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The status and phylogeny of *Moehnia* PRITCHARD, 1960

(Diptera: Sciaridae)

With 3 figures and 1 table

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Zusammenfassung

Die Gattung *Moehnia* umfasst neben der nearktischen Typusart *M. erema* PRITCHARD (California, Ontario), die bisher nur im weiblichen Geschlecht bekannt war, eine weitere Art aus der Orientalis (Borneo, Sumatra): *M. quantula* spec. nov. Die phylogenetische Verwandtschaft von *Moehnia* stellt sich wie folgt dar: *Pseudoepidapus* MOHRIG + [*Moehnia* PRITCHARD + (*Caenosciara* LENGERSDORF + *Epidapus* HALIDAY)]. Die Typusarten der beiden im folgenden akzeptierten Untergattungen von *Epidapus*, *Epidapus* s. str. und *Vimneria* KRATOCHVIL, bilden ein Monophylum.

Summary

The genus *Moehnia* includes the Nearctic type-species *M. erema* PRITCHARD (California, Ontario), of which only the female was previously known, and the new Oriental species *M. quantula* spec. nov. (Borneo, Sumatra). The phylogenetic relationship of *Moehnia* is: *Pseudoepidapus* MOHRIG + [*Moehnia* PRITCHARD + (*Caenosciara* LENGERSDORF + *Epidapus* HALIDAY)]. The type-species of the two currently recognised subgenera of *Epidapus*, *Epidapus* s. str. and *Vimneria* KRATOCHVIL, form a monophyletic group.

Introduction

The genus *Moehnia* was erected by PRITCHARD (1960) for a new species *M. erema* which was found in large numbers and in the female sex only in an entomology laboratory in Berkeley, California. PRITCHARD (1960) placed the genus in the Cecidomyiidae, subfamily Lestremiinae, and founded a new monotypic tribe Moehniini for it. GAGNÉ (1970) transferred *Moehnia* to the Sciaridae because it possesses tibial spurs and the costa does not extend around the posterior margin of the wing, and he compared it with the sciarid genus *Epidapus* HALIDAY. GAGNÉ's (1970) family assignment was accepted by STEFFAN (1981) who suggested that the species of *Moehnia* and *Epidapus* might even be congeneric. Both PRITCHARD (1960) and STEFFAN (1981) suggested that *M. erema* might be paedogenetic or parthenogenetic.

Moehnia has remained monotypic until now, and the original series of females of *M. erema* the only known material. The discovery of the male of the type-species from Canada and the male of an additional species from South-East Asia have provided the male characters which were not previously available, and have enabled an evaluation of the relationships and status of *Moehnia* to be made.

Material and methods

The new Asiatic material was preserved in alcohol, and after dehydrating it was mounted directly on to microscope slides in 'Euparal'. The Canadian specimens of *M. erema* were preserved dry and were glued on pins; they were treated with KOH and prepared on slides in 'Euparal'. The part of the type material of *M. erema* that we studied is mounted in Canada balsam. The material is deposited in the following collections (later referred to only by the name of the city): Canadian National Collections, Ottawa; Swedish Museum of Natural History, Stockholm; and United States National Museum, Washington, D. C.

The illustrations have been made from specimens on slides with the aid of a camera lucida attached to a research microscope. The morphological terminology is for the most part in general use and needs no special explanation. In *c/w*, *c* is the section of the costa between the tips of *R5* and *M1*, and *w* is the distance between the tips of *R5* and *M1*. The wing length is measured from the level of humeral cross vein.

For the cladistic computer analysis, MacClade version 3.01 (MADDISON & MADDISON 1992) was used in combination with PAUP version 3.1.1 (SWOFFORD 1993).

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Genus *Moehnia* PRITCHARD, 1960

Moehnia PRITCHARD, 1960: 308. Type-species *Moehnia erema* PRITCHARD, 1960 (original designation and monotypy).

Characters: The female characters given are based on *M. erema* only.

Head: In male subglobular, in female elongated posteriorly and flattened dorsally. The interfacetal space of eyes both with microtrichia and setae, the setae long, extending much over the upper curvature of facets. Eye bridge complete, with the ommatidia irregularly scattered in 1 to 3 rows. Anterior vertex non-setose. Prefrons and clypeus separate, prefrons with a few setae, clypeus non-setose. Maxillary palp one-segmented, with 1 - 4 setae, without a sensory pit, the hyaline sensillae extending from the dorsal side around the apex. Antennal flagellum with 14 flagellomeres, subequal in diameter; the flagellomeres with sharply defined necks that are elongated to various degrees, and with scattered setae which are directed obliquely apicad and of which the longest ones on the basal flagellomeres are from one and a half times to nearly twice the diameter of the flagellomere in male (Figs. 2E, 2F), slightly longer than the diameter in the female; flagellomere 4 of male 2.6 - 3.8, of female 1.2 - 1.6 times as long as broad.

Thorax: Mesothoracic katepisternum subtriangular with an almost straight dorsal margin, larger in male than in female. Scutum without acrostical setae, with the dorsocentral setae few in a single row or many in a more or less distinct double row, and with a few to many lateral setae, all the setae subequal in size. Scutellum with a few to many setae, subequal in size. Anterior pronotum setose, posterior pronotum non-setose, anterior epimeron setose; the meso- and metathoracic pleura non-setose. Legs slender or stout (Figs. 2C, 2D), in the latter case slightly

more so in female than in male. Tibiae apically without a comb-like row of enlarged setae, hind tibia with a dorsal row of enlarged setae, tibial spurs 1:2:2, about half the apical diameter of tibia, the two spurs on middle and hind tibia subequal in size, fore tibia with a weakly differentiated patch of setae subapically on prolateral side. Tarsi unmodified, claws without teeth.

Wing: Broad, width/length ca. 0.50 in male, 0.48 in female, without an anal lobe (Figs. 2A, 2B). Wing membrane non-setose. *StM*, *M1*, *M2*, *Cu1*, *Cu2*, *r-m* and *bM* dorsally and all veins except for C ventrally non-setose. *R1* and *r-m* unusually short, *stCu* long, as long as or longer than *Cu1*. *C/w* 0.85 - 0.90. Haltere slightly elongated in male, hardly so in female, length of haltere/length of scutum + scutellum ca. 1.00 in male, ca. 0.85 in female; the knob with a few dorsal setae only.

Abdomen: Unmodified; tergites and sternites rather weakly sclerotized.

Hypopygium (Figs. 3A-D): Gonocoxites without special modifications, narrowly separated basoventrally by a membranous strip, without a long flagellate seta at the apicoventral mesial angle. Gonostylus elongate, with a distinct basolateral apophysis, the mesial surface with a medial keel, impressed at extreme base, with an apical tooth, without enlarged setae mesially at the base of the apical tooth, without flagellate mesial setae. Tegmen unmodified. Genital rod small or rudimentary. Tergite 10 bilobed, the lobes simple. Sternite 10 non-setose.

Female genitalia of the common sciariid type.

Biology: Unknown. *M. erema* was thought to have emerged from a stem-pipe tunnel in Berkeley (PRITCHARD 1960), and was collected by sweeping in an *Acer* wood in Ontario. The Asiatic material was collected in primary forests.

Distribution: Nearctic, Oriental.

Included species: *erema* PRITCHARD, 1960 (*Moehnia*): California, Ontario
quantula spec. nov.: Borneo, Sumatra.

Diagnostic characters: The species of *Moehnia* are distinguished from all other described Sciariidae except for the Nearctic - Neotropical *Pseudosciara* SCHINER and one species of the Palaearctic *Parapnyxia* MOHRIG & MAMAEV (type-species *P. vermiformis* MOHRIG & MAMAEV) by the long stem of *Cu*. In *Pseudosciara* (type-species *P. hirtella* SCHINER), the stem of *Cu* varies from one third to equal in length to *Cu1*, and in latter case it is similar to *Moehnia*. Otherwise the two groups are very dissimilar and *Moehnia* is easily distinguished e.g. by having a one-segmented instead of three-segmented palp, by the non-setose *M* and *Cu* and their branches, by having an apical tooth instead of an apical aggregation of megasetae on the gonostylus and by lacking a megaseta - usually on a separate lobe - on the ventral mesial margin of the gonostylus. In *Parapnyxia germanica* MOHRIG, the male is winged with a long stem of *Cu*, not unlike the species of *Moehnia*, whilst the female is wingless. *P. germanica* differs from *Moehnia* by having a distinct sensory pit on the first palpal segment and by having a rudimentary second segment in the male, by the strongly reduced thorax and lack of ocelli in the female, and by having the male wing narrow, nearly three times as long as broad.

Classification: GAGNÉ (1970) noted the similarity of *Moehnia* to *Epidapus* (type-species *E. veneticus* HALIDAY = *Tipula atomaria* DEGEER). STEFFAN (1981) suspected that they could even be congeneric, and that the presence or absence of wings in the female could be of little taxonomic significance. In this connection he referred to the polymorphic species *Plastosciara pernicioso* EDWARDS which he had studied (STEFFAN 1973, 1975). The characters of the male as they are now known confirm the similarity of *Moehnia* and *Epidapus*, and their close relationship is apparent. In most respects, the species of *Moehnia* also resemble species of the

Palearctic *Caenosciara* LENGERSDORF (type-species *C. ignava* LENGERSDORF) and *Pseudoepidapus* MOHRIG (type-species *P. denticulatus* MOHRIG & KRIVOSHEINA), which are usually placed near *Epidapus* (TUOMIKOSKI 1960; MOHRIG 1969, 1970 a, 1970 b; GERBACHEVSKAJA-PAVLUCHENKO 1986; MOHRIG, KRIVOSHEINA & MAMAEV 1990).

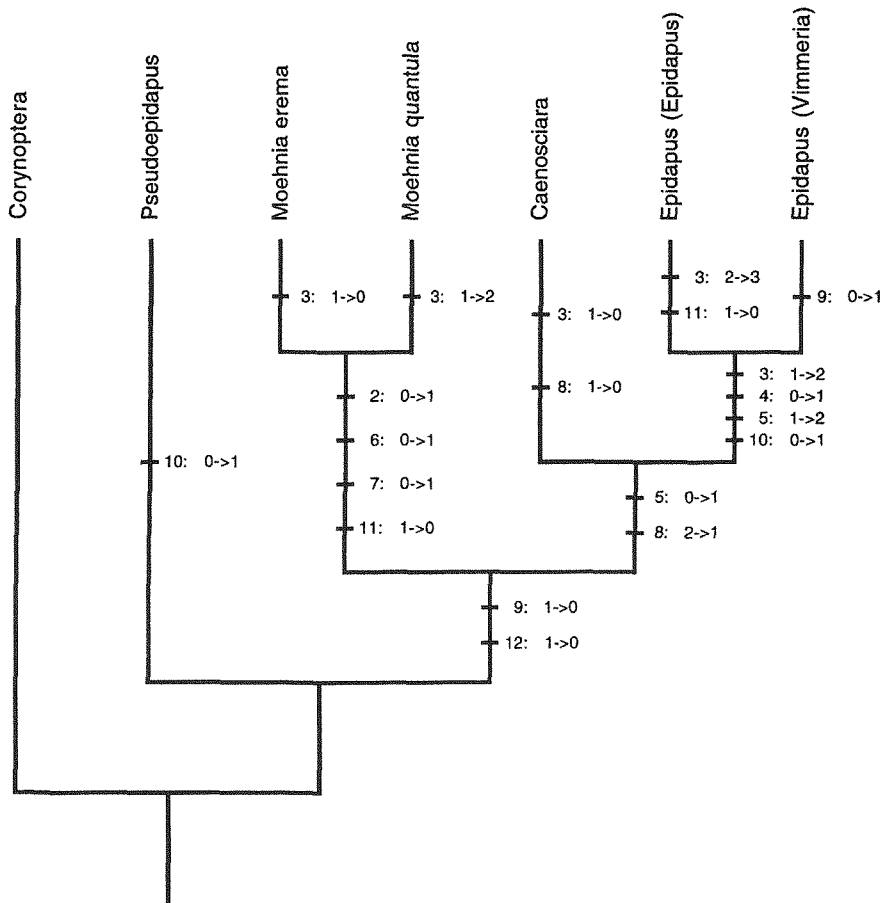


Fig. 1. Phylogeny of *Moehnia* and related genera (the shortest tree, branch and bound algorithm, tree length 23 steps, CI=0.74, RI=0.68).

The characters and character states (all unordered) are: 1) palp with three segments (0), with two segments (1), with one segment (2), 2) hyaline sensillae on palp dorsally (0), going around the tip (1), 3) length of neck/subapical width of antennal flagellomere 4 0.4 - 0.6 (0), 0.6 - 0.7 (1), 0.9 - 1.1 (2), 1.4 or more (3), 4) dorsal margin of mesothoracic katepisternum slightly curved (0), angled (1), 5) female wings normal (0), rudimentary (1), absent (2), 6) width/length of wing 0.4 (0), 0.5 (1), 7) length of stCu at most 1/10 of the length of *Cu*2 (0), longer than *Cu*2 (1), 8) c/w 0.4 - 0.5 (0), 0.6 - 0.7 (1), 0.8 (2), 0.9 (3), 9) gonostylus without subapical thickened setae (megasetae) (0), with subapical megasetae (1), 10) length of haltere/length of scutum + scutellum 0.9 - 1.1 (0), 1.5 - 1.5 (1), 11) apex of hind tibia retrolaterally without a comb-like row of strengthened setae (0), with a row of such setae (1), 12) subapical retrolateral setae of the fore tibia weak (0), enlarged (1).

Table. Coded character states for cladistic analysis (multistate characters unordered). ? = character state unknown. For explanation of characters, see Fig. 1.

| Taxon | Character | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--|-----------|---|---|---|---|---|---|---|---|---|----|----|----|
| <i>Corynoptera perpusilla</i> | | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 1 |
| <i>Pseudoepidapus denticulatus</i> | | 1 | 0 | 1 | 0 | ? | 0 | 0 | 2 | 1 | 1 | 1 | 1 |
| <i>Caenosciara ignava</i> | | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| <i>Moehnia erema</i> | | 2 | 1 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 |
| <i>Moehnia quantula</i> | | 2 | 1 | 2 | 0 | ? | 1 | 1 | 2 | 0 | 0 | 0 | 0 |
| <i>Epidapus (Epidapus) atomarius</i> | | 2 | 0 | 3 | 1 | 2 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| <i>Epidapus (Vimmeria) gracilicornis</i> | | 2 | 0 | 2 | 1 | 2 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |

So far as *Epidapus* is concerned, since the work of TUOMIKOSKI (1960) it has included two subgenera *Epidapus* s. str. and *Vimmeria* KRATOCHVIL (type-species *V. subdetrita* KRATOCHVIL = *Corynoptera gracilicornis* LENGERSDORF), which show a similarity or dissimilarity to *Moehnia* in different characters/character states (Fig. 1, Table).

In order to determine the interrelationships within this group of taxa and to test the monophyly of *Moehnia* as now delimited, a cladistic analysis was performed with the two species of *Moehnia*, the type species of *Epidapus* (*Epidapus*), *Epidapus (Vimmeria)* and *Pseudoepidapus*, and *Caenosciara alnicola* TUOMIKOSKI as ingroup and the type species of *Corynoptera* WINNERTZ (*C. perpusilla* WINNERTZ) as outgroup (Fig. 1, Table). Within *Corynoptera*, which is polyphyletic as currently used (HIPPA & VILKAMAA 1994), *C. perpusilla* and its immediate relatives have rather a close general resemblance to the members of the ingroup (e.g. TUOMIKOSKI 1960) but they are not likely to belong to it. The analysis gave the following result: Only one most parsimonious tree was obtained (length 23 steps, CI 0.74, RI 0.68), *Moehnia* is monophyletic and is the sister group of *Epidapus (Epidapus)* + *Epidapus (Vimmeria)* + *Caenosciara*. Furthermore, the type species of the subgenera of *Epidapus* form a monophyletic group. *Pseudoepidapus* appears to be the sister group of the other taxa under discussion. Consequently we recognize *Moehnia* as a genus, at least until the *Epidapus*-complex is more thoroughly studied and analyzed.

Species of *Moehnia*

Moehnia erema PRITCHARD, 1960

Moehnia erema PRITCHARD, 1960: 309.

Material studied: USA, California, Berkeley, August 1958, A.E. PRITCHARD and J.W. MACSWAIN, 5 females (holotype and paratypes, in Washington). Canada, Ontario, Ottawa, swept over bare path in *Acer* wood, 21.9.1989, J.R. VOCKEROTH, 2 males and 2 females (in Ottawa).

Male. Head: Eye bridge with 2 - 3 rows of facets. Prefrons with 4 setae. Palp with 3 - 4 setae, the hyaline sensillae extending around the apex. Antennal scape with 3 - 4 ventral setae, pedicel with ca. 12 ventral setae, flagellomere 4 as in Fig. 2E; width/length of flagellomere 4 (body) ca. 0.50, length of neck/subapical width of flagellomeral body ca. 0.40.

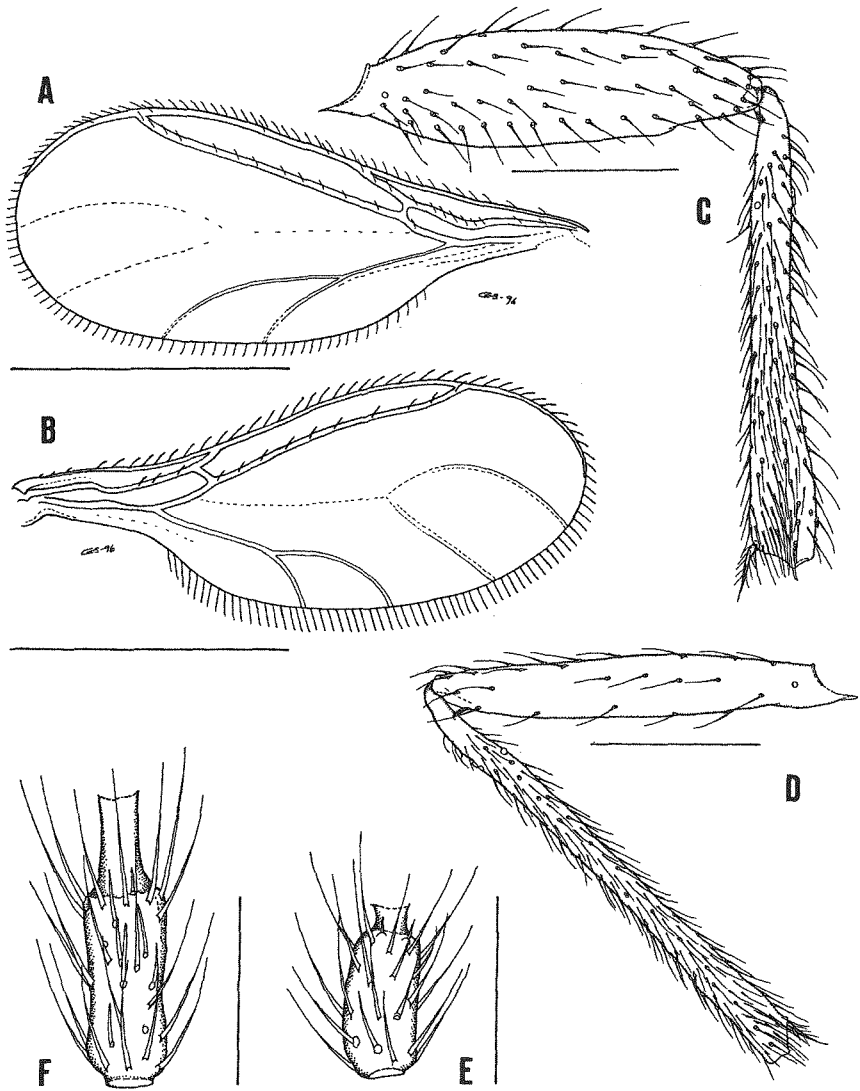


Fig. 2. Male wing (A and B), dorsal view, male fore femur and tibia (C and D), prolateral view, and male antennal flagellomere 4 (E and F). - A, C and E: *Moehnia erema* PRITCHARD (Ontario). - B, D and F: *M. quantula* spec. nov. (holotype). Scale 0.5 mm for wings, 0.1 mm for femur and tibia, and 0.01 mm for flagellomeres.

Thorax: Scutum with ca 15 dorsocentral setae in an indistinctly double row, with ca 15 lateral setae. Scutellum with ca 12 setae. Anterior pronotum with 2 - 3 setae. Epimeron 1 with 4 - 6 setae.

Wing (Fig. 2A): wing length 0.80 - 0.86 mm, width/length 0.51, c/w 0.80 - 0.88. Length of haltere/length of scutum + scutellum ca 0.90.

Legs: Stout, fore leg as in Fig. 2C.

Abdomen: Normal.

Hypopygium: Figs. 3A and 3B.

Colour: No distinct colour pattern discernible in the existing preparations.

Female. Head: Prefrons with 3 setae. Palp with 3 - 5 setae. Antennal scape with 3 - 5, pedicel with ca. 12 setae.

Thorax: Chaetotaxy as in male except for dorsocentral setae of scutum and setae of episternum 1 more numerous, ca. 20 and 6 - 8, respectively.

Wing: Media almost invisible. Wing length 0.88 - 0.90 mm, width/length 0.47 - 0.48. Length of haltere/length of scutum + scutellum 0.84.

Legs: Similar to male.

Abdomen: Normal.

Colour: The colour and colour pattern can only be discerned with difficulty in the preparations. Head and thorax dark, antennal flagellum, legs and abdomen paler.

Discussion: *M. erema* is abundantly different from *M. quantula*. For the distinguishing characters, see under the latter.

Moehnia quantula spec. nov.

Material studied: Holotype male: Indonesia, Sumatera Utara, Aceh, Gunung Leuser National Park, Malaise trap, 30.3.1992, H. & H. HIPPA (in Stockholm). Paratype male: Malaysia, Borneo, Sabah, Sipitang, Mendolong Nersery, light trap, 2.3.1989, S. ADEBRATT (in Stockholm).

Male. Head: Eye bridge with 1 - 2 rows of facets. Prefrons with 3 - 4 setae. Palp with 2 setae, the area of hyaline sensillae going around the apex. Antennal scape with 4 ventral setae, pedicel with 4 - 5 ventral setae; flagellomere 4 (Fig. 2F): width/length of the body 0.63 - 0.68, length of neck/subapical width of the flagellomeral body 1.00 - 1.18.

Thorax: Scutum with 4 - 6 dorsocentral setae in a single row, with 4 - 6 lateral setae. Scutellum with ca. 4 setae. Anterior pronotum with 1 - 2 setae. Episternum 1 with 1 - 2 setae.

Wing (Fig. 2B): Wing length 0.77 - 0.86 mm, width/length 0.50. C/w 0.82 - 0.87. Length of haltere/length of scutum + scutellum ca. 1.10.

Legs: Slender. Fore leg as in Fig. 2D.

Abdomen: Without special modifications.

Hypopygium: Figs. 3C and 3D.

Colour: No distinct colour pattern discernible in the existing preparations.

Female: Unknown.

Discussion: The holotype is distinctly larger than the paratype and has the flagellomeral necks slightly longer (see the measurements above), but otherwise they are both identical.

M. quantula is abundantly different from *M. erema*. The males of the two species can easily be distinguished by e.g. the following characters: 1) the antennal flagellomeres are remarkably longer and with longer necks in *M. quantula* (Figs. 2E and F); 2) the fore leg is slender in *M. quantula*, but stout and with an enlarged femur in *M. erema* (Figs. 2C and D); and 3) the fork of the media is oblique in relation to the longitudinal axis of wing in *M. quantula*, but almost

parallel in *M. erema* (Figs. 2A and B). Furthermore, *M. quantula* seems to be more setose on antennal scape and scutum than *M. erema*. The hypopygia of the two species differ only in some minor details: the apex of the gonostylus is slightly narrower and more curved, and the tegmen is broader, in *M. quantula* than in *M. erema* (Figs. 3A and C), but the latter could be the result of deformation by cover slip pressure. For differences, see also Table.

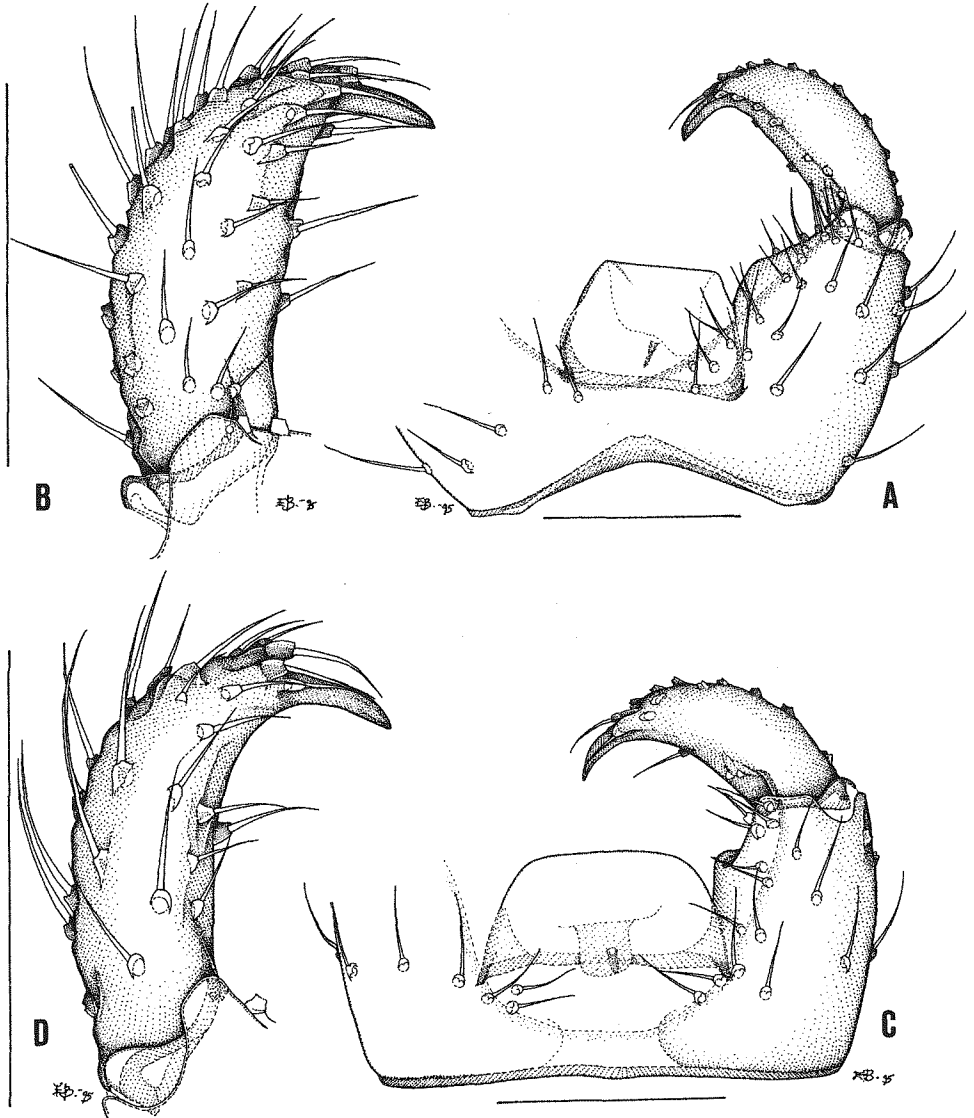


Fig. 3. Part of hypopygium (A and C) and gonostylus (B and D), ventral view. - A and B: *Moehnia erema* PRITCHARD (Ontario). - C and D: *M. quantula* spec. nov. (holotype). Scale 0.05 mm.

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