

Although a typical community maintains itself more or less in equilibrium with the prevailing conditions of the environment, in nature this is hardly true. Communities are never stable, but dynamic, changing more or less regularly over time and space. They are never found permanently in complete balance with their component species or with the physical environment. Environment is always changing over a period of time due to

- (i) Variations in climatic and physiographic factors
- (ii) The activities of the species of the communities themselves.

These influences bring about marked changes in the dominants of the existing community, which is thus sooner replaced by another community at the same place. This process continues and successive communities develop one after another over the same area, until the terminal final community again becomes more or less stable for a period of time. This occurrence of relatively definite sequence of communities over a period of time in the same area is known as ecological succession.

Odum (1971) preferred to designate this orderly as ecosystem development rather than the more often one ecological succession. He made an elaborate statement to define this process, and in his own words 'ecosystem development' or what is more often known as ecological succession, may be defined in terms of the following three parameters:

- (i) It is an orderly process of community development that involves changes in species structure and community processes with time, it is reasonably directional and therefore, predictable.
- (ii) It results from modification of the physical environment by the community, that is succession is community controlled even though the physical environment determines the pattern, the rate of change, and often sets limits as to how far development can go.
- (iii) It culminates in a stabilized ecosystem in which maximum biomass and symbiotic function between organisms are maintained per unit of 'available energy flow'

Causes and Trends of Succession

Since succession is a process, more appropriately a series of complex processes, it is natural that there may not be a single cause for this. Generally, there are three types of causes:

Initial causes: These are climatic as well as biotic. The former includes factors, such as erosion and deposits, wind, fire etc. caused by lightning or volcanic activity and the latter includes the various activities of organisms. These causes produce the bare areas or destroy the existing populations in an area.

Ecesis or continuing causes: These are the processes as migration, ecesis, aggregation, competition, reaction etc. which cause successive waves of populations as a result of changes, chiefly in the edaphic features of the area.

Stabilising causes: These cause the stabilization of the community. According to Clements, climate of the area is the chief cause of stabilization, other factors are of secondary value.

An ecological succession proceeds along the following four trends:

- (i) A continuous change in the kinds of plants and animals.
- (ii) A tending increase in the diversity of species.
- (iii) An increase in the organic matter and biomass supported by the available energy flow.
- (iv) Decrease in net community production or annual yield.

Basic types of succession

The various types of succession have been grouped in different ways on the basis of different aspects. Some basic types of succession are, however as follows:

- (i) Primary succession
 - (ii) Secondary succession
 - (iii) Autogenic succession
 - (iv) Allogenic succession
- (i) Primary succession: In any of the basic environments (terrestrial, freshwater, marine), one type of succession is primary succession which starts from the primitive substratum, where there was no previously any sort of living matter. The first group of organisms establishing there are known as the pioneers, primary community or primary colonisers.
 - (ii) Secondary succession: Another general type of succession is secondary succession which starts from previously built up substrata with already existing living matter. The action of any external force, as a sudden change in climatic factors, biotic intervention, fire etc. causes the existing community to disappear. Thus, area become devoid of living matter but its substratum, instead of primitive, it built up. Such successions are comparatively more rapid.
 - (iii) Autogenic succession: After the succession has begin, in most of the cases, it is the community itself which, as a result of its reactions with the environment, modifies its own environment and thus causing its own replacement by new communities. This course of succession is known as autogenic succession.
 - (iv) Allogenic succession: In some cases, however, the replacement of the existing community is caused largely by any other external condition and

not by the existing organisms. Such a course is referred to as allogenic succession.

On the basis of successive changes in nutritional and energy contents, successions are sometimes classified as:

(i)Autotrophic succession: It is characterized by early and continued dominance of autotrophic organisms like green plants. It begins in a predominantly inorganic environment and the energy flow is maintained indefinitely. There is gradual increase in the organic matter content supported by energy flow.

(ii)Heterotrophic succession: It is characterized by early dominance of heterotrophs, such as bacteria, actinomycetes, fungi and animals. It begins in a predominantly organic environment and there is a progressive decline in the energy content.

In ecological literature, there are mentioned still so many other kinds of succession, depending mainly upon the nature of the environment, where the process has begun and thus it may be a hydrosere-starting in regions where water is in plenty, as ponds, lakes, streams, swamps, bogs etc. a mesarch-where adequate moisture conditions are present and a xerosere-where moisture is present in minimal amounts, such as dry deserts, rocks etc.

General Process of succession

The whole process of primary auto trophic succession is actually completed through a number of sequential steps, which follow one another. These steps in sequence are as follows:

Nudation: This is the development of a bare area without any form of life. The area may develop due to several causes such as landslide, erosion, deposition or other catastrophic agency. The cause of nudation may be:

- (i) **Topographic**: Due to soil erosion by gravity, water or wind, the existing community may disappear. Other causes may be deposition of sand etc. landslides, volcanic activity and other factors.
- (ii) **Climatic**: Glaciers, dry period, hails and storms, frost, fire etc. may also destroy the community.
- (iii) **Biotic**: Man is most important, responsible for destruction of forests, grasslands for industry, agriculture, housing etc. other factors are disease epidemics due to fungi, viruses etc. which destroy the whole population.

Invasion: This is the successful establishment of a species in bare area. The species actually reaches this new site from any other area. This whole process is completed in following three successive stages:

- (i) Migration: The seeds, spores, or other propagules of the species reach the bare area. This process, known as migration, is generally brought about by air, water etc.
- (ii) Ecesis: After reaching to new area, the process of successful establishment of the species, as a result of adjustment with the conditions prevailing there, is known as ecesis.
- (iii) Aggregation: After ecesis as a result of reproduction, the individuals of the species increase in number and they come close to each other. This process is known as aggregation.

Competition and Coaction:

After aggregation of a large number of individuals of the species at the limited place, there develops competition (inter as well as intraspecific) mainly for space and nutrition. Individuals of a species affect each other life in various ways and this is called coaction. The species if unable to compete with other species, if present would be discarded. To withstand competition reproductive capacity, wide ecological amplitude etc. are of much help to the species.

Reaction

This is the most important stage in succession. The mechanism of the modification of the environment through the influence of living organisms on it is known as reaction. As a result of reactions, changes take place in soil, water, light conditions, temperature etc. of the environment. Due to all these the environment is modified, becoming unsuitable for the existing community which sooner or later is replaced by another community.