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Notes on the mites living in the flowers of *Espeletia* spp. (Asteraceae) in Colombia. I. *Carpoglyphus sturmi* sp. n. (Acari, Carpoglyphidae)

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(With 8 figures)

Abstract

Carpoglyphus sturmi sp. n. (Acari, Carpoglyphidae) is described from the flowers of *Espeletia* and *Espeletiopsis* spp. (Compositae = Asteraceae, Heliantheae) near Bogotá, Colombia.

Introduction

The mites were collected by Professor H. Sturm during the years 1985-1986 from the flowers of several species of *Espeletia* and from *Espeletiopsis corymbosa* (Compositae) near Bogotá, Colombia (alt. 3100-3800 m). These mites belong to five different families in the Mesostigmata or Astigmata. The present paper is devoted to the description of *Carpoglyphus sturmi* sp. n.. The species of other groups will be studied in a following paper.

The measurements are given in micrometers (µm).

Material examined

The material sent to us for identification was contained in the following samples:

1. N° 86/21: From *Espeletia grandiflora* (deflorate head); Páramo de Montserrate, alt. 3250 m; 10.IX.1986.
2. N° 86/22: Same data as for n° 86/21 but from a fruit bearing plant.
3. N° 86/23: Same data as for n° 86/21 but near El Granzio, alt. circa 3100 m.
4. N° 86/24: From *Espeletia grandiflora* (deflorate flowers), Páramo de Chisacá, at about 40 km South of Bogotá; alt. 3650-3800; 19.IX.1986.
5. N° 86/25: From *E. grandiflora* (in blossom), Páramo de Chingaza, at about 15 km WSW of Bogotá; alt. circa 3550-3700 m.
6. N° 86/36: Same data as n° 86/25 but on 24.IX.1986; alt. 3750 m.
7. N° 85/123: From *Espeletia grandiflora* and *E. sumapazii*, Páramo de Chisacá; alt. 3750 m; 8.IX.1985.
8. N° 85/120: From *Espeletia incana*, Páramo La Rusia, at about 200 km NNW of Bogotá and about 10 km N of Duitama; alt. 3550 m; 26.IX.1985.

9. N° 86/19: From *Espeletiopsis corymbosa* (from deflorate heads), Páramo de Montserrate, at about 3 km E of Bogotá; alt. 3250 m; 13.IX.1986.
10. N° 85/122: From the same flowers and locality as n° 86/19 but near Finca; alt. 3250 m; 28.IX.1985.

The new species, *Carpoglyphus sturmi* that we describe herein was represented in all these samples except in sample n° 86/25.

Role of the mites in the biology of the *Espeletia* spp.

The high tropical mountains of the Andin area (alt. 2800 to 4500 m) have developed a very particular ecosystem in relation to the very cold and humid climate prevailing in these regions. These conditions are suitable for the *Espeletia* spp.. Unlike other plants, the very important necromass of their leaves does not drop to the soil, but remains attached to the trunk, protecting the plant against the cold. Moreover it appears that this necromass is directly recycled and used by the plant whithout participation of the soil. The micro-arthropods, including the mites, seem to play an important role in this recycling and their presence is probably essential for the biology and the maintenance of these plants (Sturm 1978, Garay 1981).

Family Carpoglyphidae Oudemans, 1923

Genus *Carpoglyphus* Robin, 1869

The genus *Carpoglyphus* was represented until now by two valid species: *C. lactis* (Linnaeus, 1758) and *C. munroi* Hughes, 1952.

C. lactis is widely distributed in Europe and has been reported from North America and Argentina (Hughes 1976). We have also seen specimens of that species from the trunk of an olive-tree in Algeria and from a rat *Otomys* from Kenya (A. F. unpublished data). Oboussier (1939) was the first to record the formation of phoretic hypopi in that species. Vitzthum (1940) redescribed this hypopus and he noted the presence of eyes in both adults and hypopi of that species. Chmielewski (1967) obtained the hypopial stages in laboratory cultures.

The second species, *C. munroi*, was described in England from a mass of cobwebs containing dead insects. It was also recorded from bat roosts in England (Hughes 1976) and from bee-hives in Czechoslovakia (Haragsim et al. 1978). An hypopus stage is not known in that species.

Biology of *Carpoglyphus lactis*

Carpoglyphus lactis has been found almost exclusively on food products containing sugar, especially dried fruits,

honeycombs, pollen in bee-hives, but also on wine fruit-drinks, cheese, old flour etc. (Hughes 1976, Chmielewski 1970).

Vitzthum (1940) examining hypopi of *C. lactis* collected from a butterfly *Apatura iris* (Linnaeus) (Nymphalidae) in Belgium surmised that this species normally lives in the flowers and that its hypopi are transported by Lepidoptera. The presence of these hypopi on Lepidoptera was confirmed by Treat (1975) who found them on 19 noctuids from Massachusetts and New York. Their number varied from one to 28 on each noctuid. He noticed that "in all instances the mites occupied the interpalpal area on or behind the base of the proboscis". Treat however did not really believe that the flowers are the main habitat for *C. lactis*. He supposed that the species more readily fed on decaying material such as fallen fruit or exsudate of trees, apparently being more suitable for the mites.

Treat (loc. cit.) mentioned that Samšiňák after examination of some these specimens from American noctuids concluded that they are not perfectly conspecific with the European specimens of *C. lactis* and that they probably represent a new species.

Moreover Treat gave a short description of a second and apparently new species of *Carpoglyphus*, also represented by hypopi, that he had found on the noctuid *Charadra circulifera* (Walker) from Florida. They differed by the shape of dorsal striations which were shorter and all longitudinally directed, by the shorter tarsi, and by the shape of the epimera III-IV which are free.

The discovery of *Carpoglyphus sturmi* in the flowers of *Espeletia* spp. confirms the hypothesis of Vitzthum that the natural habitat of *C. lactis* could be the nectar of the flowers.

Key to the genus *Carpoglyphus*

Remark: The seta designated by Hughes (1972 and 1976) as *d1* is considered herein as to be *l1*. The setae *d2*, *d3*, *he* and *l1* of this author should become consequently *d1*, *d2*, *d3*, *h* and *l2*, respectively.

Females

1. Distance between *l1* slightly greater than that between *d1*. Setae *ve* 1,5 to 2 times as long as *vi*. Setae *d1*, *d2*, *l1*, *l2*, *l3* and *h* equal or subequal to *sc i*. Cuticle with mamillae, when present, confined to the posterior part of the dorsum behind the oil glands. Bursa very narrow; copulatory papilla vestigial. Eyes present. Propodonotal shield absent . . . . . *C. lactis* (L., 1758)

- Distance between *l1* much greater than that between *d1*. Setae *ve* about 3 times as long as *vi*. Lengths of *d1*, *d2*, *d3*, *l1*, *l2*, *l3* and *h* variable. Cuticle either mamillate or bare. Copulatory papilla well developed. Propodonotal shield and eyes either present or absent 2

2. Eyes and propodonotal shield absent. Cuticle bare. Oil glands colourles. Setae *d1, d2* and *l1* about 2 times as long as *sc i*. Setae *l1* about 30 per cent, *l3* from 38 to 45 per cent of the length of the idiosoma. Setae *a2* longer than the anus and twice as long as *a1; a3* shorter than *a1* and situated close to the anus and inside the *d5* . . . . . *C. munroi* Hughes, 1952

- Eyes and propodonotal shield present. Cuticle almost completely mamillate. Oil glands deeply pigmented. Setae *d1, d2* and *l1* equal or subequal to *sc i*. Setae *l1* is about 5 per cent, *l3* about 10 per cent of the length of the idiosoma. Setae *a1* and *a2* subequal and much shorter than the anus; *a3* longer than *a2* and situated far from the anus . . . . . *C. sturmi* sp. n.

Males

1. Propodonotum with a punctate shield wider than long. Cuticle almost completely mamillate. Oil glands deeply pigmented. A pair of eyes present in front of the setae *ve*. Anus flanked at each side by a thin seta. Setae *ve* more than 3 times as long as *vi*. Setae *gm* as long as *ga*. Dorsal setae rod-like, slightly attenuated towards apices . . . . . *C. sturmi* sp. n.

- Propodonotum without a shield. Cuticle smooth and shiny. Other characters variable 2

2. Eyes absent. Coxae I without setae. Oil glands colourless. Anus without adanal setae. Dorsal setae with pointed apices. Setae *ve* 3 to 4 times as long as *vi*. Setae *gm* much longer than *ga* . . . . . *C. munroi* Hughes, 1952

- Eyes present. Coxae I with a seta. Oil glands pigmented. Anus with a pair of adanal setae. Dorsal setae with blunt apices. Setae *ve* about twice as long as *vi*. Setae *gm* equal to *ga* . . . . . *C. lactis* (L.,1758)

Carpoglyphus sturmi sp. n.

This new species is named for Prof. Dr. H. Sturm who collected these mites.

Female holotype (figs 1-7): Idiosoma 350 long and 240 wide. Length and width in 6 paratypes 342 x 230 (ovigerous); 330 x 225 (ovigerous); 325 x 190 (ovigerous); 300 x 195 (non ovigerous); 290 x 198 (non ovigerous); 270 x 168 (non ovigerous); 260 x 160 (non ovigerous). The holotype contains 3 eggs. Cuticle almost completely mamillate dorsally and ventrally. There are 3 pairs of lyrifissures (2 dorsal and 1 ventral). Dorsum: A small punctate shield wider than long is present in front of setae *vi*. A pair of eye-lenses is visible slightly in front of setae *ve*. Dorsal setae more or less rodlike but slightly attenuated towards the apex, their

apices are not inflated nor rounded. Setae *s cx* very short and thin. Copulatory papilla narrowly conical, 12 long, situated at 20 of the posterior margin. Bursa describing two loops and slightly wider in its proximal part than in distal part. Length of setae (the lengths in 4 paratypes are in brackets): *vi* 27 (25-31); *ve* 87 (72-92); *sc i* 16 (12-22); *sc e* 48 (34-46); *d1* 25 (15-24); *d2* 21 (16-24); *d3* 40 (33-43); *d4* 35 (33-40); *l1* 15 (16-21); *l2* 40 (33-37); *l3* 36 (30-39); *l4* 31 (33-36); *l5* 270 (280-300); *h* 48 (39-44). Distance *l1-l1* 120; distance *d1-d1* 69. Venter: Epimera as in *C. lactis*. Setae *sh* 36; *d5* 210 (180-200); *ga, gm, a1* and *a2* very thin and short 10-15 long; *a3* 30 long. Base of gnathosoma 48 wide. Chelicerae 66 long. Legs: Length of tarsi I-IV (ambulacra not included): 45-42-48-67. Chaetotaxy: Tarsi with 8-8-7-8 setae. Tarsi I-II with 6 short spines, 1 spinous seta and 1 thin seta. Tarsus III with 6 spines and 1 thin and longer seta. Tarsus IV as tarsus III but with an additional spine. Tibiae with 2-2-1-1 spines. 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 2-1-0-0. Solenidia of genu I inequal (9 and 36 long).

Male (fig. 8) (from sample n° 86/19): Length of idiosoma 325, width 210. In 3 paratypes 300 x 185; 265 x 168; 258 x 170. Cuticle, eyes, propodonotal shield and oil glands as in the female. Dorsum: Distance between *l1* setae 90; between *d1* setae 51.Lengths of setae: *vi* 27; *ve* 99; *sc i* 14; *sc e* 56; *h* 63; *d1* 14; *d2* 15; *d3* 52; *d4* 45; *d5* 225; *l1* 14; *l2* 50; *l3* 34; *l4* 33; *l5* 250. There are 2 pairs of anal setae, one paraanal 15 long, the other more posterior 30 long. Venter: Sternum 45 long. Male organ followed by a triangular sclerotized plate, total length 78. Behind the penis is a bifid sclerite. Genital setae very thin and short. Anus flanked at each side by a thin seta. Gnathosoma and legs as in the female.

Tritonymph: Length and width of 2 specimens: 270 x 180 and 235 x 164. Cuticle, eyes and oil glands as in female. Epimera II not fused with the sternum.

Protonymph: One specimen is 190 long and 114 wide. Cuticle and eyes as in the female. Dorsal and anal setae as in the female. There is only one pair of genital setae, and the trochanters are bare.

H a b i t a t and d e p o s i t i o n of t y p e s: Holotype and 14 paratypes female, 8 paratypes male and 9 paratypes nymphs from the flowers (deflorate head) of *Espeletiopsis corymbosa*. Páramo de Montserrate, sample n° 86/19 (see above).

Paratypes from the following samples: n° 86/24 18 females, 17 males and 9 nymphs; n° 86/22 20 females, 13 males and 9 nymphs; n° 86/21 7 females and 4 males; n° 86/36 10 females and 2 males; n° 86/23 2 females, 3 males and 2 nymphs; n° 85/120 1 female, 3 males and 1 nymph; n° 85/122 3 females and 2 nymphs; n° 85/123 3 females, 6 males and 1 nymph.

In addition to this mounted material we also have conserved about 50 specimens in alcohol from samples 86/19, 86/21 and 86/24.

Holotype and paratypes (45 females, 35 males and 22 nymphs) in the Zoologisches Institut und Zoologisches Museum der Universität Hamburg;

other paratypes (31 females, 18 males and 11 nymphs) in the Institut royal des Sciences naturelles de Belgique, Bruxelles. Paratypes (1 male and 1 female) in the British Museum (Nat.Hist.), the Museum National d'Histoire naturelle, Paris and the U.S. National Museum, Washington.

R e m a r k s: *Carpoglyphus sturmi* differs from both *C. lactis* and *C. munroi* by the mamillate aspect of the cuticle, the presence of a propodonotal shield and the smaller size of the body. Moreover it is distinguished from *C. lactis* by the situation of setae *l1* appearing much more apart compared to the situation in the *d1*, by the greater length of the *ve* compared to the *vi* and in the female the presence of a well developed copulatory papilla. In addition, it differs from *C. munroi* by the presence of eyes and the pigmentation of the oil glands, in the female by the smaller length of setae *d1, d2* and *l1* compared to the body length and the smaller length of setae *a2;* in the male by the presence of the coxal I setae and the paraanal setae and the much shorter aspect of the *gm* setae.

Zusammenfassung

Untersucht wurden Milben aus den Blütenköpfen von Kompositen (Asteraceae) der Gattungen *Espeletia* und *Espeletiopsis,* Charakterpflanzen der den Gipfeln der Anden vorgelagerten, baumlosen Hochflächen, den sogenannten Páramos. Das Material wurde in den Jahren 1985 und 1986 von H. Sturm in Kolumbien in Höhen bis zu 3800 m gesammelt.

Bei der Untersuchung des Milbenmaterial konnten unter anderem viele Exemplare einer neuen Art der Gattung *Carpoglyphus* (Astigmata, Carpoglyphidae) gefunden werden, deren Weibchen, Männchen und Nymphen in vorliegender Arbeit, dem ersten Teil der Untersuchungsergebnisse, als *C. sturmi* sp. n. beschrieben werden. Es wird außerdem ein Bestimmungsschlüssel für die Männchen und Weibchen der drei jetzt bekannten Arten der Gattung *Carpoglyphus* gegeben.

Der neueste Fund vieler erwachsener Exemplare und Nymphen eines Vertreters der Gattung *Carpoglyphus* in Blütenköpfen 10 verschiedener Espeletien von einander entfernter Standorte ist insofern von großem Interesse, als über das natürliche Vorkommen der am längsten bekannten Art, *C. lactis* L., 1758, einem häufigen und gefürchteten Schädling zuckerhaltiger Produkte wie Trockenfrüchte, Pflaumenmus, Marmelade, Honig, Honigwaben etc. nichts bekannt ist. Der Fund weniger Exemplare der zweiten bislang beschriebenen Art, *C. munroi* Hughes, 1952 in einem Spinnennetz in England brachte über das natürliche Vorkommen auch keine Erkenntnisse.

Nachdem Vitzthum (1940) Deutonymphen, sogenannte Hypopen von *C. lactis* an einem Schillerfalter (*Apatura iridis* (L.) (Nymphalidae) aus Belgien und später Treat (1975) je 1 bis 28 solcher Hypopen an 19 verschiedenen Nachtfaltern (Noctuidae) aus New York und Massachusetts entdeckten, ist zu vermuten, daß das natürliche Habitat der *Carpoglyphus*-Arten Blüten sind, was Treat allerdings bezweifelt.

Das Auffinden der vielen Exemplare von *C. sturmi* in den Blüten der Espeletien unterstützt die Vermutung Vitzthums (1940), daß das natürliche Vorkommen und die natürliche Nahrung auch von *C. lactis* Blüten, vor allem Blütennektar darstellt, obwohl die Adulti des altbekannten Vorratsschädlings im Freien bisher noch nicht nachgewiesen werden konnten.

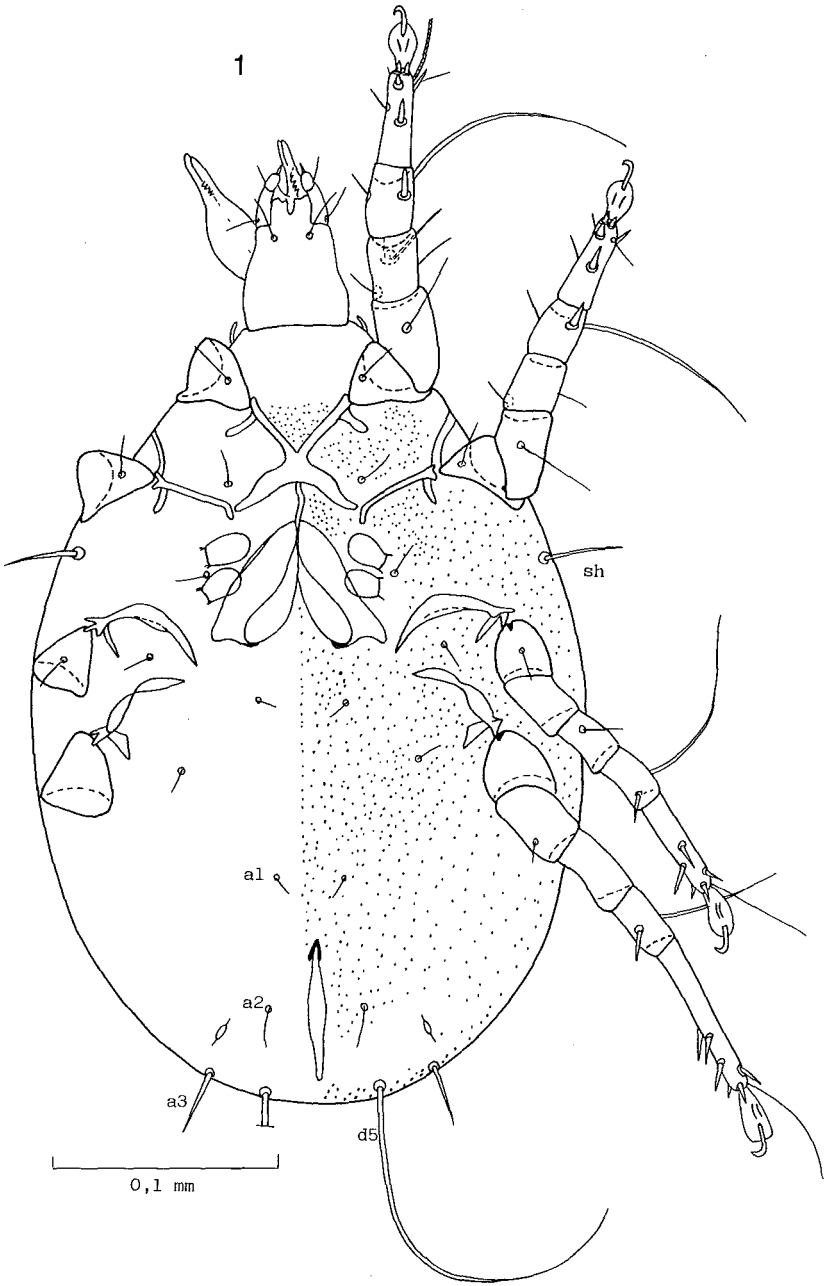
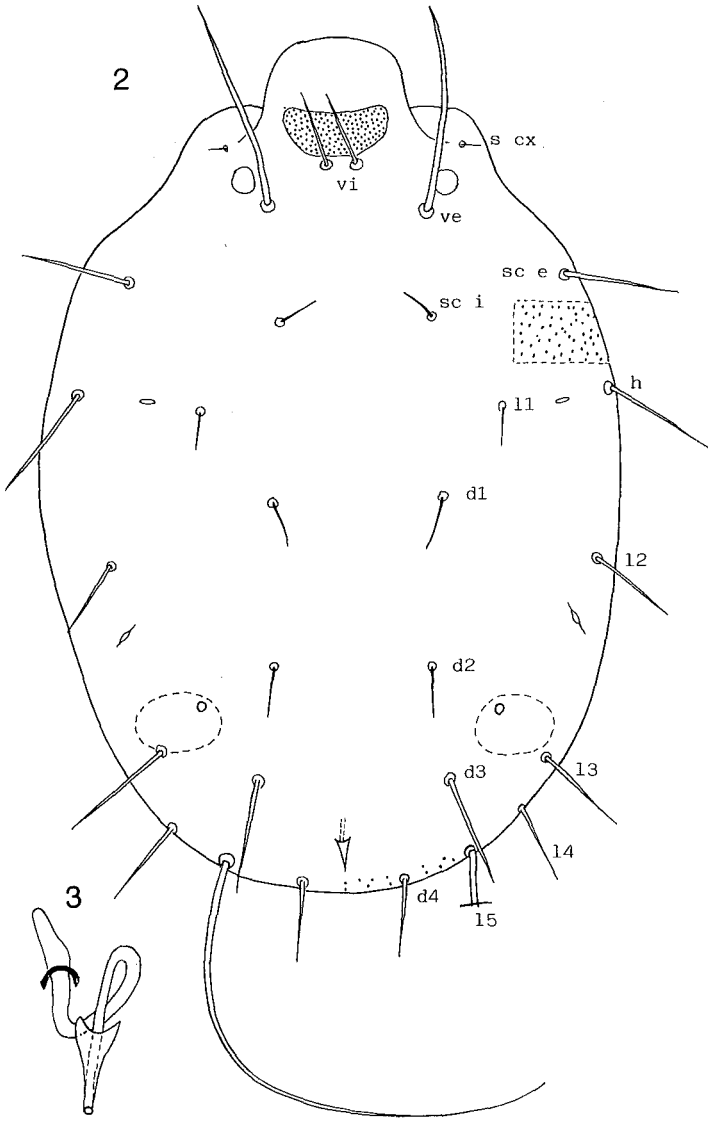
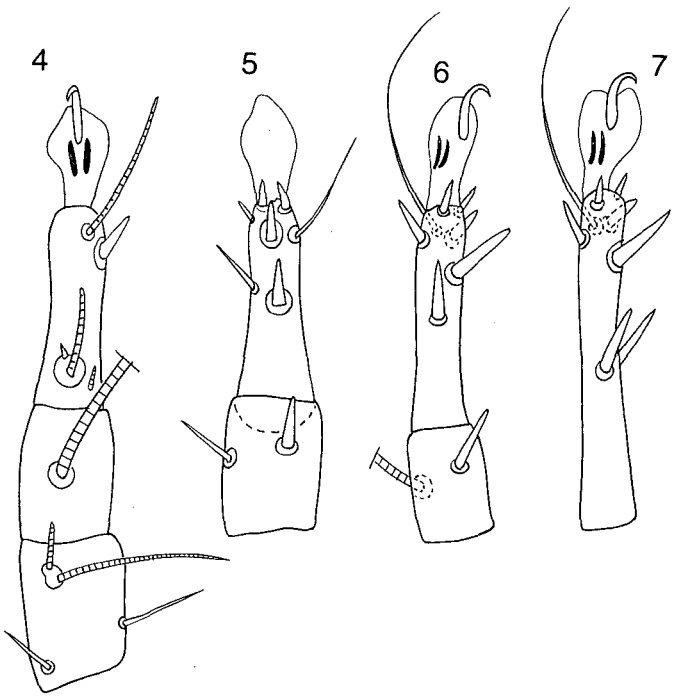


Fig. 1: *Carpoglyphus sturmi* sp. n. Female in ventral view.



Figs 2-3: *Carpoglyphus sturmi* sp. n. Female in dorsal view (2); bursa copulatrix with copulatory papilla (3).



Figs 4-7: *Carpoglyphus sturmi* sp. n. Female: apical segments of leg I dorsally (4) and ventrally (5); of legs III (6) and IV (7) laterally.

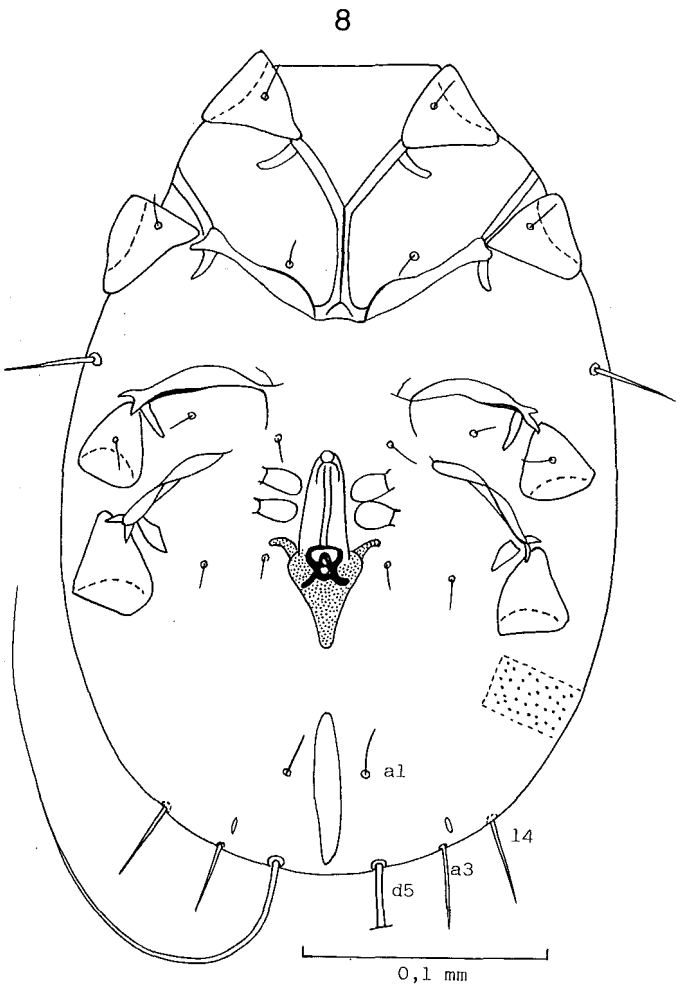


Fig. 8: *Carpoglyphus sturmi* sp. n. Male: idiosoma in ventral view.

References

Chmielewski, W., 1967: Stadium hypopus *Carpoglyphus lactis* (L., 1758) (Glycyphagidae, Acarina). - Prace Nauk. Inst. Ochrony Roślin, *9* (2): 161-173. Poznán.

Chmielewski, W., 1970: Morphological and biologic-ekological charakteristic of *Carpoglyphus lactis* (L.) - Of kind appearing in natural honey, in warehouses and beehives. - Pszczelnicze Zeszyty Nauk., *14* (1-3): 109-127. Grudzień.

Garay, I., 1981: Le peuplement des microarthropodes dans la litière sur pied de *Espeletia lutescens* et *Espeletia timotensis*. - Rev. Ecol. Biol. Sol., *18:* 209-219. Paris.

Haragsim, O., Samšiňák, K. & Vobrázkowá, E., 1978: The mites inhabiting the bee-hives in ČSR, - Z. ang. Ent., *87* (1): 52-67. Hamburg, Berlin.

Hughes, A.M., 1952: A new Glycyphagid mite - *Carpoglyphus munroi*. - J. Linn. Soc. Zool., *42* (284): 168-175. London.

Hughes, A.M., 1976: The Mites of Stored Food and Houses. - Ministry of Agriculture, Fisheries and Food, London. pp. 1-400.

Oboussier, H., 1939: Beiträge zur Biologie und Anatomie der Wohnungsmilben. - Z. ang. Ent., *26* (2): 253-296. Hamburg, Berlin.

Sturm, H., 1978: Zur Ökologie der andinen Páramoregion. - Biogeographica, *14:* 1-121. The Hague, Boston, London.

Treat, A.E., 1975: Mites of Moths and Butterflies. - Comstock Publ. Assoc., Ithaca-London, pp. 1-362.

Vitzthum, H. von, 1940: Die deutonympha von *Carpoglyphus lactis* (L. 1758) (Acari: Tyroglyphidae). - Zool. Anz., *129:* 197-201. Leipzig.

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