Arctoa (2021) **30**: *55–62*
doi: 10.15298/arctoa.30.06

MOSS FLORA OF THE NATIONAL PARK "SMOLENSKOE POOZERYE" (NORTH-WEST RUSSIA)

ФЛОРА МХОВ НАЦИОНАЛЬНОГО ПАРКА "СМОЛЕНСКОЕ ПООЗЕРЬЕ" (СЕВЕРО-ЗАПАДНАЯ ЧАСТЬ РОССИИ)

VIKTORIA V. TELEGANOVA[1]

ВИКТОРИЯ В. ТЕЛЕГАНОВА[1]

Abstract

Moss flora of "Smolenskoe Poozerye" National Park includes 171 species. The annotated list provides the data on the distribution, habitat preference of species and locations of rare species. In the territory of the national park, complexes of rare species of mosses and valuable types of their habitats are revealed.

Резюме

Флора мхов национального парка "Смоленское Поозерье" включает 171 вид. Конспект видов включает сведения об их встречаемости, эколого-ценотическую характеристику, местонахождения редких видов. На территории национального парка выделены комплексы редких видов мхов и местообитания, имеющие ключевое значение для их сохранения.

KEYWORDS: moss flora, moss species, valuable communities, complexes of rare species

INTRODUCTION

The "Smolenskoye Poozerye" National Park was established in 1992 in the north-western part of the Smolensk Region. In the north, the National Park borders the Tver Region. The total area of its territory is 1462 km^2, the length from west to east is 55 km, from south to north – 50 km.

The territory of the "Smolenskoye Poozerye" is located in the west of the Russian Plain. The central and western parts of the Park have a moraine-hilly landscape, formed during the Valdai glaciation. Glacial lakes and peat bogs occupy depressions between hills and ridges. This territory is characterized by extensive wetlands and presence of rocky soil and boulders. In the south-eastern part of the National Park, which was not affected by this glaciation, gently undulating sandy plains predominate, and erosive landforms (ravines and gullies) are expressed.

In the territory of the National Park, there are more than 30 glacial lakes; the largest (Sapsho, Baklanovskoye, Dgo, Rytoe, Chistik) are concentrated in its central and western parts. In the northern and eastern parts of the Park, along the border of the Valdai glacier, the largest oligotrophic bogs in the region have formed (Lopatinsky Moss, 1090 ha; Pelyshev Moss, 1622 ha; Vervizhsky Moss, 4000 ha). There are quite large mesotrophic and eutrophic floodplain mires. The river system belongs to the basin of Western Dvina River.

The climate of the area is moderately continental; the average annual precipitation is 700 mm, being the highest in the Smolensk Region.

As much as 74% of the territory of the National Park is covered with forest. The zonal types are hemiboreal spruce and mixed spruce+broad-leaved forests; however the old-growth forests retained in a few places. More areas are covered now by secondary aspen-birch-spruce forests with scattered *Tilia cordata, Acer platanoides,* and *Quercus robur*. In some places, areas of old spruce+broad-leaved forests have survived. Abandoned arable fields and heyfields are overgrowing with *Betula pendula, Populus tremula,* and *Alnus incana*.

Alnus glutinosa and *Ulmus* sp. are common in wet stream valleys and depressions around lakes. Pine forest grows on the sandy river terraces, while in glacial low ridges pine grows mixed with broad-leaves trees (Reshetnikova, 2002; Nemirova & Martynov, 2010).

The first data on moss flora of the "Smolenskoe Poozerye" National Park were published by Abramova *et al*. (2010), based on their own collections representing 106 species of mosses and 11 of liverworts. Later, Kosenkov (2012) compliled the list of bryophytes of the park, adding various published data; this list includes 129 mosses and 11 liverworts.

The present paper is based on exploration of the National Park bryophyte flora by the author in 2011 and 2017–2019. Fifteen areas most diverse in its environ-

1 – National Park "Ugra", Prigorodnoe lesnichestvo, Kaluga, 248007 Russia; e-mail: teleganovavika05@rambler.ru; ORCID 0000-0003-4490-9059

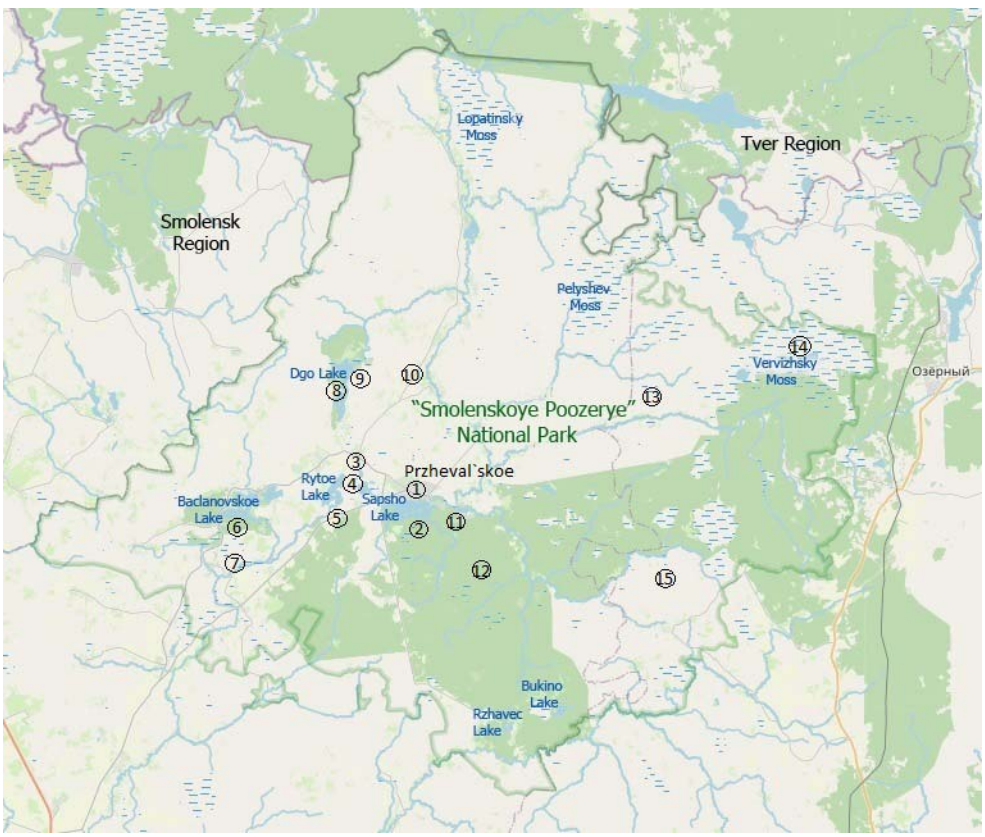

Fig. 1. Study area.
1 – Sapsho Lake, northern shore (55°30’07.9079"N – 31°50’08.9065"E)
2 – Sapsho Lake, southern shore (55°29’09.1425"N – 31°50’55.5641"E)
3 – Mutnoe Lake, eastern shore (55°31’04.9939"N – 31°47’25.5207"E)
4 – Maloe Strechnoe Lake (55°30’55.8705"N – 31°46’54.6081"E)
5 – Rytoe Lake, north-east shore (55°30’54.7735"N – 31°46’20.8865"E)
6 – Baklanovskoe Lake, southern shore (55°29’18.8015"N – 31°39’28.7001"E)
7 – Polovya River floodplain, 1.7 km W of Poboishche village, rich fens (55°27’53.8033"N – 31°39’18.9617"E)
8 – Dgo Lake, island (55°33’27.2346"N – 31°46’06.3144"E)
9 – Dgo Lake, eastern shore (55°33’56.1943"N – 31°46’38.9114"E)
10 – Bakhovskoe Lake near the Bakhovo (55°32’38.3851"N – 31°52’45.9148"E)
11 – Forest around Petrakovo (55°29’22.4740"N – 31°54’16.5624"E)
12 – Forests between Sapshanka and Paporotnya Rivers (55°28’16.8148"N – 31°55’34.1371"E)
13 – Forests between Skryteika and Sermyatka Rivers, W of Klin (55°33’32.0488"N – 31°57’29.3906"E)
14 – “Vervizhsky Moss” bog and forest on its northern shore (55°36’18.6295"N – 32°15’56.8553"E)
15 – Oknische Lake, and forest around it (55°27’42.4571"N – 32°05’51.0602"E)

mental conditions and biodiversity were studied using the route method. Own collections were supplemented by those made by E.V. Tikhonova in the course of geobotanical studies of the territory in 2016–2020. Altogether 44 species new for the bryoflora of the National Park were revealed, and only few of them were reported earlier (Teleganova, 2017). The present list summarizes data on mosses from literature and herbarium collections kept in Herbarium of the Kaluga State University (KLH).

ANNOTATED LIST OF MOSSES

Names of moss taxa are given according to Hodgetts *et al*. (2020). In some cases species names following the previously published Check-list of North Europe and East Asia (Ignatov *et al*., 2006) are given in brackets.

Species names are followed by the frequency of occurence: common (C), sporadic (S), rare (R); and then the species habitats are enumerated. Locality numbers are given for rare species, and herbarium labels are cited for species rare species found once to four times. Species new to the National Park are marked with asterisk, and species new to Smolensk Province with two asterisks.

Abietinella abietina (Hedw.) M. Fleisch. – S; on sandy soil in open dry places in young pine stands, pine forest edges, along roads in pine forests.

**Alleniella complanata* (Hedw.) S.Olsson, Enroth & D.Quandt [*Neckera complanata (*Hedw.) Huebener] – R; spruce+broad-

leaved forest near Gorodok village (55°44'19"N – 31°58'59" E) (coll. E.V. Tikhonova).

Amblyodon dealbatus (Hedw.) P. Beauv. – R; on the northern shore of Sapsho lake, on sandy soil near calcium-rich springs (coll. M.S. Ignatov, MHA).

Amblystegium serpens (Hedw.) Schimp. – S; on soil, tree trunk bases, rotten wood in forests, on artificial substrates (concrete, bricks, *etc.*).

Anomodon longifolius (Schleich. ex Brid.) Hartm. – R; in spruce+broad-leaved forest on trunks of broad-leaved trees (9, 12, 13); 1.5 km SSW of Klin Village (55°34'21.5"N, 31°56'6.7"E); 2.5 km W of Yarilovo Village (55°35'33"N-31°44'18"E) (coll. E.V. Tikhonova).

** *A. viticulosus* (Hedw.) Hook. & Taylor – R; on maple trunks (13). Epiphyte in old-growth broad-leaved forests.

** *Atrichum flavisetum* Mitt. – S; on soil on slopes in spruce +broad-leaved forests in ravines and under upturned roots.

*A. undulatum (*Hedw.) P. Beauv. – C; on a bare loamy soil and under upturned roots in mixed forests.

Aulacomnium palustre (Hedw.) Schwägr. – S; on hummocks in *Sphagnum* bogs, in swampy coniferous forests, on clearcuttings, occasionally on damp rotten wood.

Barbula unguiculata Hedw. – S; on a bare soil and rocks in open places.

Brachyteciastrum velutinum (Hedw.) Ignatov & Huttunen – C; in forests on tree bases, bare soil, rotten wood, occasionally on rocks covered with fine soil.

Brachythecium albicans (Hedw.) Schimp. – S; on dry sandy soil in open places: dry meadows, heaths, roadsides, pine forest edges.

B. campestre (Müll. Hal.) Schimp. – R; on trunk of *Fraxinus excelsior* in a mixed forest near Petrakovo village (Abramova *et al*., 2010).

B. capillaceum (F. Weber & D. Mohr) Giacom. [*Brachythecium roteanum* De Not.] – R; on soil on swampy shores of Mutnoe and Rytoe Lakes (Abramova *et al*., 2010).

**B. erythrorrhizon* Schimp. – S; on soil in small-leaved and mixed forests, in grass pine forests (coll. E.V. Tikhonova).

B. rivulare Schimp. – C; in wet habitats: on soil and rocks on banks of rivers and streams, near springs, in eutrophic mires, in alder thickets.

B. rutabulum (Hedw.) Schimp. – C; on rotten wood in forests, occasionally on rocks covered with fine soil.

B. salebrosum (Hoffm. ex F. Weber & D. Mohr) Schimp. – C; in forests on soil, tree trunk bases, rotten wood, rocks.

Bryoerythrophyllum recurvirostrum (Hedw.) P.C. Chen – R; on northern shore of Sapsho Lake (coll. M.S. Ignatov, MHA).

Bryum argenteum Hedw. – S; on a bare soil, artificial substrates (concrete, bricks, *etc.*).

Buxbaumia aphylla Hedw. – S; on sandy soil on banks of trenches in pine forests.

Callicladium haldaneanum (Grev.) H.A. Crum – C; in forests on tree trunk bases and rotten wood.

Calliergon cordifolium (Hedw.) Kindb. – S; in wet and swampy habitats: on wet and peaty soil in forests, at swamp edges, in eutrophic mires.

C. giganteum (Schimp.) Kindb. – R; in swampy forest near Bolyshoe Strechnoe lake (Abramova *et al*., 2010); in eutrophic mires, on swampy shore of lake (3,7).

Calliergonella cuspidata (Hedw.) Loeske – S; in wet and swampy habitats.

**C. lindbergii* (Mitt.) Hedenäs – R; on damp soil on swampy shore of lake (3).

**Campylium protensum* (Brid.) Kindb. – R; on forest slope to the lake, on soil near springs rich in calcium (1).

C. stellatum (Hedw.) Lange & C.E.O. Jensen – S; on damp and peaty soil near springs, on lake shores, in swampy forests and eutrophic mires.

**Campylophyllopsis calcarea* (Crundw. & Nyholm) Ochyra [*Campylidium calcareum* (Crundw. & Nyholm) Ochyra – R; on damp soil near springs (1).

**C. sommerfeltii* (Myrin) Ochyra [*Campylidium sommerfeltii* (Myrin) Ochyra] – R; in swampy forests on tree trunk bases (3, 14).

Ceratodon purpureus (Hedw.) Brid. – C; on bare soil and artificial substrates (asphalt, concrete, bricks, *etc*.).

Chionoloma tenuirostre (Hook. & Taylor) M.Alonso, M.J.Cano & J.A.Jiménez [*Oxystegus tenuirostris* (Taylor) R.H.Zander] – R; on slope of northern shore of Sapsho lake, near springs (Abramova *et al*., 2010).

Cirriphyllum piliferum (Hedw.) Grout – S; on wet soil in forests, on banks of rivers, occasionally on rocks.

Climacium dendroides (Hedw.) F. Weber & D.Mohr – C; on damp soil in mixed and swampy forests, eutrophic mires, wet meadows.

Cratoneuron filicinum (Hedw.) Spruce – R; on damp soil near springs (1).

** *Dichelyma falcatum* (Hedw.) Myrin – R; on boulders in dry riverbed (12).

Dicranella heteromalla (Hedw.) Schimp. – S; on bare sandy soil in pine and mixed forests: under upturned roots, on roadsides and banks of trenches.

D. rufescens (Dicks.) Schimp. – R; on clayish trail to Sapsho lake (Abramova *et al*., 2010)

**D. varia* (Hedw.) Schimp. – R; on soil on forest trail (6).

** *Dicranum bonjeanii* De Not. – S; on sandy soil in pine forests, occasionally on rocks covered with fine soil.

D. flagellare Hedw. – R; on birch trunk base near Strechnoe lake (Abramova *et al*., 2010), on soil on trail in spruce-pine forest, on damp rotten wood in swampy spruce forest (5, 6).

**D. fragilifolium* Lindb. – R; on tree trunk in old-growth broad-leaved forest between Skryteika and Sermyatka Rivers (55°34'10"N – 32°2'28"E) (coll. E.V. Tikhonova).

**D. fuscescens* Turner – R; Kurov-Borskoe forestry, near Petrakovo Village, sq. 31 (55°29'32.1"N, 31°52'59.2"E), on trunk base in coniferous+small-leaved blueberry+forb forest (coll. E.V. Tikhonova).

** *D. majus* Turner – R; on soil in swampy birch forest (3); 1 km W Loshamye Lake (55°30'35"N – 31°57'49"E), on soil in swampy coniferous+small-leaved blueberry+mossy forest; 3 km E of Ploschadka (55°25'16"N – 31°53'4"E), on soil in grassy spruce forest (coll. E.V. Tikhonova).

D. montanum Hedw. – C; in forests on rotten wood, tree trunk bases, exserted tree roots.

D. polysetum Sw. – C; on litter in mossy coniferous forests, occasionally on rotten wood.

D. scoparium Hedw. – C; in forests on rotten wood, tree trunk bases, occasionally on litter in mossy coniferous forests.

**D. viride* (Sull. & Lesq.) Lindb. – R; in spruce+broad-leaved forest on trunks of broad-leaved trees, less often on old birches and recently fallen trees (8, 9 ,11 ,13).

Drepanocladus aduncus (Hedw.) Warnst. – S; on damp soil in wet and swampy habitats: banks of lakes, wet meadows, eutrophic mires.

D. polygamus (Schimp.) Hedenäs – R; in swampy birch forest and rich fens (3, 7).

** *D. sendteri* (Schimp. ex H. Müll.) Warnst. – R; in rich fens (7).

Encalypta vulgaris Hedw. – R; on soil on northern shore of Sapsho Lake (coll. M.S. Ignatov, MHA).

Eurhynchiastrum pulchellum (Hedw.) Ignatov & Huttunen – R; on trunk of *Acer platanoides* on shore of Dgo lake (Abramova *et al*., 2010) and on soil in grassy pine forest (1).

*Eurhynchium angustirete (*Broth.) T.J. Kop. – C; in spruce and mixed forests on litter, soil, rotten wood, occasionally on rocks covered with fine soil.

Fissidens adianthoides Hedw. – S; on damp soil in wet swampy forests, eutrophic mires, near springs.

F. bryoides Hedw. – S; in forests on bare damp soil.

F. osmundoides Hedw. – R; on soil in birch forest on shore of Sapsho Lake and on damp peaty soil in swampy birch forest on shore of Mutnoe lake (Abramova *et al*., 2010).

F. taxifolius Hedw. – S; in forests on bare damp soil.

Fontinalis antypiretica Hedw. – S; in cold streams and small rivers with sandy or rocky bottoms, occasionally in lakes.

Funaria hydrometrica Hedw. – R; on soil along trail on lake shore (9).

Grimmia muehlenbecii Schimp. – S; on rocks in forests; on a cement curb and granite memorial in Przhevalskoe (coll. M.S. Ignatov, MHA).

**G. pulvinata* (Hedw.) Sm. – R; on granite memorial near Petrakovo village (11).

Hamatocaulus vernicosus (Mitt.) Hedenäs – R; on shore of Dgo lake, with *Calliergonella cuspidata* (Abramova *et al*., 2010); in rich fens (7).

** *Hedwigia ciliata* (Hedw.) P. Beauv. – R; on boulders at pine forest edges (8, 11).

**Helodium blandowii* (F. Weber & D. Mohr) Warnst. – R; in rich fens (7).

Herzogiella seligeri (Brid.) Z. Iwats. – S; in forests on damp rotten wood.

Homalia trichomanoides (Hedw.) Brid. – S; on trunks and trunk bases of broad-leaved trees and *Populus tremula*.

Hygroamblystegium varium (Hedw.) Mönk. – R; on cement wall of fountain fence at camping on shore of Baklanovskoe Lake (Abramova *et al*., 2010).

Hylocomiadelphus triquetrus (Hedw.) Ochyra & Stebel [*Rhytidiadelphus triquetrus* (Hedw.) Warnst.] – C; on litter in coniferous and mixed forests, occasionally on tree trunk bases and rotten wood.

**Hylocomiastrum umbratum* (Hedw.) M. Fleisch. – R; on litter in wet spruce forest (6).

Hylocomium splendens (Hedw.) Schimp. – C; on litter in mossy coniferous forests, occasionally on tree trunk bases and rotten wood in mixed forests.

Hypnum cupressiforme Hedw. – S; on trunks and trunk bases of broad-leaved trees or birches, occasionally on rocks covered with fine soil.

**Isothecium alopecuroides* (Lam. ex Dubois) Isov. – R; on trunks of *Acer platanoides* (11, 13). Epiphyte in old-growth broad-leaved forest.

Jochenia pallescens (Hedw.) Hedenäs, Schlesak & D. Quandt [*Stereodon pallescens* (Hedw.) Mitt.] – C; on tree trunks and trunk bases, occasionally on rotten wood and rocks.

** *Kindbergia praelonga* (Hedw.) Ochyra – R; at trunk base in wet spruce forest (12).

Leptodictyum riparium (Hedw.) Warnst. – R; on meadow, in wet hollow along Elsha River bank (Abramova *et al*., 2010); on wooden bridge in water (3).

Leskea polycarpa Hedw. – R; on trunk of *Salix* on lake shore (10).

Leucodon sciuroides (Hedw.) Schwägr. – R; in spruce & broad-leaved forest on trunks of broad-leaved trees (1, 9, 12, 13); on trunk of *Tilia cordata* in Przhevalskoe (Abramova *et al*., 2010); 3 km N-NE of Korevo, Kurov-Borskoe forestry, Gobzyanskaya Dacha, sq. 21 (55°24'3"N – 31°56'18"E) (coll. E.V. Tikhonova). Epiphyte in old-growth broad-leaved forest.

Lewinskia speciosa (Nees) F. Lara, Garilleti & Goffinet [*Orthotrichum speciosum* Nees] – C; on trunks of deciduous trees, most often on *Salix*.

Mnium stellare Hedw. – R; at tree base in spruce & broad-leaved forest (13).

Neckera pennata Hedw. – S; on trunks of broad-leaved trees and *Populus tremula* in spruce & broad-leaved forests, spruce-aspen forests, and on rocks at forest edge.

**Nyholmiella obtusifolia* (Brid.) Holmen & E. Warncke [*Orthotrichum obtusifolium* Brid.] – S; on trunks of *Salix, Populus,* and broad-leaved trees.

Oxyrrhynhium hians (Hedw.) Loeske – C; on bare soil and slopes in forests, in overgrown meadows, occasionally on rocks covered with fine soil.

Palustriella commutata (Hedw.) Ochyra – R; on damp soil on shore of Sapsho lake (coll. M.S. Ignatov, MHA).

** *P. decipiens* (De Not.) Ochyra – R; on damp soil near springs rich in calcium (1).

** *Paraleucobryum longifolium* (Hedw.) Loeske – R; on rock at edge of pine forest (8).

Plagiomnium affine (Blandow ex Funck) T.J. Kop. – C; on damp soil and litter in spruce forests.

P. cuspidatum (Hedw.) T.J. Kop. – C; in forests on soil, tree trunk bases, rotten wood, and rocks covered with fine soil.

P. elatum (Bruch & Schimp.) T.J. Kop. – R; in damp and light habitats: swampy meadows, shrubs, eutrophic mire edges, near springs.

P. ellipticum (Brid.) T.J. Kop. – S; in wet habitats, most often on damp soil in alder and mixed forests, on lake shores, in eutrophic mires.

P. medium (Bruch & Schimp.) T.J. Kop. – S; on soil and litter in deciduous and mixed forests.

** *P. rostratum* (Schrad.) T.J. Kop. – R; on trunk bases of *Acer platanoides* in spruce & broad-leaved forests (13).

P. undulatum (Hedw.) T.J. Kop. – S; on soil in damp deciduous and mixed forests, on lakes shores.

Plagiothecium cavifolium (Brid.) Z. Iwats. – S; on bare soil, more often on slopes in ravines, occasionally on rocks covered with fine soil in forests.

P. curvifolium Schlieph. ex Limpr. – S; in spruce and mixed forests on trunk bases of *Picea*, occasionally on rotten wood.

P. denticulatum (Hedw.) Schimp. – C; in forests on bare soil, tree trunk bases, and rotten wood.

P. denticulatum var. *undulatum* R. Ruthe ex Geh. – R; on damp soil on lake shores, in wet hollows in forests (3, 5, 12).

P. nemorale (Mitt.) A. Jaeger – R; on trail to Sapsho Lake (Abramova *et al*., 2010); on trunk base of *Acer platanoides* in spruce & broad-leaved forest (13).

P. rossicum Ignatov & Ignatova – C; on tree trunk bases and rotten wood in forests.

Platygyrium repens (Brid.) Schimp. – S; on trunks of deciduous trees and on recently fallen trunks.

Pleurozium schreberi (Brid.) Mitt. – C; common species on litter in green-moss coniferous forests, occasionally in other types of forests on litter, at tree bases and on rotten wood.

Pohlia andalusica (Höhn.) Broth. – R; near Petrakovo (Abramova *et al*., 2010).

** *P. cruda* (Hedw.) Lindb. – R; on bare soil in grassy pine forest (1).

P. nutans (Hedw.) Lindb. – S; in forests on bare soil, at tree bases, occasionally on rocks covered with fine soil and rotten wood.

P. proligera (Kindb. ex Breidl.) Lindb. ex Arnell – R; 3,5 km W of Przhevalskoe, Bolshoe Strechnoe Lake (coll. M.S. Ignatov, MHA).

Polytrichum commune Hedw. – C; on damp soil and litter in swampy forests, at bogs edges.

**P. formosum* Hedw. [*Polytrichastrum formosum* (Hedw.) G.L. Sm] – S; in coniferous and mixed forests on damp soil, forest litter, occasionally on rotten wood and under upturned roots.

P. juniperinum Hedw. – S; on bare sandy soil in forests and young pine stands.

P. longisetum Sw. ex Brid. [*Polytrichastrum longisetum* (Sw. ex Brid.) G.L. Sm.] – S; in forests on damp soil, at tree bases, under upturned roots, occasionally on damp rotten wood.

** *P. pallidisetum* Funck [*Polytrichastrum pallidisetum* (Funck) G.L. Sm.] – S; on damp soil in deciduous and mixed forests.

P. piliferum Hedw. – S; on sandy soil in open dry places in young pine stands, at pine forest edges, and on heaths.

P. strictum Menzies ex Brid. – S; on hummocks in *Sphagnum* bogs.

Pseudoamblystegium subtile (Hedw.) Vanderp. & Hedenäs [*Serpoleskea subtilis* (Hedw.) Loeske] – S; on trunks and trunk bases of broad-leaved and aspen trees in mixed and spruce & broad-leaved forests.

*Pseudobryum cinclidioides (*Huebener) T.J. Kop. – R; on damp peaty soil in swampy habitats in mixed forests (11,12).

**Pseudoleskeella nervosa* (Brid.) Nyholm – R; on trunk of *Tilia cordata* in mixed forest (8).

Ptilium crista-castrensis (Hedw.) De Not. – S; on litter in green-mossy coniferous forests.

Ptychostomum capillare (Hedw.) Holyoak & N. Pedersen [*Bryum capillare* Hedw.] – R; on sandy soil on slope to Sapsho Lake (Abramova *et al*., 2010).

P. imbricatulum (Müll. Hal.) Holyoak & N. Pedersen [*Bryum caespiticum* Hedw.] – S; on bare soil and cement (Abramova *et al*., 2010).

P. intermedium (Brid.) J.R. Spence [*Bryum intermedium* (Brid.) Blandow] – R; on shore of Sapsho Lake (coll. M.S. Ignatov, MHA).

P. moravicum (Podp.) Ros & Mazimpaka [*Bryum moravicum* Podp.] – R; on sandy soil on slope to Sapsho Lake; on soil on shore of Dgo Lake (Abramova *et al*., 2010).

P. pseudotriquetrum (Hedw.) J.R. Spence & H.P. Ramsay ex Holyoak & N. Pedersen [*Bryum pseudotriquetrum* (Hedw.) G. Gaertn., B. Mey. & Scherb.] – S; on wet soil near springs, on lake shores, in eutrophic mires (Abramova *et al*., 2010).

P. weigelii (Biehler) J.R. Spence [*Bryum weigeli* Biehler] – R; on damp soil in overgrown rut on shore of Dgo Lake (Abramova *et al*., 2010).

Pylaisia polyantha (Hedw.) Schimp. – C; epiphyte of deciduous trees.

**Racomitrium canescens* (Hedw.) Brid. [*Niphotrichum canescens* (Hedw.) Bedn.-Ochyra & Ochyra] – R; 1.2 km W of Bol'shoe Zakustische (55°25'12"N – 31°37'43"E), on sandy soil in young pine forest with birch, heather, green mosses, and spots of lichens (coll. E.V. Tikhonova).

Rhizomnium punctatum (Hedw.) T.J. Kop. – C; on damp rotten wood, damp soil, and rocks covered with fine soil in forests.

Rhodobryum roseum (Hedw.) Limpr. – S; on litter in spruce and mixed forests.

Rhytidiadelphus squarrosus (Hedw.) Warnst. – S; in more or less open and moist habitats: on damp meadows, grassy forest edges, and clearcuttings.

R. subpinnatus (Lindb.) T.J. Kop. – R; on litter in damp spruce forest (6); 0.5 km N of Przheval'skoe (55°31'10"N – 31°51'9"E), on soil in grassy spruce & small-leaved forest (coll. E.V. Tikhonova).

Saelania glaucescens – R; on northern shore of Sapsho Lake (coll. M.S. Ignatov, MHA).

Sanionia uncinata (Hedw.) Loeske – C; on rotten wood, tree trunks and trunk bases.

Schistidium apocarpum (Hedw.) Bruch & Schimp. – S; on boulders in more or less open habitats.

** S. papillosum* Culm. – R; 10 km N of Prechistoe Village (55°36'26.61" N – 32°18'38.17"E), on boulder at forest edge near dirty road.

**Schistostega pennata* (Hedw.) F. Weber & D. Mohr – R; under upturned roots in spruce and spruce & broad-leaved forests (9, 11, 12).

Sciuro-hypnum curtum (Lindb.) M.S. Ignatov – S; in spruce and spruce & broad-leaved forests on litter, occasionally on rotten wood and tree trunk bases.

*S. populeum (*Hedw.) Ignatov & Huttunen – S; on tree trunks and rocks covered with fine soil in forests.

S. reflexum (Starke) Ignatov & Huttunen – S; on tree trunks and trunks bases, occasionally on rotten wood in broad-leaved forests, willow and alder stands.

**S. starkei* (Brid.) Ignatov & Huttunen – S; on soil, rotten wood, and tree trunk bases in mixed forests (coll. E.V. Tikhonova).

**Scorpidium cossonii* (Schimp.) Hedenäs – R; Baklanovskoe lesnichestvo, 54 sq., swampy valley of Vileika river (55.47805°N – 31.5912°E), in grassy swamp with *Menyanthes trifoliata* and *Trichophorum alpinum* (coll. A.V. Titovets).

Sphagnum angustifolium (C.E.O. Jensen ex Russow) C.E.O. Jensen – C; on tops and slopes of hummocks in *Sphagnum* bogs in pine-cottongrass-*Sphagnum* communities.

S. balticum (Russow) C.E.O. Jensen – R; in *Sphagnum* bog in pine-cottongrass-*Sphagnum* community near Strechnoe Lake: between hummocks, on floating mats, dominating in communities with *Rhynchospora alba* and *Scheuchzeria palustris* (Abramova *et al*., 2010).

S. capillifolium (Ehrh.) Hedw. – S; in swampy coniferous and birch forests, occasionally on tops and slopes of hummocks in *Sphagnum* bogs.

S. centrale C.E.O. Jensen – C; at bog edges and in swampy forests.

S. cuspidatum Ehrh. ex Hoffm. – R; in a watered rut on a forest road to bog «Vorob'inyi Moss» (Abramova *et al*., 2010); in hollows of *Sphagnum* bog (14).

S. divinum Flatberg & Hassel – C; in *Sphagnum* bogs, more often on hummocks together with *S. angustifolium*, sometimes on their slopes and between hummocks, less often in swampy forests. We refer to *S. divinum* samples from the National Park identified as *S. magellanicum* before the revision. However, findings of *S. medium* Limpr. are also possible in this area.

S. fallax (H. Klinggr.) H. Klinggr. – C; one of the most common and widespread species in all types of *Sphagnum* bogs, less often in swampy pine forests.

S. fimbriatum Wilson – R; in eutrophic mire with *Calamagrostis canescens* and *Calla palustris* among mossy spruce forest on the road from «Svyatoi istochnik»; in birch-alder-grassy mire at shore of Mutnoe lake (Abramova *et al*., 2010).

S. flexuosum Dozy & Molk. – R; on small hummock in eutrophic mire with *Calamagrostis canescens* and *Calla palustris* among mossy spruce forest on the road from «Svyatoi istochnik»; in pine-shrub-*Sphagnum* bog near Strechnoe Lake; in forest bog near Petrakovo Village (Abramova *et al*., 2010).

*S. fuscum (*Schimp.) H. Klinggr. – S; in oligotrophic pine-shrub-cottongrass-*Sphagnum* bog communities.

S. girgensohnii Russow – C; at bog edges and in swampy forests; common in spruce forests.

S. majus (Russow) C.E.O. Jensen – R; on floating mat near water in pine-shrub-cottongrass-*Sphagnum* bog near Strechnoe Lake (Abramova *et al*., 2010); in hollows of *Sphagnum* bog (14).

**S. papillosum* Lindb. – R; in covers of open areas of *Sphagnum* bog (14)

S. riparium Ångstr. – S; in birch-willow communities at bogs edges and lake shores.

**S. rubellum* Wilson – R; in mixed patch with other *Sphagnum* species in covers and low, flat hummocks in pine-cottongrass-*Sphagnum* communities of *Sphagnum* bog (14).

**S. russowii* Warnst. – S; in swampy pine forests and at bog edges.

S. squarrosum Crome – C; in eutrophic mires, swampy forests and at bogs edges, more often in birch and spruce forests.

** S. subsecundum* Nees – R; in eutrophic willow-grass-moss mire (7).

** S. tenellum* (Brid.) Pers. ex Brid. – R; on slope of hummock in pine-cottongrass-*Sphagnum* community of *Sphagnum* bog (14).

**S. teres* (Schimp.) Ångstr. – R; in eutrophic willow-grass-moss mire (7).

S. wulfianum Girg. – R; in mossy spruce forest with *Vaccinium myrtillus* on Sapsho Lake shore on the road to Sapshanka river (Abramova *et al*., 2010); in swampy spruce forest (12).

Streblotrichum convolutum (Hedw.) P. Beauv [*Barbula convoluta* Hedw.] – R; near Petrakovo village (coll. M.S. Ignatov, MHA).

Stereodon pratensis (W.D.J. Koch ex Spruce) Warnst. [*Breidleria pratense (*W.D.J. Koch ex Spruce) Loeske] – S; on damp soil in swampy habitats.

Straminergon stramineum (Dicks. ex Brid.) Hedenäs – S; in eutrophic mires, on floating mats near lake shores.

Syntrichia ruralis (Hedw.) F. Weber & D. Mohr – R; on sandy soil at roadside and in young pine stands near Petrakovo (Abramova *et al*., 2010).

Tetraphis pellucida Hedw. – C; on damp rotten wood in spruce and mixed forests, occasionally under upturned roots.

*Thuidium assimile (*Mitt.) A. Jaeger – S; on trunks and trunk bases of broad-leaved trees, occasionally on soil in spruce-broad-leaved forests.

** T. delicatulum* (Hedw.) Schimp. – R; on trunk bases of maples and alders in damp forests (6, 9).

T. recognitum (Hedw.) Lindb. – S; on sod soil in more or less open habitats: meadows, clearcuttings, forest edges, light forests.

** Tomentypnum nitens* (Hedw.) Loeske – R; in grass-moss community in swampy birch forest on lake shore (3).

**Ulota intermedia* Schimp. – S; on trunks of aspen, alder and broad-leaved trees in forests; near Zahody (55°27'43"N – 31°51'29"E), on trunk of alder in alder-birch forest (coll. E.V. Tikhonova).

Warnstorfia fluitans (Hedw.) Loeske – R; in a watered rut on a forest road to bog «Vorob'inyi Moss» (Abramova *et al.*, 2010); in the water between high hummocks in eutrophic mire (7).

Weissia controversa Hedw. – R; on the northern shore to Sapsho Lake (Abramova *et al*., 2010).

LITERATURE RECORDS NOT CONFIRMED BY HERBARIUM COLLECTIONS

The following species were listed by Kosenkov (2012) without any information on their distribution and ecology. *Campylopus flexuosus* is currently unknown in Russia. However, findings of other species in the territory of the National Park "Smolenskoe Poozerye" are possible.

Atrichum tenellum (Röhl.) Bruch & Schimp.

Dicranum flexicaule Brid.

Campylopus flexuosus (Hedw.) Brid.

Fissidens exilis Hedw.

Leptobryum pyriforme (Hedw.) Wilson

Sarmentypnum exannulatum (Schimp.) Hedenäs [*Warnstorfia exannulata* (Schimp.) Loeske]

Sphagnum obtusum Warnst.

S. palustre L.

DISCUSSION

In total, 171 species of mosses were identified in collections from the National Park "Smolenskoe Poozerye", including 21 species of *Sphagnum*.

About 50% of the species are rare in the territory of the National Park, 30% occur sporadically and 20% are frequent.

In general, moss flora of the National Park "Smolenskoe Poozerye" is characterized by a quite high species diversity compared to other protected areas located in similar environments in hemiboreal and southern boreal forests. In the northern section of the National park "Ugra" 149 moss species were listed (Teleganova, 2020a); in Central Forest State Nature Reserve 150 species (Ignatov *et al*. 1998); in National Park "Sebezhsky" 157 species (Andreeva, 2005); in Polistovsky Reserve 140 species (Teleganova, 2020b); and in Prioksko-Terrasnyi Reserve 156 species (Ignatov *et al*., 2019).

Rare moss species in the National Park "Smolenskoe Poozerye" comprise several ecological groups in five types of habitats.

1. Old-growth zonal spruce+broad-leaved forests are the habitat of basiphilous epiphytes (*Dicranum viride, Leucodon sciuroides, Anomodon longifolius, A. viticulosus, Neckera pennata, Isothecium alopecuroides, Alleniella complanata*), which were severely declined in Central Russia in 20th century (Ignatov & Ignatova, 2003, 2004). This group is well represented in three areas of the National Park: south of Petrakovo, between rivers Skryteyka and Sermyatka, and in Paporotnya and Sapshanka (locs. 11, 12, and 13 in Fig. 1). Two species, *Alleniella complanata* and *Isothecium alopecuroides,* have in the National Park the easternmost localities in lowland of Central European Russia: they occur in Europe-

an Russia in the North-West (rare), common in Caucasus, and *Alleniella* has few isolated populations in Ural mountains.

2. Damp spruce and mixed forests of spruce with *Betula alba, B. pendula* and *Populus tremula* are characterized by a high species diversity of mosses, including rare species: *Fissidens adianthoides, Hylocomiastrum umbratum, Stereodon pratensis,* and *Schistostega pennata*. This group is well represented at southern shore of Baklanovskoe Lake (loc. 6) and eastern shore of Rytoe Lake (loc.5a).

3. Minerotrophic grass-moss and sedge-moss mires are the habitat for *Tomentypnum nitens, Hamatocaulis vernicosus, Calliergon giganteum, Helodium blandowii, Campylium stellatum, Scorpidium cossonii,* and *Drepanocladus sendteri*. These are mostly more northern species. Many of them have strongly declined in Central European Russia in 20th century due to peat mining and peatland irrigation (Ignatov & Ignatova, 2003, 2004). In the National part they occur on the shore of Mutnoe Lake (loc. 3), floodplain extension of Polovya River to the north-east of Poboishche village (loc. 7), and in a grass swamp in the lower part of Vileika River.

4. Rocky substrates are represented in the National Park by moraine boulders, mostly granitic, where acidophilous epilithic mosses occur: *Hedwigia ciliata, Paraleucobryum longifolium, Schistidium papillosum, Chionoloma tenuirostre, Grimmia muehlenbeckii,* and *G. pulvinata.* These species are rather common in North-Western European Russia, being very rare in its Central part. The most diverse asrea for these species is island in Dgo Lake (loc. 8), and near Petrakovo village (loc. 11).

5. Areas near carbonate water springs at the northern shore of Sapsho Lake (loc. 1) are the habitat of calciphilous species: *Fissidens osmundoides, Palustriella commutata, Encalypta vulgaris, Saelania glaucescens,* and *Amblyodon dealbatus.* In the lowland part of Central Russia they are known from a few localities.

Acknowledgemens

The author thanks the director of the National Park "Smolenckoe Poozerje" A.S. Kochergin, and scientific staff of the park G.L. Kosenkov and V.R. Khokhryakov for support and help in organizing of field work; I'm grateful to all inspectors of the park for assistance. I also thank E.V. Tikhonova (CEPF RAS) for sharing of her moss collections from the park; N.M. Reshetnikova (N.V. Tsitsin' Main Botanical Garden) and Yu.A. Semenshchikova (Bryansk State University) for participating in field work; M.S. Ignatov (N.V. Tsitsin' Main Botanical Garden) and E.A. Ignatova (M.V. Lomonosov Moscow State University) for the help with identification of some specimens.

Literature cited

[ABRAMOVA, L.I., M.S. M.S. IGNATOV & E.A. M.S. IGNATOVA] АБРАМОВА Л.И., ИГНАТОВ М.С., ИГНАТОВА Е.А. 2010. Предварительный список видов мохообразных национального парка «Смоленское Поозерье» – [Preliminary list of bryophytes of the National Park «Smolenskoe Poozerye»] *В кн.: Экспедиционные исследования: состояние и перспективы. Вторые международные научные чтения памяти Н.М. Пржевальского (материалы конференции).* [*In: Ekspedicionnye issledovaniya: sostoyanie i perspektivy. Vtorye mezhdunarodnye nauchnye chteniya pamyati N.M. Przheval'skogo (materialy konferencii)*] *Смоленск* [*Smolensk*]: *51–57*.

[ANDREEVA E.N.] АНДРЕЕВА Е.Н. 2005. Изменения и дополнения к бриофлоре национального парка "Себежский". – [Changes and additions to the bryoflora of the Sebezhsky National Park] *Природа Псковского края* [*Priroda Pskovskogo kraya*] **19**: *27–28.*

HODGETTS, G., L. SÖDERSTRÖM, T.L. BLOCKEEL, S. CASPARI, M.S. IGNATOV, N.A. KONSTANTINOVA, N. LOCKHART, B. PAPP, C. SCHRÖCK, M. SIM-SIM, D. BELL, N.E. BELL, H.H. BLOM, M.A. BRUGGEMAN-NANNENGA, M. BRUGUÉS, J. ENROTH, K.I. FLATBERG, R. GARILLETI, L. HEDENÄS, D.T. HOLYOAK, V. HUGONNOT, I. KARIYAWASAM, H. KÖCKINGER, J. KUČERA, F. LARA & R.D. PORLEY. 2020. An annotated checklist of bryophytes of Europe, Macaronesia and Cyprus. – *Journal of Bryology* **42**: *1–116.* https://doi.org/10.1080/03736687.2019.1694329

IGNATOV M.S., O.M. AFONINA, E.A. IGNATOVA *et al*. 2006. Checklist of mosses of East Europe and North Asia. – *Arctoa* **15**: *1–130*.

[IGNATOV, M.S. & E.A. IGNATOVA] ИГНАТОВ М.С., Е.А. ИГНАТОВА. 2003. Флора мхов средней части европейской России. Т. 1. Sphagnaceae – Hedwigiaceae. – [Moss flora of the middle European Russia. Vol. 1. Sphagnaceae – Hedwigiaceae] M. [Moscow]: *1–608*.

[IGNATOV, M.S. & E.A. IGNATOVA] ИГНАТОВ М.С., Е.А. ИГНАТОВА. 2004. Флора мхов средней части европейской России. Т. 2. Fontinaceae – Amblystegiaceae. – [Moss flora of the middle European Russia. Vol. 2. Fontinaceae – Amblystegiaceae] *M.* [*Moscow*]: *609–960*.

[IGNATOV M.S., E.A. IGNATOVA, E.N. KURAEVA, T.YU. MINAEVA & A.D. POTEMKIN] ИГНАТОВ М.С., Е.А. ИГНАТОВА, Е.Н. КУРАЕВА, Т.Ю. МИНАЕВА, А.Д. ПОТЕМКИН. 1998. Бриофлора Центрально-Лесного биосферного заповедника (Европейская Россия, Тверская область). – [Bryoflora of the Central Forest Biosphere Reserve (European Russia, Tver Region)] – *Arctoa* **7**: *45–58.*

IGNATOV, M., E. IGNATOVA & T. SYCHEVA. 2019. Moss checklist of Prioksko-Terrasnyi Biosphere Reserve, European Russia. Version 1.1. Prioksko-Terrasnyi Biosphere Reserve. Checklist dataset https://doi.org/10.15468/er5taj accessed via GBIF.org on 2021-06-02.

KOSENKOV, G.L.] КОСЕНКОВ Г.Л. 2012. Биологическое разнообразие национального парка "Смоленское Поозерье" (список видов). – [Biological diversity of the "Smolenskoye Poozerye" National Park (list of species)] *Смоленск* [*Smolensk*]: *29–44*.

[NEMIROVA, E.S. & B.I. MARTYNOV] НЕМИРОВА Е.С., Б.И. МАРТЫНОВ. 2010. К изучению растительности Смоленской области. – [To the study of vegetation of the Smolensk region] *Вестник Московского государственного областного университета. Серия: Естественные науки* [*Vestnik Moskovskogo gosudarstvennogo oblastnogo universiteta. Seriya: Estestvennye nauki*] **2**: *74–79*. http://vestnik-mgou.ru/Articles/View/159.

[KRUGLOV, N.D. (ed.)] КРУГЛОВ Н.Д. (ред.). 2006. Красная книга Смоленской области: Редкие и находящиеся под угрозой исчезновения виды животных и растений. – [Red Book of the Smolensk region: Rare and endangered species of animals and plants] *Смоленск* [*Smolensk*], *294 pp*.

[RESHETNIKOVA, N.M.] РЕШЕТНИКОВА Н.М. 2002. Сосудистые растения национального парка "Смоленское Поозерье" (аннотированый список видов). – [Vascular plants of the "Smolenskoye Poozerye" National Park (annotated list of species)] *M.* [*Moscow*], *92 pp*.

[[TELEGANOVA, V.V.] ТЕЛЕГАНОВА В.В. 2017. К изучению флоры мхов национального парка "Смоленское Поозерье". – [On the moss flora of the «Smolenskoe Poozerye» National Park] *В кн.: Экспедиционные исследования: "Евразийские маршруты и открытия Н.М. Пржевальского: интеграция и перспективы научных исследований в системе ООПТ". Пятые международные чтения памяти Н.М. Пржевальского (материалы конференции)* [In: *Ekspedicionnye issledovaniya: "Evraziskie marshruty I otkrytiya N.M.*

Przheval`skogo: integraciya i perspektivy. Vtorye mezhdunarodnye nauchnye chteniya pamyati N.M. Przheval`skogo (materialy konferencii)] *Смоленск, Маджента* [*Smolensk, Madzhenta*]: *112–116*.

[TELEGANOVA, V.V.] ТЕЛЕГАНОВА В.В. 2020a. Мхи (Bryophyta) Калужской области. – [Mosses (Bryophyta) of the Kaluga region] *Серия "Кадастровые и мониторинговые исследования биологического разнообразия в Калужской области". Вып. 5.* [*Seriya "Kadastrovye I monitoringovye issledovaniya biologicheskogo raznoobraziya v Kaluzhskoi oblasti. Vol.5*] *Калуга, Ваш Домъ* [*Kaluga, Vash Dom*]*, 100 pp.*

[TELEGANOVA, V.V.] ТЕЛЕГАНОВА В.В. 2020b. Мхи Полистовского заповедника (аннотированный список видов). – [Mosses of the Polystovsky Reserve (annotated list of species] *Флора и фауна заповедников. Вып. 138* [*Flora and Fauna of Reserves. Issue 138*] *М., Товарищество научных изданий КМК* [*Moscow, KMK Scientific Press*], *38 pp.*

Received 11 January 2021 *Accepted 16 July 2021*