

SPECIES CONCEPT

B.SC. SEM-3

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INTRODUCTION

- Defining and recognizing a species has been a controversial issue for a long time.
- To determine the variation and the limitation between species many concepts have been proposed .
- When a taxonomist study a particular taxa, They must adopt a species concept and provide a limitation to define a taxa.
- Taxonomic classification was first proposed by **Linnaeus**. Hierarchy of categories is the classification of organisms in a definite sequence of categories in a descending order starting from kingdom.
- The hierarchy includes seven obligate categories.
- In order to make taxonomic position of species more precise, certain categories have been added to this list and are termed as intermediate categories.

WHAT IS SPECIES?

- The word 'Species' has been derived from the Latin word meaning 'appearance' or 'kind'.
- Linnaeus described species in terms of morphology.
- Modern taxonomists put several changes on the basic concept of species by considering several factors like genetic as well as behavioral differences while describing species.
- Species is a natural population of individuals or group of population which resembles one another in all essential morphological and also reproductive characters.
- They are able to interbreed freely and produce fertile progenies.

DIFFERENT CONCEPTS OF SPECIES

➤ A species is the unit of evolution and also is the unit of classification.

Only a species undergoes reproduction and modification process.

➤ Various concepts regarding definition of a species have been given.

These are as follows :

➤ **Historical concepts:**

◆ Static concept

◆ Typological concept

◆ Nominalistic concept

◆ Dynamic concept

▶ **Modern concepts :**

◆ Evolutionary concept

◆ Biological concept

STATIC CONCEPT

- The **static concept** of species was proposed by **Linnaeus**. According to him '**species is unchangeable**'.
- There is no change in the character of species, the species of present day are same as they were in the past and they will remain same in future.
- Linnaeus believed in the theory of special creation given by Father Saurez, according to him, "all living organisms are created by God and God gave the basic size and shape to all living organisms and are present in the actual form.

DYNAMIC CONCEPT

- This concept was put forward by Lamarck, by rejecting static concept of species.
- According to him, 'species is always changeable'. Changes always occur in the character of species from one generation to another and this process is known as evolution.

TYPOLOGICAL CONCEPT

- It was proposed by **Aristotle and Plato**.
- According to this concept ‘there is a **definite type or pattern of characters in each species** of every living organism and all the members of species show maximum resemblance with this pattern.
- This includes :
 - 1: **Monotypic species**: Having a single similar pattern or resemblance.
 - 2: **Polytypic species**: In many species more than one type or pattern of characters are present.

NOMINALISTIC CONCEPT

- Nominalists deny the existence of “real” universals.
- For them only individuals exist while species are abstractions created by people.
- This concept was popular in France during 18th century supported by Buffon and Robinet.
- According to this concept, “Nature produces individuals and nothing more. Species have no actual existence in nature”.
- Evolutionary concept rejects the nominalistic concept of species.

EVOLUTIONARY CONCEPT

- An evolutionary species is a group of organisms that shares a common ancestor.
- In the process of evolution at some point of time members may diverge from one another, when such a divergence becomes sufficiently clear, the two populations are regarded as separate species.
- **Phenetic species concept:** According to this concept, phenetic similarity is all that matters in recognizing separate species.
- Phenetic characters are all the observable or measurable characters like behavioral, anatomy as well as morphological

MAYER'S CONCEPT

- According to Mayer “all the members that can interbreed among themselves and can produce fertile offspring's are the members of same species”.
- This definition of species is considered as incomplete because this is applicable only to sexually reproducing living beings and as because there are many organisms that have asexual mode of reproduction are not satisfied.
- The main character in determination of any species is interbreeding but this character is not used in taxonomy.

- When the species is determined on the basis of interbreeding then it is known as biological species, like the humans which can interbreed among themselves.
- When the determination of species is based on other characters then it is known as taxonomic species.
- Like if there are same morphological characters between two organisms, they belong to same taxonomic species i.e. one taxonomic species but these cannot interbreed among themselves, so on the basis of interbreeding they are two different biological species.

Example : *Euglena sanguinea* and *Euglena laciniata*.

FEW TERMS RELATED TO SPECIES

- **Ecotypes** : Members of same species inhabiting different environment and having some genetic variations are said to be ecotypes.
- These members can interbreed among themselves but due to geographical barriers they cannot interbreed.
- E,g.: Crow {*Corvus splendense*} found in different regions are ecotypes of one species.
 - *Corvus splendense splendense* - Indian crow
 - *Corvus splendense insolence* - Myanmar crow
 - *Corvus splendense protegatus* -Srilankan crow

- **Ecads:** Members of same species having some genetic variations due to environment are called Ecads.
- **Sibling species:** Members of species which are morphologically similar but reproductively isolated.

CONCLUSION

- No one definition has satisfied all naturalists, yet every naturalist knows vaguely what he means when he speaks of a species.
- According to biological concept of species it can be defined as the members of population that can freely interbreed and can produce fertile offspring's.
- This concept is valid till date but is still considered as incomplete.

**NOMENCLATURE
OF
FOSSILS**

The system of nomenclature for species now universally adopted is that of the Swedish naturalist Carl Gustav Linnaeus and consist in naming every species by a double name, hence, it is called the Linnaean or binomial nomenclature. For example, *Stegodon ganesha* is the scientific name or binomen of a certain species of elephant and is made up of the generic name *Stegodon* (the name of the genus to which the species belongs) and specific name *ganesha*, which distinguishes this species can be assigned same genus.

In practice, most of the newly discovered species can be assigned readily to an existing genus and thus the act of describing new species involves the invention of only one name. If the new species is apparently distinct from all established genera, a new generic name is assigned at the same time.

The name for species and genera must be Latin words have been Latinized. There is considerable latitude in the choice of words to be used as names

- (i) Latinized place name. e.g. Lametasaurus, Bohemilla, Katroliceras
- (ii) Name of scientist, e.g. Krishanania, Oldhamia, Murchisonia, Lonsdaleia
- (iii) Name of mythological characters, e.g. Sivatherium, Visnutherium, Astarte, Venus
- (iv) More or less descriptive compound words of latin or Greek derivation, e.g. Tetrabelodon, Dibelodon, Trilophodon, Micraster.

The paleontologist may introduce some additional exact details about the denomination be way of subgenus to the optional sub-generic label and the subgenus will include small group of species, neither too large nor too small.

The binomen is followed by the auther's name and the date of the description of the species, e.g. Tornoceras, keyserlingi, Muller, 1956. The sub-generic name is written in parenthesis in between the binomen, e.g. Tornoceras (Aulatornoceras)keyserlingi, Muller, 1956.

With the increases of generic names, a tendency has arisen to develop similar generic names for similar classes, e.g. majority of crinoids end with the suffix —crinus, corals with —phyllum or phyllia, echinoids with —aster, cephalopods with —ceras, brichipods with — thyris, and graptolotes with — graptus.

But it is not always the case.

The specific name may either be descriptive of some feature of the species, as in *Belemnites minimus*, indicating its first locality, as in *Palmoxydon rajamahalenis* or a noun may be used, as in *Ophicerassakuntala*.

Sometimes popular names are rejected and new names are given. This fact is indicated by putting earlier names in brackets after the new names, as in *Bullinus* (Physsa), *Venericardia* (Cardita).

Categories higher than genus are designed in Latin and the conventional suffixes are used: -inae for sub-family, -idae for family, -acae for super family, -ina for sub-order,

-ida for the order, -oidae for the class.

Fossil plants are named according to the same set of rules, but the name usually refers to parts rather than complete organism. Since the generic name may apply to only a seed, a leaf of some other parts, the genus is called a **form genus** or **artificial genus**, as contrasted with a **natural genus**. It follows that the whole plant may be known only as the sum of its separately named parts, and palaeobotanical nomenclature is, therefore, complex. As for example, the arborescent lycopod *Lepidodendron* is the name for whole plant. The roots, leaves, cones and spores of this plant are known as *Stigmaria*, *Lepidophyllum*, *Lepidostrobus* and *Triletes* respectively. The generic name *Stigmaria* is applied to alike roots of different plants like *Lepidophlois*, *Bothrodendron* and *Sigillaria*.

While writing or printing the name of organism, the following rules are to be followed,

- (i) Generic names are always written with initial capital letter, while specific names should be underlined.
- (ii) While printing, the name should be printed in italics adhering to initial capital letter for generic name and initial small letter for specific name.

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