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Alsophila aescularia (Denis & Schiffermüller, 1775) a genus and species new to the fauna of Iran, a species from a threatened habitat

(Lepidoptera, Geometridae, Ennominae)

Shamsi Feizpour, Bernd Müller, Mahmood Soofi, Lida Fekrat & Hossein Rajaei

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Alsophila aescularia (Denis & Schiffermüller, 1775) is reported for the first time for the fauna of Iran. Male and female specimens, as well as male genitalia are illustrated. Pictures of the habitat of the species in North Iran are given. Diagnostic characters of both male and female are presented and additional information about habitat and host plant is given.

Shamsi Feizpour & Hossein Rajaei, Staatliches Museum für Naturkunde Stuttgart, Rosenstein 1, 70191 Stuttgart, Germany;
e-mail: hossein.rajaei@smns-bw.de

Bernd Müller, Weissdornallee 13, 13158 Berlin, Germany

Mahmood Soofi, Workgroup on Endangered Species, J. F. Blumenbach Institute of Zoology and Anthropology, University of Goettingen, Bürgerstrasse 50, 37073 Goettingen, Germany

Shamsi Feizpour & Lida Fekrat (corresponding author), Department of Plant Protection, Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad, Iran

Introduction

Genus *Alsophila* Hübner, [1825] has previously been classified under the subfamily Alsophilinae Herbulot, 1962 (Hausmann 2001). This subfamily concept was questioned several times, and the group been assigned to different subfamilies: Oenochrominae (Seven 1991, Inoue et al. 1982), Larentiinae and Ennominae (Holloway 1996, Patocka & Zach 1994, Nakamura 1987). In the most update study, using an extensive molecular dataset, Sihvonen et al. (2011) considered this group as a tribe of the subfamily Ennominae.

Genus *Alsophila*, with ten species in the Holarctic region (Scoble & Hausmann 2007), comprises only two species in Europe (Hausmann 2001). The winter moth *Alsophila aescularia* (Denis & Schiffermüller, 1775) is a well-known species distributed in the western Palaearctic region (except northern Europe, Corsica, Malta, Albania and Greek islands; see Hausmann 2001). Outside Europe, it has been recorded from few isolated populations in North and East Turkey, Caucasus, Transcaucasus, and Turkmenistan (Kopet-Dagh mountains) (Viidalepp 1996). Here we report this species for the first time from the Hyrcanian relic temperate deciduous forests of Iran.

Material and methods

Some larvae have been collected in eastern Alborz Mountains in North Iran (Prov. Semnan, N 36°45'59.1", E 055°02'12.1", North Shahrud, North Abr, South Shirinabad, 1890 m, leg. Bernd Müller, Robert Trusch &

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Michael Falkenberg) on May 13, 2008. Adults (three males and one female) emerged from February 25 to March 12, 2009. All specimens are deposited in the private collection of Bernd Müller, Berlin, Germany.

Specimens were photographed (using an Olympus E-3 digital camera). Male specimen was dissected following a standard method (Robinson 1976). Genital preparations were photographed using a Leica microsystem (DFC-490).

Results

Alsophila aescularia (Denis & Schiffermüller, 1775)

Diagnosis

Adult male (Figs 1a,b). Wingspan 28 mm. Antennae ciliate. Ground colour of forewings greyish pale brown with some grey scales scattered. Ante- and postmedian lines distinct, postmedian line dentate, clearly projecting near costa. Apical streak and discal spot distinct. Hindwing ground colour paler, discal spots appeared as small dark-brown spots. Thorax brownish grey. Abdomen chocolate brown. Underside similar to upperside, slightly paler. Terminal line dark-brown, visible on all wings from both sides; fringed pale grey.

Adult female (Fig. 2). Wingless. Antennae filiform. Body length six mm with terminal tuft nearly as wide as abdomen width. The most similar species, *A. aceraria,* has lighter brown-creamy forewings, postmedian line not projecting basad at costa, and not showing a distinct apical streak in the forewing.

Male genitalia (Figs 3a,b). Uncus apically tapered (apically broad in *A. aceraria*), subapically broad. Juxta distinctly Y-shaped. Valva broad basally; with long, narrow costal process basally; apically bifurcate (with more stout upper projection in *A. aceraria*). Aedeagus narrow, relatively long (1 mm), slightly arched, without any cornuti (with stout cornuti in *A. aceraria*) (see Hausmann 2001, pages 217 and 232).

Habitat and distribution in Iran

The habitat of this species is located in the Hyrcanian relic temperate deciduous forests, also called Caspian forests, along the northern slopes of the Alborz Mountains range.

These forests continuously stretch from Iranian Talish Mountains in the north-west to the Golli-Dag Mountains in the eastern corner of Alborz range (Sagheb-Talebi et al. 2014). The Hyrcanian forests resemble the European forests, but with much diversity and endemism (Müller et al. 2015). The elevation ranges from minus 28 up to 2800 m a.s.l. which encompasses distinct forest types and covers an area of approx. 1.85 million hectares, being 800 km long and 110 km wide and encompassing 15 % of the Iranian forests. The mean annual precipitation ranges from 530 mm in the east to 1350 mm in the west. However, occasionally it can reach up to 2000 mm in the west. The mean temperature of the warmest and coldest months varies from 28–35 °C to 1.5–4 °C, respectively (Sagheb-Talebi et al. 2014). The lowland forests are dominated by relic tree species namely: *Parrotia persica*, *Pterocaria fraxinifolia*, *Zelcova carpinifolia*, *Gleditsia caspica* and *Diospyrus lotus*. In montane forests (400–1500 m) *Quercus castaneifolia*, *Carpinus betulus* and *Fagus orientalis* become dominant, and eventually tree line ends with *Quercus macranthera*, *Acer campestre* and *Carpinus orientalis* at 1500–2800 m. Open habitats of the region are mainly covered by *Crataegus* spp., *Rosa canina*, *Paliurus spina-christi*, *Prunus divaricata* (Sagheb-Talebi et al. 2014). Two tree species *Carpinus orientalis* (Oriental Hornbeam, Fig. 5 left side) and *Quercus macranthera* (Persian or Caucasian Oak, Fig. 5 right side) are depicted here.

The larvae were collected from lower branches in the marginal zone as well as inside the forest mainly on *Carpinus*. We noticed on these trees a distinct visual damage caused by a large number of larvae of some so called winter moths of the family Geometridae. Apart from larvae of *Alsophila aescularia* (Denis & Schiffermüller, 1775) those of *Agriopis marginaria* (Fabricius, 1776) and *Agriopis aurantiaria* (Hübner, 1799) were collected. More than 80 percent of the larvae were parasitized and died later.

In this paper, we report *A. aescularia* species only from the Hyrcanian temperate forests of southern Shirinabad (located on the northern slope of the Alborz Mts.) in Iran. As the specimens were collected on Oriental Hornbeam (*Carpinus orientalis*), this tree would be also regarded as host-plant of *A. aescularia* in Iran.

Although the species can be found in different deciduous forests, hedges and orchards in large populations in Europe, this Iranian population seems to be locally distributed.

▷

Figs 1. Wing patterns of *Alsophila aescularia* ♂ (Iran, Semnan, South Shirinabad): **a.** upperside; **b.** underside. **2.** Adult female. **3.** Male genital structure: **a.** armature; **b.** aedeagus. **4–5.** Habitat of *A. aescularia* in South Shirinabad: **4.** road expansion fragmented this habitat in Hyrcanian forest; **5.** probable host plants are visible (*Carpinus orientalis* on the left side and *Quercus macranthera* on the right side). Scale bars: 1 cm for adult specimens (Figs 1a,b and 2), 1 mm for genitalia structures (Fig. 3).

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Conservation status of Hyrcanian forests

Unfortunately, the habitat of this species south of Shirinabad has already been threatened by the road expansion during the last decade. The Hyrcanian biodiversity hotspot is a key conservation priority area and a cross-road between Asia and Europe (Olson & Dinerstein 1998, Adroit et al. 2018). However, rapid human overexploitation (logging) and habitat degradation (road construction, intensive livestock grazing) have intensively threatened the integrity and the biodiversity of these unique forests (Fig. 4). As a result, it has been halved during the past five decades (Ghoddousi et al. 2017, Müller et al. 2015). Despite existing threats, the Hyrcanian forests are still less touched and harbour many native and endemic species of fauna and flora (Ghoddousi et al. 2017).

Habitat fragmentation due to anthropogenic activities such as logging, mining, road building, and farming affects the integrity of the forest ecosystem. Unfortunately, this is the case in the Hyrcanian forests.

The winter moth *A. aescularia* is a polyphagous species and abundant, and has been listed as a pest species in continental Europe, except for the extreme north and south (Carter 1984). The females of the *A. aescularia* are wingless which substantially limits their movement ability (Carter 1984). Yet, in the Middle-East, the species has been only reported from Turkey (Hausmann 2001, Okyar & Mironov 2008) but not from Iran. Moreover, the species is not documented in the Iranian pests-list (Abaii 2000). This suggests that despite its polyphagous behaviour, the species might biologically be controlled by natural predators. We acknowledge that our ecological information (i. e. distribution range, food plant and reproduction period) is limited and insufficient to draw a clear conclusion. Nevertheless, occurrence of this species in the Hyrcanian remnant forests would of course be biogeographically and ecologically important. Recent study in Poland shows that *A. aescularia* has the highest ecological significance compared to its other geometrid counterparts (Hikisz & Soszyńska-Maj 2015).

In essence, national constant monitoring programs (i. e. taxonomy and ecological studies) are essential for identification of the fauna across the entire of Hyrcanian forests. Such monitoring would not only be important from research perspective but also is decisive for a profound knowledge of the native fauna of these remnant forests. The current rapid human developments may result in local disappearance of native species before they become identified.

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