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Short Article

Discovery of the genus *Clanoneurum* Becker, 1903 (Diptera: Ephydridae) in Iran, representing an emerging pest of sugar beet, *Clanoneurum cimiciforme* (Haliday)

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ABSTRACT. The genus *Clanoneurum* Becker, 1903 currently includes two valid species and is distributed across the Afrotropical, Nearctic, Oriental, and Palaearctic regions. This genus and its species, *C. cimiciforme* (Haliday, 1855) are reported for the first time from Iran (North Khorasan Province) as a leaf miner of sugar beet (*Beta vulgaris* L.). This species has also been collected from the mangrove habitats in southern Iran (Bushehr and Hormozgan Provinces) close to the Persian Gulf and the Oman Sea. The morphological characters of the genus and species, along with photographs of adults, immature stages, and symptoms of damage on sugar beet leaves, are presented.

KEYWORDS: *Beta vulgaris*, leaf miner, mangrove habitat, new record, Psilopini, Shore flies

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INTRODUCTION

Sugar beet (*Beta vulgaris* L.) is one of the principal sources of sucrose worldwide and has been cultivated commercially since the eighteenth century (Izzatullayeva et al. 2014). Its cultivation expanded markedly during the twentieth century and is currently practiced in approximately 50 countries across the world. In arable farming systems, sugar beet is commonly grown within three-year crop rotations, typically in combination with cereals such as winter wheat and winter barley. It may also be included in rotations with maize, common bean, potato, or oilseed rape (Märländer et al. 2003; Koga 2008). Although production is primarily concentrated in temperate regions of the Northern Hemisphere, recent advances in agricultural technologies and plant breeding have enabled its winter cultivation in certain tropical areas as well (Sharma et al. 2017).

Several families within the order Diptera include species whose larvae act as leaf miners in sugar beet cropping systems. Among these, the family Anthomyiidae has received the greatest research attention. Leaf-mining species have also been reported from the families Ephydridae, Drosophilidae, and Agromyzidae (Hespenheide 1991). Within Anthomyiidae, members of the genus *Pegomya* Robineau-Desvoidy, 1830 are recognized as the most important leaf miners of sugar beet. However, in Iran, only *Pegomya hyoscyami* (Panzer, 1809) has been reported to date (Pour Rahim et al. 2016).

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The family Ephydridae (shore flies), comprising approximately 2,000 species worldwide (Mathis & Zatwarnicki 1995), plays important ecological roles, functioning both as minor pests and as a food resource for wildlife. Despite their rich diversity, shore flies in the Middle East remain insufficiently studied. Adults can be readily identified based on several diagnostic characteristics: a distinctly convex and protruding face; an unusually large oral opening; the wing venation: two costal breaks and the absence of the anal cell (Mathis & Zatwarnicki 1998). Larvae are typically aquatic or semi-aquatic and often exhibit morphological or physiological adaptations corresponding to their specific habitats. Nevertheless, certain genera inhabiting arid desert regions have been recorded at considerable distances from any visible water source (Dawah et al. 2019).

The genus *Clanoneurum* Becker, 1903 (Ephydridae: Discomyzinae) comprises two valid species and exhibits a distribution spanning the Afrotropical, Nearctic, Oriental, and Palaearctic regions. The species *C. cimiciforme* (Haliday, 1855) is primarily a Palaearctic species, but its range extends to the Afrotropical and Oriental regions. As with the second member of this genus, this species appears to be associated with plants of the family Chenopodiaceae. Although the morphology of the immature stages and the biology of this species remain mostly unknown, its immature stage illustrations and the preliminary biological observations of *C. americanum* have been documented and examined by de Meijere (1947) and Wheeler (1982). However, there have been some studies conducted in recent years reporting this species from regions close to Iran. Mathis et al. (2017) provided identification keys to the genera of Ephydridae, the tribe Psilopini, and also presented the diagnostic characteristics of *C. cimiciforme* as a new record from the United Arab Emirates. In their study of the family Ephydridae, Dawah et al. (2019) reported this species from Saudi Arabia.

The aim of this study is to report the genus *Clanoneurum* and the species *C. cimiciforme*, for the first time from Iran, emphasizing that the larvae of this species should be recognized as an emerging leaf-miner pest in Iran and added to the list of known sugar beet pests in the country.

MATERIAL AND METHODS

Leaves of sugar beet infested by *C. cimiciforme* larvae were sampled in the summer of 2025 from Hesar Garmkhan, Bojnord, North Khorasan Province (northeastern Iran) (Fig. 1). The samples were transferred to insect rearing containers and maintained at room temperature until the emergence of adults. The adult flies were preserved in 75% ethanol and sent to the Insect Taxonomy Research Department in Tehran for identification. Other specimens were collected from the mangrove forests in southern Iran using yellow pan traps (Fig. 4).

To prepare the specimens and prevent shrinkage after ethanol preservation, we followed the AXA method proposed by van Achterberg (2009). The specimens were subsequently mounted on cardboard cards, and labels indicating the collection site were affixed. The field photographs were taken using a mobile phone, Samsung A50, while adult specimens were photographed in the laboratory using a Canon 650D camera. All specimens are deposited in the Hayk Mirzayans Insect Museum [HMIM], Insect Taxonomy Research Department, Tehran. Accurate genus and species identification was conducted using reliable taxonomic literature. The morphological terminology used in this paper follows Mathis et al. (2021).

RESULTS

Class Insecta Linnaeus, 1758

Order Diptera Linnaeus, 1758

Suborder Brachycera Zetterstedt, 1842

Family Ephydridae Zetterstedt, 1837

Subfamily Hydrelliinae Robineau-Desvoidy, 1830

Tribe Psilopini Cresson, 1925

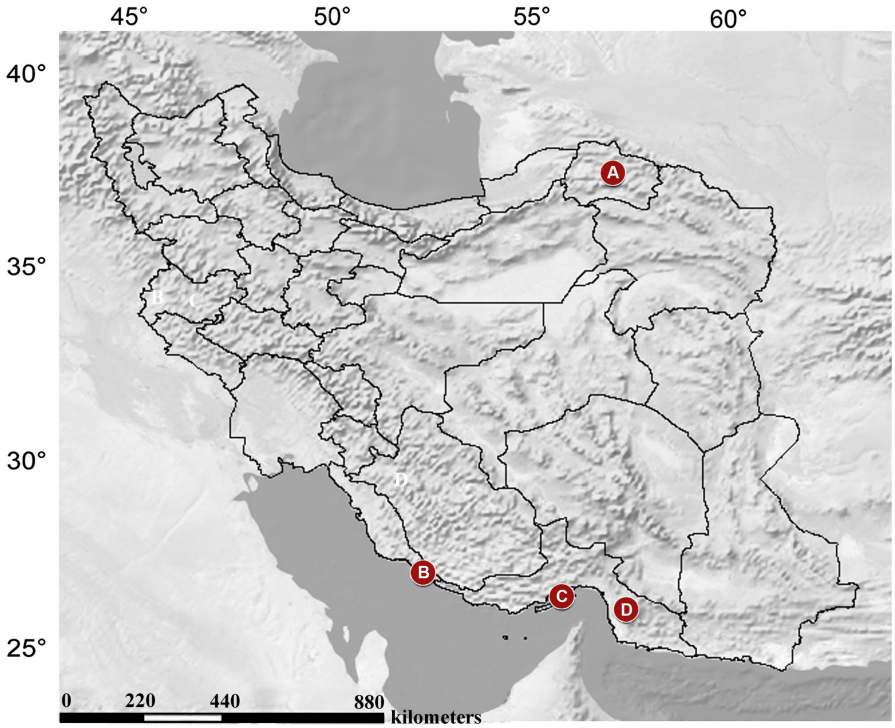

Figure 1. Distribution of *Clanoneurum cimiciforme* in Iran. **A.** Bojnord, Hesar-e Garmkhan (North Khorasan Province); **B.** Nayband (Busheher Province); **C.** Qeshm Island (Hormozgan Province); **D.** Sirik (Hormozgan Province).

Genus *Clanoneurum* Becker, 1903

Clanoneurum Becker, 1903:165. **Type species**. *Clanoneurum infumatum* Becker, 1903 [= *Discomyza cimiciforme* Haliday, 1855], by monotypy.

***Diagnosis*.** Face flat and wrinkled; antenna shorter than eye; antennal base arising from lower part of head; scape oriented anteriad, with a slight ventral inclination; pedicel and postpedicel similarly oriented ventrally, forming an obtuse angle with scape; postpedicel approximately twice as long as its height; reclinate and proclinate fronto-orbital setae present; wing venation distinctive: R_{2+3} runs along the Costa; discal medial crossvein (dm–m) with sharp angle medially.

Clanoneurum cimiciforme (Haliday, 1855)

Discomyza cimiciforme Haliday, 1855:124.

[Figs 2, 3]

Diagnosis (Fig. 2C–D). Body length 1.50–2.35 mm; generally black with shiny metallic reflections ranging from green to copper; head in lateral view two times as long as wide, with a flattened anterior surface; eye highly elongated, ranging in orientation from oblique to almost vertical; interfrons, fronto-orbital plate and face distinctly wrinkled; scape and apex of postpedicel black, other parts of antenna yellowish-orange; arista with 8–11 dorsal setulae; anepisternum strongly wrinkled; wing infuscate, occasionally becoming darker toward the base; halter brownish-black; femora and tibiae, except at their apices, black; tarsi yellow to yellowish-brown; abdominal tergites entirely black, with only sparse microtomentum and exhibit a mostly shiny metallic appearance.

Material examined*.** (Reared from *Beta vulgaris*): 1 ♂, 2 ♀♀ (glued to card point), IRAN: North Khorasan Province, Bojnord, Hesar-e Garmkhan, 37°30'47.4"N 057°29'21.9"E, 5.VIII.2025, 1150 m, reared from *Beta vulgaris*, leg. E. Hamidi [HMIM]. ***Other examined material. 1 ♀, (glued to card point), IRAN: Bushehr Province, Asaluyeh, Nayband, 27°24'45"N 052°40'09"E, 6–8.XI.2021, –10 m, leg. E. Gilasian [HMIM]; 2 ♂♂ 2 ♀♀ (glued to card point), Hormozgan Province, Sirik, Azini Wharf, 26°19'39.9"N 057°06'15.9"E, 13.V.2022, 0 m, leg. M. Mofidi Neyestanak [HMIM]; 3 ♂♂ 2 ♀♀ (glued to card point), Hormozgan Province, Qeshm Island, Kovarzin, 26°48'39"N 055°46'38"E, 3–4.XI.2021, 0 m, leg. E. Gilasian [HMIM].

Distribution. **Afrotropical** (Oman, United Arab Emirates, Yemen); **Oriental** (Taiwan); **Palaearctic**: Europe (Austria, Belgium, Bulgaria, Croatia, Cyprus, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Malta, Poland, Portugal, Romania, Russia (European Territory), Slovakia, Spain, Turkey); North Africa (Algeria, Canary Islands, Egypt, Morocco, Tunisia); Middle East: Iraq, Israel; Near East: Saudi Arabia (Mathis & Zatwarnicki 1995; Mathis et al. 2017; Dawah et al. 2019).

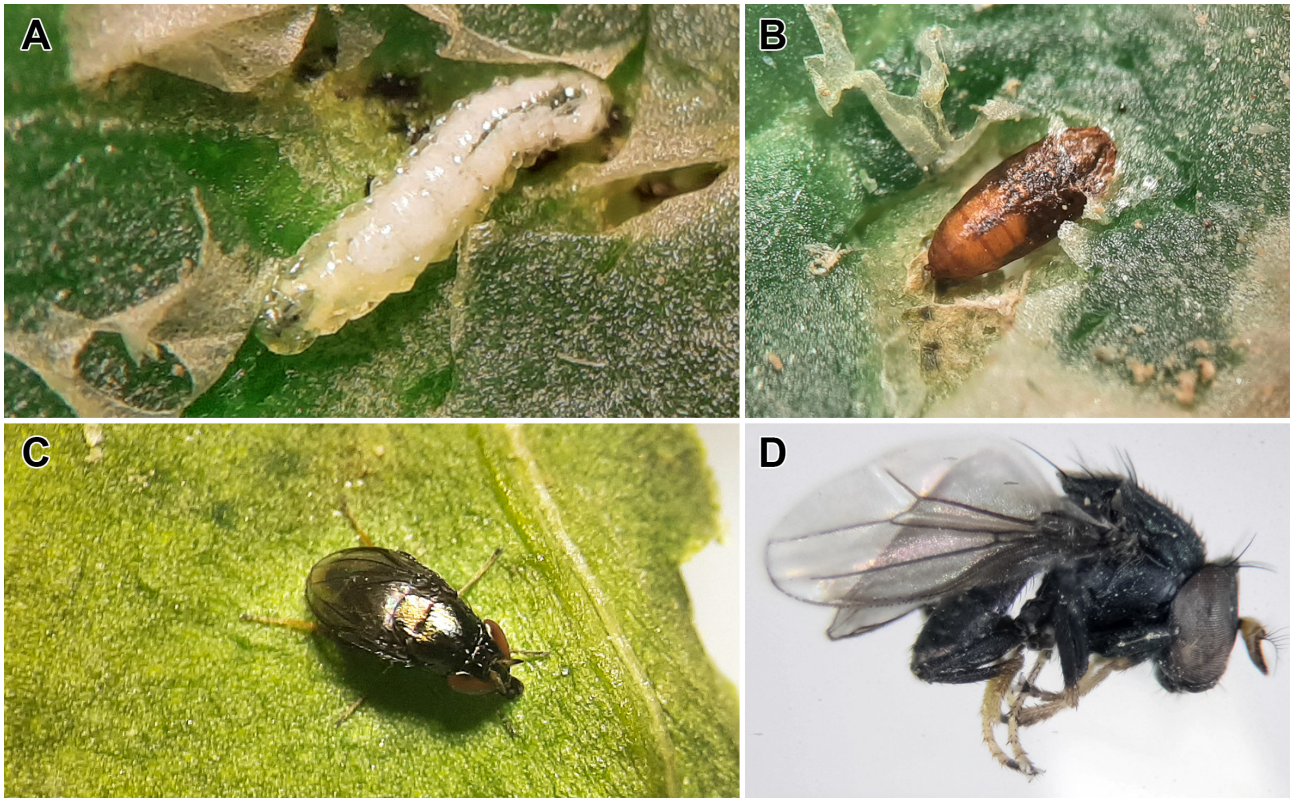

Figure 2. *Clanoneurum cimiciforme* (Haliday). **A.** Larva; **B.** Pupa; **C–D.** Habitus.

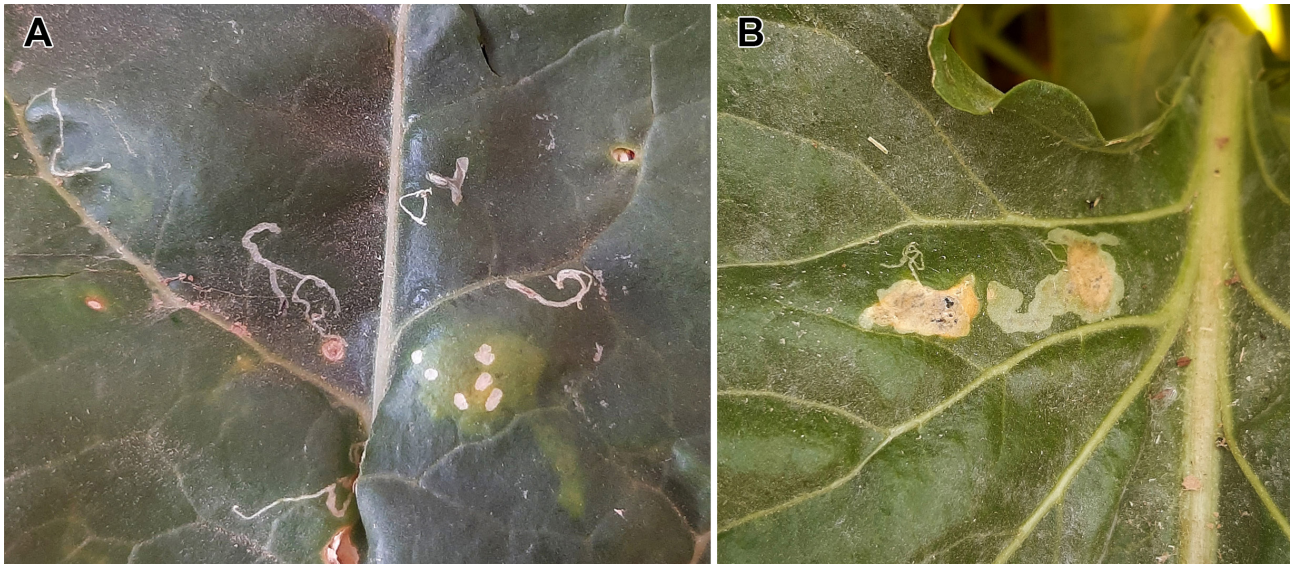

Figure 3. Damage symptoms on sugar beet leaves caused by *Clanoneurum cimiciforme* (Haliday).

Figure 4. Yellow pan traps used in mangrove habitats, Hormozgan Province.

DISCUSSION

The genus *Clanoneurum* comprises two valid species: *C. cimiciforme* and *C. americanum* Cresson, 1940, which are distributed, respectively, across the Old World, encompassing the western Palaearctic, Afrotropical and Oriental regions (including Taiwan), and the New World, specifically the Nearctic region of North America (Mathis & Zatwarnicki 1995). *Clanoneurum menozzii* Séguy, 1929, and *C. orientale* Hendel, 1913, were proposed as synonyms of *C. cimiciforme* by Canzoneri & Meneghini (1983) and Cresson (1925), respectively, a taxonomic placement that remains valid today.

Based on published reports, the host plants of this genus belong to the family Chenopodiaceae. Genera within this family that have previously been reported as hosts of *C. cimiciforme* include *Atriplex*, *Beta*, *Salicornia*, and *Suaeda* (Enderlein 1936; de Meijere 1947; Pitkin et al. 2019; Kita et al. 2022). Available evidence indicates that leaf-mining damage on sugar beet is attributable not only to *C. cimiciforme* but also to species of *Diasemocera leucostoma* (Meigen, 1830), historically referred to as *Psilopa leucostoma* in the literature. Such incidents have been documented across Europe and North America (Hering 1962; Krämer 1961, 1962; Landis et al. 1967). While both taxa produce superficially similar patterns of foliar injury, the larval tunnels of *C. cimiciforme* exhibit parallel margins and expand in a uniform manner, in contrast to the more irregular and non-uniformly expanding galleries formed by *D. leucostoma* larvae. During the summer of 2025, scattered symptoms of leaf damage consistent with mining activity were observed in sugar beet fields (Fig. 3) in northeastern Iran, specifically in North Khorasan Province. The vermiform larvae of this species are creamy white in color, and the brown pupae are formed within the same leaf mine where larval feeding takes place (Fig. 2A–B). The preliminary drawings of the immature stages of this species were made by de Meijere (1947), who

illustrated the early form of the pupa along with the structure of the anterior spiracles and the larval pharyngeal skeleton with mouth hooks. Following the collection of infested leaves and their maintenance under laboratory conditions, adult specimens were obtained and identified as *C. cimiciforme*. Although field observations currently indicate that the level of damage inflicted by this species on sugar beet is not economically significant, there is a potential risk that its distribution range and impact may increase in the coming years, potentially extending to other sugar beet–growing regions. Therefore, the implementation of monitoring, early detection, and preventive management strategies is considered essential to mitigate the risk of further spread and establishment of this pest within the country.

Specimens of this species had also previously been collected in 2021 and 2022 from mangrove habitats in southern Iran close to the Persian Gulf and Oman Sea using yellow pan traps (Fig. 4). The proximity of the deployed traps to plants belonging to the family Chenopodiaceae in these areas further supports the likelihood of a host association between this species and members of this plant family in those habitats.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: E. Gilasian: Conceptualization, methodology, investigation, draft preparation, final review and edit, visualization; E. Hamidi: Methodology, investigation, visualization. Both authors read and approved the final version of the manuscript.

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This research received no specific grant from any funding agencies.

AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the Hayk Mirzayans Insect Museum, Tehran, Iran, and are available from the curator upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study only included arthropod material, and all required ethical guidelines for the treatment and use of animals were strictly adhered to in accordance with international, national, and institutional regulations. No human participants were involved in any studies conducted by the authors for this article.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

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

GENERATIVE AI STATEMENT

No generative AI tools were used in the preparation of this paper.

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کشف جنس *Clanoneurum* Becker, 1903 (Diptera: Ephydridae) در ایران، بر اساس گزارش گونهٔ *Clanoneurum cimiciforme* (Haliday)، به عنوان آفت نوظهور چغندرقند

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انتشار: ۲۰ اردیبهشت ۱۴۰۵

چکیـده: جنس *Clanoneurum* Becker, 1903 در حال حاضر شامل دو گونه معتبر است که در مناطق آفروتروپیکال، نئارکتیک، خاورزمین و پالئارکتیک انتشار دارند. این جنس و گونه‌ای از آن به نام *C. cimiciforme* (Haliday, 1855) برای اولین بار از ایران (استان خراسان شمالی) به عنوان مینوز برگ چغندرقند (*Beta vulgaris* L.) گزارش می‌شود. این گونه همچنین از زیستگاه‌های مانگرو در جنوب ایران (استان‌های بوشهر و هرمزگان) نزدیک به خلیج فارس و دریای عمان جمع‌آوری شده است. ویژگی‌های ریخت‌شناسی جنس و گونه، همراه با تصاویر حشرات کامل، مراحل نابالغ و علایم خسارت روی برگ‌های چغندرقند ارایه شد.

واژگـان کلیدی: چغندر قند، مینوز برگ، زیستگاه مانگرو، رکورد جدید، Psilopini، مگس‌های ساحلی