

Tamralipta Mahavidyalaya
PG Department of Zoology
PG Semester II

Paper ZOO 201B: Ecological Principle
E-learning materials on Habitat Ecology

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ECOLOGICAL NICHE:

Different species occupy distinct "ecological niche" in an ecosystem. Ecological niche is quite distinct from habitat. The habitat of an organism is the place where it lives. The ecological niche on the other hand includes not only the physical space occupied by the organism but also its functional role in the community and its position in environmental gradients of temperature, moisture, pH, soil and other conditions of existence. The species may be found in the same habitat but normally they occupy distinct ecological niche. Odum (1963) compared habitat with the 'address' and ecological niche with the 'profession'. The ecological niche is a particular combination of physical factors and biotic relations required by a species for the course of its life activities (Kendeigh, 1961),

Spatial and trophic niche:

Joseph Grinnell (1917) used the word ecological niche for the first time but he thought of the niche mostly in terms of the 'microhabitat' or what is now called as the spatial niche or habitat niche - the physical space occupied by the species. Charles Elton (1927) on the other hand used the term niche in the sense of the functional status of a species in its community. Since he placed emphasis on the energy relation (trophic relation) his version of the niche concept might be considered as trophic niche.

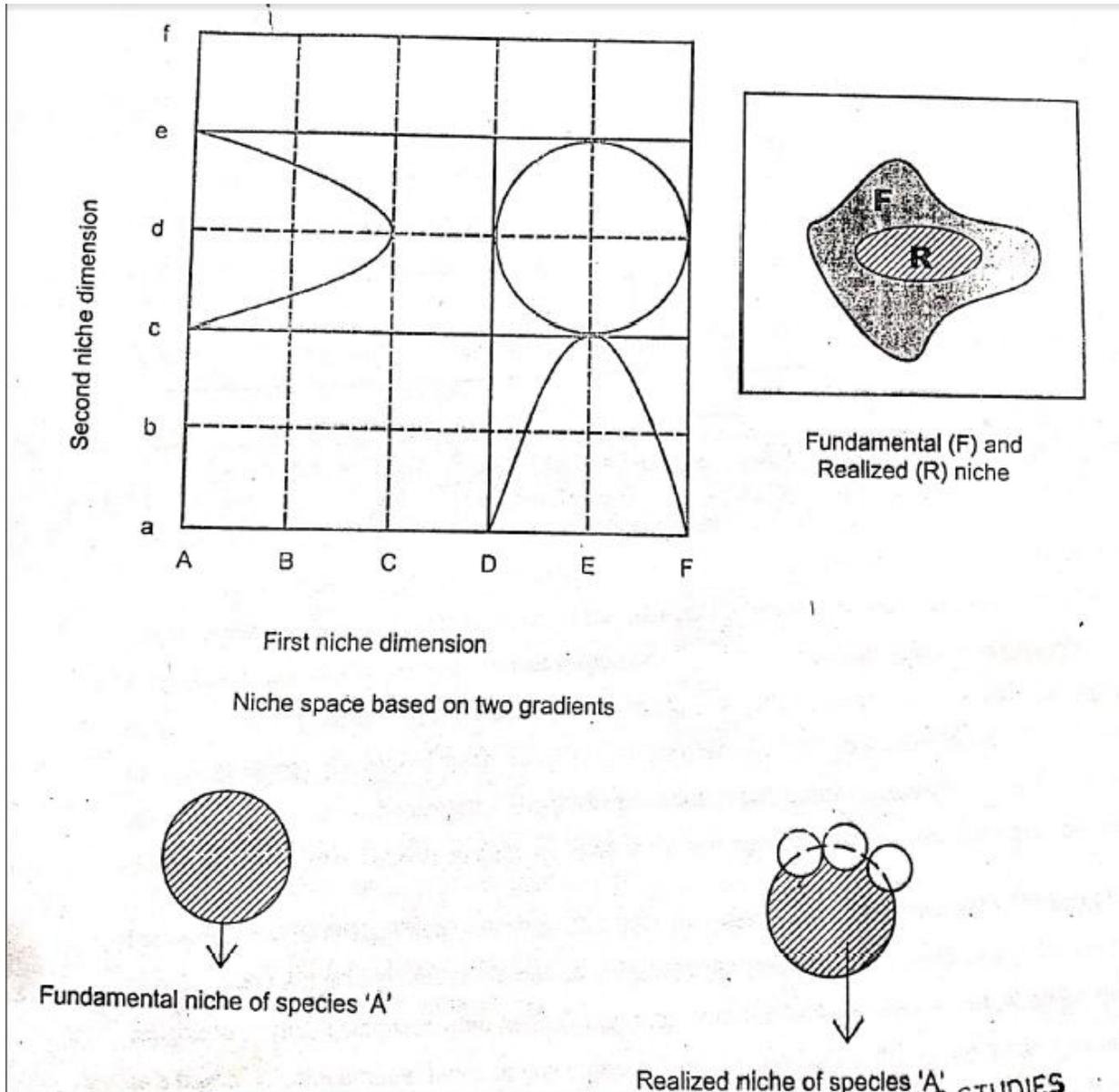
Multidimensional / hypervolume niche :

In 1927 G. E. Hutchinson suggested that the niche could be visualized as hypervolume within which the environment permits an organism to survive. This is the multidimensional niche concept which refers to the population of species in the environmental gradients.

Fundamental niche and realized niche:

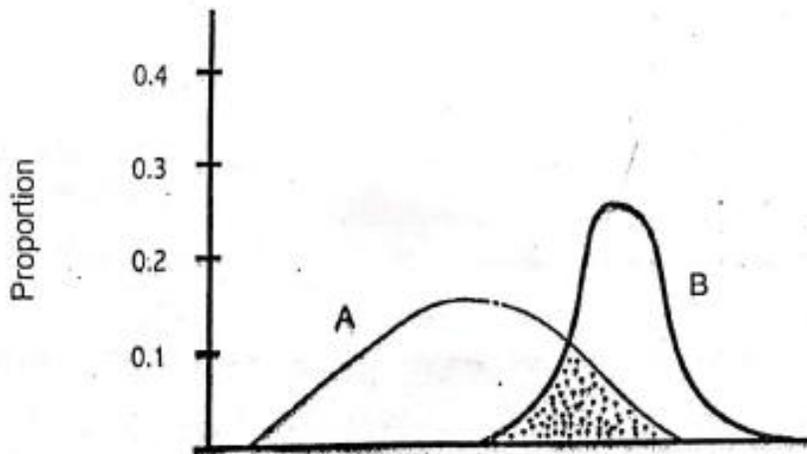
Hutchinson further made distinction between the fundamental and realized niche. Former is the maximum "abstractly inhabited hypervolume" when the species is not constrained by competition with the other species and the latter is a smaller hypervolume occupied under biotic constraints. Fundamental niche is determined by environmental gradient (climate) and biotic relations such as presence of food / prey, predator disease etc.

Consequently ecological niche of a species depends not only on where it lives but also on what it does (how it transforms energy, responds to or modifies the physical and biotic environment and also on how it is regulated by other species.



NICHE WIDTH / NICHE BREADTH / NICHE SIZE:

Niche width is the extent of the hypervolume representing the realized niche plotted in a resource gradient. Niche width is generally described as narrow and broad. This definition is derived from plots of niches on a resource axis. The width is measured by the length of the axis intercepted by the curve. Measurements of niche width usually involves some morphological traits such as bill size or some ecological variable as food size or habitat space or type of food (e.g. small fruit to large fruit). More precisely nichewidth is the sum total of variety of different resources exploited by an organism (Pianka, 1975). The wider the niche more generalized the species is considered, the narrower the niche, the more specialized is the species. Consequently a species may be classified as eurycoeous (wide range of ecological niche) and stenocoeious (narrow range of niche)

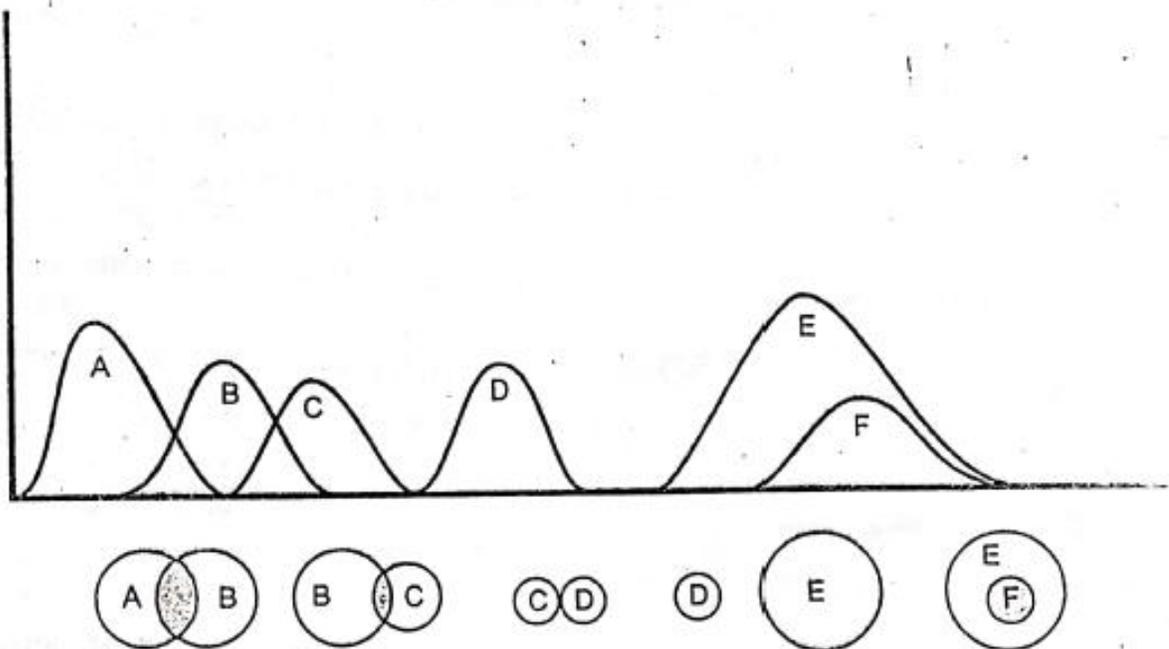


Hypothetical distribution of species with a broad niche (A) and a species with a narrow niche (B) on resource gradient. The niches overlap (shaded area). Species A overlaps species B more than species B overlaps species A.

NICHE OVERLAP:

Fundamental niches of the two species may overlap to some extent. Some niche space may be shared. Niche may overlap with respect to one or few resources. Even niche of one species may be contained in that of another. Rarely do two species have exactly same niche requirement with total overlap.

The following diagram shows different types of niche overlap.



Different types of niche relationships visualized as graphs on a resource gradient. Species A and B have overlapping niches of equal breadth but are competitive at opposite ends of the resource gradient. B and C overlapping niches of unequal breadth. Species C shares a greater proportion of its niche with B than B does with C. (In this example, however, B shares its niche also with A at the other end of its resources niche.) C and D occupy adjacent niches with little possibility of competition. D and E occupy distinct niches with no overlap and no competition. Species E has a niche contained within the niche of E. If F is superior to E competitively, it persists and E shares that part of its niche with E.

Guilds:

Guilds are group of species that forage or feedsimilarly in a given habitat.

Example:

Kangaroo and sheep in Australia belong to the same guild.

Community:

A biotic community naturally occurring mutually sustaining and interacting assemblage of plants and animals living in the same environment, fixing, utilising and transferring energy.

Ecological equivalent:

Two species cannot permanently occupy same or identical needs in the same community. However the species can occupy same or similar ecological niche in different geographical areas. Such species are called ecological equivalents.

Example:

Prairie dog in North America, golden mole in Africa, mole in Asia and marsupial mole in Australia. All these have same ecological names i.e., Fossorial herbivores.

Taxa:

Taxa are groups of organisms that are phylogenetically related.

Assemblages:

The populations that are taxonomically related in the same geographic area are called assemblages.

Local Guild:

Members of a guild of same geographical area are called local guilds.

Ensembles:

When local guilds are taxonomically related, regarded as ensembles.