

M.Sc Environmental Science

Semester- I

Subject: 16P1EVST01-Fundamentals of Environmental Science

Topic: Food chain, food web, Niche concept, Limiting factors

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Major three aspects of ecological niche

(i) Spatial or habitat niche

- Represents the physical space occupied by an organism.
- Each species is confined to a microhabitat.
- No two species can occupy the same habitat.

(ii) Trophic niche:

- Functional status of an organism in its community
- Concerned with the trophic position of an organism.

(iii) Multidimensional or hyper-volume niche:

- Niche could be visualised as a multidimensional space or hyper-volume.
- For all environmental factors there are upper and lower bounds of intensity that organisms can endure.

concept of limiting factors with Liebig's law and Shelford's law

Liebig's Law of minimum

- This law was formulated by Justus Liebig, a German biochemist, in 1840. The law states that the rate of growth of a plant depends on the amount of nutrients which is presented to it in the minimum quantity.

Shelford's law of tolerance

- This law was proposed by V. E. Shelford, in 1913. He incorporated the concept of limiting effect of maximum also to the concept of minimum as the law of tolerance. Thus, organism have an ecological minimum and maximum, with a range in between which represents the limits of tolerance.

Techniques used to measure the productivity

- Harvest method
- Oxygen measurement
- Carbon dioxide Method
- Chlorophyll method
- Light and dark bottle method

Significances of food chains in ecological studies

- In an ecosystem, the food relationship and interdependence among various organisms are studied through food chain.
- It also deals with the mechanism of transfer of food, energy and nutrients through various components of nature.
- Effect of the use of pesticides on the ecosystem can be studied. As several of them are not biodegradable it goes on accumulating at every trophic level. Hence consumers at higher trophic levels will consume more poison along with their food. This phenomena is known as **biological magnification**.

Methods of measuring population density

- Total count
- Sampling method
- Tagging and recounting method

Three ecological age groups in a population

- Prereproductive
- Reproductive
- Postreproductive

Population growth forms

‘S’ shaped or sigmoid growth pattern

- Positive acceleration phase the
- Logarithmic phase or geometric rate of increase)
- Negative acceleration phase
- Maximum carrying capacity of a given environment.

‘J’ shaped growth form

- Population after occupying a favorable area increases slowly at first, then more rapidly and continue growth in this fashion for quite some time then stops abruptly as the environmental resistance or other limiting factors become effective.

Ecotone and Edge effect

- Transitional area of vegetation between two different plant communities,
- Such as forest and grassland.
- Exist along a broad belt or in a small pocket, such as a forest clearing, where two local communities blend together.
- Has a higher density of organisms of one species and a greater number of species than are found in either flanking community.
- The number of species and population density of some of the species are greater than in the neighbouring communities.
- This tendency of ecotonal area to have increased variety and density of organisms is known as edge effect.

Reasons for species diversity loss

- Alteration and loss of the habitats:
- Introduction of exotic species and genetically modified organisms
- Pollution
- Climate change
- Overexploitation of resources

Soil development or Pedogenesis:

- It is the modification of mineral
- Developed soil shows distinct layers. These layers are called soil horizons. The sequential arrangement of different horizontal layers found in the soil is called soil profile.

A-horizon (topsoil)

- This is the surface or upper layer of the soil.

B- horizon (subsoil)

- This zone is composed of minerals plus humus.

C- horizon

- It is usually a thick layer, consisting of large masses of weathered mineral material (weathered rock).

D- horizon or R horizon

- It is the lowermost stratum of soil and is composed of unmodified parent material (rock)

Thank you