

MOSSES OF KALUGA PROVINCE (MIDDLE EUROPEAN RUSSIA) AND
THEIR REPRODUCTIVE FEATURES

ЛИСТОСТЕБЕЛЬНЫЕ МХИ КАЛУЖСКОЙ ОБЛАСТИ (СРЕДНЯЯ
ПОЛОСА ЕВРОПЕЙСКОЙ РОССИИ) И ОСОБЕННОСТИ ИХ
РЕПРОДУКТИВНОЙ БИОЛОГИИ

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Abstract

Moss flora of Kaluga Province includes 226 species, 42 of them were found for the first time in the province. The annotated list provides the data on the distribution and habitat preference of species. The proportion of sexes and the frequency of sporophytes and gametangia for monoicous and dioicous species is analyzed.

Резюме

Флора листостебельных мхов Калужской области включает 226 видов, из них 42 вида являются новыми для области. Приводится конспект флоры с указанием встречаемости, местонахождений и экологической приуроченности видов. Проанализировано соотношение полов, частота спороношения и образования гаметангиев у видов с разными половыми типами.

STUDY AREA AND ITS EXPLORATION

Kaluga Province is situated in the Central European Russia, in a lowland. Its area is 29,900 sq. km, and 44% of the territory is covered by forest, the hemiboreal type in the north, and the broad-leaved one in the south. The virgin forests are almost lacking, while secondary *Betula* forests are the most widespread. Arable lands cover extensive areas, especially in the central and eastern parts of the province. Peatlands are rare, less than 1% of the province territory, occurring mostly in the western, more forested part (Pashkang, 1989).

The moss collections from the province are known since 1910s (few collections in LE), and publications appeared since 1920. Zhadovsky (1928) listed 22 species for Chertovo Gorodishche, an interesting place with sandstone outcrops; this list includes a number of very rare species. Simultaneously, in the course of peatland studies, Gerasimov (1924) and Rabotnov (1929) reported

several mire species, including some never found after that. After about half of the century, Peshkova (1975) published a list of *Sphagna* of the north-western part of the province and also a short list (32 species) of mosses collected near the town of Tarusa. Her main collection of mosses remains unpublished, but it had been granted to the Herbarium of Moscow University (MW) and was used in the present study. Later, mosses were collected by Majorov (2001) in Kozelsky District and by Smirnova in the Nature Reserve «Kaluzhskie Zaseki» in Ulyanovsk District. The latter collection has been studied by Popova, who also made her own exploration in Kozelsk, Ulyanovsk and Khvastovich Districts (Popova & Ob'edkova, 2000; Popova, 2001, 2002). Altogether, 180 species have been reported from the province in all these publications.

My studies in recent years, 2006-2008, revealed 42 species new to the province and I col-

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Fig. 1. Collecting localities of mosses in Kaluga Province. See also Table 1.

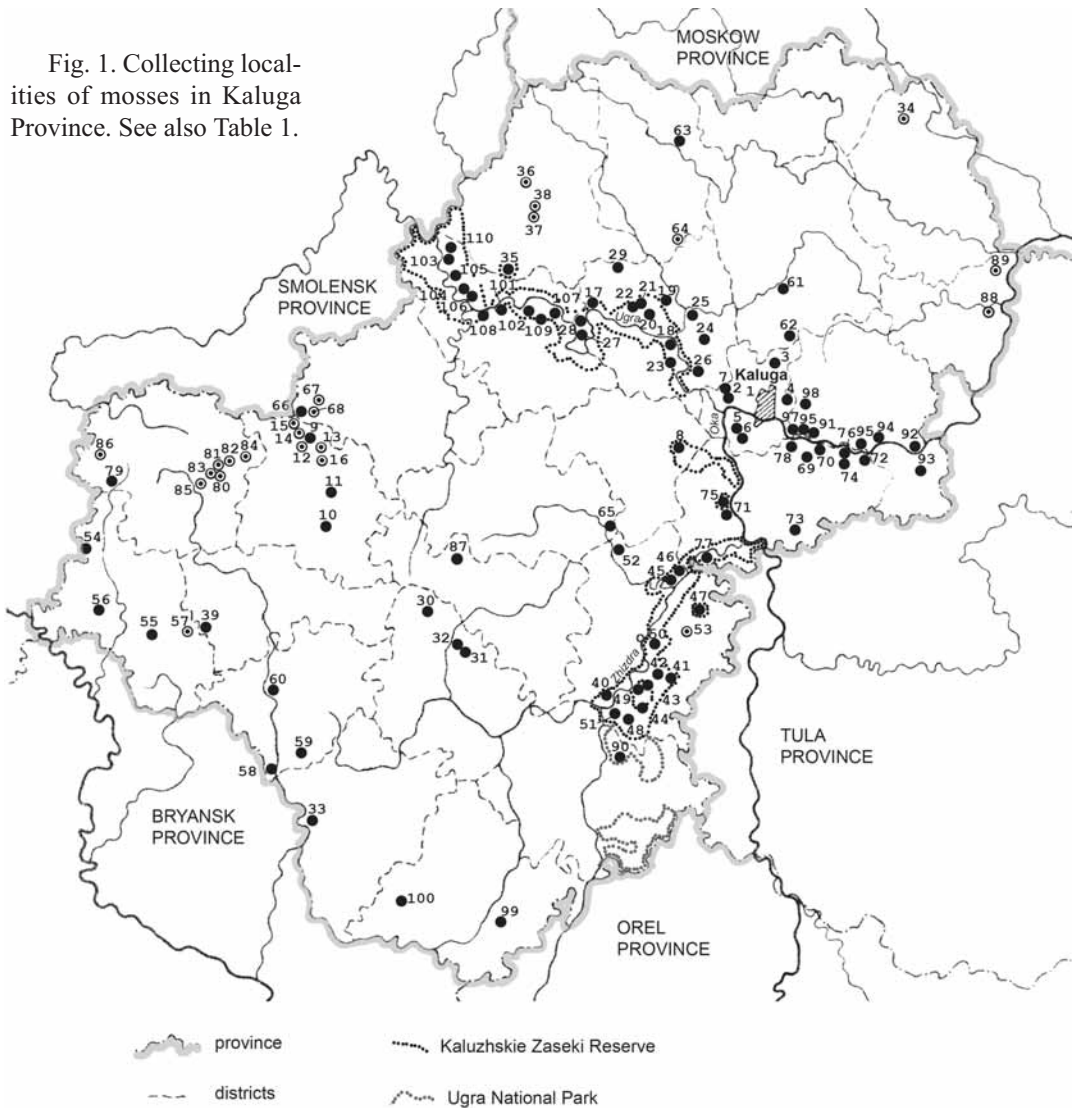


Table 1. List of localities shown in Fig. 1.

№	местонахождение	locality	Latitude – Longitude
1.	г. Калуга: Калужский городской бор	Kaluga: Kaluga City pine forest	54°31'N – 36°13'E
2.	бор за мкр. Аненки	pine forest near Anenki	54°32'N – 36°09'E
3.	заброшенный известняковый карьер в окр. ж/д ст. Садовая	abandoned lime-pit near Sadovaya railway station	54°33'N – 36°14'E
4.	окр. пос. Ждамирово	Zhdamirovo	54°31'N – 36°23'E
5.	пойменный широколиственный лес к Ю-З д. Чижовка	flood-plain broad-leaved forest S-W of Chizhovka	54°27'N – 36°07'E
6.	ельники в окр. дд. Сивково и Верх. Вырка	spruce forests near Sivkovo and Verkhnyaya Vyрка	54°25'N – 36°10'E
7.	заброшенный известняковый карьер в окр. пос. Мстихино	abandoned lime-pit near Mstikhino	54°34'N – 36°06'E
8.	Бабынинский р-н: склоны к р. Выссе	Babyninsky Distr.: slopes to Vyssa River	

	в окр. дд. Кромиино и Шамордино	near Kromino and Shamordino	54°25-26'N – 35°58-59'E
9.	Барятинский р-н: Шатино болото (зарастающие торфоразработки)	Baryatinsky Distr.: Shatino Bog (overgrowing drained bog)	54°29'N – 34°29'E
10.	окр. с. Зеваки Белозерские	Zevaki Belozerskie	54°17'N – 34°36'E
11.	окр. с. Крисаново-Пятница	Krisanovo-Pyatnitsa	54°32'N – 34°38'E
12.	д. Зимницы	Zimnitsy	54°26'N – 34°28'E
13.	д. Глазово	Glazovo	54°27'N – 34°38'E
14.	д. Калугово	Kalugovo	54°29'N – 34°29'E
15.	пос. Калуговское болото	Kalugovo Bog	54°32'N – 34°27'E
16.	д. Красниково	Krasnikovo	54°23'N – 34°33'E
17.	Дзержинский р-н: 17. склоны к р. Угре у дд. Звизжи и Никола-Ленивец	Dzerzhinsky Distr.: slopes to Ugra River near Zvizzhi and Nikola-Lenivets	54°44'N – 35°37'E
18.	склоны к р. Угре напротив пос. Товарково	slopes to Ugra River opposite Tovarkovo	54°40'N – 35°55'E
19.	выработанный торфяник и лес вокруг него в окр. д. Шеняно-Слобода	drained peatbog and forest around it near Shenyano-Sloboda	54°44'N – 35°56'E
20.	ур. Бурцево	Burtsevo	54°42'N – 35°51'E
21.	Галкинское болото	Galkino Bog	54°45'N – 35°49'E
22.	Бучкино болото	Buchkino Bog	54°45'N – 35°48'E
23.	выработанный торфяник в окр. с. Горбенки	drained peatbog near Gorbenki	54°38'N – 35°57'E
24.	зарастающие отвалы известняковых карьеров у пос. Акатово	overgrowing dumps of abandoned lime-pits near Akatovo	54°41'N – 36°02'E
25.	зарастающие отвалы известняковых карьеров у пос. Полотняный Завод	overgrowing dumps of abandoned lime-pits near Polotnyanyi Zavod	54°43'N – 35°58'E
26.	сосняки в окр. пос. Льва Толстого	pine forests near L'va Tolstogo	54°35'N – 36°00'E
27.	склоны к р. Угре в окр. д. Смагино	slopes to Ugra River near Smagino	54°41'N – 35°34'E
28.	сфагновое болото у д. Дюкино	<i>Sphagnum</i> bog near Dyukino	54°43'N – 35°32'E
29.	болото и лес вокруг него у д. Копоня	mire and forest around it near Koponya	53°52'N – 35°50'E
30.	Думиничский р-н: смешанные леса в окр. д. Верх. Сяглово	Duminichsky Distr.: mixed forests near Verkhnee Syaglovo	54°05'N – 34°59'E
31.	смешанные леса к В д. Шваново	mixed forests E of Shvanovo	54°03'N – 35°05'E
32.	ольшаники у вдхр. Брынъ	alder forest near Bryn' water reservoir	54°03'N – 35°05'E
33.	Жиздринский р-н: хвойные и пойменные широколиственные леса в окр. с. Улемль	Zhizdrinsky Distr.: coniferous and broad-leaf forests near Uleml'	53°39'N – 34°30'E
34.	Жуковский р-н: д. Воробьи	Zhukovsky Distr.: Vorob'i	55°09'N – 36°49'E
35.	Износковский р-н: Морозовское болото	Iznoskovsky Distr.: Morozovo Bog	54°49'N – 35°16'E
36.	д. Ефаново	Efanovo	55°00'N – 35°18'E
37.	д. Сигово	Sigovo	54°54'N – 35°23'E
38.	д. Даниловка	Danilovka	54°57'N – 35°20'E
39.	Кировский р-н: водораздельный широколиственный лес к С-З д. Засецкий	Kirovsky Distr.: watershed broad-leaved forest N-W of Zasetsky	54°03'N – 34°06'E
40.	Козельский р-н: хвойные и пойменные широколиственные леса в окр. с. Волконское	Kozelsky Distr.: coniferous and flood-plain broad-leaved forests near Volkonskoe	53°54'N – 35°40'E
41.	боры на дюнах на правом берегу р. Жиздры к С пос. Слаговищи	pine forests on sand-hills on right bank of Zhizdra River N of Slagovischi	53°58'N – 35°41'E

Table 1. List of localities shown in Fig. 1 (continued).

42.	окр. пос. Березичский Стеклозавод	Berezichsky Steklozavod	53°56'N – 35°48'E
43.	склоны к р. Чепчик	slopes to Chepchik Creek	53°56'N – 35°48'E
44.	водораздельные широколиственные леса к 3 д. Волосово-Звягино	watershed broad-leaf forest W of Volosovo-Zvyagino	54°50'N – 35°48'E
45.	склоны к р. Серене у д. Каменка	slopes to Serena River near Kamenka	54°09'N – 35°53'E
46.	склоны к р. Жиздре у дд. Подборки и Верх. Алопово	slopes to Zhizdra River near Podborki and Verkh. Alopovo	54°11'N – 35°57'E
47.	ур. Чертово Городище	Chertovo Gorodische	54°05'N – 36°00'E
48.	елово-широколиственные леса к 3 д. Трошна	spruce-broad-leaf forests W of Troshna	53°51'N – 35°46'E
49.	окр. экологической базы «Отрада»	ecological station “Otrada”	53°55'N – 35°45'E
50.	зарастающие торфоразработки у пос. Механический Завод	overgrowing drained peatbog near Mekhanichesky Zavod	54°00'N – 35°50'E
51.	сфагновое болото и лес вокруг него к 3 д. Кричина	<i>Sphagnum</i> bog and forest around it W of Krichina	53°50'N – 35°40'E
52.	склоны к р. Серене у д Сбелево	slopes to Serena River near Sbelevo	54°13'N – 35°39'E
53.	окр. пос. Сосенский	Sosensky	54°02'N – 35°58'E
54.	Куйбышевский р-н: окр. д. Орловка	Kuibyshevsky Distr.: Orlovka	54°20'N – 33°29'E
55.	окр. пос. Бетлица	Betlitsa	54°01'N – 33°57'E
56.	ур. Ковалевская дача	Kovalevskaya dacha	54°05'N – 33°43'E
57.	ж/д. ст. Феликсово	railway station Feliksovo	54°03'N – 34°06'E
58.	Людиновский р-н: окр. д. Куява	Ludinovsky Distr.: Kuyava	53°44'N – 34°24'E
59.	окр.д. Моисеевка	Moiseevka	53°46'N – 34°35'E
60.	ур. Красный воин	Krasnyi Voin	53°55'N – 34°21'E
61.	Малоярославецкий р-н: Природный парк «Остров» у пос. Детчино	Maloyaroslavetsky Distr.: Nature Park “Ostrov” near Detchino	54°48'N – 36°19'E
62.	заброшенная усадьба у д. Дубровка	abandoned country estate near Dubrovka	54°43'N – 36°20'E
63.	Медынский р-н: склоны к р. Лужа у д. Кременское	Medynsky Distr.: slopes to Luzha River near Kremenskoe	55°06'N – 35°57'E
64.	д. Желтыкино	Zheltykino	54°52'N – 35°55'E
65.	Мещовский р-н: склоны к р. Серене у дд. Сбежня и Копцево	Meschosky Distr.: slopes to Serena River near Sbezhnya and Koptsevo	54°15'N – 35°39'E
66.	Мосальский р-н: окр. оз. Бездон	Mosalsky Distr.: Bezdon Lake	54°30'N – 34°26'E
67.	д. Долгое	Dolgoe	54°33'N – 34°34'E
68.	д. Нов. Калугово	Novoe Kalugovo	54°32'N – 34°29'E
69.	Перемышльский р-н: склоны к р. Ужержь к Ю от с. Ахлебинино	Peremyshlsky Distr.: slopes to Uzherd River S of Akhlebinino	54°25'N – 36°25'E
70.	склоны к р. Оке у с. Ахлебинино	slopes to Oka River near Akhlebinino	54°26'N – 36°26'E
71.	склоны к р. Птаре у дд. Ладыгино и Ершовка	slopes to Ptara River near Ladygino and Ershovka	54°19'N – 36°05'E
72.	склоны к р. Оке у д. Брагино	slopes to Oka River near Bragino	54°25'N – 36°39'E
73.	склоны к р. Свободь у д. Красниково	slopes to Svobod River near Krasnikovo	54°15'N – 36°23'E
74.	окр. д. Семеновка	Semenovka	54°25'N – 36°35'E

75.	склоны к оз. Тишь у д. Желохово	slopes to Tish' Lake near Zhelokhovo	54°21'N – 36°09'E
76.	склоны к р. Оке у д. Пески	slopes to Oka River near Peski	54°25'N – 36°37'E
77.	сфагновое болото и склоны к р. Жиздре у с. Ильинское	<i>Sphagnum</i> mire and slopes to Zhizdra River near Il'inskoe	54°12'N – 36°03'E
78.	окр. д. Крутицы	Krutitsy	54°27'N – 36°21'E
79.	Спас-Деменский р-н: окр. д. Церковщина	Spas-Demensky Distr.: Tserkovschina	54°22'N – 33°42'E
80.	болото Игнатовский Мох	Ignatovo Bog	54°21'N – 34°11'E
81.	д. Князево	Knyazevo	54°23'N – 34°09'E
82.	ст. Чипляево	Chiplyaevo	54°23'N – 34°12'E
83.	д. Утриково	Utrikovo	54°21'N – 34°07'E
84.	д. Суходол	Sukhodol	54°24' – 34°15'E
85.	д. Лесково	Leskovo	54°20' – 34°00'E
86.	д. Нестеры	Nestery	54°25' – 33°42'E
87.	Сухиничский р-н: окр. д. Володино	Sukhinichsky Distr.: Volodino	54°13' – 35°05'E
88.	Тарусский р-н: окр. г. Тарусы	Tarussky Distr.: Tarusa	54°43' – 37°01'E
89.	окр. с. Некрасово	Nekrasovo	54°49' – 37°08'E
90.	Ульяновский р-н: окр. д. Новая Деревня (ГПЗ "Калужские Засеки")	Ul'yanovsky Distr.: Novaya Derevnja (Kaluzhskie Zaseki Reserve)	53°47'N – 35°44'E
91.	Ферзиковский р-н: склоны к р. Оке у д. Авчурино	Ferzikovsky Distr.: slopes to Oka River near Avchurino	54°27'N – 36°25'
92.	склоны к р. Оке напротив с. Дugna	slopes to Oka River opposite Dugna	54°26'N – 36°52'
93.	окр. д. Широково	Shirokovo	54°23'N – 36°49'E
94.	заброшенный известняковый карьер и склоны к р. Оке к В с. Кольцово	abandoned lime-pit and slopes to Oka River E of Kol'tsovo	54°26'N – 36°43'E
95.	склоны к р. Оке у д. Криуши	slopes to Oka river near Kriushi	54°27'N – 36°22'E
96.	«Кольцовские пещеры» (выходы известняков на склоне к р. Оке у д. Михайловка)	"Koltsovo caves" (limestone outcrops on the slopes to Oka River near Mikhailovka)	54°25'N – 36°36'E
97.	склоны к р. Оке в окр. пос. Турынино	slopes to Oka river near Turynino	54°30'N – 36°22'E
98.	окр. д. Красотынка	Krasotyinka	54°31'N – 36°24'E
99.	Хвастовичский р-н: боры на дюнах в окр. с. Теребень	Khvastovichsky Distr.: pine forests on sand-hills near Tereben'	53°25'N – 35°18'E
100.	окр. д. Слобода	Sloboda	53°28'N – 34°51'E
101.	Юхновский р-н: Юхновский бор, г. Юхнов	Ukhnovsky Distr.: Ukhnov pine forest	54°45'N – 35°20'E
102.	склоны к р. Угре у д. Палатки	slopes to Ugra river near Palatki	54°45'N – 35°21'E
103.	ур. Косая гора	Kosaya gora	54°51'N – 35°03'E
104.	Беляевское болото	Belyaev Bog	54°47'N – 35°06'E
105.	хвойные и смешанные леса от д. Беляево до ур. Косая гора	coniferous and mixed forests from Belyaev to Kosaya gora	54°50'N – 35°04'E
106.	ельник у д. Беляево	spruce forest near Belyaev	54°47'N – 35°06'E
107.	склоны к р. Угре в окр. д. Олоньи горы	slopes to Ugra River near Olon'i gory	54°43'N – 35°28'E
108.	сложный бор к С от д. Натальинка	pine forest N of Natal'inka	54°45'N – 35° 20'E
109.	сплавина озера и лес вокруг него у д. Озерки	mire around Ozerki Lake and forest around it	54°44'N – 35°23'E
110.	Пановское болото	Panovo Bog	54°53'N – 35°05'E

lected additional data for the characteristics of species distribution in 110 localities (Fig. 1, Table 1). The exploration was focused especially on the river valleys, where slopes often have old-growth forest and limestone outcrops. Another type of habitats of special interest was peatlands. Some interesting findings have been published before (Teleganova et al., 2008; Teleganova & Ignatov, 2006; Teleganova, 2007).

In addition to overall species distribution, the second aim of the study was an evaluation of the presence of gametangia and sporophytes. These data were collected mainly for 35 dioicous species with rare sporophyte production. This study was based on a number of samples from all studied localities. For other species such data were not collected specially in the field, but they were included in the course of preparation of the paper basing on the re-study of available herbarium collections even if a relatively few number of specimens were available for the count. We believe that the observed proportion of sexes and the frequency of sporophytes can at least give a general impression on the frequency of sexes and sporophyte production in the province.

LIST OF SPECIES

The list includes 226 species. The occurrence is abbreviated as U – unique (one locality, even if found in several places within it), R – rare (2-7), S – sporadic (8-30), C – common (usually >30, but widespread and locally abundant species, like *Amblystegium serpens* and *Aulacomnium palustre*, were referred to common even if the number of specially studied localities where they were found was smaller). Some common and well-recognizable species were not collected from all the studied places, thus some of them are under-represented in herbarium collections. Their occurrence was evaluated using both herbarium and field records. After that, the localities are listed, using numbers explained in Table 1 and Fig. 1); literature records are given before enumeration of localities studied by myself. They are followed by brief data on species ecology, and then the sex distribution is given as follow: for dioicous species abbreviations include: f – number of female collections, m – male collections, fmS- – mixed collections without sporophytes, fmS+ – mixed collections with sporophytes, st – sterile); the oc-

currence of sporophytes and sterile condition is indicated for autoicous species (S-, S+). For *Sphagna*, the presence/absence of sporophytes was registered irrespectively to their sexual condition. The differential occurrences of sexes on different substrates is indicated where this was noticed. Dioicous species that were in a special focus of this study are indicated by asterisk (*).

Voucher specimens are in KLH, most duplicates in MHA.

**Abietinella abietina* (Hedw.) M.Fleisch. – C; [1, 8, 17, 18, 24, 25, 26, 27, 33, 40, 41, 42, 43, 52, 58, 60, 61, 63, 65, 70, 71, 76, 91, 92, 93, 94, 99, 100]; in open dry places: edges of pine forests, steppe, dry meadows, on soil-covered rock outcrops, concrete blocks, also recorded on the aspen trunk base in a flood-plane forest [26f; 12m; 2fmS-; 2fmS+; 5st]. Sporophytes were found for the first time in the middle part of European Russia, and probably in the whole Russia.

Aloina rigida (Hedw.) Limpr. – U; [7]; on limestone in a limestone pit [1S+].

Amblystegium serpens (Hedw.) Bruch et al. – C; [17, 18, 24, 44, 45, 63, 70, 72, 73, 76, 91, 92, 94, 95, 97, 102, 103, 105]; on rocks, soil, rotten wood and tree trunk bases [30S+ (on all types of substrates), 3S-].

**Anomodon attenuatus* (Hedw.) Huebener – S; [Kaluzhskie Zaseki Reserve (Popova, 2002); 47 (Zhadovsky, 1928; Popova, 2002); 5, 33, 40, 44, 46, 48, 49, 52, 58, 60, 70, 72, 76, 91, 92, 94, 96, 97, 107]; broad-leaved forests; on tree trunks and soil-covered rock outcrops [26f; 10m; 2fmS-; 2fmS+; 15st]. Male and mixed populations, as well as sporophytes were found only on trunks.

**A. longifolius* (Brid.) Hartm. – S; [Kaluzhskie Zaseki Reserve, 47 (Popova, 2002); 88 (Peshkova, 1977); 5, 18, 33, 39, 44, 46, 47, 48, 52, 56, 58, 60, 62, 66, 70, 72, 73, 76, 92, 94, 95, 96, 97, 90, 99, 107]; broad-leaved forests; on tree trunks and soil-covered rock outcrops [29f; 29m (on tree trunks more often); 28fmS+; 5st].

**A. viticulosus* (Hedw.) Hook. – S; [47 (Popova, 2002); 18, 33, 39, 40, 44, 58, 60, 70, 72, 76, 92, 96, 97]; broad-leaved forests; on tree trunks and soil-covered rock outcrops [4f; 12m; 16fmS+; 9st].

Atrichum tenellum (Röhl.) Bruch et al. – R; [47, 53 (Popova, 2002) and 2 other localities (Popova, 2001); 44, 58, 61]; on bare sandy soil on roadsides in forests, on soil-covered outcrop of sandstone [3st].

A. undulatum (Hedw.) P.Beauv. – C; [88, 89 (Peshkova, 1977); 1, 4, 5, 6, 8, 10, 11, 17, 19, 23, 27, 29, 30, 31, 32, 33, 44, 46, 47, 48, 49, 50, 54, 55, 56, 66, 69, 71, 73, 77, 79, 92, 93, 102, 103, 105, 107, 108]; on bare soil and under upturned roots in forests, some-

- times in overgrowing meadows, opening, soil-covered rock outcrops [13S+ (on all types of substrates); 5S-].
- Aulacomnium palustre* (Hedw.) Schwägr. – C; [1, 2, 9, 20, 21, 28, 29, 35, 39, 40, 42, 47, 50, 51, 56, 77, 80, 90, 100, 104]; Sphagnum bogs, on hummocks; boggy pine forests, on soil, sometimes on damp rotten wood [2fmS+; 7st].
- Barbula convoluta* Hedw. – R; [72, 76]; on bare soil, soil-covered damp limestone [1f; 2st].
- **B. unguiculata* Hedw. – C; [1, 3, 4, 5, 6, 7, 8, 18, 24, 25, 26, 32, 41, 42, 45, 46, 52, 55, 58, 60, 63, 65, 69, 70, 72, 74, 75, 76, 78, 92, 93, 94, 94, 97]; on bare soil and rocks in open habitats [3f; 17fmS+; 5st].
- Brachytectiastrum velutinum* (Hedw.) Ignatov & Hutunnen – C; [5, 17, 18, 30, 33, 42, 49, 60, 66, 70, 91, 92, 97, 99, 105, 106]; on tree trunk bases, bare soil and rotten wood in forests, soil-covered rocks [13S+; 3S-].
- **Brachythecium albicans* (Hedw.) Bruch et al. – C; [5, 25, 52, 61, 63, 70, 71, 76, 91, 93, 99, 103]; in dry open habitats: steppes, dry meadows, roadsides, grassy and herbaceous slopes [8f; 4m; 4st].
- B. campestre* (Müll.Hal.) Bruch et al. – S; [5, 17, 24, 40, 42, 48, 60, 63, 70, 99, 103]; similar to previous species, and also found in broad-leaved forest on rotten wood [3S+; 4S-].
- B. glareosum* (Bruch ex Spruce) Bruch et al. – R; [17, 65]; open grassy slopes to river valleys, on soil and dry limestones [3f].
- B. mildeanum* (Schimp.) Schimp. – S; [3, 17, 23, 42, 58, 72, 46, 70, 91, 94]; in wet and disturbed habitats, on soil [4S+; 5S-].
- **B. rivulare* Bruch et al. – C; [53 (Popova, 2002); 3, 8, 9, 17, 27, 40, 46, 49, 52, 58, 63, 65, 72, 79, 90, 94, 96, 97, 102, 108]; wet habitats, mostly on soil and rocks on the banks of creeks [5f; 7m; 14fmS+; 11st].
- B. rotaeantum* De Not. – R; [8, 44, 72, 73]; on limestones and on the trunk of *Ulmus* in broad-leaved forest [4S+].
- B. rutabulum* (Hedw.) Bruch et al. – C; [17, 18, 24, 27, 31, 33, 39, 42, 44, 45, 47, 48, 49, 56, 58, 60, 62, 65, 69, 70, 71, 72, 92, 93, 94, 95, 103, 105, 106, 107, 108]; in wet and shady habitats: mostly on rotten wood and soil-covered rock outcrops in forests [29S+; 6S-].
- B. salebrosum* (F.Weber & D.Mohr) Bruch et al. – C; [1, 3, 4, 6, 8, 17, 18, 24, 25, 27, 31, 39, 44, 46, 49, 60, 62, 69, 70, 72, 74, 77, 92, 94, 95, 97, 103, 105, 108]; on tree trunk bases, soil, rotten wood, soil-covered rocks [27S+; 7S-].
- Breidleria pratensis* (W.D.J.Koch ex Spruce) Loeske – U; [9 (collection of Peshkova & Bachurina, 1965, MW)]; drained overgrowing mire with hypnanean mosses, on soil.
- Bryoerythrophyllum recurvirostrum* (Hedw.) P.C.Chen – R; [46, 52, 76, 102]; on limestones and calcareous soil in open habitats, and on rotten wood near a spring [4S+; 1S-].
- **Bryum argenteum* Hedw. – C; [17, 18, 24, 42, 65, 73, 92, 97, 100]; in different habitats and on different substrates, including variously disturbed ones [3f; 3fmS+; 3st].
- B. bimum* (Schreb.) Turner – U; [82 (Peshkova, Bachurina, 1965 (MW))]; on soil in shrub stand.
- B. caespiticium* Hedw. – C; [88 (Peshkova, 1977); 5, 18, 48, 69, 91, 92, 94, 97, 100, 103]; on bare sandy soil, often on disturbed and man-made substrates [1m; 5fmS+; 2st].
- B. capillare* Hedw. – C; [17, 54, 69, 70, 91, 97]; on soil, rotten wood, exserted roots of trees in forests [3m; 2st].
- B. creberrimum* Taylor – S; [47 (V.I. Zolotov's unpublished data); 63, 69, 103]; on bare sandy soil [4S+].
- B. intermedium* (Brid.) Blandow – U; [6 (Popova, 2002)]; on limestones in sunny place.
- B. lonchocaulon* Müll.Hal. – S; [3, 24, 45, 46, 75, 100]; on bare sandy soil, often in more or less open boggy habitats [5S+; 2S-].
- **B. moravicum* Podp. – S; [33, 42, 43, 48, 49, 60, 69, 72, 73, 77, 97, 92, 95]; on tree trunks and tree bases in forests, on soil-covered rock outcrops [1f; 15st].
- B. pallens* Sw. ex anon. – S; [Kaluzhskie Zaseki Reserve; 47 (Popova, 2002); 49, 58, 78]; on damp bare soil, often on bluff banks of rivers [1fmS+; 2st].
- B. pseudotriquetrum* (Hedw.) P.Gaertn., B.Mey. & Scherb. – C; [3, 9, 19, 23, 24, 42, 59, 65, 97, 103, 108]; on soil and rotten wood in wet habitats [1f; 10st].
- B. weigeli* Spreng. – U; [Kaluzhskie Zaseki Reserve (Popova, 2002)]; in wet habitats on soil.
- Buxbaumia aphylla* Hedw. – R; [47 (Popova, 2002); 53 (Majorov, 2001); 41, 99]; on sandy soil on banks of trenches in pine forests [2fmS+].
- Callicladium haldanianum* (Grev.) H.A. Crum. – C; [17, 33, 42, 44, 46, 47, 49, 50, 58, 60, 70, 76, 90, 92, 95, 97, 103, 105, 108]; on rotten wood and tree trunk bases in forests [17S+; 3S-].
- Calliergon cordifolium* (Hedw.) Kindb. – S; [47 (Popova, 2002); 3, 9, 17, 23, 33, 29, 42, 46, 50, 54, 55, 58, 79, 87, 90, 99, 105, 110]; on soil in swampy habitats [4S+ (meso- and eutrophic mires); 15S-].
- C. giganteum* (Schimp.) Kindb. – R; [Spas-Demensky Distr. (Rabotnov, 1929); 9]; drained overgrowing mire with hypnanean mosses, on soil [1st].
- **Calliergonella cuspidata* (Hedw.) Loeske – C; [3, 9, 17, 18, 19, 25, 42, 43, 45, 46, 49, 53, 92, 94, 100, 103]; in wet, more or less open habitats, mostly on soil on wet meadows [5f; 9m; 2fmS+; 8st].
- **C. lindbergii* (Mitt.) Hedenäs – S; [Kaluzhskie Zase-

- ki Reserve; 47, 99 (Popova, 2002); 3, 4, 8, 17, 25, 39, 42, 60, 65, 70, 71, 72, 76, 87, 92, 94, 95]; on soil, soil-covered rocks and rotten wood on banks of rivers and lakes [13f; 1m; 1fmS+; 8st].
- **Campyliadelphus chrysophyllus* (Brid.) R.S.Chopra – S; [8, 17, 24, 25, 46, 52, 65, 70, 71, 94, 97]; slopes to river valleys, overgrowing lime-pit; on limestones and calcareous soil [5f; 3m; 5fmS+; 10st].
- Campyloidium calcareum* (Crundw. & Nyholm) Ochyra – R; [18, 24, 70, 76]; slopes to river valleys, overgrowing lime-pit; on limestones [1S+; 3st].
- C. sommerfeltii* (Myrin) Ochyra – R; [2 localities (Popova, 2001); 102]; slope to river valley, on rotten wood near spring [1st].
- Campyllum protensum* (Brid.) Kindb. – R; [Baryatinsky Distr. (Popova, 2001); 3]; overgrowing lime-pit, edge of lake; on soil [2st].
- C. stellatum* (Hedw.) C.E.O.Jensen – R; [Baryatinsky Distr. (Popova, 2001); Kaluzhskie Zaseki Reserve (Popova, 2002); 24]; in bogging depression among overgrowing dumps in old lime-peat [1st].
- Ceratodon purpureus* (Hedw.) Brid. – C; [1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 18, 24, 25, 26, 27, 30, 31, 32, 41, 42, 43, 45, 46, 54, 55, 58, 59, 60, 61, 62, 63, 65, 69, 70, 71, 72, 73, 74, 75, 79, 87, 92, 93, 99, 100, 108]; in various habitats and on different substrates, including disturbed and man-made [2f; 5m; 11fmS+; 2st].
- **Cirriphyllum piliferum* (Hedw.) Grout – S; [Kaluzhskie Zaseki Reserve; 41, 47 (Popova, 2002); 89 (Peshkova, 1977); 6, 8, 17, 25, 39, 42, 48, 52, 61, 65, 87, 90, 95, 102, 105]; on dry sandy soil: dry meadows, roadsides, edges of pine forests; in rather moist habitats, mostly on bottoms of ravines in forests [8f; 3m; 3fmS+; 2st].
- **Climacium dendroides* (Hedw.) F.Weber & D.Mohr – C; [1, 2, 6, 9, 19, 21, 23, 29, 32, 33, 41, 42, 44, 49, 50, 60, 72, 73, 87, 90, 92, 94, 98, 99, 100, 103, 105, 110]; in forests in wet and shady habitats, e.g. edges of mesotrophic mires, old abandoned peat-mines among shrubs, in wet meadows; on soil, rotten wood, litter [8f; 8m; 11fmS+; 4st]. Sporophytes were found in permanently wet places, usually edges of mires and old overgrowing peat-mines.
- **Cratoneuron filicinum* (Hedw.) Spruce – C; [8, 9, 17, 27, 45, 46, 52, 63, 65, 70, 71, 72, 78, 94, 97]; in humid habitats, mostly on soil and rocks near springs [6f; 1m; 15st].
- Dichodontium pellucidum* (Hedw.) Schimp. – S; [Zhukovskiy Distr. (Ignatov, 1988 (MHA); 48, 52, 71, 72, 90, 94, 97]; banks of small rivers and creeks, on damp and wet rocks (limestones and sandstones) in more or less shady habitats [2f; 2fmS+; 5st].
- Didymodon fallax* (Hedw.) R.H.Zander – S; [7, 18, 24, 25, 63, 72, 94, 95]; on soil-covered limestones, concrete blocks, soil inclusive carbonates in open habitats [4f; 2m (only on rocks); 2fmS+; 3st].
- **D. rigidulus* Hedw. – S; [3, 8, 17, 18, 46, 52, 63, 72, 76, 92, 93, 95, 97, 102]; on limestone outcrop [9f; 2m; 3fmS+; 9st].
- Dicranella cerviculata* (Hedw.) Schimp. – R; [47 (V.I. Zolotov, unpublished data); Kaluzhskie Zaseki Reserve; 53 (Popova, 2002); 99]; on soil in forests and on rotten wood in boggy pine forest [1fmS+].
- D. crispa* (Hedw.) Schimp. – R; 2 specimens from Kaluga Distr., Romodanovo, coll. E. Nikolsky, 30.VI.1911 (LE); (2S+).
- D. heteromalla* (Hedw.) Schimp. – C; [1, 6, 19, 20, 26, 28, 31, 33, 41, 42, 48, 49, 50, 51, 55, 56, 61, 62, 70, 71, 77, 80, 87, 90, 99, 101, 106, 108]; coniferous forests, on bare sandy soil, under upturned roots, roadsides, overgrowing sides of trenches, rarely on rotten wood and rocks [6fmS+; 2st].
- D. schreberiana* (Hedw.) Hilf. ex H.A.Crum & L.E.Anderson – R; [45, 72]; on bare soil, on soil on a wet roadside meadow [1f; 1st].
- D. varia* (Hedw.) Schimp. – R; [2 localities (Popova, 2001); 24, 45, 72, 94]; on bare soil in more or less open habitats [3fmS+; 1st].
- Dicranodontium denudatum* (Brid.) E.Britton – U; [90]; mixed coniferous and broad-leaved forest, on vertical side of damp sandstone [1st].
- Dicranum bonjeanii* De Not. – R; [47 (Popova, 2002); 65]; boggy pine forest, wet meadow; on soil [1st].
- D. flagellare* Hedw. – R; [33, 44, 48]; mixed coniferous and broad-leaved forest, on wet rotten wood in deep ravine [4fmS+; 1st].
- D. fulvum* Hook. – U; [48]; mixed coniferous and broad-leaved forest, on dry bare sandstone [1st].
- D. majus* Turner – U; [19]; boggy birch forest, on litter [1f].
- **D. montanum* Hedw. – C; [88 (Peshkova, 1977); 1, 2, 4, 5, 6, 8, 9, 10, 18, 19, 23, 26, 27, 29, 30, 31, 33, 39, 40, 42, 43, 44, 46, 47, 48, 49, 51, 54, 56, 58, 60, 61, 62, 70, 71, 73, 77, 80, 87, 90, 92, 94, 99, 101, 103, 106, 108]; on rotten wood, tree trunk bases, exserted tree roots in forests [2f; 17fmS+; 4fmS-; 8st].
- D. polysetum* Sw. – C; [88 (Peshkova, 1977); 1, 2, 6, 9, 19, 21, 26, 28, 29, 33, 35, 41, 42, 43, 47, 49, 50, 51, 80, 87, 90, 99, 101, 104, 106, 108]; pine forests, on soil [2fmS+; 2st].
- **D. scoparium* Hedw. – C; [88 (Peshkova, 1977); 1, 2, 3, 4, 6, 8, 9, 10, 11, 18, 19, 20, 21, 26, 27, 28, 29, 31, 32, 33, 39, 41, 42, 43, 47, 48, 49, 51, 55, 58, 61, 62, 77, 80, 87, 90, 93, 94, 97, 98, 99, 101, 108]; pine forests, on soil; on tree trunk bases, rotten wood in different forests, edges of mires [2m; 6fmS+; 17st].
- D. viride* (Sull. & Lesq.) Lindb. – S; [Kaluzhskie Zaseki Reserve; 47 (Popova, 2002); 39, 44, 48, 60, 62, 94, 97]; flood-plain and watershed broad-leaved forests,

- on trunks of broad-leaved trees, fresh rotten wood, occasionally on trunks of alder [11st].
- **Drepanocladus aduncus* (Hedw.) Warnst. – C; [3, 17, 18, 19, 21, 23, 39, 45, 63, 65, 70, 72, 95, 97, 100, 103]; in wet habitats, on soil, more rarely on rocks [6f; 6m; 9st].
- D. polygamus* (Bruch et al.) Hedenäs – R; [Mosalsky Distr. (Popova, 2001); 3, 23, 24]; boggy dumps and bottoms of abandoned lime-pits, in overgrowing peat-mines, on soil [3S+; 5S-].
- Encalypta vulgaris* Hedw. – U; [17, 52, 77]; on soil-covered limestone outcrops, on calcareous soil in birch forest [2S+; 2S-].
- Eurhynchiastrum pulchellum* (Hedw.) Ignatov & Hutunén – S; [47 (Popova, 2002); 88 (Peshkova, 1977); 5, 8, 17, 18, 25, 33, 42, 46, 49, 58, 60, 72, 76, 77, 94, 95, 107]; on slumping slopes in forests, overgrowing meadows, on bare soil, more rarely on tree trunk bases and soil-covered outcrops [8fmS+; 14st].
- **Eurhynchium angustirete* (Broth.) T.J. Kop. – S; [Kaluzhskie Zaseki Reserve; 47 (Popova, 2002); 6, 33, 39, 42, 48, 49, 56, 58, 60, 61, 62, 70, 73, 94, 107, 109]; spruce and spruce-broad-leaved forest, mostly on slopes of ravines; on soil, litter and rotten wood [17f; 2m; 5fmS+; 5st].
- Fissidens adianthoides* Hedw. – U; [33]; swampy spruce forest, on base of birch trunk [1fmS+].
- F. bryoides* Hedw. – S; [88 (Peshkova, 1977); 10, 17, 18, 44, 46, 48, 62, 69, 70, 71, 72, 87, 91, 94, 102, 109]; on wet bare soil in forests, on banks of creeks [9S+; 4S-].
- F. exiguus* Sull. – U; [Zhukovsky Distr. (Ignatov, 1988 (MHA))]; on limestone in open habitat [1S-].
- F. exilis* Hedw. – S; [88 (Peshkova, 1977); 1, 4, 17, 40, 49, 58, 87]; on wet bare soil in forests [3S+].
- F. gracilifolius* Brugg.-Nann. & Nyholm – S; [18, 46, 48, 52, 70, 72, 73, 76, 91, 92, 94, 95, 97, 102]; flood-plane broad-leaved forest, on wet small limestone rocks, occasionally on wet pieces of brick in ravine [17fmS+].
- F. taxifolius* Hedw. – C; [89 (Peshkova, 1977); 5, 8, 10, 17, 18, 19, 23, 27, 30, 32, 40, 44, 46, 54, 55, 56, 48, 52, 63, 69, 70, 72, 91, 92, 94, 95, 97, 98, 102, 105]; on slumping slopes and wet bare soil in forests, swampy alder forests on banks of creeks, more rarely on wet limestone [11S+ (both on rocks and soil), 32S-].
- Fontinalis antipyretica* Hedw. – S; [2 localities (Popova, 2001); 4, 8, 52, 63, 90, 96]; springs, cold clear creeks and small rivers with sandy or stony bottom [5st].
- Funaria hygrometrica* Hedw. – C; [2, 4, 6, 8, 10, 17, 27, 32, 42, 45, 49, 55, 56, 59, 65, 70, 71, 72, 73, 74, 78, 79, 87, 92, 93, 94, 95, 97, 100, 101, 108]; on wet bare soil in more or less open habitats, often on fire-places [7S+].
- Grimmia muehlenbeckii* Schimp. – U; [Yuhnovsky Distr., left bank of Vorya River near Alexandrovka]; on granite boulder [1m].
- G. pulvinata* (Hedw.) Sm. – U; [24]; dumps of abandoned lime-pits, on limestone [1S+].
- Gymnostomum calcareum* Nees & Hornsch. – U; [52]; in moist limestone cave [2st].
- Gyroweisia tenuis* (Hedw.) Schimp. – R; [17, 65]; niches of large limestone rocks among meadows at a river bank [2f; 1st].
- Hamatocaulis vernicosus* (Mitt.) Hedenäs – R; [2 localities (Rabotnov, 1929); Kaluzhskie Zaseki Reserve (Popova, 2002)]; wet and less stable places on *Sphagnum* mires.
- Hedwigia ciliata* (Hedw.) P. Beauv. – U; [47 (Zhadovsky, 1928; Popova, 2002); 47]; on soil-covered sandstone outcrop [2S+].
- Helodium blandowii* (F. Weber & D. Mohr) Warnst. – R; [Spas-Demensky Distr. (Rabotnov, 1929); Kaluzhskie Zaseki Reserve; 47, 53, 99 (Popova, 2002); 9 (Peshkova, 1965 (MW)); 9]; eutrophic mires, drained overgrowing mire with hypnalian mosses, boggy pine forests; on soil [3S+].
- Herzogiella seligeri* (Brid.) Z.Iwats. – S; [Kaluzhskie Zaseki Reserve (Popova, 2002); 42, 44, 48, 49, 56, 70, 103, 107, 108]; rotten wood in forests [12S+].
- Homalia trichomanoides* (Hedw.) Bruch et al. – S; [Kaluzhskie Zaseki Reserve (Popova, 2002); 47 (Zhadovsky, 1928; Popova, 2002); 18, 40, 33, 39, 44, 48, 52, 56, 58, 60, 62, 66, 69, 70, 73, 94, 95, 97, 99, 102, 107, 108]; broad-leaved, coniferous-broad-leaved and spruce-aspen forests; on trunks of broad-leaved trees and aspen, more rarely on soil-covered outcrops [12S+ (only on tree trunks and tree trunk bases); 14S-].
- Homomallium incurvatum* (Schrader ex Brid.) Loeske – S; [47 (Zhadovsky, 1928); 18, 52, 70, 72, 76, 91, 92, 94, 95, 102]; on limestones, more rarely on sandstones [14S+].
- Hygroamblystegium fluviatile* (Hedw.) Loeske – U; [18]; river bank, on rock not high above water level [1S-].
- H. humile* (P. Beauv.) Vanderp., Goffinet & Hedenäs – S; [23, 31, 46, 51, 65, 99, 105]; temporarily flooded habitats, on soil, bases of sedge tussocks, among *Typha*, etc. [4S+; 5S-].
- H. tenax* (Hedw.) Jenn. – R; [48, 52, 65, 97]; on wet limestones in creeks [3S+; 3S-]. Sporophytes were found for the first time in the middle part of European Russia.
- H. varium* (Hedw.) Mönk – S; [88 (Peshkova, 1977); 18, 33, 47, 48, 49, 55, 62, 70, 71, 77, 95, 97]; on soil, tree trunk bases, rocks, rotten wood [6S+ (on rocks and tree trunk bases); 5S-].
- Hygrohypnum luridum* (Hedw.) Jenn. – R; [17, 70, 72,

- 76, 94]; on limestones and concrete blocks in temporarily flooded places on river banks [5S+; 2S-].
- Hylocomium splendens* (Hedw.) Bruch et al. – S; [Kaluzhskie Zaseki Reserve, 47 (Popova, 2002); 1, 6, 26, 29, 42, 49, 58, 87, 90, 99, 101, 106]; mossy coniferous and coniferous-broad-leaved forests, on soil and rotten wood [4f; 3m; 1fmS+].
- Hymenostylium recurvirostrum* (Hedw.) Dixon. – U; [46]; slope to river valley, in wet niche of limestone [1st].
- **Hypnum cupressiforme* Hedw. – S; [18, 33, 40, 42, 45, 46, 47, 48, 49, 52, 58, 60, 62, 65, 70, 71, 72, 73, 74, 92, 94, 95, 97, 99]; broad-leaved and birch forests, on tree trunk bases, more rarely on soil and soil-covered outcrops [33f; 8m (on soil and tree trunk bases); 5fmS+; 4st].
- Isoetecium alopecuroides* (Lam. ex Dubois) Isov. – U; [48]; spruce-broad-leaved forest, on the base of an oak trunk [1st].
- Leptobryum pyriforme* (Hedw.) Wilson – S; [88 (Peshkova, 1977); 17, 31, 40, 46, 50, 52, 71, 72, 76, 90, 92, 100, 106]; on bare soil, under upturned roots of fallen trees, rotten wood, soil-covered outcrops [6S+ (on all types of substrates); 6S-].
- Leptodictyum riparium* (Hedw.) Warnst. – C; [8, 17, 23, 40, 42, 44, 46, 63, 72, 77, 100]; in humid habitats, mostly on sunken wood in rivers, springs and lakes [3S+ (in temporarily dried habitats); 6S-].
- Leskea polycarpa* Hedw. – C; [5, 17, 23, 25, 33, 40, 42, 60, 61, 63, 72, 77, 91, 92, 95, 97, 99]; flood-plane forests, banks of lakes and rivers; on tree trunks, mostly on trunks of *Salix*, rarely on rocks [23S+ (both on rocks and tree trunks); 1S-].
- Leucobryum glaucum* (Hedw.) Ångstr. – U; [33 (collection of Peshkova, 1962, MW)]; mossy pine forest, on soil.
- **Leucodon sciuroides* (Hedw.) Schwägr. – S; [Kaluzhskie Zaseki Reserve, 47 (Popova, 2002); 17, 33, 39, 42, 44, 48, 52, 58, 60, 62, 92]; on trunks of old broad-leaved trees, rarely on limestones and sandstones [1f; 19st].
- **Mnium lycopodioides* Schwägr. – S; [47 (V.I. Zolotov, unpublished data); 10, 17, 18, 62, 69, 71, 72, 76, 92, 97, 102, 107]; ravines in forests, on soil and on soil-covered outcrops [13f; 3m; 4st].
- M. marginatum* (Dicks.) P.Beauv. – R; [Kaluga Distr. (Popova, 2001); 47 (Popova, 2002); 92, 95]; upland broad-leaved forests, on soil, rarely on soil-covered sandstone outcrops [2S-].
- **M. stellare* Hedw. – C; [5, 6, 18, 27, 30, 33, 42, 44, 46, 48, 49, 50, 52, 58, 62, 70, 71, 72, 73, 76, 77, 87, 90, 92, 94, 95, 96, 97, 102, 103, 107]; on bare soil in forests, soil-covered shady outcrops [29f; 7m; 1fmS-; 4fmS+; 4st].
- Myrinia pulvinata* (Wahlenb.) Schimp. – R; [33, 40]; flood-plain broad-leaved forests, on tree trunks [2S+].
- Neckera pennata* Hedw. – R; [Kaluzhskie Zaseki Reserve, 47 (Popova, 2002); 9, 28, 30, 31, 33, 39, 44, 47, 48, 49, 56, 58, 60, 90, 107]; broad-leaved, coniferous-broad-leaved and spruce-aspens forests, on trunks of broad-leaved trees and aspens [18S+; 6S-].
- N. complanata* (Hedw.) Huebener – U; [47 (Zhadovsky, 1928)]; on sandstones. No herbarium specimens were found, thus the record is somewhat doubtful. This species is very rare in the middle part of European Russia, the closest locality being in NW of Tver Province (ca. 400 km from this place), where it grows on limestone. From the other side, the Chertovo Gorodishche is the only locality of *Pohlia elongata* in the whole Middle European Russia and many other rare species occur there.
- Niphotrichum canescens* (Hedw.) Bednarek-Ochyra & Ochyra – U; [90]; bottom of abandoned pit, on sandy soil [1f].
- Orthotrichum anomalum* Hedw. – R; [17, 52]; slopes to river valleys, on dry exposed limestones [3S+].
- **O. obtusifolium* Brid. – S; [4, 18, 25, 29, 31, 42, 44, 46, 49, 51, 55, 63, 74, 87, 92, 94, 102, 103]; on tree trunks, mostly on poplars [2f; 5fmS+; 5st].
- O. pallens* Bruch ex Brid. – R; [44, 46, 62, 94]; broad-leaved forestü, on tree trunks, mostly on inclined trunks [4S+].
- O. pumilum* Sw. ex anon. – S; [8, 18, 25, 31, 42, 44, 61, 65, 73, 77, 91, 92, 107]; on tree trunks [8S+].
- O. spesiosum* Nees – C; [1, 3, 4, 5, 6, 8, 10, 11, 17, 18, 19, 23, 25, 27, 30, 31, 32, 33, 39, 40, 41, 42, 43, 44, 46, 49, 55, 58, 61, 62, 65, 66, 71, 73, 77, 87, 103, 105]; on tree trunks [14S+].
- **Oxyrrhynchium hians* (Hedw.) Loeske – C; [8, 17, 18, 31, 33, 48, 52, 63, 70, 71, 72, 76, 77, 79, 91, 92, 94, 95, 97, 102, 103]; forests, overgrowing meadows; on slumping slopes, bare soil, more rarely on rocks [14f; 1m; 11fmS+; 20st].
- Palustriella decipiens* (De Not.) Ochyra – U; [96]; broad-leaved forest on slope to river valley, on soil along a stream in ravine bottom [1f].
- Paraleucobryum longifolium* (Hedw.) Loeske – U; [47 (Zhadovsky, 1928; Popova, 2002)]; on sandstone outcrops.
- Pleuridium subulatum* (Hedw.) Rabenh. – S; [4, 6, 8, 74, 78, 87, 90, 94]; on bare soil in more or less open habitats, mostly on molehills at forest edges and overgrowing meadows [6S+].
- Philonotis caespitosa* Jur. – U; [47, 53 (Popova, 2002)]; boggy pine forest, on soil.
- P. fontana* (Hedw.) Brid. – R; [Dzerzhinsky Distr.; 100]; wet meadow and mesotrophic mires; on soil [1m, 2st].
- Physcomitrium pyriforme* (Hedw.) Hampe – S; [11, 17, 32, 55, 74, 78, 94, 95]; roadsides, edges of arable fields, abandoned field; on wet bare soil [5S+].

- Plagiomnium affine* (Blandow ex Funck) T.J.Kop. – S; [1, 6, 19, 31, 33, 39, 42, 49, 56, 60, 61, 77, 87, 90, 103, 106]; spruce and mixed forests, on litter [13f; 6m; 5st].
- P. cuspidatum* (Hedw.) T.J. Kop. – C; [1, 4, 5, 6, 8, 17, 18, 19, 24, 25, 28, 29, 31, 33, 42, 44, 47, 48, 49, 56, 58, 60, 61, 69, 70, 72, 76, 77, 87, 90, 92, 93, 94, 96, 101, 102, 103, 105, 106, 107, 108]; in more or less humid shady habitats; on soil, rotten wood, tree trunk bases, soil-covered outcrops [25S+ (on all types of substrates); 3S-].
- P. elatum* (Bruch et al.) T.J.Kop. – S; [Kaluzhskie Zaseki Reserve, 6 (Popova, 2002); 19, 27, 31, 46, 48, 58, 106]; alder swamps, bushy wet meadows, old and overgrowing peat mines; on soil [3f; 3m; 1fmS+; 1st].
- P. ellipticum* (Brid.) T.J. Kop. – C; [17, 19, 31, 32, 33, 39, 61, 63, 87, 42, 43, 47, 79, 97, 103, 105, 108]; in humid habitats, mostly on banks of creeks, on soil [6f; 4m; 1fmS+; 7st].
- P. medium* (Bruch et al.) T.J.Kop. – S; [Kozelsky Distr. (Popova, 2002); 25, 33, 42, 44, 48, 58, 70, 87, 90, 99, 106, 107]; mixed forests, on soil and litter [11S+; 2S-].
- P. rostratum* (Schrud.) T.J. Kop. – S; [Kaluzhskie Zaseki Reserve (Popova, 2002); 18, 19, 46, 52, 72, 76, 92, 96, 97, 102, 106]; broad-leaved forests, often on bottoms of ravines; on soil-covered limestone outcrops and on calcareous soil [11S+; 5S-].
- **P. undulatum* (Hedw.) T.J. Kop. – C; [6, 8, 17, 18, 27, 47, 48, 49, 52, 58, 62, 69, 65, 79, 87, 90, 92, 94, 95, 97, 98, 102, 105, 107]; on soil in humid and shady habitats, mostly in alder swamps, on banks of lakes and creeks, slopes of ravines in forests [17f; 5m; 3fmS+]. Sporophytes were found for the first time in the middle part of European Russia and probably in the whole Russia.
- **Plagiothecium cavifolium* (Brid.) Z.Iwats. – C; [Kaluzhskie Zaseki Reserve, 47 (Popova, 2002); 27, 31, 33, 46, 48, 49, 52, 60, 62, 71, 77, 90, 94, 95, 107]; on bare soil in forests, mostly on slopes of ravines, rarely on tree trunk bases, soil-covered sandstone outcrops [2f; 1m; 13fmS+; 19st].
- P. curvifolium* Schlieph. ex Limpr. – R; [Kaluzhskie Zaseki Reserve (Popova, 2002); 6]; spruce forests, on rotten wood and on spruce trunk bases [2S+]. The species is likely more widespread, but a revision of material is needed.
- P. denticulatum* (Hedw.) Bruch et al. – C; [1, 4, 6, 17, 23, 27, 31, 42, 44, 50, 55, 56, 58, 47, 49, 70, 72, 73, 77, 79, 87, 90, 98, 99, 102, 106, 108]; on soil, rotten wood, soil-covered sandstone outcrops in forests [4S+; 5S-].
- P. denticulatum* var. *undulatum* R.Ruthe ex Geh. – R; [Kozelsky Distr. (Popova, 2000); Kaluzhskie Zaseki Reserve (Popova, 2002)]; edges of boggy dishes in pine forests.
- P. laetum* Bruch et al. – C; [1, 4, 6, 8, 10, 19, 28, 29, 30, 31, 32, 33, 39, 42, 44, 46, 49, 54, 56, 60, 71, 73, 77, 90, 92, 93, 97, 99, 103, 107, 108, 109]; on tree trunk bases, rotten wood in forests [13S+; 3S-].
- P. latebricola* Bruch et al. – U; [47 (Popova, 2002); 47]; on trunk of old oak, rotten wood, soil-covered outcrop of sandstone [2fmS+; 1st].
- P. nemorale* (Mitt.) A.Jaeger – R; [47 (Popova, 2002); 27]; in a mixed forest on soil-covered sandstone outcrop, in alder swamp on the tree trunk base [1f].
- **Platygyrium repens* (Brid.) Bruch et al. – C; [1, 4, 5, 6, 8, 17, 18, 25, 27, 32, 39, 40, 42, 44, 46, 48, 52, 55, 56, 58, 60, 70, 71, 72, 76, 92, 93, 94, 97, 107]; broad-leaved and coniferous-broad-leaved forests, on tree trunks, fresh rotten wood [4f; 5m; 10fmS+].
- Pleurozium schreberi* (Brid.) Mitt. – C; [1, 2, 4, 6, 19, 20, 21, 25, 26, 28, 29, 35, 41, 42, 43, 47, 49, 51, 58, 61, 77, 80, 87, 90, 98, 101, 104, 106, 108]; on soil in mossy pine forests; on tree trunk bases, rotten wood in other types of forests [3f; 2m; 2fmS+; 4st].
- Pogonatum urnigerum* (Hedw.) P.Beauv. – R; 4 specimens collected near Kaluga by E. Nikolsky: 17.IV.1911; 17.IV.1911; 30.VI.1911; 2.IX.1911 (all in LE) [3fmS+; 1fmS-].
- Pohlia andalusica* (Höhn.) Broth. – U; [Maloyaroslavetsky Distr. (MW)]; depression of watershed area, in wet meadow.
- P. cruda* (Hedw.) Lindb. – U; [47 (Popova, 2002); 47]; on soil-covered sandstone outcrop [1fmS+].
- P. elongata* Hedw. – U; [47 (Zhadovsky, 1928; Popova, 2002)]; on soil-covered sandstone outcrop [1S+].
- P. nutans* (Hedw.) Lindb. – C; [1, 6, 17, 20, 21, 33, 42, 49, 50, 56, 69, 70, 87, 90, 92, 106]; forests, oligotrophic mires; on tree trunk bases, rotten wood, bare soil, soil-covered outcrops [8S+; 1S-].
- P. melanodon* (Brid.) A.J.Shaw – U; [94]; on wet bare soil on a creek bank [1fmS+; 1st].
- P. wahlenbergii* (F.Weber & D.Mohr) A.L.Andrews – S; [Kaluzhskie Zaseki Reserve, 47 (Popova, 2002); 8, 17, 18, 31, 45, 58, 63, 93]; on wet bare soil and sandstone outcrops at creek banks [3m; 6st].
- Polytrichastrum formosum* (Hedw.) G.L.Sm. – S; [1, 6, 19, 42, 49, 58, 60, 87]; spruce and spruce-broad-leaved forests, on soil, rotten wood, under upturned roots of fallen trunks [5fmS+; 1st].
- P. longisetum* (Sw. ex Brid.) G.L.Sm. – R; [Kaluzhskie Zaseki Reserve, 47 (Popova, 2002); 88 (Peshkova, 1977); 33, 49, 50]; similar to previous and also on the bank of overgrowing peat mines [1f; 3fmS+].
- P. pallidisetum* (Funck) G.L.Sm. – U; [39]; in dish in broad-leaved forest on wet rotten wood [1fmS+].
- Polytrichum commune* Hedw. – C; [1, 2, 6, 9, 19, 20, 21, 22, 26, 28, 29, 32, 33, 35, 41, 44, 47, 49, 50, 51, 56, 60, 77, 80, 87, 90, 99, 101, 104, 106, 108.]; edg-

- es of mires, boggy forests, *Sphagnum* mires; on soil, rarely on rotten wood [3f; 3m; 7fmS+; 1st].
- P. juniperinum* Hedw. – C; [88 (Peshkova, 1977); 1, 2, 4, 5, 6, 8, 10, 11, 17, 25, 26, 31, 32, 41, 42, 43, 49, 50, 54, 55, 70, 71, 75, 79, 87, 90, 93, 94, 97, 99, 101, 108]; pine forests, roadsides in forests, forest margins, forest clear-cuttings; on dry sandy soil [2f; 2m; 5fmS+; 2st].
- P. piliferum* Hedw. – S; [88 (Peshkova, 1977); 1, 2, 4, 6, 26, 32, 40, 41, 43, 60, 70, 71, 75, 90, 99]; on dry sandy soil in open habitats [5fmS+].
- P. strictum* Brid. – S; [Kaluzhskie Zaseki Reserve, 47, 53 (Popova, 2002); 20, 21, 22, 29, 35, 77, 80, 104, 109]; sphagnum mires, on mossy hummocks [4fmS+].
- P. swartzii* Hartm. – R; [Spas-Demensky Distr., Yuhnovsky Distr. (Popova, 2001, cited by Peshkova). *Pseudobryum cinclidioides* (Huebener) T.J.Kop. – R; [Kozelsky Distr. (Popova, 2002); 47, 90]; swampy banks of brooks in forests, on wet peaty soil [2f].
- **Pseudoleskeela nervosa* (Brid.) Nyholm – C; [5, 17, 18, 27, 33, 44, 46, 52, 58, 70, 73, 76, 77, 91, 92, 93, 94, 95, 97, 102, 107]; on trunks of broad-leaved trees and *Betula*, rarely on soil-covered outcrops and fresh rotten wood [28f; 6fmS+; 11st].
- Pterigynandrum filiforme* Hedw. – R; [57 (Popova, 2001); 60]; broad-leaved forests, on trunks of old trees [1f].
- Ptilium crista-castrensis* (Hedw.) De Not. – S; [Kaluzhskie Zaseki Reserve, 47 (Popova, 2002); 1, 2, 6, 19, 42, 49, 51, 61, 90, 99, 106]; on soil in mossy coniferous forests, rarely on tree trunk bases and rotten wood in mixed forests [3f; 2m; 4st].
- Pyloisia polyantha* (Hedw.) Bruch et al. – C; [1, 4, 5, 8, 10, 17, 18, 25, 27, 30, 31, 32, 39, 42, 44, 46, 49, 52, 55, 56, 58, 61, 62, 63, 66, 71, 73, 97, 90, 91, 92, 97, 102, 103]; on tree trunks, rarely on soil-covered outcrops [12S+].
- **Rhizomnium punctatum* (Hedw.) T.J. Kop. – C; [47 (Popova, 2002); 1, 6, 9, 11, 17, 18, 19, 23, 27, 33, 39, 42, 44, 48, 49, 50, 56, 58, 62, 70, 87, 90, 94, 97, 98, 99, 101, 102, 103, 105, 108]; on wet strongly decayed wood, on soil-covered outcrops, on wet soil in forests [8f; 9m; 11fmS+; 4st].
- Rhodobryum roseum* (Hedw.) Limpr. – S; [47 (Popova, 2002); 1, 6, 19, 21, 28, 29, 30, 33, 42, 49, 58, 60, 87, 90, 98, 106]; spruce forests, on litter [1m; 5st].
- Rhynchostegium arcticum* (I.Hagen) Ignatov & Huttunen – R; [72, 94, 95]; a broad-leaved forest on slopes to river valleys; on wet small limestone rocks, rarely on fresh rotten wood and exserted roots of *Alnus* near limestone outcrops [4S+].
- R. riparioides* (Hedw.) Cardot – U; [63]; a slope to the river valley, in running water of a spring [1S-].
- Rhytidiadelphus squarrosus* (Hedw.) Warnst. – C; [Kaluzhskie Zaseki Reserve, 47 (Popova, 2002); 1, 2, 8, 10, 18, 19, 26, 27, 32, 39, 41, 42, 49, 55, 61, 66, 87, 90, 91, 94, 99, 101, 108]; flood-plains of small rivers, wet meadows, grassy forest margins, abandoned forest clear-cuttings and roads; on soil [7f; 2m; 6st].
- R. subpinnatus* (Lindb.) T.J.Kop. – R; [48 (MW)]; broad-leaved forest in ravine bottom.
- **R. triquetrus* (Hedw.) Warnst. – C; [89 (Peshkova, 1977); 8, 18, 33, 42, 48, 52, 56, 58, 70, 72, 73, 80, 87, 90, 92, 94, 98, 99, 106, 107, 108]; coniferous, mixed and *Betula* forests, on litter [16f; 4m; 3fmS+; 3st].
- Sanionia uncinata* (Hedw.) Loeske – C; [1, 2, 4, 6, 8, 10, 11, 18, 19, 25, 27, 31, 32, 39, 40, 41, 42, 47, 49, 55, 56, 61, 72, 73, 77, 92, 103, 105, 106]; on tree trunks at bases as well as high above ground, rotten wood, rarely on litter in forests [9S+ (on all substrates); 2S-].
- Schistidium apocarpum* (Hedw.) Bruch et al. – R; [Ulyanovsky Distr. (Popova, 2001); 63]; on siliceous limestones [1S+].
- S. crassipilum* H.H.Blom – R; [72, 92]; broad-leaved forests on slopes to river valley; on dry sunny limestones [2S+].
- S. dupretii* (Thér.) W.A.Weber – R; [8, 25, 63, 94, 95]; on limestones, concrete blocks [7S+].
- S. submuticum* Broth. ex H.H.Blom – S; [42, 92, 93, 94, 99]; on limestones, concrete blocks [6S+].
- Schistostega pennata* (Hedw.) F.Weber & D.Mohr – R; [47 (Zhadovsky, 1928; Popova, 2002); 33, 90]; in moist caves of sandstone and on upturned roots of fallen trees in swampy spruce forest [4fmS+].
- Sciuro-hypnum curtum* (Lindb.) Ignatov – C; [1, 6, 19, 29, 30, 31, 33, 39, 42, 49, 50, 51, 56, 60, 62, 77, 87, 90, 105, 106, 108]; spruce and mixed forests; on litter, rarely on tree trunk bases and rotten wood [11S+; 1S-].
- S. populeum* (Hedw.) Ignatov & Huttunen – S; [47 (Popova, 2002); 17, 18, 25, 27, 46, 48, 52, 58, 63, 70, 72, 73, 92, 94, 95, 97, 107, 102]; broad-leaved forests; on soil-covered outcrops of limestone, rarely on broad-leaved tree trunk bases, sandstones, granites [27S+; 6S-].
- S. reflexum* (Starke) Ignatov & Huttunen – C; [47 (Popova, 2002); 5, 27, 30, 39, 41, 44, 46, 48, 58, 66, 72, 73, 76, 95, 105, 107, 108]; broad-leaved forest, floodplain *Alnus* and *Salix* forests; on tree trunk bases and rotten wood [15S+].
- Scorpidium cossonii* (Schimp.) Hedenäs – U; [80 (Peshkova & Abramova, 1965 (MW)); oligotrophic mire, in hollows.
- Seligeria calcarea* (Hedw.) Bruch et al. – U; [94]; abandoned lime-pits, on limestones; shady limestone rocks near creek [3S+].

- S. campylopoda* Kindb. – R; [17, 91, 94]; on wet shady limestones [10S+; 2S-].
- S. pusilla* (Hedw.) Bruch et al. – R; [18, 52, 72, 76, 92, 95]; on wet shady limestones [7S+; 3S-].
- Serpoleskea subtilis* (Hedw.) Loeske – C; [17, 24, 27, 30, 39, 46, 60, 70, 72, 73, 76, 92, 95]; on tree trunk bases, rotten wood, boulders [15S+; 2S-].
- Sphagnum angustifolium* (C.E.O.Jensen ex Russow) C.E.O.Jensen – C; [Ukchnovsky Distr. (Gerasimov, 1924); 12, 16, 57, 67, 68, 80, 81, 82, 83, 84, 85, 86 and 9 other localities (Peshkova, 1975); 47, 99 (Popova, 2002); 21, 22, 35, 77, 99, 104, 109, 110]; oligo-, mesooligo- and mesotrophic mires; on moss hummocks; one of the most common *Sphagnum* in bogs of the province [28S-].
- S. balticum* (Russow) C.E.O.Jensen – S; [14, 57, 64, 68, 80, 81, 82, 85 and 4 other localities (Peshkova, 1975)]; oligo- and mesotrophic bogs; on bases of hummocks and in hollows [24S-].
- S. capillifolium* (Ehrh.) Hedw. – S; [33, 80, 82, 83, 84, 85 and 4 other localities (Peshkova, 1975); 99 (Popova, 2002); 21]; all types of oligotrophic bogs, on tops and sides of *Sphagnum* hummocks, rarely in hollows and in boggy forests; once in mesotrophic sedge-sphagnous mire [16S-].
- S. centrale* C.E.O.Jensen – C; [Kaluzhskie Zaseki Reserve; 47, 99 (Popova, 2002); 12, 13, 14, 34, 36, 37, 38, 64, 67, 68, 81, 85 and 5 other localities (Peshkova, 1975); 1, 9, 20, 21, 29, 35, 49, 50, 51, 77, 99, 104, 110]; edges of bogs and boggy forests [17S-].
- S. compactum* Lam. & DC. – R; [33 (Peshkova, 1975); 53 (Majorov, 2001)]; pine forest with *Molinia*; wet and overgrowing road along clear-cutting area of 3-4 years old [3S+].
- S. contortum* Schultz – R; [Iznoskovsky Distr. (Gerasimov, 1924); 13, 14 (Peshkova, 1975)]; eutrophic mires, birch forests, in grass associations [8S-].
- S. cuspidatum* Ehrh. ex Hoffm. – R; [80, 82, 85 and 2 other localities (Peshkova, 1975); 104]; in hollows in oligotrophic bogs [16S-].
- S. fallax* (H.Klinggr.) H.Klinggr. – C; [Kaluzhskie Zaseki Reserve; 47 (Popova, 2002); 12, 13, 37, 64, 67, 68, 80, 81, 82, 83, 84, 85, 86 and 9 other localities (Peshkova, 1975); 20, 21, 22, 28, 29, 35, 51, 77, 104, 109, 110]; one of the most common and abundant *Sphagnum* in all types of bogs; growing on sides of hummocks and in hollows [54S-, 1S+].
- S. fimbriatum* Wilson – S; [Khvastovichsky Distr., 47 (Popova, 2002); 12, 13 and 2 other localities (Peshkova, 1975); 50, 110]; mesotrophic and eutrophic mires, *Phragmites*, *Carex*+*Sphagnum*, *Eriophorum*+*Betula*, *Salix*+*Betula*, and *Betula*+*Populus tremula* communities; also in bogging peat pits [9S-, 2S+].
- S. flexuosum* Dozy & Molk. – S; [Kaluzhskie Zaseki Reserve, 47, 99 (Popova, 2002); 12, 28, 64, 80, 81, 82, 83, 84, 85, 86 and 5 other localities (Peshkova, 1975); 110]; edges of oligo- and mesotrophic bogs [36S-, 2S+].
- S. fuscum* ((Schimp.) H.Klinggr. – S; [80 (Rabotnov; 1929); 13, 21, 34, 57, 67, 80, 81, 82, 83, 84, 85 and 2 other localities (Peshkova, 1975)]; on mesotrophic sedge-sphagnous mire; oligotrophic bogs in north-west parts of the province, mostly on tops and slopes of hummocks, more rarely in marginal parts of hollows, and, according to literature, also in eutrophic mires [29S-].
- S. girgensohnii* Russow – C; [Kaluzhskie Zaseki Reserve, 47 (Popova, 2002); 12, 13, 14, 15, 26, 57, 67, 80 and 10 other localities (Peshkova, 1975); 1, 2, 9, 19, 20, 21, 22, 28, 29, 32, 35, 39, 49, 50, 80, 99, 104]; eutrophic mires, edges of mires, swampy and wet mossy forests [38S-].
- S. inundatum* Russow – U; [36 (Peshkova, 1975)] [1S-].
- S. jensenii* H. Lindb. – U; [80 (Peshkova, 1975)]; *Eriophorum vaginatum*+*Sphagnum* pine forests, in wet hollows [3S-].
- S. magellanicum* Brid. – C; [Iznoskovsky Distr. (Gerasimov, 1924); 12, 13, 28, 57, 67, 68, 80, 81, 82, 85, 86 and 6 other localities (Peshkova, 1975); 21, 22, 28, 35, 77, 80, 99, 104, 109]; oligo- and mesooligo-trophic bogs, on tops of hummocks with *S. angustifolium*, more rarely on hummock sides and in hollows. One of the most common mosses of oligotrophic bogs [42S-].
- S. majus* (Russow) C.E.O.Jensen – R; [80, 82 (Peshkova, 1975)]; central part of Ignatovo Bog, in hollows and otherwise wet places, and in *Sphagnum*+*Eriophorum* communities [10S-].
- S. obtusum* Warnst. – R; [Khvastovichsky Distr. (Popova, 2001); 53]; mesotrophic sedge-sphagnous bog.
- S. palustre* L. – S; [12, 13, 16, 28, 34, 36, 81, 99 and 5 other localities (Peshkova, 1975)]; boggy forests, eutrophic mires, drained and grassy habitats, edges of oligotrophic bogs [15S-].
- S. papillosum* Lindb. – U; [80 (Peshkova, 1975)]; in hollows in Ignatovo Bog [8S-].
- S. platyphullum* (Lindb. ex Braithw.) Warnst. – R; [3 localities (Peshkova, 1975)] [4S-].
- S. riparium* Ångstr. – S; [Khvastovichsky Distr., 47 (Popova, 2002); 15, 64 (Peshkova, 1975); 9, 21, 22, 29, 110]; mesoeutrophic mires, at edges of hollow and peat pits, in bogging depressions [3S-].
- S. rubellum* Wilson – R; [80, 82, 83, 84 (Peshkova, 1975)]; mostly among other *Sphagna* in forested *Eriophorum vaginatum*+*Sphagnum* pairs of oligotrophic bogs [10S-].
- S. russowii* Warnst. – R; [13, 14, 34, 67 and 2 other localities (Peshkova, 1975); 35]; eutrophic and mesotrophic mires, birch and birch-pine stands; in herb communities at edges of mires; also found on moss

- hummock in mesooligotrophic bog [13S-].
- S. squarrosus* Crome – C; [Kaluzhskie Zaseki Reserve, 47, 99 (Popova, 2002); 12, 13, 14, 28, 34, 36, 37, 57, 67, 81, 82, 83 and 2 other localities (Peshkova, 1975); 1, 2, 6, 9, 19, 20, 29, 32, 35, 49, 50, 51, 104, 110]; eutrophic mires, edges of mires and overgrowing peat pits, boggy forests, banks of streams in forest [25S- 5S+].
- S. subsecundum* Nees – S; [Kaluzhskie Zaseki Reserve (Popova, 2002); 83, 84, 86 and 5 other localities (Peshkova, 1975)]; boggy forests and meadows, eutrophic mires, edges of meso- and oligotrophic bogs [16S-].
- S. tenellum* (Brid.) Pers. ex Brid. – U; [80 (Peshkova, 1975)]; central part of Ignatovo Bog in *Eriophorum vaginatum*+*Ericaceae*+*Sphagnum*, *Pinus*+*Eriophorum vaginatum* and in *Betula alba* communities [11S-].
- S. teres* (Schimp.) Ångstr. – R; [Iznoskovsky Distr. (Gerasimov, 1924); Kaluzhskie Zaseki Reserve, 90 (Popova, 2002); 14 (Peshkova, 1975)]; boggy spruce, birch and alder forests, bogging meadows and lakes, unstable parts of mires [3S-].
- S. warnstorffii* Russow – R; [13, 14, 67 and 2 other localities (Peshkova, 1975)]; eutrophic, rarely mesotrophic mires, in communities of *Betula*, *Salix* and *Carex* [11S-].
- Stereodon pallescens* (Hedw.) Mitt. – C; [4, 6, 18, 42, 44, 46, 47, 58, 70, 72, 77, 92, 95, 97, 99, 103, 106, 108]; on tree trunks, rarely on soil-covered outcrops [21S+ (on all types of substrates); 1S-].
- Straminergon stramineum* (Dicks. ex Brid.) Hedenäs – R; [21, 45, 109]; in wet and unstable parts of bogs, and at base of slope to river valley, on soil near spring [2st].
- **Syntrichia ruralis* (Hedw.) F.Weber & D.Mohr – S; [1, 2, 6, 17, 25, 26, 33, 41, 42, 43, 52, 60, 61, 63, 65, 73, 75, 90, 92, 93, 99, 100]; in dry and exposed habitats: edges of pine forests, xeric meadows, slopes with limestone outcrops, concrete blocks [6f; 1fmS+; 9st].
- Taxiphyllum wissgrillii* (Garov.) Wijk & Margad. – R; [47 (Popova, 2002); 18, 46, 48, 52, 73, 97]; in broad-leaved forests on slopes to river valleys, on wet shady limestones and sandstones [1f; 2fmS+; 7st]. Sporophytes were found for the first time in the middle part of the European Russia.
- Tetraxis pellucida* Hedw. – S; [Kaluzhskie Zaseki Reserve, 47 (Popova, 2002); 19, 33, 35, 42, 44, 48, 49, 50, 60, 87, 90, 99, 108]; spruce and mixed forests, on wet strongly decayed wood, on vertical surface of sandstone in forest [6S+(both on rocks and rotten wood); 5S-].
- **Thuidium assimile* (Mitt.) A.Jaeger – S; [88 (Peshkova, 1977); Kaluzhskie Zaseki Reserve, 47 (Popova, 2002); 3, 8, 17, 25, 42, 52, 61, 63, 69, 70, 76, 87, 90, 92, 93, 94, 96, 101]; on soil on meadows, forest edges, abandoned forest road; in rather open pine and birch forests, rarely on tree trunk bases and limestones in broad-leaved forests [11f; 20m; 1fmS+; 3st]. Sporophytes were found for the first time in the middle part of European Russia.
- T. delicatulum* (Hedw.) Bruch et al. – R; [17, 18, 45, 48, 58]; on rotten wood, limestones and sandstones in forests, on meadowy slope to river valley, on soil [2f; 4st].
- **T. recognitum* (Hedw.) Lindb. – S; [Kaluga Distr. (Popova, 2001); 9, 19, 24, 25, 30, 33, 39, 41, 42, 47, 56, 60, 61, 87, 90, 99, 106]; open herbaceous layers: meadows, forest margins, abandoned forest road; on soil in pine and birch forests [20f; 2m; 1fmS+; 3st].
- Timmia megalopolitana* Hedw. – R; [Kaluzhskie Zaseki Reserve (Popova, 2002); 52, 102]; in moist cave of limestone outcrop; on rotten wood near spring [2S-].
- Tomentypnum nitens* (Hedw.) Loeske – R; [Iznoskovsky Distr. (Rabotnov, 1929)]; small flood-plain mires.
- Tortula acaulon* (With.) R.H.Zander – S; [8, 17, 40, 46, 69, 74, 91, 92, 93]; on wet bare soil in open habitats, often on molehills in meadows, arable fields [13S+].
- T. modica* R.H.Zander – U; [17]; slope to river valley, on limestone [1S+].
- T. muralis* Hedw. – S; [8, 17, 18, 46, 65, 72, 76, 91, 92, 94]; on limestones, brick and concrete constructions [11S+; 1S-].
- T. truncata* (Hedw.) Mitt. – S; [8, 32, 40, 46, 72, 74, 78, 87, 94]; arable and abandoned fields, roadsides; on wet bare soil [8S+].
- Trematodon ambiguus* (Hedw.) Hornsch. – U; Kaluga, coll. E. Nikolsky, 4.VII.1911 (LE) [S+].
- Ulota crispa* (Hedw.) Brid. – U; [39]; broad-leaved forest, on trunk of *Tilia* [1S-].
- Warnstorfia exannulata* (Bruch et al.) Loeske – R; [Spas-Demensky Distr. (Rabotnov, 1929), 47]; boggy bank of small river in forest, on wet peaty soil [2st].
- W. fluitans* (Hedw.) Loeske – S; [Kaluzhskie Zaseki Reserve, 47 (Popova, 2002); 3, 8, 20, 21, 29, 39, 51, 90, 99]; in permanent pools in depressions and old peat pits and in lakes in flood-plains [4S+ (in temporarily dried places); 6S-].
- W. pseudostraminea* (Müll.Hal.) Tuom. & T.J.Kop. – R; [90, 103, 110, Medynsky Distr.]; in wet unstable parts of mires and in wet bogging coves [4S-].
- Weissia brachycarpa* (Nees & Hornsch.) Jur. – R; [17, 46, 70, 75]; slopes to river valleys, on soil [4S+].

UNCONFIRMED RECORDS

- Ditrichum cylindricum* (Hedw.) Grout – (Ignatov & Ignatova, 2003).
- Dicranum fuscescens* Turner – (Ignatov & Ignatova, 2003).
- Philonotis tomentella* Molendo – (Popova, 2001, cited unpublished data of Peshkova).
- Serpuleskea confervoides* (Brid.) Loeske – (Popova, 2001, cited unpublished data of Peshkova)

SOME CONSIDERATIONS ON REPRODUCTIVE
BIOLOGY OF MOSSES IN THE PROVINCE

In the moss flora of Kaluga Province, the dioicous species (including phyllo dioicous) are 133 of 226 (58.8%), while monoicous (including polyicous) 93 (41.2%). This ratio perfectly agrees with that of Russia as a whole (58.3%), as well as in many other parts of the world (Ignatov et al., 2009).

The fact that many dioicous species produce sporophytes much more rarely than monoicous species is well-known. Our data just confirm this: 59 dioicous species were never found with sporophytes, in 36 species sporophytes are rare, in 18 species sporadic, and only in 11 species frequent. In the two former groups, i.e. with never or rare sporophyte production, the mixed tufts are also very rare. However in the species with more frequent sporophytes, male and female plants were commonly found nearby or growing in mixture. Mixed populations are the most common case in such a common species as *Barbula unguiculata*, *Ceratodon purpureus*, *Rhizomnium punctatum*, *Dicranella heteromalla*.

Twelve monoicous species were never found with sporophytes in the province, most of them are rare species, known by 1-2 collections only. Of the rest, 4 monoicous mosses have rare sporophyte production, 9 sporadic, and 64 frequent.

The deviations from 50:50 frequency of sexes is common in dioicous species in Kaluga Province. Among 36 dioicous species that were in a special focus of this study, 27 (77%) have female bias, 7 (17%) have about the equal frequency of sexes, and only in 2 species (6%) male sex prevails: *Anomodon viticulosus*, *Thuidium assimile*. At the same time, among these 35 species we found none being totally sterile, and in only two species, *Bryum moravicum* and *Leucodon sciuroides*, almost all plants were sterile, with a single specimen with female gametangia. All other species have both sexes. Summing up, the absence of sporophytes in some mosses in Kaluga Province cannot be easily explained by the failure to develop one or both sexes.

Propagules or gemmae were found in Kaluga Province mostly in dioicous species: 76% of species known with propagules are dioicous.

Sporophytes were found for the first time in the middle part of European Russia for *Abietinella*

la abietina, *Plagiomnium undulatum*, *Taxiphylum wissgrillii*, *Thuidium assimile*, and *Hygroamblystegium tenax* (at least, Ignatov & Ignatova, 2003-2004 reported them without sporophytes in this area). All of them were found with sporophytes in 2008, the year that had had rather mild previous year and winter, and also very rainy summer. Summer time in 2005 and 2006 was more dry with long rainless periods.

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