

Part I (11)

Topic: 'Ecological Succession'

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Ecological succession may be defined as an orderly sequence of different communities over period of time in some particular area. Development of community in an ecosystem begins with 'Pioneer' stages which are replaced by a series of more mature communities until a relatively stable community is formed which is in equilibrium with local conditions.

The progressive development in an ecosystem Ecological succession can be summarised as-

- <1> There is usually progressive development of the soil with increasing depth, increasing organic content and increasing differentiation of layers towards mature soil of the final community.
- <11> The height, massiveness and differentiation into strata of the plant community increases
- <111> The rate of formation of organic matter per unit area in the community increases with increasing development of the soil and of community structure.
- 114) As density of above ground plants increases, the microclimate within the community is increasingly determined by characteristics of community itself.
- <115> Species - diversity increases from the simple communities of early succession to the richer communities of late succession.
- 116) Populations of pioneer stages rise and fall and replace one another with the time gradient due

due to interspecific and intraspecific competition for space provide a continuing course of succession. It is due to modification of environmental factors such as soil, moisture and humus.

The rate of this replacement shows through the course of succession as smaller and smaller short-lived pioneers (species) are replaced by larger and longer-lived ones.

vii) Consequently, the relative stability of the communities increases and the final community which is usually stable is called Climax Community.

### Kinds of Ecological Succession

Ecological Succession may be two types -

#### Primary Succession

- When succession begins on an area which has not been previously occupied by a community known as primary succession.
- The first group of organisms (Plants & animals) which becomes established in such an area is termed as Pioneer Community.

#### Secondary Succession

When community development is proceeding in an area from which a community was removed and where nutrients and conditions for existence are already favourable called secondary succession.

### Patterns of Succession

Depending upon the types of habitat and varying amount of moisture, the successions are designated as -

### (1) Xerosere

- It starts on bare rock, hind blown sand, rocky slopes or any such places where extreme deficiency of water.
- The various stages in Xerosere can be enumerated as —

### (a) Lichen stage

- It is first pioneer on the bare rock area due to extreme deficiency of water.
- The most successful organisms on this are crustose lichens.
- During rainy season they absorb large quantities of water and flourish rapidly.
- The common species of crustose lichens are Rhizocarpon, ~~Rhiz~~ Rinodina etc.
- As soon as little soil is formed by the activity of crustose lichens, higher forms of lichens such as Foliose lichens appear. These includes Dermatocarpon, Parmelia, umbilicaria etc.
- Few mites also make their appearance with lichens.

### (b) Moss stage

- With the accumulation of dust and humus in small quantities, the environment is altered and allow establishment of secondary communities.
- Scattered patches of mosses such as Tortula, Grimmia-byrum and Barfula etc. begin.
- Later on mosses like Funaria, Spagnum and Polytrichum make their appearance.
- Among the animals, mites become more varied, some small spiders and spring tails as well as tardigrades become associated with the secondary community.

### (c) Herbaceous stage

Due to mites of mosses, more soil accumulates. More mineral material is added to the soil. Thus many annual weeds develop which are followed by biennial and finally perennial grasses. *Andropogon* commonly known as broom sedge becomes a dominant grass in many areas. *Nemadodes* and Larval insects, *Collembola*, ants and mites appear in the gradually altered environment.

### (d) Shrub stage

Further modification of the environment provides conditions for the generation and growth of shrubs and perennial wood plants such as *Acacia*, *Prosopis*, *Capparis*, *Zizyphus* etc.

### (e) Climax forest

With the establishment of shrubs, more and more soil is formed and environment becomes increasingly humid.

- This favours the growth of woody trees.

Finally, a climax forest community is established.

The climax community is the last aggregation in the successional series.

## [II] Hydrosere

Hydrosere or hydrach is Succession state in water. A freshly built pond can be taken as a most suitable example of hydrach succession.

The various stages of hydrosere are -

### (a) Submerged stage

- It is initial stages of water, and poor in nutrients and devoid of life.

- The Pioneers in an aquatic habitat are Planktons.

- The Phytoplanktons grow, floating or suspended in water and multiply.
- After death of Phytoplanktons and Zooplanktons, the substratum is enriched with organic matter. Due to this certain rooted submerged hydrophytes make their appearance.
- Prominent among them are Ceratophyllum, Potamogeton, Vallisneria and Utricularia.
- By the death of these or decay, there is further enriched of medium. Thus, level of pond is raised and it becomes shallow.

### (b) Floating stage

- When water level in the pond remains only 6 to 8 ft deep, floating plants begins to appear.
- These plants includes Nymphaea, Nelumbium, Trapa & Monochoria. Their roots rooted in the mud and leaves freely floating at the surface.
- Later on, free floating plants like Lemna, Azolla and Wolffia grow & cover the water surface.

### (c) Reed-Swamp stage

- > As the water body becomes shallow by silting and removal of water by transpiration, the environment becomes less suitable for the free floating and submerged plants.
- Now reed-swampy plants like Typha, Rumex and Sagittaria invade the area.
- The reed-swamp plants built up the shores by retaining the sediments and accumulation of plants remains.
- Beavers, muskrats and other animals carry materials into the pond. Deciduous vegetation blows in from the shore, and silt is carried from surrounding.

#### (d) Marsh-meadow stage

As free water is changed to swampy land, the water plants give way to swampy plants such as sedges and rushes.

- As succession continues, marshy-meadow becomes too dry for swampy plants and these are subsequently replaced by herbs & shrubs.

#### (e) Woodland stage

As succession continues, the soil is further built up. Thus it becomes drier and also changed chemically.

- In time, certain smaller species of trees invade the area. Now full sized forest trees will dominate the scene.

- At the same time, the animal life of the community is correspondingly altered. Fish, beavers and muskrats are gradually excluded and land vertebrates make their appearance.

#### [III] Mesosere

It is intermediate type, with moisture present in adequate amounts.

- It is actually, the condition towards which ~~hydrarch~~ hydrarch and Xerarch communities are gradually progressing.

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