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OBSERVATIONS ON EXTERNAL ULTRASTRUCTURAL MORPHOLOGY OF TROMBIDIID LARVAE (TROMBIDIIDAE, MICROTROMBIDIIDAE)

ИССЛЕДОВАНИЯ ВНЕШНЕЙ УЛЬТРАСТРУКТУРНОЙ МОРФОЛОГИИ ЛИЧИНОК КЛЕЩЕЙ ТРОМБИДИИД (TROMBIDIIDAE, MICROTROMBIDIIDAE)

A.B. Shatrov
А.Б. Шатров

Zoological Institute, Russian Academy of Sciences, St. Petersburg, 199034 Russia
Зоологический институт Российской Академии наук, Санкт-Петербург, 199034 Россия

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Ключевые слова: Trombidiidae, Microtrombidiidae, личиночная стадия, морфология, ультраструктура

ABSTRACT

Detailed SEM observations on external ultrastructural morphology of unfed larvae of three species of trombidiid mites of the genera *Trombidium brevimanum* (Trombidiidae), *Platytrombidium fasciatum* and *Camerotrombidium pexatum* (Microtrombidiidae) are presented for the first time. Significant differences in external morphological organization between larvae of Trombidiidae and closely related Trombiculidae are shown. This can be explained by different adaptive strategies of mites of these families.

РЕЗЮМЕ

Впервые приведены данные по внешней ультраструктурной организации голодных личинок трех видов клещей *Trombidium brevimanum* (Trombidiidae), *Platytrombidium fasciatum* и *Camerotrombidium pexatum* (Microtrombidiidae), полученные методами растровой электронной микроскопии. Продемонстрированы значительные различия внешней морфологии исследованныхs личинок с таковой личинок близкородственного семейства Trombiculidae, что определяется различной адаптивной стратегией этих клещей.

INTRODUCTION

As Woolley stated, "morphology is the basis of zoological classification and interpretations of functional anatomy" [Woolley, 1970, p. 1253]. These two fields, classification and functional anatomy, are focused in comparative morphology. The latter, in this sense, is expected to be a necessary instrument in all aspects of the fundamental zoology. It is especially true in case of mites, still rather poorly studied morphologically. Due to their ultra-small size we have to use various sophisticated methods such as electron microscopy for the purpose of elucidating structural details or comparing diagnostic features.

Mites of the family Trombidiidae are well-known soil dwellers. They are placed into the cohort Parasitengona of the order Actinedida. Their classification is based mainly on the free-living carnivorous adults whereas the larvae are found to be parasites of arthropods, particularly insects. Their external morphology was intensively studied by light-optical methods using slide-mounted specimens and was used in the diagnostic keys and the descriptions of new species [Newell, 1958; Moss, 1962; Robaux, 1967, 1970, 1974, 1975, 1977; Southcott, 1986, 1997; etc.]. At the same time the data on their internal morphology are based on the only rather old work of Henking [1882]. This situation was quite a good reason to undertake a detailed ultrastructural study of trombidiid larvae to find principles of their morphological organization and adaptations to parasitism, especially in a comparison with another terrestrial group of Parasitengona, the family Trombiculidae.

A comparative ultrastructural morphology of trombiculid and trombidiid prelarvae was examined and discussed in the previous work [Shatrov, 1998]. The main purpose of this communication is to provide a detailed review of the external ultrastructural morphology of unfed larvae of three trombidiid species: *Trombidium brevimanum* (Berlese, 1910) (Trombidiidae), *Platytrombidium fasciatum* (C.L. Koch, 1836) and *Camerotrombidium pexatum* (C.L. Koch, 1837) (Microtrombidiidae). Taking into account a wide range of structures to be considered, I will focus my attention mainly on the most characteristic features of these larvae, leaving apart their peculiar structures, used in diagnostics and systematics of mites.

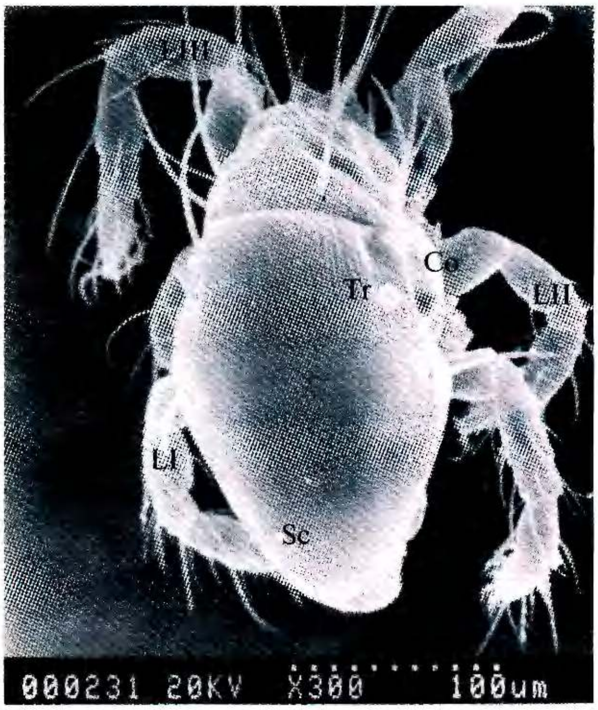

Fig. 1. Larva of *Camerotrombidium pexatum*, dorsal view.

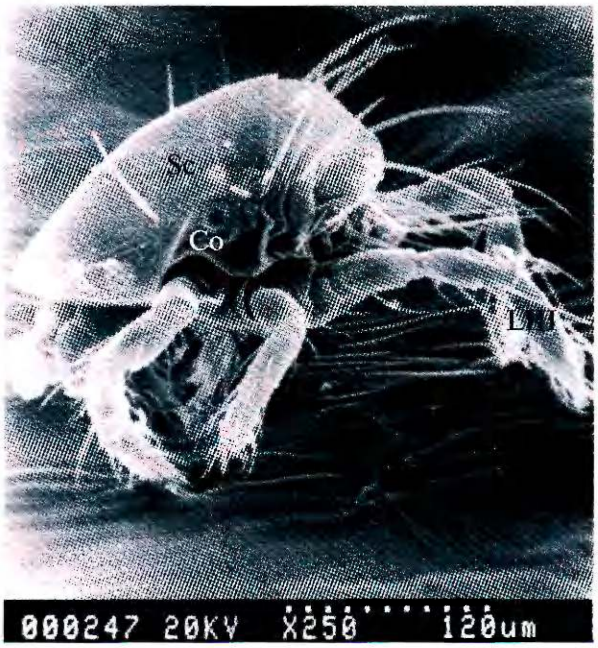

Fig. 2. Larva of *Camerotrombidium pexatum*, lateral view.

MATERIALS AND METHODS

Larvae used in this study were obtained in laboratory from adult mites collected from the soil surface in Leningrad region during spring–summer periods in 1996–1997. Identification of mites up to genera was made based on collected adult stages mounted on slides in the Hoyer-Berlese medium after clearing in the Nesbitt solution for about a month, according to Vainstein's diagnostic key [Vainstein, 1978]. Exact determination of mite species was kindly made by Dr. J. Makol from Agricultural university of Wroclaw. *T. brevimanum* and *P. fasciatum* were found predominating in this region, whereas representatives of *C. pexatum* occurred rarely. Trombidiids of other genera and species were not revealed.

About two weeks after collecting the adult mites, small unfed larvae of these three species appeared in mass in the same culture Petri dishes with soil particles where adult mites were initially placed. For comparative analysis, some larvae were also mounted on slides in the same medium either directly alive or after prior preservation in 70% ethyl alcohol as it was made in the work of Moss [1962]. Some other larvae were simultaneously prepared for electron microscopical study. Unfed larvae are by most part of pale orange color. They run very fast on the culture substrate and the walls of dishes. It is interesting to note that larvae of *C. pexatum* are capable of jumping to distances of about 1–1.5 cm. Regrettably, the host-parasite specialization of the larvae considered still remains unknown.

For the SEM analysis larvae after the alcohol fixation and alcohol and acetone treatment were dried at the critical point of carbonic acid in the Hitachi HCP-2 vacuum evaporator, covered with a platinum layer in the Eiko-5 apparatus and examined with the Hitachi S-570 electron microscope at 20 kV. For preliminary and general observations, larvae mounted on slides were investigated under the Amplival light optical microscope in the phase-contrast field.

Abbreviations for Figs. 1–28: An — anus; CI, CIII, CIII — coxae I–III; Ch — chelicera; Co — corneae of eyes; Gc — gnathocoxa; Gn — gnathosoma; Hs — hypostome; LI, LII, LIII — legs I–III; PC — palpal claw; Pp — palp; Pta — palpal tarsus; Pti — palpal tibia; Sc — scutum; Sp — palpal spur; Su — sucker; Tr — trichobothria; TS — tritorostral seta; Ur — urstigma.

RESULTS AND DISCUSSION

The special attention will be paid to the larvae of *C. pexatum*, as the representatives of this genus were not previously studied in detail.

The most characteristic feature of trombidiid larvae considered that is seen in the SEM, in contrast to larvae of the closely related family Trombiculidae [Shatrov, 1981], is the giant dorsal shield, or scutum (Figs. 1, 12, 20). The scutum covers the most part of the body of unfed larvae in

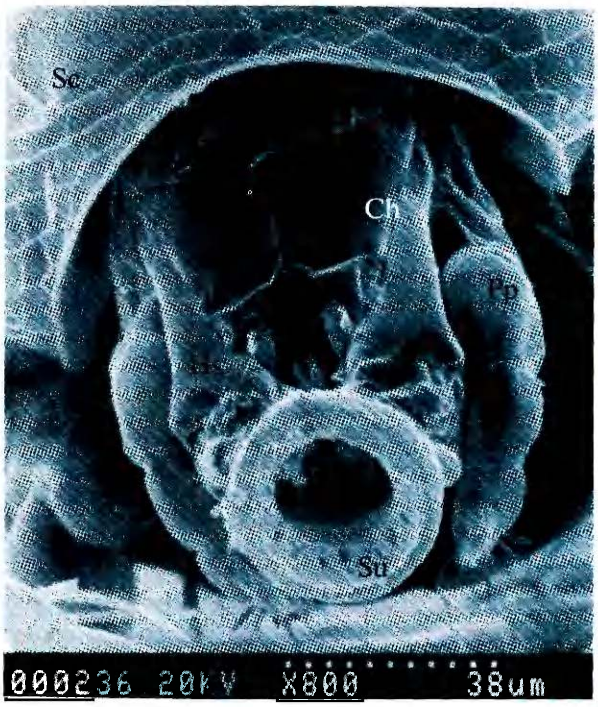

Fig. 3. Larva of *C. pexatum*. Frontal view of the protracted gnathosoma.

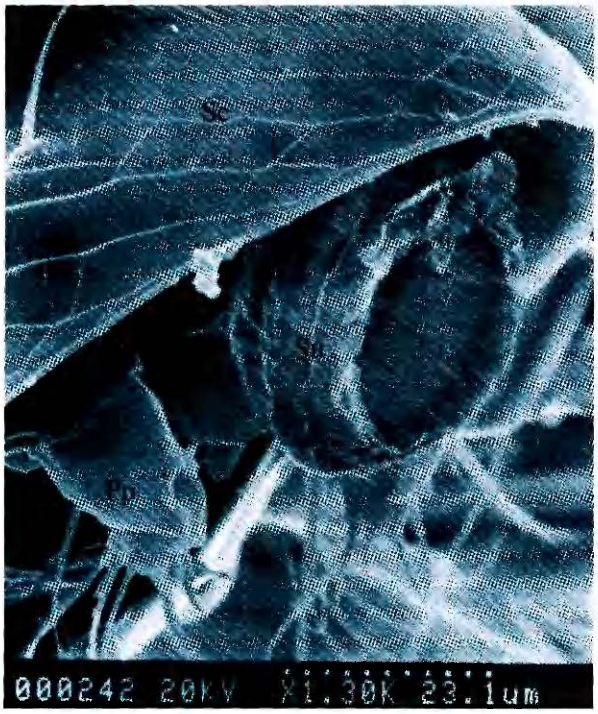

Fig. 4. Larva of *C. pexatum*. Antero-lateral view of the sucker and frontal margin of the scutum, which appear at the same level. Note small palps looking ventrad.

C. pexatum sp., approximately half the body in *P.fasciatum* and one third of the body length in *T. brevimanum.* The length of scutum measures 190–200 µm in *C. pexatum*, 170–190 µm in *P.fasciatum* and only 115–120 µm in *T. brevimanum.* This dorsal shield is found to form an arch over the gnathosoma and frontal parts of the mite body, which are most conspicuous in *C. pexatum* and *P.fasciatum*. Such structural feature of trombidiid larvae is not clearly seen in flat specimens mounted on slides and, correspondingly, was not demonstrated with certainty in previous works [Newell, 1958; Moss, 1962; Robaux, 1967, 1970, 1975, 1977a, b; Robaux et. al., 1976; Fain, Izri, 1993; Fain, Grootaert, 1994; Southcott, 1997; etc.]. Nevertheless, the observed measurements of scutum, especially in *C. pexatum* and *P.fasciatum*, appear to be the largest ones not only among other representatives of the family Trombidiidae, but even among closely related families of Actinedida.

The scutum bears three pairs of setae looking forward, upward and backward, from which the first pair is smallest and nude, whereas setae of other two pairs are branched (Figs. 2, 12, 14, 20, 21). One pair of sensillae, or trichobothriae, with few lateral barbs, arise at postero-lateral angles of the scutum just between medial and posteral scutal setae (Figs. 2, 12, 13, 20, 21). The most part of the surface of the scutal cuticle is arranged in fine longitudinal ridges (striae) (Figs. 1, 13) and possesses tiny pore foramens (punctuation), whereas the area along a frontal margin of the scutum and, especially, the lateral sides of the scutal arch in *C. pexatum* and *P.fasciatum* have a scale-like appearance (Figs. 3, 4, 14). These antero-lateral scutal sides in these two species are observed to curve ventrad intensively and extend back till coxae of the leg I. One can suppose that these lateral scutal walls serve as a well-designed rest of the scutal arch, which is rather necessary during feeding of larva and may preserve it from compression between the squamas of the insect host. In *T. brevimanum*, scutum is much more flat without the developed lateral walls that apparently implies another intimate interactions of larvae with their hosts (Figs. 20, 21).

Two sessile corneae of the paired eyes, of which the anterior one is always larger, are located laterad of the scutum in a line of trichobothriae (Figs. 2, 12, 13, 21). In *T. brevimanum* the corneae are situated on the ocular plate, whereas in *P.fasciatum* and *C. pexatum* they are found placed on the soft striated cuticle (Fig. 13).

Behind the scutum there may be observed two quite narrow dorsal sclerites, or post-scutums, in *C. pexatum*, one relatively large sclerite in *P.fasciatum*, behind which, however, there are also presented two setigerous sclerites in a transverse line, and, at least, only one most large sclerite in *T. brevimanum*

Fig. 5. Larva of *C. pexatum*. Dorsal view of the apical parts of hypostome forming permanent complex sucker.

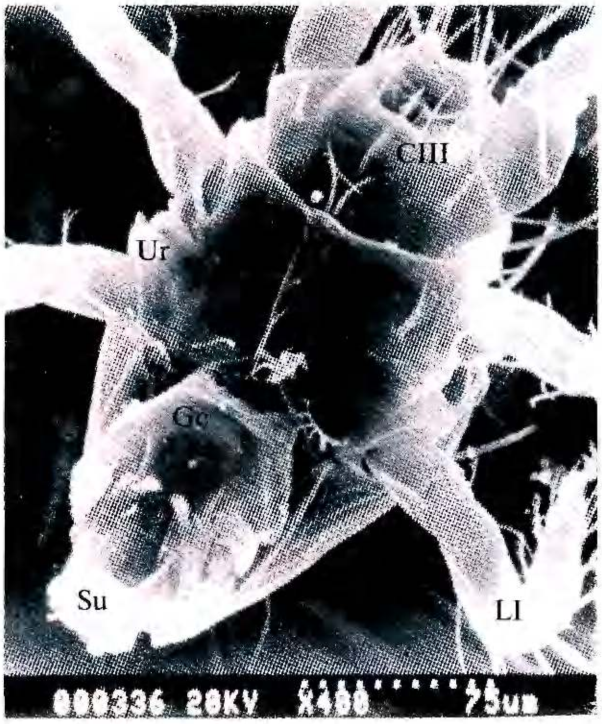

Fig. 6. Larva of *C. pexatum*, ventral view.

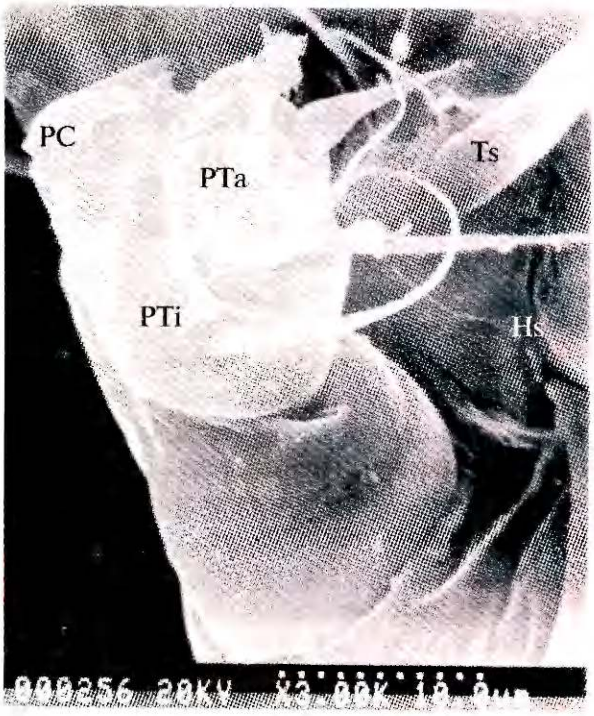

Fig. 7. Larva of *C. pexatum*. Ventral view of the right palp.

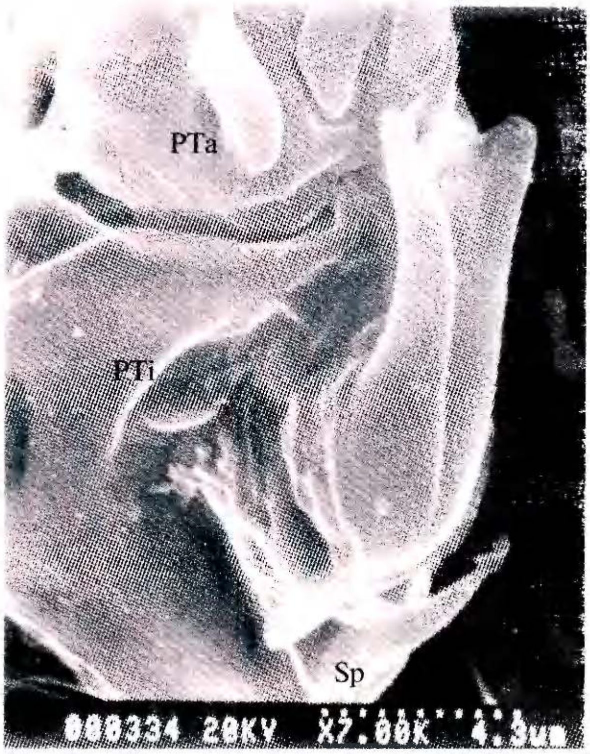

Fig. 8. Larva of *C. pexatum*. Bifurcate palpal claw and spur behind it of the right palp.

(Fig. 21). Each of unpaired sclerites bears two setae located either closer to the middle part of the sclerite as in *T. brevimanum* or on their lateral sides as in two other species studied. The surface of all these sclerites, besides two setigerous sclerites of *P. fasciatum*, has the same appearance as of the main scutum possessing longitudinal ridges. The surface of two small sclerites in *P. fasciatum* larvae is flat (Fig. 15). In other investigated trombidiid larvae there can be often seen, however, besides one post-scutal sclerite, more or less developed and numerous so-called sitegerous sclerites, bearing one seta each [Moss, 1962, Robaux, 1977a, b; Fain, Izri, 1993; Fain, Grootaert, 1994; etc.]. The latter

Fig. 9. Larva of *C. pexatum*. Right tritorostral seta with seven digits. Left seta of this larva passesses only six digits.

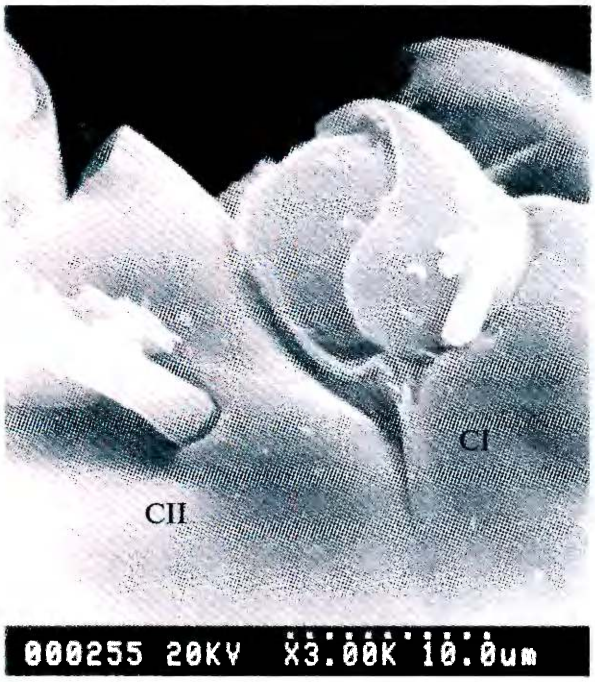

Fig. 10. Larva of *C. pexatum*. Medial aspect of the right urstigma. Note protective frontal fold of the organ.

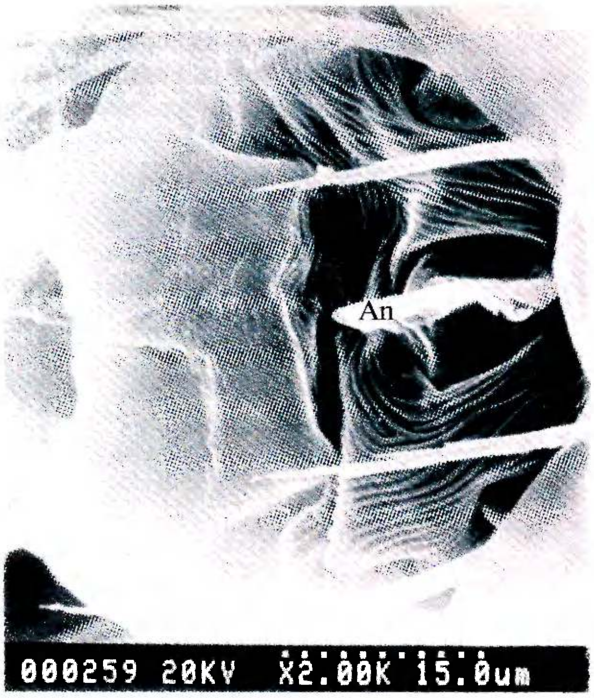

Fig. 11. Larva of *C. pexatum*. Caudal part of the body with anal slit and two sclerotized tubercles posteriorly.

feature appears to be progressive and seems to indicate a comparatively long historical evolution of the group as well as its early-derived character. This leads to a conclusion that in different groups of trombidiid mites there is an apparent tendency to a complete sclerotization of the larval body that is considered to be a normal event in the morphological evolution of trombidiform mites [Vainstein, 1978]. In trombiculid larvae, conversely, there may be typically seen only one relatively small scutum situated on the dorsal surface of idiosoma not far from its frontal margin [Shatrov, 1981].

The ventral part of the larval body bears gnathosoma anteriad and three pairs of coxae of legs I–III posteriad (Figs. 6, 16, 22). If the coxae I and II are always tightly jointed to each other, the rest of these slerotized elements separated by distinct intervals of the soft ridged (striated) cuticle developed between themselves, which are nearly invisible in *C. pexatum* and, on the contrary, are most conspicuous in *T. brevimanum* (Fig. 22).

Gnathosoma, consisting of the wide semi-circled gnathocoxal plate (basis capituli), narrow hypostome with the terminal sucker and small 4-segmented palps, looking forward, so that in normal position, particularly in *C. pexatum* and *P. fasciatum*, the apical parts of both hypostome and dorsal shield appear to be on the same level (Figs. 4, 17). In such case, gnathosoma is completely hidden by the overhanging scutum dorsally. In some cases, however, especially in *T. brevimanum* and occasionally in *C. pexatum*, there may be seen a protrusion of the gnathosoma far beyond the scutum (Fig. 3), or, more rarely, its retraction to the position completely beneath the scutal plate. In contrast to these species, in larvae of *Trombidium* gnathosoma is typically pro-

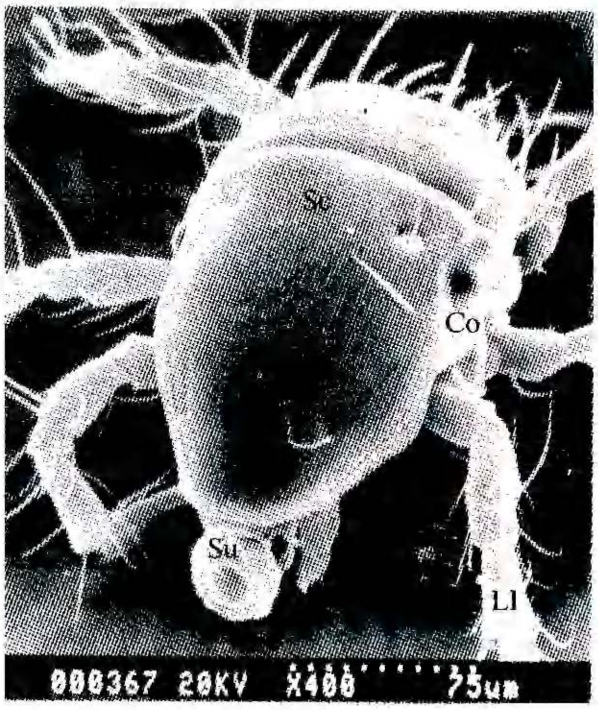

Fig. 12. Larva of *P. fasciatum*, antero-dorsal view.

Fig. 13. Larva of *P. fasciatum*. Right corneae of eyes situated immediately on the ridged soft cuticle. Note strongly ridged surface of the sclerotized scutum and of the narrow post-scutal sclerite.

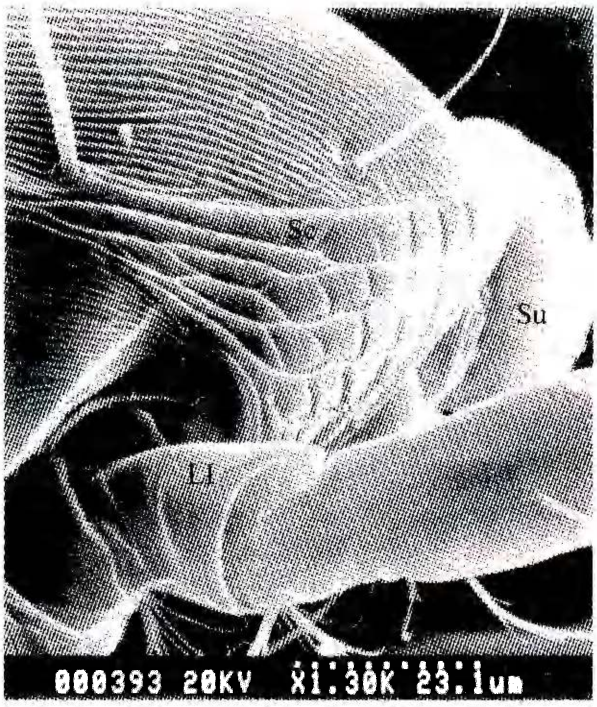

Fig. 14. Larva of *P. fasciatum*. Lateral aspect of the right-hand side of scutum. Oblique back view of the body. Note sucker and leg I.

Fig. 15. Larva of *P. fasciatum*. Dorsal view of the left setigerous sclerit situated behind unit post-scutal sclerite.

tracted, so that the apical parts of both hypostome and chelicerae are projected beyond the frontal margin of the scutal plate (Fig. 20). Gnathosoma has the most length of approximately 100 µm in *C. pexatum*, and the most width of nearly 80 µm in *T. brevimanum*. The latter mostly is distinguishable by a massive femur of the palps, flattened in a transverse aspect (Fig. 23), in contrast to another species studied, in which femur is more slim and flattened in a dorso-ventral aspect (Fig. 6).

Palps are small and composed of four free segments — femur, genu (patella), tibia and tarsus, and appear to lack a developed trochanter in all three species (Figs. 7, 24). Femur and genu have no

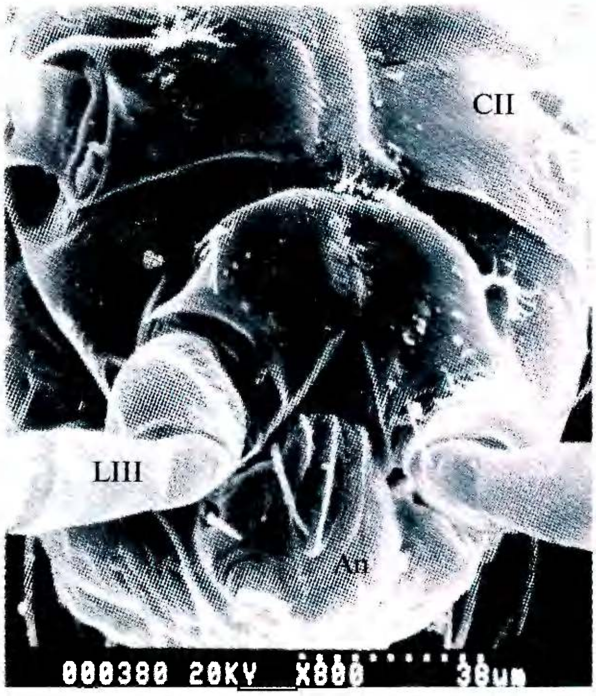

Fig. 16. Larva of *P. fasciatum*. Posterior part of the body from ventral view. Note anus and coxae III looking nearly backward.

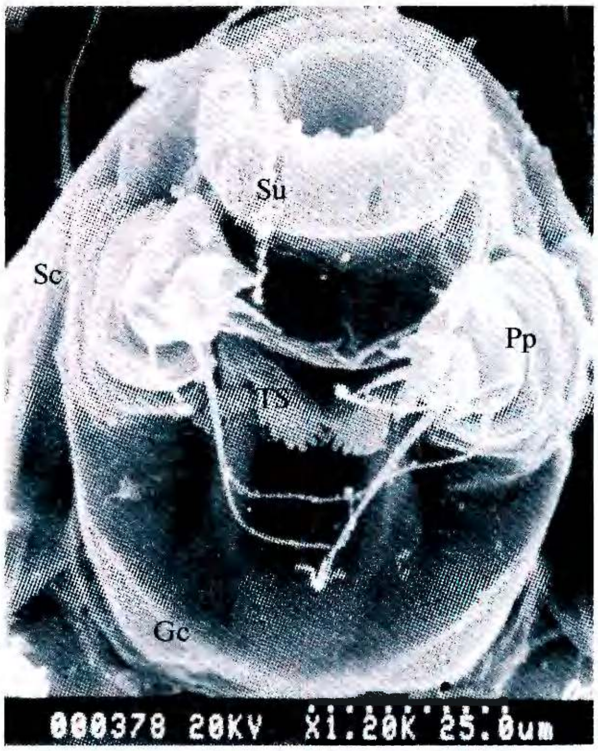

Fig. 17. Larva of *P. fasciatum*. Ventral view of the gnathosoma showing gnathocoxal plate, palps and permanent round sucker.

setae in *C. pexatum* and *P. fasciatum* (Figs. 3, 7, 17). Tibia of these species possesses one long smooth slender seta on its ventro-lateral side, looking directly downwards (Figs. 7, 17). Femur of *T. brevimanum* bears one short and occasionally faintly barbed seta on its dorsal wall, genu lacks setae, and tibia has, on the contrary with two other species, two long nude setae on its lateral and ventral sides (Fig. 24). Tarsus looks like a small semi-spherical knob situated on the frontal aspect of the tibia and bears no less than 7–8 setae of varying lengths and thicknesses (Figs. 7, 17, 24). One of these setae, supposedly mechanoreceptor, faintly barbed in *T. brevimanum* and smooth in *C. pexatum* and *P. fasciatum* is extremely long, about 30 μm in *T. brevimanum*, and directs straight downwards (Fig. 23). Behind the tarsus, on the dorsal wall of the tibia there may be seen small slender claw about 8–10 μm length divided into two sharpen branches (parts) nearly from its thickened base, the tips of which are bent to opposite sides (bifurcate claw) (Figs. 7, 8, 23). This claw does not project over the tibia, but is seen pressed to its surface. Besides that, immediately behind the claw, tibia bears small unbranched and sharpen seta looking like a spur about 3–5 μm length, developed equally in all three species (Figs. 8, 24). On the whole, palps may independently oriented either along the hypostome or look ventrad under some angle to its long axis, and have an appearance of under-developed extremities (Figs. 4, 6).

Newell [1958] described the trochanter of palps as a separate but strongly reduced segment in some species of *Paratrombium*. Robaux [1974] considered the trochanter of various species of Trombidiidae as a segment fused with the subcapitulum (gnathocoxa). At least, Newell and Tevis [1960] for *Angelothrombium pandorae* Newell and Tevis, and Moss [1962] for *Allothrombium lerouxi* Moss considered the larval palps having only four free segments without any traces of trochanter. The same number of setae on palpal segments, as is seen in *T. brevimanum*, was also described for *Thrombidium concelai* Robaux [Robaux, 1974]. Bifurcate palpal claw (odontus) having two divergent tines appears to be present nearly in all trombidiid larvae studied before [see, for instance, Southcott, 1997, etc.]. In contrast, the previous authors paid no special attention to the dorsal tibial spur, regarding this as a common seta, which seems, nevertheless, to be most conspicuous in *Campylothrombium barbarum* (Lucas) [Robaux, 1974].

Somewhat anteriad to the line of the palpal base, hypostome in *C. pexatum* and *P. fasciatum* bears two glove-like setae with wide basal part, bearing 6 to 8 digit-form blunt teeth, which are generally orientated parallel to the hypostomal surface (Figs. 7, 9, 17). These setae look backwards, facing at some angle to each other and

Fig. 18. Larva of *P. fasciatum*. Dorsal aspect of the apical part of tarsus I bearing two tri-pointed claws and empodium between them.

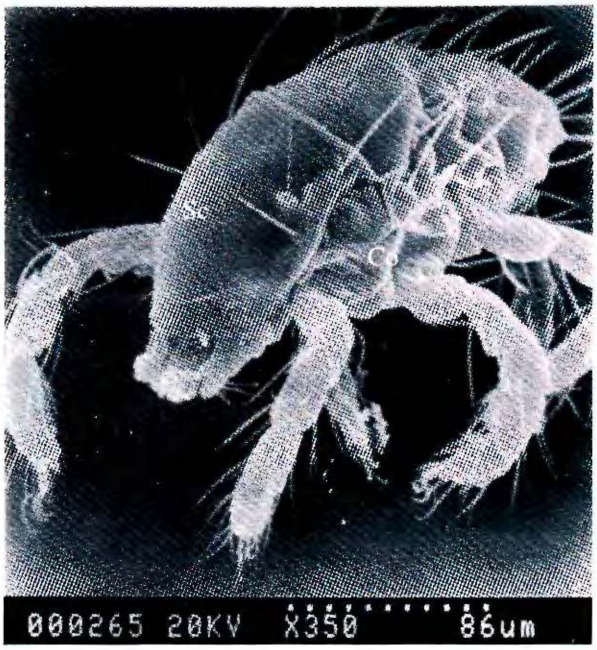

Fig. 20. Larva of *T. brevimanum*, oblique frontal view.

appear to be one of the most characteristic features of the genus *P. fasciatum*[see Fain, Grootaert, 1994]. In *T. brevimanum*, conversely, the corresponding setae have sharpened digits of different length, orienting mostly athwart of the surface of the hypostome (Fig. 25). These paired so-called "tritorostral setae" [Moss, 1962] of great various

Fig. 19. Larva of *P. fasciatum*. Dorsal aspect of the apical part of the left tarsus III showing intensively divorced claws looking like a pair of tongs from which left-hand claw looks stright medial.

organization are characteristically presented in trombidiid larvae, and seem to be most close in their structure to the examined form in *C.barbarum* [Robaux, 1974].

The frontal part of the hypostome forms a characteristic round sucker most conspicuous in *P. fasciatum* and, especially, in *C. pexatum* (Figs. 3, 4, 17). This quite complex structure seems to have permanent organization in these two species, and in general often looks like an end of the binding sleeve with one or two wristbands (Fig. 5). Such an organization of the sucker is thought to be a result of a complete fusion of the most apical parts of the hypostome dorsally, which, in this sense, cannot be able to obtain another configuration. The diameter of this structure is about 40 μm in these species. In *T. brevimanum* the sucker is seen to have another organization, which is much more complex and, simultaneously, labile, so that its structure and functions are hard to explain. Strictly speaking, this sucker in *T. brevimanum*. has the appearance of a flat, semi-circled and thrown away (onto the ventral side of the hypostome) hood with two or three folds and deep notch at the place of the imaginary "neck" (at the apical part of the hypostome) (Figs. 22, 23). The "shoulders" of this structure are quite prominent structures and look like unnatural tubercles on the sides of the hypostome, especially in its dorsal aspect (Figs. 20, 26). Concerning the suck-

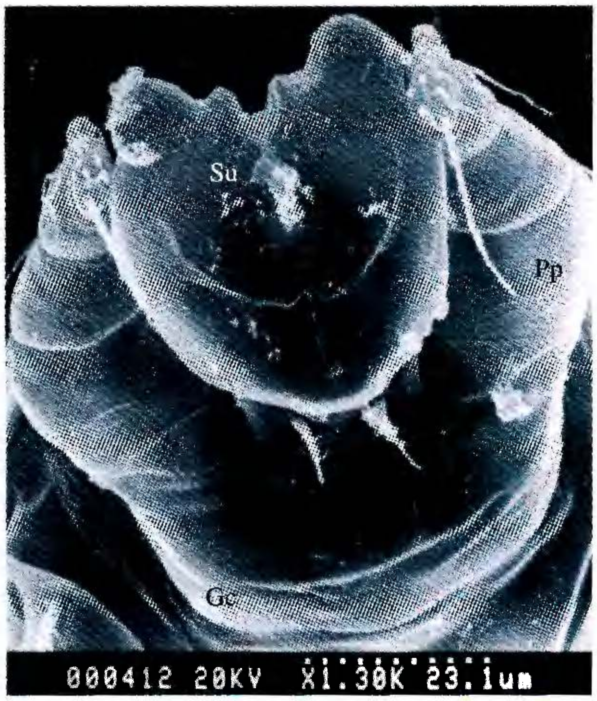

Fig. 23. Larva of *T. brevimanum*. Ventral view of gnathosoma showing large peculiar sucker and palps with wide femurs.

Fig. 24. Larva of *T. brevimanum*. Right palp from ventral view.

slides, but in the SEM. It is interesting to note, however, that the third pair of coxae turn not to the lateral sides, as is seen in other legs, but more or less in the caudal direction that is most conspicuous in *P. fasciatum* (Fig. 16). Correspondingly, the legs III direct nearly straight backwards after setting off the body. The first coxa bears two setae, from which medial one is comparatively short, slender and smooth in *C. pexatum* and *T. brevimanum* larvae (Figs. 6, 22), whereas in *P. fasciatum* this seta is barbed possessing lateral slender branches. Antero-lateral seta of coxa I, as well as other coxal setae in the species studied are longer, with numerous lateral barbs. The second coxa bears one seta in *C. pexatum* and *P. fasciatum* and two setae in *T. brevimanum*; the third coxa with only one seta in all three species (Fig. 16). Intercoxal area between coxae II and III is most conspicuous in *P. fasciatum* and *T. brevimanum* and bears in the species examined, as in many other trombidiid larvae [Newell, 1958; Moss, 1962; Southcott, 1997; etc.], a single pair of setae situated in close proximity to each other and, in the other hand, to the anteromedian angle of coxa III (Fig. 16).

A prominent urstigma (Claparede's organ) in *C. pexatum* and *P. fasciatum* is located between coxae I and II taking away some part from the first coxa posteriorly (Fig. 6). Nevertheless, I have no adequate reasons to consider urstigma occupying a position on the first coxa immediately, as some authors demonstrated earlier [Moss, 1962]. Normally, urstigma in these two species has a characteristic sclerotized anterior fold, which appears to protect a semi-spherical main part of this organ (Fig. 10). Occasionally, however, urstigma may reveal, besides anterior fold, also a posterior one, and, in this cases, its main spherical part is often seen significantly reduced. Such a dual organization of urstigma cannot still find an adequate explanation. Typically, urstigma is about 15 µm wide and 12 µm long in these species. The role of this structure is at present unclear, although some authors attribute both urstigma and genital papillae of postlarval stages in acariform mites as organs mainly functioning in osmoregulation [Alberti, 1979; Fashing 1988]. These organs are thought distributed among sequential stages of the life cycle according to the so-called the "Oudemans-Grandjean rule" [Johnston, Wacker, 1967; Kethley, 1991; etc.], which has, however, several exceptions [Andre, 1991]. Another exception to the Oudemans-Grandjean rule seems to be represented by the larvae of *T. brevimanum*. There is no conspicuous urstigma in this species, at least from the external examination. At the place of urstigma, posterior margin of coxa I, slightly curved anteriad, is separated from the anterior margin of coxa II by a more or less distinct area of smooth or, when poorly developed, striated

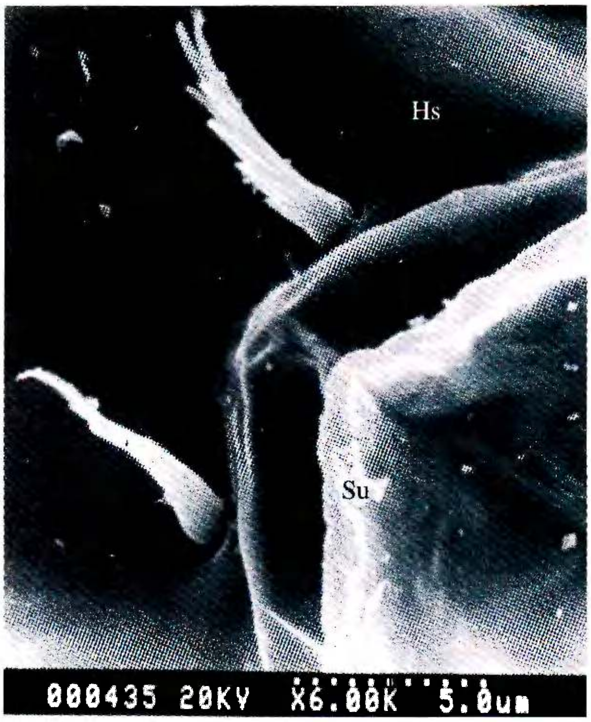

Fig. 25. Larva of *T. brevimanum*. Tritorostral setae situated on the ventral hypostomal wall just behind the posterior margin of the sucker's fold.

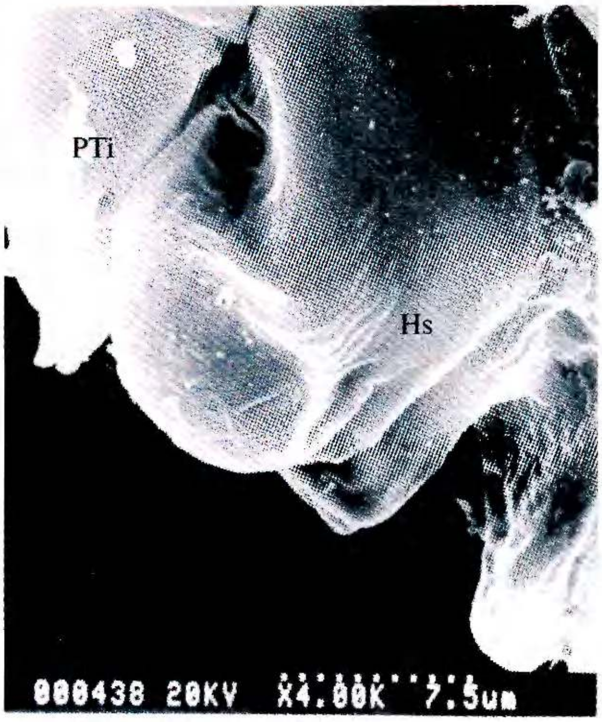

Fig. 26. Larva of *T. brevimanum*. Dorsal view of the right-hand side of the apical part of hypostome showing its unnatural tubercle. Note also right palp.

cuticle without any visible structures (Fig. 27). I have no sufficient reasons again to regard urstigma in this case concealed under the posterior margin of coxa I, as it has been observed in the genus *Paratrombium* [Newell, 1958]. It is interesting to note, that the prelarvae of *T. brevimanum* also devoid of conspicuous urstigma [Shatrov, 1998], which is seen reduced up to a rather small and simple hole in the integument.

The legs have the following articulated joints: trochanter, femur, genu (patella), tibia and tarsus. Trochanter is large, slightly curved posteriad and seems to be poorly mobile, looking backwards in legs III (Figs. 1, 22). It is quite characteristic that all legs, in particular I and II, make their movements not from the point between coxa and trochanter, but from the articulation between trochanter and femur. In *C. pexatum* and, to a lesser extent, in *P. fasciatum* the genu (patella) is a rather short segment, about 20–22 μm long, that let again the whole leg, especially the leg III, to bend intensively, just from this joint, to the position under the body. The latter may supposedly give the larvae a possibility to jump, in particular to larvae of *Camerotrombidium*, mainly as a result of a strong straightening of legs III. Description of the leg chaetotaxy is not the purpose of this study.

Tarsus is a comparatively long segment, around 70 μm long, in particular in legs I and II in *C. pexatum* and *P. fasciatum*, and bears at its tip in legs I and II in all investigated species, two lateral three-pointed claws and a median claw-like empodium (Fig. 18). The claws of legs III have another organization. In *C. pexatum* and *P. fasciatum*, besides one normal claw, there is a large thick claw with a very wide basis and a curved three-pointed tip, looking constantly mediad and forward (Fig. 19). Both these claws are a little displaced from the tip of the tarsus to its medial side, and divorced from one another to an obtuse angle, looking like a pair of tongs (Fig. 19). It seems doubtful, however, that the large claw is able to move independently, because it was observed in the same position in all studied specimens. Nevertheless, the empodium is seen developed between these claws of the tarsus III, like in other legs. The described feature of the tarsus III is also quite characteristic for at least some representatives of the genus *Microtrombidium* [Fain, Grootaert, 1994] and for *C.barbarum* [Robaux, 1974]. In *T. brevimanum*, instead of a large thick claw, there is seen a very small curved spur at the same place (Fig. 28).

Postcoxal area (opisthosoma) covered with soft-ridged cuticle is well-developed in *T. brevimanum* whereas in *C. pexatum* and *P. fasciatum* it is significantly reduced (compare Figs. 6, 16 and 22). Anal opening (slit) is located approximately in the middle of the postcoxal area, as is seen in *T.*

Fig. 27. Larva of *T. brevimanum*. The place of the unpresented urstigma between coxae I and II from ventral view.

Fig. 28. Larva of *T. brevimanum*. The apical part of tarsus III bearing one claw, curved spur and empodium.

brevimanum, or not far from the third coxae, as in another species studied, and is represented by two tightly adjacent membranous folds situated immediately on the ridged cuticle (*T. brevimanum*) or on the rounded or elliptical sclerotized plate (Fig. 11) (*C. pexatum* and *P. fasciatum*). Postcoxal area bears some barbed setae; besides that, two very long barbed setae arise from its caudal margin that is most characteristic for *Camerotrombidium* and *Platytrombidium* larvae. At the same time, in *C. pexatum*, in contrast to other species examined, a pair of sharpened sclerotized tubercles is seen situated on the ventral side of the body in the close proximity to its caudal margin (Figs. 6, 11). Their function is still unclear. General length of the larvae studied is about 250–280 µm in *C. pexatum*, 270–310 µm in *P. fasciatum* and 255–270 µm in *T. brevimanum.*

On the whole, from the lateral view, the larvae, especially *Camerotrombidium* and *Platytrombidium*, look very thick with the greatest width approximately at the level of the posterior margin of the scutum (Fig. 2). This feature of the larval organism may come to be true only after preparing of mites using critical point drying.

As it is seen from this short consideration, larvae of the two closely related terrestrial families, Trombiculidae, Microtrombidiidae and Trombidiidae, differ significantly morphologically that may supposedly be explained by a different adaptive strategies of these mites. Feeding typically on the surface of the skin of vertebrate animals, trombiculid larvae do not evolve prominent protective scutum, which reflects, in this sense, more phylogenetic trends of the group than adaptive features of its representatives. Conversely, trombidiid larvae belonging to the families Trombidiidae and Microtrombidiidae and using arthropods as their hosts, with various squamas on the integumental surface, often develop extremely large scutum which, apparently, effectively protects the larva from pressing between these squamas. It is reasonable to propose that such complex scutum developed historically for a longer period of time than the same structure did in trombiculid larvae. The same explanation may apparently be applied to a permanent sucker in larvae of trombidiids, in contrast to quite labile hypostome of trombiculid ones. These examples lead us to a conclusion that the family Trombidiidae is early derived group comparing to the family Trombiculidae. Unfortunately, the feeding specialization of trombidiid larvae, as it was mentioned above, still remains unknown. Nevertheless, leaving apart the dorsal shield and hypostomal organization, remaining morphological structures of larvae, such as ridged cuticle, legs, etc. reveal an obvious resemblance between larvae of mites of these two families. It is worth saying, however, that trombidiid larvae, which run very quickly, have only five-segmented legs, whereas trombiculid larvae, which walk much more slowly, possess legs having six free segments (femur is devided into two independent parts: basifemur and telofemur). The phenomenon is hard to explain satisfactorily at present.

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