

## Spider fauna of peat bogs in southwestern Finland

SEPPO KOPONEN

Zoological Museum, Centre for Biodiversity, University of Turku, FIN-20014 Turku, Finland  
(sepkopo@utu.fi)

### Abstract

The most common and abundant spider species on open peat bogs in mainland of SW Finland were *Arctosa alpigena*, *Pardosa hyperborea*, *P. sphagnicola*, *Alopecosa pulverulenta*, *Trochosa spinipalpis*, *Antistea elegans*, *Agyneta cauta* and *Pirata uliginosus*. Northern bog spiders can be divided into three groups: 1) species found only on the inland bogs (e.g. *Pardosa atrata* and *Mecynargus sphagnicola*), 2) also on the coastal bogs (e.g. *Pardosa hyperborea* and *Gnaphosa lapponum*) and 3) even on the archipelago bogs (*Arctosa alpigena* and *Gnaphosa microps*). Southern species on bogs include spiders 1) occurring only in the archipelago and coastal area (e.g. *Ozyptila gertschi* and *Satilatlas britteni*) and 2) species found also on mainland peat bogs in SW Finland (e.g. *Glyphesis cottonae* and *Zora parallela*).

**Key words:** spiders, peat bogs, abundance, distribution patterns, Araneae, Finland

### INTRODUCTION

The proportion of bogs or peatlands is high in Finland. About a third of the land area of Finland was originally covered by peatlands, of which about half has been drained for forestry, farming and peat harvesting (Wahlström et al. 1996). Therefore peatland habitats (mires, bogs, fens), especially in southern Finland, can be listed as endangered habitats. Although the situation is not so serious as in Central Europe, many spider species living on bogs are nowadays considered threatened (e.g. Koponen 1985). In the recently updated Finnish Red Data Book (Rassi et al. 2001) six of the total 34 listed spider species are mire-dwellers (Koponen et al. 2001).

The spiders living on bogs have not been studied thoroughly in Northern Europe, Fennoscandia and the Baltic states. Some older publications can, however, be mentioned, e.g.

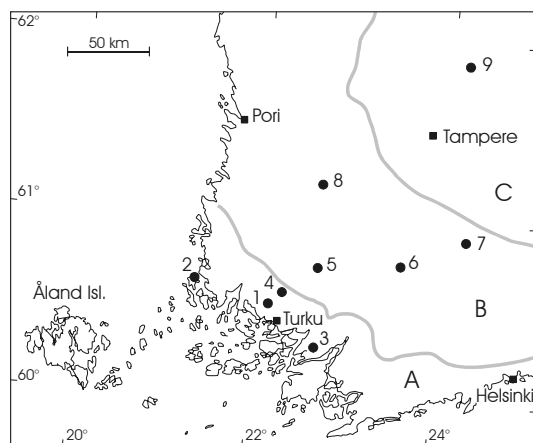
Krogerus (1960), Koponen (1968, 1978, 1979), Palmgren (1977) and Vilbaste (e.g. 1980-81). Data on bog spiders can be found also in many faunistic works, e.g. Palmgren (1972), Lehtinen et al. (1979) and in several faunistic reports by Lohmander (e.g. 1956). In recent years, research on spiders of North European bogs has increased, at least in Norway, Lithuania and Finland. In the present paper, ground-living spider fauna on open peat bogs in southwestern Finland will be presented. Special attention is paid to the most abundant and common species as well as to other typical bog spiders. Also distributional patterns of some species are discussed.

### STUDY AREA, MATERIAL AND METHODS

The nine study sites are situated in southwestern Finland (Fig. 1). The bogs studied are open peat bog sites (without trees) where *Sphagnum*,

**Table 1.** The study sites in SW Finland (see Fig. 1); Bog%: proportion of peatland in an area of 150 km<sup>2</sup> around the study site. Dist.km: distance from the Baltic Sea coast (km).

Site no.	Site name (Abbreviation)	Bog%	Dist. km
1	Masku, Karevansuo (MA)	5	10
2	Kustavi, Lautreski (KU)	2	0
3	Halikko, Sammalsuo (HA)	5	10
4	Vahto, Rehtsuo (VA)	20	20
5	Pöytyä, Kontolanrahka (PÖ)	15	50
6	Tammela, Torronsuo (TA)	25	75
7	Renko, Seitsemänlamminsuo (RE)	20	90
8	Huittinen, Isosuo (HU)	20	75
9	Ruovesi, Siikaneva (RU)	15	140



**Fig. 1.** The study sites in SW Finland, cf. Table 1. Key to bog zones: A: plateau bogs; B: concentric kermi bogs; C: eccentric kermi bogs (see Euroala et al. 1984).

*Eriophorum* and *Carex* species dominate; in addition, *Andromeda*, *Calluna*, *Ledum*, *Betula nana*, *Vaccinium oxycoccus* and *Rubus chamaemorus* can be found. Especially *Calluna*, *Ledum* and *Betula nana* grow on the hummocks. The distance of the bogs from the Baltic Sea coast is shown in Table 1. The isolation of the bogs is presented as 'bog%' which is the proportion of peatland in an area of 150 km<sup>2</sup> around each study site, based on information on 1:250000 maps (Table 1).

Material has been collected by pitfall traps.

Trapping periods and years as well as number of traps varied between sites, thus statistical analyses have not been done and the comparisons are based on percentages of abundant species on each bog studied. Nomenclature is after Platnick (1997) and the material is deposited in the Zoological Museum, University of Turku.

Besides the above study sites, some data on the occurrence of bog spiders, especially from the archipelago area, have been taken from earlier publications (Lehtinen et al. 1979; Koponen 1985).

## RESULTS AND DISCUSSION

### Fauna on peat bogs

The most abundant species of each study site are presented in Table 2. The percentages have been given only for the 'top-scorers' of each site (10-15 most abundant species; minimum 1-2.5% of the total number of specimens). The Karevansuo bog in Masku was studied most thoroughly; about 100 species were found during a two-year investigation. Its fauna represents well the SW-Finnish bog fauna: only five of the 45 listed 'top-scorers' of Table 2 were absent in the Karevansuo material, i.e. *Walckenaeria atrotibialis*, *Glyphesis cottonae*, *Pardosa atrata*, *Mecynargus sphagnicola* and *Agyneta decora*. Many of the abundant species (in Table 2) occur in Finland only on bogs; however, there are also species typical of moist habitats in general (e.g. *Antistea elegans*, *Bathyphantes gracilis* and *Dolomedes fimbriatus*) and some more eurytopic spiders (e.g. *Alopecosa pulverulenta*, *Zora spinimana*, *Agroeca proxima*, *Pardosa palustris* and *Cnephalocotes obscurus*).

The most dominant species on the nine bogs were *Pardosa hyperborea* (top dominant on three bogs), *P. sphagnicola*, *Arctosa alpigena* and *Pirata uliginosus* (each top dominant on two bogs).

The most common and abundant species on the studied peat bogs are shown in Table 3. Due to the collecting method (pitfall traps) lycosids dominated, the most frequent 'top-scorer' species being *Arctosa alpigena*, *Pardosa hyperborea*, *P. sphagnicola*, *Alopecosa pulverulenta*

**Table 2.** The most abundant ('top-scorer') species on peat bogs in SW Finland (% of the total number of specimens at each study site). +: found in small numbers; -: not found. For distribution and abbreviation of site names, see Fig. 1 and Table 1.

	1	2	3	4	5	6	7	8	9
	MA	KU	HA	VA	PÖ	TA	RE	HU	RU
<i>Pirata uliginosus</i> (Thorell, 1856)	24.1	-	10.0	+	+	-	1.8	+	18.5
<i>Pardosa hyperborea</i> (Thorell, 1872)	21.8	-	+	51.0	21.2	44.6	3.7	38.3	9.1
<i>Arctosa alpigena</i> (Doleschall, 1852)	4.3	27.4	+	7.9	30.6	13.3	+	14.5	16.0
<i>Trochosa spinipalpis</i> (F.O.P.-Cambridge, 1895)	3.2	10.6	7.5	+	+	1.8	1.8	-	4.0
<i>Agneta cauta</i> (O.P.-Cambridge, 1902)	3.0	-	1.4	-	1.4	+	2.2	-	-
<i>Walckenaeria antica</i> (Wider, 1834)	3.0	-	2.3	+	+	+	1.0	+	+
<i>Pardosa sphagnicola</i> (Dahl, 1908)	2.7	17.3	28.3	5.4	1.4	+	62.4	-	14.2
<i>Alopecosa pulverulenta</i> (Clerck, 1757)	2.5	2.9	+	1.7	8.7	+	3.8	1.0	+
<i>Macrargus carpenteri</i> (O.P.-Cambridge, 1894)	2.3	-	-	-	-	-	-	-	-
<i>Lepthyphantes angulatus</i> (O.P.-Cambridge, 1881)	2.2	-	-	+	-	+	2.9	-	+
<i>Antistea elegans</i> (Blackwall, 1841)	1.5	-	7.7	+	5.6	+	1.8	7.4	-
<i>Maro lepidus</i> Casemir, 1961	1.5	+	-	-	-	-	-	-	-
<i>Drepanotylus uncatu</i> s (O.P.-Cambridge, 1873)	1.3	+	-	-	-	-	-	1.9	-
<i>Pirata piscatorius</i> (Clerck, 1757)	1.3	13.5	+	-	-	-	+	+	-
<i>Centromerita concinna</i> (Thorell, 1875)	1.3	-	-	+	-	+	-	1.6	4.0
<i>Bathyphantes gracilis</i> (Blackwall, 1841)	+	4.8	+	-	-	+	-	+	-
<i>Pardosa pullata</i> (Clerck, 1757)	+	3.7	2.4	3.1	+	-	-	+	3.3
<i>Centromerus arcanus</i> (O.P.-Cambridge, 1873)	+	1.9	+	+	+	-	2.9	-	-
<i>Dolomedes fimbriatus</i> (Clerck, 1757)	+	1.4	1.4	-	-	-	+	-	-
<i>Gnaphosa nigerrima</i> L. Koch, 1877	+	1.4	2.6	-	+	-	+	-	-
<i>Xysticus cristatus</i> (Clerck, 1757)	+	1.4	-	+	-	-	-	+	-
<i>Euryopis flavomaculata</i> (C.L. Koch, 1836)	+	-	3.5	+	2.4	11.5	+	-	-
<i>Zora spinimana</i> (Sundevall, 1833)	+	-	2.3	-	-	-	+	-	-
<i>Scotina palliardi</i> (L. Koch, 1881)	+	-	2.1	+	+	-	+	1.3	2.9
<i>Pirata insularis</i> Emerton, 1885	+	-	2.1	-	-	-	+	-	+
<i>Meioneta affinis</i> (Kulczynski, 1898)	+	-	1.9	+	-	+	+	-	-
<i>Walckenaeria atrotibialis</i> O.P.-Cambridge, 1878	-	-	1.6	+	-	-	+	-	-
<i>Pardosa palustris</i> (Linnaeus, 1758)	+	-	-	2.8	-	+	-	1.0	-
<i>Erigone atra</i> Blackwall, 1833	+	-	-	2.5	-	-	-	-	-
<i>Glyphesis cottonae</i> (La Touche, 1945)	-	+	-	2.0	-	-	-	-	-
<i>Gnaphosa lapponum</i> (L. Koch, 1866)	+	-	-	2.0	+	6.5	-	2.6	-
<i>Pachygnatha degeeri</i> Sundevall, 1830	+	-	-	1.7	3.5	-	-	+	-
<i>Porrhomma micropthalmum</i> (O.P.-Cambridge, 1871)	+	-	-	1.7	-	+	-	-	-
<i>Pardosa atrata</i> (Thorell, 1873)	-	-	-	+	13.2	3.6	-	21.9	-
<i>Robertus arundineti</i> (O.P.-Cambridge, 1871)	+	-	+	+	1.0	-	-	-	+
<i>Walckenaeria nudipalpis</i> (Westring, 1851)	+	+	-	+	1.0	+	+	+	2.5
<i>Drassodes pubescens</i> (Thorell, 1856)	+	+	-	+	+	2.2	+	+	+
<i>Haplodrassus signifer</i> (C.L. Koch, 1839)	+	-	+	+	+	1.4	-	-	-
<i>Agroeca proxima</i> (O.P.-Cambridge, 1871)	+	-	+	+	+	1.4	+	-	-
<i>Maro minutus</i> O.P.-Cambridge, 1906	+	-	-	-	-	1.4	-	+	-
<i>Gnaphosa microps</i> Holm, 1939	+	-	-	-	-	-	4.6	+	-
<i>Mecynargus sphagnicola</i> (Holm, 1939)	-	-	-	-	-	-	-	2.3	+
<i>Centromerus levitarsis</i> (Simon, 1884)	+	-	-	+	+	-	-	-	3.6
<i>Cnephalocotes obscurus</i> (Blackwall, 1834)	+	+	+	+	+	-	+	-	3.6
<i>Agneta decora</i> (O.P.-Cambridge, 1871)	-	-	+	-	+	-	-	-	3.3
Number of specimens	3670	216	428	355	288	278	628	311	275
Number of species	98	33	36	53	34	28	40	28	34

**Table 3.** The most common and abundant spider species on peat bogs in SW Finland (frequency as dominants in nine 'top-scorer' lists (Table 2)).

<i>Arctosa alpigena</i>	7/9
<i>Pardosa hyperborea</i>	7/9
<i>P. sphagnicola</i>	7/9
<i>Alopecosa pulverulenta</i>	6/9
<i>Trochosa spinipalpis</i>	6/9
<i>Antistea elegans</i>	5/9
<i>Agyneta cauta</i>	4/9
<i>Pardosa pullata</i>	4/9
<i>Pirata uliginosus</i>	4/9
<i>Centromerita concinna</i>	3/9
<i>Euryopis flavomaculata</i>	3/9
<i>Gnaphosa lapponum</i>	3/9
<i>Pardosa atrata</i>	3/9
<i>Scotina palliardi</i>	3/9
<i>Walckenaeria antica</i>	3/9

and *Trochosa spinipalpis*. Also *Pardosa pullata*, *Antistea elegans*, *Agyneta cauta* and *Pirata uliginosus* were among dominants at least on four of the nine studied bogs (Table 3).

Many interesting bog spiders (some of them rare in Finland) not included in Table 2 were also found on some of the studied open peat bogs. These include: *Haplodrassus moderatus* (Kulczynski, 1897), *Agyneta suecica* Holm, 1950, *Aphileta misera* (O.P.-Cambridge, 1882), *Carorita limnaea* (Crosby & Bishop, 1927), *Mecynargus foveatus* (Dahl, 1912), *Meioneta mossica* Schikora, 1993, *Minicia marginella* (Wider, 1834), *Sintula corniger* (Blackwall, 1856), *Tallusia experta* (O.P.-Cambridge, 1871), *Taranucnus setosus* (O.P.-Cambridge, 1863), *Agroeca dentigera* Kulczynski, 1913, *Hygrolycosa rubrofasciata* (Ohlert, 1865), *Neon valentulus* Falconer, 1912, *Dipoena prona* (Menge, 1868), *Theonoe minutissima* (O.P.-Cambridge, 1879) and *Zora parallela* Simon, 1878. Most of them prefer bogs, or are restricted to bogs in Finland, although some are more eurytopic in Central Europe (cf. Hänggi et al. 1995).

#### Distributional notes

Peat bogs are habitats with a special microclimate, due not only to the moisture in the peat and *Sphagnum* layers but also to the open, sun-

exposed surface (cf. Nørgaard 1951; Krogerus 1960). Bogs or mires are known as localities of northern species, often these species are eurytopic in the North and found in the southern part of their range only on bogs; Petersen (1954) called these 'mire species'. In the present material, *Pardosa hyperborea* and *Gnaphosa microps* are good examples of 'mire species'. *P. hyperborea* is common on peat bogs (except some coastal ones), whereas *G. microps* is rarely caught.

Depending on the southern distributional limit, the northern species found in the present study area can be divided into three groups: 1) species found only on inland bogs (zones B-C in Fig. 1), e.g. *Pardosa atrata*, *Mecynargus sphagnicola* and *Diplocentria rectangulata* (Emerton, 1915); 2) species found also on the coastal mainland bogs, at least on some of them, e.g. *Pardosa hyperborea*, *Gnaphosa lapponum* and *Walckenaeria capito* (Westring, 1861); 3) species found even on bogs in the archipelago, at least on larger bogs in the Åland Islands (cf. Lehtinen et al. 1979), e.g. *Arctosa alpigena*, *Gnaphosa microps*, *Robertus lyrifer* Holm, 1939 and *Sisicus apertus* (Holm, 1939).

Southern species are also known to live on peat bogs. These can be divided into two groups: 1) species found only in the archipelago and coastal bogs (cf. also Koponen 1985), e.g. *Ozyptila gertschi* Kurata, 1944, *Lepthyphantes ericaeus* (Blackwall, 1853), *Satilatlas britteni* (Jackson, 1912) and *Centromerus semiater* (L. Koch, 1879) (the last-mentioned found also in the easternmost Finland, but not in the SW-Finnish mainland); 2) species found also on inland peat bogs of the study area. e.g. *Zora parallela*, *Agroeca dentigera*, *Drassyllus pusillus* (C.L. Koch, 1833), *D. lutetianus* (L. Koch, 1866), *Neon valentulus*, *Glyphesis cottonae*, *Maro minutus*, *Sintula corniger* and *Taranucnus setosus*.

(Micro)climatic factors, connected with the continentality/oceanity of the site (Dist.km in Table 1), seem to be the main factors explaining distribution patterns of the bog spiders. This fits also with the bog zonation of SW Finland (cf. Euroala et al. 1984), especially the border

between zones A and B (Fig. 1) seems to be a limit for some northern and southern species. The isolation of bog (bog% in Table 1) as well as the size of investigated open bog habitat seems to have less effect on the distribution of bog spiders in southwestern Finland.

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