

## DESCRIPTION AND OBSERVATIONS OF TWO NEW SPECIES OF HEMISARCOPTIDAE FROM DEUTONYMPHS PHORETIC ON COCCINELLIDAE (COLEOPTERA) IN BRITAIN

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**ABSTRACT** - The deutonymphs (or hypopi) of two new species of Hemisarcoptidae (Acari) of the genera *Congovidia* Fain & Elsen, 1971 and *Divilia* Sevastianov, 1969, are described from coccinellid beetles (Coleoptera: Coccinellidae) from Britain, i.e. *Congovidia coccinellidarum* n. sp. from eight genera and nine species of Coccinellidae and *Divilia occidentalis* n. sp., represented by only one deutonymph collected from *Chilocorus renipustulatus*. *Congovidia coccinellidarum* was also collected from *Rhinocimus hemirostris* (Coleoptera: Pythidae) from Britain. The most infested ladybird beetle was *Halysia sedecimguttata*, a broad-leaved deciduous woodland specialist showing a marked preference for sycamores.

### INTRODUCTION

Almost all the species of ladybird beetles (Coleoptera: Coccinellidae) are predatory and feed upon coccids (scale insects), adelgids, or aphids. Many species are thus used in the biological control of these pests. Because of their direct use in the control of these pests, coccinellids of the genus *Chilocorus* are important in biological control because they may act as carriers of mites of the genus *Hemisarcoptes* Lignières (Hemisarcoptidae) which are themselves predator of coccids. The phoretic deutonymphs (or hypopi) of these mites are carried underneath the elytra of the ladybird beetles but do not feed upon the host. They dismount on new colonies of coccids where they develop into adults which feed upon coccids causing significant mortality (see review in Gerson et al., 1990).

Of the ten genera so far included in the family Hemisarcoptidae, only three species of the genus *Hemisarcoptes* have been found to be involved in this parasitism, i.e. *H. malus* (Shimer), *H. cooremani* (Thomas) and *H. coccophagus* Meyer. No other associations between hemisarcoptid mites and coccinellids have been recorded.

We here record observations of an association between deutonymphs of two other genera of Hemisar-

coptidae (*Congovidia* and *Divilia*) with coccinellid beetles made during a general survey into the acarofauna associated with coccinellids by the junior authors (G.H., J.T. & R.L.). The species belonging to the genera *Congovidia* and *Divilia* are new and are here described. The new species *Congovidia coccinellidarum* n. sp. was especially common and infested certain species (*Halysia 16-guttata*, *Psyllobora 22-punctata*) with high frequency. It is probable, from analysis of the frequency of infestation of different coccinellids, that the adult forms of this mite will be found to inhabit conifers and certain deciduous trees (especially *Acer pseudo-platanus*). It is possible that the feeding developmental stages of this species of mite are also predators of coccids.

All measurements are given in micrometers ( $\mu\text{m}$ ). Setal nomenclature follows Fain (1988). Different abbreviations used in the text are: IRSNB = Institut royal des Sciences naturelles de Belgique; NHM = Natural History Museum, London.

### MATERIAL EXAMINED

1. *Congovidia coccinellidarum* n. sp. - All specimens were collected from sites around Juniper Hall, Surrey, U.K. Grid Ref. TQ 174524.

The deutonymphs were attached mainly on the ventral surface of the ladybird beetle, not underneath the elytra as is the case for *Hemisarcoptes* spp. associated with coccinellids. On the ventral surface, mites were found on both thorax and abdomen, occasionally on the head, and rarely on legs. One other salient fact is that the hypopi have been observed on ladybird beetles collected from overwintering sites, which suggests that the mites can pass through the winter as hypopi attached to coccinellids.

Nine species of coccinellids from eight genera were found to be infested by these deutonymphs (Table 1). All these species are mainly aphidophagous except in the four cases explicitly mentioned. However, with the exception of *Calvia 14-guttata*, the aphidophagous species also eat coccids.

2. *Divilia occidentalis* n. sp. - The genus *Divilia* Sevastianov, 1969 was represented only by the type species, *D. oculata* Sevastianov, 1969, described from Ukraine. We have found one deutonymph of this genus infesting *Chilocorus renipustulatus* from the same locality and the same position as for *C. coccinellidarum*.

#### Genus *Congovidia* Fain & Elsen, 1971

This genus previously included four species, of which three are known from the deutonymph (*C. glossinae* Fain & Elsen, 1971, type species, and *C. lomamiensis* Fain & Elsen, 1972, both described from *Glossina fuscipes quanzensis* from Zaire and *C. servalina* Fain & Elsen, 1972 described from *Glossina g. palpalis*, also from Zaire). The fourth species, *C. brasiliensis* Fain & Camerik, 1977, was represented by all the developmental stages. It was found in the nest of a solitary wasp from Brazil.

Main characters of the deutonymph - *Dorsum*: with two large median shields bearing a variably developed pattern of lines or spots and a pair of voluminous pigmented eyes situated in front of the anterior shield. Setae *vi*, *sc e*, *sc i* and *s cx* present on the propodonotum. Setae *d1* lacking or represented by small pale spots. Other dorsal setae: *d2* to *d5*, *h* and *sh*, *l1* to *l5* present (some of them being ventral). *Venter*: Epimera III free, epimera IV fused with the longitudinal sclerite. Suctorial plate with antero-lateral conoids at the level of the posterior suckers. *Legs*: Tarsus I with omega 1, a short omega 2 basal and omega 3 apical or subapical, a very thin and short famulus and six setae, all thin except seta *e* which is thicker and foliate. Tarsus II with six setae as in tarsus I but only one solenidion (omega 1). Tarsus III with three thin setae and a ventro-apical spine recurved ventrally. Tarsus IV almost completely fused with the tibia, expanded apically and bearing two long or very long and strong apical setae and two very short and thin ventral setae. Tibiae I and II each with one thin seta and a long

solenidion phi; the antero-dorsal border of these tibiae distinctly thickened and sclerotized with generally a triangular spur. Tibia III with one seta and a very short solenidion. Genua I and II each with two short setae and a short solenidion sigma. Genua III and IV bare. Femora with 1-1-0-1 setae. Trochanters I to III each with a thin seta.

Palposoma variably developed, either with a short base and two narrow palps bearing a solenidion alpha or represented only by two palps ending in a solenidion, or without palps but with only two solenidia set into sclerotized ringlets.

*Congovidia* is distinguished from the genus *Hemisarcoptes* Lignières, 1893 by the following characters: presence of solenidion omega 2 (Fig. 4) (absent in *Hemisarcoptes*), tarsus IV with four setae (only three setae in *Hemisarcoptes*), absence of a snout (in *Hemisarcoptes* there is a triangular snout-like projection in front of the eyes), presence of a thickening or a spur on the antero-dorsal border of tibiae I and II (absent in *Hemisarcoptes*), solenidia alpha (Fig. 4) well developed (very short in *Hemisarcoptes*). *Congovidia* differs from *Nanacarus* Oudemans, 1902 by the presence of a ventral spine on tarsus III (absent in *Nanacarus*), presence of one seta on tibiae I to III (no seta in *Nanacarus*), presence of four setae on tibio-tarsus IV (three setae in *Nanacarus*), absence of seta *d1* (present in *Nanacarus*), genua I and II with two short and thin setae and a solenidion sigma (in *Nanacarus*, genu I bears one seta and one solenidion, sigma, and genu II bears only one seta) (Fain, 1988).

#### *Congovidia coccinellidarum* n. sp. (Figs. 1, 3-7)

This species is known only from the deutonymph.

Deutonymph, holotype (Figs. 1, 3-7) - Maximum length and width in the holotype 204, 124; in six paratypes from four different hosts: 203, 120; 202, 120; 202, 123; 197, 120; 195, 117; 186, 114. *Dorsum*: Anterior extremity regularly rounded, without a snout. Propodonotum 80 long, hysteronotum 124 long. Both shields punctate and with a well-developed pattern of longitudinal grooves unequal in length. All dorsal setae very short, *l5* the longest (10 long); setae *d1* lacking, represented by small pale spots. *Venter*: Palposoma without a base, represented by two short conical palps ending in a solenidion. Epimera III distinctly separated from the median sclerite. Suctorial plate 51 wide, diameter of anterior suckers 6, that of posterior suckers 7.2 long. Setae *ga* and *gm* very thin, 10-12 long, *gp* 5 to 6 long. Setae *d5*, *l4* and *l5* ventral. *Legs*: Lengths of tarsi I to III (not including ambulacra) 28-27-9.5. Tibio-tarsus IV 12 long. Tarsus I and II with a claw 6 long, tarsus III with a shorter claw (4.8 to 5). Tarsus I with seta *e*

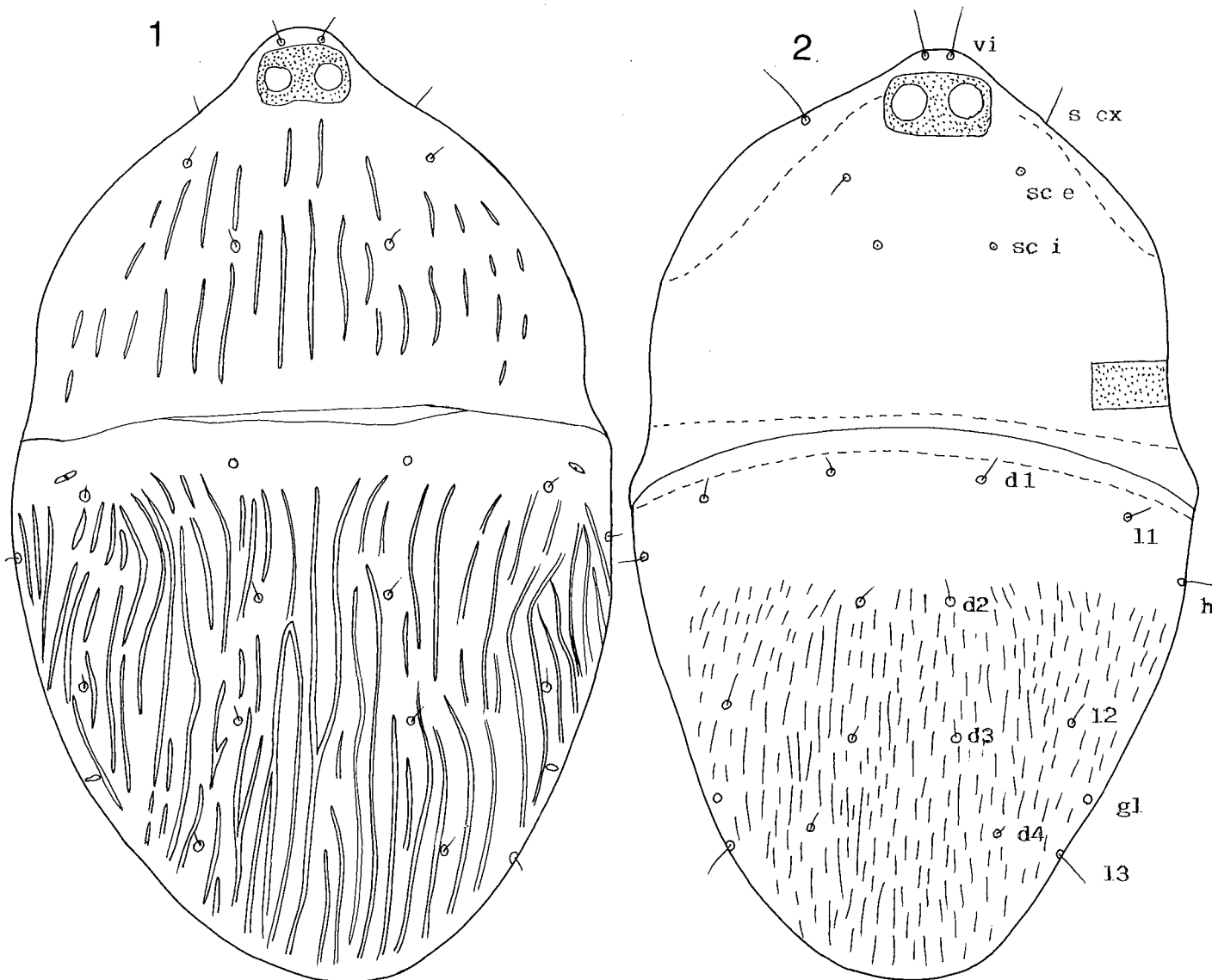


Fig. 1. *Congovidia coccinellidarum* n. sp., deutonymph in dorsal view. Fig. 2. *Divilia occidentalis* n. sp., deutonymph in dorsal view.

foliate and strongly bent, setae *la* and *ra* very thin and about 40 to 45 long; *wa* much shorter (15). Solenidion omega I cylindrical, relatively thick, 13 long; omega 3 much thinner, 12-13 long, omega 2 short and thin; a short famulus present. Tarsus II: omega 1 spindle-shaped, thicker but shorter than (11) omega 1 of tarsus I. Ventral spine of tarsus III with a strongly sclerotized apex. Tibio-tarsus IV with antero-apical seta very thick in its basal part, 180 long, a postero-apical seta narrower and 75 long and two ventral very thin and short setae (8 to 12 long). The solenidia phi of tibiae I and II 36 and 25 long respectively. Antero-dorsal border of tibiae I and II distinctly thickened but without a triangular spur. Genua I-IV with 2-2-0-0 setae and 1-1-0-0

solenidia. Femora I-IV with 1-1-0-1 setae. Trochanters with 1-1-1-0 setae.

Hosts and locality - Holotype deutonymph from *H. 16-guttata* from around Juniper Hall, Surrey, U.K. The ladybird was collected from *Acer pseudoplatanus*.

Paratypes - About 60 deutonymphs, all from the same locality and most of them from the same host as the holotype. The infested ladybirds were taken from five sycamores. Six deutonymphs paratype from *Rhinocimus planirostris* (Coleoptera: Pythidae) (collected by D.B. and identified as *Congovidia* sp. by A.F. in 1981). Holotype and 5 paratypes deposited in NHM, other paratypes in IRSNB and in the collections of the authors.

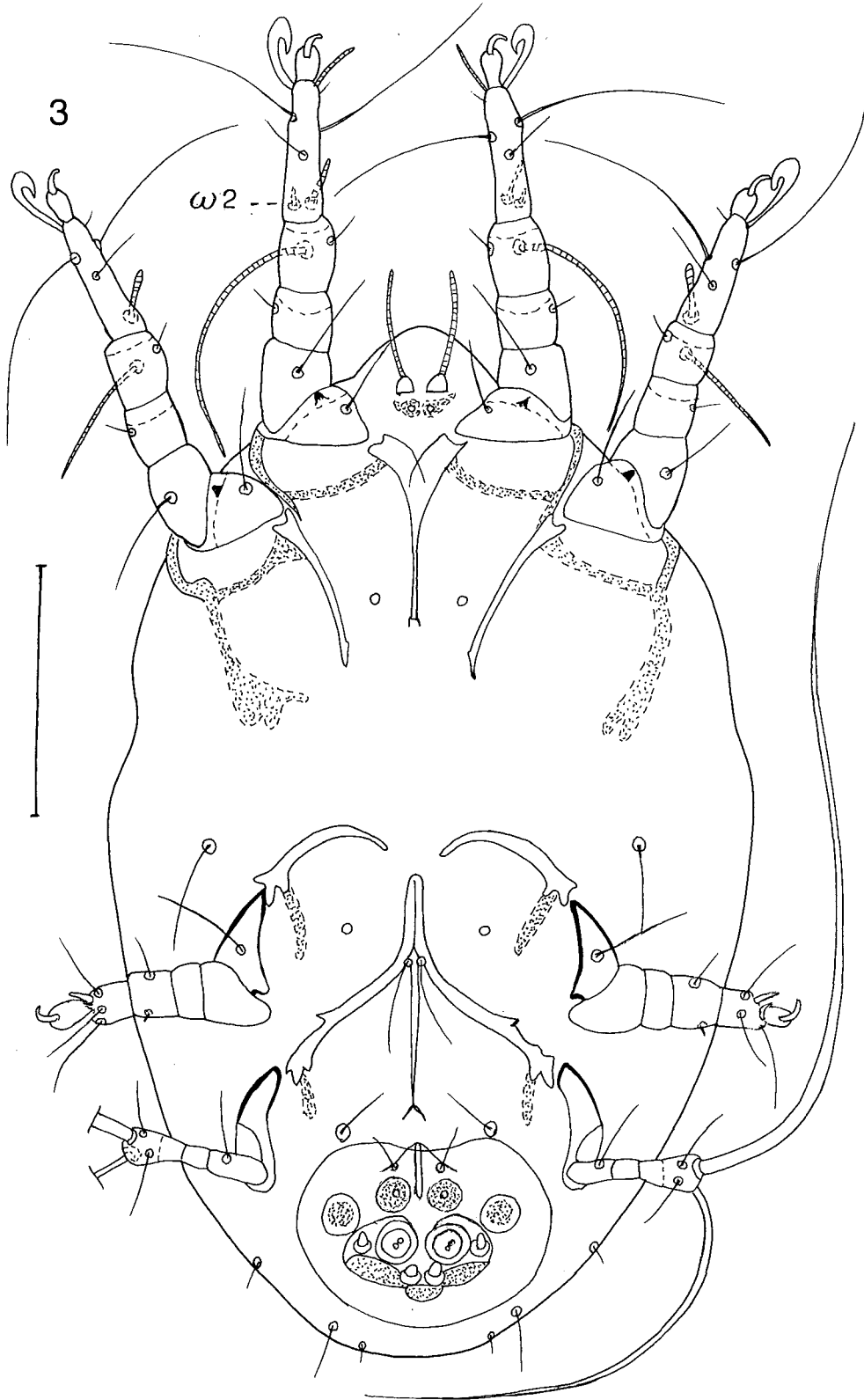


Fig. 3. *Congovidia coccinellidarum* n. sp., deutonymph in ventral view (Scale line 50  $\mu$ m).

Table. 1. The coccinellid species found infested with *Congovidia coccinellidarum*, the host plant from which mites were collected, and notes on their ecology (after Majerus, 1994).

Host species	Plant from which collected	Ecology
<i>Halyzia 16-guttata</i> (L.)	<i>Acer pseudoplatanus</i> (sycamore)	Found on a restricted range of deciduous trees; eats mildew
<i>Adalia 2-punctata</i> (L.)	<i>Urtica dioica</i> (stinging nettle)	Habitat generalist
<i>Adalia 10-punctata</i> (L.)	<i>Tillia x europaea</i> (lime)	Habitat generalist
<i>Exochomus 4-pustulatus</i> (L.)	<i>Pinus sylvestris</i> (Scots pine)	Conifer specialist; eats coccids, aphids and adelgids
<i>Chilocorus renipustulatus</i> (Scriba)	<i>Fraxinus excelsior</i> (ash)	Found on conifers and ash; coccid specialist
<i>Myzia oblongoguttata</i> (L.)	<i>Pinus sylvestris</i> (Scots pine)	Conifer specialist
<i>Calvia 14 guttata</i> (L.)	<i>Urtica dioica</i> (stinging nettle)	Habitat generalist
<i>Psyllobora 22-punctatata</i> (L.)	<i>Heracleum spondylium</i> (hogweed); other low growing herbs; <i>Acer pseudoplatanus</i>	Found on grasses, sycamore and herbs; mildew specialist
<i>Harmonia 4-punctata</i> Pontopiddan	<i>Pinus sylvestris</i> (Scots pine)	Conifer specialist

Remarks - *C. coccinellidarum* n.sp. differs from four other described species of *Congovidia* in the following characters:

1. From *C. glossinae*: By much longer seta *d* of tibio-tarsus IV (this seta is short in *C. glossinae*), the poor development of the dorso-apical thickening of tibiae I and II (it is a triangular spur in *C. glossinae*), the absence of reticulations on the dorsal shields (with numerous reticulations on the shields in *C. glossinae*), the aspect of the foliate setae of tarsi I and II, bent at 180 in our new species, but only slightly bent in *C. glossinae*.

2. From *C. lomamiensis*: By different pattern of the dorsal shields; in *C. lomamiensis* there are longitudinal grooves in the median area and very small rounded or slightly elongate depressions in the lateral areas. Moreover, in this species there are no palps and the solenidia alpha are set in small sclerotized ringlets.

3. From *C. servalina*: By different aspect of the dorsal pattern (numerous minute, rounded or shortly elongate depressions in *C. servalina*), the absence of a palposomal base (present in *C. servalina*), different lengths of solenidia phi I and II, 35 and 25 long (instead of 45 and 15 long respectively in *C. servalina*).

4. From *C. brasiliensis*: By the size of the body (idiosoma 231 to 266 long in *C. brasiliensis*), lengths of the legs (tarsi I-IV 45-45-18-28 long in *C. brasiliensis*), and pattern of the dorsal shields (mostly with small rounded or shortly oval depressions in *C. brasiliensis*).

#### Genus *Divilia* Sevastianov, 1969

This genus previously known only from the type species (*Divilia oculata* Sevastianov, 1969) described

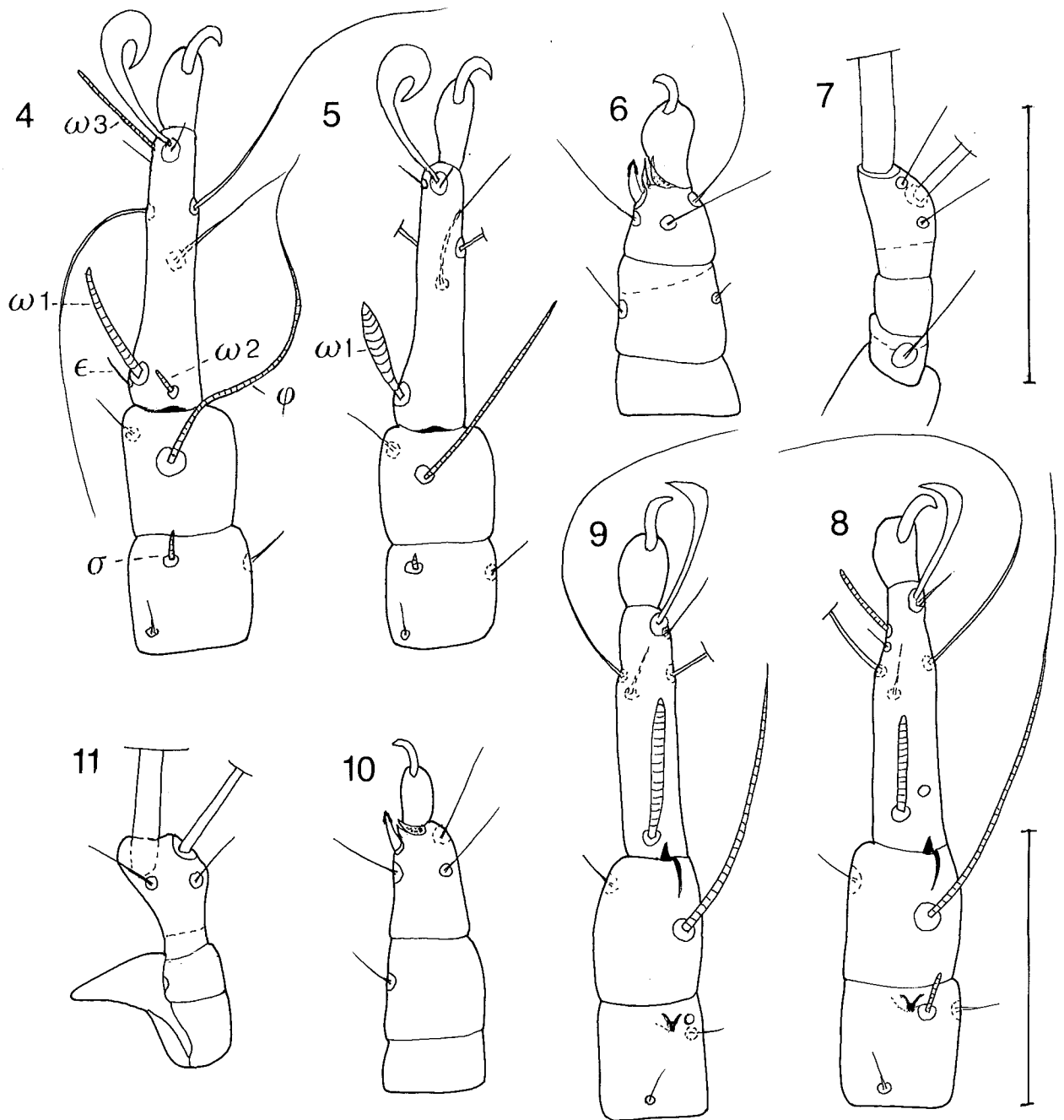
from Ukraine and represented by deutonymphs found on ants. The author placed the genus *Divilia* in the Saproglyphidae but OConnor (1991) transferred it to the Hemisarcoptidae.

The main diagnostic features of the genus are the complete absence of trochanteral setae, the position of omega 3 on tarsus I, relatively far from the apex of the segment, and the great length of the epimera III which reach very close to the median sclerite. From the original figures it appears that tarsus I bears an omega 2 and that tibio-tarsus IV has three setae, two long and thick and one much shorter and inflated basally.

In our collection we found a single deutonymph taken from *Chilocorus renipustulatus* which shows the main characters as those depicted for *D. oculata* except that in our specimen omega 2 is lacking and tibio-tarsus IV bears 4 setae. We include it, however, in the genus *Divilia* until typical specimens of *D. oculata* can be reexamined.

#### *Divilia occidentalis* n. sp. (Figs. 2, 8-12)

Deutonymph, holotype (Figs.2,8-12)- Length and width of the idiosoma 205, 124. *Dorsum*: Anterior border of body and eyes as in *Congovidia*. Propodonotal shield 86 long, uniformly punctate without lines or depressions. Hysteronotal shield 119 long, bearing in its median and posterior parts numerous short lines unequal in length. All these lines situated behind the level of setae *d2*. Presence on the propodonotum of the setae *vi*, *sc i*, *sc e* and *s cx*, on the hysteronotum the setae *d1* to *d4*, *l1* to *l4* and *h*. Setae *sc 1* broken in our specimen.



Figs. 4-7. *Congovidia coccinellidarum* n. sp., deutonymph: apical segments of leg I (4) and leg II (5) in dorsal view, and of legs III (6) and IV (7) in ventro-lateral view. Figs. 8-11. *Divilia occidentalis* n. sp., deutonymph: apical segments of legs I (8) and II (9) in dorsal view, and of legs III (10) and IV (11) in ventro-lateral or ventral view (Scale lines 25  $\mu$ m).

*Venter*: Base of palposoma wider (15) than long (7.4), with two narrow palps (7.2 long) ending in a solenidion alpha 18 long. Epimera III reaching close to median sclerite. Setae *sh* present. Suctorial plate 45 wide, diameter of anterior suckers 8.5, posterior suckers 8.5 to 9. Posterior part of venter with the setae *d5*, *l4* and *l5*. *Legs*: Lengths of tarsi I-III 26-26-13, of tibio-tarsus

IV 13 to 14. Claws of tarsi I-II 6 long, of tarsus III 3.5. Chaetotaxy of tarsus I: *la* 35 long, *ra* 42, *f* and *d* short, *e* foliate in its apical half, *wa* short, omega 1 thick, sub-cylindrical (11.5 to 12 long), omega 2 lacking, represented by a small non-sclerotized spot, omega 3 inserted at 4.5 from apex of tarsus, is thin and 8.5 long. Tarsus II with omega 1 thicker and longer (15-16) than

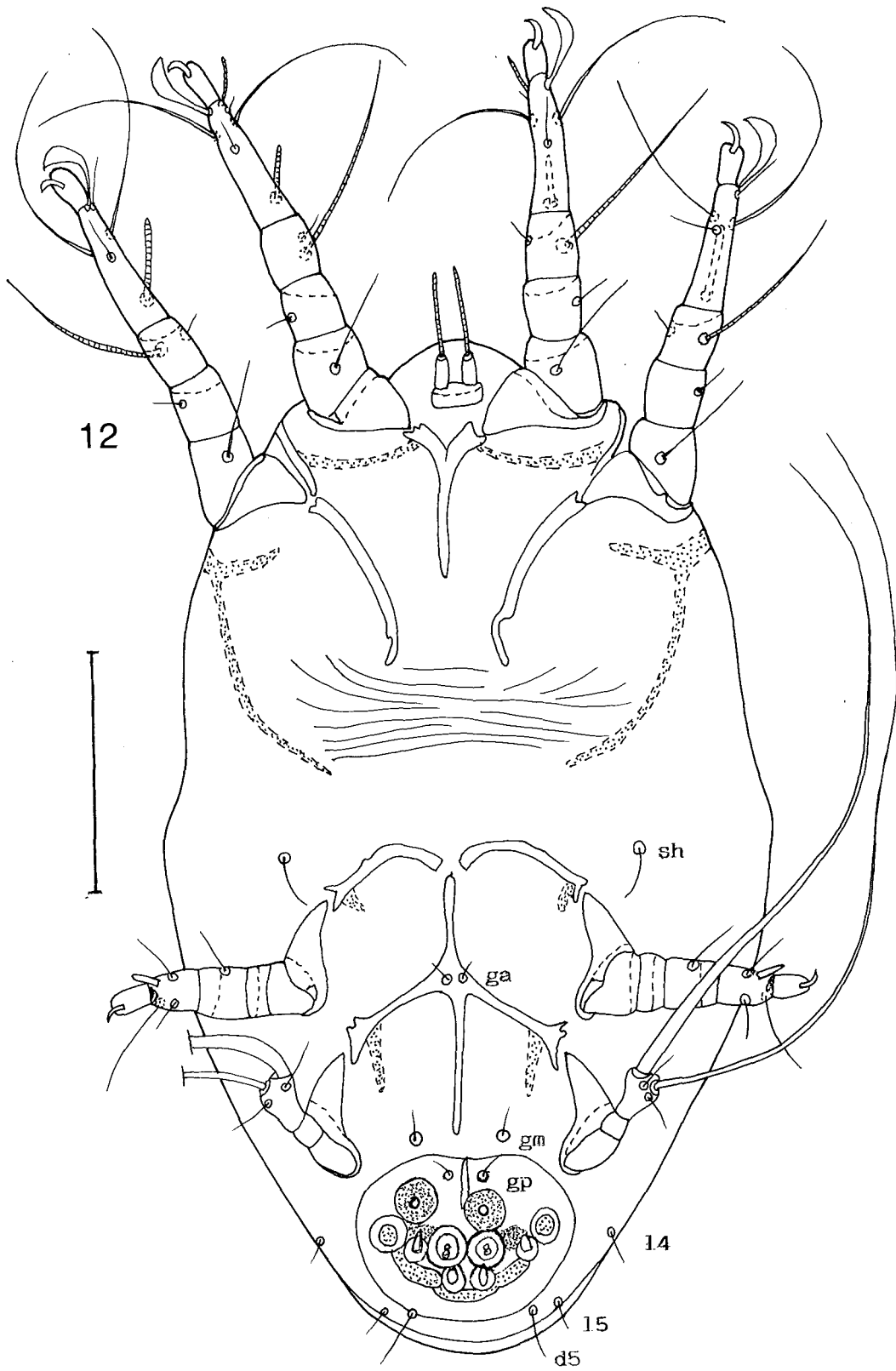


Fig. 12. *Divilia occidentalis* n. sp., deutonymph in ventral view (Scale line 50  $\mu$ m).

on tarsus I. Tarsus III with three thin setae and a ventro-subapical spine recurved ventrally. Tibio-tarsus IV with four setae: one antero-apical, very thick in basal part and 160 long, one postero-apical, thinner but longer (180) and two ventral, very thin and 8 and 12 long. Tibiae I-II with a thin seta and a long solenidion phi 42 long, on tibia I and 32 long on tibia II. Antero-dorsal border of these tibiae with a well-developed triangular spurlike process. Tarsus and tibia IV almost completely fused. Genua I-II with a small sclerotized V-like dorsal process and two short setae; sigma present only on genu I. Femora I-III with 1-1-0 setae, legs IV strongly bent and not possible to distinguish the femoral setae. All trochanters lacking setae.

Host and locality - Holotype deutonymph from *Chilocorus renipustulatus*, from same locality as for *Congovidia coccinellidarum*. Holotype in the NHM, London.

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