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***Neuropteroidea* and *Coccinellidae* (Coleoptera) of pine canopies of the pine forests in the Berezinsky Biosphere Reserve in Byelorussia**

**Abstract.** A study conducted in 1989-1990 revealed 17 *Neuropteroidea* species of the families *Raphidiidae*, *Coniopterygidae*, *Hemerobiidae* and *Chrysopidae* as well as 7 species of *Coccinellidae*. The following species were the most numerous: *Wesmaelius concinnus* (STEPH.) and *Hemerobius stigma* (STEPH.) as well as *Myrrha octodecimguttata* (L.) and *Anatis ocellata* (L.).

INTRODUCTION

The study conducted in the Berezinsky Biosphere Reserve was a continuation of investigations carried out in 1986 and 1987 in Polish pine forests. Those investigations aimed at identifying species composition and abundance structure of the insects living in this habitat type. According to the data on *Neuropteroidea* and *Coccinellidae* obtained in those studies, pine canopies are inhabited by a relatively stable group of species, most of which are stenotopic forms. The abundance structures of *Neuropteroidea* and *Coccinellidae* communities are affected by the age of the forest stand. Particularly sharp differences can be seen between young and mature pine stands (CZECHOWSKA 1994, 1995) since, in both *Neuropteroidea* and *Coccinellidae*, certain species are found to prefer either one or the other age group. The results obtained in the mature forests of the Berezinsky Biosphere Reserve indicate similar species composition, revealing, however, certain structural differences when compared to data on the Polish forests. In the pine forests of northern Poland (Puszcza Białowieska, Puszcza Biała, Bory Tucholskie) *Raphidia xanthostigma*, *Wesmaelius concinnus* and *Hemerobius stigma* were the most abundant *Neuropteroidea* species, while *Scymnus suturalis* and *Myrrha octodecimguttata* predominated among *Coccinellidae* (CZECHOWSKA 1994, 1995). The knowledge about abundance structures of *Neuropteroidea* and *Coccinellidae* inhabiting tree canopies is very scant; this paper will hopefully contribute to broadening its scope.

## STUDY AREAS, METHODS, MATERIAL

The Berezinsky Biosphere Reserve is situated in north-eastern Byelorussia, about 120 km from Minsk. Occupying an area of 76,000 hectares, the reserve comprises wet open areas (moors, swamps) and diversified forest habitats, where boreal coniferous forests constitute more than a half. The subcontinental pine forests (*Peucedano-Pinetum*) there belong to the subboreal variety, characterized by the presence of spruce in the forest stand. This habitat occupies a total of 28,800 ha.

The investigations were conducted in 1989 and 1990 in three plots:

Plot 1. Situated about 1 km west of the village of Perekhodci. The forest stand consisted of about 100-year-old pines (*Pinus silvestris*), with an addition of spruce (*Picea excelsa*) and birch (*Betula verrucosa*).

Plot 2. Situated at the foot of a hill, about 2 km east of the village of Kvetcha. The stand comprised a 80-100-year-old pine forest with a large addition of spruce.

Plot 3. Situated on top of a hillet, about 1 km east of the settlement of Postrezhe. The pine forest stand varied in age (from 40 to 150 years) with undergrowth composed of spruce and juniper (*Juniperus communis*).

Insects were caught in pine canopies into plastic yellow bowls (i.e. Moericke's pitfall traps). Three traps were hung in each area 25-30 m above the ground. Specimens were collected every fortnight throughout the vegetational season, i.e. from April to November.

More information about the scope, areas and methods of the study in the Berezinsky Biosphere Reserve can be found in the introductory paper (BAŃKOWSKA, LITVINOVA 1995).

The study material comprised 243 individuals of *Neuropteroidea* and 84 of *Coccinellidae*. They were classified according to keys by ASPÖCK, ASPÖCK, HÖLZEL (1980) and BIELAWSKI (1959).

## RESULTS

The *Neuropteroidea* specimens belonged to 17 species of 4 families (Table I). The greatest share in both species composition and abundance was that of the *Hemerobiidae* family with 7 species and 76.9% of the individuals caught. The shares of the other families were as follows: *Raphidiidae* - 3 species and 7.8% individuals, *Coniopterygidae* - 3 species and 8.65 individuals, *Chrysopidae* - 4 species and 6.6% individuals.

*Wesmaelius concinnus* was the most abundant species in all the plots studied areas. Its share in the total material was 51.9%. Other more abundant species included *Hemerobius stigma* (15.6%), *Coniopteryx parthenia* (7.0%) and *Raphidia xanthostigma* (4.5%).

The *Coccinellidae* family was represented by 7 species (Table II), of which *Myrrha octodecimguttata* and *Anatis ocellata* were most abundant (57% and 26.2%, respectively).

Table I. Species composition and numbers of individuals of *Neuropteroidea* caught on the particular plots of a pine forest in the Berezinsky Biosphere Reserve

No	Species	Plot			Total	%
		1	2	3		
1	<i>Raphidia ophiopsis ophiopsis</i> L.	-	2	4	6	2.5
2	<i>Raphidia notata</i> FABR.	1	1	-	2	0.8
3	<i>Raphidia xanthostigma</i> SCHUMM.	5	4	2	11	4.5
4	<i>Coniopteryx parthenia</i> (NAV. et MARC.)	5	10	2	17	7.0
5	<i>Parasemidalis fuscipennis</i> (REUT.)	-	2	1	3	1.2
6	<i>Semidalis aleyrodiformis</i> (STEPH.)	-	-	1	1	0.4
7	<i>Wesmaelius concinnus</i> (STEPH.)	29	41	56	126	51.9
8	<i>Wesmaelius quadrifasciatus</i> (REUT.)	-	1	-	1	0.4
9	<i>Wesmaelius mortoni</i> (MCLACHL.)	1	-	-	1	0.4
10	<i>Hemerobius humulinus</i> L.	1	2	1	4	1.6
11	<i>Hemerobius stigma</i> STEPH.	8	24	6	38	15.6
12	<i>Hemerobius nitidulus</i> FABR.	5	2	1	8	3.3
13	<i>Symphorobius fuscescens</i> (WALL.)	-	8	1	9	3.7
14	<i>Chrysopa septempunctata</i> WESM.	3	5	-	8	3.3
15	<i>Mallada prasina</i> (BURM.)	4	1	1	6	2.5
16	<i>Chrysoperla carnea</i> (STEPH.)	-	-	1	1	0.4
17	<i>Cunctochrysa albolineata</i> (KILL.)	1	-	-	1	0.4
Total		63	103	77	243	

Table II. List of species and number of individuals of *Neuropteroidea* caught in particular months in the Berezinsky Biosphere Reserve (total for all the plots studied)

No	Species	Month					Total
		V	VI	VII	VIII	IX	
1	<i>Raphidia ophiopsis ophiopsis</i>	3	1	2	-	-	6
2	<i>Raphidia notata</i>	-	2	-	-	-	2
3	<i>Raphidia xanthostigma</i>	3	7	1	-	-	11
4	<i>Coniopteryx parthenia</i>	9	8	-	-	-	17
5	<i>Parasemidalis fuscipennis</i>	2	1	-	-	-	3
6	<i>Semidalis aleyrodiformis</i>	-	1	-	-	-	1
7	<i>Wesmaelius concinnus</i>	-	99	21	6	-	126
8	<i>Wesmaelius quadrifasciatus</i>	-	1	-	-	-	1
9	<i>Wesmaelius mortoni</i>	-	-	1	-	-	1
10	<i>Hemerobius humulinus</i>	-	-	2	1	1	4
11	<i>Hemerobius stigma</i>	5	1	23	9	-	38
12	<i>Hemerobius nitidulus</i>	6	1	1	-	-	8
13	<i>Symphorobius fuscescens</i>	-	8	1	-	-	9
14	<i>Chrysopa septempunctata</i>	-	1	6	1	-	8
15	<i>Mallada prasina</i>	-	1	4	1	-	6
16	<i>Chrysoperla carnea</i>	-	-	-	-	1	1
17	<i>Cunctochrysa albolineata</i>	-	1	-	-	-	1
Total		28	133	62	18	2	243
Number of species		6	14	10	5	2	

The following species are characteristic of pine forests: *Raphidia ophiopsis ophiopsis*, *R. xanthostigma*, *Parasemidalis fuscipennis*, *Wesmaelius concinnus*, *W. mortoni*, *Hemerobius stigma*, *H. nitidulus*, and *Symphorobius fuscescens* in *Neuropteroidea*; and *Scymnus suturalis* and *Myrrha octodecimguttata* in *Coccinellidae*. All the above species are either closely associated with or show preferences for the forest habitat because of their alimentary and habitat requirements.

Table III. Species composition and numbers of species of *Coccinellidae* caught in the canopy of the pine forest of the Berezinsky Biosphere Reserve

No	Species	Plot			Total	%
		1	2	3		
1	<i>Scymnus suturalis</i> THUNB.	-	3	-	3	3.6
2	<i>Aphidecta oblitterata</i> (L.)	-	1	-	1	1.2
3	<i>Coccinella septempunctata</i> L.	3	2	-	5	6.0
4	<i>Myrrha octodecimguttata</i> (L.)	7	34	7	48	57.0
5	<i>Calvia decemguttata</i> (L.)	-	1	2	3	3.6
6	<i>Mysia oblongoguttata</i> (L.)	1	1	-	2	2.4
7	<i>Anatis ocellata</i> (L.)	3	9	10	22	26.2
Total		14	51	19	84	

Species of greater ecological resilience that still frequently occur in abundance in pine forests are: *Raphidia notata*, *Coniopteryx parthenia* and *Anatis ocellata*. Other stable elements of the pine canopies fauna in this habitat include *Chrysopa septempunctata*, *Mallada prasina* and *Cunctochrysa albolineata* as well as the ladybird *Calvia decemguttata*. All these species are, however, more abundant in deciduous or mixed forests (CZECHOWSKA 1985, 1989, 1990, 1994, 1995). Of all the species recorded, only *Chrysoperla carnea* and *Coccinella septempunctata* complete the larval stage of their development on herbaceous plants.

Table IV. List of species and numbers of individuals of *Coccinellidae* caught in particular months in the Berezinsky Biosphere Reserve (total for all the plots studied)

No	Species	Month					Total
		V	VI	VII	VIII	IX	
1	<i>Scymnus suturalis</i>	3	-	-	-	-	3
2	<i>Aphidecta oblitterata</i>	1	-	-	-	-	1
3	<i>Coccinella septempunctata</i>	-	-	1	4	-	5
4	<i>Myrrha octodecimguttata</i>	17	21	9	1	-	48
5	<i>Calvia decemguttata</i>	1	1	1	-	-	3
6	<i>Mysia oblongoguttata</i>	1	1	-	-	-	2
7	<i>Anatis ocellata</i>	4	14	4	-	-	22
Total		27	37	15	5	-	84
Number of species		6	4	4	2	-	

Both *Neuropteroidea* and *Coccinellidae* are predators, feeding chiefly on aphids and the scale insects. Their emergence during the year correlates with the appearance of their victims. In the vegetational season, the greatest abundances of the two taxons are observed in May, June and July (Tables II and IV). *Myrrha octodecimguttata*, the most abundant ladybird species, was recorded in the samples as early as the beginning of May, while the dominant *Neuropteroidea* - *Wesmaelius concinnus* - appeared a month later. This species hibernates as an egg and the June generation is a new one, while *Myrrha octodecimguttata*, like all ladybirds, hibernates as an imago and starts reproduction in spring. In both cases the larval development stage takes place at the beginning of the season, which is also the period of the greatest abundance of aphids and scales on pines.

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## STRESZCZENIE

[*Neuropteroidea* i *Coccinellidae* (*Coleoptera*) koron sosen borów sosnowych w Berezynskim Rezerwacie Biosfery na Białorusi]

Materiał zebrany w koronach sosen boru świeżego (*Peucedano-Pinetum*) zawierał 17 gatunków *Neuropteroidea* (tab. I) i 7 gatunków *Coccinellidae* (tab. II). Najliczniej reprezentowanymi gatunkami siatkoskrzydłych były *Wesmaelius concinnus* i *Hemerobius stigma*, a wśród biedronek *Myrrha octodecimguttata* i *Anatis ocellata*. Okres najliczniejszego pojawu imagines *Neuropteroidea* i *Coccinellidae* przypadał na maj, czerwiec i lipiec (tab. III i IV).