

**Distribution and ecology of pseudoscorpions  
(Arachnida: Pseudoscorpiones) in relict-forests in Styria (Austria)**

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**RIASSUNTO**

Da Luglio 1979 a Settembre 1981 è stata studiata in Stiria (Austria) la fauna di Pseudoscorpioni di 5 foreste xerothermiche. È stato raccolto mediante trappole a caduta un numero complessivo di 968 individui appartenenti a 10 specie. La specie dominante è stata *Chthonius (C.) submontanus* Beier, seguita da *Neobisium carcinoides* (Hermann) e *Chthonius (C.) pusillus* Beier. *C. submontanus* mostra una dinamica di popolazione univoltina con un picco evidente (riguardante gli adulti) da Maggio a Giugno. Un secondo periodo di attività, molto più debole, può essere osservato in Agosto. *Neobisium caporiaccoi* Hertault e *Chthonius (E.) parmensis* Beier, entrambe note per il Nord Italia, sono citate per la prima volta per l'Austria. Sono infine messe in evidenza le differenze tra *Chthonius (C.) submontanus* e *Chthonius pygmaeus carinthiacus* Beier.

Parole chiave: Pseudoscorpioni, Ecologia, Fenologia, *Chthonius submontanus*, Austria.

**SUMMARY**

The pseudoscorpion fauna of five xerothermic forests was studied in Styria (Austria) from July 1979 to September 1981. A total number of 968 individuals belonging to 10 species were collected by pitfall traps. The dominant species was *Chthonius (C.) submontanus* Beier, followed by *Neobisium carcinoides* (Hermann) and *Chthonius (C.) pusillus* Beier. *Chthonius submontanus* shows an univoltine population dynamics, with a clear peak (concerning adult specimens) during the months of May to June. A second, much weaker, activity period might be noticed in August. *Neobisium caporiaccoi* Hertault and *Chthonius (E.) parmensis* Beier (both described from Northern Italy) are mentioned for the first time from Austria. The differences between the species *Chthonius (C.) submontanus* and *Chthonius pygmaeus carinthiacus* Beier are emphasized.

Key words: Pseudoscorpions, Ecology, Phenology, *Chthonius submontanus*, Austria.

## 1. Introduction

The pseudoscorpion fauna of the eastern part of the Alps are widely characterized by BEIER (1952), BEIER & FRANZ (1954) and RESSL & BEIER (1958), with subsequent reports mainly by BEIER (1971), SCHUSTER (1972) and STROUHAL & VORNATSCHER (1975). During the years 1979 to 1981 a survey of the ground-living arthropod fauna of five relict-forests in Styria which all had developed in warm hillside positions had been carried out. The results on spider communities are already published in four papers by HORAK (e.g. 1991; see there for further literature). This paper presents the results of pseudoscorpions captured during this study.

## 2. Description of the study area

Origin and probable age of the studied xerothermic relict-forests are discussed by SCHARFETTER (1954), detailed descriptions and full literature are available from HORAK (1991) and MAURER (1981).

The five studied relict forests are situated between 47°00' and 47°30' northern degree of latitude and 15°15' and 15°45' eastern longitude.

The oak wood (*Quercetum pubescentis graecense*) at the "Kanzel" near Graz (alt. 430-450 m) grows on dolomite and dolomite sandstone. The beech forest (*Ostrya carpinifolia*) (alt. 635-675 m) appears in the "Weiz" gorge on so called "Schöckel" - limestone. The *Vaccinio-Pinetum* in the "Raab" - gorge (alt. 620-655 m) occurs on silicate, although they considered as well disposed to limestone and develops big stands on serpentine too. The fourth study area is called "Kirchkogel". Its pine forest (*Festuco-Pinetum*) grows on serpentine and forms two areas, one at an altitude of 570-620 m and the second at an altitude of 985-1010 m on top of the mountain.

The climate of all studied areas is very similar, is oceanic and differs from the climate in the surrounding areas. As all forests are situated on southern hillsides they are exposed to more sunlight which causes a stronger effect of light and temperature than in locations nearby.

Obviously the humidity is lower too. Furthermore the well structured ground gives shelter against unfavourable winds from north and west. Cold air is following to the ground of the vallies and to the south, so the warm air can sometimes stay at the upper hillside and even up to the

ridge. Plants, which prefer warm areas, benefit from this circumstance especially in spring when the period of vegetation starts.

### 3. Material and method

In each locality five pitfall traps (half filled with 4% formaldehyde) were positioned between July 1979 and September 1981. They were emptied weekly or in a three week's interval.

### 4. Results and discussion

During the period of research a total number of 968 specimen, which belong to 10 species were collected (Tab. 1). This proves a quite high abundance compared to other groups, e.g. spiders of which 4063 adult specimen had been collected.

The highest number of specimens were collected in the lower part of the Kirchkogel but more than 75% of the individuals are represented by only one species, *Chthonius submontanus*. This species is found to be the most active in every locality.

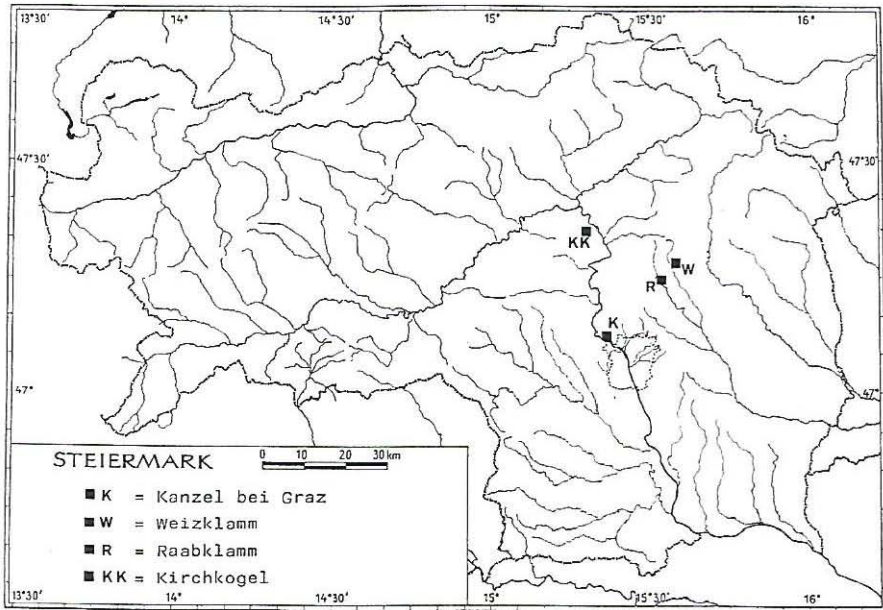
Tab. 1 - Total number of species and specimens (adults, nymphal instars) found in the different areas studied.

	Kanzel	Weizklamm	Raabklamm	KK-600 m	KK-1000 m	Individ.
<i>Ch. parmensis</i> Beier	13					13
<i>Ch. pusillus</i> Beier		35	25	44	1	105
<i>Ch. submontanus</i> Beier	72	75	129	272	99	647
<i>Ch. tetrachelatus</i> (Preysslner)	18					18
<i>N. carcinoides</i> (Hermann)	31	33	23	18	16	121
<i>N. carinthiacum</i> Beier	1					1
<i>N. fuscimanum</i> (C.L. Koch)	3	9	2	5		19
<i>N. minimum</i> Beier		2			5	7
<i>N. sylvaticum</i> (C.L. Koch)	29	2	1	3		35
<i>Mesochelifer resslii</i> Mahnert				2		2
<b>Total</b>	<b>167</b>	<b>156</b>	<b>180</b>	<b>344</b>	<b>121</b>	<b>968</b>

At the Kanzel seven species were collected. *Chthonius* (*E.*) *parmensis*, *Ch.* (*E.*) *tetrachelatus* and *Neobisium carinthiacum* were found

only in this area. But it has to be emphasized that no real difference can be established between the studied localities, most of the species represented are widely distributed in central Europe. *Chthonius (C.) submontanus* is apparently showing a preference for pine forests, but occurs also in the other studied areas. Bark-dwelling species are lacking (except for two specimens of *Mesochelifer ressl*i, a typical species of fir and pine tree bark).

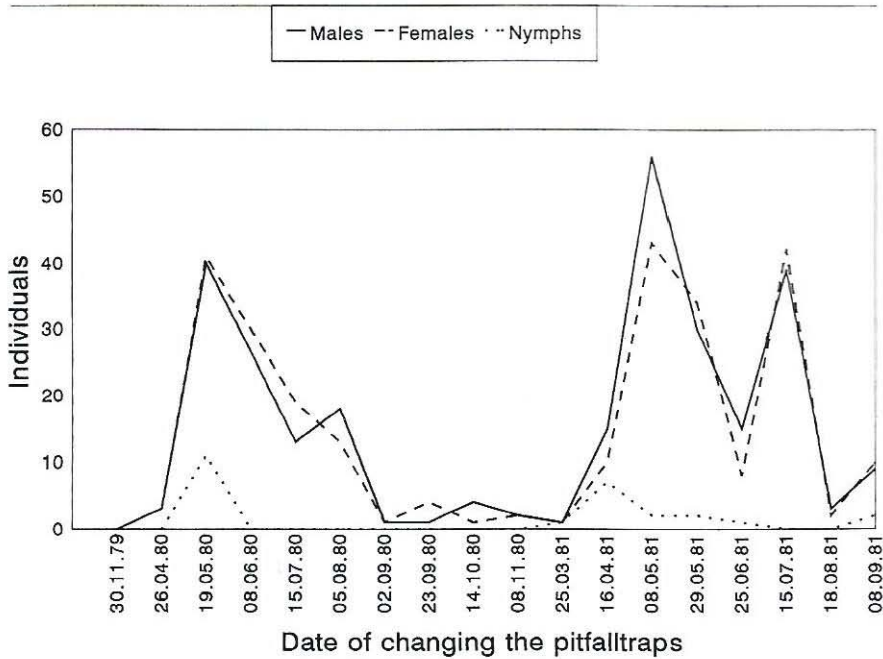
Fig. 1 - Geographical location of the studied areas in Styria (Austria).



a. Phenology of *Chthonius (C.) submontanus* Beier (Fig. 2)

Some restrictions must be formulated before interpreting the results obtained: number of specimens collected at all studied areas are lumped in fig. 2, assuming that activity is identical in those sites; pitfall traps reflect activity of specimens.

Fig. 2 - Phenology of *Chthonius (C.) submontanus* Beier.



In Fig. 2 we may distinguish one main activity pike from April to June and one smaller one in (July) August; since those data are mainly based on adults and nymphal instars only were collected in very small numbers (19.5.80: 6 tritonymphs, 5 deutonymphs; 2.9.80: 1 T; 25.3.81: 1 T; 16.4.81: 7 T; 8.5.81: 1 T, 1 D; 25.6.81: 1 T; 8.9.81: 2 T), they might be interpreted as follows:

*Chthonius submontanus* is an apparently univoltine species, at least in the studied area, its life history is probably very similar to those of other *Chthonius* species already studied (GABBUTT, 1970; GODDARD, 1976).

No protonymph is occurring under free-living condition (as this is recorded also for *Chthonius tetrachelatus*, *C. orthodactylus* and *C. tenuis*: GODDARD, op. cit.). The only deutonymphs have been collected in May with about the same number of tritonymphs, having overwintered probably together. The high number of adults in spring (May) probably is produced by the moulting of overwintered tritonymphs to adults, the

smaller peak in summer is due probably to successive moults of overwintered deutonymphs to tritonymphs and adults.

b. Faunistical and taxonomical remarks

- *Chthonius (C.) submontanus* Beier

This species has been described from Austria and has been subsequently recorded from Italy, Eastern Germany and Romania, but some of these records should be verified. The study of the type specimens of *Chthonius pygmaeus carinthiacus* Beier (Naturhistorisches Museum Vienna, female lectotype from "Warmbad Villach, Bugarboden, 520 m, Kärnten" is designated here), which seemed very close to (if not identical with) *C. submontanus* revealed some morphological differences.

*Chthonius p. carinthiacus* may be distinguished from *submontanus* by the presence of only two setae on the posterior border of carapace and by the clearly higher number of teeth on palpal finger (approx. 39 on fixed, 31 on movable finger resp. 24 and 22) and the presence of a broad dentate epistome (anterior border of carapace straight, dentate, in *submontanus*).

- *Chthonius (C.) pusillus* Beier

The species is only known from Eastern Austria (Lower Austria and Styria).

- *Chthonius (E.) parmensis* Beier

This species is reported for the first time from Austria. It is known from Northern Italy (provinces of Parma, Verona, Bergamo and Toscana), but also has been recorded from Switzerland and Eastern Germany (where it probably had been introduced) (DROGLA, 1990).

- *Neobisium carinthiacum* Beier

Only a few records are available for this species (PALMGREN, 1973), the status of which has yet to be defined. The species is apparently clearly differentiated, by its slender pedipalps, from *carcinoides* Hermann, but unfortunately variability of this character in *carinthiacum* is still unknown.

- *Neobisium caporiaccoi* Heurtault

This species was not present in the studied area, but the junior author collected one specimen in "Carinthia, Kötschach-Mauthen, Untere Valentinalm, 25.8.1981: 1 female". This is the first record for Austria of this species described from the prov. Belluno (Italy) and known from the Veneto and Friuli-Venezia (partly unpublished data).

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