**CORAL BLEACHING – ENVIRONMENT**

NEWS: A study revealed that corals in the **Lakshadweep archipelago have declined to half of what they were in 1998.**

- Over 24 years, coral cover declined from **37.24% to 19.6%**, reflecting a roughly 50% reduction from the 1998 baseline.

WHAT'S IN THE NEWS?
What are Corals?

- Coral 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 **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 2 types of corals:**
    - **Stony/Hard,** shallow-water corals—the kind that build reefs.
        - Hard corals, also called **hermatypic or 'reef building'** corals extract calcium carbonate (also found in limestone) from the seawater to build hard, white coral exoskeletons.
    - **Soft corals** and deep-water corals live in dark cold waters.
        - Soft coral polyps, however, **borrow their appearance from plants** and attach themselves to such skeletons and older skeletons built by their ancestors. Soft corals also add their own skeletons to the hard structure over the years and these growing multiplying structures gradually form coral reefs.
        - They are the **largest living structures on the planet.**

What is the Great Barrier Reef?

- Australia's Great Barrier Reef is the **world's largest reef system** stretching across 2,300 km and having nearly 3,000 individual reefs.
    - It hosts 400 different types of coral, gives shelter to 1,500 species of fish and 4,000 types of mollusc.
    - Coral reefs support over 25% of **marine biodiversity** even as they take up only 1% of the seafloor.

- The marine life supported by reefs further fuels **global fishing industries.** Besides, coral reef systems generate **$2.7 trillion in annual economic value** through goods and service trade and tourism.
- The reef is **located in the Coral Sea** (North-East Coast), off the coast of **Queensland, Australia.**
- This reef structure is composed of and built by billions of tiny organisms, known as **coral polyps.**
- It was selected as a **World Heritage Site** in 1981.

What is Coral Bleaching?

- When corals **face stress by changes in conditions** such as temperature, light, or nutrients, they expel the symbiotic algae zooxanthellae living in their tissues, causing them to turn completely white. This **phenomenon is called coral bleaching.**
- The pale white colour is of the translucent tissues of calcium carbonate which are visible due to the loss of pigment producing zooxanthellae.
- Bleached corals **can survive depending on the levels of bleaching and the recovery of sea temperatures** to normal levels.
    - If heat-pollutions subside in time, over a few weeks, the zooxanthellae can come back to the corals and restart the partnership but severe bleaching and prolonged stress in the external environment can **lead to coral death.**
- Over the last couple of decades, climate change and increased global warming owing to rising carbon emissions and other **greenhouse gases** have made seas warmer than usual.
- Coral bleaching has **occurred in the Caribbean, Indian, and Pacific oceans on a regular basis.**

- **Mass Coral Bleaching:**
    - **First Mass Bleaching:** It occurred in 1998 when the El Niño weather pattern caused sea surfaces in the Pacific Ocean to heat up; this event caused 8% of the world's coral to die.
    - **Second Mass Bleaching:** This event took place in 2002. In the past decade, however, mass bleaching occurrences have become more closely spaced in time, with the longest and most damaging bleaching event taking place from 2014 to 2017.
    - **Third Mass Bleaching:** The event that took place between 2014-17 affected reefs in Guam in the Western Pacific region, the North, South-Pacific, and the Indian Ocean. It is also to be noted that **Global temperature in 2017, was the third highest to ever be recorded.**
        - In the 2014-17 event, more than three times as many reefs were exposed to bleaching-level heat stress as compared to 1998.
- A 2021 study by the **Global Coral Reef Monitoring Network (GCRMN)**, which is supported by the United Nations, showed that 14% of the world's coral on reefs had been lost between 2009 and 2018, with most of the loss attributed to coral bleaching.

What are the Causes Responsible for Coral Bleaching?

- **Rise in Sea Temperature:** Most coral species live in waters close to the warmest temperature they can tolerate i.e., a slight increase in ocean temperature can harm corals. **El Nino** elevates the sea temperature and destroys coral reefs.
- **Ocean Acidification:** Due to rise in carbon dioxide levels, oceans absorb more carbon dioxide. This increases the acidity of ocean water and inhibits the coral's ability to create calcareous skeletons, which is essential for their survival.
- **Solar radiation and ultraviolet radiation:** Changes in tropical weather patterns result in less cloud cover and more radiations which induce coral bleaching.
- **Infectious Diseases:** Penetration of bacterium like vibrio shiloi inhibits photosynthesis of zooxanthellae. These bacteria become more potent with elevated sea temperatures.
- **Chemical Pollution:** Increased nutrient concentrations affect corals by promoting **phytoplankton** growth, which in turn supports increased numbers of organisms that compete with coral for space.
- **Increased Sedimentation:** Land clearing and coastal construction result in high rates of erosion and a higher density of suspended silt particles which can
    - smother corals when particles settle out (sedimentation),
    - reducing light availability (turbidity) and
    - potentially reducing coral photosynthesis and growth.
- **Human Induced Threats:** Over-fishing, pollution from agricultural and industrial runoff, coral mining, development of industrial areas near coral ecosystems also adversely impact corals.

What will be the Consequences?

- **Affect the Food Chain:** Changes in coral communities can affect the species that depend on them, such as the fish and invertebrates that rely on live coral for food, shelter. Loss of such marine animals can disturb the entire food chain.
- **Loss of Biodiversity:** Declines in genetic and species diversity may occur when corals die as a result of bleaching.
- **A decline in Economy:** Healthy coral reefs attract divers and other tourists. Bleached and degraded reefs can discourage tourism, which can affect the local economy.
- **Affects Food Availability:** Coral bleaching can cause large shifts in fish communities. This can translate into reduced catches for fishers, which in turn impacts food supply and associated economic activities.
- **Impact on Coastal Protection:** Coral reefs protect coastlines by absorbing constant wave energy from the ocean, thereby protecting people living near the coast from increased storm damage, erosion and flooding.

What are the 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.

What Steps should be Taken?

- Solutions for **protecting the future of coral** must transcend social, economic and cultural boundaries.
- Halting **unplanned coastal development** would play a significant role in reversing the decline of reefs in some locations.
- Promoting **sustainable fishing and providing opportunities for ecotourism** can help conserve corals.
- There is a **need to minimise the use of chemically enhanced fertilizers**, insecticides, pesticides, and herbicides which are non degradable and harm corals.
- **Harmful industrial waste must be treated** before being disposed of in bodies of water.

- Water pollution should be avoided wherever possible by **not dumping chemicals or oils in water bodies.**
- Taking all possible **measures to prevent actions that worsen global warming** since Climate change is the greatest global threat to coral reef ecosystems.

Source: https://www.thehindu.com/news/national/karnataka/24-year-study-reveals-that-coral-cover-in-lakshadweep-saw-50-reduction/article69849787.ece