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Contributions to the Turkish Agromyzidae Fauna from Anatolian Part of Turkey, with fifteen New Records

(Insecta: Diptera)

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Abstract: This study was carried out in 2006 in some provinces of Turkey's Anatolia region (Mugla, Burdur, Elazıg, Erzurum, Artvin, Rize and Trabzon). Specimens of leaf miners from cultured and non-cultured plants were collected during 6 months. In this study 15 new records belonging to 6 genera of the Turkish fauna were found. These species are *Agromyza anthracina* Meigen, 1830; *Agromyza bromi* Spencer, 1966; *Agromyza graminicola* Hendel, 1931; *Agromyza potentillae* Kaltenbach, 1864; *Chromatomyia ciliata* (Hendel, 1935); *Chromatomyia luzulae* (Hering, 1924); *Chromatomyia nigra* (Meigen, 1830); *Liriomyza dracunculi* Hering, 1932; *Melanagromyza tripolii* Spencer, 1957; *Napomyza carotae* Spencer, 1966; *Phytomyza albipennis* (Fallén, 1823); *Phytomyza astrantiae* Hendel, 1924; *Phytomyza brevifacies* Hendel, 1934; *Phytomyza glabra* Hendel, 1935; *Phytomyza nigritula* (Zetterstedt, 1838). Among these species, *N. carotae* is an economically important species as it is feeding on carrot. In this work, their hosts, general distributions and GPS (Global Positioning System) records are given.

Key words: Diptera, Agromyzidae, leafminers, new record, Turkey

Introduction

Agromyzidae (leaf mining flies) is one of the largest fly families, with more than 2742 valid species belonging to 27 genera worldwide

(SPENCER 1990). From this family, about 1165 species were identified in the Palearctic region (SCHEIRS et al. 1999). Agromyzids are typically phytophagous as their larvae live in tissues of living plants. Larvae of most leaf miners feed the leaf parenchyma. Most species are miners in leaves where they produce a characteristic form of mine, in most of the cases a substantial aid in identifying the agromyzid. Some species are stem-borers or develop in roots, seeds or galls. The larvae of one genus develop exclusively in the cambium of young and old trees. Most species are monophagous, a considerable number are oligophagous while very few are truly polyphagous (SPENCER 1972). Common characteristics of 150 species is feeding regularly on cultivated plants. Normally, most of these species do not reach high population levels, but occasional outbreaks can occur. Some species are serious pests of cultivated plants such as *Liriomyza* spp. (CERNY & BARTAK 2001; SPENCER 1973). *Liriomyza* is a cosmopolitan group of pests that consists of more than 300 species. Larvae of this genus are polyphagous, attacking ornamental and vegetable crops in the families of Asteraceae, Brassicaceae, Cucurbitaceae, Fabaceae, Solanaceae, and many other families of plants. Infestation by *Liriomyza* spp. can cause both direct and indirect damages (MINKENBERG & VAN LENTEREN 1986; MUSGRAVE et al. 1975). Direct damage given by larval feeding on palisade parenchyma tissue can reduce the photosynthetic capacity of the plant up to 62 % and several infested leaves may fall (JOHNSON et al. 1983). Indirect injury occurs when both adult males and adult females feed. When females lay eggs, they may act as vectors for diseases (MATTEONI & BROADBENT 1988; ZITTER & TSAI 1977).

Agromyzidae is one of the most important fly families in Turkey, because of their pest status especially on vegetable and ornamental plants in the greenhouses. The Turkish agromyzid fauna is poorly known. Until now, only 88 species have been identified in Turkey (GIRAY 1980; UYGUN ET AL. 1995; DEEMING & CIVELEK 1997; CIVELEK & DEMIRKAN 1998; CAMPOBASSO 1999; CIVELEK et al. 2000; CIVELEK 2002, 2003, 2004; CIKMAN & CIVELEK 2005; CIVELEK & DEMIRKAN 1998; DEEMING & CIVELEK 1997; GIRAY 1980, MART et al. 2005, CERNY & MERZ 2006).

The aim of this study was to contribute to the knowledge of the leaf miner fauna of Turkey. Also, this study will provide a base for future researchers regarding the fauna of leaf miner species.

Material and Methods

This study was carried out during 2006 in some provinces of Anatolian part (Mugla, Burdur, Elazıg, Erzurum, Artvin, Rize and Trabzon) of Turkey. Mugla and Burdur are in the west, Elazig and Erzurum are in the east, Artvin, Rize and Trabzon are in the northeast blacksea region of Anatolia. The leaf miner specimens were collected from both cultured and non-cultured plants during 6 months in 2006. A GPS (Global Positioning System) was used while the samples are collected and their GPS and altitude data were noted. The adults were obtained by sweeping. Since the male genitalia are important characters for identification of leaf miners, slide preparations were made. The following general procedures were applied: The abdomen of each male was boiled in 10% KOH, transferred into 5% glacial acetic acid for 5 minutes and subsequently transferred to 96% alcohol for 5 minutes. Then the abdomen was further dissected under a stereoscopic microscope. The male genitalia were transferred into euparal on a micro mount pinned under the individual specimen in order to preserve the material perpetually. Identifications of the species were made by using Spencer (SPENCER 1972, 1973, 1976, 1989, 1990). Representative specimens are stored in Entomology Laboratory in Biology Department, the Faculty of Science and Arts, Mugla University, Turkey.

Results

With this work, 15 agromyzid species were reported for the first time in Turkey. The taxa are presented alphabetically.

Agromyza Fallén, 1810

Agromyza abiens Zetterstedt, 1848

Material examined: *A. abiens* was found in Sayaközü, Uzümlü village, Fethiye town, Mugla on wild Poaceae, 14.10.2006 (1 ♂) by sweeping (36°50'194''N / 29°10'769''E; 970 m).

Hosts: Boraginaceae, particularly genera *Anchusa, Asperugo, Borago, Cynoglossum, Echium, Lycopsis, Pentaglottis, Pulmonaria, Symphytum* (SPENCER 1976).

General Distribution: Common and widespread throughout Europe, Denmark, Finland, Norway, Sweden, (SPENCER 1976), Germany (VON TSCHIRNHAUS 1999), Lithuania (PAKALNISKIS ET AL. 2000).

Agromyza anthracina Meigen, 1830
Material examined: *A. anthracina* was found in Yenipolat village, Erzurum on *Medicago sativa* L. and *Trifolium* sp., 09.09.2006 (1 ♂) by sweeping (40°04'599''N / 40°56'990''E; 1853 m).
Host: *Urtica dioica* (Urticaceae) (SPENCER 1976).
General Distribution: Denmark, Finland, Norway, Sweden, widespread in Europe (SPENCER 1976), Germany (VON TSCHIRNHAUS 1999), Lithuania (PAKALNISKIS et al., 2000).

Agromyza bromi Spencer, 1966
Material examined: *A. bromi* was found in Göç village, Ispir town, Erzurum on *Medicago sativa* L. and wild Poaceae, 09.09.2006 (1 ♀) by sweeping (40°35'123''N / 41°08'667''E; 971 m).
Hosts: *Ceratochloa unioloides* (Poaceaee) (SPENCER 1976).
General Distribution: Denmark, England, Germany (SPENCER 1976, VON TSCHIRNHAUS 1999), Lithuania (PAKALNISKIS et al. 2000).

Agromyza graminicola Hendel, 1931
Material examined: *A. graminicola* was found in Göç village, Ispir town, Erzurum on *Medicago sativa* L., and wild Poaceae, 09.09.2006 (2 ♀♀) by sweeping (40°35'123''N / 41°08'667''E; 971 m).
Hosts: *Phragmites communis* (Poaceaee) (SPENCER 1976).
General Distribution: Austria, Denmark, Finland, Germany, Hungary, Poland, Sweden (SPENCER 1976, VON TSCHIRNHAUS 1999), Lithuania (PAKALNISKIS et al. 2000).

Agromyza potentillae (Kaltenbach, 1864)
Material examined: *A. potentillae* was found in Karagöl (lake) Natural Park, Borcka town, Artvin on wild Poaceae, 10.09.2006 (1 ♂) by sweeping (41°23'232''N / 41°51'230''E; 1479 m).
Hosts: Rosaceae, particularly genera *Agrimonia, Alchemilla, Comarum, Filipendula, Fragaria, Geum, Potentilla, Rosa, Rubus, Sanguisorba* (SPENCER 1976).
General Distribution: Canada, Denmark, Finland, Japan, Norway, Sweden, U.S.A., western and central Europe (SPENCER 1976), Germany (VON TSCHIRNHAUS 1999), Lithuania (PAKALNISKIS et al. 2000).

Chromatomyia Hardy, 1849

Chromatomyia ciliata (Hendel, 1935)

Material examined: *C. ciliata* was found in Göç village, Ispir town, Erzurum on wild Poaceae, 09.09.2006 (1 ♂) by sweeping (40°35'123''N / 41°08'667''E; 971 m).

Hosts: *Leucanthemum* sp. (Asteraceae) (SPENCER 1990).

General Distribution: Austria, Finland, Norway, Russia, Sweden (SPENCER 1976).

Chromatomyia luzulae (Hering, 1924)

Material examined: *C. luzulae* was found in Firtina Valley, Camlihemsin town, Rize on aquatic plants 11.09.2006 (1 ♀) by sweeping (40°59'491'' N / 40°58'158''E; 451 m).

Hosts: *Luzula pilosa* (Juncaceae) (SPENCER 1976).

General Distribution: Europe, Finland, Norway, Sweden (SPENCER 1976), Germany (VON TSCHIRNHAUS 1999), Lithuania (PAKALNISKIS et al. 2000).

Chromatomyia nigra (Meigen, 1830)

Material examined: *C. nigra* was found in Curcur waterfall, Keban, Elazig on wild Poaceae, 08.09.2006 (1 ♂) by sweeping (38°47'185''N / 38°45'179''E; 798 m).

Hosts: *C. nigra* is very common on plants belonging to the family Poaceae; *Arrhenatarum, Brachypodium, Calamagrostis, Dactylis, Festuca, Holcus, Milium, Phalaris, Poa* (SPENCER 1976), *Avena sativa* L., *Hordeum vulgare* L., *Secale cereale* L., *Triticum aestivum* L., also on many wild grasses (SPENCER 1973).

General Distribution: Canada, Denmark, Europe, Finland, Japan, western U.S.A., Sweden (SPENCER 1973, 1976), Germany (VON TSCHIRNHAUS 1999), Lithuania (PAKALNISKIS et al. 2000).

Liriomyza Mik, 1894

Liriomyza dracunculi Hering, 1932

Material examined: *L. dracunculi* was found in Ovit Mountain, Iyidere, Ikizdere valley, Rize on various riverside plants, 12.09.2006 (1 ♂) by sweeping (40°45'371''N / 40°33'710''E; 20 m).

Hosts: *Senecio erucifolius, S. jacobeae* (Asteraceae) (SPENCER 1976).

General Distribution: Denmark, England, France (SPENCER 1976), Germany (VON TSCHIRNHAUS 1999).

Melanagromyza Hendel, 1920

Melanagromyza tripolii Spencer, 1957

Material examined: *M. tripolii* was found in Keban town, Elazıg on wild Poaceae, 08.09.2006 (3 ♀♀) by sweeping (38°47'185''N / 38°45'179''E; 798 m).

Host: *Aster tripolium* (Asteraceae) (SPENCER 1976).

General Distribution: Denmark, England, Finland, Germany and The Netherlands (SPENCER 1976, VON TSCHIRNHAUS 1999).

Napomyza Westwood, 1840

Napomyza carotae Spencer, 1966

Material examined: *N. carotae* was found in Göç village, Ispir town, Erzurum on *Medicago sativa,* 09.09.2006 (1 ♂) by sweeping (40°35' 123''N / 41°08'667''E; 971 m).

Hosts: *Daucus carota* L. (Apiaceae); almost certainly another Umbelliferae but exact host-range requires confirmation (SPENCER 1973).

General Distribution: Germany, The Netherlands, Switzerland (SPENCER 1973, VON TSCHIRNHAUS 1999), Lithuania (PAKALNISKIS et al. 2000).

Phytomyza Fallén, 1810

Phytomyza albipennis Fallén, 1823

Material examined: *P. albipennis* was found in Dokuzcam village, Yilanli Mountain, Mugla on wild Poaceae, 01.10.2006 (1 ♂) by sweeping (37° 23'718''N / 28°29'686''E; 753 m).

Hosts: Unknown, but the larvae are almost certainly internal feeders in Ranunculaceae (SPENCER 1976).

General Distribution: Denmark, Finland, Spain, Sweden, the former Yugoslavia (SPENCER 1976), Germany (VON TSCHIRNHAUS 1999), Lithuania (PAKALNISKIS et al. 2000).

Phytomyza astrantiae Hendel, 1924

Material examined: *P. astrantiae* was found in Uzungol (lake), Trabzon on various lakeside plants, 12.09.2006 (1 ♂) by sweeping (40°40'625''N / 40°15'430''E; 695 m).

Host: *Astrantia* sp. (Apiaceae) (SPENCER 1990).

General Distribution: Germany, Poland (VON TSCHIRNHAUS 1999, MARTINEZ 2004).

Phytomyza brevifacies Hendel, 1934
Material examined: *P. brevifacies* was found in Firtina Valley, Camlihemsin town, Rize on various aquatic plants, 11.09.2006 (1 ♂) by sweeping (40°59'491''N / 40°58'158''E; 451 m).
Hosts: Unknown (SPENCER 1976).
General Distribution: East Fennoscandia, Russia (SPENCER 1976); Lithuania (PAKALNISKIS et al. 2000).

Phytomyza glabra Hendel, 1935
Material examined: *P. glabra* was found in Göç village, Ispir town, Erzurum on *Medicago sativa,* 09.09.2006 (1 ♀) by sweeping (40°35' 123''N / 41°08'667''E; 971 m).
Hosts: *Anhriscus sylvestris* (Apiaceae) (SPENCER 1976).
General Distribution: Finland, Germany (SPENCER 1976, VON TSCHIRNHAUS 1999), Lithuania (PAKALNISKIS et al. 2000).

Phytomyza nigritula Zetterstedt, 1838
Material examined: *P. nigritula* was found in Sogut village, Burdur on *Triticum* sp. (Poaceae), 26.11.2006 (1 ♂) by sweeping (37°02'298''N / 29° 47'782''E; 1378 m).
Hosts: *Ranunculus* spp. (Ranunculaceae) (SPENCER 1976).
General Distribution: Canada, Denmark, Finland, Norway, Sweden, widespread in Europe including Faroes and Iceland (SPENCER 1976), Germany (VON TSCHIRNHAUS 1999), Lithuania (PAKALNISKIS et al. 2000).

Conclusion

With this study, the number of leaf miner species was updated to 103 species that was previously 88 species. According to the literature *A. anthracina, A. bromi*, *A. graminicola*, *A. potentillae*, *C. ciliata*, *C. luzulae*, *C. nigra*, *L. dracunculi*, *M. tripolii*, *N. carotae*, *P. albipennis*, *P. astrantiae*, *P. brevifacies*, *P. glabra*, *P. nigritula* are not economically important species because they are not feeding on the cultured plants that have economic values. On the contrary, when the species of Agromyzidae family were inspected, it is seen that *Liriomyza* spp. and *Phytomyza* spp. have economical importance. *N. carotae* is an economically important species because it is feeding on carrot. The mine channels soon collapse and lead to serious deformation of the carrot (SPENCER 1973). High infestation of carrots with *N. carotae* is frequently observed in Europe.

The species may be even more abundant than it is previously recorded. Because the feeding trace superficially resembles that of *Psila rosae* L. (Diptera, Psilidae), the agromyzid fly was presumably sometimes misidentified or overlooked. Therefore, the carrot mining fly must be considered as a serious pest. However, a thorough evaluation of the yield reduction caused by this fly has not been undertaken. Larval feeding within the root is normally restricted to the upper part, near the stem. Since the mines are superficial, they are not destroying the carrots completely and the carrots are still suitable for human consumption. On the other hand, the overall vigor of the plant can be affected by larval feeding in the petioles and the stem (SPENCER 1990).

Finally, making fifteen new records of agromyzid fly have been important in terms of showing the biodiversity of Turkey.

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