45.1C: Species Distribution

Scientists gain insight into a species' biology and ecology from studying spatial distribution of individuals.

Learning Objectives

• Differentiate among the ways in which species distribute themselves in space

Key Points

• Dispersion or distribution patterns show the spatial relationship between members of a population within a habitat.
• Individuals of a population can be distributed in one of three basic patterns: uniform, random, or clumped.
• In a uniform distribution, individuals are equally spaced apart, as seen in negative allelopathy where chemicals kill off plants surrounding sages.
• In a random distribution, individuals are spaced at unpredictable distances from each other, as seen among plants that have wind-dispersed seeds.
• In a clumped distribution, individuals are grouped together, as seen among elephants at a watering hole.

Key Terms

• dispersion pattern: the spatial relationship between members of a population within a habitat, often characteristic of a particular species
• allelopathy: the release by a plant of a toxin to suppress growth of nearby competing plants, often resulting in a uniform dispersion pattern
• habitat heterogeneity: variation in physical environmental features within an area, such as topography, soil
Species distribution

Density and size are useful measures for characterizing populations. Scientists gain additional insight into a species’ biology and ecology from studying how individuals are spatially distributed. Dispersion or distribution patterns show the spatial relationship between members of a population within a habitat. Patterns are often characteristic of a particular species; they depend on local environmental conditions and the species’ growth characteristics (as for plants) or behavior (as for animals).

Individuals of a population can be distributed in one of three basic patterns: they can be more or less equally spaced apart (uniform dispersion), dispersed randomly with no predictable pattern (random dispersion), or clustered in groups (clumped dispersion).

Figure \( \PageIndex{1} \): Three patterns of distribution in populations of organisms: A population may have a uniform, random, or clumped distribution. Territorial birds, such as penguins, tend to have uniform distribution. Plants with wind-dispersed seeds, such as dandelions, are usually distributed randomly. Animals, such as elephants, that travel in groups exhibit clumped distribution.

Uniform dispersion is observed in plant species that inhibit the growth of nearby individuals. For example, the sage plant, *Salvia leucophylla*, secretes toxins, a phenomenon called negative allelopathy. The chemicals kill off surrounding plants in a circle around the individual sage plants, leading to a uniform distance between each plant. Animals that maintain defined territories, such as nesting penguins, also exhibit uniform dispersion.

Random dispersion occurs with dandelion and other plants that have wind-dispersed seeds that germinate wherever they happen to fall in a favorable environment. Clumped dispersion is seen in plants that drop their seeds straight to the ground, such as oak trees, or animals that live in groups, such as schools of fish or herds of elephants. Clumped dispersions may also result from habitat heterogeneity. If favorable conditions are localized, organisms will tend to clump around those, such as lions around a watering hole.

In this way, the dispersion pattern of the individuals within a population provides more information about how they interact with each other and their environment than does a simple density measurement. Just as lower density species might have more difficulty finding a mate, solitary species with a random distribution might have a similar difficulty when...
compared to social species clumped together in groups.