

The genus *Teilingia Bourrelly* in waterbodies of West Siberia (Russia)

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Abstract. The data on the species diversity of representatives of the genus *Teilingia* Bourrelly are summarized, from the water bodies of Western Siberia, their distribution by zones and subzones. To date, 4 species and intraspecific taxa from the order *Desmidiiales* are known for the region. Representatives of this family are found mosaically throughout the entire territory of Western Siberia. The largest number of taxa (3) was found in the middle taiga, in the tundra – two species. No species were found in the Irtysh floodplain, forest tundra, northern taiga, forest-steppe and steppe zones. In watercourses, including the Ob and Irtysh, as well as in lakes of different types, 3 taxa were identified, respectively. One species was found in swamps and in temporary reservoirs.

1 Introduction

The genus *Teilingia* Bourrelly it was described by the French phycologist P. Burrelly in 1964. It includes some of the species previously assigned to the genus *Sphaerzosma*. The species of this genus are distinguished from other genera of the order *Desmidiiales* (family *Desmidiaceae*) by a peculiar cell structure. The cells are connected in single-row long threads by means of 4 apical outgrowths. The threads are free-floating, smooth or slightly twisted, surrounded by mucus. The cells are often elongated in length or their length is equal to the width, noticeably re-laced, less compressed. The cell wall is smooth or covered with a few granules. It is known that representatives of this genus are more often found in water bodies with low pH values, water temperature and poor mineral and biogenic substances. With insufficient knowledge of the species diversity of this genus on different continents, information on ecology and distribution is extremely important.

The first mention of the discovery of this genus in the reservoirs of Western Siberia belongs to T. K. Tripolitova [1]. *Teilingia excavata* was identified in the Sandy Lake in the vicinity of Tomsk (the authors of the species are given in the table). The accumulation of information about the diversity of these species in the flora of Western Siberia was slow. The findings were recorded during hydrobiological and floral studies in various natural areas. There are a limited number of publications with finds of representatives of this genus, a number of which are bibliographic rarity. No special systematic studies of this group of organisms have been conducted.

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After conducting original research in the «Siberian Uvaly» Nature Park located in the middle Taiga subzone and taking into account the literature data, the number of taxa in the water bodies of the studied region includes 3 species represented by 4 intraspecific taxa. This paper presents the results of the distribution of *Teilingia* in various zones of the territory of Western Siberia within the borders of the Russian Federation and their ecological characteristics. The purpose of the work is to generalize information about representatives of this genus living in water bodies on the territory of Western Siberia.

2 Materials and Methods

Phytoplankton, periphyton and phytobenthos field gathering were carried out in Natural Park “Siberian Uvaly” in 2009-2011 at two key sites in the southern part of the protected area. Floodplain and continental lakes, streams and tributaries of the Gluboky Sabun River have been studied. Algological sample collecting and measuring water temperature, pH, and transparency were concurrent. The material was examined with light microscope "Amplival" at 16 x 40 magnification. Desmidiaceae species were determined using the appropriate keys [2-4]. The article material were literature and original data on the algae of West Siberian waterbodies. A whole list of references is not presented in the article as it is quite extensive.

3 Results

After conducting original research in the Siberian Uvals Nature Park, located in the middle taiga subzone, one species was identified: *Teilingia wallichii*. This species was vegetated in oxbow lakes in the vicinity of the base "Deep Sabun" noted at a temperature range of 18 to 19 ° C and at a transparency of 0.23 to 0.30 m. Active medium reaction ranged from 5.5 to 6.6. It is known from the literature that the greatest diversity of desmidiids was noted at acidic values of the active reaction of the medium [3, 5].

To date, 3 species represented by 4 species and intraspecific taxa have been found in all water bodies of the studied region (Table). Common species that would occur in all zones and subzones have not been found, which can be explained by insufficient study of the studied region. Representatives of the genus occur mosaically throughout Western Siberia. The greatest number of species (3) was detected in the middle taiga; in tundra, two species were found in water bodies. No species were found in the Irtysh floodplain, northern taiga, forest-steppe and steppe zones. Such species as *Teilingia excavata* and *T. granulata* were found slightly more frequently than others.

Table. Distribution of *Teilingia* species in natural areas of Western Siberia and their ecological and geographical characteristics

Species	O	F	I	T	FT	SRT	UT	MS	M	GL	G	A
<i>Teilingia excavata</i> (Ralfs) Bourr.	+	-	-	+	-	+	+	-	p	i	k	az
<i>T. granulata</i> (Roy et Biss.) Bourr.	+	-	+	+	-	+	-	+	p	i	k	i
<i>Teilingia wallichii</i> var. <i>wallichii</i> (Jacobs.) Bourr.	-	+	+	-	+	+	-	-	p	i	k	i
<i>T. wallichii</i> var. <i>anglica</i> (W. et G.S. West) Förster	+	-	+	-	-	-	-	-	p	i	k	?

Note: "+" - the view is present, "-" - the view is absent. On the Ob, F – IN the floodplain of the Ob, I – Irtysh, T – tundra, FT – forest tundra, SRT – middle taiga, UT – South taiga, MS – mountain, M – habitat, p – plankton, GL – globest, i – indifferent, A – acidophiles, az – acidofil, i – indifferent, G – geographical distribution, k – cosmopolitan, ? – little studied in ecological and geographic terms look.

When moving from north to south in the forest-steppe and steppe zone, the number of species decreases, a significant number of slightly salty and salty water bodies are located in these zones. Species of the genus *Teilingia* are found in various water bodies, but their number in a particular reservoir or watercourse is different and varies from 1 to 2.

There are 2 species and one variety found in watercourses, including the Ob and Irtysh. Only two species were identified in the Ob: *Teilingia excavata*, *T. granulata* and *T. wallichii* var. *anglica* and only a variety [6] was found in the Irtysh.

Teilingia wallichii was identified in the floodplain of the lower Ob [7].

In total, 3 species were identified in different types of lakes in Western Siberia. The most common were *Teilingia excavata*, *T. granulata*, *Teilingia wallichii* was once encountered.

Marshes occupy huge areas in Western Siberia, but to date there is not a single work devoted to these unique reservoirs. In these water bodies, as well as in temporary reservoirs, one species of *Teilingia excavata* and *T. wallichii* were identified.

In the ponds on the territory of Western Siberia, not a single find of a representative of this genus has been noted.

4. Discussion

Representatives of this genus are characterized by a wide ecological amplitude. According to our and literature data, in water bodies, species are more often found in plankton, but also in periphyton and bottom samples.

With regard to the typology of water bodies, there is no clear association, they are found in main (Ob, Irtysh) and small rivers, various in lakes, in swamps and temporary reservoirs.

In all water bodies, species were encountered from the second decade of June to the end of September. Most taxa were recorded in July-August. During the entire observation period, the species were found in the temperature range from 2.4 to 27.0°C. Most representatives of the genus were observed at temperatures from 13.6 to 22.0°C. Once *T. granulata* was observed in the lake at a temperature of 27.0°C [8]. According to the available data on water transparency, it varied from 0.16 to 0.70 m, but the largest number of species was observed in the range from 0.16 to 0.35 m.

Species of the genus *Teilingia* vegetated with an active water reaction from 5.1 to 7.4. Taxa were most noted at pH values from 5.6 to 6.4. The general ecological characteristics of representatives of this genus indicate the preferences of vegetation of species in an acidic environment. The most common species of *T. granulata* was observed in the water bodies of Western Siberia at pH values from 5.27 to 7.21. However, in the marshes of the Moscow region, this species was observed at pH values from 4.1 to 7.1 [9]. At the same time, this species was observed in the Sebezhsy National Park at pH values from 7.0 to 8.0 [10]. According to the studies of P. Consul, K. Meesters [4], this species is common in both alkaline and acidic reservoirs. *Teilingia wallichii*, a more rarely occurring species in the water bodies of Western Siberia, was found in a narrower range of active reaction of the medium from 5.1 to 6.7.

There is not enough information on the ecological and geographical characteristics of algae. All identified species are planktonic organisms. In relation to salinity, they are oligogalobes, namely indifferent. Data on the range of pH values in which a particular species is marked is known for 3 taxa, 1 of which is lacidophilus, occurring at pH < 7, two

species are indifferent. In biogeographic terms, all taxa are widely distributed in the reservoirs of the world (Table).

A comparison of the number of species of the genus *Teilingia* identified in the water bodies of Western Siberia with a number of flora of Russia and abroad showed that the degree of study of these algae in reservoirs and watercourses is quite comparable to that in Russia, but somewhat inferior to the Ukrainian one. Thus, there are 3 taxa known in the water bodies of Yakutia [11], 3 – in the Far East [12], 5 taxa in Ukraine [3], 2 in Ireland [13], 3 in Romania [14]. Therefore, a detailed study of various water bodies in various zones and subzones of Western Siberia is necessary in order to identify the biological diversity of the region.

5. Conclusion

Thus, the analysis and generalization of original and literary data showed that to date, 3 species of the genus *Teilingia* are known in the water bodies of Western Siberia, represented by 4 species and intraspecific taxa. The largest number of representatives of this genus (3 species each) was observed in watercourses and various lakes of the flat part of the studied territory. Of the natural zones of Western Siberia, the floodplain of the Irtysh, the northern taiga, the forest-steppe, and the steppe remain the least studied in relation to the genus.

References

1. T. K. Tripolitova, *Izv. Tomsk State University*, **79** (4) (1928)
2. G. M. Palamar-Mordvintseva, *Determinant of freshwater algae of the USSR* (L., Nauka, 1982)
3. G. M. Palamar-Mordvintseva, *Flora of water courses of continental waters of Ukraine* (Kiev, 2005)
4. P. F. M. Coesel, K. J. Meesters, *Desmids of the Lowlands Mesotaeniaceae and Desmidiaceae of the European Lowlands*. (Zeist, 2007)
5. C. Kossinskaja, *Flora of spore plants of the USSR* (Moscow, USSR Academy of Sciences, 1960)
6. O. P. Bazhenova, *Bulletin of the Omsk State Pedagogical University. Natural Sciences and Ecology* **1** (2006)
7. T. A. Safonova, *Algae and fungi of Western Siberia* (Nauka, Novosibirsk, 1964)
8. O. V. Tulchinskaya, T. A. Safonova, *Probl. of Ecol.*, **10** (4) (2003)
9. O. V. Anisimova, *To the flora of desmidian algae (Streptophyta, Desmidiiales) of water bodies of Gorny Altai*, *Problems of botany of Southern Siberia and Mongolia*, XVII International scientific-practical conference, May 24-27, Barnaul (2018)
10. A. F. Luknitskaya, *News of systematics of lower plants* **43** (2009)
11. *Diversity of the plant world of Yakutia* (Novosibirsk, 2005)
12. L. A. Medvedeva, T. V. Nikulina, *Catalog of freshwater algae of the South of the Russian Far East* (Vladivostok, 2014)
13. D. M. John, D. B. Williamson, M. B. Guiry, *A catalogue of the Desmids (Streptophycophyta, Zygnematophyceae, Zygnematales) of Ireland* (Dublin, 2011)
14. I. Caraus, *Algae of Romania (a distribution checklist of actual algae)* (Bacău, 2012)