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INVERTEBRATES OF SCANDINAVIAN CAVES IX.
ACARI: MESOSTIGMATA (GAMASINA),
WITH A COMPLETE LIST OF MITES

by Lars LUNDQVIST*, Heikki HIPPA** and Seppo KOPONEN***

(Accepted September 1999)

SUMMARY: Six caves from Scandinavia — two from South Sweden, two from the Baltic island of Gotland, and two from Norway near the Arctic Circle — were investigated for invertebrates by means of pitfall traps and by hand-picking. 1,765 Gamasina mites were found and determined to species and developmental stages. 37 species in 9 families were identified. One species alone, Parasitus loricatus, made up 75.0% of the total number of mites. Six other species, viz. Poecilochirus carabi, Vulgarogamasus oudemansi, Pergamasus robustus, Vulgarogamasus remberti, Cyrtolaelaps mucronatus and Vulgarogamasus kraepelini made up another 20.2% of the total number of mites. The numbers of individuals and species in this investigation exceeded by far those usually reported from investigations of caves in Europe, probably due to our use of pitfall traps.

RESUME: Six grottes de Scandinavie (Suède : 2 ; îles de la mer Baltique, Gotland : 2 ; Norvège : 2 proches du Cercle polaire) sont prospectées par piègeage et récolte des invertébrés. 1765 gamasides ont été récoltés et déterminés. Ils appartiennent à 37 espèces de 9 familles différentes. Parasitus loricatus représente plus de 75% des individus et six autres espèces 20% (Poecilochirus carabi, Vulgarogamasus oudemansi, V. remberti, V. kraepelini, Pergamasus robustus et Cyrtolaelaps mucronatus). Les résultats montrent un nombre anormalement élevé d’individus et d’espèces par rapport aux autres prospections de grottes en Europe : il s’agit probablement de la conséquence de l’utilisation de pièges d’interception.

INTRODUCTION

Arthropods in caves have been the subject of several studies in continental Europe (DOBAT, 1975; LERUTH, 1939; STRINATI, 1966; WOLF, 1934–38), Britain (CHAPMAN, 1993; FORD, 1977; SMITH & DREW, 1975; WALTHAM & SWEETING, 1974) and Canada (PECK, 1988). A few Scandinavian caves have been thoroughly investigated for several groups of invertebrates (see HIPPA et al. 1984, 1989 and ÖSTBYE et al., 1987, for a full bibliography).

In many of these investigations, invertebrates have been collected by hand-picking under loose stones of the cave floor and walls. This is not a good sampling method for the very small arthropods, such as the acarids. In most studies very few mites were therefore
obtained. However, HIPPA et al. (1984) used pitfall traps in their studies of Scandinavian caves, and the numbers of mites found were much higher. In the study by HIPPA et al. (1988) sampling of acarids other than the Gamasina produced 14 species of Oribata, 14 species of Prostigmata (Rhagidiidae not included), 3 species of Astigmata and 2 species of Uropodina. HIPPA et al. (1989) presented 9 species of Rhagidiidae. Here we deal with the remaining Mesostigmata, the Gamasina. A complete list of all mites from these investigations is presented in the Appendix.

**Caves sampled**

The investigated caves (Fig. 1) were presented in detail in HIPPA et al. 1984. Here is a brief account:

1. Lummelunda cave (57°45′N, 18°25′E), 14 km NNE Visby on the Baltic island of Gotland, Sweden.
2. Galgberg cave (57°42′N, 18°20′E), a small cave near the Lummelunda cave.
3. Balsberg cave (56°06′N, 14°12′E), 7 km N Kristianstad, province of Scania, Sweden.
4. Tykarp cave (56°08′N, 13°47′E), 7 km SE Hässleholm, province of Scania, Sweden.
5. Grönli cave (66°26′N, 14°15′E), 11 km N Mo i Rana, Norway.
6. Jordbru cave (66°15′N, 14°45′E), near Mo i Rana, Norway. No Gamasina mites were found in this cave, and it will not be dealt with any further.

**Material and methods**

Sampling was in most cases done with pitfall traps. Glass jars, 4 or 6 cm in diameter, and a few larger traps, were half filled with a mixture of ethylene glycol and a few drops of detergent. They were buried in the soil of the cave floor, and left for a period of time, as follows:

Lummelunda cave, July 4–October 5, 1975: 94 nights.

Grønli cave, July 25–October 8, 1975: 75 nights.

A varied number of traps were used in each cave. In addition, due to flooding and careless handling by visitors, some traps were destroyed during the period. Hence, the number of trapnights per each cave is difficult to account for.

Mites were individually mounted on microscope slides in Hoyer’s medium, and identified under a light microscope. The slides are deposited at the Zoological Museums of Lund and Turku.

<table>
<thead>
<tr>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
<th>No of caves</th>
</tr>
</thead>
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<tr>
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<td>Macrochelus</td>
<td>decoloratus (C.L.Koch)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>glaber (Müller)</td>
<td>2</td>
</tr>
<tr>
<td>Eviphididae</td>
<td>Alliphis</td>
<td>halleri (G. &amp; R. Canestrini)</td>
<td>1</td>
</tr>
<tr>
<td>Crassicoleles</td>
<td>Concentricus (Oudemans)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>hobasticus Willmann</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Halolaelapidae</td>
<td>Halolaelaps</td>
<td>sp.</td>
<td>1</td>
</tr>
<tr>
<td>Ascidae</td>
<td>Cheirosetus</td>
<td>necorniger (Oudemans)</td>
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</tr>
<tr>
<td></td>
<td>Arctoseius</td>
<td>resinae Karg</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>semicodius (Berlese)</td>
<td>2</td>
</tr>
<tr>
<td>Laelapidae</td>
<td>Hypoaspis</td>
<td>sarob (Berlese)</td>
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</tr>
<tr>
<td></td>
<td>Eulaelaps</td>
<td>stabularis (C.L. Koch)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Haemogamasus</td>
<td>hirsutoximité Willmann</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>hirsuta Berlese</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>liponyssoides Ewing</td>
<td>1</td>
</tr>
<tr>
<td>Myonyssus</td>
<td></td>
<td>rossicus Bregetova</td>
<td>1</td>
</tr>
<tr>
<td>Rhodacaridae</td>
<td>Cyrtolaelaps</td>
<td>mucronatus (G. &amp; R. Canestrini)</td>
<td>3</td>
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<tr>
<td></td>
<td>Euryparastius</td>
<td>emarginatus (C.L. Koch)</td>
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<tr>
<td>Ologamasidae</td>
<td>Stylocirus</td>
<td>&quot;fimentarium&quot; (Müller)</td>
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<td>Veigaia</td>
<td>nemorensis (C.L. Koch)</td>
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</tr>
<tr>
<td>Parasitidae</td>
<td>Holoparasitus</td>
<td>calcaratus (C.L. Koch)</td>
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<td></td>
<td>Amblygamasus</td>
<td>dentipes (C.L. Koch)</td>
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<tr>
<td>Pergamasus</td>
<td>Artipes (Linnaeus)</td>
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</tr>
<tr>
<td></td>
<td>hamatus (C.L. Koch)</td>
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<tr>
<td></td>
<td>holzmannae Micherdzinski</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>robustus (Oudemans)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>septentrionalis (Oudemans)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>vagabundur Karg</td>
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<td></td>
</tr>
<tr>
<td>Eugamasus</td>
<td>berletsi Willmann</td>
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<td></td>
</tr>
<tr>
<td>Cornigamasus</td>
<td>lunaris (Berlese)</td>
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<td></td>
</tr>
<tr>
<td>Pocilochirus</td>
<td>carabi G. &amp; R. Canestrini</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>subterraneus (Müller)</td>
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<td></td>
</tr>
<tr>
<td>Trachygamasus</td>
<td>ambulacralis (Willmann)</td>
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<td></td>
</tr>
<tr>
<td>Parasitus</td>
<td>loricatus (Wankel)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Vulgaromamasus</td>
<td>kraepelini (Berlese)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>oudemansi (Berlese)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>remberti (Oudemans)</td>
<td>2</td>
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</tr>
</tbody>
</table>

Table 1: Mesostigmatic (Gamasina) species in the samples from Swedish and Norwegian caves. Number of caves that each species was found in is indicated.
RESULTS

Altogether 1,765 Gamasina mites were found in five caves. They were distributed among 37 species in 9 families (Table 1). No species was found in all five caves. Twenty-two species were found in only one cave, twelve species in two, and two species in three caves. One species only, Parasitus loricatus, was found in four caves.

<table>
<thead>
<tr>
<th>Genus</th>
<th>Species</th>
<th>No.</th>
</tr>
</thead>
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<tr>
<td>Macrocheles</td>
<td>decoloratus</td>
<td>1 f</td>
</tr>
<tr>
<td></td>
<td>glaber</td>
<td>1 f</td>
</tr>
<tr>
<td>Alliphis</td>
<td>halleri</td>
<td>1 f</td>
</tr>
<tr>
<td>Crassicheles</td>
<td>concentricus</td>
<td>1 NII</td>
</tr>
<tr>
<td>Halolaelaps</td>
<td>sp.</td>
<td>1 NII</td>
</tr>
<tr>
<td>Arctoaeina</td>
<td>resinae</td>
<td>5 f</td>
</tr>
<tr>
<td></td>
<td>semitectus</td>
<td>1 f</td>
</tr>
<tr>
<td>Hypoaspis</td>
<td>sardoa</td>
<td>1 f</td>
</tr>
<tr>
<td>Euolaelaps</td>
<td>stabularis</td>
<td>3 f</td>
</tr>
<tr>
<td>Haemogamasus</td>
<td>hirsutostimilis</td>
<td>2 f</td>
</tr>
<tr>
<td></td>
<td>hirsutus</td>
<td>1 NII</td>
</tr>
<tr>
<td>Cyrtolaelaps</td>
<td>mucronatus</td>
<td>7 NII</td>
</tr>
<tr>
<td>Euryparasitus</td>
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</tr>
<tr>
<td>Veigina</td>
<td>nemorensis</td>
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</tr>
<tr>
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<td>dentipes</td>
<td>5 m</td>
</tr>
<tr>
<td>Pergamasus</td>
<td>hamatus</td>
<td>3 f</td>
</tr>
<tr>
<td>Poecilocirus</td>
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<tr>
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<td>14 NII</td>
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<tr>
<td>Trachygamasus</td>
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<td>3 NII</td>
</tr>
<tr>
<td>Parasitus</td>
<td>loricatus</td>
<td>294 f</td>
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<td></td>
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<td>320 m</td>
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<td></td>
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<td>20 NI</td>
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<td></td>
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<td>221 NII</td>
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<td></td>
<td>21</td>
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<tr>
<td>Vulgarogamasus</td>
<td>oudemansi</td>
<td>2 f</td>
</tr>
<tr>
<td></td>
<td>remberti</td>
<td>4 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9 NII</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 f</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 NII</td>
</tr>
</tbody>
</table>

TABLE 2: Mesostigmatic (Gamasina) species from the Tykarp cave, South Sweden.

P. loricatus also dominated by numbers in three of the caves (Tables 2–5). In the Lummelunda cave, there were a few more individuals of Vulgarogamasus kraepelini than of P. loricatus (Table 4). In the Galgberg cave no pitfall traps were used, only hand-picking on one occasion. The result from this cave is thus not comparable to those obtained from the other caves. Nevertheless, the only gamasine mite found was P. loricatus.

<table>
<thead>
<tr>
<th>Genus</th>
<th>Species</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macrocheles</td>
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</tr>
<tr>
<td>Crassicheles</td>
<td>holasticus</td>
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<tr>
<td>Arctoaeina</td>
<td>resinae</td>
<td>1 NII</td>
</tr>
<tr>
<td></td>
<td>semitectus</td>
<td>1 f</td>
</tr>
<tr>
<td>Hypoaspis</td>
<td>sardoa</td>
<td>1 f</td>
</tr>
<tr>
<td>Euolaelaps</td>
<td>stabularis</td>
<td>2 f</td>
</tr>
<tr>
<td>Haemogamasus</td>
<td>liponyssoides</td>
<td>1 NII</td>
</tr>
<tr>
<td>Myonyssus</td>
<td>rossicae</td>
<td>2 f</td>
</tr>
<tr>
<td>Cyrtolaelaps</td>
<td>mucronatus</td>
<td>5 NII</td>
</tr>
<tr>
<td>Euryparasitus</td>
<td>emarginatus</td>
<td>1 NII</td>
</tr>
<tr>
<td>Stylochirus</td>
<td>&quot;fimetarium&quot;</td>
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<tr>
<td>Holoparasitus</td>
<td>calcidius</td>
<td>1 f</td>
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<tr>
<td></td>
<td>exspiliger</td>
<td>1 f</td>
</tr>
<tr>
<td>Pergamasus</td>
<td>holzmannae sp.</td>
<td>1 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 NII</td>
</tr>
<tr>
<td>Poecilocirus</td>
<td>carabi</td>
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<tr>
<td></td>
<td></td>
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<td></td>
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<td>11 NII</td>
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<td>86 NII</td>
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</tr>
<tr>
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<td>remberti</td>
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<td>1 f</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 NII</td>
</tr>
</tbody>
</table>

TABLE 3: Mesostigmatic (Gamasina) species from the Balsberg cave, South Sweden.

One species alone, P. loricatus, made up 75.0% of the total number of gamasine mites, and the seven most frequent species made up 95.2% (Table 6).

Four species, Parasitus loricatus, Vulgarogamasus oudemansi, Pergamasus robustus and V. remberti, were present in more than one developmental stage (Tables 2–5). They were also among the five most frequent, and constituted the bulk of the gamasine mites in the caves (Table 6).
<table>
<thead>
<tr>
<th>Genus</th>
<th>Species</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macrocheles</td>
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</tr>
<tr>
<td>Cheirozetes</td>
<td>necorneriger</td>
<td>1 f</td>
</tr>
<tr>
<td>Eulelaps</td>
<td>stabularis</td>
<td>2 f</td>
</tr>
<tr>
<td>Pergamasus</td>
<td>crassipes</td>
<td>1 m</td>
</tr>
<tr>
<td></td>
<td>hamatus</td>
<td>1 f</td>
</tr>
<tr>
<td></td>
<td>septentrionalis</td>
<td>1 f</td>
</tr>
<tr>
<td></td>
<td>vagabundus</td>
<td>1 f</td>
</tr>
<tr>
<td>Eogamasus</td>
<td>berlesi</td>
<td>1 m</td>
</tr>
<tr>
<td>Cornigamasus</td>
<td>lunaris</td>
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</tr>
<tr>
<td>Parasitus</td>
<td>loricatus</td>
<td>1 m</td>
</tr>
<tr>
<td></td>
<td>3 m</td>
<td>1 NII</td>
</tr>
<tr>
<td>Vulgarogamasus</td>
<td>kraepelini</td>
<td>1 f</td>
</tr>
<tr>
<td></td>
<td>7 m</td>
<td></td>
</tr>
</tbody>
</table>

### Table 4: Mesostigmatic (Gamasina) species from the Lummelunda cave, Gotland, Sweden.

<table>
<thead>
<tr>
<th>Genus</th>
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<tr>
<td>Crassiclzeles</td>
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<tr>
<td>Cyrtolaelaps</td>
<td>mucronatus</td>
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</tr>
<tr>
<td>Veigaia</td>
<td>sp.</td>
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<tr>
<td>Pergamasus</td>
<td>robustus</td>
<td>18 f</td>
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<tr>
<td></td>
<td>14 m</td>
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<tr>
<td></td>
<td>1 NII</td>
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</tr>
</tbody>
</table>

### Table 5: Mesostigmatic (Gamasina) species from the Grønli cave, Norway.

### Table 6: The most frequent Gamasina species in five Scandinavian caves.

**DISCUSSION**

We have found a larger number of Gamasina mites in the Scandinavian caves, compared to what is reported from continental Europe, Britain and Canada (Peck, 1988).

The mesostigmatic mites are probably introduced into the caves from three different sources: Insects, small mammals and free-living mites.

Most of the Gamasina species are associated with insects, like the families Macrocheilidae, Eviphididae, Halolaelapidae, Ologamasidae, Ascidae and some of the Parasitidae (genera Poecilochirus and Trachygamasus) (Lundqvist, 1998). It is likely that they are transported occasionally to the caves. The low number of individuals, the large number of species and the lack of correspondence in species composition between caves, even caves that are closely located, indicate association with insects.

Another source is small mammals. This is most likely the origin of the families Laelapidae and Rhodacaridae. Small rodents and bats, or their traces, were observed in most of the caves.

However, the most frequent species (families Parasitidae and Veigaiidae) are free-living predators. Four species, representing the genera Parasitus (P. loricatus) and Vulgarogamasus (V. ouedomansi, V. kraepelini and V. remberti), are obviously reproducing in the
Swedish caves, as they were found in relatively large numbers, both as juveniles and adults (Tables 2–4). In the Lummelunda cave, only a few individuals of these genera were found (Table 4), which could indicate that the populations either do not reproduce, or just had started. However, it should be noted that trapping period in Lummelunda was much shorter compared to those case in the two Scanian caves and did not include wintertime. In the northernmost cave, Grönlund, the reproducing species was Pergamasus robustus, whereas neither Parasitus nor Vulgarogamasus species were found. Whether the absence of these genera, that are so common in the southern caves, is due to the high latitude or pure chance cannot be decided.

In species lists of caves from other parts of the world, few mites are generally reported. This is most probably due to the sampling methods. There is no other reason to believe that the Scandinavian caves should be so much richer in these groups.

There are only a few species of Mesostigmatic mites frequently reported from European caves. The most common ones are Parasitus loricatus and Eugamasus magnus (=berlesei?). They were also found in the Swedish caves, although E. berlesei only in low numbers. However, these species, as well as other gamasine mites found in the Scandinavian caves, are also regularly found in other biotopes (e.g. LUNDqvist, 1974).

TAXONOMIC COMMENTS ON THE SPECIES LIST

**Alliphis halleri** (G. & R. Canestrini, 1881)
Syn: *A. siculus* (Oudemans, 1905)

**Stylochirus “fimentarium”** (Müller, 1859)

Deutonymphs of this species are known as Iphidiosoma fimentarium (KARG, 1971) and are found associated with carabid beetles during the second half of a year. Adults, however, are members of the genus Stylochirus, and can be found free living in forest litter during a short period of time in April–May (LUNDqvist, 1991). The definite name of the species still remains to be settled (KETHLEY, 1983).

**Pergamasus crassipes** (Linnaeus, 1758)

No attempt has been made to separate this species from *P. longicornis* (Berlese, 1906) (BATTACHARYA, 1963, KARG, 1971).

**Eugamasus berlesei** (Willmann, 1935)

The sole male keys out to *E. berlesei* according to HYATT (1980), who expressed doubts about differences between this species and *E. magnus* (Kramer, 1876).

FAUNISTIC COMMENTS ON THE SPECIES LIST

The laelapid species *Haemogamasus lipponyssoides*, which we found in the province of Scania, was previously known from Sweden and Finland only north of latitude 64° (LUNDqvist, 1990).


ACKNOWLEDGEMENTS

Thanks are due to Marja and Rauno MANNILA and to Hillevi SARTOLA-HIPPA for their help in the field. Matti UUSITALO, Ritva NIEMI and Miloslav ZACHARDA determined part of the mite material listed in the Appendix. Thanks are also due to Sten RUNDGREN, Lund, for reading and commenting upon the manuscript.

REFERENCES


APPENDIX. Acari species found in six Scandinavian caves by our team (HIPPA et al. 1988, 1989, and present material). Abbreviations for the caves (see map in Fig. 1): 1 = Lummelunda, 2 = Galgberg, 3 = Balsberg, 4 = Tykarp, 5 = Grönl, and 6 = Jordbru.

<table>
<thead>
<tr>
<th>ACTINOTRICHIDA</th>
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<tbody>
<tr>
<td>Oribata</td>
<td>3</td>
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<tr>
<td>Adoristes sp.</td>
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<tr>
<td>Belba sp.</td>
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<tr>
<td>Carabodes labyrinthus (Michael)</td>
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<tr>
<td>C. spinosus Sellnick</td>
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<tr>
<td>Chamaebates cuspidatus (Michael)</td>
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<tr>
<td>Danuales annulus C.L. Koch</td>
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<tr>
<td>Euxetites seminulum (O.F. Müller)</td>
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<tr>
<td>Hafnerrefferia gilipes (C.L. Koch)</td>
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<tr>
<td>Hypodamaeus brevitibialis Bulanova-Zachvatkina</td>
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<tr>
<td>H. riparius (Nicolet)</td>
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</table>


<p>| Moritzella keilbachii (Moritz)                  | 4 |
| Oribella pectinata (Michael)                  | 4 |
| Paradamaeus clavipes (Hermann)                | 3 |
| Scheloribates pallidulus (C.L. Koch)          | 1 |
| Prostigmata                                   |   |
| Anysis baccarum (Linnaeus)                    | 4 |
| Bidella iconica Berlese                       | 4 |
| Cyta latroaris (Hermann)                      | 1 |
| Ereynetes (Anereynetes) sp.                   | 3 |
| Ereynetes cf. gandensis Pain &amp; Bafort         | 1 |
| Evadorhagidia sp.                            | 3 |
| Foveacheles asdonensis (Thor)                 | 4 |
| Leptus sp.                                    | 1, 3, 4 |
| Limodites motatorius (Linnaeus)               | 3, 4, 5 |
| Pediculaster sp.                              | 4 |
| Peniboleus major (Duges)                      | 3, 4 |
| Poesicilephytus faeroensis (Tragardhi)        | 4 |
| P. pseudoreflexa Zacharda                    | 3 |
| P. spelaea (Wankel)                           | 2, 6 |
| P. weyerensis (Puckard)                      | 4 |
| Rhagidia gigas (R. Canestrini)               | 3 |
| R. raecki Zacharda                           | 4 |
| Robustochela robusta Zacharda                | 4 |
| Scutacarus desertaoloh Mahunka [as S. acarorum (Goeze) in 1988; M. Uusitalo pers. comm.] | 4 |
| S. ponticohor Mahunka [as Scutacarus sp. in 1988; M. Uusitalo pers. comm.] | 4 |
| Thordella meridionalis (Thor)                 | 5 |
| T. norregicus (Thor)                          | 3 |
| Trombidiidae sp.                              | 1 |
| Astigmata                                     |   |
| Caloglyphus berlese (Michael)                 | 4 |
| Myxiaoetus diadematus Willmann               | 1, 4 |
| Tyrophagus simillis Volgin                   | 4 |
| ANACTINOTRICHIDA                              |   |
| Mesostigmata (Uropodina)                      |   |
| Dinychopsis catula (Hull)                     | 4 |
| Leiodinychius orbicularis (C.L. Koch)         | 1 |
| Mesostigmata (Gamasina)                       |   |
| Alliphis halleri (G. &amp; R. Canestrini)         | 4 |
| Amblygamasus dentipes (C.L. Koch)             | 4 |
| Arctoseius resinae Karg                      | 3, 4 |
| A. senisiscus (Berlese)                       | 3, 4 |
| Cheiroseius necoriiger (Oudemans)             | 1 |
| Cornigenous us lunaris (Berlese)              | 1 |
| Craziichesus concentricus (Oudemans)          |   |
| C. holstaticus Willmann                     | 4, 5 |
| Cyrtolaelaps mucronatus (G. &amp; R. Canestrini)  | 3, 4, 5 |
| Eugamasus berlese/Willmann                   | 1 |
| Eulaelaps stabularis (C.L. Koch)              | 1, 3, 4 |
| Euryparasitus emarginatus (C.L. Koch)         | 3, 4 |</p>
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<th>Species</th>
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<tr>
<td>H. hirsutus Berlese</td>
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<td>H. lipoxyssoides Ewing</td>
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<td>Hololaelaps sp.</td>
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<td>Holoparasitus colorarius (C.L. Koch)</td>
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<td>H. excipuliger (Berlese)</td>
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<td>Hypoapis sardoa (Berlese)</td>
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<td>Macrocheles decoloratus (C.L. Koch)</td>
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<td>M. glaber (Müller)</td>
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<td>Parasitus loricatus (Wankel)</td>
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<td>P. hamatus (C.L. Koch)</td>
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<td>P. holzmanni Micherdzinski</td>
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<td>P. robustus (Oudemans)</td>
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<td>P. vagabundus Karg</td>
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<td>Poecilochnites carabi G. &amp; R. Canestrini</td>
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<tr>
<td>P. subterraneus (Müller)</td>
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<td>Stylochirus &quot;fanentarium&quot; (Müller)</td>
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<td>Trachygamasus ambulacralis (Willmann)</td>
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<td>V. oudemani (Berlese)</td>
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