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Gall midges (Cecidomyiidae, Diptera) of Calabria, southern Italy

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Abstract. In June 2006, 59 species of the family Cecidomyiidae were found during investigations at six localities in Calabria, a part of southern Italy. Localities were situated from the seaside up to 600 m a. s. l. The average number per locality was 14 species. *Asphondylia lathyri* Rübsaamen, 1914, *Contarinia silvestris* Kieffer, 1897, *Jaapiella reichardiae* Sylvén, 1998, *Lasioptera donacis* Coutin, 1981, *Lathyromyza schlechtendali* (Kieffer, 1886), *Odinadiplosis amygdali* (Anagnostopoulos, 1929), *Piranea spartii* Janezic, 1990, *Sitodiplosis mosellana* (Géhin, 1857) and *Xerephedromyia ustjurtensis* Fedotova, 1992 are reported from Italy for the first time. Gall midge species found in Calabria are associated with 46 host plant species belonging to 20 plant families. Fabaceae is the plant family with the highest number of gall midges (17 species). *Quercus pubescens* hosts six species, *Q. ilex*, *Erica arborea*, *Triticum vulgare* and *Lathyrus latifolius* each host three gall midges species. The gall midge fauna of Italy includes at present 508 species. *Cystiphora sonchi* (Vallot, 1827) causing galls on *Sonchus oleraceus* L. and *Dasineura plicatrix* (Loew, 1850) on *Rubus ulmifolius* L. are the most frequent gall midge species in Calabria. Zoogeography: 34% are Mediterranean species, 32% European, 24% Eurosiberian, 5% Holarctic, 3% Nearctic and 2% Euroasian species. *Xerephedromyia ustjurtensis* Fedotova, 1992 developing in galls on *Ephedra distachya* L. is the most interesting species found in Calabria. It is an Euro-Asian species with disjunct distribution. Its occurrence in Calabria is evidence of the high natural history value of this part of Italy. *Dasineura vincae* (Kieffer, 1888) causing galls on *Vinca minor* L. is a very rare gall midge species. The original material of this gall midge species was found at Avellino. The finding of galls of this species at Cetraro is the second record in Italy. Annotated lists of gall midge species and of host plants attacked by gall midges are given.

Distribution, zoogeography, Cecidomyiidae, Diptera, Italy, Calabria, Palaearctic region, plant-insect interactions

INTRODUCTION

In 1994 we published the first summary of gall midge species that were described or recorded in the whole of Italy during the period 1840–1994 (Skuhravá & Skuhravý 1994). This list included 324 gall midge species together with fundamental data on their biology. On the basis of analysis of published articles we came to the conclusion that the territory of Italy was explored very unevenly from the point of the gall midge fauna. Some parts were investigated well but the gall midge fauna of some other parts remained practically unknown. That was the reason why we resolved to carry out investigations in Sardinia in 1997 (Skuhravá & Skuhravý 2002), in northern Italy in the years 1999–2009 (Skuhravá et al. 2001, 2002, Skuhravá & Skuhravý 2003, 2005a, b, 2006, 2007, 2009, 2010) and in Calabria in June 2006.

Calabria is a region situated at the southernmost part of the Apennine Peninsula. The whole region covers 15,080 km². It is bounded to the south-west by the region of Sicily, to the west by the Tyrrhenian Sea and to the east by the Ionian Sea. About one half of the area is mountainous. Three mountain ranges are present: Pollino, La Sila and Aspromonte. All three mountain ranges are unique with their own flora and fauna. Most of the lower situated areas in Calabria have been agricultural for centuries. The lowest slopes are rich in vineyards and citrus fruit orchards. Moving

upwards, olives and chestnut trees appear while in the higher regions there are often dense forests of oak, pine, beech and fir trees. The climate is influenced by the mountainous and hilly relief of the region. A cold climate prevails in the area of Monte Pollino, temperate in the area of Aspromonte, with greater humidity on the Tyrrhenian coast and a drier climate on the Ionian coast.

From the biogeographical point of view, according to Udvardy (1975), Calabria belongs to the Mediterranean Sclerophyll Province. According to Noirfalise (1987), in Calabria, similarly as in Sicily and Sardinia, four zones of natural vegetation may be found: (1) the thermomediterranean zone; (2) the mesomediterranean zone with oakwoods with *Quercus ilex*; (3) the supramediterranean zone with beechwoods; (4) the oromediterranean or montane zone with *Ostrya* and *Carpinus orientalis*.

Only six gall midge species were known to occur in this area of Italy before our investigations. Trotter (1900) found galls of *Contarinia craccae*, and later (Trotter 1902) recorded galls of *Probruggmanniella phillyreae* and galls of *Mikiola fagi* (Trotter et Cecconi 1909); Möhn (1968) mentioned larvae of *Ozirhincus anthemidis* and *O. longicollis* and Rasis (1953) galls caused by *Hybolasioptera fasciata*.

MATERIAL AND METHODS

The occurrence and distribution of gall midges have been investigated by a uniform method, by collecting galls on host plants at each locality. The method is described in the article of Skuhravá & Skuhravý (1997).

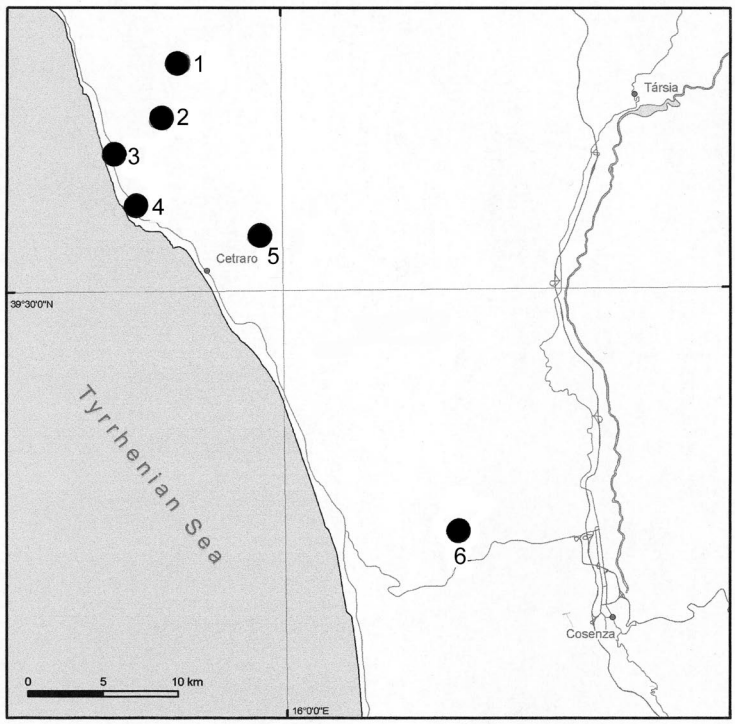

Fig. 1. Part of Calabria in the most southern Italy with localities where investigations of the family Cecidomyiidae were carried out in May and June 2006: 1 – Sangineto, 2 – Bonifati, 3 – Bonifati Marina, 4 – Cittadella del Capo, 5 – Cetraro, 6 – San Fili.

Identification of galls is based on the keys of Houard (1908–1909) and Buhr (1964–1965), identification of larvae on Möhn (1955), of adults on Skuhravá (1997a), nomenclature of gall midge species is based on Skuhravá (1986, 1989) and Gagné (2004). Nomenclature of host plants is based on Tutin et al. (1964–1980). Data about gall midges gathered during these investigations were analysed and evaluated from the zoogeographical point of view using methods described by Skuhravá (1987, 1991, 1994a, b, 1997b) and Skuhravá et al. (1984).

Gall midge galls (voucher specimens), larvae, pupae and adults are deposited in the collection of Marcela Skuhravá in Praha, Czech Republic.

Localities examined

Localities are arranged alphabetically. The following data are given for each locality: the name of locality, its altitude, brief ecological characteristics, the dates of investigations and, at the end in parentheses, the number of the locality, indicating its position on the map (Fig. 1).

Bonifati, 200–300 m a. s. l.: trees and shrubs on the hill-side and stands along the brook; of trees, mainly *Quercus pubescens*, *Ficus carica*, *Castanea*, *Phillyrea*; 30 May 2006 (2).

Bonifati Marina, 5–20 m a. s. l.: shrubs and trees round the small village situated at the seaside; 28 May 2006 (3).

Cetraro, 120–250 m a. s. l.: trees and shrubs on rocks; mainly *Quercus pubescens*, *Fraxinus ornus*, *Castanea*, *Robinia*; shrubs alongside vineyards and citrus-orchards; 1 June 2006 (5).

Cittadella del Capo, 1–20 m a. s. l.: stands along the sea-side; mainly *Arundo donax*, *Nerium oleander*; 2 June 2006 (4).

San Fili, 560–600 m a. s. l.: trees and shrubs along the road, *Castanea sativa*, *Fraxinus ornus*, *Robinia pseudoacacia*; 29 May 2006 (6).

Sangineto, 200–250 m a. s. l.: trees and shrubs along the brook and irrigation canal; stands along fields and vineyards; mainly *Arundo donax* and very old trees of *Alnus*, *Populus nigra*; *Rhamnus alaternus*, *Olea europaea*, *Sambucus*, *Ficus carica*; 31 May 2006 (1).

ANNOTATED LIST OF GALL MIDGE SPECIES

The following data are given for each species: species name, author and date of description, synonyms (if any), short description of the biology (if known), shape of the gall, host plant species and family, occurrence in Calabria and character of distribution in the Palaearctic region. An asterisk (*) before the species name indicates a new record for Italy.

***Anabremia bellevoyei* Kieffer, 1896**

Larvae develop in swollen rolled leaflet of *Lathyrus latifolius* (Fabaceae). Occurrence: Cetraro. Distribution: European.

***Aphidoletes aphidimyza* (Rondani, 1847)**

Larvae feed predaciously on various species of aphids. They are used in biological control. Several generations develop per year. Occurrence: Cetraro (among aphids living on pods of *Spartium junceum*). Distribution: Holarctic.

***Arnoldiola libera* (Kieffer, 1909)**

Larvae develop in small hollows on the lower side of the leaf of *Quercus pubescens* (Fagaceae). After the larvae have left the galls dry out. Occurrence: Bonifati, San Fili. Distribution: European.

***Arnoldiola tympanifex* (Kieffer, 1909)**

Larvae develop in small pustule galls on leaves of *Quercus ilex* (Fagaceae). Occurrence: Cetraro. (Type locality: Sicily). Distribution: Mediterranean.

***Asphondylia borzi* (De Stefani, 1897)**

Solitary larva develops in flower buds of *Rhamnus alaternus* L. (Rhamnaceae) inducing a small gall. The cavity is lined with fungus. Occurrence: Sangineto. Distribution: Mediterranean.

***Asphondylia calycotomae* Kieffer, 1912**

Solitary larva develops in swollen leaf bud (hibernationg generation) or in swollen fruit (summer generation) of *Calicotome villosa* (Poiret) Link (Fabaceae). The cavity is lined with fungus. Two generations develop per year. Occurrence: Bonifati. Distribution: Mediterranean.

***Asphondylia cytisi* Frauenfeld, 1873**

Larvae cause bud galls and pod galls on *Cytisus ratisbonensis* Schaeff. and related species (Fabaceae). The cavity is lined with fungus. Usually two generations develop per year. Pupation takes place in the galls. Occurrence: San Fili. Distribution: Eurosiberian.

***Asphondylia dorycnii* (Müller, 1870)**
Larvae cause small pointed galls in leaf axils on stems or in inflorescences of *Dorycnium* sp. (Fabaceae). The cavity is lined with fungus. Usually two generations develop per year. Pupation takes place in the galls. Occurrence: Cetraro. Distribution: Mediterranean.

*** *Asphondylia lathyri* Rübsaamen, 1914**
Larvae cause galls on pods of *Lathyrus latifolius* (Fabaceae). The cavity is lined with fungus. Usually two generations develop per year. Occurrence: Bonifati. Distribution: Eurosiberian.

***Asphondylia melanopus* Kieffer, 1890**
Larvae cause swellings on the pods of *Lotus corniculatus* L. (Fabaceae). The cavity is lined with fungus. Usually two generations develop per year. Occurrence: Cittadella del Capo. Distribution: European.

Asphondylia scrophulariae (Schiner, 1856)
A solitary larva develops inside swollen flower bud of *Scrophularia canina* L. (Scrophulariaceae). The cavity is lined with fungus. Two generations develop per year. Occurrence: Bonifati, Cittadella del Capo. Distribution: Mediterranean.

***Asphondylia verbasci* (Vallot, 1827)**
Larvae produce galls (swollen flower buds) on *Verbascum sinuatum* L. (Scrophulariaceae). The cavity is lined with fungus. Two generations develop per year. Occurrence: Cittadella del Capo. Distribution: Mediterranean.

***Contarinia craccae* (Loew, 1850)**
Contarinia craccae Kieffer, 1897
Larvae develop in swollen unopened flower buds of *Vicia cracca* L. (Fabaceae). One or two generations develop per year. Occurrence: San Fili. Trotter (1900) found galls of this species on *Vicia pseudocracca* Bert. at Tiriolo e Lagopoli in Calabria in 1899. Distribution: Eurosiberian.

***Contarinia ilicis* Kieffer, 1898**
Larvae cause small pointed galls on leaves of *Quercus ilex* L. (Fabaceae). Only one generation develop per year. Occurrence: Cetraro. Distribution: Mediterranean.

***Contarinia medicaginis* Kieffer, 1895**
Larvae induce galls on flower buds of *Medicago sativa* L. and *M. falcata* L. (Fabaceae). Two or more generations develop per year according to geographical position and weather conditions. Pupation takes place in the soil. In central, southern and southeastern Europe it is a serious pest of lucerne (Darvas et al. 2000). Occurrence: Sangineto. Distribution: Eurosiberian.

***Contarinia melanocera* Kieffer, 1904**
Larvae produce plurilocular swellings on the twigs of *Genista tinctoria* L. (Fabaceae). Only one generation develops per year. Larvae hibernate in the soil. Occurrence: San Fili. Distribution: European.

***Contarinia nasturtii* (Kieffer, 1888)**
Larvae live in swollen flower buds of an undetermined species of the family Brassicaceae. Two generations develop per year. Occurrence: Cittadella del Capo. Distribution: European.

***Contarinia quercina* (Rübsaamen, 1890)**
Larvae develop among small young leaves of terminal leaf bud of *Quercus pubescens* Willd. (Fagaceae). Two generations develop per year. Occurrence: Bonifati, Bonifati Marina, Cetraro, San Fili. Distribution: European.

*** *Contarinia silvestris* Kieffer, 1897**
Larvae live inside slightly deformed pods of *Lathyrus sylvestris* L. (Fabaceae). Occurrence: Bonifati. Distribution: European.

***Contarinia steini* (Karsch, 1881)**
Larvae live in swollen flower buds of *Silene pratensis* (Rafn.) Godr. (= *Silene alba* Mill., *Melandrium album* Mill.) (Caryophyllaceae). Two generations develop a year. Pupation and overwintering takes place in the soil. Occurrence: San Fili. Distribution: Eurosiberian.

***Contarinia tritici* (Kirby, 1798)**
Lemon or golden yellow gregarious larvae develop in spikelets of *Triticum vulgare* L. (Poaceae). It is an inconspicuous and often overlooked, but serious pest of wheat. Loss of seed results. One generation develops a year but it may develop a numerically small partial second generation. *C. tritici* is a serious pest of wheat in Europe (Darvas et al. 2000). Occurrence: Sangineto. Distribution: Holarctic.

***Cystiphora sonchi* (Vallot, 1827)**
Cecidomyia sonchi Bremi, 1847
Cecidomyia sonchi F. Löw, 1875
Yellow-whitish larvae cause pustule galls on the leaves of *Sonchus oleraceus* L. and *S. arvensis* L. (Asteraceae). Two or more generations develop a year. A part of the population pupates in galls, part in the soil. Overwintering in the soil. Occurrence: Bonifati, Bonifati Marina, Cetraro, Cittadella del Capo, San Fili, Sangineto. Distribution: Eurosiberian.

***Dasineura aparines* (Kieffer, 1889)**
Larvae live inside large terminal galls on the shoots of *Galium aparine* L. (Rubiaceae). Only one generation develops per year. Larvae hibernate in the soil. Occurrence: Cittadella del Capo. Distribution: European.

***Dasineura ericaescopariae* (Dufour, 1837)**
Larvae cause large galls at tips of shoots of *Erica scoparia* L. and *E. arborea* L. (Ericaceae). Many larvae live together inside one gall. Only one generation develops a year. Larvae overwinter in galls. Adults emerge in the spring. Occurrence: Bonifati. Distribution: Mediterranean.

***Dasineura lathyri* (Kieffer, 1909)**
Larvae develop in folded leaflets of *Lathyrus latifolius* (Fabaceae). Probably two generations develop per year. Larvae pupate in the soil. Occurrence: Bonifati. Distribution: Eurosiberian.

***Dasineura plicatrix* (Loew, 1850)**
Larvae cause contorted and twisted young leaves of *Rubus ulmifolius* L. and related species (Rosaceae). Two or more generations develop per year. Larvae leave galls and pupate in the soil. Occurrence: Bonifati, Bonifati Marina, Cetraro, Cittadella del Capo, San Fili, Sangineto. Distribution: European.

***Dasineura pteridicola* (Kieffer, 1901)**
White larvae develop in inconspicuous galls on leaflet margin of *Pteridium aquilinum* (L.) Kuhn (Dennstaedtiaceae). The margin is only bent, not rolled. Full-grown larvae leave the gall, drop to the soil where they hibernate. One generation develops a year. Occurrence: Cetraro. Distribution: European.

***Dasineura pteridis* (Müller, 1871)**
Syn. *Cecidomyia filicina* Kieffer, 1889
Larvae develop in rolled and swollen leaflet margins of *Pteridium aquilinum* (L.) Kuhn (Dennstaedtiaceae). Only one generation develops per year. Larvae hibernate in the soil. Occurrence: Cetraro, San Fili. Distribution: Eurosiberian.

***Dasineura turionum* (Kieffer et Trotter, 1904)**
Larvae live under the scale-shaped and swollen young leaves on very young eary growths on shoots of *Asparagus aphyllus* L. (Liliaceae). Attacked plants are later irregularly deformed forming a cluster of malformed stem and branches. Usually two generations develop per year. Larvae pupate in the soil. Occurrence: Bonifati, Bonifati Marina, Cittadella del Capo**.** Distribution: Mediterranean.

***Dasineura viciae* (Kieffer, 1888)**
Larvae cause pod-like galls on leaflets of *Vicia* sp. (Fabaceae). Two or more generations develop per year. Larvae pupate in the soil. Occurrence: Cetraro, San Fili, Sangineto. Distribution: Eurosiberian.

***Dasineura vincae* (Kieffer et Trotter, 1904)**
Larvae cause large galls at the tips of the shoots of *Vinca major* L. (Apocyanaceae), or galls in side leaf buds. Type locality: Avellino. Occurrence: Cetraro. Distribution: Mediterranean.

***Geocrypta galii* (Loew, 1850)**
Reddish-yellow larvae cause round bladder swellings on stems and flower stalks of *Galium verum* L. and other species (Rubiaceae). Usually two generations develop per year. Larvae pupate in the soil. Occurrence: Cetraro, San Fili. Distribution: Eurosiberian.

***Hybolasioptera fasciata* Kieffer, 1904**
Lasioptera fasciata Kieffer, 1904, as var. of *cerealis* of Lindemann (misident.) not Fitch (Gagné 2004)
Larvae cause blackening of the stem under the leaf-sheath usually at the first node of *Secale cereale*, *Triticum vulgare* and other Poaceae. Occurrence: Cosenza (Rasis 1953). Distribution: European.

***Jaapiella medicaginis* (Rübsaamen, 1912)**
Larvae develop in pod-like folded leaflets of *Medicago sativa* L. and *M. falcata* L. (Fabaceae). Two or more generations develop a year. Pupation takes place in the soil. It is a minor pest of lucerne (Darvas et al. 2000). Occurrence: Sangineto. Distribution: Eurosiberian.

*** *Jaapiella reichardiae* Sylvén, 1998**
Larvae develop in flower heads of *Reichardia picroides* (Asteraceae). Larvae pupate in flower heads or in the soil. Two generations develop per year. Occurrence: Bonifati Marina. Distribution: Mediterranean.

***Janetiella siskiyou* Felt, 1917**
Craneiobia lawsonianae Meijere, 1935
Larvae live among scales in the cones of *Chamaecyparis lawsoniana* (Murray) Parl. (Cupressaceae). Only one generation develops per year. Larvae spin cocoons in cones and pupate there in the spring. Occurrence: Bonifati Marina. Distribution: Nearctic, introduced into Europe.

***Lasioptera carophila* F. Löw, 1874**
Larvae cause unilocular swellings at bases of umbels in inflorescences of *Foeniculum vulgare* (Apiaceae). A single larva develops in a chamber, the walls of which are covered with mycelium. Two generations develop per year. Larvae pupate in the galls. Occurrence: Bonifati Marina, Cetraro, Cittadella del Capo. Distribution: European.

*** *Lasioptera donacis* Coutin, 1981**
Larvae develop inside damaged shoots of *Arundo donax* L. (Poaceae). Occurrence: Cittadella del Capo. Distribution: Mediterranean.

*** *Lathyromyza schlechtendali* (Kieffer, 1886)**
Larvae live gregariously in rolled not swollen leaves of *Lathyrus linifolius* Reich. (Bassl.) (= *Orobus montanus* Bernh.) (Fabaceae) and related species. Occurrence: Bonifati. Distribution: Eurosiberian.

***Macrodiplosis pustularis* (Bremi, 1847)**
Diplosis dryobia F. Löw, 1877
Macrodiplosis dryobia (F. Löw, 1877)
Larvae cause galls on leaves of *Quercus pubescens* Willd. (Fagaceae). The marginal leaf lobe is folded downwards. Only one generation develops per year. Larvae leave galls and remain in the soil until the spring of the following year. Occurrence: Bonifati, Cetraro, San Fili. Distribution: European.

***Macrodiplosis roboris* (Hardy, 1854)**
Macrodiplosis volvens Kieffer, 1895
Larvae cause galls on leaves of *Quercus pubescens* Willd. (Fagaceae). The gall is formed of a rolled leaf segment, situated between two lobes. Only one generation develops per year. Larvae leave galls and remain in the soil until the spring of the following year. Occurrence: Bonifati, Bonifati Marina, Cetraro, San Fili. Distribution: European.

***Mikiola fagi* (Hartig, 1839)**
A solitary white larva produces a large, smooth hairless hard gall, pointed at the tip, on the leaf of *Fagus sylvatica* L. (Fagaceae). Only one generation develops per year. Occurrence: near Cosenza (Trotter & Cecconi 1909). Distribution: European.

***Monodiplosis liebeli* (Kieffer, 1889)**
Larvae live as inquilines in galls of *Macrodiplosis pustularis* and *Macrodiplosis roboris* on leaves of *Quercus pubescens* Willd. (Fagaceae). One generation develops a year. Larvae overwinter in the soil. Occurrence: San Fili. Distribution: European.

***Myricomyia mediterranea* (F. Löw, 1885)**
Larvae cause small rosette galls on twigs of *Erica arborea* L. (Ericaceae). In the middle of each gall is a small chamber containing one larva. Only one generation develops per year. Larvae pupate in the galls. Occurrence: Bonifati, Bonifati Marina. Distribution: Mediterranean.

***Obolodiplosis robiniae* (Haldeman, 1847)**
Larvae cause galls on leaflets of *Robinia pseudoacacia* L. (Fabaceae). The margin of attacked leaflets is swollen and rolled downwards. Occurrence: Bonifati Marina, Cetraro, Cittadella del Capo. Distribution: Nearctic, introduced into Europe where it is an alien species. Galls were recorded for the first time by Duso & Skuhravá (2003) at Paese, Treviso Province, in northern Italy. In 2004 the galls were found at several localities around Bolzano and in the same year also in the Czech Republic. Since that time *O. robiniae* spread quickly in Europe and in 2009 the galls were recorded even in southern Sweden (Molnar et al. 2009) and in Denmark (Jörgensen 2009). This species has spread rapidly throughout Europe in the course of seven years and at present it occupies a large distribution area from southern England in the west up to Doneck in Ukraine in the east and from southern Italy up to the southern part of Sweden (Skuhravá et al. 2007). The occurrence of *O. robiniae* in Calabria is at the present its most southern occurrence in Europe.

*** *Odinadiplosis amygdali* (Anagnostopoulos, 1929)**
Larvae cause abnormal multiplication of buds of *Prunus dulcis* (Miller) D.A.Webb (= *Prunus amygdalus* Batsch., *Amygdalus communis* L.) and *Prunus persica* (L.) Batsch (*Amygdalus persica* L.) (Rosaceae). Flowers and fruits do not develop. Attacks result in death of trees (Nijveldt, Talhouk 1976). Occurrence: Sangineto. Distribution: Mediterranean.

***Orseolia cynodontis* Kieffer et Massalongo, 1902**
Larvae cause oval galls, consisting of malformed leaves massed together at the extremity of shoot of *Cynodon dactylon* (L.) Pers. (Poaceae). Larvae pupate in the galls. This species was described on the basis of material found near Verona (Kieffer et Massalongo, 1902). Occurrence: Bonifati Marina. Distribution: Mediterranean.

***Ozirhincus anthemidis* (Rübsaamen, 1915)**
Solitary larva develops in the achene in the flower head of *Anthemis montana* L. (Asteraceae).
Occurrence: Gerace, Calabria, 14.7.1877 (Möhn 1968). Distribution: European.

***Ozirhincus longicollis* Rondani, 1840**
Solitary larva develops in the achene in the flower head of *Anthemis brachyceros* J.Gay (Asteraceae). Occurrence: Gerace in Calabria, 26.5.1877 (Möhn, 1968). Distribution: European.

***Phyllodiplosis cocciferae* (Tavares, 1902)**
Larvae live in swollen leaf buds of *Quercus ilex* L. (Fagaceae). One generation develops per year. Hibernation takes place in the soil. Occurrence: Cetraro. Distribution: Mediterranean.

*** *Piranea spartii* Janezic, 1990**
Orange coloured larvae live in dry flower buds of *Spartium junceum* L. (Fabaceae). Only one generation develops per year. Larvae leave flower buds and hibernate in the soil. Occurrence: San Fili. Distribution: Mediterranean.

***Placochela nigripes* (F. Löw, 1877)**
Larvae live in swollen flower buds of *Sambucus nigra* L. (Caprifoliaceae). One generation develops a year. Hibernation takes place in the soil. Occurrence: Cetraro. Distribution: European.

***Polystepha malpighii* (Kieffer, 1909)**
Larvae cause pustule galls on leaves of *Quercus pubescens* (Fagaceae), opening on the lower side. One generation develops a year. Hibernation takes place in the soil. Occurrence: Bonifati, Bonifati Marina. Distribution: European.

***Probruggmanniella phillyreae* (Tavares, 1907)**
Larvae develop in swollen fruits of *Phillyrea media* L. (Oleaceae). Only one generation develops per year. Larvae pupate in the galls. Occurrence: Calabria, without name of the locality, 1899, on *Phillyrea latifolia* L., leg. A. Fiori (Trotter 1902). Distribution: Mediterranean.

***Psectrosema tamaricis* (De Stefani, 1902)**
Larvae cause swellings of branches of *Tamarix gallica* L. (formerly *T. tetrandra* L.) (Tamaricaceae). Many larvae develop in each gall. This species was described on the basis of material found in Sicily. Occurrence: Cittadella del Capo. Distribution: Mediterranean.

***Rhopalomyia baccarum* (Wachtl, 1883)**
A solitary larva lives in a soft, globular bud gall on stem of *Artemisia scoparia* L. (Asteraceae). The larva pupates in the gall. Two generations develop per year. Occurrence: San Fili. Distribution: Eurosiberian.

***Schizomyia galiorum* Kieffer, 1889**
Larvae develop in swollen flower buds of *Galium* sp. (Rubiaceae). Two generations develop per year. Larvae leave galls and pupate in the soil. Occurrence: Cetraro, San Fili. Distribution: Eurosiberian.

*** *Sitodiplosis mosellana* (Géhin, 1857)**
Orange larvae feed solitarily on the developing grains in the ears of *Triticum vulgare* L. and *Hordeum vulgare* L. (Poaceae). One to five larvae usually develop on one grain, but one larva is able to totally destroy one grain. One generation develops a year. Pupation takes place in the soil. At present it is a minor pest, but in the past it was a serious pest in Germany, England and Sweden (Darvas et al. 2000, Skuhravá et al. 1984). Occurrence: Sangineto. Distribution: Holarctic.

***Wachtliella ericina* (F. Löw, 1885)**
A solitary larva develops in a rosette gall at the shoot tip of *Erica arborea* L. (Ericaceae). Only one generation develops a year. Larvae overwinter in the galls. Adults emerge in the spring. Occurrence: Bonifati, Bonifati Marina. Distribution: Submediterranean, subatlantic.

*** *Xerephedromyia ustjurtensis* Fedotova, 1992**
Larvae develop inside swollen stem internodies of *Ephedra distachya* L. (Ephedraceae). Occurrence: Calabria: Cropani Marina, 28 May 1995, leg. E. Hadač. Distribution: Euro-Asian species, with disjunct distribution, originally decribed from Kazakhstan (Fedotova 1992). It is known to occur in southern France (Skuhravá et al. 2005) and in northern Spain (Skuhravá et al. 2006). – New distribution data: Turkmenistan: Firjuza, 40 km from Ashkhabad, 25 April 1979, leg. E. Hadač and Š. Husák; Jordan: Dana, 24 April 2000, leg. B. Massa; Ukraine: Karadag Nature Reserve, Crimea, 2005, leg. S. Molchanoff (galls in the collection of M. Skuhravá) (Fig. 2).

List of host plants attacked by gall midges

Host plant species	Gall midge species
Anthemis brachyceros	*Ozirhincus longicollis*
Anthemis montana	*Ozirhincus anthemidis*
Artemisia scoparia	*Rhopalomyia baccarum*
Arundo donax	*Lasioptera donacis*
Asparagus aphyllus	*Dasineura turionum*
Brassica	*Contarinia nasturtii*
Calicotome villosa	*Asphondylia calycotomae*
Chamaecyparis lawsoniana	*Janetiella siskiyou*
Cynodon dactylon	*Orseolia cynodontis*
Cytisus ratisbonensis	*Asphondylia cytisi*
Dorycnium pentaphyllum	*Asphondylia dorycnii*
Ephedra distachya	*Xerephedromyia ustjurtensis*
Erica arborea	*Dasineura ericaescopariae*
	Myricomyia mediterranea
	Wachtliella ericina
Erica scoparia	*Dasineura ericaescopariae*
Fagus sylvatica	*Mikiola fagi*
Foeniculum vulgare	*Lasioptera carophila*
Galium aparine	*Dasineura aparines*
Galium verum	*Geocrypta galii*
	Schizomyia galiorum
Genista tinctoria	*Contarinia melanocera*
Hordeum vulgare	*Sitodiplosis mosellana*
Lathyrus latifolius	*Anabremia bellevoyei*
	Asphondylia lathyri
	Dasineura lathyri
Lathyrus linifolius	*Lathyromyza schlechtendali*
Lathyrus sylvestris	*Contarinia silvestris*
Lotus corniculatus	*Asphondylia melanopus*
Medicago falcata	*Contarinia medicaginis*
	Jaapiella medicaginis
Medicago sativa	*Contarinia medicaginis*
	Jaapiella medicaginis
Prunus dulcis	*Odinadiplosis amygdali*
Pteridium aquilinum	*Dasineura pteridicola*
	Dasineura pteridis
Phillyrea media	*Probruggmanniella phillyreae*
Quercus ilex	*Arnoldiola tympanifex*
	Contarinia ilicis
	Phyllodiplosis cocciferae
Quercus pubescens	*Arnoldiola libera*
	Contarinia quercina
	Macrodiplosis pustularis
	Macrodiplosis roboris
	Monodiplosis liebeli
	Polystepha malpighii

Reichardia picroides	*Jaapiella reichardiae*
Rhamnus alaternus	*Asphondylia borzi*
Robinia pseudoacacia	*Obolodiplosis robiniae*
Rubus ulmifolius	*Dasineura plicatrix*
Sambucus nigra	*Placochela nigripes*
Scrophularia canina	*Asphondylia scrophulariae*
Secale cereale	*Hybolasioptera fasciata*
Silene pratensis	*Contarinia steini*
Sonchus oleraceus	*Cystiphora sonchi*
Spartium junceum	*Piranea spartii*
	Aphidoletes aphidimyza
Tamarix gallica	*Psectrosema tamaricis*
Triticum vulgare	*Contarinia tritici*
	Hybolasioptera fasciata
	Sitodiplosis mosellana
Verbascum sinuatum	*Asphondylia verbasci*
Vicia cracca	*Contarinia craccae*
	Dasineura viciae
Vinca major	*Dasineura vincae*

RESULTS

In the course of our investigations in Calabria carried out from 27 May – 3 June 2006 we found 59 gall midge species at six localities situated along an altitudinal transect from sea level up to 600 m a. s. l. at San Fili. Nine gall midge species are new records for Italy, viz. *Asphondylia lathyri*,

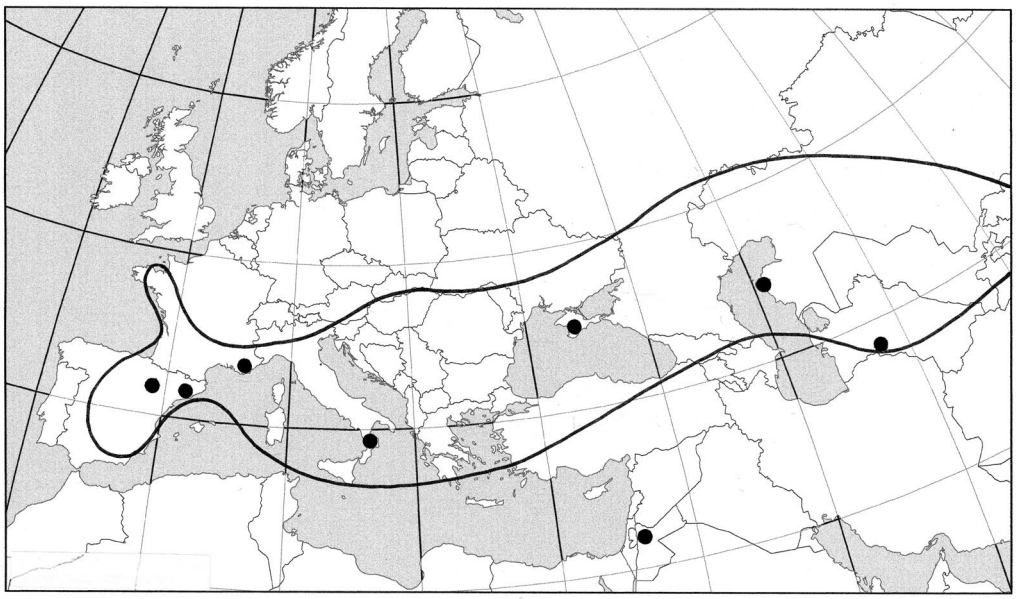

Fig. 2. Occurrence of *Xerephedromyia ustjurtensis* Fedotova, 1992 causing galls on *Ephedra distachya* (Ephedraceae) in southern Europe and in western Asia including new records and distribution area of its host plant (after Tutin et al. 1964–1980).

Contarinia silvestris, *Jaapiella reichardiae*, *Lasioptera donacis*, *Lathyromyza schlechtendali*, *Odinadiplosis amygdali*, *Piranea spartii*, *Sitodiplosis mosellana* and *Xerephedromyia ustjurtensis*. The gall midge fauna of Calabria may be considered to be relatively rich in comparison with the gall midge fauna of Sardinia where 44 gall midge species were found (Skuhravá & Skuhravý 2002) and with the gall midge fauna of Vallombrosa (near Firenze, regio Toscana) where 65 gall midge species were found by Cecconi (1897, 1899, 1900, 1901a,b, 1902, 1904) in the course of several years of his investigations. The gall midge fauna of Calabria is poorer than that of Sicily where 89 gall midge species were found (Skuhravá et al. 2007). The known gall midge fauna of Italy now includes 508 species (Skuhravá, in prep.).

Gall midge species found in Calabria are associated with 46 host plant species that belong to 20 plant families. Seventeen gall midge species are associated with Fabaceae, five species with Asteraceae and with Poaceae. Other plant families host one to three gall midge species. *Quercus pubescens* is the host plant associated with six gall midge species. *Quercus ilex*, *Erica arborea*, *Triticum vulgare* and *Lathyrus latifolius* each host three gall midges species.

Other host plant species usually host two or one gall midge species.

Cystiphora sonchi causing galls on *Sonchus oleraceus* and *Dasineura plicatrix* on *Rubus ulmifolius* are the most abundant gall midge species in Calabria. Their galls were found at each locality where we collected galls. Also *Contarinia quercina* and *Macrodiplosis roboris* causing galls on *Quercus pubescens* are abundant. Their galls were found at four localities. On the other hand, each of 41 gall midge species (70%) was found at only one locality.

In Calabria the average number per locality was 14 species, ranging from 7 to 18. Forest stands at Cetraro between altitudes from 120 to 250 m a. s. l. was the locality with the highest number of species found (18). In contrast, we found only a few gall midge species along the seaside.

The gall midge fauna of Calabria may be divided on the basis of zoogeographical analysis, according to the distribution of species in the Palaearctic region, into six groups. Of 59 gall midge species, 34% have Mediterranean, 32% European, 24% Eurosiberian, 5% Holarctic, 3% Nearctic and 2% Euro-Asian type of distribution.

Xerephedromyia ustjurtensis developing in galls on *Ephedra distachya* is the most interesting species found in Calabria. It is an Euro-Asian species with disjunct distribution. Its occurrence in Calabria is evidence of the high natural history value of this part of Italy (Ribera & Blasco-Zumeta 1998).

Dasineura vincae causing galls on *Vinca minor* is a very rare gall midge species. The original material of this gall midge species was found at Avellino (Kieffer & Trotter 1904). The finding of galls of this species at Cetraro is the second record in Italy.

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