

SPEICES CONCEPT – BIOLOGICAL & PHYLOGENETIC SUB SPECIES

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Species concepts were first defined based on morphological traits. Linnaeus, being limited by technology at the time, used the "eyeball method" to study things - meaning he looked at them and described what he saw. This is formalized as the morphological or typological species concept.

The biological species concept

According to the most widely used species definition, the biological species concept, a species is a group of organisms that can potentially interbreed, or mate, with one another to produce viable, fertile offspring.

In this definition, members of the same species must have the potential to interbreed. However, that doesn't mean they have to be part of the same interbreeding group in real life. In order to be considered to be a single species in the biological species concept, a group of organisms must produce healthy, fertile offspring when they interbreed. In some case, organisms of different species can mate and produce healthy offspring, but the offspring are infertile, can't reproduce.

Phylogenetic Species Concept (PSC)

The concept of a species as an irreducible group whose members are descended from a common ancestor and who all possess a combination of certain defining, or derived, traits. Hence, this concept defines a species as a group having a shared and unique evolutionary history. It is less restrictive than the biological species concept, in that breeding between members of different species does not pose a problem. Also, it permits successive species to be defined even if they have evolved in an unbroken line of descent, with continuity of sexual fertility. However, because slight differences can be found among virtually any group of organisms, the concept tends to encourage extreme division of species into ever-smaller groups.

Morphological species concept (MSC)

Morphological species concept defined species as the smallest groups that are constantly and determinedly distinctive and distinguishable by average means.

Thus, species are the smallest natural populations permanently separated from each other by a distinct discontinuity in the series of biotype

Ecological species concept (ESC)

The ecological species concept is mainly about ecological competition. “A species is a lineage (or a closely related set of lineages) which occupies an adaptive zone minimally different from that of any other lineage in its range and which evolves separately from all lineages outside its range”.

Evolutionary species concept

An evolutionary species “is a single lineage of ancestor-descendant populations of organisms which maintains its identity from other such lineages [in space and time] and which has its own evolutionary tendencies and historical fate”

Cohesion species concept

A cohesion species is “an evolutionary lineage that serves as the arena of action of basic micro evolutionary forces, such as gene flow (when applicable), genetic drift and natural selection”

Phenetic species concept

“A species is a set of organisms that look similar to each other and distinct from other sets”. Thus, it would clarify some particular degree of phenetic resemblance, and similarity would be measured by a phenetic remoteness statistic.

Pluralistic species concept

When a given species concept is favored in a given conditions, that does not mean it could be universally applicable. For understanding all species living at all times, a broader concept of species should be applied. A comprehensive concept larger than any species concept indicated above. The need to use more than one species concepts in order to be applicable arose the idea of a pluralistic species concept. This recognizes, basically, that “the factors that are most important for the cohesion of individuals as a species vary”

How new species arise

New species arise through a process called **speciation**. In speciation, an ancestral species splits into two or more descendant species that are genetically different from one another and can no longer interbreed.

Darwin envisioned speciation as a branching event. In fact, he considered it so important that he depicted it in the only illustration of his famous book, *On the Origin of Species*, below left. A modern representation of Darwin's idea is shown in the evolutionary tree of elephants and their relatives, below right, which reconstructs speciation events during the evolution of this group.

For speciation to occur, two new populations must be formed from one original population, and they must evolve in such a way that it becomes impossible for individuals from the two new populations to interbreed. Biologists often divide the ways that speciation can occur into two broad categories:

- **Allopatric speciation**—allo meaning other and patric meaning homeland—involves geographic separation of populations from a parent species and subsequent evolution.
- **Sympatric speciation**—sym meaning same and patric meaning homeland—involves speciation occurring within a parent species remaining in one location.

Conclusion

The biological species concept defines a species as a group of individuals living in one or more populations that can potentially interbreed to produce healthy, fertile offspring. Other species concepts exist and may be more useful for certain types of organisms.

Species are kept distinct from one another by prezygotic and postzygotic barriers. These barriers keep organisms of different species from mating to produce fertile offspring, acting before and after the formation of a zygote, respectively. These barriers maintain the reproductive isolation of species.

New species form by speciation, in which an ancestral population splits into two or more genetically distinct descendant populations. Speciation involves reproductive isolation of groups within the original population and accumulation of genetic differences between the two groups.

These species concepts mentioned above are some of the others present in taxonomic world. There are many others (ex. composite, internodal, genetic and etc.). With this large number of concepts it is not an easy or simple decision to adapt one. Generally, it depends on the criteria and the aim of each project. For example, biological, isolation and recognition concepts can be used if the organisms were sexual breeding and from same community or geographical area. In addition, if a study is concerned on the similarity of a group of plant with enough information of characters (morphology, anatomy, cytology) with no need to a lineage, a morphological concept could be adapted. Sometimes more than one concept can be used, for example the ecological concept can be used with the morphological one.

The process of species identification itself is not simplified by having a meaning of “species”. It may not be possible to identify species in many cases, but it is clearer why species can be so difficult to identify. This difficulty has led to the cynical definition of a species as a group of individuals sufficiently distinct from other groups to be considered by taxonomist to worth specific rank. The term “sufficiently distinct” here is the most important one. Since there is no agreed formula to decide this, taxonomists decide these sufficient distinct according to what information they have. Then, the species concept they adapt may become applicable.

In the present time most taxonomists use one or more of the following main criteria as

1. The individuals should bear a close resemblance to one another such that they are always readily recognizable as members of that group.
2. There are gaps between the spectra of variation exhibited by related species ; if there are no such gaps then there is a case for amalgamating the taxa as a single species.
3. Each species occupies a definable geographical area (wide or narrow) and is demonstrably situated to the environmental conditions which it encounters.
4. In sexual taxa, the individuals should be capable of interbreeding with little or no loss of fertility, and there should be some reduction in the level or success (measured in terms of hybrid fertility or competitiveness) of crossing with other species.