

Секция: Биологические науки

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PRZEWALSKI'S HORSES (*EQUUS PRZEWALSKII*) SOCIAL RELATIONS INFLUENCE ON TIME BUDGETS AND SPACE USAGE

Przewalski's horse (*Equus ferus przewalskii* Polj., 1881) disappeared from the wild in the 1960s. However, this species was saved from extinction thanks to the efforts of scientists. Przewalski's horses currently live and reproduce successfully in zoos, reserves and natural parks around the world. They have been reintroduced to their native habitat in Mongolia. The largest population of horses is located in the Biosphere Reserve "Askania Nova", Ukraine.

The behavior of Przewalski's horses wasn't studied until they disappeared in nature. Nowadays scientists pay a lot of attention to social behavior of horses, but bachelor groups compared to reproductive ones are studied less. Most of them study the relationship between animals or budgets of their time separately, but don't search connection between these indicators.

The aim of this work was to determine the influence of social relationships of bachelor group of Przewalski's horses on time budgets and their preferences to certain zones in the paddock in terms of semi-free maintenance. According to the purpose of the work there were the following tasks:

- 1) to compare time budgets of different individuals in the morning (5:00 - 10:00), afternoon (10:00 - 15:00) and evening (15:00 - 20:00);
- 2) to determine the territorial distribution of horses in the paddocks;
- 3) to define the relationship in the group, to detect the hierarchical status of each individual and social precedencies;

- 4) to clarify the relations between the social structure of the group, full-time activity and preferences to staying in certain areas in the paddock.

The observation of the male bachelor group of Przewalski's horses was conducted at the Biosphere Reserve "Askania Nova" named after Faltz-Fein in summer, 2015. The group consisted of horses ($n = 9$) of different age (6-21 years). Horses were distinguished by cool brands, ear notches and individual features. There were Zakat (6 years), Lepet (13), Palats (14), Bulat (14), Lovelas (14), Vernij (17), Vityaz (19), Losk (19) and Parus (21) among the horses.

During the study, the animals were located in the paddock I (an area of 3.5 ha). In the period from July 21 to August 3 horses had entrance to paddock II (an area of 1.1 ha). The territory was conditionally divided into 23 zones. Researches were conducted during daylight hours from dawn to dusk (5:00 –20:30). Total time of observation composed 70 hours.

Observations were carried out by a mixed strategy of registration. The method of time slices (interval of 2 min) allowed to note the type of activity of each animal, its location and the nearest neighbor. The nearest neighbor was meant the horse, who stood at a distance of 1 m to the other. The method of fixing certain behavioral patterns allowed to notice interactions between horses. The observer was in the paddock at the distance of 5-40 m from animals.

Intermediate calculations, single-factor analysis of variance and descriptive statistics were performed in Microsoft Excel spreadsheets. The data was analyzed using multivariate analysis of variance, histograms and distribution in Box Analysis software package Statistica 13.0.

According to numerous studies, trophic behavior prevails in the time budgets of Przewalski's horses in captivity and after their reintroduction ($50 \pm 9.5\%$ of observation time). Horses rest in breaks between grazing (they often rest in the morning and feed at dawn and in the afternoon). Locomotor activity takes from 7.0 to 10.0% of time during the day. Comfortable behavior is intended to minimize the harmful effects of environmental factors such as heat, wind, storms and insects.

Horses procure self-care by using autogrooming (licking, scratching, biting), scratching on subjects and wallow in the dust. Individuals who demonstrate social commitment to each other are often engaged in mutual grooming.

The proportions of area where horses live can vary and depend on available land (0.8–606 km²). Animals use their own territory unevenly, preferring one or the other zone. With a lack of fodder and water resources groups can divide them among themselves, but if there is enough of it, the group may limit its land and protect it from outsiders. Everyday life of horses is rhythmic: they visit certain places of their territory at a regular time. Horses don't usually depart too far from the members of their family group, this limit is called social distance. The greater the attachment of companions to each other is, the smaller is the distance between them. Individual distance can reach sizes of a hull horse (about 1.5 m); when a horse reaches the individual distance of the other one, the latter can demonstrate the threat.

Horses are social polygamous animals. They usually form a family group, which consists of harem stallions, 1-4 mares and foals aged 2-3 years. Several groups form a herd. There are also single horses and bachelor groups of the stallions in the herd. Each horse has its own preferences in communicating with congeners. The stronger mutual relations are, the more stable the group is on the whole. Parity communications are both homosexual and heterosexual. The relationships in the group of horses are built on hierarchy close to linear. Alpha is the main horse in the group and it submits any other individual; omega has a lower rank. The rest of the horses are subordinated but they also submit others. However, there are also non-linear relations where one horse dominates the other, but the remaining members of the group do not obey him. Horses achieve dominance by demonstrating their superiority, forcing other individuals to retreat. It may be without apparent physical contact (threats of strike and bite, head and neck tremors) or with it (bites, bruises front legs).

Thirty types of activities were noted during our observation of Przewalski's horses. They were divided into 8 main behavioral groups: trophic behavior, rest,

movement, orientatation, comfortable behavior, interactions, exploratory and other kinds of behavior. The distribution of behavioral patterns by hours is presented in Table 1.

Table 1

Time budget of Przewalski's horses by hours

Behavioral pattern / hours	05:00 – 10:00 (%)	10:00 – 15:00 (%)	15:00 – 20:00 (%)	Total (%)
Trophic	47.3	54.6	66.0	56.2
Rest	27.3	23.1	11.5	20.4
Movement	8.6	7.1	10.8	8.8
Orientate	13.4	9.7	8.3	10.4
Comfortable	0.8	0.9	1.2	1.0
Interactions	1.9	4.4	1.8	2.7
Exploratory	0.1	0.1	0.1	0.1
Other	0.7	0.3	0.3	0.4

Trophic behavior had the highest percentage of daily time budget (from 51.7 to 62.4%). Horses spent fifth of the day for rest (20.4%). There were pronounced benefits to feeding horses in the evening due to the high air temperatures during the day. Significant differences in the preference to rest were observed for Lovelas and Vernij compared with other animals. Horses rested standing (often next to each other's muzzle or muzzle to tail). Horses spent on average 8.8% of time per day for movement. They often moved by step, sometimes ran trot and galloped even less. Comfortable behavior took 1.0% in the time budgets of horses. Carding body by teeth prevailed over using static subjects (0.6 and 0.2%). Horses usually scratched shoulder, leg, croup, stomach and side (0.3 and less than 0.1%). They used column, fewer fence, shelter and tree for grooming (0.1% and less). The interactions between horses took on average 2.7% of time budget. Exploratory behavior was presented by sniffing and digging the ground. Another behavior took 0.4% in the budgets of time and introduced urination (0.2%) and defecation (0.2%).

All 23 areas, into which the paddock was divided for data analysis, were combined into groups A1, A3, A4-A6, B1-B3, B4-B6, C1-C3, C4-C6, D1, E1 and D2, E2. The distribution of space usage by horses is presented in Figure 1.

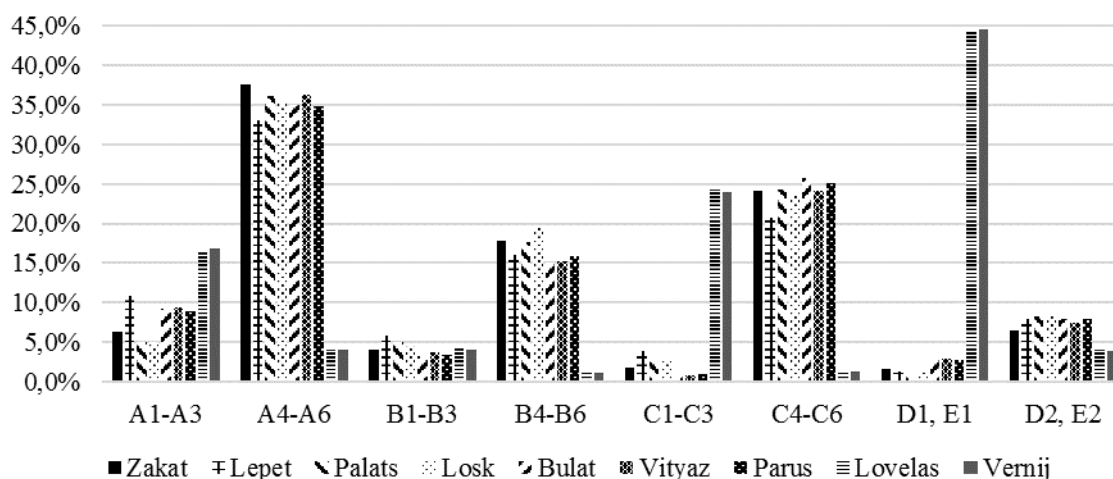


Figure 1. Preferences to being in different zones (% of total time)

In the zones A1-A3 we can observe the prevalence of staying there of Lovelas and Vernij (16.5 and 16.9% respectively), while other horses were there during not more than 9.5% of time. Conversely, Lovelas and Vernij visited zones A4-A6 less frequently than others (4.1% each), and the remaining animals were there from 33.0 to 37.6% of time per day. All horses used areas B1-B3 almost equally (from 3.3 to 5.9%). It was noticeable that Lovelas and Vernij avoided zones B4-B6 (1.2 and 1.1%), while other horses stayed there from 15.1 to 19.5%. In areas C1-C3 there were almost only Lovelas and Vernij (24.4 and 24.0%), other stallions visited it from 0.9 to 4%. Both stallions also avoided zones C4-C6 (1.3%), the rest of the horses were there from 23.6 to 25.7%. Lovelas and Vernij preferred to be in areas D1, E1 (44.3 and 44.7%), other animals visited this part of the second paddock equally often (from 1.0 to 2.9%). All the horses visited areas D2 and E2 with almost equal frequency (from 4.0 to 8.3%). These differences are explained by the fact that there was a drinking bowl in the area C6, a pile of hay in the area A4, areas A4-A6, B4-B6 and C4-C6 had richer grass cover than others, so dominant stallion Lepet and subordinate horses didn't allow Lovelas and Vernij to be there.

The bachelor group of horses which we studied was divided into several subgroups in accordance with the frequency of co-location. Lovelas and Vernij were together most of the time (60.9%), and they had almost no contact with other horses.

Losk and Palats were often together (37.8%), sometimes Zakat (5.6% of cases), Lepet (3.7%), or both stallions (2.0%) joined them. The third stable group consisted of Bulat, Vityaz and Parus: three of them were found together in 16.2% of all time slices, Bulat with Vityaz in 11.1%, Bulat with Parus in 12.4%, and Vityaz with Parus in 15.0%. Zakat periodically joined one or another subgroup. Lepet showed traits of a leader and dominant stallion, while Lovelas and Vernij were dependent individuals. The distribution of subgroups in different zones is shown in Figure 2.

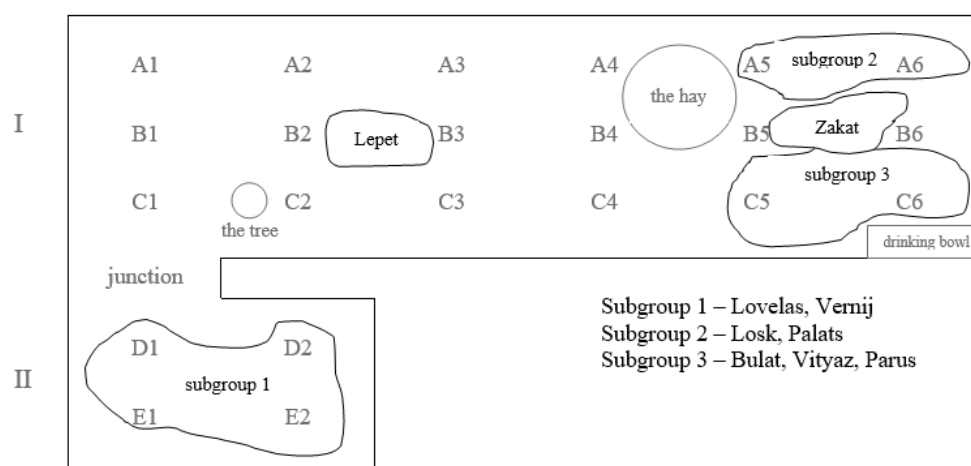


Figure 2. The scheme of paddocks with conditional division into zones

Among the interactions between horses there were mutual grooming, sniffing and licking, avoidance, pursuing, threats, kicking the hind legs, biting and some specific rituals. Overall, friendly contacts prevailed there (especially mutual grooming), indicating that the relationships are already established. It should be noted that the majority of cases of mutual grooming showed members of one group. Only Lepet showed aggression towards Lovelas and Vernij.

We can build a hierarchical structure of studied herd: stallion-dominant is Lepet, two subordinated subgroups (Losk, Palats and Bulat, Vityaz, Parus) and Zakat, which joined one or the other group. Lovelas and Vernij avoided contacts with the rest of the horses, so we can assume that they were driven out of the group, so they created their own independent union.

The work made the following conclusions:

1. Trophic behavior and rest prevail in the time budget of all animals. Differences in the behavior of the submitted and dominant stallions were identified (dominants mostly ate hay and subordinate horses were grazing, etc.).

2. A group of horses that were usually in one and the same units of paddock was discovered (Lovelas and Vernij in the one part, the rest of the horses in the other).

3. In the herd of horses there was found a nonlinear structure of the hierarchy with the dominant horse in the head (Lepet), two equal subgroups of horses (Losk, Palats, and Bulat, Vityaz, Parus and Zakat who joins one or the other group) and two horses that submit to the rest (Lovelas and Vernij). Mutual grooming dominates among the contacts noticed in the group, only male-dominant demonstrates aggression.

4. Subgroups of horses match each other in superior types of behavior, in their preferences to different zones and their joint stay. This fact indicates that social relationships of horses have impact on their daily activity. Indicating that the impact of social relationships on the of the horses.

Literature

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