44.1B: Organismal Ecology and Population Ecology

Organismal and population ecology study the adaptations that allow organisms to live in a habitat and organisms' relationships to one another.

Learning Objectives

- Describe populations as studied in population ecology and organisms as studied in organismal ecology

Key Points

- Organismal ecology focuses on the morphological, physiological, and behavioral adaptations that let an organism survive in a specific habitat.
- Population ecology studies the number of individuals in an area, as well as how and why their population size changes over time.
- The Karner blue butterfly, an endangered species, makes a good model for both organismal and population ecology since it is dependent, as a population, on a specific plant that grows within specific areas, which, thus, influences butterfly distribution and numbers.

Key Terms

- **conspecific**: an organism belonging to the same species as another
- **population**: a collection of organisms of a particular species, sharing a particular characteristic of interest, most often that of living in a given area
- **oviposit**: to lay eggs
Organismal Ecology

Figure 1: Karner blue butterfly: The Karner blue butterfly (Lycaeides melissa samuelis) is a rare butterfly that lives only in open areas with few trees or shrubs, such as pine barrens and oak savannas. It can only lay its eggs on lupine plants.

Researchers studying ecology at the organismal level are interested in the adaptations that enable individuals to live in specific habitats. These adaptations can be morphological (pertaining to the study of form or structure), physiological, and behavioral. For instance, the Karner blue butterfly (Lycaeides melissa samuelis) is considered a specialist because the females preferentially oviposit (that is, lay eggs) on wild lupine. This preferential adaptation means that the Karner blue butterfly is highly dependent on the presence of wild lupine plants for its continued survival.
Wild lupine: The wild lupine (Lupinus perennis) is the host plant for the Karner blue butterfly. After hatching, the larval caterpillars emerge to spend four to six weeks feeding solely on wild lupine. The caterpillars pupate (undergo metamorphosis), emerging as butterflies after about four weeks. The adult butterflies feed on the nectar of flowers of wild lupine and other plant species. A researcher interested in studying Karner blue butterflies at the organismal level might, in addition to asking questions about egg laying, ask questions about the butterflies’ preferred temperature (a physiological question) or the behavior of the caterpillars when they are at different larval stages (a behavioral question).

Population Ecology

A population is a group of interbreeding organisms that are members of the same species living in the same area at the same time. Organisms that are all members of the same species, a population, are called conspecifics. A population is...
identified, in part, by where it lives; its area of population may have natural or artificial boundaries. Natural boundaries might be rivers, mountains, or deserts, while examples of artificial boundaries include mowed grass or manmade structures such as roads. The study of population ecology focuses on the number of individuals in an area and how and why population size changes over time. Population ecologists are particularly interested in counting the Karner blue butterfly, for example, because it is classified as federally endangered. However, the distribution and density of this species is highly influenced by the distribution and abundance of wild lupine. Researchers might ask questions about the factors leading to the decline of wild lupine and how these affect Karner blue butterflies. For example, ecologists know that wild lupine thrives in open areas where trees and shrubs are largely absent. In natural settings, intermittent wildfires regularly remove trees and shrubs, helping to maintain the open areas that wild lupine requires. Mathematical models can be used to understand how wildfire suppression by humans has led to the decline of this important plant for the Karner blue butterfly.