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 with thanks for the *Sarcos Ahrum* work,
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Revision of the *Phytomyza syngenesiae* group (Diptera, Agromyzidae), including species hitherto known as "*Phytomyza atricornis* hlegien"

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With 23 Figures

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I. Introduction

The small group of species treated in this paper includes two species, *Phytomyza syngenesiae* (Hardy) and *P. horticola* Gourcau, which are of substantial economic importance. Hitherto these species have been confused in the literature, since they are not separable on the basis of external morphology. On present knowledge a reliable diagnosis is possible only by examination of the male aedeagus. Dissection of the abdomen is necessary for this examination, except in the case of specimens whose aedeagus is extruded during copulation. Since 1920 the above two species have generally been called "*Phytomyza atricornis* hlegien", a name whose use I propose to discontinue for reasons which are explained below in the section headed "Notes on types and nomenclature". An immense literature has accumulated on these two species. I have devoted my attention in this study mainly to taxonomic and biological papers, and have made no attempt to consider papers concerned primarily with control measures.

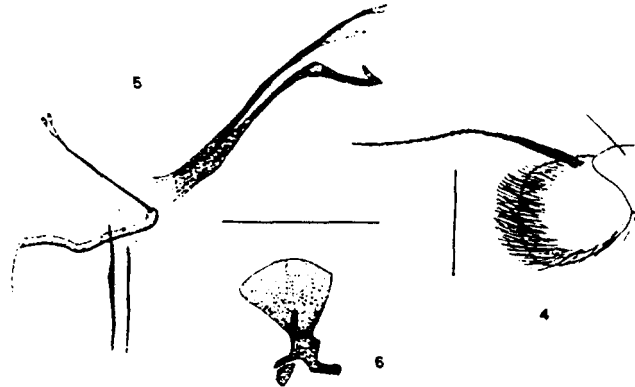
The figures of male genitalia in this paper are based on specimens which have been cleared in potassium hydroxide or sodium hydroxide, as is the practice in most contemporary work on the Agromyzidae.

The descriptions given in this paper refer solely to characters which seem to me useful for purposes of identification or relevant to the classification proposed. Additional information on the external morphology of the adults can be obtained from the very detailed descriptions of "*Phytomyza atricornis* Meigen" given by HENDEL, 1934 (probably based both on *P. syngenesiae* [Hardy] and *P. horticola* Gourcau) and MELIS (1935), whose paper clearly refers to *P. horticola* Gourcau, as is shown by his figures of the male genitalia. Some details of the female genitalia of *horticola* are given by MELIS (1935) and SASAKAWA (1961a). Studies of the larval morphology and biology of *horticola* (as "*atricornis*") have been published by MELIS (1935), AHMAD and GUPTA (1941), BUHR (1953), KURODA (1960) and TREHAN and SENEGAL (1963). However the only biological accounts certainly referable to *syngenesiae* are those referring to America (of which the most detailed is that of SMULYAN, 1914) and New Zealand (see WATT, 1923 and KELSEY, 1937). The results of the important British studies by COHEN

strongly developed on one side only in the other female). 3rd antennal segment (fig. 4) with a fringe of conspicuous long white pubescence.

Acrostichal hairs (*acr*) completely absent.

Trochanters and apes of the front coxae yellow-brown or brown. Basal cone of ovipositor (♀) entirely grey dusted.



Figs. 4—6. *Phytomyza aragonensis* n. sp. holotype ♂: 4, third antennal segment; 5, aedeagus in lateral view; 6, ejaculatory bulb. (Scale 0.1 mm.)

♂ genitalia: Aedeagus (fig. 5) with the distiphallus only weakly divergent towards its apex; mesophallus with its apical third characteristically sinuate; the sac below the mesophallus is large (similar to that of *farfarella*), with its hind margins strongly sclerotised. Ejaculatory bulb (fig. 6) only weakly asymmetrical.

Material examined: Holotype ♂; 2 ♀♀ paratypes, from larvae and puparia 2.VI.33 in leaves of *Lactuca tenerrima*, Albarracin, Aragon, Spain, ern. mid-VI. 33, leg. HERING no. 4225 (ISZ).

The type series was recorded as "*Phytomyza atricornis* Meigen" by HERING (1936). They were bred from narrow leaf-mines similar to those of *syngenesiae* and *horticola*. Pupation took place on the underside of the leaf.

It should be noted that the species with very long antennal pubescence occurring on *Lactuca* in North America, *Phytomyza lactuca* Frost, is not referable to the *syngenesiae* group as defined in this paper; nor is the European *P. ciliata* Hendel (associated with *Chrysanthemum leucanthemum*). The resemblance of *aragonensis* to these species in respect of its long antennal pubescence is clearly to be interpreted as convergence.

Phytomyza lindbergi Spencer

Phytomyza lindbergi Spencer, 1957 (p. 1—2) and 1965a Holotype ♂, La Palma (Canary Isles), in the University Zoological Museum, Helsinki.

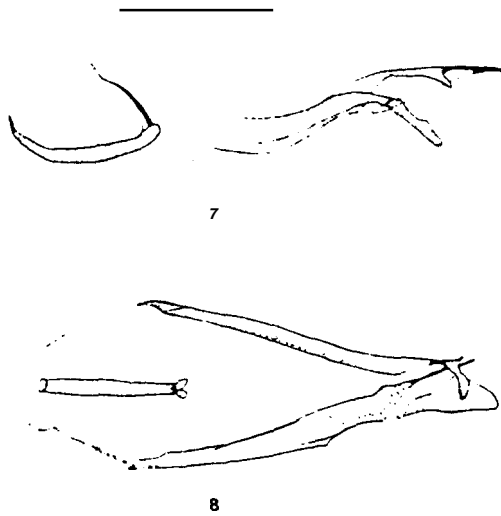
Adult

Only a single strong lower orbital bristle (*ori*) present (2nd *ori* vestigial). Antennal pubescence short.

Six acrostichal hairs (*acr*) present.

Trochanters and the apes of the front coxae rather bright yellow.

♂ genitalia: Aedeagus (figs. 7 and 8) with the sclerites of the basiphallus becoming broad and obscurely defined towards their apex; distiphallus weakly developed; mesophallus slightly longer than in the other species of this group; the sac below the



Figs. 7—8. *Phytomyza lindbergi* Spencer holotype ♂: 7, aedeagus in lateral view; 8, aedeagus in ventral view. (Scale 0.1 mm.)

mesophallus is membranous and appears smaller than in the other species (the latter character however requires checking on fresh material). (Ejaculatory bulb lost.)

(♀ unknown.)

Material examined: Holotype ♂, El Paso (600 metres), La Palma, Canary Isles, 4. IV. 50, leg. LINDBERG (HEL).

The holotype is still the only known specimen.

SPENCER (1957) originally compared this species with *Phytomyza asteris* Hendel, but it is evident from the male genitalia that it should be included in the *syngenesiae* group. In *asteris* the aedeagus is of a somewhat different form, lacking the characteristic mesophallus of the *syngenesiae* group.

Phytomyza farfarella Hendel

Phytomyza farfarella Hendel. 1935 (p. 401) Holotype ♀, Yugoslavia, in the Naturhistorisches Museum, Vienna

Phytomyza atricornis Hleigen sensu Griffiths, 1964 and earlier record; referring to Iceland (nomen dubium).

Adult

Usually only a single lower orbital bristle (*ori*) present, but a vestigial 2nd (lower) *ori* is found in a few specimens (including the holotype). Antennal pubescence short.

Usually 4—7 acrostichal hairs (*acr*) present, but no more than two in some Icelandic specimens.

Coxae and trochanters dark (contrast *lindbergi*). Basal cone of ovipositor (♀) grey dusted basally, but with about its apical third shining.

♂ genitalia: Aedeagus (figs. 9 and 10) with the sclerites of the basiphallus becoming broad and obscurely defined towards their apex; distiphallus weakly developed, sometimes hardly visible; mesophallus as in *syngenesiae*, with about its apical third bent upwards; the sac below the mesophallus is larger than in *syngenesiae* and more strongly sclerotised, especially along its hind margins. Ejaculatory bulb (fig. 11) usually with a rather longer "stalk" than in the other species of this group.

Material examined:

Yugoslavia — 2 ♀♀ (one the holotype), Blede See, V., leg. HENDEL (WIEN).

Figs. 9—11, 12
10, dis.

Germany — 1 ♂ ex
HERING no. 244
23, leg. HERING
no. 2971 (ISZ)
HERING no. 1066

Denmark — 1 ♀ ex

Sweden — 1 ♂ ex
LUNDQVIST (LUN
(LUND).

Finland — 1 ♂, Sa
Ireland — 1 ♂, Lo
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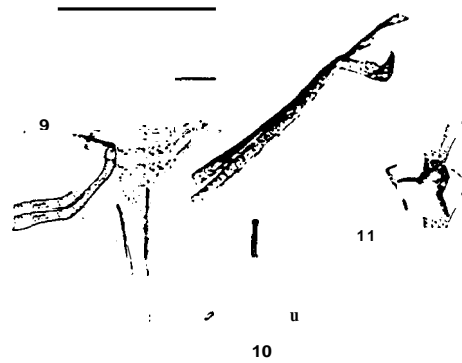
Faroes — 4 ♂♂, 2
in GRIFFITHS, 19

Iceland — 44 es. fr
FITHS, 1964 (LU
Skagafjardarsýs
Westmann Isles

Other Fennoscand
in northern Finland

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Faroes. I failed to d
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the male genitalia
misleading in one
owing to a confusio
is of similar relativ

Chromatomyia Syn
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Figs. 9—11. *Phytomyza farfarella* Hendel ♂, Iceland: 9, aedeagus in lateral view; 10, distiphallus in dorsal view; 11, ejaculatory bulb. (Scale 0.1 mm.)

- Germany — 1 ♂ es *Taraxacum officinale* agg., Berlin-Finkenkrug, em. 3. VI. 24, leg. HERING no. 2447 (ISZ). 2 ♂♂ 1 ♀, same plant, Berlin-Frohnau, em. 21–27. VI. 25, leg. HERING (ISZ). 2 ♂♂, same plant and locality, em. 31. VII. 26, leg. HERING no. 2971 (ISZ). 1 ♂, same plant, Güntersberg an der Oder, em. 20. VI. 29, leg. HERING no. 1066 (ISZ).
- Denmark — 1 ♀ ex *Leontodon autumnalis*, Lemvig, em. 5. VI. 50, leg. SONDERUP (ICZ).
- Sweden — 1 ♂ es *Taraxacum* sp., Hedlandet, Sodermanland, em. 30. VI. 43, leg. LUNDQVIST (LUND): 1 ♀, same host and locality, em 15. VII. 43, leg. LUNDQVIST (LUND).
- Finland — 1 ♂, Saltvik, Åland, VII. 42, leg. FREY (HEL).
- Ireland — 1 ♂, Lough Rask, near Ballyvaughan, Co. Clare, 3–8. VII. 60, leg. COE (BM). 1 ♂ from the HALIDAY collection (NMI).
- Faroes — 4 ♂♂, 2 ♀♀ from the islands of Streymoy, Nólsoy and Svinoy, as recorded in GRIFFITHS, 1964 (KB).
- Iceland — 44 es. from localities in South and South-East Iceland, as recorded in GRIFFITHS, 1964 (LUND and Göteborg Natural History Museum). 1 ♂, Skidastadalaug, Skagafjardarsýsla (North Iceland), 27. VII. 33, leg. TUXEN (KB). 4 ♂♂, Heimaey, Westmann Isles, 23. VII. 65 (2 es.) and 13–14. VI. 66, leg. ANDERSSON (LUND).

Other Fennoscandian localities given in the literature are Paanajarvi, near Kuusamo in northern Finland (FREY, 1916) and Gotland (Fridhem), Sweden (RYDÉN, 1952).

This is the only species of the *syngenesiae* group occurring in Iceland and the Faroes. I failed to distinguish it from *syngenesiae* and *horticola* when writing my work on the Agromyzid fauna of these islands (GRIFFITHS, 1964), and consequently some of the comments on "*atricornis*" in that paper require revision. Since there is no evidence that *farfarella* is a species likely to be spread by human agency, I think it must be regarded as part of the indigenous fauna of these islands which is believed to have entered them during an interglacial period over a land-bridge from Europe. The species seems particularly common in the vicinity of hot springs in Iceland. My figure of the male genitalia of this species in that paper (GRIFFITHS, 1964, fig. 4) was slightly misleading in one respect: the ejaculatory bulb figured is disproportionately large owing to a confusion in the scale of magnification. The ejaculatory bulb in this species is of similar relative size to that of other members of the *syngenesiae* group.

Phytomyza syngenesiae (Hardy)

Chromatomyia Syngenesiae Hardy. 1819 (p. 391), in pan. Neotype ♂, Ireland, by present designation in the British Museum (Natural History): type locality, Scotland.

Phytomyza nigricornis M. Macquart sensu auctt. (e. g. CURTIS, 1845) (nec *Phytomyza nigricornis* M. Macquart, 1833).

Phytomyza geniculata M. Macquart sensu auctt. (nomen dubium preoccupied by *Phytomyza geniculata* Brullé, 1832).

Phytomyza lateralis Fallén sensu auctt. (e. g. GOUREAU, 1851 and ROBINEAU-DESVOIDY, 1851) (nec *Phytomyza lateralis* Fallén, 1823).

Phytomyza albiceps Meigen sensu auctt. (e. g. KALTENBACH, 1874 [in part] and WATT, 1923) (nec *Phytomyza albiceps* Meigen, 1830).

Phytomyza affinis Fallén sensu auctt. (e. g. FRENCH, 1900) (nec *Phytomyza affinis* Fallén, 1823).

Phytomyza Chrysanthemi Kowarz in Lintner, 1891 (p. 242—243). Lectotype ♂, U.S.A., by present designation in the Deutsches Entomologisches Institut, Eberswalde, *Syn. nov.*

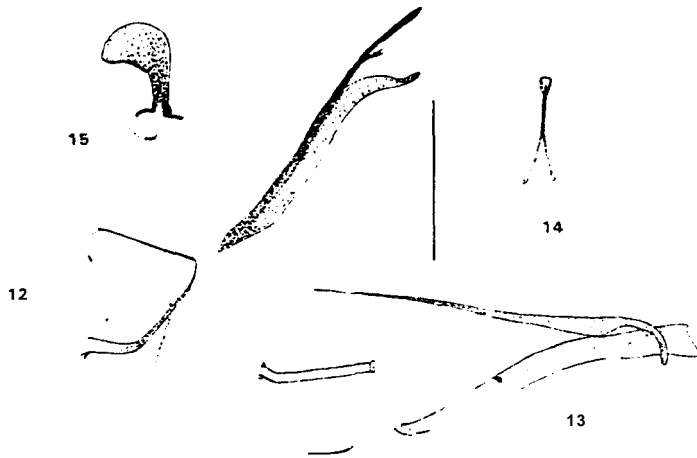
Phytomyza atricornis Hågigen sensu Hendel, 1920 (in part) and widely in subsequent literature (nomen dubium).

Adult

Only a single lower orbital bristle (*ori*) present. Antennal pubescence short.

Acrostichal hairs (*acr*) often completely absent, at most one to four isolated hairs present. (Such specimens with a few *acr* present occur frequently in this species, but only rarely in *horticola*.)

Basal cone of ovipositor (♀) grey dusted basally, but with its apical half or third shining.



Figs. 12—15. *Phytomyza syngenesiae* (Hardy) ♂ es *Chrysanthemum vulgare*, Ireland: 12 aedeagus in lateral view; 13, aedeagus in ventral view; 14, distiphallus in dorsal view; 15, ejaculatory bulb. (Scale 0.1 mm.)

d genitalia: Aedeagus (figs. 12—14) with the sclerites of the basiphallus becoming rather widely separated distally, more well defined towards their apex than in *farfarella* and *lindbergi*; distiphallus rather weakly developed, divergent only towards its apex; mesophallus with about its apical third bent upwards (as also in *farfarella*); the sac below the mesophallus is membranous (easily distorted in preserved specimens), rather smaller than in *farfarella*. Ejaculatory bulb (fig. 15) usually distinctly asymmetrical.

Material identified by examination of the aedeagus (♂♂ only)

Ireland — 1 ♂ neotype (by present designation) ex *Seriecio jacobaea*, Doolin, Clare, em. 30. VIII. 66, leg. GRIFFITHS (deposited in the British Museum [Natural History]). 1 ♂ ex *Senecio* sp., Dalkey, em. VI. 04 (NMI). 1 ♂ ex *Sonchus arvensis*, Poulsallagh, Clare, em. 20. VI. 65 (GCDG). 1 ♂ ex *Chrysanthemum leucanthemum*, Caherconnell, Clare, em. 26. VI. 63 (GCDG). 2 ♂♂ ex *Chrysanthemum vulgare*, Burren (near Ballyvaughan), Clare, em. 16 and 22. IX. 66 (GCDG).

Grrat Britain
 Scotland — 1 ♂ ex
 SPENCER (KAS)
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 es *Chrysanthemum*
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 Germany — 1 ♂ es
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 HERING no. 258
 Yugoslavia — 1 ♂ es
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 Canary Isles — 1
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 dale, Rhode I
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 1 ♂ ex *Sonchus*
cruentus, San
 1 ♂ es *Dahlia*
sinthenium sp
 1 ♂ ex *Zinnia*
 1 ♂ es *Picris*
 FRICK (USNM
 51, leg. FRICK
 em. 18. VI. 48

Great Britain

Scotland — 1 ♂ ex *Chrysanthemum argyrophyllum*, Edinburgh, em. 15. VI. 53, leg. SPENCER (KAS).

Wales — 1 ♂ es *Inula crirhmoides*, Burry Holms, Gower, em. 7. X. 62 (GCDG).

England — 1 ♂ ex *Senecio cruentus*, Bristol, em. IV. 20, leg. A. L. SMITH (BM). 1 ♂ es *Chrysanthemum* sp., Putney, Loiidoi, em. VI. 18, leg. CAXT (BM). 7 ♂ d ex *Chrysanthemum* sp. (cultivated), Littlehanipton, Sussex, leg. HUSSEY and GURNEY (CCRI). 1 ♂ ex *Chrysanthemum* sp. (cultivated), Kensington, London, em. 1. VII. 15, leg. ROBISON (BM). 1 ♂ ex *Serratula tinctoria*, Woodside Park, London, em. 10. VIII. 53 (GCDG). 1 ♂ ex *Sonchus asper*, Whitby, Yorks., em. 15. VII. 37, leg. BRITTEN (BM). 1 ♂ es *Arnoseris minima* (labelled "*Lapsana pusilla*"), Middlesex, em. 3. VII. 23, leg. HEATH (BM).

France — 1 ♂ ex *Anthemis* sp., Asnières, em. 7. IV. 1889, leg. LESNE (MNHN). 1 d ex *Chrysanthemum leucanthemum*, 1899, leg. BLANCHARD (MKHN). 1 ♂ ex *Chrysanthemum* sp., Paris, em. 14. VII. 46 (MNHN). 1 ♂ ex *Inula crirhmoides*, La Baule, Loire inf., em. 15. IV. 43, leg. BUHR no. 4965 (ISZ).

Denmark — 1 ♂ ex *Daucus carota*, Copenhagen, em. 18. IX. 29, leg. GUDMAN (ISZ). 1 ♂ es *Senecio squalidus*, Copenhagen Botanical Gardens, em. 15. XII. 65, leg. SORENSEN (GCDG).

Sweden — 1 ♂ es *Carduus crispus*, Hälsingborg, Skåne, em. 3. IX. 23, leg. RYDCN (LUND). 1 ♂ ex *Taraxacum* sp., Hälsingborg, Skåne, em. 18. VII. 23, leg. RYDCN (LUND).

Finland — 1 d ex *Chrysanthemum* sp., Hoplax, near Helsinki, 1936 (HEL).

Germany — 1 d es *Othonna integrifolia*, Berlin Botanical Gardens, em. 5. III. 34, leg. HERING (ISZ). 1 ♂ ex *Xeranthemum annuum*, Berlin, em. 38. VII. 24, leg. HERING no. 2584 (ISZ).

Yugoslavia — 1 ♂ es *Sonchus oleraceus*, Lesina, Hvar Island, em. IV. 29, leg. BUHR (ISZ).

Spain — 1 ♂ es *Sonchus oleraceus*, Irun, em. 10. IV. 33, leg. HERING no. 4101 (ISZ).

Canary Isles — 1 ♂ es unidentified plant, Los Arucas, Gran Canaria, em. 21. II. 63, leg. SPENCER (KAS). 1 ♂ (caught), Maspalomas, Gran Canaria, 9-10. III. 50, leg. LINDBERG (HEL). 1 ♂ (caught), Pico de Teyde, Tenerife, 21-23. VII. 31, leg. FREY (HEL). 1 ♂ (caught), La Llanos, La Palma, 8. VIII. 31, leg. STORÀ (HEL).

Canada — 1 ♂ ex *Crepis* sp., Edmonton, Alberta, em. 4. VI. 66, leg. SEHGAL (in Mr. SEHGAL's collection). 1 ♂ es *Senecio* sp., Frank, South Alberta (4,000 ft.), em. 1. VII. 66, leg. SPENCER (KAS).

U.S.A. — 2 ♂¹ syntypes of *Phytomyza chrysanthemi* Kowarz (one of which is hereby designated lectotype), presumably Boston, Massachusetts (DEI): host-plant not stated, but presumably a cultivated *Chrysanthemum* species. 1 ♂ ex "daisy", Glendale, Rhode Island, em. 16. V. 10 (USNM). 1 ♂ ex "marguerite", Kingston, Rhode Island, em. 6. I. 16, leg. STONE (USNM). 1 d es lettuce (*Lactuca* sp.) in greenhouses, Puyallup, Pierce Co., Washington, em. 1. I. 53, leg. FRICK (USNM). 1 ♂ es *Sonchus* sp., Seattle, Washington, em. IV. 41 (USNM). 1 ♂ ex *Senecio cruentus*, San Francisco, California, em. 1. VI. 65, leg. TOSCHI & TAUBER (BM). 1 ♂ es *Dahlia* sp., San Francisco, California, leg. WHITNEY (USNM). 1 ♂ ex *Chrysanthemum* sp., Alameda Co., California, em. 31. IV. 11, leg. ALDRICH (USNM). 1 ♂ es *Zinnia elegans*, Albany, Alameda Co., em. 27. IX. 48, leg. FRICK (USNM). 1 ♂ ex *Picris echioides*, Albany, Alameda Co., California, em. 3. VIII. 48, leg. FRICK (USNM). 1 ♂ ex *Lactuca* sp., Albany, Alameda Co., California, em. 21. XI. 51, leg. FRICK (USNM). 1 ♂ ex *Matricaria* sp., Berkeley, Alameda Co., California, em. 18. VI. 48, leg. FRICK (USNM). 1 ♂ ex *Sonchus asper*, Berkeley, Alameda Co.,

- California, em. 21. VII. 48, leg. FRICK (USNM). 1 ♀ ex *Sonchus oleraceus*, Berkeley, Alameda Co., California, em. 1. VIII. 65, leg. TOSCHI and TAUBER (KAS). 1 ♂ ex *Silybum marianum*, Berkeley, Alameda Co., California, em. 23. XII. 48, leg. FRICK (USNM). 1 ♂ ex *Pisum sativum*, Berkeley, Alameda Co., California, em. 14. VII. 17, leg. ALDRICH (USNM). 1 ♂ ex *Cynara scolymus*, Half Moon Bay, California, em. 11. V. 37, leg. LANGE (USNM). 1 ♂ ex *Helianthus californicus*, ? California, leg. WHITNEY (USNM).
- Australia — 1 ♂ ex *Senecio jacobaea*, Leongatha, Victoria, em. 16. VII. 27, leg. HULL (CSIRO). 2 ♂♂ (caught), same locality, undated and 31. VIII. 27, leg. HULL (CSIRO). 1 ♀ (caught), Bronte, New South Wales, 8. IX. 54, leg. McALPINE (AM). 1 ♂ (caught), Belltrees, near Scone, New South Wales, 19. X. 56, leg. McALPINE (AM). 1 ♂ (caught), North Beach, Bellinger River, New South Wales, 16. XI. 64, leg. McALPINE (AM). 1 ♀ (caught), Sydney University, New South Wales, 23. IX. 54, leg. McALPINE (AM).
- New Zealand — 2 ♂♂ ex *Sonchus* sp., Canterbury, em. 11. VII. 63, leg. YOONG (GCDG).

The absence of records of this species from the Eastern part of the Palaearctic region hardly seems significant in view of the limited material of the *syngenesiae* group available to me from that area. I think it probable that *syngenesiae* is a holarctic species which has been able to spread across the former land connection between Siberia and Alaska. Its extensive distribution in North America suggests that it is not a recent introduction there.

I have no doubt that the occurrence of this species in Australia and New Zealand is the result of recent introduction. There seems no significant morphological differentiation in the material I have seen from these countries, and the recorded host range there includes many introduced plants.

It is evident from the records given above that this species usually develops in Compositae hosts. The range of Compositae attacked is clearly very wide, although there are no records for a few genera (e. g. *Aster* and *Solidago*). Whether these apparent gaps are fortuitous or represent real discontinuities in the host range is not yet clear.

The occurrence of this species on hosts other than Compositae appears to be rare, and may be regarded as xenophagy. Details of one North American specimen labelled as bred from *Pisum* (Leguminosae) have been given above, and FRICK (1939) also records *Mentha* sp. and *Stachys bullata* (Labiatae), *Malva borealis* (Malvaceae) and *Melilotus indica* (Leguminosae) as hosts of "*Phytomyza atricornis* Meigen" in North America. It seems probable that some or all of these records refer to *syngenesiae* (since *horticola* is not known in North America), but confirmation from the dissection of males bred from these hosts seems desirable before they can be finally accepted. From Australia I have received one female presumably referable to this species which was bred from *Urtica incisa* (Urticaceae) (Jenolan Caves, 2,000 ft., New South Wales, leg. WILBUR (AM)), and HENDEL (1934) also recorded a specimen of "*atricornis*" bred from *Urtica ferox* in New Zealand. WATT's (1923) and HARRISON's (1959) lists of hosts of "*atricornis*" in New Zealand also include *Plantago* spp. (Plantaginaceae) and *Melilotus* sp. (Leguminosae). However the former record requires careful checking in view of the possibility of confusion with *Phytomyza plantaginis* Robineau-Desvoidy; and the latter record was clearly doubtful, as WATT prefaced it with the word "possibly". From Europe I have discovered only one case of *syngenesiae* having been bred from a non-Compositae host, the record for *Daucus* (Umbelliferae) given above. But it would be unwise to assume from this evidence that the host tolerance of European strains of *syngenesiae* is less than that shown in other parts of the species' range. The abundance of *horticola* on non-Compositae hosts must inevitably tend to mask the rarer occurrence of *syngenesiae* on such hosts in areas where both species occur. Any apparent diffe-

rence in host tolerance in the Palearctic region should therefore be regarded with caution unless confirmed by laboratory experiments.

Complete lists of the host records which seem attributable to this species (subject to the remarks above) in areas where no other species of the *syngenesiae* group occurs have been given by SPENCER (1963) for Australia, HARRISON (1939) for New Zealand and FRICK (1959) for North America. One correction of FRICK's list should however be noted. The series which he bred from *Gnaphalium leucocephalum* in California does not represent a species of the *syngenesiae* group, but a species related to the European *Phytomyza ciliata* Hendel and *P. farfarae* Hendel.

Phytomyza horticola Goureau

Phytomyza horticola Goureau, 1851 (p. 148—149). Neotype ♂, Germany, by present designation in the Institut für Spezielle Zoologie und Zoologisches Museum der Humboldt-Universität, Berlin; type locality, France.

Phytomyza geniculata M. Macquart sensu auct. (e. g. ROBINEAU-DESVOIDY, 1851 and GOUREAU, 1861 and 1869) (nomen dubium preoccupied by *Phytomyza geniculata* Brullé, 1832).

Phytomyza cucumidis J. Macquart, 1854 (p. 233) (nomen nudum). **Syn. nov.**

Phytomyza Tropaeoli Dufour, 1857 (p. 45). Types lost: type locality, France. **Syn. nov.**

Phytomyza Fediae Kaltenbach, 1860 (p. 250). Types lost: type locality, Germany. **Syn. nov.**

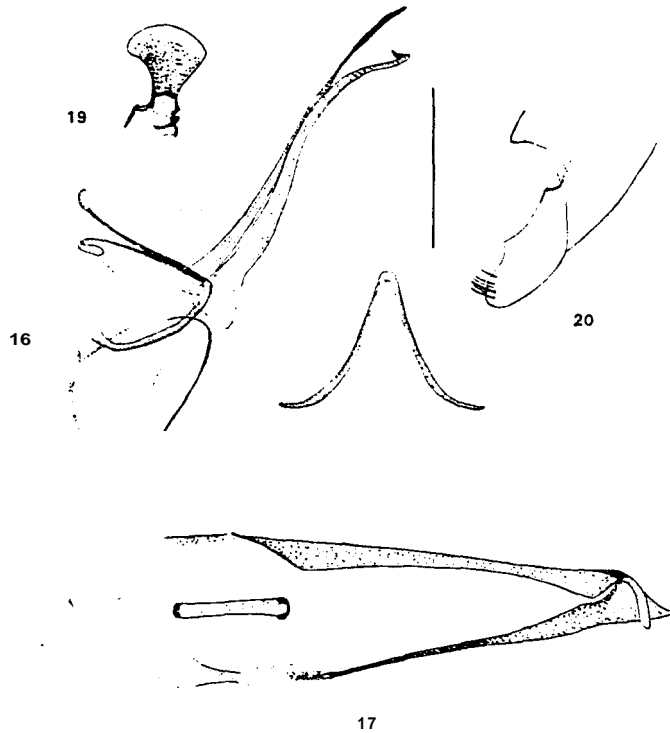
Phytomyza Linariae Kaltenbach, 1862 (p. 83) and 1874. Types lost: type locality, Germany. **Syn. nov.**

Phytomyza Pisi Kaltenbach, 1864 (p. 305) and 1874. Types lost: type locality, Germany. **Syn. nov.**

Phytomyza albiceps Meigen sensu auct. (e. g. KALTENBACH, 1874, in part) (nec *Phytomyza albiceps* Meigen, 1830).

Phytomyza subaffinis Malloch, 1914 (p. 333). Holotype ♀, Formosa, in the Hungarian Natural History Museum, Budapest. **Syn. nov.**

Phytomyza atricornis Meigen sensu Hendel, 1920 (in part) and widely in subsequent literature (nomen dubium).



Figs 16—20. *Phytomyza horticola* Goureau ♂ ex *Linaria*, Italy: 16, aedeagus in lateral view; 17, aedeagus in ventral view; 18, distiphallus in dorsal view; 19, ejaculatory bulb; 20, surstylus and pan of 9th tergite (epandrium) in posteroventral view. (Scale 0.1 mm.)

Napomyza lactucae Vimmer, 1926 (p. 117). Syntype ♀, Czechoslovakia, in Mr. K. A. SPENCER'S collection, London. Syn. nov.

Phytomyza bidensicora Séguy, 1951 (p. 313—314), PAULIAN, 1953 and SPENCER, 1959. Lectotype ♂, Madagascar, by present designation in the Muséum National d'Histoire Naturelle, Paris. Syn. noi.

Adult

Only a single lower orbital bristle (*ori*) present. Antennal pubescence short.

Acrostichal hairs (*acr*) usually completely absent, rarely one or two isolated hairs present.

Basal cone of ovipositor (?) grey dusted basally, but with its apical half or third shining.

d genitalia¹: Aedeagus (figs. 16—18) with the distiphallus strongly developed, divergent from its base; mesophallus more evenly curved than in *syngenesiae* and *farfarella*, bent upwards only at its apex; the sides of the sac below the mesophallus form a pair of sclerotised plates which unite apically (fig. 17); these are largely transparent but with a variable degree of pigmentation along their margins. Ejaculatory bulb (fig. 19) usually almost symmetrical, rarely as strongly asymmetrical as that figured for *syngenesiae* (compare fig. 15).

Material identified by examination of the aedeagus (♂♂ only)

Ireland — 1 ♂ es *Pisum sativum*, from the HALIDAY collection (NMI).

England — 1 ♂ es *Vicia sepium*, Faversham, Kent, em. 7. VII. 54 (GCDG). 2 ♂♂ ex *Dahlia* sp., Littlehampton, Sussex, leg. HUSSEY & GURNEY (GCRI). 1 ♂ es *Allium sativum* in my garden at Barnet, London, em. 24. VI. 66 (GCDG).

France — 1 ♂ es *Lepidium draba*, Hyères, ern. 21. V. 35, leg. WILSON (BM). 1 ♂ ex *Lycium* sp., em. VII. 26, leg. LESNE (MNHN). 1 ♂ ex *Senecio vulgaris*, Tence (H. L.), em. 8. VII. 27, leg. MENEVAL (MNHN). 1 d es *Arctium lappa*, Paris, em. 28. VI. 53, leg. SPENCER (KAS). 1 ♂ es *Cirsium vulgare*, La Baule, Loire inf., em. 5. VI. 43, leg. BCHR no. 386 (ISZ). 1 ♂ es *Allium cepa*, Cherbourg, em. 10. VI. 28, leg. HERING (ISZ).

Switzerland — 1 ♂ es *Inula hirta*, Lenzerheide, ern. 16. VII. 25, leg. HOPP (ISZ).

Denmark — 1 ♂ ex *Taraxacum officinale* agg., Lemvig, Denmark, em. 10. X. 53, leg. SONDERUP (KAS).

Sweden — 1 ♂ ex *Brassica campestris* var. *capitata*, Halsingborg, Skåne, ern. 19. VIII. 23, leg. RYDÉN (LUND). 1 ♂ es *Linum usitatissimum*, Halsingborg, Skåne, em. 2. IX. 24, leg. RYDÉN (ISZ). 1 ♂ es *Pisum sativum*, Hedlandet, Södermanland, em. 23. VII. 43, leg. LUNDQVIST (LUND). 1 ♂ ex *Melilotus albus*, Halsingborg, Skåne, ern. 2. VIII. 27, leg. RYDÉN (LUND). 1 ♂ es *Matricaria* sp., SONDERUP, em. 17. VII. 52, leg. RYDÉN (LUND). 1 ♂ ex *Senecio vulgaris*, Halsingborg, Skåne, ern. 30. VI. 23, leg. RYDÉN (LUND). 1 ♂ es *Helichrysum* sp., Hedlandet, Södermanland, ern. 22. VIII. 43, leg. LUNDQVIST (LUND).

Finland — 1 ♂ (caught), Forvas, leg. FREY (HEL).

Gernany — 1 ♂ ex *Adonis aestivalis*, Erfiirt, Schwelienburg, Thuringia, ern. 12. VI. 58, leg. BUHR no. 1333 (KAS). 1 ♂ es *Brassica napus*, Kiel, ern. IX. 28, leg. BLUNCK (ISZ). 1 ♂ ex *Conringia orientalis*, Kostock Botanical Gardens, Mecklenburg, ern. 5. VII. 49, leg. BUHR no. 182 (ISZ). 1 ♂ es *Thlaspi arvense*, Masserberg, Thuringia, ern. 11. X. 58, leg. BUHR no. 1449 (ISZ). 1 ♂ es *Papaver* sp., Jerichow (Elbe), ern. 8. VII. 23, leg. HERING no. 2305 (ISZ). 1 ♂ es *Papaver* sp., Aschersleberi, leg. NOLTE, VI. 50 (DEI). 1 ♂ es *Cleome dodecandra*, Rostock, hlecklenburg, ern. 27. VII. 32, leg. BUHR (ISZ). 1 ♂ neotype (by present designation) ex *Tropaeolum majus*, Jerichow (Elbe), ern. 23. VII. 22, leg. HERING no. 2085 (ISZ). 1 ♂ es *Cerastium semidecandrum*, Berlin-Frohnau, ern. 13. VI. 26, leg.

¹ The description relates to typical material from the Palaearctic and Oriental Regions. Geographical variation in the Ethiopian Region is discussed below.

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HERING (ISZ). 1 ♂ ex *Salicornia herbacea*, Rostock Botanical Gardens, Mecklenburg, ern. 12. VIII. 37, leg. BUHR (ISZ). 1 d ex *Ononis hircina*, Rostock, Mecklenburg, ern. 26. VI. 35, leg. BUHR (ISZ). 1 ♂ ex *Pisurn sativum*, Aschersleben, leg. NOLTE, VI. 50 (DEI). 1 ♂ ex *Pimpinella anisum*, Rostock Botanical Gardens, Mecklenburg, em. 12. VII. 36, leg. BUHR (ISZ). 1 ♂ ex *Tordylium persicum*, Mecklenburg, ern. 21. VI. 37, leg. BUHR (ISZ). 1 ♂ es *Asperugo procurrans*. Schwäbischer Jura, ern. 12. VIII. 23, leg. HERING no. 2369 (ISZ). 1 ♂ ex *Lithospermum officinale*, Bellinchen Mark, em. 4. VI. 26, leg. HERING no. 2887 (ISZ). 1 ♂ ex *Symphytum officinale*, Kirschberge, Mühlhausen, Thuringia, ern. 7. VI. 66, leg. BUHR no. 2800 (GCDG). 1 ♂ ex *Echium vulgare*, Bredow bei Nauen, ern. 29. VII. 23, leg. HERING no. 2337 (ISZ). 1 ♂ ex *Satureia hortensis*, Berlin-Frohnau, em. 3. IX. 26, leg. HERISC no. 2952 (ISZ). 1 ♂ ex *Phlox drummondii*, Rostock, Mecklenburg, ern. 3. VIII. 35, leg. BUHR no. 77/7 (ISZ). 1 ♂ ex *Linaria vulgaris*, Jerichow (Elbe), ern. 9. VII. 23, leg. HERING no. 2303 (ISZ). 1 ♂ ex *Valeriana sambucifolia*, Rostock, Mecklenburg, ern. 6. VI. 35, leg. BUHR no. 682 a (ISZ). 1 ♂ ex *Valeriana officinalis*, Jerichow (Elbe), ern. 5. VII. 23, leg. HERISC no. 2302 (ISZ). 1 ♂ ex *Centaurea jacea*, Berlin-Dahlem, ern. 27. VI. 42, leg. HERING no. 4838 (ISZ). 1 ♂ ex *Doronicum austriacum*, Berlin Botanical Gardens, ern. 24. VI. 23, leg. HERING no. 2235 (ISZ). 1 d es *Chrysanthemum corymbosum*, Berlin Botanical Gardens, ern. 28. VI. 23, leg. HERING no. 2211 (ISZ). 1 ♂ es *Chrysanthemum vulgare*, Berlin-Frohnau, em. 6. VII. 26, leg. HERING no. 2916 (ISZ). 1 ♂ es *Artemisia dracuncululus*, Berlin-Frohnau, em. 13. VII. 26, leg. HERING no. 2939 (ISZ). 1 d ex *Setiocio vernalis*, Berlin, em. VI. 26, leg. HOPP (ISZ). 1 ♂ es *Setiocio vulgare*, Berlin-Dahlem, em. 12. VI. IS, leg. HERING no. 5420 a (ISZ). 1 d ex *Erigeron canadense*, Berlin-Frohnau, em. 8. VI. 26, leg. HERING no. 2921 (ISZ). 1 d ex *Anthemis tinctoria*, Sternpeda. Harz, em. 25. VI. 27, leg. HERING no. 3158 (ISZ). 1 ♂ es *Taraxacum officinale* agg., Berlin-Frohnau, em. 1. VIII. 26, leg. HERING no. 2971 (ISZ).

Austria — 1 ♂ es *Centaurea jacea*, Linz, Upper Austria, em. 1. VII. 62, leg. HERING no. 6792 (KAS).

Poland — 1 ♂ ex *Hesperis matronalis*, Rabendorf, Silesia, leg. TEICHEL (ISZ).

Russia — 1 ♂ ex *Brassica juncea*, Rostov-on-Don, ern. 17. VI. 27, leg. MAMONOW (ISZ). 1 ♂ ex *Ononis hircina*, Rostov-on-Don, em. 12. VII. 27, leg. MAMONOW (ISZ). 1 ♂ ex *Cicer arietinum*, Rostov-on-Don, em. 7. VII. 27, leg. MAMONOW (ISZ). 1 ♂ ex *Vigna sinensis*, Rostov-on-Don, em. 28. VI. 27, leg. MAMONOW (ISZ).

Yugoslavia — 1 ♂ es *Chrysanthemum coronarium*, Jelsa, Hvar Island, ern. 12. V. 65, leg. HERING no. 7326 (ISZ). 1 d ex *Cirsium creticum*, Jelsa, Hvar Island, em. 27. V. 65, leg. HERING no. 7399 (ISZ).

Italy — 3 ♂♂ es *Linaria* sp., Ostia, near Rome, em. 18. IV. 54 (GCDG). 1 ♂ ex *Senecio doria*, Rome, em. 7. I. 65, leg. FRICK (KAS).

Corsica — 1 ♂ es *Isatis* sp., Corté, em. IX. 33, leg. BCHR (ISZ).

Sicily — 1 ♂ (caught), Sinofsi. Mount Etna, 8. IV. 61, leg. SPENCER (KAS).

Spain — 2 ♂♂ es *Sisymbrium orientale*, Albarracin, Aragon, em. VI. 33, leg. HERING no. 4222 (KAS and ISZ). 3 ♂♂ (caught), Mongat, near Barcelona, 21. II. 10, coll. LICHTWARDT (DEI).

Portugal — 1 ♂ ex *Gazania* sp., Lisbon, em. 4. IV. 53, leg. SPENCER (KAS).

Azores — S. Miguel. 1 ♂, Ponta Delgada, 12. V. 38, leg. STORÁ (HEL). 1 ♂, Furnas, 19-21. V. 38, leg. STORÁ (HEL).

Terceira. 1 ♂, Santa Barbara, 7. VI. 38, leg. FREY (HEL). 1 ♂, Achada, 3-4. VI. 38, leg. FREY (HEL).

Pico. 1 ♂, Madalena, 6-9. VII. 38, leg. STORÁ (HEL).

- Fayal. 3 d d, Caldeira, 4. VII. 38, leg. FREY (HEL).
 Flores. 1 ♂, Santa Cruz, VI. 38, leg. STORÅ (HEL). 1 ♂, Ribeira Fazenda, VI. 38, leg. STORÅ (HEL).
 Corvo. 1 ♂, Caldeiras, 24. VI. 38, leg. STORÅ (HEL).
 Madeira — 1 ♂, Funchal, 1-8. V. 38, leg. FREY (HEL). 1 ♂, Porto Novo, 5. V. 38, leg. FREY (HEL).
 Canary Isles — 2 ♂♂ ex *Malva neglecta*, Santa Cruz, Tenerife, em. 16-17. III. 26, leg. HERING no. 2765 (ISZ). 2 ♂♂ ex *Lathyrus tuberosus*, Laguna, Tenerife, em. 14-15. III. 26, leg. HERING no. 2778 (KAS and ISZ). 1 ♂ ex *Plantago lanceolata*, Puerto de Cabras, Fuerteventura, em. 21. III. 26, leg. HERING no. 2784 (ISS). 1 ♂ ex *Bystropogon plumosum*, El Paco! Palma, em. 11. IV. 26, leg. HERING no. 2830 (ISZ). 1 ♂ ex *Lithospermum arvense*, Puerto de Cabras, Fuerteventura, em. 27. III. 26, leg. HERING no. 2788 (ISZ). 1 ♂ ex *Bidens pilosus*, Santa Cruz. La Palma, em. 16. IV. 26, leg. HERING no. 2808 (ISZ). 1 ♂ ex *Carduus baecephalus*, Laguna, Tenerife, em. 28. IV. 26, leg. HERING no. 2875 (ISZ). 2 d ♂ (caught), Las Palmas, Gran Canaria, 28-30. VI. 31, leg. FREY and STORÅ (HEL). 1 ♂ (caught), Chilegua, Fuerteventura, 4-14. III. 49, leg. LINDBERG (HEL). 2 d ♂ (caught), Haria, Lanzarote, 19. III. 49, leg. LINDBERG (HEL).
 hlorocco — 1 ♂ ex *Compositae* sp., Casablanca. em. 28. I. 66, leg. SPENCER (KAS).
 Egypt — 1 ♂ ex *Pisum sativum*, Heliopolis. em. 20. XII. 21, leg. HARGREAVES (BM). 1 ♂ ex *Solanum melongena*, Alexandria. em. 29. III. 56, leg. HAMMAD (ISZ).
 Palestine — 1 ♂ ex *Eruca sativa*, Tel Aviv. leg. BODENHEIMER (ICZ). 1 ♂ ex *Papaver somniferum*, Tel Aviv. leg. BODENHEIMER (ISZ). 1 ♂ ex *Pisum sativum*, Tel Aviv. leg. BODENHEIMER (ISZ). 1 ♂ ex *Linaria vulgaris*, Tel Aviv. em. 21-30. IV. 20, leg. BODENHEIMER (ISZ). 1 ♂ ex *Chrysanthemum* sp., Tel Aviv. leg. BODENHEIMER (ISZ). 1 ♂ ex *Sonchus oleraceus*, Tel Aviv. em. II. 26, leg. BODENHEIMER (ISZ).
 India — 1 d ex *Melilotus parviflora*, Lyallpur. Punjab, em. 19. II. 23, leg. BAHADUR (BM). 1 ♂ ex *Pisum sativum*, Lyallpur, Punjab, em. 19. III. 20, leg. BAHADUR (BM). 1 d ex *Chrysanthemum* sp., Lyallpur. Punjab, em. 16. III. 23, leg. BAHADUR (Bhl). 1 ♂ ex *Sonchus asper*, Lyallpur. Punjab, em. 23. III. 20, leg. BAHADUR (BM).
 China — 1 ♂ ex *Brassica f. oleifera*, Shanghai. em. V. 33, leg. HOENE (ISZ). 1 ♂ ex *Papaver somniferum*, Shanghai, em. V. 33, leg. HOENE (ISZ). 1 ♂ ex *Pisum sativum*, Canton, leg. HOFFMAN (BM). 1 ♂ ex *Linum usitatissimum*, Canton, leg. HOFFMAN (BM). 2 ♂♂ ex *Carduus* sp., Charbin, Manchuria, em. 5-10. VI. 51, leg. ALIN (ISZ). 1 ♂ ex *Helianthus annuus*, Charbin. Manchuria, em. 8. V. 51, leg. ALIN (ISZ).
 Formosa — 1 ♂ (paratype of *Phytomyza subaffinis* Malloch), Tainan, II. 1909, leg. SAUTER (Hungarian Natural History Museum). 1 ♂ ex *Solanum indicum*, Taipei, em. 7. IV. 65, leg. SASAKAWA (GCDG).
 Japan — 1 d ex *Artemisia vulgaris*, Asiiro. Hokkaido, em. 16. IV. 54, leg. SASAKAWA (GCDG). 1 ♂ ex *Nasturtium indicum*, Kibune (Yamashiro). Honshii, em. 19. V. 53, leg. SASAKAWA (GCDG). 1 ♂ ex *Chrysanthemum* sp., Kibune (Yamashiro). Honshú, em. 7. V. 53, leg. SASAKAWA (GCDG). 1 ♂ ex *Mentha arvensis*, Hikosan (Buzen), Kyúshú, em. 24. V. 56, leg. SASAKAWA (GCDG).
 Cape Verde Isles — 1 d (caught). S. Antão Cova, 31. XII. 53, leg. LINDBERG (HEI.).
 Cameroons — 1 ♂ ex *Veronica* sp., Canieroon mountain (2.900 metres), em. 17. V. 38, leg. BUHR (ISZ).
 Eritrea — 1 ♂ ex *Brassica oleracen.* Actia (2.350 metres), Asrnara. em. 22. XII. 46, leg. DE LOTTO (Bhl).
 Kenya — 1 d ex *Petunia* sp., em. 12. VIII. 40, leg. PELLEY (BM). 1 ♂ ex *Galinsoga parviflora*, Nairobi, em. 1. XII. 61, leg. SPENCER (KAS).

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Madagascar — 1 ♂ (lectotype by present designation of *Phytomyza bidensivora* Séguéy) ex *Bidens pilosa*, Tsirnbazaza, near Tananarive, em. 15. IV. 49 (MNHN).

South Africa — 1 ♂ ex *Solanum nigrum*, Stellenbosch, ern. 8. XII. 61, leg. SPENCER (KAS).

Distribution and Geographical Variation

The above records indicate that this species is very widely distributed throughout the Old World from highboreal to subtropical areas, but it seems entirely absent from the New World. The most northerly record is that for Finland. The species is evidently very common both in temperate areas, such as central Europe, and in warmer areas such as China, Japan, India and the Mediterranean. But the available records for tropical latitudes all refer to localities at substantial altitudes. It is not yet clear whether the species can exist at sea level on the equator.

Other records in the literature which most probably refer to *horticola*, for countries other than those listed above, are as follows.

Indonesia — KALSHOVEN (1931) gives an account of "*atricornis*" attacking *Pisum sativum* in western Java.

Thailand — 1 ♀, Chiangmai, Suthep (1,278 m) recorded by SPENCER (1962).

Libya — DAMIANO (1962) records "*atricornis*" as a pest of "fava" (presumably *Vicia faba*) in Tripolitania.

Senegal — RISBEC (1950) records "*atricornis*" as occurring on *Lactuca*.

Abyssinia — SPENCER (1964) reported females of "*atricornis*" bred from *Mikaniopsis* and *Cotula*.

Congo (Leopoldville) — SPENCER (1939) reported "isolated records".

In all the above countries the occurrence of any species of the *syngenesiae* group except *horticola* seems unlikely.

In the lectotype of *bidensivora* (from Madagascar) and the males examined from South Africa, Kenya, Eritrea and the Cameroons, the sac below the mesophallus is slightly larger than in material from other areas, with its hind margin forming a more pronounced angle with the basiphallus (fig. 21). It is possible that an analysis of more numerous material from the Ethiopian region will enable the definition of a geographical subspecies (for which the name *bidensivora* is available) on the basis of this variation. But I am not able to offer a firm opinion on this question at present, since only six males have been available to me from these areas. The single male from the Cape Verde Isles agrees well with material from Europe and the other Atlantic islands.

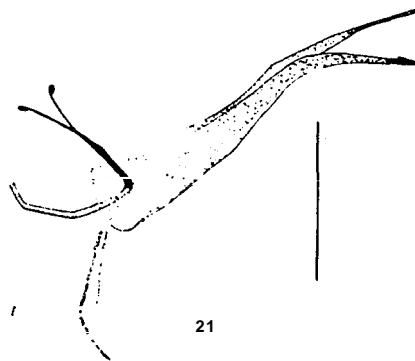


Fig. 21. *Phytomyza horticola* Goureau ♂ (lectotype of *P. bidensivora* Séguéy), aedeagus in lateral view. (Scale 0.1 mm.)