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Spiders of the Skäralid Gorge, southernmost Sweden

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Summary

The spider fauna of the Skäralid Gorge, in southernmost Sweden, was investigated in 1994 and 1995. Nine stations in partially different biotopes were sampled with pitfall traps. Trees, bushes and cliffs were also investigated by various methods. The slopes and screes are sparsely populated. However, in most biotopes diversity is rather high. On the northern slopes and in the bottom of the gorge some cold-adapted northern species are found. In the rather dark, shaded and, moist bottom of the gorge live typical forest species, including some rare spiders such as *Robertus neglectus*, *Lepthyphantes angulatus*, *Diplocentria bidentata* and *Coelotes atropos*. The sunny slopes have the most interesting spider fauna, with rich populations of *Atypus affinis*, *Pardosa alacris*, *Liocranum rupicola*, *Zelotes subterraneus*, *Scotina celans*, and *Sitticus pubescens*. Three species of *Pardosa lugubris s.l.* live in Skäralid: *P. lugubris s.s.* in the shaded, forested parts, *P. saltans* on partially shaded slopes and *P. alacris* in sunnier and stonier parts of the southern slopes. On trees and bushes on the slopes some thermophilous species can be found, such as *Araniella inconspicua*.

Introduction

The southernmost part of Sweden, Scania (Skåne), has an undulating, rather flat landscape. The climate and geology are more similar to those of Western and Central Europe than to those of the rest of Sweden, and it has milder winters than most of Scandinavia. Scania has a few rocky ridges, termed horsts. In the south-eastern part of one of these, Söderåsen, 56°N 13°E, is a narrow gorge, almost 100 m at its deepest part, called Skäralid. It is nearly 8 km long and only 150 m at its widest part. This gorge is an old canyon created by a large, pre-glacial river (Carserud, 1992). Today the river is small. The steep slopes have a lot of stony screes: rock debris created by weathering by frost action. Most of the rock is acidic.

In the bottom of the gorge is a moist wood. The ground is covered by herbs in spring: in the poorer parts mostly by *Anemone pratensis* Linnaeus, but in richer parts there is a dense cover of herbs. The stones and boulders in the south-facing screes are, in many places, only covered by a thin layer of lichens. In other parts, the stones are partly covered by leaf litter and some soil. Where the soil layer is thicker there are trees and heather or blueberry. In partly shaded areas there is often a cover of mosses and also, in some places, *Cladonia* lichens. The north-facing slopes are covered with mosses. In the most shaded and cold slopes *Sphagnum* spp. are frequent. Those north-facing talus slopes are cold, with ice persisting among the boulders into early summer. Cold air accumulates in the lower part of screes (Růžička & Hajer, 1996).

The gorge and its surroundings are scheduled to become a National Park in 1998. Skäralid is known to have an interesting fauna and flora with some northern cold-adapted species. The spider fauna has not previously been thoroughly investigated, although some collecting was carried out in the nineteenth century (Wetter, 1874).

Methods

The spider fauna was investigated by setting a row of 5 pitfall traps in 9 different locations, in different biotopes. The 45 traps were in operation for 12 months. Three of the rows were placed in ecotones in order to sample woodland edge species. Additional methods, such as sieving, shaking, and hand-picking, were used to obtain an overall knowledge of the spider fauna.

Results and discussion

In all, 167 species were found by pitfall sampling. The number of catches in the pitfall traps was low compared with other areas in southern Sweden (Jonsson unpubl.). Sieving also yielded few specimens: for example, among mosses and litter in the lower part of the stony screes, only 14–30 specimens m^{-2} were found.

The species richness is low, with only 205 species found, but several are rather rare. As many as 50 species can be considered as first-order relict species in accordance with Buchar (1992): species that only live in habitats undisturbed by human impact. Four species that he did not categorize seem to belong to this group, as they are normally only found in environments little affected by human activity: *Pardosa alacris* (C. L. Koch), *Scotina celans* (Blackwall), *Philodromus praedatus* O. P.-Cambridge and *Araniella inconspicua* (Simon). The diversity is higher in most investigated biotopes in the gorge compared to other biotopes nearby.

37% of the species found can be considered as thermophilous and live only on the south-facing slopes. 27% can be regarded as psychrophilous and are restricted to the bottom of the gorge and the north-facing slopes.

Only a few specimens can be found on the open, stony parts of the south-facing slopes. The only species regularly found there is *Sitticus pubescens* (Fabricius). *Pardosa alacris* is dominant in the sunny, stony parts of the screes, on stones, and among leaf litter at the edge of the woods (38–58% of the specimen found in the pitfall traps on the south-facing slopes). *Pardosa lugubris* (Walckenaer) *s.l.* is represented in this area by three different species: *P. lugubris s.s.*, *P. alacris* and *P. saltans* as interpreted by Töpfer-Hofmann & von Helversen (1990). *P. lugubris s.s.* is most common in the beech (*Fagus*) forest surrounding the gorge. *P. saltans* is a thermophilous species in southern Sweden, found on a few, partially shaded, southern slopes with sparse, dry soil (often sand) with grasses and herbs. Both *P. lugubris s.s.* and *P. saltans* were also found on the south-facing screes, but only as 2–3% of the specimens per row of pitfall traps.

The stony screes of Skäralid gorge are island biotopes. The sunny slopes have the most interesting spider fauna. Several species are restricted to the ecotones on the south-facing slopes: *Atypus affinis* Eichwald, *Segestria senoculata* (Linnaeus), *Crustulina guttata* (Wider), *Pholcomma gibbum* (Westring), *Diplocephalus cristatus* (Blackwall), *Pelecopsis nemoralis* (Blackwall), *Walckenaeria capito* (Westring), *Mastigusa arietina* (Thorell), *Scotina celans*, *Hahnia helveola* Simon, *Xerolycosa nemoralis* (Westring), *Liocranum rupicola* (Walckenaer), *Zora silvestris* Kulczyński, *Callilepis nocturna* (Linnaeus), *Gnaphosa bicolor* (Hahn), *G. montana* (L. Koch), *Micaria fulgens* (Walckenaer), *Zelotes clivicolus* (L. Koch), *Z. petrensis* (C. L. Koch), *Z. subterraneus* (C. L. Koch) (4–7%), *Neon levis* (Simon) and *Aelurillus v-insignitus* (Clerck).

The rare *Atypus affinis* is common on two of the south-exposed screes. It lives among mosses, leaf litter, soil and stones at the top and on the sides of the open stony screes, in areas somewhat shaded by trees on sunny summer days. The population density is high, e.g. 1 m^2 contained 90 fresh tubes. Some species that are typical of such an environment, notably *Hahnia helveola* and *Scotina celans*, are common in Skäralid although they are rare or absent in other places in south Sweden. The latter species formed 8% of the specimens found among leaf litter and heather in a semi-open wooded part of a south-facing slope.

Lepthyphantes zimmermanni Bertkau and *Apostenus fuscus* Westring are sub-dominant on both south-facing and north-facing slopes. They are favoured by the stony, three-dimensional habitat. Nearly all records of *A. fuscus* in Sweden are from stony slopes, both shaded and sunny. Also favoured by the three-dimensional habitat is *Lepthyphantes flavipes* (Blackwall). On the south-facing slopes, 2–4% of the spiders found are *L. flavipes*, but it is also found regularly in other biotopes in the gorge. It is noteworthy that many species normally only found on trees are also living on the boulders on less sunny parts of the slopes, for example, *Philodromus* spp. (often with parasites), *Metellina mengei* (Blackwall), *Araneus sturmi* (Hahn), *Anyphaena accentuata* (Walckenaer), *Labulla thoracica* (Wider) and *Drapetisca socialis* (Sundevall). *Monocephalus castaneipes* (Simon) was found among mosses on the south-facing slopes, and also on trees and on the ground in the bottom of the gorge. It is only

known from a few places south of 59°N in Sweden (Tullgren, 1955).

On the trees, 42 species were found. Most common were: *Neriene peltata* (Wider), *N. emphana* (Walckenaer), *Araniella opistographa* (Kulczyński), *Cyclosa conica* (Pallas), *Heliophanus dubius* C. L. Koch, *Metellina mengei* (Blackwall), *Araneus diadematus* Clerck, *Entelecara acuminata* (Wider) and *Troxochrus nasutus* Schenkel. *A. opistographa* and *H. dubius* seem to be restricted to the trees on the sunniest parts of the screes. Two females and one male of *Araniella inconspicua*, not hitherto found in Sweden, were found on conifers and oak, but not in direct sunlight.

In the rather dark, shaded, and moist bottom of the gorge live forest species. Dominant on ground among mosses is *Diplocephalus latifrons* (O. P.-Cambridge), and among leaf litter *D. picinus* (O. P.-Cambridge) and *Lepthyphantes tenebricola* (Wider). Most species found on the ground in the bottom of the gorge are more or less common forest-living species, but also found regularly are two species typical of gorges in south Sweden: *Robertus neglectus* (O. P.-Cambridge) and *Hilaira excisa* (O. P.-Cambridge). Sub-dominant on the ground and on trees in the bottom of the gorge is *Coelotes atropos* (Walckenaer). In Sweden it is only known from a few moist places in the south-west. The southern forest species *Saloca diceros* (O. P.-Cambridge) lives on the ground in the bottom of the gorge, in places with a rich herb layer. In wetter habitats of the gorge *Lepthorhoptrum robustum* (Westring) is not uncommon.

A very high diversity was found in the bottom of the gorge, in a semi-open area near a small brook and a south-facing scree, $H_{(s)} = 3.35$. The northern species *Lepthyphantes angulatus* (O. P.-Cambridge) was found regularly. It has not previously been reported south of 60°N in Scandinavia (Holm, 1983). In this habitat the following were also found as subdominant species: *Centromerus arcanus* (O. P.-Cambridge), *Lepthyphantes cristatus* (Menge) and *Hilaira excisa*. *Saaristoa abnormis* (Blackwall) is not uncommon in this habitat, but also found in other semi-open habitats.

Some cavernicolous species were found among the stones in the screes: *Meta menardi* (Latreille), *Nesticus cellanus* (Clerck) and *Rugathodes bellicosus* (Simon). The last has not previously been reported from the south of Scandinavia (Kronestedt, 1993). Two males of *Theonoe minutissima* (O. P.-Cambridge) were found on a north-facing stony scree; it is known from similar biotopes in the Czech Republic (Růžička & Hajer, 1996).

Some northern species live in the shaded parts of the gorge. The commonest species on the cold north-facing slopes are: *Lepthyphantes alacris* (Blackwall), *L. zimmermanni* and *Walckenaeria cuspidata* (Blackwall) and, only on the open slopes, *Pocadicnemis pumila* (Blackwall). Some species were only found on the open and cold north-facing slopes: *Agyneta cauta* (O. P.-Cambridge), *Pelecopsis mengei* (Simon), *Metellina merianae* (Scopoli) and *Ozyptila trux* (Blackwall). The highest diversity was found on one of those slopes, $H_{(s)} = 3.36$, although fewer specimens occurred compared to other areas.

Among the psychrophilous species found in the bottom of the gorge and on the north-facing slopes are: *Robertus lividus* (Blackwall), *Agyneta conigera* (O. P.-Cambridge), *A. ramosa* Jackson, *Centromerus arcanus* (O. P.-Cambridge), *Diplocentria bidentata* (Emerton), *Gonatium rubellum* (Blackwall), *Pachygnatha listeri* Sundevall and *Agroeca brunnea* (Blackwall). The cold-adapted, northern species *Diplocentria bidentata* is very rare in lowland areas south of 59°N (Tullgren, 1955). It is common among mosses in the colder parts of the gorge. Most specimens were found by sieving.

Acknowledgement

I thank Torbjörn Kronestedt for help with identification of males of the *Pardosa lugubris*-group.

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