Zoology (2) (Basics of Animal Taxonomy)



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Agenda 1-Taxonomy – classification 2- important of Taxonomy 3- History of Taxonomy

Dr. Shereen Ahmed Fahmy

• Taxonomy is the science of grouping and naming organisms.

•The term taxonomy is a Greek word. Its components are taxis and nomos. While taxis means arrangement, nomos means <u>law</u>.

What is Classification?

- The grouping of information or objects based on similarities
- The classification of organisms into groups is known as biological taxonomy.
- Classification is also known as <u>taxonomy</u>
- Taxonomists are scientists that identify & name organisms

Classification of Animals

Scientists have divided the Animal Kingdom into two main groups:

VertebratesandInvertebrates(animals with(animals withouta backbone)a backbone)

Vertebrates

Animals with backbones can be divided into five main groups:



Vertebrates



Animals with a backbone.

Invertebrates













Animals without a backbone.

Why is taxonomy useful?

- 1) Helps prevent confusion among scientists
- 2) Helps to show how organisms are related
- 3) Can be used to reconstruct
 <u>phylogenesis</u> evolutionary histories
 of an organism or group

Chapter (1) History of Taxonomy

Early Taxonomists

- •1- Aristotle 2000 years ago(384-322BC), the Greek philosopher, Aristotle was the first taxonomist
- •he is considered as the <u>__father</u> of biological classification'.
- •Aristotle divided organisms into plants & animals



•He subdivided them by their habitat ---land, sea, or •air dwellers



Early Taxonomists

- •2- John Ray, the first work was carried out by John Ray (1627 -1705) of England.
- He divided animals into those with blood and those without blood.
- He also classified animals based on gills, lungs, claws, teeth and other structures.



Modern System: Hierarchy Seven Levels of Organization

3- Carolus Linnaeus (mid-1700(1707-1778) was a Swedish biologist who established a simple system for classifying and naming organisms.

He developed a Hierarchy for classifying organisms that is the **Basis for Modern Taxonomy.**

For this reason, he is considered to be "father" of modern taxonomy.



Modern System -Seven Levels of Organization

- **Linnaeus** used an organisms morphology (form and structure), to categorize it.
- His system is still being used today.
- His system allowed organisms to be grouped with similar organisms.
- He first divided all organisms into two Kingdoms, Plantae (Plants) AND Animalia (animals).
- This was the same as Aristotle's main categories.



Modern System -Seven Levels of Organization

Modern System:

- Each <u>kingdom</u> (plant and animal) was divided into a phylum*)
- Each <u>phylum</u> into a smaller groups called class.
- Each <u>class</u> was divided into an order.
- Each <u>order</u> was divided into family (families).
- Each <u>family</u> was divided into a genus
- Each <u>genus</u> was divided into a <u>species</u>. (scientific name)





Agenda 1- History of Taxonomy(continued) 2- basis of animal taxonomy

- quiz questions
- □ Why classification of animal is important ?
- **The originator of hierarchic system is.....**
- The taxonomist that classified animals based on gills, lungs, claws, teeth and other structures is.....

Modern System

4- Robert Harding Whittaker (1920 -1980) was a distinguished American plant ecologist.

He was the first to propose the five-kingdom of organisms taxonomic classification of the world's biota into the Animalia, Plantae, Fungi, Protista, and Monera in 1969.



Modern System

Basis of Five Kingdom Theory

The five kingdom classification is based on the following important criteria:

- 1. Complexity of the cell structure: Prokaryotic or Eukaryotic
- 2. Complexity of the organisms body : Unicellular or Multi cellular
- 3. Mode of obtaining nutrition : Autotrophs or Heterotrophs
- 4. Lifestyle
- 5. Phylogenetic relationships



Robert H. Whittaker (1969)



Classification is always a work in progress.

Monera

bacteria and cyanobacteria are prokaryotic







Protista

- single or colonies of eukaryotic cells (Amoeba, Paramecium)









Plantae

- eukaryotic, multicellular, and photosynthetic. Have cell wall, and usually nonmotile



Fungi

-eukaryotic and multicellular. Have cell wall and nonmotile. Mode of nutrition distinguishes fungi from plant- fungi digest extracellularly and absorb the breakdown products











Animalia

eukaryotic and multicellular, usually feed by ingesting other organisms, cell lack cell walls, and usually motile



Classification is always a work in progress.

Modern System

5-Carl Richard Woese (1928 – 2012)

American <u>microbiologist</u> and <u>biophysicist</u>. Woese is famous for defining the <u>Archaea</u> (a new <u>domain</u> of life) in 1977 by <u>phylogenetic taxonomy</u> of <u>16S ribosomal</u> <u>RNA</u>, a technique pioneered by Woese which revolutionized the discipline of microbiology.

He was also the originator of the <u>RNA world</u> <u>hypothesis</u> in 1967, although not by that name. He held the <u>Stanley O. Ikenberry</u> Chair and was professor of microbiology at the <u>University of Illinois at Urbana–</u> <u>Champaign</u>.





Kingdom **Phylum** Class Order Family Genus **Species Hierarchic system** (Carolus Linnaeus) of classification



Modern System

Synthesis: six kingdoms (Cavalier-Smith 1998)

 Superkingdom Prokaryota Kingdom Bacteria
 Superkingdom Eukaryota Kingdom Protozoa
 Kingdom Animalia
 Kingdom Fungi
 Kingdom Plantae
 Kingdom Chromista







Modern System CHROMISTA

WHAT IS 17? This kingdom consists of eukaryotic organisms that are plant-like because they contain chlorophyl WHAT DOES 17 INCLUDE?

PEPEROVE. A CELIA - Territak has Concerning of



Chromista

- 1. Slime moulds not really fungi
 - no hyphae
 - amoeboid phases
 - often coenocytic no cell walls to plasmodial stages

2. Those considered as fungi with motile stages

- have hyphae with walls of cellulose or other non-chitin material. (The Eumycota have chitin in the walls)
- have motile cells bearing flagellac
- hyphae are diploid

1-Hierarchic system of classification
2-Scientific nomenclature
Standardized Naming
3-Basis of animal kingdom
taxonomy (Basis of classification)

| Hierarc | hic syste | em of cla | ssificatio | on | |
|-------------|-----------|------------------|------------|-----------|--|
| Phylum | I | Phylum | | Phylum | |
| Subphylum | or | Class | or | Superclas | |
| Class | | | | Class | |
| | Exampl | les of subdivisi | on | | |
| Class | Class | | | | |
| Subclass | | | Order | | |
| Superord | er | or | | | |
| | Order | | | | |
| Order | | Ord | er | | |
| Superfamily | | UI | Family | | |
| Fan | uly | | | | |

Standardized Naming

- Binomial nomenclature used,
- Genus species
- Latin or Greek.
- Italicized in print
- Capitalize genus, but NOT species
- Underline when writing



Binomial Nomenclature



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Ailuropoda melanoleuca

Polar Bear Ursus maritimus Ursus arctos

Chapter (1)

Basis of animal kingdom taxonomy (Basis of classification)

Basis of animal kingdom taxonomy (Basis of classification)

1- Animal Organization

Animal Body Designs

- Animals are made up of a complex system of <u>cells</u>. Ex: sponges
- Cells grouped together make up <u>tissues</u>.ex:coelenterates
- Tissues grouped together make up <u>organs</u>.ex:Platyhelminthes
- Organs grouped together make up <u>organ systems</u>. e.g., Annelids, Arthropods



Anatomical Orientation



Anatomical Orientation



2- Body symmetry i- Asymmetry

cannot be divided into mirror images









A, fresh-water sponge ; B, a simple colonial marine sponge ; C, a simple solitary marine sponge ; D, a bath sponge. (After various authors.)

2- Radial Symmetry: can be cut in half along many planes that allow for nearly identical halves



What type of symmetry do each of the following exhibit?

What type of symmetry do each of the following exhibit?

Bilateral

Bilateral

Asymmetrical

Asymmetrical

Radial

Radial

7- Digestive System:

i-Incomplete digestive system – digestive system has only a single opening to the outside of the body that serves as both mouth and anus. **e.g., Coelenterates, Platyhelminthes**

ii-Complete digestive system – digestive system has two openings, mouth and anus. **e.g., aschelminthes to chordates**

8- Circulatory system: (ii) Closed type

(i) **Open type**

Open Blood Vascular System

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Closed Blood Vascular System

9- body skeleton

THANKS

THANKS