Review of the millipedes of the Sikhote-Alin State Nature Biosphere Reserve (Far East of Russia), with detection of the morphological variability of Diplomaragna terricolor (Attems, 1899) (Diplopoda)

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Abstract. The millipede fauna of the Sikhote-Alin State Nature Biosphere Reserve (Far East, Russia) is reviewed, at present containing 17 recognizable species from 15 genera, 9 families and 5 orders. A brief historical account and new faunistic records as well as a key to all Diplopoda taxa presently known from the Sikhote-Alin State Nature Biosphere Reserve are provided. Morphological variability of Diplomaragna terricolor (Attems, 1899) is revealed and analyzed, including the material from other territories of the Primorsky Krai and Khabarovsky Krai. The species diversity of Diplopoda within the reserve is mapped.

Keywords: diplopods, faunistcs, variability, key, new faunistic records, Russian Far East.
Review of the millipedes of the Sikhote-Alin State Nature Biosphere Reserve (Far East of Russia)...
illustrated using standard stereomicroscopic (MBS–1) and drawing equipment (RA–6).

SEM micrographs were prepared at the Centre of Collective Use “Biotechnology and Gene Engineering” of the FSCB using a Merlin 62–15 scanning electron microscope. Mounts for SEM were made through air-drying after the transfer to acetone via 96% alcohol, mounting on stubs, and coating with carbon. After the examination, SEM material was removed from stubs and returned to alcohol.

The family-level classification adopted here is that of Shelley (2003). Publication and synonymy lists of each species include the literature references for the Sikhote-Alin State Nature Biosphere Reserve only.

All the natural landmarks in the Sikhote-Alin Nature Reserve are areas of its territory traditionally designated; they are tied to the reserve’s cordon and include parts of the basins of the main rivers or large streams (Pimenova 2016d).

The natural landmarks:
1. 2. Abrek: floodplain of the Upolnomochen-ny Stream (45°09′402″N, 136°46′721″E); same locality, floodplain of the Skrytaya River (45°06′290″N, 136°45′319″E);
3. 4. 5. Blagodatnoe: upper reaches of the Su-khoy Stream (44°58′577″N, 136°31′09″E); same locality, environs of the Blagodatnoe Lake (44°57′12″N, 136°32′48″E); Ozerny Stream (44°57′51″N, 136°29′46″E);
6. Kunaleika: floodplain of the Khanov Stream (44°53′825″N, 136°20′241″E);
7. Kuruma: floodplain of the Kuruma River (44°54′937″N, 136°12′752″E);
8. Nevidimka: floodplain of the Lianovaya River (44°55′575″N, 136°05′505″E);
9. Kabany: floodplain of the Kabany Stream (45°06′36″N, 135°51′59″E);
10. surroundings of the Glukhomanuka Mountain: upper reaches of the Irtiysh Stream (45°10′07″N, 135°47′48″E);
11. Sporny: upper part of the Serebryanka River, floodplain of the Sporny Stream (45°09′427″N, 135°54′154″E);
12. Zymoveyny: Zymoveyny Stream, floodplain of the Serebryanka River (45°08′317″N, 136°18′935″E);
13. Beloborodovskiy: upper reaches of the Yas-naya River (45°16′594″N, 136°23′934″E);
14. Yasnya: floodplain of the Zabolochen-naya River (45°19′619″N, 136°28′381″E);
15. Solontsovy: floodplain of the Za-bolochennaya River, Solontsovy Stream (45°18′877″N, 136°28′578″E);
16. Ust-Solontsovy: Solontsovy Stream (45°24′750″N, 136°30′542″E);
17. Sakhalinsky: floodplain of the Sakhalinsky Stream (45°28′231″N, 136°14′277″E);
18. Nechet: floodplain of the Krivoy Stream (45°29′974″N, 136°32′775″E).

Results and discussion

Order Polyxenida Verhoeff, 1934
Family Polyxenidae Lucas, 1840
Genus Polyxenus Latreille, 1802/1803

Polyxenus sp.

Polyxenus sp. — Mikhaljova 1993: 34; 2004: 41; 2017: 35; Ganin 1997: 124; 2011: 341; Gromyko, Potikha 2006: 232.

Material. Russia: 6 specimens (FSCB), Primorsky Krai, Sikhote-Alin State Nature Biosphere Reserve, Yasnya, Quercus forest, 28.05.1985, leg. M. N. Gromyko.

Remarks. This material still requires a closer determination. At present, only the family Polyxenidae and the genus Polyxenus Latreille, 1802/1803 are known from the Asian part of Russia: Polyxenus sp. belonging to the Polyxenus shinoharai Ishii, 1983 group was recorded in Lazovsky District, Primorsky Krai (M. Short’s [Deakin University, Australia] personal communication).

Above material is a second find of representatives of Polyxenida taxa in the territories lying between the Ural Mountains in the west and the Pacific Ocean in the east. These specimens most likely belong to the same genus and species group. The reason that we venture to determine these specimens as belonging to Polyxenus is geographical evidence.

Occurrences in the natural landmarks of the Sikhote-Alin State Nature Biosphere Reserve: Yasnya.
Oder Polyzoniida Cook, 1895  
Family Polyzoniidae Newport, 1844  
Genus Angarozonium Shelley, 1998

Angarozonium bonum (Mikhailova, 1979)  
Polyzonium bonum — Gromyko 1990: 63; Mikhailova 1993: 4, Map 1; Ganin 1997: 123.  
Angarozonium bonum — Mikhailova 1998: 15, Figs. 36–41, Map 2; Ganin 2011: 340, 344.

Material. Russia: 1♂, 1♀ (FSCB), Primorsky Krai, Sikhote-Alin State Nature Biosphere Reserve: Blagodatnoe, Quercus forest with Corylus, 24.07.1986; 1♂, 2♀ (FSCB), Kabany, Pinus koraiensis forest with Betula costata, 13.08.1986; 2♀, 2 juv. (FSCB), Zimoveyny, Pinus koraiensis forest with Larix, 24.08.1979, all leg. M. N. Gromyko.

Distribution. Russia: Far East (Primorsky Krai, southern part of Khabarovsk Krai).

Occurrences in the natural landmarks of the Sikhote-Alin State Nature Biosphere Reserve: Blagodatnoe, Kabany, Yasnaya, Zimoveyny.

Order Julida Brandt, 1833  
Family Julidae Leach, 1814  
Genus Pacifius Mikhailova, 1982

Pacifius amurensis (Gerstfeldt, 1859)  
Pacifius imbricatus (sic!) — Gromyko 1990: 66.  
Pacifius imbricatus — Mikhailova 1993: 12, Map 2; Ganin 1997: 123.  
Pacifius amurensis — Ganin 2011: 340, 344.

Material. Russia: 1♀ (FSCB), Primorsky Krai, Sikhote-Alin State Nature Biosphere Reserve: Blagodatnoe, environs of Blagodatnoe Lake, Quercus forest, 44°57ʹ14′′N, 136°32ʹ50′′E, 13.05.2016; 2♂, 1♀ (FSCB), Blagodatnoe, Sukhoy Stream (upper reaches), 600–700 m a.s.l., 44°58ʹ29′′N, 136°31ʹ09′′E, 9–10.07.2020; 1♀, 1 juv., 1 fragment (FSCB), Sakhalinsky, Sakhalinsky Stream (upper reaches), 45°41ʹ47′′N, 136°37ʹ13′′E, 30.05.2020; 1♀ (FSCB), Kuruma, floodplain of Kuruma River, 44°91ʹ52′′N, 136°21ʹ18′′E, 6–9.06.2020; 1♀ (FSCB), Zimoveyny, watershed between the Zimoveyny and Sukhoy streams, Pinus koraiensis forest with Larix, 24.08.1978; 1♀ (FSCB), Zimoveyny, Pinus koraiensis forest with Larix, 25.09.1979; 1 juv. (subadult male) (FSCB), Zimoveyny, watershed between the Zimoveyny and Sukhoy streams, Pinus koraiensis forest with Quercus, 20.05.1980; 1♀ (FSCB), Sporny Stream, Picea forest, 19.08.1981, all leg. M.N. Gromyko; 1♂ (FSCB), Beloborodovsky, Yasnaya River (upper reaches), 45°29ʹ39′′N, 136°38ʹ29′′E, 18–20.05.2016. 2♀ (FSCB), Dalnegorsky Dis-
trict, near Glukhomanka Mts., Irtysh Stream (upper reaches), 45°17′03.24″N, 135°77′77″E, 18.09.2015; all leg. M. E. Sergeev.

**Distribution.** Russia: Far East (Primorsky Krai, southern part of Khabarovsky Krai); Northeast China.

**Occurrences in the natural landmarks of the Sikhote-Alin State Nature Biosphere Reserve:** Beloborodovsky, Solontsovy, Sporny, Yasnya, Zimoveyny + near Glukhomanka Mts., Dalnegorsky District.

**Genus* Skleroprotopus* Attems, 1901

*Skleroprotopus coreanus* (Pocock, 1895)

*Skleroprotopus coreanus* — Mikhaljova 1993: 15; Ganin 1997: 123; 2011: 340, 344.

**Material.** Russia: 1 ♀ (FSCB), Primorsky Krai, Sikhote-Alin State Nature Biosphere Reserve: Zimoveyny, *Pinus koraiensis* with *Quercus* forest, 28.08.1978; 1 ♀ (FSCB), Zimoveyny, valley *Pinus koraiensis* forest, 13.09.1978, all leg. M. N. Gromyko; 2 ♂, 1 ♀, 1 juv. (FSCB), Beloborodovskiy, Yasnaya River (upper reaches), 45°29'39″N, 136°38′29″E, 18–20.05.2016; 1 ♀ (FSCB), Sakhalinsky, Sakhalinsky Stream (upper reaches), 45°41′47″N, 136°37′13″E, 30.05.2020; 1 ♀ (FSCB), Abrek, Skrytaya River floodplain, 45°09′82″N, 136°69′08″E, 3–5.07.2020, all leg. M. E. Sergeev.

**Distribution.** Russia: Far East (Primorsky Krai, Sikhote-Alin State Nature Biosphere Reserve).

**Occurrences in the natural landmarks of the Sikhote-Alin State Nature Biosphere Reserve:** Abrek, Beloborodovsky, Blagodatnoe, Kuruma, Nevidimka, Sakhalinsky, Ust-Solontsovy, Yasnaya, Zimoveyny.

**Order* Chordeumatida* Pocock, 1894

**Family* Diplomaragnidae* Attems, 1907

**Genus* Orientyla* Mikhaljova, 2000

*Orientyla dahurica* (Gerstfeldt, 1859)

*Orientyla dahurica* — Mikhaljova 1993: 29; 1998: 27, Figs. 86–87, Map 6.

**Material.** Russia: 1 ♂ (FSCB), Primorsky Krai: Ussuriysky Nature Reserve, mixed forest, litter, 25.09.1977; 2 ♂, 1 ♀ (FSCB), Vladivostok, Okeanskaya Station, forest, litter, 26.04.1980; 2 ♂ (FSCB), near Vladivostok, Popova Island, forest litter, 27.09.1980, all leg. E. V. Mikhaljova; 1 ♂, 4 ♀ (FSCB), Anuchinsky District, near 35 km NW of Arseniev, forest, August 1986, leg. V. D. Bakurov; 2 ♂ (FSCB), Chuguevsky District, Verkhneussuriysky Research Station, ca. 43°50′N, 134°15′E, 31.07.–5.08.1998, leg. Yu. M. Marusik; 1 ♂ (FSCB), Khasansky District, about 6 km NW of Zanadvorovka village, Gusevsky Mine, mixed forest on slope, litter, 18.08.2002, leg. E. V. Mikhaljova; 1 ♂, 2 ♀, fragments (FSCB), Kedrovaya Pad Nature Reserve, forest, pitfall traps, 13.06.2004, leg. V. N. Kuznetsov; 1 ♂ (FSCB), Shkотовs-
ky District, environs of Anisimovka, Litovka Mt., about 100 m a.s.l., Pinus koraiensis forest, 11.09.2006, leg. A. A. Rodionov; 2♂, 2♀ (FSCB), Sikhote-Alin Nature Biosphere Reserve, Blagodatnoe, Ozerny Stream, 29.09.2015, leg. M. E. Sergeev.

Material re-examined. Russia: 1♂, 1♀, 1 juv. (FSCB), Primorsky Krai: Churuevsky District, Verkhneussuriysky Research Station, Picea forest, litter, 20.05.1977, leg. E. V. Mikhaljova (specimens published by Mikhaljova 1997a); 1♂ (FSCB), Vladivostok, Okeanskaya Station, forest, litter, 8.05.1977, leg. E. V. Mikhaljova (specimen published by Mikhaljova 1997a); 1♂ (FSCB), Ussuriysky Nature Reserve, Picea forest, 20.05.1977, leg. E. V. Mikhaljova (spec-
imen published by Mikhaljova 1997a); 1♂, 2 juv. (FSCB), Ussuriysky Nature Reserve, *Abies holophylla* forest, 26.10.1977, leg. R. Fedorova (specimens published by Mikhaljova 1997a); 1♂, 1♀ (FSCB), near Vladivostok, Popova Island, *Quercus, Tilia, Betula, Acer*, etc., forest, litter, 9.10.1979, leg. E. V. Mikhaljova (specimens published by Mikhaljova 1993); 2♂, 1♀ (FSCB), near Vladivostok, Popova Island, *Quercus, Tilia, Betula, Acer*, etc., forest, litter, 7.09.1980, leg. E. V. Mikhaljova (specimens published by Mikhaljova 1993); 1♂, 3 juv. (FSCB), Sikhote-Alin Nature Biosphere Reserve, floodplain terrace, Yasnaya River, valley *Betula* forest, 5.06.1984, leg. M. N. Gromyko (specimens published by Mikhaljova 1993); 1♂, 1 juv. (FSCB), Gamova Peninsula, environs of Telyakovsky Cape, leaved forest, near stream, litter, 17.06.2003, leg. E. V. Mikhaljova (specimens published by Mikhaljova and Marusik 2004); 1♂, 1♀ (FSCB), Lazovsky Nature Reserve, Amerika Cordon, 15.05.2007, leg. S. A. Shabalin (specimens published by Mikhaljova 2009); 1♂, 7♀ (IBSS), Khabarovsky Krai: Sikhote-Alin, Mt. Ko, 1000 m, 6.07.2007, leg. P. V. Budilov (specimens published by Mikhaljova 2016).

**Distribution.** Russia: Far East (Primorsky Krai, southern part of Khabarovsky Krai).

**Remarks.** This species was originally described from the environs of Vladivostok, Russia (Attems 1899). Later, based on type material, a re-description of this species was provided (Shear 1990).

In the course of our study of males of *D. terricolor* from the Blagodatnoe of the Sikho-
te-Alin Reserve, the unusual structure of their gonopods has been revealed (see Figs 16, 20). The gonopods differ in the configuration of the posterior angiocoxal processes with the very high apical oval outgrowths (a) (vs not high apical oval outgrowth according to the original description and re-description by Shear) and with broad mesal protrusions (m) carrying finger-shaped processes (b) directed to body dorsum (vs finger-shaped processes directed strictly forward according to the re-description by Shear).

Additional investigation of males of this species from different territories of the Primorsky and Khabarovsky Krai allowed discovering of the specific variations in the gonopod structure of D. terricolor. The basic diagnostic characters of D. terricolor are the configuration of the posterior gonopod’s posterior angiocoxal process with arms and outgrowths of different size, and the architecture of the colpocoxite distal part. The above material appears to show certain variation exactly in the configuration of the posterior angiocoxal process. Thus, the apical oval outgrowth (a) of posterior angiocoxal process ranges from very low to very high (Figs. 1–16). Also, the finger-shaped process (b) is straight (Figs. 11, 12, 16) or more (Figs. 1–3, 5–6, 8–9, 13) or less (Figs. 4, 7, 10, 14, 15) strongly curved forward; its length varies too.

In addition, the variation of the coxal process of the male leg 11 (p) is revealed. Thus, its size ranges from small to large (Figs. 21–24). An increase in the size of this coxal process correlates with an increase in the size of
the apical oval outgrowth (a) (see Figs. 13 and 21; 16 and 24). Moreover, we can distinguish two distinct extreme forms of the gonopods + male coxae 11. The first form (males from the Anuchinsky District of the Primorsky Krai and from the environs of Ko Mountain, the Khabarovsky Krai): a very low apical oval outgrowth (a) of the posterior angiocoxal process, a strongly curved forward process b, a small coxal process of leg 11 (Figs. 1, 2, 13, 17, 21). The second form (males from the Blagodatnoe, Sikhote-Alin Nature Reserve,): a very high apical oval outgrowth (a) of the posterior angiocoxal process, straight (directed to dorsum) process b, large coxal process of leg 11 (Figs. 12, 16, 20, 24). The differences between these extreme forms are linked by a complete series of transitions. At that, the gonopods of a male from the flood-plain terrace of the Yasnaya River (Sikhote-Alin Reserve) (Fig. 9) belong to an intermediate transitional form in contrast to the second extreme gonopod form of the males from Blagodatnoe (Sikhote-Alin Reserve). It should be noted that the second gonopod form and forms close to one are more common for males of the eastern part of the Primorsky Krai. While the first gonopod form and forms close to one were mainly recorded in males from the central and southern parts of the Primorsky Krai as well as in the male from the south of Khabarovsky Krai. However, both forms can occur together. For example, males of two opposite forms (Figs. 6, 11) were found together in the same locality of the Popova Island, south of Primorsky Krai.

Figs. 21–24. Diplomaragna terricolor (Attems, 1899). Coxae of male leg pair 11, front view. 21 — from Mt. Ko, Khabarovsky Krai; 22 — from Vladivostok, Okeanskaya Station, Primorsky Krai; 23 — from Lazovsky Nature Reserve, Primorsky Krai; 24 — from Sikhote-Alin Nature Biosphere Reserve, Blagodatnoe, Ozerny Stream, Primorsky Krai; p — coxal process. Scales: 100 μm

Рис. 21–24. Diplomaragna terricolor (Attems, 1899). Коксы 11-й пары ног самца, вид спереди: 21 — с горы Ко в Хабаровском крае; 22 — из Владивостока, станция Океанская; 23 — из Лазовского заповедника в Приморском крае; 24 — из Сихотэ-Алинского заповедника (урочище Благодатное, ключ Озёрный) в Приморском крае; p — коксальный отросток. Масштабы: 100 μm
The species is rather variable. However, the present material being unrepresentative, we have preferred not to make conclusion on the nature of variability. An investigation of this phenomenon is a very considerable project in itself, which can only be realized in future with further accumulation of abundant, representative material and using molecular genetic methods too. Now, it can only be assumed that the morphological variability of this species is due to the different ecological conditions of the eastern, southern and central territories of the Primorsky Krai and the Khabarovskiy Krai.

Also, it is necessary to add to the description of *D. terricolor* the presence of a process on the male coxa 11 since this character was omitted in the re-description of *D. terricolor* (see Shear 1990).

### Occurrences in the natural landmarks of the Sikhote-Alin State Nature Biosphere Reserve

Blagodatnoe, Yasnaya.

*Diplomaragna zimoveinaya* Mikhaljova, 1997

*Diplomaragna zimoveinaya* — Mikhaljova 1998: 28, Figs. 88–90, Map 6; 2000: 175; 2004: 140, Figs. 330–332, Map 18; 2017: 363–365, Map 24; Ganin 2011: 340.

**Material.** Russia: 1♂, 1 juv. (FSCB), Primorsky Krai, Sikhote-Alin State Nature Biosphere Reserve, Zimoveyny, *Pinus koraiensis* with *Larix* forest, 24.08.1978, leg. M. N. Gromyko.

**Distribution.** Russia: Far East (Primorsky Krai, Sikhote-Alin Nature Biosphere Reserve).

### Occurrences in the natural landmarks of the Sikhote-Alin State Nature Biosphere Reserve

Kunaleika, Solontsovy, Zimoveyny.

*Levizonus distinctus* Mikhaljova, 1990

*Levizonus distinctus* Mikhaljova 1990: 134, fig. 1. *Levizonus distinctus* — Mikhaljova 1993: 33; 1998: 53, Figs. 200–204, Map 12; 2004: 245, Figs. 612–616, Map 32; 2017: 295, Figs. 660–663, Map 43; Ganin 2011: 341.

*Levizonus distinctus* (sic!) — Ganin 1997: 124; Gromyko, Potikha 2006: 232.

**Material.** Russia: 1♂, 1 juv. (FSCB), Primorsky Krai, Sikhote-Alin State Nature Biosphere Reserve: Zimoveyny, *Pinus koraiensis* with *Rhododendron*, 22.08.1978; 1♂, 1 ♀ (FSCB), Ust-Solontsovy, burnt *Pinus koraiensis* with *Quercus* forest (5 year old), 4.06.1983; 1♂, 2♀♀, 12 juv., 2 fragments (FSCB), Yasnaya, valley *Betula* forest, floodplain terrace, 24.06.1984, all leg. M.N. Gromyko; 1♂, 1 ♀ (FSCB), Abrek, floodplain of Skritaya River, 45°09’82″N, 136°69’08″E, 3–5.07.2020; 1♂ (FSCB), Sporny, Serebryanka River (upper reaches), environs of Bromleevkaya Izb, 45°19’40″N, 135°99’01″E, 31.07.–2.08.2020, all leg. M.E. Sergeev.

**Distribution.** Russia: Far East (Primorsky Krai, Sikhote-Alin State Nature Biosphere Reserve).

### Occurrences in the natural landmarks of the Sikhote-Alin State Nature Biosphere Reserve

Abrek, Nechet, Ust-Solontsovy, Sporny, Yasnaya, Zimoveyny.
**Family Paradoxosomatidae Daday, 1889**

**Genus Sichotanus Attems, 1914**

*Sichotanus eurygaster* (Attems, 1898) — Gromyko 1990: 66; Mikhaljova 1993: 30; Ganin 1997: 124; 2011: 341.

**Material.** Russia: 1 ♀ (FSCB), Primorsky Krai, Sikhote-Alin State Nature Biosphere Reserve: Yasnya, floodplain of Zabolochennaya River, 2.07.2015; 12 ♂ (FSCB), Yasnya, floodplain of Zabolochennaya River, forest, pitfall traps, 44°53′25″N, 136°20′18″E, 3–5.07.2015; 1♂ (FSCB), Beloborodovsky, Yasnya River (upper reaches), 45°29′39″N, 136°38′29″E, 18–20.05.2016; 1♂ (FSCB), Sporny Stream (upper reaches), 29.06.2017; 1juven. (FSCB), Sporny, Serebryanka River (upper reaches), environs of Bromleevskaya Izba, 45°19′40″N, 135°99′01″E, 31.07.–2.08.2020; 1♂ (FSCB), Sakhlinsky, Sakhlinsky Stream (upper reaches), 45°41′47″N, 136°37′13″E, 30.05.2020; 2♂, 1♀ (FSCB), Kuruma, floodplain of Kuruma River, 44°91′52″N, 136°21′18″E, 6–9.06.2020; 1♂ (FSCB), Abrek, floodplain of Skrytaya River, 45°09′82″N, 136°69′08″E, 3–5.07.2020; 1♂ (FSCB), Blagodatnoe, Sukhoy Stream (upper reaches), 600–700 m a.s.l., 44°58′57″N, 136°31′09″E, 9–10.07.2020; all leg. M. E. Sergeev.

**Distribution.** Russia: Far East (Primorsky Krai, Amur Oblast); North Korea.

**Occurrences in the natural landmarks of the Sikhote-Alin State Nature Biosphere Reserve:** Blagodatnoe, Kuruma.

**Family Polydesmidae Leach, 1815**

**Genus Epanerchodus Attems, 1901**

*Epanerchodus polymorphus* Mikhaljova et Golovatch, 1981

**Material.** Russia: 4♂ (morpha simplificata), 2♀, 1juven. (FSCB), Primorsky Krai, Sikhote-Alin State Nature Biosphere Reserve: Kuruma, floodplain of Kuruma River, 44°91′52″N, 136°21′18″E, 6–9.06.2020, leg. M. E. Sergeev.

**Distribution.** Russia: Far East (Primorsky Krai); North Korea.

**Remarks.** This is the first record of *Epanerchodus polymorphus* in the Sikhote-Alin State Nature Biosphere Reserve.

**Occurrences in the natural landmarks of the Sikhote-Alin State Nature Biosphere Reserve:** Kuruma.

**Genus Uniramidesmus Golovatch, 1979**

*Uniramidesmus dentatus* Mikhaljova, 1979

*Uniramidesmus dentatus* — Mikhaljova 1993: 32; Ganin 1997: 124; 2011: 341.

**Distribution.** Russia: Far East (Primorsky Krai, southern part of Khabarovskiy Krai, ?Amur Oblast).

**Occurrences in the natural landmarks of the Sikhote-Alin State Nature Biosphere Reserve:** Kuruma.

**Conclusion**

At present, 17 species from 15 genera, 9 families and 5 orders of Diplopoda are known from the Sikhote-Alin State Nature Biosphere Reserve. This is 36.9% of the total number of millipede species inhabiting the Pimorsky Krai. Three species are new to the reserve fauna. Rather this pattern expresses the degree of diplopod fauna study.

Generally, the reserve fauna of Diplopoda is relatively original. At the species level, the endemism amounts to at least 18.2% of the...
total number of millipede species occurring there. Three species (*Levizonus distinctus*, *Diplomaragna zimoveinaya*, *Pacifiosoma kuruma*) are known from the Sikhote-Alin State Nature Biosphere Reserve only. Most of the species that populate the Sikhote-Alin State Nature Biosphere Reserve can be attributed to the Manchurian distribution pattern, which includes the Primorsky Krai, the southern part of the Khabarovsky Krai, the Amur Oblast, the Jewish Autonomous Oblast, Northeast China, and Korea. Only three species (*Orientyla dahurica* as well as parthenogenetic *Pacifiiulus amurensis* and *Underwoodia kurtschevae*) show wider distributions; both *O. dahuica* and *P. amurensis* are also known from Siberia while *U. kurtschevae* also from the Kamchatka Peninsula.

*Underwoodia* is a genus showing a trans-Beringian distribution pattern (Golovatch 1980). *Orientyla* and *Pacifiiulus* are endemic to the Asian part of Russia.

The order Polydesmida is definitely dominant in the diplopod fauna of the reserve. It is represented by three families, five genera and six species. Families Paradoxosomatidae and Polydesmidae include the species being quite common in the southern part of the Russian Far East and the adjacent territories. However, family Xystodesmidae is represented by both *Levizonus distinctus*, endemic to the reserve, and by *Levizonus malewitschi* known from the central-eastern part of the Primorsky Krai only. The orders Polyzoniida and Polyxenida are the smallest; they include one species each.

The distribution of Diplopoda in the Sikhote-Alin State Nature Biosphere Reserve (Map) shows four of the species (Sichotanus eurygaster, *Underwoodia kurtschevae*, *Skleroprotopus coreanus*, *Pacifiiulus amurensis*) as being common and occurring at 8–10 natural landmarks of the reserve. Three species (*Levizonus distinctus*, *Kopidoiulus continentes*, *Angarozonium bonum*) are recorded in 4–7 natural landmarks. Of course, our map is provisional, reflecting the state of the art and the distribution of collecting efforts.

Millipedes occur in most of the biotopes, only excluding the steppe sea terrace within the natural landmark of Blagodatnoe (Gromyko, Potitkha 2006). Millipede abundance is a variable characteristic. Thus, it ranges from 0.2 to 4.1 ind./m² in different dry *Quercus* forests, and from 23.3 to 57.1 ind./m² in different humid *Quercus* forests (Gromyko 1990). *Levizonus distinctus* is the most numerous species; its maximum numbers (more 30 ind./m²) were registered in the valley with *Pinus koraiensis* forests (Gromyko, Potitkha 2006).

**Key to Diplopoda orders, families, genera and species occurring in the Sikhote-Alin State Nature Biosphere Reserve**

1(2) Cuticle soft, not impregnated with calcites. Head, most of pleura and telson with bundles of hollow serrate setae (= trichomes) ................................... order Polyxenida, family Polyxenidae, genus Polyxenus, *Polyxenus* sp.

2(1) Cuticle hard, impregnated with calcites. Complex trichomes absent, body bare or with simple setae ...................... 3

3(4) Head very small, elongated anteriorly into a rostrum. Body strongly flattened dorso-ventrally, without paraterga and macrochaetae ........... order Polyzoniida, family Polyzoniidae, genus *Angarozonium*, *A. bonum*.

4(3) Head larger, more or less ovoid, devoid of a rostrum. Body more or less cylindrical, with paraterga and 3+3 macrochaetae .... ................................. 5

5(14) Telson with a pair of spinnerets .............. order Chordeumatida

6(13) Each metatergite with paraterga ............. family Diplomaragnidae

7(8) Colpocoxites of posterior gonopods flattened on sides, not sagittally. Lateral sheath process present ........................ Genus *Orientyla*, *O. dahurica*

8(7) Colpocoxites of posterior gonopods different, if flattened, then frontocaudally. Lateral sheath process absent .......... 9

9(12) Gonopod anterior angiocoxal processes present .......... genus *Diplomaragna*
10(11) Posterior angiocoaxal process of posterior gonopod like a caudally convex plate with an undulate edge, devoid of teeth. Body length 12–12.5 mm ...................... D. zimoveinaya

11(10) Posterior angiocoaxal process of posterior gonopod large, with broad mesal denticle protrusions. Body length 20–22 mm ....................... D. terricolor

Map. Species diversity of Diplopoda within the Sikhote-Alin State Nature Biosphere Reserve. The numbers of the natural landmarks (1–18) are explained in the "Material and Methods section"
12(9) Gonopod anterior angiocoxal processes absent ........ genus *Pacifosoma, P. kuruma*
13(6) Each metatergite without paraterga .................. family Caseyidae, genus *Underwoodia, U. kurtseveia*
14(5) Telson without a pair of spinnerets ............ .......................... 15
15(26) Metatergites with paraterga. Eyes absent. Adult body with 20 segments, including telson ........... order Polydesmida
16(19) Paraterga well-developed, serrate at lateral margin, without peritremata. Body relatively slender; metaterga relatively flat, with three transverse rows of bosses. Gonopod coxites fused medially .................. family Polydesmidae
17(18) Paraterga broad. Body relatively large (adults >15 mm long) ........... genus *Epanerchodus, E. polymorphus*
18(17) Paraterga narrow. Body relatively small (adults <15 mm long) ........... genus *Uniramidesmus, U. dentatus*
19(16) Paraterga relatively poorly-developed, with peritremata, non-serrate at lateral margin. Body stout, metaterga strongly convex, arched, without rows of bosses. Gonopods free from each other basally ............ family Xystodesmidae, genus *Levizonus*
20(23) Adults poorly pigmented: whitish to yellowish with or without brown dorsal pattern. Gonopods simple, without conspicuous solenomere branch ............ family Paradoxosomatidae
21(22) Apex of gonopod telopodite like two plates placed perpendicular to each other; one of the plates serrate at outer margin .................. *L. malewitschi*
22(21) Apex of gonopod telopodite different. Solenomere with a large horn basally ............ *L. distinctus*
23 (20) Adults strongly pigmented: brown to dark brown with yellow peritremata. Gonopods complex, with an evident solenomere branch .................. family Paradoxosomatidae
24(25) Peritremata of midbody segments poorly demarcated ventrally. Gonopod solenomere flagelliform .................. genus *Sichotanus, S. eurygaster*
25(24) Peritremata of midbody segments evidently demarcated ventrally. Gonopod solenomere different .................. genus *Cawjekelia, C. koreana*
26(15) Metatergites without paraterga, body subcylindrical Eyes present. Adult body with more than 30 segments .......... order Julida
27(28) Surface of metazonites completely striate .................. family Julidae, genus *Pacifiilus, P. amurensis*
28(27) Surface of metazonites clearly striate only below ozopore level .................. family Mongoliulidae
29(30) Male leg 7 with very long coxal process covering with spinose setae, large ............ genus *Skleroprotopus, S. coreanus*
30(29) Male leg 7 without very long coxal process covering with spinose setae, small .... 31
31(32) Posterior gonopod divided from the basis into two equally long branches .................. genus *Koiulus, K. interruptus*
32(31) Posterior gonopod not divided from the basis into two equally long branches ....... genus *Kopidoiulus, K. continentalis*

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