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New records of Agromyzidae (Diptera) from Western Turkey

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Abstract. Specimens were collected once a week from Mugla province, western Turkey, in 2000 and 2001 from cultured and non-cultured plants. During this study *Ophiomyia pulicaria* (Meigen, 1830); *Aulagromyza buhri* (de Meijere, 1938); *Chromatomyia scolopendri* (Robineau-Desvoidy, 1851); *Liriomyza flaveola* (Fallén 1823); *Liriomyza sativae* Blanchard, 1938; *Phytomyza angelicae* Kaltenbach, 1872; *Phytomyza conyzae* Hering, 1920; *Phytomyza rufipes* Meigen, 1830; *Phytomyza thyselinivora* Hering, 1924 are newly recorded for the Turkish leafminer fauna. Morphological descriptions, hosts and their general distributions are given.

Key Words : Agromyzidae, leafminer, new records, Turkey.

Introduction

With more than 2,500 described species belonging to 26 genera in the world, Agromyzidae (leaf-mining flies) is one of the largest fly families. From this family, 776 species were identified in Europe. Adults can be minute, with wing length of little more than 1 mm. The maximum size known is 6.5 mm. The majority of species are in the range of 2 to 3 mm. There is a high degree of host specificity (Spencer 1990). Although the larvae of all species are exclusively internal feeders of living plants, they are not confined to leaves and petioles as the common name may suggest. Numerous species live in different parts of the plant, including the cambium of trees, others feed in seeds and flowers, and few species induce galls. Altogether about 150 species are known to feed regularly on cultivated plants, of these many species normally do not reach high population levels but occasional outbreaks can occur. However, there are species that tend to high reproduction and can cause significant yield reduction or even plant mortality (Dempewolf 2001).

Until now, 59 species have been identified in Turkey (Civelek *et al.* 2000; Deeming and Civelek 1997; Giray 1980; Spencer 1966; Uygun *et al.* 1995). The goal of this study is to contribute to the knowledge of the leafminer fauna from Mugla province, Western Turkey

Materials and Methods

This study was carried out during 2000 and 2001 in Mugla province, which was divided into

four subareas for the convenience of the collection of specimens. The specimens were collected from both cultured and non-cultured plants once a week. The adults of leafminers were obtained by sweeping or by rearing specimens from infested leaves in the laboratory. Due to the fact that the male genitalia are important characters for identification of leafminers, they were removed from the fly, chemically treated, and slide preparations were made for identification of different species. Male abdomens were boiled in 10% KOH, then moved into glacial acetic acid for 5 minutes; and then into 96% alcohol for another 5 minutes; and then dissected under a stereoscopic microscope. The male genitalia were slide-mounted in euparal. Identifications of were made by using Spencer (1965, 1966, 1972, 1973, 1976, and 1990). The aedeagus of all species were illustrated. Representative specimens were deposited at the Laboratory in the Ortaca Vocational School, Mugla, Turkey.

Results

In this study *Ophiomyia pulicaria* (Meigen, 1830), *Aulagromyza buhri* (de Meijere, 1938), *Chromatomyia scolopendri* (Robineau-Desvoidy, 1851), *Liriomyza flaveola* (Fallén 1823), *Liriomyza sativae* Blanchard, 1938, *Phytomyza angelicae* Kaltenbach, 1872, *Phytomyza conyzae* Hering, 1920, *Phytomyza rufipes* Meigen, 1830, and *Phytomyza thyselinivora* Hering, 1924 are reported for the first time from Turkey.

Subfamily Agromyzinae

Ophiomyia (Brazhnikov, 1897)

Type species: *Agromyza pulicaria* Meigen, 1830: Syst. Besch., 6: 170

Ophiomyia pulicaria (Meigen, 1830): Syst. Besch., 6: 170

Synonym: *Ophiomyia olgae* (Hering, 1922)

Description: Wing length from 2.0 to 2.5 mm; frons shining black, 1.5 times width of eye, not projecting above eye in profile; orbital setulae entirely reclinate; jowls 1/8 height of eye, deepest in centre; cheeks linear; vibrissal fasciculus and facial keel lacking; mesonotum with 2 postsutural dorso-central bristles, brilliantly shining black; costa extending to vein M_{1+2} , last section of M_{3+4} shorter than penultimate; squamae grey, margin and fringe black. Aedeagus as in Figure 1.

Hosts: *Ophiomyia pulicaria* is very common on plants belonging to the family Lactuceae: *Andryala* spp., *Chondrilla* spp., *Crepis* spp., *Hieracium* spp., *Hypochoeris* spp., *Lapsana* spp., *Leontodon* spp., *Picris* spp., *Sonchus* spp., *Taraxacum* spp. (Spencer, 1976; Spencer 1990).

Distribution: South Britain (Spencer, 1972); Canada, Denmark, Finland, Norway, Russia (Siberia) (Spencer 1976); Germany (Soos and Papp 1984); Czech Republic (Cerny and Vala 1999).

Material examined: Fethiye-Centre (*Medicago* sp., 10.11.2000, 6m, 9f), Koycegiz-Beyobas (*Triticum* sp., 08.03.2001, 3m, 6f) by sweeping.

Phytomyzinae

Aulagromyza Enderlein, 1936

Type species: *Phytomyza luteoscutellata* de Meijere, 1924: Tijdschr. Ent., 67: 143.

Aulagromyza buhri (de Meijere, 1938): Ent. Ber. Amst., 10: 83

Synonyms: *Paraphytomyza approximatonervis* (Frey, 1946)

Phytomyza incognita (Hering, 1956)

Phytomyza simplonensis (Spencer, 1957)

Description: Wing length from 1.5 to 1.9 mm; frons orange with 2 ors and 2 ori and distinctly projecting above eye near base of antennae; face with black; orbital setulae minute, upright or reclinate; jowls angular, deeply extended at rear, slightly more than 1/3 height of eye; third antennal segment small, round and black, arista short; mesonotum and scutellum black; Costa extending to R_{4+5} ; last and penultimate sections of M_{3+4} equal or last section longer; second cross vein lacking, squamae grey, margin and fringe black; femora black, only fore knees yellow. Aedeagus as in Figure 2.

Hosts: *Galium mollugo*, *Asperula* spp. (Spencer 1976; Spencer 1990).

Distribution: Germany, Finland, Switzerland. (Spencer 1976).

Material examined: Yatagan-Eskiköy (wild grasses, 11.06.2001, 1m) by sweeping.

Chromatomyia Hardy, 1849

Type species: *Phytomyza periclymeni* de Meijere, 1924: Nath. Mus. 37: 499.

Chromatomyia scolopendri (Robineau-Desvoidy, 1851): Annl. Soc. ent. Fr., 2 (9): 139

Synonyms: *Chromatomyia elegans* (Goureau, 1851)

Chromatomyia nevadensis (Strobl, 1900)

Description: Wing length from 2.1 to 2.6 mm; frons and entire margin of eye yellow; 2 equal ors and 2 ori; first and second antennal segments yellow, third segment small, round and brownish-black; mesonotum with 3 postsutural and 1 presutural dorsocentral bristles, acrostichal bristles irregularly in 4 rows, shining black except entire margin adjoining scutellum bright yellow; humerus and notopleura bright yellow, mesopleura greyish below, yellow at least in upper half; second costal section just over 2 1/2 times length of fourth; squamae yellow, margin and fringe black; legs entirely yellow. Aedeagus as in Figure 3.

Hosts: *Asplenium ruta-muraria*, *Asplenium (Phyllitis) scolopendrium*, *Polypodium vulgare* (Spencer 1976).

Distribution: Germany, Great Britain, Belgium (Collart 1953); Denmark (Spencer 1976); France, Spain (Soos and Papp 1984).

Material Examined: Ula-Gokova (*Trifolium* sp., 10.05.2001, 2m, 3f) by sweeping.

Liriomyza Mik, 1894

Type species: *Liriomyza urophorina* Mik.: l.c.: 290.

Liriomyza flaveola (Fallén 1823): Agromyzides Sveciae, 6

Synonyms: *Liriomyza blanda* (Meigen, 1830)
Liriomyza variegata (Meigen, 1838)

Description: Wing length from 2.1 to 2.7 mm; head largely yellow, including all antennal segments and palps; hind margin of eye dark at least to base of vti; frons yellow, not significantly projecting above eye, with 2 ors and 3 ori; mesonotum deep black, though distinctly mat, with 3 postsutural and 1 presutural dorsocentral bristles, acrostichal bristles irregularly in 4 rows; pleura broadly yellow; mesopleural bristle on yellow ground; last section of vein M_{3+4} approximately twice length of penultimate; squamae yellow, margin and fringe black; femora largely black but conspicuously yellow knees. Aedeagus as in Figure 4.

Hosts: *Avena sativa*, *Hordeum vulgare*, many pasture and wild grasses frequently *Bromus* spp., *Dactylus* spp., *Holcus* spp., *Poa* spp. (Cerny and Vala 1999).

Distribution: Finland, Norway, Sweden and Mediterranean area (Spencer 1976); Czech Republic (Cerny and Vala 1999); Australia, Netherlands, Spain, Uzbekistan (Danielsson 1999); Germany (Tschirnhaus, 1999); Japan (Iwasaki 2001).

Material examined: Bodrum-Yal kavak (*Trifolium* spp., 25.07.2001, 2m, 7f); Ula-Çiçekli (*Triticum* spp., 14.03.2000, 4m, 6f) by sweeping.

Liriomyza sativae Blanchard, 1938: An. Soc. Cient. Santa Fé, 126: 352

Synonyms: *Liriomyza pullata* Frick, 1952
Liriomyza canomarginis Frick, 1952
Liriomyza minutiseta Frick, 1952
Liriomyza munda Frick, 1957
Liriomyza guytona Freeman, 1958

Description: Wing length from 1.3 to 1.7 mm; orbits yellow, both vertical bristles on dark ground, vti at margin of black and yellow; 2 equal ors, 2 ori; orbital setulae sparse, reclinate; jowls deep, almost 1/3 height of eye; third antennal segment small, round; mesonotum brilliantly shining black; 3 postsutural and 1 presutural dorsocentral bristles, acrostichal bristles irregularly in 4 rows; mesopleura largely yellow but variably black on lower half, either with separated black areas or with entire lower half uniformly black; last section of M_{3+4} 3-4 times length of penultimate; squamae yellowish, margin and fringe dark. Aedeagus as in Figure 5.

Hosts: There are well over 20 hosts in the Cucurbitaceae, Fabaceae, Solanaceae and Brassicaceae families recorded for this insect (Spencer, 1973).

Distribution: Jamaica (Spencer 1965); Argentina, Peru, Venezuela (Spencer 1973); Yemen, Oman (Deeming, 1992). Sudan, Cameroon (Martinez and Bordat, 1996). Nigeria (Deeming and Mann, 1999).

Material examined: Fethiye-Kayadibi (*Citrullus lanatus* L., 2m, 1f) by rearing from infested leaves.

Phytomyza Fallén, 1810

Type species: *Phytomyza flaveola* Fallén, 1810: l.c.: 26.

Phytomyza angelicae Kaltenbach, 1872:
Pflanzen-Feinde, 279

Synonyms: *Phytomyza aegopodii* Hendel, 1923
Phytomyza laserpitii Hendel, 1924

Description: Wing length from 2.0 to 3.0 mm; frons bright yellow, broad 2-2 ½ times width of eye; 2 ors and 2 ori; first and second antennal segments yellow, third antennal segment black, small and round; face yellow; jowls deeply extended, ¼ height of eyes; mesonotum greyish-black with 3 postsutural and 1 presutural dorsocentral bristles, acros-

tichal bristles in 2 rows; side of thorax dark apart from narrow upper margin of mesopleura; second costal section from just over 3 to just less than 4 times length of fourth; legs dark with only fore-knees yellow; squamae yellowish, with dark margin and fringe. Aedeagus as in Figure 6.

Hosts: *Angelica archangelica*, *A. volgens* (Spencer, 1976); *Aegopodia podagraria*, *Angelica silvestris*, *Heracleum* spp., *Laserpitium* spp. (Cerny and Vala 1999).

Distribution: Alaska, Canada, Finland, Kazakhstan, Norway, Russia (eastwards) (Spencer 1976); Austria, Germany (Soos and Papp 1984); Czech Republic (Cerny and Vala 1999); Sweden, Iceland (Danielsson 1999).

Material examined: Kavakl dere (*Triticum* sp., 16.03.2000, 1m) by sweeping.

Phytomyza conyzae Hering, 1920: Arch. Naturgesch., 84A (7): 152

Synonyms: *Phytomyza centaureae* Hering, 1924
Phytomyza arnicophila Hering, 1931
Phytomyza rivierae Hering, 1932
Phytomyza inulina Hering, 1932

Description: Wing length from 2.1 to 2.4 mm; frons and entire hind-margin of head yellow; upper ors if present substantially weaker than lower; 2 incurved ori; third antennal segment slightly longer than broad and black, first and second yellowish, finely pubescent; jowls deep, $\frac{1}{4}$ of eyes; mesonotum greyish, with 3 postsutural and 1 presutural strong dorsocentral bristles, acrostichal bristles irregularly in 3 rows; humerus and notopleura bright yellow, upper half of mesopleura yellow, but black along front and lower margins; scutellum yellow; legs, femora black with bright yellow knees. Aedeagus as in Figure 7.

Hosts: *Inula viscosa*, *Telekia* spp. (Spencer 1990); *Arnica montana*, *Inula conyza*, *Pulicaria dysenterica* (Cerny and Vala 1999).

Distribution: France, Denmark, Czech Republic (Cerny and Vala 1999); Austria, Germany, Romania (Soos and Papp 1984).

Material examined: Fethiye-Kayadibi (*Amaranthus* spp., 10.11.2000, 3m, 5f); Koycegiz-Eskikoy (*Inula* sp., 18.10.2000, 2m, 5f); Koycegiz-Toparlar (*Rumex* sp., 17.09.2000, 1m, 1f) by rearing from infested leaves.

Phytomyza rufipes Meigen, 1830: Syst. Besch., 6: 192

Synonyms: *Phytomyza sulphuripes* Meigen, 1830
Phytomyza ruficornis Zetterstedt, 1848
Phytomyza femoralis Brischke, 1871
Phytomyza genislatissimus Strobl, 1893
Phytomyza bistrigata Strobl, 1906

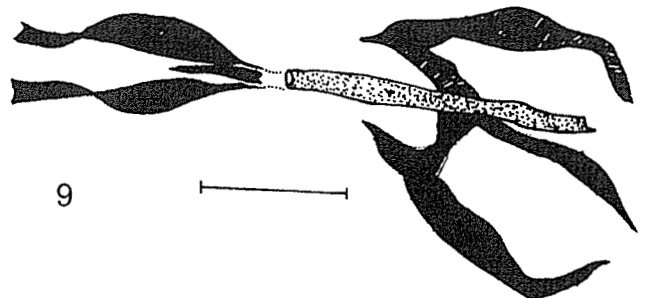
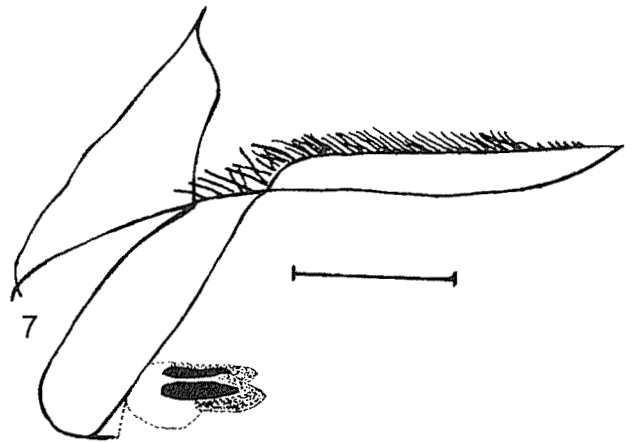
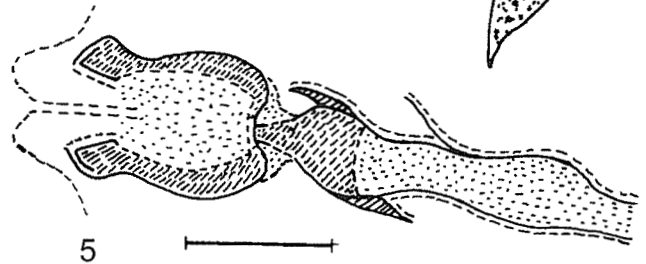
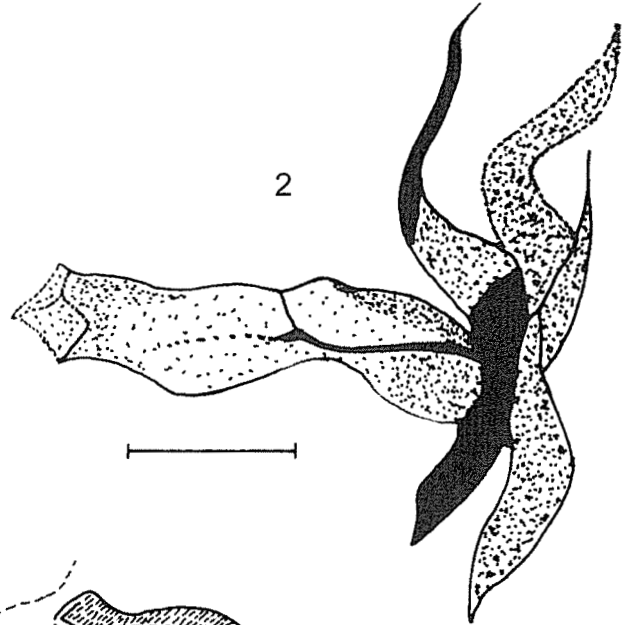
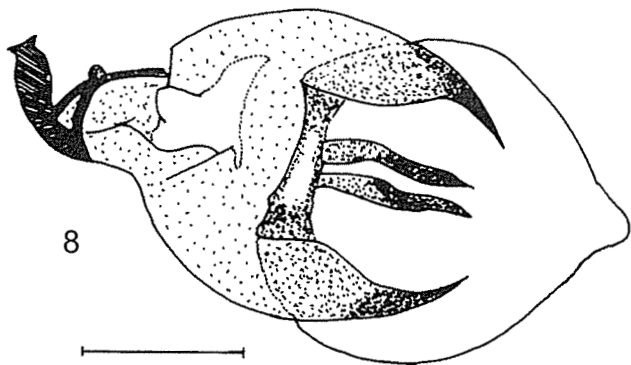
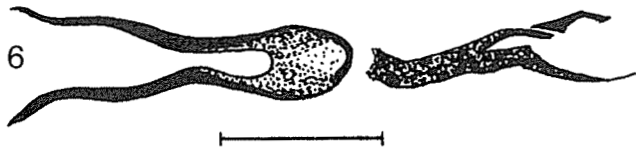
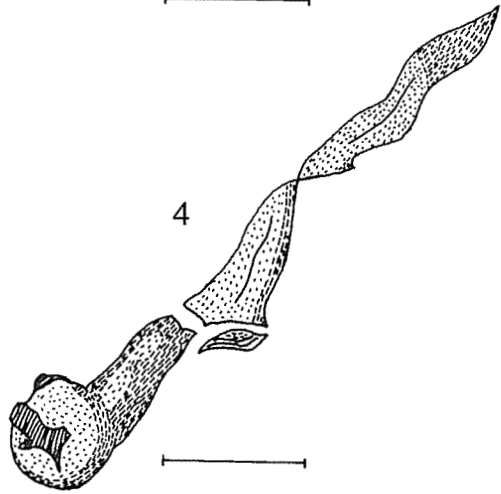
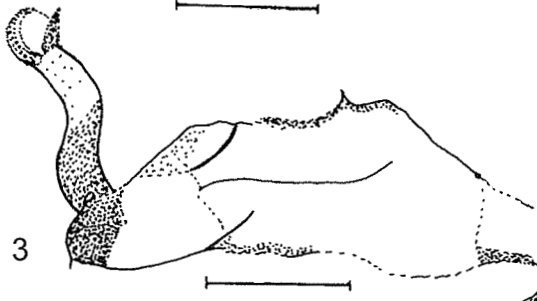
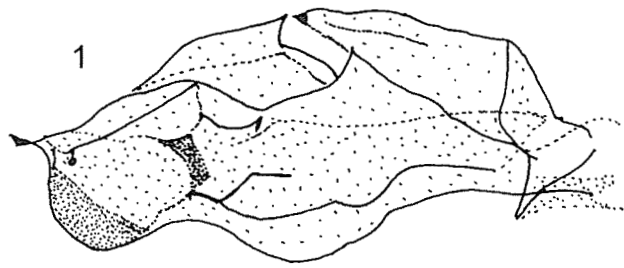
Description: Wing length from 2.5 to 3.5 mm; frons yellowish orange and broad; vte on dark ground, vti on yellow; 2 ors and 3 ori; jowls extended up to 0.75 height of eye; third antennal segment small, round, yellowish-brown; mesonotum mat grey, with 3 postsutural and 1 presutural dorsocentral bristles; acrostichal bristles sparse; humerus and notopleural area yellow, mesopleura yellow but mat grey at least on lower three-quarters; squamae and fringes greyish-white; femora yellow with irregular brownish striations. Aedeagus as in Figure 8.

Hosts: Exclusively Cruciferae; *Allaria* spp., *A Armoracia* spp.; *Brassica* spp., *Conringia* spp., *Diplo-taxis* spp., *Moricandia* spp., *Peltaria* spp., *Raphanus* spp., *Sinapis* spp. and *Vappula* spp. (Spencer, 1973).

Distribution: Canary Islands, Denmark, Egypt, Finland, Norway, Sweden (Spencer 1976); Germany, Spain, Yugoslavia (Soos and Papp 1984); Czech Republic, Iceland, Tunisia (Cerny and Vala 1999).

Material examined: Marmaris-Çetibeli (*Trifolium* sp., 02.07.2001, 2m, 3f); Ula-Ataköy (*Trifolium* sp., 10.08.2001, 4m, 3f) by sweeping.

Figures 1-9. 1. *Ophiomyia pulicaria*; aedeagus, lateral view; 2. *Aulagromyza buhri*; aedeagus, lateral view; 3. *Chromatomyia scolopendri*; aedeagus, lateral view; 4. *Liriomyza flaveola*; aedeagus, lateral view; 5. *Liriomyza sativae*; aedeagus, dorsal view; 6. *Phytomyza angelicae*, dorsal view; 7. *Phytomyza conyzae*, aedeagus, lateral view; 8. *Phytomyza rufipes*, aedeagus, dorsal view; 9. *Phytomyza thyselinivora*; aedeagus, dorsal view (scale lines = 0.1 mm).



Phytomyza thysselinivora Hering, 1924: Z. Morh. Ökol. Tiere, 2: 241

Description: Wing length from 2.1 to 2.4 mm.; frons yellow, twice width of eye, not significantly projecting above eye; 2 ors and 1 ori; hind-margin of eye black to base of vti; all antennal segments black, third antennal segment large, ovoid; jowls deep, 1/3 of eyes; mesonotum mat greyish-black; acrostichal bristles irregularly in 4 rows; sides of thorax generally dark but rear of humerus and notopleura frequently brownish; second costal section long, 3 ½ - 4 ½ times length of fourth; squame yellow, margin and fringe dark; legs black, knees on fore-femora bright yellow. Aedeagus as in Figure 9.

Hosts: Umbelliferae, *Peucedanum palustre* (Spencer 1976).

Distribution: Sweden (Danielsson 1999); Germany (Tschirnhaus, 1999).

Material examined: Ortaca-Dalyan (*Triticum* sp., 03.02.2001, 1m) by sweeping.

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