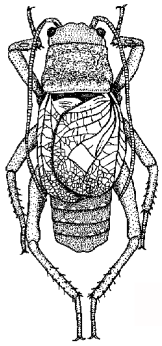

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NEW RECORDS OF THE LEAF MINING GRACILLARIID MOTHS (LEPIDOPTERA: GRACILLARIIDAE) FROM ASIAN PART OF RUSSIA

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Summary. New data on distribution of seven species of the family Gracillariidae in Asian part of Russia are provided. Six species, *Phyllonorycter comparella, Ph. dubitella, Ph. medicaginella, Ph. pyrifoliella*, *Ph. ringoniella* and *Ph. sorbi*, were recorded in Siberia (Krasnoyarsk krai, Novosibirsk and Omsk oblasts) for the first time. *Micrurapteryx caraganella* is new for Tuva Republic and the Russian Far East

(Amur oblast). *Phyllonorycter sorbi* was collected in Novosibirsk on new host plants: *Amelanchier* sp., *Sorbocotoneaster pozdnjakovii* and *Prunus virginiana* (Rosaceae). Male genitalia are illustrated for the majority of the listed species.

Key words: Gracillariidae, fauna, new records, new host plants, Siberia, Russian Far East.

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Резюме. Приводятся сведения о новых находках 7 видов молей-пестрянок (Gracillariidae) в азиатской части России. Шесть видов (*Phyllonorycter comparella, Ph. dubitella, Ph. medicaginella, Ph. pyrifoliella, Ph. ringoniella* и *Ph. sorbi*) впервые отмечены для Сибири (Красноярский край, Новосибирская и Омская области). *Micrurapteryx caraganella* впервые указывается из Республики Тыва и с Дальнего Востока (Амурская область). *Phyllonorycter sorbi* был собран в Новосибирске на новых кормовых растениях: *Amelanchier* sp., *Sorbocotoneaster pozdnjakovii* и *Prunus virginiana* (Rosaceae). Для большинства обнаруженных видов приводятся иллюстрации гениталий самцов.

INTRODUCTION

Taxonomic diversity and distribution of microlepidopteran species remain poorly studied in Asian part of Russia, particularly in Siberia, comparing to European part of the country (Sinev, 2008, 2013). Therefore regional revisions of micromoth fauna and discoveries of new species would represent an added value. Here we report several new records of gracillariid species from Siberia and the Russian Far East. Each species is provided with a short diagnosis, general distribution and host range data. Additionally male genitalia are illustrated for the majority of the listed species.

MATERIAL AND METHODS

The material for this study has been collected in Asian part of Russia: Omsk oblast, Novosibirsk oblast, Krasnoyarsk krai, Tuva Republic and Amur oblast in 2011–2016. Insects were sampled in botanical gardens (Central Siberian botanical garden SB RAS, Novosibirsk; Arboretum of Sukachev Institute of Forest SB RAS and V.M. Krutovsky botanical garden, Krasnoyarsk; Botanical garden of the Tuva State University, Kyzyl), city parks (Victory park, Omsk), in city or village plantations along main roads (Krasnoyarsk, Kyzyl and Skovorodino) and in private orchards (Abakan, Minusinsk, Krasnoyarsk and suburban area). Majority of gracillariid specimens were sampled at larval and pupal stages together with their leaf mines from following plants: *Caragana* (Fabaceae), *Populus, Salix* (Salicaceae) and *Malus* (Rosaceae). A few gracillariid moths were collected from pheromone traps that were targeted at other insect species (noted in the text below).

Gracillariid larvae and pupae were reared indoor in the stable conditions (22 °C, 55% RH, LD 18:6) following Hering (1951) to obtain adult moths. Some immature stages of species were also preserved in 96% ethanol; leaves with mines were dried under press and placed in herbarium collection. Adults were pinned; genitalia dissections and slide mounts were prepared according to Robinson (1976). Genitalia were photographed using digital camera Canon EOS 650 D through Olympus CX 41trinocular microscope. All photos and illustrations were revised using Adobe Photoshop®CS2 (v.9).

The names of Russian regions in Distribution of each species are given in accordance with the Catalogue of Lepidoptera of Russia (Sinev, 2008); new faunistic records are marked by asterisk (*).

Gracillariid specimens and their mines are kept in Sukachev Institute of Forest, Sukachev Institute of Forest SB RAS, Federal Research Center «Krasnoyarsk Science Center SB RAS».

LIST OF SPECIES

Subfamily Gracillariinae Stainton, 1854

***Micrurapteryx caraganella* (Hering, 1957)**
Fig. 1

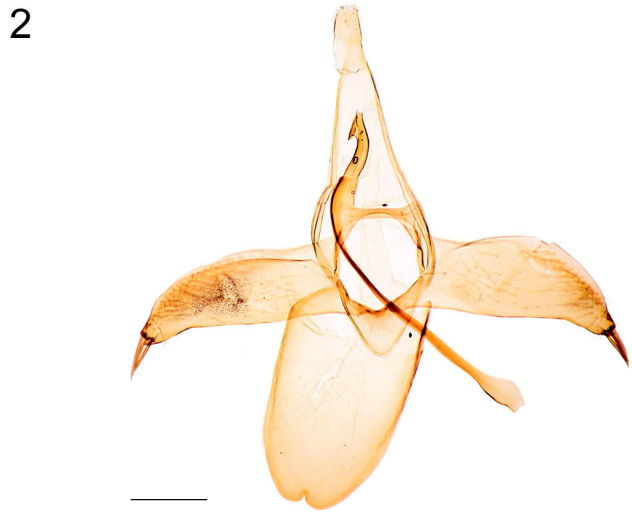
MATERIAL EXAMINED. **Russia**: Amur oblast, Skovodorino, bushes of *Caragana arborescens* near by train station, 26.VI 2016, 15 leaf mines (herbarium, vol. XIV, 2016), 3 larvae, 4 pupae, 1♂, 1♀, adults reared from mine (em. 3.VII 2016), gen. slide nos. NK38♂, NK39♀, N. Kirichenko; Tuva Republic, Kyzyl, bushes of *Caragana arborescens* along Kalinina str., 12.VII 2016, 5 leaf mines (herbarium, vol. XV, 2016), 1 larva, 1 pupa, N. Kirichenko.

DIAGNOSIS. The forewing pattern of *M. caraganella* is very similar to *M. gradatella* and only genitalia allow distinguishing these two species. In male genitalia, *M. caraganella* has a prominent tooth on the middle of the ventral margin of the valva which is absent in *M. gradatella*. In female genitalia, the antrum is ampulla-shaped with lateral broadenings, whereas it is almost cylindrical in *M. gradatella*. In pupa of *M. caraganella* cremaster has five pairs of little spines versus three pairs in *M. gradatella*.

NOTES. The species has been recently found in Siberia where it was previously confused with *Micrurapteryx gradatella* which exists in sympatry in some Siberian regions but develops on other Fabaceae species (*Lathyrus, Vicia*) (Kirichenko *et al*., 2016). Drawing of male genitalia in Kuznetzov (1981, fig. 173, 3) is to be attributed to *M. caraganella*, not to *M. gradatella.*

DISTRIBUTION. Russia: Central Siberia (Hering, 1957), Tyumen, Omsk, Novosibirsk, Kemerovo and Irkutsk oblast, Altai and Krasnoyarsk krai (Kirichenko *et al*., 2016), *Tuva Republic, Transbaikal krai (Kirichenko *et al*., 2016), *Amur oblast.

HOST PLANTS. Oligophagous species on Fabaceae. In Siberia: *Caragana arborescens, C. boisii, Medicago sativa* (Kirichenko *et al*., 2016). In Tuva Republic and Amur oblast we found mines only on *Caragana arborescens.*



Figs 1, 2. Male genitalia (ventral view). 1 – *Micrurapteryx caraganella* (with dissected aedeagus, lateral view), gen. slide no. NK38♂; 2 – *Phyllonorycter comparella*, gen. slide no. NK33♂. Scale bars = 200μm (1), 150μm (2).

Subfamily Lithocolletinae Stainton, 1854

***Phyllonorycter comparella* (Duponchel, 1843)**
Fig. 2

MATERIAL EXAMINED. **Russia**: Krasnoyarsk krai, Krasnoyarsk, Udachny district, trees of *Populus alba* along the main road, 15.VII 2016, 2 leaf mines (herbarium, vol. XV, 2016), 2♂, reared from mine (em. 22.VII 2016), gen. slides nos. NK33♂, NK36♂, N. Kirichenko; Krasnoyarsk, Akademgorodok, *Populus alba* tree near garage, 28.VI.2012, 2 leaf mines (herbarium, vol. VII, 2013), 2 larvae from mines, N. Kirichenko & O. Baskareva; Krasnoyarsk, Akademgorodok, Arboretum of Sukachev Institute of Forest SB RAS, *Populus alba,* 20.VI 2011, 4 larva, 3 pupa, N. Kirichenko; Novosibirsk oblast, Novosibirsk, arboretum of Central Siberian botanical garden SB RAS, *Populus alba*, 11.VII 2012, 6 leaf mines (herbarium, vol. I, 2008), 1 larva, N. Kirichenko; Omsk oblast, Omsk, Victory park, *Populus alba*, 29.VI 2013, 2 leaf mines (herbarium, vol. IX, 2013), 2 larvae, N. Kirichenko; Tuva Republic, Kyzyl, *Populus alba,* Botanical garden of the Tuvan State University, 13.VII 2016, 2 leaf mines (herbarium, vol. XV, 2016), 1 larva, 1 pupa, N. Kirichenko.

DIAGNOSIS. Forewings whitish with greyish scales and usually three costal and two dorsal strigulae, very oblique. Male genitalia with simple valva, endowed with a clump of thick bristles. Female genitalia with antrum fairly developed, bursa copulatrix with the usual round signum, characteristic of *Phyllonorycter*, with a central spine. This species was included in *salicifoliella* group (Davis & Deschka, 2001). In this group, feeding only on Salicaceae, *Ph. comparella* is similar to the European *Ph. chiclanella* (Staudinger, 1859) but in the forewing pattern of this species there is a remarkable antemedian fascia not present in *Ph. comparella.*

DISTRIBUTION. Europe: from the United Kingdom to Ukraine (De Prins & De Prins, 2017); Russia: European Central Chernozem region, Volga region, Volga-Don region (Baryshnikova, 2008), South Urals (Stackelberg, 1955; Baryshnikova, 2008), *Novosibirsk oblast, *Omsk oblasts, *Krasnoyarsk krai, *Tuva Republic; Kazakhstan, Turkmenistan, Uzbekistan (De Prins & De Prins, 2017).

HOST PLANTS. Monophagous species on *Populus* (Salicaceae). Europe: *P. alba, P. canescens* (Ellis, 2017), *P. nigra, P. tremula* (De Prins & De Prins, 2017). European part of Russia: *P. alba*, *P. nigra* (Stackelberg, 1955; Gusev, 1984). In Siberia we found mines exclusively on *P. alba.* In 2015–2016 we recorded *P. comparella* mines in mass on *Populus alba* plantation in Krasnoyarsk (Udachniy district).

***Phyllonorycter dubitella* (Herrich-Schäffer, 1855)**

MATERIAL EXAMINED. **Russia**: Krasnoyarsk krai, Krasnoyarsk, Trostentsovo, private garden (dacha), *Salix caprea*, 17.VII 2016, 1♀, reared from mine (em. 22.VII 2016), gen. slides no. NK117-16♀, N. Kirichenko.

DIAGNOSIS. Davis & Deschka (2001) included this species in *hilarella* group feeding on Salicaceae. The members of this group are characterized by the asymmetrical valvae, with a large, often curved spine typically arising near the apex of the left, more enlarged valva. This species is very similar to *Ph. salicicolella* (Sircom, 1848); the only differences are the fusion of the first costal and dorsal strigulae in the male of *Ph. salicicolella* to form an angled band and a well defined lamella antevaginalis in the female genitalia of *Ph. dubitella.*

DISTRIBUTION. Europe: from United Kingdom to Ukraine (De Prins & De Prins, 2017); Russia: European Central region (Baryshnikova, 2008), *Krasnoyarsk krai.

HOST PLANTS. Monophagous species on *Salix* (Salicaceae). In Europe: *S. appendiculata, S. aurita, S. caprea, S. fragilis, S. inerea, S. pedicellata* (Stackelberg, 1955; Ellis, 2017; De Prins & De Prins, 2017). In Siberia the host plant is *Salix caprea* according to our observations.

***Phyllonorycter medicaginella* (Gerasimov, 1930)**
Fig. 3

MATERIAL EXAMINED. **Russia**: Omsk oblast, Omsk, Victory park, *Medicago* sp., 23.VII 2015, 1♂, reared from mine (em. 28.VII 2015), gen. slide no. NK-191-15♂, N. Kirichenko.

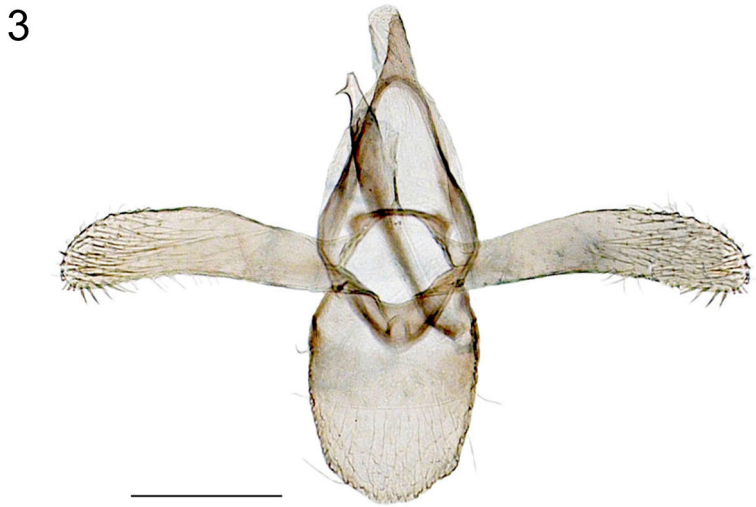
DIAGNOSIS. Forewing with basal streak well defined four costal and three dorsal strigulae, the first pair touching but forming an angulated band sometimes interrupted in the middle. This character distinguishes this species from the similar species feeding on Fabaceae – *Ph. nigrescentella* (Logan, 1851) and *Ph. insignitella* (Zeller, 1846), where the first band, always present, is rounded or slightly angulated. Male genitalia of *Ph. medicaginella* are simple, symmetrical, whereas the other two species with strongly asymmetrical genitalia, similar to species feeding on Salicaceae.

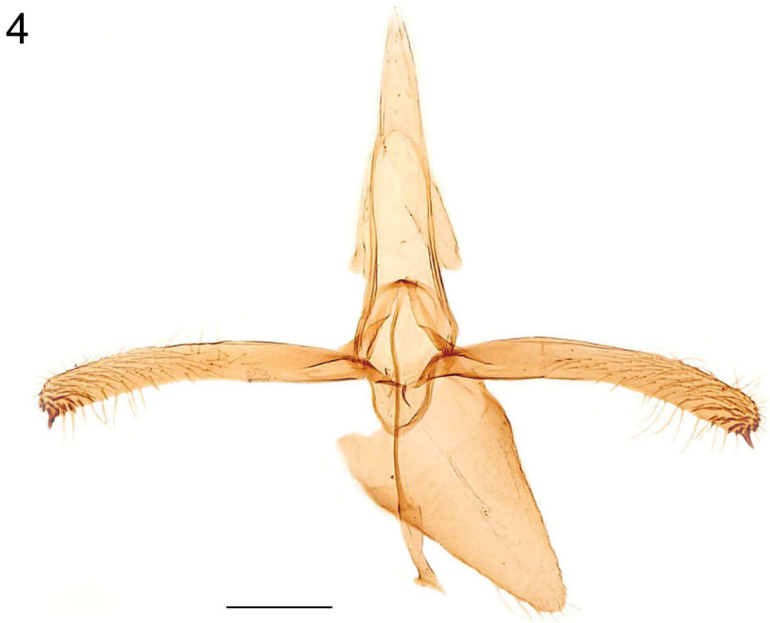
DISTRIBUTION. Europe: from Belgium and the Netherlands to Ukraine (De Prins & De Prins, 2017); Russia: Middle Volga and Volga-Don regions (Baryshnikova, 2008), *Omsk oblast; Kazakhstan, Tajikistan, Turkmenistan, Uzbekistan (Noreika, 1991).

HOST PLANTS. Oligophagous species on Fabaceae. In Europe: *Lotus, Ononis, Medicago*, *Melilotus, Trifolium* (De Prins & De Prins, 2017; Ellis, 2017), occasionally on *Vicia* (Szőcs, 1977). In Siberia the host plant is *Medicago* sp. according to our observations.

***Phyllonorycter pyrifoliella* (Gerasimov, 1933)**
Fig. 4

MATERIAL EXAMINED. **Russia**: Novosibirsk oblast, Novosibirsk, Central Siberian botanical garden RAS, *Malus baccata,* 1.VII 2016, 2 leaf mines (herbarium, vol. XV, 2016), 1♀, reared from mine (em. 6.VII 2016), gen. slide no. NK28(1.1)♀, N. Kirichenko; Krasnoyarsk krai, Krasnoyarsk, dacha community "Pobeda", *Malus* sp., 29.VI 2016, 2♂, reared from mine (em. 2-5.VII 2016), gen. slide EA-1-15♂, EA-2-15♂, E. Akulov; Krasnoyarsk, V.M. Krutovsky botanical garden, *Malus* sp., 29.VI 2016, 3♂, reared from mine (em. 1-5.VII 2016), E. Akulov.





Figs 3, 4. Male genitalia (ventral view). 3 – *Phyllonorycter medicaginella,* gen. slide no. NK-191-15♂; 4 – *Ph. pyrifoliella,* gen. slide no. EA-1-15♂. Scale bars = 140µm (3), 150µm (4).

DIAGNOSIS. This species was placed in *blancardella* group, mining Rosaceae (Triberti, 2007). Forewing pattern is very similar to *Ph. blancardella* (Fabricius, 1781) and *Ph. hostis* (Triberti, 2007) and only the genitalia allow separating these species. Male *Ph. pyrifoliella* can be identified easily by lacking of the basal processes on valvae. Female genitalia are characterized by a projected sterigma forming a truncate cone, extended just beyond the posterior margin of 8th sternum, very similar to *hostis*.

DISTRIBUTION. Europe: from Austria to Ukraine (De Prins & De Prins, 2017); Russia: European central, European Central Chernozem, Middle Volga and Volga-Don regions (Baryshnikova, 2008), *Novosibirsk oblast, *Krasnoyarsk krai.

HOST PLANTS. Typically monophagous species on *Malus* (Rosaceae). In Europe: *Malus* sp., *M. domestica, M. sylvestris,* occasionally *Pyrus communis* (De Prins & De Prins, 2017). In Siberia the host plant is *Malus* sp. and *M. baccata* according to our observations.

***Phyllonorycter ringoniella* (Matsumura, 1931)**
Fig. 5

MATERIAL EXAMINED. **Russia**: Krasnoyarsk krai, Minusinsk, village Opytnoe pole, orchard plantation (mostly *Malus* spp.), pheromone trap (with pheromone of San Jose scale, *Quadraspidiotus perniciosus* Comstock), 02.VIII 2016, 8♂, E. Akulov; Krasnoyarsk, V.M. Krutovsky botanical garden, pheromone trap (with pheromone of oriental fruit moth, *Grapholita molesta*), 13.VII 2014, 26.VIII 2016, 10♂, E. Akulov; Krasnoyarsk, Studgorodok, dacha community "Pobeda", pheromone trap (*G. molesta*), 05.VIII.2014, 4 ♂, E. Akulov; Krasnoyarsk, Vetlujanka district, Dacha community «KZK-2», pheromone trap (*G. molesta*), 13.VII 2016, 2♂, E. Akulov.

DIAGNOSIS. Triberti (2007) proposed a group for *Ph. ringoniella* only. Forewing pattern as in the *blancardella* group, with basal streak and four costal and three dorsal strigulae. Male genitalia simple, valvae without any basal process; the main character is localized in the apex of valve of the male genitalia, bearing variously modified setae. Female genitalia with signum formed by a sclerotized, elongate plate with an irregular, more sclerotized central area with many minute spines.

DISTRIBUTION. Russia: *Krasnoyarsk krai; Amur region, Primorskii krai, Sakhalin (Ermolaev, 1977), South Kuril region (Baryshnikova, 2008); China, South Korea, Japan (De Prins & De Prins, 2017).

HOST PLANTS. Oligophagous species on Rosaceae (*Malus, Prunus, Pyrus*). In China, Korea and Japan: *Malus baccata* (inc. varieties), *M. domestica, M. pumila, M. sieboldii, M. toringo, Malus* sp., *Prunus padus* (*Padus avium*), *P. salicina, Pyrus* sp. (De Prins & De Prins, 2017). In the Russian Far East: *Malus baccata* (Kumata *et al*., 1983), *M. mandshurica* (Ermolaev, 1977). No host plant data from Siberia because we collected specimens from pheromone traps.

5

6

Figs 5, 6. Male genitalia (ventral view). 5 – *Phyllonorycter ringoniella*, gen. slide no. NK-191-15♂; 6 – *Ph. sorbi,* gen. slide no. NK-191-15♂. Scale bars = 150μm (5), 140μm (6).

***Phyllonorycter sorbi* (Frey, 1855)**
Fig. 6

MATERIAL EXAMINED. **Russia**, Novosibirsk oblast, Novosibirsk, Central Siberian botanical garden SB RAS, *Prunus padus,* 10.VII 2012, 1 larva from mine, NK85, N. Kirichenko; the same locality, *Prunus virginiana* f. 'Atropurpureum', 10.VII 2012, 1 leaf mine (herbarium, vol. VII, 2012), 1 pupa from mine, NK86, N. Kirichenko; the same locality, *Sorbus aucuparia,* 10.VII 2012, 5 leaf mines (herbarium, vol. VII, 2012), 1 pupa from mine, NK87, N. Kirichenko; the same locality, *Amelanchier* sp., 1.VII 2016, 1 larva from mine, NK-92-16-1, N. Kirichenko; the same locality, *Sorbocotoneaster pozdnjakovii,* 1.VII 2016, 1 leaf mine (herbarium, vol. XV, 2016), 1♂, reared from mine (em. 9.VII 2016), gen. slide no. NK-25-16♂, N. Kirichenko; the same locality, *Sorbus aucuparia,* 1.VII 2016, 5 leaf mines (herbarium, vol. XV, 2016), 1♂, reared from mine (em. 8.VII 2016), gen. slide no. NK-114-16♂, N. Kirichenko.

DIAGNOSIS. This species was placed into the *blancardella* group (Triberti, 2007). The forewing pattern is very uniform, with four costal and three dorsal white strigulae more or less bordered inwardly with dark brown; a narrow basal streak is present. The nearly symmetry of the basal processes of the valvae in male genitalia makes this species easy to recognize. Sometimes the female genitalia can be confused with *Ph. cydoniella* ([Denis et Schiffermüller], 1775) in ventral view but in lateral view the small, subcylindrical projection of the sterigma of *Ph. sorbi* is evident. This projection also resembles with that in *Ph. hostis* Triberti, 2007 but in this species it is much wider than in *Ph. sorbi.*

DISTRIBUTION. Europe: widely distributed (De Prins & De Prins, 2017). Russia: Kolsk, Karelia, European North-Western, European South-Taiga and European Central regions (Baryshnikova, 2008); *Novosibirsk oblast; Kazakhstan, Turkmenistan (De Prins & De Prins, 2017).

NOTES. Records of *Ph. sorbi* in North America (Oregon) on apple (Pottinger & LeRoux, 1971) are regarded as misidentifications of *P. elmaella* (Landry & Wagner, 1995).

HOST PLANTS. Oligophagous species on Rosaceae. In Europe: *Chaenomeles, Cotoneaster, Crataegus, Cydonia, Malus, Prunus, Pyrus, Sorbus* spp. (De Prins & De Prins, 2017; Ellis, 2017). In European part of Russia: *Cydonia* sp. (Kuznetsov, 1981) and *Sorbus aucuparia* (Yefremova *et al*., 2009). In Siberia according to our observations: *Amelanchier* sp. (new host), *Sorbus aucuparia, Sorbocotoneaster pozdnjakovii* (new host)*, Prunus padus, P. virginiana* f. 'Atropurpureum' (new host).

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