MARISIA

Studii şi materiale

XXXIII–XXXIV

Ştiinţele Naturii

CONSILIUL JUDEȚEAN MUREȘ

MUZEUL JUDEȚEAN MUREȘ

Correspondence:
© MUZEUL JUDEȚEAN MUREȘ
CP 85, str. Mărăști nr. 8A, 540328
Târgu-Mureș, România
www.muzeumures.ro

Front cover: *Narcissus poeticus* L. ssp. *radiiflorus* (Salisb.) Baker (photo and design: Mihaela Sămărghițan)

ISSN: 1016–9652

Editura Mega | www.edituramega.ro
Editura Mega este acreditată C.N.C.S.I.S.
(*Consiliul Național al Cercetării Științifice din Învățământul Superior* | www.cncsis.ro)

MUZEUL JUDEŢEAN MUREŞ

MARISIA

STUDII ŞI MATERIALE

XXXIII–XXXIV

ŞTIINŢELE NATURII

Târgu-Mureş
2014

PREVIOUS VOLUMES

Studii și Materiale I, 1965 (Ştiinţele Naturii, Istorie, Etnografie, Muzeologie)
Studii și Materiale II, 1967 (Ştiinţele Naturii, Istorie, Muzeologie)
Studii și Materiale III–IV, 1972 (Ştiinţele Naturii, Istorie, Muzeologie)
Marisia V, 1975 (Arheologie, Istorie, Etnografie)
Marisia VI, 1976 (Arheologie, Istorie, Etnografie)
Marisia VII, 1977 (Arheologie, Istorie, Etnografie)
Marisia VIII, 1978 (Arheologie, Istorie, Etnografie)
Marisia IX, 1979 (Arheologie, Istorie, Etnografie)
Marisia X, 1980 (Arheologie, Istorie, Etnografie)
Marisia XI–XII, 1981–1982 (Arheologie, Istorie, Etnografie)
Marisia XI–XII, 1983, Fascicola 1 (Studia Scientiarum Naturae)
Marisia XIII–XIV, 1984 (Arheologie, Istorie, Etnografie)
Marisia XV–XXII, 1985–1992 (Arheologie, Istorie, Etnografie, Etnotoponimie)
Marisia XXIII–XXIV, 1994 (Arheologie, Istorie, Etnografie)
Marisia XXIII–XXIV, 1995, Fascicola 2 (Studia Scientiarum Naturae)
Marisia XXV, 1996 (Arheologie, Istorie)
Marisia XXV, 1996, Fascicola 1 (Etnografie, Artă, Artă populară)
Marisia XXV, 1997 (Studia Scientiarum Naturae)
Marisia XXVI, 2000 (Arheologie, Istorie)
Marisia XXVI, 2000, Fascicola 2 (Etnografie, Artă, Artă populară)
Marisia XXVI, 2000, Fascicola 4 (Studia Scientiarum Naturae)
Marisia XXVII, 2003 (Arheologie, Istorie)
Marisia XXVII, 2003, Fascicola 2 (Etnografie, Artă, Artă populară)
Marisia XXVII, 2003, Fascicola 5 (Studia Scientiarum Naturae)
Marisia XXVIII, 2005, Fascicola 2 (Etnografie, Artă, Artă populară)
Marisia XXVIII, 2006 (Arheologie, Istorie)
Marisia XXVIII, 2006, Fascicola 6 (Studia Scientiarum Naturae)
Marisia XXIX, 2009 (Arheologie)
Marisia XXIX, 2009 (Istorie)
Marisia XXIX, 2009 (Etnografie)
Marisia XXX, 2010 (Arheologie)
Marisia XXIX–XXX, 2010 (Ştiinţele Naturii)
Marisia XXX–XXXI, 2011 (Istorie)
Marisia XXXI, 2011 (Arheologie)
Marisia XXXI, 2011 (Ştiinţele Naturii)
Marisia XXXII, 2012 (Arheologie)
Marisia XXXII, 2012 (Ştiinţele Naturii)
Marisia XXX, 2013 (Etnografie şi Artă Populară)
Marisia XXXII–XXXIII, 2013 (Istorie)

CONTENTS

BOTANY

ZOOLOGY

PALEONTOLOGY

MUSEOLOGY

DIVERSITY OF THE BEETLE (COLEOPTERA) FAUNA FROM RAPESEED AND ADJACENT FOREST STRIP (SADACLIA, REPUBLIC OF MOLDOVA)

Svetlana BACAL, Natalia MUNTEANU, Anna MOLDOVAN
Institute of Zoology, Academy of Sciences of Moldova,
Academiei 1 str., **2028 Chişinău**, Republic of Moldova

Abstract: The present paper is a synthesis of the data on the occurrence and autecology of beetles fauna collected from the rapeseed crop and adjacent forest strip in Sadaclia locality (Republic of Moldova). Altogether, from both fields 53 species of beetles belonging to 31 genera and 13 families were identified. The most characteristic for these ecosystems were species from Carabidae and Scarabaeidae families. The most abundant species for rapeseed crop were *Harpalus distinguendus* and *Phyllotreta nigripes*, and for forest strip *Harpalus distinguendus* and *H. amplicollis*.

Keywords: Coleoptera, fauna, ecology, rapeseed, forest strip

Introduction

Rapeseed is one of the most important oilseed crops cultivated around the world, used in both food and technical industries. Rapeseed is used to produce animal feed, vegetable oil for human consumption and biodiesel. During flowering rapeseed is a great source of nectar for honeybees. Worldwide production of rapeseed constitutes 27 million hectares. The top largest areas planted with rapeseed are in China (7.2 million hectares), India (6.9 million hectares), Canada (5.1 million hectares), Germany (1.3 million hectares), and France (1.2 million hectares) [8].

In the Republic of Moldova rapeseed has been grown since 2003. Climate and soil conditions of the republic are favorable for rapeseed cultivation and last years it occupied considerable area, nearly 16000 hectares. Rapeseed prefers cernoziom soils and requires specific water conditions during germination, rosette formation, flowering and fruiting [10].

Rapeseed represents a source of food for a wide range of insects, including beetles, during whole growing season. Extension of area cultivated with different rapeseed hybrids and particularly monoculture favored the appearance of pest outbreaks. Phytophagous beetles are usually controlled by predators. Thus, to maintain rising yields of rapeseeds in conditions of economic and environmental pressures, real knowledge of beetle's fauna of this culture and adjacent forest strips is absolutely necessary.

Preliminary data on rapeseed crops entomofauna diversity in the Republic of Moldova were published by: Bacal [3]; Bacal, Cilipic [4; 5] and Bacal et al. [2].

The aim of our study was to assess the structure of beetles associated with studied crops and adjacent forest strip and to identify the most important pests and in the meantime to indicate the beneficial predators.

Material and methods

An extensive survey was conducted during 2013 in Sadaclia district Basarabeasca, Republic of Moldova (Latitude: 46° 44' 91" North, Longitude: 28° 87' 86" East, Altitude: 74 m) in order to study the distribution, and species diversity of beetles associated with rapeseed crops (*Brassica napus* L.) and adjacent forest strip. Faunistic material was collected using pitfall traps, every 10 days at each site, during spring and summer time. Beetles were identified using available literature [11]. The classification adopted in the article is by Alonso-Zarazaga, Lyal [1] and Bouchard et al. [6]. To process the data on collected materials, different ecological parameters have been used: abundance, dominance, constancy and value of the ecological significance [9]. Sample based rarefaction of the community was considered using the statistic software Biodiversity Pro version 2 [7]. Voucher specimens were deposited in the collection of the Entomological Museum, Institute of Zoology of the Academy of Sciences of Moldova.

Results and discussions

A total of 299 and 202 beetle individuals were collected from rapeseed field and adjacent forest strip, respectively. Altogether 53 species belonging to 31 genera and 13 families were found; 40 species were identified from rapeseed and 37 from forest strip. Of the total revealed species 24 were common for both ecosystems, 16 species were collected only from rapeseed and other 13 only from adjacent forest strip. The largest family proved to be Carabidae, which includes 14 apecies from 6 genera, followed by Scarabaeidae, with 11 species from 6 genera, Curculionidae with 4 species and 4 genera, Histeridae with 4 species and 3 genera, Tenebrionidae with 3 species and 3 genera, Cerambycidae with 3 species from 1 genus and Chrysomelidae with 2 species and 2 genera. Families Dermestidae, Trogidae and Meloidae had by 2 species from one genus each. Last three families Agirtidae, Coccinellidae and Silphidae were represented by one species each.

On the basis of the calculated ecological parameters we can state, that the most abundant and eudominant for rapeseed crop were species: *Harpalus distinguendus* and *Phyllotreta nigripes,* this two species being also the most characteristic for this crop. Other 4 species (*Opatrum sabulosum*, *Amara aenea*, *A. familiaris* and *Harpalus flavicornis*) were subdominant and the rest of species were recedent. In adjacent forest strip the most abundant and eudominant were species *Harpalus distinguendus* and *H. amplicollis*, being also characteristic to this ecosystem. As dominant species were noticed *Hister quadrimaculatus* and *Opatrum sabulosum*, other 10 species (*Margarinotus purpurascens*, *Phyllotreta nigripes*, *Dorcadion pedestre*, *Trox hispidus*, *Aphodius quadrimaculatus*, *A. distinctus*, *Onthophagus vitulus*, *Gonocephalum pusillum*, *Dermestes laniarius* and *Valgus hemipterus*) were subdominant and the rest were recedent (Table 1).

Table 1: Sinecological analysis of beetle fauna from rapeseed and adjacent forest strip(Sadaclia, Republic of Moldova).

A – abundance, D – dominance index, C – constancy index, W – value of the ecological significance.

Species	A		D (%)		C (%)		W (%)	
	Rapeseed	Forest strip	Rapeseed	Forest strip	Rapeseed	Forest strip	Rapeseed	Forest strip
Agyrtes castaneus F.	1	1	0.3	0.5	5	5	0.02	0.02
Amara aenea (DeG.)	10	4	3.3	2	25	15	0.84	0.3
A. familiaris (Duft.)	8	4	2.7	2	25	20	0.67	0.4
A. similata (Gyll.)	4	-	1.3	-	10	-	0.13	-
Aphodius distinctus (Mull.)	5	5	1.7	2.5	15	15	0.25	0.37
A. luridus (F.)	-	1	-	0.5	-	5	-	0.02
A. quadrimaculatus (L.)	5	7	1.7	3.5	25	30	0.42	1.04
Blaps halophila F.-W.	-	3	-	1.5	-	15	-	0.22
Calathus melanocephalus (L.)	-	1	-	0.5	-	5	-	0.02
Ceutorhynchus pallidactylus (Mrsh.)	1	-	0.3	-	5	-	0.02	-
Coccinella septempunctata (L.)	1	2	0.3	1	5	5	0.02	0.05
Dermestes laniarius Ill.	2	5	0.7	2.5	10	20	0.07	0.5
D. murinus (L.)	1	-	0.3	-	5	-	0.02	-
Dorcadion pedestre (Poda)	3	9	1	4.5	10	25	0.1	1.11
D. scopolii Hbst.	1	1	0.3	0.5	5	5	0.02	0.02
D. tauricum Waltl	1	-	0.3	-	5	-	0.02	-
Epicometis hirta (Poda)	3	3	1	1.5	10	10	0.1	0.15
Gonocephalum pusillum (F.)	-	6	-	3	-	15	-	0.45
Harpalus amplicollis Mntr.	2	22	0.7	10.9	10	40	0.07	4.36
H. atratus Latr.	2	-	0.7	-	10	-	0.07	-
H. distinguendus (Duft.)	143	33	47.8	16.3	80	40	38.26	6.53
H. flavicornis Dejean	7	-	2.3	-	10	-	0.23	-
H. fuliginosus Duft.	5	-	1.7	-	15	-	0.25	-
H. hospes Sturm	4	4	1.3	2	20	15	0.27	0.3
H. neglectus Serv.	-	1	-	0.5	-	5	-	0.02
H. vernalis (F.)	5	2	1.7	1	10	10	0.17	0.1
Hister bimaculatus L.	1	-	0.3	-	5	-	0.02	-
H. quadrimaculatus L.	6	17	2	8.4	20	25	0.4	2.1
Laemostenus sericeus Fischer	-	2	-	1	-	10	-	0.1
Lixus albomarginatus Boh	1	-	0.3	-	5	-	0.02	-
Margarinotus purpurascens (Hbst.)	-	10	-	5	-	40	-	1.98
Meloe proscarabaeus L.	-	1	-	0.5	-	5	-	0.02
M. rugosus Mrsh.	1	-	0.3	-	5	-	0.02	-
Onthophagus furciceps Mrsl.	2	-	0.7	-	5	-	0.03	-
O. kindermanni Hrld.	-	2	-	1	-	10	-	0.1
O. ovatus (L.)	1	2	0.3	1	5	10	0.02	0.1

O. ruficapillus Brulle	5	-	1.7	-	15	-	0.25	-
O. vitulus (F.)	5	7	1.7	3.5	20	30	0.33	1.04
Opatrum sabulosum (L.)	12	12	4	5.9	25	25	1	1.49
Ophonus diffinis (Dejean)	-	1	-	0.5	-	5	-	0.02
O. schaubergerianus Puel	1	3	0.3	1.5	5	10	0.02	0.15
Otiorhynchus velutinus Germ.	6	4	2	2	20	10	0.4	0.2
Paraphonus mendax (Rossi)	-	1	-	0.5	-	5	-	0.02
Phyllotreta nigripes (F.)	32	9	10.7	4.5	40	30	4.28	1.34
Potosia hungarica Hbst.	2	-	0.7	-	5	-	0.03	-
Psylliodes chrysocephalus (L.)	2	-	0.7	-	10	-	0.07	-
Rhizotrogus aequinoctialis (Hbst.)	1	2	0.3	1	5	5	0.02	0.05
Saprinus cribellatus (Mrs.)	3	-	1	-	5	-	0.05	-
Silpha carinata Hbst.	-	2	-	1	-	10	-	0.1
Stenocarus ruficornis Steph.	2	-	0.7	-	10	-	0.07	-
Trox hispidus Pontop.	1	7	0.3	3.5	5	25	0.02	0.87
Trox sabulosus (L.)	-	1		0.5	-	5	-	0.02
Valgus hemipterus (L.)	1	5	0.3	2.5	5	5	0.02	0.12

The rank-abundance plots show (Figure 1) that three species were dominant (relative abundance >5%) when considering the total capture list (*Harpalus distinguendus* (176 specimens), *Phyllotreta nigripes* (41) and *Harpalus amplicollis* (24)).

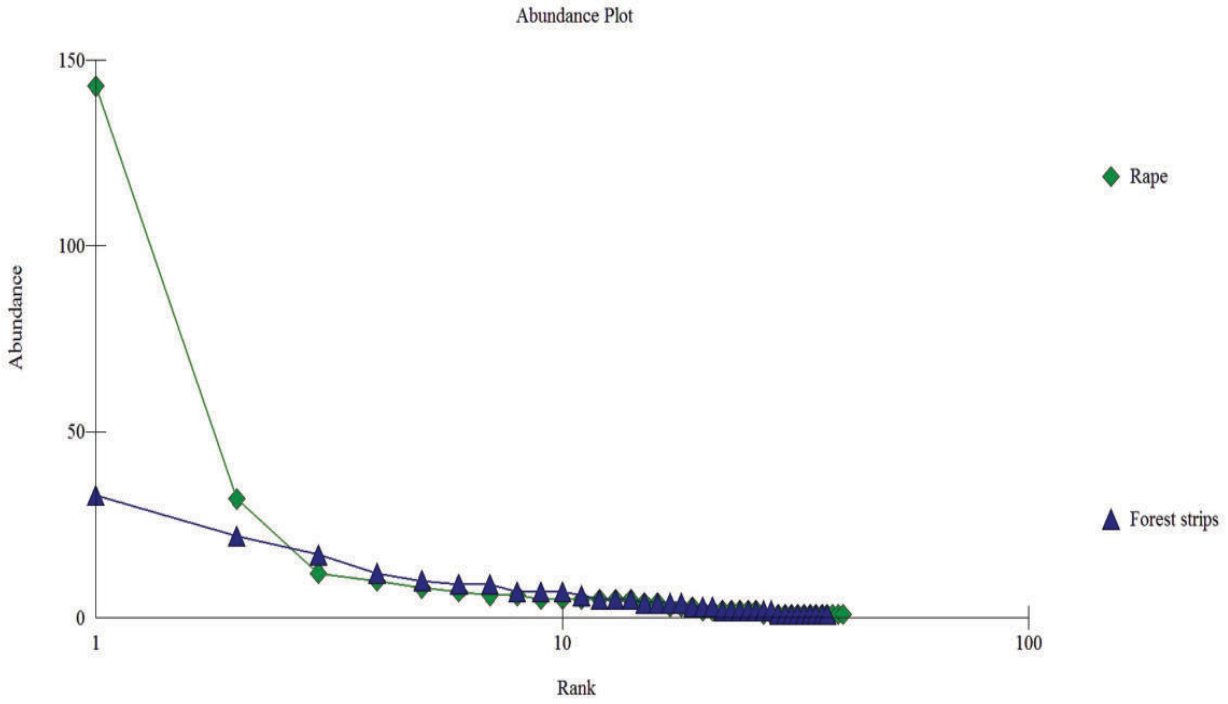

Fig. 1: Species abundance curves for rapeseed and adjacent forest strip beetle cenoses (Sadaclia)

Rarefaction curves for rapeseed crop and forest strip beetle communities are shown in Figure 2. Expected number of species has been plotted against number of individuals. This plot provides a measure of species diversity. Stepper curve indicated that forest strip habitat is slightly

more diverse than rapeseed crop. Both curves are rising and do not yet reach a flat progression, which means that the beetle community has not been recorded completely.

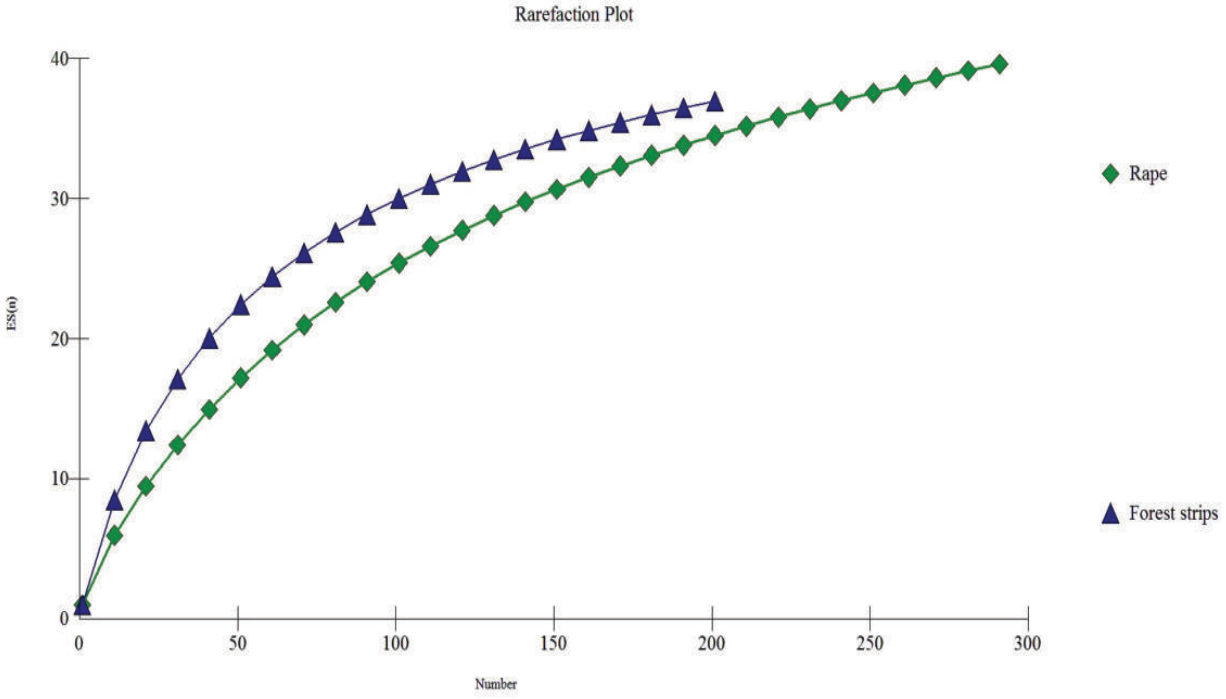

Fig. 2: Rarefaction curves for rapeseed and adjacent forest strip beetle cenoses (Sadaclia)

Knowledge of beetle faunal assemblages in ecosystems, their trophic preferences and the ratio between groups is very important, because it can provide useful information on the ecological situation of the ecosystem and its functioning. The revealed beetle community from rapeseed crop was mainly composed by phytophagous (21 species), followed by coprophagous (9), mixophagous (5), saprophagous (3), necrophagous and predators (by 1). Regarding forest strip, beetle community was represented by 17 phytophagous species, 8 coprophagous, 4 mixophagous, 3 predators, 3 necrophagous and 2 saprophagous.

Both ecosystems are populated primarily by phytophagous beetles, among them are known to cause serious damages to rapeseed species *Phyllotreta nigripes, Epicometis hirta* and *Psylliodes chrysocephalus*. The number of specimens collected is not alarming at present especially for last two species, but a careful monitoring of adult activity may be required.

It is very important to know the status of predatory populations in agricultural ecosystems and to increase their potential as biological control agents. Only one predator species highlighted for rapeseed crop and other three for forest strip with a low effective number show that ecosystems are trophically unbalanced being anthropogenic affected. Also, a high number of coprophagous beetles caught from forest strip indicate the presence of livestock (cattle and sheep) and degradation of this ecosystem through overgrazing.

Soil processing of the agricultural crops has strong influences on insect complexes, during this period they find refuge to the edge of fields and adjacent forest belts and return back to the field after emergence of the plants when there is enough food. Usually, the fields near the forest strip present a greater fauna diversity, but in this study it was not confirmed.

Conclusions

The aim of this study was to investigate the fauna of beetle diversity from rapeseed, which is an economically important culture, and adjacent forest strip as ecologically significant biotope. As a result of conducted research 53 species of beetles were revealed. The most abundant species for rapeseed crop were *Harpalus distinguendus* and *Phyllotreta nigripes*, and for forest strip *Harpalus distinguendus* and *H. amplicollis*. Species of the Carabidae family, as a typical component of insect complexes, were highlighted.

Acknowledgments

The research was performed within the project 11.817.08.16A funded by Supreme Council for Sciences and Technological Development of Academy of Sciences of Moldova.

REFERENCES

1. Alonso-Zarazaga, M., Lyal, C., 1999, A World Catalogue of Families and Genera of Curculionoidea (Insecta: Coleoptera) (Excepting Scolytidae and Platypodidae), *Entomopraxis*, Barcelona.
2. Bacal, S., Busmachiu, G., Maican, S., Fiera, C., 2011 Invetrebrates (Collembola, Coleoptera) from Brassica napus culture in comparative aspects between the Republic of Moldova and Romania. *Actual problems of protection and sustainable use of the animal World diversity*, Chisinău: 85.
3. Bacal, S., 2011 Contributions to the knowledge of the beetle fauna of rape culture in the Republic of Moldova. *Muzeul Judeţean Mureş, Târgul-Mureş, România, Revista Marisia,* **XXXI:** 51–54.
4. Bacal, S., Cilipic, G., 2011, Coleoptere scarabeide (Coleoptera: Scarabaeoidea) din cultura de rapiţă, *Materialele Simpozionului Ştiinţific Internaţional, Rezervaţia Codrii, 40 de ani. Lozova*: 32.
5. Bacal, S., Cilipic, G., 2011, Noi contribuţii la cunoaşterea faunei de coleoptere edafice din cultura de rapiţă, *Mediul Ambiant, Nr* **5 (59)**: 27–30.
6. Bouchard, P., Bousquet, Y., Davies, A.E., Alonso-Zarazaga, M.A., Lawrence, J.F., Lyal, C.H.C., Newton, A.F., Reid, C.A.M., Schmitt, M., Ślipiński, A.S., Smith, A.B.T., 2011, Family-group names in Coleoptera (Insecta). In: *ZooKeys*: 972.
7. Neil McAleece, P.J., Lambshead, D., Paterson, G.L.J., 1997, Biodiversity Pro (Version 2). The Natural History Museum, London.
8. Pirnă, I., Voicu, E., Vlăduţ, V., 2011, *Tehnologia de cultivare a rapiţei*, INMA-P2, Bucureşti: 32.
9. Simionescu, V., 1983, *Lucrări practice de ecologie*, Iaşi, Universitatea "A.I. Cuza": 174–190.
10. Starodub, V., Gheorghiev, N., 2008, *Fitotehnie*, Museum, Chişinău: 544.
11. Крыжановсий, О., 1965, Определитель насекомых Европейской части СССР, т. 2, Москва: 668.

DIVERSITATEA FAUNEI DE COLEOPTERE (COLEOPTERA) DIN CULTURA DE RAPIŢĂ ŞI FÂŞIA FORESTIERĂ ADIACENTĂ (SADACLIA, REPUBLICA MOLDOVA)
(Rezumat)

Prezenta lucrare este o sinteză a datelor privind diversitatea și ecologia faunei coleopterelor asociate cu cultura de rapiță și fâșia forestieră alăturată din localitatea Sadaclia (Republica Moldova). În total, din ambele cenoze au fost identificate 53 de specii de coleoptere care aparţin la 31 genuri și 13 familii. Cele mai caracteristice pentru aceste ecosisteme au fost speciile din familiile Carabidae și Scarabaeidae. Cele mai abundente specii pentru cultura de rapiță au fost *Harpalus distinguendus* și *Phyllotreta nigripes*, iar pentru fâșia forestieră alăturată *Harpalus distinguendus* și *H. amplicollis*.