Ecological Succession

Communities of organisms do not come into existence all of a sudden, they develop gradually through a series of stages until they reach a state of maturity. Such community tends to stabilize. There is an interaction between organism and environment to make a balance to become self sufficient and self sustainable. Such an equilibrium does not long last since ecological systems are dynamic and continues to change slowly and gradually.

These changes replace one community to make way for another. The process of replacement continues and successive communities develop one another after another in the same area until a final community arises with more ~~elasticity~~ stability. Such a series of community replacement is called Ecological Succession.

Ecological succession is the steady and gradual change in a species of a given area with respect to the changing environment. It is a predictable change and a continuous process of nature as all the biotic components have to keep up with the changes in our environment.

The aim of this process is to reach equilibrium in the ecosystem. The community that acheives this aim is called climax community, as in an attempt to reach the equilibrium, some species increases in number while some other decreases.

In an area the consecutive sequence of communities that undergo

Changes is called a sere. Thus each community that changes is called a seral stage or a seral community.

All the communities that we observe today undergo succession over a period of time, thus we can say that evolution is a process taking place simultaneously along with that of ecological succession so it can be said that all life forms existing on earth can be considered as the result of Ecological succession.

Types of Ecological Succession —

(1) Primary Succession - Primary succession is that starts in lifeless areas such as the regions devoid of soil or the areas where soil is unable to sustain life.

When the earth come into existence there was no soil it was made up rocky these rocks were broken down by micro organisms and eroded to form soil. The soil then became the formulation of plant life. These plants helped in the survival of different animals and progress form primary succession to the climax community.

If this primary succession is ~~destroyed~~ destroyed secondary succession takes place

(2) Secondary Succession — Secondary succession occurs when the primary ecosystem get ~~destroyed~~ destroyed for eg a forest

ecosystem gets destroyed by fire. It gets recolonized after destruction leading to secondary ecological succession, small plants emerge first, followed by larger plants. The tall trees block the sunlight and change the structure of the organism below the canopy. Finally the climax community arrived

Cyclic Succession - Change in the structure of ecosystem on a cyclic basis for eg - some dormant species emerge at all changing drastically the structure of ecosystem

Seral Community —

A seral community is an intermediate stage of ecological succession advancing towards the ~~con~~ climax community.

A seral community is replaced by the subsequent community It consists by simple food webs and food chains. It exhibits a very low degree of diversity. The individuals are less in number and the nutrients are also less.

There are following types of seres.

(1) Hydrosere - Succession in Aquatic habitat
(2) Xerosere - Succession in dry habitat
(3) Lithosere - Succession on a bare rock surface
(4) Halosere - Succession starting in a saline soil or water.

Importance of Ecological Succession—

Ecological succession is important for the growth and development of an ecosystem. It initiates colonization by new areas and recolonization of the areas that has been destroyed due to certain biotic and climatic factors which leads to adaptation in organism to the changing environment and changing climatic conditions.

General Process of Succession

The entire process of primary autotrophic succession is completed through the following sequential steps—

(1) Nudation
(2) Invasion
(3) Competition and coaction
(4) Reaction
5) Stabilization (climax)

(1) Nudation — This is the development of a bare area without any life form. An area may become like due to various reasons
(a) Topographical → Geographical reasons such as soil erosion, deposition of sand, land slide volcanic eruption etc.
b) climatic → Glaciers, fire, drought etc.
c) Biotic → Destruction of area by man made activities such as for clearing a forest for agriculture, industry or spread of any epidemic.

(2) Invasion → Successful establishment of a species in bare area it may be due to any reasons like migration

Ecesis (adjustment with the conditions prevailing in that area by organism) and aggregation after ecesis as a result of reproduction the number of individuals increase in a population and they come close to each other, these autotrophic organisms are called Pioneers. They are more dynamic and need less nutrients, small in size and their requirement is less)

(3) Competition and Coaction — Due to aggregation of communities there is competition for space and food among organisms it may inter or intra specific effecting the life of each other and the process is called Coaction. The species which do not survive in this competition are discarded and the species with more fertility and vitality withstand the competition.

(4) Reaction — The increase in no of organisms play a vital role on the environment and gradually it becomes unsuitable for the existing population or sere which is replaced by another set of organisms called Seral Stages. or developmental Stages.

(5) Stabilization (Climax) → After various seral stages a climax community is established. This final community is not replaced it remains for a longer period and establishes an equilibrium with the surrounding environment.

Examples of Ecological Succession —

Hydrosere — A good and most common.

is succession in aquatic bodies such as ponds when it is converted into a land community. The stages of hydrosere succession can be depicted as

Initial Stage – Phytoplanktons – Pioneer community
(1) Blue green algae Cyanobacteria etc
↓
(2) Zooplanktons (Amoeba, Paramoecium euglena etc)
↓
(3) Fishes (blue gill fish, Sunfish etc)
↓
Formation of nutrient rich mud
(4) Supporting growth of aquatic plants (Hydrilla, Elodea etc)
↓
(5) Reduction in the depth of Pond and arrival of more organisms such as crustaceans, dragon flies etc.
↓
(6) Further reduction of pond due to death and decay of living organism and development of submerged plants (Trapa, nelumbo)
↓
(7) Increase and diversification of fauna and flora and conversion of land into a swamp. The reed swamps ecosystem develops
↓
(8) Development of mesic communities
↓
(9) Development of land plants and land animals and achievement of climax community.

(2) Succession in Xeric habitat —
xerosere succession begins on bare rock (lithosere) or dry sand (Psammosere) A lithosere develops in following stages -
Pioneers → eg crustose lichen stage
↓
Foliose lichen stage
↓
Moss stage
↓
Herbs stage
↓
Shrub stage
↓
Forest stage (climax)
Pioneer in animals - mites ants and spiders in lichen stage where the living conditions are very harsh and unfavourable
↓
Mites spiders and spring tales during Moss stage
↓
Herb stage is invaded by nematodes ants and insect larvae
↓
At shrub and forest stage a variety of amphibians, reptiles, Mammals arise given a balance to the ecosystem and achieving a climax stage.

Theories of Ecological Succession -
(1) Monoclimax theory - Monoclimax or climatic climax theory was given by Clements which states that only one climax is achieved which is determined the composition

species, structure and balance of a climax community.

Polyclimax theory — This theory was put forward by Nicholve, Champion and Whittaker in 1953. According to this theories different climax communities are present in a particular geographical region.

Climax Pattern theory - This theory was given by McIntosh (1958). According to this theory the structure composition and other characters of the climax communities are determined by the total environment of the ecosystem. It is not determined by a single factor.

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