

THE SYSTEMATIC POSITION OF MOSS MITES
OF THE GENUS ANACHIPTERIA GRANDJEAN, 1935 (ACARINA, ORIBATEI)
IN THE LIGHT OF ONTOGENETIC STUDIES

BY

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INTRODUCTION

The genus *Anachipteria* was described by GRANDJEAN (1935) on the base of the species *A. deficiens* Grandjean. One of the characteristics distinguishing this genus from the genus *Achipteria* is the lack of the anteriorly projecting processes of pteromorphae, which do occur in the genus *Achipteria*. In spite of the difference in the shape of pteromorphae in adult individuals, GRANDJEAN (1953) referred both genera to the same family Achipteriidae. It was justified by similar morphology of the juvenile forms of the two genera as well as by ontogenetic and phylogenetic facts. GRANDJEAN'S (1953) diagnosis of the family Achipteriidae takes into account morphological characteristics of both juvenile and adult individuals.

The taxonomists' views of this diagnosis are divided. GRANDJEAN'S opinion was not accepted by SELLNICK (1960). In his diagnosis of the family Achipteriidae he writes among other things: « ... Vorderende der Pteromorphen ist in eine Spitze ausgezogen, die meist bis die Höhe der halben Länge des Propodosoma reicht ... » Sellnick included in the family Achipteriidae only genera having long processes on the front margins of pteromorphae. The genus *Anachipteria* was referred outside the family Achipteriidae to the vast family Notaspidae.

BALOGH (1961, 1965, 1972) and KUNST (1971) understand the diagnosis of the family Achipteriidae in a similar way to GRANDJEAN, and they, too, refer to it the genus *Anachipteria*.

A different view is represented by ŠALDYBINA. In the key « Opređelitel obitajušćich v počvie kleščej (Sarcoptiformes) » edited by GILAROV and KRIVOLUCKI (1975) the author treats the family Achipteriidae in line with SELLNICK (1960), including into it only genera with long processes on the front margins of pteromorphae. The genus *Anochipteria* has been again placed outside the family Achipteriidae, viz. in the family Oribatellidae.

Thus, at present, the taxonomists' opinions concerning the diagnostic characters of the family Achipteriidae and the systematic position of the moss mites of the genus *Anachipteria* are divided.

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Having in the laboratory juvenile forms of species of the genera *Achipteria*, *Anachipteria* and *Parachipteria*, I should like to point to some common morphological features of larvae, nymphs and adult representatives of the above genera, which, in my opinion, are evidence of a close relationship among them. The morphology of juvenile forms of representatives of the genus *Achipteria*: *A. coleoptrata* (L.) and *A. nitens* (Nic.), and of the genus *Parachipteria*: *P. willmanni* v. d. Hammen have been described in an earlier paper (SENICZAK, in press), therefore only those common features of the larvae and nymphs of the genera *Achipteria*, *Anachipteria* and *Parachipteria* will be discussed which may prove common for the whole family Achipteriidae. The differences in structure among the juvenile forms of the genera in question will also be illustrated.

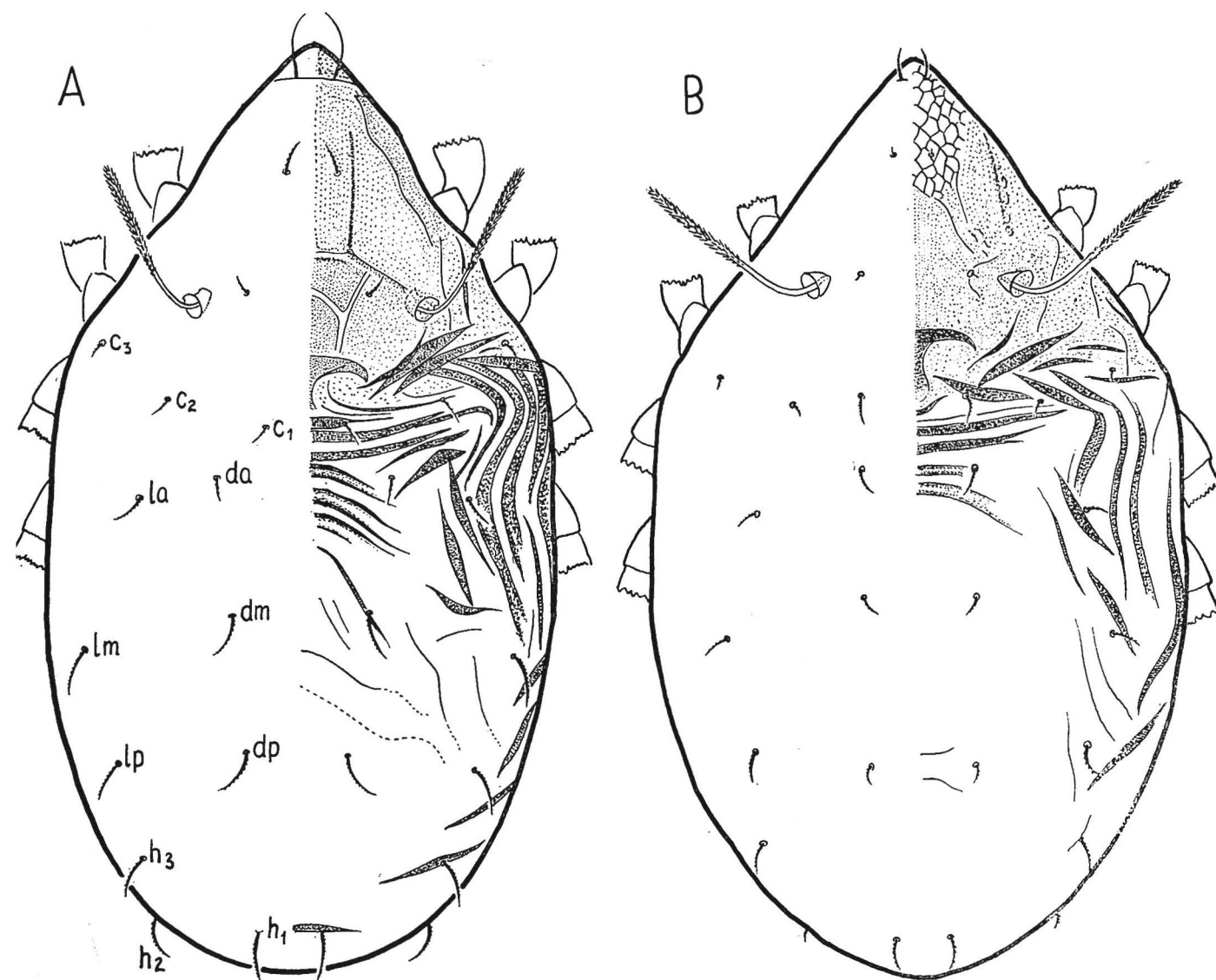


FIG. 1. — The tritonymf, dorsal view.

A) *Achipteria coleoptrata* (L.) — x 420 ; B) *Anachipteria latitecta* (Berl.) — x 490.

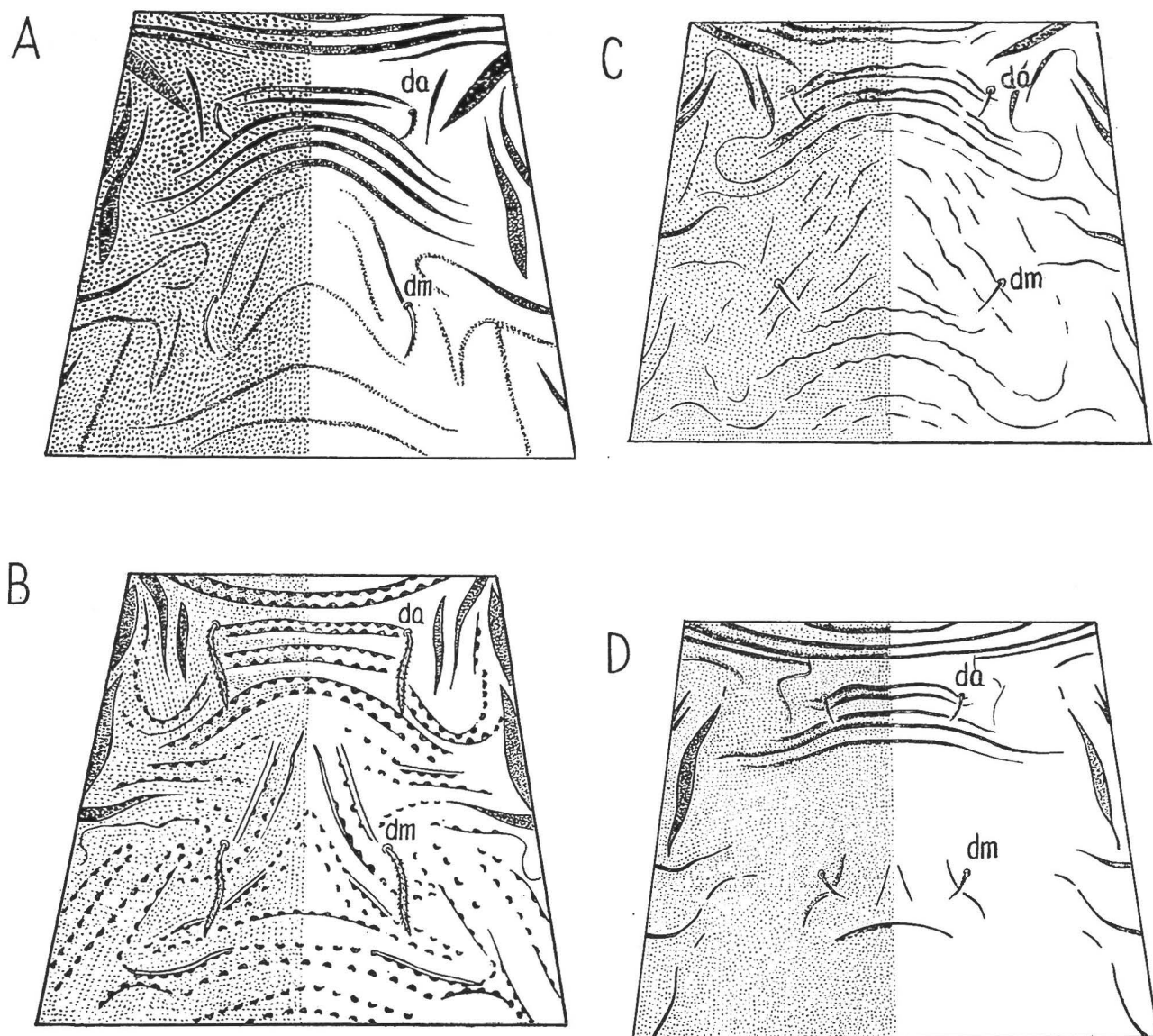


FIG. 2. — Fragment of notogaster of tritonymf.

A) *Achipteria coleoprata* (L.); B) *Achipteria nitens* (Nic); C) *Parachipteria willmanni* Hammen; D) *Ana-chipteria latitecta* (Berl.)

RESULTS

The juvenile forms of *Achipteria coleoptrata* (L.), *A. nitens* (Nic.), *Parachipteria Willmanni* v.d. Hammen and *Anachipteria latitecta* ? (Berl.) resemble each other in body shape, in the colouring and skin folding (Fig. 1), in the shape of sensillus and in the short setation of aspis and notogaster. The larvae and nymphs of these species are stocky, brownish in colour, with heavily folded skin. Only in individuals just before moult the folding may be less conspicuous owing to the tension of the skin, but even then it is clearly visible. The sensillus head in the juvenile forms of the species under study is long, slender, pointed and covered with minute thorns. The setation of the juvenile forms of all the species discussed is subject to similar changes in the course of development. The setae on the aspis and notogaster of larvae and nymphs of the particular species differ slightly in shape and size (Fig. 2), but they are always short. The setation of legs is also much alike in all of them. On the tarsus of the first pair of legs in nymphs is found solenidium ω_1 of a characteristic shape. It is arranged in a loop round solenidium ω_2 (Fig. 3 A). Moreover, in deutonymphs and in tritonymphs solenidium φ on the fourth pair of legs has a protection seta d (Fig. 3 B).

The above common features of the juvenile forms of species of the genera *Achipteria*, *Anachipteria* and *Parachipteria* are strong evidence of a relationship among these genera and confirm the validity of GRANDJEAN'S (1953) diagnosis concerning the family Achipteriidae.

The larvae and nymphs of the species under study were found to differ only in size and in the appearance of the grooves (Fig. 2), which has already been noted by v.d. HAMMEN (1952), as well as in the shape and length of setae and in the shape of the claw (Fig. 3 C, D), but these I consider specific characters.

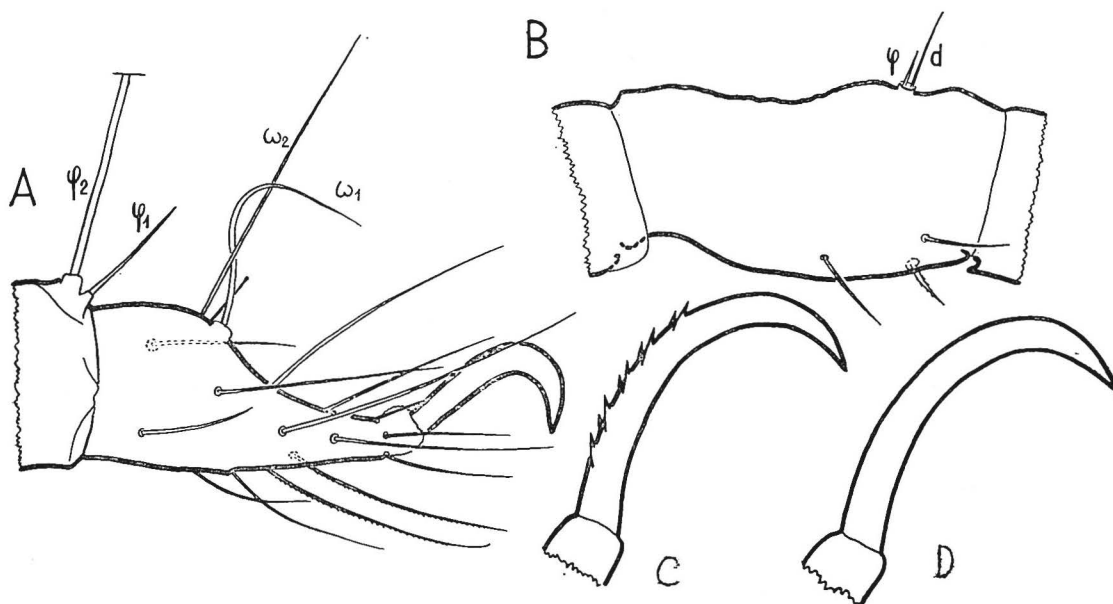


FIG. 3. — Fragment of legs of tritonymf.

A) Tarsus of leg I, of *Anachipteria latitecta* (Berl.) ; B) Tibia of leg IV of *Anachipteria latitecta* (Berl.) ; C) Claw of legs of *Achipteria coleoptrata* (L.) ; D) Claw of legs of *Anachipteria latitecta* (Berl.), *Achipteria nitens* (Nic) and *Parachipteria willmanni* Hammen.

There is, therefore, good reason to claim that the present studies of the morphology of juvenile forms of representatives of the genera *Achipteria*, *Anachipteria* and *Parachipteria* have shown no significant differences distinguishing these genera from each other, but, on the contrary, have revealed common features which unite them into one group.

When comparing the morphology of adult representatives of the three genera in question (Fig. 4), it can be roughly assumed that these species belong to one group, provided one does not overestimate the significance of the chitinous skeleton, in this particular case of the shape of the front margin of pteromorphae. All species have 10 pairs of setae on the notogaster, viz. : ta, te, ti, ms, r₁, r₂, r₃, p₁, p₂, p₃. *Achipteria coleoptrata* (L.) is the only one to have all setae on the notogaster short. In the remaining species setae ta and te are long, while the rest of the setae are also short. In all species the lamellae are similar in shape, and setae in are short. Other significant features of these species are fissures or porous areas on the notogaster, given by v. d. HAMMEN (1952) the rank of generic characters (*Achipteria* and *Parachipteria*). No correlation, however, has been found between these characters and those occurring in the juvenile forms of the genera under study ; the same is true of the shape of the front margin of the notogaster, which is characteristic of the genus *Anachipteria*.

DISCUSSION

In the taxonomy of moss mites a great diagnostic significance is ascribed to features of the chitinous skeleton of adult individuals. Not infrequently a feature is adopted as criterion of division of these mites into groups without sufficient evidence that it is in fact of great systematic significance. Similarly controversial is the systematic position of the genus *Anachipteria* as viewed by SELLNICK (1960) and ŠALDYBINA (1975). It seems disputable whether the shape of the front margin of pteromorphae is a more significant feature than the shape of the lamellae. The former distinguishes the genus *Anachipteria* from the genera *Achipteria* and *Parachipteria*, while the latter unites all three genera. Each side would have their good reasons, but neither feature has its analogue in the morphology of the juvenile forms of the genera in question.

GRANDJEAN'S (1953) systematic division of moss mites has the advantage over the former two ones that it largely takes into account the morphology of juvenile forms and is supported by ontogenetic and phylogenetic facts. In his diagnosis of the family Achipteriidae Grandjean did not define the shape of the front margin of pteromorphae considering this feature as generic.

In my opinion the common features of the juvenile forms of the representatives of the genera *Achipteria*, *Anachipteria* and *Parachipteria* are a strong argument for a close relationship among these genera, which should, therefore, be referred to the family Achipteriidae in line with GRANDJEAN'S (1953) diagnosis. KRIVOLUCKIJ (1975) also admits that the morphology of juvenile forms of the genus *Anachipteria* points to a closer association of this genus with the family Achipteriidae than with the family Oribatellidae, but in his opinion morphological features of larvae and nymphs cannot be recognized as diagnostic, since so far the juvenile forms have been studied in only less than 1/3 of genera.

Referring the genus *Anachipteria* to the family Oribatellidae (Krivoluckij 1975) on the ground of the shape of the front margin of their pteromorphae is, in my opinion, unjustified. In his diagnosis of the family Oribatellidae Grandjean (1953) says : « Nymphes apopheredermes, unidentificables. Leur hysterosoma est caréné latéralement, non plissé, sans sclérites dorsaux et latéraux à bords définis... » The skin of the juvenile forms of the genus *Anachipteria* is folded and, as they have short setae on the notogaster, they do not carry the moulted skins of their preceding stages.

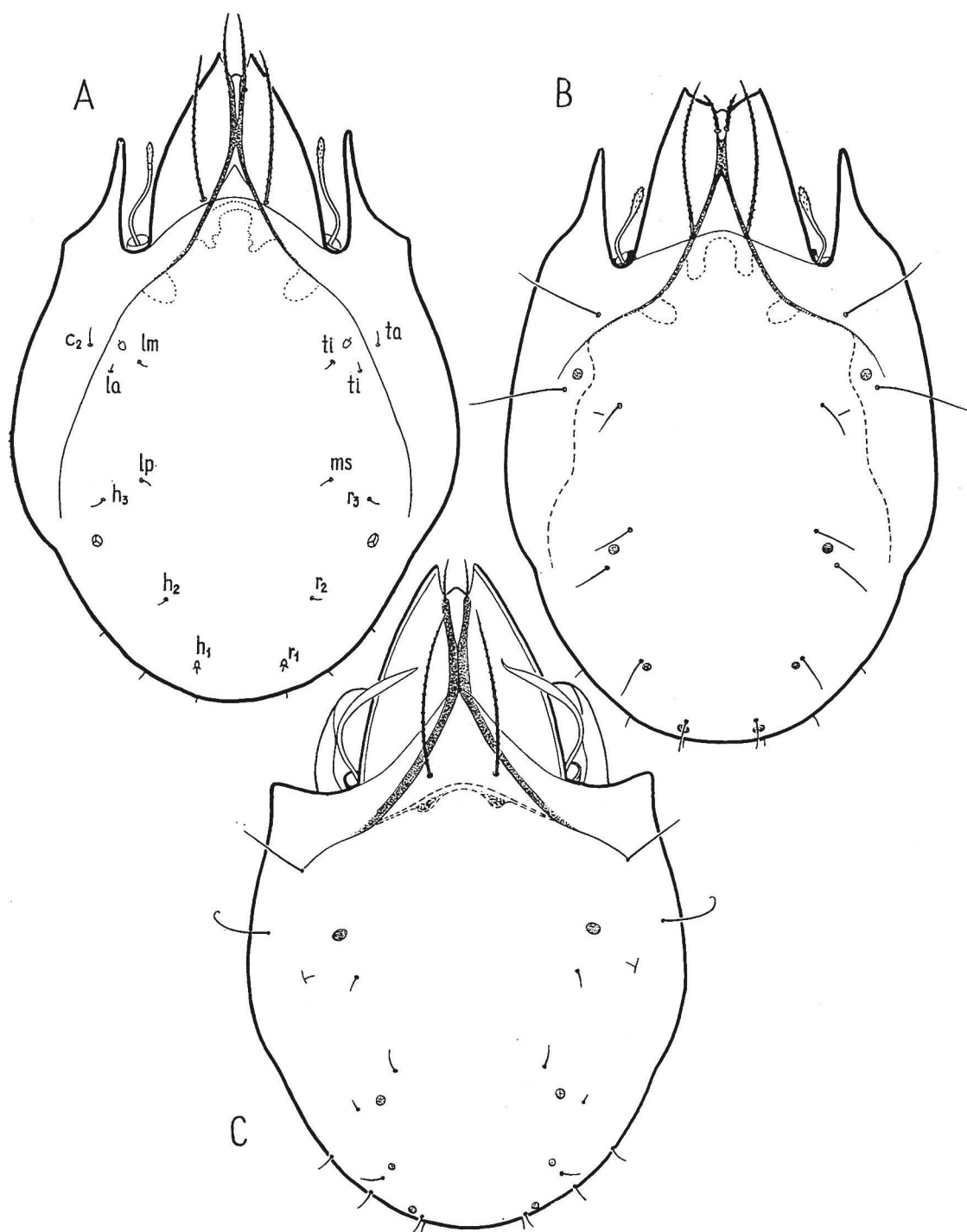


FIG. 4. — The adult specimens, dorsal view.

A) *Achipterina coleoptrata* (L.) — x 370 ; B) *Parachipteria willmanni* Hammen — x 340 ; C) *Anachipteria latitecta* (Berl.) — x 490.

This genus does not, therefore, fulfill the criteria of the family Oribatellidae in GRANDJEAN'S (1953) understanding.

It is noteworthy that, as systematic studies go deeper, setation rises in rank in the taxonomy of mites. The systematic division of moss mites is largely based on setation. My own studies on the taxonomy of the family Oppiidae have demonstrated that in this group of moss mites the setation of the notogaster in adult individuals is higher in taxonomic rank than the features of the richly sculptured chitinous skeleton (SENICZAK, 1975). The new criterion of division of that family into subfamilies, the presence or lack of setae on the notogaster of adult individuals, correlates with different setation of legs of the juvenile forms of the particular subfamilies. The genera distinguished in the family Oppiidae differ from one another in the setation of the notogaster. As concerns the family Achipteridae, the genera included in it have the same number of setae on the notogaster: 10 pairs. There are good reasons to presume that also in that family setation has a higher taxonomic rank than the shape of the front margin of pteromorphae.

Further studies on the morphology of juvenile forms of representatives of other genera of the family Achipteridae will contribute to a fuller working out of the taxonomy of this family. It seems rather unlikely that all genera referred by BALOGH (1972) to the family Achipteridae should actually be members of one group. All changes in taxonomy, however, should be based on thorough studies of the morphology of juvenile forms, since only ontogenetic and phylogenetic facts provide the proper foundation for building a natural taxonomy of mites reflecting the relationship among species.

CONCLUSIONS

Studies on the morphology of juvenile forms of representatives of the genera *Achipteria*, *Anachipteria* and *Parachipteria* point to their similarity reflected in:

- a similar body shape, colouring and skin folding,
- a similar setation of aspis, notogaster and legs,
- a similar shape of sensillus,
- the characteristic shape of solenidium ω_1 on the tarsus of the first pair of legs in nymphs and the occurrence of a protection seta at solenidium ϕ on the tibia of the fourth pair of legs in deutonymphs and tritonymphs.

The above features are evidence of a relationship among the genera *Achipteria*, *Anachipteria* and *Parachipteria*, which, consequently, should be referred to one common family Achipteridae in line with GRANDJEAN'S (1953) diagnosis.

SUMMARY

At present the opinions among taxonomists on the diagnostic features of the family Achipteridae and the systematic position of moss mites of the genus *Anachipteria* are divided.

Studies on the morphology of juvenile forms of representatives of the genera *Achipteria*, *Anachipteria* and *Parachipteria* point to a great deal of similarity among them. The similarities concern the body shape, colouring, skin folding, setation, as well as the characteristic shape of solenidium ω_1 on the tarsus of the first pair of legs in nymphs and the occurrence of a protection seta at solenidium ϕ on the tibia of the fourth pair of legs in deutonymphs and tritonymphs. These characters provide strong evidence

of a relationship among the three genera which should therefore be referred to the common family Achip-
teriidae in line with GRANDJEAN'S (1953) diagnosis.

RÉSUMÉ

Actuellement il y a différents points de vue des systématiciens concernant certains traits particuliers de la famille Achipteriidae ainsi que l'appartenance systématique des oribates du genre Anachipteria.

Des recherches sur la morphologie des jeunes représentants des *Achipteria*, *Anachipteria* et *Parachipteria* démontrent leur remarquable ressemblance au sujet de leur forme, de leur coloration, de leur plis de la peau, de leur système pileux. De même, le solénidion ω_1 au tarse de la I-re paire de pattes des nymphes se distingue par une forme bien particulière, tandis que soledinium ϕ au tibia de la IV-e paire de pattes chez la deutonymphe et la tritonymphe a un poil compagnon. Tous ces caractères démontrent certaines affinités des genres cités ci-dessus. Par conséquent on doit les incorporer à la famille Achip-
teriidae, conformément à la thèse de GRANDJEAN 1953.

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