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On the occurrence of hypogean spiders in forest habitats

by Hendrik SEGERS

Summary

Starting from results, obtained during a sampling campaign in the Zoniën forest (prov. Brabant, Belgium), some general remarks on the taxonomy and ecology of hypogean spiders are made. An attempt is made to explain observed differences in distribution and to give some conclusions on the possible ecological significance of these rare spiders.
Key-words: Hypogean fauna, spiders, ecology.

Samenvatting

Uitgaande van resultaten, bekomen tijdens een bemonsteringscampagne in het Zoniënbos worden enkele algemene beschouwingen omtrent de taxonomie en ecologie van hypogeïsche spinnen geformuleerd. Er wordt gepoogd de waargenomen fenomenen te verklaren en enkele besluiten omtrent het mogelijk ecologisch belang van deze zeldzame soorten te formuleren.
Sleutelwoorden: Hypogeïsche fauna, spinnen, ecologie.

Introduction

Spiders are known to occur in a large variety of habitats. Some have even colonised subterranean habitats. Much work has already been done on the spider fauna of caves. Examples of such studies are those of DENIS (1952), FAGE (1933), LERUTH (1939), and, more recently, BRIGNOLI (1979), BOURNE (1978), HIPPA *et al.* (1984) and THALER & PLACHTER (1983). Many of these species live not only in large caves, but also in smaller crevices, such as mole and mice burrows, or even extend their range to the leaf litter stratum (FAGE, 1933; VAN HELSDINGEN, 1986).
This study deals with the hypogean spiders which were caught during a sampling campaign in the Zoniën forest (prov. Brabant, Belgium). Starting from these results, some general comments on such spiders are made.

Material and methods

Sampling took place in sixteen different stands in the Zoniën forest and lasted at least one year in every stand. The sampling periods lasted from May 1985 to May 1986, from June 1986 tot July 1987 and from July 1987 to August 1988. Per stand seven glass jars (diam. 9,5 cm., depth 10 cm.), filled with a 4% formaldehyde solution, were used as pitfall traps.
For this study, ten stands were selected, based on the degree of soil compaction in the different stands. This compaction of the upper soil layer is due to horse riding or to the heavy machinery used for forest exploitation and presents one of the most important problems in the Zoniën forest at present. In table 1 some characteristics of the selected stands are listed, table 2 provides the results of captures of known or presumed hypogean spider species.

Results and discussion

In the Zoniën forest, seven different hypogean spider species have been found. Three of them (*Porrhomma campbelli* O.P. - CAMBRIDGE 1894, *Porrhomma egeria* SIMON, 1884 and *Porrhomma* spec.) have reduced eyes and thus seem adapted to a subterranean life. *Porrhomma* spec. has not been caught in the stands considered here. Three other species (*Robertus* spec., *Centromerus leruthi* FAGE, 1933 and *Lepthyphantis insignis* O.P.-CAMBRIDGE 1913) are palecolored spiders with well developed eyes. Literature citations of *C. leruthi* and *L. insignis* mention captures in caves (THALER & PLACHTER, 1983; FAGE, 1933) or mole nests (LOCKET & MILLIDGE, 1953). Similar to these species, *Robertus* spec. is also believed to be a hypogean spider. *Lepthyphantes pallidus* (O.P.-CAMBRIDGE 1871) is a well-known spider which lives in grass tussocks, crevices and the entrance of mole and mice burrows (LOCKET & MILLIDGE, 1953; THALER & PLACHTER, 1983; WIEHLE, 1956).
An initial observation is that the total number of individuals caught was very low. This can be due to the sampling methodology, as pitfall traps are effective in capturing surface-active animals (MAELFAIT & BAERT, 1975). It is unlikely that they are effective in sampling species which only accidentally exhibit soil surface activity. This probably also explains the important differences between catches from different sampling years in the same stand, a phenomenon most obvious in the catches of stand F. In this stand, *P. campbelli* was

Table 1 : Characteristics of the sampled stands in the Zoniën forest.

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Stand :	A	C	D	E	F	G	I	J	N	P
* Vegetation :										
- Tree and shrub cover (%)	70	80	100	50	100	50	50	100	50	70
- herb cover (%)	30	5	0	30	0	50	100	0	90	100
* Litter layer :										
- Litter depth (cm.)	2.1	4.1	3.6	2.2	3.2	5.2	4.6	3.2	1.3	1.3
- composition (%)										
Beech		30	100	100	5	100	100	15	100	60
Oak	45	60			65			50		40
Hornbeam	10				20			30		
Birch	35	5								
* Soil water content :										
(% weight)	36.6	36.1	34.9	33.7	40.3	37.1	38.8	28.7	38.1	31.2
* Surface soil compaction :										
(N : none, S : strong)	N	S	S	S	N	S	S	N	S	N

Table 2 : Number of hypogean spiders caught.

Stand :	A	A	A	C	D	E	F	F	F	G	I	J	N	P
Sampling year :	1	2	3	1	1	1	1	2	3	2	2	2	3	3
Species :														
- Robertus spec.						1	2	1						1
- Porrhomma spec.														
- P. campbelli	1			3	5		2							1
- P. egeria			3		3		4	8	4		1	5		4
- C. leruthi								2	1					
- L. insignis	1													
- L. pallidus	13	20	12	1	12		10	5	4	2	6	8		2
TOTAL :	25	20	15	4	20	1	18	16	9	2	7	13	0	8

caught only during the first year. The opposite was the case for *C. leruthi*. Only *P. egeria* was caught during all three years.
A second remark to be made concerns the taxonomic difficulties encountered while studying these species. These difficulties are mainly due to two factors: the rarity of the species and their high intraspecific variability. The latter can be illustrated by figs. 1 and 2, which represent the eye region of two conspecific individuals from different localities. As early taxonomists frequently used eye size and eye disposition as diagnostic characteristics, it is not surprising that problems arose. These taxonomical problems are further illustrated by our capture of two species which we have not yet been able to identify.

The possible ecological significance of these species is that their habitat is easily influenced by human activities such as horse riding. In order to illustrate this, the results obtained in ten stands with different degrees of soil compaction will be commented upon. Four stands without any soil compaction (A, F, J and P) and six with pronounced coil compaction (C, D, E, G, I and N) were selected from the sixteen stands we sampled.
The number of individuals caught is relatively high in the stands A, D, F and J, and relatively low in the stands C, E, G and N. These results indeed suggest that the occurrence of hypogean spiders is at least partly determined by the degree of soil compaction in a stand. The relatively high number of individuals caught in stand D can be due to the fact that thisis a relatively young, recently planted beech stand. The planting activity seems to be (temporarily?) favorable for the occurrence of hypogean spiders. In stand I, relatively more *L. pallidus* were caught, which is probably due to the quality of the field layer. The same factor may cause the low yield of this species in stand P. The obvious differences observed between the catches of the stands A and F are presumably due to other factors than soil compaction.

Concluding remarks

Our knowledge on hypogean spiders is still limited. Much is left to be done on the taxonomy, faunistics and ecology of this group of spiders. It is however shown that these species can be of some importance to ecologists, as the results presented here indicate that the degree of soil compaction, in this case mostly resulting from human activities, influences the occurrence of hypogean spiders to an important degree. We hope that this contribution will encourage more ecologists to pay more attention to these spiders as hitherto has been done.

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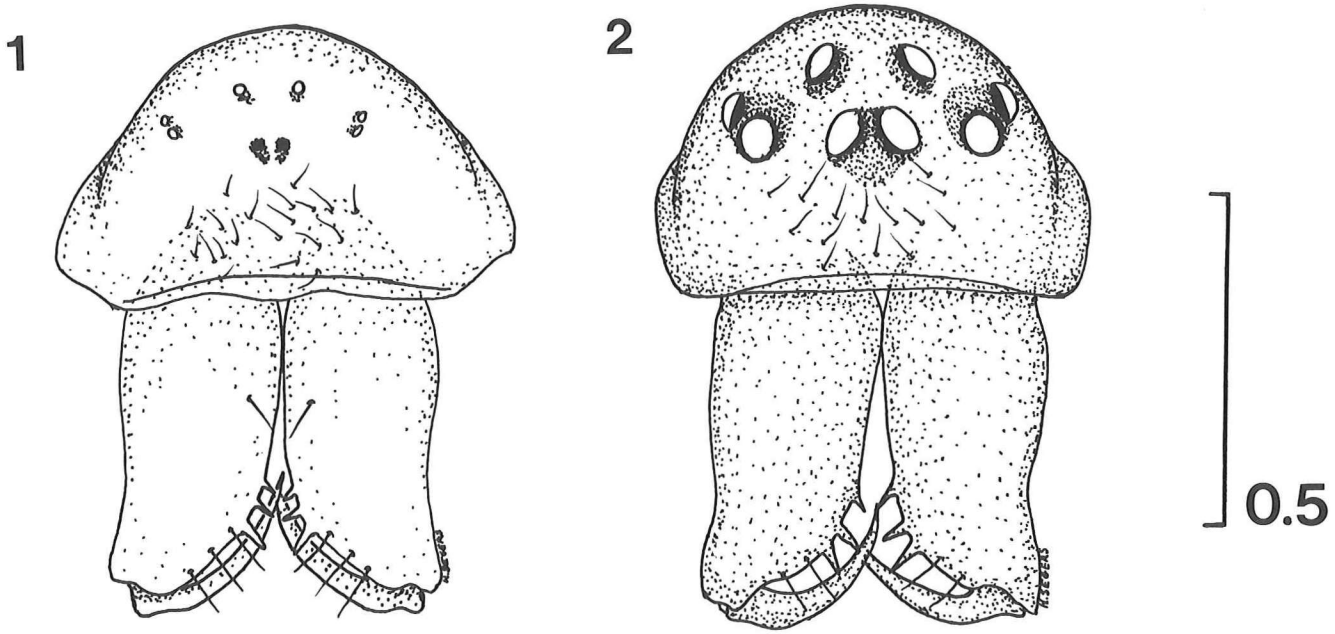

Figs. 1-2. Porrhomma microphthalmum *(O.P. - CAMBRIDGE, 1871) Males: Eye region and chelicera, frontal view. Fig. 1: Specimen from St.-Maria-Lierde (Belgium), Fig. 2: Specimen from Nature Reserve "De Blankaart" (Wouwen, Belgium). Scale line: 0,5 mm.*

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