

Classifying Aquatic Organisms: Ch. 7

- The Species Concept
- Classifying Species
 - Taxonomically
 - Functionally
 - Source of carbon
 - Feeding mode
 - Interactions with other species
 - By habitat

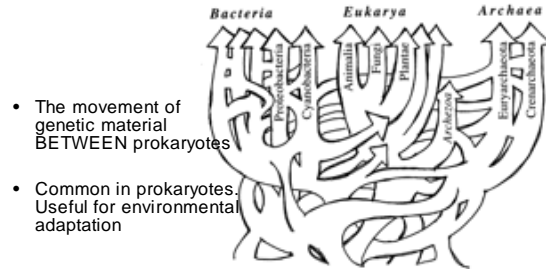
What do you think?

- Opening sentence: "Correct identification of freshwater organisms is essential to understanding their ecology?"
- "This evolutionary innovation (Serial endosymbiosis) occurred several billion years ago and vastly increased the complexity of organisms"

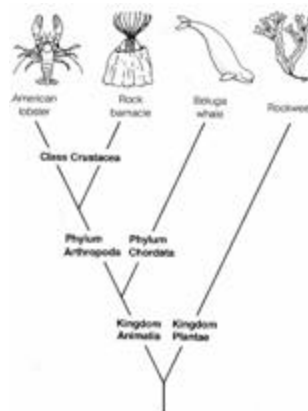
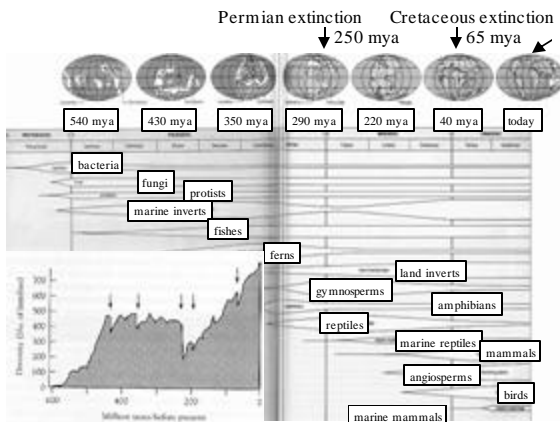
The Species Concept

- How do you define species?
- Biological Species Concept: a group of potentially or actually interbreeding populations that are reproductively isolated from all other populations?
- Operational Species Definition: a group of organisms that more closely resemble each other, with respect to their physical appearance (morphology) physiology, behavior, and reproductive patterns than they resemble any other organism
- Utilitarian species definition: a species may be considered distinct if the majority of the systematists studying the group of organisms agree that it is a distinct species
- Molecular techniques (rRNA, DNA, lipids, secondary metabolites)
- Problems with each of these schemes?
 - Hybridization
 - Asexual reproduction
 - Horizontal gene transfer among different taxa
 - Heteromorphic life histories
 - Phenotypic plasticity
 - Always suspicious of panel of experts
- Is it necessary to have a definition for species?

Horizontal Gene Transfer



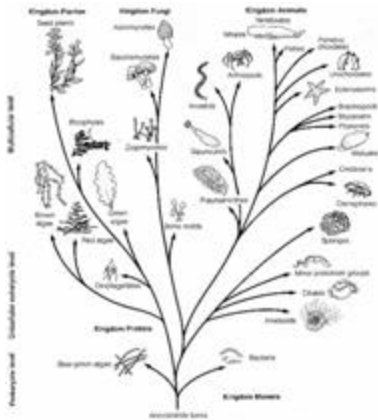
Doolittle, 1997



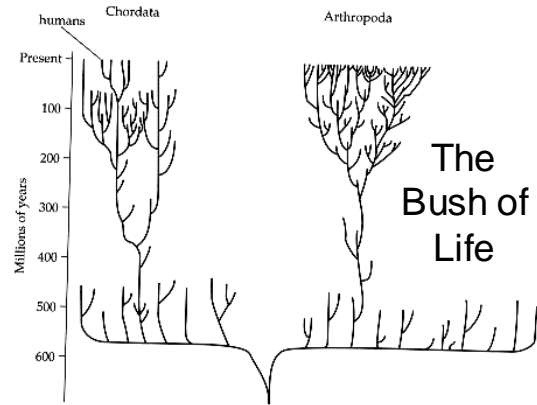
Linnaean system of naming organisms

Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Primate
Family	Hominae
Genus	Homo
Species	sapiens

<http://phylogeny.arizona.edu/tree/phylogeny.html>



The Tree of Life



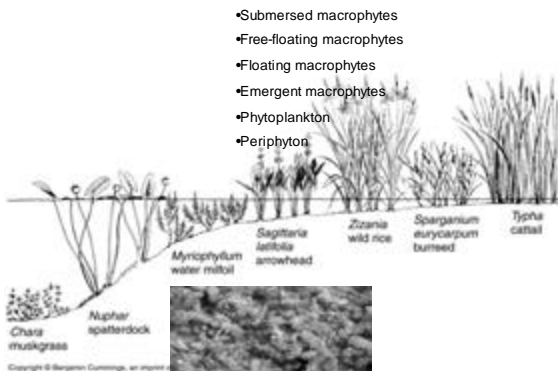
Classification of Organisms by Functional Significance

- How do they obtain carbon?
 - Autotrophic versus heterotrophic
 - Mixitrophy
- Autotrophs
 - Chemoautotrophic
 - Photoautotrophic
- Heterotrophs
 - Detritivory
 - Predation
- Functional feeding groups

Some chemoautotrophic bacteria

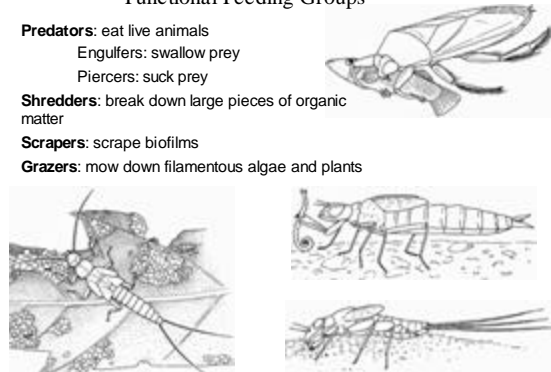
- Energy is released when a substance is oxidized
- Oxidation of ammonia: Nitrifying bacteria
- Oxidation of methane: Methanotrophic bacteria
- Oxidation of sulfide: 'sulfide oxidizing bacteria' such as thermal vent bacteria and acid-mine drainage bacteria
- Oxidation of metals such as iron: bacteria

Photoautotrophs functional groups



Functional Feeding Groups

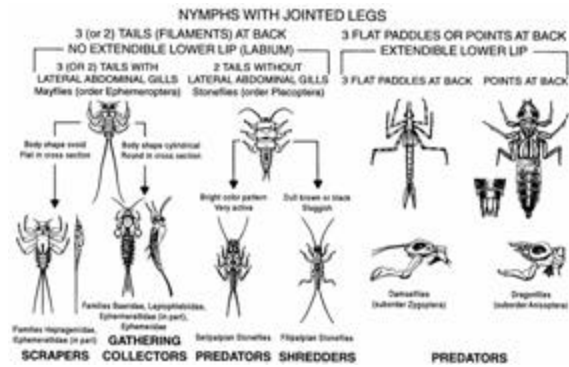
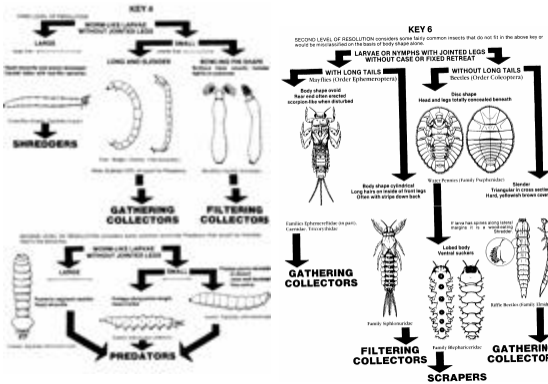
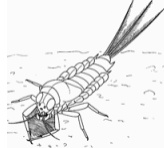
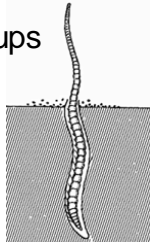
- Predators:** eat live animals
- Engulfers:** swallow prey
- Piercers:** suck prey
- Shredders:** break down large pieces of organic matter
- Scrapers:** scrape biofilms
- Grazers:** mow down filamentous algae and plants



Functional Feeding Groups

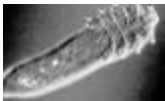
Collectors

- **Filters:** sieve particles out of the water column; suspension feeders
- **Gatherers:** acquire nourishment from small particles in the benthos; deposit feeders



Species-Species Interactions

Species A

		Species A		
		Harmed	No Effect	Benefit
Species B	Harmed	Competition both species compete for limiting resource	Amensalism asymmetric competition for limiting resource	Predation Parasitism Herbivory Species A eats Species B
	No Effect		Neutralism most species interactions	Commensalism plants benefit from decomposers; follicle mite
	Benefit			Mutualism zoxanthellae and coral; fungus and algae in lichen

Classification by Direct Interaction Type

- Competition -/-
- Mutualism +/+
- Exploitation +/-
- Commensalism +/-
- Amensalism -/0
- Neutralism 0/0