

# COCCINELLA ALGERICA KOVÁŘ, 1977: A NEW SPECIES TO THE FAUNA OF MAINLAND EUROPE, AND A KEY TO THE COCCINELLA LINNAEUS, 1758 OF IBERIA, THE MAGHREB AND THE CANARY ISLANDS (COLEOPTERA, COCCINELLIDAE)

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**Abstract:** The ladybird *Coccinella algerica* Kovář, 1977 is recorded from Gibraltar. This constitutes the first record of this species for Iberia and mainland Europe. Furthermore, the presence of the closely related *Coccinella septempunctata* Linnaeus, 1758 in Gibraltar is also confirmed, providing the first record of sympatry between these two sibling species. Figures showing the genitalia of specimens from Gibraltar are included to support the record of the presence of both species on the Rock. Finally, a key to the members of the genus *Coccinella* Linnaeus, 1758 present in Iberia, the Maghreb and the Canary Islands is included.

**Key words:** Coleoptera, Coccinellidae, *Coccinella algerica*, *Coccinella septempunctata*, sympatry, key, Gibraltar, Iberia, Europe.

***Coccinella algerica* Kovář, 1977: una nueva especie para la fauna europea continental, y clave para las *Coccinella* Linnaeus, 1758 de la Península Ibérica, el Maghreb y las Islas Canarias (Coleoptera, Coccinellidae)**

**Resumen:** Se cita *Coccinella algerica* Kovář, 1977 de Gibraltar. Esta es la primera cita de la especie para la Península Ibérica y Europa continental. También se confirma la presencia en Gibraltar de *Coccinella septempunctata* Linnaeus, 1758, especie muy similar a *C. algerica*. Esta es la primera cita de la convivencia de las dos especies en el mismo ámbito. Se incluyen figuras de genitalias de especímenes procedentes de Gibraltar para confirmar las citas. Finalmente, se incluye una clave para la identificación de los *Coccinella* Linnaeus, 1758 de la Península Ibérica, el Maghreb y las Canarias.

**Palabras clave:** Coleoptera, Coccinellidae, *Coccinella algerica*, *Coccinella septempunctata*, simpatria, clave, Gibraltar, Península Ibérica, Europa.

## Introduction

*Coccinella algerica* Kovář, 1977 is a sibling species of the extremely well known *Coccinella septempunctata* Linnaeus 1758, a ladybird that is found across the entire Palaearctic, from Iberia to Japan (Kovář, 1977; Iablokoff-Khnzorian, 1982). *Coccinella algerica* is distributed across Northwest Africa, from Morocco to Tunisia (the geographical area known as the Maghreb) and the Canary Islands (Kovář, 1977; Machado & Oromí, 2000). It is also recorded from the Italian islands of Lampedusa, Linosa and Pantelleria to the south of Sicily (Canepari, 1995). Kovář (1977) states that *C. algerica* replaces *C. septempunctata* throughout its range. No cases of sympatry between these two very closely related species have been recorded up until the present.

The two species, which are extremely similar morphologically, can be distinguished by the shape of the median lobe of the tegmen of male specimens (Kovář, 1977, and see fig. 1). Indeed, it was largely on the basis of genital differences in males that *C. algerica* was described as a species distinct from *C. septempunctata*. In *C. algerica*, the median lobe is slightly shorter and pear-shaped compared to that of *C. septempunctata*, the basal lobe of which is triangular in shape (Kovář, 1977; Cardoso Raimundo & Gomes Alves, 1986). In addition, the median lobe is at its widest close to the centre in *C. algerica*, whereas in *C. septempunctata* it is widest close to the base. The shape and extent of the parameres are similar in both species, as is the siphon (Kovář, 1977).

Kovář (1977) discusses the morphological differences that exist between *C. algerica* and *C. septempunctata*. The

very recent description of *C. algerica* as a species distinct from *C. septempunctata* owes to the great macroscopic, and indeed microscopic morphological proximity of these species. Table I lists the characters given as useful in distinguishing between the two species by Kovář (1977). It is interesting that Kovář (1977) compares his North African and Canary material to a male *C. septempunctata* from Algeciras, Cadiz, Spain.

*Coccinella septempunctata* is a generalist feeder, taking aphids, coccids, adelgids, mites, honeydew, pollen, nectar and mildew (Majerus, 1994). Furthermore, this species can be found on an extremely diverse range of plants, having been recorded on more than 250 native plant species in Great Britain (Majerus, 1994). It is very probable that *C. algerica* is similarly a generalist, particularly in parts of its range where *C. septempunctata* is not present such as the Canaries and presumably much or all of Northwest Africa.

Up until the present, five species belonging to the genus *Coccinella* Linnaeus, 1758 had been recorded from Iberia (Plaza, 1984, 1986). The aim of this paper is to cite the first record of *C. algerica* for mainland Europe, bringing the number of *Coccinella* species found in Iberia up to six. We also highlight possible directions for future investigation.

## Materials and Methods

*Coccinella* specimens from Iberia and the Canaries were dissected and male genitalia were mounted, examined and photographed.

**Table I.** Useful characters in diagnosing and separating *Coccinella septempunctata* and *Coccinella algerica* according to Kovář (1977).

<i>C. algerica</i> (fig. 1, 2, 3, 9)	<i>C. septempunctata</i> (fig. 1, 3, 10)
Body generally smaller.	Body generally larger.
Dorsal surface of elytra generally less convex, if observed from side, it is either regularly convex or more strongly arcuate posteriorly.	Dorsal surface of elytra more convex, if observed from side, it is either regularly convex or less arcuate, to almost straight posteriorly.
Scutellar black spot (1/2 + 1/2) rather transverse widened, other spots larger than on European <i>C. septempunctata</i> .	Scutellar black spot (1/2 + 1/2) usually rounded.
Interocular and praecocular white spots not connected as a rule.	Interocular and praecocular white spots connected as a rule.
Anterior corners of pronotum rather sharply rounded.	Anterior corners of pronotum more rounded.
Anteromedial corner of fore trochanter rounded, anterior margin of the trochanter shallowly arcuately emarginate.	Anteromedial corner of fore trochanter distinctly obtusangulate, anterior margin of the trochanter more deeply emarginate.
Median lobus of male tegmen pear-shaped.	Median lobus of male tegmen subconical.
Anterior edge of the ventrally inflexed portion of the female ix tergite arcuately emarginate laterally.	Anterior edge of the ventrally inflexed portion of the female ix tergite straight.

Details of all male specimens that have been determined positively are given in the results section. Examples of the tegmen of both species have been photographed and are included.

In addition, a key to the genus *Coccinella* in Iberia, the Maghreb and the Canary Islands has been developed using Kovář (1977), Iablokoff-Khinzorian (1982), Plaza (1984), Cardoso Raimundo & Gomes Alves (1986) and Majerus & Kearns (1989), as well as our own observations. Photographs of all species included in the key are also provided.

Specimens examined and positively identified are listed, together with their data. Only dissected, male specimens are included. GONHS = Gibraltar Ornithological & Natural History Society. MZ Barcelona = Museu de Zoologia de Barcelona

## Results

### *Coccinella septempunctata* (fig. 1, 3, 10):

3 ex. Puente de Genil, Córdoba, 13-May-1958 (Gascill leg./ MZ Barcelona coll.); 2 ex. Pórtugos, Granada, Jun-1959 (Vives leg. / MZ Barcelona coll.); 2 ex. Garganta de las Hoces, Fanlo, Huesca, 12-Jul-1985 (O. Escolá leg. / MZ Barcelona coll.); 1 ex. Algeciras, Cádiz, 08-Jun-1993 (J. Pérez Guerra leg./ J. de Ferrer Andreu coll.); 2 ex. Vilallo-

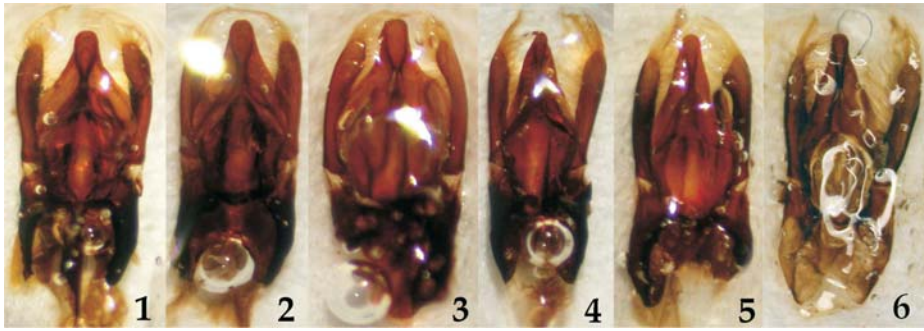
bent, Girona, 29-Apr-1995 (Bech leg./ MZ Barcelona coll.); 1 ex. Gibraltar, 11-Apr-2004 (C. Perez & K. Bensusan leg./ GONHS coll.); 1 ex. Gibraltar, 15-Mar-2006 (C. Perez & K. Bensusan leg. et coll.); 1 ex. Gibraltar, 21-May-2006 (C. Perez & K. Bensusan leg. et coll.); 1 ex. Sierra de las Nieves, Málaga, 10-Jun-2006 (K. Bensusan leg. et coll.).

### *Coccinella algerica* (fig. 1, 2, 3 y 9):

1 ex. Teguisse, Lanzarote, Canarias, 13/11/1980 (J. de Ferrer leg. et coll.); 2 ex. Gibraltar, 04/06/2004 (C. Perez & K. Bensusan leg. / GONHS coll.); 1 ex. Gibraltar, 21/05/2006 (C. Perez & K. Bensusan leg. / GONHS coll.).

Figure 1 demonstrates that both *Coccinella algerica* and *C. septempunctata* occur in Gibraltar. As can be seen, the median lobe of the tegmen of male specimens clearly separates the two species. As highlighted by Kovář (1977), the median lobe of *C. algerica* is pear-shaped and widest close to the centre (fig. 1, 2, 3), whereas that of *C. septempunctata* is sub-cylindrical and widest close to the base (fig. 4, 5, 6). Table I lists all of the characters that can be used to separate the species according to Kovář (1977). The key at the end of the discussion separates both species primarily on the basis of the structure of the tegmen. Morphological characters that are deemed inconsistent or awkward to observe have been omitted from this key.

→ **Fig. 1.** Male tegmen of *Coccinella algerica* & *C. septempunctata*: **1-2.** *C. algerica* from Gibraltar (K. Bensusan & C. Perez Leg. 04-Jun-2004, GONHS Coll.), **3.** *C. algerica* from Lanzarote, the Canaries (J. de Ferrer Leg. 13-Nov-1980, K. Bensusan Coll.), **4.** *C. septempunctata* from Gibraltar (K. Bensusan & C. Perez Leg. 11-Apr-2004, GONHS Coll.), **5.** *C. septempunctata* from Algeciras, Cádiz (J. Pérez Guerra Leg. 08-Jun-1983, J. de Ferrer Coll.), **6.** *C. septempunctata* from Garganta de las Gloces, Fanlo, Huesca (O. Escolá Leg. 12-Jul-1985, Museu de Zoologia Barcelona Coll.). **Fig. 2.** Habitus of *Coccinella algerica* male (♂) from Gibraltar (K. Bensusan & C. Perez Leg. 04-Jun-2004, GONHS Coll.). **Fig. 3.** Lateral view of *C. algerica* from Lanzarote (above) (J. de Ferrer Leg. 13-Nov-1980, K. Bensusan Coll.) and *C. septempunctata* from Gerona (below) (J. de Ferrer Leg. 16-Jul-1954, J. de Ferrer Coll.). The taller, more convex elytra and smaller spots of *C. septempunctata* can be observed, although some overlap exists between the two species. **Fig. 4.** *Coccinella hieroglyphica*, melanic (left) and typical forms (Ashdown Forest, East Sussex, UK, 26-Sep-1976, P.J. Hodge Leg. & Coll.). **Fig. 5.** *Coccinella miranda* (Tenerife, Canarias, 05-May-1946, J. de Ferrer Leg., K. Bensusan Coll.). **Fig. 6.** *Coccinella magnifica* (Esher Common, Surrey, UK, 08-Sep-1990, P.J. Hodge Leg. & Coll.). **Fig. 7.** *Coccinella undecimpunctata* showing variation in elytral maculae (Deal, Kent, UK, 26-Feb-1978, P.J. Hodge Leg. & Coll.). **Fig. 8.** *Coccinella* Sant Ferriol, Girona, España, 180m., 25/03/1987, J. Muñoz leg. y coll. **Fig. 9.** *Coccinella septempunctata* (Gibraltar, 21-May-2006, K. Bensusan & C. Perez Leg., GONHS Coll.). **Fig. 10.** *Coccinella algerica* (Lanzarote, Canarias, 13-Nov-1980, J. de Ferrer Leg., K. Bensusan Coll.).



1

1

2

3

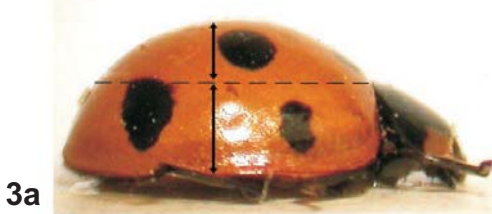
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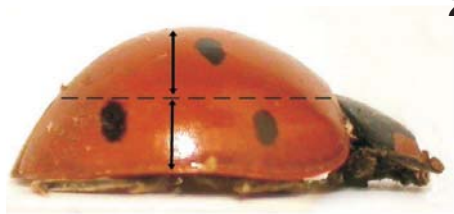
6



2



3a



3b



4a



4b



5



6



7a



7b



8



9



10

## Discussion

This is the first time that *Coccinella algerica* has been recorded from mainland Europe. Although the species has so far only been recorded from Gibraltar, it is likely that it also occurs in nearby Spain. It is also the first time that *C. algerica* and *C. septempunctata* have been recorded as sympatric species. The very small and clearly defined geographical area in which these species have been recorded (i.e., Gibraltar) means that these sibling species, with (presumably) extremely similar ecologies, share a common space. Moreover, it is clear given that the two species have been taken within metres from each other on the same date that at least some overlap exists with regard to phenology. However, the *C. algerica* examined from Gibraltar were all found after mid-May, and no specimens exhibiting typical characteristics of this species have been observed before then. On the other hand, *C. septempunctata* has been recorded some months earlier than this suggesting that this species emerges earlier than *C. algerica*.

Given the perfectly similar structure of the male siphon in *C. algerica* and *C. septempunctata*, there exists a possibility of hybridisation at sites where the species are sympatric. However, it is interesting to note in this respect that populations in Gibraltar have retained two distinct and clearly definable edaegal structures (fig. 1). Given that copulatory organs have been shown to demonstrate intermediate characters in hybrids of other closely related insect species (e.g., Monetti *et al.*, 2002), the situation in Gibraltar with regard to *C. algerica* and *C. septempunctata* may suggest that populations of both species are discreet and that hybridisation is limited. Given the difficulty in identifying live specimens, any work on hybridisation will most likely have to form part of a phylomolecular study.

Complex ecological studies of the interactions between these two species would prove problematic given that accurate determination of specimens can be problematic without dissection. However, simple studies on aspects such as the frequency of occurrence of our two species, phenology and very simple ecological correlates such as habitat and elevation may prove useful in our understanding of the mechanics behind the coexistence of two such closely related species in southern Iberia. It is clear however that in Gibraltar, these species coexist closely.

The Maghreb lies a mere 14 km away from Tarifa, Iberia's southernmost tip, and 24 km away from Gibraltar. *Coccinella* spp. fly well and can be highly mobile. This, coupled with the strong winds that occur in the area, means that if both *C. septempunctata* and *C. algerica* occur on the northern shore of the Strait of Gibraltar, it is very possible or even probable that they occur on the southern shore too.

Although some of the characters given by Kovář (1977) are indeed useful in providing an indication of what species a particular individual may belong to, we find that some overlap does exist in the extent of the characters displayed between individuals of these species. Thus for example, although it seems that the elytral spots on *C. algerica* are on average larger than those on *C. septempunctata*, there are some individuals of *C. septempunctata* that have larger elytral spots, overlapping with some *C. algerica* specimens which, as highlighted by Kovář (1977), may sometimes have smaller elytral maculae. Similarly, smaller individuals of *C. septempunctata* may recall *C. algerica* in

size. Overall it seems that, when dealing with specimens that originate in areas from which both species are known or suspected, it would be careless to determine any of these species based on external observations alone. Examination of the tegmen of male specimens would seem the only way of ensuring that specimens are correctly identified and that the distribution of these two species is mapped accurately.

Six species of *Coccinella* have now been recorded from Iberia. These are: *Coccinella hieroglyphica* Linnaeus, 1758 (fig. 4), *C. magnifica* Redtenbacher, 1848 (fig. 6), *C. quinquepunctata* Linnaeus, 1758 (fig. 8), *C. septempunctata* Linnaeus, 1758 and *C. undecimpunctata* Linnaeus, 1758 (fig. 7) (Plaza, 1984, 1986), to which we add *C. algerica* Kovář, 1977. Of these, three have been recorded from the Maghreb: *C. algerica*, *C. undecimpunctata* and *C. quinquepunctata* (Kovář, 1977; Iablokoff-Khnzorian, 1982). Only two species are found on the Canary Islands: *C. algerica* and the Macaronesian endemic *Coccinella miranda* Wollaston, 1864 (fig. 5) (Iablokoff-Khnzorian, 1982; Machado & Oromí, 2000). The taxonomy of Iberian, Maghrebi and Canary *Coccinella* is as follows:

Genus *Coccinella* Linnaeus, 1758

Subgenus *Coccinella* s. str.

*Coccinella* (s. str.) *algerica* Kovář 1977

*Coccinella* (s. str.) *hieroglyphica* Linnaeus, 1758

*Coccinella* (s. str.) *magnifica* Redtenbacher, 1848

*Coccinella* (s. str.) *quinquepunctata* Linnaeus, 1758

*Coccinella* (s. str.) *septempunctata* Linnaeus, 1758

Subgenus *Spilota* Billberg, 1820

*Coccinella* (*Spilota*) *miranda* Wollaston, 1864

*Coccinella* (*Spilota*) *undecimpunctata* Linnaeus, 1758

A key to the *Coccinella* species of Iberia, the Maghreb and the Canary Islands is included. A version of the key is also given in Spanish. In addition, photographs of all of the species are included.

Since the principal role of a key is the separation of species with maximum ease, the taxonomic question of subgenus diagnosis has been excluded.

### Key to the *Coccinella* species of Iberia, the Maghreb and the Canary Islands:

1. Scutellary spot elongate; elytra bronze, brown or reddish-brown with black markings or black with tan markings, or almost completely black ..... 2  
– Scutellary spot round, or broader than long; elytra red with black spots ..... 3
2. Elytra bronze or brown with black markings or black with tan markings, or almost completely black; mesosternal epimera black ..... *hieroglyphica* L.  
– Elytra reddish-brown with black markings; Scutellary spot running along almost entire length of suture; mesosternal epimera white. Macaronesian endemic .....  
..... *miranda* Woll.
3. Metasternal epimera white; front angles of pronotum somewhat rounded; spaces between elytral punctures reticulate; elytra with seven or nine spots .....  
..... *magnifica* Redtenbacher  
– Metasternal epimera black; front angles of pronotum somewhat pointed; spaces between elytral punctures smooth ..... 4

4. Prosternal keels parallel; body elongate (ratio length to width 6:4 or more); pits on head between eyes separated by much more than their diameter; elytra with eleven black markings, one of these on the scutellum (1/2, 1, 2, 2), although any or all of these may be absent; claws simple ..... *undecimpunctata* L.
- Prosternal keels diverging towards anterior; body rather rounded (ratio length to width not more than 5:4); pits on head between eyes separated by their own diameter or less; claws with basal tooth ..... 5
5. Body round; Prosternum black with large white patches in front outer angles, these as extensive as white markings on pronotum; elytra with five black markings, with one on scutellum ..... *quinquepunctata* L.
- Body slightly oval; prosternum black with small white patches in front outer angles, these much less extensive than white on pronotum; elytra with seven black markings, with one on scutellum (1/2, 1, 1, 1); a pale, yellow to white marking next to scutellum ..... 6
6. Species larger on average, with elytral spots often smaller. Dorsal surface of elytra generally more convex. Sides of median lobe of tegmen straight, giving basal lobe a subconical shape. Median lobe widest close to base ..... *septempunctata* L.
- Species smaller on average, with elytral spots often larger. Dorsal surface of elytra generally less convex. Sides of median lobe of tegmen concave, giving basal lobe a pear-shape. Median lobe widest close to centre ..... *algerica* Kovář

**Clave para la separación de las especies de *Coccinella* de Iberia, el Maghreb y las Canarias:**

1. Mancha escutelar alargada; elitros bronceados o castaños con manchas negras o negros con marcas pardas o casi completamente negros ..... 2
- Mancha escutelar redondeada o no pero siempre más ancha que larga; elitros rojos con manchas negras ..... 3
2. Elitros bronceados o castaños con manchas negras o negros con marcas pardas o casi completamente negros; epímeras mesosternales negras ..... *hieroglyphica* L.
- Elitros pardo-rojizos con marcas negras; la mancha escutelar se desliza a lo largo de la sutura en casi toda su longitud; epímeras mesosternales blancas. Endemismo macaronesio ..... *miranda* Woll.
3. Epímeras metasternales blancas; ángulos anteriores del pronoto más bien redondeados; superficie elitral reticulada entre la puntuación; elitros con siete o nueve manchas ..... *magnifica* Redtenbacher
- Epímeras metasternales negras; ángulos anteriores del pronoto más bien agudos; superficie elitral lisa entre la puntuación ..... 4
4. Quillas prosternales paralelas; cuerpo alargado (proporción entre longitud y anchura de 6:4 o más); fosetas interoculares separadas entre sí por una distancia mucho mayor que su diámetro; elitros con once manchas negras, una de ellas en el escutelo (1/2, 1, 2, 2), aunque el patrón es muy variable y puede faltar cualquiera de ellas ..... *undecimpunctata* L.

- Quillas prosternales divergentes anteriormente; cuerpo bastante redondeado (proporción entre longitud y anchura como mucho de 5:4); fosetas interoculares separadas por una distancia igual o menor a su diámetro ..... 5
5. Cuerpo redondo; prosterno negro, las marcas blancas de la parte externa de sus ángulos anteriores tan extendidas como las marcas blancas del pronoto; elitros con cinco manchas negras, una de ellas en el escutelo ..... *quinquepunctata* L.
- Cuerpo ligeramente oval; prosterno negro, las marcas blancas de la parte externa de sus ángulos anteriores mucho menos extendidas que las marcas blancas del pronoto; elitros con siete manchas negras, una de ellas en el escutelo (1/2, 1, 1, 1); una marca pálida, amarilloblancuzca, cerca del escutelo ..... 6
6. Especie de mayor tamaño de promedio, con manchas elitrales generalmente menores. Superficie dorsal de los elitros, en vista lateral, más convexa. Lados del lóbulo basal del tegmen rectos, dando al lóbulo basal una forma subcónica. Máxima anchura del lóbulo basal en la base ..... *septempunctata* L.
- Especie de menor tamaño de promedio, con manchas elitrales generalmente mayores. Superficie dorsal de los elitros, en vista lateral, menos convexa. Lados del lóbulo mediano del tegmen cóncavos, dando al lóbulo basal forma de pera. Máxima anchura del lóbulo basal cerca de su mitad .. *algerica* Kovář

**Acknowledgments**

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