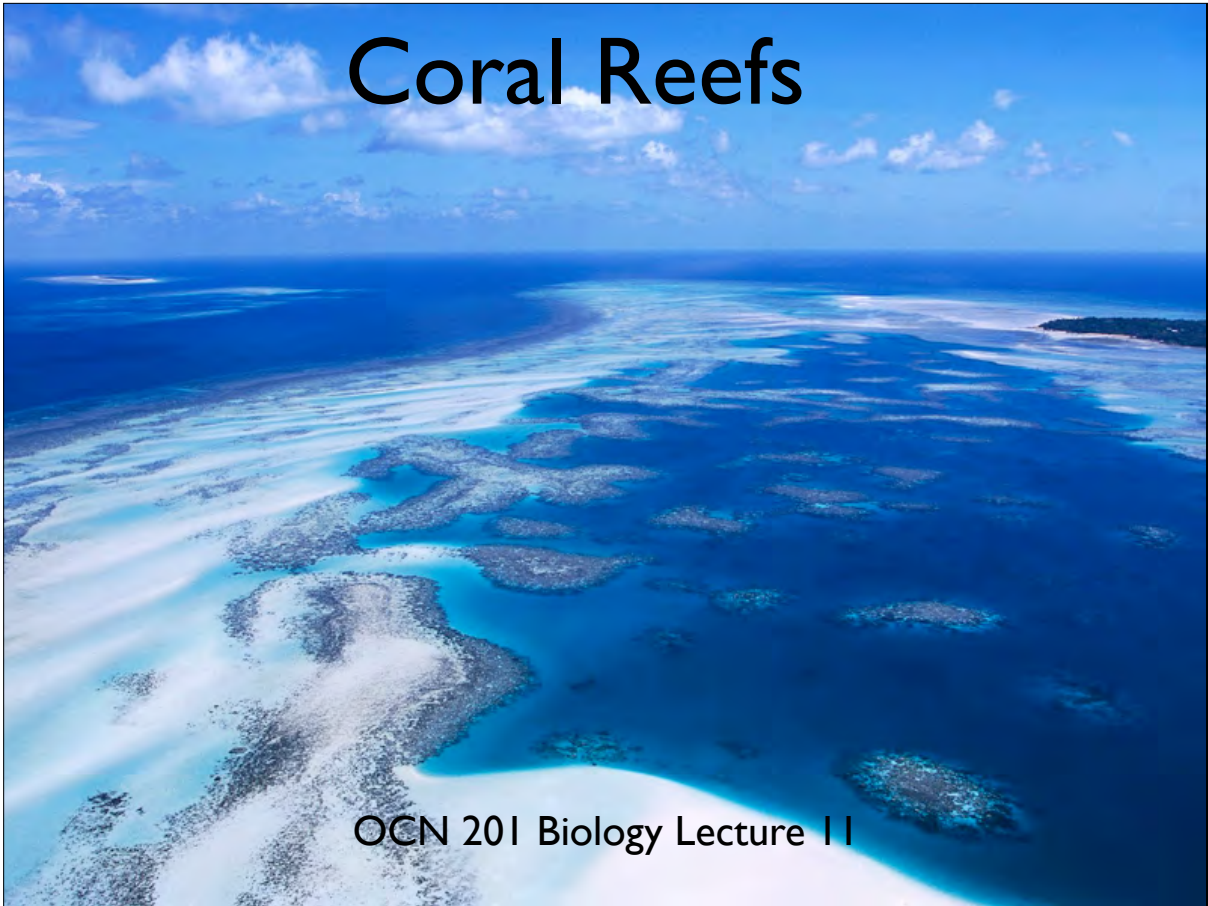


Coral Reefs

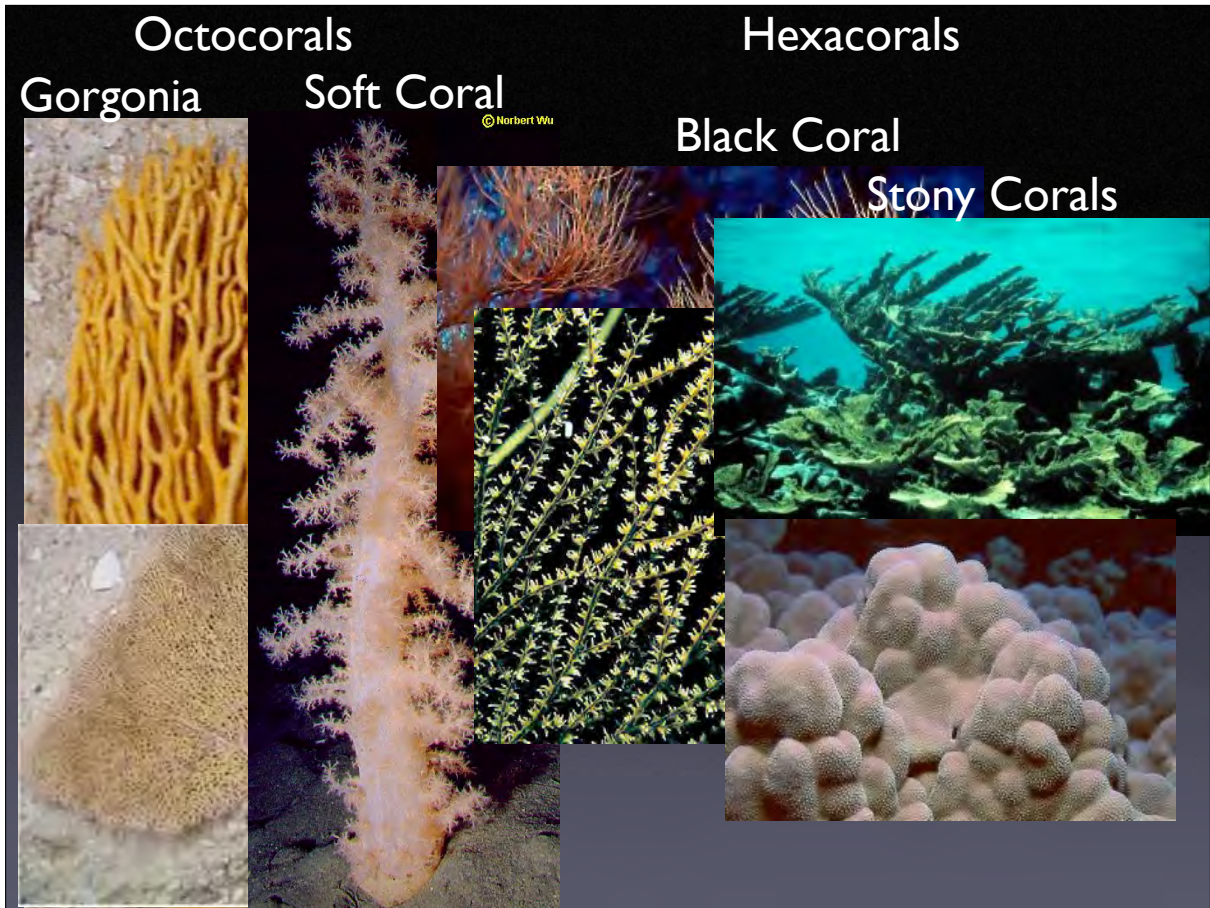


OCN 201 Biology Lecture 11

Corals - Main reef builders

- **Zoantharia/Hexacorallia** (multiples of 6 tentacles, solitary or colonial)
 - **stony corals (reef building)**, black coral, white coral, zoanthids, anemones
- **Octocorals** (8 tentacles, almost always colonial)
 - Gorgonians, Soft corals, Blue coral

sponges & calcareous algae also can be important reef builders & space occupiers

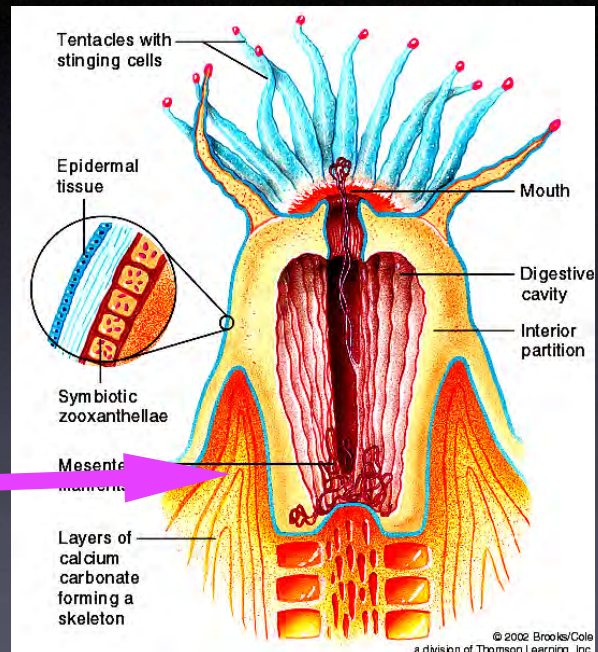


Reef-Building Coral Polyp

Hermatypic: Reef-builders secrete calcium carbonate skeleton

Have symbiotic zooxanthellae (photosynthetic dinoflagellates)

Calyx (or cup)



Symbiosis

- Coral ingests small fish, zooplankton, and supplies nutrients to the symbiont
- Zooxanthellae photosynthesize and provide carbon to the host coral

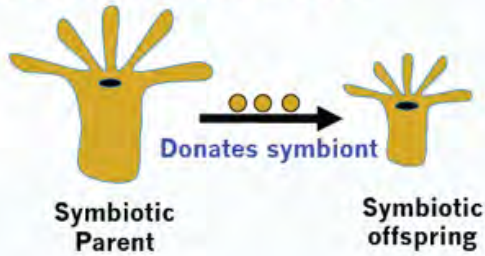


Zooxanthellae

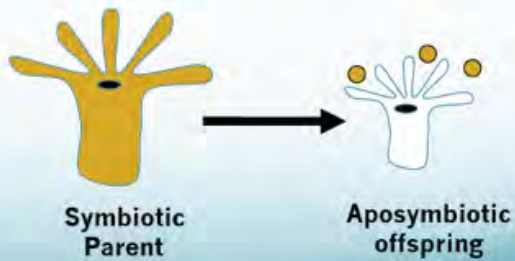
- Are held in endodermal cells, in a compartment called a symbiosome
- are genetically and physiologically diverse, with the particular type present related to the environmental regime

Transmission

“Closed” or Vertical Transmission

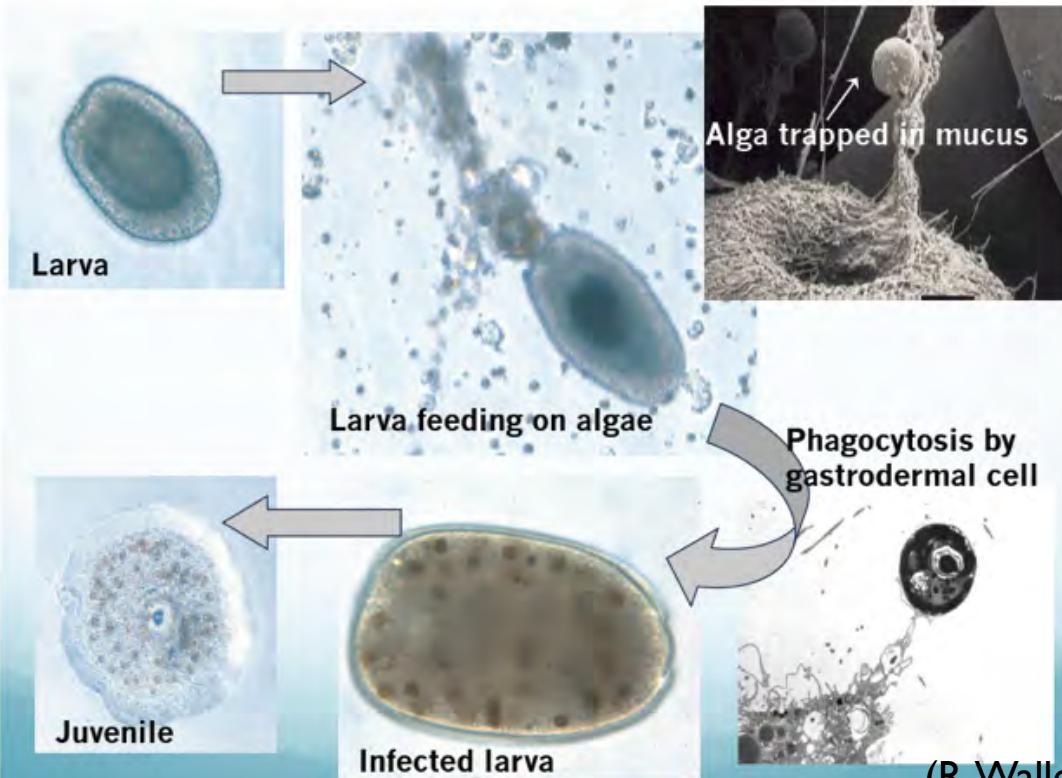


“Open” or Horizontal Transmission



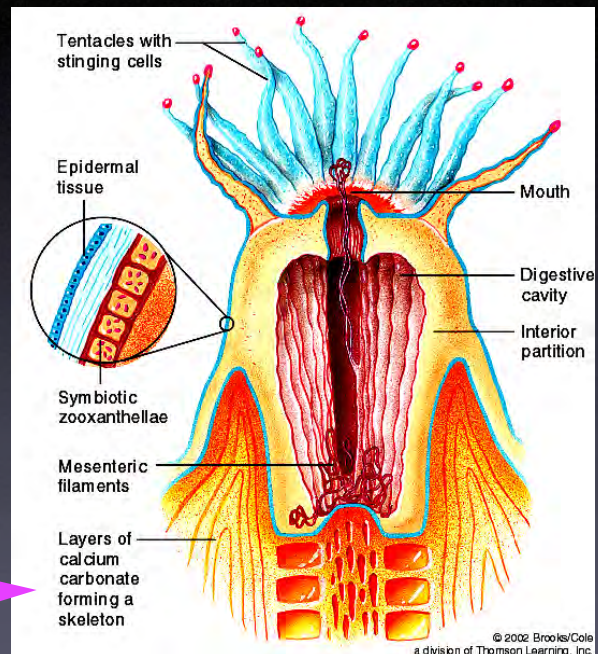
more common

(R. Waller)



(R. Waller)

Reef-Building Coral Polyp



coral growth



Growth

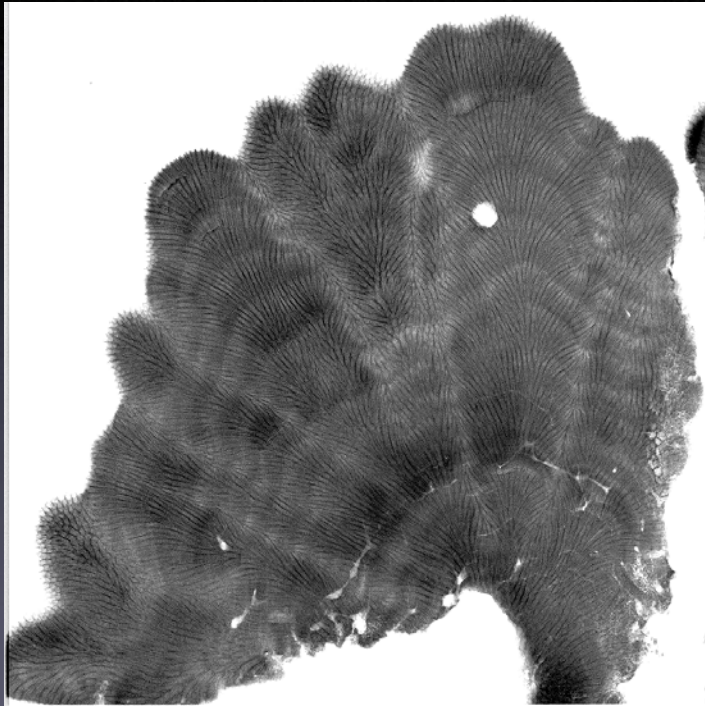
- Polyp secretes calcium carbonate underneath
- Occasionally will lift up and create a new floor (basal plate), leaving a trapped space
- Coral growth varies with temperature, light (depth), colony age and size, as well as across species. Slow growing ~ 1-10 cm/yr
- Other processes contribute to growth rate of entire reef system: e.g., physical erosion & bioerosion, growth of multiple species

X-ray of coral section

Coral bands indicate:

- Age (# bands)
- Growth rate
(band width)

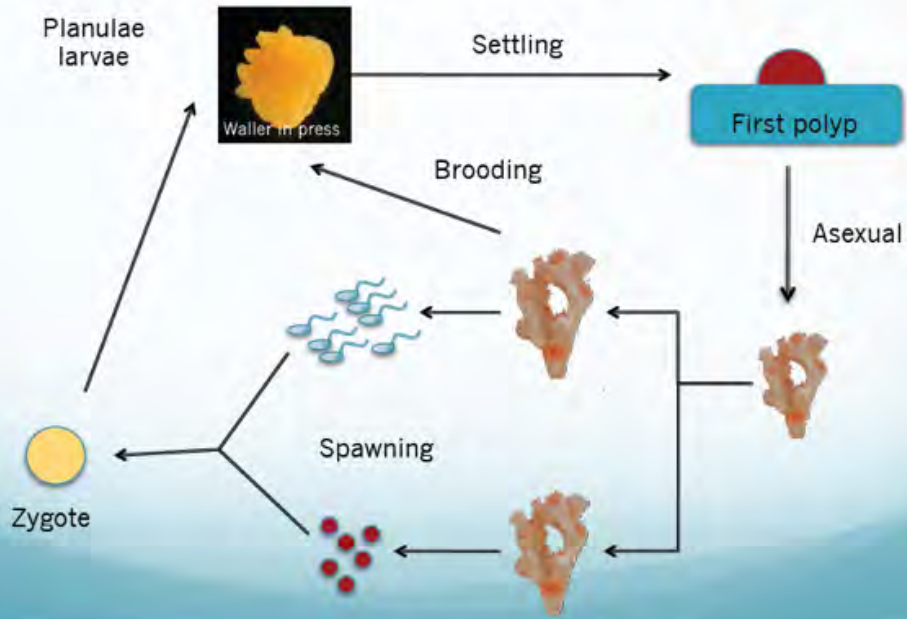
used for climate
reconstruction



Reproduction

- Reproduction is frequently by synchronized broadcast fertilization (release of eggs and sperm into water)
- Fertilized eggs develop into larvae
- Many settle quickly, but can stay in plankton for 60 days or more - dispersal by currents
- Settlement is controlled by chemical cues
- Settled larvae develops into polyp and forms colony

Colonial Coral Life Cycle



(R. Waller)

Coral Reproduction and Growth

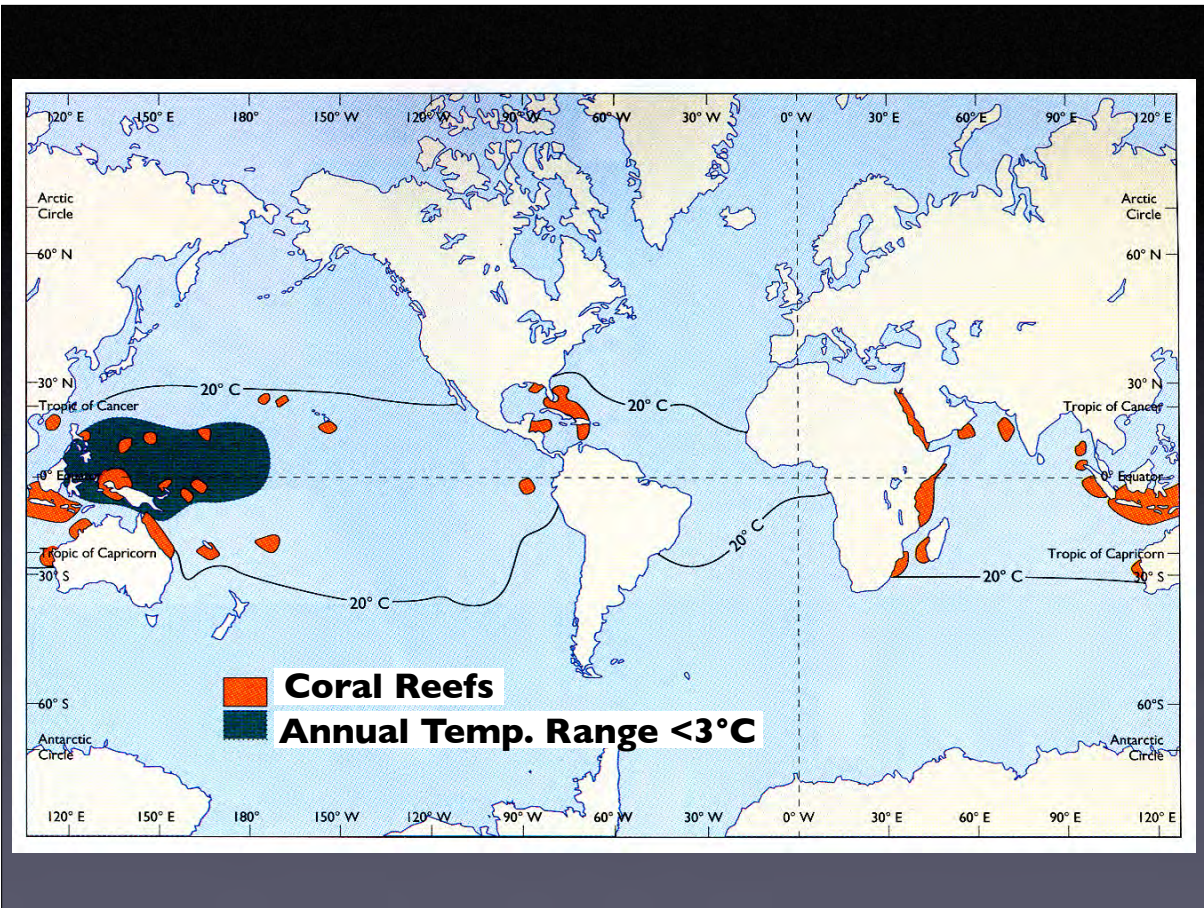


Coral Reef Habitat

- Reefs are the foundation of incredibly complex communities
 - more species, more feeding modes, more methods of reproduction, growth, predation, symbiosis, and locomotion than in any other marine ecosystem
- The reef provides structure that **shelters** diverse creatures and primary productivity that provides **food**

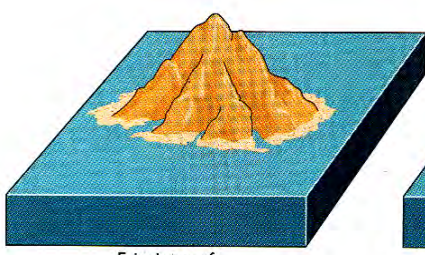
Coral Reef Distribution

- Found in tropical, nutrient-poor areas
- Where water temperature does not go below 18°C
- Higher diversity at western side of the ocean basins



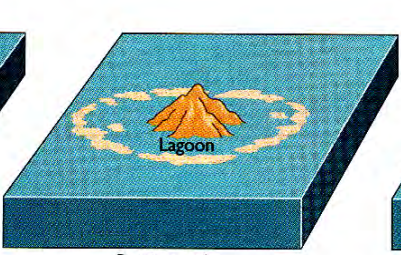
Reef Types

Fringing



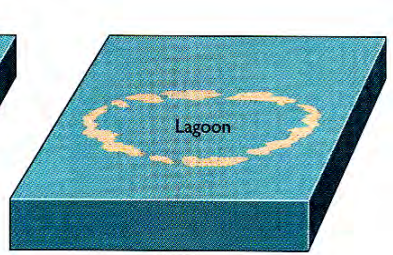
Fringing reef

Barrier



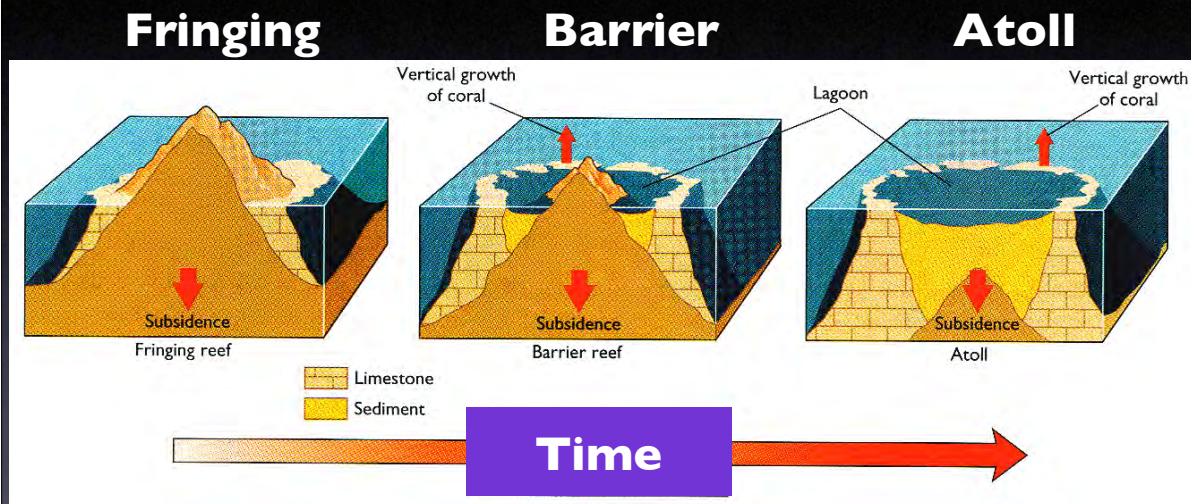
Barrier reef

Atoll



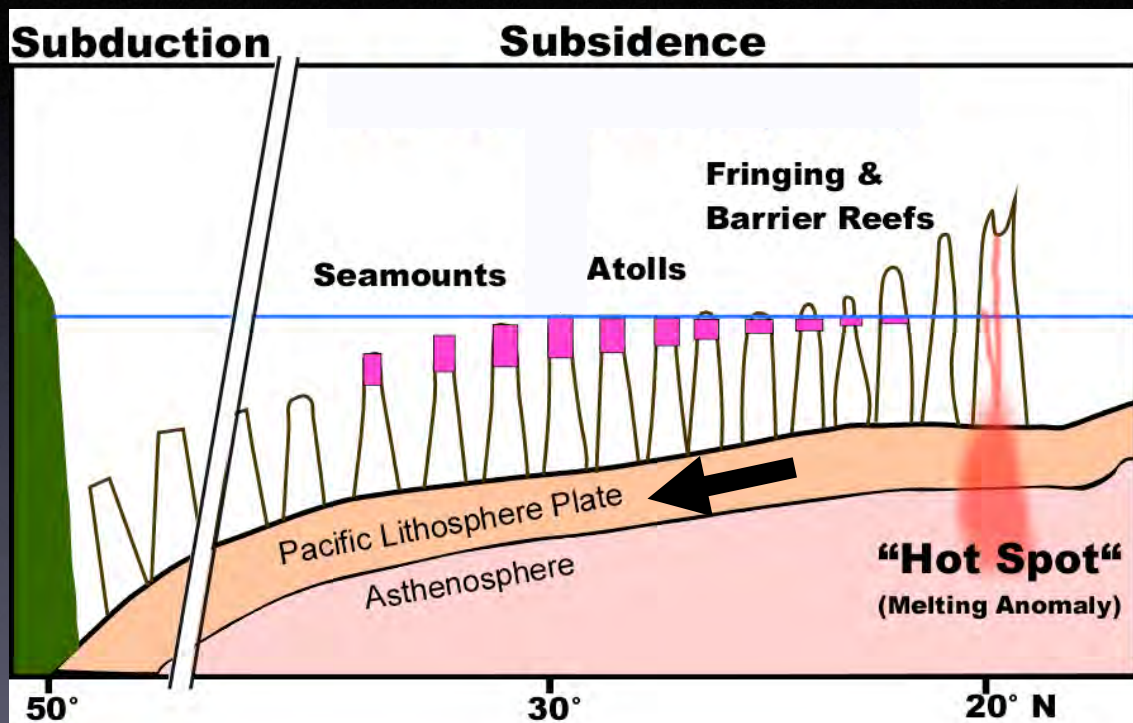
Atoll

Evolution of Island Reefs



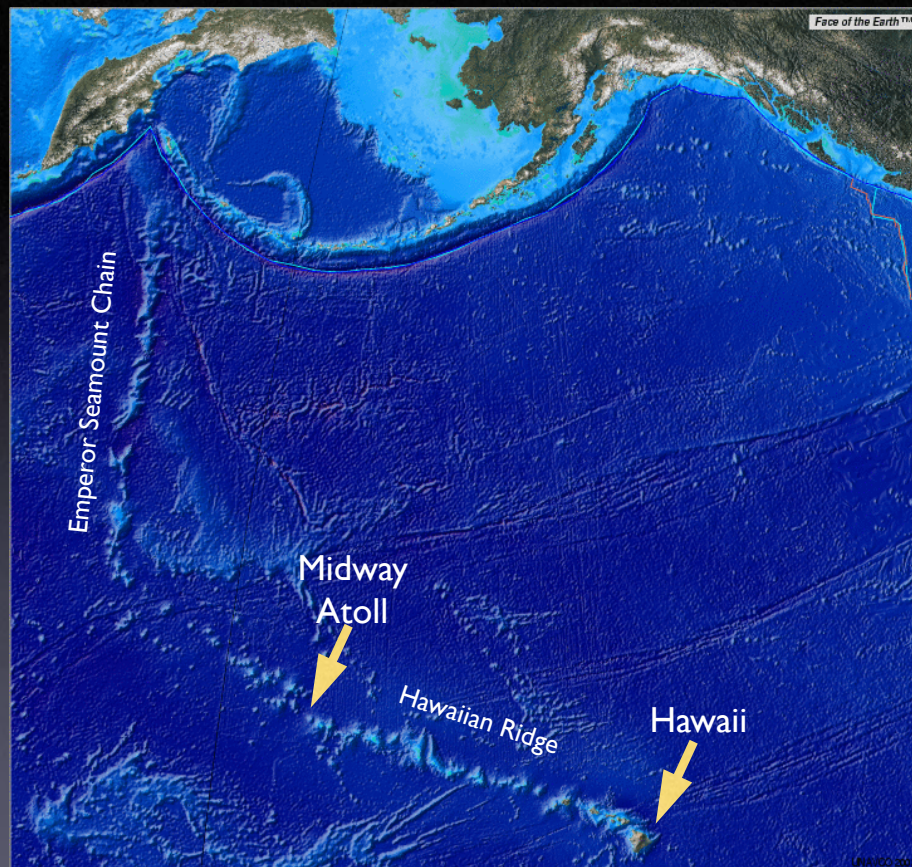
Eventually Atoll Drowns

The Darwin Point



The Darwin Point

- Volcanic Islands ride the Pacific Plate northward into cooler waters
- Growth rate declines until it can no longer keep up with subsidence
- Critical Point (Darwin Point) is where the reef growth is slower than subsidence





Human impacts on corals

Warming bleaches Great Barrier Reef corals for second year in a row

Posted on April 12, 2017 by Brooks Bays



A bleached coral near the Great Barrier Reef on 16 March 2017. Image courtesy of Reuters.

Human impacts on corals

- **Global climate change**
 - Warming leads to coral bleaching
 - Acidification dissolves coral skeletons
- **Coastal runoff and sedimentation**
 - industrial discharge, no sewage treatment, land use changes
 - excess nutrients = excess algae; blocks light, inhibiting coral growth
 - sediment from deforestation, dredging

Questions?