

# Ecology, ecogenetics

## Ecology of populations

**By population** we call a set of individuals of the same species inhabiting a certain territory in a given time period.

**Population ecology** examines the influence of ecological factors on populations (demecology).

In a population, individuals are distributed in such a way that each has a probability of participating in the reproduction of the population's offspring. It is therefore a living system in which not only the biological properties of individuals are manifested, but also the biological properties of the entire group. A population can thus: grow, age, differentiate, maintain itself, have a certain structure, birth rate, mortality, dispersion, etc. Population ecology makes it possible to examine these characteristics, thereby contributing to a more complete knowledge of the nature of the population.

## Dispersion

**Dispersion (spread)** – distribution of individuals in the population, informs about the location of individuals in the inhabited area. Divided:

- *linear*;
- *flat*;
- *spatial*.

## Population density

- Population density is related to the distribution of individuals - it is given by the number of individuals per unit area – **abundance**.

Population density is subject to species-related changes:

- oscillations (fluctuations in frequency during 1 year);
- fluctuations (fluctuations in abundance over several years, the result of mortality and birth rates).
- Some species overgrow from time to time. Proliferation phase: gradation → gradation peak → culmination → retrogradation → latency → pregradation → progression with a new gradation peak.
- Fluctuations in the number of populations are influenced by: climatic conditions, diseases, human interventions, ...
- As a result of the uneven distribution of the vital components of the environment, animals are scattered in the landscape non-randomly and unevenly.
- The social structure of the population and the gender ratio also play a role.

## Age structure of the population

- Another characteristic of the population is its age structure. From this point of view, we can divide the population into 3 categories:

1. *pre-productive*;
2. *productive*;
3. *postproductive* (old individuals).

- **Natality** (multiplicity) is directly dependent on metabolic rate and inversely dependent on size.
- **Mortality** (mortality rate).

The animal population is subject to a kind of spatial activity, either during movement due to the expansion of the species, or also in search of warmth, reproduction, food, etc. Vertical activity (chamois) is interesting.

A significant feature is the form of population growth:

1. closed growth (S curve) – the maximum population density fluctuates around the so-called carrying capacity of the environment;
2. open growth (J curve) – a gradual increase at first, then a sharp rise and finally a steep decline.

## Ecogenetics

- It studies hereditary differences in people's reactions to physical, biological and chemical environmental influences.
- It follows on from pharmacokinetics and the development of modern medicine.

## Physical influences

- UV radiation – a strong mutagen for unicellular organisms. In humans, it is needed in small amounts for the production of vitamins. Protection is provided by the pigment.
- Pigmentation is polygenically inherited, the level of protection is given genotype.
- UV radiation causes Mutation, these are removed by reparation activities enzymee. Persons with repair disorders have an increased risk of malignancies.
- Diseases associated with sensitivity to UV radiation:
- Xeroderma pigmentosum is an autosomal recessive disease. The skin is extremely sensitive to sunlight, cancers form at an early age in exposed areas. Endonuclease defect + mutation of about 6 others genes, individuals with a combination Alleles Aa affected less.
- Ataxia teleangiectasia.
- Bloom syndrome (erythema congenitale teleangiectaticum Bloom) is an autosomal recessive syndrome of chromosomal instability.

## Foodstuffs

### Fats

- Hyperlipemia with subsequent atherosclerosis, ICHS, Heart Attack.
- Individual risk is determined not only by lifestyle, but also by genetic disposition.
- The metabolism of fats depends on their transport in the blood, their binding to cell receptors and the breakdown of fats in cells.
- The amount of fat can be influenced by diet and medication.

### Salt

- the sensitivity of sensors to salty taste is influenced by the threshold of sensitivity to salty taste and gender habits;
- genetically conditioned, modified in childhood;
- persons with a dominantly inherited disorder of transport of Na<sup>+</sup> from cells and K<sup>+</sup> into cells (Na-K pump);
- arterial hypertension.

### Milk

- reduced lactase activity → undigested lactose → GIT problems;
- AR hereditary lactase deficiency - atrophic enteritis;
- degenerative changes in the renal canals

### Flour

- Persons with Celiac disease (gluten enteropathy) – it is the inability to break down gluten in flour, nutrient absorption disorders, digestive difficulties. Inheritance irregularly dominant. The condition can be modified by diet (gluten-free).

### Proteins

- Toxic for children with congenital disorders of amino acid metabolism (e.g. PKU, diet low in phenylalanine).

### Alcohol

- Alcoholism it is conditioned by social factors and genetically.
- Alcohol dehydrogenases (ADH) – alcohol is metabolized in the liver to acetaldehyde (absorption already in the stomach).
- Tolerance to alcohol is also affected by the activity of acetaldehyde dehydrogenase (ALDH).

### Inhalants

- dust (antitrypsin deficiency → pulmonary emphysema);
- smoking (lung cancers);
- Allergens (changes in the immune response, bronchial asthma).

### Infection

1. Insulin dependent DM (DM I.type):
  - manifestation in childhood;
  - the antigenic makeup (HLA haplotypes, DR3 and 4) is inherited – in 95% of those affected;
2. Immune disorders:
  - Agama-globulinemia (GR);
  - aplasia thymus;
  - AIDS, mononucleosis due to the EB-virus;
3. Ulcer disease of the stomach and duodenum:
  - Helicobacter pylori.
4. Jaundice, TBC, ...

## Links

- ws: Ekologie, ekogenetika

## related articles

- Population polymorphisms
- Multifactorial Inheritance
- Origin and development of species
- Evolution

## Zdroj

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