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## **Protecting the ocean genome to ensure greater equity**

### **Human activity is the greatest threat to the biodiversity of our oceans**

The vast array of species that inhabit the oceans has already proven to be an important source of innovative resources, including enzymes for COVID-19 testing and a protein valuable in the fight against the Middle East Respiratory Syndrome.

Today on World Oceans Day, Professor Rachel Wynberg from the University of Cape Town's Department of Environmental and Geographical Science and a member of the High Level Panel for a Sustainable Ocean Economy, says human activity is the greatest threat to the biodiversity of our oceans. "There is now widespread recognition that overexploitation, habitat destruction, pollution, invasive species, and increasingly, the degradation of marine ecosystems are the central threats eroding the ocean genome."

To safeguard ocean biodiversity, world leaders must unite in conserving the oceans in protected areas and beyond. Large areas that are fully or highly protected as well as networks of marine protected areas can encompass multiple sites of importance for the lifecycles of marine species, says Wynberg. "When well managed and with adequate protection levels, they can act as storehouses of genetic diversity that also serve as important reference points for understanding changes to the ocean."

Wynberg says such measures need to respect the rights of local fishing communities and place emphasis on avoiding the damaging impacts of activities such as mining, which is increasingly prevalent along the South African coastline and elsewhere.

"In fact, much of the deep ocean and ocean bed remain unexplored, which is also why researchers frequently find new species on ocean expeditions," adds Wynberg. According to two recently published papers Wynberg co-authored as part of the High Level Panel for a Sustainable Ocean Economy – a global group of experts and leaders working to protect the ocean – there are thought to be 2.2 million marine species. Only 230 000 of these have so far been confirmed – and that's not counting single-cell organisms, such as viruses and bacteria.

## **From evolutionary resilience to COVID-19 testing**

This genetic variety is important for a number of reasons. "Firstly, genetic diversity allows for species to evolve faster and to adapt better to disease or changing conditions," says Wynberg. "It is not an understatement to say that the genetic biodiversity we see on land is just a tiny fraction of the biodiversity that is in our oceans."

Wynberg says: "When it comes to the ways us humans rely on the oceans, however, genetic biodiversity – what we call the marine genome – provides a treasure trove of helpful products. They are used as food, medicine and much more, and we're only just beginning to understand the extent of these possibilities."

For example, in the case of testing for the novel coronavirus, SARS-CoV-2, an enzyme found in bacteria that live near deep-ocean hydrothermal vents is crucial to the polymerase chain reaction that amplifies DNA signals of the virus. And a protein derived from a coral reef red alga has been valuable in the fight against the Middle East Respiratory Syndrome, an illness caused by a coronavirus closely related to SARS-CoV-2.

These kinds of scientific breakthroughs rely on technologies that allow for the rapid genetic sequencing of marine organisms. "In the past decades, it's become possible to store the genetic information of a species' DNA digitally. This information, which for the most part is stored in enormous databases, can then be used to make proteins, recreate molecular processes and even modify organisms," says Wynberg.

While this can lead to many novel discoveries and useful innovations, Wynberg explains that at present, there is a big discrepancy between research capacity in high-income countries – with the resources to conduct marine genetic research and mine such data – and low- and middle-income countries – where many biodiversity hotspots are located, but which frequently lack the resources to undertake the research themselves or to use the genetic sequence data.

Wynberg comments: "Governments must also work hard to create benefit-sharing mechanisms and agreements for research taking place both within and beyond their national boundaries, and to ensure that such benefits support conservation and equity outcomes. In the bigger picture, we need to encourage greater support from governments, research institutions and philanthropic organisations towards joint, collaborative ventures that better our understanding of the ocean genome."

***ENDS***

*Original story by Ambre Nicolson*

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