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A Revision of the American Spiders of the Family Microstigmatidae (Araneae, Mygalomorphae)

ROBERT J. RAVEN¹ AND NORMAN I. PLATNICK²

ABSTRACT

The tribal grouping Microstigmatidae Roewer is removed from the Dipluridae and elevated to familial rank. The subfamily Pseudonemesiinae Caporiacco is transferred from the Ctenizidae to the Microstigmatidae. The family is suggested to be the sister group of the Mecicobothriidae plus Hexathelidae and Dipluridae. The male of the

Venezuelan species *Pseudonemesia parva* Caporiacco is described for the first time, and a new species, *P. kochalkai*, is described from Colombia. A genus (*Ministigmata*) described for a new species (*M. minuta*) from Brazil is hypothesized to be more closely related to the South African genus *Microstigmata* than to *Pseudonemesia*.

INTRODUCTION

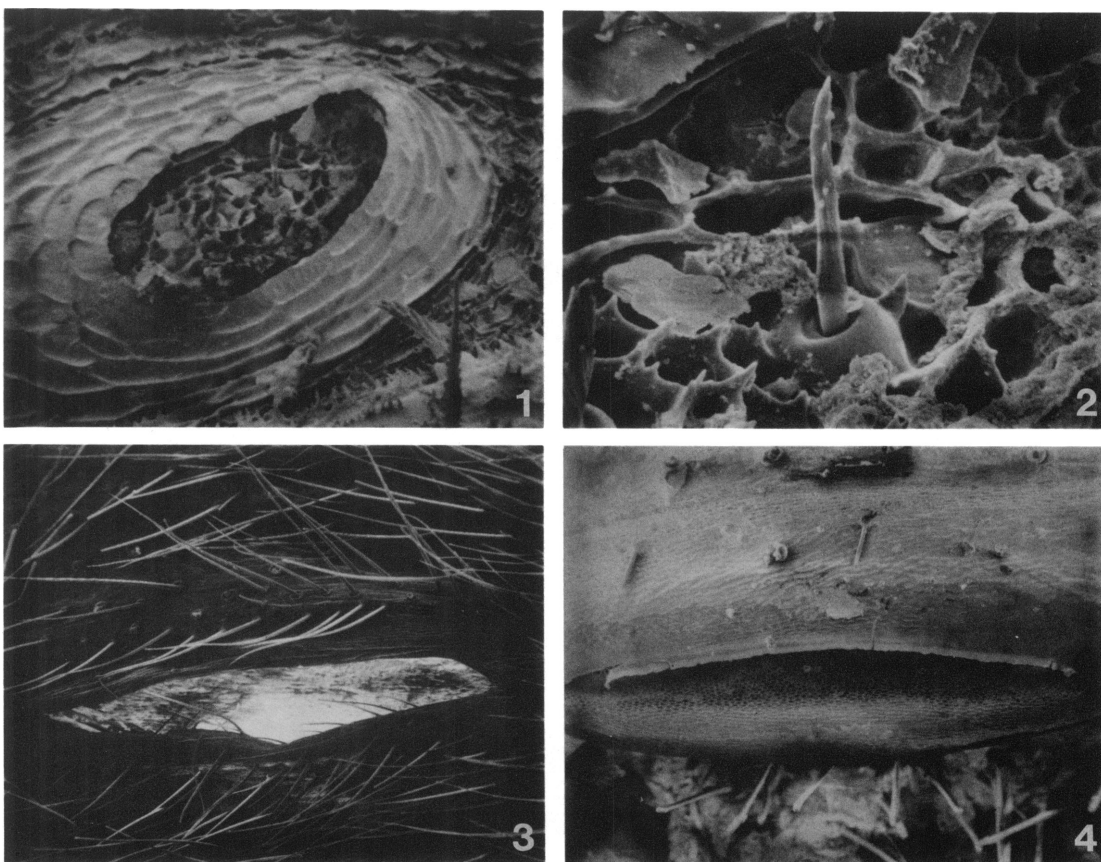
The unusual mygalomorph spiders which form the subject of this paper have been previously studied by only three other arachnologists: Hewitt (1916, 1925), Lawrence (1938), and Caporiacco (1955). The New World species, in particular, have long been overlooked both because of their rarity in collections and their extremely small size (adult males, reported here for the first time, range from 1 to 3 mm. in total length and thus rival the mecicobothriid genus *Hexurella* and the diplurid genera *Microhexura* and *Masteria* as the world's smallest mygalomorphs). Moreover, these spiders illustrate the difficulties currently plaguing the higher classification of mygalomorphs, having been described in two different families

(Dipluridae and Ctenizidae), neither of whose defining features they share.

Hewitt (1916) had difficulty assigning the first known species, *Microstigmata geophilum* from Grahamstown, South Africa, to a family. He excluded the genus from the Ctenizidae because of the absence of a cheliceral rastellum and placed it in the Dipluridae, even though he was "unable to discover definite indication of close relationship to any of the known genera" of that family. If the species actually was a diplurid, the presence of two rows of teeth on the paired tarsal claws would associate it with the subfamily Diplurinae, and the short posterior lateral spinnerets would exclude it from diplurine subgroups other than the Brachytheleae and

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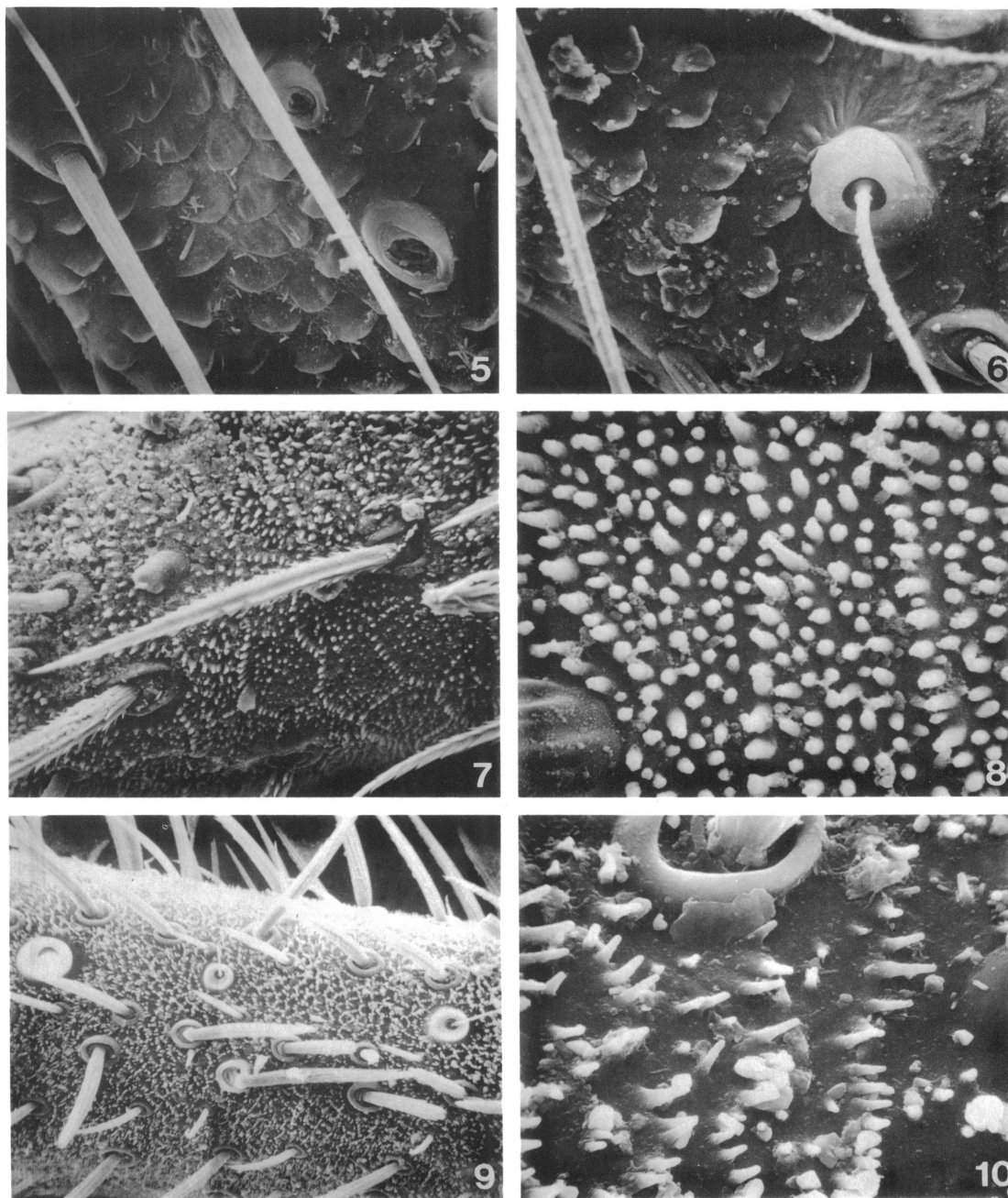
FIGS. 1-4. Book-lung openings, ventral views. 1. *Microstigmata* sp., 560 \times . 2. *Microstigmata* sp., 2400 \times . 3. *Sphodros* sp. (Atypidae), 125 \times . 4. *Paratropis* sp. (Paratropididae), 125 \times .

similar forms. However, Hewitt noted that *Microstigmata* lacks the tarsal scopulae typical of the Brachytheleae, and concluded only that the genus "can be considered as one of the connecting links between the two families Ctenizidae and Dipluridae" (1916, p. 206).

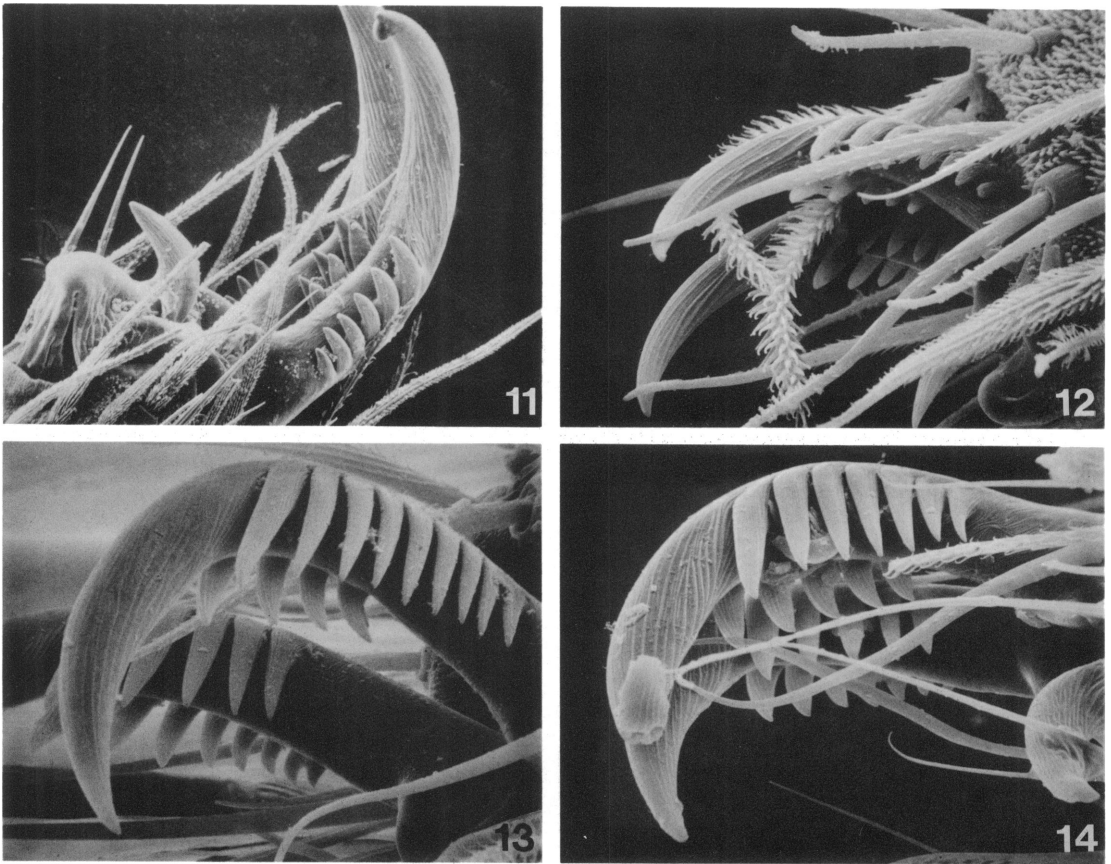
Discovery of the male of the species did not lead Hewitt (1925) to change his assessment of the familial position of *Microstigmata*, but in addition to the Brachytheleae he did indicate a possibly close relationship to the family Paratropididae. Lawrence (1938), in describing two additional species

of *Microstigmata* from Natal, gave no indication of his views on their affinities beyond labeling them as members of a "primitive genus of four-lunged spider" (p. 460).

Caporiacco (1955) had similar difficulties in placing his new Venezuelan spider, *Pseudonemesia parva*. He noted that it generally resembled diplurids but (like *Microstigmata*) is excluded from that family by having short posterior lateral spinnerets with short apical segments. He assigned the species to the Ctenizidae and established for it the new subfamily Pseudonemesiinae, differing from most other ctenizids in having only two spin-



FIGS. 5-10. Cuticle of tarsus I, dorsal views. 5. *Pseudonemesia parva* Caporiacco, 1150 \times . 6. *P. kochalkai*, new species, 1350 \times . 7, 8. *Ministigmata minuta*, new species; 7, 1300 \times , 8, 5250 \times . 9, 10. *Microstigmata* sp.; 9, 210 \times , 10, 2000 \times .



FIGS. 11-14. Claws of leg I, ventrolateral views. 11. *Microstigmata* sp., 240 \times . 12. *Ministigmata minuta*, new species, 1250 \times . 13. *Pseudonemesia parva* Caporiacco, 1050 \times . 14. *P. kochalkai*, new species, 1100 \times .

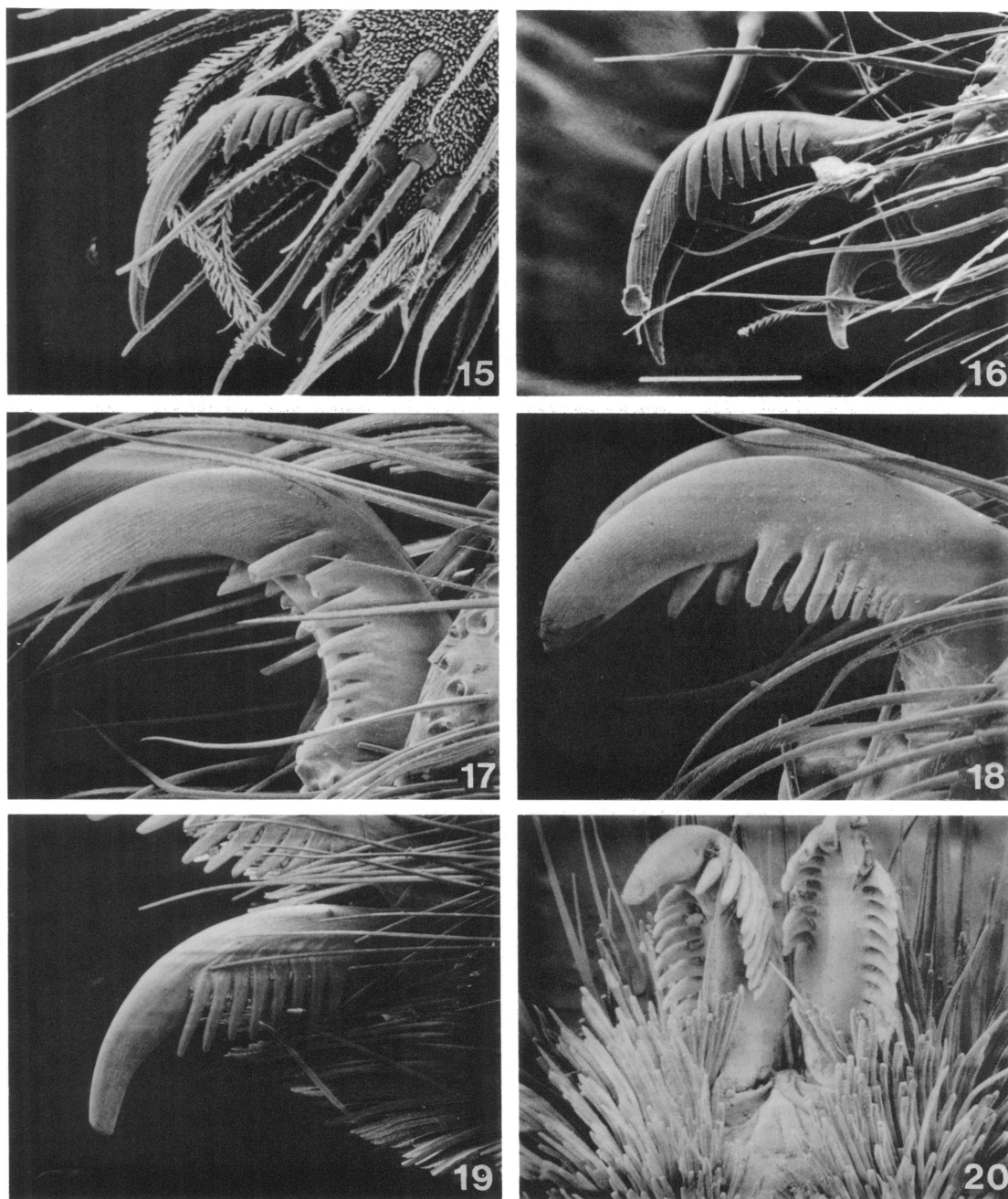
nerets and lacking a cheliceral rastellum. As the presence of a rastellum is virtually the only defining character of the Ctenizidae, Caporiacco's assessment is fully as problematical as Hewitt's. Caporiacco did not associate *Pseudonemesia* with *Microstigmata*, probably because the small size of the former prevented him from observing some of the characters they share.

Thus it is clear even from the literature that the present taxonomic positions of these two genera are untenable. The discovery of adult males that can be attributed to *P. parva*, as well as of two additional South Amer-

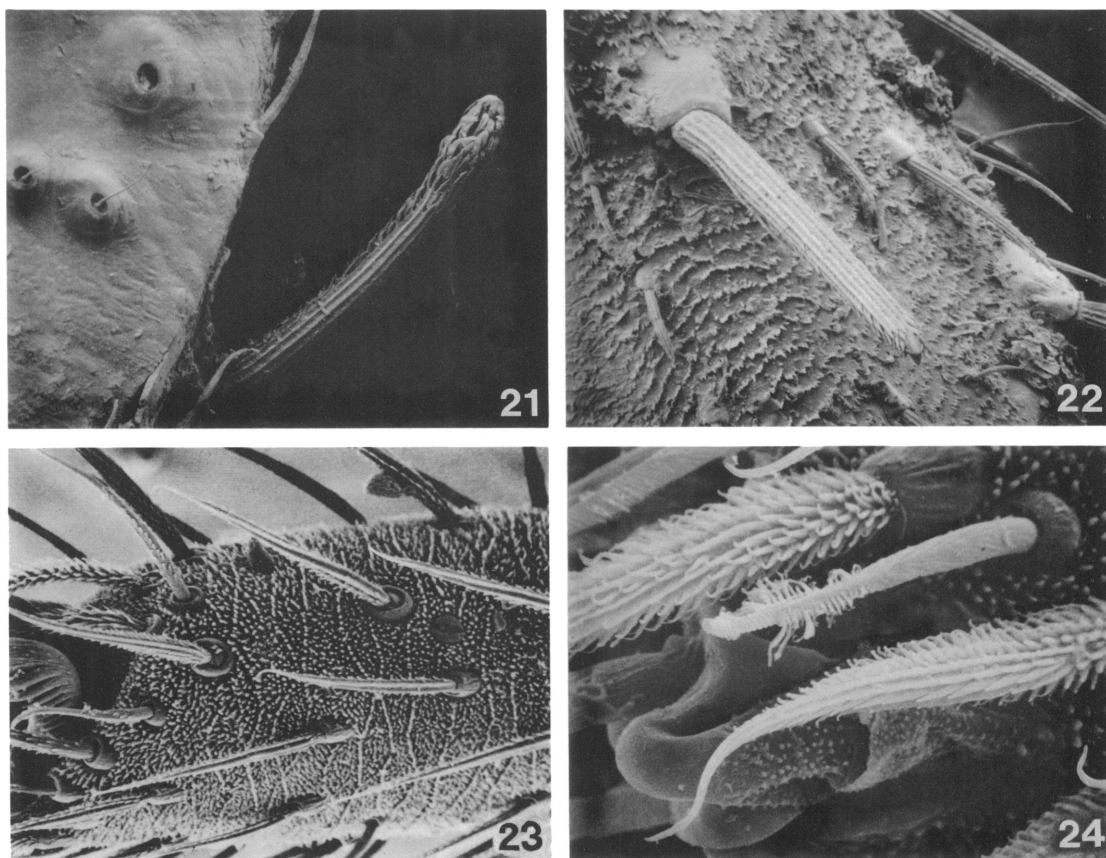
ican species, has allowed us to present below a reassessment of these spiders and their relationships. We will first argue that *Microstigmata*, *Pseudonemesia*, and the new species described below represent a distinct and monophyletic group, and then inquire as to what their sister group may be and how the various microstigmatid species may be interrelated.

MONOPHYLY

There are three characters that seem to be synapomorphies uniting the species treated below as microstigmatids: the tiny, oval



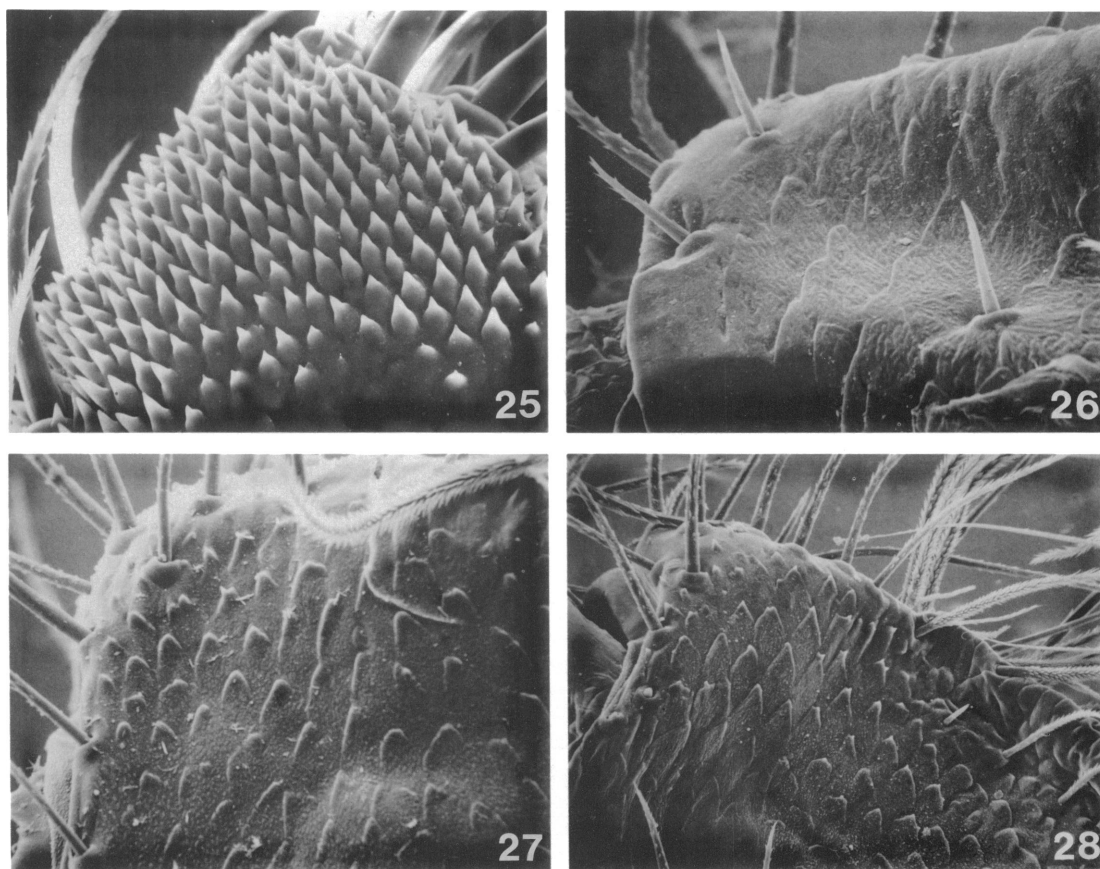
FIGS. 15-20. Claws of leg I, lateral views (15-19), ventral view (20). 15. *Ministigmata minuta*, new species, 1160 \times . 16. *Pseudonemesia kochalkai*, new species, 750 \times . 17. *Nemesia* sp. (Ctenizidae), 240 \times . 18. *Diplura* sp. (Dipluridae), 240 \times . 19, 20. *Diplothelopsis* sp. (Pycnothelidae), 125 \times .



FIGS. 21-24. Cuticle and setae of leg I, dorsolateral views. 21. *Paratropis* sp. (Paratropididae), 240 \times . 22. *Microstigmata* sp., 240 \times . 23, 24. *Ministigmata minuta*, new species; 23, 1040 \times , 24, 2400 \times (whorled seta at base of claws).

book-lung openings, the scaly cuticle of the legs and palpi, and the tarsal claw dentition. Hewitt (1916) first recognized the peculiarities of the book-lung apertures of *Microstigmata*. Whereas in other mygalomorphs the book-lungs open through long, transverse slits (figs. 3, 4), in *Microstigmata* the openings are unusually small oval pores completely surrounded by a sclerotized rim, with the opening consisting "of a rather cribriform plate reminiscent of the stigmata of certain insects, which is provided with a few minute black hairs on its surface" (Lawrence, 1938, p. 460; figs. 1, 2). The only other mygalomorph group known to us that even

begins to approach the microstigmatids in this character is the Paratropididae. Some paratropidids, particularly small ones, have book-lung openings that are reduced in size (perhaps an adaptation to living in, and having their bodies encrusted and camouflaged by, dirt), but they have a sclerotized rim only along their anterior borders and generally retain the slit-like form found in other mygalomorphs (fig. 4). The peculiar book-lung openings of microstigmatids cannot be dismissed as merely being adaptations to small size and a resulting higher rate of water loss, for *Microstigmata* species are no smaller than many other mygalomorphs, and the



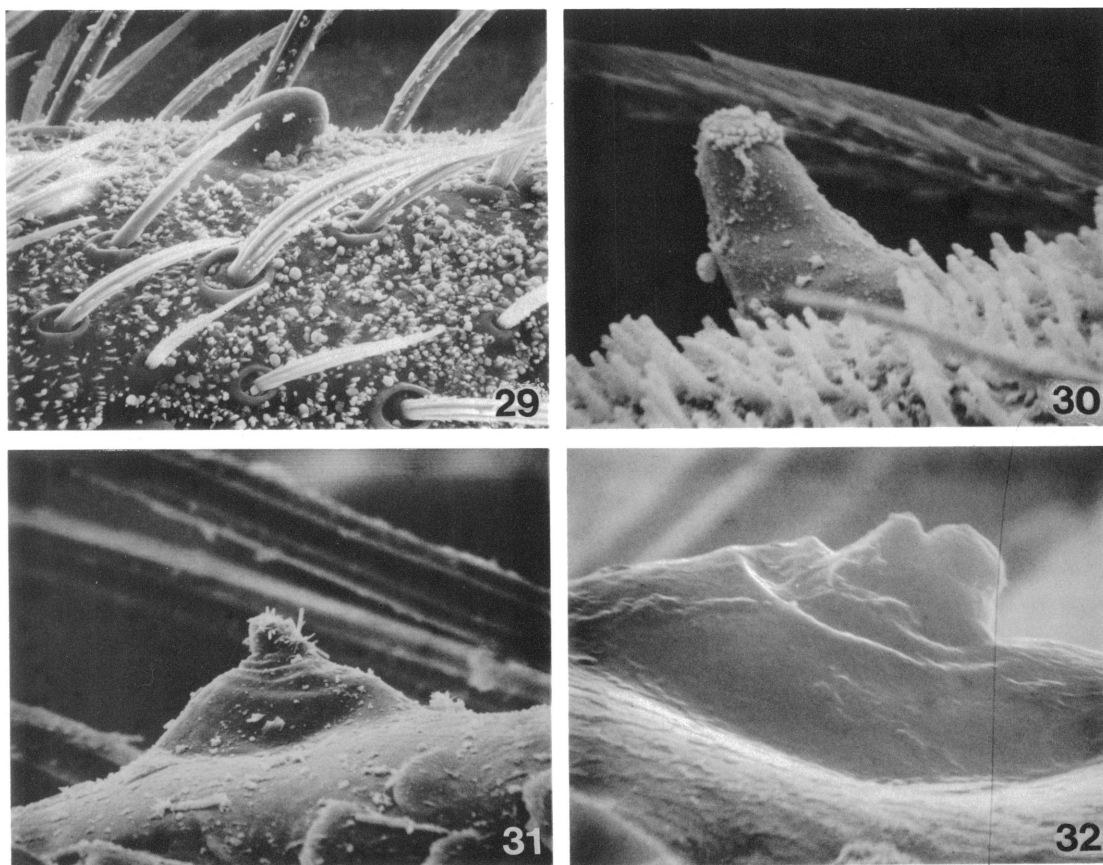
FIGS. 25-28. Serrula, anterior views. 25. *Microstigmata* sp., 500 \times . 26. *Ministigmata minuta*, new species, 1250 \times . 27. *Pseudonemesia parva* Caporiacco, 725 \times . 28. *P. kochalkai*, new species, 600 \times .

modifications do not occur in other tiny forms like *Hexurella*, *Microhexura*, and *Masteria*.

Secondly, the microstigmatids are distinctive in having the cuticle of the legs and pedipalps covered with flattened scales, semi-circular or triangular in shape and highest at their distal ends. These are most easily seen in *Pseudonemesia* (figs. 5, 6), but they also occur in *Microstigmata* and the new genus *Ministigmata*, where they bear numerous digitiform pustules (figs. 7, 9); the outlines of the scales in these species are marked by longer pustules (figs. 8, 10). Such scales are not known to occur in other mygalomorphs (comparable scanning electron micrographs

of atypid, antrodiaetid, hexathelid, and diplurid legs can be found in Gertsch and Platnick, 1979, figs. 5, 7, 9, 15, 17, 19, 21, 23, 25, 27). Interestingly, spiders of the suborder Mesothelae have similar (although less elevated) digitiform pustules (Gertsch and Platnick, 1979, figs. 11, 13), as do a few species of Dipluridae (*Ixamatus* and a related genus in the Diplurinae; Raven, 1980a, figs. 11-13), but there are no scales underlying the pustules in those species.

Finally, the form of the tarsal claws may also be synapomorphic for microstigmatids. The paired (superior) claws each bear two rows of teeth (figs. 11-14), a condition unusual among mygalomorphs but also found



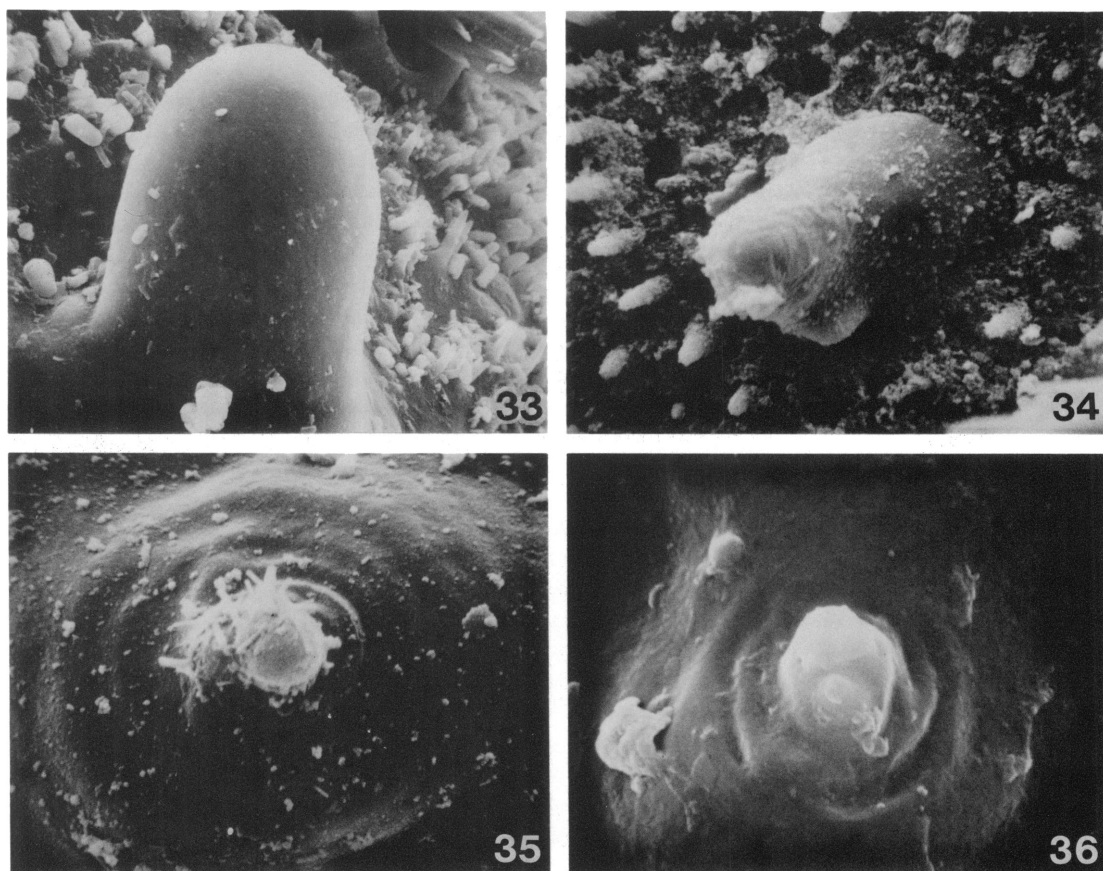
FIGS. 29-32. Tarsal organ of leg I, lateral views. 29. *Microstigmata* sp., 500 \times . 30. *Ministigmata minuta*, new species, 5250 \times . 31. *Pseudonemesia parva* Caporiacco, 2800 \times . 32. *P. kochalkai*, new species, 11,500 \times .

in the Pycnothelidae, Dipluridae (Diplurinae), and some Ctenizidae (the Aporoptychae and Nemesieae of Simon, 1892). However, the teeth in microstigmatids may be distinctive in originating near the dorsal surface of the claws (figs. 15, 16) and resting alongside the claw itself. In the pycnothelid genus *Diplothelopsis*, for example, the teeth originate near the ventral surface of the claw (fig. 19) and hang below the claw itself (fig. 20). The pycnothelid type of tooth arrangement is also found in at least some Diplurinae (fig. 18) and even Ctenizidae (fig. 17), where the tooth origin does become more dorsal toward the tip of the claw but is clearly ventral in at least the most proximal teeth. As the

claws of other diplurines (such as *Teyl*) resemble this ctenizid condition more than the pycnothelid one, a wider survey of claw dentition is needed before much reliance can be placed on the character.

INTERRELATIONSHIPS

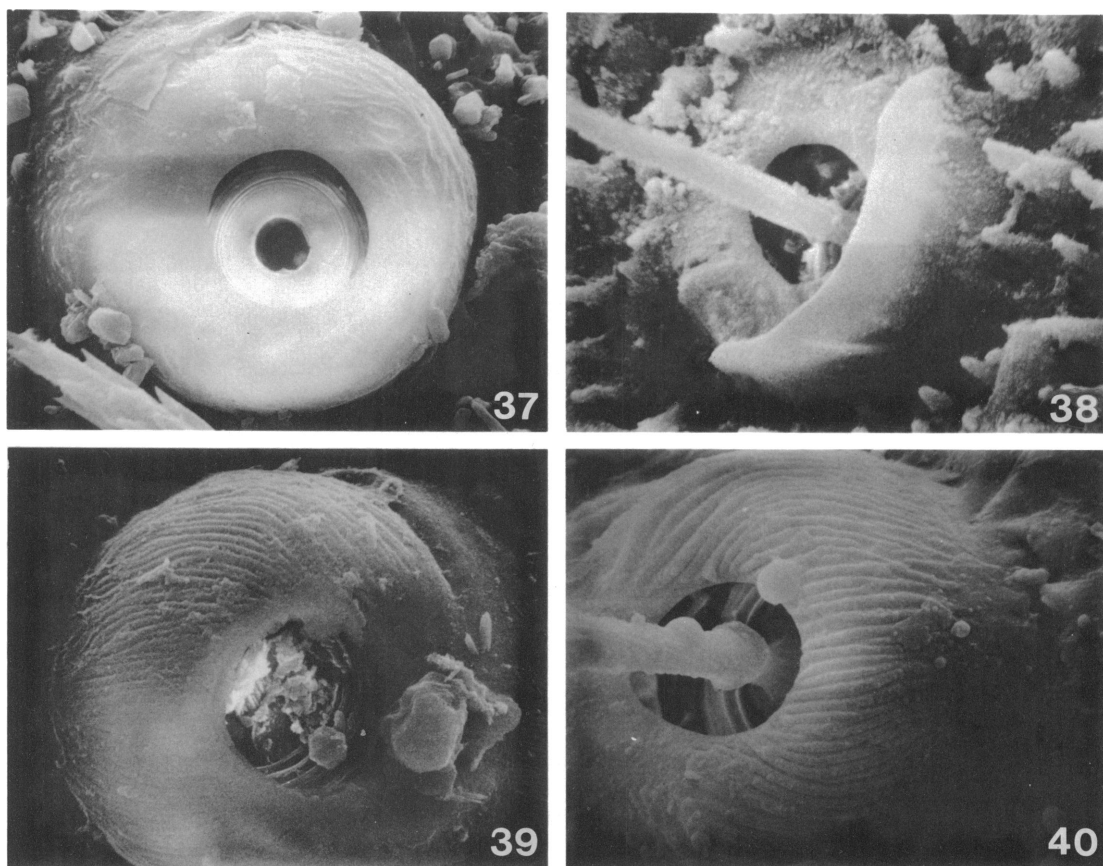
In this section we will first examine previous suggestions that the closest relatives of the microstigmatids may lie within the Paratropidae, Ctenizidae, or Dipluridae, and then present an alternative hypothesis of our own. Hewitt's (1925) proposal of a paratropid relationship was based on similarities between *Paratropis* and *Microstigmata* in



FIGS. 33–36. Tarsal organ of leg I, dorsal views. 33. *Microstigmata* sp., 2000 \times . 34. *Ministigmata minuta*, new species, 6500 \times . 35. *Pseudonemesia parva* Caporiacco, 6250 \times . 36. *P. kochalkai*, new species, 9500 \times .

spinneret structure, the “minutely scaly integument, more or less encrusted with grains of grit, and the peculiar thick hairs,” although he concluded that “the relationship of these two genera is not so very close, the ocular tubercle being globular in *Paratropis*, paired tarsal claws unidentate, and the maxilla has a conspicuous process at the anterior apical angle” (pp. 288–289). Although the latter objections are not crucial (for they indicate only that *Microstigmata* lacks the autapomorphies of *Paratropis*), Hewitt’s cited similarities are not convincing. The posterior lateral spinnerets of the two genera differ in having the apical segment almost twice as long as the median one in *Paratropis* but

shorter than the median one in *Microstigmata*, and the close spacing of the posterior median spinnerets mentioned by Hewitt seems to be only a step involved in their reduction (other genera in each family have lost the posterior median spinnerets entirely). The cuticle of *Paratropis* does not have the scales of microstigmatids (fig. 21), and although the characteristic paratropidid habit of encrusting the body with dirt does occur in *Microstigmata*, it does not occur in *Pseudonemesia* or *Ministigmata* and is hence presumably a parallel development. *Paratropis* and *Microstigmata* do have similar enlarged setae on the legs and abdomen (figs. 21, 22) that are also normally encrusted with

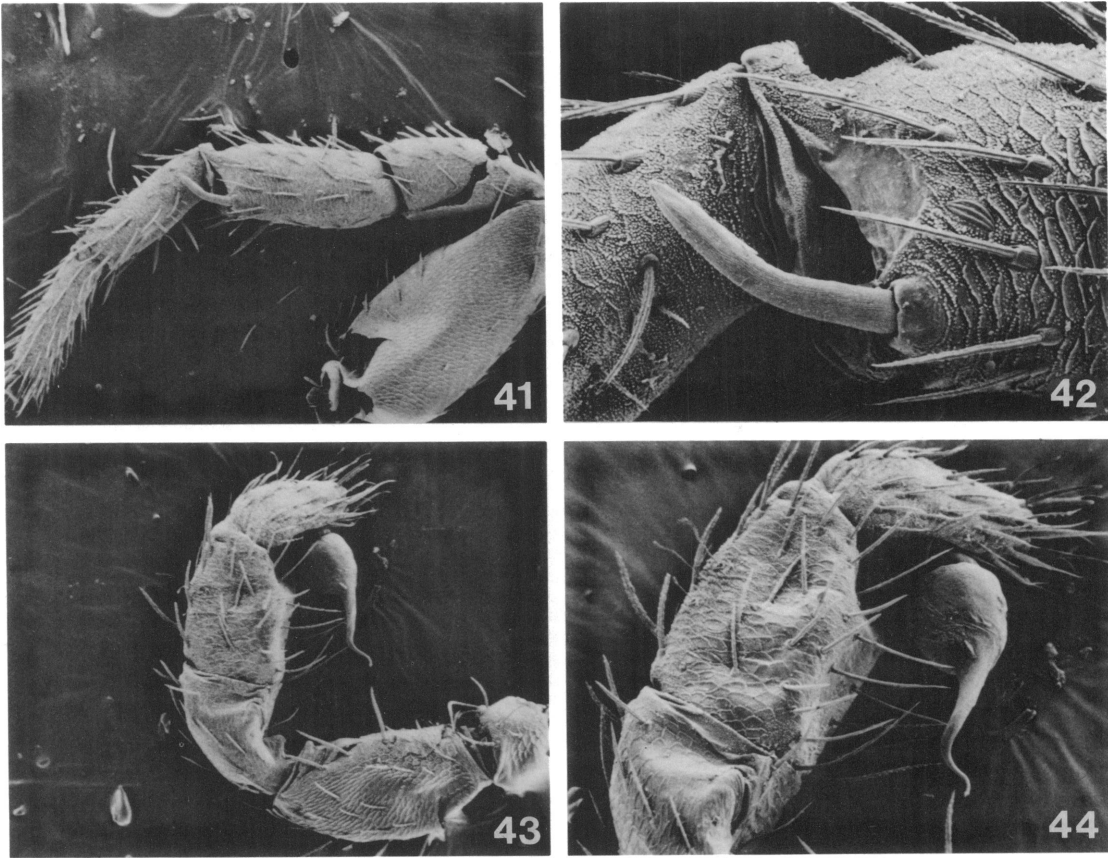


FIGS. 37–40. Trichobothrial base from tarsus I, dorsal views. 37. *Microstigmata* sp., 2100 \times . 38. *Ministigmata minuta*, new species, 6700 \times . 39. *Pseudonemesia parva* Caporiacco, 5000 \times . 40. *P. kochalkai*, new species, 6750 \times .

dirt, but the setae of *Microstigmata* are just as similar to the ordinary leg setae of other microstigmatids (fig. 23).

If the sister group of the microstigmatids were to lie within the Ctenizidae, as suggested by Caporiacco's (1955) placement, the absence of a rastellum would presumably be an apomorphic loss. This hypothesis would be parsimonious only if there are other characters unique to microstigmatids and some ctenizids (presumably the Nemesiidae, as indicated by the two rows of teeth on their paired tarsal claws; cf. Caporiacco's choice of name for the Pseudonemesiinae). We know of no such characters.

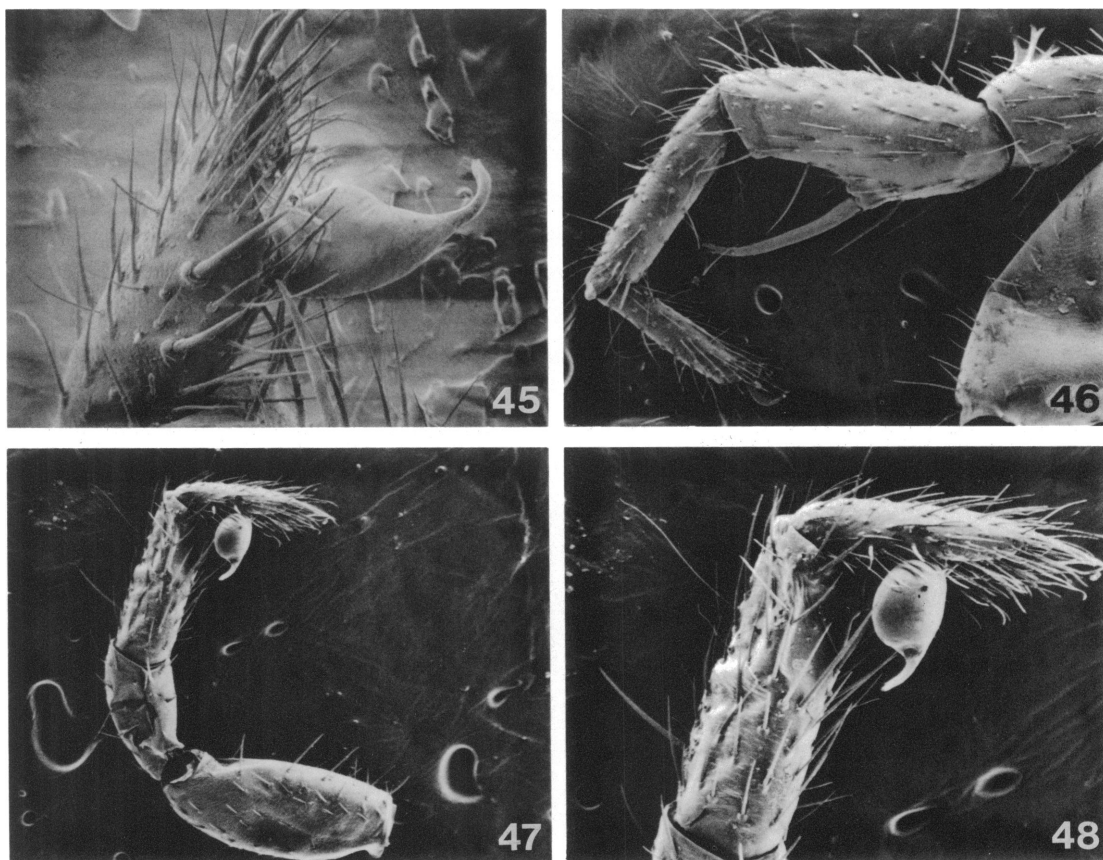
Discussion of possible microstigmatid relationships with the Dipluridae, following Hewitt's (1916) placement, is difficult. The spiders formerly included in the Dipluridae are now placed in two families, the Hexathelidae and Dipluridae, believed to be sister groups (Raven, 1980b), and it is not certain whether Hewitt would have advocated a microstigmatid relationship to both or to only one of these families. As later workers (such as Roewer, 1942) have placed *Microstigmata* in the Diplurinae (presumably because of the two rows of teeth on their paired tarsal claws), we will consider that hypothesis as reflecting Hewitt's intent. Unfortunately, the



FIGS. 41–44. *Ministigmata minuta*, new species, male, lateral views. 41, 42. Leg I, showing clasp spiny; 41, 130 \times , 42, 560 \times . 43, 44. Palp; 43, 180 \times , 44, 320 \times .

Diplurinae is at present heterogeneous, and it is possible that some of the spiders currently placed in the group (such as the Northern Hemisphere “Brachytheleae” and the Australian “Anamini”) do not belong there. For the purposes of this discussion, the term Diplurinae refers only to those genera, like *Diplura*, with elongated posterior lateral spinnerets and pseudosegmented tarsi in males. Placement of the microstigmatids within this restricted Diplurinae, or as their sister group, is contradicted by their short posterior lateral spinnerets (the elongated spinnerets group the Diplurinae with the other diplurids and the Hexathelidae and Mecicobothriidae instead), and supported by no synapomorphies that we are aware of.

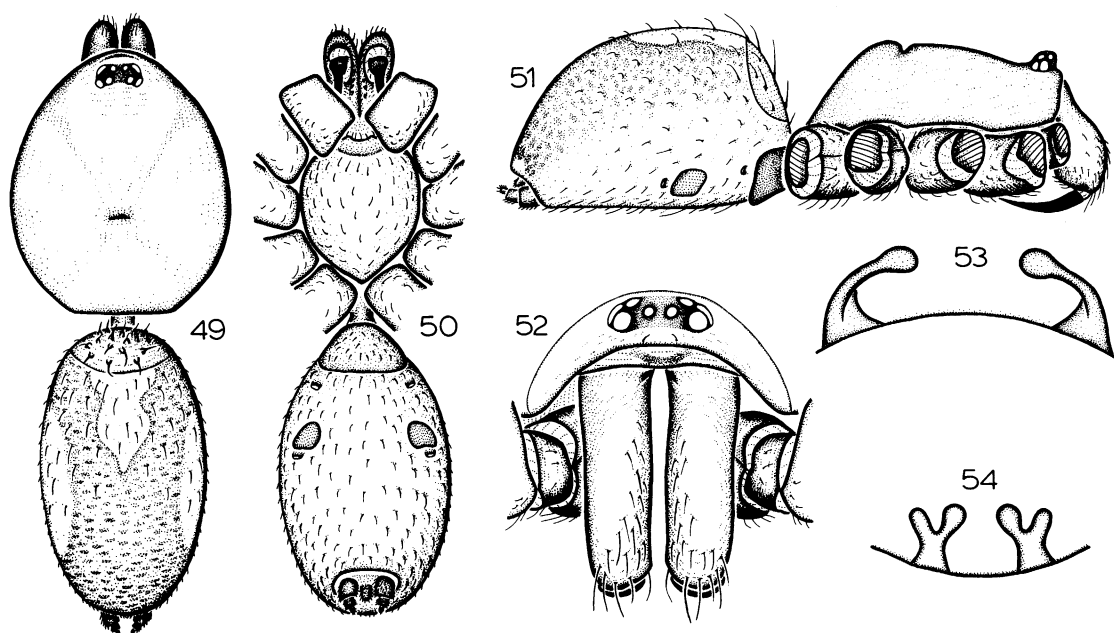
Similarly, a close relationship to the Brachytheleae or Anamini may be contradicted by the presence in microstigmatids of a serrula on the anterior surface of the palpal coxae. The serrula is fully developed in *Microstigmata* (fig. 25), somewhat reduced in *Pseudonemesia* (figs. 27, 28), and almost completely lost in *Ministigmata* (fig. 25); a similar reduction of the serrula in small species occurs in the Mecicobothriidae, where *Hexurella* has a serrula much reduced from that of the genera containing larger species (Gertsch and Platnick, 1979, figs. 1–4). A serrula is generally lacking in mygalomorphs other than the Mecicobothriidae, Hexathelidae, and Dipluridae and present in those groups. However, it apparently does



FIGS. 45–48. *Pseudonemesia* males, lateral views. 45. *P. parva* Caporiacco, palp, 100 \times . 46–48. *P. kochalkai*, new species. 46. Leg I, showing clasp spine, 95 \times . 47. Palp, 80 \times . 48. Palp, 160 \times .

not occur in at least some Brachytheleae and Anamini (i.e., “Diplurinae” with short posterior lateral spinnerets; although, contrary to the statement of Raven, 1980a, a serrula does occur in *Ixamatus*) and hence argues for a closer relationship between microstigmatids and the Mecicobothriidae, Hexathelidae, and restricted Dipluridae than the Brachytheleae or Anamini. The only exceptions to the lack of a serrula in non-dipluroid groups known to us occur in the Pycnothelidae. Although Platnick (1977, p. 14) reported that specimens of an unidentified pycnothelid genus lack a serrula, one has subsequently been found in the type species of *Pycnothele* and in a species of *Diplothelopsis* (and thus in both of the pycnothelid subfamilies recognized by Schiapelli and de

Pikelin, 1967); the unidentified specimens reported on previously may belong to the Brachytheleae or Anamini rather than Pycnothelidae. Hence the pycnothelids may prove to be dipluroids when the limits and affinities of the Diplurinae, Brachytheleae, Anamini, and Pycnothelidae can be investigated in detail. Until then, the most we can suggest, following Platnick (1977) and Raven (1980b), is that the Mecicobothriidae and the Hexathelidae plus Dipluridae (possibly minus some current Diplurinae and/or plus some current Pycnothelidae) are sister groups united by the elongated posterior lateral spinnerets, and further, that the Microstigmatidae is the sister group of all three families, being united with them by the presence of a serrula.



FIGS. 49–54. 49–52. *Pseudonemesia parva* Caporiacco. 49. Body, dorsal view. 50. Body, ventral view. 51. Body, lateral view. 52. Carapace, anterior view. 53, 54. Spermathecae, dorsal views. 53. *Ministigmata minuta*, new species. 54. *Pseudonemesia kochalkai*, new species.

The tarsal organ morphology of microstigmatids is compatible with this hypothesis. All examined mecicobothriids, hexathelids, and diplurids (other than *Ixamatus*; see below) have a flattened tarsal organ bearing numerous concentric ridges (Gertsch and Platnick, 1979, figs. 17–32). The genera *Microstigmata* and *Ministigmata* have a very different tarsal organ, in the form of a narrow, protruding lobe that extends considerably above the cuticle (figs. 29, 30, 33, 34). However, *Pseudonemesia* has an intermediate form of tarsal organ in which only the central (receptor) area of the organ protrudes high above the cuticle, and is surrounded by the concentric ridges typical of diplurids, hexathelids, and mecicobothriids (figs. 31, 32, 35, 36). Hence the microstigmatids seem merely to have an apomorphic form of the type of tarsal organ found in their putative sister group. A similar protruding tarsal organ may have developed in a parallel fashion in the diplurine genus *Ixamatus* (Raven, 1980a, figs. 11, 12) and a closely related undescribed genus.

INTRARELATIONSHIPS

There is little doubt that the fundamental dichotomy within the Microstigmatidae is between *Microstigmata* and *Ministigmata*, on the one hand, and *Pseudonemesia* on the other; these two groups are considered subfamilies below. The first two genera agree in having the scales of the cuticle covered with numerous digitiform pustules (figs. 8, 10) and in having lost the concentric ridges around the elevated portions of the tarsal organ (figs. 33, 34). Similarly, the two species assigned to *Pseudonemesia* below differ from *Microstigmata* and *Ministigmata* in having corrugated trichobothrial bases (figs. 37–40); as primitive dipluroids (Mecicobothriidae and Hexathelidae) have smooth trichobothrial bases (Raven, 1980b), that is presumably the plesiomorphic state of the character for the Microstigmatidae. The two *Pseudonemesia* species also have a unique type of serrula morphology (figs. 27, 28) in which the teeth of the serrula are widely separated and greatly flattened, and a peculiarly elevated pars thoracica (fig. 51).

If the reduced serrula of *Ministigmata* (fig. 26) were a modified form of the type of serrula found in *Pseudonemesia*, the character would argue against the dichotomy proposed above, but there seems to be little in the details of the morphology to support that view. The only other character that might contradict the grouping adopted here is the spinneret number; the posterior median spinnerets have been lost in both *Pseudonemesia* and *Ministigmata*. Since the same loss has also occurred in the families Paratropididae (*Anisaspis* and *Anisaspoides*), Ctenizidae (one species of *Nemesia*), Barychelidae (*Diplothele* and related taxa), and Pycnothelidae (*Diplothelopsis*), it is not unreasonable to assume a parallel loss of those spinnerets in the two genera of tiny microstigmatids.

Pseudonemesia parva and *P. kochalkai* differ in modifications of the male tibia I (a character that frequently provides good indications of roughly generic-level affinities in mygalomorphs), and we suspect that they will be placed in separate genera when additional species are discovered. Description of a new monotypic genus for *P. kochalkai*, however, seems premature at this time. Also, no detailed discussion of *Microstigmata* is provided here because there are undescribed species of that genus in African collections.

ACKNOWLEDGMENTS

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MICROSTIGMATIDAE ROEWER

Microstigmatidae Roewer, 1942, p. 194.

Pseudonemesiinae Caporiacco, 1955, p. 265.

NEW SYNONYMY.

DIAGNOSIS: Microstigmatids can be easily recognized by the small, oval openings of the book-lungs (figs. 1, 50), the scaly cuticle (figs. 5–10), and the two rows of dorsally originating teeth on the paired tarsal claws (figs. 11–14). They can be distinguished from the other mygalomorph families as follows: from the Theraphosidae and Barychelidae by the presence of three tarsal claws and the absence of tarsal claw tufts, from the Pycnothelidae by the absence of tarsal scopulae, from the Paratropididae and Migidae by the presence of two rows of teeth on the paired tarsal claws, from the Ctenizidae, Actinopodidae, and Antrodiaetidae by the absence of a cheliceral rastellum, from the Mecicobothriidae, Hexathelidae, and Dipluridae (except "Brachytheleae" and "Anamini") by the short posterior lateral spinnerets, from the "Brachytheleae" and "Anamini" by the presence of a serrula and/or the absence of tarsal scopulae, and from the Atypidae by the absence of the anterior lateral spinnerets and lobes on the palpal coxae.

DESCRIPTION: Small to tiny mygalomorph spiders. Carapace oval, with short transverse thoracic groove and compact group of eight eyes in two rows. Chelicerae paraxial, geniculate, with promarginal row of teeth, with or without mesal teeth, without rastellum. Palpal coxae longer than wide, without anterior lobes, with or without cusps, with serrula (slightly reduced in *Pseudonemesia*, almost completely lost in *Ministigmata*); female palp with claw bearing single row of teeth. Labium wider than long, with or without cusps. Sternum cordate, with or without visible sigilla. Tarsi with three claws, paired claws with two rows of dor-

sally originating teeth, unpaired claws long, bare; tarsal organ elevated, with or without surrounding concentric ridges; trichobothria in two rows on tibiae, single row on metatarsi and tarsi; trichobothrial bases smooth or corrugated; claw tufts and scopulae absent. Cuticle scaly, with or without digitiform pustules. Abdomen with or without tergite-like anterior scutum, with book-lung apertures very small, oval; spinnerets four or two, posterior laterals very short, three-segmented, with apical segment shorter than median, coniform. Males with pyriform palpal bulb, with or without incrassate spine on tibia I.

MICROSTIGMATINAE ROEWER

Microstigmatinae Roewer, 1942, p. 194.

DIAGNOSIS: Microstigmatines can be distinguished from pseudonemesiines by the presence of digitiform cuticular pustules (figs. 7–10) and smooth trichobothrial bases (figs. 37, 38), and by the absence of concentric ridges surrounding the tarsal organ (figs. 29, 30, 33, 34).

INCLUDED GENERA: *Microstigmata* and *Ministigmata*.

DISTRIBUTION: Known only from South Africa (*Microstigmata*) and Brazil (*Ministigmata*).

MICROSTIGMATATA STRAND

Microstigma Hewitt, 1916, p. 206 (type species by monotypy *Microstigma geophilum* Hewitt); 1925, p. 286. Lawrence, 1938, p. 459. Bonnet, 1957, p. 2906.

Microstigmata Strand, 1932, p. 142 (*nomen novum* for *Microstigma* Hewitt, preoccupied in the Odonata by *Microstigma* Rambus, 1842). Roewer, 1942, p. 194.

DIAGNOSIS: *Microstigmata* can be distinguished from *Ministigmata* by the presence of four spinnerets.

DESCRIPTION: Small mygalomorph spiders. Thoracic groove slightly recurved, depressed. Chelicerae with mesal denticles. Palpal coxae and labium usually with cusps. Sternum with one to three pairs of sigilla visible. Tarsal organ without concentric ridges. Trichobothrial bases smooth, with re-

duced overlapping ridge. Tarsi without whorled seta at base of claws. Cuticle with digitiform pustules. Abdomen without scutum, usually encrusted with dirt. Four spinnerets, posterior medians tiny, one-segmented, closely spaced. Males with incrassate prolateroventral spine at apex of tibia I.

INCLUDED SPECIES: *M. geophilum* (Hewitt), *M. zuluense* (Lawrence), *M. longipes* (Lawrence).

DISTRIBUTION: The genus is known only from the Cape Province and Natal, South Africa, and found under stones in damp bush and forest (Hewitt, 1916, 1925).

MINISTIGMATATA, NEW GENUS

TYPE SPECIES: *Ministigmata minuta*, new species.

ETYMOLOGY: The generic name is from the Latin *minimus* (smallest) and *stigma* (a cut), referring to the scarcely visible book-lung openings, and is feminine in gender.

DIAGNOSIS: *Ministigmata* can be distinguished from *Microstigmata* by the presence of only two spinnerets. The peculiar whorled seta found at the base of the tarsal claws (fig. 24) is also diagnostic.

DESCRIPTION: Tiny mygalomorph spiders. Thoracic groove very narrow, straight. Chelicerae with mesal denticles. Palpal coxae with, labium without cusps. Sternum without visible sigilla. Tarsal organ without concentric ridges. Trichobothrial bases smooth, with well-developed overlapping ridge. Tarsi with whorled seta at base of claws. Cuticle with digitiform pustules. Abdomen with vaguely limited, shiny, anterior scutum at base, not encrusted with dirt. Two spinnerets. Males with incrassate prolateroventral spine at apex of tibia I.

Ministigmata minuta, new species

Figures 7, 8, 12, 15, 23, 24, 26, 30, 34, 38, 41–44,
53

TYPES: Male holotype and female paratype from Berlese sample of leaf litter taken in shady rainforest along the Rio Negro at Ponta Negra, Manaus, Amazonas, Brazil (September 1, 1962; W. L. Brown, Jr.), deposited in the American Museum of Natural History.

ETYMOLOGY: The specific name is from the Latin *minutus* (tiny).

DIAGNOSIS: With the characters of the genus.

MALE: Total length, including chelicerae, 1.80. Carapace and legs uniformly brownish yellow, chelicerae paler; underside of cephalothorax concolorous. Dorsum of abdomen yellow with irregular median purplish brown mottling and shiny brown scutum above base; sides and venter uniformly yellow.

Carapace 0.88 long, 0.69 wide, sloping evenly from thoracic groove in all directions except anteriorly on medially domed caput, glabrous, with two rows each of four or five posteriorly directed bristles reaching from lateral eyes toward thoracic groove, two bristles at posterolateral corners, two bristles lateral of eyes, one long recurved bristle between anterior median eyes, and two long bristles, with apices touching, on clypeal edge. Thoracic groove a short, straight, transverse slit situated back two-thirds of carapace length, occupying only one-tenth of carapace width at that point.

Eight eyes on low tubercle occupying about one-third of front width. Ratio of eyes, anterior lateral: anterior median: posterior lateral: posterior median, 4:2:3:2. Anterior row very slightly narrower than posterior, strongly recurved from above; medians separated by their radius, by half their radius from laterals. Posterior row strongly recurved; medians separated by three times their diameter, by half their radius from laterals. Median ocular quadrangle wider than long (9/6), narrowed in front (9/5). Lateral eyes of each side separated by half their radius.

Sternum 0.46 long, 0.46 wide, domed, with bristles on margin. Labium 0.06 long, 0.18 wide, quadrangular, without cuspules, with five bristles anteriorly. Palpal coxae 0.25 long, 0.14 wide, with two or three cuspules and attenuate bristles. Chelicerae short, promargin with five to seven teeth, mesally with about four teeth; fang long, slender.

Leg formula 4123. Legs glabrous but with erect attenuate and bluntly tipped bristles; femur II slightly incrassate; tibia I with single apical incrassate clasping spine (figs. 41, 42);

coxae III and IV with incipient hooked distal processes retrolaterally. Spination (no spines on tarsi): leg I, femur d4, patella 0, tibia v2 (plus clasping spine), metatarsus v2; leg II, femur d4, patella 0, tibia v2, metatarsus v2; leg III, femur d4, patella dl, p2, tibia d3, pl, v4, rl, metatarsus p3, v3, r2; leg IV, femur d3, pl, r2, patella pl, rl, tibia d4, pl, v3, r2, metatarsus p3, v2, r3. Paired tarsal claws with two rows, each of five to seven teeth. Four to five trichobothria in irregular row on metatarsi and tarsi, two rows of four to five each on tibiae.

	I	II	III	IV	Palp
Femur	0.56	0.56	0.46	0.71	0.33
Patella	0.35	0.36	0.29	0.39	0.25
Tibia	0.34	0.30	0.28	0.50	0.25
Metatarsus	0.31	0.31	0.39	0.68	—
Tarsus	0.26	0.26	0.30	0.39	0.15
Total	1.82	1.79	1.72	2.67	0.98

Palp (figs. 43, 44) with incrassate tibia and tarsus and elongate, distally twisted embolus; tibia with two dorsal spines.

Abdomen 0.75 long, 0.44 wide, glabrous but with long, erect, clavate bristles; posterior book-lung covers each marked by long erect bristle. Three-segmented posterior lateral spinnerets with basal, median, and apical segments 0.05, 0.06, 0.03 long, respectively.

FEMALE: As in male, except as noted. Total length, including chelicerae, 2.00. Carapace, legs, and chelicerae uniformly yellowish. Brown mottling of abdominal dorsum forming numerous pigmentless spots. Carapace 0.78 long, 0.65 wide. Eye group occupying almost one-half of front width. Ratio of eyes, anterior lateral: anterior median: posterior lateral: posterior median, 4:2:3:3. Anterior medians separated by half their radius. Median ocular quadrangle wider than long (4/3), narrowed in front (4/3). Sternum 0.46 long, 0.31 wide. Labium 0.05 long, 0.14 wide. Palpal coxae 0.23 long, 0.15 wide, with one or two cuspules. Cheliceral promargin with five teeth, mesally with eight teeth. Coxae III and IV with small hooked distal protuberance retrolaterally. Spination: leg I, tibia v2, metatarsus 0; leg II, patella d1, tibia d1, v2, metatarsus pl, v2; leg III, femur d3,

patella d2, p2, r1, tibia d3, p1, v2, r1, metatarsus d2, p2, v3, r2; leg IV, femur d2, patella d1, p1, r1, tibia d3, p1, v4, r1, metatarsus d2, p2, v3, r3; palp, femur d2, patella 0, tibia d1, tarsus 0.

	I	II	III	IV	Palp
Femur	0.56	0.44	0.39	0.60	0.34
Patella	0.38	0.30	0.28	0.34	0.28
Tibia	0.31	0.28	0.24	0.44	0.19
Metatarsus	0.28	0.26	0.31	0.50	—
Tarsus	0.19	0.20	0.25	0.34	0.24
Total	1.72	1.48	1.47	2.22	1.05

Abdomen 1.00 long, 0.63 wide. Spinnerets with basal, median, and apical segments 0.06, 0.05, 0.02 long, respectively. Spermathecae two, elongate, medially directed, basally expanded (fig. 53).

MATERIAL EXAMINED: Two females and one juvenile taken with the types in a degraded forest just north of a swimming beach and back from low, red cliffs lining the river at that point. The type locality was revisited by Dr. W. L. Brown, Jr., in 1971, and was much modified as the beach has become a resort and even more of the forest has been chopped.

PEUDONEMESIINAE CAPORACCO

Pseudonemesiinae Caporiacco, 1955, p. 265.

DIAGNOSIS: *Pseudonemesiinae* can be distinguished from *microstigmatinae* by the absence of digitiform cuticular pustules (figs. 5, 6) and the presence of corrugated trichobothrial bases (figs. 39, 40) and concentric ridges surrounding the tarsal organ (figs. 31, 32, 35, 36).

INCLUDED GENERA: *Pseudonemesia*.

DISTRIBUTION: Known only from Venezuela (*P. parva*) and Colombia (*P. kochalkai*).

Pseudonemesia Caporiacco

Pseudonemesia Caporiacco, 1955, p. 266 (type species by original designation *Pseudonemesia parva* Caporiacco).

DIAGNOSIS: With the characters of the subfamily.

DESCRIPTION: Tiny mygalomorph spiders.

Thoracic groove slightly recurved. Chelicerae with promarginal teeth only. Palpal coxae with or without, labium without cuspules. Sternum without visible sigilla. Tarsal organ with concentric ridges. Trichobothrial bases corrugated. Tarsi without whorled seta at base of claws. Cuticle without digitiform pustules. Abdomen with vaguely limited, shiny, anterior scutum at base, not encrusted with dirt. Two spinnerets. Males with or without incrassate spine on tibia I.

Pseudonemesia parva Caporiacco

Figures 5, 13, 27, 31, 35, 45, 49–52

Pseudonemesia parva Caporiacco, 1955, p. 266 (female holotype from El Junquito, Distrito Federal, Venezuela, in Museo de Biología, Universidad Central de Venezuela, examined).

DIAGNOSIS: Male of *P. parva* can be easily distinguished from *P. kochalkai* by the absence of an incrassate spine on tibia I, females by the absence of cuspules on the palpal coxae.

MALE: Total length, including chelicerae, 2.74; body as in figures 49–52. Carapace tan, with irregular darker pigmentation on interstitial ridges and caput; chelicerae, underside of cephalothorax, and legs pale tan. Dorsum of abdomen light brown with pale flanks and pale, irregularly defined anteromedian scutum, venter entirely pale yellow.

Carapace 1.42 long, 1.20 wide, sloping down on all sides from thoracic groove; glabrous except for five bristles in posterior striae, one pair of foveal bristles, four or five bristles on anterior and posterior cephalic margins, and four bristles in front of eyes. Thoracic groove short, shallow, slightly recurved line situated back four-sevenths of carapace length, occupying two-fifteenths of carapace width at that point.

Eight eyes on distinctly raised tubercle occupying about one-half of front width. Ratio of eyes, anterior lateral: anterior median: posterior lateral: posterior median, 9:5:9:6. Anterior row slightly narrower than posterior row, slightly recurved from above; medians separated by slightly more than their radius, slightly closer to laterals. Posterior row strongly recurved, medians separated by

twice their diameter, by their radius from laterals. Median ocular quadrangle wider than long (3/2), narrowed in front (3/2). Lateral eyes of each side separated by half their radius.

Sternum 0.80 long, 0.70 wide, smooth, with steeply sloping lateral margins, without bristles. Labium 0.06 long, 0.28 wide, anteriorly excavate, separated from sternum by depression, without cuspules, with eight bristles on anterior margin. Palpal coxae 0.62 long, 0.30 wide, without cuspules, with about five darkened regions at bases of scapular hairs. Chelicerae short, rounded, clothed with about 20 widely spaced bristles; promargin with six to eight teeth; fang long, curved, rising upwards apically.

Leg formula 4132. Legs glabrous but with erect bristles; femora I and II incrassate but otherwise without modifications. Spination (no spines on tarsi): leg I, femur d5, patella 0, tibia v5, metatarsus v4; leg II, femur d5, patella 0, tibia v6, metatarsus p1, v6; leg III, femur d5, p3, r3, patella p1, r1, tibia d2, p1, v4, r2, metatarsus p2, v4, r2; leg IV, femur d5, r1, patella p1, r1, tibia d3, p2, v3, r3, metatarsus p3, v4, r3. Paired tarsal claws with two rows, each of two to five teeth. Trichobothria as in *M. minuta*.

	I	II	III	IV	Palp
Femur	1.08	0.96	0.92	1.24	0.64
Patella	0.68	0.56	0.48	0.64	0.44
Tibia	0.72	0.56	0.60	0.84	0.52
Metatarsus	0.64	0.64	0.68	1.16	—
Tarsus	0.48	0.44	0.56	0.72	0.28
Total	3.60	3.16	3.24	4.60	1.88

Palp (fig. 45) with normal tibia and very short embolus; femur with four dorsal and one prolateral, tibia with four ventral, tarsus with one ventral and two apical spines.

Abdomen 1.56 long, 0.94 wide, glabrous but with erect bristles; posterior book-lungs widely separated, in anterior half of abdomen. Three-segmented posterior lateral spinnerets with basal, median, and apical segments 0.12, 0.06, 0.06 long, respectively.

FEMALE: Described by Caporacci (1955), who considered the holotype to be a juvenile. Comparison with other species indicates that it is probably an adult, but the

specimen is too fragile to dissect safely. It agrees with the males described above in the structure of the book-lung openings, cuticle, tarsal claws, serrula, tarsal organ, and trichobothrial bases. Since the males were collected in an area very close to the type locality, we have no hesitation in considering the specimens conspecific.

MATERIAL EXAMINED: The holotype, plus two males found with the syntypes of *Accola lucifuga* Simon, presumably taken with them at Colonia Tovar, Aragua, Venezuela, and housed in the Muséum National d'Histoire Naturelle. Colonia Tovar is at latitude 10° 25' N, longitude 67° 17' W; El Junquito is nearby at latitude 10° 28' N, longitude 67° 05' W.

***Pseudonemesia kochalkai*, new species**

Figures 6, 14, 16, 28, 32, 36, 40, 46–48, 54

TYPES: Male holotype and female paratype sifted from leaf litter at an elevation of 960 m. at San Pedro, Sierra Nevada de Santa Marta, Magdalena, Colombia (May 19, 1975; J. A. Kochalka), deposited in the American Museum of Natural History courtesy of Mr. Kochalka.

ETYMOLOGY: The specific name is a patronym in honor of the collector of the type specimens.

DIAGNOSIS: Males of *P. kochalkai* can be easily distinguished from those of *P. parva* by the large spine on tibia I (fig. 46), females by the presence of cuspules on the palpal coxae.

MALE: Total length, including chelicerae, 3.08. Carapace brown with irregular darker areas on median caput and interstitial ridges; underside of cephalothorax and legs lighter brown. Dorsum of abdomen dark brown with paler anterior areas covered with shiny scutum; venter white with irregular brown mottling laterally.

Carapace 1.50 long, 1.20 wide, sloping down on all sides from thoracic groove but less so anteriorly; glabrous except for several fine bristles in posterior striae and on cephalic margin, one pair of foveal bristles, and two bristles in front of eye group. Thoracic groove short, shallow, slightly re-curved line positioned as in *P. parva*.

Eight eyes on raised tubercle occupying almost two-thirds of front width. Ratio of eyes, anterior lateral: anterior median: posterior lateral: posterior median, 8:5:6:4. Anterior row slightly narrower than posterior row, procurved from above; medians separated by slightly more than their radius, slightly closer to laterals. Posterior row recurved, medians separated by twice their diameter, by their radius from laterals. Median ocular quadrangle wider than long (15/9), narrowed in front (15/11). Lateral eyes of each side separated by half their radius.

Sternum 0.78 long, 0.66 wide, domed, with few bristles at margins. Labium 0.08 long, 0.21 wide, anteriorly excavate, separated from sternum by depression, without cuspules, with about eight bristles anteriorly. Palpal coxae 0.44 long, 0.30 wide, with three cuspules on inner edge. Chelicerae clothed only with about 15 widely spaced bristles, promargin with seven teeth; fang as in *P. parva*.

Leg formula 4132. Legs glabrous but with erect scattered bristles; femora I and II incrassate; tibia I with very long incrassate spine at half its length, raised on apophysis distal of which segment is excavate with retrolateroventral thornlike spine (fig. 46). Spination (no spines on tarsi): leg I, femur d6, patella 0, tibia v2 (plus clasping spine), metatarsus v2; leg II, femur d5, patella p1, tibia v5, metatarsus v4; leg III, femur d3, p3, r3, patella p1, r1, tibia d1, p1, v6, r1, metatarsus d1, p1, v6, r2; leg IV, femur d4, r1, patella p1, r1, tibia d1, p2, v5, r2, metatarsus p4, v6, r3. Paired tarsal claws with two rows, each of five to six teeth. Trichobothria as in *M. minuta*.

	I	II	III	IV	Palp
Femur	1.06	1.00	0.84	1.23	0.60
Patella	0.70	0.56	0.46	0.64	0.45
Tibia	0.75	0.53	0.56	1.13	0.45
Metatarsus	0.68	0.59	0.84	1.25	—
Tarsus	<u>0.43</u>	<u>0.49</u>	<u>0.51</u>	<u>0.68</u>	<u>0.33</u>
Total	3.62	3.17	3.21	4.93	1.83

Palp (figs. 47, 48) with normal tibia, short, blunt embolus, and oval bulb situated subapically on tarsus; tibia with one dorsal and

one ventral, tarsus with one ventral and two apical spines.

Abdomen 1.34 long, 0.84 wide, glabrous but with erect bristles; posterior book-lung apertures very small, round, anterior pair obscured. Three-segmented posterior lateral spinnerets with basal, median, and apical segments 0.13, 0.10, 0.04 long, respectively.

FEMALE: As in male, except as noted. Total length, including chelicerae, 2.90. Carapace 1.34 long, 1.10 wide, with few bristles on posterior margin, row of short erect bristles from lateral of eyes to thoracic groove, two bristles on clypeal edge, and one recurved bristle between posterior median eyes. Thoracic groove straight. Ratio of eyes, anterior lateral: anterior median: posterior lateral: posterior median, 4:1:2:2. Anterior eye row straight from above, medians separated by twice their diameter, by their radius from laterals. Median ocular quadrangle wider than long (14/7), narrowed in front (14/10). Sternum 0.64 long, 0.69 wide. Labium 0.06 long, 0.25 wide. Palpal coxae 0.38 long, 0.31 wide, with three or four cuspules. Chelicerae clothed with 15-20 fine bristles, promargin with six teeth. Leg formula 4123, legs unmodified. Spination: leg I, femur d5, tibia v3, metatarsus v4; leg II, femur d6, patella 0, tibia v4, metatarsus v3; leg III, femur d4, p2, tibia d2, p1, v3, metatarsus d1, p2, v5, r2; leg IV, femur d5, tibia d1, p2, v5, r3, metatarsus p3, v6, r2; palp, femur d5, patella 0, tibia v5, tarsus p1. Paired tarsal claws with two rows, each of six teeth on legs I and II, three or four teeth on legs III and IV.

	I	II	III	IV	Palp
Femur	1.00	0.84	0.73	1.00	0.63
Patella	0.63	0.50	0.46	0.53	0.49
Tibia	0.63	0.50	0.48	0.80	0.45
Metatarsus	0.51	0.50	0.59	0.88	—
Tarsus	<u>0.38</u>	<u>0.41</u>	<u>0.40</u>	<u>0.48</u>	<u>0.44</u>
Total	3.15	2.75	2.66	3.69	2.01

Palp with claw bearing single row of six teeth. Abdomen 1.20 long, 0.64 wide, with low white mound and central bristle representing expected position of posterior median spinnerets; three-segmented posterior lateral spinnerets with basal, median, and

apical segments 0.18, 0.10, 0.04 long, respectively. Two bifid spermathecae (fig. 54).

MATERIAL EXAMINED: Three females and one juvenile taken with the type specimens.

LITERATURE CITED

- Bonnet, Pierre
1957. *Bibliographia araneorum*. Toulouse, vol. 2, pt. 3, pp. 1927-3026.
- Caporiacco, Lodovico D.
1955. Estudios sobre los arcnidos de Venezuela, 2. Araneae. *Acta Biol. Venezuelica*, vol. 1, pp. 265-448, figs. 1-83.
- Gertsch, Willis J., and Norman I. Platnick
1979. A revision of the spider family Mecicobothriidae (Araneae, Mygalomorphae). *Amer. Mus. Novitates*, no. 2687, pp. 1-32, figs. 1-91.
- Hewitt, John
1916. Descriptions of new South African spiders. *Ann. Transvaal Mus.*, vol. 5, pp. 180-213, figs. 1-11.
1925. Descriptions of some African Arachnida. *Rec. Albany Mus.*, vol. 3, pp. 277-299, figs. 1-3.
- Lawrence, Reginald F.
1938. A collection of spiders from Natal and Zululand. *Ann. Natal Mus.*, vol. 8, pp. 455-524, figs. 1-40.
- Platnick, Norman I.
1977. The hypochiloid spiders: A cladistic analysis, with notes on the Atypoidea (Arachnida, Araneae). *Amer. Mus. Novitates*, no. 2627, pp. 1-23, figs. 1-31.
- Raven, Robert J.
1980a. The Australian mygalomorph spider genus *Ixamatus* Simon (Dipluridae: Diplurinae) and its affinities. *Bull. British Arachnol. Soc.*, vol. 5, pp. 43-49, figs. 1-14.
1980b. The evolution and biogeography of the mygalomorph spider family Hexathelidae (Araneae, Chelicerata). *Jour. Arachnol.*, vol. 8, pp. 251-266, figs. 1-4.
- Roewer, Carl F.
1942. *Katalog der Araneae*. Bremen, vol. 1, 1040 pp.
- Schiapelli, Rita D., and Berta S. Gerschman de Pikelin
1967. La familia Pycnothelidae (Chamberlin, 1917) (Araneae—Mygalomorphae). *Segundas Jornadas Entomoepidemiologicas Argentinas*, vol. 1, pp. 45-64, figs. 1-33.
- Simon, Eugène
1892. *Histoire naturelle des Araignées*. Paris, vol. 1, pt. 1, pp. 1-256, figs. 1-215.
- Strand, Embrik
1932. *Miscellanea nomenclatoria zoologica et paleontologica*, III. *Folia Zool. Hydrobiol.*, vol. 4, pp. 133-147.

