

ACTA ZOOLOGICA FENNICA 97
EDIDIT
SOCIETAS PRO FAUNA ET FLORA FENNICA

ON THE GENUS SCAPTOMYZA HARDY
(DIPT., DROSOPHILIDAE)

WITH DESCRIPTIONS OF NEW SPECIES FROM
VARIOUS PARTS OF THE WORLD

BY
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HELSINKI—HELSINGFORS
1959



PRINTED BY TILGMANN
HELSINKI—HELSINGFORS

1959

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INTRODUCTION

Since my previous paper on the genera *Scaptomyza* and *Parascaptomyza* (HACKMAN 1955b) was published, I have received a large amount of additional material of these *Drosophilidae* flies for study. In 1956, I got from the U.S. National Museum (Washington, D.C.) several hundreds of specimens collected in various parts of the world, mainly in the Nearctic Region. The nearctic material was further completed by 87 specimens from the collection of Cornell University (Ithaca, N.Y.). A collection from Costa Rica was sent to me from Deutsches Entomologisches Institut (Berlin—Friedrichshagen, D.D.R.). In a large collection of *Drosophilidae* from Tadzhikstan and neighbouring areas, received for study from the Leningrad Museum, contained some species of the *Scaptomyza* complex. A collection from Hawaii sent by Prof. D. ELMO HARDY proved to be very interesting and contained numerous new species described in the present paper. In all 65 species of the *Scaptomyza* complex has been investigated by me. Further all other species known to me from the literature have been briefly commented on and if possible placed in subgenera and species groups.

I wish here to acknowledge my thanks to the following persons which have lent me specimens for investigation or otherwise aided me in the work:

Mr E. B. BADSEN (Institute of Animal Genetics, Edinburgh), Dr. H. BURLA (Zool.-Vergl. Anat. Institut, Zürich), Dr. J. F. G. CLARKE (U.S. National

Museum, Washington, D.C.), Dr. H. DIETRICH (Cornell Univ., Ithaca, N.Y.), Prof. D. E. HARDY (Univ. of Hawaii, Honolulu), Prof. W. HENNIG (Deutsches Entom. Inst., Berlin), Dr. HERTEL (Staatl. Museum für Tierkunde, Dresden), Dr. C. SABROSKY (Washington, D.C.), Prof. A. STACKELBERG (Zool. Inst. Akad. Nauk, Leningrad) Dr. W. W. WIRTH (Washington, D.C.), Dr. M. R. WHEELER (Univ. of Texas, Austin).

1. GENERIC AND SUBGENERIC SYSTEMATICS

In my previous paper on the subject (HACKMAN 1955b) I tried to modify DUDA's key for separating *Scaptomyza* Hardy from *Parasaptomyza* Duda (DUDA in LINDNER 1935, p. 49) in order to make it possible to place some aberrant species in their correct groups. BURLA (1957) points out that *Scaptomyza cochleata* Burla described by him from East Africa is intermediate between *Parasaptomyza* and *Scaptomyza* according to the chaetotactic key characters. Other transitional species have also turned up in the material I have had for study. These cases show that it is not possible to separate the two genera by means of clearcut key characters. WHEELER (1952a) has already considered these flies, at least the species he had before him in American collections, as belonging to a single genus *Scaptomyza* Hardy. WHEELER (op. cit.) further states that far too little is known about the genus to warrant erection of subgenera. FREY (1954), on the other hand, divides *Parasaptomyza* into four subgenera (*Parasaptomyza* s.str., *Troglosaptomyza* Frey, *Ctenosaptomyza* Frey and *Macrosaptomyza* Frey) and erects a new genus *Tristanomyia* Frey for a Tristan da Cunha species with reduced wings and chaetotactic features intermediate between *Scaptomyza* and *Parasaptomyza* sensu DUDA.

The best solution seems to me to unite *Parasaptomyza*, *Tristanomyia* and *Scaptomyza* into a single genus *Scaptomyza* Hardy. If this is done we arrive at the question of a subdivision of the genus. A division into only two subgenera, *Scaptomyza* and *Parasaptomyza*, will be quite as difficult as maintaining these taxons as genera. Since subgenera of the *Parasaptomyza* group have already been erected by FREY (op.cit.), it appears best to follow this line and erect the necessary number of subgenera in conformity with those described by FREY. This has led to creation of three new subgeneric names. The subdivision is, to a certain extent, based on genital characters. The genus *Tristanomyia* Frey is here included as a synonym of the subgenus *Parasaptomyza* Duda (s.str.). It is obvious that the number of rows of acrostichal hairs, four or two, has changed several times during the evolution of the *Scaptomyza* complex. The vestigial wings of *Tristanomyia frustulifera* is further a character

which might depend on a single gene and further nearly the same degree of wing reduction occurs in *Parascaptomyza freyi* n.sp., a species with 2 acrostichal rows.

The maintenance of the subg. *Ctenoscaptomyza* Frey (from Tristan da Cunha) depends on a single genital character (the comb-like paralobes) and I have decided to include this subgenus in *Parascaptomyza*, which already contains related species from Tristan da Cunha.

An investigation of the male hypopygium and the female ovipositor guides in *Scaptomyza melancholica* Duda (from South America) showed that this species (and also *S. denticauda* Malloch) must be rather closely related to the *fenestrarum* group in the genus *Drosophila* (cf. HACKMAN 1955a and WHEELER 1957). It would at first sight be tempting to transfer the *fenestrarum* group to *Scaptomyza*, especially as this group occupies a rather isolated position in the genus *Drosophila* and has not yet been incerted in any of the *Drosophila* subgenera (cf. PATTERSON & STONE 1952).

There are, however, characters common to the species of the *fenestrarum* group which do not occur in *S. melancholica* and *denticauda*: The hair-tuft of the male first metatarsus, the characteristic size ratio of the anterior sternopleurals and further that the acrostichal hairs are sometimes unregularly arranged in 6 rows (usually in 4 rows). This characters occur in other groups of *Drosophila* but (with the exception of a unicoloured mesonotum) not in the genus *Scaptomyza*. It therefore seems to me wiser to retain the same boundary between the two genera as has been used by previous authors.

The genera *Euscaptomyza* and *Neoscaptomyza* erected by SÉGUY (1938) for African species seem (judging from the descriptions) to be distinctly different from *Scaptomyza* s. lat. and are not considered in this paper.

The boundaries of the genus *Scaptomyza* against some genera described by MALLOCH from Islands in the Pacific appear, on the other hand, to be far from distinct. The genus *Rosenwaldia* Malloch from Marquesas (type species *R. kaavae* Mall.) has some important characters in common with certain *Trogloscaptomyza* species described in the present paper: Less than 6 rows of acrostichal hairs, a prominent pair of presutural dorsocentral bristles and oblique eyes. The *Trogloscaptomyza* species seem to differ, however, from *Rosenwaldia* by the lack of ventral branches on arista basally of the end fork (in *Rosenwaldia* one small ventral branch). If this is the only separating character it is not enough for maintenance of *Rosenwaldia* as a genus, especially as numerous *Scaptomyza* species of other subgenera have one or more ventral branches on arista. As I know the genus *Rosenwaldia* only from the description (MALLOCH 1935) I must leave the question open.

The genus *Tantalia* Malloch differs as little from *Trogloscaptomyza* that I have decided to include it in *Scaptomyza* sensu lat. as a subgenus. The type

species of *Tantalia*, *albovittata* Malloch (from Hawaii) is of course rather aberrant as a member of the genus *Scaptomyza* because of the numerous wing spots and the supernumerary cross-veins but two other species which I have seen have not these characters. The male genitalia in *T. albovittata* are much like those of some *Trogloscaptomyza* species.

The genus *Marquesia* Malloch (genus type: *Marquesia major* Malloch from Marquesas) must also be considered in this connection. According to the description (MALLOCH 1932) and WHEELER's key of *Drosophilidae* genera from the Pacific Islands (1952b) the genus is characterized by 4 pairs of dorsocentrals and more than 4 rows of acrostichal hairs and large body size (up to 6.5 mm). On the other hand MALLOCH himself has transferred his own species *Scaptomyza femoralis* (from the Society Islands), which has two acrostichal rows, to the genus *Marquesia* (according to the label on the female allotype). It appears to me that the genus *Marquesia* Mall. is very closely related to a trend of species in the subgenus *Parascaptomyza*: *latifrons* Mall., *mumfordi* Mall., *quadriseriata* Mall. and *longisetosa* n.sp., all from Islands in the Pacific. *Marquesia major* Mall. (the type species of the genus) and *M. femoralis* Mall. differ from the above mentioned *Parascaptomyza* species in having 4 pairs of dorso-central bristles (1+3). As four pairs of dorsocentrals also occur in a subgenus of *Scaptomyza*, namely *Macrosaptomyza* Frey the boundary between *Marquesia* and *Scaptomyza* (sensu lat.) is not clearcut. WHEELER (1952b) separates, as mentioned above, *Marquesia* from *Scaptomyza* by the number of acrostichal rows, but if *femoralis* Malloch is considered as a *Marquesia* this character cannot be used. As long as I have neither seen the type species *M. major* nor any males of *femoralis* I must leave the question open. A study of the male genitalia of these species might solve the problem.

The genus *Bunostoma* Malloch, containing hitherto only two described and named species (the genus type *B. flavifacies* Malloch from Marquesas and *B. brasiliensis* Frota-Pessoa from Brazil), is according to WHEELER (1952b) rather difficult to separate from *Scaptomyza* s. lat. It seems to me that the characters used are of more specific than generic nature. Prof. D. ELMO HARDY (Honolulu) has recently in a letter to me expressed his doubts that *Bunostoma* can be maintained as a proper genus. It is obvious that *Bunostoma flavifacies*, *Scaptomyza australis* Mall. (N.S. Wales) *S. bicolor* Mall. (Samoa), *S. stramineipes* Malloch (Samoa) and some further allied species (3 or 4 spp. from Hawaii, 2 of them recorded as *Bunostoma* spp. from Oahu by HARDY 1952) form a clearcut group as far as colour characters and chaetotaxy are concerned. The male genitalia of *S. australis* Malloch, and two Hawaiian a species show a number of common features. I have decided to consider the group as belonging to *Scaptomyza* and maintained the name *Bunostoma* Malloch in a subgeneric sense. It must, however, be admitted that I have not seen the type species

flavifacies Mall. *Bunostoma brasiliensis* Frota-Pessoa has, according to the description (FROTA-PESSOA 1946), 8 rows (in other *Bunostoma* species 2—4) of acrostichal hairs, a character not occurring in any *Scaptomyza* species s. lat. It seems to me that this species must be excluded from the subg. *Bunostoma* sensu mihi and might belong to the genus *Drosophila*. The densely dentate ovipositor guides of *brasiliensis* is further a character differing from those of other *Bunostoma* species. A new species from Equador forms a link between *Bunostoma* and *Parascaptomyza* and I have placed it in the latter subgenus because of some genital characters. The subg. *Bunostoma* sensu mihi seems to represent an old branch in phylogeny of the genus. It shows relations to *Drosophila* (the shining mesonotum and the branching of arista) and also to *Scaptomyza* s.str. (especially the *melancholica* group) and *Parascaptomyza*.

2. THE SUBDIVISION OF THE GENUS SCAPTOMYZA S.LAT. KEYS TO SUBGENERA AND SPECIES

The main characters used by me for the division into subgenera are given in the key below:

1. One presutural and three postsutural dorsocentral bristles. Large species (body length 3.5—4 mm) sg. *Macrosaptomyza* Frey
- A presutural dorsocentral bristle rarely present; two postsutural dorsocentrals ... 2
2. Only one prominent humeral bristle, sometimes below this bristle a short bristle-like hair, at most half as long as the humeral bristle. Ovipositor guides usually weakly sclerotized 3
- Two humeral bristles of nearly equal size or the lower one at least half as long as the upper one. Ovipositor guides more strongly sclerotized and usually coarsely dentate 8
3. Male genitalia usually with «paralobes» (sensu FREY 1954; secondary clasper, HSU 1949), if lacking then arista with more than one ventral branch basally of the end fork 5
- Male genitalia without paralobes. Arista usually without ventral branches basally of end fork (rarely with one ventral branch). Ovipositor guides always very weakly sclerotized, never dentate 4
4. Dorsocentral bristles 0 + 2 or 1 + 2. Arista always without ventral branches basally of end fork. The branches of the end fork shorter than the two dorsal branches (see figs. 11, 12) sg. *Troglosaptomyza* Frey
- Dorsocentrals always 0 + 2, the anterior pair at or close to the suture. Arista in two species without ventral branches, in one species with a ventral branch; end fork deep, its branches about as long as the other aristal branches. Small species with medially white scutellum sg. *Tantalia* Malloch
5. Apical scutellar bristles more than half as long as the basal ones (index 1.0—1.5). Ovipositor usually weakly sclerotized 6

- Apical scutellar bristles about half as long as the basal ones (index 1.7—2.0). Ovipositor guides of various shape 7
- 6. Paralobes of male genitalia present. Mesonotum dull, with or without stripe pattern. Occiput not as below sg. *Parascaptomyza* Duda
- Paralobes lacking. Mesonotum shining, usually entirely black. At least the upper half of orbitae shining black. Each side behind the ocellar triangle a whitish pollinose spot on the occiput. Lateral parts of occiput dark, usually black sg. *Bunostoma* Malloch
- 7. Male cerci long, drawn out ventrally. Ovipositor guides weakly sclerotized. One or rarely two ventral branches on aristam sg. *Metascaptomyza* n.sg.
- Male cerci not as above. Ovipositor guides more strongly sclerotized and at least apically dentate. Two or more ventral branches on arista ... sg. *Mesoscaptomyza* n.sg.
- 8. Lower humeral bristle hardly more than half as long as the upper one. Hind trochanters with a dark short, sometimes spine-like bristle. Wings in the male usually with an apical dark spot (sometimes also in the female) sg. *Hemiscaptomyza* n.sg.
- Humeral bristles subequal in size. Hind trochanters usually not with a dark bristle. Wings never spotted sg. *Scaptomyza* Hardy (s.str.)

Subg. TROGLOSCAPTOMYZA Frey

Subgenus type: *Parascaptomyza* (*Trogloscaptomyza*) *brevilamellata* Frey (1954).

Synonyme: ?*Rosenwaldia* Malloch (1935).

This subgenus was erected by FREY (1954) for a single species from Tristan da Cunha. The study of a large *Scaptomyza* collection from Hawaii revealed the interesting fact that this subgenus has numerous endemic Hawaiian species. The subgenus is characterized by the following: One humeral bristle. Arista without central branches and with very few dorsal ones, usually two basally of the end fork. The male genitalia are rather simply built (see figs. 1—10). Paralobes are always lacking; forceps strong and protruding. Cerci small and simple. Ovipositor guides weakly sclerotized. Two or four rows of acrostichal hairs. In some species these hairs are irregularly 6-rowed in the front part of the presutural area. A group of Hawaiian species have a pair of presutural dorsocentral bristles, oblique eyes and an somewhat flattened head (see fig. 11). This combination of characters also occurs in *Rosenwaldia kaavae* Malloch from the Marquesas Isles, and it seems possible to me that *Rosenwaldia* could be united with *Trogloscaptomyza*. I have, however, left this question open as the male genitalic structures of the single *Rosenwaldia* species are not known (*R. kaavae* is described from the female only).

Key to species:

- 1 Two rows of acrostichal hairs or outside the internal rows only 2—3 hairs representing the external rows 2
- Four rows of acrostichal hairs; the external rows consisting of numerous hairs. Acrostichal hairs in the front part of the presutural area sometimes irregularly 6-rowed 3

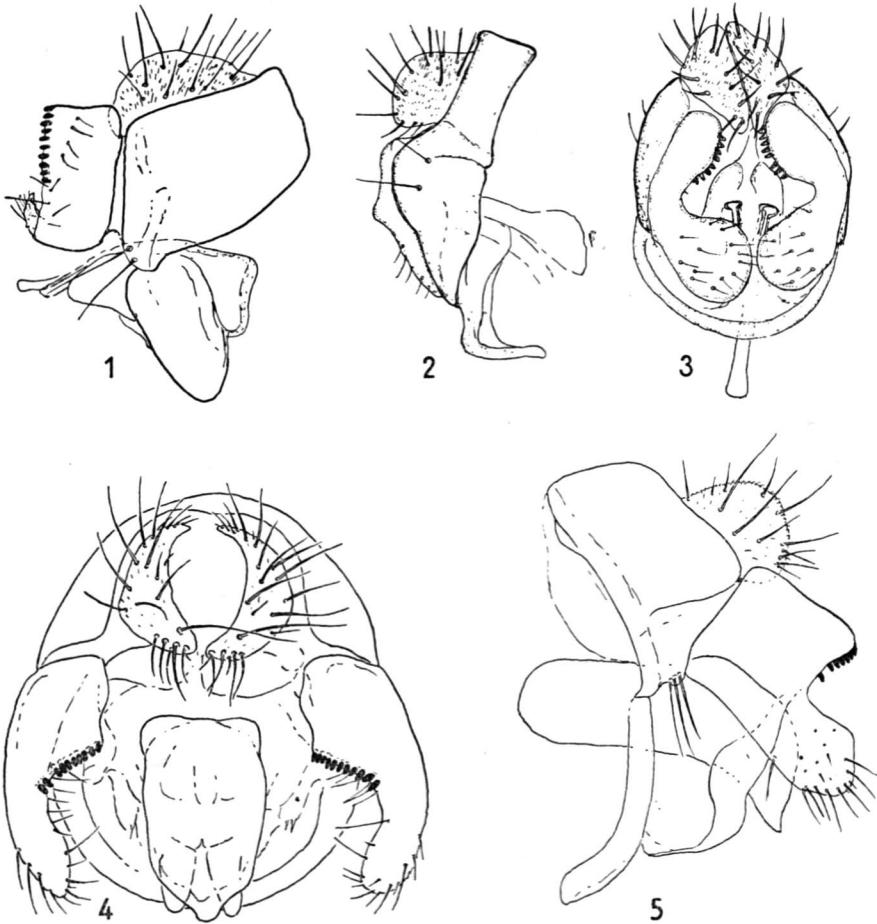
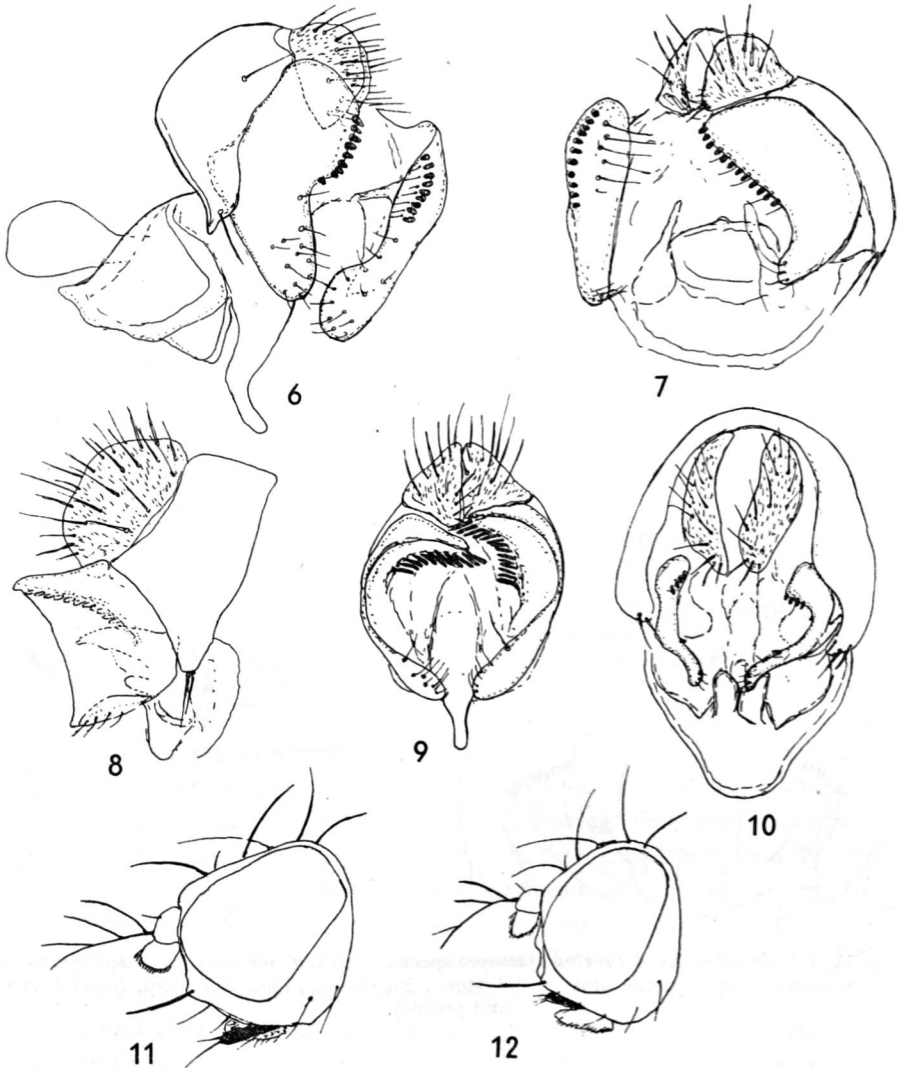


Fig. 1—5. Male genitalia of *Trogloscaptomyza* species. Fig. 1. *T. mediopallens* n.sp. Fig. 2—3. *T. striatifrons* n.sp. (profile and caudal view). Fig. 4—5. *T. mitchelli* n.sp. (caudal view and profile).

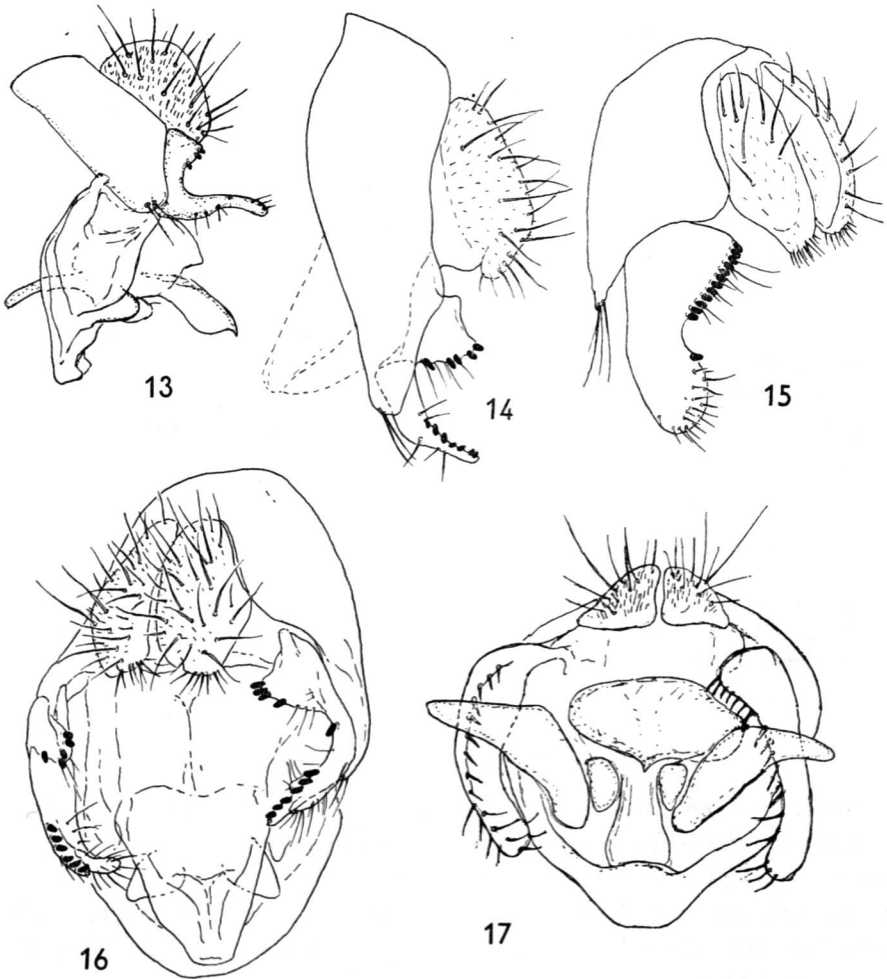
- 2. Mesonotum without distinct pattern, pale yellow-brown. No presutural dorsocentral bristles. (Tristan da Cunha) *brevilamellata* Frey
- Mesonotum with a broad dark band on either side outside the dorsocentral rows. Median area of mesonotum pale without any stripe. One pair of presutural dorsocentral bristles present. (Hawaii Island) *mediopallens* n.sp.
- 3. A distinct pair of presutural dorsocentral bristles. Head somewhat flattened and the longest diameter of the eye more or less horizontal (see fig. 11) 4
- No presutural dorsocentrals. Head not flattened, eyes normal (fig. 12) 7
- 4. Frons with a distinct dark median stripe from the ocellar triangle to the front margin. (Hawaii: Kauai) *striatifrons* n.sp.
- Frons without a distinct dark median stripe; if the ocellar triangle is broadly darkened there may be an indistinct median suffusion in front of it 5



Figs. 6—10. Male genitalia of *Trogloscaphomyza* species. Fig. 6. *T. abrupta* n.sp. Fig. 7. *T. aloha* n.sp. Fig. 8—9. *T. longipecten* n.sp. (from Molokai) profile and caudal view. Fig. 10. *T. pallifrons* n.sp. (Hawaii Island). Fig. 11. Head of *T. striatifrons* n.sp. Fig. 12. Head of *T. hawaiiensis* n.sp.

- 5. Median area of mesonotum in the anterior $\frac{2}{3}$ yellowish, in the caudal third abruptly darkened. Ocellar triangle and upper half of orbitae dark grey. (Hawaii: Maui) *abrupta* n.sp.
- Mesonotal pattern not as above. Ocellar triangle not darkened or at most only above the ocelli 6
- 6. Palpi entirely pale in both sexes. Male genitalia as in fig. 4—5. (Hawaii: Maui) *mitchelli* n.sp.

- Palpi in the male slightly darkened at apex, in the female in the apical half brown to black. Male genitalia as in fig. 7. (Hawaii: Molokai) *aloha* n.sp.
- 7. Male palpi yellow, rarely slightly brown at apex. Female palpi yellow or piceous in the apical half. In the latter case the mesonotal pattern is indistinct and the frons pale yellowish 8
- Palpi in both sexes dark, brown to black in the apical half. Mesonotal pattern usually distinct 9
- 8. Male genitalia as in figs. 10 and 13. Frons pale yellowish-grey, only the central spot of the ocellar triangle dark grey. Mesonotal pattern indistinct. (Hawaii IIs.)
..... *pallifrons* n.sp.



Figs. 13—17. Male genitalia of *Trogloscaptomyza* species. Fig. 13. *T. pallifrons* n.sp. (Hawaii Island), profile. Fig. 14. *T. hardyi* n.sp. profile (ventral parts omitted). Fig. 15. *T. hawaiiensis* n.sp. (from Maui; ventral parts omitted). Fig. 16. *T. hardyi* n.sp., caudal view. Fig. 17. *T. kauaiensis* n.sp.

- Male genitalia as in figs. 8—9. Orbitae darker greyish, front margin of frons broadly bright yellow. (Hawaii IIs.) *longipecten* n.sp.
9. ♂. Front margin of frons, antennae and lower and median parts of the face piceous. ♀. Lower margin of face darkened. (Hawaii: Kauai) *kauaiensis* n.sp.
- Front margin of frons yellow, at most slightly darkened medially. Face unicolorous greyish yellow 10
10. Male genitalia as in fig. 15. The yellow front marginal zone of frons never medially brownish. Mesonotal ground colour usually greyish in the female. Hawaii IIs.) *hawaiiensis* n.sp.
- Male genitalia as in figs. 14 and 16. A median brownish suffusion usually reaches the front margin of frons. Mesonotal ground colour yellow-brown in both sexes. (Hawaii: Kauai) *hardyi* n.sp.

Subg. TANTALIA Malloch

Subgenus type: *Tantalia albovittata* Malloch 1938.

This subgenus is very close to *Trogloscaptomyza*. Characteristics: One prominent humeral bristle. Dorsocentrals 0+2, the anterior pair very close to the suture. Arista in some of the species without ventral branches basally of end fork, in one species with a ventral branch. End fork deep, its branches about as long as the other aristal branches. Male genitalia of the type species much like those of *Trogloscaptomyza*. Ovipositor guides very weakly sclerotized. Small species (body length < 2 mm.) with broadly white scutellar disc. Apical scutellar bristles more than half as long as the basal ones. Sex species from Hawaii.

1. Wings with two supernumerary cross-veins between costa and the second longitudinal vein. On these cross-veins and the ordinary ones there are (4) dark spots and further dark spots are found one at the ending 2nd vein, one at the end of 2rd vein and two on the last portion of 4th vein (Hawaii: Oahu) *albovittata* Malloch
- Wings without supernumerary cross-veins and without spots. 5 undescribed species from various islands of Hawaii.*

Subg. MACROSCAPTOMYZA Frey

Subgenus type: *Parascaptomyza* (*Macrosaptomyza*) *altissima* Frey 1954.

Large species (body length 3.5—5 mm.) with one prominent and one lower minute humeral bristle. 2 rows of acrostichal hairs. Dorsocentrals 1 + 3. Arista with one ventral branch basally of the end fork. Male genitalia with paralobes and rather like those of *Parascaptomyza* s.str. Ovipositor guides weak, not dentate. Contains two species from Tristan da Cunha:

* Prof. D. ELMO HARDY (Honolulu) has informed me that he is going to describe five new species of *Tantalia* from Hawaii. I have seen specimens of two of these species.

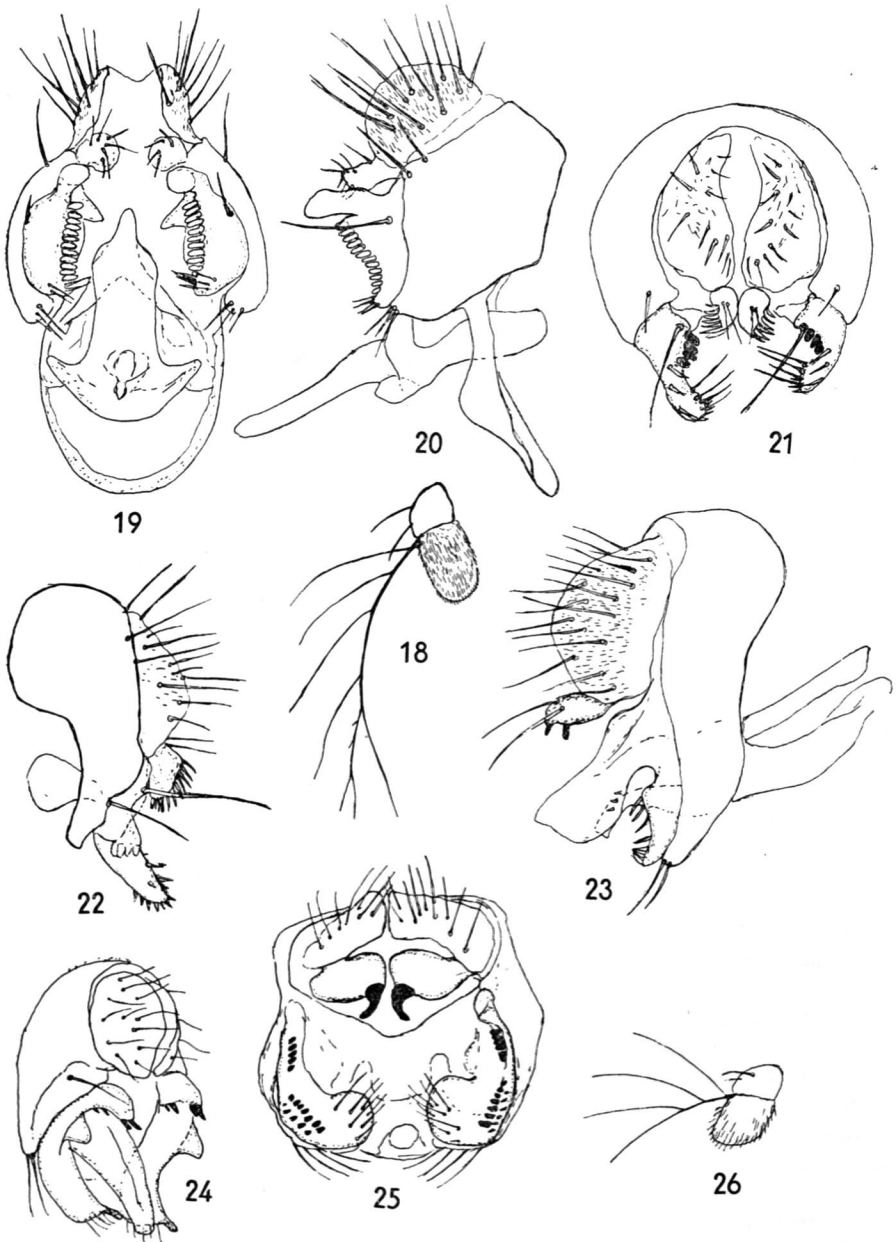


Fig. 18. Antenna of *Parascaptomyza longisetosa* n.sp. (from Molokai). Figs. 19—23 male genitalia of *Parascaptomyza* species. Figs. 19—20. *P. quadriseriata* Mall. (caudal view and profile). Figs. 21—22. *P. mumfordi* Mall. (caudal view and profile). Fig. 23. *P. freyi* n.sp. Fig. 24. male genitalia of *Tantalia albovittata* Mall. Fig. 25. *Parascaptomyza pici-femorata* n.sp., male genitalia. Fig. 26. *Tantalia* sp., antenna.

1. Femora brown, other parts of legs yellow. Mesonotum and abdomen piceous. Large species (body length 4—5 mm., wing length 4.5—5 mm.) *altissima* Frey
 — Legs unicoloured yellow. Mesonotum yellow-brown. Smaller species (body length 2.5—3 mm., wing length 3.5 mm.) *helvola* Frey

Subg. PARASCAPTOMYZA Duda (s.str.)

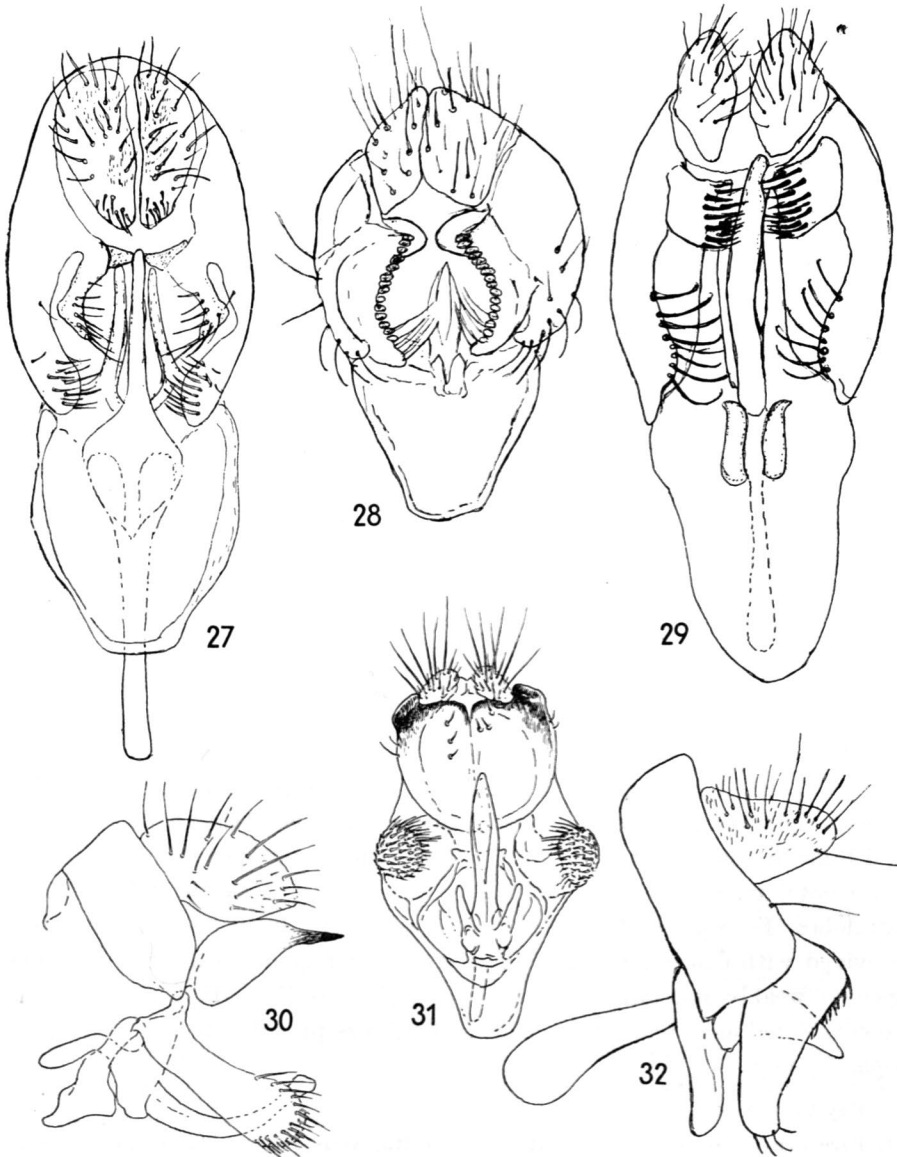
Subgenus type: *Drosophila pallida* Zetterstedt 1847 (= *Scaptomyza disticha* Duda 1921). Subgeneric synonyms: *Ctenoscaptoomyza* Frey and *Tristanomyia* Frey.

Characteristics: One prominent humeral bristle. Apical scutellar long, not bent upright. Ventral branches of arista varying from 0 to 2 (usually one or two). Dorsocentrals 0 + 2 or 1 + 2. Acrostichal hairs in two or four rows. Distinct paralobes of male genitalia are present in all species of which males have been investigated. Ovipositor guides weakly developed, rarely provided with marginal denticles (*latifrons* Malloch).

In a group of species from Islands in the Pacific the head is conspicuously broad (*latifrons* Malloch, *mumfordi* Malloch, *quadriseriata* Malloch and *longisetosa* n.sp.). These species obviously lead over to the genus *Marquesia* Malloch. The species from Tristan da Cunha show a trend of forms with reduced wings (*angustipennis* Frey, *freyi* n.sp. and *frustulifera* Frey) and in two species, *pectinifera* Frey and *horrida* Frey the paralobes of the male genitalia are strongly developed and comb-like (see fig. 41). All these species have many genital characters in common with the cosmopolitan species *P. pallida* Zett.

Key to species:

1. Wings normally developed 2
 — Wings lanceolate or more strongly reduced, narrow, in the latter case without the distal cross-vein 12
 2. Head broader than the length of mesonotum (Species from Islands in the Pacific) 3
 — Width of head not bigger than the length of mesonotum 6
 3. Acrostichal hairs in two rows 4
 — Acrostichal hairs in four rows 5
 4. One pair of acrostichal macrochaetae. Arista with 4 dorsal and one ventral branch basally of the endfork. (Marquesas IIs) *mumfordi* Malloch
 — No acrostichal macrochaetae. Arista with 6 dorsal and 2 ventral branches basally of end fork. Frons yellow-brown and very broad. (Marquesas IIs) *latifrons* Malloch
 5. Internal vertical bristle as long as the vertical diameter of the eye. Frons between the ocellar triangle and the orbitae brownish yellow. (Hawaii IIs) ... *longisetosa* n.sp.
 — Internal vertical bristle much shorter than the vertical diameter of the eye. Frons blackish, only the anterior margin narrowly yellow. (Marquesas IIs)
 *quadriseriata* Malloch
 6. Arista without ventral branches on arista basally of end fork 7
 — Arista with one or two branches on arista basally of end fork 9
 7. A presutural dorsocentral bristle present and about half as long as the postsutural dorsocentrals 8



Figs. 27—32. Male genitalia of *Scaptomysza* (s.lat.) species. Fig. 27. *Bunostoma australis* Mall., fig. 28. *Scaptomysza* sp. pr. *noei* Brncic, fig. 29. *Bunostoma bryanti* n.sp., figs. 30 31. *Hemiscaptomysza intermedia* Duda (Chile) profile and caudal view, fig. 32. *Trogloscaptomyza kauaiensis* n.sp. profile.

7. No presutural dorsocentral bristle. (Tristan da Cunha) *pectinifera* Frey
8. Ovipositor guides short, with one prominent subapical bristle and a few short hairs. (Tristan da Cunha) *horrida* Frey
- Ovipositor guides rather large but weakly sclerotized and provided with numerous long hair-like bristles. (Tristan da Cunha) *incerta* Frey
9. Arista with two ventral branches basally of end fork 10
- Arista with one ventral branch basally of end fork 11
10. Acrostichal hairs in two rows. Mesonotum and legs entirely yellow. (Java, Cape Verde) *substrigata* de Meijere
- Acrostichal hairs in four rows. Mesonotum black, somewhat shining. Femora darkened. (Equador) *piciemorata* n.sp.
11. Acrostichal hairs always in two rows. Mesonotum variable in colour from pale yellowish to grey with «*Scaptomomyza* pattern». (Cosmopolitan species) ... *pallida* Zett.
- Acrostichal hairs usually in two four rows (in f. *clavigera* Frey in two and then the species is only separable by genital characters from *pallida*). Mesonotum yellow, sometimes with brownish «*Scaptomomyza* pattern». (Azores) *impunctata* Frey
12. Acrostichal hairs in two rows, Arista without ventral branches basally of end fork. 13
- Acrostichal hairs in four rows. Arista with one ventral branch. Wings narrow and strongly reduced. (Tristan da Cunha) *frustulifera* Frey
13. Wings narrowly lanceolate, external cross-vein present. (Tristan da Cunha) *angustipennis* Frey
- Wings strongly reduced, long but extremely narrow, external cross-vein lacking. (Tristan da Cunha) *freyi* n.sp.

Subg. BUNOSTOMA Malloch

Subgenus type: *Bunostoma flavifacies* Malloch 1932.

Characteristics: Mesonotum shining and usually black. One humeral bristle and two pairs of dorsocentral bristles, (0 + 2) the anterior one close or rather close to the suture. Acrostichal hairs in two or four rows. Arista with 2 or 3 ventral branches basally of end fork. Occiput with a light spot each side behind the frontal triangle. Orbitae shining, usually black. Male genitalia without paralobes. Forceps (in the species of which males have been investigated) provided with dense dentiform spines. Ovipositor guides (except in the type species) weakly sclerotized. *Bunostoma brasiliensis* Frota-Pessoa can hardly be considered as a *Scaptomomyza* s.lat. and belongs probably to the genus *Drosophila* (see p. 7).

Key to species:

1. Face evenly convex below on its entire width, sloping gradually to the epistome. (Marquesas IIs.) *flavifacies* Malloch
- Face more or less carinate, the carina separated from the epistome by a distinct depression 2
2. Arista with more than 6 dorsal branches in addition to the end fork. Acrostichal hairs in four rows. Legs entirely yellow. (Samoa) *stramineipes* Malloch
- Arista usually with 5, at most with 6 dorsal branches. Acrostichal hairs in two or four rows 3

3. Fore tibiae and parts of fore tarsi blackened. All femora yellow. One prominent oral bristle, the vibrissa. (Samoa) *bicolor* Mall.
 — Legs entirely yellow or femora 1—3 darkened and tibiae dusky yellow 4
4. Acrostichal hairs in four rows. Legs entirely yellow. (Hawaii) *B. sp.*
 — Acrostichal hairs in two rows 5
5. Femora 1—3 partially darkened. The frontal triangle extended to the level of the the posterior reclinate orbital bristle. (Hawaii: Maui) *bryanti* n.sp.
 — Legs entirely yellow 6
6. Frontal triangle extended to the level of the anterior proclinate bristle. (Mesonotum shining black, slightly pollinose. (Hawaii: Oahu) *cordigera* n.sp.
 — Frontal triangle ending near the middle of frons. Mesonotum somewhat shining, yellow-brown to black and with greyish or greenish pollinosity. In paler specimens a dark median mesonotal stripe can be seen. (Australia) *australis* Malloch

Scaptomyza melania Séguy possibly belongs to this subgenus, but has not been included in the key.

Subg. METASCAPTOMYZA n.subg.

Subgenus type: *Scaptomyza cochleata* Burla (1957).

Characteristics: One prominent humeral bristle. Dorsocentral bristles 0—2 (1—2 prolonged presutural dorsocentral hairs occur but they are not true bristles). Acrostichal hairs in four rows. Arista with one ventral branch in addition to the end fork. Apical scutellars short. Male genitalia with comparatively large paralobes not provided with teeth or spines; cerci large. Ovipositor guides weakly sclerotized, without marginal dentation.

A single species from East Africa: *S. (M.) cochleata* Burla.

Subg. MESOSCAPTOMYZA n.sg.

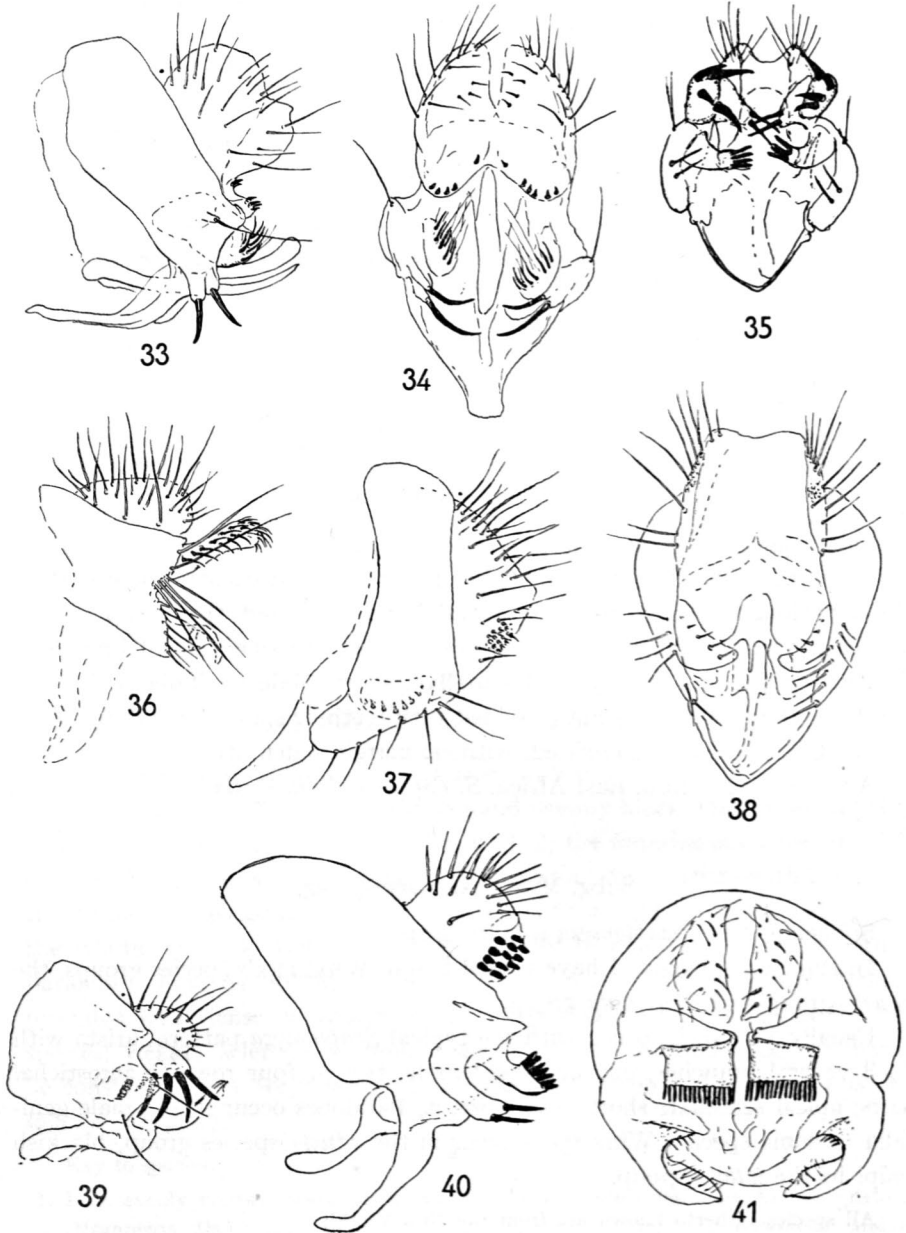
Subgenus type: *Scaptomyza wheeleri* n.sp.

In this new subgenus I have united two of WHEELER's species groups, the *adusta* group and the *vittata* group.

Usually yellowish species with the typical *Scaptomyza* pattern; arista with 2—3 ventral branches; one humeral bristle; two or four rows of acrostichal hairs; apical scutellars short, bent upright; Paralobes occur in the male genitalia of some species. Wing spots occur in the *adusta* species group, blackish palpi in the *vittata* group.

All species hitherto known are from the New World:

1. Wings as a rule with an apical dark spot. Four rows of acrostichal hairs (*adusta* species group) 2
 — Wings not spotted. Two rows of acrostichal hairs. Palpi dark (*vittata* group) 5
2. Wing spot large. A distinct presutural dorsocentral bristle (Argentina)
 *spinipalpis* Séguy
- Wing spot small (sometimes lacking). No presutural dorsocentral bristle 3



Figs. 33—40. Male genitalia of *Mesoscaptomyza* species. Figs 33—34. *M. wheeleri* n.sp. (Virginia), profile and caudal view. Fig. 35. *M. vittata* Coqu. (Puerto Rico). Fig. 36. *M. subvittata* n.sp. Fig. 37—38. *M. paravittata* Wheeler (California) profile and caudal view. Fig. 39. *M. vittata* Coqu. (Puerto Rico). Fig. 40. *M. ?nigripalpis* Mall. (Brazil). Fig. 41. *Parascaptomyza pectinifera* Frey, caudal view of male genitalia.

3. Mesonotum mostly brown. Apical wing spot small and indistinct, sometimes lacking (Arizona—Mexico) *hirsuta* Wheeler
 — Mesonotum yellowish to pale brownish. Wing spot distinct 4
4. Scutellum and disc of mesonotum nearly of same colour. Arista with 4—5 dorsal branches basal to the fork. Palpi with very stout black bristles (Eastern U.S.A. — South America) *adusta* Loew
 — Scutellum distinctly darker than mesonotum. Arista with about 3 dorsal branches. Palpal bristles not very stout. Posterior cross-vein often with a slight cloud (Western North America) *paradusta* Wheeler
5. Two subequal oral bristles (vibrissa and the second one). Paralobes of the male genitalia with stout black spines (Southern U.S.A. — Central America)
 *vittata* Coq. and ssp. *pseudovittata* Brcic (from Chile)
- Vibrissa much longer than the second oral bristle 6
6. A distinct presutural dorsocentral bristle (about half as long as the postsutural ones) (Maryland—South America) *wheeleri* n.sp.
 — No distinct presutural dorsocentral bristle 7
7. Palpi black from near the base. Male genitalia figs. 00 (SW. U.S.A. Central America) *paravittata* Wheeler
 — Palpi piceous, basal half yellowish 8
8. Male genitalia as in fig. 36 (Costa Rica) *subvittata* n.sp.
 — Male genitalia as in fig. 40 (Brazil) (?) *nigripalpis* Malloch
- Not included in the key: *S. fuscinervis* Malloch (Brazil).

Subg. HEMISCAPTOMYZA n.sg.

Subgenus type: *Geomyza unipunctum* Zett. 1847.

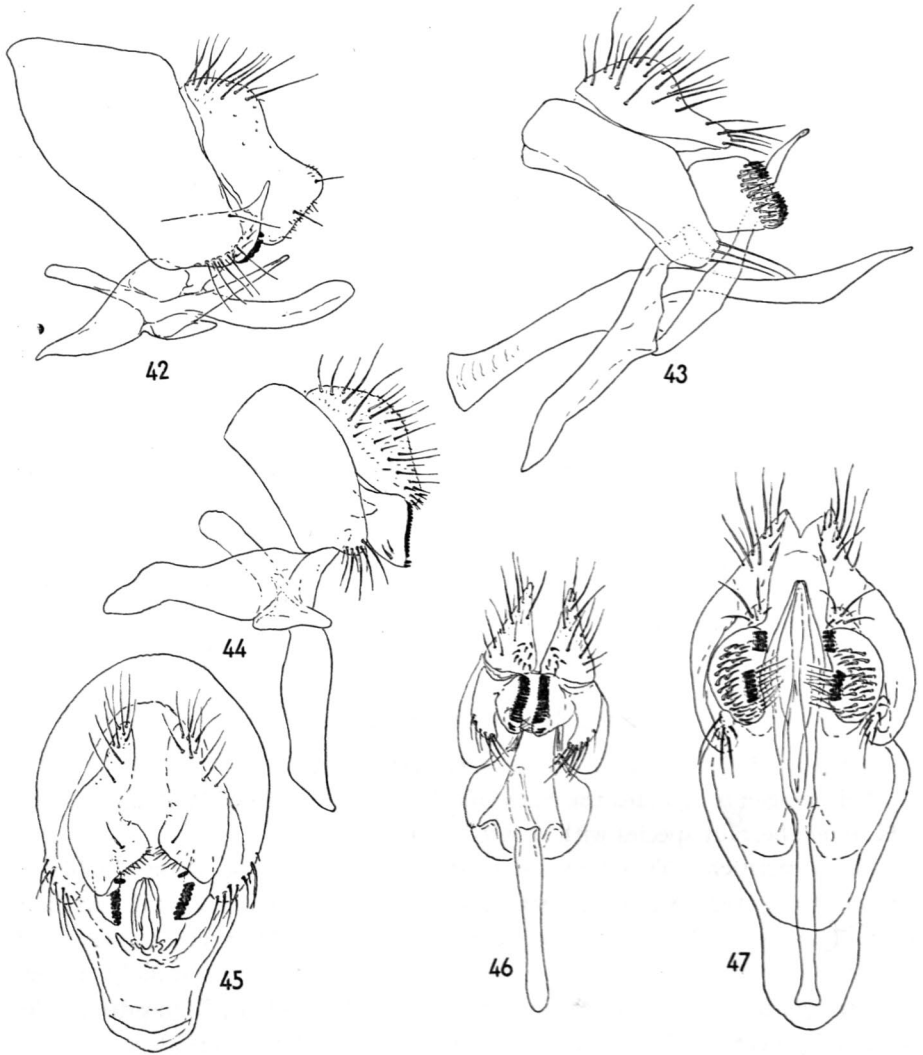
This subgenus includes the *S. terminalis* species group of WHEELER (1952) and some aberrant species with spotted wings.

Characteristics: Two humeral bristles, the upper one about double as long as the lower one. Arista with 1—2 ventral branches. Apical scutellars more than half as long as the basal ones. Wings usually with an apical spot in the male, sometimes also in the female. Acrostichal hairs usually in four rows (rarely in two). Mesonotum more or less dark in colour. Ovipositor guides marginally dentate. As far as known the larvae are leaf miners.

The majority of the species are from the New World, but 3 species, one of them holarctic, occur in the Palearctic region. *S. longipennis* Séguéy from Africa might belong here. Mainly in mountain areas.

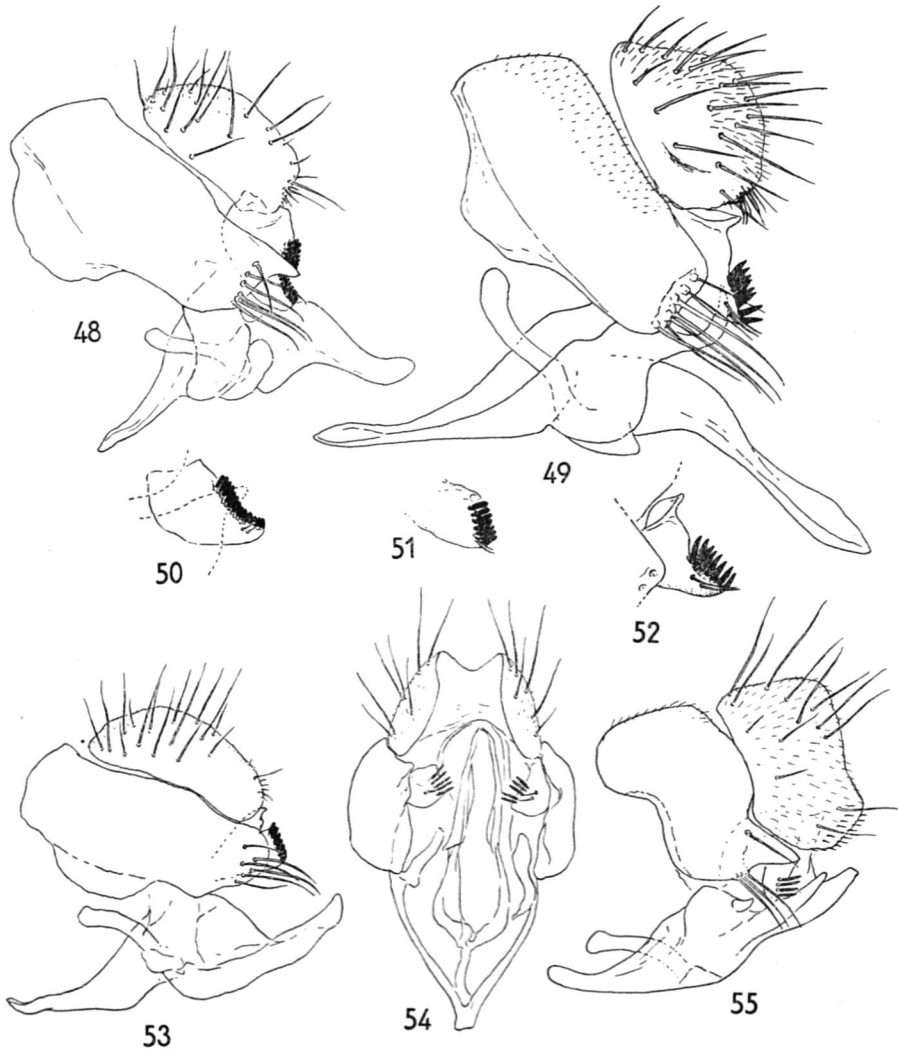
Key to species:

1. Male wings with 3 subapical spots on and between 3rd and 4th vein in addition to small apical clouds on these veins. In the female only one subapical spot. Male genitalia with large paralobes (figs. 30, 31) (Chile) *intermedia* Duda
 — Wings not as above 2
2. Male wings with a dense black cloud over apex of third vein and usually with a smaller, less distinct cloud over apex of 4th vein. In the female the apical cloud of 3rd vein is much smaller and the cloud at apex of third vein lacking. Male genital arch with a



Figs. 42—47. Male genitalia of *Hemisaptomyza* species. Fig. 42. *H. trochanterata* Collin (Manitoba), side view. Fig. 43. *H. hennigi* n.sp. (Costa Rica), side view. Fig. 44. *H. atahualpa* n.sp., side view. Fig. 45. *H. trochanterata* Collin (Alaska) caudal view. Fig. 46. *H. atahualpa* n.sp. (caudal view). Fig. 47. *H. hennigi* n.sp., caudal view.

- projection from the posterior margin extending inside beneath the cerci. (Western U.S.A.) *bipunctipennis* Wheeler
- Only one apical wing spot of almost similar size in both sexes or lacking entirely in the female or rarely lacking in both sexes 3
- 3. An apical wing spot present at least in the male 4
- Wings not spotted 12



Figs. 48—55. Male genitalia of *Hemiscaptomyza* species. Fig. 48. *H. unipunctum* Zett. (Finland), side view. Fig. 49. *H. okadai* n.sp. (Kamtchatka). Fig. 50. *H. unipunctum* Zett. (Finland), forceps. Fig. 51. *H. unipunctum bocharensis* n.ssp., forceps. Fig. 52. *H. okadai* n.sp., forceps. Fig. 53. *H. unipunctum bocharensis* n.ssp., side view. Fig. 54—55. *H. parapi-cata* n.sp. (Equador), caudal view and side view.

- 4. Apical wing spot of male large and subquadrate and extended from the 3rd to the 4th vein. (Female unknown) (Argentina) *apicipuncta* Malloch 5
- Apical wing spot of the male not reaching to the 4th vein 5
- 5. Male genital arch at the lower posterior corner with a pointed projection (figs. 55)... 6
- Male genitalia without the above-mentioned projection 8
- 6. Male anal cerci with a cluster of dense black hairs at the caudoventral corner. Ovipositor guides tapering apically (fig. 71). (SW U.S.A.) *apicata* Thoms.

- Male anal cerci without a distinct cluster of black hairs. Ovipositor guides ending more bluntly (fig. 69) 7
7. Male forceps with only about 5 dark short marginal spines. Both sexes with a wing spot. (Ecuador, Bolivia) *parapicata* n.sp.
- Male forceps with a dense row of numerous dark tooth-like marginal spines. Females usually without a wing spot (Northern Europe—Siberia) *unipunctum* Zett.
8. Dark tooth-like spines of the male forceps in a single continuous row 9
- Dark tooth-like spines of male forceps in two groups 11
9. Male cerci ventrocaudally pointed (Sitka) *terminalis* Loew
- Male cerci ventrocaudally rounded 10
10. Male usually with only two rows of acrostichal hairs. Male genitalia as in fig. 49. (Kamchatka, Amur, Japan) *okadai* n.sp.
- Males and females with four rows of acrostichal hairs Male genitalia as in fig. 53. (U S S.R.: Tadjikstan) *unipunctum* ssp. *bocharensis* n.ssp.
11. The upper group of tooth-like marginal spines of the male forceps consisting of only 2—3 spines, the lower one of 9—10 spines. Ovipositor guide as in fig. 70. (Western U.S.A.) *hsui* Hackman
- The upper group of tooth-like spines consist of more than 3, the lower of less than 9. In addition to this the forceps are provided with numerous pale spines (figs. 43, 47). (Central America) *hennigi* n.sp.
12. Male anal cerci forming an upper corner at the ventral margin and provided with long hairs almost only in the dorsal half (figs. 42, 45). Female ovipositor guides with rather dense marginal dentation. (Europe, Alaska—Newfoundland) *trochanterata* Collin
- Male cerci not as above (fig. 44, 46). (Peru) *atahualpa* n.sp.
- Not included in the key: *S. maculifera* Becker (Ecuador) and *S. longipennis* Ségué (Kenya).

Subg. SCAPTOMYZA (s.str.).

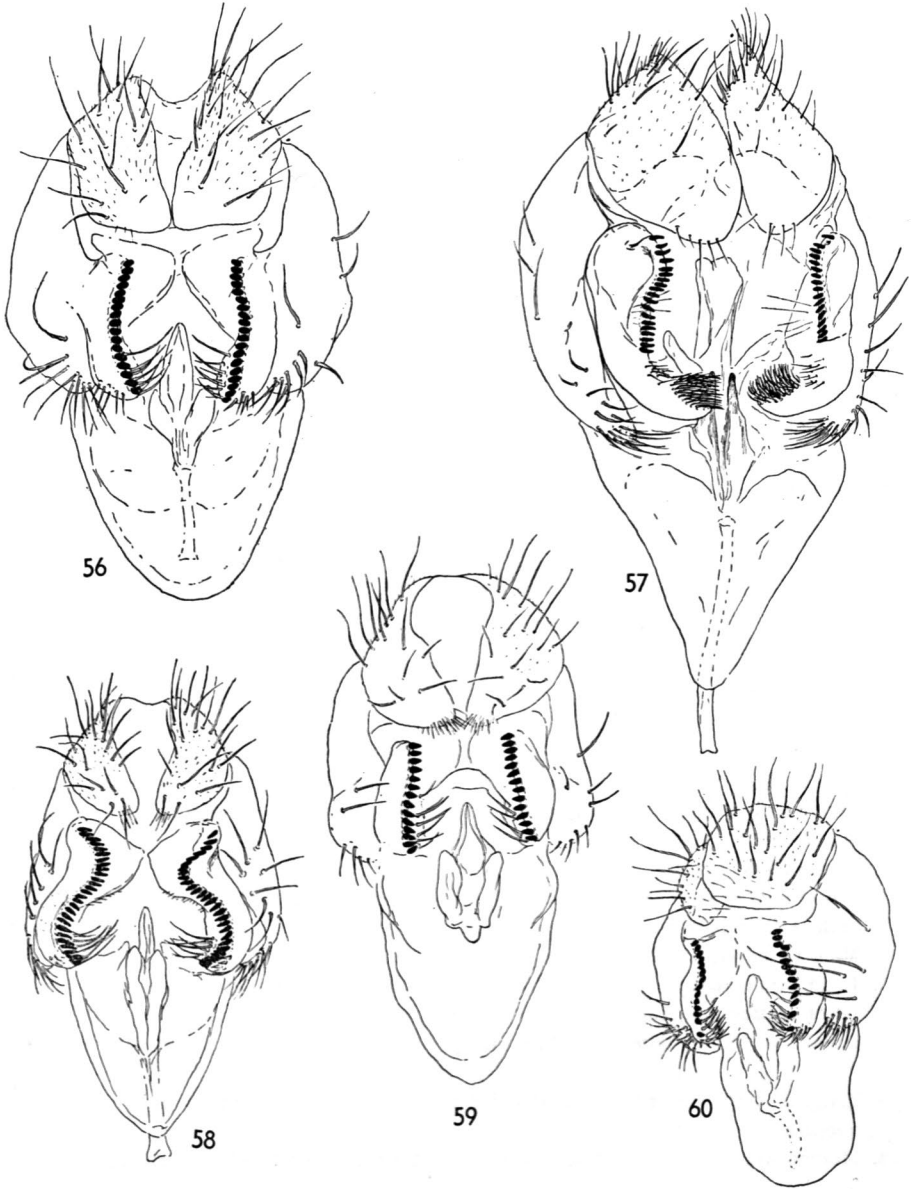
Subgenus type: *Drosophila graminum* Fall. sensu COLLIN.

This subgenus includes the *montana* species group of WHEELER (1952) and the nearctic *melancholica* group and an allied old world species which leads over to the *fenestralis* group in the genus *Drosophila*.

Characteristics: Two humeral bristles; the lower one at least $\frac{2}{3}$ the length of the upper one. Arista usually with one or two ventral branches basally of the fork (ventral branches are lacking in a species from China, 3 in a Japanese species). Acrostichal hairs as a rule in four rows (two rows only in *S. subsplendens* Duda). Male genitalia usually without paralobes, forceps in most cases with a continuous row of dark marginal teeth. Ovipositor guides usually densely and coarsely dentate. Wings never spotted. As far as known leaf-mining species.

Key to species:

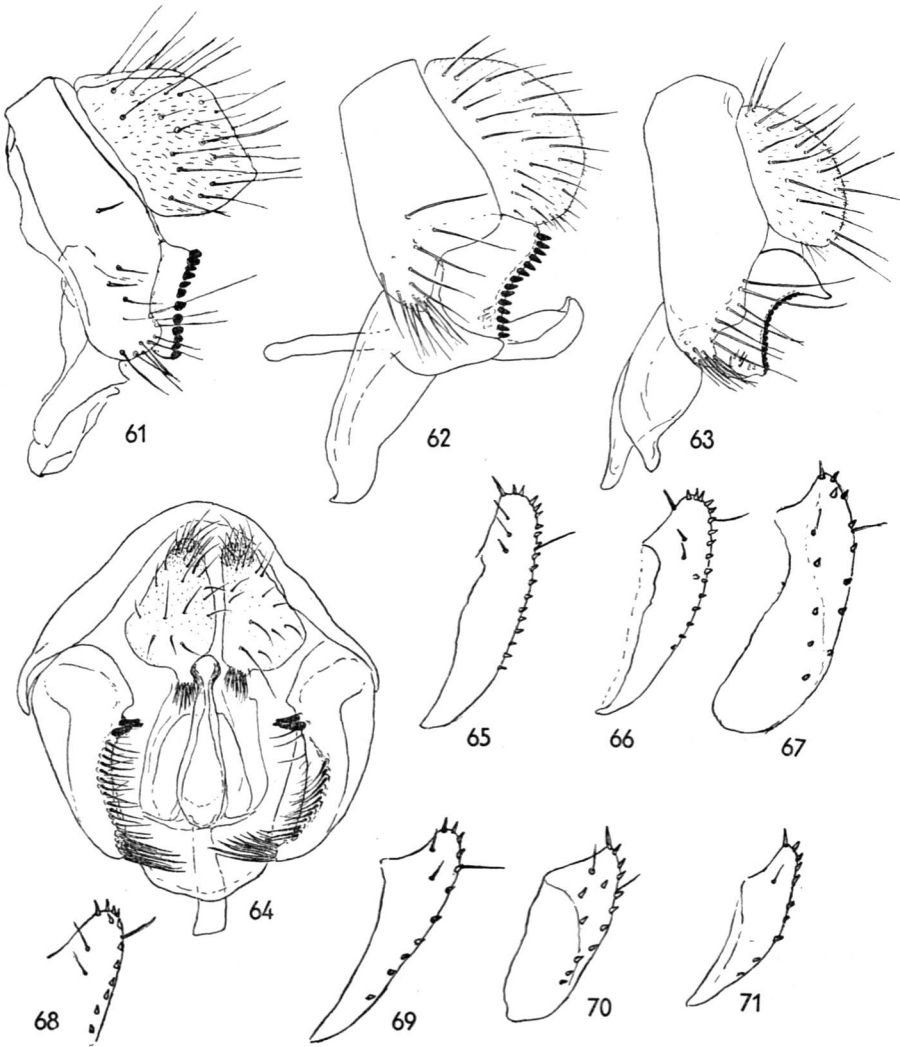
1. Two rows of acrostichal hairs. (Siberia) *subsplendens* Duda
- Four rows of acrostichal hairs 2
2. No ventral branches on arista basally of the end fork. A longwinged species. (China) *grahami* n.sp.



Figs. 56—60: Male genitalia of *Scaptomyza* (s.str.) species. Fig. 56, *S. flaveola* Meig. (long-winged yellow form, California). Fig. 57, *S. grahami* n.sp. Fig. 58, *S. nigrita* Wheeler (California). Fig. 59, *S. flaviventris* n.sp. Fig. 60, *S. flaveola* Meigen (small yellow specimen, California).

2. Arista with one or more ventral branches 3
3. Arista with one ventral branch. Male forceps with a continuous row of marginal teeth; Paralobes always lacking. Ovipositor guides usually with dense marginal dentation and sometimes also with numerous teeth on the surface 4
- Arista with more than one ventral branch basally of the end fork. Male forceps as above or different. Paralobes sometimes present (*multispinosa*). Ovipositor guides (as far as known) ending bluntly provided with coarse apical dentation 14
4. Posterior orbits with an extra orbital hair (or bristle) between the posterior reclinate orbital and the inner vertical bristle. Posterior scutellars long (Scutellar index < 1.5) 5
- No such orbital hair or bristle. Posterior scutellars sometimes short 7
5. The extra orbital hair bristle-like and at least half as stout as the anterior reclinate orbital. (Austrian Alps) *norica* Hackman
- The extra orbital hair minute, much smaller than the orbital bristles 6
6. General colour of mesonotum grey 7
- General colour of mesonotum yellow *flaveola* Meig. nominate ssp. (Holarctic region) and yellow specimens of *flaveola* ssp. *montana* (Western North America).
7. Ovipositor guides yellowish, stouter and broad to the truncated end *flaveola montana* and occasional grey specimens of the nominate subspecies.
- Ovipositor guides to a great part blackish, more narrowing towards the end. (Scotland) undescribed species.*
8. Abdomen entirely yellow, contrasting with the gray pollinose metanotum. (Western U.S.A.) *flaviventris* n.sp.
- Abdomen dark or at least not paler than the thorax 9
9. Palpi with only one prominent apical bristle. Ovipositor guide apically narrowing, not provided with tooth-like bristles. (Northern Europe, Eastern Asia) *consimilis* Hackman
- Palpi with more than one prominent apical bristle. Ovipositor guides apically rounded, usually with coarse marginal dentation and numerous teeth on the surface 10
10. Femora nearly black, tibiae and tarsi somewhat brownish, the fore coxae pale. (Western U.S.A.) *nigrita* Wheeler
- Legs yellow, more or less pale 11
11. Lower part of male anal cerci strongly curved anteriorly. Ventral margin of the genital arch with a bare finger-like projection. (Japan) *polygonia* Okada
- Male hypopygium not as above 12
12. In the male genitalia the teeth of the forceps margin are remarkably elongated in the ventral direction. Anal cerci moderately large, not much protruding ventrally. Wing length as a rule more than 2.7 mm. (Northern Europe, Alaska: Sitka) *teinoptera* Hackman
- Marginal teeth of forceps almost equal in size, short and blunt. Wing length usually less than 2.7 mm 13
13. Mesonotum with distinct «*Scaptomyza* pattern», general colour pale grey or yellowish 14
- Mesonotum dark grey with faint or no pattern. Male anal cerci small, not protruding ventrally, and completely covered with microscopic hairs. (Northern Europe) *griseola* Zett.

* This species will be described by Mr. E. B. BASDEN (Edinburgh) in the next future.



Figs. 61—64. Male genitalia of *Scaptomyza* (s.str.) species. Fig. 61. *S. flaveola montana* Wheeler, (Oregon) side view. Fig. 62. *S. flaviventris* n.sp. Fig. 63. *S. nigrita* Wheeler (California). Fig. 64. *S. melancholica* Duda (Chile). Figs. 65—71. Ovipositor guides of *Hemicaptomyza* species. Fig. 65. *H. trochanterata* (Alaska), fig. 66. the same species from Newfoundland, fig. 67. *H. terminalis* Loew (Sitka), fig. 68. *H. okadai* n.sp. (Kamtchatka), fig. 69. *H. unipunctum* (Finland), fig. 70 *H. hsui* (California), fig. 71. *H. apicata* Thoms. (California).

14. Male anal cerci large, protruding ventrally. Upper corner of forceps margin rather blunt. General colour of mesonotum light grey. (Wide holarctic distribution) *graminum* Fall.
 — Male anal cerci moderately large. Upper corner of forceps margin forming a sharp

- angle (seen in profile). Mesonotal general colour yellowish grey. (Canary Islands, Azores) *atlantica* Hackman
15. Mesonotum dark grey to blackish with less distinct »*Scaptomyza* pattern» 16
 — Mesonotum yellowish brown, without pattern. Arista with 2 or 3 ventral branches basal of the fork. Palpi dark. (Japan) *S. sp. (apicalis* Okada nec Hardy)
16. Frons broadly yellow in front. Male cerci comparatively large and protruding in caudal direction. Paralobes present, nut rather small. Forceps margin with two projections each carrying a dark dentiform spine. (Chile, Argentina) *multispinosa* Malloch
 — Frons dark or at most becoming reddish yellow in front. Male genitalia not as above 17
17. Antennae dark brown or blackish. Male cerci large and elongated dorsoventrally, protruding below. Male forceps not conspicuously large (length of hind margin about half the vertical diameter of the cerci). (Chile) *noei* Brncic
 — Antennae brownish yellow, third joint usually darkened above or at apex. Male cerci comparatively small. Forceps large (hind margin as long as or longer than the vertical diameter of the cerci) 18
18. Carina nose-like. Hind femora yellowish in both sexes. Two central series of acrostichal hairs normal. Hind margin of male forceps with a few dark dentiform spines near the basal corner; a comb of hairlike bristles along the margin (Fig. 64). (Argentina, Bolivia, Chile) *melancholica* Duda
 — Carina narrow, low and rounded below. Hind femora darkened in the females. The two central series of acrostichals stronger than usual. Hind margin of male forceps with strong dentiform dark spines near the apex. (Argentina, Chile)
 *denticauda* Malloch

3. ON CERTAIN CHARACTERS USED IN THE CLASSIFICATION OF THE SCAPTOMYZA SPECIES

The systematics of the *Drosophilidae* has in the case of the large genus *Drosophila* Fall. been developed to a higher level than in any other group of Diptera. The division into subgenera and species groups was initiated by STURTEVANT (1921) and continued by a number of authors (see PATTERSON & STONE 1952). It is now based not only on characters which can be studied in dried specimens, but also on internal anatomic characters of the reproductive organs, egg morphology, caryological features and even behaviour. It must, however, be admitted that the *Drosophila fenestratum* group, obviously deserving the rank of a subgenus (HACKMAN 1955, WHEELER 1957), is still very little known in the above respects. In the case of *Scaptomyza* only the first pioneer work has been done by WHEELER (1952) and OKADA (1956), who have studied the internal reproductive organs in a number of species and by STALKER (1945) and BRNCIC (1955) who have published figures of the chromosomes of certain species. My own classification of the species in the genus *Scaptomyza* is based purely on dried material and I admit that the estimation of the systematic value of the different chaetotactic and genital characters may be more or less subjective in some cases. If we compare with the genus *Drosophila*, it can be

condition in the genus, 2 occur in numerous species. More than two occur in a few species. The number is in some of these cases less stable even within the species, and is sometimes correlated with the size of the end fork.

The orbital bristles. The site and direction of the orbital bristles is relatively constant in the genus and involves general characters of the entire family *Drosophilidae*. In details, these bristles in some cases give good specific characters but I have not tried to use these bristle characters in the subdivision of the genus.

The humeral bristles. The number and relative size of the humeral bristles is a fundamental character in my subdivision of *Scaptomyza*. There are three different main types with regard to this character: 1 stout humeral, 1 + 1/2 and 2 subequal ones. These types are not always so clearcut and one may encounter doubtful cases. In any event, the condition of the humeral bristles is strongly correlated with a number of other characters.

The dorsocentral bristles. As a rule the *Scaptomyza* species have only two pairs of postsutural dorsocentrals. The only exceptions are the two *Macrosaptomyza* species, which have three postsutural pairs. The subg. *Macrosaptomyza* shows, however so many genital characters in common with the *Parasaptomyza pallida* group (*pallida* Zett., *impunctata* Frey, *substrigata* de Meijere) that there seems to be no reason to remove it from the genus *Scaptomyza*. One pair of presutural dorsocentrals occurs in some species of *Troglosaptomyza* and *Parasaptomyza* and further in the *vittata* group among *Mesosaptomyza*.

The acrostichal rows of hairs. A general character of the genus is that the number of acrostichal hairs are not more than four. It must be mentioned that in some species of *Troglosaptomyza* for example, the acrostichal rows may be irregularly six-rowed in the front part of the presutural area of the mesonotum but even in these cases there are distinctly four rows in the postsutural area. In a number of *Scaptomyza* species there are only two rows (the inner rows), but as already mentioned in another connection, the difference 2- or 4-rowed has proved to be less useful in the subgeneric systematics of the genus and both types may occur even within a species (*Troglosaptomyza mediopallens* n.sp., *Parasaptomyza impunctata* Frey, *Hemisaptomyza okadai* n.sp.). SÉGUY (1938) reports a case of total absence of acrostichal hairs in an African species, *Bunostoma* (?) *melania* Séguy. Acrostichal macrochaetae have been found in one species, *Parasaptomyza mumfordi* Mall.

The scutellar bristles. Short upright apical scutellars are a characteristic feature of the subg. *Mesosaptomyza* but also occur in single species of other subgenera. *Scaptomyza graminum* Fall. shows considerable geographical variation in the relative size of the scutellars. With »scutellar index» I have meant here the length ratio of the basal scutellars to the apical ones.

The mesonotal pattern. Most *Scaptomyza* species have a very characteristic pattern of brown stripes on a greyish or yellow-brown ground colour: a median stripe between the inner rows of acrostichal hairs and broader lateral stripes outside the dorsocentral rows. In this paper I have used the term »*Scaptomyza* pattern» for this pattern. In a number of dark coloured or pale yellowish species, the pattern may be very faint or disappear entirely. In the subg. *Tantalia* and in some *Trogloscaphomyza* species there are stripe patterns of aberrant types.

The venation of the wings. The wing indices: costal index, 4th vein index etc., have proved to be very valuable for separating closely related species (see e.g. HACKMAN 1955b). Some species, for example *S. (Mesoscaphomyza) wheeleri* n.sp. show a considerable amount of variability in this respect, but it seems as if the costal index in general is fairly constant within individual populations. Obviously there is an allometric relation between the costal portion mg_2 and the length of the wing. Reduced wings with more or less modified venation are found in three species of the subg. *Parascaphomyza*. I have not found any vein character usable for the subgeneric division.

Wing spots. An apical wing spot, often only a diffuse cloud around the end of 3rd vein, occurs in males of most species of the subg. *Hemiscaphomyza*, and sometimes also in the females. A wing spot of the above type is also a characteristic of the *adusta* group in subg. *Mesoscaphomyza*. This group is obviously very closely related to the *Hemiscaphomyza* species. In a few aberrant species there is more than one wing spot (*Hemiscaphomyza intermedia* Duda, *H. bipunctipennis* Wheeler and *Tantalia albovittata* Mall.).

Male cerci (Anal plates). Except in a few cases, these organs of the male genitalia are less useful for the subgeneric classification. In *Parascaphomyza* the cerci are comparatively small, in the hitherto monotypic subg. *Metascaphomyza* they are conspicuously prolonged. For separating species they give useful characters.

The »paralobes» of the male genitalia. FREY (1954) has used the term paralobes for paired forceps-like structures usually armed with stout dentiform bristles and inserted between the cerci and the true forceps of the *Scaptomyza* species. At least in *Parascaphomyza* and *Macrosaphomyza* these structures are most probably derived from the cerci. A schematized figure of the male genitalia of *S. (Parascaphomyza) pallida* Zett. (= *disticha* Duda) given by NATER (1953) shows that the author has interpreted the origin of these structures in this way. Paralobes are present in all species of the three above-mentioned subgenera and, in addition occur in some species of *Mesoscaphomyza*, and are in *M. vittata* Coq. much stronger than the forceps. In *Metascaphomyza cochleata* Burla large spatulate structures are seen which may be homologous with the above-described paralobes. Whether the »paralobes» of *S. (Hemiscaphomyza)*

intermedia Duda and *Scaptomyza multispinosa* Mall. are of the same origin remains uncertain. In *Trogloscaptomyza* all trace of paralobes is lacking, and the same is true of all other species of *Tantalia*, *Bunostoma*, *Hemiscaptomyza* and *Scaptomyza* studied, except the above-mentioned two species. I have regarded the absence or presence of paralobes as an important character for the subgeneric division of the genus.

Other characters of the male genitalia. The forceps is fairly uniform and of a simply built type in *Trogloscaptomyza*, *Tantalia* and *Bunostoma*. In the *flaveola* — *graminum* group (*montana* group of WHEELER) among *Scaptomyza* s.str. and in most *Hemiscaptomyza* species, it is also fairly uniform in shape and provided with a marginal (sometimes interrupted) row of dark dentiform bristles. More complicated types are represented in *Parascaptomyza*, *Macrosaptomyza* and in species of the *melancholica* group of *Scaptomyza* s.str. *Mesosaptomyza* shows some aberrant types (*subvittata* n.sp., *paravittata* Wheeler, *wheeleri* n.sp.). The ventral parts of the male genitalia have not been much considered in this work, but here, too, characters useful in phylogenetic studies might possibly be found, as NATER (1953) has shown in the case of the genus *Drosophila*.

The ovipositor guides (egg guides). The coarsely dentate ovipositor guides of the *Scaptomyza* (s.str.) species are obviously an adaption for (leaf-mining) and facilitate egg-laying on the leaves of the food plant. Likewise in most *Hemiscaptomyza* species the ovipositor guides are strongly sclerotized and dentate. The species of *Trogloscaptomyza*, *Tantalia*, *Macrosaptomyza*, *Bunostoma* (most species), *Parascaptomyza* and *Metascaptomyza* have weakly sclerotized ovipositor guides. *S. (Parascaptomyza) pallida* Zett., at least, is known to be saprophagous and probably this is also the case in most species the other 6 subgenera mentioned above. The subg. *Mesosaptomyza* here takes a more or less intermediate position.

4. ASPECTS OF THE BIOLOGY AND ZOOGEOGRAPHY OF THE SCAPTOMYZA SPECIES

Relatively few *Scaptomyza* (s.lat.) species have hitherto been reared from eggs or larvae. *S. (Parascaptomyza) pallida* Zett., a cosmopolite occurring in the open from arctic areas in the North to the tropics in the South, is obviously mainly saprophagous. STALKER (1945) has cultivated this species on a modified »*Drosophila* medium». It seems to me that the statements that this is a leaf-mining species need to be checked because of the nomenclatorial confusion concerning this species (*S. graminum* auct.). *S. (Trogloscaptomyza) brevilamelata* Frey was found on Tristan da Cunha in nest holes of birds and is probably also saprophagous. Of the *Scaptomyza* sensu str., a number of species have

TABLE 1.

The distribution of the subgenera in the different regions.

	Trogloscapto- myza	Tantalia	Parascapto- myza	Macroscapto- myza	Bunostoma	Metascapto- myza	Mesoscapto- myza	Hemiscapto- myza	Scaptomyza
R e g i o n s :									
Palaearctic			●					●	●
Nearctic			●				●	●	●
Ethiopian			●		?	●		?	
Oriental			●						
Australian			●		●				
Neotropical			●				●	●	●
R e m o t e o c e a n i c i s l a n d g r o u p s :									
Macaronesia			●						●
Cape Verde			●						
Tristan da Cunha	●		●	●					
Hawaii	●	●	●		●				
Marquesas	?		●		●				
Samoa					●				

been reared from leaf-mining larvae: *S. flaveola* Meig. (*Cruciferae* plants mainly), *S. graminum* Fall. (*Caryophyllaceae*), *griseola* Zett. (*Caryophyllaceae*). It is most probable that all the *Scaptomyza* (s.str.) species with coarsely dentate ovipositor guides are leaf-miners. Several of these species have been swept from cruciferous or caryophyllaceous plants as imagines.

The species of subg. *Mesoscapto-myza* occupies obviously an intermediate position. WHEELER (1952 a p. 197) states that the larvae of *S. (M.) adusta* Loew can feed either as leaf-miners or as saprophages (on rotting cactus). The species has also been raised in the laboratory by Wheeler. *S. (M.) paravitata* Wheeler has been raised from leaf-mines on *Nasturtium* (WHEELER op.c.).

In the subg. *Hemiscapto-myza* there are also leaf-mining species, for example *S. (H.) apicata* Thoms. (on *Nasturtium*, WHEELER 1952 a p. 202, («*S. terminalis*»)). Most species of *Hemiscapto-myza* have dentate ovipositor guides.

The distribution of the *Scaptomyza* subgenera shows a number of interesting features: At first sight, the subgenus *Trogloscapto-myza* attracts attention because of the very peculiar distribution: Tristan da Cunha and Hawaii. We must, however, bear in mind that we are dealing with very small and easily overlooked insects, the distribution of which is still very little known. That *S. (T.) bervilamellata* from Tristan da Cunha is really very closely related to some of

the Hawaiian species is shown by a number of structural characters. There are features indicating that the *Trogloscaptomyza* species represent an old group in the genus the remnants of which have survived on remote island groups. Closely allied to this subgenus is subg. *Tantalia*, also from Hawaii and further *Rosenwaldia* Mall. (probably a synonyme of *Trogloscaptomyza*) from the Marquesas.

The subg. *Parascaptomyza* contains with few exceptions (the cosmopolitan *P. pallida* Zett. = *disticha* Duda, *P. picipemorata* n.sp., and obviously *P. substrigata* de Meijere) island endemites: 6 species on Tristan da Cunha, 1 species on the Azores, 3 on Marquesas Islands and 1 in Hawaii. The Tristan da Cunha subgenus *Macrosaptomyza* is closely allied to *Parascaptomyza*. It is further interesting to state that *Parascaptomyza freyi* n.sp. has some characteristic features in common with the *Parascaptomyza* species from islands in the Pacific: Broad head, short mesonotum and exceptionally long internal vertical bristles. *Parascaptomyza pallida* Zett. is the only species of *Scaptomyza* s.lat. which has a world-wide distribution. Probably this species has been introduced by man into many places, for example into Hawaii, but it might be mentioned that the species is also taken in biotopes not influenced by man. For example, the species was collected by Dr. H. KROGERUS in long series in the Cicq Cerf River area of Newfoundland, i.e. in localities very far from human settlements.

The subg. *Mesosaptomyza* is restricted to the New World. The *vittata* species group is mainly neotropic but extends northward up to Maryland. *S. (M.) adusta* Loew obviously has the widest distribution of the species of the subgenus covering large areas of North and South America.

The *Hemiscaptomyza* species seem to be mainly mountainous forms, occurring in lower altitudes in arctic or subarctic areas. The distribution of the *terminalis* species group in North America (See fig. 73) shows features found in a number of other groups of closely related species among the arthropods, for example species of the *Pityohyphantes costatus* group and the *Pusillia mandibulata* group among the spiders (see HACKMAN 1954 p. 11): One species, *S. (Hemiscaptomyza) trochanterata* Collin (occurring also in Europe), distributed from Alaska to New England, and a number of related species (in this case 4) occurring mainly in mountain areas in Western North America. Some further *Hemiscaptomyza* species of the same group occur at high altitudes in Central and South America.

Scaptomyza (s.str.) consists in two sections, the species related to *flaveola* Meig. and *graminum* Fall. (*montana* species group of WHEELER) and on the other hand, the *melancholica* group and a Japanese species leading over to *Drosophila*. The first section has a mainly holarctic distribution with the majority of the species in the Palearctic Region. It seems possible that the nominate yellow

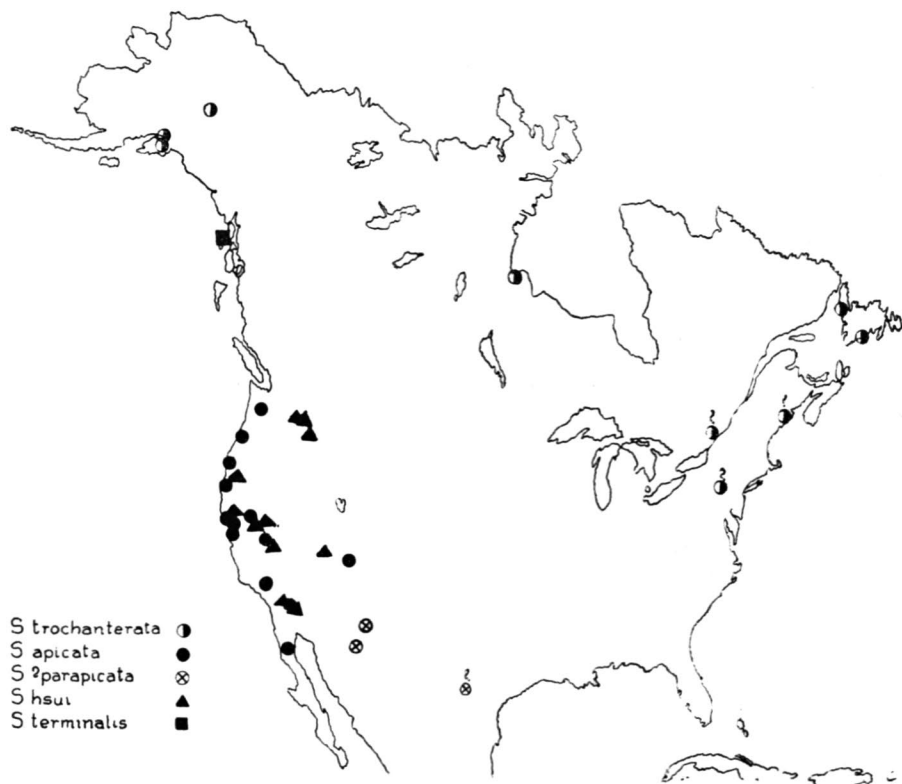


Fig. 73. Map showing the distribution of five *Hemiscaptomyza* species in North America.

form of *S. flaveola* Meig. has been introduced with man from Europe into Eastern North America and has spread in a westward direction as a pest on cabbage. FROST (1923) expresses this suspicion in his paper on leaf-mining North American Diptera. The finds of small yellow-coloured specimens in California might also have been secondarily introduced and might perhaps interbreed with the Western American grey form, *S. montana* Wheeler, here considered as a subspecies of *flaveola*. This would be one explanation for the local populations of mainly yellowish *montana*-like flies in California. All this is, however, hypothetical and the problem of *S. flaveola* can be solved definitely first by breeding and crossing experiments.

The *melancholica* group is restricted to South America but there is an unnamed Japanese species identified by OKADA (1956) as *apicalis* (but certainly not HARDY's species) probably related to this group. The *melancholica* group and related forms probably represent, like *Trogloscaptomyza* and *Bunostoma*, an old branch of *Scaptomyza* (sens.lat.) showing a number of characters in common with the *Drosophila fenestratum* group.

The species placed in the subgenus *Bunostoma* occur all in the Australian region.

The endemic African *Scaptomyza* species are still too little known to bring them into any certain systematic relation to the species from other areas of the world. A separate subgenus has been erected here for one species, *Metascaptomyza cochleata* Burla, the only endemic African species of which the male genitalia have been depicted in the literature.

5. THE SCAPTOMYZA (S.LAT.) SPECIES

Subg. TROGLOSCAPTOMYZA Frey

S. (T.) brevilamellata Frey.

Parascaptomyza (Trogloscaptomyza) brevilamellata FREY 1954.

This species from Tristan da Cunha has a flattened head and the longest eye diameter is nearly horizontal. These characters also occur in some of the Hawaiian species of the subgenus. *S. (T.) brevilamellata* differs from the Hawaiian species in having only two rows of acrostichal hairs. Detailed figures of the male genitalia of this species are given by FREY (1954 figs. 4 and 5). Female unknown.

Type locality: TRISTAN DA CUNHA: Nightingale Island.

S. (T.) mediopallens n.sp.

Body length about 2 mm. Wing length 2.2–2.4 mm. Costal index 2.7–3.1.

♂ — Head moderately flattened (in comparison with *mitchelli* n.sp.; longest diameter of eye forming an angle of about 30° with the frontal plane. Ocellar triangle and orbitae pale grey, the remaining median parts of frons yellow brown, front quarter pale yellow. Orbital bristles normal. Antennae pale yellow, arista with large end fork and two dorsal branches. Face pale greyish yellow, carina low but distinct. Oral bristles of normal type. Jowls pale greyish yellow, $\frac{1}{7}$ of the vertical diameter of the eye. Palpi brownish yellow with one prominent apical bristle. Mesonotum inside the dorsocentral rows pale brownish yellow, outside these rows a broad dark brown band on both sides. Humeral area and a broad marginal zone pale. One humeral bristle. Only two rows of acrostichal hairs. A presutural pair of dorsocentral bristles present and about as prominent as the humeral bristle. Pleura brownish yellow, brownish suffused at the upper margin. Scutellum pale yellowish, but with distinct continuation of the dark lateral bands of the mesonotum. Scutellar index 2.1, in other words, apical scutellar bristles short. Legs yellow, the last joints of tarsi darkened. Wings slightly greyish yellow, veins normal. Halteres yellowish. Abdomen dark brown. Male genitalia as in fig. 1.

♀ — Similar to the male in colour and appearance. Outside the two inner rows of acrostichal hairs there are a few hairs (2—3) representing the external row on each side. Abdomen above dusky brown. Anal plate blackish. Ovipositor weakly sclerotized, reddish yellow and provided with sparse marginal hairs.

Holotype ♂, H a w a i i (Island Hawaii): Kaula Gulch (2,100 m.) VIII 1952 leg. E. Hardy. Allotype ♀, from the same locality.

S. (T.) mitchelli n.sp.

Body length about 2 mm., wing length 2.1—2.2 mm. Costal index 3.3—3.7

♂ — Head somewhat flattened, longest diameter of eye nearly horizontal. Frons greyish pollinose, ocellar triangle grey, orbitae greyish yellow, other parts reddish fulvous yellow, pale yellow in the front fourth. Chaetotaxy of the head as in *brevillamellata* Frey. Face pale yellow, carina low but distinct. Antennae yellow, third joint of about the same length as the second. Arista with 2 dorsal branches in addition to the end fork. Palpi yellow with 2 apical bristles, one of them long. Jowls yellow. Width about $\frac{1}{4}$ of the vertical diameter of the eye. Vibrissa stout, the other oral bristles half as long as the vibrissa or shorter and more hairlike. Mesonotum dusky yellow and as in *brevilamellata* without any distinct pattern. One stout humeral bristle. Four rows of acrostichal hairs. Dorsocentrals 1 + 2, the presutural one of the same size as the humeral bristle. Scutellum of same colour as the mesonotum. Index of scutellar bristles 1.3. Abdominal tergites brownish, slightly darker than the mesonotum. Wings clear, veins normal. Halteres pale yellow. Male genitalia figs. 4, 5.

♀ — Almost similar to the male. The third joint of the antennae is darkened, however, in the apical half. The mesonotum shows traces of a median brown stripe. Abdomen brownish yellow, the three last tergites paler. Anal plate black. Ovipositor guides weakly sclerotized, yellow and provided with sparse hairs along the margin.

Holotype ♂, H a w a i i: Maui, Paliku, Haleakala Crater, VIII 1952 leg. W. C. Mitchell. Allotype ♀ from the same locality VI 1952 leg. E. Hardy. 2 male paratypes from the same locality.

S. (T.) aloha n.sp.

Body length about 2.3 mm. Wing length 2.3—2.7 mm. Costal index 3.4—4.0.

♂ — Very similar to the preceding species and differing mainly in the male genitalia. Frons more flattened than in *mitchelli* and paler in colour. Face whitish, carina less distinct. Palpi slightly brownish near the apex. The two dark apical bristles less different in size than in *mitchelli*. Second oral bristle distinctly stronger than in *mitchelli* and more than half as long as the vibrissa. Mesonotum dusky yellow with faintly shadowed lines along the dorsocentral

rows. Chaetotaxy of thorax as in *mitchelli*. Scutellum of same colour as mesonotum. Scutellar bristle index 1.3. Wings and halteres as in *mitchelli*. Legs yellow, ultimate tarsal joints dusky. Abdomen yellow-brown. Male genitalia as in fig. 7.

♀ — Differs from the male in some external characters: Third antennal joint blackish. Palpi except at the base blackish brown. The brown stripes along the dorsocentral rows more distinct. Abdomen yellow-brown but the last two tergites are blackish. This character, if constant, would easily separate the females of this species from those of *mitchelli*. Anal plate and ovipositor guides similar to those of *mitchelli*.

Holotype ♂, H a w a i i: Molokai, Puu Alii VII 1953 leg. M. Tamashiro. Allotype ♀, from the same locality. Two female paratypes from the same locality. There is a further female specimen from the above locality with a more distinct pattern on the mesonotum and only slightly darkened last tergites. It is possible that it belongs to some other new species.

S. (T.) striatifrons n.sp.

Body length about 2 mm. Wing length 2.1–2.6 mm. Costal index 2.9–3.4.

♂ — Head flattened as in the three preceding species. Frons orange-brown with a dark grey median stripe running the whole length of the frons. The lateral parts of the ocellar triangle and the orbitae pale grey. Chaetotaxy of frons as in the preceding species. Face whitish, carina distinct. Antennae yellow. Arista with a large end fork and 2 dorsal branches. Palpi black with two apical bristles unequal in size. Vibrissa much stronger than the other oral bristles. Jowls pale and of the same width as in the preceding species. Mesonotum yellow-brown, pale greyish pollinose with a very faint brown median stripe and indistinct brown lines along the dorsocentral rows. 1 humeral bristle. Dorsocentrals 1+2; the presutural pair nearly as stout as the post-sutural ones. Pleura yellow, brownish suffused in the upper part. Scutellum darker greyish brown. Scutellar index 1.3. Wings clear, venation normal. Halteres dusky yellow. Legs yellow, ultimate tarsal joint dark. Abdomen dusky brown. Male genitalia as in figs. 2, 3.

♀ — Similar to the male but differing in the following characters: Second and third antennal joint darkened. The brown suffusion in the upper half of the pleura forms an oblique band. The dark brown abdominal tergites have a rather narrow yellow caudal border. The two last tergites entirely dark. Anal plate black. Ovipositor guides as in the other species of the subgenus weakly sclerotized and provided with marginal hairs.

Holotype ♂ H a w a i i: Kauai: Waialae Stream, 1,000 m. VII 1952 leg. E. Hardy. Allotype ♀, from the same locality. 3 female paratypes from the same locality, a male one from Kauai: Kokee (1,100 m.) and a female one from Kauai: Alakai Swamp (1,100 m.) all taken by Dr. E. Hardy.

S. (T.) abrupta n.sp.

Body length about 2 mm. Wing length 2.7 mm. Costal index 2.9.

♂ — Head less flattened than in the preceding species. The longest diameter of the eye forming an angle of about 30° with the frontal plane. The ocellar triangle broadly dark grey, so also the upper half of the orbitae. The remaining front parts of the frons yellow, laterally paler. Antennae yellow; second joint darkened above. Arista with two dorsal branches in addition to the comparatively large end fork. Face pale yellowish with indistinct varina. Width of the pale yellow jowls about $\frac{1}{7}$ of the vertical diameter of the eyes. Palpi yellow with two unequal black apical bristles. Oral bristles as in *mitchelli* and other species of the subgenus. Mesonotum yellow except for diffuse lines along the dorsocentral rows and the caudal third, which is greyish brown. One stout humeral bristle. Dorsocentrals $\frac{1}{2}+2$, e.g. the presutural dorsocentral is only half as long as the postsutural ones. Lateral parts of mesonotum and most parts of the pleura brownish suffused. Scutellum dark, of same colour as the hind part of mesonotum. Scutellar index 1.5. Legs dusky yellow, distal joints of tarsi darkened. Wings slightly greyish, veins dusky yellow. Abdomen red-brown. Male genitalia as in fig. 6.

Holotype ♂, H a w a i i: Maui, Haleakala Crater VI 1952 leg. E. Hardy. Female unknown.

S. (T.) longipecten n.sp.

Body length 1.7–2 mm. Wing length 1.8–2.2 mm. Costal index 2.9–3.8.

♂ — Frons reddish yellow, ocellar triangle greyish, only its central part dark. Orbitals pale grey. Orbital bristles of usual type. Eyes of normal type, head not flattened. Antennae yellow; arista with a small end fork and two dorsal branches. Face pale greyish yellow, carina low. Palpi usually entirely yellow, sometimes brownish at apex; apical bristles subequal in size. Jowls narrow, about $\frac{1}{7}$ of the vertical diameter of the eye. Mesonotum grey-brown, with brown »*Scaptomyza* pattern». One stout humeral bristle. Acrostichal hairs in four rows, the anterior hairs somewhat irregularly inserted. No distinct presutural dorsocentral bristle. Pleura brownish yellow. Scutellum of same colour as the mesonotum. Scutellar index 1.7. Legs dusky yellow, last tarsal joint darkened. Wings slightly greyish brown, veins darkened. Halteres yellowish. Abdomen yellow-brown, somewhat variable in colour, usually paler than the mesonotum. Hypopygium dark. Male genitalia as in figs. 8, 9. Forceps with a long comb of teeth on the inner surface.

♀ — Similar to the male, sometimes deeper in colour on frons and mesonotum. Palpi sometimes darkened against apex. Scutellum usually darker on the disc than laterally. Abdominal tergites laterally paler yellowish, except

at the hind margins. Anal cerci dark. Ovipositor guides yellowish, very weakly developed.

Holotype: ♂, H a w a i i: Molokai: Puu Kolekole, VII 1952 leg. E. Hardy. Allotype from the same locality. Paratypes: 3 ♂♂, 9 ♀♀ from the same locality, 1 ♂ Molokai: Hanalililo, 2 ♂♂, 2 ♀♀ Molokai: Puu o Kaeha, 2 ♂♂ 6 ♀♀ Molokai: Puu Alii, 1 ♂, Lanai: Lanathale. A grey male specimen from Maui: Holua (2,000 m) agree with *longipecten* in the genitalia and obviously belongs here in spite of the difference in mesonotal colour.

S. (T.) pallifrons n.sp.

Body length 1.7–1.9 mm. Wing length ♂ 2.0–2.5 mm, ♀ 2.2–2.5 mm. Costal index 2.8–3.6.

♂ — Frons pale greyish yellow to yellow-brown. Only the central part of the ocellar triangle dark grey; Orbitae pale greyish pollinose, the front margin of frons a brighter yellow. Frontal bristles of usual type and position, but the anterior reclinate orbital is a very small and fine hair. Antennae yellow. Arista with two dorsal branches, an end fork and no ventral branches. Face whitish yellow and without a distinct carina. Jowls pale yellowish and narrow. Vibrissa strong, the other oral bristles small and hair-like. Palpi yellow, sometimes slightly brownish at apex and provided with one apical bristle and two small subapical ones. Mesonotum greyish yellow with pale, usually indistinct, brown *Scaptomyza* pattern. One strong humeral bristle. Dorsocentrals 0+2. Acrostichal hairs in four rows at the level of the anterior pair of dorsocentrals, farther backwards in two rows. Pleura pale yellowish. Scutellum of the same colour as the mesonotum, medially somewhat darker. Index of scutellar bristles about 1.5. Wings normal, slight yellowish. Halteres yellow-brown. Legs pale yellowish, end joints of tarsi slightly darkened. Abdomen greyish yellow yellow-brown; Two last tergites darkened. Hypopygium dark. The male genitalia are depicted in figs. 10, 13.

♀ — Almost similar to the male in colour and chaetotaxy but the palpi are more variable in colour; yellow with brownish apex to dark fuscous. Facial carina forming a knob hidden between the antennae. Abdominal tergites yellow-brown, caudal margin darker. Last tergites blackish. Ovipositor guides pale and weakly sclerotized, provided with some pale marginal hairs. Some females are difficult to separate from those of *hawaiiensis* n.sp. described below. The frons however, is darker and the mesonotal pattern more distinct and usually on a grey ground in the latter species.

Holotype, ♂: H a w a i i: Hawaii Island, Kaula Gulch (2,100 m.) VIII 1952 (leg. E. Hardy). Allotype, ♀, from the same locality. Paratypes from the same locality (18 ♂♂, 21 ♀♀) and from Hawaii Island: Keanakolu (♂, ♀) and Kaiholena (1 ♀), further from Maui: Haleakala (2 ♂♂, 7 ♀♀).

A female specimen from Molokai (Hanalililo) and some further ones from Kauai Island (Nualolo Valley and Poomau Valley) might probably belong here.

S. (T.) hawaiiensis n.sp.

Body length about 2 mm. Wing length: ♂ 2.2 mm, ♀ 2.5 mm. Costal index 2.8—3.7.

♂ — Orbitae and the ocellar triangle greyish pollinose; frons between these parts yellow-brown — red-brown, in the front third bright yellow. Frontal bristles as in *pallifrons*. Antennae yellow — yellow-brown. Arista as in *pallifrons*. Face greyish yellow, carina not very distinct. Jowls narrow, greyish yellow. Second oral bristle about half as strong as the vibrissa. Palpi blackening against apex and provided with one prominent apical bristle and 2 smaller subapical ones. Mesonotum dark yellow-brown or light grey, with a usually distinct dark brown *Scaptomyza* pattern. Thoracic bristles as in the preceding species. Four rows of acrostichal hairs; the external rows reach farther back between the dorsocentral bristles than in *pallifrons*. Scutellum of the same colour as the mesonotum, basal-medially darkened. Pleura dusky yellow, darkened along the mesonotal border or sometimes almost entirely greyish brown. Wings normal, usually somewhat greyish. Halteres yellow to yellow-brown. Legs pale greyish yellow, the last tarsal joints darkened. Abdomen grey-brown. Hypopygium dark. Genitalia fig. 15.

♀ — Similar to the male in chaetotaxy and most colour characters. The brown parts of frons between the ocellar triangle and the orbitae usually darker, sometimes dark reddish brown. Facial carina more distinct than in the male but not decidedly nasiform. Antennal joints darker than in the male. Abdominal tergites dark grey-brown, basal-laterally lighter. Ovipositor guides weakly chitinized and pale.

Holotype, ♂, H a w a i i: Hawaii Island: Kaula Gulch (2,100 m), VIII 1952 (leg. E. Hardy). Allotype, ♀ from the same locality. From this locality there are further 4 ♂♂ and 4 ♀♀, from Hawaii Island: Kulani (1,600 m) there is 1 ♀ from Hualalai (1,200—1,800 m.) 4 ♀♀ and from Maui Island: Haleakala Crater (2,000 m.) 2 ♂♂ and 1 ♀.

S. (T.) hardyi n.sp.

Body length about 2 mm. Wing length 2.0—2.2 mm. Costal index 3.0—3.7.

♂ — Head not flattened, as in *hawaiiensis*. Frons brownish yellow; Ocellar triangle and orbitae greyish pollinose. Front 4th of frons yellow but with a median brownish spot beginning from the tip of the ocellar triangle and continued until the front margin. The spot between the ocelli is dark grey. Orbital bristles of normal size and position. Antennae yellow — yellow-brown, second joint darker than the third. Arista as in *hawaiiensis* and other related species. Face greyish or whitish yellow and with a low carina. Mesonotum brownish yellow with usually dark and distinct brown *Scaptomyza* pattern. Chaetotaxy of thorax as in *hawaiiensis*. Jowls narrow, pale yellow. Vibrissa much stouter than the second oral bristles (about half as long as the vibrissa). Palpi brown-blackish. Pleura yellow, brownish along the upper border. Scu-

tellum brownish yellow, darkened medially. Wings normal, yellowish. Halteres dusky yellow. Legs yellow, tarsi darkening against apex. Abdominal tergites yellow-brown, laterally at the basal margin light yellow. Male genitalia figs. 14, 16. Forceps distinctly different in this species and *hawaiiensis*.

♀ — Similar to the male in chaetotaxy and colour characters. Last abdominal tergite dark brown. Ovipositor guides as in *hawaiiensis*.

Holotype: ♂, H a w a i i : Kauai, Waialae Stream (1,100 m.) VIII 1953, (leg. E. Hardy). Allotype: ♀ from the same locality. Paratypes from the same locality (10 ♂♂ 9 ♀♀) and further from Kawaikoi Stream, Mt. Waialele Trail (1,300 m.), Kokee, Alakai Swamp, Kalaiau Lookout and Nualolo Val., all localities on Kauai Island.

S. (T.) kauaiensis n.sp.

Body length about 2 mm. Wing length 2.2 mm. Costal index 3.7.

♂ — Head not flattened, normal as in *hawaiiensis* and *hardyi*. Frons yellow-brown, darkening gradually against the front margin, which is blackish. Ocellar triangle pale greyish pollinose dark in the middle. Orbitae pale greyish yellow, pollinose. Anterior reclinate bristle represented by a very small short hair. Other orbitals normal. Antennae dark red-brown. Arista with two dorsal branches and a comparatively large end fork. Face medially and at the lower border broadly dark brown, laterally yellowish grey. Carina low. Second oral bristle more than half as long as the vibrissa. Jowls narrow, whitish yellow with a narrow dark border. Clypeus margin blackish. Palpi black with one prominent apical bristle. Mesonotum brownish yellow with light brown *Scaptomyza* pattern. The lateral bands are, however, only represented by suffuse lines along the dorsocentral rows. One strong humeral bristle. Dorsocentrals 0 + 2; acrostichal hairs in 4 rows. Pleura of the same colour as the mesonotum but with a dark brown stripe along the mesonotal border. Scutellum brownish yellow, with a narrow median light stripe. Apical acutellar bristles almost as long as the basal ones. Wings normal, yellowish. Halteres yellow. Legs pale yellowish, tarsi slightly darkened towards the ends. Abdomen yellow-brown, each tergite basally lighter. Male genitalia figs. 17, 32. A part of the periphallidic organs (gonite ?) is conspicuously large and projects laterally.

♀ — Similar to the male in chaetotaxy and most colour characters. The frons is, however, much lighter in colour and not blackened at the front margin. Antennae dusky yellowish. The mesonotal pattern is as in the male specimen. Scutellum unicolorous brownish yellow. Abdominal tergites each yellow in the basal half and dark brown in the distal half. Anal plate entirely dark brown. Ovipositor guides weakly developed.

Holotype ♂ H a w a i i : Kauai, Kawaikoi Stream (1,100 m.) VIII 1953 (E. Hardy). Allotype, ♀ from the same locality.

Rosenwaldia kaavae Malloch*R. kaavae* MALLOCH 1935

As already mentioned, the genus *Rosenwaldia* Malloch might be a synonym to *Trogloscaptopomyza* Frey. If this is so the name *Rosenwaldia* has priority. In any way the single species *R. kaavae* Mall. from the Marquesas Islands belongs to the *Scaptopomyza* complex. The male of this species is not yet known. I know the species from the description only.

Subg. TANTALIA Malloch

S. (T.) albovittata Malloch*Tantalia albovittata* MALLOCH 1938

This species is in external appearance rather aberrant as a *Scaptopomyza* sensu lat. because of the 8 dark spots on the wing and the supernumerary cross-veins. On the other hand, the male genitalia are very similar to those of *Trogloscaptopomyza hardyi* n.sp. (see fig. 24). The thoracic pattern reminds much of *Trogloscaptopomyza mediopallens* n.sp.

Type locality Hawaii: Oahu Island (MALLOCH 1938). The two specimens I have seen are also from this Island.

Subg. MACROSCAPTOMYZA Frey

S. (M.) altissima Frey

Parascaptopomyza (Macrosclaptomyza) altissima FREY 1954, figs. 10, 11. The largest known *Scaptopomyza* species (body length 4—5 mm., wing length 4.5—5 mm.). Tristan da Cunha Islands: Tristan da Cunha, Nightingale and Inaccessible (FREY 1954).

S. (M.) helvola Frey

Parascaptopomyza (Macrosclaptomyza) helvola FREY 1954, fig. 12. Like the preceding species, from the Tristan da Cunha Islands: Tristan da Cunha, Nightingale, Stoltenhoff and Inaccessible (FREY 1954).

Subg. PARASCAPTOMYZA Duda (s.str.)

S. (P.) pallida Zett.

Drosophila pallida ZETTERSTEDT (1847). — *Scaptopomyza graminum* auct. nec FALLÉN. — *S. disticha* DUDA 1921. — *Parascaptopomyza disticha* Duda 1935, COLLIN 1953, BASDEN 1954, HACKMAN 1955 b, fig. 1. — ? = *Diasata claripennis* MACQUART 1835.

There has been much nomenclatorial confusion concerning this cosmopolitan species. Several European and most American authors have used the name *Scaptopomyza graminum*. FALLÉN's type series of *graminum* contained two species, a mainly saprophagous one with two rows of acrostichal hairs (= *pal-*

lida Zett. = *disticha* Duda) and a leaf-mining one with 4 rows (*graminum* Fallén sensu Collin). Unfortunately a cotype belonging to the latter species was selected as a lectotype by COLLIN. If a specimen of the former species had been selected much confusion had been avoided. Following COLLIN I used the name *disticha* Duda in my paper of 1955, but there is a point that has been overlooked: FREY (1954 p. 19) states, after study of some of ZETTERSTEDT's type specimens, that *Drosophila pallida* ZETTERSTEDT (1847) is not *unistriata* Strobl (= *cameraria* Haliday), as supposed by some authors, but identical with *disticha* Duda (*graminum* FREY 1954 nec FALLÉN). This has recently been confirmed by BASDEN who has selected a lectotype of *pallida*. ZETTERSTEDT's name *pallida* has priority over *disticha* Duda 1921. There is, however, another still older name to be considered: SÉGUY (1934) lists *Diastata claripennis* Macquart 1835 as a synonym of »*graminum*» (= *pallida* Zett.), but this identification has not been confirmed by genital preparations, and it seems to me unwise to introduce the name *claripennis* and I am using the name *pallida* Zetterstedt.

S. (P.) pallida occurs in a grey and a yellow form, and STALKER (1945) has shown experimentally that the colour difference is at least partly dependent on temperature. In Northern areas, pale specimens are rare, but it might be mentioned that the lectotype and some paratypes of *pallida* Zett. belong to this yellow form (BASDEN in litt.).

Japanese specimens of this species show some variation in the dentation of the paralobes of the male genitalia and OKADA (1956) seems to have figured an extreme variant. BURLA (1957) mentions as »*Parascaptomyza aff. disticha* Duda» a single specimen from Msingi in East Africa differing from the European *pallida* Zett. mainly in colour characters. The (male) genitalia of this specimen seem to be rather similar to those of some Japanese specimens.

S. (P.) pallida Zett. has a world-wide distribution: The whole of Europe (including northern areas), the Canary Islands, the Azores, Madeira, the Cape Verde Islands, North Africa, East Africa (?), various parts of Asia (Iraq, Turkestan, Siberia, China, Japan, Assam, Indonesia), Australia (New South Wales), Hawaii, North and South America.

S. (P.) impunctata Frey

Scaptomyzella adusta impunctata FREY 1945 — *Parascaptomyza impunctata* Frey, proper species, HACKMAN 1955 b, fig. 3 — ? = *Scaptomyza gracilis* BECKER 1908 nec WALKER — ? *S. chopardi* SÉGUY 1936 — *S. clavigera* FREY 1954, fig. 15.

This species is rather closely related to *pallida* Zett., but has usually 4 rows of acrostichal hairs. Sometimes the external rows consist of only a few hairs and I have considered *clavigera* Frey, which has only two rows (the internal ones), as an extreme variant of *impunctata*. Both forms were taken in the same locality on the Azores. The name *clavigera* was given as a nom.nov. for BEC-

KER's *gracilis* from Teneriffe (not *gracilis* Walker), also a form with 2 acrostichal rows (cf FREY 1945 p. 71).

Taken on several Islands of the Azores (FREY op.c.). Whether BECKER's *gracilis* from Teneriffe (Canary Islands) belongs here remains uncertain.

S. (P.) substrigata de Meij.

Scaptomyza substrigata de Meijere 1914, — *Parascaptomyza substrigata* HACKMAN 1955 b, fig. 2.

I have not seen de MEIJERE's type specimen from Java, but the description fits entirely with the specimens from the Cape Verde Islands that I have studied.

Hitherto known only from Java and the Cape Verde Islands.

S. (P.) angustipennis Frey

Parascaptomyza (Parascaptomyza s.str.) angustipennis FREY 1954, figs. 13, 14, 24.

A species with narrow wings, comparatively broad head, strong vertical bristles and without ventral branches on the arista. Like the following species, only taken on Tristan da Cunha and showing many features in common with the *Parascaptomyza* species from the Marquesas Islands and Hawaii. *P. angustipennis* probably lives in burrows of the bird *Puffinus gravis* (cf FREY 1954).

Tristan da Cunha: Nightingale.

S. (P.) freyi n.sp.

A male paratype of *angustipennis* proved to belong to a separate species and is described here under the name *freyi* n.sp.

♂ — Body length 1.7 mm. Wing length 1.7 mm., width of wing 0.25 mm.

Similar to *angustipennis* in colour and chaetotaxy of head and thorax. Arista with 2 dorsal branches, a small end fork and no ventral branches. Head broader than the length of mesonotum. Two rows of acrostichal hairs; dorso-centrals 0+2. Wings very narrow, almost as in *frustulifera* Frey (FREY 1954 fig. 23) and as in this species without an external cross-vein. Male genitalia (figs. 23) different from those of *angustipennis*: The paralobes are provided with coarse teeth and two long bristles; In *angustipennis* there are no dentiform spines on the paralobes.

The species takes an intermediate position between *angustipennis* and *frustulifera*.

Holotype: ♂, Tristan da Cunha: Nightingale 10.II.1938 (taken together with *angustipennis* by Y. Hagen).

S. (P.) frustulifera Frey*Tristanomyia frustulifera* Frey 1954.

Like the preceding, a Tristan Da Cunha species with reduced wings. Arista with 3 dorsal branches, an end fork and one ventral branch. Acrostichal hairs in four rows. The male genitalia are of the usual *Parascaptomyza* type.

T R I S T A N D A C U N H A : Nightingale.

S. (P.) horrida Frey

Parascaptomyza (Ctenoscaptomyza) horrida FREY 1954, figs. 8, 9, 17. Known only from Tristan da Cunha: Inaccessible.

S. (P.) pectinifera Frey*Parascaptomyza (Ctenoscaptomyza) pectinifera* Frey 1954, figs. 6, 7, 18, 19.

Like the preceding, an endemic species from T R I S T A N D A C U N H A : from Nightingale and Inaccessible.

S. (P.) incerta Frey*Parascaptomyza (Ctenoscaptomyza ?) incerta* Frey 1954, figs. 20, 21.

Only the female of this species is known from T R I S T A N D A C U N H A : Inaccessible. FREY mentions that *incerta* resembles *horrida* in the chaetotaxy of the thorax.

S. (P.) quadriseriata Malloch*Scaptomyza quadriseriata* MALLOCH 1935.

A dark coloured species with characteristic branching of the arista (see fig. 18). 4 rows of acrostichal hairs. The male genitalia are depicted in figs. 19, 20.

I have seen a male and a female paratype from the M A R Q U E S A S I S L A N D S : Hivaoa.

S. (P.) longisetosa n.sp.

The description of this species is developed only on two females but a number of chaetotactic characters make it most probable that the species belongs to *Parascaptomyza* and is related to *quadriseriata* Mall.

♀ — Body length 2.3 mm. Wing length 2.4–2.5 mm. Costal index 2.6.

Ocellar triangle dark grey, orbitae greyish pollinose; the rest of frons dull brownish yellow. Head broader than the length of mesonotum. Frons above nearly double as wide as its median length. Frontal bristles, except for the small anterior reclinate bristle, coarse and long. The internal vertical bristle nearly as long as the vertical diameter of eye. Postvertical bristles as strong as the posterior reclinate bristle. Second antennal joint dusky yellow, third joint blackish. The branching of arista is seen in fig. 18. Face yellowish, carina low and indistinct. jowls narrow and dusky yellowish. Vibrissa strong, other oral bristles short. Palpi yellow to yellow-brown with two short black apical bristles. Mesonotum greyish yellow with traces of a median linear pattern. One humeral

bristle. Dorsocentral bristles: $0 + 2$, strong like the other mesonotal bristles. Acrostichal hairs in 4 somewhat irregular rows ending at the level of the posterior pair of dorsocentrals. Pleura yellow-brown, darker greyish above and paler yellowish below. Sternopleural bristles of usual size and site. Scutellum of the same greyish yellow colour as the mesonotum. Index of scutellar bristles 1.2. Wings slightly yellowish and of normal width and with normal venation. Halteres bright yellow. Legs pale greyish yellow, chaetotaxy normal. Abdomen greyish brown. Ovipositor guides small and weakly sclerotized.

The species resembles *quadriseriata* Mall. in the branching of arista and the general appearance but differs in the unusual coarseness of the frontal bristles and in some colour characters.

Holotype, ♀, H a w a i i : Molokai: Manawainui Valley, VIII 1953 (leg. M. Tamashiro). A female paratype from Hawaii: Maui, Puu Kukui, (900—1.300 m.) VI 1953 (leg. E. Hardy).

S. (P.) mumfordi Malloch

Scaptomyza mumfordi MALLOCH 1935.

A broad-headed dark species with more or less distinct *Scaptomyza* pattern. Arista with 4 long dorsal branches, a large end fork and a long ventral branch. A conspicuous feature of this species is a pair of true bristles (macrochaetae) in the acrostichal rows at the level of the suture. Male genitalia depicted in fig. 21, 22.

M a r q u e s a s I s l a n d s : Ua Pou, Hakahetau Valley. (I have investigated 1 male and 5 females of the paratype series).

S. (P.) latifrons Malloch

Scaptomyza latifrons MALLOCH 1932.

A species with broad head and short frons. The vertical bristles are exceptionally long as in *longisetosa* n.sp. Like *mumfordi* Mall. the species has two rows of acrostichal hairs, but in *latifrons* there are no true bristles among them. I have not studied the male of this species, but its insertion in *Parascaptomyza* is based on its similarity with *mumfordi* in many important characters. Ovipositor guides with marginal row of denticles, a feature not found in other *Parascaptomyza* species.

I have seen two female paratypes from M a r q u e s a s I s l a n d s : Kopaafaa (leg. Mumford & Adamson).

S. (P.) picifemorata n.sp.

A neotropical species very similar to the *Bunostoma* species in external characters, but with typical *Parascaptomyza* genitalia.

♂ — Body length 2.2 mm., Wing length 2.5 mm. Costal index 3.7. Frontal triangle, orbitae and occiput black. The remaining parts of frons lighter co-

loured, reddish yellow, only above the antennal base. Orbital bristles normal. External and internal vertical bristles of nearly the same size. Second antennal joint reddish yellow, slightly darkened above. Third joint paler yellow. Arista with two dorsal and two ventral branches in addition to the rather small end fork. Face greyish yellow with a distinct nose-like carina. Jowls yellow, rather narrow. Second oral bristle nearly as long as the vibrissa. Palpi yellow and with one prominent apical bristle. Mesonotum somewhat shing, black. One prominent humeral bristle, dorsocentrals $0 + 2$, acrostichal hairs in four rows. Pleura dull dark grey. Scutellum shining black. Scutellar index 1.3. Fore coxae and trochanteres yellow, same parts of the other legs darkened. Femora darkened, tibiae and tarsi dusky yellow. Wings yellowish with dusky yellow veins. Venation normal. Halteres yellow. Abdominal tergites black, not shining. Male genitalia fig. 25.

Holotype, ♂, Ecuador: Sect. de Otavalo, Lago San Pablo de Imbabura (leg. R. Levi-Castillo).

Subg. BUNOSTOMA Malloch

S. (B.) flavifacies Malloch

Bunostoma flavifacies MALLOCH 1932.

I know this species only from the description. A species with black shining mesonotum with $0 + 2$ dorsocentrals and two rows of acrostichal hairs. Arista with 7 dorsal and 3 ventral branches basally et the endfork. The face is of a very characteristic shape different from that of other species. The ovipositor guides dentate.

Known only from the Marquesas Islands.

S. (B.) australis Malloch

Scaptomyza australis MALLOCH 1923.

The male hypopygium of this Australian species (fig. 27) is as in some other species in this subgenus conspicuously long. I have seen specimens from the following localities:

New South Wales: Illawarra (female paratypes), Sydney, Botany Bay (♀♀, ♂♂), Mosman, Careel Bay, Narrabeen, Colo Vale, Mittagong and Hornsby. «South Australia» (1 ♂ leg. A. H. Elston). The type locality is Sydney.

S. (B.) stramineipes Malloch

Scaptomyza stramineipes Malloch 1934.

According to the description this species fits well in the subgenus *Bunostoma*. It differs from the other species among others in having more arisal branches.

Known from Samoa: Savaii: Salailua.

S. (B.) cordigera n.sp.

Probably identic with one of the two »*Bunostoma* sp.» mentioned from Oahu Island by HARDY (1952).

♀ — Body length about 2 mm. Wing length 2.2 mm. Costal index 3.2—3.4. Ocellar spot and orbitae dark brown to black, shining. Orbitae broadening anteriorly, narrowest point immediately anteriorly of the internal vertical bristles. Both sides of the ocellar spot a yellow-brown some times whitish opalescent spot is continued on the occiput. The Frontal triangle looks therefore »hart-shaped». Frons in front of the orbitae and the frontal triangle reddish yellow. Internal vertical bristles longer than the external ones. Antennal joints dusky yellow. Arista with 4—5 dorsal branches, an end fork and two ventral branches. Face with a nose-like carina, yellowish and slightly darkened medially. Yowls yellow and narrow. Vibrissa and second oral bristle subequal in size. Palpi yellow with two apical bristles of unequal size. Mesonotum shining, almost black with faint pollinosity. One prominent humeral bristle. Two pairs of strong postsutural dorsocentral bristles, the anterior one situated close to the suture. Acrostichals in two rows, more bristle-like than usual in the genus. Pleura dark brown. Scutellum black. Apical scutellars as long as the basal ones. Halteres dusky yellow. Wings yellowish and with normal venation. Legs yellow. Abdomen piceous, 6th tergite shining, other tergites dull. Ovipositor guides very poorly developed.

Male not known.

Holotype; ♀, H a w a i i: Oahu (coll. Bridwell). 4 paratypes from the same Island (coll. Bridwell).

S. (Bunostoma) sp.

An undescribed species represented by a single male specimen from Hawaii Island: Hilo. The species differs from the other Hawaiian *Bunostoma* species in having four rows of acrostichal hairs. The male genitalia are rather similar to those of *B. australis*. The genital preparation was, however, accidentally lost and I have in lack of more material not named this species, which is closely allied to *cordigera* from Oahu.

S. (B.) bicolor Malloch

Scaptomyza bicolor MALLOCH 1934.

Known to me only from the description. This Samoan species has darkened fore tibiae and tarsi and one prominent oral bristle.

S a m o a: Upolu, Malololelei.

S. (B.) bryanti n.sp.

♂ — Body length 2.1 mm., Wing length 2.5 mm. Costal index 2.9 mm. Frontal triangle black, reaching to the level of the posterior reclinate orbital bristles. Orbitae piceous. Remaining parts of frons orange-brown, darkened above. Occiput black with the pair of whitish pollinose spots characteristic for most species of the subgenus. Vertical bristles very prominent, the internal verticals longer than the external ones. Postvertical bristles also strongly developed. Antennae orange-brown, whitish pollinose. Arista with 5 dorsal branches, the end fork and two ventral branches. Face yellow-brown; Carina rather low but with a distinct depression separating it from the epistome. Jowls narrow, dusky yellow. Second oral bristle nearly of the same size as the vibrissa. Palpi yellow with two apical bristles of unequal size. Mesonotum somewhat shining, black with yellowish pollinosity. One prominent humeral bristle. Dorsocentrals 0 + 2; the anterior pair very close to the suture. Acrostichal hairs in two rows. Pleura piceous, pollinose. Scutellum black with light pollinosity. Scutellar index 1.1. Coxae dusky yellow. Femora to a large extent darkened. Tibiae and tarsi dusky yellow. Wings yellowish with normal venation. Halteres yellow. Abdominal tergites black. Hypopygium long as in *B. australis* Mall. (fig. 29).

Holotype: ♂, Hawaii: Maui, Kula Pipe Line (1,400—1,500 m.) 19. IV. 1932 (leg. O. Bryant).

Subg. METASCAPTOMYZA n.sp.

S. (M.) cochleata Burla

Scaptomyza cochleata Burla 1957, fig. 15—19.

An interesting African species probably related to the *Parascaptomyza* species but differing in characters of the male genitalia and in having short posterior scutellar bristles. Whether the »paralobes», the spoon-like structures (BURLA op.c., fig. 15), inserted at the base of the forceps are homologous with those of the *Parascaptomyza* species remains uncertain. The species has one humeral bristle and 4 rows of acrostichal hairs. The ovipositor guides are weakly sclerotized and not dentate.

East Africa: Kibo-West (2,800 m.).

Subg. MESOSCAPTOMYZA n.subg.

S. (M.) vittata Coq.

Drosophila vittata COQUILLET 1895. — *Scaptomyza vittata* WHEELER 1952 a.

This species has been confused with some other related ones and I have here followed WHEELER'S interpretation. COQUILLET'S type specimen has not been investigated by Wheeler and the nomenclatorial matter is thus not yet

settled. BRNCIC (1955) describes a species from Chile under the name *pseudovittata* Brncic, but according to the figure in his paper the male genitalia of his specimens are almost similar to those of the *vittata* specimens from Florida and Puerto Rico investigated by me. The spines of the paralobes seems, however, to be less stout in the Chilean specimens. Some colour characters mentioned in the description of *pseudovittata* are slightly different from those of the specimens from North and Central America. I have preferred to regard *pseudovittata* Brncic as a subspecies of *vittata*.

I have seen *vittata* Coqu. from the following localities: Florida: Bisquit Bay (Slosson), Lake Worth (Wirth), Orlando (Wirth); Puerto Rico: Vega Baja (Aderson, Faxon & Mills), Arroyo (Buschk). The species is known previously from Georgia, Florida, Alabama, Costa Rica, El Salvador, Puerto Rico and Cuba (MALLOCH 1924 a, WHEELER 1952 a, HEED 1957, TOWNSEND & WHEELER 1955).

Ssp. *pseudovittata* Brncic: type locality Chile: Arica: Azapa. A female specimen from Ecuador: Guayas, Naranjal (Levi-Castillo) agrees rather well with the description of *pseudovittata*. The ground colour of mesonotum and abdomen is much brighter yellow than in the North and Central Americas specimens I have seen.

S. (M.) wheeleri n.sp.

Scaptomyza vittata DUDA 1925 nec Coq. — S.sp. »A», WHEELER 1952 a.

This species has already been separated from *vittata* Coq. by WHEELER (1952 a), but because of some uncertainty concerning the interpretation of COQUILLET's species he preferred not to name the species but designate it as »*Scaptomyza* species A». I have not been able to solve the nomenclatorial problem definitely, but it seems to me better to give this »species A» a name, especially as this species is widely spread and present both in North, Central and South American material I have got for study. The description:

♂ — Body length 2–2.3 mm., wing length 1.8–2.3 mm. Costal index 2.7–3.9. Sc 2.

Frons greyish yellow, pale yellow in front. Frontal chaetotaxy as in *vittata*. Antennae as in *vittata*; arista with 4–5 dorsal branches, an end fork and two ventral branches. Face and jowls as in *vittata*. Vibrissa much stronger than the second oral bristle. In *vittata* these two bristles are of almost equal size. Palpi in the distal $\frac{2}{3}$ black. Mesonotum yellow with the usual »*Scaptomyza* pattern», in North American specimens less distinct than in specimens from the southern part of the range of this species. One humeral bristle; 2 rows of acrostichal hairs. Dorsocentrals 1 + 2; the presutural dorsocentral about as prominent as the humeral bristle. Apical scutellars short, bent upright. Upper part of pleura as dark as the mesonotal stripes. Rest of pleura and the legs yellow. Chaetotaxy of pleura and legs as in *vittata*. Wings clear without spots. Halteres usually dark. Abdominal pattern as in *vittata*. Paralobes lacking in the male genitalia (see figs. 33, 34).

♀ — Body length 2.3 mm., wing length 1.7–2.8 mm. Costal index 2.9–4.0. Sc 2. In colour, pattern and chaetotaxy similar to the male. The abdominal pattern seems to be slightly less contrasting than in *vittata*. Ovipositor guides of the same type as in *vittata*.

S. (M.) wheeleri is easily separated from *vittata* by the unequal sized two first oral bristles. From *paravittata* Wheeler and *subvittata* n.sp. it differs in having a distinct presutural pair of dorsocentral bristles.

Holotype: ♂, U.S.A.: Virginia: Falls Church 30. VI. 1951 leg. W. Wirth. Allotype: ♀, from the same locality.

I have further seen specimens of *S. (N.) wheeleri* from the following localities: M a r y l a n d: Glen Echo (A. Stone), Plummers Island (R. C. Shannon), Cabin John (R. I. Sailer); Virginia: Augusta Co., Reddish Knob (leg. W. Wirth), Franklin (W. Wirth), Fairfax Co. (R. C. Shannon), Alexandria (W. Wirth), Mt. Solon (W. S. Murray); F l o r i d a: Orlando (W. Wirth); M e x i c o: Tacubava (leg. ?); Costa Rica: San Jose (H. Shannon); P u e r t o R i c o: Adjuntas, Guilarte Peak (J. Maldonado & S. Medina), Yauco-Lares (J. A. Ramos & J. Maldonado), Via Guantanamo, Cuba (leg. Hennig); E c u a d o r: Sect. de Otavalo y Laga San Pablo de Imbabura (R. Levi-Castillo), Chimborazo, Bugna (R. Levi-Castillo). Two female specimens from P e r u: Lima Parish (leg. Aldrich) might probably belong to this species. WHEELER (1952 a) records the species from Virginia, Alabama, Mexico and Costa Rica. DUDA's (1925 b) *S. vittata* from Costa Rica is certainly *wheeleri*. Also the species recorded as *vittata* by DUDA (1925 a) from Bolivia and Peru belong to *wheeleri*. The figures of the male genitalia of the Peruan specimens agree well with the latter species.

S. (M.) paravittata Wheeler

Scaptomomyza paravittata WHEELER 1952 a.

In the material investigated, there are only two specimens of this species, both from C a l i f o r n i a: Stanford University Campus (J. M. Aldrich). The species is described by WHEELER from California and later reported also from E l S a l v a d o r (HEED 1957). Male genitalia figs. 37, 38.

S. (M.) subvittata n.sp.

In general appearance and chaetotaxy extremely like *M. paravittata* Wheeler, but the male genitalia are distinctly different.

Body length 2 mm. Wing length 1.95 mm. Costal index 2.5.

♂ — Frons pale greyish yellow; orbitae somewhat lighter; ocellar area slightly darker, front margin brighter yellow, with a small darker median spot. Frontal bristles of the usual type in the *vittata* group. Face pale yellow; carina low. Antennae yellowish; the second joint dorsally darkened. Arista with 5 dorsal branches, an end fork and 2 ventral branches. Jowls narrow and yellowish. Vibrissa well developed, double as long as the second oral bristle, which is more hair-like. Palpus brown, much lighter than in the other species of the *vittata* group, basal half yellow. It has one dark apical bristle and two less stout ones on the ventral margin. Mesonotum with the usual *Scaptomomyza*

pattern, and of the same colour and nearly as distinct as in *paravittata*. As in *paravittata* there is no presutural dorsocentral bristle differing from the hairs. Other thoracic bristles as in the other species of the group. The mesonotal median stripe is continued on the scutellum. Scutellar bristles of usual *Mesoscaptomyza* type. Dark pleural stripe as in *paravittata*. Wings clear as in the other species of the group. Whether the low costal index (2.5) found in the single specimen of this new species has any significance cannot be said, but it falls at least beyond the variation 2.9—3 mentioned by WHEELER (1952 a) for *paravittata* (large material). Legs pale yellow, showing no special characteristics for this species. The male genitalia (fig. 36) differ clearly from *paravittata* in having paralobes and from the other species of the group by the lack of any dark dentation.

Holotype: ♂, C o s t a R i c a: San Jose, leg. H. Schmidt.

S. (Mesoscaptomyza) sp.

Scaptomyza vittata Hsu 1949 nec Coq.

Under the name *Scaptomyza vittata* Hsu (1949) figures the male genitalia of a *Mesoscaptomyza* species which cannot be any of those I have had for study. Hsu's species is from M e x i c o: Peño de Gato and is obviously undescribed.

S. (M.) ? nigripalpis Malloch

? *Scaptomyza nigripalpis* Malloch 1924 b.

In the collection of the U.S. National Museum there is a male specimen of the *vittata* group from Brazil which might possibly be *nigripalpis* Malloch. This species is described briefly from female specimens from Itatiaya in Brazil (MALLOCH 1924 b). The identification of the male specimen with *nigripalpis* is thus far from certain. A brief description of the specimen is given below:

♂ — Body length about 2 mm. Wing length 2.1 mm. Costal index 3.1. Very similar to *subvittata* in colour and chaetotaxy. Frons including orbitae pale yellowish grey, front third pale yellow. The area between the ocelli dark. Apical half of palpi piceous. Mesonotal colour as in *subvittata*, *Scaptomyza* pattern not very distinct. Oral and mesonotal bristles as in *paravittata* and *subvittata*. The male genitalia most like those of *wheeleri* but distinctly different (see fig. 40). Ventral lobes of cerci with numerous coarse dark denticles. Forceps stronger sclerotized than in any other species of the *vittata* group.

The specimen is taken in B r a z i l: Ouro Preto, IV. 1954 by N. L. H. Krauss.

The type locality of *nigripalpis* Malloch is Brazil: Alto Itatiaya (7,150 ft.). MALLOCH (1934) mentions the species also from Montevideo and Buenos Aires, but it seems to me that this records need to be checked, as we here have to do with a group of superficially extremely similar species.

S. (M.) hirsuta Wheeler*Scaptomyza hirsuta* WHEELER 1949, HSU 1949.

In the material examined, there is a female specimen from New Mexico: Penasco River (leg. Wirth) and two females from Mexico (leg. O. W. Barrett) probably belonging to this species. HSU (1949) figures the male genitalia of *hirsuta* and the figure indicates that the paralobes are probably lacking in this species. Having only one stout humeral bristle, the species fits rather well in *Mesoscaptomyza*. WHEELER (1952) inserts *hirsuta* with some hesitation in his *S. adusta* species group. The type locality of *hirsuta* is Arizona: Rustler Park, Chiricahua Mts.

S. (M.) adusta Loew.*Drosophila adusta* LOEW 1862. — *Scaptomyza adusta* WHEELER 1952 a — *Parascaptomyza adusta* HACKMAN 1955 b figs. 4, 5.

I have seen specimens of this species from Virginia, Georgia, Florida, Colorado, Texas and the Bermuda Islands, further a long series from Mexico: Sonora, Imuris (leg. R. E. Ryckman) and some specimens from Venezuela: El Valle (leg. C. H. Ballou). Three female specimens from Argentina (Tucuman and Salta) probably belong to this species. WHEELER (1952 a) mentions that *adusta* is very common and widely distributed over the eastern half of North America, extending west into the foothills of the Rocky Mountains. HEED (1957) records the species from El Salvador and TOWNSEND & WHEELER (1955) from Puerto Rico.

S. (M.) paradusta Wheeler*Scaptomyza paradusta* WHEELER 1952.

There is a single female specimen in the material which probably belongs to this species: Washington: Mt. Constitution (leg. J. M. Aldrich). The species is known from California and Arizona (Wheeler 1952).

S. (? Mesoscaptomyza) spinipalpis Séguy*Scaptomyza spinipalpis* SÉGUY 1934.

I have not seen this species, but according to the description and figure (SÉGUY 1934 p. 11–12, fig. 2) the following are among its more important characters: Arista with 4 dorsal branches, the end fork and 2 ventral branches. Palpi yellow. Mesonotum reddish yellow with *Scaptomyza* pattern. 1 humeral bristle, 1 ciliform presutural dorsocentral and two stout postsutural ones. 4 rows of acristochal hairs. Wings with a large apical spot. The brief description of the male genitalia indicates a fairly close relationship to *S. (M.) adusta* Loew. If *S. spinipalpis* is a *Mesoscaptomyza* it will be relatively easy to separate it from *adusta* and *paradusta* by its larger wing spot and the presence of a presutural dorsocentral bristle.

Type locality: Argentina: La Plata.

S. (? Mesoscaptomyza) fuscinervis Malloch*Scaptomyza fuscinervis* MALLOCH 1924 b.

I have not seen this neotropic species described by MALLOCH from 3 female specimens. Malloch compares the species with *nigripalpis* and mentions, among other things, that it has a less distinct mesonotal pattern, shorter and more convex scutellum and abdomen almost uniformly dark glossy brown; the bases of the wing veins distally of the humeral cross-vein and including the costal vein on almost the entire length darker than the other veins. If other more important characters, the humeral bristles, acrostichal rows, colour of palpi are as in *nigripalpis* Malloch, the species should be placed into *Mesoscaptomyza*, but this is rather hypothetical.

The type locality is S o u t h e a s t e r n B r a z i l: Alto Itatiaya, Serro do Itatiaya.

Subg. HEMISCAPTOMYZA n.sg.

S. (H.) intermedia Duda*S. adusta* var. *intermedia* DUDA 1925 a. — *S. dissimilis* MALLOCH 1934.

DUDA (1925 a) described a *Scaptomyza* specimen from Chile as a variety var. *intermedia* Duda of *S. adusta* Loew. The statement that the specimen has two humeral bristles, the lower about half as long as the upper one, made it hardly probable that the specimen could belong to *adusta*. I received the single type specimen of var. *intermedia*, (described by Duda as a male), for investigation from the Dresden Museum. This specimen is, however, without doubt a female of *S. dissimilis* Malloch described from Chile in 1934. The name *intermedia* Duda has priority over *dissimilis*. The species has nothing to do with *adusta* Loew, which belongs to the subgenus *Mesoscaptomyza*.

Holotype: ♀, C h i l e: Quillota 20. IX. 1902. Allotype: Malloch's male type specimen of *dissimilis* from Angol.

I have seen specimens from the type series of *dissimilis* Malloch from C h i l e: Angol (leg. D. S. Bullock). BRNCIC (1955) records the species (*dissimilis*) from Santiago and Los Alpes in Chile.

S. (H.) bipunctipennis Wheeler*Scaptomyza bipunctipennis* WHEELER 1952 b.

In the material received from U.S. National museum there is a ♀ specimen labelled *S. bipunctipennis* Wheeler from California: San Mateo Co., but at least the ovipositor plates do not agree with the description of this species (WHEELER op.c.). I have not seen any original material of *bipunctipennis*. WHEELER (p. 208 op.c.) points out that the species is closely related to some undescribed species from Argentina. *S. bipunctipennis* is known from C a l i f o r n i a, W a s h i n g t o n and I d a h o.

S. (Hemiscaptomyza) sp. (pr. bipunctipennis Wheeler)

WHEELER (1952) mentions an undescribed South American species coming close to *bipunctipennis*. The species is known from 8 specimens in the collections of Prof. SOUZA LOPES of the Instituto Oswaldo Cruz, and Dr. BLANCHARD of Buenos Aires. In this species the males have large dark spots over the apices of 3rd and 4th veins, often confluent. The females have a spot over apex of the 3rd vein only.

S. (H.) apicipuncta Malloch 1934

Scaptomyza apicipuncta MALLOCH 1934.

This neotropic species is known to me only from the description. MALLOCH's statement that the humeral bristles are two and unequal in size shows, in addition to some other characters mentioned, that the species belongs to the *terminalis* species group among the *Scaptomyza* s.str. Like the following species *S. maculifera* Becker, it has a large wing spot. As neither figures nor descriptions of the genitalia of these two species are given and the descriptions as a whole are rather brief, no characters for separating them can be given here.

S. apicipuncta is described from L. Correntoso, Rio Negro, Argentina.

S. (H.) maculifera Becker

Scaptomyza maculifera BECKER 1919.

I have not seen BECKER's description of this species from Ecuador in the original, but DUDA (1925 a) cites the essentials of it. The species is compared by BECKER with *S. apicata* Thoms. and he states, among other things, that *maculifera* has a larger wing spot than *apicata*. Here it must be noted that Becker has had before him for comparison specimens from Ecuador identified by him as *apicata* and probably not THOMSON's Californian type material. In the neotropic *Scaptomyza* material from the U.S. National Museum there is a species from Ecuador very similar to *apicata* but differing in the male genitalia. The wing spot in these specimens is of the same size as in *apicata* and it seems to me most probable that the species described below by me as new is BECKER's *apicata* nec Thoms. and not identical with *maculifera* Becker.

S. maculifera is described from specimens from La Rinconada (alt. 3.200 m.), Danas (3.778 m.) and Alausi (2.390 m.). All these localities are in Ecuador.

S. (H.) parapicata n.sp.

? *S. apicata* BECKER (1919) nec Thoms. — *S. adusta* DUDA 1925 a nec Loew — ? «S.sp. D» WHEELER 1952 a.

The species described here is, as already mentioned in connection with *S. maculifera*, most probably identical with BECKER's *apicata* and perhaps with WHEELER's *Scaptomyza* sp. D from Mexico (1952 a). Further a series of 8 specimens reported as *adusta* by DUDA 1925 a from Bolivia belongs here.

Body length 2 mm., wing length 2.5—2.7 mm. Costal index 2.9—3.3.

♂ — Frons red-brown with dark grey ocellar triangle and partly darkened orbitae, paler in front. Face pale greyish yellow, carina distinct but not decidedly nose-like. Antennae yellow. Arista with 4 dorsal and 2 ventral branches basally of end fork. Jowls yellow, width about a quarter that of the vertical diameter of the eye. Vibrissa strong and black, second oral bristle finer. Palpi yellow with two rather stout black apical bristles and a less stout and shorter subapical one. Chaetotaxy of the head in general like that of *apicata* Thoms. and other species of the group. Mesonotum dark grey with very indistinct brown *Scaptomiza* pattern. Two humeral bristles, the lower one slightly more than half as long as the upper one. A presutural dorsocentral can hardly be distinguished among the hairs; two strong postsutural dorsocentrals. Four rows of acrostichal hairs. Pleura dull and dark grey. Three sternopleurals, similar in size and position to those of *apicata*. Scutellum dark grey, scutellar bristles normal as in other species of the *terminalis* group. Wings with a dark apical spot around the ending of the third vein. The size and position of this spot is exactly the same as in *apicata*. In the single male specimen the third vein is distinctly bent downward within the spot. Legs yellow-brown and chaetotactically similar to those of other species of the *terminalis* group. The characteristic black ventral bristle on the hind trochanters is also present in this species. Halteres yellow-brown. Abdomen dark grey-brown. In the male genitalia (figs. 54, 55) the anal cerci (anal plates) differ in shape from those of *apicata* and have no cluster of dense black hairs at the caudoventral corner. The forceps have fewer and more irregularly situated and finer dentiform bristles than in *apicata*. On the other hand, the genital arch has the same »toe»-like projection characteristic of *apicata*. The penis and its appendages are slightly different from those in *apicata*.

♀ — In colour and chaetotaxy similar to the male. Antennae yellow; arista with 4 dorsal branches, end fork and 2 ventral branches. Third vein only slightly bent downward near apex. Costa continued until fourth vein. Wing spot of the same size and position as in the male. Ovipositor plates broader and ending more bluntly than in *apicata* Thoms. and more like those of *trochanterata* Collin, but with less coarse and less dense dentation.

Holotype: ♂, Ecuador, Pomasqui 16. X. 1953 (H. R. Yust). Allotype from the same locality. Paratypes from the above locality and from Ecuador: Latacunga (leg. Yust) and Bolivia: Sorata (2.300 m.). It seems very probable that WHEELER'S *Scaptomiza* species »D» from new Mexico and Arizona belongs here. A female specimen from Texas: Gillespie Co. (leg. W. Wirth) might possibly be this species.

S. (H.) apicata Thoms.

Drosophila apicata THOMSON 1870. — *Scaptomiza terminalis* WHEELER 1952 a nec Loew — *S. apicata* HACKMAN 1955 b figs. 12, 14.

S. apicata Thoms. and *S. hsui* Hackman are extremely similar in external characters, but the male genitalia are different. There are, however, characters which make it possible to separate the females also, namely the shape and dentation of the ovipositor plates (see figs. 70, 71). To large extent the distributions of these two species overlap each other. *S. apicata* is found along the Pacific Coast of North America from Southern California (in Mexico) to the State of Washington (Keyport, leg. J. M. Aldrich). In the material investigated there are also specimens from inner parts of California (Mono Lake, leg. J. M. Aldrich). WHEELER (1953) records specimens from Oak Greek Canyon in Arizona. In the South, probably already in Mexico, the species is replaced by the very closely related species *parapicata* n.sp.

S. (H.) hsui Hackman

S. terminalis HSU 1949 nec LOEW 1863. — *Scaptomyza* species »C», WHEELER 1952 a. — *S. hsui* HACKMAN 1955 b. figs. 10, 13.

In the material investigated there are numerous specimens of this species from Western U.S.A., most of them from California. Some specimens are taken in the same localities as *S. apicata* (in California: Bolinas; Strawberry Canyon at Berkely; Stanford University Campus). Further localities for *S. hsui* are: California: Mt. San Jacinto near Riverside (type locality), Indio (near Riverside), Tuolumne Co., Lake Tahoe, Eureka, Sisar Creek in Ventura Co., Palo Alto; Nevada: Harrison Pass; Caliente (HSU 1949); Idaho: Moscow, Grange Ville, Viola; Washington State: Pullman.

S. (H.) terminalis Loew

Drosophila terminalis LOEW 1863. — *Scaptomyza terminalis* HACKMAN 1955 b. fig. 11.

In the material from the U.S. National Museum there is one female specimen from Sitka (June 1899 leg. T. Kincaid). The ovipositor plates of one ♀ from F. Sahlberg's Sitka-material is figured on p. 67. This species is hitherto known only from Sitka Island (Alaska).

S. (H.) trochanterata Collin

Scaptomyza trochanterata COLLIN 1953, HACKMAN 1955 b.

This species of the *terminalis* group has hitherto been known only from Europe (Great Britain and Finland). When I investigated the few male specimens in the material of the *terminalis* group from Alaska, Manitoba and Newfoundland and found to my surprise that the genitalia of these specimens agreed exactly with those of a Finnish *trochanterata*. Also the males of this species lack a wingspot. A number of ♀ specimens from Alaska and Newfoundland belong to this same species. They have all densely dentate ovipositor guides (figs. 65, 66).

The New World localities for *trochanterata* Collin are: Alaska: Fairbanks, Birch Hill 15. VIII. 1948 1 ♂ (C. O. Esselbaugh), 1 ♀ 4. VII. 1921 (J. M. Aldrich), Bell Cr., N. Fairbanks 24. VI. 1948 1 ♀ (R. I. Sailer); Anchorage. 20. V. 1948 1 ♀ (R. I. Sailer); Matanuska 1944 6 ♂♂, 16 ♀♀ (J. C. Chamberlin). Manitoba: Churchill 2—9. VIII.

1937 1 ♂ (D. G. Denning); Newfoundland: Cow Head 7. VIII. 1949 1 ♂, 5 ♀♀ (H. Krogerus), Cinc Cerf River 10. VI. 1949 1 ♀ (H. Krogerus). The records of «*S. terminalis*» from New England (WHEELER's hypothetical species «E») refer most probably to *trochanterata*.

S. (H.) unipunctum Zett.

Geomyza unipunctum ZETTERSTEDT 1847. — *Scaptomysza unipunctum* Zett. DUDA 1935. — HACKMAN 1955 b, figs. 6—7; 1957.

This species has hitherto been reported from Fennoscandia, from the Leningrad area, Semitetshe, Irkutsk and Kamtchatka. In a collection from the Leningrad Museum there are a series from localities in Tadjikstan (high altitudes, 1.100—2.500 m. near Stalinabad). Recently, OKADA (1956) reports the species from Japan, but, as BASDEN (1957) points out, there are considerable differences between the Japanese and European specimens. I have now made genital preparations of the Kamtchatkan male specimens in the collection of our museum and found that these specimens agree well with OKADA's figures, but differ from the Finnish specimens in several details. The specimen from Tadjikstan proved to be intermediate in some genital characters (see figs. 48—53 showing the male genitalia of all three forms). In the Finnish specimens the genital arch has a toe-like projection (of the same type as in *S. apicata* Thoms. and *parapicata* n. sp.). This projection is lacking in the specimens from Tadjikstan; otherwise they are very similar to the Finnish ones. In the Kamtchatka specimens, the toe-like projection is also lacking,

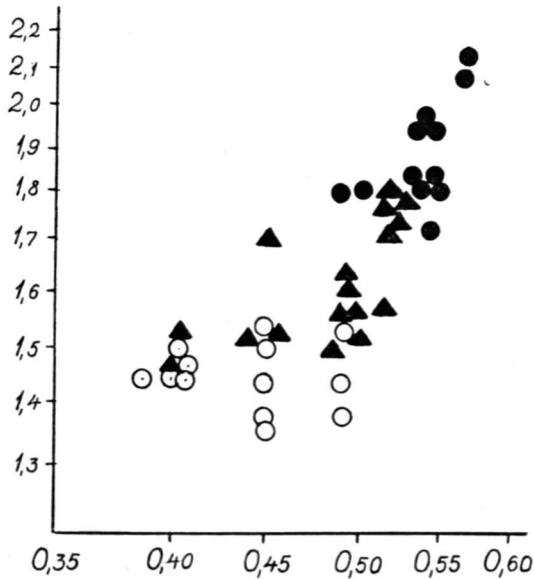


Fig. 74. Costal portion mg_2 plotted against mg_3 in *Hemiscaptomysza unipunctum* Zett. (○), *H. u. boharensis* n. ssp. (▲) and *H. u. okadai* n. sp. (●).

but further several parts of the genital apparatus show proportions different from the two other forms. The penis and the periphallic organs are of the same type as in OKADA's figure for the Japanese specimens. There are also some external characters to be considered. Okada mentions that the Japanese specimens have 2 acrostichal rows and only one ventral branch on the arista. Further it seems, to judge from OKADA's key to the species, that the female also has a dark wing spot. In the specimens from Kamtschatka, the arista has also only one ventral branch; the acrostichal rows are two or four in the latter case the outer rows consisting of very few hairs. A wing spot in the females from Kamtschatka is lacking or very faint. On the other hand, in several of the females from Tadjikstan there is a distinct wing spot but not in all specimens. In some case the arista in the Tadjikstan specimens has two ventral branches, in others, only one. In some cases the outer row of acrostichal hairs consists only of 3—4 hairs on each side.

It seems to me that the difference between the Finnish and the Tadjikstan forms are big enough to give them at least the rank of subspecies. The Kamtschatka form and the Japanese one I have considered as a distinct species.

The nominate ssp. can be characterized by the following: Arista with two ventral branches. Wing spot present in ♂, lacking or at most very faint in ♀. Genital arch in ♂ with a toe-like marginal projection (figs. 48, 50).

Body length 2.3—2.5 mm. Wing length 2.2—2.5 mm. Costal index 2.9—3.7.

ZETTERSTEDT (1847 p. 2.533) describes *unipunctum* from Northern Sweden («Dalecarliae alpinus»; Helsingia: Arbrå). The Finnish localities for *unipunctum* have been listed in my earlier paper on *Scaptomyza* (HACKMAN 1955 b).

S. unipunctum bocharensis n.ssp.

Body length 2.2—2.7 mm., Wing length 2.4—2.9. Costal index 3.1—3.7.

Arista with one or two ventral branches. Wing spot distinct in ♂, usually quite distinct in ♀. Genital arch in ♂ without any toe-like marginal projection (figs. 51, 53).

Holotype ♂, USSR: Tadjikstan: Stalinabad 17. V. 1943 (leg. A. Stackelberg). Allotype, ♀ from the same locality 28. IV. 1942 (leg. Gussakowsky). Paratypes 3 ♂♂ and 3 ♀♀ from the Stalinabad area (one of them taken at an altitude of 3.000 m.), 1 ♂ 2 ♀♀ from Kondara Mt. (1.100 m.), 3 ♂♂ 4 ♀♀ from Kvak Mt. (3 specimens from 2.000 m.) and 1 ♀ from Gafirabad. All localities are in Tadjikstan («Bochara» pro partim).

S. (H.) okadai n.sp.

Scaptomyza unipunctum OKADA (1956) nec Zett.

As already mentioned above, I have preferred to consider the «*unipunctum*» from Kamtschatka and Japan as a species proper, but it is, of course, possible that the populations of these flies in Kamtschatka and Japan represent the

extreme end links of a series of subspecies of *unipunctum*. The specimens from Kamtchatka seem not to differ in any essential point from the Japanese ones (according to the description given by OKADA 1956). The male genitalia of the Kamtchatka specimens agree in every detail with the figures given for the Japanese males. I have therefore regarded these Eastern Asiatic forms as conspecific and describe the species under the name *S. okadai* n.sp.

Body length 2.5—3.0 mm., wing length 2.9—3.4 mm., costal index 3.3—3.7 (OKADA: Japanese specimens 2.8).

♂ — Frons orange-yellow with greyish brown pollinose orbitae and frontal triangle, the latter reaching to the front margin. Antennae orange-yellow, second joint above somewhat darker. Arista with one ventral branch below the fork. Face pale yellow, carina low. Jowls pale, about a fifth of the vertical diameter of the eye. Palpi yellow with two stout black bristles. Vibrissa at least double as long as the second oral bristle. Mesonotum yellow-brown with distinct *Scaptomyza* pattern. Two humeral bristles, the upper one about double as long as the lower one. Acrostichal hairs in two or rarely in four rows, but the outer rows then consisting of very few hairs. Two stout postsutural dorso-centrals on each side. Pleura brown, darker above. Scutellum dark yellow-brown. Apical scutellar bristles reaching nearly as far as the basal ones. Wings with distinct dark spot at the end of third vein. Halteres yellow-brown. Legs yellow. Abdomen above dark brown, somewhat shining. Male genitalia figs. 49, 52.

♀ — Similar to the male in most external characters but the wing spot is lacking in the females from Kamtchatka. Acrostichal hairs usually in four rows. Ovipositor plates see fig. 68.

Holotype: ♂ K a m t c h a t k a : Bolscherjetsk 26.—27. VI. 1917 (Y. Wuorentaus). Allotype: ♀ from the same locality. Paratypes from Bolscherjetsk and Ozernaja and A m u r : Nikolajevsk (leg. Wuorentaus). Further from J a p a n (*unipunctum* of OKADA 1956).

S. (H.) atahualpa n.sp.

Body length 2.2—2.4 mm., wing length 2.5—3.0 mm. Costal index 3.4—4.0. Sc. 1.2—1.6.

♂ — Frons dark grey, reddish yellow only at the front margin. Face dusky yellow, medially darker. Carina nose-like. Anterior reclinate orbital bristle stronger than is usual in the group about $\frac{2}{3}$ of the anterior proclinate one. Antennae dusky brown, third joint darker. Arista with four dorsal branches, the fork and 1—2 ventral branches and with some additional shorter dorsal hairs. Jowls yellowish and narrow (about $\frac{1}{6}$ vertical diameter of the eye). Vibrissa nearly twice as long as the second oral bristle. Palpi yellow with one prominent apical bristle and a less stout subapical one. Mouth margin

darkened anteriorly. Mesonotum dark grey with faint brown *Scaptomyza* pattern. Two humeral bristles, the upper nearly twice as long as the lower one. Two strong postsutural dorsocentrals. Acrostichal hairs in four rows. Pleura dark grey. Scutellum of the same dark colour. Apical scutellars short and bent upright (about $\frac{1}{2}$ the length of the basal ones). Wings clear without any trace of a wing spot. Halteres yellow. Legs dusky yellow. Second and third trochanter with a curve dark bristle. Abdomen red-brown above, contrasting with the nearly black postnotum. Male genitalia figs. 44, 46.

♀ — Similar to the male in external characters. Ovipositor plates of almost the same type as in *trochanterata* Collin.

The humeral bristles, the bristle on the hind trochanters and further the male genitalia show clearly that this species belongs to the *terminalis* group. The dark colour of head and mesonotum, in addition to the lack of a wing spot, easily separates the species from other species of the group.

Holotype: ♀, Peru: Lima (coll. J. M. Aldrich). Allotype ♂ labelled «Peru (Parish)» Coll. J. M. Aldrich. Paratypes: 1 ♀ Lima (Aldrich), 1 ♂, 3 ♀♀ labelled as the allotype, 1 ♂ from Pisco in Peru. I had to select a female as a holotype because of the unprecise labelling of two of the males, and the bad condition of the third male specimen (from Pisco).

S. (H.) hennigi n.sp.

The 132 specimens of the genus *Scaptomyza* from Costa Rica from the collections of Deutsches Entomologisches Institut all proved to belong to one species, a n.sp. of the *terminalis* group. I have named the species in honour of Prof. WILLI HENNIG, who sent me this material for study.

Body length 2.1—2.4 mm. Wing length 2.5—2.7 mm. Costal index 4.0—4.2 Sc. ind. 1.7.

♂ — Frons yellow-brown, paler yellow in the front third, slightly greyish pollinose. Frontal bristles of usual type and position. Face whitish with very low carina. Antennae yellow. Arista with 4 dorsal branches, end fork and 2 ventral branches. Vibrissa stout, black. Other oral bristles weak, not half as long as the vibrissa. Jowls narrow and pale yellow. Palpi yellow with two stout black apical bristles. Mesonotum yellow-brown with darker brown unsharp *Scaptomyza* pattern. Humeral bristles two, the upper one longer and stronger than the lower one. Two pairs of strong postsutural dorsocentrals. Acrostichal hairs in 4 rows. Pleura yellow, darkening towards the upper margin; the dark areas form a ill-defined stripe from the humeral region to the base of the haltere. One stout and two small sternopleural bristles, the two latter near the upper margin. Scutellum yellow-brown; apical scutellars rather short bent upright. Wings with a dark, not very distinct, spot at the ending of the third vein. Third and fourth vein nearly. The small short costal bristles terminate before the half of mg_3 . Halteres yellow-brown. Legs yellow. Abdomen dark brown, paler along the hind margin of the tergites. Male genitalia (figs.

43, 47) distinctly different from other species of the *terminalis* group I have seen. The forceps have two separate rows of tooth-like black bristles, in addition to these there are numerous short yellowish more or less irregularly scattered bristles on the surface of the forceps.

♀ — In external characters similar to the male, but the wing spot is less distinct and slightly smaller. Abdominal tergites medially reddish brown, darkening towards the nearly black lateral margins. Last tergite entirely black and somewhat shining. The coarsely dentate ovipositor guides are ending bluntly.

Holotype: ♂, Costa Rica: San José, La Caja 1930 (leg. H. Schmidt). Allotype, ♀ from the same locality. Numerous paratypes from the same locality and from Vara Blanca (2,000 m.) between Barba and Poas in Costa Rica (H. Schmidt) and further 1 ♂ from Guatemala: El Salto (J. M. Aldrich). The species mentioned as *S. terminalis* by DUDA (1925 b) from Costa Rica might probably be *hennigi*.

S. (? Hemiscaptomyza) longipennis Séguy

Scaptomyza longipennis SÉGUY 1938.

The insertion of this species (not seen by me) in *Hemiscaptomyza* is very uncertain. The presence of black spines on the third trochanteres and an apical wing spot («tache apicale de l'aile», SÉGUY 1938 p. 350) indicates that the species might belong here. Nothing is mentioned in the description about the humeral bristles. Arista with 4 dorsal and one ventral branch. Two rows of acrostichal hairs. The male genitalia are very briefly described and not depicted.

Type locality: Kenya: Naivasha, Rift Valley, 1,900 m.

Subg. SCAPTOMYZA Hardy (s.str.).

S. (S.) flaveola Meig.

Drosophila flaveola MEIGEN 1830. — *Scaptomyza apicalis* HARDY 1849, DUDA 1935, BASDEN 1955. — *S. flaveola* HACKMAN 1955 figs. 17—18. — *S. nigrocella* WHEELER 1949. — ? = *S. flava* Fallén. 1823 (Basden unpublished).

As in my earlier paper (HACKMAN 1955 b), I am here using the name *flaveola* Meig. for a leaf-mining species distributed over large areas of the Holarctic region. *S. nigrocella* Wheeler, described from New York State, is certainly identical with this species. It seems quite possible that *flaveola* has been introduced into North America by man and has spread over large areas as a pest on Brassica and other cultivated cruciferous plants (cf. FROST 1923). Usually this species has a yellow-brown mesonotum with a more or less distinct *Scaptomyza* pattern. According to BASDEN (*S. apicalis*, 1954 p. 621) varieties with a grey mesonotum occur. In certain areas of Western U.S.A., populations of a grey are found and this form has been described as a separate species *montana*, Wheeler (1949). The male genitalia of this form do not differ from those

of *flaveola* from Europe and eastern U.S.A. In California, populations of the grey form and of the yellow form occur. (cf. WHEELER 1952 a) A series from Stanford University Campus studied by me contains only yellow specimens, but it is worth noting that these flies have longer wings than the *flaveola* from the Eastern States and from Europe. On the other hand, I have seen specimens from Berkley and Kelseyville Lake in California, representing the usual yellow form of *flaveola*. WHEELER (1952 a) has dealt with the problem of these American yellow and grey forms and states that the taxonomic problem of these forms can only be solved when breeding and crossing experiments have been made. Here, however, I have considered *montana* Wheeler as a subspecies of *flaveola*. The name can then be used for American populations with more than 75 % grey specimens.

COLLIN (1953) has used the name *montana* Wheeler for a dark grey form from Scotland, but BASDEN considers it as a new species (see below). In my paper of 1955, I used the name *montana* for grey specimens bred from leaf-mines on Pisum and Brassica. The male cerci in this form recorded by TIENSUU under a nomen nudum (in Ann. Ent. Fennici, 17 p. 175) are slightly more pointed than is usual in *flaveola*. TIENSUU has also mentioned to me that the leaf-mines caused by larvae of this grey form differ from those made by *flaveola*. This form might be an own sibling species, but hitherto I have not been able to find in it sufficiently separating characters for describing it as new. I have also seen a grey form in material from the Leningrad area (HACKMAN 1957). In any case, the name *montana* Wheeler cannot be used for these European grey forms.

S. flaveola is widely distributed in the Old World: From Fennoscandia in the north to the Mediterranean countries in the south, in the west: the British Isles and France; In the east to Siberia. Further taken on the Canary Isles, Azores and Madeira (both yellow and grey form on Madeira in Frey's and Storå's material). Reported by DUDA (1940) from Southern Africa, but probably here some other species is involved. In the New World, the yellow form is taken in Nova Scotia and the Eastern States of U.S.A. but also in California.

I have seen American material of the yellow nominate form from the following localities: Nova Scotia: Kentville; Connecticut: New York: Ithaca, Distr. of Columbia: Washington; Indiana: Lafayette; Maryland: Plummers Island; California: Berkley, Kelseyville Lake.

Ssp. montana Wheeler I have seen from Alaska: Sitka (leg. F. Sahlberg); Idaho: Juliaetta; Oregon: Cornwallis; California: Strawberry in Tuolumne Co., Stanford University Campus. WHEELER reports *montana* from Montana, Oregon, Washington State and California.

I have seen a single grey specimen from Virginia: Rosslyn (leg. R. C. Shannon). This specimen has erroneously been identified as *S. terminalis* Loew by MALLOCH.

S. (S.) sp.

Scaptomyza ?montana BASDEN 1954 nec WHEELER 1949.

This grey species is extremely like the greyish specimens of *flaveola* Meig. The species will be described as new by E. B. BASDEN. The specimens are from Scotland.

S. (S.) norica Hackman

Scaptomyza norica HACKMAN 1955 b.

This species, hitherto known only from Austria (HACKMAN op.c.), is very closely related to *flaveola* but the male genitalia and the supernumerary orbital bristle are different.

S. (S.) subsplendens Duda

Scaptomyza subsplendens DUDA 1935.

I have not seen this Eastern Siberian species, but the description (DUDA 1935) shows rather clearly that *subsplendens* must be placed in *Scaptomyza* s.str. The species has two equally long humeral bristles and the male cerci are similar to those of *S. graminum* Fall. It differs from the other species in the subgenus in having only two rows of acrostichal hairs, but I have already (p. 28) pointed out in this paper that this character is of lesser importance for the subgeneric classification. The female is unknown.

Type locality: Ussuri: Spasskaja: Jakovlevka.

S. (S.) flaviventris n.sp.

Scaptomyza sp. «F», WHEELER 1952 a.

Three specimens, two from Washington State and one from California, obviously belong to the species which WHEELER (1952 a) mentions as *Scaptomyza* sp. «F» and I am now giving this new species the name *flaviventris* n.sp.

Body length 2.3—2.5 mm., wing length 2.8—3.6 mm., Costal index 3.4—3.7.

♂ — Frons yellow, slightly greyish on the orbitae and in the ocellar area. Face pale yellow, almost flat. Antennae yellow; arista with 3 dorsal branches, an end fork and one ventral branch. No supernumerary bristle between upper reclinate orbital bristle and the vertical bristles. Vibrissa black and strong, nearly twice as long as the second oral bristle. Jowls yellow, width nearly a fifth of the vertical diameter of the eye. Thorax brownish yellow. Two subequal humeral bristles. Mesonotum with very faint *Scaptomyza* pattern. Two pairs of strong postsutural dorsocentrals and four rows of acrostichal hairs, Scutellum somewhat darker in the middle. Apical scutellars reaching as far as the basal ones. Postnotum slightly greyish pollinose. Sternum coxae and legs of the same brownish yellow colour as the mesonotum. Wings clear, veins as in *flaveola* and *montana*. Halteres yellow. Abdomen above bright yellow,

contrasting in colour with the greyish pollinose postnotum. Hypopygium yellow and the cerci yellow-brown, not dark as in *flaveola* and yellow-brown specimens of *f. montana*. Male genitalia figs. 59, 62.

♀ — Similar to the male in size, colour and chaetotaxy. Here, also, Abdominal tergites bright yellow, only the ultimate plate above the anus dark brown. Ovipositor plates yellow-brown with dense black marginal dentation.

Holotype, ♂, Washington: Mt. Constitution (leg. J. M. Aldrich). Allotype, ♀, California: Muir Woods Marin Co., 19. V. 1915 (M. C. Van Duzee). A male paratype from the same locality as the holotype.

WHEELER (1952 b) mentions his »species F» from California: Sequoia Park (altitude about 1.500 m.) and from Washington: Castle Rock.

S. (S.) consimilis Hackman

S. consimilis HACKMAN 1955 b. — *S. monticola* OKADA 1956.

This species was described by me from Tvärminne in S. W. Finland (HACKMAN op.c.) but later found in Joutseno (SE Finland) by E. Thuneberg. Further the species has been taken in the Leningrad area and in Kamtchatka (see HACKMAN 1955 b, 1957). *Scaptomyza monticola* described by OKADA (1956) from Japan is without any doubt identical with *consimilis*.

S. (S.) polygonia Okada

Scaptomyza polygonia OKADA 1956.

I know this species only from OKADA's description. The species belongs to the *graminum* group. Known from Japan (Tokyo and Sapporo).

S. (S.) teinoptera Hackman

Scaptomyza teinoptera Hackman 1955 b.

The species is known from numerous localities in Finland, from the Leningrad area and from Alaska: Sitka. (HACKMAN 1955 b, 1957).

S. (S.) grahami n.sp.

In the material sent to me from the U.S. National Museum there is a long series of an obviously new *Scaptomyza* species from Szechuen in China collected by D. C. GRAHAM. It is a long-winged species rather close to *S. consimilis* and *teinoptera*.

Body length 2.5 mm., wing length 2.8–3.5 mm., costal index 3.2–4.0.

♂ — The greater part of frons dark grey, but the front quarter light orange-yellow; the ocellar triangle darker than any other part of frons. Orbital bristles of the usual type, no supernumerary bristle above the upper reclinate one. Face pale yellow, carina very low. Antennae reddish yellow. Arista with four dorsal branches, an end fork but no ventral branches. Vibrissa stout, more than twice as long as the second oral bristle. Jowls yellow, their width about $\frac{1}{5}$ of

the vertical diameter of the eye. Palpi yellow, with a long and a shorter black apical bristle. Mesonotum grey with brownish *Scaptomyza* pattern. Humeral bristles two, the upper one nearly twice as long as the lower one, 4 rows of acrostichal hairs. Two pairs of stout postsutural dorsocentrals. Pleura dark red-brown. Two stout sternopleural bristles, the posterior one stronger. Scutellum grey, medially brownish. Apical scutellars about $\frac{2}{3}$ the length of the basal ones. Wings hyaline, unusually long. Halteres yellow. Legs dusky yellow, their chaetotaxy of the usual type in the *flaveola* — *graminum* species group. Abdomen blackish grey. Male genitalia fig. 57. Cerci unusually large and seen in profile more strongly produced in the ventral direction than in *graminum*.

♀ — Similar to the male in external characters. Ovipositor plates coarsely dentate and broadly rounded at apex.

The species is fairly easy to separate from *consimilis* and *teinoptera* because of the lack of ventral branches on the arista, the contrasting frontal pattern and the conspicuous cerci in the male.

Holotype: ♂, China: Szechuen: Beh Luh Din (30 miles N of Chengtu), April 1935 leg. D. C. Graham. Allotype, ♀ from the same locality. 26 paratypes (♀♀, ♂♂) from the same locality.

S. (S.) graminum Fallén

Drosophila graminum FALLÉN 1823. — *Drosophila sordida* ZETTERSTEDT 1840. — *Drosophila flavipennis* ZETTERSTEDT 1840. — *Scaptomyza graminum* DUDA 1935, COLLIN 1953, BASDEN 1954, HACKMAN 1955 b. — *S. tetrasticha* BECKER 1908. — *S. borealis* WHEELER 1952 b. — ? = *Drosophila incana* MEIGEN 1830. — ? = *Hydrellia amoena* MEIGEN 1838. — ? = *Drosophila rufipes* MEIGEN 1830.

A widely distributed holarctic species. *S. borealis* Wheeler from North America agrees in most essential characters, external and genital, with the European *S. graminum*. Dr WHEELER has also informed me in a letter that he regards *borealis* as a synonym of *graminum*. There is, however, one point to be observed: The apical scutellars are longer in the American specimens ($\frac{2}{3}$ of the basal ones); in Fennoscandian and British specimens only about half as long as the basal ones. In specimens from Madeira and from Kopetdagh (Turkistan) the length ratio of the scutellar bristles lies between $\frac{1}{2}$ and $\frac{2}{3}$. In Japanese specimens there is a variation between the limits $\frac{1}{2}$ — $\frac{2}{3}$.

Distribution: Europe (most parts), Transcaspia, Siberia, Japan, Madeira, Newfoundland, New England States, Michigan, Virginia, Oregon, Washington and California (Cazadero, coll. Bradley).

S. (S.) atlantica Hackm.

S. tetrasticha BECKER 1909 pro partim. — *S. atlantica* HACKMAN 1955 b.

A species very close to *graminum*. Known only from the Canary Islands and the Azores (HACKMAN 1955 b).

Scaptomyza (*S.*) *griseola* Zett.

Drosophila griseola ZETTERSTEDT 1847. — *Scaptomyza griseola* COLLIN 1953, BASDEN 1954, HACKMAN 1955 b, 1957.

Closely allied to *graminum* and known from Fennoscandia, the Leningrad area and from the British Isles (COLLIN 1953, BASDEN 1954, HACKMAN 1955, 1957).

S. (*S.*) *nigrita* Wheeler.

Scaptomyza nigrita WHEELER 1952 a.

A species from Western North America belonging to the *flaveola-graminum* group. The male genitalia are not figured in WHEELER's description of the species. I have therefore given two figures (figs. 58, 63) here drawn from Californian specimens from the collection of the U.S. National Museum. I have seen specimens from the following localities:

California: Berkley (J. M. Aldrich), Howland Flat (R. L. Lyon & G. R. Struble), Mt. San Jacinto near Riverside (R. E. Ryckman & C. T. Ames); Idaho: Viola (J. M. Aldrich). The type locality is California: Pasadena. WHEELER further mentions the species from other localities in California and from Wyoming and Idaho.

S. (*S.*) *noei* Brncic

Scaptomyza noei BRNCIC 1955.

This species from Chile, known to me only from the description, seems to be a link between the *flaveola-graminum* group and the *melancholica* group. The male genitalia (BRNCIC 1955 plate I fig. 2) are nearer to the those of the former group. The dark frontal triangle, the two ventral branches of arista, the large size of the second oral bristle and the dark pollinose thorax is a combination of characters occurring in the subgenus *Bunostoma* (see further next species).

Type locality: Chile: Yuta.

S. (*Scaptomyza?*) sp.

In the collection of the U.S. National Museum there are two damaged males from Panama (Cerra Punta) of a species in external characters resembling a *Bunostoma*, but in genitalic characters (fig. 28) very close to *S. noei* Brncic. As most thoracic bristles are lost in the specimens it is not possible to state whether it has one or two prominent humeral bristles. The arista seems to lack ventral branches in addition to the end fork. The fore tibiae are dark as in *Bunostoma bicolor* Mall. Possibly we have here to do with a transitional species between *Bunostoma* and *Scaptomyza* s.str.

S. (*S.*) *multispinosa* Malloch

Scaptomyza multispinosa MALLOCH 1934, BRNCIC 1955.

In external characters of structure and colour, a typical *Scaptomyza sensu str.* (two humeral bristles, 4 acrostichal rows of hairs). The dentate

ovipositor plates show indisputably that the species is correctly inserted. On the other hand, the male genitalia have distinct paralobes. The shape of the forceps indicates a relation to *S. melancholica* Duda and *denticauda* Malloch, both neotropical.

I have seen specimens from the following localities:

Argentina: Rio Negro, Bariloche and Correntoso (R. & E. Shannon); *Chile*: Angol (D. S. Bulloch), Coquimbo, Punta Teatidos (P. G. Kuschel), Llanquihue, Puerto Varas (E. E. Shannon), Isla Chiloe, Castro (R. & E. Shannon). MALLOCH (1934) and BRNCIC (1955) record the species from numerous localities in Argentina and Chile (type locality Bariloche).

S. (S.) melancholica Duda.

Scaptomyza melancholica DUDA 1925 a, MALLOCH 1934, BRNCIC 1955.

A widely distributed neotropic species. I have seen material from the following localities:

Argentina: Correntoso and Bariloche at Rio Negro. *Chile*: Angol, Temuco, Valparaiso, Puerto Mt. at Llanquihue, Ancud and Castro on Chiloe Island.

DUDA's description of the species is based on specimens from Chile: Santiago, «Los Andes», Quillota and *Bolivia*: Sorata and Yungasweg. MALLOCH (1934) and BRNCIC (1955) records the species from numerous localities in Argentina and Chile.

S. (S.) denticauda Malloch

Scaptomyza denticauda MALLOCH 1934, BRNCIC 1955.

I have not seen this species, but MALLOCH (1934) and BRNCIC (1955) gives figures of the male hypopygium showing clearly that *denticauda* is very closely related to *melancholica* but a distinct species.

Like the preceding species, *denticauda* was taken in numerous localities in *Argentina* and *Chile*. Type locality: Peulla.

Scaptomyza (S.) sp.

Scaptomyza apicalis OKADA 1956 nec HARDY.

OKADA (1956) describes and figures under the name *Scaptomyza apicalis* Hardy an interesting species from Japan. BASDEN (1957) points out that this species has nothing to do with *apicalis* Hardy (= *flaveola* Meig.) and I am of the same opinion. The black palpi and certain structures of the male genitalia figured in OKADA's paper show a striking similarity with *Drosophila acuminata* Collin (*Drosophila fenestrarum* group), but the sternoindex does not fit with the *D. fenestralis* group. Unfortunately, Okada does not mention anything about the shape of the first metatarsi, which would settle the question of whether this species should be inserted in the *Drosophila fenestrarum* group or in *Scaptomyza* (s.str.). In any case OKADA has been examining a new species and a species which forms one of the links between *Scaptomyza* and *Drosophila*. The species was taken in *Hokkaido* and *Honshu*.

SPECIES INCERTAE SEDIS

Scaptomyza dorsalis Séguv (1938).

I have only seen the description of this African species, of which only the female is known. In his description SÉGUV omits to mention the number of the humeral bristles, arisal branches, and about the ovipositor and it is therefore not possible to insert the species in any of the subgenera. The species is described from K e n y a : Mt. Elgon.

S. S. melania Séguv (1938).

I have not been able to insert this species, like the preceding only known to me by description. Nothing is mentioned about the humeral bristles, arisal branches or the ovipositor. This species is said to have no acrostichal bristles («Soies acrostichal nulles», SÉGUV 1938 p. 350.). If by this it is meant that the rows of acrostichal hairs are wanting this would be a unique character in the genus. Possibly *S. melania* could be placed in the subg. *Bunostoma*.

Type locality: K e n y a, Mt. Elgon.

S. biseta Malloch (1932).

I have not seen this species and MALLOCH's (1932) description of it is too brief to indicate to which subgenus the species might belong. Probably *biseta* Mall. is a *Parascaptomyza* but it does not belong to the broad-headed group of Pacific species of this subgenus. The subg. *Trogloscaptomyza* might also come in question, as the species lacks ventral branches on arista.

Type locality: M a r q u e s a s I s l a n d s : Hivaoa

S. dilacerata Becker (1919).

The description is too brief to give a clear picture of this species from E q u a t o r i a l A m e r i c a. DUDA (1925 a) supposes that this fly is a *Scaptomyza*.

SPECIES TRANSFERRED TO OTHER GENERA.

S. bimaculata de Meijere (1908) from Java; Semarang can hardly belong to *Scaptomyza*, because it is said to have 8 rows of acrostichal hairs. DUDA (1939) inserts the species in the genus *Leucophenga* Mik.

S. femoralis Malloch (1935) from the Marquesas Islands is transferred to the genus *Marquesia* Malloch.

LOCATION OF THE TYPES OF THE NEW SPECIES.

The holo- and allotypes of the species described in this paper either will be deposited in or belong to the following institutions:

<i>S. (Trogloscaptomyza) abrupta</i> n.sp.	♂	B. P. Bishop Museum, Honolulu		
—→—	<i>aloha</i> n.sp.	♂ ♀	—→—	—→—
—→—	<i>hardyi</i> n.sp.	♂ ♀	—→—	—→—
—→—	<i>hawaiiensis</i> n.sp.	♂ ♀	—→—	—→—
—→—	<i>kauaiensis</i> n.sp.	♂ ♀	—→—	—→—
—→—	<i>longipecten</i> n.sp.	♂ ♀	—→—	—→—
—→—	<i>mediopallens</i> n.sp.	♂ ♀	—→—	—→—
—→—	<i>mittchelli</i> n.sp.	♂ ♀	—→—	—→—
—→—	<i>pallifrons</i> n.sp.	♂ ♀	—→—	—→—
—→—	<i>striatifrons</i> n.sp.	♂ ♀	—→—	—→—

<i>S. (Parascaptomyza)</i>	<i>freyi</i> n.sp.	♂	Zool. Museum, Helsinki/Helsingfors		
—	<i>longisetosa</i> n.sp.	♀	B. P. Bishop Museum, Honolulu		
—	<i>picijemorata</i> n.sp.	♂	U. S. National Museum, Washington		
<i>S. (Bunostoma)</i>	<i>bryanti</i> n.sp.	♂	B. P. Bishop Museum, Honolulu		
—	<i>cordigera</i> n.sp.	♀	U. S. National Museum, Washington		
<i>S. (Mesoscaptomyza)</i>	<i>subvittata</i> n.sp.	♂	U. S. National Museum, Washington		
—	<i>wheeleri</i> n.sp.	♂ ♀	—	—	
<i>S. (Hemiscaptomyza)</i>	<i>atahualpa</i> n.sp.	♂ ♀	—	—	
—	<i>hennigi</i> n.sp.	♂ ♀	Deutsches Ent. Inst., Berlin		
—	<i>okadai</i> n.sp.	♂ ♀	Zool. Museum, Helsinki/Helsingfors		
—	<i>parapicata</i> n.sp.	♂ ♀	U. S. National Museum, Washington		
<i>S. (s.str.) flaviventris</i>	n.sp.	♂ ♀	U. S. National Museum, Washington		
—	<i>grahami</i> n.sp.	♂ ♀	—	—	

The type series of *S. (Hemiscaptomyza) unipunctum* ssp. *bocharensis* n.ssp. belongs to the Mus. Zool. Acad. Nauk, Leningrad.

SUMMARY

The present paper is an attempt at a world monograph on the genus *Scaptomyza* Hardy sensu lat. (*Dipt.*, *Drosophilidae*). The genus has been divided into 9 subgenera: *Trogloscaptomyza* Frey, *Tantalia* Mall., *Macroscaptomyza* Frey, *Parascaptomyza* Duda, *Bunostoma* Mall., *Metascaptomyza* n.sg., *Mesoscaptomyza* n.sg., *Hemiscaptomyza* n.sg. and *Scaptomyza* Hardy. 23 species are described as new: 13 from Hawaii, 4 from North and Central America, 3 from South America, 2 from Asia and 1 from Tristan da Cunha. A new subspecies of *S. unipunctum* is described from Tadjikstan (U.S.S.R.). Keys to the subgenera and to species are given.

The subgenus *Trogloscaptomyza* Frey, erected for a species from Tristan da Cunha, is represented by 10 species on the Hawaii Islands. Subg. *Parascaptomyza* (including *Ctenoscaptomyza* Frey and *Tristanomyia* Frey) contains two main groups, one with the cosmopolitan species *P. pallida* Zett. (*disticha* Duda) and some closely related species and further two trends of endemic species on Tristan da Cunha, a second group of broad-headed species from islands in the Pacific. The genera *Tantalia* Mall. and *Bunostoma* Mall. have been included as subgenera of *Scaptomyza*. To the latter subgenus some species originally described in the genus *Scaptomyza* have been transferred.

The subg. *Mesoscaptomyza* contains WHEELER's *adusta* and *vittata* species group and is restricted to the New World. The subg. *Hemiscaptomyza* is mainly holarctic and contains boreal or montanous species, but has also some representatives in high altitudes in the tropics. Subg. *Scaptomyza* is mainly holarctic, but is represented by the *melancholica* group in the Neotropical region.

The taxonomic relations of the few hitherto known endemic species from the Ethiopian region still remain obscure. The only species sufficiently known has been placed in a subgenus of its own, *Metascaptomyza*.

A survey of a number of characters used in the systematics of the genus *Scaptomyza* is given and the value of these characters discussed.

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