



First record of *Euxoa acuminifera* (Lepidoptera, Noctuidae) from Iran with new data on distribution of *Euxoa* species in north-east Iran

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ABSTRACT. The genus *Euxoa* Hübner, [1821] is regarded as the most highly evolved among the genera of the subfamily Noctuinae and contains by far the largest number of species of the subfamily in Europe and in the Palaearctic region. Fifty-four species of this genus has been already reported from Iran. In this paper a list of 17 already recorded species and subspecies of *Euxoa* from the north-east of Iran is given and discussed. Furthermore, *E. acuminifera* (Eversmann, 1854) is newly reported for the fauna of Iran. Figures of its adult male and female and their genitalia are provided together with bionomics and distribution of the species.

Key words: Noctuidae, *Euxoa*, fauna, distribution, new record, Khorasan

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Introduction

The genus *Euxoa* (Lepidoptera: Noctuidae) is regarded as the most highly evolved among the genera of the subfamily Noctuinae and contains by far the largest number of species of the subfamily in Europe and in the Palaearctic region (Fibiger 1990). Based on the available literature, fifty-five species and subspecies of this genus has already been reported from Iran by different authors (e.g. Boursin 1940; Brandt 1941; Fibiger 1990; Hacker 1990; Hacker and Kautt 1999; Hacker and Meineke 2001; Ebert and Hacke 2002; Muhabbet *et al.* 2007; Rabieh *et al.* 2013). This genus is characterized by the male genitalia in

having both harp (long or short) and a pointed saccular extension (long or short); everted vesica often forms a right angle with the aedeagus near the middle; and vesica provided with two or more diverticula, which may be basal or distal to the angle (Fibiger 1990).

North-eastern provinces of Iran including Khorasan-e-Razavi, Khorasan-e-Shomali and Khorasan-e-Jonoubi (the former great Khorasan) are believed to be transitional area included in the Irano-Turanian subregion of the Saharo-Gobian biogeographic region of the Palaearctic realm. Due to its geographical position, fauna of the north-east of Iran is

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influenced by the elements of the Central Asia region (Fet 1994). In this region, higher elevations of the mountains contain the dry mountain steppes (e.g. Kopet-Dagh Mts) with high insect diversity. The southern plains of this area with low annual rainfall are believed to have semi-desert geographical and natural vegetation characteristics which dominated with plant species of genera *Haloxylon*, *Sophora*, *Astragalus*, *Zygophyllum* and *Tamarix* (Raziei *et al.* 2005; Heshmati 2007).

This paper presents data on the geographical distribution of the genus *Euxoa* in the north-east of Iran according to lots of collected specimens and literature review. Furthermore, *E. acuminifera* (Eversmann, 1854) is reported as a new record for the fauna of Iran. Its adult male and female with their genitalia are figured, together with some

notes on the bionomics and distribution of the species.

Material and methods

Sampling was carried out mostly during 2013-2014, once a week on the average, by using a light trap (about 1m in height-, powered by 12 volt batteries and 8 watt UVB light tubes) in Khorasan-e-Razavi province, NE Iran (Fig. 1). The genitalia of the specimens were prepared and mounted according to Fibiger (1997) with little modifications. The specimens and slides of their genitalia were deposited in the insects' collection of the Institute of Higher Education of Jihad Daneshgahi Khorasan Razavi, Kashmar, Khorasan-e-Razavi, Iran. Data on the other species of the genus *Euxoa* which were not collected in this study is based on - literature reviews.



Figure 1. Map of Iran showing Khorasan-e-Razavi and other provinces of north-eastern Iran.

Results

Here we present a list of 14 species and 4 subspecies of *Euxoa* occur in north-east of Iran including *E. acuminifera* a new record for the Iranian fauna, according to our collectings and literature reviews.

Euxoa acuminifera (Eversmann, 1854)

Hadena acuminifera Eversmann, 1854, Bull. Soc. Imp. Nat. Moscow, 27(3): 188.

Type-locality: Kirgizstan (Southern steppe).

Type material: Holotype, male, pinned, from S. Kirgizstan, deposited in Bavarian State Coll. of Zoology (ZSM); Para type: one male, from Astrakhan (SW Russia), deposited in Bavarian State Coll. of Zoology (ZSM).

Material Examined: 3 ♂♂, Iran, Khorasan-e-Razavi Prov., Mashhad, Fariman Rd., 1407m, 03.xi.2013, 35°43'56" N 54°41'01" E, leg. M. Allahverdi.

Diagnosis: This species externally resembles *E. triaena* Kozhanchikov, 1929 and *E. eremopersa* Gyulai & Varga, 2006. *E. acuminifera* differs from *E. triaena* by its larger body size, except of the size, this species may be difficult to distinguish superficially from *E. triaena*, but the genitalia are very different. In *E. triaena*, clasper is slightly longer than or equal in length to the saccular extension unlike *E. acuminifera* which clasper is twice as long as the saccular extension. *E. acuminifera* differs from *E. eremopersa* by its narrower, darker antennae, narrow, darker costal stripe, brown sub terminal field and pale brown with median fuscous tripe cilia. The male genitalia differs from *E. eremopersa* by shorter saccular processes and an apical diverticulum in the everted vesica (Gyulai and Varga, 2006) (Figs 2A,B).

Description: In adult male, wingspan 33-38 mm; head and thorax olive-brown mixed with fuscous and white; abdomen cream; ground colour of fore wing pale reddish

brown irrorated with black; the costal area whitish to the post medial line, nearly pure white at base; ante medial line obscure, claviform stigma small, outlined by black tripe; orbicular and reniform stigmata with pale brown centre sirrorated with a few black scales and narrow white annuli defined by black, claviform spot oblique, elliptical; the post medial line hardly dentate, slightly defined by pale colour on outer side, bent outwards below costa, excurved to vein 5, then incurved; sub terminal line indistinct, pale, defined by small dentate black marks on inner side; a terminal series of small black lunules; cilia pale brown, whitish at base and with fuscous medial line. Hind wing whitish, the termen very slightly tinged with brown and with fine brown terminal line; the underside with the costal area irrorated with brown, a small discoidal spot, and post medial series of short streaks on the veins (Figs 2A,B).

Male genitalia: Valve narrow, clasper sparsely pubescent, twice as long as saccular extension. Juxta longer than wide. Vesica with subbasal diverticulum which is foot shaped with large rounded heel and big toes; occasionally a small cornutus is present on the small angle; additional subbasal diverticulum small, pointed; median diverticulum small, narrow; apical diverticulum present (Fibiger 1997) (Figs 2C,D).

Female genitalia: Ovipositor medium long, strong, conical, papillae anales covered with short setae; Anterior gonapophyses long, slender; posteriors short, strong; Ductus bursae narrow, tubular, flattened, both surface with continuous sclerotized plates running from posterior end of ostium to proximal part of ductus bursae. Appendix bursae small, conical, pointed, projected laterally, corpus bursae elliptical, sacculi form (Fibiger 1997) (Fig. 2E).

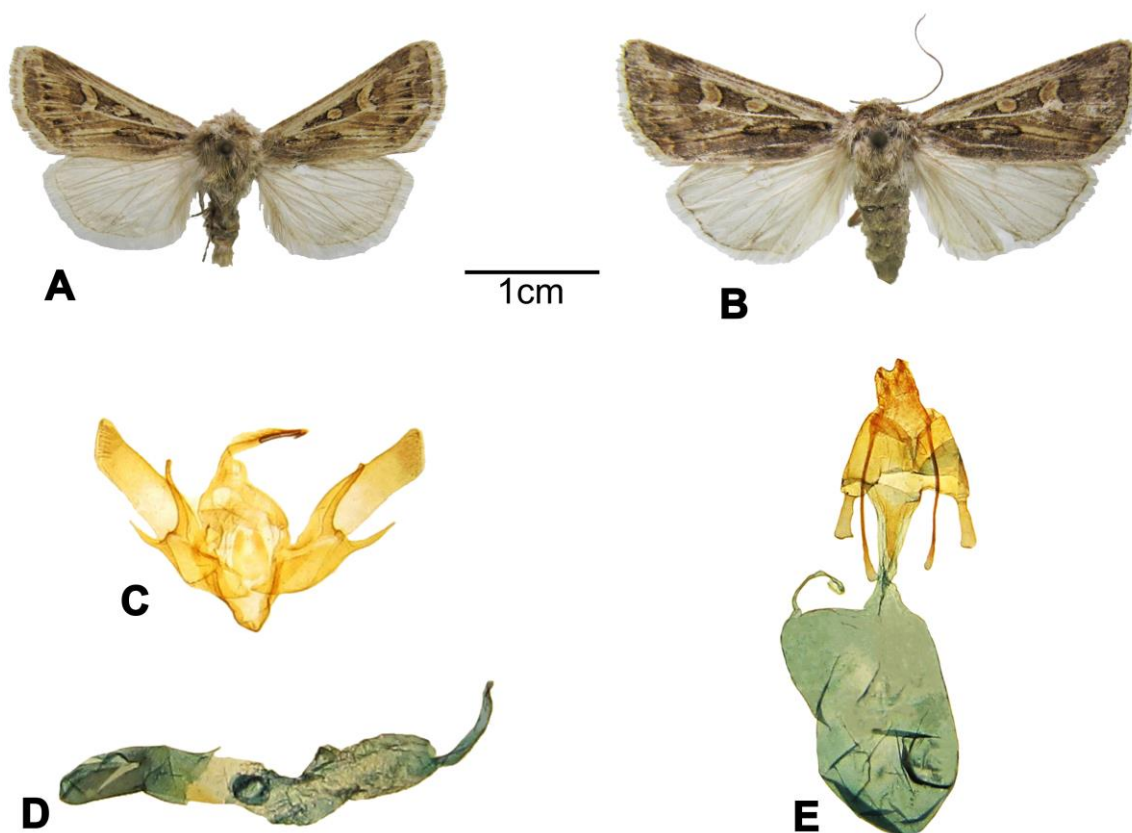


Figure 2. Adults of *Euxoa acuminifera* (Eversmann) and their genitalia. **A.** Adult male, **B.** Adult female, **C.** Armature of the male genitalia, **D.** Aedeagus with everted vesica, **E.** Female genitalia.

Distribution: *E. acuminifera* is believed to be an Eurasiatic species but very few records of this species are known from Europe (Fibiger 1990). Outside Europe, this species is known to exist in south western Russia, Turkmenistan and Kirgizstan (Eversmann 1854; Hacker 1990).

Bionomics: In Central Asia, adults of *E. acuminifera* fly in August (Fibiger 1990). The area in Iran from which the species were collected was agricultural land in a plain area with various crop plants (Fig. 3). Adults are active during autumn and are attracted to the light trap. Mating behaviors are seen in the cold and calm nights near the light traps. The early stages and their

host plants are unknown in Iran and elsewhere.

***Euxoa aneucta binaloudica* Brandt, 1941 (Figs 6B; 7B)**

Material Examined: 1 male, Iran, Khorasan-e-Razavi Prov., Mashhad, Shandiz, 1560 m, 19.x.2014, 36°09'13"N 59°27'26"E, leg. M. Allahverdi.

Distribution: Iran and Turkmenistan (Brandt 1941; Hacker 1990; Rabieh *et al.* 2013)

Distribution in Iran: This subspecies is restricted to the Binaloud Mountains (Brandt 1941; Hacker 1990; Rabieh *et al.* 2013; Present study) (Fig. 4B).



Figure 3. Habitat of *Euxoa acuminifera* (Eversmann) in the plains of southern Khorasan-e-Razavi province, NE Iran. Sparse bushes and shrubs of the genera *Haloxylon*, *Sophora*, *Astragalus*, *Zygophyllum* and *Tamarix* occur in this habitat at an altitude of 1400 m.

***Euxoa aquilina* (Denis & Schiffermüller), 1775 (Figs 6C; 7C,I)**

Material Examined: 1 male, Iran, Khorasan-e-Razavi Prov., Akhlamad mountains, 1560 m, 1 ♀, 03.viii.2014, 36°36'52"N 58°54'07"E, leg. M. Allahverdi.

Distribution: Europe, north Africa and Asia (Fibiger 1990).

Distribution in Iran: Mazandaran, Azarbayegan-e-Gharbi, Tehran, Alburz, Fars, Kurdistan, Lorestan, Kuhgiluyeh va Boyehahmad (Ebert and Hacker 2002), Azarbayegan-e-Sharghi (Modarres Awal 2002), Esfahan, Chaharmahal va Bakhtyari (Hacker and Meink 2001), Khorasan-e-Razavi provinces (Present study; Rabieh *et al.* 2013). In the north-east of Iran it exists in Binaloud Mountains. (Akhlamad) and

Gonabad (Present study; Rabieh *et al.* 2013) (Fig. 4C).

***Euxoa basigramma hyrcana* Corti, 1932 (Figs 6D; 7D)**

Material Examined: 1 male, Iran, Khorasan-e-Razavi Prov., Ghouchan, 1667 m, 12.iv.2015, 37°14'32"N 58°28'17"E, leg. M. Allahverdi.

Distribution: *E. basigramma* is distributed in Europe and eastward to Mongolia and southward to Turkey and Iran (Fibiger 1990).

Distribution in Iran: This subspecies is reported from north (Hacker, 1990) and north-east (Kopet-Dagh Mts) of Iran (Rabieh *et al.* 2013; Present study) (Fig. 4D).

***Euxoa clauda* Püngeler, 1906 (Figs 6E; 7E).**

Material Examined: 1 male, Iran, Khorasan-e-Razavi Prov., Mashhad, 1034m, 28.v.2015, 36°29'38"N 59°32'01"E, leg. M. Allahverdi.

Distribution: Turkey, Turkmenistan and Iran (Hacker 1990).

Distribution in Iran: North, southwest and east of Iran (Hacker 1990). Also this species is reported from Fars and Khorasan-e-Razavi provinces (Ebert and Hacker 2002). In the north-east of Iran it occurs in Mashhad (Present study), Binaloud Mountains (Brandt 1941; Ebert and Hacker 2002) and Kopet-Dagh Mts (Rabieh *et al.* 2013) (Fig. 4E).

***Euxoa conspicua* (Hübner, 1827) (Figs 6A; 7A,J)**

Material Examined: 1 male, Iran, Khorasan-e-Razavi Prov., Mashhad, Torogh, 990 m, 19.iv.2015, 36°12'29" N 59°38'32" E, leg. M. Allahverdi.

Distribution: Outside Europe, this species occurs eastwards to northern Mongolia and western India (Fibiger 1990).

Distribution in Iran: Mazandaran, Tehran, Azarbayejan-e-Sharghi, Azarbayejan-e-Gharbi, Fars, Kermanshah, Kordestan, Lorestan, Zanzan, Hamedan, Kerman and Khuzestan provinces (Ebert and Hacker 2002). In the north-east of Iran it has reported from Binaloud Mountains (Brandt 1941), Dasht (Wieser and Stangelmaier 2005), Mashhad and Gonabad (Rabieh *et al.* 2013; Present study) (Fig. 4A).

***Euxoa cos* (Hübner, 1824) (Figs 6F; 7F)**

Material Examined: 2 ♂♂, Iran, Khorasan-e-Razavi Prov., Mashhad, Binaloud mountains, 1566 m, 15.iv.2015, 36°26'01"N 59°09'53"E, leg. M. M. Rabieh.

Distribution: Outside Europe, this species is reported from Tunisia, Algeria, Turkey, Syria, Iraq, Iran, Armenia, Turkmenistan and Russia (Fibiger 1990).

Distribution in Iran: It has reported from central and east parts of the country (Hacker 1990). In the north-east of Iran it has only recorded from Binaloud Mountains (Brandt 1941; Rabieh *et al.* 2013) (Fig. 4F).

***Euxoa difficillima* Draudt, 1937 (Figs 6G; 7G)**

Material Examined: 2 ♂♂, Iran, Khorasan-e-Razavi Prov., Mashhad, Binaloud mountains, 3100 m, 16.vii.2015, 36°16'02"N 59°04'19"E, leg. M. M. Rabieh.

Distribution: Armenia, Turkey, Iran and Afghanistan (Hacker, 1990)

Distribution in Iran: Lorestan, Tehran, Alburz, Fars and Khorasan-e-Razavi provinces (Ebert and Hacker 2002). In the north-east of Iran it has only reported from Binaloud Mountains (Brandt 1941; Ebert and Hacker 2002; Rabieh *et al.* 2013) (Fig. 4G).

***Euxoa fallax* (Eversmann, 1854)**

Distribution: European part of Russia, Kazakhstan, Uzbekistan, Kirghizia, Mongolia (Fibiger 1990), Turkmenistan (Hacker 1990; Fibiger 1990), Turkey and Iran (Hacker 1990).

Distribution in Iran: Sistan va Balouchestan and Khorasan-e-Razavi (Binaloud Mountains) provinces (Brandt 1941). In the north-east of Iran, it occurs in Binaloud Mountains (Brandt 1941) (Fig. 4H).

***Euxoa foeda* (Lederer, 1855)**

Distribution: This species is distributed through the Europe, Turkey, Russia, Armenia, Turkmenistan, Iraq and Iran (Fibiger 1990).

Distribution in Iran: Tehran, Fars, Lorestan, Kordestan, Markazi (Ebert and Hacker 2002) and Khorasan-e-Razavi (Brandt 1941; Ebert and Hacker 2002) provinces. In the north-east of Iran, this species was recorded from Binaloud Mountains (Brandt 1941; Ebert and Hacker 2002) (Fig. 4I).

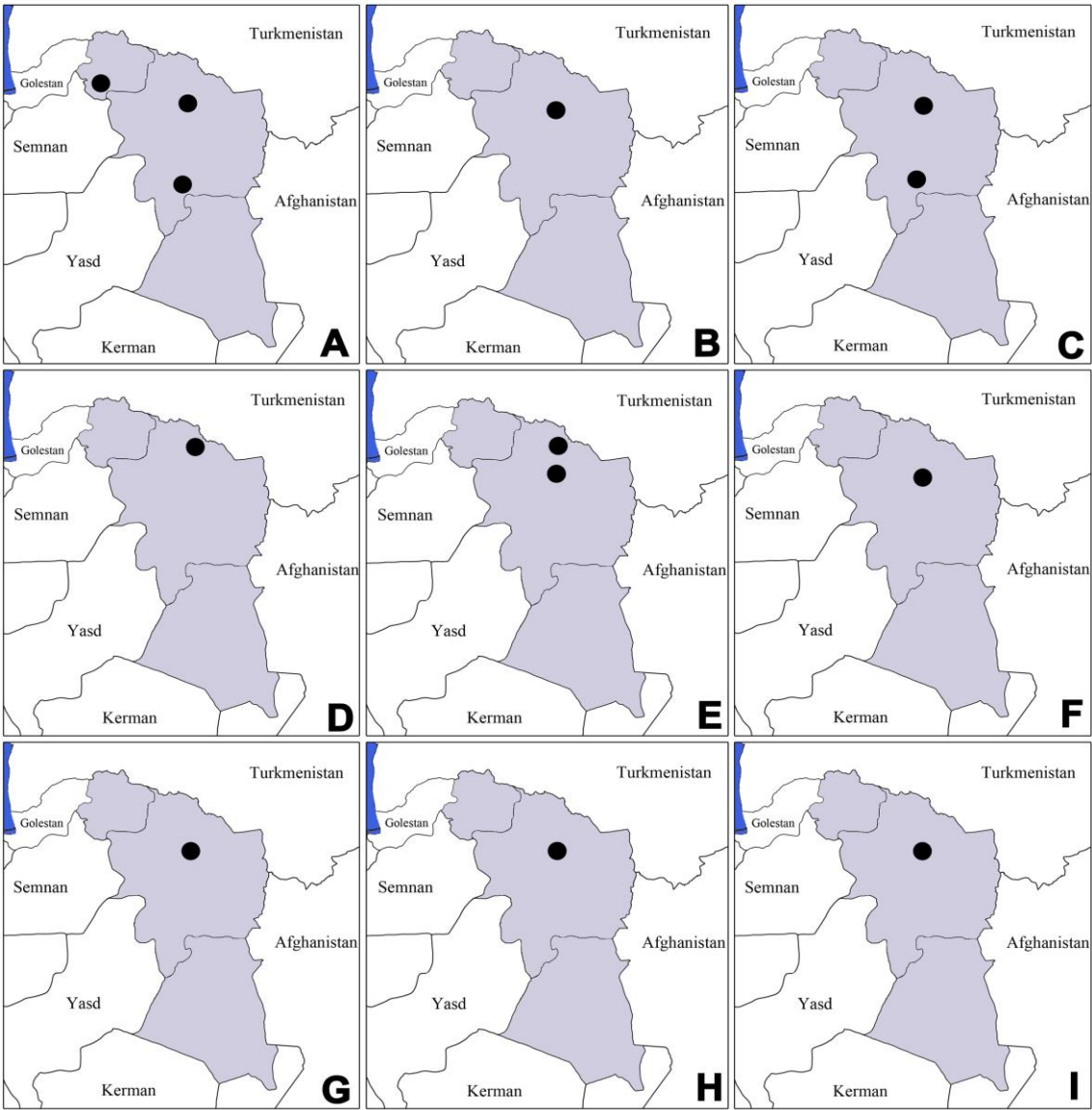


Figure 4. Distribution of *Euxoa* species in north-east of Iran: **A.** *E. conspicua* (Hübner, 1827), **B.** *E. aneucta binaloudica* Brandt, **C.** *E. aquilina* (Denis & Schiffermuller), **D.** *E. basigramma hyrcana* Corti, **E.** *E. clauda* Püngeler, **F.** *E. cos* (Hübner), **G.** *E. difficillima* Draudt, **H.** *E. fallax* (Eversmann), **I.** *E. foeda* (Lederer).

***Euxoa homicida* (Staudinger, 1900) (Figs 6H; 7H)**

Material Examined: 2 ♂♂, Iran, Khorasan-e-Razavi Prov., Fariman road, 1110 m, 08.v.2015, 35°42'39" N 59°50'09", leg. M. Allahverdi.

Distribution: Turkey, Armenia, Turkmenistan, Iran and Afghanistan (Hacker 1990).

Distribution in Iran: This species has reported from Kordestan, Lorestan, Zanjan, Sistan Baluchestan, Hormozgan, Tehran and Khorasan-e-Razavi provinces (Ebert and Hacker 2002). In north-east of Iran it occurs insouthern (Present study) and northern (Rabieh *et al.* 2013) slops of Binaloud Mountains (Fig. 5A).

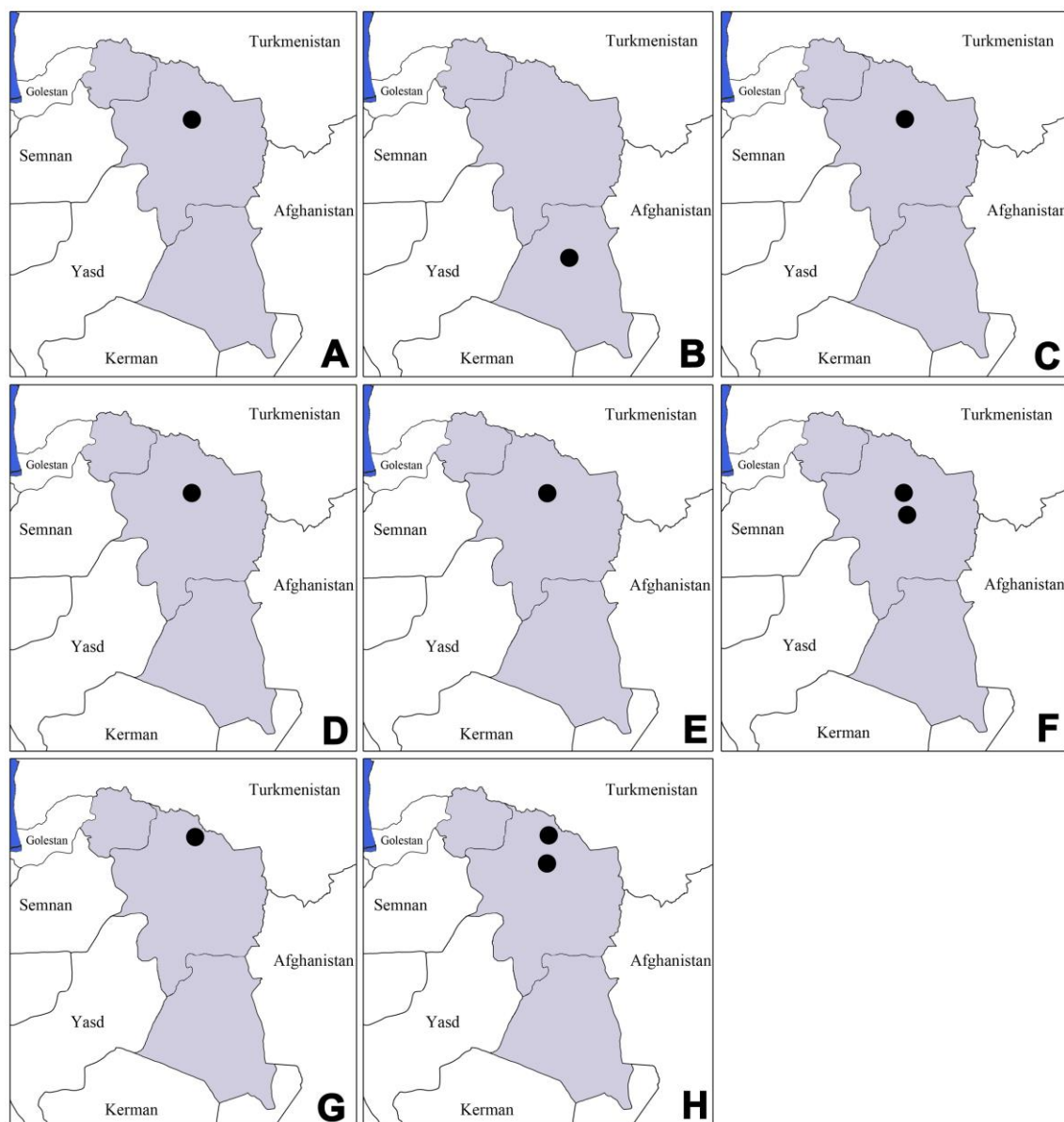


Figure 5. Distribution of *Euxoa* species in north-east of Iran: **A.** *E. homicida* (Staudinger), **B.** *E. homicida schahkuhensis* Bartel, **C.** *E. mustelina* (Christoph), **D.** *E. perierga* Brandt, **E.** *E. perierga dolomedes* Boursin, **F.** *E. sayvana* Varga & Ronkay, **G.** *E. shahabbasi* Gyulai & Varga, **H.** *E. stigmata* Kozhanchikov.

***Euxoa homicida schahkuhensis* Bartel, 1907**

Distribution: native to Iran (Hacker 1990).

Distribution in Iran: Golestan (Hacker 1990), Khorasan-e-Jonoubi (Birjand) (Hacker and Meineke 2001), Tehran, Alborz and Hamadan provinces. In the north-east of Iran, it has only reported from Birjand (Hacker and Meineke 2001) (Fig. 5B).

***Euxoa mustelina* (Christoph, 1877)**

Distribution: Europe, Turkey, Iran, Armenia, Turkmenistan, Russia (Fibiger 1990) and Iraq (Hacker 1990).

Distribution in Iran: Tehran and Khorasan-e-Razavi (Brandt 1941; Ebert and Hacker 2002) provinces. In the north-east of Iran, it was

reported from Binaloud Mountains (Brandt 1941; Ebert and Hacker 2002) (Fig. 5C).

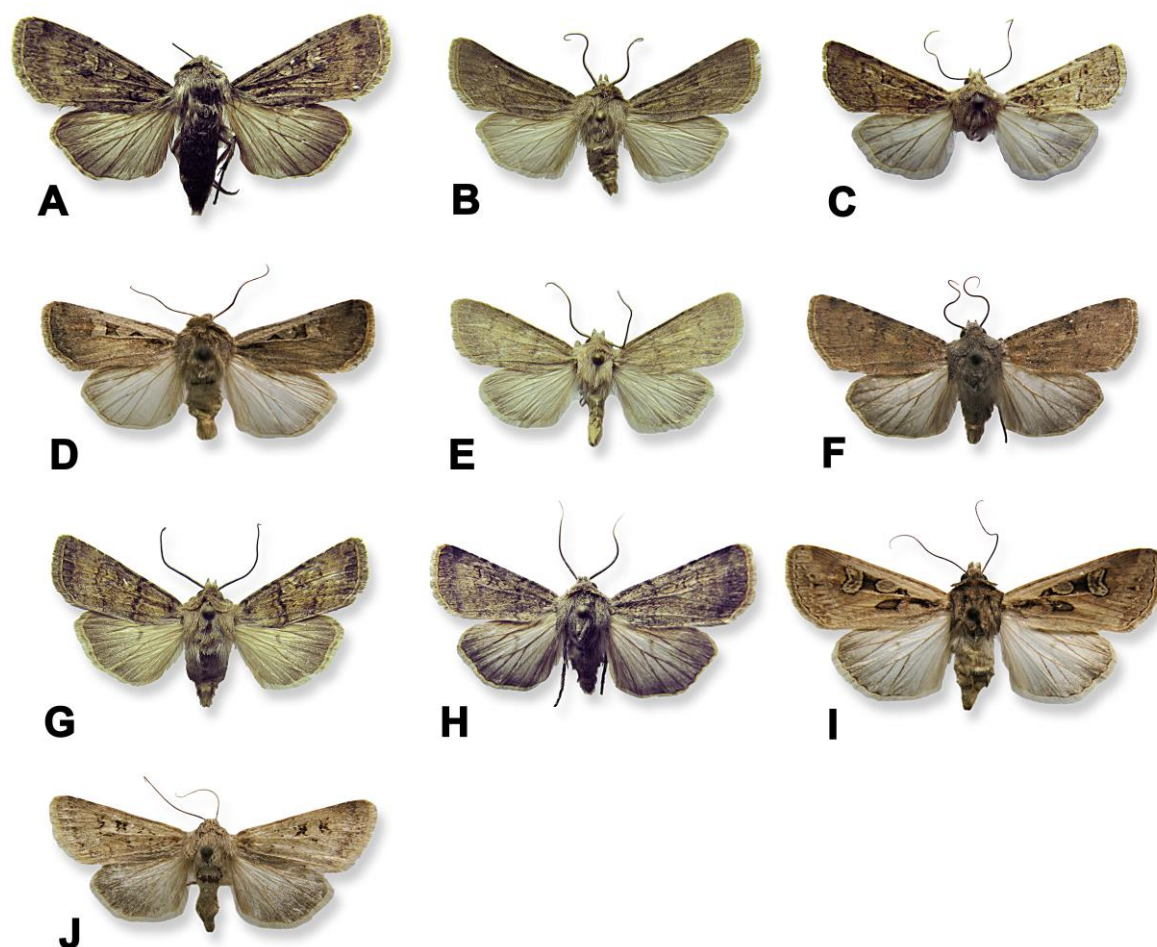


Figure 6. Adult specimens of *Euxoa* species collected in north-east of Iran. **A.** *E. conspicua* (Hübner), female; **B.** *E. aneucta binaloudica* Brandt, male; **C.** *E. aquiline* (Denis & Schifferrmüller), male; **D.** *E. basigramma hyrcana* Corti, male; **E.** *E. clauda* Püngeler, female; **F.** *E. cos* (Hübner), male; **G.** *E. difficillima* Draudt, male; **H.** *E. homicida* (Staudinger), male; **I.** *E. sayoana* Varga and Ronkay, female; **J.** *E. stigmata* Kozhanchikov, female.

Euxoa perierga Brandt, 1938

Distribution: native to Iran (Hacker 1990).

Distribution in Iran: Fars (Hacker, 1990; Ebert and Hacker 2002; Hacker and Kautt 1999) and Khorasan-e-Razavi provinces (Ebert and Hacker 2002). In the north-east of Iran, it has reported from Binaloud Mountains (Ebert and Hacker 2002) (Fig. 5D).

E. perierga dolomedes Boursin, 1940

Distribution: Iran and Turkey (Hacker 1990).

Distribution in Iran: Fars, Tehran (Hacker 1990) and Khorasan-e-Razavi (Brandt 1941;

Hacker 1990) provinces. In the north-east of Iran it was reported from Binaloud Mountains (Brandt 1941) (Fig. 5E).

Note: *E. perierga perierga* Brandt, 1938 was reported from Binaloud Mountains (Ebert and hacker 2002). As two subspecies could not be present in the same area, more study is needed to clarify these data. The subspecies *E. perierga perierga* was described from Fars province (Sinehsefid Mt.) As the subspecies *E. perierga dolomedes* distributed from Turkey to the Alburz Mts in the north of Iran and extended to the Binaloud Mountains (Hacker

1990), the occurrence of the nominate subspecies in northern parts of Iran is doubtful.

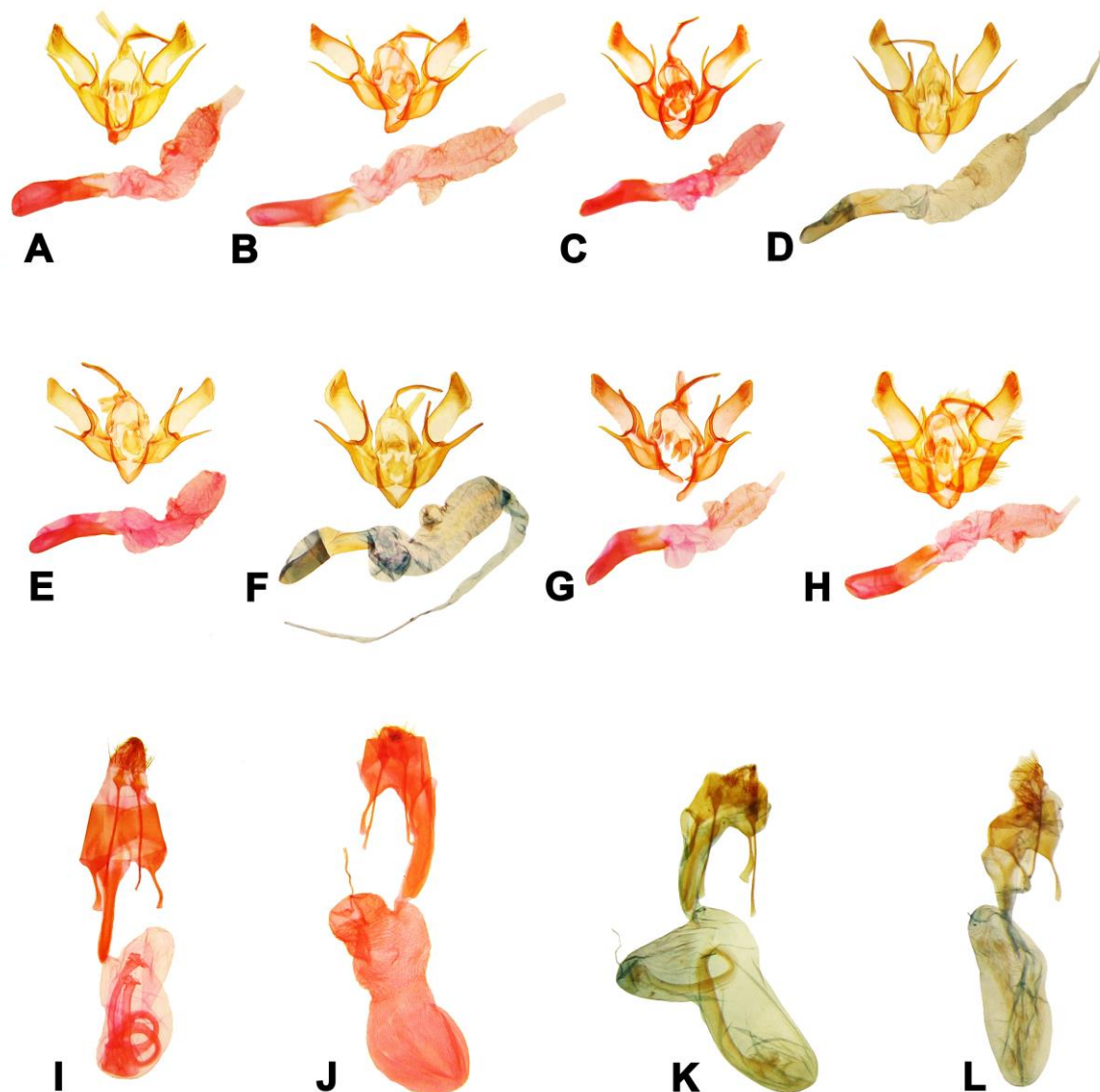


Figure 7. Genitalia of the *Euxoa* species collected in north-east of Iran. **A.** *E. conspicua* (Hübner) (male), **B.** *E. aneucta binaloudica* Brandt (male); **C.** *E. aquilina* (Denis & Schiffermüller) (male); **D.** *E. basigramma hyrcana* Corti (male); **E.** *E. Claudia* Püngeler (male); **F.** *E. cos* (Hübner) (male); **G.** *E. difficillima* Draudt (male); **H.** *E. homicida* (Staudinger) (male); **I.** *E. aquilina* (Denis & Schiffermüller) (female); **J.** *E. conspicua* (Hübner) (female); **K.** *E. sayvana* Varga & Ronkay (female); **L.** *E. stigmata* Kozhanchikov (female).

***Euxoa sayvana* Varga and Ronkay 1998 (Figs 6I; 7K)**

Material Examined: 1 ♀, Iran, Khorasan-e-Razavi Prov., Mashhad, Torogh, 990 m, 19.iv.2015, 36°12'29" N 59°38'32" E, leg. M. Allahverdi.

Distribution: Turkmenistan (Ronkay *et al.* 1998) and Iran (Rabieh *et al.* 2013).

Distribution in Iran: In Iran, this species occurs in Khorasan-e-Razavi province (Fariman and Binaloud Mountains) (Rabieh *et al.* 2013; Present study) (Fig. 5F).

***Euxoa shahabbasi* Gyulai and Varga 2002**

Distribution: This species is native to Iran (Varga and Gyulai 2002).

Distribution in Iran: It has reported from Khorasan-e-Razavi province (Kopet-Dagh Mts) in north-east (Varga and Gyulai 2002) (Fig. 5G).

***Euxoa stigmata* Kozhanchikov, 1928 (Figs 6J; 7L)**

Material Examined: 1 ♀, Iran, Khorasan-e-Razavi Prov., Mashhad, 1034 m, 28.v.2015, 36°29'38"N 59°32'01"E, leg. M. M. Rabieh.

Distribution: Turkmenistan and Iran (Hacker 1990).

Distribution in Iran: Khorasan-e-Razavi province (Ebert and Hacker 2002) and central parts of Iran (Hacker 1990). In north-east of Iran it exists in Mashhad (Present study); Binaloud Mountains (Brandt 1941; Ebert and Hacker 2002) and Kopet-Dagh Mts (Rabieh *et al.* 2013) (Fig. 5H).

Discussion

Fourteen species and four subspecies of the genus *Euxoa* are listed from the north-east of Iran, so far. The habitat of the most recorded *Euxoa* species in north-east of Iran is restricted to the Binaloud mountains (Brandt 1941; Hacker 1990; Rabieh *et al.* 2013), where, there is a large variety of plant species. But, it may be due to the lack of sufficient sampling in the other parts of north-east of Iran (Brandt 1941; Hacker, 1990; Rabieh *et al.* 2013; Present study). *E. homicida shahkuhensis* is the only taxa of the genus *Euxoa* which was reported from the Khorasan-e-Jonoubi province in the southern part of the area (Brandt 1941; Hacker, 1990; Fibiger 1990; Hacker and Meineke 2001; Ebert and Hacker 2002) (Fig. 5B). Many other parts of north-eastern Iran are still very little studied and by further sampling, it may also improve our

knowledge about the fauna of these species.

There is a little information on the biology and ecology of the *Euxoa* larvae in Iran. Food plants mentioned for the species of *Euxoa* are different species of Poaceae, Cruciferae, Solanaceae, Chenopodiaceae, Plantaginaceae, Asteraceae and so on. There are also reports on their larval damage to vegetable and farm crops (Fibiger 1990; Merzheevskaya 1988). *E. conspicua* larvae damage sugar beet, cabbage, water melon, tobacco, sunflower, flax, wheat, barley and other crops in Iran (Modarres-Awal 2002).

The new *E. acuminifera* has raised the number of previously recorded *Euxoa* species in Iran. Specimens of the new record were collected from the lowland of Mashhad-Fariman Road at the center of Khorasan-e-Razavi province. With the new record, distribution of the species has broadened to the eastern parts of Iran where there is a natural vegetation of *Haloxylon*, *Sophora*, *Astragalus*, *Zygophyllum*, *Tamarix* and *Amygdalus* species and vast traditional saffron farms around the collection area of *E. acuminifera*.

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اولین گزارش گونه *Euxoa acuminifera* (Lepidoptera, Noctuidae) از ایران و اطلاعات جدید از پراکنش گونه های جنس *Euxoa* در شمال شرقی ایران

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چکیده: جنس *Euxoa* بزرگترین جنس زیرخانواده Noctuidae محسوب می شود و تاکنون دارای بیشترین تعداد گونه گزارش شده در بین جنس های زیرخانواده Noctuidae در اروپا و منطقه پالتارکتیک می باشد. تاکنون ۵۴ گونه از این جنس از ایران گزارش شده است. در این مقاله، لیستی از ۱۷ گونه و زیرگونه از جنس *Euxoa* که تاکنون از منطقه شمال شرقی ایران گزارش شده است، ارایه و بحث شده است. همچنین گونه *E. acuminifera* (Eversmann, 1854) برای اولین بار برای فون ایران گزارش می شود. تصاویر مربوط به حشرات کامل نر و ماده گونه های گزارش شده همراه با اندام تولید مثلی خارجی و اطلاعات مربوط به بیونومی و پراکنش آنها ارایه شده است.

واژگان کلیدی: *Euxoa*، Noctuidae، فون، پراکنش، گزارش جدید، خراسان