Tough Corals

Why in News

A recent study has suggested that **coral structures may withstand climate change** owing to their impressive process of **forming rock-hard skeletons.**

Key Points

- **The Study:**
    - It studied ***Stylophora pistillata,*** a common stony coral in the Indo-Pacific revealing that **coral structures consist of a biomineral** containing a highly organized organic mix of proteins that resembles human bones.
    - It highlighted that **several proteins are organized spatially –** a process that's critical to forming a rock-hard coral skeleton.
    - The study highlighted that corals have survived global climate change over millions of years by the process called **Biomineralization.**
        - **Biomineralization** is the study of processes that lead to the formation of hierarchically structured organic–inorganic materials generated by living organisms, such as shells, bone and teeth.
- **Coral:**
    - 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.
        - In addition to providing corals with essential nutrients, zooxanthellae are responsible for the **unique and beautiful colors of corals.**
    - They are also called the **"rainforests of the seas".**
    - There are **two types of corals:**
        - Hard, shallow-water corals—the kind that builds reefs.
        - Soft corals and deepwater corals that live in dark cold waters.
- **Benefits of Coral:**
    - **Habitat:** Corals are home to over 1 million diverse aquatic species, including thousands of fish species.
    - **Income:** Coral reefs and related ecosystems have a global estimated value of '$2.7 trillion per year, or 2.2% of all global ecosystem service values', this includes tourism and food.
    - **Coastal Protection:** Coral reefs reduce shoreline erosion by absorbing energy from the waves. They can protect coastal housing, agricultural land, and beaches.
    - **Medicine:** Reefs are home to species that have the potential for treatments for some of

the world's most prevalent and dangerous illnesses and diseases.

- **Threat to Corals:**
    - **Overfishing:**
        - Overfishing of certain species on or adjacent to coral reefs can affect the reef's ecological balance and biodiversity. For example, overfishing of herbivorous fish can lead to high levels of algal growth.
    - **Destructive Fishing Methods:**
        - Fishing with dynamite, cyanide, bottom trawling and Muro Ami (banging on the reef with sticks) can damage entire reefs and is unsustainable.
    - **Recreational Activities:**
        - Unregulated recreational activities and tourism cause damage to the very environment upon which the industries depend. Physical damage to the coral reefs can occur through contact from careless swimmers, divers, and poorly placed boat anchors.
    - **Coastal Development:**
        - Coastal areas have some of the fastest rates of growth in tropical countries. Airports and buildings are often built on land reclaimed from the sea. Sensitive habitats are destroyed or disturbed by the dredging of deep-water channels or marinas, and through the dumping of waste materials.
    - **Pollution:**
        - Urban and industrial waste, sewage, agrochemicals, and oil pollution are poisoning reefs. These toxins are dumped directly into the ocean or carried by river systems from sources upstream. Some pollutants, such as sewage and runoff from farming, increase the level of nitrogen in seawater, causing an overgrowth of algae, which 'smothers' reefs by cutting off their sunlight.
    - **Climate Change:**
        - **Coral Bleaching:**
            - **Coral bleaching** is the loss of the algae and a rapid whitening of the coral. This is a stress response by the coral host that can be caused by various factors such as the rise in sea surface temperature. If the temperature decreases, the stressed coral can recover; if it persists, the affected colony can die.
        - **Ocean Acidification:**
            - The decrease in the pH of the Earth's oceans, caused by their uptake of anthropogenic CO_2 from the atmosphere is known as Ocean Acidification. The decrease in pH has negative consequences for oceanic calcifying organisms such as coral reefs.
- **Initiatives to Protect Corals:**
    - A number of global initiatives are being taken to address the issues, like:
        - **International Coral Reef Initiative**
        - Global Coral Reef Monitoring Network (GCRMN)
        - Global Coral Reef Alliance (GCRA)
        - The Global Coral Reef R&D Accelerator Platform
    - Similarly, the Ministry of Environment and Forests and Climate Change(MoEF&CC), India has included the studies on coral reefs under the **Coastal Zone Studies (CZS).**
        - In india, the **Zoological Survey of India** (ZSI), with help from Gujarat's forest department, is attempting a process to restore coral reefs using **"biorock" or**

mineral accretion technology.

- **National Coastal Mission Programme** to protect and sustain coral reefs in the country.