

M. Sc IV Semester Zoology

Paper:401 Animal Taxonomy and Evolution

Topic: Basic Concepts of Biosystematics and Taxonomy,

Trends in biosystematics

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Introduction

- In 1813 taxonomy term was coined by A.P. de Candolle initially for plants and subsequently changed to animals.
- In general art of classification is called taxonomy.
Arrangements of the organisms in orderly fashion.
- Systematic arrangements of plants and animals in particular fashion.
- Each species may exist in numerous different forms (sexes, age, classes, seasonal forms, morphs and other phenotypes).

Definition of taxonomy

- According to Simpson, “taxonomy is the theoretical study of classification including its basis, principle, procedure and rules”.

Definition of Systematics

- The term Systematics is derived from Latinized Greek word systema, as applied to the systems of classifications developed by early naturalists.
- Systematics is the science of diversity of organisms.

Basic concepts of taxonomy

- Two major basic concept of taxonomy :
 - Older concept
 - Modern concept
- 1. Older concept:** when nothing was there or known, Aristotle, Plateau and Hypocraks were the naturalist, who stated that nature provides variation so animal vary from each other.
 - There were no classification. They observed the nature on the basis of similarity and differences. e.g. grouping of wing/unwinged insects, bipoda/tetrapoda and bloody/ blood less.

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2. Modern concept : later on Linnaeus states his own terminology. He gave his own concept and was considered as “father of taxonomy”. Nature has not given names. But it is the art of human being to give nomenclature. He wrote a book *Systema Naturalae*.


Trends in biosystematics

- The main aim of modern classification is not only the understanding, identification, and proper arrangement of animals but it also include the study of history of their development and evolution.
- During early periods the animals were studied only on the basis of their outer structure i.e. morphology attention was paid in different species, sub-species, sub-groups etc.
- Morphologic species are now called as biological species.
- Now the study of animals includes the study of genetics, hereditary, biochemical and other characters along with morphological characters.
- This idea provides knowledge of actual structure and history of development of species.

1. **Chemotaxonomy**: This new technique of taxonomic science is more applicable on plants and animals. Candolle (1813) was first to approach this method in his experiment and to develop new methods to identify closely related species.
 - It was well known that the metabolic activities of an organism are related with complex chemical changes.
 - In addition to this a number of proteins, nucleic acids, enzymes, hormones etc. are also found in body of an organism.
 - The diversity or difference in these substances can also play an important role in classification.
 - This the difference or change in these substances is considered to be basic and real difference in genetical and hereditary process which is more important than morphological changes. Which were considered to be base of classification.

2. **Cytotaxonomy** : Cytotaxonomy means the cytological approach of taxonomy i.e. how cytology makes the task of taxonomist easy. It is studied in following steps:

- ❑ **Genetic compliments:** It compares the genome (the DNA in the nucleus) and plasmid (the DNA in cytoplasmic organelle). DNA is the essential materials of heredity.
 - It is believed that the amount of DNA per chromosome set is constant for each species.
 - But it is still not certain that ratio of DNA content of chromosomes are attributable to variation in size of heterochromatin segment.
- ❑ **Karyological studies:** The karyotype which is characterized by chromosomes no., size and morphology is a definite and constant character of each species.
 - The number, shape and banding of chromosomes can be determined by using various dissecting and staining techniques.

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- ❑ **Histochemical studies:** When same kind of tissue of different animal species, may exhibit apparently the same functions, histochemical difference between them may be observed which would be of taxonomic value.

□ Molecular taxonomy:

- Molecular taxonomy is the classification of organisms on the basis of the distribution and composition of chemical substances in them.
- The species can be differentiated on the basis of amino acid sequence in the protein of an organism and their difference can be found in different species.
- The name molecular taxonomy can be given by Lahni (1964).
- Turner (1966) preferred to divided into two types micromolecular and macromolecular taxonomy.

1. Micro molecular taxonomy: Stress upon the distribution and biosynthetic interrelationship of small molecular weight compounds.

- Such as free amino acids, terpenes, flavonoids etc. commonly referred as secondary compounds.

2. Macromolecular taxonomy: It is considered with polymeric molecules like DNA, RNA, polysaccharides and proteins.

Conclusions

- Taxonomy is the science of defining and naming groups of biological groups of organisms on the basis of shared characteristics.
- Systematics is the science of naming and organizing organisms based on common ancestry. In a systematic taxonomy all of the species in a genus are more related to one another than to any other species.

References

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- Theory and Practice of Animal Taxonomy: By V.C. Kapoor.