

Study of ladybirds (Col:Coccinellidae) in Khorramabad district and the first report of *Hyperaspis quadrimaculata* (Redtenbacher 1844) for Iranian fauna

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Abstract: Ladybird fauna of the farms, orchards and pastures of Khorramabad city were studied during 2009 and 2010. In this study, a total of 22 species belonging to 13 genus of ladybird were detected, among them four new species for the province of Lorestan (marked *) and one for Iranian fauna (marked **) were identified. Samples were collected using a valid key and identified by characteristics of their appearance and their genitalia. The species identified are as follows:

1. *Adalia bipunctata* (Linnaeus 1758)
2. *Adalia decempunctata* (Linnaeus 1758)
3. *Chilocorus bipustulatus* (Linnaeus 1758)
4. *Coccinella septempunctata* (Linnaeus 1758)
5. *Coccinella undecimpunctata* (Linnaeus 1758)*
6. *Coccinula elegantula* (Weise, 1980)*
7. *Cryptolaemus montrouzieri* (Mulsant 1853)*
8. *Exochomus flavipes* (Goeze 1777)
9. *Exochomus pubescens* (Kuster 1848)
10. *Exochomus quadripustulatus* (Linnaeus 1758)
11. *Exochomus undulatus* (Linnaeus 1758)
12. *Hippodamia variegata* (Goeze 1777)
13. *Hyperaspis quadrimaculata* (Redtenbacher 1844) **
14. *Oenopia conglobata* (Linnaeus 1758)
15. *Oenopia oncina* (Olivier 1808)*
16. *Propylea quatuordecimpunctata* (Linnaeus 1758)
17. *Psyllobora vigintiduopunctata* (Linnaeus 1758)
18. *Scymnus apetzi* (Mulsant 1846)
19. *Scymnus flavicollis* (Redtenbacher 1844)
20. *Scymnus syriacus* (Marseul 1868)
21. *Stethorus gilvifrons* (Mulsant 1850)
22. *Stethorus siphonulus* (Kapur 1948)

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1. Introduction

Lorestan province is located in western Iran and its center is Khorramabad. This study has been done to identify species of ladybird in the Khorramabad district. Ladybirds (Coccinellidae) are a popular, widely recognized and highly regarded insect group due to their bright color and role in controlling insect pests (Gordon, 1985). Useful application of this insect has in many cases has proven successful and case studies of this type of pest control around the world have been recorded (Sadeghi, 1991; Farahi & Sadeghi Namghi, 2009). The first successful, classical biological control was related to the use of the ladybird *vedalia*, *Rodolia cardinalis* (Mulsant) against the Australian crab

louse, *Icerya purchasi* Maskell (Heteroptera: Margarodidae) in the orange farms of California, in 1880 AD (Caltagirone and Doust, 1989). Ladybird classification, together with that of other animals was first conducted in the mid-seventeenth century by Linnaeus, and then over 100 years later the classification of ladybirds, together with that of other insects, was progressed by Fabricius, Degger, Thunberg and Herbst (Gordon, 1985). Ladybird classification was revised by Mulsant in 1850; he presented a new basis for ladybird classification. Today further detection of new ladybird species takes place by observation of the characteristics of insect genitalia (Sadeghi, 1991; Bagheri & Mossadegh, 1995; Haji zade, 1995) adult male genitalia have two

distinct parts, Observations of tegmen as well as the siphon that may be symmetrical or asymmetrical are also used to determine ladybird species (Sadeghi, 1991). Research on the diversity of ladybird species in the world has studied the taxonomy and morphology of adult and larval ladybird (Hodek, 1973) and has been used to name ordinary species of ladybird in alfalfa fields throughout the United States; as a result the species *Hippodamia convergens* Goeze was introduced. The Ladybird *Stethorus* has been reported for China in a list of new species, determined by the sex of the insects in China by Yu, (1996). Ladybird fauna of the Himalayan country Nepal and the surrounding region has been compiled by Canepari (1997) and the study recorded new species. A list of the ladybird species of East Russia was published by (Kuznetsov, 1997). A family of predatory ladybirds was identified in India (Afroze, 1999). The published list of identified ladybird fauna of India included ladybird *Epilachna* (Poorani, 2002) List of ladybird by Durverger, (1983) was published. Naeem, in the year 1972 published a list of the ladybirds of Iran (Sadeghi, 1991). Various lists of ladybird fauna in different regions have subsequently been registered (Fatemi, 1982; Sadeghi, 1991; Montazeri and Mosadegh, 1995; Haji zade *et al*, 2001; Yaghmaei and Kharazi Pakdel, 2005; Farahi and Sadeghi Namghi, 2010; Ansari pour, 2010).

2. Material and Methods

Samples collected

Ladybird samples were collected from March 2009 to September of 2010, from farms, agricultural land, gardens and parks within and around the city of Khorramabad. Samples were collected weekly and sometimes daily. The sampling procedure was to record the name of the place, its geographical location (using a GPS device) and the names of the tree and shrub varieties from which the samples were taken. Samples were collected from within cultivated fields, especially alfalfa fields with insect nets or by hand directly from the plant or from the surface of the farm land. samples were also collected from within gardens, from trees and shrubs on a glazed tray by hitting several branches and an aspirator was used for the removal of leaves from trees to collect ladybirds.

Maintenance and identification of samples

Collected insects were killed with ethyl acetate and some of these samples for identification were placed in a 70% alcohol solution After separation of the genitalia, cleared (by 10% potassium hydroxide), and dewatering with alcohol of varying purity, permanent slides were kept for identification. Samples were catalogued using valid

keys (Hodek, 1973) and (Gordon, 1985) and a team of internal and external experts assisted in the sex determination of the insects and then species were identified and described. Some species were identified and confirmed by Dr. Fursch from Germany.

3. Results and discussion

In this study, a total of 22 ladybird species were identified, among which four species of fauna for Lorestan province and a new species for the country's fauna were identified as follows:

Adalia bipunctata (L.)

A total of 40 ladybirds of this species were collected and identified, of which 18 were male and the others female. This species of ladybird was identified from samples taken from fruit orchards, wheat fields and alfalfa fields of Khorramabad. It should also be noted that this ladybird has reportedly been found in other regions of Iran, the province of Kerman (Koochpayezadeh & Mossadegh, 1991), Mazandaran (Montazeri & Mossadegh, 1995), south-eastern province of Khorasan (Moadi & Mossadegh, 1995), in Mashhad (Yaghmaei & Kharazi Pakdel, 1995), Chahar Mahal and Bakhtiari province (Bagheri & Mossadegh, 1995), Mazandaran and Lorestan province (Jafari & Kamali 2007). The geographical location of the collection site was 33°48.40'N, 48°57.74' E at an altitude of 1638 m.

Adalia decempunctata (L.)

A total of 19 species of this ladybird species were collected and identified, of which 12 were male and the others female. This species was collected from fruit gardens in the city of Khorramabad. The ladybird has reportedly been found in other areas (Montazeri & Mossadegh, 1995), in the south-eastern province of Khorasan (Moadi & Mossadegh, 1995), Mazandaran and Lorestan province (Jafari & Kamali, 2007). The geographical location of the collection site was 33° 48.40'N, 48°57.74'E at an altitude of 1638 m.

Chilocorus bipustulatus (L.)

A total of 10 species of this ladybird species were collected and identified, of which 3 were male and the others female. This species of ladybird was identified from samples taken from cedar trees of Khorramabad. The ladybird has reportedly been found in other areas: Khorasan Province (Farahi & Sadeghi Namghi, 2009). The geographical location of the collection site was 33°48.24'N, 48°25.17' E at an altitude of 1333 m.

Coccinella septempunctata (L.)

A total of 150 ladybirds of this species were collected and identified, of which 49 were male and the others female. The ladybirds were collected from all regions of Khorramabad city in wheat, barley, cucumber, tomato, alfalfa fields, from fruit gardens and on weeds. This species has spread to all parts of the country and has been reported in all ecosystems. The geographical location of the collection site was 33°48.40'N, 48°57.74'E at an altitude of 1638 m.

***Coccinella undecimpunctata* (L)**

A total of 17 ladybirds of this species were collected and identified, of which 9 were male and the others female. The ladybirds were collected from alfalfa fields. The ladybird has reportedly been found in other areas: Kerman Province (Koohpayezadeh & Mossadegh, 1991), Mazandaran province (Montazeri & Mossadegh, 1995), south-eastern province of Khorasan (Moadi & Mossadegh, 1995), Mashhad province (Yaghmae & Kharazi Pakdel, 1995). The geographical location of the collection site was 33°48.40'N, 48°57.74'E at an altitude of 1638 m.

***Coccinula elegantula* (Weise)**

A total of 37 ladybirds of this species was collected and identified, of which 16 were male and the others female. The ladybird has an adult body length of 3 to 3.5 mm, white elytra with orange spots on them: several were seen with five white and orange spots visible on the pronotum. The insect body is very soft. The ladybirds were collected whilst feeding on two-spotted spider mite from cypress trees in the region of Khorramabad. The geographical location of the collection site was 33°48.40'N, 48°57.74'E at an altitude of 1638 m.

***Cryptolaemus montrouzieri* (Mulsant)**

A total of 25 of this ladybird species were collected and identified, 10 of these were male and the others female. They were collected from ladybird crypts found in apple orchards and fruit gardens city of Khorramabad, (especially from apple and peach trees). But most of the ladybird was Kakareza of Khorramabad region. The geographical location of the collection site was 33°47.15'N, 48°57.74'E at an altitude of 1556 m.

***Exochomus flavipes* (Goeze)**

A total of 75 of this ladybird species was collected and identified, of which 33 were male and the others female. They were collected from the city of Khorramabad, from alfalfa hay fields and fruit orchards, especially peach and apricot trees. The ladybird has been reported in other areas and provinces, cited as follows; in Chahar Mahal and Bakhtiari (Bagheri & Mossadegh, 1995), in Mashhad

(Yaghmae & Kharazi Pakdel, 1995), in Mazandaran (Ghahari *et al.* 2004), Lorestan province (Jafari & Kamali, 2007), Khorasan Province (Farahi & Sadeghi Namghi, 2009). The geographical location of the collection site was 33°48.40'N, 48°57.74'E at an altitude of 1638 m.

***Exochomus pubescens* (Kuster)**

A total of 33 of this ladybird species were collected and identified, of which 13 were male and the others female. They were collected from alfalfa hay fields and fruit orchards, especially peach and apricot trees in the city of Khorramabad. Other areas where this ladybird has been reported are cited by Ghahari *et al.* (2004), also in Mazandaran by Montazeri & Mossadegh (1995), south-eastern province of Khorasan (Moadi & Mossadegh, 1995) and Lorestan province (Jafari & Kamali, 2007). The geographical location of the collection site was 33°48.40'N, 48°57.74'E at an altitude of 1638 m.

***Exochomus quadripustulatus* (L.)**

A total of 29 ladybirds of this species were collected and identified, of which 12 were male and the others female. The Ladybirds were collected from fruit gardens in the city of Khorramabad and from peach trees and alfalfa fields around the fruit orchards. The ladybird has been reported in other areas, cited as follows; in the province of Kerman by (Koohpayezadeh & Mossadegh, 1991), in Mashhad by (Yaghmae & Kharazi Pakdel, 1995) and Chahar Mahal and Bakhtiari by (Bagheri & Mossadegh, 1995). The geographical location of the collection site was 33°48.40'N, 48°57.74'E at an altitude of 1638 m.

***Exochomus undulatus* (Weise)**

A total of 23 of this ladybird species were collected and identified, of which 10 were male and the others female. The ladybirds were collected from trees in city parks, and especially in Khorramabad from oleander shrub and fruit trees such as peach, nectarine and apricot. The ladybird has been reported in other areas; the province of Chahar Mahal and Bakhtiari (Bagheri & Mossadegh, 1995), Mazandaran (Montazeri & Mossadegh, 1995), south-eastern province of Khorasan (Moadi & Mossadegh, 1995), Lorestan province (Jafari & Kamali, 2007) and Khorasan (Farahi & Sadeghi Namghi, 2009). The geographical location of the collection site was 33°49.51'N 48°35.39'E at an altitude of 1211 m.

***Hippodamia variegata* (Goeze)**

A total of 312 of this species of ladybird was collected and identified, of which 154 were male and the others female. This kind of ladybird was found in

most of all alfalfa fields of Khorramabad district. Its presence been reported in most areas of the country (Sadeghi, 1991; Koohpayezadeh & Mossadegh, 1991; Yaghmae & Kharazi Pakdel, 1995; Bagheri & Mossadegh, 1995; Ghahari *et al.* 2004). The geographical location of the collection site was 33°48.40'N 48°57.74'E at an altitude of 1638 m.

***Hyperaspis quadrimaculata* (Redtenbacher)**

Description:

A total of 3 of this species of ladybird was collected and identified, 2 of which were male and the other was female. The Ladybird has a length of 3 – 3.5 mm and a width of 2 – 2.4 mm, Elytra shiny black hair is not elytra level, two red spots on each elytron can be seen, in the middle of the patches of spots on the elytra and other spots are located at the end of the elytra. The genitalia Tegmenin males of this genus is asymmetric and can therefore be easily distinguished from other types of ladybird. This was the first time this ladybird has been collected and reported in Khorramabad city. This species has been identified by Dr. Fursch form Germany. The geographical location of the collection site 33°48.41'N 48°57.72'E at an altitude of 1641 m.

***Oenopia conglobata* (L.)**

A total of 45 of this species of ladybird was collected and identified, of which 19 were male and the others female. The ladybird has been reported in other areas, cited as follow; in the province of Kerman (Koohpayezadeh & Mossadegh, 1991), Mazandaran (Montazeri & Mossadegh, 1995), the south-eastern province of Khorasan (Moadi & Mossadegh, 1995), Chahar Mahal and Bakhtiari (Bagheri & Mossadegh, 1995), in Mashhad (Yaghmae & Kharazi Pakdel, 1995), Gilan (Haji zade *et al.*, 2001), Mazandaran (Ghahari *et al.* 2004), Lorestan province (Jafari & Kamali, 2007) and in Khorasan (Farahi & Sadeghi Namghi, 2009). The geographical location of the collection site was 33°48.40'N 48°57.74'E at an altitude of 1638 m.

***Oenopia oncina* (Olivier)**

A total of 15 ladybird species were collected and identified, of which 7 were male and the others female. The adult length is 3 - 4/5 mm, with black elytra and 10 yellow spots were observed in the spot test, which observed that elytra on each side were L shaped. Two yellow spots were visible on the black side area of the pronotom. The geographical location of the collection site was 33°48.40'N, 48°57.74'E at an altitude of 1638 m.

***Propylea quatuordecimpunctata* (L.)**

A total of 16 ladybird species were collected and identified, a number of which were male and the others female. Other areas where this ladybird has been reported are cited by (Montazeri & Mossadegh, 1995), in Chahar Mahal and Bakhtiari (Bagheri and Mossadegh, 1995), in Mashhad (Yaghmae & Kharazi Pakdel, 1995), Gilan (Haji Zade *et al.*, 2001), Lorestan province (Jafari & Kamali, 2007), Khorasan (Farahi & Sadeghi Namghi, 2009) and in Golestan (Afshari, 2010). The geographical location of the collection site was 33°48.40'N, 48°57.74'E at an altitude of 1638 m.

***Psyllobora vigintiduopunctata* (L.)**

A total of 19 ladybird species were collected and identified, a number of which were male and the others female. The ladybird has been reported in other areas of the province of Kerman (Koohpayezadeh & Mossadegh, 1991), Mazandaran (Montazeri & Mossadegh, 1995), south-eastern province of Khorasan (Moadi & Mossadegh, 1995), Chahar Mahal and Bakhtiari (Bagheri & Mossadegh, 1995), in Mashhad (Yaghmae & Kharazi Pakdel, 1995), Gilan (Haji Zade *et al.*, 2001), Lorestan province (Jafari & Kamali, 2007) and Khorasan (Farahi & Sadeghi Namghi, 2009). The geographical location of the collection site was 33°48.40'N, 48°57.74'E at an altitude of 1638 m.

***Scymnus apetzi* (Mulsant)**

A total of 35 ladybird species were collected and identified, of which 16 were male and the others female. The ladybird was collected from Khorramabad district in the fruit gardens and alfalfa fields. The ladybird has been reported in other areas of Fars province (Yazdani & Ahmadi, 1991), Mazandaran (Montazeri & Mossadegh, 1995), Chahar Mahal and Bakhtiari (Bagheri & Mossadegh, 1995), Mazandaran (Mafi, 1997), Guilan (Haji Zade *et al.*, 2001), Lorestan province (Jafari & Kamali, 2007), and Khorasan (Farahi & Sadeghi Namghi, 2009). The geographical location of the collection site was 33°40.73'N 48°61.25'E at an altitude of 1639 m.

***Scymnus flavicollis* (Redtenbacher)**

A total of 26 ladybird species were collected and identified, of which 15 were male and the others female. The adult length is 2 – 2.5 mm, elytra color is black and covered with hair on them is a shiny gray. Elytra a spot on each orange to dark brown inclined, there have been a way that are seen as two eyes. This is the first report of ladybird from this province that has been collected from the fruit gardens in city of Khorramabad. The geographical location of the

collection site was 33°49.16'N, 48°35.12'E at an altitude of 1185.5 m.

***Symnus syriacus* (Marseul)**

A total of 25 ladybird species were collected and identified, 9 of which were male and the others female. The ladybird was collected from fruit orchards in Khorramabad city. The ladybird has been reported in other areas of the province of Fars (Yazdani & Ahmadi, 1991), south-eastern province of Khorasan (Moadi & Mossadegh, 1995), in Mashhad (Yaghmae & Kharazi Pakdel, 1995), Gilan (Haji Zade *et al.*, 2001) and Khorasan (Farahi & Sadeghi Namghi, 2009). The geographical location of the collection site was 33°48.41'N, 48°57.72'E at an altitude of 1641 m.

***Stethorus gilvifrons* (Mulsant)**

A total of 8 Ladybirds of this species were collected and identified, of which 1 was male and the rest were female. This species was collected from cedar tree in the city of Khorramabad and was identified after separation of the genitalia.

The ladybird has been reported in other areas of the province of Kerman (Koochpayezadeh & Mossadegh, 1991), Mazandaran (Montazeri & Mossadegh, 1995), south-eastern province of Khorasan (Moadi & Mossadegh, 1995), Tehran province (Haji zade, 1995), in Mashhad (Yaghmae & Kharazi Pakdel, 1995), Chahar Mahal and Bakhtiari (Bagheri & Mossadegh, 1995), Gilan (Haji zade *et al.*, 2001), Lorestan province (Jafari & Kamali, 2007) and Razavi province (Farahi & Sadeghi Namghi, 2009). The geographical location of the collection site was 33°48.41'N 48°57.72'E at an altitude of 1641 m.

Table 1: List of ladybird Khorramabad and host from which they were collected.

Ladybirds	Feeding preferences
<i>Adalia bipunctata</i> Linnaeus 1758	<i>Sitobiun avenae</i> (F.), <i>Schizaphis graminum</i> (Roud.) & <i>Therioaphis maculata</i> (Bukt.)
<i>Adalia decempunctata</i> Linnaeus 1758	<i>Brachycaudus schwartzi</i> (Borner), <i>Eriosoma lanigerum</i> (Hausm.) & <i>Aphis pomi</i> (Deg.)
<i>Coccinella septempunctata</i> Linnaeus 1758	Aphididae
<i>Coccinella undecimpunctata</i> Linnaeus 1758	<i>Sitobiun avenae</i> (F.), <i>Schizaphis graminum</i> (Roud.) & <i>Aphis fabae</i> (Scop.)
<i>Coccinula elegantula</i> Weise, 1980*	<i>Leucaspis pusillai</i> (Loew.), <i>Planococcus vovae</i> (Nasanov)
<i>Cryptolaemus montrouzieri</i> Mulsant 1853	<i>Pseudococcidae</i>
<i>Exochomus flavipes</i> Goeze 1777	<i>Brachycaudus schwartzi</i> (Borner), <i>Eriosoma lanigerum</i> (Hausm.), <i>Myzus persicae</i> (Sulz.) & <i>Aphis pomi</i> (Deg.)
<i>Exochomus pubescens</i> Kuster 1848	<i>Brachycaudus schwartzi</i> (Borner), <i>Eriosoma lanigerum</i> (Hausm.), <i>Myzus persicae</i> (Sulz.) & <i>Aphis pomi</i> (Deg.)
<i>Exochomus quadripustulatus</i> Linnaeus 1758	<i>Myzus persicae</i> (Sulz.) & <i>Aphis pomi</i> (Deg.)
<i>Exochomus undulatus</i> Linnaeus 1758	<i>Aphis nerii</i> (Boyer de Fon.) & <i>Myzus persicae</i> (Sulz.)
<i>Hippodamia variegata</i> Goeze 1777	<i>Aphis nerii</i> (Boyer de Fon.), <i>Aphis pomi</i> (Deg.), <i>Therioaphis maculata</i> (Bukt.), <i>Aphis gossypii</i> (Glov.) & <i>Myzus persicae</i> (Sulz.)
<i>Hyperaspis quadrimaculata</i> Redtenbacher 1844	<i>Aphis gossypii</i> (Glov.)
<i>Oenopia conglobata</i> Linnaeus 1758	<i>Myzus persicae</i> (Sulz.) & <i>Aphis gossypii</i> (Glov.)
<i>Oenopia oncina</i> Olivier 1808	
<i>Propylea quatuordecimpunctata</i> Linnaeus 1758	<i>Myzus persicae</i> (Sulz.) & <i>Aphis gossypii</i> (Glov.)
<i>Psyllobora vigintiduopunctata</i> Linnaeus 1758	
<i>Scymnus apetzi</i> Mulsant 1846	Aphididae
<i>Scymnus flavicollis</i> redtenbacher 1844	Aphididae
<i>Scymnus syriacus</i> Marseul 1868	Aphididae
<i>Stethorus gilvifrons</i> Mulsant 1850	<i>Tetranichus urticae</i> (Koch)
<i>Stethorus siphonulus</i> Kapur 1948	<i>Tetranichus urticae</i> (Koch)

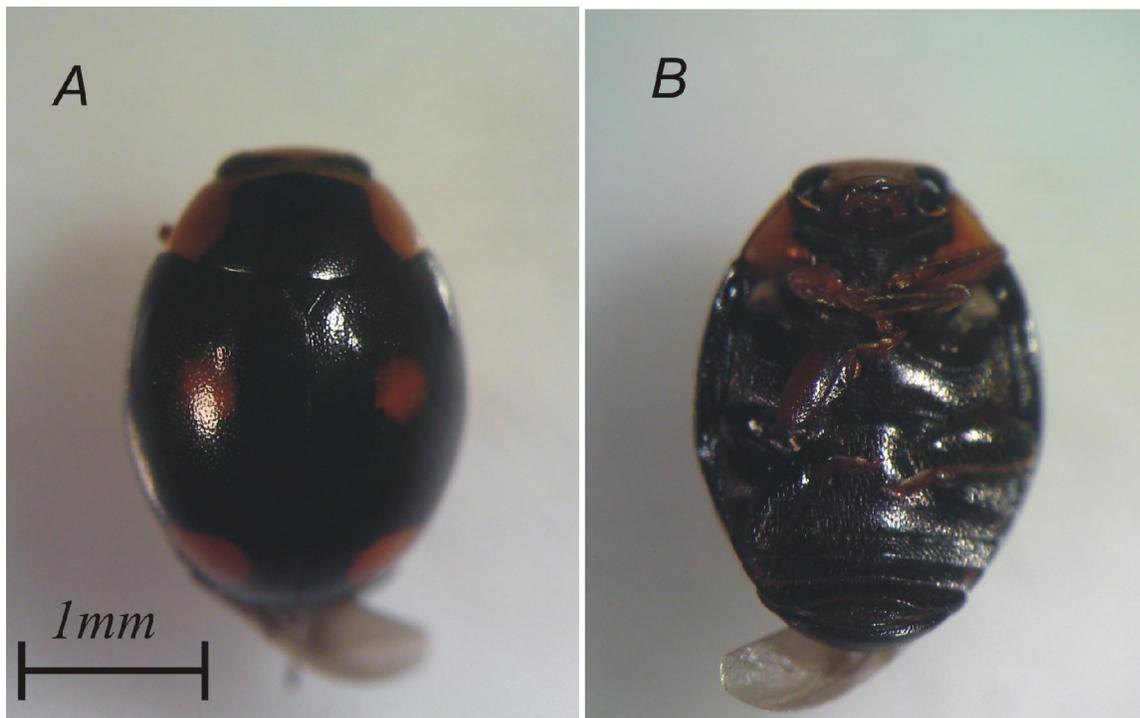


Fig 1: *Hyperaspis quadrimaculata* (Redtenbacher 1844), A: Front surface of body, B: Dorsal surface of body.



Fig 2: Male genitalia (Siphon) of *H. quadrimaculata*

***Stethorus siphonulus* (Kapur)**

A total of 7 of this ladybird species was collected and identified, of which 2 were male and the others female. The ladybird has a length of 1.1 – 1.5 and width of 1 – 1.2 mm. The body is an elliptical shape and is convex. The body has a black color, antennae, mouth parts, leg and the toe tip is yellow / brown. The ladybird has been reported for the first time in the province. The geographical location of the collection site was 33°48.41'N 48°57.72'E at an altitude of 1641 m.

4. Discussion

The study of fauna conducted in this survey show that 22 species of ladybird in the city of Khorramabad have been identified, among them the five species as follows:

1. *Coccinella undecimpunctata**
2. *Coccinula elegantula**
3. *Cryptolaemus montrouzieri**
4. *Hyperaspis quadrimaculata***
5. *Oenopia oncina**

The species marked * are new fauna of Lorestan province and the species marked ** are the new fauna of Iran. The results are agreed with former study (Jafari and Kamali, 2007).

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