Acarologia is proudly non-profit, with no page charges and free open access

Please help us maintain this system by encouraging your institutes to subscribe to the print version of the journal and by sending us your high quality research on the Acari.

Subscriptions: Year 2020 (Volume 60): 450 €
http://www1.montpellier.inra.fr/CBGP/acarologia/subscribe.php
Previous volumes (2010-2018): 250 € / year (4 issues)
Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France
ISSN 0044-586X (print), ISSN 2107-7207 (electronic)

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d’avenir » programme (Labex Agro: ANR-10-LABX-0001-01)

Acarologia is under free license and distributed under the terms of the Creative Commons-BY-NC-ND which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original author and source are credited.
THE GENUS CALVOLIA OUDEMANS, 1931
(ACARI : SARCOPTIFORMES)

BY
A. Margaret HUGHES.

(Biology Department, Royal Free Hospital School of Medicine, also Ministry of Agriculture, Fisheries and Food, Infestation Control Division.)

Introduction:

The purpose of this paper is (1) to give full descriptions of Calvolia transversostriata (Oudemans, 1931), C. romanovae Zachvatkin, 1941 and C. bakeri nov. n.; (2) to give an account of the genus Calvolia and to define it; and (3) to list the species that have been described in adult and deutonymphal (hypopial) stage.

*Calvolia transversostriata* (Oudemans, 1931) comb. nov.

*Czenspinskia* heterocoma Oudemans, 1927 (not Michael, 1903); *Dondorffia* transversostriata Oudemans, 1931; *Czenspinskia lording*, Nesbitt, 1946; syn. nov.

*Calvolia* heterocoma E. and F. Türk, 1957 (not Michael, 1903).

Female (fig. 1). Length of idiosoma of ten specimens: 230 to 274 μ.

The idiosoma is pale yellow in colour, contrasting with the bright reddish-brown contents of the latero-abdominal glands; it has a transverse constriction between the second and third pairs of legs and the hysterosomal region is covered with a finely wrinkled cuticle. This wrinkling is mainly transverse and extends over the dorsal side of the hysterosoma and the area behind coxae IV on the ventral side, with the exception of the cuticle covering the latero-abdominal glands and that surrounding the same setae. Posterior to the d₃ setae, the wrinkling is almost longitudinal, as shown in fig. 1, and a longitudinal fold runs down the side of the body. The dorsal side of the propodosoma is partially covered with a faintly-patterned shield and on the lateral corners of this is a pair of colourless corneae.

The body setae are smooth and arranged as in fig. 1. Except for v₁, s₁ and p₁, they are short (less than 10% of the idiosoma in length), the distance between the base of d₁ and d₂ being more than twice the length of d₁. Sc₁ are more than three

*Acarologia*, t. IV, fasc. 1, 1962.
times longer than sc i and arise from distinct tubercles, sc i being considerably nearer to sc e than to each other. V e are missing. Grandjean's organ is a small rod and the supracoxal seta is similar to the short body setae. Two pairs of coxal and three pairs of genital setae are present and the anus is bordered by three pairs of anal setae, the post anals being about the same length as sc e (fig. 2).

Ventrally, the apodemes are slender and feebly cuticularised; those of legs I meet to form a short sternum and apodemes IV and epimerites III merge with one another. The genital opening is covered by lontigudinal folds and its anterior end is overhung by a transverse fold of cuticle attached to the epigynium (fig. 3 a).

The gnathosoma is of the usual sarcoptiform type. The legs are slender and feebly tanned; each terminates in a membranous pretarsus to which is attached

--- 49 ---
a small claw. At the base of the pretarsus on leg I are inserted the solenidion \( \omega_2 \), two setae \((d \text{ and } f)\) and three small ventral spines. On tarsus I (fig. 4 a), the solenidion \( \omega_1 \) is a slightly tapering rod and it and the famulus arise from the same depression in the cuticle midway along this segment and distal to the origin of the seta \( wa \). On tarsus II (fig. 4 b), \( \omega_1 \) is more proximal in position and the base of \( wa \) is distal to it. On genu I, \( \sigma_2 \) is more than twice as long as \( \sigma_1 \).

No male or hypopus has been found and the nymphal stages closely resemble the adult.

![Diagram](image)

**Fig. 2. — *Calvola transversostriata* (Oud.) 2. Anal region. a, pa setae associated with the anus.**

The larva (fig. 5) is about 120 \( \mu \) long and has a colourless smooth cuticle. The same transparent corneae are present on the propodosoma and a pair of small blunt coxal rods, as well as coxal setae, arise from coxae I.

**Biology:**

This mite is found on the under surface of leaves close to the midrib and it feeds on the epidermis and also on fungal mycelium. According to G. DOSSE & I. SCHNEIDER (1957) it can do a certain amount of damage to the leaf tissue in May and June, but later on it grazes on the sooty mould growing on the honeydew excretion of Aphids. This observation was also made by P. GARMAN (1943). The mite overwinters in the tritonymphal stage and has three generations yearly in the neighbourhood of Stuttgart-Hohenheim, Germany. It is parthenogenetic, and the white, oval eggs are attached to “hairs” arising from the leaf epidermis.
Distribution:

*C. transversostriata* is widely distributed in Europe, Holland, France, Italy, Switzerland and Spain on a number of trees and herbaceous plants, e.g. apple, pear, plum, walnut, alder, oak, violet, etc. (G. Dosse & I. Schneider, 1957; F. Grandjean, 1942). In North America it has been found on apple trees in Connecticut (P. Garman, 1948) and Nova Scotia (F.T. Lord, 1949) where it was the only mite destroyed by fungicides containing copper. In Maryland, W.C. Atcheson (1953) found it on lime, and it also occurs in very large numbers on filbert in Oregon (B. Ainscough coll.). In Australia, it has been found in Queensland (D. Macfarlane). In this country, it is often found on the leaves of apple, cherry, lime

Fig. 3. — Genital region Of (a) *Calvia transversostriata* (Oud.) ♀, (b) *C. romanovae* Zach. ♀, (c) *C. romanovae* ♂ and (d) *C. bakeri* nov. n. ♀. ep III epimerite III; ap IV apodeme IV; epg epigynium; H H-shaped sclerite; gf genital fold; P penis.
Fig. 4. — Dorsal view of right legs I (a) and (b) of *Calvolia transversostriata* (Oud.) *♀*, *ω₁, ω₂*, *σ₁* and *σ₂* solenidia; *ε* famulus; *d, f, wa* setae.

Fig. 5. — *Calvolia transversostriata* (Oud.). Dorsal view of larva.
Fig. 6. — *Calvola romanovae* Zach. ♀. Dorsal view. c cornea; a, d₁, d₂, sc e, sc i setae of the idiosoma.
(G. Rich coll.), oak and hawthorn in Kent, Sussex, Surrey and Hampshire. E. and F. Türk (1957) found it in very large numbers under the cast skins of Coccids in Erlangen, Germany and A. C. Oudemans' specimens were living on elm, lime and Heliotrope in Holland.

_Calvolia romanovae_ Zachvatkin, 1941.

_C. tarsoinfracta_ Türk & Türk, 1957 syn. nov.

_Female_ (fig. 6). Length of idiosoma of ten specimens: 288 to 361 μ.

The idiosoma is colourless and has a smooth, translucent cuticule; the propodosomal shield is ill-defined, its anterior angles marked by a pair of colourless corneae. The contents of the latero-abdominal glands are also colourless.

The dorsal setae do not vary greatly in length, 

The contents of the latero-abdominal glands are also colourless.

Ventrally, the apodemes are feebly sclerotized and apodemes IV and epimerites III are not fused, although the two sclerites are close together (fig. 3 b). The most anterior pair of anal setae is considerably in front of the anus (fig. 6).

---

**Fig. 7.** *Calvolia romanovae* Zach. (a) Dorsal view of right leg I of ♀; (b) ventral view of left leg I of ♂; (c) dorsal view of right leg I of hypopus. ω₁, ω₂, π₁, π₂ solenidia; ε famulus; d, la, ra, wa setae.
On leg I, d and ω2 always lie close together (fig. 7a) and ω1 and the famulus are proximal to wa and near the base of the tarsus. On genu, τ2 is less than twice as long as τ1. Apart from this, the chaetotaxy of the legs is the same as in the preceding species.

**Male** (fig. 8): Length of idiosoma of ten specimens = 260 to 288 μ.

The general appearance of the male is similar to that of the female.

The genital opening is between coxae IV, the vas deferens terminating in a curved penis which is posterior to an H-shaped strut. The penis is covered by genital folds and, in front of these, apodemes IV are connected by a fine transverse sclerite (fig. 3c).

---

**Fig. 8.** *Calvolia romanovae* Zach. ♂. Lateral view.
Legs I and II differ from those of the female in having a single, membranous sucker at the ventral, distal end of the tarsus (fig. 7 b). Also, the ventral setae la, ra and wa are clustered round the base of the sucker. The solenidion \( \omega_3 \) and \( \delta \) on tarsus I are separate from one another.

_Hypopus_ (figs 9, 10). Length of idiosoma: about 200 \( \mu \). The hypopus has a smooth, yellowish cuticle with traces of reticulations on the dorsal side of the propodosoma. On the sides of the rostrum is a pair of cornea lying above a pigmented sclerite. Ventrally, the sternal shield is outlined posteriorly by a curved line continuous with epimerites II; apodemes III and IV are joined to a longitudinal sclerite as shown in fig. 10. Paired setae arise in front of apodemes III, at the junction of apodemes IV in the midline and anterior to the sucker plate. The sucker plate is removed from the hind edge of the body and bears three pairs of suckers, two additional pairs of suckers are associated with it.
The first three pairs of legs are long and slender and each terminates in a well-developed pretarsus and claw. The fourth pair is short, its tarsus bearing two long setae of unequal length, of these the base of the shorter is more proximal. The chaetotaxy of leg I (fig. 7 c) is similar to that of the adult, except that immediately in front of o₃ and the famulus, there arises a long seta which is not present on tarsus II. On genu I only one solenidion (σ) is present, as is customary in the hypopus.

**FIG. 10. — Calvacia romanovae** Zach. Hypopus. Ventral view. ep II epimerite II; ap III and IV apodemes III and IV.

**Biology and Distribution:**

*C. romanovae* was found by ZACHVATKIN (1941) with *Acarus siro* on stored wheat in Moscow. E. and F. TÜRK (1957) found all stages on rotting potatoes in Erlangen, Germany. My specimens were found on New Zealand cheese by E. POWELL.
Fig. II. — Calvolaia bakeri nov. n. ♀. Dorsal view. c cornea; d₁, d₃ setae of the idiosoma.
Calvolia bakeri nov. n.

Oulenzia arboricola Baker & Wharton, 1952 (not Oudemans, 1928).

**Female** (fig. 11). Length of idiosoma of three specimens: 288 to 360 μ.

The idiosoma is rather more rounded in outline than in the previous species and its proportions are rather different; thus, the corneae are more posterior in position (cf.: fig. 1 and 11) owing to the fact that the distance between the base of v i and the supracoxal setae is greater. The posterior edge of the propodosomal shield is lobed. The arrangement of the dorsal setae is the same as in *C. romanovae*, but the dorsal setae vary more in length and d 3 are more than twice as long as d 1. Ventrally, the apodeme are slender and apodemes IV and epimerites III are united. The epigynium is a transversely elongated sclerite lying at the anterior end of a fold of cuticle which overhangs the genital opening (fig. 3 d) as in *Calvolia transversostriata*.

The chaetotaxy of leg I differs from that of *C. romanovae* in that the seta wa arises at almost the same level as ω 1 (fig. 12 a), and on genu I σ 1 is more than twice as long as σ 1.

**Male.** Length of idiosoma of one specimen: 230 μ.

The genital opening is between coxae III and IV. On leg I the seta wa is nearer to ω 1 than to the base of the terminal sucker. A similar sucker is also found on leg II as is characteristic for the genus (fig. 12 b and c).

**Distribution:**

*C. bakeri* was found on the leaves of *Hevea* in Sumatra and on jute in India (C. Baker & G. W. Wharton, 1952). The specimens figured in this paper were also found on jute in Dacca, India (G. M. Das coll.).
According to A. C. Oudemans’ unpublished drawing of Calvolia (= Lenzia) arboricola, C. bakeri differs in the following respects:

1. It possesses a dorsal shield.
2. The dorsal setae d₄ are anterior to the latero-abdominal glands and to I p. In C. arboricola these glands and the I p setae are further forward and d₄ are posterior to them.
3. The corneae are intermediate between v i and the supra-coxal seta. In C. arboricola they are almost on the same transverse line as the supra-coxal setae.
4. On leg I, the solenidion ω₁ tapers slightly towards its distal end; in C. arboricola it is expanded.

Discussion:

The genus Calvolia was erected by A. C. Oudemans in 1911 to include the hypopolial or deutonymphal form of Calvolia hagensis Oudemans, 1911; this is distinguished by having a pair of corneae lying external to a band of reddish-brown pigment on the rostrum. No adults were described. In the same paper Oudemans recognised that the hypopus of A. D. Michael’s species Tyroglyphus heterocomus also had the same structures. He did not, however, include this species in the genus Calvolia and in 1927 erected the genus Czenspinskia with A. D. Michael’s species as type, but with no further diagnosis of the genus. Four years later, A. C. Oudemans founded the genus Dondorffia, and described the type species: D. transversostriata Oud., 1931, the most prominent characters of which were the fine wrinkling of the cuticle and the reddish-brown contents of the latero-abdominal glands.

I have examined three slides of “Czenspinskia heterocomus Michael, 1903” from the Oudemans’ collection in Leiden, dated 1896, 1900 and 1921 and find that these are, in fact, specimens of Calvolia (= Dondorffia) transversostriata. As these specimens were found before 1927, it seems likely that these specimens were used in founding the genus Czenspinskia.

The genus Lenzia (type species: Lenzia arboricola Oud., 1928) was erected by A. C. Oudemans in 1928 to include those forms which lack the ve setae, but possess a pair of corneae in the same region. Similar corneae are also present in C. transversostriata and C. romanovae and possibly in other species as well. C. Radford (1950) found that the name Lenzia was pre-occupied and consequently he changed it to Oulenzia.

Zachvatkin (1941) recognised the close affinity between Calvolia and Czenspinskia (judging from Michael’s description of Tyroglyphus heterocomus) and he united the two genera. Subsequent examination of Oulenzia bakeri and Calvolia romanovae (which possesses a typical Calvolia-like hypopus) also shows the close relationship between these two genera and, in my opinion, justifies the inclusion of Oulenzia, as well as Czenspinskia, into the genus Calvolia.

The following diagnosis can be given of the genus Calvolia: Acarid mites having a smooth, or more rarely, a wrinkled cuticle and a transverse constriction between propodosoma and hysterosoma, and usually with a pair of corneae in the position of the anterior corners of the propodosomal shield.
The setae of the idiosoma are smooth and ve are always lacking. Sc e are
usually more than three times longer than sc i.

The genital opening is between coxae III and IV or coxae IV in both sexes
and anal suckers are absent in the male. An epigynum is usually developed in the
female.

The legs end in prominent pretarsi and claws, and no prominent spines are
developed. Males possess a single sucker at the distal end of tarsi I and II.

The hypopi are often yellowish in colour, sometimes with a sculptured dorsal
surface. They always possess a pair of corneae situated close together at the tip
of the rostrum. On leg IV the claw is replaced by one or two setae which exceed
half the length of the idiosoma. A well-developed sucker plate is present.

Type species: Calvolia hagensis Oudemans, 1911.

In addition to the three species described here, the following have been described
as adults: — Calvolia (= Lenzia) arboricola (Oud., 1928) from Hevea leaves, Sumatra; C. heterocoma (Michael, 1903) from oak trees and a squirrel’s nest, New Forest, Hampshire, England; C. kamenski Zach, 1941, from plant refuse, Bashkeria, U.S.S.R.; C. kneissli Krausse, 1919 from the debris of Scotch pine or, more rarely, spruce (Türk and Türk, 1957). The hypopi are carried on Orthotomicus laricis (Fabr.) (see Krausse, 1919), Clerus formicarius and a variety of other insects (Türk and Türk, 1957; Samsinák, 1957); C. ruehmi Türk and Türk, 1957 found in galleries of Dryococetes villosus on an American oak, Erlangen, Germany; C. tuberculata Zach, 1941 on maize seedlings, Georgia, U.S.S.R.; C. hebeclinii Sicher on a hot house plant Hebeclinium macrophyllum D. C. Sicily (Canestrini, 1899).

The following have been described only in the hypopial stage — Calvolia astoma Türk and Türk, 1957 on Lasius fuliginosus and Formica rufa, Erlangen, Germany; C. bulgarica Storkán, 1935, Bulgaria; it has also been found by Zachvatkin, 1941 on the flax flea Aphtona euphorbiae in the U.S.S.R.; C. calliphorae Vitzthum, 1922 was found on a bluebottle Calliphora vomitoria in Germany; C. circumspectans Vitzthum, 1920 on Ips stebbingi Stroh, Tibet; C. fraxini Türk and Türk, 1957 on Leperinus omi, München, Germany; C. elliptica Zach, 1941 on Eillobius talpinus Pall, U.S.S.R.; C. fusiformis Zach., 1941 on a bark-boring beetle Blastophagus minor Ratz., near Moscow, U.S.S.R.; C. goetzae Türk and Türk, 1957 on Aphodius prodromus, Erlangen, Germany; C. hagensis Oud., 1911 on rotting leaves, Holland; C. longipes Türk and Türk, 1957 on Chelidura acanthopygia, Erlangen, Germany; C. minima Türk and Türk, 1957 on Scolytus intricatus, Erlangen, Germany; C. nataliae Zach, 1941 on a bark-boring beetle Hylesinus fraxini Pzn. near Moscow, U.S.S.R.; C. reticulata Zach, 1941 on Osmia (Anthocopa) dalmatina F. Mor., Switzerland; C. striata Vitzthum, 1914 on a bark borer: Taphrorynchus sp., Italy and Pityogenes lepidus Wichm., Africa (Vitzthum, 1922); C. thraca Vitzthum, 1922 from a fly found near Sofia, Bulgaria and in dung on a collective farm, U.S.S.R. (Zachvatkin, 1941); C. wichmanni Türk and Türk, 1957 on Pyrrhidium sanguineum and in oak debris, Erlangen, Germany; C. zacheri Oud., 1929 from mouldy cheese, Germany.
Summary:

1. Descriptions are given of Calvolia transversostriata (Oud., 1931). C. romanovae Zach., 1941 and C. bakeri nov. n.

2. The genera Czenspinskia Oud., 1927, Dendorbia Oud., 1931, and Oulenzia Radford, 1950 (= Lensia Oud., 1928) are considered to form part of the genus Calvolia.

3. A list is given of the known species of the genus Calvolia.

Acknowledgments:

I am indebted to Dr. Owen Evans and Mr. D. MacFarlane of the British Museum (Nat. hist.) for lending me specimens and also for helping in the identifications. I am also grateful to Mr. G. Rich for bringing me samples from his lime trees.

BIBLIOGRAPHY


