

UPSC Civil Services Examination

UPSC Notes GS-I [Geography]

Topic: Coral Reefs – Types of Coral Reefs, Coral Bleaching

What are Coral Reefs?

Coral reefs are the colonies of tiny living creatures that are found in oceans. They are the underwater structures that are formed of coral polyps that are held together by calcium carbonate. Coral reefs are also regarded as the tropical rainforest of the sea and occupy just 0.1% of the ocean's surface but are home to 25% of marine species. They are usually found in shallow areas at a depth less than 150 feet. However, some coral reefs extend even deeper, up to about 450 feet.

Coral polyps are the individual corals that are found on the calcium carbonate exoskeletons of their ancestors. Corals can be found in all the oceans but the biggest coral reefs are mostly found in the clear, shallow waters of the tropics and subtropics. The largest of these coral reef systems, The Great Barrier Reef in Australia, the largest coral reef is more than 1,500 miles long.

Factors affecting Coral Reefs

- **Extreme climate conditions:** High temperature of water leads to the declination of these corals as they cannot survive in high temperature. As estimated by scientists, most of the coral reefs of the world will soon decline with the increasing rates of ocean warming.
- **Overfishing:** It is another major concern as it is leading to an ecological imbalance of the coral reefs.
- **Coastal development:** Development of coastal infrastructure and tourist resorts on or close by these coral reefs causes significant damages.
- **Pollution:** The toxic pollutants which are dumped directly into the ocean can lead to the poisoning of the coral reefs as it increases the nitrogen level of the seawater leading to an overgrowth of algae.
- **Sedimentation:** Construction along the coasts and islands lead to soil erosion increasing the sediments in the river. As a result, it can smother corals by depriving them of the light needed to survive.

Growth conditions for Coral Reefs

1. The temperature of the water should not be below 20°C. The most favourable temperature for the growth of the coral reefs is between 23°C to 25°C. The temperature should not exceed 35°C.
2. Corals can survive only under saline conditions with an average salinity between 27‰ to 40‰.
3. Coral reefs grow better in shallow water having a depth less than 50 m. The depth of the water should not exceed 200m.

Types of Coral Reefs

Coral Reefs are differentiated into three categories based on their shape, nature and mode of occurrence.

1. **Fringing Reef:** The coral reefs that are found very close to the land and forms a shallow lagoon known as Boat Channel are called Fringing Coral Reefs. The Fringing Reefs develop along the islands and the continental margins. They grow from the deep bottom of the sea and have their seaward side sloping steeply into the deep sea. Fringing Reefs are the most commonly found coral reefs among the three. For example Sakau Island in New Hebrides, South Florida Reef.
2. **Barrier Reef:** Barrier Reefs are considered as the largest, highest and widest reefs among the three coral reefs. They develop off the coast and parallel to the shore as a broken and irregular ring. Being the largest reef among the all, they run for 100kms and is several kilometres wide. One example of Barrier Reef is the Great Barrier Reef of Australia which is 1200 mile long.
3. **Atolls:** An atoll can be defined as a reef that is roughly circular and surrounds a large central lagoon. This lagoon is mostly deep having a depth of 80-150 metres. The atolls are situated away from the deep sea platforms and are found around an island or on a submarine platform in an elliptical form. For example Fiji Atolls, Suvadivo in Maldives and Funafootis Atoll of Ellice.

Coral Reefs in India

India has its coastline extending over 7500 kilometres. It is due to the subtropical climatic conditions, there are a very few coral reefs in India. The major coral reefs in India includes the Palk Bay, the Gulf of

Mannar, the Gulf of Kutch, the Andaman and Nicobar Islands and Lakshadweep Islands. Among all these coral reefs, the Lakshadweep reef is an example of atoll while the rest are all fringing reefs.

Palk Bay

Situated in the south-east coast of India, Palk Bay is separated from the Gulf of Mannar by the Mandapam Peninsula and the Rameshwaram Island and is centered on $9^{\circ}17'N$ and $79^{\circ}15'$. The one fringing reef in the Palk Bay is 25-30km long, and less than 200m wide lies in the east-west direction of the Pamban channel. This reef has a maximum depth of around 3 m.

The Gulf of Mannar

Situated around a chain of 21 islands, the Gulf of Mannar lies between Tuticorin and Rameswaram at a stretch of 140 km. These 21 islands fall between latitude $8^{\circ}47' N$ and $9^{\circ}15' N$ and longitude $78^{\circ}12' E$ and $79^{\circ}14'E$ and form a part of the Mannar Barrier Reef which is 140 km long and 25 km wide.

Andaman and Nicobar Islands

The Andaman and Nicobar Islands fall between $6^{\circ}-14^{\circ} N$ lat and $91^{\circ}-94^{\circ} E$ longitude. They are situated at the south-eastern part of the Bay of Bengal and consist of 350 islands, of which only 38 are inhabited. These islands extend southward from the Irrawaddy Delta of Burma to the Arakan Yoma Range. All the islands of the Andaman and Nicobar groups are almost fringing reefs.

The Gulf of Kutch

The Gulf of Kutch is situated in the northern part of Saurashtra Peninsula and is located between $22^{\circ}15'-23^{\circ}40' N$ Latitude and $68^{\circ}20'-70^{\circ}40' E$ East Longitude having an area of about 7350 sq km. These reefs are of fringing type and are about 170 km long and 75 km wide at the mouth which narrows down at a longitude of $72^{\circ}20'$. Due to the mud deposits on various coral reefs, these coral reefs are in a highly degraded condition.

Lakshadweep Islands

Located between $8^{\circ}N - 12^{\circ}3'N$ latitude and $71^{\circ}E - 74^{\circ}E$ longitude, the Lakshadweep Islands which lies scattered in the Arabian Sea are situated at about 225 kms to 450 kms from the Kerala Coast. The islands covering an area of 32 km² consist of 36 tiny islands, 12 atolls, 3 reefs and 5 submerged banks, with lagoons occupying about 4200 km².

Due to the warm humid climate of these islands, the temperature of the water varies between 28-31 °C with salinity ranging from 34% - 37%.

What is Coral Bleaching?

The coral and the zooxanthellae share a symbiotic relationship and 90% of the nutrients that are produced by the algae are transferred to the coral hosts. But this relationship gets affected under severe environmental stress which causes the loss of symbiotic algae (zooxanthellae). As a result, the white calcium-carbonate exoskeleton is visible through its transparent tissue leading to a condition known as Coral Bleaching. The corals become vulnerable in the absence of the algae and begin to die if the temperature of the sea remains high for weeks.

According to the records of 2016 and 2017, half of the Great Barrier Reef died due to Coral Bleaching.

Snowflake Coral - A Threat to Biodiversity

Carijao riisei also known as snowflake coral is an invasive species discovered recently by the scientists off the coast of Thiruvananthapuram and Kanyakumari. These fast-growing species were found at a depth of 10m off Kovalam in Thiruvananthapuram and at a depth of 18m off Enayam in Kanyakumari.

The snowflake coral is known to cause a serious threat to the marine ecosystem due to the following reasons:

1. According to a survey conducted on Maui Black Coral Bed in 2001, it was found that the snowflake corals killed 60% of the black coral trees which was found between 80 metres to 150 metres depth.
2. They consume large quantities of the zooplanktons which can have a high ecological impact.
3. They threaten the biodiversity by displacing the native species and by monopolizing food resources.
4. It has the capacity to invade space and as a result, it can crowd out marine species like corals, algae and sponges that play a major role in maintaining the marine biodiversity.