

Natural selection

Natural selection is one of **Charles Darwin's** fundamental reflections on the principle of **evolution**, which, in developing of the species, operates with a shift of phenotypic traits towards increased adaptation of the individual and its offspring. The prerequisites for the functioning of natural selection are mainly: inheritances of characters, 2 or more heterogeneous offspring, evolutionarily stable strategies. Natural selection also includes parental and uninformed selection by humans.

There are several types of natural selection. But each can share the principle of hard and soft selection. **Soft selection** eliminates from the population such individuals who are below the value of a certain character (for example, 25% of the smallest individuals), which cannot be avoided. **Hard selection** eliminates from the population those individuals who are below a certain threshold (for example, all individuals below 50 kg), which can be avoided.

Mutations are a factor that also contributes to a certain extent to selection, but most of the time we encounter **neutral mutations** that neither improve the wearer nor disadvantage him.

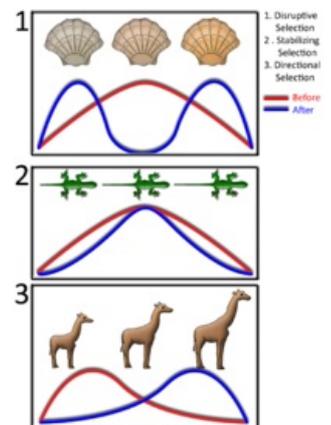
Types of natural selection

- **By nature** - this type of selection is often used as a synonym for natural selection, but not all of it overlaps between sexual and natural selection.
- **Sexual** - leads to secondary sexual features and sexual dimorphism. **The Fisher's model of autoelex** - the gene for trait preference in the population spreads along with the genes for the preferred trait (for example, male trait preferences are passed on by females to their offspring).
- **Stabilising** - favours individuals outside the Gauss curve limits.
- **Disruptive** - favours individuals with threshold values (often in a variable environment).
- **Directional** - prefers individuals on one side of the Gauss curve.

- **R - Selection** - This type of selection favours individuals with the ability to reproduce quickly. These organisms are capable of rapidly colonising new territory, have rapid growth, a large number of offspring and are often light on living conditions.
- **K - selection** - favours individuals with the ability to compete with other individuals. They have a long generational period, they grow more slowly, they are prone to extreme changes in conditions, they have a small number of offspring (human).
- **Intermittently dependent** - it is probably one of the most important mechanisms for maintaining polymorphism in populations. This type shall be indicated as follows: "The ability of the holders of an allele depends on their frequency in the population" ^[1]. A beautiful example exists in the model of predator and prey, in which predator hunts prey that has a higher frequency (greater representation of certain alleles in the population), but often decreases with hunting. At a certain point, the frequency breaks, and it becomes more numerous prey with a different allele that was previously "rare" (**apostatic selection**). Or in the so-called **rare male phenomenon**, where males with rare signs are preferred, but as a result these signs start to increase in the population and males with different and less numerous signs become preferred.

▪ According to the competitors

1. Intra-species - this selection covers all the above-mentioned phenomena, gradually improves different biological structures,
2. Interspecies - is used to select the species most suitable for the habitat (based on developed features, structures, organs, etc.);
3. Species - based on the competency of entire evolutionary lines, a mechanism described relatively recently;
4. Individual - individual survival is determined by individual characteristics and qualities. It occurs, for example, in vegetatively propagating organisms, but for which it is not possible to determine where the line between individual, group and related selection lies;
5. Group - survival of an individual depends on the ability to survive in the whole group (groups, flocks). Selection of features beneficial to the group (altruism);
6. Related - occurrence in related individuals. This type of selection is assumed to have given rise to altruistic behaviour, and thus to reciprocal altruism, in which the individual assumes that in case of danger the person he/she has helped will be willing to help him/her in return.



Selection Types Chart

1. **An evolutionary stable strategy:** The strategy that dominates the population will always be more successful than the minority strategy.
2. **The theory of the selfish gene:** It is not only the theory of competition between alleles of the same locus, but it is mainly about producing as much DNA sequence as possible, which brings no benefit to the wearer.
3. **Gaia:** The planet's biosphere cannot be subject to biological evolution, so it cannot be considered a living organism.

Darwin's Reasoning

Pre-Mendelian, i.e. non-genetic reasoning

Only the best adapted individuals, whose descendants resemble them, survive and reproduce in nature. Well, probably just as well adapted as their parents. This, according to Darwin, is the main engine of evolution, which he described in his famous book **On the Origin of Species by Means of Natural Selection**. Darwin's theory was not, of course, the first consideration of natural selection, but it was one of the few that became famous and highly debated.

"But the Natural Selection, as we will see later, is a power that is always ready to act, and much stronger than the feeble human effort, just as the works of nature are stronger than the works of art."^[2]

Ways of limiting character extensions for an individual:

- Limitation of fertility of the individual – infertility, sterility, unattractiveness to the other sex.
- Limiting the number of offspring – a disadvantaged individual will not feed and protect a large number of young.
- Mortality of the individual before reproduction – the individual is unable to survive.

Natural Selection Problems in Evolution Discussion

The main reason for questioning natural selection as a driver of evolution is the difference between the selected phenotype and the hereditary genotype. Many external traits are influenced by the interaction of genes and non-genetic factors, epigenetics.

Given the complex heritage of the characters, it is not difficult to think of natural selection as a very crude instrument of evolution, but we do not yet have sufficient knowledge to express the relationship of natural selection to the differentiation of new species.

Links

Related articles

- Selection
- Origin and development of species
- Evolution

External links

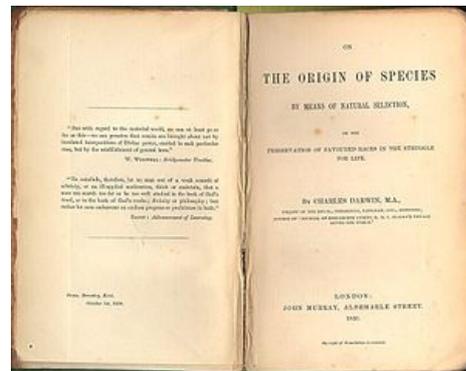
- **Vesmír magazine** – article about Darwin's *On the Origin of Species by Means of Natural Selection* (in Czech) (<http://www.vesmir.cz/clanky/clanek/id/8375>)
- Natural selection on Wikipedia
- Charles Darwin on Wikipedia

References

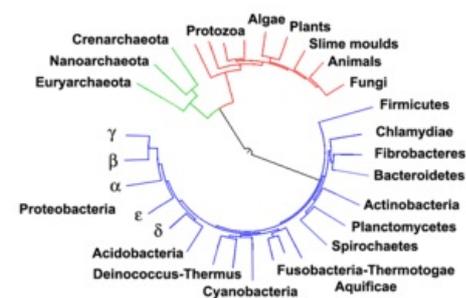
1. FLEGR, Jaroslav. *Evoluční biologie*. 2.edition. Praha: Academia, 2009. ISBN 978-80-200-1767-3.
2. DARWIN, Charles. *O vzniku druhů přírodním výběrem*. 3.edition. Translation Emil Hadač, Alena Hadačová, Hana Marsault-Rejlková. Praha: Academia, 2007, page 579. ISBN 978-80-200-1492-4.

Bibliography

- ZRZAVÝ, Jan, David Storch, Stanislav Mihulka *Jak se dělá evoluce : od sobeckého genu k rozmanitosti života*. [s.l.] : Paseka, 2004.
- DARWIN, Charles *O vzniku druhů přírodním výběrem*. 3.edition. Praha: Academia, 2007.
- FLEGR, Jaroslav. *Evoluční biologie*. 2. edition. Praha : Academia, 2009. ISBN 978-80-200-1767-3.



The Introductory Page of the Darwin Book



Current adaptation of the development tree