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## Review of the leafhopper genus *Euscelis* Brulle (Hemiptera, Cicadellidae, Deltocephalinae) from Iran

Mehdi Khoobdel<sup>id</sup> & Farzad Pakarpour Rayeni\*<sup>id</sup>

Health Research Center, Lifestyle Institute, Baqiyatallah University of Medical Sciences, Tehran, Iran.  
[khoobdel@yahoo.com](mailto:khoobdel@yahoo.com); [pakarpour@gmail.com](mailto:pakarpour@gmail.com)

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**ABSTRACT.** The leafhopper genus *Euscelis* Brulle in Iran comprises three species: *Euscelis alsia* Ribaut, *E. incisa* Kirschbaum and *E. lineolata* Brulle. The fourth species, *E. distinguenda* Kirschbaum is here recorded for the first time from Iran. Diagnostic characters of the species, as well as a male-based key for the identification of the known *Euscelis* in Iran are provided.

**Key words:** Auchenorrhyncha, Athysanini, new record, Hormozgan

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### Introduction

The genus *Euscelis* was established by Brulle (1832) with the type species *Euscelis lineolata* Brulle, 1832. It contains 32 known species worldwide, predominantly occurring in the Palearctic region. This genus is a widespread leafhopper mostly distributed in the Palearctic region. Some species have been recorded as pathogen vectors; for example, *E. incisa* has been recorded as a vector of various mycoplasma-like organisms, such as Clover phyllody (CP), Clover dwarf (CD), Stolure and Parastolbur in various European countries or *E. lineolata* has been identified as a vector of Clover phyllody (CP) and other clover diseases in England (Nickel, 2003; Jakovljević et al. 2020). *Euscelis* differs from other Athysanini by the following combination of characters: aedeagus strip-shaped, flattened dorso-ventrally, without process arising from base and without medial process but at the apex with a pair of process and median excision. Up to now, only three species have been recorded from Iran (Mozaffarian & Wilson, 2016). Pakarpour Rayeni et al. (2015) also listed *Euscelis obsoletus* Kirschbaum from Iran but it appears to have been based on misidentifications. In this paper *E. distinguenda* Kirschbaum collected from Kuh-e Geno (Hormozgan province) is reported first time from Iran. The known species of the genus *Euscelis* from Iran are also taxonomically reviewed and keyed.

Corresponding author: Farzad Pakarpour Rayeni, E-mail: [pakarpour@gmail.com](mailto:pakarpour@gmail.com)

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## Material and methods

Specimens were collected using the sweep net from Kerman, Khuzestan and Hormozgan provinces with different climate, during 2009-2021. Specimens were killed by dropping into standard killing jar containing ethyl acetate and then mounted on the points, labeled and put into collection boxes. Examinations were done under an Olympus SZ40 stereo microscope, Line drawings were made with a drawing tube. All images and line drawings were compiled and photo edited using Corel DRAW X7. The identifications were done according to Ribaut (1952), Anufriev & Emeljanov (1988), Biedermann & Niedringhaus (2009). The specimens were deposited in Jalal Afshar Zoological Museum at University of Tehran (JAZMUT), Iran. Morphological terminology follows Dietrich (2005).

## Results

### *Euscelis* Brulle, 1832

*Euscelis* Brulle, 1832: 109 (Type: *Euscelis lineolata* Brulle, 1832)

**Comment:** The main distinguishing features are given in introduction; also an adequate description is presented by Ribaut (1952).

### Key to species of *Euscelis* Brulle from Iran

1. Apex of aedeagus without appendages and incision (Fig. 2a). ..... *E. lineolata* Brulle  
– Apex of aedeagus with appendages and apical incision more or less deep. .... 2
2. Aedeagus with short appendages reaching incision base (Fig. 2b)..... *E. incise* Kirschbaum  
– Aedeagus with short appendages not reaching incision base. .... 3
3. Apically incision of aedeagus very deep, appendages not reaching till median part of incision (Fig. 2c). ..... *E. distinguenda* Kirschbaum  
– Apically incision more or less deep, appendages reaching till median part of incision (Fig. 2d). ..... *E. alsia* Ribaut

### *Euscelis lineolata* Brulle, 1832 (Fig. 1a)

*Euscelis lineolatus* Blöte, 1927b:34.

*Euscelis plebeja lineolatus* Wagner, 1939:179.

*Euscelis bilobatus* Ribaut, 1952:93.

**Material examined:** Khuzestan province, Dezful, 1♂, 1♀, collected with swept, 27.ix.2014; Ahvaz, Kut-Abdollah, 3♂♂, 7♀♀, swept on weeds in palm orchards, 26.iv.2015; leg.: Farzad Pakarpour Rayeni (JAZMUT).

**Brief description:** Body length in male: 3.7–4.3 mm; in female: 3.9–4.6. Body color light grayish or light yellow, fore wing grayish yellow and with more or less spots especially in males, vertex sometimes with dark spots, and shaft of aedeagus slightly curved, apically without appendages and incision is very small (Fig. 2a).

**Distribution in Iran:** Isfahan and Khuzestan provinces (Dlabola 1981, 1984; Pakarpour Rayeni et al., 2015, 2016); northeast and center of Iran (Mozaffarian & Wilson, 2016).

**General distribution:** Albania, Algeria, Austria, Azerbaijan, Belgium, Bulgaria, Canary Islands, Czech Republic, Estonia, Russia (European part), France, Germany, Great Britain, Greece, Hungary, Ireland, Israel, Italy, Jordan, Latvia, Morocco, Netherlands, Portugal,

Romania, Serbia, Spain, Sweden, Switzerland, Tunisia, United Kingdom, Uzbekistan, former Yugoslavia (Dmitriev, 2003–2021).

***Euscelis incisa* (Kirschbaum, 1858) (Fig. 1b)**

*Athysanus incisus* Kirschbaum, 1858:10.

*Euscelis plebeja incisa* Ribaut, 1952:93.

*Euscelis galiberti* Ribaut, 1952:93.

**Material examined:** Kerman Province, Jiroft, 2♂♂ and 2♀♀, with light trap in palm orchard 2.xii.2009; Khuzestan province, Dezful, 1♂; swept on weeds, 12.ix.2014; Hormozgan province, Kuh-e Geno, 6♂♂ and 10♀♀, 11.iii.2020; leg.: F. Pakarpour Rayeni (JAZMUT).

**Brief description:** Body length in male: 3.1–3.7 mm; in female: 3.5–4.2, body color grayish yellow, fore wing grayish yellow and strongly spotted, vertex with confluent dark spots, shaft of aedeagus slightly curved, apically a pair of small appendages reaching incision base (Fig. 2b).

**Distribution in Iran:** Qom, Hormozgan, Isfahan, Kerman, Tehran Provinces (Dlabola, 1960; Mirzayans, 1995; Pakarpour Rayeni et al., 2015); north, center and south of Iran (Mozaffarian & Wilson, 2016).

**General distribution:** Afghanistan, Albania, Algeria, Altai Mts., Armenia, Austria, Azerbaijan, Belgium, Bohemia, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Russia (European part), Finland, France, Georgia, Germany, Great Britain, Hungary, Iran, Ireland, Israel, Italy, Jordan, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Madeira, Moldova, Moravia, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Siberia, Slovakia, Spain, Sweden, Switzerland, Tunisia, Turkey, Ukraine, United Kingdom, Uzbekistan, former Yugoslavia (Dmitriev, 2003–2021).

***Euscelis distinguenda* (Kirschbaum, 1858) (Fig. 1c)**

*Athysanus distinguendus* Kirschbaum, 1858:8.

*Jassus (Athysanus) distinguendus* Kirschbaum, 1868:111.

*Euscelis distinguenda* Metcalf, 1967:25.

**Material examined:** Kuh-e Geno, 4♂♂ and 3♀♀, 11.iii.2020; leg.: F. Pakarpour Rayeni (JAZMUT).

**Brief description:** Body length in male: 3.4–3.8 mm; in female: 3.5–4.2, body color dark grayish to brown, with dark brown spotted pattern, crown and frontoclypeus with dark stripes, fore wing with light vein with dark spots sometimes fusing together, aedeagus with a pair of laterally appendages at apex and with a deep incision apically.

**Distribution in Iran:** This is a first record of this species from Iran.

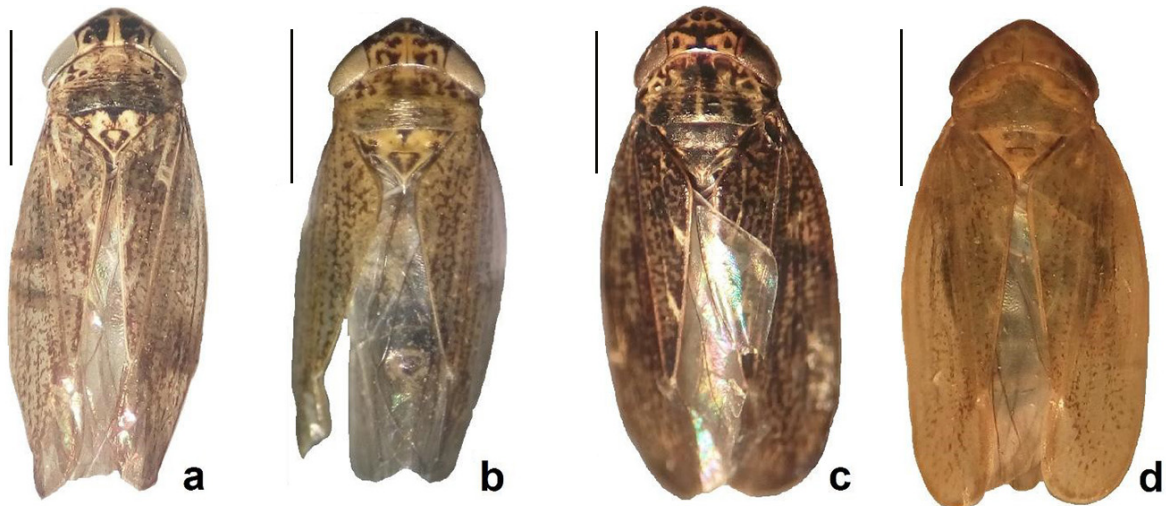
**General distribution:** Albania, Austria, Belgium, Bulgaria, Czechoslovakia, Estonia, Finland, France, Germany, Iraq, Italy, Latvia, Lithuania, Moravia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Sweden, Tunisia, Turkey, Ukraine, former Yugoslavia (Dmitriev, 2003–2021).

***Euscelis alsia* Ribaut, 1952 (Fig. 1d)**

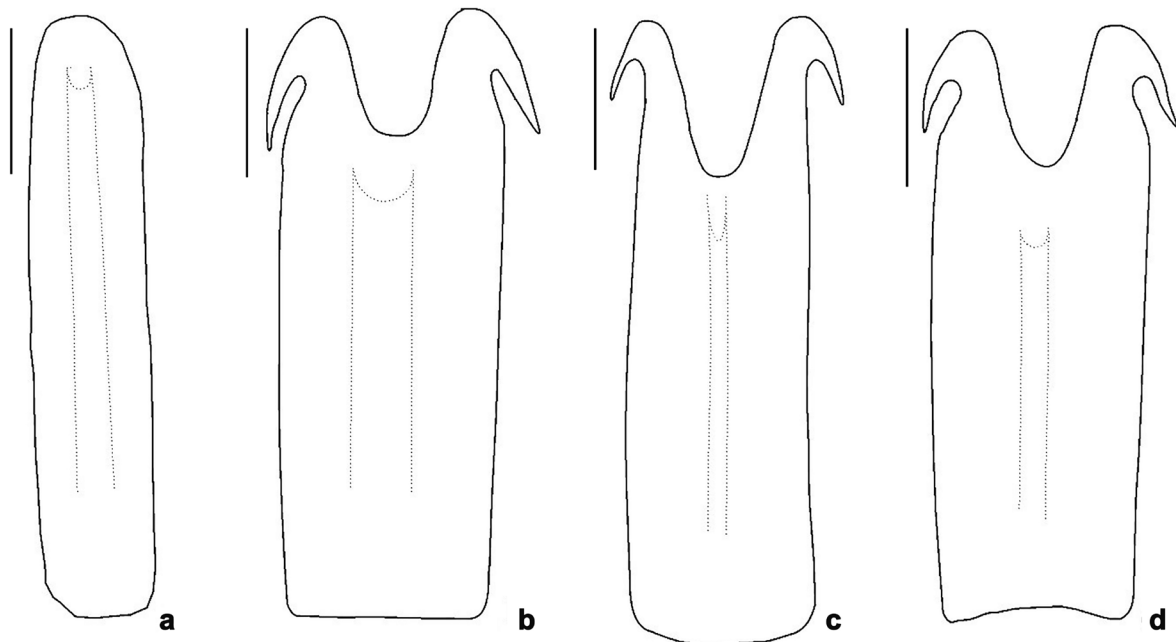
*Euscelis alsius* Ribaut, 1952: 94.

*Euscelis alsia* Metcalf, 1967: 22.

**Material examined:** Kerman Province, Jiroft, 2.xii.2009, 20♂♂ and 12♀♀, by light trap in corn field; Shahdad, 10.iv.2010, 24♂♂ and 13♀♀, swept on Graminae, leg.: F. Pakarpour (JAZMUT); Khuzestan province, Dezful, 3♂♂, 3♀♀, swept on weeds in citrus orchards, 14.iii.2014, Bagh-e-malek, 1♂, 2♀♀, swept on grasslands, 09.ix.2014; Ahvaz, 3♂♂, 4♀♀, swept on *Medicago sativa*, 26.iv.2015; Ahvaz, 1♂, 1♀, swept on *Medicago sativa* in palm orchards, 25.vii.2015, leg.: F. Pakarpour (JAZMUT).



**Figure 1.** General habitus of Iranian *Euscelis* Brulle: **a.** *E. lineolata* Brulle; **b.** *E. incisa* Kirschbaum; **c.** *E. distinguenda* Kirschbaum; **d.** *E. alsia* Ribaut. (scale bar = 1mm).



**Figure 2.** Apex of aedeagus (dorsal view) in Iranian *Euscelis* Brulle: **a.** *E. lineolata* Brulle; **b.** *E. incisa* Kirschbaum; **c.** *E. distinguenda* Kirschbaum; **d.** *E. alsia* Ribaut (scale bar = 500 µm).

**Brief description:** Body length in male: 3.1–3.7 mm; in female: 3.6–4.0, base color of body light grayish or yellow, fore wing grayish yellow and weakly spotted, vertex without or sometimes with weak spots, shaft of aedeagus slightly curved, apically with a pair of appendages reaching median part of incision (Fig. 2d).

**Distribution in Iran:** Fars, Kerman, Khuzestan and Tehran province (Pakarpour Ryeni et al. 2015; 2016); north, northwest, west and southwest of Iran (Mozaffarian & Wilson, 2016).

**General distribution:** Bulgaria, Cyprus, France, Greece, Iran, Israel, Italy, Kazakhstan, Kyrgyzstan, Mongolia, Morocco, Portugal, Russia, Spain, Tajikistan, Turkey, Turkmenistan, Uzbekistan, former Yugoslavia (Dmitriev, 2003–2021).

## Discussion

Some morphological and color variation is found in all population of insects, and this may cause difficulty in assigning certain individuals to one or other species. In *Euscelis* high amount of variability of the male genital structures, size of body and markings caused by environment conditions during their larval development (Remane et al. 2005); for example, *E. inscisa* has spring form and summer form in Europe. In spring form, the specimens have pale body and no appendages have been seen on apex of aedeagus (Biedermann & Niedringhaus, 2009). As a result of this paper, *E. distinguenda* is newly recorded for the fauna of Iran which collected from Kuh-e Geno, Hormozgan province. In Europe this species mainly found in temporarily moist to moderately dry low productivity pastures and meadows and lives on species of Asteraceae, probably *Taraxacum*, *Picris hieracoides*, *Hieracium* and others (Nickel, 2003). At the end, the present study is the first taxonomic work on the genus *Euscelis* in Iran and provides diagnostic species identification tools to be used for future investigations of species of this genus in Iran and adjacent areas. Future faunal research, as well as studies on the host plant associations is necessary for species discrimination and complementary sampling can be recommended. Finally, it seems that the general problem of the high variability in this genus is increased by possible seasonal variability.

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## Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

## ORCID

Mehdi Khoobdel: <https://orcid.org/0000-0003-1355-294X>

Farzad Pakarpour Rayeni: <https://orcid.org/0000-0003-0796-0912>

## References

- Anufriev, G.A. & Emeljanov, A.F. (1988) Suborder Cicadinea (Auchenorrhyncha)- cicadas. In: Lera, P.A. (Ed.), *Key to the Identification of Insects of the Far East USSR. Vol. 2 Homoptera and Heteroptera*. Leningrad, Nauka Publishing House, 495 pp.

- Biedermann, R. & Niedringhaus, R. (2009) *The plant and Leafhoppers of Germany, Identification key to all species*. Wilhelm Brüggemann GmbH, Bremen, 409 pp.
- Brullé, G.A. (1832) IV. Classe. Insectes. In: Brullé, A.G. (Ed.), *Expédition Scientifique de Morée. Section des sciences physiques. Tome III. I. Partie. Zoologie. Deuxième Section. Des animaux articulés*. F.G. Lavrault, Paris, pp. 64–345.
- Dietrich, C.H. (2005) Keys to the families of Cicadomorpha and subfamilies and tribes of Cicadellidae (Hemiptera, Auchenorrhyncha). *Florida Entomologist*, 88 (4), 502–517.  
[https://doi.org/10.1653/0015-4040\(2005\)88\[502:KTTFOC\]2.0.CO;2](https://doi.org/10.1653/0015-4040(2005)88[502:KTTFOC]2.0.CO;2)
- Dlabola, J. (1960) Iranische Zikaden (Homoptera: Auchenorrhyncha). (Ergebnisse der entomologischen Reisen Willy Richter, Stuttgart, in Iran, 1954 und 1956, N: 31). *Stuttgarter Beiträge zur Naturkunde*, 41, 1–24.
- Dlabola, J. (1981) Ergebnisse der tschechoslovakisch-iranischen entomologischen Expeditionen nach dem Iran (Mit Angaben über einige Sammelresultate in Anatolien) (1970 und 1973) (Homoptera, Auchenorrhyncha). II Teil. *Acta Musei Nationalis Pragae*, 40, 127–311.
- Dlabola, J. (1984) Neue Zikadenarten von dem Mediterraneum-Raum und Iran mit weiteren Beiträgen zur iranischen Fauna (Hom, Auchenorrhyncha). *Acta Musei Nationalis Pragae*, 40, 21–63.
- Dmitriev, D. (2003–2021) 3I Interactive Keys and Taxonomic Databases. Available from: <http://dmitriev.speciesfile.org/> (Accessed 18th September 2021).
- Jakovljević, M., Jović, J., Krstić, O., Mitrović, M., Marinković, S., Toceviski, I. & Cvrković, T. (2020) Diversity of phytoplasmas identified in the polyphagous leafhopper *Euscelis incisus* (Cicadellidae, Deltocephalinae) in Serbia: pathogen inventory, epidemiological significance and vectoring potential. *European Journal of Plant Pathology*, 156, 201–221.  
<https://doi.org/10.1007/s10658-019-01878-w>
- Metcalf, Z. P. (1968) *Fascicle VI, Cicadelloidea, Part 17, Cicadellidae. General Catalogue of the Homoptera*. United States Department of Agriculture, Agricultural Research Service, Washington, D.C. 6 (17), 1513 pp.
- Mirzayans, H. (1995) *Insects of Iran, The list of Homoptera: Auchenorrhyncha in the Insect Collection of plant Pests and Diseases Research Institute*. Ministry of Agriculture, Agricultural Research, Iran, 63 pp.
- Mozaffarian, F. & Wilson, M.R. (2016) A checklist of the leafhoppers of Iran (Hemiptera: Auchenorrhyncha: Cicadellidae). *Zootaxa*, 4062 (1), 1–63. <https://doi.org/10.11646/zootaxa.4062.1.1>
- Nickel, H. (2003) *The Leafhoppers and Planthoppers of Germany (Hemiptera, Auchenorrhyncha)*. Patterns and Strategies in a Highly Diverse Group of Phytophagous Insects. Co-published by Pensoft Publishers, Sofia-Moscow Goecke & Evers, Keltern, 460 pp.
- Pakarpour Rayeni, F., Nozari, J. & Seraj, A.A. (2015) A checklist of Iranian Deltocephalinae (Hemiptera: Cicadellidae). *Iranian Journal of Animal Biosystematics*, 11 (2), 121–148.
- Pakarpour Rayeni, F., Seraj, A.A. & Nozari, J. (2016) Contributions to the leafhoppers (Auchenorrhyncha: Cicadellidae) of Khuzestan, southwest of Iran. *Journal of Insect Biodiversity and Systematics*, 2 (2), 229–257.
- Remane R., Bückle C. & Guglielmino A. (2005) *Euscelis venitala* nov. sp., a new *Euscelis* taxon from the Appennine Mountains of Central Italy. *Marburger Entomologische Publikationen*, 3 (3), 1–11.
- Ribaut, H. (1952) *Homopteres Auchenorrhynques, II (Jassidae), Faune de France*, 57. Paul Lechevalier, Paris, 474 pp.

## مطالعه زنجبرک‌های جنس *Euscelis* Brulle (Hemiptera, Cicadellidae, Deltocephalinae) در ایران

مهدی خوبدل و فرزاد پاکارپور رایینی\*

مرکز تحقیقات بهداشت، انستیتو سبک زندگی، دانشگاه علوم پزشکی بقیه الله، تهران، ایران.  
\* پست الکترونیکی نویسنده مسئول مکاتبه: [pakarpour@gmail.com](mailto:pakarpour@gmail.com)

| تاریخ دریافت: ۱۰ خرداد ۱۴۰۰ | تاریخ پذیرش: ۳۰ شهریور ۱۴۰۰ | تاریخ انتشار: ۱۹ مهر ۱۴۰۰ |

**چکیده:** در این پژوهش زنجبرک‌های جنس *Euscelis* Brulle در ایران شامل: *E. lineolata* Brulle و *E. incisa* Kirschbaum، *Euscelis alsia* Ribaut قرار گرفته و همچنین گونه *E. distinguenda* Kirschbaum برای اولین بار از ایران گزارش شده است. ویژگی‌های شکل‌شناسی هر یک از گونه‌ها، تصاویر و ترسیم‌های اصلی به همراه کلید شناسایی ارائه گردیده است.

**واژگان کلیدی:** Auchenorrhyncha، Athysanini، گزارش جدید، هرمزگان