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THE WEEVILS (*Curculionoidea*) OF SELECTED PLANT COMMUNITIES IN THE KOZŁÓWKA LANDSCAPE PARK AND ITS ENVIRONS

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Summary. The article presents the results of 2-year (2006/2007) studies conducted in the Kozłówka Landscape Park. The research was carried out in 11 different plant communities (forest mainly) located at 16 study sites, and resulted in entomological material that consisted of 1835 specimens belonging to 140 species of weevils. Obtained data were considered in respect of population structure (quality and quantity analysis, individual dominance). Moreover, the collected material was analysed in terms of ecology (habitat selection, ecological elements and food preferences) and zoogeography. Among recorded taxa rare species were indicated.

Key words: *Curculionoidea,* weevils, faunistics, ecology, Kozłówka Landscape Park

INTRODUCTION

The Kozłówka Landscape Park (KLP) is the largest forest complex (area of 6121 ha) near the city of Lublin. It is situated on the Lubartów Plain, with location just a few kilometres from the northern verge of the Lublin Upland. According to its geobotanical classification, the area belongs to the Small Mazowsze Region and the Lubartów Plain Subregion, where forests are in domination [Fijałkowski 1972, Szafer and Zarzycki 1977]. This interesting area was the subject of floristic investigations [Fijałkowski 1954, 1962, Otłuszewski and Filipek 1956, Łuczycka-Popiel 1974, 1981–1986, 1993]. Some information about selected groups of insects of the Park is also known [Buczyński 2008]. Few data about the fauna of weevils from this area (mainly Kozie Góry nature reserve and the vicinity of Wandzin) are given in unpublished dissertations only [Staniec 1984, Chobotow 1985, Magryta 1985, Szymanik 1987].

This paper presents a characterisation of the weevil fauna of selected plant associations in the Kozłówka Landscape Park (KLP). During the research the qualitative and quantitative composition of *Curculionoidea* was determined. Ecological issues, such as habitat preferences, food selectivity, ecological elements and zoogeography of the studied material were also addressed.

STUDY AREA

Forests in KLP occupy 90.5% of the area, meadows and pastures – 5.95%, the rest is taken up by agricultural areas (croplands, orchards, plantations) and water reservoirs. Pine is the main tree species in the forest stand (circa 90%) with an admixture of oak, birch, poplar and hornbeam [Fijałkowski 1996].

The subsoil of the Small Mazowsze is built of glacial deposits, especially fluvioglacials, as well as moraines which are residues of Middle-Polish glaciation. In the relief of examined terrain sandy plains with dunes are dominating in the form of long series up to 1.5 km long. The height of moraine hills reaches 180–200 m above sea level. The largest area of the Park is occupied by podsols made of clayey sands [Łuczycka-Popiel 1981, Fijałkowski 1993].

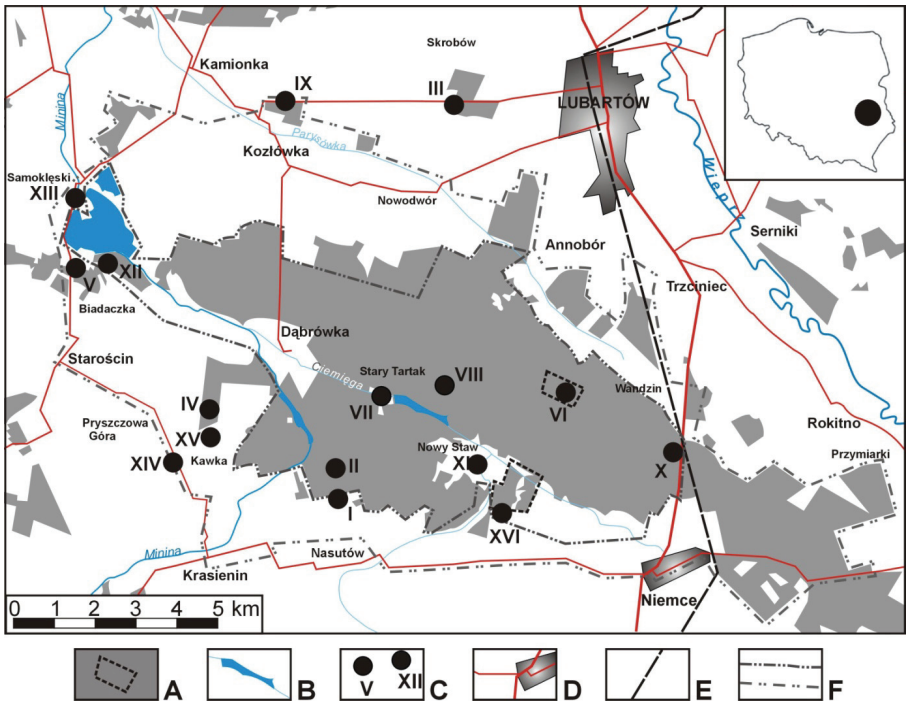

Fig. 1. Distribution of study sites: A – forests and nature reserves borders (VI – Kozie Góry, XVI – planned „Wielosił" reserve), B – water reservoirs, C – study sites, D – roads, towns and bigger villages, E – railway track, F – boundaries of the KLP and its buffer zone

The KLP is situated in the region of continental climate with considerable periodical influences of Atlantic climate. Strong frosts in autumn and spring are characteristic. The average temperature of vegetation period is circa 13.5°C. Annual fall sums of that area are not high and reach circa 550 mm, and those in the vegetation period (IV–VIII) 363 mm [Łuczycka-Popiel 1981, Fijałkowski 1993, Wilgat 1998].

The main forest phytocoenoses in the KLP are fresh pine forest, bog pine forest and meso-oligotrophic mixed forest; the dominating plant communities are *Leucobryo-Pinetum*, *Molinio-Pinetum, Peucedano-Pinetum* and also fragments of thermophilous oak forest (*Potentillo albae-Quercetum*) as well as mesophilous deciduous oak-linden-hornbeam forest (*Tilio-Carpinetum stachyetosum silvaticae* and *T.-C. typicum*) which are gradually undergoing a pinetisation process [Fijałkowski 1993, Nowak 1996]. A floristic peculiarity of the forests examined is the remaining fragment of the Kozłówka primeval forest, composed of oak (*Quercus petraea*) mainly, protected in the form of a nature reserve since 1958 (Kozie Góry nature reserve).

The studies of *Curculionoidea* fauna in the KLP were conducted at 16 study sites (st. s.), covering the most representative plant communities of the Park and its buffer zone (Fig. 1). These were:

– young stand of pine; Nasutów (study site I),

– meso-oligotrophic mixed forest (*Querco roboris-Pinetum*); Nasutów (st. s. II), Skrobów (st. s. III), Kawka (st. s. IV), Biadaczka (st. s. V) and Kozie Góry nature reserve (st. s.VI),

– pine forest; Stary Tartak (st. s. VIII),

– black-currant alder (*Ribeso nigri-Alnetum*); Stary Tartak (st. s. VII),

– tussock-sedge swamp (*Caricetum appropinquatae*); Nowy Staw (st. s. XI),

– lime-hornbeam-oak forest (*Tilio-Carpinetum typicum*); Kozłówka (st. s. IX),

– fresh pine forest (*Peucedano-Pinetum*); Niemce (st. s.X),

– substitute bush communities with the fraction of *Betula pendula*; Pryszczowa Góra (st. s. XIV); Kawka (st. s. XV),

– humid meadow from the class *Molinio-Arrhenetheretea*; Biadaczka (st. s. XII),

– tall herb association *Filipendulo-Geranietum*; planned „Wielosił" nature reserve (st. s. XVI),

– reed beds with common reed (*Phragmitetum australis*); Samoklęski (st. s. XIII).

MATERIALS AND METHODS

Material was collected during two vegetation seasons, from April to September, in the years 2006 and 2007. Samples were picked up with the use of an entomological scoop at all sixteen sites. Moreover, on sites I, II, VII, VIII and XI in one vegetation season Barber traps were used as a complementary method for collecting epigeic insects. A total of 21965 insect specimens were acquired, belonging to 13 orders (1835 individuals of *Curculionoidea*). Using the entomo-

logical scoop 122 samples were collected, grouping 14 792 individuals (about 4000 specimens of *Coleoptera* and 1714 specimens of *Curculionoidea*). With the application of 36 Barber traps, 7173 specimens were separated (about 1862 specimens of *Coleoptera*, 121 individuals of *Curculionoidea*).

The material was determined to orders, beetles (*Coleoptera*) to families [Pławilszczikow 1968] and weevils (*Curculionoidea*) to species [Smreczyński 1965, 1966, 1968, 1972, 1974, 1976, Cmoluch 1979]. The systematic classification and species nomenclature follow Petryszak [2004] and Wanat, Mokrzycki [2005].

The ecological analysis of the obtained material was carried out at the range of number of individuals (ind.), number of species (spec.), relative density, individual dominance (D) and stability of occurrence [Cmoluch 1975, Witkowski 1975].

Examined flora and particular plant specimens were distinguished according to Łuczycka-Popiel [1974, 1981–1985], Matuszkiewicz [2005] and Mowszowicz [1986].

RESULTS

General characteristic of studied material

In studied material insects belonging to hymenopterans were dominant (6570 ind., 30% of all). Beetles (5721 ind., 26%), dipterans (4858 ind., 22%) and bugs (3633 ind., 16,5%) were also represented in large numbers. Among beetles (28 families found), weevils were the most numerous (32% of all *Coleoptera* spec.), followed by *Staphylinidae*, *Chrysomelidae*, *Carabidae*, *Coccinellidae* and *Scarabaeidae*.

The number of 1835 acquired specimens of *Curculionoidea* was identified as representatives of 140 species and comprised 13.3% of weevils occurring in Poland (Tab. 1). In comparison to unpublished data about curculionids from some selected plant communities in the Park (acquired mainly from the Kozie Góry nature reserve) [Staniec 1984, Chobotow 1985, Magryta 1985, Szymanik 1987], 51 species were new for the examined area, the occurrence of 89 were confirmed, and the same number (89 spec.) was not registered in the latest investigations. In total, 229 species of weevils were identified in the KLP in the periods of 1984–1985 and 2006–2007. Taking into account that the previous material was obtained with the use of different methods and from a different set of localities, comparison of those zoocenological analyses with the results of the present studies is not adequate.

Back to the current results, the most numerous weevils at a majority of the study sites were ranked to the common forest poliphages: *Strophosoma capitatum*, *Phyllobius pomaceus* and *Ph. argentatus*. Species like *Rhinoncus castor*, *Nedyus quadrimaculatus*, *Phyllobius arborator* and *Perapion curtirostre* were also numerous but unstable in occurrence and were found in masses in single

Table 1. Weevils (*Coleoptera*, *Curculionoidea*) of selected plant communities in the Kozłówka Landscape Park and its environs (numbers of specimens)

No.	Species/Study site	Forest communities										Σ	Meadow and reed beds				Σ	Bush communities		Σ	Barber's traps					Σ
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**		**XI**	**XII**	**XIII**	**XVI**		**XIV**	**XV**		**I**	**II**	**VII**	**VIII**	**XI**	
	Nemonychidae																									
1	*Cimberis attelaboides* (Fabricius,1787)		2									**2**														
	Attelabidae																									
2	*Apoderus coryli* (Linnaeus, 1758)	1										**1**														
*3	*Apoderus erythropterus* (Gmelin, 1790)															3	**3**									
	Rhynchitidae																									
*4	*Temnocerus nanus* (Paykull, 1792)							1				**1**							2	**2**						
5	*Neocoenorrhinus germanicus* (Herbst, 1797)															1	**1**									
6	*Deporaus betulae* (Linnaeus, 1758)							1				**1**														
	Apionidae																									
*7	*Apion frumentarium* (Linnaeus, 1758)	2	1									**3**	1	1		3	**5**					2				**2**
*8	*Apion cruentatum* (Walton, 1844)	9			1							**10**	1	1			**2**					1				**1**
*9	*Apion rubiginosum* Grill, 1893	5										**5**														
10	*Pseudoperapion brevirostre* (Herbst, 1797)	1			1						2	**4**				1	**1**	4	1	**5**						
11	*Pseudostenapion simum* (Germar, 1817)						1					**1**														
12	*Perapion affine* (Kirby, 1808)	3										**3**	1			1	**2**									
13	*Perapion curtirostre* (Germar, 1817)	6	1	2	1	1		1	3	11	1	**27**	10	27			**37**		1	**1**	2					**2**
14	*Perapion marchicum* (Herbst, 1797)	4		1		1					1	**7**	1				**1**	3	2	**5**						
15	*Perapion violaceum* (Kirby, 1808)	1										**1**	1	1	4	5	**11**									
16	*Protapion apricans* (Herbst, 1797)		7	1	4	3			1	5	1	**22**				1	**1**									
17	*Protapion fulvipes* (Geoffroy, 1785)	1	3		7	3		4	1	4		**23**	2				**2**	1		**1**						
*18	*Protapion nigritarse* (Kirby, 1808)										1	**1**														

*19	*Catapion pubescens* (Kirby, 1811)					3	**3**				
20	*Catapion seniculus* (Kirby, 1808)					1	**1**				
21	*Betulapion simile* (Kirby, 1811)			1	**1**						
22	*Ischnopterapion loti* (Kirby, 1808)					1	**1**				
23	*Ischnopterapion virens* (Herbst, 1797)	1		2	**3**						
*24	*Stenopterapion intermedium* (Eppelsheim, 1875)	1			**1**						
25	*Hemitrichapion pavidum* (Germar, 1817)		1		**1**	3	**3**				
26	*Eutrichapion viciae* (Paykull, 1800)	3	8	1	10 1	**23**	2	**2**	1	**1**	
27	*Oxystoma cerdo* (Gerstaecker, 1854)	2		1	**3**						
28	*Oxystoma craccae* (Linnaeus, 1767)			1 4	**5**			1		**1**	
*29	*Oxystoma pomonae* (Fabricius, 1798)	1	1 1	4	**7**						
*30	*Oxystoma subulatum* (Kirby, 1808)					1	**1**				
31	*Exapion difficile* (Herbst, 1797)		1		**1**						
*32	*Exapion elongatulum* (Desbrochers, 1891)	3		1	**4**						
33	*Aspidapion radiolus* (Marsham, 1802)			1	**1**			1		**1**	
34	*Taeniapion urticarium* (Herbst, 1784)		4		**4**	5	3 **8**				
35	*Melanapion minimum* (Herbst, 1797)					2	**2**				
*36	*Squamapion vicinum* (Kirby, 1808)			1	**1**						
*37	*Omphalapion dispar* (Germar, 1817)	2	4 3		**9**	1	**1**		1	**1**	
38	*Omphalapion hookerorum* (Kirby, 1808)		1		**1**	1	**1**				
39	*Omphalapion laevigatum* (Paykull, 1792)					1	**1**				
*40	*Ceratapion basicorne* (Illiger, 1807)	1	1		**2**						

	Nanophyidae								
41	*Nanophyes marmoratus* (Goeze, 1777)			14 1 30	**45**				
*42	*Nanophyes globiformis* Kiesenwetter, 1864			3	**3**				
*43	*Microon sahlbergi* (Sahlberg, 1835)			2	**2**				
44	*Grypus equiseti* (Fabricius, 1775)			2	**2**			1 6	**7**
45	*Tanysphyrus lemnae* (Paykull, 1792)			1	**1**				
	Curculionidae								
46	*Otiorhynchus multipunctatus* (Fabricius,1792)							1	**1**
*47	*Otiorhynchus repletus* Boheman, 1843	2 1	**3**						
48	*Otiorhynchus raucus* (Fabricius,1777)	1 4	**5**					1	**1**
49	*Otiorhynchus scaber* (Linnaeus,1758)							2	**2**
50	*Otiorhynchus ovatus* (Linnaeus, 1758)					1	**1**	2	**2**
*51	*Trachyphloeus alternans* Gyllenhal, 1834	1	**1**						
52	*Trachyphloeus bifoveolatus* (Beck, 1817)	2	**2**			1	**1**	15	**15**
*53	*Trachyphloeus spinimanus* Germar, 1824							17	**17**
54	*Phyllobius arborator* (Herbst, 1797)	1 3 7 19 40	**70**			7	**7**	2	**2**
55	*Phyllobius pyri* (Linnaeus, 1758)	2 1 3	**6**	1 2	**3**	1	**1**		
56	*Phyllobius vespertinus* (Fabricius, 1792)			2	**2**				
57	*Phyllobius argentatus* (Linnaeus, 1758)	1 2 11 6 1 12 2 30 1	**66**			1 43	**44**		
58	*Phyllobius pomaceus* Gyllenhal, 1834	15	**15**	12 3 93	**108**				
59	*Phyllobius maculicornis* Germar, 1824	2	**2**	1	**1**	6	**6**		
60	*Phyllobius virideaeris* (Laicharting, 1781)					1	**1**		
61	*Polydrusus picus* (Fabricius, 1792)	10	**10**						

62	*Polydrusus tereticollis* (De Geer, 1775)		1	**1**							
63	*Polydrusus cervinus* (Linnaeus, 1758)	2 1		**3**				2 26	**28**		
64	*Polydrusus impar* (Gozis, 1882)		2	**2**							
65	*Sciaphilus asperatus* (Bonsdorff, 1785)	2 2	2 1	**7**							
66	*Brachysomus echinatus* (Bonsdorff, 1785)		2	**2**	1	**1**					
67	*Barypeithes pellucidus* (Boheman, 1834)		22	**22**							
68	*Brachyderes incanus* (Linnaeus, 1758)	3		**3**				3	**3**	1	**1**
69	*Strophosoma capitatum* (De Geer, 1775)	20 39 51 37 110 19 10	70 34 1	**391**	1 1	**2**		7	**7**	2 2 8 23	**35**
70	*Strophosoma melanogrammum* (Foerster, 1771)	4		**4**							
*71	*Strophosoma faber* (Herbst, 1785)	1		**1**				1	**1**		
72	*Sitona hispidulus* (Fabricius 1777)	1	1	**2**						1	**1**
73	*Sitona humeralis* Stephens, 1831				1	**1**		1	**1**		
74	*Sitona lepidus* Gyllenhal, 1834		1	**1**	2 1	1 **4**					
75	*Sitona lineatus* (Linnaeus, 1758)				1	**1**		7 1	**8**	1	**1**
76	*Sitona macularius* (Marsham, 1802)	5	1	**6**				8 2	**10**		
77	*Sitona puncticollis* Stephens, 1831	1		**1**							
78	*Sitona striatellus* Gyllenhal, 1834	22		**22**							
79	*Sitona sulcifrons* (Thunberg, 1798)				1	**1**					
80	*Sitona suturalis* Stephens, 1831	1		**1**	40	**40**					
81	*Sitona gressorius* (Fabricius, 1792)	2 13	1	**16**							
82	*Sitona griseus* (Fabricius, 1775)	1	1	**2**				1	**1**		
*83	*Asperogronops inaequalis* Boheman, 1842									1	**1**
84	*Hypera arator* (Linnaeus,1758)	1		**1**							

85	*Hypera nigrirostris* (Fabricius, 1775)			1	**1**					
86	*Hypera plantaginis* (De Geer, 1775)	1	**1**							
87	*Hypera viciae* (Gyllenhal, 1813)			1	**1**				1	**1**
*88	*Hypera meles* (Fabricius, 1792)			5	**5**					
89	*Hypera adspersa* (Fabricius, 1792)			1	**1**					
*90	*Rhinocyllus conicus* (Froelich, 1792)			1	**1**					
91	*Larinus planus* (Fabricius, 1792)			1	**1**					
*92	*Coniocleonus* = *Stephanocleonus hollbergii* (Fahraeus, 1842)								4	**4**
*93	*Magdalis phlegmatica* (Herbst, 1797)	1	**1**							
*94	*Magdalis violacea* (Linnaeus,1758)	1 1	**2**							
95	*Magdalis ruficornis* (Linnaeus,1758)	1 2	**3**							
96	*Hylobius abietis* (Linnaeus, 1758)								2 3	**5**
*97	*Hylobius transversovittatus* (Goeze, 1777)								1	**1**
98	*Trachodes hispidus* (Linnaeus,1758)	2	**2**							
*99	*Brachytemnus porcatus* (Germar, 1824)								1 7	**8**
*100	*Curculio rubidius* (Gyllenhal, 1836)	1	**1**							
101	*Archarius pyrrhoceras* (Marsham, 1802)	1 2	**3**							
*102	*Tychius parallelus* (Panzer, 1794)	2	**2**							
103	*Tychius picirostris* (Fabricius, 1787)	4 1	**5**	2	**2**					
104	*Sibinia pyrrhodactyla* (Marsham, 1802)	4 2 1 1	**8**	3	**3**	1 1	**2**			
*105	*Sibinia sodalis* (Germar, 1824)	1	**1**							
106	*Anthonomus rubi* (Herbst, 1795)	2 1 1 6	**10**							
107	*Anthonomus phyllocola* (Herbst, 1795)	1 1	**2**							

108	*Anthonomus rectirostris* (Linnaeus, 1758)		1	1	**2**						
109	*Brachonyx pineti* (Paykull, 1792)	1	1		**2**						
110	*Mecinus labilis* (Herbst, 1795)					1	**1**				
111	*Mecinus pascuorum* (Gyllenhal, 1813)					4	29	**33**			
*112	*Gymnetron melanarium* (Germar, 1821)						2	**2**			
*113	*Gymnetron veronicae* (Germar, 1821)					1		**1**	1	**1**	
114	*Rhinusa tetra* (Fabricius, 1792)						1	**1**			
*115	*Cleopomiarus micros* (Germar, 1821)	2			**2**						
116	*Cionus hortulanus* (Geoffroy, 1785)						2	**2**			
117	*Rhamphus pulicarius* (Herbst, 1795)								1	**1**	
*118	*Baris artemisiae* (Herbst, 1795)		3		**3**						
119	*Coryssomerus capucinus* (Becker, 1817)						1	**1**			
*120	*Mononychus punctumalbum* (Herbst, 1784)		1		**1**						
121	*Rhinoncus bruchoides* (Herbst, 1784)	1			**1**		1	2	**3**		
122	*Rhinoncus castor* (Fabricius, 1792)	87	1	1	**89**	2	1	1	**4**	9	**9**	2	**2**
123	*Rhinoncus inconspectus* (Herbst, 1795)					1			**1**			1	**1**
124	*Rhinoncus pericarpius* (Linnaeus, 1758)					2	35	13	**50**				
125	*Rhinoncus perpendicularis* (Reich, 1797)		1		**1**								
*126	*Marmoropus besseri* Gyllenhal, 1837					1	1		**2**				
*127	*Rutidosoma globulus* (Herbst, 1795)	1			**1**								
128	*Tapeinotus sellatus* (Fabricius, 1794)			1	**1**								
*129	*Coeliodinus transversealbovittatus* (Goeze, 1777)		2	1	**3**								
130	*Trichosirocalus troglodytes* (Fabricius, 1787)					4	1	**5**					

131	*Zacladus geranii* (Paykull, 1800)															1	**1**									
132	*Nedyus quadrimaculatus* (Linnaeus, 1758)			1				13		2	3	**19**	40	9	3	11	**63**									
133	*Ceutorhynchus assimilis* (Paykull, 1792)				1				1			**2**														
134	*Ceutorhynchus minutus* (Reich, 1797)				1	2				1	1	**5**		13			**13**									
135	*Ceutorhynchus erysimi* (Fabricius, 1787)		1		1					1		**3**	2	3			**5**									
*136	*Ceutorhynchus pulvinatus* Gyllenhal, 1837												1		1		**2**									
137	*Ceutorhynchus typhae* (Herbst, 1792)		1							2		**3**	2	22			**24**									
138	*Glocianus punctiger* (Gyllenhal, 1837)									1		**1**														
139	*Datonychus arquatus* (Herbst, 1795)																								1	**1**
140	*Orobitis cyanea* (Linnaeus,1758)																								7	**7**
	Σ	193	71	107	99	135	23	61	92	179	67	**1027**	128	120	19	269	**536**	40	111	**151**	57	2	12	36	14	**121**

Explanations: I (Nasutów) – young stand of pine; II (Nasutów), III (Skrobów), IV (Kawka), V (Biadaczka), VI (Kozie Góry nature reserve) – *Querco roboris-Pinetum*; VII (Stary Tartak) – *Ribeso nigri-Alnetum*; VIII (Stary Tartak) – pine forest; IX (Kozłówka) –*Tilio-Carpinetum typicum*; X (Niemce) – *Peucedano-Pinetum*; XI (Nowy Staw) – *Caricetum appropinquatae*; XII (Biadaczka) – humid meadow from the class of *Molinio-Arrhenetheretea*; XIII (Samoklęski) – reed beds with *Phragmitetum australis*; XIV (Pryszczowa Góra), XV (Kawka) – substitute bush communities with the fraction of *Betula pendula*; XVI (planned Wielosił reserve) – *Filipendulo-Geranietum*
** rare species.*

samples only. The number of specimens belonging to the species mentioned above comprised 54.34% (920 ind.) of all collected individuals.

Weevils of selected plant communities

Forest communities

The examined forest communities included a young stand of pine (study site I), *Querco roboris-Pinetum* (st.s. II–VI), pine forest (st.s. VIII), *Peucedano-Pinetum* (st. X), *Tilio-Carpinetum* (st.s. IX) and *Ribeso nigri-Alnetum* (st. s. VII). At those study sites 1027 specimens representing 91 species (65% of all collected weevils) were caught (about 56% of all).

The highest number of specimens was collected in the young stand of pine – 250 specimens representing 42 species. With the use of an entomological scoop the most numerous was *Rhinoncus castor*, while in Barber traps typical xerothermophilous beetles dominated – *Trachyphloeus bifoveolatus* and *T. spinimanus*. A peculiarity found at this study site was *Cleopomiarus micros* Germ. – a monophagous species living on *Jasione montana* L., described by Smreczyński [1955] as a subatlantic element, rare in central Poland and not found in southtern regions yet. This species has reached the eastern border of its range in Poland and was common on seaside sand dunes near Gdańsk [Burakowski *et al*. 1997].

19 species were obtained in the pine forest in Stary Tartak (study site VIII), one rare species *Otiorhynchus repletus* and two strong dominants: *Strophosoma capitatum* and *Phyllobius arborator* were among them. Characteristic species for this plant community were *Anthonomus phyllocola, Hylobius abietis* and *Brachytemnus porcatus* (two last species from Barber traps).

The main common elements for mixed coniferous forests *Querco roboris-Pinetum* (study sites: II–VI) were *Strophosoma capitatum*, *Perapion curtirostre, Protapion apricans* and *Phyllobius argentatus*; the rest of identified species appeared randomly and were not representative for the examined habitats. At study site III in Skrobów, beside *S. capitatum* in the class of eudominants, *Sitona striatellus* and *S. gressorius* were numerous, too. The mentioned species are associated, *inter alia,* with *Sarothamnus scoparius* L.; this plant was the main component of undergrowth on the edge of the examined forest and during flowering (May/June) *S. striatellus* was caught the most numerously. Another xerotermophilous species living on this plant, but not numerous in Skrobów, was *Exapion elongatulum*. Especially in spring in mixed coniferous forest in Kawka (st. s. IV), apart from *Strophosoma capitatum*, typical forest poliphages were caught – *Phyllobius argentatus* and *Polydrusus picus.* At a similar study site in Nasutów two rare subpontian species were obtained: *Stenopterapion intermedium* and *Othiorhynchus repletus*. In the mixed forest in Biadaczka the diversity of entomofauna was the poorest, with *Strophosoma capitatum* amounting to over 80% of all specimens caught. Moreover, in samples from July and September, the presence of meadow species (*Protapion apricans*, *Perapion marchicum* and

a synanthropic *Omphalapion dispar*) was noticeable. The mentioned species occurred in a forest probably because of seasonal migration [Chroliński 1963]. From the study site number VI in Kozie Góry nature reserve with considerable part of *Quercus sessilis* only sparse data were derived. Only 4 species of *Curculionoidea* were recorded: the most numerous was *Strophosoma capitatum* (19 ind.), one individual of *Pseudostenapion simum*, one specimen of *Phyllobius argentatus* and two of *Trachodes hispidus*. The reason for so immeasurable results was the poor undergrowth in that place, where only an entomological scoop samples were taken. Some information about weevils fauna of mentioned reserve come from several unpublished older sources [Staniec 1984, Chobotow 1985, Magryta 1985, Szymanik 1987]. From 13 to 28 species were caught there, with strong dominance of *Strophosoma capitatum* (reaching 80%) and less numerous but also predominating individuals of *Phyllobius arborator* and *Ph. argentatus*. The material from the subcontinental pine forest in Niemce (st. s. X) differed from the rest of Kozłówka LP's pine forests in the lack of *S. capitatum* dominance. Instead of mentioned species the class of eudominants included *Phyllobius arborator* which has reached the highest number of individuals and the largest dominance (64.91%) at this study site, as well as *Anthonomus rubi* (10.53%) that had colonized numerous raspberry and blackberry bushes on this place.

In the discussed pine forest habitats (st. s. I–VIII, X), 74 species were distinguished in total. The greatest stability of occurrence at those sites was characteristic of the following species of weevils: *Strophosoma capitatum* (most numerous, only in *Peucedano-Pinetum* forest it did not belong to the class of eudominants), *Protapion apricans*, *Phyllobius argentatus* and *Protapion fulvipes*. Among the most abundant species of described habitat *Phyllobius arborator* was also present. Mentioned taxa reached their maximum in the *Peucedano-Pinetum* forest, besides it was noticed in a pine forest on study site VIII. The domination structure of obtained weevils of all examined pine forest communities in the KLP is presented in Fig. 2.

Lime-hornbeam-oak forest *Tilio-Carpinetum* (st. s. IX) in Kozłówka appeared as very rich in terms of the number of *Curculionoidea* species (35 spec., 179 ind.). Eudominants were: *Strophosoma capitatum*, *Barypeithes pellucidus, Phyllobius arborator* and *Ph. argentatus*. In the first decade of July a quantitative increase of meadow species was noted, generally *Apionidae*: *Perapion curtirostre*, *Eutrichapion viciae*, *Protapion apricans*, *P. fulvipes* and six other taxa which created a summer peak. The rare species category was represented by one specimen of submediterranean element – *Hypera plantaginis* living on *Lotus uliginosus* Schk.

Among weevils of *Ribeso nigri-Alnetum* forest 18 species were recorded, identified from 73 specimens, which was similar in part to the pine forest fauna. The collection of insects gathered with an entomological scoop was dominated by *Nedyus quadrimaculatus* (21.31%), *Phyllobius argentatus* (19.67%) and *Strophosoma capitatum* (16.39%). In Barber traps, which were systematically destroyed by wild boars, *Strophosoma capitatum* was the most numerous.

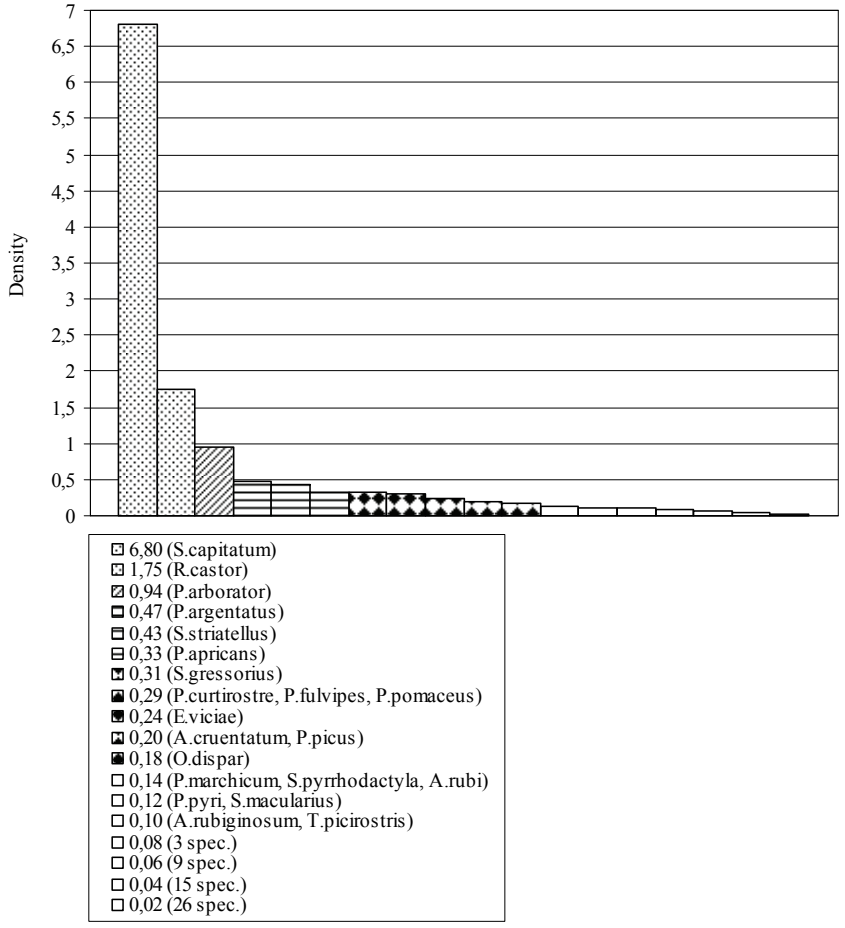

Fig. 2. Domination structure of *Curculionoidea* in pine forest communities of the Kozłówka LP, acquired by entomological scoop

Meadow communities and reed beds

Within open habitats of the KLP the following study areas were investigated: reed beds (*Phragmitetum australis*) along fish farming pond in Samoklęski (st. s. XIII), tussock-sedge swamp *Caricetum appropinquatae* in Nowy Staw (st. s. XI), fresh meadow in Biadaczka (st. s. XII) and meadow complex *Filipendulo-Geranietum* in the planned Wielosił nature reserve (st. s. XVI). Among curculionids of discussed sites 63 species (circa 45% of fauna of all study sites) were specified, in the amount of 536 individuals (circa 29.2% of all). The common species of mentioned habitats, but not dominating in all cases, were *Perapion violaceum* and *Nedyus quadrimaculatus*. Other relating taxa were *Nanophyes marmoratus*, *Phyllobius pomaceus*, *Rhinoncus pericarpius*, *Sitona lepidus* and *Apion frumentarium*. The domination structure of obtained weevils of examined meadow communities and reed beds in the KLP is presented in Fig. 3.

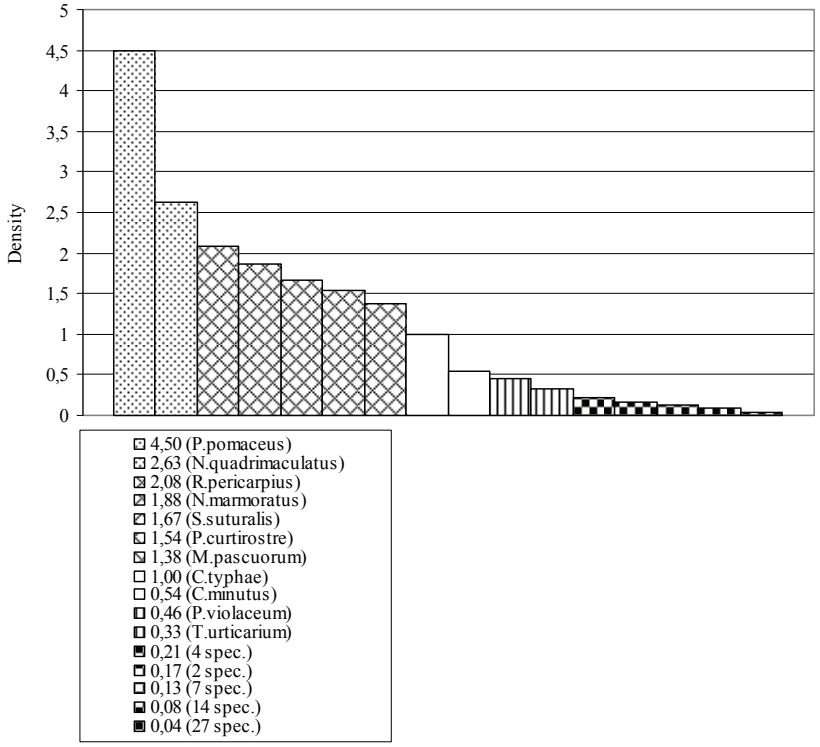

Fig. 3. Domination structure of *Curculionoidea* in meadow communities and reed beds of the Kozłówka LP, acquired by entomological scoop

Among all of considered plant communities the most altered study site in terms of species quality (12 spec.) and quantity was the reed bed in Samoklęski. The occurrence of synanthropic species *Omphalapion dispar* is a confirmation of the anthropogenic character of this study site. The sedge association *Caricetum appropinquatae* was relatively rich in species (36 spec., 142 ind.). A comparatively great deal of wet meadow species was noticeable there, such as *Grypus equiseti*, *Datonychus arquatus*, *Orobitis cyanea* (caught in Barber traps), *Nanophyes marmoratus* and only one representative of water forms – *Tanysphyrus lemnae*. 15 species were found on the meadow in Biadaczka, however, species characteristic of such habitats, like *Rhinoncus castor* and *Sitona lineatus*, occurred only once at a time. The distinctive eudominants on the examined fresh meadow were *Rhinoncus pericarpius, Perapion curtirostre, Ceutorhynchus typhae* and *C. minutus*. The *Filipendulo-Geranietum* community (st. s. XVI) appeared as the most diversified and rich in respect of weevil fauna; 37 species were noted there, the most numerous among them being *Phyllobius pomaceus*, *Perapion curtirostre*, *Sitona suturalis* and *Nanophyes marmoratus*.

Bush communities

Material to the analysis was collected from 2 study sites: the substitute communities with the fraction of *Betula pendula* in Pryszczowa Góra (st. s. XIV) and Kawka (st. s. XV). 151 individuals were obtained in total (about 8.2% of all), identified to 28 species (20% of all). The domination structure of *Curculionoidea* of the studied bush communities in the KLP is presented in Fig. 4.

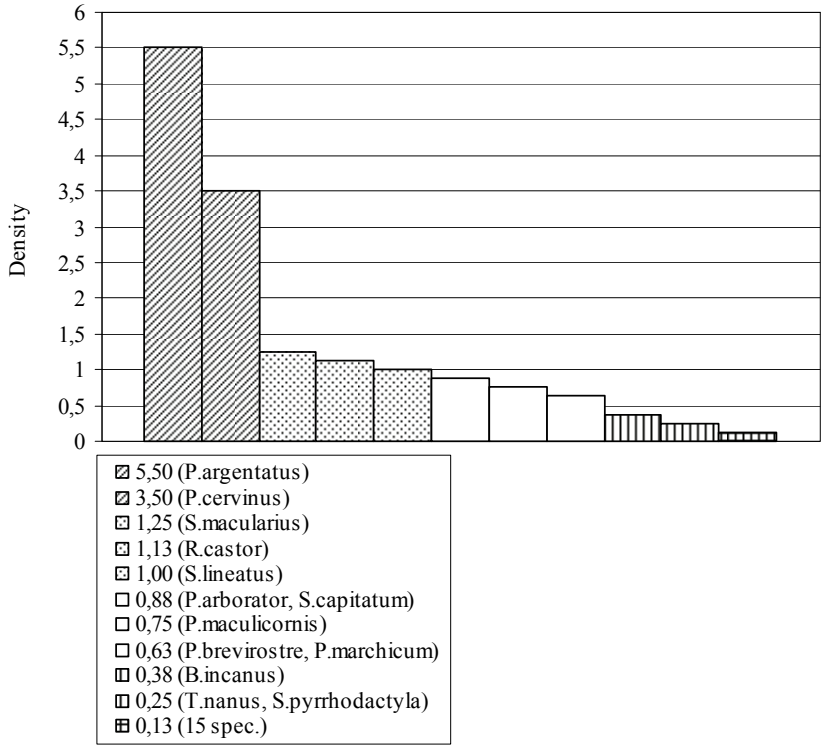

Fig. 4. Domination structure of *Curculionoidea* in bush communities of the Kozłówka LP, acquired by entomological scoop

Despite being under a strong anthropogenic influence (mowing, trampling), from the poor ground cover in Kawka more specimens (105 ind.) were caught in fewer samples than in Pryszczowa Góra (40 ind.), where the composition of the undergrowth and trees was richer. Moreover, at the former site weevils *Phyllobius* spp. and *Polydrusus* spp. were dominating (especially *Ph. argentatus* and *P. cervinus*), probably because the samples were taken generally in May – the month of the greatest quantity of that species, whereas at the latter study site (XIV) curculionids of *Sitona* spp. (*S. macularius* and *S. lineatus*) were in advantage. The reason for that contrast may be the different location of the examined areas in the relation to the forest: the former one was isolated from the forest by a dirt road only and the latter – by fields. An oddity at the study site in

Pryszczowa Góra is minimal stability of species occurrence - practically in every single sample a different composition of *Curculionoidea* species was found. In April and September individuals of *Apionidae* and *Sitona* spp. (but different species) were dominating, whereas in May *Phyllobius* spp. and *Polydrusus* spp. On the discussed study site only one specimen of *Rhampus pulicarius* was obtained – the beetle living on birches (*Betula* spp.) and willows (*Salix* spp.).

Faunistic and ecological analysis

The majority of species within the examined assemblages of weevils were meadow forms (42% spec., including moist meadows), containing mainly oligophages and monophages (Fig. 5). Forest elements were in quantity advantage

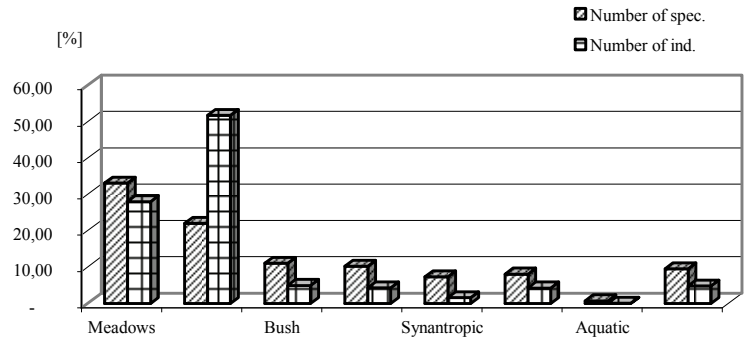

Fig. 5. Habitat selection of *Curculionoidea* obtained in the Kozłówka LP

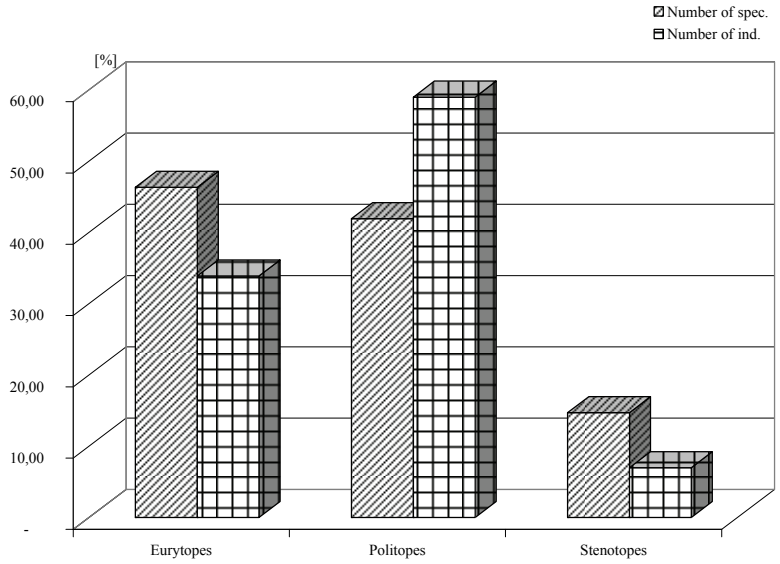

Fig. 6. Ecological elements of *Curculionoidea* obtained in the Kozłówka LP

(51.8% ind.), comprising the most of dendrophilous poliphages. The studied fauna grouped eurytopes in the largest percentage (45% spec.) (Fig. 6). Taking note of relatively big part of wet habitats in the KLP, among all the stenotopes moist meadow elements were the most numerous (10.29%). Quite a big number of xerothermophilous species was also recorded (8.6%). Totally, the stenotopes included 13,6% of all species.

In respect of food preferences (Fig. 7), oligophages were distinguished by considerable predominance (62.1% spec.) and meadow species were in a large majority within that group. Forest poliphages were dominating in terms of quantity (50% ind.). Among monophages, which were in a minority, meadow forms were mainly represented.

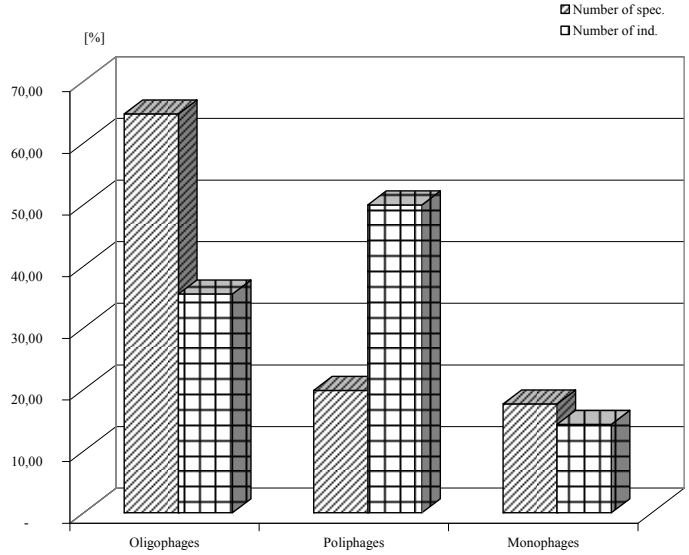

Fig. 7. Food preferences of *Curculionoidea* obtained in the Kozłówka LP

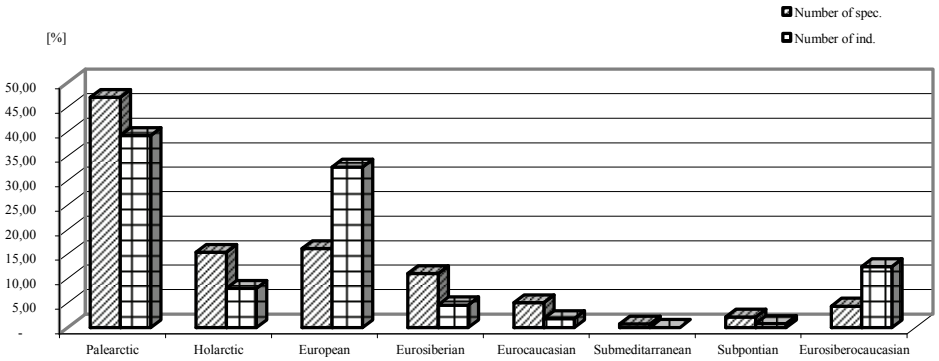

Fig. 8. Zoogeographical elements of *Curculionoidea* obtained in the Kozłówka LP

Nine zoogeographical elements were discriminated within the explored fauna of *Curculionoidea* (Fig. 8). Palearctic weevils represented the largest part in terms of quality (64 spec., 45.7%). Fewer European elements were caught (21 spec., 15%). Subatlantic, subpontian and submediterranean species were obtained sporadically.

DISCUSSION AND CONCLUSIONS

The fauna of weevils of the Kozłowiecki Landscape Park, in comparison to other similar floristic sites in the Lublin region, is moderately rich in species (140 spec.). In a forest community near Kraśnik, examined in 1963 [Cmoluch and Kowalik], the registered number of *Curculionoidea* was 161 species. Gosik *et. al*. [2002], at 10 localities situated in the Krzczonów LP, acquired 184 species. Within the mentioned area the study site with *Filipendula ulmaria* was poorer (97 ind., 27 spec.) than in the resembling association of the KLP, in the planned Wielosił reserve (269 ind., 37 spec.), which pertained to the most diversified. In Las Klasztorny nature reserve in the Sandomierska Lowland, 89 species of curculionids were detected [Łętowski 1991]. During researches conducted at 8 study sites in various forest associations in the Lasy Janowskie Landscape Park – LJLP (with area of 391.50 km^2) 81 species of weevils (935 spec.) were caught [Łętowski *et al*. 2002]. In comparison to the results of the last studies, a lower quantity contribution of forest elements in the KLP was indicated (79.86% vs. 51.8%). No species with southern provenience (Pontian, subpontian and Mediterranean elements) were recorded in the LJLP.

Strophosoma capitatum was an eudominant in almost all forest associations in the KLP (D = 37.6 for all forest communities combined) as well as in 2 similar localities in the Krzczonów LP (D = 18.9 and 27.8 respectively) [Gosik *et al*. 2002]. Contrary to domination structure in *Leucobryo-Pinetum* researched in LJLP, in a similar community in the KLP the mentioned species has not been classified to the group of eudominants. In respect of biodiversity, the poorest assemblage of weevils has been detected in LJLP in undergrowth of *Tilio-Carpinetum* (38 ind. of 11 species), in contrast to relatively rich fauna in the same type of forest in the KLP (179 ind., 35 spec.). Similar results from undergrowth of discussed plant association to these in the KLP were recorded in the Krzczonów LP (47 spec.) and in the Bachus reserve 42 [Cmoluch *et al.* 1990].

Predominating pine communities in the KLP were relatively rich in species (74 spec. from all such localities), whereas in the Roztocze NP (on similar plant assemblages but with domination of *Abies alba*) 42 species of weevils were noted [Minda-Lechowska 1993] and 53 species acquired during research conducted in 1886–1990 [Cmoluch *et al.* 1994].

Within the scope of the conducted studies, in the KLP the typical anthropogenic plant communities – the substitute assemblages with *Betula pendula*, were also examined (st. s. XIV, XV). The results of that research (151 ind., 28 spec. in

total from both sites) were similar to those obtained in the Kazimierz LP [Łętowski *et. al*. 2003], where relatively poor and little diversified fauna of weevils was found (140 ind. of 19 spec.), with the domination of *Phyllobius arborator* and *Strophosoma capitatum*.

Moderately strong and long lasting influence of anthropopressure (e.g. intensive forestry, melioration, depositing of litter) has an impact on the area of the KLP, causing such processes as the destruction of valuable floristic assemblages (observed e.g. in the planned Wielosił nature reserve). Especially in the eighties of the 20th century, the main method of wood acquisition was total clearing and afforestation of the grounds with pine [Łuczycka-Popiel 1985]. The results of that activity are processes like: pinetisation, fruticetisation and appearance of replacement assemblages with *Betula pendula*, or pinening of lime-hornbeam-oak forests like it is observed in the Knyszyńska primeval forest [Szujecki 1990]. Progressive synanthropisation of forest communities (notable even in the protected area of Kozie Góry nature reserve) leads to a reduction of biodiversity of fauna and flora on one side, and to the introduction of foreign species on the other.

Also the share of eurytopic and wide-spread elements increases, which was perceived in grass-lands in comparison to the forest biocenoses. On the studied meadows (Biadaczka, Wielosił projected reserve) the level of Palearctic eurytopes reached 66.7% whereas in the forest 58.3%. A similar phenomenon was noted in the Łężczak and Kopce nature reserves in Silesia [Kuśka 1982] and it could be explained by deforestation of surfaces, covered by meadow communities instead, which has led to a disturbance of the natural balance of zoogeographical structure.

The processes mentioned cause that communities of *Curculionoidea* are less stable in sites where the human pressure is strong. The disturbance of the ecological balance might lead to mass appearance of species like *Hylobius abietis*, development of which is especially promoted by the system of total clearing [Szujecki 1998], or *Strophosoma capitatum* [Szmidt and Stachowiak 1980, Stachowiak 1993]. Mentioned species could make considerable economic damage in weakened forests.

Worth emphasizing is the fact that *Curculionoidea*, as a very numerous super-family of beetles, rich in species and tightly connected with particular habitats (stenotopes) and plants, could be one of the most helpful group of insects used in bioindication [Anderson and Ashe 2000]. According to identified combinations of species and their quantity, the condition of an examined biotope can be easily estimated [Stachowiak 1993].

Aside from all those unfavourable effects, having an impact on the Kozłówka Landscape Park environment, a lot of various macro- and microhabitats are preserved in a relatively good condition. There are still many different biotopes worth investigating and appropriate for further studying. Corroboration of that hypothesis is the fact that a considerable number of rare species were indicated there (40 spec.), including the following: *Apoderus erythropterus*,

Temnocerus nanus, *Apion frumentarium*, *A. cruentatum*, *A. rubiginosum*, *Protapion nigritarse*, *Catapion pubescens*, *Stenopterapion intermedium*, *Oxystoma pomonae*, *O. subulatum*, *Exapion elongatulum*, *Squamapion vicinum*, *Omphalapion dispar*, *Ceratapion basicorne*, *Nanophyes globiformis*, *Microon sahlbergi*, *Otiorhynchus repletus*, *Trachyphloeus alternans*, *T. spinimanus*, *Strophosoma faber*, *Asperogronops inaequalis*, *Hypera meles*, *Rhinocyllus conicus*, *Stephanocleonus hollbergii*, *Magdalis phlegmatica*, *M. violacea*, *Hylobius transversovittatus*, *Brachytemnus porcatus*, *Curculio rubidius*, *Tychius parallelus*, *Sibinia sodalis*, *Gymnetron melanarium*, *G. veronicae*, *Cleopomiarus micros*, *Baris artemisiae*, *Mononychus punctumalbum*, *Marmoropus besseri*, *Rutidosoma globulus*, *Coeliodinus transversealbovittatus*, *Ceutorhynchus pulvinatus*.

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RYJKOWCOWATE (*Curculionoidea*) WYBRANYCH ZESPOŁÓW ROŚLINNYCH KOZŁOWIECKIEGO PARKU KRAJOBRAZOWEGO I OKOLIC

Streszczenie: Praca prezentuje wyniki badań uzyskane w latach 2006–2007 w Kozłowieckim Parku Krajobrazowym. Materiał pochodzi z 11 różnych zbiorowisk roślinnych (głównie leśnych) rozmieszczonych na 16 stanowiskach badawczych. Uzyskano 1835 osobników *Curculionoidea* należących do 140 gatunków. Otrzymane dane przeanalizowano pod względem struktury populacji (jakościowej i ilościowej oraz dominacji osobniczej), ekologii (wybiórczość siedliskowa i pokarmowa, elementy ekologiczne) oraz struktury zoogeograficznej. Wśród odnotowanych taksonów wyróżniono 40 gatunków rzadkich.

Słowa kluczowe: *Curculionoidea*, ryjkowcowate, faunistyka, ekologia, Kozłowiecki Park Krajobrazowy