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MARINE RESEARCH

Scientists tackle coastal food security

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The western Indian Ocean region has the most serious food security problem on the planet. It extends up the eastern coast of Africa, including Somalia, Kenya, Tanzania, Mozambique, SA and the island states of Comoros, Madagascar, Seychelles, Mauritius and Réunion.

In these countries, 60-million people depend on the ocean for their food and livelihood. Climate change measurements show that the western Indian Ocean is warming faster than any other part of the world's oceans.

The region is experiencing the rapid deterioration of the marine environment caused by overfishing and destructive forms of fishing.

Prof Mike Roberts

Marine specialist scientist Prof Mike Roberts presented his inaugural lecture at Nelson Mandela University in October titled Big Thinking. Big science. Can Africa grow intellectual and research capacity to fix its development challenges?

He is leading a new research chair, the UK-SA Bilateral Chair in Ocean Science and Marine Food Security, at the new Ocean Sciences campus at Nelson Mandela University in Port Elizabeth.

The chair is jointly funded by the Department of Science and Technology's National Research Foundation, which is providing R1.5m a year over five years; and the UK's Newton Fund, administered by the British Council, which is providing £100,000 a year over five years. The joint hosts of the chair are Nelson Mandela University and the UK's University of Southampton and the National Oceanography Centre, which are also loaning technology for data collection.

Roberts's research programme is called the Western Indian Ocean Upwelling Research Initiative.

Upwelling, he explains, is the upward movement of deep, cold, nutrient-rich water to the ocean surface, encouraging the growth of phytoplankton. Together with ocean physics, upwelling directly underpins marine food security. As the planet's climate is changing, so is the ocean's upwelling system, affecting all levels of the food chain in the western Indian Ocean.

"To find solutions to address the region's problems requires an intensive transdisciplinary research approach. This encompasses research in physical oceanography, biogeochemistry, plankton, trophic ecology, fisheries and food resources, quantified by end-to-end ecosystem and socioeconomic modelling," Roberts says.

The number of PhDs in ocean sciences has to be increased throughout Africa. Big thinking and big science are required, too. This includes the development and use of advanced ocean-atmospheric computer models that are "forced" with historical satellite data to simulate accurately.

The models and satellite data need to run on computers costing about R500m to build and R120m to operate annually. The Nasa Centre for Climate Simulation in the US and the Australian National University have these computers.

"Such big science and the advanced skill sets required to process and interpret the output data, are fabrications of rich nations, which, with the exception of Australia, are all found in the northern hemisphere," says Roberts.

"This implies South America and, in particular, Africa have little means to understand their oceans and ecosystems, and how these will change in the future. In other words, big science is beyond our reach."

The new Indian Ocean Marine Research Institute in Perth, Australia, has 132 staff members, 82 with PhDs, and a brand-new research ship. By comparison, one of Africa's chief research institutes, the Institute for Marine Science in Zanzibar, uses a ski boat as a research vessel and has 20 staff members and 15 PhDs.

"The lack of good research infrastructure hugely impacts our capabilities to do good research that matters."

Roberts believes there might be a way around this predicament, through formalised partnerships between institutions in the southern hemisphere and several top-end, well-resourced research institutions in the northern hemisphere.

The Ocean Science Campus at Nelson Mandela University, which will specialise in ocean physics and productivity (ecosystem functioning), forms the principal southern footprint of the innovation hub in partnership with Rhodes University, which will provide expertise in fisheries science and ocean governance.

"By offering master's and PhD students from our university and our partner universities and institutes in Kenya, Tanzania and Uganda, the additional exposure to researchers and facilities at the University of Southampton and National Oceanography Centre, we are creating a Western Indian Ocean Upwelling Research Initiative Centre of Excellence in Ocean Sciences and a PhD production pipeline," says Roberts.

One of the technologies already being used by the chair is a form of satellite measurement, "coastal altimetry". Satellite data become corrupted close to land especially in the zone less than 50km from the coast. The National Oceanography Centre, the world expert in reprocessing the data to derive accurate data 2km-3km from the coastline, is helping Nelson Mandela University to do this.

He has secured R160m from the UK, which will be used for two case studies in SA and East Africa. The studies officially started on October 1.

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