

# New records of native and alien true bugs (Heteroptera) from Kemerovo Region, Western Siberia, Russia

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The article provides first records of 20 true bugs species (Heteroptera) from seven families (Lygaeidae, Miridae, Tingidae, Acanthosomatidae, Berytidae, and Saldidae) in Kemerovo Region, Western Siberia, Russia. These species, except two, are known in other regions of the Asian part of Russia, thus, the novel data clarify their up-to-date distribution. Most of true bugs, including an alien *Hoplomachus thunbergii* (Fallén) (i.e. 70% of all species in the study) were found in two botanical gardens (Kuzbasskiy and Orbita) in Kemerovo Region, highlighting the importance of surveying such plantings when running faunal studies and inventories. Two alien species, *H. thunbergii* (fam. Miridae) and *Arocatus rufipes* Stål (fam. Lygaeidae) originating from the European and Far Eastern parts of Russia respectively, were found in the city of Kemerovo and represent novel records for the Asian part of Russia (the former species) and Siberia (the latter species). These species could be introduced to Kemerovo Region with plants for planting, plant material or transported with human vehicles. Further studies would be needed to confirm this hypothesis. Here we provide short synopses of the bionomics, distributional records and trophic associations for all species newly documented in Kemerovo Region. The images of adults and male genitalia are given for the majority of species.

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## Keywords

Heteroptera, Kemerovo, Western Siberia, fauna, new regional records, alien species

## Introduction

True bugs are a taxonomic group of insects known by their worldwide distribution, inhabiting various biotopes and having trophic associations with the varieties of substrates (plants, arthropods etc.) (Vinokurov *et al.* 2010). Among those insects, a number of important pests are known in forestry and agriculture, for instance, *Graphosoma lineatum* (Linnaeus, 1758), *Rubiconia intermedia* (Wolff, 1811), *Dolycoris baccarum* (Linnaeus, 1758) (Pentatomidae), *Acanthosoma haemorrhoidalis angulatum* Jakovlev, 1880, *Elasmucha grisea* (Linnaeus, 1758) (Acanthosomatidae) (Petrova 1975). Besides, some species are presently known by expanding their ranges and penetrating Russia from other regions of the world, in particular, *Leptoglossus occidentalis* Heidemann, 1910, *Molipteryx fuliginosa* (Uhler, 1860) (Coreidae), *Halyomorpha halys* (Stål, 1855) (Pentatomidae), *Corythucha arcuata* (Say, 1832) (Tingidae) (Neimorovets *et al.* 2017; Garipey *et al.* 2021; Kornev *et al.* 2021; Markova *et al.* 2021; Reznik *et al.* 2022; Musolin *et al.* 2022).

Fauna of true bugs of Kemerovo, the region situated in the forest-steppe in the southern part of Western Siberia, remains poorly studied (Zolotarev 2005). Overall, 187 aquatic and terrestrial species from 27 families of Heteroptera have been documented here so far (Vinokurov *et al.* 2010). The data on true bugs diversity was accumulated for this region through the exploration of entomological collections gathered together by various researchers for more than one century and deposited in the Zoological Institute of the Russian Academy of Sciences (St. Petersburg) (Jakovlev 1903; Kiritshenko 1910, 1913; Wnukowsky 1926, 1927; Kulik 1965, 1967; Putshkov 1965, 1974; Kanyukova 1973; Kiritshenko, Kerzhner 1974; Kanyukova 1982, 1984; Kerzhner 1981; Putshkov PV 1982; Muminov 1987; Petrova 1974, 1975, 1978; Golub 1976, 1989; Cobben 1985; Aglyamzyanov 1990; Vinokurov, Kanyukova 1995; Vinokurov 2005, 2009; Vinokurov, Golub 2007, 2009; Kanyukova, Vinokurov 2007, 2009a, 2009b; Namyatova, Konstantinov 2009). Occasional faunistic studies were carried out based on the collections stored in the Kemerovo region (Eremeeva 2004a, 2004b). Furthermore, some region studies, besides faunistic records, provide interesting data on the impact of technogenic pollution on the composition of true bugs communities in Kemerovo Region (Zolotarev 2003; Zolotarev 2005).

The present article provides the list of 20 true bug species documented in Kemerovo Region for the first time, including two alien species, *Hoplomachus thunbergii* (Miridae) and *Arocatus rufipes* (Lygaeidae), originally known from extreme west and east of Russia, respectively. For all species, brief synopses of the bionomics, data on modern range and trophic associations are given. The adults and male genitalia of the majority of true bug species are illustrated.

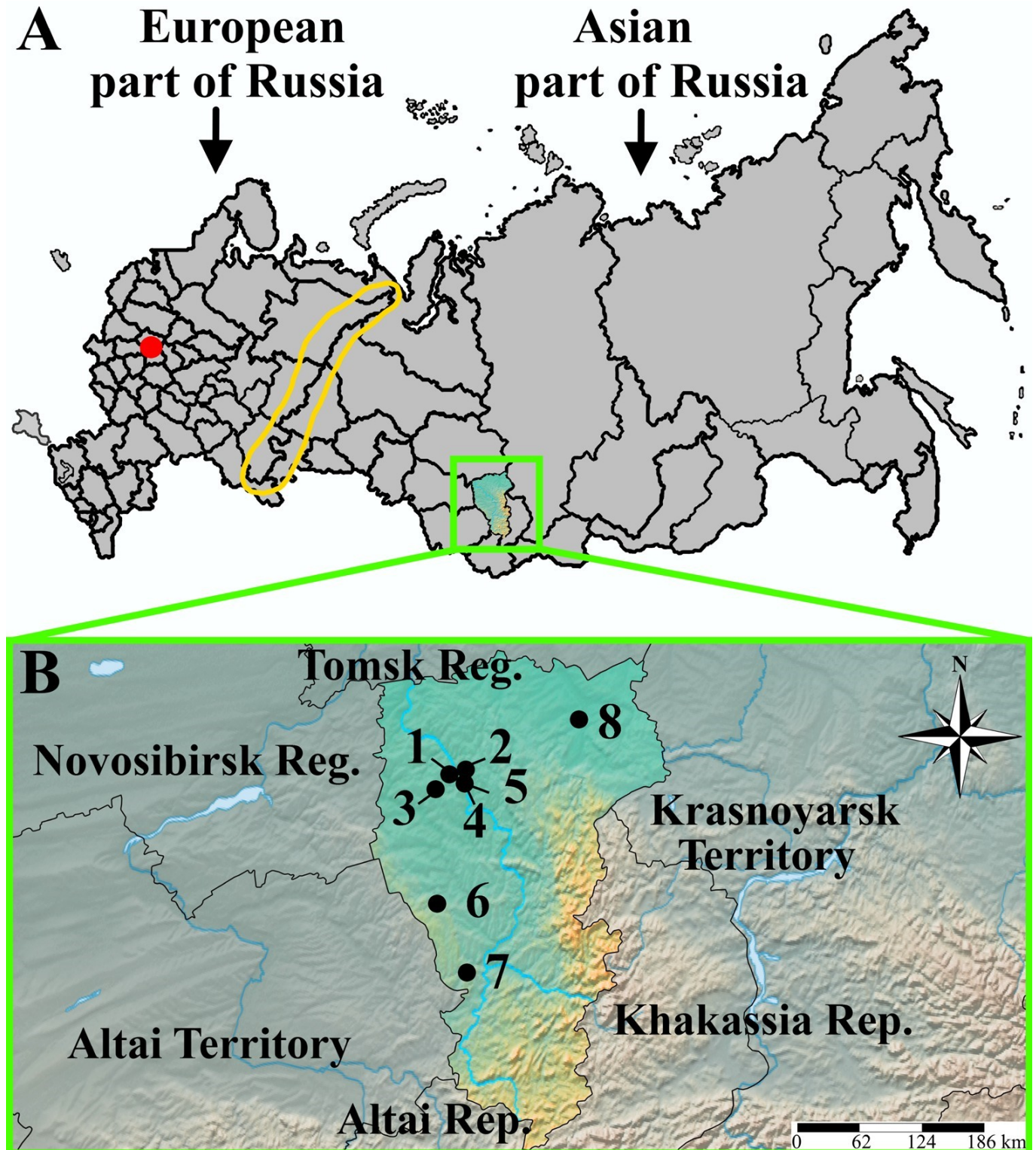
## Material and methods

The adults of true bugs were collected in Kemerovo Region from May to August 2021 by AV Korshunov and DA Efimov following the standard approaches (Golub *et al.* 2012). Following eight localities were sampled: 1) Kemerovo city district, 2.5 km SE Mozhzykha village (55°24'48"N, 85°56'11"E); 2) Kemerovo, near Golubaya laguna lake (55°28'59"N, 86°09'54"E); 3) Topkinskiy district, Orbita botanical garden (55°14'57"N, 85°45'57"E); 4) Kemerovo, Central district of the city (55°20'53"N, 86°05'49"E); 5) Kemerovo, Kuzbasskiy botanical garden (55°21'57" N, 86°11'32" E); 6) Belovskiy district, Chudnoe lake (54°13'05"N, 86°13'28"E); 7) Novokuznetsk (53°39'48" N, 86°56'17" E); 8) Mariinskiy district, Acherkas recreation center (56°10'31"N, 87°46'43"E) (Fig. 1).

The insects were killed using ethyl acetate and transported to the laboratory, where they were pinned, labeled and placed in dry entomological collection at the Altai State University. Species identification was based on external adult morphology and characteristics of male genitalia apparatus. Genitalia slides were prepared following standard protocol (Golub *et al.* 2012). The

species were identified using the keys in Putshkov (1961, 1974), Kerzhner Yachevsky (1964), Petrova (1975), Vinokurov, Kanyukova (1995), Golub (1974), and Vinokurov (1988). All species were identified by V.V. Rudoi and confirmed by N.N. Vinokurov.

Data on bionomic, modern range and trophic associations were retrieved from various sources (Kiritshenko 1951; Wagner, Weber 1964; Kulik 1965; Lindskog 1975; Vinokurov 1988, 2004; Esenbekova 2013; Gao *et al.* 2013; Kuzhuget 2017). When referring to trophic specialization, following terminology was used: zoophagous species feeds on small arthropods, polyphytophagous – on plants from various taxonomic orders, zoophytophagous – on small arthropods and plants from various orders, oligophytophagous – on plants from certain families or genera (Giljarov 1986). Following terminology was used in regard to species distribution: Holarctic species are distributed across Palaearctic and Nearctic realms; Palaearctic species – across Europe, Asia, North Africa and their range extends to the southern borders of the Sahara desert; West Central Palaearctic species – in Europe, Siberia and Central Asia; Eastern Palaearctic species – in Asian Russia (South Siberia and Far East, Trans-Baikal), Central and Eastern Asia countries; Transpalaearctic species are distributed from the Atlantic coast to the Pacific coast; Euroasian species are common in extratropical Eurasia; European species are found in European countries (Emeljanov 1974; Kerzhner, Josifov 1999; Vinokourov 2004; Sofronova 2015; Knyshov, Namyatova 2010; Vinokurov *et al.* 2010; Kuzhuget 2017). Data on species distribution are provided mainly for Western Siberia and retrieved from Vinokurov *et al.* (2010) and some other literature sources (listed in the species essays).



**Figure 1.** The sampled localities of true bugs (*Heteroptera*) in Kemerovo Region (**A**, **B**). In the general map (**A**), the capital is indicated by red circle; the Ural Mountains are outlined by orange line; the study region is indicated by green rectangle. In zoom up (**B**), sampled localities are indicated: **1** – 2.5 km SE Mozhzykha village; **2** – Golubaya laguna lake; **3** – Orbita botanical garden; **4**, **5** – Kemerovo (**4** – Central district of the city, **5** – Kuzbasskiy botanical garden); **6** – Chudnoe lake; **7** – Novokuznetsk; **8** – Archerkas recreation center.

The images of true bug adults and their genitalia were taken with a digital camera Olympus DP74 attached to the stereomicroscope Olympus SZX16 at the Altai State University. The photographs were revised in Paint.net, a free (except for Microsoft Store) raster graphics editor for Windows NT

based on NET Framework (getpaint.net). The map with sampled localities was produced using the online mapping software SimpleMappr (Shorthouse 2010). Plant species were verified based on the data provided in plantarium.ru (Plantarium 2007–2022).

## Results

Overall 20 species of true bugs were collected representing seven families: Lygaeidae (nine species, i.e. 45% of all recorded species in the study), Miridae (five species, 25%), Tingidae (two species, 10%), Acanthosomatidae, Berytidae, Saldidae (represented by one species each, i.e. 5% in each case).

All species recorded in the study are new for Kemerovo Region. Eighteen out of 20 species are known from other parts of Siberia (see faunistic list below). Two species, *Hoplomachus thunbergii* (Miridae) and *Arocatus rufipes* (Lygaeidae) are alien for Kemerovo Region and represent new records for the Asian part of Russia (the former species) and Siberia (the latter species). These two species are originally known from European and Far Eastern parts of Russia, respectively (Kerzhner, Yachevsky 1964; Vinokurov 1988). *Hoplomachus thunbergii* feeds on herbaceous plants from Asteraceae and Fabaceae (Kerzhner, Yachevsky 1964; Wagner, Weber 1964; Schuh 1995; Malenovský *et al.* 2011), whereas *Arocatus rufipes* is known to develop on *Ulmus* (Ulmaceae) (Vinokurov 1988; Gao *et al.* 2013). So far, no noticeable impact of these two true bug species on their host plants in Kemerovo Region was documented.

The majority of species, 14 out of 20 (i.e. 70%), were collected exclusively in the botanical gardens in Kemerovo Region. Three species (15%) were collected both in the botanical gardens and outside, on adjustment territories, whereas other three species (15%) were collected outside the botanical gardens, in different urbanized areas of Kemerovo.

Overall, seven out of 20 species are known to be associated with herbs, six species with roots and seeds of herbs and shrubs, two with woody plants, two species consume small arthropods, one species consumes small arthropods and saps herbs, one species feeds on small arthropods and woody plants, and for one species no specific information is found in literature. Thus, 11 out of 20 species are polyphytophagous, two species are zoophagous, four species are oligophytophagous, two species are zoophytophagous, and one species with unknown trophic relations.

### **New records of true bugs in Kemerovo Region**

#### **Family Saldidae Amyot et Serville, 1843**

##### ***Saldula saltatoria* (Linnaeus, 1758)**

Figures 2, 3

*Material examined.* 1 ♂, Orbita botanical garden, 1.07.2021, 270 m alt., D.A. Efimov leg.

*Distribution.* Holarctic species (Péricart 1990; Vinokourov 2004; Kuzhuget 2017). West Siberia: Tyumen and Tomsk Regions, Altai Krai, Yamal, Khanty-Mansi Republic (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* The species is found on the surface of wet sandy or clayey soil, sediments and debris on the banks of rivers, lakes, near puddles, on wet meadows and swamps (Lindskog 1975; Vinokorov 2004). Imago hibernates in grass; in case of short-term warming, overwintering individuals are able to move (Péricart 1990). In England, mating and ovipositing adults were observed between late April and early June; eggs are laid in hard dirt or in uneven soils among low vegetation (Péricart 1990). In the Carpathians, the species has two generations per year (Benedek 1970).

*Trophic associations.* Zoophagous species (Esenbekova 2013; Kuzhuget 2017); feeds on small insects (larvae of Diptera), ear thworms (Enchytraeidae) etc. (Vinokourov 2004).

### **Family Miridae Hahn, 1833**

#### ***Deraeocoris (Deraeocoris) scutellaris* (Fabricius, 1794)**

Figures 4, 5

*Material examined.* 1 ♂, Kuzbasskiy botanical garden, 17-18.05.2021, 130 m alt., A.V. Korshunov leg.

*Distribution.* Eurosiberian species (Vinokurov *et al.* 2010). West Siberia: Tyumen, Novosibirsk Regions, Altai Territory (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* In Kazakhstan, this species lives on mesophyte multiherbal forest meadows; has one generation per year and hibernates in the egg stage (Esenbekova 2013).

*Trophic associations.* Zoophagous species; consumes small insects (Kulik 1965).

#### ***Phytocoris (Ktenocoris) nowickyi* Fieber, 1870**

Figures 6–9

*Material examined.* 1 ♂, Orbita botanical garden, 17.08.2021, 270 m alt., D.A. Efimov leg.

*Distribution.* Euroasian species (Sofronova 2015). West Siberia: Altai Territory (Vinokurov, Golub 2009); first record for Kemerovo Region (present paper).

*Bionomics.* In Eastern Siberia and the Russian Far East, adults can be found in July and August; the species hibernates in the egg stage (Kulik 1965).

*Trophic associations.* Zoophytophagous (Sofronova 2015). In the European part of Russia, this species is found on *Atriplex* (Chenopodiaceae) (Kiritschenko 1951) and on deciduous trees (exact species are not listed in literature) (Kerzhner, Yachevsky 1964). In Eastern Siberia and the Russian Far East, it was documented on *Salix* (Salicaceae) (Kulik 1965). In Europe, it was found in humid areas on *Rumex conglomeratus* Murray (Polygonaceae) (Wagner, Weber 1964).

*Remarks.* Common species in Eastern Siberia and the Russian Far East (Kulik 1965).

#### ***Polymerus (Poeciloscytus) brevicornis* (Reuter, 1879)**

Fig. 10

*Material examined.* 1 ♀, Kuzbasskiy botanical garden, 10.06.2021, 130 m alt., A.V. Korshunov leg.; 1 ♀, ibidem, 17-18.05.2021, A.V. Korshunov leg.

*Distribution.* Transpalaeartic species (Kuzhuget 2017). West Siberia: Tyumen, Omsk Regions, Altai Territory, Altai Republic (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* This species inhabits steppes and found on rocky and sandy soil; has two generations per year, hibernates in the egg stage (Kulik 1965; Kuzhuget 2017).

*Trophic associations.* Polyphytophagous; feeds on Fabaceae, *Urtica* (Urticaceae), *Galium* (Rubiaceae) (Kulik 1965).

***Hoplomachus thunbergii* (Fallén, 1807)**

Figs 11–13

*Material examined.* 1 ♂, Kuzbasskiy botanical garden, 30.06.2021, 130 m alt., A.V. Korshunov leg.

*Distribution.* Euro-Caucasian (Zinovyeva, Polumordvinov 2017). Native to European part of Russia: widely distributed from south (Transcaucasia) to north and from west to east up to the Ural Mountains (Zinovyeva, Polumordvinov, 2017); first record for Asian part of Russia from Kemerovo Region (present paper).

*Bionomics.* In France, this species was found from July to August; hibernates in the egg stage (Wagner, Weber 1964).

*Trophic associations.* Polyphytophagous; feeds on *Pilosella officinarum* F.W. Schultz & Sch. Bip. (= *Hieracium pilosella* L.) (Asteraceae) in European part of Russia and France (Kerzhner, Yachevsky 1964; Wagner, Weber 1964), *Sarothamnus scoparius* (L.) W.D.J. Koch (Fabaceae) (Schuh 1995), *Hippocrepis* sp. (Fabaceae), *Leucanthemum vulgare* Lam. (Asteraceae), *Senecio erucifolius* L. (Asteraceae) in Czech Republic (Malenovský *et al.* 2011).

*Remarks.* The species could arrive to Kemerovo Region through natural dispersion or anthropogenic transportation. Bearing in mind that the host plants of this true bug, *Senecio erucifolius* and *Leucanthemum vulgare* (Asteraceae), are naturally present in Siberia, the species could potentially be found in other Siberian regions and in such case its alien status would need further exploration and confirmation.

***Psallus (Apocremnus) aethiops* (Zetterstedt, 1838)**

Figures 14, 15

*Material examined.* 1 ♂, Kuzbasskiy botanical garden, 8.06.2021, 130 m alt., A.V. Korshunov leg.

*Distribution.* Holarctic species (Kuzhuget 2017). West Siberia: Yamalo-Nenets Autonomous Okrug, Altai Republic (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* Species hibernates on the egg stage (Kulik 1965). In tundra of the European part of Russia, it was noted in a high density (Zinovjeva 2006).

*Trophic associations.* In Eastern Siberia, it was mentioned either as zoophagous (Kulik 1965) or zoophytophagous (Kuzhuget, 2017). In the Far East (Kerzhner, 1998) and the European part of Russia, it was noted as a phytophagous on *Salix* sp. (Salicaceae) (Zinovjeva 2006).

**Family Tingidae Laporte, 1832*****Derephysia (Paraderephysia) longispina* Golub, 1974**

Fig. 16

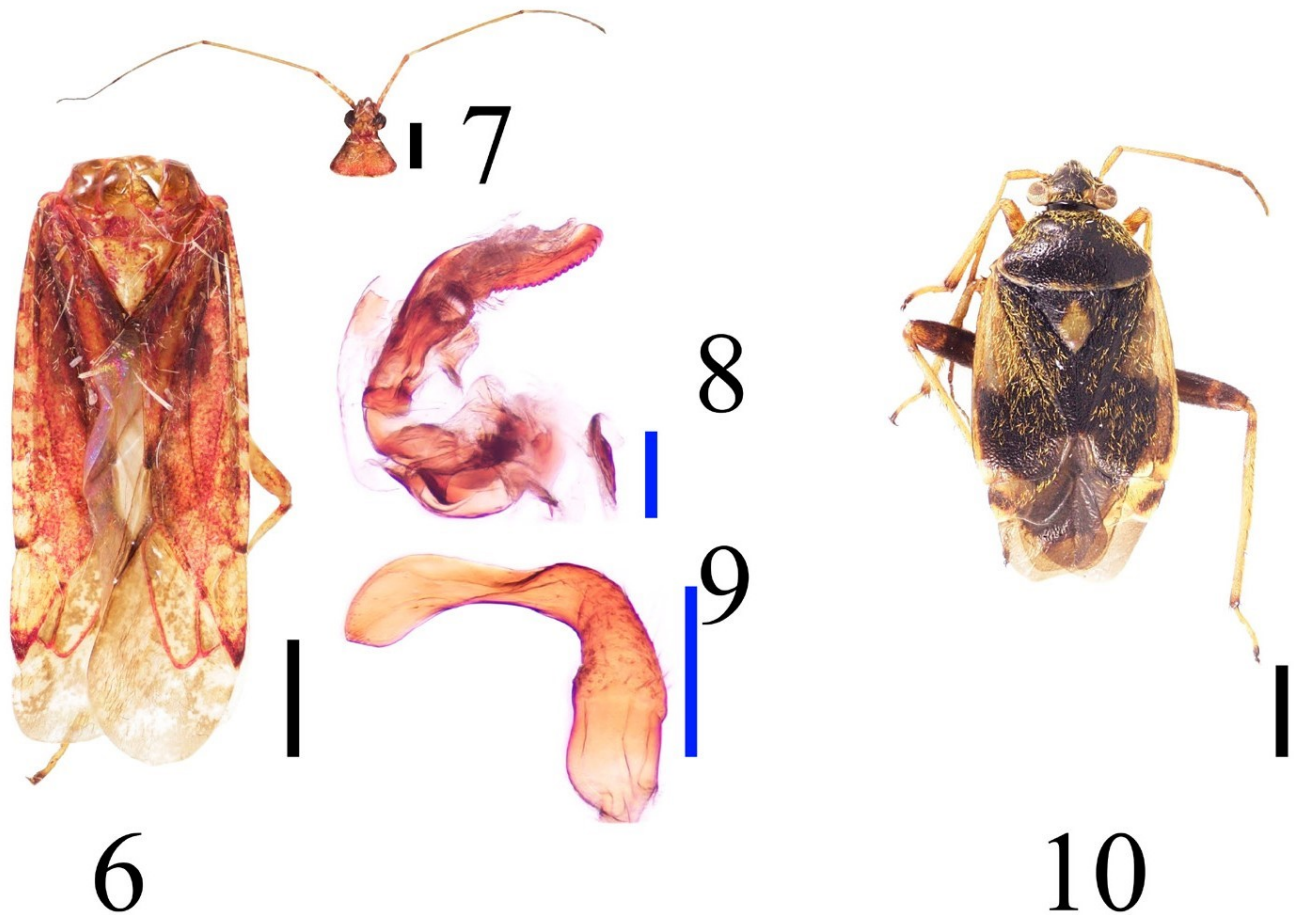
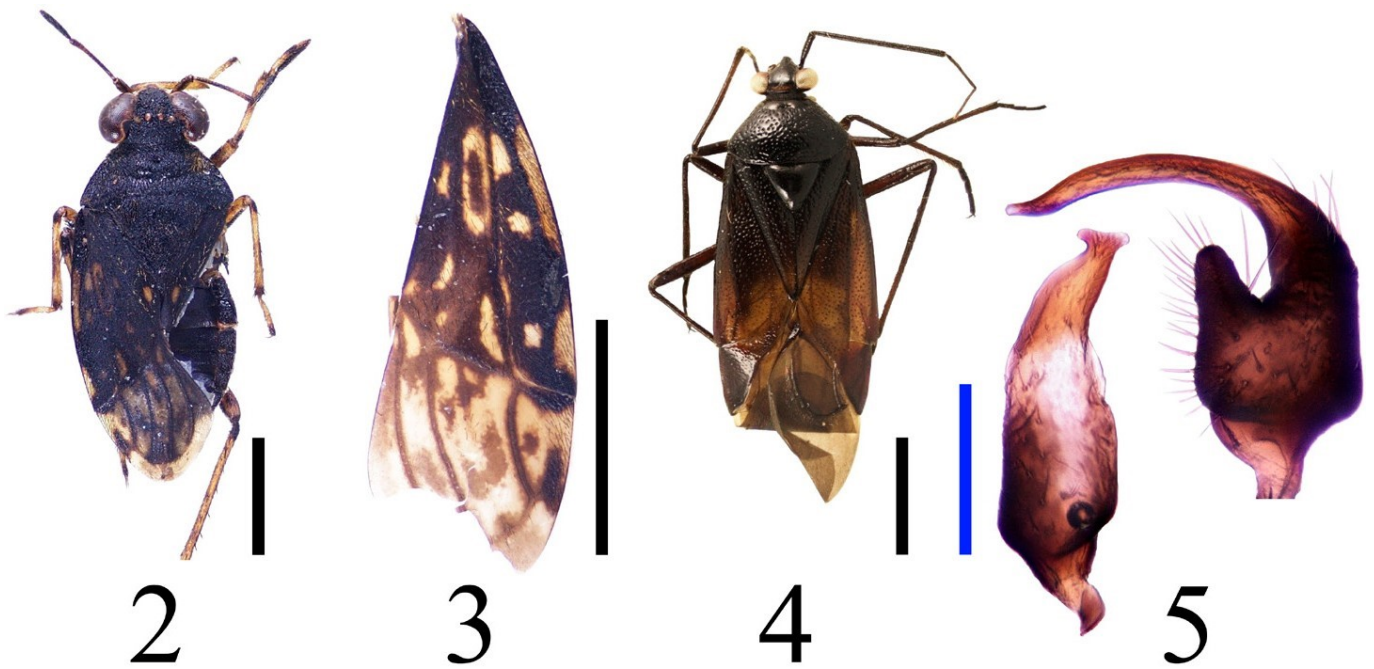
*Material examined.* 1 ♂, Orbita botanical garden, 17.08.2021, 270 m alt., D.A. Efimov leg.

*Distribution.* Palaearctic species (Knyshov, Namyatova 2010). West Siberia: Novosibirsk Region (Petrova 1974, 1978), Altai Territory (Knyshov, Namyatova 2010; Vinokurov, Rudoi 2022a); first record for Kemerovo Region (present paper).

*Bionomics.* The species inhabits grassy meadows; has one generation per year and hibernates as

adults (Esenbekova 2013).

*Trophic associations.* Oligophytophagous; feeds on plants from Asteraceae (Esenbekova 2013).





**Figure 2. Figures 2-10.** Novel species of Heteroptera for Kemerovo Region. **2, 3** – *Saldula saltatoria*. **4, 5** – *Deraeocoris scutellaris*. **6-9** – *Phytocoris nowickyi*. **10** – *Polymerus brevicornis* (**2, 4, 6, 10** – dorsal view, **3** – right hemelytron, **5, 9** – paramers, **6** – body dorsal view, **7** – head dorsal view, **8** – aedeagus). The scale for adults (black vertical line) is 1 mm; for genitalia (blue line) is 0.2 mm.

### ***Dictyla echii* (Schrank, 1782)**

Fig. 17

*Material examined.* 1 ♂, 1 ♀, Orbita botanical garden, 17.08.2021, 270 m alt., D.A. Efimov leg.; 2 ♂, Belovskiy district, Chudnoe lake, 3.06.2021, 230 m alt., A.V. Korshunov leg.

*Distribution.* Transpalearctic species (Péricart, Golub 1996). West Siberia: Tyumen, Omsk, Novosibirsk, Tomsk Regions, Altai Territory (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* In Kazakhstan and the Republic of Tuva, the species inhabits a variety of biotopes, avoiding wet and strongly shaded places in the steppe; has two generations per year, hibernates as adults (Esenbekova 2013; Kuzhuget 2017).

*Trophic associations.* Oligophytophagous; feeds on *Symphytum*, *Echium* and *Pulmonaria* (Boraginaceae) (Esenbekova 2013; Kuzhuget 2017).

### **Family Berytidae Fieber, 1851**

#### ***Berytinus (Berytinus) clavipes* (Fabricius, 1775)**

Figures 18, 19

*Material examined.* 1 ♂, Kuzbasskiy botanical garden, 130 m alt., 23.05.2021, A.V. Korshunov leg.; 1 ♀, Kemerovo, near Golubaya laguna lake, 25.08.2021, 250 m alt., D.A. Efimov leg.

*Distribution.* Holarctic species (Kuzhuget 2017). West Siberia: Tyumen Region, Altai Territory, Altai Republic (see in Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* In Ukraine, this species inhabits forest steppes, forest edges and woodlands, mesophyte meadows, middle belt of mountains, as well as urbanized areas (parks); one generation per year, hibernates as adults (Putshkov 1974).

*Trophic associations.* Oligophytophagous; feeds on Fabaceae (Putshkov 1974; Esenbekova 2013; Kuzhuget 2017).

### **Family Lygaeidae Schilling, 1829**

#### ***Arocatus rufipes* Stål, 1872**

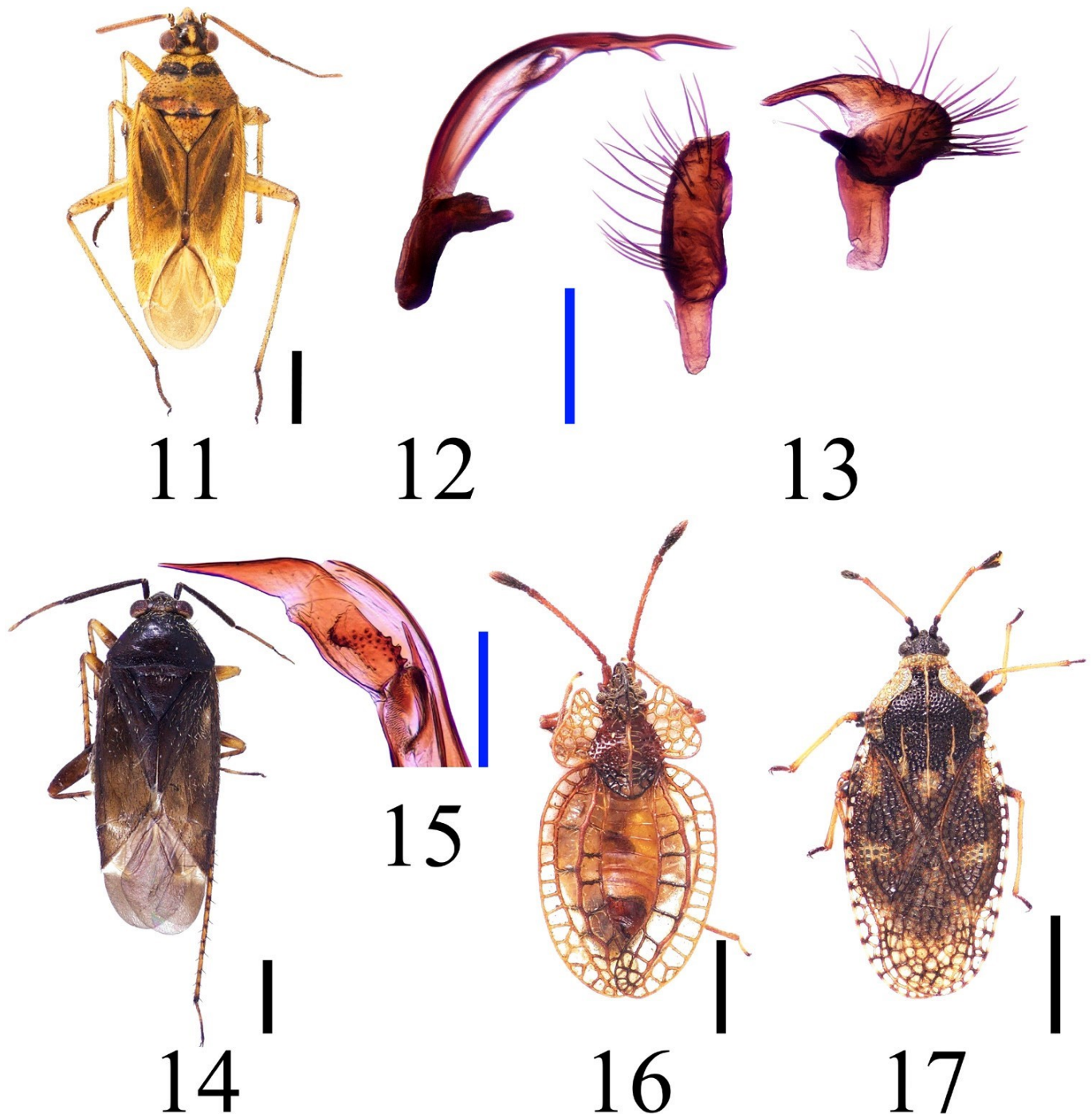
Fig. 20

*Material examined.* 1 ♀, Kemerovo, Central district of the city, 25.08.2021, 120 m alt., A.V. Korshunov leg.

*Distribution.* Eastern Palaearctic species (Kuzhuget 2017), naturally present in Mongolia, Japan (Vinokurov *et al.* 2010), the Russian Far East and Eastern Siberia (up to Buryatia Republic inclusively) (Sofronova, Sofronov 2021); recorded in Krasnoyarsk Territory as an alien species (Kanyukova, Vinokurov 2010). Western Siberia: first record for Kemerovo Region (present paper).

*Trophic associations.* Oligophytophagous; feeds on *Ulmus* (Ulmaceae) (Vinokurov 1988; Gao *et al.* 2013). In the Republic of Buryatia, the true bug isolated population was found in a relict grove of Japanese elm, *U. japonica* (Sofronova, Sofronov 2021).

*Remarks.* This true bug species could be introduced to Kemerovo either with elms or with other goods, or adults, as hitchhikers, could be transported with vehicles. Its further distribution in Western Siberia would require further study.



**Figure 3. Figures 11-17.** Novel species of Heteroptera for Kemerovo Region. **11-13** - *Hoplomachus thunbergii*. **14, 15** - *Psallus graminicola*. **16** - *Derephysia longispina*. **17** - *Dictyla echii* (**11, 14, 16, 17** - dorsal view, **13** - paramers, **12, 15** - vesica). The scale for adults (black vertical line) is 1 mm; for genitalia (blue line) is 0.2 mm.

***Cymus aurescens* Distant, 1883**

Figures 21, 22

*Material examined.* 2 ♂, 2 ♀, Novokuznetsk, 24.07.2021, 280 m alt., D.A. Efimov leg.; 2 ♀, Kemerovo, Kuzbassky botanical garden, 130 m alt., 23.05.2021, 130 m alt., A.V. Korshunov leg.

*Distribution.* Euroasian species (Vinokurov *et al.* 2010). West Siberia: Tyumen Region, Altai Territory, Altai Republic (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* This species inhabits floodplains, damp and wetlands; one generation per year, hibernates as adults (Esenbekova 2013).

*Trophic associations.* Polyphitophagous; feeds on *Scirpus* (Cyperaceae), *Carex* (Cyperaceae), *Juncus* (Juncaceae) (Esenbekova 2013).

***Ischnodemus sabuleti* (Fallén, 1826)**

Fig. 23

*Material examined.* 1 ♀, Kuzbasskiy botanical garden, 130 m alt., 23.05.2021, A.V. Korshunov leg.

*Distribution.* Transpalaeartic species (Vinokurov *et al.* 2010). West Siberia: Tyumen, Tomsk Regions, Altai Territory (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* This species inhabits steppes, meadows of the floodplains, as well as can be found on open patches on the banks of lakes and ponds; one generation per year, hibernates as adults (Putshkov 1969; Esenbekova 2013).

*Trophic associations.* Polyphitophagous; feeds on *Agropyron*, *Glyceria*, *Elymus*, *Calamagrostis*, *Pragmites* (Poaceae), and *Typha latifolia* L. (Typhaceae) (Putshkov 1969).

***Drymus (Sylvadrymus) sylvaticus* (Fabricius, 1775)**

Figures 25, 26

*Material examined.* 1 ♂, Kuzbasskiy botanical garden, 130 m alt., 23.05.2021, A.V. Korshunov leg.

*Distribution.* Transpalaeartic species (Kuzhuget 2017). West Siberia: Tyumen Region, Altai Territory, Altai Republic (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* This species inhabits forest edge and meadows next to deciduous forests, can be found in urbanized areas (parks, gardens, in places with ruderal vegetation); one generation per year, hibernates as adults (Putshkov 1969; Esenbekova 2013; Kuzhuget 2017).

*Trophic associations.* Polyphitophagous (Esenbekova 2013; Kuzhuget 2017); feeds on fallen seeds of *Rumex acetocella* L. (Polygonaceae) and *Erica cinerea* L (Ericaceae) and saps juice of roots of these plants (Putshkov 1969).

***Aphanus rolandri* (Linnaeus, 1758)**

Fig. 27

*Material examined.* 1 ♂, Kuzbasskiy botanical garden, 130 m alt., 29.05.2021, A.V. Korshunov leg.

*Distribution.* West-Central Palaeartic species (Vinokurov *et al.* 2010). West Siberia: Tyumen Region, Altai Territory (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* It inhabits meadows and forest edge, found on the ground under plants, most often under *Verbascum* (Scrophulariaceae) or in the litter among vegetable detritus and grass, rarely on plants, can also be found in urbanized area (parks); has one generation per year, hibernates as adults (Putshkov 1969; Esenbekova 2013).

*Trophic associations.* Polyphitophagous (Esenbekova 2013); feeds on fallen seeds of *Verbascum* sp. (Scrophulariaceae) (Putshkov 1969) *Thuja occidentalis* L. (Cupressaceae) (Stehlik, Varinova 1998b).

***Megalonotus chiragra* (Fabricius, 1794)**

Fig. 28

*Material examined.* 1 ♀, Acherkas recreation center, 23.06.2021, 160 m alt., A.V. Korshunov leg.

*Distribution.* Transpalaeartic (Péricart 2001). West Siberia: Tyumen, Tomsk Regions, Altai Territory (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* It is found in steppes, semi-deserts, floodplains, along forest edges and meadows, on roadsides, on/in litter, under plants of *Artemisia* (Asteraceae), *Potentilla* (Rosaceae), among the detritus of woody plants; has from two to three generations per year, hibernates as adults (Putshkov 1969; Esenbekova 2013; Kuzhuget 2017).

*Trophic associations.* Polyphitophagous (Esenbekova 2013; Kuzhuget 2017); feeds on Chenopodiaceae, Asteraceae, Brassicaceae (Putshkov 1969).

***Peritrechus geniculatus* (Hahn, 1832)**

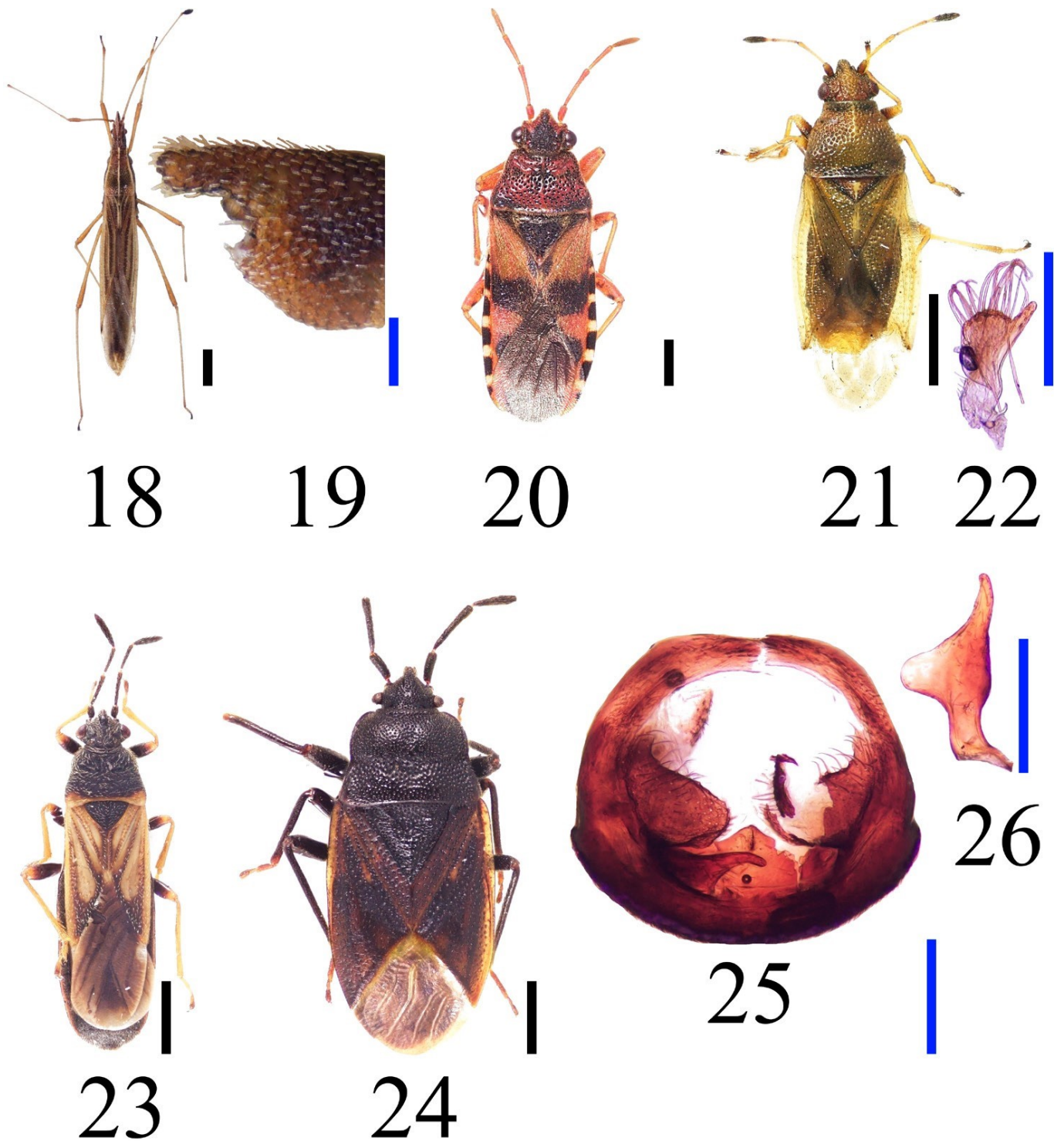
Fig. 29

*Material examined.* 2 ♀, Kuzbasskiy botanical garden, 130 m alt., 14-30.06.2021, A.V. Korshunov leg.; 1 ♀, Orbita botanical garden, 270 m alt., 1.07.2021, D.A. Efimov leg.

*Distribution.* West-Central Palaeartic species (Vinokurov *et al.* 2010). West Siberia: Tyumen, Novosibirsk and Tomsk Regions (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* It is found among vegetable detritus, on the edge and meadows of forests. This species prefers wet places with overgrown ruderal vegetation; has one generation per year; hibernates as adults (Putshkov 1969; Esenbekova 2013).

*Trophic associations.* Polyphitophagous; feeds on plant sap and fallen seeds (exact plant species were not found in literature) (Putshkov 1969; Esenbekova 2013).



**Figure 4. Figures 18–26.** Novel species of Heteroptera for Kemerovo Region. **18, 19** – *Berytinus clavipes*. **20** – *Arocatus rufipes*. **21, 22** – *Cymus aurescens*. **23** – *Ischnodemus sabuleti*. **24, 25, 26** – *Drymus sylvaticus* (18, 20, 21, 23, 24 – dorsal view, 19 – external male segment, lateral view, 22, 26 – paramers, 25 – male genital capsule). The scale for adults (black vertical line) is 1 mm; for genitalia (blue line) is 0.2 mm.

***Acompus rufipes* (Wolff, 1804)**

Fig. 30

*Material examined.* 1 ♂, Kuzbasskiy botanical garden, 130 m alt., 14.06.2021, A.V. Korshunov leg.

*Distribution.* Transpalaeartic species (Vinokurov *et al.* 2010). West Siberia: Tyumen, Tomsk Regions, Altai Territory (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* It inhabits humid biotopes, can be found on the edge of forest steppe; has one generation per year, hibernates as adults (Putshkov 1969; Esenbekova 2013).

*Trophic associations.* Polyphitophagous (Esenbekova 2013); feeds on Valerianaceae and Poaceae (Putshkov 1969).

### ***Stygnocoris sabulosus* (Schilling, 1829)**

Fig. 31

*Material examined.* 1 ♂, 1 ♀, Orbita botanical garden, 270 m alt., 17.08.2021, D.A. Efimov leg.

*Distribution.* Transpalaeartic species (Vinokurov *et al.* 2010). West Siberia: Altai Republic (Vinokurov 2007); first record for Kemerovo Region (present paper).

*Bionomics.* The species prefers mesophytic places, can be found on meadows and forest steppe, in thickets of ruderal vegetation; has one generation per year, hibernates in the egg stage (Putshkov 1969; Esenbekova 2013).

*Trophic associations.* Polyphitophagous, imago feeds on fallen plant seeds, larvae suck plant juice on *Ranunculus* (Ranunculaceae), *Erica* (Ericaceae), *Rumex* (Polygonaceae) (Putshkov 1969; Esenbekova 2013).

### **Family Acanthosomatidae Signoret, 1864**

#### ***Acanthosoma denticaudum* Jakovlev, 1880**

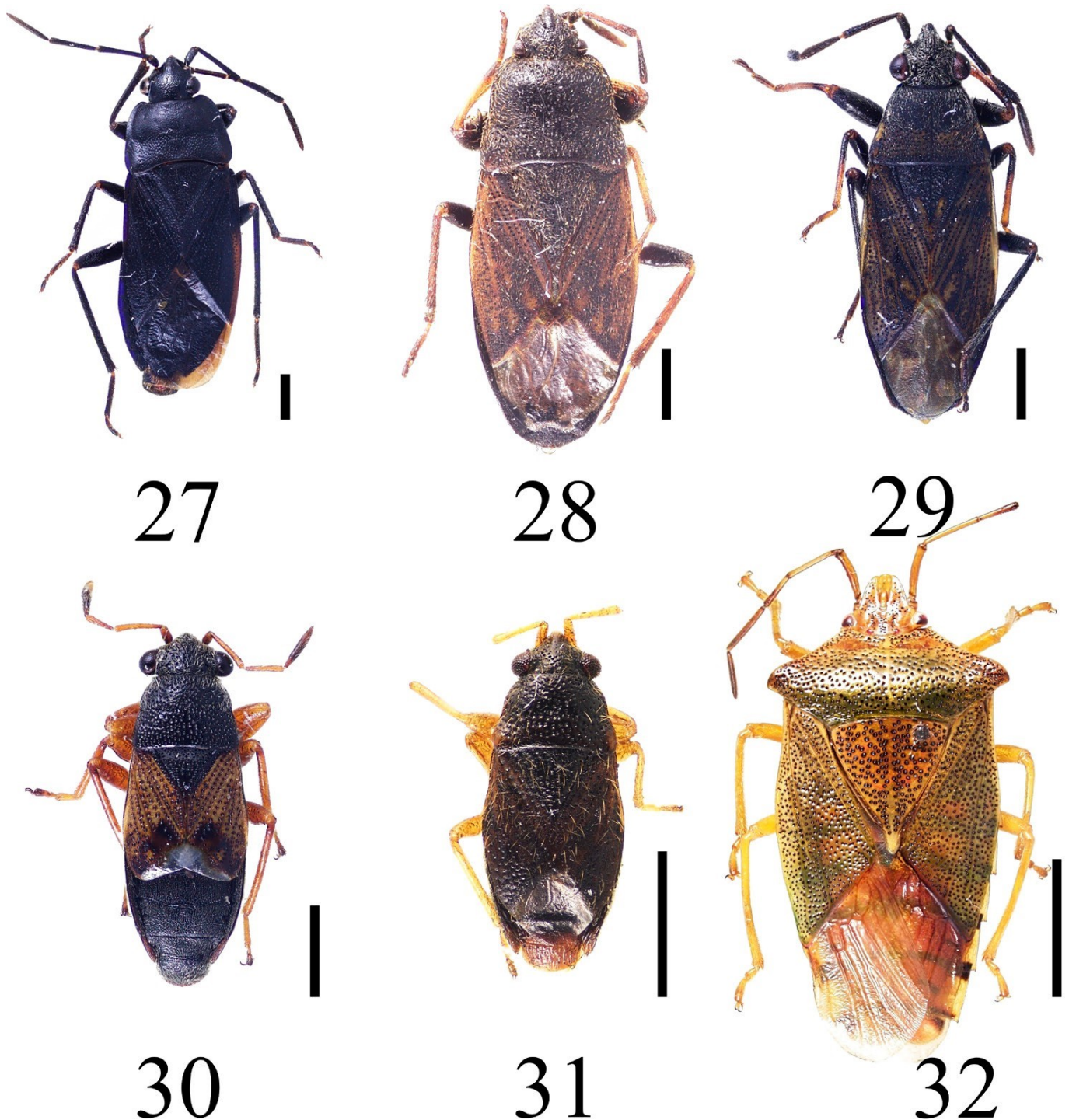
Fig. 32

*Material examined.* 1 ♀, Kuzbasskiy botanical garden, 130 m alt., 23.05.2021, A.V. Korshunov leg.

*Distribution.* Eastern Palaeartic species (Vinokurov *et al.* 2010). West Siberia: Omsk, Novosibirsk, Tomsk Regions, Altai Territory, Altai Republic (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

*Bionomics.* The species inhabits forested areas and steppes, prefers wetlands of sparse mixed and deciduous forests, can be also found at the edges of swamps, river valleys, lake banks, as well as in urbanized areas (gardens and parks); has one generation per year, hibernates as adults (Petrova 1975).

*Trophic associations.* Polyphitophagous; feeds on woody plants from Rosaceae, Grossulariaceae, Betulaceae, and Salicaceae (Petrova 1975).



**Figure 5. Figures 27–32.** Novel species of Heteroptera for Kemerovo Region. **27** – *Aphanus rolandri*. **28** – *Megalonotus chiragra*. **29** – *Peritrechus geniculatus*. **30** – *Acompus rufipes*. **31** – *Stygnocoris sabulosus*. **32** – *Acanthosoma denticaudum* (**27–32** – dorsal view). The scale for adults (black vertical line) is 1 mm (except Fig. **32**, where the scale is 4 mm); for genitalia (blue line) is 0.2 mm.

#### **Family Pentatomidae Leach, 1815**

#### ***Pentatoma (Pentatoma) rufipes* (Linnaeus, 1758)**

*Material examined.* 1 ♀, 2.5 km SE Mozzhykha vill., 10.08.2021, 120 m alt., A.V. Korshunov leg.

*Distribution.* Transpalearctic species (Kuzhuget 2017). West Siberia: Tyumen, Omsk, Tomsk

Regions, Altai Territory, Altai Republic (Vinokurov *et al.* 2010); first record for Kemerovo Region (present paper).

**Bionomics.** This species is commonly found in coniferous and deciduous forests and meadows including along flooded plains; has one generation per year, hibernates as adults (Putshkov 1961; Petrova 1975; Esenbekova 2013; Kuzhuget 2017).

**Trophic associations.** Zoophytophagous; feeds on *Quercus*, *Fagus* (Fagaceae), *Tilia* (Malvaceae), *Betula*, *Alnus*, *Corylus* (Betulaceae), *Acer* (Sapindaceae), *Cornus* (Cornaceae), sucks vegetative and generative parts of tree and shrubs (Putshkov 1961; Petrova 1975; Esenbekova 2013; Kuzhuget 2017). This species was also documented as sucking eggs, larvae and pupae of various insects (Putshkov 1961; Petrova 1975).

## Discussion

The study performed within one field season allowed us to detect 20 new true bug species for Kemerovo Region, increasing the list of Heteroptera of this region from 187 to 207 species., i.e. on 10,7%. In contract, in neighboring regions the number of documented heteropteran species is much higher. For instance, 351 and 382 species of Heteroptera are known from Altai Territory and the Altai Republic, respectively (Vinokurov *et al.* 2010; Vinokurov, Golub 2016; Vinokurov, Rudoi 2020, 2022a, 2022b; Golub *et al.* 2021), 388 true bug species are recorded from the Republic of Tuva (Kuzhuget 2017).

Notably, the majority of true bugs, i.e. 70% of all species in the study, we collected in two botanical gardens (Kuzbasskiy and Orbita) in Kemerovo Region, highlighting the importance of such plantings for performing faunal research. Indeed, the botanical gardens and arboreta gathering together many plant species originating from different countries/ floristic regions of the world can be served as sentinel plantings allowing detecting native insect species shifting on novel host plants or alien species arrived to the region, which host plants are present in such planting (Kirichenko, Kenis 2016; Eschen *et al.* 2019). One of the two alien true bug species, *Hoplomachus thunbergii* (Miridae) was detected in the botanical garden. Another alien species, *Arocatus rufipes* (Lygaeidae), was found in urbanized area. These two species represented novel records for the Asian part of Russia (*H. thunbergii*) and Siberia (*A. rufipes*). They did not provide any noticeable damage to their host plants, i.e. various species of herbs (in case of *H. thunbergii*), and *Ulmus* spp. (Ulmaceae) (in case of *A. rufipes*) in Kemerovo Region in 2021. In natural habitats, these species have not been recorded as pests (Kerzhner, Yachevsky 1964; Wagner, Weber 1964; Schuh 1995; Vinokurov 1988; Malenovský *et al.* 2011; Gao *et al.* 2013; Sofronova, Sofronov 2021).

Among other true bug species recorded in Kemerovo Regions for the first time, following three species, found in a botanical garden, represent interesting geographical records: *Phytocoris nowickyi* was known before only from Altai Territory (Vinokurov, Golub 2009), *Derephysia longispina* from Novosibirsk Region (Petrova 1974, 1978) and *Stygnocoris sabulosus* from Altai Republic (Vinokurov 2007). Their detection in Kemerovo Region indicates that these species may have a wider distribution in Siberia than previously thought.

Despite novel records, the fauna of true bugs in Kemerovo Region remains still little studied. In 2021, we performed field research only in few localities of the region and in the city of Kemerovo, whereas other biotopes (in particular the mountainous part of the region) were not explored. We expect that some species present in neighboring regions (Tomsk, Novosibirsk Regions, Krasnoyarsk, Altai Territories, the Republics Altai and Khakassia) can be found in Kemerovo Region. Thus, the faunal list of true bugs of the region can be increased, if not twice, at least on 30%.

## Conclusions



Our research underlines the importance of faunistic observations and field collections in Siberian regions for better understanding faunal communities, detecting alien species and clarifying their modern ranges. As shown in our paper, surveying botanical gardens may play an important role in such research, and even opportunistic sampling during one season may provide valuable data on the mentioned above aspects. Further studies would be needed to better explore the compositions of true bugs in Kemerovo Region as well as in other poorly studied regions of Siberia for improving our knowledge on this ecologically and economically important insect group. Furthermore, the development of DNA barcoding reference library would be of a high importance to genetically characterize true bug species of Siberia and accumulate data for fast and reliable species identification, defining the origin and clarifying the routes of species distribution.

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