

# The psyllid *Macrohomotoma gladiata* Kuwayama, 1908 (Hemiptera: Psylloidea: Homotomidae): a *Ficus* pest recently introduced in the EPPO region

D. Mifsud<sup>1</sup> and F. Porcelli<sup>2</sup>

<sup>1</sup>Department of Biology, Junior College, University of Malta, Msida MSD 1252 (Malta); e-mail: david.a.mifsud@um.edu.mt

<sup>2</sup>DiBCA Sez. Entomologia e Zoologia, Università degli Studi di Bari Aldo Moro, Bari (Italy)

The psyllid *Macrohomotoma gladiata*, is a new insect pest of *Ficus* originating from Asia which has recently been found in Spain (Alicante) on urban *Ficus microcarpa* trees. This species may be of phytosanitary concern because of its leaf wrapping habits, wax secretion and honeydew excretion that may lead to direct and secondary twig damage. Although more studies are needed on the biology of *M. gladiata*, it is suspected that it might behave in the Euro-Mediterranean as an invasive alien species. The predation by *Anthocoris* sp. (*nemoralis*?) needs to be investigated in order to assess its effectiveness as a natural biological control agent. This is the first report of *M. gladiata* from the EPPO region.

## Introduction

The Oriental region, and its Indo-Burma and Sundaland biodiversity hotspots (Mittermeier *et al.*, 2011), is one of the major areas of origin of many plant pests that have been introduced into the EPPO region (Roques, 2010). Among these alien pest species, insects are the most rapidly increasing pest group (Roques *et al.*, 2009), and NPOs and entomologists are engaged in Integrated Pest Management (IPM) and Pest Risk Analysis (PRA) to try to limit damage caused by these pests. The massive introduction and widescale planting of several ornamental *Ficus* species from the tropical Far East to urban areas in the EPPO region has led many fig-associated insects to escape their natural biogeographic borders and invade new areas. Recent examples of such invasions include pollinating, *Parapristina verticillata* (Waterston), and non-pollinating fig wasps, *Odontofraggata galili* Wiebes, 1980 and *Philotripes emeryi* Grandi, and leaf fig-gall wasps, *Josephiella microcarpae* Beardsley & Rasplus and *Walkerella microcarpae* Boucek, all on *Ficus microcarpa* (Lo Verde *et al.*, 1991, 2007; Lo Verde, 2001; Lo Verde & Porcelli, 2010). A new alien species *Macrohomotoma gladiata*, a jumping plant-louse, was recently observed in Spain (Alicante) on urban trees of *Ficus microcarpa*. To date, this species was only known from Japan, Taiwan and Hong Kong with most records being found on *Ficus microcarpa* (Hollis & Broomfield, 1989). *Macrohomotoma gladiata* is of concern because of its leaf-wrapping habits, abundant wax secretion (Fig. 1E) and honeydew excretion, damage to tree twigs and consequent stunting of growth. This paper is intended to report the first occurrence of this psyllid in the EPPO region and to discuss the possible risks of this new pest on European *Ficus* trees.

## Materials and methods

Several infested twigs were collected on four *Ficus microcarpa* adult trees on 20 July 2011 in the Alicante University Campus.

The trees had been planted there several years before (observations by local personnel) and similar damage on the twigs of the same plants had been noted during the previous year (2010). All photos of living material were taken on site. Subsequently specimens were stored in 75% alcohol. The collection was examined in detail in Italy (DiBCA sez. Entomologia e Zoologia) and in Malta (University of Malta). Plant names used for *Ficus* species in this paper follow the International Plant Name Index (<http://www.ipni.org>).

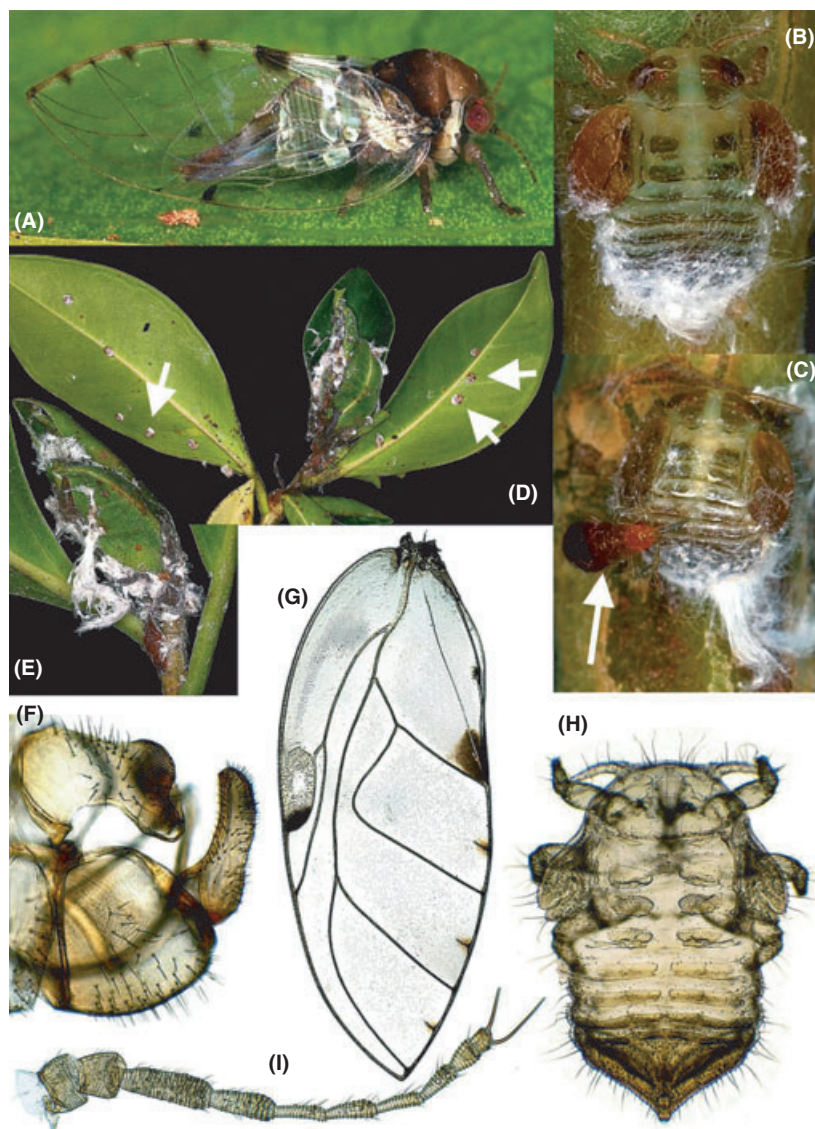
## Results and discussion

### Detection

The infested *Ficus* trees could be clearly identified from a distance, as the last instar nymphs' exuviae that are scattered over the healthy leaves nearest the twig tips excrete a lot of woolly wax. The psyllids infested the growing tips of host plants which appeared somewhat misshapen, blackened by sooty mould and covered by white woolly wax. All this locked the twig into a firm wrap made up of reciprocally enveloping leaves and sheaths that were attached together. Removing the outer leaves revealed numerous juveniles belonging to all instar stages living in this protected environment. Outer leaves were still green in contrast to internal leaflets that are usually dead and blackened. In between the leaflets, several living and dead juveniles could be found along with exuviae and wax threads.

### Identification

Within the EPPO region the family Homotomidae is represented by *Homotoma ficus* (Linnaeus) and *H. viridis* Klimaszewski. The morphological differentiation which separates these two species has a weak basis. In addition the two species occupy the same niche, within the same geographical area and there is no biological evidence which suggests that these two species are



**Fig. 1** *Macrohomotoma gladiata*: (A) adult female from side; (B) 5th instar nymph of *M. gladiata* on a twig of *Ficus microcarpa*; (C) *Anthocoris* sp. (*nemoralis* ?) juvenile preying on a nymph of *M. gladiata*; (D) Infested *F. microcarpa* twig: white arrows indicate the exuviae of last instar nymphs; (E) Infested twig: detail of the wrapped apical leaves, white wax threads and sheaths; (F) Male terminalia from side; (G) Forewing; (H) Nymph; (I) Antenna from an adult male.

distinct. For these reasons several authors treat them as a single taxon. *Macrohomotoma gladiata* is easily distinguished from *Homotoma ficus* by the strongly arched thorax as viewed in profile and the very different forewing shape and venation. A short description of the adult of *M. gladiata* is presented below. Body length varies from 2.0–2.3 mm in males, whereas females can attain a total length of 3 mm. Adults are light to dark brown (Fig. 1A) with yellowish white stripes before forewing base; forewing transparent with distinct brown-blackish markings proximal of  $Cu_{1a}$  and at apex of pterostigma (Fig. 1G); genae yellowish brown; antennae 10-segmented yellowish-brown with last segment darker in colour (Fig. 1I). Head as wide as thorax, strongly down-curved. Vertex about 2.5 times as wide as long.

Thorax strongly arched. Metatibia without basal spine, with 4 apical internal spurs. Male genitalia (Fig. 1F) with proctiger much wider than long and with two lobes posteriorly; aedeagus long, with basal segment twice as long as apical one.

#### Expected damage

Based on the observations in Spain, *Ficus* appears not to suffer direct damage at a low to moderate infestation of psylloids. However, plant growth will slow down and two smaller growth tips will replace the infested one. At high population levels the fig tree will become misshapen and this is unsightly for urban amenity trees. Indirect damage is due to abundant wax secretion and

honeydew excretion. Both will attract ants, thus driving secondary homopteran plant pest infestations of mealybugs, for example, and facilitate overinfestations by thigmotaxis. Moreover, excretion of honeydew and wax over cars, footpaths and urban areas is undesirable.

### Control perspective

The strongly curled leaves protect the juveniles of this psyllid pest from direct insecticide application and also from possible antagonists. The urban environment and the fact these pests have sap-sucking mouthparts suggests that the most suitable pesticide application may be via the use of preventive tree-injection to distribute a bi-directional systemic active ingredient into the infested plant. The predation by *Anthocoris* sp. (*nemoralis* ?)<sup>1</sup> (Fig. 1C) may help to control *M. gladiata*, but further investigations are required to assess the effectiveness of this natural biological control agent.

### Conclusion

The example of *Ficus microcarpa* pests, described above, indicates that urban host plant corridors greatly assist alien species dispersion from their area of origin (Narendran *et al.*, 2007) to a destination country (Lo Verde *et al.*, 1991; Lo Verde, 2001; Lo Verde & Porcelli, 2010). Once introduced into a destination country, these pests can establish and eventually make their host plant undesirable as an urban amenity tree (Nadel *et al.*, 1992; Schicchi, 1999). From this point of view, the discovery of *M. gladiata* in the EPPO area may be considered as the most recent (unexpected) introduction event of fig-associated insects. No other member of the family Homotomidae was considered as an alien species to Europe to-date (Mifsud *et al.*, 2010). Several questions arise from this evidence. The first is about the origin of *Homotoma ficus* that was possibly introduced into the Mediterranean Basin from the Fertile Crescent following the tracks of the edible fig (*Ficus carica*) (Prance & Nesbitt, 2005). The second concerns the ability of European populations of *M. gladiata* to feed on other oriental ornamental *Ficus* species and their potential to become invasive.

### **Le psylle *Macrohomotoma gladiata* Kuwayama, 1908 (Hemiptera: Psylloidea: Homotomidae): un ravageur des *Ficus* récemment introduit dans la région OEPP**

Le psylle *Macrohomotoma gladiata*, est un nouveau ravageur des *Ficus*, originaire d'Asie, qui a été récemment trouvé en Espagne (Alicante) sur des *Ficus microcarpa* urbains. Cette espèce pourrait poser des problèmes phytosanitaires parce qu'il s'enroule dans les feuilles, sécrète de la cire et excrète du miellat, ce qui peut causer des dégâts directs et indirects aux rameaux. Même si d'autres études sont nécessaires sur la biologie de *M. gladiata*, il est soupçonné qu'il pourrait se comporter dans la

région euro-méditerranéenne comme une espèce exotique envahissante. La prédation par *Anthocoris* sp. (*nemoralis* ?) doit être investiguée afin d'évaluer son efficacité en tant qu'agent de lutte biologique naturel. Ceci est le premier signalement de *M. gladiata* dans la région OEPP.

### **Листоблошка *Macrohomotoma gladiata* (Kuwayama, 1908) (Hemiptera: Psylloidea: Homotomidae): вредный организм на *Ficus*, недавно интродуцировавшийся в регионе ЕОКЗР**

Листоблошка *Macrohomotoma gladiata* представляет собой новый вредный организм азиатского происхождения на фикусах (*Ficus*), который недавно был обнаружен в Испании, в Аликанте, на городских посадках *Ficus microcarpa*. Этот вид может иметь фитосанитарное значение, так как он обычно вызывает скручивание листьев, выделение воска и медвяной росы, что может приводить к прямому и косвенному повреждению побегов. Несмотря на то, что еще требуется проведение более подробного изучения биологических характеристик *M. gladiata*, можно опасаться того, что в Европейско-средиземноморском регионе он может оказаться инвазивным видом. Необходимо также исследовать роль *A. nemoralis* как хищника листоблошки, с тем чтобы оценить его эффективность как местного агента биологической борьбы. Статья представляет собой первое сообщение о появлении *M. gladiata* в регионе ЕОКЗР.

### References

- Hollis D & Broomfield PS (1989) *Ficus*-feeding psyllids (Homoptera), with special reference to the Homotomidae. *Bulletin British Museum (Natural History), Entomology Series*, **58**, 131–183.
- Lo Verde G (2001) Ritrovamento in Italia di *Josephiella microcarpa* Beardsley & Rasplus galligeno fogliare di *Ficus microcarpa* L. (Moraceae). *Naturalista Siciliano*, **26**, 199–203. (in Italian, English abstract).
- Lo Verde G & Porcelli F (2010) First record of the non-pollinating fig wasp *Odontofroggata galili* Wiebes, 1980 from Malta (Hymenoptera, Chalcidoidea, Agaonidae). *Bulletin of the Entomological Society of Malta*, **3**, 51–54.
- Lo Verde G, Porcelli F, Bella S & Rasplus JI (2007) Imenotteri Agonidi nuovi per l'Europa e loro ruolo nella naturalizzazione di *Ficus* spp. in Italia. *Atti XXI CNIE, Campobasso*, 11-16 giugno 2007, 60 (in Italian).
- Lo Verde G, Porcelli F & Sinacori A (1991) Presenza di *Parapristina verticillata* (Waterst.) e *Odontofroggata galili* Wlebes in Sicilia. *Atti XVI Congresso nazionale italiano di Entomologia*, 139–143 (in Italian, English abstract).
- Mifsud D, Cocquemot C, Mühlethaler R, Wilson M & Streito J-C (2010) Other Hemiptera Sternorrhyncha (Aleyrodidae, Phylloxeroidea, and Psylloidea) and Hemiptera Auchenorrhyncha. In: *Alien Terrestrial Arthropods of Europe* (Ed. Roques A, Kenis M, Lees D, Lopez-Vaamonde C, Rabitch W, Rasplus J-Y, Roy DB), Chapter 9.4. Biorisk, 4, 511-552. doi: 10.3897/biorisk.4.63.
- Mittermeier RA, Turner WR, Larsen FW, Brooks TB & Gascon C (2011) Global biodiversity conservation: the critical role of hotspots. In: *Biodiversity Hotspots Distribution and Protection of Conservation Priority Areas* (Eds Zachos FE & Habel JC), 546 pp. Springer-Verlag Berlin Heidelberg.

<sup>1</sup>The identification as *Anthocoris nemoralis* to species level was not confirmed.

- Nadel H, Frank JH & Knight RJ (1992) Escapees and accomplices: the naturalization of exotic *Ficus* and their associated faunas in Florida. *Florida Entomologist*, **75**, 29–38.
- Narendran TC, Santhosh S & Sudheer K (2007) Biosystematics and biogeography of oriental Chalcidoidea (Hymenoptera) associated with plant galls. *Oriental Insects*, **41**, 141–167.
- Prance G & Nesbitt M (2005) The Cultural History of Plants. *Routledge*, New York (USA), 452 pp.
- Roques A (2010) Taxonomy, time and geographic patterns. *BioRisk* **4**, 11–26. doi: 10.3897/biorisk.4.70.
- Roques A, Rabitsch W, Rasplus JY, Lopez-Vaamonde C, Nentwig W & Kenis M (2009) Alien Terrestrial Invertebrates of Europe. In: *DAISIE Handbook of Alien Species in Europe. Invading Nature Springer Series in Invasion Ecology 3* (Ed. Drake JA). Springer, Berlin (DE), 399 pp.
- Schicchi R (1999) Spontaneizzazione di *Ficus microcarpa* (Moraceae) e *Cardiospermum grandiflorum* (Sapindaceae) in Sicilia. *Naturalista siciliano*, **23**, 315–317, (in Italian, English abstract).