

UDK 595.782

# TO THE STUDY OF SPECIES DIVERSITY OF MOTHS (LEPIDOPTERA, GELECHIIDAE, ARGYRESTHIIDAE) OF THE FAUNA OF BELARUS AND UKRAINE CONFORMING TO THE TROPICAL CONNECTION

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*Microlepidopteran moths belong to the vast faunal complex which dominates in almost all terrestrial biocenoses of Palaearctic region. The article continues the series of previous papers published in the Bulletin concerning the study of phytophagous moths of the fauna of Belarus and Ukraine. The representatives of these phytophages are suitable candidates for studying the dynamics of insect-plant interaction and the main evolutionary processes in nature leading ultimately to specific diversity.*

*The purpose of this work is to consider the trophical connections and stenotopic adaptation as prerequisites for characterizing the species composition of these phytophagous micromoths.*

**Material and methods.** *The moths dealt with in this work were collected by means of netting. Moreover, a lot of species stored in the main scientific museums of the Western Europe and the former USSR were studied. The classification used in this article is according to the recent monographic publications containing the modern classification based on the molecular-genetic results.*

**Findings and their discussion.** *A recently improved list of specific diversity conforming to the trophical connections of 31 species from 2 families of moths which occur in different landscapes of Belarus and Ukraine is presented. Insect-plant interrelation of these phytophages as trophoconsorts in the natural environment is discussed for the first time.*

**Conclusions.** *It is noted that in the examined moths which are consortive components of biocenoses the evolution of trophic adaptations is closely linked with the host plants of their larvae. Obviously it is necessary to monitor the reproduction of injurious species in order to protect agrocenoses and natural phytocenoses under anthropogenic ecofactors.*

**Key words:** *moths, phytophages, trophoconsorts, Belarus, Ukraine.*

# К ИЗУЧЕНИЮ ВИДОВОГО РАЗНООБРАЗИЯ МОЛЕЙ (LEPIDOPTERA, GELECHIIDAE, ARGYRESTHIIDAE) ФАУНЫ БЕЛАРУСИ И УКРАИНЫ В СООТВЕТСТВИИ С ТРОФИЧЕСКОЙ ПРИУРОЧЕННОСТЬЮ

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*Моли группы микрочешуекрылых являются всеветно распространенным фаунистическим комплексом, обитающим почти во всех наземных биоценозах Палеарктики. Настоящая статья продолжает серию предыдущих, опубликованных в данном журнале, касающихся изучения молей-фитофагов фауны Беларуси и Украины. Представители рассматриваемых фитофагов – подходящие объекты для изучения взаимодействия насекомых и растений, обуславливающих в конечном итоге видовое разнообразие.*

*Цель работы – рассмотрение трофической приуроченности и стенотопной адаптации как предпосылок для характеристики видового состава указанных молей-фитофагов.*

**Материал и методы.** *Бабочки пойманы с применением энтомологического сачка, кроме того, исследованы экземпляры, хранящиеся в основных научных музеях Европы и бывшего СССР. Классификация, представленная в публикации, соответствует данным, опубликованным в современных монографических работах, содержащих обновленную классификацию, основанную на молекулярно-генетических результатах.*

**Результаты и их обсуждение.** Составлен современный уточненный список видового разнообразия в соответствии с трофической приуроченностью 31 вида из 2 семейств молей, распространенных в различных ландшафтах Беларуси и Украины. Взаимосвязь с растениями у этих фитофагов как трофоконсортов природной среды обсуждается впервые.

**Заключение.** Установлено, что у исследованных видов, которые являются компонентами биоценозов, эволюция трофических адаптаций тесно связана с эволюцией кормовых растений их гусениц. Очевидна необходимость мониторинга размножения вредных видов с целью защиты агроценозов и природных фитоценозов в условиях антропогенных экофакторов.

**Ключевые слова:** моли, фитофаги, трофоконсорты, Беларусь, Украина.

In this paper we dealt with the world-wide distributed phytophagous moths of two microlepidopteran families (Gelechiidae, Argyresthiidae) recorded in the fauna of Belarus and Ukraine [1–2]. The present article is a continuation of the previous papers published in the journal devoted to studying on the phytophagous moths of Belarus and Ukraine [3–6]. The main aim of this overview is to take in consideration the examined species according to their trophical connections. Most of these species are phytophagous, they feed on leaves of certain host plants, therefore appearing as trophoconsorts. The last one often exert a direct influence on the productivity of the food plants by decreasing the overall amount of the phytomass [7]. The complete list of food plants of each species is given. Such information may be used in order to protect agrocenoses and natural phytocenoses.

**Material and methods.** The above mentioned moths were collected by netting during 1968–2016. The specimens stored in the main scientific museums of the Western Europe and the former USSR were also examined. The classification used in this paper is according to Lewis and Sohn, 2015 [8].

**Findings and their discussion.** As a result of the carried out research it can be considered that a discernment of phytophagous moths as trophoconsorts caused to reveal the insect-plant interrelations in the natural environment that is necessary for plant-protection elaboration. A renovated list of the examined 31 species from the families Gelechiidae and Argyresthiidae recorded in the fauna of Belarus and Ukraine is represented.

Nomenclature terms are given according to the recent publications [1; 2].

## Family Gelechiidae

Gelechiidae is a cosmopolitan group of Microlepidoptera widely distributed in Palaearctic region [1; 6; 9]. There are more than 5000 species in the world and nearly 900 are European species. In Belarus 164 species are recorded. Fauna of Ukraine being studied now. Larvae of gelechiid species are generally oligophagous, trophically connected with four plant orders: mostly with Magnoliophyta and rarely with Bryophyta, Polypodiophyta and Pinophyta. Life-way of these moths is rather hidden. The majority of species prefer mixed habitats of trees and bushes as well as flowering plants in all landscape zones. Usually larvae often start mining the buds, leaves, stems, shoots of their host plants. Larvae of some species are carpophagous and often are injurious to seeds and fruits. In mines larvae feed during 10–12 days and then moult and pass to external feeding among leaves entwining them and twigs with a silken thread. Such nests form a protection for the larvae, because inside these nests they are less accessible for birds and parasitoids. In the majority of species hibernate larvae. Some species often damage agriculture crops, fruit trees, arboreal and bush plants. Taxonomic diversity of the family Gelechiidae is clear. However, its range connected with subfamilies and tribes is discussible.

### *Gelechia* Hübner, [1825]

At the present time 13 species of this genus is known from Belarus and 10 species already studied from Ukraine. These moths are phytophages trophically connected with plants of the following seven families: *Cupressaceae*, *Salicaceae*, *Rosaceae*, *Fagaceae*, *Grossulariaceae*, *Sapindaceae*, *Elaeagnaceae*.

Here the list of the host plants of the Gelechiid larvae is represented.

This list based on the results of the investigations of the first author. Besides that, an information from the labels of the specimens stored in the different collections was used. Also the literature data were taken in account.

***G. cuneatella*** Douglas, 1852. Host plants: *Salix caprea* L., *S. alba* L. (*Salicaceae*) [1; 9]. Phyllophage. Injurious among strongly moisture *Salix* undergrows. Monovoltine.

***G. hippophaella*** (Shrank, 1802). Host plant: *Hippophae rhamnoides* L. (*Elaeagnaceae*) [1; 9]. Phyllophage, miner, caulophage. Monovoltine.

**G. jakovlevi** (Krulikovski, 1905). Host plants: *Ribes nigrum* L. (Grossulariaceae), *Malus domestica* Borkh. (Rosaceae), *Salix caprea* L. (Salicaceae) [1; 6]. Phyllophage. Pest of the fruit trees and bushes. Monovoltine.

**G. muscosella** Zeller, 1839. Host plants: *Salix caprea* L., *Populus tremula* L. (Salicaceae) [1; 6; 9]. Anthophage. Injurious to the willows bed in the parks and public gardens. Monovoltine.

**G. nigra** (Haworth, 1828). Host plants: *Populus tremula* L., *P. alba* L., *P. nigra* L., *P. canescens* (Ait.), *Salix caprea* L. (Salicaceae) [1; 6; 9]. Phyllophage. Injurious to the forests and forest-parks. Monovoltine.

**G. rhombella** ([Denis & Schiffermüller], 1775). Host plants: *Malus silvestris* Mill., *M. domestica* Borkh., *Pyrus communis* L., *Prunus domestica* L., *Cerasus vulgaris* Mill., *Sorbus aucuparia* L., *Amelanchier spicata* (Lam.) C. Koch, *Padus avium* Mill., *Cydonia oblonga* Mill., *Aronia michurinii* Skvortz et Maitul (Rosaceae). Phyllophage [1; 6; 9]. Pest of the fruit trees and bushes in the gardens and parks. Monovoltine.

**G. rhombelliformis** Staudinger, 1871. Host plants: *Populus nigra* L., *P. pyramidalis* (Roz.) Cel., *P. balsamifera* L. (Salicaceae) [1; 6; 9]. Phyllophage. Injurious in the parks, public gardens and sides of roads. Monovoltine.

**G. sabinellus** (Zeller, 1839). Host plants: *Juniperus communis* L., *J. sabina* L., (Cupressaceae) [1; 6]. Phyllophage. Economical important pest in the cities.

**G. scotinella** Herrich-Schäffer, 1854. Host plants: *Prunus spinosa* L., *P. domestica* L., *P. cerasifera* Ehrh., *Cerasus avium* (L.) Moench., *Armeniaca vulgaris* Lam., *Crataegus curvisepala* Lindm., *C. sanguinea* Pall. (Rosaceae) [1; 6; 9]. Anthophage. Injurious to the fruit trees, bushes in the gardens and forests. Monovoltine.

**G. sestertiella** Herrich-Schäffer, 1854. Host-plants: *Acer platanoides* L., *A. campestre* L. (Sapindaceae) [1; 6; 9]. Pest in the botanical gardens, parks, public gardens and sides of roads. Monovoltine.

**G. sirotina** Omelko, 1986. Host plants unknown. Possibly *Salix* spp. (Salicaceae) [1]. Phytophages. Monovoltine.

**G. sororculella** (Hübner, 1817), Host plants: *Salix caprea* L., *S. cinerea* L., *S. auritra* L., *S. purpurea* L., *S. viminalis* L. (Salicaceae), *Quercus robur* L. (Fagaceae), *Sorbus aucuparia* L. (Rosaceae), *Ribes nigrum* L. (Grossulariaceae) [1; 6; 9]. Phyllophage. Monovoltine.

**G. turpella** ([Denis & Schiffermüller], 1775) (= *pinguinella* Treitschke, 1832). Host plants: *Populus nigra* L., *P. pyramidalis* (Roz.) Cel., *P. balsamifera* L., *P. laurifolia* Ledeb. (Salicaceae) [1; 6; 9]. Phyllophage. Pest in the botanical gardens, public gardens and urban plantings. Monovoltine.

#### Family Argyresthiidae

Argyresthiidae is cosmopolitan group of 157 species widely distributed in Palaearctic region [10]. The larvae are oligophagous being miners or borers in flowers, buds, seeds, twigs of trees and shrubs. Recently molecular studies, consisted of eight nuclear genes were sampled for searching barcode sequences in the Barcode of Life Data system. As a result, substantial clarification of independence of this family was strongly supported [11]. Thus, taxonomic status of Argyresthiidae which was a basis for discussion during last centuries became clear.

#### *Argyresthia* Hübner, [1825]

For the fauna of Belarus and Ukraine 18 species of this genus are recorded [1; 2]. These phytophages trophically connected with the following 5 plant families: Pinaceae, Rosaceae, Betulaceae, Cupressaceae, Salicaceae.

Here we are giving the list of food plants on which Argyresthiidae larvae have been observed to develop. The host plants that we give are based on observations of larval feeding that are mentioned in the literature or on the labels of the specimens we investigated.

**A. abdominalis** Zeller, 1839. Host-plant: *Juniperus communis* (L.) (Cupressaceae) [12]. Univoltine species.

**A. albistria** (Haworth, 1828). Host plants: *Prunus cerasus* L., *P. domestica* L., *P. spinosa* L., *Pyrus communis* L. (Rosaceae). [11]. Univoltine species. Injurious as borer of buds, twigs and fruits in orchards. Carpophagous.

**A. bonnetella** (Linnaeus, 1758). Host-plants: *Prunus spinosa* L., *Crataegus* spp. (Rosaceae) [12]. Univoltine species.

**A. brockeella** (Hübner, 1813). Host-plants: *Betula* spp., *Alnus* spp. (Betulaceae) [12; 13]. Univoltine species.

**A. conjugella** Zeller, 1839. Host-plant: *Sorbus aucuparia* L. (Rosaceae) [12; 13]. Univoltine species.

**A. curvella** (Linnaeus, 1761). Host-plants: *Prunus spinosa* L., *Malus sylvestris* Mill. (Rosaceae) [2]. Bivoltine species. Injurious as borer of buds, leaves and twigs in orchards.

**A. fundella** (Fischer von Roslerstamm, 1835). Host-plant: *Abies alba* Mill (Pinaceae) [2]. Univoltine species.

**A. glabratella** Zeller, 1847. Host-plants: *Picea abies* (L.), *P. excelsa* (Lem.) (Pinaceae) [12]. Univoltine species.

**A. goedartella** (Linnaeus, 1758). Host-plants: *Betula verrucosa* Ehr., *Alnus* spp. (Betulaceae) [12; 13]. Univoltine species.

**A. illuminatella** (Zeller, 1839). Host-plants: *Abies alba* Mill., *Larix decidua* Mill. (Pinaceae) [12]. Univoltine species.

**A. ivella** (Haworth, 1828). Host-plants: *Malus sylvestris* Mill., *M. domestica* Borkh., *Pyrus communis* L. (Rosaceae), *Corylus avellana* L. (Betulaceae) [13; 14]. Univoltine species. Injurious as borer of the buds in orchards [9].

**A. juniperivorella** (Kuznetsov, 1958). Host-plant: *Juniperus* sp. (Cupressaceae) [15]. Univoltine species.

**A. pruniella** (Clerck, 1759). Host-plants: *Prunus avium* (L.), *P. cerasus* L., *P. persica* (L.), *Sorbus aucuparia* L. (Rosaceae) [12; 13]. Univoltine species. Injurious as borer of buds, twigs and fruits in orchards. Carpophagous.

**A. pulchella** Lienig & Zeller, 1846. Host-plants: *Sorbus aucuparia* L., *Malus sylvestris* Mill. (Rosaceae). [12]. Univoltine species.

**A. pygmaeella** ([Denis & Schiffermüller], 1775). Host-plant: *Salix caprea* L. (Salicaceae) [12]. Univoltine species.

**A. retinella** Zeller, 1839. Host-plant: *Betula pubescens* Ehrh. (Betulaceae) [2]. Univoltine species.

**A. semifusca** (Haworth, 1828). Host-plants: *Prunus padus* L., *P. spinosa* L., *Sorbus aucuparia* L. (Rosaceae) [12; 13]. Univoltine species. Injurious as borer of the buds and twigs.

**A. sorbiella** (Treitschke, 1833). Host-plant: *Sorbus aucuparia* L. (Rosaceae) [12; 15]. Univoltine species.

Recently the abundance of decorated bushes and fruit trees increase because of agricultural and gardening practices. In such an alternative phytocenoses the role of phytophagous trophoconsorts just as like examined moths increase also. Consequently, often these species transformed from potential to predominant pests and sometimes are found widespread in orchards and parks.

Obviously a decoding of the nature and specific action of trophoconsorts in part represented by the species of the families Gelechiidae and Argyrethiidae is necessary to prevent the abundance of injurious species in order to protect agrocenoses and natural phytocenoses under anthropogenic pressure.

**Conclusion.** In this paper as a result of the carried out research a contemporary checklist of specific diversity and trophical connections of 31 species from two families of phytophagous moths distributed in the fauna of Belarus and Ukraine as well as interpretation these Microlepidoptera as trophoconsorts are noted for first time.

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Поступила в редакцию 17.02.2021

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