

Hymenoptera Chalcidoidea inhabiting galls of Cynipidae in Jordan

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Twenty-three species of Chalcidoidea (5 Eurytomidae, 4 Torymidae, 2 Ormyridae, 5 Pteromalidae and 7 Eulophidae) are recorded as regular members of the parasitoid fauna inhabiting galls of Cynipidae in Jordan. The occurrence of three additional species, probably only facultatively associated with cynipid galls, is noted. Twenty-two out of the total 26 species were previously unrecorded in the country, while 13 of them are also new for the entire Middle East. Eighteen new host records were detected, together with 24 new plant-parasitoid associations. The biology of each species is briefly commented upon, as well as the presence of a host-related colour variation in some species.

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1. Introduction

Gall-inducing species of Cynipidae are well-known to suffer considerable mortality from chalcidoid parasitoids (Askew 1984, Stone *et al.* 2002, Csóka *et al.* 2005). Gall wasps of *Quercus* Linnaeus (Fagaceae), the Cynipini, are particularly severely attacked and their associated communities of inquilines and parasitoids are often large (Askew 1984, Stone *et al.* 2002, Csóka *et al.* 2005). Whilst the parasitoid communities of cynipid gall wasps in the Western Palaearctic are relatively well-known (Stone *et al.* 2002, Csóka *et al.* 2005, Askew *et al.* 2006a), those of the Middle East have been studied very little (cf. Noyes 2003). In this paper we present details of the Chalcidoidea reared from some samples of cynipid galls collected by Bruno Massa (Palermo) in Jordan during three visits between 1999 and 2000 (Nieves-Aldrey & Massa 2006).

All the collected galls were induced by Cynipini on *Quercus* spp. (Fagaceae), except for one sample induced by a species of Aylacini on stems of *Salvia* sp. (Lamiaceae).

2. Materials and methods

About 400 galls of Cynipidae were collected by Bruno Massa in Jordan during the periods 22.V.–3.VI.1999, 23.X.–4.XI.1999 and 23.IV.–3.V.2000. The collecting area extended over 1,950 km² and lied in the highlands. Climate and vegetation are typically Mediterranean, even if large areas are now agricultural land. Forests of *Pinus halepensis* Miller and evergreen oak *Quercus calliprinos* Webb occur up to 1200 m above sea level, while two deciduous oaks, *Q. ithaburensis* Decaisne and *Q. boissieri* (Reuter), have scattered stands at lower altitudes and over 700 m

a.s.l., respectively. Annual rainfall ranges in this area between 250 and 550 mm.

Galls were stored in cooled bags, transferred in Italy, and put by B. Massa in small boxes at room temperature in laboratory for three years, in order to obtain adult insects. Galls were induced by 17 species of Cynipidae (for details, see Nieves-Aldrey & Massa 2006); parasitoids emerged only from 9 of them. They were mounted, labelled and studied by us.

3. Results and discussion

The families of Chalcidoidea represented in the parasitoid communities associated with galls of Cynipidae in the Western Palaearctic are Eurytomidae, Torymidae, Ormyridae, Pteromalidae, Eupelmidae and Eulophidae (Askew 1984, Csóka *et al.* 2005). All these families, with the exception of Eupelmidae, are represented in our samples from Jordan.

We obtained 916 parasitoids from 9 species of Cynipidae, belonging to 23 species regularly inhabiting cynipid galls and to three additional species, probably only facultatively associated with them. Among them 22 were unrecorded for Jordan, and 13 of these were also new for the whole Middle East (Table 1). Moreover, 18 new host records were detected, together with 24 new plant-parasitoid associations (Table 1). Two species showed a host-related variation in body pigmentation. Details on this aspect as well as on the biology of each species are given below.

3.1. Annotated list of Chalcidoidea

3.1.1. Family Eurytomidae

Eurytoma brunniventris Ratzeburg, 1852

Material. 2♂♂ 2♀♀, Ajlun, reared from unidentified galls (possibly *Neuroterus quercus-baccarum* (Linnaeus) (sexual generation)) collected 28.IV.2000 on *Q. boissieri*; 49♂♂ 41♀♀, Ajlun, ex galls *Plagiotrochus quercusilicis* (Fabricius) (sexual generation) collected 25.V.1999 on *Q. calliprinos*.

Notes. *Eurytoma brunniventris* is undoubtedly a very polyphagous parasitoid in galls of Cynipini, although there are indications from re-

cent molecular analyses that at least two species are confused under the name. As a larva it is an ectophagous parasitoid and can develop on the host cynipid, another parasitoid or, very commonly, on a cynipid inquiline (*Synergus* spp.), sometimes consuming gall tissue as well as the insect host (Askew 1961a). The species was known only for Israel in the Middle East (Pujade-Villar *et al.* 2003), and unrecorded on the cited plants (cf. Noyes 2003).

Eurytoma cynipsea Boheman, 1836

Material. 3♂♂ 8♀♀, Umm Qays, 2♂♂ 5♀♀, Dair Abi Said 30.IV.2000, 1♀, Judayta (Ajlun) 29.IV.2000, all ex galls *Hedickiana levantina* (Hedicke) collected in stems of *Salvia* sp.

Notes. This material has already been cited by Askew *et al.* (2006a), as a new host and plant record and for the first time in the entire Middle East. *E. cynipsea* was previously known as a parasitoid of several species of Aylacini (*Aulacidea* Ashmead, *Phanacis* Foerster, *Timaspis* Mayr, *Iraella* Nieves-Aldrey, *Isocolus* Foerster) gall-inducers on herbaceous plants, particularly of those forming galls in the flower stems of Asteraceae (cf. Askew *et al.* 2006a).

Eurytoma infracta Mayr, 1904

Material. 1♂ 4♀♀, Umm Qays, ex galls *Hedickiana levantina* collected 24.V.1999 in stems of *Salvia* sp.

Notes. This material has already been cited by Askew *et al.* (2006a). The species was previously unknown for the whole Middle East and the host record is new. *E. infracta* was described originally from material reared from galls of *Neaylax salviae* (Giraud) in flower heads of *Salvia officinalis* Linnaeus, and it seems to be most frequently associated with galls of Aylacini on *Salvia* spp. (Askew *et al.* 2006a). It is also reported parasitizing *Oxyna parietina* (Linnaeus) (Tephritidae) (Klausnitzer 1968), and it has been reared from galls of *Aylax minor* (Hartig) and *Barbotinia oraniensis* (Barbotin) in seed capsules of *Papaver* spp. (Askew *et al.* 2006a).

Sycophila biguttata (Swederus, 1795)

Material. 2♀♀, Judayta (Ajlun), ex galls *Andricus grossulariae* Giraud (sexual generation) collected 29.IV.2000 on *Q. ithaburensis*.

Table 1. Chalcidoidea reared from galls of Cynipidae in Jordan. All chalcidoid species are new for Jordan except those marked with a star, which were already cited by Askew *et al.* (2006a). Species marked with a black dot are new host or plant/parasitoid associations.

New records	Chalcidoid parasitoid	Cynipid host	Host plant
Jordan	<i>Eurytoma brunniventris</i>	? <i>Neuroterus quercusbaccarum</i> ♂♀ <i>Plagiotrochus quercusilicis</i> ♂♀	<i>Quercus boissieri</i> • <i>Q. calliprinos</i> •
Middle East	<i>Eurytoma cynipsea</i> *	<i>Hedickiana levantina</i> •	<i>Salvia</i> sp. •
Middle East	<i>Eurytoma infracta</i> *	<i>Hedickiana levantina</i> •	<i>Salvia</i> sp.
Jordan	<i>Sycophila biguttata</i>	<i>Andricus grossulariae</i> ♂♀ •	<i>Q. ithaburensis</i> •
Jordan	<i>Sycophila variegata</i>	<i>Andricus miriami</i> ♂♀ • <i>Andricus grossulariae</i> ♂♀ <i>Plagiotrochus quercusilicis</i> ♂♀ •	<i>Q. ithaburensis</i> <i>Q. calliprinos</i> •
Jordan	<i>Megastigmus dorsalis</i>	<i>Andricus grossulariae</i> ♂♀ <i>Dryocosmus cerriphilus</i> ♂♀ • <i>Plagiotrochus quercusilicis</i> ♂♀ •	<i>Q. ithaburensis</i> <i>Q. calliprinos</i> •
Middle East	<i>Glyphomerus tibialis</i> *	<i>Hedickiana levantina</i> •	<i>Salvia</i> sp.
Middle East	<i>Torymus geranii</i>	<i>Andricus grossulariae</i> ♂♀ • <i>Dryocosmus cerriphilus</i> ♂♀ •	<i>Q. ithaburensis</i> •
Middle East	<i>Torymus notatus</i>	<i>Plagiotrochus quercusilicis</i> ♂♀	<i>Q. calliprinos</i> •
Jordan	<i>Ormyrus nitidulus</i>	<i>Dryocosmus israeli</i> ♂♀ •	<i>Q. ithaburensis</i> •
Jordan	<i>Ormyrus pomaceus</i>	<i>Andricus grossulariae</i> ♂♀ <i>Dryocosmus israeli</i> ♂♀ • <i>Plagiotrochus quercusilicis</i> ♂♀	<i>Q. ithaburensis</i> • <i>Q. calliprinos</i> •
Jordan	<i>Cyrtoptyx robustus</i>	<i>Andricus grossulariae</i> ♂♀ • <i>Aphelonyx cerricola</i> •	<i>Q. ithaburensis</i> •
Jordan	<i>Cecidostiba fungosa</i>	<i>Andricus miriami</i> ♂♀ • <i>Andricus grossulariae</i> ♂♀ <i>Aphelonyx cerricola</i>	<i>Q. ithaburensis</i> • <i>Q. calliprinos</i> •
Middle East	<i>Cecidostiba ilicina</i>	<i>Plagiotrochus quercusilicis</i> ♂♀	<i>Q. calliprinos</i> •
Jordan	<i>Hobbya stenonota</i>	<i>Dryocosmus israeli</i> ♂♀ •	<i>Q. ithaburensis</i> •
Jordan	<i>Mesopolobus amaenus</i>	<i>Andricus grossulariae</i> ♂♀	<i>Q. ithaburensis</i> •
Middle East	<i>Aulogymnus arsames</i>	? <i>Neuroterus quercusbaccarum</i> ♂♀	<i>Q. boissieri</i> •
Middle East	<i>Aulogymnus bicolor</i>	<i>Plagiotrochus quercusilicis</i> ♂♀	<i>Q. calliprinos</i> •
Middle East	<i>Aulogymnus testaceoviridis</i>	<i>Andricus miriami</i> ♂♀ • <i>Andricus grossulariae</i> ♂♀ •	<i>Q. ithaburensis</i> • <i>Q. boissieri</i> •
Middle East	<i>Pediobius lysis</i>	<i>Andricus quercustozae</i> ♀♀ •	<i>Q. boissieri</i> •
Middle East	<i>Pediobius rotundatus</i>	<i>Andricus grossulariae</i> ♂♀ • <i>Plagiotrochus quercusilicis</i> ♂♀	<i>Q. ithaburensis</i> • <i>Q. calliprinos</i> •
Middle East	<i>Baryscapus berhidanus</i>	<i>Andricus quercustozae</i> ♀♀	<i>Q. boissieri</i>
Jordan	<i>Baryscapus ?papaveris</i> *	<i>Hedickiana levantina</i> •	<i>Salvia</i> sp. •
New records	Occasional species	Inquiline host	Host plant
Jordan	<i>Perilampus</i> sp. nr <i>tristis</i>	Tortricidae	<i>Q. ithaburensis</i> •
Middle East	<i>Copidosoma ortyx</i>	Gelechiidae •	<i>Q. ithaburensis</i> •
Jordan	<i>Dibrachys</i> sp.	Gelechiidae	<i>Q. ithaburensis</i> •

Notes. New host and plant records (cf. Noyes 2003). *S. biguttata* is the commonest *Sycophila* species in galls of Cynipini in which it is, usually at least, an endophagous parasitoid of the larva of the host cynipid. This species was previously known in the Middle East only for Turkey (Öncüer 1991, Gencer 2003).

Sycophila variegata (Curtis, 1831)
Material. 2♂♂, Judayta (Ajlun) and Abu Assou, ex galls *Andricus miriami* Sternlicht (sexual generation) collected 29.IV.2000 and 23.V.1999 respectively on *Quercus ithaburensis*; 15♂♂ 11♀♀, Judayta (Ajlun), ex galls *Andricus grossulariae* (sexual generation) collected

29.IV.2000 on *Q. ithaburensis*; 22♂♂ 29♀♀, Ajlun, ex galls *Plagiotrochus quercusilicis* (sexual generation) collected 25.V.1999 on *Q. calliprinos*.

Notes. *A. miriami* and *P. quercusilicis* are new host records for the species, as well as the association with *Q. calliprinos* (cf. Noyes 2003, Pujade-Villar *et al.* 2003). The biology of *S. variegata* is similar to that of *S. biguttata* and it is frequently reared from the same types of oak galls. It is a widespread species occurring from northern Europe to the Mediterranean and eastwards into central Asia. Specimens from the south and east of this range usually have more extensive pale colouration than those from the north and west. Jordanian specimens are very pale, especially those reared from *Plagiotrochus quercusilicis* galls in which the females are entirely testaceous with only a little darkening of the occiput around the foramen magnum. Females reared from *Andricus grossulariae* are slightly darker with black colouration about the ocelli, on the occiput and anterior surface of the pronotum, on the metanotum and anterior of the propodeum, and with a median, longitudinal black line on the gaster. In all females the characteristic pale vertical streak on the side of the fourth gastral tergite shows as a whitish area on a testaceous background. Males are more extensively darkened than their females and those reared from *A. grossulariae* galls often have, in addition, black areas on the anterior of the mesoscutum, on the scutellum mid-dorsally, the entire propodeum, parts of petiole and gaster and medially on metafemur and metatibia. Colour variations are very common in Chalcidoidea (Flanders & Quednau 1960, Askew 1971, Barrett *et al.* 1988, Fisher & La Salle 2005) and often they are linked to temperature range (Laudonia & Viggiani 1993, Bernardo *et al.* 2007). Our findings fit the thermal budget adaptive hypothesis (Gibert *et al.* 2000), which argues that a lighter body colour, which reflects more light, is an adaptation to living in warmer places. In accord with this theory, a latitudinal cline of body pigmentation has been recorded in many insect populations (David *et al.* 1985, Munjal *et al.* 1997, de Oliveira *et al.* 2004), and our records are in agreement with this kind of geographical distribution, even if a host-related selective pressure is also evident. In the Middle

East area the species was already known for Iraq (Abdul-Rassoul 1980), Turkey (Öncüer 1991), and Israel (Pujade-Villar *et al.* 2003).

3.1.2. Family Torymidae

Megastigmus dorsalis (Fabricius, 1798)

Material. 10♂♂ 8♀♀, Judayta (Ajlun), ex galls *Andricus grossulariae* (sexual generation) collected 29.IV.2000 on *Quercus ithaburensis*; 3♀♀, Judayta (Ajlun), ex galls *Dryocosmus cerriphilus* Giraud (sexual generation) collected 29.IV.2000 on *Q. ithaburensis*; 14♂♂ 3♀♀, Ajlun, ex galls *Plagiotrochus quercusilicis* (sexual generation) collected 25.V.1999 on *Q. calliprinos*.

Notes. *D. cerriphilus* and *P. quercusilicis* are new host records and the association with *Q. calliprinos* (cf. Noyes 2003, Pujade-Villar *et al.* 2003) is also new. A species that occurs across the Palaearctic region in the parasitoid communities of a very broad range of oak galls, perhaps associated particularly with woody galls although the contents of soft succulent and spongy galls, and spangle galls, may also be attacked (Askew 1966). The larva is ectophagous. Comments made for *Sycophila variegata* (above) on body pigmentation apply also to this species, as Jordanian specimens tend to be more extensively pale-coloured than material from Europe, and there is host-related variation. Specimens from *D. cerriphilus* and *P. quercusilicis* are almost entirely pale, whereas those from *A. grossulariae* have a mid-dorsal metallic green stripe, similar to but rather narrower than that in material from central and northern Europe. This species was hitherto known in the Middle East only from Iran (OILB 1971), Turkey (Öncüer 1991), and Israel (Pujade-Villar *et al.* 2003).

Glyphomerus tibialis (Förster, 1859)

Material. 9♂♂ 9♀♀, Umm Qays 24.V.1999, 6♂♂ 6♀♀, Judayta (Ajlun) 29.IV.2000, all ex galls *Hedickiana levantina* collected in stems of *Salvia* sp.

Notes. This material has already been reported by Askew *et al.* (2006a) and it constitutes a new host record and extension of its known range into the Middle East. This is a rather uncommon

parasitoid with previous host records of *Aulacidea subterminalis* Niblett, *Barbotinia oraniensis*, *Diastrophus mayri* Reinhard, *Liposthenes glechomae* (Linnaeus), *Neaylax salviae*, *Phanacis hypochoeridis* (Kieffer), *Rhodus cyprius* (Houard) (Aylacini) and *Diplolepis spinosissimae* Giraud (Diplolepidini) (Askew *et al.* 2006a).

Torymus geranii (Walker, 1833)

Material. 2♂♂, Judayta (Ajlun), ex galls *Andricus grossulariae* (sexual generation) collected 29.IV.2000 on *Quercus ithaburensis*; 1♂ 2♀♀, Judayta (Ajlun), ex galls *Dryocosmus cerriphilus* (sexual generation) collected 29.IV.2000 on *Q. ithaburensis*.

Notes. New host records and parasitoid-plant association (cf. Noyes 2003). This is a polyphagous ectoparasitoid with a moderately broad host range of oak gall wasps. Species of *Torymus* were less well-represented in the Jordanian samples than might have been anticipated. This is the first record in the Middle East for this species (cf. Noyes 2003).

Torymus notatus (Walker, 1833)

Material. 2♂♂, Ajlun, ex galls *Plagiotrochus quercusilicis* (sexual generation) collected 23.V.1999 on *Quercus calliprinos*.

Notes. Formerly placed in the genus *Syntomaspis* Foerster, *T. notatus* belongs to a group of univoltine parasitoids, in galls of Cynipini, with relatively narrow host gall ranges (Askew 1961b). Over much of Europe, *T. notatus* is recorded mostly from galls of *Andricus curvator* Hartig (sexual generation) on *Quercus robur* Linnaeus, *Q. petraea* (Mattuschka) Liebl. and *Q. faginea* Lamarck, but in the Mediterranean region what appears to be the same species is known as a parasitoid of *Plagiotrochus* on evergreen oaks (Nieves-Aldrey 1984, Pujade-Villar & Ros-Farre 1998). Unknown till now in the entire Middle East and for the cited *Quercus* species (cf. Noyes 2003).

3.1.3. Family Ormyridae

Ormyrus nitidulus (Fabricius, 1804)

Material. 2♀♀, Sammu, ex galls *Dryocosmus israeli* (Sternlicht) (= *Chilaspis israeli* (Sternlicht))

(sexual generation) collected 30.IV.2000 on catkins of *Quercus ithaburensis*.

Notes. A new host and plant record (cf. Noyes 2003). The genus *Chilaspis* Mayr has been recently synonymized with *Dryocosmus* Giraud by Ács *et al.* (2007) based on molecular phylogenetic results; all the species in the group make galls on the section *Cerris* oaks, as our record confirms. *O. nitidulus* and the following species are ectoparasitoids in cynipid galls on oak. The species is uncommon in northern Europe but increases in abundance towards the Mediterranean and eastwards across the Middle East into Asia. It is primarily a parasitoid in large, woody galls in which it seems usually to develop upon the gall-inducer. The species was unrecorded for Jordan (cf. Noyes 2003), but already known for Turkey (Doganlar 1991).

Ormyrus pomaceus (Fourcroy, 1785)

Material. 4♂♂ 1♀, Judayta (Ajlun), ex galls *Andricus grossulariae* (sexual generation) collected 29.IV.2000 on *Quercus ithaburensis*; 1♂, Sammu, ex gall *Dryocosmus israeli* (sexual generation) collected 30.IV.2000 on catkins of *Q. ithaburensis*; 1♀, Ajlun, ex gall *Plagiotrochus quercusilicis* (sexual generation) collected 23.V.1999 on *Q. calliprinos*.

Notes. *D. israeli* is a new host record for the parasitoid, and also new is the association with the cited *Quercus* species (cf. Noyes 2003). Generally a smaller insect than the preceding species, it has a more diverse range of host oak galls in which it may attack inquiline *Synergus* and other chalcidoid parasitoids, in addition to the gall-inducers. The species was previously known from Iran in the Middle East (OILB 1971).

3.1.4. Family Pteromalidae

Cyrtoptyx robustus (Masi, 1907)

Material. 1♀, Judayta (Ajlun), ex gall *Andricus grossulariae* (sexual generation) collected 29.IV.2000 on *Quercus ithaburensis*; 2♂♂ 2♀♀, Judayta (Ajlun), ex galls *Aphelonyx cerricola* (Giraud) collected 29.IV.2000 on *Q. ithaburensis*; 1♂, Abu Assous, ex unidentified gall collected 23.V.1999 on *Q. ithaburensis*.

Notes. New host and plant records (cf. Noyes 2003). A poorly known and rather uncommon

parasitoid which has been recorded only from galls of Cynipini, mainly the larger asexual generation galls of *Andricus* Hartig and *Cynips* Linnaeus in the Mediterranean region (cf. Noyes 2003). It was already recorded in Turkey for the Middle East (Öncüer 1991), whereas it is new for Jordan (cf. Noyes 2003).

Cecidostiba fungosa (Fourcroy, 1785)

Material. 8♂♂ 3♀♀, Judayta (Ajlu) and 2♂♂, Abu Assous, ex galls *Andricus miriami* (sexual generation) collected 29.IV.2000 and 23.V.1999 respectively on *Quercus ithaburensis*; 3♂♂ 6♀♀, Judayta (Ajlu), ex galls *Andricus grossulariae* (sexual generation) collected 29.IV.2000 on *Q. ithaburensis*; 1♂, Judayta (Ajlu), ex gall *Aphelonyx cerricola* collected 29.IV.2000 on *Q. ithaburensis*.

Notes. *A. miriami* is a new host record for this species, and also new is the association with *Q. ithaburensis* (cf. Noyes 2003). *C. fungosa* is a polyphagous parasitoid in Cynipini galls in Jordan, as it is over most of Europe. In Britain, however, before the advent of *Andricus quercuscalicis* (Burgsdorf) it was apparently a host gall specific parasitoid of *Biorhiza pallida* (Olivier) (sexual generation). Previously recorded only for Israel in the Middle East (cf. Noyes 2003, Pujade-Villar *et al.* 2003).

Cecidostiba ilicina Nieves-Aldrey & Askew, 1988

Material. 5♂ 1♀, Ajlu, ex galls *Plagiotrochus quercusilicis* (sexual generation) collected 25.V.1999 on *Quercus calliprinos*.

Notes. Described by Nieves-Aldrey & Askew (1988) from galls of *Plagiotrochus quercusilicis* and more recently reported for *P. australis* (Mayr) (Garrido Torres & Nieves-Aldrey 1999) and from galls of sexual generation *Biorhiza pallida* (Bellido & Pujade-Villar 1999). The present record is the first for the species outside the Iberian Peninsula and on *Q. calliprinos* (cf. Noyes 2003); however, it was already cited on *Q. coccifera* Linnaeus (Garrido Torres & Nieves-Aldrey 1999), of which *Q. calliprinos* is considered a subspecies or a variety by some botanists.

Hobbya stenonota (Ratzeburg, 1848)

Material. 3♂♂ 8♀♀, Sammu, ex galls *Dryocosmus israeli* (sexual generation) collected 30.IV.2000 on catkins of *Quercus ithaburensis*; 2♀♀, Ajlu, ex unidentified gall collected 23.V.1999 on *Q. ithaburensis*.

Notes. A new host and plant record. *H. stenonota* is another moderately polyphagous ectoparasitoid in galls of Cynipini; it has also been reared, exceptionally, from the rose gall of *Diplolepis mayri* (Schlechtendal) in Iran (Askew *et al.* 2006b). It was known previously in the Middle East from Iran (Askew *et al.* 2006b), and Turkey (Öncüer 1991).

Mesopolobus amaenus (Walker, 1834)

Material. 3♀♀, Judayta (Ajlu), ex galls *Andricus grossulariae* (sexual generation) collected 29.IV.2000 on *Quercus ithaburensis*.

Notes. *M. amaenus* is associated with many species of oak gall wasps, especially those inducing bud galls such as the larger *Andricus* species (Askew 1961c). The association with *Q. ithaburensis* is new (cf. Noyes 2003). Exceptionally, it is known from Iran as a parasitoid in rose galls of *Diplolepis mayri* (Askew *et al.* 2006b). In the Middle East recorded only from Israel (Pujade-Villar *et al.* 2003), and Iran (Haeselbarth 1983, Askew *et al.* 2006b).

3.1.5. Family Eulophidae

Aulogymnus arsames (Walker, 1838)

Material. 9♀♀, Ajlu, ex unidentified leaf galls (possibly *Neuroterus quercusbaccarum* (sexual generation)) collected 28.IV.2000 on *Quercus boissieri*.

Notes. *Aulogymnus* species are mostly parasitoids of Cynipini with a more or less restricted host gall range and developing as larvae externally on the gall wasp larvae (Askew 1961d). *A. arsames* is a univoltine species, at least in central and northern Europe, with a relatively small host gall range. It is frequent in galls of sexual generation *Neuroterus quercusbaccarum* in Britain, which supports the suggestion of Nieves-Aldrey & Massa (2006) that the unidentified galls from *Quercus boissieri* in Jordan are of this species. This is the first record on this plant and for the whole Middle East (cf. Noyes 2003).

Aulogymnus bicolor (Askew, 1975)

Material. 11♂♂ 3♀♀, Ajlun, ex galls *Plagiotrochus quercusilicis* (sexual generation) collected 23.–25.V.1999 on *Quercus calliprinos*.

Notes. This very distinctive species has previously been recorded only from the Iberian Peninsula (Askew 1975). It appears to be associated only with galls of *Plagiotrochus* (Askew pers.obs.). The association with the cited *Quercus* species is new (cf. Noyes 2003).

Aulogymnus testaceoviridis (Erdős, 1961)

Material. 21♂♂ 27♀♀, Judayta (Ajlun), ex galls *Andricus miriami* (sexual generation) collected 29.IV.2000 on *Quercus ithaburensis*; 4♂♂ 6♀♀, Judayta (Ajlun), ex galls *Andricus grossulariae* (sexual generation) collected 29.IV.2000 on *Q. ithaburensis*.

Notes. New host and plant records (cf. Noyes 2003). *A. testaceoviridis* was known previously as a central European species, recorded from galls of *A. multiplicatus* Giraud (sexual generation) in Hungary (Melika *et al.* 2002) and *A. quercus-ramuli* (Linnaeus) (sexual generation) in Romania (Andriescu & Schiopu 2002). Previously unknown outside Hungary and Romania (cf. Noyes 2003).

Pediobius lysis (Walker, 1839)

Material. 1♀, Ajlun, ex gall *Andricus quercustozae* (Bosc) (asexual generation) collected 29.X.1999 on *Quercus boissieri*.

Notes. New host and plant records (cf. Noyes 2003). However, *Pediobius lysis* is primarily a parasitoid of asexual spangle galls of *Neuroterus* (in Europe), and its presence in a gall of *Andricus quercustozae* is probably accidental. Species of *Pediobius* are small endoparasitoids and, so far as is known, attack only larvae of the gall-inducer, therefore needing to oviposit into a young host larva in a small gall. Unrecorded in the whole Middle East before now (cf. Noyes 2003).

Pediobius rotundatus (Fonscolombe, 1832)

Material. 1♀, Judayta (Ajlun), ex gall *Andricus grossulariae* (sexual generation) collected 29.IV.2000 on *Quercus ithaburensis*; 2♂♂ 2♀♀, Ajlun, ex galls *Plagiotrochus quercusilicis* (sexual generation) collected 25.V.1999 on *Quercus calliprinos*.

Notes. This is a bivoltine species, a common endoparasitoid of *Plagiotrochus* larvae, especially *P. quercusilicis*. The rearing from *Andricus grossulariae* constitutes a new host record as well as are new the associations with the cited *Quercus* species (cf. Noyes 2003). Previously unknown in the Middle East (cf. Noyes 2003).

Baryscapus berhidanus (Erdős, 1954)

Material. 1♀, Ajlun, ex gall *Andricus quercustozae* (asexual generation) collected 29.V.1999 on *Quercus boissieri*.

Notes. Described from specimens reared from galls of *Andricus quercustozae* (asexual generation) collected in Hungary, but more recently associated with several other species of *Andricus* (cf. Noyes 2003). Previously unrecorded outside Europe and on *Q. boissieri* (cf. Noyes 2003).

Baryscapus ?papaveris Graham, 1991

Material. About 480 specimens (approximate sex ratio 1♂:20♀♀), Umm Qays, ex galls *Hedickiana levantina* collected 23–24.V.1999 on *Salvia* sp.

Notes. *B. papaveris* was described from galls of *Aylax papaveris* (Perris) in *Papaver* seed capsules collected in France (Graham 1991). The Jordanian material resembles *B. papaveris* reared from *A. minor* and *A. papaveris* galls in Spain (cf. Nieves-Aldrey & Askew 2002), but small morphological differences cause us to hesitate to firmly designate it as *B. papaveris*. This material has already been reported by Askew *et al.* (2006a). No *Baryscapus* species was previously known for Jordan (cf. Noyes 2003).

3.2. Other species of Chalcidoidea

The species listed above are considered to be obligatory parasitoids of the cynipid gall-inducers, or of their inquiline, or of other parasitoids. In addition, some other Chalcidoidea were reared from the galls. These are regarded as casual or accidental members of the gall community, not attacking the regular inhabitants of the galls but probably finding their hosts among the several diverse insects that use cynipid galls facultatively as shelters.

3.2.1. Family Perilampidae

Perilampus sp. nr *tristis* Mayr, 1905

Material. 3♂♂ 4♀♀, Judayta (Ajlun), ex galls *Andricus ceconii* Kieffer (sexual generation) collected 29.IV.2000 on *Quercus ithaburensis*; 1♀, Judayta (Ajlun), ex gall *Aphelonyx cerricola* collected 29.IV.2000 on *Q. ithaburensis*; 1♀, Ajlun, ex unidentified gall collected 24.V.1999 on *Q. ithaburensis*.

Notes. *Perilampus tristis* is a parasitoid of microlepidoptera larvae (Bouček 1977) and it is thought that the specimens reared from Jordanian galls could have developed upon larval Tortricidae. No *Perilampus* species was previously known for Jordan, although *P. tristis* is recorded for many countries of the Middle East (cf. Noyes 2003).

3.2.2. Family Encyrtidae

Copidosoma ortyx Guerrieri & Noyes, 2005

Material. 2♀♀ Judayta (Ajlun), ex gall *Andricus miriami* (sexual generation) collected 29.IV.2000 on *Quercus ithaburensis*.

Notes. These specimens probably emerged from a Gelechiidae inquiline, which is the first host record for this species. *C. ortyx* was described from Portugal and hitherto known only from that country (Guerrieri & Noyes 2005).

3.2.3. Family Pteromalidae

Dibrachys sp.

Material. 1♀, Judayta (Ajlun), ex gall *Andricus miriami* (sexual generation) collected 29.IV.2000 on *Quercus ithaburensis*.

Notes. Species of *Dibrachys* are primary or secondary parasitoids of holometabolous insects. The most abundant Holarctic species, *D. cavus* (Walker) is 'a very polyphagous species' (Graham 1969), but most often reared as a secondary parasitoid from cocoons of Ichneumonoidea parasitic upon Lepidoptera. The Jordanian specimen is either *D. cavus* or a species closely allied to it, and probably developed upon a larval Gelechiidae. No *Dibrachys* is recorded for Jordan, although the very similar *D. boarmiae* (Walker) is known from Iran and Turkey (cf. Noyes 2003).

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