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First record of *Leucania herrichii* Herrich-Schäffer from Iran with new distribution data of Leucaniini (Lep., Noctuidae)

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ABSTRACT. The larvae of certain species in the Noctuidae family cause significant economic damage annually. Due to the importance of this group, specimens of the subfamily Noctuinae, specifically from the tribe Leucaniini, collected from the Fars, Ilam, Kerman and Khuzestan provinces were studied. As a result, among the nine identified and studied species from the genera *Mythimna* and *Leucania*, four species from Khuzestan province, three species from Ilam province and one species from Fars province were registered as new provincial records. Additionally, the distribution of *Leucania* (*Leucania*) *herrichii* Herrich-Schäffer, 1849 was confirmed for the first time in Iran. Further studies on this tribe in different parts of Iran are recommended.

Keywords: distribution, fauna, moth, *Mythimna*, new record

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INTRODUCTION

At least 1,500 species in the superfamily Noctuoidea are considered economically important (Zhang, 1994). The Larvae of these species cause significant damage to both natural and artificial habitats annually (Kitching, 1984; Zahiri et al., 2011). Many species of the superfamily Noctuoidea belong to what is referred to as the "pest clade" by Mitchell et al. (2006), which includes members of subfamilies such as Heliothinae and Noctuinae, within the Noctuidae family. Given the importance of these groups, various taxa have been the focus of our studies over the past 15 years (e.g. Esfandiari et al., 2011; Mehravar et al., 2017; Shahreyari-Nejad et al., 2024). In this study, we aim to examine specimens of the tribe Leucaniini (Noctuinae), housed in the "Insects and Mites Collection of Ahvaz (IMCA)". This tribe includes significant pest species such as *L. loreyi* (Jalaeian et al., 2017). Currently, 26 species of this tribe have been listed from Iran (Rajaei et al., 2023).

MATERIAL AND METHODS

All studied specimens have been deposited in the "IMCA", located in the Department of Plant Protection, at Shahid Chamran University of Ahvaz, Iran. The specimens were primarily collected using light traps,

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which consisted of a UV lamp (8 W - Hitachi) mounted on top of a funnel placed over a bucket, with electricity supplied by a 12V battery. Species identification was conducted by examining wing patterns and genitalia, referencing taxonomic descriptions in literature (Hacker et al., 2002; Lödl et al., 2012), and comparing identified specimens available in IMCA. Photos of adults were taken using a Canon® EOS 600D digital camera. Genital organs were extracted and mounted on microscopic slides using Euparal as the medium. The slides were dried in an oven and subsequently photographed using a Canon® SX40 digital camera mounted on an Olympus® SZX12 stereomicroscope.

RESULTS

As a result, among the nine identified species from the genera *Mythimna* and *Leucania*, four species from Khuzestan province, three species from Ilam province, and one species from Fars province were new records to the fauna of these provinces. Additionally, the distribution of *Leucania* (*Leucania*) *herrichii* Herrich-Schäffer was confirmed for the first time in Iran.

Taxonomic hierarchy

Class Insecta Linnaeus, 1785

Order Lepidoptera Linnaeus, 1785

Family Noctuidae Latreille, 1809

Subfamily Noctuinae Latreille, 1809

tribe Leucaniini Guenée, 1837

Genus *Mythimna* Ochsenheimer, 1816

***Mythimna vitellina* (Hübner, 1808)**

Material examined. ILAM: 1♀ 1♂, Manesht and Ghelarang, 33°34'47"N, 46°33'52"E, 1719m, 15.v.2018, leg. M. Ahmadi; same data, 1♀, 3.vi.2018; same data, 1♀ 1♂, 12.v.2019; 2♀♀ 1♂, Manesht and Ghelarang, 33°34'33"N, 46°36'15"E, 2215m, 13.v.2019, leg. M. Ahmadi; 4♀/♂, Kabirkuh, 33º03′56″N, 47º18′57″E, 1700m, 10.v.2019, leg. M. Ahmadi. KHUZESTAN: 3♀♀ 1♂, Baghmalek, Malaqa, 31°23'03"N, 50°09'13"E, 1100m, 27.iv.2011, leg. M. Esfandiari; same data, 1♀ 1♂, 20.v.2012; same data, 1♀, 9.iv.2015; 1♀, Shelal, 32°16'19"N, 49°33'07"E, 954m, 3.v.2019, leg. M. Ahmadi; 1♀, Imamzadeh Abdollah, 31°23'10"N, 50°09'29"E, 2118m, 6.v.2019, leg. M. Ahmadi.

Remarks. This species is new to the fauna of Khuzestan and Ilam provinces.

***Mythimna l-album* (Linnaeus, 1767)**

Material examined. FARS: 1♀, Firuzabad, 28°59'54"N, 52°31'26"E, 1540m, 30.viii.2008, leg. M. Esfandiari. ILAM: 1♂, Manesht and Ghelarang, 33°34'47"N, 46°33'52"E, 1719m, 19.vii.2018, leg. M. Ahmadi; same data, 1♂, 15.v.2018; 1♀, Kabirkuh, 33º03′56″N, 47º18′57″E, 1700m, 12.v.2018, leg. M. Ahmadi; KHUZESTAN: 1♀, Baghmalek, Malaqa, 31°23'03"N, 50°09'13"E, 1100m, 26.vii.2011, leg. M. Esfandiari; same data, 1♂, 22.iv.2015; 1♀, Izeh, Karun-3 Dam, 31°46'54"N, 50°06'13"E, 900m, 4.v.2011, leg. M. Esfandiari; 1♂, Shelal, 32°16'19"N, 49°33'07"E, 954m, 3.v.2019, leg. M. Ahmadi; 1♀, Imamzadeh Abdollah, 31°22'24"N, 50°07'51"E, 1407m, 27.v.2018, leg. M. Ahmadi; same data, 1♂, 25.v.2018.

Remarks. This species is new to the fauna of Khuzestan and Ilam provinces.

***Mythimna* (*Pseudaletia*) *unipuncta* (Haworth, 1809)**

Material examined. KHUZESTAN: 2♀♀, Baghmalek, Malaqa, 31°23'03"N, 50°09'13"E, 1100m, 20.viii.2011, leg. M. Esfandiari.

Mythimna (*Hyphilare*) *ferrago* (Fabricius, 1787)

Material examined. FARS: 1♀ 1♂, Nurabad, 29°55'56"N, 51°35'52"E, 1100m, 16.ix.2011, leg. M. Esfandiari; same data, 2♀, 4.x.2011; 2♀♀, Kamfiruz, 30°20'28"N, 52°13'13"E, 1720m, 25.viii.2011, leg. M. Esfandiari; 1♀, Kazerun, 29°29'24"N, 51°58'23"E, 1680m, 27.ix.2011, leg. M. Esfandiari. KHUZESTAN: 1♂, Baghmalek, Malaqa, 31°23'03"N, 50°09'13"E, 1100m, 16.x.2011, leg. M. Esfandiari; same data, 12♀/♂, 8.ix.2011.

Remarks. This species is new to the fauna of Khuzestan province.

Mythimna (Hyphilare) congrua (Hübner, [1817])

Material examined. KHUZESTAN: 2♀♀, Shushtar, 32°8'18"N, 48°32'19"E, 50m, 30.viii.2011, leg. M. Esfandiari.

Genus *Leucania* Ochsenheimer, 1816

Leucania (*Leucania*) *herrichii* Herrich-Schäffer, 1849 (Figs 1, 2)

Material examined. FARS: 10♀/♂, Tang-e abolhayat, 29°44'02"N, 51°46'58"E, 1310m, 29.ix.2011, leg. M. Esfandiari; 3♀♀ 3♂♂, Qir-o-Karzin, 28°26'36"N, 53°10'11"E, 860m, 22.ix.2011, leg. M. Esfandiari; 4♀♀ 1♂, Kamfiruz, 30°20'28"N, 52°13'13"E, 1720m, 25.viii.2011, leg. M. Esfandiari. ILAM: 1♂, Manesht and Ghelarang, 33°34'47"N, 46°33'52"E, 1719m, 10.ix.2018, leg. M. Ahmadi. KERMAN: 1♀, Baft, Khabr, 28°39'43"N, 56°26'50"E, 1920m, 14.ix.2015, leg. S. Shahreyari-Nejad; 1♀, Baft, Dehsard, 28°40'39"N, 56°33'02"E, 1811m, 15.x.2015, leg. S. Shahreyari-Nejad; 1♀, Jiroft, Hishin, 28°38'23"N, 57°56'43"E, 1341m, 23.ix.2015, leg. S. Shahreyari-Nejad. KHUZESTAN: 4♀♀ 1♂, Baghmalek, Malaqa, 31°23'03"N, 50°09'13"E, 1100m, 16.x.2011, leg. M. Esfandiari; 2♀♀ 1♂, Shelal, 32°16'19"N, 49°33'07"E, 954m, 19.ix.2018; leg. M. Ahmadi; 2♂♂, Imamzadeh Abdollah, 31°22'24"N, 50°07'51"E, 1407m, 23.ix.2018, leg. M. Ahmadi.

Morphological characters. The head, thorax and forewings are dark brown, whole the abdomen is lighter. The antennae are filiform. The terminal area and center of the median area are darker. Crosslines are darker, somewhat wide, and undulating, with a prominent black basal dash; the reniform stigma narrows to a small white spot at outer part of the cell, orbicular and claviform stigmata are absent. Terminal spots are indistinct. The hindwings creamy white with slender brown margin in male, whereas in female, the marginal field and veins are distinctly darker with a slight greyish brown suffusion toward the outer margin. Transverse lines are indistinct on the underside of the forewings, and the underside of the hindwings is whiter with no pattern (Fig. 1A–B).

Male genitalia. The valve has an arciform outer margin, with the cucullus having an ovate outer margin and being pressed at the neck, and lacking corona. The harpe is long and slender, crossing the costal edge of the valva. The ampulla is elongated and pointed toward the outer valval edge (Fig. 2A). The vinculum is V-shaped and attached to a long tegumen and ends in a long and tapered uncus. The juxta is short and wide. The sacculus is short, and slightly convex, with a small clavus. The aedeagus is wider and rounded at caecum side and curved in the middle. The vesica is tubular and very long, medially curved, with somewhat broad and long cornuti area. The terminal part is narrow (Fig. 2B).

Female genitalia. The ovipositor is robust with long and narrow gonapophyses. The ostium bursae is somewhat broad, tapering, and evenly sclerotized. The ductus bursae is elongated and tube-shaped, decorated by longitudinal ribs. The appendix bursae broad and short with longitudinal ribs on the proximal part, compared to the ductus bursae (Fig. 2C).

Diagnosis. According to Hacker et al. (2002), *L. herrichii* is closely related and similar to *L. punctosa* (Treitschke) and *L. putrescens* (Hübner) (both occurring in Iran) in its habitus but differs by having wider and larger forewings with more pronounced crosslines and a generally darker colouration. In the male genitalia, *L. herrichii* differs from *L. punctosa* by having a larger cucullus and a shorter vesica with a shorter field of cornuti. The female genitalia of *L. herrichii* has shorter ductus and appendix bursae than those of *L. punctosa*. The male genitalia of *L. herrichii* differ from those of *L. putrescens* in having a longer ampulla, a less rounded cucullus, a slightly shorter and wider field of the cornute, and a shorter terminal cornutus on the vesica.

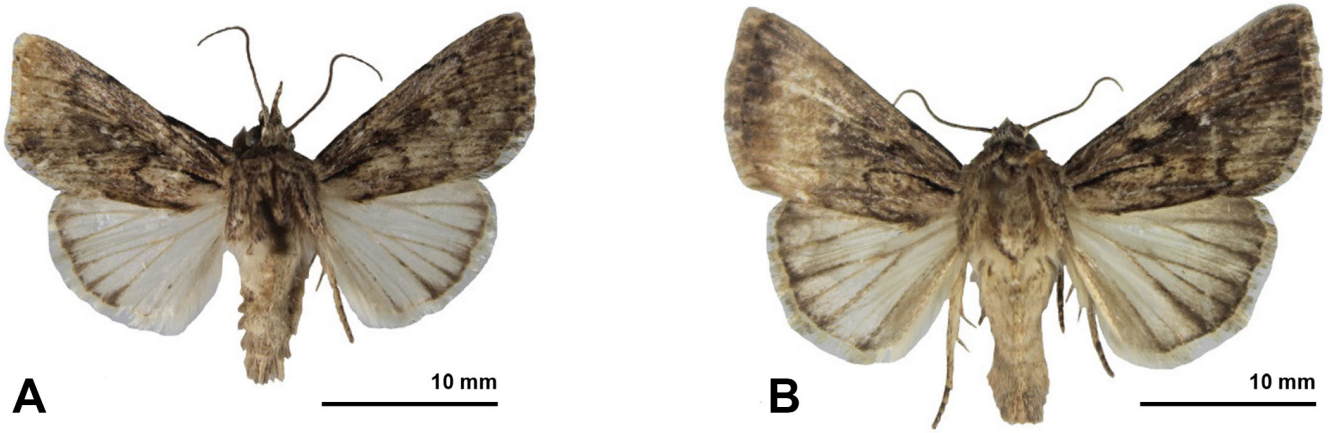

Figure 1. Wing pattern of *Leucania herrichii* Herrich-Schäffer, 1849. **A.** Male (Fars, Qir-o-Karzin); **B.** Female (Fars, Tang-e abolhayat).

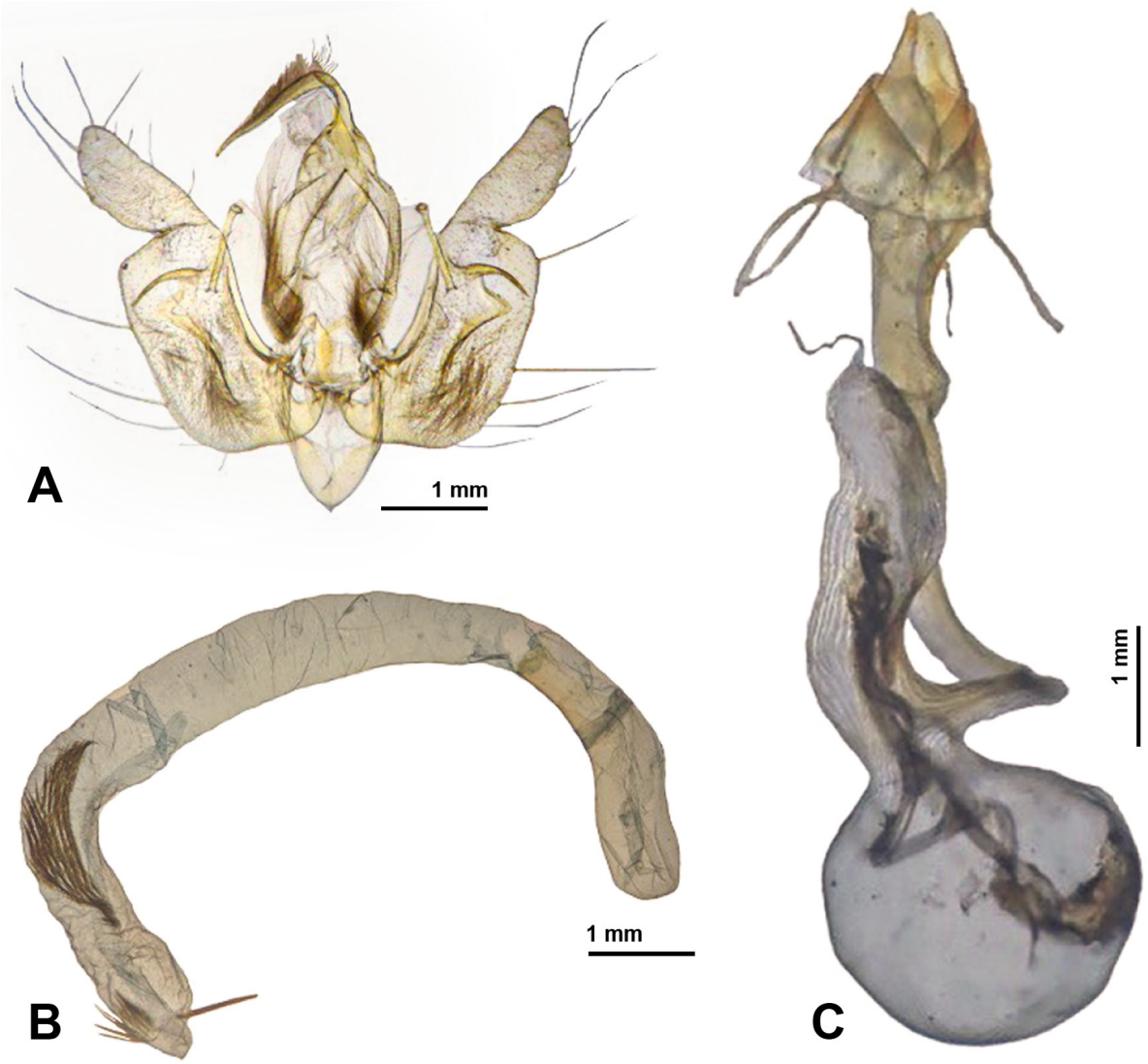

Figure 2. Genitalia structure of *Leucania herrichii* Herrich-Schäffer, 1849. **A.** Armature (Fars, Qir-o-Karzin, genitalia preparation: 1/11.12.2014); **B.** Aedeagus; **C.** Female genitalia (Fars, Tang-e abolhayat, genitalia preparation: 3/11.10.2014).

Bionomics. This univoltine species is active from August to mid-autumn. It inhabits xerophilic and thermophilic biotopes, preferring medium altitudes. The early stages and bionomics are unknown. The larval host plants are probably Poaceae species (Hacker, 2001; Hacker et al., 2002).
Distribution. *Leucania herrichii* ranges from Bulgaria and Greece to Turkmenistan (Hacker et al., 2002), and is also present in Iran (**New record**).

Leucania (*Leucania*) *zeae* (Duponchel, 1827)

Material examined. ILAM: 1♀, Manesht and Ghelarang, 33°34'47"N, 46°33'52"E, 1719m, 10.ix.2018, leg. M. Ahmadi. KHUZESTAN: 4♀♀ 3♂♂, Baghmalek, Malaqa, 31°23'03"N, 50°09'13"E, 1100m, 16.iv.2012, leg. M. Esfandiari; 1♂, Shelal, 32°16'19"N, 49°33'07"E, 954m, 23.v.2018, leg. M. Ahmadi.

Remarks. This species is new to the fauna of Ilam province.

Leucania (*Leucania*) *putrescens* (Hübner, [1824])

Material examined. FARS: 4♀♀, Sepidan, 30º21′22″N, 52º03′36″E, 2300m, 21.vii.2011, leg. M. Esfandiari; 1♀ 2♂♂, Nurabad, 29°55'56"N, 51°35'52"E, 1100m, 3.xi.2011, leg. M. Esfandiari; 2♀♀ 2♂♂, Kazerun, 29°29'24"N, 51°58'23"E, 1680m, 27.x.2011, leg. M. Esfandiari. KHUZESTAN: 1♀, Baghmalek, Malaqa, 31°23'03"N, 50°09'13"E, 1100m, 16.x.2011, leg. M. Esfandiari.

Remarks. This species is new to the fauna of Khuzestan and Fars provinces.

Leucania (Acantholeucania) loreyi (Doponchel, 1827)

Material examined. ILAM: 1♀ 1♂, 12.v.2018, Kabirkuh, 33º03′56″N, 47º18′57″E, 1700m, 10.v.2019, leg. M. Ahmadi. KHUZESTAN: 9♀/♂, Baghmalek, Malaqa, 31°23'03"N, 50°09'13"E, 1100m, 30.vii.2011, leg. M. Esfandiari; 1♀, 2♂♂, Shushtar, 32°8'18"N, 48°32'19"E, 50m, 3.xi.2012, leg. M. Esfandiari; 1♂, Gotvand, 32°11'10"N, 48°45'24"E, 85m, 28.ix.2011, leg. M. Esfandiari; 6♀/♂, Shelal, 32°16'19"N, 49°33'07"E, 954m, 3.v.2019, leg. M. Ahmadi.

DISCUSSION

Most of the species of the tribe Leucaniini belong to the *Mythimna* and *Leucania* lineage. The separation of these genera is based on a key feature in the male genitalia: *Mythimna* has a corona on the cucullus, while *Leucania* has secondarily lost it, which is considered a synapomorphic feature (Hacker et al., 2002). Apart from *Anapoma riparia* (Rambur), the other 25 species of Leucaniini in Iran belong to the *Mythimna* – *Leucania* complex (Rajaei et al., 2023). Although Hacker et al. (2002) included Iran in the distribution range of *L. herrichii* in the Ponto-Mediterranean area, no confirmed record was available for this occurrence in Iran until now. This is the reason why Rajaei et al. (2023) did not include this species in the recent catalogue of "Lepidoptera Iranica".

Leucania herrichii and its similar species *L. punctosa* and *L. putrescens* are all univoltine, with larvae feeding on various grasses (Hacker et al., 2002). *Leucania putrescens* has been recorded from Ardabil, Hormozgan (Rajaei et al., 2023) Khuzestan and Fars (this study). *L. punctosa* is distributed in Fars, Kerman, Tehran and Gilan (Rajaei et al., 2023). *Leucania herrichii* is found in sympatric distribution with *L. putrescens* and *L. punctosa* in the southern provinces. All nine studied species of Leucaniini feed on various grasses of the Poaceae family, with some, such as *L.* zeae, *L. loreyi*, *Mythimna vitellina*, *M. unipuncta*, and *M. congrua* reported as pest of maize (Hacker et al., 2002). The heavily sclerotized papillae anales of the ovipositor, which is one of the strongest synapomorphies of the tribe, help members of Leucaniini to oviposit in grasses. These species mostly prefer dry biotopes and are xero- and thermophilous. However, *M. ferrago* and *M. l-album* can be found at rather high altitudes (Hacker et al., 2002), and *L. loreyi* has a wide distribution range in 15 provinces (Rajaei et al. 2023) and has been recorded as a pest of crops in Iran along with *M. unipuncta* (Khanjani, 2004).

As mentioned earlier, some species of the genera *Mythimna* and *Leucania* have been reported as plant feeders and pests (Esfandiari et al., 2011; Jalaeian et al., 2017). For example, *Leucania loreyi* and

Mythimna unipuncta, which were collected in sugarcane fields of Khuzestan province, have been previously recorded as sugarcane feeders in other countries (Kumarasinghe, 2002; Esfandiari et al., 2011). *Leucania loreyi* was also recorded as a pest of maize and rice in Iran (Jalaeian et al., 2017). These species may use sugarcane as an alternative host when their primary hosts, such as maize, wheat, rice, and sorghum, which are of short duration, are harvested. Species like *L. loreyi, L. zeae* and *M. unipuncta* have all been recorded as maize feeders in Iran (Khanjani, 2004). Therefore, it is necessary to properly study these genera, given their economic importance.

Many studies have been conducted on the Noctuidae fauna of Iran by both European and Iranian researchers (e.g., Ebert & Hacker, 2002; Ahmadi et al., 2021; Esfandiari & Rabieh, 2022; Esfandiari et al., 2022; Shahreyari-Nejad et al., 2023). The results of these studies were summarized in the recently published catalogue "Lepidoptera Iranica" (Rajaei et al., 2023). However, Landry et al. (2023) showed that due to the geographical extent and climatic diversity of Iran, a large part of the Lepidoptera diversity in the country remains unknown. Our local studies confirm these findings. Therefore, it is recommended to intensify sampling activities and faunistic studies in different regions of the country.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: B. Ravan: assisted in the field survey, collected and photographed the specimens and contributed to writing the initial draft; M. Esfandiari: conducted field surveys, identified specimens, wrote the manuscript, and handled correspondence; M.S. Mossadegh: participated in designing the study and provided comments on the manuscript. All authors read and approved the final version of the manuscript.

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AVAILABILITY OF DATA AND MATERIAL

The specimens listed in this study are deposited in the Insect and Mite Collection of Ahvaz (IMCA), located in the Plant Protection Department at Shahid Chamran University of Ahvaz. They are available from the curator upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study only included plants and 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.

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اولین گزارش از حضور گونه *Leucania herrichii* Herrich-Schäffer همراه با داده‌های پراکنش جدید از Leucaniini (Lep., Noctuidae) در ایران

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چکیده: لارو برخی از گونه‌ها در خانواده Noctuidae سالانه خسارت اقتصادی وسیعی به بار می‌آورند. به جهت اهمیت این گروه، نمونه‌های زیرخانواده Noctuinae متعلق به قبیله Leucaniini در کلکسیون حشرات و کنه‌های اهواز در دانشگاه شهید چمران که از چهار استان فارس، ایلام، کرمان و خوزستان جمع آوری شده بود مطالعه شد. در نتیجه از ۹ گونه شناسایی و مطالعه شده متعلق به دو جنس *Mythimna* و *Leucania* چهار گونه برای فون استان خوزستان، سه گونه برای فون استان ایلام و یک گونه برای فون استان فارس جدید بود. به‌علاوه، پراکنش گونه *Leucania* (*Leucania*) *herrichii* Herrich-Schäffer, 1849 برای اولین بار در ایران محرز گردید. توصیه می‌شود در مناطق مختلف کشور فون حشرات این قبیله به‌طور متمرکز مطالعه گردد.

واژگان کلیدی: انتشار، فون، شب‌پره، *Mythimna*، گزارش جدید