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Saltbush-associated *Asphondylia* species (Diptera: Cecidomyiidae) in the Mediterranean Basin and their chalcidoid parasitoids (Hymenoptera: Chalcidoidea)

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Abstract

Numerous species of gall midges (Diptera: Cecidomyiidae) have been recorded from saltbush (Chenopodiaceae: *Atriplex*) around the world but only 11 of them belong to the large cecidomyiid genus *Asphondylia*. Of these, two species were described in the late 19th century from complex bud galls on *Atriplex halimus* in the Mediterranean Basin. In the present study *Asphondylia punica* is redescribed, *A. conglomerata* is synonymized with it, and *Asphondylia scopuli* is described from *Atriplex lanfrancoi*, an endemic plant to the Maltese Islands. Descriptions are accompanied by information about the galls and life history of the gall midges, and a review of the parasitic Hymenoptera associated with *A. scopuli* is provided. Four species of parasitoids were found and attributed to the families Eurytomidae, Pteromalidae, Eupelmidae and Eulophidae, of which the pteromalid *Mesopolobus melitensis* is described as new.

Key words: *Atriplex*, gall midges, *Mesopolobus*, Pteromalidae

Introduction

Atriplex (Chenopodiaceae) is a cosmopolitan genus comprising ca. 300 described species of annual or perennial herbs or shrubs, which spread from its Eurasian origin to North and South America, Australia and Africa (Kadereit *et al.* 2010). The minority of species in this genus are C₃ plants that are mostly distributed in Eurasia, while the much larger lineage of C₄ species radiated to all other continents (Kadereit *et al.* 2010). The Mediterranean Basin is home to numerous and diverse species of *Atriplex* and closely related chenopod genera (e.g., *Halimione*) that are dominant components of arid and salt-marsh habitats. One of these is *Atriplex halimus* (Fig. 1), a circum-Mediterranean shrub that has been the subject of numerous studies focusing on its ecology, physiology and genetics (e.g., Ben Hassine *et al.* 2008, Le Hourou 1992, Ortiz-Dorda *et al.* 2005, Walker *et al.* 2005). A unique Mediterranean species is *A. lanfrancoi*, a woody shrub endemic to sheer seaside cliffs of Malta and Gozo (Fig. 5), which is currently classified as critically endangered by the IUCN Red List of threatened species (www.iucnredlist.org). Due to its unique morphology, *A. lanfrancoi* was previously accommodated in the monotypic genus *Cremnophyton*, but recent studies showed that it should be placed in *Atriplex* (Kadereit *et al.* 2010).

Several species of gall-inducing arthropods have been recorded from *Atriplex* hosts in the Mediterranean, including mites and lepidopterans, but most are gall midges (De Stefani 1900, Houard 1908, 1922, Hegazi *et al.* 1980, Elsayed *et al.*, in press). These include the monotypic genus *Aplonyx* De Stefani from Italy (which has not been found again since its original description in 1908), four species of *Stefaniella* Kieffer, and two species of *Asphondylia* Loew (Gagné & Jaschhof 2014). Some of the original descriptions and subsequent notices provided good illustrations of the galls, making it possible to recognize the species again, but the descriptions of the gall midges were either superficial or limited to only one sex. The *Stefaniella* species from *Atriplex* were subsequently

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