NAT. CROAT. | VOL. 32 | No 1 | 199-211 | ZAGREB | June 30, 2023

original scientific paper / izvorni znanstveni rad
DOI 10.20302/NC.2023.32.14

CATALOGUE OF THE ENTOMOLOGICAL COLLECTIONS OF THE DIVISION OF ZOOLOGY OF THE FACULTY OF SCIENCE IN ZAGREB, COLLECTION OF FAMILY COCCINELLIDAE (INSECTA: COLEOPTERA)

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Horvatić, B., Koren, T., Zadravec, M., Durbešić, P. & Brigić, A.: Catalogue of the entomological collection of the Division of Zoology of the Faculty of Science in Zagreb, collection of family Coccinellidae (Insecta: Coleoptera). Nat. Croat., Vol. 32, No. 1., 199-211, Zagreb, 2023.

Entomological collections are an invaluable source of data, due to the variety of species they contain, capturing the biodiversity of a given time. Thus, the entomology part of the Division of Zoology Collection (Faculty of Science, Department of Biology), in Zagreb, established in 1890, is an important asset for all faunistic research and any overview of historical changes in species composition, as well as an important resource in the education of young scientists. Here we provide records of 198 ladybird specimens belonging to five tribes and 24 taxa. *Coccinella septempunctata* Linnaeus, 1758 and *Hippodamia* (*Hemisphaerica*) *tredecimpunctata* (Linnaeus, 1758) were the most abundant species in the collection, with 59 and 40 specimens respectively. The altitudinal range for the specimens in the collection is 10–1031 m a.s.l., with most records having been found between 10 and 199 m a.s.l. Due to the educational and scientific importance of entomological collections, it is recommended that the review and inventory of the entomological material within the Division of Zoology Collection be continued.

Key words: ladybird, ladybug, university collections, insects

Horvatić, B., Koren, T., Zadravec, M., Durbešić, P. & Brigić, A.: Katalog entomološke zbirke Zoologijskog zavoda Prirodoslovno-matematičkog fakulteta u Zagrebu, zbirka porodice Coccinellidae (Insecta: Coleoptera). Nat. Croat., Vol. 32, No. 1., 199-211, Zagreb, 2023.

Entomološke zbirke predstavljaju neprocjenjiv izvor podataka u vidu raznolikosti vrsta, koji tako bilježe biološku raznolikost određenog vremena. Iz tog razloga, entomološki materijal Zbirke Zoologijskog zavoda Biološkog odsjeka Prirodoslovno-matematičkog fakulteta u Zagrebu, ustanovljene 1890. godine, predstavlja važno bogatstvo za faunistička istraživanja, pregled povijesnih promjena sastava vrsta te važan alat za edukaciju mladih znanstvenika. U Zbirci je zabilježeno 198 jedinki te ukupno 24 svojte božjih ovčica koje su smještene unutar pet tribusa. *Coccinella septempunctata* Linnaeus, 1758 i *Hippodamia* (*Hemisphaerica*) *tredecimpunctata* (Linnaeus, 1758) najčešće su vrste u Zbirci s 59, odnosno 40 jedinki. Jedinke božjih ovčica zabilježene su od 10 do 1031 metar nadmorske visine, s najvećim brojem zabilježenih vrsta u rasponu od 10 do 199 m. Zbog velikog znanstvenog i edukacijskog značaja entomoloških zbirki, preporuča se nastavak pregleda i inventarizacije entomološkog dijela Zbirke Zoologijskog zavoda.

Key words: božje ovčice, fakultetska zbirka, kukci

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INTRODUCTION

Entomological collections, whether museum, university, or private, are an invaluable source of data. They usually contain a variety of species, each represented by many specimens, and thus record the biodiversity of a given time and/or area. Consequently, they are important for all faunistic research, providing an overview of historical changes in species composition and constituting an important tool for the training of young scientists (Puillandre *et al.*, 2012). There are a small number of literature sources related to Croatian ladybird fauna, consisting of a limited number of historical records (Müller, 1901; Novak, 1925; Košćec, 1975; Jelovčan *et al.*, 2007; Mičetić Stanković *et al.*, 2011; Koren *et al.*, 2012). Ladybirds are an ecologically extremely important group; most species of Coccinellidae are predatory, predominantly feeding on aphids (Aphidoidea) and scale insects (Coccoidea) and are therefore used for the biological control of both groups (Roy *et al.*, 2013, 2018). It should also be noted that there are no books dealing specifically with Croatian ladybirds, but in some works they are presented together with the data for other beetle families (e.g. Schlosser Klekovski, 1879; Novak, 1952, 1964, 1970). Although there are not many published data, there is a large amount of unpublished data and unexamined specimens in Croatian and foreign collections that can further clarify distribution and ecology. Therefore, entomological collections are an invaluable resource for the study of ladybirds.

In Croatia, entomological collections are stored in several city and national museums (e.g. the Croatian Natural History Museum, Dubrovnik Natural History Museum, Varaždin City Museum, Zadar National Museum, Split Natural History Museum, Rijeka Natural History Museum etc.). Additionally, several faculties have their own collections (Faculty of Forestry and Wood Technology, and Faculty of Agriculture – both University of Zagreb, Josip Juraj Strossmayer University of Osijek etc.). An important, but mostly overlooked collection is the entomology part of the Division of Zoology Collection (Faculty of Science, Department of Biology), in Zagreb. The first material deposited here dates back to the 1890s. From the 1950s onwards scientists deposited specimens collected in the course of their research, which was primarily on beetles in forest ecosystems and in the Dinaric karst area. Most of the research was organised and led by Professor Paula Durbešić and her associates. Therefore, their material makes up of the largest part of the collection. So far, only the orthopteran fauna of the collection has been discussed in print, providing new country records, and underlining the importance of the collection (Šerić Jelaska & Skejo, 2014). Here we present the collection of ladybirds assembled during the years of field research from 1953 to 1997.

MATERIAL AND METHODS

Insects were either pinned directly on entomological needles or glued to paper boards. The genitalia were not isolated in any of the individuals. Most individuals in the collections are in good condition, while some have been recorded as being infested with pests. Ladybirds are most often placed in boxes with individuals from other groups collected during the same research. All data on the labels of ladybird specimens were copied into a database. The labels contained information on the location and date of sampling. Additionally, most labels contained the legator name and sampling method. Locations were searched using the Google search engine, maps HERE WeGo, ARKOD Browser and Google Earth Pro. They were georeferenced using the latest

version of the the Gazetteer of the Republic of Croatia (Registar geografskih imena Republike Hrvatske, alias: CroGeoNames) WFS (DGU, 2021) in the programme QGIS 2.14.3. Coordinates are given in the WGS84 coordinate system (EPSG: 4326), as decimal degrees. All records were grouped, according to their georeferenced coordinates, into the corresponding biogeographic regions (Continental, Alpine and Mediterranean, according to EEA, 2016). Altitudes were extrapolated using a digital elevation model of Croatia (50 m cell size). For Slovenia and Montenegro, altitudes were searched via Google Earth Pro.

Existing identifications were reviewed, and unidentified specimens were identified by using the following identification keys: Fürsch (1967), Lompe (2022), Mader (1955), Nedvěd (2015), and Roy *et al*. (2013). In some genera, i.e. *Scymnus* Kugelann, 1794; *Nephus* Mulsant, 1846; *Hyperaspis* Chevrolat, 1836, the genitalia are a necessary diagnostic character and so must be removed from the body. Since the individuals are old, dry, and glued on paper boards, they were not processed in this way because of the risk of destroying the specimens. Hence, three individuals that could not be reliably identified even at the genus level were left at the level of the tribe Scymnini Mulsant, 1846, and one specimen was identified at the genus level (*Hyperaspis* sp.). The taxonomy follows Nedvěd (2020).

RESULTS

Within the Collection, a total of 198 individuals, belonging to five tribes (Chilocorini Mulsant, 1846; Coccinellini Latreille, 1807; Epilachnini Mulsant, 1846, Hyperasidini Mulsant, 1846, and Scymnini Mulsant, 1846) and 24 taxa (most on species level) were recorded (Tab. 1). More than 50 previously unidentified specimens are now identified, and five specimens were re-identified. There are four genera recorded within this Collection with more than one species in Croatia (*Adalia* Mulsant, 1846; *Coccinella* Linnaeus, 1758; *Hippodamia* Chevrolat, 1836 and *Oenopia* Mulsant, 1850). Others (*Henosepilachna* Li & Cook, 1961, *Exochomus* Redtenbacher, 1843, *Chilocorus* Leach, 1815) are represented by one each.

Coccinella septempunctata Linnaeus, 1758 was the most abundant coccinellid species, accounting for 30% of the total number of specimens, and was found at 12 localities. *Hippodamia tredecimpunctata* Linnaeus, 1758 was the second most common species in the collection comprising 21% of the total number of specimens and was found at four localities.

The coccinellid collection includes specimens from a total of 35 localities collected from June 1953 to November 1997 (Tab. 2). Most of the specimens were collected at lower altitudes due to greater accessibility of the terrain and/or the sampling sites were associated with specific research projects in which ladybirds were sampled randomly rather than specifically. The location "Lonjsko polje, Vulpinec" was too vague and could not be pinpointed precisely, even after consultation with Lonjsko polje Nature Park officials. Therefore, it could not be georeferenced. Additionally, several specimens from Slovenia, e.g. Krško, and one from Montenegro, e.g. Male Krće, were also found in the collection. Specimens were collected at altitudes ranging from 10–1031 m a.s.l., with most records found between 10–199 m a.s.l. Sixteen species were recorded in the Continental, four species in the Alpine and ten in the Mediterranean biogeographical region. Some of the species were recorded in more than one biogeographical region

(Tab. 1). Ladybirds were collected using the following methods: collecting by hand, sweep netting and beating of branches. The Catalogue of the entomological Collections at the Division of Zoology, Department of Biology, Coleoptera Coccinellidae is presented in Tab. 3.

DISCUSSION

Our results show that 24 taxa are present in the Collection, 22 of which were identified to species level. This represents 23% of the total Croatian ladybird fauna (Horvatić, 2017). Although the amount of ladybird records in the collection is relatively low, and no rare species were recorded, this is still an important contribution, due to the low number of surveys and historical records (Tables 2 & 3).

Tab. 1. List of coccinellid species present in the entomological Collection at the Division of Zoology, Department of Biology, Faculty of Science, in Zagreb. Legend: C – Continental biogeographical region; A – Alpine biogeographical region; M – Mediterranean biogeographical region; SLO – Slovenia; MNE – Montenegro.

Species		No. of locations	No. of specimens	Biogeographical region
Tribe: Epilachnini Mulsant, 1846				
1	*Subcoccinella vigintiquatuorpunctata* (Linnaeus, 1758)	6	9	C, M
2	*Henosepilachna elaterii* (Rossi, 1794)	1	1	C
Tribe: Chilocorini Mulsant, 1846				
3	*Exochomus quadripustulatus* (Linnaeus, 1758)	1	1	C
4	*Platynaspis luteorubra* (Goeze, 1777)	2	2	C, A
5	*Chilocorus bipustulatus* (Linnaeus, 1758)	1	1	M
Tribe: Hyperasidini Mulsant, 1846				
6	*Hyperaspis* sp. Chevrolat, 1836	1	1	C
Tribe: Scymnini Mulsant, 1846				
7	Scymnnini Mulsant, 1846	3	3	C, M, SLO
Tribe: Coccinellini Latreille, 1807				
8	*Adalia* (*Adalia*) *bipunctata* (Linnaeus, 1758)	10	17	C, M, SLO
9	*Adalia* (*Adalia*) *decempunctata* (Linnaeus, 1758)	2	2	C, M
10	*Anisosticta novemdecimpunctata* (Linnaeus, 1758)	2	16	C
11	*Aphidecta obliterata* (Linnaeus, 1758)	2	2	A, M
12	*Hippodamia* (*Semiadalia*) *undecimnotata* (Schneider, D. H., 1792)	1	1	C
13	*Coccinella* (*Coccinella*) *magnifica* Redtenbacher, 1843	2	2	C
14	*Coccinella* (*Coccinella*) *septempunctata* Linnaeus, 1758	12	59	C, A, SLO
15	*Coccinula quatuordecimpustulata* (Linnaeus, 1758)	1	2	C
16	*Halyzia sedecimguttata* (Linnaeus, 1758)	1	1	A
17	*Hippodamia* (*Hemisphaerica*) *tredecimpunctata* (Linnaeus, 1758)	4	40	C
18	*Hippodamia* (*Hippodamia*) *variegata* Goeze, 1777	3	3	C
19	*Myrrha octodecimguttata* (Linnaeus, 1758)	1	1	M
20	*Oenopia conglobata* (Linnaeus, 1758)	2	2	M
21	*Oenopia lyncea* (Olivier, 1808)	1	1	C
22	*Propylea quatuordecimpunctata* (Linnaeus, 1758)	8	25	C, M, SLO
23	*Psyllobora vigintiduopunctata* (Linnaeus, 1758)	3	3	M, MNE
24	*Tytthaspis sedecimpunctata* (Linnaeus, 1758)	2	3	C, M

Tab. 2. List of locations from the entomological Collection at the Division of Zoology, Department of Biology, Faculty of Science, in Zagreb – Coccinellidae, with given coordinates, biogeographical region and elevation. Locations in Slovenia and Montenegro were not assigned a corresponding biogeographic region (/).

	Location	N	E	BioRegion	Country	a.s.l.
1.	Mirna, brickworks	45.33527	13.65451	Mediterranean	Croatia	10
2.	Mirna, ispod Motovuna	45.34328	13.82667	Mediterranean	Croatia	10
3.	Mirna, Rušnjak (Roželija)	45.32034	13.58803	Mediterranean	Croatia	37
4.	Neretva, Modro oko	43.05750	17.51022	Mediterranean	Croatia	10
5.	Opatija	45.33757	14.30519	Mediterranean	Croatia	63
6.	Roč	45.39401	14.04612	Mediterranean	Croatia	323
8.	Vis, Brgujac	43.02698	16.22389	Mediterranean	Croatia	5
9.	Motovun forest	45.34986	13.83863	Mediterranean	Croatia	23
10.	Rovinj, Zlatni Rt	45.06833	13.62869	Mediterranean	Croatia	24
11.	Crveni otok	45.05912	13.62211	Mediterranean	Croatia	14
13.	Rovinj, Sveta Katarina	45.07766	13.62745	Mediterranean	Croatia	19
14.	Jasenak	45.23133	15.04261	Alpine	Croatia	626
15.	Zagorska Kosa	45.18996	15.20058	Alpine	Croatia	831
16.	Čorkova uvala	44.91343	15.52890	Alpine	Croatia	865
17.	Brodsko Vinogorje	45.18234	17.99588	Continental	Croatia	108
18.	Daruvar	45.59299	17.22385	Continental	Croatia	160
19.	Demerje	45.73059	15.88458	Continental	Croatia	126
20.	Duboki Jarak	45.84089	16.12388	Continental	Croatia	130
21.	Đurđevac	46.03985	17.07146	Continental	Croatia	120
22.	Ježevo	45.73608	16.29903	Continental	Croatia	100
23.	Lipovljani	45.39813	16.89463	Continental	Croatia	150
24.	Lonjsko polje	45.41435	16.67369	Continental	Croatia	94
25.	Lonjsko polje by Mužilovčica Village	45.39137	16.67823	Continental	Croatia	95
26.	Sabljaci	45.22655	15.22697	Continental	Croatia	320
27.	Sirova Katalena	45.96102	17.06389	Continental	Croatia	157
28.	Stupnik	45.74472	15.85252	Continental	Croatia	130
29.	Varaždin	46.30566	16.33662	Continental	Croatia	171
30.	Zagreb, Gornja Kustošija	45.83208	15.92178	Continental	Croatia	170
31.	Zagreb, Sljeme	45.89942	15.94807	Continental	Croatia	1031
32.	Preloščica	45.442537	16.48071	Continental	Croatia	97
33.	Slunj	45.11609	15.58760	Continental	Croatia	250
34.	Krško	45.96068	15.45480	/	Slovenia	172
35.	Lonjsko polje, Vulpinec	–	–	Continental	Croatia	–
36.	Male Krće	43.41778	19.28167	/	Montenegro	1023

Coccinellids in the Collection were sampled using a variety of methods, such as sweep netting/beating and visual examination, which are the most common methods used in ladybird surveys (Roy *et al.*, 2013, 2018; Nedvěd, 2015). During warm weather, ladybirds are highly active. Thus, sweep netting/beating the branches is very effective. Due to their conspicuous colouration, visual examination is of great use when searching for ladybirds in vegetation (Nedvěd, 2015). Using this method, it is possible to record large numbers of conspicuous individuals. Since most of the research were conducted in grasslands, it is not surprising that many species inhabiting such habitats were recorded.

Tab. 3. Catalogue of the Entomological Collections at the Division of Zoology, Department of Biology, Coleoptera Coccinellidae. INVN – inventory number of each specimen, LEG – legator. When the legator is unknown, it is denoted by "leg. nesc.".

INVN	VALID SCIENTIFIC NAME	LOCATION	DATE	LEG
PMF EZ COL COCC 1-1	*Adalia bipunctata*	Đurđevac	16.10.1971	Krpan M.
PMF EZ COL COCC 1-2	*A. bipunctata*	Daruvar	1.7.1969	leg. nesc.
PMF EZ COL COCC 1-3	*A. bipunctata*	Daruvar	1.7.1969	leg. nesc.
PMF EZ COL COCC 1-4	*A. bipunctata*	Duboki jarak	14.8.1956	leg. nesc.
PMF EZ COL COCC 1-5	*A. bipunctata*	Duboki jarak	14.8.1956	Krpan M.
PMF EZ COL COCC 1-6	*A. bipunctata*	Lipovljani	12.7.1957	Krpan M.
PMF EZ COL COCC 1-7	*A. bipunctata*	Lonjsko polje by Mužilovčica Village	12.6.1990	Steiner
PMF EZ COL COCC 1-8	*A. bipunctata*	Lonjsko polje by Mužilovčica Village	12.6.1990	Steiner
PMF EZ COL COCC 1-9	*A. bipunctata*	Lonjsko polje by Mužilovčica Village	12.6.1990	Čurić D.
PMF EZ COL COCC 1-10	*A. bipunctata*	Opatija	8.1972.	Krpan M.
PMF EZ COL COCC 1-11	*A. bipunctata*	Sirova Katalena	14.10.1971	Krpan M.
PMF EZ COL COCC 1-12	*A. bipunctata*	Stupnik	5.7.1956	Krpan M.
PMF EZ COL COCC 1-13	*A. bipunctata*	Stupnik	12.7.1957	Krpan M.
PMF PD COCC 1-1	*A. bipunctata*	Krško	16.6.1978	Durbešić P.
PMF PD COCC 1-2	*A. bipunctata*	Krško	16.6.1978	Durbešić P.
PMF EZ COL COCC 1-14	*A. bipunctata*	Lonjsko polje by Mužilovčica Village	12.6.1990	Ćurić
PMF EZ COL COCC 1-15	*A. bipunctata*	The Red Island (St. Andrew Island), Rovinj	30.5.1995	Vuković M.
PMF EZ COL COCC 1-16	*Adalia decempunctata*	Zlatni Rt, Rovinj	25.5.1993	Kajšel B.
PMF EZ COL COCC 1-17	*A. decempunctata*	The St. Katarina Island, Rovinj	30.5.1995	Žulj I. & Vorih A. M.
PMF EZ COL COCC 1-18	*Anisosticta novemdecimpunctata*	Lonjsko polje by Mužilovčica Village	22.9.1990	Ćurić
PMF EZ COL COCC 1-19	*A. novemdecimpunctata*	Lonjsko polje by Mužilovčica Village	22.9.1990	Ćurić
PMF EZ COL COCC 1-20	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-21	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-22	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-23	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-24	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-25	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-26	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-27	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-28	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-29	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-30	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-31	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-32	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-33	*A. novemdecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF PD COCC 1-3	*Aphidecta obliterata*	Zagorska Kosa	14.7.1969	Durbešić P.
PMF PD COCC 1-4	*A. obliterata*	Zlatni Rt, Rovinj	24.5.1994	Durbešić P.
PMF EZ COL COCC 1-34	*Hippodamia undecimnotata*	Demerje	2.7.1956	Krpan M.
PMF PD COCC 1-5	*Chilocorus bipustulatus*	Brgujac, Vis	8.1991.	Durbešić P.
PMF EZ COL COCC 1-35	*Coccinella magnifica*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić

INVN	VALID SCIENTIFIC NAME	LOCATION	DATE	LEG
PMF EZ COL COCC 1-36	*C. magnifica*	Lonjsko polje by Mužilovčica Village	1990	Ćurić
PMF EZ COL COCC 1-37	*Coccinella septempunctata*	Gornja Kustošija, Zagreb	14.5.1990	leg. nesc.
PMF EZ COL COCC 1-38	*C. septempunctata*	Brodsko Vinogorje	5.5.1954	leg. nesc.
PMF EZ COL COCC 1-39	*C. septempunctata*	Jasenak	15.7.1969	leg. nesc.
PMF EZ COL COCC 1-40	*C. septempunctata*	Ježevo	26.5.1973	leg. nesc.
PMF EZ COL COCC 1-41	*C. septempunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-42	*C. septempunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-43	*C. septempunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-44	*C. septempunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-45	*C. septempunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-46	*C. septempunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-47	*C. septempunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-48	*C. septempunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-49	*C. septempunctata*	Ježevo	23.6.1973	leg. nesc.
PMF EZ COL COCC 1-50	*C. septempunctata*	Ježevo	23.6.1973	leg. nesc.
PMF EZ COL COCC 1-51	*C. septempunctata*	Ježevo	23.6.1973	leg. nesc.
PMF EZ COL COCC 1-52	*C. septempunctata*	Ježevo	23.6.1973	leg. nesc.
PMF EZ COL COCC 1-53	*C. septempunctata*	Ježevo	23.6.1973	leg. nesc.
PMF EZ COL COCC 1-54	*C. septempunctata*	Ježevo	23.6.1973	leg. nesc.
PMF EZ COL COCC 1-55	*C. septempunctata*	Ježevo	3.7.1973	leg. nesc.
PMF EZ COL COCC 1-56	*C. septempunctata*	Ježevo	3.7.1973	leg. nesc.
PMF EZ COL COCC 1-57	*C. septempunctata*	Ježevo	3.7.1973	leg. nesc.
PMF EZ COL COCC 1-58	*C. septempunctata*	Ježevo	3.7.1973	leg. nesc.
PMF EZ COL COCC 1-59	*C. septempunctata*	Ježevo	3.7.1973	leg. nesc.
PMF EZ COL COCC 1-60	*C. septempunctata*	Ježevo	20.4.1974	leg. nesc.
PMF EZ COL COCC 1-61	*C. septempunctata*	Ježevo	20.4.1974	leg. nesc.
PMF EZ COL COCC 1-62	*C. septempunctata*	Ježevo	3.5.1974	leg. nesc.
PMF EZ COL COCC 1-63	*C. septempunctata*	Ježevo	3.5.1974	leg. nesc.
PMF EZ COL COCC 1-64	*C. septempunctata*	Ježevo	26.5.1974	leg. nesc.
PMF PD COCC 1-6	*C. septempunctata*	Krško	15.5.1979	Durbešić P.
PMF PD COCC 1-7	*C. septempunctata*	Krško	15.5.1979	Durbešić P.
PMF PD COCC 1-8	*C. septempunctata*	Krško	15.5.1979	Durbešić P.
PMF PD COCC 1-9	*C. septempunctata*	Krško	15.5.1979	Durbešić P.
PMF PD COCC 1-10	*C. septempunctata*	Krško	15.6.1980	Durbešić P.
PMF PD COCC 1-11	*C. septempunctata*	Krško	26.6.1980	Durbešić P.
PMF PD COCC 1-12	*C. septempunctata*	Krško	26.6.1980	Durbešić P.
PMF PD COCC 1-13	*C. septempunctata*	Krško	26.6.1980	Durbešić P.
PMF PD COCC 1-14	*C. septempunctata*	Krško	26.6.1980	Durbešić P.
PMF PD COCC 1-15	*C. septempunctata*	Krško	26.6.1980	Durbešić P.
PMF PD COCC 1-16	*C. septempunctata*	Krško	26.6.1980	Durbešić P.
PMF EZ COL COCC 1-65	*C. septempunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-66	*C. septempunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-67	*C. septempunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-68	*C. septempunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-69	*C. septempunctata*	Lonjsko polje	14.7.1990	Ćurić
PMF EZ COL COCC 1-70	*C. septempunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-71	*C. septempunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-72	*C. septempunctata*	Lonjsko polje	1990	Ćurić

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PMF EZ COL COCC 1-73	*C. septempunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-74	*C. septempunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-75	*C. septempunctata*	Prelošica	12.6.1990	leg. nesc.
PMF EZ COL COCC 1-76	*C. septempunctata*	Prelošica	12.6.1990	leg. nesc.
PMF EZ COL COCC 1-77	*C. septempunctata*	Prelošica	12.6.1990	leg. nesc.
PMF EZ COL COCC 1-78	*C. septempunctata*	Lonjsko polje by Mužilovčica Village	22.9.1990	leg. nesc.
PMF EZ COL COCC 1-79	*C. septempunctata*	Lonjsko polje by Mužilovčica Village	22.9.1990	Ćurić
PMF EZ COL COCC 1-80	*C. septempunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-81	*C. septempunctata*	Sirova Katalena	21.6.1971	Krpan M.
PMF EZ COL COCC 1-82	*C. septempunctata*	Stupnik	5.7.1956	Krpan M.
PMF EZ COL COCC 1-83	*C. septempunctata*	Stupnik	5.7.1956	Krpan M.
PMF PD COCC 1-17	*C. septempunctata*	Sabljaci	3.6.1969	Durbešić P.
PMF EZ COL COCC 1-84	*Coccinula quatuordecimpustulata*	Daruvar	1.7.1969	leg. nesc.
PMF EZ COL COCC 1-85	*C. quatuordecimpustulata*	Daruvar	1.5.1969	leg. nesc.
PMF EZ COL COCC 1-86	*Exochomus quadripustulatus*	Varaždin	12.5.1990	Bracko L.
PMF EZ COL COCC 1-87	*Halyzia sedecimguttata*	Čorkova uvala, the Plitvice Lakes National Park	5.6.1969	leg. nesc.
PMF EZ COL COCC 1-88	*Henosepilachna elaterii*	Sljeme, Zagreb		leg. nesc.
PMF EZ COL COCC 1-89	*Hippodamia tredecimpunctata*	Lonjsko polje by Mužilovčica Village	14.7.1990	Vujčić - Karlo S.
PMF EZ COL COCC 1-90	*H. tredecimpunctata*	Lonjsko polje by Mužilovčica Village	14.7.1990	Vujčić-Karlo S.
PMF EZ COL COCC 1-91	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-92	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-93	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-94	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-95	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-96	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-97	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-98	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-99	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-100	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-101	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-102	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-103	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-104	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-105	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-106	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-107	*H. tredecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-108	*H. tredecimpunctata*	Ježevo	23.6.1973	leg. nesc.
PMF EZ COL COCC 1-109	*H. tredecimpunctata*	Ježevo	3.7.1973	leg. nesc.
PMF EZ COL COCC 1-110	*H. tredecimpunctata*	Ježevo	3.7.1973	leg. nesc.
PMF EZ COL COCC 1-111	*H. tredecimpunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-112	*H. tredecimpunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-113	*H. tredecimpunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-114	*H. tredecimpunctata*	Lonjsko polje	1990	Ćurić

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PMF EZ COL COCC 1-115	*H. tredecimpunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-116	*H. tredecimpunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-117	*H. tredecimpunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-118	*H. tredecimpunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-119	*H. tredecimpunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-120	*H. tredecimpunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-121	*H. tredecimpunctata*	Lonjsko polje by Mužilovčica Village	1990	Ćurić
PMF EZ COL COCC 1-122	*H. tredecimpunctata*	Lonjsko polje by Mužilovčica Village	1990	Ćurić
PMF EZ COL COCC 1-123	*H. tredecimpunctata*	Lonjsko polje by Mužilovčica Village	1990	Ćurić
PMF EZ COL COCC 1-124	*H. tredecimpunctata*	Lonjsko polje by Mužilovčica Village	1990	Ćurić
PMF EZ COL COCC 1-125	*H. tredecimpunctata*	Lonjsko polje by Mužilovčica Village	1990	Ćurić
PMF EZ COL COCC 1-126	*H. tredecimpunctata*	Lonjsko polje by Mužilovčica Village	1990	Ćurić
PMF EZ COL COCC 1-127	*H. tredecimpunctata*	Lonjsko polje by Mužilovčica Village	22.9.1990	leg. nesc.
PMF EZ COL COCC 1-128	*H. tredecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF EZ COL COCC 1-129	*Hippodamia variegata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-130	*H. variegata*	Ježevo	20.1.1974	leg. nesc.
PMF EZ COL COCC 1-131	*H. variegata*	Prelošica	12.6.1990	leg. nesc.
PMF EZ COL COCC 1-132	*Hyperaspis sp.*	Slunj	6.6.1969	leg. nesc.
PMF PD COCC 1-18	*Myrrha octodecimguttata*	Sv. Katarina, Rovinj	29.5.1995	Durbešić P.
PMF PD COCC 1-19	*Oenopia conglobata*	Modro oko, Neretva	8.11.1997	Durbešić P. & Vujčić - Karlo S.
PMF PD COCC 1-20	*O. conglobata*	Roč, Mirna		Durbešić P.
PMF PD COCC 1-21	*Oenopia lyncea*	Gornja Kustošija, Zagreb	14.5.1990	Durbešić P.
PMF PD COCC 1-22	*Platynaspis luteorubra*	Jasenak	15.7.1969	Durbešić P.
PMF EZ COL COCC 1-133	*P. luteorubra*	Lonjsko polje by Mužilovčica Village	22.9.1990	leg. nesc.
PMF EZ COL COCC 1-134	*Propylea quatuordecimpunctata*	Brodsko Vinogorje	27.6.1953	leg. nesc.
PMF EZ COL COCC 1-135	*P. quatuordecimpunctata*	Brodsko Vinogorje	10.5.1954	leg. nesc.
PMF EZ COL COCC 1-136	*P. quatuordecimpunctata*	Ježevo	5.5.1973	leg. nesc.
PMF EZ COL COCC 1-137	*P. quatuordecimpunctata*	Ježevo	5.5.1973	leg. nesc.
PMF EZ COL COCC 1-138	*P. quatuordecimpunctata*	Ježevo	5.5.1973	leg. nesc.
PMF EZ COL COCC 1-139	*P. quatuordecimpunctata*	Ježevo	13.6.1973	leg. nesc.
PMF EZ COL COCC 1-140	*P. quatuordecimpunctata*	Ježevo	23.6.1973	leg. nesc.
PMF EZ COL COCC 1-141	*P. quatuordecimpunctata*	Ježevo	3.7.1973	leg. nesc.
PMF EZ COL COCC 1-142	*P. quatuordecimpunctata*	Ježevo	3.7.1973	leg. nesc.
PMF EZ COL COCC 1-143	*P. quatuordecimpunctata*	Ježevo	3.7.1973	leg. nesc.
PMF EZ COL COCC 1-144	*P. quatuordecimpunctata*	Ježevo	3.7.1973	leg. nesc.
PMF EZ COL COCC 1-145	*P. quatuordecimpunctata*	Ježevo	3.7.1973	leg. nesc.
PMF EZ COL COCC 1-146	*P. quatuordecimpunctata*	Ježevo	3.7.1973	leg. nesc.
PMF PD COCC 1-23	*P. quatuordecimpunctata*	Krško	7.7.1979	Durbešić P.
PMF PD COCC 1-24	*P. quatuordecimpunctata*	Krško	26.6.1980	Durbešić P.
PMF PD COCC 1-25	*P. quatuordecimpunctata*	Krško	17.7.1980	Durbešić P.

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PMF EZ COL COCC 1-147	*P. quatuordecimpunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-148	*P. quatuordecimpunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-149	*P. quatuordecimpunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-150	*P. quatuordecimpunctata*	Lonjsko polje	1990	Ćurić
PMF EZ COL COCC 1-151	*P. quatuordecimpunctata*	Lonjsko polje, Vulpinec	14.6.1990	Ćurić
PMF PD COCC 1-26	*P. quatuordecimpunctata*	Mirna, brickworks	9.5.1980	Durbešić P.
PMF PD COCC 1-27	*P. quatuordecimpunctata*	Mirna, brickworks	9.5.1980	Durbešić P.
PMF PD COCC 1-28	*P. quatuordecimpunctata*	Sabljaci	3.6.1969	Durbešić P.
PMF PD COCC 1-29	*P. quatuordecimpunctata*	Mirna, Rušnjak (Roželija)	9.5.1980	Durbešić P.
PMF PD COCC 1-30	*Psyllobora vigintiduopunctata*	Male Krće	20.7.1970	Durbešić P.
PMF PD COCC 1-31	*P. vigintiduopunctata*	Modro oko, Neretva	8.11.1997	Durbešić P. & Vujčić - Karlo S.
PMF PD COCC 1-32	*P. vigintiduopunctata*	Mirna, ispod Motovuna	9.5.1980	Durbešić P.
PMF EZ COL COCC 1-152	*Scymnini*	Prelošica	12.6.1990	leg. nesc.
PMF PD COCC 1-33	*Scymnini*	Motovun forest	9.5.1980	Durbešić P.
PMF PD COCC 1-34	*Scymnini*	Krško	31.3.1978	Durbešić P.
PMF EZ COL COCC 1-153	*Subcoccinella vigintiquatuorpunctata*	Daruvar	20.5.1960	leg. nesc.
PMF EZ COL COCC 1-154	*S. vigintiquatuorpunctata*	Daruvar	1.7.1969	leg. nesc.
PMF EZ COL COCC 1-155	*S. vigintiquatuorpunctata*	Daruvar	5.10.1969	leg. nesc.
PMF EZ COL COCC 1-156	*S. vigintiquatuorpunctata*	Ježevo	2.6.1973	leg. nesc.
PMF EZ COL COCC 1-157	*S. vigintiquatuorpunctata*	Lonjsko polje	1990	Ćurić
PMF PD COCC 1-35	*S. vigintiquatuorpunctata*	Mirna, ispod Motovuna	9.5.1980	Durbešić P.
PMF PD COCC 1-36	*S. vigintiquatuorpunctata*	Gornja Kustošija, Zagreb	8.5.1989	Durbešić P.
PMF PD COCC 1-37	*S. vigintiquatuorpunctata*	Gornja Kustošija, Zagreb	14.5.1990	Durbešić P.
PMF EZ COL COCC 1-158	*S. vigintiquatuorpunctata*	Slunj	6.6.1969	leg. nesc.
PMF EZ COL COCC 1-159	*Tytthaspis sedecimpunctata*	Daruvar	1.9.1969	leg. nesc.
PMF EZ COL COCC 1-160	*T. sedecimpunctata*	Daruvar	1.9.1969	leg. nesc.
PMF PD COCC 1-38	*T. sedecimpunctata*	Roč	9.5.1980	Durbešić P.

Moreover, individuals of these species are among the most common incidental finds during other research that does not specifically target coccinellids but is associated with this habitat type (B. Horvatić & M. Zadravec, pers. obs.). Out of 22 identified species, 11 recorded species inhabit grasslands, and fields. The most frequently recorded species in those habitats are *C. septempunctata*, *H. variegata*, *Propylea quatuordecimpunctata*, *Psyllobora vigintiduopunctata*, *Subcoccinella vigintiquatuorpunctata* and *Tythaspis sedecimpunctata*. The remaining 11 species prefer deciduous and coniferous trees and shrubs (Nedvěd, 2015; Roy *et al.*, 2018; Nedvěd & Djurić, 2022). Most samples were taken from May to July, which is the preferable period for Coccinellidae field research.

Coccinella septempunctata is the most common and widespread species of the Croatian ladybird fauna (Horvatić, 2017). It feeds on a variety of food, including aphids, but sometimes on small soft-bodied insects and pollen, if the main food source is scarce (Nedvěd, 2015). It also inhabits a wide variety of habitats which gives it an advantage over some more food- or habitat- specialist species and contributes to its widespread distribution (Hodek & Michaud, 2008; Nedvěd, 2015). It is one of the largest

representatives of the Croatian ladybird fauna and is quite easy to recognize. All this can, at least partially, explain its presence in the collection. In addition, sweep netting is usually performed on herbaceous plants in grasslands, where aphids can be prolific, thus the predatory *C. septempunctata* is often found there. *Hippodamia tredecimpunctata*, the second most abundant species in this collection, lives in wet meadows and on the banks of water bodies in fields, and is mostly found in lowlands (Nedvěd, 2015). Therefore, it is not surprising that most of the findings were collected from Lonjsko polje Nature Park, which is one of the largest and best preserved natural floodplains in Europe (Schneider-Jacoby & Ern, 1993). Systematic research in Lonjsko polje was carried out during one vegetation season and covered a wide range of habitats. *Anisosticta novemdecimpunctata* is also a wetland specialist. It lives on emerged aquatic vegetation, including reeds and reedmace, grasslands in marshy or wet habitats (Nedvěd, 2015; Roy *et al*., 2018). Thus, Lonjsko polje Nature Park, the only place where it has been collected, is the perfect habitat. Since there are only few records of this species, and only one individual was recorded during intensive fieldwork in the last five years (B. Horvatić, pers. obs.), findings of this species are of exceptional importance. It is important to mention the larger number of findings of *Adalia bipunctata*, a species once considered widespread with many findings throughout Croatia (Horvatić, 2017), while today it is found sporadically in rather few locations (B. Horvatić, pers. obs.). Due to the small number of specific studies, it is not possible to assert with certainty the cause of the sudden decline in the number of these and other species. However, it can be assumed that the drying out of wetlands (Radović *et al*., 2012), the ever-intensifying climate change, and competition from the widespread invasive species *Harmonia axyridis* over the past 12 years (Horvatić *et al*., 2018), and possibly other pressures and threats, have had a detrimental impact on the number of native ladybird species and their population sizes.

The Scymnini is poorly researched in Croatia: the identification of old collected material is difficult and the specimens are old while the possibility of successful non-destructive extraction of genitalia is greatly diminished, if not impossible. This presents a problem, but also an opportunity – the potential for newer, modern methods of identification, such as DNA barcoding. This method can shine a new light on old work and has already proven to be successful with old beetle collection material (Asghar *et al*., 2015).

In conclusion, future research efforts to complement the overall knowledge on ladybird fauna are recommended. For this reason, it is necessary to revise and publish data from museum collections in order to complete the knowledge about the distribution and composition of ladybird species in Croatia. Also, due to the great value of the Division of Zoology Collection (Faculty of Science, Department of Biology, Zagreb), it is important that the cataloguing of many specimens deposited in the Collection continues in the future.

ACKNOWLEDGEMENTS

Our gratitude to the two anonymous reviewers for their helpful comments.

Received November 29, 2022

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SAŽETAK

Katalog entomološke zbirke Zoologijskog zavoda Prirodoslovno-matematičkog fakulteta u Zagrebu, zbirka porodice Coccinellidae (Coleoptera)

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Entomološke zbirke neprocjenjiv su izvor podataka glede raznolikosti vrsta i bioraznolikosti određenog vremena. U Zbirci Zoologijskog zavoda Biološkog odsjeka Prirodoslovno-matematičkog fakulteta u Zagrebu zabilježeno je 198 jedinki 24 svojte božjih ovčica iz pet tribusa. Pri tome je preko 50 primjeraka po prvi puta determinirano, a za pet primjeraka je ispravljena determinacija. Tri primjerka nije bilo moguće determinirati na razinu nižu od potporodice, a jednog primjerka nije bilo moguće determinirati na razinu nižu od roda. Najviše je primjeraka vrsta *Coccinella septempunctata* Linnaeus, 1758 (59 primjeraka, 12 lokacija) i *Hippodamia* (*Hemisphaerica*) *tredecimpunctata* Linnaeus, 1758 (40 primjeraka, četiri lokaliteta). Jedinke iz zbirke prikupljene su na 35 lokaliteta od lipnja 1953. do studenog 1997. te u rasponu nadmorskih visina od deset do 1031 m, a najveći broj zabilježenih vrsta je iz intervala 10–199 m. U zbirci je prisutno i nekoliko primjeraka sakupljenih u Sloveniji i jedna iz Crne Gore. Zbog velikog znanstvenog i edukacijskog značaja zbirki, preporuča se daljnja obrada materjiala entomološkog dijela Zbirke Zoologijskog zavoda.