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COCCINELLIDAE (COLEOPTERA) OF MOIST MEADOWS ON THE  
MAZOVIAN LOWLAND

## ABSTRACT

Species composition and structure of *Coccinellidae* communities were examined on 4 moist meadows (*Arrhenatheretum medioeuropaeum*) of the Mazovian Lowland. Altogether 10 *Coccinellidae* species were recorded to occur in the studied habitat. An average abundance index of the community amounted to 0.37 individuals per sweep-net sample. The dominating species was *Calvia quatordecimpunctata* and, locally, *Tytthaspis sedecimpunctata*. The communities of ladybirds on the studied moist meadows of the Mazovian Lowland were compared to those of mountain meadows as well as to the communities dwelling on Warsaw urban lawns. Warsaw greens, alike the moist meadows, are located on sites of a potential linden-oak-hornbeam forest (*Tilio-Carpinetum*).

## INTRODUCTION

Fifty-eight ladybird species have been so far reported from the Mazovian Lowland (Czechowska, Bielawski 1981). More than half (52%) of these species develop in the canopy of tress and shrubs, whereas less than one-third (29%) of the species live exclusively on herbage. 19% of all the ladybirds reveal a wide-range adaptability, permitting for their existence in all the plant layers.

Among *Coccinellidae* dwelling on communities of herbaceous plants, certain species may be particularly abundant in anthropogeneous environments, i.e. on crop fields, in gardens, parks and ruderal biotopes.

Moist meadows (*Arrhenatheretum medioeuropaeum*) also rank among habitats subject to permanent human control. Their subsistence depends on a regular mowing or grazing and fertilization. These treatments, however, have an unfavourable effect on the development of abundant populations on ladybirds. The available papers on meadow entomofauna (Boness 1953, Doskočil, Hůrka 1962) supply only scanty data on ladybirds. Certain information on *Coccinellidae*



of meadows and pastures may also be drawn from the faunistic studies by Bielawski (1971, 1978), examining the regions of the Bieszczady and Pieniny Mountains.

#### STUDY AREA, METHODS, MATERIAL

All the studied moist meadows were located in the vicinity of Warsaw (within a radius of 60 km), in the following localities: Klembów, Chylice, Zbroszki and Białoleka Dworska. The last is a suburban district of Warsaw. The studies at Białoleka Dworska were carried out in 1976–1977, while on the remaining meadows in 1980–1984. The longest, three-year research was conducted at Chylice (1981–1983). The studies at Klembów (1980–1981) and Zbroszki (1983–1984) lasted for two years.

The floristic composition of the examined meadows was typical of the association of the rye grass meadow *Arrhenatheretum medioeuropaeum*. The particular sites were overgrown mainly with various species of grasses. The proportion of perennial plants was low, especially on the newly set meadows at Klembów and Zbroszki. A relatively abundant composition of grasses and herbs was noted on the meadow at Chylice. This meadow was different from all the others also with regard to peculiar soil conditions, marked for high fluctuations of the ground water level and the alkaline soil reaction caused by liming (Kotowska, Okołowicz 1989).

The examined meadows differed in the form of their management. The meadow at Chylice was a mown one, those at Klembów and Białoleka Dworska were mown and grazed meadows, whereas that at Zbroszki — the intensively pastured meadow.

Insects were captured by entomological net every 7 days. Every sampling series included 10 sweep-net samples of 25 individual sweeping each. The collected material amounted to 627 imagines and 200 larvae of *Coccinellidae*. About 78% of the sampled material came from the meadow at Chylice, the remaining three sites contributing jointly 22%.

Ladybird abundance was denoted by means of an index calculated as the number of individuals per one sample (25 sweepings).

#### SPECIES COMPOSITION AND COMMUNITY ABUNDANCE

A total of ladybird species were recorded on the four examined moist meadows (Tab. 1), what accounts for 17% of *Coccinellidae* fauna of the Mazovian Lowland (Czechowska, Bielawski 1981).

Six ladybird species were recorded to occur at each plot. The species of the



Table 1. Species composition and abundance of *Coccinellidae* of moist meadows on the Mazovian Lowland (n — abundance index, % — proportion)

No.	Plot	Klembów		Białoleka		Chylice		Zbroszki	
		n	%	n	%	n	%	n	%
1	<i>Subcoccinella vigintiquatuor-punctata</i> (L.)	—	—	—	—	—	—	0.01	3.8
2	<i>Scymnus haemorrhoidalis</i> Herbst.	0.01	4.2	0.01	4.0	—	—	—	—
3	<i>Hippodamia tredecimpunctata</i> (L.)	—	—	—	—	0.01	1.3	—	—
4	<i>Adonia variegata</i> (Goeze)	—	—	—	—	—	—	0.01	3.8
5	<i>Tytthaspis sedecimpunctata</i> (L.)	0.02	8.3	0.03	12.0	0.59	75.6	—	—
6	<i>Coccinella septempunctata</i> L.	0.03	12.5	0.04	16.0	0.07	8.9	0.05	19.3
7	<i>Coccinella quinquepunctata</i> L.	0.01	4.2	—	—	0.01	1.3	0.02	7.7
8	<i>Coccinella undecimpunctata</i> L.	—	—	0.01	4.0	—	—	—	—
9	<i>Coccinula quatuordecimpustulata</i> (L.)	0.02	8.3	0.02	8.0	0.01	1.3	0.02	7.7
10	<i>Calvia quatuordecimpunctata</i> (L.)	0.15	62.5	0.14	56.0	0.09	11.5	0.15	57.7
Total		0.24		0.25		0.78		0.26	

greatest constancy of occurrence were: *Calvia quatuordecimpunctata*, *Coccinella septempunctata* and *Coccinula quatuordecimpustulata*. These species were sampled from all the plots in each year of the studies. Somewhat less constant were *Coccinella quinquepunctata* and *Tytthaspis sedecimpunctata*. They were sampled at 3 plots. Each of the remaining 5 species was recorded to occur on one of the studied meadows only.

An average abundance index of meadow communities of ladybirds amounted to 0.37. The value of the index ranged 0.24–0.78 at particular plots (Tab. 1).

The abundance of the ladybird communities on the meadows at Klembów, Białoleka Dworska and Zbroszki were much alike and figured out at 0.24, 0.25 and 0.26, respectively. The species pronouncedly dominating there was *Calvia quatuordecimpunctata*, accounting for about 60% of each community (Tab. 1, Fig. 1). The second most numerous species was *Coccinella septempunctata*. Its proportion ranged from 12.5 to 19.3%.

The abundance index of ladybirds on the meadow at Chylice amounted to 0.78, so its value was three times higher than those estimated for the remaining meadows. The community of this meadow differed also with respect to its dominance structure. The species most numerously occurring there was *Tytthaspis sedecimpunctata* (75.6%). Single individuals of these ladybirds were also collected at Klembów and Białoleka Dworska. *Calvia quatuordecimpunctata* (11.5%)



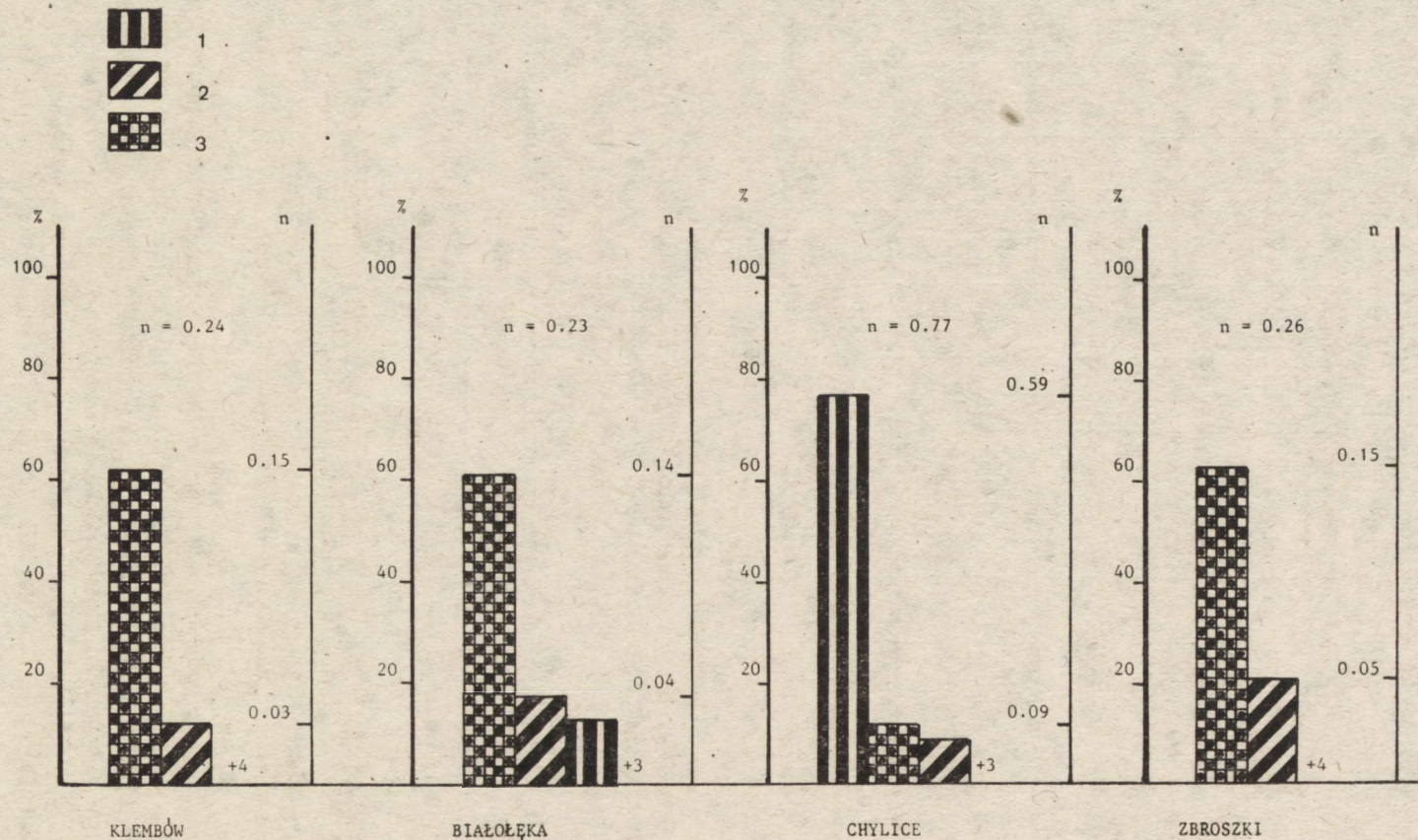


Fig. 1. Dominance structures of *Coccinellidae* communities on the studied moist meadows on the Mazovian Lowland



and *Coccinella septempunctata* (8.9%) were the subdominants on the meadow at Chylice.

From among 200 larvae collected, 162 individuals came from Chylice, 34 from Zbroszki, and 4 from Klembów. A majority of the larvae swept on the meadow at Chylice belonged to the fungivorous species *Tytthaspis sedecimpunctata* though in 1982 season numerous larvae of predatory ladybirds also occurred in the samples. The larvae of predatory species coming from all the other three meadows were identified mainly as *Calvia quatuordecimpunctata* and *Coccinella septempunctata*.

The dominance structure of the meadow ladybird communities was little diversified. Usually one species prevailed quantitatively, which attested to a homogeneity of site conditions in the studied habitats (Fig. 1).

#### ECOLOGICAL COMPOSITION OF THE COMMUNITIES

**Ecological amplitude and habitat requirements.** Depending on a potential range of ecological amplitude, the species reported from the meadows may be divided into three groups, namely, eurytopes, polytopes and oligotopes.

Eurytopes include the species of the widest amplitude, which may occur both in open as well as in wooded habitats. *Calvia quatuordecimpunctata* and *Coccinella septempunctata*, accounting for 48.6% of all the sampled material, were ordered to this group. The two species in question rank among the most common ladybirds all over Poland. Despite their wide ecological amplitude, they differ in their habitat preferences. *Calvia quatuordecimpunctata* inhabits all the vegetation layers in a majority of Polish habitats. However, it clearly avoids coniferous tree stands (Bielawski 1971, Czechowska 1981). Unlike the former species, *Coccinella septempunctata* is primarily a herb layer species. Its imagines may also be found on trees, yet the larvae are most likely to develop solely on herbaceous plants (Bielawski 1961).

The group of polytopes include the species which occur in various habitats of a certain category, e.g. the wooded or the open areas. Five species were classified to this group, namely, *Hippodamia tredecimpunctata*, *Adonia variegata*, *Tytthaspis sedecimpunctata*, *Coccinella quinquepunctata* and *C. undecimpunctata*. They accounted for 45.9% of the material collected on meadows. The aforelisted species are bound to open habitats, such as fields, meadows, pastures, clearings and glades, fallows, roadside ditches, etc. From among the polytopes mentioned above, *Coccinella quinquepunctata* has the widest ecological amplitude, being found in all the open biotopes. *Adonia variegata* and *Tytthaspis sedecimpunctata* are the species most frequently found in the habitats of a grass-sward character. The habitats preferred by *Hippodamia tredecimpunctata* are waterlogged meadows and shrubberies in the vicinity of stagnant waters.



*Coccinella undecimpunctata* is a rare species, hence it is difficult to define precisely its habitat preferences. Single individuals were sampled on lawns and lindens in Warsaw (Czechowska 1981). Larger populations of these ladybirds were reported from plantations of fennel (*Foeniculum capillaceum*) in the vicinity of Poznań (Obarski 1960, 1961). According to data supplied in foreign literature (Semjanov 1965, Benham, Muggleton 1970), the species in question is likely to be associated with dry sandy habitats.

The group of oligotopes include the species occurring either in open or in wooded habitats, yet depending on a certain ecological factor, e.g. temperature, humidity or host plant. The following species were ordered to this group: *Subcoccinella vigintiquatuor punctata*, *Scymnus haemorrhoidalis* and *Coccinula quatuordecimpustulata*. They accounted for 5.4% of all the individuals sampled on the meadows.

*Scymnus haemorrhoidalis*, according to Polish literature (Bielawski 1971, 1978, Stebnicka 1972), lives mainly on trees and shrubs in humid habitats. Foreign authors (Semjanov 1965, Klausnitzer 1971) reported the species also from wet meadows.

*Coccinula quatuordecimpustulata* is a species typical of arid and warm sward habitats. It may occur also in the herb layer of warm, wooded habitats, e.g. in pine forests (Czechowska 1981).

The occurrence of *Subcoccinella vigintiquatuor punctata* depends on the presence of host plants. The species inhabits primarily crop fields (of alfalfa, clover, sugar beets and mangels) and meadows, yet it may also be found in other habitats, both open as well as wooded ones.

Humidity requirements. A majority of species reported from the meadows are common in various open habitats. The communities of *Coccinellidae* occurring there frequently exhibit a similar qualitative composition yet they differ in quantitative structure (Tab. 2). One of the significant factors modifying the proportions of particular species is the microclimate of a given habitat. Even species of a greatest adaptability have a range of temperature and humidity optimum for their development, and, consequently, in some habitats they occur in larger numbers than in others.

*Hippodamia tredecimpunctata* is marked for its preference of very humid habitats, *Calvia quatuordecimpunctata* and *Scymnus haemorrhoidalis* — for humid habitats, while *Coccinella septempunctata* — for slightly humid ones.

*Coccinula quatuordecimpustulata* and *Tytthaspis sedecimpunctata* are markedly xerophilous ladybirds. Also *Adonia variegata* exhibits a preference for dry sites.

*Subcoccinella viginquatuor punctata* and *Coccinella quinquepunctata* are euryhygrophilous species. These ladybirds live both in dry and humid habitats, though the latter species, occurring in a humid habitat, stays in rather more insolated places (Bielawski 1971).

Hygrophilous species (*Calvia quatuordecimpunctata* and *Coccinella septem-*



Table 2. Humidity-due changes in the proportions % of particular species in *Coccinellidae* communities on various communities of herbaceous plants

No.	Habitat	Alphalpa crop fields (Bańko- wska et al. 1975)	Moist meadows at Klembów, Białoleka Dworska and Zbroszki	Humid urban lawns	Tempora- rily arid moist meadows in Chylice	Arid urban lawns	Dry sward on the suburbs of Warsaw (Biela- wski 1961)
1	<i>Calvia quatuordecim- punctata</i>	62.7	59.0	34.5	8.9	7.4	8.9
2	<i>Coccinella septempunc- tata</i>	21.3	16.0	31.0	11.5	20.4	2.2
3	<i>Tytthaspis sedecim- punctata</i>	2.8	6.4	13.8	75.6	33.3	24.0
4	<i>Coccinula quatuor- decimpustulata</i>	6.7	8.0	3.5	1.3	29.6	51.0
5	<i>Coccinella quinque- punctata</i>	—	4.0	10.3	1.3	1.9	0.5
6	<i>Adonia variegata</i>	2.1	1.0	—	—	3.0	0.5
7	<i>Hippodamia tredecim- punctata</i>	3.5	—	—	1.3	1.9	—
8	<i>Coccinella undecim- punctata</i>	—	+	—	—	1.9	—
	Other species	—	5.6	6.9	—	1.5	12.9

*punctata*) prevail quantitatively in the communities of ladybirds on the meadows at Klembów, Zbroszki and Białoleka Dworska. They accounted for 76% of the abundance of each of the studied communities.

As regards their structure and qualitative composition, the communities of ladybirds at the plots mentioned above much resembled those recorded on the alphalpa fields (Bańkowska *et al.* 1975). Thus, such a ladybird community structure is probably characteristic of the plant communities of almost homogeneous microclimatic conditions of fairly exuberant, dense vegetation and moderately humid (Tab. 2).

On the other hand, site conditions of the meadow at Chylice were most variable. The meadow was situated on areas marked for strong fluctuations of the ground water level, hence it had a tendency to dry up, especially in periods of draught. Due to these habitational peculiarities, the ladybird community of this meadow was noted for the prevalence of *Tytthaspis sedecimpunctata*, i.e. a species characteristic of xerothermal swards.

Nutritive requirements. The ladybird species reported from the studied



meadows included 1 herbivorous species, 1 fungivorous species and 8 aphidophagous species.

*Subcoccinella vigintiquatuorpunktata* is a herbivorous ladybird. It is most frequently found on *Papilionaceae*, mainly on alfalfa and clover. It may also feed on plants of the families *Caryophyllaceae*, *Asteraceae* and *Chenopodiaceae* (Tanasijevic 1958, Klausnitzer, Klausnitzer 1979). The sampled material included only single individuals of this species.

*Tytthaspis sedecimpunctata* is a fungivorous species. These ladybirds feed on lower fungi, especially on powdery mildews (*Erysiphaceae*) (Turian 1969), which develop frequently in mass quantities on aboveground parts of plants. It is not unlikely that *Tytthaspis sedecimpunctata* also feeds on aphids of the species *Aphis gossypii frangulae* Glov. (Klausnitzer, Klausnitzer 1979). The discussed species accounted for 43.2% of the entire material sampled on the meadows.

The remaining species ranked among aphidophages, feeding on various species of aphids infesting meadow herbaceous plants. Aphidophagous ladybirds accounted for 56.7% of the collected individuals.

#### EFFECT OF MOWING AND GRAZING ON THE COMMUNITY ABUNDANCE

Abundance of *Coccinellidae* on meadows is usually very low. Regular mowing or grazing prevents numerous occurrences of ladybirds there, since together with the removed vegetation, also aphids and lower fungi, i.e. the potential food resource for ladybirds, perish. Furthermore, pre-imaginal forms of ladybirds perish as well, by the reason of which the flight of a local ladybird generation is not accomplished (Boness 1953).

The studied meadows were subjected to various types of utilization, however, it did not cause any significant effect on the abundance of meadow communities of *Coccinellidae*. The values of the abundance index were approximately the same for both the mown-grazed meadows (Klembów, Białołęka Dworska) as well as the grazed one (Zbroszki) (Tab. 1).

An unfavourable effect of mowing on the ladybird abundance was observed on the meadow at Chylice. The ladybird abundance index for 1981 and 1982, i.e. for the years when the meadow was mown three times a season, amounted to 0.29 and 0.34 respectively. The estimated values approximated those calculated at the plots in Białołęka Dworska, Klembów and Zbroszki.

However, in 1983 a greater community abundance was noted. Due to draught and slight grass upgrowth, the meadow was not subject to second mowing in this season. Consequently, under these conditions there could have been completed the full development cycle of the ladybirds living on this meadow (mainly of *Tytthaspis sedecimpunctata*), and the brood of a new generation could have been accomplished. The abundance index of ladybirds in this season amounted to 1.69, and its value was 5 times higher than in the previous years.



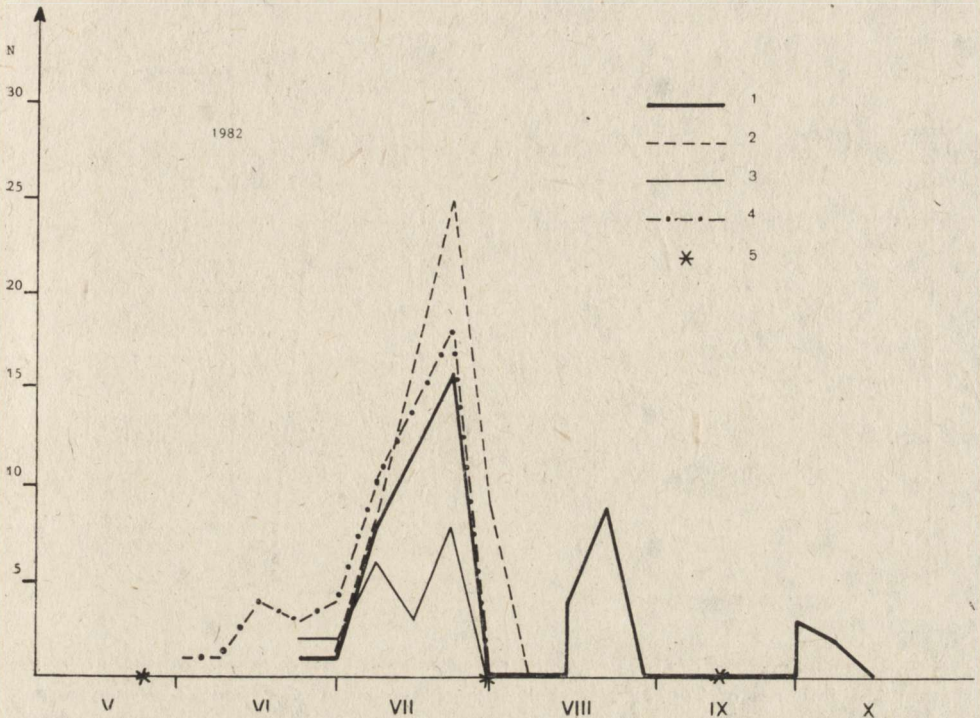


Fig. 2. Seasonal dynamics of *Coccinellidae* on the meadow at Chylice mown three times over the season: 1 — imagines of *Tytthaspis sedecimpunctata*, 2 — larvae of *Tytthaspis sedecimpunctata*, 3 — imagines of predatory ladybirds, 4 — larvae of predatory ladybirds, 5 — terms of mowings, N — number of individuals

The first and the second mowing are of decisive significance to the ladybird community abundance and the course of seasonal dynamics (Figs 2 and 3).

The first mowing, usually falling on the turn of May and June, concurs with the time when ladybirds disperse from their wintering places to their proper habitats and intensively penetrate these sites in searching for food. The removal of vegetation from meadows at that time causes that ladybirds already present there fly away to adjacent areas and the rate of increase in the community abundance is inhibited for a long time. No sooner than 2–4 weeks later, i.e. when grasses are lush again, a gradual increase in the number of the swept imagines and larvae was observed. An increment of the ladybird abundance continued up to the time of the second mowing. This mowing, falling on the turn of July and August, brought about an irrevocable breakdown of the community dynamics of predatory ladybirds and a considerable fall in the abundance of herbivorous *Tytthaspis sedecimpunctata* (Fig. 2). It was associated with the perishment of larvae, removal of nymphs (with hay) and ultimate dispersal of imagines.



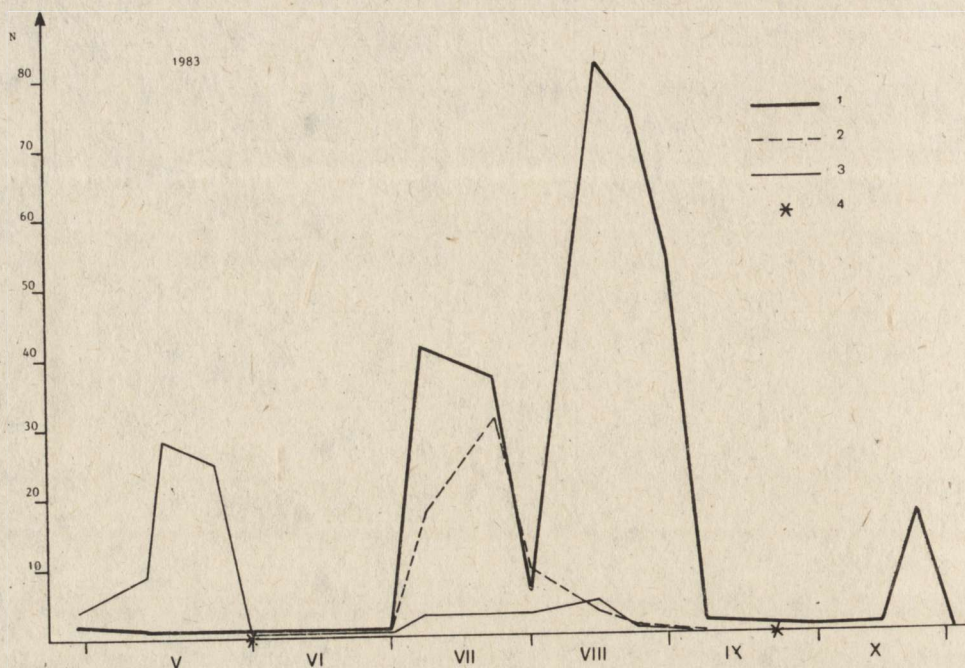


Fig. 3. Seasonal dynamics of *Coccinellidae* on the meadow at Chylisce mown two times over the season: 1 — imagines of *Tytthaspis sedecimpunctata*, 2 — larvae of *Tytthaspis sedecimpunctata*, 3 — imagines of predatory ladybirds, 4 — terms of mowings, N — number of individuals

#### COMPARISON OF COMMUNITIES ON LOWLAND AND HIGHLAND MEADOWS

The ladybird fauna of Polish grasslands was most thoroughly studied on highland meadows in the Bieszczady and Pieniny Mountains (Bielawski 1971, 1978).

Bieszczady meadows and pastures are set on former croplands, in habitats of a linden-oak-hornbeam forest (*Tilio-Carpinetum*). As regards their phytosociological status, they rank among the communities of the type *Arrhenatheretum* at various succession stages (Zarzycki 1971).

Six ladybird species were reported from these areas (Tab. 3). The species most numerous occurring there were: *Coccinella quinquepunctata* and *Coccinula quatuordecimpunctata*.<sup>1</sup> All the species reported from the meadows in the Bieszczady were found on the meadows of the Mazovian Lowland. The qualitative simi-

<sup>1</sup> As the abundance of ladybirds in the studied environments in the Bieszczady and Pieniny Mountains was very low, the author did not provide accurate number values, yet only roughly estimated which species occurred most abundantly.



Table 3. Comparison of *Coccinellidae* species composition on meadows of the Mazovian Lowland and on highland meadows of the Bieszczady and Pieniny Mountains (+ + — the most abundant species in the community)

No.	Region	Mazovian Lowland	Bieszczady (Bielawski 1971)	Pieniny (Bielawski 1978)
	Species			
1	<i>Subcoccinella vigintiquatuorpunctata</i> (L.)	+	+	+
2	<i>Scymnus haemorrhoidalis</i> Hbst.	+	—	—
3	<i>Scymnus redtenbacheri</i> Muls.	—	—	+ +
4	<i>Hippodamia tredecimpunctata</i> (L.)	+	—	+
5	<i>Adonia variegata</i> (Goeze)	+	+	+
6	<i>Semiadalia notata</i> (Lach.)	—	—	+
7	<i>Semiadalia undecimnotata</i> (Schn.)	—	—	+
8	<i>Tytthaspis sedecimpunctata</i> (L.)	+ +	—	—
9	<i>Adalia bipunctata</i> (L.)	—	—	+
10	<i>Coccinella septempunctata</i> L.	+ +	+	+ +
11	<i>Coccinella quinquepunctata</i> L.	+	+ +	—
12	<i>Coccinella undecimpunctata</i> L.	+	—	—
13	<i>Coccinula quatuordecimpustulata</i> (L.)	+	+ +	—
14	<i>Calvia quatuordecimpunctata</i> (L.)	+ +	+	+
15	<i>Psyllobora vigintiduopunctata</i> (L.)	—	—	+

larity of the compared ladybird communities, calculated on the basis of Sørensen formula, was very high and amounted to 75%.

In the Pieniny Mountains two types of meadows are found, namely, the Pieniny meadow (*Anthylli-Trifolietum*) and the herbaceous meadow (the community with *Veratum lobelianum* and *Laserpitium latifolium*). These two types of meadows develop in the habitat of the Carpathian beech (*Fagetum carpathicum typicum*) (Pancer-Kotejowa, Zarzycki 1976).

Apart from random species, altogether 10 ladybird species occur on these meadows (Tab. 3). The species most abundantly occurring on the two types of meadows was *Coccinella septempunctata*. Moreover, on the herbaceous meadow fairly abundant populations were recorded of *Adonia variegata* and *Psyllobora vigintiduopunctata*. The following species were reported as rare from the studied meadows: *Scymnus redtenbacheri*, *Semiadalia notata* and *S. undecimnotata*.

The qualitative similarity of the ladybird communities on the Mazovian Lowland and the meadows in the Pieniny amounted to 50%. The species common for the ladybird communities of these two habitats included: *Subcoccinella vigintiquatuorpunctata*, *Hippodamia tredecimpunctata*, *Adonia variegata*, *Coccinella septempunctata* and *Calvia quatuordecimpunctata*. Except for *Hippodamia tredecimpunctata*, all the aforementioned species were common for meadow habitats of all the three regions under comparison.

The compared communities differed in the dominance structure and, to some



extent, also in their qualitative structure. However, the dominating species always included common ladybirds of wide ecological amplitude, such as: *Adonia variegata*, *Coccinella septempunctata*, *Coccinella quinquepunctata* or *Calvia quatuordecimpunctata*.

#### COMPARISON OF THE COMMUNITIES ON THE MOIST MEADOWS AND WARSAW URBAN LAWNS

Warsaw urban greens occupy, in their overwhelming majority, areas homologous to the habitats of a linden-oak-hornbeam forest (*Tilio-Carpinetum*). The total area of Warsaw greens amounts to about 12 thousand hectares, out of which almost 70% are man-managed and shaped lawns (Kowalska 1979).

The largest grassland areas are situated in parks and modern housing estates. As regards their phytosociological classification, these lawns correspond to fertile pastures of the alliance Cynosurion (Wysocki et al. 1979, Nowakowski 1981).

In the course of the studies carried out on several dozen years old lawns in one of Warsaw housing estate in 1983–1984, 10 ladybird species were recorded to occur there (Tab. 3). An average abundance index amounted to 0.42, its value approximating those calculated for the moist meadows. The species occurring in the greatest numbers were: *Coccinella septempunctata*, *Coccinula quatuordecimpustulata*, *Tytthaspis sedecimpunctata* and *Calvia quatuordecimpunctata*.

As compared to homologous country habitats, the urban areas are marked for a smaller soil moisture content. Owing to a low level of ground water and draining off precipitation waters, most open lawns are subject to rapid loss of humidity and xerothermication. Hence the microclimate of these environments greatly depends on weather conditions and the frequency of mowing and watering. The dominance structures of *Coccinellidae* communities change according to actual alternations in the habitational conditions on the lawns.

Structures of extremely different quantitative relationships were observed on lawns of lush and dense grass and on arid lawns of low vegetation. On the former, marked for a more humid microclimate, *Calvia quatuordecimpunctata* and *Coccinella septempunctata* dominated, similarly as in the case of the meadows at Klembów, Białoleka Dworska and Zbroszki. However, the proportions of *Calvia quatuordecimpunctata* in the urban communities were much lower than in the meadow ones. As compared to meadows, the following species had higher proportions in the communities of urban lawns: *Coccinella septempunctata*, *Tytthaspis sedecimpunctata* and *Coccinella quinquepunctata* (Tab. 3).

The species dominating on arid lawns of low vegetation were *Coccinula quatuordecimpustulata* and *Tytthaspis sedecimpunctata*. Due to a large proportion of xerophilous species, the community of this habitat, as well as the community of the meadow at Chylice, resembled those occurring in the habitat of dry swards (Bielawski 1961) (Tab. 3).



Apart from the lawns situated in parks and housing estates, also streetside lawns may be found in the city. They are marked for damaged and impoverished vegetation. The brink parts of these lawns often resemble xerophilous sandy swards of the class *Sedo-Sclerantea*. The abundance of *Coccinellidae* in this habitat is extremely low. *Coccinula quatuordecimpustulata* was the species relatively most frequently found there. Furthermore, other species occurring there included: *Coccinula rufa*, *Rhysobius litura* and *Scymnus mimulus mimulus* (Czechowska, Bielawski 1981).

#### SUMMARY

*Calvia quatuordecimpunctata*, *Coccinella septempunctata* and *Coccinula quatuordecimpustulata* were the species of the greatest constancy of occurrence in the *Coccinellidae* communities of the moist meadows on the Mazovian Lowland. The dominant species was *Calvia quatuordecimpunctata*, and locally, also *Tytthaspis sedecimpunctata*.

The dominance structure of the meadow ladybird communities was little diversified. Usually one species prevailed quantitatively, which attests to homogeneity of the site conditions in the studied habitats.

The abundance of meadow communities of *Coccinellidae* was, on the whole, small. The removal of vegetation, either by mowing or grazing, leads up to depletion of food resources as well as perishment of ladybird development stages, i.e. eggs, larvae and nymphs. As regards mown meadows, the mid-summer mowing is a factor of a decisive significance to the abundance of ladybird communities. The removal of vegetation at this time precludes development of the brood of a local population of ladybirds.

The communities of ladybirds dwelling on moist meadows lack species characteristic exclusively of this type of habitat. The association of species found there occurs on various other communities of herbaceous plants. However, depending on local habitat conditions, the communities differ in the proportions of particular species and their constancy.

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## COCCINELLIDAE (COLEOPTERA) ŁĄK ŚWIEŻYCH NIZINY MAZOWIECKIEJ

## STRESZCZENIE

Badania przeprowadzono na 4 łąkach świeżych (*Arrhenatheretum medioeuropaeum*) w miejscowościach Klembów, Białoleka Dworska, Chylice i Zbroszki, położonych w promieniu ok. 60 km od Warszawy. Materiał zbierano w latach 1976–1977 i 1980–1984. Odłowy prowadzono za pomocą czerpaka entomologicznego. Zebrano 627 okazów imagines i 200 larw.

Łącznie w badanych środowiskach stwierdzono 10 gatunków biedronek. Najbardziej stałymi elementami w faunie łąkowej były *Calvia quatuordecimpunctata*, *Coccinella septempunctata* i *Coccinula quatuordecimpustulata*. Gatunkiem dominującym był *Calvia quatuordecimpunctata*, lokalnie *Tytthaspis sedecimpunctata*.

Liczebność łąkowych zgrupowań *Coccinellidae* była na ogół niewielka. Przeciętna wartość wskaźnika wynosiła 0,37. Najwyższą liczebność (wskaźnik 0,78) stwierdzono na łące w Chylicach. Łąki w Klembowie, Białolece Dworskiej i Zbroszkach miały bardzo zbliżone liczebności biedronek wynoszące 0,24–0,26 osobnika na 1 próbę czerpakową.

Badane łąki były w różnorodny sposób użytkowane (koszone, wypasane oraz koszone i wypasane), jednakże nie stwierdzono w związku z tym istotnych różnic w składzie gatunkowym czy liczebności zgrupowań. Decydujący wpływ na niski poziom liczebności biedronek ma samo usuwanie roślinności. Prowadzi to bowiem do likwidacji źródeł pożywienia, a także stadiów rozwojowych (jaj, larw i poczwerek).

Na łąkach kośnych decydujące znaczenie dla liczebności zgrupowań ma zabieg wykonywany w połowie lata. Poprzez usunięcie roślinności w tym okresie nie dochodzi do wylotu lokalnej populacji biedronek. W jednym, wyjątkowym przypadku, kiedy zaniechano sianokosów w tym okresie (na łące w Chylicach), liczebność biedronek była 5-krotnie wyższa aniżeli w poprzednich sezonach.

## COCCINELLIDAE (COLEOPTERA) СВЕЖИХ ЛУГОВ МАЗОВЕЦКОЙ НИЗМЕННОСТИ

## РЕЗЮМЕ

Были исследованы видовой состав и структура сообществ *Coccinellidae* на 4 свежих лугах (*Arrhenatheretum medioeuropaeum*) Мазовецкой низменности. В рассматриваемом биотопе найдено в общем 10 видов *Coccinellidae*. Средний показатель численности сообществ составил 0,37 особи на 1 пробу, взятую энтомологическим сачком. Четко доминирующим видом был *Calvia quatuordecimpunctata*, а в некоторых местах *Tytthaspis sedecimpunctata*.

Сообщества божьих коровок свежих лугов Мазовецкой низменности сравнены с сообществами горных лугов, а также с сообществами, населяющими городские газоны в Варшаве. Как городские зеленные насаждения Варшавы, так и свежие луга занимают потенциальные местонахождения леса типа гряда (*Tilio-Carpinetum*).