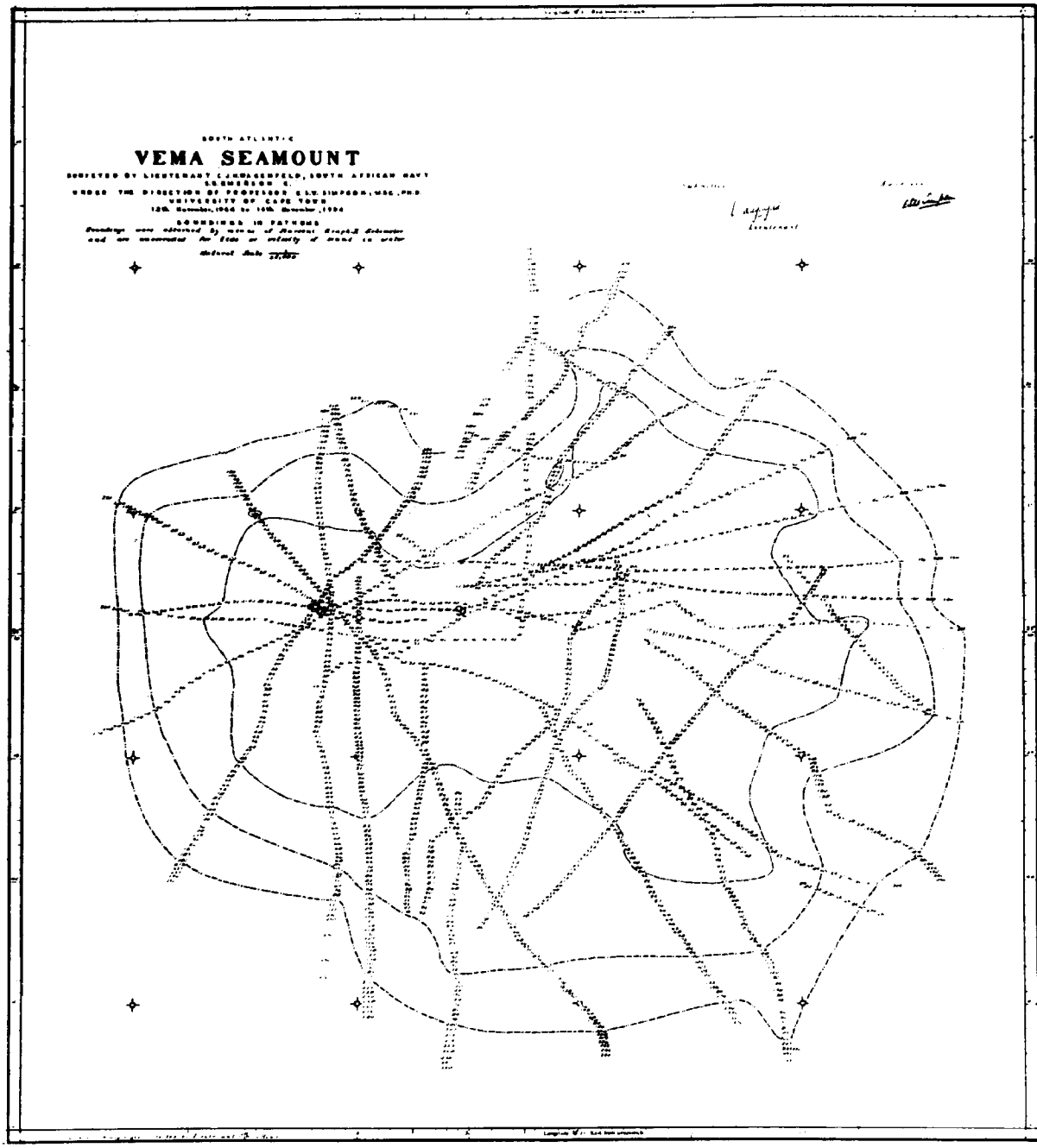

FIG. 2. — Hydrographic survey chart.

The skin divers found large quantities of rocklobster amongst the prolific and varied growth of seaweed and kelp. There was an abundance of fish having a high commercial value. Most prolific were the Yellowtail (*Seriola Lalandii*), ranging in size from 27 - 48 inches in length. Here again the similarity to the fish found around Tristan da Cunha is striking.

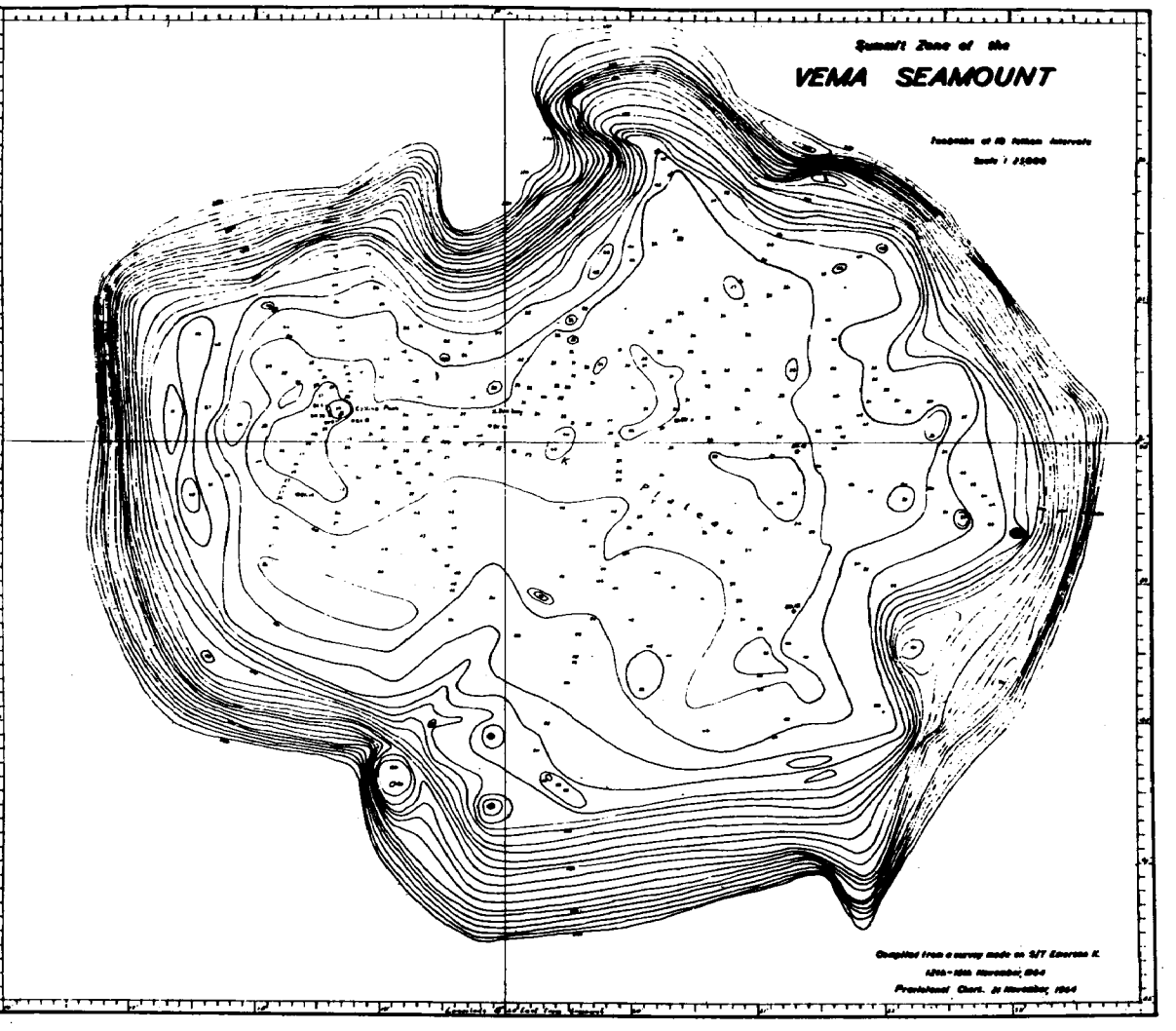

FIG. 3. — Topographical map of the summit.

Because of the limiting factor of the echo-sounder recorder, the exploration of the Vema Seamount was severely handicapped, especially the bathymetric survey of the mountain as a whole. Fortunately the wealth of data that was obtained during such a short stay in the area has persuaded responsible authorities to investigate ways and means of preparing a further operation, using a vessel fully equipped to carry out hydrological work as well as deep-sea echo-sounding. It is accordingly expected that a worthwhile expedition will be organized early in 1965 (*) to obtain more detailed particulars of the quantitative value of the fishing potential and, whilst doing so, to carry out a full bathymetric survey in order to obtain more precise knowledge of the geomorphology of the seamount.

(*) This manuscript was received in March 1965.

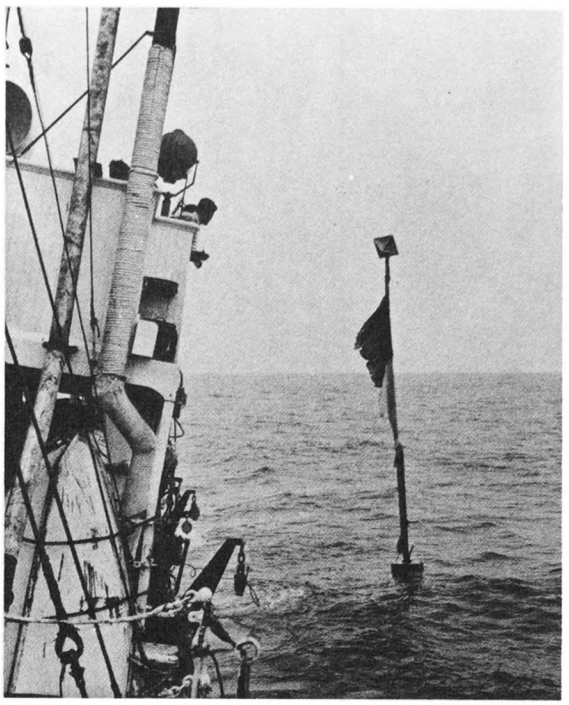

FIG. 4. — A survey beacon moored in 20 fathoms on Collins Peak.

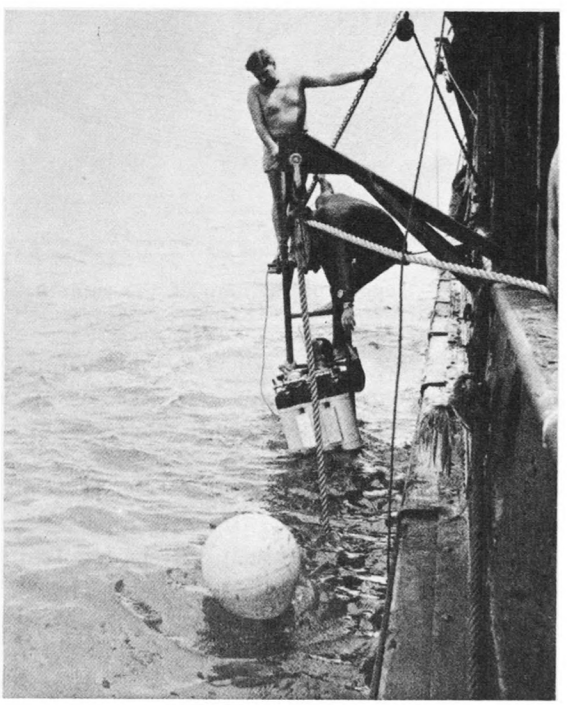

FIG. 5. — A scuba diver preparing to dive to explore the top of the mountain.

However, despite its limitations, " Operation Vema " proved to be a most interesting and rewarding cruise which has stimulated interest in oceanography and supplied valuable data which may be used, not only by commercial fishing concerns, but also by the Weather Bureau and the South African Navy.