

Chapter 11-3: Ecological Niches

A population is defined as a group of individuals of a single species living together within a habitat. A habitat affords variables such as space, food, climate, mating conditions, behavior, and other factors. An ecological niche is the very specific place an organism occupies in its environment, and the very specific role it plays within it.

This plate discusses the ecological concept of the niche. We examine five different species of warbler and see how each fits into different niches in a very small environment. Examine the first diagram as you begin your reading below.

The noted ecologist, Robert H. MacArthur, described habitats as being subdivided so that each species comes to live where it will survive and propagate.

Begin your work with diagram 1. This diagram shows the spruce tree (A), which you may wish to color green. One species of warbler studied by MacArthur was the Cape May warbler (B). A light color may be used to outline this bird, or you may wish to color its lighter parts. The niche of the Cape May warbler (B₁) is shown in the top, shaded portion of the tree. A color similar to the one used for the bird should be used for its niche. The Cape May warbler uses the resources and shelter of the upper portion of the tree and, by feeding and nesting here, the bird avoids some competition with other species of warblers.

A second species of bird studied by MacArthur is the bay-breasted warbler (C); the niche of the bay-breasted warbler (C₁) is shown in diagram 2. Note that this niche lies below that of the first bird, and that it occupies areas at the exterior of the tree as well as the interior.

We proceed to diagram 3 and the Blackburnian warbler (D). The niche of the Blackburnian warbler (D₁) is very similar to that of the Cape May warbler seen in diagram 1. Although there is a slight overlap, the two species are not in direct competition because the Blackburnian warbler spends most of its time in the outer branches of the tree and feeds in an area that's lower in the tree. This bird may be in the tree at the same time as the other two warblers, but by feeding in different areas, it avoids direct competition.

We conclude our study of ecological niches by examining those occupied by two remaining species studied by MacArthur.

The species of warbler studied by MacArthur belongs to the genus *Dendroica*. The fourth member of this genus is the black-throated green warbler (E). This bird spends at least half of its feeding time in the upper portion of the spruce tree. In diagram 4, we see that the bird occupies the exterior portion of the tree and avoids the interior area. This prevents its overlap with the bay-breasted warbler. The niche of the black-throated green warbler (E₁) should be colored the same color as the bird.

A clear differentiation of niches is seen for the Myrtle warbler (F). The niche of the Myrtle warbler (F₁) includes areas at the central portion of the spruce tree as well as the bottom. This is a ground-dwelling warbler that feeds on insects from the soil and in the tree.

The principle of competitive exclusion states that evolutionary forces pull the niches of similar organisms apart so that the organisms adapt differently, resulting in niche differentiation. No two species can occupy the same ecological niche in a community. When two or more species are found to coexist on a long-term basis, their niches will always differ, and if their niches do not differ, extinction of one of the species occurs. The divergence of feeding behavior is a factor in niche separation, and the resources exploited to meet the energy, nutrient, and survival demands of the species are all aspects of species' niches.

Ecological Niches

- ☐ Spruce Tree.....A
- ☐ Cape May WarblerB
- ☐ Niche of Cape May WarblerB₁
- ☐ Bay-Breasted Warbler ..C

- ☐ Niche of Bay-Breasted WarblerC₁
- ☐ Blackburnian Warbler ..D
- ☐ Niche of Blackburnian WarblerD₁

- ☐ Black-Throated Green Warbler.....E
- ☐ Niche of Black-Throated Green WarblerE₁
- ☐ Myrtle WarblerF
- ☐ Niche of M. Warbler ..F₁

