

Genome mapping of Indian Ocean by NIO

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In news : National Institute of Oceanography (NIO) first-of-its-kind research project in the country to map genomes in Indian Ocean

Key updates

- A team of of scientists and researchers from the National Institute of Oceanography (NIO) in Panaji and another 30 crew members including six women are taking part in it
- They will spend three months on the research vessel Sindhu Sadhana traversing the course of over 10,000 nautical miles in the Indian Ocean on a research project to reveal the internal working of the body of the ocean at a cellular level.
- Aim of the project: Understanding the biochemistry and the response of the ocean to climate change, nutrient stress and increasing pollution
- **Project cost & Duration:** Rs 25 crore and will take three years to complete

A brief note on CSIR-NIO project

- The project aims to gather samples for genome mapping of microorganisms in the Indian Ocean.
- The researchers will collect samples from various stretches of the ocean at an average depth of about 5 km.
- Just like gene mapping is carried out on blood samples collected from humans, the scientists will map these in the bacteria, microbes found in the ocean.
- The mapping of the DNA and RNA will show the nutrients present in them, and also those lacking in different

parts of the ocean.

- Coverage: Course the Indian Ocean from India's east coast, Australia, Port Louis in Mauritius and up to the border of Pakistan, off India's west coast

NIO project: Objective of studying the interactions of trace metals and marine plant and animal life

Scientists say that it is important to understand the interactions of trace metals with marine biota "for having a holistic understanding about nutrient cycling and productivity of the oceans".

Apart from their reactions on marine life, isotopic forms of trace metals can be utilised to track the movement of water masses responsible for ocean circulation and as tools to study the biological, geochemical and ecosystem processes and food web analyse

Route map of the project

- The 30 member team will stay aboard their research vessel for about 90 days with refueling scheduled at Mauritius.
- The route is from Visakhapatnam to the mouth of the Ganga then down the ocean to Australia, then westward to Mauritius and up to the Pakistan border

Collection of samples

- At various stages and stretches, samples will be collected by lowering a Kevlar cable of up to 8 km with a set of 24 teflon coated bottles to collect samples.
- They have a capacity of 12 litres. The Kevlar cable and the Teflon coating are to ensure that metals are not inadvertently introduced into the water by the vessel itself.
- The samples will be collected and the bacteria will be stored at -60 degrees Celsius with the help of liquid

nitrogen.

- While some samples will be tested at six laboratories on board the vessel, several samples will be brought back to NIO for study and analysis

Benefits of the project

- It will help scientists understand the internal working of the ecosystem of the Indian Ocean.
- The research will enable scientists to identify the factors controlling the changes in RNA, DNA in the oceans, and various stressors impacting them.
- The ocean has several micronutrients like nitrates, sulphates and silicates, minerals like iron ore and zinc, and trace metals like cadmium or copper.
- The genome mapping will show the presence of which these microbes have adapted to, in addition to their reaction to atmospheric carbon dioxide.
- This will help in identifying which part of the ocean has a greater concentration of which mineral or element.
- Scientists will then use these as tracers to tackle the causative factors for excess or lack of a certain mineral or element and suggest possible solutions for their mitigation.
- The large pool of RNA, DNA library of the oceans will be utilised for using the Indian Ocean to human benefit in the future.
- Genome mapping will enable an increase in the growing number of commercial biotechnology applications, extending from multiple anticancer treatments to cosmetics and industrial enzymes, to antiviral molecules
- Exploration of the ocean at a genetic level will result in new insights into taxonomy and adaptive capacity that can help optimize conservation efforts

What is Genome Mapping?

It describes the methods used to identify the locus of a gene

and the distances between genes. Gene mapping can also describe the distances between different sites within a gene.

About CSIR-the National Institute of Oceanography (NIO)

- CSIR-NIO was established on 1 January 1966 following the International Indian Ocean Expedition (IIOE) in the 1960s. The institute has since grown into a multi-disciplinary oceanographic research institute of international repute. The principal focus of research has been on observing and understanding special oceanographic characteristics of the Indian Ocean.
- NIO, with its headquarters at Dona Paula, Goa, and regional centres at Kochi, Mumbai and Visakhapatnam, is one of the 37 constituent laboratories of the Council of Scientific & Industrial Research (CSIR), New Delhi.