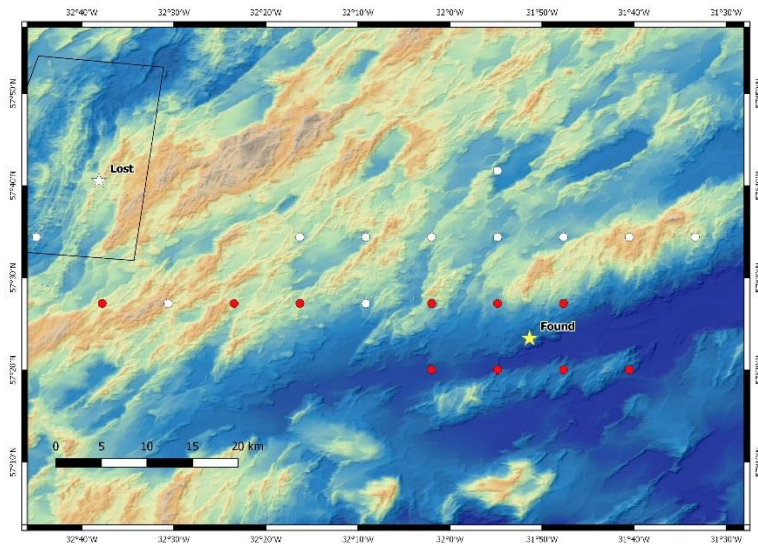


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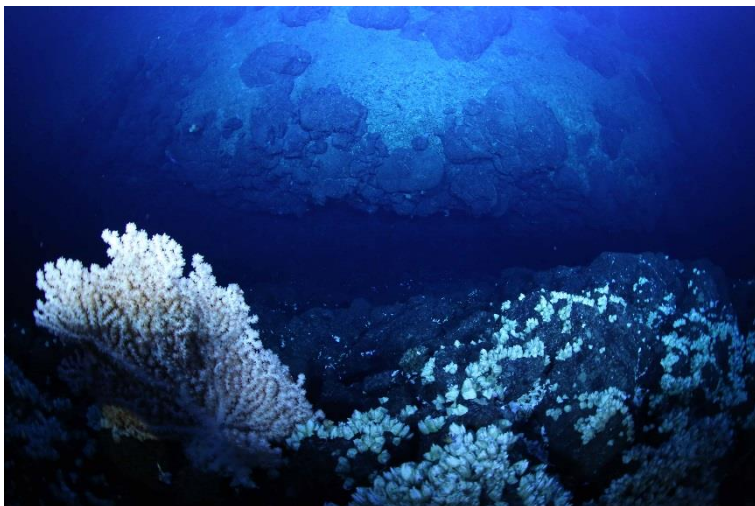
Weekly Report #6

30.07.2018 – 05.08.2018

The sixth week of the cruise began, of course, with the continued search for the autonomous underwater vehicle (AUV) officially called ABYSS but known to all on board affectionately as Tiffy. Late on the evening of Sunday 29th July we got a signal from the vehicle, indicating that she was at the surface with some battery power left but without any GPS location. In such a situation the vehicle can be roughly positioned by the satellite phone company based on which satellites are receiving messages from her, but those fixes have errors of many kilometers, actually finding her needs to be done “by hand”. On Monday morning we arrived in the area suggested by the phone company and began listening for acoustic signals from the vehicle, following a rough north-south search pattern in quite stormy seas. This continued until the afternoon when we got all the fixes that the phone company had received in the previous 24 hours. Plotting these on a map (shown adjacent, the black box marks our working area 4) we were able to see



both where the fixes were clustering (the red and white points on the map are 8km apart, so they were spread around) and also how they were changing with time (white points are from 29th July, red points from 30th), giving us a drift direction. We moved our search area somewhat to the north and started searching, waiting for the wind to subside as forecast and above all for night to fall ... on a dark and starless night, the flashing LED on top of Tiffy's antenna can be seen literally for miles. The scientists organized themselves into 4-person look-out shifts on the bridge and, as night fell, the tension rose. We were on the second line of our 17km-long, 3 km line spacing search grid when the shout “I see her” went up from Daniel Thorhallsson, our Icelandic student scientist on board. Within the next 5 minutes all on the bridge had seen the flash between the wave crests and the ship was on course for a pick-up. Shortly before midnight the crew and AUV-Team made a perfect recovery in still



quite stormy seas and Tiffy was back with us! In her 6-day odyssey she had drifted over 50km from her initial position, having apparently suffered a complete system reset shortly after launching.

Following the rescue we set sail for our final working targets in Areas 1&2. As the AUV needed repairing before we were willing to deploy her again, these targets consisted of sampling stations and ROV dives. During the ROV dives we also had

the opportunity to use the photogrammetry system, consisting of a high-resolution camera and strong LED flash lights designed and built at GEOMAR, to take closely-spaced photographs of the seafloor. Using object recognition software to match objects seen from different perspectives in several photos, this dense mass of images allows stereoscopic reconstruction of the seafloor at cm-resolution. Due to the limited number of berths aboard, our photogrammetry expert could not join the cruise so we used the bandwidth which during the day allows live-streaming to send the data back to Kiel for checking and initial processing. This use of the internet to involve colleagues from around the world in what is happening at sea is rapidly changing how we perform cruises, vastly increasing our productivity and the richness of information each cruise produces. The final example of this came on Friday when we arrived in Area 1. Up until then we had seen no direct evidence of high-temperature venting on the ridge, even though traces of such venting in the overlying water column had been reported in the 90s. We set out to do a final, detailed search, using the ship's echosounder to look for trails of bubbles rising from the vents. This sort of search only works in shallow water, but with Area 1 having water depths of only ca. 300m, we were hopeful. We spent many hours staring at the water column data coming in on the echosounder screen looking for the tell-tale vertical line marking the bubbles (and in the process seeing lots of fish schools and krill swarms in the rich Icelandic waters) but to no avail. The search had been called off and the ship was starting to turn to head for the next planned ROV dive position when, at the edge of the screen, a suspicious vertical line appeared! There followed a hectic hour of ship and dive replanning and at around 11:00 we arrived on the seafloor at the bubble site, directly in front of a 250°C hydrothermal vent with chimney!

As our colleague from America who originally detected the water column signals here in 1993 and was watching the dive online wrote to us, "That is awesome! Taking 25 years from detection to imaging just shows that ocean exploration doesn't happen immediately".



At the time of writing we have just recovered Tiffy from her second successful dive following the repairs, the ROV is also safely aboard after imaging further chimneys in the Steinaholl area. With just two more working days left before we need to head back to Reykjavik and with that transit only scheduled to take 8 hours, it is time for many aboard to begin packing, finishing contributions to the cruise report etc.. Only the mapping and rock-sampling crews will be collecting data right up to departure on Tuesday evening.

On behalf of the scientific team of MSM75

Colin Devey

Illustrations: Details of the search for Tiffy on 30.07.18 (map - Devey); One of the thousands of pictures taken for photogrammetry and sent to Kiel for analysis (© Tom Kwasnitschka); Our first view of the Steinaholl vent field and one of its chimneys (© GEOMAR ROV-Team).