

## OBSERVATIONS ON THE MITES (ACARI) ASSOCIATED WITH CARABIDAE (COLEOPTERA) IN BELGIUM. I. ANNOTATED LIST OF THE SPECIES

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**ABSTRACT** - The acarofauna associated with Carabidae (Coleoptera) in Belgium is studied. About 1000 mites were collected from 19 sites from 155 carabid beetles belonging to 21 species and 8 genera. The mites belonged to 12 species, 8 genera, 8 families and 3 orders. All mites were found beneath the elytra of the beetles except the hypopi of the Histiostomatidae which were found attached to the body. A new species of *Antennoseius*, *A. calathi* n. sp. (Ascidae), is described from *Calathus micropterus* and *Pterostichus diligens*. More than half of the mites of our collections were deutonymphs belonging to 2 species of the genus *Halodarcia* Karg (Halolaelapidae) i.e. *H. incideta* Karg, 1969 and *Halodarcia* sp.

**RÉSUMÉ** - L'acarofaune associée aux Carabidae (Coleoptera) de Belgique est étudiée. Environ 1000 acariens ont été récoltés dans 19 sites et sur 155 carabides appartenant à 21 espèces et 8 genres. Les acariens récoltés font partie de 12 espèces, 8 genres, 8 familles et 3 ordres. Tous ces acariens furent découverts sous les élytres de leurs hôtes excepté des hypopes d'Histiostomatidae qui étaient attachés au corps des Carabides. Une nouvelle espèce d'*Antennoseius*, *A. calathi* n. sp. (Ascidae) est décrite de *Calathus micropterus* et *Pterostichus diligens*. Plus de la moitié du nombre total d'acariens récoltés était constituée de deutonymphes appartenant à 2 espèces du genre *Halodarcia* Karg (Halolaelapidae): *H. incideta* Karg, 1969 et *Halodarcia* sp.

### INTRODUCTION

The present paper is devoted to the study of a collection of mites (Acari) living in association with carabid beetles in Belgium. It forms part of a study on the ecology of the Carabidae initiated by M. Dufrêne in Belgium since 1986 and continued in 1987 and 1991 (Dufrêne, 1992). These investigations allowed the sampling of 39,984 specimens of Carabidae belonging to 187 species. They represent more than half of the species recorded from Belgium since 1950.

Until now only a small part of this collection has been checked for mites. The results of the first investigation are reported herein. The taxonomy of the Carabidae in Belgium is based on the work of Desender (1985).

All measurements are given in micrometers ( $\mu\text{m}$ ).

Abbreviations : IRSNB = Institut Royal des Sciences Naturelles de Belgique; NHML = Natural History Museum, London; UCL = Unité d'Écologie et de Biogéographie à l'Université Catholique de Louvain, Louvain-la-Neuve.

### REVIEW OF LITERATURE

Until now two papers have dealt with the acarofauna of Carabid beetles in Belgium.

In 1950, Cooreman reported the presence of 3 species of Canestriniidae (Acari, Astigmata), collected from *Carabus* spp. from South of Belgium, i.e. *Procericola bourgognei* (Oudemans, 1923) (= *Caraboecius coriacei* Cooreman, 1950) and *Canestrinia saetolata* Cooreman, 1950, both from *Carabus coriaceus*, and *Photia chrysocarabi* Cooreman, 1950, from several species of *Carabus*.

In 1984, Desender and Vaneechoutte, in the course of an ecological study on Carabidae in 17 localities of Belgium, collected 3581 specimens of Carabid beetles belonging to 55 species and 17 genera. Among these, 223 (= 6.23%), belonging to 29 species, were found infested by mites. The genus *Carabus* was not included in this survey.

Most of the mites that were collected, especially the Mesostigmata, were immatures and not identified to the species level. They belonged to 17 genera and 4 orders of Acari (see Table 1). This material included 2 species of Oribatida, which normally are not associated with insects but live mainly in forest soils where they feed on fungi and algae. Their occurrence on the beetles was probably accidental. However, in certain groups of oribatids (e.g. the "box mites" and especially in the genus *Mesoplophora*), the mites may attach to the hairs of insects by clasping the hair between the rostrum of the aspis and the anterior portion of the genital plates (Norton, 1980).

A part of the material examined by these authors was collected during the hibernating period of the beetles and that can explain the scarcity of adult mites in their collection.

The mites collected by Desender and Vaneechoutte were, unfortunately, not available for our study because they had been loaned abroad and are probably lost (Desender, pers. comm.).

Mites have been recorded from Carabidae in several other countries, and some groups (e.g. Canestriniidae) are very common in numerous countries. A list of all the species of mites recorded so far from Carabidae on a world basis is in preparation.

## MATERIAL AND METHODS

The 155 carabid beetles found infested by mites during the course of this study were collected by means of pitfall traps placed in 19 sites. The geographical data of these sites are listed in Table 1. Only the natural and subnatural open habitats were included. The search for mites was not extensive and the species with coalescing elytra (e.g. genera *Carabus* and *Cychrus*) were not examined.

The beetles collected during this study belong to 21 species and 8 genera of Carabidae. Among these the genera *Pterostichus*, *Bembidion* and *Agonum*, represented by 6, 5 and 4 species respectively, were the most frequently infested by mites. Among the 155 specimens of beetles carrying mites, 63 belonged to *Pterostichus* (especially *P. diligens*), 39 to *Agonum* spp (especially *A.*

*fuliginosum*) and 9 to *Bembidion* spp. Almost all the mites found on these beetles were located beneath the elytra.

## REMARKS ON SOME SPECIES OF MITES COLLECTED DURING THIS STUDY

### I. Order MESOSTIGMATA

#### Family ASCIDAE

#### Subfamily ASCINAE

#### Genus *Antennoseius* Berlese, 1916

This cosmopolitan genus includes, at present, about 35 species. These mites live generally in soil, on leaf litter, moss, under stones etc.

Costa (1969), recorded, for the first time, females of this genus beneath the elytra of Carabidae, in Israel. Two species were recorded from this habitat, i.e. *A. bytinskii* Costa (1969) from *Sciarettes striatus* and *A. masoviae* Sellnick, 1943, from *Carabus hemprichi*. Olynyk and Freitag (1979) recorded the presence of 2 females of *Antennoseius* sp. (near *pannonicus* Sellnick) beneath the elytra of an unidentified Carabidae in Canada. More recently Desender and Vaneechoutte (1984) found (?) deutonymphs of this genus beneath the elytra of *Harpalus rufibarbis*, *Trechus quadristriatus* and *Bradycellus verbasci*, all from Belgium. One may wonder if these deutonymphs belonged really to *Antennoseius*. In most of the gamasine mites, in absence of the females, it is not possible to identify the genus to which a deutonymph belongs. The deutonymphs of *Antennoseius* (*Vitzthumia*) *janus* were described for the first time in 1989 by Lindquist and Walter. These authors succeeded in rearing this new species and obtained all its developmental stages.

The genus *Antennoseius* has been divided into 2 subgenera with the following characters :

*Antennoseius* s. str. - Tarsus I devoid of pretarsus and claws.

*Vitzthumia* Thor, 1930 - Tarsus I bearing a pretarsus and a pair of claws.

There is some disagreement between the authors concerning the taxonomic position of several species of these genera. Bregetova (in Ghilarov, 1977) included only 2 species in *Vitzthumia*, i.e. *A. oudemansi* Thor (1930) and *A. belajevi* Bregetova (1977) and left the remaining species in *Antennoseius*. In contrast, Lindquist and Walter (1989) included *oudemansi*, *belajevi*, *A. granulata* Willmann (1949) and *A. spinosa* Willmann (1949) in *Vitzthumia*. Several authors, e.g. Ryke (1962), Karg (1977) and Evans and Till (1979) considered *Vitzthumia* as a synonym of *Antennoseius*.

1. *Antennoseius (Antennoseius) masoviae* Sellnick, 1943

The 5 females in our material were collected beneath the elytra of *Olisthopus rotundatus*, *Calathus fuscipes* and *Bembidion lampros* (Table 1).

This species was initially described from moss cushions in East Prussia. Costa (1969) reported it for the first time under elytra of carabid beetles in Israel.

The leg chaetotaxy of our specimens is of the Ascidae type (Evans, 1963; Evans and Till, 1979).

2. *Antennoseius (Antennoseius) calathi* nov. spec. (Figs. 1-7)

*Female, holotype*: Maximum length and width of idiosoma 480 x 296; lengths and widths in 4 paratypes 495 x 290; 490 x 280; 480 x 270; 475 x 290. *Dorsum*: With 2 large shields, a podonotal 264 long and 270 wide and an opisthonotal 220 long and 240 wide (maximum measurements). Both shields covered by a well developed network of striae forming polygons partly filled with short longitudinally or obliquely oriented lines. Podonotal shield with 19 pairs of stout, spinous and smooth setae, 18-30 long. Opisthonotal shield with 15 pairs of setae 22-30 long, slightly thinner than those of anterior shield; J5, Z5 and S5 with short barbs. Soft cuticle with about 15 pairs of short setae, some with short barbs. Gnathotectum rounded, anterior margin denticulate. *Venter*: Tritosternum with 2 short, pilose laciniae. Sternal shield 120 long and 102 wide at level of *st* 2, without network of striae and with a sclerotized concave sclerite between *st* 1, bearing 2 pairs of lyrifissures; *st* 1 and *st* 2 18 long; *st* 3 and metasternal setae inserted on soft integument, 18 and 15 long. Genital shield strongly narrowed anteriorly (width 12), posterior half broadly oval, almost circular (width 54); genital setae 13 long, inserted on margin of shield. Metapodal shields oval, 20 long, 12 wide. Anal shield triangular, 90 long (including cribrum), maximum width 86; anus located in anterior half of shield; anterior anal

setae 12 long, posterior setae 17 long. Soft integument with 17 pairs of setae. Peritremes extending to setae *z*1; peritremal shield strongly developed projecting posteriorly behind coxa IV, at level of *s* 2, fusing with podonotal shield. *Gnathosoma*: Palps 170 long, chaetotaxy: trochanter 2, femur 5, genu 6, tibiae 13-14. Deutosternal groove with 7 rows of 4-10 denticles. *Chelicerae*: Fixed digit 42 long, with a row of 11-13 small teeth and a short pilus dentilis externally arising from a rounded base; movable digit 48 long, with 2 triangular teeth, most apical bifid. *Legs*: Leg I without pretarsus or claws, apex with 6 short, thick, subcylindrical sensory setae. Length of legs I-IV (excluding pretarsi): 570, 339, 309, 414.

*Holotype* female found beneath the elytra of *Calathus micropterus* (2) (site no. 82, relevé 6), trapped in a sandy moor at Camp de Lagland, Lorraine Belge (Table 1).

*Paratypes*: 18 females with same date as holotype; 4 females from *Pterostichus diligens* (site no. 46, relevé 4: 1 female and site no. 46, relevé 7 bis: 3 females), all from Les Eplattis, Ardenne, near border of a pond (Table 1); 2 females from an unidentified carabid beetle, from same site (site no. 46, relevé 7).

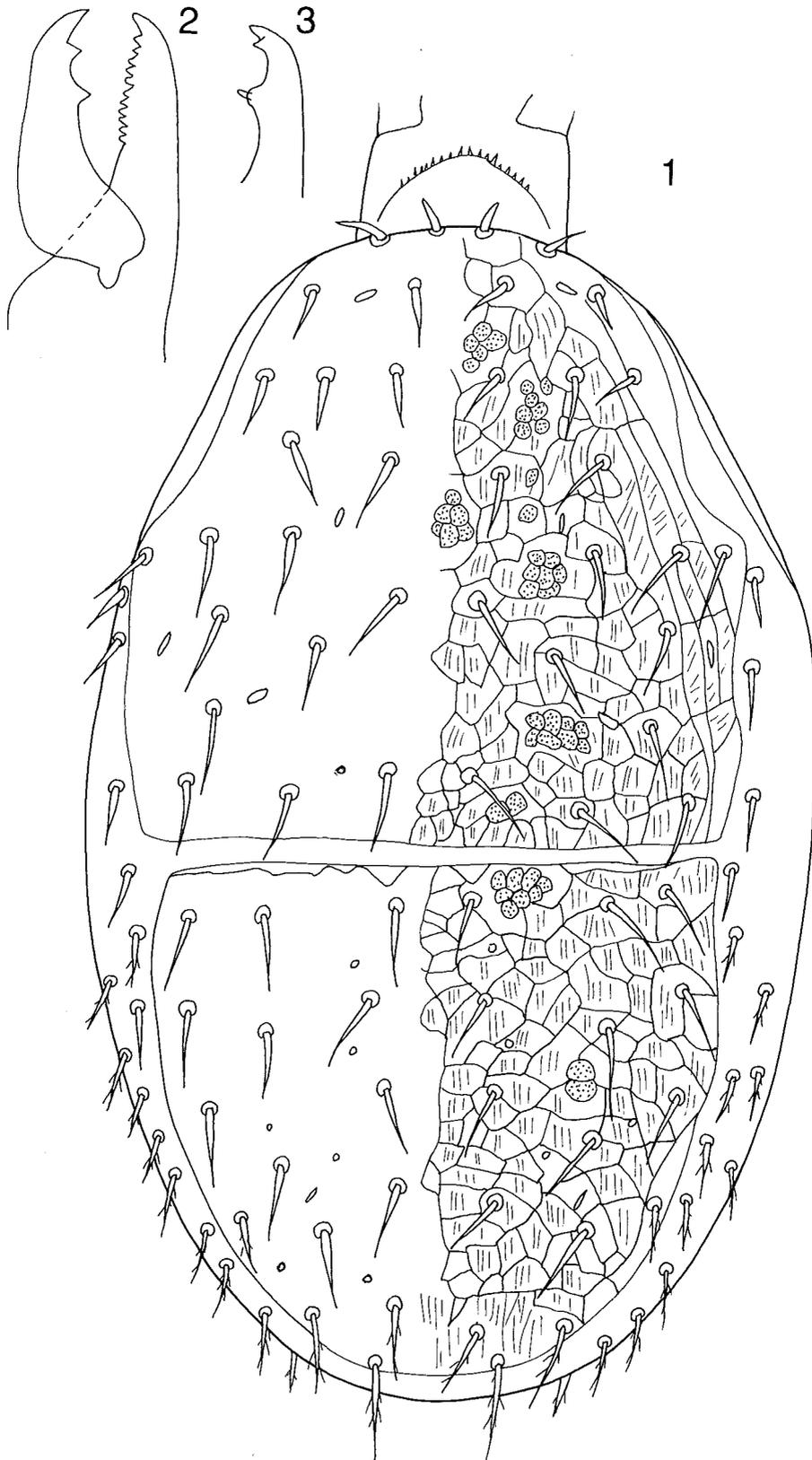
Holotype and 19 paratypes in the IRSNB, 4 paratypes in UCL and 1 paratype in the NHML.

*Remarks*: *A. (A.) calathi* belongs to a small group of species (*delicatus* group) characterized by small size of the anal shield bearing only 3 anal setae, and setae of the podonotal shield subequal except *j* 1 which is inflated in some species. This group includes 6 species, i.e. *A. (A.) delicatus* Berlese (1916), *A. (A.) boskopensis* Ryke (1962), *A. (A.) bullitus* Karg (1969), *A. (A.) dargomensis* Barillo (1987), *A. (A.) chirae* Jordaan et al. (1987) and *A. (A.) ghilarovi* Balan (1988).

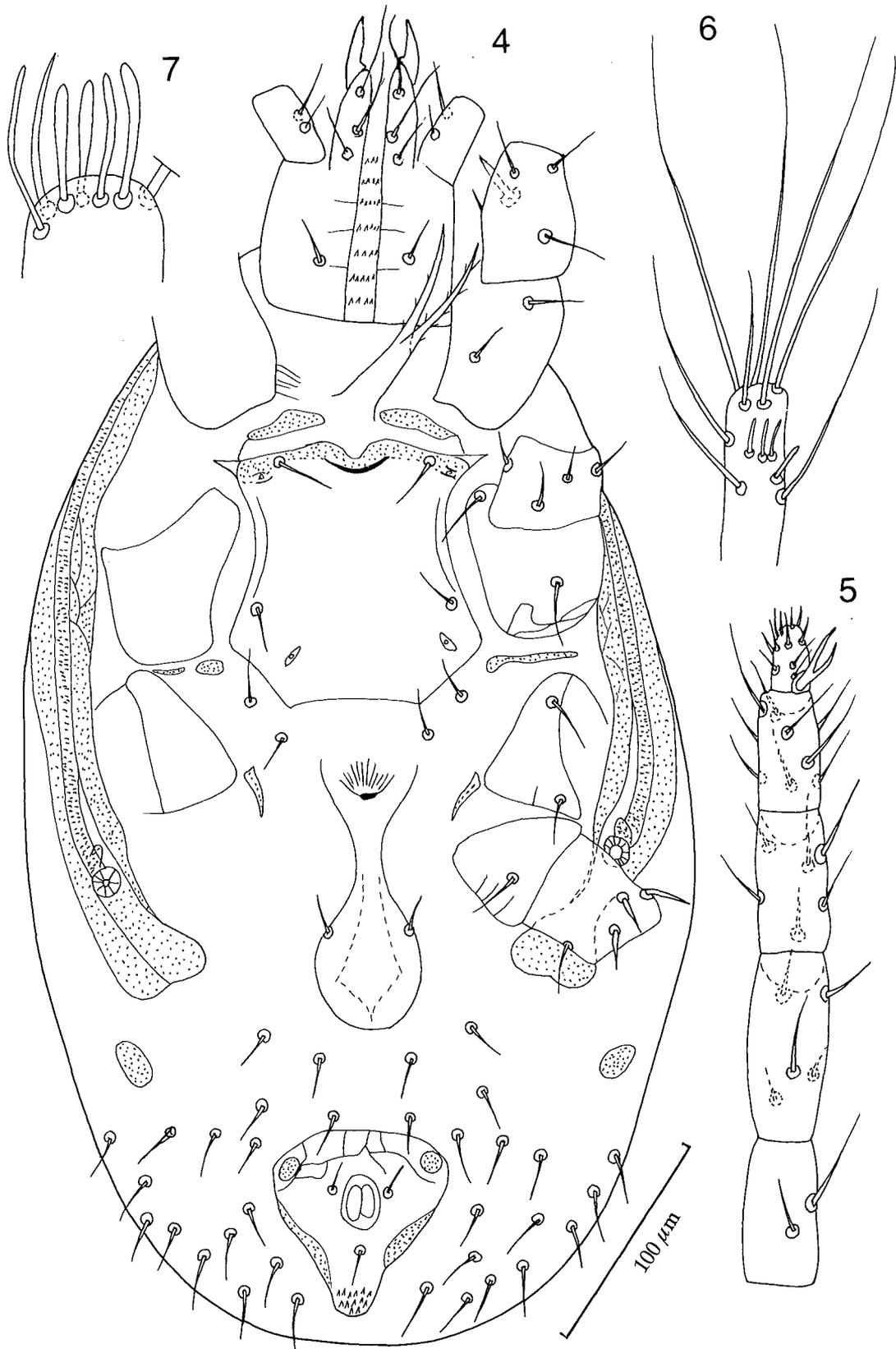
Our new species differs from all above species by the location of *st* 3 and the metasternal setae which are set on soft integument. In *A. delicatus* these setae are located on a small, distinct, shield behind the sternal shield. In all other species *st* 3 is set on the sternal shield.

Chaetotaxy of legs I-IV in *A. calathi* nov. spec.:

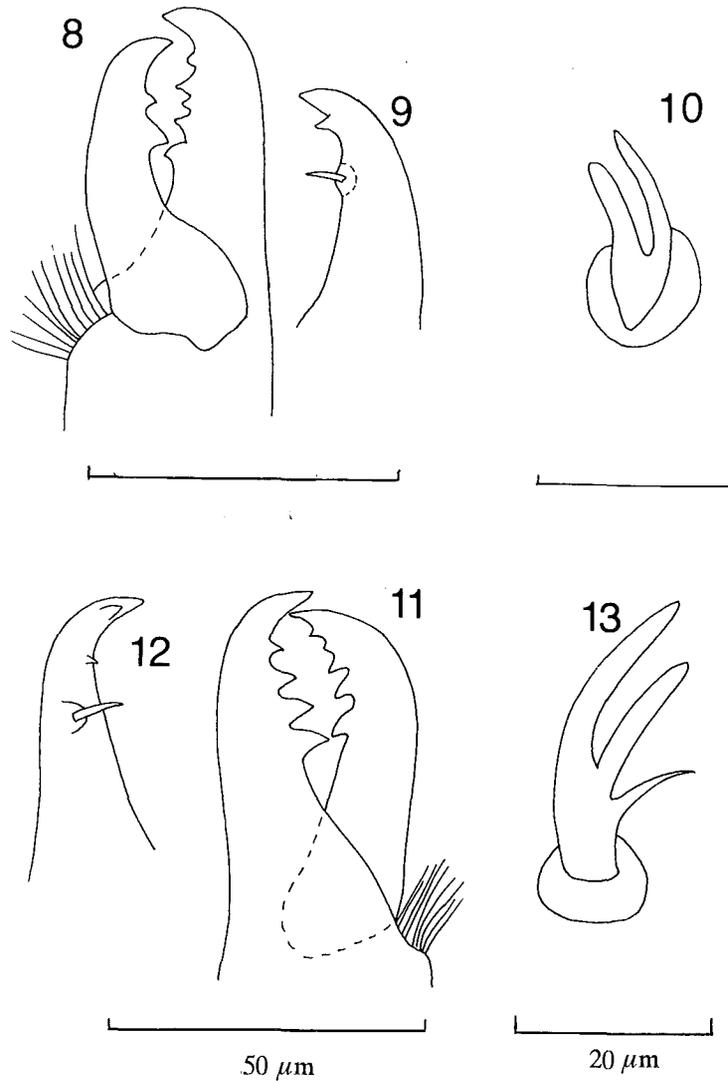
|            | I            | II           | III          | IV           |
|------------|--------------|--------------|--------------|--------------|
| Trochanter | 1-0/1, 1/2-1 | 1-0/1, 0/2-1 | 1-0/2, 0/1-1 | 1-0/2, 0/1-1 |
| Femur      | 2-3/3, 2/0-2 | 2-3/2, 2/1-1 | 1-2/1, 1/0-1 | 1-2/1, 2/0-0 |
| Genu       | 2-3/2, 3/1-2 | 2-3/1, 2/1-2 | 2-2/1, 2/1-1 | 2-2/0, 3/1-1 |
| Tibia      | 2-3/2, 3/1-2 | 2-2/1, 2/1-2 | 2-1/1, 2/1-1 | 2-1/1, 3/1-2 |



Figs. 1-3. *Antennoseius calathi* nov. spec. (Female) - 1. dorsal view, 2. cheliceral digits, medial view, 3. fixed digit, lateral view.



Figs. 4-7. *Antennoseius calathi* nov. spec. (Female) - 4. ventral view, 5. palp, ventral view, 6. apical part of leg I, ventral view, 7. apical part of leg I, dorsal view.



Figs. 8-10. *Hypoaspis nollii* Karg (Female) - 8. medial view of cheliceral digits, 9. lateral view of fixed digit, 10. palptarsus apotele. Figs. 11-13. *Halodarcia incideta* Karg (Deutonymph) - From Carabidae from Belgium. 11. cheliceral digits, medial view, 12. fixed digit, lateral view, 13. palptarsus apotele.

**Family LAELAPIDAE**

**Subfamily LAELAPINAE**

*Hypoaspis nollii* Karg, 1962

= *Hypoaspis praesternalis* Evans & Till, 1966, non  
*praesternalis* Willmann, 1949

This species was described from soil, grassland and marshes in Europe (Karg, 1962).

*Hypoaspis nollii* prior to this report has not been recorded previously from carabid beetles. Our 14 female mites were found beneath the elytra of 2 beetles of *Agonum fuliginosum* (site no. 69, relevé 5). These beetles were caught near the border of a pond (Etang de Luchy, Ardenne) (Table 1).

We give here a brief description of our specimens (Figs 8-10). Lengths and maximum widths of 4 females: 435 x 225; 429 x 215; 426 x 225; 425 x 226. Dorsal shield covering almost entire dorsum, with a network of striae and 38 pairs of setae, 18-30 long. Peritreme extending to middle of coxa II. Gnathotectum slightly rounded and denticulate. Sternal shield reticulate, 111 long and 85 wide at level of *st* 2. Genital shield tongue-shaped, maximum width 60. Anal shield triangular, 75 long, maximum width 70. *Chelicerae*: Fixed digit 45 long, with 6 teeth (3 thick and 3 small) and a short pilus dentilis; movable digit 51 long, with 2 unequal teeth. Palptarsus with a two-tined apotele. Chaetotaxy of palps: Tr 2, F 5, G 6, Ti 13-14.

Chaetotaxy of legs I-IV in *H. nollii* Karg:

|       | I                               | II           | III          | IV           |
|-------|---------------------------------|--------------|--------------|--------------|
| Femur | 2-2/1, 3/3-2<br>or 2-3/1, 2/3-2 | 2-3/1, 2/2-1 | 1-2/1, 1/0-1 | 1-2/1, 1/0-1 |
| Genu  | 2-3/2, 3/1-2                    | 2-3/1, 2/1-2 | 2-2/1, 2/1-1 | 2-2/1, 3/0-1 |
| Tibia | 2-3/2, 3/1-2                    | 2-2/1, 2/1-2 | 2-1/1, 2/1-1 | 2-1/1, 3/1-2 |

### Family HALOLAELAPIDAE

#### Genus *Halodarcia* Karg, 1969

This genus is represented in our collection by 2 species: *Halodarcia incideta* Karg, 1969 and *Halodarcia* sp.

#### *Halodarcia incideta* Karg, 1969

This species has been described from the coastal region of the Baltic Sea, N.E. of Germany, near Rostock and in a beech plantation at Darss. The mites were found in decaying beech-leaves, in humus of a swampy area and on roots and in the humus of fern. It is a rare species and has not been recorded again since its description (Karg, 1993).

More than 500 deutonymphs of this species were found by us, all beneath the elytra of carabid beetles from Belgium. These deutonymphs were collected from 6 species of *Pterostichus*, 3 species of *Bembidion*, 3 species of *Agonum* and from *Dyschirius globosus*, *Amanus similata* and *Olisthopus rotundatus* (Table 1). Adult forms, protonymphs or larvae were not found on these beetles nor in soil at the sites where the infested beetles had been caught.

We describe here this deutonymph from specimens collected from *Pterostichus diligens*.

*Deutonymph* (Figs. 11-16): Length in 5 specimens: 610 to 700, width 380 to 470. Maximum length and width of podonotal shield 270 x 240, of opisthotal shield 225 x 210. Both shields strongly reticulate, most anterior part of podonotal shield bearing *j1* setae poorly sclerotized and lacking reticulations. This shield with 15 pairs of setae (exceptionally 14 pairs), 8 pairs of

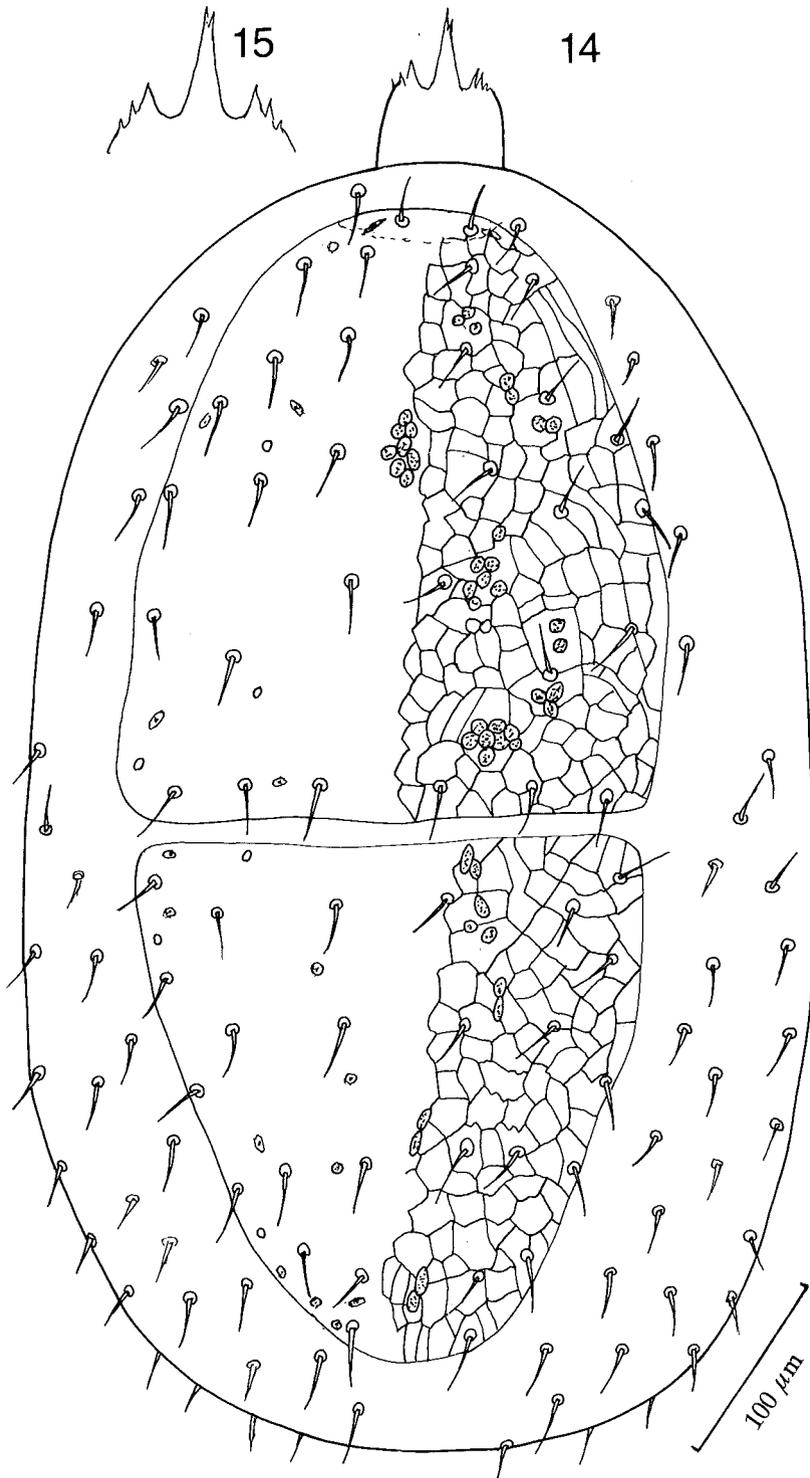
pores and 1 pair of lyrifissures; opisthotal shield with 13 pairs of setae (rarely 12 + 13 or 12 + 12) and 13 pairs of pores. All these setae 15 to 21 long. Soft cuticle of dorsum with about 25-30 pairs of setae, 12 to 22 long, of which 6 pairs set in podonotal region and 1 pair in front of shield. Anterior margin of gnathotectum tridentate, with a median triangular process much larger than lateral ones. *Venter*: Tritosternum ending in 2 barbed laciniae. Sternal shield 225 long, maximum width 103, strongly narrowed in its posterior fifth and bearing 3 sternal setae, a pair of metasternal setae and 2 pairs of pores. About 16 pairs of stout setae on soft cuticle of opisthogaster, 2 pairs of paramedian platelets and 1 pair of elongate metapodal shields. Peritreme 146 long, extending to middle or anterior half of coxa II. Anal shield triangular or more or less oval, 78 long (cribrum included) and 66 wide (maximum); anus in middle of shield, 3 anal setae 27 long. *Gnathosoma*: With 6 rows of deutosternal teeth. Palpcoxal setae pectinate. Hypostomal setae smooth. Corniculi thick, well sclerotized. Palps 190 to 200 long; chaetotaxy: Tr 2, Fe 5, G 6, Ti 13-14. Apotele 33 long, with 3 tines, basal tine thin and finely attenuate at apex. Fixed digit of chelicera 48 long, bearing 4 unequal teeth and a short pilus dentilis; movable digit 54 long, with 5 unequal teeth of which proximal ones well developed and 3 apical distinctly smaller, especially 2 apical, but size variable.

Metatarsi of legs II to IV with 4 setae. All tarsi end in well-developed pretarsus including a pair of claws and a pulvillus without acuminate lobes.

*Remarks*: Until now, mites of the genus *Halodarcia* were known only from the typical localities in N.E. of Germany; moreover phoretic association between

Chaetotaxy of legs I-IV in *H. incideta* Karg:

|       | I            | II           | III          | IV           |
|-------|--------------|--------------|--------------|--------------|
| Femur | 2-3/2, 2/2-2 | 2-3/1, 2/2-1 | 1-2/1, 2/0-0 | 1-2/1, 2/0-0 |
| Genu  | 2-3/2, 3/1-2 | 2-3/1, 2/1-2 | 2-2/1, 2/1-1 | 2-2/1, 3/1-1 |
| Tibia | 2-3/2, 3/1-2 | 2-2/1, 2/1-2 | 2-1/1, 2/1-1 | 2-1/1, 3/1-2 |



Figs. 14-15. *Halodarcia incideta* Karg - 14. Deutonymph from a carabid beetle from Belgium, dorsal view, 15. gnathotectum.

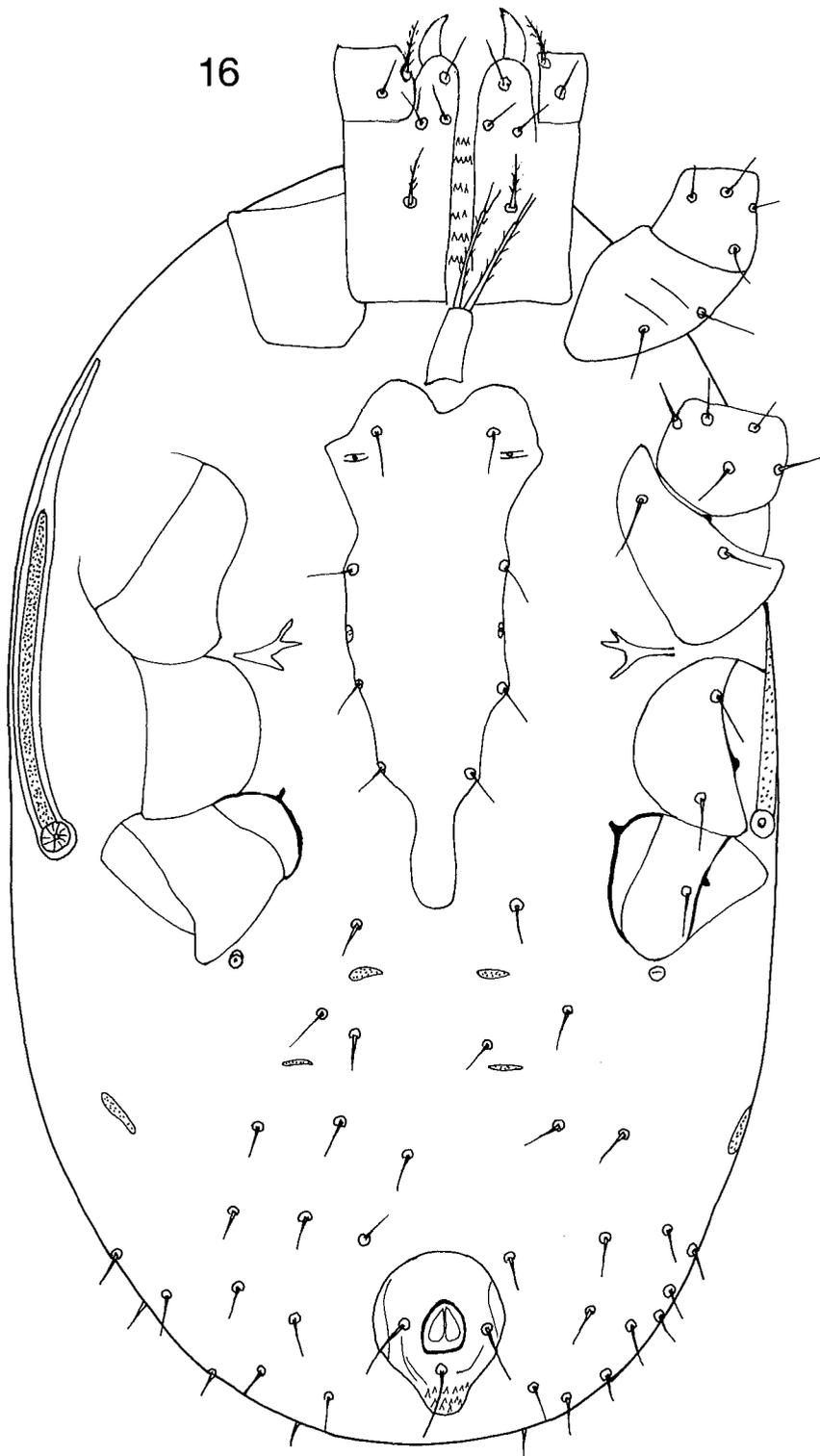


Fig. 16. *Halodarcia incideta* Karg - Deutonymph, ventral view (from a carabid beetle from Belgium).

these mites and carabid beetles had not been recorded previously.

All the specimens of this genus found by us in Belgium were deutonymphs located beneath the elytra of carabid beetles. We checked for adult mites by examining soil samples, using Berlese funnels, collecting at the sites where infested beetles had been captured. No mites were found. The absence of mites in the soil, contrasting with their abundance on the beetles, suggests that they live and reproduce in some specialized habitats which are visited by the beetles. The discovery of these habitats would probably provide interesting information about the biology of both these mites and their vectors.

*Halodarcia* sp.

These deutonymphs are distinguished from those of *H. incideta* by several important characters. They belong to a new species that will be described in the near future.

These nymphs were less frequent (89 specimens) than those of *H. incideta*. They were only found from 2 genera of carabid beetles, *Pterostichus* and *Agonum* and in 3 sites (Table 1). On 2 beetles (*P. diligens* and *P. minor*) they were associated with deutonymphs of *H. incideta*.

It is worthy of note that Desender and Vaneechoutte (1984) recorded the presence of nymphs of Halolaelapidae beneath the elytra of carabid beetles in Belgium. The mites were identified at the family level by E. Van Daele (University of Ghent). It is probable that they actually belonged to the genus *Halodarcia*.

**Family MACROCHELIDAE**

*Macrocheles nataliae* Bregetova & Koroleva, 1960

This species was described from mammals and soil samples in USSR. It was also reported from burying beetles (*Nicrophorus humator* spp.) from the British Isles (Hyatt & Emberson, 1988) and Germany (Karg, 1993). The single female of our collection was found on *Agonum fuliginosum* in an alluvial grassland (site no. 38, relevé 3).

**II. Order PROSTIGMATA**  
**Family PODAPOLIPIDAE**  
**Genus *Eutarsopolipus* Berlese, 1913**

This genus includes 26 species, of which 18 are described from Europe. It is completely confined to Carabidae, and in Europe is known from genera *Agonum*, *Amara*, *Broschus*, *Carabus* and *Pterostichus*.

All species of *Eutarsopolipus* are highly host specific and generally confined to a single or a few closely related host species (Regenfuss, 1968). They live beneath the elytra of their hosts. These mites probably feed on secretions of the teguments of their hosts. One species (*E. stammeri* Regenfuss) is endoparasitic and lives in the hemocoel of *Pterostichus melanarius* Illiger in Germany.

*Eutarsopolipus globosus* Regenfuss, 1968

This species was described from *Agonum marginatum* (L.), in Germany. Our specimens (18 females, 8 males, 2 larvae, eggs) were found under the elytra of 3 specimens of *Agonum fuliginosum* (Panzer) from 3 sites (no. 53, relevé 3, no. 50, relevé 3 and no. 30, relevé 4 (Table 1).

*Eutarsopolipus agonobius* Regenfuss, 1968

This species was described from *Agonum sexpunctatum* (L.), in Germany. We found 5 females and eggs beneath the elytra of *Metabletus foveatus* (Fourcroy) (site no. 14, relevé 7 and no. 74, relevé 8) (Table 1).

**Family SCUTACARIDAE**  
**Genus *Archidispus* Karafiat, 1959**

This genus is represented by numerous species living on Carabidae. In W. Germany, Karafiat (1959) found 4 mite species infesting 40 species of Carabidae representing 16 genera. In Japan, Kurosa (1970- 1989) described 27 new species from Japan in a series of papers dealing with this genus.

*Archidispus bembidii* Karafiat, 1959

This species was described from several genera of Carabidae in Germany, i.e. *Bembidion*, *Agonum*, *Elaphrus* etc.

We found 30 females of this species from *Bembidion obliquum* Sturm in no. 69, relevé 10.5 (Table 1).

TABLE 1. LIST OF THE MITES ASSOCIATED WITH CARABIDAE IN BELGIUM  
(Abbreviation: P.W. = present work; DN = deutonymph)

| Mite species                                       | Number of Mites | Carabid host                              | No. of site | Geographical data   |            | Reference |
|--|-----------------|---|-------------|---------------------|------------|-----------|
|  |                 |   |             | Longitude E         | Latitude N |           |
| <b>ORDER MESOSTIGMATA</b>                          |                 |   |             |                     |            |           |
| <b>SUBORDER GAMASINA</b>                           |                 |   |             |                     |            |           |
| <b>Family Parasitidae</b>                          |                 |   |             |                     |            |           |
| <i>Parasitus fimetorum</i> (Berlese, 1904)         | 1 DN            | <i>Pterostichus vernalis</i> (Panzer)     | -           | -                   | -          | P.W.      |
| <i>Parasitus</i> sp.                               | DN              | <i>Bembidion properans</i> Stephens       | -           | -                   | -          | 9         |
|  | DN              | <i>Bembidion iricolor</i> Bedel           | -           | -                   | -          | 9         |
|  | DN              | <i>Agonum moestum</i> (Duftschmidt)       | -           | -                   | -          | 9         |
| <b>Family Ascidae</b>                              |                 |   |             |                     |            |           |
| <b>Subfamily Ascinae</b>                           |                 |   |             |                     |            |           |
| <i>Antennoseius masoviae</i> Sellnick, 1943        | 1 ♀             | <i>Olisthopus rotundatus</i> (Paykull)    | 19          | 5°38'10"; 50°59'6"  |            | P.W.      |
|  | 2 ♀♀            | <i>Calathus fuscipes</i> (Goese)          | -           | -                   | -          | P.W.      |
|  | 2 ♀♀            | <i>Bembidion lampros</i> (Herbst)         | -           | -                   | -          | P.W.      |
| <i>Antennoseius calathi</i> nov. species           | 18 ♀♀           | <i>Calathus micropterus</i> (Duftschmidt) | 82          | 5°44'37"; 49°39'13" |            | P.W.      |
|  | 4 ♀♀            | <i>Pterostichus diligens</i> (Sturm)      | 46          | 5°18'36"; 49°45'43" |            | P.W.      |
|  | 2 ♀♀            | Host ?                                    | 46          | 5°18'36"; 49°45'43" |            | P.W.      |
| ? <i>Antennoseius</i> sp.                          | ? DN            | <i>Harpalus rufibarbis</i> (Fabricius)    | -           | -                   | -          | 9         |
|  | ? DN            | <i>Trechus quadristriatus</i> (Schrank)   | -           | -                   | -          | 9         |
|  | ? DN            | <i>Bradycellus verbasci</i> (Duftschmidt) | -           | -                   | -          | 9         |
| <i>Arctoseius longispinosus</i> (Hirschmann, 1963) | Nymphs          | <i>Agonum obscurum</i> (Herbst)           | -           | -                   | -          | 9         |
|  | Nymphs          | <i>Agonum fuliginosum</i> (Panzer)        | -           | -                   | -          | 9         |
| <i>Blattisocius</i> sp.                            | Nymphs          | <i>Agonum assimile</i> (Paykull)          | -           | -                   | -          | 9         |
|  | Nymphs          | <i>Agonum moestum</i>                     | -           | -                   | -          | 9         |
| <i>Proctolaelaps</i> sp.                           | Nymphs          | <i>Asaphideon flavipes</i> (L.)           | -           | -                   | -          | 9         |
|  | Nymphs          | <i>Dicheirotrichus gustavii</i> Crotch    | -           | -                   | -          | 9         |

| Family Halolaelapidae  |                                       |  |                              |           |           |           |      |
|------------------------|---------------------------------------|--|------------------------------|-----------|-----------|-----------|------|
| <i>Halolaelaps</i> sp. | DN                                    | <i>Agonum fuliginosum</i>                | -                            | -         | -         | 9         |      |
|                        | DN                                    | <i>Agonum marginatum</i> L.              | -                            | -         | -         | 9         |      |
|                        | DN                                    | <i>Bembidion genei</i> Kuester           | -                            | -         | -         | 9         |      |
|                        | DN                                    | <i>Bembidion minimum</i><br>Fabricius    | -                            | -         | -         | 9         |      |
|                        | DN                                    | <i>Bembidion tetracolum</i> Say          | -                            | -         | -         | 9         |      |
|                        | DN                                    | <i>Bembidion varium</i> (Olivier)        | -                            | -         | -         | 9         |      |
|                        | DN                                    | <i>Pterostichus minor</i><br>(Gyllenhal) | -                            | -         | -         | 9         |      |
|                        | <i>Halodarcia incideta</i> Karg, 1969 | 17 DN                                    | <i>Pterostichus diligens</i> | 34        | 5°33'31"; | 49°41'17" | P.W. |
| 50 DN                  |                                       | " "                                      | 38                           | 5°39'36"; | 49°39'34" | P.W.      |      |
| 10 DN                  |                                       | " "                                      | 39                           | 5°42'20"; | 49°40'54" | P.W.      |      |
| 133 DN                 |                                       | " "                                      | 46                           | 5°18'36"; | 49°45'43" | P.W.      |      |
| 3 DN                   |                                       | " "                                      | 69                           | 5°19'9";  | 49°53'22" | P.W.      |      |
| 23 DN                  |                                       | <i>P. versicolor</i> (Sturm)             | 15                           | 5°38'56"; | 50°56'15" | P.W.      |      |
| 8 DN                   |                                       | <i>P. vernalis</i>                       | 62                           | 5°18'36"; | 49°45'43" | P.W.      |      |
| 43 DN                  |                                       | <i>P. vernalis</i>                       | -                            | -         | -         | P.W.      |      |
| 2 DN                   |                                       | <i>P. strenuus</i> (Panzer)              | 34                           | 5°33'31"; | 49°41'17" | P.W.      |      |
| 15 DN                  |                                       | " "                                      | 38                           | 5°39'36"; | 49°39'34" | P.W.      |      |
| 5 DN                   |                                       | " "                                      | 39                           | 5°42'20"; | 49°40'54" | P.W.      |      |
| 2 DN                   |                                       | " "                                      | 55                           | 6°18'56"; | 50°25'26" | P.W.      |      |
| 57 DN                  |                                       | <i>P. minor</i>                          | 46                           | 5°18'36"; | 49°45'43" | P.W.      |      |
| 2 DN                   |                                       | " "                                      | 69                           | 5°19'9";  | 49°53'22" | P.W.      |      |
| 6 DN                   |                                       | <i>P. nigrita</i> (Paykull)              | 39                           | 5°42'20"; | 49°40'54" | P.W.      |      |
| 51 DN                  |                                       | <i>Agonum fuliginosum</i>                | 38                           | 5°39'36"; | 49°39'34" | P.W.      |      |
| 13 DN                  |                                       | " "                                      | 39                           | 5°42'20"; | 49°40'54" | P.W.      |      |
| 19 DN                  |                                       | " "                                      | 46                           | 5°18'36"; | 49°45'43" | P.W.      |      |
| 1 DN                   |                                       | " "                                      | 69                           | 5°19'9";  | 49°53'22" | P.W.      |      |
| 3 DN                   |                                       | " "                                      | 72                           | 5°55'10"; | 50°27'54" | P.W.      |      |
| 1 DN                   |                                       | <i>A. obscurum</i>                       | 69                           | 5°19'9";  | 49°53'22" | P.W.      |      |
| 10 DN                  |                                       | <i>A. moestum</i>                        | 38                           | 5°39'36"; | 49°39'34" | P.W.      |      |
| 12 DN                  |                                       | " "                                      | 39                           | 5°42'20"; | 49°40'54" | P.W.      |      |
| 1 DN                   |                                       | <i>Olisthopus rotundatus</i>             | 19                           | 5°38'10"; | 50°59'6"  | P.W.      |      |
| 2 DN                   |                                       | <i>Dyschirius globosus</i><br>(Herbst)   | 38                           | 5°39'36"; | 49°39'34" | P.W.      |      |
| 13 DN                  |                                       | <i>Bembidion unicolor</i><br>Chaudoir    | 34                           | 5°33'31"; | 49°41'17" | P.W.      |      |
| 2 DN                   |                                       | " "                                      | 69                           | 5°19'9";  | 49°53'22" | P.W.      |      |
| 4 DN                   |                                       | <i>B. doris</i> (Panzer)                 | 46                           | 5°18'36"; | 49°45'43" | P.W.      |      |
| 43 DN                  |                                       | <i>B. dentellum</i> (Thunberg)           | -                            | -         | -         | P.W.      |      |
| 16 DN                  |                                       | <i>Amara similata</i> (Gyllenhal)        | 61                           | 5°40'27"; | 50°35'10" | P.W.      |      |
| 54 DN                  |                                       | <i>Agonum versutum</i><br>(Gyllenhal)    | 46                           | 5°18'36"; | 49°45'43" | P.W.      |      |
| <i>Halodarcia</i> sp.  |                                       | 2 DN                                     | " "                          | 69        | 5°19'9";  | 49°53'22" | P.W. |
|                        |                                       | 1 DN                                     | <i>Pterostichus diligens</i> | 46        | 5°18'36"; | 49°45'43" | P.W. |
|                        | 9 DN                                  | <i>P. versicolor</i>                     | 15                           | 5°38'56"; | 50°56'15" | P.W.      |      |
|                        | 23 DN                                 | <i>P. minor</i>                          | 46                           | 5°18'36"; | 49°45'43" | P.W.      |      |

|   |                          |  |    |                         |      |
|---|--------------------------|--|----|-------------------------|------|
| <b>Family Laelapidae</b>                                      |                          |  |    |                         |      |
| <b>Subfamily Laelapinae</b>                                   |                          |  |    |                         |      |
| <i>Hypoaspis nollii</i> Karg, 1962                            | 14 ♀♀                    | <i>Agonum fuliginosum</i>                        | 69 | 5° 19' 9"; 49° 53' 22"  | P.W. |
| <i>Hypoaspis</i> sp.  | Nymphs                   | <i>Bembidion gilvipes</i> Sturm                  | -  | -                       | 9    |
|   | DN                       | <i>Calathus fuscipes</i>                         | -  | -                       | 9    |
| <b>Family Macrochelidae</b>                                   |                          |  |    |                         |      |
| <i>Macrocheles nataliae</i> Bregetova & Koroleva, 1960        | 1 ♀                      | <i>Agonum fuliginosum</i>                        | 38 | 5° 39' 36"; 49° 39' 34" | P.W. |
| <b>SUBORDER UROPODINA</b>                                     |                          |  |    |                         |      |
| <b>Family Uropodidae</b>                                      |                          |  |    |                         |      |
| <i>Trichouropoda ovalis</i> (Berlese, 1916)                   | DN                       | <i>Agonum assimile</i> (Paykull)                 | -  | -                       | 9    |
| <i>Uroobovella varians</i> Hirschmann & Zirngiebl-Nicol, 1962 | DN                       | <i>Bembidion lunulatum</i><br>Fourcroy           | -  | -                       | 9    |
| <i>Nenteria breviunguiculata</i> (Willmann, 1949)             | DN                       | <i>Bembidion femoratum</i><br>Sturm              | -  | -                       | 9    |
| <b>ORDER PROSTIGMATA</b>                                      |                          |  |    |                         |      |
| <b>Family Eupodidae</b>                                       |                          |  |    |                         |      |
| <i>Eupodes</i> sp.  | ?                        | <i>Pterostichus madidus</i><br>(Fabricius)       | -  | -                       | 9    |
| <b>Family Bdellidae</b>                                       |                          |  |    |                         |      |
| <i>Bdella longicornis</i> Linné, 1758                         | adult                    | <i>Pterostichus oblongopunctatus</i> (Fabricius) | -  | -                       | 9    |
| <b>Family Podapolipidae</b>                                   |                          |  |    |                         |      |
| <i>Eutarsopolipus globosus</i> Regenfuss, 1968                | 4 ♀♀,<br>5 ♂♂,<br>immat. | <i>Agonum fuliginosum</i>                        | 30 | 5° 45' 34"; 50° 14' 1"  | P.W. |
|   | 8 ♀♀,<br>imm.            | " "  | 50 | 5° 47' 36"; 50° 14' 24" | P.W. |
|   | 6 ♀♀,<br>3 ♂♂            | " "  | 53 | 5° 47' 36"; 50° 14' 23" | P.W. |
| <i>Eutarsopolipus agonobius</i> Regenfuss, 1968               | 4 ♀♀                     | <i>Metabletus foveatus</i><br>(Fourcroy)         | 14 | 5° 38' 36"; 50° 56' 13" | P.W. |
|   | 1 ♀                      | " "  | 74 | 5° 38' 28"; 50° 35' 25" | P.W. |
| <b>Family Scutacaridae</b>                                    |                          |  |    |                         |      |
| <i>Archidispus bembidii</i> (Karafiat, 1959)                  | 30 ♀♀                    | <i>Bembidion obliquum</i> Sturm                  | 69 | 5° 19' 9"; 49° 53' 22"  | P.W. |
| <i>Imparipes</i> sp.  | ? DN                     | <i>Bembidion tetracolum</i> Say                  | -  | -                       | 9    |
| <i>Scutacarus</i> sp.   | ? DN                     | <i>Agonum ruficorne</i> (Goeze)                  | -  | -                       | 9    |
|   | ? DN                     | <i>Agonum obscurum</i>                           | -  | -                       | 9    |
|   | ? DN                     | <i>Agonum moestum</i>                            | -  | -                       | 9    |

|  |         |  |    |                      |      |
|--|---------|--|----|----------------------|------|
| <b>Family Tenuipalpidae</b>  |         |  |    |                      |      |
| <i>Brevipalpus</i> sp.   | 1 ♀     | <i>Agonum fuliginosum</i>              | 39 | 5°42'20"; 49°40'54"  | P.W. |
| <b>ORDER ASTIGMATA</b>   |         |  |    |                      |      |
| <b>Family Acaridae</b>   |         |  |    |                      |      |
| <i>Caloglyphus</i> sp.   | 1 DN    | <i>Pterostichus oblongopunctatus</i>   | -  | -                    | 9    |
| <i>Tyrophagus putrescentiae</i><br>(Schränk, 1781)   | 1 nymph | <i>Agonum fuliginosum</i>              | 38 | 5°39'36"; 49°39'34"  | P.W. |
| <b>Family Glycyphagidae</b>  |         |  |    |                      |      |
| <i>Glycyphagus domesticus</i> (De Geer, 1778)  | 1 ♀     | <i>Agonum fuliginosum</i>              | 38 | 5°39'36"; 49°39'34"  | P.W. |
| <b>Family Histiostomatidae<br/>(Anoetidae)</b>   |         |  |    |                      |      |
| <i>Histiostoma sapromyzarum</i><br>(Dufour, 1839)  | 10 DN   | <i>Pterostichus minor</i>              | 69 | 5°19'9"; 49°53'22"   | P.W. |
|  | DN      | <i>Agonum fuliginosum</i>              | 69 | " "                  | P.W. |
|  | DN      | <i>Dyschirius luedersi</i> Wagner      | -  | -                    | 9    |
|  | DN      | <i>Clivina collaris</i> (Herbst)       | -  | -                    | 9    |
| <b>Family Canestriniidae</b>   |         |  |    |                      |      |
| <i>Procericola bourgognei</i><br>(Oudemans, 1923)<br>(= <i>Caraboecius coriacei</i><br>Cooreman, 1950) | -       | <i>Carabus coriaceus</i> L.            | -  | Tontelange (Belgium) | 6    |
|  | -       | <i>Carabus coriaceus</i> L.            | -  | ? ?                  | 6    |
| <i>Percanestrinia saetolata</i><br>Cooreman, 1950  | -       | <i>Carabus auronitens</i><br>Fabricius | -  | Arlon (Belgium)      | 6    |
| <i>Photia chryso-carabi</i> Cooreman,<br>1950  | -       | <i>C. nemoralis</i> Müller             | -  | Lessines (Belgium)   | 6    |
|  | -       | <i>C. auratus</i> L.                   | -  | Lessines (Belgium)   | 6    |
| <b>ORDER ORIBATIDA</b>   |         |  |    |                      |      |
| <b>Family Oribatulidae</b>   |         |  |    |                      |      |
| <i>Schelorbates confundatus</i> Berlese,<br>1908   | adult   | <i>Pterostichus diligens</i>           | -  | -                    | 9    |
| <i>Schelorbates</i> sp.  | -       | <i>Pterostichus minor</i>              | -  | -                    | 9    |

### III. Order ASTIGMATA

#### Family HISTIOSTOMATIDAE (= ANOETIDAE)

##### *Histiostoma sapromyzarum* (Dufour, 1839)

The hypopi (heteromorphic deutonymphs) of this species are not separable from those of *Histiostoma feroniarum* (Dufour, 1839). Both species are distinguished from each other only by their adult forms.

The poorly sclerotized hypopi of our collection resemble the description of *H. feroniarum* by Scheucher (1957) while the well-sclerotized ones are similar to her description of *H. sapromyzarum*.

Hosts: *Pterostichus minor* (Gyllenhal) and *Agonum fuliginosum* (Panzer) both from site no. 69, relevé 5 (numerous hypopi).

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\* Numbers in bracket given at the end of references are referred in the text and Table 1.

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