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GEOL 117 Class 31

Some sections omitted 2008- covered in grey

MARINE ORGANISMS AND ENVIRONMENTS

Taxonomic classification

Diversity and distribution of species

Ecological classification of organisms

Marine environmental zones

Taxonomic classification - - reflects evolutionary relationships.

Domain (Kingdom)

Phylum

Class

Order

Family

Genus

Species -- the fundamental category.

Any individual of a species possesses the essential distinguishing characteristic of that species.

Five Kingdoms

1. Monera: unicellular bacteria, archaea
photosynthesizing bacteria (blue-green algae)
2. Protocista: unicellular but more complex;
planktonic algae and protozoans of the ocean
3. Fungi: plant-like, but do not photosynthesize
4. Plantae: Multicellular plants
5. Animalia: Multicellular animals

Diversity of life forms

- 1.5 millions species of plants and animals are known.
- ~5-30 million remain to be identified!

Characterizing organisms by reading their DNA sequences

- DNA sequence holds the information needed to build and maintain an organism
- Sequence of base pairs codes for proteins, enzymes, etc.
- We can read this code for various organisms to determine how closely related they are
- HUGE differences in the genetic code between various single-celled organisms (less among animals)
 - Humans more closely related to fungi than fungi are to archaea

Distribution of species

Animals = 1,200,000 total

Land: 80% (majority are insects)

Oceans: 20%, or ~200,000

Only 5 % of these Inhabit the water column

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MOST Inhabit the bottom

- Plants (including algae) = 300,000 total
- Land: 96 % (dominated by flowering, higher plants)
- Ocean: 4 %, or 11,000 (almost all planktonic algae)

Important note: Majority of marine "plants" are quite different from their terrestrial counterparts.

Microorganisms (e.g., Bacteria) are VERY important

- 1) e.g., 10^6 cells in every ml of natural water
- 2) found in extreme environments (cold, acidic, hot etc.)
- 3) account for 50%(?) of all organic matter on earth
- 4) ***the primary recycling agents***

Organism-Environment Relationships

The shape, size, color, behavior, etc. of every organism depends on the environment in which it lives and its place (niche) in the ecosystem

Essential strategies for all organisms:

- Obtain or make food
- Avoid being eaten
- Reproduce

Meeting those requirements dictates

... where organisms live -- habitat

... how they obtain food -- nutrition

Nutrition: Two basic ways living organisms can obtain food/energy

(A) Autotrophs: make food.... VERY IMPORTANT

Photosynthesizers- use sunlight

Chemosynthesizers- use chemical energy

(B) Heterotrophs: eat food made by others

- Herbivores: eat plants
- Carnivores: eat animals
- Detritivores: eat detritus

Habitat and Mobility ("Life Mode")

(A) Pelagic -- live in the water column

- **Planktonic:** float or drift in surface waters
- **Nektonic:** swimmers

(B) Benthic -- live on the bottom

- **Epifauna:** at the surface
 - Mobile -- crawl or swim
 - Sessile -- attached
- **Infauna:** within the sediment -- burrowers

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Marine Environmental Zones

Environment depends strongly on depth:

1. Availability of ...
 - ... sunlight (autotrophs)
 - ... food (heterotrophs)
2. Variations in ...
 - ... T and S
 - ... nature of the bottom -- rocky, muddy, etc.

Oceanic Zones

1. Open ocean, "deep sea"

Not much diversity

Pelagic

Photic Zone (upper 200 m) -- much activity

Deeper pelagic zones -- food very limited

Benthic

Low availability of food

Not much activity

2. Coastal Zones . . more variable environments

Photic zone reaches the bottom

Abundant pelagic and benthic organisms

Benthic- strongly differing environments depending on water depth

Subtidal: Below low tide

Intertidal: Stressful--but populous

Supratidal ("splash")