Arctoa (2009) **18**: *225-228*

CHROMOSOME NUMBERS OF SCHISTIDIUM (GRIMMIACEAE, BRYOPHYTA)

ХРОМОСОМНЫЕ ЧИСЛА ВИДОВ РОДА SCHISTIDIUM (GRIMMIACEAE, BRYOPHYTA)

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Abstract

Chromosome numbers were reported for the genus *Schistidium* mostly before it was critically revised by H.H. Blom, who strongly changes species-level taxonomy of this genus. Old data on chromosome counts in *Schistidium* thus became difficult to use. In the present study 106 specimens with chromosome counts were revised. Among them we identified 13 species (*S. apocarpum, S. crassipilum, S. dupretii, S. elegantulum, S. flaccidum, S. helveticum, S. lancifolium, S. papillosum, S. platyphyllum, S. pulchrum, S. robustum, S. trichodon* var. *nutans, S. submuticum)*, thus providing for many 'narrow' species the chromosome counts (all based on meiosis) for the first time. Most of them have n=13, while n=26 seems to be a characteristic of most specimens of *S. apocarpum* s. str. and one of *S. submuticum*, but other specimens of both these species have n=13 as well.

Резюме

Хромосомные числа исследовались у видов рода *Schistidium* преимущественно до его ревизии Г.Бломом, в результате которой объем и понимание видов значительно изменились. Старые данные по хромосомным числам рода стало практически невозможно использовать. В связи с этим были переизучены 106 образцов с определенными хромосомными числами, среди которых выявлены 13 видов (*S. apocarpum, S. crassipilum, S. dupretii, S. elegantulum, S. flaccidum, S. helveticum, S. lancifolium, S. papillosum, S. platyphyllum, S. pulchrum, S. robustum, S. trichodon* var. *nutans, S. submuticum)*, для многих из которых хромосомные числа (основанные на изучении мейоза) приводятся впервые. Большинство видов имеет n=13, тогда как n=26 выявлен только у *S. apocarpum* s. str. (большинство образцов) и *S. submuticum* (один образец). Для обоих этих видов, однако имеются и расы с n=13.

KEYWORDS: *Schistidium,* Grimmiaceae, Bryophyta, chromosome numbers

The taxonomy of the genus *Schistidium* provides the case of the major incongruence of approaches among the recent authors. Bremer (1980a, b; 1981) published a world monograph, where she accepted 12 species in the genus, among them 6 species in Europe and 4 of them from *S. apocarpum* complex. Blom (1996) recognized 31 species in the *S. apocarpum* complex in Norway and Sweden. The primary negative reaction on this catastrofic over-splitting shifted soon afterward to a successful application of Blom concept in regional floristic studies (cf. Ochyra et al., 2003; Smith, 2004). Recent checklist of the Europe (Hill et al., 2005), the North Europe and North Asia (Ignatov, Afonina, Ignatova et al., 2006), as well the treatment of the genus in

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Table 1. Chromosome numbers of *Schistidium* species (specimens in LWKS)

Species	Locality	n=	Coll. date	Collector	№
apocarpum	Belarus, Grodno Prov., Grodno	13	11.X.1972	O.I.Vysotska	18
apocarpum	Belarus, Grodno Prov., Zarubichi	13	10.X.1972	O.I.Vysotska	31
apocarpum	Belarus, Grodno Prov., Zarubichi	13	10.X.1972	O.I.Vysotska	33
apocarpum	Belarus, Grodno Prov., Zarubichi	13	10.X.1972	O.I.Vysotska	35
apocarpum	Belarus, Grodno Prov., Zarubichi	26	10.X.1972	O.I.Vysotska	65
apocarpum	Belarus, Minsk Prov., Myadel	13	25.IX.1973	O.I.Vysotska	19
apocarpum	Belarus, Minsk Prov., Myadel	26	23.IX.1973	O.I.Vysotska	63
apocarpum	Belarus, Minsk Prov., Myadel Distr., Brusi	26	25.IX.1973	O.I.Vysotska	80
apocarpum	Belarus, Minsk Prov., Myadel Distr., Pasinki	26	22.IX.1973	O.I.Vysotska	77
apocarpum	Belarus, Minsk Prov., Myadel Distr., Pasinki	13	23.IX.1973	O.I.Vysotska	83
apocarpum	Latvia, Pabazhi	26	11.IX.1967	L.M.Fetisova	50
apocarpum	Latvia, Sigulda	26	15.IX.1968	L.M.Fetisova	6
apocarpum	Latvia, Smiltine	26	18.IX.1975	I.S.Danilkiv	68
apocarpum	Latvia, Smiltine	26	18.IX.1975	I.S.Danilkiv	79
apocarpum	Latvia, Smiltine	26	18.IX.1975	I.S.Danilkiv	96
apocarpum	Latvia, Smiltine	26	18.IX.1972	I.S.Danilkiv	97
apocarpum	Lietuva, Alitus Distr., Daugay	26	01.X.1973	I.S.Danilkiv	74
apocarpum	Lietuva, Shaulyay	26	12.IX.1971	I.S.Danilkiv	3
apocarpum	Lietuva, Shaulyay	26	23.IX.1966	I.S.Danilkiv	61
apocarpum	Lietuva, Shaulyay	26	12.IX.1971	I.S.Danilkiv	66
apocarpum	Lietuva, Vilnyus	26	12.X.1971	I.S.Danilkiv	5
apocarpum	Lietuva, Vilnyus	26	12.XI.1971	I.S.Danilkiv	60
apocarpum	Lietuva, Vilnyus	26	09.X.1973	I.S.Danilkiv	70
apocarpum	Lietuva, Vilnyus	26	09.X.1973	I.S.Danilkiv	71
apocarpum	Lietuva, Vilnyus	26	09.X.1973	I.S.Danilkiv	72
apocarpum	Lietuva, Vilnyus	26	09.X.1973	I.S.Danilkiv	75
apocarpum	Lietuva, Vilnyus	26	09.X.1973	I.S.Danilkiv	76
apocarpum	Lietuva, Vilnyus	26	16.X.1971	I.S.Danilkiv	94
apocarpum	Russia, Kaliningrad Prov.	26	1.IX.1974	I.S.Danilkiv	4
apocarpum	Russia, Karelia, Sortavala	26	10.IX.1986	E.M.Lesnyak	53
apocarpum	Russia, Karelia, Sortavala	26	10.IX.1986	E.M.Lesnyak	55
apocarpum	Ukraine, Ivano-Frankivsk	13	12.X.1968	E.M.Lesnyak	89
apocarpum	Ukraine, Ivano-Frankivsk Prov., Vorokhta	13	24.IX.1970	O.I.Vysotska	20
apocarpum	Ukraine, Ivano-Frankivsk Prov., Yaremche	26	15.X.1983	I.S.Danilkiv	58
apocarpum	Ukraine, Lviv	26	01.XI.1983	I.S.Danilkiv	56
apocarpum	Ukraine, Lviv	26	01.XI.1983	I.S.Danilkiv	57
apocarpum	Ukraine, Lviv	26	04.IX.1969	A.Skalska	62
apocarpum	Ukraine, Lviv	13	13.IV.1980	E.M.Lesnyak	90
apocarpum	Ukraine, Lviv	13	13.IV.1980	E.M.Lesnyak	91
apocarpum	Ukraine, Lviv	26	13.IV.1980	E.M.Lesnyak	91a
apocarpum	Ukraine, Lviv Prov., Borislav	13	01.XI.1969	A.Skalska	14
apocarpum	Ukraine, Lviv Prov., Borislav	26	15.X.1969	E.M.Lesnyak	48
apocarpum	Ukraine, Lviv Prov., Borislav	26	15.X.1969	E.M.Lesnyak	59
apocarpum	Ukraine, Lviv Prov., Borislav	26	15.X.1969	E.M.Lesnyak	67
apocarpum	Ukraine, Lviv Prov., Borislav	26	01.XI.1969	A.Skalska	7
apocarpum	Ukraine, Lviv Prov., Skole Distr., Dubyna/Kamyanka	26	22.IX.1968	O.I.Vysotska	51
apocarpum	Ukraine, Lviv Prov., Skole Distr., Kamyanka	26	30.IX.1969	O.I.Vysotska	69
apocarpum	Ukraine, Lviv Prov., Yaniv to Stradch	26	15.X.1969	E.M.Lesnyak	73
*apocarpum**	Georgia, Bakuriani	26	22.IX.1967	U.K.Mamatkulov	95
*apocarpum**	Georgia, Batumi	13	10.X.1972	L.M.Fetisova	39
*apocarpum**	Georgia, Batumi	13	23.XI.1965	L.M.Fetisova	43
*apocarpum**	Latvia, Lelupe	13	12.IX.1968	L.M.Fetisova	15
*apocarpum**	Latvia, Smiltine	26	18.IX.1975	I.S.Danilkiv	78
*apocarpum**	Ukraine, Ivano-Frankivsk Prov., Kosiv	13	18.X.1969	E.M.Lesnyak	13

*apocarpum**	Ukraine, Lviv	26	1.XI.1983	O.V.Lobachevska	64
*apocarpum**	Ukraine, Lviv	26	29.VIII.1969	E.Sytnik	8
*apocarpum**	Ukraine, Lviv Prov., Borislav	26	15.X.1969	E.M.Lesnyak	47
*apocarpum**	Ukraine, Lviv Prov., Borislav	26	01.XI.1969	A.Skalska	49
*apocarpum**	Ukraine, Lviv Prov., Skole Distr., Dubyna	13	28.IX.1971	O.I.Vysotska	28
*apocarpum**	Ukraine, Lviv Prov., Skole Distr., Dubyna/Kamyanka	13	22.IX.1968	O.I.Vysotska	34
*apocarpum**	Ukraine, Lviv Prov., Skole Distr., Dubyna/Kamyanka	13	22.VIII.1968	O.I.Vysotska	40
*apocarpum**	Ukraine, Lviv Prov., Skole Distr., Dubyna/Kamyanka	13	22.IX.1968	O.I.Vysotska	41
*apocarpum**	Ukraine, Lviv Prov., Skole Distr., Kamyanka	13	30.IX.1969	O.I.Vysotska	27
*apocarpum**	Ukraine, Zhitomir Prov., Teteriv	26	10.IX.1965	A.S.Lazarenko	2
crassipilum	Russia, Adygeya, Rufabgo Creek	13	06.XI.1974	I.S.Danilkiv	101
crassipilum	Russia, Adygeya, Rufabgo Creek	13	20.XI.1974	I.S.Danilkiv	85
crassipilum	Russia, Adygeya, Rufabgo Creek	13	20.XI.1974	I.S.Danilkiv	98
*crassipilum**	Georgia, Batumi	13	29.X.1955	L.M.Fetisova	24
*crassipilum**	Russia, Adygeya, Dagestanskaya	13	26.XI.1974	I.S.Danilkiv	92
*crassipilum**	Russia, Adygeya, Dakhovskaya	13	18.XI.1974	I.S.Danilkiv	93
*crassipilum**	Russia, Adygeya, Rufabgo Creek	13	25.XI.1974	I.S.Danilkiv	102
*crassipilum**	Russia, Adygeya, Rufabgo Creek	13	06.XI.1974	I.S.Danilkiv	104
*crassipilum**	Russia, Adygeya, Rufabgo Creek	13	20.XI.1974	I.S.Danilkiv	84
*crassipilum**	Ukraine, Lviv Prov., Borislav	13	15.X.1969	E.M.Lesnyak	45
dupretii	Ukraine, Ivano-Frankivsk	13	25.VIII.1967	E.M.Lesnyak	32
dupretii	Ukraine, Ivano-Frankivsk Prov., Chornogora Range	13	21.X.1970	O.I.Vysotska	29
dupretii	Ukraine, Lviv Prov., Borislav	13	01.XI.1969	A.Skalska	12
elegantulum	Russia, Adygeya, Dagestanskaya	13	26.XI.1974	I.S.Danilkiv	86
elegantulum	Russia, Adygeya, Dakhovskaya	13	18.XI.1974	I.S.Danilkiv	100
elegantulum	Russia, Adygeya, Dakhovskaya	13	18.XI.1974	I.S.Danilkiv	16
elegantulum	Russia, Adygeya, Dakhovskaya	13	18.XI.1974	I.S.Danilkiv	21
elegantulum	Russia, Adygeya, Dakhovskaya	13	18.XI.1974	I.S.Danilkiv	22
elegantulum	Russia, Adygeya, Rufabgo Creek	13	20.XI.1974	I.S.Danilkiv	99
flaccidum	Tadjikistan, Kondara Canyon	13	30.III.1965	U.K.Mamatkulov	1
*flaccidum**	Ukraine, Ternopil Prov., Kremenets	13	22.X.1981	O.I.Vysotska	30
helveticum	Russia, Altay Republic, Chike-Taman Pass	13	12.VII.1977	O.I.Vysotska	103
helveticum	Russia, Altay Republic, Chike-Taman Pass	13	12.VII.1977	O.I.Vysotska	105
lancifolium	Belarus, Minsk Prov., Myadel	13	15.X.1969	O.I.Vysotska	81
lancifolium	Georgia, Bakuriani	13	22.IX.1967	U.K.Mamatkulov	82
lancifolium	Latvia, Plyavinyas	13	27.IX.1966	L.M.Fetisova	88
lancifolium	Ukraine, Ivano-Frankivsk Prov., Vorokhta	13	25.IX.1970	O.I.Vysotska	106
lancifolium	Ukraine, Khmelnitsky Prov., Chemirivtsy	13	15.X.1983	I.S.Danilkiv	42
lancifolium	Ukraine, Lviv Prov., Skole Distr., Kamyanka	13	30.IX.1966	O.I.Vysotska	87
*lancifolium**	Kazakhstan, Almaatinka River	13	12.IX.1964	A.S.Lazarenko	10
trichodon var. *nutans*	Ukraine, Ivano-Frankivsk Prov., Chornogora Range	13	05.X.1966	A.S.Lazarenko	46
papillosum	Ukraine, Lviv Prov., Skole Distr., Kamyanka	13	22.IX.1968	E.M.Lesnyak	23
platyphyllum	Russia, Altay Republic, Ust-Sema	13	14.VIII.1977	O.I.Vysotska	37
*platyphyllum**	Russia, Altay Republic, Ust-Sema	13	14.VIII.1977	O.I.Vysotska	36
pulchrum	Ukraine, Chernivtsi Prov., Shepit	13	23.IX.1966	A.S.Lazarenko	44
robustum	Ukraine, Lviv Prov., Borislav	13	27.X.1964	E.M.Lesnyak	17
*robustum**	Ukraine, Ternopil Prov., Ostapye	13	24.VI.1975	I.S.Danilkiv	11
robustum [1]	Ukraine, Lviv Prov., Borislav	13	27.IX.1964	E.M.Lesnyak	9
submuticum	Estonia, Akhij River	13	29.V.1967	L.M.Fetisova	38
submuticum	Estonia, Tallinn	13	24.IX.1968	L.M.Fetisova	26
submuticum	Estonia, Tallinn	26	24.IX.1968	L.M.Fetisova	52
submuticum	Latvia, Plyavinyas	13	27.IX.1966	L.M.Fetisova	25
submuticum	Russia, Lipetsk Prov., Galichya Gora Reserve	13	28.IX.1992	Vyshegorodskikh	54

[1] – this specimens has *S. apocarpum* as admixture, but premature capsules that likely were used for chromosome count belong to plants of *S. robustum*.

new bryophyte flora of North America (McIntosh, 2007) followed Blom's narrow concept for this genus, accepting 42, 42, and 30 species correspondingly. Finally, Goryunov et al. (2007) supported Blom's approach by molecular phylogenetic data, and subsequent studies with the broader set of data just confirm this point.

This changes in taxonomy, of course, urge the complete revision of the genus: old data of distribution of species can not be used any more (at least in most cases). Similarly, old data of chromosome numbers need a complete revision. By this reason we undertook this revision of collection of 106 specimens with identified numbers in LWKS. Part of them was published previously by Lazarenko et al. (1971).

Results of the revision of the collections is given in Table 1. All identificatios were made based of meiosis study, the details of method explained in Lazarenko et al. (1971).

A certain disadvantage of this method in our case is that the plants were collected with premature capsules, which in some cases makes the species identification not very certain, as peristome and mature spores were unavailable for study. Such specimens are marked in the table with asterisk (*), indicating somewhat less reliable determinations. In many specimens, however, few more mature capsules occur in collections, allowing identification as certain as can be done for optimally collected material.

Few specimens represented by scanty material with only very young capsules are not included in the present list.

Most of specimens have n=13, while n=26, identified for as many as for 45 specimens, and 44 of them belong to *S. apocarpum*, while only one to *S. submuticum*. Both latter species, however, have n=13 as well, in 20 and 4 specimens correspondingly.

ACKNOWLEDGEMENTS

The study was partly supported by RFBR 07-04-00013.

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