



## Coral Restoration Through Biorock

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### Why in News

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The **Zoological Survey of India (ZSI)**, with help from Gujarat's forest department, is attempting for the first time a process to **restore coral reefs using biorock or mineral accretion technology**.

### Mineral Accretion Technology

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- Also called '**Biorock Technology**', it is a method that applies safe, **low voltage electrical currents** through seawater, causing **dissolved minerals to crystallize** on structures, growing into a white limestone ( $\text{CaCO}_3$ ) similar to that which naturally makes up coral reefs and tropical white sand beaches.
  - **Biorock**, also known as Seacrete or Seament, refers to the substance formed by electro-accumulation of minerals dissolved in seawater.
- The formed material has a strength similar to concrete. It can be used to make robust **artificial reefs** on which corals grow at very rapid rates.
  - Fragments of broken corals are tied to the biorock structure, where they are able to grow at least four to six times faster than their actual growth as they **need not spend their energy in building their own calcium carbonate skeletons**.
  - The technology also helps corals, including the highly sensitive branching corals, to counter the **threats posed by global warming**.
- **Working**
  - The technology works by passing a small amount of electrical current through electrodes in the water.
  - When a positively charged anode and negatively charged cathode are placed on the seafloor, with an electric current flowing between them, calcium ions combine with carbonate ions and adhere to the structure (cathode). This results in calcium carbonate formation ( $\text{CaCO}_3$ ).
  - Coral larvae adhere to the  $\text{CaCO}_3$  and grow quickly.

- Biorock projects **can be powered by a wide range of electrical sources** including renewable energy like windmills, photovoltaic solar panels and tidal current generators. This enables their construction in areas where conventional electric power is unavailable.
- The mineral accretion process **was first developed by architect Wolf Hilbertz in 1976** in order to provide alternative construction materials. He and Tom Goreau of the Global Coral Reef Alliance later developed its use for reef restoration and shore protection.

## Use of Technology in India

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- A biorock structure was **installed one nautical mile off the Mithapur coast in the Gulf of Kachchh** on 19<sup>th</sup> January, 2020. The scientists have **used solar panels** for power in this case.
- The calcification (conversion into calcium carbonate) has started but real success will come when attached and new organisms (corals) start grow faster.

### Coral Reefs

- Corals are made up of genetically identical organisms called **polyps**. These polyps have microscopic **algae called zooxanthellae** living within their tissues.
- The **corals and algae have a mutualistic relationship**.
  - The coral provides the zooxanthellae with the compounds necessary for photosynthesis.
  - In return, the zooxanthellae supply the coral with organic products of photosynthesis, like carbohydrates, which are utilized by the coral polyps for the synthesis of their **calcium carbonate skeletons**.
  - Zooxanthellae are also responsible for the **unique and beautiful colors of corals**.
- It is the above **relationship** that allows shallow water corals to grow fast enough to build the enormous structures called **reefs**.  
Often called the **"rainforests of the sea,"** coral reefs are home to a spectacular variety of organisms.
- **India has four major coral reefs areas:** Andaman and Nicobar Islands, Lakshadweep, Gulf of Mannar and the Gulf of Kachchh.
- The coral reefs are **threatened by** climate change induced acidification as well as by anthropogenic factors such as overfishing, pollution.

### Zoological Survey of India

- The Zoological Survey of India (ZSI) is a **subordinate organization of the Ministry of Environment and Forests** which was established in **1916**.

- It is a national centre for faunistic survey and exploration of the resources leading to the advancement of knowledge on the exceptionally rich faunal diversity of the country.
- It has its **headquarters at Kolkata** and 16 regional stations located in different geographic locations of the country.

**Source: TH**