

## **Part 3.1. The city as an ecosystem. Features.**

### **3. Biological and social aspects of the life of dogs and cats in settlements.**

#### **3.1. "Ecological balance" in the city and its difference from the natural one.**

##### **3.1.1. "Ecological balance".**

Let's start in order – with the "ecological balance". More precisely, from the general laws of the ecological system of settlements. They determine how certain relatively stable ("equilibrium") states of the urban ecosystem are formed.

Note that the term "ecological balance" is now popular in the light of the ideas of nature conservation and the "green" movement. In the strict sense, such "equilibrium" is a phenomenon that arose naturally. It is appropriate to describe natural ecological systems, such as forests, where the most complex relationships between species of flora and fauna have been formed over thousands of years, and where every birth and every death is not in vain and serves to maintain an overall balance. Let's take an exaggerated example: predators feed on herbivorous animals (which serves as a factor that does not allow herbivores to multiply too much, allows them to get rid of sick and inferior individuals) - but in the event of an overabundance of predators, they themselves will begin to die intensively due to a decrease in the number of victims (and this will save the ecosystem from a further, excessive drop in the number of herbivores ...), etc. In the city, as will be shown below, so verified and naturally arising balance No.

##### **3.1.2. General patterns and relationships between the elements of the urban ecosystem.**

Simply put, an ecological system is considered as a whole set of living beings, with all their mutual connections located in a common habitat for them.

The city as an ecosystem is significantly different from natural ecosystems. Let's consider the difference in more detail, especially paying attention to the most interesting, significant species of animals. The modern city as a habitat is, first of all, a completely evolutionarily unique and completely new in the history of the Earth combination of artificial inanimate objects (houses, roads, vehicles, etc.) and a huge number of individuals of one species of intelligent beings - that is, people who create and change these objects. Cities originated and exist in natural, natural landscapes; their ecosystem to some extent includes elements of the former natural ecosystem that existed before the emergence of the city – but these are only individual elements, and not an integral system.

The urban ecosystem as a type was formed in an insignificant period by natural standards - several decades, at best centuries. Whereas the types of natural ecosystems have been forming for at least tens and hundreds of thousands of years. In ecosystems, there is a cycle of matter and energy. In natural ecosystems (large, the level of biogeocenoses) there is mainly a closed cycle of matter. Animals receive food (organic matter) and, accordingly, energy, from local green plants. Then the organic matter is transmitted through food chains (from herbivores to predators), the substance of all dead animals and plants returns back to the cycle with the help of destructor microorganisms. In the city, the cycle is mostly open. Plants are only a minor component of the ecosystem, and their abundance is regulated by man – through the arrangement (or destruction) of green areas, parks, squares, lawns, etc. In the nutrition of urban vertebrates, native plants play a relatively small role (for example, plant seeds serve as food for omnivorous synanthropic birds) or do not play at all (domestic dogs and cats do not use urban plants as a food resource). The predominant flow of organic matter suitable for consumption by large animals enters the city from the outside. The main part of organic matter is imported into the city by man (in the form of food products - the result of extra-urban agricultural production, fishing, etc.). A large proportion of waste is also diverted outside the settlement, for example, to landfills. So, the main sources of food for large animals are controlled by man - both the urban plant world, and the main resource - food.

Food links between species in a natural ecosystem exist in the form of complex long-term multi-link chains that form entire biocenotic networks. Each species of animal consumes the "organics" provided by other organisms, and itself serves as food for the next links in the food chain. The general direction of the chains (more precisely, the "eating chains") is as follows: plants serve as food for herbivores, and herbivores for predators. Moreover, some relatively weak predators, in turn, are food for stronger ones.

In the city, food connections are largely random and short – because in nutrition animals are attached to a person, and not to each other (with the exception of the remnants of the natural environment in the form of forest parks, etc.).

A person determines not only the nature and abundance of the food base in the city, but also "spatial resources" - that is, he provides shelters, shelters, dens for animals in his buildings and structures, determines the spatial characteristics of habitats (residential development, warehouses, industrial development, etc.). This happens in two ways: 1. purposefully, when people specifically create conditions for a comfortable life for selected animals (usually pets) in their apartments, houses, yards, and 2. Unfocused - animals independently use the design features of structures with voids and holes, master available basements, construction sites, wastelands, etc.

And the climatic factor significantly depends on the person: the temperature regime in the shelters provided by man is significantly different from the natural one - pets in winter do not suffer from the cold in the apartments of the owners. And stray dogs and cats and wild animals-synanthropes (see below) - can bask in open basements, in attics, near heat supply pipelines, etc.

Thus, most of the so-called abiotic (non-dietary) factors – for example, the presence and nature of shelters – are also set by people. Even the microclimate, temperature and light regimes in the city are markedly different from the surrounding natural ones and are subject to significant local variations. Thus, the parameters of both the food base and habitats are almost all set by purposeful or unfocused human activity (see also Appendix 1).

The sum, availability, and distribution of all resources determine the potential maximum abundance of a particular species – the so-called "sustaining capacity of the medium. Human activity in actively regulating the number of a species determines whether it reaches the maximum possible values or not.

### 3.1.3 Stability and balance.

The stability of ecosystems - natural and urban - is different. In the existing natural ecosystem, no species can dramatically change the conditions, in the city - a person has such an opportunity. "The natural system has a relatively high stability, there is a dynamic equilibrium and self-regulation. The stability of the urban is low, the system is constantly exposed to various anthropogenic disturbances. Self-regulation is almost absent, a person himself must perform a regulatory function" (Clausnitzer B. Ecology of urban fauna. M., 1990).

I would especially like to draw attention to the last thesis in view of the ideas spread about the alleged self-regulation (or "self-regulation") of urban animals.

"Self-regulation" of the number of animals in the city, especially domestic animals, is the "self-regulation" of water in a glass. The larger the glass a person takes, the more water will fit into it. The more (less) ecologically favorable conditions a person creates, consciously or unconsciously, for a certain species in the city, the greater (less) the number of this species will be. The dimensions of the glass - that is, the parameters of ecological niches, are set by human activity. All this control is carried out either intentionally or unintentionally - indirect regulation of the number and interspecies relations by changing the parameters of the urban environment.

The scope of human regulation is potentially almost limitless and limited only by specific civilizational factors: available technologies and economic feasibility. For example, theoretically it is possible to build buildings absolutely without small voids and cavities in which rodents live, but in the mass it is technologically difficult and

economically unprofitable (so far?). These control parameters, by the way, may include favoring one species to the detriment of another (see below).

#### 3.1.4 . Commensalism of urban animals in relation to humans. Food chains.

If we consider only higher vertebrates - however, this partially applies to many groups of invertebrates - it turns out that the urban ecosystem is very depleted in species compared to most natural ecosystems, but the main species are usually represented by an "unnaturally" large number of individuals per unit area. These are: 1) domestic dogs and cats, including stray ones, as well as all other domestic animals kept in the city and 2) wild synanthropic animals, classic examples - rats, mice, sparrows, crows, seagulls, etc. Their number largely depends on the degree of loyalty of animals to humans - the most numerous are those who are less afraid of humans. The difference between stray pets and wild synanthropic animals is that pets have been adapted by man to life next to him (domesticated) and once introduced into populated areas for certain utilitarian purposes; wild synanthropic animals in general themselves adapted to the neighborhood with man and settled in the city independently or as a result of accidental, unintentional delivery. Domestic animals have undergone targeted or unfocused artificial selection during the domestication process, wild synanthropics have not undergone such selection.

From the point of view of the use of space, urban animals are human tenants living in his artificially created landscape. And in the aspect of food (trophic) interspecies relations, most large urban animals are freeloaders-"commensals" in relation to humans, in their diet completely or almost completely dependent on him, eating up food for him that a person no longer needs (garbage) or which he specifically allocates to animals (feeding). "Commensalism" is sometimes defined as co-eating or freeloaders. The origin of the term is from the Latin - "together", "c" and mensa - "table". It is a form of relationship between species, in which one species - the host - provides for another the conditions for existence, itself ecologically independent of the freeloader. Examples from nature are the shark and the stickleback fish, the lion and the jackal. But commensalism of such a scale as in the city, nature, perhaps, does not know. One species - a person feeds a huge number of large animals, and several species at once.

(As with natural commensalism, the number of human hostesses is trophically independent of the number of freeloaders (but not vice versa!). In a biological sense, this is a one-way relationship - after all, commensals do not eat a person as a species, competing with him for food, and do not hunt him. (However, the categorical nature of this thesis in relation to dogs in modern Russian conditions can be questioned, so, stray dogs can intercept scraps from containers from homeless people - competition, and cases of death of people from dog attacks can be regarded as an example of hunting. However, these exceptions do not make the weather. In addition, a person

obeys not only direct biological laws, and animals can influence him in other areas: but in any case, animals are much more dependent on humans than they are on them).

Let us analyze in more detail some of the patterns of the urban ecosystem in relation to these most significant species of animals. As already mentioned, human food products, including in the form of garbage, are the first link in short trophic chains. The second link is the main synanthropic and domestic animals. Further, the "food chains of eating", as a rule, do not extend – that is, there are no or few predatory species that build their existence on eating representatives of the first link. After all, there is a lot of garbage and fertilization, in addition, they are for every taste (for sparrows - small crumbs on the asphalt, for pigeons - larger crumbs, for rats - scraps in garbage chutes, for dogs - in bags from tanks or from the hands of passers-by). Thus, human activity not only provides abundant food, but also markedly divided in food terms "ecological niches" among omnivorous synanthropes and domestic animals. This allows very dense populations to exist, transfers interspecific competition "for food" to the periphery of "ecological niches" (unless there is a radical restructuring of the environment by man, giving an advantage to a particular species) and makes predation for the sake of food relatively unimportant for the survival of species. (Which, however, does not automatically mean peaceful coexistence; there is strong intraspecific competition, and there is also "hunting for the sake of hunting," often inspired by man.) There are no real natural predators in the city, existing precisely due to eating prey, or few - they do not get along very well with a person. (With relatively rare exceptions, such as pigeon-hunting hawks, small falcons in some places on high-rise buildings and stone marten in southern Russian cities, etc. In any case, their numbers are lower than those that can be supported by the potential food base available to them).

By the way, much more often natural predators come to cities not for the sake of hunting, but for the sake of the same garbage that they collect in the garbage (see synanthropization and its consequences in Appendix 4).

### 3.1.5 Stable states are the result of human activity.

So, the city is an artificial system created and maintained by man, something like a huge house or apartment, in which only its creator and owner - a person - can maintain this or that stable state, that is, the very "balance". This is especially important for more or less large animals of the city - first of all, these are domestic animals (cats and dogs, including the homeless) and synanthropic wild animals (pigeons, rats, sparrows, etc.). Their nutrition depends on the feed that they are specially (feeding) or unintentionally (waste) provided by a person. Their houses, shelters, dens and burrows are either located directly in the buildings of a person (for example, in domestic animals), or their presence otherwise depends on his activity,

for example, for some birds - on the number of trees planted in the city. Even the climate and lighting in the city are not quite natural - even outdoors in winter it is warmer in the city, and at night it is lighter than outside the city.

In addition, the history of the modern type of urban environment, asphalt-concrete space is only a few decades. This is not enough for the emergence of an equilibrium ecosystem. Man by his activity constantly, continuously changes the living conditions. The connections between animal species in the city are coarser, more primitive, unbalanced than in nature.

Consequently, in the city, a particular ecological situation (a relatively stable state characterized by a certain number of animals of different species and their ratio) does not arise by itself, but is defined as equivalent to the forces of action or inaction of a person, depends on his ability or inability to manage the ecosystem created by him.

All this control is carried out either intentionally or unintentionally – in the latter case, it is an indirect regulation of the number and interspecific relations by changing the parameters of the urban environment (for more details, see Appendix 1.)