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Contributions to the knowledge of the entomofauna of the Sikhote-Alin Biosphere Reserve. I. Neuropteroid insects: alderflies (Megaloptera: Sialidae), snake-flies (Raphidioptera) and lacewings (Neuroptera)

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Abstract: A survey of Neuropterida in the Sikhote-Alin Biosphere Reserve, conducted in 2018 (supplemented with other specimens collected mainly in 2015-2017), yielded 41 species of alderflies (2), snake-flies (3) and lacewings (36). *Conwentzia pineticola* End., *Wesmaelius quadrifasciatus* (Reuter) and *Chrysopa gibeauxi* (Leraut) are new for Primorskiy Krai. The treatment of *Hemerobius fenestratus* Tjeder as a junior synonym of *H. striatus* Nakahara is confirmed. *Forcipomyia eques* Joh. (Diptera: Ceratopogonidae) is a new species for the Russian entomofauna. *Nineta carinthiaca* (Höl.), *Chrysotropia ciliata* (Wesm.) and *Chrysopa intima* McLach. are new host species for this ectoparasite.

Key words: Neuropterida, *Forcipomyia eques*, Russian Far East, Primorskiy Krai, faunistics, biology, ectoparasite.

INTRODUCTION

Knowledge of the fauna of all three neuropterid orders (Megaloptera, Raphidioptera, Neuroptera) from the Russian Far East is patchy. The state of knowledge of insects from this region, including Neuropterida, was summarized at the beginning of the twenty-first century (Storozhenko *et al*. 2002). The most intensive research was conducted in the south of this region, especially in Primorskiy Krai, Sakhalin and the southern Kuril Islands, which started with the pioneer works of Navás (1912) and Kuwayama (1924, 1936), respectively. The worst studied areas are the northern parts of Khabarovskiy Krai and Amurskaya Oblast. To date, 60 species of Neuroptera belonging to nine families are known from Primorskiy Krai (Pleshanov 1974, Makarkin 1984, 1985a-f, 1986, 1990, 1991, 1995b, 1996, 2009b,

Makarkin & Kholin 2009, Krivokhatsky 2011). The order Raphidioptera is represented in this region by four species from two families (Aspöck & Aspöck 1973, Aspöck *et al.* 1985, 1991, 1998, Makarkin 1995a, 2009a), and Megaloptera by six species from two families (Vshivkova 1979, 1980, 1995, 2009). Here, the results of a survey of Neuropterida in the Sikhote-Alin Biosphere Reserve are presented.

The Sikhote-Alin State Nature Biosphere Reserve, named after K.G. Abramov, was founded in 1935 and is located on the eastern and western slopes of central Sikhote-Alin, within three administrative districts of Primorskiy Krai: Terneyskiy, Dalnegorskiy and Krasnoarmeyskiy. The reserve extends from the coast of the Sea of Japan more than 90 kilometers inland, and includes the eastern and western offshoots of Sikhote-Alin. The area of the reserve is about 4 thousand square kilometers, including the isolated natural boundary of Abrek. The geographical coordinates of the main territory are 44º49'13" – 45º41'25" N, 135º48'46" – 136º34'23"E, and those of the natural boundary of Abrek are 45º02'53" – 45º09'38" N, 136º40'14" – 136º34'51"E.

A peculiarity of the Sikhote-Alin relief is the gentle inclination of the western macroslope and the steepness of the eastern one. Mean altitudes are 500–800 m a.s.l., the highest point is the Glukhomanka Mountain (1598 m a.s.l.). The slopes of the river valleys are often steep, and stone placers ("kurumniki" in Russian) are common. Mountain slopes of various steepness occupy up to 80% of the reserve area, while the remaining 20% consists of the valley bottoms. Approximately 2/3 of the reserve's territory is situated in the basins of the rivers of the eastern macroslope – the Serebryanka, Dzhigitovka and Taiga (the Sea of Japan basin). On the western macroslope, the reserve covers only the upper half of the basin of the Kolumbe River (the Ussuri River basin). The climatic parameters of the western and eastern macroslopes within the Sikhote-Alin Reserve also differ. The average temperatures in June and January vary greatly owing to the mountainous relief and the proximity of the sea. Snow cover along the middle reaches of the rivers reaches 30-50 cm and lasts from three to four months (Utenkova & Labetskaya 2006).

Forest is the dominant type of vegetation, covering about 97% of the area. Seven altitudinal vegetation zones can be distinguished: coastal vegetation, coastal oak forests, *Pinus koraiensis*-broadleaved tree forests, fir-spruce forests, *Betula ermani* forests, the *Pinus pumila* zone, and mountain tundra. The main dominants of the forest ecosystems are *Pinus koraiensis*, *Picea jezoensis* and *Quercus mongolicus*, which respectively occupy 35.0%, 24.3% and 13.1% of the total forest cover, and represent more than 70% of the reserve's forest vegetation. Other forest types (larch forests, birch forests, as well as extrazonal forests in river valleys, represented by willow, alder, *Chosenia* and poplar) make up ca 25% of the total forest cover. Non-forest vegetation types (valley and mountain meadows, swamps, plant communities of stony places, rocky cliffs and coastlines) occupy just a small area – ca 2% (Pimenova 2016). The reserve's indigenous flora may become modified under the influence of forest fires, typhoons and human activities. As a result, there are significant areas occupied by fire-sites of different ages, areas with windfalls and a number of ruderal plant species, not characteristic of the reserve's flora (Gromyko 2010).

The study of the reserve's insect fauna started almost from the day when the reserve was founded and continues to this day. The first information about the reserve's entomofauna is contained in the works of the famous Soviet entomologists A.I. Kurentsov and K.Ya. Grunin, which focused on the fauna of bark beetles, Lepidoptera, and some dipteran species (Kurentsov 1935, 1941, Grunin 1938, 1948). Later the range of investigations was expanded and covered many insect groups. The species composition of some hydrobiont

insect families (Potikha 1991, 2014, Potikha & Zhiltsova 2005), some beetles (Sundukov 2003, Sergeev 2017, 2018), Diptera (Savchenko 1976, Mutin 1987) and bugs (Vinokurov *et al*. 2017) is well known. Currently, the reserve's entomofauna is known to contain more than 3,500 species, but this number is estimated to be no more than 50% of the reserve's entire entomofauna.

The reserve's Neuropterida are very poorly known. Among the Neuroptera, four species of Chrysopidae were recorded from the environs of Terney: *Chrysopa intima* McLachlan, *Chrysoperla nipponensis* (Okamoto), *Pseudomallada prasinus* (Burmeister) and *Nineta carinthiaca* (Hölzel) (Dorokhova 1981, Makarkin 1985c, d). The megalopteran *Sialis levanidovae* Vshivkova was recorded from the 'Poima' River (Vshivkova 1980) and the raphidiopteran *Xanthostigma xanthostigma* (Schummel) was mentioned from the Terney area (Aspöck *et al.* 1991: map 94).

MATERIAL AND METHODS

The material for this work was collected by the authors at 26 localities in the reserve and its buffer zone from 2015 to 2018 (Fig. 1). The majority of the collection of Neuropterida is a result of the first expedition to the Far East, organized by the Upper Silesian Museum, Bytom, and the Silesian Entomological Society in cooperation with the management of the Sikhote-Alin State Nature Biosphere Reserve in the summer of 2018. The remaining neuropterids were collected incidentally, mainly during coleopterological surveys carried out by one of the paper's co-authors. The neuropterid collections as a whole (along with the specimens collected by the Reserve staff) contain 986 specimens from 41 species. Standard methods were used to collect the neuropterid insects: netting (sweep net, heavy duty sweep net), and beating (entomological umbrella), some specimens were attracted to light. The materials are housed in the Upper Silesian Museum, Bytom, Poland (USMB) and the Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far Eastern Branch of the Russian Academy of Sciences, Vladivostok. The species were identified by Roland Dobosz and Vladimir Makarkin by direct examination of specimens. Habitus photographs of selected interesting species were taken by Adam Larysz (Department of Natural History, Upper Silesian Museum) using a Nikon D700 camera together with macrophotography equipment (AF-S Micro Nikkor lens 60 mm). When necessary, the apex of the abdomen was macerated in a cold, saturated KOH solution for 2–10 h. After rinsing the KOH with acetic acid and water, the apex of the abdomen was transferred to glycerin for further dissection and examination. The genital structures of dustywings (Coniopterygidae) were imaged using a Nikon Eclipse E-600 biological microscope with a Nikon DS-Fi2 digital camera and NIS Elements 4.10 software. After examination, the genitalia were placed in fresh glycerin and stored in a microvial pinned below the specimen or, as in the case of Coniopterygidae, placed in sealed tubes in the ethanol ("wet") collection of the Upper Silesian Museum, Bytom.

Localities (Fig. 1):

Dalnegorskiy district:

[loc. 1] – Upper reaches of the Dzhigitovka River, Kabaniy Stream [45º06'36"N 135º51'59"E]

Krasnoarmeyskiy district:

[loc. 2] – Kaplanovskiye Solontsy [45°32'10.6548"N 136°13'27.912"E], upper reaches of the Kolumbe River,

[loc. 3] – Cordon Jupiter [45º31'57"N 135º54'36"E], near a stream in the upper reaches of the Kolumbe River,

[loc. 4] – Floodplain of the Serokamenka River [45º32’27”N 135º59’05”E], upper reaches of the Kolumbe River,

[loc. 5] – Venera Stream [45º25’43”N 135º45’47”E], the basin of the Kolumbe River.

Terneyskiy district:

[loc. 6] – Terney, the office of the Sikhote Alin Reserve [45°02’56.511”N, 136°37’13.044”E],

[loc. 7] – Environs of Terney, floodplain of the Serebryanka River [45°03’12.06”N 136°37’16.3272”E], 5 m a.s.l.,

[loc. 8] – Environs of Terney, oak forests on slopes [45°01’54.9006”N 136°38’3.7824”E],

[loc. 9] – 25 km NNW of Terney [45°12’0.48”N 136°31’43.98”E],

[loc. 10] – Cordon «Upolnomochynnyi», natural boundary of Abrek [45°11’6.88”N 136°47’1.12”E],

[loc. 11] – Cordon «Nizhnyaya Beya», natural boundary of Abrek [45º05’46”N 136º41’09”E],

[loc. 12] – Middle reaches of the Zabolochennaya River [45°19’6.19”N 136°28’38.08”E],

[loc. 13] – Solontsovyi Stream [45º18’46”N 136º28’42”E], middle reaches of the Zabolochennaya River,

[loc. 14] – Cordon «Yasnaya» [45º14’09”N 136º30’42”E], 149 m a.s.l.,

[loc. 15] – Middle reaches of the Lianovaya River [44°55’57.53”N 136°05’50.47”E], the basin of the Dzhigitovka River,

[loc. 16] – Lake Golubichnoe [44º54’30”N 136º31’36”E],

[loc. 17] – Lake Blagodatnoe [44°56’56.93”N 136°31’56.39”E],

[loc. 18] – Natural boundary [урочище] of Blagodatnoe [44º57’12”N 136º32’48”E],

[loc. 19] – Natural boundary of Blagodatnoe, Sukhoy Stream [44º58’57”N 136º31’09”E],

[loc. 20] – Cordon «Blagodatnoe» [44.952560N 136.546941E 44º57’49”N 136º32’07”E], 80 m a.s.l.,

[loc. 21] – Cordon «Khanov» [44º53’49”N 136º20’14”E], 95 m a.s.l.,

[loc. 22] – Khanov Stream, cordon [44º53’25”N 136º20’18”E], the basin of the Kunaleika River,

[loc. 23] – Cape Severnyi [44°57’17.84”N 136°33’55.92”E], 40 m a.s.l.,

[loc. 24] – Cordon «Ust’-Serebryanyi» [45º8’25”N 136º22’43”E], right bank of the Serebryanka River, floodplain of the Zimoveyny Stream,

[loc. 25] – Zimoveinyi Stream [45º08’29”N 136º18’33”E], middle reaches of the Serebryanka River,

[loc. 26] – Natural boundary of Kunaleika [44° 54’ 22.4748”N 136° 21’ 4.3302”E].

Abbreviations:

ADS – A.D. Syknev

EP – Elena V. Potikha

MS – Maxim E. Sergeyev

PA – P. Averkova

RD – Roland Dobosz

RK – Roman Królik

VM – Valery A. Mutin

(USMB 019/E6) – systematic labeling of individual samples in the ethanol collection of the Upper Silesian Museum, Bytom

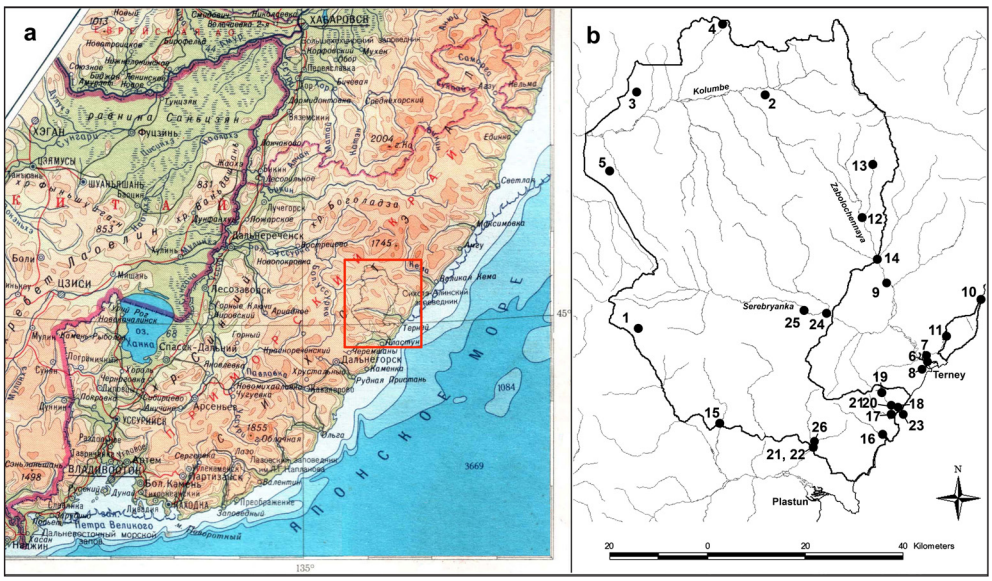

Fig. 1. Maps of Primorskiy Krai (a) and the Sikhote-Alin Biosphere Reserve (b). The numbers of the localities (1–25) are explained in the text.

RESULTS

List of species

Megaloptera

Sialidae

Sialis longidens Klingstedt, 1932

Material examined: 1♂ 6♀♀
Terneyskiy district: 2♀♀ – 14–23 VI 2015, loc. 8, leg. MS,
Krasnoarmeyskiy district: 3♀♀ – 17–18 VI 2016, loc. 2, leg. MS, 1♂1♀ – 10 VI 2017, loc. 4, leg. MS.

Distribution. Asian species, widely distributed in Siberia and the Russian Far East (Khabarovskiy Krai, Amurskaya Oblast, Primorskiy Krai, Sakhalin, Kuril Islands: Kunashir, Shikotan). Also known from north-eastern China (Heilongjiang), northern Mongolia (Bogdo Ula Mountains), Japan (Hokkaido), South and North Korea (Vshivkova & Ito 1993, Vshivkova 2009, Jung & Bae 2012, Liu & Dobosz 2019, Yang *et al.* 2018).

Sialis sibirica McLachlan, 1872

Material examined: 2♂♂
Krasnoarmeyskiy district: 2♂♂ – 8 VI 2016, loc. 2, leg. MS.

Distribution. Trans-Palearctic species, known from northern Europe to the Russian Far East (Primorskiy Krai, Khabarovskiy Krai, Amurskaya Oblast, Shantar Islands, Kamchatka), China (Heilongjiang, Jilin, Inner Mongolia, Quinghai), North and South Korea, Japan (Vshivkova 1980, 2009, Kwon & Moon 1994, Paek *et al*. 2010, Jung & Bae 2012, Yang *et al*. 2018).

Raphidioptera
Raphidiidae

Mongoloraphidia pudica H. Aspöck, U. Aspöck & Rausch, 1985

Material examined: 1♂
Terneyskiy district: 1♂ – 12 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RK.

Distribution. Russian Far East (south of Khabarovskiy Krai, Primorskiy Krai) and South Korea (Aspöck *et al*. 1991, 1998, Makarkin 2009a).

Inocelliidae

Amurinocellia calida H. Aspöck & U. Aspöck, 1973

Material examined: 2♂♂ 2♀♀
Terneyskiy district: 1♀ – 10 VII 2015, loc. 18, leg. MS, 1♂,1♀ – 6–9 VII 2017, loc. 10, 1♂ – 15 VII 2018, loc. 7, 5 m a.s.l., netting, leg. RK.

Distribution. Russian Far East (Primorskiy Krai, Khabarovskiy Krai), North and South Korea, China (Jilin) (Aspöck *et al.* 1991, Makarkin 1995a, Liu *et al.* 2009, Yang *et al.* 2018).

Remarks. The genus *Amurinocellia* H. & U. Aspöck, 1973 includes three east Asian species and is distributed in eastern China, the Korean Peninsula and the Russian Far East. The genus is represented in Russia by just this one species, which is known in Khabarovskiy Krai from Khabarovsk and in Primorskiy Krai from the four localities in southern Primorye marked on the map (Aspöck *et al.* 1991) and the Ussuri Nature Reserve (Liu *et al.* 2009).

Inocellia crassicornis (Schummel, 1832)

Material examined: 2♂♂ 1♀ 2 larvae
Terneyskiy district: 2♂♂ – 6 VII 2017, loc. 10, leg. MS, 1♀ – 1 VII 2018, loc. 24, leg. MS, 2 larvae – 17 VII 2018, loc. 21, 95 m a.s.l., leg. RD.

Distribution. Trans-Palearctic species known from European Russia right across to the Far East of the country (Primorskiy Krai, Khabarovskiy Krai, Sakhalin), North and South Korea, China (Heilongjiang, Jilin) (Aspöck *et al*. 1991, Makarkin 1995a, Liu *et al*. 2009, Yang *et al.* 2018).

Neuroptera
Coniopterygidae

Semidalis aleyrodiformis (Stephens, 1836)

Material examined: 9♂♂ 96♀♀
Terneyskiy district: 1♂6♀♀ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, *Tilia* sp., leg. RD (USMB 019/E7), 1♂ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, *Tilia* sp., *Quercus mongolicus*, *Corylus* sp., leg. RD (USMB 019/F9), 2♀♀ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, *Larix* sp., leg. RD (USMB 019/E10), 2♂♂1♀ – 9 VII 2018, loc. 14, 149 m a.s.l., netting, trees (deciduous and coniferous), leg. RD (USMB 019/C6), 1♂19♀♀ – 10–13 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD (USMB 019/F5, USMB 019/D5, USMB 019/F2, USMB 019/D3, USMB 019/E2, USMB 019/E4), 6♀♀ – 13 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous trees, leg. RD (USMB 019/G3), 3♂♂21♀♀ – 15 VII 2018, loc. 18, netting, deciduous trees *Quercus mongolicus*, 50 m a.s.l., leg. RD (USMB 019/G6), 5♀♀ – 16 VII 2018, loc. 21, 95 m a.s.l., netting, deciduous and coniferous trees, leg. RD (USMB 019/E6), 1♂35♀♀ – 18 VII 2018, loc. 21, 95 m a.s.l., netting, *Acer* sp., leg. RD (USMB 019/D9), 1♀ – 19 VII 2018, loc. 21, 95 m a.s.l., netting, *Larix* sp., leg. RD (USMB 019/D8).

Distribution. Widely distributed in Europe, North Africa and Asia, known from the Russian Far East from Amurskaya Oblast and Primorskiy Krai (Makarkin 1995b, Sziráki 2011, Yang *et al.* 2018).

Coniopteryx (*Coniopteryx*) *aspoecki* Kis, 1967

Material examined: 1♂
Terneyskiy district: 1♂ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, *Tilia* sp., *Quercus* sp., *Corylus* sp., leg. RD (USMB 019/F10).

Distribution. Central Europe, Yakutia, Russian Far East (Amurskaya Oblast, Primorskiy Krai), Mongolia, China (Makarkin 1995b, Sziráki 2011, Yang *et al.* 2018).

Remarks. Sziráki (2011) distinguished 25 species in the *Coniopteryx exigua* species group, three of which occur in the Russian Far East. During this research, the presence of two of them, i.e., *C. aspoecki* and *C. helvola*, was confirmed in Sikhote-Alin (Sziráki 2011). The third species from this group, *Coniopteryx alinica* Sziráki, 1992, originally included in the *Coniopteryx tineiformis* species group, is known only from the holotype (Sziráki 2004, 2011), which was collected on the Litovka [=Krinichnaya, Khualaza] Mountain, 10 km south of Anisimovka, a village lying over 350 km to the south-west of the Sikhote-Alin Reserve (Sziráki 1992, Makarkin 2000).

Coniopteryx (*C.*) *helvola* Zakharenko, 1987

Material examined: 4♂♂ 8♀♀
Terneyskiy district: 1♂ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, *Tilia* sp., *Quercus* sp., *Corylus* sp., leg. RD (USMB 019/G1), 1♂1♀ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, *Tilia* sp., leg. RD (USMB 019/E8), 1♂ – 9 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous and coniferous trees, leg. RD (USMB 019/C7), 1♂7♀♀ – 10–11 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD (USMB 019/F6, USMB 019/D7).

Distribution. Only the Russian Far East (Primorskiy Krai) (Makarkin 1995b, Sziráki 2011).

Remarks. The species was hitherto known only from the type specimen, collected in Yakovlevka, lying about 250 km to the west of Terney (Zakharenko 1987a). Meinander (1990) mentioned that this species is "apparently very close to *Coniopteryx* (*C.*) *pygmaea"* (= *Coniopteryx hoelzeli* H. Aspöck, 1964), but *C. helvola* is currently considered to be valid. The genitalia of all the males of this species from the Sikhote-Alin Reserve differ markedly from those of *C. hoelzeli* (cf. Figs. 2a, b and 2c, d), which however slightly differ from genitalia of European specimens. Most specimens were collected on various species of deciduous trees, including *Tilia* sp., *Quercus mongolicus* and *Corylus* sp.

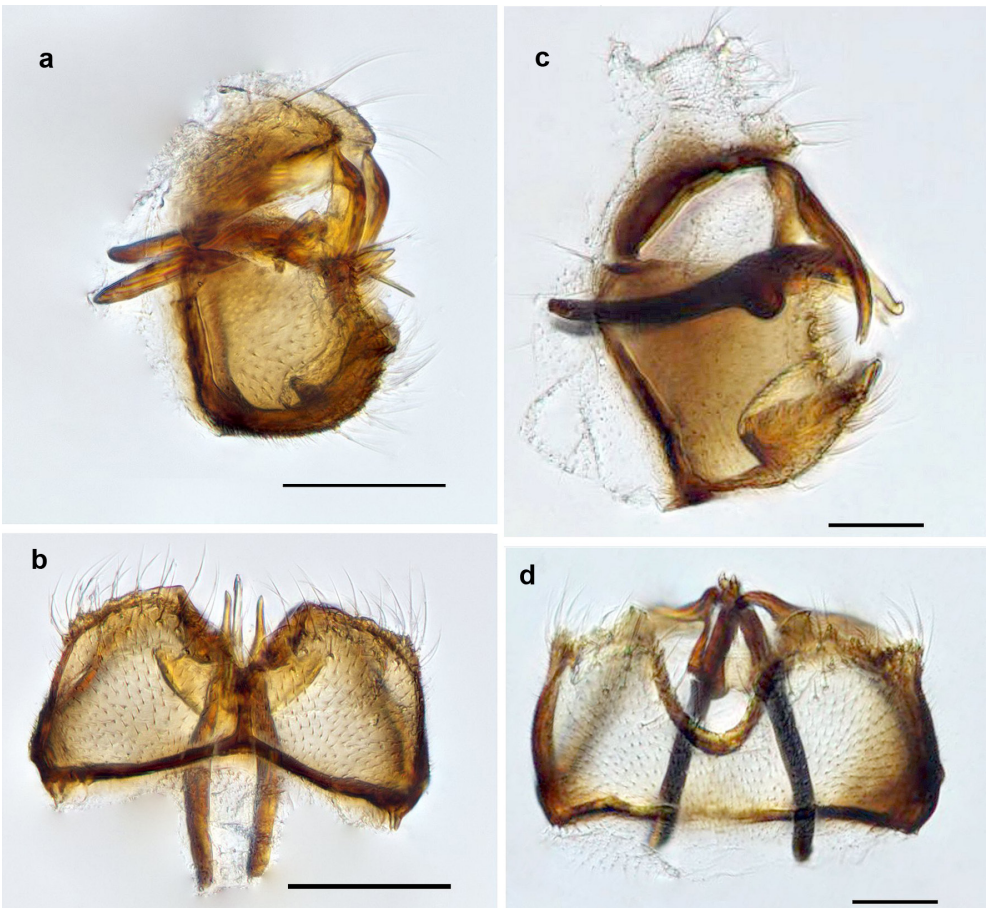

Fig. 2. Male genitalia of *Coniopteryx* (*C.*) *helvola* (a, b) and *Coniopteryx* (*C.*) *hoelzeli* (c, d): a, c – lateral view; b, d – ventral view. Scale bar = 0.1 mm.

Coniopteryx* (*C.*) *hoelzeli H. Aspöck, 1964

Material examined: 7♂♂ 34♀♀
Terneyskiy district: 1♂7♀♀ – 9 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous and coniferous trees, leg. RD (USMB 019/C8), 5♂27♀ – 11–13 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD (USMB 019/D6, USMB 019/E1, USMB 019/E5), 1♂ – 15 VII 2018, loc. 18, netting, deciduous trees *Quercus mongolicus*, 50 m a.s.l., leg. RD (USMB 019/G7).

Distribution. Europe, Siberia, Russian Far East (Amurskaya Oblast, Primorskiy Krai, southern Kuril Islands: Kunashir, Shikotan) (Meinander 1981, Makarkin 1995b, Sziráki 2011).

Remarks. Makarkin (1990, 1992, 1995b) followed Meinander (1972) in the interpretation of species of Coniopterygidae. However, Günther (1993) found that *Coniopteryx pygmaea* sensu Meinander (1972) is actually *Coniopteryx hoelzeli*, and true *C. pygmaea* is *Coniopteryx parthenia* Navás & Marcet, 1910 sensu Meinander (1972). So the distributions of these species are incorrect in these publications of V. Makarkin. *Coniopteryx hoelzeli* (= *C. pygmaea* sensu Makarkin 1990, 1992, 1995b) is recorded from Amurskaya Oblast, Primorskiy Krai and the southern Kuril Islands, whereas *C. pygmaea* (= *C. parthenia* sensu Makarkin 1990, 1995b) is known only from Kharavosliy Krai.

Coniopteryx sp.

Material examined: 28♀♀
Terneyskiy district: 7♀♀ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, *Tilia* sp., *Quercus mongolicus*, *Corylus* sp., leg. RD (USMB 019/G2), 9♀♀ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, *Tilia* sp., leg. RD (USMB 019/E9), 4♀♀ – 9–12 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD (USMB 019/F8, USMB 019/F3, USMB 019/D4), 6♀♀ – 13 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous trees, leg. RD (USMB 019/G4), 1♀ – 19 VII 2018, loc. 23, 40 m a.s.l., netting, *Larix* sp., leg. RD (USMB 019/D2), 1♀ – 20 VII 2018, loc. 7, 5 m a.s.l., netting, *Alnus* sp., leg. RD (USMB 019/C10).

Conwentzia pineticola Enderlein, 1905

Material examined: 8♂♂ 54♀♀
Terneyskiy district: 1♂1♀ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, *Larix* sp., leg. RD (USMB 019/F1), 1♀ – 10 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD (USMB 019/F7), 4♂10♀♀ – 16–19 VII 2018, loc. 21, 95 m a.s.l., netting, *Larix* sp. leg. RD (USMB 019/E3, USMB 019/D10), 2♀♀ – 16 VII 2018, loc. 21, 95 m a.s.l., netting, *Larix* sp., *Quercus mongolicus*, leg. RD (USMB 019/G5), 3♂♂39♀♀ – 19 VII 2018, loc. 23, 40 m a.s.l., netting, *Larix* sp., leg. RD (USMB 019/D1, USMB 019/F4), 1♀ – 20 VII 2018, loc. 7, 5 m a.s.l., netting, *Alnus* sp., leg. RD (USMB 019/C9).

Distribution. Holarctic species, known from Europe, North Africa, Asia Minor, Georgia, Siberia, the Russian Far East (northern Khabarovskiy Krai, Yakutia), Canada, USA (Makarkin 1995b, Sziráki 2011).

Remarks. New for Primorskiy Krai.

Osmylidae

Osmylus (*Osmylus*) *decoratus* Nakahara, 1914

Material examined: 1♂
Terneyskiy district: 1♂ – 17 VII 2018, loc. 21, 95 m a.s.l., at light, leg. RD.

Distribution. Russian Far East (south of Khabarovskiy Krai, Primorskiy Krai, Kuril Islands: Kunashir), Japan (Hokkaido, Honshu, Kyushiu) (Nakahara 1914, Makarkin 2009b, Sekimoto & Yoshizawa 2011).

Dilaridae

Dilar septentrionalis Navás, 1912

Material examined: 1♂
Terneyskiy district: 1♂ – 2 VIII 2018, loc. 18, leg. MS.

Distribution. Russian Far East (Primorskiy Krai), China (Jilin, Liaoning), South Korea (Kwon & Moon 1994, Paek *et al.* 2010, Zhang *et al*. 2014).

Remarks. This is the northernmost locality of the species and the family in Asia.

Hemerobiidae

Neuronema laminatum Tjeder, 1936

Material examined: 2♂♂
Terneyskiy district: 2♂♂ – 8–10 VII 2018, loc. 14, 149 m a.s.l., at light and yellow traps, leg. RD.

Distribution. Eastern Siberia (Zabaikalskiy Krai), Russian Far East (Amurskaya Oblast, Khabarovskiy Krai, Primorskiy Krai, Sakhalin), China (widespread), South Korea (Makarkin 1993, 2009b, Yang *et al.* 2018).

Drepanepteryx algida (Erichson, 1851)

Material examined: 1♂
Terneyskiy district: 1♂ – 15 IV 1987, loc. 19, leg. EP (in alcohol).

Distribution. Central and north-eastern Europe, Kazakhstan, Mongolia, Siberia (Taymyrskiy Autonomous Okrug, Tomskaya Oblast, Kemerovskaya Oblast, Krasnoyarskiy Krai, Altai, Tuva, Irkutskaya Oblast, Zabaikalskiy Krai, Buryatia, Yakutia), Russian Far East (Khabarovskiy Krai, Amurskaya Oblast, Primorskiy Krai, Sakhalin) (Makarkin 1986, 1995b, Aspöck *et al.* 2001).

Remarks. This is the only known specimen of this species from Primorskiy Krai. Previously, this information was briefly reported by Makarkin (1991, 1993) but without detailed label data.

Drepanepteryx phalaenoides (Linnaeus, 1758)

Material examined: 1♂
Dalnegorskiy district: 1♂ – 3 VII 2017, loc. 1, leg. MS.

Distribution. Trans-Palearctic species, known from the Canary Islands, Europe, Siberia, Mongolia, Russian Far East (Sakhalin, Kamchatka, Khabarovskiy Krai, Amurskaya Oblast, Primorskiy Krai, southern Kuril Islands), China (Heilongjiang, Jilin, Beijing, Shanxi), South Korea, Japan (Hokkaido, Honshu, Kyushu) (Makarkin 1995b, Aspöck *et al.* 2001, Kim & Cho 2016, Yang *et al*. 2018)

Hemerobius marginatus Stephens, 1836

Material examined: 58♂♂ 70♀♀

Terneyskiy district: 5♂♂7♀♀ – 10–11 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD, 2♂♂1♀ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous trees, leg. RD, 14♂♂8♀♀ – 9 VII 2018, loc. 14, 149 m a.s.l., netting, trees, leg. RD, 19♂♂23♀♀ – 15–18 VII 2018, loc. 21, netting, 95 m a.s.l., leg. RD, 17♂♂29♀♀ – 18 VII 2018, loc. 21, *Acer* sp., 95 m a.s.l., leg. RD, 1♂ – 19 VII 2018, loc. 23, 40 m a.s.l., netting, deciduous trees, leg. RD, 2♀♀ – 30 VII 2018, loc. 7, leg. MS.

Distribution. Trans-Palearctic species: Europe to the Urals, Georgia, Azerbaijan, China (Inner Mongolia, Hebei, Shanxi, Henan), Japan (Honshu, Hokkaido), and the Asian part of Russia (Yamalo-Nenetskiy Autonomous Okrug, Novosibirskaya Oblast, Krasnoyarskiy Krai, Chitinskaya Oblast, Buryatia, Yakutia, Magadanskaya Oblast, Kamchatka, Khabarovskiy Krai, Amurskaya Oblast, Primorskiy Krai, Sakhalin, southern Kuril Islands) (Makarkin 1985a, 1995b, Aspöck *et al.* 2001, Yang *et al*. 2018).

Hemerobius humulinus Linnaeus, 1758

Material examined: 29♂♂ 45♀♀

Terneyskiy district: 1♂2♀♀ – 18 VIII 2015, loc. 18, leg. MS, 1♀ – 3 VIII 2016, loc. 18, leg. MS, 1♂ – 11 V 2018, loc. 24, leg. MS, 1♂1♀ – 9 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous and coniferous trees, leg. RD, 2♀♀ – 10 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD, 2♀♀ – 11 VII 2018, loc. 14, 149 m a.s.l., netting, trees, leg. RD, 1♀ – 15 VII 2018, loc. 21, netting, 95 m a.s.l., leg. RD, 1♂1♀ – 15 VII 2018, loc. 18, *Larix* sp., 50 m a.s.l., leg. RD, 5♂♂5♀♀ – 15 VII 2018, loc. 18, deciduous trees, 50 m a.s.l., leg. RD, 1♂ – 16 VII 2018, loc. 21, netting, *Acer* sp., 95 m a.s.l., leg. RD, 3♂♂1♀ – 19 VII 2018, loc. 23, 40 m a.s.l., netting, *Larix* sp., leg. RD, 5♂♂7♀♀ – 19 VII 2018, loc. 23, 40 m a.s.l., netting, *Larix* sp. and deciduous trees, leg. RD, 1♂1♀ – 20 VII 2018, loc. 7, 5 m a.s.l., netting, leg. RD, 3♀♀ – 21 VII 2018, loc. 7, 5 m a.s.l., netting, meadow, leg. RD, 2♀♀ – 21 VII 2018, loc. 7, 5 m a.s.l., netting, *Salix* sp. and *Populus* sp., leg. RD, 10♂♂16♀♀ – 2 VIII 2018, loc. 18, leg. MS.

Distribution. Holartic species: Europe from Macaronesia (Azores) to the Urals, Asia: Georgia, Turkey, Armenia, north-western Iran, Kazakhstan, Turkmenistan, Tajikistan, Kyrgyzstan, Russia (from the Urals to the Pacific islands), China (Liaoning, Hebei, Shanxi, Shaanxi, Jiangsu, Jiangxi, Hubei, Sichuan, Xizang), Korean Peninsula, Japan (Hokkaido, Honshu, Shikoku, Kyushu), North America (Makarkin 1985a, 1995b, Kwon & Moon 1994, Aspöck *et al.* 2001, Paek *et al.* 2010, Yang *et al*. 2018).

Hemerobius simulans Walker, 1853

Material examined: 48♂♂ 63♀♀

Terneyskiy district: 1♀ – 4 VII 1982, 25 km NNW from Terney, leg. VM, 2♀♀ – 28 III 1988, loc. 15, leg. ADS (in alcohol), 1♂1♀ – 14 IV 2015, loc. 12, leg MS, 1♀ – 28-29 VI 2016, loc. 16, leg. MS, 1♂ – date unknown, loc. 24, leg. PA (in alcohol), 1♀ – 9 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous and coniferous trees, leg. RD (USMB 019/C4), 5♂♂3♀♀ – 10–11 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD, 3♂♂3♀♀ – 13 VII 2018, loc. 14, 149 m a.s.l., netting, pine and deciduous trees, leg. RD, 3♀♀ – 15 VII 2018, loc. 21, 95 m a.s.l., netting, leg. RD, 7♂♂7♀♀ – 15 VII 2018, loc. 18, deciduous trees, 50 m a.s.l., leg. RD, 3♂♂4♀♀ – 15 VII 2018, loc. 18, *Larix* sp., 50 m a.s.l., leg. RD, 5♂♂4♀♀ – 19 VII 2018, loc. 23, 40 m a.s.l., netting, *Larix* sp., leg. RD, 22♂♂25♀♀ – 19 VII 2018, loc. 23, 40 m a.s.l., netting, *Larix* sp. and deciduous trees, leg. RD, 1♀ – 20 VII 2018, loc. 7, 5 m a.s.l.,

netting, leg. RD, 1♀ – 21 VII 2018, loc. 7, 5 m a.s.l., netting, *Salix* sp. and *Populus* sp., leg. RD, 5♀♀ – 2 VIII 2018, loc. 18, leg. MS.
Krasnoarmeyskiy district: 1♀ – 13–17 IV 2016, loc. 5, leg. MS, 1♂ – 19–21 VII 2016, loc. 4, leg. MS.

Distribution. Holarctic species. North America: Canada, USA, Greenland, Europe from Spain to the Urals, Georgia, Turkey, Kazakhstan (Karatau ridge), Mongolia, Siberia (Krasnoyarskiy Krai, Novosibirskaya Oblast, Irkutskaya Oblast, Buryatia, Zabaikalskiy Krai, Yakutia), Russian Far East (Magadanskaya Oblast, Kamchatka, Amurskaya Oblast, Khabarovskiy Krai, Primorskiy Krai, Moneron Island, Sakhalin), Japan (Hokkaido) (Makarkin 1985a, 1995b, Aspöck *et al*. 2001).

Hemerobius striatus Nakahara, 1915

Material examined: 2♂♂ 1♀
Terneyskiy district: 2♂♂ – 15 VII 2018, loc. 18, *Larix* sp., 50 m a.s.l., leg. RD, 1♀ – 2 VIII 2018, loc. 18, leg. MS.

Distribution. Central and northern Europe, Russia (Leningradskaya Oblast, Tversakaya Oblast, Moskovskaya Oblast, Stavropolskiy Krai, Buryatia, Amurskaya Oblast, Primorskiy Krai, Kamchatka, Moneron I., Sakhalin, Kuril Islands: Kunashir), Mongolia, Japan (Honshu, Hokkaido) (Makarkin 1985a, 1995b, Zakharanko & Krivokhatsky 1993, Aspöck *et al.* 2001)

Remarks. *Hemerobius striatus* was described from a female collected on the shore of Lake Oze [now Ozenuma] in Kozuke Province [now Gunma Prefecture], Honshu, Japan (Nakahara 1915). It had been kept in the author's collection, but has since been lost. Two specimens of this species determined by W. Nakahara (a male and a female) are now deposited in the Nakahara collection in the National Museum of Nature and Science (Tokyo, Japan). These specimens were collected by F. Fujimoto in Aizenkei (Hokkaido) on 18-26 June 1959, and partially cited by Nakahara (1960). One of the authors (VM) examined these specimens and found them to be identical with *Hemerobius fenestratus* Tjeder, 1932, both eidonomically and by the male genitalia. These species were synonymized by Makarkin (1995b). Unfortunately, no photographs or drawings of wings of *H. striatus* have been published, and we have also no photographs of this species from Japan. The genitalia were figured by Nakahara (1960, fig. 99). The ectoproct and parameres are figured adequately, but the gonarcus not. Nakahara stated that the species is "genitalically closest to [*H.*] *contumax* but the processes of aedeagus are more close together at base" (p. 43). However, "the processes of aedeagus" of *H. striatus* are shown as more widely spaced at the base (Fig. 99) than those of *H. contumax* (Fig. 98), the gonarcus are actually shaped as shown in Makarkin (1985f, fig. 33). VM has seen several other specimens from Japan, mainly from Hokkaido, this species was also recorded from islands laying north of Hokkaido (e.g., Kunashir, Sakhalin, Moneron). These island specimens do not differ from those from Primorye (shown in Fig. 3a). Therefore, the synonymization of *H. fenestratus* and *H. striatus* appears to be undoubted.

Hemerobius striatus occurs in the Russian Far East mainly on *Picea* and *Abies*, rarely on deciduous trees (in particular, on *Quercus mongolicus*). Its host plant specificity in Japan is unknown. But judging that the species is distributed in Japan mainly in Hokkaido and in mountains of Honshu, it may also inhabit there *Picea* and *Abies*.

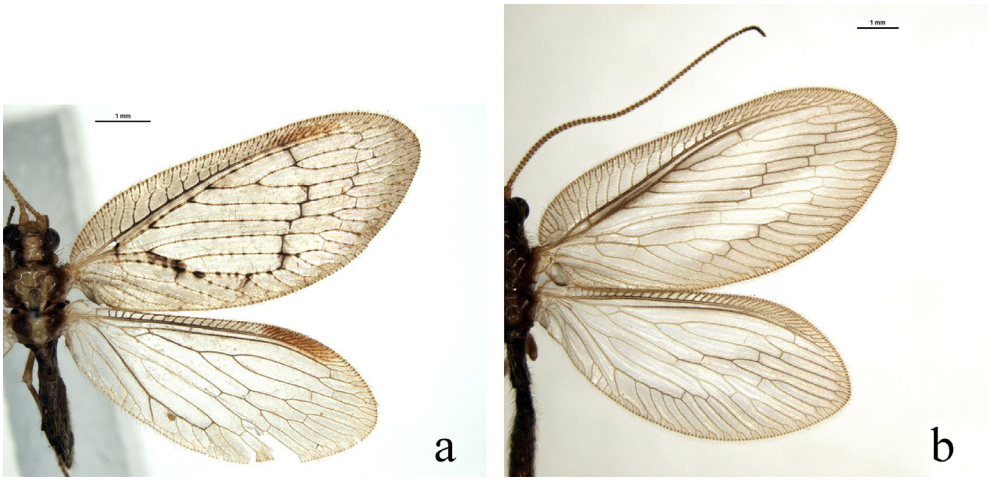

Fig. 3. Wings of *Hemerobius striatus* (a), and *Hemerobius tristriatus* (b). Scale bar = 1 mm.

Hemerobius fujimotoi Nakahara, 1960

Material examined: 1 ex.
Dalnegorskiy district: 1 ex. – 20.09.2015, loc. 1, leg. MS.

Distribution. Russian Caucasus (Adygea, Karachay-Cherkess Republic), Georgia (Lesser Caucasus, western Caucasus), Siberia (Krasnoyarskiy Krai, Tuva, Irkutskaya Oblast, Zabaikalskiy Krai, Yakutia), Russian Far East (Amurskaya Oblast, Khabarovskiy Krai, Primorskiy Krai, Sakhalin), Japan (Hokkaido, Honshu) (Nakahara 1960, Makarkin & Shchurov 2011).

Remarks. The species occurs mainly on *Picea* and *Abies*.

Hemerobius tristriatus Kuwayama, 1954

Material examined: 20♂♂ 31♀♀
Terneyskiy district: 20♂♂ 31♀♀ – 10–13 VII 2018, loc. 14, 149 m a.s.l., *Picea* sp. netting, leg. RD.

Distribution. Russian Far East (Amurskaya Oblast, Khabarovskiy Krai, Primorskiy Krai, Sakhalin, Kuril Islands: Kunashir, Shikotan), Japan (Hokkaido, Honshu) (Makarkin 1985a, 1995b).

Remarks. The longitudinal fasciae (streaks) are characteristic of the forewing of *H. tristriatus* (Fig. 3b). The species occurs on *Picea* and *Abies*.

Wesmaelius quadrifasciatus (Reuter, 1894)

Material examined: 16♀♀
Terneyskiy district: 7♀♀ – 15 VII 2018, loc. 18, on *Larix* sp., 50 m a.s.l., leg. RD, 1♀ – 16 VII 2018, loc. 21, 95 m a.s.l., netting, *Larix* sp., leg. RD, 8♀♀ – 19 VII 2018, loc. 23, 40 m a.s.l., netting, on *Larix* sp., leg. RD.

Distribution. Europe, European Russia (Leningradskaya Oblast, Moskovskaya Oblast, Tverskaya Oblast, Komi Republic, Permskaya Oblast), Turkey, Georgia, Siberia (Nenetskiy Autonomous Okrug, Yamalo-Nenetskiy Autonomous Okrug, Taymyrskiy Autonomous Okrug, Tomskaya Oblast, Krasnoyarskiy Krai, Sayan Mountains, Irkutskaya Oblast, Zabaikalskiy Krai, Buryatia, Yakutia), Russian Fat East (Magadanskaya Oblast, Kamchatka, Khabarovskiy Krai, Amurskaya Oblast, Sakhalin, southern Kuril Islands: Kunashir), Mongolia, Japan (Honshu) (Makarkin 1995b, 1995c, Aspöck *et al.* 2001, Duelli *et al.* 2015).

Remarks. New for Primorskiy Krai. This is the southernmost locality of the species in the Sikhote Alin Mountains. It is associated (at least in the Russian Far East) almost exclusively with *Larix*. In Siberia and the Russian Far East, *W. quadrifasciatus* coexists with *W. asiaticus* C.-k. Yang, 1980, which inhabits mainly *Abies* and *Picea* in Primorskiy Krai (VM, pers. obs.) and *Pinus sibiricus* and *P. pumila* in Siberia (Kaverzina 2011). *W. quadrifasciatus* differs from *W. asiaticus* by the color pattern of the forewing (the transverse fasciae are absent in *W. asiaticus*) and by the subgenital plate of the female (Figs. 4a, b).

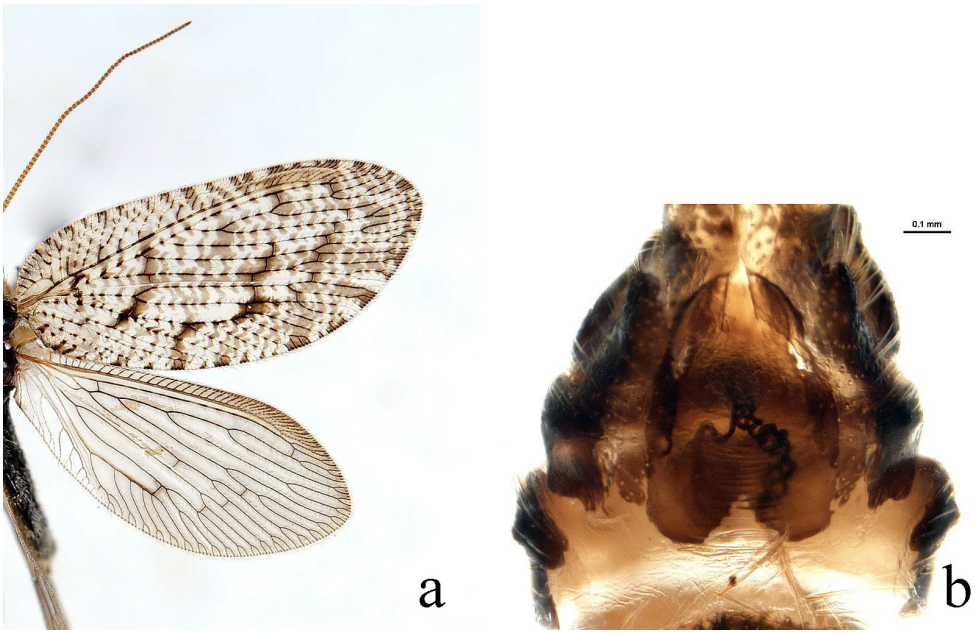

Fig. 4. Female of *Wesmaelius quadrifasciatus*: a – wings; b – subgenital plate. Scale bar = 0.1 mm.

Wesmaelius nervosus (Fabricius, 1793)

Material examined: 1♂ 1♀
Terneyskiy district: 1♂ – 2 VI 2016, loc. 18, leg. MS, 1♀ – 2 VIII 2018, loc. 18, leg. MS.

Distribution. Holarctic species. Europe, Siberia (Irkutskaya Oblast, Krasnoyarskiy Krai, Zabaikalskiy Krai, Buryatia, Yakutia), Georgia, Armenia, Iran, eastern Kazakhstan, Kyrgyzstan, Russian Far East (Kamchatka, Chukotka, Magadanskaya Oblast, Khabarovskiy

Krai, Primorskiy Krai, Amurskaya Oblast, Sakhalin, Kuril Islands: Kunashir), China (Liaoning, Hebei, Xizang), Japan (Honshu, Hokkaido), Canada, USA (Alaska) (Makarkin 1996, Aspöck *et al.* 2001, Dobosz *et al.* 2017, Yang *et al.* 2018).

Psectra diptera (Burmeister, 1839)

Material examined: 1♀
Terneyskiy district: 1♀ – 20 IX 2018, loc. 16, leg. MS.

Distribution. Holarctic species, known from Europe, Georgia, Turkey, Siberia (Altai, Irkutskaya Oblast), Russian Far East (Primorskiy Krai, Kamchatka, Kuril Islands: Kunashir), China (Heilongjiang, Hebei), Japan (Hokkaido, Honshu), Canada, northern USA (Makarkin 1995b, Aspöck *et al*. 2001, Yang *et al.* 2018).

Micromus variegatus (Fabricius, 1793**)**

Material examined: 1♀
Terneyskiy district: 1♀ – 15 VI 2016, loc. 25, leg. MS.

Distribution. Holarctic species, known from Europe, Georgia, Armenia, northern Caucasus, Azerbaijan, Turkey, northern Iran, Kazakhstan, Siberia (Tyumenskaya Oblast, Altai), Russian Far East (southern Primorskiy Krai), China (Henan, Shanxi, Zhejiang, Hubei, Sichuan), Japan (Honshu, Hokkaido) and Canada (Makarkin 1995b, Aspöck *et al.* 2001, Yang *et al.* 2018).

Micromus angulatus (Stephens, 1836)

Material examined: 2♂♂
Terneyskiy district: 1♂ – 11 VIII 2015, loc. 8, leg. MS, 1♂ – 30 VII 2018, loc. 8, leg. MS.

Distribution. Holarctic species. Europe from Macaronesia (Azores, Madeira) to the Urals, Africa (Morocco), Asia: Armenia, Turkey, Israel, Turkmenistan, Kazakhstan, Mongolia, Russian Far East (Magadanskaya Oblast, Kamchatka, Khabarovskiy Krai, Amurskaya Oblast, Primorskiy Krai, Sakhalin), China (Inner Mongolia, Hebei, Beijing, Henan, Shaanxi, Ningxia, Zhejiang, Hubei, Yunnan, Taiwan), Japan (Hokkaido, Honshu), USA and Canada (Makarkin 1995b, Aspöck *et al.* 2001, Kovanci *et al.* 2014, Yang *et al.* 2018).

Micromus paganus (Linnaeus, 1767)

Material examined: 3♀♀
Krasnoarmeyskiy district: 1♀ – 19 VII 2016, loc. 4, leg. MS.
Terneyskiy district: 1♀ – 4 VIII 2016, loc. 15, leg. MS, 1♀ – 21 VII 2018, loc. 7, *Salix* sp. and *Populus* sp., 5 m a.s.l., leg. RD.

Distribution. Europe, Georgia, Armenia, Kazakhstan, Mongolia, Siberia, Russian Far East (Kamchatka, Khabarovskiy Krai, Amurskaya Oblast, Primorskiy Krai, Sakhalin, Kuril Islands), China (Inner Mongolia, Hebei, Beijing, Shaanxi, Xinjiang, Hunan, Sichuan, Yunnan, Guangxi), North Korea, Japan (Hokkaido, Honshu) (Makarkin 1995b, Aspöck *et al.* 2001, Duelli *et al.* 2015, Yang *et al*. 2018).

Chrysopidae

Nineta carinthiaca (Hölzel, 1965)

Material examined: 11♂♂ 4♀♀
Terneyskiy district: 1♂ – 10 VIII 2016, loc. 18, leg. MS, 1♀ – 12 VII 2017, loc. 12, leg. MS, 1♂ – 16 VI 2018, loc. 16, leg. MS, 1♂ – 9 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous and coniferous trees, leg. RD, 2♂♂ – 9 VII 2018, loc. 14, 149 m a.s.l., netting, ectoparasite *Forcipomyia* sp., leg. RD, 2♂♂2♀♀ – 10 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD, 1♂ – 12 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RK, 1♂ – 13 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous and coniferous trees, leg. RD, 1♀ – 15 VII 2018, loc. 20, 80 m a.s.l., at light, leg. RD, 2♂♂ – 19 VII 2018, loc. 23, 40 m a.s.l., netting, *Larix* sp. and deciduous trees, leg. RD.

Distribution. Europe (Austria, Hungary, Slovenia), Georgia, Turkey, Russia (Mordovia, Bashkortostan, Yaroslavskaya Oblast, Novosibirskaya Oblast, Amurskaya Oblast, Khabarovskiy Krai and Primorskiy Krai) (Makarkin 1985b, 1990, Aspöck *et al.* 2001, Duelli *et al.* 2015, Markova *et al.* 2016).

Remarks. Tsukaguchi (1995) in his revision of Japanese green lacewings considered *N. carinthiaca* as a junior synonym of *N. alpicola* (Kuwayama, 1936). One of the co-authors (VM) agrees with this synonymy, but one of the others (RD) disagrees, as he believes that it is difficult to agree with this synonymy by analyzing and comparing the morphological features of the terminalia and genital segments of both species. A critical comparison of their taxonomic features was carried out by Canard (2004). Aspöck *et al.* (2001) assumed that specimens of *N. carinthiaca* from the Russian Far East (Makarkin 1990) could refer to *N. alpicola*. The males collected in the Sikhote-Alin Reserve were examined, and all of them belong to the same species as the European *N. carinthiaca*, showing the genital morphology typical of this species. However, both species (or at least only *N. carinthiaca*) are probably synonyms of the eastern Chinese species *Nineta grandis* Navás, 1915. Its type has yet to be re-examined, but a specimen of *Nineta grandis* from Beijing is very similar to *N. carinthiaca* and *N. alpicola*, both externally and genitally (see Yi *et al.* 2018: Figs. 3H, S2G).

The genus *Forcipomyia* Meigen, 1818 (Diptera: Ceratopogonidae) is represented in the Russian Far Eastern fauna only by *Forcipomyia tonnoiri* (Goetghebuer, 1920). This species is an ectoparasite of butterflies (Remm 1971, Alwin & Szadziewski 2013). Here, *Forcipomyia eques* (Johannsen, 1908) is recorded for the first time as an ectoparasite of green lacewings from the Russian Far East, and Russia in general. Previously, *F. eques* was reported from Europe (Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, Germany, Great Britain, Latvia, Norway, Poland and Slovakia), Asia (Japan, North Korea) and North America (Alwin & Szadziewski 2013). This species is known to be an ectoparasite of a number of species of Chrysopidae: *Nineta flava* (Scopoli, 1763), *N. pallida* (Schneider, 1846), *N. vittata* (Wesmael, 1841), *Chrysopa perla* (Linnaeus, 1758), *Ch. phyllochroma* Wesmael, 1841, *Pseudomallada flavifrons* (Brauer, 1851), *Ps. parsinus* (Burmeister, 1839), *Ps. ventralis* (Curtis, 1834), *Chrysoperla carnea* (Stephens, 1836) s.l. (Tjeder 1936, 1944, Greve 1968, 1969, Gepp 1973, 1980, 1982, Dobosz 1991, 1994, 1998). *Nineta carinthiaca* is a new host for *F. eques*.

Nineta vittata (Wesmael, 1841)

Material examined: 7♂♂ 5♀♀

Terneyskiy district: 5♂♂4♀♀ – 8–10 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous trees, leg. RD, 1♂ – 13 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous trees, leg. RD, 1♂ – 16 VII 2018, loc. 21, 95 m a.s.l., netting, leg. RD, 1♀ – 18 VII 2018, loc. 21, 95 m a.s.l., netting, *Acer* sp., leg. RD.

Distribution. Palearctic species, known from Europe, Azerbaijan, Siberia, the Russian Far East (Khabarovskiy Krai, Primorskiy Krai, Sakhalin, Kamchatka, Kuril Islands: Iturup, Kunashir, Shikotan), China (Heilongjiang, Inner Mongolia, Shaanxi, Ningxia, Hunan, Hebei, Sichuan, Taiwan), Japan (Hokkaido, Honshu, Shikoku) (Makarkin 1990, Tsukaguchi 1995, Kurganov 1996, Markova *et al.* 2016, Yang *et al*. 2018).

Chrysotropia ciliata (Wesmael, 1841)

Material examined: 12♂♂ 18♀♀
Terneyskiy district: 1♀ – 5 VII 2018, loc. 12, leg. MS, 1♀ – 5 VII 2018, loc. 14, 149 m a.s.l., Barber trap, leg. MS, 1♂2♀♀ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous trees, leg. RD, 1♂ – 9 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous and coniferous trees, ectoparasite *Forcipomyia* sp., leg. RD (USMB 019/C3), 3♂♂5♀♀ – 10–11 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD, 1♀ – 13 VII 2018, loc. 14, 149 m a.s.l., netting, trees, leg. RD, 2♂♂ – 15 VII 2018, loc. 21, 95 m a.s.l., netting, leg. RD, 1♂1♀ – 18 VII 2018, loc. 21, 95 m a.s.l., *Acer* sp., netting, leg. RD, 2♂♂2♀♀ – 19 VII 2018, loc. 21, 95 m a.s.l., *Larix* sp. and deciduous trees, leg. RD, 2♀♀ – 21 VII 2018, loc. 7, 5 m a.s.l., netting, meadow, leg. RD, 1♂2♀♀ – 2 VIII 2018, loc. 18, leg. MS, 1♂1♀ – 9 VIII 2018, loc. 8, leg. MS.

Distribution. Palearctic region (Europe and Asia): Armenia, Azerbaijan, Georgia, Turkey, Kazakhstan, Kyrgyzstan, Siberia, Russian Far East (Amurskaya Oblast, Khabarovskiy Krai, Primorskiy Krai, Sakhalin, Kuril Islands: Kunashir), Mongolia, South Korea, Japan (Hokkaido, Honshu) (Makarkin 1990, Kwon & Moon 1994, Tsukaguchi 1995, Kurganov 1996, Aspöck *et al.* 2001, Paek *et al.* 2010, Duelli *et al.* 2015, Makarova *et al.* 2016).

Remarks. *Chrysotropia ciliata* is a new host for *Forcipomyia eques*.

Chrysopa commata Kis & Újhelyi, 1965

Material examined: 49♂♂ 39♀♀
Terneyskiy district: 1♂1♀ – 7 VII 2018, loc. 7, 5 m a.s.l., netting, meadow, leg. RD, 1♂ – 14 VII 2018, loc. 7, 5 m a.s.l., netting, leg. RD, 1♀ – 16 VII 2018, loc. 21, 95 m a.s.l., at light, leg. RD, 1♀ – 19 VII 2018, loc. 21, 95 m a.s.l., at light, leg. RD, 25♂♂25♀♀ – 20 VII 2018, loc. 7, 5 m a.s.l., netting, leg. RD, 20♂♂11♀♀ – 21 VII 2018, loc. 7, 5 m a.s.l., netting, meadow, leg. RD, 2♂♂ – 9 VIII 2018, loc. 8, leg. MS.

Distribution. The species is known from many countries of Europe and Asia: Armenia, Iran, Tajikistan, China (Inner Mongolia) and Russia: Siberia and the Russian Far East (Amurskaya Oblast, Khabarovskiy Krai, Primorskiy Krai) (Makarkin 1985b, 1990, Aspöck *et al.* 2001, Lock & San Martin 2013, Makarova *et al.* 2016, Yang *et al*. 2018). It is noteworthy that the species is not found on the islands of the north-western Pacific, i.e., Japan, the Kurils and Sakhalin.

Remarks. The record of this species in Kunashir (southern Kuril Islands) by Makarkin (1985b, 1990, 1995b) is incorrect. The single known female does not differ from the Japanese *Chrysopa lezeyi* Navás, 1910.

Most specimens from the Russian Far East have no spots on the vertex. However,

many specimens from the Sikhote Alin Reserve bear two (5 ♂♂ 7♀♀) or four (5 ♂♂ 4♀♀) such spots (Fig. 5). Some variability of spots on the vertex of *Ch. commata* was mentioned already in the original description of the species. This variation in Hungarian specimens was illustrated by Sziráki (1994, figs. 1–6). *Ch. commata* is characterized by black thoracic sutures. However, Lock & San Martin (2013) noted that black thoracic sutures are also present in the holotype of *Ch. phyllochroma* Wesmael, 1841 (!) (also confirmed by Peter Duelli – personal communication), a species which is normally characterized by the absence of black color on thoracic sutures. These authors also noted that the genitalia of the holotype have not yet been examined. It is probable, therefore, that the holotype of *Ch. phyllochroma* may actually be the *Ch. commata* of the authors, and that the *Ch. phyllochroma* of the authors is one of its synonyms. A revision of these two species is therefore needed to clarify this nomenclature question. The presence of a black spot on the scapus, another external character frequently used, is probably not a good characteristic because of its geographical variability, this spot can be absent in both species (Tröger 2003).

Fig. 5. Three males of *Chrysopa commata* demonstrating the variability of the species: a, e, i, – head and thorax, lateral view; b, f, j – head, frontal view; c, g, k – head, dorsal view; d, h, l – genital segments, lateral view.

Chrysopa intima McLachlan, 1893

Material examined: 43♂♂ 39♀♀ 2 ex.
Terneyskiy district: 1 ex. – 23 VI 2015, loc. 11, leg. MS, 1♂ – 23 VI 2015, loc. 8, leg. MS, 1 ex. – 1 VII 2015, loc. 12, MS, 1♂ – 4 VII 2015, loc. 13, leg. MS, 1♀ – 21 VI 2016, loc. 16, leg. MS, 1♂ – 28–29 VI 2016, loc. 16, leg. MS, 1♂1♀ – 3 VIII 2016, loc. 18, leg. MS, 1♂1♀ – 6 VII 2017, loc. 10, leg. MS, 2♂♂1♀ – 14–16 VII 2017, loc. 16, leg. MS, 1♂2♀♀ – 15 VIII 2017, loc. 12, leg. MS, 1♂ – 21 VI 2018, loc. 22, trap, leg. MS, 1♂ – 23 VI 2018, loc. 17, leg. MS, 1♀ – 1 VII 2018, loc. 25, leg. MS, 11♂♂4♀♀ – 7 VII 2018, loc. 7, 5 m a.s.l., netting, meadow, leg. RD, 1♀ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous trees, ectoparasite *Forcipomyia* sp., leg. RD (USMB 019/C2), 2♂♂ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous trees, leg. RD, 1♂1♀ – 9 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous and coniferous trees, leg. RD, 6♂♂1♀ – 10–11 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD, 2♀♀ – 12 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RK, 1♂1♀ – 13 VII 2018, loc. 14, 149 m a.s.l., netting, trees, leg. RD, 1♂ – 15 VII 2018, loc. 7, 5 m a.s.l., netting, leg. RD, 1♂ – 15 VII 2018, loc. 18, netting, leg. RD, 1♂ – 15 VII 2018, loc. 20, 80 m a.s.l., at light, leg. RD, 2♂♂2♀♀ – 15 VII 2018, loc. 21, 95 m a.s.l., netting, leg. RD, 1♀ – 15-16 VII 2018, loc. 25, leg. MS, 2♂♂6♀♀ – 16–19 VII 2018, loc. 21, 95 m a.s.l., at light, leg. RD, 1♂3♀♀ – 18 VII 2018, loc. 21, 95 m a.s.l., netting, leg. RD, 1♂1♀ – 20 VII 2018, loc. 7, 5 m a.s.l., netting, leg. RD, 1♂1♀ – 21 VII 2018, loc. 7, 5 m a.s.l., netting, meadow, leg. RD, 5♀♀ – 2 VIII 2018, loc. 18, leg. MS, 1♀ – 9 VIII 2018, loc. 8, leg. MS.
Krasnoarmeyskiy district: 1♀ – 19-21 VII 2016, loc. 4, leg. MS, 1♂ – 9 VI 2017, loc. 4, leg. MS, 1♀ – 13 VI 2017, loc. 3, leg. MS.
Dalnegorskiy district: 1♂ – 3 VII 2017, loc. 1, leg. MS.

Distribution. Siberia (from Tomskaya Oblast to Yakutia), Russian Far East (Amurskaya Oblast, Khabarovskiy Krai, Kamchatka, Primorskiy Krai, Kuril Islands: Iturup, Kunashir), North and South Korea, Mongolia, China (Heilongjiang, Jilin, Liaoning, Inner Mongolia, Shanxi, Shaanxi, Gansu, Hubei, Sichuan, Yunnan), Japan (Hokkaido, Honshu) (Makarkin 1985b, 1990, Kwon & Moon 1994, Tsukaguchi 1995, Paek *et al.* 2010, Makarova *et al.* 2016, Yang *et al.* 2018, Oswald 2019).

Remarks. *Chrysopa intima* is a new host for *Forcipomyia eques*.

Chrysopa gibeauxi (Leraut, 1989)

Material examined: 2♀♀
Terneyskiy district: 1♀ – 11 VII 2018, loc. 14, 149 m a.s.l., at light, leg. RD, 1♀ – 14–15 VII 2017, loc. 16, at light, leg. MS.

Distribution. France, Slovenia, Croatia, Serbia, Poland, Finland, North Korea (Tillier *et al.* 2014, Devetak *et al.* 2015).

Remarks. This species is new for the Russian Far East. The re-discovery of *Ch. gibeauxi* in central Europe and other countries and the indication of clear taxonomic features (Tillier *et al.* 2014) will undoubtedly affect the finding of many new localities in both museum collections and during field studies. Based on the revision of the ZIN collection (St. Petersburg), a publication on the occurrence of green lacewing species from the *Ch. pallens* species group in Russia and neighboring countries is being prepared (Dobosz *et al.* in prep.). Previously, the Russian Far East specimens of this species were considered as belonging to *Ch. septempunctata* by Makarkin (1990, 1995b) and later to *Ch. septemmaculata* Tsukaguchi by Makarkin (2000).

Chrysopa pallens (Rambur, 1838)

Material examined: 1♂ 3♀♀
Terneyskiy district: 1♀ – 10 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD, 1♂ – 20 VII 2018, loc. 7, 5 m a.s.l., netting, leg. RD, 2♀♀ – 2 VIII 2018, loc. 18, leg. MS.

Distribution. Europe, Africa (Morocco, Tunisia, Mauritius), Asia (from Georgia to the Pacific Coast: South Korea? and Japan?) (Kwon & Moon 1994, Tsukaguchi 1995, Makarkin 1995b, Aspöck *et al*. 2001, Paek *et al.* 2010, Yang *et al*. 2018).

Remarks. Based on a recent taxonomic examination of the *Chrysopa pallens* species group (Canard & Thierry 2017), some specimens from the Sikhote-Alin Biosphere Reserve belong to the confirmed easternmost locations of *Ch. pallens*. Previously, Makarkin (1990, 1992, 1995b) had considered the Russian Far East specimens of this species as belonging to *Ch. cognata* McLachlan. Later, this species was regarded as a synonym of *Chrysopa pallens* (Tsukaguchi 1995, Makarkin 2000).

Chrysopa perplexa McLachlan, 1887

Material examined: 34♂♂ 11♀♀
Terneyskiy district: 1♀ – 9 VIII 2018, loc. 8, leg. MS, 2♂♂ – 7 VII 2018, loc. 7, 5 m a.s.l., netting, meadow, leg. RD, 1♂ – 14 VII 2018, loc. 7, 5 m a.s.l., netting, leg. RD, 1♂ – 15 VII 2018, loc. 7, 5 m a.s.l., netting, leg. RD, 1♀ – 16 VII 2018, loc. 21, 95 m a.s.l., at light, leg. RD, 2♂♂ – 19 VII 2018, loc. 21, 95 m a.s.l., at light, leg. RD, 1♂ – 20 VII 2018, loc. 7, 5 m a.s.l., netting, leg. RD, 28♂♂9♀♀ – 21 VII 2018, loc. 7, 5 m a.s.l., netting, meadow, leg. RD.

Distribution. Eastern Siberia (Zabaikalskiy Krai), Russian Far East (Amurskaya Oblast, Khabarovskiy Krai, Primorskiy Krai), North and South Korea, China (Heilongjiang, Inner Mongolia, Shandong, Qinghai, Sichuan), Japan (Hölzel 1973, Makarkin 1985b, 1990, 2009b, Kwon & Moon 1994, Paek *et al.* 2010, Makarova *et al.* 2016, Yang *et al.* 2018, Oswald 2019).

Remarks. This species is externally similar to some specimens of *Chrysopa phyllochroma* (by head maculation and the absence of black color on the thoracic sutures, see Figs. 6a–c), but it genitally resembles *Ch. commata*. The genitalia segments of *Ch. perplexa* differ from those of *Ch. commata*, in particular by the structure of the 9th sternite: their shape is different, where the posterior part (from the dorsal bend to the posterior margin) is shorter in *Ch. perplexa* but clearly longer and massive in *Ch. commata*, and (2) its anterior margin is not sclerotized or only slightly so (strongly sclerotized in *Ch. commata*). Also, the structure of the gonocrystae appears to be different: not curved in the lateral view in *Ch. perplexa*, but strongly curved in *Ch. commata* (compare Figs. 5 and 6).

Head maculation is variable in this species. The spots on the face and frons may be larger (see Figs. 6b, c) or smaller (see Figs. 6f, g, j, k). Four spots (usually indistinct) are often present on the vertex (see Fig. 6k).

One male of *Ch. perplexa* from the Sikhote Alin Reserve (with genitalia typical of this species) has atypical black thoracic sutures (Fig. 7). We intend to treat this as an anomaly because it occurs in just one specimen out of 45. Nevertheless, this may make it difficult to identify the species, especially females, if such specimens turn out to be normal. Only future research will show how frequently specimens with black thoracic sutures occur.

In some publications (Makarkin 1990, 2009b, Oswald 2019) this species is said to occur in Japan, but Tsukaguchi (1995) does not mention it. However, the Japanese

species *Chrysopa sapporensis* Okamoto, 1914 was considered as a junior synonym of *Chrysopa perplexa* by Makarkin (2000). Indeed, its eidonomical and genital features are fully concordant with those of *Chrysopa perplexa* (cf. e.g., Hölzel 1973, figs. 2-4 and Tsukaguchi 1995, fig. 72).

Pseudomallada prasinus (Burmeister, 1839)

Material examined: 10♂♂ 15♀♀
Terneyskiy district: 1♂ – 14 VII 2017, loc. 16, leg. MS, 1♂1♀ – 14-15 VII 2017, loc. 16, at light, leg. MS, 2♀♀ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous trees, leg. RD, 1♀ – 10 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD, 7♂♂2♀♀ – 15 VII 2018, loc. 18, deciduous trees, 50 m a.s.l., leg. RD, 1♀ – 15 VII 2018, loc. 21, netting, 95 m a.s.l., leg. RD, 1♂7♀♀ – 15–17 VII 2018, loc. 21, at light, 95 m a.s.l., leg. RD, 1♀ – 19 VII 2018, loc. 23, 40 m a.s.l., netting, *Larix* sp. and deciduous trees, leg. RD.

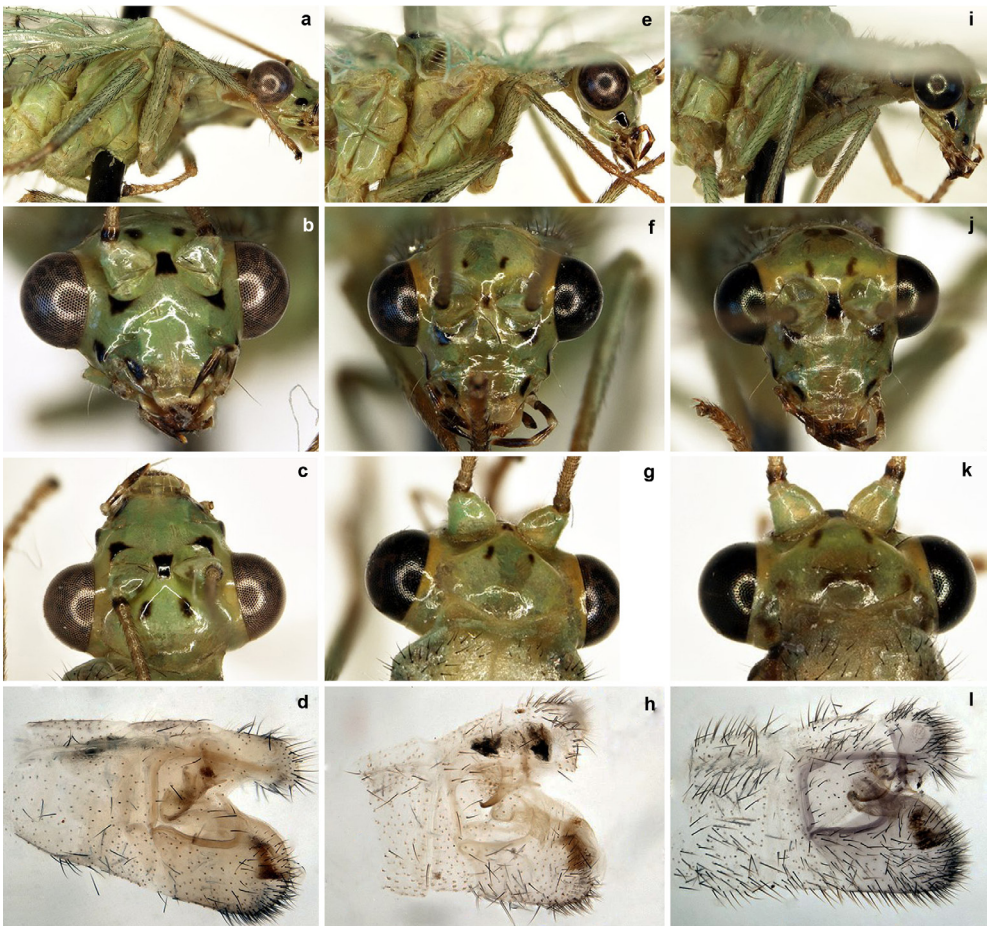

Fig. 6. Three males of *Chrysopa perplexa* demonstrating the variability of the species: a, e, i, – head and thorax, lateral view; b, f, j – head, frontal view; c, g, k – head, dorsal view; d, h, l – genital segments, lateral view.

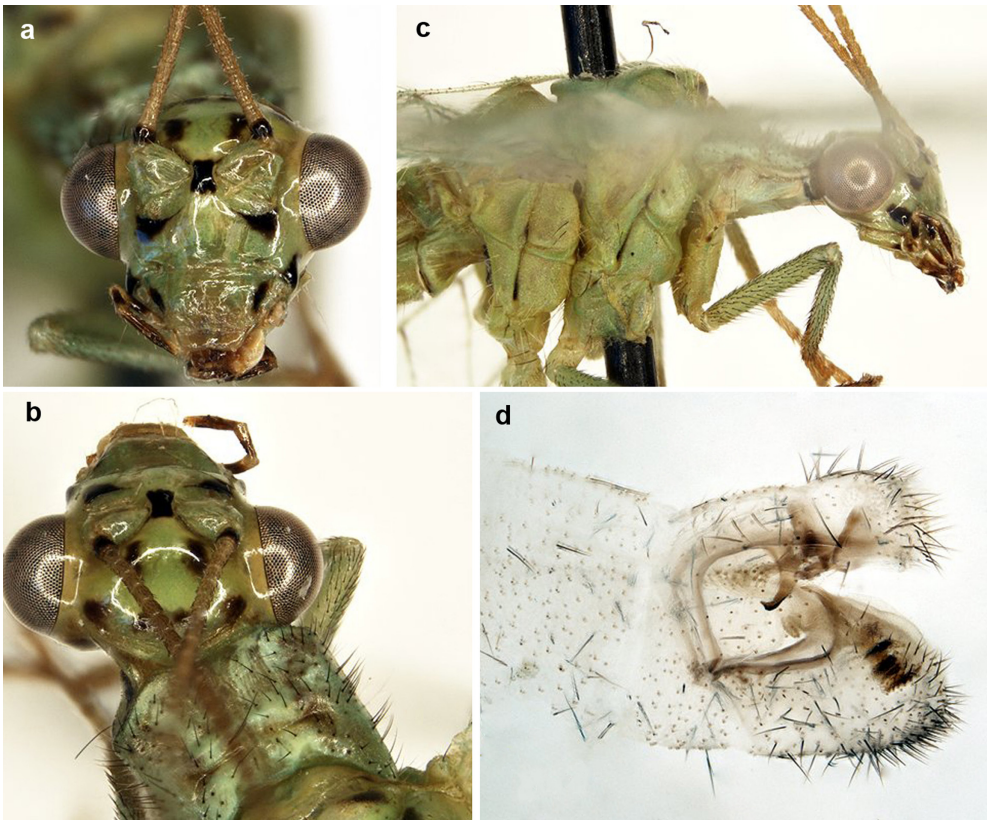

Fig. 7. Male of the presumed *Chrysopa perplexa* with black thoracic sutures: a – head, frontal view; b – head, dorsal view; c – head and thorax, lateral view; d – genital segments, lateral view.

Distribution. *Ps. prasinus* is one of the most widespread and abundant green lacewings in the Palearctic Region. It is known from Europe, North Africa (Morocco, Algeria, Tunisia) and Asia: Armenia, Azerbaijan, Georgia, Turkey, Cyprus, Lebanon, Iraq, Iran, Afghanistan, Kyrgyzstan, Mongolia, Siberia, the Russian Far East (Amurskaya Oblast, Khabarovskiy Krai, Primorskiy Krai, Sakhalin, Kuril Islands: Kunashir, Shikotan), China (Heilongjiang), Japan (Hokkaido, Honshu) (Makarkin 1990, 2009b, Tsukaguchi 1995, Kurganov 1996, Aspöck *et al.* 2001, Duelli *et al.* 2015, Makarova *et al.* 2016, Yang *et al.* 2018).

Remarks. *Pseudomallada prasinus* is a highly variable species, which has led to numerous parallel descriptions of species and varieties. Today, intensive research is being carried out, which may significantly affect the status of this taxon (Duelli & Obrist 2019).

Cunctochrysa albolineata (Killington, 1935)

Material examined: 1♂ 4♀♀
Terneyskiy district: 1♀ – 8 VII 2018, loc. 14, 149 m a.s.l., netting, deciduous trees, leg. RD, 1♀ – 9 VII 2018, loc. 14, 149 m a.s.l., netting, trees, leg. RD, 1♀ – 10 VII 2018, loc. 14, 149 m a.s.l., netting, leg. RD, 1♂ – 16 VII 2018, loc. 21, 95 m a.s.l., at light, leg. RD, 1♀ – 19 VII 2018, loc. 23, 40 m a.s.l., netting, *Larix* sp. and deciduous trees, leg. RD.

Distribution. Known from many European countries, also from Asia: Armenia, Azerbaijan, Georgia, Turkey, Iran, Afghanistan, Turkmenistan, Kyrgyzstan, Siberia, the Russian Far East (Primorskiy Krai), North and South Korea, China (Beijing, Shanxi, Shaanxi, Jiangxi, Hubei, Sichuan, Guizhou, Xizang, Fujian) Japan (Honshu, Sikoku) (Hölzel 1973, Makarkin 1985b, 1990, 2000, Kwon & Moon 1994, Aspöck *et al.* 2001, Paek *et al*. 2010, Makarova *et al*. 2016, Yang *et al.* 2018).

Chrysoperla carnea (Stephens, 1836), sensu lato

Material examined: 2♀♀
Terneyskiy district: 1♀ – 14 VII 2017, loc. 16, leg. MS, 1♀ – 15 VII 2018, loc. 20, 80 m a.s.l., at light, leg. RD.

Distribution. The most abundant Trans-Palearctic species, but not present on the islands in the north-western Pacific (i.e., Japan, Kuril Islands, Sakhalin). In the Russian Far East, it is known from the Amurskaya Oblast, Khabarovskiy Krai and Primorskiy Krai (Makarkin 2009b).

Mantispidae

Eumantispa harmandi (Navás, 1909)

Material examined: 3♀♀ 1 ex.
Terneyskiy district: 1♀ – 1997, Sikhote-Alin Reserve, precise locality unknown (in alcohol), 1 ex. – 10 VIII 2015, loc. 6, at light, leg. MS, 1 ex. (abd. miss.), 2♀♀ – 25 VIII 2001, loc. 6, at light, leg. EP.

Distribution. Russian Far East (Primorskiy Krai), Japan (Hokkaido, Honshu, Kyushu), North and South Korea, China (Jilin, Hebei, Beijing, Shaanxi, Hubei, Hunan, Sichuan, Taiwan) (Kwon & Moon 1994, Paek *et al*. 2010, Makarkin 2009b, Yang & Liu 2010, Yang *et al.* 2018).

Remarks. This is the northernmost locality of the species and family in the Far East. Previously, *E. harmandi* was recorded in the Russian Far East only from southern Primorye: the "Kedrovaya Pad", Ussuriyskiy and Lazovskiy Reserves, the middle reaches of the Borisovka (=Shufan) River, Vladivostok, Sedanka and Kievka (Makarkin 1985a, 2009, Zakharenko 1987b).

Myrmeleontidae

Myrmeleon formicarius Linnaeus, 1767

Material examined: 2♀♀
Terneyskiy district: 1♀ – 17 VII 2017, loc. 16, leg. MS, 1♀ – 20 VII 2018, environs of Terney, in a spider's web, leg. local coll.

Distribution. Trans-Palearctic species, known from many countries of Europe and Asia: Armenia, Turkey, Iran, Kazakhstan, Tajikistan, Kyrgyzstan. In eastern Asia, it occurs in the Russian Far East (Amurskaya Oblast, Khabarovskiy Krai, Primorskiy Krai, Sakhalin, Kuril Islands: Kunashir), China (Xinjiang), and Japan (Hokkaido, Honshu, Shikoku, Kyushu) (Makarkin 2009b, Aspöck *et al.* 2001, Krivokhatsky 2011, Yang *et al.* 2018).

Ascalaphidae

Libelloides sibiricus (Eversmann, 1850)

Distribution. Asian species, known from Siberia (Altai, Khakassia, Krasnoyarkskiy Krai, Irkutskaya Oblast, Buryatia, Zabaikalskiy Krai), Russian Far East (Amurskaya Oblast, Khabarovskiy Krai, Primorskiy Krai), Mongolia, China (widespread), Korea (Pleshanov 1974, Makarkin 1995b, 2009b, Yang *et al*. 2018).

Remarks. A male of this species was photographed by Nikolay N. Rybin on 24 May 2019 in open woodland on south-eastern slopes of the natural boundary of Kunaleika (locality 26) (Fig. 8). Several years ago, the species was observed by Svetlana N. Bondarchuk in the environs of the Blagodatnoe Lake (locality 17).

Fig. 8. Male of *Libelloides sibiricus* in open woodland of the natural boundary of Kunaleika (loc. 26).

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