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A revision of the African spiders of the family Microstigmatidae (Araneae: Mygalomorphae)

by

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ABSTRACT

The African Microstigmatidae, all *Microstigmata*, are revised. Predictions implicit in the familial cladogram of Platnick & Forster (1982) are tested and corroborated. Six species of *Microstigmata* are recognised, including *M. ukhahlamba* sp. n., *M. lawrencei* sp. n., and *M. amatola* sp. n., and a cladogram is proposed. Vicariant distributional patterns among sister-taxa are related to historical geographic barriers. A minimum age of late Miocene to early Pliocene is suggested for *Microstigmata* species.

INTRODUCTION

In 1916 John Hewitt described a remarkable mygalomorph spider from the moist bush near Grahamstown, South Africa. Of particular interest were the tiny, round openings to the book lungs, and he named the spider *Microstigma geophilum*. He recognised the uniqueness of this small, earth-encrusted spider, and tentatively placed it in the Dipluridae. While commenting on certain similarities to the diplurid group Brachytheleae and the South American family Paratropididae, Hewitt cited critical differences from these taxa and suggested that this species was a connecting link between the Dipluridae and Ctenizidae. Two more South African species were subsequently added to this genus by R. F. Lawrence. He placed *Microstigma* within his broad concept of the Aviculariidae.

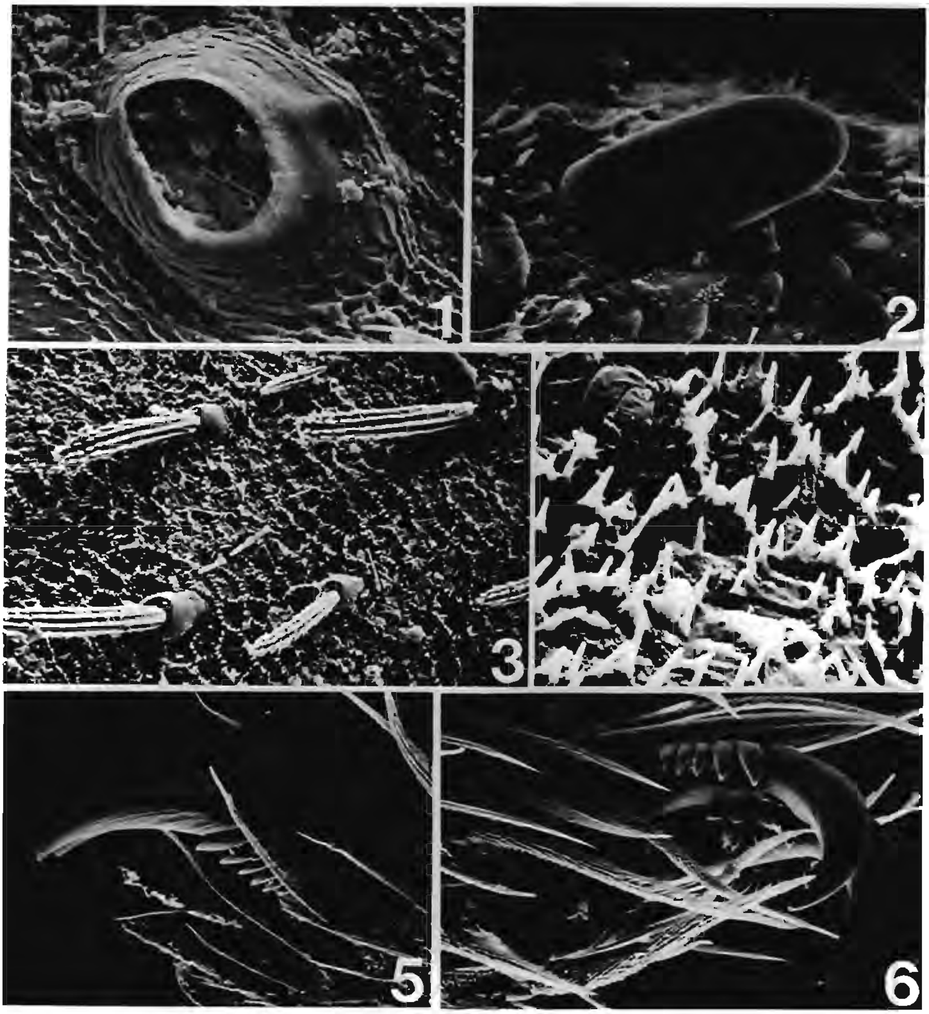
Recently (Raven & Platnick 1981; Platnick & Forster 1982), the taxonomic and biogeographic context of this genus was greatly widened with the discovery of three related genera from the American tropics and the proposal of the family Microstigmatidae to contain them. For the first time these spiders were examined with modern techniques, and a cladogram for the four genera of the Microstigmatidae was proposed.

The present study draws both upon the groundwork of those cited above and upon unstudied collections of Microstigmatidae from several South African museums. It has been possible to test the predictions implicit in the cladogram of Platnick & Forster (1982) for all known species of *Microstigmata*, and to add to our knowledge of the diversity and distribution of the African members of this unique family.

RELATIONSHIPS

The family Microstigmatidae *sensu* Platnick & Forster (1982) is characterised among the Mygalomorphae by two presumably synapomorphic characters: small, oval spiracles (Fig. 1) and the scaly cuticle (Fig. 3). The phylogeny proposed by

Platnick & Forster divides the family into two subfamilies, the monotypic Micromygalinae and the Microstigmatinae. The former includes the remarkable *Micromygale diblemma* Platnick & Forster, 1982, a tiny, two-eyed, lungless denizen of the litter layer of Panamanian montane forests. While highly specialised, it also retains the plesiomorphic states of several characters crucial to the proposed phylogeny, including a flattened tarsal organ with concentric ridges (Platnick & Forster 1982, Fig. 7) similar to that found in the Mecicobothriidae, Hexathelidae, and Dipluridae, tarsal claws with a single row of ventral teeth, and retention of three pairs of spinnerets and a palpal conductor in the male. The second subfamily, Microstigmatinae, includes the genera *Pseudonemesia* Caporiacco, *Ministigmata*

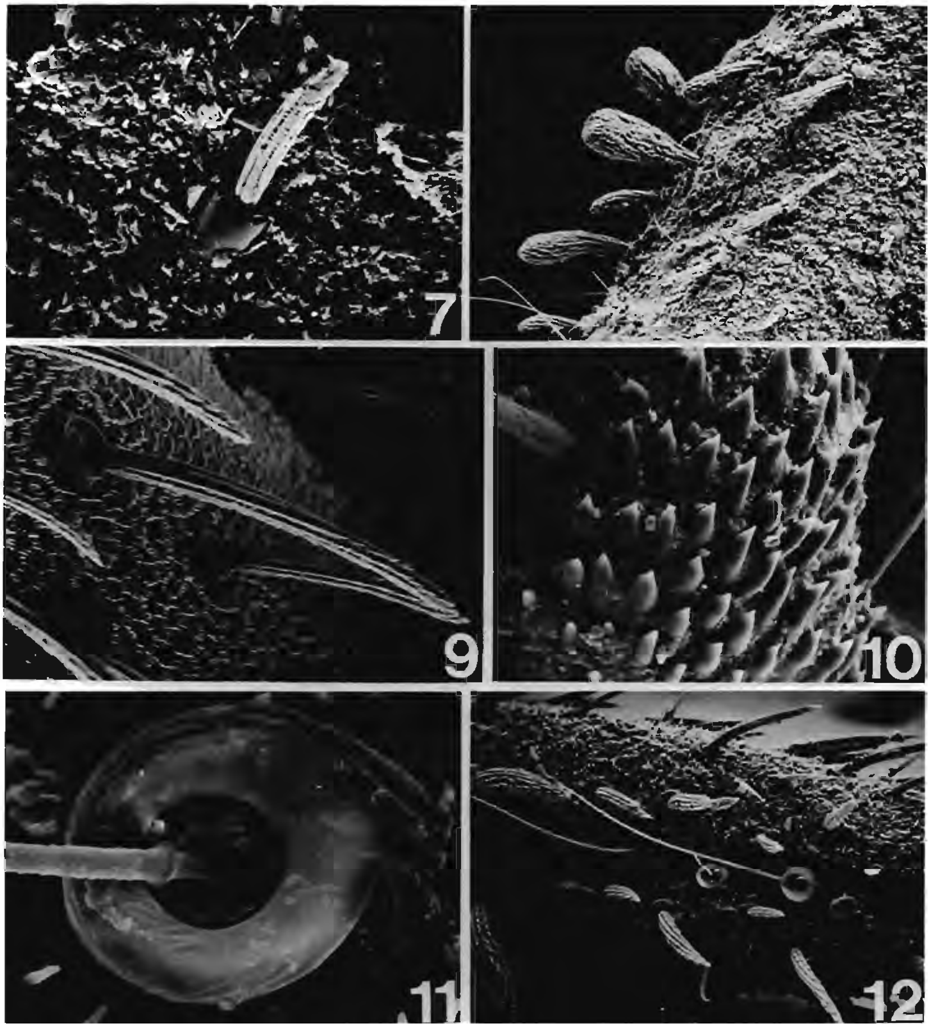


Figs 1–6. *Microstigmata* spp., females. 1, 2. *M. geophilum* (Hewitt). 3, 5, 6. *M. longipes* (Lawrence). 4. *M. amatola* sp. n. 1. Book-lung spiracle, anterior. 2. Tarsal organ, leg I. 3. Tibia I, scaly cuticle and blunt-tipped setae. 4. Leg I, cuticular scales with pustules. 5. Leg I, claws, lateral. 6. Leg I, claws, oblique ventral.

Raven & Platnick, and *Microstigmata* Strand, and is based upon the following presumed synapomorphies: tarsal organ protruding above the dorsal surface of the tarsus (Fig. 2, and Raven & Platnick 1981, Figs 30, 31), two rows of dorsolaterally originating teeth on the tarsal claws (Figs 5, 6), and the loss of the anterior lateral spinnerets and palpal conductor. The subfamily Microstigmatinae is divided into two tribes, the Pseudonemesiini and Microstigmatini. The former includes the genus *Pseudonemesia* Caporiacco with 2 species known from northern South America, and is characterised by the elevated pars cephalica (Raven & Platnick 1981, Fig. 51) and a distinct type of maxillary serrula (Raven & Platnick 1981, Figs 27, 28). The Microstigmatini includes the monotypic *Ministigmata* from Brazil and the exclusively African *Microstigmata*. The tribe is founded upon two synapomorphies: the loss of concentric ridges at the base of the tarsal organ (Fig. 2, and Raven & Platnick 1981, Figs 30, 34) and the presence of 'digitiform pustules' along the margins of cuticular scales (Fig. 4, and Raven & Platnick 1981, Figs 7, 8). In the context of the Microstigmatidae, the exclusive presence in these two genera of erect clavate bristles (Figs 3, 7–9), and the apical position of the clasping spine on tibia I of the male (Figs 27, 39, 51, 57, 63) (absent in *Micromygale*, mid-ventral in *Pseudonemesia*) may constitute two additional synapomorphies for the Microstigmatini. Finally *Microstigmata* is characterised by the habit of encrusting the body with bits of dirt and debris (Fig. 7), a habit found in many distantly related groups of spiders but otherwise found among mygalomorphs only in the Paratropididae.

In the context of the family the presence of labial cuspules deserves comment. Raven (1980:257) considered that a dense group of labial cuspules is apomorphic where occurring in the Migidae, Barychelidae plus Theraphosidae, and Hexathelidae. Within the Microstigmatidae labial cuspules occur only in *Microstigmata*, and are found in all species though rarely absent in individuals. It is suggested that the presence of labial cuspules is a second synapomorphy supporting the monophyly of *Microstigmata*.

A cladogram contains implicit predictions that character states considered synapomorphic for a taxon at a given level of inclusivity are true for all subordinate levels of inclusivity and will be found in all subsequently discovered members of that taxon. Raven & Platnick (1981) and Platnick & Forster (1982) used *M. longipes* to serve as an exemplar for the genus, and examination of the six known *Microstigmata* species has revealed that character states implied by synapomorphies for the familial, subfamilial, and tribal levels of inclusivity are true in all cases. The cladogram is not contradicted by new data for *Microstigmata*, and is accepted as the basis for out-group comparison for cladistic analysis within the genus. Out-group comparison for *Microstigmata* is complicated in that the sister groups are tiny mygalomorphs, and the genus standing in the most plesiomorphic position in the family, *Micromygale*, is among the smallest of spiders. It is a frequently recognised phenomenon that with a reduction in size there is a reduction in number, or outright loss, of structures. This is exemplified by the absence in *Micromygale* of spines on the legs, tarsal trichobothria, and book-lungs. These are generally present in mygalomorphs and are certainly independent losses in this genus. In cladistic analyses in this family there is always the danger that character



Figs 7–12. *Microstigmata* spp., females. 7, 8, 12. *M. zuluense* (Lawrence). 9. *M. longipes* (Lawrence). 10. *M. amatola*, sp. n. 11. *M. geophilum* (Hewitt). 7. Tibia I, cuticle and blunt-tipped setae. 8. Tibia I, cuticle and bulbous setae. 9. Tibia I, cuticle and blunt-tipped setae. 10. Serrula. 11. Tibia I, trichobothrial base. 12. Dorsum of tarsus I.

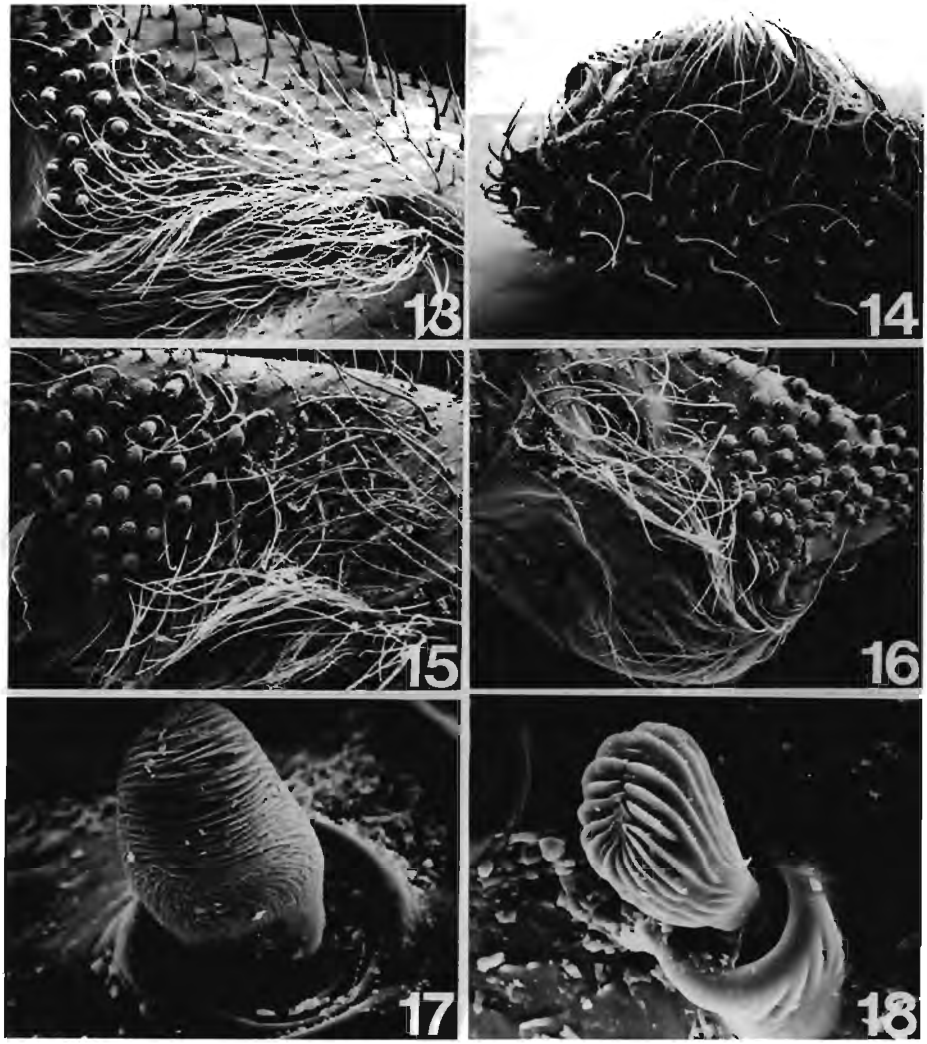
states of a greater level of generality, and therefore interpreted as relatively plesiomorphic, may instead result from independent reduction associated with small size. Bearing these pitfalls in mind, a cladogram supported by four non-conflicting characters is proposed (Fig. 19).

Characters 1 and 2 refer to the origin of the incrassate clasping spine at the prolateroventral apex of tibiae I in the male. Sessile spines occur in both *Ministigmata* (Raven & Platnick 1981, Figs 41, 42) and *Microstigmata* (*M. longipes*, Fig. 25), and this state of more general occurrence is considered plesiomorphic. In males of the remaining species of *Microstigmata* the spine is situated on a cuticular apophysis (Figs 40, 52, 58, 64) and this is considered synapomorphic for clade A. Character 2 refers to a prolongation of this apophysis to a length similar to that of the spine (Figs 52, 58, 64), and is synapomorphic for clade B. The male of *M. lawrencei* sp. n. is unknown, but it is predicted that when discovered it will be found to have the tibial clasping spine situated on an elongate apophysis.

Character 3 refers to the distribution of teeth on the promargin of the cheliceral fang furrow. Most general in distribution is the configuration of several widely spaced, more or less equally developed teeth, occurring in *Micromygale*, *Pseudonemesia*, *Ministigmata*, and *Microstigmata zuluense* (Lawrence) (Fig. 41) and *ukhahlamba* sp. n. (Fig. 53). In *M. geophilum* (Hewitt), *amatola* sp. n. and *lawrencei* sp. n., the several large promarginal teeth are separated by small, intercalary denticles (Figs 65, 59, 29), and this is considered synapomorphic for clade C. Juveniles of *geophilum* have only the larger teeth, with the intercalary teeth appearing in the adult. This may be interpreted as ontogenetic support for cladistic reasoning through parsimony, but in reality the application of ontogeny to the proposal of polarity hypotheses is parsimony in another guise. In this case widely spaced teeth are more general in distribution (all stages of *M. ukhahlamba* and juveniles of at least *geophilum*, and probably *amatola* and *lawrencei* as well), while the presence of intercalary teeth is less general (adults of *geophilum*, *amatola* and *lawrencei*). The configuration of 10–13 closely spaced, even teeth found in *M. longipes* (Fig. 26) is unique in the family and considered autapomorphic for this species.

Character 4 refers to the distribution of capsules on the pedipalpal coxa, or maxilla. Maxillary cuspules are present in all microstigmatid genera except *Micromygale*. Raven (1980:257) considers maxillary cuspules synapomorphic for the Mygalomorphae, and their absence a subsequent reversal. This is certainly the case in *Micromygale* and in *Pseudonemesia parva* as well. In the remaining genera there occurs a configuration of a few to several cuspules in a group along the inner proximal edge of the segment. In *M. ukhahlamba* and *zuluense* (Fig. 14) there are 5–12 cuspules in this group, and although there may be 10–30 in *longipes*, these are still clustered near the inner proximal margin (Fig. 13). The configuration of an inner, proximal cluster of cuspules is considered plesiomorphic. In *M. amatola*, *geophilum* and *lawrencei* in excess of 30 cuspules (as many as 80) are scattered across the proximal one-third to one-half of the maxilla (Figs 15, 16) and this broad distribution of cuspules is considered synapomorphic for clade C. The trichotomy for clade C is unresolved by any known synapomorphy, but it is worthy of note that *amatola* and *geophilum* are more similar in the form of female genitalia and distribution of maxillary cuspules.

Two other phylogenetically ambiguous characters are worthy of comment. Maxillary cuspules in members of clade C have deep grooves (Fig. 18), while those of *zuluense* and *longipes* have many fine, shallow grooves (Fig. 17). The fine structure of maxillary cuspules in the other microstigmatid genera has not yet been examined, but it is possible that deeply grooved cuspules may be synapomorphic for the clade containing *geophilum*, *amatola* and *lawrencei*. The internal genitalia of the female are certainly homoplasious as well as variable within species and even individuals. An unbranched spermatheca is most general in distribution, occurring



Figs 13–18. *Microstigmata* spp., females. 13, 17. *M. longipes* (Lawrence). 14. *M. zuluense* (Lawrence). 15. *M. amatola*, sp. n. 16, 18. *M. geophilum* (Hewitt). 13–15. Pedipalpal coxae, ventral. 16. Pedipalpal coxa, oblique ventral. 17, 18. Cuspules.

in *Micromygale* (Platnick & Forster 1982, Fig. 26), *Ministigmata* (Raven & Platnick 1981, Fig. 53) and *Microstigmata lawrencei* (Fig. 35), and might therefore be considered plesiomorphic. Parallel derivation of branched spermathecae would minimally be required twice, in *Pseudonemesia* (Raven & Platnick 1981, Fig. 54) and in *Microstigmata*, though the cladogram proposed (Fig. 19) would require independent derivations within *Microstigmata* (for *longipes*, *zuluense*, *ukhahlamba* and *geophilum* plus *amatola*). On the other hand, assuming that the hypothetical ancestor of the family had branched spermathecae, at least three derivations of unbranched spermathecae in the ancestors of *Micromygale*, *Ministigmata* and

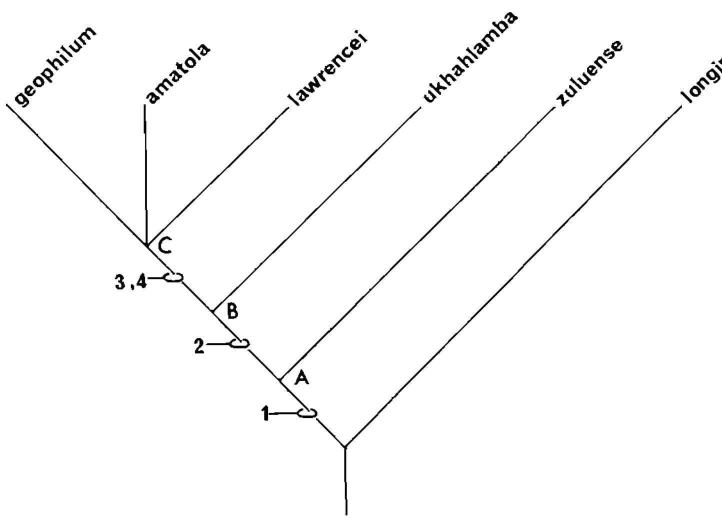
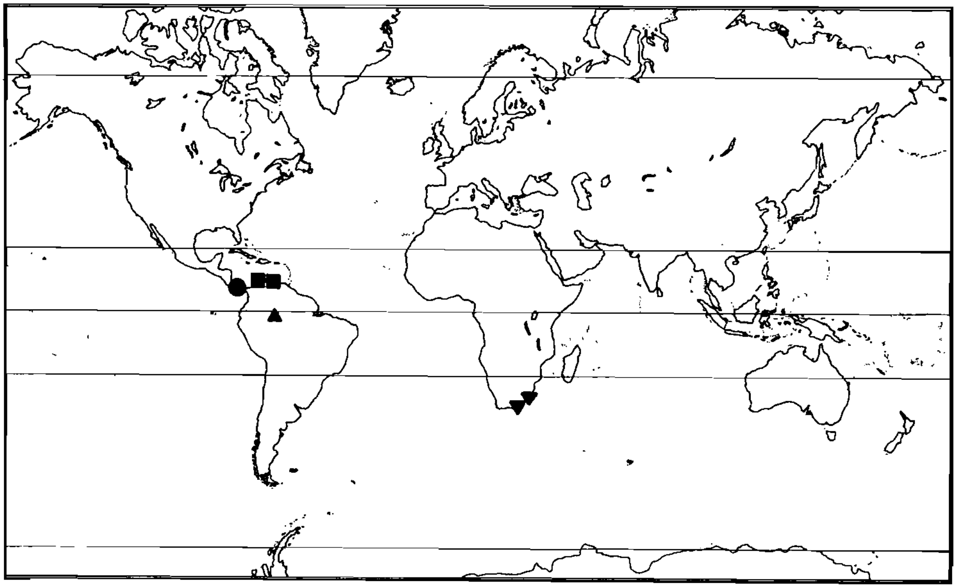


Fig. 19. Cladogram for *Microstigmata* species.

Microstigmata lawrencei are required. Considering the degree of homoplasy and variability (individuals of *longipes* may have both a branched and unbranched spermatheca, Fig. 35) no phylogenetic decision is made. The spermathecae of *geophilum* (Fig. 42) and *amatola* (Fig. 44), are similar in having a long outer trunk and a short inner kink or diverticulum, and those of *ukhahlamba* (Fig. 47) and *zuluense* (Figs 43, 45) are similar in having the inner branch longer than the outer.

BIOGEOGRAPHY OF *MICROSTIGMATA*

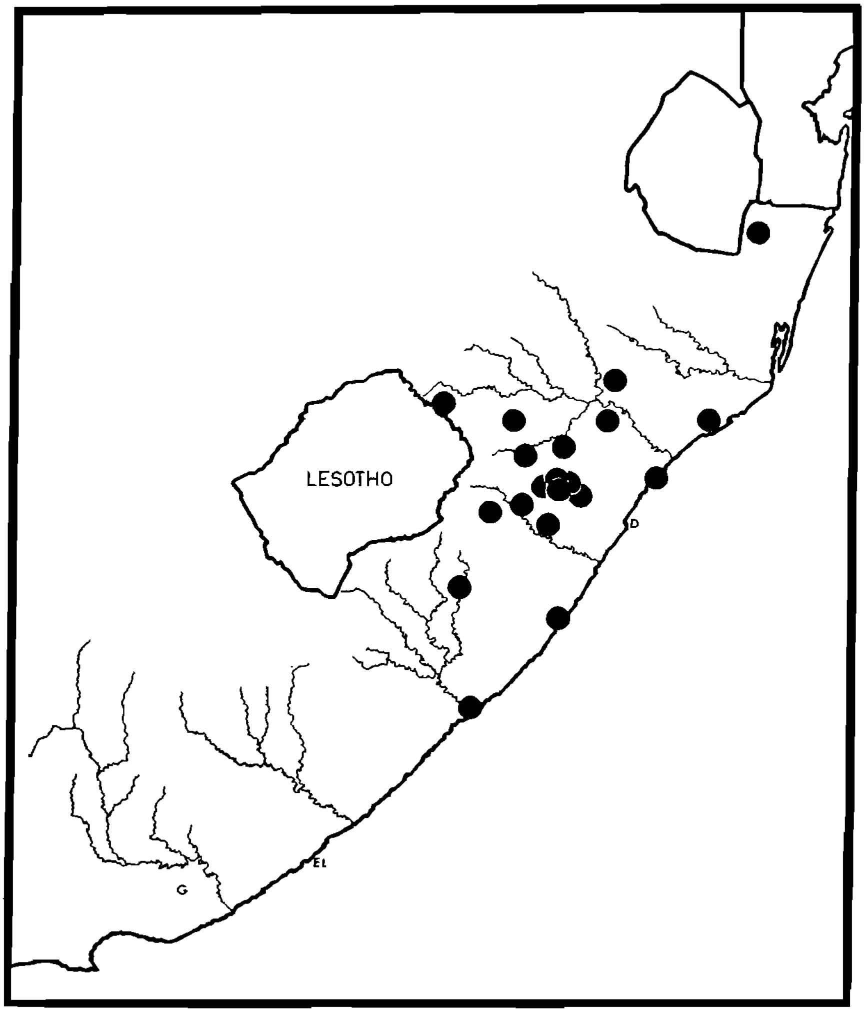
The known distribution of *Microstigmata* is confined to eastern South Africa from near the border of Mozambique at 27°S to the Grahamstown region of the eastern Cape at 33°S, and extends from sea-level at the coast to elevations of 1 500 m on the Drakensberg escarpment (Maps 2, 3). Except for the southernmost portion, which occasionally receives rain from South Atlantic cyclonic storms in the winter, the entire area lies in the exclusively summer rainfall region and is among the wettest regions of southern Africa. It appears that these spiders are restricted by conditions of high humidity and relatively even temperature as are found in the understory and litter layer of indigenous forest and closed-canopy bush. The present distribution of such habitats is a patchy one related to such natural factors as aspect, exposure to drying winds and fire, rainfall and mist, and to such man-made catastrophies as grazing and cultivation, burning and urbanisation. It is likely that the distribution of populations reflects the patchiness of suitable habitats. The distributions of the species are: *longipes* is the most widespread species (Map 2), ranging from the Gwaliweni Forest in the Lebombo Mountains at 27°23′S to the coastal bush at Umzimvubu (Port St Johns) at 31°37′S, and it occurs widely through Zululand, Natal and the Transkei from the coast to the Drakensberg escarpment; *zuluense* (Map 3) is recorded from coastal localities at St Lucia (18°22′S) and Umzimvubu (Port St Johns) (31°37′S), and presumably has a continuous



Map 1. World distribution of Microstigmatidae: *Micromygale* ●; *Pseudonemesia* ■; *Ministigmata* ▲; *Microstigmata* ▼.

distribution in coastal bush between these sites; the types were taken more than 70 km inland at over 1 500 m elevation in the Nkandla Forest; *ukhahlamba* (Map 3) is known only from the Drakensberg escarpment forests in the vicinity of Cathedral Peak; *lawrencei* (Map 3) is known from two widely separated localities in the midlands of the Transkei and southern Natal and is presumed widespread at least between the Bashee and Mkomazi Rivers; *amatola* (Map 3) is endemic to the Amatola and Kologha Mountains isolated by the valleys of the Great Kei River on the north and the Great Fish River in the south, and finally *geophilum* (Map 3) occurs in the Albany district of the eastern Cape bounded on the east by the Great Fish River valley and on the west by the arid Uitenhage valley.

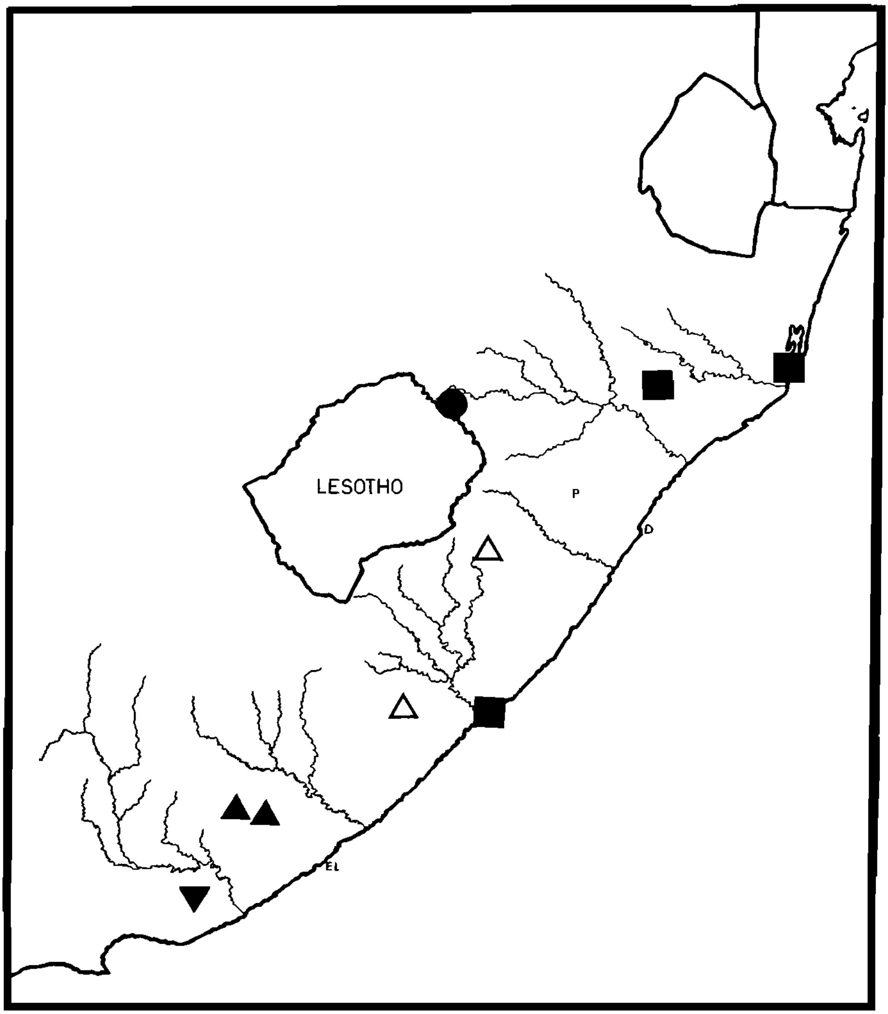
Any causal explanation for biogeographic patterns contains implicit assumptions about the mechanisms of diversification and dispersal. Here an attempt is made to interpret the pattern in the context of vicariance biogeography (Croizat, Nelson & Rosen 1974, Nelson & Platnick 1980), and implicit assumptions are that diversity is generated through the action of barriers fragmenting formerly continuous ranges, and that the relatively greater age of such vicariance events is reflected in increasing inclusivity of the sister-group relationships on the proposed cladogram (Fig. 19). The contribution of dispersal toward the present pattern is likely to have been significant considering the climatic vicissitudes and vegetational shifts that have occurred in southern Africa during the later Tertiary (Axelrod & Raven 1978) and Quaternary (Van Zinderen Bakker 1978), but it is difficult to develop testable hypotheses concerning this factor in biogeography. In the present case the recognised contribution of dispersal is minimal and is considered to be the cause of the broad sympatry between species, especially that of *longipes* with *zuluense*, *ukhahlamba* and *lawrencei*. Three vicariant events of increasing age are implied for



Map 2. Map of eastern South Africa, Lesotho, Swaziland and southern Mozambique, with distribution of *Microstigmata longipes* (Lawrence).

the allopatric taxa by the cladogram (Fig. 19 and Map 3): *(a)* the separation of the three members of clade C (*lawrencei*, *amatola* and *geophilum*), *(b)* separation of the common ancestor of clade C from that of *ukhahlamba*, and *(c)* separation of the common ancestor of clade B (*ukhahlamba*, *lawrencei*, *amatola* and *geophilum*) from that of *zuluense*.

With this in mind it is useful to review the recent geomorphological and vegetational history of eastern South Africa. Subsequent to the breakup of Gondwanaland, the eastern part of southern Africa underwent a period of gradual erosion known as the 'Moorland Cycle', which lasted nearly 80 m.y. By Miocene times much of eastern South Africa was a nearly featureless peneplain across which meandered slow-flowing rivers. Beginning near the end of the Miocene and



Map 3. Map of eastern South Africa, Lesotho, Swaziland and southern Mozambique, with distributions of *Microstigmata* spp.: *M. zuluense* (Lawrence) ■; *M. ukhahlamba*, sp. n. ●; *M. lawrencei*, sp. n. △; *M. amatola*, sp. n. ▲; *M. geophilum* (Hewitt) ▼.

continuing with intermissions to the present day a series of uplifts raised the escarpment more than 1 000 m, and rejuvenated the eastward flowing rivers, which cut deep valleys and gorges (King 1982). It is likely that the Amatola range, built of hard crystalline rocks, has been isolated since this time by the deep erosion of the Great Kei and Great Fish Rivers in soft Ecca shales. During Pliocene times a major marine incursion occurred in which the ocean may have extended to 300 m above present level in the Uitenhage basin, effectively isolating the Cape Fold mountains of the eastern Cape from those to the west (King 1972). The Uitenhage basin is today very dry (receiving less than 50 cm rainfall per year) and remains a barrier to forest forms. It appears that deep river valleys may have acted as effective barriers since Miocene/Pliocene times. The vegetational history of this region, particularly that of forest, is neither so simple nor well understood. The eastern Cape Fold mountains of the Albany district and Amatola range appear to have been long isolated by arid vegetation in the valleys of the Great Fish and Great Kei Rivers, and similar vegetation may have occupied the valleys of the Mzimvubu, Mkomazi, Mgeni, Tugela, and other later Tertiary Rivers to the north. Today these areas host valley bushveld vegetation (Acocks 1975). The question of former forest connections in the area north of the Great Kei River has given rise to conflicting opinions. Cooke (1972), presuming an increase in precipitation of 140–150% during the pluvial periods coordinate with glaciation, mapped extensive forest coverage extending from the Transkei into the southern Transvaal. He considered that the forest patches on the eastern Cape fold mountains were isolated even under these conditions. Van Zinderen Bakker (1976) considered that evergreen forest formations may have occupied much greater areas during those periods preceding and following glacial maxima, and lowland and montane forests may have merged in Natal, though he cautioned (Van Zinderen Bakker 1978) that not enough was known about the implications of former climatic changes or vegetation types to reconstruct detailed vegetation patterns. Acocks (1975) projected that much of the Transkei and Natal were covered with scrub forest as recently as late prehistoric times, and that high forest, while still patchy in distribution, covered a much greater area than at present. However, Stuckenberg (1969) felt that forests exhibited a patchy distribution throughout the Pleistocene and that the area occupied may have been reduced during the coldest periods because forests are particularly susceptible to depression in mean annual temperature through the effects of physiological drought in exposed windy sites. He suggested that forests were eliminated above 1 000 m in the Drakensberg during glacial maxima, while at lower elevations they were distributed in sheltered sites much as today. Moving backward in time from the Quaternary the evidence is scanty and the picture still less clear. Axelrod & Raven (1978) suggest a more general distribution of forest in southern Africa through the mid-Tertiary which became increasingly fragmented and reduced by the uplift, erosion and increase in aridity through Miocene/Pliocene times. Although the evidence is unclear with respect to possible connections among the forest patches in the Transkei and Natal during Quaternary times, it is likely that forest may have had a general distribution through this area during later Tertiary times, and that the distribution of *Microstigmata* in southern Africa may date from then.

The geological and vegetational history outlined above is clearly relevant to the diversification of clade C (*lawrencei*, *amatola* and *geophilum*), though the effective age of the barriers, and by implication the species themselves, is uncertain. Today these species are separated by the deep valleys of the Great Fish and Great Kei Rivers filled with dry valley bushveld vegetation, and the distribution is bounded on the southwest by the very arid Uitenhage basin. A maximum age of late-Miocene/lower Pleiocene is possible for this pattern of vicariance and this implies in turn that relationships to *ukhahlamba* and more inclusive sister-groups may be of even greater age. No obvious barrier separates the distribution of clade C and *ukhahlamba*. The deep (300 m) gorge of the Mkomazi River borders the northern end of the known range of *lawrencei*, but this feature is no more profound than the Mzimvubu drainage in the centre of this species' range, and probably no more effective as a barrier. Between the distributions of clade B (*ukhahlamba*, *lawrencei*, *amatola* and *geophilum*) and *zuluense* no barrier is apparent, though it is tempting to consider the former as a primitively cool-adapted group and the latter as warm-adapted. In this context it is of interest to note that the distribution of *zuluense* falls largely above the 16 °C effective temperature isoline (Stuckenberg 1969) while that of the former clade lies largely below the 15 °C isoline. It is likely that the extensive coastal distribution of *zuluense* is related to a continuous belt of coastal forest which has been fragmented by agriculture and urban development in relatively recent times. The absence of obvious barriers between allopatric vicariant pairs is a disturbing, but not necessarily fatal aspect of this hypothesis. Given the possible great age (Miocene or earlier) for the hypothetical vicariant events implied by the distribution of clade C it is possible that these events occurred on a map much different from that of today, and that former barriers may no longer be recognisable. Finally, *longipes* is a widespread species and as such provides little information relevant to vicariance biogeography (Nelson & Platnick 1978). It is sympatric wholly or in part with three species (*zuluense*, *ukhahlamba* and *lawrencei*) and is likely to have attained this sympatry through dispersal though the nature and age of this dispersal is unknown.

Is this pattern a general one? As with cladograms, biogeographic hypotheses are open to testing and refutation through the weight of new data and better informed interpretation. The phylogenetic relationships among arthropods of the southern African cryptic fauna are little studied, and few data are at present available to test this hypothesis. But as more systematic work is completed among these key groups data will accumulate which should enable one to judge if the above pattern is erroneous, spurious, or indicative of underlying biotic history.

Is there more to the biogeographic picture of *Microstigmata*? The cryptic fauna of the soil and litter of moist forests is among the richest but least known ecosystems, and the distributions of such groups are likely to be more extensive than can currently be documented. By examining the known distribution of *Microstigmata* in the context of recognised biogeographic patterns of which the range of this genus forms a portion it may be possible to predict where related taxa may be discovered. Such an examination is based upon both positive and negative evidence: (1) the distribution of the family involves disjunction between Africa and South America (Map 1) suggesting an ancient relictual pattern; (2) the American representatives of the family are tropical; (3) within southern Africa *Microstigmata* occurs in both warm, near-tropical climates (2 species) and cool, temperate climates (5 species); (4) in spite of collections, *Microstigmata* is not recorded from the Cape region west of Algoa Bay; (5) the Microstigmatidae are not known from the continents of the northern hemisphere, North America or Eurasia, and (6) except for southern Africa, the family is not known from the temperate parts of southern lands: South America, Australia, Tasmania, or New Zealand (although the cryptic faunas of the three former areas are imperfectly known, the absence of the Microstigmatidae from New Zealand is telling as the arachnid fauna of this region has been relatively well collected [Forster & Wilton 1968]).

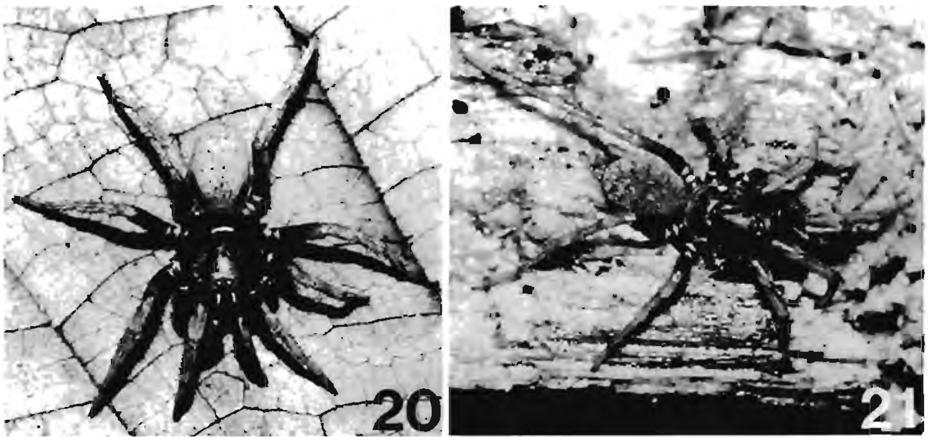
Southern Africa is biogeographically perhaps the most complex region of Africa, and the biotic affinities of this region are many and complex. There are two recognised patterns in which the cool, wet, eastern region figures prominently, the 'palaeogene' and 'afromontane' biotas. The former has been reviewed by Stuckenberg (1962). Important features of this pattern are *(a)* the presence of elements especially in the Cape fold mountains, frequently the eastern highlands as far north as the Transvaal Drakensberg, and occasionally the mountains of the Zimbabwe-Mozambique border; *(b)* significant restriction of elements to elevations above 1 500 m in Natal, and *(c)* transcontinental disjunctions involving temperate South America and/or temperate regions of Australasia including Tasmania and New Zealand. Many invertebrate groups exhibit this pattern (for examples see Stuckenberg 1962 and Brundin 1967). The second pattern, or afromontane, has been recognised for forest trees (White 1978), birds (Moreau 1966), butterflies (Carcasson 1964) and certain Diptera (Feijen 1983). It is characterised by striking biotic homogeneity over an archipelago-like array of montane forest patches scattered over eastern Africa with outliers in equatorial west Africa as well. The situation presented by this biota in South Africa is complex, for it is only in this area that afromontane elements descend to sea-level or intermix to a significant degree with tropical lowland taxa. The southern African region of this biota is characterised by its poverty (Carcasson 1964, Moreau 1966) and its uniqueness (White 1978, Feijen 1983).

The presence of *Microstigmata* in subtropical parts of Zululand, and the absence of the genus from the western Cape fold belt and especially of its relatives from temperate regions of the southern hemisphere suggest that *Microstigmata* is not an element of the palaeogene biota. On the other hand, certain points are consistent with an interpretation as an element of the afromontane biota. The greater proportion of the species are known from cool, montane forests, and the only clearly warmth-loving species *(zuluense)* comes from a region noted for mixture of afromontane and tropical elements. It has been noted (White 1978) that a high proportion of afromontane elements have their nearest relatives in the tropical lowlands: while no members of this family are known from tropical Africa, the occurrence of the sister-group of *Microstigmata* in the lowland tropics of Brazil is not inconsistent with this point. It is reasonable to expect a rich fauna of Microstigmatidae awaiting discovery in tropical Africa, at least in the areas of montane forest.

NATURAL HISTORY

Spiders of the genus *Microstigmata* appear to be characteristic members of the forest cryptofauna and may be restricted to habitats offering constant high humidity and even temperature (Lawrence 1953). Though widely distributed they are rarely collected. These spiders have been collected in forest and moist bush by turning stones and logs and sifting or Berlese sampling leaf-litter and humus. At the Karkloof Forest in the Natal mistbelt individuals of *Microstigmata longipes* were found by splitting open very damp, rotting logs (Figs 20, 21).

The spiders are not known to construct burrows or retreats and appear to make minimal use of silk. Spiders were never found with webs in the field, nor did captive



Figs 20, 21. *Microstigmata longipes* (Lawrence), females, Karkloof Forest, Natal, South Africa (photos by T. Meikle Griswold). 20. On fallen leaf. 21. In situ in wet, rotting log.

individuals spin any sort of web. Captive individuals readily attacked and fed upon small insects.

Little is known of the phenology of *Microstigmata* populations. Collections indicate that during the summer months many developmental stages, from adults of both sexes to young juveniles coexist. Adult males of *Microstigmata longipes* have been collected during the dry season and winter, from May to October, whereas adult females have been taken at all times of the year. A female of this species was collected with an eggsac at Karkloof Forest in January. The sac was held in the chelicerae and apparently eaten during captivity. As is typical in mygalomorphs, females of this species continue to moult after reaching maturity, and may be perennial. Adults of both sexes of the other species were taken during the summer wet season, from November to March.

MATERIALS AND METHODS

All measurements are in millimetres. Measurements of the diameters of the median eyes were made from above, those of the lateral eyes were made from the side. The following abbreviations are used for ocular region measurements: AM—anterior median eyes, AL—anterior lateral eyes, PM—posterior median eyes, PL—posterior lateral eyes, OQA—anterior width of median ocular quadrangle, OQP—posterior width of median ocular quadrangle, and OQL—length of ocular quadrangle. Leg segments were measured in a straight line between the most dorsal point of the proximal and distal margins. Except where noted, measurements are expressed as mean (minimum–maximum) for three individuals. Spination patterns are recorded from an individual according to the following conventions: v—ventral, a—anterolateral, d—dorsal, and r—retrolateral; spine positions are reported from distal to proximal, unpaired spines are listed 1, pairs or transverse series of three spines are listed as 2 or 3. Body setae are classed as follows: attenuate—tapering to tip; blunt-tipped—cylindrical with the tip as wide as base, and clavate bulbous—with the maximum diameter at least twice that of the base. Spermathecae were dissected out with fine needles, cleared for 10–16 hours in warm 10 % KOH, and temporarily mounted in glycerine for examination with a Zeiss compound microscope. Illustrations were made with the aid of a camera lucida (drawing tube) on a Wild stereomicroscope and Zeiss compound microscope.

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The remainder of the specimens are from the collection of the Natal Museum, Pietermaritzburg (NM).

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TAXONOMY

Microstigmata Strand

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

Microstigmata Strand, 1932:142 (*nomen novum* for *Microstigma* Hewitt, preoccupied in the Odonata by *Microstigma* Rambus, 1842). Roewer, 1942:194. Raven & Platnick, 1981:15.

Diagnosis: *Microstigmata* is a member of the tribe Microstigmatini, characterised by digitiform pustules along the margins of cuticular scales (Figs 3, 4), smooth trichobothrial bases (Fig. 11) and the absence of concentric ridges surrounding the base of the tarsal organ (Fig. 2). It may be distinguished from *Ministigmata* by the presence of labial cuspules and two pairs of spinnerets, by the habit of encrusting the cuticle with detritus, and by the absence of whorled setae at the base of the tarsal claws.

Description: Small mygalomorph spiders, total length 4,5 to 12,5 mm. Body glabrous but with attenuate, blunt-tipped, or clavate setae. Cuticle scaly with digitiform pustules. Eight eyes closely grouped on low tubercle. Thoracic fovea straight to slightly recurved, depressed. Chelicerae with 6 to 13 teeth along promargin of fang furrow, denticles present on retromargin, rastellum absent. Fang long, slender, margins smooth. Pedipalpal coxae rectangular, inner edge slightly concave, with cuspules. Serrula of overlapping, triangular teeth (Fig. 10). Labium domed, at least twice as wide as long, apparently fused to sternum, usually with cuspules. Sternum oval to nearly round, with sigilla small, round, faintly marked, one to three pairs visible. Legs with spines. Tarsal organ protruding, cylindrical, cuticle surrounding base without concentric ridges. Trichobothria in single, irregular rows on dorsa of tarsi (Fig. 12) and metatarsi, in two dorsal rows in middle of tibiae; bases smooth, overlapping ridges absent. Tarsal scopulae weakly developed or absent. Three claws, superior with 2 rows of 4–7 dorsolaterally originating teeth, whorled setae absent. Abdomen with erect, blunt-tipped bristles at least at apex. Spermathecae simple or branched, chitinous walls with numerous pores. Male tibiae I with prolateroventral spine at apex. Male palpus with stout spines on tarsus, bulb pyriform, conductor absent.

Distribution: Known only from the eastern portion of South Africa.

Key to species of *Microstigmata*

1 Males 2

— Females 6

2(1) Apical apophysis on tibia I equal to or greater than length of clasping spine (Figs 52, 58, 64) 3

— Apical apophysis on tibia I much shorter than clasping spine, or absent (Figs 25, 40) 5

3(2) Pedipalpal coxa with fewer than 15 cuspules in group near margin with labium; promargin of cheliceral fang furrow with fewer than 8 widely spaced teeth (Fig. 53) .... **ukhahlamba**

— Pedipalpal coxa with more than 25 cuspules spread nearly across proximal margin of segment (Figs 15, 16); promargin of cheliceral fang furrow with 10 or more teeth, usually mixed large and small (Figs 59, 65) 4

4(3) Embolus sharply bent (Figs 60–62); length of palpal tibia less than 1,8 times width .... **geophilum**

— Embolus short, slender (Figs 54–56); length of palpal tibia greater than 1,9 times width .... **amatola**

5(2) Promargin of cheliceral fang furrow with 10 or more even, closely spaced teeth (Fig. 26); embolus long, slender (Fig. 22); length of pedipalpal tibia greater than 2,2 times width .... **longipes**

— Promargin of cheliceral fang furrow with 7 or fewer widely spaced teeth (Fig. 41); embolus short, slender (Fig. 36); length of pedipalpal tibia less than 2 times width .... **zuluense**

6(1) Promargin of cheliceral fang furrow with mixed large and small teeth (Figs 29, 59, 65); pedipalpal coxa with 30 or more cuspules spread across proximal surface (Figs 15, 16); sclerotised portion of genitalia visible through epigynal cuticle; spermathecal duct long, unbranched or with small mesal diverticulum at mid-length 7

— Promargin of cheliceral fang furrow with series of teeth of about equal size, close or widely spaced; pedipalpal coxae with fewer than 30 cuspules in cluster on proximal margin near labium (Figs 13, 14); genitalia not visible through epigynal cuticle; spermathecal duct short, usually branched 9

7(6) Pedipalpal coxa with more than 55 cuspules; spermathecal ducts long, straight, unbranched (Fig. 46) .... **lawrencei**

— Pedipalpal coxa with fewer than 50 cuspules; spermathecal ducts sharply bent, usually with short inner diverticulum (Figs 42, 44) 8

8(7) Opening of spermathecal duct into vulval chamber surrounded by chitinous ring (Fig. 42) .... **geophilum**

— Opening of spermathecal duct into vulval chamber simple, without chitinous ring (Fig. 44) .... **amatola**

9(6) Promargin of cheliceral fang furrow with 10 or more closely spaced, even teeth (Fig. 26); base of femora with attenuate bristles on ventral surface; abdomen without clavate bulbous setae; spermathecae with branches equal or outer branch longer, rarely unbranched .... **longipes**

— Promargin of cheliceral fang furrow with 7 or fewer widely spaced teeth (Figs 41, 53); base of femora with blunt-tipped or clavate bristles in ventral row; abdomen with clavate bulbous setae; spermathecae with inner branch longer than outer 10

10(9) Spermathecal branches confluent into duct leading to vulval chamber (Figs 43, 45); sternum and coxa with clavate bulbous bristles (Fig. 8); dorsum of abdomen with light markings on dark grey background .... **zuluense**

— Spermathecal branches sessile on vulval chamber (Fig. 47); sternum and coxae with only blunt-tipped bristles; dorsum of abdomen with dark brown markings on brown background .... **ukhahlamba**

Microstigmata longipes (Lawrence)

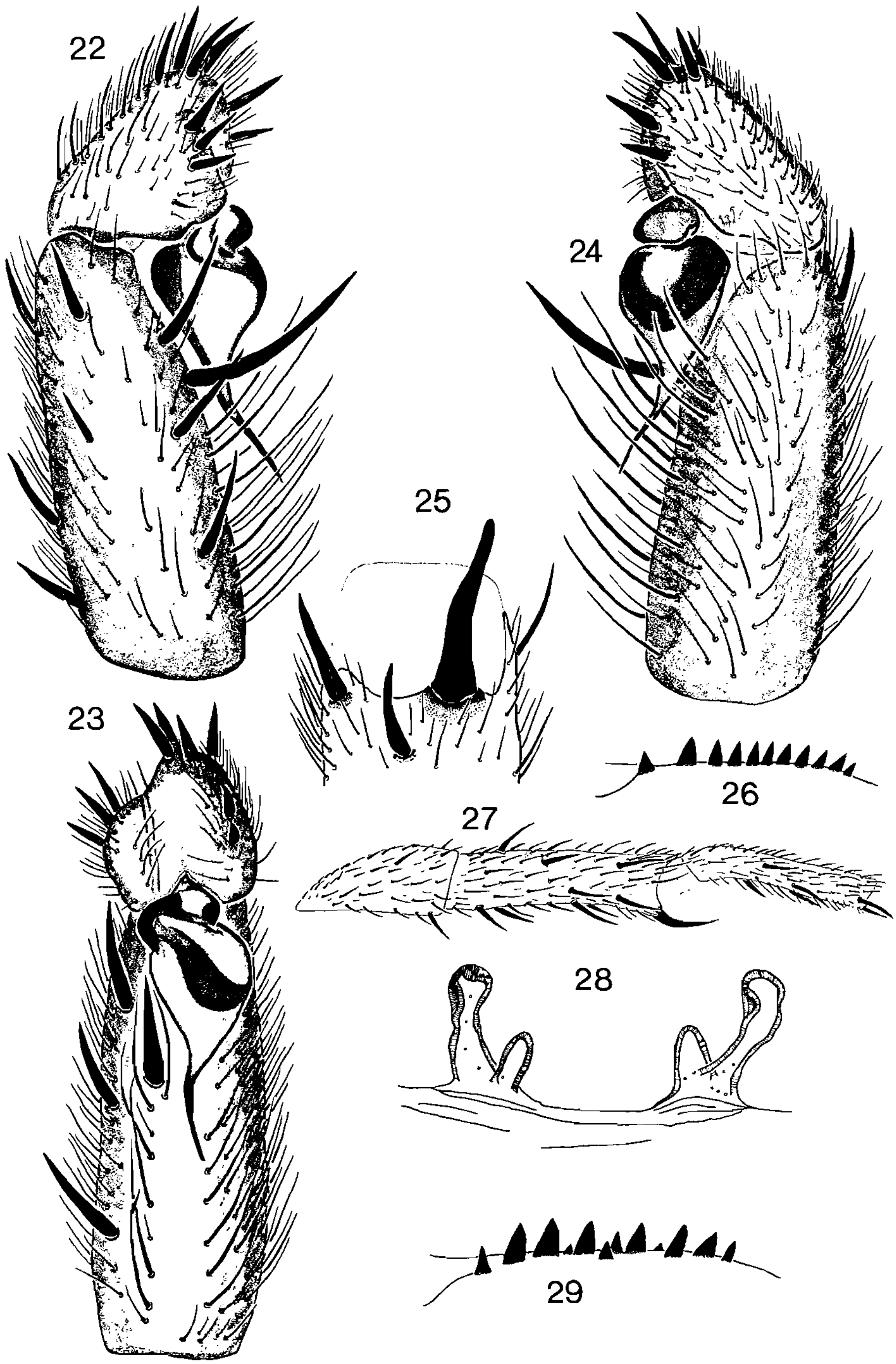
Figs 3, 5, 6, 9, 13, 17, 20–28, 30–35; Map 2

Microstigma longipes Lawrence, 1938:463, figs 4a,b,d (lectotype ♂, here designated, from Umkomaas Valley near Bulwer, Natal, South Africa, in Natal Museum: NM 123, type number A1166; paralectotype ♀, same data, type number A1167). Bonnet, 1957:2906.
Microstigmata longipes, Roewer, 1942:194. Raven & Platnick, 1981:15.

Diagnosis: May be recognised by having the promargin of the cheliceral fang furrow with 10 or more closely spaced, even teeth (Fig. 26); males lack the prolateroventral apophysis at the apex of tibia I (Fig. 25).

Male: Total length, including chelicerae 9,33(8,27–10,93). Carapace light to dark brown, unicolourous or with interstrial ridges darkened; venter of cephalothorax light brown, legs light to dark brown; abdomen yellow brown to pale grey, dorsum with dark grey forming 5–6 faint to strong chevrons extending to spinnerets.

Carapace 3,6(3,33–4,13) long, 3,2(3,0–3,67) wide, slightly domed posterior to thoracic groove; caput slightly domed; thoracic striae depressed, deepest anterolateral and along margin of caput. Thoracic fovea straight, small, occupying 0,1 to 0,15 width of carapace. Glabrous except for 3–4 rows of fine setae along interstrial ridges; caput with several rows of fine setae, may be 2 rows of blunt-tipped setae.



Figs 22–29. *Microstigmata* spp. 22–27. *M. longipes* (Lawrence), lectotype male. 28. *M. longipes*, paralectotype female. 29. *M. lawrencei*, sp. n., paratype female. 22. Palpus, anterolateral. 23. Palpus, ventral. 24. Palpus, retrolateral. 25. Apex of tibia I, right, ventral. 26. Chelicera, promarginal teeth. 27. Patella-metatarsus I, anterolateral. 28. Spermathecae, cleared, ventral. 29. Chelicera, promarginal teeth.

Margin with elongate attenuate bristles. Clypeal margin with 3–4 blunt-tipped bristles in centre, lateral bristles present or absent; 1 long, recurved and 2 short bristles anterior to ocular tubercle, 2 blunt-tipped setae between PME, 2–4 between PLE.

Eyes on low tubercle occupying 0,37–0,41 width of front; from above anterior eye row slightly recurved, posterior row recurved. Ratio of eyes AM:AL:PM:PL, 1:1,6:1,2:1,4; posterior median eyes flattened along outside lateral margin, others round. Distances between eyes: AM–AL, 0,032, AM–PM 0,064, AL–PL 0,032, PM and PL separate, distance between 0,024. Ocular quadrangle 1,65–1,9 times wider than long; narrowed anteriorly, posterior 1,6 width of anterior; OQA 0,304 (0,288–0,336), OQP 0,496 (0,464–0,544), OQL 0,272 (0,240–0,328).

Sternum 1,77 (1,65–2,00) long, 1,58 (1,52–1,74) wide; slightly domed; posterior sigilla visible, middle visible or faint; with attenuate bristles only. Labium 0,31 (0,29–0,35) long, 0,70 (0,68–0,74) wide, with 3–7 cuspules. Pedipalpal coxae 1,13 (1,03–1,29) long, 0,70 (0,68–0,74) wide, with 12–20 cuspules in proximal patch near inner margin. Chelicerae 1,33 (1,27–1,47) long, promargin of fang furrow with 10–13 regular teeth, largest proximally (Fig. 26), retromargin with 2–5 denticles.

Leg formula 4132. Legs glabrous with even or irregular rows of attenuate and blunt-tipped setae on all surfaces. Coxae and trochanters with attenuate or attenuate and blunt-tipped setae; ventral base of femora without clavate setae. Apex of tibia I without apophysis, clasping spine sessile (Fig. 25); metatarsus I bent at base (Fig. 27). Spination (Lectotype): leg I, femur aldlllll, patella v2al, tibia v322a2lldlrl, metatarsus v22lal, tarsus 0; leg II, femur dllllrl, patella v2al, tibia v222allldlrl, metatarsus v222all, tarsus 0; leg III, femur aldllllrlll, patella allrl, tibia v2212a2ldll2rl, metatarsus v2212lalllldllr2l, tarsus 0; leg IV, femur aldllllrll, patella vlalrl, tibia v222a2ldllrlll, metatarsus v222a2llldlrlll, tarsus 0; palpus, femur aldllll, patella 0, tibia vllllalld2l, tarsus, 9 apical. Tarsi I, II, and sometimes III, IV with ventral scopulae; leg I with 5 teeth on retrolateral claw. Tarsus I with dorsal row of 8–11 trichobothria. Leg measurements:

	I	II	III	IV
Femur	2,81(2,65–3,10)	2,55(2,39–2,84)	2,35(2,16–2,65)	3,13(2,94–3,48)
Patella	1,79(1,71–1,94)	1,58(1,48–1,74)	1,39(1,29–1,55)	1,58(1,45–1,74)
Tibia	2,23(2,13–2,42)	1,87(1,77–2,06)	1,84(1,74–2,00)	2,65(2,52–2,90)
Metatarsus	1,97(1,87–2,13)	2,06(1,94–2,26)	2,48(2,32–2,71)	3,55(3,39–3,81)
Tarsus	1,77(1,68–1,90)	1,77(1,77–1,94)	1,87(1,74–2,03)	2,16(2,06–2,32)
Total	10,56(10,03–11,48)	9,84(9,58–10,84)	9,94(9,26–10,94)	13,06(12,35–14,25)

Palpus: femur, 1,90(1,61–1,94); patella, 1,13(1,06–1,19); tibia, 1,39(1,29–1,48); tarsus, 0,71(0,68–0,81); total, 5,13(4,65–5,42).

Palpus with tibia slender, length 2,29 to 2,56 width; apex of tarsus with 2–3 anterolateral, 6 retrolateral spines. Bulb (Figs 22–24) with embolus long, slender, straight, length 2,65 to 2,8 times width; bulb equal to 0,695 to 0,75 length tibia.

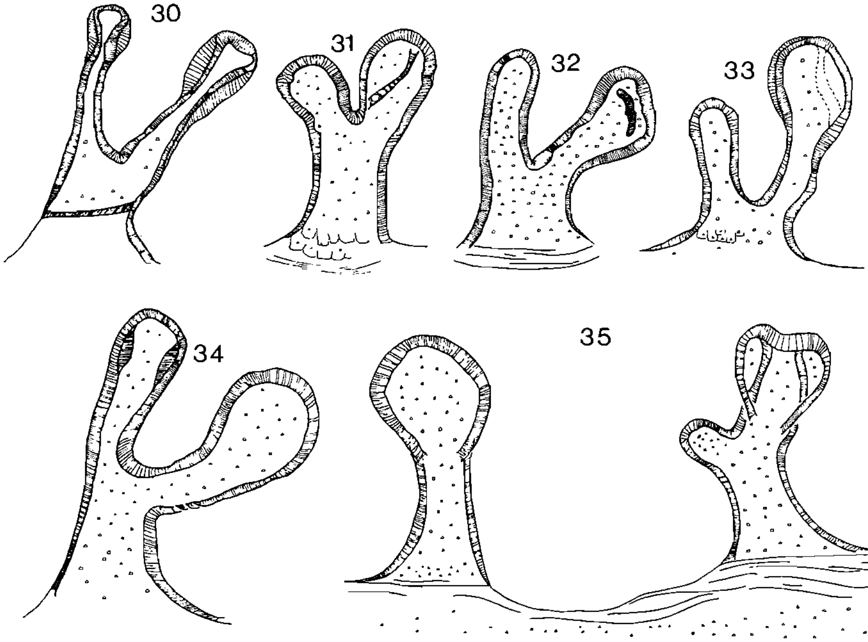
Abdomen 4,07(3,53–5,00) long, 2,73(2,20–3,53) wide; glabrous, with numerous elongate, blunt-tipped bristles anteriorly and forming 2–4 dorsal rows ending above spinnerets, dorsum and sides with many rows of short attenuate or attenuate and blunt-tipped bristles, venter with attenuate bristles. Spinnerets exposed, length of segments of posterior laterals: proximal 0,288(0,272–0,304), median 0,202(0,192–0,208), distal 1,170(1,160–0,176); length posterior medians 0,160(0,144–0,192).

Female (Figs 20–21): As in ♂ except where noted. Total length, including chelicerae 10,80(7,73–12,67). Abdomen yellow brown, grey or dark brown, dorsum with series of dark grey chevrons, mottled with grey, or unmarked; venter unmarked or with faint, transverse grey stripe. Carapace 3,93(2,80–4,60) long, 3,27(2,33–3,73) wide; thoracic fovea occupying 0,25 width of carapace. Eyes on low tubercle occupying 0,43 width of carapace. Ratio of eyes AM:AL:PM:PL, 1:1,33:1,2:1,5. Distances between eyes: AM–AL 0,016–0,032, AM–PM 0,04–0,064, AL–PL 0,016–0,04, PM and PL close or separate, distance between 0,008–0,024. Ocular quadrangle 1,6–1,7 times wider than long, narrowed anteriorly, posterior 1,5–1,65 times wider than anterior; OQA 0,320(0,256–0,368), OQP 0,528(0,400–0,592), OQL 0,312(0,240–0,368). Sternum 1,84(1,32–2,13) long, 1,61(1,29–2,10) wide, sigilla visible or obscure, with attenuate or attenuate and blunt-tipped bristles. Labium 0,45(0,29–0,61) long, 0,90(0,65–1,10) wide, with 2–10 cuspules. Pedipalpal coxa 1,42(0,94–1,77) long, 0,87(0,61–1,03) wide, with 10–28 cuspules in patch on inner, proximal margin (Fig. 13), cuspules with shallow grooves (Fig. 17). Chelicerae 3,47(2,47–4,47) long, promargin of fang furrow with 10–12 regular teeth, largest proximally, retromargin with 2–6 denticles. Leg formula 412=3; glabrous, with regular rows of attenuate and blunt-tipped setae on all legs. Coxae with attenuate or attenuate and blunt-tipped bristles; trochanters with attenuate or blunt-tipped bristles; ventral base of femora without clavate bristles. Spination (specimen from Richmond, Natal): leg I, femur aldllll, patella 0, tibia v2llall, metatarsus v222, tarsus 0; leg II, femur dlll, patella al, tibia v2l2allldl, metatarsus v222allrlll, tarsus 0; leg III, femur dllrl, patella al, tibia v222a2lldllrlll, metatarsus v222a2ll, tarsus 0; leg IV, femur dlllrl, patella alrl, tibia vl22allldlrlll, metatarsus v222alllr2ll, tarsus 0; palpus, femur aldlll, patella 0, tibia v322, tarsus v222l. Dorsal spines usually blunt-tipped, others attenuate. Scopulae absent; leg I with 5–7 teeth on retrolateral claw; tarsus I with dorsal row of 7–11 trichobothria, tarsal organ slender. Leg measurements (5 ♀):

	I	II	III	IV
Femur	2,97(2,10–3,61)	2,61(1,84–3,19)	2,39(1,81–2,87)	3,06(2,26–3,87)
Patella	1,87(1,29–2,26)	1,61(1,10–1,90)	1,45(0,97–1,74)	1,58(1,13–1,97)
Tibia	2,35(1,61–2,90)	1,97(1,32–2,42)	1,87(1,32–2,26)	2,61(1,97–3,23)
Metatarsus	1,94(1,26–2,35)	1,94(1,29–2,42)	2,42(1,58–3,00)	3,26(2,32–4,13)
Tarsus	1,55(1,13–1,84)	1,68(1,16–2,10)	1,77(1,32–2,16)	2,19(1,65–2,77)
Total	10,68(7,39–12,97)	9,81(6,71–12,03)	9,90(7,00–12,03)	12,71(9,32–16,00)

Palpus: femur, 2,10(1,45–2,71); patella, 1,32(0,84–1,61); tibia, 1,48(0,94–1,90); tarsus, 1,74(1,23–2,10); total, 6,65(4,45–8,32).

Abdomen 5,33(3,93–6,60) long, 3,47(2,47–4,47) wide; venter with attenuate or attenuate and blunt-tipped setae, spinnerets exposed, length of segments of posterior laterals: proximal 0,368(0,240–0,448), median 0,256(0,176–0,336), distal 0,224(0,160–0,272); posterior medians 0,224(0,128–0,272). Female genitalia not visible through epigynal cuticle. Spermathecae variable, usually branched with branches confluent before vulval chamber. Rarely unbranched or unilaterally branched and unbranched (Champagne Castle [Fig. 35], Nottingham Forest); branches typically asymmetrical, outer longer and broader than inner (cotype female [Fig. 28] and all central Natal populations [Figs 32, 33]), spermathecae with more symmetrical branches found in some northern (Gwaliweni [Fig. 34], Qudeni [Fig. 30], and Ngoye Forests) and southern (Ngali Forest [Fig. 31]) populations.



Figs 30–35. *Microstigmata longipes* (Lawrence), females, spermathecae, left, cleared, ventral. 30. Qudeni Forest, NM 5940. 31. Ngali Forest, NM 8010. 32. Estcourt, NM 1719. 33. Swartkop, Pietermaritzburg, NM 6951. 34. Gwaliweni Forest, NM 6894. 35. (both) Champagne Castle, Drakensberg Mts., NM 6423.

Distribution (Map 2): Coastal region of eastern Cape north of the Kei River, southern Natal from coast to Drakensberg, and northeastern Natal.

Material examined: TRANSKEI: Umzimvubu (Port St Johns), viii.1937, 1 ♂, W. G. Rump (NM 1706). SOUTH AFRICA: *Natal:* Ingali Forest, near Kokstad (30°31'S,29°40'E), 1 ♀, R. Lawrence (NM 4571), i.1960, 1 ♀, R. F. and J. Y. Lawrence (NM 8010); Port Shepstone, x.1936, 1 ♀, R. F. Lawrence (NM 1139); Umkomaas River, 40 mi. W. Pietermaritzburg, vi.1936, 1 ♂ 1 ♀ (lectotype, paralectotype), R. Lawrence and W. Rump (NM 123); Lundies Hill, 17 mi. E. Bulwer, xi.1957, 1 ♀, R. F. Lawrence (NM 6959); Richmond, iii.1959, 1 ♀, R. F. Lawrence (NM 7340); Umhlali, vi.1960, 1 ♀, R. F. Lawrence (NM 7987); Umhlali Beach Forest, x.1960, 2 ♀, R. F. and J. Y. Lawrence (NM 8067); Pietermaritzburg, xii.1939, 1 ♀, (NM 2906), Swartkop summit, el. 4 300 ft, viii.1957, 1 ♀ (NM 6951), Shooters Hill, xii.1936, 1 ♀, (NM 1477), and Table Mountain, xii.1938, 1 ♀ (NM 2178) all collected by R. F. Lawrence; Fort Nottingham Forest (29°25'S,29°55'E), viii.1954, 1 ♀ 1 ♂, R. F. Lawrence (NM 6313); Karkloof forest, el. 4 800 ft, 25 mi. NNW Pietermaritzburg, (29°26'S,30°19'E), 4 i.1984, 1♀, 19 iv.1984, 1 ♀, 1 juv., 'in rotting log', C. E. Griswold (NM); New Hanover, v.1940, 2 ♂ 2 ♀, R. F. Lawrence (NM 2963); Kranskop, x.1940, 2 ♀, R. F. Lawrence (NM 2996); Estcourt (28°58'S,29°53'E), x.1937, R. F. Lawrence, 3 ♂ 1 ♀ (NM 1727), 2 ♀ (NM 1719) 1 ♂ (NMZ A283); Champagne Castle Hostel, R. F. Lawrence, i.1945, 1 ♀ (NM 4300), i.1957, 1 ♀ (NM 4300); Zululand: Ngoye Forest (28°51'S,31°43'E), ii.1953, 3

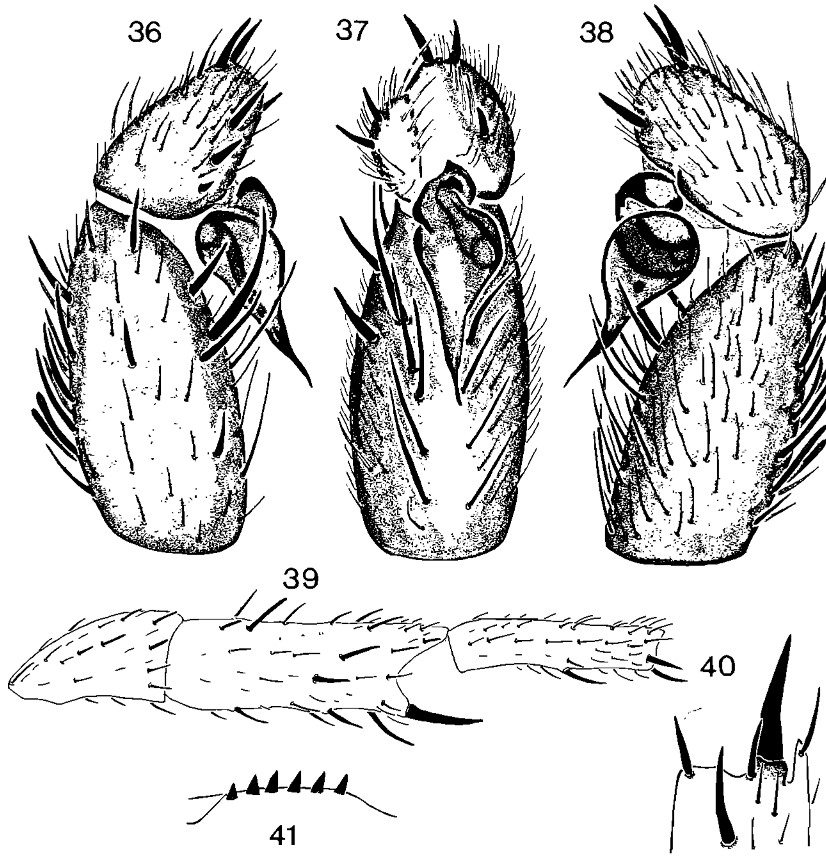
♀, Lawrence, Holliday & Schofield (NM 5914); Qudeni Forest (28°38'S,30°45'E), ii.1953, 1 ♀, Lawrence, Holliday & Schofield (NM 5940); Gwaliweni Forest (27°23'S,32°03'E), ii.1957, 1 ♀, R. F. Lawrence (NM 6894).

Microstigmata zuluense (Lawrence)

Figs 7, 8, 12, 14, 36–41, 43, 45; Map 3

Microstigma zuluense Lawrence, 1938:461, figs 3a,b, 4c (lectotype male, here designated, from Nkandla Forest, Zululand, South Africa, in Natal Museum: NM 1389, type no. A1164; paralectotypes, 1 ♂, 1 ♀, same data, type number A1165). Bonnet, 1957:2906.
Microstigmata zuluense, Roewer, 1942:194. Raven & Platnick, 1981:15.

Diagnosis: This species may be recognised by its small size (less than 6,5 mm) and by having the promargin of the cheliceral fang furrow with 7 or fewer widely spaced teeth (Fig. 41). Males have the clasping spine on tibia I situated on a short apophysis (Fig. 40). Females have clavate bulbous bristles (Fig. 8) on the sternum and the spermathecae branched, with the inner branch longer and confluent with the outer before the vulval chamber (Figs 43, 45).



Figs 36–41. *Microstigmata zuluense* (Lawrence), male. 36–38. NM 1703. 39–41. Lectotype. 36. Palpus, anterolateral. 37. Palpus, ventral. 38. Palpus, retrolateral. 39. Patella-metatarsus I, anterolateral. 40. Apex of tibia I, right, ventral. 41. Chelicera, promarginal teeth.

Male: Total length, including chelicerae 5,24(4,8–5,73). Carapace brown; venter of cephalothorax and legs light brown; dorsum of abdomen dark grey, with fine short chevrons from anterior to above spinnerets; venter pale yellow brown, mottled with dark grey, palest above posterior book-lungs and anterior to epigastric furrow.

Carapace 2,25(2,07–2,47) long, 2,0(1,86–2,2) wide; sloping posterior to thoracic groove; caput slightly domed; thoracic striae depressed, deepest laterally and along margins of caput. Thoracic fovea straight, occupying 0,18 width carapace. Glabrous except for rows of fine, attenuate setae along interstrial ridges, clavate setae in 2 rows on caput. Margin with attenuate bristles, bristles short, longest posteriorly; clypeal margin with series of attenuate bristles, 3 to 7 blunt bristles anterior to ocular tubercle; one long, recurved bristle and two short bristles on anterior of ocular tubercle; one pair short, clavate bristles between PME, one pair between PLE.

Eyes on low tubercle occupying 0,42 of front width. Ratio of eyes AM:AL:PM:PL, 1:2:1,14:1,7; posterior eyes straightened along adjoining surfaces, others round. From above anterior row nearly straight, posterior row recurved. Distances between eyes: AM–AL 0,016, AM–PM 0,032, AL–PL 0,016, PM and PL nearly touching, distance between less than 0,008. Ocular quadrangle 1,5–1,6 times wider than long, narrowed anteriorly, posteror 1,5 times width of anterior; OQA 0,21(0,17–0,24), OQP 0,29(0,25–0,36), OQL 0,19(0,17–0,22).

Sternum 1,09(1,03–1,16) long, 1,03(1,0–1,13) wide, nearly flat, posterior sigilla depressed; with stout attenuate and blunt-tipped bristles. Labium 0,19(0,16–0,25) long, 0,43(0,39–0,52) wide, with 0 to 1 cuspule, 14 to 18 slender attenuate bristles. Palpal coxae 0,63(0,61–0,64) long, 0,42(0,39–0,48) wide, with 5 to 10 cuspules in small proximal patch, cuspules with shallow grooves. Chelicerae 0,57(0,53–0,6) long, with 6 to 7 teeth on promargin of fang furrow (Fig. 41), retromargin with 2–3 denticles.

Leg formula 4123. Legs glabrous with attenuate bristles scattered and in uneven rows. Coxae with attenuate and blunt-tipped bristles, trochanters and ventral bases of femora with blunt-tipped and slightly clavate bristles. Apex of tibia I with short anteroventral apophysis (Figs 39, 40), metatarsus I straight. Spination (lectotype): leg I, femur aldllll, patella 0, tibia v2l2l2lall, metatarsus v2l, tarsus 0; leg II, femur aldlll, patella v2al, tibia v322allld2, metatarsus v222allrll, tarsus 0; leg III, femur allldlllrll, patella alrl, tibia v2l2alldl2rl, metatarsus v222allldlr2ll, tarsus 0; leg IV, femur alldllllrll, patella alrl, tibia v322aldllrll, metatarsus v222alldlrlll, tarsus 0; palpus, femur dlll, patella 0, tibia vllll, tarsus 6 apical. Dorsal spines blunt, lateral and ventral attenuate. All tarsi without scopulae. Leg I with 4 to 5 teeth on retrolateral claw. Tarsus I with dorsal row of 4 to 5 trichobothria, tarsal organ long, slender. Leg measurements:

	I	II	III	IV
Femur	1,74(1,61–1,90)	1,48(1,39–1,65)	1,42(1,32–1,55)	2,00(1,87–2,16)
Patella	1,00(0,97–1,10)	0,90(0,81–1,03)	0,81(0,71–0,90)	0,97(0,90–1,06)
Tibia	1,26(1,19–1,32)	1,06(1,00–1,16)	1,06(1,00–1,16)	1,65(1,55–1,74)
Metatarsus	1,16(1,03–1,32)	1,16(1,06–1,32)	1,39(1,26–1,61)	2,22(2,10–2,39)
Tarsus	1,00(0,94–1,06)	0,97(0,94–1,00)	0,97(0,94–1,00)	1,22(1,16–1,26)
Total	6,16(5,74–6,71)	5,58(5,19–6,16)	5,65(5,23–6,23)	8,06(7,58–8,61)

Palpus: femur, 0,98(0,90–1,06); patella, 0,58(0,52–0,68); tibia, 0,68(0,65–0,71); tarsus, 0,40(0,39–0,44); total, 2,63(2,45–2,89).

Palpus (Figs 36–38) with tibia broad, length 1,9 to 2,0 times width; apex of tarsus with 2 anterolateral, 3 to 6 retrolateral spines. Bulb with embolus straight or slightly curved, length 2,5 to 2,9 times width; bulb equal to 0,68 to 0,75 length tibia.

Abdomen 2,35(2,13–2,53) long, 1,6(1,53–1,8) wide, encrusted with dirt, with long and short bristles; anterodorsal patch of elongate, blunt-tipped bristles; dorsum, sides, and venter with several rows of clavate setae. Spinnerets partially hidden by cuticular fold lined with a few flattened setae; posterior lateral spinnerets 3-segmented, lengths of visible portions of proximal, middle and distal 0,18(0,17–0,24), 0,13(0,11–0,14), 0,09(0,08–0,11), posterior median 0,1(0,09–0,11).

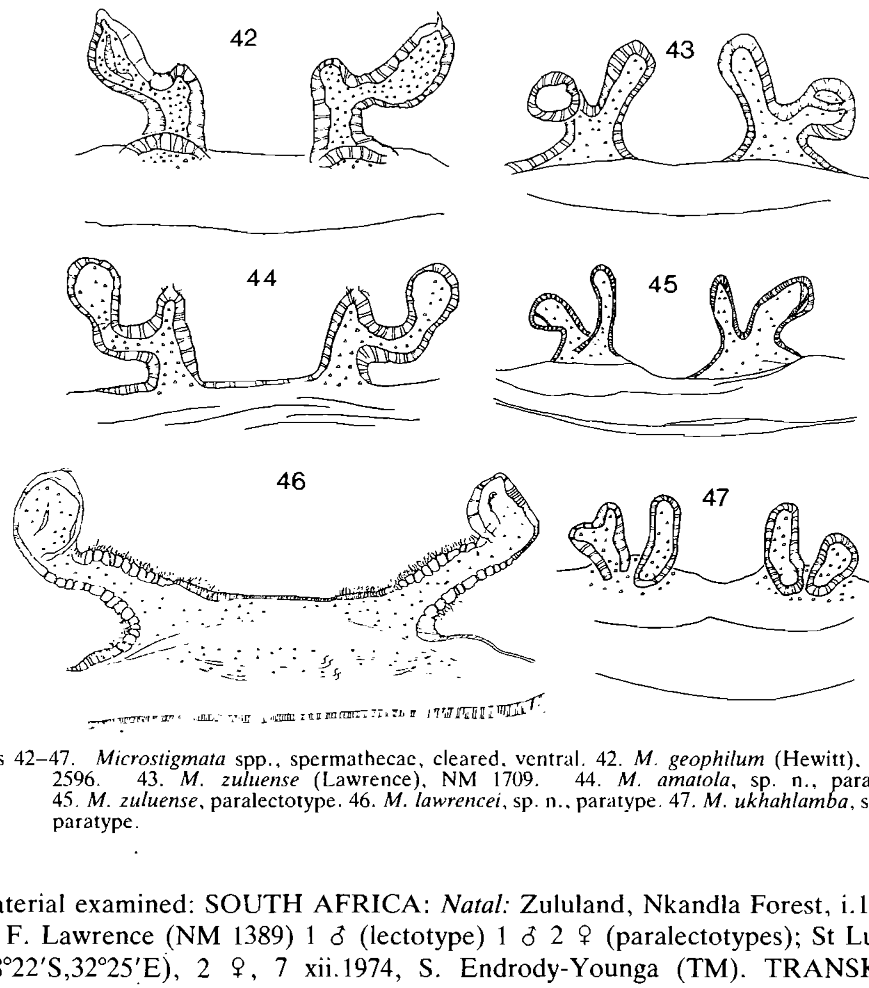
Female: As in ♂, except where noted. Total length, including chelicerae, 5,62(4,53–6,27). Abdomen with dorsum dark grey, pale markings forming anterolateral transverse band, two pair of dorsal spots, and two posterior chevrons; venter mottled with dark brown or grey. Carapace 2,26(1,9–2,6) long, 2,0(1,5–2,26) wide, thoracic fovea occupying 0,28 width; dorsum with clavate setae, pattern obscured by encrustation; margin with few clavate bristles or with setae absent; clypeal margin with lateral bristles, 6 to 7 blunt-tipped bristles anterior to ocular tubercle. Ocular tubercle low or raised, occupying 0,4 width of front; ratio of eyes (Nkandla), AM:AL:PM:PL, 1,125:1,5:1:1,125. Distances between eyes: AM–AL 0,008–0,016, AM–PM 0,024–0,048, AL–PL 0,008, PM and PL nearly touching. Ocular quadrangle 1,6 (1,5–1,7) times wider than long, posterior 1,54 (1,49–1,7) wider than anterior; OQA 0,21(0,16–0,25), OQP 0,32(0,27–0,35), OQL 0,19(0,16–0,23). Sternum 1,0(0,77–1,19) long, 1,06(0,87–1,22) wide; sternal sigilla obscure or with posterior visible; attenuate bristles anteriorly, centre and sides with stout, blunt-tipped and clavate bristles. Labium 0,17(0,145–0,225) long, 0,52(0,42–0,61) wide, with 1 to 3 cuspules. Palpal coxae 0,68(0,55–0,74) long, 0,44(0,35–0,48) wide, with 3 to 10 cuspules in row or patch along proximal edge (Fig. 14). Chelicerae 0,64(0,53–0,87) long, promargin of fang furrow with 6 to 7 even teeth, retromargin with 2 to 4 denticles. Leg formula 412=3; coxae and trochanters with blunt-tipped and clavate bulbous bristles, femora with bulbous bristles (Fig. 8) ventrally near base, usually forming two ventral rows; legs unmodified, with irregular rows of blunt and clavate setae. Spination (Nkandla Forest): leg I, femur dll, patella 0, tibia vl, metatarsus v2ll, tarsus 0; leg II, femur 0, patella 0, tibia vl, metatarsus v2ll, tarsus 0; leg III, femur 0, patella 0, tibia vllaldllrl, metatarsus v222alrl, tarsus 0; leg IV, femur dl, patella 0, tibia v2lllaldlrl, metatarsus v22rll, tarsus 0; palpus, femur dll, patella 0, tibia v22ldlrl, tarsus v222l. Dorsal spines clavate, others attenuate. Tarsus I with dorsal row of 3 to 4 trichobothria (Fig. 12), tarsal organ slender (Nkandla) or short (coastal). Leg measurements:

	I	II	III	IV
Femur	1,48(1,19–1,68)	1,32(1,00–1,48)	1,22(0,94–1,42)	1,74(1,32–1,97)
Patella	1,00(0,77–1,13)	0,90(0,68–1,03)	0,81(0,58–0,97)	0,97(0,68–1,13)
Tibia	1,10(0,84–1,19)	0,94(0,68–1,13)	0,90(0,68–1,06)	1,48(1,10–1,71)
Metatarsus	0,87(0,68–1,03)	0,90(0,71–1,03)	1,10(0,81–1,29)	1,77(1,29–2,03)
Tarsus	0,77(0,65–0,87)	0,77(0,68–0,84)	0,84(0,68–0,90)	1,00(0,84–1,10)
Total	5,23(4,13–6,00)	4,84(3,74–5,52)	4,87(3,68–5,65)	6,97(5,23–7,94)

Palpus: femur, 1,06(0,84–1,19); patella, 0,68(0,55–0,77); tibia, 0,68(0,55–0,77); tarsus, 0,84(0,68–0,94); total, 3,26(2,61–3,68).

Abdomen 2,73(2,07–3,2) long, 2,07(1,6–2,5) wide; a few long, clavate bristles anteriorly; several rows of clavate bulbous bristles on dorsum, sides and venter. Base of spinnerets surrounded by cuticular fold with many flattened setae, lengths of visible portions: posterior laterals, proximal 0,24, median 0,14, distal 0,11, posterior medians 0,16. Spermathecae not visible through epigynal cuticle; branched, branches confluent before vulval chamber, inner branch longer than outer (Fig. 43, 45).

Distribution (Map 3): Coastal Natal extending inland in Zululand.



Figs 42–47. *Microstigmata* spp., spermathecae, cleared, ventral. 42. *M. geophilum* (Hewitt), SAM 2596. 43. *M. zuluense* (Lawrence), NM 1709. 44. *M. amatola*, sp. n., paratype. 45. *M. zuluense*, paralectotype. 46. *M. lawrencei*, sp. n., paratype. 47. *M. ukhahlamba*, sp. n., paratype.

Material examined: SOUTH AFRICA: *Natal:* Zululand, Nkandla Forest, i.1937, R. F. Lawrence (NM 1389) 1 ♂ (lectotype) 1 ♂ 2 ♀ (paralectotypes); St Lucia, (28°22'S,32°25'E), 2 ♀, 7 xii.1974, S. Endrody-Younga (TM). TRANSKEI: Umzimvubu (Port St Johns), 1 ♀ 3 ♀, viii.1937, W. G. Rump (NM 1703).

Microstigmata ukhahlamba sp. n.

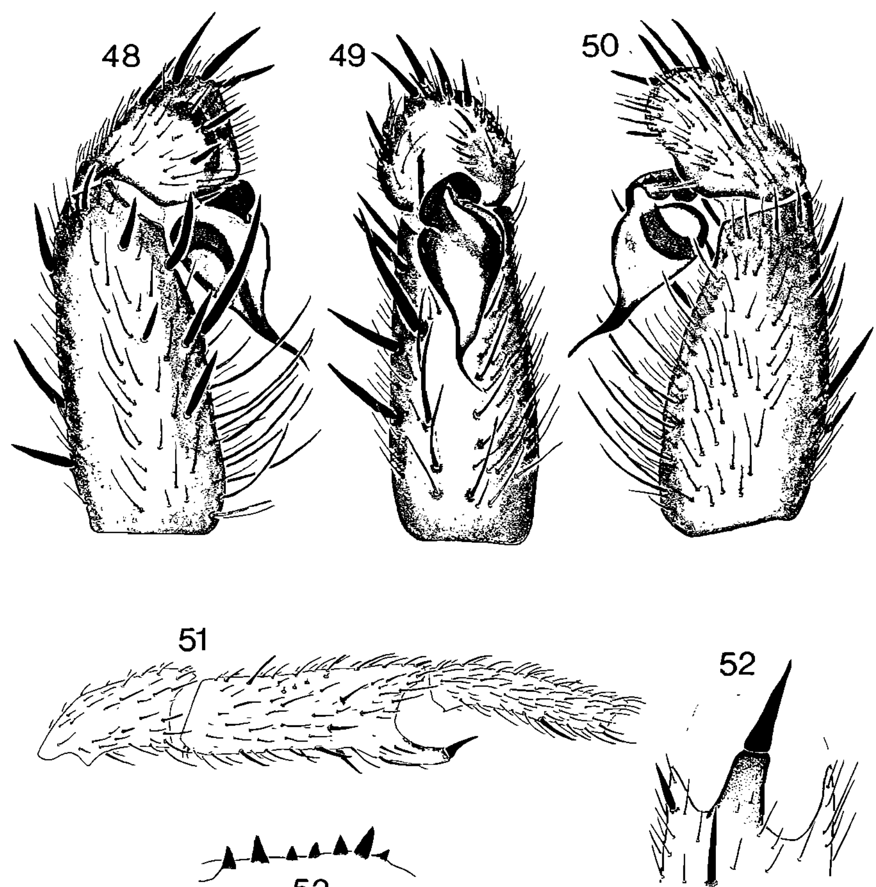
Figs 44, 48–53; Map 3

Etymology: From the Zulu 'ukhahlamba' or 'barrier of spears' referring to the Drakensberg mountains.

Diagnosis: This species has the pedipalpal coxae with fewer than 15 cuspules in a group along the inner margin and the promargin of the cheliceral fang furrow with fewer than eight widely spaced teeth (Fig. 53). The male has the tibial clasping spine situated on a well developed apophysis (Figs 51, 52) and the embolus slightly bent (Figs 48, 50). Females have the spermathecal branches sessile on the vulval chamber, with the inner branch longer than the outer (Fig. 47).

Male: Total length, including chelicerae 6,26; carapace brown, slightly darkened on interstrial ridges; venter of cephalothorax and legs lighter brown. Dorsum of abdomen light brown, thickly encrusted with dirt, no pattern discernible; venter light brown, mottled, lightly encrusted with earth, pale over posterior book-lungs and anterior to epigastic furrow.

Carapace 3,07 long, 2,6 wide, sloping posterior to thoracic groove; thoracic striae slightly depressed, deepest along margins of caput; caput sloping gradually up toward apex. Thoracic fovea straight, occupying 0,18 width. Glabrous except for



Figs 48–53. *Microstigmata ukhahlamba*, sp. n., male holotype. 48. Palpus, anterolateral. 49. Palpus, ventral. 50. Palpus, retrolateral. 51. Patella-metatarsus I, anterolateral. 52. Apex of tibia I, right, ventral. 53. Chelicera, promarginal teeth.

fine rows of mostly attenuate bristles along margins of thoracic striae, two rows on sides of caput; a few blunt-tipped bristles mixed in rows on caput and posterior of thorax. Margin with attenuate bristles, longest posteriorly; margin of clypeus bare laterally, with 7 long and short attenuate bristles anterior to ocular tubercle; one long, recurved bristle and two short bristles anterior to ocular tubercle, one pair attenuate bristles between PME, one short pair between PLE.

Eyes on raised tubercle occupying 0,35 of front width. Ratio of eyes AM:AL:PM:PL, 1:1,8:1,25:1,5. Posterior medians angled posteriorly, others round; from above anterior and posterior rows recurved. Distances between eyes: AM–AL 0,016, AM–PM 0,03, AL–PL 0,016, PM and PL nearly touching, distance between 0,008. Ocular quadrangle 1,5 times wider than long, narrowed anteriorly, posterior 1,6 times width of anterior; OQA 0,27, OQP 0,43, OQL 0,3.

Sternum 1,61 long, 1,41 wide, slightly domed, posterior sigilla visible; laterally with stout attenuate bristles. Labium 0,29 long, 0,58 wide, with two cuspules, about 10 attenuate bristles anteriorly. Palpal coxae 0,84 long, 0,61 wide, with 12 cuspules in proximal patch. Chelicerae 0,67 long, promargin of fang furrow with 7 irregular teeth (Fig. 53), retromargin with 4 to 5 small denticles.

Leg formula 4132. Legs glabrous, with uneven rows of attenuate bristles. Coxae with attenuate bristles only, trochanters and ventral bases of femora with attenuate and blunt bristles. Apex of tibia I with long anteroventral apophysis, curved and tipped with spine (Figs 51, 52); metatarsus I bent slightly at base. Spination (all spines attenuate): Leg I, femur a1ld1l1, patella 0, tibia v322a2, metatarsus v222a1l1, tarsus 0; leg II, femur a1d1l1r1l1, patella a1, tibia v222a1d2, metatarsus v222a1l1, tarsus 0; leg III, femur a1l1d1l1r1, patella a1r1, tibia v322a21d12r1l, metatarsus v222a21ld1lr2l1, tarsus 0; leg IV, femur d1l1l1r1, patella a1r1, tibia v222a21ld12r1l, metatarsus v2122a21ld1lr1l1, tarsus 0; palpus, femur a1d1l1l, patella 0, tibia v1l1la1ld1l1, tarsus 8 apical. All tarsi without scopulae. Leg I with 5 retrolateral teeth on claw, tarsus I with dorsal row of 7 trichobothria, tarsal organ short. Leg measurements:

	I	II	III	IV	Palpus
Femur	2,35	2,09	1,97	2,58	1,19
Patella	1,42	1,32	1,19	1,32	0,81
Tibia	1,77	1,52	1,58	2,32	0,97
Metatarsus	1,58	1,61	2,19	3,29	—
Tarsus	1,55	1,45	1,55	1,93	0,45
Total	8,68	8,0	8,48	11,45	3,42

Palpus (Figs 48–50) with tibia slender, length 2,3 times width; apex of tarsus with 6 retrolateral spines, anterolateral spines one strong and one weak. Bulb with embolus long, slightly curved, length 2,7 times width; bulb equal to 0,65 length tibia.

Abdomen 3,75 long, 1,87 wide, glabrous, encrusted with dirt, with large and small bristles; several elongate, blunt-tipped bristles at apex and extending posteriad on dorsum in 5 or 6 irregular rows to behind middle; dorsum and sides with several rows of short, clavate bristles; dorsum, sides, and venter with fine rows of short, attenuate setae. Spinnerets partially hidden at base by cuticular fold lined with scattered attenuate and flattened setae; posterior lateral spinnerets with lengths of visible portions of proximal, middle, and distal segments 0,16, 0,096, 0,08; posterior median spinnerets with visible length 0,08.

Female: As in ♂, except where noted. Total length, including chelicerae 6,27 (6,0–0,67). Abdomen brown, dorsum may have darker transverse bands forming 4 or 5 chevrons. Carapace 3,1(2,87–3,33) long, 2,07(1,93–2,2) wide. Dorsal setae short, clavate; margin with few, blunt-tipped bristles; clypeal margin with five blunt-tipped bristles. Ocular tubercle occupying 0,37 width of front; ratio of eyes AM:AL:PM:PL, 1:1,4:1:1. Distances between eyes: AM–AL 0,016, AM–PM 0,032(0,016–0,056), AL–PL 0,021(0,016–0,032), PM and PL nearly touching. Ocular quadrangle 1,55(1,4–1,7) times wide as long, posterior 1,5 times wider than anterior; OQA 0,24(0,22–0,26), OQP 0,37(0,32–0,4), OQL 0,24(0,22–0,27). Sternum length 1,22(1,10–1,29), width 1,22(1,13–1,32); sigilla not visible; laterally with stout, blunt-tipped bristles. Labium length 0,25(0,22–0,29), width 0,58(0,52–0,61), with 2 to 3 cuspules. Palpal coxae 0,77(0,71–0,84) long, 0,52(0,48–0,58) wide, with proximal cluster of 8–15 cuspules. Chelicerae 0,77(0,73–0,87) long, promargin of fang furrow with 6–7 even teeth, retromargin with 3–4 denticles. Leg formula 412=3; legs unmodified, with irregular rows of blunt-tipped and slightly clavate bulbous bristles. Coxae with blunt-tipped bristles; trochanters and ventral bases of femora with blunt and clavate bristles. Spination (Ndumeni Forest specimen): leg I, femur dlll, patella 0, tibia v2ll, metatarsus v22, tarsus 0; leg II, femur dll, patella 0, tibia v2lld2, metatarsus v21, tarsus 0; leg III, femur dl, patella al, tibia v2lalld2lrll, metatarsus v222a2lr2l, tarsus 0; leg IV, femur dlrl, patella aldlrl, tibia v2aldlrll, metatarsus v222allrll, tarsus 0; palpus, femur dll, patella 0, tibia v32laldl, tarsus v222ll. Tarsus I with dorsal row of 6–7 trichobothria. Leg measurements:

	I	II	III	IV
Femur	1,68(1,55–1,87)	1,45(1,35–1,61)	1,31(1,23–1,39)	1,97(1,77–2,16)
Patella	1,03(0,97–1,13)	0,94(0,87–1,00)	0,81(0,77–0,84)	1,00(0,94–1,10)
Tibia	1,19(1,13–1,32)	1,03(0,98–1,10)	1,00(0,97–1,03)	1,61(1,48–1,81)
Metatarsus	0,94(0,87–1,03)	0,97(0,90–1,03)	1,24(1,19–1,29)	2,06(1,87–2,32)
Tarsus	0,84(0,81–0,90)	0,87(0,84–0,90)	0,95(0,94–0,97)	1,29(1,23–1,32)
Total	5,68(5,32–6,26)	5,26(4,94–5,65)	5,31(5,10–5,52)	7,94(7,29–8,71)

Palpus: femur 1,13(1,06–1,19); patella, 0,87(0,74–1,06); tibia, 0,79(0,71–0,87); tarsus 0,94(0,87–1,00); total 3,71(3,39–4,13).

Abdomen 3,0(2,8–3,33) long, 1,93(1,73–2,2) wide; with a few elongate, clavate bristles anteriorly and forming 2 dorsal rows; dorsum and sides with numerous rows of short, blunt and clavate setae; several rows of short blunt setae on venter. Spinnerets partially recessed, lengths of visible portions of posterolaterals: proximal 0,22(0,21–0,24), medial 0,13(0,11–0,16), distal 0,12(0,09–0,16); posteromedians 0,16(0,14–0,18) long. Spermathecae not visible through epigynal cuticle; two-branched, branches sessile on vulval pocket; inner branch longer than outer (Fig. 47).

Distribution (Map 3): Known only from the type locality in the Drakensberg.

Material examined: SOUTH AFRICA: *Natal:* 1♂ (holotype TM14679) 2♀ (paratypes TM14680) Drakensberg Mts, Cathedral Peak, Ndumeni Forest, sifted from wet forest litter in spray zone of water, 14 May 1976, S. Endrody-Younga (TM); 2♀, 75 km WSW Estcourt, Cathedral Peak forest Stn, el. 1 500 m, 'berlese of rotted bark, frass of *Cussonia spicata*, Podocarp forest', 18.xii.1979, S. & J. Peck (AMNH): this is probably the type locality.

Microstigmata lawrencei sp. n.

Figs 29, 46; Map 3

Etymology: It is a pleasure to name this species in honour of Dr R. F. Lawrence, a pioneer in South African Arachnology and recognised expert on the cryptic fauna of indigenous forests of which *Microstigmata* is an important element.

Diagnosis: This species is known only from the female, which may be recognised by having the pedipalpal coxae with more than 55 cuspules spread across the proximal third and the spermathecal ducts long, straight, and unbranched (Fig. 46).

Female (holotype): Total length, including chelicerae 12,27. Carapace brown, darker along margin of caput; venter of cephalothorax and legs light brown; abdomen with sides and dorsum dark grey, pale markings on dorsum forming anterior transverse band, two pair of central spots, three posterior chevrons; venter pale, with dark grey transverse bands along epigastric furrow and anterior to spinnerets; longitudinal band from furrow to spinnerets.

Carapace 4,4 long, 4,4 wide, sloping posterior to thoracic fovea; caput slightly domed; thoracic striae slightly depressed, deepest along margins of caput. Thoracic fovea occupying 0,2 width. Glabrous except for rows of fine attenuate setae along margins of thoracic striae, strongest posteriorly; caput with 2 longitudinal rows of blunt-tipped setae. Margin with few short, attenuate and blunt bristles; clypeal margin with 4 blunt-tipped bristles, bare laterally; one long, recurved blunt bristle and 2 short anterior on ocular tubercle, 1 pair between PME, 1 pair between PLE, and 1 at posterior margin.

Eyes on raised tubercle occupying 0,39 width of front. Ratio of eyes AM:AL:PM:PL 1,11:1,3:1:1,11; posterior medians slightly flattened along lateral margin, others round; from above, anterior row slightly, posterior row strongly procurved. Distances between eyes: AM–AL 0,032, AM–PM 0,064, AL–PL 0,032, PM and PL well separated, distance between 0,032. Ocular quadrangle 1,64 times wider than long, narrowed anteriorly, posterior 1,7 times width of anterior; OQA 0,41, OQP 0,66, OQL 0,04.

Sternum 2,06 long, 1,96 wide, slightly domed, 3 pairs small sigilla, anterior marginal, median and posterior submarginal; bristles attenuate. Labium 0,45 long, 0,87 wide, with 3 cuspules, about 20 slender attenuate bristles. Pedipalpal coxae 1,67 long, 1,0 wide, with pronounced proximal heel, more than 80 cuspules spread across proximal one half. Chelicerae 2,06 long, promargin with 12 mixed large and small teeth (Fig. 29), retromargin with 4 denticles.

Leg formula 4123. Legs glabrous with even rows of short setae, attenuate on lateral surfaces, blunt-tipped dorsally and ventrally. Coxae with attenuate bristles, trochanters and ventral base of femora with attenuate and blunt-tipped bristles. Spination: leg I, femur dlllll, patella v2, tibia v2222lalllrllll, metatarsus v2222allrl, tarsus 0; leg II, femur dlll, patella vl, tibia v2222allrl, metatarsus v2222lalllrl, tarsus 0; leg III, femur dl, patella vlalrl, tibia v222la2212dllrll, metatarsus v222la22121dlrlll, tarsus 0; leg IV, femur dlll, patella vlalrl, tibia v222aldllrllll, metatarsus v222a2ll2dlrlll, tarsus 0; palpus, femur aldlll, patella 0, tibia vl222al2222rlllll, tarsus v22222l; spines, especially on palpi and legs I, II, short and stout. All tarsi without scopulae. Leg I with 4 teeth on retrolateral claw. Tarsus I with dorsal row of 10 trichobothria, tarsal organ short. Leg measurements:

	I	II	III	IV
Femur	2,58(1,87–3,06)	2,32(1,65–2,84)	2,19(1,55–2,55)	3,10(2,26–3,68)
Patella	1,39(1,26–2,00)	1,52(1,10–1,74)	1,35(0,87–1,58)	1,71(1,19–2,03)
Tibia	1,81(1,26–2,19)	1,55(1,10–1,81)	1,55(1,13–1,84)	2,39(1,74–2,77)
Metatarsus	1,55(1,06–1,87)	1,42(1,03–1,65)	1,90(1,35–2,23)	3,19(2,26–3,94)
Tarsus	1,23(0,98–1,42)	1,26(1,00–1,45)	1,42(1,06–1,61)	1,71(1,29–1,94)
Total	8,55(6,42–10,55)	8,06(5,87–9,48)	7,45(5,97–9,81)	12,10(8,74–14,35)

Palpus: femur, 1,84(1,32–2,19); patella, 1,23(0,90–1,45); tibia, 1,23(0,90–1,45); tarsus, 1,45(1,03–1,68); total, 5,74(4,16–6,77).

Abdomen 6,33 long, 4,4 wide; anterior patch of elongate, blunt-tipped bristles, extending posteriad in 2 dorsal rows; on each side 5 or 6 rows of short, clavate setae; venter with scattered attenuate setae. Spinnerets exposed, without flattened setae at base; length of segments of posterior laterals: proximal 0,4, median 0,29, distal 0,26, posterior medians 0,22 long.

Genitalia visible through epigynal cuticle as 2 small spots. Spermathecae unbranched, from broad vulval chamber, diverging (Fig. 46).

Variation: The holotype and paratype ♀ are essentially the same in all characteristics although the latter is slightly smaller. The ♀ from the Franklin area differs in a number of ways: smaller, total length 7,73 mm, carapace length 2,73, width 2,33; pedipalpal coxae with fewer than 60 cuspules; legs somewhat less spinose; tarsus I with 6 teeth on retrolateral claw, dorsal row of 7 trichobothria; spermathecae parallel to converging.

Distribution (Map 3): Midlands of southern Natal.

Material examined: TRANSKEI: Kambi Forest, 31°35'S,28°48'E, xi.1961, R. F. Lawrence, NM 8099, NM type No. A2944, 2 ♀ (holotype & paratype); between Franklin and Riverside, 1 ♀, ii.1947, R. F. Lawrence (NM 5210).

Microstigmata amatola sp. n.

Figs 4, 10, 15, 44, 54–59; Map 3

Etymology: A noun in apposition after the type locality.

Diagnosis: This species has mixed large and small intercalary teeth along the promargin of the cheliceral fang furrow (Fig. 59) and 30 or more cuspules spread across the proximal third of the pedipalpal coxa (Fig. 15). Males have the clasping spine on tibia I situated on a well-developed apophysis (Fig. 58) and may be distinguished from *geophilum* by having the embolus straight (Figs 54–56). Females have the spermathecae sharply bent with a short inner branch (Fig. 44) and may be distinguished from *geophilum* in lacking the chitinised ring surrounding the spermathecal openings into the vulval chamber.

Male (holotype): Total length, including chelicerae, 7,87. Carapace light brown, darker on thoracic striae and along margins; venter of cephalothorax, legs light brown. Dorsum and sides of abdomen dark grey, pale markings on dorsum forming anterior transverse band, and 3 pairs of oblique transverse bands, 3 posterior chevrons above spinnerets; venter pale grey with slender transverse grey band, yellow white anterior to spinnerets, over posterior book-lungs, and anterior to epigastric furrow.

Sternum 1,68 long, 1,45 wide, nearly flat, anterior, median, and posterior sigilla marked; with attenuate bristles only. Labium 0,225 long, 0,61 wide, with 7 cuspules. Pedipalpal coxae 0,9 long, 0,65 wide, with about 30 cuspules spread across proximal third, cuspules with deep grooves. Chelicerae 0,87 long, promargin of fang furrow with 11 mixed large and small teeth, retromargin with 3 denticles.

Leg formula 4132. Legs glabrous with several rows of attenuate setae on all surfaces. Coxae, trochanters, and ventral base of femora with attenuate bristles only. Apex of tibia I with anteroventral apophysis (Figs 57, 58), metatarsus I slightly bent proximally. Spination: leg I, femur vldlllll, patella v2al, tibia v3l222alldl, metatarsus v22, tarsus 0; leg II, femur vlalldllll, patella v2al, tibia v222alld2, metatarsus v222all, tarsus 0; leg III, femur alllldllll, patella al, tibia v222allld12, metatarsus v222allldl, tarsus 0; leg IV, femur aldllll, patella al, tibia v222alldll, metatarsus v22l22allldll, tarsus 0; palpus, femur aldlll, patella 0, tibia vllllalrl, tarsus 9–10 apical. Tarsi I, II with weak ventral scopulae; leg I with 4 teeth on retrolateral claw. Tarsus I with dorsal row of 9 trichobothria, tarsal organ slender. Leg measurements (based on holotype and 2 paratypes):

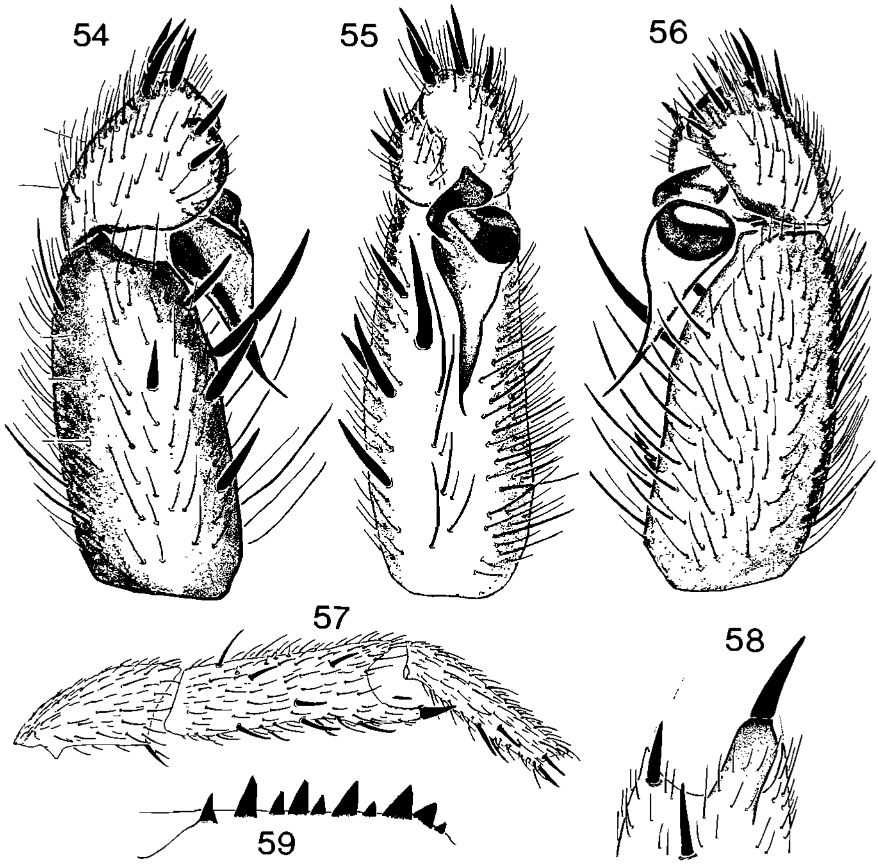
	I	II	III	IV
Femur	2,45(2,32–2,52)	2,23(2,16–2,26)	2,00(1,94–2,03)	2,74(2,68–2,81)
Patella	1,42(1,32–1,52)	1,26(1,16–1,35)	1,19(1,13–1,26)	1,32(1,29–1,39)
Tibia	1,81(1,74–1,84)	1,45(1,45–1,48)	1,55(1,55–1,58)	2,48(2,45–2,48)
Metatarsus	1,68(1,65–1,68)	1,58(1,35–1,74)	2,16(2,10–2,23)	3,32(3,19–3,45)
Tarsus	1,58(1,55–1,61)	1,55(1,52–1,58)	1,58(1,58–1,61)	1,87(1,84–1,94)
Total	8,94(8,58–9,16)	8,06(7,65–8,42)	8,48(8,35–8,71)	11,74(11,45–12,06)

Palpus: femur, 1,32(1,26–1,39); patella, 0,84(0,71–0,90); tibia, 0,97(0,87–1,00); tarsus, 0,52(0,52); total, 3,65(3,35–3,81).

Palpus (Figs 54–56) with tibia length 2,0 times width; apex of tarsus with 2 anterolateral, 7–8 retrolateral spines. Bulb with embolus long, slightly bent distally, length 2,8 times width; bulb equal to 0,69 length tibia.

Abdomen 3,73 long, 1,4 wide; glabrous, numerous elongate blunt-tipped bristles anteriorly and forming 2 dorsal rows ending above spinnerets; dorsum, sides, and venter with rows of small, attenuate setae, scattered blunt-tipped setae on posterior. Length of segments of posterior lateral spinnerets: proximal 0,24, median 0,19, distal 0,16, length posterior median spinnerets 0,13.

Female (3 paratypes): As in ♂ except where noted. Total length, including chelicerae 8,4(7,87–9,07). Carapace brown, venter of cephalothorax and legs light brown; venter of abdomen light brown. Carapace 3,53(3,27–3,73) long, 3,13(2,93–3,33) wide; thoracic fovea occupying 0,23 width of carapace. Eyes on low tubercle occupying 0,36 width of front. Ratio of eyes AM:AL:PM:PL, 1:1,67:1,25:1,5. Distances between eyes: AM–AL 0,016–0,032, AM–PM 0,048–0,064, AL–PL 0,024–0,032, PM and PL close, 0,008–0,016 apart. Ocular quadrangle 1,5 times wider than long, narrowed anteriorly, posterior 1,58 width of anterior; OQA 0,32(0,3–0,34), OQP 0,49(0,45–0,55), OQL 0,31(0,3–0,32). Sternum 1,71(1,55–1,87) long, 1,61(1,48–1,77) wide. Labium 0,34(0,32–0,35) long, 0,71(0,645–0,77) wide, with 4–12 cuspules. Pedipalpal coxae 1,61(1,09–1,29) long, 0,74(0,68–0,84) wide; with 34–45 cuspules spread across proximal portion (Fig. 15), cuspules deeply grooved. Chelicerae 1,04(1,0–1,07) long, promargin of fang furrow with 8 to 12 mixed large and small teeth (Fig. 59), retromargin with 2–5 denticles. Leg formula 4132. Legs unmodified, glabrous with rows of attenuate



Figs 54–59. *Microstigmata amatola*, sp. n. 54–58. Male, holotype. 59. Female, paratype. 54. Palpus, anterolateral. 55. Palpus, ventral. 56. Palpus, retrolateral. 57. Patella-metatarsus I, anterolateral. 58. Apex of tibia I, right, ventral. 59. Chelicera, promarginal teeth.

Carapace 3,27 long, 2,73 wide, flat, then sloping posterior to thoracic groove, caput slightly domed; thoracic striae depressed, deepest laterally and along margin of caput. Thoracic fovea straight, occupying 0,2 width of carapace. Glabrous except for 3 to 4 rows of fine setae along interstrial ridges; caput with several rows of fine setae, 2 rows of attenuate bristles. Margin with numerous long and short attenuate bristles; clypeal margin bare laterally, with 2 long and 1 short attenuate bristles in centre; 1 long, recurved and 2 short bristles anterior to ocular tubercle, 2 large and 2 small bristles between PME, 3 bristles between PLE.

Eyes on raised tubercle occupying 0,36 width of front; from above anterior eye row straight, posterior row slightly recurved. Ratio of eyes AM:AL:PM:PL, 1:1,8:1,2:1,5; posterior median eyes strongly flattened along margin with laterals, others round. Distance between eyes: AM–AL 0,024, AM–PM 0,08, AL–PL 0,048, PM and PL separate, distance between 0,032. Ocular quadrangle 1,5 times wider than long, narrowed anteriorly, posterior 1,38 times width of anterior; OQA 0,33, OQP 0,46, OQL 0,3.

and blunt-tipped setae; coxae trochanters, and ventral base of femora with attenuate and blunt-tipped setae. Spination: leg I, femur dllll, patella 0, tibia v222dl, metatarsus v222al, tarsus 0; leg II, femur dllll, patella 0, tibia v222alld2, metatarsus v222all, tarsus 0; leg III, femur dlll, patella al, tibia v222alldllrl, metatarsus v222allrl, tarsus 0; leg IV, femur dlll, patella alrl, tibia v2l2alldllrlll, metatarsus v2l2allrll, tarsus 0; palpus, femur aldlll, patella 0, tibia v222al2ll, tarsus v22221. Dorsal spines usually blunt-tipped, others attenuate. Scopulae absent; leg I with 4–5 teeth on retrolateral claw; tarsus I with dorsal row of 7–9 trichobothria. Leg measurements:

	I	II	III	IV
Femur	2,39(2,26–2,55)	2,06(1,90–2,19)	2,00(1,90–2,10)	2,71(2,52–2,87)
Patella	1,55(1,45–1,71)	1,39(1,29–1,55)	1,19(1,03–1,32)	1,48(1,35–1,55)
Tibia	1,71(1,61–1,84)	1,42(1,35–1,55)	1,42(1,29–1,48)	2,26(2,16–2,32)
Metatarsus	1,32(1,26–1,35)	1,32(1,26–1,35)	1,74(1,65–1,77)	2,87(2,68–3,03)
Tarsus	1,16(1,10–1,23)	1,19(1,10–1,26)	1,26(1,19–1,29)	1,55(1,52–1,61)
Total	8,13(7,68–8,68)	7,39(6,90–7,90)	7,61(7,06–7,97)	10,87(10,23–11,39)

Palpus: femur, 1,65(1,65–1,68); patella, 1,16(1,13–1,23); tibia, 1,13(1,06–1,19); tarsus, 1,39(1,35–1,42); total, 5,32(5,23–5,52).

Abdomen 4,0(3,67–4,2) long, 2,87(2,6–3,07) wide; elongate, blunt-tipped bristles in anterior patch and forming 2 dorsal rows, laterally several rows of short, blunt-tipped setae, venter with attenuate setae. Spinnerets with cuticular fold around base, exposed, length of segments of posterior laterals proximal 0,3(0,22–0,37), median 0,2(0,19–0,21), distal 0,17(0,16–0,18), posterior medians 0,18 long. Spermathecae visible as 2 dark spots through epigynal cuticle; slender, diverging, inner branch short or vestigial, outer branch elongate (Fig. 44).

Distribution (Map 3): Mountains of the eastern Cape between the Great Fish and Kei Rivers.

Material examined: CISKEI: Amatola Mts near Hogsback, ii.1933, R. F. Lawrence, 1 ♂ (holotype SAM 2709) 3 ♂ 20 ♀ (paratypes) 1 ♂ 3 ♀ in NM, 1 ♂ 2 ♀ in AMNH, remainder in SAM including holotype; Kologha Forest, Stutterheim, iii.1962, 2 ♂, R. F. Lawrence (NM 8764).

Microstigmata geophilum (Hewitt)

Figs 1, 2, 11, 16, 18, 42, 60–65; Map 3

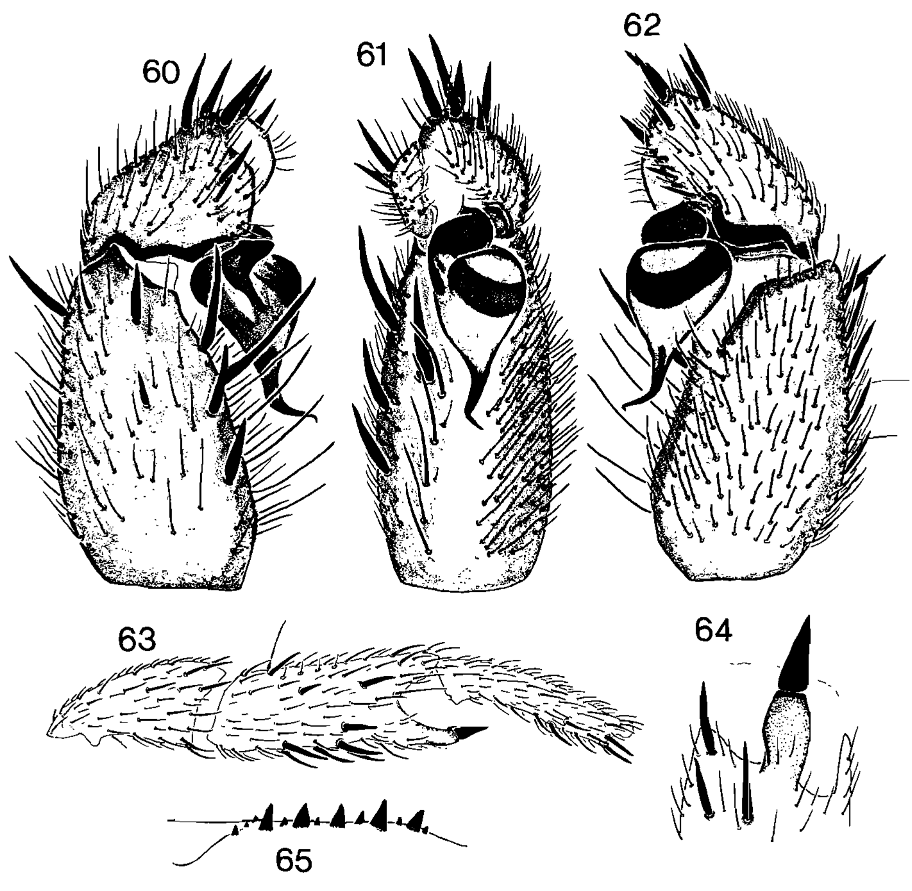
Microstigma geophilum Hewitt, 1916:207, fig. 8 (female lectotype, here designated, and 7 female paralectotypes from Grahamstown, South Africa, iii.1915, J. Hewitt, in the Albany Museum); 1925:287, figs 2, 3. Bonnet, 1957:2906.
Microstigmata geophilum, Strand, 1932:142. Roewer, 1942:194. Raven & Platnick, 1981:15.

Diagnosis: This species has mixed large and small intercalary teeth along the promargin of the cheliceral fang furrow (Fig. 65) and 40 or more cuspules spread across the proximal third of the pedipalpal coxa (Fig. 16). Males may be distinguished from those of *amatola* by having the embolus sharply bent (Figs 60–62). Females may be recognised by the chitinous ring surrounding the spermathecal openings into the vulval chamber (Fig. 42).

Male: Total length, including chelicerae 7,47. Carapace light brown, darker on thoracic striae and along margin; venter of cephalothorax and legs light brown; abdomen with dorsum dark grey, sides mottled with dark grey; pale markings on dorsum forming anterior rectangular spot, 3 pair dorsal spots and 2 posterior chevrons; venter pale grey with faint longitudinal grey mark, covers of book-lungs yellow brown, spinnerets white.

Carapace 3,07 long, 2,6 wide, gradually sloping posterior to thoracic fovea; caput flat; thoracic striae slightly depressed. Thoracic fovea straight, occupying 0,18 width of carapace. Glabrous except for 1 or 2 rows of fine, attenuate setae along interstrial ridges, longest on posterolateral ridge; caput with four irregular rows of attenuate setae; margin lined with attenuate bristles, longest posteriorly; clypeal margin with 3 attenuate bristles in centre, bare laterally; 1 long and 2 short recurved bristles anterior to ocular tubercle, 2 large and 2 small blunt-tipped bristles between PME.

Eyes on low tubercle occupying 0,43 width of front; from above anterior and posterior rows slightly recurved. Ratio of eyes AM:AL:PM:PL, 1:1,6:1,25:1,4; PME flattened along posterior margin, others round. Distances between eyes: AM–AL 0,008, AM–PM 0,048, AL–PL 0,024, PM and PL nearly touching. Ocular



Figs 60–65. *Microstigmata geophilum* (Hewitt), SAM 2596. 60–64. Male. 65. Female. 60. Palpus, anterolateral. 61. Palpus, ventral. 62. Palpus, retrolateral. 63. Patella-metatarsus I, left, anterolateral. 64. Apex of tibia I, right, ventral. 65. Chelicera, promarginal teeth.

quadrangle 1,44 times wide as long, narrowed anteriorly, posterior 1,67 times wide as anterior; OQA 0,25, OQP 0,42, OQL 0,29. Sternum 1,48 long, 0,64 wide, flat, median and posterior sigilla faintly marked, with attenuate bristles only. Labium 0,225 long, 0,55 wide, with 5 cuspules. Pedipalpal coxae 0,9 long, 0,52 wide, with more than 40 cuspules spread across proximal portion, cuspules deeply grooved. Chelicerae 0,8 long, promargin of fang furrow with 10 mixed large and small teeth, retromargin with 1–2 denticles.

Leg formula 412=3. Glabrous, with regular rows of attenuate and blunt-tipped bristles, latter longest along retroventral margin of femora I, II. Coxae, trochanters, and ventral base of femora with attenuate and blunt-tipped bristles. Apex of tibia with anteroventral apophysis (Figs 63, 64), metatarsus I slightly bent at base. Spination: leg I, femur aldlllll, patella v2, tibia v22212a2ld2, metatarsus v212llal, tarsus 0; leg II, femur aldllll, patella alrl, tibia v222alld2rl, metatarsus v222al, tarsus 0; leg III, femur allldllllrlll, patella a2rl, tibia v222a22ldl2rlll, metatarsus v222allldlrlll, tarsus 0; leg IV, femur aldllllrll, patella a2rl, tibia v222al2ldlllrll, metatarsus v222a2lldlrlll, tarsus 0; palpus, femur aldllll, patella 0, tibia vllllа2dl, tarsus 9 apical. Dorsal and lateral spines usually blunt-tipped, ventral attenuate. Scopulae absent; leg I with 4 teeth on retrolateral claw. Tarsus I with dorsal row of 7 trichobothria, tarsal organ short. Leg measurements:

	I	II	III	IV	Palpus
Femur	2,26	2,10	1,87	2,68	1,23
Patella	1,35	1,29	1,13	1,42	0,81
Tibia	1,65	1,35	1,39	2,26	0,87
Metatarsus	1,45	1,52	1,90	3,42	—
Tarsus	1,45	1,42	1,35	1,77	0,61
Total	8,16	7,68	7,65	11,55	3,52

Palpus (Figs 60–62) with tibia length 1,67–1,78 times width; apex of tarsus with 2 anterolateral, 7 retrolateral spines. Bulb with embolus long, sharply bent distally; length 2,3–2,5 times width; bulb equal to 0,67–0,72 length tibia.

Abdomen 3,47 long, 2,4 wide; glabrous, with elongate, blunt-tipped bristles in anterior patch and forming 2 dorsal rows extending past middle; dorsum and sides with several rows of short, blunt-tipped bristles, venter with attenuate setae. Length of segments of posterior lateral spinnerets: proximal 0,26, median 0,18, distal 0,14; length posterior medians 0,14.

Female: As in ♂, except where noted. Total length, including chelicerae 8,67(8,0–9,87). Carapace light brown to dark brown, 3,2(2,87–3,87) long, 2,67(2,4–3,2) wide, thoracic fovea occupying 0,15 width of carapace. Clypeal margin with 3–5 blunt-tipped bristles in middle, lateral setae absent. Eyes on low tubercle occupying 0,37 width of front. Ratio of eyes AM:AL:PM:PL, 1:1,7:1,2:1,7. Distances between eyes: AM–AL 0,024, AM–PM 0,072, AL–PL 0,04, PM and PL separate, distance between 0,016. All eyes nearly round. Ocular quadrangle 1,5 times wider than long, narrowed anteriorly, posterior 1,6 times wider than anterior; OQA 0,29(0,26–0,34), OQP 0,45(0,4–0,53), OQL 0,29(0,26–0,35). Sternum 1,52(1,35–1,81) long, 1,48(1,39–1,71) wide, with attenuate and few blunt-tipped bristles. Labium 0,32(0,29–0,35) long, 0,645(0,58–0,74) wide, with 3–7 cuspules. Pedipalpal coxa 1,1(1,0–1,32) long, 0,71(0,645–0,81) wide, with about 40 cuspules spread across proximal portion (Fig. 16), cuspules with deep grooves (Fig. 18).

Chelicerae 1,13(0,93–1,27) long, promargin of fang furrow with 10–12 mixed large and small teeth (Fig. 65), retromargin with 3–4 denticles.

Leg formula 412=3; legs glabrous with attenuate and blunt-tipped setae scattered or arranged in irregular rows; coxae, trochanters, and ventral base of femora with attenuate and blunt-tipped bristles. Spination: leg I, femur dlll, patella 0, tibia v222d2, metatarsus v222, tarsus 0; leg II, femur dlll, patella 0, tibia v212a1d2, metatarsus v222a11, tarsus 0; leg III, femur dl, patella al, tibia v22lalldl2rl, metatarsus v222alllrlll, tarsus 0; leg IV, femur dll, patella alrl, tibia v222alldllrl, metatarsus v222alllrlll, tarsus 0; palpus, femur dlll, patella 0, tibia v422a2dl, tarsus v22222. Legs unmodified, leg I with 5 teeth on retrolateral claw, tarsus I with dorsal row of 6–7 trichobothria. Leg measurements:

	I	II	III	IV
Femur	2,23(2,00–2,52)	1,94(1,71–2,32)	1,77(1,58–2,06)	2,55(2,32–2,90)
Patella	1,42(1,23–1,61)	1,29(1,03–1,48)	1,06(0,97–1,23)	1,32(1,26–1,48)
Tibia	1,52(1,35–1,81)	1,42(1,16–1,58)	1,29(1,16–1,48)	2,06(1,87–2,32)
Metatarsus	1,26(1,16–1,35)	1,23(1,06–1,35)	1,55(1,42–1,74)	2,61(2,35–2,97)
Tarsus	1,10(1,03–1,23)	1,10(1,03–1,23)	1,23(1,19–1,29)	1,45(1,35–1,55)
Total	7,52(6,77–8,52)	6,97(6,00–7,97)	6,90(6,32–7,81)	10,00(9,16–11,23)

Palpus: femur, 1,58(1,39–1,94); patella, 1,03(0,90–1,23); tibia, 1,03(0,94–1,23); tarsus, 1,29(1,16–1,48); total, 4,94(4,39–5,87).

Abdomen 4,13(3,73–4,87) long, 2,93(2,4–3,93) wide, venter pale grey with faint grey longitudinal band and transverse bands on epigastric furrow and half distance to spinnerets. Spinnerets exposed, lengths of segments of posterior laterals: proximal 0,40(0,35–0,46), median 0,22(0,19–0,24), distal 0,18(0,17–0,19); length posterior median spinnerets 0,20(0,19–0,21). Female genitalia visible through epigynal cuticle as 2 spots; spermathecae diverging, unbranched with strong bend at half of length or with short inner branch; opening to vulval chamber surrounded by conspicuous ring (Fig. 42).

Distribution (Map 3): Eastern Cape around Grahamstown.

Material examined: SOUTH AFRICA: Grahamstown, iii.1915, 8 ♀ (lectotype & paralectotypes), J. Hewitt (AM); 1 ♂, R. F. Lawrence (SAM 2596); Coldspring Farm, near Grahamstown, 23.i.1924, 1 ♂, J. Hewitt (AM).

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