Population Biology

Heather Brennan20.8K reads

Population biology is a subdivision of ecology

Population biology is a type of ecology that focuses specifically on how populations behave. A population is a group of individuals of the same species.

Although there are individual behaviors that can be studied populations also have characteristics that relate to them as a cohesive unit. They have a growth rate which is related to the birth and death rates of the population. They also have an age structure and genetic fitness.

K & r Selection

Populations have different reproductive strategies [1]. Some species will have many offspring of which only a few will survive while others have only a few offspring but they have a much higher rate of survival.

> K is the coefficient that represents the maximum number of individuals in a population that the environment can support.

> The r coefficient represents the growth rate of the population.

The r coefficient is determined by subtracting the death rate from the birth rate of the population. If the growth rate is a positive number then the population is growing. If it is a negative digit then the population is declining.

A population is described as r selected if the emphasis is on rapid reproduction to take advantage of good conditions. These species tend to produce a lot of offspring at a time, with little parental care, high death rate of juveniles (ie few individuals survive to reproduce), and generally short life spans. They live in conditions that can be quite unpredictable due to environmental conditions. Examples of r selected species include frogs, many insects, and many rodents.

K selected populations tend to grow to slowly fill a more stable environment's capacity. K selected organisms generally have fewer offspring but more offspring survive to maturity. They may provide more parental care than r selected species. K selected species are often larger animals and live longer lives.

Examples of K selected species include:

- humans
- apes
- elephants
- parrots
- whales

Some species exhibit characteristics of both r and K selected species. For example turtles lay many eggs and provide little parental care. Few turtles survive to maturity but those that do tend to live very long lives and reproduce often.

Environmental Factors Affecting Population

Populations are affected by density-dependent and density-independent environmental factors [1].

Density-independent factors

Density-independent factors includes things like weather, interference by man in the form of habitat destruction or poisons.

These are things that affect the population regardless of its size at the time of occurrence. They tend to cause fluctuations but do not control population growth, unless of course they completely eliminate the population.

Density-dependent factors

Density-dependent factors are things that are more likely to happen when the population density peaks.

They include things like diseases, insufficient food and starvation, increase in predator population (due to increase in food supply) leading to increased predation rates, and stress and crowding factors which can lower birth rates. These elements often control population density. The environment can only support a given number of individuals. When the population grows beyond that level, those factors will kick in and lower the population level again.

Hardy-Weinberg Population Law

The Hardy-Weinberg principle [2] states that gene frequencies and genotype ratios will remain constant in a randomly-bred population. This principle ceases to apply to a population under the following conditions:

- Non-random mating occurs
- Genetic drift occurs

- Mutation occurs
- Natural selection occurs
- Gene flow occurs

Those five factors will lead to evolutionary change which affects how a population reacts to its environment.

Population biology focuses specifically on how populations behave and their characteristics. It often uses mathematical models to help predict how a population will react to change. It is a specific aspect of ecological studies.

Links
[1] http://www.bio.miami.edu/tom/courses/bil160/bil160goods/16_rKselection.html
[2] http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/H/Hardy_Weinberg.html