

East African Agromyzidae (Diptera): further descriptions, revisionary notes and new records

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Twenty-seven new species of Agromyzidae are described from Kenya and two from Uganda in the genera *Melanagromyza*, *Ophiomyia*, *Tropicomyia*, *Agromyza*, *Cerodontha*, *Liriomyza*, *Phytoliriomyza*, *Napomyza*, *Phytomyza* and *Chromatomyia*. The following new combinations are established: *Cerodontha* (*Butomomyza*) *cariciphaga* (Spencer 1963), *Cerodontha* (*Butomomyza*) *pubicata* (Spencer 1959), *Napomyza* *eximia* (Spencer 1964 a) and *Chromatomyia* *anonera* (Séguy 1951); in addition *Phytomyza natalensis* Spencer 1964 a is raised to specific status.

New records are given of the important pest species *Ophiomyia spencerella* and *Liriomyza trifolii*.

The distribution of Kenyan species within Africa is discussed and the Palaearctic origin of new, high altitude species from Mt. Kenya is documented.

Introduction

Considerable basic information on the African Agromyzidae is available, following publication of a Synopsis of known species (Spencer 1959) and 8 further papers shortly thereafter (Spencer, 1960 a, 1960 b, 1961 a, 1961 b, 1961 c, 1963, 1964 a and 1965). Additional species from Nigeria and the Principe Islands were discussed by Spencer (1977 b). This work has been conveniently summarized by Cogan (1980), who records 230 species in the Afrotropical Region.

In East Africa collecting has been fragmentary and only 22 species have hitherto been known in Kenya. During a visit to Kenya and Uganda in 1971 and further visits to Kenya in 1979 and twice in 1983 much additional material has been obtained and this forms the basis of the present paper. Twenty-seven new species are now described and 19 are recorded as new to Kenya. Four further new species are diagnosed but not formally described in the absence of males. In addition, 2 new species are described from Uganda.

The economic importance of the Agromyzidae throughout the world was discussed by Spencer (1973) and since that time *Liriomyza* leaf miners have developed into even more serious pests. *Liriomyza trifolii* was introduced into Kenya from the United States in 1976. This highly polyphagous species caused serious damage to chrysanthemums at the large farm at Masongaleni near Kibwezi, resulting in the cessation of production and consequent loss of substantial exports. It is now causing considerable damage to tomatoes in the Voi area west of Mombasa. Bean flies are serious pests in East Africa

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and it is now established that *Ophiomyia spencerella*, originally discovered in Uganda, is widespread in Kenya and is a more important pest than the better known *O. phaseoli*.

The Agromyzidae are of special scientific interest and are an ideal family for evolutionary studies, in view of their close association with their plant hosts and the relationships which become apparent from studies of their male genitalia. Dispersal of ancestral species from the Palaearctic Region to high altitude areas in East Africa is now apparent (see discussion below) and evolutionary divergence of populations (or species) in the Ethiopian Highlands, the mountains in East Africa and southwards to South Africa can be documented.

Materials and methods

Most of the material now studied was personally collected in the Nairobi area, on the Aberdares, in the Western Highlands when based at Kapsabet and during several visits to Embu. Unidentified material (BMNH) from Mt. Elgon and up to 13,000 ft. on Mt. Kenya, and two interesting species collected in and near Nairobi by Dr J. Mark Ritchie and Mr Charles Dewhurst are also discussed. Some 300 specimens from Kenya have been examined and 80 slides of male genitalia have been prepared. In Uganda I was able to collect in the Kampala area and west to Fort Portal and Kilembe on the edge of the Ruwenzoris, and at Masaka south of Kampala.

Identification of new species has been possible by examining when necessary, material now in BMNH and holotypes have also been borrowed from several European museums.

The following abbreviations have been used in descriptions of species and when indicating the location of type material:

- acr acrostichal hairs
- 3 a.s. third antennal segment
- dc dorso-central bristle(s)
- ori lower orbital bristle(s)
- ors upper orbital bristle(s)
- BMNH British Museum (Natural History), London
- NMK National Museums of Kenya, Nairobi
- AC Author's collection

Discussion

The 27 new species now described and the records of 19 species new to Kenya show that the Agromyzidae are better represented in Kenya than had previously been believed. Clearly the 72 species now known only form a small proportion of the total fauna and intensive collecting throughout the year, particularly in tropical coastal areas, will certainly produce many additional species. However, it must be pointed out that with the two large leaf-mining genera *Liriomyza* and *Phytomyza* so much better represented in northern temperate areas, the relative proportion of species in the Afrotropical Region, and particularly in Kenya, will remain substantially less than in the Palaearctic and Nearctic Regions. At the present time 312 species are known in Britain and 550 in the United States (Spencer and Steyskal in press).

The close relationships between a number of populations in Kenya and South Africa on the one hand and Kenya and the Ethiopian Highlands on the other have now

become apparent in many genera, with varying degrees of evolutionary divergence. A decision on whether to treat such populations as representing distinct species, or merely forms showing incipient speciation, is difficult and inevitably largely subjective. With so little information available on populations in intermediate areas, detectable differences, primarily in the male genitalia, may well be clinal. However, the following examples indicate the differing degrees of relationships and some of the evolutionary steps shown among Kenyan species.

1. High altitude endemism, with Palaearctic affinities: *Chromatomyia nigrissima* sp. nov. and *C. subnigra* sp. nov., both Mt. Kenya; related to *C. nigra* in Europe.
2. Species pairs in Kenya and South Africa, with Palaearctic relationships of Kenyan species: *Phytoliriomyza immoderata* in S. Africa, *P. intermedia* in Kenya (related to *P. oasis* in S. Europe); *Napomyza eximia* in S. Africa, *N. subeximia* sp. nov. in Kenya (related to *N. ranunculella* in Israel).
3. Identical species in Kenya and South Africa: *Hexomyza gymnosporivora*, *Phytomyza natalensis* (related to *P. ranunculina* in Ethiopia) and *P. renovata*.
4. Species present in Ethiopia, Kenya and South Africa: *Cerodontha heringiella* (incipient speciation detectable from the male genitalia, figs. 57, 58).
5. Identical species in Palaearctic Region and Kenya: *Pseudonapomyza hispanica* (Spain and Israel) and *Ptochomyza asparagivora* (Mediterranean area, also Ethiopia).
6. Identical species in Ethiopia and Kenya: *Melanagromyza generosa* (related to *M. ballardi* in South Africa, cf. Spencer, 1965: figs. 20, 21).

These complex relationships of Kenyan species reflect passive long-distance aerial dispersal of ancestral species from Europe, either by 'mountain hopping' or during damper and cooler climatic conditions when suitable hosts would have been present at substantially lower altitudes. The great mobility of the Agromyzidae became particularly clear when studying the faunas in such areas as Florida (Spencer and Stegmaier 1973) and Chile (Spencer 1982) and their ability to cross water gaps of 800 km has been documented in analysing the origin of the New Zealand fauna (Spencer 1976 b). The extensive distributional range of individual species from Ethiopia through Kenya to South Africa is thus in no way surprising but such cases probably indicate relatively recent dispersal, with little or no differentiation between widely separated populations. More detailed analysis of the relationships of Kenyan Agromyzidae goes beyond the scope of this paper but will be an intriguing task for future research.

Hosts are known of only 28 Kenyan species but in addition 17 are certainly grass-feeders. Only three are truly polyphagous—*Tropicomyia flacourtae*, the widespread *Chromatomyia horticola* and the introduced *Liriomyza trifolii*. Other species are either oligophagous, restricted to several genera within one family, such as *Chromatomyia seneciovora* feeding on *Senecio* and *Helichrysum* and grass-feeders in the genera *Agromyza*, *Cerodontha*, *Pseudonapomyza* and *Chromatomyia*, or strictly monophagous, feeding on a single family or even genus, such as *Melanagromyza cyrtorchidis* sp. nov. on *Cyrtorchis* (possibly also on *Rangaeris*) and *Ptochomyza asparagivora* on *Asparagus*. Species in the genus *Phytomyza* feed on a wide range of host families in other faunal regions and it is remarkable that in Africa *Phytomyza* species are only known to feed on the single family Ranunculaceae.

Liriomyza trifolii has recently developed into a major pest in the United States, Colombia and Israel on vegetables and flowers. Following its introduction to Kenya, at

Masongaleni it has spread to many local hosts and is present on chrysanthemums, gerbera, beans, cucurbits and tomatoes at small farms in the Nairobi area and east to Voi and as far north as Isiolo. Its destructive potential was shown by the enormous, uncontrollable population which developed at Masongaleni on chrysanthemums, resulting in the closure of that part of the farm, with the loss of some 3000 jobs. Additional wild hosts are recorded below. New records are also given of the bean fly *Ophiomyia spencerella*. This appears to be widespread on wild leguminous hosts and is probably present on most farms where beans are grown. With the larvae feeding in the stem and root, the presence of the pest is not immediately apparent, as with leaf miners, but when attacked the plants become stunted, there is secondary attack by aphids and damage can be considerable. The loss of yield of beans due to *O. spencerella* and *O. phaseoli* remains to be accurately assessed but it is probably substantial. Three further species in the bean fly complex are *Melanagromyza bonavistae*, *M. chalcosoma* and *M. vignalis*, in all of which the larvae feed in the young pods of cowpea, pigeon-pea and other leguminous crops.

The rapidity with which a relatively unimportant species can turn into a major international pest is illustrated by *Liriomyza trifolii* which in less than 10 years has become one of the most serious pests in the Agromyzidae. It is thus essential to have a full understanding of the biology of all species which may attack cultivated plants. However, such pest species cannot properly be studied in isolation and a knowledge of the agromyzid fauna present throughout East Africa is clearly desirable.

MELANAGROMYZA Hendel

This large genus of over 300 species is of worldwide distribution but is best represented in the tropics, with numbers diminishing substantially in both northern and southern temperate areas. Cogan (1980) recorded 97 species in the Afrotropical Region (including Madagascar) of which only 8 are known in Kenya.

Four new species are described below and first records for Kenya are given for six further species. Of these, *M. crotonella* Spencer, 1964a, previously only known from Addis Ababa, Ethiopia, has now been found north of Nairobi and is temporarily retained in *Melanagromyza*, although it is now considered that this and other species from South Africa belong in a new genus (see below, p. 000).

Melanagromyza species are stout, sometimes large and normally black or greenish. The costa invariably extends to vein M1 + 2, while in the smaller species in *Tropicomyia* it ends at or shortly after the termination of R4 + 5. For purposes of identification the colour of the squamal fringe, which may be silvery-white or black, is a most important character. However, a positive identification is in many cases only possible from the male genitalia and illustrations of the aedeagus are given of most species discussed here.

Damage caused by larval feeding can be significant and species known as potential pests on leguminous plants in Kenya are *M. bonavistae* (pods of beans), *M. chalcosoma* and *M. vignalis* (pods of cow-pea and pigeon-pea).

A key is given below to the new species and those new to Kenya, and including also *Hexomyza gymnosporivora* (new to Kenya) and *Ophiomyia pulicaria* (new to the Afrotropical Region), both of which cannot be distinguished from *Melanagromyza* on external characters.

A species pupating in seeds of *Aloe* at and near Naivasha was thought to represent an undescribed *Melanagromyza* sp. but adults have now been reared (J. M. Ritchie) and it is not an agromyzid but a drosophilid in the genus *Erima* Kertész (det. Deeming).

- | | | |
|-------|--|-------------------------------------|
| 1 | Squamal fringe white | 2 |
| – | Black species, including squamal fringe | 6 |
| 2(1) | Black species; gall-causer on <i>Maytenus</i> (Celastraceae); aedeagus as in figs. 36, 37 | |
| | <i>Hexomyza gymnosporivora</i> (Spencer) | |
| – | Greenish species | 3 |
| 3(2) | Eye in male distinctly pilose | <i>metallica</i> (Thomson) |
| – | Eye in male bare | 4 |
| 4(3) | Mesonotum black | <i>leguminosarum</i> sp. nov. |
| – | Mesonotum green | 5 |
| 5(4) | Aedeagus as in figs. 9, 10 | <i>albisquama</i> (Malloch) |
| – | Not so (<i>cf.</i> Spencer, 1973, figs. 8, 9) | <i>bonavistae</i> Greathead |
| 6(1) | Minute species, wing length 1.6–1.9 mm. | <i>crotonella</i> Spencer |
| – | Larger species, wing length 2–3 mm | 7 |
| 7(6) | Ocellar triangle mat, at most weakly shining. | 8 |
| – | Ocellar triangle conspicuously shining | 10 |
| 8(6) | Mesonotum brilliantly shining black | <i>Ophiomyia pulicaria</i> (Meigen) |
| – | Mesonotum more mat black | 9 |
| 9(8) | Third antennal segment with conspicuous fringe of white hairs | <i>provecta</i> (Meijere) |
| – | Third antennal segment with only short pubescence | <i>crassocephali</i> sp. nov. |
| 10(7) | Ocellar triangle large, not narrowing distally; host: leaf-miner on <i>Cyrtorchis arcuata</i> (Orchidaceae); aedeagus as in figs. 3, 4 | <i>cyrtorchidis</i> sp. nov. |
| – | Ocellar triangle distinctly narrowing distally; host unknown; aedeagus as in figs. 7, 8 | <i>livida</i> sp. nov. |

***Melanagromyza crassocephali* sp. nov.**

(Figs. 1, 2)

Generally resembling *M. cyrtorchidis*, with following essential differences: frons broad, twice width of eye; ocellar triangle mat, ill-defined, developed in outline only; orbits mat, greyish; lunule large, semicircular, grey; jowls relatively broad, almost $\frac{1}{4}$ height of eye; third antennal segment distinctly but finely pubescent, arista appearing bare; mesonotum mat, greyish, abdomen moderately shining black; squamae grey, fringe black; wing length 2.6 mm in male, 2.75–3.0 mm in female, last section of M3 + 4 in ratio 20:35 with penultimate. Male genitalia: aedeagus as in figs. 1, 2, sperm pump with large blade, slightly longer than broad, with well-defined central vein.

HOLOTYPE ♂, Kenya: Western Province, Kakamega Forest, 17 × 71, on *Crassocephalum* sp. (BMNH). PARATYPES, 4 ♀, same data (all K.A.S.) (BMNH).

Remarks: Important characters of this species are the large size, mat ocellar triangle and greyish mesonotum. The male genitalia are distinctive. It somewhat resembles *M. provecta* but this species has the third antennal segment more conspicuously pubescent and the mesonotum is more blackish.

***Melanagromyza cyrtorchidis* sp. nov.**

(Figs. 3, 4)

Head: Frons $1\frac{1}{2}$ times width of eye, not projecting above eye in profile; 2 strong, reclinate ors, 2 weaker ori, the upper partially inclined, the lower entirely so; orbital setulae sparse, reclinate; ocellar triangle broad, well-defined, apex extending to just below level of lower ors; jowls about $\frac{1}{3}$ vertical height of eye, this bare in both sexes; 3 a.s. small, round, appearing bare, arista long, only slightly shorter than height of eye, weakly pubescent.

Mesonotum: 2 strong dc, acr numerous, in about 10 rows. Wing. Length 2.0 mm in male, 2–2.3 mm in female, costa extending strongly to vein M1 + 2, last section of M3 + 4 in ratio 16:25 with penultimate, inner cross-vein just beyond centre of discal cell.

Colour: Ocellar triangle brilliantly, orbits conspicuously shining; mesonotum and abdomen brilliantly shining black; squamae white, fringe black, sometimes appearing partially whitish; halteres black.

Male genitalia: Aedeagus (figs. 3, 4) symmetrical, pale, weakly pigmented, somewhat aberrant, indicating isolated position of this species.

Leaf-mine/Puparium: Leaf-mine long, narrow, upper surface, up to 12 mines in a leaf measuring $15 \times 2\frac{1}{2}$ cm; prior to pupation the larva burrows towards the lower surface, preparing for emergence of the adult by leaving only the lower epidermis intact at the end of the channel; the puparium is relatively long and narrow, whitish-yellow, delicate with thin walls and becomes firmly embedded in the succulent leaf tissue; posterior spiracles each on a rounded protuberance resembling a young female breast, with a small central scar, surrounded by some 6–10 ill-defined pores; anterior spiracles not seen but larval cephalopharyngeal skeleton short and stout; mouth-hooks each with 2 small teeth.

HOLOTYPE ♂, Kenya: Nairobi, car park in grounds of National Museums, ex mine on *Cyrtorchis arcuata* (a succulent epiphytic orchid) coll. 3.ii.84, emerged 6–17.ii.84, MR-055 (NMK). **PARATYPES:** 3 ♂, 15 ♀, 10 unsexed, same data (all J. M. Ritchie); 3 ♀, Karen, emerged 25.xi.79 (C. F. Dewhurst) (NMK; BMNH; AC).

Remarks: Despite the unusual feeding habit of the larva, the adults are in all respects typical of the genus. Mines were present in very large numbers at both localities in the Nairobi area and the species is also present at Entebbe, Uganda—mines visible in illustration by Piers (1968, fig. 98). A further host appears to be *Rangaeris amaniensis* found on the same tree as the main type series but no adults were obtained.

***Melanagromyza leguminosarum* sp. nov.**

(Figs. 5, 6)

Closely resembling *M. cyrtorchidis*, with following essential differences: frons narrower, only slightly wider than eye; wing length in male 2 mm; colour: squamae and fringe white; abdomen shining greenish; male genitalia: aedeagus as in figs. 5, 6, with ventral bladder extending beyond end of distiphallus complex, conspicuously bending to right in ventral view.

HOLOTYPE, ♂, Kenya: Thika Sports Club, 14.iv.83 (NMK). **PARATYPES:** 1 ♂, same data; 1 ♂, Kikuyu, 17.iv.83 (all K. A. S.) (NMK; BMNH).

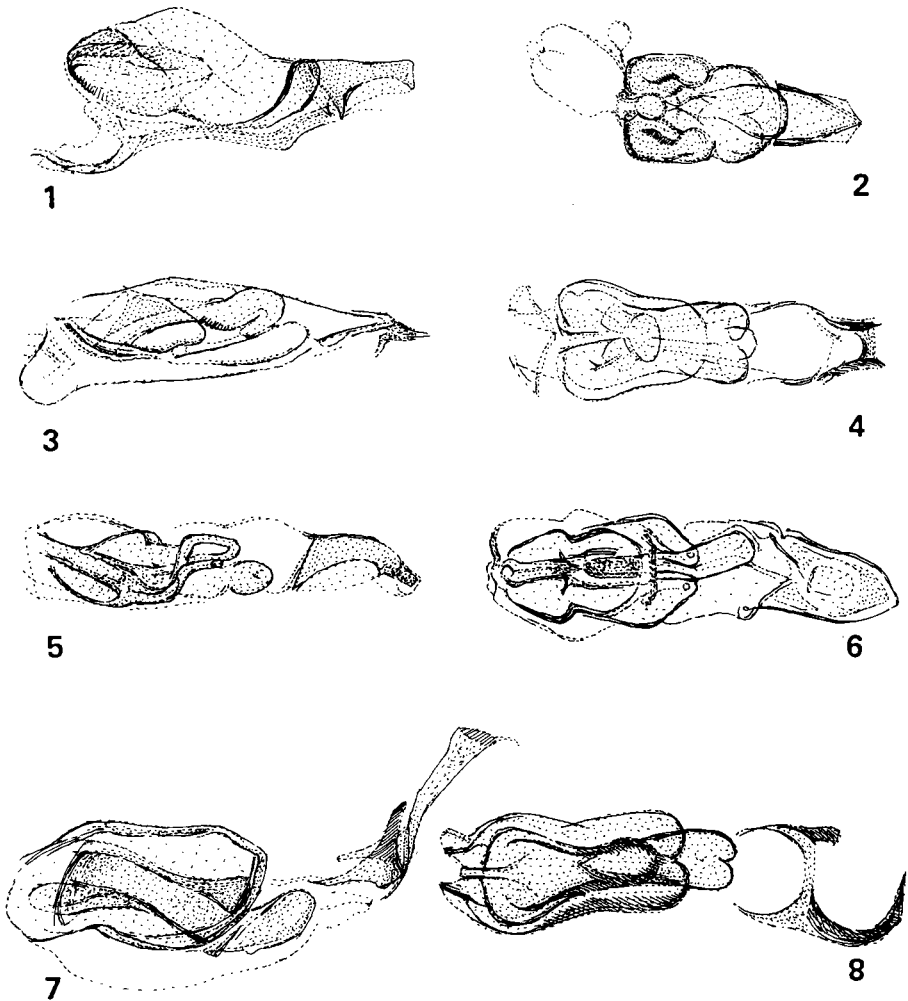
Remarks: Important characters of this species are the shining ocellar triangle, the bare eye in the male, the shining black mesonotum, green abdomen and white squamal fringe. On these characters the species closely resembles *M. sojae*, a well-known Oriental species with its westward range extending to Egypt, feeding as a stem-borer in a number of genera of cultivated and wild Leguminosae. The bending ventral bladder of the aedeagus (fig. 6) is characteristic of this group.

M. leguminosarum externally resembles *M. crotolariana* Spencer 1961 b, known as a stem-borer in *Crotalaria* in Uganda but the male genitalia (Spencer 1961 b: fig. 3 a) shows that this is distinct.

***Melanagromyza livida* sp. nov.**

(Figs. 7, 8)

Closely resembling *M. cyrtorchidis* with following differences: ocellar triangle broad above but narrowing at midpoint, with faint bluish tinge; jowls narrow, $\frac{1}{8}$ height of eye; wing: length in male 2.0 mm; last section of M3+4 in ratio 18:22 with



FIGS. 1-8. 1, 2, *Melanagromyza crassocephali*: 1, aedeagus, side view; 2, same, ventral view. 3, 4, *M. cyrtorchidis*: 3, aedeagus, side view; 4, same, ventral view. 5, 6, *M. leguminosarum*: 5, aedeagus, side view; 6, same, ventral view. 7, 8, *M. livida*: 7, aedeagus, side view; 8, same, ventral view.

penultimate; male genitalia: aedeagus as in Figs. 7, 8; sperm pump with large blade.

HOLOTYPE ♂, Kenya: Kikuyu, marshy area beside stream, 17.iv.83 (K.A.S.) (NMK).

Remarks: Important characters of this species are the brilliantly shining ocellar triangle and orbits, the shining black mesonotum and the black squamal fringe. Although it very closely resembles *M. cyrtorchidis*, the colour and form of the ocellar triangle and the distinctive genitalia show it to be distinct.

A male from Nairobi, at roadside on Limuru Road, 11.iv.8 (in which the aedeagus was lost during preparation) possibly represents *M. livida*. It has a similarly shining black mesonotum but the ocellar triangle is less shining and the identity of this specimen remains in doubt.

***Melanagromyza albisquama* (Malloch, 1927)**

(Figs. 9, 10)

This small green species is widespread from the Cape Verde Is. and Principe Is. to Fiji and northern Australia. It has not hitherto been recorded from mainland Africa but a series of 5 males and 6 females were collected at Fort Portal, Uganda, 25.xi.71 (K.A.S.).

Before examination of male genitalia became standard practice the species was described a number of times from different countries (*cf.* Spencer 1965, 241). The distinctive aedeagus is shown in figs. 9, 10. The larvae feed in pods of *Desmodium* and probably other genera of Leguminosae but the species is not known to occur on any cultivated leguminous crops.

M. albisquama closely resembles an even commoner green species, *M. metallica*, but the two can be readily distinguished by the eyes being bare in the male of *albisquama* but distinctly pilose in *metaleica*.

***Melanagromyza bonavistae* Greathead, 1971**

Hitherto this species has only been known in Uganda, where it was discovered feeding in the pods of *Dolichos lablab* (bonavist bean) and *Vigna unguiculata* (cow-pea). Its biology has been discussed in some detail by Greathead (1971) but its economic importance has not been established.

A single male was collected at Westwood Park, Nairobi, 17.x.71 (K.A.S.), representing the first record for Kenya.

***Melanagromyza candidipennis* (Lamb, 1912)**

(Figs. 11, 12)

This is a widespread but uncommon species, described from the Seychelles and subsequently recorded in South Africa, Tanzania and Nigeria, with a single specimen known from Kenya, Naivasha, iii.37. A further male was collected at the roadside between Nairobi and Limuru, 11.iv.83 (K.A.S.) and the genitalia are shown in figs. 11, 12.

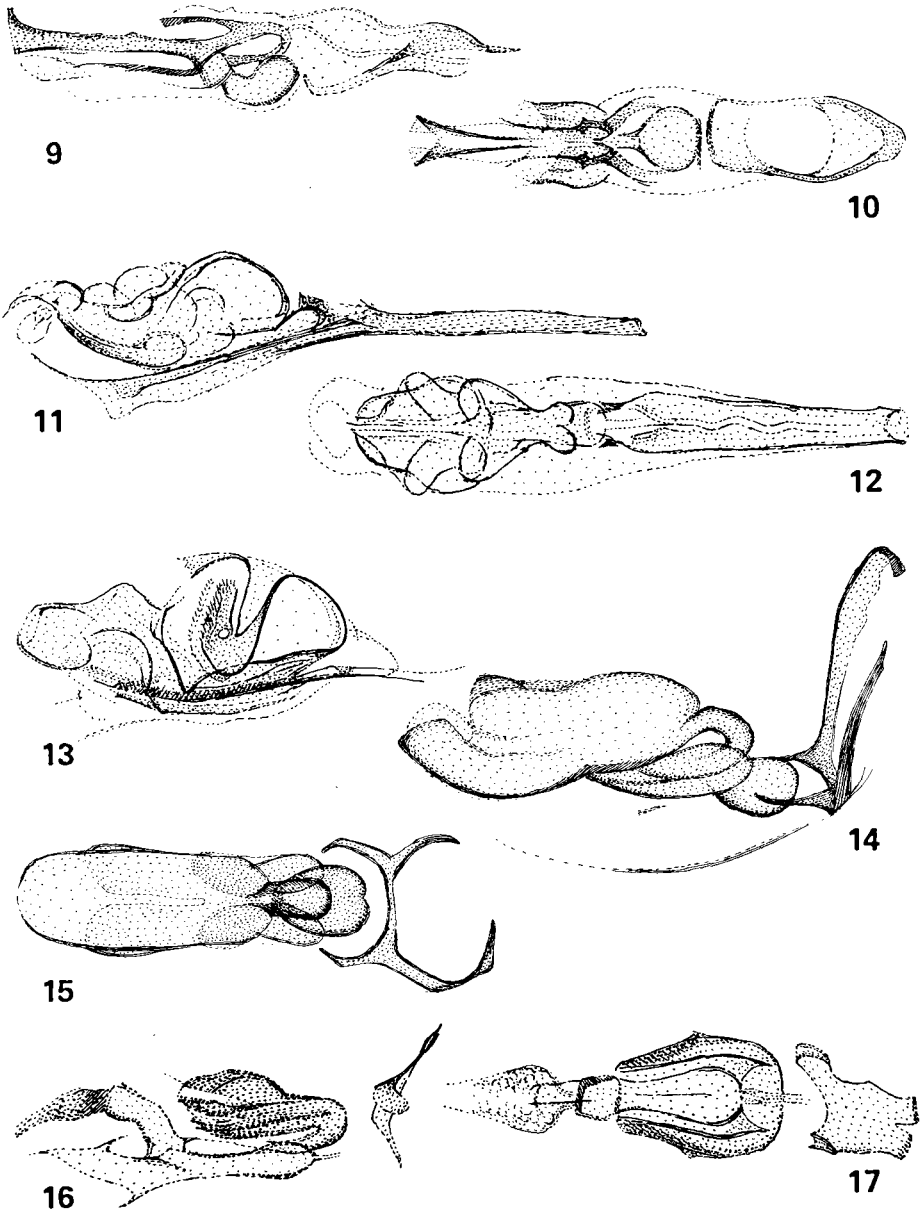
M. candidipennis is an aberrant species, with largely colourless wings and veins and the two cross-veins approximated (*cf.* Spencer 1973, fig. 12); the aedeagus of the specimen from the Nairobi-Limuru road has the basal sclerites fully fused in the basal half and greatly extended, and the hypandrial apodeme (Spencer 1973, fig. 14) is also more elongate than in any other species known in Africa. The posterior spiracles of the puparium consist of adjoining plates, each with about 20 pores arranged irregularly around the atrophied central horn (Spencer 1973, fig. 16).

In Nigeria the host has been established as *Vigna unguiculata* (cow-pea), the larva feeding and pupating in the stem. With populations apparently always small, this species can be of little economic importance but it is of interest as part of the complex of species present on leguminous crops.

***Melanagromyza chalcosoma* Spencer, 1959**

This is a potentially serious pest, with the larvae feeding in individual seeds in the pods of cow-pea (*Vigna sinensis*). Its economic importance was studied by Koehler and Mehta (1971).

M. chalcosoma belongs to the complex of greenish species but is probably recognisable by its large size and large, shining greenish ocellar triangle.



FIGS. 9–17. 9, 10, *Melanagromyza albisquama*: 9, aedeagus, side view; 10, same, ventral view. 11, 12, *M. candidipennis*: 11, aedeagus, side view; 12, same, ventral view. 13, *M. compositana*: aedeagus, side view. 14, 15, *M. generosa*: 14, aedeagus, side view; 15, same, ventral view. 16, 17, *M. metallica*: 16, aedeagus, side view; 17, same, ventral view.

This species was described from Malawi and was subsequently re-described from Kikuyu, Kenya as *M. kikuyana* (Spencer 1959). The synonymy was established by Spencer 1973: 34. Many specimens were recently reared from pods of pigeon pea (*Cajanus cajan*), Machakos, 17.ix.82 (W. R. Ingram).

***Melanagromyza compositana* Spencer, 1959**

(Fig. 13)

A large greenish species, with the type series from Naivasha, Kenya 'ex composite 1' (Spencer 1959).

Before the genitalia were studied in this group specimens from several parts of Africa were identified as *M. compositana*, and later Spencer (1961 b, figs. 5 a, b) illustrated the aedeagus of a specimen from South Africa. It now appears that this may not represent true *compositana* and the aedeagus of a paratype from Naivasha is now shown in fig. 13. It is again emphasized that reliable identification of this difficult group of greenish species is only possible by studying the male genitalia.

***Melanagromyza generosa* Spencer, 1961 b**

(Figs. 14, 15)

This small black species is readily recognizable by its distinctive male genitalia (figs. 14, 15). It was previously only known from Addis Ababa but appears to be widespread in Kenya, with records given below from three localities in the Nairobi area and also from Western Province.

M. ballardi Spencer (1965, figs. 20, 21) from Cape Province, South Africa is now considered to be doubtfully distinct from *M. generosa*. The distiphallus is shorter and broader but of the same general form and the distinctively fused basal sclerites are identical. A decision on this possible synonymy is best delayed until additional material becomes available from intermediate areas, when it will become clear whether the difference is clinal or whether the South African population can justifiably be treated as distinct.

No hosts are known of *M. generosa* but it is probably a stem-feeder in some widespread species of Asteraceae.

Material examined: Nairobi, National Agricultural Laboratories, 1 ♂, 11.x.71; Sigona, Muhia Farm, 4 ♂, 1 ♀, 13.iv.83; Limuru, Lari Farm, 1 ♂, 17.iv.83; Western Province Timboroa, 1 ♂, 19.x.71 (all K.A.S.).

***Melanagromyza kenyensis* Spencer, 1959**

A medium-sized black species, with black squamal fringe, unusual in having a small, third dorso-central bristle only slightly beyond the second. The male genitalia are not typical of the genus. The aedeagus was shown in side view by Spencer (1965, fig. 33) with the basal bladder large and curving dorsally behind the distiphallus complex; this is in the form of a hollow bowl, open above.

The type series was reared from an unidentified Composite at Naivasha and further specimens have been seen from Nairobi 'ex *Croton* sp.' It was originally believed (Spencer 1959) that this indicated that this series had been reared from *Croton*. I now consider this to be improbable, and it is more likely that the specimens were merely resting on the plant.

A single male has now been seen from Western Province, Timboroa, 8000 ft., 19.x.71 (K.A.S.).

***Melanagromyza metallica* (Thomson, 1869)**

(Figs. 16, 17)

This small green species is widespread in much of Africa and its distribution extends to the Pacific and northern Australia. I found it to be particularly common in Papua

New Guinea in 1973 (Spencer 1977 a, 348). The eye in the male has a conspicuous patch of white hairs. The distinctive aedeagus is shown in figs. 16, 17.

The only confirmed hosts are *Ageratum conyzoides* and *Bidens pilosa*, the larvae feeding and pupating in the stem. No hosts have been recorded in Africa but it seems probable that *Bidens* is one and there are almost certainly other endemic genera in the Asteraceae. The first records from Kenya and Uganda are given below.

Kenya: Ruiru, 5 ♂, 2 ♀, 11.x.71; Karen, W. of Nairobi, 1 ♂, 2 ♀, 12.xii.83 (all K.A.S.).
Uganda: Kawanda, 1 ♂, 5 ♀, 23.x.71 (K.A.S.).

***Melanagromyza nairobiensis* Spencer, 1959**

(Figs. 18, 19)

This is one of the large complex of greenish species which can only be reliably identified by the male genitalia. The original description was based on three males collected by Van Someren in 1937 (Spencer 1959). Two further males have been seen from N.A.L., Nairobi, 11.x.71 (K.A.S.) and also 4 ♂, 2 ♀, 19.x.71 from Timboroa, Western Highlands, 8000 ft. (K.A.S.).

The distinctive aedeagus is shown in figs. 18, 19. The vertical projection near the front of the distiphallus is particularly characteristic. In the type series the arista is long and distinctly pubescent, while in the specimens from N.A.L. and Timboroa it is shorter and virtually bare. This difference is puzzling but with the genitalia in all specimens apparently identical it is accepted that only a single species is involved.

***Melanagromyza provecta* (Meijere, 1910)**

(Fig. 20)

A distinctive character of this black species is the long pubescence on the third antennal segment. The male genitalia are unusual, in having the distiphallus extended ventrally, with a supporting loop to the basal sclerites (fig. 20). A somewhat similar arrangement is present in *M. luthulii* Spencer (1964 a, fig. 23) from South Africa.

The species is widespread in Africa, from Ethiopia to South Africa. The first records can now be given for Kenya and Uganda. No hosts are known but I suspect that one host in Kenya is *Bidens*.

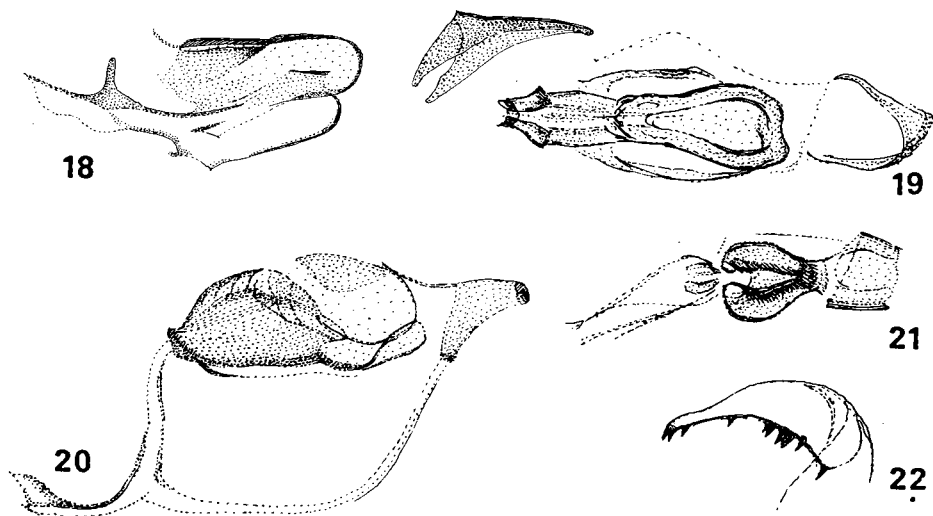
Kenya: Ruiru, 1 ♂, 11.x.71; N.A.L., Nairobi, 1 ♂, 11.x.71; Karen, W. Nairobi, 1 ♂, 1 ♀, 12 & 18.xii.83; Embu, 2 ♂, 9–10.xii.83; Thika, 1 ♂, 10.xii.83 (all K.A.S.). Uganda: Kawanda, 1 ♂, 22.x.71 (K.A.S.).

A minute female from Embu, 10.xii.83 (K.A.S.) has wing length of only 1 mm and this is tentatively accepted as a dwarf specimen of this species.

Species temporarily retained in Melanagromyza

Species now in the genus *Tropicomyia* were all originally described in *Melanagromyza*, which they closely resemble apart from their smaller size. *Tropicomyia* is well-defined by the structure of the larval mouth-hooks, which have a close serration of some 8 'teeth' (Spencer 1973, figs. 269, 288), the formation of epidermal leaf-mines, the distinctive male genitalia (figs. 39, 40) and the small size, with wing length of 1.5–1.9 mm and the costa ending at or shortly after the termination of vein R4+5.

A further group of similarly small black species form normal upper or lower surface mines (not epidermal), the mouth-hooks each have 2 teeth as in *Melanagromyza* (cf. *M. clutiae* Spencer 1963, fig. 6 a), the male genitalia are of varying form, differing from both *Melanagromyza* and *Tropicomyia* and the costa extends to vein M1+2. These species



FIGS. 18–22. 18, 19, *M. nairobiensis*: 18, aedeagus, side view (paratype); 19, same, ventral view (Timboroa). 20, *M. prosecta*: aedeagus, side view. 21, 22, *M. crotonella*: 21, aedeagus, ventral view; 22, surstylus.

have hitherto been retained in *Melanagromyza* but it is now clear that erection of a new genus to accommodate them is justified. It goes beyond the scope of this paper to carry out the necessary revisionary studies to describe this new genus, and in any case it is believed that this work is being done elsewhere. Species in Africa belonging in this group are: *M. capeneri* Hering (1957); *M. cassinis* Hering (1957); *M. dicksoni* Hering (1957); *M. philocroton* Hering (1957); *M. clutiae* Spencer (1963)—all from South Africa and known only from females; *M. crotalariae* Hering (1957) also from South Africa (cf. Spencer, 1963, 102); and *M. crotonella* Spencer (1964 a) from Addis Ababa, Ethiopia. Of these, *M. crotonella* has now been discovered in Kenya. Pending further clarification of its generic status it is here left in *Melanagromyza* and is discussed below.

***Melanagromyza crotonella* Spencer, 1964 a**

(Figs. 21, 22)

This species, known only from Addis Ababa, Ethiopia (coll. Hering) can now be recorded from Kenya: Ruiru, Coffee Research Station, 1 ♂, caught on *Bougainvillea* [though this is no indication of the host], 11.x.71 (K.A.S.) (BMNH). The type-series was bred from lower surface leaf-mines on *Croton macrostachys*; the mines are not epidermal but the puparium remains in the leaf (as in *Tropicomyia*).

Adults are minute, with wing length of 1.6–1.9 mm, generally resembling *Tropicomyia*, including the position of the inner cross-vein close to the outer but the costa extends strongly to vein M1 + 2. An interesting character is the very short upper ori, which is substantially shorter than the lower; colour is black, with both ocellar triangle and mesonotum mat. The male genitalia (fig. 21) differ in form from both *Melanagromyza* and *Tropicomyia* and the narrow, elongate surstyli with irregular stout bristles which are particularly numerous basally (fig. 22) are highly distinctive. The genitalia of the holotype were illustrated by Spencer (1964 a, fig. 17).

OPHIOMYIA Braschnikov

Twenty-eight species have hitherto been known in Africa, thus making it the second largest genus after *Melanagromyza*. Among the new material now studied, four new species are described, three from Kenya, one from Uganda.

Recent work has shown *Ophiomyia* to be one of the larger genera in most faunal regions. The majority of species form inconspicuous external stemmines and relatively few hosts are thus known and larvae are difficult to find, in contrast to leaf-miners or even internal stem-borers in the genus *Melanagromyza*.

New records are given below of three species of economic importance in the bean fly complex and it is now clear that *O. spencerella* is widespread in Kenya and is a more important pest than the better known *O. phaseoli*.

Typically the males in this genus have a pronounced vibrissal fasciculus (figs. 25, 28) and in both sexes there is a raised facial keel dividing the base of the antennae. However, a further group lacking these characters and which externally resemble *Melanagromyza* are also included in *Ophiomyia* on the basis of larval characters and the form of the male genitalia. In both larva and puparium the posterior spiracles are on raised stalks as opposed to the flat plates in *Melanagromyza*.

The four new species described below can be identified by the following key:

- | | |
|---|-----------------------------|
| 1 Jowls broad, $\frac{1}{4}$ vertical height of eye; vibrissal fasciculus finely tapering at end (fig. 25) | 2 |
| – Jowls narrower, $\frac{1}{6}$ – $\frac{1}{8}$ vertical height of eye; vibrissal fasciculus with a conspicuous dilation at end (fig. 28) | 3 |
| 2 Vibrissal fasciculus uniformly curving (fig. 31); mesonotum greyish-black | |
| – Vibrissal fasciculus with a distinct bend near midpoint (fig. 25); mesonotum brownish-black | <i>ocimivora</i> sp. nov. |
| 3 Vibrissal fasciculus uniformly curving (fig. 28) | <i>kilembensis</i> sp. nov. |
| – Vibrissal fasciculus with a distinct bend towards end | <i>kilimanii</i> sp. nov. |
| | <i>kenyae</i> sp. nov. |

***Ophiomyia kenyae* sp. nov.**

(Figs. 23, 24)

Head: Frons broad, twice width of eye; ocellar triangle indicated in outline only, large, apex extending to lower ors; jowls forming angle of 60°, narrow, $\frac{1}{8}$ vertical height of eye; vibrissal fasciculus straight below, then with distinct bend and conspicuously dilated at end; third antennal segment with fringe of short but conspicuous pubescence; facial keel broad but flat.

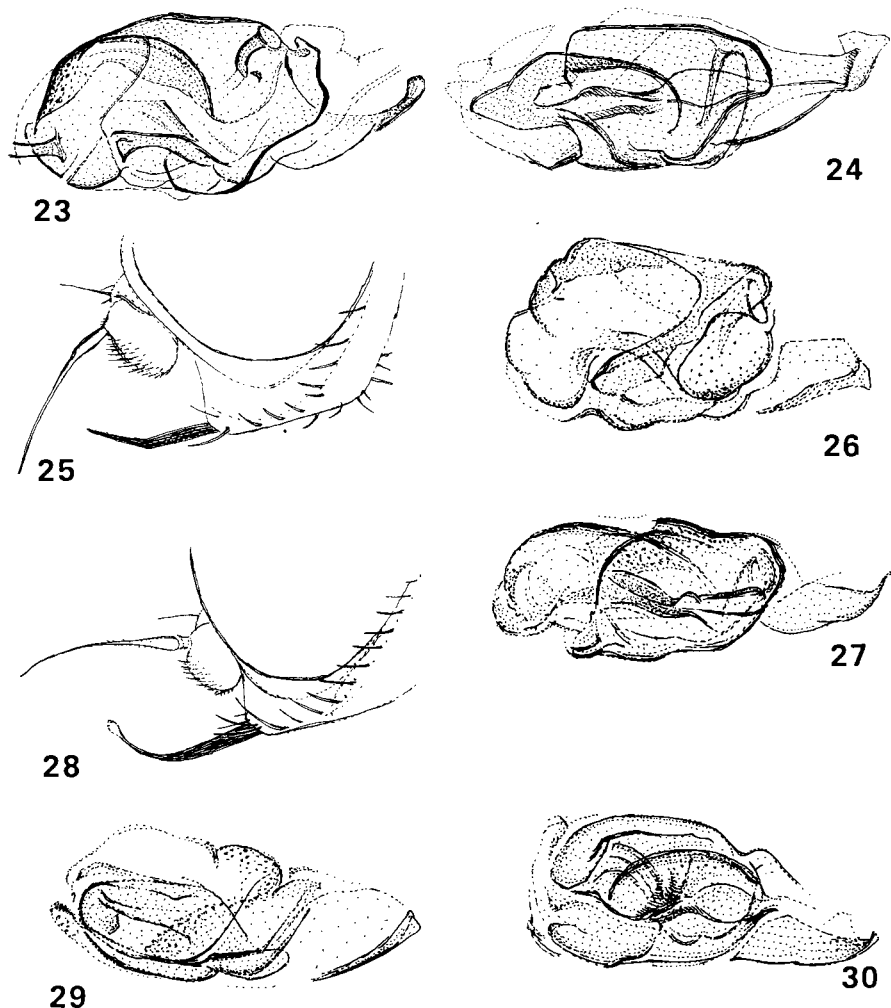
Mesonotum: 2 strong dc, acr in some 8 rows.

Wing: Length 2 mm in male, last section of M3 + 4 shorter than penultimate, in ratio 15:23, inner cross-vein near centre of discal cell.

Colour: Black; ocellar triangle and orbits virtually without shine; mesonotum mat black, slightly brownish; squamal fringe dark grey, fringe black.

Male genitalia: Aedeagus as in figs. 23, 24; sperm pump with large, round blade.

HOLOTYPE ♂, Kenya: Western Province, Kapsabet, 18.x.71 (K.A.S.) (BMNH). A male and female from Central Province, Mwala Clinic, W. of Macharkos are tentatively identified as *O. kenyae*. The complex male genitalia appear virtually identical to those of the holotype but these specimens are smaller, with wing length



FIGS. 23–30. 23, 24, *Ophiomyia kenya*: 23, aedeagus, side view; 24, same, side view. 25–27, *O. kilembensis*: 25, head; 26, aedeagus, side view; 27, same, ventral view. 28–30, *O. kilimani*: 28, head; 29, aedeagus, side view; 30, same, ventral view.

from 1.4 mm in male to 1.6 mm in female, the last and penultimate sections of M3 + 4 are equal, and the inner cross-vein is well beyond the centre of the discal cell. It will only be possible to clarify these two populations further as additional material becomes available.

Remarks: The most distinctive character of this species is the form of the vibrissal fasciculus, with the conspicuous bend and terminal dilation. There is general similarity with *O. mesonotata* Spencer (1961 b, fig. 8) from Addis Ababa. However, the male genitalia show the two species to be distinct.

***Ophiomyia kilembensis* sp. nov.**

(Figs. 25–27)

Closely resembling *O. ocimivora* with following essential characters: *Head* (fig. 25): Jowls forming angle of 90° , broad, $\frac{1}{4}$ height of eye; vibrissa with conspicuous bend at distal third, finely tapering at end; facial keel narrow, flat.

Wing: Length in male 1.9 mm, last and penultimate sections of M3 + 4 equal, inner cross-vein only slightly beyond centre of discal cell.

Colour: Black, mesonotum mat, brownish-black, with only weak subshine.

Male genitalia: Aedeagus highly asymmetrical, as in figs. 26, 27; sperm pump with large, round blade.

HOLOTYPE ♂, Uganda: Kilembe, eastern edge of Ruwenzori, 4000 ft, 26.x.71 (K.A.S.) (BMNH).

Remarks: Although differing only slightly from *O. ocimivora*, the male genitalia of the two species are entirely distinct.

***Ophiomyia kilimanii* sp. nov.**

(Figs. 28–30)

Closely resembling *O. kenyae* with following points of difference: jowls slightly broader, $\frac{1}{6}$ height of eye (fig. 28); vibrissal fasciculus curving more uniformly, with less pronounced dilation at end; facial keel slightly narrower; male genitalia: aedeagus as in figs. 29, 30, sperm pump with blade more asymmetrical, longer than broad.

HOLOTYPE ♂, Kenya: Kilimani, Nairobi, beside stream, 19.iv.83 (K.A.S.) (NMK).

Remarks: Despite the general similarity with *O. kenyae*, the male genitalia confirm that the two species are distinct.

***Ophiomyia ocimivora* sp. nov.**

(Figs. 31, 32)

Head (fig. 31): Orbits with 2 strong ors, 2 weaker ori; orbital setulae sparse, reclinate; jowls forming angle of 80° – 90° , broad, $\frac{1}{4}$ height of eye; vibrissal fasciculus strong, uniformly curving; ocellar triangle ill-defined; facial keel prominent but not raised.

Mesonotum: 2 strong dc, acr in some 6 rows.

Wing: Length 1.9 mm in male, 2–2.25 mm in female; last section of vein M3 + 4 only slightly shorter than penultimate, inner cross-vein well beyond centre of discal cell.

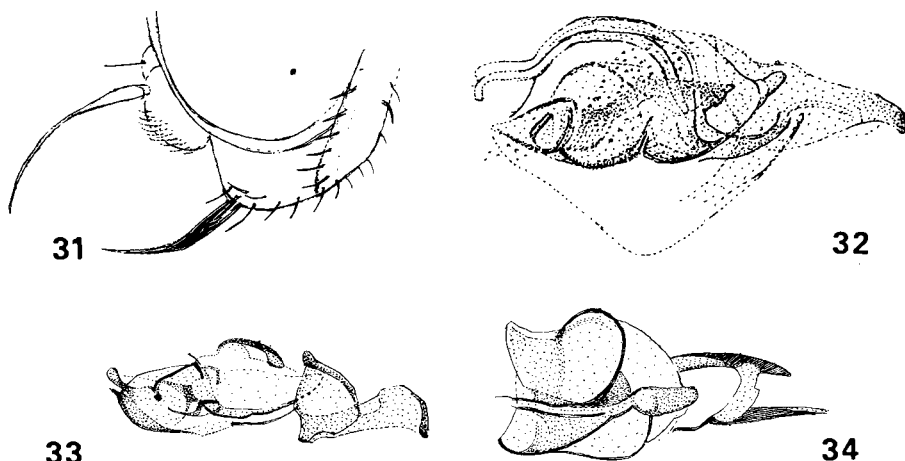
Colour: Black, ocellar triangle almost completely mat, with only faint subshine, orbits only slightly more shining; mesonotum mat black, with slight greyish tinge; squamae dark grey, margin black.

Male genitalia: Aedeagus (fig. 32) with paired sinuate tubules projecting beyond within distiphallus complex; sperm pump large, blade longer than broad.

HOLOTYPE ♂, Kenya: Kapsabet, 17.x.71, caught on *Ocimum lamiifolium* (K.A.S.) (BMNH). PARATYPES: 4 ♂, 10 ♀, same data as holotype (BMNH; N.M.K.).

Remarks: Among the four new species now described, *O. ocimivora* can only be compared with *O. kilembensis* from Uganda which has the vibrissal fasciculus with a distinct bend towards the end (fig. 25) and the mesonotum is more brownish rather than grey. The male genitalia of the two species are entirely distinct.

O. colei Spencer (1965) forms leaf mines on *Ocimum gratissimum* in Guinea. I suspect that *O. ocimivora* feeds as a stem-miner which is more normal in this genus.



FIGS. 31–34. 31, 32, *Ophiomyia ocimivora*: 31, head; 32, aedeagus, side view. 33, 34, *O. pulicaria*: 33, aedeagus, side view; 34, same, ventral view.

Bean flies

The three bean flies discussed below belong to the group without a vibrissal fasciculus in the male or a pronounced facial keel.

Ophiomyia centrosematis (Meijere, 1940)

This minor pest in the bean fly complex is widespread from East Africa through the Oriental Region to northern Australia. Greathead (1969) recorded it from Nairobi and Mtwapa near Mombasa and I collected a male and female at Thika, 14.iv.83. Populations always appear to be small and the larva occurs singly, mining and pupating in the stem.

Hosts known in East Africa are *Phaseolus vulgaris*, *P. lunatus*, *Vigna unguiculata* and *Crotalaria mucronata*.

Ophiomyia phaseoli (Tryon, 1895)

This serious pest of beans occurs widely in the Old World tropics from Africa to Pacific islands and northern Australia. In East Africa it has been discussed by Wallace (1939) and Taylor (1958), although in these early papers it could have been confused with *O. spencerella* (see below). Greathead (1969) discusses the biology in some detail based on investigations in Uganda, and in Kenya gives confirmed records from Nairobi and Mtwapa near Mombasa.

Adults are recognizable by the long, narrow, brilliantly shining ocellar triangle. The head and wing are otherwise similar to many *Melanagromyza* species. However, the male genitalia are distinctive and in particular the form of the posterior larval spiracles on two raised stalks confirms that it correctly belongs in *Ophiomyia* rather than *Melanagromyza* (Spencer 1973).

The females oviposit in young leaves and the larva follows the first vein it encounters to the midrib and then feeds down into the stem where pupation takes place. The puparium is yellowish, as opposed to the black puparium of *O. spencerella*.

***Ophiomyia spencerella* Greathead, 1969**

This medium-sized black species was discovered by Greathead (1969) when investigating the 'bean fly' complex in Uganda. It differs from the more widespread *O. phaseoli* by the slightly broader and shorter ocellar triangle, by the entirely different male genitalia (Spencer 1973) and in the pupal stage by the puparium being black, not yellowish-white.

Greathead found that *O. spencerella* is widespread in East Africa, overlapping in distribution with *O. phaseoli* but it is normally the dominant species. The following additional records can now be given: Mwala Clinic, N. Macharkos, 1 ♂, 15.iv.83; Embu, 2 ♀, 9.xii.83; Thika, Blue Posts Hotel, 1 ♂, 10.xii.83; Karen, west of Nairobi, 1 ♀, on beans, 12.xii.83; Muguga, 1 ♂, 1 ♀, emerged 25.xii.83 and 10.i.84 from puparia coll. on beans 16.xii. (all K.A.S.).

It is clear from these records that this species feeds on wild leguminous hosts, in addition to cultivated beans. The females normally oviposit in very young plants, the eggs being laid low on the stem or most frequently in the hypocotyl between the cotyledons and the root. Puparia remain in the stem, normally near ground level. The root system can be severely damaged and the stem is liable to break where a number of puparia can be found together. It was noticed in the bean plot at Muguga that infested plants were stunted and normally with a heavy attack of the aphid, *Aphis fabae*. Such plants were clearly dying but apparently, if adventitious roots are produced sufficiently fast, plants may recover but the yield will certainly be reduced. This is probably the most important pest among the agromyzids attacking beans in Kenya and overall losses could be conservatively estimated at 10% of the total crop.

*Species new to Kenya****Ophiomyia pulicaria* (Meigen, 1830)**

(Figs. 33, 34)

Leaf mines of this species were found on *Sonchus oleraceus* in the grounds of I.C.I.P.E., Nairobi, 19.xii.83, and a single female emerged 23.xii.83. This is the first record of this common Palearctic species in the Afrotropical Region. The male genitalia are shown in figs. 33, 34.

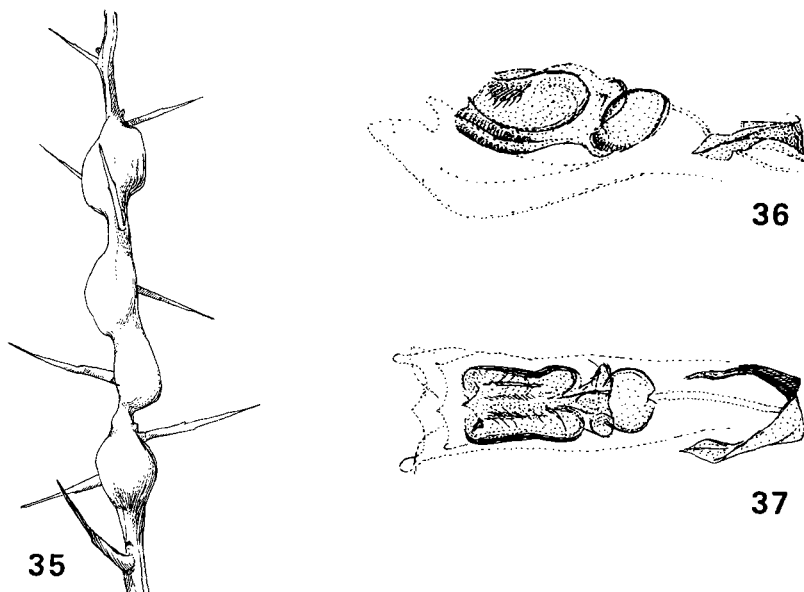
The larvae feed on a number of genera of Asteraceae and *Sonchus* is one of the commonest hosts in Europe. The larva feeds primarily along the midrib, forming lateral offshoots into the leaf-blade, normally pupating at the base of the leaf. There seems little doubt that this species was introduced to Kenya together with its host.

Adults resemble *Melanagromyza* species and *O. pulicaria* is included in the partial key to *Melanagromyza* (p. 973).

HEXOMYZA Enderlein

This small genus includes 12 species and is found primarily in the Palearctic and Nearctic Regions, with one species in the Afrotropical Region and one in New Zealand. The genus was revised by Spencer (1966 a) and was further discussed by Spencer (1981).

Adults are not obviously distinguishable externally from *Melanagromyza* but the male genitalia and distinctive biology, with the larvae forming galls on twigs of trees and shrubs (fig. 35) appear to justify the retention of this group as a distinct genus.



FIGS. 35–37. *Hexomyza gymnosporivora*: 35, galls on *Maytenus buxifolia* (South Africa); 36, aedeagus, side view; 37, same, dorsal view.

***Hexomyza gymnosporivora* (Spencer, 1963)**

(Figs. 35–37)

This species has hitherto only been known in the Cape Town area, South Africa where the distinctive galls (fig. 35) can occur in large numbers on *Maytenus* (formerly *Gymnosporia*) *buxifolia*.

Similar galls were found on *Maytenus heterophylla* in the Ololua Forest, west of Nairobi, 15.xii.83 (K.A.S.). Unfortunately no adults were obtained but it is highly probable that the species is *H. gymnosporivora*. The adult resembles a typical black *Melanagromyza* but it is unusual in having the squamal fringe white. New illustrations of the small aedeagus of the holotype are shown in figs. 36, 37. The species was transferred to *Hexomyza* by Spencer (1966 a, 39) primarily on the gall-causing habit of the larva.

***TROPICOMYIA* Spencer**

This genus was erected for the small black species forming silvery epidermal mines, with the puparium remaining firmly glued at the end of the mine below the epidermis. The larval mouth-hooks are distinctive, each with a serration of about 6 teeth (*cf.* Spencer 1973, fig. 269). The posterior spiracles are on two short stalks on a stout conical projection, each with 3 or 4 pores. Adults closely resemble *Melanagromyza* but the costa normally ends shortly after the termination of vein $R4 + 5$ and the inner cross-vein is towards the distal end of the discal cell.

Cogan (1980) recorded 16 species in the Afrotropical Region. Of these, I consider that seven species correctly belong in a new, undescribed genus (see above under *Melanagromyza*, p. 972). Also *T. coffeae* (Koningsberger) must be deleted (see below under *T. flacourtiæ*) and it is considered doubtful whether *T. theae* (Green) occurs in

Africa. The true *theae* is believed to be restricted to Sri Lanka (see Spencer 1973, 194) and the species occurring on tea in East Africa is almost certainly the polyphagous *T. flacourthiae*. Thus of known African species only seven correctly belong in *Tropicomyia*.

One new species from *Kalanchoe densiflorum* from the Aberdares is described below.

***Tropicomyia flacourthiae* (Séguy, 1951)**

(Figs. 38–43)

This is a widespread, polyphagous species, described from Madagascar and present in East, West and South Africa. Three common hosts in Kenya are *Bougainvillea*, *Coffea arabica* and *Thevetia neriifolia*. The conspicuous, silvery mines (fig. 38) seem to be present wherever these plants occur. Two localities in Nairobi where the species is common are the grounds of the National Museums (*Bougainvillea*) and the National Agricultural Laboratories, Kabete (coffee).

The small black fly cannot be easily distinguished from closely related species but characters of the male genitalia (figs. 39, 40) are constant on the different hosts. The wing of *T. flacourthiae* from coffee is illustrated in fig. 41, showing the costa ending just after the termination of vein R4+5 (and not continuing to M1+2, as is normal in *Melanagromyza*). As frequently happens with polyphagous species, it was assumed in the past that mines on different hosts represented distinct species, and five synonyms were established by Spencer (1973, 185).

A new host, *Eulophia porphyroglossa* (Orchidaceae), was discovered at Kabsabet, Western Highlands, 18.x.71 (K.A.S.) from which 5 specimens were reared, and mines were found on *Passiflora edulis*, 12.x.71 at Westwood Park, Nairobi.

The mines on coffee in East Africa were described by Hering (1940) as *Melanagromyza coffeae*. This, however, was a misidentification and also a homonym of *coffeae* Koningsberger from Java. It is now accepted that *T. coffeae* (Kon.) is restricted to the Oriental-Pacific area and the genitalia of a specimen from Papua New Guinea were illustrated by Spencer (1977 a, figs. 20, 21).

A male and female, both in poor condition, were reared from *Cassia floribunda* Cav. at Kapsabet, 18.x.71 (K.A.S.). They possibly represent a distinct species but the male genitalia (figs. 42, 43) are close to typical *flacourthiae*. It is hoped that the status of this population can be further clarified when additional material becomes available.

The original spelling *flacourthiae*, accepted by Cogan (1980), is here rejected as a *lapsus*, as Séguy in his description mentions *Flacourtia* as one of the hosts.

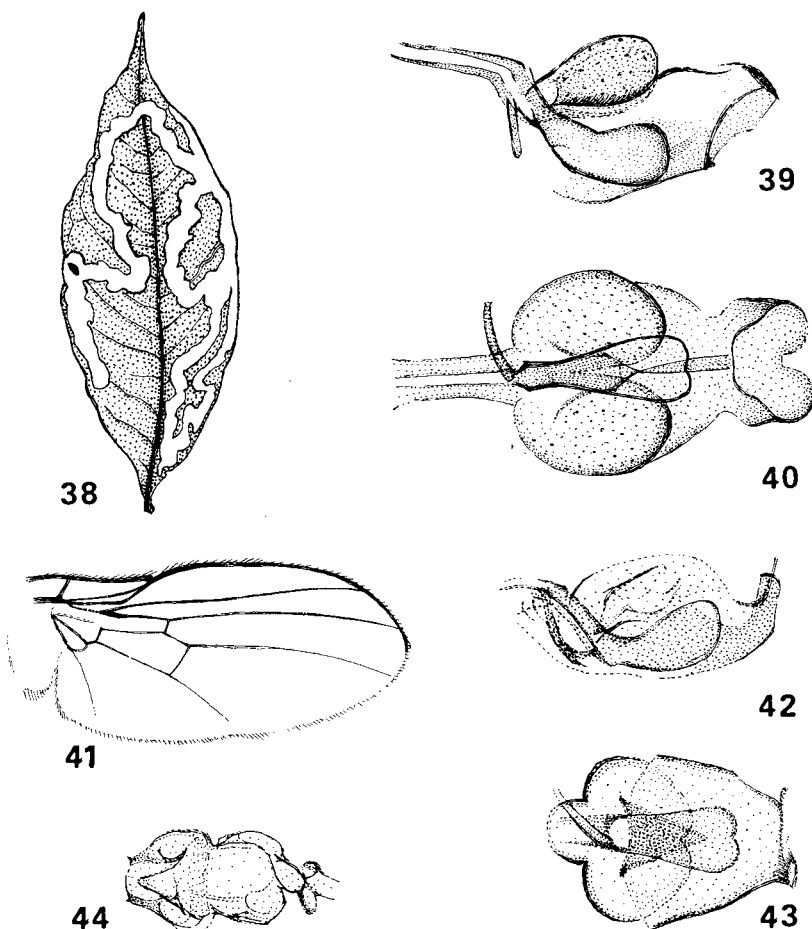
***Tropicomyia kalanchoes* sp. nov.**

(Fig. 44)

Head: Frons $1\frac{1}{2}$ times width of eye, not projecting above eye in profile; 2 strong ors, the upper slightly longer; 2 ori, the upper reclinate and only slightly shorter than lower ors, the lower weaker, inclined; orbital setulae sparse, reclinate, most numerous between the ori; ocellar triangle large, extending narrowly almost to margin of lunule; jowls exceptionally narrow, about $\frac{1}{20}$ vertical height of eye; 3 a.s. small, round, finely pubescent, arista relatively short, in ratio 13:15 with width of eye.

Mesonotum: 2 strong dc, acr numerous, in about 10 rows.

Wing: Length in male 2.0 mm, costa ending just after vein R4+5; last and penultimate sections of M3+4 equal, inner cross-vein only slightly more than own length from outer.



FIGS. 38–44. 38–43, *Tropicomyia flacourtiæ*: 38, leaf mine on coffee; 39, aedeagus, side view; 40, same, ventral view; 41, wing (coffee); 42, aedeagus, side view; 43, same, ventral view (*Cassia*). 44, *T. kalanchoes*: aedeagus, ventral view.

Colour: Frons sooty-black, ocellar triangle entirely mat, orbits weakly shining, particularly around base of bristles; mesonotum deep black, moderately shining; side of thorax and legs black; squamae dark grey, margin black; halteres black.

Male genitalia: Aedeagus exceptionally small (fig. 44), distiphallus symmetrical (possibly damaged in preparation and basal sclerites missing).

Host: *Kalanchoe densiflorum*, larva forming irregular mine, predominantly on underside of leaf but not infrequently feeding also on upper surface; mine appearing greenish, rather than silvery, owing to the succulent nature of the leaves; puparium remaining in leaf, whitish, with narrow dark band along dorsal surface, the long black anterior spiracles projecting through the epidermis, posterior spiracles each with 3 pores on short stalks at each corner of a rectangular projection.

HOLOTYPE ♂, Kenya: Kerita Forest, southern edge of Aberdares, c. 8000 ft, emerged 11.i.84 ex leaf mine coll. 17.xii.83 on *Kalanchoe densiflorum* (K.A.S. and J. M. Ritchie) (NMK); leaf-mines on same host, Aberdares, below Tuffa village, c. 6000 ft. 14.x.71 (K.A.S.).

Remarks: Externally there appears to be no essential difference between this species, which is presumably host-specific on *Kalanchoe*, and the polyphagous *T. flacourtiæ*. However, the male genitalia and also the leaf-mines are significantly different. In the puparium the basal projection bearing the spiracles is broader and the two stalks with the spiracular pores are distinctly stouter.

The reference given by Spencer (1973, 185) to *Kalanchoe* as a host of *T. flacourtiæ* was clearly an error.

AGROMYZA Fallén

Agromyza is a predominantly north-temperate genus, with about 70 species known in Europe and 36 in North America. Distribution on all southern continents is greatly reduced, with only 3 species having reached Australia. None are known in New Zealand and there is a single introduced species in Chile. It can be accepted that the genus evolved in the northern hemisphere and the small number of species present in the tropics and the southern hemisphere suggests a relatively recent origin, with insufficient time for any considerable dispersal to the south and with little local radiation from the few species which have reached South Africa and Australia.

Fifteen species have hitherto been known in this genus in Africa (with, in addition, four in Madagascar), of which only two—*A. abutilonis* Spencer (1959) and *A. somereni* Spencer (1959)—are known in Kenya. A single species, *A. oliviae* Spencer (1959), is known from Tanzania. Seven species are present in South Africa and three have reached the Ethiopian Highlands.

Only three species have been recorded in West Africa—*A. penniseti* Spencer from Cameroun, Nigeria and Senegal, a species identified by de Meijere (1940, 161) as *A. rufipes* Mg. from leaf mines and puparia on *Cynoglossum* in Cameroun, and a species near *A. intermittens* Becker on millet in Nigeria (Spencer 1977 b, 252).

There is now some doubt about the identification of *A. rufipes*, as males on *Cynoglossum* at Addis Ababa, Ethiopia produced flies identified as *A. myosotidis* Kalt. (Spencer 1964 a, 17). The leaf mines and puparia of *A. rufipes* cannot be distinguished from those of *A. myosotidis* and it now seems more probable that the species in Cameroun is *A. myosotidis*.

De Meijere (1940, 162-4) distinguished five *Agromyza* species in Cameroun by larval differences from leaf mines on grasses and many further species clearly await discovery in this group. Empty mines found on *Sporobolus filipes* at the Game Park, Nairobi, 3.ii.64 (K.A.S.) appear to represent an undescribed species.

Only two Palaearctic species are known in the Afrotropical Region—*A. myosotidis* Kaltenbach in the Ethiopian Highlands (Spencer 1964 a) and *A. luteifrons* Strobl (*A. albipila* Becker) in South Africa.

Two further species are recorded below from Kenya. One is described as new and the second, almost certainly undescribed, is known only from three females and the formal description is being delayed until a male is available. A new species is also described from the eastern Ruwenzori, Uganda.

The only known hosts of African species are *Abutilon* (Solanaceae), *Cynoglossum* (Boraginaceae), *Pennisetum*, *Sporobolus* and other grasses.

Agromyza graminacea sp. nov.

(Figs. 45, 46)

Entirely black, with costa extending to vein M1 + 2.

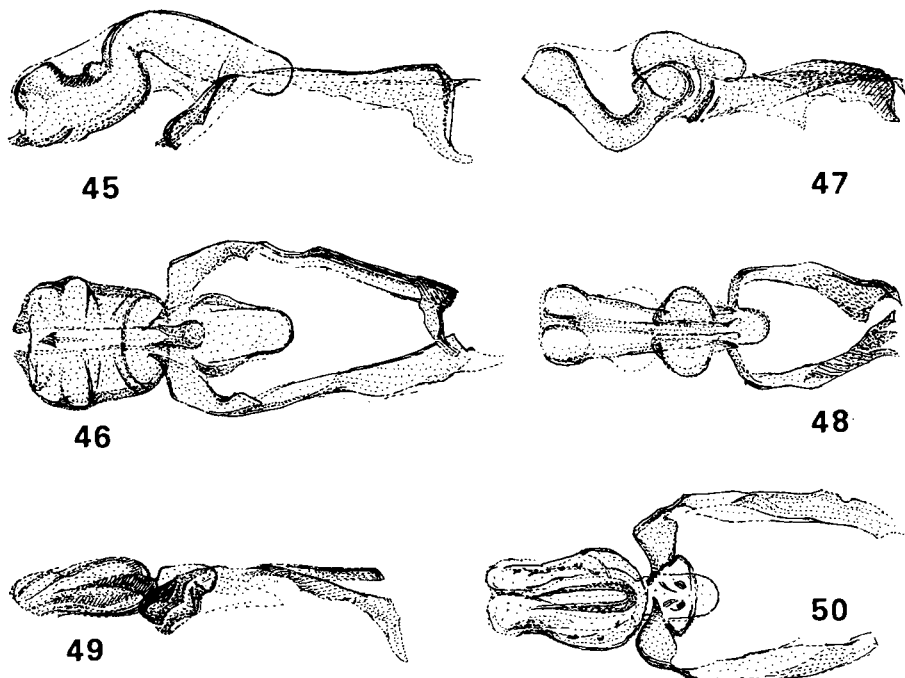
Head: Frons $1\frac{1}{2}$ times width of eye, not projecting above eye; 4 slender orbital bristles, 2 ors and 2 ori, distance between the two ors twice that between the ori; orbital setulae sparse, reclinate; ocellar triangle short, apex extending only slightly beyond foremost ocellus; 3 a.s. small, slightly longer than broad, arista finely pubescent; jowls angular, $\frac{1}{3}$ height of eye at rear; broad epistoma above mouth margin equal to length of 3 a.s.

Mesonotum: 3 post-sutural dc, 3rd short, little longer than acr, these numerous, in about 10 rows.

Wing: Length from 2.5 mm in male to 2.7 mm in female; costa extending strongly to M1 + 2; last section of M3 + 4 $\frac{2}{3}$ penultimate, inner cross-vein at or just beyond centre of discal cell.

Colour: Frons mat black or slightly brownish-black; jowls and epistoma brownish-black, face black; all antennal segments predominantly black but third faintly brownish on inside; mesonotum moderately shining black, appearing more mat viewed from front; pleura, legs and abdomen black; squamae yellowish-grey, fringe dark, brownish; halteres white.

Male genitalia: Aedeagus with characteristic curvature (figs. 45, 46), sperm pump large, equal in length to aedeagus, blade uniformly rounded above.



FIGS. 45–50. 45, 46, *Agromyza graminacea*: 45, aedeagus, side view; 46, same, ventral view. 47, 48, *A. somereni*: 47, aedeagus, side view; 48, same, ventral view (holotype). 49, 50, *A. ugandae*: 49, aedeagus, side view; 50, same, ventral view.

HOLOTYPE ♂, Kenya: Sigona, W. of Nairobi, at Thitu farm, 11.iv.83 (NMK). **PARATYPES**: ♀, Thika Sports Club, 14.iv.83; 1 ♀, Thika, Blue Posts Hotel, 10.xii.83 (all K.A.S.) (BMNH; NMK). A further female from Embu, Izaak Walton Hotel, 10.iv.83 possibly represents this species but the frons is narrower and wing length is only 2.3 mm. Positive identification will only be possible when a male becomes available.

Remarks: The male genitalia clearly indicate that this new species is a grass-feeder, the first which has been identified in Kenya. Externally it closely resembles both *A. oliviae* Spencer (1959) described from Tanzania and subsequently recorded at Addis Ababa, and *A. ugandae* sp. nov. described below. However, in *A. oliviae* and *A. ugandae* the orbital bristles are substantially stronger and more equally spaced and the epistoma is narrower and *A. graminacea* can be readily distinguished on these characters.

***Agromyza penniseti* Spencer, 1959**

One female, bred from leaf mine on *Pennisetum purpureum*, 27.x.71, Masaka, Uganda, emerged 16.xi.71; 6 further puparia obtained but no adults emerged; 4 ♀, caught on plant, 27.x.71 (all in BMNH).

This species has hitherto only been known in West Africa. It was described from material obtained by Dr. H. Buhr in Cameroun and has subsequently been recorded from Senegal on *Digitaria adscendens* Henrard (Spencer 1959, 249) and from Nigeria on *Pennisetum pediculatum* (Spencer 1977 b, 252). This new record from East Africa suggests that *A. penniseti* occurs widely together with its hosts.

The structure of the puparium of *A. penniseti* is unusual and diagnostic, with the anal segments curving ventrally at right angles to the front segments (Spencer 1959, fig. 11); the posterior spiracular processes adjoin and each has three pores.

***Agromyza somereni* Spencer, 1959**

(Figs. 47, 48)

The unique male holotype from Ngong, Kenya (Van Someren, v.1945) was placed in *Agromyza*, despite the dark brown halteres (normally white or yellow in this genus). The genitalia have now been examined (figs. 47, 48) and it is clear that this species correctly belongs in *Agromyza* and is almost certainly a grass-feeder.

***Agromyza ugandae* sp. nov.**

(Figs. 49, 50)

Head: Frons broad, almost twice width of eye, narrowly projecting above eye in front; 2 strong ors, the upper slightly longer, 2 equal ori similar to lower ors (on one side a very weak third ori present); orbital setulae sparse, reclinate; ocellar triangle short, only slightly extending beyond foremost ocellus; lunule small, narrow, higher than a semicircle; jowls extended at rear, 0.2 times height of eye, with a fringe of numerous strong bristles, many only slightly weaker than vibrissa; eye large, upright, bare; 3 a.s. small, round, arista finely pubescent; conspicuous epistoma present, height equal to width of 3 a.s., well-developed facial keel present.

Mesonotum: 3 post-sutural dc, third weak; acr numerous, in some 8 rows.

Wing: Length in male 2.85 mm, costa extending strongly to M1 + 2; inner cross-vein at midpoint of large discal cell, last section of M3 + 4 relatively short, in ratio 19:34 with penultimate.

Colour: Frons sooty-black, orbits and ocellar triangle weakly shining; mesonotum and abdomen brilliantly shining black; legs largely black, only fore-knees narrowly yellowish; squamae whitish-grey, margin and fringe black; halteres white.

Male genitalia: Aedeagus as in figs. 49, 50.

HOLOTYPE ♂, Uganda: Kilembe, 4000 ft., eastern edge of Ruwenzori, 26.x.71 (K.A.S.) (BMNH).

Remarks: The male genitalia indicate that this species is not closely related to *A. graminacea*, although the two are generally similar externally. It is apparently not a grass-feeder but the host cannot be deduced. *A. ugandae* is distinguishable from *graminacea* by the stronger, equally-spaced orbital bristles and the narrower epistoma. It more closely resembles *A. oliviae* described from two females from Tanganyika. A series from Addis Ababa, Ethiopia was later identified as *A. oliviae* and the distinctive male genitalia were illustrated by Spencer (1964 a, figs. 5, 6). In view of the close similarity of species in this group, confirmation that this identification is correct is desirable by the examination of males from Tanzania referable to *oliviae*. It is now considered possible that the Addis Ababa species may be distinct from *oliviae* and if this is so, the male of *oliviae* remains unknown.

Agromyza sp. (N.A.L.)

Three females caught on the rough vegetation immediately to the right of the entrance to the National Agricultural Laboratories, Kabete, Nairobi, 14.iv.83 (K.A.S.) almost certainly represent an undescribed species but I consider it preferable to delay the formal description until a male is available, permitting accurate diagnosis from the genitalia.

The species is certainly a grass-feeder and belongs to the small group in which the frons is predominately reddish. Other important characters are: 1 ors, 3 ori, all slender; 3 a.s. slightly elongated, largely black, faintly paler on inside; jowls broad, extended at rear, mesonotum moderately shining black, with 3+0 dc, pre-scutellars strong; legs entirely black; squamae yellowish-white, fringe whitish; abdomen shining black; wing length 2.5–2.6 mm, costa extending to vein M1+2; halteres white.

This species can only be compared to *A. verdensis* Spencer (1959) from S. Vincente, Cape Verde Islands which is substantially smaller, with wing length of 2.0 mm and which has the normal arrangement of 2 ors and 2 ori; the male genitalia of the holotype were illustrated by Spencer (1965, figs. 7, 8). It also somewhat resembles an undescribed species from Nigeria (Spencer 1977 b, 252) reared from millet but this has the mesonotum mat-grey.

It is to be hoped that at the readily accessible locality where these specimens were obtained further collecting will be undertaken, so that a male can be obtained permitting accurate identification of this species.

CERODONTA Rondani

This genus, as at present accepted following Nowakowski's revision of Palaearctic species (1973), embraces *Cerodontha* s.s. and subgenera included by Hendel (1931) in *Dizygomyza*. The larvae in this 'natural genus' all feed on one or more of the four monocot families Cyperaceae, Iridaceae, Juncaceae and Poaceae.

Cerodontha occurs virtually throughout the world, with 76 species recorded in Europe and 35 in the United States. Cogan (1980) recorded 14 species in the Afrotropical Region but three of these represent misidentifications of European

species. No species have hitherto been known in Kenya but seven are now recorded in the subgenera *Cerodontha*, *Icteromyza*, *Dizygomyza* and *Poemyza* and of these, four are described as new, three in *Cerodontha*, one in *Poemyza*; two further undescribed species are recorded in *Butomyza* and *Dizygomyza*.

***Cerodontha (Cerodontha)* Rondani**

This subgenus is distinctive in having only a single pair of scutellar bristles instead of the normal two, and a conspicuous spine on the third antennal segment (fig. 55), although in a few species this spine may be replaced by an angular projection.

Three species have been recorded in the Afrotropical Region. Two were described from Ethiopia, Addis Ababa and subsequently recorded in South Africa, while the third, *C. denticornis*, represents a misidentification (see below).

Four species are now recorded in Kenya—*C. heringiella* from Mt. Elgon and the Aberdares and three new species, one from the Aberdares, one from Mt. Kenya and a widespread species which appears to be common in the Nairobi area but is also present in Tanzania on Mt. Kilimanjaro, in Nigeria and South Africa. Records of *C. denticornis*, a common species in the Palearctic Region, with the most southern record being the Atlas Mountains in Morocco, almost certainly represent this same species (see below).

All species in this subgenus are believed to be grass-feeders and three are known as minor pests on cultivated cereals in Europe, North America and New Zealand (Spencer 1973).

***Cerodontha (Cerodontha) aberdarensis* sp. nov.**

(Fig. 51)

Mesonotum uniformly grey, without acrostichals.

Closely resembling the common Palearctic species, *C. denticornis*, with following essential characters:

Head: with 2 equal ors, 1 inclined ori; frons, face, jowls, 2 a.s. bright yellow, 3 a.s. black with short spine at upper corner (*cf.* fig. 55); palps black; mesonotum and scutellum uniformly mat grey, acr entirely lacking; legs with femora bright yellow, tibiae and tarsi dark-brown; wing length from 2 mm in male to 2.75 mm in female; male genitalia (fig. 51): paired tubules of distiphallus sinuate but curvature relatively flat (contrast the straight or almost straight tubules in *C. heringiella*, figs. 57, 58).

HOLOTYPE ♂, Kenya: Aberdare Range, Cave Falls, 10,000 ft, 14.x.71 (K.A.S.) (BMNH). **PARATYPES**, 1 ♀ same data (BMNH).

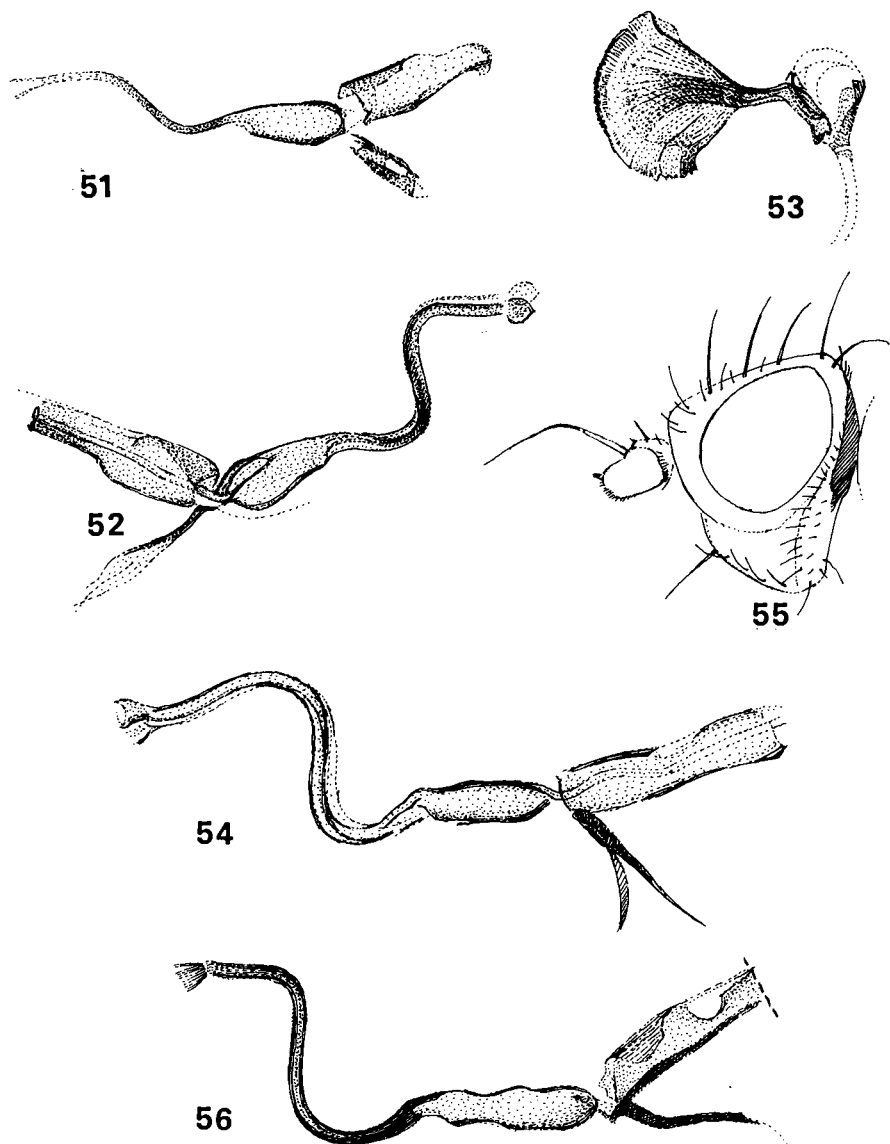
Remarks: Although there appear to be no external differences between *C. aberdarensis* and *C. heringiella* the curvature of the aedeagus is sufficiently differentiated to treat the Kenya population as distinct.

***Cerodontha (Cerodontha) africana* sp. nov.**

(Figs. 52–54)

Mesonotum banded, scutellum yellow.

Head: Frons twice width of eye, distinctly projecting above eye; 3 orbital bristles, long, equal, the single ori more inclined; orbital setulae sparse, proclinate; jowls deeply extended at rear, from 0.3–0.4 times height of eye, this conspicuously slanting; 3 a.s. elongate, with a short, fine spine at end, with numerous hairs both above and below the spine and only slightly shorter.



FIGS. 51–56. 51, *Cerodontha* (C.) *aberdarensis*: aedeagus, side view. 52–54, *C. (C.) africana*: 52, aedeagus, side view; 53, sperm pump (both holotype, Nairobi); 54, aedeagus, side view (Nigeria). 55, 56, *C. (C.) elevata*: 55, head; 56, aedeagus, side view.

Mesonotum: 3 + 1 strong dc, acr entirely lacking.

Wing: Length 2–2.3 mm in male, 2.3 mm in female, last and penultimate sections of M3 + 4 equal, first cross-vein at midpoint of discal cell.

Colour: Head yellow, including palps, only 3 a.s. black; mesonotum variable, ground colour moderately shining, yellow, with five darker bands, which may be almost black to paler grey, central area adjoining scutellum always yellow; scutellum largely yellow, variably darkened at sides; side of thorax largely yellow, only sternopleura variably

darkened on lower three-quarters; legs: coxae and femora bright yellow, tibiae and tarsi darker, brownish-yellow, almost black on hind-legs; abdomen with tergites darkened centrally, yellow at sides; halteres yellow.

Male genitalia: Curvature of distal tubules of aedeagus somewhat variable (Nairobi, fig. 52; Nigeria, fig. 54) but distal end consistently enlarged in all populations; sperm pump as in fig. 53.

HOLOTYPE ♂, Kenya: Nairobi, roadside at entrance to National Agricultural Laboratories, 14.iv.83 (K.A.S.) (NMK). PARATYPES: 1 ♂, 1 ♀, same data; 1 ♂, 7.xii.83; Nairobi, herbage bordering stream, 1 ♂, 8.ix.71 (J. C. Deeming); 1 ♂, Nairobi, 5,500 ft, 7.i.71 (A. E. Stubbs); 6 ♂, Nigeria, Mambilla Plateau, Ngel Nyaki, overgrown cocoyam plots in village, 28.xi–3.xii.68 (J. C. Deeming); 1 ♂, 1 ♀, South Africa, Cape Province, Somerset East, 10–22.xii.30 (R. E. Turner) (BMNH).

Remarks: This species is immediately distinguishable from *C. abyssinica* Spencer (1961 b) by the bright yellow palps and the lack of acrostichals. It resembles the pale form of *C. denticornis* but is distinguishable by the different curvature of the aedeagus and the enlarged ends of the distal tubules.

The specimens from Nigeria were previously recorded as 'nr. *abyssinica*' by Spencer (1977 b, 252). Those from Somerset East, South Africa (as two females) were identified as *abyssinica* by Spencer (1963, 112); 4 females from Natal were similarly identified in the same paper and almost certainly represent *africana*. Further specimens have been collected in Tanzania on Mt. Kilimanjaro by Dr. von Tschirnhaus.

Two females from Nairobi, Karura Forest, 5500 ft, 9–13.xii.70 (A. E. Stubbs) possibly represent *C. africana* but they are larger, paler and with wing length of 2.85 mm and the spine on the third antennal segment is longer and stouter. Clarification of this species will only be possible when a male becomes available.

C. denticornis was recorded from Uganda, Zaire (Belgian Congo) and Natal (Spencer 1959, 302) and from Basutoland by Spencer (1960 a, 31) before the significance of differences in the male genitalia was appreciated. These specimens almost certainly all represent *C. africana* but confirmation should be obtained from the examination of males when possible.

***Cerodontha (Cerodontha) elevata* sp. nov.**

(Figs. 55, 56)

Mesonotum silvery grey, faintly yellow centrally adjoining scutellum.

Head (fig. 55): Frons broad, almost twice width of eye, strongly projecting above eye, increasingly so towards base of antennae; 4 strong orbital bristles, the two ors and upper ori equal, lower ori weaker; orbital setulae long but sparse; eye slanting, jowls deeply extended at rear, in ratio 8:14 with vertical eye height; 3 a.s. elongate, with a short, stout spine at end and a fringe of hairs below.

Mesonotum: 3+1 strong dc, acr lacking.

Wing: Length 2.7 mm in male, 2.9–3.0 mm in female; inner cross-vein beyond centre of discal cell, this large, last and penultimate sections of M3+4 equal.

Colour: Head bright yellow, apart from black 3 a.s.; palps black; mesonotum predominantly mat, almost silvery-grey, apart from small patch centrally adjoining scutellum which is faintly yellow, more obviously so in female; side of thorax largely yellow, only narrow dark bar along lower and front margins of mesopleura, and lower two-thirds of sternopleura dark; legs: coxae and femora bright yellow, tibiae and tarsi

brownish, with yellow undertone; abdomen largely mat black, in female basal cone of ovipositor strongly grey-dusted; halteres yellow.

Male genitalia: Aedeagus (fig. 56) with paired distal tubules long, narrow, upper curve slightly longer than lower; sperm pump with broad, slightly asymmetrical blade; surstyli strongly projecting inward, with numerous short bristles.

HOLOTYPE ♂, Kenya: Mt. Kenya, N. side, 11,000 ft, 20–22.xii.1980 (P. S. Cranston) (BMNH). PARATYPES: 1 ♂, 1 ♀, same data (BMNH).

Remarks: This is the largest *Cerodontha* known in Africa. A female from South Africa, Natal, Drakensberg, Cathedral Peak Forestry Reserve, Organ Pipes Pass, at summit, 9600 ft, March, 1959 (B. R. and P. J. Stuckenberg) is tentatively identified as this species but is not treated as a paratype. The silvery grey ground colour of the mesonotum is distinctive.

A single male from Addis Ababa (coll. Hering, BM) generally resembles *C. elevata* but the slight curvature of the aedeagus suggests that this may be a further undescribed species.

***Cerodontha (Cerodontha) heringiella* Spencer, 1961 b**

(Figs. 57, 58)

Described from Addis Ababa, Ethiopia, this species is only distinguishable from *C. aberdarensis* sp. nov. by the short, broad distal tubules of the aedeagus (fig. 57, holotype). In three males seen from Mt. Elgon, 10,250 ft, 1°05'N, 34°40'E, 24–25.i.72 (C. F. Huggins, in BMNH) these tubules are more slender and there is very slight curvature at the base (fig. 58); 5 ♂, 2 ♀ (male genitalia similar) were obtained at Kerita Forest, S. Aberdares, Kenya, 17.xii.83 (K.A.S.). In a further specimen from South Africa, East Cape Province, Barkly East District, Lundeans Nek, 1925–2100 m., 18.i.63 (B. and P. Stuckenberg, in BMNH) the tubules are entirely straight.

Specimens collected by Dr. M. von Tschirnhaus on Mt. Kilimanjaro also show variation in the form of the distal tubules, from straight to having slight curvature. A female from Tanganyika, Mt. Kilimanjaro recorded by Spencer (1960 b, 323) as *C. denticornis* has been re-examined and this is now accepted as *C. heringiella*.

***Cerodontha (Icteromyza)* Hendel**

This small subgenus of 15 known species is widely distributed, with 5 species known in Europe, 5 in the United States and is represented in Sri Lanka, Papua New Guinea, Australia and New Zealand. Two species have hitherto been known in the Afrotropical Region—the widespread species *C. (I.) piliseta* recorded below and *C. (I.) stuckenbergiella* Spencer (1977 b) in South Africa (previously misidentified as the European species *C. (I.) geniculata* Fallén (cf. Spencer 1959, 304; 1961 b, 339).

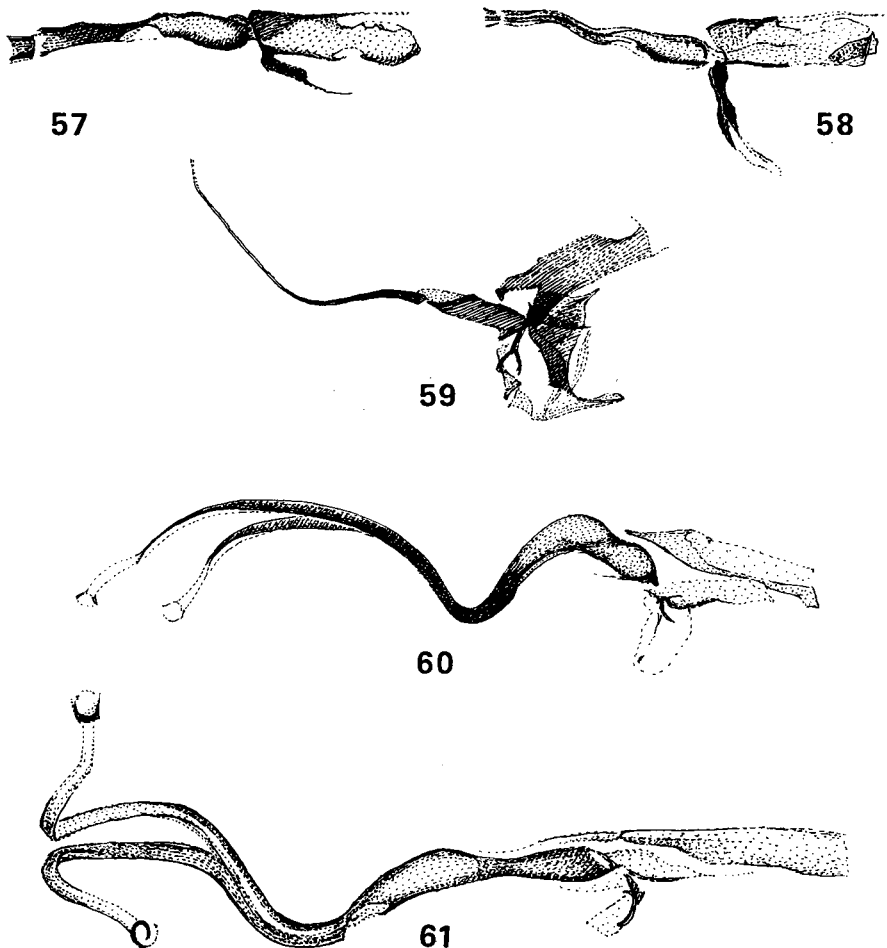
The only known hosts are in the Cyperaceae and Juncaceae.

***Cerodontha (Icteromyza) piliseta* (Becker, 1903)**

(Fig. 59)

Kenya: Embu, garden of Izaak Walton Hotel, 1 ♂, 10.iv.83 (K.A.S.).

This is the first record for Kenya of this widespread tropical species which is known from the Cape Verde Is. and Zimbabwe to Sri Lanka, Papua New Guinea, northern Australia, Guam, Yap and the Bismarck Is. in the Pacific. I have also recently seen a specimen from Mt. Kilimanjaro, Tanzania (von Tschirnhaus).



FIGS. 57–61. 57, 58, *Cerodontha* (*C.*) *heringiella*: 57, aedeagus (holotype, Addis Ababa); 58, same (Mt. Elgon). 59, *C. (I.) piliseta*: aedeagus. 60, *C. (P.) setariae*: aedeagus. 61, *C. (P.) kakamegae*: aedeagus.

No host has been confirmed but the larvae almost certainly feed on species of Cyperaceae or Juncaceae.

The distinctive male genitalia are shown in fig. 59.

Cerodontha (*Poemyza*) Hendel

This subgenus is widely distributed, with 24 species recorded in Europe (Nowakowski 1973) and single species have reached Sri Lanka and Papua New Guinea. None are known from Australia or the Neotropical Region.

Four species were included in *Poemyza* in the Afrotropical Catalogue by Cogan (1980, 644). Of these, both *cariciphaga* (Spencer 1963) from Cameroun and *pubicata* (Spencer 1959) from Zaire, correctly belong in *Butomomyza* (see below). *C. aristella*

Spencer from South Africa and Zimbabwe, and *C. magnificans* Spencer from South Africa and Zaire, which were rightly transferred to *Cerodontha* from *Phytobia* by Cogan (*loc. cit.*) were inadvertently placed in *Dizygomyza* but belong in *Poemyza* (*cf.* Spencer 1963, fig. 22, genitalia of *aristella*). *C. (P.) orbitona* is now recorded for the first time in East Africa, in both Kenya and Uganda, and a new species from Kenya is described below.

Re-examination of the two type specimens of *P. setariae* (Spencer 1959) from Sierra Leone has shown that, although the posterior puparial spiracles (Spencer 1959, fig. 66) appear identical to those of *P. orbitona* (Spencer 1973, fig. 452), these species are distinct despite some variation in the colour of both the third antennal segment and notopleural triangle. The genitalia of the male holotype of *P. setariae* are shown in fig. 60 and it will be seen that the aedeagus differs significantly from that of *P. orbitona* (fig. 64). A revised key to the four African species accepted in *Poemyza* is given as follows:

- 1 Orbits entirely dark. *aristella* (Spencer)
- Orbits at least partially yellow. 2
- 2(1) Orbits entirely yellow 3
- Orbits yellow only on inner margin, black adjoining eye margin . . . *kakamegae* sp. nov.
- 3(2) Third antennal segment black; notopleural area normally bright yellow or at least somewhat pale; male genitalia as in fig. 64 *orbitona* (Spencer)
- Third antennal segment yellow in male, black in female (in only two specimens seen); notopleural area black; male genitalia as in fig. 60 *setariae* (Spencer)

The majority of species in *Poemyza* are leaf miners on Poaceae but a new species was recently found mining *Carex* in Mississippi, U.S.A. (Spencer and Steyskal, in press).

***Cerodontha (Poemyza) kakamegae* sp. nov.**

(Fig. 61)

Black, with orbits yellow on inner margin.

Head: Frons just less than $1\frac{1}{2}$ times width of eye, not projecting above eye in profile; orbital bristles strong, 2 equal ors, 2 ori, the lower slightly weaker; the two ori and lower ors equidistant, distance between ors twice that of the other three; orbits widening anteriorly, greatest width at lower edge of lunule, this narrow, upper margin just above level of upper ori; jowls deepest at rear, about $\frac{1}{4}$ height of eye; 3 a.s. small, round, arista long, equal to vertical height of eye.

Mesonotum: 3 post-sutural dc, third $\frac{1}{2}$ length of second; acr in about 8 rows, pre-scutellars lacking.

Wing: Length in male 2.3 mm; last section of M3+4 in ratio 20:25 with penultimate, inner cross-vein at basal third of discal cell.

Colour: Frons brownish-black, orbits yellow inside line of bristles and extending to rear of head each side of ocellar triangle, shining black adjoining eye margin; lunule and jowls brownish, face and all antennal segments black; mesonotum and scutellum shining black, pleura black apart from narrow yellow upper margin of mesopleura; legs and abdomen entirely black; squamae grey, margin and fringe black; halteres yellowish-white.

Male genitalia: Aedeagus long, distal tubules diverging (fig. 61); sperm pump with narrow blade.

HOLOTYPE ♂, Kenya: Western Highlands, Kakamega Forest, 17.x.71 (K.A.S.) (BMNH).

Remarks: This species is readily distinguishable from all others known in the Afrotropical Region by the distinctive colour of the orbits.

***Cerodontha (Poemyza) orbitona* (Spencer, 1960 a)**

(Figs. 62–64)

This distinctive species with broad, yellow orbits (fig. 62) was described from South Africa and has subsequently been recorded in Ghana attacking rice (Scheibelreiter 1973). In 1977 it was also identified from Réunion where the primary host is *Zea mays* (C.I.E. A10514).

The first records can now be given for Kenya: Nairobi, Kilimani, 1 ♂, 19.iv.81; Thika Sports Club, 1 ♀, 14.iv.83 (both K.A.S.). Mines with puparia were also found in Uganda: Kilembe, 20.x.71, on *Hyparrhenia cymbaria* (K.A.S.). The distinctive posterior spiracles are shown in fig. 63.

C. orbitona can now be seen to have a wide distribution in South, West and East Africa, with its range extending to the Indian Ocean. Apart from rice and maize its hosts probably include a number of wild grasses in addition to *Hyparrhenia*. Scheibelreiter (*loc. cit.*) discusses the biology on rice in Ghana in some detail and found that at one locality 50% of young plants were attacked. However, parasitism by six species in the families Ceraphronidae, Pteromalidae, Eulophidae and Eucoilidae was high, up to 66% at one locality, and at normal population levels the species does not appear to be of economic importance.

The male genitalia were illustrated by Spencer (1973, fig. 451) but examination of additional specimens shows that the exceptionally long distal tubules were broken in this preparation; the aedeagus of the male from Nairobi is shown in fig. 64.

Cerodontha (Butomomyza) Nowakowski

This small subgenus was erected for species which are intermediate between *Poemyza* and *Dizygomyza*. Eleven species have been recorded in Europe (Nowakowski 1973), 8 in the United States and a single species is known from Australia. None have hitherto been placed in *Butomomyza* in the Afrotropical Region but it is now clear that two correctly belong here, and a further undescribed species probably referable to this subgenus is recorded below.

Hosts of *Butomomyza* are mainly *Carex* spp. but a few species feed on Poaceae. Although this subgenus has not hitherto been recorded in Kenya, species will almost certainly be discovered with further collecting.

***Cerodontha (Butomomyza) cariciphaga* (Spencer 1963), comb. nov.**

Phytobia (*Dizygomyza*) *cariciphaga* Spencer, 1963, 113 from Cameroun.

Cerodontha (*Dizygomyza*) *cariciphaga*, Cogan (1980, 644)

A long series was reared from *Carex* sp. on Mt. Cameroun and the genitalia were illustrated by Spencer (1963, fig. 21).

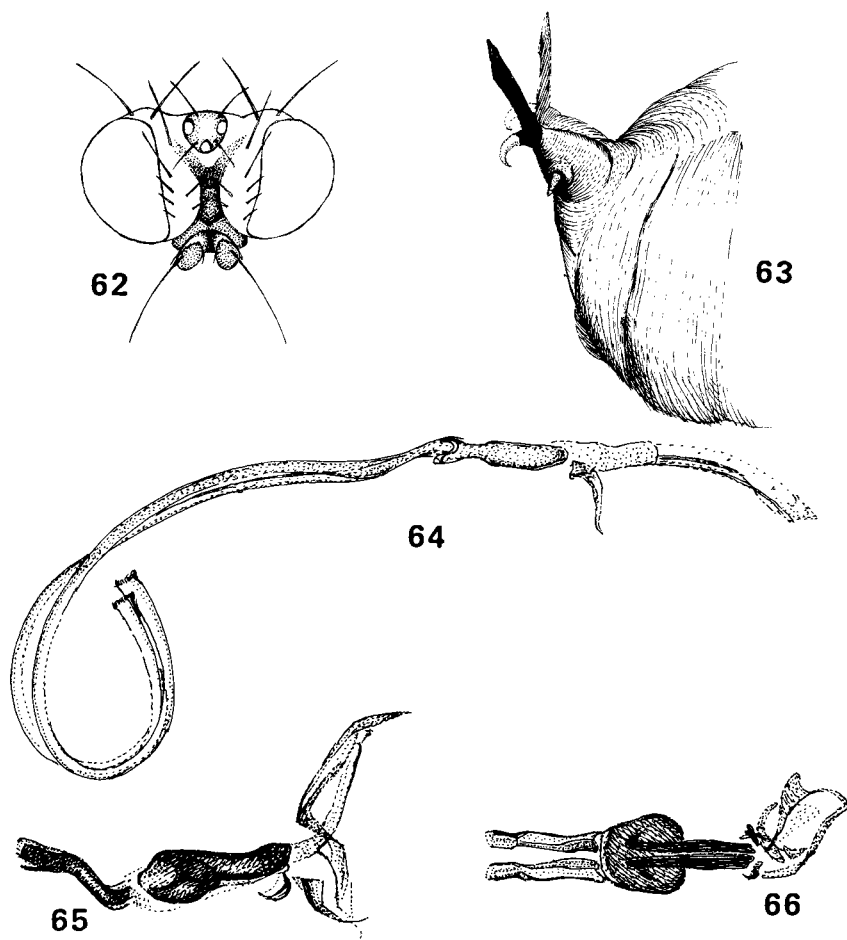
***Cerodontha (Butomomyza) pubicata* (Spencer 1959), comb. nov.**

(Figs. 65, 66)

Phytobia (*Poemyza*) *pubicata* Spencer, 1959, 306 from Zaire (Belgian Congo).

Cerodontha (*Poemyza*) *pubicata*, Cogan (1980, 645).

Re-examination of the holotype shows that this species belongs in *Butomomyza* and the characteristic genitalia are shown in figs. 65, 66. Differences in the genitalia among all species in this subgenus are relatively slight but in *pubicata* the distal tubules of the aedeagus are shorter and the gap between their base and the mesophallus is less pronounced than in *cariciphaga*. The most significant difference in external characters



FIGS. 62–66. 62–64, *Cerodontha* (*P.*) *orbitona*: 62, head; 63, posterior spiracles of puparium; 64, aedeagus. 65, 66, *C. (B.) pubicata* (holotype); 65, aedeagus, side view; 66, same, ventral view.

is the darker, largely black legs, with the tibiae and tarsi being paler, more brownish-yellow in *cariciphaga*.

Cerodontha (Butomomyza) sp.

Kenya: Tuffa, Aberdares above Nyeri, c. 8000 ft, one empty puparium in mine on *Cyperus ajax* C.B.Cl., 14.x.71 (K.A.S.).

This certainly represents an undescribed species, most probably in this subgenus. The puparium is exceptionally large, 3.5×1.75 mm, dark brown, with the posterior spiracles at each corner of a ventrally directed projection on the lower side of the anal segment; each process has an irregular arrangement of some 20 minute pores, with one greatly enlarged in the form of a curving, whitish, horn-like structure. The leaf mine is a broad, elongate blotch, 15 cm long; the puparium remains within the mine.

***Cerodontha (Dizygomyza)* Hendel**

This is the largest subgenus, with about 60 species, of which 40 occur in Europe (Nowakowski 1973) and 16 in the United States. Only two are known in the Neotropical Region and the subgenus has not reached Australia.

Only two species are known in the Afrotropical Region, of which one (undescribed) is recorded below in Kenya. The only species hitherto known as definitely ascribable to *Dizygomyza* is *C. (D.) kivuensis* Spencer (1959) from Zaire.

All known species are leaf miners in the four families Cyperaceae, Iridaceae, Juncaceae and Poaceae.

***Cerodontha (Dizygomyza)* sp.**

Kenya: Western Highlands, Timboroa, c. 8000 ft, 1♀, 19.x.71 (K.A.S.).

This species is characteristic of the subgenus and is the first adult known in Kenya. It closely resembles those in the Palaearctic Region but identification is not possible without examination of the male genitalia. The host is probably *Carex*.

***LIRIOMYZA* Mik**

Liriomyza is one of the largest agromyzid genera, with over 300 described species. It is the second largest genus in the northern hemisphere and there has been some proliferation in South America, Australia and New Zealand. In Africa, however, only 12 species are known (with two more in Madagascar). The genus appears to be poorly represented in Kenya where hitherto no endemic species have been known. The semi-cosmopolitan *L. brassicae* is widespread in association with cultivated brassicas and *L. trifolii* has been recently introduced from Florida (see below). One new species from the Western Highlands is now described.

The larvae of *Liriomyza* are preponderantly leaf miners, forming either linear or blotch mines but a few species are known feeding in seeds or as stem miners. The preferred host family is Asteraceae.

***Liriomyza brassicae* (Riley, 1884)**

This species is readily distinguishable from *L. trifolii* by the brilliantly shining black mesonotum. Hosts are primarily in the Cruciferae but it has also been recorded on *Pisum* in Zimbabwe, India and now in Kenya. It can occur as a minor pest on cultivated brassicas.

New records: Sigona, W. of Nairobi, 1 ♂, 13.iv.83, also mines on *Brassica oleracea*; Langata, W. of Nairobi, 1 ♀, 29.xii.83 ex mine on *Erucastrum arabicum* (new host record) coll. 15.xii.; Embu, 1 ♂, 9.xii.83; Karen, W. of Nairobi, empty mines on *Pisum*, 18.xii.83 (all K.A.S.).

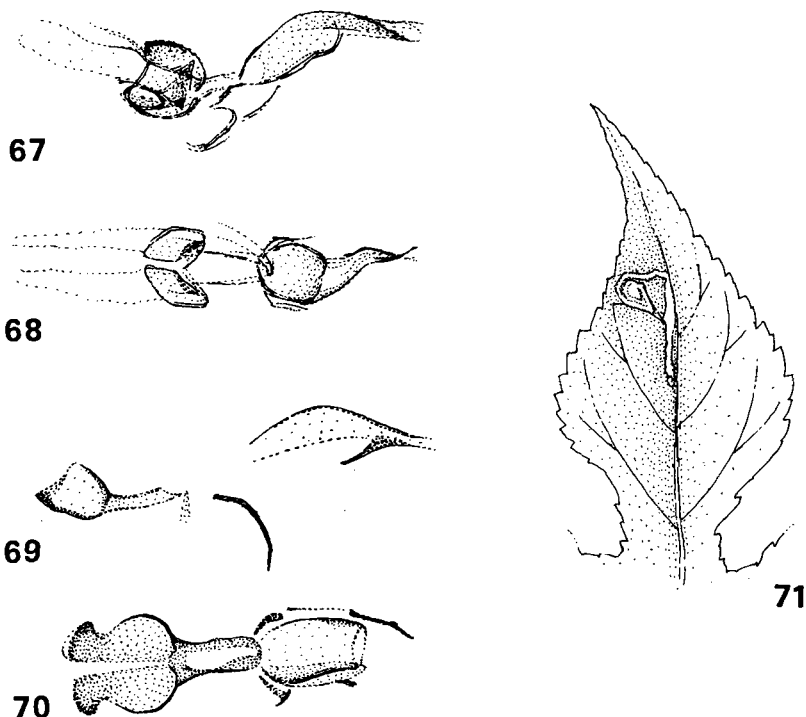
***Liriomyza manni* sp. nov.**

(Figs. 67, 68)

Pale, with large discal cell and grey mesonotum.

Head: Frons about $1\frac{1}{2}$ times width of eye, not projecting above eye in profile; 2 strong, equal ors, 2 ori, the lower weaker; orbital setulae sparse, with 2 or 3 minute hairs; jowls extended at rear, about $\frac{1}{4}$ height of eye; 3 a.s. small, round, with fringe of distinct but not exceptionally long hairs, arista distinctly pubescent.

Mesonotum: 3 + 1 dc, acr sparse, in 2–3 rows, inner post-alar at least half length of post-alar.



FIGS. 67–71. 67, 68, *Liriomyza manni*: 67, aedeagus, side view; 68, same, ventral view. 69–71, *L. trifolii*: 69, aedeagus, side view; 70, same, ventral view; 71, leaf mine on *Tithonia diversifolia*, Embu.

Wing: Length in male 2.4 mm, discal cell large, last section of M3 + 4 twice length of penultimate.

Colour: Head largely by yellow, hind-margin of eye narrowly black beyond base of vte; mesonotum mat grey, only weakly shining; pleura largely yellow, mesopleura with small, faint, brownish bar along lower margin, sternopleura yellow on upper quarter; scutellum mainly yellow, with only small black patches below front bristles; femora bright yellow, tibiae and tarsi appearing dark, brownish-yellow; squamae yellowish-grey, margin and fringe black.

Male genitalia: Aedeagus as in figs. 67, 68, distiphallus ending in paired membranous tubules; sperm pump long, equal in length to aedeagus, blade broad, symmetrical.

HOLOTYPE ♂, Kenya: Western Highlands, Kapsabet, 17.x.71 (K.A.S.) (BMNH).

Remarks: This species resembles both *L. trifolii* and *L. mosselensis* Spencer (1965) from South Africa but it is larger and in particular the discal cell is larger. The male genitalia confirm that the three species are distinct. *L. mosselensis* is certainly a grass-feeder but the host of *L. manni* cannot be deduced with certainty from the genitalia.

I have pleasure in naming this species after Clive Mann, who gave me valuable assistance with my collecting at Kapsabet, Timboroa and the Kakamega Forest and kindly provided me with hospitality during my visit to Kapsabet in 1971.

Liriomyza trifolii (Burgess, 1880)

(Figs. 69–71)

Essential characters of this species are: head largely yellow, with both vertical bristles on yellow ground, hind-margin of eye may be black for short distance beyond outer vertical; mesonotum distinctly mat, greyish, with *acr* in 3–4 irregular rows; side of thorax predominantly yellow but lower margin of mesopleura normally slightly darkened; legs with femora largely yellow; small species, wing length 1.25–1.9 mm, discal cell small, last section of M3+4 3 times penultimate; male genitalia: aedeagus (fig. 69) small, pale, distiphallus with distinctive curvature in ventral view (fig. 70).

L. trifolii is believed to have been introduced to Kenya with chrysanthemum cuttings from Florida in 1976 at a large propagating nursery at Masongaleni, near Kibwezi. This nursery has now been closed but in 1979 *L. trifolii* had become established on a number of wild plants nearby, particularly *Bidens pilosa*, *Launaea cornuta*, *Tridax procumbens*, and cultivated *Tagetes* (marigold). It was present on tomatoes and *Ricinus communis* at Athi River, about 20 km W. of Kibwezi. The National Agricultural Laboratories, Nairobi has records of *L. trifolii* from Nairobi, Naivasha, Ruaraka, Thika, Kibirigwi near Karatina, Isiolo, at the Pekerra Dam site and at the Hola Irrigation scheme. Hosts cited are beans, cucurbits, tomatoes, *Bidens* and 'sunflower' (De Lima 1979).

During a visit to Kenya in April, 1983 I found *L. trifolii* on a small field of chrysanthemums at Sigona, west of Nairobi and in the gardens of the Blue Posts Hotel, Thika on *Bidens* and *Gerbera*. A small population was also present in an isolated area beside the Rupengazi River, south of Embu, on *Bidens* and *Tithonia diversifolia* (this is possibly the 'sunflower' referred to above). In December, 1983 I found numerous mines on beans at Karen W. of Nairobi and it was found and reared by Dr J. M. Ritchie from *Ajuga remota* in November, 1983 occurring as a weed at the roadside near Langata, W. of Nairobi. Empty mines were also found on *Tagetes minuta* in the grounds of the National Museums.

There are a number of small chrysanthemum farms in the Nairobi area, all of which received cuttings from Kibwezi up to 1979 or possibly 1980. It is thus virtually certain that *L. trifolii* spread to the Nairobi area with these plants. The Blue Posts at Thika doubtless received plants from some infested nursery. To what extent other records represent natural dispersal or merely reflect normal commercial distribution of infested plants cannot be established with certainty. The ability of *L. trifolii* to colonize widespread local plants such as *Bidens* and *Tithonia* will obviously have facilitated its dispersal, and with no natural barriers and certainly some distribution through the trade in chrysanthemums, it is not surprising that *L. trifolii* now occurs widely in Kenya and it can be expected to be found at further localities.

L. trifolii is considered as a major pest in Florida, California and in the large chrysanthemum farms in Colombia and other countries in South and Central America (Spencer 1983), and also in Israel. It has reached some localities in Tanzania and has become a major problem on the island of Réunion in the Indian Ocean where it has been recorded on 76 different hosts (Vercambre 1980). In Senegal it has occurred as a serious pest on potatoes. It is also present in most countries in Europe, mainly in glasshouses, having been introduced with chrysanthemum cuttings from Kenya. *L. trifolii* is a particularly serious pest, as it is one of the few polyphagous species of Agromyzidae and readily transfers from chrysanthemums to beans, tomatoes and cucurbits. Its ability to colonize local wild plants can provide population reservoirs able to re-infest crops cultivated nearby. Fagoonee and Toory (1983, 1984) have studied its biology on Mauritius.

The larva normally forms an irregular linear mine but both at Sigona on chrysanthemums and on *Tithonia* near Embu the mines begin with a conspicuous spiral (fig. 71). This character of the mine has previously been associated with distinct species, such as *L. eupatorii* Kaltenbach in Europe (cf. Spencer 1976 a, fig. 427) and it is surprising now to find such mines occurring in *L. trifolii*. Many adults were reared from these mines at Sigona and all represent normal *trifolii*.

***PHYTOLIRIOMYZA* Hendel**

This relatively small genus is represented in all faunal Regions, with 14 species known in Europe, 14 in Australia (Spencer 1977 c) and 10 in Chile (Spencer 1982). Only 2 species have been recorded in the Afrotropical Region. Of these, *P. immoderata* Spencer 1963, is known from South Africa and there are records of *P. perpusilla* Meigen from South Africa, Lesotho and Cape Verde Is. (Cogan 1980). The latter species has frequently been misidentified and often confused with the widespread species *P. arctica* Lundbeck, and the African records require checking.

A new species is now described from Kenya, known from the Tsava National Park and the Nairobi area.

***Phytoliriomyza intermedia* sp. nov.**

(Figs. 72, 73)

Head: Frons twice width of eye; 2 strong equal ors, 1 similar inclined ori; orbital setulae sparse, minute, virtually lacking; jowls extended at rear, about $\frac{1}{3}$ height of eye, this conspicuously slanting, bare; cheeks forming narrow ring below eye; 3 a.s. slightly longer than broad, flatter below, more rounded above, only finely pubescent; arista long, slightly longer than vertical height of eye.

Mesonotum: 3 + 1 strong dc, 2nd, 3rd and 4th equal, acr lacking.

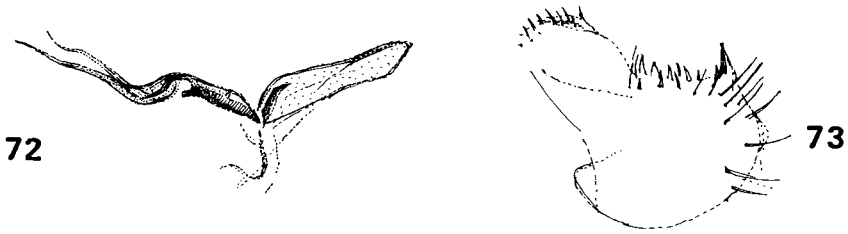
Wing: Length in male 1.6 mm, last section of M3 + 4 twice length of penultimate.

Colour: Head largely yellow, including entire hind-margin of eye, frons slightly darkened, yellowish-brown, orbits pale yellow; jowls and face bright yellow; 3 a.s. variable, greyish above, more yellow below (holotype) or more uniformly greyish-yellow (paratype); palps yellow; mesonotum mat greyish, with 2 distinct yellow bands each side of central grey band, this becoming faintly yellowish centrally towards rear (in paratype mesonotum appears more blackish towards front but this is due to dampness during mounting); scutellum mat greyish, faintly yellow centrally; side of thorax completely yellow; legs largely yellow, tibiae slightly darker, yellowish brown; abdomen largely yellow but all tergites narrowly black centrally; halteres yellow below, brownish-black above.

Male genitalia: Aedeagus (fig. 72) with 2 asymmetrical tubules; epandrium (fig. 73) with conspicuous spines on inner margin, surstyli with a fringe of short spines at end; sperm pump with small, narrow blade.

HOLOTYPE ♂, Kenya: Tsavo National Park (East), 4-7.iv.68 (B. Cogan and A. Hutson) (BMNH). **PARATYPE** ♂, Karen, W. of Nairobi, 12.xii.83 (K.A.S.) (NMK).

Remarks: Externally this species closely resembles *P. immoderata* Spencer, 1963 from South Africa but this is slightly darker, with the mesonotum frequently entirely grey. In the male genitalia the aedeagus of the two species is also similar (cf. Spencer 1963, fig. 26 and 1964 b, fig. 1) but there is a significant difference in the form of the



FIGS. 72, 73. *Phytoliriomyza intermedia*: 72, aedeagus; 73, epandrium with surstylus.

epandrium and surstyli. In *immoderata* the conspicuous spines, present in *intermedia*, are lacking and the surstyli are longer and narrower, with fewer bristles on the inner corner (Spencer 1964 b, fig. 1). Both these species are clearly related to *P. oasis* Becker, a predominantly Mediterranean species, but this differs even more in the aedeagus, epandrium and surstyli (cf. Spencer 1964 b, fig. 2).

***PSEUDONAPOMYZA* Hendel**

This genus may be divided into two distinct groups, both of which are well represented in the Afrotropical Region, where 19 species have been recorded. The first group has the third antennal segment angulate (figs. 76, 85) and in the wing the outer cross-vein is lacking, there thus being no complete discal cell; hosts are exclusively in the Poaceae. In the second group the third antennal segment is round and the discal cell is present but small, with the outer cross-vein close to the inner; hosts here are in the Acanthaceae. An important generic character in the larva and puparium is the presence (normally) of a band of spinules around each segment.

Fifty species have hitherto been known throughout the world, but none have been recorded in Kenya. Only 8 species are known in Europe and 2 in North America. The genus is well represented in Australia where 8 endemic species have been recorded (Spencer 1977 c).

Six new species are now described below from Kenya and records are given of 3 further species, the most interesting being of *Ps. hispanica* in both Kenya and Tanzania (Mt. Kilimanjaro) which has previously only been known in the Mediterranean area. Five further undescribed species have been seen from Tanzania: Mt. Kilimanjaro (von Tschirnhaus).

It is thus apparent that the greatest proliferation of this genus has occurred in the Afrotropical Region. In addition to the many grass-feeding species at higher altitudes, it is certain that many further species await discovery with hosts in the Acanthaceae in lower, more tropical areas.

Species can be difficult or even impossible to identify on external characters but the male genitalia are highly distinctive (cf. figs. 74, 77, and Spencer 1973, 262–279). A tentative key to the 9 species now recorded in Kenya is given below but with some only known from single specimens and the range of variation unknown, it must be stressed that positive identification may only be possible from the male genitalia, in which the form is usually remarkably constant.

Key to Kenyan *Pseudonapomyza* species

- 1 Third antennal segment round; squamal fringe black *ruiruensis* sp. nov.
- Third antennal segment pointed or angulate at upper corner; squamal fringe silvery-white (darker only in *Ps. hispanica*) 2
- 2(1) Male genitalia distinctive, with distiphallus having short, paired tubules (fig. 78) *embui* sp. nov.
- Male genitalia not so 3
- 3(2) Squamal fringe at least partially darkened *hispanica* Spencer
- Squamal fringe silvery-white 4
- 4(3) Second costal section exceptionally short, little longer than length of fourth (fig. 89) 5
- Second costal section longer, at least $1\frac{1}{4}$ times length of fourth 6
- 5(4) Ocellar triangle not developed beyond ocellar plate, orbits not shining; male genitalia: distiphallus large, black, appearing entire, with slight projection at lower corner (fig. 90) *spinosa* Spencer
- Ocellar triangle large, this and orbits strongly shining; male genitalia: distiphallus with two ventral projections (fig. 83). *subspinosa* sp. nov.
- 6(5) Veins R2+3 and R4+5 pale; male genitalia as in fig. 86 *asiatica* Spencer
- Veins R2+3 and R4+5 black 7
- 7(6) Frons ochrous above, darker, blackish below; male genitalia: aedeagus as in figs. 79, 80 *gilletti* sp. nov.
- Frons uniformly dark brown or black 8
- 8(7) Third antennal segment finely pointed at upper corner; male genitalia: distiphallus appearing largely solid, with paired membranous extensions distally (fig. 75) *embuensis* sp. nov.
- Third antennal segment with extended angular projection; male genitalia: distiphallus divided (fig. 81) *similis* sp. nov.

***Pseudonapomyza embuensis* sp. nov.**

(Figs. 74, 75)

Closely resembling *Ps. spinosa* but wing with second costal section longer, $1\frac{1}{4}$ times length of fourth; frons uniformly black, ocellar triangle and orbits weakly shining; third antennal segment only finely pointed at upper corner; wing length in male 1.6 mm; male genitalia: distiphallus large, black (fig. 74), with conspicuous paired projections centrally (fig. 75).

HOLOTYPE ♂, Kenya: Embu, Yoder's Farm, 9.xii.83 (K.A.S.) (NMK).

***Pseudonapomyza embui* sp. nov.**

(Figs. 76–78)

Unique holotype in poor condition, accurate description not possible.

Head: Frons approx. equal to width of eye; third antennal segment with distinct projection at upper corner (fig. 76).

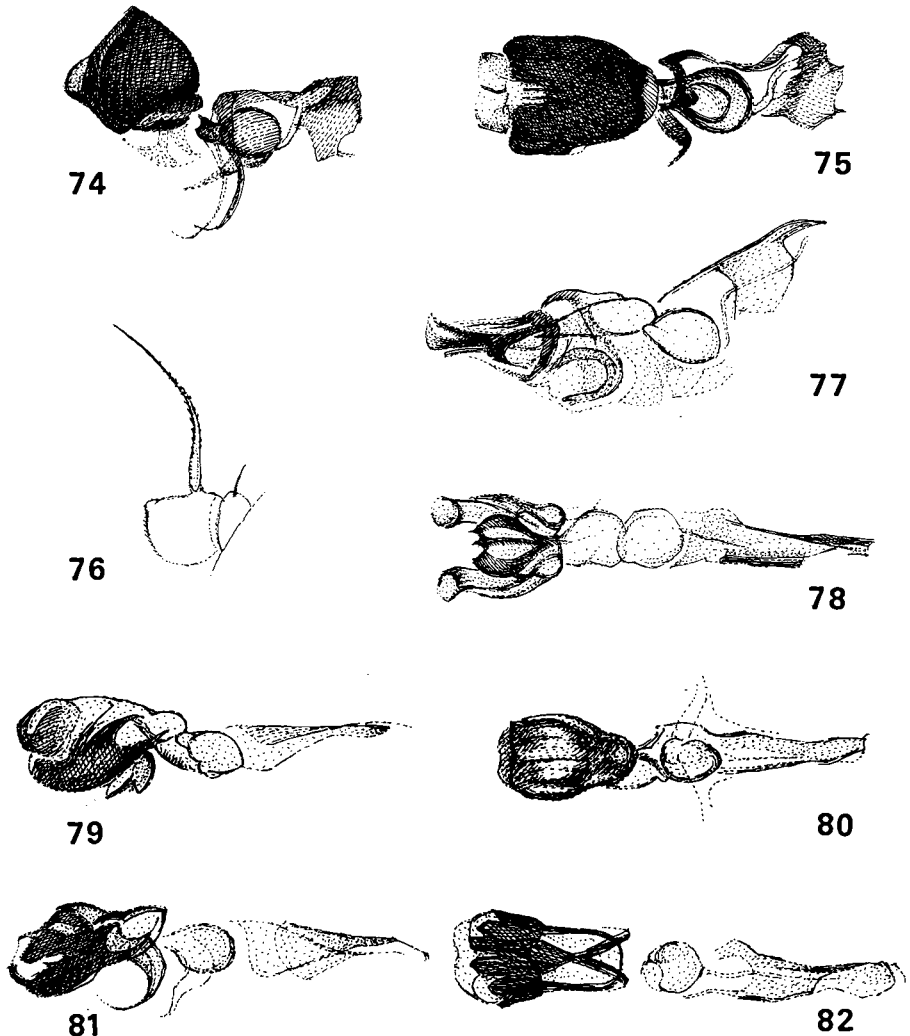
Mesonotum: Black, somewhat mat; acr in 4 rows.

Wing: Length in male 1.4 mm (costal sections not detectable).

Male genitalia: Aedeagus (figs. 77, 78) with distiphallus having 2 short, discrete tubules.

HOLOTYPE ♂, Kenya: Embu, Yoder's Farm, 9.xii.83 (K.A.S.) (NMK).

Remarks: Although the only available specimen is in such poor condition, with the distinctive form of the third antennal segment and the unique form of the male genitalia, formal description is justified.



FIGS. 74–82. 74, 75, *Pseudonapomyza embuensis*: 74, aedeagus, side view; 75, same, ventral view. 76–78, *P. embui*: 76, third antennal segment; 77, aedeagus, side view; 78, same, ventral view. 79, 80, *P. gilletti*: 79, aedeagus, side view; 80, same, ventral view. 81, 82, *P. similis*: 81, aedeagus, side view; 82, same, dorsal view.

***Pseudonapomyza gilletti* sp. nov.**

(Figs. 79, 80)

Closely resembling *Ps. asiatica*, with following essential characters: Frons ochrous above, black below; ocellar triangle not developed beyond ocellar plate; 3 a.s. conspicuously angulate; mesonotum distinctly greyish-black, largely mat but with some subshine; acr in 4 irregular rows; wing length 1.25–1.3 mm in male, costal sections 2, 3, 4 in ratio 16:7:12 (holotype), 14:7:10 (paratype); squamae and fringe silvery-white; male genitalia: aedeagus as in figs. 79, 80.

HOLOTYPE ♂, Kenya: Nairobi, Kilimani, beside stream, 19.iv.83 (K.A.S.) (NMK).

PARATYPE ♂, same data (BMNH).

Remarks: I have pleasure in naming this species after the eminent botanist and specialist on African flora, Jan Gillett, whose hospitality I was enjoying when I caught these specimens.

***Pseudonapomyza ruiyuensis* sp. nov.**

Head: Orbits with 2 strong, equal ors, 2 weak ori; orbital setulae sparse, reclinate; ocellar triangle scarcely developed beyond ocellar plate; frons apparently narrow (exact width not detectable, as head shrunk); jowls narrow, $\frac{1}{6}$ height of eye, this large, upright; 3 a.s. round, largely bare; arista long, equal to height of eye, slightly pubescent.

Mesonotum: 3 strong dc, 3rd $\frac{3}{4}$ length of 2nd; acr numerous, in about 10 rows.

Wing: Length in female 2.5 mm; second costal section long, 4 times length of fourth, vein R2+3 sinuous, outer cross-vein lacking.

Colour: Black, orbits weakly shining; mesonotum shining black; side of thorax predominantly black but notopleural triangle distinctly brown; wing with veins pale brown, base yellowish; legs black, abdomen brilliantly shining black; squamae whitish-grey, fringe black.

HOLOTYPE ♀, Kenya: Ruiru, Coffee Research Institute, 11.x.71 (K.A.S.) (BMNH).

Remarks: Although only a female is available, this species is sufficiently distinctive to justify formal description. With the round third antennal segment and lack of the inner cross-vein, the only comparable species is *Ps. lucentis* Spencer, 1959 from the Cape Verde Islands. However, the two are readily distinguishable by the differing wing venation, with the second costal section short in *Ps. lucentis*, only twice the length of the fourth, as against 4 times in *Ps. ruiyuensis*. The holotype of *Ps. lucentis* in the University Museum, Helsinki, Finland, is a male and it will be of great interest to compare the genitalia of this species with a male of *ruiyuensis* when this can be found.

***Pseudonapomyza similis* sp. nov.**

(Figs. 81, 82)

Resembling *Ps. gilletti* in the conspicuously angulate third antennal segment but frons uniformly dark brown; wing length in male 1.4 mm, second costal section $1\frac{1}{3}$ times length of penultimate; male genitalia (figs. 81, 82): distiphallus distinctly divided, with prominent, curving ventral sclerite at rear.

HOLOTYPE ♂, Kenya: Nairobi, Kilimani, beside stream, 19.iv.83 (K.A.S.) (NMK).

PARATYPE ♂, Tanzania, Mt. Kilimanjaro, 28.ii.71, above Mandava Hut (von Tschirnhaus, x.366) (coll. von Tschirnhaus).

***Pseudonapomyza subspinosa* sp. nov.**

(Figs. 83, 84)

Closely resembling *Ps. spinosa*, with similar wing venation, but distinguishable by the large, shining ocellar triangle and the shining black orbits; mesonotum moderately shining black. Male genitalia: distiphallus large, black, with 2 ventral projections (fig. 83) and distinctly divided (fig. 84); 2 pale, broad sclerites between distiphallus and mesophallus.

HOLOTYPE ♂, Kenya: Embu, Yoder's Farm, 9.xii.83 (K.A.S.) (NMK).

*Species new to Kenya****Pseudonapomyza asiatica* Spencer, 1961 b**
(Figs. 85, 86)

This species was described from Singapore and has since been found to occur widely in the Oriental Region, and in the Afrotropical Region it has been recorded in Ethiopia, Cape Verde Is. and Zululand. Two specimens can now be recorded from Kenya: 1 ♂, Nairobi, Limuru Road, 11.iv.83; 1 ♀, Karen, W. Nairobi, 12.xii.83 (both K.A.S.). A specimen has also been seen from Tanzania: Mt. Kilimanjaro (von Tschirnhaus).

Ps. asiatica is distinguishable from *Ps. spicata* (Malloch) (cf. Spencer 1973) and *Ps. spinosa* Spencer, 1973 by the more blunt angle on the third antennal segment (fig. 85) and the mat greyish mesonotum, which is more shining black in the other two species. The male genitalia are shown in fig. 86. *Ps. spicata* is considered as a pest on *Zea mays* (corn, maize) and young sugar seedlings; in Africa it has not hitherto been known south of Egypt and Sudan.

***Pseudonapomyza hispanica* Spencer, 1973**
(Figs. 87, 88)

This species was described from Spain and Israel. The male holotype was from the coastal area south of Barcelona and two paratypes were from mountain areas further south, including one from 1200 m in the Sierra Nevada; a single male was seen from Israel.

A male and a second specimen (sex doubtful owing to damaged abdomen) were collected at the Thika Sports Club, 14.iv.83 (K.A.S.) and the genitalia of this male are shown in figs. 87, 88. While the essential structure agrees with that of the holotype (Spencer 1973, figs. 410, 411), there is some difference in detail. However, re-examination of the holotype shows that the genitalia, in the view now examined, are very close indeed to that of the Kenyan specimen. I also have 1 ♀ from Karen, W. Nairobi, 13.xii.83. Von Tschirnhaus has collected this species in Tanzania: Mt. Kilimanjaro.

A character not noted in the type series is that the squamal margin and fringe are distinctly darkened, not silvery-white as in other species in this group.

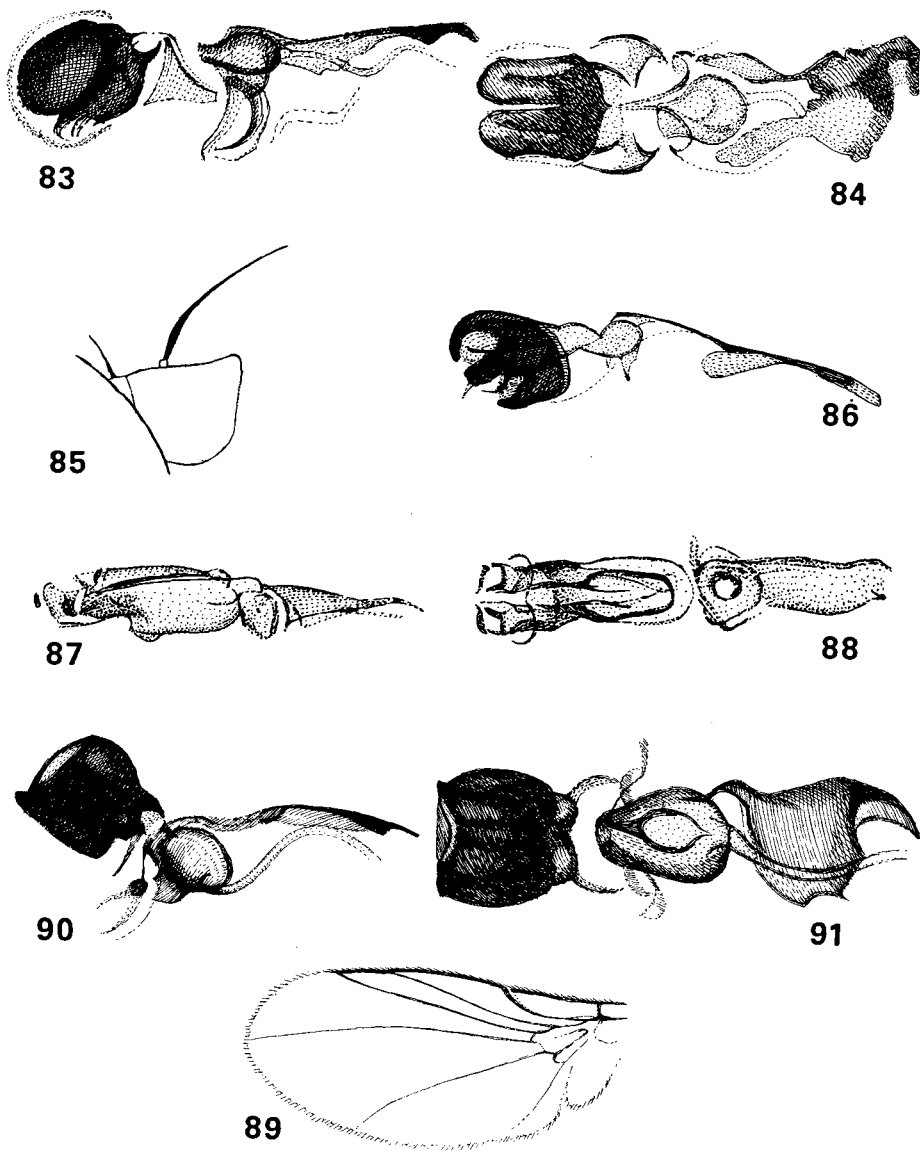
The present known distribution of this species indicates that it has reached East Africa from the Mediterranean area via the Ethiopian Highlands where it is almost certainly present.

***Pseudonapomyza spinosa* Spencer, 1973**
(Figs. 89–91)

A distinctive character in this species in the wing venation is the exceptionally short second costal section, which is normally little longer than the fourth (fig. 89). In the male genitalia the distiphallus is uniformly heavily sclerotized, with a small projection at the lower front corner, distinguishing it from all other species (figs. 90, 91).

Ps. spinosa is widespread in Africa from Egypt to South Africa. It is also present in India, Micronesia and northern Australia. The larva feeds on a number of wild grasses and also on cultivated cereals, with records from barley and oats.

The species can now be recorded for the first time in Kenya at Karen, W. of Nairobi, 2 ♂, 4 ♀, 11–13.xii.83 (K.A.S.). I have also recently seen a male from Tanzania: Mt. Kilimanjaro (coll. M. von Tschirnhaus).



FIGS. 83-91. 83, 84, *Pseudonapomyza subspinoso*: 83, aedeagus, side view; 84, same, ventral view. 85, 86, *P. asiatica*: 85, third antennal segment; 86, aedeagus, side view. 87, 88, *P. hispanica*: 87, aedeagus, side view; 88, same, ventral view. 89-91, *P. spinosa*: 89, wing; 90, aedeagus, side view; 91, same, ventral view.

NAPOMYZA Westwood

Originally this genus was confined to species which are generally similar to *Phytomyza* but having a complete discal cell, with the outer cross-vein close to the inner (fig. 92). Four species have hitherto been known in Africa fitting this definition of the genus, from Tanzania, Lesotho and South Africa (Cogan 1980, 645).

More recent studies have shown that a widespread group of species lacking the outer cross-vein and which thus externally resemble typical *Phytomyza* species correctly belong in *Napomyza*. Two species in this group can now be recorded in the Afrotropical Region—*N. eximia* (Spencer 1964 a), comb. nov. from South Africa, and a new species described below from the Aberdares, Kenya.

N. subeximia sp. nov. is considered to be sufficiently distinct from *N. eximia* to justify treating it as a new species. A further species in this group, *N. ranunculella* Spencer (1974), is known from Israel. The differentiation of these three very similar and obviously closely-related species is a striking example of speciation which has occurred in three now widely separated populations.

***Napomyza subeximia* sp. nov.**

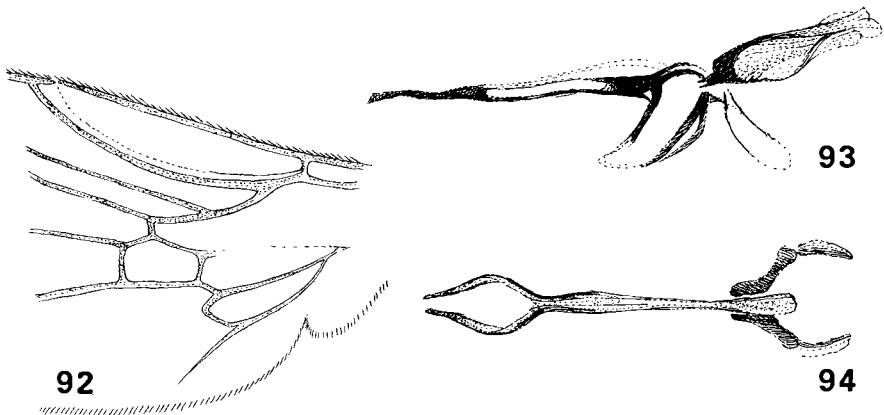
(Figs. 93, 94)

Head: Frons twice width of eye, slightly projecting above eye in profile; 2 equal reclinate ors (1 additional bristle on one side in holotype), 1 inclined ori; orbital setulae sparse, proclinate; jowls broad, slightly more than $\frac{1}{3}$ height of eye, this virtually round; 3 a.s. quadrate, with a fringe of only short hairs, arista only slightly pubescent.

Mesonotum: 3 + 1 strong dc, acr sparse, in 2 rows.

Wing: Length in male 2.1–2.25 mm, costal sections 2, 3, 4 in ratio 38:9:16.

Colour: Frons, jowls and face bright yellow; first antennal segment yellow, second and third black; palps black; mesonotum and scutellum uniformly brownish-grey; side of thorax grey, with mesopleura having narrow yellow upper margin; legs: fore-coxae yellow, others black; femora black with yellow knees, tibiae and tarsi black; abdomen largely black but all tergites narrowly yellow on hind-margins and tergites 1 and 2 narrowly yellow laterally; squamae yellowish-grey, fringe black.



FIGS. 92–94. 92, *Napomyza* sp.: wing, showing complete discal cell. 93, 94, *N. subeximia*: 93, aedeagus, side view; 94, distiphallus, ventral view.

Male genitalia: Aedeagus (figs. 93, 94) with distiphallus elongate, forked distally, the two tubules closely approximate at end; 2 pairs of ventral sclerites, those behind slender and forming a complete loop, the front pair stouter, more strongly sclerotized; sperm pump with broad, slightly asymmetrical blade.

HOLOTYPE ♂, Kenya, Kerita Forest, southern Aberdares, c. 8000 ft, at roadside with stream, sweeping *Ranunculus multifidus* (NMK). PARATYPE, 1 ♂: same data (BMNH).

Remarks: It is now clear from the male genitalia that this species feeds internally either in the stem or receptacle of *Ranunculus*. It closely resembles both *N. eximia* (Spencer 1964 a) from South Africa (host previously unknown but *Ranunculus* was growing at the type locality near Pietermaritzburg) and *N. ranunculella* Spencer (1974) from Israel which was reared from the stem and receptacle of *Ranunculus* sp. This new species differs from *eximia* by the darker, black second antennal segment and the brownish-grey rather than ash-grey mesonotum; and in the aedeagus by the less diverging distal tubules of the distiphallus (contrast *eximia*, Spencer 1964 a, fig. 40). *N. ranunculella* is substantially larger, with wing length of 2.8–3.1 mm and the aedeagus is even more differentiated (*cf.* Spencer 1974, fig. 12).

PHYTOMYZA Fallén

This is the largest agromyzid genus, with over 450 described species. It is present in all faunal regions but is essentially north-temperate, with the largest number of species present in Europe and North America. In the tropics species are restricted to relatively high altitudes and few have reached the southern hemisphere. Six are known in New Zealand, nine in Australia and one in Sri Lanka. Only 14 species have hitherto been known in the Afrotropical Region, of which five have been recorded in South Africa.

Of the 18 species listed in the Afrotropical Catalogue (Cogan 1980, 646), *atricornis* is a name now discarded following revisionary work by Griffiths (1967) and is replaced by *horticola* Goureau and *syngenesiae* Hardy (the latter not present in Africa). These two species and *seneciovora* Spencer (1960 a) are now included in *Chromatomyia* (see below). *P. vitalbae* Kalt., a common European species feeding on *Clematis*, was misidentified by Hering (1957) in South Africa; subsequent examination showed it to be distinct and it was described as *varii* Spencer (1964 a).

Only a single species, *P. clematidella* Spencer (1959) has hitherto been known in Kenya. Five further species can now be recorded, of which one is described below.

Larvae feed primarily as leaf miners but a number feed in stems or seeds. There is a high degree of host specificity, particularly at the generic or family level and a wide range of families are attacked, including grasses and ferns. Hosts are known of 9 of the 14 African species and all are in the Ranunculaceae. This is a preferred host family throughout the world, second only to the Asteraceae, most species occurring on *Clematis* or *Ranunculus*. Among African species five are known to feed on *Clematis*, 4 on *Ranunculus* and 1 on *Knowltonia*.

In view of the difficulty of separating *Chromatomyia* from *Phytomyza* species on external characters, a composite key to those two genera, and including also one *Napomyza* species now known in Kenya which lacks the outer cross-vein, is given below.

Key to East African *Phytomyza*, *Napomyza* and *Chromatomyia* species

(Note. *P. clematidella* is included in both halves of the key at couplets 10 and 13, as the colour of the scutellum in the unique holotype is not visible owing to the way it is pinned).

- | | | |
|--------|--|---|
| 1 | Scutellum dark, grey or black | 2 |
| — | Scutellum partially yellow, at least centrally | 11 |
| 2(1) | Acrostichals lacking | 3 |
| — | Acrostichals present, at least in 2 rows | 5 |
| 3(2) | Frons dark, brownish-black | <i>Chromatomyia subnigra</i> sp. nov. |
| — | Frons yellow | 4 |
| 4(3) | Second costal section short, about twice length of fourth | |
| — | Second costal section long, over 3 times length of fourth | |
| | | <i>Chromatomyia horticola</i> (Goureau) |
| | | <i>Chromatomyia seneciophila</i> sp. nov. |
| 5(2) | All coxae black | 6 |
| — | At least fore-coxae yellow | 8 |
| 6(5) | Frons black | <i>Chromatomyia nigrissima</i> sp. nov. |
| — | Frons yellow | 7 |
| 7(6) | Large species, wing length 2.5–2.75 mm; in female third antennal segment enlarged, with long pubescence (fig. 102) | <i>Chromatomyia elgonensis</i> sp. nov. |
| — | Smaller species, wing length 2.25 mm; third antennal segment with short, normal pubescence in both sexes | <i>Chromatomyia seneciovora</i> (Spencer) |
| 8(5) | Two equal ors | 9 |
| — | Upper ors distinctly weaker than lower | <i>Phytomyza clematidis</i> Spencer |
| 9(8) | Femora black, yellow only at knees | <i>Napomyza subeximia</i> sp. nov. |
| — | Femora predominantly yellow | 10 |
| 10(9) | Palps and second antennal segment black | <i>Phytomyza clematidella</i> Spencer |
| — | Palps and second antennal segment yellow | <i>Phytomyza renovata</i> Spencer |
| 11(1) | Mesonotum largely yellow | <i>Phytomyza natalensis</i> Spencer |
| — | Mesonotum dark, at most with faint yellow bands | 12 |
| 12(11) | Mesonotum greyish-black, with faint yellow bands | <i>Phytomyza philoclematidis</i> Hering |
| — | Mesonotum uniformly dark | 13 |
| 13(12) | Mesonotum mat grey | <i>Phytomyza clematidella</i> Spencer |
| — | Mesonotum brownish-grey | <i>Phytomyza multifidi</i> sp. nov. |

***Phytomyza clematidella* Spencer, 1959**

(Fig. 95)

This species was described from a single specimen (?sex, abdomen missing) bred 'ex galls *Clematis*' by Van Someren in 1938 at the Ngong Hills, Kenya.

No gall-causers have previously been known on *Clematis*. Several species are known to feed internally in the stem and whether this species is a true gall-causer or merely feeds in the stem where a swelling might be expected at the pupation site remains to be established. The unusually long anterior spiracles drawn from a fragment of the pupal case mounted with holotype (BMNH) are shown in fig. 95.

***Phytomyza multifidi* sp. nov.**

(Figs. 96)

Head: Frons broad, twice width of eye; 2 ors, the upper weak, hair-like, 1 strong ori, similar to lower ors; orbital setulae sparse; jowls broad, almost one-third height of eye; 3 a.s. rounded, slightly longer than broad, with a fringe of short black hairs, arista broad in lower half, distinctly pubescent.

Mesonotum: 3 + 1 long dc, presutural similar to 3rd; acr in 2 rows, sparse, with only 3 pairs present.

Wing: Length in male 2 mm, costal sections 2, 3, 4 in ratio 4:1.1:1.2.

Colour: Frons, orbits and jowls yellowish-orange, face similar but black in lateral depressions; palps black; mesonotum uniformly brownish-black, mat, scutellum largely similar but faintly yellow centrally, more distinctly so at rear; side of thorax yellow above, including humerus, notopleural area and upper third of mesopleura; legs: coxae yellow, femora basically yellow but darkened with irregular greyish striations, tibiae and tarsi black.

Male genitalia: Aedeagus (fig. 96) with elongate basal sclerites, at ends a symmetrical pair of bowl-shaped processes, and a pair of strongly-sclerotized ventral sclerites; a pair of short, linear sclerites lying at base of distiphallus, this forming one strongly sclerotized, somewhat irregular outer coil, then dividing into 2 further entirely membranous coils.

Leaf-mine: White, linear, not greatly widening, except at end immediately before the conspicuous exit slit; frass in irregular black strips or smaller grains.

Puparium: Elongate, greyish-yellow, posterior spiracles on prominent projections, each with an irregular ellipse of 12–15 raised pores.

HOLOTYPE ♂, Kenya: Kerita Forest at southern edge of Aberdares, emerged 15.i.84 ex leaf-mine on *Ranunculus multifidus*, coll. 17.xii.83 (K.A.S.) (NMK).

Remarks: In the author's key (1964 a) to African *Phytomyza* species *P. multifidi* runs to couplet 16, which includes two South African species, *philoclematidis* Hering (1957) bred from *Clematis brachiata* at Pretoria and *vitalbella* Hering (1957) from the same host in Natal. *P. vitalbella* was subsequently found at Addis Ababa, Ethiopia on *C. simensis*. However, *P. multifidi* differs from these two species which have the femora entirely bright yellow, the second antennal segment partially yellowish and, in *philoclematidis*, there is a trace of yellow banding on the mesonotum. The aedeagus of *P. multifidi*, with the coiled distiphallus, is of a form present in a number of species feeding on *Ranunculus* and is quite distinct from that of the two South African species (cf. Spencer 1964 a, figs. 45 and 48). It is closely related to the common Palearctic species, *P. ranunculi* (Schrank).

Leaf-mines which are generally similar to those of *P. multifidi* were found on the same host at Kapsabet, Western Highlands, 17.x.71. Similar puparia were also obtained but unfortunately no adults were reared. Two species were caught on the plants, *P. natalensis* and *P. renovata* (see below) and it is believed that these mines are referable to *P. natalensis*. However, the possibility that *P. multifidi* may also be present in the Western Highlands cannot be excluded.

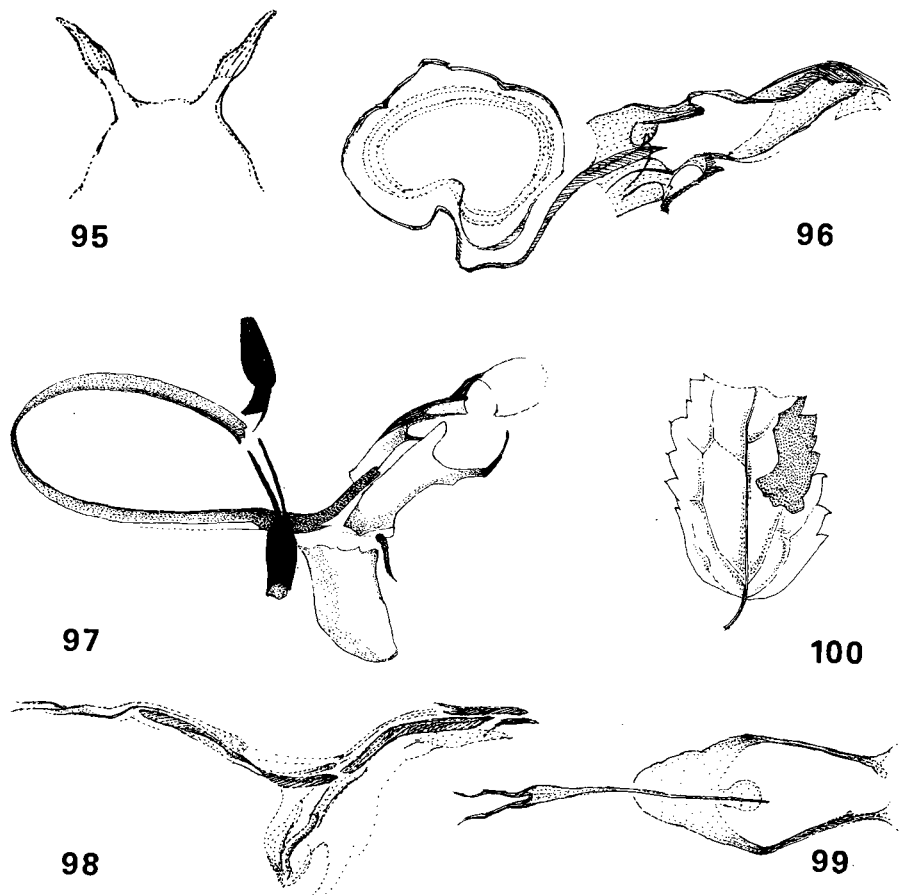
***Phytomyza natalensis* Spencer, stat. nov.**

(Fig. 97)

Phytomyza ranunculina ssp. *natalensis*, Spencer, 1964 a, 37. HOLOTYPE ♂, South Africa: Pietermaritzburg (BMNH).

Phytomyza ranunculina Spencer (1963) was described from Addis Ababa, Ethiopia, reared from leaf mines on *Ranunculus multifidus* Forsk. Specimens from Pietermaritzburg were at that time considered as paratypes but later (Spencer 1964 a, 37) were treated as a distinct sub-species, *natalensis*, in view of colour differences and slight differences in the male genitalia.

A single male was caught at Kapsabet, 17.x.71 on *Ranunculus multifidus* which agrees exactly with *natalensis*, both in colour and in the genitalia, and it is now considered justified to treat this as a distinct species. The aedeagus of *P. natalensis* is



FIGS. 95–100. 95, *Phytomyza clematidella* (holotype): anterior spiracles of puparium. 96, *P. multifidi*: aedeagus. 97, *P. natalensis*: aedeagus. 98, 99, *P. renovata*: 98, aedeagus, side view; 99, same, ventral view (Kapsabet). 100, *P. clematissi*: leaf mine on *Clematis simensis*, Addis Ababa.

shown in fig. 97 (originally ascribed to *P. ranunculina*, cf. Spencer 1963, fig. 30). The aedeagus of *P. ranunculina* was shown in Spencer 1964 a, fig. 42. In *P. natalensis* the distal processes of the aedeagus are on two stalks which are equal in length to the black distal process itself, while in *P. ranunculina* the distal processes are solid throughout, linked directly to the long curving distal tubules of the aedeagus. The two species are also readily distinguishable by the colour of the mesonotum, which is uniformly yellow and without acrostichals in *natalensis* but with distinct grey bands in *ranunculina*, particularly between the lines of the dorso-centrals, and a few acrostichals are also invariably present. In both species the scutellum is yellow.

Numerous narrow linear mines were present on the plants on which the single specimen was caught at Kapsabet and four puparia were obtained but no adults reared. The puparium is greyish, with the posterior spiracles on prominent projections (though

shorter than in *P. ranunculina*), each with an open ellipse of about 10 pores. It is believed that these mines are referable to *P. natalensis*.

The distribution of *P. ranunculina* is thus restricted to the Ethiopian Highlands, while *P. natalensis* is present both in South Africa and the Kenya Highlands.

***Phytomyza renovata* Spencer, 1960 a**

(Figs. 98, 99)

In addition to the female holotype from Pretoria (head and wing illustrated by Spencer (1960 a, figs. 29, 30), the only other specimen hitherto known has been a male I caught at Pietermaritzburg in 1961. The male genitalia of this specimen were illustrated by Spencer (1963, figs. 31 a; b) and the genitalia of a specimen from Kenya is now shown here (figs. 98, 99).

Ten males and four females were caught at Kapsabet, Western Highlands, 17 and 18.x.71 (K.A.S.) on *Ranunculus multifidus*. It seems virtually certain that this species feeds internally in *Ranunculus*.

***Phytomyza* sp. 1**

(Fig. 100)

Kenya: Ngong Hills, empty blotch mines on *Clematis simensis*, 15.x.71 (K.A.S.).

These mines agree completely with that of *P. clematidis* Spencer (1964 a) described from Addis Ababa (fig. 100). It seems very probable that this is the species concerned.

A single female from the Western Highlands, Timboroa, 9000 ft, 19.x.71 (K.A.S.) probably represents *P. clematidis*. It has the large, round third antennal segment, the minute upper ors, the pale side of the thorax and the brownish-grey mesonotum. The only significant difference is the darkening of the orbits, which are blackish to the base of the ori, while they are completely yellow in *P. clematidis*.

Clarification of this blotch-miner on *Clematis* will only be possible as additional material becomes available.

***Phytomyza* sp. 2**

Kenya: Ngong, linear mines on *Clematis simensis*, 15.x.71 (K.A.S.).

P. philoclematidis Hering, 1957 was described from similar linear mines on *Clematis brachiata* at Pretoria and the species was subsequently recorded from Natal (Spencer 1965, 273). It seems very probable that the Kenyan species represents *philoclematidis* but a positive identification is not possible without adults and a comparison of the male genitalia with those of the holotype (Spencer 1963, fig. 29).

***Chromatomyia* Hardy**

Griffiths (1967) revised this group of species and split the widely recorded 'species' *Phytomyza atricornis* into two species, *P. horticola* Goureaux and *P. syngenesiae* (Hardy), with a partially overlapping but largely distinct distribution. The name *atricornis* was discarded as a *nomen dubium*. Later, Griffiths (1974) revived Hardy's generic name *Chromatomyia* on the basis of the distinctive genitalia and form of pupation and 85 species are now accepted in this genus. The majority occur in the Palaearctic and Nearctic Regions, with one endemic species in South America. In Africa only the common *C. horticola* and *C. seneciovora* (Spencer 1959) described from Cameroun on *Senecio mannii* have previously been referable to this genus. Four new

species are described below—one from the Aberdares on *Dendrosenecio battescombei*, two from Mt. Kenya related to the common holarctic grass-feeder, *C. nigra* (Meigen), and one from Mt. Elgon. In addition it has been discovered that *C. seneciiovora* is present on the Ruwenzori in Uganda on *Helichrysum odoratissimum*. This species was also recorded on *Senecio* sp. on Mt. Meru, Tanzania (Spencer 1960 b, 324), but this material is now tentatively referred to *C. seneciophila* sp. nov.

Two females from the Aberdares cannot be positively identified but almost certainly represent two further grass-feeders (see *C. subnigra* below).

Examination of the genitalia of a male paratype has shown that *Phytomyza anonera* Séguy belongs in *Chromatomyia*.

***Chromatomyia anonera* (Séguy, 1951), comb. nov.**

(Fig. 101)

Phytomyza anonera Séguy 1951, 312. HOLOTYPE ♀, Madagascar: Tsimbazaza (Museum d'Histoire Naturelle, Paris).

A male paratype has now been examined and the genitalia are shown in fig. 101. The long, slightly diverging supporting sclerites are directed dorsally and the minute ejaculatory duct lies between two small sclerites below; there is a further pair of small sclerites beyond the distal end of the asymmetrical basal sclerites. The sperm pump is of medium size, with the blade almost completely unpigmented.

The type series was bred from leaf mines on *Vernonia appendiculata* Less, and, although no indication was given in the original description, I suspect that the species pupates in the mines, as with the great majority of species in this genus. A single female has been identified from Addis Ababa and the species is probably widespread in Africa, though apparently uncommon, and it can be expected to occur in Kenya.

***Chromatomyia elgonensis* sp. nov.**

(Figs. 102–104)

Head: Frons broad, twice width of eye, 2 strong, equal, reclinate ors, 1 similar inclined ori; orbital setulae minute, sparse, proclinate; eye virtually bare; 3 a.s. small, round, bare in male, enlarged, with conspicuously long pubescence in female (fig. 102).

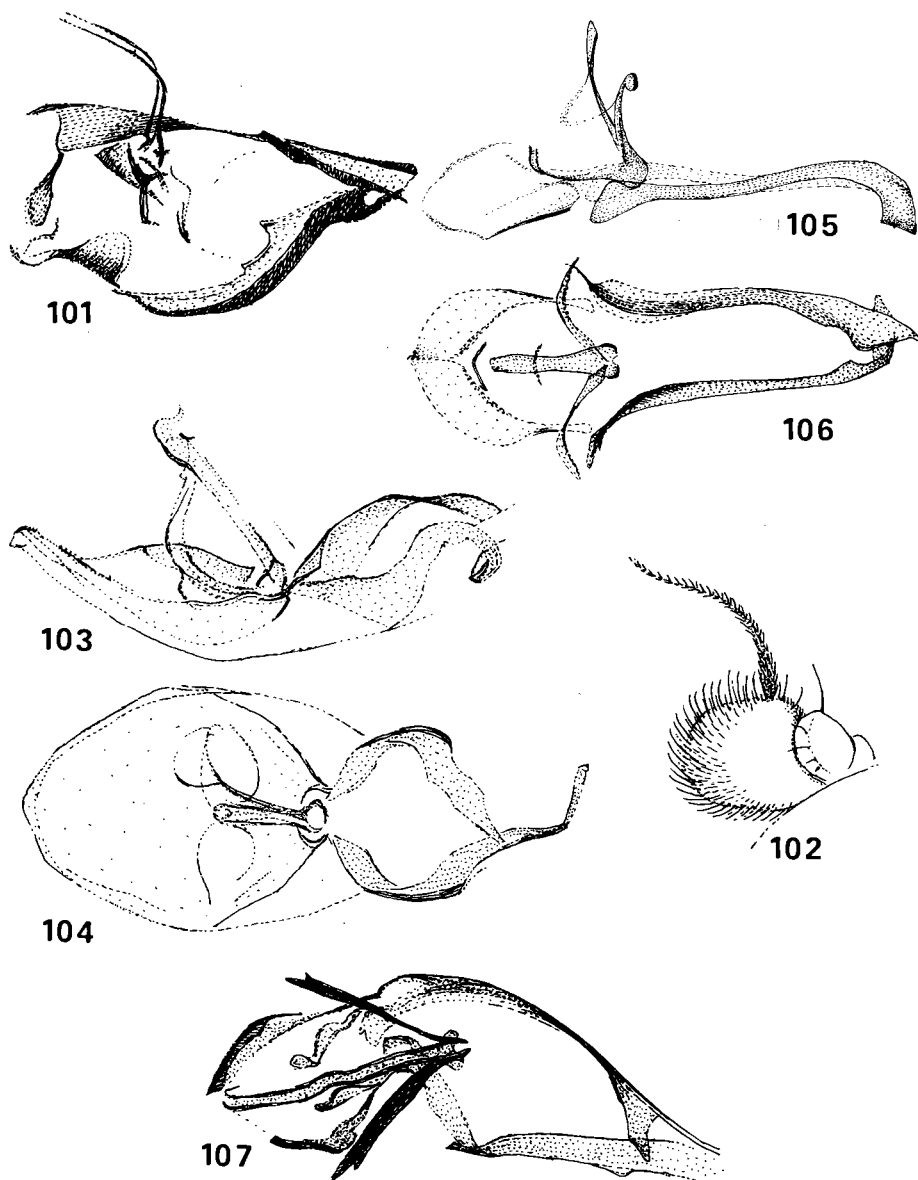
Mesonotum: 3 + 1 strong dc, presutural similar to 3rd, acr in 2 rows, relatively long, with 4–5 pairs.

Wing: Length from 2.5 mm in male to 2.75 mm in female; second costal section long, 3 times length of fourth.

Colour: Frons and orbits bright yellow, hind-margin of eye black to base of inner vertical; face black centrally, antennae and palps black; mesonotum mat, blackish-grey; legs black apart from femora which are distally bright yellow for slightly more than their width; wing base bright yellow, squamae yellowish, fringe black.

Male genitalia: Aedeagus with well sclerotized, asymmetrical basal sclerites, remainder pale, very lightly pigmented; dorsal sclerites narrow, largely fused, slightly diverging distally (fig. 104); paired medial lobes broad, projecting horizontally far beyond distiphallus, this small, curving dorsally (fig. 103); sperm pump with large, pale blade, almost as wide as long; surstyli fully fused with epandrium.

HOLOTYPE ♂, Kenya: Mt. Elgon, 10,000 ft, 1°04'N, 34°41', 26.i.72 (C. F. Huggins) (BMNH). PARATYPE ♀, same data (BMNH).



FIGS. 101–107. 101, *Chromatomyia anonera*: aedeagus (paratype, Madagascar). 102–104, *C. elgonensis*: 102, third antennal segment of female; 103, aedeagus, side view; 104, same, dorsal view. 105, 106, *C. horticola*: 105, aedeagus, side view; 106, same, dorsal view. 107, *C. nigrissima*: aedeagus, dorsal view.

Remarks: The sexual dimorphism in this species, with the enlarged, pubescent third antennal segment in the female, is unique among African species but comparable dimorphism is known in *C. lactuca* (Frost), a not uncommon species in North America (cf. Spencer 1981, figs. 628, 629). However, the male genitalia show that these two species are not closely related. The host of this new species is almost certainly in the Asteraceae.

***Chromatomyia horticola* (Goureau, 1851)**

(Figs. 105, 106)

Widespread in Kenya in temperate areas and locally common in South Africa, particularly in Cape Town area. Recorded host genera in Africa are *Bidens*, *Dahlia*, *Erigeron*, *Galinsoga*, *Petunia*, *Pisum*, *Solanum* and *Sonchus*. *C. horticola* is widespread in most of Europe, particularly in the Mediterranean area. Its natural range extends eastwards to much of Asia and it can be a pest of some significance on peas in India.

Although *C. horticola* superficially resembles *C. seneciophila* sp. nov. and *C. seneciovora*, it is readily distinguishable by the complete absence of acrostichals and short second costal section. The male genitalia are shown in figs. 105, 106. It will be seen that although the aedeagus is of the same general form as in the two *Senecio*-feeders it differs considerably in detail.

***Chromatomyia nigrissima* sp. nov.**

(Fig. 107)

Head: Frons almost twice width of eye, distinctly projecting above eye in profile, 2 equal ors, 2 ori, the upper similar to ors, the lower weak; orbital setulae sparse but long; lunule large, semicircular, upper margin at level of upper ori; jowls broad, at rear in ratio 6:15 with eye height; eye slanting, strongly pilose; 3 a.s. small, round, bare.

Mesonotum: 3+1 strong dc, acr sparse, irregularly in 2 rows.

Wing: Length from 2.6 mm in male to 3 mm in female; costal sections 2, 3, 4 in ratio 45:15:20 in male, 55:15:20 in female.

Colour: Frons largely black, more brownish on upper third; orbits and jowls brownish-black; all antennal segments and face black; mesonotum and side of thorax mat black with faint brownish tinge; scutellum more shining black; legs black, only fore-knees narrowly yellowish; squamae grey, fringe black; halteres whitish-yellow.

Male genitalia (fig. 107): Basal sclerites long, asymmetrical, the left one with conspicuous bend at distal third; two asymmetrical pairs of sclerites extending forwards from ends of basal sclerites; supporting sclerites strong, black, forked at end, diverging at 45°, arising from just above base of mesophallus, this strongly pigmented, slightly sinuous at midpoint, distiphallus very short; sperm pump minute; surstyli large, discrete, fully separated from epandrium.

HOLOTYPE ♂, Kenya: Mt. Kenya, N. side, Liki stream, 13,000 ft, 20–22.xii.1980 (P. S. Cranston) (BMNH). **PARATYPES** ♀, same data (BMNH).

PARATYPES ♀, same data (BMNH).

Remarks: This species is readily distinguishable from *C. subnigra* by the larger size, darker colour, the presence of two lower orbital bristles and sparse acrostichals. The pilose eyes, discrete surstyli and minute sperm pump are characters common to the two species. The male genitalia associate *C. nigrissima* with *C. subnigra* but the supporting sclerites are discrete throughout their length and the presence of two pairs of asymmetrical sclerites beyond the basal sclerites is distinctive.

The host is certainly in the Poaceae.

***Chromatomyia seneciophila* sp. nov.**

(Figs. 108–110)

Generally resembling *C. seneciovora*, with following essential characters:

Head: (Collapsed in both reared specimens, accurate description not possible); lunule in form of semicircle, upper margin at level of ori; frons, orbits, jowls and face

uniformly yellow; 3 a.s. small, round, black, only slightly pubescent; eye with short pilosity.

Mesonotum: Acr virtually lacking, in one specimen only a single hair detectable.

Wing: Length in male holotype 3.15 mm, costal sections 2, 3, 4 in ratio 67:10:18, with the second costal section thus very long, over $3\frac{1}{2}$ times the length of the fourth; wing base bright yellow, veins pale.

Legs: Coxae black, all femora broadly bright yellow at knees.

Male genitalia: Aedeagus, with dorsal sclerites large, broad but narrowing to fine point (fig. 109); medial lobe projecting horizontally beyond ends of basal sclerites, strongly sclerotized at margin, thus appearing U-shaped; distiphallus (fig. 108) extending dorsally as a relatively long, narrow tubule, ending before upper corner of supporting sclerites, paired sclerites at base of distiphallus strongly developed, a narrow connecting line of sclerotization just beyond midpoint of medial lobe; hypandrium with broad side-arms; sperm pump large, with blade strongly asymmetrical.

HOLOTYPE ♂, Kenya: Aberdares, Cave Falls, 10,000 ft, 18.x.71 ex leaf-mines coll. 14.x.71 on *Senecio battescombei* (K.A.S.) (BMNH). PARATYPE 1 ♂, same data (wings damaged) (BMNH).

Remarks: In *C. seneciovora*, which is known from Cameroun and the Ruwenzori in Uganda, the frons is similarly yellow but the legs are almost entirely black and the size is appreciably smaller, with wing length in the male of 2–2.5 mm. The male genitalia are entirely distinct, with greatly reduced supporting sclerites (*cf.* figs. 111, 112).

A specimen from Mt. Meru, Tanzania, 2500–2600 m. bred ex *Senecio* sp. was recorded as *Phytomyza seneciovora* by Spencer (1960 b, 324) and the genitalia were illustrated by Spencer (1965, figs. 81, 82). A new illustration in ventral view is given in fig. 110. This agrees essentially with that of the holotype of *seneciophila* but the supporting sclerites are less pigmented; these and the distiphallus were not properly seen in the earlier illustration. This appears to represent a further case of incipient speciation. Rather than treat the Mt. Meru population as distinct, it is proposed to refer it tentatively to *C. seneciophila* but the single available specimen in the Musée Royal de l'Afrique Centrale, Tervuren, Belgium is not considered as a paratype.

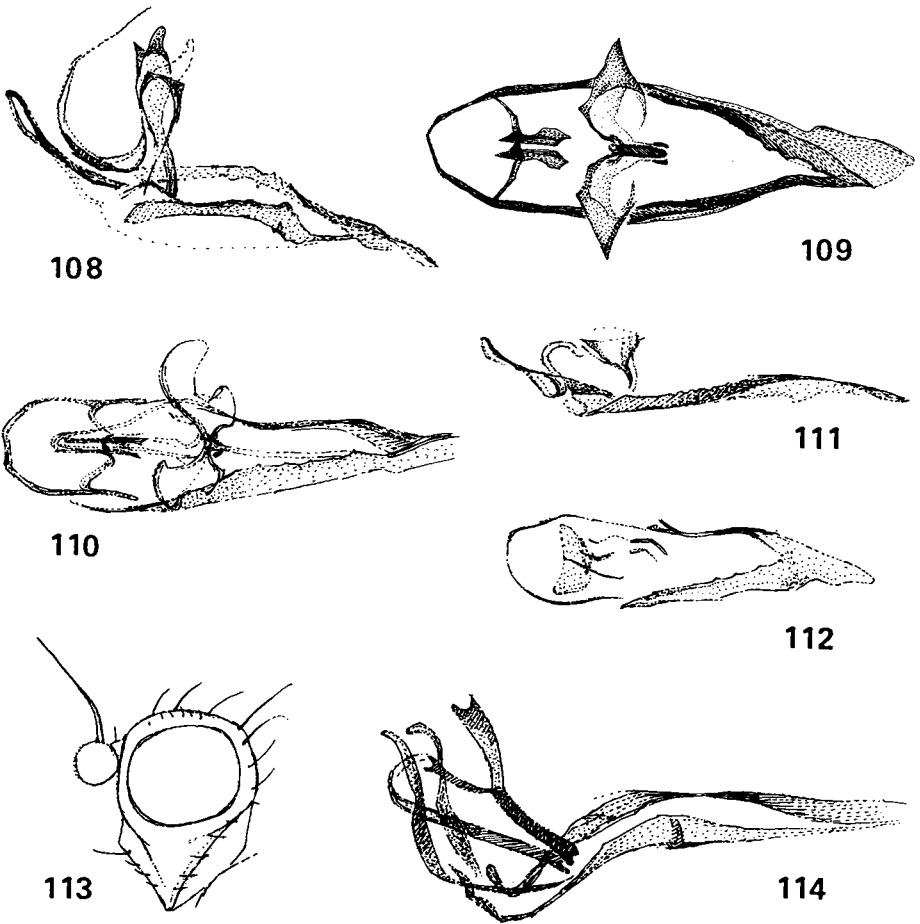
The paler frons and knees, the larger size and the longer second costal section distinguishes *C. seneciophila* from a grass-feeding species, of which a female was caught at the same locality. This cannot be positively identified.

***Chromatomyia seneciovora* (Spencer, 1959)**

(Figs. 111, 112)

This species from Cameroun was reared from linear mines on the tree-like ('baumartigen') *Senecio mannii* at an altitude of 2200 m, near the Mannesquelle Hut, Mt. Cameroun with the puparium remaining in the mine (De Meijere 1940, 184). It is clear from the male genitalia (Spencer 1961 b, fig. 24) that the species belongs in *Chromatomyia* and this combination was established by Griffiths (1974, 37).

Six specimens were caught on *Helichrysum odoratissimum* above Kilembe, c. 4000 ft, on the eastern edge of the Ruwenzori, Uganda, 26.x.71 (K.A.S.). Linear mines were present on the plants which it was believed were caused by these flies and three larvae were obtained which pupated externally but no adults emerged. After examination of the male genitalia it is clear that the species is a *Chromatomyia* and the larvae would thus pupate in the mines. The mines found therefore obviously belonged to another



FIGS. 108–114. 108–110, *Chromatomyia seneciophila*: 108, aedeagus, side view; 109, same dorsal view (Aberdares); 110, same, dorsal view (Mt. Meru). 111, 112, *C. seneciovora*: 111, aedeagus, side view; 112, same, dorsal view (Ruwenzori Mts.). 113, 114, *C. subnigra*: 113, head; 114, aedeagus, side view.

species, almost certainly a *Liriomyza*. *L. helichrysisivora* Spencer (1965) was reared from *Helichrysum nudifolium* at Pietermaritzburg, Natal, 29.i.64 and many empty mines were found at a nearby locality on *H. cooperi*. This or something closely related was therefore almost certainly the species concerned. Similar mines were found on the Aberdares, below Tuffa village, 14.x.71 on *Helichrysum foetidum* (K.A.S.).

The genitalia of the species from Kilembe are very similar to those of *P. seneciovora* from Cameroun. The supporting sclerites are short, weak and scarcely diverging, with a further weak pair, more widely diverging and projecting forwards (figs. 111, 112). De Meijere (1940, 1985), in addition to records of mines on *Senecio mannii*, also records mines at other nearby localities on Mt. Cameroun on *Helichrysum*, *Coreopsis monticola*, *Gynura* sp. and a 'large-leaved Inulee'. De Meijere refers to this 'widespread fly in Cameroun', which Hering tentatively placed near *Phytomyza affinis* Fall. It is of interest that *Helichrysum* is included among the hosts of *C. seneciovora* and this is

significant evidence supporting the probability that the species caught on *Helichrysum* in Uganda really was breeding on this host and is identical to that described from Cameroun.

Two further records of *C. seneciovora* have been given from Mt. Meru, Tanzania and from Addis Ababa, Ethiopia. That from Mt. Meru (Spencer 1965, figs. 81, 82) is now tentatively referred to *C. seneciophila* (see above), while the single female from Addis Ababa (Spencer 1961 b, 429) is considered as doubtful, as re-examination of the specimen shows the pubescence of the third antennal segment to be distinctly longer than on other specimens now seen.

The additional material seen from Uganda confirms that *C. seneciovora* is a high altitude, oligophagous feeder on Asteraceae.

***Chromatomyia subnigra* sp. nov.**

(Figs. 113, 114)

Head (fig. 113): Frons broad, almost twice width of eye, orbits broad, distinctly projecting above eye in profile; 2 equal, reclinate ors, 1 weaker, inclined ori, orbital setulae relatively long, proclinate; lunule high and narrow, upper margin at level of lower ors; jowls angular, exceptionally broad, almost equal to vertical height of eye, this small, round, with thick pilosity; 3 a.s. small, round.

Mesonotum: 3 + 1 strong dc, acr lacking.

Wing: Length in male 2.3 mm, costal sections 2, 3, 4 in ratio 39 : 15 : 18, second costal section thus little over twice length of fourth; length in female 2.5 mm.

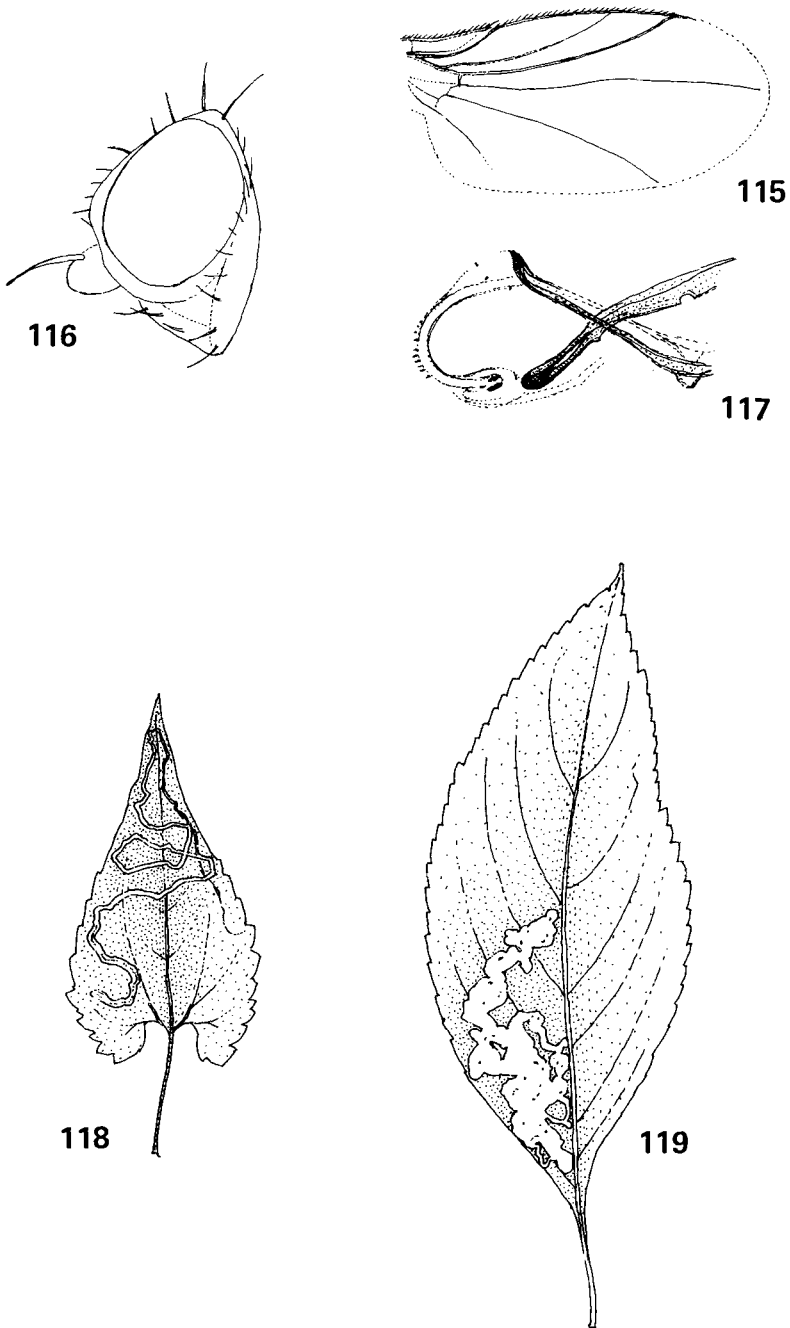
Colour: Frons dark-brown, orbits and lunule paler, yellowish; jowls yellowish-brown, face and all antennal segments black; mesonotum and scutellum uniformly mat grey; side of thorax blackish-grey, legs black, femora narrowly yellowish at knees, most distinctly so on fore-legs; squamae grey, fringe black; wing base and veins dark.

Male genitalia (fig. 114): Basal sclerites conspicuously sinuate, narrowing and curving dorsally at distal end; a pair of narrow secondary sclerites projecting beyond and above basal sclerites, the one on the left longer, beginning near distal third of left basal sclerite; supporting (dorsal) sclerites fully fused on lower half, then dividing and forked at apex; distiphallus strongly pigmented and straight basally, only curving dorsally for short length at end (contrast *C. nigriissima*, fig. 107); surstyli discrete, large; sperm pump minute, with blade linear.

HOLOTYPE ♂, Kenya: Mt. Kenya, N. side, 11,000–12,000 ft, 'heather, stream', 20–22.xii.80 (P. S. Cranston) (BMNH).

Remarks: The complex aedeagus clearly associates this species with *C. nigra*, a common European and North American grass-feeder. The unique feature in this complex is the presence of the pair of secondary sclerites between the end of the basal sclerites and the supporting sclerites above (cf. Spencer 1981, fig. 636). A further important external character in common between *C. nigra* and *C. subnigra* is the strong pilosity of the eyes. Griffiths (1980, 52) lists 49 genera of Poaceae on which *C. nigra* is known to feed. It is probable that *C. subnigra* on Mt. Kenya has a far more restricted host range, possibly even only a single graminaceous host.

Two females have been seen from the Aberdares which are almost certainly distinct from *C. subnigra* and distinct from each other, from Cave Falls, c. 10,000 ft., 14.x.71 and Kerita Forest, at roadside, c. 8000 ft., 17.xii.83 (both K.A.S., the first in BMNH, the second in NMK). Accurate diagnosis of these specimens is not possible without associated males which it is hoped can be obtained with further collecting.



FIGS. 115–119. 115–117, *Ptochomyza asparagivora*: 115, wing; 116, head; 117, aedeagus, side view. 118, 119, Leaf mines: 118, on *Mikania cordata*; 119, on seedling of unidentified bush.

***PTOCHOMYZA* Hering**

Hering (1942) erected this genus for the minute species *asparagi* feeding in the fine leaves of cultivated asparagus, *A. officinalis*, in Germany. It was subsequently found in China at Peking (Spencer 1973). A second species, *P. asparagivora* Spencer (1964 a) was described from Addis Ababa on *Asparagus africanus* and has also been recorded from Italy and Yugoslavia on *A. acutifolius* and from the island Menorca, Spain on *A. stipularis*; there is also a tentative record from Pakistan. This species has now been discovered at Langata, west of Nairobi by Dr. J. M. Ritchie on *A. falcatus* and I found it on the same host at Karen, west of Nairobi. Only one other species is known in the genus, *P. czernyi* (Strobl), from Dalmatia, Yugoslavia (Spencer 1966 b).

The genus is close to *Phytomyza* but was segregated by Hering in view of the presence of only a single notopleural bristle instead of the normal two and the distinctive wing venation (fig. 115). In fact 2 notopleural bristles are present in both *Pt. asparagivora* and *Pt. czernyi* but the genus has been retained owing to the wing venation and characteristic male genitalia.

***Ptochomyza asparagivora* Spencer, 1964 a**

(Figs. 115–117)

Kenya: Langata, W. Nairobi, many specimens emerged early June from mines on *A. falcatus* coll. 29.v.83 (J. M. Ritchie); same locality, 7 ♂, 6 ♀, emerged 22–31.xii.83 coll. 15.xii.83 (K.A.S. and J. M. Ritchie); mines at Karen on same host, 17.xii.83 (K.A.S.).

The minute flies are largely yellow, with the mesonotum having 3 grey bands; wing length is 1.1–1.5 mm. The head is shown in fig. 116. The male genitalia were illustrated by Spencer (1964 a, fig. 51) but a new illustration is now given (fig. 117) showing that the aedeagus ends in paired membranous tubules which continue from two spots of strong sclerotization beyond the ends of the basiphallus (these were not seen or were lost during preparation in the original drawing).

The larva feeds predominantly in the stout young thorns on *A. acutifolius*, *A. stipularis* and *A. africanus* but occasionally also in the stem or leaves, while in *A. falcatus*, in which the thorns are rudimentary, larval feeding occurs exclusively in the narrow leaves. The larva feeds either in a zig-zag fashion or along the midrib, with up to 10 short lateral offshoots into the leaf-blade. The dark brown puparium remains beneath the epidermis in the mine.

It seems likely that the presence of *Pt. asparagi* in Europe and in China represents spread by commerce. However, with *P. asparagivora* widespread in the Mediterranean area and also in Ethiopia, Kenya and Pakistan and feeding on at least 4 wild hosts, this probably reflects natural dispersal.

Unidentified Leaf Mines in Kenya**ACANTHACEAE**

1. *Justicia flava*. Kakamega Forest, 17.x.71 Broad, dark linear mine, Probably *Pseudonapomyza* sp.

ASTERACEAE

2. *Aspilia mossambicensis*. Riuru, 11.x.71; Masongaleni, near Kibwezi, 27.xi.79. Long, narrow, white linear mine. Probably *Liriomyza* sp.
3. *Carduus chamaecephalus*. Kerita Forest, S. Aberdares, c. 8000 ft. Short, irregular linear-blotch mine at leaf margin. Genus uncertain.

4. *Crassocephalum montuosum*. Kapsabet, 18.x.71. Broad, whitish, irregular linear mine. Genus uncertain, possibly even Micro-Lepidopteron, suggested by regular frass pellets.
5. *Gnaphalium luteo-album*. Ololua Forest, W. Nairboi, 15.xii. White linear mine along midrib, with long offshoots also from base of leaf. Pupation probably at leaf-base but no puparia found. Genus uncertain.
6. *Melanthera scandens*. Beside Lake Naivasha, 10.x.71. Irregular linear mine, turning black when old. Possibly *Liriomyza* sp.
7. *Mikania cordata*. Kapsabet, 18.x.71; Ololua Forest, W. Nairobi, 15.xii.83. Long, narrow, white linear mine (fig. 118). Probably *Liriomyza* sp.
8. *Sphaeranthus suaveolens*. Ololua Forest, 15.xii.83. A single short linear mine found. Possibly *L. trifolii* but more likely an endemic species.
9. *Vernonia glabra*. Kapsabet, 17.x.71. Large, brownish blotch. Genus uncertain.
10. Unidentified genus, species. Kerita Forest, 17.xii.83 (fig. 119). Possibly *Agromyza* sp.

LAMIACEAE

11. *Achyrospermum schimperi*. Kapsabet, 17.x.71. Brownish blotch. Genus uncertain, possibly coleopterous.
12. *Plectranthus sylvestris*. Aberdares, below Kimatja, c. 7000 ft., 13.x.71. White, linear-blotch mine, starting at leaf-base. Genus uncertain.

POACEAE

13. *Panicum calvum*. Aberdares, below Kimatja, c. 7000 ft., 13.x.71. Broad, whitish linear mine, with conspicuous black frass. Probably *Agromyza* sp.

SOLANACEAE

14. *Solanum indicum*. Embu, Yoder's Farm, 9.xii.83. Short linear mine, in one leaf several forming an irregular blotch. Possibly *Liriomyza trifolii*.

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