The counting of winter pellet groups of cervines as the method of assessment of their browsing pressure and population structure

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The results of the ascertaining of browsing pressure of the red deer elementary population and elks by the method of winter pellet group counting were analysed in the paper. In the following years browsing pressure of the red deer elementary populations on the forest winter habitats change from 1.3 to 2.1 times. It depends on the deer wintering conditions and on the possibilities of animals to forage in the fields. After the winters with a snow cover stability up to 40 days of duration, and coming winters with snow cover stability up to 70 days of duration, the deer browsing pressure on the forest habitats on average increased up to 2 times. As after mentioned winters the coming winters are with a snow cover stability up to 80 days, the deer browsing pressure in the forest habitats increase only up to 1.3-1.4 times. The snowy winter conditions slightly influenced browsing pressure on forest habitats. This feature more depends on the animal movements within large areas.

In the study the possibility to ascertain the number of deer and elk males, females, fawns and calves was tested as well count animal winter pellets on the ground. The specified results offer a possibility to ascertain above mentioned indices of the cervine population structure. However, for the solution of this goal it is necessary to conduct more elaborate studies on the basis of the co-operation of scientists and financial supporters from European states and U.S.A.

Key words: winter pellet group counts, red deer, elk, browsing pressure, population structure

Introduction

The method of assessing browsing pressure of American cervines by counting their winter pellet groups was first applied in the USA in 1940 (Mac Cain, 1948). In Russia this method was first used by P. Jurgenson in 1958 to assess browsing pressure by elk (Jurgenson, 1961), while in Lithuania by V. Padaiga in 1964 for roe deer (Padaiga, 1965). Later on the assessment of population density abundance or browsing pressure on deer winter habitats by pellet-group counting in spring were widely applied and developed in the USA (Neff et al., 1965; Roger et al., 1958; Smith, 1964; Van Etten et al., 1965), in Russia (Ivanova, 1967; Pivovarova, 1965; Jurgenson, 1963), in Lithuania (Padaiga, 1973, 1975, 1983; Padaiga, Petružis, 1983).

The most important criteria to assess population number (settled species) or browsing pressure (nomadic species) of different deer varieties on habitats by counting winter pellet-groups are the mean daily number of pellet groups left by an animal and the duration of their feeding on bark-twigs fodder.

As a positive side of the method might be considered the possibility to assess browsing pressure of cervines in winter habitats by their feeding seasons, its importance in studying foraging capacity of the crops and deer distribution in the forest in winter, which is of importance while organizing management of these populations, selecting places for supplementary feeding and applying technical means to protect forest plantations and stands against damage (Jurgenson, 1961, 1963; Padaiga, 1965, 1973, 1983 et al.). This method is indispensable in studying browsing pressure of cervines on winter habitats, allowing at the same time to assess the browsing pressure and damage on woody vegetation (Padaiga, 1975). As a disadvantage of the method is the variation in the number of pellet-groups left by one deer per day and the duration of this process. Absolute data on the number of deer were obtained only for settled populations, while for nomadic populations only the number of winter deer-seasons or browsing pressure on winter habitats were ascertained. Besides this, in deciduous forest winter pellet-groups of elk remain for a year, while in pine stands by the next spring remain 62% from the total number, by the third spring – 45% and by the fourth – 7% (Červonyj, 1973). However, an experienced investigator can easily distinguish between the pellet groups of the last winter and those of previous years or older ones.

The aim of this study was to ascertain changes in browsing pressure on the forest by the two elementary red deer populations over three years in succession, as well as by elks, finding out at the same time the number of males, females and calves and fawns by counting winter pellet-groups.

Methods

Assessment of browsing pressure and structure of the Punia and Padauguva elementary red deer populations as well as these of elk in the winter of 1982/83 – 1984/85 was carried out in forest tracts covering 8848 ha and 10528 ha. Counts of winter pellet-groups of deer and elks in the forests were made in April 1983-1985 until the appearance of plant cover. On the area of 100 ha a sampling strip of 1 km long and 4 m wide was established by dividing it into 100 m pieces. All winter pellet-groups left by deer and elks were recorded within them according to sex and age. The length of the sampling strip by azimuth was measured pacing (120 steps = 100m), while width (2 m on both sides of the route) – holding a stick of 1.2 m in an extended hand. In the Punia forest tract inhabited by the red deer population the length of the sampling strip over 3 years was 272 km and a total of 8750 winter pellet-groups left by red deer as well 610 pellet-groups left by elks were recorded on it. In the forest tract of Padauguva the strip was 331 km long with 6068 pellet-groups of red deer and 2395 of elk recorded on it. The number of winter pellet-groups counted on sampling strips was processed by statistical methods and extrapolated on the area of studied forest tracts. The number of deer (elk) seasons is found out dividing the total amount of winter pellet groups by the amount of pellet groups left by one animal in winter period (deer – 2085, elk – 2800). Browsing pressure on the mentioned species per 1000 ha is ascertained dividing the number of deer (elks) seasons by the area under study.

Results

Climatic conditions of deer and elk wintering on studied areas is given in Table 1.

In spruce-pine and spruce-deciduous forest regions inhabited by the Punia and Padauguva elementary red deer populations in the winters of 1982/83, 1983/84 and 1984/85 the meteorological conditions were similar. In the winter of 1982/83 the average monthly temperatures in January and March were above zero (from + 0.7 to +1.5° C), while in February -4.4-4.5° C. The number of days with snow cover in January-March in both regions was 40, while its depth was 6-7 and 9 cm. Such winters for deer and elk wintering are considered to be mild with low snow cover. In the winter of 1983/84 the average monthly air temperatures in January-March in both regions fluctuated from -0.3 to -4.4° C and from -0.6 to -4.1° C. The days with snow cover in January-March in both regions numbered 70, however, the mean depth of snow in the first region was 2-4 cm, while in the second 1-9 cm. Such winters according to snow cover stability are characterized as moderate. In the winter of 1984/85 the average monthly air temperature in January-February in both regions were low – from -11.7 to -12.2° C, while snow cover was stable for 80 days. The mean depth of snow cover in January-March in the first region was 6-7 cm, while in the second – 10-17 cm. Such winters for deer under Lithuanian conditions are cold with deep snow cover.

Table 1. Specification of the climatic conditions of the red deer and elk wintering on the territories tested

Climatic features	Years and months								
	in 1983			in 1984			in 1985		
	January	February	March	January	February	March	January	February	March
				Spruce - pine stands					
The average monthly air temperature (°N)	1,5	-4,5	1,2	-1,6	-4,4	-0,3	-11,7	-12,2	-0,9
The number of days with snow cover (numerator) and its average height (cm) (denominator)	10/7	30/6	-	30/2	30/4	10/2	30/6	30/7	20/7
				Spruce - deciduous stands					
The average monthly air temperature (°N)	1,5	-4,4	0,7	-1,7	-4,1	-0,6	-11,8	-12,2	-1,1
The number of days with snow cover and its average height (cm)	10/9	30/9	-	30/6	30/9	10/1	30/10	30/17	20/13

Browsing pressure variation in the Punia and Padauguva elementary deer populations and elks on winter habitats in successive years are shown in Tables 2 and 3.

In comparison to the mild winter of 1982/83, in moderate cold winter of 1983/84 browsing pressure by the Punia elementary red deer population on winter

Table 2. Browsing pressure changes of the red deer of the Punia elementary population and elks in the spruce-pine forests

Forests	Area, ha	Inventory year	Red deer				Elk			
			deer-season (M±m)	browsing pressure per 1000 ha (M±m)	sex ratio	fawns, %	elk-season (M±m)	browsing pressure per 1000 ha (M±m)	sex ratio	calves, %
The Punia forest	2720	1983	89.0±6.7	33.0±2.5	1:1.3	23.5	3.0±0.6	1.1±0.2	1:0.8	22.0
		1984	153.9±9.3	56.6±3.4	1:1.2	16.6	10.8±1.9	4.0±0.7	1:1	10.1
		1985	289.0±15.5	106.3±5.8	1:0.9	11.8	1.6±0.5	0.6±0.2	1:0.8	-
The Siponiai forest	2603	1983	35.6±3.7	13.7±1.4	1:1.8	25.8	6.7±1.1	2.6±0.4	1:0.5	25.1
		1984	86.5±6.1	33.2±2.3	1:0.8	23.5	12.7±1.8	4.9±0.7	1:0.7	12.3
		1985	89.0±7.2	34.0±2.8	1:1.2	25.1	2.6±0.7	1.0±0.3	1:0.8	42.5
The Balbieriškis forest	3064	1983	33.9±3.6	11.0±1.2	1:0.6	21.0	4.3±1.0	1.4±0.3	1:0.4	11.1
		1984	73.3±6.1	23.9±2.0	1:0.6	30.2	7.4±1.2	2.4±0.4	1:0.4	6.7
		1985	53.9±3.9	18.0±1.3	1:0.6	19.4	4.8±0.4	1.6±0.1	1:0.4	23.3
The Degsnė forest	461	1983	14.7±2.1	31.9±4.6	1:0.8	26.7	0.3±0.16	0.7±0.3	-	
		1984	18.2±2.2	39.5±4.8	1:0.6	26.0	0.2±0.1	0.4±0.2	-	
		1985	19.8±2.9	42.9±6.2	1:0.6	13.7	0.3±0.1	0.8±0.3	-	
Total	8848	1983	177.7±9.4	20.0±1.1	1:1.2	23.5	14.8±1.6	1.7±0.2	1:0.5	19.8
		1984	336.0±13.5	38.0±1.5	1:0.9	21.7	30.9±2.9	3.5±0.3	1:0.6	9.8
		1985	437.2±20.4	49.7±2.3	1:0.9	16.3	8.5±1.2	1.0±0.1	1:0.6	24.1

Table 3. Browsing pressure changes of the red deer of the Padauguva elementary population and elks in the spruce - deciduous forest

Forests	Area, ha	Inventory year	Red deer				Elk			
			deer-season (M±m)	browsing pressure per 1000 ha (M±m)	sex ratio	fawns, %	elk-season (M±m)	browsing pressure per 1000 ha (M±m)	sex ratio	calves, %
The Vilkija forest	1324	1983	18.6±1.8	14.1±1.4	1:0.9	19.0	4.5±1.0	3.5±0.8	1:0.6	4.0
		1984	30.7±3.3	23.2±2.5	1:0.9	13.2	6.3±1.4	4.8±1.1	1:0.8	12.7
		1985	63.9±6.2	49.1±4.8	1:0.8	16.9	10.6±2.2	8.1±1.7	1:0.8	16.8
The Karalgiris forest	2372	1983	19.1±1.1	8.1±1.1	1:1.1	19.1	20.0±2.4	8.4±1.0	1:1.0	24.4
		1984	22.7±3.1	9.6±1.3	1:1.1	16.3	15.1±2.0	6.4±0.8	1:1.2	23.9
		1985	42.7±4.2	17.8±1.8	1:1.1	24.6	25.9±2.3	10.8±1.0	1:1.6	10.1
The Padauguva forest	1722	1983	17.4±2.2	10.1±2.2	1:0.7	30.4	8.1±2.6	4.8±1.5	1:1.0	30.9
		1984	40.4±3.7	23.5±2.1	1:0.6	20.9	9.0±1.7	5.2±1.0	1:0.8	11.7
		1985	43.9±3.6	25.8±2.1	1:1.3	22.6	8.9±1.0	5.3±0.6	1:0.7	11.4
The Babtai forest	2181	1983	22.9±2.7	10.5±1.2	1:1.0	24.2	8.1±1.1	3.7±0.5	1:0.7	24.9
		1984	69.9±6.4	31.9±2.9	1:0.8	16.5	13.8±1.9	6.3±0.9	1:0.4	16.8
		1985	77.1±6.4	35.0±2.9	1:1.1	16.7	12.0±1.9	5.4±0.9	1:1.2	23.9
The Sausinė forest	1658	1983	12.4±1.5	7.5±0.9	1:1.0	18.5	7.1±1.1	4.3±0.7	1:0.5	11.9
		1984	23.5±3.0	14.1±1.8	1:0.5	12.5	19.8±4.2	11.9±2.5	1:0.5	19.6
		1985	44.0±4.1	25.9±2.4	1:2.1	15.0	14.3±1.8	8.4±1.0	1:0.6	22.3
The Varluva forest	1271	1983	15.7±2.0	12.4±1.6	1:0.8	21.8	3.7±0.6	2.9±0.5	1:0.8	20.0
		1984	44.6±3.1	35.1±2.4	1:1.1	14.6	10.8±1.2	8.5±0.9	1:0.5	8.2
		1985	69.6±6.9	53.5±5.3	1:0.8	16.7	4.1±0.9	3.2±0.7	1:0.5	19.0
Total	10528	1983	117.3±6.1	11.1±0.6	1:0.9	24.2	48.5±3.0	4.6±0.3	1:0.8	22.8
		1984	245.4±10.2	23.3±1.0	1:0.8	16.2	73.4±0.5	7.0±0.5	1:0.6	15.5
		1985	332.6±14.5	31.7±1.4	1:1.1	18.4	73.7±4.6	7.0±0.4	1:1.0	16.4

habitats increased by 1.9, while by the Padauguva population – by 2.1 times. A comparison of moderate cold winter of 1983/84 and cold winter with deep snow cover in 1984/85 had shown that browsing pressure of the mentioned populations on forest was larger by 1.3 and 1.4 times, respectively. An increase in browsing pressure by red deer on forest depends upon the severity of winters and the duration and depth of snow cover,which determine the possibility of deer pasturing in fields. Browsing pressure on forest by both red deer populations, depending on the character of winters, varied synchronously.

In separate forest tracts within the area inhabited by the elementary red deer populations browsing pressure on forest was obviously assessed considering intrapopulational movement of herds.

The correlation between the character of winters and winter browsing pressure by elk was not established, as far as these animals fail to use fields for pasturing in winter. Besides, the elementary elk populations spread on vaster areas.

Based on separate pellet-group counting, the ratio of male to female deer in both populations in different winters was close – 1:0.8 – 1:1.1 and 1:0.9 – 1:1.2, respectively, while the share of fawns in these populations was similar as well – 16.2-24.2 and 16.3-23.5%, respectively. In accordance with visual observation the ratio of male to female deer in this population was 1:1.4, while the number of fawns comprised 21±3% (Padaiga, 1996). The difference in the ratio of male to female deer is obviously due to the variation in the number of pellet-groups. The numbers of fawns ascertained by the method, were similar.

The ratio of male to female elks, determined by counting pellet- groups, in both forest tracts was 1:0.5 – 1:0.6 and 1:0.5 – 1:1, respectively. The share of calves in the first case ranged from 9.8-24.1%, in the second – 15.5-22.8%. The ratio of male to female elks defermined visually in Lithuania was 1:1.2, while the share of calves on average comprised 24.6% (Baleišis, 1973). Thus, the share of female elks and calves defermined by counting pellet-groups was reduced. This is obviously due to differences in the number of pellet-groups left by males, females and calves.

Discussion

We, apart from Dzieciołowski (Dzieciołowski, 1974, 1976), keep to the method of cervines browsing pressure assessment by counting winter pellet-groups. Firstly, this is due to the fact, that the mean-seasonal daily number of pellet-groups by American and European deer species ranges from 12 to 15 and is found to be constant (Padaiga, Marma, 1979). Secondly, as it was shown in Lithuania in 1976 by an experiment on a forest area of 45 thousand ha, browsing pressure by elks assessed by the number of pellet-groups comprised 755 elk-seasons, on the wintering area of 21 thousand ha 426 elks were counted by the aerial method, while according to hunting extent and the annual increment – 570 (Petružis, Padaiga, 1976).

Current studies have shown that seeking to assess browsing pressure by red deer on forest, it is necessary to make counts of their winter pellets in all forest tracts within the area inhabited by individual elementary populations of the species. By applying the method of winter pellet-group counting, it is possible to determine the ratio of males to females and fawns in the elementary deer populations. However, it requires a detailed investigation on finding out the mean daily and mean seasonal pellet-groups left by male, female deer and their fawns. This is possible only under close cooperation and financial support both by European and North American states.

Conclusions

1. To ascertain browsing pressure by red deer on forest, it is necessary to carry out their winter pellet-group counting in all forest tracts within the area inhabited by individual elementary populations of the species.

2. Browsing pressure of the elementary red deer populations in winter habitats is determined by wintering conditions and possibilities to pasture in the fields.

3. In separate forest tracts browsing pressure variation by deer is obviously ascertained considering intrapopulational movement of their herds.

4. The correlation between the character of winters and browsing pressure by elks on forest has not been established.

5. The ratio of male to female deer and elks found according to winter pellets reduces the number of females within the population. The share of calves, determined by the method, corresponds to that obtained by visual observation, while the share of elks is lower.

6. The difference in ratio of male to female deer and elks, determined by counting winter pellets and visual observation, is obviously due to the difference in the number of pellets left by animals of different age and sex.

7. The method of deer winter pellet-group counting allows us to determine not only browsing pressure on forest, but also the structure of the population. To solve this problem, cooperation of scientists and financial support from various countries is sought.

References

Baleišis R. 1977. Briedis [Moose]. Vilnius, 68 p. (in Lithuanian).

Dzieciolowski R. 1974. The use of pellet-group counts to census red deer. XI Internat. Cong. of game biologists, Stockholm, p. 559-563.

Dzieciołowski R. 1976. Roe deer census by pellet-group counts. Acta theriologica, 21, No 24-31, p. 351-358.

Mc. Cain Randal. 1948. A method for measuring deer range use. Transact. of 13 North Amer. Wildlife conference. Washington.

Neff D.J., Wallmo O.C., Morrison D.C. 1965. A determination of defecation rate for elk. J. Wildlife Manag., 29, No 2, p. 406-407.

Padaiga V. 1996. Medžioklės ūkio biologiniai pagrindai [Biological fundamentals of the game management]. Vilnius, 212 p. (in Lithuanian).

Petružis G., Padaiga V. 1976. Briedžių antžeminė ir aviapskaita [Above-ground and areal census of moose]. Girios, No 4, p. 19-22 (in Lithuanian).

Rogers G., Julander O., Robinett W. 1985. Pellet group counts for deer census and range use index. J. Wildlife manag., 22, No 2, p. 193-199.

Smith A. 1964. Defecation rates of mule deer. J. Wildlife Manag., 28, No 3, p. 435-444.

Van Etten R.C., Benett C.L. 1965. Some sources of error in using pellet group counts for censuring deer. J. Wildlife Manag., 29, No 4, p. 723-729.

Иванова Г. 1967. Оценка угодий для лося в зимний период на основании учета экскрементов [Assessment of the moose habitats by the pellet groaup counts during the winter period]. Биология и промысел лося. М., с. 281-287 (in Russian).

Падайга В. 1965. Значение косули в лесном хозяйстве и система мероприятий по защите от нее лесовозобновления в Литовской ССР [Roe deer importance in the forestry, and the system of the measures for the protection of the forest regeneration against its damage in the Lithuanian SSR]. Таллин, 25 с. (in Russian).

Падайга В. 1973. Зимнее пространственное распределение оленей в лесных угодиях [Deer distribution in the forest habitats during the winter]. Тр. ЛитНИИЛХ'а, т. XIV, с. 337-344 (in Russian).

Падайга В. 1975. Комплексный метод изучения влияния оленьих на лесовозобновление и кормовой емкости лесных охотничьих угодий [Combined method of the study of deer impact on the forest regeneration, and of the carrying capacity of forest game managed habitats]. Охотничье хозяйство в интенсивном комплексном лесном хозяйстве. Каунас-Гирионис, с. 77-80 (in Russian).

Падайга В., Марма Б. 1979. О методе оценки численности европейской косули по количеству дефекаций [On the assessment method of the roe deer abundance by the defecation rate]. Экология, 4, с. 101-103 (in Russian).

Падайга В. 1983. Кормовая емкость зимних кустарничковых пастбищ для косули [Feeding capacity of the winter small shrub habitats for the roe deer]. Охотоустройство в специализированном лесном хозяйстве. Каунас-Гирионис, с. 30-31 (in Russian).

Падайга В., Пятружис Г. 1983. Кормовая емкость зимних кустарничковых пастбищ для европейского оленя [Feeding capacity of the winter small shrub habitats for the red deer]. Охотоустройство в специализированном лесном хозяйстве. Каунас-Гирионис, с. 32-34 (in Russian).

Пивоварова Е. 1965. О зимнем размещении лосей в охотничьих хозяйствах Владимирской и Калужской областей [On the moose winter distribution in the game management enterprises of Vladimir and Kaluga districts]. Биология и промысел лося. М., сб. 2, с. 106-112 (in Russian).

Червонный В. 1967. Об экологии, лесохозяйственном значении и промысле лося в Сосновском государственном лесоохотничьем хозяйстве [On the moose ecology, forest management importance, and usage in the Sosnovskij State forest and game management enterprise]. Биология и промысел лося. М., вып. 3, с. 177-188 (in Russian).

Юргенсон П. 1961. Учет лосей и оценка их зимней деятельности в лесах средней полосы методом весеннего учета числа дефекаций [Moose census and measuring of their winter activity in the forest habitats of the Middle zone by the count of pellet groups in spring]. Тр. Приокско-Террасного гос. зап-ка. М., вып. III, с. 19-28 (in Russian).

Юргенсон П. 1963. Учет зимнего пребывания лосей в лесных угодиях средней полосы [Moose census in the forest habitats of the Middle Zone]. Ресурсы фауны промысловых зверей в СССР и их учет. М., с. 118-124 (in Russian).

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УЧЕТ КУЧЕК ЗИМНИХ ЭКСКРЕМЕНТОВ ОЛЕНЬИХ КАК МЕТОД УСТАНОВЛЕНИЯ ИХ КОРМОВОЙ НАГРУЗКИ И СТРУКТУРЫ ПОПУЛЯЦИЙ

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Резюме

В работе анализируются результаты установления кормовой нагрузки элементарных популяций европейского оленя и лося методом учета кучек зимних экскрементов. Кормовая нагрузка элементарных популяций оленя на лесные зимние пастбища в смежные годы изменяется от 1,3 до 2,1 раза. Это определяется условиями зимовок и возможностью пастьбы оленей на полях. После зим с 40-дневым стоянием снежного покрова последующие зимы с 70-дневным

снежным покровом кормовая нагрузка оленя в лесных угодиях увеличивается в 1,9-2,1 раза. Вслед за ними идущие холодные зимы с 80-дневным стоянием снежного покрова кормовая нагрузка оленя увеличивается лишь в 1,3-1,4 раза. Снежность зим на кормовую нагрузку лося в лесных угодиях отражается мало и зависит от кочевок этих животных на больших территориях.

В работе также предпринята попытка определить количество самцов, самок и молодняка оленя и лося на основе раздельного учета кучек их зимних экскрементов. Полученные результаты вселяют надежду на возможность установления этим методом указанных параметров структуры популяций оленьих. Для решения этой проблемы необходимы более глубокие исследования, основанные на кооперации ученых и финансовых средств государств Европы и Северной Америки.

Ключевые слова: Учет оленей, кучки экскрементов, кормовая нагрузка, структура популяций, европейский олень, лось.