

FOX (*VULPES VULPES*) IN URBANIZED LANDSCAPE OF MOSCOW REGION

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Abstract: the red fox acquires some ecological and ethological features which contribute survival of the species near humans in suburban biotopes of Moscow region where it exposed by moderate and high human impact. The fox actively expands the territory which earlier has been considered as unsuitable for its habitation and adapts to any activity proportion and type of human impact and satisfies with necessary minimum of environmental conditions.

Keywords: red fox, adaptation, anthropogenic pressure, adaptability, urbanized environment, disturbance factor.

High ethological flexibility of the red fox is a basic term of successful habitation of this predator in anthropogenic landscapes. The red fox habitation area is not reduced with hunting areas invasion by humans. Under influence of anthropogenic pressure the red fox begins to expand actively the territories which earlier have been considered as unsuitable for its habitation such as: peat borrow pits, disposal sites, embankments near a rail road, etc. It inhabits area transformed by humans and adapts to unusual conditions. This appears particularly in making burrows near buildings, railroad bridges and highways. The red fox uses some of the following materials for burrows: breaks, concrete slabs, garbage, wood boards, etc. Fox settlements occur also close to cities (or even within their area) and villages. This is a result of rapid adaptation of animals to a powerful disturbance factor which sometimes becomes fatal to some species of hunting fauna. The fox avoids negative influence of the disturbance factor partially because of its nocturnalism [1, 2, 3].

The objective of this work was to study fox adaptation to urban terrain habitation. Researches had been carried out during period of 1992 up to 2006 within Moscow region near settlements of Solnechnogorsky, Istrinsky and Ozeretsky hunting entities areas.

Methods

Standard methods were used during the research procedure [4-7]. Visual surveillance, tracing, video and photo had been carried out together with questionnaire of hunters, excavation of burrows, collection and analysis of fecals, animal body mass measurement, stomachs' examination, colour estimation of hunted foxes. Institutional documentation and analysis of hunting estate documentation were used.

Results

An adaptation feature of this species that is the ability of living together with humans is lively shown in recent decades. The fox is rife in urban area even despite of a direct chasing. Areas of cities and their suburbs feel the significant anthropogenic load and one of

its aspects is technogenic pollution which leads to quality deterioration of terrains and even impossibility to live there for animals. The fox has adapted to live in polluted territories that goes to show expansion of species ecological flexibility, adaptation to a new (in the historical perspective) anthropogenic factor having characteristics of the global process.

We pointed out the following adaptive reactions of foxes connected to their exposure in city and settlement suburbs.

1. Animals migration closer to human dwelling from remote biotopes can be seen especially in snowing period of winter beginning from January. Preferential activity is carried out in anthropogenic and especially urban biotopes. Individual territories of foxes adjoin to areas changed by human activity.

2. Making rounds of the territories with paths and person's footsteps. Fox habitat configuration areas and rounds routes of individual territories reflect the characteristics of human communication system in the area. Foxes migrate within an individual territory usually using paths, dirt roads and highways, ski tracks, fishermen footsteps, wood and hay transport roads, pathways of hunters, but they use snowmobile roads even in the remotest areas of biotopes in recent years.

The advantages of such behavior are primarily associated with the attitude of foxes to the trophic factor, the ability of using different trophic substrata depending on ecological situation.

There are a lot of new food items in suburban biotopes which are regularly used by foxes in case of basic food insufficiency, and that is no less important the foraging efficiency of the basic fox food (muridae rodents) is increased in the terrain changed by anthropogenic influence. Snow of roads and ski tracks is firmed and frozen to the soil, on the one hand, preventing the movement of rodents under the snow, on the other hand, helping to increase their population along the paths and ski tracks. Rodents mass along roads, come out of the snow to the surface, and this makes it easier for foxes to catch them. The speed of fox movement along roads and paths also increases as the snow becomes denser. Foxes often return to places of their successful hunt and the discovery of additional food during their activity within individual territories.

Foxes migrate closer to the human dwelling in the second half of winter where there is a lot of synanthropic (cats, rats, crows) origin food. Diurnal migrations of animals concentrate along boundaries of settlements or in the city recreational area, buildings backyards habited in winter. Besides, it is possible for foxes to move by paths and roads in the snowy season.

There are a large number of objects both food and non-food origin along the highways. If the first is directly eaten by foxes, the latter, having associative meaning apparently, are signs of the available food proximity. Foxes are getting used to such objects and do not react negatively to them and associate them with objects of food.

The attitude of the red fox to the anthropogenic objects on their way around the territories having anthropogenic objects has been changed. In 47 (55, 3%) of 85 meeting cases an active reaction to anthropogenic objects has been observed. While in the remote from anthropogenic objects territory, foxes actively have reacted only in 19 (30.1%) cases out of 63 meetings.

An ungulate hunt plays quite an important role. Foxes which live in hunting areas have a different behavioral adaptation: the shots in forests and hunters smell do not scare them, but attract as far as there are wounded animals, skin and internal organs of shot ungulates after a hunt (especially in case of poaching).

We had observed an interesting case, while the moose hunting two foxes had been watching hunters moving parallel to the beaters. After shooting of the moose, cut and took

part of it out of the forest, foxes came to the place of cutting a trophy, but they were afraid to come closer to the meat, because one of the hunters remained to guard part of the carcass.

Change of behavior can be defined as a general rise of disturbance. In this case, the following behavior features of foxes are observed as a general trend. Proportion of imitative reactions is increased. Animals orient movement by old traces or the other animal traces making many attempts to move in a direction opposite to the basic route. Proportion of research reactions is increased in comparison with the average defined for this type of behavior. Animals often move at the same place and stand without reference to the object. The number of marking reactions is increased. Foxes change a gait type more often than usually, and duration of continuous foraging behavior decreases while moving. Specific orientation response are developed which can be changed to the movement around the area. Vertical climbing reactions appear, and direct movement within the area increases.

When inhabiting in a suburban area, the movement of foxes in the snow becomes more "clear", because moving animals leave in the snow chain of the individual traces, footprints which called "dragged" and special for foxes in low anthropogenic factor biotopes disappear. This reaction is presumably a consequence of adaptation to traps in many generations of foxes.

Foxes living in recreational areas of small towns or villages periodically (several times a week) go to the objects of anthropogenic food (landfills, dumps on the outskirts of summer houses settlements and health improvement camps, piles of garbage taken out by trucks to forest grassy clearings). Permanent large landfills are usually located on the border of their individual territories. So the red fox visits a landfill area of 100 m² 51 times for 30 days in the winter, while the raccoon dog - only 38 times, polecat - 5 times, weasel - 5 times, marten - 3 times, mink - 2 times, ermine - 2 times.

Individual territories of the red fox resemble the shape of an elongated triangle or a pyramid with one edge adjacent to the landfill. Animals who migrate within the central part of the "alien" territory, both males and females rarely leave marks in the area associated with the orientation in space (if the movement direction is changed), but they mark places previously marked by other animals.

Foxes, when they met with new human footprints or ski tracks, show usually one of three reactions (they are given in descending order of occurrence frequency): 1) "turning" the movement in the opposite direction to the main one to go a few meters by their traces, then when re-approached to human footprints, they leap them; 2) the foxes go along footprints or ski tracks without crossing them and then cross them by leaps 3) go along ski tracks or human footprints and then cross human footprints not by new snow, but by traces of animals of their species or by traces of mustelids and ungulates. Reactions to old ski tracks as well as the behavior of foxes in general can vary considerably in different specimens of foxes depending on currently dominant motivation when meeting with familiar anthropogenic objects (not new). Female and male foxes have the following reactions to anthropogenic objects in various period of activity: orientation behavior, foraging behavior, marking, defensive behavior and "no" reaction. As a general trend it can be noted that the males have higher proportion of foraging reactions to anthropogenic objects while the females have higher proportion of protective and orientation reactions. The reactions information value of both to the anthropogenic objects grows in the proper context of behavior that occur as a lot of primitive movements associated with the perception of such objects. The male have higher percentage of an indifferent attitude to anthropogenic signals at territorial behavior and the females have it at foraging behavior. Thus motivation plays quite an important role in the reactions of foxes to the anthropogenic signals.

The red fox gets a number of ecological and ethological features in suburban biotopes of Moscow region affected by moderate and high human impact which contribute to the survival of this species close to humans.

Conclusion

1. The red fox quite successfully adapts to anthropogenic impacts which different in proportion and type of activity, and activity of territory invasion is increased.
2. Anthropogenic food begins to play a role of the major food to most foxes. Trophic factor together with the disturbance factor while the breeding remains crucial to the ecology of the fox.
3. Foxes have learned to differentiate the occurrence of a new food particularly during the ungulate hunt and the danger from fox hunters.

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ЛИСИЦА *VULPES VULPES* L. В УСЛОВИЯХ УРБАНИЗИРОВАННОГО ЛАНДШАФТА МОСКОВСКОЙ ОБЛАСТИ

Аннотация: в пригородных биотопах Подмосковья, подверженных умеренному и высокому антропогенному воздействию, обыкновенная лисица приобретает ряд экологических и эволюционных особенностей, которые способствуют выживанию этого вида рядом с человеком. Адаптации лисицы реализуются через подражательное поведение, которое основывается на информации, аккумулирующейся и хранящейся в среде совместного обитания. Питание и территориальное поведение лисиц адаптируются к антропогенным условиям. Лисица стала активно осваивать территории, считающиеся ранее непригодными для ее обитания. Изменилось отношение лисицы обыкновенной к объектам антропогенного происхождения, формируется иная поведенческая адаптация. Обыкновенная лисица достаточно успешно приспосабливается к различным по масштабу и виду деятельности антропогенным воздействиям, довольствуясь необходимым минимумом экологических условий.

Ключевые слова: адаптация, антропогенный пресс, выживаемость, загрязненные территории, образ жизни, обыкновенная лисица, приспособляемость, реакция, сосуществование, стрессогенные объекты, урбанизированная среда, фактор беспокойства.

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