

The relationship between the Red deer and European bison over the winter period

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The relations between the wide-spread game herbivores, such as the red deer, and rare herbivores, such as the European bison, which had entered the Lithuanian Red Data Book, were studied in their common habitats. All signs of animal location and movements were recorded. The methods of the selective observations, sample plots and belt transect route one were used. Red deer preferred foraging in the remote places from the location of European bison. The supplemental feeding in winter does not restrain the damage caused by deer on the preferable species of trees and shrubs. Deer avoid the direct contact with bison. Indifferent relations usually predominate in the common habitats. The bison is the nearest competitor of the deer. Because of the philopatry and common wintering territory of both species under unfavourable foraging conditions the relations between the species are taking the character of certain competition till amensalism.

Key words: Red deer, European bison, common habitat, avoidance, competition.

Introduction

Red deer are wide-spread and well-known game animals in Lithuania. They belong to the Middle Europe subspecies *Cervus elaphus hippelaphus*. There are many works concerning the ecology of red deer and their importance connected with the impact of deer on the forest vegetation (Padaiga, 1971, 1990, 1994; etc.). Deer prefer the stands covering not less than 1000 hectares, and usually step aside from the stands covering less than 500 hectares (Baleišis, Škėrys, 1984). The foraging depends on the stand characteristics, seasonal conditions, animal density, population indices, the habitat carrying capacity. In snowy winter shoots and bark of preferable deciduous species comprised up to 92.3% of deer diet while these of coniferous species constituted from 26 to 46.5% and more (Liet.Fauna..., 1988; Padaiga, 1990). Woody species constituted from 2.5 to 25.4%, small shrubs from 13.5 to 57.6%, and herbs — from 11.2 to 79.5% (Liet.Fauna..., 1988).

The European bison (*Bison bonasus L.*) was a usual game animal in ancient Lithuania. In the XVth century the abundance of bison diminished, and finally they vanished. The first bison breeding ground was established in 1969 in the Pašiliai forest (The Panevėžys district). In 1979 there were 14 free bison. The animals migrated through the Pašiliai forest and pastured on the

surrounding lands. This period was unfavourable for animals. The optimal density is 1 bison per 150 hectares of forest area and 1 bison per 5-7 hectares in enclosure. The experience has shown that the breeding of free bison in comparatively small stands is not real in Lithuania (Baleišis et al., 1987). Because of enclosure reconstruction in 1981, all animals were released from the enclosures to the forest. Then the bison rambled about the forest by the radius of 4-11 km. Some animals were lost. The remaining animals were enclosed again. In 1985 there were 19 bison (3 males and 16 females). It is known that more than 400 species of used plants are in the bison diet, including 50 species of trees and shrubs. The most preferable species are *Populus tremula L.*, *Sorbus aucuparia L.*, *Fraxinus sp.*, *Acer sp.*, as well *Salix sp.*, *Eonymus europaeus*, *Padus racemosa Lam.*, *Quercus robur L.*, *Tilia sp.*, *Betula sp.*, *Picea abies L.*, *Pine sylvestris L.* are rare in the diet. The bison prefer the shoots with diameter of 2 cm and more. The bark is stripped off in the spring and winter then the air temperature is not less than -15°C (Liet.Fauna..., 1988). The bison from the Pašiliai forest prefer cultural plants. In the enclosures the bison preferred *Alnus glutinosa L.*, *Betula sp.*, *Fraxinus sp.*, *Padus racemosa Lam.*, *Populus tremula L.*, *Quercus robur L.*, *Sorbus aucuparia L.*, and other woody plants (Baleišis et al., 1987). In the two enclosures usually there are 14-15

bisons. A total of 15 animals are in the surrounding forest too. The free animals adapted well to different seasonal changes and successfully survived in inclement winters of recent years. However, the bison ecology has not received due consideration in Lithuania (Baleišis et al, 1987). Of importance to the works connected with the management of red deer population, to the improvement of the European bison herd and also to further extension of studies on the bison are the questions on the relations of rare bisons with other animals such as abundant red deer.

Material and methods

Trials were established in the Pašiliai forest (the Panevėžys forest enterprise) to test attraction of red deer into certain places near the breeding-ground of enclosed bisons. The area of forest is 2,800 hectares. The reaction to the supplemental attractive foods was studied near the mentioned enclosures and within the track of 2 km around this place by the method of selective observation on the wintering territory of animals. The daily route observations were carried out in 9-10 hours within the day. The total time of observations was 195 hours over the later autumn-middle winter period. A total of 40 observations were carried out every month from the second part of January till second part of April. All signs of animal location and movements on the mentioned territory were recorded including the direct contacts with animals. The attractive foods were presented in the places of yearly supplemental feeding (3 locations) within the territory tested, and along the enclosure perimeter on the strip of 100x1 m (n=80 sample plots) every 5 meters. The route unit was 100x4 m. Particular transect belts were set along the roads — forest block lines. This territory was covered with transect belt net every 100 m. The total observed territory covered 196 hectares.

In accordance with the 1997 census there are 30 bison in the Pašiliai forest (10 males, 14 females and 6 young animals) at present. In the tested period there were about 19 animals in the forest and also 15 bisons (10 females and 5 males) were enclosed. The census (Padaiga, Bielova, 1994) by the method of pellet-group counting has shown that the deer were gathered in the northern (namely on the territory where the bison enclosures were located), and western parts of the stand. Pine and birch stands growing on *Vaccinio-myrtilloso* sites predominate there. Deciduous stands with spruce grow on *Aegopodiosa*, *Oxalidosa* sites. The average

deer density in the forest was 30 animals per 1000 hectares, and the total of 84 deer foraged there (Padaiga, Bielova, 1994).

Results

The tracks of red deer concentrated near the sample plots with attractive foods in the northern part of the territory tested. There were the main moving directions of deer to the yearly supplemental foraging places. The deer began to attend these places at the end of November when the air temperature was lower than 0°C, and it snowed a little. They avoided the places of free European bison location in the southern part of the territory investigated. Here bisons moved from the yearly supplemental feeding places where last year the animals had no assistance in the winter period. Every day they gathered in the mentioned part near their late native place, namely, the enclosures. The most concentrations of deer tracks were in the remote places. Within the whole tested period from November to the second part of April the deer held themselves apart the bison concentration place. The behaviour of deer was stereotype: animals moved to the usual feeding places, and the solitary approaches to the attractive food patches took place on the way. The supplemental feeding places were attended by animals one after another. While the free herd of bison always had rallied in the same part of the territory, the deer began to attend only at some distance, and did not come to place of the bison locality nearer than up to 48-70 m. The use of the attractive food in the northern part of the territory comprised up to 90% (Tables 1, 2).

In the second period of the studies (January-April) sugar beet rootlets were given as attractive food (the sugar beet rootlets are usual supplement food for game animals in the study forest). The use of this food made up from 98 to 100%. In the southern part of the territory the deer tracks turned aside from the bison locality place on average up to 45 m (the bisons usually came from south-eastern and southern part of the territory). Later on the behaviour of deer has changed slightly. However, the northern part of the territory was always attended by deer (Figure 1). The use of the attractive food constituted up to 100%. A total of 10 tracks were permanent. In the situation of disturbance (such as human approaching) the deer allowed humans to approach up to 250 m, and ran to the spruce thicket. Bisons allowed them to approach up to 20-25 m, and retreated clamor-

Table 1. The use of tested territory by red deer and European bison within the first study period

No of test	Frequency of the tracks, n per day, in different part of the territory					
	southern part		northern part		surrounded forest blocks*	
	deer	bison	deer	bison	deer	bison
1	0	0	0	0	0	0
2	0	9	1	0	29	0
3	8	0	6	0	7	0
4	1	14	13	0	35	0
5	0	12	11	0	44	0
6	7	0	9	0	8	0
7	1	4	16	0	8	0
8	2**	4	17	0	32	0
9	1**	12	28	0	9	0

* - surrounded forest blocks with places of yearly supplemental feeding of game animals

** - the strip of 48-70 m not used by deer up to the places of bison locality

Table 2. The use of the attractive food by red deer and European bison on the tested territory

No of test	The use of the attractive food, of total the quantity, in different parts of the territory					
	southern part		northern part		surrounded forest blocks*	
	deer	bison	deer	bison	deer	bison
1	0	0	0	0	0	0
2	0	100	88	0	85	0
3	single	30	38	0	single	single
4	0	70	10	0	43	0
5	0	20	50	0	75	0
6	0	0.8	30	0	90	0
7	0	80	70	0	90	0
8	0	100	81	0	50	0
9	0	90	70	0	11	0
10	0	60	50	0	80	0

ously and hastily. In April the average frequency of the deer tracks in the southern part of the territory was 4/100 m and in the northern part 16/100 m. The direction of the moving remained the same as in March. In the places of attractive fodder (sugar beet rootlets) the deer stripped off the bark of 75% and more of ashes on average at the distance of up to 12 m from the feeding place. It shows that the supplemental feeding within the winter period does not restrain the damage caused by deer on the preferable tree species as ash, especially at the end of winter and in early spring.

Discussion

The Lithuanian deer are not highly social (that is the social animal which is prone to grouping and to making common cause with other relatives). The tradition

of certain migration is not their characteristic feature. However, the seasonal movements or micromigrations within their habitats are so peculiar to deer. While there is no shortage of fodder the deer stay late at the places of a sufficient forage in the forest in the vicinity of farmlands. The favourable living conditions usually arouse a tolerance to the neighbours. This tolerance is the beginning of the social instinct. Eventually the tolerance becomes the need to group (Bielova, 1995a). The tradition of the local red deer population is moving along the well-known tracks to the places of better foraging and supplemental feeding. This behavioural dominance began to display at the second part of November on the territory tested. Eventually, the moving of deer becomes more intensive, especially in January-February. The moving activity depends on the weather conditions, disturbances of anthropogeneous and other origin (Bielova 1995a,b). Over the tested

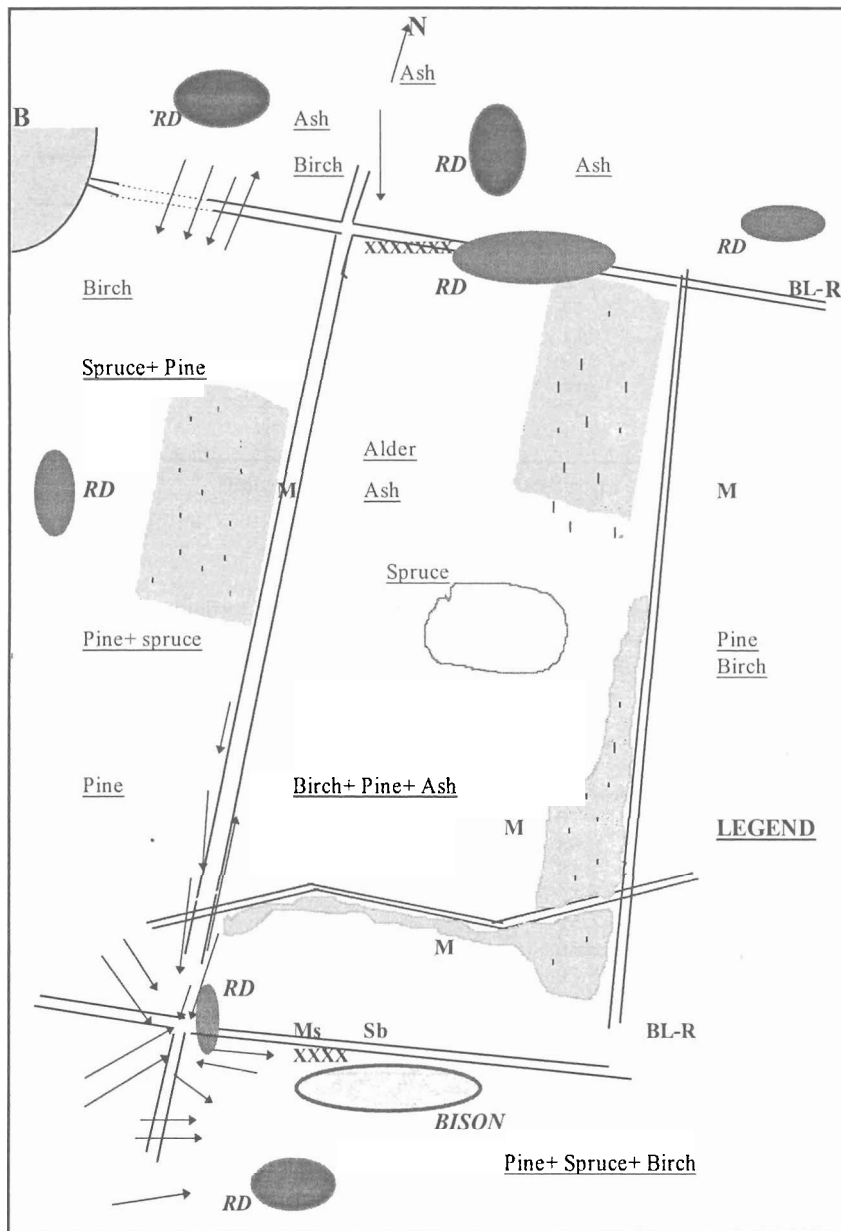


Fig. 1. The scheme of the red deer and European bison location on the tested territory

LEGEND

- Ms – mistletoe (*Viscum alba*);
- Sb – location of the sugar beet routlets;
- RD – concentration places of red deer;
- BISON – location place of European bison;
- XXXXXX – use of the attractive food;
- M – meadow;
- B – barley;
- Pine, Spruce, Birch... – predominated tree species;
- BL-R -block line – forest road;
- C - land – improvement canal;
- Spruce – spruce thicket
- – the main direction of red deer movement

period the need of animals for forage prevails. The characteristic feature of the deer is certain conservatism to the habitat objects and fodder. The usual fodder (natural and supplemental ones) in the habitat determined the stability of the deer feeding — the foraging in the usual places of supplemental feeding predominates. However, the supplemental feeding by all means does not restrain the damage caused by deer on the preferable species of forest plants (in this case, it was ash bark stripping) directly near the place of the attractive food. Such intensive damage has not been caused only due to foraging favourability within the tested winter period but also due to disturbances of anthropogeneous origin (hunting, machinery, transport, etc.). The repeated disturbances can result in frustration and eventually in stress (Lochman, 1976; Missbach, 1981; Ozoga, Verme, 1982; Bielova, 1993). One of the disturbance could be the attendance of bisons in the usual places of deer moving especially under the conditions of forage shortage. Usually the relations between the deer and bison are not distinctive, and they avoid contacts because of indifference. Say, animals tried to meet their needs, but they failed to do it, then next time their memory suspends the need and incentive to avoid an unpleasant situation (Bielova, 1995a) (the place is occupied, and deer slightly goes round). The bisons occupied the same habitat on the territory investigated. Free European bisons usually occupied 10,000 hectares, and more frequently attended the area of 4,700 hectares (Baleišis et al., 1987). The herd of 10-16 animals within the pasturing occupied about 1 hectare. Their daily territory is 3-5 hectares, and the length of daily track is about 1.3 km. In winter the bisons usually attend the territory near the special supplemental feeding and near the bison breeding-ground as well (Baleišis et al., 1987). In the period of our study the free bisons started attending the territory of their supplemental feeding and of the bison enclosures in the second part of November and stepped aside at the end of March. This behaviour corroborates relatively settled life and a philopatry of the bison. Bisons yearly return on the well-known territory. The loss of supplemental fodder in the usual places caused intensive feeding of bisons on the attractive new food. It shows a more flexible feeding behaviour of the bison in comparison to the deer. Our study of niches of herbivores has shown that the niches mostly overlapped during the winter-spring period. The niches of the European hare and roe deer, roe deer and red deer, red deer and elk are mostly overlapped (Bielova,

1997). However, the nearest competitor of the red deer could be the European bison in their common habitats. In bison diet there is up to 100% of tree and shrub species that are well used by red deer. However, the differences between the feeding needs, intensity, feeding conditions, and especially between the abundance of animals, decrease the possible competition. In accordance with the common number of used plant species the competitiveness of deer (then the plants used by deer comprise 100%) with roe deer is found to be 16.3%, with elk 13.1% and with bison 47% in their common habitat (Šostak et al., 1983; Bielova, 1997). The European bison is the potential competitor — amensal of deer within the winter period.

Conclusions

1. The tradition of the local red deer population is moving along the well-known tracks to the places of better foraging and supplemental feeding.
2. Behavioural dominance of moving began to display at the second part of November and becomes especially intensive in January-February.
3. The prevailing need of animals is hunger in the winter period. However, the certain conservatism to the fodder and other habitat objects is still characteristic feature of red deer in any season.
4. The usual fodder determined the stability of the deer feeding and predominance of the foraging in the usual places of supplemental feeding. However, the supplemental feeding by all means does not restrain the damage caused by deer on the preferable species of forest plants especially directly near the place of the food.
5. The relations between the deer and bison are not distinctive, and they avoid contacts because of indifference.
6. The free bisons started attending the territory of their supplemental feeding and their native place in the second part of November and stepped aside at the end of March. This behaviour corroborates relatively settled life and a philopatry of the bison.
7. The feeding behaviour of the bison is more flexible in comparison to the deer.
8. The differences between the feeding needs, intensity, feeding conditions, and especially between the abundance of animals, decrease the possible competition. However, between the European bison and red deer

the potential competition is possible up to amensalism in their common habitats under the unfavourable living conditions.

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ОТНОШЕНИЯ МЕЖДУ БЛАГОРОДНЫМ ОЛЕНЕМ И ЕВРОПЕЙСКИМ ЗУБРОМ В ЗИМНИЙ ПЕРИОД

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Резюме

Отношения между широко распространенными охотничьими растительноядными как благородный олень, и редкими растительноядными, занесенными в Красную Книгу Литвы, как европейский зубр, изучались в их общих местообитаниях. Регистрировались все следы пребывания и перемещений животных. Используются методы селективных наблюдений, экспериментальных площадок и маршрутный ленточный. Благородный олень предпочитал питание в местах удаленных от местопребывания европейского зубра. Дополнительная подкормка зимой не предотвращает повреждений наносимых оленями предпочитаемым видам деревьев и кустарников. Олени избегают прямого контакта с зубром. В общих местообитаниях обычно преобладают индифферентные отношения. Зубр является здесь ближайшим конкурентом оленя. В следствии филопатрии и общей территории зимования обеих видов при неблагоприятных условиях питания отношения между видами принимают характер определенной конкуренции вплоть до амэнсализма.

Ключевые слова: благородный олень, европейский зубр, общее местообитание, избегание, конкуренция.