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New Records of Noctuid Moths (Noctuidae, Noctuinae, Xylenini) from Iran

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ABSTRACT

Two noctuid moths *Agrochola turcomanica* Ronkay *et al*., 1998 and *Polymixis achrysa* Ronkay *et al*., 1998 are first reported for the fauna of Iran from Khorasan Shomali province. Morphology, bionomy and geographic distribution of the newly recorded species are presented. The diagnostic characteristics for each species are discussed with its closest relative. An annotated checklist of the genera *Agrochola* Hübner, [1821] and *Polymixis* Hübner, [1820] is presented. Adult and genitalia of two newly reported species are illustrated.

Key words: Xylenini, *Agrochola*, *Polymixis*, Iran.

INTRODUCTION

Both the genera *Agrochola* Hübner and *Polymixis* Hübner are members of the subfamily Noctuinae, tribe Xylenini, subtribes Xylenina and Antitypina respectively. The subtribe Xylenina, that the genus *Agrochola* belongs to, is identified by the long and curved harpe crossing the costal margin of the male valve (Fibiger and Lafontaine, 2005). *Agrochola* with the Holarctic distribution is well defined by its rather unique male and female genital characteristics as well as its conspicuous external features (Ronkay *et al*., 2001). The peculiar shapes of the male valve, harpe and vesica and the elongate, triangular and pointed or acute forewings are among those diagnostic traits identical for this genus (Ronkay *et al*., 2001). Although the overall investigations on the whole world's fauna are necessary to achieve more precise phylogeny, some authors have considered subgenera and species groups, based on the Palaearctic fauna, within this genus. This genus is presented in the Nearctic, Palaearctic and Oriental regions by almost 78 described species (Ronkay *et al*., 2001, 2010; Ronkay and Gyulai, 2006b; Kravchenko *et al*., 2007; Lafontaine and Schmidt, 2010). The Palaearctic species are classified into nine subgenera, 16 species-groups and 75 species (Ronkay *et al*., 2001). The members of this genus are known by their late flying activity that inhabit various zones from the forests to shrubby and open lands as well as dry or mountainous areas (Ronkay *et al*., 2001; Kravchenko *et al*., 2007). So far, 13 species have been recorded

from Iran (Wiltshire, 1941, 1946a, 1952; Benedek and Ronkay, 2001; Ebert and Hacker, 2002; Wieser and Stangelmaier, 2005; Ronkay and Gyulai, 2006b).

The subtribe Antitypina is known by its very short male harpe and short and broad spinneret in the larvae (Fibiger and Lafontaine, 2005). The genus *Polymixis* with the genera *Bornolis* Holloway, *Hakkaria* Ronkay and Varga, *Mniotype* Franclemont, *Blepharita* Hampson, and etc. comprise the large *Polymixis*-generic complex in the subtribe Antitypina (Ronkay *et al*., 2001). The main differences of the members in this interconnected group are mostly based on the configuration of distal parts of the male valve, cornuti position in the vesica as well as the ovipositor. The Palaearctic genus, *Polymixis* species are identified by a mixture of both external and genital characteristics. The separation of the species-groups and the species within are based on the configuration of male genital capsula and the imaginal features, too. The closest relative of the genus is *Mniotype,* though the taxonomic placement of the later is problematic as some authors place this species within the *Polymixis* (Ronkay *et al*., 2001).

So far, the 86 species of the genus are classified, based on morphological features of both adults and larvae, into 17 subgenera (Hacker and Ronkay, 1992; Benedek and Ronkay, 2002; Ronkay *et al*., 2001, 2010; Ronkay and Gyulai, 2006a, b). The species inhabit various kinds of habitats and vegetation including woods, mountainous and semi-mountainous regions, shrubs and grasslands. Up to present time 22 species of this genus have been recorded from Iran (e.g., Wiltshire, 1941, 1946b, 1952; Benedek and Ronkay, 2001; Ebert and Hacker, 2002; Wieser and Stangelmaier, 2005; Ronkay and Gyulai, 2006a, b; Babics and Benedek, 2011).

The present paper reports two noctuid moths, *Agrochola turcomanica* and *Polymixis achrysa* new to Iran. An annotated checklist of the Iranian members of the two genera *Agrochola* and *Polymixis* with their original combinations, citation and provincial distribution are given. The external and genital characteristics of the species, their bionomy, host plants and distribution are presented. Adult and the genitalia of the newly reported species are illustrated.

MATERIALS AND METHODS

The material was collected from Khorasan Shomali province in the Northeast of Iran in September and October months during 2010-2011. Portable light traps (powered by 12 volt batteries and 8 watt black light UVB tubes) were used in order to collect the most number of specimens from different locations of various coordinates. Six different locations from 1500 to 3000 m altitudes were sampled based on a scheduled sampling program. Along with external characteristics, for precise identifications, the genitalia of two specimens were extracted, stained and mounted. Adult moths and the genitalia were photographed using Canon Digital Camera (model Power Shot A710).

RESULTS

The annotated checklist of *Agrochola* with their provincial distribution in Iran.

Genus *Agrochola* Hübner, [1821]

Agrochola Hübner, [1821], *Verzeichnis Bekannter Schmetterlinge*: 229. Type species: *Noctua pistacina* ([Denis and Schiffermüller], 1775). L.t.: Austria, Vienna district.

Synonymy: *Agrolitha* Berio, 1980; *Pseudanchoscelis* Beck, 1991; *Rufachola* Beck, 1991; *Thurnericola* Beck, 1991; *Osthelderichola* Beck, 1991; *Humichola* Beck, 1991.

***Agrochola disrupta* Wiltshire, 1952**

Agrochola disrupta Wiltshire, 1952, *Bulletin de la Société Fouad ler d'Entomologie* 36: 193. L.t.: Iran, Fars.

Distribution: Fars (Wiltshire, 1952)

***Agrochola lychnidis* ([Denis and Schiffermüller], 1775)**

Noctua lychnidis [Denis and Schiffermüller], 1775, *Schmetterlingen der Wienergegend*: 76. L.t.: Austria.

Distribution: Tehran (Ebert and Hacker, 2002); Khorasan Shomali (not registered, stored in the collection of Shahid Bahonar University in kerman)

***Agrochola elbursica* Ronkay and Gyulai, 2006**

Agrochola elbursica Ronkay and Gyulai, 2006, *Esperiana* 12: 215. L.t.: Iran, Zanjan.

Distribution: Zanjan (Ronkay and Gyulai, 2006b)

***Agrochola oropotamica thermopotamica* (Wiltshire, 1941)**

Amathes oropotamica thermopotamica Wiltshire, 1941, *Journal of the Bombay Natural History Society,* 42: 476. L.t.: Iran, Fars.

Distribution: Fars (Wiltshire, 1941); Mazandaran, Markazi, Tehran (Ebert and Hacker, 2002); Khorasan, Golestan (Wieser and Stangelmaier, 2005); Sistan va Balouchestan (not registered, stored in the collection of Shahid Bahonar University in Kerman)

***Agrochola fuscomixta* Ronkay and Gyulai, 2006**

Agrochola fuscomixta Ronkay and Gyulai, 2006, *Esperiana* 12: 216. L.t.: Iran, Azarbayjan-e-Sharghi.

Distribution: Azarbayjan-e-Sharghi (Ronkay and Gyulai, 2006b)

***Agrochola elami* Benedek and Ronkay, 2001**

Agrochola elami Benedek and Ronkay, 2001, *Annales Historico-Naturales Musei Nationalis Hungarici,* 93: 202. L.t.: Iran, Lorestan.

Distribution: Lorestan (Benedek and Ronkay, 2001)

***Agrochola luteogrisea* (Warren, 1911)**

Amathes litura ab. *luteogrisea* Warren, 1911, *Die Gross-Schmetterlinge der Erde,* 3: 152. L.t.: Turkey.

Distribution: Guilan (Ebert and Hacker, 2002)

***Agrochola plumbea* (Wiltshire, 1941)**

Amathes macilenta plumbea Wiltshire, 1941, *Journal of the Bombay Natural History Society,* 42: 476. L.t.: Iran, Fars.

Distribution: Fars (Wiltshire, 1941)

***Agrochola plumbea convergens* (Wiltshire, 1946)**

Anchoscelis plumbea convergens Wiltshire, 1946, *Entomologist`s Record and Journal of Variation* 58: 31. L.t.: Iran, Kermanshah.

Distribution: Kermanshah (Wiltshire, 1946a); Markazi (Ebert and Hacker, 2002)

***Agrochola macilenta rubrescens* (Wiltshire, 1939)**

Amathes macilenta rubrescens Wiltshire, 1939, *Transactions of the Royal Entomological Society of London,* 88: 37. L.t.: Lebanon.

Distribution: Fars (Hacker, 1990)

Agrochola circellaris (Hüfnagel, 1766)

Phalaena circellaris Hüfnagel, 1766, *Berlinisches Magazin,* 3(3): 404. L.t.: Germany.

Distribution: Tehran, Guilan, Mazandaran (Ebert and Hacker, 2002)

***Agrochola dubatolovi* Varga and Ronkay, 1991**

Agrochola dubatolovi Varga and Ronkay, 1991, *Acta Zoologica Academiae Scientiarum Hungaricae* 37: 285. L.t.: Turkmenistan.

Distribution: Khorasan (Wieser and Stangelmaier, 2005)

***Agrochola turcomanica* Ronkay, Varga and Hreblay, 1998**

Agrochola turcomanica Ronkay, Varga and Hreblay, 1998, *Acta Zoologica Academiae Scientiarum Hungaricae,* 44: 258. L.t.: Turkmenistan.

Morphology Adult Female (Fig. 1a): Antennae filiform. Collar with a small dorsal line. Wingspan 31 mm; forewing greyish bright brown mixed with ochreous, weakly glossy, median area weakly brighter, antemedian and postmedian lines completely defined, a dark mark present along the postmedian line close to costal margin, costal margin with scattered dark marks. Reniform and orbicular stigmata distinct, reniform stigma elliptical, weakly constricted medially, distal half filled with dark colour, encircled with bright brown line, orbicular stigma elliptical, slightly broader than reniform mark, brighter, encircled with greyish brown, reddish brown scales mixed with grey between two stigmata, claviform stigma missing. Hindwing unicolourous, greyish brown mixed with cream, slightly brighter than forewing, underside with a small discal spot.

Female genitalia (Fig. 2a): Ovipositor very long, papilla anales small, short, broad, with sparse hairs, posterior apophyses very long, two times longer than anterior ones, all expanded anteriorly. Ostium bursae plate-shaped, broad, concave ventrally, sclerotised; ductus bursae sclerotised, moderate size; appendix bursae smaller than corpus sac locating laterally at the left, heavily sclerotised, rugulose, apically rounded

and slightly swollen. Corpus bursae much broad, nearly rounded, membranous but weakly sclerotised with three signa located at the distances far from each other.

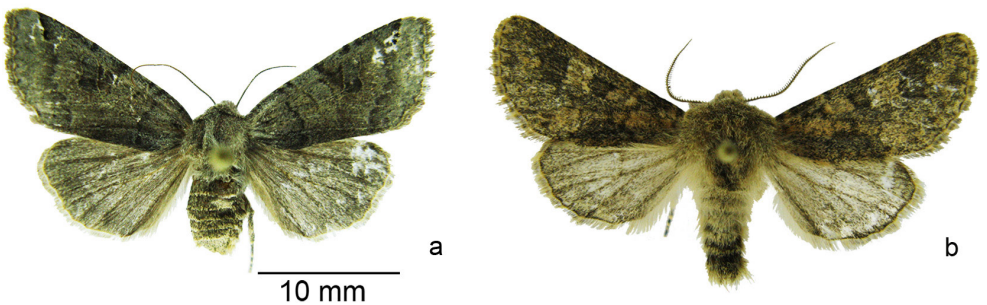

Fig. 1. Adult moths: a) female of *Agrochola turcomanica*; b) male of *Polymixis achrysa*.

Bionomy and distribution: Probably univoltine, it inhabits semi-arid locations up to 2000 m altitudes surrounded, on all sides, by mountains. The sampling site of the specimen was covered by outspread Juniper trees, thorny shrubs, *Artemisia* species, Milk Vetch, wild Nasturtium, Barberry, Hawthorn and various Tulips. Adults fly in late summer and early autumn and come to artificial lights. The early stages are unknown as yet. This species has only been collected from its type locality, Turkmenistan (Ronkay *et al*., 1998)

Remarks: The species externally resembles to *A. luteogrisea*, but in the latter, forewing is more unicolourous, beige mixed with reddish brown, the reniform stigma filled with darker spot and the cross lines are double. In the male genitalia of *A. luteogrisea*, the valve is apically more arcuate, the indentation of costal plate is faint slightly and the terminal spiny hair is shorter. In the female genitalia, ostium bursae ventrally slightly concaved, appendix bursae weakly sclerotised, and corpus bursae are less dilated.

Material examined: 1♀, Iran, Khorasan Shomali, Shoghan, 2035 m, 37°20'01"N 57°04'31"E, 07.09.2011, leg. Sh. Feizpoor.

The annotated checklist of *Polymixis* with their provincial distribution in Iran

Genus *Polymixis* Hübner, [1820]

Polymixis Hübner, [1820], *Verzeichnis Bekannter Schmetterlinge*: 205. Type species: *Phalaena Noctua polymita* Linnaeus, 1761. L.t.: Sweden.

Polymixis rosinae (Bohatsch, 1908)

Leucochlaena rosinae Bohatsch, 1908*, Jahresbericht des Entomologischen Vereins Wien,* 19: 11, L.t.: Armenia.

Distribution: Tehran (Ebert and Hacker, 2002); Golestan, Khorasan (Wieser and Stangelmaier, 2005); Kerman, Markazi, Azarbayjan-e-Sharghi (not registered, stored in the collection of Shahid Bahonar University in Kerman)

***Polymixis zagrobia* (Wiltshire, 1941)**

Crymodes bischoffii zagrobia Wiltshire, 1941*, Journal of the Bombay Natural History Society,* 42: 476. L.t.: Iran, Lorestan (Khorramabad).

Distribution: Lorestan, Fars (Wiltshire, 1941); Kerman, Sistan va Balouchestan (not registered, stored in the collection of Shahid Bahonar University in Kerman)

***Polymixis crinomima* (Wiltshire, 1946)**

Antitype crinomima Wiltshire, 1946, *Proceedings of the Royal Entomological Society of London,*15: 120. L.t.: Iran, Fars, Kermanshah.

Distribution: Fars (Wiltshire, 1946b; Ebert and Hacker, 2002); Kermanshah (Wiltshire, 1946b); Golestan, Khorasan (Wieser and Stangelmaier, 2005); Kerman (not registered, stored in the collection of Shahid Bahonar University in Kerman)

***Polymixis fibrillata* Ronkay and Gyulai, 2006**

Polymixis fibrillata Ronkay and Gyulai, 2006, *Esperiana* 12: 243. L.t.: Iran, Tehran.

Distribution: Tehran (Ronkay and Gyulai, 2006a)

***Polymixis rufocincta flavidior* (Warren, 1911)**

Antitype rufocincta flavidior Warren, 1911, *Die Gross-Schmett. der Erde* 3: 136. L.t.: Turkey, Syria.

Distribution: Tehran (Ebert and Hacker, 2002)

***Polymixis philippsi* (Püngeler, 1911)**

Polia philippsi Püngeler, 1911*, Zeitschrift für wissenschaftliche Insektenbiologie,* 7: 160. L.t.: Iran, Sultanabad: Fars.

Distribution: Fars (Püngeler, 1911)

***Polymixis chosroes* (Brandt, 1938)**

Antitype chosroes Brandt, 1938, *Entomologische Rundschan,* 55: 518. L.t.: Iran, Fars.

Distribution: Fars (Brandt, 1938)

***Polymixis trisignata* (Ménétriés, 1847)**

Hadena trisignata Ménétriés, 1847, *Mémoires de l'Académie Impériale des sciences de St. Pétersbourg,* 6: 70. L.t.: Turkmenistan.

Distribution: Tehran (Ebert and Hacker, 2002); Markazi, Esfahan (not registered, stored in the collection of Shahid Bahonar University in Kerman)

***Polymixis apotheina* (Brandt, 1938)**

Sidemia apotheina Brandt, 1938, *Entomologische Rundschan,* 55: 522. L.t.: Iran, Karaj.

Distribution: Karaj (Brandt, 1938); Tehran, Azarbayjan-e-Gharbi (Ebert and Hacker, 2002)

***Polymixis apotheina laristana* (Brandt, 1941)**

Sidemia apotheina laristana Brandt, 1941, *Mitteilungen der Münchner Entomologischen Gesellschaft,* 31: 850. L.t.: Iran, Lorestan.

Distribution: Lorestan (Brandt, 1941); Fars, Kerman, Sistan va Balouchestan (not registered, stored in the collection of Shahid Bahonar University in kerman)

***Polymixis scrophulariae* (Wiltshire, 1952)**

Sidemia scrophulariae Wiltshire, 1952*, Bulletin de la Société Fouad Ier d'Entomologie,* 36: 194. L.t.: Iran, Fars.

Distribution: Fars (Wiltshire, 1952)

***Polymixis gracilis* (Brandt, 1941)**

Sidemia gracilis Brandt, 1941, *Mitteilungen der Münchner Entomologischen Gesellschaft,* 31: 849. L.t.: Iran, Lorestan, Sistan va Balouchestan.

Distribution: Lorestan, Sistan va Balouchestan (Brandt, 1941; Ebert and Hacker, 2002)

***Polymixis hedygramma* (Brandt, 1941)**

Sidemia hedygramma Brandt, 1941, *Mitteilungen der Münchner Entomologischen Gesellschaft,* 31: 849. L.t.: Iran, Lorestan, Sistan va Balouchestan.

Distribution: Lorestan, Sistan va Balouchestan (Brandt, 1941; Ebert and Hacker, 2002)

***Polymixis pirkadatka* Ronkay and Gyulai, 2006**

Polymixis pirkadatka Ronkay and Gyulai, 2006, *Esperiana* 12: 217. L.t.: Iran, Esfahan.

Distribution: Esfahan (Ronkay and Gyulai, 2006b)

***Polymixis dubiosa dubiosa* (Brandt, 1938)**

Antitype dubiosa Brandt, 1938, *Entomologische Rundschan,* 55: 518. L.t.: Iran, Karaj.

Distribution: Karaj (Brandt, 1938); Kerman (not registered, stored in the collection of Shahid Bahonar University in kerman)

***Polymixis dubiosa roseotincta* (Brandt, 1941)**

Antitype dubiosa roseotincta Brandt, 1941, *Mitteilungen der Münchner Entomologischen Gesellschaft,* 31: 847. L.t.: Iran, Lorestan, Sistan va Balouchestan.

Distribution: Lorestan, Sistan va Balouchestan (Brandt, 1941; Ebert and Hacker, 2002); Hormozgan (Ebert and Hacker, 2002)

***Polymixis zophodes* Boursin, 1960**

Polymixis zophodes Boursin, 1960, *Bulletin de la Société Linnéenne de Lyon,* 29: 142. L.t.: Afghanistan.

Distribution: Fars (not registered, stored in the collection of Shahid Bahonar University in kerman)

***Polymixis serpentina* (Treitschke, 1825)**

Miselia serpentina Treitschke, 1825, *Die Schmetterlinge von Europa,* 5(1): 399. L.t.: Fiume.

Distribution: Fars, Khorasan Shomali (not registered, stored in the collection of Shahid Bahonar University in kerman)

***Polymixis alborsa* Babics and Benedek, 2011**

Polymixis alborsa Babics and Benedek, 2011, *Esperiana* 16: 198. L.t.: Iran, Khorasan.

Distribution: Khorasan, Mazandaran (Babics and Benedek, 2011)

***Polymixis atossa atossa* (Wiltshire, 1941)**

Brachionycha atossa Wiltshire, 1941, *Journal of the Bombay Natural History Society,* 42: 475. L.t.: Iran, Fars.

Distribution: Fars (Wiltshire, 1941); Golestan, Khorasan (Wieser and Stangelmaier, 2005)

***Polymixis latesco* Fibiger, 2001**

Polymixis latesco Fibiger, 2001, *Noctuidae Europaeae* vol. 3: 225. L.t.: Turkmenistan.

Distribution: Golestan, Khorasan (Wieser and Stangelmaier, 2005)

***Polymixis achrysa* Ronkay, Varga and Hreblay, 1988**

Polymixis achrysa Ronkay, Varga and Hreblay, 1998, *Acta Zoologica Academiae Scientiarum Hungaricae,* 44: 247. L.t.: Turkmenistan.

Morphology Adult Male (Fig. 1b): Antennae pectinate. Thorax brownish grey mixed with cream, shaggy. Wingspan 30-34 mm, forewing ochreous with sparse and irregular areas of grey-dark brown, cross lines weakly defined, median area greyish brown, terminal line defined, noctuid maculation present, nearly concolourous with subterminal area. Reniform stigma elliptical, weakly kidney-shaped, orbicular stigma elliptical, both yellowish cream and sporadically weakly centred with grey scales; claviform stigma smaller and weakly darker than the other two spots, encircled with dark brown-grey line. Cilia yellowish cream, spotted with brownish grey. Hindwing greyish white, glossy, discal spot as a fine grey line, cilia cream with fine grey band. Female as male, antennae filiform.

Male genitalia (Figs. 2b and 2c): Uncus signated, hairy, penicular lobe weakly defined, juxta plate-shaped, incised medio-dorsally, concave ventrally, weakly tipped. Valvae long, weakly pointed apically, costal margin developed, constituting one-third of the valve, heavily sclerotised, apically quadrangular, tapering toward the sacculus, cucullus more than two times longer, sacculus mostly sclerotised, clasper short, based with two long stalks, a small tubular ampulla situated near the clasper, rounded apically. Vinculum more or less U shaped. Aedeagus tubular, straight; vesica tubular with irregular sacs along, with strong large spines basally and with fine strong large hairs apically, a tubular appendix bulge bears next to the hairs.

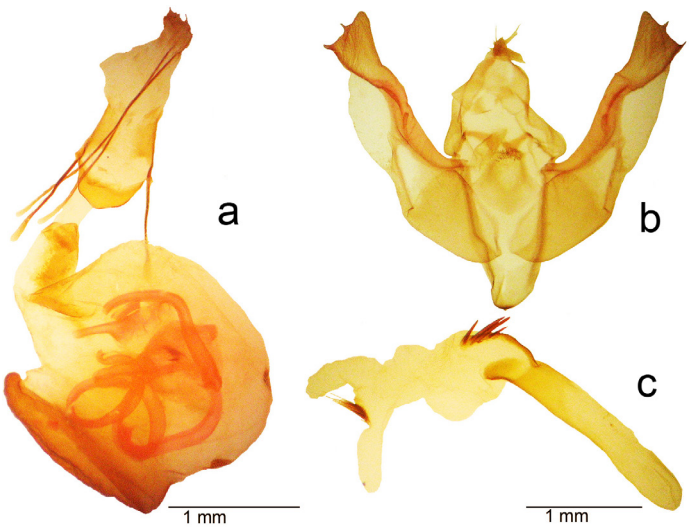

Fig. 2. Genitalia: a) female genitalia of *Agrochola turcomanica*; b) male armature and c) male aedeagus and vesica of *Polymixis achrysa*.

Bionomy and distribution: Probably univoltine, it inhabits mostly high altitudes in semi-arid mountainous regions. The imagines were collected from North-East of Bojnurd city. This species inhabits locations covered with Juniper trees in steep slopes and high rocks, as well in plains, grasslands and hillsides covered with *Astragalus*, *Artemisia* and annual plants. The moths fly in early autumn especially in October and are attracted to the artificial light. The larval stages are unknown. This species has only been collected from its type locality, Turkmenistan (Ronkay *et al*., 1998)

Remarks: The closest relative to this species is *P. philippsi* Püngeler, the diagnostic features that are useful to separate them are; the forewing colour scheme is more ochreous and unicolourous with more defined noctuid maculation in *P. philippsi*. The costal plate of the male genitalia in *P. philippsi* is finely arched ventrally while that of *P. achrysa* is significantly strongly arched ventrally with stronger teeth apically.

Material Examined: 10 ♂♂, Iran, Khorasan Shomali, Langar, 1536 m, 37°34'06"N 57°15'19"E, 25.10.2011, leg. Sh. Feizpoor.

DISCUSSION

The Iranian fauna of *Agrochola* in addition to our new record (*A. turcomanica*) consists of 13 species. Of those, seven species have originally been described from Iran that was collected from the western provinces of the country. Wiltshire (1941, 1946a, 1952) with four species and subspecies, *A. disrupta, A. oropotamica thermopotamica, A. plumbea* and *A. plumbea convergens* shares the most number of explored species of this genus in Iran. The other three species, *A. elbursica*, *A. fuscomixta* and *A. elami* were discovered in the beginning of the 21 century by Ronkay

and Gyulai (2006b) and Benedek and Ronkay (2001). The present study reveals that *Polymixis* comprises 22 species in Iran, of those, 15 species have Iranian type locality that mostly discovered by Brandt in the first half of the previous century. Recently, the genus *Polymixis* as well as *Agrochola*, includes three new discovered species from Iran (i.e., *P. fibrillata, P. pirkadatka* and *P. alborsa*) (Ronkay and Gyulai 2006a, b, Babics and Benedek 2011) emphasizing the importance of more expeditions in the country.

Agrochola turcomanica and *Polymixis achrysa* were collected from Khorasan Shomali province in northeast of Iran. Both species are recorded for the first time for the fauna of the country the result that indicates the importance of more investigations on the fauna of this subfamily as well as other noctuid moths in this region. The location of this province in two Iranian-Turanian and Hyrcanian biomes has led to a variety of plant covering from forest (e.g., outspread forests of juniper, oak, hazelnut, maple) to mountainous and steppe areas or grasslands (mostly covered with barberry, tamarisk, Artemisia and etc.). Along with these geographical features and climate of the province, it bears the diversity of animals and increases the high richness of the arthropod's fauna too (Darvishsefat, 2006).

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