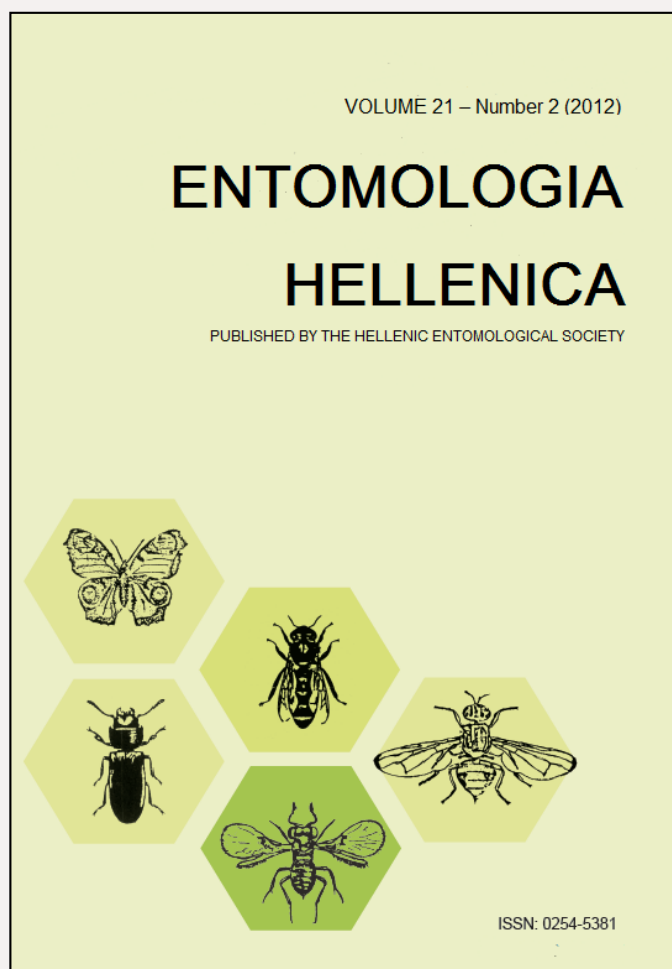


ENTOMOLOGIA HELLENICA

Vol. 21, 2012



New records of aphid species (Hemiptera: Aphididae) in Greece

- Papapanagiotou A. Laboratory of Crop Protection, Department of Greenhouse Crops and Floriculture, Techno-logical Institute of Messolonghi, Nea Ktiria, 302 00, Messolonghi, Greece
- Nathanailidou M. Laboratory of Entomology and Agricultural Zoology, Department of Crop Production and Agricultural Environment, University of Thessaly, Fytokou Str., 384 46 Nea Ionia, Volos, Greece
- Taylor M. AgroEcology, Rothamsted Research, West Common, Harpenden, Hertfordshire, AL5 2JQ, UK
- Zarpas K. Laboratory of Entomology and Agricultural Zoology, Department of Crop Production and Agricultural Environment, University of Thessaly, Fytokou Str., 384 46 Nea Ionia, Volos, Greece
- Voudouris K. Department of Biochemistry and Biotechnology, University of Thessaly, 26 Ploutonos Str., 412 21 Larissa, Greece
- Tsitsipis J. Laboratory of Entomology and Agricultural Zoology, Department of Crop Production and Agricultural Environment, University of Thessaly, Fytokou Str., 384 46 Nea Ionia, Volos, Greece & Present Address: Mainalou 4, 152 35 Vrilissia, Athens, Greece
- Margaritopoulos J. Department of Biochemistry and Biotechnology, University of Thessaly, 26 Ploutonos Str., 412 21

Copyright © 2017 A. P. Papapanagiotou, M.
Nathanailidou, M. Taylor, K. D. Zarpas, K.
Voudouris, J. A. Tsitsipis, J. T. Margaritopoulos



To cite this article:

Papapanagiotou, A., Nathanailidou, M., Taylor, M., Zarpas, K., Voudouris, K., Tsitsipis, J., & Margaritopoulos, J. (2012). New records of aphid species (Hemiptera: Aphididae) in Greece. *ENTOMOLOGIA HELLENICA*, 21(2), 54-68. doi:<https://doi.org/10.12681/eh.11518>

New records of aphid species (Hemiptera: Aphididae) in Greece

A.P. PAPAPANAGIOTOU¹, M. NATHANAILIDOU², M. TAYLOR³,
K.D. ZARPAS², K. VOUDOURIS⁵, J.A. TSITSIPIS^{2,4}
AND J.T. MARGARITOPOULOS^{5*}

¹Laboratory of Crop Protection, Department of Greenhouse Crops and Floriculture, Technological Institute of Messolonghi, Nea Ktiria, 302 00, Messolonghi, Greece

²Laboratory of Entomology and Agricultural Zoology, Department of Crop Production and Agricultural Environment, University of Thessaly, Fytokou Str., 384 46 Nea Ionia, Volos, Greece

³AgroEcology, Rothamsted Research, West Common, Harpenden, Hertfordshire, AL5 2JQ, UK

⁴Present Address: Mainalou 4, 152 35 Vrilissia, Athens, Greece

⁵Department of Biochemistry and Biotechnology, University of Thessaly, 26 Ploutonos Str., 412 21 Larissa, Greece

ABSTRACT

Several papers have been published on aphid fauna in Greece during the last two decades, but the number of recorded species is still low compared to other European countries, including some from the Mediterranean basin. In this context, we collected aphids from various host-plants and regions in southern, central and northern Greece characterized by diverse flora, climatic conditions and ecological habitats. In total, 128 aphid species belonging to 55 genera and six subfamilies were collected on 200 host-species. Most of the species dominated the subfamily Aphidinae (especially tribes Macrosiphini and Aphidini). Among the species collected, 18 were new records in Greece. The present work improves our knowledge regarding the aphid fauna of Greece and suggests that the number of recorded species could increase further if additional studies were undertaken.

KEY WORDS: Aphidoidea, aphid fauna, Greece.

Introduction

Aphids (Hemiptera: Aphidoidea) are small-sized plant-sucking insects. They make up an insect group with interesting characteristics such as cyclical parthenogenesis (alternation of sexual and asexual reproduction), loss of sexual reproduction, polyphenism

(i.e. different morphs produced by a single aphid genotype), close association with host-plants, important virus-vectors and worldwide distribution. These traits make aphids an ideal study model. Aphids are not considered a species rich group when they are compared to other hemi- or holometabolous insect groups (e.g. the number of species of

*Corresponding author, e-mail: johnmargaritopoulos@gmail.com

grasshoppers and weevils are approximately 3- and 12-fold higher than aphids; Dixon 1998). The known world aphid fauna consists of 4358 species placed in 510 genera (Blackman and Eastop 1994, 2000, 2006; see also the updated version available online at www.aphidsonworldsplants.info, accessed 15 December 2012). About 450 species have been recorded from crop plants, but only about 100 species are economically important agricultural pests (Blackman and Eastop 2007).

The study of the Greek aphid fauna is fairly limited. Until the early 90s 195 aphid species had been recorded. Later, an almost ten-year survey, based on Rothamsted suction and Moericke traps, increased our knowledge on the Greek aphid fauna substantially. The recorded species reached 300 (Tsitsipis et al. 2007). In this paper *Aphis fabae solanella* Theobald (Hemiptera: Aphididae) was reported as subspecies, but Blackman and Eastop (2006) have proposed that this taxon is elevated to species (*Aphis solanella* Theobald) (see also Thieme and Dixon 2004 and Blackman and Eastop 2007). In addition, a recent study on the *Hyalopterus pruni* complex (Hemiptera: Aphididae) (Lozier et al. 2008) proposed the species status for *Hyalopterus amygdali* B that has been also recorded in Greece (Poulios et al. 2007). Therefore, the total number of recorded aphid species was 302 in Greece at that time. All but one of these species belong to the family Aphididae which is represented by 13 subfamilies and 120 genera. The remaining species belong to the family Phylloxeridae. Kavallieratos et al. (2007) made a survey of aphid species on cultivated and non-cultivated plants in various regions in Greece. The comparison of their data with the check-list provided by Tsitsipis et al. (2007) results in 13 additional species, all of them belonging to the family Aphididae. Therefore, the recorded aphid species in Greece amount to 315. Regardless of these efforts, the number of species recorded is much lower than that in other European countries. In a review, Patti and Bar-

bagallo (1998a, see also references there in) reported that the number of species recorded in European countries, including some from the Mediterranean basin, ranged from about 600 to 850, although some of the data reviewed were rather old. According to the Fauna Europaea project (Fauna Europaea 2012) the number of species in some Mediterranean or Balkan countries (and regions) are: Bulgaria 419, Corsica 163, Italian mainland 649, Sardinia 173, Sicily 382 (Italy total: 860 Barbagallo et al. 2011), Spanish mainland 603 and Yugoslavia 344 (total 1373 species in Europe). These data suggest that the knowledge on the Greek aphid fauna would have been richer had there been more studies and surveys performed. In this context, we collected aphids from various host-plants and regions in southern, central and northern Greece which are characterized by diverse flora, climatic conditions and ecological habitats.

Materials and Methods

Approximately 700 samples of leaves or young shoots infested by aphids were collected from various host-plants and regions (altitude 0-800 m) in south (Agrinio, Argos, Messolonghi and Patra), central (Volos, various sites in Pelion Mountain), and north (Thessaloniki, Veroia, Katerini, Nea Moudania in Chalkidiki Peninsula) Greece during the growing season (spring, summer and autumn) of the years 2003-2008 (Fig. 1). Each sample was placed inside a self-sealing plastic bag containing a piece of paper towel to absorb excessive moisture. The samples were put in insulated plastic containers, containing frozen ice packs, and transferred to the laboratory. In the laboratory wingless females from each sample (along with winged females in some cases) were stored in vials filled with two volumes of ethanol (95%) and one volume of lactic acid 75% w/w (Eastop and van Emden 1972) until species identification. Permanent microscope slides of aphids were prepared accord-

ing to Blackman and Eastop (1994, 2000). The identification of the aphid species was based mostly on the keys described by Blackman and Eastop (1994, 2000, 2006, updated version available online at www.aphidsonworldsplants.info, accessed 15 December 2012). Additional information, when required, was obtained from the keys by Jacky and Bouchery (1980), Taylor (1984), Stroyan (1984), Heie (1986) and Remaudiere and Seco Fernandez (1990). The identification of the members of *H. pruni* complex was based on the keys of Lozier et al. (2008) and the application of multivariate morphometric methods (Poulios et al. 2007).

The classification system in the present paper follows the one used by Blackman and Eastop [1994, 2000, 2006, updated version available online at www.aphidsonworldsplants.info, accessed 15 December 2012; see also the online taxonomic database “Aphid Species File” by Favret (2012)] and Remaudière and Remaudière (1997). Permanent slides of the collected aphids are kept in the aphid collection of the last author in the Department of Biochemistry & Biotechnology, University of Thessaly, Greece. Preserved aphid material is also stored in the collection of the first author at the Department of Greenhouse Crops and Floriculture, Technological Institute of Messolonghi, Messolonghi, Greece.

Lastly, the identification of plant species was based on Tutin et al. (1964, 1968, 1972, 1976, 1980).

Results and Discussion

A total of 128 aphid species belonging to 55 genera, were identified among the samples collected from 200 host-species. Of these hosts, 91 were cultivated species of economic importance (crops, trees, ornamentals) and the remaining non-cultivated (herbs, weeds or forest tree species). Table 1 provides statistics on the plant species and

families that were surveyed in three large geographical regions of Greece as well as on the aphid species and higher taxonomic categories identified. A total of six aphid subfamilies were recorded, although the aphid fauna is dominated by the subfamily Aphidinae (Aphidinae: 102 species, Calaphidinae: 8 species, Chaitophorinae: 5 species, Eriosomatinae: 10 species, Lachninae: 2 species, Thelaxinae: 1 species). The same trend was observed in each of the three regions surveyed, with the percentage of the Aphidinae species being 89.4, 78.9 and 81.7 % in south, central and north Greece respectively. Macrosiphini was the predominant tribe followed by Aphidini in the total sample (47.3 and 31.8 % respectively) and in each of the three regions surveyed (south Greece: 57.4 and 31.9 %; central Greece: 42.1 and 36.8 %; north Greece: 47.9 and 33.8 %) (Table 2).

Eighteen of the 128 aphid species identified in the present study were new records in Greece. These species are: *Aphis balloticola* Szelegiewicz, *Aphis brotericola* Mier Durante, *Aphis confusa* Walker, *Aphis lambersi* (Börner), *Aphis spiraephaga* Müller, *Aphis tormentillae* Passerini, *Brachyunguis tamaricis* (Lichtenstein), *Dysaphis devecta* (Walker), *Dysaphis lappae* (Koch) [particularly the subspecies *D. lappae cynarae* (Theobald)], *Hyadaphis passerinii* (del Quercio), *Macrosiphum knautiae* Holman, *Monellia caryella* (Fitch), *Pemphigus bursarius* (L.), *Pemphigus spyrothecae* Passerini, *Pemphigus vesicarius* Passerini, *Tinocallis takachihoensis* Higuchi, *Uroleucon carthami* (Hille Ris Lambers) and *Uroleucon nigrocampanulae* (Theobald) (Table 3). General features of these 18 species are summarized below. The complete check-list of the aphid species identified in the present study is not presented here as this information is beyond the purpose of the present paper. The list is available from the authors upon request.



Greece

FIG. 1. Sampling sites in Greece. South Greece: 1 Argos, 2 Patra, 3 Messolonghi, 4 Agrinio
Central Greece: 5 Pelion Mountain, 6 Volos, North Greece: 7 Kitros, Katerini, 8 Vero-
ia, 9 Thessaloniki, 10 Nea Moudania, Chalkidiki.

TABLE 1. Summary statistics of the number of plant species surveyed and the aphid species identified in south, central and north Greece.

Region	Plants		Aphids			
	Species	Families	Species	Genera	Subfamilies	Tribes
South Greece	53	25	47	27	3	5
Central Greece	121	43	76	35	6	10
North Greece	92	36	71	38	4	8
Total	200	57	128	55	6	11

1. *Aphis (Aphis) balloticola* Szelegiewicz, 1968 (Aphidinae: Aphidini - Aphidina).

Wingless parthenogenetic females are dark gray-blue to mottled green. The aphid is found on stems and abaxial leaf surface of *Ballota nigra* L. causing slight downward leaf curling in early summer (Stroyan 1984). It has been also recorded from *Dracocephalum nutans* L. and *Marrybium* spp. The species is non-host alternating (monoecious), holocyclic (cyclical parthenogenesis) with winged males (Börner 1950). It has been recorded throughout Europe (except Scandinavia), Morocco, and eastward to Crimea, Iran and Turkey. The aphid is a member of the *Aphis frangulae* Kaltenschmidt complex (Blackman and Eastop 2006).

Material examined: adult wingless females from *B. nigra*; sampling site: Thessaloniki, North Greece; collected in June 2007.

2. *Aphis (Aphis) brotericola* Mier Durante, 1978 (Aphidinae: Aphidini - Aphidina)

Wingless parthenogenetic females are black, sometimes dusted with gray wax powder. The aphid builds dense colonies on leaves of *Euphorbia* spp. In Spain the species has been characterized as monoecious, holocyclic with winged males (García Prieto et al. 2001). It has been recorded in Spain, Italy (Barbagallo and Patti 1998), France, Turkey and Morocco (Blackman and Eastop 2006).

Material examined: adult wingless females from *Euphorbia dendroides* L., sampling site: Aghios Georgios, Pelion Mountain, Central Greece; collected in May 2003.

3. *Aphis (Aphis) confusa* Walker, 1849 (Aphidinae: Aphidini - Aphidina)

Wingless parthenogenetic females are pale yellow, yellowish green, green or dark green. The species is widely distributed in Europe. It is monoecious, holocyclic with wingless males and it hosts *Knautia* and *Scabiosa* species. It is found as larger green or dark green aphids on upper parts of stems and inflorescences, while in summer as

smaller yellow or yellowish green specimens mainly on undersides of lower leaves or on roots. It is ant-attended (Heie 1986, Blackman and Eastop 2006).

Material examined: adult wingless females from *Knautia arvensis* L.; sampling site: Volos, Central Greece; collected on May 2003.

4. *Aphis (Aphis) lambersi* (Börner, 1940) (Aphidinae: Aphidini - Aphidina)

Wingless parthenogenetic females are dark green to almost black. The species is widespread throughout Europe. It is monoecious holocyclic with apterous males found on lower parts of stems, basal leaf sheaths and root collar of *Daucus carota* L. (Heie 1986, Blackman and Eastop 2006). The aphid has been also recorded on *Conopodium majus* (Gouan) (Niето Nafria et al. 2005). It is ant-attended.

Material examined: adult wingless females from *D. carota*; sampling site: Lehonía, Pelion Mountain, Central Greece; collected in May 2003.

5. *Aphis (Aphis) spiraephaga* Müller, 1961 (Aphidinae: Aphidini - Aphidina)

Wingless parthenogenetic females are dark greyish brown, often with irregular dorsal colour pattern, with transverse dorsal bands of wax and dark appendages. The species *A. spiraephaga* lives in dense colonies on young shoots of *Spiraea* spp. It has been recorded also from *Epilobium* spp. (Holman 1990) and other genera in various plant families (*Arabis*, *Carum*, *Erica*, *Filipendula*, *Helichrysum*, *Symphoricarpus*, *Trinia* and *Valeriana*; Müller 1987). The species has been recorded in several European countries, Western Siberia and Mongolia (Heie 1986). It is monoecious, holocyclic with winged males (Blackman and Eastop 2006).

Material examined: adult wingless females from *Spiraea* sp.; sampling site: Thessaloniki, North Greece; collected in May 2006 and May 2007.

6. *Aphis (Aphis) tormentillae* Passerini, 1879 (Aphidinae: Aphidini - Aphidina)

Wingless parthenogenetic females are blackish green or black. The species is distributed throughout Europe. It is monoecious, holocyclic with winged males and it hosts *Potentilla* spp., especially *erecta*. The aphids are found on stems, petioles and undersides of leaves. It is usually not ant-attended (Heie 1986, Blackman and Eastop 2006).

Material examined: adult wingless females from *Potentilla reptans* L.; sampling site: Lechonia, Pelion Mountain, Central Greece; collected in May 2003.

7. *Brachyunguis (Brachyunguis) tamaricis* (Lichtenstein, 1885) (Aphidinae: Aphidini - Aphidina)

Wingless parthenogenetic females are velvety grey-green, development of wax dust may depend on age and microclimate. Colonies on twigs are inconspicuous, resembling small leaves or leaf-scales of the host plant. Colonies may be attended by ants. The species *B. tamaricis* infests *Tamarix* spp. and it is recorded in South and Central Europe, North Africa, South-west and Central Asia. The species is monoecious, holocyclic [updated version of Blackman and Eastop (1994, 2006) available online at www.aphidsonworldsplants.info, accessed 15 December 2012].

Material examined: adult wingless females from *Tamarix* sp.; sampling site: Messolonghi, South Greece; collected in May 2006.

8. *Dysaphis (Dysaphis) devectora* (Walker, 1849) (Aphidinae: Macrosiphini)

The aphids roll and redden the edges of the leaves of *Malus* spp. forming galls in spring. The galls contain both wingless and alatiform parthenogenetic females. The former are bluish-grey wax-powdered while the latter dark green to reddish with different degrees of pigmentation and sclerotisation

of head and thorax (Blackman and Eastop 2006). It is a monoecious species, with a life cycle of only 3-4 generations. Oviparae (sexual females) and winged males are also produced within the galls (Hille Ris Lambers 1945, Forrest 1970). The species is found in Europe (Blackman and Eastop 2006) and also recorded from China (Zhang et al. 1990).

Material examined: adult wingless females from *Malus domestica* Borkhausen; sampling site: Kitros, Katerini, North Greece; collected in May 2006.

9. *Dysaphis (Dysaphis) lappae* (Koch, 1854) (Aphidinae: Macrosiphini)

Wingless parthenogenetic females are dirty olive greenish to brownish, sometimes with a purple tinge. Older adults may have yellowish margins on abdomen. The species builds colonies on stem bases, root collars and roots of *Arctium* spp. and it has been also recorded from *Petasites albus* (L.). The colonies are ant-attended. The aphid is distributed in Europe, Transcaucasia, Central Asia and Western Siberia, also in North Africa (Egypt, Eritrea), and has been introduced to Brazil (ssp. *cynarae*). It is monoecious, holocyclic on *Arctium*, with winged males (Blackman and Eastop 2006). There are very similar aphids on *Cirsium arvense* (L.) in Europe and on *Cynara* spp. in the Mediterranean region which are currently classified as subspecies, *D. lappae* ssp. *cirsii* (Börner) and *D. lappae* ssp. *cynarae* (Theobald) respectively (Blackman and Eastop 2006). Colonies of *D. lappae* ssp. *cirsii* are reportedly not ant-attended (Stroyan 1963). In Sicily, ssp. *cynarae* is apparently anholocyclic on *Cynara scolymus* L. and anholocyclic populations have also been found on *Notobasis syriaca* (L.) (formerly *Cisrium syriacum*), *Galactites tomentosa* (L.) (formerly *Lupsia galactites*) and *Silybum marianum* (L.) (Barbagallo 1974).

Material examined: adult wingless females from *C. scolymus*; sampling site: Argos, South Greece; collected in May 2007.

10. *Hyadaphis passerinii* (del Quercio, 1911) (Aphidinae: Macrosiphini)

Wingless parthenogenetic females are greyish green or light green with dark appendages. On its primary hosts *Lonicera* spp. infestations cause upward leaf curling in spring. The species migrates to various Apiaceae, particularly *Daucus* and also *Coinium* and *Pastinaca*, colonizing stems, leaves and inflorescences. It reproduces parthenogenetically the year round on Apiaceae in warmer climates. It is recorded from Europe, especially the South, Mediterranean region, Middle East, Pakistan, India, and also introduced to Southern Africa, Australia, New Zealand, North and South America (Blackman and Eastop 2006).

Material examined: adult wingless females from *Lonicera* sp.; sampling site: Thessaloniki, North Greece; collected in April 2008.

11. *Macrosiphum (Macrosiphum) knautiae* Holman, 1972 (Aphidinae: Macrosiphini)

Wingless parthenogenetic females are yellowish green to grass-green, rarely pinkish, with dark head and thorax and black siphunculi. The aphid builds colonies on abaxial leaf surface and shoot apices of *Knautia* spp. A monoecious, holocyclic species with oviparae and winged males appearing in October (Blackman and Eastop 2006).

Material examined: adult wingless females from *Knautia* sp., sampling sites: Messolonghi, South Greece and Nea Moudania, Chalkidiki, North Greece; collected in May 2006 and June 2007 respectively.

12. *Monellia (Agrioaphis) caryella* (Fitch, 1855) (Aphidinae: Panaphidini – Panaphidina)

The parthenogenetic females are winged, pale lemon-yellow to greenish yellow with

banded antennae. Seasonal variation in colour patterns. The generations from mid-summer to autumn bear a continuous broad black band running around front and sides of head and down sides of body as far as the third abdominal tergite, and a broad brown-black band along the anterior margin of the forewing. It infests leaves of *Carya* spp., especially *Carya illinoensis* (Wangenh) and *C. cordiformis* (Wangenh) [updated version of Blackman and Eastop (1994, 2006) available online at www.aphidsonworldsplants.info, accessed 15 December 2012]. The species is monoecious, holocyclic and the sexual morphs occur from mid-October to early December (Mansour and Harris 1988). It is widespread in USA (Bissell 1978), Ontario, Canada and introduced into Israel (Mansour and Harris 1988), Spain (Nieto Nafria and Mier Durante 1998) and Argentina (Ortego et al. 2004). In Israel it is a serious pest of pecan.

Material examined: adult winged females from *C. illinoensis*; sampling site: Thessaloniki, North Greece; collected in August 2008.

13. *Pemphigus (Pemphigus) bursarius* (Linnaeus, 1758) (Eriosomatinae: Pemphigini)

The species is heteroecious, holocyclic with the sexual phase on *Populus* spp. (mostly on *Populus nigra* L.) but anholocyclic (parthenogenetic) overwintering on roots of secondary hosts is common. The fundatrix makes galls (yellowish or reddish when mature, purse-shaped) on leaf petioles. The fundatrix is greyish green, slightly wax-dusted and produces winged females that leave the gall from late May to September (peak emergence late June-July in northern hemisphere) and migrate to make colonies on roots of various Compositae (e.g. *Cichorium*, *Lactuca*, *Lampsana*, *Sonchus*, *Taraxacum*, *Tussilago*). In the root-feeding colonies the wingless females are yellowish white

with a tuft of white wax on the posterior part of the abdomen and the winged females (sexuparae) have a brownish orange abdomen. The return migration of sexuparae to *Populus* takes place in October-September. The species is found in Europe, Western and Central Asia, North and Southern Africa, North and South America, and (perhaps) Australia and New Zealand. The aphid colonies are not attended by ants [Blackman and Eastop (1994, 2006) and updated version available online at www.aphidsonworldsplants.info, accessed 15 December 2012].

Material examined: winged females and galls from *P. nigra*; sampling site: Katighiorghis, Pelion Mountain, Central Greece, collected on June 2004.

14. *Pemphigus (Pemphigus) spyrothecae* Passerini, 1860 (Eriosomatinae: Pemphigini)

Fundatrix make galls on petioles of *P. nigra* leaves, which are green, reddish or yellowish, smooth, formed by thickening, flattening and spiral twisting of the petiole. Fundatrix is pale green, giving rise to second generation wingless females within the gall. The species is monoecious holocyclic and winged sexuparae emerge in August-November to produce sexuals on the bark of the trees (Lampel 1960). First instar nymphs with thick forelegs function as soldiers and defend the gall against predators (Aoki and Kurosu 1986, Foster 1990), repair the gall (Pike and Foster 2004) and remove wax-coated droplets of honeydew (Pike et al. 2002). The species is widely distributed in Europe, in North Africa (Tunisia), Western Siberia, Pakistan and introduced into Canada [Blackman and Eastop (1994) and updated version available online at www.aphidsonworldsplants.info, accessed 15 December 2012].

Material examined: wingless and winged females and galls from *P. nigra*, sampling

site: Messolonghi, South Greece; collected in June 2006.

15. *Pemphigus (Pemphigus) vesicarius* Passerini, 1861 (Eriosomatinae: Pemphigini)

It is a holocyclic, heteroecious species and the fundatrix makes galls on leaves of *P. nigra* which originate from the mid-rib at the base of the upper side of the leaf. The developed galls are irregular pale green structures with many tubular outgrowths. The fundatrix is dark slate-grey to blue-black. The winged females leave the gall in May-June and migrate to *Colutea arborescens*. Colonies are found on the stems and basal parts of this plant. The wingless females secreting wax and winged sexuparae are produced in October and return to *Populus*. The species is distributed in Southern Europe, Algeria, South-West and Central Asia, Afghanistan and India [Blackman and Eastop (1994, 2006) and updated version available online at www.aphidsonworldsplants.info, accessed 15 December 2012].

Material examined: winged females and galls from *P. nigra*; sampling site: Katighiorghis, Pelion Mountain, Central Greece; collected in June 2004.

16. *Tinocallis (Tinocallis) takachihoensis* Higuchi, 1972 (Calaphidinae: Panaphidini-Panaphidina)

All viviparous females are winged, pale yellow-green with shiny black head and thorax, black distal section of hind femur and base of hind tibia and black markings on the wings (Moritsu 1983). The species is recorded from *Ulmus* spp. in Japan (Higuchi 1972), China (Tao 1999), and eastern Siberia as *Tinocallis ussuriensis* Pashtshenko (Pashchenko 1988), and also from *Hemiptelea davidii* (Hance) in China as *Tinocallis hemipteleae* Zhang (Zhang and Zhong 1980). It has been introduced to Europe, where it is recorded from *Ulmus* spp. in southern France (Quednau and

TABLE 2. Summary statistics of the number of aphid species identified in south, central and north Greece.

Tribe	Subtribe	South Greece	Central Greece	North Greece	<i>All regions</i>
Aphidini	Aphidina	13	20	19	32
	Rhopalosiphina	2	8	5	10
Chaitophorini		1	4	2	4
Eriosomatini		0	1	2	2
Eulachnini		0	1	0	1
Fordini		3	0	1	3
Lachnini		0	1	0	1
Macrosiphini		27	32	34	61
Panaphidini	Myzocallidina	0	2	1	2
	Panaphidina	0	3	4	6
Pemphigini		1	2	2	5
Siphini		0	1	1	1
Thelexini		0	1	0	1

Shaposhnikov 1988), Germany, Sicily (Patti and Barbagallo 1998b), Andorra (Mier Durante and Pérez Hidalgo 2002), Malta (Mifsud et al. 2009), and to USA (first record 1996, Foottit et al. 2006). In England it has been collected outdoors on *Ulmus glabra* Hudson (Döring 2007). Winged males and oviparae occur in Sicily from mid-October (Patti and Barbagallo 1998b).

Material examined: adult winged females from *Ulmus americana* L.; sampling site: Thessaloniki, North Greece; collected in May 2006 and 2007.

17. *Uroleucon (Uromelan) carthami* (Hille Ris Lambers 1948) (Aphidinae - Macrosiphini)

According to Blackman and Eastop (2006) the color of wingless parthenogenetic

female has not been reported and that they are probably reddish brown to blackish brown. In our sample the females were dark brown to blackish brown. The species colonizes *Carthamus* spp. and it is found in South and Central Europe, Israel, Turkey, and eastward to Pakistan and India. Sexual morphs and the life cycle of the species are still unknown (Blackman and Eastop 2006).

Material examined: adult wingless females from *Carthamus lanatus* L.; sampling site: Pinakates, Pelion Mountain, Central Greece; collected in June 2004.

18. *Uroleucon (Uromelan) nigro-campanulae* (Theobald 1928) (Aphidinae: Macrosiphini)

Wingless females are dark brown with black antennae, siphunculi and cauda, and

TABLE 3. New records of aphid species (family Aphididae) in Greece.

Aphid genus (subgenus) species	Tribe-Subtribe	Subfamily	Host species
<i>Aphis (Aphis) balloticola</i> Szelegiewicz	Aphidini-Aphidina	Aphidinae	<i>Ballota nigra</i> L.
<i>Aphis (Aphis) brotericola</i> Mier Durante	Aphidini-Aphidina	Aphidinae	<i>Euphorbia seguierana</i> Necker
<i>Aphis (Aphis) confusa</i> Walker	Aphidini-Aphidina	Aphidinae	<i>Knautia arvensis</i> L.
<i>Aphis (Aphis) lambersi</i> (Börner)	Aphidini-Aphidina	Aphidinae	<i>Daucus carota</i> L.
<i>Aphis (Aphis) spiraephaga</i> Müller	Aphidini-Aphidina	Aphidinae	<i>Spiraea</i> sp.
<i>Aphis (Aphis) tormentillae</i> Passerini	Aphidini-Aphidina	Aphidinae	<i>Potentilla reptans</i> L.
<i>Brachyunguis (Brachyunguis) tamaricis</i> (Lichtenstein)	Aphidini-Aphidina	Aphidinae	<i>Tamarix</i> sp.
<i>Dysaphis (Dysaphis) devecta</i> (Walker)	Macrosiphini	Aphidinae	<i>Malus domestica</i> Borkhausen
<i>Dysaphis (Dysaphis) lappae</i> (Koch)*	Macrosiphini	Aphidinae	<i>Cynara scolymus</i> L.
<i>Hyadaphis passerinii</i> (del Quercio)	Macrosiphini	Aphidinae	<i>Lonicera</i> sp.
<i>Macrosiphum (Macrosiphum) knautiae</i> Holman	Macrosiphini	Aphidinae	<i>Knautia</i> sp.
<i>Monellia (Agrioaphis) caryella</i> (Fitch)	Panaphidini-Panaphidina	Aphidinae	<i>Carya illinoensis</i> (Wangenh)
<i>Pemphigus (Pemphigus) bursarius</i> (L.)	Pemphigini	Eriosomatinae	<i>Populus nigra</i> L.
<i>Pemphigus (Pemphigus) spyrothecae</i> Passerini	Pemphigini	Eriosomatinae	<i>Populus nigra</i> L.
<i>Pemphigus (Pemphigus) vesicarius</i> Passerini	Pemphigini	Eriosomatinae	<i>Populus nigra</i> L.
<i>Tinocallis (Tinocallis) takachihoensis</i> Higuchi	Panaphidini-Panaphidina	Calaphidinae	<i>Ulmus americana</i> L.
<i>Uroleucon (Uromelan) nigrocampanulae</i> (Theobald)	Macrosiphini	Aphidinae	<i>Campanula</i> spp.
<i>Uroleucon (Uromelan) carthami</i> (Hille Ris Lambers)	Macrosiphini	Aphidinae	<i>Carthamus lanatus</i> L.

*The subspecies *D. lappae* ssp. *cynarae* (Theobald) has been collected.

bicolored yellowish and brown-black legs. The aphid hosts species of the genus *Campanula*, where it feeds on the leaves causing them to become curled in spring, whereas later attacks and subsequent feeding produces yellow spots. Sexual forms have not been recorded. The species is found in Europe and across Asia to Eastern Siberia (Pashtshenko 1988, Blackman and Eastop 2006).

Material examined: adult wingless females from *Campanula* sp.; sampling site: Thessaloniki, North Greece; collected in May 2007.

The work undertaken during a five year sampling period (emphasis was given to Pelion Mountain due to great biodiversity in wild, forest and cultivated plant species) is an attempt to extent our knowledge on the Greek aphid fauna and to establish the base for the development of a check-list where association between aphid species of the Greek fauna and their host-plant will be described in detail. In this paper we present 18 new species for the Greek aphid fauna which increase the number of species recorded in Greece to 333. The fact that new species were found, which consist 5.4% of the total recorded Greek aphid fauna, suggests that with further research and organization of similar studies in different regions of Greece, the recorded Greek aphid fauna will be substantially increased and might reach that reported in other European countries (Patti and Barbagallo 1998a, Fauna Europaea 2012).

Of the newly recorded species, *D. lappae* is probably an established pest on artichoke *C. cardunculus* in the main production area in Greece (Argolida, Peloponese). Some species (*D. devecta*, *M. caryella*, *P. bursarius*, *P. spyrothecae*, *P. vesicarius* and *T. takachihoensis*) host plants of economic importance and also *T. takachihoensis* was recently recorded as a vector of the *Potyvirus watermelon mosaic virus* (WMV) (Potyviridae) (Papapanagiotou and Marantis

2011). Lastly, the species *T. takachihoensis* and *M. caryella* are relatively recent introductions in Europe as they have been recorded for first time in the continent in the 80s.

References

- Aoki, S. and U. Kurosu. 1986. Soldiers of a European gall aphid, *Pemphigus spyrothecae* (Homoptera: Aphidoidea): why do they molt? J. Ethol. 4: 97-104.
- Barbagallo, S. 1974. Osservazioni sugli afide del carciofo (*Cynara scolymus*). Boll. Lab. Ent. agr. Filippo Silvestri 31: 197-252.
- Barbagallo, S. and I. Patti. 1998. Acquisizioni bio-ecologiche sugli afidi del territorio centro-orientale italiano. Boll. Zool. agr. Bachic. 30: 223-310.
- Barbagallo, S., A. Binazzi, F. Pennacchio and A. Pollini. 2011. An annotated checklist of aphids surveyed in the Italian regions of Tuscany and Emilia Romagna. Redia 94: 59-96.
- Blackman, R.L. and V.F. Eastop. 1994. Aphids on the World's Trees: an Identification and Information Guide. CABI, Wallingford, UK., 1024 pp.
- Blackman, R.L. and V.F. Eastop. 2000. Aphids on the World's crops: an Identification and Information Guide. John Wiley & Sons, Ltd, Chichester, 2nd ed. 466 pp.
- Blackman, R.L. and V.F. Eastop. 2006. Aphids on the World's Herbaceous Plants and Shrubs. John Wiley & Sons, Ltd, Chichester, 1439 pp.
- Blackman, R.L. and V.F. Eastop. 2007. Taxonomic Issues. In: van Emden HF. and R. Harrington (eds.). Aphids as Crop Pests. Wallingford, Oxfordshire, pp 1-30.
- Bissell, T.L. 1978. Aphids on Juglandaceae in North America. University of Maryland Agricultural Experiment Station Contribution 911, 78 pp.

- Börner, C. 1950. Neue europäische Blattlausarten. Selbstverlag, Naumberg/Saale, 19 pp.
- Dixon, A.F.G. 1998. Aphid Ecology. London, U.K., Chapman and Hall, London, 2nd ed. 300 pp.
- Döring, T.F. 2007. Colonies of the Asian elm aphid *Tinocallis takachihoensis* Higuchi (Hem. Aphididae) in Britain. Entomologist's Record 119: 228-229.
- Eastop, V.F. and H.F. van Emden. 1972. The insect material. In: van Emden HF. (ed.). Aphid Technology. Academic Press, London, pp. 1-45.
- Fauna Europaea 2012. Fauna Europaea version 2.5. Web Service available online at <http://www.faunaeur.org>.
- Favret, C. 2012. Aphid Species File. Version 1.0/4.0. [15/12/2012]. <<http://Aphid.SpeciesFile.org>>.
- Forrest, J.M.S. 1970. The effects of maternal and larval experience on morph determination in *Dysaphis devectora*. J. Insect Physiol. 16: 2281-2292.
- Foster, W.A. 1990. Experimental evidence for effective and altruistic colony defence against natural predators by soldiers of the gall-forming aphid *Pemphigus spyrothecae* (Hemiptera: Pemphigidae). Behav. Ecol. Sociobiol. 27: 421-430.
- Footitt, R.G., S.E. Halbert, G.L. Miller, E. Maw and L.M. Russell. 2006. Adventive aphids (Hemiptera: Aphididae) of America North of Mexico. Proc. Ent. Soc. Wash. 108: 583-610.
- García Prieto, F., M.P. Mier Durante and F. Leclant. 2001. Variabilidad, nuevas formas y ciclo vital de *Aphis brotericola*. Revue fr. Ent. (N.S.). 23: 153-160.
- Heie, O.E. 1986. The Aphidoidea (Hemiptera) of Fennoscandia and Denmark. III. Family Aphididae: subfamily Pterocommatinae & tribe Aphidini of subfamily Aphidinae. Fauna Entomologica Scandinavica, Volume 17. E.J. Brill/Scandinavian Science Press Ltd. 314 pp.
- Higuchi, H. 1972. A taxonomic study of the subfamily Callipterinae in Japan. Insecta Matsum. 35: 19-126.
- Hille Ris Lambers, D. 1945. De Bloedulekkenluis van appel, *Sappaphis devectora* (Walker). Tijdschr. PlZiekt. 51: 57-72.
- Holman, J. 1990. On new and little-known European *Aphis* species. Acta ent. bohemoslov. 87: 122-127.
- Jacky, F. and Y. Bouchery. 1980. Atlas des Formes Ailés des Espèces Courantes de Puceron. Institut National de la Recherche Agronomique, Colmar, France, 48 pp.
- Kavallieratos, N.G., Ž. Tomanovic, G.P. Sarlis, B.J. Vayias, V. Žikic and N.E. Emmanouel. 2007. Aphids (Hemiptera: Aphidoidea) on cultivated and self-sown plants in Greece. Biologia (Bratisl.) 62: 335-344.
- Lampel, G. 1960. Die morphologischen und ökologischen Grundlagen des Generationswechsels monözischer und heterözischer Pemphiginen der Schwarz- und Pyramidenpappel. Z. angew. Entomol. 47: 334-375.
- Lozier, J.D., R.G. Footitt, G.L. Miller, N.J. Mills and G.K. Roderick. 2008. Molecular and morphological evaluation of the aphid genus *Hyalopterus* Koch (Insecta: Hemiptera: Aphididae), with a description of a new species. Zootaxa 1688: 1-19.
- Mansour, F. and M.K. Harris. 1988. Biology and phenology of the black margined aphid, *Monellia caryella* (Fitch), a new pest of pecan in Israel. Southwest Entomol. 13: 19-29.
- Mier Durante, M.P. and N. Pérez Hidalgo. 2002. Dos especies de Panaphidini (Hemiptera, Aphididae: Calaphidinae), propias de árboles ornamentales, introducidas en la Península Ibérica. Bolm Soc. Port. Ent. 157 (Suppl. 6): 213-217.

- Mifsud, D., N. Pérez and S. Barbagallo. 2009. Aphids (Hemiptera: Aphidoidea) associated with native trees in Malta (Central Mediterranean). *Bull. Ent. Soc.* 2: 81-93.
- Moritsu, M. 1983. Aphids of Japan in Colors. Zenkoku Noson Kyoiku Kyokai, Publishing Co., Ltd., Tokyo, Japan (in Japanese), 545 pp.
- Müller, F.P. 1987. Faunistisch-ökologische Untersuchungen über Aphiden im westlichen Erzgebirge und Vogtland. *Faun. Abhandl. St. Mus. Tierk. Dresden* 14: 105-129.
- Nieto Nafria, J.M. and M.P. Mier Durante. 1998. Hemiptera, Aphididae I. In: Ramos, M.A., J. Alba Tercedor, X. Bellés i Ros, J. Gosálbez i Noguera, A. Guerra Sierra, E. Macpherson Mayol, F. Martín Piera, J. Serrano Marino, and J. Templado González (eds.). *Fauna Ibérica*, volumen 11. Museo Nacional de Ciencias Naturales, CSIC, Madrid. 424 pp.
- Nieto Nafria, J.M., M.P. Mier Durante, F. García Prieto and N. Pérez Hidalgo. 2005. Hemiptera, Aphididae III. In: Ramos, M.A. et al. (eds.). *Fauna Ibérica*. Vol. 28. Madrid: Museo Nacional de Ciencias Naturales: CSIC. 362 pp.
- Ortego, J., M.E. Difabio and M.P. Mier Durante. 2004. Neuvos registros y actualización de la lista faunística de los pulgones (Hemiptera: Aphididae) de la Argentina. *Revta Soc. ent. Arg.* 63: 19-30.
- Papapanagiotou, A.P. and A. Marantis. 2011. New aphid vectors of watermelon mosaic virus (WMV). In: Proceedings of the 14th Conference of the Hellenic Entomological Society, Nafplion, Greece, October 11-14, 2011. Hellenic Entomological Society, Kifissia, Athens, pp. 206-208.
- Pashtshenko, N.F. 1988. Suborder Aphidinea - aphids. In: Ler, P.A. (ed.). *Keys to the Identification of Insects of the Soviet Far East*. Vol. 2, Hemiptera and Heteroptera. 'Nauka', Leningrad. pp. 546-686.
- Patti, I. and S. Barbagallo. 1998a. An approach to the knowledge on the Italian aphid fauna. In: Nafria, N. and J.M. Dixon (eds.). *Aphids in Natural and Managed Ecosystems*. Universidad de León, León, Spain., pp. 397-405.
- Patti, I. and S. Barbagallo. 1998b. Aphids of genus *Tinocallis* infesting elms in Italy (Homoptera Aphididae) [*Ulmus* spp.]. *Infotore Fitopatol.* 12: 21-30.
- Pike, N. and W.A. Foster. 2004. Fortress repair in the social aphid species, *Pemphigus spyrothecae*. *Anim. Behav.* 67: 909-914.
- Pike, N., D. Richard, W. Foster and L. Mahadevan. 2002. How aphids lose their marbles. *Proc. R. Soc. B.* 269: 1211-1215.
- Poulios, K.D., J.T. Margaritopoulos and J.A. Tsitsipis. 2007. Morphological separation of host adapted taxa within the *Hyalopterus pruni* complex (Hemiptera: Aphididae). *Eur. J. Entomol.* 104: 235-242.
- Quednau, F.W. and G.Ch. Shaposhnikov. 1988. A list of Drepanosiphine aphids from the Soviet Far East, with description of new species (Homoptera: Aphidoidea). *Canad. Ent.* 120: 1017-1032.
- Remaudière, G. and M. Remaudière. 1997. *Catalogue des Aphididae du Monde (Catalogue of the world's Aphididae)* Homoptera, Aphidoidea INRA editions, Paris. 473 pp.
- Remaudière, G. and M.A.V. Seco Fernandez. 1990. *Claves para Ayudar al Reconocimiento de Alados de Pulgones Trampeados en la Region Mediterranea (Hom. Aphidoidea)*. Universidad De León, León, 2V, 205 pp.
- Stroyan, H.L.G. 1963. *The British Species of Dysaphis Börner (Sappaphis auctt. nec Mats.)*. Part 2. HMSO, London. 119 pp.

- Stroyan, H.L.G. 1984. Aphids - Pterocommatinae and Aphidinae (Aphidini), Homoptera, Aphididae. Handbooks for the identification of British Insects. Vol. 2, Part 6. Royal Entomological Society of London, 232 pp.
- Tao, C.C. 1999. List of Aphidoidea (Homoptera) of China. Taiwan Agric. Res. Inst. Spec. Publ. 77: 1-144 pp.
- Taylor, L.R. 1984. A Handbook for Aphid Identification. Rothamsted Experimental Station, England, 171 pp.
- Thieme, T. and A.F.G. Dixon. 2004. The case for *Aphis solanella* being a good species. In: Simon, J.-C., C.A. Dedryver, C. Rispe, and M. Hullé (eds.). Aphids in the New Millennium. INRA, Paris, pp. 189-204.
- Tsitsipis, J.A., N.I. Katis, J.T. Margaritopoulos, D.P. Lykouressis, A.D. Avgelis, I. Gargalianou, K.D. Zarpas, D.Ch. Perdiki and A. Papapanayotou. 2007. A contribution to the aphid fauna of Greece. Bull. Insectol. 60: 31-38.
- Tutin, T.G., V.H. Heywood, N.A. Burges, D.H. Valentine, S.M. Walters and D.A. Webb. 1964. Flora Europaea. Volume 1: Lycopodiaceae to Platanaceae. University Press, Cambridge, United Kingdom, 464 pp.
- Tutin, T.G., V.H. Heywood, N.A. Burges, D.H. Valentine, S.M. Walters and D.A. Webb. 1968. Flora Europaea. Volume 2: Rosaceae to Umbelliferae. University Press, Cambridge, United Kingdom, 469 pp.
- Tutin, T.G., V.H. Heywood, N.A. Burges, D.H. Valentine, S.M. Walters and D.A. Webb. 1972. Flora Europaea. Volume 3: Diapensiaceae to Myoporaceae. University Press, Cambridge, United Kingdom, 385 pp.
- Tutin, T.G., V.H. Heywood, N.A. Burges, D.H. Valentine, S.M. Walters and D.A. Webb. 1976. Flora Europaea. Volume 4: Plantaginaceae to Compositae (and Rubiaceae). University Press: Cambridge, United Kingdom, 505 pp.
- Tutin T.G., V.H. Heywood, N.A. Burges, D.H. Valentine, S.M. Walters and D.A. Webb. 1980. Flora Europaea. Volume 5: Alismataceae to Orchidaceae. University Press: Cambridge, United Kingdom, 452 pp.
- Zhang, G. and T. Zhong. 1980. Six new species of *Tinocallis* Matsumura and a new species of *Sinotherioaphis* Zhang, gen. non. from China (Aphidoidea: Calapphidae). Zool. Res. 1: 429-442.
- Zhang, G., S. Tian and T. Zhong. 1990. Thirty-eight new records of Aphidoidea from China. Sinozoologia 7: 325-331.

Νέες καταγραφές ειδών αφίδων (Hemiptera: Aphididae) στην Ελλάδα

Α.Π. ΠΑΠΑΠΑΝΑΓΙΩΤΟΥ¹, Μ. ΝΑΘΑΝΑΪΛΙΔΟΥ², Μ. ΤΑΥΛΟΡ³,
Κ.Δ. ΖΑΡΠΑΣ², Κ. ΒΟΥΔΟΥΡΗΣ⁵, Ι.Α. ΤΣΙΤΣΙΠΗΣ^{2,4}
ΚΑΙ Ι.Α. ΜΑΡΓΑΡΙΤΟΠΟΥΛΟΣ^{5*}

¹Εργαστήριο Φυτοπροστασίας, Τμήμα Θερμοκηπιακών Καλλιεργειών και Ανθοκομίας,
ΤΕΙ Μεσολογίου, Νέα Κτήρια, 302 00, Μεσολόγγι

²Εργαστήριο Εντομολογίας και Γεωργικής Ζωολογίας, Τμήμα Φυτικής Παραγωγής και
Αγροτικού Περιβάλλοντος, Πανεπιστήμιο Θεσσαλίας, Οδός Φυτόκου, 384 46 Νέα Ιωνία, Βόλος

³AgroEcology, Rothamsted Research, West Common, Harpenden, Hertfordshire, AL5 2JQ, UK

⁴Παρούσα διεύθυνση: Μαινάλου 4, 152 35 Βριλήσσια, Αθήνα

⁵Τμήμα Βιοχημείας και Βιοτεχνολογίας, Πανεπιστήμιο Θεσσαλίας,
Πλούτωνος 26, 412 21 Λάρισα

ΠΕΡΙΛΗΨΗ

Τις τελευταίες δυο δεκαετίες έχουν δημοσιευθεί αρκετές εργασίες σχετικές με την αφιδοπανίδα της Ελλάδας. Ωστόσο, ο αριθμός των καταγεγραμμένων ειδών αφίδων είναι αρκετά μικρότερος από άλλες Ευρωπαϊκές χώρες, συμπεριλαμβανομένων αυτών στη λεκάνη της Μεσογείου. Στην παρούσα εργασία συλλέξαμε δείγματα αφίδων από διάφορους ξενιστές και περιοχές της νότιας, κεντρικής και βόρειας Ελλάδας. Συνολικά συλλέχθηκαν 128 είδη αφίδων, που ανήκουν σε 55 γένη και έξι υποοικογένειες, από 200 είδη φυτών-ξενιστών. Τα περισσότερα είδη αφίδων ανήκαν στην υποοικογένεια Aphidinae (ειδικά στις φυλές Macrosiphini και Aphidini). Δεκαοκτώ από τα συλλεχθέντα είδη είναι νέες αναφορές για την Ελλάδα. Τα αποτελέσματα της παρούσας εργασίας αυξάνουν τη γνώση μας σχετικά με την αφιδοπανίδα της Ελλάδας και δείχνουν ότι ο αριθμός των καταγεγραμμένων ειδών στην Ελλάδα μπορεί να αυξηθεί σημαντικά αν πραγματοποιηθούν επιπλέον σχετικές μελέτες.