

# *Julus ghilarovi* Gulička, 1963 s.str.: time to put an end to confusion (Diplopoda: Julida: Julidae)

## *Julus ghilarovi* Gulička, 1963 s.str.: пора заканчивать путаницу (Diplopoda: Julida: Julidae)

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KEY WORDS: *Julus*, *ghilarovi*, *brachydactylus*, *insolitus*, taxonomy, millipedes, fauna, new records, Siberia, Asian Russia.

КЛЮЧЕВЫЕ СЛОВА: *Julus*, *ghilarovi*, *brachydactylus*, *insolitus*, таксономия, двупарноногие многоножки, фауна, новые находки, Сибирь, азиатская часть России.

ABSTRACT. The following few taxonomic changes are proposed: *Julus ghilarovi* Gulička, 1977, stat.revalid. ex *Julus ghilarovi ghilarovi* Gulička, 1972, *Julus ghilarovi brachydactylus* Gulička, 1972 = *Julus brachydactylus* Gulička, 1972, stat.n. = *Julus insolitus* Mikhaljova, 2009, syn.n. The distributions of both species are refined.

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РЕЗЮМЕ. Предложены несколько таксономических изменений: *Julus ghilarovi* Gulička, 1972, stat.revalid. ex *Julus ghilarovi ghilarovi* Gulička, 1972, *Julus ghilarovi brachydactylus* Gulička, 1972 = *Julus brachydactylus* Gulička, 1972, stat.n. = *Julus insolitus* Mikhaljova, 2009, syn.n. Для обоих видов приведены уточненные сведения по их распространению.

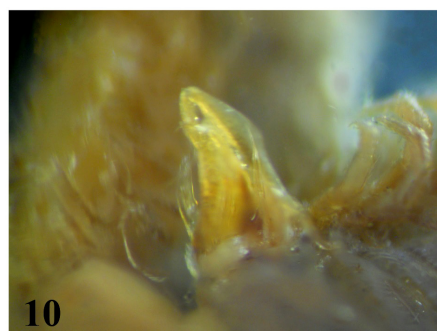
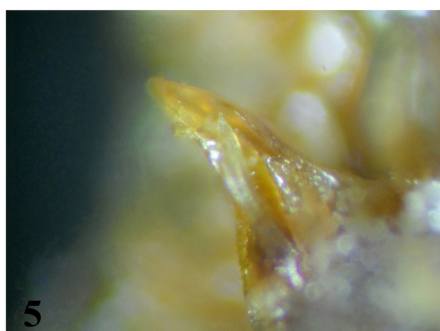
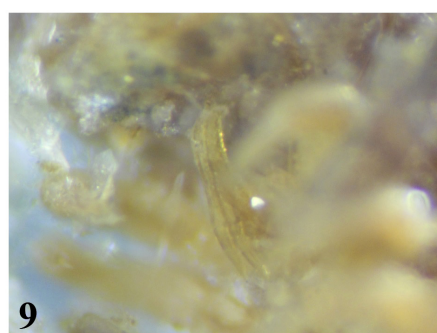
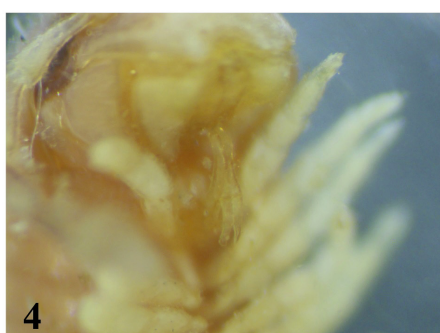
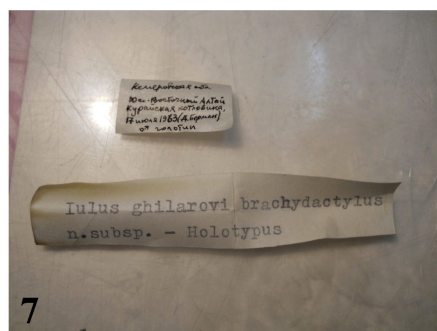
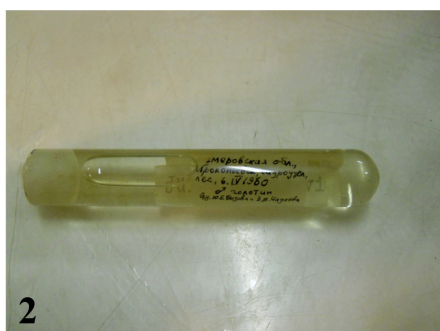
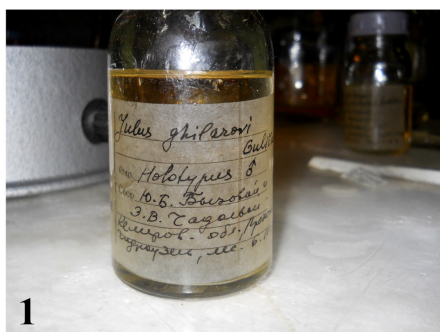
### Introduction

In 1963 and 1972, the Czechoslovak myriapodologist Jan Gulička, of Bratislava, published the results of his studies on some millipede material from the former Soviet Union, mostly Siberia, that had been sent to him by Prof. M.S. Ghilarov, Head of the Laboratory of Soil Zoology at the A.N. Severtsov Institute of Animal Evolutionary Morphology and Ecology, USSR Academy of Sciences, Moscow (now the Institute for Problems of Ecology and Evolution, Russian Academy of Sciences, Moscow). Among the numerous Diplopoda then considered, Gulička [1963] described a new species of *Julus* Linnaeus, 1758 he dedicated to M.S. Ghilarov: *Julus ghilarovi* Gulička, 1963, from the Kemerovo

Area, southwestern Siberia. That was the first valid record of a *Julus* in the Asian part of Russia, because the original description of *Julus profugus* Stuxberg, 1876, from between Tomsk and Kansk [Stuxberg, 1876], was too poor to be certain about its generic allocation.

*Julus* Linnaeus, 1758 is a rather small, but common and widespread genus of the diplopod family Julidae; it counts 18 species or subspecies and covers much, but not all of the Palaearctic, ranging from Western Europe (east of both Ireland and the Iberian Peninsula) in the west, through the Caucasus, to southern Siberia and Mongolia in the east [Evsyukov *et al.*, 2018].

A few years following the description of *J. ghilarovi*, Gulička [1972] distinguished two subspecies of that species: *J. g. ghilarovi* and *J. g. brachydactylus* Gulička, 1972. The latter subspecies he described from the Kurai Depression, SE Altai, was stated to differ from the nominotypical *J. g. ghilarovi* only by the structure of the opisthomere. In particular, this was depicted to lower and wider, with a notch/emargination between the lateral process of the opisthomere and the solenomere being relatively shallow, only ca 1/3 as deep as opisthomere height. Subsequent records of *J. g. brachydactylus* from near Ust-Kan and in eastern Kazakhstan [Mikhaljova, Golovatch, 2001] added some more characters that distinguished these two subspecies even more clearly, but for a long time they all were regarded as demonstrating only intraspecific variations between these two forms [Mikhaljova, 2004]. The *J. g. ghilarovi* – *J. g. brachydactylus* pair of subspecies remained the sole in *Julus*. A few more records of *J. g. brachydactylus* from south of Lake Teletskoye [Nefedieva, Nefediev, 2008] were later re-identified as *J. insolitus* Mikhaljova, 2009 [Nefediev, Nefedieva, 2013; Nefedieva *et al.*, 2014, 2015].





Only very recently has E.V. Mikhajlova [2017] reinstated the minimal variability in *J. g. ghilarovi* both in the shape of the outer lateral process of the opisthomere and the depth of its notch. She also pointed out the need to check the distribution area of this subspecies.

To solve the riddle, the type material of both subspecies of *J. ghilarovi*, now deposited in the collection of the Zoological Institute, St. Petersburg, Russia (ZIN), has been restudied. Additional material of *J. ghilarovi* s.str. from the collections of the Zoological Museum of the Lomonosov Moscow State University, Moscow (ZMUM) and the Federal Scientific Center of the East Asian Terrestrial Biodiversity, Far Eastern Branch of the Russian Academy of Sciences, Vladivostok (FSCB), both Russia, has also been re-examined. Fresh material from a typical territory of *J. g. brachydactylus* has been taken and considered as well. The present paper clarifies the status of both subspecies of *J. ghilarovi*, provides new records and refines the distribution area of the species involved.

The new material treated herein has mainly been deposited in the collection of the Altai State University, Barnaul, Russia (ASU), partly shared also between the ZMUM and FSCB collections.

The specimens were examined using MBS-1, MBS-9 and MBS-10 stereo microscopes, and stacks of colour images were manually generated using a Nikon Coolpix L22 digital camera. SEM micrographs were prepared at two labs: the Laboratory of Phylogeny and Faunogenesis, Institute of Systematics and Ecology of Animals, Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia (ISEA) using a Hitachi TM-1000 scanning electron microscope; and the Laboratory of Aquatic Ecology, Institute for Water and Environmental Problems, Siberian Branch, Russian Academy of Sciences, Barnaul, Russia (IWEP) using a Hitachi S-3400N scanning electron microscope. Digital images were prepared with the help of Helicon Focus 6 image stacking software. The distribution map was composed using QGIS 3.0.

## Taxonomic part

### Class Diplopoda

### Order Julida

### Family JULIDAE

#### *Julus ghilarovi* Gulička, 1963

Figs 1–5, 12, 14, 15, 18.

*Julus ghilarovi* Gulička, 1963: 521, 520: figs.

*Julus ghilarovi* — Byzova, Chadaeva, 1965: 337; Mikhajlova, 1993: 5; 2002: 206; 2016: 6; Nefediev, 2002: 35; Mikhajlova, Nefediev, 2003: 84; Nefediev, Nefedieva, 2007b: 161; 2008a: 117; Babenko *et al.*, 2009: 184.

*Julus ghilarovi ghilarovi* Gulička, 1972: 44, fig., **syn.n.**

*Julus ghilarovi ghilarovi* — Lokšina, Golovatch, 1979: 386; Mikhajlova, 1993: 10, 11: figs; 2004: 59, 60: figs; 61: map; 2013: 8; 2017: 61, figs; 63: map; Mikhajlova, Golovatch, 2001: 104; Nefediev, Nefedieva, 2006: 98; 2007a: 139; 2007b: 161; 2008b: 62; 2013: 87; 2017: 288; Nefedieva, Nefediev, 2008: 123; Babenko *et al.*, 2009: 183; Nefediev *et al.*, 2014: 63; Nefedieva *et al.*, 2014: 65; 2015: 144; Evsyukov, 2016: 241; Evsyukov *et al.*, 2018: 91.

non *Julus ghilarovi* pro parte — Mikhajlova, Nefediev, 2003: 84.

NEW MATERIAL EXAMINED. 1 ♂, 1 ♂ subad. (ZMUM), [Russia, southwestern] Siberia, [Republic of Altai, Turochak District], Altai Mts., Lake Teletskoe, Altaisky Nature Reserve, Korbu Waterfalls, *Picea obovata* + *Abies sibirica* + *Pinus sibirica* taiga forest, 600 m, 17.07.1997, leg. S. Golovatch; 2 ♀♀ (FSCB), [same Republic], Central Altai, E slope of Kyzylart Mt. Range, subalpine meadows, 2100–2300 m a.s.l., 16–19.07.2000, leg. A.V. Matalin; 6 ♂♂, 6 ♀♀, 21 juv. (ASU), same Republic, Ulagan District, near Aktash, N slope of Mt Belkenek, *Pinus sibirica*, *Larix sibirica* and *Picea obovata* forest, 50.306065°N, 87.586254°E, 1390 m a.s.l., 16.07.2006; 4 ♂♂, 13 ♀♀, 2 ♂♂ subad., 2 ♀♀ subad. (ASU), same Republic, same District, near Aktash, foot of Mt Belkenek, *Pinus sibirica*, *Larix sibirica* and *Picea obovata* forest with *Caragana arborescens*, 50.308720°N, 87.579705°E, 1320 m a.s.l., 1.08.2006; 1 ♂ (ASU), same Republic, same District, near Aktash, foot of Mt Aktash, valley of Chibitka River, *Larix sibirica* forest with *Caragana arborescens*, 50.317514°N, 87.588288°E, 1330 m a.s.l., 3.08.2006; 2 ♀♀ (ASU), same locality, 50.318818°N, 87.599060°E, 1380 m a.s.l., 5.08.2006; 15 ♂♂, 23 ♀♀, 7 juv. (ASU), same Republic, same District, near Aktash, ravine on S slope of Mt Aktash, bush thicket along brook, 50.333888°N, 87.581207°E, 1760 m a.s.l., 5.08.2006; 4 ♂♂, 26 ♀♀, 1 ♂ subad., 1 ♀ subad., 21 juv., 1 fragm. (ASU), same Republic, same District, 3.7 km N of Aktash, summit of Mt Aktash, *Pinus sibirica* and *Larix sibirica* forest, 50.349499°N, 87.585986°E, 2110 m a.s.l., 5.08.2006; 4 ♂♂, 1 ♀, 1 ♂ subad., 3 ♀♀ subad., 1 juv. (ASU), same Republic, Ongudai District, 6.5 km ESE of Belyi Bom, valley of Tutugoi River, *Betula* forest, 50.360284°N, 87.128623°E, 1220 m a.s.l., 9.08.2006; 2 ♀♀, 1 ♂ subad. (ASU), same Republic, same District, 9 km NNW of Tuekta, valley of Tuekta River, *Larix sibirica* forest with *Ribes rubrum*, *Lonicera* and rich herbaceous vegetation, 50.360284°N, 87.128623°E, 1095 m a.s.l., 12.08.2006; 3 ♂♂, 7 ♀♀, 1 ♂ subad., 11 ♀♀ subad., 1 juv. (ASU), same Republic, Ulagan District, 17 km NNW of Aktash, Lake Sorulukiol, *Betula rotundifolia*, *Pentaphylloides fruticosa*, *Salix*, Poaceae, *Carex*, 50.456107°N, 87.485613°E, 1825 m a.s.l., 9.08.2007; 5 ♂♂, 12 ♀♀, 3 ♂♂ subad., 3 ♀♀ subad., 6 juv. (ASU), same Republic, same District, 17.5 km NNW of Aktash, Lake Sorulukiol, *Betula rotundifolia*, 50.455771°N, 87.480603°E, 1840 m a.s.l., 13.08.2007, all leg. P.S. Nefediev, J.S. Nefedieva; 1 ♂ (ASU), same Republic, same District, Aigulakskii Mt. Range, source of Sardyma River, scree going down the river, 50°23'N, 87°33'E, 2250 m a.s.l., 29.07.2016; 1 ♀ (ASU), same Republic, same District, Kuraiskii Mt. Range, watershed of Korumduairy and Yarlyamry rivers, mossy rocky wall of ravine in *Larix sibirica* forest, 50°19'N, 87°42'E, 2000–2150 m a.s.l., 7.08.2016; 1 ♂ (ASU), same locality, rocks at timberline of *Larix sibirica* forest, 50°20'N 87°43'E, 2300 m a.s.l., 7.08.2016, all leg. A.A. Fomichev; 1 ♂, 1 ♀ (ASU), same Republic, Ongudai District, 7.5 air-km ENE of Seminskii Pass, Seminskii Mt. Range, near Mt Sarlyk, alpine meadow with sparse stands of *Pinus sibirica* and *Picea obovata* with *Betula*

Figs 1–10. *Julus ghilarovi* Gulička, 1963, ♂ holotype. 1 — jar with the specimen; 2 — vial with a label; 3 — midbody segments, lateral view; 4 — large coxal outgrowth of ♂ leg pair 2, ventro-lateral view; 5 — gonopods, lateral view. *Julus ghilarovi brachydactylus* Gulička, 1972, ♂ holotype. 6 — jar with the specimen; 7 — labels; 8 — habitus, lateral view; 9 — large coxal outgrowth of ♂ leg pair 2, ventro-lateral view; 10 — gonopods, caudo-lateral view. Pictures taken not to scale.

Рис. 1–10. *Julus ghilarovi* Gulička, 1963, голотип ♂. 1 — банка с экземпляром; 2 — пробирка с этикеткой; 3 — средние сегменты тела, вид сбоку; 4 — большой коксальный отросток 2 пары ног ♂, вид сбоку и снизу; 5 — гоноподы, вид сбоку. *Julus ghilarovi brachydactylus* Gulička, 1972, голотип ♂. 6 — банка с экземпляром; 7 — этикетки; 8 — габитус, вид сбоку; 9 — большой коксальный отросток 2 пары ног ♂, вид сбоку и снизу; 10 — гоноподы, вид сбоку и сзади. Фотографии без масштаба.

*rotundifolia*, rocks, 51.06257°N, 85.70872°E, 1970 m a.s.l., under stones, 21.07.2018, leg. P.S. Nefediev, V.I. Gusarov; 7 ♂♂, 2 ♀♀, 5 juv. (ASU), same Republic, same District, 7.5 air-km ENE of Seminskii Pass, Seminskii Mt. Range, near Mt Sarlyk, forest patch with *Pinus sibirica* and *Picea obovata*, small gaps, rocks, *Betula rotundifolia*, 51°03.964'N, 85°42.421'E, ca 1990 m a.s.l., sifting leaf litter and moss over 120 m, 21.07.2018; 7 juv. (ASU), same locality, 8 air-km ENE of Seminskii Pass, alpine meadow with bush patches (*Betula rotundifolia* and *Salix*) and a few scattered trees (*Pinus sibirica*, *Picea obovata*, *Larix sibirica*), 51°04.031'N, 85°42.779'E, ca 2065 m a.s.l., sifting leaf litter and moss over 70 m, 21.07.2018, all leg. V.I. Gusarov, M.F. Maurstad, V. Løvgeng; 1 ♂ subad. (ASU), same Republic, same District, 20 air-km W of Chibit, floodplain of Chuya River, near Shirak Waterfall, right bank of the river, *Betula* forest, 50.34461°N, 87.22323°E, 1015 m a.s.l., 23.07.2018, leg. V.I. Gusarov; 4 ♂♂, 6 ♀♀, 5 ♂♂ subad., 8 ♀♀ subad., 64 juv. (ASU), same locality, riverine terrace and slopes with *Picea obovata*, *Betula*, *Caragana arborescens*, 50°20.670'N, 87°13.388'E, 1000 m a.s.l., sifting flood refuse and leaf litter at river banks and on slopes over 300 m, 23.07.2018, leg. V.I. Gusarov, M.F. Maurstad, V. Løvgeng; 14 ♂♂, 11 ♀♀, 4 ♂♂ subad., 8 ♀♀ subad., 8 juv. (ASU), same locality, *Betula* forest with *Larix sibirica*, *Caragana arborescens*, low grasses and green mosses, 50.34358°N, 87.22225°E, ca 1015 m a.s.l., 23.07.2018; 10 ♀♀, 3 ♀♀ subad., 4 juv. (ASU), same locality, valley of Chuya River, near Shirak Waterfall, *Picea obovata* forest with *Betula*, 50.34417°N, 87.22231°E, ca 1035 m a.s.l., in green mosses, 23.07.2018; 5 ♂♂, 7 ♀♀, 5 ♂♂ subad., 18 ♀♀ subad., 17 juv. (ASU), same locality, valley of Chuya River, Shirak Waterfall, *Betula* forest with *Alnus*, *Lonicera* and tall grasses, along brook down the waterfall, 50.34542°N, 87.21915°E, ca 1080 m a.s.l., 23.07.2018, all leg. P.S. Nefediev; 3 ♂♂, 3 ♀♀, 2 ♂♂ subad., 5 juv. (ASU), same locality, *Betula* grove along creek, 50°20.690'N, 87°13.213'E, ca 1080 m a.s.l., sifting leaf litter over 40 m, 23.07.2018, leg. V.I. Gusarov, M.F. Maurstad, V. Løvgeng; 4 ♂♂, 5 ♀♀, 1 ♂ subad., 1 ♀ subad. (ASU), same Republic, Kosh-Agach District, 5.5 air-km NNE of Kurai, S macroslope of Kurai Mt. Range, valley of Kuraika River, left bank of Kuraika River, 5.5 km up the river from Chuya Tract, *Larix sibirica* and *Picea obovata* forest with *Pinus sibirica*, *Caragana arborescens*, low grasses and green mosses, 50.28225°N, 87.95463°E, ca 1790 m a.s.l., in mosses, under fallen tree trunks, 25.07.2018; 3 ♂♂, 13 ♀♀, 2 ♀♀ subad., 1 juv. (ASU), same Republic, same District, 20 air-km NE of Kokorya, W macroslope of Chikhachiova Mt. Range, Talduair Massif, valley of Sailugem River, right bank of Sailugem River, bottom of S slope, scree with *Astragalus*, *Artemisia*, *Comarum salesovianum*, 50.01770°N, 89.23775°E, ca 2245 m a.s.l., under stones lying on bush branches, in herb debris, 26.07.2018; 1 ♂, 2 ♀♀ (ASU), Russia, **Altai Province**, Zalesovo District, at border with Kemerovo Area, 54.235533°N, 85.375949°E, *Betula* forest with *Ribes nigrum*, 400 m a.s.l., 3.07.2018, all leg. P.S. Nefediev; 1 ♂, 4 ♀♀ (ASU), Russia, **Novosibirsk Area**, Toguchin District, Yurty, 14.08.2007, leg. A.S. Babenko.

TYPE MATERIAL RE-EXAMINED. ♂ holotype of *Julus ghilarovi* Gulička, 1963 (ZIN), labeled "Kemerovo Area, Prokopyevsk, waterworks, forest, 6.IV.1960, Yu.B. Byzova, Z.V. Chadava".

REMARKS. Despite the holotype of *J. ghilarovi* Gulička, 1963 remaining intact, I do not hesitate to confirm that the specimen belongs to a typical ♂ of *J. ghilarovi*. No dissection of the gonopods was necessary, because they protrude outside and can easily be examined in situ (see also below). In addition, the large coxal outgrowth of ♂ leg pair 2 is slender all along, with a posterior process (Figs 1–5).

MATERIAL RE-EXAMINED (specimens previously identified as *J. ghilarovi* or *J. g. ghilarovi* and published by Mikhajlova, 1993, Mikhajlova, Golovatch, 2001, Mikhajlova, Nefediev, 2003). 6 ♀♀ (FSCB), [Russia, southwestern Siberia, **Republic of Altai**, Ulagan District], Altai Mts., Kuraisky Mt. Range, Aktash, 2500 m, *Betula nana* [in fact, *Betula rotundifolia*] + mountain tundra, under stones, 12–25.07.2000, leg. O. Gorbunov; 1 ♂, 5 ♀♀ (FSCB), **Krasnoyarsk Province**, Sayano-Shushenskii Nature Reserve, Lake

Ekspeditsionnoye, bald mountain (= goltsy), 2100 m a.s.l., 27.07.–20.08.1993; 1 ♂ (FSCB), same locality, pitfall traps, 14–19.07.1992; 1 juv. (FSCB), same locality, plot B, soil sample 61, AoF, 18.07.1992; 1 ♂ (FSCB), same locality, plot B, soil sample 63, AoF, 18.07.1992, all leg. L.B. Rybalov; 11 ♂♂, 6 ♀♀, 17 juv. (FSCB), **Republic of Khakassia**, Bolshoi On River, 15.06.1990, leg. A.B. Ryvkin; 3 ♂♂, 4 ♀♀, 1 ♂ subad., 1 ♀ subad., 8 juv. (ASU), same Republic, [Shira District], near Kommunar, ca 2 km upstream of Bolnichnyi Stream, lower part of talus, under stones and moss, 30.07.1999; 2 ♂♂, 6 ♀♀, 2 juv. (ASU), same locality, *Abies* forest, 2.08.1999; 1 ♂ (ASU), same locality, *Betula* and *Abies* forest, 2.08.1999; 2 ♂♂, 8 ♀♀, 4 ♂♂ subad., 1 ♀ subad., 6 juv., 1 fragm. (ASU), same Republic, [Shira District], near Kommunar, ca 4 km upstream of Bolnichnyi Stream, mixed forest, 1.08.1999, all leg. P.S. Nefediev.

REMARKS. A restudy of ten ♀♀ from the Altai Mts., Kuraisky Mt. Range, near Aktash, 2500 m a.s.l., *Betula nana* + mountain tundra, under stones, 12–25.VII.2000, leg. O.G. Gorbunov, previously identified as *J. ghilarovi* by Mikhajlova, Nefediev [2003], shows that only six ♀♀ actually belong to *J. ghilarovi*. A re-examination of all specimens from the Krasnoyarsk Province, Sayano-Shushenskii Nature Reserve, previously determined as *J. g. ghilarovi* by Mikhajlova, Golovatch [2001], shows that all of them apparently belong to a new species of *Julus* (sp. 1). The same situation was faced as regards all specimens from the Republic of Khakassia, Bolshoi On River, previously identified as *J. g. ghilarovi* by Mikhajlova [1993], as all of these samples belong to another new species (*Julus* cf. sp. 2). Hence, these localities can be excluded from the distribution area of *J. ghilarovi*, whereas these new species will be described elsewhere. However, a restudy of some material from the environs of Kommunar [see Mikhajlova, Nefediev, 2003] shows that *J. ghilarovi* does inhabit the Republic of Khakassia (see re-examined records above), as well as *Julus* cf. sp. 2.

DISTRIBUTION. Being one of the most widespread *Julus* species in SW Siberia, the distribution area of *J. ghilarovi* is restricted to the Novosibirsk and Kemerovo areas, the Republic of Khakassia, the Altai Province and the Republic of Altai (Fig. 18).

### *Julus brachydactylus* Gulička, 1972, stat.n. Figs 6–11, 13, 16–18.

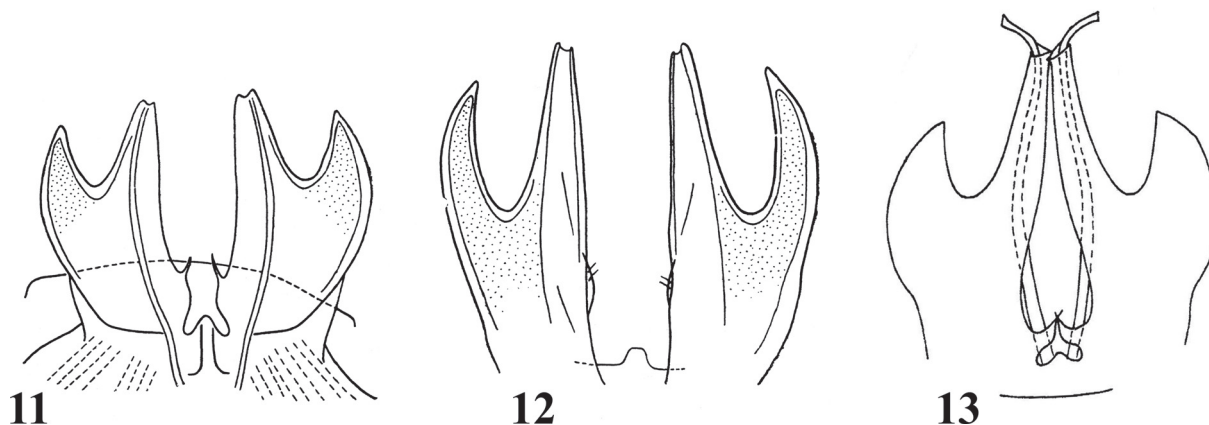
*Julus ghilarovi brachydactylus* Gulička, 1972: 44, fig., **syn.n.**  
*Julus ghilarovi brachydactylus* — Lokšina, Golovatch, 1979: 386; Mikhajlova, 1993: 10; 2013: 8; Nefediev, Nefedieva, 2007b: 162; 2008a: 117; 2008b: 62; 2013: 87; Evsyukov, 2016: 241; Evsyukov et al., 2018: 91.

dubia *Julus ghilarovi brachydactylus* — Mikhajlova, Golovatch, 2001: 104; Mikhajlova, 2004: 61, 62; figs, 61: map; 2017: 63, 64; fig, 63: map.

non *Julus ghilarovi brachydactylus* — Nefedieva, Nefediev, 2008: 123.

*Julus insolitus* Mikhajlova, 2009: 66, 64: figs., **syn.n.**  
*Julus insolitus* — Nefediev, Nefedieva, 2013: 87; Nefedieva et al., 2014: 65; 2015:145; Mikhajlova, 2016: 6; Evsyukov, 2016: 241; Evsyukov et al., 2018: 91; Mikhajlova, 2017: 67, 68: figs, 56: map.

NEW MATERIAL EXAMINED. 3 ♂♂, 10 ♀♀, 10 ♂♂ subad., 6 ♀♀ subad., 1 juv. (ASU), Russia, southwestern Siberia, **Republic of Altai**, Ulagan District, 5.5 km SE of Aktash, Starye Miony, near Kara-Tyt Spring, floodplain of Mionka River, *Picea obovata* forest with green mosses, 50.281032°N, 87.680762°E, 1410 m a.s.l., 20.07.2006; 8 ♂♂, 4 ♀♀ (ASU), same Republic, Ongudai District, 3.5 km SW of Belyi Bom, valley of Syrnakh River, along the road to Shavla Nature Reserve, *Ribes nigrum*, 50.347834°N, 86.998210°E, 1165 m a.s.l., 21.07.2006; 1 ♂, 4 ♀♀ (ASU), same Republic, same District, 9 km SSW of Belyi Bom,



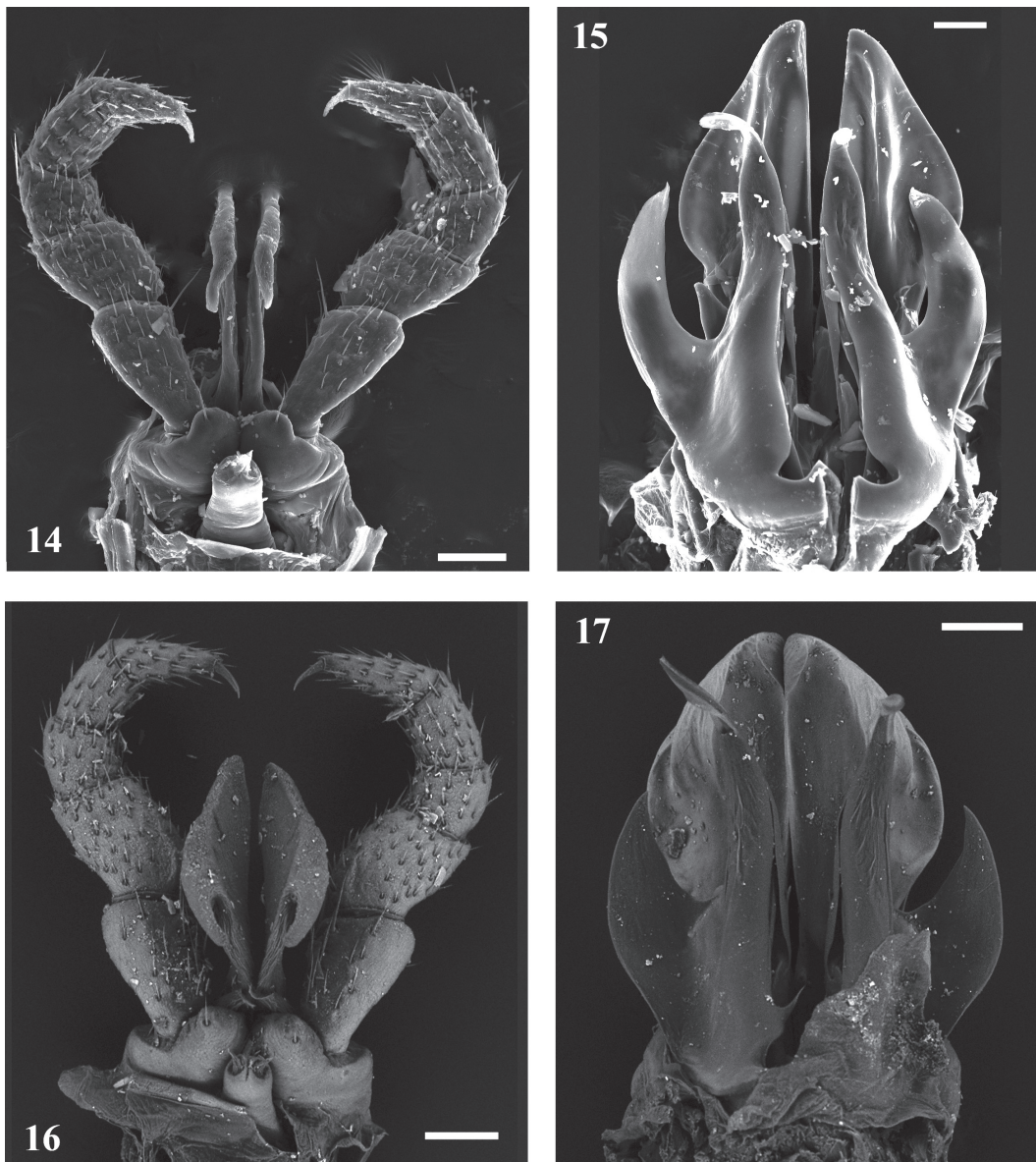
Figs 11–13. *Julus ghilarovi brachydactylus* Gulička, 1972. 11 — opisthomere, caudal view. *Julus ghilarovi ghilarovi* Gulička, 1972. 2 — opisthomere, caudal view. *Julus insolitus* Mikhailjova, 2009. 3 — opisthomere, caudal view (1–2 after Gulička, 1972, 3 — after Mikhailjova, 2009 with changes).

Рис. 11–13. *Julus ghilarovi brachydactylus* Gulička, 1972. 11 — опистомер, вид сзади. *Julus ghilarovi ghilarovi* Gulička, 1972. 2 — опистомер, вид сзади. *Julus insolitus* Михайлова, 2009. 3 — опистомер, вид сзади (1–2 по Гуличка, 1972, 3 — по Михайлова, 2009 с изменениями).

near Achik Pass, sparse *Pinus sibirica* forest edge, 50.295678°N, 86.977943°E, 2120 m a.s.l., 21.07.2006; 24 ♂♂, 21 ♀♀, 11 ♂♂ subad., 3 ♀♀ subad., 6 juv. (ASU), same Republic, Kosh-Agach District, 14.5 km S of Belyi Bom, sparse *Pinus sibirica* forest with *Larix sibirica*, *Betula rotundifolia* and *Lonicera*, 50.238173°N, 87.003786°E, 1830 m a.s.l., 22.07.2006; 1 ♂ (ASU), same Republic, same District, 15.5 km S of Belyi Bom, *Juniperus* on cliff, 50.229991°N, 87.002996°E, 1725 m a.s.l., 22.07.2006; 7 ♂♂ (ASU), same Republic, same District, 15 km S of Belyi Bom, *Larix sibirica* forest, 50.233899°N, 87.004114°E, 1810 m a.s.l., 22.07.2006; 4 ♂♂, 3 ♀♀, 1 juv. (ASU), same Republic, same District, 15.5 km S of Belyi Bom, subalpine meadow, 50.230637°N, 87.002505°E, 1735 m a.s.l., under *Pentaphylloides fruticosa*, 22.07.2006; 9 ♂♂, 26 ♀♀, 1 ♂ subad., 3 ♀♀ subad., 10 juv. (ASU), same Republic, Ulagan District, 12 km N of Aktash, *Pinus sibirica* forest, 50.425335°N, 87.591517°E, 1960 m a.s.l., 31.07.2006; 2 ♂♂, 12 ♀♀, 2 ♂♂ subad., 5 ♀♀ subad. (ASU), same Republic, same District, near Aktash, foot of Mt Belkenek, *Pinus sibirica*, *Larix sibirica* and *Picea obovata* forest with *Caragana arborescens*, 50.308720°N, 87.579705°E, 1325 m a.s.l., 1.08.2006; 12 ♂♂, 5 ♀♀, 1 ♂ subad., 1 ♀ subad. (ASU), same Republic, same District, near Aktash, N slope of Mt Belkenek, old fire-site with young *Betula* forest, *Ribes nigrum*, 50.304158°N, 87.582366°E, 1530 m a.s.l., 2.08.2006; 2 ♂♂, 5 ♀♀ (ASU), same Republic, same District, near Aktash, ravine on S slope of Mt Aktash, bush thicket along brook, 50.333888°N, 87.581207°E, 1765 m a.s.l., 5.08.2006; 29 ♂♂, 33 ♀♀, 4 ♂♂ subad., 5 ♀♀ subad., 4 juv. (ASU), same Republic, same District, 3.7 km N of Aktash, summit of Mt Aktash, *Pinus sibirica* and *Larix sibirica* forest, 50.349499°N, 87.585986°E, 2115 m a.s.l., 5.08.2006; 1 ♂, 1 ♀ (ASU), same Republic, same District, near Aktash, foot of Mt Aktash, valley of Chibitka River, 50.318818°N, 87.599060°E, 1380 m a.s.l., 5.08.2006; 4 ♂♂, 8 ♀♀, 2 juv. (ASU), same Republic, Ongudai District, 6.5 km ESE of Belyi Bom, valley of Tutugoi River, *Betula* forest, 50.360284°N, 87.128623°E, 1200 m a.s.l., 9.08.2006; 1 ♂, 3 ♀♀ (ASU), same locality, *Betula* and *Larix sibirica* forest, 50.359698°N, 87.126924°E, 1195 m a.s.l., 9.08.2006; 2 ♀♀ (ASU), same Republic, same District, 9 km NNW of Tuekta, valley of Tuekta River, *Larix sibirica* forest with *Ribes rubrum*, *Lonicera* and rich herbaceous vegetation, 50.360284°N, 87.128623°E, 1095 m a.s.l., 12.08.2006, all leg. P.S. Nefediev, J.S. Nefedieva; 1 ♂, 1 ♀ (ASU), same Republic, Ulagan District, Aigulakskii Mt. Range, source of Sardyma River, scree under rocks in *Larix sibirica* forest, 50°23'N 87°33'E, 2200 m a.s.l., 29.07.2016; 1 ♂, 4 ♀♀, 1 juv. (ASU), same Republic, same District, Kuraiskii

Mt. Range, watershed of Korumduairy River and Yarlyamry River, mossy rocky wall of ravine in *Larix sibirica* forest, 50°19'N 87°42'E, 2000–2150 m a.s.l., 7.08.2016, all leg. A.A. Fomichev; 2 ♂♂, 6 ♀♀, 2 ♂♂ subad., 2 juv. (ASU), same Republic, same District, Aigulakskii Mt. Range, subalpine meadow with stony streams, 50°24'N, 87°33'E, 2400–2500 m a.s.l., 29.07.2016, leg. Yu.V. Dyachkov; 2 ♂♂, 1 ♀ (ASU), same Republic, Ongudai District, 20 air-km W of Chibit, floodplain of Chuya River, near Shirlak Waterfall, right bank of the river, *Betula* forest with *Larix sibirica*, *Caragana arborescens*, low grasses and green mosses, 50.34358°N, 87.22225°E, ca 1015 m a.s.l., 23.07.2018; 1 ♀ (ASU), same locality, *Picea obovata* forest with *Betula*, 50.34417°N, 87.22231°E, ca 1035 m a.s.l., in green mosses, 23.07.2018, leg. P.S. Nefediev; 1 ♂, 7 ♂♂ subad., 1 ♀ subad., 2 juv. (ASU), same locality, riverine terrace and slopes with *Picea obovata*, *Betula*, *Caragana arborescens*, 50°20.670'N, 87°13.388'E, 1000 m a.s.l., sifting flood refuse and leaf litter at river banks and on slopes over 300 m, 23.07.2018, leg. V.I. Gusarov, M.F. Maurstad, V. Løveng; 1 ♂ (ASU), same locality, valley of Chuya River, Shirlak Waterfall, *Betula* forest with *Alnus*, *Lonicera* and tall grasses, along brook down the waterfall, 50.34542°N, 87.21915°E, 1081 m a.s.l., 23.07.2018, leg. P.S. Nefediev; 2 ♂♂ (ASU), same locality, *Betula* grove along creek, 50°20.690'N, 87°13.213'E, ca 1080 m a.s.l., sifting leaf litter over 40 m, 23.07.2018, leg. V.I. Gusarov, M.F. Maurstad, V. Løveng; 1 ♂ (ASU), same Republic, Ulagan District, 10 air-km ENE of Aktash, Kuraiskii Mt. Range, near summit with retranslator, alpine meadow with *Dryas oxyodonta*, 50.32598°N, 87.73575°E, ca 2570 m a.s.l., under stones, in litter, 23.07.2018, leg. P.S. Nefediev; 1 ♂ (ASU), same locality, alpine meadow with rich herbaceous vegetation, Poaceae, *Dryas*, moss and lichens, 50°19.539'N, 87°44.175'E, ca 2555 m a.s.l., sifting dead grass and moss over 50 m, 23.07.2018, leg. V.I. Gusarov, M.F. Maurstad, V. Løveng; 1 ♂, 1 ♀ (ASU), same Republic, Ulagan District, 3 air-km NE of Aktash, valley of Yarlyamry River, *Picea obovata* taiga forest with *Larix sibirica*, *Caragana arborescens* and *Alnus*, 50.33350°N, 87.64925°E, 1575 m a.s.l., in green mosses, 24.07.2018, leg. P.S. Nefediev; 42 ♂♂, 20 ♀♀, 4 ♂♂ subad., 17 ♀♀ subad., 29 juv. (ASU), same locality, forest with *Picea obovata*, *Larix sibirica*, *Pinus sibirica*, *Caragana arborescens*, *Lonicera*, *Ribes*, moss, 50°20.027'N, 87°38.945'E, 1575 m a.s.l., sifting leaf litter and moss over 50 m, 24.07.2018, leg. V.I. Gusarov, M.F. Maurstad, V. Løveng; 4 ♂♂, 7 ♀♀, 1 juv. (ASU), same Republic, Ulagan District, 4 air-km NE of Aktash, valley of Yarlyamry River, *Picea obovata* taiga forest with *Larix sibirica*, *Vaccinium vitis-idaea* and *Alnus*, 50.33167°N, 87.65897°E, ca 1615 m a.s.l., in green mosses, 24.07.2018, leg.





Figs 14–17. *Julus ghilarovi* Gulička, 1963 (Republic of Altai, near Aktash, Mt Aktash). 14 — ♂ leg pair 2, caudal view; 15 — gonopods, caudal view. *Julus brachydactylus* Gulička, 1972 stat.n. 16 — ♂ leg pair 2, caudal view (Republic of Altai, 6.5 km ESE of Belyi Bom, valley of Tutugoi River); 17 — gonopods, caudal view (Republic of Altai, near Aktash, floodplain of Mionka River). Scale bar: 0.1 mm.

Рис. 14–17. *Julus ghilarovi* Гуличка, 1963 (Республика Алтай, около Акташа, гора Акташ). 14 — 2 пара ног ♂, вид сзади; 15 — гоноподы, вид сзади. *Julus brachydactylus* Гуличка, 1972 stat.n. 16 — 2 пара ног ♂, вид сзади (Республика Алтай, 6,5 км ВЮВ Белый Бом, долина реки Тутугой); 17 — гоноподы, вид сзади (Республика Алтай, около Акташа, пойма реки Мёнки). Масштаб: 0,1 мм.

P.S. Nefediev; 21 ♂♂, 12 ♀♀, 3 ♂♂ subad., 4 ♀♀ subad., 16 juv. (ASU), same locality, forest with *Picea obovata*, *Pinus sibirica*, *Larix sibirica*, *Vaccinium vitis-idaea*, *Equisetum*, *Lonicera*, 50° 19.912'N, 87°39.539'E, ca 1640 m a.s.l., sifting leaf litter and moss, over 50 m, 24.07.2018, leg. V.I. Gusarov, M.F. Maurstad, V. Løvend; **neotype** ♂ (ZMUM, Rd 4128), **topotypes**: 5 ♂♂, 4 ♀♀, 1 ♂ subad., 5 ♀♀ subad., 1 juv. (ASU), same Republic, Kosh-Agach District, 5.5 air-km NNE of Kurai, S macroslope of Kurai Mt. Range, valley of Kurai River, left bank of Kurai River, 5.5 km up the river from Chuya Tract, *Larix sibirica* and *Picea obovata* forest with *Pinus sibirica*, *Caragana arborescens*, low grasses and green mosses, 50.28225°N, 87.95463°E, ca 1790 m a.s.l., in mosses, under fallen tree trunks, 25.07.2018; 2 ♂♂, 12 ♀♀ (ASU), same Republic, same District, 9.5 air-km NW of Belyashi (Dzhaza-

tor), W macroslope of Yuzhno-Chuiskii Mt. Range, ford on Ashik River, *Larix sibirica* forest with *Ribes nigrum*, 49.75772°N, 87.31074°E, ca 1665 m a.s.l., in green mosses, 28.07.2018; 8 ♂♂, 4 ♀♀, 12 ♂♂ subad., 9 ♀♀ subad., 66 juv. (ASU), same Republic, same District, 26 air-km NNW of Belyashi (Dzhazator), W macroslope of Yuzhno-Chuiskii Mt. Range, valley of Karagem River, left bank of Karagem River, *Larix sibirica* and *Picea obovata* forest with *Caragana arborescens* and *Alnus* in stream valley, 49.88194°N, 87.20650°E, ca 1560 m a.s.l., under stones, in green mosses, 29.07.2018; 1 ♂, 1 ♀, 1 ♂ subad. (ASU), same locality, open W slope with *Spiraea* in brook valley, 49.88120°N, 87.20644°E, ca 1575 m a.s.l., under stones, in green mosses, 29.07.2018; 3 ♂♂, 2 ♀♀, 8 juv. (ASU), same locality, *Larix sibirica* forest on W slope in stream valley, 49.88080°N, 87.20740°E, ca 1590 m a.s.l., in green



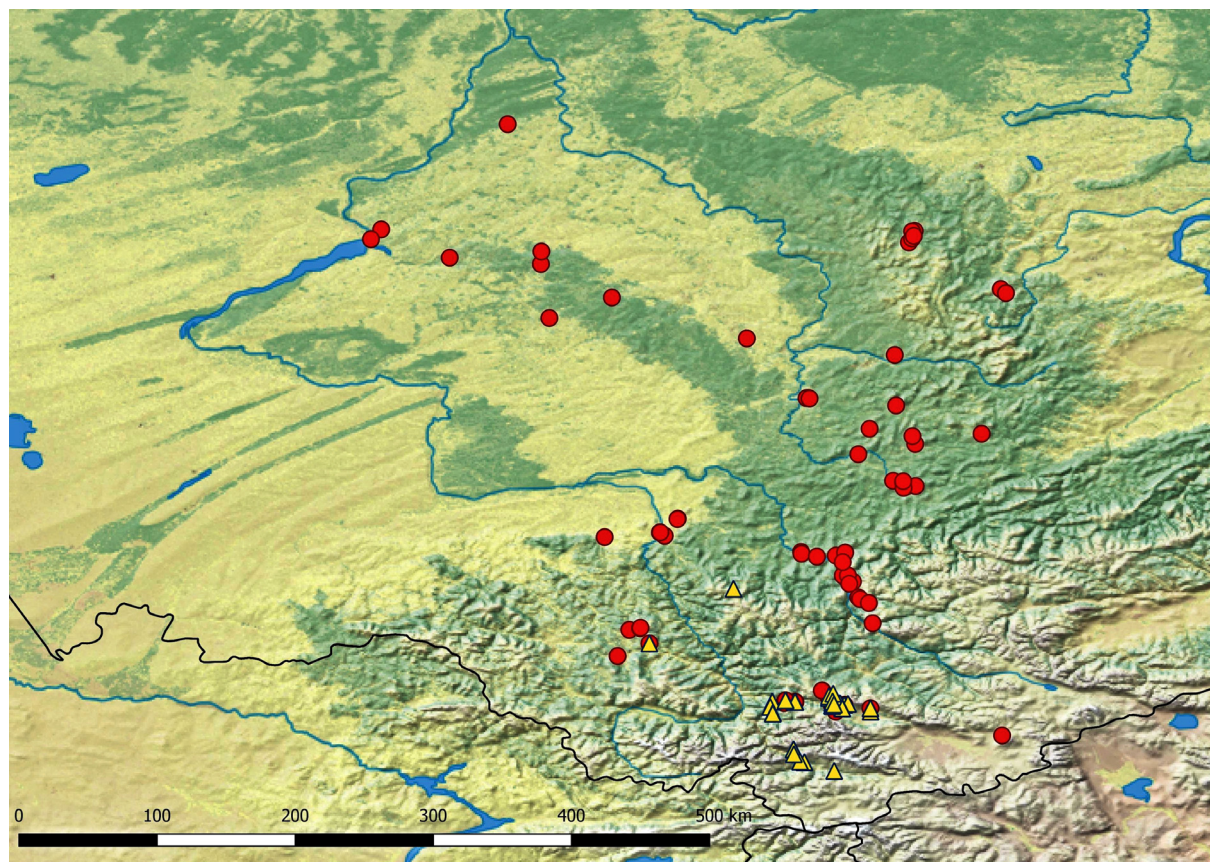


Fig. 18. Distribution of *Julus* species: *ghilarovi* Gulička, 1963 (red circle) and *brachydactylus* Gulička, 1972 stat.n. (yellow triangle).

Рис. 18. Распространение видов *Julus*: *ghilarovi* Gulička, 1963 (красный круг) и *brachydactylus* Gulička, 1972 stat.n. (желтый треугольник).

mosses, 29.07.2018; 1 ♂, 1 ♀, 1 ♀ subad., 10 juv. (ASU), same locality, *Larix sibirica* forest with *Alnus* and young *Betula*, 49.88201°N, 87.20499°E, 1545 m a.s.l., in green mosses, 29.07.2018; 6 ♂♂, 21 ♀♀, 13 ♀♀ subad., 4 juv. (ASU), same Republic, same District, 12.5 air-km WNW of Belyashi (Dzhazator), W macroslope of Yuzhno-Chuiskii Mt. Range, *Larix sibirica* forest with *Caragana arborescens* on pass, 49.76330°N, 87.26820°E, 1800 m a.s.l., in green mosses and litter, 29.07.2018, all leg. P.S. Nefediev; 44 ♂♂, 9 ♀♀, 6 juv. (ASU), same locality, forest with *Larix sibirica* and *Caragana arborescens*, 49°45.799'N, 87°16.114'E, ca 1785 m a.s.l., sifting leaf litter over 40 m, 29.07.2018; 2 ♂♂ (ASU), same Republic, same District, 20 air-km NW of Belyashi (Dzhazator), W macroslope of Yuzhno-Chuiskii Mt. Range, valley of Karasu River, forest with *Pinus sibirica* and *Larix sibirica*, large trees, 49°50.122'N, 87°12.493'E, 1590 m a.s.l., sifting leaf litter and moss over 50 m, 29.07.2018, all leg. V.I. Gusarov, M.F. Maurstad, V. Løveng; 1 ♀ (ASU), same Republic, same District, 13 air-km ESE of Belyashi (Dzhazator), valley of Dzhazator River, *Larix sibirica*, *Picea obovata* and *Betula* stands with *Alnus*, *Lonicera* and *Ribes nigrum* in ravine with brook, 49.67255°N, 87.60155°E, ca 1685 m a.s.l., in leaf litter, 30.07.2018, leg. P.S. Nefediev.

TYPE MATERIAL RE-EXAMINED. ♂ holotype of *Julus ghilarovi brachydactylus* (ZIN), labeled "Kemerovo Area [sic!], SE Altai, Kurai Depression, 17 July 1963, D. Berman" [locality refined by the collector: Russia, southwestern Siberia, **Republic of Altai**, Kosh-Agach District, environs of Kurai Village, 2 km upstream of Chuya Tract along left bank of Kuraika River, motley grass gramineous steppe, 17.07.1963, leg. D.I. Berman].

REMARKS. A restudy of the ♂ holotypes of *J. ghilarovi* Gulička, 1963 and *J. g. brachydactylus* Gulička, 1972 shows

that both males undoubtedly belong to one species: *Julus ghilarovi* Gulička, 1963. Although both are intact, their gonopods are well exposed, thus requiring no dissection and making their study easy in situ (see also above). The large coxal outgrowth of ♂ leg pair 2 is slender all along, with a posterior process; a thin longitudinal crest is present on the posterior face of the gonopodal promere (Figs 6–11).

According to the original descriptions [Gulička, 1963, 1972], all holotypes should have been deposited in the author's collection in Bratislava, while paratypes in the ZIN collection. However, Gulička had not shared the promised paratypes until S.I. Golovatch requested their return to the USSR. Only after a scandal did Gulička finally return the holotypes to Golovatch who then rendered them to ZIN. Yet some vials contained deliberately wrong specimens (females instead of males), torsos without gonopods, incorrect labels, etc. (S.I. Golovatch, pers. comm.). Among Gulička's returned diplopods, no paratypes of *J. ghilarovi* s.str. had come back, but he had labeled "*Julus ghilarovi brachydactylus* n. subspec. – Holotypus" and sent back an erroneous male of *J. ghilarovi* instead of *J. g. brachydactylus*. Besides this, the Kemerovo Area is a separate region which borders from the north only with the Republic of Altai, but the Kurai Depression is situated much more southeast of the Kemerovo Area, indicating a label error as well (Fig. 7).

MATERIAL RE-EXAMINED (specimens previously identified as *J. ghilarovi* and published by Mikhajlova, Nefediev [2003]). 8 ♀♀ (FSCB), [Russia, southwestern Siberia, **Republic of Altai**,

Ulagan District], Altai Mts., Kuraisky Mt. Range, Aktash, 2500 m a.s.l., *Betula nana* [in fact, *Betula rotundifolia*] + mountain tundra, under stones, 12–25.07.2000, leg. O.G. Gorbunov.

REMARKS. A restudy of ten ♀♀ from the Altai Mts., Kuraisky Mt. Range, near Aktash, 2500 m a.s.l., *Betula nana* + mountain tundra, under stones, 12–25.VII.2000, leg. O.G. Gorbunov, previously identified as *J. ghilarovi* by Mikhajlova & Nefediev [2003], and of four ♀♀ from the same locality, previously determined as *Pacifiulus amurensis* (Gerstfeldt, 1859) by Mikhajlova & Nefediev [2003], shows that four ♀♀ of the former species and all ♀♀ of the latter one actually belong to *J. brachydactylus* stat.n.

MATERIAL RE-EXAMINED (material previously identified as *J. g. brachydactylus* and published by Mikhajlova, Golovatch [2001]). 2 ♂♂, 3 ♀♀, 2 juv. (FSCB), [Kazakhstan, Eastern Kazakhstan Area], W-Altai, Ivanovsky Mt. Range, Mt “Rossypnoi Belok”, 2000–2300 m a.s.l., mountain tundra, 1–2.06.1996, R.Yu. Dudko coll.; 8 ♂♂, 2 ♀♀, 4 juv. (FSCB), [Russia, Republic of Altai, Ust-Kan District], E slope of Korgon Mt. Range, lower flow of Kutergen River, 2 km S of Ust-Kan, ca 1200 m a.s.l., 12.06.1998; 3 ♂♂, 15 juv. (FSCB), [same Republic, same District], E slope of Korgon Mt. Range, lower flow of Kutergen River, 25 km S of Ust-Kan, ca 2000 m a.s.l., 15.06.1998, all leg. A.A. Matalin.

REMARKS. A re-examination of all above specimens from eastern Kazakhstan and the environs of Ust-Kan, previously identified as *J. g. brachydactylus* by Mikhajlova & Golovatch, [2001], shows that they belong to a new species, *Julus* sp. 3. It is noteworthy that all of these specimens are in very poor condition and most of them are completely broken into pieces. Very recently, I have collected more than 100 fresh specimens of this new species and its description will appear a forthcoming publication.

MATERIAL RE-EXAMINED (specimens previously identified as *J. g. ghilarovi* and published by Mikhajlova, Golovatch [2001]). 30 ♂♂, 20 ♀♀, 63 juv. (ZMUM), 2 ♂♂ (FSCB), [Russia, southwestern Siberia, Republic of Altai, Ulagan District], Altai Mts., Lake Teletskoe, Altaisky Nature Reserve, Chiri, upper reaches of Chiri River, *Picea obovata* + *Pinus sibirica* taiga forest, 1350 m, 28–29.07.1997; 27 ♂♂, 19 ♀♀, 15 juv. (ZMUM), same locality, near Lake Chiri, subalpine belt (= goltsy), 1750–2000 m a.s.l., 29–30.07.1997; 7 ♂♂, 4 ♀♀, 7 juv. (FSCB), same locality, nr Lake Chiri, upper timberline of *Picea obovata* + *Pinus sibirica* taiga, mainly nr water, 1700–1750 m, 29.07.–1.08.1997, all leg. S. Golovatch & A. Tanasevich.

REMARKS. A restudy of the above material from south of Lake Teletskoye in the environs of the Chiri cordon, previously determined as *J. g. ghilarovi* by Mikhajlova, Golovatch [2001], shows that all these specimens belong to a new species (*Julus* sp. 2), same as all specimens identified as *J. insolitus* and published in Nefedieva *et al.* [2014, 2015]. Besides this, the records of *J. insolitus* from the Kemerovo Area (Shorskii National Park) and the Republic of Altai (upper reaches of Chiri River), published by Mikhajlova [2016], appear to be morphologically similar to specimens of *J. insolitus* from Nefedieva *et al.* [2014, 2015] as well (E.V. Mikhajlova, pers. comm.), apparently also belonging to *Julus* sp. 2.

DISTRIBUTION. The distribution area of *Julus brachydactylus* stat.n. covers only the territory of the Republic of Altai (Fig. 18).

## Discussion

A restudy of the holotypes of *Julus ghilarovi* Gulička, 1963 and *J. g. brachydactylus* Gulička, 1972, both deposited in ZIN, shows that these specimens belong to one species: *J. ghilarovi*. A mix-up must have hap-

pened to the holotype sample of *J. g. brachydactylus* before it joined the ZIN collection (see above). As Gulička's *J. g. brachydactylus* is easy to recognize and the false “*J. g. brachydactylus* Gulička, 1972 Holotype” sample in ZIN actually contains a different species (*J. ghilarovi*), to overcome the mislabeled type option, I am inclined to designate a neotype of *J. g. brachydactylus* coming from a precise locality.

The illustration of the opisthomere of *J. g. brachydactylus* in the original description [Gulička, 1972] is so similar to that of *J. insolitus* Mikhajlova, 2009 (Figs 11, 13) that I do not hesitate to synonymize both these taxa and promote *J. g. brachydactylus* to a full species rank.

Since the gonopods and ♂ leg pair 2 of both the species concerned, *J. ghilarovi* and *J. brachydactylus*, have never been shown in due detail, I provide their SEM micrographs (Figs 14–17).

## Conclusions

Despite the considerable confusion as regards the taxonomy and distribution of the only pair of subspecies heretofore delimited within the genus *Julus*, i.e. the southern Siberian *J. ghilarovi* with the formal subspecies *J. ghilarovi* and *J. g. brachydactylus*, I believe that: (1) *J. ghilarovi* has no subspecific taxa and its full species status is revalidated; (2) the subspecies *J. g. brachydactylus* Gulička, 1972 is elevated to a full species rank, with *J. insolitus* Mikhajlova, 2009 being a junior synonym of *J. brachydactylus* Gulička, 1972, syn.n., stat.n.

The distribution of *J. ghilarovi* is mostly restricted to southwestern Siberia (the Novosibirsk and Kemerovo areas, the Altai Province and the Republic of Altai), as well as to southeastern Siberia (the Republic of Khakassia), whereas the southern part of the Krasnoyarsk Province must be removed from the distribution area of this species. The distribution range of *J. brachydactylus* stat.n. spans only the Republic of Altai, where it can often be found living syntopically with *J. ghilarovi*.

At least three new species of *Julus* have been found when refining the taxonomy and distribution areas of *J. ghilarovi* and *J. brachydactylus* stat.n., their descriptions are to be deferred for the future.

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