

Ecological studies on wolf spiders (Lycosidae, Araneae) in Central Belarus: seasonal activities and habitat preferences observed by pitfall trapping.

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Abstract

The seasonal activity and habitat preferences of wolf spiders were studied in Central Belarus. The spiders were collected during the period April 30 - November 18, 2000, and March 18 - November 25, 2001 using 30 pitfall traps in three different habitats: (A) a glade with lupine and nettle, (B) a hornbeam woodland (*Carpinetum galebdolosum*) and (C) a birch woodland (*Betuletum myrtillosum*). The seasonal activity of the most abundant species of wolf spiders (*Pardosa lugubris*, *Pardosa prativaga*, *Pirata hygrophilus*, *Trochosa ruricola*, *Trochosa spinipalpis* and *Trochosa terricola*) was studied. Clear differences in the habitat preference of the species could be observed. The species found in the glade included *Alopecosa cuneata*, *Pardosa paludicola*, *Pardosa prativaga*, *Pardosa pullata*, *Trochosa ruricola* and *Trochosa spinipalpis*. *Pirata hygrophilus* was collected mainly in the hornbeam woodland. *Pardosa lugubris* and *Trochosa terricola* were abundant in the birch woodland. *Pardosa maisa* is a new species for Belarus. Phenological analyses are provided for some of the most abundant spider species.

Key words: *Pardosa maisa*, phenology, wolf spiders

INTRODUCTION

Presently there are 44 known species of spiders from the family Lycosidae in the territory of Belarus. The first regular studies of the spiders of Belarus were carried out by Pereleshina in 1922-1925 and Petruszewicz in 1934, who reported 32 species of wolf-spiders from the territory of the republic. The works of Pereleshina (1928, 1931) and Petruszewicz (1935) concentrated on determining the faunal assembly, although data on phenology and the habitat preferences of some species of lycosids were also given. During the last century, Shlyakhtyonok (1983) and Pristavko & Zhukovets (1987) published data on the phenology of some species of the spiders living in fields. However, the majority of publications of that period were devoted to studying the spiders of forest communities

(Litvinova et al. 1981; Shavanova 1995). Until recently, special studies on the phenology of wolf-spiders in Belarus have not been carried out.

The aim of this work was to analyse the occurrence of wolf spiders collected in three biotopes, and also to study the phenology of some abundant species.

STUDY AREA

The study was carried out near the village of Deshchenka, in the Uzda district (53°34'20"N, 27°24'51"E). The place of research is characterised by uniform relief and distinct soil types, from sandy soil in dry places to peaty soil in strongly humidified sites. The vegetative cover is characterised by high species diversity and mosaic distribution of plants.

Three biotopes, representing the most typical vegetation, communities were chosen for study:

Biotope A. This area was a glade with lupine, nettle and green moss. The glade's vegetative cover at the beginning of July reaches a height of 80-90 cm. Here, the ground is damp, and in spring the site is frequently flooded by thawed snow.

Biotope B. This region has a hornbeam wood (*Carpinetum galeobdolosum*) occupying an area of 0.5 ha. *Galeobdolon luteus* and *Hepatica nobilis* dominated the grass layer, and the ground was covered with a dense layer of litter.

Biotope C. Here, the traps were situated in a birch wood (*Betuletum myrtillosum*) with fir-trees and bilberry, surrounded by a road in the east and south.

MATERIAL AND METHODS

The specimens were caught with 30 pitfall traps (plastic pots 6.5 cm in diameter, 10 cm depth). Formalin (4%) was used as a preservative. No cover was used on the traps, and they were emptied every ten days. The traps were arranged in lines of 10. The total length of the line was about 9 m. Some of the traps were pushed up or destroyed by subterranean mammals, their samples were therefore excluded from counting.

The wolf spiders were preserved in alcohol (70%) and deposited in the collection of Ivan G. Lukashevich (Minsk). Spiders were caught between April and November 2000, and between March and November 2001.

Table 1. Total catch of wolf spiders (Lycosidae) in three biotopes during 2000 – 2001.

Species	Biotope A		Biotope B		Biotope C	
	Nos.	%	Nos.	%	Nos.	%
<i>Acantholycosa lignaria</i> (Clerck, 1757)			1	0.5		
<i>Alopecosa cuneata</i> (Clerck, 1757)	5	1				
<i>Alopecosa pulverulenta</i> (Clerck, 1757)	1	0.2				
<i>Aulonia albimana</i> (Walckenaer, 1805)	1	0.2				
<i>Hygrolycosa rubrofasciata</i> (Ohlert, 1865)	1	0.2				
<i>Pardosa agrestis</i> (Westring, 1861)			1	0.5		
<i>Pardosa lugubris</i> (Walckenaer, 1802)	1	0.2	32	14.8	271	53
<i>Pardosa amentata</i> (Clerck, 1757)	2	0.4	5	2.3	4	0.8
<i>Pardosa maisa</i> Hippa & Mannila, 1982	1	0.2				
<i>Pardosa paludicola</i> (Clerck, 1757)	16	3.3				
<i>Pardosa palustris</i> (Linnaeus, 1758)	1	0.2				
<i>Pardosa pratavaga</i> (C.L. Koch, 1870)	141	29.4	2	0.9		
<i>Pardosa pullata</i> (Clerck, 1757)	43	9				
<i>Pardosa riparia</i> (C.L. Koch, 1833)	1	0.2				
<i>Pirata hygrophilus</i> Thorell, 1872	23	4.8	154	71.3	11	2.2
<i>Trochosa ruricola</i> (De Geer, 1778)	94	19.6				
<i>Trochosa spinipalpis</i> (F.O. Pickard-Cambridge, 1895)	120	25				
<i>Trochosa terricola</i> Thorell, 1856	29	6	21	9.7	224	43.8
<i>Xerolycosa miniata</i> (C.L. Koch, 1834)					1	0.2
Total number of individuals:	480	100	216	100	511	100
Total number of species:	16		7		5	

RESULTS

As pitfall traps catch mainly adult spiders and juveniles could not be reliably identified, the analysis was restricted to the adult catches only. A total of 1207 adult spiders were caught in the traps during the entire study period (Table 1).

In the traps a total of 19 species of wolf-spiders were captured, including *Pardosa maisa* Hippa & Mannila, 1982 a new species for Belarus. Previously *P. maisa* was found in Austria (Zulka & Milasowszky 1997), Czech Republic (Milasowszky et al. 1999), Finland (Hippa and Mannila 1982), Hungary (Szinétár & Guitprecht 2001) and Poland (Kupryjanowicz et al. 1998). The finding of *P. maisa* in Belarus expands the distribution of the species to the east.

Phenological analysis of some abundant species

Pardosa lugubris (Walckenaer, 1802). The lifecycle of this species is generally annual. Adult spiders first appeared in the traps at the beginning of May and the maximum numbers were caught at the end of May and the beginning of June. The peak number of males is much higher than that of females. Females with eggsacs were caught in biotope A: 2 - 20-30.05.2000, 4 - 30.05-10.06.2000, 1 - 10-18.06.2000, 1 - 26.07-7.08.2001. The last males were caught at the end of June, and the last females –were caught at the beginning of August (Fig. 1).

P. prativaga (C.L. Koch, 1870). The first adult males of this species were caught at the beginning of May (Fig. 2). The peak of activity was in the first 10 days of June. After the second 10 days of June, males were not caught, and females were also not numerous.

Pirata hygrophilus Thorell, 1872. Adult specimens of this species began to be caught at the beginning of May 2000 (Fig. 3). Males were caught until the end of June. For females two peaks of activity are typical during spring and summer. The spring peak is associated with

the period of copulation. The summer peak to some extent exceeds the one in spring, due to the high activity of females during the hatching of young from eggs. Females with eggsacs were caught in biotope A: 1 - 10-18.06.2000, in biotope B: 1 - 18.06-1.07.2000, 3 - 18-28.08.2000, 2 - 28.08-9.09.2000, 1 - 9-17.09.2000, 1 - 28.09-8.10.2000, 1 - 8-15.10.2000, and in biotope C: 1 - 28.09-8.10.2000, 1 - 8-15.10.2000.

Trochosa ruricola (De Geer, 1778). The first adult males of this species were caught at the beginning of April, and the last one was caught in mid September (Fig. 4). Their greatest activity, according to our data, was at the end of April, although Tretzel (1954) registered the peak of activity of males in June. Females were not numerous, and a precise maximum could not be established. They were no longer caught after May.

T. spinipalpis (F.O. Pickard-Cambridge, 1895). We caught the first adult males of this species at the beginning of April (Fig. 5). The greatest activity was observed at the end of April. Males were not caught between June and the middle of August.. The summer maximum in the middle of August was associated with a second period of copulation. Females appeared in the beginning of May, and disappeared from catches in the middle of September. Females with eggsacs were caught in biotope A: 1 - 18-28.10.2000.

T. terricola Thorell, 1856. The phenology for *T. terricola* is similar to that of *T. spinipalpis*. The first adult specimens were caught in traps at the beginning of April (Fig. 6). Males were most active at the end of April and the beginning of May. The peak abundance for females is lower than for males, but occurs over a longer period of time. For *T. terricola*, two periods of copulation are typical, spring and autumn (Tretzel 1954; Wiebes 1960; Itamies & Ruotsalainen 1984). In September males were caught again, which coincided with the second period of copulation. Females with eggsacs were caught in biotope C: 1 - 9-19.07.2000, 1 - 6-16.06.2001.

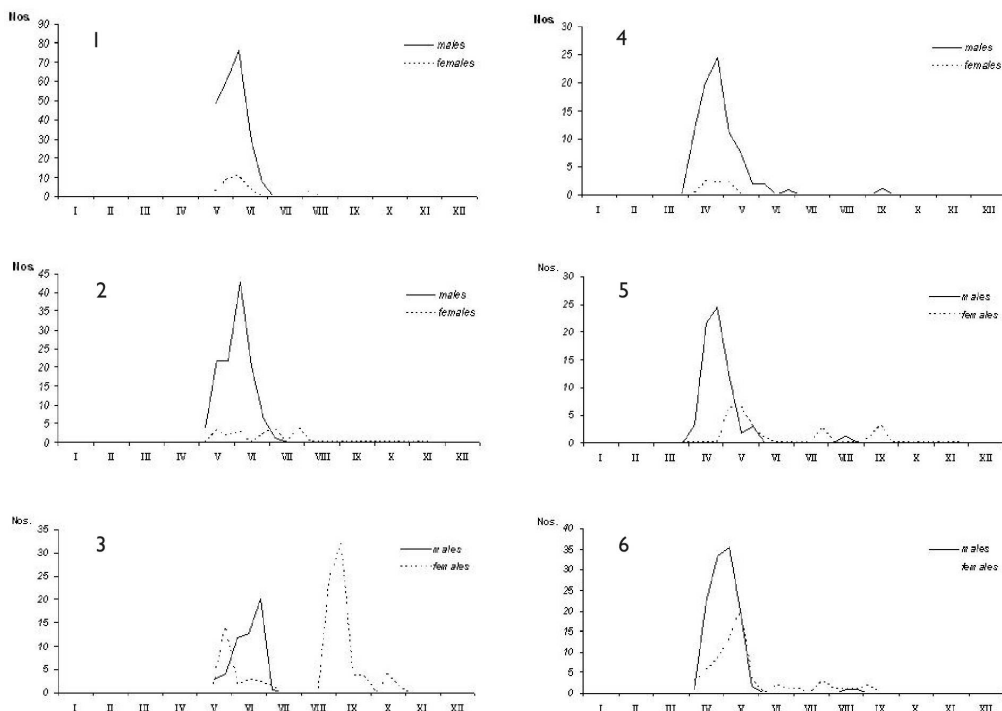


Fig. 1. Pitfall catches of *Pardosa lugubris* in 2000 (numbers/10 days/10 traps) in the birch wood.

Fig. 2. Pitfall catches of *Pardosa prativaga* in 2000 (numbers/10 days/10 traps) in the glade.

Fig. 3. Pitfall catches of *Pirata hygrophilus* in 2000 (numbers/10 days/10 traps) in the hornbeam wood.

Fig. 4. Pitfall catches of *Trochosa ruficollis* in 2001 (numbers/10 days/10 traps) in the glade.

Fig. 5. Pitfall catches of *Trochosa spinipalpis* in 2001 (numbers/10 days/10 traps) in the glade.

Fig. 6. Pitfall catches of *Trochosa terricola* in 2001 (numbers/10 days/10 traps) in the birch wood.

DISCUSSION

In lycosid spiders Wiebes (1960) distinguished three types of life cycles:

Type I lifecycles pass in one year, the period of copulation is in the spring and the juveniles overwinter.

Type II lifecycles pass in one year. They have two periods of copulation, one in spring, and a second, less pronounced period in autumn. There is overwintering in all stages.

Type III lifecycles are probably finished in two years. There are two periods of copulation. The first, more pronounced is in autumn, the second is in spring. The last overwintering is as adult spiders.

When analysing the phenology of the most abundant species of wolf spiders in the research area, we may assign all *Pardosa* species

and *Pirata hygrophilus* to the first type of life cycle, and all *Trochosa* species to the second. The greatest number of *Pardosa lugubris*, *Pardosa prativaga* and *Pirata hygrophilus* males were caught at the end of May and at the beginning of June. Tretzel (1954) also reports the greatest activity for *Pirata hygrophilus* males to be in June. As for *Trochosa ruficollis*, *Trochosa spinipalpis* and *Trochosa terricola*, the peak abundance of males was observed at the end of April, and in August until the beginning of September. In the second period the return of adult males to the traps testified the presence of a second period of copulation. Petrusiewicz (1934) and Tretzel (1954) report the greatest activity of *T. terricola* in April and also specify the presence of the second period of copulation in August. Tretzel (1954) found a peak of

activity for *T. ruricola* in June, which does not quite correspond to the present data. The phenology of other species was not considered because of insufficient collected material.

The choice of habitat by spiders is influenced by microclimatic conditions. Some species can be met in a wide range of biotopes if certain conditions are met. Huhta (1971) for instance reports that *Pardosa pullata* (Clerck, 1757), which generally inhabits open spaces, may also settle in places where the vegetation is dense if the conditions are humid.

Alopecosa cuneata (Clerck, 1757), *Pardosa paludicola* (Clerck, 1757), *Pardosa prativaga*, *Pardosa pullata*, *Trochosa ruricola* and *Trochosa spinipalpis* species prefer open, damp habitats (Petrusewicz 1934, 1935; Huhta 1971; Shlyakhtyonok 1983; Itamies & Ruotsalainen 1985; Zhukovets 1989). In the present study they were caught mainly in the glade. For *Pirata hygrophilus* the light exposure of a biotope has little importance, instead the limiting factor is high level humidity (Huhta 1971). Petrusewicz (1934) caught *Pirata hygrophilus* in great numbers on a peat bog. In the current study, this species was caught in all three biotopes but most commonly in biotope B. *Pardosa lugubris* and *Trochosa terricola* were numerous in biotope C. Itamies and Ruotsalainen (1985) describe *Trochosa terricola* as a species inhabiting forest margins.

Acantholycosa lignaria (Clerck, 1757), *Alopecosa pulverulenta* (Clerck, 1757), *Aulonia albimana* (Walckenaer, 1805), *Hygrolycosa rubrofasciata* (Ohlert, 1865), *Pardosa agrestis* (Westring, 1861), *Pardosa palustris* (Linnaeus, 1758), *Pardosa riparia* (C.L. Koch, 1870) and *Xerolycosa miniata* (C.L. Koch, 1834) were caught in small numbers and it was not possible to draw generalised conclusions about their habitat. Nevertheless, it is apparent that *Acantholycosa lignaria*, *Alopecosa pulverulenta*, *Pardosa agrestis*, *Pardosa palustris*, *Pardosa riparia* and *Xerolycosa miniata* prefer open, sunny biotopes. *P. palustris*, *P. riparia*, *X. miniata* were often collected in meadows (Itamies & Ruotsalainen 1984, 1985; Pristavko & Zhukovets 1987; Zhukovets

1989). *Alopecosa pulverulenta* has been caught in a meadow (Itamies & Ruotsalainen 1984, 1985; Pristavko & Zhukovets 1987), and in a drained bog (Khotko et al. 1987). *P. agrestis* has been found in fields or, in open spaces overgrown with low grass (Petrusewicz 1934; Itamies & Ruotsalainen 1985). According to Petrusewicz (1934) and Zhukovets (1989), *H. rubrofasciata* prefers humid places with *Sphagnum* moss.

Hippa & Mannila (1982) described *Pardosa maisa* as a sister species to *Pardosa nigriceps* (Thorell, 1856). *P. nigriceps* was caught in Belarus by Petrusewicz (Petrusewicz 1935) (4 females and 1 juv.). As *P. maisa* and *P. nigriceps* are similar in morphology, it is possible, that the spiders caught by Petrusewicz refer to *P. maisa*. Zyuzin (1979) reports *P. nigriceps* from the Russian plain. Therefore it is necessary to re-examine the spiders collected by Petrusewicz (Petrusewicz 1935) and stored in Vilnius (Lithuania).

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