

FEATURES

Journey into the deep

Part II

DR DIVA AMON

IN 1934, Dr William Beebe made a series of historical dives, the deepest to 923 metres, off the coast of Bermuda. Beebe along with Otis Barton, are famously known for being the first people to enter the deep sea.

Their vessel was the bathysphere, a primitive spherical tethered submersible. Here, Trinidadian biologist Dr Diva Amon recounts her experience of heading even deeper than Beebe, journeying to 2,382 metres below the ocean surface in the Cayman Trench. The first part was carried on June 15.

13.34: 2,343 metres – We have retrieved several experiments on the periphery of the vent field using the dexterous mechanical arms of the Shinkai6500. These experiments were left in March 2013 during a previous research expedition that I was fortunate to participate in with colleagues



TRINIDAD AND TOBAGO
FIELD NATURALISTS' CLUB

from the University of Southampton on board the RRS James Cook.

On to the Von Damm vents! We move off the sedimented sea floor to begin to climb the rocky mound up to the vents. During the discovery expedition in 2010 on the RRS James Cook, the Von Damm vent field was not the only one found. In fact, the deepest-known vent field in the world was found approximately 20 kilometres to the north at a depth of 4,967 metres. This site was named the Beebe vent field after William Beebe, the famous naturalist and explorer. Beebe spent a great deal of his life in Caribbean



Dense endemic shrimp, *Rimicaris hybisae*, with eelpout fish scattered between *Pachycara caribbaeum*.

PHOTO BY COURTESY NOAA OFFICE FOR OCEAN EXPLORATION AND RESEARCH

including undertaking his deep dives and spending his final years at the research station, Simla, that he founded in Trinidad. This research station is still in operation as part of the Asa Wright Nature Centre.

14.51: 2,299 metres – The main spire of the Von Damm vent field is in sight. Hot, mineral-rich water emanates from several small orifices around the 30-metre tall conical mound; some of these have had fluids as hot as 140°C recorded. At the top

of this mound is a spire that shelters a nearly two-metre-wide hole with gushing hot, clear fluid.

The numbers of animals have increased dramatically. There are white squat lobsters, red shrimp with bright green eggs located in their heads, metre-long tubeworms, white eel-like fish, and snails dotted on the rocks. The main spire comes into view further up the mound; it appears that the whole spire is moving. Upon closer inspection, I can see that there are millions of white shrimp covering every inch of the

main spire, constantly jostling to get close to the hot fluids. These shrimp have no eyes; instead they have evolved a dorsal eyespot on its carapace, which can see the thermal radiation given off by the vents. They are also successful farmers – their bacterial food source grows in their gill chambers using the chemical-rich hydrothermal-vent fluid as fuel.

Every species of animal observed inhabiting the Von Damm vent field is new to science and without a name. Many of these animals are endemic to this site, meaning that they have not been found anywhere else on the planet thus far. Since the discovery of hydrothermal vents more than three decades ago, more than 500 new faunal species have been found in association with these habitats, many of which are exquisitely adapted to their environment. Our knowledge of species dispersal, biogeography and evolution in the deep ocean has also been advanced greatly, however, there is still much to discover and learn.

DEEP continues on Page 7B

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A special species of shrimp found only at the hydrothermal vents in the Cayman Trench, Lebeus, virentova. PHOTO BY NOAA OFFICE FOR OCEAN EXPLORATION AND RESEARCH



The endemic deep-sea shrimp, Rimicaris hybisae, swarming the Von Damm vents in their thousands, trying to get close to the source of the hydrothermal fluid.

Deep-sea mining looms but at what price?

DEEP from Page 7B

16.02: 2,290 metres

- We attempt to get one last temperature measurement of the fluids gushing from within the sea floor. The list of tasks has not been completed but the pilots have given the signal that we need to ascend. We should be on the surface in just over an hour and then scientists will have a sleepless night processing the samples collected. My time in the Shinkai6500 is drawing to a close. As we back away from the main spire, I watch it fade into the darkness. I am so grateful to have been given the opportunity to see these remarkable ecosystems with my own eyes.

As the human population grows and technology increases, we find ourselves pushing deeper into the world's oceans for resources. There are deep-sea fisheries, deepwater cables for communication, deepwater oil and natural gas exploitation and now the possibility of deep-sea mining looms in the near future. The hydrothermal vent structures themselves are made of ores of copper, zinc, silver and gold. With commodity prices and demand on the rise, the mining of deep-sea vents looks set to begin as early as next year.

Some vent fields are located within the Exclusive Economic Zones of countries; this may be a blessing for some where governments have introduced marine parks to protect vents of particular scientific interest. For other vents and the accompanying animals, such as Solwara I off Papua New Guinea, this may signal disaster, as mining has been given the go-ahead by the government of this island nation. The Beebe and Von Damm vent fields lie within the territorial waters of the Cayman Islands and thus we can only hope for a favourable future for these vents and their special inhabitants.

Most vents, however, are found in international waters, where the International Seabed Authority, an organisation established under the United Nations Convention of the Law of the Sea and operating out of Jamaica, has jurisdiction. Several exploratory leases for mineral exploration have already been granted, including one for exploration at vents in the Indian Ocean by China and another for exploration in the Atlantic Ocean by Russia.

As I gaze out the journey on the way back to the surface, I contemplate that until 2010, we didn't know

this incredible place or many of these species existed. Without a full understanding of deep-sea hydrothermal-vent habitats, we cannot predict the consequences of our decisions and actions for our planet's largest realm. For now, we can only speculate as to what will happen if mining were to begin. Would the habitat ever recover and return to its original state? If so, how long would that take: a decade? A century? Millennia? If an ecosystem inhabited by rare animals thousands of metres below the ocean, closed off to the human eye, were to be lost, would it matter?

Looking at examples from elsewhere on the planet, it is clear that national and international policies for conservation have not kept up with mineral exploration but maybe this is a chance for the outcome to be different. By taking part in research expeditions such as this one, it is hoped that we can gain insights that will be invaluable when it comes to answering these questions and making these decisions in the future.

For more info on our natural environment contact the TTFNC at admin@tfnf.org or visit website at www.tfnf.org, Facebook or YouTube pages.

NOTICE



The Water and Sewerage Authority (WASA) invites proposals from eligible respondents for the following:

• Ref. No. W.T.C. - 95/2016

TENDER FOR THE RENTAL OF TWO HUNDRED & TWENTY-SEVEN (227) NEW CNG OEM BI FUEL OR GASOLINE/DIESEL FUEL VEHICLES FOR A THREE (3) YEAR PERIOD.

ELIGIBILITY

Invitation to Tender is open to firms that can demonstrate their ability to carry out the works according to the required specifications.

TENDER DOCUMENTS

Interested respondents will have the opportunity to view the tender documents at Purchasing Department, Head Office. Documents would be issued via WASA Oracle ERP upon presentation of a receipt showing a non-refundable fee of **Three Thousand Dollars (\$3,000.00 TT) or United States Dollar equivalent for W.T.C. 95/2016**, has been paid to the Authority's Cashier, Farm Road, St. Joseph. Alternatively, the fee may be deposited or wire transferred to WASA's Account at RBC Royal Bank (Trinidad and Tobago) Limited 4th Floor, St. Clair Place 7-9 St. Clair Avenue, RBC Operating Account Number - 1100 0000 2053 239

Further, interested respondents are required to provide a valid e-mail when registering for the tender.

Late submissions will not be accepted.

WASA will not defray any cost incurred by bidders.

SCHEDULED DATES

Item	Date
ITT Publication	June 13, 2017
Pre-Submission Meeting	June 16, 2017 @ 10:00 a.m.
Submissions Due/Tender Opening	July 07, 2017 @ 2:00 p.m.

INFORMATION

Further information may be obtained from the Purchasing Department, Head Office, St. Joseph. (Telephone No. 662-2302-07 Ext. 2870-71; Fax No. 645-5247/645-1306).