Arctoa (1998) **7**: *21-24*

DISTRIBUTION AND ECOLOGY OF SPHAGNUM SUBFULVUM IN EUROPEAN RUSSIA

РАСПРОСТРАНЕНИЕ И ЭКОЛОГИЯ SPHAGNUM SUBFULVUM В ЕВРОПЕЙСКОЙ ЧАСТИ РОССИИ

ANATOLI I. MAKSIMOV[1]

А. И. МАКСИМОВ[1]

Abstract

In the European Russia *Sphagnum subfulvum* Sjors is widely distributed in the northern taiga subzone of the Kola Peninsula and Karelia. In the subzone of middle taiga the occurrence of *S. subfulvum* sharply decreases and south of 61° 45' N in Karelia it has not been found. A new locality of *S. subfulvum* is reported in the Kama River basin in Komi-Permyatskiy Autonomous District of Perm Province. This species grows usually in eutrophic-mesotrophic mires of aapa-type.

Резюме

Sphagnum subfulvum Sjors в европейской части России приурочен к подзоне северотаежных лесов Кольского полуострова и Карелии. В подзоне среднетаежных лесов встречаемость вида резко сокращается и южнее 61° 45' с. ш. в Карелии он не найден. Указывается новое местонахождение *S. subfulvum* на северо-востоке европейской тайги в бассейне р. Камы (Коми-Пермяцкий АО, Пермская область). Типичные местообитания вида – евтрофно-мезотрофные участки болот аапа-типа.

The discription of *S. subfulvum* by Sjors (1944) included a wealth of information on ecology and distribution of the new species. Sjors reported collections from Fennoscandia, Central Europe and Greenland, but correctly suggested that further investigation of northern Russia and North America would reveal its circumpolar range. Subsequently *S. subfulvum* has been found in North America, there it is rather common in northwest, in New Hempshire and Newfoundland and occurs also in Alaska; in Greenland, it has been found as far as to 78° N (Steere, 1978; Andrus, 1980; Lange, 1984; Crum, 1984, 1986). In Asia, *S. subfulvum* has been reported from Chukotka (Afonina & Czernyadjeva, 1995), the Amur region (Savich-Lyubitskaya, 1952) and Japan (Suzuki, 1972). In Europe outside Russia this species occurs mainly in Fennoscandia (Sjors, 1944; Nyholm, 1969; Isoviita, 1970; Daniels & Eddy, 1985; Flatberg, 1985). Disjunct localities of *S. subfulvum* have been reported in Estonia (Kannukene & Kask, 1982; Ingerpuu & Vellak, 1995), Latvia (Abolin', 1968), Switzerland and Germany (Sjors, 1944; Flatberg, 1985) and Ireland (Moen & Synnot, 1983). M. O. Hill (1978) has some doubts as to whether the species occurs in Wales.

In European Russia, *Sphagnum subfulvum* has its main distribution within Murmansk Province (Isoviita, 1970; Schljakov & Konstantinova, 1982; Kuzmina, 1987; Boch, 1989) and Karelia (Yurkovskaya, 1963, 1967; Maksimov, 1982, 1988). Most of these localities are in the subzone of northern taiga forests. In the subzone of middle taiga forests in Karelia, *S. subfulvum* is much less frequent and south of 61° 45' N it has not been found. Outside the main area it is known in Arkhangelsk Province, Pinega River basin (Volkova & Yurkovskaya, 1987) and recently has been found in collections of G. A. Elina from the Komi-Perm Autonomous Region of Perm Province (Fig. 1).

Sphagnum subfulvum is similar in appearance to *S. teres* (Schimp.) Aongst. ex Hartm., and its pink-coloured morphotypes (Flatberg, 1985) were confused with *S. subnitens* Warnst.

[1] – Institute of Biology, Karelian Research Centre, Russian Academy of Sciences, Pushkinskaya 11, Petrozavodsk 185610 Karelia, Russia - Россия 185610 Петрозаводск, Пушкинская 11, Институт биологии Карельского НЦ РАН

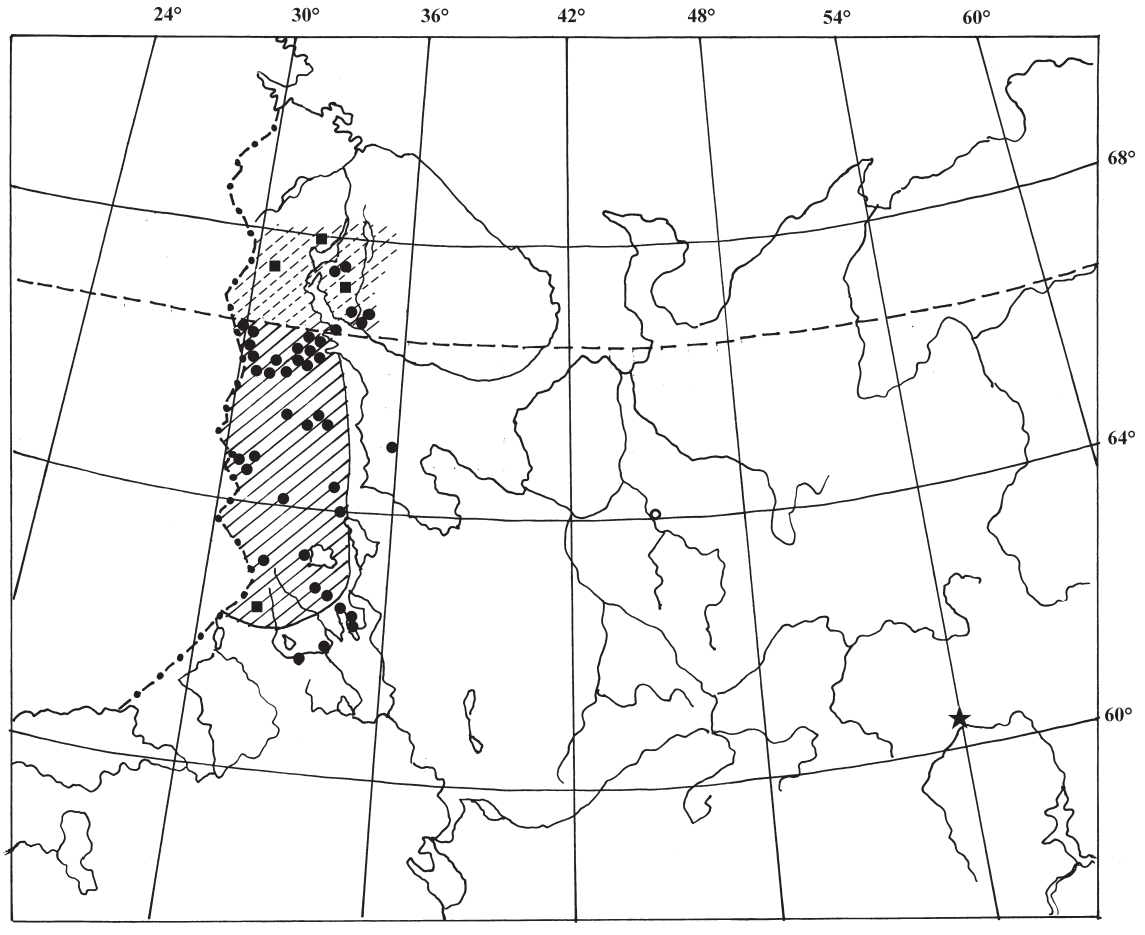

Fig. 1. Distribution of *Sphagnum subfulvum* Sjors in European Russia. Shading indicates the area where the species is rather common (dash-shading is basing on mostly literature data); solid circles – herbarium data; squares – literature data; open circle – disjunct locality in Pinega, asterisk – disjunct locality in Kama River basin.

and *S. capillifolium* (Ehrh.) Hedw. However *S. subfulvum* can be recognized by the following combination of characters: plants reddish-brown with a pinkish-violet shade of colour and slight metalic lustre. Stem leaves 1.17-1.30 mm, with broad border below; branch leaves with rather short and broad apex. Pores on the convex surface narrow, elliptical and bigger than in *S. subnitens*.

Ecological and phytocoenotic characteristics of *Sphagnum subfulvum* in Russia were discussed in several publications (Yurkovskaya, 1963, 1967; Maksimov, 1982; Volkova & Yurkovskaya, 1987). It grows usually in eutrophic-mesotrophic sites in aapa mires, occurring in lawns, low ridges and hummock. It is often a dominant or subdominant, in the latter case intermixing with *S. warnstorfii* Russ. and *S. papillosum* Lindb. Less frequently, *S. subfulvum* is found in small hollows between hummocks together with *S. contortum* K. F. Schultz, *S. subsecundum* Nees, *Scorpidium scorpioides* (Hedw.) Limpr. and *Loeskypnum badium* (Hartm.) Paul. In Karelia, *S. subfulvum* is found as a dominant in the following associations: *Carex lasiocarpa+Molinia caerulea+ Baeothryon alpinum+S. subfulvum; Carex livida+C. chordorrhiza+Scheuchzeria palustris+S. subfulvum; Carex lasiocarpa+Molinia caerulea+ Menyanthes trifoliata+S. subfulvum; Pinus sylvestris f. litwinowii+Molinia caerulea+ Baeothryon caespitosum+S. subfulvum; Carex panicea+S. subfulvum.* Communities dominated by *S. subfulvum* in the Arkhangelsk Region

(Volkova, Yurkovskaya, 1987) are referred to the association *Carex limosa+S. subfulvum*.

The chemical characteristics of the habitats in which *S. subfulvum* is found in Karelia, at a level of 5-10 cm below the mire surface, are: pH (KCl) 3.11-5.13, pH (H_2O) 4.1-6.3, ash content 5.2-6.8%, total base content 43.0-100 mmol/100 g, the degree of base saturation 67.4 - 81.0%, mobile form content K_2O 50.0-375.5 and P_2O_5 2.4-16.2 % per 100 g of dry soil. The total content of some elements per dry soil is as follows: 1.24-2.23% CaO, 0.64-0.87 % MgO, 0.03-0.47% K_2O and 0.04-0.16% P_2O_5 (Maksimov, 1984). The above values agree with a depleted eutrophic (eutrophic-mesotrophic) type of nutrition. The samples were collected on mires of northern and middle taiga forests. The average dates of ten replications were gave. pH(KCl) was determined after extracting peat samples for one day in 1N KCl solution. The samples were analysed for element content by atomic absorption spectrometry (AAS-1) after the ash was treated with a mineral acid solution HF+H_2SO_4. *Sphagnum subfulvum* occurs at pH(H_2O) 4.9-6.9 in Sweden (Sjors, 1944) and at pH(H_2O) 5.0-6.0 in Norway (Moen & Synnot, 1983).

Selected specimens examined

(if otherwise is not indicated, specimens are in Herbarium of the Institute of Biology in Petrozavodsk)

Karelia. **North-taiga forest zone:** ***Belomorsk District:*** *mire Tiksha (Ronkonen 13.VIII.1954); mire Severnoe Shuezerskoe (Maksimov 11.VII.1988; Kuznetsov 11.VII.1988).* ***Kalevala District:*** *mire Zapovednoe (Kozlova VIII.1971); mire Kentisuo (Elina 9.VIII.1972); mire Tyuryujarvi (Elina 3.VIII.1972); mire Kentikolmisuo (Elina 10.VIII.1972; Kuznetsova VIII.1972); mire Trassasuo (Elina 30.VII.1972); mire Zhosuo (Elina 11.VII.1972); mire Kentiyuksisuo (Kuznetsova 9.VIII.1972); mire Zigzagsuo (Kuznetsov 20.VII.1972); mire Amebasuo (Kuznetsov 23.VII.1973); mire Vedmina Metla (Kuznetsov 18.VII.1972; 18.VII.1973; Maksimova 10.VII; 13.VII.1981).* ***Kem District:*** *mire near Ignatovaara (Yurkovskaya 23.VII; 27.VII.1964); mire in quarter N40 (Kozlova VII.1971); mire Shombasuo (Maksimov 28.VII.1986; Maksimova 2.VIII.1976; Kuznetsov VIII.1976); mire Lebyazhje (Maksimov 14.IX.1978; 23.VII.1979; Kuznetsov 16.VIII.1976); mire Rodnoe (Maksimov 8.IX.1978; 19.VII.1990; Kuznetsov 29.VII; 24.VIII.1976); mire Zapovednoe (Kuznetsov 19.VIII; 22.VIII.1976); mire Chudesnoe (Kuznetsov 2.VII.1977); mire Pavlosuo (Kuznetsov 15.VIII.1977); mire Vostochnoe (Kuznetsov 3.VII.1978).* ***Loukhi District:*** *mire near station Loukhy (Blagoveshchensky 1930); mire near Chernaya river (Elina 7.VIII.1957); mire near Sofporog (Yurkovskaya 25.VII.1957); mire near Kestenga, 15 km to S (Yurkovskaya 1.VIII.1957); mire near Ashtakhma lake (Yurkovskaya 5.VIII.1957); mire Sennoe (Kuznetsov 19.VII.1977); mire Lovuosuo (Kuznetsov 23.VII.1977); mire Ptichje (Kuznetsov 28.VII.1977); mire Sulkasuo (Kuznetsov 18.VII.1978); mire Sitnikovoe (Kuznetsov 27.VII.1989); mire Uzkoe (Maksimov 8.VII.1987; Stoikina 10.VII.1987); mire Velikolepnoje (Maksimov 17.VII.1987; Stoikina 17.VII.1987); mire Pribrezhnoe (Stoikina 14.VIII.1988); mire Mustasuo (Stoikina 23.VII.1989); mire Pirttisuo (Stoikina 25.VII.1989); mire near Chernaja Reczka (Maksimov 5.VII.1987); mire Chkalovskoe (Maksimov 16.VII.1987); mire Zybkoe (Maksimov 22.VII.1987); mire near Savankajarvi Lake (Maksimov 21.IX.1989); mire Ukonsuo (Kuznetsov 29.VI.1979); mire Kulisuo (Kuznetsov 9.VII.1982); Pyaozero, shore of lake Tukha (Maksimov 2.VII.1996).* ***Muezersk District:*** *mire near Lubosalma (Ramenskaya 11.VIII.1948); mire near village Luvozero (Kozlova VII.1971); mire Kikulyasuo-2 (20.VII.1970).* ***Segezha district:*** *mire near Kochkoma (Yurkovskaya 28.VII.1962).* **Middle-taiga forest zone:** ***Kondopoga district:*** *mire Lan (Stoikina VIII.1973); mire Koppalasuo (Stoikina VII.1980); mire near Semcha river (Maksimov 28.VII.1980; Maksimova 18.VII; 21.VII.1980); mire Hongoyasuo (30.VII.1980; Maksimova 30.VII.1980); mire Syuvyalampi (Maksimova VII.1980); mire near village Yustozero (Ronkonen 1953); mire Salgoshildansuo (Djyachkova 17.VII.1989); mire Garvia (Kuznetsov 20.VIII.1991).* ***Medvezhyegorsk district:*** *mire Kannuzh (Maksimova 16.VIII; 17.VIII.1978); mire Schelonichny mokh, Kizhy (28.VII.1991).* ***Prionezhsky district:*** *mire Molinievoe near Shuiskaya (Maksimov 20.XI.1986).* ***Pryazha district:*** *mire Nenazvannoe (Maksimov 17.V.1983; 2.VII.1986; 23.VII.1996; Kuznetsov 3.VIII.1983; 20.VIII.1984; Maksimova 26.VII.1993).* **Reserve territories: Paanajarvi national park:** *mire near lake Vaarakumpu (Maksimov 4.VII.1996).* **Reserve Kostomukshskii:** *mire Sulkasuo (Maksimov 6.VIII.1991).*

Murmansk Province. **North-taiga forest zone:** *mire near Apatity (Schljakov 17.IX.1958, KPABG); mire near village Velmeshka (Payanskaya-Gvozdeva 8.VIII, 10.VIII, 16.VIII, 18.VIII.1980); mire near Porya Guba (Payanskaya-Gvozdeva 25.VII, 27.VII.1980); mire near village Umba (Boch 1985* KPABG*); environs Apatity, mire near Imandra Lake (Kuzmina 1990); Kandalaksha Reserve, Island Velikii (Likhachov 16.VIII.1992* KPABG*).*

Archangelsk Province. **North-taiga forest zone:** *mire Seb near village Valtevo (Yurkovskaya 26.VII, 31.VII.1977); Solovetsk Archipelago, island Bolshaya Muksalma (Maksimov 2.VIII.1997).*

Komi-Permyatskiy Autonomous District. **Middle-taiga forest zone:** *mire Bolshoe Kamskoe near village Dainy (Elina 5.IX.1976).*

LITERATURE CITED

[ABOLIN', А. А.] АБОЛИНЬ, А. А. 1968. Листостебельные мхи Латвийской ССР. – [Mosses of the Latvian SSR] *Рига, Зинанте [Riga, Zinante]: 1-329.*

AFONINA, O. M. & I. V. CZERNYADJEVA. 1995. Mosses of the Russian Arctic: check-list and bibliography. – *Arctoa* **5**: *99-142.*

ANDRUS, R. S. 1980. Sphagnaceae (Peat Moss Family) of New York State. – *Contributions to a Flora of New York State III. N. Y. State Museum Bull.* **442***: 1-89.*

[BOCH, M. S.] БОЧ, М. С. 1989. О болотах лесной полосы Кольского полуострова. – [On the mires of the forest zone in the Kola Peninsula] *Бот. Журн. [Bot. Zhurn.]* **74***: 1747-1756.*

CRUM, H. A. 1984. Sphagnopsida, Sphagnaceae. *North American Flora. Series II, Pat. 11. New York Botanical Garden, New York : 1-180 (78-79).*

CRUM, H. A. 1986. Illustrated Moss Flora of Arctic North America and Greenland. 2. Sphagnaceae. – *Meddelelser om Gronland, Bioscience* **18**: *1-61.*

DANIELS, R. E. & A. EDDY 1985. Handbook of European Sphagna. – *Institute of Terrestrial Ecolody, Huntigton: 1-262.*

FLATBERG, K. I. 1985. Studies in Sphagnum subfulvum Sjors, and related morphotypes. – *Lindbergia* **11**: *38-54.*

HILL, M. O. 1978. Sphagnopsida. – *In: Smith, A. J. E. (ed.) The Moss Flora of Britain and Ireland. Cambridge Univ. Press, Cambridge: 30-78.*

INGERPUU, N. & K. VELLAK 1995. The distribution and some ecological characteristics of Estonian rare bryophytes. – *Arctoa* **5**: *143-148.*

ISOVIITA, P**.** 1970. Studies on Sphagnum L. II. Synopsis of the distribution in Finland and adjacent parts of Norway and the U. S. S. R. – *Ann. Bot. Fennici* **7**: *157-162.*

KANNUKENE, L. & M. KASK 1982. A preliminary list of bryophytes of Estonian peatlands. – *In: V. Masing (ed.) Peatland ecosystems. Tallin "Valgus": 34-38.*

[KUZMINA, E. O.] КУЗЬМИНА, Е. О. 1987. О распространении сфагновых мхов на болотах лесной зоны Мурманской области. – [On the distribution of Sphagnum mosses on mires of forests zone in the Murmansk region] *Бот. Журн. [Bot. Zhurn.]* **72**: *1365-1369.*

LANGE, B. 1984. Sphagnum in Greenland, Svalbard, Iceland, and the Faroes. – *Lindbergia* **10**: *133-158.*

[MAKSIMOV, A. I.] МАКСИМОВ, А. И. 1982. Новые сведения об экологии и распространении Sphagnum subfulvum в Карельской АССР. – [New data on the ecology and distribution of *Sphagnum subfulvum* in the Karelian ASSR] *Бот. Журн. [Bot. Zhurn.]* **67**: *104-106.*

[MAKSIMOV, A. I.] МАКСИМОВ, А. И. 1984. Эколого-фитоценотическое значение сфагновых мхов. – [Ecological and phytocenotical significance of Sphagnum mosses] *В кн. : Елина, Г. А., О. Л. Кузнецов, А. И. Максимов. Структурно-функциональная организация и динамика болотных экосистем Карелии [In: Elina, G. A., O. L. Kuznetsov & A. I. Maksimov. Strukturno-funktsional'naya organizatsiya i dinamika bolotnykh ekosistem Karelii] Л., Наука [Leningrad, Nauka]: 9-18.*

[MAKSIMOV, A. I.] МАКСИМОВ, А. И. 1988. Бриофлора болот Карелии и ее анализ. – [Mire bryoflora of Karelia and its analysis] *В кн: Флористические исследования в Карелии. [In: Floristicheskie issledovaniya v Karelii] Петрозаводск. Карельский филиал АН СССР [Petrozavodsk, Karel'skii filial AN SSSR]: 35-62.*

MOEN, A & D. SYNNOT 1983. Sphagnum subfulvum Sjoers in Ireland compare with the occurrences in Norway. – *J. Bryol.* **12**: *331-336.*

NYHOLM, E. 1969. Illustrated moss flora of Fennoscandia. II. Musci, fasc. 6. *Lund, CWK Gleerup, 647-799.*

[SAVICZ- LYUBITSKAYA, L. I.] САВИЧ-ЛЮБИЦКАЯ, Л. И. 1952. Сфагновые (торфяные) мхи. – [Sphagnum (peat) mosses] *В кн.: Флора споровых растений СССР. Т. 1. Листостебельные мхи (ред. Савич В. П.) [In: Savicz, V. P. (ed.) Flora sporovykh rastenii SSSR. T. 1. Listostebel'nye mkhi]. М.-Л., АН СССР [Moskva-Leningrad, AN SSSR]* **1**: *1-254.*

[SAVICZ-LYUBITSKAYA, L. I. & Z. N. SMIRNOVA] САВИЧ-ЛЮБИЦКАЯ, Л. И., З. Н. СМИРНОВА 1968. Определитель сфагновых мхов СССР. – [The Handbook of Sphagnaceae of the USSR] *Л., Наука [Leningrag, Nauka]: 1-112.*

[SCHLJAKOV, R. N. & A. N. KONSTANTINOVA] ШЛЯКОВ, Р. Н., Н. А. КОНСТАНТИНОВА. 1982. Конспект флоры мохообрахных Мурманской области. – [A synopsis of Bryophyta in the Murmansk region] *Апатиты, Кольский филиал АН СССР [Apatity, Kol'skii filial Akad. Nauk SSSR]: 1-226.*

SJORS, H. 1944. Sphagnum subfulvum n. sp. and its relation to S. flavicomans (Card.) Warnst. and S. plumulosum Roll. pp. – *Svensk. Bot. Tidskr. Bd.* **38**: *403-427.*

STEERE, W. C. 1978. The mosses of Arctic Alaska. *Vaduz: Cramer. 1-508.*

SUZUKI, H. 1972. Distribution of Sphagnum species in Japan and an attempt to classify the moors based on their combination. – *J. Hattori Bot. Lab.* **35**: *3-24.*

[VOLKOVA, L. A. & T. K. YURKOVSKAYA] ВОЛКОВА, Л. А., Т. К. ЮРКОВСКАЯ 1987. Sphagnum subfulvum (Sphagnaceae) на аапа болотах онежско-печерского типа. – [Sphagnum sufulvum (Sphagnaceae) on the Onega-Pechora type of aapa mires] *Бот. Журн. [Bot. Zhurn.]* **72**: *316-318.*

[YURKOVSKAYA, T. K.] ЮРКОВСКАЯ, Т. К. 1963. К экологии и географии Sphagnum subfulvum Sjors в Карельской АССР. – [On the ecology and geography of Sphagnum subfulvum Sjors in the Karelian ASSR] *Бот. Журн. [Bot. Zhurn]* **48**: *1837-1838.*

[YURKOVSKAYA, T. K.] ЮРКОВСКАЯ, Т. К. 1967. О некоторых малоизученных видах сфагновых мхов в Карелии. – [On some poorly studied Sphagnum mosses in Karelia*] В кн.: Природа болот и методы их исследования. [V kn. : Priroda bolot i metody ikh issledovaniya.] Л., Наука [Leningrad, Nauka]: 85-89.*