LADYBUGS (INSECTA: COCCINELLIDAE) FROM THE COLLECTION OF THE INSTITUTE OF GENETICS, PHYSIOLOGY AND PLANT PROTECTION, MSU

CREȚU Irina, BUȘMACHIU Galina, BACAL Svetlana

Abstract. Research on coccinellids on the territory of the Republic of Moldova started at the beginning of the 20th century, collected insects being kept in entomological collections. Following the inventory of the collection of coccinellids from the Museum of the Institute of Genetics, Physiology and Plant Protection, 2461 specimens belonging to 47 species were identified. Most of the specimens were collected during 1957-1987 years, from agroecosystems and orchards, adjacent forest belts in the Republic of Moldova, as well as other countries. The work includes the list of species identified in the collection, the date, place and habitat from which they were collected.

Keywords: collection, Coccinellidae, inventory, museum, Republic of Moldova.

Rezumat. Coccinellidele (Insecta: Coccinellidae) din colecția Institutului de Genetică, Fiziologie și Protecția Plantelor, USM. Cercetările coccinelidelor pe teritoriul Republicii Moldova au debutat la începutul secolului al XX-lea, fiind colectate insecte care au fost păstrate în colecții entomologice. În urma inventarierii colecției de Coccinellidae din Muzeul Institutului de Genetică, Fiziologie și Protecția Plantelor al USM, au fost identificate 2461 exemplare, care fac parte din 47 specii. Exemplarele au fost colectate în perioada anilor 1957-1987 din agrocenoze și livezi, fâșiile forestiere alăturate din Republica Moldova, precum și din alte țări. Lucrarea include lista speciilor identificate în colecție, data, locul și habitatul din care au fost colectate.

Cuvinte cheie: colecție, Coccinellidae, inventariere, muzeu, Republica Moldova.

INTRODUCTION

Ladybugs are insects that belong to the family Coccinellidae, superfamily Cucujoidea, order Coleoptera, class Insecta. Worldwide, the Coccinellidae family includes approximately 6,000 species classified into 370 genera, 30 tribes and 2 subfamilies. These insects are small in size, ranging from 0.8 to 28 mm, with a very varied body color, with shades from yellow, orange, red to black. Adult females tend to be slightly larger than males, all of them have large compound eyes and clubbed antennae with seven to eleven segments. Coccinellids fly mostly during the day and may migrate to long distances for find the hibernation sites in the winter and more food in summer. The study of ladybugs in the UK found that coccinellids can fly 120 km away, at an approximate speed of 30 km/h (BACAL et al., 2021).

Often, on the elytra, they have small round dots in different shades from white to black. However, there are ladybugs that have wavy bands or even lines on elytra. The most famous ladybugs in the Republic of Moldova have red, yellow, black or brown elytra.

The trophic regime of coccinellids is diverse, although most of them are predators, some species are mycophagous, others phytophagous, feeding on the leaves of some plants and pollen. Some species have a mixed diet, for example *Bulaea lichatschovi* consumes pollen, leaves and aphids. The powerful mandibles a typical and have pairs of "teeth" which face each other.

Knowledge and identification of ladybug species is important for assessing their impact on agricultural pest control and overall ecosystem health. Ladybugs are known for their role in controlling such pests as aphids and other sucking insects that affect agricultural crops, making them allies of farmers and gardeners.

Research on ladybugs on the current territory of the Republic of Moldova started at the beginning of the 20th century. The first 20 species of Coccinellidae were cited by MILLER & ZUBOWSKY in 1917 as being collected in 1899, 1901, 1902 and 1904 years in Bessarabia around localities Chișinău, Bender, Tiraspol and Vadul – lui – Vodă. Several species were cited in the paper of RUSCINSKY (1933), and MEDVEDEV & SAPIRO (1957). In the volume "Invertebrate" of "Animal World of Moldova" published in 1983, OSTAFICHIUC cited only the number of ladybugs species – 32, without their names (BACAL et al., 2021).

At the beginning of the 20th century, research on ladybugs was resumed. In the Catalog of Zubowskiy's Entomological Collection, published by DERJANSCHI et al., 2016, 25 species of ladybugs are cited, one of which has been identified to the genus level (DERJANSCHI et al., 2016). In 2021 BACAL et al., published the first work dedicated to the inventory of ladybugs specimens stored in the collection of the Museum of Entomology, Institute of Zoology. The inventory of species continues with the publication in 2024 by Crețu et al., of the second part of the collection of ladybug housed in the Museum of Entomology of the Institute of Zoology (CREȚU et al., 2024).

The ladybug specimens were studied in the field and from the collections, and a series of papers dedicated to their species diversity were recently published (BUȘMACHIU et al., 2022; BURDUJA & BUȘMACHIU, 2023a, 2023b; GROZDEVA et al., 2023).

The purpose of this work was to inventory and identify the species of ladybugs within the insect collection of the Museum of the Institute of Genetics, Physiology and Plant Protection.

Inventorying species previously collected and stored in collections represents an important step in understanding the diversity and distribution of ladybug species.

MATERIALS AND METHODS

The entomological material used in this work consisted of inventoried Coccinellidae individuals stored in the Museum of the Institute of Genetics, Physiology and Plant Protection, MSU. The Coccinellid collection included 8 boxes with specimens collected between 1957-1987 years from the territory of the Republic of Moldova, as well as other countries (Bulgaria, Caucasus, Russia, Korea and Ukraine).

The specimens stored in the boxes were collected manually, using entomological nets and Barber trap from natural ecosystems such as forests, forest plantation, bank of river, garden, herbaceous vegetation, shore of ponds, several types of orchards (apple, apricot, cherry, peach, plum, walnut, sour cherry) and other agroecosystems (alfalfa crops, blackcurrant, blackthorn, buckwheat, carrot, coriander, dill, fennel, mulberry, grapevine etc.). Some of specimens stored in the collection did not have labels and were not identified.

For the species identification, МБС-10 binocular and Meiji Techno stereomicroscope were used. For the processing and analysis of data on the specimens of Coccinellidae the statistical method was used, and the graphical method was used to highlight the dominant species in the analyzed collection.

RESULTS AND DISCUSSIONS

A total of 2461 specimens, belonging to 47 species, were stored in the insect's collection of the Institute of Genetics, Physiology and Plant Protection, MSU. The inventory of 8 boxes with specimens of Coccinellidae allowed to increase our database of coccinellids stored in collections in the Republic of Moldova with several specimens not only form our country but also from: Bulgaria (1 specimen), Ukraine (21 specimens), Caucasus (4 specimens), Korea (4 specimens) and Russia (2 specimens). The stored specimens were collected abroad by Talitchii V., Palii and Vinocurov during their international expeditions in 1957, 1961, 1963, 1967, 1969, 1976, 1987.

Most of the specimens were collected between 1957-1967 years (Table 1). The specimens were identified by Talițchii V., Goanța I., Tuganov S., Talițcaea N., Chiriac I., Maevscaea V. and others, who collected and stored insects in this collection. As a result of the investigation, two species of Coccinellidae are cited for the first time in the Republic of Moldova: *Scymnus redtenbacheri* (Mulsant, 1846) and *Oenopia lyncea* (Oliver, 1808). The new species are market with an asterisc (*) in the table 1.

Only one or two specimens of six species *Coccinella trifasciata, Chilocorus nigritus, Harmonia dimidiata, H. octomaculata, Propylea japonica* and *Scymnus hoffmanni* were identified and housed in the boxes without any data and locality of collection. These specimens are not included in the table 1.

One species labeled as *Chilocorus geminus* Zaslavskij, 1962 was misidentified. After verification of specimens these individuals belong to *C. bipustulatus* species.

The species genus and name included in the table 1 correspond to the modern classification according to key of BIEŃKOWSKI (2018).

Table 1. List of coccinellid species from the collection of the Institute of Genetics, Physiology and Plant Protection, MSU.

No.	Species	No. ex.	Country	Locality	Habitat	Year
1	*Adalia bipunctata* (Linnaeus, 1758)	137	Moldova	Carmanova, Călărași, Chișinău, Dondușeni, Dubăsari, Grătiești, Nisporeni, Plopi, Sipoteni, Tiraspol	Orchards (plum, apple, pear, walnut, apricot, sour cherry, cherry), lily, carrot, maple, acacia, forest and forest belt	1958-1986
2	*Adalia decempuctata* (Linnaeus, 1758)	103	Moldova	Bălți, Bender, Briceni, Carmanova, Chișinău, Dereneu, Dubăsari, Hâncești, Ivancea, Pănășești, Plopi, Rîbnița, Sadova, Țaul	Forest, forest belt, linden, slope, garden, orchards (cherry, walnut, plum, apple, sour cherry)	1958-1987
			Ucraina	Ovidiopol		
			Ex-URSS	Ialta		
3	*Anisosticta novemdecimpunctata* (Linnaeus, 1758)	47	Moldova	Bucovăț, Chișinău, Ciumai, Dișcova, Sângerei, Vadul lui Vodă	Reed, forest belt, hill	1961, 1963,1967,1974
4	*Anatis ocellata* (Linnaeus, 1758)	3	Moldova	Chișinău, Criuleni	Forest, pear and walnut orchard	1959, 1976, 1987
5	*Bulaea lichatschovi* (Hummel, 1827)	2	Moldova	Carmanova, Slobozia	Carrot	1960, 1967
6	*Calvia quatuordecimguttata* (Linnaeus, 1758)	13	Moldova	Anenii Noi, Briceni, Chișinău, Copanca, Hâncești, Strășeni	Garden, orchards (apple, pear, cherry, walnut), hawthorn, pond shore	1958-1977
			Rusia	Magnitogorsk		
7	*Ceratomegilla undecimnotata* (Schneider, 1792)	33	Moldova	Carmanova, Călărași, Chișinău, Dubăsari, Hâncești, Grătiești, Leova, Plopi, Râbnița, Tartaul	Forest, forest belt, forest edge, slope, hill, herbs, orchard (apple, cherry, plum, peach, sour cherry,	1957-1986

			Ucraina	Ovidiopol	walnut), dill, garden, willow, Dniester bank	
8	*Chilocorus bipustulatus* (Linnaeus, 1758)	225	Moldova	Anenii Noi, Bender, Cahul, Călărași, Chișinău, Pănășești, Sadova, Slobozia, Vadul Turcului	Orchards (apple, apricot, plum, pear, walnut), acacia plantation, oak forest, forest belt	1957-1986
9	*Coccinella quinquepunctata* (Linnaeus,1758)	3	Moldova	Camenca, Calarașovca, Dișcova	Dniester bank, slope	1958, 1964, 1987
10	*Coccinella septempunctata* (Linnaeus, 1758)	138	Moldova	Bahmut, Bender, Briceni, Carmanova, Chișinău, Călărași, Comrat, Cornești, Criuleni, Dubăsari, Hâncești, Ghidighici, Ialoveni, Ivancea, Lipcani, Plopi, Râbnița, Sadova, Slobozia, Strășeni, Tiraspol, Vadul Turcului	Forest, forest belt, slope, hill, garden, herbs, orchards (apple, pear, plum), dill, carrot, wild plant garden, field, riverbank, steppe, blackcurrant etc.	1957-1963
			Ucraina	Budki, Karolino-Bugaz, Ovidiopol		
11	*Coccinella magnifica* (*dictincta*) (Redtenbacher, 1843)	10	Moldova	Chișinău, Carmanova, Dubăsari, Hâncești, Plopi, Vadul lui Vodă	Forest belt, forest, slope, plum, grasses, reed	1960-1987
			Caucaz	Kislovodsk		
12	*Coccidula scutellata* (Herbst, 1783)	27	Moldova	Chișinău, Ciumai, Palanca, Văsieni	Tree bark, maple, reed, orchards (apple and walnut)	1957-1986
13	*Coccinula quatuordecimpustulata* (Linnaeus, 1758)	160	Moldova	Bahmut, Briceni, Carmanova, Călărași, Cornești, Hâncești, Ivancea, Plopi, Ocnița, Râbnița, Sadova, Strășeni, Vadul Turcului, Dolna, Grădina Botanică din Chișinău	Forest, forest edge, forest belt, carrot, coriander, steppe, slope, orchards (apple, pear, peach), hill, wild plant, blackcurrant, dill, herbs	1957-1962
14	*Cynegetis impunctata* (Linnaeus, 1758)	1	Ucraina	Transcarpatia	Field herbs	1969
15	*Exochomus quadripustulatus* (Linnaeus, 1758)	127	Moldova	Bender, Cahul, Carmanova, Călărași, Chetrosu, Chișinău, Ciumai, Dondușeni, Dubăsari, Giurgiulești, Hâncești, Plopi, Ivancea, Pănășești, Râbnița, Sadova, Strășeni, Tudora Vadul Turcului,	Young and old orchards (apple, plum, peach, pear, walnut), garden, forest, slope, blackcurrant, dill, pine plantation, herbs, *Pseudoacacia* sp.	1957-1987
			Ucraina	Necrasovca		
16	*Halyzia sedecimguttata* (Linnaeus, 1758)	13	Moldova	Bălți, Carmanova, Chișinău, Chetrosu, Hâncești, Leova, Țaul	Orchards (cherry, plum, peach, walnut), forest, and forest belt	1957-1979
			URSS	Ialta		
17	*Harmonia axyridis* (Pallas, 1773)	4	Coreea	-	-	1987
18	*Harmonia quadripunctata* (Pontoppidan, 1763)	3	Moldova	Chișinău, Pănășești, Strășeni	Sour cherry, apple nursery	1959, 1987
19	*Henosepilachna vigintioctomaculata* (Motschulsky, 1857)	1	Ucraina	Primorsc	-	1987
20	*Hippodamia tredecimpunctata* (Linnaeus, 1758)	16	Moldova	Băcioi, Cimișlia, Cornești, Sângerei, Vadul lui Vodă	Valley, forest, apple tree, reed, pond shore, alfalfa	1959-1986
			URSS	Ialta		
221	*Hippodamia variegata* (Goeze, 1777)	112	Moldova	Anenii Noi, Cahul, Chișinău, Dubăsari, Dișcova, Hâncești, Ghidighici, Ialoveni, Plopi, Râbnița, Sadova, Șerpeni, Slobozia, Strășeni, Vadul lui Vodă	Garden, dill, carrot, herbs, Dniester bank, pun, valley, slope, orchards (apple, peach, pear, walnut) mulberry, alfalfa,	1957-1986
22	*Hyperaspis campestris* (Herbst, 1783)	23	Moldova	Bender, Carmanova, Chișinău, Dubăsari, Hâncești, Strășeni	Forest, slope, steppe, pear orchard, blackthorn	1957-1968
23	*Hyperaspis reppensis* (Herbst, 1783)	11	Moldova	Carmanova, Camenca, Chișinău Dubăsari, Hâncești, Slobozia	Forest, slope, garden, Dniester bank, plum tree, mulberry	1958-1976
24	*Nephus bipunctatus* (Kugelann, 1794)	61	Moldova	Anenii Noi, Bender, Carmanova, Chișinău, Ciumai, Cornești, Dubăsari, Hâncești, Plopi, Râbnița, Slobozia, Sadova, Vadul Turcului,	Steppe, plant, forest, forest belt, walnut, fabaceae herbs	1959-1977
25	*Nephys quadrimaculatus* (Herbst, 1783)	2	Moldova	Căpriana, Hâncești	Oak, hill	1958,1960
26	**Nephus redtenbacheri* (Mulsant, 1846)	5	Moldova	Anenii Noi, Bender, Hâncești, Slobozia	Forest, walnut tree	1962,1968,1976
27	*Oenopia conglobata* (Linnaeus, 1758)	217	Moldova	Anenii Noi, Carmanova, Călărași, Chișinău, Ciumai, Criuleni, Dubăsari, Flămânda, Grătiești, Hâncești, Ivancea, Pănășești, Plopi, Rîbnița, Strășeni, Tartaul, Sipoteni,	Forest, forest belt, garden, orchard (apple,, cherry, pear, peach, plum, sour cherry, walnut), linden, park, maple, riverbank, slope	1957-1986
28	**Oenopia lyncea* (Oliver, 1808)	4	Moldova	Chișinău, Hâncești	Forest, plum tree, garden	1959,1961

29	*Parexochromus nigromaculatus* (Thunberg, 1781)	3	Moldova	Vadul Turcului	-	1959,1967
30	*Platynaspis luteorubra* (Goeze, 1777)	48	Moldova	Bender, Cantemir, Chișinău, Dișcova, Dubăsari, Hâncești, Plopi, Râbnița, Strășeni, Vadul Turcului		1958-1986
31	*Propylea quatuordecimpunctata* (Linnaeus, 1758)	68	Moldova	Bender, Carmanova, Călărași, Chișinău Ceadîr-Lunga, Ciumai, Cornești, Grădina Botanică (Chișinău), Hâncești, Ivancea, Ocnița, Râbnița, Sadova, Vadul Turcului, Vadul lui Vodă	Forest, forest belt, herbs, slope, orchards (apple, peach, plum, walnut), dill, carrot, garden	1958-1970
32	*Psyllobora vigintiduopunctata* (Linnaeus, 1758)	69	Moldova	Bahmut, Chișinău, Cornești, Criuleni, Hâncești, Ivancea, Leușeni, Plopi	Forest, park, forest belt, slope, meadow, garden, grass, alfalfa, orchards (apple, peach, plum, walnut), grapevine blackcurrant,	1958-1986
33	*Scymnus apetzi* (Mulsant, 1846)	71	Moldova	Bender, Camenca, Carmanova, Călărași, Chișinău, Dișcova, Dubăsari, Hâncești, Moscovei, Plopi, Rîbnița, Slobozia, Vadul Turcului, Sadova	Slope, forest, forest belt, park, walnut, Dniester bank.	1957-1967
			Ucraina	Budki, Kiev		
34	*Scymnus auritus* (Thunberg, 1795)	25	Moldova	Bender, Călărași, Ciumai, Chișinău, Dișcova, Dubăsari, Moscovei, Hâncești, Leova, Plopi, Sadova, Vadul Turcului,	Apple and cherry trees, slope, walnut, phylloxera gall, maple, forest.	1957-1976
35	*Scymnus ferrugatus (*Moll, 1785)	1	Moldova	Strășeni	Forest	1961
36	*Scymnus frontalis* (Fabricius, 1787)	66	Moldova	Bugeac, Carmanova, Chișinău, Cornești Cimișlia, Cimișeni, Dubăsari, Fălești, Grătiești, Hâncești, Ivancea, Leușeni, Plopi, Râbnița, Vadul lui Vodă, Vadul Turcului, Văsieni, Zloți	Forest, forest belt, slope, apple and cherry orchards, grass, steppe, river, alfalfa, hill, reed, walnut tree.	1958-1986
			Caucaz	-		
37	*Scymnus haemorrhoidalis* (Herbst, 1797)	1	Moldova	Văleni	-	1967
38	*Scymnus interruptus* (Goeze, 1777)	9	Moldova	Călărași, Chișinău, Lozova, Plopi, Văsieni	Maple, herbs, fennel, walnut, reed, pond, apple orchard	1957-1986
39	*Scymnus nigrinus* (Kugelann, 1794)	87	Moldova	Bălți, Călărași, Chișinău, Cimișeni, Cornești, Dubăsari, Hâncești, Plopi, Râbnița, Sadova, Slobozia, Strășeni Vadul Turcului Vadul lui Vodă,	Forest, forest belt, park, valley, garden, herbs, Dniester bank, walnut tree, common laburnum, alfalfa, orchards (apple, pear, cherry, peach) buckwheat in bloom	1957-1986
40	*Scymnus schmidti* (*rufipes*) (Fürsch, 1967)	1	Ucraina	Kiev	-	1957
41	*Scymnus subvillosus* (Goeze, 1777)	92	Moldova	Cahul, Călărași, Chișinău, Dubăsari, Hâncești, Plopi, Pănășești, Sadova, Strășeni,	Forest, slope, orchards (apple, cherry, plum, pear, peach, sour cherry, walnut), alfalfa, acacia, hawthorn, maple, willow.	1957-1986
42	*Scymnus suturalis* (Thunberg, 1795)	18	Moldova	Bender, Carmanova, Criuleni, Chișinău, Râbnița, Sadova, , Slobozia, Tiraspol, Vadul lui Vodă, Vadul Turcului	Forest, slope, valley, orchards (plum, pear, walnut), Dniester bank, garden, herbs.	1957-1986
43	*Scymnus rubromaculatus* (Goeze, 1777)	97	Moldova	Bălți, Cahul, Carmanova, Călărași, Căpriana, Chișinău, Cimișeni, Cornești, Dubăsari, Hîncești, Moscovei, Lozova, Plopi, Rîbnița, Sadova, Strășeni, Slobozia, Vadul Turcului, Vasileni	Forest, forest belt, carrot, orchards (apple, plum, peach, sour cherry, walnut), park, slope, hill, blackcurrant, alfalfa, Dniester bank, fennel, herbs, oak and linden trees, reed.	1957-1986
44	*Stethorus punctillum* (Weise, 1891)	175	Moldova	Călărași, Chișinău, Criuleni, Cornești, Dubăsari, Hâncești, Fălești, Lipcani, Plopi, Rîbnița Slobozia, Strășeni, Țaul, Vadul lui Vodă, Vadul Turcului	Forest, forest belt, steppe, slope, garden, carrot, orchards (apple, pear,peach, plum,), alfalfa, park, blackcurrant, herbs, valley, Dniester bank, linden	1957-1974
45	*Subcoccinella vigintiquatuorpunctata* (Linnaeus, 1758)	55	Moldova	Bahmut, Bender, Carmanova, Călărași, Chișinău, Cornești, Dubăsari, Hâncești, Plopi, Sadova, Slobozia, Țaul, Vadul Turcului	Forest, forest belt, slope, valley, park, grasses, alfalfa, cherry and walnut trees	1959-1977
			Caucaz	-		
			Ucraina	Ovidiopol		
46	*Tytthaspis sedecimpunctata* (Linnaeus, 1758)	44	Moldova	Călărășeuca, Carmanova, Călărași, Chișinău, Hâncești, Ialoveni, Vadul Turcului, Vadul lui Vodă	Forest, forest belt,, grasses, slope, valley, common laburnum, Dniester bank	1959-1987
47	*Vibidia duodecimguttata* (Poda, 1761)	21	Moldova	Carmanova, Chișinău, Beloci, Hâncești, Sadova, Vadul Turcului	Forest, walnut tree, orchards (cherry and peach)	1957-1987
			Ex-URSS	Ialta		

The result of the research shows that 9 species of coccinellids have the most inventoried specimens: *Chilocorus bipustulatus* (225 ind.), *Oenopia conglobata* (217 ind.), *Stethorus punctillum* (175 ind.), *Coccinula quatuordecimpustulata* (160 ind.), *C. septempunctata* (138 ind.), *Adalia bipunctata* (137 ind.), *Exochomus quadripustulatus* (127 ind.), *Hippodamia variegata* (112 ind.) and *Adalia decempuctata* (103 ind.).

Figure 1. *Chilocorus bipustulatus* (original photo Crețu I.)

Figure 2. *Oenopia conglobata* (original photo Crețu I.)

The trophic relationships of the most common species are presented below. The species *Chilocorus bipustulatus* (Fig. 1) is aphidophagous and coccidophagous, found on both herbaceous and woody plants. *Oenopia conglobata* (Fig. 2) are aphid-eating, dendrobiont species, whole *Stethorus punctillum* is generally known as a eater of smaller mites. *Coccinula quatuordecimpustulata* is an aphid-eating species, preferring dry habitats, forest edges, especially open habitats, steppe areas and dry meadows.

Coccinella septempunctata is a zoophagous species, being the most common and best known ladybug in the Republic of Moldova. It can be seen throughout the year except on days with negative temperatures, when it hides in litter, under bark or in any hidden place. The species is widespread throughout the world and is found in a wide range of habitats. Both adults and larvae are predators of aphids, with the species being considered a biocontrol agent of harmful aphids. *Adalia bipunctata* and *A. decempuctata* are predatory species, attached to forest ecosystems, consuming aphids on trees, but have also been reported on fruit trees. *Exochomus quadripustulatus* is a eurytopic, dendrobiont, aphidophagous and coccidophagous species, but currently one of the rare species in the Republic of Moldova (BACAL et al., 2021). *Hippodamia variegata* is a xerophilic, eurytopic, aphid-eating species that feeds on grasses, trees, and bushes. These species are zoophagous, consuming mainly aphids, thus being economically important for the biological control of pest species, thus contributing to reducing the need to use chemical pesticides (BACAL et al., 2021).

In the analyzed collection, 536 specimens of the *Scymnus* genus were identified, which belong to 11 species: *Scymnus rubromaculatus* (97 ind), *S. subvillosus* (92), *S. nigrinus* (87), *S. apetzi* (71), *S. frontalis* (66), *S. auritus* (25), *S. suturalis* (18), *S. interruptus* (9) and with 1 individual for the species: *S. ferrugatus*, *S. haemorrhoidalis* and *S. rufipes.* Also in the collection are several species of genus *Nephus*. Specimens of only one of them *Nephus bipunctatus* (61) are widely distributed, the others two species having a small number of specimens *N. redtenbacheri* (5) and *N. quadrimaculatus* (2).

ACKNOWLEDGEMENTS

The research was carried within subprogram 010701 „Evaluation of the structure and functioning of the animal world and aquatic ecosystems under the influence of biotic and abiotic factors in the context of ensuring ecological security and the well-being of the population” and „Assessment of the state of plant, fungi and animal species, development of the list of species with rarity status and the algorithm for their presentation in the 4th edition of the Red Book of the Republic of Moldova”.

CONCLUSIONS

In conclusion, the results of this study highlight the crucial role of biological diversity in ensuring the healthy functioning of ecosystems and in supporting sustainable agricultural practices, underlining the need to protect and conserve these ladybug species and their natural habitats.

The ladybugs species stored in the Museum of the Institute of Genetics, Physiology and Plant Protection, MSU are very interesting because they were collected mostly from various agricultural crops and orchards. This allowed the collection and identification of very small and rare species from genera *Scymnus* and *Nephus*.

Summarizing all the data from all inventoried collections, was found that individuals of more than 50 species of ladybugs are housed in the museums from the Republic of Moldova, but in the scientific papers being cited much more species.

By updating information on ladybug species, this work can contribute to the development of more effective strategies for biodiversity conservation and natural habitat management, ensuring the protection and conservation of these valuable insects for maintaining of the ecological balance.

REFERENCES

BACAL S., BUȘMACHIU G., BURDUJA D. 2021. Contribuții la cunoașterea buburuzelor (Coleoptera: Coccinellidae) din fauna Republicii Moldova. *Academia de Științe a Moldovei*. Academia de Științe a Moldovei, Chișinău, **1**(60): 20-27. http://akademos.asm.md/files/34-41_14.pdf (accessed: February 19, 2025).

BIEŃKOWSKI A. O. 2018. Key for identification of the ladybirds (Coleoptera: Coccinellidae) of European Russia and the Russian Caucasus (native and alien species). *Zootaxa*. **4472**(2): 233. DOI:10.11646/zootaxa.4472.2.2 (accessed: february 09, 2025).

BUȘMACHIU G., BACAL S., BURDUJA D., CALESTRU L., BELOVA V. 2022. *Buburuzele (Insecta: Coccinellidae) din Republica Moldova*. Institutul de Zoologie. Chișinău, Capatina Print. 68 pp.

BURDUJA D. & BUȘMACHIU G. 2023a. The diversity of ladybug species (Coleoptera: Coccinellidae) in alfalfa crops, Republic of Moldova. In: *Oltenia. Studii şi comunicări. Ştiinţele Naturii.* Muzeul Olteniei Craiova. **39**(2): 91-99. http://olteniastudiisicomunicaristiintelenaturii.ro/cont.html (accessed: February 24, 2025).

BURDUJA D. & BUȘMACHIU G. 2023b. Diversitatea coccinelidelor (Insecta: Coccinellidae) din Rezervația „Plaiul Fagului". In: *Protecţia plantelor - realizări şi perspective,* Edit. Editorial-Printing Center of USM, Chișinău. **58**: 33-39. Available online at: https://doi.org/10.53040/ppap2023.05 (accessed: March 03, 2025).

CREȚU I., BURDUJA D., BUȘMACHIU G. 2024. Ladybirds (Insecta: Coleoptera) from the museum of entomology, Institute of Zoology, Republic of Moldova. In: *Oltenia. Studii și comunicări. Științele Naturii*. Muzeul Olteniei Craiova. **40**(1): 92-98. http://olteniastudiisicomunicaristiintelenaturii.ro/cont/40_1/III.%20ANIMAL%20BIOLOGY%20III.a.%20INVERTEBRATES%20VARIOUS/12.%20Cre_u.pdf (accessed: March 13, 2025).

DERJANSCHI V., BABAN E., CALESTRU L., STAHI N., ŢUGULEA C. 2016. *Catalogue of the "N. Zubowsky entomological collection"*. Academy of Sciences of Moldova, National Museum of Ethnography and Natural History. Institute of Zoology. Edit. "Bons Offices". Chișinău. 296 pp.

GROZDEVA S., BURDUJA D., BUȘMACHIU G., GĂLUȘCĂ A. 2023. Insectele (Odonata, Hemiptera, Coleoptera) asociate cu Phacelia tanacetifolia din Rezervația „Plaiul Fagului", Republica Moldova. In: *Ştiinţa Agricolă, Chișinău*, **2**: 54-62. https://ibn.idsi.md/en/vizualizare_articol/201576 (accessed: February 28, 2025).

MEDVEDEV S. & SHAPIRO D. 1957. *To the knowledge of beetle fauna (Coleoptera) of the Moldavian Soviet Socialist Republic and the neighboring regions of Ukraine*. Scientific works on the IBF. Chișinău. **30**: 173-206.

MILLER E. & ZUBOWSKY N. 1917. Materials on the entomological fauna of Bessarabia. *Proceedings of the Bessarabian Society Naturalists and Life Science Amateurs*. Typography Bessarabian Provincial Board. Chișinău. **2**(1): 32-150.

OSTAFICIUC V. 1983. Otrjad zhestkokrylye ili zhuki Coleoptera. In: *Zhivotnyj mir Moldavii. Nasekomye. Kishinev*: Shtiinca: 133-184.

RUSCINSKII A. 1933. *Beitrag zur Coleopterenfauna Bessarabiens*. In: Bulletin du Musee National de Sciences naturelles de Chisinău–Roumanie. Chișinău. **5**: 131-143.

Creţu Irina, Bușmachiu Galina, Bacal Svetlana
Institute of Zoology, Moldova State University, Republic of Moldova.
E-mail: bushmakiu@yahoo.com

Received: April 12, 2025
Accepted: August 11, 2025