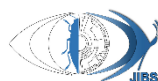


Original Article 

Chalcidoidea (Hymenoptera) associated with oak gall wasps (Hymenoptera: Cynipidae: Cynipini) in northern Algeria

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ABSTRACT. Oak gall wasps (Hymenoptera: Cynipidae: Cynipini) form galls on different parts of their hosts (Fagaceae), mainly on the genus *Quercus*. The shape, size, and color of these structures differ from one species to another and from one generation to another (sexual and asexual). They present a very diverse microfauna ranging from oak gall-inducing wasps to inquiline (Hymenoptera: Cynipidae: Synergini and Ceroptresini) and chalcidoid parasitoids (Hymenoptera: Chalcidoidea: Eulophidae, Eupelmidae, Eurytomidae, Megastigmidae, Ormyridae, Pteromalidae and Torymidae). The results of this study from Kabylie (Algeria) were obtained by gall rearing and branch beating during 2015–2016. In total, 26 parasitoid species were identified, including 10 species recorded for the first time in North Africa [Eulophidae: *Aulogymnus arsames* (Walker), *A. skianeuros* (Ratzeburg), *Pediobius chilaspidis* (Bouček); Pteromalidae: *Cyrtotypx robustus* (Masi), *Mesopolobus albitarsus* (Walker), *M. dubius* (Walker), *M. sericeus* (Forster), *M. tarsatus* (Nees), *Ormocerus vernalis* (Walker); and Torymidae: *Torymus flavipes* (Walker)]. In addition to the species mentioned above, three species are recorded for the first time in Algeria: *Hobbya stenonota* (Ratzeburg), *Mesopolobus tibialis* (Westwood) and *M. xanthocerus* (Thomson).

KEYWORDS: Cynipids, Forest, North Africa, Parasitoids, *Quercus*

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INTRODUCTION

Oak gall-inhabiting Cynipidae are consistently associated with a diverse assemblage of parasitic entomofauna, which is, more or less, well known (Askew et al. 2013). To date, numerous inquiline and parasitoid species have already been identified and catalogued in the Western Palaearctic (Askew et al. 2013). According to the authors, the identification of parasitoids and inquilines in this region is generally reliable; however, taxonomic difficulties increase when a wider geographical area is considered (Askew et al. 2013). In this case, the appearance of intermediate species complicates the accuracy of the identification. In Algeria, several studies have been carried out on chalcidoid parasitoids (Dieuzeide 1927; Marchal 1900; Viggiani 1964; Herting 1973; Pujade-Villar 1994; Garrido Torres & Nieves-Aldrey 1999), and recently by Kechrid et al. (2025). The first studies concerning the Cynipidae on oaks in Algeria began very early with those of Kieffer (1897), Marchal (1897, 1900) and Houard (1912, 1914), and subsequently followed by other researchers (Benia et al. 2009, 2010; Pujade-Villar et al. 2010a, 2012; Boukreris et al. 2015; Ghanem et al. 2016; Haddar et al. 2016; Adjami et al. 2017; Gouri et al. 2024).

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The present study aims to document the parasitoids associated with oak gall wasps in the Beni-Ghobri and Akfadou massif, in Algeria, through gall collection and oak branch beating to evaluate the presence of oak gall wasps in the studied area.

MATERIALS AND METHODS

The Beni-Ghobri and Akfadou massif, with its very rugged relief, joins the Djurdjura and Chellata mountain ranges to the Southwest, and the coastal ranges (Djebel Azouza and Djebel Taksebt) to the North, and is connected to the Tamgout range to the Northwest by Djebel Zraïb (Meddour 2010). The Akfadou and Beni-Ghobri forest massifs (Figs 1–2) are considered the two largest massifs of Kabylie Djurdjuréenne after Djurdjura. The respective areas are 11,000 ha for Akfadou (Messaoudene et al. 2007) and 5,710 ha for the Beni-Ghobri massif (Messaoudene et al. 2008). The arboreal layer of the massifs is mainly composed of mosaic species of various ages belonging to the genus *Quercus*: *Quercus suber* Linnaeus, *Q. canariensis* Willd. and *Q. afares* Pomel (stabilized hybrid). These so-called "mixed" forests are generally accompanied by hybrids themselves. Concerning the climate, the Akfadou and Beni-Ghobri massifs (Figs 1–2) are homogeneously part of the humid meso-Mediterranean at least up to 1,000 m altitude (Meddour 2010). Country records follow the 'Universal Chalcidoidea Database' online website (UCD Community 2023) and reflect the original literature sources.

The sampling for our study began with a few surveys in May and November 2015 in order to subsequently choose the species to be retained and the plots suitable for our final study. Gall collections (Fig. 3) were carried out on *Q. suber*, *Q. afares*, *Q. canariensis* as well as on the hybrids *Q. ×kabylica* Trabut and *Q. ×numidica* Trabut at the following localities: Lazella (Akfadou), Tala Kitane (Akfadou), El Kelâa (Akfadou), Tizi-Ouffela (Beni-Ghobri), Forêt école (Beni-Ghobri) and Sidi Brahim (Beni-Ghobri) (Figs 1–2). It was only in spring 2016 that more intensive sampling was carried out, limiting ourselves to three localities which were chosen for the structure of their population (Lazella, El Kelâa and Sidi-Brahim). These forests present mixed stands, with a mixture of oak species belonging to the same section (*Cerris*): *Q. suber* and *Q. afares*, as well as their hybrids *Q. ×kabylica* and *Q. ×numidica*. Coombes and Vázquez (2021) have confirmed that both taxa represent variants resulting from hybridization between *Q. afares* and *Q. suber* and are synonyms, the earliest and correct name being *Q. ×numidica* Trabut, 1890. Nevertheless, Akli et al. (2022) found that there are different hybrids that need to be defined by studying them genetically. For this reason, the hybrids sampled in this study will be named as follows: **Station El Kelâa** – *Quercus* ×hybride-1, where we find *Q. ×kabylica*; **Station Sidi-Brahim** – *Quercus* ×hybride-2, where we find *Q. ×numidica*; **Station Lazella** – *Quercus* ×hybride-3 different from the previous ones. To maximize our results in spring 2016, a second method was added: "branch beating". This technique is the first tool used by biologists to assess the foliage fauna (Mouna 1982). All the entomofauna captured by branch beating was placed in bags with a number, which was recorded on a field sheet, allowing us to list the sampled trees, the date, and the place of collection. The microhymenoptera captured by this sweep method were collected immediately as they fell from the trees onto the hunting mat using a hand-held suction device, which allowed us to prevent other parasitoids from nearby trees from landing on the mat while we collected them. All specimens obtained by rearing from galls and branch beating were preserved in test tubes containing 70° ethyl alcohol; the information necessary for identification was mentioned on the tubes containing the material to be studied. Their biology was reviewed using the West Palaearctic catalogue of oak gall wasp parasitoids (Askew et al. 2013). All oak species and hybrids were sampled in 2015 and 2016, as well as the studied areas, which are reported in Figure 1 and Table 1.

The specimens were determined by the last author and are deposited at the JP-V collection (UB). The parasitoids were identified using an unpublished key by R.R. Askew and Cs. Thuroczy to Palearctic parasitoids associated with oak galls, supplemented by Bouček (1965) for *Pediobius chilaspidis* Bouček, 1965, and Zerova (1995) – revision of Eurytominae and Decatominae. To elaborate the parasitoids list, we first consulted the online resource 'Universal Chalcidoidea Database' (UCD Community 2023) and Askew et al. (2013), from which we extracted all Chalcidoidea species related to gall wasps in North Africa.

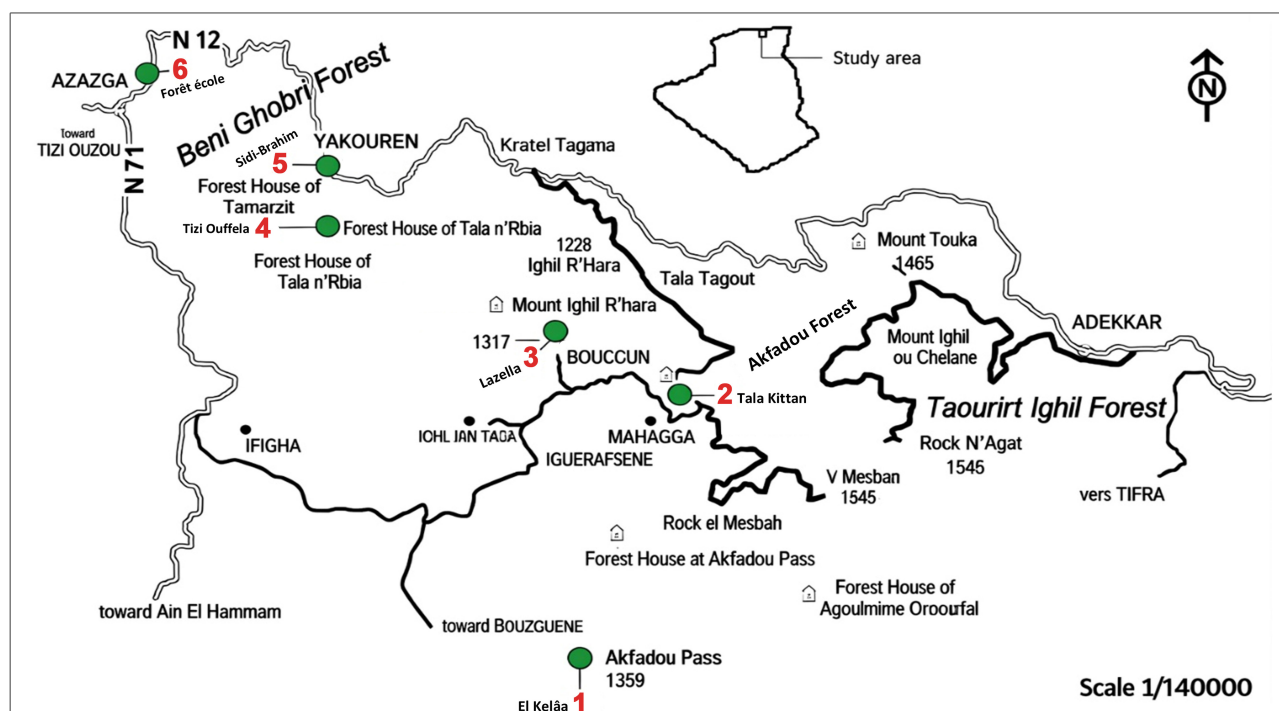


Figure 1. Location of the sampled plots in the study area, Algeria (North of Africa).

Subsequently, a new list was produced giving the association between gall wasps and chalcid species. Additionally, we reviewed all the original publications to verify the accuracy of data in UCD Community (2023) and correct possible mistakes. We have also consulted the chalcidoid catalogues published by Askew et al. (2013), Kissayi and BenHalima (2017), Kissayi et al. (2021) and Rahmani et al. (2022). Furthermore, we reviewed supplementary literature, including the references obtained in the catalogues mentioned above. An intensive search was then conducted to identify all published studies on Chalcidoidea in North Africa from 2023 to the present. This information is summarized in Table 2. For global distribution, we consulted the online resource UCD Community (2023) and all the works cited in the study. In the global distribution of each species mentioned, we have added as a bibliography, in addition to UCD Community (2023), all those works not mentioned in that resource. This allows you to determine the actual distribution of each species by consulting these sources.

Table 1. Description of the six sampling sites included in this study. For each site, the table provides the sampling location, altitude above sea level (m), geographic coordinates (latitude and longitude), the *Quercus* species from which galls have been collected, and the sampling method used for the specimen collection (gall collection or branch beating).

N°	Sampling site	Altitude	Coordination	<i>Quercus</i> species	Sampling method
1	El Kelâa (Akfadou) Fig. 2A	1223 m	36°36'55"N, 4°30'48"E	<i>Q. suber</i> , <i>Q. afares</i>	Gall collection
				<i>Quercus</i> ×hybride-1	Branch beating
2	Tala Kittan (Akfadou) Fig. 2B	1103 m	36°41'09"N, 4°33'42"E	<i>Q. canariensis</i>	Gall collection
				<i>Q. suber</i> , <i>Q. afares</i>	Gall collection
3	Lazella (Akfadou) Fig. 2C	980 m	36°41'37"N, 4°31'19"E	<i>Quercus</i> ×hybride-3	Branch beating
				<i>Q. canariensis</i>	
4	Tizi-Ouffela (Beni-Ghobri) Fig. 2D	763,85 m	36°42'57"N, 4°27'36"E	<i>Q. canariensis</i>	Gall collection
5	Sidi-Brahim (Beni-Ghobri) Fig. 2E	728,52 m	36°42'50"N, 4°27'03"E	<i>Q. suber</i> , <i>Q. afares</i>	Gall collection and branch beating
				<i>Quercus</i> ×hybride-2	
6	Forêt école (Beni-Ghobri) Fig. 2F	479,20 m	36°45'49"N, 4°23'06"E	<i>Q. suber</i> , <i>Q. canariensis</i>	Gall collection

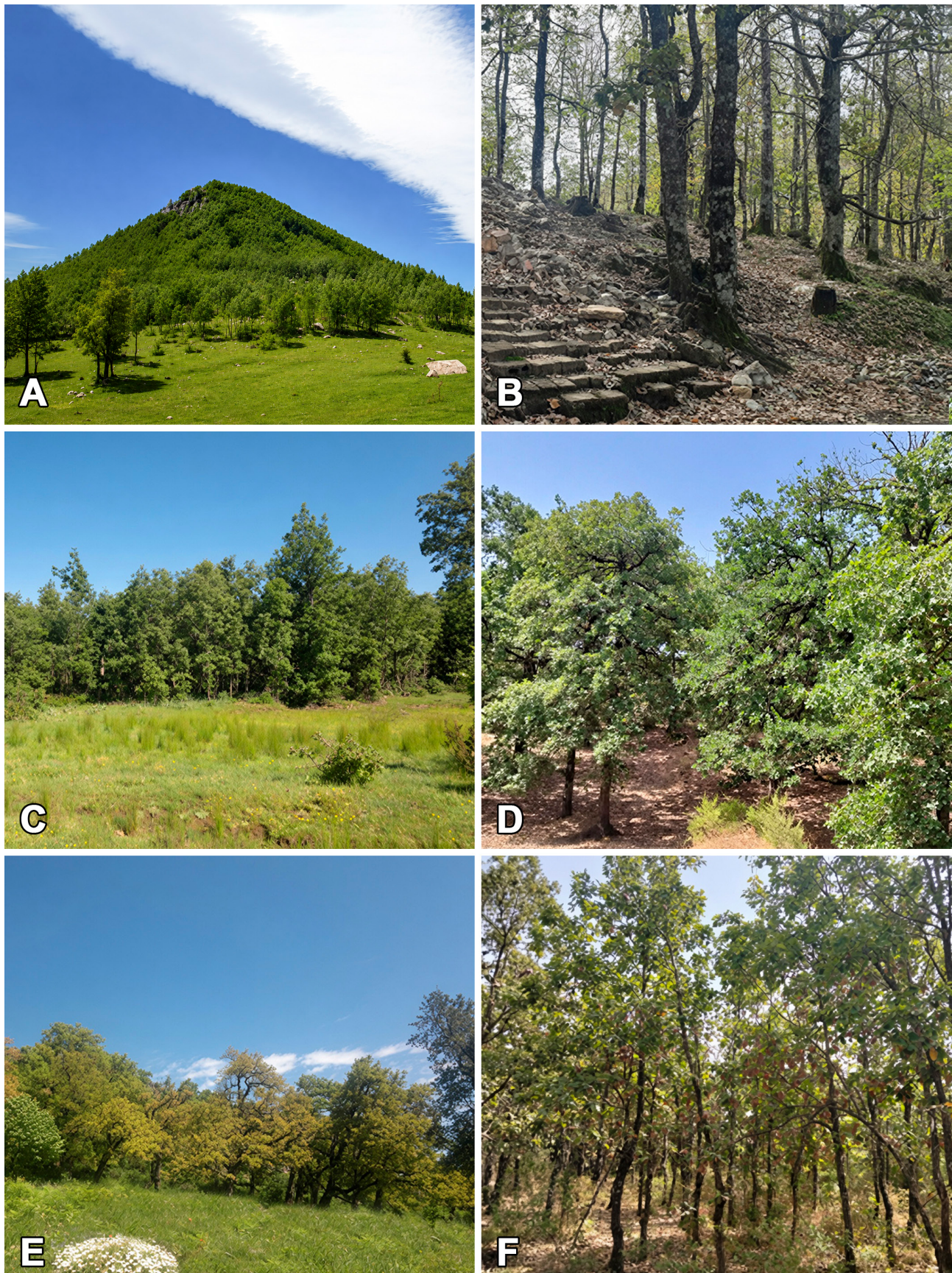


Figure 2. Sampling sites. **A.** El Kelâa (Akfadou); **B.** Tala Kittan (Akfadou); **C.** Lazella (Akfadou); **D.** Tizi-Ouffela (Beni-Ghobri); **E.** Sidi-Brahim (Beni-Ghobri); **F.** Forêt école (Beni-Ghobri).

RESULTS

In this study, 26 chalcidoid species associated with Cynipidae were identified from Akfadou and Beni-Ghobri. Among these species, 10 species (Figs 3–4) are cited for the first time in North Africa [*Aulogymnus arsames* (Walker, 1838), *A. skianeuros* (Ratzeburg, 1844), *Pediobius chilaspidis* Bouček, 1965, *Cyrtotypx robustus* (Masi, 1907), *Mesopolobus albitarsus* (Walker, 1834), *M. dubius* (Walker, 1834), *M. sericeus* (Förster, 1770), *M. tarsatus* (Nees, 1834), *Ormocerus vernalis* Walker, 1834 and *Torymus flavipes* (Walker, 1833)]. In addition to the species mentioned above, three species (Fig. 4) are recorded for the first time in Algeria: *Hobhya stenonota* (Ratzeburg, 1848), *Mesopolobus tibialis* (Westwood, 1833) and *M. xanthocerus* (Thomson, 1878). The listed species are unevenly distributed over six families (Eurytomidae, Eulophidae, Eupelmidae, Ormyridae, Pteromalidae and Torymidae).

Family Eulophidae Westwood, 1829

Genus *Aulogymnus* Förster, 1851

Aulogymnus arsames (Walker, 1838)

(Fig. 4A)

Material examined. Algeria: 1♀, Akfadou (El Kelâa), by branch beating, *Q. suber*, V-2016.

Biology. Parasitoid species associated with some oak gall wasps (Askew et al. 2013) but very common in sexual generation galls of *Andricus crispator* (Tschek, 1871), which is absent in Algeria, *A. curvator* (Hartig, 1840), and *Neuroterus quercusbaccarum*.

Global distribution. WESTERN PALAEARCTIC. **Asia** (Iran and Turkey – UCD Community 2023), **Europe** (Widely distributed – UCD Community 2023), and **North Africa** (Algeria – **new record**).

Distribution in North Africa. Algeria, the first record for North Africa.

Aulogymnus skianeuros (Ratzeburg, 1844)

(Fig. 4B)

Material examined. Algeria: 1♀, Akfadou (El Kelâa), by branch beating, *Q. afares*, VI-2016; 1♀, Akfadou (El Kelâa) by branch beating, *Quercus* ×hybride-1, V-2016; 2♀♀, Beni-Ghobri (Sidi-Brahim), by branch beating, *Quercus* ×hybride-2, V-2016.

Biology. Associated with some oak gall wasps (Askew et al. 2013), but very common in sexual generation galls of *Biorhiza pallida*.

Global distribution. WESTERN PALAEARCTIC. **Asia** (Iran and Turkey – Hesami et al. 2010; UCD Community 2023), **Europe** (widely distributed – UCD Community 2023), and **North Africa** (Algeria – **new record**).

Distribution in North Africa. Algeria, the first record for North Africa.

Pediobius chilaspidis (Bouček, 1965)

(Fig. 4C)

Material examined. Algeria: 1♂, Akfadou (El Kelâa), by branch beating, *Q. afares*, V-2016.

Biology. This species is only known to emerge from asexual generation galls of *Chilaspis nitida* (Giraud, 1859) on *Q. cerris* (L.) (Askew et al. 2013), but this species is absent in Algeria, and from *Dryocosmus kuriphilus* (Yasumatsu, 1951), which is an invasive species native to Asia, absent in Algeria.

Global distribution. WESTERN PALAEARCTIC. **Europe** (Austria, Czech Republic, Germany, Hungary, Italy, Slovakia and Sweden – UCD Community 2023); **North Africa** (Algeria – **new record**).

Distribution in North Africa. Algeria, the first record for North Africa.

Remarks. Three other species could emerge from galls of oak gall wasps: *Pediobius clita* (Walker, 1839), *P. lysis* (Walker, 1839) and *P. rotundatus* (Fonscolombe, 1832) (see below); the first two have not yet

been reported in North Africa. The male specimen of *P. chilaspidis* is a very rarely collected species, but we do not doubt that it is correctly identified because it has the speculum of fore wings closed by a cubital hair-line (open in *P. clita* and *P. lysis*), and the mesoscutum with notaular depressions smooth (all over reticulate in *P. rotundatus*). *Pediobius chilaspidis* is related to section *Cerris*, and *Q. afares* belongs to this section. The biology of this species in Algeria is unknown, its reported hosts being absent.

Pediobius rotundatus (Fonscolombe, 1832)

Material examined. Algeria: 2♂♂, Akfadou (El Kelâa), by branch beating, *Quercus* ×hybride-1, V-2016; 2♀♀, Beni-Ghobri (Sidi-Brahim), by branch beating, *Q. suber*, IV-2016; 1♀, Beni-Ghobri (Sidi-Brahim), by branch beating, *Q. afares*, VI-2016.

Biology. Associated with galls of the section *Cerris* (Askew et al. 2013), very abundant on galls of *Plagiotrochus*, in particular, *P. quercusilicis*.

Global distribution. WESTERN PALAEARCTIC and Circum-Mediterranean. **Asia** (Iran, Jordan, Turkey and Yemen – Tavakoli et al. 2010; UCD Community 2023), **Europe** (Andorra, France, Italy, Portugal and Spain [including Balearic Is.] – UCD Community 2023), and **North Africa** (Algeria and Tunisia – Viggiani 1964; UCD Community 2023).

Distribution in North Africa. Recorded as *Pediobius plagiotrochus* in Algeria from *Plagiotrochus quercusilicis* as *Plagiotrochus tubifer* (n.n.) according to Viggiani (1964), Bouček & Askew (1968) and Askew et al. (2013) in Tunisia.

Family Eupelmidae Walker, 1833

Genus *Eupelmus* Dalman, 1820

Eupelmus annulatus (Nees, 1834)

Material examined. Algeria: 1♀, Akfadou (Lazella), by branch beating, *Q. suber*, V-2016; 1♀, Akfadou (Lazella), ex *Andricus hispanicus* (asex.), *Q. afares*, VI-2016.

Biology. Associated with several oak cynipid galls (Askew et al. 2013) and commonly with woody galls such as those in the genus *Andricus*. Askew et al. (2013) named it as *Eupelmus spongipartus* (Förster, 1860), but it is a synonym of *E. annulatus* (Nees, 1834) (UCD Community 2023).

Global distribution. WESTERN PALAEARCTIC and probably introduced in the Nearctic (Gibson 2011). **Asia** (Iran and Turkey – UCD Community 2023), and **Europe** (widely distributed – UCD Community 2023), **North Africa** (Algeria and Morocco – Marchal 1900; Gibson & Fusu 2016), and **North America** (Canada, United States – UCD Community 2023),

Distribution in North Africa. Previously recorded from Algeria by Marchal (1900) ex *Biorhiza pallida* and from Morocco by Gibson & Fusu (2016).

Remarks. Gibson (2011) mentioned that it is unknown whether *E. annulatus* is a naturally occurring Holarctic species or was introduced accidentally to North America from Europe, but *E. annulatus* has never been reared as a parasitoid in Cynipini (Hymenoptera) galls in North America.

Eupelmus urozonus (Dalman, 1820)

Material examined. Algeria: 2♀♀, Beni-Ghobri (Forêt école), ex *A. grossulariae* (sex.) and/or *Pseudoneuroterus saliens* (sex.), *Q. suber*, V-2015; 1♀, Beni-Ghobri (Sidi-Brahim), by branch beating, *Q. afares*, V-2016.

Biology. Polyphagous species attacking several insect orders (Gibson & Fusu 2016), associated with numerous oak gall wasps, very abundant emerging from *Biorhiza pallida* (sex.) and any asexual woody gall from *Andricus* (Askew et al. 2013).

Global distribution (in several biogeographic regions). AFROTROPICAL: (**South Africa** – UCD Community 2023); AUSTRALASIAN (**Australia** – UCD Community 2023); INDO-MALAYAN (India,

Pakistan and southern China – UCD Community 2023); PALAEARCTIC: **Asia** and **Europe** (widely distributed – UCD Community 2023); **North Africa** (Algeria, Egypt and Morocco – Daneshvar et al. 2009; Gibson & Fusu 2016; Herting 1973, 1977; Kissayi & Benhalima 2017; UCD Community 2023); NEARCTIC: **North America** (United States – UCD Community 2023).

Distribution in North Africa. Algeria (Herting 1973; Daneshvar et al. 2009); Morocco (Herting 1973, 1977; Gibson & Fusu 2016; Kissayi & Benhalima 2017).

Eupelmus vesicularis (Retzius, 1783)

Material examined. Algeria: 1♀, Akfadou (El Kelâa), by branch beating, *Q. suber*, V-2016. 3♀♀, Beni-Ghobri (Sidi-Brahim), by branch beating, *Q. afares*, VI-2016; 1♀, Beni-Ghobri (Sidi-Brahim), by branch beating, *Quercus* ×hybride-2, V-2016.

Biology. Polyphagous species attaching several insect orders (Ferrière 1954). In oak gall wasps, usually in some *Andricus* species and also in the asexual form of *Cynips disticha* (Askew et al. 2013). According to Fusu (2010), *E. vesicularis* (Retzius, 1783) is considered a widespread and polyphagous parasitoid, recorded in more than 200 hosts.

Global distribution. WESTERN PALAEARCTIC, probably introduced in the NEARCTIC (Gibson 1990). **Asia** (Iran, Israel, Russia and Turkey – UCD Community 2023), **Europe** (widely distributed – UCD Community 2023); **North Africa** (Algeria, Morocco and Turkey – Kissayi & Benhalima 2017; UCD Community 2023); **North America** (Canada, United States – UCD Community 2023).

Distribution in North Africa. Recorded in Morocco by Herting (1973, 1977, 1978) and Kissayi & BenHalima (2017) and in Algeria by Herting (1973).

Family Eurytomidae Walker, 1832

Genus *Eurytoma* Illiger, 1807

Eurytoma brunniventris (Ratzeburg, 1852)

Material examined. Algeria: 1♀, Akfadou (Tala Kitane), ex *Cynips disticha* (Hartig, 1840), *Q. canariensis*, XI-2015; 1♀, Akfadou (El Kelâa), by branch beating, *Q. suber*, VI-2016; 2♀♀, Akfadou (Lazella), ex *Synophrus olivieri* (Kieffer, 1898), *Quercus* ×hybride-3, V-2016. 1♀, Akfadou (Lazella), ex *A. grossulariae* (sex.), *Q. suber*, VI-2016.

Biology. Associated with many oak cynipid galls (Askew et al. 2013). Probably a species complex (Pujade-Villar & Ros-Farré 1998).

Global distribution. PALAEARCTIC. **Asia** and **Europe** (widely distributed – UCD Community 2023), **North Africa** (Algeria and Morocco – UCD Community 2023; Kechrid et al. 2025).

Distribution in North Africa. Recorded in Morocco on *Andricus pictus* (Hartig, 1856) (asex.) by Askew et al. (2013) and recently in Algeria by Kechrid et al. (2025) from *Andricus coriarius* (Hartig, 1843) (asex.), *A. grossulariae* (Giraud, 1859) (sex. and asex.), *A. hispanicus* (Hartig, 1856) (asex.), *A. pictus* (Hartig, 1856) (asex.), *A. quercustozae* (Bosc, 1792) (asex.), *Cynips quercus* (Fourcroy, 1785) (asex.), *Neuroterus quercusbaccarum* (Linnaeus, 1758) (asex.) and *Pseudoneuroterus saliens* (Kollar, 1857) (sex.).

Eurytoma pistaciae Rondani, 1877

Material examined. Algeria: 4♀♀, Akfadou (Lazella), ex *Synophrus olivieri*, *Quercus* ×hybride-3, VI-2016.

Biology. Species associated with several oak gall wasps (Askew et al. 2013). Also known as *Eurytoma setigera* (Mayr, 1878), currently synonymized under *E. pistaciae* Rondani, 1877 (UCD Community 2023).

Global distribution. PALAEARCTIC. **Asia** and **Europe** (widely distributed – UCD Community 2023), and **North Africa** (Algeria – Kechrid et al. 2025).

Distribution in North Africa. Recorded in Algeria by Kechrid et al. (2025) from *Andricus coriarius* (asex.), *A. hispanicus* (asex.), and *Synophrus olivieri*.

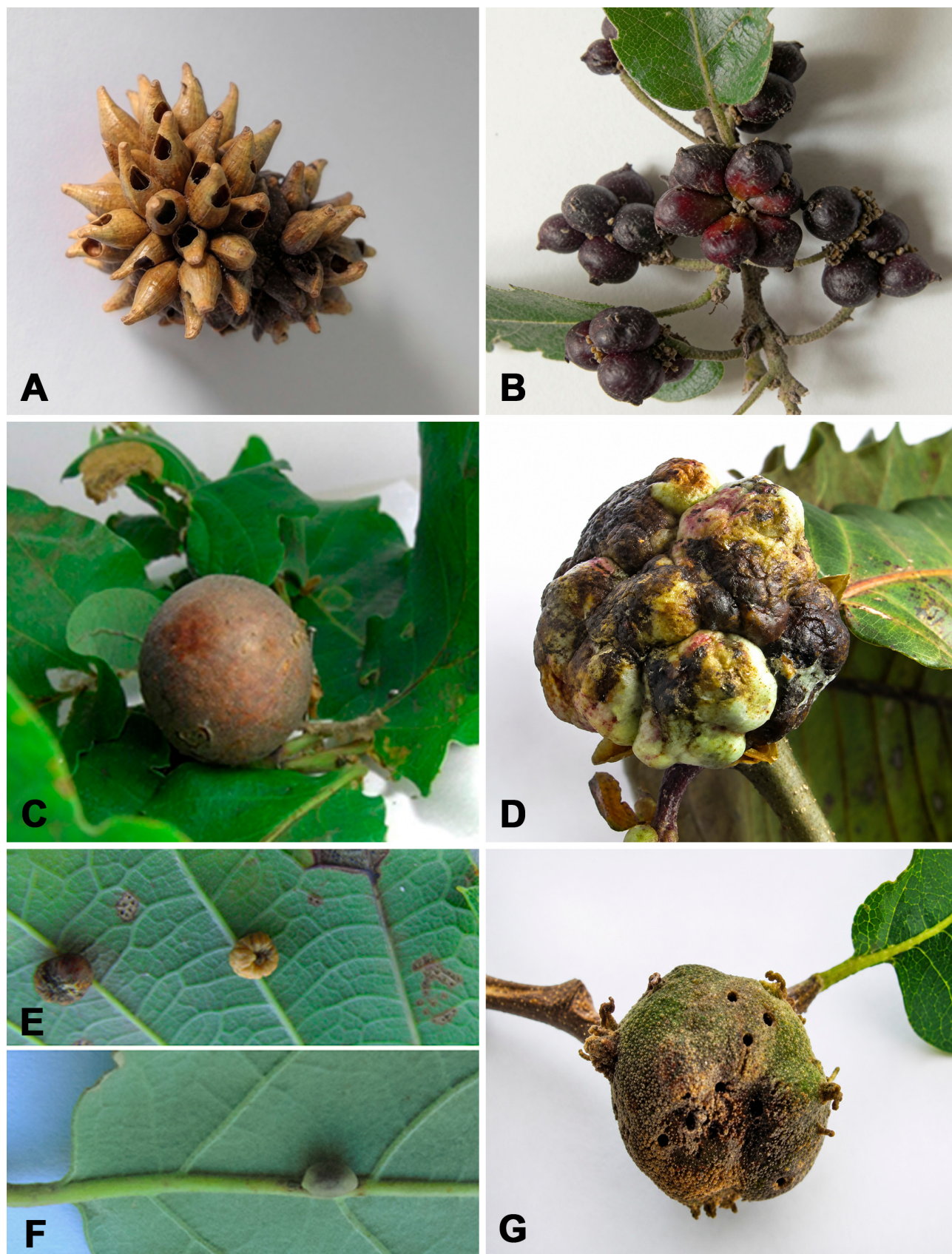


Figure 3. Oak gall wasps from which parasitoids have emerged. **A.** *Andricus burgundus* (sex); **B.** *A. grossulariae* (sex); **C.** *A. hispanicus* (asex); *Biorhiza pallida* (sex); **E.** *Cynips disticha* cf (asex); **F.** *Pseudoneuroterus saliens* (sex); **G.** *Synophrus olivieri*.

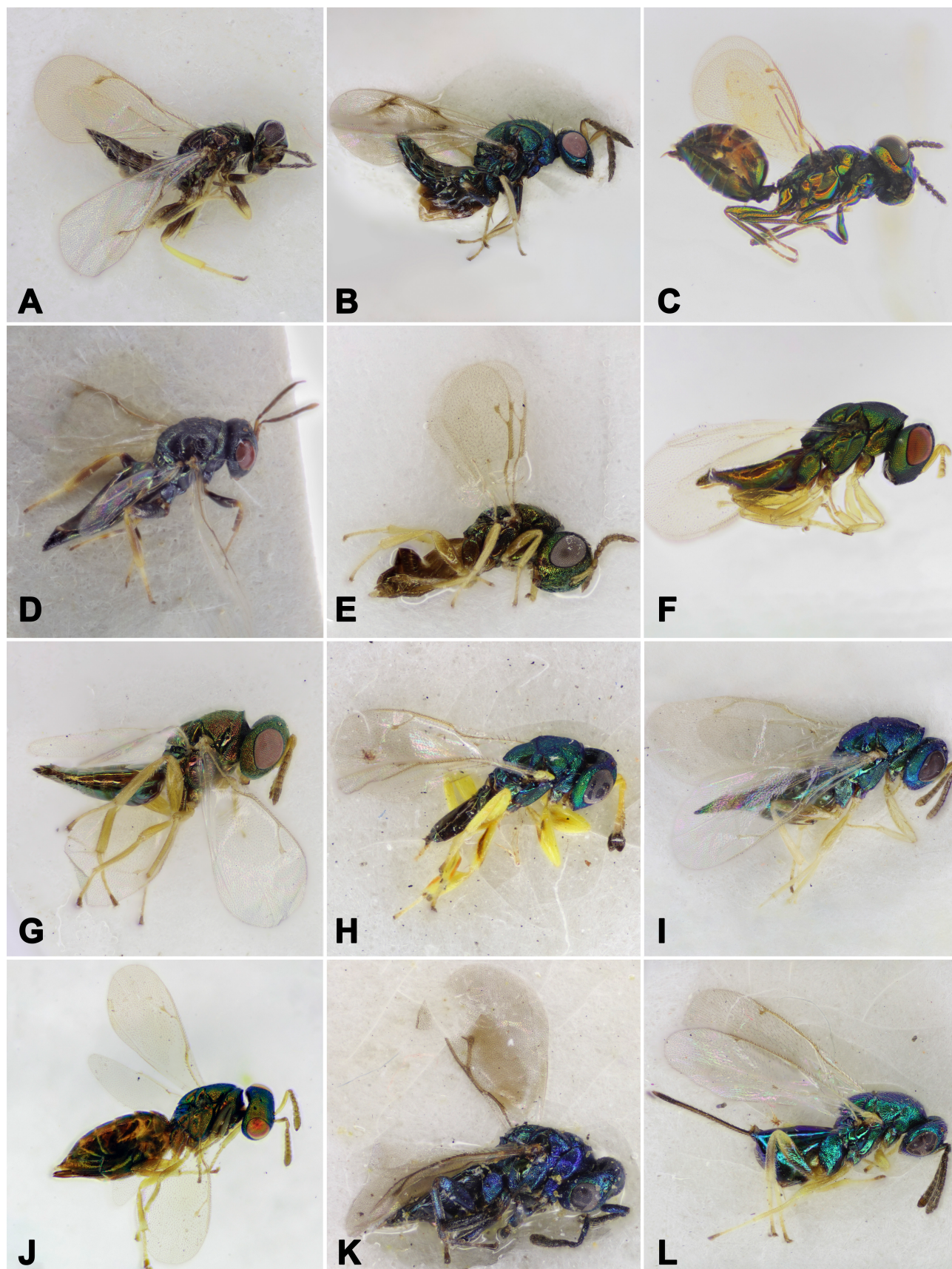


Figure 4. Representative species reported in this study. Eulophidae: **A.** *Aulogymnus arsames* (female); **B.** *A. skianeuros* (female); **C.** *Pediobius chilaspidis* (male); Pteromalidae: **D.** *Cyrtoptyx robustus* (female); **E.** *Hobbya stenonota* (female); **F.** *Mesopolobus albitarsus* (female); **G.** *M. dubius* (female); **H.** *M. sericeus* (female); **I.** *M. tibialis* (male); **J.** *M. xanthocerus* (female); **K.** *Ormocerus vernalis* (female); Torymidae: **L.** *Torymus flavipes* (female).

Genus *Sycophila* Walker, 1871

Sycophila biguttata (Swederus, 1795)

Material examined. Algeria: 3♂♂, Beni-Ghobri (Forêt école), ex *Andricus grossulariae* (sex.), *Q. suber*, V-2015; 1♀, Beni-Ghobri (Sidi-Brahim), by branch beating, *Q. afares*, VI-2016; 5♂♂ & 1♀, Beni-Ghobri (Sidi-Brahim), ex *Andricus grossulariae* (sex.), *Andricus grossulariae* (sex.), *Q. suber*, VI-2016; 1♀, Akfadou (Lazella), ex *Andricus grossulariae* (sex.), *Q. suber*, VI-2016; 1♂, Akfadou (Lazella), ex *Synophrus olivieri*, *Quercus* ×hybride-3, V-2016; 1♂, Akfadou (Lazella), ex *Andricus grossulariae* (sex.), *Q. suber*, VI-2016.

Biology. Associated with many oak gall wasps (Askew et al. 2013) and very common in galls of *Andricus coriarius* (asex.), *A. grossulariae* (sex. and asex.), *A. quercusramuli* (Linnaeus, 1761) (sex.), and *Biorhiza pallida* (Olivier, 1791) (sex.).

Global distribution. PALAEARCTIC. **Asia** and **Europe** (widely distributed – UCD Community 2023), and **North Africa** (Algeria and Tunisia – Marchal 1900; Pujade-Villar 2010b; UCD Community 2023; Kechrid et al. 2025).

Distribution in North Africa. Recorded in Algeria by Marchal (1900) under the name of *Decatoma biguttata* (Swederus, 1795) from *Andricus quercustozae* (asex.) and recently by Kechrid et al. (2025) from *Andricus pictus* (asex.), *A. coriarius* (asex.), *A. grossulariae* (sex.), *A. quercustozae* (asex.) and *Synophrus olivieri*. Recorded in Tunisia from *S. olivieri* by Pujade-Villar et al. (2010b) and Askew et al. (2013).

Sycophila binotata (Fonscolombe, 1832)

Material examined. Algeria: 1♀, Akfadou (El Kelâa), by branch beating, *Q. afares*, V-2016.

Biology. Associated with a few oak gall wasps, usually on galls of the genus *Plagiotrochus* (Askew et al. 2013).

Global distribution. WESTERN PALAEARCTIC. **Asia** (Iran – UCD Community 2023), **Europe** (Bulgaria, Croatia, England, France, Greece, Italy [including Sardinia], Montenegro and Spain) (UCD Community 2023), and **North Africa** (Algeria – Benia & Bounechada 2011).

Distribution in North Africa. Recorded in Algeria by Benia & Bounechada (2011) ex *Plagiotrochus gibbosus* (Pujade-Villar, 2003) (asex.).

Sycophila variegata (Curtis, 1831)

Material examined. Algeria: 1♂ & 5♀♀, Beni-Ghobri (Forêt école), ex *A. grossulariae* (sex.) and/or *Pseudoneuroterus saliens* (sex.), *Q. suber*, V-2015; 1♂, Beni-Ghobri (Sidi-Brahim), ex *Synophrus olivieri*, *Q. afares*, V-2016; 1♀, Akfadou (Lazella), ex *Synophrus olivieri*, *Quercus* ×hybride-3, VI-2016; 2♀♀, Akfadou (El Kelâa), ex *Pseudoneuroterus saliens* (sex.), *Q. afares*, V-2016; 3♂♂ & 1♀, Akfadou (El Kelâa), ex *Synophrus olivieri*, *Q. afares*, VI-2016; 1♀, Akfadou (El Kelâa), by branch beating, *Q. afares*, VI-2016.

Biology. Associated with several oak gall wasps (Askew et al. 2013) and very abundant on *Plagiotrochus quercusilicis* (Fabricius, 1798).

Global distribution. PALAEARCTIC. **Asia** and **Europe** (widely distributed – UCD Community 2023), and **North Africa** (Algeria – UCD Community 2023; Kechrid et al. 2025).

Distribution in North Africa. Recently recorded in Algeria by Kechrid et al. (2025) from *Andricus coriarius* (asex.), *A. grossulariae* (sex.) and *Synophrus olivieri*.

Family Ormyridae Förster, 1856

Genus *Ormyrus* Westwood, 1832

Ormyrus pomaceus (Geoffroy, 1785)

Material examined. Algeria: 1♀, Beni-Ghobri (Sidi-Brahim), by branch beating, *Q. afares*, V-2016.

Biology. Reported species in galls of numerous oak gall wasps. Historically known as *Ormyrus punctiger* (Westwood, 1832), which is probably a species complex (Pujade-Villar 1989).

Global distribution. PALAEARCTIC. **Asia** (China – UCD Community 2023), **Europe** (widely distributed – UCD Community 2023), and **North Africa** (Algeria – Marchal 1900; Kechrid et al. 2025).

Distribution in North Africa. Recorded in Algeria; Marchal (1900) reported *Ormyrus cosmozonus* (Förster, 1860), but according to Kechrid et al. (2025) this record probably corresponds to *Ormyrus pomaceus* (Geoffroy, 1785), and recently by Kechrid et al. (2025) in *Andricus quercustozae*, *A. grossulariae* (asex.) and *Plagiotrochus amenti* (Kieffer, 1901) (asex.).

Family Pteromalidae Dalman, 1820

Genus *Cecidostiba* Thomson, 1878

Cecidostiba fungosa (Geoffroy, 1785)

Material examined. Algeria: 2♂♂ & 5♀♀, Beni-Ghobri (Tizi-Ouffela), ex *Biorhiza pallida* (sex.), *Q. canariensis*, V-2015; 2♂♂ & 1♀, Beni-Ghobri (Forêt école), ex *Andricus grossulariae* (sex.) and/or *Pseudoneuroterus saliens* (Kollar, 1857) (sex.), *Q. suber*, V-2015 (see Remarks).

Biology. Parasitoid species associated with many oak gall wasps, but very common in the asexual form of *Andricus quercuscalicis* (Burgsdorff, 1783) and the sexual form of *Biorhiza pallida* (Askew et al. 2013).

Global distribution. PALAEARCTIC. **Asia** (Kazakhstan, Iran, Israel, Kazakhstan and Turkey – UCD Community (2023), **Europe** (widely distributed – Rahmani et al. 2022; UCD Community 2023), and **North Africa** (Algeria, Morocco and Tunisia – Delucchi 1962; Pujade-Villar 2010b; Kissayi et al. 2021).

Distribution in North Africa. Recorded in Algeria emerging from asexual galls of *Andricus hispanicus*, *A. quercustozae*, *A. grossulariae* and *A. coriaceus*, in Morocco from an undetermined gall (Delucchi 1962; Kissayi et al. 2021) and in Tunisia from *Synophrus olivieri* according to Pujade-Villar et al. (2010b).

Remarks. Galls of *Andricus grossulariae* (sex.) and *Pseudoneuroterus saliens* (sex.) were inadvertently mixed during the sampling. *Cecidostiba fungosa* (Geoffroy, 1785) was probably obtained from both types of gall; the species is known to attack gall inhabitants of both gall wasps.

Cecidostiba semifascia (Walker, 1835)

Material examined. Algeria: 1♀, Beni-Ghobri (Sidi-Brahim), by branch beating, *Q. suber*, VI-2016.

Biology. Very common in galls of the sexual form of *Biorhiza pallida* (Askew et al. 2013).

Global distribution. PALAEARCTIC. **Asia** (Iran and Japan – UCD Community 2023), **Europe** (widely distributed – Sadeghi et al. 2009; UCD Community 2023), and **North Africa** (Algeria – Marchal 1900; Kechrid et al. 2025).

Distribution in North Africa. Recorded from Algeria by Marchal (1900) ex *Biorhiza pallida* (sex.) under *Pteromalus gallicus* (Ratzeburg, 1848) and recently in *Andricus pictus* and *A. hispanicus* Kechrid et al. (2025).

Genus *Cyrtoptyx* Delucchi, 1956

Cyrtoptyx robustus (Masi, 1907)

(Fig. 4D)

Material examined. Algeria: 1♀, Akfadou (El Kelâa), by branch beating, *Q. suber*, VI-2016.

Biology. Associated with some oak cynipid galls (Askew et al. 2013) but more abundant in asexual woody galls like *A. hispanicus* and *A. coriarius*.

Global distribution. WESTERN PALAEARCTIC. **Asia** (Iran, Jordan and Turkey – UCD Community 2023), **Europe** (Andorra, Croatia, Greece, Hungary, Italy and Romania – UCD Community 2023), and **North Africa** (Algeria – new record).

Distribution in North Africa. Algeria, the first record for North Africa.

Genus *Hobbya* Delucchi, 1957

Hobbya stenonota (Ratzeburg, 1848)

(Fig. 4E)

Material examined. Algeria: 1♀, Beni-Ghobri (Forêt école), ex *Andricus grossulariae* (sex.), *Q. suber*, V-2015.

Biology. Emerging from numerous species of *Andricus* but very abundant in *Biorhiza pallida* (sex.) (Askew et al. 2013).

Global distribution. WESTERN PALAEARCTIC. **Asia** (Iran, Jordan and Turkey – UCD Community 2023), **Europe** (widely distributed – UCD Community 2023), and **North Africa** (Morocco – Delucchi 1962, Algeria – new record).

Distribution in North Africa. Morocco by Delucchi (1962) and Algeria (the first record).

Genus *Mesopolobus* Westwood, 1833

Mesopolobus albitarsus (Walker, 1834)

(Fig. 4F)

Material examined. Algeria: 1♀, Beni-Ghobri (Forêt école) ex *Synophrus olivieri*, *Q. suber*, V-2015.

Biology. Recorded as emerging from galls of very few oak gall wasps such as *Andricus burgundus* (Giraud, 1859) (sex.), *A. curvator* (sex.), *A. inflator* (Hartig, 1840) (sex.), *A. quercusramuli* and *Neuroterus quercusbaccarum* (sex.) (Askew et al. 2013).

Global distribution. Palaearctic. **Asia** (China and Iran – Sadeghi et al. 2009; UCD Community 2023), **Europe** (Croatia, Czech Republic, England, France, Germany, Romania, Slovakia, Sweden and Ukraine – UCD Community 2023), and **North Africa** (Algeria – new record).

Distribution in North Africa. Algeria, the first record for North Africa.

Remarks. This species was reported for the first time from galls of *Synophrus olivieri*, but this host association may be erroneous; *S. olivieri* is a lethal inquiline in galls of *Andricus burgundus*, capable of transforming the gall of the inducer (Pujade-Villar et al. 2012). Therefore, it is possible that *Mesopolobus albitarsus* (Walker, 1834) was already parasitizing *A. burgundus* when the gall was attacked by *S. olivieri*.

Mesopolobus dubius (Walker, 1834)

(Fig. 4G)

Material examined. Algeria: 1♂, Beni-Ghobri (Sidi-Brahim), VI-2016, by branch beating, *Q. suber*; 1♂ & 1♀, Beni-Ghobri (Sidi-Brahim), by branch beating, *Quercus* ×hybride-2, V-2016; 1♂, Akfadou (El Kelâa), ex *Synophrus olivieri*, *Q. suber*, VI-2016; 4♀♀, Akfadou (El Kelâa), ex *Synophrus olivieri*, *Q. afares*, VI-2016.

Biology. Associated with several oak gall wasps (Askew et al. 2013) but very commonly with the asexual form of *Neuroterus quercusbaccarum*.

Global distribution. WESTERN PALAEARCTIC. **Asia** (Turkey – UCD Community 2023), **Europe** (widely distributed – UCD Community 2023), and **North Africa** (Algeria – new record).

Distribution in North Africa. Algeria, the first record for North Africa.

Mesopolobus lichtensteini (Mayr, 1903)

Material examined. Algeria: 2♀♀, Beni-Ghobri (Forêt école), ex *Andricus grossulariae* (sex.) and/or *Pseudoneuroterus saliens* (sex.), *Q. suber*, V-2015.

Biology. Known to attack oak gall wasps of the genera *Andricus*, *Neuroterus* and *Plagiotrochus* associated with galls of the section *Cerris* (Askew et al. 2013).

Global distribution. CIRCUM-MEDITERRANEAN. **Europe** (France, Hungary, Italy and Spain – UCD Community 2023), and **North Africa** (Algeria – Dieuzeide 1927; Pujade-Villar 1994; Garrido-Torres & Nieves-Aldrey 1999; UCD Community 2023).

Distribution in North Africa. Recorded in Algeria by Dieuzeide (1927) from *Dryomyia lichtensteinii* (Löw, 1878), Pujade-Villar (1994) and Garrido-Torres & Nieves-Aldrey (1999). Recently recorded by Kechrid et al. (2025) from *Andricus quercustozae*. Nevertheless, this data needs to be confirmed because *Mesopolobus lichtensteini* (Mayr, 1903) is associated with galls of the section *Cerris*.

Mesopolobus sericeus (Förster, 1770)

(Fig. 4H)

Material examined. Algeria: 2♀, Akfadou (El Kelâa), ex *A. grossulariae*, *Q. suber*, VI-2016.

Biology. Associated with several oak gall wasps but very common in asexual galls of *Andricus kollari* (Hartig, 1843) and *A. quercuscalicis*, and the sexual gall of *Biorhiza pallida* (Askew et al. 2013).

Global distribution. WESTERN PALAEARCTIC. **Asia** (East Kazakhstan, Iran, Israel and Turkey – Rahmani et al. 2022; UCD Community 2023); **Europe** (widely distributed – UCD Community 2023), and **North Africa** (Algeria – new record).

Distribution in North Africa. Algeria, the first record for North Africa.

Mesopolobus tarsatus (Nees, 1834)

Material examined. Algeria: 1♀, Beni-Ghobri (Sidi-Brahim), ex *Synophrus olivieri*, *Q. afares*, V-2016; 1♂, Akfadou (El Kelâa), ex *Synophrus olivieri*, *Q. afares*, VI-2016. 1♀, Akfadou (El Kelâa), ex *Andricus burgundus*, *Q. afares*, VI-2016.

Biology. This species is known to attack gall inhabitants of very few oak gall wasps: *Andricus burgundus* (sex.), *A. curvator* (sex.), *A. infectorius* (Hartig, 1843) (asex.), *A. quercuscalicis* (sex.), *Dryocosmus kuriphilus* (asex) and *Plagiotrochus quercusilicis* (sex.) (Askew et al. 2013). In Algeria, *A. infectorius* (asex.), *A. quercuscalicis* (sex.) and *D. kuriphilus* are not reported.

Global distribution. WESTERN PALAEARCTIC. **Europe** (Czechoslovakia, England, Germany, Hungary, Italy, Spain and Sweden – UCD Community 2023), and **North Africa** (Algeria – new record).

Distribution in North Africa. Algeria, the first record for North Africa.

Remarks. This study reports for the first time *M. tarsatus* emerging from galls of *Synophrus olivieri*, but this could be an artifact. The latter species is a later inquiline of *Andricus burgundus*, capable of completely transforming the gall of the inductor (Pujade-Villar et al. 2012). Therefore, it is possible that *M. tarsatus* was already parasitizing *A. burgundus* when it was attacked by *S. olivieri*.

Mesopolobus tibialis (Westwood, 1833)

(Fig. 4I)

Material examined. Algeria: 3♀, Akfadou (El Kelâa), by branch beating, *Q. afares*, VI-2016; 1♂, Akfadou (El Kelâa), by branch beating, *Q. suber*, VI-2016; 1♀, Beni-Ghobri (Sidi-Brahim), by branch beating, *Quercus* ×hybride-2, IV-2016.

Biology. Associated with several oak gall wasps (Askew et al. 2013) but very common emerging from galls of the genera *Andricus*, *Neuroterus* and *Plagiotrochus*.

Global distribution. PALAEARCTIC. **Asia** (China, Iran, Syria and Turkey – Rahmani et al. 2022; UCD Community 2023); widely distributed in **Europe** (UCD Community 2023), and **North Africa** (Morocco – Delucchi 1962; Kissayi et al. 2021).

Distribution in North Africa. Recorded in Morocco by Delucchi (1962) and recently by Kissayi et al. (2021). The first record for Algeria.

Mesopolobus xanthocerus (Thomson, 1878)

(Fig. 4J)

Material examined. Algeria: 2♀, Akfadou (El Kelâa), by branch beating, *Q. afares*, V-2016; 1♀, Akfadou (Lazella), by branch beating, *Q. suber*, V-2016. 2♀, Akfadou (Lazella), by branch beating, *Q. afares*, V-2016; 1♀, Akfadou (Lazella), by branch beating, *Quercus* ×hybride-3, V-2016.

Biology. Emerging from several oak gall wasps (Askew et al. 2013) but very abundant in the sexual forms of three species reported in Algeria: *Andricus burgundus*, *A. quercusramuli* and *Biorhiza pallida*.

Global distribution. WESTERN PALAEARCTIC. **Asia** (Iran – Dehdar & Madjdzadeh 2016); **Europe** (widely distributed – UCD Community 2023), and **North Africa** (Algeria – **new record**; Morocco – Delucchi 1962; Kissayi et al. 2021).

Distribution in North Africa. Recorded in Morocco by Delucchi (1962), and recently by Kissayi et al. (2021). The first record for Algeria.

Genus *Ormocerus* Walker, 1834

Ormocerus vernalis (Walker, 1834)

(Fig. 4K)

Material examined. Algeria: 1♀, Beni-Ghobri (Sidi-Brahim), by branch beating, *Q. suber*, IV-2016; 1♀, Akfadou (El Kelâa), by branch beating, *Q. afares*, V-2016; 1♀, Beni-Ghobri (Sidi-Brahim), by branch beating, *Quercus* ×hybride-2, IV-2016.

Biology. Associated with several oak gall wasps (Askew et al. 2013) but very abundant in galls of the genera *Andricus* and *Neuroterus*. Hillary et al. (2017) state that this species is known to attack 13 species of Cynipini.

Global distribution. WESTERN PALAEARCTIC. **Asia** (Iran – UCD Community 2023), **Europe** (widely distributed – UCD Community 2023), and **North Africa** (Algeria – **new record**).

Distribution in North Africa. Algeria, the first record for North Africa.

Family Torymidae Walker, 1833

Genus *Torymus* Dalman, 1820

Torymus flavipes (Walker, 1833)

(Fig. 4I)

Material examined. Algeria: 1♀, Beni-Ghobri (Tizi-Ouffela), ex *Biorhiza pallida* (sex.), *Quercus canariensis*, V-2015; 1♂, Akfadou (Tala Kittan), ex *Cynips disticha*, *Q. canariensis*, XI-2015.

Biology. Common species in numerous oak gall wasps but never appeared in the sexual form of *Biorhiza pallida* (sex.) and the asexual form of *Neuroterus nimismalis* (Geoffroy & Fourcroy, 1785) (Askew et al. 2013).

Global distribution. WESTERN PALAEARCTIC. **Asia** (Azerbaijan, Israel and Turkey – UCD Community 2023), **Europe** (widely distributed – UCD Community 2023), and **North Africa** (Algeria – **new record**).

Distribution in North Africa. Algeria, the first record for North Africa.

DISCUSSION

In the present study, the collection and rearing of galls of seven species of Cynipidae (Fig. 3) allowed us to identify 63 parasitoids belonging to 14 species (Table 3). The branch beating method, applied in 2016, added 43 more individuals from 18 parasitoid species. In both Tables (2 & 3), *Quercus suber* appears as the oak species hosting the greatest diversity and abundance of parasitoids, confirming its central role in maintaining the entomological biodiversity. The results obtained by gall rearing and branch beating are complementary. Gall rearing demonstrates its effectiveness for analyzing ecological interactions and the functional role of parasitoids, while sampling by branch beating offers a broader view of the parasitoid community associated with oaks. We must take into account that most parasitoid species of oak galls are specific to oak gall wasps, so the absence of emergents in the studied galls may be due either to chance or to their emergence from other Cynipini galls. All parasitoid species emerged from Algerian galls were also obtained from the same galls in Europe. No new host has been detected.

Table 2. Geographic data reported for parasitoid species in North Africa, including the family, country, and the corresponding bibliographic reference. Species marked with a single asterisk (*) are recorded for the first time in North Africa, whereas species marked with a double asterisk (**) are reported for the first time in Algeria.

FAMILY	SPECIES	COUNTRY	REFERENCES
Eulophidae	<i>Aulogymnus arsames</i> (Walker, 1838) *	Algeria	Current study
	<i>Aulogymnus balani</i> (Pujade-Villar, 1991)	Tunisia	Pujade-Villar et al. (2010b)
	<i>Aulogymnus skianeuros</i> (Ratzeburg, 1844) *	Algeria	Current study
	<i>Aulogymnus trilineatus</i> (Mayr, 1877)	Algeria	Kechrid et al. (2025)
	<i>Pediobius chilaspidis</i> (Bouček, 1965) *	Algeria	Current study
	<i>Pediobius rotundatus</i> (Fonscolombe, 1832)	Algeria Tunisia	Viggiani (1964), Askew (1968), Current study Askew et al. (2013)
Eupelmidae	<i>Eupelmus annulatus</i> (Nees, 1834)	Algeria Morocco	Marchal (1900), Current study Gibson & Fusu (2016)
	<i>Eupelmus azureus</i> (Ratzeburg, 1844)	Algeria	Marchal (1900), Kechrid et al. (2025)
	<i>Eupelmus cerris</i> (Förster, 1860)	Tunisia	Pujade-Villar et al. (2010b)
	<i>Eupelmus urozonus</i> (Dalman, 1820)	Algeria Morocco	Herting (1973), Current study Herting (1973, 1977), Daneshvar et al. (2009), Gibson & Fusu (2016), Kissayi & BenHalima (2017)
	<i>Eupelmus vesicularis</i> (Retzius, 1783)	Algeria Morocco	Herting (1973), Current study Herting (1973, 1977, 1978), Kissayi & Benhalima (2017)
Eurytomidae	<i>Eurytoma brunniventris</i> (Ratzeburg, 1852)	Algeria Morocco	Kechrid et al. (2025), Current study Askew et al. (2013)
	<i>Eurytoma pistaciae</i> (Rondani, 1877)		
	<i>Eurytoma setigara</i> (Mayr, 1878)	Algeria	Kechrid et al. (2025), Current study
	<i>Sycophila biguttata</i> (Swederus, 1795)	Algeria Tunisia	Marchal (1900), Kechrid et al. (2025), Current study Askew et al. (2013), Pujade-Villar et al. (2010b)
	<i>Sycophila binotata</i> (Fonscolombe, 1832)	Algeria	Benia & Bounchada (2011), Current study
	<i>Sycophila iracemae</i> (Nieves- Aldrey, 1984)	Algeria	Kechrid et al. (2025)
	<i>Sycophila variegata</i> (Curtis, 1831)	Algeria	Kechrid et al. (2025), Current study
Megastigmidae	<i>Bootanomyia dorsalis</i> (Fabricius, 1798)	Algeria Tunisia	Kechrid et al. (2025) Pujade-Villar et al. (2010b)
	<i>Bootanomyia stigmatizans</i> (Fabricius, 1798)	Algeria	Kechrid et al. (2025)
		Morocco	Askew et al. (2013), Delucchi (1962), Kissayi et al. (2021)
Ormyridae	<i>Ormyrus nitidulus</i> (Fabricius, 1804)	Algeria	Fabricius (1804), Marchal (1897), Kechrid et al. (2025)
	<i>Ormyrus pomaceus</i> (Geoffroy, 1785)	Algeria	Marchal (1900), Kechrid et al. (2025), Current study
Pteromalidae		Algeria	Kechrid et al. Current
	<i>Cecidostiba fungosa</i> (Geoffroy, 1785)	Morocco Tunisia	Delucchi (1962), Kissayi et al. (2021), Rahmani et al. (2022) Pujade-Villar et al. (2010b), Rahmani et al. (2022)
	<i>Cecidostiba semifascia</i> (Walker, 1835)	Algeria	Marchal (1900), Kechrid et al. (2025), Current study
	<i>Cyrtotypx robustus</i> (Masi, 1907) *	Algeria	Current study
	<i>Hobbya stenonota</i> (Ratzeburg, 1848) **	Algeria	Current study
	<i>Mesopolobus albitarsus</i> (Walker, 1834) *	Algeria	Current study
	<i>Mesopolobus amaeus</i> (Walker, 1834)	Algeria	Kechrid et al. (2025)
	<i>Mesopolobus dubius</i> (Walker, 1834) *	Morocco	Benyahia (2016), Kissayi et al. (2021), Rahmani et al. (2022)
	<i>Mesopolobus lichtensteini</i> (Mayr, 1903)	Algeria	Current study
	<i>Mesopolobus mediterraneus</i> (Mayr, 1903)	Algeria	Dieuzeide (1927), Pujade-Villar (1994), Garrido Torres & Nieves-Aldrey (1999), Kechrid et al. (2025), Rahmani et al. (2022), Current study
	<i>Mesopolobus sericeus</i> (Förster, 1770) *	Tunisia	Askew et al. (2013), Rahmani et al. (2022)
	<i>Mesopolobus tarsatus</i> (Nees, 1834) *	Algeria	Current study
	<i>Mesopolobus tibialis</i> (Westwood, 1833) **	Algeria	Current study
	<i>Mesopolobus xanthocerus</i> (Thomson, 1878) **	Morocco	Delucchi (1962), Kissayi et al. (2021)
		Algeria	Current study
	<i>Ormocerus latus</i> (Walker, 1834)	Morocco	Delucchi (1962), Rahmani et al. (2022)
	<i>Ormocerus vernalis</i> (Walker, 1834) *	Tunisia	Pujade-Villar et al. (2010b), Askew et al. (2013), Rahmani et al. (2022)
		Algeria	Current study
Torymidae	<i>Torymus afinis</i> (Foscolombe, 1832)	Algeria	Kechrid et al. (2025)
	<i>Torymus auratus</i> (Müller, 1764)	Algeria Morocco	Kieffer (1897), Kechrid et al. (2025) Askew et al. (2013)
	<i>Torymus cerri</i> (Mayr, 1874)	Algeria	Kechrid et al. (2025)
		Tunisia	Pujade-Villar et al. (2010b)
	<i>Torymus flavipes</i> (Walker, 1833) *	Algeria	Current study

Table 3. Biological associations of parasitoid species recorded in this study including *Quercus* species, Oak gall wasps and the collection methods of parasitoids. Species marked with a single asterisk (*) are recorded for the first time in North Africa, whereas species marked with a double asterisk (**) are reported for the first time in Algeria.

Parasitoids	<i>Quercus</i> species	Sampling method **	Emerged from galls
EULOPHIDAE			
<i>Aulogymnus arsames</i> *	<i>Q. suber</i>	BB	
	<i>Q. afares</i>	BB	
<i>Aulogymnus skianeuros</i> *	<i>Quercus</i> ×hybride-1	BB	
	<i>Quercus</i> ×hybride-2	BB	
<i>Pediobius chilaspidis</i> *	<i>Q. afares</i>	BB	
<i>Pediobius rotundatus</i>	<i>Q. afares</i>	BB	
	<i>Q. suber</i>	BB	
	<i>Quercus</i> ×hybride-1	BB	
EUELMIDAE			
<i>Eupelmus annulatus</i>	<i>Q. afares</i>	R	<i>Andricus hispanicus</i> (asex)
	<i>Q. suber</i>	BB	
<i>Eupelmus urozonus</i>	<i>Q. suber</i>	R	<i>Andricus grossulariae</i> (sex) and/or <i>Pseudoneuroterus saliens</i> (sex)
	<i>Q. afares</i>	BB	
<i>Eupelmus vesicularis</i>	<i>Q. afares</i>	BB	
	<i>Q. suber</i>	BB	
	<i>Quercus</i> ×hybride-2	BB	
ERYTOMIDAE			
<i>Eurytoma brunniventris</i>	<i>Q. suber</i>	BB/R	<i>Andricus grossulariae</i> (sex)
	<i>Q. canariensis</i>	R	<i>Cynips disticha</i> cf (asex)
	<i>Quercus</i> ×hybride-3	R	<i>Synophrus olivieri</i>
<i>Eurytoma pistaciae</i>	<i>Quercus</i> ×hybride-3	R	<i>Synophrus olivieri</i>
<i>Sycophila biguttata</i>	<i>Q. suber</i>	R	<i>Andricus grossulariae</i> (sex)
	<i>Quercus</i> ×hybride-3	R	<i>Synophrus olivieri</i>
	<i>Q. afares</i>	BB	
<i>Sycophila binotata</i>	<i>Q. afares</i>	BB	
<i>Sycophila variegata</i>	<i>Q. suber</i>	R	<i>Andricus grossulariae</i> (sex) and/or <i>Pseudoneuroterus saliens</i> (sex)
	<i>Q. afares</i>	BB/R	<i>Pseudoneuroterus saliens</i> (sex)
	<i>Q. afares, Quercus</i>	R	<i>Synophrus olivieri</i>
ORMYRIDAE			
<i>Ormyrus pomaceus</i>	<i>Q. afares</i>	BB	
PTEROMALIDAE			
<i>Cecidostiba fungosa</i>	<i>Q. suber</i>	R	<i>Andricus grossulariae</i> (sex) and/or <i>Pseudoneuroterus saliens</i> (sex)
	<i>Q. canariensis</i>	R	<i>Biorhiza pallida</i> (sex)
<i>Cecidostiba semifascia</i>	<i>Q. suber</i>	BB	
<i>Cyrtoptyx robustus</i> *	<i>Q. suber</i>	BB	
<i>Hobhya stenonota</i> **	<i>Q. suber</i>	R	<i>Andricus grossulariae</i> (sex)
<i>Mesopolobus albitarsus</i> *	<i>Q. suber</i>	R	<i>Andricus burgundus</i> (sex) <i>Synophrus olivieri</i> (see remarks)
<i>Mesopolobus dubius</i> *	<i>Q. suber</i>	BB/R	<i>Synophrus olivieri</i>
	<i>Q. afares</i>	R	
	<i>Quercus</i> ×hybride-2	BB	
<i>Mesopolobus</i>	<i>Q. suber</i>	R	<i>Andricus grossulariae</i> (sex) and/or <i>Pseudoneuroterus saliens</i> (sex)
<i>Mesopolobus sericeus</i> *	<i>Q. suber</i>	R	<i>Andricus grossulariae</i> (sex)
<i>Mesopolobus tarsatus</i> *	<i>Q. afares</i>	R	<i>A. burgundus</i> (sex) <i>S. olivieri</i> (see remarks)
	<i>Q. afares</i>	BB	
	<i>Q. suber</i>	BB	
<i>Mesopolobus tibialis</i> **	<i>Q. suber</i>	BB	
	<i>Quercus</i> ×hybride-2	BB	
	<i>Q. afares</i>	BB	
<i>Mesopolobus xanthocerus</i> **	<i>Q. suber</i>	BB	
	<i>Quercus</i> ×hybride-2	BB	
	<i>Q. afares</i>	BB	
<i>Ormocerus vernalis</i> *	<i>Q. suber</i>	BB	
	<i>Quercus</i> ×hybride-2	BB	
TORYMIDAE			
<i>Torymus flavipes</i> *	<i>Q. canariensis</i>	R	<i>Biorhiza pallida</i> (sex)
			<i>Cynips disticha</i> cf (asex)

** BB – Branch beating; R – Rearing

Overall, the parasitoid species obtained in this study are divided into six families and 12 genera. These species are unevenly represented at the family level: five species for Eurytomidae, four species for Eulophidae, three species for Eupelmidae, one species for Ormyridae, 12 species for Pteromalidae, and one species for Torymidae. To date, no species of the family Megastigmidae has been recorded either through gall rearing or branch beating. Previously, some megastigmid species have been recorded in Tunisia from *Synophrus olivieri* in Pujade-Villar et al. (2010b) and in Algeria from *Andricus coriarius*, *A. hispanicus*, *A. pictus*, *A. quercustozae*, and *S. olivieri* in Kechrid et al. (2025). We certainly believe that Megastigmidae exist in the Akfadou and Beni-Ghobri mountain ranges, but we have not yet captured them. Extensive sampling over longer periods and more intensive breeding will probably lead to the discovery of other oak gall wasps and parasitoid species previously unknown in Algeria or North Africa, particularly for *Quercus afares*, whose vegetative growth at altitude lasts until the end of April and whose collections must be continued until the beginning of summer. Furthermore, most of the chalcidoid species recorded are only polyphagous parasitoids of several species of Cynipini (Askew et al. 2013). Very few species, such as *Eupelmus urozonus*, are polyphagous of several orders of insects (Gibson & Fusu 2016). These species are very interesting from a biological perspective in the population control of phytophagous species. In addition, it is important to note the unexpected presence of the species *Pediobius chilaspidis*, a species reported for the first time in North Africa in this study. In fact, this species was captured by branch beating; it was mentioned by Askew et al. (2013) from *Chilaspis nitida* and *Dryocosmus kuriphilus*, both absent in Algeria. This most likely implies the presence of other Cynipidae species as hosts, related to galls on oak trees of the *Cerris* section.

To better highlight the specific richness of the parasitoids of oak gall wasps in North Africa, all the species identified since the initial studies up to the previous study are listed in Table 2. The summary of the results shows significant specific richness, particularly for Algeria, followed by Morocco and Tunisia, respectively. This distribution reflects both recent sampling efforts and a growing interest in parasitoid entomofauna in North African forest ecosystems. The 10 species recorded in North Africa for the first time indicate that the knowledge of the regional fauna is still incomplete. In addition to the species recorded for the first time in North Africa, three other species recorded for the first time in Algeria demonstrate the central role of this region as a key area for the study of parasitoid biodiversity. Table 2 clearly illustrates that North Africa, particularly Algeria, is home to a diverse and still partially unknown chalcidoid fauna, as is likewise observed in Morocco and Tunisia, where fewer species are listed, suggesting that there is still significant potential for study and discovery. We must take into account that in Europe 102 parasitoid species have been cited from oak galls (Askew et al. 2013), galls that are also mostly found in North Africa. It is expected that with further sampling, the biodiversity of Algeria and North Africa in general will approach that of Europe.

The identification of the species *Ormyrus pomaceus* is just as interesting; this species is a parasitoid of an oak gall wasp that is potentially dangerous to the cork oak: *Plagiotrochus amenti*. The latter species was first reported in Algeria by Benia et al. (2009) on *Quercus suber*. In the present study, we have also identified several adults of *P. amenti* reared by branch beating in 2016 on *Q. suber*, *Q. afares* and the hybrid species *Quercus* ×hybride-2. The list of species in this study complements previous studies by demonstrating that Algeria is particularly rich in biodiversity. The identified species undoubtedly play a fundamental role in regulating the gall wasps, and a small number, such as *Eupelmus urozonus*, attack other insect groups, helping to maintain the ecological balance in Mediterranean forests.

We must take into account that deaths of *Q. suber* branches have been reported due to the presence of *Plagiotrochus amenti* because of an imbalance of the parasitic complex (Benia et al. 2009; Pujade-Villar et al. 2010c; Pujade-Villar 2014). However, it is important to bear in mind the significant decline currently affecting Algerian forests as a result of several factors, such as climate change, recurrent forest fires, and pollution, among others. These perturbations undoubtedly threaten the balance and distribution of all forest species, including parasitoids. Further studies to better understand the biology of chalcidoid parasitoids of oak gall wasps in Algeria will probably be very necessary, which will be more interesting if the health status of each area studied is taken into consideration. Furthermore, the heterogeneity of data between Algeria, Morocco and Tunisia probably demonstrates a need for taxonomic revisions and molecular studies to know the presence of possible cryptic species (Pujade-Villar et al. 2026).

AUTHOR CONTRIBUTIONS

The authors confirm their contribution to the paper as follows: L. Haddar: Conceptualization, Investigation, Methodology, Data curation, Writing – original draft, Writing – review & editing. D. Salaheddine: Supervision, Writing – review & editing. Júlia Cazorla-Vila: Validation, Writing – review & editing. Aitor Martínez-Romero: Visualization; J. Pujade-Villar: Conceptualization, Supervision, Project administration, Writing – review & editing. All authors contributed to the interpretation and discussion of the results, critically reviewed the manuscript, and approved the final version. All authors read and approved the final version of the manuscript.

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AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the JP-V Collection, University of Barcelona, and are available from the curator upon reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study only included arthropod material, and all required ethical guidelines for the treatment and use of animals were strictly adhered to in accordance with international, national, and institutional regulations. No human participants were involved in any studies conducted by the authors for this article.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

GENERATIVE AI STATEMENT

No generative AI tools were used in the preparation of this manuscript.

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زنبورهای کالسید (Hymenoptera) مرتبط با زنبورهای گالزای بلوط (Hymenoptera: Cynipidae: Cynipini) در شمال الجزایر

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انتشار: ۲۵ مرداد ۱۴۰۵

چکیده: زنبورهای گالزای بلوط (Hymenoptera: Cynipidae: Cynipini)، روی قسمت‌های مختلف میزبان‌های خود (Fagaceae) به ویژه در گونه‌های بلوط (جنس *Quercus*) گال ایجاد می‌کنند. شکل، اندازه و رنگ این ساختارها از یک گونه به گونه دیگر و از یک نسل به نسل دیگر (جنسی و غیرجنسی) متفاوت است. گال‌ها دربرگیرنده فون بسیار متنوعی هستند که از زنبورهای ایجادکننده گال بلوط تا هم‌زیست‌ها (Hymenoptera: Cynipidae: Synergini) و Ceroptriesini (و پارازیتوئیدهای متعلق به بالاخانواده Chalcidoidea (Hymenoptera: Chalcidoidea: Eulophidae) هستند. نتایج این مطالعه از منطقه کبیل (الجزایر) از طریق پرورش گال‌ها و همچنین ضربه به شاخه‌ها در سال‌های ۱۳۹۴-۱۳۹۵ به دست آمد. در مجموع، ۲۶ گونه پارازیتوئید شناسایی شد که از میان آنها ۱۰ گونه برای اولین بار در شمال آفریقا ثبت شده‌اند (*Pediobius chilaspidis* A. skianeuros (Ratzeburg), Eulophidae: *Aulogymnus arsames* (Walker), *M. dubius* Mesopolobus albitarsus (Walker), Pteromalidae: *Cyrtotypyx robustus* (Masi) (Bouček), *M. tarsatus* (Nees), *M. sericeus* (Forster) (Walker), *Ornocer* vernalis (Walker) و Torymidae: *Torymus flavipes* (Walker). علاوه بر گونه‌های ذکر شده، سه گونه شامل (*Hobhya stenonota* (Ratzeburg), *M. xanthocerus* (Thomson) و *Mesopolobus tibialis* (Westwood) برای اولین بار در الجزایر ثبت شدند.

واژگان کلیدی: زنبورهای گال‌زا، جنگل، شمال آفریقا، پارازیتوئید، بلوط