The Classification of Living Things

Reasons for Classification

- Common basis for communication about different groups of living things.
- Human attempt to make sense of the tremendous diversity of the living world.
- Imply evolutionary relationships (phylogeny).

Classification (Taxonomy) & Nomenclature (Naming)

Example of Coral Classification

Phylum Cnidaria
Class Anthozoa
Order Scleractinia
Family Fungiidae
Genus Fungia
Species scutaria

The Mushroom Coral
Fungia scutaria

Traditional Kingdoms of Life

The Plant Kingdom & The Animal Kingdom

Classification

Carl von Linne
Carolus Linnaeus
1707 -1765

Traditional Kingdoms of Life

The Plant Kingdom
& The Animal Kingdom
Five Kingdoms of Life

Kingdom Monera

- Prokaryotic, single-celled organisms.
- While not very diverse morphologically, they are very diverse at the biochemical level, including heterotrophic, photoautotrophic, and chemoautotrophic species.
- Some with cell walls, but cell walls composed of peptidoglycan, not cellulose (as in higher plants).
- Includes heterotrophic eubacteria, cyanobacteria, and archaeobacteria.

Kingdom Monera

Heterotrophic Eubacteria

Cyanobacteria

Major Characteristics Used to Classify Organisms into Kingdoms

- Cell Structure
  - Prokaryote versus Eukaryote
  - Cell Wall Present or Absent
  - Cell Wall Chemistry
  - Presence or Absence of other Organelles
- Cellularity
  - Unicellular versus Multicellular
- Level of Organization of Cells into Tissues
- Mode of Nutrition
  - Heterotrophy versus Autotrophy
  - Photoautotrophy versus Chemoautotrophy
  - Saprophytic versus Ingestive
Kingdom Protista
- Eukaryotic, generally single-celled, organisms.
- If multicellular, then cells not well-organized into tissues and organs (more colonies of cells).
- A very heterogeneous group include both heterotrophic and photoautotrophic forms.
- Includes protozoa (e.g., Paramecium, Amoeba, & Euglena, etc.) and algae (e.g., diatoms, dinoflagellates, Volvox, & most seaweed groups).

Kingdom Protista: Protozoa
- amoeba
- stentor
- vorticella
- paramecium

Kingdom Protista: Algae
- diatoms
- dinoflagellates
- volvox
- spirogyra

Kingdom Fungi
- Eukaryotic, generally multicellular, organisms (a few species, e.g., yeast are unicellular).
- Heterotrophic, saprophytic (absorptive) nutrition.
- Most with cell walls (usually composed of chitin) and complex life histories.
- Includes molds, yeasts, rusts, and mushrooms.
Kingdom Fungi
- Eukaryotic, multicellular organisms with cells organized into distinct tissues.
- Photoautotrophic nutrition.
- Most adapted for a terrestrial existence and possessing vascular tissues.
- Cells with chloroplasts and cellulose cell walls.
- Includes mosses, ferns, pine trees, cycads, ginkgos, and flowering plants.

Kingdom Plantae
- Eukaryotic, multicellular organisms with cells organized into distinct tissues.
- Photoautotrophic nutrition.
- Most adapted for a terrestrial existence and possessing vascular tissues.
- Cells with chloroplasts and cellulose cell walls.
- Includes mosses, ferns, pine trees, cycads, ginkgos, and flowering plants.

Kingdom Plantae
- Mosses, ferns, pine trees, cycads, ginkgos, and flowering plants.
- Sea grasses, mangroves.

Kingdom Animalia
- Eukaryotic, multicellular organisms with cells organized into distinct tissues.
- Heterotrophic, ingestive nutrition.
- Most exhibit significant capacity for locomotion.
- Cells not surrounded by cell walls.
- Includes sponges, sea anemones, snails, insects, sea stars, fish, reptiles, birds, and human beings.

Kingdom Animalia: Invertebrates
- Invertebrates include: insects, butterflies, snails, sea anemones, octopuses, and sponges.
What is a Species?

Typological Species

Definition based upon the morphological and anatomical characteristics of organisms.

Biological Species

Definition based upon the ability of organisms to interbreed and produce viable, fertile offspring.

Biological Nomenclature

A species is identified by both its genus name and specific name. Example: *Fungia scutaria*

*Fungia* = genus name
*scutaria* = specific name
Biological Nomenclature Rules

- No two different species with the same combination of genus and specific names.
- No species given more than one combination of genus and specific name.
- Genus name always capitalized & italicized (or underlined).
- Specific name not capitalized, but is always italicized (or underlined).

Examples of Scientific Names for Selected Species

**Bears**
- *Ursus arctos* Alaskan Brown Bear
- *Ursus maritimus* Polar Bear
- *Ursus americanus* American Black Bear

**Lobsters**
- *Homarus americanus* Atlantic Clawed Lobster
- *Panulirus marginatus* White-Margined Hawaiian Spiny Lobster
- *Panulirus penicillatus* Green Hawaiian Spiny Lobster