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Food Resources for Deer in Niepołomicka Forest[1]

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Estimates were made of food resources, in the form of browse and herb layer plants, in a mixed coniferous forest (*Pino-Quercetum*) and deciduous fores (*Tilio-Carpinetum typicum*) in Niepołomicka Forest. In the coniferous biotope species for which deer exhibit either a low degree of preference, or are totally avoided by them, in summer form over $^2/_3$ and in winter about $^1/_2$ of their whole food, whereas in the deciduous biotope this figures is 10% for both seasons of the year. The real food supply of these animals, which in winter is about 8 t of dry mass/100 ha in the deciduous biotope is thus about 30% higher there than in the coniferous biotope. During the growing season this difference is even greater, being three times as much (65 and 20 t dry mass/100 ha respectively for deciduous and coniferous biotope).

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1. INTRODUCTION

The definition traditionally accepted for the natural food resources of deer includes browse, herb layer plants, mushrooms and other components such as seeds etc. available within the feeding range of these animals (Siuda *et al.*, 1969; Dzięciołowski, 1970). The results of a large number of studies have, however, shown that certain species of plants, although easily and abundantly available, form only a negligible fraction of the diet of roe deer or red deer (Szmidt, 1975). The reason for the animals avoiding these species, which would appear to be their natural food, is most often the unfavourable chemical composition of the plants, reducing their nutritive value, and even occasionally inhabiting the animals' digestive processes (Nagy *et al.*, 1977; Perzanowski, 1978). If these species are included as forming food resources this may lead to considerable overestimation of the capacity of hunting ranges.

In order to account for the avoidance of certain plant by deer it is of course necessary to determine exactly their chemical composition. It is, however, only necessary to analyze the structure of these animals'

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feeding habits in order to distinguish species avoided or occuppying the lowest place in order of preferences exhibited by roe and red deer.

Use has been made in the present study of data on the amount and species composition of food resources and of the deer's feeding habits, in order to show what part of the supply of available browse and herb plants may be considered as their real food and in consequence of this — what the nutritive capacity is in different types of forest biotopes.

2. STUDY AREA, MATERIAL AND METHODS

Data were obtained from 1975—80 in Niepołomicka Forest, situated to the northeast of Kraków (50°07'N, 20°23'E) in its greater area of approx. 9500 ha. The types of tree stand dominating there, included in the studies, are continental pine-oak mixed forest (*Pino-Quercetum*) and deciduous forest (*Tilio-Carpinetum typicum*). They jointly occupy 65% of the area of this stretch of wooded land (Bobek *et al.*, 1978). During the study period 59.4% of this area consisted of timber stands, 27.4% pole-size stands from 20—40 years old, 5.1% thickets from 8—15 years old and 7.6 young plantations up to 6 years old. Large ruminants are represented there by roe deer — *Capreolus capreolus* (Linnaeus, 1758) and red deer — *Cervus elaphus* (Linnaeus, 1758), the density of which is about ten times less than that of roe deer.

In order to estimate browse resources and its consumption by deer we used a random system of enclosed or open plots each 7×3 m (Halls & Dell, 1966; Bobek & Dzięciołowski, 1972). The supply of browse was estimated by the harvesting method twice a year — winter supply on the basis of data from March, and summer supply from data obtained in September. Estimates were made by collecting material each time from 10 plots in four age stages in the two types of forest. At the same time twigs and shoots were cut and the diameter of contacts in neighbouring open plots was counted and measured (Telfer, 1969, 1973). Browse consumption was estimated on the basis of known values of the weight of browse bitten off by deer and the number of contacts recorded in the area (Bobek *et al.*, 1979).

Herb layer plants were collected in order to estimate their resources and consumption in the mixed coniferous forest, on enclosed and open plots chosen at random and each measuring 3×0.5 m.

In order to estimate maximum biomass of all phenological types of herb layer plants, collections were made 5 times a year in March, June, July, September and November on a total of 136 plots. The upper plants of herb layer plants and grasses, and current growth of bilberry bushes (*Vaccinium myrtillus*), cranberry (*Vaccinium vitis-idaea*) and heather (*Calluna vulgaris*) were cut. The browse and herb layer plants collected were segregated into species and dried at 80°C to constant weight.

3. RESULTS

3.1. Food Resources

Considerable variations were found in both the whole of browse resources and the species composition in the different age classes of

tree stand. In both the mixed coniferous forest and deciduous forest the most abundant food supply occurred in thickets, on an average respectively about 75 g/m² and about 50 g/m², whereas far less abundant resources were present in the older age classes, the average for the mixed coniferous forest about 2 g/m², and deciduous forest about 0.7 g/m² (Table 1).

There are marked differences between the various age classes in respect of species composition also, since, *e.g.* the figure for pine in thickets for summer and winter is respectively 86 and 90.5%, whereas in the pole-sized stand as much as 90% of their food consists of buckthorn.

Table 1

Seasonal variations in browse supply and feeding intensity (N of contacts/m²) in four age stages of a tree stand, based on supply estimated in enclosed plots (t of dry mass/100 ha±SD).

Age stages	Summer	N	Winter	N
		Continental pine-oak mixed forest		
Young plantation	17.30±12.60	1.55	24.70±16.00	28.80
Thickets	71.30±42.20	7.46	78.20±22.20	3.16
Pole-sized stands	2.61± 1.91	0.25	0.95± 0.87	1.19
Timber stand	5.90± 5.34	0.34	0.52± 0.48	0.26
		Deciduous forest		
Young plantation	2.18± 2.16	0.66	1.71± 3.62	0.60
Thickets	72.32±39.59	13.28	24.03± 9.69	14.16
Pole-sized stands	1.17± 2.05	0.30	0.21± 0.22	1.44
Timber stand	0.92± 1.16	0.28	0.27± 0.20	1.35

In the deciduous forest the majority of food is supplied by hornbeam, which provides from 36—84% of dry mass of food in the thicket, pole-sized stand and timber stand, whereas in the plantation beech, birch and larch provide jointy 93% in summer and 63% in winter, of the animals' food supply.

Food resources exhibited considerable seasonal fluctuations, particularly in the deciduous forest, where the summer state exceeded the winter by 3—4 times as much (Table 2). On account of the presence of coniferous species, however, seasonal differences between summer and winter were not so extreme in the mixed coniferous forest, differing by about 50%. In the mixed coniferous forest more than 80% of the winter browse supply consisted of coniferous species, and among the deciduous species buckthorn decidedly provided the most food. In summer, owing to the presence of foliage, the percentage of coniferous species decreased to about 50%, with buckthorn and oak forming the majority and jointly providing about 43%.

In addition in plantations and thickets the winter supply of browse is greater than the summer supply (Table 1). The pine, as a dominant species in these age stages of the forest may, both after the summer estimate of food supply (September) an before the winter estimate (March), by assimilation and transport of assimilation products to the buds increase the weight of browse, this becoming clear when estimating

Table 2

Browse resources in summer and winter in the mixed coniferous stand and deciduous stand of the Niepołomicka Forest in t dry mass/100 ha of forest.

Browse	Continental pine-oak mixed forest		Deciduous forest	
	Summer	Winter	Summer	Winter
Coniferous	4.65	3.29	0.20	0.10
Deciduous	4.55	1.21	4.50	1.50
Total	9.20	6.50	4.70	1.60

Table 3

Species composition (%) of browse in the mixed coniferous and deciduous stands of Niepołomicka Forest in summer and winter. Data given for statistical 100 ha of forest.

Continental pine-oak mixed forest			Deciduous forest		
Species	Winter	Summer	Species	Winter	Summer
Pinus silvestris	79.29	49.54	*Carpinus betulus*	40.21	45.75
Frangula alnus	10.40	23.30	*Quercus robur*	30.14	32.38
Quercus robur	1.65	18.80	*Frangula alnus*	15.31	9.48
Betula pubescens	4.97	5.05	*Betula pubescens*	5.33	3.14
Salix aurita	1.36	1.41	*Larix decidua*	3.19	3.26
Larix decidua	1.47	1.00	*Pinus silvestris*	3.31	1.16
Populus tremula	0.17	0.63	*Sambucus nigra*	1.26	1.63
Sorbus aucuparia	0.06	0.23	*Tilia cordata*	0.84	1.98
Picea excelsa	0.63	—	*Fagus silvatica*	0.34	1.20
Corylus avellana	—	0.02	*Populus tremula*	0.07	—
Padus avium	—	0.02	*Salix aurita*	—	0.02

the supply. In the deciduous forest the three main species, hornbeam, oak and buckthorn, form 85% in winter, and in summer about 87% of the dry mass of browse, while the remaining 8 species merely form an admixture (Table 3).

The resources of herb layer plants in the mixed coniferous forest, including monocotyledonous and dicotyledonous plants and shrubs, is greatest in the thicket in July — 204.2 g dry mass/m^2, and lowest in plantations in March — 1.98 g dry mass/m^2. On an average this gives 5.03 t per 100 ha of forest in winter, and 50.27 t in summer. Distinct

seasonal difference also occurred in species composition, since in winter shrubs formed as much as approx. 85% of the whole of the herb layer resources, but only 10% in summer. The figure for monocotyledonous plants in winter is approx. 10%, and over 87% during the growing season (Fig. 1).

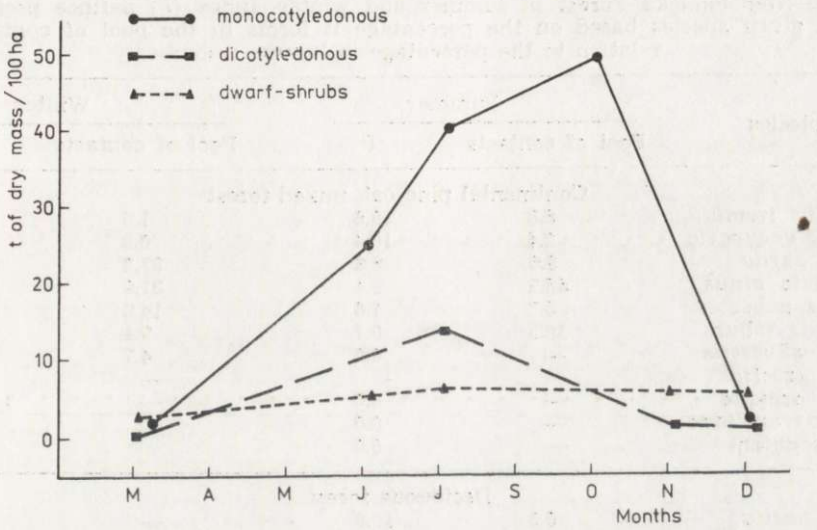

Fig. 1. Dynamics of herb layer plant resources over the annual cycle in a mixed coniferous tree stand of Niepołomicka Forest.

3.2. Description of Feeding Habits

In the coniferous forest the largest number of contacts was recorded in winter in plantations — 28.8/m², while pole-sized stands were least cropped in summer, that is, a figure of only 0.25 contact/m² was recorded. In the deciduous forest the largest number of contacts was found in winter in the thicket, 14.16/m², and least in summer in the timber stand, 0.82/m² (Table 1).

Browse consumption in the mixed coniferous forest, calculated on the basis of the number of contacts per average 100 ha of forest was 0.415 t dry mass in winter, and 0.266 t dry mass in summer. In the deciduous forest deer consumed 0.359 per average 100 ha in summer, and 0.141 t dry mass in winter.

Order of preference for browse was determined by means of the index (*P*), which was calculated for each species, dividing its percentage in the pool of contacts by the percentage in the whole of browse. Although the index calculated in this way differed for the same species in the deciduous and coniferous forest, and also at different age stages and in

different seasons of the year, such species as willow, aspen, buckthorn, beech and service-tree always occupied leading positions in the order of preference, while pine and larch came last (Table 4).

Table 4

Comparison of the food preferences of deer in relation to species of trees and bushes forming food resources in the mixed coniferous stand and deciduous stand of the Niepołomicka Forest in summer and winter. Index (*P*) defince preference for a given species based on the percentage it forms in the pool of contacts in relation to the percentage in browse resources.

Spiecies	Summer		Winter	
	Pool of contacts	*P*	Pool of contacts	*P*
	Continental pine-oak mixed forest			
Populus tremula	6.8	10.8	1.6	2.5
Sorbus aucuparia	2.4	10.4	0.3	1.3
Salix aurita	9.6	6.8	37.2	26.4
Frangula alnus	56.2	2.4	31.9	1.4
Betula pubescens	8.2	1.6	14.8	2.9
Quercus robur	16.5	0.7	9.4	0.5
Pinus silvestris	—	0.0	4.7	0.1
Picea excelsa	—	—	—	0.0
Larix decidua	—	0.0	—	—
Corylus avellana	—	0.0	—	—
Padus avium	—	0.0	—	—
	Deciduous forest			
Salix aurita	0.2	10.0	—	—
Fagus silvatica	2.3	1.9	0.3	0.9
Frangula alnus	17.5	1.8	21.7	1.4
Quercus robur	40.1	1.2	38.9	1.3
Tilia cordata	1.9	0.9	0.6	5.5
Sambucus nigra	1.5	0.9	0.4	0.3
Betula pubescens	2.7	0.9	4.5	0.8
Carpinus betulus	37.6	0.8	28.3	0.7
Larix decidua	1.2	0.4	0.8	0.3
Pinus silvestris	0.2	0.2	0.4	0.1
Populus tremula	—	—	0.1	1.4

4. DISCUSSION

The reliability of the estimate of food resources and capacity of the biotope is of particular importance during the winter, when there are no leaves and the biomass of herb layer plants is greatly reduced, with simultaneous reduction in the nutritive value of both herb layer plants and browse from trees and bushes (Bobek *et al.*, 1974). It is particularly in the deciduous forest that the seasonal reduction in supply of accessible browse occurred most clearly. The winter supply of this food was only 1.6 t/100 ha, of which only about 6.5% applied to coniferous species. In the mixed coniferous forest, on the other hand, of the 6.5 t/100 of browse, over 80% was formed by pine, larch and spruce (Table 3). The order of preference for browse determined in Niepołomicka Forest justi-

fies the statement that in this area coniferous species are consumed by deer to a negligible degree only. If therefore they are omitted when estimating food resources, it becomes clear that in winter deer in the deciduous forest have a food supply of about 1.5 t/100 ha of browse, whereas in the mixed coniferous forest this value is approx. 1.21 t/100 ha.

If herb layer plants are taken into account, then as shown by analysis of rumen contents of roe deer and red deer (Matuła, 1977) during the winter period also they form preferred food. Dicotyledonous species of the herb layer and current growth of shrubs are particularly readily

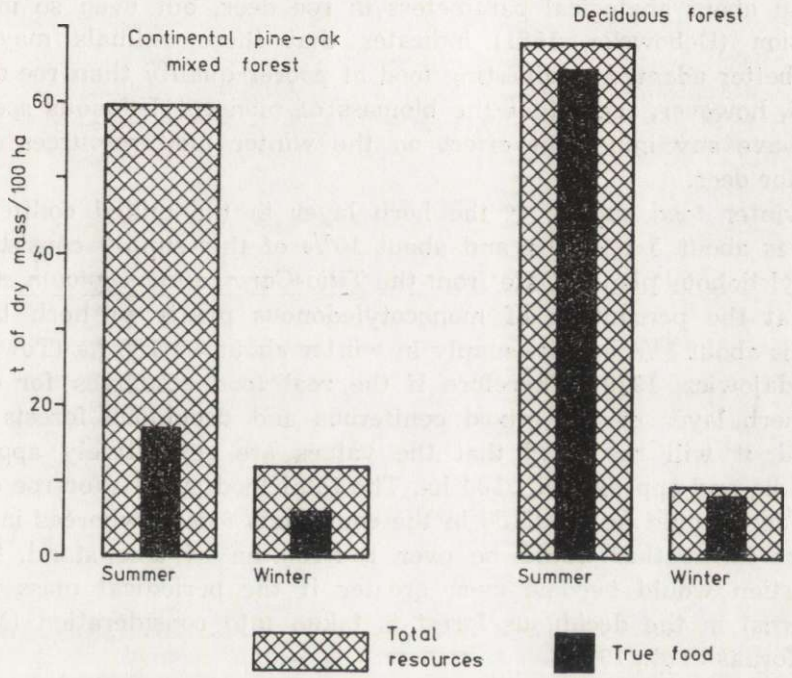

Fig. 2. Comparison of total resources of browse and herb layer plants and true food supply of deer in Niepołomicka Forest in summer and winter.

consumed. Examination of the chemical compositions of herb layer plants showed that highly ligneous upper parts of monocotyledonous plants have very low nutritive value (Mydlarz, 1976). Studies on the energy budget of roe deer and feeding experiments also showed that in order to maintain their energy balance in winter these animals are obliged to consume plants, of which only about 60% is digestible (Weiner, 1977; Perzanowski, 1978; Drożdż, 1979). It is also known that very ligneous parts of shoots and stalks take a far longer time to pass through the alimentary tract of ruminants than green plants or leaves of trees (Mautz & Petrides, 1971), which additionally reduces the amount of energy

capable of assimilation by the animal within a unit of time. It would therefore appear that the upper parts of monocotyledonous plants which roe deer are able to find in winter may be of marginal importance only as food. The fairly high percentage of such monocotyledenous plants in stomach contents may be due on the one hand to their easy indentification, and on the other the length of retention in the alimentary tract of these species may result in their considerable concentration in rumen contents.

Far less is known about the food relations and bioenergetics of red deer than about analogical parameters in roe deer, but even so initial information (Dębowska, 1981) indicates that these animals may be slightly better adapted to digesting food of poorer quality than roe deer. It would, however, seem that the biomass of monocotyledonous species cannot have any important effect on the winter food resources of a biotope for deer.

The winter food supply of the herb layer in the mixed coniferous forest was about 5 t/100 ha and about 10% of this supply consists of monocotyledonous plants. Date from the *Tilio-Carpinetum typicum* stand show that the percentage of monocotyledonous plants in herb layer biomass is about 5%, and its supply in winter about 7 t/100 ha (Towpasz & Tumidajowicz, 1979). Therefore if the real food resources for deer in the herb layer of the mixed coniferous and deciduous forests are compared, it will be found that the values are respectively approx. 4.5 t/100 ha and approx. 6.6 t/100 ha. The total food supply for roe deer and red deer would be 5.7 t/100 in the coniferous forest, whereas in the deciduous forest this would be over 8 t/100 ha of tree stand. This disproportion would become even greater if the periodical mass seed fall (acorns) in the deciduous forest is taken into consideration (Medwecka-Kornaś *et al.*, 1974).

The trophic capacity of the mixed coniferous tree stand of Niepołomicka Forest would then be about 30% smaller in winter than that of the deciduous forest. If an analogical calculation is made for the growing season, it can be seen that the food supply consisting of deciduous browse is 4.55 in the mixed coniferous forest, and 4.50 t/100 ha in the deciduous forest. The food supply formed by herb layer plants, however, consisting in the coniferous biotope of dicotyledonous plants and shrubs, is on an average for the growing season 12 t/100 ha. If the supply of monocotyledonous species is added in March and April, when their young shoots are also readily consumed by deer (Kmak, 1979), this amount increases to about 15 t/100 ha. In the deciduous biotope the supply of herb layer plants varies during the growing season from about 27 t/100 ha to almost 120 t/100 ha, with an average for dicotyledonous

plants of about 60 t. In Niepołomicka Forest the total summer food supply is thus also far greater in the deciduous biotope. This means that biotope capacity is also greater in the deciduous forest during this period, since the food supply determines the size of the roe deer's home range (Bobek, 1977).

The results of this study may provide a partial explanation of the apparent anomalies in the distribution of the roe deer's density in different biotope types of forest stands, although the coniferous biotopes of Niepołomicka Forest cannot be considered as typical, on account of their considerable degradation caused by disturbance of water relations and the effect of industrial pollution. For instance the supply of browse in coniferous biotopes in other forests in Poland has frequently been assesed as far greater (Borowski & Dzięciołowski, 1980). The enormous biotope differences also shown in the supply of dicotyledenous species are not necessarily always so considerable, since production of herb layer plants in the same biotope may differ markedly in successive years (Aulak, 1975). Numbers of roe deer are, however, usually found to be low in a coniferous biotope (Pucek *et al.*, 1977), despite the fact that particularly in winter the total browse supply is relatively high there. If, however, it is accepted, in accordance with the results of this study, that the real food resources are far greater in the deciduous biotope in both summer and winter, then the logical consequence is also greater density of roe deer in this type of biotope. Predominance of coniferous biotopes over deciduous ones may however occur in areas characterized by high snowfall, which limits access to green herb layer plants to a greater degree than to relatively tall shrubs. It may therefore be anticipated that with increasing geographical latitude the winter capacity of coniferous biotopes for providing food for roe deer will be more favourable when compared with biotopes of deciduous forests.

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REFERENCES

1. Adamczyk B., Bobek B., Fabijanowski J., Grodzińska K., Grodziński W., Irzabek T., Lesiński J. A., Lewiński A., Suliński J. & Zając K. P., 1978: Podstawy i wskazówki dla przebudowy kompleksu leśnego Puszczy Niepołomickiej. 1—80 pp., Kraków.
2. Aulak W., 1975: A comparison of production of the ground flora and of the rate of organic fall in two areas of the association *Circaeo-Alnetum* Doerd. 1953 in the Białowieża Natl. Park. Ekol. Pol., *23*: 65—81.
3. Bobek B. & Dzięciołowski R., 1972: Method of browse estimation in different types of forests. Acta theriol., *17*: 171—186.

4. Bobek B., Perzanowski K., Sajdak G. & Szulakowska G., 1974: Seasonal changes in quality and quantity of deer browse in a deciduous forest. Proc. XI-th Int. Congr. Game Biol.: 545—552. Stockholm, 1974.
5. Bobek B., 1977: Summer food as the factor limiting roe-deer population size. Nature, *268*: 47—49.
6. Bobek B., Perzanowski K., Siwanowicz J. & Zieliński J., 1979: Deer pressure on forage in a deciduous forest. Oikos, *32*: 373—380.
7. Borowski S. & Dzięciołowski R., 1980: Browse supply in lowland forests of eastern Poland. Holarctic Ecol., *3*: 203—213.
8. Dębowska B., 1981: Konsumpcja i wykorzystanie naturalnych pokarmów przez jelenie. Msc. Zakł. Ekol. Zw. Kraków, 19 pp.
9. Drożdż A., 1979: Seasonal intake and digestibility of natural foods by roe-deer. Acta theriol., *18*: 81—91.
10. Dzięciołowski R., 1970: Foods of the red deer as determined by rumen content analyses. Acta theriol., *15*: 89—110.
11. Halls L. K. & Dell T. R., 1966: Trial of ranked-set sampling for forage yields. For. Sci., *12*: 22—26.
12. Kmak E., 1979: Preferencje pokarmowe sarn w lasach grądowych Puszczy Niepołomickiej. Msc. Zakł. Ekol. Zw. Kraków, 14 pp.
13. Matuła H., 1977: Zależność składu i jakości pokarmu sarny (*Capreolus capreolus*) od grubości pokrywy śnieżnej w grądach Puszczy Niepołomickiej. Msc. Zakł. Ekol. Zw. Kraków, 22 pp.
14. Mautz W. W. & Petrides G. A., 1971: Food passage rate in the white tailed deer. J. Wildl. Manage., *35*: 723—731.
15. Medwecka-Kornaś A., Łomnicki A. & Bandoła-Ciołczyk E., 1973: Energy flow in the deciduous woodland ecosystem, Ispina Project Poland. [In: Kern L. (ed.) "Modeling forest ecosystems"]. Rep. of mt. Woodland. Worksh. IBP/PT Sect. Oak Ridge Natl. Lab., Oak Ridge, Tenn. pp. 144—150.
16. Mydlarz J., 1976: Zasobność runa i jego wykorzystanie przez jeleniowate w lasach Puszczy Niepołomickiej. Msc. Zakł. Ekol. Zw. Kraków, 18 pp.
17. Nagy J. G. & Regelin W. L., 1977: Influence of plant volatile oils in food selection by animals. Proc. XIII-th Congr. Game Biol.
18. Perzanowski K., 1978: The effect of winter food consumption on roe-deer energy budget. Acta theriol., *23*: 451—467.
19. Pucek Z., Bobek B., Łabudzki L., Miłkowski L., Morow K. & Tomek A., 1975: Estimates of density and number of ungulates. Pol. ecol. Stud., *1*: 121—136.
20. Siuda A., Żurowski W. & Siuda H., 1969: The food of the roe-deer. Acta theriol., *14*: 247—262.
21. Szmidt A., 1975: Food preference of roe-deer in relation to principal species of forest trees and shrubs. Acta theriol., *20*: 255—266.
22. Telfer E. S., 1969: Twig weight-diameter relationships for browse species. J. Wildl. Manage., *33*: 917—921.
23. Telfer E. S., 1973: Browse selection by deer and hares. J. Wildl. Manage., *36*: 1344—1349.
24. Towpasz K. & Tumidajowicz D., 1979: Dynamika sezonowa i produkcja runa oraz ściółki w grądzie (*Tilio-Carpinetum typicum*) na Pogórzu Wielickim (Polska Południowa). Frag. Flor. et Geobot., *25*: 146—189.
25. Weiner J., 1977: Energy metabolism of the roe-deer. Acta theriol., *22*: 3—24.

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BAZA POKARMOWA JELENIOWATYCH W PUSZCZY NIEPOŁOMICKIEJ

Streszczenie

W grądach (*Tilio-Carpinetum typicum*) i borach (*Pino-Quercetum*) Puszczy Niepołomickiej oceniono zasobność żeru pędowego w czterech stadiach wiekowych (starodrzew, drągowina, młodnik, uprawa) w sezonie wegetacyjnym i zimą. Najbogatsza baza żerowa występuje tu w młodnikach (średnio 75 i 50 g s.m./m²), natomiast najuboższa jest w najstarszych stadiach wiekowych (średnio 2,0 i 0,7 g s.m./m²) odpowiednio w borze i grądzie (Tabela 1). Całkowita zimowa zasobność żeru pędowego wynosiła średnio 1,6 t s.m./100 w grądzie i 6,5 t s.m./100 ha w borze, a w sezonie wegetacyjnym odpowiednio 4,7 i 9,2 t s.m./100 ha (Tabela 2). Oba badane typy siedliskowe lasu różniły się znacznie udziałem gatunków iglastych w zapasie żeru pędowego. Sięgał on ponad 80% w siedlisku borowym i tylko 6,5% w grądzie (Tabela 1).

W oparciu o stosunek udziału badanych gatunków w puli zgryzów do ich udziału w zapasie pędów (Tabela 4) wyznaczono szereg preferencyjny żeru pędowego.

W siedlisku borowym przeprowadzono także oceny zapasu roślin runa. W sezonie wegetacyjnym osiągał on tam nieco ponad 50 t s.m./100 ha, a zimą zmniejszał się prawie 10-krotnie. Gatunki jednoliścienne stanowiły tu ponad 87% zapasu latem i około 10% w zimie (Ryc. 1).

Rzeczywista baza pokarmowa jeleniowatych obejmująca drzewa i krzewy liściaste, krzewinki oraz dwuliścienne rośliny runa, oszacowana została odpowiednio w borze i grądzie na około 5,7 i 8,0 t s.m./100 ha zimą, a 20 i 65 t s.m./100 ha w sezonie wegetacyjnym.