Coral Bleaching in the Lakshadweep

Why in news?

The ICAR-Central Marine Fisheries Research Institute (CMFRI) has found that coral reefs in the Lakshadweep Sea have undergone severe bleaching due to prolonged marine heatwaves since October 2023.

Lakshadweep Islands

• Lakshadweep means *'a hundred thousand islands'* in Sanskrit and Malayalam.
• **Capital**- Kavaratti
• **Geography-**Lakshadweep consists of 36 islands, which are scattered across approximately 32 square kilometers of the Arabian Sea.
• **Subgroups-** These islands are grouped into three geographical subgroups.
  - Amindivi Islands,
  - Laccadive Islands, and the
  - Uninhabited Minicoy Island.
• **Minicoy** - It is the southernmost atoll of the Lakshadweep archipelago.

What is coral reefs?

- **Nature-** They are *largest living structures* on Earth crucial for underwater ecosystems formed by skeletons of colonial marine invertebrates known as coral polyps.

Types of coral reefs	
Types	**About**
Hard coral	They are reef building corals, they extract calcium carbonate from seawater to build their hard exoskeleton.
Soft coral	They lack rigid structures and have a more plant-like appearance which attach themselves to existing structures.

- **Formation of coral reefs-** Over thousands and millions of years, the stony skeletons of hard corals accumulate and form the complex structures known as coral reefs.
- These reefs are among the most diverse ecosystems on the planet, hosting thousands of marine species and supporting vibrant marine life.
- **Sessile Nature of Corals**- Corals are *stationary marine animals* that permanently attach themselves to the ocean floor. This sessile lifestyle allows them to form colonies and build intricate structures over time.
- **Symbiotic relationship-** Corals have a symbiotic relationship with single-celled algae called *zooxanthellae* which provide corals with food and nutrients through photosynthesis, while corals offer shelter and nutrients to the algae. This symbiotic relationship offers vibrant colour to corals.
- **Rainforests of sea**- Coral reeds are often referred to as the "rainforests of the sea" due to their high biodiversity and ecological significance.
- They provide habitat and shelter for a vast array of marine organisms, including fish, invertebrates, and algae.
- **Ecosystem services**- They provide services such as coastal protection, shoreline stabilization, and support for fisheries and tourism.
- **Lakshadweep's coral atolls**- The majority of the islands in the Lakshadweep archipelago are coral atolls, characterized by low-lying islands surrounded by coral reefs.
- The soil composition of these islands is largely derived from the accumulation of coral skeletons over time, highlighting the close relationship between the islands and the surrounding coral reef ecosystems.
- **Coral bleaching-** It occurs when corals experience stress due to factors such as changes in temperature, pollution or high levels of ocean acidity.
- **Warm temperature-** Coral bleaching occurs when water temperatures become too warm, leading corals to expel the microscopic algae, known as zooxanthellae, which live within their tissues.

  Zooxanthellae algae are essential for the corals' survival as they provide them with nutrients through photosynthesis.

- **Consequences-** Without their algae, corals' tissues become transparent, revealing their white calcium carbonate skeleton. While bleached corals are not immediately dead, they are at risk of starvation and disease. Without intervention, bleached corals can ultimately die.

Why there is coral bleaching in Lakshadweep?

- **Thermal stress**- Corals experience thermal stress when sea surface temperatures exceed the maximum mean temperature by 1°Celsius, prolonged high temperature exacerbates this stress.
- **Degree Heating Week (DHW)-** It is used to measure accumulated heat stress over 12 weeks which sums temperatures exceeding the bleaching threshold calculated in Celsius-weeks.

DHW values above 4°C-weeks cause significant coral bleaching.

- **Lakshadweep sea**- It has been experiencing temperatures 1°C above the norm since October, 2023 which has led to significant coral bleaching surpassing events in 1998, 2010 and 2015.
- **Marine heatwaves**- They are driven by various factors, including excessive atmospheric heat due to global warming and shifts in ocean currents.
- These heatwaves are becoming more frequent and severe in the Indian Ocean region, with significant implications for coral reef ecosystems.
- **Study by IITM (Pune)-** A study by the Indian Institute of Tropical Meteorology (IITM), Pune, reported an increase in marine heatwaves in the Indian Ocean.
- The western Indian Ocean region, including areas near the Lakshadweep islands, has experienced a significant rise in marine heatwaves, leading to widespread coral bleaching events
- **Impact beyond Lakshadweep**- Coral bleaching events are not limited to Lakshadweep alone but affect coral reef ecosystems throughout the Indian Ocean region.
    - For example, the *Gulf of Mannar* near the *Tamil Nadu* coast experienced extensive coral bleaching after a marine heatwave in 2020, underscoring the widespread nature of the problem.
- **Consequences-** The heat waves threaten livelihoods of coastal communities, tourism and fisheries sectors, and critical marine habitats, including seagrass meadows.
- **Ecological impact**- The degradation of seagrass meadows and kelp forests can have cascading effects on marine ecosystems, affecting species interactions, food webs, and overall ecosystem resilience.

What lies ahead?

- Lakshadweep is formed by coral reefs and hence the health of reefs are important for the very structure of the islands.
- Coral reef health is intertwined with the health of the entire marine ecosystem hence the coral reef must be protected for ecosystem resilience and biodiversity conservation.

References

1. Indian Express- Lakshadweep coral reef severe bleaching
2. PIB- Marine heat waves in Lakshadweep