

## *Pardosa maisa* (Araneae, Lycosidae) in eastern Austria, with data on habitat and phenology

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### Summary

The present study reports on the fifth record of *Pardosa maisa* Hippa & Mannila in Europe. The species was found at five places in the "Seewinkel" area, the salt pan region in eastern Austria. *P. maisa* showed a stenochronous phenology with an activity peak at the beginning of May. The habitat of *P. maisa* is characterised by dense vegetation over wet ground close to the water-line on the salt pan shores.

### Introduction

*Pardosa maisa* was first described on specimens from a poor pine fen with a rich *Sphagnum* layer in central Finland (Hippa & Mannila, 1982). Three individuals of each sex were collected in the type locality (Itämies & Jarva, 1983; Itämies & Jarva-Kärenlampi, 1987, 1989). The northernmost localities of the species found so far are also situated in Finland. Six males and three females were collected on an island and along the mainland coast in the Bothnian Bay (Caselius & Itämies, 1993). Furthermore, a single adult male ("*Pardosa* sp." in Miller & Obrtel, 1975) was found in the Czech Republic (Buchar, 1993). The fourth and most numerous record was made in eastern Poland in a sedge-moss marsh with 370 males, 93 females and 20 juveniles collected between 1991 and 1993 (Kupryjanowicz, 1995). The present paper reports on *P. maisa* from two separate investigations, both carried out in the "Seewinkel" area in eastern Austria; a one-year study in a salt meadow in 1990 (Lethmayer, 1992), and our own study in 1993 and 1994 concerned with the habitat requirements of spiders in saline alkaline pans. A total of 27 males and 10 females of *P. maisa* were collected from five sites, adding further information to the phenology and habitat requirements of this little-known wolf spider.

### Material and methods

#### Study area

The "Seewinkel" area is situated in the panonic region of eastern Austria between the Hungarian border and "Neusiedler See" and extends from 47°37' to 47°57'N and from 16°45' to 16°55'E (altitude: 115 to 130 m). It is the most western outpost of the pontic south-Siberian steppe belt (Löffler, 1982). The climate of the "Seewinkel" is subcontinental with panonic influences (Neuwirth, 1976). Owing to the geographical situation, the local climatic conditions can lead to periods of extreme cold in winter and semi-arid periods in summer. The investigations were carried out on the shores of saline alkaline pans, most of which were located in the newly founded National Park Neusiedler See-Seewinkel. The shallow salt pans are inundated from

spring to summer and then usually dry out during the summer period.

#### Study sites

The first study site comprised a salt meadow situated near the "Illmitzer Zicksee" (47°46'30"N, 16°47'30"E). The site was densely covered by *Puccinellia peisonis* dominated vegetation as a part of the endemic Atropidetum peisonis Franz *et al.* 1937 plant assemblage (Mucina *et al.*, 1993). In spring, the salt meadow had a swampy character due to temporary ditches supplied by melting snow (Lethmayer, 1992). Spiders were sampled using five pitfall traps emptied at ten-day intervals from 9 April to 26 October 1990 (Lethmayer, 1992). Results from this study are mainly used to describe the spider's phenology.

In the second study, 20 salt pans in the "Seewinkel" area were sampled during four ten-day periods using three pitfall traps at each site (28 May–7 June, 13–23 July, 10–20 September 1993 and 20–30 April 1994). Fourteen continuous environmental variables (vegetation cover, vegetation height, water content, pH, conductivity, organic material, coarse, medium and fine gravel, coarse, medium and fine sand, silt, clay) were measured at each site at the beginning of each sampling period. Additionally, five categorical parameters concerning these sites were determined in the field (birds, disturbance, grazing, mowing, water-line). The results obtained in this study are mainly used to describe the spider's habitat requirements.

#### Identification

*Pardosa maisa* specimens were identified using the descriptions and drawings of Hippa & Mannila (1982) and Kupryjanowicz (1995). Additionally, comparisons were made with a Finnish male and female paratype. Males were determined by the shape of the median apophysis of the palp, females by characters of the epigynum: the trapezoidal shape of the median septum, the non-bulging transverse rim at the posterior margin and the conspicuous asymmetrical anterior pocket. Apart from these characters, our specimens also fitted the general descriptions of the morphology and measurements of the carapace and tibia I given in Kupryjanowicz (1995).

### Results

#### Phenology

At "Illmitzer Zicksee", a total of 16 male and 10 female *P. maisa* specimens were collected. Males were caught from 9 April to 19 May 1990 and females from 9 April to 28 June 1990 (Fig. 1). According to the system of Schaefer (1976), *P. maisa* can, therefore, be classified as a stenochronous species reproducing in spring and early summer. During the first sampling period (9 to 19 April), seven of the 26 individuals were caught when the temperature increased from 10 to 20°C within a few

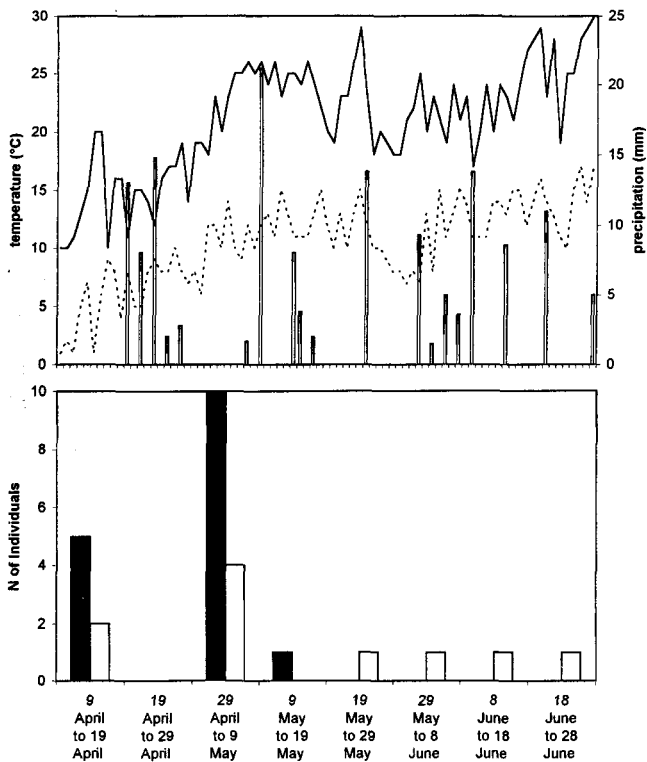


Fig. 1: Bottom: Phenology of males (black bars) and females (white bars) of *Pardosa maisa*, during the activity period from 9 April to 28 June 1990, as collected in ten-day periods with pitfall traps in a salt meadow at "Illmitzer Zicksee" (Lethmayer, 1992). Top: Daily precipitation in mm (thin, white bars), maximum temperature in °C (thick line) and minimum temperature in °C (dashed line) during the activity period.

days (Fig. 1). The following sampling period (19 to 29 April) did not yield any specimens. This period was characterised by repeated precipitation. From 29 April to 9 May the daily maximum temperature increased from 15 to 25°C, and no precipitation was measured until the end of this period. The rise of the ambient temperature coincided with increased activity of *P. maisa*, and during this period the activity of both sexes was at its highest. In each of the subsequent sampling periods only single specimens, mainly females, were caught (Fig. 1). The phenology data of *P. maisa* from Austria correspond with those of the closely related *Pardosa nigriceps* (Thorell) in Germany. (Tretzel, 1954).

### Habitat

In the 20 salt pans, *P. maisa* was only caught in spring (from 20–30 April 1994). Eleven males were caught in higher situated shore zones at four salt pans: six at "Unterer Stinkersee" (47°47'51"N, 16°47'10"E), three at "Darscholakke" (47°46'26"N, 16°50'35"E), one at "Lacke südlich Unterer Stinkersee" (47°47'24"N, 16°47'09"E) and one at "Martinhoflacke" (47°45'06"N, 16°51'28"E). The first two salt pans were perennial in the study year, since their water level was artificially raised and stabilised. All of the four *P. maisa* sites belonged to the dry meadow plant assemblage *Potentilla arenariae-Festucetum pseudovinae* Soó 1940 (E. Knogler, *pers. comm.*), which is an element of the union *Festucetalia*

*valesiaca* Braun-Blanquet & R. Tüxen ex Braun-Blanquet 1949 (Mucina *et al.*, 1993). However, these dry meadows were not dry at all during the spring sampling period. The soil water content was high, ranging from 24 to even 40%.

Comparing the four *P. maisa* localities with the 16 sites where it was absent, a significant association was found only in the parameter "water-line" ( $p=0.014$ , Fisher's exact test). *P. maisa* was found exclusively in sites where the water-line directly bordered the higher situated meadows. The sites of presence and absence did not differ significantly at the 95% significance level in any of the other environmental parameters. However, the error probability values of vegetation height ( $p=0.064$ ) and vegetation cover ( $p=0.121$ ) were lowest, indicating a probable importance of these variables. However, this remains to be confirmed by larger data sets. Although the vegetation height ranged between only 15 and 30 cm in the occupied sites, the median was higher than in the unoccupied sites. Within the four *P. maisa* sites, the vegetation cover was high, ranging from 90 to 100%.

In the dry meadows by the salt pans the most abundant spider species during the spring period was *Alopecosa pulverulenta* (Clerck), a widely distributed and euryoecious lycosid spider (Heimer & Nentwig, 1991). It was the only accompanying species to occur in each of the four sites. At "Illmitzer Zicksee" the most dominant species, comprising 37.5% of the total catch for the year, was *Pardosa prativaga* (L. Koch) (Zulka *et al.*, 1997), a species of shores, fens and moist meadows, occurring also in the herb layer (Hänggi *et al.*, 1995).

### Discussion

Since the bog habitat, in which *P. maisa* was initially discovered, is widespread in boreal Europe, Hippa & Mannila (1982) suggested that the species probably has a vast distribution, especially in the boreal region in eastern Europe. Now, the records in the Czech Republic and in Austria show that *P. maisa* also occurs in temperate climates. The presence of *P. maisa* in central Europe might be considered a glacial relict occurrence. In spiders, there are some examples of boreo-alpine species with relict occurrences in the montane and alpine regions (e.g. Löser *et al.*, 1982; Růžicka, 1989; Thaler, 1976). However, *P. maisa* occurs in central Europe at an altitude of only 115 m in Austria and 174 m in the Czech Republic ("*Pardosa* sp." in Miller & Obrtel, 1975). An example of a boreo-alpine spider occurring in central Europe at low altitudes in wet meadows and bogs is *Gnaphosa microps* Holm (Grimm, 1985). Further examples of relict species in western and central Europe occurring with isolated scattered colonies mainly in fen habitats are beetles (Bilton, 1992, 1994) and butterflies (Krampl, 1991; Spitzer, 1994).

All of the *P. maisa* localities can be characterised as wetlands (see Introduction). The hydrological history of the "Seewinkel" documents that it has been a large wetland area since the ice-age (Dick *et al.*, 1994), and it was once covered by forests except for the salt pans and

their surroundings (Wendelberger, 1959). Within the bog area in central Finland, *P. maisa* was not caught in any of the traps situated in drier places, which suggests a preference for damp habitats (Itämies & Jarva, 1983). This was confirmed by the records from waterside meadows and shores in the Bothnian Bay (Caselius & Itämies, 1993), sedge-moss marshes in Poland (Kupryjanowicz, 1995) and a reed swamp in the Czech Republic ("*Pardosa* sp." in Miller & Obrtel, 1975). Hippa & Mannila (1982) suggested that the small number of *P. maisa* individuals in pitfall traps may be the result of possible field layer preferences. We assume that *P. maisa* is a field type spider according to the classification of Duffey (1966), preferring vegetation structures rising above a wet environment with high atmospheric humidity. In the "Seewinkel", such microhabitats can be found in swampy salt meadows as well as in dry meadows adjacent to the water-line of salt pans, especially in the spring and early summer season to which the yearly activity of adult *P. maisa* is limited. The close vicinity of dry and wet patches is also a common feature of certain parts of the "Seewinkel" landscape and bogs with a patchwork of bulks and inundated hollows (Ellenberg, 1986: 436).

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