

THE CARABIDAE (COLEOPTERA) FAUNA ON THE SODIC SOILS OF THE TISA VALLEY (YUGOSLAVIA)

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Abstract

An investigation of the Carabid fauna present in a solonetz-type soil was conducted in the period 1984—1986. The experimental site was located on the left bank of the Tisza River, near the village of Kumane, in the western part of the region of Banat.

Fifty-five species from 22 genera were registered. According to the zoogeographical distribution, there predominated the species with a wide area of distribution (Palearctic, Euro-Siberian species). As the species whose area of distribution is located south or southeast of the examined region were present in a significant portion (33 percent), it may be concluded that the examined region is a transitive area between the typical European fauna and Oriental-Balkan, i.e. Mediterranean fauna.

A large number of the registred species (40 percent) are regular members of agrobiocoenoses of Vojvodina Province. *Harpalus aeneus* (FABRICIUS), *Harpalus pygmaeus* DEJEAN, *Poecilus puncticollis*, (DEJEAN) *Harpalus distinguendus* (DUFTSCHMID), and *Harpalus serripes* (QUENSEL) are the dominant species comprising more than two thirds of the specimens caught. The dominant and subdominant species (17 of them) comprise 86 percent of the total collected materials while the remaining 38 species take only 14 percent of the total registered specimens.

Introduction

The Carabid fauna in the dominant soil types of Vojvodina Province has been studied by SEKULIĆ (1976, 1977). However, there are scant data on the occurrence of that insect group on saline soils (ČAMPRAK & J. DJURKIĆ 1967). Saline soils take over 160.000 ha in Vojvodina Province, stretching mostly along the major rivers of the Province, the Danube and the Tisza. The most frequent soil type on these areas is solonetz which takes over 65% of the total area. The above authors merely summarized the presence of the Carabidae family without going in detail regarding the quality or quantity of their population.

Considering the trend of turning these areas into arable land, by means of modern cultivation methods, and considering the importance of Carabids in a biocoenosis, a program was started in 1981 aimed at a better knowledge of the epigeal entomofauna of these biotopes. Two-year research data of the program were analysed by ČAMPRAK & SEKULIĆ (1984) who placed emphasis on dominant Carabid species and the dynamics of their population in the course of growing season. The program then proceeded for next three years. Bearing in mind the importance of pastures on saline soils as the last refuge to a number of elements of the steppe fauna which have vanished from other sites, we decided to define the fauna of such a biotope from both faunal-zoogeographical and ecological aspect.

Experimental site and method of work

Experiments were conducted in the course of 1984, 1985, and 1986 at a spacious pasture on the left bank of the Tisza River, near the village of Kumane located in the western part of the region of Banat. *Achilleo-Festucetum pseudovinae* was the dominant association at the experimental site consisting mainly of the following plant species: *Festuca pseudovina*, *Achillea millefolium* ssp. *collina*, *Alopecurus partensis*, *Podospermum canum*, *Bromus mollis*, and *Eryngium campestre*.

The vegetative cover is luxuriant in spring, due to high soil moisture and abundant rainfall. Large or small puddles occur in depressions allowing the development of some hygrophilous species.

In summer, the intensive drought in combination with unfavourable edaphic factors and intensive grazing lead to a high degradation of the vegetative cover. Strong winds throughout the year and intensive insolation in summer months are additional unfavourable factors which should not be disregarded.

Experimental materials were collected by means of 12 Barber traps containing 4% formaline as a conserver. The traps were visited and renewed at 20-day intervals from April to November.

Results and Discussion

Over the period of the three experimental years, 861 specimens of the Carabid fauna were collected, three specimens per trap.

The presence of the following species has been established:

Cicindelinae

1. *Cicindela germanica* LINNÉ 1758, a thermophilous Euro-Asian species.

Carabinae

2. *Calosoma auro-punctatum* (HERBST) 1784, distributed in Europe, except in south-western parts, Asia Minor, Syria, and Egypt.
3. *Carabus coriaceus rugifer* KRAATZ a mesophilous sub-species inhabiting south eastern Europe.
4. *Carabus cancellatus tibiscinus* CSIKI 1905, a mesophilous species inhabiting southern parts of Central Europe.

Trechinae

5. *Trechus quadristriatus* (SCHRANK) 1781, an eurytopic, palaearctic species.

Ditominae

6. *Ditomus clypeatus* (ROSSI) 1790, a thermophilous Mediterranean species.

Anisodactylinae

7. *Anisodactylus signatus* (PANZER) 1797, a thermophilous species inhabiting southern and central Europe.

Harpalinae

8. *Acinopus picipes* DEJEAN, a thermophilous southern European species.
9. *Parophonus maculicornis* (DUFTSCHMIND) 1812, a thermophilous species distributed in western Asia and southern Europe.
10. *Parophonus mendax* (ROSSI) 1790, a thermophilous southern European species spreading to the southern parts of central Europe and to the Caucasus Mountain.
11. *Harpalus cephalotes* FAIRMAIRE 1854—56. a thermophilous and halophilous species inhabiting southern parts of Europe.

12. *Harpalus diffinis* DEJEAN 1829, a thermophilous species present in all parts of Europe except the northern part.
13. *Harpalus azureus* (FABRICIUS) 1775, a thermophilous and xerophilous species inhabiting Europe to western Asia.
14. *Harpalus rupicola* STURM 1818, a thermophilous species present in Europe, except in western and northern parts, and Asia Minor.
15. *Harpalus rufipes* (DE GEER) 1774, an eurytopic species distributed over the entire palearctic area.
16. *Harpalus griseus* (PANZER) 1797, an eurytopic species distributed over the entire palearctic area.
17. *Harpalus froelichi* STURM 1818, a thermophilous species inhabiting Europe except its southern part, Siberia, and the northern part of China.
18. *Harpalus zabroides* DEJEAN 1829, distributed in Europe to western Siberia.
19. *Harpalus aeneus* (FABRICIUS) 1775, an eurytopic, palearctic species.
20. *Harpalus distinguendus* (DUFTSCHMID) 1812, an eurytopic, Euro-Siberian species.
21. *Harpalus smaragdinus* (DUFTSCHMID) 1812, a thermophilous Euro-Siberian species.
22. *Harpalus saxicola* DEJEAN 1829, a thermophilous and xerophilous pontic species.
23. *Harpalus pygmaeus* DEJEAN 1829, a thermophilous species inhabiting the Mediterranean and southern parts of Europe.
24. *Harpalus rubripes* (DUFTSCHMID) 1812, a xerophilous species, distributed in Euro-Asia except far north.
25. *Harpalus albanicus* REITTER 1900, a thermophilous species inhabiting southeastern Europe.
26. *Harpalus flavicornis* DEJEAN 1829, inhabits southeastern Europe to Switzerland.
27. *Harpalus anxius* (DUFTSCHMID) 1812, a xerophilous palearctic species.
28. *Harpalus serripes* (QUENSEL) 1806, a xerophilous palearctic species.

Pterostichinae

29. *Poecilus punctulatus* (SCHALLER) 1783, inhabits Europe to western Siberia.
30. *Poecilus sericeus* FISCHER de WALDHEIM 1823 a xerophilous species, distributed from Siberia to southeastern Europe.
31. *Poecilus cupreus* (LINNÉ) 1758, a hygrophilous species of Euro-Siberian distribution.
32. *Poecilus puncticollis* (DEJEAN) 1828, a halophilous species, distributed in southern and southeastern Europe.
33. *Pterostichus macer* (MARSHAM) 1802, a thermophilous Euro-Siberian species.
34. *Pterostichus melanarius* (ILLIGER) 1798, an eurytopic Euro-Siberian species.
35. *Pterostichus cylindricus* (HERBST) 1785, distributed from southeastern parts of central Europe to Turkey
36. *Calathus ambiguus* (PAYKULL) 1790, a xerophilous species, distributed in the western part of the palearctic region.
37. *Dolichus halensis* (SCHALLER) 1783, spreads in the southern half of Europe to eastern Asia.
38. *Agonum viridicupreum* (GOEZE) 1777, a hygrophilous species, distributed in Europe.
39. *Platynus dorsalis* (PONTOPPIDIAN) 1763, an eurytopic species of Euro-Siberian distribution.

Zabrinæ

40. *Zabrus tenebrioides* (GOEZE) 1777, inhabits south and central Europe, Asia Minor, and southern parts of western Siberia.
41. *Amara aenea* (DE GEER) 1774, a xerophilous, sometimes halophilous species, inhabits the entire palearctic region.
42. *Amara familiaris* (DUFTSCHMID) 1812, inhabits the entire palearctic region.
43. *Amara ingenua* (DUFTSCHMID) 1812, a halophilous Euro-Siberian species.
44. *Amara apricaria* (PAYKULL) 1790, an eurytropic species of Euro-Siberian distribution.
45. *Amara aulica* (PANZER) 1797, an eurytropic species of Euro-Siberian distribution.

Dallistinae

46. *Chalaenius nigricornis* (FABRICIUS) 1787, a hygrophilous species, distributed in Euro-Siberian region and Asia Minor.
47. *Chalaenius decipiens* (DUFOUR) 1820, a hygrophilous species, distributed in southern parts of central Europe, southern Europe, Marroco, and Asia Minor.
48. *Callistus lunatus* (FABRICIUS) 1775, a xerophilous species, distributed in central Europe, Mediterranean, and western Asia.

Cymindinae

49. *Cymindis variolosa* (FABRICIUS) 1794, a xerophilous species, inhabits the southern half of Europe to southeastern Siberia, and Asia Minor.

Drominae

50. *Microlestes maurus* (STRUM) 1827, a thermophilous species, distributed from western Asia over the entire Europe except far north.

Zuphiinae

51. *Polystichus connexus* (Fourcroy) 1785, a thermophilous species, inhabits northern Africa, the southern half of Europe, western Asia, and Siberia.

Brachininae

52. *Brachinus crepitans* (LINNÉ) 1758, a thermophilous species, distributed in northern Africa, Europe, western Asia, and Siberia.
53. *Brachinus ganglbaueri* APFELBECK 1904, a hygrophilous species, inhabits southeastern Europe, Asia Minor, and the Caucasus Mountain.
54. *Brachinus explodens* DUFTSCHMID 1812, a thermo-mezophilous species, distributed in southern and central Europe, western Asia, and Siberia.
55. *Brachinus bipustulatus* QUENS, a thermophilous species, inhabits the Balkan Peninsula, Asia Minor, and southern Russia.

The 55 species listed above belong to 22 genera. ČAMPRAK & SEKULIĆ (1984) found 35 species in the same area, but they classified only 23 of those as frequent species. This study confirms the presence of the previously registred species.

According to the area of distribution, the registered species may be divided as follows.

Widely distributed species (Palearctic, Euro-Asian, Euro-Siberian): *Cic. germanica*, *Tr. quadristriatus*, *H. rufipes*, *H. griseus*, *H. froelichi*, *J. zabroides*, *H. aeneus*, *H. distinguendus*, *H. smaragdinus*, *H. rubripes*, *H. anxius*, *H. serripes*, *Poe. punctuala-*

tus, *Poe. cupreus*, *Pt. mecer*, *Pt. melanarius*, *Cal. ambiguus*, *Dol. halensis*, *Pl. dorsalis*, *Z. tenebrioides*, *A. aenea*, *A. familiaris*, *A. ingenua*, *A. apricaria*, *A. aulica*, *Chl. nigricornis*, *Mic. murus*, *Pol. connexus*, *Br. crepitans*, *Br. explodens*.

Southern and southeastern European species for which the Panonian basin is a border area. The following species are rare north or west of this region: *Cal. auro-punctatum*, *C. coriaceus rugifer*, *Dit. clypeatus*, *Acin. picipes*, *Par. maculicornis*, *Per. mendax*, *H. cephalotes*, *H. saxicola*, *H. pygmaeus*, *H. albanicus*, *H. flavicornis*, *Poe. sericeus*, *Poe. puncticollis*, *Pt. cylindricus*, *Chl. decipiens*, *Cym. variolosa*, *Br. ganglbaueri*, *Br. bipustulatus*.

The species *Acin. picipes* is distributed in southern Europe and it has been found in other locations in Vojvodina Province (Futog, leg. SEKULIĆ R.) These are the northernmost findings of that species.

European species characteristic for central Europe but whose area of distribution spreads eventually to the neighbouring regions: *C. cancellatus tibiscinus*, *Anis. signatus*, *H. diffinis*, *H. azureus*, *H. rupicola*, *Ag. viridicupreum*, and *Calis. lunatus*.

It may thus be concluded that the number of widely distributed species was 30 or 54 percent, while the number of southern and southeastern European species was 18 or 33 percent. The elements characteristic for the European entomofauna were less frequent being represented by 7 species or 13 percent. The southern part of the Pannonian basin is the site of mixing and exchange of faunal elements. The ecological conditions of pastures on saline soils in the region of Banat are suitable for thermophilous and xerophilous species with the southern area of distribution. The species *Acin. picipes*, *Dit. clypeatus*, *H. cephalotes*, and *H. saxicola* may be considered relict species in this disjunctive area (MÜLLER 1931; CSIKI 1948; FREUDE 1977).

Ecological peculiarities of the Caribid fauna

Taking into account the existing ecological conditions of the examined site, species preferring warm and sunny sites may be expected to predominate the population. The results discussed previously show that the majority of the registered species, 71 percent, were thermophilous and partially xerophilous species (According to different authors: HURKA 1960; FREUDE 1977, HIEKE 1981). On the other side, a limited number of hygrophilous species, taking 9 percent, may be found around large or small puddles at the beginning of growing season. According to the observations of HORION (1959) and FREUDE (1977), some species from our list express a high or low affinity towards saline soils: *A. aenea*, *A. ingenua*, *H. cephalotes*, and *Poe. punctiollis*.

Forty percent of the registered species are regular members of the agrobiocoenoses of Vojvodina Province and wider (SEKULIĆ & HORVATOVICH 1973, SEKULIĆ 1976). This category includes so-called eurytopic species, i.e., those with a wide ecological valency: *H. aeneus*, *H. distinguendus*, *H. rufipes*, *Pl. dorsalis*, *T. quadristriatus*, and *Poe. cupreus* (Table 1). The last species is counted among hygrophilous species by many authors. Nevertheless, it is a regular member of the Carabid fauna in agrobiocenoses, especially on chernozem soils (SEKULIĆ 1976). Considering the relationships among the species of the Carabid family (Graph 1), it may be seen that the five dominant species comprise slightly more than two thirds of the specimens caught. If the 12 subdominant species (25 percent) are added the sum figure is 86 percent of the total collected material. The remaining 38 species from receding and subreceding groups take 14 percent of the total collected material.

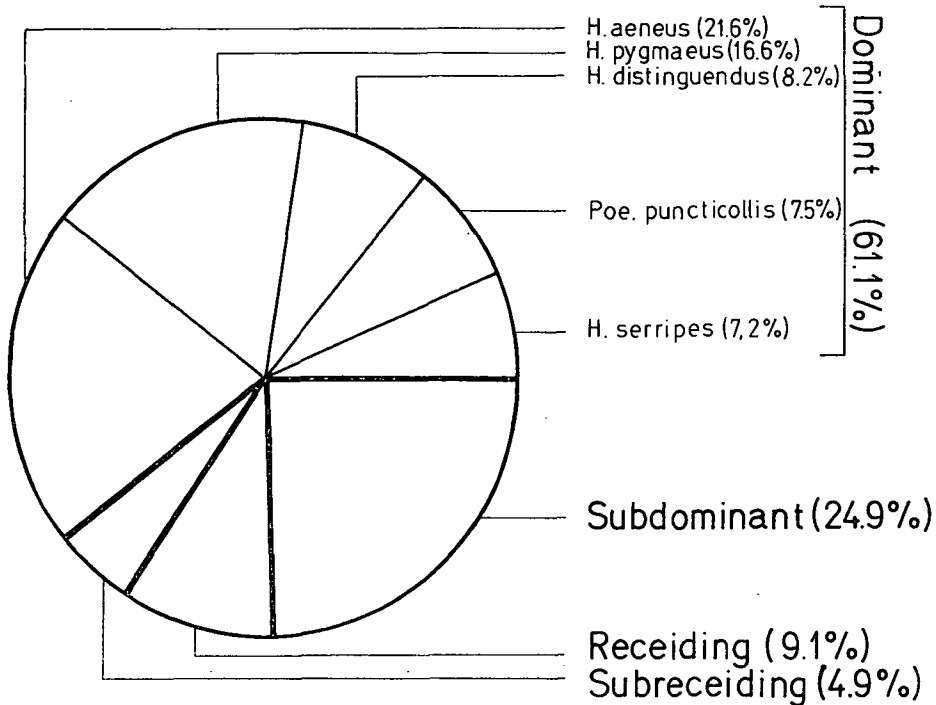


Fig. 1. Inhabiting structure of the Carabid family at a pasture established on a solonetz-type saline soil on the bank of the Tisza River in the western part of the region of Banat (1984—1986)

Table 1. Composition of the Carabid fauna at a pasture established on a solonetz-type saline soil on the bank of the Tisza River in the western part of region of Banat (1984—1986)

Species	No. of specimens	Dominance (%)
Dominant		
<i>Harpalus aeneus</i>	186	21.6
<i>Harpalus pygmaeus</i>	143	16.6
<i>Harpalus distinguendus</i>	71	8.2
<i>Poecilus punctiollis</i>	65	7.5
<i>Harpalus serripes</i>	62	7.2
Subdominant		
<i>Amara aenea</i>	35	4.2
<i>Poecilus cupreus</i>	33	3.8
<i>Harpalus rufipes</i>	21	2.4
<i>Harpalus saxicola</i>	18	2.1
<i>Amara apricaria</i>	18	2.1
<i>Poecilus punctulatus</i>	17	1.9
<i>Pterostichus macer</i>	17	1.9
<i>Brachinus ganglbaueri</i>	14	1.6
<i>Calathus ambiguus</i>	13	1.5
<i>Harpalus rubripes</i>	11	1.3
<i>Acinopus picipes</i>	9	1.1
<i>Brachinus crepitans</i>	9	1.1

Species	No. of specimens	Dominance (%)
Receiding		
<i>Anisodactylus signatus</i>	7	0.8
<i>Ditomus clypeatus</i>	7	0.8
<i>Calosoma auropunctatum</i>	6	0.7
<i>Harpalus anxius</i>	6	0.7
<i>Brachinus bipustulatus</i>	6	0.7
<i>Harpalus froelichi</i>	5	0.6
<i>Harpalus cephalotes</i>	5	0.6
<i>Amara ingenua</i>	5	0.6
<i>Poecilus sericeus</i>	5	0.6
<i>Chlaenius decipiens</i>	5	0.6
<i>Dolichus halensis</i>	5	0.6
<i>Cymindis variolosa</i>	5	0.6
<i>Brachinus explodens</i>	5	0.6
<i>Cicindela germanica</i>	5	0.6
Subreceiding		
2 4 species	42	4.9
Total	861	100.0

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A Tiszavölgyi szikések futóbogár faunája (Coleoptera: Carabidea) (Jugoslávia)

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Kivonat

A szerzők 1984 és 1986 között Nyugat-Bánát futóbogár-faunáját vizsgálták, a Tisza bal partján elterülő szikésen, Kumán (Kumane) község határában. Kutatásaik során 22 nemet és 55 fajt mutattak ki.

Túlsúlyban vannak a messze elterjedt fajok (palearktikus, eurázsiai, eurosibériai, melyek a talált fajok 54 százalékát képezik. Jelentős számmal vannak képviselve a dél- és délkelet-európai fajok is (33%). Állatföldrajzi szempontból e térséget átmenetinek tekinthetjük a tipikusan európai és az orientális-balkáni, illetve a mediterrán régió között. Ezt bizonyítja néhány tipikusan déli elterjedésű faj jelenléte is. A balkán-mediterrán elem, *Acinopus picipes* Dejean esetében ezek a legészakibb lelőhelyadatok. Az előbbi, valamint a mediterrán-balkáni *Ditomus clypeatus* (Rossi), a pontikus *Harpalus saxicola* Dejean és a *Harpalus cephalotes* Fairmaire faj ezen a területen reliktumnak tekinthető. A jellemzően európai fajok mindössze a futóbogárfauna 13 százalékát alkotják.

A fajok 71 százaléka termoofil, és ezeknek nagyobb hányada xerofil is. Tavasszal a nagyobb nedvesség következtében jelentkeznek néhány kifejezetten higrofil faj is. A halofil fajok karakterfajoknak tekinthetők, ezek a következők: *Amara aenea* (DEGEER), *Amara ingenua* (DUFTSCHMID), *H. cephalotes* és *Poecilus puncticollis* (DEJEAN). Jelentős azoknak a fajoknak a száma, amelyek a vajdasági szántóföldek megszokott lakói.

A domináns fajok: *Harpalus aeneus* (FABRICIUS), *Harpalus pygmaeus* (DEJEAN), *Poe. puncticollis*, *Harpalus distinguendus* (DUFTSCHMID) és *Harpalus serripes* (QUENSEL); ezek a begyűjtött példányok 2/3-át képezik. A domináns és a szubdomináns fajok együtt (17 faj) az összpéldányok több mint 86 százalékát teszik ki. A maradék 38 faj csupán 14 százalékkal vesz részt a begyűjtött anyagban.

Фауна жужелиц (Coleoptera: Carabidea) на почве в долине реки Тиса (Югославия)

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Резюме

В периоде с 1984 по 1986 г.г., в результате исследований фауны сем. Carabidae на почве типа «солонец» в районе западного Баната, на левом берегу р. Тиса, недалеко от места Кумане, обнаружено 55 видов из 22 родов.

По зоогеографической принадлежности выделяются виды с широкой областью распространения палеарктические, европеосоазиатские и европейскосибирские, составляющие 54% зарегистрированных видов. Существует значительное количество пород распространяющихся в более южных или югосточных районах (33%), так, что эти края мы можем считать переходными между типичной европейской и восточно-балканской, т.е. средиземноморской фаунами. Эта область также является самым северным местом нахождения балканско-средиземноморского вида *Acinopus picipes* DEJEAN. Вышеуказанный вид, а также и вид *Harpalus cephalotes* FAIRMAIRE, средиземноморско-балканский вид *Ditomus clypeatus* Росси и понтийский вид *Harpalus saxicola* DEJEAN наблюдаются в пределах остаточных видов. Характерные европейские виды обнаружены в гораздо меньшем количестве и составляют всего 13% фауны.

Самое большое количество видов — термофильные (71%), а частично и ксерофильные. Весной появляются и некоторые гигрофильные виды, благодаря повышенной влажности. Галофильные виды *Amara aenea* (DEGEER), *Amara ingenua* (DUFTSCHMID), *H. cephalotes* и *Poecilus puncticollis* (DEJEAN) можем считать характерными для испытываемого биотипа. Существует и большой процент (40%) видов постоянных членов агробиоценоза в Воеводине.

Доминирующими видами являются: *Harpalus aeneus* (FABRICIUS), *Harpalus pygmaeus* DEJEAN, *P. puncticollis*, *Harpalus distinguendus* (DUFTSCHMID) и *Harpalus serripes* (QUENSEL).

Доминирующие и субдоминирующие виды 17 составляют больше чем 86,1 % приобретенного материала, а остальные 38 видов представляют 14 % из многочисленных экземпляров.

Fauna trčuljaka (Coleoptera: Carabidae) na slatinama u dolini reke Tise (Jugoslavija)

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Izvod

U periodu od 1984. do 1986. godine istraživanjem faune fam. Carabidae na zemljištu tipa solonjec u zapadnom Banatu, na levoj obali reke Tise, u blizini mesta Kumane, registrovano je 55 vrsta iz 22 roda.

Prema zoogeografskoj pripadnosti ističu se vrste sa širokim arealom rasprostranjenja (palearktičke, evroazijske i evrosibirske) koje čine 54 % registrovanih vrsta. U značajnom broju su prisutne i vrste čiji areal leži južno ili jugoistočno (33 %), te ovo područje možemo smatrati prelaznim između tipične evropske i orijentalno-balkanske odn. mediteranske faune. Takođe je ovo stanište najseverniji nalaz balkansko-mediteranske vrste *Acinopus picipes* DEJEAN. Predhodna vrsta kao i vrsta *Harpalus cephalotes*, FAIRMAIRE, mediteransko-balkanska vrsta *Ditonus clypeatus* (ROSSI) i pontska vrsta *Harpalus saxicole* DEJEAN su prisutne u okviru reliktnog areala. Karakteristične evropske vrste su konstatovane u znatno manjem broju i čine svega 13 % faune.

Najveći broj vrsta je termofilan (71 %), a delom i kserofilan. U proleće se javljaju i neke higrofilne vrste, zahvaljujući većoj vlažnosti. Halofilne vrste *Amara aenea* (DEGEER), *Amara ingenua* (DUFTSCHMID), *H. cephalotes* *Poecilus puncticollis* (DEJEAN) možemo smatrati karakterističnim za istraživani biotop. U velikom postotku (40 %) su prisutne vrste koje su redovni članovi agrobiocenoza u Vojvodini.

Dominantne vrste su *Harpalus aeneus* (FABRICIUS), *Harpalus pygmaeus* DEJEAN, *P. puncticollis*, *Harpalus distinguendus* (DUFTSCHMID) i *Harpalus serripes* (QUENSEL). One čine više od 2/3 registrovanih primeraka. Dominantne i subdominantne vrste (17) čine više od 86,1 % sakupljenog materijala, dok preostalih 38 vrsta učesvuje sa svega 14 % u sumi registrovanih primeraka.