

Introduction to Coral Reefs

Lesson Plan

- What are Coral Reefs?
 - Polyps
- Where are Coral Reefs Located?
- Biological Significance
- Other Contributions
- Coral Reef Example
 - Great Barrier Reef

What are Coral Reefs?

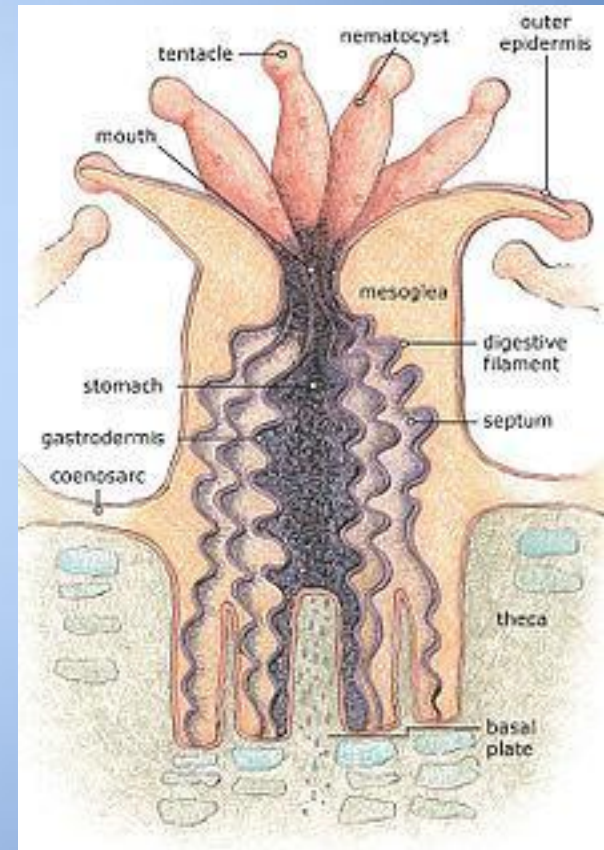
- Colonies of various reef-building stony, hard corals
- Each colony is composed of tiny animals known as Polyps

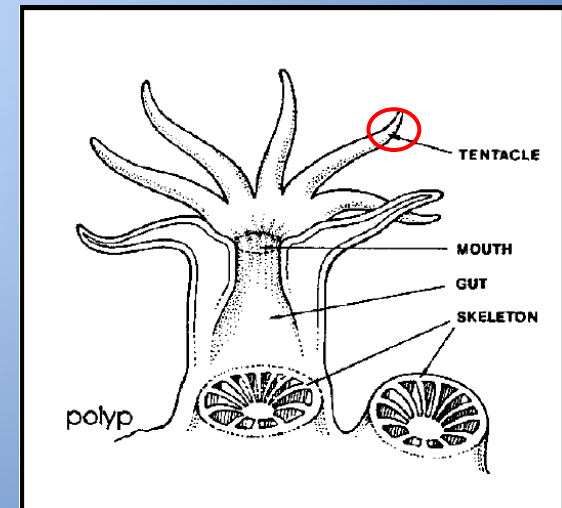
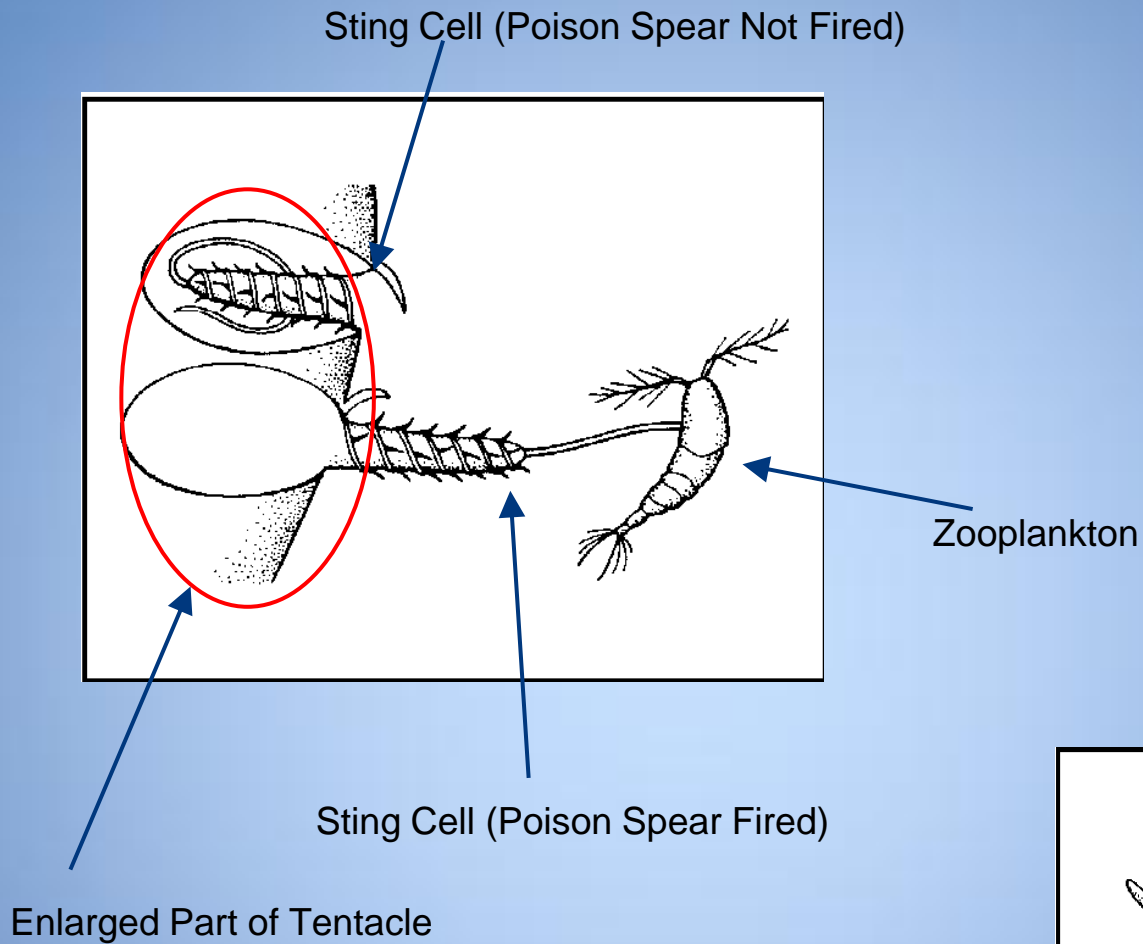


[Click picture for an Intro Video on Coral Reefs](#)

Polyps

- Constantly Secretes a Calcium Carbonate (e.g. Limestone) skeleton
 - Acts as base for the colony
- During the day...
 - Polyps retreat into cup-like skeleton
 - Also do this when threatened
- During the night...
 - Tentacles stretch out to capture food
 - Tentacles have stinging cells called nematocysts
 - Shoot Poison into Zooplankton floating by
 - Also get food from small plant cells which live inside polyp tissue called zooxanthellae
 - This food is shared with coral





Question

Zooxanthellae produce food that is shared with the coral. Coral give shelter to polyps. What type of relationship is this?

Hint!

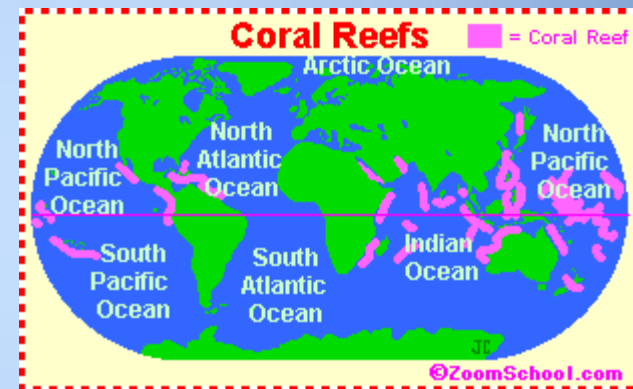


Answer

- This is known as a: **Symbiotic Relationship** (more Specifically it is Mutualistic)
- Click [Here](#) for a Review of Symbiotic Relationships!

Where are Coral Reefs Located?

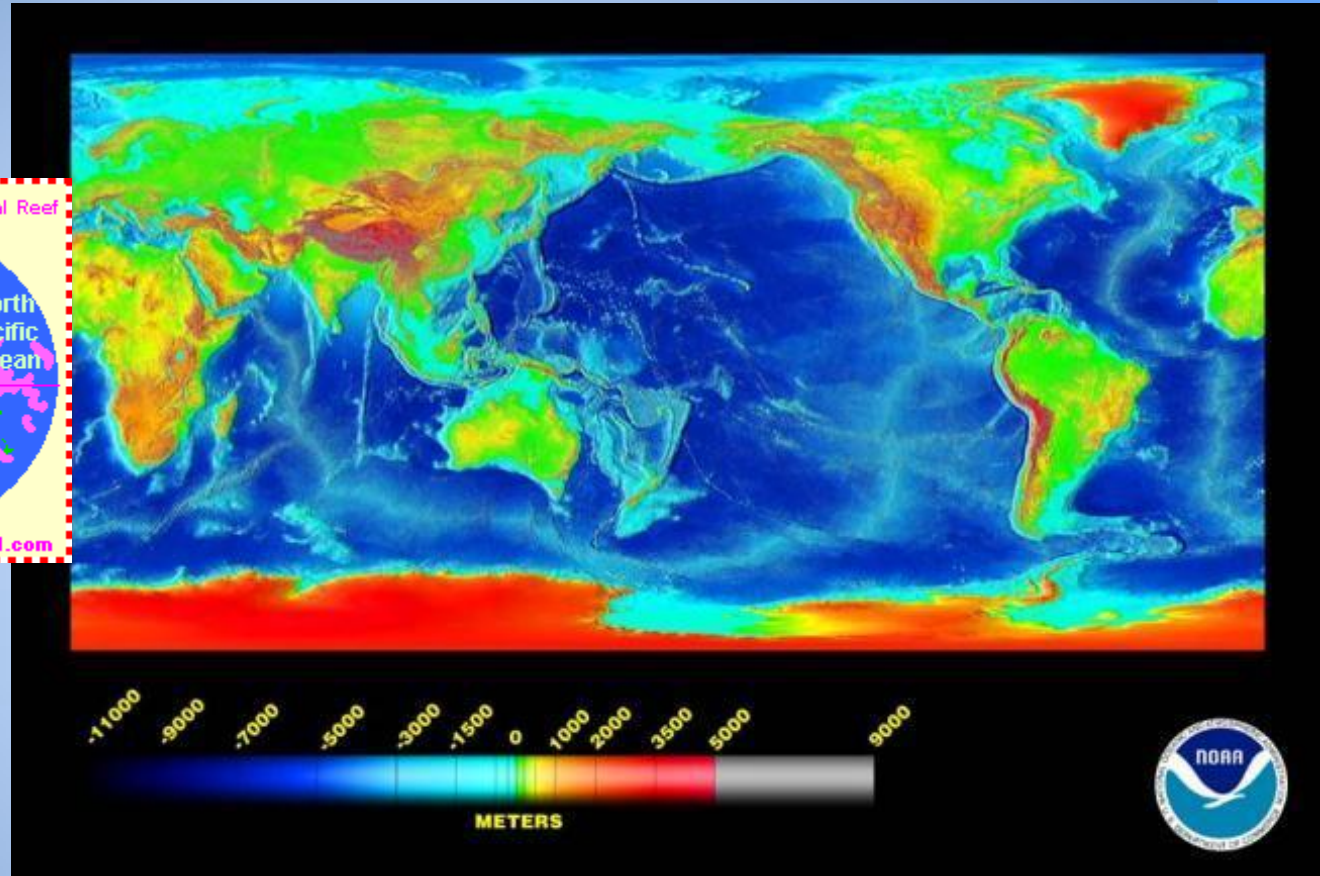
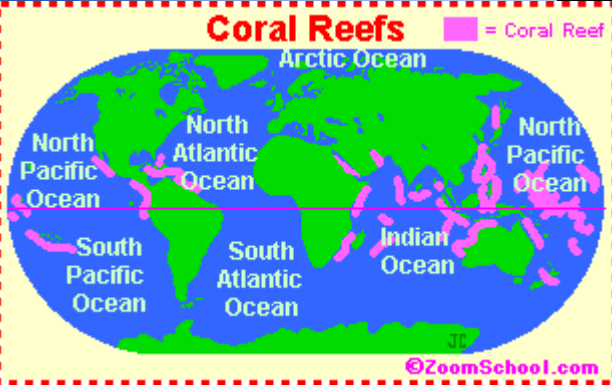
- Factors
 - Depth (Light Penetration)
 - Temperature
 - Salinity
 - Aragonite (Calcium Carbonate) Saturation



Depth

- Photosynthesizers need a significant amount of light to secrete the Calcium Carbonate
 - Light → Photosynthesis → Byproduct serves as food source → Secretion of Calcium Carbonate
- So...
 - Deep or Shallow?

Depth



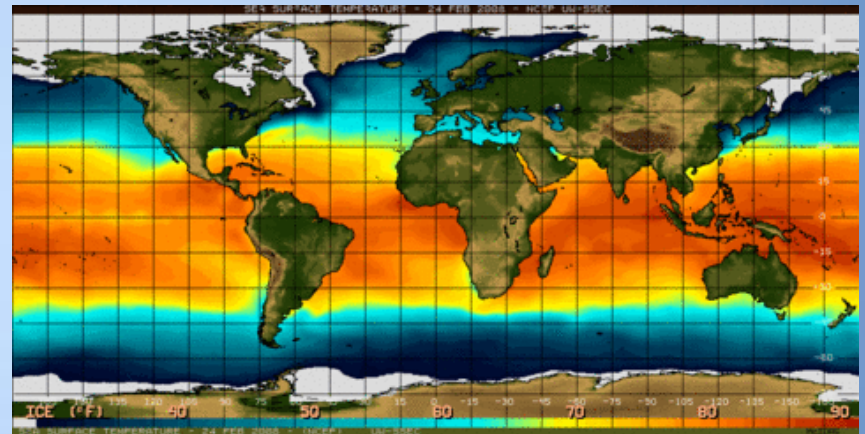
Analyze the two maps and decide if coral reefs are found in shallow or deep areas of the ocean.

Depth

- If you answered that coral reefs occur in more shallow areas (light blue on the map) of the ocean you are correct.
 - Light doesn't have to penetrate too far so maximum amount of photosynthesis occurs
 - Coral reefs generally found in depths of less than 120 ft.

Temperature

- Reefs found in tropical or subtropical zones centered around the equator and extending to 30 degrees North and South Latitude.
 - Why?
 - Colder water inhibits chemical reaction that creates calcium carbonate
 - Can you think of a reason a coral reef would occur in a non-tropical zone?



Temperature

- Non-tropical Coral Reefs
 - Example is Red Sea
 - Heat from the sun caused by the surrounding desert climate provides the needed warmth



[Click for video of the Red Sea Reef](#)

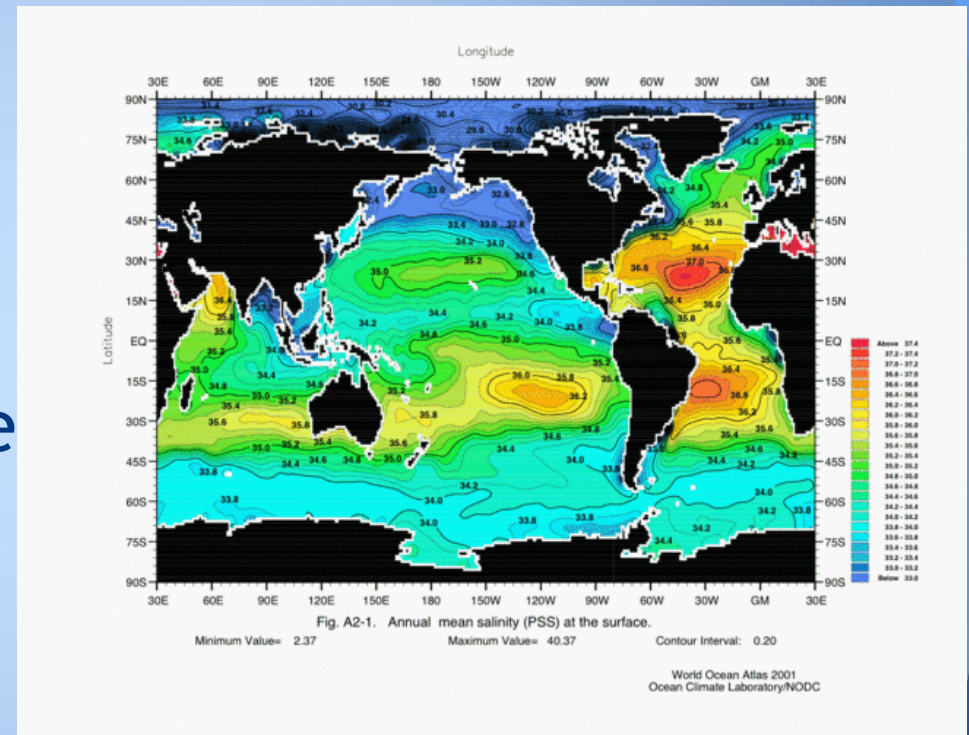
Salinity

- A high amount of salinity (~25-42‰) is needed for coral to live
- If not enough salinity loss of zooxanthellae will occur
 - Known as bleaching



Salinity

- Salinity highest at lower latitudes
- River runoff or flooding will significantly change salinity and cause death of reef
 - This means very shallow reefs are susceptible to decrease in salinity

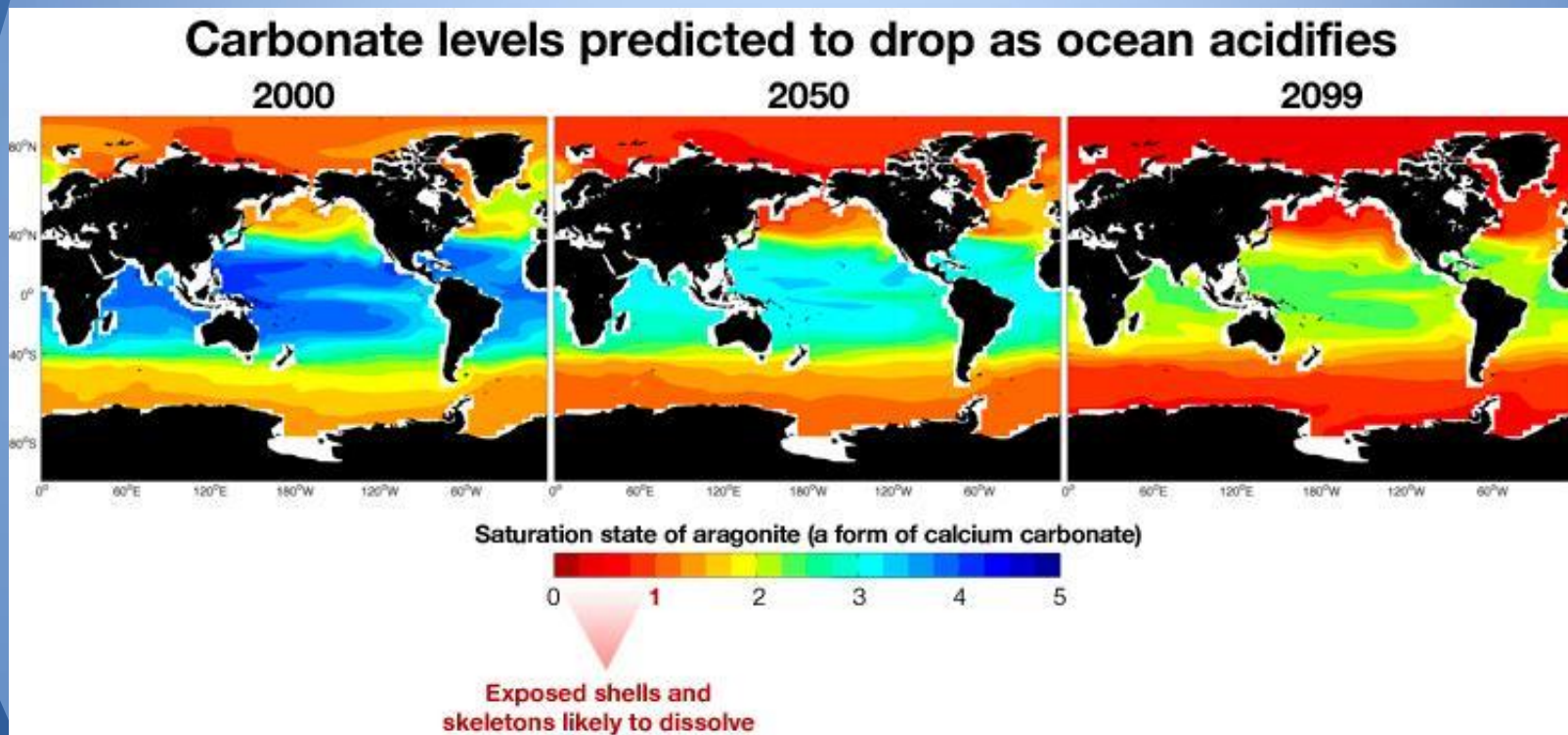


Higher Salinity Signified by Lighter Colors

Aragonite Saturation

- Reefs are composed of Aragonite (Calcium Carbonate)
 - If the water surrounding a reef is undersaturated (low pH level) reef could dissolve
 - Therefore Oceans surrounding reefs must be oversaturated with Calcium Carbonate Ions
 - This is a problem because as greenhouse gasses attributed with global warming rises...
 - Calcium Carbonate levels lower

Aragonite Saturation



Ideal Level for reef construction > 4

Biological Significance

"Ecologically speaking the value of coral reefs is even greater [than these estimates] because they are integral to the well being of the oceans as we know them. ... picture [reefs] as the undersea equivalent of rainforest trees. Tropical waters are naturally low in nutrients because the warm water limits nutrients essential for life from welling up from the deep, which is why they are sometimes called a “marine desert”. Through the photosynthesis carried out by their algae, coral serve as a vital input of food into the tropical/sub-tropical marine food-chain, and assist in recycling the nutrients too. The reefs provide home and shelter to over 25% of fish in the ocean and up to two million marine species. They are also a nursery for the juvenile forms of many marine creatures."

-Rob Painting , Skeptical Science, January 13, 2011

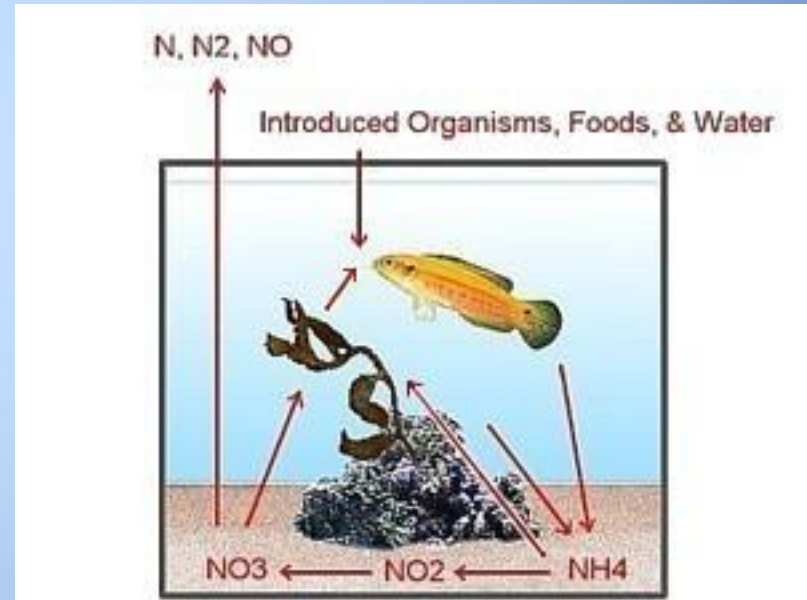
Biological Significance

- Coral Reefs, like rainforests, contain a disproportionate number of species compared to the rest of marine environments
- Less than 1% of Ocean floor but support 25% of all marine creatures



Biological Significance

- Coral Reefs also have a very complicated and efficient **Nutrient Cycle**
 - This allows coral reefs to survive in "nutrient poor" environments
 - Notice how this is not unlike rainforest environments



Other Contributions

- Economic
- Coastal/Shore Protection
- Recreation/Tourism
- Medical Value

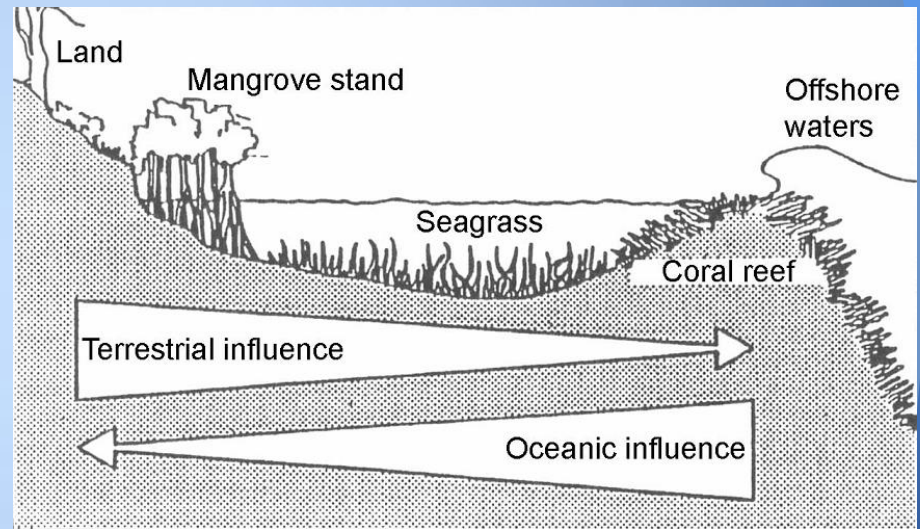
Economic Value

- Estimated that 1 Square Kilometer of Coral Reef will yield 15 tonnes of fish and other seafood per year
 - If managed properly!
- Coral Reefs provide economic goods and ecosystem services worth ~\$375 billion each year!



Coastal/Shore Protection

- Coral Reefs Serve as a buffer
 - Protect in-shore areas from the pounding ocean waves
- In the infamous 2004 Tsunami some coastlines spared of further damage due to the healthy reefs
- Coral was mined away in Maldives
 - Cost \$10 Million/Kilometer to build wall to protect coastline



Recreation/Tourism

- Every year millions of divers and snorkelers visit coral reefs
 - Supports local businesses and economies
 - Creates local jobs
- Because divers and snorkelers look for most diverse, best reefs, this encourages healthy coral reefs
- Click on picture for a coral reef scuba diving video!



Medical Value

- Several important drugs already been developed from chemicals found in coral reef organisms
- More than half of all new cancer drug research centers on marine organisms
- Click on picture for link to video and examples of drugs from the coral reef "Medicine Cabinet"



The Great Barrier Reef



Great Barrier Reef

- 1 of the 7 Wonders of the World
 - Larger than the Great Wall of China
 - Only living thing visible from space
- Spreads for 1,800 miles parallel to the queensland coast



Great Barrier Reef

- Biodiversity
 - 400 Species of Coral
 - 1,500 Species of Tropical Fish
 - 200 Types of Birds
 - 20 Types of Reptiles
 - Breeding Area for Humpback Whales
 - Habitat for Endangered Species such as Dugong and Green Sea Turtle



Click the Picture to Learn about Dugongs!

Great Barrier Reef

- Tourism
 - Draws over 1 Million visitors from all over the world each year
 - Important to economy of Australia?
 - Generates over 6 Billion Dollars of revenue each year
 - Daily fee levied on visitors each day to contribute to conservation of the reef

our great barrier reef
let's keep it great



What We Learned

- Formation and Makeup of Coral Reefs
- Best Conditions for Reefs to Form In
- Why Coral Reefs are Biologically Important
- Why Coral Reefs Are Important to Humans
- Basic Facts About the Great Barrier Reef

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