Checklist of ladybirds of Algeria with two new recorded species (Coleoptera, Coccinellidae)

Mohamed Amin Lakhal¹, Djelloul Ghezali¹, Oldřich Nedvěď²³, Salaheddine Doumandji¹

¹ Department of Agricultural and Forest Zoology, Agronomic National School Superior of El Harrach, Algeria Avenue Hassan Badi, 16200, El Harrach, Algeria ² Faculty of Science, University of South Bohemia, Branišovská 1760, 370 05 České Budejovice, Czech Republic ³ Institute of Entomology, Biology Centre AS CR, Branišovská 31a, 370 05 České Budejovice, Czech Republic

Corresponding author: Mohamed A. Lakhal (lakhal.agro@yahoo.fr)

Abstract

An updated and corrected checklist of species of ladybird beetles (Coleoptera: Coccinellidae) known in Algeria now contains 75 species belonging in ten tribes. New country records include the European species *Oenopia conglobata* and the invasive Asian species *Harmonia axyridis*. Sampling data is provided for 14 species found during a faunistic survey performed mostly in agroecosystems, together with host plant and prey species.

Keywords

Africa, aphids, *Coccinelloidea*, distribution, ladybug, taxonomy

Introduction

Family Coccinellidae (ladybirds) is the most species-rich family in the recently recognized beetle superfamily Coccinelloidea (Robertson et al. 2015) with approximately 6000 species described worldwide (Vandenberg 2002). They are mostly beneficial in-
sects, their larvae and adults feeding on pests, especially on scale insects and aphids (Hodek et al. 2012, Giorgi et al. 2009).

Among beetle families, ladybird beetles (Coccinellidae) of individual countries are relatively well known, and the fauna of Algeria is also relatively well documented (Saharaoui and Gourreau 2000, Kovář 2007, Saharaoui et al. 2014). During a recent relatively limited survey, we found two species recorded for the first time in Algeria which need to be added to the list. In preparing the checklist, we also found many taxonomical errors in the previous species lists or old taxonomy that was recently changed mainly due to molecular phylogenetic studies. Thus, we provide an updated and corrected checklist of species of the family Coccinellidae in Algeria.

During the faunistic survey performed mostly in agroecosystems, we found 12 species reported before and therefore we provide details of their localities and dates of sampling as well as their host plants and prey species.

Materials and methods

Literature records were reviewed to set up an up-to-date list of species of Coccinellidae recorded from Algeria. Our sampling was performed to confirm species occurrence and their host/food relationships as a part of study on the natural enemies of aphids. Survey has been carried out in agroecosystems in distant localities within the country – name of locality, geographic coordinates, date of sampling and host plant are given in Table 1. Beetles were sampled from plants using sweeping net (the most effective method for Coccinellidae found by Kherbouche et al. 2015) and the Japanese umbrella. We also sampled plant fragments infested with aphids for their identification. Besides adults, also larvae of the ladybirds were collected for identification. Samples were preserved in 70% ethanol, adult beetles were subsequently allowed to dry. Insects were photographed by digital camera Lumenera Infinity 2 mounted on stereomicroscope Nikon SMZ 1500, operated by QuickPHOTO CAMERA software. Series of images was stacked using Zerene Stacker 1.04. Species were identified using various available keys, such as Iablokoff-Khnzorian (1982), Nedvěd (2015). The specimens are deposited in Agronomic National School Superior of El Harrach, Algeria.

Results

The updated checklist of Coccinellidae species of Algeria now includes the following 75 species assigned in ten tribes in the sense of Seago et al. (2011). Species taxonomy and synonymy follow Kovář (2007) and Nedvěd (2015). Species collected by the authors are marked with asterisk (*). The details of sampling regimes are listed in Table 1. Presence of herbivorous insects that may serve as food for the ladybirds is indicated in Table 2.
Table 1. Original records of the species of Coccinellidae in Algeria. Developmental stages, host plants or habitat, region of sampling, date of sampling, and coordinates are provided. The two species in bold are new records for Algeria.

| Species | Adult | Larva | Plant/habitat | Region | Date       | Coordinates       |
|---------|-------|-------|---------------|--------|------------|-------------------|
| Adalia bipunctata (Linnaeus, 1758) | +     | –     | peach orchard  | Mouzaia, BLIDA | 10/04/2017 | 36°32’49”N, 2°41’47”E |
| Adalia decempunctata (Linnaeus, 1758) | 3     | 0     | Ficus retusa   | El Harrach, ALGER | 29/04/2017 | 36°43’02”N, 3°09’16”E |
|        | +     | –     | pear orchard   | Mouzaia, BLIDA  | 10 and 15/04/2017 | 36°32’51”N, 2°41’54”E |
|        | +     | –     | peach orchard  | Mouzaia, BLIDA  | 10 and 15/04/2017 | 36°32’49”N, 2°41’47”E |
|        | +     | +     | wheat field    | Mouzaia, BLIDA  | 01/05/2017 | 36°32’55”N, 2°41’32”E |
|        | +     | –     | alphalpaha     | (university) OUARGLA | 04/04/2017 | 31°56’28”N, 5°18’20”E |
| Coccinella septempunctata Linnaeus, 1758 | +     | –     | wheat field    | ITDAS OUARGLA | 02/04/2017 | 32°0’13”N, 5°27’58”E |
|        | +     | –     | Aristida sp    | Oued en Nsa, OUARGLA | 04/04/2017 | 32°36’46”N, 4°57’43”E |
|        | +     | +     | Nerium oleander| Mouzaia, BLIDA  | 10/05/2017 | 36°28’13”N, 2°41’29”E |
|        | +     | –     | Malva parviflora| Mouzaia, BLIDA | 08/05/2018 | 36°28’14”N, 2°41’29”E |
|        | +     | –     | Anthemis sp.    | Mouzaia, BLIDA  | 08/05/2018 | 36°28’14”N, 2°41’29”E |
| Harmonia axyridis (Pallas, 1773) | 1     | 0     | peach orchard  | Mouzaia, BLIDA  | 10/04/2017 | 36°32’49”N, 2°41’46”E |
|        | 1     | 0     | –               | El Harrach, ALGER | 05/12/2017 | 36°43’01”N, 3°09’16”E |
|        | 20    | 16    | Malva parviflora| Mouzaia, BLIDA | 08/05/2018 | 36°28’14”N, 2°41’29”E |
|        | 12    | 13    | Notobasis syriaca| Mouzaia, BLIDA | 08/05/2018 | 36°28’14”N, 2°41’29”E |
| Hippodamia variegata (Goeze, 1777) | +     | +     | alphalpaha field| (university) OUARGLA | 04/04/2017 | 31°56’28”N, 5°18’20”E |
|        | +     | +     | wheat field    | ITDAS OUARGLA | 03/04/2017 | 32°0’13”N, 5°27’58”E |
|        | +     | +     | wheat field    | Mouzaia, BLIDA  | 01/05/2017 | 36°32’54”N, 2°41’32”E |
|        | +     | –     | wheat field    | El Harrach, ALGER | 17/04/2017 | 36°43’11”N, 3°09’03”E |
|        | +     | –     | Nerium oleander| El Harrach, ALGER | 05/05/2017 | 36°43’16”N, 3°09’20”E |
|        | +     | +     | Nerium oleander| Mouzaia, BLIDA  | 10/05/2017 | 36°28’13”N, 2°41’29”E |
|        | +     | –     | Nerium oleander| Mouzaia, BLIDA  | 08/05/2018 | 36°28’14”N, 2°41’29”E |
|        | +     | –     | Malva parviflora| Mouzaia, BLIDA | 08/05/2018 | 36°28’14”N, 2°41’29”E |
|        | +     | –     | Anthemis sp.    | Mouzaia, BLIDA  | 08/05/2018 | 36°28’14”N, 2°41’29”E |
| Species                                  | Adult | Larva | Plant/habitat        | Region      | Date      | Coordinates       |
|-----------------------------------------|-------|-------|----------------------|-------------|-----------|------------------|
| Hyperaspis duvergeri                    | +     | –     | conifers             | El Harrach, ALGER | 09/03/2017 | 36°43'19"N, 3°08'58"E |
| Fürsch, 1985                            |       |       |                      |             |           |                  |
| Hyperaspis marmottani (Fairmaire, 1868) | +     | –     | peach orchard        | Mouzaia, BLIDA | 10/04/2017 | 36°32'49"N, 2°41'47"E |
| Nephus (Bipunctatus) peyerimhoffi (Sicard, 1923) | +     | –     | Ficus retusa         | El Harrach, ALGER | 29/04/2017 | 36°43'02"N, 3°09'16"E |
| Hyperaspis marmottani (Fairmaire, 1868) | +     | –     | peach orchard        | Mouzaia, BLIDA | 10/04/2017 | 36°32'49"N, 2°41'47"E |
| Nephus (Bipunctatus) peyerimhoffi (Sicard, 1923) | +     | –     | Ficus retusa         | El Harrach, ALGER | 29/04/2017 | 36°43'02"N, 3°09'16"E |
| Oenopia conglobata (Linnaeus, 1758)     | 1     | 0     | Quercus ilex         | El Harrach, ALGER | 13/04/2017 | 36°43'14"N, 3°8'58"E |
| Oenopia doublieri (Mulsant, 1846)       |       |       |                      |             |           |                  |
| Psyllobora vigintiduopunctata (Linnaeus, 1758) |       |       |                      |             |           |                  |
| Rodolia cardinalis (Mulsant, 1850)      | +     | +     | Pittosporum tobira   | El Harrach, ALGER | 02/05/2017 | 36°43'05.2"N, 3°09'13"E |
| Scymnus suffraianioides Sahlberg, 1913  | +     | +     | Pittosporum tobira   | El Harrach, ALGER | 17/04/2017 | 36°43'15"N, 3°8'59"E |
| Stethorus pusillus (Herbst, 1797)       | +     | –     | Pittosporum tobira   | El Harrach, ALGER | 02/05/2017 | 36°43'05"N, 3°09'13"E |

Table 2. Occurrence of aphid species on host plants that were visited by coccinellid predators.
Chilocorini

*Chilocorus bipustulatus* (Linnaeus, 1758) (not *C. bipunctatus* as misspelled by Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

*Exochomus ericae* Crotch, 1874 (syn. *E. anchorifer* Bedel, 1885; syn. *Parexochomus anchorifer* (Allard, 1870) used by Saharaoui’ and Gourreau 2000 and Saharaoui et al. 2014; Kovář 2007)

*Exochomus quadripustulatus* (Linnaeus, 1758) (source: Saharaoui’ and Gourreau 2000; missing in Kovář 2007; syn. *Brumus quadripustulatus* used by Saharaoui et al. 2014)

*Parexochomus nigripennis* (Erichson, 1843) (syn. *Exochomus nigripennis* used by Saharaoui’ and Gourreau 2000 and Saharaoui et al. 2014; Kovář 2007)

*Parexochomus pubescens* (Küster, 1848) (syn. *Exochomus pubescens* used by Saharaoui’ and Gourreau 2000 and Saharaoui et al. 2014; Kovář 2007)

Coccidulini

*Rhyzobius chrysomeloides* (Herbst, 1793) (source: Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

*Rhyzobius litura* (Fabricius, 1787) (Kovář 2007)

*Rhyzobius lophanta* (Blaisdell, 1892) (source: Saharaoui’ and Gourreau 2000; occurrence confirmed by Kherbouche et al. 2015; Kovář 2007; Saharaoui et al. 2014)

*Tetrabrachys cordicollis* (Guérin-Méneville, 1844) (Kovář 2007)

*Tetrabrachys cribratellus* (Fairmaire, 1876) (Kovář 2007)

*Tetrabrachys volkonskyi* (Peyerimhoff, 1943) (Kovář 2007)

Coccinellini

*Adalia bipunctata* (Linnaeus, 1758) (source: Saharaoui’ and Gourreau 2000; missing in Kovář 2007; Saharaoui et al. 2014) *

*Adalia decempunctata* (Linnaeus, 1758) (not *A. decimpunctata* as misspelled by Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014) *

*Bulacea lividula* Mulsant, 1850 (Kovář 2007)

*Calvia quatuordecimguttata* (Linnaeus, 1758) (source: Saharaoui’ and Gourreau 2000; missing in Kovář 2007; Saharaoui et al. 2014)

*Ceratomegilla notata* (Laiharting, 1781) (syn. *Semiadalia notata* used by Frah et al. 2009; missing in Kovář 2007)

*Ceratomegilla undecimnotata* (Schneider, 1792) (syn. *Hippodamia (Semiadalia) undecimnotata* used by Saharaoui’ and Gourreau 2000; missing in Kovář 2007; Saharaoui et al. 2014)

*Cheilomenes propinqua* (Mulsant, 1850) (Kovář 2007)

*Coccinella septempunctata* Linnaeus, 1758 (syn. *C. algerica* Kovář 1977 used by Saharaoui’ and Gourreau 2000; Kovář 2007; occurrence confirmed by Frah et al. 2009; Saharaoui et al. 2014) *

*Coccinella undecimpunctata* Linnaeus, 1758 (source: Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

*Harmonia axyridis* (Pallas, 1773) (new record) *
Harmonia quadripunctata (Pontoppidan, 1763) (Kovář 2007)
Hippodamia tredecimpunctata (Linnaeus, 1758) (source: Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)
Hippodamia variegata (Goeze, 1777) (as H. (Adonia) variegata by Saharaoui’ and Gourreau 2000; Kovář 2007; occurrence confirmed by Frah et al. 2009; Saharaoui et al. 2014) *
Myrrha octodecimguttata (not M. octodecimpunctata as misspelled by Saharaoui’ and Gourreau 2000 and Saharaoui et al. 2014; Kovář 2007)
Myrrha thuriferae (Sicard, 1923) (Kovář 2007)
Oenopia conglobata (Linnaeus, 1758) (new record) *
Oenopia doublieri (Mulsant, 1846) (source: Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014) *
Oenopia lynceu (Olivier, 1808) (source: Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)
Propylea quatuordecimpunctata (Linnaeus, 1758) (not P. quatuordecimpunctata as misspelled by Saharaoui’ and Gourreau 2000; missing in Kovář 2007; Saharaoui et al. 2014)
Psyllobora vigintiduopunctata (Linnaeus, 1758) (source: Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014) *
Tytthaspis phalerata (Costa, 1849) (source: Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

Epilachnini
Chnootriba elaterii (Rossi, 1794) (syn. Henosepilachna elaterii used by Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)
Henosepilachna angusticollis (Reiche, 1862) (Kovář 2007)
Henosepilachna argus (Geoffroy, 1785) (source: Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

Hyperaspidini
Hyperaspis algirica Crotch, 1874 (not H. algerica as misspelled by Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)
Hyperaspis duvergeri Fürsch, 1985 (Kovář 2007) *
Hyperaspis guttulata Fairmaire, 1870 (Kovář 2007)
Hyperaspis marmottani (Fairmaire, 1868) (source: Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014) *
Hyperaspis pseudopustulata Mulsant, 1853 (Kovář 2007)
Hyperaspis teinturieri Mulsant & Godart, 1869 (Kovář 2007)

Noviini
Novius cruentatus Mulsant, 1846 (Kovář 2007)
Rodolia cardinalis (Mulsant, 1850) (source: Saharaoui’ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014) *
Checklist of ladybirds of Algeria with two new recorded species (Coleoptera, Coccinellidae)

Platynaspidini
*Platynaspis luteorubra* (Goeze, 1777) (source: Saharaoui‘ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

Scymnini

*Clitostethus arcuatus* (Rossi, 1794) (source: Saharaoui‘ and Gourreau 2000; missing in Kovář 2007; Saharaoui et al. 2014)

*Diomus rubidus* (Motschulsky, 1837) (Kovář 2007)

*Nephus* (*Bipunctatus*) *bicinctus* (Mulsant & Godart, 1870) (Kovář 2007)

*Nephus* (*Bipunctatus*) *bipunctatus* (Kugelann, 1794) (Saharaoui et al. 2014; missing in Kovář 2007)

*Nephus* (*Bipunctatus*) *conjunctus* (Wollaston, 1870) (Kovář 2007)

*Nephus* (*Sidis*) *hiekei* (Fürsch, 1965) (Kovář 2007)

*Nephus* (*Sidis*) *levaillanti* (Mulsant, 1850) (syn. *Scymnus levaillanti* used by Saharaoui‘ and Gourreau 2000; missing in Kovář 2007)

*Nephus* (*Nephus*) *ludyi* (Weise, 1879) (Kovář 2007)

*Nephus* (*Bipunctatus*) *peyerimhoffi* (Sicard, 1923) (source: Saharaoui‘ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014) *

*Nephus* (*Nephus*) *quadrimaculatus* (Herbst, 1783) (source: Saharaoui‘ and Gourreau 2000; missing in Kovář 2007; Saharaoui et al. 2014)

*Nephus* (*Nephus*) *redtenbacheri* (Mulsant, 1846) (Kovář 2007)

*Scymniscus splendidulus* (Stenius, 1952) (Kovář 2007)

*Scymnus* (*Scymnus*) *apetzi* Mulsant, 1846 (source: Saharaoui‘ and Gourreau 2000; missing in Kovář 2007; Saharaoui et al. 2014)

*Scymnus* (*Scymnus*) *bivulnerus* Baudi di Selve, 1894 (source: Saharaoui‘ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

*Scymnus* (*Mimopullus*) *fulvicollis* Mulsant, 1846 (syn. *Pullus fulvicollis* used by Saharaoui‘ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

*Scymnus* (*Scymnus*) *interruptus* (Goeze, 1777) (source: Saharaoui‘ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

*Scymnus* (*Scymnus*) *laetificus* Weise, 1879 (Kovář 2007)

*Scymnus* (*Scymnus*) *marginalis* (Rossi, 1794) (Kovář 2007)

*Scymnus* (*Mimopullus*) *marinus* (Mulsant, 1850) (syn. *Mimopullus mediterraneus* Iablokoff-Khnzorian, 1972 used by Saharaoui‘ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

*Scymnus* (*Scymnus*) *nobilis* (Mulsant, 1850) (Saharaoui et al. 2014; missing in Kovář 2007)

*Scymnus* (*Scymnus*) *pavesii* Canepari, 1983 (Kovář 2007)

*Scymnus* (*Scymnus*) *rufipes* (Fabricius, 1798) (source: Saharaoui‘ and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

*Scymnus* (*Pullus*) *subvillosus* (Goeze, 1777) (syn *Pullus subvillosus* used by Saharaoui‘ and Gourreau 2000; Kovář 2007 Saharaoui et al. 2014)
**Scymnus (Scymnus)** suffrianioides Sahlberg, 1913 (syn. *S. pallipediformis* Günther, 1958 used by Saharaoui and Gourreau 2000 and Saharaoui et al. 2014; missing in Kovář 2007) *

**Scymnus (Pullus)** suturalis Thunberg, 1795 (syn. *Pullus suturalis* used by Saharaoui and Gourreau 2000; Kovář, 2007; Saharaoui et al. 2014)

**Stethorini**

*Stethorus pussilus* (Herbst, 1797) (syn. *S. punctillum* (Weise, 1891) used by Saharaoui and Gourreau 2000 and Saharaoui et al. 2014; occurrence confirmed by Idder and Pintureau 2008; missing in Kovář 2007) *

**Sticholotidini**

*Coelopterus salinus* Mulsant & Rey, 1852 (Kovář 2007)

*Pharoscymnus numidicus* (Pic, 1900) (not *P. numidicus* as misspelled by Saharaoui and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

*Pharoscymnus ovoides* Sicard, 1929 (source: Saharaoui and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

*Pharoscymnus setulosus* (Chevrolat, 1861) (source: Saharaoui and Gourreau 2000; Kovář 2007; Saharaoui et al. 2014)

*Pharoscymnus sexguttatus* (Pic, 1926) (Kovář 2007)

**Discussion**

*Chilocorus cacti* was introduced in Algeria but probably did not establish itself (Smirnoff 1957). *Coccinella algerica* Kovář, 1977 was described based on small morphological differences of North African populations originally thought to be *C. septempunctata*. Marin et al. (2010) demonstrated that these two species do not form genetically distinct lineages and synonymized *C. algerica* with *C. septempunctata*.

*Adalia decempunctata* was previously known from Algeria. Specimens of *Adalia decempunctata* found during our survey bear a mixture of characters of *A. decempunctata* and *A. conglomerata* (see Table 3 and Fig. 1). The former lives on a wide variety

**Table 3.** Character states for *Adalia decempunctata*, *A. conglomerata*, and the specimens from El Harrach from 29 April 2017.

| Character               | *Adalia conglomerata* | *Adalia decempunctata* | Specimen 29/4/2017 |
|-------------------------|-----------------------|------------------------|---------------------|
| Subapical elytral keel  | absent                | usually present        | absent              |
| Elytral background      | yellow                | variable               | yellow              |
| Shape of spots          | deltoid               | variable               | deltoid             |
| Length to width ratio   | 1.5                   | 1.4                    | 1.4                 |
| Tarsal claws            | with tiny tooth       | with large tooth       | with large tooth    |
| Body to scutellum ratio | 25–30                 | 15–18                  | 25                  |
| Host plant              | conifers              | trees                  | *Ficus*             |
Checklist of ladybirds of Algeria with two new recorded species (Coleoptera, Coccinellidae)

Figure 1. *Adalia decempunctata* found on *Ficus retusa* in El Harrach, Alger, 29 April 2017.

Figure 2. *Harmonia axyridis* found on *Prunus persica* (peach) in Mouzaia, Blida, 10 April 2017.

of woody plants, while *A. conglomerata* is a specialist on conifers, mainly spruce in Central Europe. Differences in the shape of male genitalia are generally small within *Adalia* to be used for clear species identification.

The occurrence of the invasive alien species *H. axyridis* in Algeria confirms predictions of its potential distribution made by Poutsma (2008) using a CLIMEX model. Although meanwhile it has been found in a few countries with wet tropical climate (Kenya: Nedvěd et al. 2011; Tanzania: Nedvěd and Háva 2016), and in dry tropical desert (Biranvand et al., in press) not predicted by the model, it probably did not establish itself there. The climate and host plants present in north Algeria and the occurrence of prey species and other predator ladybirds found during our study suggested establishment and future spread of *H. axyridis* in Algeria. The first specimen found was a male (Fig. 2), the second a female, both with well-developed elytral ridge, belonging to the form *succinea*. The establishment of the species was confirmed by occurrence of
many larvae and pupae in 2018. All adults found in 2018 were of form *succinea*, which is the most common colour form in the native Chinese as well as in most invasive populations (Roy et al. 2016).

*Oenopia conglobata* is a common tree inhabiting predatory ladybird living in most European countries and as a subspecies in large parts of Asia. The specimen collected in Algeria has yellow elytral background (Fig. 3), while it is usually pink or beige in Europe. Additionally, the spots are rather small, while in many European individuals, at least some spots fuse together (Nedved 2015).

**Acknowledgments**

The study was supported by grant GA JU 152/2016/P by University of South Bohemia to O. Nedvěd.

**References**

Frah N, Khelil MA, Medjdoub-Bensaad F (2009) Circulating entomofauna in orchards of apple trees in the region of the Aures (Eastern – Algeria). African Journal of Agricultural Research 4: 178–186. http://www.academicjournals.org/article/article1380874487_Frah%20et%20al.pdf

Giorgi JA, Vandenberg NJ, McHugh JV, Forrester JA, Ślipiński SA, Miller KB, Shapiro LR, Whiting MF (2009) The evolution of food preferences in Coccinellidae. Biological Control 51: 215–31. https://doi.org/10.1016/j.biocontrol.2009.05.019

Hodek I, van Emden HF, Honěk A (2012) Ecology and behaviour of the ladybird beetles (Coccinellidae). Wiley-Blackwell, Chichester, 604 pp. https://doi.org/10.1002/9781118223208

---

**Figure 3.** *Oenopia conglobata* found on *Quercus ilex* in El Harrach, 13 April 2017.
Iablokoff-Khnzorian SM (1982) Les Coccinelles, Coléoptères-Coccinellidae, tribu Coccinellini des Régions Paléarctiques et Orientale. Société Nouvelle des Éditions Boubée, Paris, 568 pp.

Idder MA, Pintureau B (2008) Effectiveness of the ladybird Stethorus punctillum (Weise) as a predator of the mite Oligonychus aphisialisicus (McGregor) in the palm plantations of the area of Wargla in Algeria. Fruits 63: 85–92. https://doi.org/10.1051/fruits:2007050

Kherbouche Y, Sekour M, Gasmi D, Chaabna A, Chakali G, Lasserre-Joulín F, Doumandji S (2015) Diversity and Distribution of arthropod community in the lucerne fields in northern Sahara of Algeria. Pakistan Journal of Zoology 47: 505–514. https://www.zsp.com.pk/pdf47/505-514%20(26)%20PJZ-2103-14%2022-3-15%20Kherbouche%20MS.%20Arthropods%20diversity%20of%20Lucerne.pdf

Kovář I (2007) Coccinellidae. In: Löbl I, Smetana A (Eds) Catalogue of Palaearctic Coleoptera, Vol. 4. Stenstrup: Apollo Books, 568–631.

Marin J, Crouau-Roy B, Hemptinne JL, Lecompte E, Magro A (2010). Coccinella septempunctata (Coleoptera, Coccinellidae): a species complex? Zoologica Scripta 39: 591–602. https://doi.org/10.1111/j.1463-6409.2010.00450.x

Nedvěd O, Háva J (2016) New record of the invasive lady beetle Harmonia axyridis in Afro-tropical Region: Tanzania, Zanzibar. African Entomology 24: 247–249. https://doi.org/10.4001/003.024.0247

Nedvěd O, Háva J, Kulíková D (2011) Record of the invasive alien ladybird Harmonia axyridis (Coleoptera, Coccinellidae) from Kenya. ZooKeys 106: 77–81. https://doi.org/10.3897/zookeys.106.1242

Nedvěd O (2015) Ladybird beetles (Coccinellidae) of Central Europe. Academia, Praha, 304 pp.

Poutsma J, Loomans AJM, Aukema B, Heijerman T (2008) Predicting the potential geographical distribution of the harlequin ladybird, Harmonia axyridis, using the CLIMEX model. BioControl 53: 103–125. https://doi.org/10.1007/s10526-007-9140-y

Robertson JA, Ślipiński A, Moulton M, Shockley FW, Giorgi A, Lord NP, McKenna DD, Tomaszewska W, Forrester J, Miller KB, Whiting MF, McHugh JV (2015) Phylogeny and classification of Cucujoida and the recognition of a new superfamily Coccinelloidea (Coleoptera: Cucujiformia). Systematic Entomology 40: 745–78. https://doi.org/10.1111/syen.12138

Roy HE, Brown PMJ, Adriaens T, Berkvens N, Borges I, Clusella-Trullas S, Comont RF, De Clercq P, Eschen R, Estoup A, Evans EW, Facon B, Gardiner MM, Gil A, Grez AA, Guillemaud T, Haelewaters D, Herz A, Honek A, Howe AG, Hui C, Hutchison WD, Kenis M, Koch RL, Kulfan J, Handley LL, Lombaert E, Loomans A, Losey J, Lukashuk AO, Maes D, Magro A, Murray KM, Martin GS, Martinkova Z, Minnaar IA, Nedvěd O, Orlov-Bienkowskaia MJ, Osawa N, Rabitsch W, Ravn HP, Rondoni G, Rorke SL, Ryndevich SK, Saethre MG, Sloggett JJ, Soares AO, Stals R, Tinsley MC, Vandereycken A (2016) The harlequin ladybird, Harmonia axyridis: global perspectives on invasion history and ecology. Biological Invasions 18(4): 997–1044. https://doi.org/10.1007/s10530-016-1077-6

Saharaoui L, Hemptinne JL, Magro A (2014) Biogéographie des coccinelles (Coleoptera: Coccinellidae) d’Algérie. Entomologie Faunistique. Faunistic Entomology 67: 147–164.
Saharaoui L, Gourreau JM (2000) Les Coccinelles d’Algérie: inventaire et régime alimentaire (Coleoptera, Coccinellidae). Récherche Agronomique 6: 1–27.

Seago AE, Giorgi JA, Li JH, Ślipiński A (2011) Phylogeny, classification and evolution of ladybird beetles (Coleoptera: Coccinellidae) based on simultaneous analysis of molecular and morphological data. Molecular Phylogenetics and Evolution: 60: 137–151. https://doi.org/10.1016/j.ympev.2011.03.015

Smirnoff W (1957) La cochenille du palmier dattier (Parlatoria blanchardi Targ.) en Afrique duNord, comportement, importance économique, prédateurs et lutte biologique. Entomophaga 2: 1–98. https://doi.org/10.1007/BF02371117

Vandenberg NJ (2002) Family 93. Coccinellidae Latreille, 1807. In: Arnett RH, Thomas MC, Skelley PE, Frank JH (Eds) American Beetles. Vol. 2. Polyphaga: Scarabaeoidea through Curculionoidea. CRC Press LLC, Boca Raton, 371–389.