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Description and life cycle of *Cerophagus trigona* spec. nov. (Acari, Acaridae), associated with the stingless bee *Trigona carbonaria* SMITH in Australia

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Summary

Cerophagus trigona sp. n. is described from the stingless bee *Trigona carbonaria* in Eastern Australia. The life cycle of the genus *Cerophagus* OUDEMANS, 1904 is described for the first time. The genus *Cerophagopsis* ZACHVATKIN, 1941 is synonymized with *Cerophagus* OUDEMANS, 1904.
Key-words: Acari, Acaridae, *Cerophagus,* Australia.

Introduction

FAIN (1986) described a new acarid mite, *Tyroborus houstoni,* from the brood cell of the wasp *Paragia tricolor* (Vespidae, Masarinae) in Western Australia. The mites apparently were breeding in unused pollen provision.
In this paper we describe another new acarid mite, also from an hymenopteran, but in Eastern Australia. The mites were associated with the stingless bee *Trigona carbonaria* (Apidae, Meliponinae). They were found, in great numbers, in the comb of a hive that died inexplicably two weeks before. All the developing stages of the mite were represented, specially adults females and protonymphs. Only one phoretic deutonymph was present in the hive.
One of us (T.H.) is attempting to domesticate these bees in order to utilize them for the pollination of fruit and nut crops.
Further investigations will show if the mites are pathogenic for the adult or larval bees and able to cause the death of the hive.
These mites belong to a new species of the genus *Cerophagus* OUDEMANS, 1904. All the measurements given herein are in micrometers (μm).

Family ACARIDAE
Subfamily Acarinae

Genus *Cerophagus* OUDEMANS, 1904
syn. *Cerophagopsis* ZACHVATKIN, 1941, syn. nov.

Until now the genus *Cerophagus* (and also *Cerophagopsis*) was known only from the hypopial stage (heteromorphic deutonymph). We present here, for the first time, a description of the adults:

Adults:
Cuticle bare except the anterior region of the propodonotum which bears a relatively large punctate shield. The posterior part of the body in the female is mamillate. There are 4 pairs of lyrifissures. Sejugal furrow present. All dorsal setae thin and short. Setae *ve* and *sc e* very lateral. Bases of *ve* not visible in specimens mounted dorso-ventrally, and situated at the level of *vi,* very close to the Grandjean organ. The *sc e* is close to the *s cx,* the latter is thick and short. Setae *sc i* relatively far behind the *sc e.* Grandjean organ ending anteriorly into about 10 short teeth. Setae of hysterosoma in female: *d1* to *d5, l1* to *l5, h, sh, a1* to *a6.* Setae *a6* are from 2 to 5 times as long as the other anal setae (in female). Male: as in female but with only 3 paires of anals. Genitalia: vulva longitudinal, situated between coxae III and IV. Male organ between coxae IV; penis short, cylindrico conical; adanal suckers well developed; tarsi IV with a pair of small suckers. In both sexes the genital suckers are very small. Legs relatively short; in male the legs III are thicker than legs IV. All tarsi with a well-developed non-pedunculate claw. In the male the claw III is larger than the claw IV. All the males are homeomorphic. Chaetotaxy of the legs: in female: taris I-IV with 12-11-10-10 setae. Tarsi I with 3 apicoventral conical spines, 2 apicolateral thin spines and 7 thin setae. Tarsi III-IV with 5 apical spines and 5 thin setae. Male as in female but tarsus IV with 8 setae (of which 6 spines) and 2 small suckers. Tibiae 2-2-1-1. Genua 2-2-1-0. Femora 1-1-0-1. Trochanters 1-1-1-0. Solenidia: Tarsi 3-1-0-0. Tibiae 1-1-1-1. Genua 2-1-1-0.

Heteromorphic deutonymph (hypopus):
Dorsum either pitted or striated. Claws of tarsi I-IV equal, rather long, non pedunculate and strongly modified in shape, they are abruptly bent in their middle at 90° to 110°, the basal part being inflated while the apical half is narrow and blade-like. These

claws are not twisted spirally. Condylophores relatively long, especially the posterior ones. Tarsi I-IV with 10-9-8-8 setae of which 7-7-6-4 are foliate, most of them very narrowly so. Palposoma strongly reduced, the palpi being either very short or completely lacking.

Larva:
With short and narrow Claparède organs.

Type species:
Hypopus granulatus DUJARDIN, 1849 (= *Glycyphagus bomborum* OUDEMANS, 1902, *Cerophagus gracilis* VITZTHUM, 1912).
ZACHVATKIN (1941) placed *Cerophagus* and his new genus *Cerophagopsis,* both known only from the hypopi, in the Glycyphagidae, Chaetodactylinae. FAIN (1974) transferred the genus *Cerophagopsis* to the Acaridae, Rhizoglyphinae. The discovery of the adults of *Cerophagus* confirms its close relationship with the Acaridae but with the Acarinae.
Cerophagus is distinguished from the other genera in the Acarinae by the following characters:
In the adults by the longitudinal shape of the vulva, the very small size of the genital suckers in both sexes, the situation of the *ve* setae very lateral and close to the organ of Grandjean and the anterolateral situation of the *sc e.*
In the hypopi the claws are characteristic and very different from those in the Acarinae. They are equal in size, rather long, non pedunculate, all equal in size and shape and not twisted spirally and they are abruptly bent in their middle with a thick basal half and a narrower apical half. The tarsi bear 10-9-8-8 setae, most of them being foliate.

Status of the genus *Cerophagopsis* ZACHVATKIN, 1941

OUDEMANS (1904) erected the genus *Cerophagus* for *Glycyphagus bomborum* OUDEMANS, 1902. This species was represented only by hypopi found on *Bombus terrestris* L. ZACHVATKIN (1941) synonymized the species of OUDEMANS with *Hypopus granulatus* DUJARDIN, 1849 found on *Bombus lapidarius* L. and with *Cerophagus gracilis* VITZTHUM, 1912 from *Bombus terrestris* and he recorded a new host [*Bombus argillaceus* (SCOP.)] for this species. This author (*loc. cit.*) described (also from hypopi) a new genus *Cerophagopsis* with as type species *Cerophagopsis skorikovi* ZACHVATKIN, 1941. This species was collected from *Megachile döderleini* FR. in Japan. This new genus appeared very close to *Cerophagus.* The claws have the same shape as in this genus, as shown by the drawing n° 701 of ZACHVATKIN, although this author describes them as "twisted spirally".
FAIN (1974) described a new species (based on one hypopus) of *Cerophagopsis, C. furcata.* The host was *Bembix borrei* HANDL., the locality Vietnam. This species was very close to *C. skorikovi* but however differed by the shape of the epimera and the sternum, and the splitting of the pregenital sclerite. The claws were identical as in that species except that they were not twisted spirally. Recently FAIN found a new specimen of *C. furcata* on *Megachile* sp. in Vietnam (not published).
Through the kindness of Dr. L. VAN DER HAMMEN, Leiden Museum, we could examine the types of *Cerophagus bomborum.* These specimens have exactly the same type of claws as in *c. furcata* and as in the new species that we describe herein.
From the drawing n° 701 of ZACHVATKIN, representing the claw of *C. skorikovi,* it becomes clear that the claws are identical in both genera. The "spiral" aspect described by ZACHVATKIN in *Cerophagopsis* resulted probably from a misinterpretation on the part of this author. We think therefore that these two genera are synonymous, *Cerophagopsis* being a junior synonym of *Cerophagus.* The following new combinations are proposed:
Genus *Cerophagus* OUDEMANS, 1904
= *Cerophagopsis* ZACHVATKIN, 1941, syn. nov.
Cerophagus granulatus (DUJARDIN, 1849)
= *Cerophagus bomborum* (OUDEMANS, 1902)
= *Cerophagus gracilipes* VITZTHUM, 1912
Cerophagus skorikovi (ZACHVATKIN, 1941) comb. nov.
Cerophagus furcata (FAIN, 1974) comb. nov.

Key to the genus *Cerophagus* OUDEMANS, 1904
(Hypopi)

1. – Dorsum with numerous large pits. From *Bombus* spp (Europe) . . . . . *C. granulatus* (DUJARDIN, 1849)
– Dorsum without pits but with numerous short inequal striations . . . . 2.
2. – With a median pregenital sclerite. Epimera III fused with epimera IV forming closed coxae III. Epimera II free. From *Megachile döderleini* (Japan) . . . . *C. skorikovi* (ZACHVATKIN, 1941).
– With two paramedian pregenital sclerites. Coxae III open . . . . . 3.
3. – Epimera II and III free, coxae II open. Setae *sc e* situated about at the same distance from either *s cx* and *sc i* and closer from each other (distance *sc e – sc e* = 53). Distance *sc i – sc i* = 42. Idiosoma relatively wider (225 × 165). From *Bembix borrei* (Vietnam) and *Megachile* sp. (Vietnam) . . . . . *C. furcata* (FAIN, 1974).
– Epimera II and III fused, coxae II closed. Setae *sc e* closer to *s cx* than to *sc i.* Setae *sc e* more apart (distance *sc e – sc e* = 62). Setae *sc i* less apart

(33). Idiosoma relatively narrower (220 × 135). From a hive of *Trigona carbonaria* (Australia) . . *C. trigona* sp. n.

Description of the new species

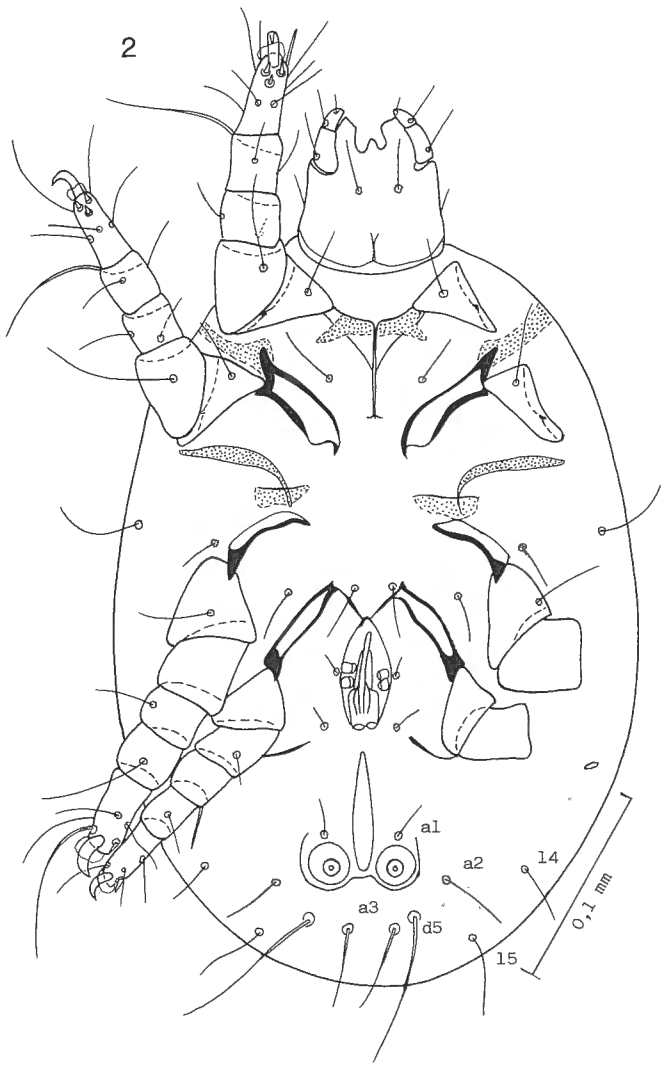
Cerophagus trigona spec. nov.

Female (Figs. 1, 3-7, 10, 11):
Length and width of idiosoma in the holotype 405 × 285. Length and width in 5 paratypes: 425 × 295; 420 × 300; 396 × 270; 390 × 267; 385 × 260. The large females contain one egg. Dorsum: Sejugal furrow moderately developed. Propodonotal shield approximately as wide as long. Posterior region of hysterosoma with small mamillae (ventrally and dorsally). Dorsal setae 12 to 30 long. Setae *ve* situated at the level of *vi* but very lateral and out of the shield (Fig. 11). Setae *sc e* very lateral and close to the *s cx*. Epimera I fused in a sternum. Other epimera free. Vulva longitudinal. Gnathosoma relatively large. Legs with all setae thin except the 5 apicoventral or apicolateral which are spines. Solenidia: *ω2* nearly as long as *ω1*. Genu I with two subequal solenidia. Other characters: see definition of the genus.

Male (Figs. 2, 8-9):
Idiosoma in 5 paratypes: 370 × 240; 369 × 255; 360 × 235; 320 × 190; 310 × 185. Dorsum as in female. Venter as in female but the epimera IV are fused in midline by means of the V-shaped sclerite. Penis 24 long. Genital suckers very small. Length of setae: *a1* 18; *a2* 40; *a3* 42; *d5* 105; *l5* 40. Length of tarsi 36-36-32-27. Gnathosoma 72 wide at its base. Other characters see definition of genus.

Fig. 1. Cerophagus trigona *sp.n. Female in ventral view.*

Fig. 2. Cerophagus trigona *sp.n. Male in ventral view.*



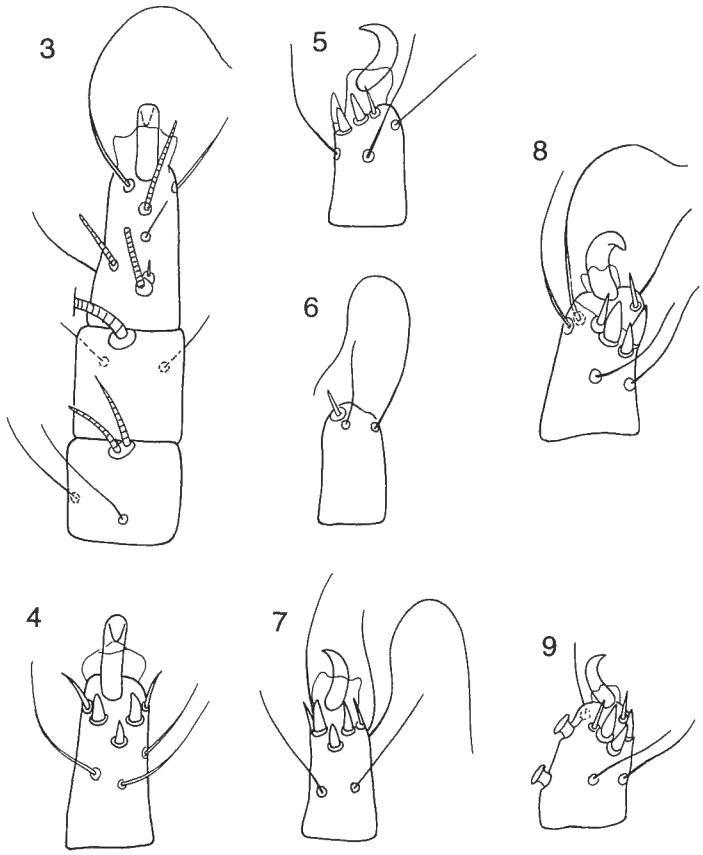
Tritonymph:
One specimen is 285 long and 180 wide. Characters as in female except that the vulva and the copulatory orifice are absent. Posterior extremity without mamillae. There are only 5 pairs of anal setae (*a1* are represented by a pair of ringlets) and *d5* are absent.

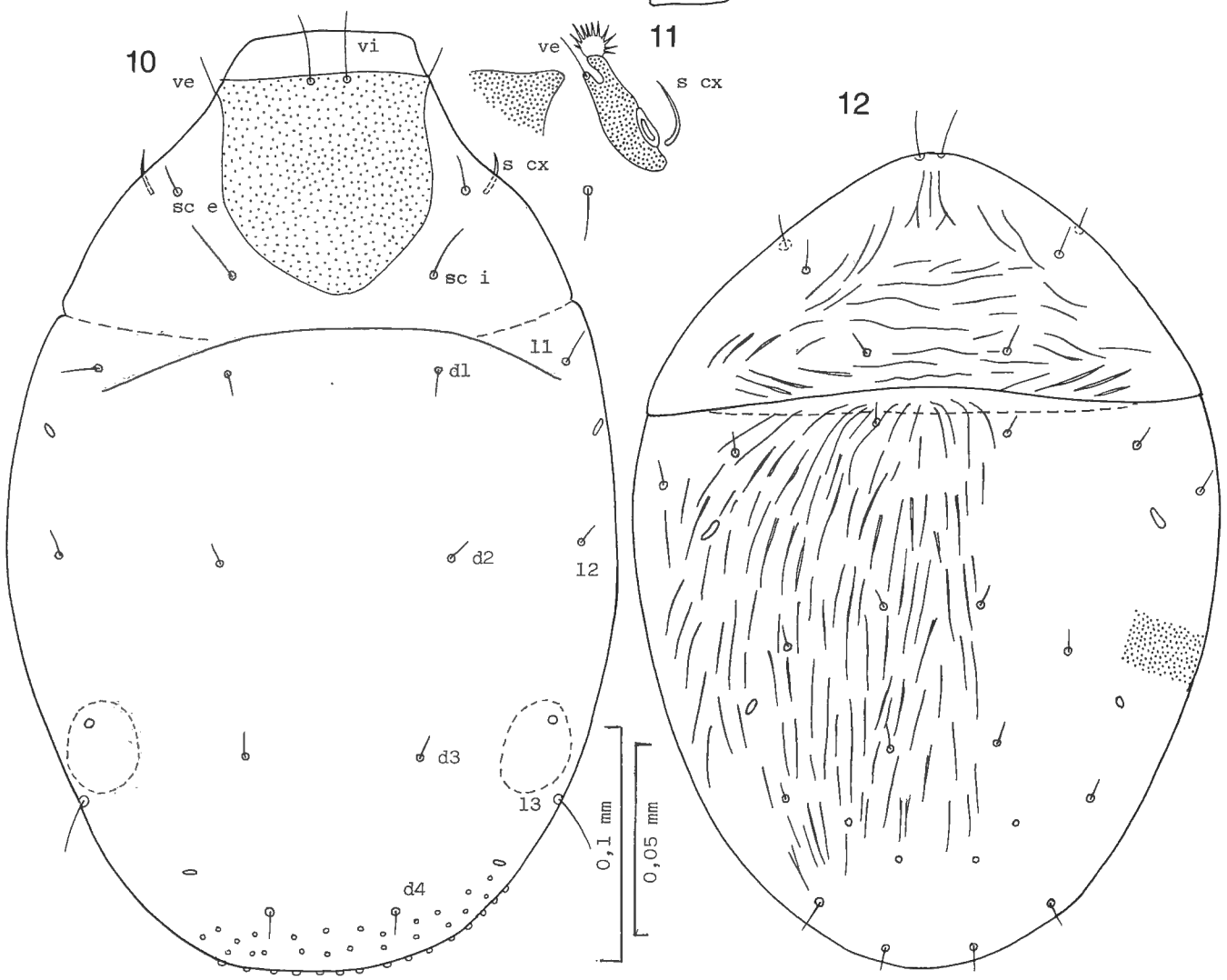
Protonymph:
Measurements of 3 specimens: 285 × 160; 240 × 170; 210 × 150. Perianal setae as in tritonymph.

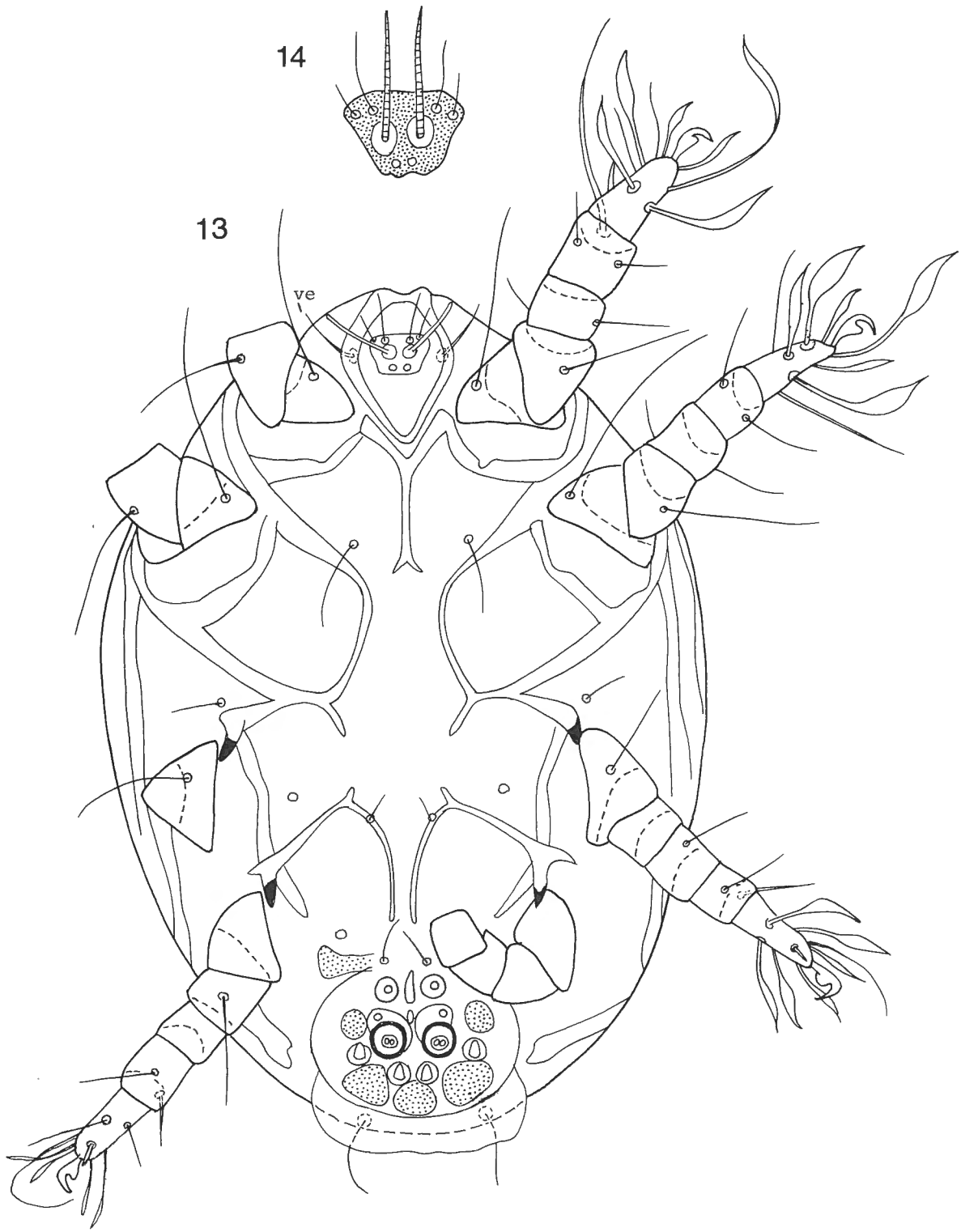
Larva:
Length and width of a larva: 175 × 112. Organ of Claparède short and thin.

Figs. 3-9. Cerophagus trigona *sp.n. Figs. 3-7: Female: leg I, apical segments in dorsal view (3); tarsus I ventrally (4); tarsus III laterally (5, 6); tarsus IV ventrally (7). Figs. 8-9: Male: tarsi III (8) and IV (9).*

Figs. 10-12. Cerophagus trigona *sp.n. Female: dorsal view (10); organ of Grandjean (11), Hypopus in dorsal view (12).*

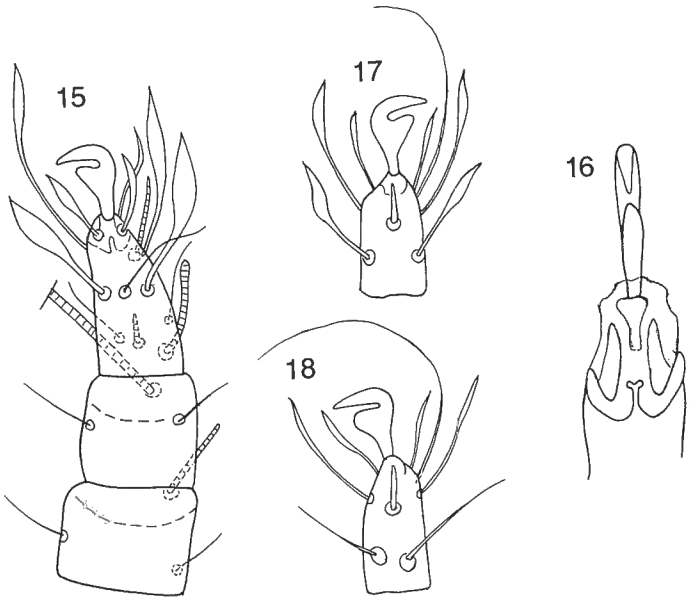






Figs. 13-14. Cerophagus trigona *sp.n. Hypopus in ventral view (13); palposoma (14).*

Hypopus (Heteromorphic Deutonymph) (Figs. 12-18): We found only one hypopus among our specimens. Idiosoma 220 × 135. Sejugal furrow well developed. Dorsum punctate and with numerous short and irregular striations, mostly longitudinal on hysteronotum and transverse or oblique on propodonotum. Setae *sc e* very anterior and lateral and close to the *s cx*. Setae *ve* ventral. Sternum bifid posteriorly. Epimera II and III fused, closing the coxae II. There are 2 separate paramedian pregenital sclerites. Anterior suckers slightly smaller than posterior suckers. Lateral conoids (on suctorial plate) slightly behind the poste-



Figs. 15-18. Cerophagus trigona *sp.n. Hypopus: leg I (15); apex of tarsus I in ventral view (16); tarsus III (17) and IV (18) in ventral view.*

rior suckers. Palposoma reduced to a small sclerotized plate bearing 2 long solenidia (alpha) and 2 pairs of thin setae. Legs rather long. Tarsi 18-18-16-16 long. Claws I-IV equal, non-pedonculate, relatively long and modified: they are abruptely bent at 90° to 110° in their middle, the basal part is inflated while the apical part is narrower and slightly curved. Tarsi without apical spines, setae 10-9-8-8. Tarsi I with 7 foliate setae and 3 thin simple setae. Tarsi II as tarsi I but one simple seta is missing. Tarsi III with 8 setae (6 foliate) and tarsi IV with 4 foliate setae and 4 not foliate setae.

REMARKS

The hypopus of *C. trigona* is the most close to *C. furcata.* It is distinguished from it by the shape of the epimera (epimera II and III fused), the situation of the *sc e* setae more apart and more close to the *s cx,* the absence of setae *d4* and the shape of the idiosoma relatively wider.

HABITAT

Holotype female from the comb of a hive of *Trigona carbonaria,* Queensland, 4 May 1987 (Coll. T. HEARD). Paratypes with the same data: 33 females, 12 males, 6 tritonymphs, 14 protonymphs, 2 larvae and 1 hypopus.
Holotype and 15 PARATYPES females, 6 paratypes males, 4 paratypes tritonymphs, 7 paratypes protonymphs and 1 paratype larva in the Queensland Museum, Brisbane, Australia. One female and one male paratypes in the British Museum (Nat. Hist.), London. Other specimens in the Institut royal des Sciences naturelles de Belgique.

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