

NOTEWORTHY NEW RECORDS OF CHAROPHYTES
(CHARALES, CHAROPHYCEAE) FROM RUSSIA:
REVISION OF SPECIES DISTRIBUTION RANGES IN EURASIA

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Novel species records for some Russian regions were found as a result of field studies of 2016–2020 and survey of herbarium collections. They improved the species distribution in the Northern Eurasia. The novel species records were revealed for Belgorod, Bryansk, Ivanovo, Leningrad, Omsk, Novgorod, Novosibirsk, Tula, Tyumen, and Vladimir Regions, Khanty-Mansi Autonomous Area – Yugra, Krasnoyarsk Territory, Altai Republic, Republics of Khakassia and Mordovia, and Saint Petersburg. New localities of *Chara canescens*, *C. papillosa* and *C. subspinosa* are the northernmost in Asia. The first exact localities of *Nitella confervacea* in Asian Russia, *N. mucronata* in Kurgan, Novosibirsk, and Tyumen Regions were indicated. The northernmost in Asia old record of *C. braunii* was georeferenced. All known records in Central and South-West European Russia, West Siberia and neighboring regions for the species listed were illustrated with maps. They allowed outlining northern borders of distribution ranges for some species in West Siberia and southern border of *N. wahlbergiana* distribution range in the European Russia.

Keywords: *Chara*, *Nitella*, *Tolypella*, European Russia, West Siberia, Sakha Republic

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The vast territory of Russia is a real challenge for study of charophyte distribution. It could be recognized as an important area for improvement of recent knowledge about species distribution range in Eurasia and for search of their borders. Despite long history of botanical exploration of Russia and voluminous bibliography for species records summarized data are available for some but not for the majority of its regions (cf. Hollerbach, 1950; references below in “Materials and methods”). In attempt to reduce number and area of blank spots for charophyte distribution in Russia we conducted field studies in different regions as well as checking of all specimens from publicly available herbaria. It resulted in confirmation of many species records and allowed tentative outlining some parts of their distribution range borders in Eurasia, implemented in this research.

MATERIALS AND METHODS

The charophytes were collected during field studies of water bodies in different regions of Asian and European Russia during 2016–2020. The new specimens were placed in LE, SASY and TMN. The first author checked all specimens in available herbaria (LE, KEM, IBIW, MIRE, H, BILAS, SASY). The oospores were treated with acetic acid to remove any lime-shell, washed with distilled water and cleaned from spiral cells by adding 10% Triton X100, then stored at 60°C for at least 10 hours. Finally, they were washed with distilled water and gently sonicated to remove spiral cells completely. The cleaned oospores and gyrogonites were stored in 95% alcohol. They were coated with gold and studied using a ZEISS EVO 40 scanning electron microscope to confirm species identification.

The exact localities for charophyte species in European Russia and West Siberia with neighboring regions were taken from numerous references (Ruprecht, 1845; Nordstedt, 1889; Vilhelm, 1930; Cedercreutz, 1933; Decksbach, 1958; Katanskaya, 1970; Kulikov et al., 1977; Vesnin, 1984; Il'in, 1971, 1988; Volobaev, 1990; Kipriyanova, 2005; Sviridenko, Sviridenko, 2008, 2016; Taran, 2008; Romanov, Kipriyanova, 2010; Veisberg, Isakova, 2010; Evzhenko, 2010; Belyakova, 2011; Zhakova, Konechnaya, 2011; Kipriyanova, Romanov, 2013; Evzhenko, 2014; Klinkova, Zhakova 2014; Romanov, Nikolaenko, 2014; Stobbe et al., 2014; Romanov, Pechenyuk, 2015; Romanov et al., 2015; Romanov, Zhamangara, 2017; Romanov et al. 2017a, b, c, 2018a, b; Sviridenko et al., 2018; Vishnyakov, Philippov, 2018; Krasnaya kniga..., 2020; Vishnyakov et al., 2020; Vishnyakov et al., 2021), including ones cited in the above listed. The earlier records were summarized by Hollerbach (1950), but we checked the first published records too. We aimed to confirm published records as completely as possible, and succeeded for many of them, as well as their georeferencing as a result of checking herbarium

specimens (LE, H, KEM, indicated with exclamation mark in each case) and recent recollecting from the same water bodies implemented by the authors. Few published records were confirmed according to the published images of the specimens. Maps of the species records were made with SimpleMappr, including ecoregions (Shorthouse, 2010). The records which cannot be georeferenced because of laconic labels and misidentifications found during checking of their vouchers were omitted on the maps.

RESULTS AND DISCUSSION

The annotated list for species records was compiled according labels of the specimens studied. The improvement of their labels was added in the brackets.

Chara altaica A. Braun in A. Braun et Nordst. (Figs. 1A, B, 3A) – Tyumen Region: Armizonskoe District, 3.2 km east of the village of Poloe, Lake Sen'kovo, shallow near south coast, 55°44'30.6"N 67°49'40.8"E, together with *C. aspera* Willd. var. *subinermis* Kütz., *C. canescens* Loisel., 30.07.2019, O.A. Kapitonova (LE: A0000195). – A novel species record for the region. Its close localities are known from Northern Kazakhstan (Sviridenko, Sviridenko, 2008, 2016) and Omsk Region (Romanov et al., 2017a). The northern border of its distribution range in West Siberia seems to be delimited with northern forest-steppe (Fig. 3A), which could be explained with species occurrence mostly in slightly and evidently brackish waters. *Chara altaica* is known mainly from South Siberia and Central Asia, but its easternmost distribution range covers China (Han, Li, 1994) and Japan (Kato et al., 2010).

Chara braunii C.C. Gmel. (Figs. 2A, 3B) – Khanty-Mansi Autonomous Area – Yugra: “Guv. Tobolsk, distr. Surgut, in lacu” [Nefteyugansk District, northeastern part of western reach of Lake Sorovskoe, not far from the source of Tarsap River, a left tributary of Bo'shoy Salym River, shallow, at drying out muddy bottom, together with *Potamogeton perfoliatus* L. and *P. pusillus* L., 59°56'N, 71°34'E], 10.07.1911, B. Gorodkov (Vilhelm, 1930; LE: A0000196!). Tyumen Region: Tyumen District, Tyumen fish farm, pond No. 5, free standing patches in the channel of fish hatchery and drainage net, up to 0.2 m depth, silty sand, A.A. Babushkin (IBIW: 54066). – For a long time, the northernmost locality in Asia found by B. Gorodkov can be georeferenced for whole Surgut District only because of its laconic label. It was improved here as a result of its comparison with the expedition diary (Gorodkov, 1913). This species was found during low water year with hot summer (Gorodkov, 1913), being in agreement with ecological traits of *C. braunii* at northern distribution range, where the species was collected mostly during years with similar summer weather. A novel species record for Tyumen Region. Its close localities are known from Omsk Region and Northern Kazakhstan (Sviridenko, Sviriden-



Fig. 1. Species of *Chara*: A, B – *C. altaica*, arrowheads – conjoined gametangia, C – *C. canescens*, arrowheads – bractlets below oogonia, D, E – *C. contraria*, arrowheads – fertile node between ecorticate cells (D), spine cells (E), F – *C. subspinosa*, arrowhead – spine cells, G, H – *C. virgata*, arrowhead – outgrowth of stem node culminating in nodal bulbil formation (H). Scale bars: A – 2 mm, B–D, F – 1 mm, E, G, H – 0.5 mm. All photos by R. Romanov.

ko, 2008, 2016; Evzhenko, 2010), Novosibirsk Region and Altai Territory (Romanov et al., 2017a). The species has cosmopolitan distribution, but is really rare in Northern Asia where it is known from forest to steppe (Fig. 3B).

Chara canescens Loisel. (Figs. 1C, 3C) – Tyumen Region: 1. Sladkovo District, north vicinity of the

village of Mikhaylovka, south-eastern shore of Lake Solenoe (Tavolzhan), shallow, 55°16'06.8"N 70°05'15.9"E, 10.08.2016, O.A. Kapitonova (LE: A0000197). 2. Armizonskoye District, 3.2 km east of the village of Poloe, south coast of Lake Sen'kovo, shallow, 55°44'30.6"N 67°49'40.8"E, together with *C. altaica*, *C. aspera* f. *subinermis*, 30.07.2019,

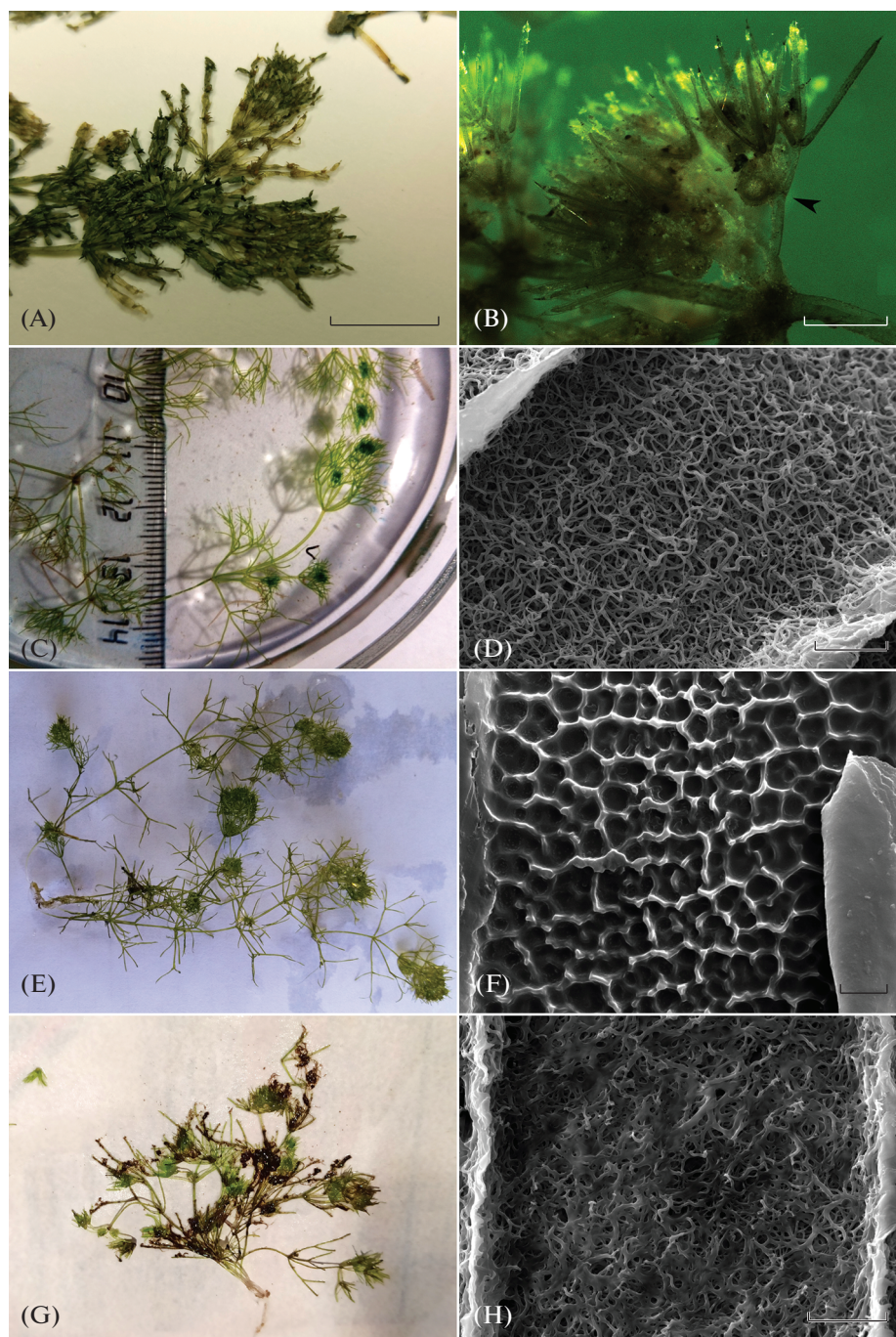


Fig. 2. *Chara braunii* and species of *Nitella*: A – *C. braunii*, B – *N. confervacea*, arrowhead – fertile first node of the branchlet, C – *N. gracilis*, D – fossa of oospore of *N. gracilis*, SEM, E – *N. mucronata*, F – fossa of oospore of *N. mucronata*, G – *N. wahlbergiana*, H – fossa of oospore of *N. wahlbergiana*. Scale bars: A – 1 cm, B – 0.5 mm, D, F, H – 10 μ m. Photo C by O.V. Anisimova, photo E by E.L. Vodeneeva, the other photos by R. Romanov.

O.A. Kapitonova (LE: A0000195). – A novel species record for Tyumen Region, the northernmost locality in Asia. Its close localities are known from Omsk Region and Northern Kazakhstan (Sviridenko, Sviridenko, 2008; Sviridenko et al., 2018), and Kurgan Region (Romanov, 2017a). The northern border of its distribution range in West Siberia seems to be delimited

with northern forest-steppe (Fig. 3C), which could be explained with its occurrence mostly in brackish waters. *Chara canescens* has Holarctic distribution range.

Chara contraria A. Braun ex Kütz. (Figs. 1D, E, 4A) – Bryansk Region: 1. Starodub District, vicinity of the settlement of Mokhonovka, near dam part of the pond, 52°37'44"N 32°39'07.4"E, 20.09.2019,

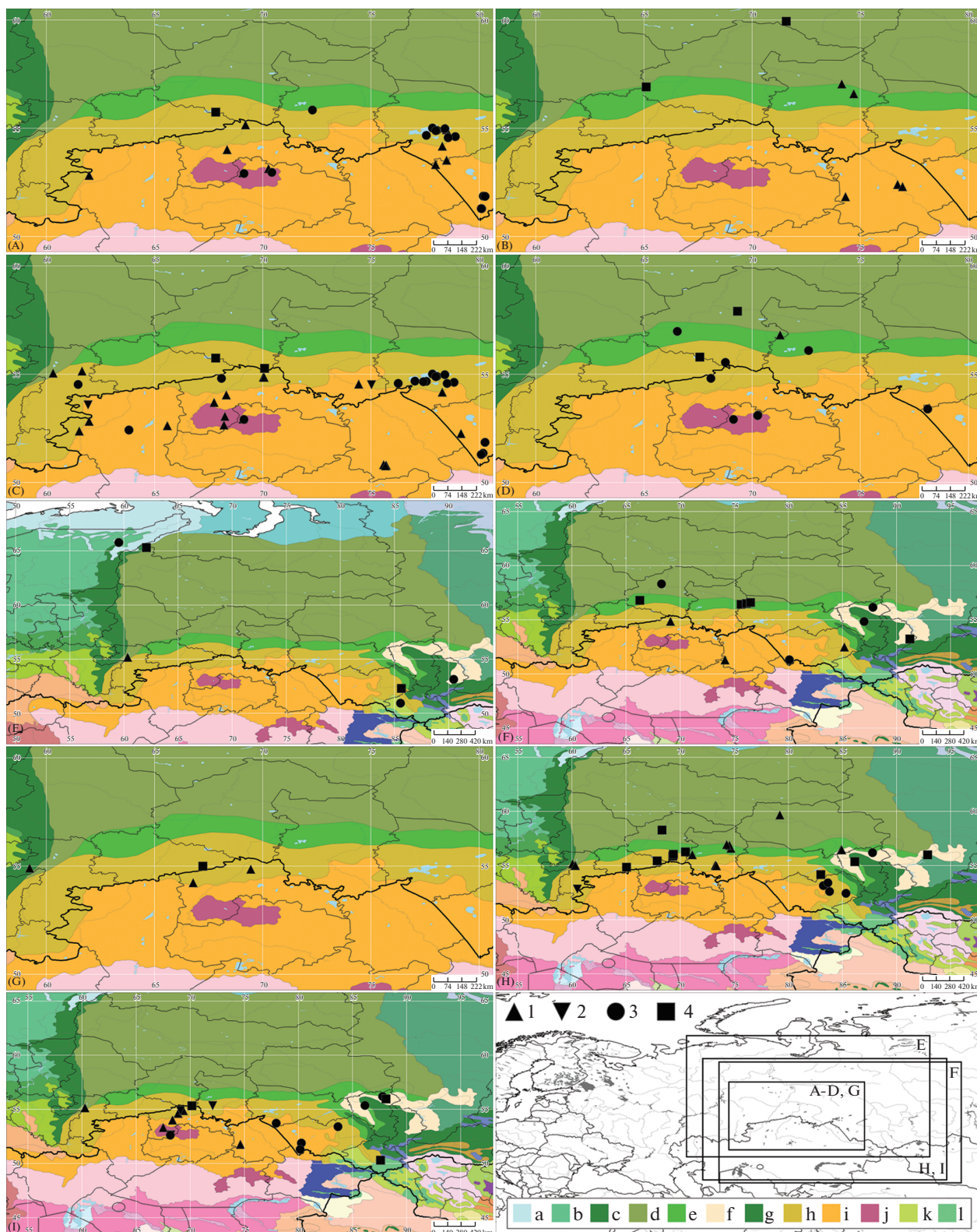


Fig. 3. Northern borders of distribution range in North Asia for *Chara altaica* (A), *C. braunii* (B), *C. canescens* (C), *C. papillosa* (D), *C. subspinosa* (E), *Nitella confervacea* (G), *N. mucronata* (H), *Tolypella prolifera* (I), in West Siberia for *C. virgata* (F) in context of ecoregions. 1 – unchecked published records, 2 – published records confirmed with photos, 3 – published records confirmed with vouchers studied by us, 4 – new records. Ecoregions (Shorthouse, 2021): a – Northwest Russian – Novaya Zemlya tundra, b – Scandinavian and Russian taiga, c – Ural mountain forests and tundra, d – West Siberian taiga, e – West Siberian hemiboreal forests, f – South Siberian forest steppe, g – Sayan mountain conifer forests, h – West Siberian – Kazakh forest steppe, i – West Siberian – Kazakh steppe, j – Kazakh upland, k – Altay mountain forest and forest steppe, l – Altay alpine meadows and tundra.

N.N. Panasenko (LE: A0000198). 2. The same water body, 52°37'46.5"N 32°39'03.1"E, 20.09.2019, N.N. Panasenko (LE: A0000199). Republic of Sakha (Yakutia): Olenyok District, backwater of Ulakh-Muna River, near left riverside, ca. 1 m depth, 67°15'50.1"N 115°01'14.1"E, together with *C. globularis*, 24.07.2018, N.K. Sosina (SASY). Tula Region: Leninskiy District, inundated stone quarry "Barsuki", 54°15'44"N 37°30'29"E, 09.08.2020, E.V. Smirnova (LE: A0000200). – The plants from Bryansk Region and Republic of Sakha belong to the morphotype mostly known as *C. inconnexa* Allen (Fig. 1D) and accepted here as *C. contraria*. This is a novel species record for Bryansk Region, and the species confirmation for Tula Region, where it was known from single locality (Nikolaev, 2003). Its close sites are known from Moscow, Orel and Smolensk Regions according to the vouchers (Hollerbach, 1950; Romanov, 2019: as *C. inconnexa* for Moscow Region). *Chara contraria* is unknown from neighboring regions of Belarus and Ukraine (Borisova et al. 2016; Vishnyakov et al., 2020). This is a new site for the Republic of Sakha, where several species localities were known (Romanov, Kopyrina, 2014; Romanov et al., 2015; Chemeris, Philippova, 2017; Chemeris et al., 2020). The species has subcosmopolitan distribution range with most localities known from north temperate regions.

Chara globularis Thuill. (Fig. 4B) – Republic of Sakha (Yakutia): Olenyok District, backwater of Ulakh-Muna River, near left riverside, ca. 1 m depth, 67°15'50.1"N 115°01'14.1"E, together with *C. contraria*, 24.07.2018, N.K. Sosina (SASY). Tula Region: Tula, Central District, north-eastern vicinity of the microdistrict of Severnyy, small pond, 54°07'21.6"N 37°38'05.4"E, 04.07.2020, T.V. Maksimova (LE: A0000313). – A novel species record for Tula Region. Its close localities are known from Moscow and Ryazan Regions (Romanov et al., 2017b, c; Romanov, 2019; Vishnyakov et al., 2021). This is a new site for the Republic of Sakha, where several species localities were known (Romanov, Kopyrina, 2014; Romanov et al., 2015; Chemeris, Philippova, 2017; Chemeris et al., 2020). The species has cosmopolitan distribution with most localities known from north temperate regions, where it can be one of the most common species. Therefore, first reliable records of *C. contraria* and *C. globularis* for two regions of European Russia indicate poor knowledge of charophytes in some Russian regions.

Chara papillosa Kütz. (Fig. 3D) – Tyumen Region: 1. Vagay District, Lake Dikoe, up to 1 m depth, silt with plant debris, 57°54'21.9"N, 69°19'27.9"E, 28.08.2005, A.A. Babushkin (LE: A0000314, TMN). 2. Armizonskoe District, 6 km north-east of the settlement Yuzhno-Dubrovnoe, Lake Chernoe, shallow, 55°47'17.9"N 67°35'01"E, 31.07.2017, O.A. Kapitonova (LE: A0000315). – A novel species record for southern taiga of West Siberia, the northernmost in Asia, and a new locality in northern forest-steppe. Its

close site is known from subtaiga of the same region (Sviridenko, Sviridenko, 2016). The record from Kulduna River in Altai Territory (Romanov, Kipriyanova, 2010) is erroneous, based on misidentification of *C. vulgaris* L. (LE!). This Palearctic species is really rare in Northern Asia, although it occurs there in wide spectrum of natural regions (Fig. 3D).

Chara subspinosa Rupr. (= *C. rudis* A. Braun; Figs. 1F, 3E) – Khanty-Mansi Autonomous Area – Yugra: Subpolar Ural, Beryozovo District, right bank of Khulga River, a nameless lake, 65°17'54.6"N 62°05'04.5"E, 12.07.2018, S.A. Nikolaenko (LE: A0000316, TMN). Altai Territory: Sovetskoe District, the reserve "Lebediny", Lake Koksha (Svetloe), 25.09.2018, A.V. Kotovshchikov (LE: A0000317). – A novel species record for Khanty-Mansi Autonomous Area – Yugra, the northernmost locality in Asia. Its close records are known from Komi Republic (Romanov et al., 2018b) and Chelyabinsk Region (as *C. rudis*; Veisberg, Isakova, 2010). The first species record from Altai Territory with close localities from Altai Republic (as *C. rudis*; Il'in, 1971; LE!, BILAS!, Romanov, unpubl. data). This Palearctic species has obvious disjunctions in the eastern part of its distribution range, and West-Siberian Plain seems to be the largest one (Fig. 3E). *Chara subspinosa* is non-typical for arid and semiarid regions.

Chara virgata Kütz. (Figs. 1G, H, 3F) – Tyumen Region: Yalutorovsk District, 2.5 km north-east of the village of Stary Kavdyk [Lake Stary Kavdyk], 16.06.2014, E.S. Bayanov (LE: A0000318, TMN). Omsk Region: Muromtsevo District, Lake Lenevo, 02.08.2016, E.Yu. Zarubina (LE: A0000319). Novosibirsk Region: 1. Kyshtovka District, Lake Urmanka [Urmannoe], 04.08.2016, E.Yu. Zarubina (LE: A0000320). 2. The same, Lake Karbalyk, 03.08.2016, E.Yu. Zarubina (LE: A0000330). Republic of Khakassia: Beya District, 3 km south-east-east of the village of Novonikolaevka, Lake Krasnoe, sandy shallow, 53.20724°N, 91.23516°E, 28.08.2020, D.Yu. Efimov (IBIW, LE: A0000331). – Novel species records for Omsk and Novosibirsk Regions, Republic of Khakassia. Its close localities are known from Tyumen (Romanov et al., 2017a) and Kemerovo Regions (Voloebaev, 1990; KEM!), Altai Territory (Romanov, Kipriyanova, 2010) and Northern Kazakhstan (Sviridenko, Sviridenko, 2008), the closest records to Republic of Khakassia – from Krasnoyarsk Territory, where it cannot be exactly georeferenced (Ruprecht, 1845; LE!). The species occurs in wide spectrum of natural regions of Northern Asia (Fig. 3F). *Chara virgata* has wide distribution range, but most localities are known from Palearctic.

Nitella confervacea (Bréb.) A. Braun ex Leonh. (Figs. 2B, 3G) – Kurgan Region: Makushino District, 1.9 km north-north-east of the settlement of Slevnoe, Lake Paranino, eastern part of the lake, nearshore shallow, together with *Chara aspera*, *C. globularis*,

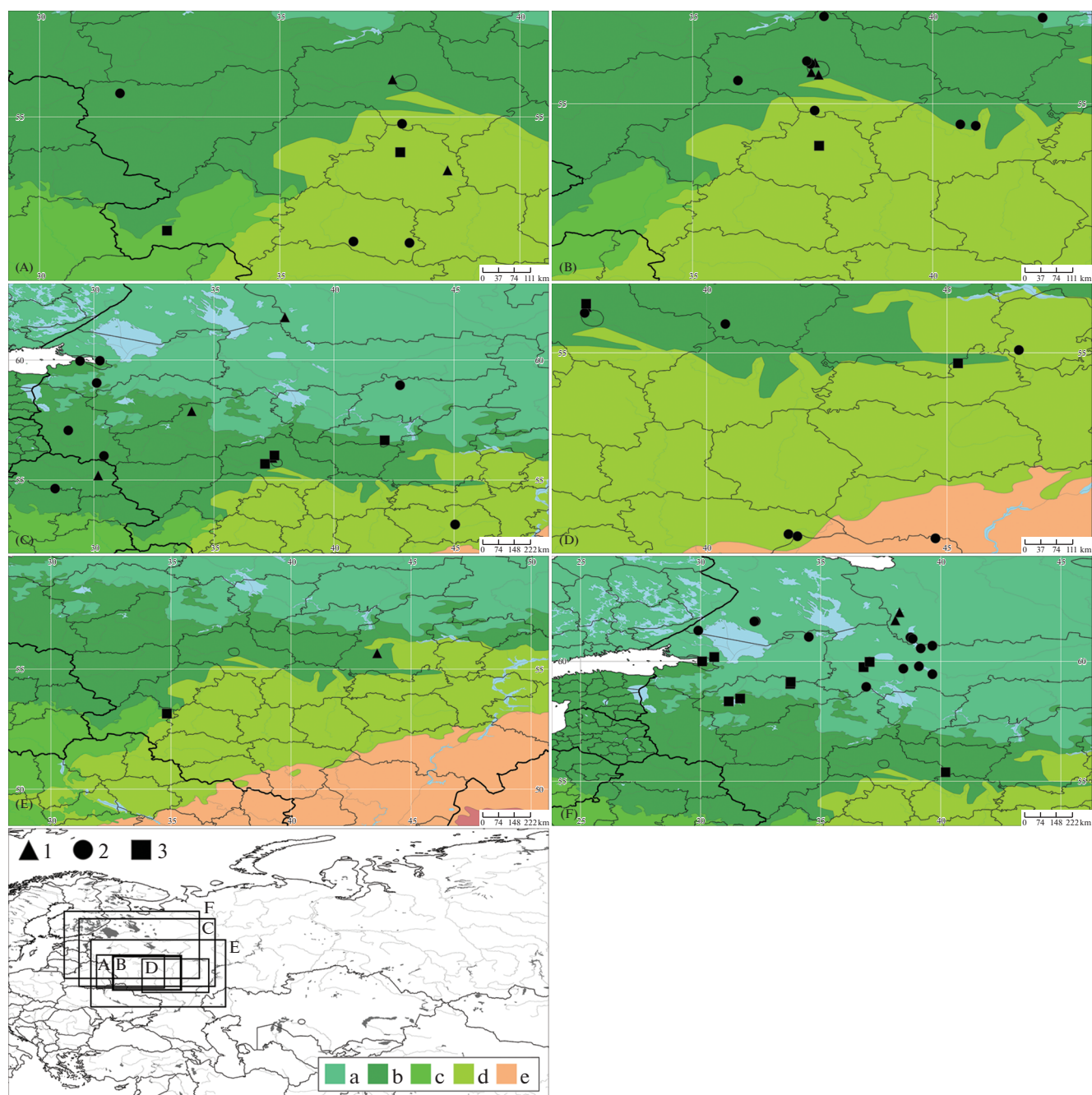


Fig. 4. New records of species in the context of neighboring localities and southern distribution range of *N. wahlbergiana* in European Russia in the context of ecoregions: A – *Chara contraria*, B – *C. globularis*, C – *Nitella gracilis*, D – *N. mucronata*, E – *N. opaca*, F – *N. wahlbergiana*. 1 – unchecked published records, 2 – published records confirmed with vouchers studied by us, 3 – new records. Ecoregions (Shorthouse, 2021): a – Scandinavian and Russian taiga, b – Sarmatic mixed forests, c – Central European mixed forests, d – East European forest steppe, e – Pontic steppe.

54°59'46.7"N, 67°13'55.3"E, 18.08.2016, R.E. Romanov (LE: A0000332). – The first exact locality in Kurgan Region, the single one in Asian Russia. Few close records are known from Northern Kazakhstan (Sviridenko, Sviridenko, 2008) and Chelyabinsk Region (Veisberg, Isakova, 2010). The species is known in Northern Asia from forest-steppe only (Fig. 3G). *Ni-*

tella confervacea has wide distribution range, but most records are known from Europe.

Nitella gracilis (J.E. Smith) C.A. Agardh (Figs. 2C, D, 4C) – Ivanovo Region: Yuzha District, 0.2 km north-north-east of the former settlement Malaya Lamna, Lake Lamna, sandy shallow of eastern coast, small scarce groups with rare occurrence of *Spargani-*

um emersum Rehm. And small groups at the depth of 0.1–0.2 m, 56°39'18.7"N 42°06'33.1"E, 31.08.2019, M.P. Shilov, A.A. Kurganov, D.S. Markov (LE: A0000333). Moscow Region: 1. Odintsovo District, vicinity of the settlement Dar'ino, swampy glade in pine forest, 55°40'29.94"N, 37°07'31.24"E, 13.11.2020, O.V. Anisimova (LE: A0000334); 2. Mytishchi District, vicinity of the town of Lobnya, nameless lake in the swamp at the electric transmission line right-of-way, 56°01'27.82"N 37°31'10.76"E, 22.09.2018, O.V. Anisimova (LE: A0000335). – Novel species records for Ivanovo Region, its close localities are known from Moscow, Kostroma and Tver Regions, one from each region (cf. Romanov et al., 2017c). The confirmation of recent species presence in Moscow Region, where *N. gracilis* was known from one record of XIX century (cf. Romanov et al., 2017c). The record for Vladimir Region (Romanov et al., 2017c; IBIW; see below) is erroneous, based on misidentification of *N. wahlbergiana* Wallm. Reliable records of this species in Russia are situated almost within forest zone (Fig. 4C). The species has cosmopolitan distribution range, but it is really rare everywhere.

Nitella mucronata (A. Braun) Miq. (Figs. 2E, F, 3H, 4D) – Republic of Mordovia: Smolny National Park, 81th quadrant of Kemlya Forest District, Tashkinskiy pond, 54°44'49.3"N 45°15'46.7"E, nearshore, 0.5–0.6 m depth, at sand, 24.08.2019, E.L. Vodeneeva (NNSU: 8214, LE). Moscow Region: Mytishchi District, town of Lobnya, Lake Kiyev, 56°01'08.4"N, 37°29'18.9"E, 15.09.2018, O.V. Anisimova (LE: A0000336). Kurgan Region: 1. Chastoozer'e District, 9 km east of the settlement of Dolgoe, near settlement of Vostochnoe, Lake Kamennoe, shallow in front of reed stands, together with *Chara globularis*, 55°25'51.2"N, 67°52'34.7"E, 16.08.2016, R.E. Romanov (LE: A0000337); 2. Pritobolnyy District, 7 km south-south-west of the settlement of Glyadyanskoe, oxbow lake of Tobol River, 23.08.2016, 54°50'45.1"N, 65°02'48.5"E, L.M. Kipriyanova (LE: A0000338). Tyumen Region: 1. Abatskoe District, vicinity of the settlement of Abatskoe, Lake Malaya Khomutina, an oxbow lake of Ishim River, 56°15'51.20"N, 70°29'33.85"E, 12.08.2016, R.E. Romanov, L.M. Kipriyanova (LE: A0000339); 2. Ishim District, 0.3 km west of the settlement of Larikha, floodplain of Ishim River, in stream, 55°52'09.9"N, 69°19'21.1"E, 14.08.2016, R.E. Romanov (LE: A0000340); 3. Ishim District, 2.43 km south-west of the settlement of Pakhomova, Lake Dolgoe, an oxbow lake of Ishim River, at the depth of 1 m, 56°02'15.3"N, 69°22'48.68"E, 24.08.2016, L.M. Kipriyanova (LE: A0000341); 4. Tobolsk, microdistrict Mendeleevo, Mendeleevo quarry, shallow near south-east coast, 58°16'51.9"N 68°19'34.9"E, 06.08.2020, O.A. Kapitonova (LE: A0000342); 5. The same water body, 58°16'55.9"N 68°19'34.7"E, together with *C. globularis*, 06.08.2020, O.A. Kapitonova (LE: A0000343) Novosibirsk Region: Cherepanovo District, near settlement of Kara-

sevo, water reservoir at Arapikha River, near the dam, 0.5 m depth, single plant in community of *Ceratophyllum oryzetorum* Kom., at silt, 54°09'47.8"N, 83°00'01.8"E, 22.08.2014, R.E. Romanov, E.V. Romanova (LE: A0000344). Krasnoyarsk Territory: Krasnoyarsk, Abakanskaya Arm of Yenisey River, 55°59'24.57"N, 92°52'27.48"E, 31.07.2019, A.V. Kotovshchikov, L.M. Kipriyanova (LE: A0000345). – Novel species records for Krasnoyarsk Region and Republic of Mordovia, the first exact localities for Kurgan, Novosibirsk and Tyumen Regions. The new site in Moscow Region is a confirmation of its recent presence in this region, where this species was known from record and specimen of XIX century (Romanov et al., 2017c). *Nitella mucronata* tends avoiding semiarid regions in Northern Asia (Fig. 4D). This species has wide distribution range, but most localities are known from Palearctic.

Nitella opaca (C. Agardh ex Bruzelius) C. Agardh (Fig. 4E) – Bryansk Region: Karachev District, village of Berezovka, pond, shallow, at silty sand, 14.09.2017, L.N. Anishchenko (LE: A0000346). – A novel species record for this region, its close locality is reported from Nizhniy Novgorod Region, but the voucher is unknown (cf. Romanov et al., 2017c). The exact localities were not found in neighboring regions of Belarus and Ukraine, although this species was reported for Belarusian Polesia (Borisova et al., 2016; Vishnyakov et al., 2020). The record from Pskov Region (Zhakova, Konechnaya, 2011) cannot be confirmed (LE!). *Nitella opaca* is a cosmopolitan species.

Nitella wahlbergiana Wallm. (Figs. 2G, H, 4F) – Saint Petersburg: Neva Bay, northern coast, vicinity of the former railway station of Morskaya, between Ol'gino and Lisiy Nos, reserve "Northern coast of Neva Bay", 03.09.2001, L.V. Zhakova (LE: A0000347). Leningrad Region: Vsevolozhsk District, Lake Khepoyarvi, 30.07.2020, R.E. Romanov (LE: A0000348). Novgorod Region: Novgorod District: 1. Msta River in vicinity of the village of Bronnitsa, 18.07.2014, G.Yu. Konechnaya (LE); 2. Near the village of Navolok, northern shore of Lake Il'men', near water discharges, 17.07.2014, G.Yu. Konechnaya (LE); Lyubytino District: 3. Vicinity of the village of Rusovschina, west of the tract of Kuz'mikha, small lake, 07.08.2020, A.Yu. Doronina, V.V. Kuropatkin (LE: A0000969); 4. Lake Nikulinskoe, near eastern shore, G.Yu. Konechnaya (LE: A0000972). Vladimir Region: Gus-Khrustalnyy District, Lake Svyatoye, nearshore shallow, 55°22'42"N, 40°11'44.8"E, 13.08.2009, V.G. Papchenkov (IBIW: 54006, 54008). Vologda Region: 1. Belozersk District, the village of Ol'kino, Andoga River, backwater near a bridge, 14.07.2003, A.A. Bobrov (IBIW: 54201); 2. Cherepovets, Sheksna reach of the Rybinsk Reservoir, shallow in the area of B[ol'shaya] Dora, 26.07.2006, N. Paklyashova (IBIW: 54199). – Novel species records for Saint-Petersburg, Novgorod and Vladimir Regions. The locality in the latter region is the south-

ernmost in the species distribution range. It was known there as *N. gracilis* (cf. Romanov et al., 2017c) because of misidentification. Its close localities are known from north-east of Leningrad Region, Vologda Region and Republic of Karelia (Vishnyakov et al., 2021), and the most of records were reported from Finland (Langangen et al., 2002). *Nitella wahlbergiana* is a North-Paleartic species, but its eastern distribution pattern is still poorly known. Its southern distribution range seems to be not exceeding southern range of forest zone (Fig. 4F).

Tolypella prolifera (Ziz ex A. Braun) Leonh. (Fig. 3I) – Tyumen Region: Sladkovo District, 0.5 km south of the village of Tavalzhan, dugout at the coast of Lake Solenoe, 55°20'10"N 70°09'06.1"E, 20.06.2018, O.A. Kapitonova (LE: A0000349). Altai Republic: Ulagan District, settlement of Aktash, pond at Menka River, 50°18'24.07"N, 87°35'30.17"E, 20.07.2020, L.M. Kipriyanova (LE: A0000350). – Novel genus records for Altai Republic and Tyumen Region, its close localities are known from Kemerovo Region (Volobaev, 1990; Romanov, in press; KEM!), Northern Kazakhstan, Omsk Region (Sviridenko, Sviridenko, 2016; LE!), Altai Territory (Romanov, Kipriyanova, 2010). In Northern Asia it occurs in wide spectrum of natural regions (Fig. 3I). *Tolypella prolifera* has Holarctic distribution range, but seems to be mostly very rare in many regions which can be explained by meteoric appearance of this ephemeral species in time and space.

The habitat types at the borders of distribution ranges of the species studied do not evidently differ from all other parts of their ranges, and environmental factors limiting their distribution are still far from clear. However, the joint efforts during this study resulted in improvement of species distribution in Northern Eurasia, allowing to fill some blank spots and tentatively outline northern and southern borders of the species distribution ranges in large areas of East Europe and Northern Asia. At the same time they pointed towards further joint research for revealing actual species distribution in Russia which is important on a scale of whole Eurasia.

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ПРИМЕЧАТЕЛЬНЫЕ НОВЫЕ НАХОДКИ ХАРОВЫХ ВОДОРΟΣЛЕЙ (CHARALES, CHAROPHYCEAE) ИЗ РОССИИ — УТОЧНЕНИЕ РАСПРОСТРАНЕНИЯ ВИДОВ В ЕВРАЗИИ

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Новые находки харовых водорослей в ряде регионов России, уточняющие распространение видов в Евразии, были обнаружены в результате полевых исследований 2016–2021 гг. и изучения гербарных коллекций. Новые виды были выявлены для Белгородской, Брянской, Владимирской, Ивановской, Ленинградской, Новгородской, Новосибирской, Омской, Тульской и Тюменской областей, Ханты-Мансийского Автономного Округа – Югра, Красноярского края, Республик Алтай, Мордовия и Хакасия, г. Санкт-Петербург. Новые местонахождения *Chara canescens*, *C. papillosa* и *C. subspinosa* являются самыми северными в Азии. Приведены первые точные локалитеты для *Nitella confervacea* в Азиатской России, *N. micronata* в Курганской, Новосибирской и Тюменской областях. Выяснена геопривязка наиболее северной в Азии, давней находки *C. braunii*. Все известные местонахождения изученных видов отражены на картах их распространения в центральной и юго-западной части Европейской России, Западной Сибири, которые позволяют очертить северные границы распространения ряда видов в Западной Сибири и южную границу распространения *N. wahlbergiana* в Европейской России.

Ключевые слова: *Chara*, *Nitella*, *Tolypella*, Европейская Россия, Западная Сибирь, Республика Саха