Exploring fauna of Microlepidoptera in South Siberia: novel regional records and interception of quarantine species

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Running title: Exploring fauna of Microlepidoptera in South Siberia

Abstract

We report the results of faunistic study of Microlepidoptera performed on the territory of Southern Siberia using diverse sampling techniques allowing to cover various taxonomic groups. The provided taxonomic list is comprised of 64 species from 44 genera and 18 families, where all species represent novel geographical records. Of them only 62 species inhabit Southern Siberia, the other two species are quarantine pests: the tomato leafminer, *Tuta absoluta* (Meyrick) and peach fruit moth, *Carposina sasakii* Matsumura intercepted in this region. 43 species are new for Krasnoyarskii Krai, 22 species new for Khakassia Republic, 18 genera and 3 families (Glyphipterigidae, Chimabachidae and Oecophoridae) are reported for the first ime from the studied region. Overall, 11 species from 7 families are novel for Siberia: *Bohemannia pulverosella* (Nepticulidae), *Bucculatrix nigricomella, B. pannonica* (Bucculatricidae), *Glyphipterix simpliciella* (Glyphipterigidae), *Monopis obviella* (Tineidae), *Ardania onobrychiella*, *Casignetella heihensis, Coleophora curictae* (Coleophoridae), *Pancalia*

hexachrysa (Cosmopterigidae) and *Caryocolum fischerella*, *C. repentis* (Gelechiidae). Two species, *Bucculatrix pannonica* and *Coleophora curictae* are also the new records for Russia.

For the species newly recorded in fauna Siberia and Russia male or female genitalia are illustrated. For *Coleophora curictae*, representing a novel record for Russia, the bionomics is given for the first time.

Keywords

Microlepidoptera; new regional records; quarantine species; Russia; Southern Siberia.

Introduction

Regular faunistic inventories of species essentially contribute to the knowledge of the regional fauna (Ponomarenko 2008, 2016; Akulov et al 2018; Knyazev et al 2018; Kirichenko et al 2019c) and allow to detect the species expanding their ranges, as well as intercept invasive and quarantine pests (Kenis et al 2007; Fattorini 2013; Akulov et al 2013, 2015).

Situated in the middle of Siberia, Krasnoyarskii Krai (its' southern part) and the Republic of Khakassia, together often referred in Russian literature to South Siberia, represent an important transition zone for the species of organisms having their distribution on the west or on the east of the Palearctic zone. Lepidoptera is a highly diverse world-wide distributed group of insects (Kristensen et al 2007), among which number of pests and invasive species are known (Suckling et al 2017). The faunal studies of this insect order have been conducted on the territory of South Siberia for already more than one century (see an extended literature review in Akulov et al 2018). However, these studies were sporadic, covering certain groups of Lepidoptera (mainly Macrolepidoptera), or were dedicated to biology and ecology of particular species having pest status, that undoubtedly have an important value. For decades, Microlepidoptera have been paid much less attention.

Since 2000, we have been running faunistic studies on the south of Krasnoyarskii Krai and occasionally in the Republic of Khakassia gaining knowledge about the diversity of Microlepidoptera in the region, describing new species to science and developing regional DNA barcode libraries for certain microlepidopteran groups (Akulov et al 2013, 2014, 2015, 2018; Akulov and Kirichenko 2014; Kirichenko et al 2016, 2017a, 2017b, 2018, 2019a, 2019b, 2019c).

Here we present the result of our most recent faunistic surveys of Microlepidoptera in South Siberia that were based on utilization of various sampling techniques allowing to reveal the micromoths of different taxonomic groups, to clarify the species distribution at a regional and within-country scale and to intercept quarantine pests.

Material and methods

The species of Microlepidoptera were collected in the south of Krasnoyarskii Krai (15 localities) and in the Republic of Khakassia (2 localities) from April to August 2015–2019 (Figures 1 and 2). Overall, about 120 specimens of adult moths were collected. As an exception, 5 specimens of *Coleophora* spp. were sampled as larvae in the cases.

In Krasnoyarskii Krai, sampling was done in gardens (V.M. Krutovsky Botanical Garden, private gardens' community «KZK-2», private gardens' community «Pobeda», Opytnoe pole),

city plantations (Krasnoyarsk), in green house complex and market with import fruit production, as well as in nature biotopes, in particular in the Nature reserve «Stolby», the Biryusa Bay, Pogorelskiy bor, and in the meadows and forest surrounding the settlements Berezovskii, Novaya Syda, Kubekovo, and Minino. In the Republic of Khakassia, Microlepidoptera were collected in the forest in Tuimskoe forestry and in the steppe (field research station of SIF SB RAS, Chjernoe Ozero village.) (Figures 1 and 2).

We used various sampling techniques in this study. Among them, the pheromone trapping was most utilized method (Figure 2C). We used pheromone traps with pheromone for regional pests or quarantine species (*Grapholita molesta* (Busck, 1916), *Dendrolimus sibiricus* Tschetverikov, 1877, *Frankliniella occidentalis* Pergande, 1895, *Lymantria dispar* Linnaeus, 1758, *Carposina* "*niponensis*" (*niponensis* auct. (nec Walsingham, 1900)), and *Ceratitis capitata* Wiedemann, 1824). In pheromone traps, captured insects were fixed on the sticky substrate, which was replaced with fresh one 1-2 times a week. The methodology for collecting material in pheromone traps has been described in details in our recent study (Akulov et al 2018). We also used light trapping (the lamp DRV, 250W) (Figures 2F and 2H), sweeping moths from grass by the insect net, as well as making opportunistic sampling of moths resting on different surfaces. In addition, the two species of Coleophoridae were sampled as feeding larvae on leaves on *Ulmus pumila* and *Rosa* sp.

The moths from pheromone traps often had shabby wings because of sticky substrate in the traps. For their preservation, 70% ethanol was commonly used. The adult moths sampled by other approaches were all mounted and placed in dry collections. Coleophoridae larvae were preserved in 96% ethanol solution for following DNA barcoding.

Identification of Microlepidoptera was done, where possible, based on external adult morphology and charcaters of their genitalic apparatus. Genitalia dissections and slide mounts were done following Robinson (1976). Different keys (Lerh 1997, 1999; Medvedev 1981) and lepidopterological sites (Savela 2001; Lepiforum 2019; Moth Dissection UK Lepidoptera 2019; North American Moth Photographers Group 2019; Svenska fjärilar Lepidoptera 2019) were used for species determination. The two species of Coleophoridae collected as larvae, were DNA barcoded in Forest zoology laboratory at INRA, Orleans (France) within postdoctoral fellowship of NIK. The folmer fragment of the COI mtDNA gene, 658 bp, was targeted, using standart primers LCO (5' GGT CAA CAA ATC ATA AAG ATA TTG G 3') and HCO (5' TAA ACT TCA GGG TGA CCA AAA AAT CA 3') (Folmer et al 1994). DNA extraction, amplification and sequencing conditions are given in Kirichenko et al (2016). The DNA barcodes of *Coleophora curictaes* and *C. gryphipennella* and data on their vouchers are publicly available in the BOLD data set “DS- COLEOF”, accessed at: dx.doi.org/10.5883/DS-COLEOF.

The taxonomic lists is comprised exceptionally of the species that represented novel geographic records. The species that had been known from the region and that were re-captured in our surveys were not included in this paper.

The map showing sampling localities in South Siberia is built using ArcGIS 10.6. The photographs of insects and genitalia were taken using digital camera Sony NEX3 portable with ZEISS Stemi Dv4 stereomicroscope.

For each species, the place and the date of collection, the number of specimens and the gender are provided. The data on the trophic associations are compilled from the numerous literature and electronic resources cited in the essay for each species. Geographic range is indicated according to the area typification proposed by Gorodkov (1984, 1992). Since the majority of listed species inhabits the temperate zone of Old and New World, we largely avoided repeating it every time when characterising the species range. For each species, the detailed distribution in Russia is provided, except for quarantine species for which the whole actual range is listed. The names of the regions in Russia are given according to the territorial division adopted from the Catalogue of the Lepidoptera of Russia (Sinev 2008a).

In the taxonomic list, the novel records are marked with asterisks: for Krasnoyarskii Krai and/ or the Republic of Khakassia by one symbol [*], novel records for Siberia with two symbols [**], specis for the first time recorded on the territory of the Russia with three symbols [***], quarantine species, introduced with fruits and treated now as adventive species are indicated by plus sign [‡]. Following abbrevistion is used for the pheromone traps with the attractant for a particular insect species: PHTGM – pheromone trap with the attractant for *Grapholita molesta*, PHTDS – for *Dendrolimus sibiricus*, PHTFO – for *Frankliniella occidentalis*, PHTLD – for *Lymantria dispar*, PHTCN – for *Carposina "niponensis"*, and PHTCC – for *Ceratitis capitata*. Collectors: ENA – Evgeny N. Akulov, NIK – Natalia I. Kirichenko, MAI – Mikhail A. Ivanov.

The specimens are stored in the collection of the Krasnoyarsk branch of the All-Russian Center for Plant Quarantine, the vouchers of *Coleophora gryphipennella* and *C. curictae* are stored in the collection Sukachev Institute of Forest SB RAS (Krasnoyarsk, Russia).

Systematic accounts

Superfamily Nepticuloidea
Family Nepticulidae

Bohemannia pulverosella (Stainton, 1849) **
(Figure 3A)

Material examined. 9 ♀, Krasnoyarskii Krai, Krasnoyarsk, V.M. Krutovsky Botanical Garden, orchard, PHTGM, 17, 24 v 2017 (ENA).

Bionomics. Leaf-miner of the *Malus* and *Pyrus* (Rosaceae) (Emmet 1979; Heath 1983). Only females were collected in south Siberia that suggests that the species is probably parthenogenetic in that area same as most European populations (Nieukerken van et al 2016).

Remarks. Transholarctic species with disjunction in geographic range on the territory of Central Eurasia, it was introduced in North America (Nieukerken van et al 2016). Russia: North-Western European part, Middle Volga Region and South Ural and Primorskii Krai (as *piotra* Puplesis 1984) (Sinev 2008b). First record for Siberia (present paper).

Superfamily Incurvarioidea
Family Adelidae

Nematopogon robertella (Clerck, 1759) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk, Nature reserve "Stolby", forest, at daytime, 15 vi 2017 (ENA).

Bionomics. Phytophagous species. In Europe the larvae of younger age are leaf-miner, and later they live in foliar case and feed on withered leaves on the litter in coniferous-deciduous forest. The foliar case maden from *Fagus sylvatica* (Fagaceae) was recorded in Switzerland (Fagaceae) (Lepiforum 2019) and *Vaccinium myrtillus* (Ericaceae) as host plant in Europe (Kozlov 2016).

Remarks. Eurasian temperate species. Russia: Kola Peninsula, Karelia Republic, North-Western, North-Eastern and Central European parts, Middle Volga Region, Altaiskii Krai, Tuva Republic and South Kuril Isl. (Kozlov 2016). First record for Krasnoyarskii Krai (present paper).

Superfamily Tineoidea
Family Tineidae

Archinemapogon yildizae (Koçak, 1981) *****

Material examined. 1 ♂, Khakassia Republic, Shirinskii District, Tuimskoe forestry, HTLD, viii 2017 (ENA).

Bionomics. Phytophagous species. Larvae feed in rotten wood affected by fungal hyphae and in bracket fungi (Polyporaceae) growing on deciduous trees.

Remarks. Eurasian temperate species. Russia: Kola Peninsula, Karelia Republic, North-Western and Central European parts, Middle Volga and Volga-Don Regions, North Caucasus, Middle and South Ural, Altaiskii Krai and Primorskii Krai (Baryshnikova 2008; Ponomarenko 2016). First record for Khakassia Republic (present paper).

Nemapogon variatella (Clemens, 1859) *****

Material examined. 1 ♀, Krasnoyarskii Krai, Krasnoyarsk, V.M. Krutovsky Botanical Garden, orchard, PHTGM, 07 vi 2017 (ENA).

Bionomics. Phytophagous species. The larvae feed in decayed wood affected by fungal hyphae and in bracket fungi (Polyporaceae), also can develop in storages and in warehouses with grain and products of its processing (Emmet 1988).

Remarks. Transholarctic species. Russia: Kaliningradskaya Oblast, North-Western and Central European parts, Middle Volga and Volga-Don Regions, North Caucasus, Middle and South Ural, Altaiskii Krai, Irkutskaya Oblast, Zabaikalskii Krai and Primorskii Krai (Baryshnikova 2008; Ponomarenko 2016). First record for Krasnoyarskii Krai (present paper).

Monopis obviella ([Denis et Schiffermüller], 1775) ******
(Figure 3B)

Material examined. 1 ♂, Khakassia Republic, Shirinskii District, Tuimskoe forestry, HTLD, viii 2017 (ENA).

Bionomics. Saprophagous species. The larvae feed on substrate of animal and plant (especially wood) origin (Emmet and Heath 1991).

Remarks. Euro-Siberian species. Russia: Kaliningradskaya Oblast, Central European part, Middle Volga and Volga-Don Regions, North Caucasus and South Ural (Baryshnikova 2008). First record for Siberia (present paper), Khakassia Republic is most eastern locality in distribution.

Monopis weaverella (Scott, 1858) *****

Material examined. 1 ♀, 1 ♂, Krasnoyarskii Krai, Berezovskii District, Berezovskii settl., at light, 24 vi 2018 (ENA).

Bionomics. Saprophagous species. The larvae feed on substrate of animal origin (Heath and Emmet 1985).

Remarks. Transholactic species with disjunction in geographic range in East Eurasia. Russia: Kola Peninsula, North-Western and Central European parts, Middle Volga, South Ural, North Enisej Region, Altaiskii Krai and Primorskii Krai (Baryshnikova 2008; Ponomarenko 2016). First record for Krasnoyarskii Krai (present paper).

Family Psychidae

Proutia betulina (Zeller, 1839) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk, Vetluzhanka, private gardens' community «KZK-2»», PHTGM, 26 vi 2018 (ENA).

Bionomics. Phytophagous species. In Europe the larvae feed by lichens and decaying leaves living in case from pieces of plant such as leaves, bark etc., lives in deciduous forests on the bark of *Betula* spp. (Betulaceae) (Sinev 2016).

*Remarks.*Eurasian temperate species. Russia: Karelia Republic, North-Western and Central Regions, Middle Volga and Volga-Don Regions, North Caucasus, south of West Siberia, Tuva Republic, Buryatia Republic, Amurskaya Oblast and Primorskii Krai (Sinev and Lovtsova 2008; Sinev 2016). First record for Krasnoyarskii Krai (present paper).

Superfamily Gracillarioidea
Family Bucculatricidae

Bucculatrix artemisiella (Herrich-Schäffer, 1855) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Emeljanovskii District, Kubekovo settl., at daytime on herbaceous vegetation, 13 v 2017 (ENA).

Bionomics. Phytophagous species mining leaves on *Artemisia campestris* (Asteraceae) (Lepiforum 2019).

Remarks. Euro-Siberian species. Russia: Central European part, Middle Volga, Volga-Don and Low Volga Regions, Zabaikalskii Krai (Baryshnikova 2008). First record for Krasnoyarskii Krai (present paper).

Bucculatrix bechsteinella (Bechstein et Scharfenberg, 1805) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk, market with import fruit production, PHTCN, 03 viii 2017 (ENA).

Bionomics. Phytophagous species, facultative leaf-miner and leaf-skeletonizer on *Crataegus, Malus, Pyrus* and *Sorbus* (Rosaceae) (Emmet and Heath 1991).

Remarks. Euro-Siberian species. Russia: Kaliningradskaya Oblast, North-Western and Central European parts, Middle Volga, South Ural and Buryatia Republic (Baryshnikova 2008). First record for Krasnoyarskii Krai (present paper).

Bucculatrix nigricomella (Zeller, 1839) **
(Figure 3C)

Material examined. 1 ♂, Khakassia Republic, Shirinskii District, Tuimskoe forestry, PHTLD, viii 2017 (ENA).

Bionomics. Phytophagous species, mining and skeletonizing the leaves on *Leucanthemum vulgare* and *Chrysanthemum leucanthemum* (Asteraceae) (Emmet and Heath 1991).

Remarks. Euro-Siberian species. Russia: Kaliningradskaya Oblast, Karelia Republic, Central European part and Middle Volga (Baryshnikova 2008). First record for Siberia (present paper), Khakassia Republic is the most eastern locality of the species distribution.

Bucculatrix pannonica (Deschka, 1982) ***
(Figure 3D)

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk, Nature reserve "Stolby", steppe slope, at daytime, 22 vi 2018 (ENA).

Bionomics. Phytophagous species, mining leaves on *Artemisia maritima* (Asteraceae) (Deschka 1982).

Remarks. Euro-Siberian species, in Europe known only from Austria, Hungary, Slovakia and Ukraine (Deschka 1982; Baraniak 1996; Bidzilya and Budashkin 2017). First record for Russia and Siberia (present paper). Krasnoyarskii Krai is most eastern locality in the species range.

Superfamily Yponomeutoidea
Family Yponomeutidae

Swammerdamia glaucella Junnilainen, 2001 *****

Material examined. 1 ♂, Krasnoyarskii Krai, Berezovskii District, Berezovskii settl., at light, 24 vi 2018 (ENA).

Remarks. East-Palearctic species, with geographic range included South Ural, Tuva Republic and Buryatia Republic in Russia, also South-East Kazakhstan, Mongolia (Junnilainen 2001) and South Korea (Sohn 2009). First record for Krasnoyarskii Krai (present paper).

Family Argyresthiidae

Argyresthia brockeella (Hübner, 1813) *****

Material examined. 1 ♂, Khakassia Republic, Shirinskii District, Chjernoe Ozero vil., at light, 16 vii 2018 (ENA); 1 ♂, Krasnoyarskii Krai, Emeljanovskii District, Minino settl., forest steppe, at light, 18 viii 2018 (ENA).

Bionomics. Phytophagous species. In Europe the larvae feed in catkins and buds on birch (*Betula*) и alder (*Alnus*) (Betulaceae) (Agassiz 1987; Emmet 1996).

Remarks. Eurasian temperate species. Russia: Kaliningradskaya Oblast, Karelia Republic, North-Western, North-Eastern and Central European parts, Middle Volga Region, Middle and South Ural, south of West Siberia, Irkutskaya Oblast, Zabaikalskii Krai, Amurskaya Oblast, Khabarovskii Krai (south), Sakhalin Isl. and Primorskii Krai (Sinev 2008b; Ponomarenko 2016). First record for Khakassia Republic and Krasnoyarskii Krai (present paper).

Family Ypsolophidae

Ypsolopha asperella (Linnaeus, 1761) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Emeljanovskii District, Minino settl., forest steppe, at light, 17 iv 2017 (MAI).

Bionomics. Phytophagous species, the larvae live in spinning a slight web and feed on the leaves of *Malus*, *Prunus*, *Crataegus* and *Pyrus* (Rosaceae) (Emmet 1996).

Remarks. Eurasian temperate species. Russia: Kaliningradskaya Oblast, Karelia Republic, North-Western and Central European parts, Middle Volga and Volga-Don Regions, South Ural, Altai Republic, Irkutskaya Oblast, Buryatia Republic, Zabaikalskii Krai, Amurskaya Oblast,

Khabarovskii Krai (south), Sakhalin Isl. and Primorskii Krai (Sinev 2008b; Ponomarenko 2016). First record for Krasnoyarskii Krai (present paper).

Ypsolopha dentella (Fabricius, 1775) *

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk, at light, 22 vii 2018 (MAI).

Bionomics. Phytophagous species, the larvae feed on *Lonicera* sp. and *Symphoricarpos rivularis* (Caprifoliaceae) (Agassiz 1983).

*Remarks.*Transholarctic species. Russia: Kaliningradskaya Oblast, North-Western, North-Eastern and Central European parts, Middle Volga and Volga-Don Regions, North Caucasus, South Ural, Altai Republic, Irkutskaya Oblast, Buryatia Republic, Zabaikalskii Krai, Amurskaya Oblast, Khabarovskii Krai (south) and Primorskii Krai (Sinev 2008b; Ponomarenko 2016; Huemer et al 2017). First record for Krasnoyarskii Krai (present paper).

Ypsolopha falcella ([Denis et Schiffermüller], 1775) *

Material examined. 1 ♂, Krasnoyarskii Krai, Berezovskii District, Berezovskii settl., at light, 14 iv 2018 (ENA).

Bionomics. Phytophagous species, the larvae feed on *Lonicera xylosteum*, *L. carprifolium* (Caprifoliaceae) (Gershenson and Kozhevnikova 2013).

*Remarks.*Eurasian temperate species. Russia: Kaliningradskaya Oblast, North-Western and Central European parts, Middle Volga Region, Middle Ural, Altai Republic, Irkutskaya Oblast, Zabaikalskii Krai, Khabarovskii Krai (south) and Primorskii Krai (Sinev 2008b; Ponomarenko 2016). First record for Krasnoyarskii Krai (present paper).

Family Glyphipterigidae

Glyphipterix magnatella Erschoff, 1877 *

Material examined. 2 ♂, Krasnoyarskii Krai, Krasnoyarsk, Nature reserve "Stolby", birch & pine forest, at daytime, 22 vi 2018 (ENA).

*Remarks.*East-Palearctic. Russia: Altai Republic, Irkutskaya Oblast and Primorskii Krai (Sinev 2008b; Ponomarenko 2016). First record for Krasnoyarskii Krai (present paper).

Glyphipterix simpliciella (Stephens, 1834) **

(Figure 3E-F)

Material examined. 1 ♀, Krasnoyarskii Krai, Krasnoyarsk, V.M. Krutovsky Botanical Garden, orchard, PHTGM, 07 vi 2017 (ENA).

Bionomics. Phytophagous, carpophagous species, the larvae feed in the seeds of *Dactylis glomerata* and *Festuca* spp. (Poaceae).

Remarks. Eurasian temperate species. Russia: Kaliningradskaya Oblast, Karelia Republic, North-Western and Central European parts, Middle Volga and Volga-Don Regions, Altaiskii Krai (S.Yu. Sinev, pers. commun.) and Primorskii Krai (Sinev 2008b; Ponomarenko 2016). First record for Siberia (present paper).

Superfam. Gelechioidea
Family Depressariidae

Agonopterix alstromeriana (Clerck, 1759) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Emeljanovskii District, Minino settl. vicinity, forest steppe, at light, 17 iv 2017 (MAI); 1 ♂, Krasnoyarsk, Vertluzhanka, private gardens' community «KZK-2», PHTGM, 24 v 2017 (ENA); 1 ♂, Berezovskii District, Berezovskii settl., at light, 14 iv 2018 (ENA).

Bionomics. Phytophagous, the larvae feed on hemlock (*Conium maculatum*, Apiaceae), rolling leaves, sometimes together with flowers and developing seeds (Berenbaum and Passoa 1983).

Remarks. Transholarctic species introduced in New Zealand (Winston et al 2014; Hayes 2019). Russia: Kaliningradskaya Oblast, Karelia Republic, North-Western, North-Eastern and Central European parts, Middle Volga and Volga-Don Regions, North Caucasus, Middle and South Ural, Altai Republic (Lvovsky 2006, 2008). First record for Krasnoyarskii Krai (present paper), this locality is most eastern in territory of species existence in Russia.

Agonopterix bipunctosa (Curtis, 1850) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Emeljanovskii District, Minino settl., forest steppe, at light, 20 viii 2015 (MAI); 15 ♂, same locality, 18 viii 2018 (EHA).

Bionomics. Phytophagous species, the larvae leaf-roller, feeding on *Centaurea scabiosa* and *Serratula tinctoria* (Asteraceae) (Lvovsky 2006).

Remarks. Euro-Siberian species. Russia: South Ural, south of West Siberia (Lvovsky 2006). First record for Krasnoyarskii Krai (present paper), this locality is most eastern in the species range.

Agonopterix multiplicella (Erschoff, 1877) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk, V.M. Krutovsky Botanical Garden, orchard, PHTGM, 07 vi 2017 (ENA); 1 ♂, Minusinskii district, Opytnoe pole settl., orchard, PHTGM, 15 v 2018 (ENA).

Bionomics. Phytophagous species, the larvae live and feed between webbed leaves of *Artemisia vulgaris* (Asteraceae) (Lvovsky 2006).

Remarks. Eurasian temperate species. Russia: North-Western and Central European parts, Middle Volga and Volga-Don Regions, South Ural, south of West Siberia, Zabaikalskii Krai, Amurskaya Oblast, Khabarovskii Krai (south) and Primorskii Krai (Lvovsky 2008; 2016). First record for Krasnoyarskii Krai (present paper).

Agonopterix propinquella (Treitschke, 1835) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Emeljanovskii District, Minino settl., forest steppe, at light, 18 viii 2018 (ENA).

Bionomics. Phytophagous species, facultative leaf-miner. The larvae of young ages mining the leaves of different Asteraceae (*Cirsium*, *Serratula*, *Carduus*, *Centaurea*, *Arctium*, *Cirsium*), the larvae of older ages feed in webbed leaves or in web under the leaf midrib (Lvovsky 2006).

Remarks. Eurasian temperate species. Russia: Kaliningradskaya Oblast, North-Western, North-Eastern and Central European parts, Middle Volga and Volga-Don Regions, North Caucasus, South Ural, south of West Siberia, Zabaikalskii Krai, Amurskaya Oblast, Khabarovskii Krai (south) and Primorskii Krai (Lvovsky 2008). First record for Krasnoyarskii Krai (present paper).

Depressaria depressana (Fabricius, 1775) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk, at light, 05 x 2017 (MAI).

Bionomics. Anthophagous, rarely phytophagous species. The larvae live and feed in inflorescences and leaves of different Apiaceae (*Daucus*, *Pastinaca*, *Peucedanum*, *Pimpinella*, *Seseli*, and others) (Lvovsky 2006).

Remarks. Transpalearctic species. Russia: Kaliningradskaya Oblast, Karelia Republic, North-Western, North-Eastern and Central European parts, Middle Volga, Volga-Don and Low Volga Regions, North Caucasus, Middle and South Ural, south of West Siberia, Altai Republic, Zabaikalskii Krai and Primorskii Krai (Lvovsky 2008, 2016). First record for Krasnoyarskii Krai (present paper).

Depressaria golovushkini Lvovsky, 1995 *****

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk, V.M. Krutovsky Botanical Garden, orchard, PHTCN, vii 2017 (ENA).

Bionomics. Phytophagous species. The larvae on *Diospyros* (Ebenaceae) in China (Lvovsky 2016).

Remarks. East-Palearctic species. Russia: Buryatia Republic, Zabaikalskii Krai and Amurskaya Oblast (Lvovsky 2008, 2016). First record for Krasnoyarskii Krai (present paper), this locality is most western in the species range.

Family Elachistidae

Elachista adscitella Stainton, 1851 *****

Material examined. 1 ♂, Khakassia Republic, Shirinskii District, Tuimskoe forestry, PHTLD, vii 2017 (ENA).

Bionomics. Phytophagous species, the larvae are leaf-miners on *Deschampsia caespitosa*, *Brachypodium sylvaticum*, *Sesleria caerulea*, *Poa*, *Festuca altissima*, *F. gigantea*, *Milium effusum* (Poaceae) (Traugott-Olsen and Nielsen 1977).

Remarks. Eurasian temperate species, with disjunction in area in West Siberia. Russia: North-Western and Central European parts, North Caucasus, South Ural, Irkutskaya Oblast and Primorskii Krai (Sinev 2008b, 2016). First record for Khakassia Republic (present paper).

Family Scythrididae

Scythris pudorinella (M□schler, 1866) *****

Material examined. 1 ♀, Khakassia Republic, Shirinskii District, Tuimskoe forestry, PHTDS, vii 2017 (ENA).

Remarks. Euro-Siberian species. Russia: Middle Volga, Volga-Don and Low Volga Regions, South Ural (Sinev 2008b, Nupponen 2009). First record for Khakassia Republic (present paper), this locality is most eastern in the species range.

Family Chimabachidae

Dasystoma salicella (Hübner, 1796) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Emeljanovskii District, Minino settl. vicinity, forest steppe, at light, 17 iv 2017 (MAI).

Bionomics. Phytophagous species, the larvae are polyphagous and feed on different plants from Betulaceae (*Betula*), Salicaceae (*Salix caprea*), Ericaceae (*Rhododendron*, *Vaccinium myrtillus*), Rosaceae (*Rubus fruticosus*, *Filipendula ulmaria*, *Prunus spinosa*, *Potentilla anserina*), Rhamnaceae (*Rhamnus cathartica*) and Myricaceae (*Myrica gale*) (Emmet and Langmaid 2002; Lvovsky 2006).

Remarks. Transholarctic species. Russia: Karelia Republic, North-Western and Central European parts, Middle Volga and Volga-Don Regions, North Caucasus, Irkutskaya Oblast, Zabaikalskii Krai, Amurskaya Oblast, Khabarovskii Krai (south) and Primorskii Krai (Lvovsky 2008, 2016). First record for Krasnoyarskii Krai (present paper).

Family Oecophoridae

Bisigna procerella ([Denis et Schiffermüller], 1775) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk, Nature reserve "Stolby", birch-pine forest, at daytime, 22 vi 2018 (ENA).

Bionomics. Phytophagous species, the larvae feed on lichenes on the trucks of the trees, they were found on *Betula* (Betulacea) and *Fagus* (Fagaceae) (Lvovsky 2006).

Remarks. Eurasian temperate species. Russia: North-Western and Central European parts, Middle Volga and Volga-Don Regions, South Ural, Altai Republic, Zabaikalskii Krai, Amurskaya Oblast, Khabarovskii Krai (south) and Primorskii Krai (Lvovsky 2008, 2016). First record for Krasnoyarskii Krai (present paper).

Epicallima formosella ([Denis et Schiffermüller], 1775) *****

Material examined. 1 ♀, Krasnoyarskii Krai, Emeljanovskii District, Minino settl., forest steppe, at light, 18 viii 2018 (ENA).

Bionomics. Phytophagous species, the larvae live and feed under dead bark, in Europe they were found on the *Malus domestica* (Rosaceae), *Robinia pseudacacia* (Fabaceae) and *Populus* (Salicaceae) (Emmet and Langmaid 2002; Lvovsky 2006).

Remarks. Transholarctic species, with disjunction in range in Eastern Eurasia. Russia: North-Western and Central European parts, Middle Volga and Volga-Don Regions, South Ural and south of West Siberia (Lvovsky 2008). First record for East Siberia (present paper), Krasnoyarskii Krai is the most eastern locality in the species range.

Endrosis sarcitrella (Linnaeus, 1758) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Berezovskii District, Berezovskii settl., at light, 10 vi 2017 (ENA).

Bionomics. Saprophagous species, the larvae feed on remains of plant and animal origin, and stored goods.

Remarks. Subcosmopolitan synanthropic species, introduced into different parts of the world. Russia: Kaliningradskaya Oblast, Kola Peninsula, Karelia Republic, North-Western, North-Eastern and Central European parts, Middle Volga and Volga-Don Regions, Middle and South Ural, Altaiskii Krai, Irkutskaya Oblast, Zabaikalskii Krai, South Yakutia, Kamchatka Peninsula, Khabarovskii Krai (south) and Primorskii Krai (Lvovsky 2008, 2016). First record for Krasnoyarskii Krai (present paper).

Family Coleophoridae

Coleophora gryphipennella (Hübner, 1796) *****
(Figure 4A–D)

Material examined. 2 feeding larvae in the cases (Figure 4A–D), Krasnoyarskii Krai, Pogorelskiy bor, Arboretum SIF SB RAS, *Rosa* sp., 16 ix 2013 (NIK); one DNA barcoded larva: sample ID (NK253), process ID (ISSIK117-14), BIN (BOLD:AAE8826).

Bionomics. Oligophagous species on Rosaceae. In Europe, larvae develop on *Rosa acicularis, R. arkansana, R. canina, R. glauca, R. pendulina, R. rubiginosa, R. serafinii, R. soulieana, R. spinosissima, R. tomentosa* (Ellis 2019), occasionally on *Rubus caesius* and *R. corylifolius* (Hering 1957; Maček 1999). In the Netherlands, it was occasionally recorded on *Fragaria vesca*

(van Roosmalen et al 2015), in Japan on *R. rugosa* and *R. suavis* (Anikin 2016). In Siberia, feeding larvae were found exceptionally on *Rosa* sp.

Remarks. Eurasian temperate species. Russia: Kaliningradskaya Oblast, North-Western European part, Middle Volga and Volga-Don regions, Irkutskaya Oblast, Kamchatka Peninsula and Primorskii Krai (Anikin 2016). First record for Krasnoyarskii Krai (present paper).

The DNA barcode of the specimen from Siberia matches that of *C. gryphipennella* specimens from Central and Northern Europe (Netherlands, Belgium, France, Italy, Austria, Germany, Bulgaria, Finland, Norway, Denmark), with 97.70–98.88% min-max similarity. The nearest neighbor of the Siberian specimen, with 98.88% similarity, is the specimen from Austria (process ID: PHLAI641-13.COI-5P, GenBank Accession: KM573253) (Huemer et al 2014). All DNA barcodes of *C. gryphipennella* have unique BIN (BOLD:AAE8826) and the Siberian specimen correspond to this BIN. Keeping in mind high genetic proximity of the Siberian specimen and European specimens reliable identified as *C. gryphipennella* and their possession to one BIN, the larva feeding on *Rosa* sp. in Krasnoyarskii Krai is assigned to *C. gryphipennella.* Additional sampling and rearing of adults in the region would be needed to morphologically confirm the species.

Coleophora curictae Baldizzone, 2016 ***
(Figure 5A–H)

Material examined. 2 leaves with mines (Figure 5A-B) and 3 feeding larvae in the cases (Figure 5C–H), Krasnoyarskii Krai, Krasnoyarsk, Red Square, trees along the road, *Ulmus pumila*, 12 vi 2013 (NIK); one DNA barcoded larva: sample ID (NK241), process ID (ISSIK105-14), BIN (BOLD:AAM2030).

Bionomics. No biology neither host plants are known for the species in Europe (Baldizzone 2016). However, Baldizzone (2016) suggested that it may probably feed on *Quercus*. In Siberia, we found feeding larva on *Ulmus pumila* L. (Ulmaceae) (Figure 5A–D). Based on our observations in Krasnoyarsk, larval development takes place in June (starting in late May and probably lasting till sometime in July). Larva feeds moving on the leaf making oval blotch mines; several mines per a leaf made by one larva can be recorded (Figure 5A–D). When the leaf is significantly mined, the larva moves to a neighbor leaf and continues feeding. Larva has rough pistol case with swirling rear part, about 8 mm in length, with a mouth angle of 15°-25° standing obliquely on the leaf. The case of a younger larva is brownish-silvery, later with more extended mouth part (Figure 5E-F).

Remarks. Euro-Siberian species. First record for Russia based on our sampling in Krasnoyarskii Krai (present paper).

The specimen from Siberia was identified through DNA barcoding. It showed 98.58% similarity with an adult moth sampled in Tyrol (Austria), process ID: LEATI273-15.COI-5P (Huemer and Hebert 2016). Based on a high genetic similarity of the Siberian and Austrian specimens, that the species feeding in Siberia on *Ulmus pumila* is *Coleophora curictae.* Additional sampling and rearing of adults in the region would be needed to morphologically confirm the species.

Ardania onobrychiella (Zeller, 1849) ******
(Figure 3G)

Material examined. 1 ♂, Krasnoyarskii Krai, Emeljanovskii District, Minino settl., steppe, at light, 18 viii 2018 (ENA).

Bionomics. Phytophagous species on *Astragalus arenarius*, *Onobrychis viciifolia, Hyppocrepis comosa* (Fabaceae) (Falkovitsh 2006).

Remarks. Euro-Siberian species with vast disjunction in range. Russia: Kaliningradskaya Oblast (Anikin 2008). First record for Siberia with only locality in Krasnoyarskii Krai (present paper).

Ardania sergiella Falkovitsh, 1979 *****

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoturanskii District, Novaya Syda settl., steppes slope, 12 vi 2018 (ENA).

Bionomics. Phytophagous species on *Potentilla cinerea* (Rosaceae).

Remarks. South-Siberian species. Russia: North Caucasus, Altai Republic, Tuva Republic, Zabaikalskii Krai (Anikin 2008). First record for Krasnoyarskii Krai (present paper).

Damophila alcyonipennella (Kollar, 1832) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Emeljanovskii District, Minino settl. vicinity, forest steppe, at light, 17 iv 2017 (MAI); 1 ♂, Berezovskii District, Berezovskii settl., at light, 10 vi 2017 (ENA); 1 ♂, Emeljanovskii District, Krasnoyarsk Reservoir, Bay of Biryusa 30 vi 2018 (ENA).

Bionomics. Phytophagous species, feeds in inflorescences on *Trifolium* (Fabaceae) (Falkovitsh 2006).

Remarks. Transpalearctic species introduced into New Zealand and Ausralia. Russia: Kaliningradskaya Oblast, North-Western and Central European parts, Middle Volga, Low Volga Regions and Volgo-Don Regions, North Caucasus, South Ural, south of West Siberia, Tuva Republic, Irkutskaya Oblast, Yakutia Republic (north-east), Khabarovskii Krai (south), Sakhalin Isl., and Primorskii Krai (Anikin 2016). First record for Krasnoyarskii Krai (present paper).

Damophila trifolii (Curtis, 1832) *****

Material examined. 1 ♀,1 ♂, Khakassia Republic, Shirinskii District, Chjernoe Ozero vil., at light, 16 vii 2018 (ENA); 1 ♀, Krasnoyarskii Krai, Emeljanovskii District, Minino settl. vicinity, forest steppe, at light, 17 iv 2017 (MAI); 1 ♀, Emeljanovskii District, Krasnoyarsk Reservoir, Biryusa Bay 30 vi 2018 (ENA); 1 ♀, Krasnoyarsk, V.M. Krutovsky Botanical Garden, orchard, at daytime on Fabaceae, 11 vii 2018 (ENA); 1 ♂, Krasnoyarsk, at light, 04 viii 2018 (ENA).

Bionomics. Carpophagous species, feeds on seeds of *Melilotus officinalis*, *M. altissimus* (Falkovitsh 2006) and probably on *Trifolium* (Fabaceae).

*Remarks.*Transholarctic species. Russia: Central European part, Middle Volga, Volga-Don Regions, North Caucasus, Ural, south of West Siberia, Altai Republic, Irkutskaya Oblast, Zabaikalskii Krai and Primorskii Krai (Anikin 2016). First record for Khakassia Republic and Krasnoyarskii Krai (present paper).

Multicoloria vibicigerella (Zeller, 1839) *****

Material examined. 1 ♀, Khakassia Republic, Shirinskii District, Chjernoe Ozero vil., at light, 16 vii 2018 (ENA).

Bionomics. Phytophagous species, the larvae mine leaves *Achillea millefolium*, *A. ptarmica* and *Artemisia campestris* (Asteraceae) (Anikin 2004).

Remarks. Transpalearctic species. Russia: North-west and Central European parts, Middle Volga, Low Volga, Volga-Don Regions, North Caucasus, South Ural, Altai Republic, Tuva Republic, questionably Zabaikalskii Krai, and Primorskii Krai (Anikin 2008, 2016). First record for Khakassia Republic (present paper).

Ecebalia hsiaolingensis (Toll, 1942) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk, at light, 11 ix 2017 (ENA); 3 ♂, Berezovskii District, Berezovskii settl., at light, 12, 28 viii 2018 (ENA); 3 ♂, Emeljanovskii Distict, Minino settl., steppe, at light, 18 viii 2018 (ENA).

Bionomics. Phytophagous species, the larvae feed in inflorescence of *Aster* (Asteraceae) (Anikin 2016).

Remarks. East-Palearctic species. Russia: south of West Siberia, Irkutskaya Oblast, Buryatia Republic, Zabaikalskii Krai, Magadanskaya Oblast and Primorskii Krai (Anikin 2016). First record for Krasnoyarskii Krai (present paper).

Ecebalia therinella (Tengstr□m, 1848) *****

Material examined. 2 ♀, Khakassia Republic, Shirinskii District, Chjernoe Ozero vil., at light, 16 vii 2018 (ENA).

Bionomics. Phytophagous, carpophagous species, the larvae feed on seeds of *Fallopia convolvulus* (Polygonaceae) (Falkovitsh 2006) or mine the leaves of *Carlina, Carduus* and *Cirsium* (Asteraceae) (Anikin 2016).

Remarks. Eurasian temperate species. Russia: Kaliningradskaya Oblast, North-Western and Central European parts; Middle Volga, Low Volga, Volga-Don Regions, North Caucasus, South Ural, south of West Siberia, Irkutskaya Oblast, Zabaikalskii Krai, Yuakutia Republic, Amurskaya Oblast, Khabarovskii Krai (south) and Primorskii Krai (Anikin 2016). First record for Khakassia Republic (present paper).

Ecebalia versurella (Zeller, 1849) *****

Material examined. 2 ♀, Khakassia Republic, Shirinskii District, Chjernoe Ozero vil., at light, 16 vii 2018 (ENA).

Bionomics. Phytophagous species on *Chenopodium*, *Atriplex*, *Halimione* and *Amaranthus* (Amaranthaceae) (Falkovitsh 2006).

Remarks. Subcosmopolitan species unknown in Africa and Austalian Region. Russia: Kaliningradskaya Oblast, Karelia Republic, Central European part, Middle Volga, Low Volga, Volga-Don Regions, North Caucasus, South Ural, Altai Republic, Khabarovskii Krai (south) and Primorskii Krai (north) (Anikin 2008, 2016). First record for Khakassia Republic (present paper).

Casignetella burmanni (Toll, 1952) *****

Material examined. 2 ♀, Khakassia Republic, Shirinskii District, Chjernoe Ozero vil., at light, 16 vii 2018 (ENA).

Bionomics. Phytophagous species, the larvae mine leaves of *Gypsophila fastigiata* and *G. repens* (Caryophyllaceae) (Falkovitsh 2006).

Remarks. Euro-Siberian species. Russia: Altaiskii Krai (Anikin 2008). First record for Khakassia Republic (present paper).

Casignetella heihensis (Li et Zhang, 2000) ******
(Figure 3H)

Material examined. 1 ♂, Krasnoyarskii Krai, Emeljanovskii Distict, Minino settl., steppe, at light, 18 viii 2018 (ENA).

Bionomics. Phytophagous species on *Artemisia* (Asteraceae).

Remarks. East-Palearctic species. Russia: Amurskaya Oblast and Primorskii Krai (Anikin 2016). First record for Siberia (present paper). Krasnoyarskii Krai is most western locality in the species distribution.

Casignetella striatipennella (Nylander in Tengström, [1848]) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Berezovskii District, Berezovskii settl., at light, 10 vi 2017 (ENA).

Bionomics. Carpophagous species, feeds on seeds of *Stellaria, Cerastium, Moehringia* and *Myosoton* (Caryophyllaceae) (Falkovitsh 2006).

Remarks. Eurasian temperate species. Russia: Kola Peninsula, Karelia Republic, North-Western and Central European parts, Middle Volga and Volga-Don Regions, North Caucasus, south of West Siberia, Altaiskii Krai, Altai Republic, Magadanskaya Oblast, Khabarovskii Krai (south), and Primorskii Krai (Anikin 2008, 2016). First record for Krasnoyarskii Krai (present paper).

Family Momphidae

Mompha langiella (Hübner, 1796) *****

Material examined. 1 ♀, Krasnoyarskii Krai, Berezovskii District, Berezovskii settl., at daytime, 28 v 2017 (ENA).

Bionomics. Phytophagous species, the larvae are leaf-miner on *Circaea lutetiana*, *C. alpina*, *Epilobium hirsutum*, *E. montanum*, *E. parviflorum*, *Chamaenorium angustifolium*, *Oenothera biennis* (Onagraceae) (Koster and Sinev 2003).

Remarks. Euro-Siberian species. Russia: Kaliningradskaya Oblast, Central European part, Middle Volga Region (Sinev 2008b) and Altaiskii Krai (Irisova et al 2014). First record for Krasnoyarskii Krai (present paper).

Family Cosmopterigidae

Pancalia hexachrysa (Meyrick, 1935) ******
(Figure 6A)

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk, Nature reserve "Stolby", steppe slope, at daytime, 22 vi 2018 (ENA).

*Remarks.*East-Palearctic species. Russia: Primorskii Krai (Sinev 2008b, 2016). First record for Siberia (present paper). Krasnoyarskii Krai is most western locality in the species distribution.

Cosmopterix sibirica Sinev, 1985 *****

Material examined. 1 ♂, Krasnoyarskii Krai, Berezovskii District, Berezovskii settl., at light, 10 vi 2017 (ENA).

Remarks. Euro-Siberian species. Russia: Middle Volga Region, South Ural, Irkutskaya Oblast, Buryatia Republic, Zabaikalskii Krai (Sinev 2008b). First record for Krasnoyarskii Krai (present paper).

Eteobalea serratella (Treitschke, 1833) *****

Material examined. 1 ♂, Khakassia Republic, Shirinskii District, Chjernoe Ozero vil., at light, 16 vii 2018 (ENA).

Bionomics. Phytophagous species, the larvae are stem-miner and root-miner on *Linaria vulgaris*, *L. genistifolia* ssp. *euxina* (Plantaginaceae) (Koster and Sinev 2003).

Remarks. Euro-Siberian species. Russia: Middle Volga, Volga-Don and Low Volga Regions, North Caucasus, South Ural and Zabaikalskii Krai (Sinev 2008b). First record for Khakassia Republic (present paper).

Family Gelechiidae

Metzneria metzneriella (Stainton, 1851) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Berezovskii District, Berezovskii settl., at light,10 vi 2017 (ENA).

Bionomics. Carpophagous species. The larvae feed on seeds of *Serratula tinctoria*, *Centaurea nigra*, *C. jacea*, *C. scabiosa* (Asteraceae) (Elsner et al 1999; Bland, Emmet et al 2002).

Remarks. Eurasian temperate species. Russia: Karelia Republic, North-Western and Central European parts, Middle Volga, Volga-Don and Low Volga Regions, North Caucasus, South Ural, Zabaikalskii Krai, Amurskaya Oblast and Khabarovskii Krai (south) (Ponomarenko 2016). First record for Krasnoyarskii Krai (present paper).

Argolamprotes micella ([Denis et Schiffermüller], 1775) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk: Studgorodok, private gardens' community «Pobeda», orchard, PHTGM, 11 vii 2018 (ENA).

Bionomics. Phytophagous species. The larvae feed by flower buds, shoots boring them, and by leaves skeletonizing the latter on *Rubus idaeus*, *R. fruticosus* and *R. caesius* (Rosaceae) (Elsner et al 1999; Bland, Emmet et al 2002).

Remarks. Eurasian temperate species. Russia: North-West and Central European parts, Middle Volga Region, Middle and South Ural, Irkutskaya Oblast, Zabaikalskii Krai, Amurskaya Oblast, Khabarovskii Krai (south), Sakhalin Isl., Kuril Isl. and Primorskii Krai (Junnilainen et al 2010; Ponomarenko 2016). First record for Krasnoyarskii Krai (present paper).

Monochroa simplicella (Lienig et Zeller, 1846) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Berezovskii District, Berezovskii settl., at light, 10 vi 2017 (ENA).

Bionomics. Phytophagous species. The larvae on *Juncus* sp. (Juncaceae) and *Eriophorum* sp. (Cyperaceae) (Elsner et al 1999).

Remarks. Euro-Siberian species. Russia: Central European part, South Ural, Altai Republic and Irkutskaya oblast (Ponomarenko 2008; Bidzilya 2009; Junnilainen et al 2010). First record for Krasnoyarskii Krai (present paper).

Chionodes tragicella (Heyden, 1865) *****

Material examined. 1 ♂, Khakassia Republic, Shirinskii District, Tuimskoe forestry, PHTDS, vii 2017 (ENA).

Bionomics. Phytophagous species. The larvae live under the scales of bark and feed on the needles of *Larix decidua* (Pinaceae) (Huemer and Karsholt 1999).

Remarks. Euro-Siberian species. Russia: Karelia Republic, Volga-Don Region, South Ural, Tuva and Buryatia Republics and Zabaikalskii Krai (Anikin et al 1999, 2017; Bidzilya et al 1998; Ponomarenko 2008; Bidzilya 2009; Junnilainen et al 2010; Kutenkova et al 2015). First record for Khakassia Republic (present paper).

Aroga controvalva Li et Zheng, 1998 *****

Material examined. 4 ♂, Khakassia Republic, Shirinskii District, Chjernoe Ozero vil., at light, 16 vii 2018 (ENA); 1 ♂, Krasnoyarskii Krai, Emeljanovskii District, Minino settl., forest steppe, at light, 18 viii 2018 (ENA).

Remarks. East-Palearctic species. Russia: Zabaikalskii Krai (Kostjuk et al 1994, as *A. mesostrepta* (Meyrick, 1932); Bidzilya et al 1998, as *A. trilineella* (Chambers, 1877); Bidzilya 2009). First record for Khakassia Republic and Krasnoyarskii Krai (present paper).

Filatima incomptella (Herrich-Schaffer, 1854) *****

Material examined. 1 ♂, Krasnoyarskii Krai, Berezovskii District, Berezovskii settl., at light, 24 vi 2018 (ENA).

Bionomics. Phytophagous species. The larvae feed by leaves of *Salix caprea*, *S. aurita*, *S. bicolor*, *S. repens* (Salicaceae) (Huemer and Karsholt 1999).

Remarks. Euro-Siberian species. Russia: Karelia Republic, North-Western and Central European parts, Middle-Volga, Volga-Don and Low Volga Regions, South Ural and Zabaikalskii Krai (Junnilainen et al 2010; Ponomarenko 2016; Ismagilov 2018). First record for Krasnoyarskii Krai (present paper).

Gnorimoschema epithymella (Staudinger, 1859) *****

Material examined. 1 ♂, Khakassia Republic, Shirinskii District, Tuimskoe forestry, PHTLD, vii 2017 (ENA).

Bionomics. Phytophagous species. The larvae bore lower stems and mine the leaves of *Solidago virgaurea* и *Aster alpinus* (Asteraceae) (Huemer and Karsholt 1999).

Remarks. Euro-Siberian species. Russia: Kola Peninsula, Central European part, Middle-Volga, Volga-Don and Low Volga Regions, North Caucasus and Zabaikalskii Krai (Ponomarenko 2008). First record for Khakassia Republic (present paper).

Gnorimoschema jalavai Povolný, 1994 *****

Material examined. 1 ♂, Khakassia Republic, Shirinskii District, Chjernoe Ozero vil., at light, 16 vii 2018 (ENA).

Remarks. East-Palearctic species. Russia: Altai Republic, Tuva Republic, Irkutskaya Oblast, Buryatia Republic, Zabaikalskii Krai and Chukotian Region (Ponomarenko 2008). First record for Khakassia Republic (present paper).

Tuta absoluta (Meyrick, 1917) ‡
(Figure 6B)

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk, market with import fruit production, PHTCC, 24 vii 2019 (ENA).

Bionomics. Phytophagous species, pest of different Solanaceae, carantine object for Russia. The larvae feed on different parts of host plant and have different feeding habits from leaf-mining to boring into buds, stalks and fruits (Huemer and Karsholt 1999).

Remarks. Widely distributed species, originated from South America and introduced into Europe, Africa, Nearest East, Asia Minor and India. Invasive in Russia: Low Volga Region, North Caucasus, South Ural; for the first time recorded in Krasnoyarskii Krai (present paper).

It is the object of the external quarantine in Russia, included into the List 1 "Quarantine objects absent in the territory of the Russian Federation" in the site of Federal Service for Veterinary and Phytosanitary Surveillance (Rosselkhoznadzor 2019). For the first time, it was documented registration of the South American tomato moth in Russia in North Caucasus (Krasnodarskii Krai) in 2010 (Izhevsky et al 2011). Later, the pest was found in other regions of North Caucasus (Adygea and Dagestan Republics) and in South Ural (Bashkortostan Republic) (Zhimerikin and Mironov 2012). Recently, it was captured in Low Volga Region (Astrakhanskaya Oblast) (Medvedeva 2018). All these records are probably due to accidental

movement of the pest with the imported vegetables, seeds or seedlings. The data confirming naturalization of *T. absoluta* in these regions are absent. However, this potential pest could be able to settle down in the southen regions with low sum of the negative temperatures in winter, low soil freezing depth and sufficient snow cover, as was shown in the experiments in south Ukraine (Klechkovsky et al 2014).

Agonochaetia lvovskyi Bidzilya, 2001 *

Material examined. 3 ♂, Krasnoyarskii Krai, Krasnoyarsk, Nature reserve "Stolby", steppe slope, at daytime, 22 vi 2018 (ENA).

Remarks. South-Siberian species. Russia: Altai Republic (Bidzilya 2001). First record for Krasnoyarskii Krai (present paper).

Caryocolum fischerella (Treitschke, 1833) **

Material examined. 2 ♀, Krasnoyarskii Krai, Krasnoyarsk, greenhouse complex, PHTFO, viii 2018 (ENA).

Bionomics. Phytophagous species. The larvae live and feed in spinned terminal shoots and leaves on *Saponaria officinalis*, *S. ocymoides* (Caryophyllaceae) (Huemer and Karsholt 1999).

Remarks. Euro-Siberian species. Russia: North-Western and Central European parts, Middle Volga and Volga-Don Regions (Ponomarenko 2008). First record for Siberia (present paper). Krasnoyarskii Krai is most eastern locality in geographic range of this species.

Caryocolum repentis (Huemer et Luquet, 1992) **
(Figure 6C)

Material examined. 1 ♂, Khakassia Republic, Shirinskii District, Tuimskoe forestry, PHTLD, viii 2017 (ENA).

Bionomics. Phytophagous species. The larvae are facultative leaf-miner, mining the leaves in young ages, latter they live and feed in pod-like dwelling, madden on the terminal part of shoots on *Gypsophila repens* (Caryophyllacea) (Huemer and Karsholt 1999).

Remarks. Euro-Siberian species. Russia: South Ural (Junnilainen et al 2010). First record for Siberia (present paper). Khakassia Republic is most eastern locality in geographic range of this species.

Pseudotelphusa paripunctella (Thunberg, 1794) *****

Material examined. 1 ♂, 1 ♀, Khakassia Republic, Shirinskii District, Tuimskoe forestry, PHTDS, viii 2017 (ENA).

Bionomics. Phytophagous species. The larvae feed on *Betula* spp. (Betulaceae), *Fagus u Quercus* (Fagaceae), *Myrica gale* (Myricaceae), *Hippophae rhamnoides* (Elaeagnaceae) (Sattler 1980).

Remarks. Eurasian temperate species. Russia: Kola Peninsula, Karelia Republic, North-Western, and Central European parts, Middle Volga and Volga-Don Regions, North Caucasus, Middle and South Ural, south of West Siberia, Irkutskaya Oblast, Zabaikalskii Krai, Amurskaya Oblast, Khabarovskii Krai (south), Kuril Isl. and Primorskii Krai (Ponomarenko 2016). First record for Khakassia Republic (present paper).

Anacampsis temerella (Lienig et Zeller, 1846) *****

Material examined. 1 ♂, Khakassia Republic, Shirinskii District, Chjernoe Ozero vil., at light, 16 vii 2018 (ENA).

Bionomics. Phytophagous species. The larvae live and feed in spinning terminal shoots and leaves of *Salix lapponum*, *S. caprea*, *S. repens*, and *S. phylicifolia* (Salicaceae) (Elsner et al 1999; Savela 2001; Bland et al 2002).

Remarks. Eurasian temperate species. Russia: North-Western and North-Eastern European parts, Middle Volga and Volgo-Don Regions, North Caucasus, Buryatia Republic, Zabaikalskii Krai, Amurskaya Oblast, Sakhalin Isl. and Primorskii Krai (Ponomarenko 2016). First record for Khakassia Republic (present paper).

Dichomeris rasilella (Herrich-Schaffer, 1854) *****

Material examined. 1 ♂, Khakassia Republic, Shirinskii District, Chjernoe Ozero vil., at light, 16 vii 2018 (ENA).

Bionomics. Phytophagous species. The larvae feed on *Artemisia vulgaris*, *A. pontica, Acosta rhenana* и *Centaurea* spp. (Asteraceae) (Ponomarenko 1997; Elsner et al 1999; Savela 2001).

Remarks. Eurasian temperate species. Russia: Central European part, Volga-Don and Low Volga Regions, North Caucasus, South Ural, Altai Republic, Tuva Republic, Irkutskaya Oblast, Buryatia Republic, Zabaikalskii Krai, Amurskaya Oblast, Khabarovskii Krai (south), Kuril Isl. and Primorskii Krai (Ponomarenko 2008). First record for Khakassia Republic (present paper).

Acanthophila latipennella (Rebel, 1937) *

Material examined. 1 ♀, Khakassia Republic, Shirinskii District, Chjernoe Ozero vil., at light, 16 vii 2018 (ENA).

Bionomics. Phytophagous species. The larvae feed on *Picea abies* (Pinaceae) (Elsner et al 1999).

Remarks. Eurasian temperate species. Russia: North-Western, North-Eastern and Central European parts, South Ural, Altaiskii Krai, Irkutskaya Oblast, Zabaikalskii Krai, Sakhalin Isl. and Primorskii Krai (Ponomarenko and Omelko 2003; Junnilainen et al 2010; Ponomarenko 2016; Ismagilov 2018). First record for Khakassia Republic (present paper).

Superfamily Copromorphoidea
Family Carposinidae

Carposina sasakii Matsumura, 1900 ‡
(Figure 6D–E)
Carposina niponensis auct. (nec Walsingham, 1900), error identification.

Material examined. 1 ♂, Krasnoyarskii Krai, Krasnoyarsk, market with import fruit production, PHTCN, 01 viii 2015 (ENA).

Bionomics. Phytophagous species. The larvae feed in fruits of different Rosaceae (*Prunus* spp., *Malus* spp., *Pyrus* spp.).

Remarks. The present species range includes East Asia, from where the species originated and North America (Canada, east and south of the USA), where it was introduced and naturalized (North American Moth Photographers Group 2019). Russia: Amurskaya Oblast, Khabarovskii Krai (south), Kuril Isl. and Primorskii Krai. In KrasnoyarskiiKrai, the species was intercepted in the pheromone trap in the market for the first time, suggesting introduction of the species with imported fruits.

The species, known as peach fruit moth, is the pest of Rosaceae in East Asia and the object of internal (in Russia) and external (in Europe) quarantine. Despite of the series of scientific publications devoted to the morphology of *Carposina sasakii* (Diakonoff 1989; Ponomarenko 1999; Nasu et al 2010), the species has been constantly confused with *C. niponensis* Walsingham, 1900 and both species names were erroneously treated as synonyms. Thus, the *Carposina niponensis* hitherto is mentioned instead of *C. sasakii* in Handbooks on the pests

(Savotikov and Smetnik 1995) and in List 2 "Quarantine objects restrictedly distributed in the territory of the Russian Federation" on official site of Federal Service for Veterinary and Phytosanitary Surveillance in Russia (Rosselkhoznadzor: Normativnye dokumenty 2019). Also the "*Carposina niponensis* Walsingham" is erroneously indicated as other scientific name for *C. sasakii* in the website of CABI (2019).

The lectotype of the species *C. sasakii* Matsumura, 1900 was designated by Razowski and Kumata (1985). Detailed re-description of both species, *C. sasakii* and *C. niponensis*, with illustrations of the type material (adults and genitalia) was provided by Diakonoff (1989). In the latter, *C. sasakii* and *C. niponensis* are treated as two different species that is proven by their distinctive morphology. Therewith, *C. sasakii* is widely distributed in East Asia and well known mainly as pest of *Prunus persica*, and other fruit trees of Rosaceae, whereas the only specimen of *C. niponensis* (Holotype) was known for a long time until the species was rediscovered by capturing two specimens in the pheromone trap for *C. sasakii* in Wakayama and Oita Prefectures in 2008 (Japan) (Nasu et al 2010).

Discussion

As a result of our samplings, in total 62 species from 42 genera and 18 Microlepidopteran families were added to the faunistic list of Krasnoyarskii Krai and Khakassia Republic. The two quarantine species intercepted in Krasnoyarsk are not counted since there are no data confirming their establishment in the region. Forthy four out of 62 species are new for Krasnoyarskii Krai, 22 species new for Khakassia Republic, 18 genera and 3 families (Glyphipterigidae, Chimabachidae and Oecophoridae) are registered for studied region for the first time.

Two species, i.e. *Bucculatrix pannonica* (Bucculatricidae) and *Coleophora curictae* (Coleophoridae), collected on the territory of the city Krasnoyarsk and the suburban area, are new records for Russia. Taking into account the latters, overall eleven species are novel for Siberia. Among them, there are the representatives of nine families: Nepticulidae (*Bohemannia pulverosella*), Tineidae (*Monopis obviella*), Bucculatricidae (*Bucculatrix nigricomella*), Glyphipterigidae (*Glyphipterix simpliciella*), Coleophoridae (*Ardania onobrychiella*, *Casignetella heihensis*), Cosmopterigidae (*Pancalia hexachrysa*) and Gelechiidae (*Caryocolum fischerella*, *C. repentis*).

The two species detected for the first time in Siberia (the tomato leafminer, *Tuta absoluta* and the peach fruit moth, *Carposina sasakii*) are known as serious agricultural pests. *T. absoluta*, originally known from South America, is a quarantine pest in Russia, unintentionally introduced to the European part of the country, in particular to Krasnodarskii Krai. Native to East Asia, *C. sasakii* has restricted distribution in Russia (with a primary range in the Russian Far East) and

thus, it has a quarantine status for the rest of country. Both species were intercepted on the fruit markets in Krasnoyarsk using pheromone traps. They could be introduced into the region accidently, with fruit crops from the regions with those Krasnoyarsk Krai has trade relations (Central and East Asia, Europe). The records of these two species in South Siberia are nominative and should be treated with a caution. The chances for *T. absoluta* and *C. sasakii* to establish the populations in Siberia are low keeping in mind unfovourable climatic conditions for this species originating from warmer areas. Nevertheless, the question about naturalization of these species on the southern territories of Krasnoyarsk Krai would require further monitoring programs.

Conclusions

Our study highlights the importance of regional inventories for defining faunal composition, clarifying species ranges and revealing unwelcome guests – the invasive and quarantine species. As shown in our paper, gathering the diverse collection on Microlepidoptera in South Siberia comprising exclusively of novel faunistic and geographic records was only possible thanks to the involvement of various sampling techniques allowing to cover different taxonomic groups of the moths. Besides continuing exploring the fauna of Microlepidoptera in South Siberia, our future goals will be to specify trophic associations and geographic ranges of the indigenous species and to explore the potential of non-native pestiferous species, that might be accidently introduced to the region through various pathways, to establish and spread in the region.

Conflict of interest

The authors declare that there is no conflict of interest.

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Legend for Figures

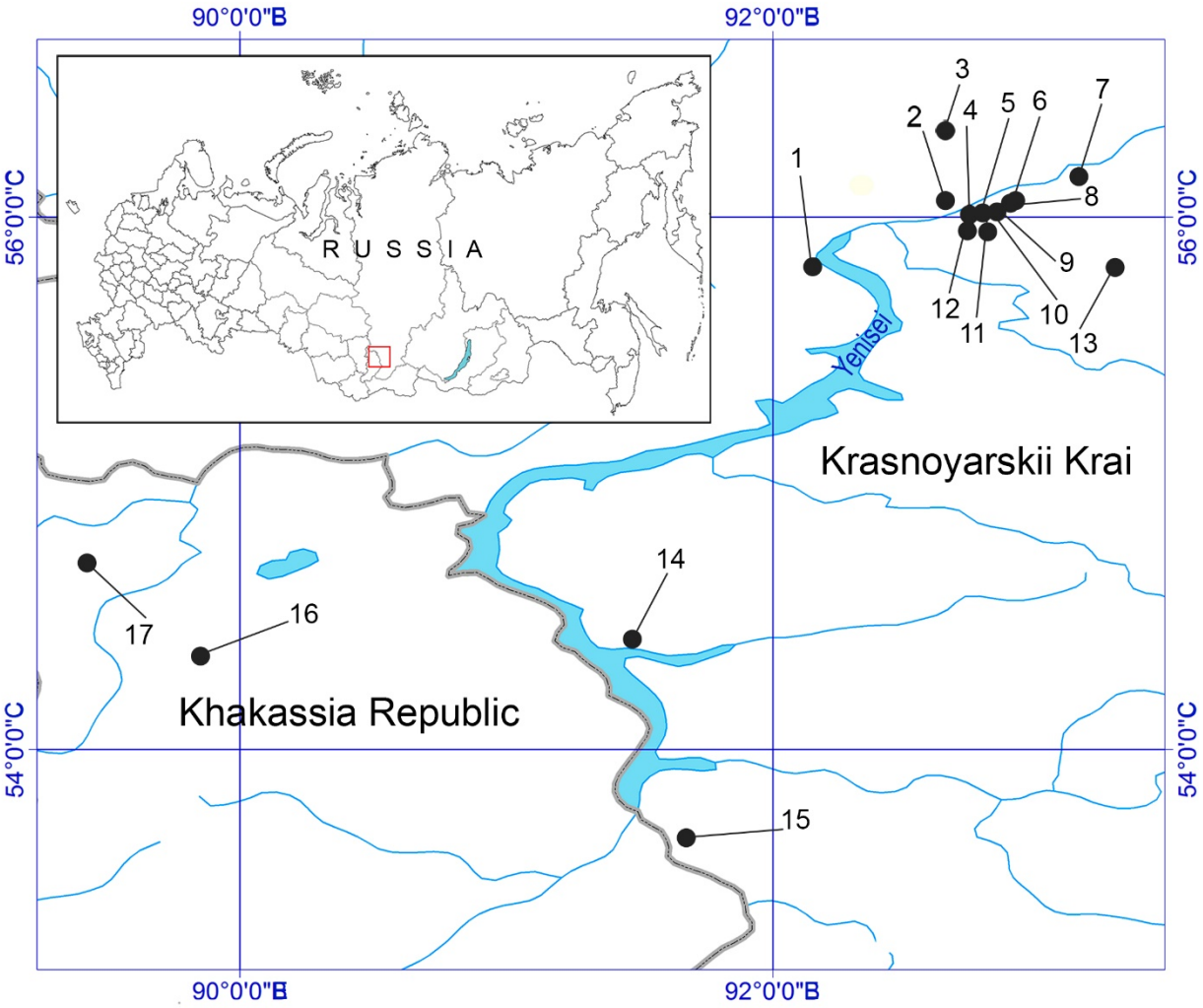

Figure 1. Sampling locations in South Siberia. In the left corner on the map of Russia, the sampled area is shown by red square. Locations in Krasnoyarskii Krai: 1, Emeljanovskii District, the Biryusa Bay; 2, ibidem, Minino settl.; 3, Pogorelskiy bor, Arboretum SIF SB RAS; 4, Krasnoyarsk, private gardens' community «KZK-2»; 5, ibidem, private gardens' community «Pobeda»; 6, ibidem, Red Square; 7, Emeljanovskii District, Kubekovo settl.; 8, Krasnoyarsk, city plantations; 9, ibidem, market with imported fruits; 10, ibidem, greenhouse complex; 11, ibidem, Nature reserve «Stolby»; 12, ibidem, V.M. Krutovsky Botanical Garden; 13, Berezovskii District, Berezovskii settl.; 14, Krasnoturanskii District, Novaya Syda settl.; 15, Minusinskii District, Opytnoe pole settl.; locations in Khakassia Republic: 16, Shirinskii District, Tuimskoe forestry; 17, Shirinskii District, Chjernoe Ozero vil., field research station of SIF SB RAS.

Figure 2. Some biotopes and sampling methods in South Siberia. In Krasnoyarskii Krai: A–B, V.M. Krutovsky Botanical Garden; C, pheromone trapining in private gardens' community «Pobeda»; D, Nature reserve «Stolby»; E, forests around Berezovskii settl.; F, light trapping in Minino settl. In Khakassia Republic: G, steppe around Chjernoe Ozero vil.; H, light trapping at the field research station of SIF SB RAS.

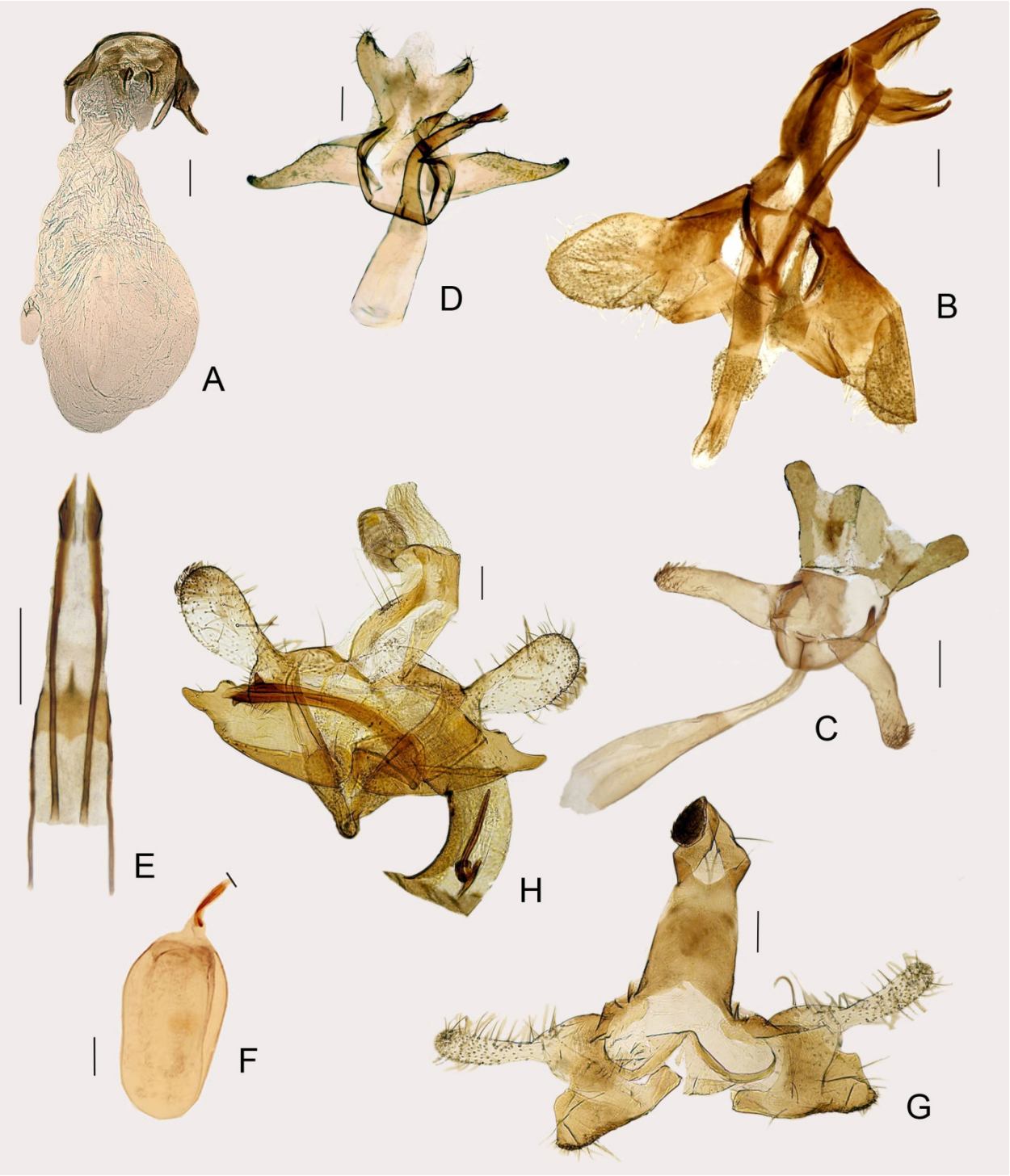

Figure 3. Genitalia, ventral view.: A, *Bohemannia pulverosella* (Stainton, 1849), female genitalia; B, *Monopis obviella* ([Denis et Schiffermüller], 1775), male genitalia; C, *Bucculatrix nigricomella* (Zeller, 1839); D, *Bucculatrix pannonica* (Deschka, 1982), male genitalia; E–F, *Glyphipterix simpliciella* (Stephens, 1834): E, ovipositor and 8th sternite, F, bursa copulatrix; G, *Ardania onobrychiella* (Zeller, 1849), male genitalia; H, *Casignetella heihensis* (Li et Zhang, 2000), male genitalia. <scale bars: 0.1 mm(A-D, G-H,); 0.5 mm(E); 0.2 mm(F)>.

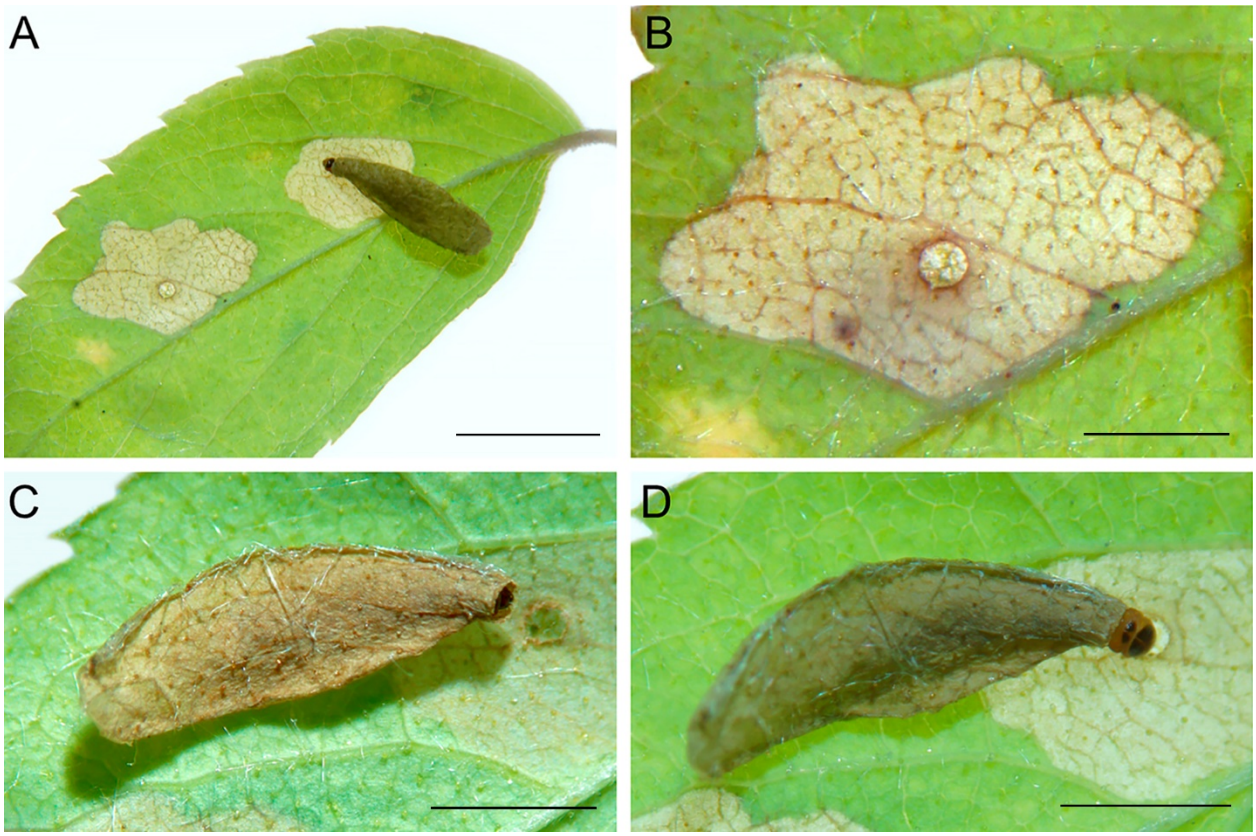

Figure 4. Biology of *Coleophora gryphipennella* (Hübner, 1796) in Krasnoyarskii Krai.: A, larva feeding on *Rosa* leaf; B, the leaf mine; C–D, the larval case. <scale bars: 12 mm(A); 5 mm(B); 6 mm(C–D)>.

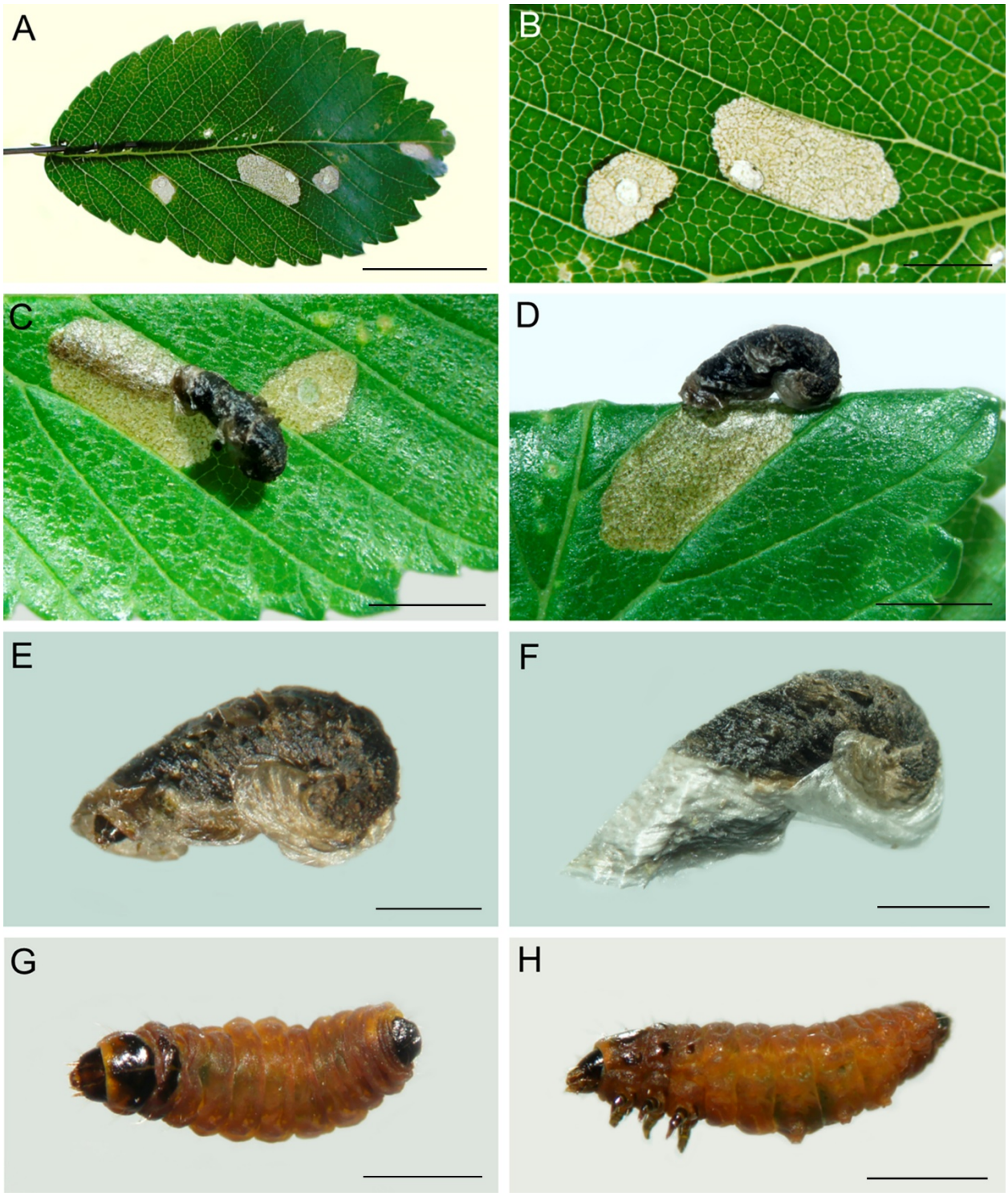

Figure 5. Biology of *Coleophora curictae* Baldizzone, 2016 in Krasnoyarskii Krai.: A, mines on *Ulmus pumila* L.; C–D, larva feeding in the mine not entirely leaving the case attached to the mine; E, the case of a young larva (lateral view); F, the case of the older larva (lateral view); G–H, larva (G, dorsal and H, lateral views). <scale bars: 20 mm(A); 8 mm(B);7 mm(C–D); 3 mm(E); 4 mm(F);2 mm(G–H)>.

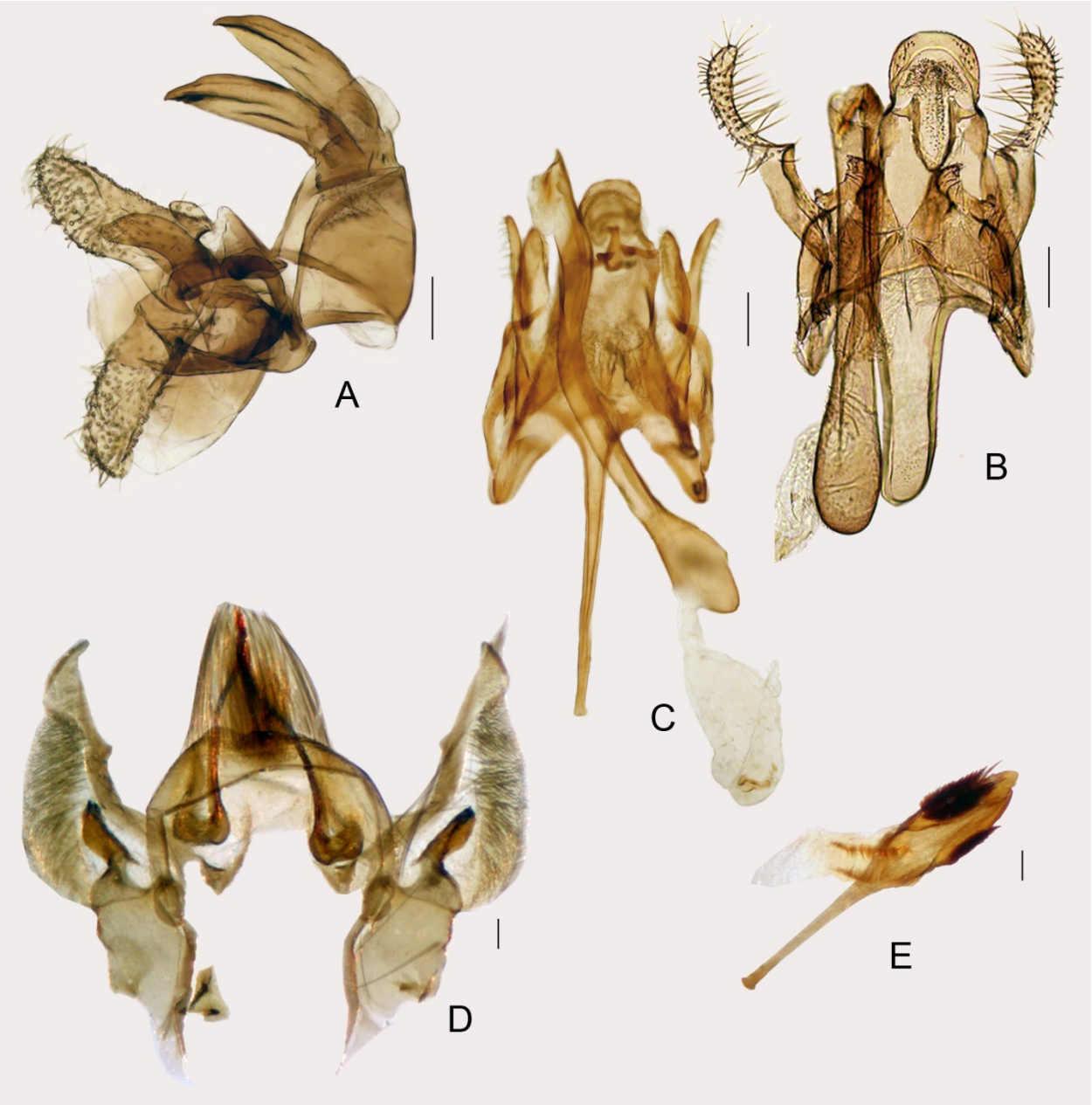

Figure 6. Male genitalia.: A, *Pancalia hexachrysa* (Meyrick, 1935), lateral view; B, *Tuta absoluta* (Meyrick, 1917), ventral view; C, *Caryocolum repentis* (Huemer et Luquet, 1992), ventral view; D-E, *Carposina sasakii* Matsumura, 1900: D, ventral view, E, aedeagus. <scale bars: 0.1 mm>.