Anthropogenic impact on coral bleaching

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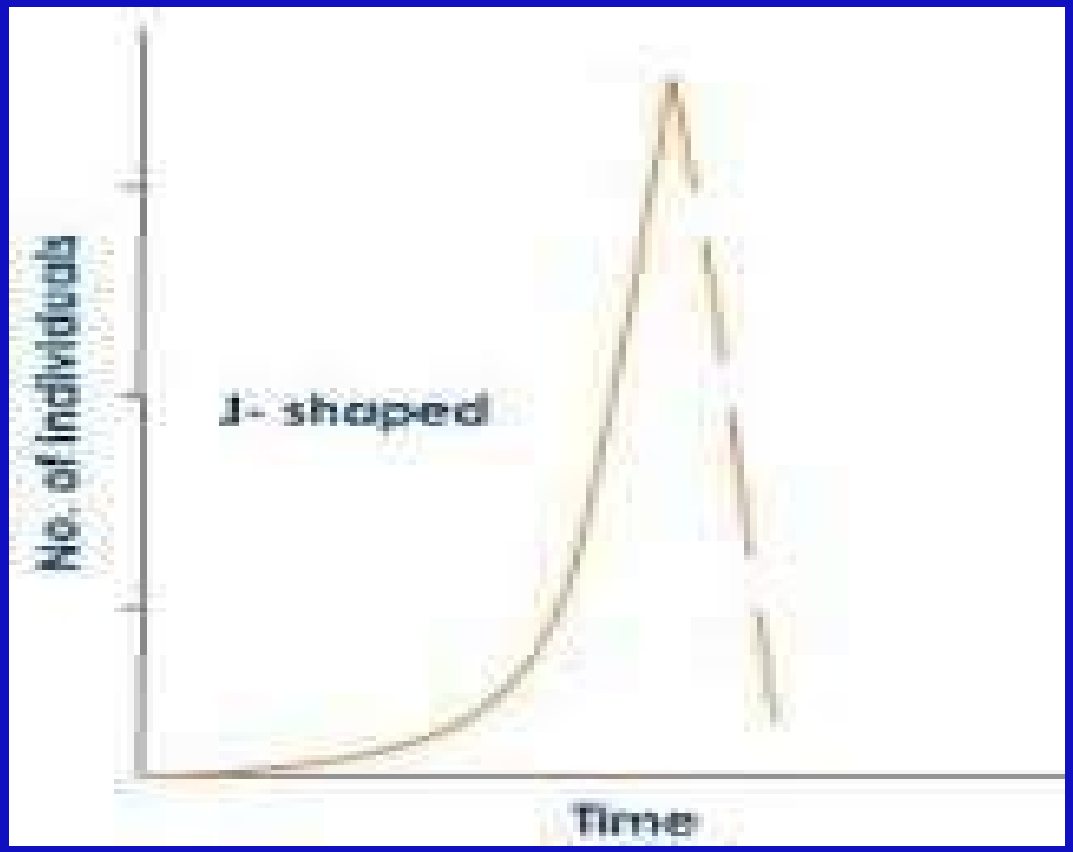
Exponential growth of human:



Environment being modified by organisms action : A hydrosere ; typical example of

Community succession

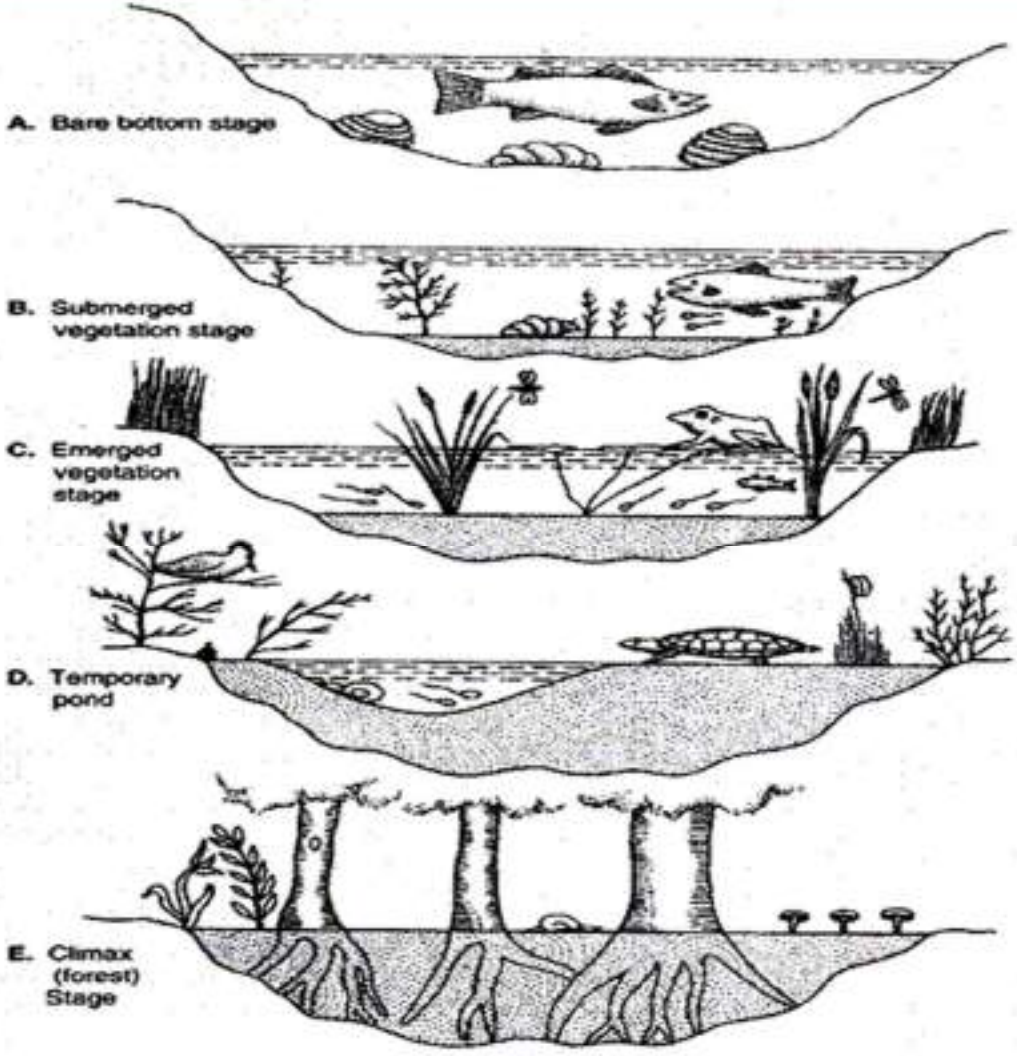


Fig. 7.2. Community succession in an open pond.

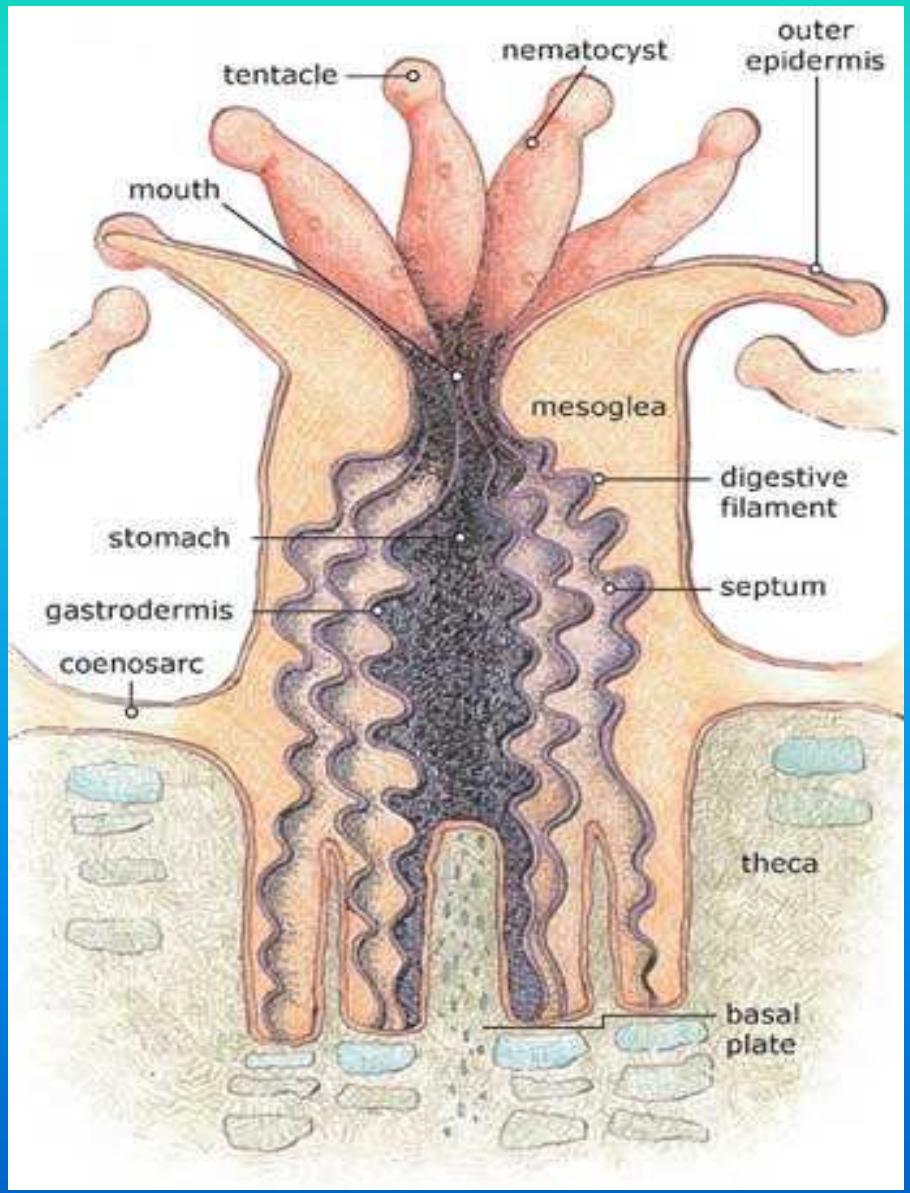
What are corals?

-A “coral” is actually a “coral colony”
-Rocky limestone base

-Surface is covered by thousands of tiny coral animals, called “polyps”

-Polyps are filled with microscopic algae

Anatomy of one coral animal



-Each polyp looks like a tiny sea anemone

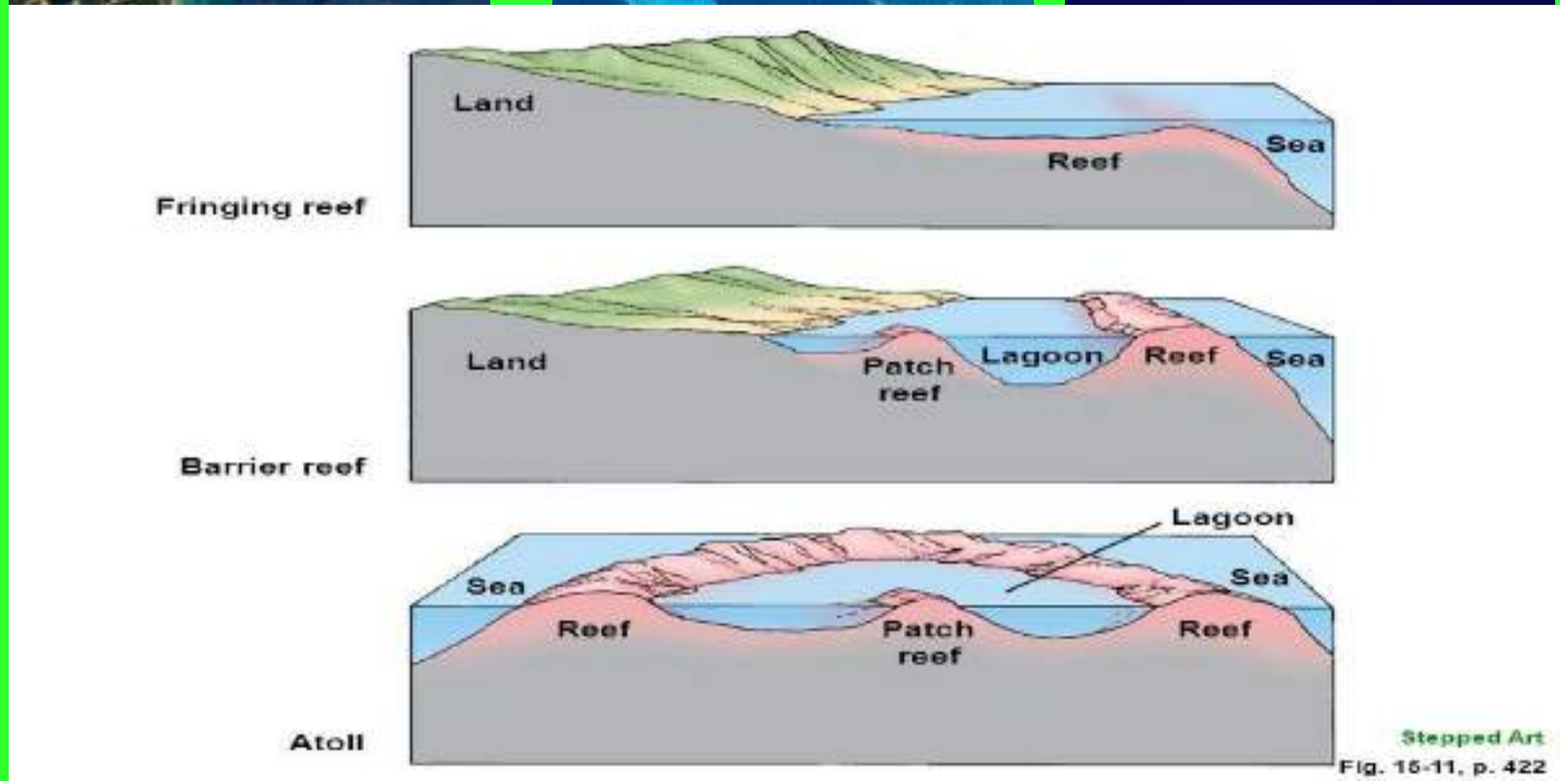
-Ring of stinging tentacles around a central mouth

What is a coral reef?

- A structure formed by coral polyps, tiny animals that live in colonies
- Coral polyps form a hard ,stony ,branching structure made of limestone
- New polyps attach to old coral and gradually build the reef

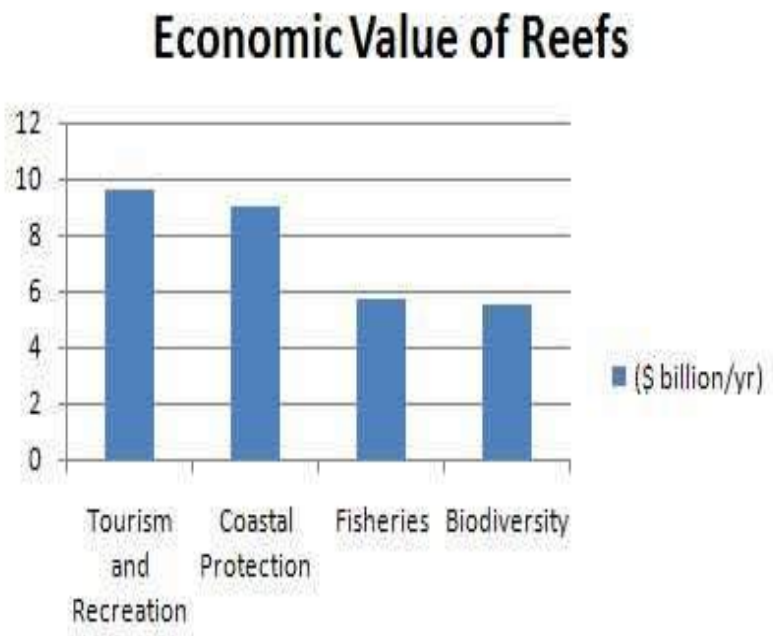
Types of reefs:

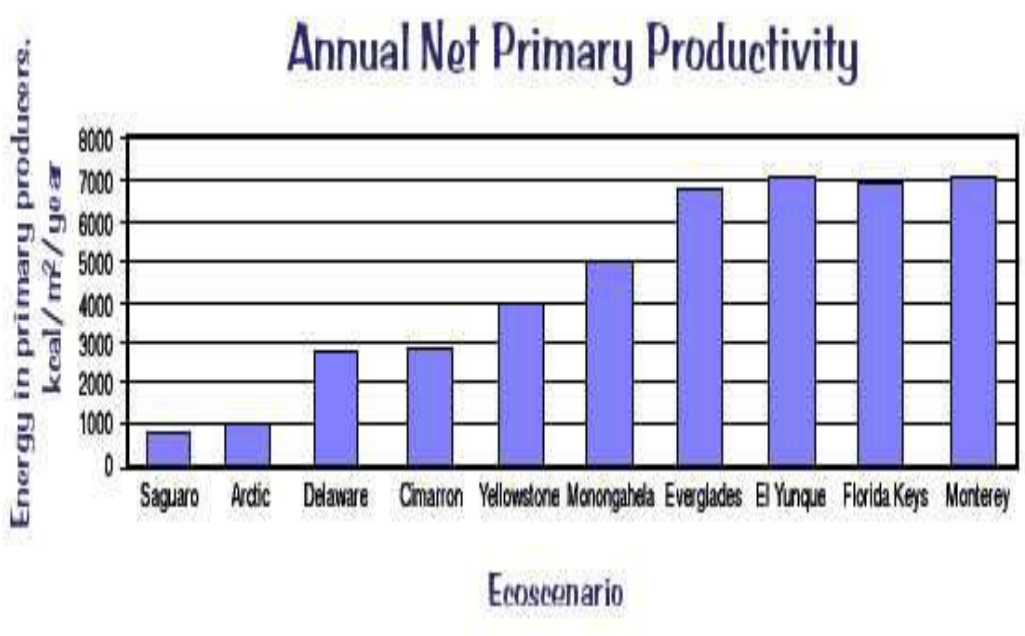
A. Fringing reef **B. Barrier reef** **C. Atoll**



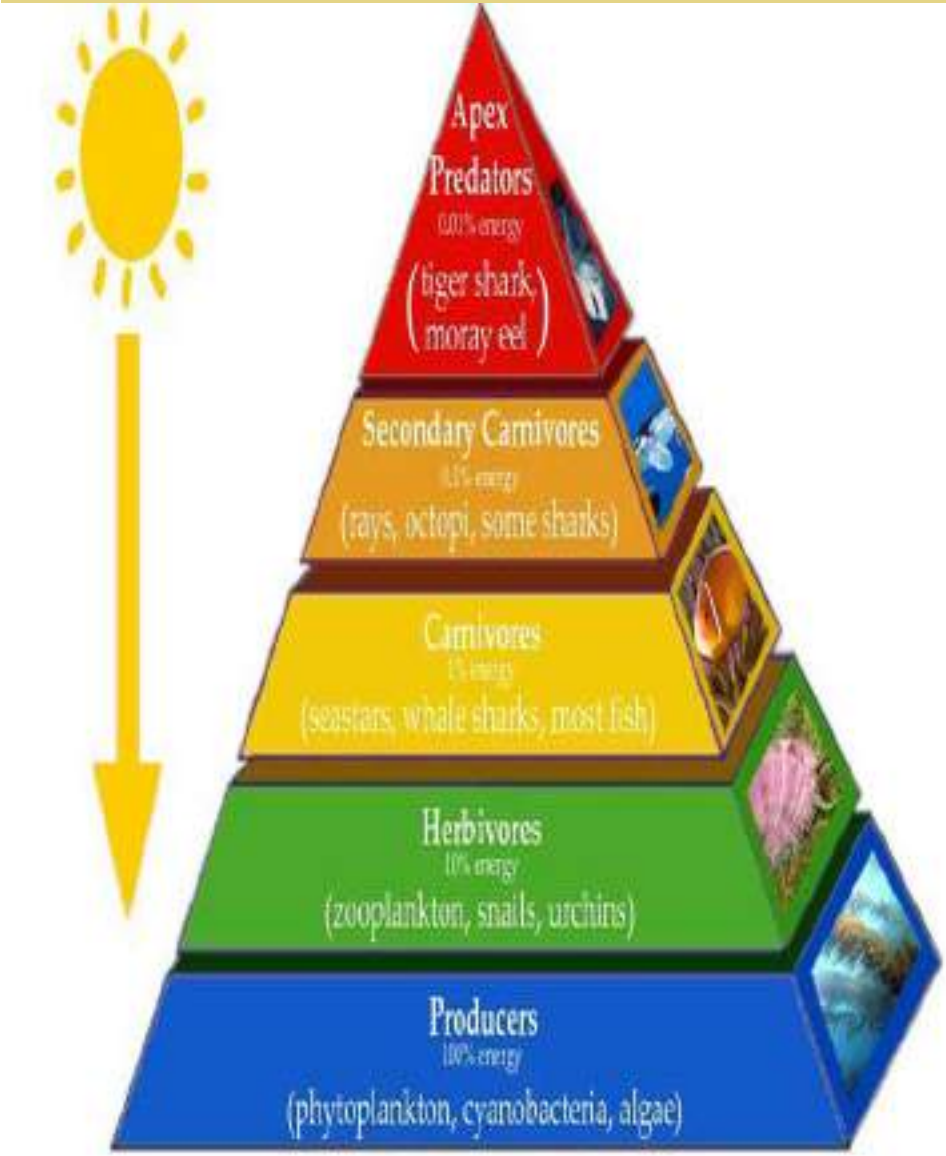
SIGNIFICANCE OF CORAL REEF:

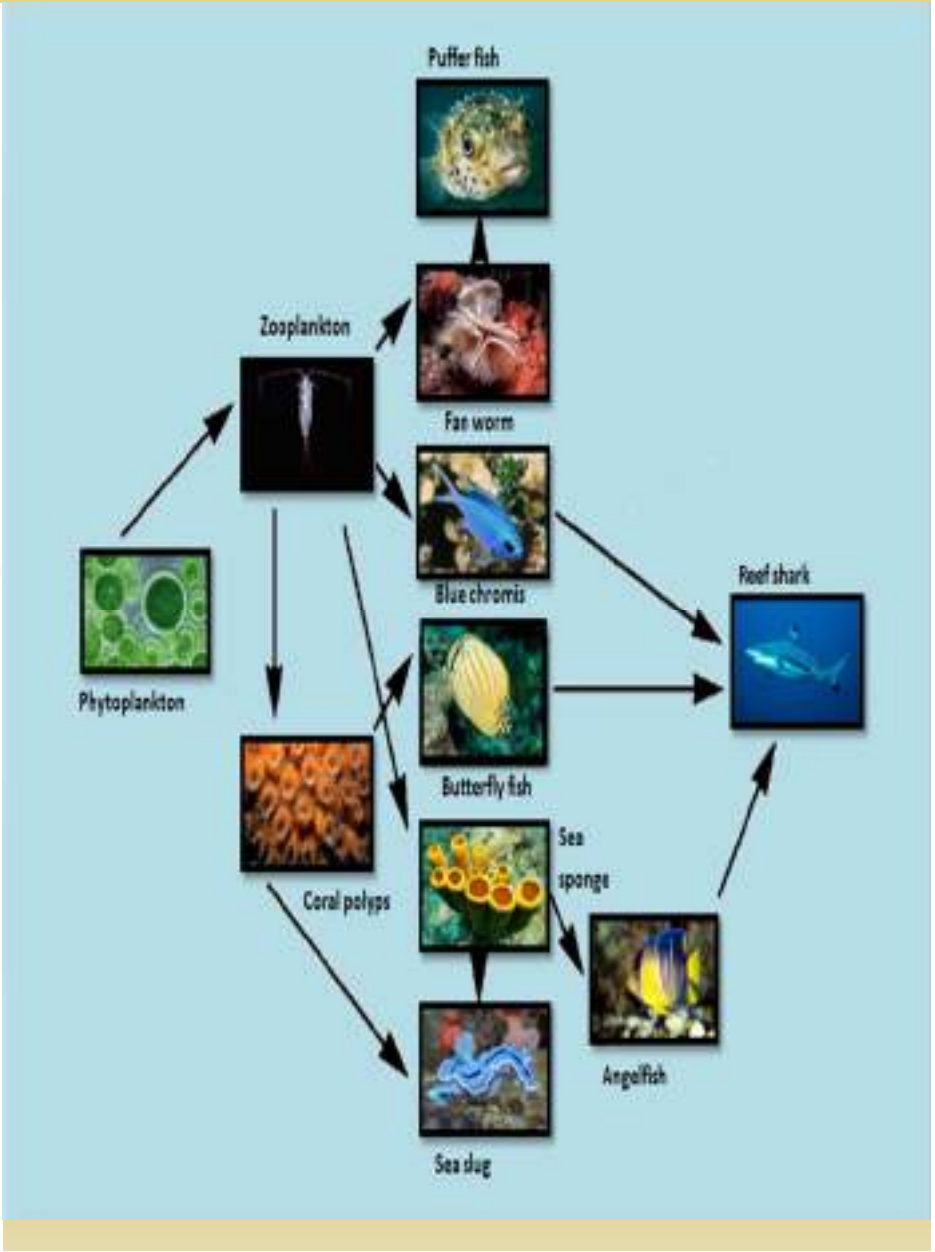
- One of the most diverse ecosystem ,considered Tropical rainforest of marine ecosystem.
- Can withstand significant disturbances like natural calamities
- Provides food to millions of people
- Provides medicine
- Huge amount of revenue is generated from fishing and tourism



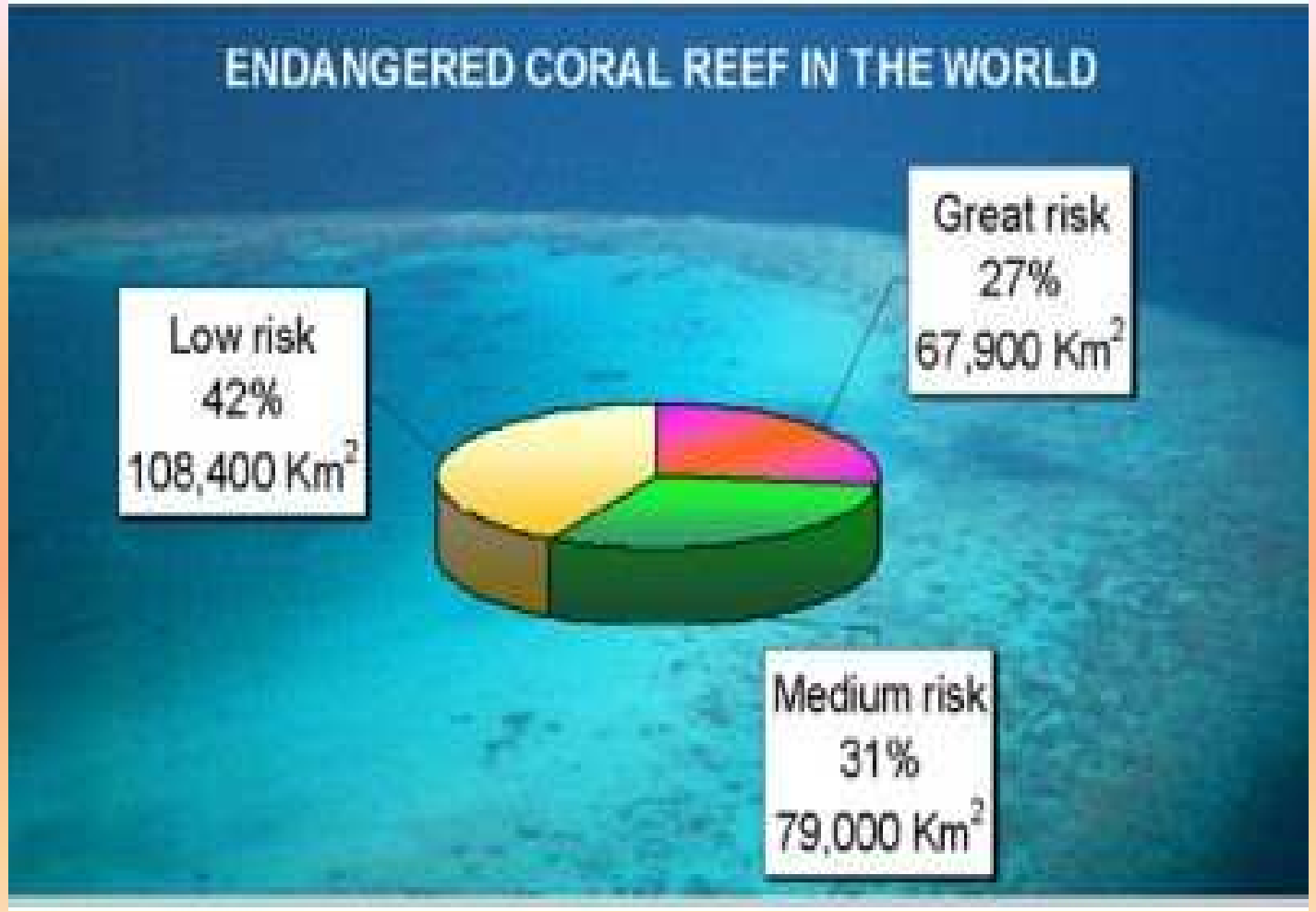


Coral reef ecosystem



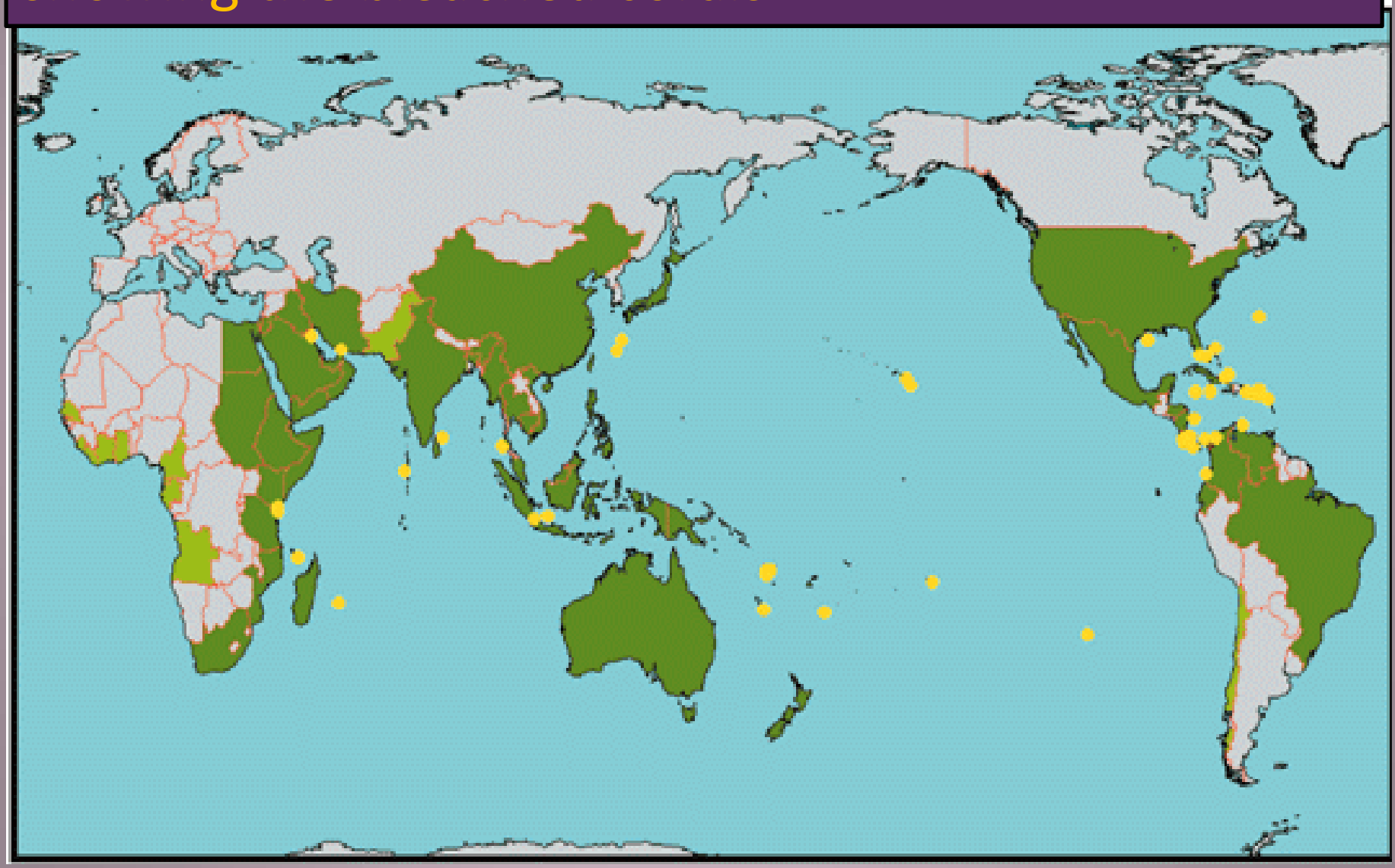


Global threat to coral reefs



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION,US REPORT

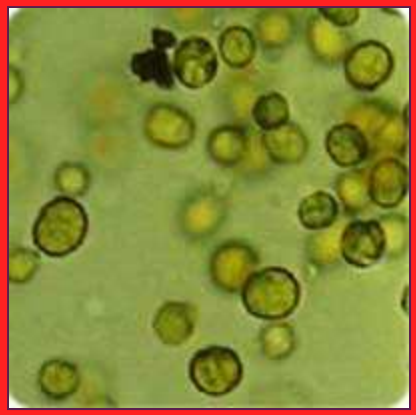
World map of coral bleaching: yellow dots are showing the bleached corals



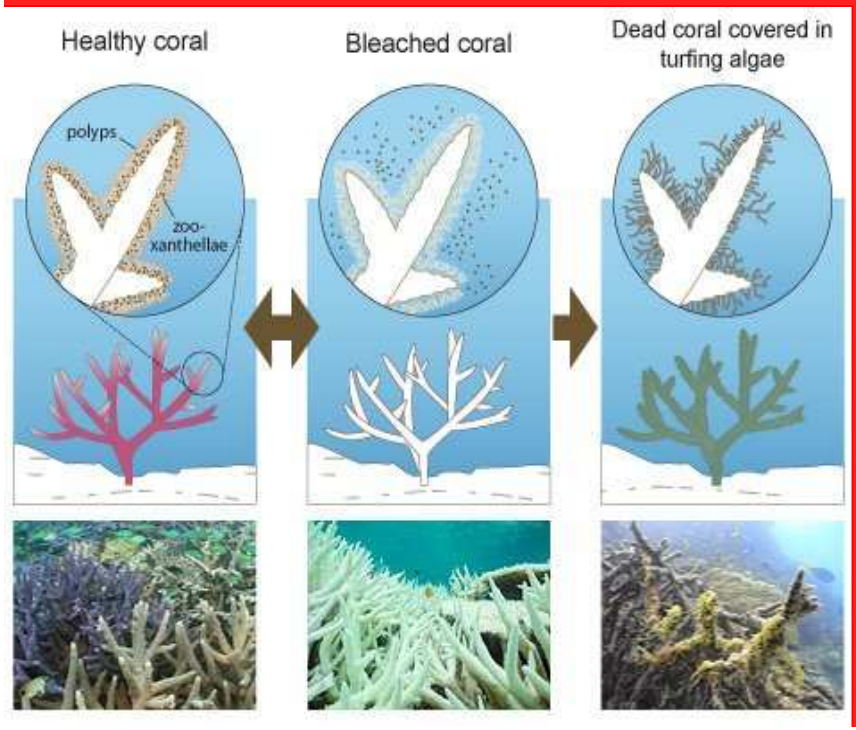
Coral Bleaching is a stress condition in coral reefs that involves the breakdown of zooxanthellae.

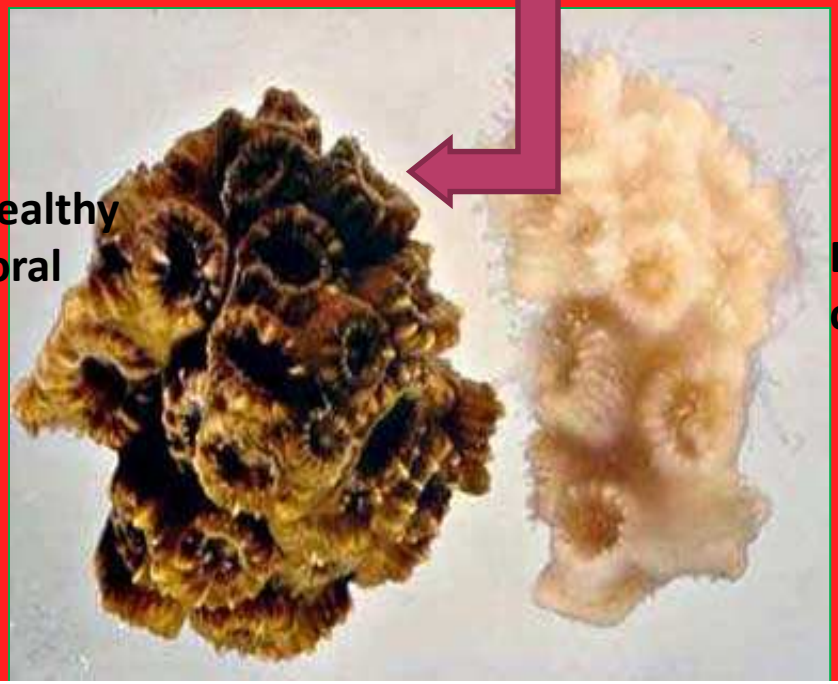
As a stress response, corals expel the symbiotic zooxanthellae from their tissues

The coral tissue is clear, so you see the white limestone skeleton underneath



Zooxanthellae lives within healthy coral





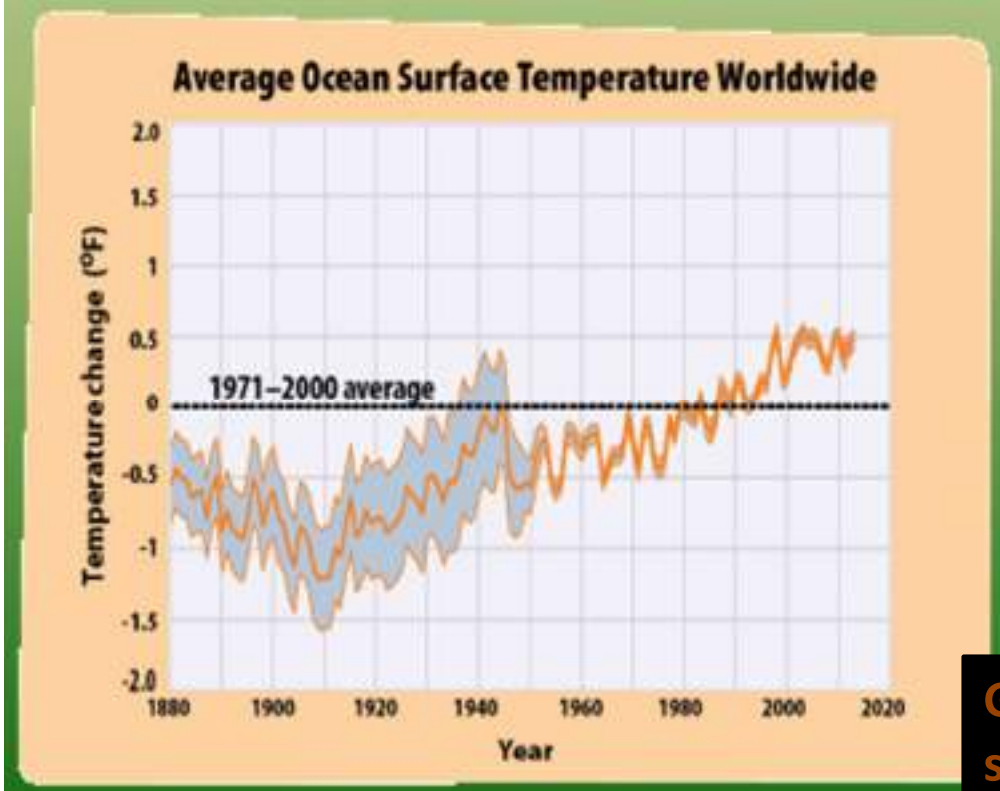
Healthy coral

Bleached coral

Anthropogenic Triggers or human induced stress leading to coral bleaching

Trigger 1: Global warming is a major concern:

- increase of 1-2 C for next 20 years there will be mass coral bleaching
- 95% of species living within the coral can become extinct

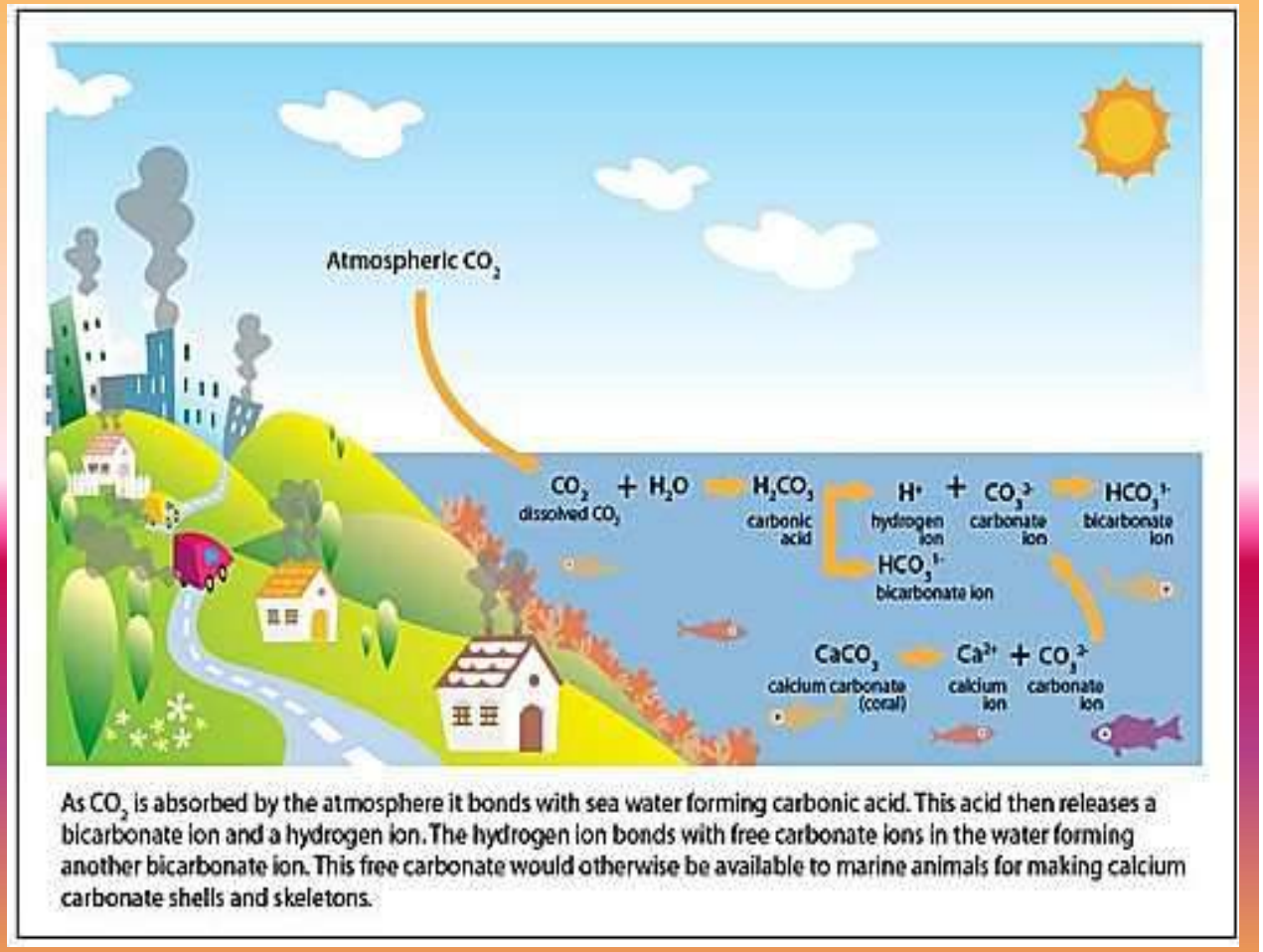


Green house gas emission from human sources

Trigger 2: ocean acidification

[Carbon dioxide emission]

When CO_2 gas from the atmosphere dissolves in water, H^+ concentration increases.



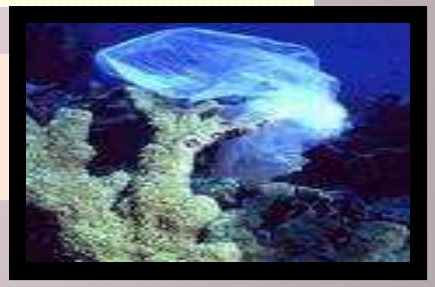
As CO_2 is absorbed by the atmosphere it bonds with sea water forming carbonic acid. This acid then releases a bicarbonate ion and a hydrogen ion. The hydrogen ion bonds with free carbonate ions in the water forming another bicarbonate ion. This free carbonate would otherwise be available to marine animals for making calcium carbonate shells and skeletons.

More triggers or stressors

Sedimentation

Over-Fishing

Careless Recreation



Pollution

Sedimentation

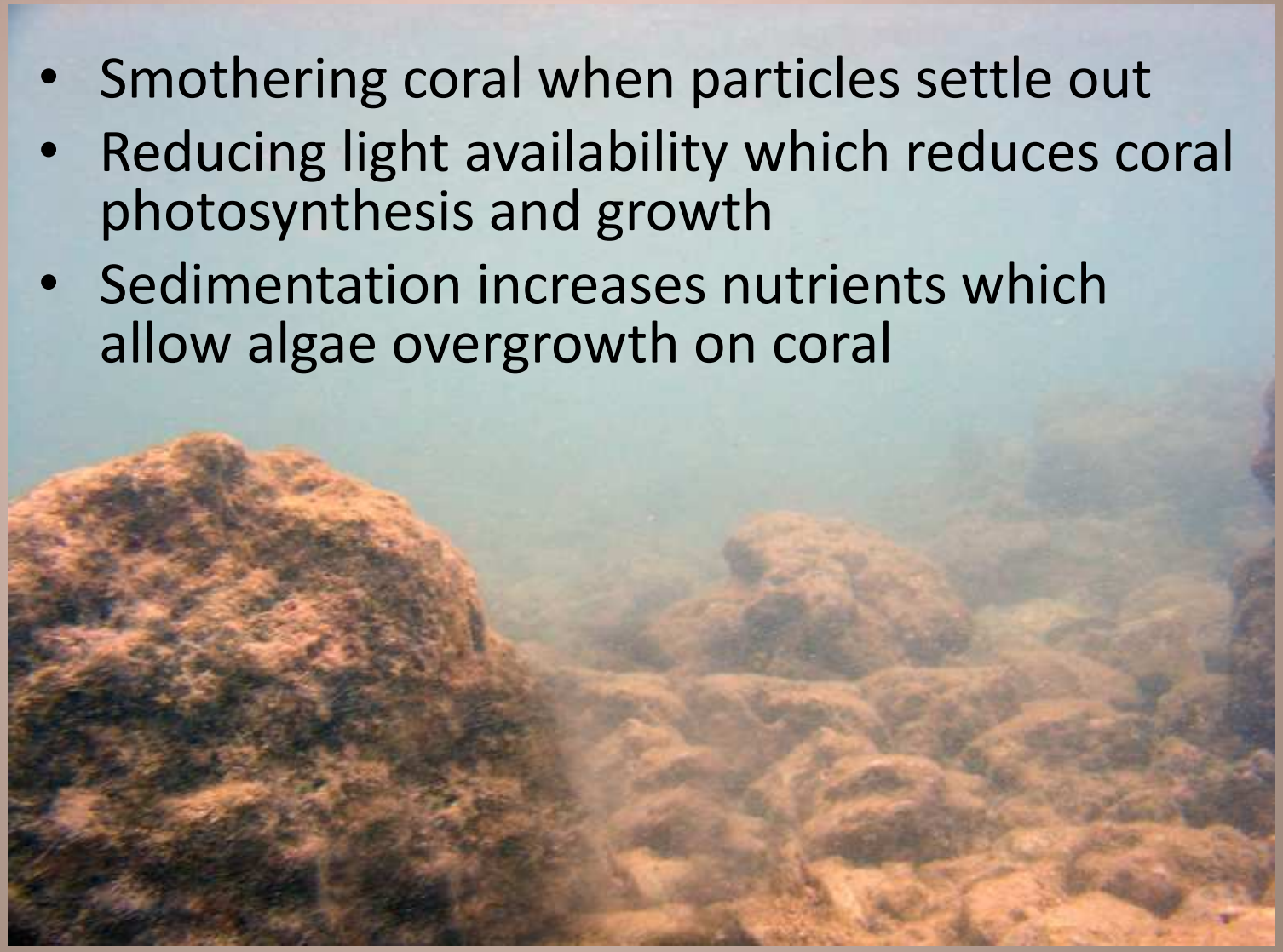
What is sedimentation?

Sedimentation occurs when sediments found on land (soil, silt, & sand) enter the ocean and cause the water to become very murky

Sedimentation

How does sedimentation threaten the coral reef habitat?

- Smothering coral when particles settle out
- Reducing light availability which reduces coral photosynthesis and growth
- Sedimentation increases nutrients which allow algae overgrowth on coral



Over-Fishing

Over-fishing is when people take more fish from the ocean than the ocean can produce and coral reef ecosystem can be damaged

Careless Recreation

- Kicking, touching, or standing on coral
- Boats can drop anchor or drive across shallow coral
- Abandoning fishing gear

Pollution

Raw sewage

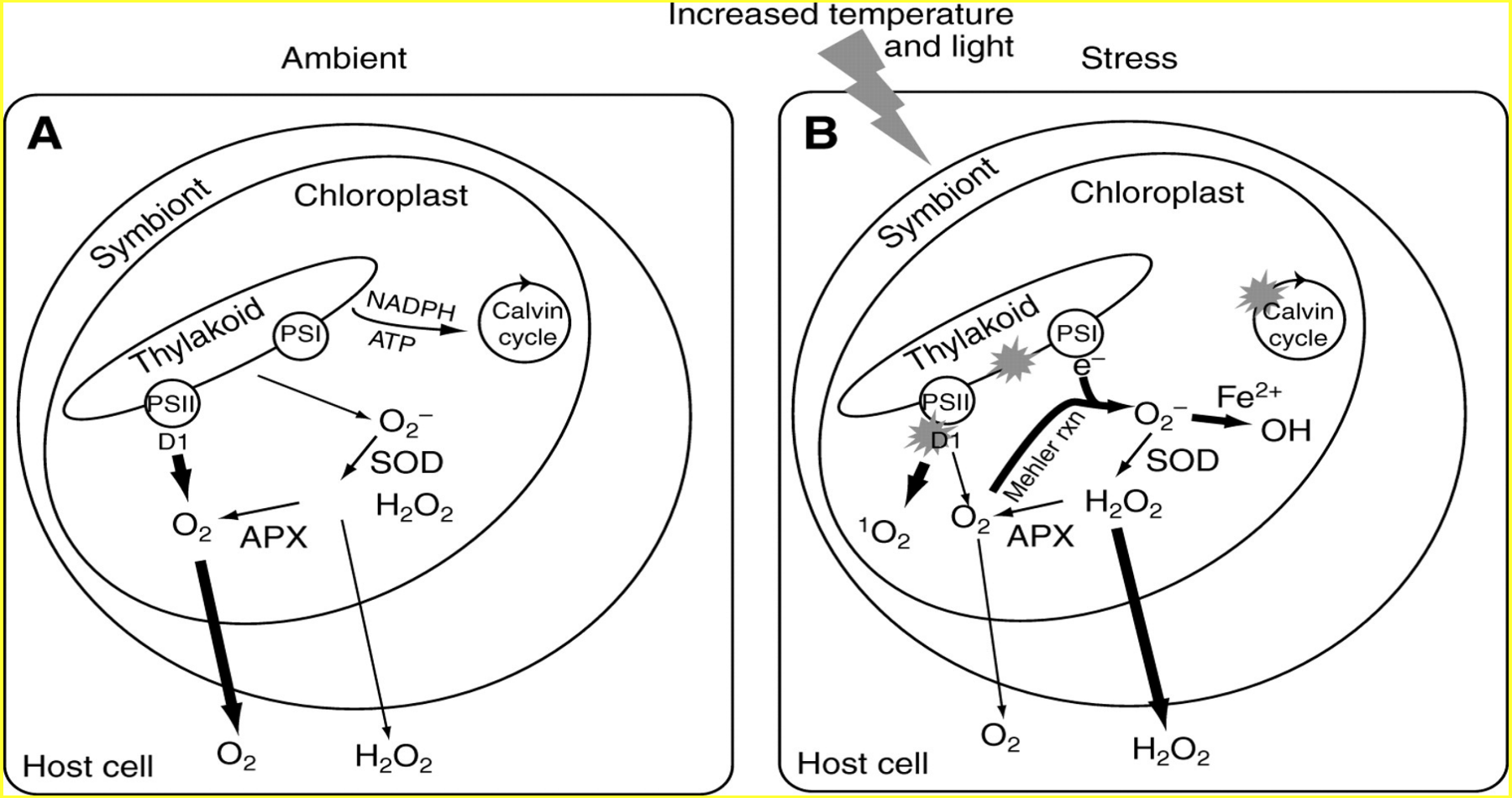
Trash that settles on coral will kill it

Human cause many forms of pollution that harms or kills coral.

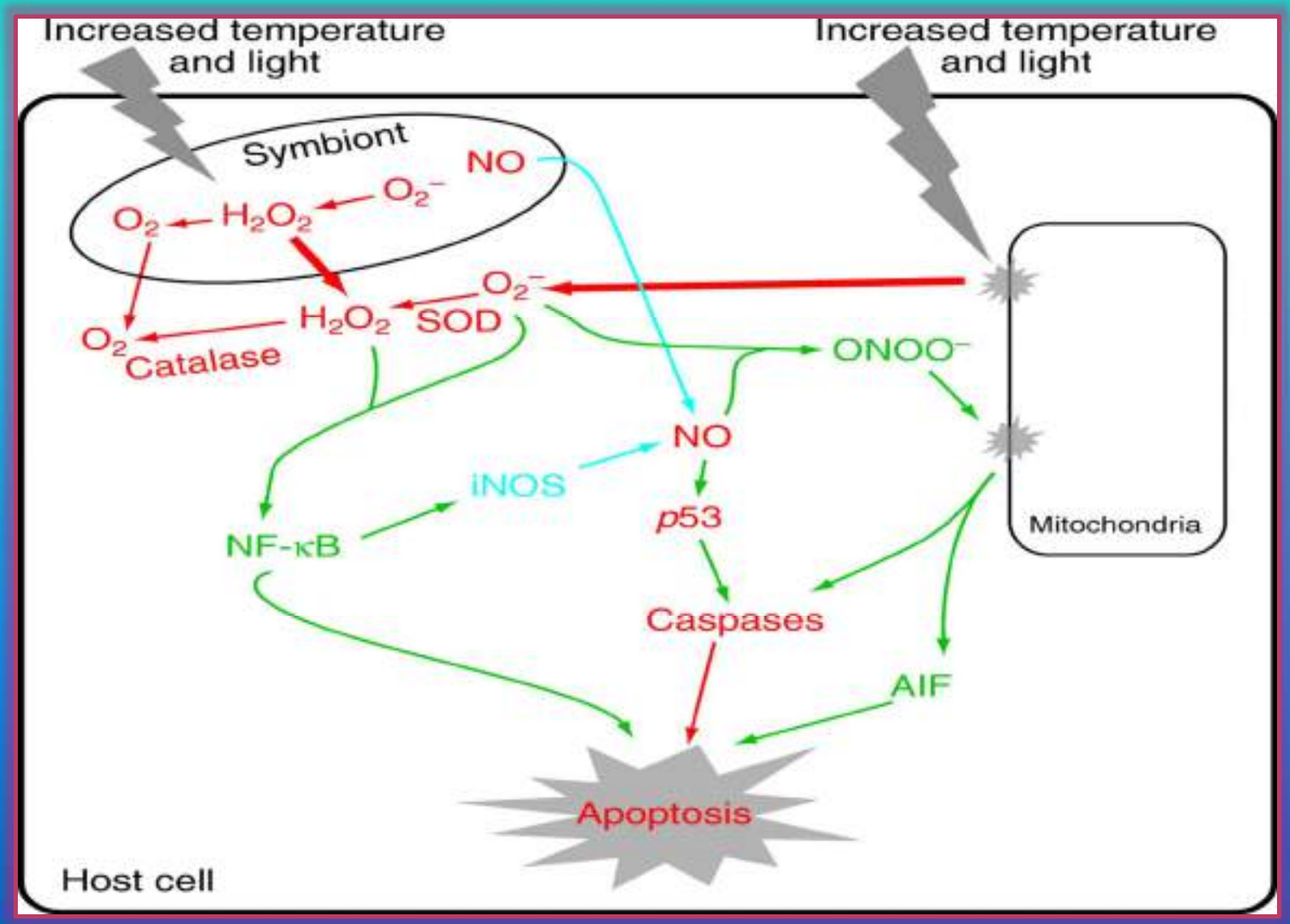
Lost fishing gear (ghost gear)

Oil can kill all forms of sea life

Molecular mechanism coral bleaching: (by free radical generation)



Bleaching by host cell apoptosis:



Ecological consequences of coral bleaching:

- **Widespread bleaching can lead to coral mortality.**
- **Even some corals that can recover exhibit decreased growth,fecundity and increased susceptibility to diseases**
- **Explosion in the observation of novel coral diseases in the last decade can be attributed to increased coral stress and bleaching**

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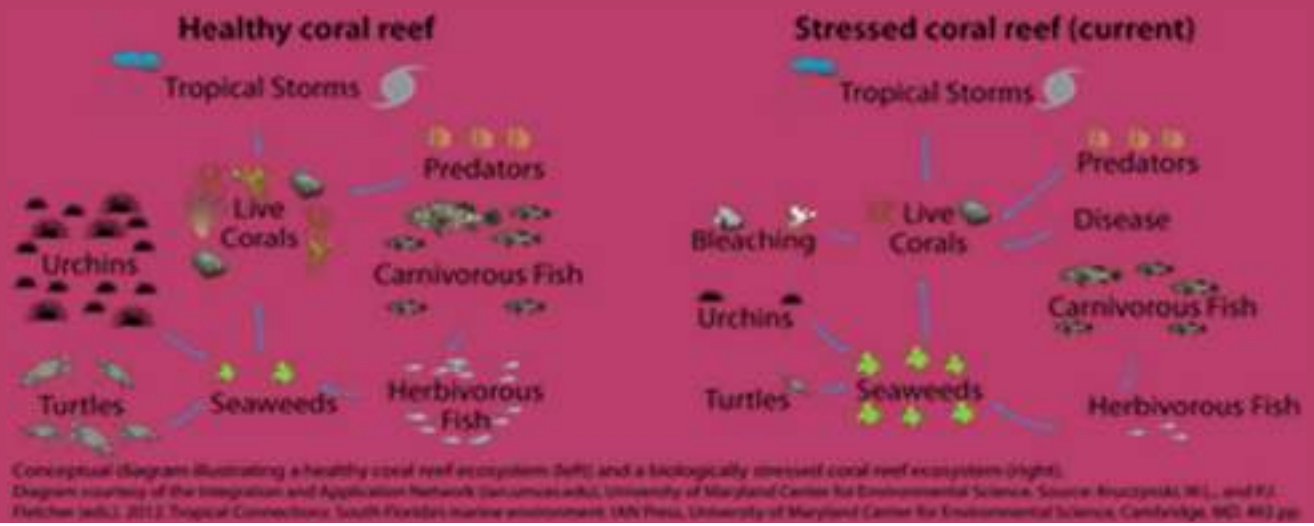
Total collapse of the reef ecosystem



What can be done to at least to reduce the pace of the process?

- Try to reduce the green house gas emission
- Try to curb industrial sewage addition and oil leakage in the sea
- Coral reef fishing should be strictly prohibited.
- Mass awareness regarding the importance of coral reef should be generated specially in the inhabitants near coastline by workshops and seminars.


Thank you!