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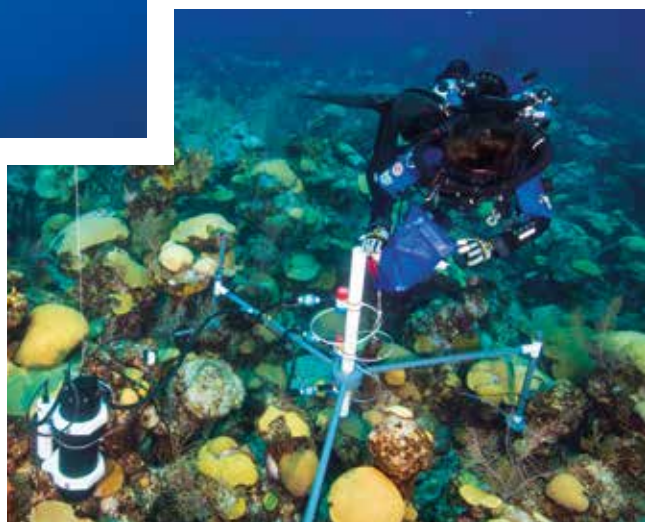
DEEP SCIENCE IN BERMUDA

The deep oceans play a critical part in sustaining life on this planet, but we know precious little about them. **JASON BROWN** talks to a member of a cutting-edge dive team that set out to reveal some of its secrets

Photographs by **GRAHAM BLACKMORE, JP BRESSER, SU EUN KIM – PROJECT BASELINE**



What did you do on your last dive? Did you swim around admiring the marine flora and fauna, or maybe you're a wreck diver who enjoys nothing more than visiting your favourite shipwreck. For divers involved in the recent Nekton Mission to explore the deep ecosystems around the remote volcanic islands of Bermuda, there was little time to take in the sights – for them, every dive was about achieving an objective to further our understanding of the health of the world's oceans.

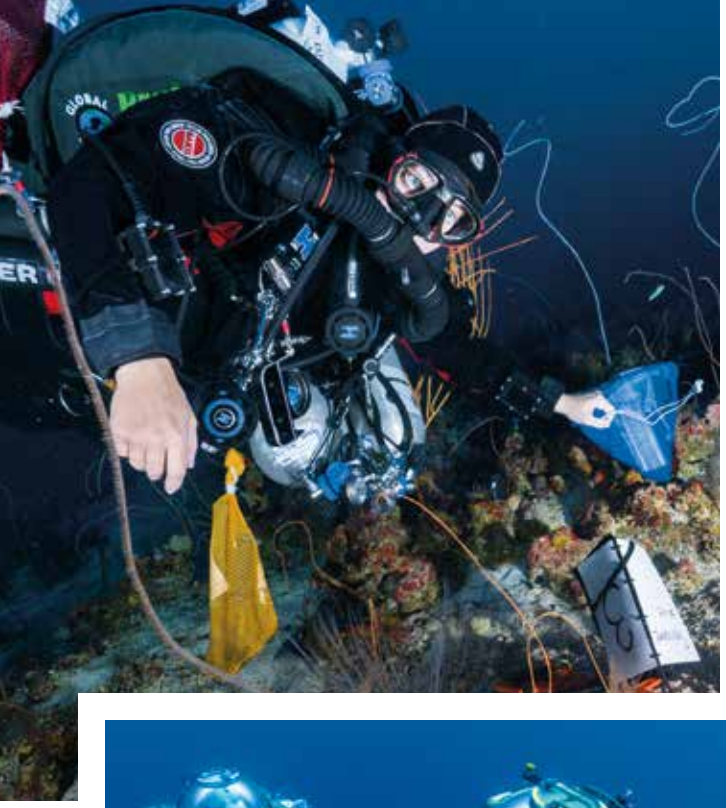
We know that the oceans cover seven tenths of the Earth's surface and that they contain 97 percent of all our water, yet we take them so much for granted. Much of what we know is restricted to the shallower depths – the deep ocean is the most-critical part, yet it's the region we know the least about. The so-called 'Bathyal zone' is located between 200 and 2,000m below the surface and is home to the greatest diversity of marine life anywhere on the planet. This all-important deep zone contains all the critical indicators of ocean health and its effect on the planet is far reaching – it performs the essential task of absorbing CO2 and regulating the world's climate. But, like so many delicate eco systems, the Bathyal zone is under constant threat from human exploitation due to the wealth of oil, gas and fish stocks that lay within it.

It's only in recent years that we've really begun to fully appreciate the importance that the deep ocean plays in regulating the 'life support systems' that sustains life on planet Earth. Realising that greater insight was clearly needed, Nekton – a charitable foundation whose mission is to explore and research the deep ocean – teamed up with key players, including Unesco, Oxford University and Global Underwater Explorers, to deliver the XL Catlin Deep Ocean Survey. Nekton's mission brief is ambitious – to create a baseline to measure change in the function, health and resilience of the deep ocean that scientists and key decision makers can use to influence future policy and our own attitudes towards the ocean.

Nekton chose Bermuda for this initial phase as it was historically the location for some of the very first submersibles dives into the deep ocean. Its location played a prominent role in its selection too - nestled at the very western edge of the Sargasso Sea near the transition into the Gulf Stream, Bermuda is a collection of 130 coral islands capping an ancient volcano that rises from the depths of the Atlantic Ocean. Rising up from 3,000m right to the surface, its sits atop the transition zone between the shallow and deep ocean.

To aid the project's ambitious goals, Nekton partnered with Project Baseline – an environmental monitoring initiative established by diver training agency Global Underwater Explorers. Set up in 1999, Project Baseline empowers divers through 'citizen science' to observe and record changes within the world's underwater environments. Groups of like-minded divers are actively encouraged to set up their own projects with data collected and recorded into a vast online database. In the UK alone, there are three Project Baseline sites. Baseline projects don't need to be deep or technical – the Portland Harbour wrecks project in Dorset monitors sites in less than 15m of water, making it perfect for divers of any level.

While Nekton's own science team included divers with experience in conducting science projects underwater, they lacked the equipment, procedures and training to carry out complex dive operations beyond recreational dive limits. GUE sent a team of nine volunteer technical divers to work alongside the scientists at Nekton aboard Project Baseline's own research vessel, Baseline Explorer. Over the



course of 27 days, the dive team from Project Baseline, lead by Science and Conservation Director Todd Kincaid, documented 13 miles of reef at depths ranging from 15m down to 90m. For deeper dives, the team employed Baseline Explorer's own submersibles to take the researchers down to depths of up to 250m.

The UK was proudly represented on the dive team by Dorset-based Graham Blackmore, a GUE technical and rebreather instructor who has been actively involved in a variety of exploration and science projects over the years. For Graham, the Nekton mission was a perfect fit for his own academic background and echoes what first got him interested in diving.

"I'm somewhat unique in that I have a PhD in Marine Biology and that's really what inspired me to learn to dive. I felt that I was missing out on a huge amount of what was happening with marine biology by only being able to see what was going on above the waterline. So when I was studying for my PhD, I learned to dive. That's really when I found GUE - they took my diving to a new level and enabled me to travel the world and dive with like-minded divers and conduct some relatively aggressive diving down to 120m plus," he said.

"I've done a lot of research work on corals in shallow water so I was very comfortable conducting video transects, sampling corals underwater, collecting water samples and so it worked out quite well. On this project, we worked as three-person teams - we had a guy laying out the transects, somebody else to video the transects and then the third person to manage the marker that we needed to resurface."

Conducting all this science takes time and the teams endured some pretty aggressive diving to achieve their objectives. "We were doing six to seven hour run times with something like 40 to 60 minutes at 90m-100m. We would then move up to 60m and do a further 20 to 60 minutes before moving up to 30m to do another hour. When we started the project, the plan was really to achieve one level on one dive but when you run the profiles, you find out that if you do an hour at 30m after an hour at 90m, it doesn't change the decompression a great deal so you almost get that 30m dive for free. Running the profiles, it was quite interesting to see the run time increase by an hour, but the total time to surface remained very, very similar."

Not surprisingly, traditional open circuit equipment wasn't really an option as the sheer volume of gas required to complete the profiles the dive team were conducting would simply have been unmanageable above and below water. To make life easier, the dive team used JJ-CCR rebreathers configured in a GUE configuration. This unique set-up gave the team access to a large amount of accessible bail-out back-mounted on the rebreathers via a pair of seven-litre diluent tanks. The flexibility that the rebreathers delivered allowed the divers to conduct fairly aggressive multi-level dives without having to carry specific mixes for those depths. The rebreathers made life a lot easier for the team members pumping gas too – with little more than 50 bar of diluent and approximately 150 bar of oxygen being used on a seven-hour dive, the gas blenders didn't need to chalk up any overtime refilling cylinders.

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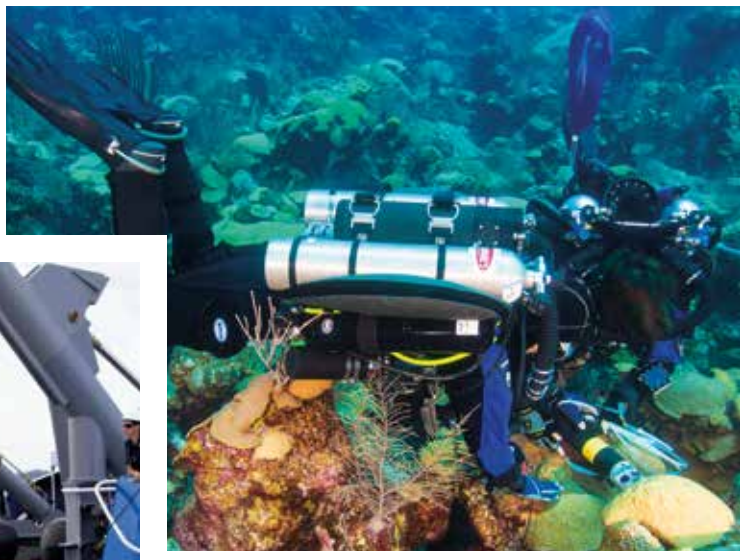

"There was a nice friendly rivalry between the subs and the divers. The subs are multi-million pound pieces of equipment and quite complicated with long check lists and huge amounts of fettling in order to get them ready to go diving. We often had to stand on the back deck and sweat in our drysuits while we waited for the subs to be ready.

"Of course, the real benefit of the subs is that they can take someone who can't dive to an environment they wouldn't otherwise be able to experience. Being able to take a scientist underwater so they can actually see what's going on at the bottom and how the divers collect the data, and to be able to communicate with the dive team through the 90mm thick pressurised acrylic dome which surrounds them."

As the project progressed, the co-ordination between the divers and the submersibles began to pay real dividends for the science team. While the submersibles are sophisticated, their interaction with the environment is limited by the quite primitive and clunky manipulator arm that the sub team are forced to use to pick up samples – they can literally spend an entire dive fumbling to pick up a rock and place it into the sub's collector basket. As Graham explains, the inclusion of the divers into the equation made life a lot easier for the scientists.

"A diver has two functional hands and can swim up to something, pick it up, show it to the scientist in the sub, twist it around, turn it over and so on. There was real delight on the scientist's faces when they were able to interact with somebody who could act as their hands actually in the environment."

The dive and submersible teams collected a mountain of data which is now being evaluated by Nekton's scientists at their base in Oxford right here in the UK. Already the scientists believe they have identified a number of new species and have made discoveries that are changing the way we look at the health of the world's oceans. With legal protection of the oceans still so sadly lacking despite calls from the UN to establish more protected zones, the work that Nekton and the divers from Project Baseline are doing will prove invaluable in winning over the hearts and minds of the world. If the rainforests are the lungs of the planet, it's clear that the oceans are its heart... ■