

A contribution to the Alysiinae of southeastern Iran, with description of the male of *Chorebus longiarticulis*

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Abstract: A survey was conducted from 2012 to 2013 in order to study the Alysiinae (Hymenoptera: Braconidae) species of the southeastern part of Iran. A total of 11 species belonging to 5 genera have been listed, of which 4 species, *Dinotrema contracticorne* (Fischer 1974), *Synaldis ultima* Fischer 1970, *Chorebus parvungula* (Thomson 1895), and *Dacnusa abdita* (Haliday 1839), are reported for the first time from Iran. In addition, the male of *Chorebus longiarticulis* Fischer, Lashkari Bod, Rakhshani & Talebi 2011 is recorded for the first time and described.

Key words: Hymenoptera, Alysiinae, *Chorebus longiarticulis*, new records, Iran

1. Introduction

Alysiinae is a large subfamily containing about 2000 described species and more than 100 genera worldwide (Yu et al., 2012), of which more than 65 genera and 1200 species are known from the Palearctic region (Yu et al., 2012; Fischer et al., 2014). All species are koinobiont endoparasitoids of Diptera (Wharton, 1997, 2002). Alysiines can play an important role in the regulation of pest insects, and many species have been considered as biological control agents of the economically important cyclorrhaphous Diptera, the more common Agromyzidae, Phoridae, Ephydriidae, Chloropidae, Calliphoridae, and Anthomyiidae. They finish their development in the puparium of the host flies (Griffiths, 1968; Drea et al., 1986; Wharton, 1997; van Achterberg et al., 2012). To date, this subfamily is divided into 2 large tribes, Alysiini Leach, 1815 and Dacnusiini Foerster, 1862, the main diagnostic character of which is the presence (Alysiini) or absence (Dacnusiini) of the second radiomedial vein of the forewing (Shenefelt, 1974; Docavo et al., 2002). Almost all Dacnusiini are parasitoids of leaf- and stem-mining dipterans, usually Agromyzidae, but members of Alysiini attack a wide range of dipteran hosts from at least 20 different families (Belokobylskij and Kostromina, 2011; Peris-Felipo and Jiménez-Peydró, 2013). It seems that the Alysiinae fauna of Iran is very diverse, but there

is no complete published information from different parts of Iran on this valuable group. However, some scattered published information and recent faunistic and taxonomic studies are available (Ghahari et al., 2009, 2010a, 2010b, 2011a, 2011b, 2011c, 2011d; Fallahzadeh and Saghaei, 2010; Fischer et al., 2011; Ghahari and Fischer, 2011a, 2011b; Lashkari-Bod et al., 2011; Rastegar et al., 2012; Sedighi et al., 2014). Kerman Province (southeastern Iran) is the largest province of Iran (11.15% of the entire country). In this region, the Zagros Mountains, central mountains, and lowland deserts are located. Kerman is located next to the Loot Desert, one of the hottest zones of Iran and of the world. However, the presence of several mountains at the margins of the desert moderates the destructive effects on fauna and flora. The extension of the Zagros and central mountains is differentiated into 2 areas, dry deserts and temperate valleys, which are subdivided into 3 zones: desert and marginal desert, tropical zones, and temperate mountain zones (Kerman Management and Planning Organization, 2007). These conditions cause very different climatic conditions. As a result of this geographic isolation, the diversity of fauna and habitats is unique. The objective of the present study was to report the list of Alysiinae species in Kerman Province, Iran. Taxonomic remarks and reports of new species for the Alysiinae of Iran are given.

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2. Materials and methods

The present research was conducted within the range of 6 localities located in Kerman Province (southeastern Iran): Gughar, Dashtkar, Lalehzar, Negar, Bardsir, and Qal-eh-Askar (Figure 1). The sampling was carried out in all areas on *Triticum aestivum* L. and primarily on *Medicago sativa* L. Specimens were collected using a standard sweeping net from 2012 to 2013. They were captured using an aspirator and dropped directly into ethyl alcohol (75%) for subsequent studies. The specimens were then softened in the laboratory using the AXA method (van Achterberg, 2009) and mounted on triangular point cards. The external morphology of specimens was examined using a Nikon SMZ800 stereomicroscope. Classification, nomenclature, and the distributional data of Braconidae followed Yu et al. (2012). For the identification of Alysiniinae, the criteria indicated by van Achterberg (1993), Tobias et al. (1986), and Wharton et al. (1997) were followed. The identified material is deposited in the insect collection of the Department of Biology, Shahid Bahonar University of Kerman, and in the Entomological Collection of the University of Valencia (ENV).

3. Results

In the current study, 11 species of Alysiniinae belonging to 5 genera, including 3 genera of the tribe Alysini (*Dinotrema* Foerster, 1862; *Orthostigma* Ratzeburg, 1844; and *Synaldis* Foerster, 1862) and 2 genera of tribe Dacnusi (*Chorebus* Haliday, 1833 and *Dacnusa* Haliday, 1833), are listed. The identified material is given below and new records are marked with asterisks.

Subfamily Alysiniinae Leach, 1815

Tribe Alysini Leach, 1815

1. *Dinotrema contracticorne* (Fischer, 1974)*

Material captured: Iran: 1 female, Kerman Province, Bardsir, Dashtkar, 33°07'360"N, 46°88'86"E, 2084 m, 30.viii.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi.

Distribution in Iran: Kerman Province.

General distribution: Austria, Czech Republic, Hungary, Iran (new record), and Russia.

2. *Orthostigma beyarslani* Fischer, 1995

Material captured: Iran: 2 females, Kerman Province, Lalehzar, 32°64'075"N, E048°22'96", 2910 m, 5.vii.2013, swept on *Medicago sativa* L. leg.: S. Ghotbi; 1 female and 1 male, Kerman Province, Lalehzar, 32°67'325"N, 047°69'12"E, 2687 m, 10.viii.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi.

Distribution in Iran: Fars Province: Marvdasht (Fischer et al., 2011; Lashkari-Bod et al., 2011; Khajeh et al., 2014); Kerman Province.

General distribution: Iran, Spain, and Turkey.

3. *Synaldis concolor* (Nees, 1812)

Material captured: Iran: 1 female, Kerman Province, Negar, 33°04'130"N, 047°90'07"E, 2087 m, 17.v.2013, swept on *Triticum aestivum* L., leg.: S. Ghotbi.

Distribution in Iran: Fars Province: Neyriz (Lashkari-Bod et al., 2011; Khajeh et al., 2014); Qazvin Province: Danesfahan (Ghahari et al., 2011c); East Azarbaijan Province: Oskoo (Rastegar et al., 2012); Kerman Province.

General distribution: Afghanistan, Austria, Bulgaria, Czech Republic, England, France, Germany, Greece, Hungary, Iceland, Iran, Ireland, Italy, Korea, Lithuania, Mongolia, Montenegro, Netherlands, Norway, Poland, Russia, Serbia, Spain, Switzerland.

4. *Synaldis distracta* (Nees, 1834)

Material captured: Iran: 2 females, Kerman Province, Lalehzar, 32°64'075"N, 048°22'96"E, 2910 m, 5.vii.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi; 1 male, Kerman Province, Negar, 33°04'130"N, 047°90'07"E, 2087 m, 17.v.2013, swept on *Triticum aestivum* L., leg.: S. Ghotbi.

Distribution in Iran: Isfahan Province: Isfahan and Shahreza (Ghahari et al., 2011a); Kerman Province.

General distribution: Austria, Bulgaria, China, Croatia, Czech Republic, England, Finland, Germany,

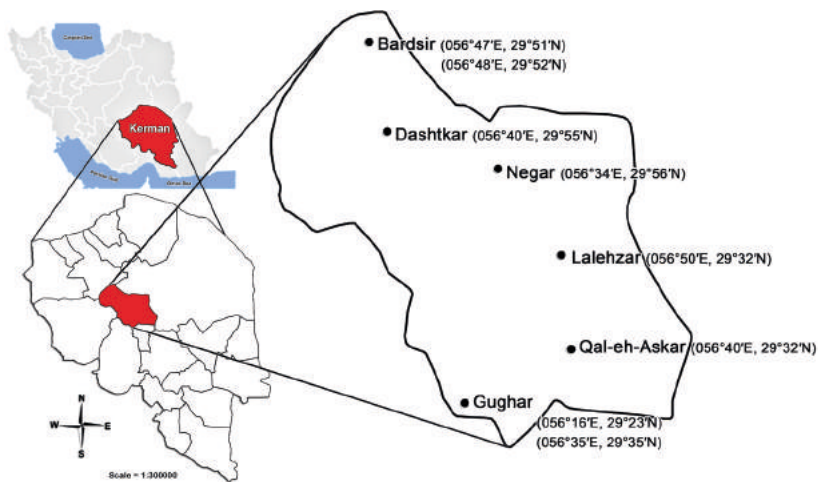


Figure 1. Map of the area indicating collecting localities for Alysiniinae species.

Greece, Hungary, Iceland, Iran, Ireland, Korea, Lithuania, Mongolia, Poland, Portugal, Romania, Russia, Slovenia, Spain, Switzerland, Tunisia, Uzbekistan, and former Yugoslavia.

5. *Synaldis ultima* Fischer, 1970*

Material captured: Iran: 1 male, Kerman Province, Negar, 33°04'130"N, 047°90'07"E, 2087 m, 17.v.2013, swept on *Triticum aestivum* L., leg.: S. Ghotbi.

Distribution in Iran: Kerman Province.

General distribution: Austria, Czech Republic, Hungary, Iran (new record), Russia, and Spain.

Tribe Dacnusiini Foerster, 1862

6. *Chorebus (Phaenolexis) bathyzonus* (Marshall, 1895)

Material captured: Iran: 5 females, Kerman Province, Dashtkar, 33°07'360"N, 046°88'86"E, 2084 m, 30.viii.2013, swept on *Medicago sativa* L. and on *Mentha longifolia* L., leg.: S. Ghotbi; 1 female, Kerman Province, Negar, 33°03'949"N, 047°94'27"E, 2093 m, 16.v.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi; 1 female, Kerman Province, Qal-eh-Askar, 32°66'211"N, 046°79'47"E, 2628 m, 16.v.2013, swept on *Triticum aestivum* L., leg.: S. Ghotbi; 6 males, Kerman Province, Lalehzar, 32°67'325"N, 047°69'12"E, 2687 m, 10.viii.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi; 1 male, Kerman Province, Gughar, 32°59'466"N, 044°46'41"E, 2600 m, 05.vi.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi; 1 male, Kerman Province, Bardsir, 33°10'829"N, 046°30'95"E, 2064 m, 4.vii.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi.

Distribution in Iran: Sistan-Baluchestan (Sedighi et al., 2014) and Kerman provinces.

General distribution: Austria, Azerbaijan, Bosnia Hercegovina, Croatia, Czech Republic, England, Finland, France, Germany, Hungary, Iran, Ireland, Italy, Kazakhstan, Macedonia, Montenegro, Netherlands, Poland, Portugal, Romania, Russia, Serbia, Spain, Sweden, Switzerland, and Ukraine.

7. *Chorebus (Stiphrocera) lar* (Morley, 1924)

Material captured: Iran: 2 males, Kerman Province, Qal-eh-Askar, 32°67'639"N, 046°78'74"E, 2615 m, 16.vi.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi; 1 male, Kerman Province, Negar, 33°03'949"N, 047°94'27"E, 2093 m, 16.v.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi.

Distribution in Iran: Isfahan Province: Anarak (Ghahari et al., 2011a), Sistan-Baluchestan Province (Sedighi et al., 2014), and Kerman Province.

General distribution: Afghanistan, Austria, Azerbaijan, Croatia, England, Greece, Hungary, Iran, Korea, Macedonia, Moldova, Poland, Russia, Serbia, Spain, Sweden.

8. *Chorebus longiarticulis* Fischer, Lashkari Bod, Rakhshani & Talebi, 2011

(Figures 2 and 3)

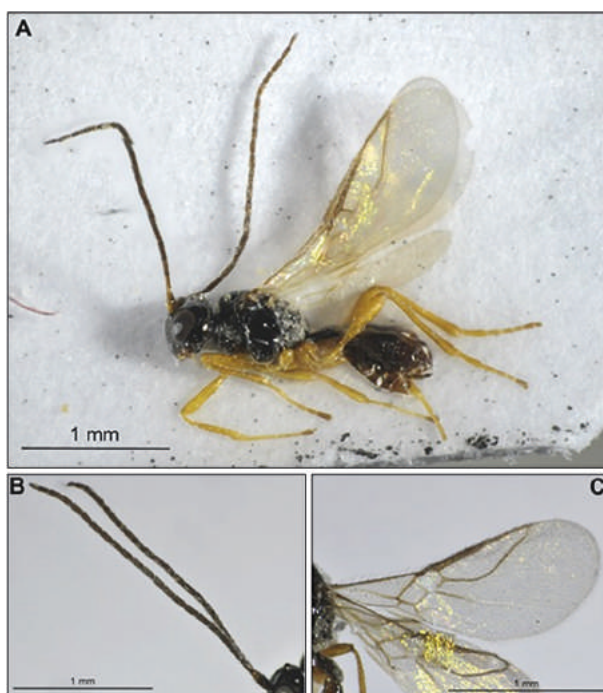


Figure 2. *Chorebus longiarticulis* Fischer, Lashkari Bod, Rakhshani & Talebi 2011 (A: female, B-C: male). A- Habitus, lateral view. B- Antenna. C- Forewing.

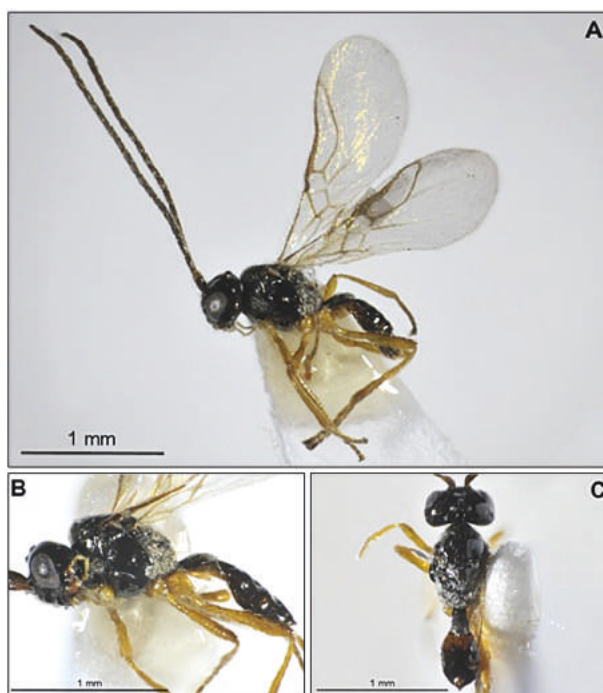


Figure 3. *Chorebus longiarticulis* Fischer, Lashkari Bod, Rakhshani & Talebi 2011 (male). A- Habitus, lateral view. B- Head, lateral view, mesosoma, lateral view, hind leg, and metasoma. C- Head, dorsal view, mesonotum, and first metasomal tergite.

Material examined: Iran: 1 female (holotype), Zarghan, 27.iv.2008, swept on alfalfa (Lashkari) (NHMW).

Material captured: Iran: 1 female and 1 male, Kerman Province, Qal-eh-Askar, 32°67'639"N, 046°78'74"E, 2617 m, 05.vi.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi; 2 females, Kerman Province, Qal-eh-Askar, 32°66'149"N, 046°50'51"E, 2633 m, 05.vi.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi; 6 females and 2 males, Kerman Province, Negar, 33°03'949"N, 047°94'27"E, 2093 m, 16.v.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi; 1 male, Kerman Province, Negar, 33°04'130"N, 047°90'07"E, 2087 m, 17.v.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi.

Description of the male

Head entirely smooth; in dorsal view twice as wide as median length, 1.6 times as wide as mesoscutum, with rounded temples behind eye. Eye in lateral view 1.6 times as high as wide and as wide as temple medially. POL twice OD; OOL 3.0 times OD. Face 1.7 times as wide as high; inner margins of eyes subparallel. Clypeus slightly curved ventrally, 3.3 times as wide as high. Mandible as long as its maximum width. First mandibular tooth broad, rounded, deflected sideward; second tooth pointed; third and fourth teeth in a straight row and clearly separated from each other. Antenna thick, 23-segmented. Scape 1.65 times as long as pedicel. First flagellar segment 5.0 times as long as its apical width, 1.3 times as long as second segment; second segment 3.0 times as long as its maximum width. Third to 20th flagellar segments 2.4–2.7 times and 21st segment 2.2 times as long as their maximum widths, respectively.

Mesosoma 1.25 times as long as high (lateral view). Mesoscutum 0.9 times as long as maximum width. Notauli mainly absent. Mesoscutal pit present, rounded. Prescutellar depression with lateral carinae. Metascutum with white hairs over the lateral fields. Pronotum covered with dirty-white hairs. Precoxal sulcus present, not reaching anterior or posterior margins of mesopleuron. Posterior mesopleural furrow entirely smooth. Metapleuron densely covered with dirty-white hairs hiding the surface, a rosette of radiating hairs around a central swelling. Propodeum densely covered with dirty-white hairs hiding the surface, the hairs tending to radiate around the lateral spiracles.

Wings. Length of forewing 2.4 times its maximum width. Radial cell ending far to the apex of wing, 4.8 times as long as its maximum width. Nervulus postfurcal. Brachial cell closed, widened apically, 2.8 times as long as its maximum width. Hind wing 4.6 times as long as its maximum width.

Legs. Hind coxae with a few longer white hairs, without tuft of hairs. Hind femur 4.75 times as long as its maximum width. Hind tibia weakly widened towards apex, about 9.5 times as long as its maximum subapical width, 1.2 times as long as hind tarsus. First segment of hind tarsus 1.85 times as long as second segment.

Metasoma distinctly compressed. First tergite mainly smooth, very slightly granulated, weakly widened towards apex, 1.75 times as long as its apical width and covered with sparse hairs; dense white hairs at hind corners.

Color. Body dark brown. Legs and pterostigma brown-yellowish. Wings hyaline.

Body length 1.4 mm; forewing length 1.75 mm; antenna length 1.6 times as long as body length.

Female (original description in Fischer et al., 2011). Body length 1.5 mm. Antenna length 1.1 times as long as body length. Antenna 21-segmented. First flagellar segment 4.5 times as long its maximum width; middle segments 3.0 times as long as their maximum width. Hind femur 5.0 times as long as its maximum width. First metasomal tergite 1.6 times as long as its apical width. Face 1.6 times as long as high. Clypeus 3.0 times as wide as high.

Distribution in Iran: Fars Province: Zarghan (Fischer et al., 2011; Khajeh et al., 2014); Kerman Province.

General distribution: Iran.

9. *Chorebus (Stiphrocera) misellus* (Marshall, 1895)

Material captured: Iran: 2 females, Negar, 33°04'130"N, 047°90'07"E, 2087 m, 17.v.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi; 1 female, Kerman Province, Dashtkar, 33°07'360"N, 046°88'86"E, 2084 m, 30.viii.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi.

Distribution in Iran: Semnan Province: Shahrood (Ghahari et al., 2010b); Kerman Province.

General distribution: Afghanistan, Austria, Azerbaijan, Belgium, Czech Republic, Denmark, England, France, Germany, Greece, Hungary, Iran, Italy, Kazakhstan, Mongolia, Poland, Russia, Serbia, Spain, Sweden, Ukraine, and Uzbekistan.

10. *Chorebus parvungula* (Thomson, 1895)*

Material captured: Iran: 1 male, Kerman Province, Lalehzar, 32°67'325"N, 047°69'12"E, 2687 m, 10.viii.2013, swept on *Medicago sativa* L., leg.: S. Ghotbi.

Distribution in Iran: Kerman Province.

General distribution: Belgium, England, Germany, Hungary, Iran (**new record**), Ireland, Kazakhstan, Netherlands, Spain, Sweden, and Ukraine.

11. *Dacnusa (Pachysema) abdita* (Haliday, 1839)*

Material captured: Iran: 1 female, Kerman Province, Qal-eh-Askar, 32°66'211"N, 046°79'47"E, 2628 m, 16.v.2013, swept on *Triticum aestivum* L., leg.: S. Ghotbi.

Distribution in Iran: Kerman Province.

General distribution: Bulgaria, England, France, Germany, Hungary, Iran (**new record**), Ireland, Italy, Mongolia, Netherlands, Poland, Sweden, and Switzerland.

4. Discussion

Because of the scarcity of information on the braconid fauna of Kerman Province, a recent preliminary study of the Alysiinae fauna of this region associated with common field crops has been locally performed. In the

course of this survey of Braconidae of Kerman Province, 4 species of Alysiinae were recorded for the first time from Iran: *Chorebus parvungula* (Thomson 1895), *Dacnusa (Pachysema) abdita* (Haliday 1839), *Dinotrema contracticorne* (Fischer 1974), and *Synaldis ultima* Fischer 1970. The genus *Chorebus* is the largest group of the tribe Dacnusiini, which contains about 215 Holarctic species. *Chorebus longiarticulis* is considered an endemic species (Fischer et al., 2011). In the original description, Fischer et al. (2011) had only found a single female as the type material of *Chorebus longiarticulis*. Here we found and described the male, as well as confirming the existence of these species in alfalfa fields. Almost all the collected species except *Chorebus longiarticulis* are widely distributed in the Palearctic region. A few species such as *Synaldis distracta*, *Chorebus bathyzonus*, and *Chorebus lar* have also been recorded from the Oriental region. The genus *Synaldis* contains 84 known species worldwide (Yu et al., 2012). To date, 4 species of the genus *Synaldis* have been reported from Iran: *Synaldis concolor* (Nees, 1812), *Synaldis distracta* (Nees, 1834), *Synaldis maxima* (Fischer, 1962), and *Synaldis megastigma* Fischer, 1967 (Khajeh et al., 2014). However, some species of this genus are

endemic to the country. Among neighboring countries, several surveying attempts have been made in Russia (Tobias, 1986), very few in Turkey (Fischer et al., 2014), and almost none in the others. It seems that with more sampling, the number of the species of this genus will be increased. Unfortunately, from the viewpoint of faunistic diversity, Kerman Province, located in the southeast of Iran, has been given little attention. In addition, some habitats in other parts of Kerman and parts of southern provinces have not been studied in detail to date. It is also acknowledged that almost all the recorded species in this paper have proven to be potentially useful in biological control programs (Griffiths, 1968; Drea and Hendrickson, 1986). Further taxonomic investigations, together with host association data, are necessary to increase the knowledge of diversity and applicability of this group of insects in Kerman Province and other parts of Iran.

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