

OCEAN SCIENCE IN ACTION

10.2 A DAY IN THE LIFE OF THE MARINE ROBOTICS TEAM VIDEO DURATION– 05:08

In this lecture you will join an international glider team working in the Pemba Channel, off the coast of Tanzania. You will learn about their objectives and share their challenges and successes.

The glider team is operating out of Mkoani, a busy harbour town in the southwest of Pemba island. Here, they are setting up their base, preparing their instruments and embarking on daily expeditions into the Pemba Channel.

Despite the majority of the preparation for the underwater gliders having already been done in the laboratories of the National Oceanography Centre in the UK, the team still had lots to do before the expeditions could properly start.

Thankfully, the gliders did not sustain any damage during their long transport to Tanzania, and the gliders' communication between the team on the ground in Mkoani and at the NOC was working fine. This wasn't always easy, as power and internet access was sometimes intermittent, but the team worked hard to resolve all issues alongside local partners.

An important component of the glider work was measuring nutrients, using a nutrient sensor developed at the NOC. The microfluidic sensor was integrated into the Seaglider by Dr Alex Beaton, and measures the nitrate concentration of the ocean as the glider dives between the sea surface and up to 1000m depth.

In addition to the gliders, the team also set up the other instruments that were needed for the daily expeditions in the Pemba Channel, to measure temperature, ocean currents, weather and mixing.

At first light each morning, the daily mission started with a glider deployment. This meant that the engineers made all the necessary checks during the transit to the designated waypoint of the day. Once the boat was on station, the engines were turned off to avoid any accidental damage to the equipment, and the glider was deployed by hand.

Before the glider is allowed to leave the surface, additional tests are run to make sure that the glider is communicating with the pilots back in the UK, and that system checks indicate that the glider is ready to dive. The most important tests are checks on the gliders' communication via satellite, so the team can track the gliders location, check its status and retrieve data. Once all tests come back positive, the glider dives to its designated depth of hundreds of metres beneath the surface and works alone until it next surfaces and communicates home.

The successful deployment of the gliders only gives the team a short break, as the more hands-on aspects of the data collection work can now begin.

First to be deployed is the acoustic ocean current profiler, which measures the speed and direction of currents flowing through the Pemba channel up to 500m depth, using the Doppler shift in the returning acoustic signal of free-flowing particles in the ocean. The team can use these data later to understand how the currents in the Pemba Channel change with depth and time, and how they

transport nutrients from the deep ocean up to phytoplankton at the surface where photosynthesis can occur.

Another important instrument used on the mission is a Rockland Scientific VMP, which stands for Vertical Microstructure Profiler. This profiler measures tiny fluctuations in the ocean at over 500 times per second, which provides data that the team will use to estimate mixing in the ocean interior. This will provide valuable insight into how the structure of the ocean is transformed by fast-moving currents and how nutrients are distributed in the Pemba channel.

Combining these measurements with those provided by the glider and meteorological sensors will help the international team to better understand how the ecosystem of the Pemba Channel functions during the South East Monsoon season.

All good things come to an end and so does a day at sea. As the sun approaches the horizon, the team perform the last dip of the day and it's time to go and find the glider. Despite having a GPS fix on the glider's last known position, the fast-moving currents of the Pemba Channel still provide a final challenge of the day to the team. Using years of experience, educated guesses and the sharp eyes of the MV Huntress crew, the team were able to eventually recover the glider each night, and the long steam home begins for a well-deserved rest and a cold drink. After a long day at sea it's now a great opportunity to go over the activity of the day and sift through the day's newly collected data and enjoy the sunset.

While working at sea always brings a variety of challenges, fieldwork is one of the most rewarding aspects of being an oceanographer.

Having the opportunity to meet with partners from across the globe, who each bring their own unique experience and expertise, makes these missions incredibly rewarding; providing opportunities to build new collaborations but also friendships.

Having the chance to work in the ocean rather than just working on data from afar also provides oceanographers with improved intuition for the complex processes that contribute to ocean circulation and the marine life it sustains.