

Principles of Taxonomy

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Introduction

Aquatic vertebrates that have gills throughout life and limbs, if any, in the shape of fins.

- Fishes constitute slightly more than one-half of the total number of approximately 48,170 recognized living vertebrate species.
- There are descriptions of an estimated 24,618 valid species of fishes.
- Number of extant fish species may be close to 28,500.
- Of the 482 fish families with living species recognized, the eight largest families, each with over 400 species, contain approximately 33% of all species.
- These families, in the order of decreasing numbers of species are *Cyprinidae*, *Gobiidae*, *Cichlidae*, *Characidae*, *Loricariidae*, *Labridae*, *Belontiidae* and *Serranidae*.
- About 66% of the species in the eight largest families are freshwater fishes, where as about 40% of all fishes occur in or almost always in freshwater.

Classification

It is the practice of arranging organisms into groups or categories.

Taxa (Taxon)

Groups of organisms recognized in a classification and given biological names (e.g. *Cypriniformes*, *Cyprinidae*, and *Cyprinus*)

Category

The level or rank at which the taxon is placed (e.g. order, family and genus)

Systematics

- It is a biological science that discovers names, determines relationships, classifies and studies evolution of living organisms.
- It is a synthesis of many kinds of knowledge, theory and method applied to all kinds of classifications of organisms.
- It includes taxonomy.
- Our knowledge of biodiversity is incomplete. Only 1.70 million of the earth is estimated 10-100 million sp have been scientifically erected, named and classified. In the marine biota, 3,40,000 sp are known including many unnamed species. It could be impossible to deal with the enormous diversity if it were not ordered and classified.
- Systematic zoology solves this problem and develops many methods and principles to make this task possible.
- It has a broader base than genetics, biochemistry and physiology.

Taxonomy

- The term 'taxonomy' is derived from the Greek word '*taxis*' - arrangement and '*nomos*' – law.
- The name taxonomy was first proposed by Candolle (1813)
- It is the theory and practice of classifying organisms based on the similarities and differences by following certain internationally accepted principles, laws, rules and regulations.

Identification

Placing the individual to each taxon by deductive procedure.

Classification

Ordering of animals into groups on the basis of their relationships.

Three stages of taxonomy

Alpha taxonomy

Description of new species and its arrangements in comprehensive genera.

Beta taxonomy

Relationships are worked out on the species level and on higher categories.

Gamma taxonomy

Studying the intraspecific variations and its evolutionary relationship.

Importance of Fish taxonomy

1. Reveals numerous interesting evolutionary phenomena in ichthyology.
2. Cultivates away of thinking and approaching of all biological problems needed for the balance and well being of fish biology.
3. Produces catalogues, revisions, hand books, keys, monographs etc.
4. Avoids exotic species which may otherwise harm the habitats and native fauna.
5. Proper identification of fishes helps in museum development and maintenance.
6. Identification of fishes helps in the export of processed edible fishes as the buyers are very conscious about the correct fish identification along with their scientific and popular names.
7. Correct identification of a particular candidate finfish for aquaculture is very important for successful culture practice.

8. Correct scientific name of any organism on which one is going to work is a prerequisite for anyone before starting his biological research.
9. Correct scientific name is a functional label using which various pieces of information concerning that organism can be retrieved.

Principal tasks of the taxonomists

Identification of Fish species

- When these are available, the description of the appropriate species should be checked character by character with the keys and manuals available.
- Once this is over, the identifier has to compare with the type specimens deposited in the established museums.

Taxonomical Revision

- For taxonomical revision of a family or genus, the investigator should study specimens from various museums including the holotype and also fresh specimens available in its native environment.
- While collecting fishes for revisional study there should not be any biased population samples.
- Specimens of all stages and different sexes have to be collected with adequate number of samples. Collections should cover all localities of the species.
- Sampling should be done in such a way as to provide study materials not only for the species but also for the evolutionist.
- All the characters of a particular species for identification should be carefully studied.

Study the evolutionary link

The taxonomist has to link the species from its ancestor. This will help to group the organisms at higher taxon level.