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PRESENT STATUS OF APHID STUDIES IN MALTA (CENTRAL MEDITERRANEAN) WITH SPECIAL REFERENCE TO TREE DWELLING SPECIES

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Mifsud D., Pérez Hidalgo N., Barbagallo S. – Present status of aphid studies in Malta (Central Mediterranean) with special reference to tree dwelling species.

A critical review of aphid literature dealing with Maltese records revealed the presence of 50 species. Most of these records were included in local journals, some of which not accessible to the rest of the scientific community. Because of this, the Fauna Europaea Project and other works about aphids in Europe included only a few aphid records from Malta. In the present paper all names are corrected and updated and doubtful records have been highlighted. Although many species of trees which are known to host aphids are lacking in Malta, and those present are often rare and with confined distributions, aphid records total 25 species and most of these aphids can be considered as locally rare.

KEY WORDS: Malta, Central Mediterranean, aphids, trees, check-list.

INTRODUCTION

Despite the economic importance of aphids, very few studies have so far been carried out to provide a preliminary check list of species inhabiting the Maltese Islands. Perhaps the first Maltese naturalist to mention aphid species from Malta was BORG (1922) in his book entitled "*Cultivation and diseases of fruit trees in the Maltese Islands*". However, in this work (BORG, 1922) it is often not clear if species mentioned were actually observed in the Maltese Islands or not. CARUANA GATTO (1926) provided a detailed study on some 90 plant deformations/galls found in the Maltese Islands. In this work, some 20 aphid species were listed as causing leaf deformations or plant galls. It is possible that most of the aphid species listed in this work were entirely based on plant gall morphology. SALIBA (1963) produced a general work on insect pests of crop plants in the Maltese Islands. In this work he listed 11 species of aphids as injurious on several economically important crop plants. In this work the only details provided for these aphids included local abundance and host crops. Most likely the species list of SALIBA (1963) was more based on direct aphid observations on crops rather than on detailed taxonomic studies of the aphids themselves. HILLE RIS LAMBERS (1969) described *Protrama baronii* from material collected from Malta. In the early 1970s, the Plant Protection Section (through Mrs June M. Wilkinson) of the Ministry of Agriculture in Malta was in correspondence with the Department of Entomology (through Dr V.F. Eastop) of the then British Museum (Natural History). In this correspondence (of which only a small part was available), reference is provided for some aphid species identified by V.F. Eastop. In 1994, the Plant Health Section of the Ministry for Agriculture and Fisheries in Malta embarked on a Plant Quarantine Strengthening Project funded by FAO. This technical co-operation project (TCP) involved a number of consultants from different disciplines (including entomologists) and

following field sampling and species identifications, plant pests and diseases are to be found in unpublished FAO reports (e.g. WATSON, 1994; WATSON and ISMAY, 1994). In these reports, 29 species of aphids are included of which three were not identified to species level. It is not the scope of the present work to provide a list of these aphids, but these will be included in a future work dealing with aphids on crop plants of the Maltese Islands. BLACKMAN and EASTOP (1994) recorded *Forda riccobonii* De Stefani Perez from Malta based on material housed at The Natural History Museum in London and ORTIZ-RIVAS *et al.* (2009) used material of this species collected from Valletta for a molecular study. FARRUGIA (1997) recorded four aphids as occurring on cauliflower in Gozo. MIFSUD and WATSON (1999) provided information on four introduced and established aphid species in Malta and MIFSUD (2008) provided further information on a recently established species, *Greenidea ficicola* Takahashi. BLACKMAN and EASTOP (2006) cited also *Dysaphis crithmi* (Buckton) from Malta. In a recent study (2009) on aphids associated with native trees in the Maltese Islands, MIFSUD *et al.*, (2009) reported a total of 25 aphid records of which 18 represented new records. This work was almost entirely based on a detailed morphological study of the aphid itself and only one species, *Tetraneura nigriabdominalis* was identified on the bases of plant-gall morphology alone.

METHODOLOGY

All previously published information was carefully examined and a list of aphid species (in alphabetical order) is included. In this list we provide currently accepted names, source of publication with reference to the Maltese literature and any other relevant information. Finally, a brief overview on tree dwelling aphids of the Maltese Islands is provided with details of local distributions and other notes were relevant.

RESULTS

Aphid species records from the Maltese Islands:

1. *Amphorophora rubi* (Kaltenbach); CARUANA GATTO, 1926. This species was recorded under the name *Nectarosiphum rubi* Kalt., as causing leaf deformations on *Rubus ulmifolius*. These symptoms are unusual for that aphid and therefore it is suspected that *Aphis ruborum* (Börner) could also be involved.
2. *Anuraphis farfarae* (Koch); CARUANA GATTO, 1926; SALIBA, 1963. This species was locally recorded under the names of *Aphis kochi* Schouteden and *Aphis pyri* Koch respectively.
3. *Aphis craccivora* Koch; MIFSUD *et al.*, 2009
4. *Aphis fabae* Scopoli; SALIBA, 1963
5. *Aphis gossypii* Glover; MIFSUD and WATSON, 1999. The record of *Aphis fragulae* Kalt. [sic] by SALIBA (1963) should probably refer to *A. gossypii*.
6. *Aphis nerii* Boyer de Fonscolombe; CARUANA GATTO, 1926
7. *Aphis pomi* De Geer; CARUANA GATTO, 1926; SALIBA, 1963. *Aphis eriobotryae* Sch. recorded by CARUANA GATTO, 1926 is incorrect and should refer to *A. pomi*.
8. *Aphis rumicis* Linnaeus; CARUANA GATTO, 1926
9. *Aphis spiraeicola* Patch; MIFSUD and WATSON, 1999
10. *Aphis umbrellae* (Börner); CARUANA GATTO, 1926. This species was recorded as *Aphis malvae* Koch and as causing leaf deformation on *Althea rosea* and *Malva* spp.
11. *Aploneura lentisci* (Passerini); CARUANA GATTO, 1926; MIFSUD *et al.*, 2009
12. *Baizongia pistaciae* (Linnaeus); CARUANA GATTO, 1926; MIFSUD *et al.*, 2009. CARUANA GATTO (1926) recorded this species under its synonym *Pemphigus cornicularius* Pass. [sic].
13. *Brachycaudus cardui* (Linnaeus); CARUANA GATTO (1926). This species was recorded by CARUANA GATTO (1926) on the authority of BORG (1922), who collected the aphid on *Prunus domestica* and naming it as *Aphis pruni* Koch.
14. *Brachycaudus schwartzi* (Börner); CARUANA GATTO, 1926; SALIBA, 1963. The latter author recorded this species under the name of *Anuraphis persicae* Fonsc. This name has been applied for both *Brachycaudus persicae* (Passerini) and *B. schwartzi*. Collections carried out in recent years in Malta point out the frequent presence of the latter species in Malta.
15. *Brachycolus cucubali* (Passerini); CARUANA GATTO, 1926
16. *Brachyunguis tamaricis* (Lichtenstein); MIFSUD *et al.*, 2009
17. *Brevicoryne brassicae* (Linnaeus); CARUANA GATTO, 1926; SALIBA, 1963; FARRUGIA, 1997
18. *Caviarella aegopodii* (Scopoli); MIFSUD *et al.*, 2009
19. *Chaetosiphon fragaefolii* (Cockerell); SALIBA, 1963
20. *Chaitophorus capreae* (Mosley); MIFSUD *et al.*, 2009
21. *Chaitophorus populialbae* (Boyer de Fonscolombe); MIFSUD *et al.*, 2009
22. *Cinara cupressi* (Buckton); MIFSUD *et al.*, 2009
23. *Cinara maghrebica* Mimeur; MIFSUD *et al.*, 2009
24. *Cinara palaestinis* Hille Ris Lambers; MIFSUD *et al.*, 2009
25. *Dysaphis crithmi* (Buckton); BLACKMAN and EASTOP, 2006
26. *Dysaphis plantaginea* (Passerini); CARUANA GATTO, 1926. This aphid was recorded as *Mysus mali* Ferrari [sic].
27. *Eriosoma lanigerum* (Hausmann); CARUANA GATTO, 1926; SALIBA, 1963. CARUANA GATTO (1926) recorded this species under *Myzoxylus laniger* Hausm.
28. *Eriosoma lanuginosum* (Hartig); CARUANA GATTO, 1926; MIFSUD *et al.*, 2009
29. *Essigella californica* (Essig); MIFSUD *et al.*, 2009
30. *Eulachnus rileyi* (Williams); MIFSUD *et al.*, 2009
31. *Eulachnus tuberculostemmatus* (Theobald); MIFSUD *et al.*, 2009
32. *Forda riccobonii* (De Stefani Perez); BLACKMAN and EASTOP, 1994; MIFSUD *et al.*, 2009; ORTIZ-RIVAS *et al.*, 2009
33. *Greenidea ficicola* Takahashi; MIFSUD, 2008
34. *Hayhurstia atriplicis* (Linnaeus); CARUANA GATTO, 1926
35. *Hoplocallis picta* (Ferrari); MIFSUD *et al.*, 2009
36. *Lachnus roboris* (Linnaeus); MIFSUD *et al.*, 2009
37. *Lipaphis pseudobrassicae* (Davis); FARRUGIA, 1997. The species was previously recorded under the name of *L. erysimi* Kaltenbach.
38. *Myzocallis schreiberei* Hille Ris Lambers and Stroyan; MIFSUD *et al.*, 2009
39. *Myzus cerasi* (Fabricius); SALIBA, 1963
40. *Myzus persicae* (Sulzer); FARRUGIA, 1997; MIFSUD and WATSON, 1999
41. *Paracletus cimiciformis* von Heyden; CARUANA GATTO, 1926; MIFSUD *et al.*, 2009. This species was recorded by CARUANA GATTO (1926) under its synonym, *Pemphigus Derbesi* Licht.
42. *Smynthuroides betae* Westwood; FARRUGIA, 1997; MIFSUD *et al.*, 2009
43. *Tetraneura nigriabdominalis* (Sasaki); MIFSUD *et al.*, 2009
44. *Tetraneura ulmi* (Linnaeus); CARUANA GATTO, 1926
45. *Thelaxes suberi* (Del Guercio); MIFSUD *et al.*, 2009
46. *Tinocallis takachiboensis* Higuchi; MIFSUD *et al.*, 2009
47. *Toxoptera aurantii* (Boyer de Fonscolombe); CARUANA GATTO, 1926; SALIBA, 1963
48. *Trama baronii* (Hille Ris Lambers); HILLE RIS LAMBERS, 1969
49. *Tuberolachnus salignus* (Gmelin); MIFSUD *et al.*, 2009
50. *Viteus vitifoliae* (Fitch); BORG, 1922; CARUANA GATTO, 1926; SALIBA, 1963; MIFSUD and WATSON, 1999. BORG (1922) and CARUANA GATTO (1926) recorded this species under the name *Phylloxera vastatrix* Planchon.

Aphid species recorded from the Maltese Islands whose identity remains uncertain:

1. *Aphis* sp. This taxon was reported by CARUANA GATTO (1926). He described leaf deformations of this possibly single *Aphis* sp. from *Carthamus lanatus*, *Hedysarum coronarium* and *Polygonum convolvulus*. Such deformations may be caused by several species of *Aphis* or other taxa of different genera, but in the absence of recently collected material on the mentioned host plants no definite conclusions are taken.
2. *Aphis* sp. This taxon was reported by CARUANA GATTO (1926) on *Sisymbrium officinale*. From the description of the plant deformations caused by this aphid, the record may be attributed to *Brevicoryne brassicae* or *Lipaphis erysimi* or to some other species.
3. *Aphis persicae* Fonsc. This species was recorded by CARUANA GATTO (1926) on both *Prunus amygdalus* (almond) and *Prunus persica* (peach). There is no doubt that the record on peach should refer to *Brachycaudus schwartzi* as quoted above, but the record on almond could be attributed to more than one species. From the

description of the host plant deformations it could be *Brachycaudus amygdalinus*, but this remains to be asserted with collection of new material.

4. *Aphis pyri* Kock. This species was reported by SALIBA (1963) as occasionally found on pear (see above, under *Anuraphis farfarae*), as well as on apple and on pomegranate; but records on these latter two plants should be refer to different aphid species.

DISCUSSION AND CONCLUSION

The above list provides detailed literature records of aphid species from the Maltese Islands. A total of 50 species are included and the identity of some additional records remain uncertain. Most of the aphid studies carried out in Malta so far were mainly based on plant symptoms/ plant-gall morphology (e.g. CARUANA GATTO, 1926) or listing of aphid pests associated with crop plants which are known to be present in Southern Europe (e.g. BORG, 1922; SALIBA, 1963). A few aphid studies were carried out where detailed taxonomic studies of the aphids were undertaken. One such comprehensive study was that carried out by MIFSUD *et al.*, (2009) were a total of 25 aphid species associated with native trees in Malta were found. In this study trees of economic importance (mainly crops) were not considered as these will be included in a separate study on aphids of crops in Malta. Some general considerations are here included with respect to aphids associated with native trees in Malta.

As a general statement, the Maltese Islands are not rich in tree species and several Euro-Mediterranean species which are known to host several aphid species are completely lacking (e.g. *Abies*, *Acer*, *Betula*, *Castanea*, *Juniperus*, *Picea*, several *Pinus* and others). Perhaps the most common tree which is widely distributed in Malta is *Ceratonia siliqua* with which a common aphid is found between May and June, *Aphis craccivora*. Another very common tree is *Pistacia lentiscus*, present in most habitat types and which almost always hosts *Aploneura lentisci*. Other *Pistacia* are not common and mainly found in private or public gardens and afforested areas. *Pistacia atlantica* hosting *Forda riccobonii* and *Smynthuroides betae* whereas *P. terebinthus* hosting *Baizongia pistaciae* and *Paracletus cimiciformis*. The latter known from very few galls.

Trees with a native status but which are also widely planted both in the wild and in non-rural areas such as roundabouts, along road-sides and near coastal areas include *Quercus ilex*, *Pinus halepensis*, *Cupressus sempervirens*, *Tamarix* spp. and several species of *Ficus*. *Quercus ilex* is known to host four aphid species, *Hoplocallis picta*, *Myzocallis schreiberei*, *Thelaxes suberi* and *Lachnus roboris*. The former three species may be regarded as frequent and often occur concurrently whereas *L. roboris* seems to be rather rare and with a restricted distribution. On *Pinus*, five aphids were found, namely *Cinara maghrebica*, *C. palaestinaensis*, *Essigella californica*, *Eulachnus rileyi* and *E. tuberculostemmatus*. Both *Cinara* species seem to be rather frequent where *Pinus halepensis* is found. *E. californica* is not native and to-date was found in single numbers in one location. Not much data is available on *Eulachnus rileyi* which most likely was collected on some cultivated *Pinus*, such as *P. pinea* which is not native to the Maltese Islands. On the other hand *E. tuberculostemmatus* seems to be a rather frequent species in Malta. Only one specimen of *Cinara cupressi* was found on *Cupressus sempervirens* but we are of the opinion that this aphid is more common and

more widely distributed in the Maltese Islands. *Tamarix africana*, although commonly cultivated in coastal localities, represents a true native and is listed as such in the Red Data Book for the Maltese Islands (LANFRANCO, 1989). This tree and other *Tamarix* spp. host *Brachyunguis tamaricis* which can be considered as frequently found in Malta.

Other trees which are known to host aphids have far more restricted distributions in the Maltese Islands and are all included in the Red Data Book (LANFRANCO, 1989). These include *Populus alba*, *Salix alba* and *S. pedicellata* and *Ulmus canescens*. *Chaitophorus populiabae* is the only aphid species found associated with *Populus* in Malta. The species was observed wherever *Populus* is present and often large ant-attended colonies are present. Three aphid species are known to be associated with *Salix*; these include *Cavariella aegopodii*, *Chaitophorus capreae* and *Tuberolachnus salignus*. Of these, only *C. capreae* was found in large colonies on *Salix pedicellata* whereas the other two species were often found in either single records or small populations. *Ulmus canescens* represents a true native with small pockets of trees in some five different localities in Malta. In almost all these locations, the gall forming aphids *Eriosoma lanuginosum* and *Tetraneura nigriabdominalis* were found, generally in small numbers. The record of *Tetraneura ulmi* by CARUANA GATTO (1926) is the only one which was not sustained by the recent study of MIFSUD *et al.*, (2009). It is most likely that this record is erroneous and should refer to *T. nigriabdominalis*. A very interesting record was that of the South East Asian aphid, *Tinocallis takachihoensis*, found in only one location where *Ulmus* is present. The presence of this species in Malta in such an isolated and natural place is somewhat unusual even though the species was found in several Euro-Mediterranean localities and on different species of elms (DÖRING, 2007). The aphid must have reached the Maltese Islands, by strong winds. Another alien species which is widely distributed in Malta and common on cultivated *Ficus* spp. is *Greenidea ficicola* (MIFSUD, 2008).

We are of the opinion that more species of aphids associated with trees will be eventually found in Malta. Certain trees which are known to host aphids (e.g. *Crataegus*) and which are present in Malta have not been properly investigated. The above checklist was developed to facilitate future work which is ongoing on aphids on crop plants and aphids on herbaceous plants and shrubs in Malta. With the rich flora of the Maltese Islands, especially herbaceous plants and shrubs, some 150-200 aphid species are expected to be found.

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