

Research article

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Mylabrini diversity and host plants in a Saharan oasis ecosystem with an updated checklist of Meloidae from Algeria (Coleoptera)

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Introduction

Covering a variety of ecosystems ranging from deserts, steppes to large oases, the wilaya of Ouled Djellal, northern Algeria, have virgin ecosystems scarcely studied until now (Deghiche-Diab 2009; Deghiche-Diab 2015). Insects, and particularly beetles, represent the main diversity with nearly 400.000 described species, but the knowledge on the Maghreb beetle diversity is still scarce. Meloidae is a beetle family of Coleoptera with about 130 genera and 3000 species (Bologna 1991; Bologna & Di Giulio 2011; Ricciari et al. 2022) and Mylabrini are the most speciose tribe within the family, with about 760 species distributed in 11 genera (Bologna 1991; Bologna & Pinto 2002; Bologna et al. 2005, 2010; Pan & Bologna 2014; Bologna et al. 2018; Salvi et al. 2019). Throughout the Palaearctic, Oriental and Afrotropical regions, the most diverse mylabrine genus is *Hycleus* Latreille, 1817, but also *Mylabris* Fabricius, 1775 is really speciose and includes over 170 species and 14 subgenera exclusive of the Palaearctic Region (Salvi et al. 2019; Bologna 2020; Ricciari et al. 2020). Mylabrini are primarily distributed in temperate steppe and arid ecosystems, and in sub-tropical and tropical savannas or other open habitats (Bologna & Di Giulio 2011). The complex biology of Meloidae is greatly distinct in the subfamilies and tribes, and includes parasites or predators of other insects, especially Hymenoptera Aculeata and Orthoptera Caelifera, except in basal subfamily of Eleticinae; Mylabrini are typically predators of grasshopper's eggs (Bologna 1991; Bologna et al. 2001; Bologna et al. 2010).

In Algeria were recorded almost thirty genera and more than one hundred species belonging to the tribes Cero-comini, Epicautini, Lyttini (s.l.), Mylabrini, Meloini, Nemognathini. In this paper, we summarize the present knowledge in an updated checklist. In particular, in the Algerian Sahara occur five Mylabrini genera: *Actenodia* Laporte de Castelnau, 1840 (3 species), *Ammabris* Kuzin, 1954 (5 species), *Croscherichia* Pardo Alcaide, 1950 (11 species), *Hycleus* Latreille, 1817 (15 species) and *Mylabris* Fabricius, 1775 (12 species).

The distribution of Mylabrini species in the oasis ecosystem is scarcely known, and our project is aimed at improving the knowledge of the beetle fauna of this very peculiar and severe habitat, represented by isolated spots in the desert. Even though the new records do not represent a significant range extension of the species, our collections will improve the knowledge also on their host plants in this ecosystem.

Material and methods

Study area

The Ouled Djellal Wilaya was formalized in 2021 and extends on an area of 131,220 km², completely located in the Algerian Sahara (Fig. 1). To study the diversity of blister beetle species in the oasis ecosystem, the widely extended oasis near Biskra, south of Ouled Djellel (34° 25' 44" N,

5° 03' 51" E), was chosen for trapping. Distinct sectors of the oasis were studied, namely Oued El Assel, Oued Djai and Saad (Figs 2A, 2B, 2C respectively). All palm groves are characterized by the presence of the date palm (*Deget nour*, *Mech Degla*) cultivated on 1 ha in addition to other cultivated crops and some fruit trees, grapevine, and pomegranate trees. Due to the importance of the region in sheep breeding, different fodder cultivations (alfalfa, sorghum, wheat, etc.) are practiced.

Trapping, collecting and identification

In each palm grove of different oasis sectors (Fig. 1), five pitfall traps were setup and visited every week (Moulin et al. 2007). The content of each trap was stored in labelled vial and identified using binocular, reference collection and literature at the laboratory (Deghiche-Diab 2009; Deghiche-Diab et al. 2015a, 2015b, 2020a, 2020b, 2020c; Deghiche-Diab & Belhamra 2019). All collected specimens were photographed. The identification was confirmed by one of us (M.A. Bologna) by examining photos of the samples for comparison with his specialized collection.

Additionally, field surveys were repeatedly performed with observation of the same species and other spontaneous and weeds plants.

Results and discussion

From the trap samplings we obtained three species of Mylabrini belonging to the genera *Croscherichia* Pardo Alcaide, 1950 and *Mylabris* Fabricius, 1775, and one from Lyttini possibly referable to the genus *Alosimus* Mulsant, 1857 (Table 1, Fig. 3). The identification by photo (Fig. 3D) of this sample is slightly uncertain, but according with its metallic green integuments, it belongs to *A. viridissimus* (Lucas, 1846), the single Algerian species of the *viridissimus* group.

The knowledge of the Meloidae fauna of the Saharan oases is still scanty. For comparison, during field opportunistic collection in a palm oasis in southern Tunisia, near El Guettar, one of us (Bologna pers. obs. 1986) found only *Oenas afer* (Linnaeus 1758) (Lyttini tribe) and *Mylabris tenebrosa* Laporte, 1840 (Mylabrini), both on *Daucus* sp. (Apiaceae).

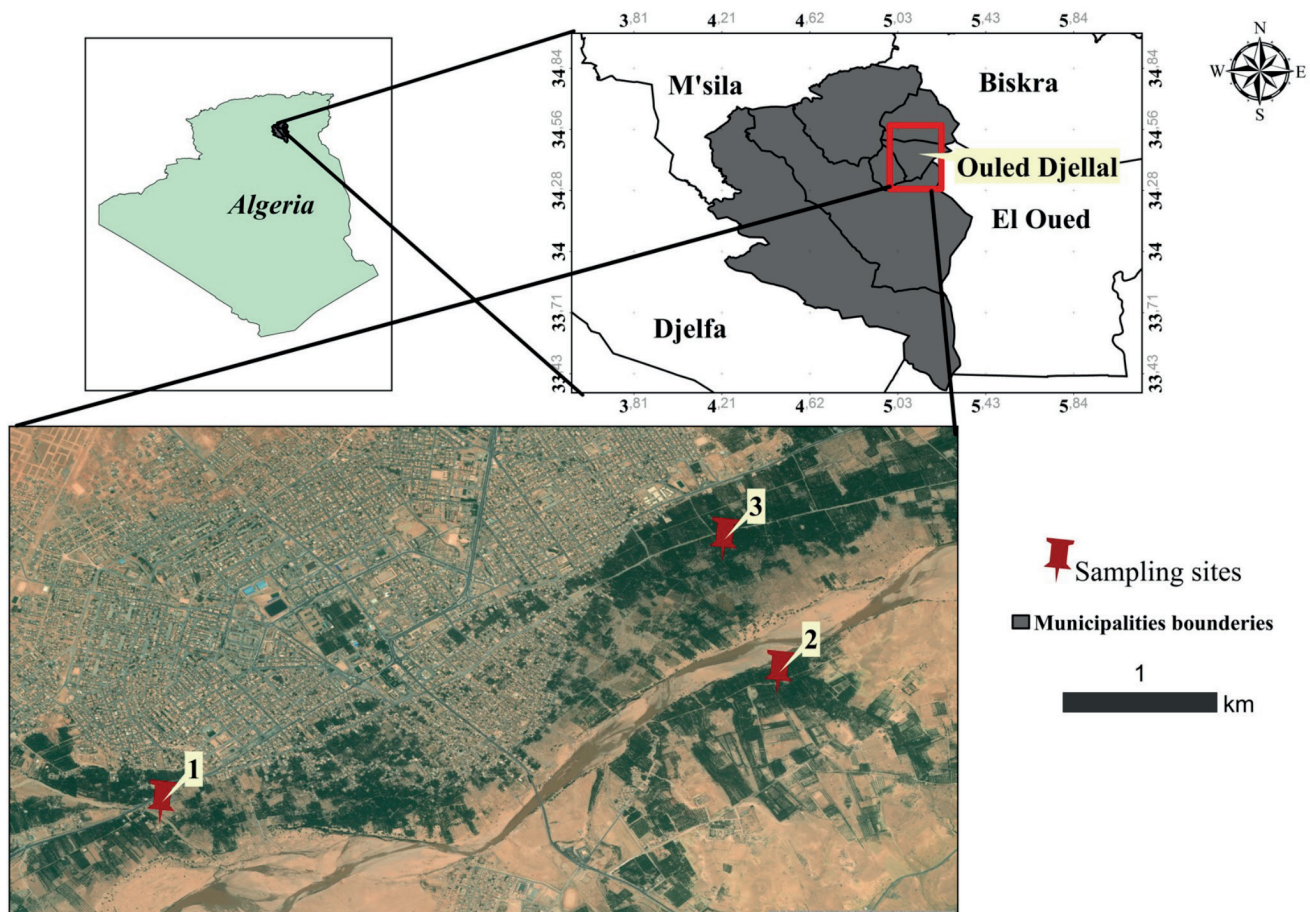


Fig. 1 – Location of Ouled Djellal Wilaya; sampling sites: 1, Oued El Assel, 2, Oued Djai 3, Saad.

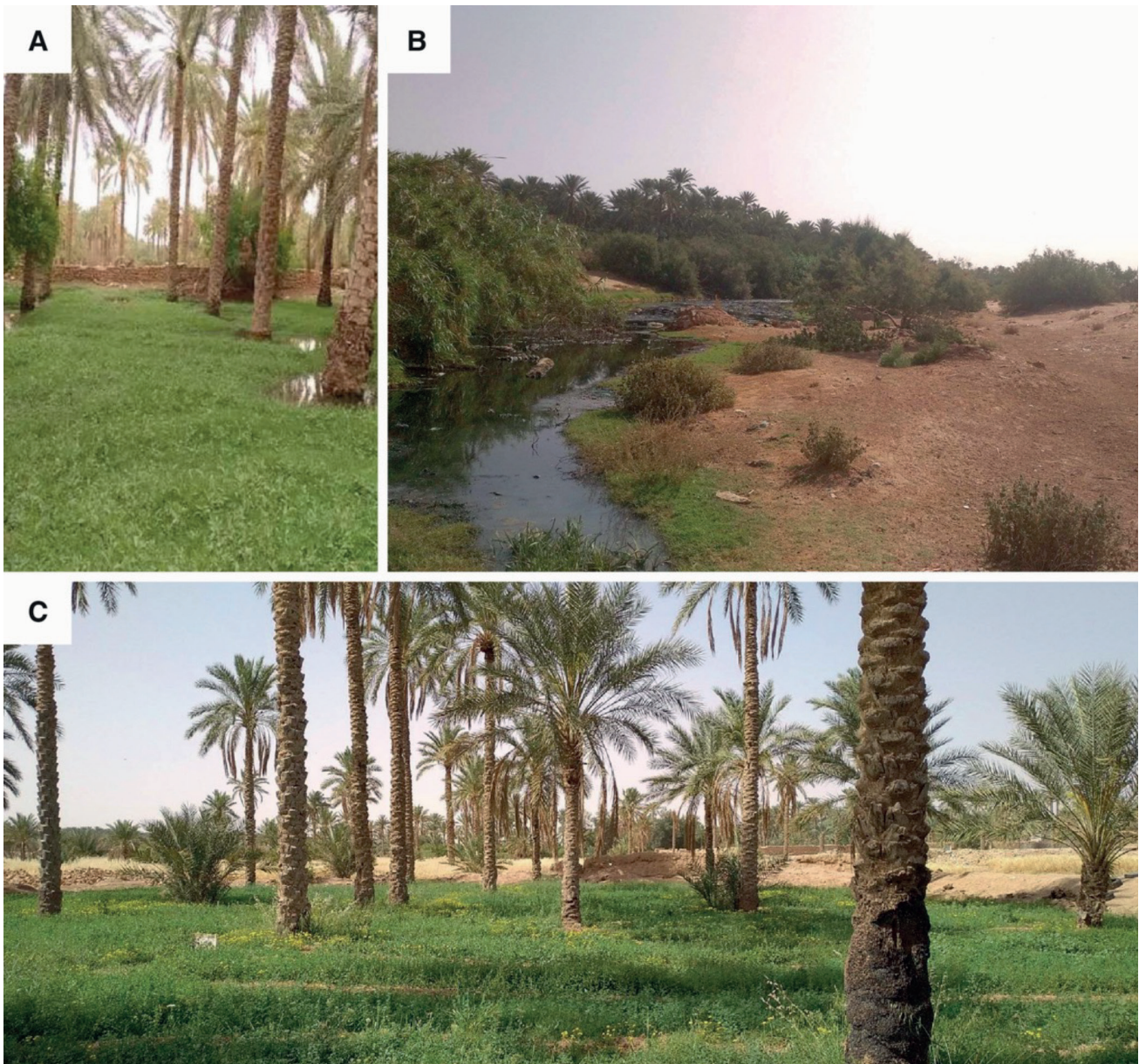


Fig. 2 – Blister beetle habitats at Ouled Djellal palm groves; A, Oued El Assel, B, Oued Djjai and C, Saad.

Distribution and Checklist

Mylabris impressa Chevrolat, 1840 (Fig. 3A) is a xeric Mediterranean species recorded from Morocco, Algeria, Tunisia, and southern Sicily, with isolated populations in the Ahaggar Massif (Algerian Sahara), more than 1770 km south of Ouled Djellal. Both the *Croscherichia* species are typical eremic element: *C. litigiosa* (Chevrolat, 1840) (Fig. 3B), is recorded from Morocco to Tunisia, and from Egypt to the whole Levant, Arabian Peninsula and southern Iran; *C. gilvipes* (Chevrolat, 1840) (Fig. 3C) is distributed from Morocco east to Egypt, Sinai and Jordan. The *Alosimus* of the *viridissimus* group (Fig. 3D), mostly distributed in Morocco, have a still unresolved taxonomy;

A. viridissimus is distributed in eastern Morocco, Algeria, Tunisia, West to Tripolitania.

In Algeria, after the pioneering work published by Lucas (1846), and several contributions published in the late XIX and early XX centuries, especially by French entomologists such as Abeille de Perrin, Faimaire, Pic, Chobaut, Bedel, Peyerimhoff, and Rotrou, a synthesis on the Algerian species was carried out by Cros (1940), followed by more specialized papers published in the second half of the XX century by Pardo Alcaide, Kaszab, Bologna and Ruiz. Moreover, Khelil (1990) published data from the western part of Algeria (Tlemcen) and some fragmented works was done by different authors: Deghiche-Diab (2009), Saharaoui et al. (2014), Deghiche-Diab (2015),

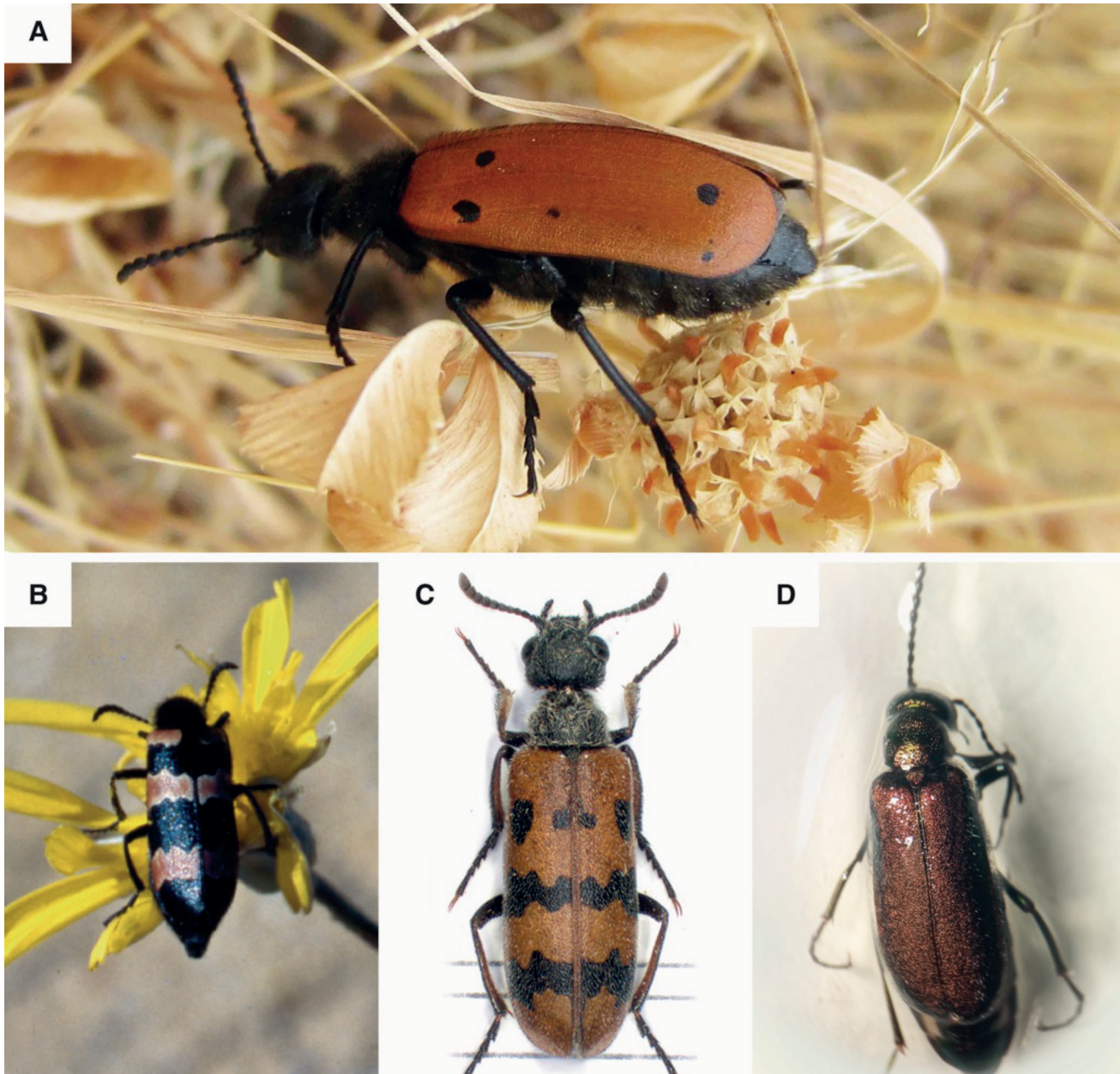


Fig. 3 – **A**, *Mylabris impressa*; **B**, *Croscherichia litigiosa*, **C**, *Croscherichia gilvipes* and **D**, a specimen of *Alosimus* sp. cfr. *viridissimus*.

Deghiche-Diab et al. (2015a, b), Saharaoui (2017), Deghiche-Diab (2020).

In particular, Deghiche-Diab & Deghiche (2022) studied the Biskra region and erroneously noticed the presence of *Mylabris variabilis* in the oasis ecosystem. After the examination of this specimen, we suggest that this record refers to *Croscherichia sanguinolenta* (Olivier 1811), another eremic species noted distributed from Morocco to Levant, Arabia and southern Iran, which must be added to the list of species inhabiting the western Saharan oases.

A complete and updated list of the Coleoptera Meloidae from Algeria (see also Bologna 2020) is summarized in Table 2. It includes 29 genera and 118 species belonging to

the tribes Cerocomini, Epicautini, Lyttini (s.l.), Mylabrini, Meloini, Nemognathini. In this checklist we considered the tribe Lyttini in a general sense, because the systematics of this tribe, as previously considered in the literature, is totally turned upside by recent molecular analyses (Ricciari et al. 2022) and a new classification is still lacking; on the contrary that of Nemognathinae resulted more stable (Ricciari et al. 2023).

Host plants

During our samplings, different spontaneous and weeds plants were identified from each palm groves (Table 3).

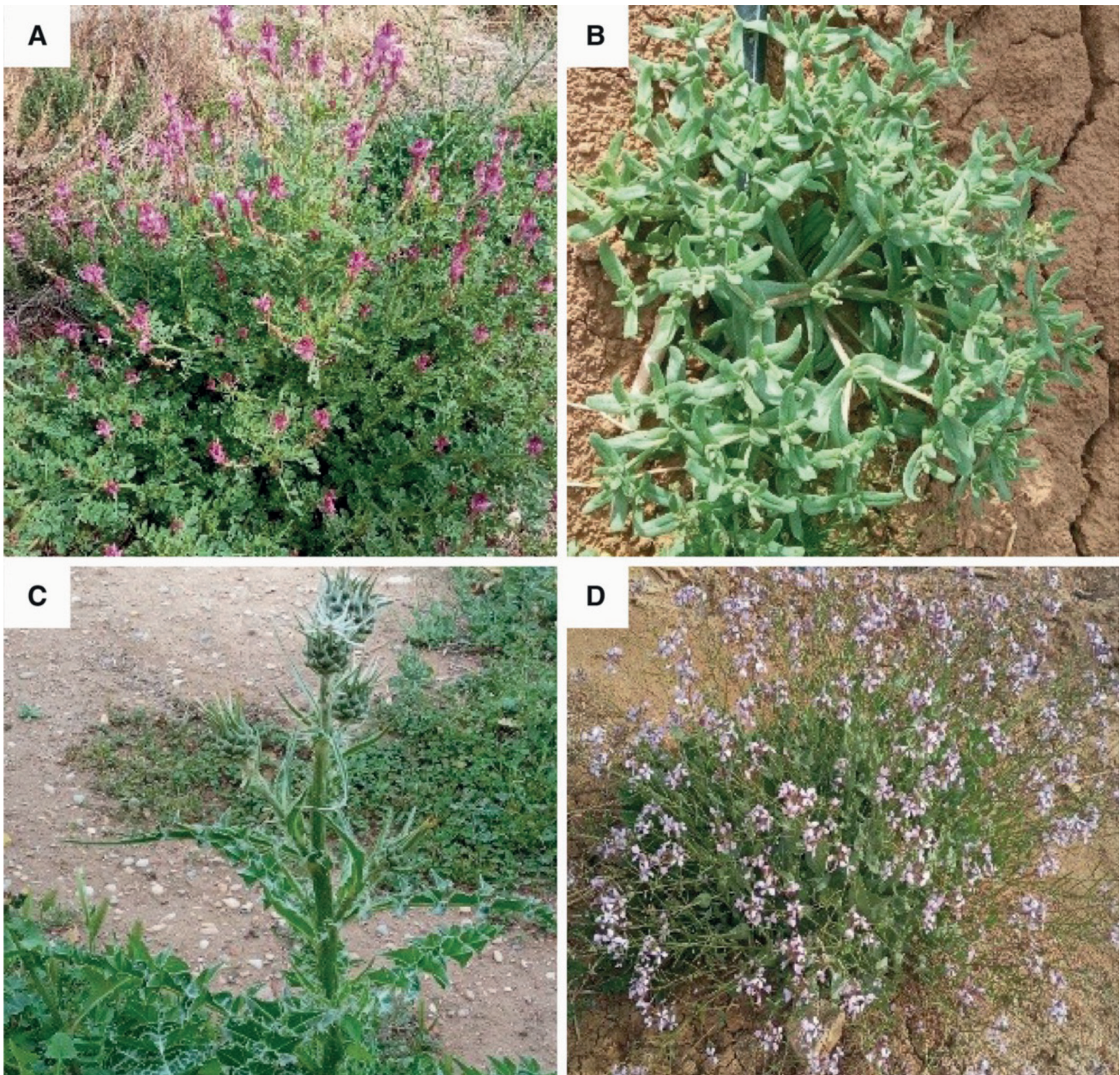


Fig. 4 – Major blister beetles host plants in the oasis ecosystem **A**, *Hedysarum carnosum*, **B**, *Aizoon hispanicum*, **C**, *Silybum marianum*, **D**, *Moricandia arvensis*.

They belong to different families (Asteraceae, Apiaceae, Brassicaceae, Malvaceae, Caryophyllaceae, Primulaceae, etc.). Among these, the most frequent plant species the flowers of which were feed by blister beetles are: *Silybum marianum* (Asteraceae) (Fig. 4C), *Hedysarum carnosum* (Fabaceae) (Fig. 4A), *Raphanus raphanistrum*, *Moricandia arvensis* (Brassicaceae) (Fig. 4D) and *Aizoon hispanicum* (Aizoaceae) (Fig. 4B).

Croscherichia litigiosa, *C. gilvipes* and *Mylabris impressa* were frequently found on flowers of *Hedysarum carnosum*, *Raphanus raphanistrum*, *Silybum marianum* and *Moricandia arvensis*. *Croscherichia litigiosa* was observed feeding also on flowers of *Aizoon canariense* and

Convolvulus arvensis. The *Malva sylvestris* flowers were visited by *Croscherichia litigiosa* and *Mylabris impressa*. Whereas *Daucus carota* flowers were only visited by *Mylabris impressa*. *Launaea nudicaulis* (Asteraceae) was frequently visited only by *C. gilvipes*

As reported by Bologna (1991) and Bologna & Di Giulio (2011), Meloidae is a family virtually cosmopolitan (except in eastern Polynesia and Antarctica) and includes species feeding on a variety of plants families: among others, Asteraceae, Cucurbitaceae, Malvaceae, Fabaceae and Solanaceae (Bologna 1991). Since Meloidae are phytophagous, they can act as serious pests of various agricultural crops and several plant species on which they feed (Hall

1984). They were once considered minor pests but have assumed a major pest status in recent years. Ward (1985) indicated that blister beetles had been observed feeding on alfalfa, peanuts, soybeans, and many other plant species. The attacked Nearctic plants belong mainly to Asclepiadaceae, Capparidaceae, Asteraceae, Brassicaceae, Euphorbiaceae, Lamiaceae, Malvaceae, Papaveraceae,

Polygonaceae, Solanaceae and Zygophyllaceae families. A wide variety of ornamental flowers are also attacked (e.g. Balachowsky 1962; Beirne 1971; App & Manglitz 1972; Zethner & Laurence 1972). In Algeria no indication was given on their attacks to crops, while in Morocco Ruiz et al. (2019) reported their presence on *Atriplex halimus* (Chenopodiaceae).

Table 1 – Meloidae species from Ouled Djellal palm groves.

Family	Tribe	Species	Figure
Meloidae	Mylabrini	<i>Mylabris impressa</i> (Chevrolat, 1840)	3A
		<i>Croscherichia litigiosa</i> (Chevrolat, 1840)	3B
		<i>Croscherichia gilvipes</i> (Chevrolat, 1840)	3C
	Lyttini	<i>Alosimus</i> cfr. <i>viridissimus</i>	3D

Table 2 – Host plants of Mylabrini species from the weed flora in the oasis ecosystem of Ouled Djellal (Algeria). (x) host plant, (-) not a host plant.

Subfamily Meloinae	
Tribe Cerocomini	<i>Cerocoma (Cerocomina) vahli vahli</i> Fabricius, 1787 <i>Diaphorocera carinicolis</i> Chobaut, 1921 <i>Diaphorocera chrysopraxis</i> Fairmaire, 1863 <i>Diaphorocera hemprichi hemprichi</i> Heyden, 1863 <i>Diaphorocera obscuritarsis</i> Fairmaire, 1885 <i>Diaphorocera promelaena</i> Fairmaire, 1876 <i>Diaphorocera sicardi</i> Bedel, 1918
Tribe Epicautini	<i>Epicauta (Epicauta) sanguiniceps</i> (Fairmaire, 1885)
Tribe Lyttini [sensu Ricciari et al. (2022)]	<i>Alosimus cirtanus</i> (Lucas, 1846) <i>Alosimus mendax</i> (Fairmaire, 1879) <i>Alosimus viridissimus</i> (Lucas, 1846) <i>Lydus algiricus</i> (Linnaeus, 1758) <i>Lydus marginatus</i> (Fabricius, 1792) <i>Lydus sanguinipennis</i> Chevrolat, 1840 <i>Oenas afer</i> (Linnaeus, 1767) <i>Oenas sericeus</i> (A.G. Olivier, 1795)
Tribe Lyttini s.l. [see Ricciari et al. 2022]	<i>Berberomeloe maculifrons</i> (Lucas, 1846) <i>Cabalia longicollis</i> Kaszab, 1948 <i>Cabalia rubriventris</i> (Fairmaire, 1860) <i>Cabalia rufiventris</i> (Walker, 1871) <i>Cabalia segetum</i> (Fabricius, 1792) <i>Lagorina scutellata</i> (Laporte, 1840) <i>Lagorina sericea</i> (Waltl, 1835) <i>Lydomorphus</i> (?) <i>chanzyi</i> (Fairmaire, 1876) <i>Lydomorphus</i> (?) <i>reymondi</i> (Selander, 1988) <i>Lydomorphus</i> (?) <i>saharanus</i> (Kaszab, 1961) <i>Mimovesperus verrucicollis</i> (Karsch, 1881) <i>Lyttolydulus cinereovestitus</i> (Fairmaire, 1876) <i>Lyttolydulus mozabita</i> (Chobaut, 1897) <i>Lyttolydulus nigronotatus</i> (Pic, 1907) <i>Lyttolydulus nubeculosus</i> Kaszab, 1952 <i>Lyttolydulus rufulus</i> (Fairmaire, 1863) <i>Lyttolydulus thiebaulti thiebaulti</i> (Fairmaire, 1876) <i>Lyttonyx bicolor</i> (Walker, 1871)
Tribe Mylabrini	<i>Actenodia distincta</i> (Chevrolat, 1840) <i>Actenodia septempunctata</i> (Baudi di Selve, 1878) <i>Actenodia suturifera</i> (Pic, 1896) <i>Ammabris boghariensis</i> (Raffary, 1873) <i>Ammabris chudeaui</i> (Bedel, 1921)

<p>Tribe Mylabrini</p>	<p><i>Ammabris elegans</i> (A.G. Olivier, 1811) <i>Ammabris myrmidon</i> (Marseul, 1870) <i>Ammabris theryi</i> (Abeille de Perin, 1894) <i>Croscherichia albilaena</i> (Bedel, 1899) <i>Croscherichia bedeli</i> (Blause, 1899) <i>Croscherichia fulgurita</i> (Reiche, 1866) <i>Croscherichia gilvipes</i> (Chevrolat, 1840) <i>Croscherichia litigiosa</i> (Chevrolat, 1840) <i>Croscherichia mozabita</i> (Pic, 1897) <i>Croscherichia paykulli</i> (Billberg, 1813) <i>Croscherichia quadrizonata</i> (Fairmaire, 1875) <i>Croscherichia sanguinolenta sanguinolenta</i> (A.G. Olivier, 1811) <i>Croscherichia tigrinipennis</i> (Latreille, 1827) <i>Croscherichia wartmanni</i> (Pic, 1896) <i>Hycleus allardi</i> (Marseul, 1870) <i>Hycleus argentifer argentifer</i> (Pic, 1895) <i>Hycleus brevicollis</i> (Baudi di Selve, 1878) <i>Hycleus brunripes</i> (Klug, 1845) <i>Hycleus diversesignatus</i> (Pic, 1919) <i>Hycleus hemprichi</i> (Klug, 1845) <i>Hycleus novemdecimpunctatus</i> (A.G. Olivier, 1811) <i>Hycleus octodecimmaculatus</i> (Marseul, 1870) <i>Hycleus praeustus</i> (Fabricius, 1792) <i>Hycleus quatuordecmsignatus</i> (Pallas, 1781) <i>Hycleus rotroui</i> (Pic, 1930) <i>Hycleus saharicus</i> (Chobaut, 1901) <i>Hycleus silbermanni</i> (Chevrolat, 1840) <i>Hycleus trizonatus</i> (Reiche, 1866) <i>Hycleus wagneri</i> (Chevrolat, 1840) <i>Mylabris (Eumylabris) calida</i> (Pallas, 1782) <i>Mylabris (Eumylabris) cincta</i> A.G.Olivier, 1811 <i>Mylabris (Eumylabris) impressa impressa</i> Chevrolat, 1840, <i>M. i. hoggarensis</i> (Pic, 1929) <i>Mylabris (Mauritabris) baulnyi</i> Marseul, 1870 <i>Mylabris (Mauritabris) oleae</i> Chevrolat, 1840 <i>Mylabris (Mauritabris) rimosa</i> Marseul, 1870 <i>Mylabris (Mauritabris) tenebrosa</i> Laporte, 1840 <i>Mylabris (Mesosulcata) hirtipennis</i> Raffray, 1873 <i>Mylabris (Mylabris) (?) batnensis</i> Marseul, 1870 <i>Mylabris (Mylabris) guerini</i> Chevrolat, 1840 <i>Mylabris (Mylabris) schreibersi</i> Reiche, 1866 <i>Mylabris (Mylabris) tricincta</i> Chevrolat, 1840</p>
<p>Subfamily Nemognathinae Tribe Nemognathini</p>	<p><i>Allendesalazaria nymphoides</i> Escalera, 1910 <i>Apalus bimaculatus</i> (Linnaeus, 1760) <i>Apalus cinctus</i> (Pic, 1896) <i>Euzonitis quadrimaculata</i> (Pallas, 1773) <i>Leptopalpus rostratus</i> (Fabricius, 1792) <i>Nemognatha chrysomelina</i> (Fabricius, 1775) <i>Sitaris (Sitaris) balachowskyi</i> (Peyerimhoff, 1931) <i>Sitaris (Sitaris) ferrantei</i> Pic, 1911 <i>Sitaris (Sitaris) incantatus</i> (Peyerimhoff, 1929) <i>Sitaris (Sitaris) muralis</i> (Förster, 1771) <i>Sitaris (Sitaris) rufipes</i> Gory, 1841 <i>Sitaris (Sitaris) solieri</i> Pecchioli, 1839 <i>Sitarobrachys thoracicus</i> (Kraatz, 1862) <i>Stenoria (Stenoria) antoinei</i> Pardo Alcaide, 1953 <i>Zonitis (Zonitis) bellieri</i> Reiche, 1860 <i>Zonitis (Zonitis) flava</i> Fabricius, 1775 <i>Zonitis (Zonitis) immaculata</i> (A.G. Olivier, 1789) <i>Zonitis (Zonitis) novercalis</i> Escherich, 1891 <i>Zonitis (Zonitis) ruuficollis</i> J. Frivaldszky, 1877 <i>Zonitoschema oculatissimum</i> Peyerimhoff, 1929 <i>Zonitoschema pallidissimum</i> (Reitter, 1908)</p>

Table 3 – Updated Checklist of the Coleoptera Meloidae from Algeria.

FAMILIES	Species	<i>Croscherichia litigiosa</i>	<i>C. gilvipes</i>	<i>Mylabris impressa</i>
Fabaceae	<i>Melilotus indicus</i> (L.) All.	-	-	-
	<i>Vicia faba</i> (L.)	-	-	-
	<i>Hedysarum carnosum</i> Desf.	x	x	x
Brassicaceae	<i>Moricandia arvensis</i> (L.) D.C.	x	x	x
	<i>Raphanus raphanistrum</i> L.	x	x	x
	<i>Sinapis arvensis</i> L.	-	-	-
Convolvulaceae	<i>Convolvulus arvensis</i> L.	x	-	-
Apiaceae	<i>Daucus carota</i> L.	-	-	x
Aizoaceae	<i>Aizoon canariense</i> L.	x	-	-
	<i>Aizoon hispanicum</i> L.	x	x	x
Asteraceae	<i>Aster squamatus</i> (Spreng.) Hieron.	-	-	-
	<i>Sonchus oleraceus</i> L.	-	-	-
	<i>Carduus nutans</i> L.	-	-	-
	<i>Centaurea algeriensis</i> Durieu & Coss.	-	-	-
	<i>Silybum marianum</i> (L.) Gaertn.	x	x	x
	<i>Launaea nudicaulis</i> (L.) H	-	x	-
Convolvulaceae	<i>Convolvulus arvensis</i> L.	-	-	-
Primulaceae	<i>Anagallis arvensis</i> L.	-	-	-
Rubiaceae	<i>Galium aparine</i> L.	-	-	-
Zygophyllaceae	<i>Zygophyllum cornutum</i> Coss.	-	-	-
Frankeniaceae	<i>Frankenia pulvirulenta</i> L.	-	-	-
Polygonaceae	<i>Polygonum aviculare</i> L.	-	-	-
	<i>Cynodon dactylon</i> (L.) Pers.	-	-	-
	<i>Pholius incurvus</i> (L.) Schinz. & Thell.	-	-	-
	<i>Imperata cylindrica</i> (L.) Rausch.	-	-	-
Amaranthaceae	<i>Setaria verticillata</i> (L.) P: Beauv.	-	-	-
	<i>Suaeda fruticosa</i> (L.) Delille	-	-	-
	<i>Chenopodium murale</i> (L.) S. Fuentes, Uotila & Borsch	-	-	-
	<i>Amaranthus hybridus</i> L.	-	-	-
Malvaceae	<i>Malva sylvestris</i> L.	x	-	x

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