Topic 10D:
Coral Reefs

Online Lecture:
Coral Reefs

- Coral Polyps & Zooxanthellae
- Coral Bleaching
- Coral Reef Development
- Benefits/Uses of Coral Reefs
Corals polyps are small animals

- **Algae** called *zooxanthellae* live in corals.
- Zooxanthellae carry out **photosynthesis** and make food for the corals.

*Corals get most of their food from their zooxanthellae.*

- Corals help their zooxanthellae get sunlight and nutrients (so they zooxanthellae can make more food for them)
Coral Reefs

○ Coral reefs are made of calcium carbonate:
  add a little calcium carbonate beneath them each year

○ Corals need sunlight so the zooxanthellae (algae inside the corals) can make more food for the corals

○ Corals use carbon dioxide to make calcium carbonate, so building reefs help reduce global warming
Corals & Their Environment

Reef Flat (Lagoon)
Reef Crest
Reef Slope
Reef Flat

Slide 4
Reef Slope
Coral reefs are more common on the western sides of oceans where the water is warmer due to ocean currents: water warms up as it travels west along the Equator.
Corals bleach if the water gets too warm.

Corals lose their color, because they kick out their zooxanthellae.

Bleached corals die from a lack of food. Zooxanthellae make food for the corals.
Deep Sea Corals
Ocean Acidification

- Humans add a lot of carbon dioxide to the atmosphere by burning fossil fuels like oil and coal to power our vehicles and generate electricity.

- **A lot of our carbon dioxide pollution is absorbed by ocean water.**

- The carbon dioxide bonds with water to form carbonic acid, and shift the balance of the carbonate compounds towards *more acidic water.*

- Makes it harder for corals to grow *their calcium carbonate shells*, and can even make their *shells dissolve.*
Corals, Nutrients, & Algae

BEFORE: Healthy Coral

Too many nutrients encourages the growth of algae which grow over the corals and block sunlight.

AFTER: Algae have taken over

Corals die from a lack of food.

Zooxanthellae cannot make food for the corals.
There is little life in most of the tropical ocean.

- Warm surface water reduces the number of phytoplankton that grow at the surface of the ocean:
  - harder for waves to bring up nutrients from below
  - harder for phytoplankton to float and get sunlight
- Fewer zooplankton: have less food (phytoplankton)
- Fewer small fish: have less food (zooplankton)

clear, blue water = not many phytoplankton in it
Why is life so abundant in coral reefs?

There are *more nutrients* in the water of coral reefs than in other parts of the tropical ocean due to the corals. More algae (phytoplankton & seaweed) can grow (need nutrients for photosynthesis).

More animals are present, because there is more food (algae).

- Corals eat plankton that drift into the reef. Planktons’ bodies contain nutrients.
  - Corals keep the nutrients for their zooxanthellae (so the algae can make more food for the corals)
  - corals build up nutrients over time
- When corals die, their bodies decompose and the nutrients in them are slowly released into the water.
Why is life so abundant in coral reefs?

It is **easier to get sunlight** in coral reefs than in other parts of the tropical ocean **due to the corals**.

More algae (phytoplankton & seaweed) can grow (need sunlight for photosynthesis).

More animals are present, because there is more food (algae).

- **Corals** add **layers of calcium carbonate below them, creating the reef**.
  - Corals grow upwards so their zooxanthellae get sunlight & make more food for the corals.

- **Corals** make their environment **SHALLOW**:
  - Algae in the water cannot sink down deep. Algae can always get sunlight.
Kinds of Coral Reefs

Fringing Reef: next to shore of island

Barrier Reef: water (lagoon) separates reef from island

Atoll: only reef (no volcanic island)
When the volcanic island sinks, corals grow upwards by adding layers of calcium carbonate below them.

Corals need to stay at the surface so their zooxanthellae can get sunlight and make food for the corals.
We can see the patterns of coral reef development in island-seamount chains. They provide evidence that seafloor spreading happens and thus support the theory of plate tectonics.
How humans harm coral reefs

Carbon dioxide from burning fossil fuels makes ocean water more acidic

Fertilizers washed off the land add too many nutrients to coral reefs

green water full of phytoplankton (algae): algae block sunlight from reaching corals
How coral reefs benefit humans

Fish and other seafood to eat

Tourism

Good place for bioprospecting for example, looking for organisms that make chemicals that can be used as medicines
How coral reefs benefit humans

- Waves grind up calcium carbonate reefs and make beach sand
- Drilling into reefs: layers tell us how climate changed in the past
- Reefs reflect tsunami
- Reefs block waves & reduce erosion of the land