

## Coral Bleaching -

◦ Coral Reefs are very imp Ecosystems of the world. Coral Reefs are  $< 1\%$  of marine water but they account for  $15\%$  of marine Bio Diversity.

◦ ∴ Coral Reefs are "Rainforest of the Ocean"

◦ Coral Reefs has 3 imp roles to play -

\* They are very imp part of marine Habitat

\* They have very high Ecological productivity

\* They are very imp part of coastal Economy - support livelihood, fishing, part of coastal mangrove Tourism Economy / Dive Economy

\* Corals are imp for coastal protection from coastal tsunamis, cyclones etc

◦ Coral Polyps grow in symbiosis with the zooxanthellae algae. & algae is responsible for vibrant colour of Coral Reef Systems.

◦ Coral Polyps themselves are white & translucent.

◦ There are events when the algae die or expelled or failed to attach to coral polyps body i.e corals losing algae & start turning white. This results in

### Bleaching of Coral Reefs

◦ ∴ Coral bleaching are now considered as one of the global catastrophic events because of large scale loss of coral habitats.

◦ Dying corals & bleaching are part of cycles of marine regeneration where after some periods of coral bleaching the corals can revive themselves.

• Corals are one of very old evolutionary life forms but the corals can survive only if the loss is within certain limits.

• In the geological past, there has been events of major coral bleaching during Devonian, Permian & Pleistocene times  
(400mya) (280mya) (1.5-2mya)

• In the 20<sup>th</sup> & 21<sup>st</sup> century, coral bleaching have been more rapid where the loss is at the scale where it's unlikely for some of the reefs to survive themselves

• some of the major coral bleaching event years were -

\* 1998 - coral bleaching in Mediterranean Sea

\* 2007-08 - bleaching of corals in Seychelles Island

\* 2016-17 - Large scale bleaching across  
Indian Ocean

\* 2017 & 2022 - Large scale bleaching in  
Great Barrier Reef, Australia



o The Great barrier reef has been impacted

across > 70% of the Reef systems

### Reasons of Coral Bleaching-

o The last 3-4 decades of consistent coral bleaching is associated with Anthropogenic factors (Human activities) - factors which have impacted marine quality of environment.

• Factors impacting are:-

① Increase in avg temp. of oceans - across oceans temp. have increased from 0.5-1°C. Indian Ocean surrounding > 1.5-3°C. (Avg. temp. of Indian Ocean 28-30°C, now the avg. is > 32°C)

② Oceans have more frequent events of marine heat waves. (Ocean waters temp increased 0.5°C to as much as 3-4°C for 5-7 days)

③ More frequent catastrophic events like Tropical cyclones, ENSO cycle etc.

EX 2017-2022, 2019-2020 - El Niño cycles & La Niña cycles - water temp changing very fast & Great Barrier Reef is greatly impacted by ENSO oscillation

• 2023 - Severe El-Niño where northern parts of Great Barrier Reef were severely impacted

③ Higher Ocean Acidification - where ocean starts absorbing more  $\text{CO}_2$  because of higher  $\text{CO}_2$  concentration in the atmosphere  
 $\therefore$  waters become more acidic  $\therefore$  dissolving coral reefs faster.

④ Infections & Epizootics (Foreign invasive species) - due to higher Ocean Temp

EX 1998 - Mediterranean blackening was related to SW101 virus. It was a Mediterranean viral pandemic impacting coral reefs

EX Marine Algal blooms & regime shifts. -

They are associated with Nutrient enrichment of Marine waters - a condition called as Eutrophication. It happens when Nitrate and phosphate waste accumulate rapidly along coast. Such waters are invaded by a diff. range of algae which can displace the beneficial zooxanthellae algae.

Such a process is called as Marine Algal Regime shift. Coral bleaching because of such algal shift is almost irreversible. Most of the tropical coastal areas have reported such coral bleaching events ex

Coral bleaching in Red Sea & parts of the Mediterranean waters

⑤ Pollution of waters because of oil spills,

Ballast water pollution, Plastic pollution have also impacted Coral Reefs.

o Indian Ocean oil spills along Malacca Strait.

⑥ Unsustainable fishing methods - can also impact coral bleaching. (Cyanide fishing, Bottom trawling)

◦ Bottom Trawling in Gulf of Mannar Region has impacted coral reefs.

◦ Gulf of Mannar is a rich Biodiversity zone with coral reefs around Mandapam Islands, Haveli Island, Swingle Islands, Manoli Is., Kerosacki Island & a part of Gulf of

Kerosacki Island & a part of Gulf of Mannar Marine Protected Area (MPA) (India's only Marine Biosphere Reserve)



o In India, where we have coral Reef systems ÷

1] Lakshadweep Atolls

2] Andaman & Nicobar (more)

↳ Galathea Bay

↳ Campbell Bay

3] Gulf of Mannar

4] Gulf of Cambay & Gulf of Kutch

## Solutions for Coral Management -

(Clive Wilkinson Report) - (Pg 9)

a] Long Term Mitigation Solutions ÷

o stopping & reversing global warming & climate change, ocean acidification (this will take time)

## b) Short Term Solution -

- ① Deal with Coastal Pollution
- ② Regulate unsustainable fishing - Cyanide fishing, stop bottom trawling etc
- ③ Manage Coral Reef Tourism
- ④ Global Alliance for Coral Reefs
- ⑤ Methods →

BOROK  
CONSERVATION  
METHOD

LYONNESE  
CONSERVATION  
METHOD

of Calcium Carbonate  
of Ocean waters on Nan  
Maerl structures. These  
calcium carbonate  
accumulation help colonis  
ation of coral colonies  
(70% faster coral growth)

introduced in  
water when  
conditions are  
more conducive.  
(EX situ conservat<sup>n</sup>)