

**Description of a new species of *Histiostoma* KRAMER, 1876
(Acari: Histiostomatidae)
phoretic on the solitary bee
Halictus sexcinctus (FABRICIUS, 1775)
(Hymenoptera: Apidae: Halictinae)***

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Summary

Histiostoma halicticola sp. n. (Acari: Histiostomatidae) is described from its deutonymphal stage phoretic on a solitary bee, *Halictus sexcinctus* (F.) (Hymenoptera: Apidae: Halictinae). The mites were found on male and female bees collected in the "Döberitzer Heide" natural reserve close to Berlin, Germany. The deutonymphs use specific transportation sites on the bees. These are of different structure in male and female bees, respectively. A true acarinarium has been observed only in the female bee. The structure and the function of the deutonymphal organs called "conoides" are re-examined and discussed.

Key words: Acari, Histiostomatidae, new species, phoresy, bees, Germany.

Zusammenfassung

Histiostoma halicticola (Acari: Histiostomatidae) wird anhand ihrer Deutonymphen beschrieben, die bei der solitären Biene *Halictus sexcinctus* (F.) (Hymenoptera: Apidae: Halictinae) phoretisch sind. Die Milben wurden an männlichen und weiblichen Bienen aus dem Naturschutzgebiet "Döberitzer Heide" bei Berlin (Deutschland) gefunden. Die Deutonymphen nutzen spezielle Transportplätze (Acarinarium) die sich bei männlichen und weiblichen Bienen unterscheiden. Die Struktur und Funktion der deutonymphen Organe der sogenannten "Conoiden", wurde untersucht und diskutiert.

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Résumé

Histiostoma halicticola sp. n. est décrite d'après son stade deutonymphal, phorétique sur une abeille solitaire, *Halictus sexcinctus* (F.) (Hymenoptera: Apidae: Halictinae). Ces acariens étaient attachés aux abeilles, mâles et femelles, récoltés dans la réserve naturelle de "Döberitzer Heide", près de Berlin, Allemagne. Les deutonymphes utilisent des sites de fixation spécialisés (acarinaria). Les abeilles mâles et femelles ont des sites de fixation différents. Seule l'abeille femelle possède un acarinarium. La structure et la fonction des organes de la deutonymphe appelés "conoïdes" sont réexaminées et discutées.

Introduction

During investigations on the biology of the ground-nesting solitary bee *Halictus sexcinctus* in the "Döberitzer Heide" natural reserve, close to Berlin (Germany), numerous deutonymphs (= hypopi) of a hitherto undescribed species of the genus *Histiostoma* KRAMER (Histiostomatidae) were found by the junior author on the bees. Our attempts to find the other stages (adults, tritonymph, protonymph and larva) of the mites failed as yet, however. The purpose of this paper is to describe the new mite species and summarize what is known about its ecology. Moreover, the structure and the function of the deutonymphal organs called "conoïdes" are discussed. All the measurements are in micrometers (μm).

Family Histiostomatidae BERLESE, 1897

Genus *Histiostoma* KRAMER, 1876*Histiostoma halicticola* sp. n.

This new species is known only from the deutonymphal stage.

Deutonymph holotype (hypopus) (Figs 1-15): *Idiosoma* 245 long and 165 wide. Length and width of 6 paratypes: 250 \times 166; 261 \times 180; 280 \times 190; 290 \times 198; 310 \times 204; 315 \times 210. **Dorsum** with two rather poorly sclerotized shields. Propodonal shield with a faint reticulate pattern consisting of polyedric elongated and slightly raised platelets. Hysteronotal shield with a reticulate pattern poorly developed and restricted to its anterior third, the rest of the shield is uniformly punctate without lines. Sejugal furrow well developed. Anterior border of hysteronotum distinctly crenelated. **Chaetotaxy**: *vi*, *ve*, *scx* and *d5* are lacking; *sci* and *sce* very short (3-5), situated on a transverse very slightly convex line; *d1*, *d2* and *d3* 3 to 4 long, *d4* 10, *l1* to *l4* 4 to 6, *l5* relatively thick and 12 long. Oil glands each represented by a small ring between setae *l2* and *l3*. **Venter**: Palposoma large, trapezoidal, its anterior border 12 wide, its posterior border 22 wide, its length 22; palposoma carries a pair of apical solenidia alpha (α) 55 long, flanked laterally and at both sides by a very short seta (palposomal seta). Sternum 42 long, epimera II fused posteriorly with epimera III, the common sclerite being fused in the midline into a short longitudinal sclerite. Suctorial plate 90 wide and 65 long, its membranous

margins striated radially, the striations of the anterior part of the plate are distinctly thicker than those more behind. Diameter of anterior movable suckers 12, of posterior fixed suckers 30. There are two pairs of *conoïdes*, a lateral pair (*lc*) situated almost at the same level as the posterior suckers and a paramedian pair (*pc*) situated behind the posterior suckers. **Chaetotaxy**: Setae *cxI*, *cxIII* and *gp* modified into *conoïdes* and similar to the *lc* and *pc*. Setae *sh* thin and short (5-10). **Legs**: Lengths of tarsi I-IV 78-57-72-76. In a paratype measuring 290 long and 198 wide the lengths of these tarsi are 96-66-78-85. **Chaetotaxy** and **solenidiotaxy**: see figures.

Host and locality: Holotype deutonymph from *Halictus sexcinctus*. **Locality**: Döberitzer Heide natural reserve, near Berlin, Germany. (July 1997). **Paratypes**: 20 deutonymphs with the same data as holotype. Holotype in the Institut royal des Sciences naturelles de Belgique. Paratypes in the same Institute and in the collections of the authors.

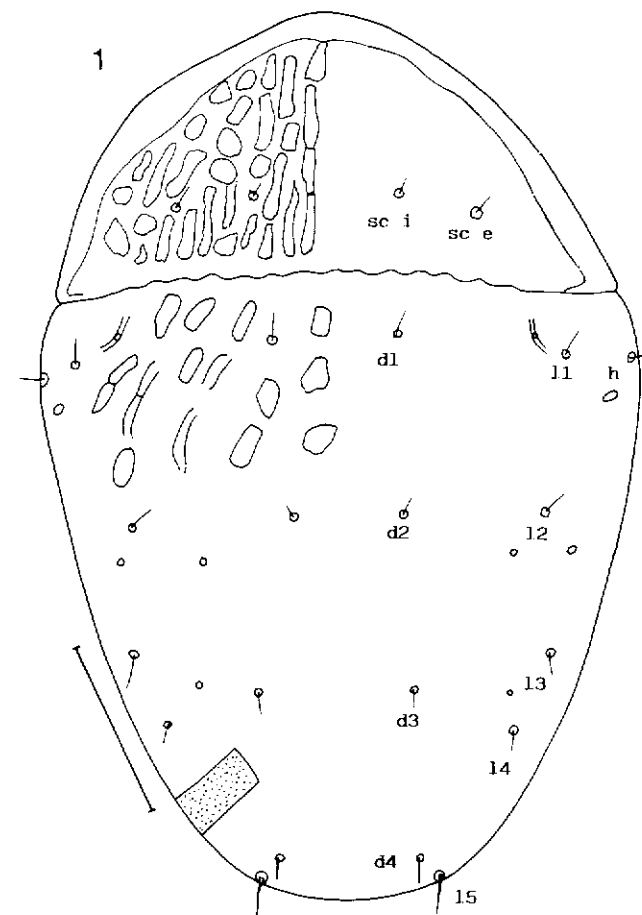
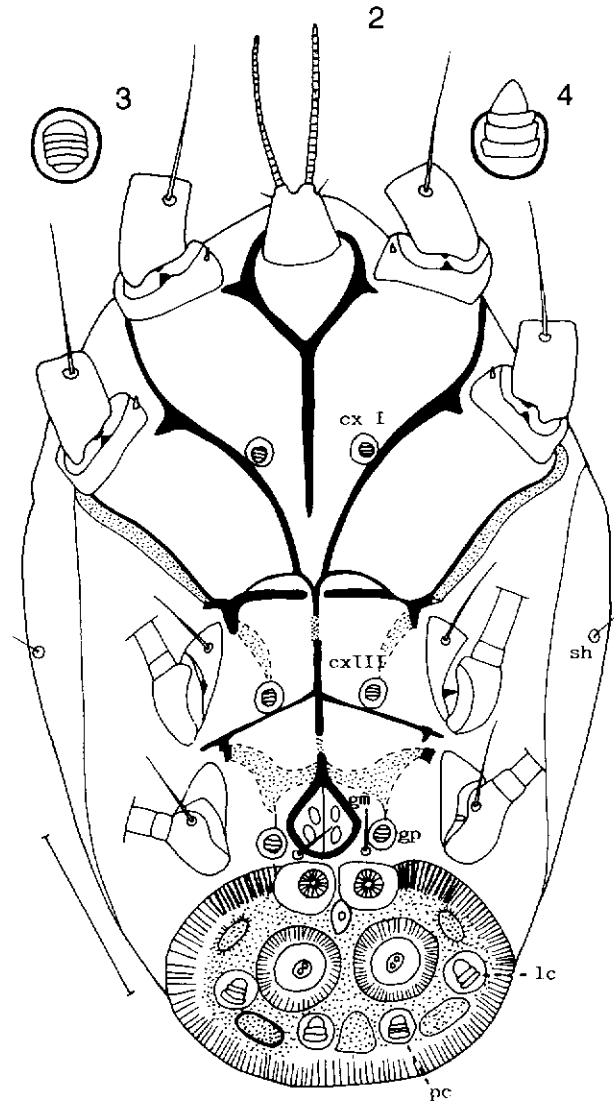


Fig. 1. *Histiostoma halicticola* sp. n. Deutonymph in dorsal view. Scale line 50 μm .

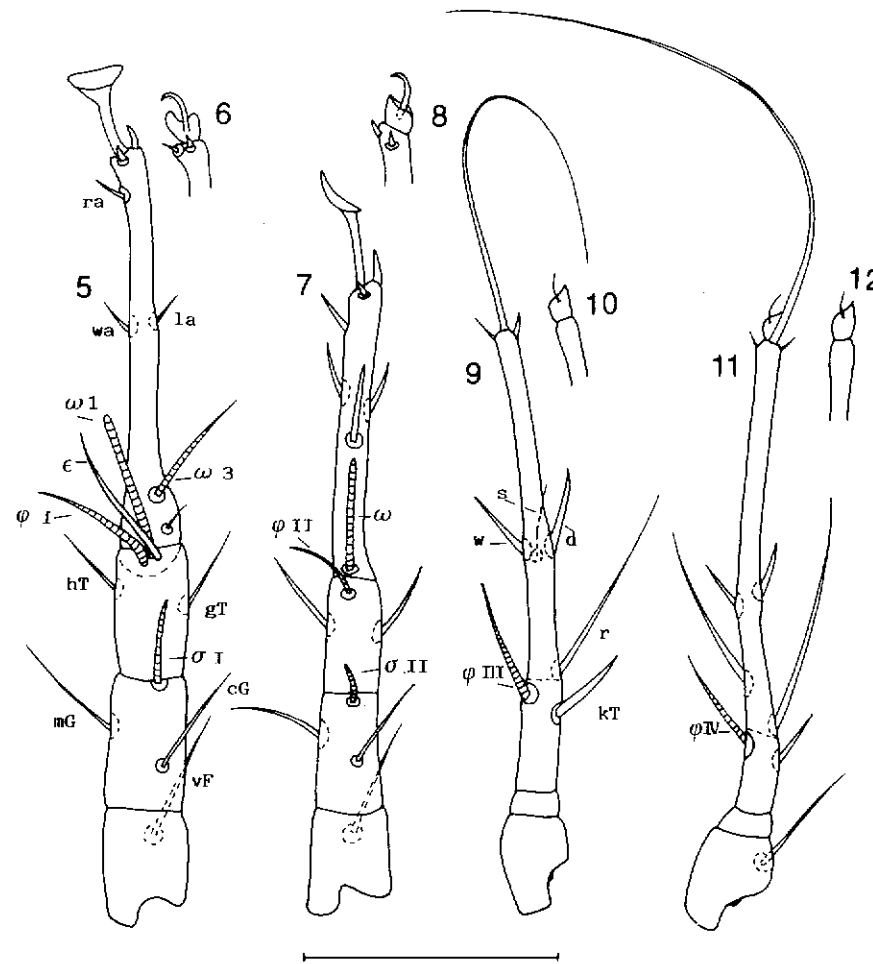
Remarks on the structure and the fonction of the "conoides":

FAIN (1973), in a revision of the genus *Crabrovidia* ZACHVATKIN (1941) (Winterschmidtidae) based on deutonymphs, described the "conoides": 2 pairs of conical soft and collapsible structures with concentric thickenings or ridges, located on the suctorial plate. One pair is situated behind the posterior suckers (paramedian conoides or *pc*), the other is more lateral and often outside of the posterior suckers (= lateral conoides or *lc*). FAIN surmised that these structures



Figs 2-4. *Histiotoma halicticola* sp. n. 2: deutonymph in ventral view; 3: collapsed conoides; 4: erected conoides. Scale line 50 μ m.

could act as elastic buffers facilitating the release of the mite when it detaches from the host. These organs could therefore be considered as releasing organs. In the present paper we depict a conoide in a collapsed condition (Fig. 3) and another in erected condition (Fig. 4). The concentric ridges of the conoides are easily visible in scanning micrograph n° 15. FAIN & BEAUCOURNU (1973, p. 519) described the deutonymph of a new genus and species of *Histiostomatidae* (= *Anoetidae*) and they noted the presence of conoides not only on the suctorial plate but also on the coxal areas. Setae *cxI*, *cxIII* and the *gp* also were modified into conoides. These organs have also been observed in other families of Astigmata (e.g. *Acaridae*) but always only on the



Figs 5-12. *Histiotoma halicticola* sp. n. Deutonymph. 5 and 7: Leg I and II in dorsal view; 6 and 8: Apical part of tarsi I and II in ventral view; 9 and 11: Legs III and IV in dorso-lateral view; 10 and 12: Apical part of tarsi III and IV in ventral view. Scale line 50 μ m.

deutonymphs. In the genus *Histiostoma* all the species carry 5 pairs of conoides, whilst in some other genera conoides are present only on the suctorial plate.

WOODRING & CARTER (1974), in their study of the suctorial plate of *Caloglyphus boharti* (CROSS, 1969) (Acaridae), overlooked our paper and considered these organs as discs (*d5* and *d6*), with probably a sensory function. More recently, EVANS (1992), unaware of our papers, proposed to designate the "discs" of these authors as "conoides", a term that we have used since 1973, in numerous papers.

Systematic position of Histiostoma halicticola:

H. halicticola is clearly distinguished from the other species of *Histiostoma*, and especially those described from Halictidae, by the characters given in the following key:

Key to the *Histiostoma* species phoretic on halictid bees (Deutonymphs)

1. Conoides *cx1* distinctly removed from trochanters II. Anterior margin of hysteronotum crenelated or straight 2
- Conoides *cx1* very close to trochanters II. Anterior border of hysteronotum straight 3
2. Anterior suckers much smaller (diameter 12) than posterior ones (diameter 30). Anterior border of hysteronotum crenelated. Antero-dorsal shield completely covered with a faint reticulated pattern formed of polygonal or elongate slightly raised platelets. Palposoma trapezoidal with posterior border almost twice as wide as the anterior border. Body larger: 245-315 long, 165-210 wide. Host: *Halictus sexcinctus* (F.), Germany *H. halicticola* sp. n.
- Anterior and posterior suckers equal or subequal in diameter. Anterior border of hysteronotum not crenelated. Antero-dorsal shield with a faint pattern in its lateral regions, the median area punctate. Palposoma smaller, only slightly widened in its posterior half. Body smaller, idiosoma 193-202 long and 141-147 wide. Host: *Halictus holtzi* SCHULTZ, Afghanistan *H. szelenyii* MAHUNKA, 1974
3. Small species: Idiosoma 170-180 long. Solenidion $\omega 1$ (on tibia I) club-shaped. Dorsal shields finely punctate. Hosts: *Augochlora* spp., Costa-Rica *H. eickworti* WOODRING, 1973
- Larger species: Idiosoma 229-250 long. Solenidion $\omega 1$ (on tibia I) cylindrical 4
4. Idiosoma 229-237 long and 149-158 wide. Both dorsal shields with a pattern of longitudinal sinuous lines. Palposoma only slightly trapezoidal, almost as wide as long. Host: *Halictus tatzonianellus* SHEL. Locality? *H. orientalis* MAHUNKA, 1974

- Idiosoma 250 long. Antero-dorsal shield with a pattern of reticulated lines forming polygonal or rounded raised platelets. Palposoma one and an half times as wide as long. Host: *Halictus rubicundus* (CHRIST), U.S.A. *H. halictonida* WOODRING, 1973

Biology and distribution of the deutonymphs on the bee

The deutonymphs of *Histiostoma halicticola* sp. n. were found on males and females of the solitary ground-nesting bee, *Halictus sexcinctus*. This bee is abundant in the open, in part heathlike grassland of the former "Döberitzer Heide" military training area which is now a natural reserve (ERTELD, 1995). The mated females hibernate in the nests. In the following year, from the end of May to beginning of June, they start building new nests and begin foraging for pollen and nectar, which is stored in their nests to serve as food for the larvae. In July and August, the males and females of the new generation hatch whilst the old females die. The female offspring remains in the nest and the males leave in search of other nests. Males enter several nests to mate with newly emerged females (ERTELD, 1996). The males die in autumn while the mated females hibernate. From 15 July to 6 August, the junior author examined 22 bees (6 females and 16 males). Among them, 17 individuals carried a total of 532 deutonymphs (Table I).

The deutonymphs of *H. halicticola* attach themselves to specific sites on the bees which appear to facilitate the most successful transportation. Mites may be observed in roof tile-like aggregations at these sites. On female bees the mites are generally found in a deep setose furrow on the second tergite where they are sheltered and well protected from removal (acarinarium) (Fig. 13). This structure is not present in males. On females with more than 30 mites, some were also found on the propodeum and in the hypoepimeral field, which show no specific sheltering structures. This suggests that the mites prefer the furrow and only accept other transportation sites when the furrow has already been occupied by other individuals.

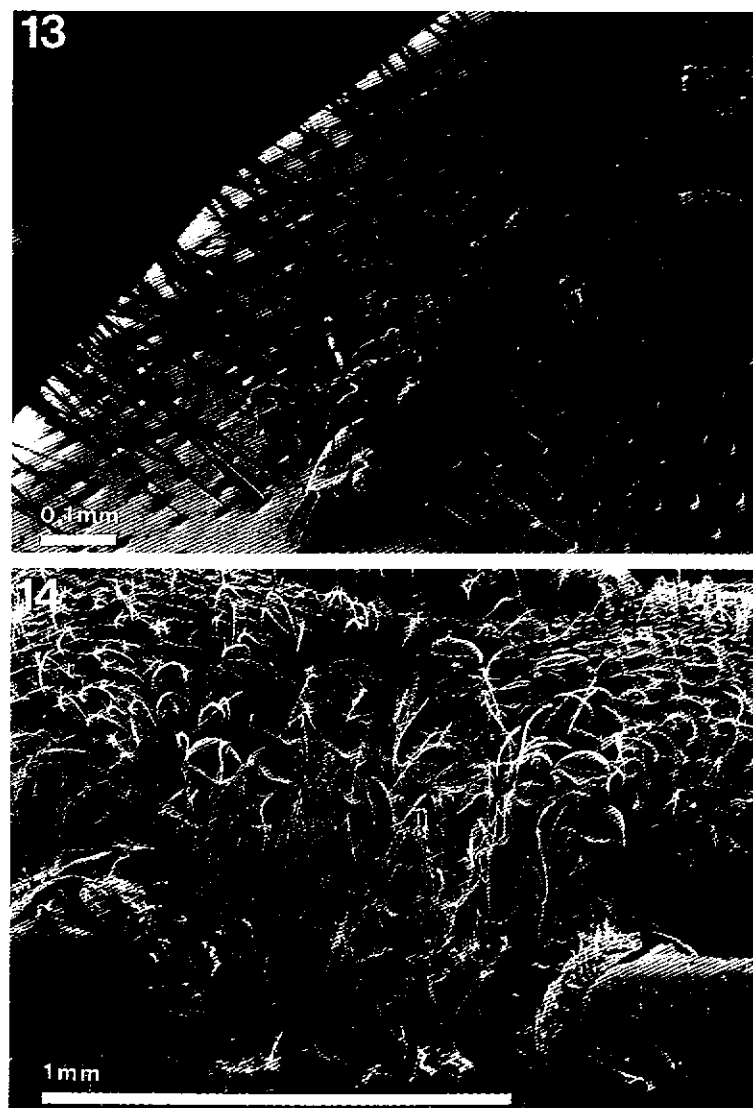
On male bees most of the mites were attached to the ventral surface of the thorax between the coxae (Fig. 14). This site is more concave and smoother in males than in females. In the absence of a setose furrow, the deutonymphs may attach to the smooth area between the coxae on which their suctorial plate presumably stick (Fig. 15). This in combination with protection offered by the deep concavity, seems to provide a safe transportation site.

The phenomenon described here represents a case of phoresy facilitated by the presence of an acarinarium. Acarinarium have been described in other Hymenoptera (e.g. COOPER, 1955; KROMBEIN, 1961; MADEL, 1975; OCONNOR, 1993 see also KIONTKE, 1997).

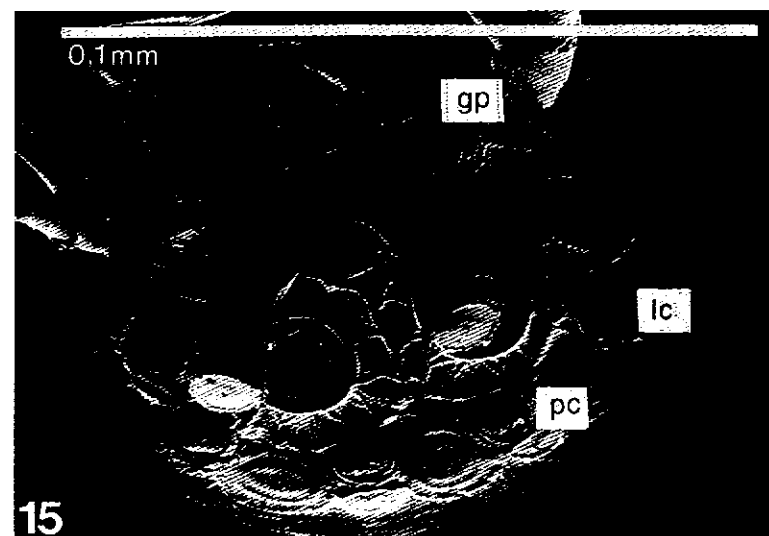
Besides *Histiostoma halicticola*, the junior author also collected two other species of mites of the families Pygmephoridae and Scutacaridae on the bees. These species are being studied separately.

Table 1. Number and attachment sites of the deutonymphs of *Histiostoma halicticola* on the bees

| Date | Number of mites | Location on the bee |
|---|-----------------|---|
| nesting females: | | |
| 17.VII.1997 | 1 | ventral thorax |
| 17.VII.1997 | 43 | 2. tergite, propodaeum lateral and dorsal |
| 06.VIII.1997 | 60 | 2. tergite, propodaeum lateral and dorsal, hypopimeral fields |
| females dug out the nest: | | |
| freshly emerged and unmated bee out of an closed brootcell: | | |
| 06.VIII.1997 | - | |
| freshly emerged possibly mated out of an borrow of the nest: | | |
| 06.VIII.1997 | 14 | 2. tergite |
| 06.VIII.1997 | 30 | 2. tergite |
| males: | | |
| 15.VII.1997 | 8 | ventral thorax |
| 15.VII.1997 | 9 | ventral thorax |
| 15.VII.1997 | 51 | ventral thorax, 2. tergite |
| 15.VII.1997 | 95 | ventral thorax |
| 17.VII.1997 | 79 | ventral thorax |
| 17.VII.1997 | 3 | ventral thorax |
| 17.VII.1997 | - | |
| 17.VII.1997 | - | |
| 17.VII.1997 | - | |
| 17.VII.1997 | 89 | ventral thorax |
| 25.VII.1997 | 10 | ventral thorax |
| 25.VII.1997 | 6 | ventral thorax |
| 25.VII.1997 | 12 | ventral thorax |
| 25.VII.1997 | 2 | ventral thorax |
| 25.VII.1997 | 20 | ventral thorax |
| 25.VII.1997 | - | |



Figs 13-15. Scanning electron micrographs of deutonymphs of *Histiostoma halicticola* sp. n. attached to the bees; 13: deutonymphs aggregated in a deep hairy furrow on the second tergite of the female bee (forming an acarinarium). Right side of the figure is the anterior part of the bee; 14: male bee with numerous deutonymphs attached to ventral surface of thoracic segment between coxae of second legs. The anterior part of the bee is the top of the figure; 15 (see p. 56): suckorial plate of deutonymph bearing *conoides pc* and *lc*; *conoide gp* in front of the plate.



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