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Top > Nature & Earth > NTU Partners International Universities to... >



NTU Partners International Universities to Build a Network of Citizen Oceanographers

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Nanyang Technological University (NTU) is working with other international universities to build a global network of 'citizen scientists' on a free-to-access database for oceanographic data.

While much attention is placed on mammals and fish in the sea, it is the tiny, marine microbes that supports the nutrient cycle and forms the foundation of the food web. Known as the marine microbiome, they are the most abundant organisms in the ocean but also the least understood.

To gain a better understanding of such marine life and its environment, NTU scientists at the Singapore Centre on Environmental Life Sciences Engineering (SCElse) has embarked on a pilot project to crowd-source the collection of oceanographic data globally.

The pilot project hopes to inspire other scientists to take advantage of the thousands of private yachts that sail around the world each year to become its floating microbial observatories. This is done by using simple scientific equipment attached to yachts to collect water samples and monitor the health of the world's oceans.

This large amount of data collected will be hosted and analysed at the University of Technology Sydney and made accessible to researchers worldwide and also the public.

To prove that crowdsourcing from citizen scientists can work, NTU Associate Professor Federico Lauro and his wife Ms Rachelle Jensen led a team of scientists from twelve international universities on a four-month-long expedition across the Indian Ocean to collect oceanographic data and biological samples.

Housing their scientific equipment and acting as both their transport and accommodation is the privately owned 18.5 metre-long Nautor Swan yacht, S/Y Indigo V.

Captained by Prof Lauro, who was a national sailing champion in Italy and Australia, S/Y Indigo V started her 6500 nautical mile (12,000 km) journey in Cape Town, South Africa, sailing up to Sri Lanka before coming down the Straits of Malacca to Singapore.

Prof Lauro's team collected hundreds of samples containing invaluable data on bacteria, plankton and the marine eco-systems. These samples provided a more complete picture of the health of the Indian Ocean and its environmental conditions.

The team's scientific findings and details of the expedition were published yesterday in the international scientific journal, *PLOS Biology*.

"The ocean samples we collected will allow us to sequence the genes and genomes of the microbial population in the ocean, some of which were previously unknown to us," said Prof Lauro, an Italian-born oceanographer, who is teaching environmental sciences in NTU and also holds a concurrent appointment at the University of New South Wales.

By having a common database of such new information, scientists will be able to analyse the role the microbial population plays in ocean geochemistry. It will help develop advanced ocean health models, which will lead to scientifically-based preservation of this valuable resource. For example, such models



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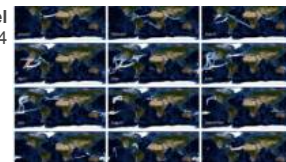
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could also be used to predict the spread of toxins or pathogens and even the spread of antibiotic resistance in bacteria.

"With our successful voyage, we have also proven that it is indeed possible for recreational sailors who are not scientifically trained to help collect data about our oceans," said Prof Lauro.

How the oceanographic data is collected

To help volunteer sailors with their data collection, there will be a rugged box containing all the instrumentation needed to collect biological samples and to measure physical parameters like temperature, conductivity and depth, as well as weather conditions.

This automated prototype device, now being developed by Indigo V Expeditions, is slated to be ready by early 2015. The device will make it easy for volunteers to participate in citizen oceanography. After the yacht reaches his or her next port, a volunteer will collect the device for use by another participant.

The device will also come with a small solar panel for energy collection to recharge its batteries, and a satellite connection to transmit data or an emergency distress signal.

Low cost, high yield

The main driving factor to get the oceans mapped and analysed through crowd sourcing is the high cost of operating a scientific oceanographic vessel.

The average daily cost of operating a scientific vessel can cost up to USD \$30,000, and such an expedition usually lasts for months. Mapping all the oceans on Earth would require about 20 such ships over two and a half years at an estimated costs of USD \$300 million. This would still not yield any data from higher and lower latitudes or remote areas such as the Indian Ocean.

In comparison, the Indigo V Expedition Indian Ocean pilot project cost the team only USD \$75,000 over four months. The global network envisaged by the scientists has the potential to tap on more than 5,000 yachts sailing on the oceans annually on popular routes.

Prof Lauro, who is also the Director of Indigo V Expeditions, believes that with the help of these recreational sailors, consistent data points with multiple samples can be established, leading to more reliable scientific data at only a fraction of the cost.

"Moving forward, some of the things we can do include assessing the environmental impact of ships in the shipping lanes, how climate change affects the ocean and how bacteria and viruses get transported from one part of the world to another," said the experienced microbiologist.

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