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Changes in Weevils Groups (*Col.*, *Curculionidae*) in Dry-ground Forest Communities near Sawin (Chełm Province) *

Zmiany w zgrupowaniach ryjkowców (*Col.*, *Curculionidae*) zbiorowisk grądowych koło Sawina (woj. chełmskie)

Изменения группировок долгоносиков (*Col.*, *Curculionidae*) грудовых сообществ окрестностей Савина (Холмское воеводство)

Curculionidae are herbivorous forms that live in various plant associations on land and in water. This taxon has been the object of qualitative and quantitative studies only in a few dry-ground forest communities (1, 2, 4, 6—9, 13). That is why it appeared desirable to investigate that group of insects in the habitats of that type. The aim of the present study was to follow changes in species composition and in the numerical structure of *Curculionidae* that took place in the successive years of investigation in two dry-ground forest subassociations and in a clearing community on a dry-ground forest habitat.

AREA, METHODS AND MATERIAL

Studies on *Curculionidae* fauna were conducted in 1982—1984 in the forests of the Chełm Forest Inspectorate, Sawin District. The insects were collected in the herb layer of the two subassociations of the dry-ground forest association: *Tilio-Carpinetum typicum* (Stand I) and *Tilio-Carpinetum stachyetosum* (Stand II) and in a clearing community (Stand III) — 3.

The area of the first subassociation was ca 5 ha. The herb layer was poorly developed with a cover of ca 50%. The dominant plants were *Galeobdolon luteum*, *Asperula odorata*, *Stellaria holostea*, *Anemone nemerosa*.

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The area of Stand II was ca 3 ha, stretching at the bottom of a local depression. The herb layer cover was 70% with the dominant plants: *Aeogopodium podagraria, Oxalis acetosella, Stellaria nemorum* and sycamore seedlings. In the more humid parts there were numerous *Impatiens noli-tangere* and *Circaea lutetiana*.

The clearing community covered an area of ca 10 ha. In 1982 it was three years old. The herb layer cover was ca 90%. The dominant plants were: *Calamagrostis epigeios, Aegopodium podagraria, Rubus idaeus* and oak, hornbeam, linden and larch seedlings.

In all the stands samples were taken during the whole growing season (May through September) with an entomological net. One sample equalled a series of 10×25 catches with a net. Two such samples were taken from each surface at the same time. A total of 64 samples was taken from the typical dry-ground forest, 60 from the low and 66 from the clearing.

The collected material was analyzed using two indices: that of individual domination and of relative density. The following domination classes were distinguished: eudominants >10%, dominants — 5.1—10%, sudominants — 1.1—5% and recedents ⩽1%.

Estimation of similarity of *Curculionidae* fauna inhabiting the plant communities under investigation was based on the Jaccard index, relative density serving as basis of calculations (5). Species diversity (*H'*) of *Curculionidae* was estimated with the Shannon formula (10). The index of even distribution of domination structure was calculated using the Tramer formula (11). For the purpose of assessment of the dynamics of changes in particular parameters mean variability coefficient (*CV*) was calculated (12).

ANALYSIS OF MATERIAL

2008 specimens of *Curculionidae* were collected in plant communities during three years of studies. In this collection 94 species were distinguished (Table 1).

The lowest numbers of specimens and species were collected in the herb layer of the typical dry-ground forest. 124—185 individuals were reported, representing 15—27 species. In stand II, in the herb layer of low dry-ground forest, 123—341 individuals were collected (i.e. 22—30 species). Most specimens and species were collected in the clearing community. 211—382 individuals were reported representing 40—47 species (Table 2).

Similar values were found for the species diversity index (H'), the highest being assumed in the clearing while the lowest were reported for the subassociation of *Tilio-Carpinetum typicum*. By analyzing the intensity of changes in those parameters with the mean variability coefficient (*CV*) it was demonstrated that in the course of the successive years of investigation both the number of species and their diversity assumed the lowest values of this parameter in the clearing (Table 2), the highest intensity of changes being reported in the low dry-ground forest ($CV = 26$) and the highest species number in the typical dry-ground forest

Table 1. Numerical comparison of *Curculionidae* collected in *Tilio-Carpinetum* associations in the Bachus reserve

No.	Name of species / Stand / Year	*Tilio-Carpinetum typicum* 1982	1983	1984	*Tilio-Carpinetum stachyetosum* 1982	1983	1984	Clearing community 1982	1983	1984
1	2	3	4	5	6	7	8	9	10	11
1.	*Coenorhinus germanicus* (Herbst)								1	
2.	*Byctiscus populi* (L.)								4	1
3.	*Attelabus nitens* (Scop.)	2		1			2			
4.	*Apoderus coryli* (L.)							1	1	3
5.	*Apion brevirostre* Herbst							1	4	22
6.	*A. violaceum* Kirby							3		
7.	*A. marchicum* Herbst							6	5	7
8.	*A. curtirostre* Germ.	3	1		2			11	12	13
9.	*A. simum* Germ.									2
10.	*A. radiolus* (Marsh.)	1							1	
11.	*A. miniatum* Germ.									1
12.	*A. cruentatum* Walt.								3	8
13.	*A. sanguineum* (De Geer)									1
14.	*A. seniculus* Kirby						1	1	2	
15.	*A. laevigatum* (Payk.)						2			
16.	*A. hookeri* Kirby	1	1							
17.	*A. tenue* Kirby									1
18.	*A. pavidum* Germ.		1					2	3	39
19.	*A. simile* Kirby									2
20.	*A. viciae* Payk.	1		4	1	2	3	1	1	1
21.	*A. virens* Herbst				2		2	12	3	1
22.	*A. astragali* Payk.								1	4
23.	*A. craccae* (L.)				1					1
24.	*A. cerdo* Gerst.									1
25.	*A. flavipes* (Payk.)	17	21	13	15	21	19	5	2	12
26.	*A. nigritarse* Kirby		2	1			1			
27.	*A. trifolii* (L.)			1						
28.	*A. apricans* Herbst	13	12	8		6	13		2	4
29.	*Phyllobius argentatus* (L.)	43	11	38	22	73	153	1		1
30.	*Ph. calcaratus* (F.)	5			1	27	5			
31.	*Ph. arborator* (Herbst)					1		1		1
32.	*Polydrusus flavipes* (De Geer)						3			
33.	*Sciaphilus asperatus* (Bonsd.)				11	12	50	1		
34.	*Strophosoma capitatum* (De Geer)	56	55	56	28	31	27	13	17	68
35.	*S. humeralis* Steph.								1	
36.	*Sitona griseus* (F.)								1	8
37.	*S. lineatus* (L.)	1		1	1		1	3	8	24
38.	*S. sulcifrons* (Thunbg.)							3	4	5
39.	*S. flavescens* (Marsh.)			1				1	1	
40.	*S. hispidulus* (F.)	2						1	1	2
41.	*Tropiphorus carinatus* (Müll.)					1				
42.	*Lixus iridis* Ol.							3		
43.	*Hypera zoilus* (Scop.)									1
44.	*H. nigrirostris* (F.)					1			2	
45.	*H. arator* (L.)			1				3	1	4
46.	*Tanysphyrus lemnae* (Payk.)	1	6		2	5	1		1	
47.	*Ellescus scanicus* (Payk.)								1	
48.	*Tychius junceus* (Reich.)		1	1						
49.	*Miccotrogus picirostris* (F.)			1	1	3		1	4	22
50.	*Sibinia primita* (Herbst)	1								

Table 1 continued

1	2	3	4	5	6	7	8	9	10	11
51.	*S. potentillae* Germ.									1
52.	*Anthonomus rubi* (Herbst)			1			2	16	10	28
53.	*Brachonyx pineti* (Payk.)								1	
54.	*Bradybatus kellneri* Bach				1					
55.	*Curculio nucum* L.	1	1			1		1		
56.	*C. glandium* Marsh.				3		1			
57.	*C. pyrrhoceras* Marsh.			1			2			1
58.	*Magdalis barbicornis* (Latr.)			1			1			
59.	*Trachodes hispidus* (L.)	3	1	8	6	8	11	1		1
60.	*Acalles camelus* (F.)				2					
61.	*A. echinatus* Germ.			2	2	5	1	1		
62.	*Mononychus punctumalbum* (Herbst)								1	9
63.	*Litodactylus leucogaster* (Marsh.)				1			1		
64.	*Phytobius waltoni* Boh.					1	1			
65.	*Ph. quadrituberculosus* (F.)	2			1					
66.	*Rhinoncus bruchoides* (Herbst)	1	3		2	1				
67.	*Rh. castor* (F.)	3					1	78	68	14
68.	*Amalus haemorrhous* (Herbst)									1
69.	*Coeliodes dryados* (Gmel.)	5			1		2	1		1
70.	*C. cinctus* (Geoffr.)				1		4			
71.	*Ceutorhynchus pleurostigma* (Marsh.)				1				3	
72.	*C. assimilis* (Payk.)			1	1			1	1	1
73.	*C. gallorhenanus* Solari				1		1			
74.	*C. contractus* (Marsh.)		3						2	
75.	*C. erysimi* (F.)	2			3		2			6
76.	*C. quadridens* (Panz.)	1								
77.	*C. pallidicornis* Bris.					1			1	
78.	*C. floralis* (Payk.)	13	5	2	9	4	5		1	8
79.	*C. quercicola* (Payk.)					1				
80.	*Cidnorhinus quadrimaculatus* (L.)	1			1	10	22	3		
81.	*Nanophyes marmoratus* (Goeze)							1		
82.	*N. globulus* (Germ.)							1		
83.	*Gymnaetron pascuorum* (Gyll.)								3	10
84.	*G. melanarium* (Germ.)	1						3		8
85.	*G. veronicae* (Germ.)	1								
86.	*G. antirrhini* (Payk.)							4	4	
87.	*G. linariae* (Panz.)								1	
88.	*Cionus alauda* (Herbst)							7	3	
89.	*C. tuberculosus* (Scop.)	3				3	2	45	10	3
90.	*C. scrophulariae* (L.)							10	1	25
91.	*C. hortulanus* (Geoffr.)	1						5	2	2
92.	*Cleopus solani* (F.)							22	1	
93.	*Rhynchaenus stigma* (Germ.)							4	10	2
94.	*Rhamphus pulicarius* (Herbst)									1
Total number of individuals		185	124	144	123	219	341	279	211	382
Number of samples			64			60			66	

(Table 2). In the association of *Tilio-Carpinetum stachyetosum* both domination structure and abundance of species underwent intense changes. This was due to an increase in the successive years of investigation in the number of collected specimens of *Phyllobius argentatus* with a drop in the numbers of *Strophosoma capitatum* and the occurrence of *Sciaphilus asperatus* in this subassociation. This species prefers shady and damp places with the dominant *Primula officinalis* in the herb layer. It found favourable conditions for development in the low dry-ground forest.

Season dynamics of abundance of *Curculionidae* in the association of *Tilio-Carpinetum typicum* had a similar course in the successive years of investigation. Two maxima were found in the development of *Curculionidae* population: that of spring (turn of May and June) and that of autumn — September until mid-October (Fig. 1). In spring many *P. argentatus* and *S. capitatum* were collected, and in autumn *A. apricans* and *A. flavipes*.

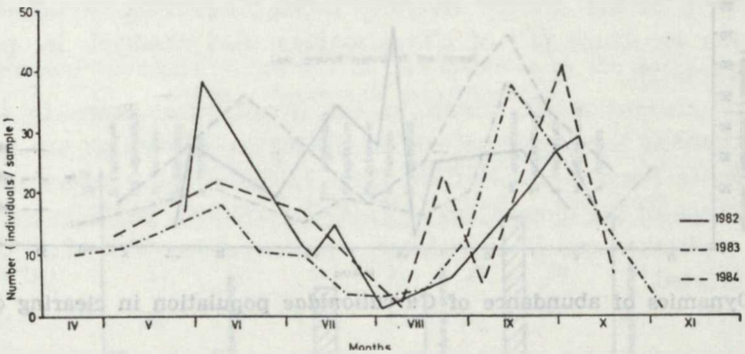

Fig. 1. Dynamics of abundance of *Curculionidae* population in typical dry-ground forest

The course of changes in abundance in the association of *Tilio-Carpinetum stachyetosum* was similar, *Curculionidae* being collected in far greater numbers in spring than in autumn (Fig. 2).

The analysis of the dynamics of abundance *Curculionidae* inhabiting the clearing community had a similar profile after two years of investigation. Two periods of increased numbers were reported in the development of the population. In spring *A. pavidum*, *A. brevirostre*, *C. tuberculosus*, *R. castor* were more numerous, and in autumn *S. capitatum*. An exception was the course of changes in numbers in 1982 where a high increase in abundance of *Curculionidae* was reported in full summer. *R. castor* was collected in large numbers at that time, which mainly contributed to this maximum (Fig. 3).

Fig. 2. Dynamics of abundance of *Curculionidae* population in low dry-ground forest

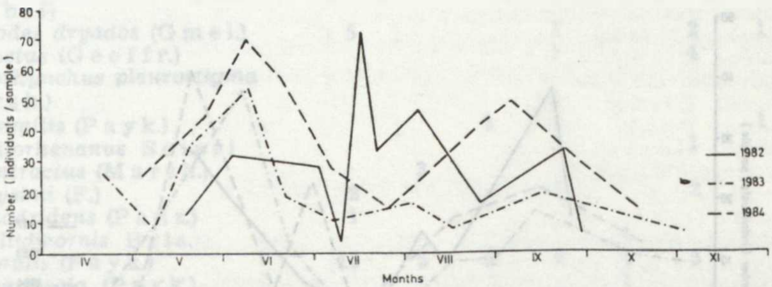

Fig. 3. Dynamics of abundance of *Curculionidae* population in clearing community

The highest class of domination (eudominants, dominants) in all stands comprised 19 species represented by 1370 specimens, which is 68.2% of all that were collected. The class of eudominants and dominants in the herb layer of the typical dry-ground forest in all the years of investigation was made up of the same 4 species, with their order in domination structure changing. They were two dendrophiles — *S. capitatum* and *P. argentatus* and two species living on the *Papilionaceae* — *A. flavipes* and *A. apricans*, which spent the winter in this environment. In one year a synantrope *C. floralis* was more numerous, and in 1984 a forest species *T. hispidus* appeared (Fig. 4).

Very similar was domination structure in the low dry-ground forest (Fig. 5). In all three years of investigation 4 species were collected, three of which being the same as in the typical dry-ground forest and *S. asperatus* appearing only in this stand. *P. arborator* and *N. marmoratus* were also fairly numerous, which were not reported in stand I.

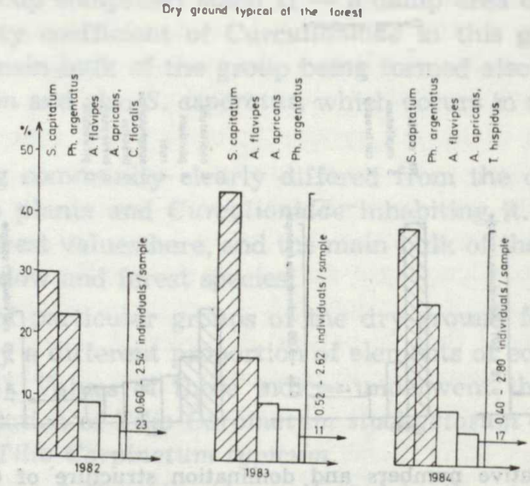

Fig. 4. Level of relative numbers and domination structure of *Curculionidae* in typical dry-ground forest

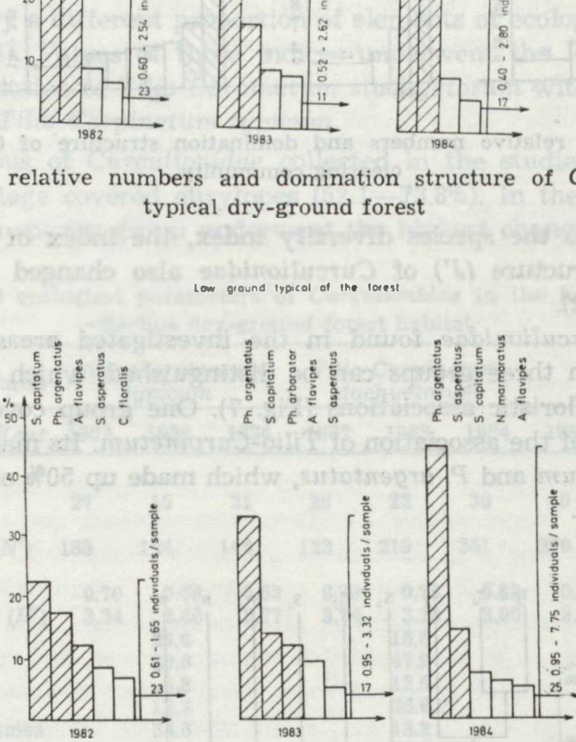

Fig. 5. Level of relative numbers and domination structure of *Curculionidae* in low dry-ground forest

Quite a different domination structure was observed in the clearing community. Apart from one species, this index changed in successive years of investigation (Fig. 6). There was a distinct drop in abundance of meadow species in favour of forest and brushy species. In the first two years *R. castor*, a meadow element, was dominant while in the last year *S. capitatum* (a forest species), the former being collected in very few numbers.

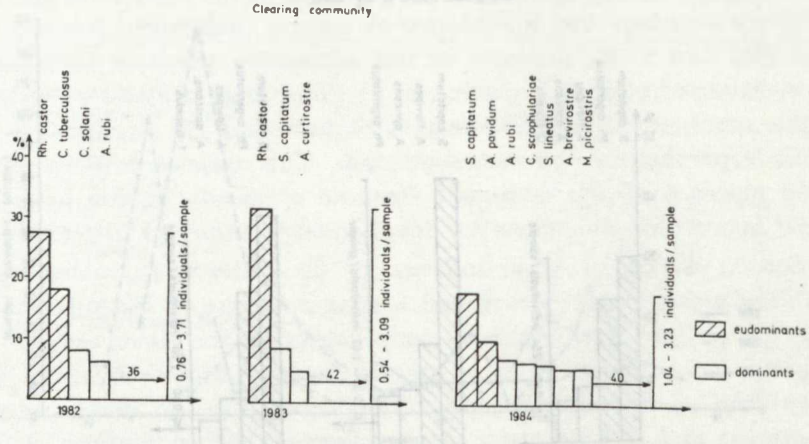

Fig. 6. Level of relative numbers and domination structure of *Curculionidae* in clearing community

Similarly to the species diversity index, the index of uniformity of domination structure *(J')* of *Curculionidae* also changed in particular stands (Table 2).

Among *Curculionidae* found in the investigated areas in all years of investigation three groups can be distinguished, which are connected with definite floristic associations (Fig. 7). One group covers stand I — a typical area of the association of *Tilio-Carpinetum*. Its main components were *S. capitatum* and *P. argentatus*, which made up 50% of all *Curculionidae* collected.

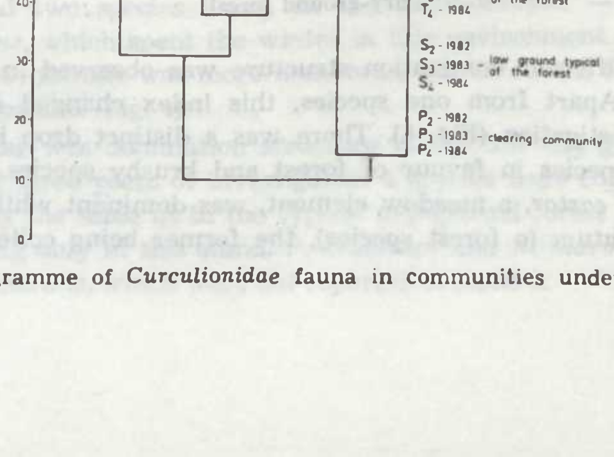

Fig. 7. Dendrogramme of *Curculionidae* fauna in communities under investigation

The next group comprised stand II — a damp area of the dry-ground forest. Similarity coefficient of *Curculionidae* in this group did not exceed 40%, the main bulk of the group being formed also by *P. argentatus* and *S. capitatum* and also *S. asperatus*, which occurs in more humid communities.

The clearing community clearly differed from the other stands both with respect to plants and *Curculionidae* inhabiting it. Similarity index assumed the lowest values here, and the main bulk of the group was made up both of meadow and forest species.

The fauna of particular groups of the dry-ground forest habitat was characterized by a different proportion of elements of ecological plasticity (Table 2 and 4). Values of those indices underwent the lowest changes in the subassociation of *Tilio-Carpinetum stachyetosum* with very intense changes in the *Tilio-Carpinetum typicum*.

In the corpus of *Curculionidae* collected in the studied habitat, the highest percentage covered eurytopes (52.1—73.8%). In the course of investigation this species group underwent the highest changes in the typi-

Table 2. Selected ecological parameters of *Curculionidae* in the herb layer of the Bachus dry-ground forest habitat

Parameters / Stand	*Tilio-Carpinetum typicum*			*Tilio-Carpinetum stachyetosum*			Clearing community		
Year	1982	1983	1984	1982	1983	1984	1982	1983	1984
Number of species (N)	27	15	21	28	22	30	40	45	47
Number of individuals (N')	185	124	144	123	219	341	279	211	382
Domination structure (J')	0.70	0.69	0.63	0.78	0.73	0.62	0.74	0.76	0.81
Species diversity (H')	3.34	2.68	2.77	3.74	3.28	3.00	3.96	4.18	4.49
CV for N		28.6			15.6			8.2	
CV for N'		20.6			47.9			29.6	
CV for J'		5.8			12.5			4.7	
CV for H'		12.2			26.0			6.3	
CV for forest species		34.5			18.2			33.1	
CV for brushy specie		50.0			35.2			16.7	
CV for xerothermophilous species		82.7			—			100.0	
CV for meadow and pasture species		20.9			15.9			18.7	
CV for rushes species		100.0			45.5			100.0	
CV for synantropic species		56.3			41.4			36.6	
CV for eurytopes		29.0			15.7			19.2	
CV for polytopes		57.9			28.9			30.4	
CV for stenotopes		44.5			25.4			100.0	
CV for polyfages		17.9			10.3			67.2	
CV for oligofages		33.8			31.1			12.5	
CV for monofages		68.3			43.0			39.9	

cal dry-ground forest and in the clearing. Polytops made up only 21.3% of species collected in the investigated habitat. They underwent similar changes as eurytopes (the smallest in the low dry-ground forest). A somewhat different dynamics characterized stenotopes.

The proportion of trophic groups in the studied communities varied in fairly high ranges, with strong changes affecting polyphages in the clearing community and monophages in the typical dry-ground forest (Table 3). In stable communities (typical and low dry-ground forest) the *CV* coefficient for oligophages stayed at the similar level (*CV* ca 30) while in the clearing it was low (12.5) and in particular years it was inversely proportional than in natural dry-ground forests (Table 2).

In assigning *Curculionidae* to particular types of habitats in the collected material 6 ecological elements were distinguished (Table 5). Group I comprised species inhabiting forest communities, group II brushy communities, group III — species inhabiting xerothermic communities, group IV — covered meadows and pastures, group V — comprised insects of rushes communities, and group VI — synantropic forms. Among the collected *Curculionidae* forest (43.3%) and meadows and pasture species (42.8%) were the most numerous in representation. Forest species also had the highest relative density (11.8 specimen per sample). The index for the dynamics of changes in the number of forest species and meadow and pasture species assumed the highest values in the typical dry-ground forest and in the clearing, and low in the low dry-ground forest (Table 2). Brushy species were less numerous (at the density of 0.04—6.48 specimen per sample) and intensity of their changes had the highest values in the typical dry-ground forest (Table 2). Xerothermophilous and rushes species were scarce or single in successive years of study with mean density ranging from 0.04—0.28 specimen per sample. *Curculionidae* inhabiting rushes communities were found in all subassociations, and the xerothermic ones in two — in the typical dry-ground forest and in the clearing. In all stands a total of 16 synantropic species were collected. They were most numerous in the clearing: 1.4 specimen per sample. The most in-

Table 5. Proportion of ecological elements in the fauna of weevils

Species \ Stand	*Tilio-Carpinetum typicum*								
	N			%			*n'*		
	82	83	84	82	83	84	82	83	84
Forest	8	4	7	28.6	26.6	33.5	5.04	3.23	5.30
Brushy	3	1	2	10.7	6.6	9.5	0.22	0.04	0.25
Xerothermophilous	1	—	1	3.5	—	4.8	0.04	—	0.05
Meadow and pasture	7	6	9	25.0	40.0	42.8	1.90	1.90	1.40
Rushes	2	1	—	7.4	6.7	—	0.09	0.28	—
Synantropic	6	3	2	22.2	20.0	9.5	0.86	0.42	0.15

tense changes characterized that category of *Curculionidae* in the typical dry-ground forest ($CV = 56.3$).

Curculionidae determined for species represented 6 zoogeographical elements (Table 6). In the qualitative and quantitatitive structures there were predominantly Palearctic species. The greatest percentage (44.4%) of them and relative density ($n' = 7.48$ specimen per sample) was reported for the clearing community. European species came in second. Their density was similar in all associations — $n' =$ ca 3.10 specimen per sample and their percentage was the highest in the low dry-ground forest. The lowest percentage values and densities were reported for South-Eurosiberian forms.

Table 3. Numerical and percentage comparison of trophic groups of *Curculionidae* in the herb layer of dry-ground forest habitat in the Bachus reserve

Stand / Group	*Tilio-Carpinetum typicum*			*Tilio-Carpinetum stachyetosum*			Clearing community		
	N	%	*n'*	*N*	%	*n'*	*N*	%	*n'*
Polyphages	4	9.5	4.33	7	15.2	7.38	8	11.1	1.63
Oligophaegs	34	81.0	2.76	33	71.7	3.35	51	70.8	10.54
Monophages	4	9.5	0.09	6	13.0	0.65	13	18.1	1.03
Total	42	100.0	7.18	46	99.9	11.38	72	100.0	13.20

Table 4. Numerical and percentage comparison of *Curculionidae* in the herb layer in the dry-ground habitat in the Bachus reserve

Stand / Form	*Tilio-Carpinetum typicum*			*Tilio-Carpinetum stachyetosum*			Clearing community		
	N	%	*n'*	*N*	%	*n'*	*N*	%	*n'*
Eurytopes	31	73.8	6.65	24	52.1	8.66	50	69.4	8.25
Polytopes	8	19.0	0.39	11	23.9	2.01	15	20.8	4.42
Stenotopes	3	7.1	0.14	11	23.9	0.70	7	9.7	0.52
Total	42	99.9	7.18	46	99.9	11.37	72	99.9	13.19

in the herb layer of dry-ground forest in the Bachus reserve

Tilio-Carpinetum stachyetosum									Clearing community								
N			%			*n'*			*N*			%			*n'*		
82	83	84	82	83	84	82	83	84	82	83	84	82	83	84	82	83	84
11	9	13	39.2	40.9	43.3	4.39	7.14	11.83	10	4	10	25.0	8.8	21.3	1.33	1.32	3.85
2	4	4	7.1	18.2	13.3	0.66	0.82	2.85	10	14	12	25.0	31.1	25.5	4.33	1.95	6.48
—	—	—	—	—	—	—	—	—	1	1	1	2.5	2.2	2.1	0.14	0.04	0.19
8	6	8	28.6	27.2	26.6	1.38	1.50	1.95	13	17	19	32.5	37.7	40.4	6.00	5.54	6.52
2	1	1	7.1	4.5	3.3	0.16	0.22	0.05	2	1	—	5.0	2.2	—	0.09	0.04	—
5	2	4	17.9	9.1	13.3	0.83	0.22	0.50	4	8	5	10.0	17.7	10.6	1.42	0.63	1.10

Table 6. Numerical and percentage comparison of the proportion of zoogeographical elements in weevils fauna in the herb layer of dry-ground forest in the Bachus reserve

Stand / Element	*Tilio-Carpinetum typicum*			*Tilio-Carpinetum stachyetosum*			Clearing community		
	N	%	*n'*	*N*	%	*n'*	*N*	%	*n'*
Holoarctic	7	16.6	0.28	5	10.8	0.80	7	9.7	0.56
Paleoarctic	17	40.4	3.57	16	34.7	6.20	32	44.4	7.48
Eurosiberian	4	9.5	0.13	7	15.2	0.70	9	12.5	0.65
South-Eurosiberian	2	4.7	0.06	3	6.5	0.20	3	4.2	0.57
Submediterranean	4	9.5	0.07	4	8.7	0.13	7	9.7	0.89
European	8	19.0	3.01	11	23.9	3.25	14	19.4	3.04
Total	42	99.7	7.12	46	99.8	11.28	72	99.9	13.19

CONCLUSION

The analysis of changes of particular ecological parameters by means of variability coefficient *CV* in all the studied communities demonstrated that *CV* reached the highest values in the typical dry-ground forest and in the clearing community. In the latter the most intense change covered the number of xerothermic and rushes species, stenotopes and polyphages. The *CV* assumed the lowest values here with domination structure uniformity *(J')*, species diversity *(H')* and numbers of species *(N)*. In comparison with the dry-ground forest subassociations the number of species in the clearing communities underwent the least intense changes. In the typical dry-ground forest the value of *CV* changed most intensely for the numbers of rushes species and polytopes, and the least for domination structure and abundance.

The analysis of similarity coefficient for *Curculionidae* groups in successive years showed that it assumed the highest values in the typical and low dry-ground forests (Fig. 7). This value can indicate a species group typical for a given habitat, the species representing particularly high classes of numbers. These were mainly forest species like *P. argentatus*, *S. capitatum* and *S. asperatus*.

Lower values of similarity coefficient were reported for the clearing community. The value of this coefficient may indicate a lack of stability of *Curculionidae* inhabiting this habitat. Dominants included both species characteristic of open communities — *R. castor* together with species of genus *Apion*, *Sitona*, *Cionus* and for forest communities — *S. capitatum* and *A. pavidum*.

According to Witkowski (12) the parameters whose values decrease during secondary succession are species number and index for domination structure uniformity and species diversity. In this study a drop in the values of these parameters was also reported for dry-ground forest association in comparison with the clearing community.

It follows from the analysis of the intensity of changes of selected ecological parameters that the subassociation of *Tilio-Carpinetum typicum* and the clearing community underwent considerable changes. Changes in the typical dry-ground forest were probably due to unfavourable weather conditions — the 1983 drought. Changes in the clearing community took place as a result of secondary succession progressing in the dry-ground forest habitat after the trees were felled, the herb layer was plowed and trees were planted that belong to the climactic stand: oak, hornbeam, larch and linden.

REFERENCES

1. Cholewicka K.: Ryjkowce (*Curculionidae, Coleoptera*). Fragm. Faun. **26**, 267—284 (1981).
2. Cmoluch Z., Łętowski J., Minda-Lechowska A.: Ryjkowce (*Coleoptera, Curculionidae*) w rezerwacie „Bachus" (Wyżyna Lubelska). Fragm. Faun. **33**, 383—392 (1990).
3. Fijałkowski D.: Rezerwat leśny „Bachus" koło Chełma. Ann. Univ. Mariae Curie-Skłodowska, sectio C **14**, 297—343 (1961).
4. Gotwald A.: Fauna ryjkowcowatych (*Curculionidae, Col.*) niektórych parków narodowych i rezerwatów. Prace Inst. Bad. Leśn. **363**, 1—72 (1968).
5. Jaccard P.: Gesetze der Pflanzenverteilung in der alpinen Region auf grund statistisch-floristischer Untersuchungen. Flora **90**, 349—377 (1902).
6. Karpiński J.: Ryjkowce (*Curculionidae*) w biocenozie Białowieskiego Parku Narodowego. Roczn. Nauk Leśn. **21**, 29—47 (1958).
7. Knutelski S.: Charakterystyka zgrupowań ryjkowców (*Coleoptera, Curculionidae*) grądu (*Tilio-Carpinetum*) doliny Wierzbanówki na Pogórzu Wielickim. Zesz. Nauk. UJ **34**, 67—87 (1988).
8. Kuśka A.: Ryjkowce (*Coleoptera, Curculionidae*) rezerwatów przyrody Łężczak koło Raciborza i Kopce koło Cieszyna — studium ekologiczno-faunistyczne. Ochr. Przyr. **44**, 249—282 (1982).
9. Petryszak B.: Ryjkowce (*Coleoptera, Curculionidae*) Pienin. Zesz. Nauk. UJ **26**, 109—173 (1980).
10. Shannon C. E.: A Mathematical Theory of Communication. Bell. System. Tech. J. **27**, 379—423, 623—656 (1948).
11. Tramer E.: Bird Species Diversity: Components of Shannonis Formula. Ecology **50**, 927—929 (1969).
12. Witkowski Z.: Sukcesja wtórna biocenozy grądu w Puszczy Niepołomickiej na tle modelu sukcesji Margalefa i Oduma. Stud. Natur., ser. A **27**, 7—78 (1983).
13. Witkowski Z., Mazur M.: Rośliny i ryjkowce (*Coleoptera, Curculionidae*) warstwy zielnej w toku sukcesji wtórnej w grądzie Puszczy Niepołomickiej. Stud. Natur., ser. A **27**, 79—100 (1983).

STRESZCZENIE

Omówiono wyniki 3-letnich badań nad fauną ryjkowców warstwy runa zbiorowisk klimaksowych i sukcesyjnych występujących na siedlisku grądowym Bachus (Wyżyna Lubelska). W całym okresie badań stwierdzono występowanie 94 gatunków ryjkowców, obejmujących 2008 osobników (tab. 1). Najwyższym zagęszczeniem w zespołach grądowych charakteryzowały się gatunki leśne: *Strophosoma capitatum* i *Phyllobius argentatus*. W zbiorowisku porębowym zaś liczniej odławiano gatunki charakterystyczne dla terenów otwartych (*Rhinoncus castor*) — ryc. 4—6. Dynamika liczebności populacji ryjkowców grądów i zbiorowiska porębowego układała się podobnie, w postaci krzywej dwuwierzchołkowej. Wyjątek stanowił r. 1982, wówczas na porębie obserwowano trójwierzchołkowy przebieg zmian liczebności (ryc. 1—3).

Największą dynamikę zmian w zgrupowaniach ryjkowców obserwowano w grądzie typowym i na porębie (tab. 2), a największe podobieństwo stwierdzono pomiędzy zespołami owadów obu grądów (ryc. 7). W omawianym materiale najliczniej reprezentowane były eurytopy leśne i łąkowe (tab. 4 i 5), większość z nich to formy oligofagiczne (tab. 3). Wśród całego zgrupowania ryjkowców wyróżniono 6 elementów zoogeograficznych, z których najliczniej reprezentowane były palearktyczne i europejskie (tab. 6).

РЕЗЮМЕ

В работе представлены результаты 3-летних исследований фауны долгоносиков травяного покрова климаксовых и сукцессионных сообществ, выступающих на грудовом местообитании — Bachus (Люблинская возвышенность). В течение всего периода исследований обнаружено 94 вида долгоносиков, содержащих 2008 экземпляров (табл. 1). Самой высокой плотностью в грудовых ассоциациях отличались лесные виды *Strophosoma capitatum* и *Phyllobius argentatus*. В вырубных сообществах, однако, наиболее многочисленными были виды, характерные для открытых территорий (*Rhinoncus castor*) — рис. 4—6. Динамика численности популяции долгоносиков грудов и вырубных сообществ была похожа и формировалась в виде двувершинной кривой. Исключением был 1982 год, где на вырубе наблюдали трехвершинный процесс изменений численности (рис. 1—3).

Самую высокую динамику изменений в группировках долгоносиков наблюдали в типичном груде и на вырубке (табл. 2), а самое большое сходство отметили между ассоциациями насекомых обеих грудов (рис. 7). В рассматриваемом материале наиболее многочисленными представителями были лесные и луговые эвритипы (табл. 4, 5), большую их часть составляют олигофагные формы (табл. 3). Из всей группировки долгоносиков выделили 6 зоогеографических элементов, в которых наиболее многочисленными представителями были полеарктические и европейские (табл. 6).