The genus *Mucroberotha* Tjed. and its systematic position (Neuroptera)

By Bo Tjeder

In 1959 I described the genera *Rhachiberotha* and *Mucroberotha* which I classified as belonging to the family Berothidae. A new subfamily, the Rhachiberothinae, was established for these genera which are distinguished from all other Berothids chiefly by having raptorial forelegs of a type very similar to those of the Platymantispinae, a subfamily of the Mantispidae. All the specimens on which I based the descriptions were females.

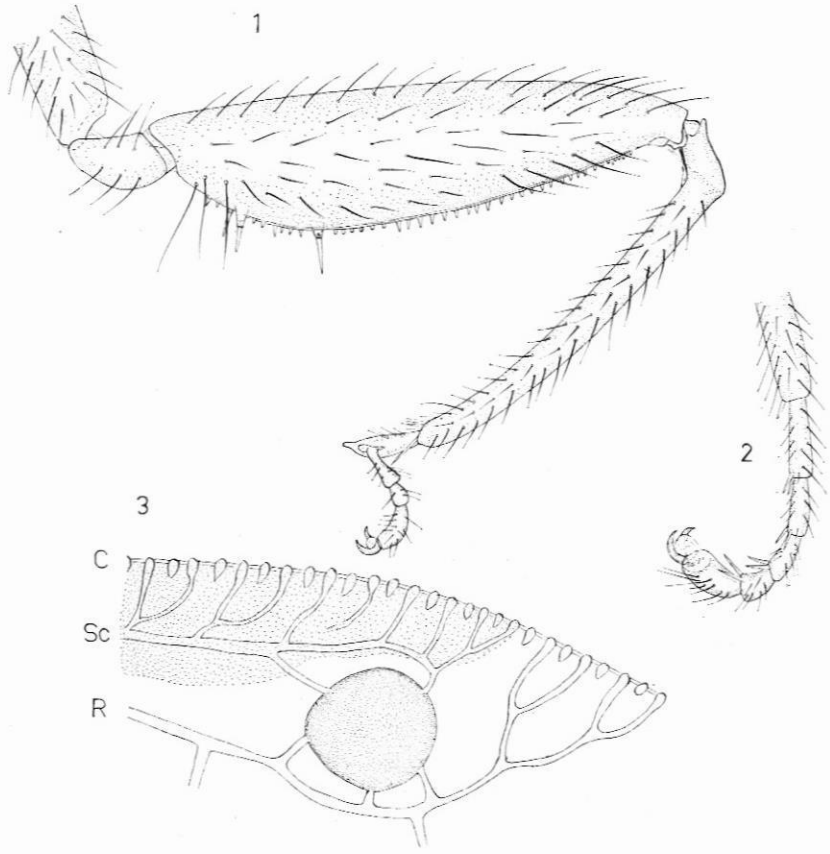
In 1964 I received from the Riksmuseum, Stockholm, a number of specimens of various families of Neuroptera for identification, among them a male from Southern Africa which I regarded as probably being a *Mucroberotha*. The specimen differs, however, in very important characteristics from the described ♀ of *M. fasciata,* having 4-segmented fore tarsi (5-segmented in the ♀), possessing peculiar vesicular structures in the wings (absent in the ♀) and having the ectoprocts separate from the 9th tergite (fused with one another and with the 9th tergite in the ♀). In size, venation and colour pattern of the wings the specimen agrees well with *M. fasciata*. Not sure about the classification of the ♂ I set it aside awaiting more material of both sexes. Recently I received from the Transvaal Museum, Pretoria, and the National Museums of Rhodesia, Bulawayo, collections of Neuroptera for identification, and in both these collections there are additional ♂♂ of the same species and also some ♀♀, representing two different species of *Mucroberotha*. One of these females is from a locality quite close to that of one of the males, and I am no longer in doubt about the generic association.

All the specimens now available, 9 ♂♂ and 3 ♀♀, have the same characteristic colour pattern of the wings as has *M. fasciata* but they do not seem to belong to this species, the terminal abdominal structures of the females being different. The 3 ♀♀ represent two new species. One of them, *M. nigrescens* n. sp., is from a locality (fig. 24, ■) only 150 miles from the type locality of *M. fasciata* (fig. 24, ●), while the other species, *M. vesicaria* n. sp. seems to have a wide, more westerly and southerly distribution (fig. 24, ▲). All the ♂♂ are considered to belong to this latter species.

Gen. *Mucroberotha* Tjeder, 1959

Mucroberotha Tjeder, 1959. S. Afr. Anim Life, 6. P. 276, 1959.

Type species: *M. fasciata* Tjeder, 1959.



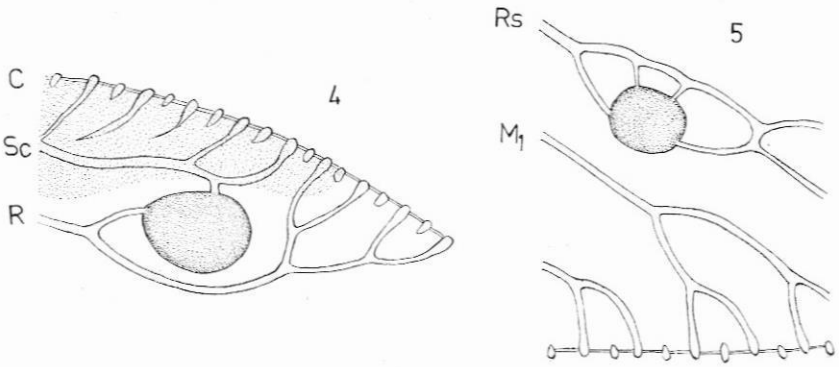
Figs. 1—3. *Mucroberotha vesicaria* n.sp. (holotype ♂). — 1. Foreleg, frontal. — 2. Tip of tibia and tarsus of middle leg. — 3. Portion of right forewing with vesica.

Description

♀. Examination of the additional females now available has shown that the statement in 1959 "cercal callus and the trichobothria lacking" is incorrect as concerns the two new species. In both of them a faint callus cerci is present, clothed with some short, trichobothria-like hairs (as in *Rhachiberotha* Tjed., 1959). The description of the female abdominal end has to be modified thus: callus cerci and trichobothria present or lacking. Tergite 9 and ectoprocts fused.

Forelegs raptorial with 5-segmented tarsi. Wings without vesicular structures; veins R and M of forewing on a common stem.

♂. Similar to the female but fore tarsi 4-segmented with modified 1st segment, and wings with vesicular structures (vesicae) which are covered with sense organs and are situated as follows: in the forewings between Sc and R below and a little distad of the pterostigma; in the hindwings in all available



Figs. 4—5. *Mucroberotha vesicaria* n.sp. (holotype ♂). — 4. Portion of right hindwing with anterior vesica. — 5. Ditto with posterior vesica.

specimens between the 1st branch from Rs and M_1 near the margin (on level with the pterostigma) and occasionally also between Sc and R as in the forewing. The tip of R is displaced in a curve to make room for the vesica between Sc and R. The vesicae are connected with veins to the main veins in question.

Tip of abdomen enlarged dorso-ventrally. Tergite 9 distinctly separate from the ectoprocts by a suture and not divided dorsally. Sternites 8 and 9 fused. Ectoprocts with faint callus cerci with trichobothria-like hairs. Gonarcus large, shield-like. Parameres fused, with a large and flattened apophysis proxima. A very long penisfilum is present. Hypandrium internum present.

Geographical distribution

Transvaal, Rhodesia, S.W. Africa.

Key to species:

1. Antennae: scape and pedicel black, flagellum yellow 2
– „ scape, pedicel and 5 basal flagellar segments black; flagellum otherwise yellow with dark tip porton ..... 3. *nigrescens* n. sp.
2. Dorsum of abdomen yellow ..... 1. *fasciata* Tjed.
– „ „ „ black with yellow areas ..... 2. *vesicaria* n. sp.

1. *M. fasciata* Tjed., 1959

Mucroberotha fasciata Tjeder, 1959. S. Afr. Anim. Life, 6. P. 277, figs. 253 B—N.

Locus typicus: Goromonzi, Mkota Reserve, Mtoko Distr., Rhodesia (cf. map, fig. 24, ●). Type: one female in the collections of the British Museum, Natural History, London.

♂ unknown. No additional material available.

2. *M. vesicaria* n. sp. (Figs. 1—19, 25—30, 32)

Locus typicus: "Caffraria". — Type: one male in the collections of the Riksmuseum, Stockholm. Restricted type-locality: Zoutpan, Pretoria, in the Transvaal.

Description

Available material: 9 ♂♂ and 1 ♀ (pinned).

Holotype ♂.

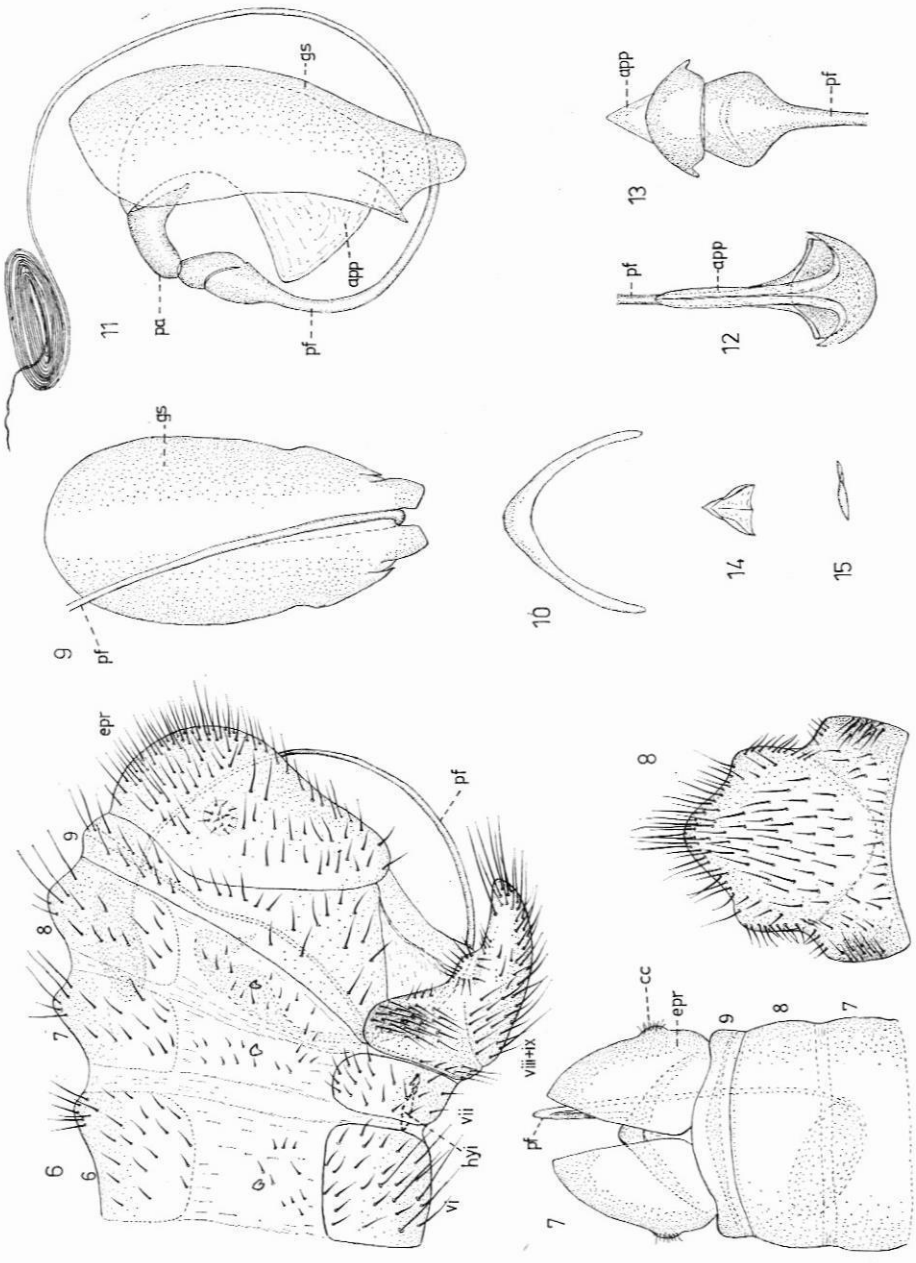
Size: length of body 4 mm, of forewing 6 mm, of hindwing 5 mm.

Head light yellowish brown, without dark spots. Mouthparts of the same colour but 5th segment of maxillary palpi somewhat darker. Scape blackish brown (pedicel and flagellum lost). Vertex and frons with pale, long hairs which are directed forwards and slightly decumbent on the vertex.

Pronotum yellow with yellowish brown lateral margins. Meso- and metathorax light yellowish brown. Hairiness of thorax pale and rather long, erect. Legs pale yellow with yellow hairs. Foreleg (fig. 1): coxa, trochanter and femur as in *M. fasciata* but tarsus different, 4-segmented; its 1st segment is enlarged end prolonged beyond the insertion of the 2nd segment and ends as a strong, subacute tooth as illustrated in the figure. Teeth and nodules of the femur dark brown. Middle and hind legs slender with 5-segmented tarsi.

Wings (fig. 25) hyaline with reddish pterostigma and brown spots and stripes as shown in the figure. The colour pattern is almost identical with that of *M. fasciata*. Veins of forewings yellowish brown, of hindwings yellowish, a little darker in the striped areas. Marginal fringes and hairs on veins mainly pale but some dark hairs are intermingled among the pale ones, especially in the dark areas. The vesica of the forewing is large and the radius is strongly curved behind the structure and Rs also shows displacement behind it. The hindwing has two vesicae which are much smaller than that of the forewing. As in the forewing, the tip of R is abruptly curved behind the vesica. The vesicae of the right pair of wings and their connections to the main veins are shown in figs. 3—5.

Abdomen. Dorsum very weakly sclerotized, sooty black with yellow areas. Each tergite has thus a pair of transverse dorsal, somewhat elongate central spots and on each side a yellow elongate spot near fore margin. This black colour disappears totally when the abdomen is cleared in potassium hydroxide. Venter more strongly sclerotized, yellow, but sternite 8+9 with a dark lateral spot as shown in fig. 6. Tergite 9 and ectoprocts also more strongly sclerotized than the preceding tergites, yellow. Hairs rather long, pale but blackish on the spot on sternite 8+9. Tergite 9 very narrow dorsally, gradually becoming wider downwards; its expanded portion is nearly three times as broad as the dorsal portion. Its anterior corner is strongly connected by membraneous tissues to the upper part of sternite 8+9. A long apodeme runs on the inside of tergite 9 (indicated as a dotted double-line in fig. 6). Sternite 8+9 scoop-like in lateral view; in ventral view shaped as shown in fig. 8. Limit between sternites 8 and 9 partly indicated by a faint suture. Ectoprocts (epr) almost pear-shaped in lateral view; callus cerci small, rounded, with 14 trichobothria-like hairs. Gonarcus (gs) pale, very large,



Figs. 6—15. *Mucroberotha vesicaria* n.sp. (holotype ♂). — 6. Apex of abdomen, lateral. — 7. Ditto, dorsal. — 8. Sternite 9, ventral. — 9. Gonarcus and part of penisfilum, caudal. — 10. Gonarcus, dorsal. — 11. Gonarcus and parameres with penisfilum, lateral. — 12. Parameres, dorsal. — 13. Ditto, frontal. — 14. Hypandrium internum, dorsal. — 15. Ditto, lateral.

Abbreviations: app = apophysis proxima; cc = callus cerci; epr = ectoproct; gs = gonarcus; hyi = hypandrium internum; pa = parameres; pf = penisfilum; 6—9 = tergites 6—9; vi-ix = sternites 6—9.

reaching from anus to sternite 8+9, as a convex shield forming the hind body wall of the abdomen. Its lower portion is weakly sclerotized, ending as two weak, truncate processes, separated by a deep, semi-circular incision

(fig. 9). On each side above these processes there is a sclerotized brown-pigmented acute process (figs. 9 and 11). The gonarcus appears arch-shaped in dorsal view (fig. 10). The parameres are situated behind the gonarcus as illustrated in fig. 11. They are fused but their very large apophysis proxima is distinctly formed by a pair of leaf-like pieces which have grown together (figs. 11—13, app). The apophysis is completely unpigmented while the other part of the parameres is brown, being a convex plate with acute side-corners. This is movably joined to a similar plate which has a transverse, deep furrow and ends in an extremely long penisfilum as shown in figs. 11—13. The penisfilum runs downwards and projects out of the abdomen through the ventral incision of the gonarcus as illustrated in fig. 9, describes a wide curve and reenters the abdomen above the gonarcus and ends as a dense curl situated in a membraneous flattened envelope (it is exactly so arranged in seven of the paratypes, in the 8th paratype it is partly drawn out, forming two large loops outside the abdomen but the apical part is hidden within the abdomen). Hypandrium internum very small, flattened (figs. 14—15).

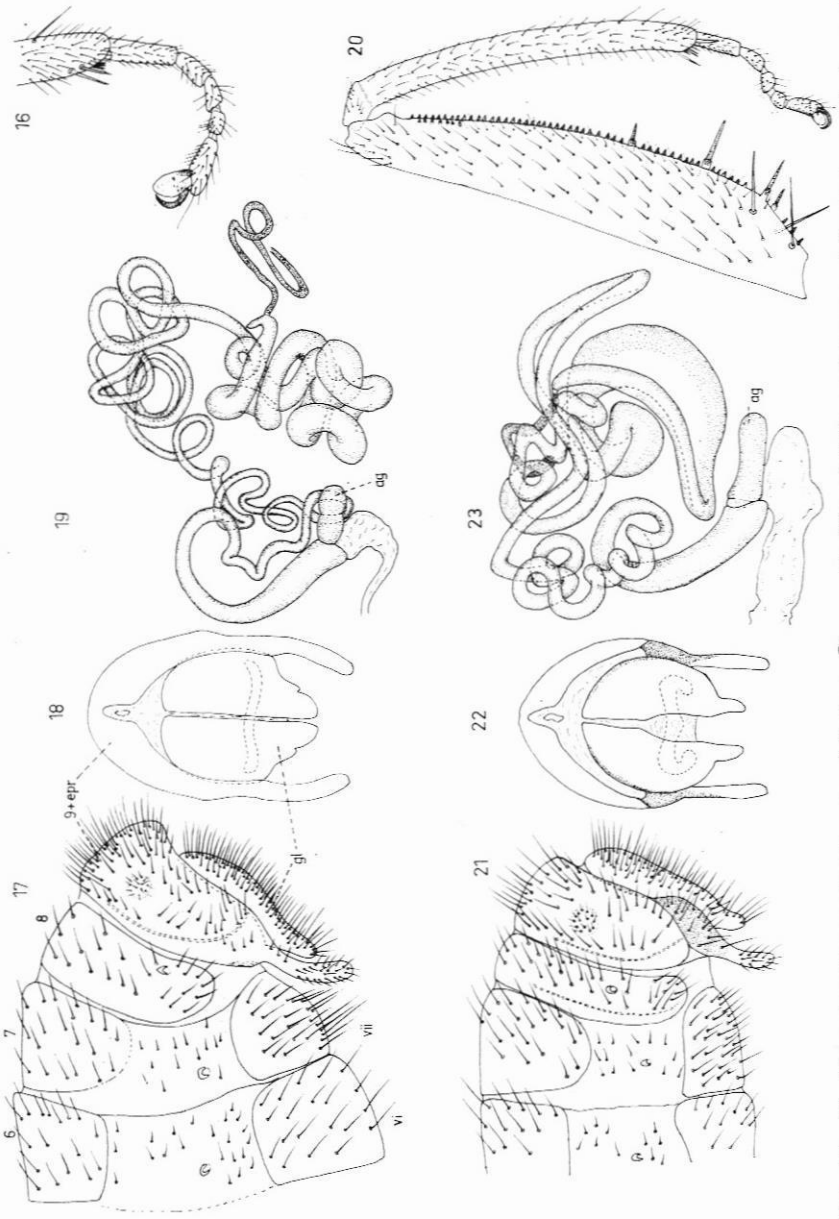
There are eight ♂♂ paratypes. Their forewings measure: 6, 6, 6.5, 6.5, 6.5, 6.5, 6.8 and 7 mm respectively. The two largest are from Rhodesia. The antennae of the paratypes are more or less complete, measuring 4—4.5 mm and being yellow with black scape and pedicel (as in *M. fasciata*). The apical segment is elongate and the setae on the flagellum are long, dark yellowish. The vesicae of the wings vary in number and size as follows:

1 paratype from Zoutpan, Pretoria, (fig. 26) is similar to holotype;
1 paratype from the same locality has a small vesica in the forewing, lacks the anterior one in the hindwing but has a large posterior one, larger than that of the forewing (about of the same condition as shown in fig. 28);
2 paratypes from the same locality have a very small vesica in the forewing, lack the anterior one in the hindwing and have a very small posterior one (fig. 27);
1 paratype from Moorddrift has a small vesica in the forewing, lacks the anterior one in the hindwing but has a large posterior one (as in fig. 28);
1 paratype from Abachaus (head lost) has a relatively large vesica in the forewing, lacks the anterior one in the hindwing but has a relatively large posterior one (of the same size as that in the forewing);
1 paratype from Douglasdale has a relatively large vesica in the forewing, lacks the anterior one in the hindwing but has a very large posterior one (fig. 28).

All these paratypes are symmetrical, i. e. the vesicae are exactly similar in the left and right pairs of wings. A paratype from Wankie is, however, asymmetrical. In addition to a large vesica in each forewing and a small posterior vesica in each hindwing this specimens has also an extremely small anterior vesica in the left hindwing (fig. 29) whereas the right hindwing lacks a corresponding structure. This minute vesica is in close connection with R which is not displaced in a curve behind it.

The paratypes otherwise agree well with the holotype. There are only slight differences in the colour pattern on the wings and in the venation. One paratype, fig. 26, has thus an additional prong from Rs in the hindwings.

Allotype ♀ (fig. 30).



Figs. 16—19. *Mucroberotha vesicaria* n.sp. (allotype ♀). — 16. Tip of tibia and tarsus of foreleg. — 17. Apex of abdomen, lateral. — 18. Ditto, caudal. — 19. Spermatheca, lateral. — Figs. 20—23. *Mucroberotha nigrescens* n.sp. (holotype ♀). — 20. Foreleg, frontal. — 21. Apex of abdomen, lateral. — 22. Ditto, caudal. — 23. Spermatheca, lateral. Abbreviations: ag = accessory gland; epr = ectoproct; gl = gonapophyses laterales; 6—9 = tergites 6—9; vi-vii = sternites 6—7.

I hope I am right in associating a ♀ from Naboomsspruit with the ♂♂ described above. The locality is quite close to Moorddrift, where one of the paratypes was collected.

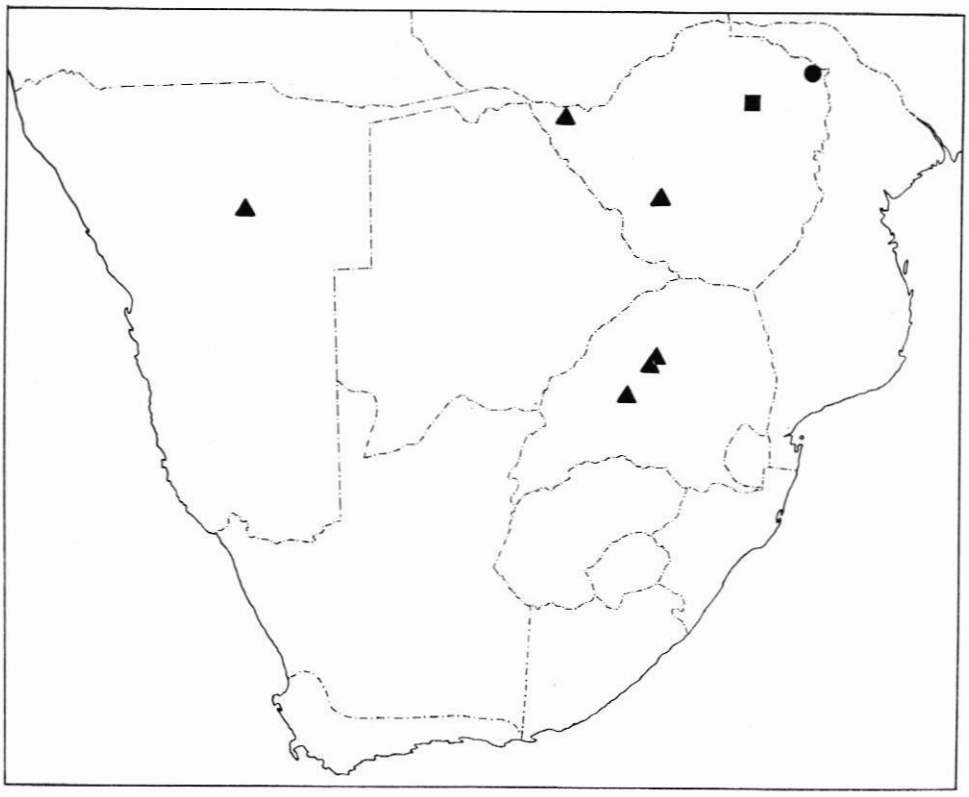


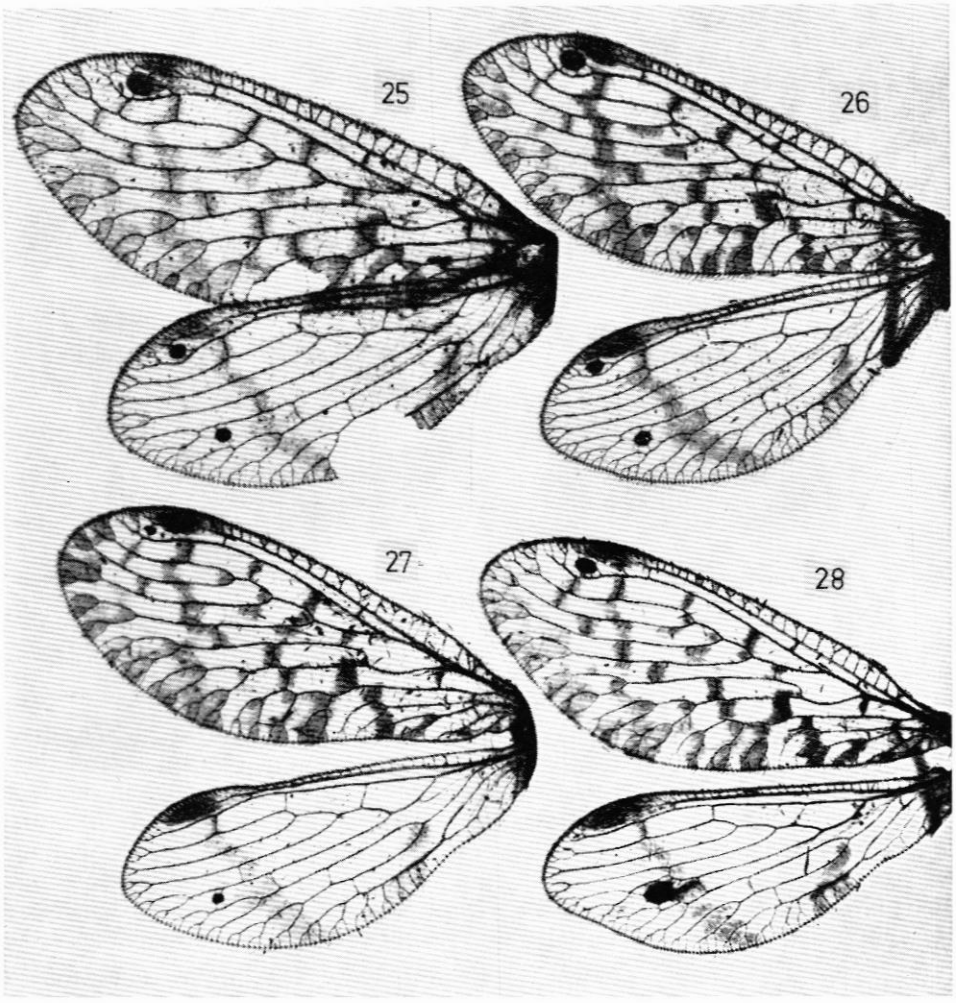
Fig. 24. Distribution of the genus *Mucroberotha* Tjed. Symbols: ●=*M. fasciata* Tjed.; ▲=*M. vesicaria* n.sp.; ■=*M. nigrescens* n.sp.

Size: length of body 5 mm, of forewing 7 mm, of hindwing 6 mm, of antenna about 4 mm.

Head and thorax as in the holotype but lateral margins of pronotum less darkened, almost as pale as the disc. Antennae with two basal segments black and the flagellum yellow. Femur of foreleg as in the holotype. Tibia of the same leg also similar but the arrangement of the apical spurs is slightly different, the distal spur lacking (fig. 16). Middle and hind legs as in the holotype. All tarsi 5-segmented, with large empodium and blackish claws (fig. 16).

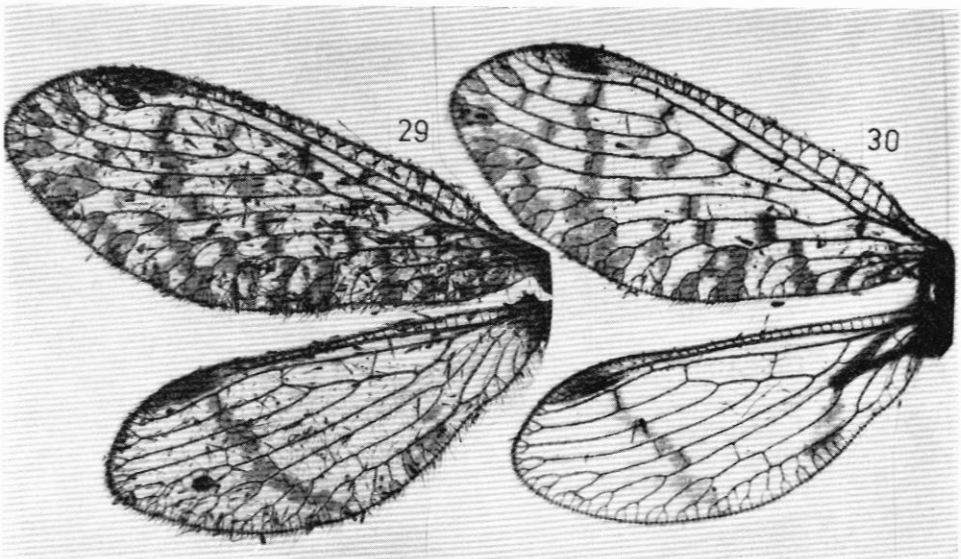
Wings (fig. 30) as in the holotype but vesicae lacking and Rs straight behind the pterostigma.

Colour of abdomen as in the holotype, the dorsum being sooty black with yellow areas, the venter and the apex yellow. As in the ♂ the black colour disappeared when the abdomen was cleared in KOH. The terminal structures (figs. 17—19) are of the same general pattern as in *M. fasciata* but there are some important differences. Tergite 9 and ectoprocts (9+epr) are completely fused, without the suture between the two parts which is discernible in



Figs. 25—28. *Mucroberotha vesicaria* n.sp. Wings. — 25. Holotype ♂. — 26. Paratype ♂ from Zoutpan. — 27. Paratype ♂ from Zoutpan. — 28. Paratype ♂ from Douglasdale.

fasciata. The structure carries a distinct callus cerci with 14 short trichobothria-like hairs (not seen in *fasciata*), its upper hind corner is prominent in lateral view and its lower portion forms a long and slender, slightly curved process. A curved apodeme is present on the inside of the structure, indicated by dots in fig. 17. The lateral gonapophyses are similar to those of *fasciata* but their lower apices appear broader in caudal view (fig. 18). Postgenitale as in *fasciata*. Spermatheca (fig. 19) sclerotized, brown, similar to that of *fasciata* but different in details.



Figs. 29—30. *Macroberotha vesicaria* n.sp. Wings. — 29. Paratype ♂ from Wankie. — 30. Allotype ♀.

Geographical distribution

"**Caffraria**" without further data, holotype ♂, leg. J. A. Wahlberg, in coll. Riksmuseum, Stockholm. — **Transvaal:** Zoutpan, Pretoria, 4 paratypes ♂♂, 4—10.2.1929, leg. G. van Son, in coll. Mus. Pretoria and Mus. Lund. — Naboomspruit, allotype ♀, 8.1.1927, leg. id., in coll. Mus. Pretoria. — Moorddrift, 1 paratype ♂, 8.12.1914, leg. C. J. Swiersta, in coll. Mus. Pretoria. — **Rhodesia:** Douglasdale, Hillside, Bulawayo, 1 paratype ♂, 8.1.1967, in coll. Mus. Lund. — Wankie, 1 paratype ♂, Dec. 1961, in coll. Mus. Bulawayo. — **S.W. Africa:** Abachaus, Otjimvarongo, 1 paratype ♂, Dec. 1949, leg. G. Hobohm, in coll. Mus. Pretoria. (Distribution, cf. map, fig. 24, ▲.)

J. A. Wahlberg collected insects in Southern Africa in the years 1839—1844 (Cape Province, Natal and the Transvaal) and again in the years 1854—1855 (S.W. Africa and northern Botswana). The insects from the years 1839—1844 are labelled "Caffraria". It is accordingly impossible to state the exact locality of the holotype of *M. vesicaria* but it is most probably from the Transvaal, where he collected insects in many places, also in the regions closely to the west and north of present Pretoria. He had his headquarter for a long time in Haartbeespoort and he collected for example at the Aapies-river and the Pienaars River, which are very close to Zoutpan, where four paratypes were captured in 1929 by the late Dr van Son.

Ecological distribution

Zoutpan, about 30 miles NW of Pretoria, is an old crater-like formation, presumably meteoric, surrounded by savanna. The diameter of the crater is about 800 metres. Its bottom is plain and stony with a sparse vegetation of

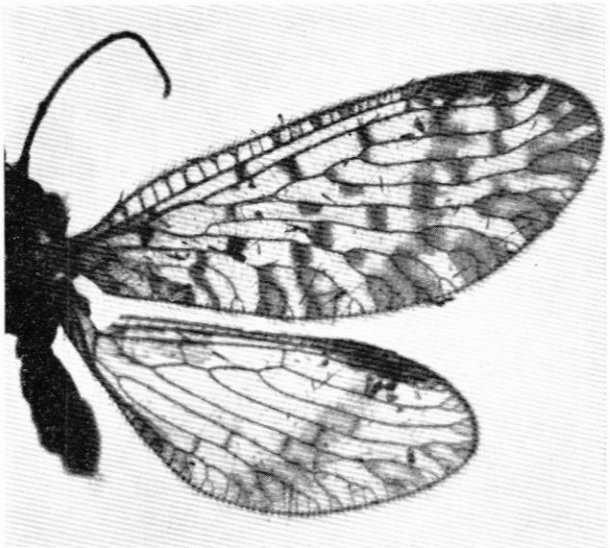


Fig. 31. *Mucroberotha nigrescens* n.sp. (holotype ♀).

grasses, scattered Acacias, shrubs and various small trees. — Moorddrift and the nearby small town Naboomspruit are situated about 90 miles N of Pretoria, surrounded by savanna and with almost tropical climate. — Wankie is in dry bush country. — Abachaus (Outjo Distr.) is in semi-arid country with mainly "thorn-tree" vegetation. The annual rainfall is low, about 15 inches a year, but the relative humidity is fairly high, resulting in dew at night.

3. *M. nigrescens* n. sp. (Figs. 20—23, 31)

Locus typicus: Atlantica Research Station, Lake McIlwaine near Salisbury, Rhodesia. — Type: a female in the collections of the National Museums of Rhodesia, Bulawayo.

Description

Available material: 2 ♀♀ (pinned).

Holotype ♀.

Size: length of body about 4 mm, of forewing 6 mm. of hindwing 5 mm, of antenna about 4 mm.

Head yellow. Palpi with brown apical segment. Antennae: scape, pedicel and six basal segments of flagellum black, the following segments yellow but distal part of flagellum gradually becoming darker, the apical 6—7 segments almost black; apical segment elongate, twice as long as the penultimate segment. Setae of antennae yellowish. Hairiness on the vertex and

frons similar to that of *M. vesicaria* but hairs on vertex slightly shorter than in that species.

Pronotum light reddish yellow. Meso- and meta-notum light yellowish brown with darker shadings (possibly due to discoloration). Legs yellow. Femur of foreleg (fig. 20) more elongate than in *fasciata* and *vesicaria*; its spines and nodules black. In addition to the three basal spines there is in this species a short, more distally situated spine as shown in the figure. Tibia with apical spurs and the 5-segmented tarsi of the foreleg as illustrated in the same figure. Claws yellowish brown. Middle legs as in the other two species. Hindlegs lost. Hairs on legs pale.

Wings hyaline with yellowish red pterostigma and brownish spots and stripes as shown in fig. 31. The pattern is very similar to that of *fasciata* and *vesicaria*. The spots over the 1st and 2nd crossveins between M and Cu_1 are, however, darker than in these species, black. Marginal fringes and hairs on veins pale with intermingled dark hairs. Longitudinal veins yellow. Some proximal costals brownish. 1st and 2nd crossveins between Sc and R, and 1st and 2nd crossveins between M and Cu_1 black.

Dorsum of abdomen yellowish with broad black cross-stripes, the tergites having black fore and hind margins. As in *vesicaria* the black colour disappeared when the abdomen was cleared in KOH. Venter and apex yellow but distal lower portion of fused tergite 9 and ectoprocts partly black. The terminal structures (figs. 21—23) are like those of *vesicaria* but there are some important differences. The fused tergite 9 and ectoprocts carries similar calli cerci with trichobothria as in that species but there is in this species on each side a distinct suture, dividing the structure into dorsal and ventral parts. The portion below the suture is black below the suture as shown in fig. 21 but its slender distal portion is pale. An apodeme is present on the inside as in *fasciata* and *vesicaria* and the 8th tergite also has a similar apodeme. The gonapophyses laterales are similar to those of the other two species but their lower parts appear more elongate in caudal view (fig. 22). Postgenitale with the lateral parts curved downwards as shown in the same figure. Spermatheca sclerotized, brown, of the same general pattern as in the other species but very different in some details (cf. fig. 23).

One paratype ♀ (forewing 6 mm; antennae lost) agrees with the holotype. The apex of the abdomen is somewhat damaged but the spermatheca is intact, similar to that of the holotype.

Geographical distribution

Rhodesia: Atlantica Research Station, Lake McIlwaine, about 15 miles W of Salisbury, holotype ♀ and one paratype ♀, 6.1.1965, in the museums of Bulawayo (holotype) and Lund (paratype). (Cf. map, fig. 24, ■.)

Summary and conclusions

If the herein described males of *Mucroberotha vesicaria* really do belong to this genus, the genus exhibits some peculiar features in sexual dimorphism: the difference in number of segments of the foretarsi (4 in the ♂,

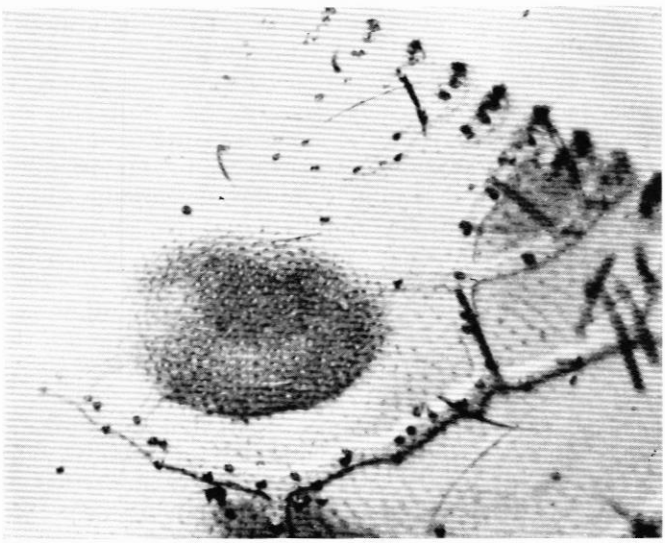


Fig. 32. *Mucroberotha vesicaria* n.sp. (paratype ♂ from Abachaus). Vesica of right forewing.

5 in the ♀), the presence of vesicae on the wings of the ♂ (absent in the ♀) and the fusion of the tergite 9 with the ectoprocts in the ♀ (no fusion in the ♂).

The raptorial forelegs og both sexes are presumably used for capturing prey and it is therefore remarkable that the foretarsi are different in the sexes. In the ♂, a prolonged 1st segment which ends in a tooth does not seem necessary for this purpose since the ♀ apparently is able to capture prey without this adaptation. The gut of specimens of both sexes has been examined and has proved to be filled with remains of small insects. It is likely that the modified 1st segment of the ♂ has some other function, perhaps in copulation.

The fore tarsus of the *M. vesicaria* ♂ is very like that of the *Trichoscelia* (*Symphrasis*)[1] ♂ (subfam. Platymantispinae, fam. Mantispidae) which has a similarly shaped 1st segment, but with a much sharper apex. But in *Trichoscelia* the ♀ also has similar, 4-segmented tarsi (cf. Tjeder, 1959, p. 274, fig. 250). Raptorial forelegs of similar pattern are known to occur in several other orders (e.g. Mantodea, Hemiptera, Diptera) and are considered to have developed independently, not always demonstrating relationship between the groups in which they occur. I think that the closely similar forelegs of the *Mucroberotha* ♂ and *Trichoscelia* are not to be considered as a decisive evidence of close relationship between the two taxa.

The vesicae of the wings of the ♂ are peculiar structures. In the dried specimens they are dark brown, somewhat flattened, finely granulate, more or less shrivelled and appear exactly the same on the dorsal and on the ventral surfaces of the wing. The structures are thus not comparable with the dorsal embossments of the membrane present on the wings in several Neuroptera. One forewing has been treated with potassium hydroxide and

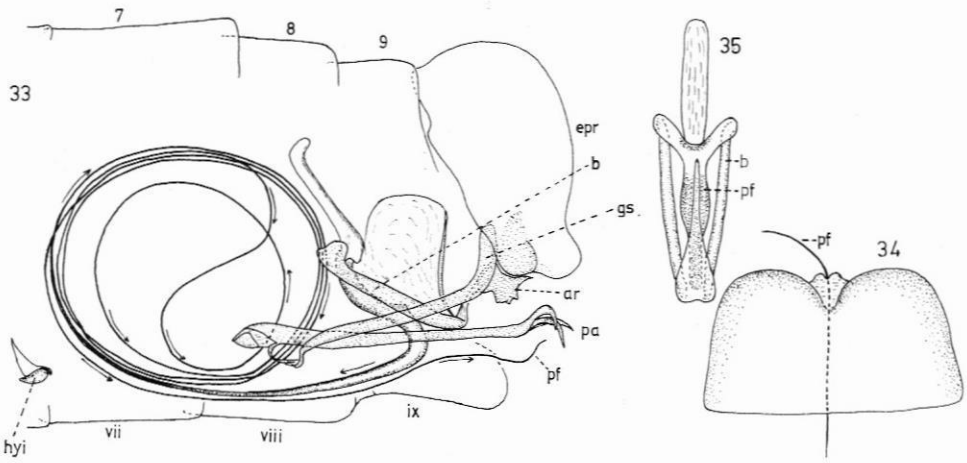
[1] Parker and Stange (1965) consider *Symphrasis* Hagen, 1877, as synonymous with *Trichoscelia* Westwood, 1852.

the vesica appears to have recovered its condition before drying. It is lens-shaped with convex dorsal and ventral surfaces which are rather densely covered with some sort of sense organs, appearing as round, pale discs or pits, encircled by low ridges (fig. 32). Numbers of extremely small microtrichia are present on the surface of the vesica as well as on the wing membrane and the veins. The vesicae are presumably developed as vesicular dilations of tracheal channels in the developing wing-sheaths. The purpose of these vesicae and the function of their sense organs are unknown. Corresponding structures in other insects are unknown to me. The variability of the number and size of the vesicae (cf. figs. 25—29) is remarkable, indicating perhaps that these structures are under evolutionary reduction.

The different condition in the sexes of the 9th tergite and the ectoprocts which are fused in the ♀ but not in the ♂ is also a matter of interest. In the Neuroptera, the condition is usually the same in both sexes, either fused (e.g. Berothidae; subfam. Chrysopinae) or not fused (most families). In fact I know of only one genus, *Trichoscelia,* in which the tergite 9 and the ectoprocts of the ♂♂ are not fused whereas these structures in the ♀ of at least *T. varia* (Walker) are fused (cf. Tjeder, 1959, p. 276, fig. 251). But Ferris (1940) in his figure of the ♀ of the allied species *T. signata* (Hagen) indicates a distinct suture between tergite 9 and the ectoprocts.

The long and coiled penisfilum in the *Mucroberotha vesicaria* ♂ is also of interest. The ♂♂ of the Berothidae are known to have more or less intricately coiled structures but I do not know of anything like the pattern in *Mucroberotha.* As described above the penisfilum of *Mucroberotha* proceeds from a pair of fused leaf-like pieces which are situated behind the large gonarcus but without distinct membraneous connection to it. These leaf-like fused pieces resemble very much the apophysis proxima of the parameres of certain Neuroptera (with proximally fused parameres). I have therefore dealt with the penisfilum as fixed to the apical portion of a pair of fused parameres. There are no other paired structures present which could be supposed to be parameres. It is possible, however, that the whole structure in question is homologous with the pseudopenis of certain Neuroptera (a central unpaired organ, not fused with the gonarcus). The paired apophysis proxima makes, however, this rather improbable. Assuming that impregnation is effected by means of spermatophores — as is usual in the Planipennia — the penisfilum seems too narrow for the transport of spermatophores. As only dried specimens are available it has not been possible to locate the gonopore. The hypandrium internum (hyi), a structure which is known to be connected with the base of the ductus ejaculatorius, is situated below the other sclerotized genital structures, indicating that the duct might run below them and open in the membraneous tissues dorsad of the 9th sternite. Study of pairs in copula, fixed appropriately for microscopic investigation, seems to be the only way to solve the problem of the true function of the penisfilum.

The ♂♂ of the genus *Trichoscelia* (Mantispidae) have also a long and coiled penisfilum, situated in a flattened envelope, but in this genus (figs. 33—35) it proceeds as an unpaired transverse structure, situated between a pair of bars which are distinctly connected with the arcessus (an organ which is movably attached to the central upper portion of the gonarcus). When viewed from the left side the penisfilum of this genus — at least in the species *varia* (Walk.), *signata* (Hag.) and *banksi* (Rehn)



Figs. 33—35. *Trichoscelia signata* (Hag.) (♂ from California, Joshua Tree N.M., L. Corrington Flat). — 33. Apex of abdomen, lateral; lateral parts of tergites and sternites not drawn in order to show the genital structures; arrows indicate direction of penisfilum. — 34. Sternite 9, ventral, and tip of penisfilum. — 35. Bars from arcessus and base of penisfilum, dorso-caudal.
Abbreviations as in figs. 6—15 and: ar=arcessus; b=bars from arcessus.

— commences in a clockwise curve, twists after about one and a half turns, continues anti-clockwise and ends in the membraneous tissues which cover the 9th sternite, or has its apex a little projecting as shown in the figures. In *Mucroberotha* (fig. 11) it begins in an anti-clockwise curve and ends as a dense coil in the dorsal portion of the abdominal apex. The penisfilum of *Trichoscelia* seems therefore hardly to be homologous with that of *Mucroberotha,* though the similarity is striking. In *Trichoscelia* there is a pair of long and distinct parameres which are membraneously connected with the lower ends of the narrow and arch-formed gonarcus. The three species examined, *varia, signata* and *banksi* have the same genital pattern and are no doubt closely allied, distinguished mainly by small differences in the shape of the parameres, the arcessus and the sternite 9. The penisfilum of *Trichoscelia* (*Plega*) *signata* (Hag.) was consideres by Ferris (1940, p. 52, fig. 16) to be the penis.

The females of the three *Mucroberotha*-species show some remarkable differences in the structure dealt with as tergite 9+ectoprocts. *M. vesicaria* and *M. nigrescens* have both a fairly distinct callus cerci whereas such a structure is lacking in *M. fasciata. M. fasciata* and *M. nigrescens* have distinct, though differently situated, vertical sutures, but there are no traces of a similar suture in *M. vesicaria.* I do not know of comparable divergences in other genera.

In 1959 I referred the Rhachiberothinae (gen. *Rhachiberotha* and *Mucroberotha*) to the family Berothidae, having compared the then available females with females of Berothidae and Platymantispinae (*Trichoscelia varia*). I found similarities with both but the quite different female genitalia

of *Trichoscelia,* developed as a long ovipositor, prevented me from classifying the two genera among the Platymantispinae. If I at that time instead of only females had had only males at my disposal I most surely would have classified the genera among the Platymantispinae, especially because of the similar 4-segmented fore tarsi, the strikingly similar penisfilum and the condition of the 9th tergite and the ectoprocts (not fused). Now, with both sexes available (of *Mucroberotha*) I feel very doubtful about the classification. The do not fit well in either of the two taxa in question. I hope that some South African entomologist will take an interest in the matter for further studies. The discovery of the still unknown male of *Rhachiberotha* and studies of the life history and the preimaginal stages of some species in question will most certainly confirm or disprove the present classification among the Berothidae.

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