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Roe Deer Census by Pellet-group Counts [1]

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Dzięciołowski R., 1976: Roe deer census by pellet-group counts. Acta theriol., 21, 26: 351—358 [With 3 Tables & 1 Fig.].

Pellet-group counts were taken in a big pen (ca 87 thous. m²) to determine whether they could be used to census roe deer, *Capreolus capreolus* (Linnaeus, 1758). Twenty counts made from August 1972 to May 1974 showed that the method was unreliable for estimating roe deer numbers in an unrestrained environment. An adaptation of pellet-group counts to roe deer would require a determination of daily defecation rates during individual seasons of the year, assessment of the weathering rate and decomposition of pellets under various habitat conditions, and repeated field tests based on a known number of animals. Pellet-group counts may provide an index of use among various types of habitats by roe deer. A young plantation, a pole-sized stand of pine, and the ecotone between various habitat types were more intensively frequented by roe deer than a timber stand and thicket.

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1. INTRODUCTION

The technique of estimating deer population numbers by pellet-group counts was developed in North America in 1940 (Benett *et al.* 1970), and later used for research and management purposes in northern USA and southern Canada (Julander *et al.* 1963). Its main applications were to index trends in herd numbers (Robinette *et al.* 1958) and to appraise habitat use by game animals and cattle (Rogers, *et al.* 1958).

There have been several attempts to use the pellet-group technique in Europe, namely in USSR (Yurgenson, 1970; Padaiga, 1970), France (Daburon, 1970), Scotland (Welch, 1971) and Poland (Dzięciołowski, 1974). The Padaiga's (1970) test was the only one concerned with roe deer.

In the pellet-group method it is assumed that animals defecate at a rather constant rate, that pellets are maintained sufficiently long to be found and counted, and that their age and time of deposition can be determined (Ryel, 1972).

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The purpose of the present work was to test whether pellet-group counts could be used to census roe deer, *Capreolus capreolus* (Linnaeus, 1758) and to determine the extent of deer use in various habitats. The need for a reliable census method is especially important

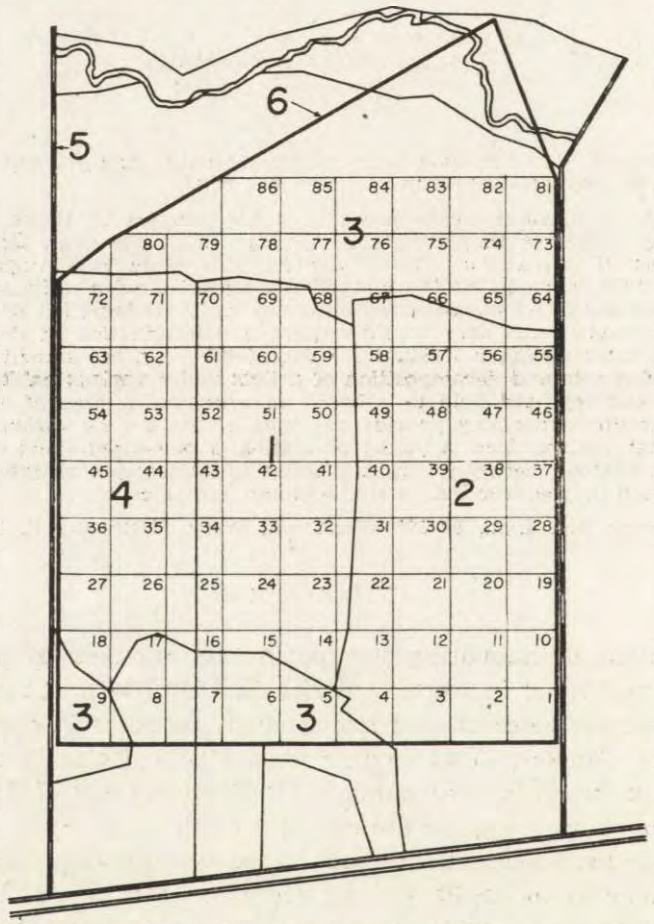

Fig. 1. Sketch of the enclosure in which roe deer pellet group counts were done. 1 — young plantation, 2—6 years old plantation, 27,500 m²; 2 — pine thicket, 20—25 years old, 52,500 m²; 3 — pole-sized stand of pine, 50—55 years old, 42,805 m²; 4 — timber stand of pine, 120—125 years old, 20,000 m²; 5 — compartment lines; 6 — fence.

for roe deer since they are the most difficult of all ungulates to count (Anderson, 1953, 1961).

2. MATERIAL AND METHODS

Pellet-group counts were made in a 86,875 m² enclosure (Fig. 1) at the Józefów forest district (Zamość province). The enclosed area includes patches of the

following forest associations: *Dicrano-Pinetum typicum, Leucobryo-Pinetum molinietosum, Vaccinio uliginosi-Pinetum,* and a riverside meadow.

The enclosure was divided into 86 50×50 m plots and four additional plots of irregular shape, but similar area. The plots were permanently marked with pegs and paint on bordering trees. Pellet-groups were counted and recorded monthly for each plot from August 1972 until May 1974. The counted pellet groups were dug into the soil to prevent double counting. The number of roe deer varied from two to six during the study.

The rate of pellet decomposition was observed on three series of summer samples and three series of winter samples of red deer droppings [2]. Each series, consisting of 10 groups of 20 pellets, was placed in the following habitats: pine thicket with alder admixture, young plantation, and timber stand with well developed understory. Fresh winter pellets were placed on plots April 16, 1973, and summer pellets July 13, 1973. Thereafter, the number, colour, degree of dryness, and consistency of pellets were recorded monthly.

3. RESULTS AND DISCUSSION

3.1. Number Estimates

Pellet-group data (Table 1) were arranged according to seasons of year and subjected to an analysis of variance. Confidence interval $t \cdot S_r$ was determined by the so-called gap test (Oktaba, 1963), with the mean values arranged in a decreasing order.

The accumulation of pellets was significantly greater during spring than for any other season of the year (Table 2), probably because of the shift in roe deer diet to succulent young spring forage.

An estimate of animal numbers by the pellet-group count is possible only when the daily rate of defecation is known. Padaiga (1970) found that a roe deer dismissed an average of 15.6 pellet-groups daily during winter. According to this value I succeeded in finding only 21% of the pellet-groups during the winter and 43% on an annual basis. The results are slightly better than those obtained by Downing *et al.* (1965), who estimated a deer population within 25% of its actual number by the pellet-group counts. My results revealed an enormous variation between and within seasons and show that I worked with a wide margin of error (Table 1).

According to Neff (1968) the following factors cause changes in the defecation rate: good environmental conditions and relatively high uptake of food, high water content in diet, rapid change in diet, high proportion of juvenile animals in population (young animals have a higher rate of defecation), and impact of captivity upon behaviour and psychics. In my study the habitat conditions and food uptake were rather constant throughout the study. There were no unnatural, rapid al-

[2] The author realized the possibility of a differing rate of decomposition between red and roe deer pellets, but did not carry out tests with roe deer pellets.

terations in the diet of enclosed roe deer and there were no fawns in the pen. The psychological effect of captivity should not operate here, because roe deer inhabited the pen for several years. Thus, it seems that

Table 1

Seasonal counts of roe deer pellet-groups.

Season and date of count	Days since previous count	Actual number of pellet-groups	Deer-days	Pellet-groups per deer-day, mean	Pellet-groups at the daily defecation of 15.6 groups/day	Pellet-groups found, %
Autumn						
24.09.1972	27	594	183	3.2	2,855	20.8
15.10.1972	21	537	105	5.1	1,638	32.8
20.11.1972	36	1110	180	6.2	2,808	39.5
21.10.1973	67	435	201	2.2	3,136	14.4
		2676	669	4.0	10,436	25.6
Winter						
28.01.1973	68	478	345	1.4	5,382	8.9
5.01.1974	76	1389	228	6.1	3,557	39.0
		1867	573	3.3	8,939	20.9
Spring						
18.03.1973	49	1146	245	4.7	3,822	30.0
8.04.1973	21	2466	95	26.0	1,482	166.4
24.04.1973	15	1669	60	27.8	936	178.3
13.05.1973	19	596	57	10.5	889	67.0
27.05.1973	14	855	42	20.4	655	130.5
24.03.1974	78	1782	234	7.6	3,650	48.8
21.04.1974	28	1431	84	17.0	1,310	109.2
21.05.1974	30	514	90	5.7	1,404	36.6
		10,459	907	11.5	14,149	73.9
Summer						
28.08.1972		139	89	1.6	1,388	10.0
11.06.1973	14	318	42	7.6	655	48.5
25.06.1973	14	288	42	6.9	655	44.0
10.07.1973	15	422	45	9.4	702	60.1
27.07.1973	17	248	51	4.9	796	31.2
15.08.1973	19	91	57	1.6	889	10.2
		1,506	326	4.6	5,086	29.6
Annual Mean		16,508	2475	6.7	38,610	42.8

difficulties in locating pellets among herb layer vegetation and observers' error were responsible for the low percentage of groups located.

3.2. Habitat Use

The distribution of pellet-groups for 20 counts taken during 2 years is shown in Table 3. This distribution significantly differs from Poisson's and negative binomial distributions.

There was a statistically significant difference (<0.05 probability) in the density of pellet-groups (and indirectly in the extent of habitat use) between habitat types. The highest accumulation of roe deer pellets

Table 2

Seasonal differences between pellet-group means.

Statistics	Spring		Summer		Autumn	Winter
mean	14.93		5.33		4.18	3.75
$t \cdot S_r$		7.31 *		8.76-	11.75-	

* statistically significant, - statistically non-significant

Table 3

The distribution of roe deer pellet-group numbers in the pen.

Pellet-groups on plot	Observations	Pellet-groups on plot	Observations
0	355	39	3
1	200	40	2
1	143	41	5
3	147	42	7
4	98	43	4
5	73	44	2
6	57	45	2
7	69	46	2
8	56	47	2
9	48	48	1
10	51	49	1
11	30	50	0
12	31	51	2
13	27	52	5
14	24	53	4
15	15	54	0
16	19	55	1
17	14	56	1
18	24	57	2
19	9	58	0
20	12	59	2
21	12	60	0
22	13	61	0
23	12	62	2
24	5	63	3
25	8	64	1
26	13	65	1
27	9	66	0
28	8	67	1
29	6	68	3
30	7	69	0
31	15	70	0
32	9	71	2
33	1	72	1
34	4	73	1
35	4	74	0
36	5	75	0
37	5	76	17
38	2		

(0.119 group/m²) was found in the young plantation, the preferred feeding ground of roe deer. The density of pellet-groups was slightly less in the pole-size stand of pine (0.099 group/m²) and in the ecotone between various habitat types (0.081 group/m²). The timber stand of pine (0.039 group/m²) and the pine thicket (0.025 group/m²) had the lowest accumulation of roe deer pellets (Fig. 1).

These results agree, in general, with those obtained for red deer (Dzięciołowski, 1974) where the sequence of habitat preference was timber stand, ecotone, and thicket.

3.3. Rate of Pellet Decomposition

The rate of decomposition and weathering of red deer pellets depended to some degree upon the place and time of their deposition. The most rapid decomposition and weathering occurred in the young plantation, and secondly in thickets. Pellets were maintained for the longest time under the timber stand canopy. Winter pellets decomposed and disintegrated in 3 months, whereas summer pellets disappeared in two months.

4. CONCLUSIONS

The pellet-group count is not a promising technique for estimating roe deer numbers in an unrestrained environment.

The adaptation of this technique to roe deer in our natural conditions would require an additional determination of daily defecation rates during individual seasons of year, determination of weathering rate and decomposition of pellets under various habitat conditions (Wallmo *et al.* 1962), and repeated field tests based on a known number of animals.

Pellet-group counts may provide an index of use among various types of habitat by roe deer. My studies indicated that a young plantation, a pole-sized stand of pine, and ecotone zone between various habitat types were more intensively used by roe deer than a timber stand and a thicket.

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INWENTARYZACJA SARN METODĄ LICZENIA ODCHODÓW

Streszczenie

Badania miały na celu sprawdzenie czy metoda liczenia grup odchodów może być zastosowana do inwentaryzacji pogłowia sarn, *Capreolus capreolus* (Linnaeus,

1758) oraz do określenia rozmiaru użytkowania różnych środowisk leśnych przez te zwierzęta.

Inwentaryzację odchodów prowadzono w zagrodzie o pow. 9 ha, zasiedlonej w okresie badań przez 2—6 sarn. Obszar zagrody podzielono na 86 działek o rozmiarach 50×50 m i 4 działki o kształcie nieregularnym. Inwentaryzację grup odchodów sarnich prowadzono na całej powierzchni zagrody notując ich liczbę oddzielnie dla poszczególnych działek. W okresie od sierpnia 1972 r. do maja 1974 r. przeprowadzono 20 inwentaryzacji (Tabela 1).

Wykazano, że nagromadzenie odchodów sarnich wykazuje statystycznie istotne zróżnicowanie w zależności od pory roku (Tabela 2). Jedynie wiosną nagromadzenie odchodów różni się w sposób istotny od odpowiadających mu wartości w innych porach roku. W obliczeniach przyjęto za P a d a i g ą (1970), że sarna wydala przeciętnie 15,6 grup odchodów na dobę. Znajdowano tylko 21% grup odchodów podczas inwentaryzacji zimowych, 74% latem i 43% — w skali całorocznej (Tabela 1).

Rozkład wyników inwentaryzacji odchodów (Tabela 3) różni się od rozkładów Poissona i ujemnego dwumianu. Rozmieszczenie grup odchodów sarn (a zatem frekwencja zwierząt) w różnych środowiskach w obrębie zagrody (Ryc. 1) wskazuje, że uprawa leśna, drągowina sosnowa i strefa ekotonu są bardziej preferowane przez sarny, niż starodrzew i młodnik.

Tempo rozkładu i rozmywania odchodów przez deszcz zależy w pewnym stopniu od miejsca ich złożenia, najszybsze jest na uprawie, pośrednie — w młodniku a najwolniejsze — pod okapem starodrzewia. Odchody zimowe rozkładały się i rozsypywały w ciągu 3 miesięcy a odchody letnie w ciągu dwóch miesięcy.

Metoda liczenia grup odchodów nie jest zatem obiecującą techniką szacowania liczebności sarn w środowisku otwartym. Dostosowanie tej metody do sarn i naszych warunków przyrodniczych wymaga określenia dobowego tempa wydalania odchodów w poszczególnych porach roku, określenia tempa wietrzenia i rozkładu odchodów w różnych warunkach środowiskowych oraz powtarzanych prób terenowych w oparciu o znaną liczbę zwierząt. Metoda liczenia grup odchodów może być natomiast stosowana jako wskaźnik intensywności użytkowania przez sarny różnych typów środowiska.