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Zdzisław CMOLUCH, Jacek ŁĘTOWSKI,
Alicja MINDA-LECHOWSKA

The Composition and Number of Weevil Species (*Curculionidae*, *Coleoptera*) of the Lublin Coal Basin Plant Communities *

Skład gatunkowy i liczebność ryjkowców (*Curculionidae*, *Coleoptera*) zbiorowisk roślinnych Lubelskiego Zagłębia Węglowego

Видовой состав и численность долгоносиков (*Curculionidae*, *Coleoptera*) растительных сообществ Люблинского угольного бассейна

Investigations on weevils fauna were carried out in 1977—1980 in eight plant communities of the Lublin Coal Basin located at Kaniwola (stands I, V), Wólka Wytycka (stands II, VI), Dratów (stands III, VI) and Płotycze (stands IV, VIII). Two of them constituted fragments of association having the nature of transitory peat-bogs (*Caricetum limosae* — stand I, *Caricetum lasiocarpae* — stand II), two — of the high sedges (*Caricetum gracilis* — stand III), *Caricetum elatae* — stand IV), and the remaining four — meadow associations (*Poa-Festucetum rubrae* — stands V—VIII). Their detailed characteristics is presented in the paper by Cmoluch and others (2).

Upon all these stands the samples were taken during the whole vegetative season (from May till October). One of the samples was a series of 8×25 catches with a net. When analysing the collected material two bioceonological indicators were used: specimen domination and relative density (1, 11, 14). Taking into consideration the former indicator, there have been distinguished three classes of numerical force: eudominants ⩾ 10%, dominants 5.1 — 10%, subdominants ⩽ 5%.

The investigations aimed at determining the composition of species and the structure of weevil fauna upon the area of the Lublin Coal Basin before the exploitation.

The species collected at all the stands were listed in Table 1, and quantitative results of investigations — in the Figs. 1—3.

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* The paper was written within the project "The Structure and Dynamics of Numerical Force of Insect Fauna of the Lublin Coal Basin", investigated by the research workers of the Department of Zoology of Maria Curie-Skłodowska University under the direction of prof. dr. hab. Z. Cmoluch.

ANALYSIS OF MATERIAL

During the four-year investigations carried out in all plant associations of the Lublin Coal Basin 1700 weevil specimens were collected. From this collection 123 species have been distinguished (Table 1).

The highest density of weevils, 12.4 specimens/sample, was found in sedge associations, much lower density (8.4 specimens/sample) — in meadow associations, and the lowest density (6.3 specimens/sample) — in peat-bogs. Somewhat different dependencies have been observed in the course of carrying investigations in meadow communities of various degrees of moisturing, where less weevils were found on wet stands, and more — on rye-grass meadows (6, 14). A relativly high number of weevils in sedge communities resulted from the fact that the main floristic component of these associations, beside monocotyledonous plants, was *Lythrum salicaria* (stand IV). On this plant, *Nanophyes marmoratus*, a species related to it biologically, has been caught in large number. This species, decidedly influenced an increase in the value of the relative quantity indicator in sedge associations. Among the class of the highest number of weevils (eudominants) in all the stands 9 species represented by 1099 specimens were included, which is ca 65% of all the collected specimens. An attempt was made to present changes in the structure of domination and the species composition of weevils in three types of habitats as exemplified mainly by the species from the same quantity class.

The main essential part of the group of weevils' fauna of boggy communities were two hygrophilous species — *Limnobaris pilistriata* and *Nanophyes marmoratus* (Fig. 1). Their share in settling the investigated associations was relatively high (21—35%). It was there where their host plants — *Lythrum salicaria* and *Scirpus silvatici* have been found in great number. Less numerous hygrophilous species at these stands were *Apion minimum* and *Tapinotus sellatus*. Both represented the class of dominants. The other indicatory species for this type of habitats were caught in lesser number or individually and were included among the group of subdominants. These are: *Apion vicinum, Hypera adspersa, Bagous tempestivus, B. lutulentus lutulentus, Tanysphyrus lemnae, Mononychus puncum-album, Poophagus sisymbrii, Nanophyes circumscriptus, N. hemisphericus, N. globiformis, Gymnaetron beccabungae* (Table 1).

Among sedge associations *Apion curtirostrae, Sitona lineatus* and *Nanophyes marmoratus* showed the highest relative density. It was also here (stand IV), where *Nanophyes marmoratus* reached the highest, among all the collected species, relative density of 18.5 specimens/sample. The number of two others was lower (1.1—1.3 specimens/sample). *Apion curti-*

Table 1. The list and the number of weevils found upon the Lublin Coal Basin

No.	Name of species	Kaniwola stand I	Wólka Wytycka stand II	Dratów stand III	Płotycze stand IV	Kaniwola stand V	Wólka Wytycka stand VI	Dratów stand VII	Płotycze stand VIII	Sum of specimens
1	2	3	4	5	6	7	8	9	10	11
1.	Psalaphorhynchites nanus /Payk./	1								1
2.	Psalaphorhynchites tomentosus /Gyll./	1								1
3.	Psalaphorhynchites longiceps /Thoms./	6				2	1			9
4.x	Apoderus erythropterus /Gmel./					1				1
5.	Apion violaceum Kirby	1		2		10	1			14
6.	Apion marchicum Herbst					2				2
7.	Apion curtirostre Germ.	13		33	1	28	7	7		89
8.	Apion radiolus Kirby	1	1	2				2		6
9.	Apion cruentatum Walt.	1		11		3		3		18
10.	Apion sanquineum /Deg./					1				1
11.	Apion urticarium Herbst			1		2				3
12.x	Apion vicinum Kirby		1							1
13.	Apion atomarium Kirby				1					1
14.	Apion seniculus Kirby	5				6	10	2		23
15.	Apion onopordi Kirby			2		2			1	5
16.	Apion alliarie Herbst			1						1
17.	Apion carduorum Kirby			1		1				2
18.	Apion laevigatum Payk.			3				1		4
19.	Apion hookeri Kirby	6		2		2		1		11
20.	Apion loti Kirby							3		3
21.	Apion tenue Kirby							3		3
22.x	Apion minimum Herbst	27	1			2		1		31
23.	Apion pavidum Germ.							1		1
24.	Apion viciae Payk.			1		1		3		5
25.	Apion virenq Herbst	16		10		17	9	16	2	70
26.	Apion aestimatum Fst.						1			1
27.	Apion craccae /L./			3				3		6
28.	Apion cerdo Gerst.					1		1	1	3
29.	Apion pseudocerdo Dieckm.	1						1		2
30.	Apion pomonae /F./							1		1
31.	Apion flavipes /Payk./	13	1	5	1	57	6	8	3	93
32.	Apion aestivum Germ.	1		1	1			1		4
33.	Apion apricans Herbst	8	1	11		7	2	10		39
34.	Apion assimile Kirby	1				1				2
35.	Trachyphloeus bifoveolatus Beck.							1		1
36.	Phyllobius pyri /L./	1		26		29	1	203		260
37.	Phyllobius arborator /Herbst/				2			2		4
38.	Phyllobius urticae /Deg./			2		2				4
39.	Polydrusus atomarius /Ol./	1								1
40.	Polydrusus pilosus Gredl.	1	2							3
41.	Strophosoma capitatum /Deg./							2		2
42.	Sitona griseus /F./	1						1		2
43.	Sitona lineatus /L./	13		38		8	2	15		76
44.	Sitona suturalis Steph.	1		9		3		1		14
45.	Sitona sulcifrons /Thunbg./	6		3		1		18		29

Table 1 continued

1	2	3	4	5	6	7	8	9	10	11
46.	Sitona puncticollis Steph.	1		3			1	3		8
47.	Sitona flavescens /Mrsh./	1	2	1		5		6		15
48.	Sitona waterhousei Walt.							4		4
49.	Sitona crinitus /Herbst/							1		1
50.	Sitona hispidulus /F./			13		2	2	18		35
51.	Sitona humeralis Steph.			1	1	1		5		8
52.	Lixus iridis Ol.		2							2
53.	Hypera zoila /Scop./							1		1
54.x	Hypera adspersa /F./	1	1	1						3
55.x	Hypera rumicis /L./					1				1
56.	Hypera nigrirostris /F./	3						1		4
57.	Hypera arator /L./	2		4				1		7
58.	Hypera pedestris /Payk./		1			1				2
59.x	Hypera elongata /Payk./				1					1
60.	Hypera viciae /Gyll./					1				1
61.	Hypera trilineata /Mrsh./					2		1		3
62.x	Bagous tempestivus /Herbst/		1	1			1			3
63.x	Bagous lutulentus lutulentus /Gyll./	2		1						3
64.x	Tanysphyrus lemnae /Payk./	2								2
65.	Dorytomus taeniatus /F./	1								1
66.x	Notaris acridulus /L./			1						1
67.x	Notaris scirpi /F./			2				2		4
68.x	Grypus equiseti F.			1				1		2
69.	Ellescus scanicus /Payk./					1				1
70.	Tychius aureolus femoralis Bris.								1	1
71.	Miccotrogus picirostris F.	6	1	1		4	3	1	2	17
72.	Sibinia sodalis Germ.						1			1
73.	Sibinia primita /Herbst/			1						1
74.	Sibinia potentillae Germ.	2				2				4
75.	Anthonomus humeralis /Panz./					1				1
76.	Anthonomus rubi /Herbst/						2			2
77.	Curculio crux /F./					4				4
78.	Curculio salicivorus /Payk./		1							1
79.	Curculio pyrrhoceras /Mrsh./					1				1
80.	Magdalis exarata Bris.					1				1
81.x	Limnobaris pilistriata /Steph./	63	24	29		2	1	3		122
82.x	Mononychus punctumalbum /Herbst/		1							1
83.x	Phytobius comari /Herbst/				2					2
84.	Phytobius waltoni Boh.		1							1
85.	Rhinoncus perpendicularis /Reich./					2	1		2	5
86.x	Rhinoncus gramineus /F./					1			1	2
87.x	Rhinoncus pericarpius /L./			20		2		1		23
88.	Rhinoncus bruchoides /Herbst/	4		1		3				8
89.	Rhinoncus castor /F./	3	2	2		3	1	1		12
90.x	Poophagus sisymbrii /F./		1							1
91.x	Tapinotus sellatus /F./		8		1					9
92.	Coeliodes rubicundus /Herbst/	3				1				4
93.	Ceutorhynchus pleurostigma /Mrsh./	2		6		6				14
94.	Ceutorhynchus assimilis /Payk./	6	1	6		7	4	1		25
95.	Ceutorhynchus gallorhenanus Solari					1				1
96.	Ceutorhynchus contractus /Mrsh./				1			1		2
97.	Ceutorhynchus erysimi /F./	1		1		2		3		7
98.	Ceutorhynchus quadridens /Panz./	9		2		1		2		14

Table 1 continued

1	2	3	4	5	6	7	8	9	10	11
99.	Ceutorhynchus denticulatus /Schrank/	1								1
100.	Ceutorhynchus punctiger Gyll.					1		3		4
101.	Ceutorhynchus viduatus Schultze		3							3
102.	Ceutorhynchus argentatus /Herbst/			2						2
103.	Ceutorhynchus rugulosus Herbst	1								1
104.	Ceutorhynchus litura /F./	1	1							2
105.	Ceutorhynchus floralis /Payk./	9		13		18	4	19	9	72
106.	Ceuthorhynchidius barnevillei /Grenier/							1		1
107.	Cidnorhinus quadrimaculatus /L./	1		21		11		3		36
108.x	Nanophyes circumscriptus Aubé	1		1						2
109.x	Nanophyes marmoratus /Goeze/	34	9	17	148	74	10	3		295
110.x	Nanophyes globiformis Kiesw.		1							1
111.x	Nanophyes hemisphericus /Ol./	1								1
112.	Gymnaetron labilae /Herbst/					1				1
113.	Gymnaetron pascuorum /Gyll./	1					2		1	4
114.	Gymnaetron rostellum /Herbst/	1								1
115.x	Gymnaetron melanarium /Germ./			1						1
116.x	Gymnaetron beccabungae /L./	1			1					2
117.x	Gymnaetron veronicae /Germ./			1						1
118.	Gymnaetron anthirrhini /Payk./				4					4
119.	Gymnaetron linariae /Panz./	1								1
120.	Rhynchaenus rusci /Herbst/					1				1
121.	Rhynchaenus fagi /L./	1								1
122.	Rhynchaenus salicis /L./	2							1	3
123.	Rhynchaenus stigma /Germ./	3			1	3				7
	Total	295	68	321	166	358	72	396	24	1700

Explanation: x — hygrophilous species.

rostre is biologically related to herbaceous plants from *Rumex* genus (8). *Sitona lineatus* lives on papilionaceous plants of *Pisum* and *Vicia* genera (4, 12, 13). It shows a relatively high relative density on sedge stand, which was located near the embankment surrounding the lake. On its slope there were found plants which that species preferred.

The density of other weevils, included among the class of dominants upon these stands was lower than 1.0 specimens/sample. There were hygrophilous elements among them: *Limnobaris pilistriata*, *Nanophyes marmoratus* and biologically related to the nettles: *Phyllobius pyri* and *Cidnorhinus quadrimaculatus* (Fig. 1).

Phyllobius pyri was most numerously caught species among meadow communities. It showed a specially high relative density (reaching 6.6 specim./sample) stand VII. One of its host plants, *Urtica dioica* (9) prevailed there. Upon the other areas *Phyllobius pyri* has been caught in lesser number and it represented the class of dominants or subdominants (Fig. 2).

Also numerously represented on meadows was *Nanophyes marmoratus* association. It was included among the class of eudominants upon two meadows, at the borders of which its host plant — *Lythrum salicaria*

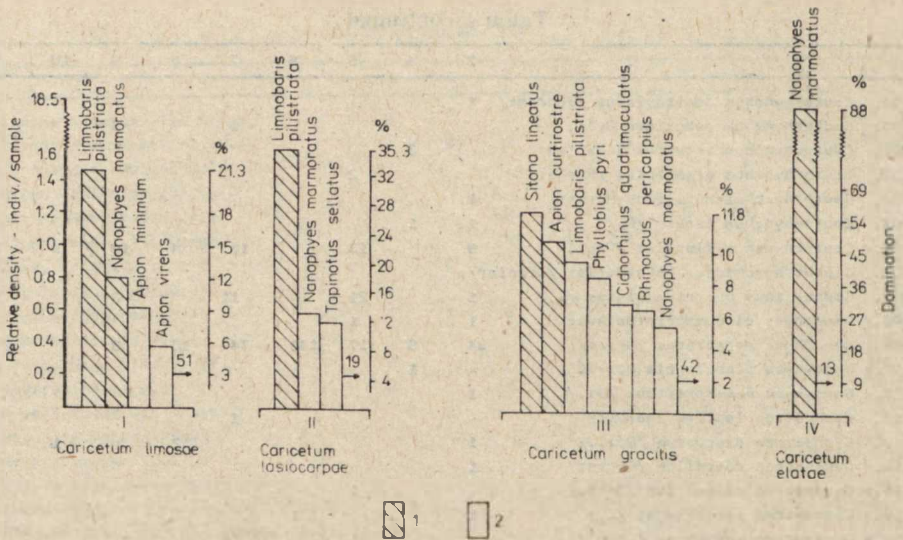

Fig. 1. Relative density and per cent share of weevils in transitory peat-bogs (stands I, II) and high sedges (stands III, IV) associations; 1 — eudominants, 2 — dominants

was found. The relative density of the other species caught in greater number on meadows was lower then 1.4 specimens/sample. Those were mainly ubiquistic, biologically related to different species of papilionaceous plants, sorrel and *Cruciferae* plants — Fig. 2 (5, 7, 10).

Among the found weevils two groups of species with different range of ecological plasticity (3) were distinguished: steno- and eurotopic. The latter category constituted the main part of weevils (62% species, 61.9% specimens). The other group — stenotopic forms — was composed of hygrophilous elements (19.4% species, 30.3% specimens) and xerothermophilous (1.6% species, 1% specimens).

It is evident that the number of eury- and stenotopic elements caught at the particular stands was different. However, there was observed a tendency towards an increase in the number of eurytopic species and decrease in the number of stenotopic species as the observations proceeded from boggy communities, through sedge communities — to grass communities (Fig. 3). Upon wet (boggy) stands 68% eurytopic species and 32% stenotopic species on the average was found. Among sedge communities eurytopic forms were represented by 70% species, and upon meadows as many as 89%. Stenotopic element in boggy and sedge associations were hygrophilous species whose number gradually decreased as the habitat moistening decreased. Therefore, this group of species was relatively scarce, while eurytopic forms were very numerous on meadows.

The weevils collected upon the investigated area were represented

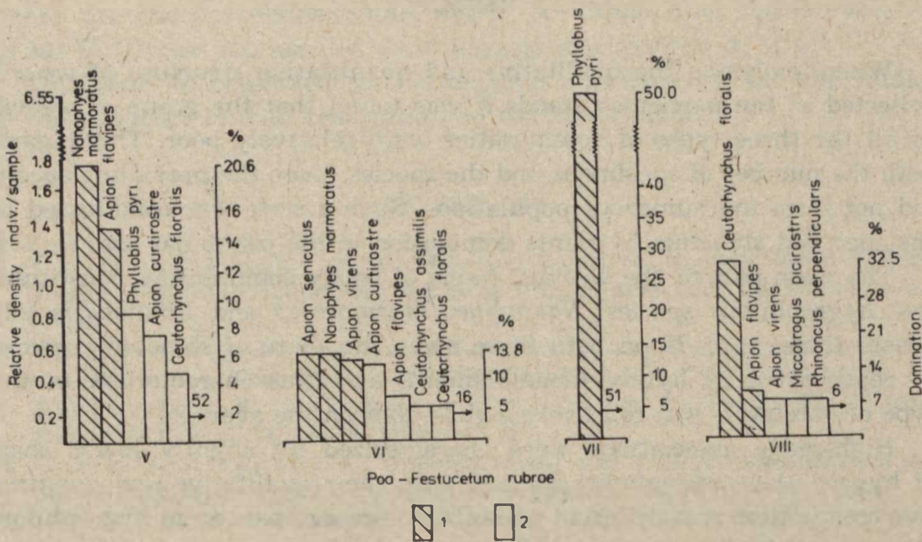

Fig. 2. Relative density and per cent share of weevils in meadow communities; 1 — eudominants, 2 — dominants

by 10 zoogeographical elements (Table 2). Most numerous were the species of palaearctic and Euro-Siberian range of occurrence. Together they constituted about 52% species. Holarctic and European forms were also numerous (10.6% species and 19.5% species, respectively). The other 6 zoogeographic types were less numerously represented (0.8—4.9% species, 0.2—1.0% specimens). The qualitative and quantitative share of the particular species decreased together with decreasing of their zoogeographic range.

Table 2. Per cent share of zoogeographic elements in weevils' fauna of the Lublin Coal Basin

Zoogeographic elements	N	%	n	%
Holarctic	13	10,6	114	6,7
Palaearctic	46	37,4	793	46,6
Euro-Siberian	18	14,6	647	38,0
Euro-Caucasian	6	4,9	13	0,8
European	24	19,5	92	5,4
Subponto-Mediterranean	4	3,3	17	1,0
Submediterranean	3	2,4	11	0,6
Subpontic	3	2,4	3	0,2
Subatlantic	1	0,8	4	0,2
Mountainous	1	0,8	3	0,2
of unknown location	4	3,3	5	0,3

Explanation: N — number of species, n — numerical force.

RESULTS

When analysing the qualitative and quantitative structure of weevils collected at the particular stands it was found that the group of weevils of all the three types of communities were relatively poor. This regards both the number of specimens and the species. Even the prevailing species did not form too numerous populations. Such a state was conditioned by the specified structure of plants domination in the particular associations.

The main part of the weevils' fauna of boggy communities constituted two hygrophilous species: *Nanophyes marmoratus* and *Limnobaris pilistriata* (Figs. 1, 3). Upon both these areas the share of stenotopic species — represented by hygrophilous elements and thus characteristic of this type of habitat — was relatively high — 32% on the average.

High-sedge associations were characterized by slightly lower share of hygrophilous (stenotopic) species. Also their qualitative and quantitative composition was different on both the areas. Apart from hygrophilous elements, ubiquistic elements started to appear more and more numerously — stand III (Figs. 1, 3).

A great diversity, as regards quality and quantity, was characteristic of the weevils of meadow communities. The amount of stenotopic elements decidedly decreased, whereas the amount of eurytopic elements increased,

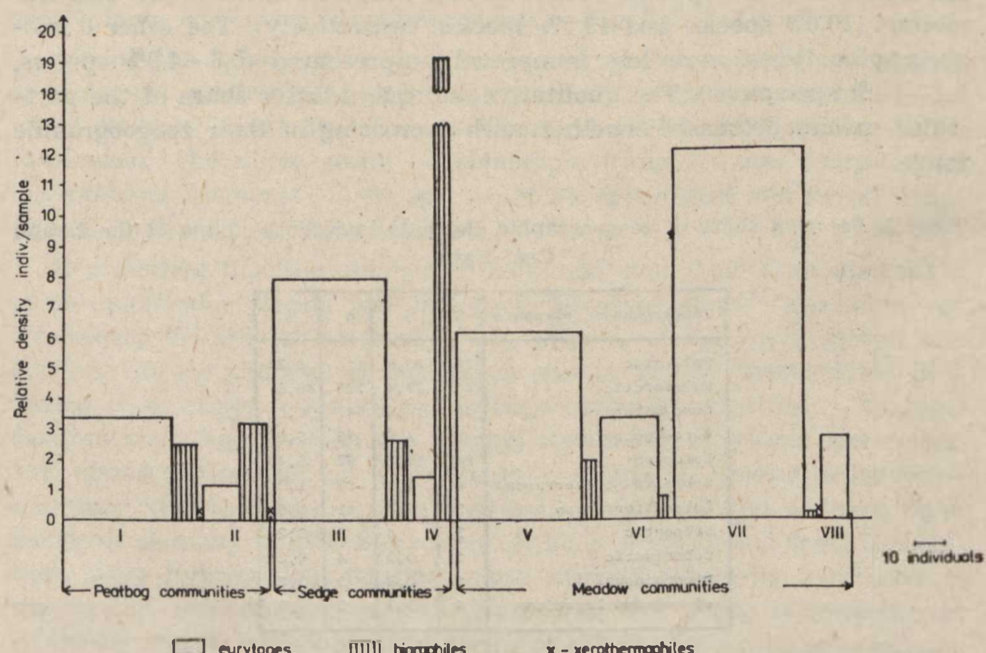

Fig. 3. Share of ecological elements in weevils; fauna of the Lublin Coal Basin

where the class of eudominants, except for *Nanophyes marmoratus* — stands V, VI, was represented by ubiquistic species (Figs. 2, 3).

The material presented in this paper is the basis for further studies on the influence of industrialization on the insect fauna.

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STRESZCZENIE

Przedstawiono wyniki badań prowadzonych w latach 1977—1980 nad fauną ryjkowców Lubelskiego Zagłębia Węglowego. Zebrano 1700 osobników należących do 123 gatunków (tab. 1). Najwyższe zagęszczenie, zarówno w zespołach turzycowych, jak i w torfowiskowych, wykazywały dwa gatunki higrofilne: *Limnobaris pilistriata* i *Nanophyes marmoratus* (ryc. 1). W zbiorowiskach łąkowych stosunkowo wysoką gęstość względną osiągnął *Phyllobius pyri* (ryc. 2). W obrębie stwierdzonych ryjkowców wyróżniono gatunki stenotopowe i eurytopowe (ryc. 3). Te ostatnie stanowiły trzon zgrupowania fauny. Formy stenotopowe, liczne na torfowiskach i wysokich turzycach, tworzyły głównie elementy higrofilne. Ryjkowce zebrane na badanym terenie należały do 10 elementów zoogeograficznych. Najliczniejsze były gatunki o zasięgu palearktycznym i eurosyberyjskim (tab. 2).

РЕЗЮМЕ

В работе представлены результаты исследований, проведенных в 1977—1980 гг. над фауной долгоносиков в Люблинском угольном бассейне. Собрано 1700 особей, принадлежащих к 123 видам (табл. 1). Самой высокой плотностью, причем как в осоковых ассоциациях, так и в торфяниковых, отличались два гигрофильных вида: *Limnobaris pilistriata* и *Nanophyes marmoratus* (рис. 1). В луговых сообществах относительно высокую плотность достигал *Phyllobius pyri*, (рис. 2). Среди выявленных долгоносиков выделили стенотопные и эвритопные виды (рис. 3). Последние составляли основу группировки фауны. Стенотопные формы, многочисленные на торфяниках и в высоких осоках, создавались, главным образом, гигрофильными элементами. Собранные на этой территории долгоносики принадлежали к 10 зоогеографическим элементам. Самыми многочисленными были виды с палеарктическим и евро-сибирским размещением (табл. 2).