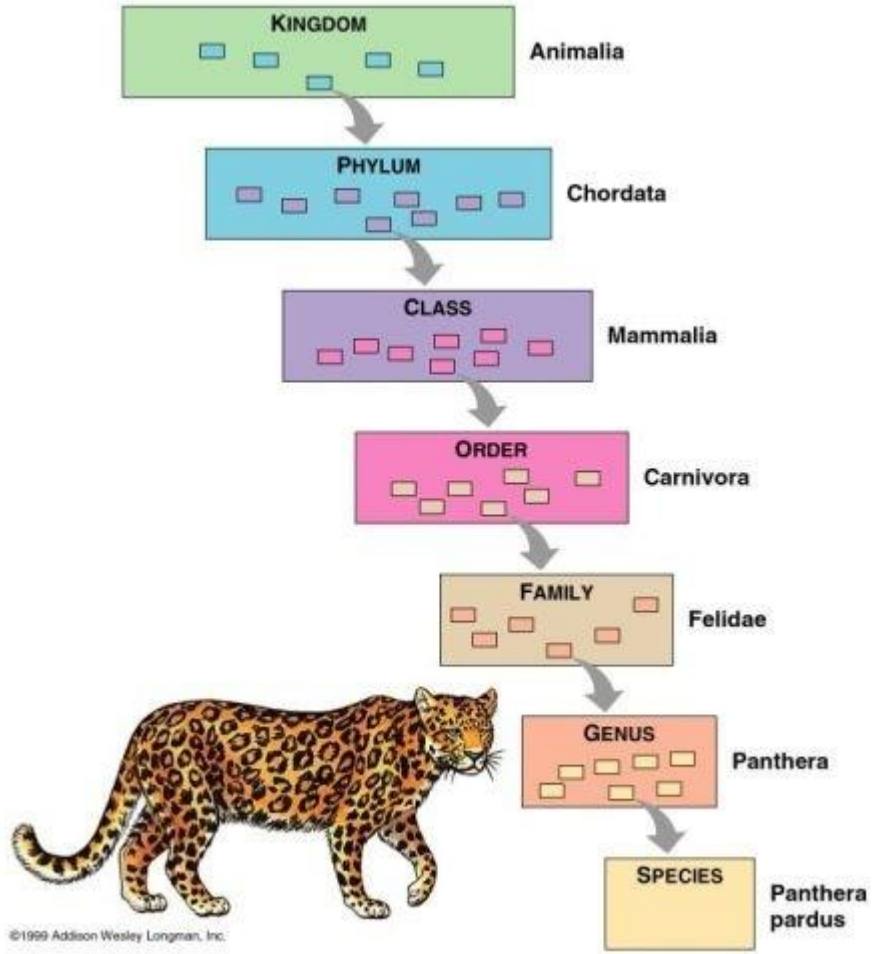

Concept of taxonomy & systematic

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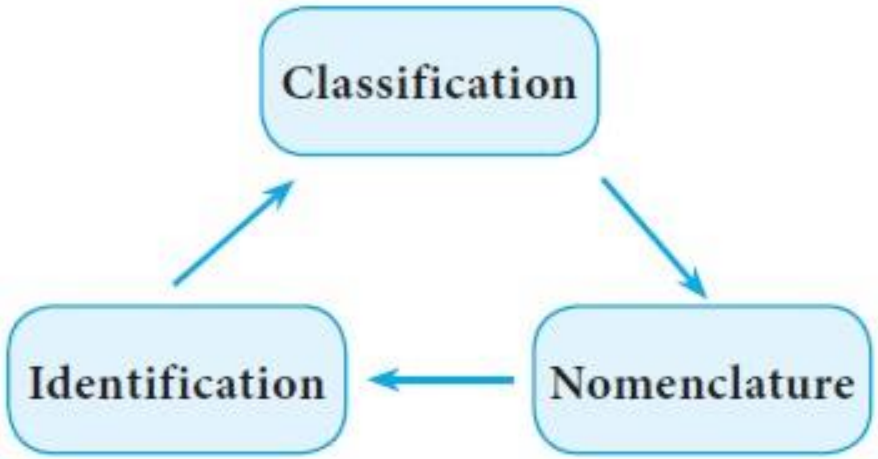
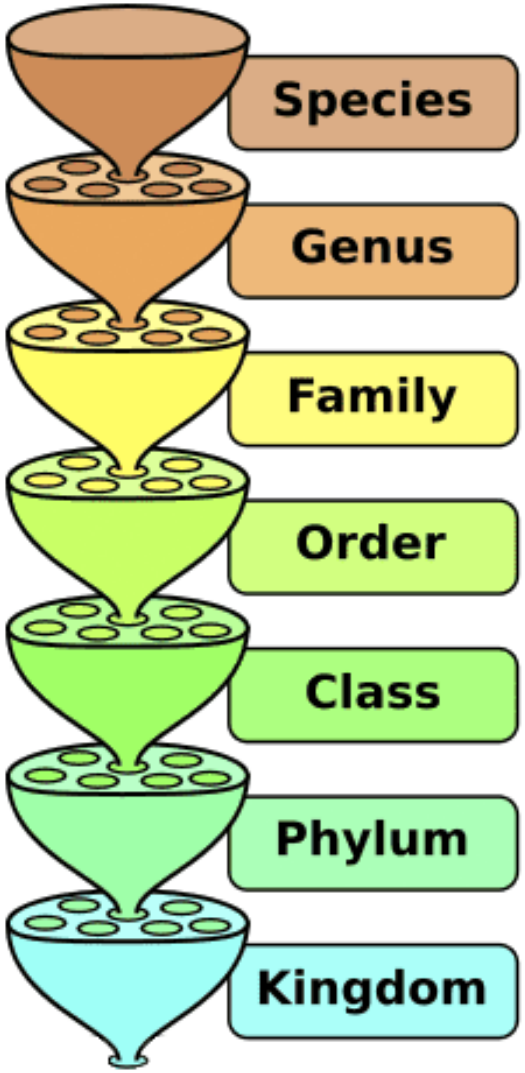
Introduction

- **Taxonomy** word derived from Greek- Taxis means arrangement and nomous means Law
- Taxonomy word given by AP De Candolle (1813)
- Taxonomy is the arrangement of organism on the basis of rules and principles.
- Father of taxonomy – Carolus Linnaeus (1707-1778)
- Step in taxonomy-
  - Identification
  - Nomenclature
  - Classification



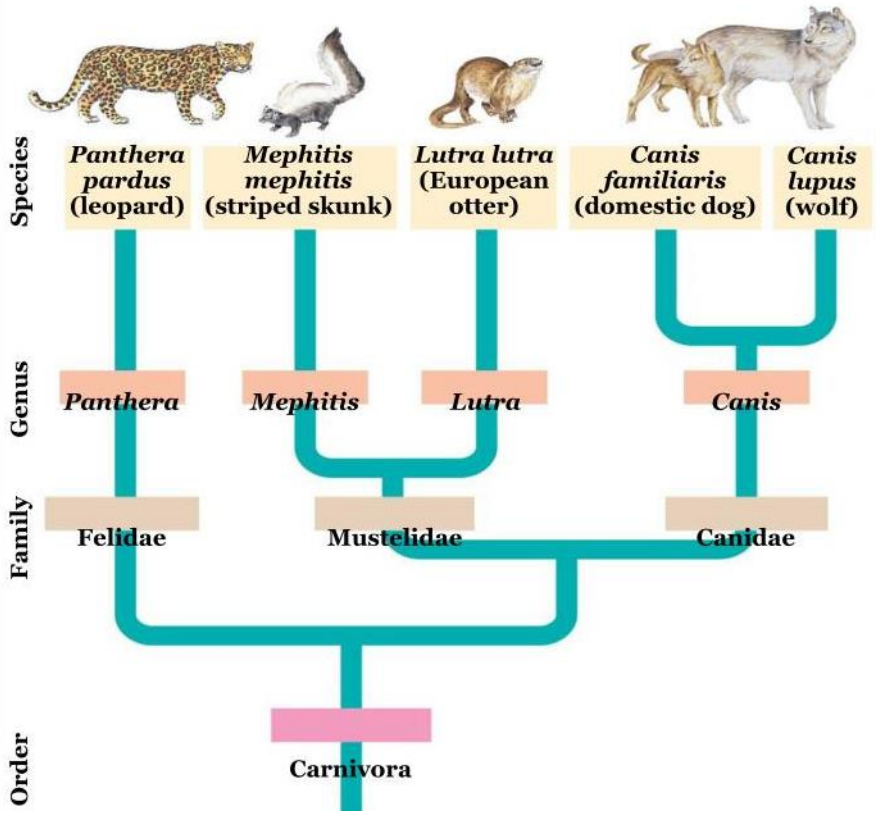
Introduction

- **Taxonomy** is the branch of biology that deals with the identification, nomenclature & classification of organisms
  - **IDENTIFICATION** – placing of new organism in previously described group
  - **NOMENCLATURE** – naming of organism
  - **CLASSIFICATION** – ordering of organism into group; can be phenetic or phylogenetic



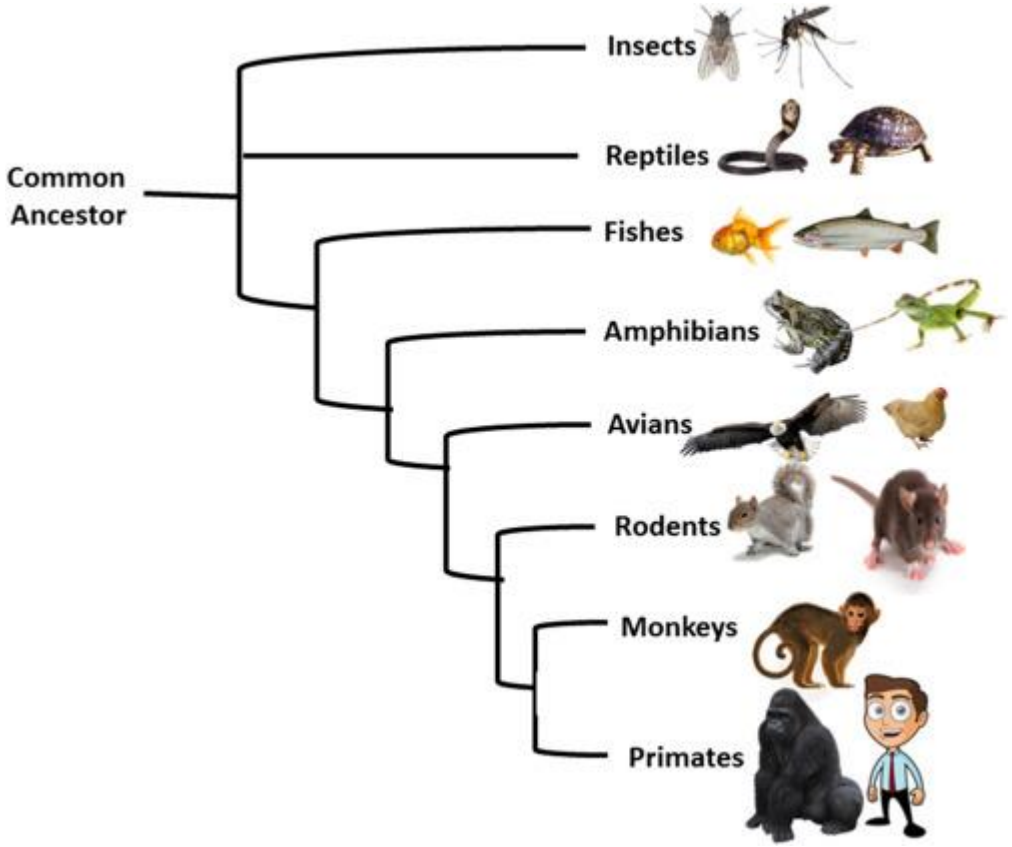
Introduction

- **Systematics-**
  - It is Greek word, Systema means System, means systematic arrangement of organism.
- The study of the diversity of the organism and the evolutionary relationship among them is called systematics.
- Step in Systematics-
  - Identification
  - Nomenclature
  - Classification
  - Phylogeny



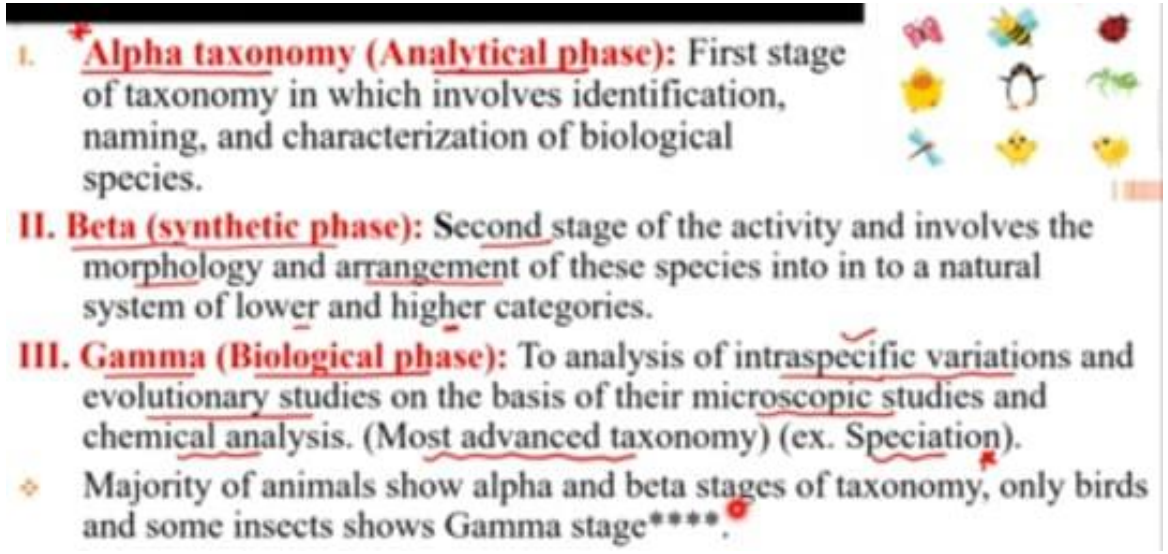
Introduction

- **Systematics-**
  - Organizing the taxonomic information about the organism into a logical classification that provides the framework for all comparative studies
  - Study of biological diversity and evolutionary history
  - Systematics + taxonomy = systematic biology



Introduction

- **Levels of taxonomy -**
  - **ALPHA TAXONOMY – includes species description, taxonomic keys, diagnoses**
  - **BETA TAXONOMY– includes identification of natural groups and biological classes.**
  - **GAMMA TAXONOMY – includes study of evolutionary processes and patterns**



Introduction

- Organisms – first classified – ARISTOTLE (2000 yrs. ago) – as plants and animals
- Modern biological classification – C. LINNAEUS - developed hierarchy (a ranking system) - basis of modern taxonomy
- A hierarchical system is used for classifying organisms to the species level.

- Robert Harding Whittaker (December 27, 1920 – October 20, 1980) was an American plant ecologist, active in the 1950s to the 1970s.
- He was the first to propose the five kingdom taxonomic classification of the world's biota into the Animalia, Plantae, Fungi, Protista, and Monera in 1969

Levels of classification or Taxonomic rankings

- The smallest taxon is species. Organisms that look alike and successfully interbreed belong to the same species.
- The next largest taxon is a genus—a group of similar species that have similar features and are closely related.

	Mnemonic
Kingdom	kings
Phylum	play
Class	cards
Order	on
Family	fine
Genus	green
Specific species	sofas

Levels of classification

- **Species** is a **natural population of individuals** or group of population which resemble one another in all essential morphological and also reproductive characters so that they are able to interbreed freely and produce fertile offspring.

	Mnemonic
Kingdom	kings
Phylum	play
Class	cards
Order	on
Family	fine
Genus	green
Specific species	sofas

Levels of classification

- **Genus-** it is a group or assemblage of relate species which resemble one another in certain correlated characters.
- All the species of genus are presumed to have evolved from a common ancestor.

	Mnemonic
Kingdom	kings
Phylum	play
Class	cards
Order	on
Family	fine
Genus	green
Specific species	sofas

Levels of classification

- **Family-** it is taxonomic category which contains one or more related genera.
- All the genera of a family have some common features or correlated characters.
- They are separable from genera of a related family because differences in both vegetative and reproductive features.

	Mnemonic
Kingdom	kings
Phylum	play
Class	cards
Order	on
Family	fine
Genus	green
Specific species	sofas

Levels of classification

- **Order-** the category includes one or more related families.
- **Class-** a class is made of one or more relates order.
- **Division or phylum-** it is a category higher than that of class.
- **Kingdom-** it is the highest taxonomic category.

	Mnemonic
Kingdom	kings
Phylum	play
Class	cards
Order	on
Family	fine
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Specific species	sofas

Aim

- Place organisms into logical categories system must be capable of being used for information recovery, so anyone can properly identify any organism
- Place organisms into categories that show ancestor-descendant relationships.

Aims and tasks of taxonomist

- 1. To catalogue and preserve the biodiversity collected from different sources.
- 2. To differentiate the variations among organisms and arranged them on the basis of their relationships or associations.
- 3. To provide scientific name to the taxa, so that one can recorded, stoe and retrieved when needed.
- 4. To establish a set of rules to choice characters for arranging species into hierarchic classification.
- 5. To study the genetic and phylogenetic relationships among life forms.
- 6. To make extensive use of computer to analyze and differentiate the intra and interspecific relationships among organisms.

Objectives of Taxonomy

- 1. Classifying organisms into taxa on the basis of similarities in phenotypic (phenetic) characteristics i.e. the characteristics which are expressed in an organism and can be examined visually.
- 2. Aassign each taxon a name, this naming of a taxon is known as nomenclature. Assigning a name to an organism is necessary for identifying it without confusion throughout the scientific world.
- 3. To serve as an instrument for identification of bacteria. A newly isolated organism can be assorted to its nearest associates.
- This makes taxonomy a dynamic branch of biology, because discovery of new organisms constantly demands changes in the existing classification.

Principle

- **Taxonomy,** the science and method of naming organisms, is a fundamental basis for all biological science and its application. The primary task of taxonomy is to describe, establish, and give an account of the order that is an inherent property of biological diversity.

- **Systematics,** the Phylogenetic Approach gives evolutionary relationships between groups. Uses morphological, genetic, and chemical characters to construct a phylogenetic tree, also called a “cladogram.”

Importance of taxonomy & systematics

- It helps us categorize organisms so we can more easily communicate biological information.
- Taxonomy uses hierarchical classification as a way to help scientists understand and organize the diversity of life on our planet.
- Systematics, or taxonomy, is the study of the diversity of life on Earth. Its goals are to discover and describe new biological diversity and to understand its evolutionary and biogeographic origins and relationships.
- Gives insight into biological processes: speciation processes, adaptation to environment.

History of animal's classification

- Democritus (470-380 B. C.) was the first Greek philosopher and scientist who attempted a classification of animals, based on presence or absence of red blood.
- Aristotle (384-322 B. C.) put forward the scheme of classification based on presence or absence of red blood, which followed Democritus's pattern of classification.

History of animal's classification

- He divided the animal kingdom into two major divisions
- I. Anaima:
  - This group included all the invertebrates which is characterized by the absence of red blood.
  - He recognized 3 classes under Anaima and three of these are Malakia, Malacostraca and Ostracoderma.
  - His 'Malakia' would be placed in present day's Cephalopoda, and Malacostraca with the Crustacea, and Ostracoderma contained several miscellaneous molluscs and certain representatives of lower phyla.

History of animal's classification

- He divided the animal kingdom into two major divisions
- **II. Enaima:**
  - This group included the vertebrates, having red blood.
  - The Enaima was again subdivided into two categories:

  - **A. Oviparous:**
  - It included the egg-laying vertebrates, e.g., the fishes, amphibians, reptiles and birds.

  - **B. Viviparous:**
  - This group on the other hand included the vertebrates where the young's are born alive, e.g., the mammals.

History of animal's classification

- Linnaeus (1707-1778) introduced a complete biological system of naming and classification of animals.
- Linnaeus divided the animal kingdom into several classes: Mammalia, Aves, Amphibia, Pisces, Insecta and Vermis.
- The class Vermis includes all invertebrates except the insects and is divided into the following orders: Intestina, Mollusca, Testacea (former order of rhizopods), Lithophyta (Plant) and Zoophyta.

Carl Linnaeus Work

Systema Naturae

The 1st edition of Systema Naturae in 1735. It was a twelve-page work

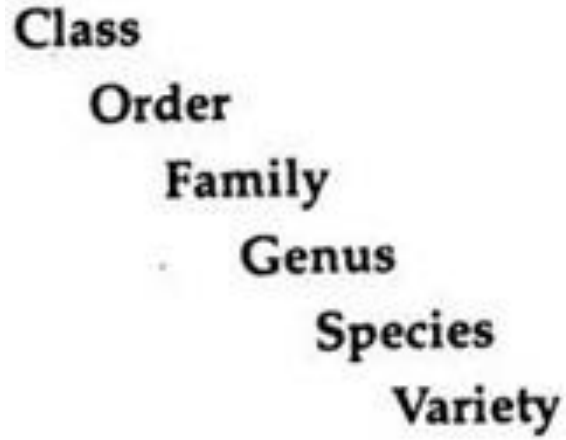
10th edition in 1758, It classified 4,400 species of animals and

7,700 species of plants.

Linnaean System of Classification:

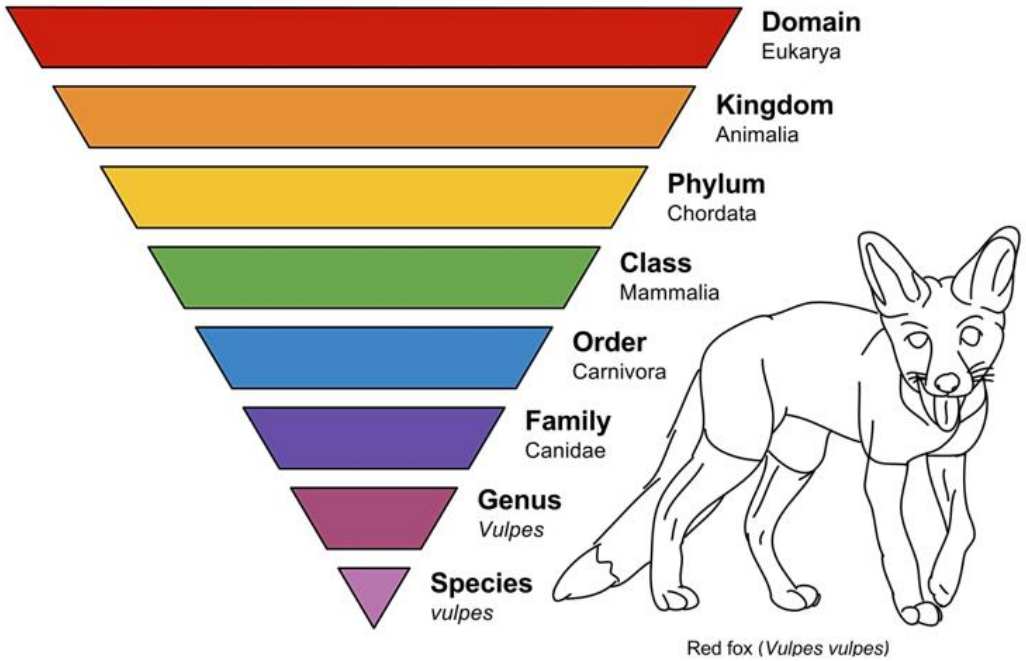
- In order to place the known organisms in their proper systematic status Linnaeus (1758) employed 5 levels of classificatory categories in Systema naturae, called Linnaean hierarchy, such as

- He used only 5 categories for zoological classification, such as Classis (Class), Ordo (Order), Genus, Species and Varietas (Variety). Later 'Family' was added by Butschli in 1790 between Genus and Order, and Phylum by Haeckel in 1886 between the two levels— Class and kingdom.



Linnaean System of Classification:

- The term ‘Varietas’ (variety) has been discarded as a level from animal taxonomy but is now widely familiar in botany. The term ‘varietas’ was commonly used in the Linnaean period but after 1960 the use of ‘variety’ is not accepted by Zoological commission. Earlier taxonomists used variety instead of subspecies.
- Linnaeus first placed closely resembling organisms in a species, then similar species under a genus and several genera under a family and so on.
- The taxonomists, before Linnaeus, were engaged in classifying animals only for the own good of identification.
- It is Linnaeus who, for the first time, suggested a scheme to establish relationship amongst different members.



Thank You