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Research note

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SMALL MAMMALS IN TWO MIDFIELD SHELTERBELTS OF DIFFERENT AGE

ABSTRACT: Small mammals were studied in two midfield shelterbelts (6–7 and 170 years old) in Turew area (west Poland). Eight species: *Apodemus flavicollis, A. sylvaticus, A. agrarius, Mus musculus, Micromys minutus, Microtus arvalis, M. agrestis, Clethrionomys glareolus* were found. Species structure was significantly different between studied shelterbelts. In the old shelterbelt species characteristic for forest environments dominated. Species structure in the old shelterbelts was more stable than in the young one.

KEY WORDS: midfield shelterbelts, small mammals

Midfield shelterbelts are the components of agricultural landscape, important for reducing the water and wind soil erosion, protecting the water quality and control of pollution and noise. They are important also for the biodiversity (Ryszkowski 1975, Karg and Karlik 1993). The shelterbelts are the remainders of natural forest complex or they are newly created in the environment and connect different sites as ecological corridors.

Szacki (1987) found that a stripe of alder can be used as the ecological corridor by yellow-necked mouse (*Apodemus flavicollis*) and bank vole (*Clethrionomys glareolus*). Szacki *et al.* (1994) have found, that small mammals can migrate along river valleys sometimes over 3000 m. Wegner and Merriam (1979) concluded, that shelterbelts can reduce isolation effect of forest patches in agricultural landscape. They found also, that the longest distance of migration of small mammals was found in agricultural landscape along shelterbelts. One supposes, that midfield shelterbelts can function as the ecological corridors for those animals. However, the preliminary studies carried in the study area (Turew, west Poland) (Łęcki 1998) do not confirm these statements.

The aim of the studies was to estimate the occurrence of small mammals in midfield shelterbelts and the changes of species structure in shelterbelts of different age, i.e. 170 and 6–7 years old.

The studies were carried in agricultural landscape near Turew locality (West Poland), on the area of Dezydery Chłapowski Landscape Park. Two typical shelterbelts were

analysed. They connect the forest patches and they are surrounded by arable fields.

One of studied shelterbelts (local name "Wyskoć" – Ryszkowski *et al.* 2003) is a component of the new shelterbelt net and was planted in autumn 1993. Its length is 390 m, width 16 m and area – 0.62 ha. Main trees species are following: oak (*Quercus robur*), elm (*Ulmus laevis*), larch (*Larix decidua*), poplar (*Populus sp.*), birch (*Betula verrucosa*), pine (*Pinus silvestris*), linden (*Tilia cordata*), spruce (*Picea abies*), Swedish whitebeam tree (*Sorbus intermedia*).

The second studied shelterbelt was created in XIX century and it is about 170 years old. Its length is about 600 m, width from 4–6 m to 10–12 m. It consists mainly of black locust (*Robinia pseudoacacia*) with elder (*Sambucus nigra*) and hawthorn (*Crataegus sp.*) in shrubs and grass and couch grass (*Agropyron repens*) in herb layer.

In 1999 and 2000 three series of catching in each shelterbelt were made every year, in spring, summer and autumn and the fragments of the shelterbelts 300 m long were analysed. Live-traps were located in 16 transects perpendicular to the shelterbelts, every 20 m. Four points were marked in every transects and 2 traps were put in every point (Fig. 1). In this way, 128 traps were used in each shelterbelt. Traps were checked daily, during 10 days in every series. New individuals were marked by cutting their claws. The species, place of catching, and number of individual were noted and caught animals were released in the place of catching.

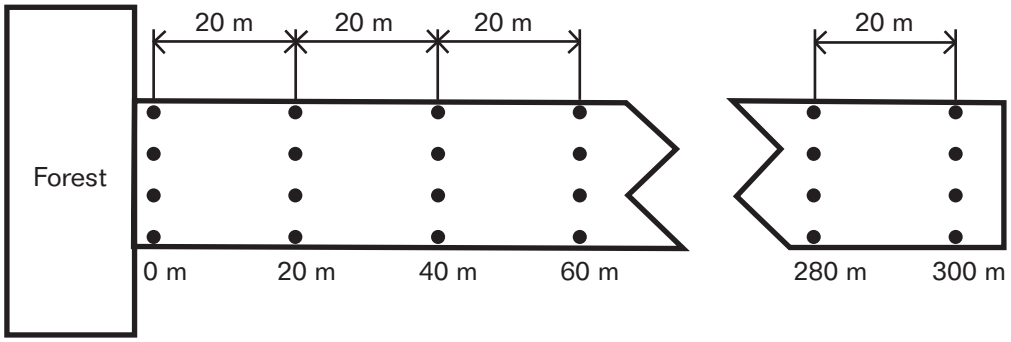

Fig. 1. Scheme of traps distribution in the shelterbelts. One black point marks two traps.

Eight species of rodents were found in both shelterbelts: Five species of Muridae: yellow necked mouse (*Apodemus flavicollis*), wood mouse (*A. sylvaticus*), field mouse (*A. agrarius*), house mouse (*Mus musculus*), harvest mouse (*Micromys minutus*), and three Microtidae species: common vole (*Microtus arvalis*), field vole (*M. agrestis*), bank vole (*Clethrionomys glareolus*).

In 1999 and 2000 in the old shelterbelt 6–89 and 4–42 individuals per catching series (10 days) were captured respectively (Table 1), while in younger shelterbelt 22–262 and 4–155 individuals were captured respectively (Table 2).

Three different groups of rodents were distinguished: characteristic for forest environments, for arable fields and "intermediate" – not connected to any specific environment (Yahner 1983, Hansson 1987). Yellow necked mouse (*A. flavicollis*) and bank vole (*C. glareolus*) were recognized as "forest" species (Pucek 1984). Common vole (*M. arvalis*), field vole (*M. agrestis*), harvest mouse (*M. minutus*) and house mouse (*M. musculus*) are typical "field" species. The "intermediate" species are: wood mouse (*A. sylvaticus*) and field mouse (*A. agrarius*). In the shelterbelts all those groups of rodents were captured; it means, that the shelterbelts have the forest and the field features, but they are different from those environments.

Species composition of small mammals was significantly different between studied shelterbelts during all analysed seasons (Tab. 3). Statistically significant differences in species composition were also observed between seasons inside shelterbelts. In the old, as well as in young shelterbelt. Species composition in summer differed ($P < 0.01$) from the species composition in autumn for both years of study.

Although species composition changed in a year, differences between analogical seasons (i.e. summer 1999 and 2000 or

Table 1. Number of rodents captured in 128 traps exposed for 10 days in the old (170 years old) shelterbelt.

1999	Spring		Summer		Autumn	
	N. ind.	%	N. ind.	%	N. ind.	%
Apodemus flavicollis	3	50	11	24	48	54
Apodemus sylvaticus	2	33	1	2	—	—
Apodemus agrarius	1	17	4	9	25	28
Mus musculus	—	—	—	—	1	1
Microtus arvalis	—	—	24	52	13	15
Clethrionomys glareolus	—	—	6	13	2	2
Sum:	6		46		89	
2000	Spring		Summer		Autumn	
	N. ind.	%	N. ind.	%	N. ind.	%
Apodemus flavicollis	4	100	19	56	16	38
Apodemus sylvaticus	—	—	3	9	2	5
Apodemus agrarius	—	—	—	—	15	36
Mus musculus	—	—	1	3	1	2
Micromys minutus	—	—	—	—	1	2
Microtus arvalis	—	—	8	24	5	12
Clethrionomys glareolus	—	—	3	9	2	5
Sum:	4		34		42	

Table 2. Number of rodents captured in 128 traps exposed for 10 days in the young (7–8 years old) shelterbelt.

1999	Spring		Summer		Autumn	
	N. ind.	%	N. ind.	%	N. ind.	%
Apodemus flavicollis	7	32	40	26	17	7
Apodemus sylvaticus	1	5	8	5	1	<1
Apodemus agrarius	7	32	32	21	215	82
Mus musculus	—	—	1	1	2	1
Micromys minutus	—	—	—	—	1	<1
Microtus arvalis	7	32	74	48	22	8
Microtus agrestis	—	—	—	—	4	2
Sum:	22		155		262	
2000	Spring		Summer		Autumn	
	N. ind.	%	N. ind.	%	N. ind.	%
Apodemus flavicollis	—	—	18	32	36	23
Apodemus sylvaticus	—	—	1	2	20	13
Apodemus agrarius	—	—	—	—	58	37
Mus musculus	—	—	1	2	4	3
Micromys minutus	—	—	—	—	2	1
Micromys arralis	4	100	36	64	35	23
Sum:	4		56		155	

autumn 1999 and 2000) in successive years were statistically significant only in the young shelterbelt ($P < 0.05$). In the old one, results from 1999 and 2000 didn't differ significantly between summer and autumn periods. It means, that species composition in the old shelterbelt is more stable than in the young one. It can be a result of a fact, that vegetation of the young shelterbelt still grows and changes its structure and coverage.

The results for spring periods were not analysed statistically, because the numbers of animals captured in these seasons were too low. It shows that numbers of animals in summer and autumn are higher that in spring. It confirms the results of other researchers (Grodziński *et al.* 1966, Ryszkowski 1971, 1982, Bocchini and Nieder 1994, Butet and Leroux 1994, Bujalska 1995). That winter mortality of *C. glareolus* amounts to 95%, according to Mazurkie-

Table 3. A comparison of species composition of small mammals in 7–8 years old and 170 years old shelterbelts.

	Summer 1999	Autumn 1999	Summer 2000	Autumn 2000
χ^2 test	χ^2=24.24; df=5; P<0.001	χ^2=119.65; df=7; P<0.001	χ^2=20.11; df=4; P<0.001	χ^2=14.25; df=6; P<0.05
Number of species:				
old shelterbelt	5	5	5	7
young shelterbelt	5	7	4	6

Table 4. The values of Shannon-Wiener's coefficient of diversity H' of small mammals community for two shelterbelts and different seasons and years.

	1999			2000		
	Spring	Summer	Autumn	Spring	Summer	Autumn
Old shelterbelt	1.01	1.24	1.11	—	1.20	1.46
Young shelterbelt	1.23	1.21	0.69	—	0.79	1.46

wicz and Rajska-Jurgiel (1998) and winter mortality of *A. flavicollis* amounts to 93%.

The values of Shannon-Wiener's index of species diversity H' (Shannon and Weaver 1949) were calculated (Table 4). Seasonal changes of this index in 1999 in the old shelterbelt were smaller than in the young one. Bigger fluctuations were observed in both shelterbelts in 2000. Values of H' differed significantly between shelterbelts only in autumn 1999 ($t = 4.0256$; $df = 13$; $P < 0.05$) and in summer 2000 ($t = 2.4233$; $df = 10$; $P < 0.05$).

The following conclusions can be formulated:

- midfield shelterbelts are habitat suitable for eight species of small mammals, both "field" and "forest",
- species composition of small mammals is different in the shelterbelts of different age,
- dynamics of seasonal changes of species composition is bigger in the young shelterbelt than in the old one.

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