Week Seven Oceanography Notes
October 22 and October 24, NO CLASS OCT 26

October 22

Tides

Lighter class today. We watched **Blue Planet, Season 1, Episode Seven: Tidal Seas.** It is available on Netflix. Here are some noted from what we discussed in class :)

- Tides
    - Forced waves by gravity
    - Moon and sun affect them, but moon more important than sun because of proximity to Earth
    - Neap Tide: Small Tide, usually when Sun and Moon are out of sync, forces pulling in different directions
    - Spring Tide: Bigger tide, when Sun and Moon line up, a lot of gravitational pull
    - Sun further away from the Earth, moon closer
    - Distance and mass matters because the moon is closer, Lunar day is longer (24h 50m)
    - **Diurnal** and **semidiurnal** tides
- After this we started watching Blue Planet, Season 1 Episode 7.

If anyone doesn't have Netflix that was absent, I'm fairly certain the episode is also on YouTube!

Class 10.24.18

Marine Ecology Overview

- Ecology comes from the Greek "oikos" (not the yogurt) meaning "house"
- Ecology is "the study of organisms at home"
- It's all about understanding animals in a system

**Ecology: the study of inter-relationships between the physical and biological aspects of the environment, including abiotic and biotic factors**

- How organisms adapt to and alter their environment
- The ocean is one big environment, all organisms in it are linked directly or indirectly.
- What's Life?
    - Reproduction
    - Growth
    - Waste
    - Homeostasis
    - Response to stimuli
- Life:
    - Capture, store, and transmit energy
    - Capable of reproduction

    - Adapts to environment
    - Changes over time
- Viruses: Are they alive? This is up for debate: how much energy do they produce and transmit? Does their reproduction habit disqualify them? (occupying a host)
- Mad Cow Disease
    - Prions
    - Unfolding other proteins in the brain
    - Changing the protein structure
    - Cannibalism, infected meat have prions, cause mad cow disease
- Marine Provinces
    - Pelagic: Water column
    - Benthic/ Benthos: Bottom (at any depth)
        - These two interact a lot, especially in shallow water, close proximity
        - Interaction decreases as depth increases
    - A lot more food available in shallow zone
- Zones of the Sea (There is a very helpful song about this in Finding Nemo if anyone is interested)
    - Pelagic
        - Epipelagic (200m)
        - Mesopelagic (200-1000m)
        - Bathypelagic (1000-2000m)
        - Abyssopelagic (2000-6000m)
        - Hadal Zone (> 6000m)
    - Benthic
        - Littoral (Intertidal)
        - Sublittoral (0-200m)
        - Bathyl (200-2000m)
        - Abyssal (2000-6000m)
        - Hadal (>6000m)
- There is a lot of life in the shallow area and it decreases with increasing depth and decreasing food availability as you move away from shore.

- Classifying the Ocean by Light
    - Most of the light from the sun is gone within the top 100m of the Ocean.
    - After 500m, there is no light.
    - ZONES
        - **Photic Zone**: Depth where light is sufficient for photosynthesis. Also called the euphotic zone. It's range is approx. 0-100m, but can **disappear quicker in shallower areas especially where there is a lot of stuff in the water.** Think about how much a red tide could hinder photosynthesis even in a really shallow area. On the other hand, the euphotic zone can last longer in clearer water, like tropical ocean.

        - **Dysphotic Zone:** Illumination is too weak for photosynthesis, but there is still a little light. Range varies. Also called the Twilight Zone.
        - **Aphotic Zone:** No light from the surface reaches here, all absorbed by the water above.
        - New: **Rariphotic Zone, b/w 100-300m**
- How many species live in the ocean?
    - Over 250k catalogued
    - Anywhere between 750k to 1 million species to be found and many scientists think this is low-balling it
    - We are finding new things all the time!
    - Christmas Tree Worm, Vampire Squid both crazy finds
- Oceanic life is classified by evolutionary heritage
    - Taxonomy
    - Archaea: relatively new
- Linnaeus 1735: invents taxonomic classification used in zoology, descending from more inclusive to less inclusive
    - Kingdom
    - Phylum
    - Class
    - Order
    - Family
    - Genus
    - Species
- Species name: Genus Name (capitalized), trivial name lowercase
- Phylogenetic tree of life
    - Prokaryotes and Eukaryotes
        - Pro: No nucleus, bacteria, no organelles, single DNA, circular molecule
        - Eu: Nucleus, organelles

Carl Woese

- Physicist
- Has better idea about classification, looking at DNA encoding
- Blueprints through DNA
- 16s rRNA genes, sub-unit of a ribosome

Conserved Molecular component: No matter your species, you have a 16s rRNA

- Archaea are added: missing group of organisms
- Archaea are more closely related to Euk. although they look like Pro.
- Proposed in 1977, officially become a domain in 1990

Many leading biologists thought that Woese was crazy

Archaea

- Differ from bacteria
- Form and structure of ribosomes
- Type linkage of lipids

- Cell structure
- RNA, ribosomes
- Cannot be classified as Euk. or Pro., although they are closer to Euk.
- It is believed that our common ancestor is an Archaea
    - They can live in extreme environments
    - Can make methane
    - Super hot or super cold, really basic or acidic conditions
- Bacteria
    - Spirilla, Bacilli, Cocci (There are images of these shapes in the slides)
    - Usually Unicellular
- Phytoplankton
    - Seawater dwellers, super busy and full of life
    - Copepods: fat sac and oil sac
    - Diatom
    - Spicule
    - Zooplankton
    - Egg sac
- Autotrophs
    - No sustained horizontal movement
    - Phytoplankton
    - Make their own food
    - Photosynthesizing
- Heterotrophs
    - Zooplankton
    - Animals
    - Larval (fish larvae, Ichthyoplankton)
    - Eat autotrophs
    - Not plankton forever
- Nekton
    - Active swimmers (you)
    - Fish, sea turtles, giant squid, etc.
- Plankton: greek for aimless wanderer, drifter
    - Viruses, bacteria, phytoplankton, zooplankton
    - Found anywhere in ocean
    - Vary in size, from picoplankton (really tiny) to megaplankton (really big, Jellyfish)

**NO CLASS ON OCTOBER 26.**