

ISSN 2226-4701

VOLUME 1, NO. 1

botanica pacific

A JOURNAL OF PLANT SCIENCE
AND CONSERVATION



BOTANICAL
GARDEN-INSTITUTE
FEB RAS

*

INSTITUTE OF BIOLOGY
AND
SOIL SCIENCE FEB RAS

WWW.GEOBOTANICA.RU/BP



SEPTEMBER 2012



Chromosome Numbers of Some Vascular Plant Species from the South Baikal Siberia

Victor V. CHEPINOGA^{1,2*}, Aleksandr A. GNUTIKOV³ & Pavel I. LUBOGOSCHINSKY¹

Victor V. Chepinoga
¹ Department of Botany
Irkutsk State University
Irkutsk 664003 Russia

² Albrecht von Hallier Institute of Plant Sciences
Georg-August University of Göttingen
Göttingen 37073 Germany
E-mail: Victor.Chepinoga@gmail.com

Aleksandr A. Gnutikov
³ V. L. Komarov Botanical Institute RAS
St.-Petersburg 197376 Russia

Pavel I. Lubogoschinsky
¹ Department of Botany
Irkutsk State University
Irkutsk 664003 Russia

* Corresponding author

Manuscript received: 21.02.2012
Review completed: 12.04.2012
Accepted for publication: 15.07.2012

ABSTRACT

Chromosome numbers for 22 vascular plant species from Baikal Siberia are reported. The four species (*Asparagus brachyphyllus* Turcz., *Lupinaster popovii* Roskov, *Primula serrata* Georgi, *Galium paradoxum* Maxim.) are studied caryologically for the first time. Also the new cytotypes in *Asparagus danuricus* Fisch. ex Link and *Myriophyllum verticillatum* L. were revealed. For 7 species there are first chromosome counts in Siberia.

Keywords:

chromosome numbers, vascular plants, flora, Baikal region, South Siberia, Russia

Чепинога В. В., Гнутиков А. А., Любогощинский П. И. Хромосомные числа некоторых видов сосудистых растений из Байкальской Сибири

Приводятся хромосомные числа для 22 видов сосудистых растений с территории Байкальской Сибири. Четыре вида (*Asparagus brachyphyllus* Turcz., *Lupinaster popovii* Roskov, *Primula serrata* Georgi, *Galium paradoxum* Maxim.) исследованы впервые. Новые кариологические расы обнаружены у *Asparagus danuricus* Fisch. ex Link, *Myriophyllum verticillatum* L. Для семи видов впервые хромосомные числа получены на материале с территории Сибири.

Ключевые слова:

числа хромосом, сосудистые растения, флора, Байкальский регион, Южная Сибирь, Россия

This paper continues a series of our contributions to chromosome numbers study on plant species from the Baikal Siberia (Chepinoga et al. 2008, 2009, 2010a, 2010b, Probatova et al. 2008a, 2008c, etc.). Plants for this study were mostly collected in the south of Zabaikalskii Krai (former Chitinskaya Oblast'), including Aginskii, Borzinskii, Mогойтуйский, Ononskii, Soloviovskii, Uletovskii Raions (districts). Some plants were collected in southern part of Republic of Buryatia (Kabanskii, Mukhorshibirskii Raions) and Irkutskaya Oblast' (Shelekhovskii, Slud'yanskii Raions, Irkutsk city).

An asterisk (*) before the species name indicates the first chromosome count for the species, and before chromosome number – a new cytotype. Chromosome counting was made by A. A. Gnutikov. Vouchers are deposited in IRKU; duplicate samples are in VLA.

ACERACEAE

Acer negundo L., 2n = 26.

IRKU C089, Russia, Irkutskaya Oblast', downtown of Irkutsk city, Kirov square, 52°17'N, 104°16'E, 22.VI.2005, coll. A. Chepinoga & B. Batbayar.

The diploid chromosome number 2n = 26 is constant within the species (see Index ..., 1981, 1985, 1990, 1991, 1998, 2000). First count in Siberia.

ALLIACEAE

Allium microdictyon Prokh., 2n = 16.

IRKU C1034, Russia, Republic of Buryatia, Kabanskii Raion, Khamar-Daban Range, 2 km S of Baikal Lake, lower course of the Pereyemnaya River, riverbank, 453 m alt., 51°33'N, 105°10'E, 07.VII.2009, coll. R. Moriz.

The species has been repeatedly investigated karyologically; data from the Baikal Siberia are also available (Krogulevich 1976, 1978, Belaeva & Siplivinsky 1981, Friesen 1985, 1991, Chepinoga et al. 2010b). The chromosome number is constant.

Allium neriniflorum G. Don ex Loudon

(*Caloscordum neriniflorum* Herb.), 2n = 16.

IRKU C737, Russia, Zabaikalskii Krai, Aginskii Raion, 4 km W of Gunei village, left riverside of the Onon River, lakeside of oxbow lake Stepnoe, in grassland steppe, 652 m alt., 50°30'N, 114°29'E, 17.VII.2008, coll. P. Lubogoschinsky.

A. neriniflorum, an East Asian species, occurs in Russia in Zabaikalskii Krai only. Outside Russia it is distributed in Eastern Mongolia and North-Eastern provinces of China. Diploid, with apparently constant chromosome number 2n = 16 (Friesen, 1986; see Index ..., 2000, 2006). The tetraploid chromosome number 2n = 32, reported from Shanxi, China (Zhang 1994) evidently belongs to another species. Noteworthy, Xu & Kamelin (2000) have not reported *A. neriniflorum* from Shanxi, and they indicated only 2n = 16 for this species.

***Allium polyrhizum* Turcz. ex Regel, 2n = 32.**

IRKU C760, Russia, Zabaikalskii Krai, Borzinskii Raion, 15 km S of Kulussutai village, between Zun-Torei and Barun-Torei lakes, feather grass steppe, 601 m alt., 50°06'N, 115°41'E, 28.VII.2008, coll. P. Lubogoschinsky. First count in Siberia.

This species has been investigated karyologically from China only. Two counts (2n = 32) were made from the North-East China, territories neighboring to Zabaikalskii Krai (Toglor et al. 1993, Yang et al. 1998). In contrast, diploid number 2n = 16 was reported from Tibetan Plateau (Hongguan et al. 2005); however, this count may belong to some other species.

***Allium ramosum* L., 2n = 16.**

IRKU C609, Russia, Zabaikalskii Krai: Uletovskii Raion, 5 km SW of Cheremkhovo village, left riverside of the Ingoda River, steppe, 51°28'N, 112°43'E, 10.VIII.2007, coll. A. Gnutikov & I. Enushchenko; IRKU C877, C879, Aginskii Raion, 28 km NW of Nizhnii Zassuchey village, saline lake Kunkur, feather grass steppe, 636 m alt., 50°42'N, 114°53'E, 21.VII.2008, coll. M. Isaikina.

— 2n = 32.

IRKU C762, Russia, Zabaikalskii Krai, Borzinskii Raion, 15 km S of Kulussutai village, between Zun-Torei and Barun-Torei lakes, feather grass steppe, 601 m alt., 50°06'N, 115°41'E, 28.VII.2008, coll. P. Lubogoschinsky.

Two karyological races are known for this Asian forest-steppe species: di- and tetraploid ($x = 8$; 2n = 16 and 32). Diploids were reported from China only (Index... 1988, 1998, 2000, 2006, 2010). The origin of some diploid specimens is unknown (see Agapova et al. 1990). Chromosome numbers for *A. ramosum* were repeatedly counted in plants from different regions of South Siberia and the Russian Far East (Primorskii Krai), but all of them were 2n = 32 (Sokolovskaya 1966, Rostovtseva 1977, Gritsenko & Gursenkov 1983; Friesen 1983, 1985, 1986, 1988, Krogulevich & Rostovtseva 1984, Rudyka 1984, Krasnikov 1985, Probatova et al. 2011). Noteworthy, in plants from SE Transbaikalia (neighboring to China) we revealed both (2x and 4x) races.

AMARANTHACEAE***Amaranthus blitoides* S. Watson, 2n = 32.**

IRKU C799, Russia, Zabaikalskii Krai, Borzinskii Raion, Soloviovsk village, near a fence, 608 m alt., 49°53'N, 115°45'E, 29.VII.2008, coll. V. Chepinoga, S. Rosbakh & A. Konovalov. First count in Siberia.

This cosmopolitan species is probably tetraploid ($x = 8$) and its chromosome number has been reported many times (see Index... 1981, 1988, 1990, 1991, 1994, 1996, 2006, Probatova et al. 2009).

ASPARAGACEAE****Asparagus brachyphyllus* Turcz., 2n = 20.**

IRKU C854, Russia, Zabaikalskii Krai, Borzinskii Raion, 10 km N of Soloviovsk village, between Zun-Torei and Barun-Torei lakes, steppe, 593 m alt., 49°58'N, 115°43'E, 27.VII.2008, coll. M. Isaikina, K. Fleckenstein & N. Pazdnikova.

A. brachyphyllus is mainly Daurian species, it occurs in Russia in SE Transbaikalia only. The only known chromosome count (4x; 2n = 40) was made for *A. brachyphyllus* from plants cultivated in the Omsk botanical garden (Zakharjeva & Makushenko 1969). The origin of these plants is unknown, but most likely they were collected in surroundings of Omsk city (SW Siberia). If this hypothesis is true, then the published count belongs not to *A. brachyphyllus* but to *A. pallasii* Miscz., which had not been distinguished from *A. brachyphyllus* at the time when the cited work was done. In this case our count of chromosome number is the first count for *A. brachyphyllus* s. str. The same

chromosome number 2n = 20 was independently obtained in *A. brachyphyllus* from plants collected by S. Kazanovsky at the northern shore of Zun-Torei Lake (N. Probatova, pers. comm.).

Closely related species (*A. brachyphyllus*, *A. pallasii*, *A. tamariscinus* Ivanova ex Grubov, *A. trichophyllus* Bunge) are distinguished mostly on the geographical basis, while morphological differences are weak and unstable (Vlassova 1989, Gubanov 1996, Chen & Tamanian 2000). We tend to support the opinion by V. Grubov (1977), who considered all these species as *A. trichophyllus* s. l. Further studies applying methods of karyology and molecular markers (see, for example: Fukuda et al. 2005) are needed to elucidate relationships within this taxon.

***Asparagus davuricus* Fisch. ex Link**

(incl. *A. burjaticus* Peschkova), 2n = 20.

IRKU C856, Russia, Zabaikalskii Krai: Mogoituyskii Raion, 6 km NE Kusocha village, floodplain of right riverside of the Onon River, floodplain, shore of the quarry lake, 571 m alt., 50°44'N, 115°42'E, 14.VII.2008, coll. V. Chepinoga & S. Rosbakh; IRKU C857, C875, Borzinskii Raion, 10 km N of Soloviovsk village, between Zun-Torei and Barun-Torei lakes, steppe, 593 m alt., 49°58'N, 115°43'E, 27.VII.2008, coll. M. Isaikina, K. Fleckenstein & N. Pazdnikova; IRKU C860, C876, Borzinskii Raion, 15 km S of Kulussutai village, between Zun-Torei and Barun-Torei lakes, feather grass steppe, 601 m alt., 50°06'N, 115°41'E, 28.VII.2008, coll. V. Chepinoga, S. Rosbakh & P. Lubogoschinsky.

***— 2n = 40.**

IRKU C761, Russia, Zabaikalskii Krai, Borzinskii Raion, 15 km S of Kulussutai village, between Zun-Torei and Barun-Torei lakes, feather grass steppe, 601 m alt., 50°06'N, 115°41'E, 28.VII.2008, coll. P. Lubogoschinsky.

The reports of chromosome numbers for *A. davuricus* were made from Zabaikalskii Krai (2n = 20, Borzia town and Kazanovo village – Vlassova 1981, Krogulevich & Rostovtseva 1984) and China (2n = 18; see Index... 2003). The 2n = 20 was also obtained independently in *A. davuricus* from plants collected by S. Kazanovsky in the Adon-Chelon mountain-steppe massif (SE Transbaikalia), but for *A. burjaticus* it was 2n = 40, from plants collected by D. Krivenko along the Selenga River (Southern Buryatia) (N. Probatova, pers. comm.).

A. davuricus and *A. burjaticus* are closely related species with unstable morphological differences; nevertheless the difference in ploidy levels can be a good reason to consider these two taxa as separate species.

***Asparagus gibbus* Bunge, 2n = 40.**

IRKU C858, Russia, Zabaikalskii Krai: Borzinskii Raion, 12 km E of Soloviovsk village, on the shore of Zun-Torei lake, 597 m alt., 49°59'N, 115°50'E, 29.VII.2008, coll. V. Chepinoga, S. Rosbakh & A. Konovalov; IRKU C859, C871, C873, Borzinskii Raion, 15 km S of Kulussutai village, between Zun-Torei and Barun-Torei lakes, feather grass steppe, 601 m alt., 50°06'N, 115°41'E, 28.VII.2008, coll. V. Chepinoga, S. Rosbakh & P. Lubogoschinsky.

The unique report of chromosome number for *A. gibbus* (2n = 40) was made from the same region, the lake Zun-Torei (Vlassova 1981, Krogulevich & Rostovtseva 1984). In *A. gibbus*, identified according to morphological characters reported by Vlassova (2001), we found tetraploid chromosome number 2n = 40 as well. *A. gibbus* is closely related to *A. davuricus* and the morphological differences between these species are weak and unstable.

BORAGINACEAE

***Tournefortia sibirica* L. (*Argusia rosamarinifolia* (Willd.) Steven, *A. sibirica* (L.) Dandy), 2n = 26.**

IRKU C690, Russia, Zabaikalskii Krai, Ononskii Raion, 8 km NE of Builessan village, saline lake Khotochei, lakeshore, 678 m alt., 50°18'N, 114°57'E, 02.VI.2008, coll. P. Lubogoschinsky. First count in Siberia.

We found two references to the counts of chromosome number of this E European-Asian species. The first we found in "Flora of China" (2n = 26; Zi 1995); however, we were unable to discover the primary source of these data. The second was published on the material from Russian Far East (Probatova et al. 2010, as *Argusia sibirica*). The chromosome number of the species was 2n = 26 in both cases. Plants from Transbaikalia confirm the diploid chromosome number of *T. sibirica*.

FABACEAE

**Lupinaster popovii* Roskov, 2n = 32.

IRKU C720, Russia, Zabaikalskii Krai, Mogoituyskii Raion, 2 km SW of Yasnogorsk town, near the mouth of the Turga River, sandy roadside, 582 m alt., 50°50'N, 115°40'E, 12.VII.2008, coll. P. Lubogoschinsky.

This species, described from Baikal Siberia, is a poorly delineated race of *L. pentaphyllus* Moench s. l. *L. pentaphyllus* has two ploidy levels: more common is tetraploid (2n = 4x = 32; Belaeva & Siplivinsky 1975, Krogulevich 1978, Probatova et al. 2008a, Krivenko et al. 2011) and less common is hexaploid (2n = 6x = 48; Belaeva & Siplivinsky 1975, Krogulevich & Rostovtseva 1984). Hexaploid race of *L. pentaphyllus* was described as a separate species, *L. baicalensis* (Belyaeva et Sipliv.) Roskov (= *Trifolium baicalense* Belyaeva et Sipliv.), which has pinkish-white flowers, while the flowers of *L. pentaphyllus* s. str. are red-violet. *L. popovii* has the same chromosome number as *L. pentaphyllus* s. str. and differs from it mainly by quantitative features: plants are stocky, with numerous stems, smaller leaves and smaller flowers. A more detailed karyological study of *L. pentaphyllus* s. l. complex is needed.

HALORAGACEAE

Myriophyllum sibiricum Kom., 2n = 28.

IRKU C372, Russia, Zabaikalskii Krai: Uletovskii Raion, 28 km W of Tanga village, Areiskoe lake, submerged, 50°58'N, 111°33'E, 15.VI.2007, coll. A. Gnutikov & I. Enushchenko; IRKU C669, Ononskii Raion, 6 km W of Nizhnii Zassuchey village, right riverside of the Onon River, floodplain, oxbow lake, in shallow water, 663 m alt., 50°31'N, 115°02'E, 27.VI.2008, coll. P. Lubogoschinsky & V. Chepinoga; IRKU C735, Aginskii Raion, 8 km W of Gunei village, left riverside of the Onon River, oxbow lake Krivoye, in shallow water, 655 m alt., 50°30'N, 114°25'E, 18.VII.2008, coll. P. Lubogoschinsky, S. Rosbakh & V. Chepinoga; IRKU C777, Ononskii Raion, 6 km W of Nizhnii Zassuchey, floodplain of right riverside of the Onon River, oxbow lake Pashutkino, submerged, 663 m alt., 50°31'N, 115°02'E, 05.VIII.2008, coll. P. Lubogoschinsky.

Counts from Transbaikalia confirm the tetraploid chromosome number (2n = 4x = 28) in *M. sibiricum* that we obtained earlier on the material from Cisbaikalia (Irkutskaya Oblast'; Probatova et al. 2008a). It should be stressed that for North American *M. exalbescens* Fernald, which is commonly considered as a synonym of *M. sibiricum*, only hexaploid number (2n = 48) was reported from U.S.A. (Aiken 1978) and Canada (Löve & Löve 1982).

**Myriophyllum verticillatum* L., 2n = 14.

IRKU C270, Russia, Republic of Buryatia, Mukhorshibirskii Raion, left riverside of the Khilok River, opposite of Podlopatki village, small oxbow, submerged, 50°54'N, 107°04'E, 13.VI.2006, coll. I. Enushchenko & I. Salovarov; IRKU C619, Zabaikalskii Krai, Uletovskii Raion, 2 km N of Cheremkhovo village, steppe lake Nympeinikovoye, in shallow water, 725 m alt., 51°28'N, 112°43'E, 12.VII.2007, coll. A. Gnutikov & I. Enushchenko. First count in Siberia.

Several chromosome counts from the Russian Far East revealed 2n = 4x = 28 (see Index ... 1998, 2000, 2006, etc.). Nevertheless from Transbaikalia we obtained (twice) the diploid chromosome number (2n = 14). None of the four known diploid species of the genus *Myriophyllum* (*M. alternifolium* DC., *M. propinquum* A. Cunn., *M. tenellum* Bigelow, *M. ussuriense* Maxim.: see Index ... 1984, 1985, 1990, 1996, 2003, 2010) was found so far in Siberia. Distribution range of *M. ussuriense* is relatively close to Siberia, but this species (dioecious, subtile, often with reduced number of lobes of the leaves) differs substantially from plants investigated by us. A more detailed karyological study on *M. verticillatum*, as well as the genus *Myriophyllum* in Siberia is needed to clarify the problem outlined above.

PAPAVERACEAE

Chelidonium asiaticum (Hara) Krahulc., 2n = 10.

IRKU C683, Russia, Zabaikalskii Krai, Ononskii Raion, Nizhnii Zassuchey village, on roadside, 647 m alt., 50°30'N, 115°06'E, 01.VII.2008, coll. P. Lubogoschinsky.

Ch. asiaticum is an East Asian vicariant of *Ch. majus* L. s. l., differing by the lower number of chromosomes – 2n = 10 (cf. 2n = 12 of *Ch. majus*). *Ch. asiaticum* has some morphological differences from *Ch. majus*: it is slightly more hairy, with a bit narrower and subacute lobes of the leaves (Krahulcová 1982). Earlier it was thought that *Ch. asiaticum* is limited to East Asia, and that in Russia it occurs in the Far East. Really, only *Ch. asiaticum* is presented in the Russian Far East. However, the karyological study demonstrated that both *Ch. asiaticum* and *Ch. majus* occur in the Baikal Siberia (Belaeva & Siplivinsky 1975, Safronova 1991, Chepinoga et al. 2008, Probatova et al. 2008b, 2008c, 2008d), *Ch. asiaticum* exists also at the west coast of the Baikal Lake (Fig. 1). Noteworthy, a *Chelidonium* with 2n = 10 was once reported from West Siberia (the vicinity of Tomsk city; Kartashova et al. 1974). We doubt that the distribution range of *Ch. asiaticum* really reaches West Siberia. Still the problem requires further investigation.

Chelidonium majus L., 2n = 12.

IRKU C131, 132, Russia, Irkutskaya Oblast', Shelekhovskii Raion, surroundings of Bolshoi Lug village, anthropogenic meadow, 52°06'N, 104°06'E, 02.V.2005, coll. V. Chepinoga.

According to A. Krahulcová (1982), *Ch. majus* is Eurasian species (also known from North America as an introduced plant), but this species is absent in the Russian Far East (Bezdeleva 1987). As stated above, both this species and *Ch. asiaticum* occur in the Baikal Siberia (Fig. 1).

POACEAE

Hordeum brevisubulatum Link, 2n = 28.

IRKU C364, Russia, Republic of Buryatia, Mukhorshibirskii Raion, 15 km NNW of Mukhorshibir village, a pond on the tributary of the Tugnui River, on the bank, 51°11'N, 107°16'E, 14.VI.2007, coll. A. Gnutikov & I. Enushchenko; IRKU C728, Russia, Zabaikalskii Krai: Aginskii Raion, 8 km W of Gunei village, left riverside of the Onon River, oxbow lake Krivoye, in shrubs on the shore, 655 m alt., 50°30'N, 114°25'E, 17.VII.2008, coll. P. Lubogoschinsky; IRKU C812, Ononskii Raion, 8 km SSE of Bolshevik village, the saline lake Balyktui, steppe-meadow on the shore, 676 m alt., 50°24'N, 114°42'E, 04.VI.2008, coll. M. Isaikina & P. Lubogoschinsky.

H. brevisubulatum is an Asian forest-steppe species with constant chromosome number. Earlier data from the Baikal Siberia exist for plants from East Sayan Mts. (Krogulevich 1978) and SE Transbaikalia (Probatova et al. 2011).

Hordeum roshevitzii Bowden, 2n = 14.

IRKU C809, Russia, Zabaikalskii Krai: Ononskii Raion, 15 km W of Ust'-Imalka village, saline lake Bulun-Zagan, moist meadow on the shore, 653 m alt., 50°07'N, 115°06'E, 25.VII.2008, coll. V. Chepinoga; IRKU C866, Ononskii Raion, 10 km SE

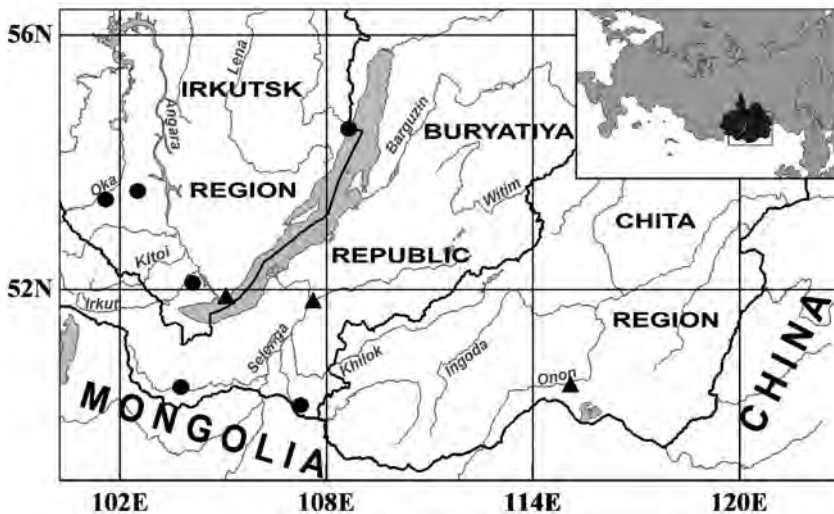


Figure 1 Localities of specimens of *Chelidonium* with chromosome numbers studied, in the Baikal Siberia. Triangles – *Ch. asiaticum*, dots – *Ch. majus* (sources: Belaeva & Siplivinsky 1975, Safronova 1991, Chepinoga et al. 2008, Probatova et al. 2008b, 2008c, 2008d; this study).

of Builessan village, saline lake Zagan-Nor, on shore, 678 m alt., 50°11'N, 114°57'E, 24.VII.2008, coll. P. Lubogoschinsky.

Previous studies demonstrated that *H. roshewitzii* is a diploid species: $2n = 2x = 14$, the only report of $2n = 28$ is doubtful (see Index ... 1984).

***Lolium multiflorum* Lam., $2n = 14$.**

IRKU C835, Russia, Irkutskaya Oblast', Shelekhovskii Raion, downtown of Shelekhov town, in the pine forest edge, 52°12'N, 104°04'E, 25.VII.2004, coll. N. Dulepova. First count in Siberia.

L. multiflorum is alien species in the Baikal Siberia, where it is cultivated on lawns. Diploid chromosome number ($2n = 14$) is the most common (see Index ... 1998, 2006).

PRIMULACEAE

****Primula serrata* Georgi, $2n = 18$.**

IRKU C657, Russia, Zabaikalskii Krai, Uletovskii Raion, 3 km NE of Cheremkhovo village, left riverside of the Ingoda River, wet meadow, 51°28'N, 112°44'E, 24.VI.2008, coll. P. Lubogoschinsky.

P. serrata is an Asian species growing on wet meadows.

ROSACEAE

***Waldsteinia ternata* Fritsch, $2n = 28$.**

IRKU C1067, Russia, Republic of Buryatia, Kabanskii Raion, Khamar-Daban Mountain Range, 1.5 km S of Baikal Lake, lower course of the Anosovka River, *Populus* forest, 470 m alt., 51°31'N, 104°57'E, 14.VII.2009, coll. R. Moriz.

— $2n = 42$.

IRKU C958, Russia, Irkutskaya Oblast', Sludyanskii Raion, Khamar-Daban Mountain Range, 10 km S of Baikal Lake, lower course of the Snezhnaya River, Teplye Lakes, on the shore nearby the forest edge, 492 m alt., 51°23'N, 104°38'E, 01.VII.2009, coll. V. Chepinoga & R. Moriz.

Nemoral relict species described from the Khamar-Daban Range (south coast of the Baikal Lake). Geographically separated populations from Europe and from the Russian Far East were recognized as two subspecies *W. ternata* ssp. *trifolia* (Rochel ex W. D. J. Koch) Teppner and *W. ternata* ssp. *maximowicziana* Teppner, respectively. Some researches treat these taxa as species (*W. trifolia* Rochel ex W.D.J. Koch, *W. maximowicziana* (Teppner) Prob.). In all parts of the geographical range of *W. ternata* s. l., except for one (in Romania), more than one ploidy level occur: Carinthia (Austria) / Slovenia – 4x, 5x,

Slovakia – 4x, 5x; Romania – 6x; Southern Siberia – 2x, 6x and Eastern Asia – 2x, 4x, 6x (Stepanov 1994, Teppner 2003, Probatova et al. 2006, Teppner et al. 2009). Earlier information from South Siberia originated from Krasnoyarskii Krai ($2n = 2x = 14$; Stepanov 1994, as *W. tanzybeica* Stepanov) and from Khamar-Daban Range ($2n = 6x = 42$; Teppner 2003). Our data confirm the occurrence of hexaploids ($2n = 42$) in the Khamar-Daban Range, where we also found a new, tetraploid cytotype ($2n = 28$). These findings support the opinion by H. Teppner that "such a pattern makes the independent, convergent evolution of the different ploidy levels probable" (Teppner et al. 2009: 231).

RUBIACEAE

****Galium paradoxum* Maxim., $2n = 22$.**

IRKU C951, Russia, Irkutskaya Oblast', Sludyanskii Raion, Khamar-Daban Range, 8 km S of Baikal Lake, lower course of the Snezhnaya River, *Populus* forest edge, 506 m alt., 51°24'N, 104°38'E, 30.VI.2009, coll. R. Moriz.

G. paradoxum is an East Asian plant growing in shady coniferous and mixed forests.

***Galium ruthenicum* Willd., $2n = 44$.**

IRKU C703, Russia, Zabaikalskii Krai, Ononskii Raion, Nizhnii Zassuchey village, on the roadside, 647 m alt., 50°30'N, 115°06'E, 07.VII.2008, coll. P. Lubogoschinsky.

Our data confirm the tetraploid ($x = 11$) chromosome number for the species reported earlier from the Russian Far East (Probatova & Sokolovskaya 1989). Importantly, the closely related *G. verum* L. also has $2n = 44$. First count in Siberia.

ACKNOWLEDGEMENTS

We are grateful to Dr. Nina S. Probatova (Vladivostok) for the revision of an earlier version of the manuscript, valuable discussions and information on unpublished results.

The study was financially supported by the Russian Foundation for Basic Research (05-05-64061-a, 11-04-00240-a), by Ministry of Education and Science of Russian Federation (RNP.2.2.3.1.4667) and by the Erasmus Mundus External Cooperation Window Programme (TRIPLEI2010364).

LITERATURE CITED

- Agapova, N. D., K. B. Arkharova, L. I. Vakhtina, E. A. Zemskova & L. V. Tarvis 1990. *Chromosome numbers in flowering plants of the flora of the USSR: Aceraceae – Menyanthaceae*. Nauka, Leningrad, 509 pp. (in Russian). [Агапова Н.Д., Архарова К.Б., Вахтина Л.И., Земскова Е.А., Тарвис Л.В. 1990. Числа хромосом цветковых растений флоры СССР: Семейства Aceraceae – Menyanthaceae. Л.: Наука. 509 с.]
- Aiken, S. 1978. In: IOPB chromosome reports LXII (Á. Löve, ed.) *Taxon* 27(5-6):522.
- Belaeva, V. A. & V. N. Siplivinsky 1975. Chromosome numbers and taxonomy of some species from the flora of the Baikal Region 1. *Botanicheskii Zhurnal* 60(6):864–872 (in Russian). [Белаева В.А., Сипливинский В.Н. 1975. Хромосомные числа и таксономия некоторых видов Байкальской флоры, 1 // Ботанический журнал. Т. 60, № 6. С. 864–872.]
- Belaeva, V.A. & V.N. Siplivinsky 1981. In: Chromosome number reports LXXIII (Á. Löve, ed.) *Taxon* 30(4):857–860.
- Bezdeleva, T. A. 1987. Fam. *Papaveraceae*. In: *Vascular plants of the Soviet Far East* (S. S. Kharkevich, ed.), vol. 2, pp. 37–69, Nauka, Leningrad (in Russian). [Безделева Т.А. 1987. Сем. Маковые – Papaveraceae // Сосудистые растения советского Дальнего Востока. Л.: Наука. Т. 2. С. 37–69.]
- Chen, S.-C. & K. G. Tamanián 2000. *Asparagus* L. In: *Flora of China* (Zh. Wu & P. H. Raven, eds.), vol. 24. *Flagellariaceae* through *Marantaceae*, pp. 208–215. Science Press, Beijing & Missouri Botanical Garden Press, St. Louis.
- Chepinoga, V. V., A. A. Gnutikov & I. V. Enushchenko 2008. Chromosome numbers in some species of vascular plants of the Baikal Siberia. *Botanicheskii Zhurnal* 93(8):1286–1295 (in Russian). [Чепинога В.В., Гнутиков А.А., Енущенко И.В. 2008. Числа хромосом некоторых видов сосудистых растений флоры Байкальской Сибири // Бот. журн. Т. 93, № 8. С. 1286–1295.]
- Chepinoga, V. V., A. A. Gnutikov, I. V. Enushchenko & S. A. Rosbakh 2009. In: IAPT/IOPB chromosome data 8 (K. Marhold, ed.). *Taxon* 58(4):1281–1282; E1–E3.
- Chepinoga, V. V., A. A. Gnutikov & I. V. Enushchenko 2010a. Chromosome numbers of some plants species from the southern part of East Siberia. *Botanicheskii Zhurnal* 95(1):129–139 (in Russian). [Чепинога В.В., Гнутиков А.А., Енущенко И.В. 2010. Числа хромосом некоторых видов растений из южной части Восточной Сибири // Бот. журн. Т. 95, № 1. С. 129–139.]
- Chepinoga, V. V., A. A. Gnutikov & I. V. Enushchenko 2010b. In: IAPT/IOPB chromosome data 9 (K. Marhold, ed.). *Taxon* 59(4):1298–1299; E1–E5.
- Friesen, N. V. 1983. Cytotaxonomical study of some species of *Allium* L. in Siberia. *Izvestiya Sibirskogo otdeleniya AN SSSR. Ser. Biol. Nauk* 5(1):48–52 (in Russian). [Фризен Н.В. 1983. Цитотаксономическое исследование некоторых видов рода *Allium* L. в Сибири // Изв. СО АН СССР. Сер. биол. наук. Т. 5, № 1. С. 48–52.]
- Friesen, N. V. 1985. Chromosome numbers in some species of the family *Alliaceae* from Siberia. *Botanicheskii Zhurnal* 70(7):1001–1002 (in Russian). [Фризен Н.В. 1985. Числа хромосом представителей семейства *Alliaceae* из Сибири // Бот. журн. Т. 70, № 7. С. 1001–1002.]
- Friesen, N. V. 1986. Chromosome numbers in some species of the family *Alliaceae* from Siberia. *Botanicheskii Zhurnal* 71(1):113–115 (in Russian). [Фризен Н.В. 1986. Числа хромосом представителей семейства *Alliaceae* из Сибири // Бот. журн. Т. 71, № 1. С. 113–115.]
- Friesen, N. V. 1988. *Onion family in Siberia. Systematics, karyology, chorology*. Nauka, Novosibirsk, 185 pp. (in Russian). [Фризен Н.В. 1988. Луковые Сибири. Систематика, карология, хорология. Новосибирск: Наука. 185 с.]
- Friesen, N. V. 1991. Chromosome numbers in some species of the *Alliaceae* from Siberia. *Botanicheskii Zhurnal* 76(1):141–142 (in Russian). [Фризен Н.В. 1991. Числа хромосом представителей семейства *Alliaceae* из Сибири // Бот. журн. Т. 76, № 1. С. 141–142.]
- Fukuda, T., H. Ashizawa, R. Suzuki, T. Ochiai, T. Nakamura, A. Kanno, T. Kameya & J. Yokoyama 2005. Molecular phylogeny of the genus *Asparagus* (*Asparagaceae*) inferred from plastid petB intron and petD-rpoA intergenic spacer sequences. *Plant Species Biology* 20:121–132.
- Index to plant chromosome numbers 1975–1978 (P. Goldblatt, ed.) 1981. *Monographs in Systematic Botany, Missouri Botanical Garden, USA* 5:1–553.
- Index to plant chromosome numbers 1979–1981 (P. Goldblatt, ed.) 1984. *Ibid.* 8:1–427.
- Index to plant chromosome numbers 1982–1983 (P. Goldblatt, ed.) 1985. *Ibid.* 13:1–224.
- Index to plant chromosome numbers 1984–1985 (P. Goldblatt, ed.) 1988. *Ibid.* 23:1–264.
- Index to plant chromosome numbers 1986–1987 (P. Goldblatt & D. E. Johnson, eds.) 1990. *Ibid.* 30:1–243.
- Index to plant chromosome numbers 1988–1989 (P. Goldblatt & D. E. Johnson, eds.) 1991. *Ibid.* 40:1–238.
- Index to plant chromosome numbers 1990–1991 (P. Goldblatt & D. E. Johnson, eds.) 1994. *Ibid.* 51:1–267.
- Index to plant chromosome numbers 1992–1993 (P. Goldblatt & D. E. Johnson, eds.) 1996. *Ibid.* 58:1–276.
- Index to plant chromosome numbers 1994–1995 (P. Goldblatt & D. E. Johnson, eds.) 1998. *Ibid.* 69:1–208.
- Index to plant chromosome numbers 1996–1997 (P. Goldblatt & D. E. Johnson, eds.) 2000. *Ibid.* 81:1–188.
- Index to plant chromosome numbers 1998–2000 (P. Goldblatt & D. E. Johnson, eds.) 2003. *Ibid.* 94:1–297.
- Index to plant chromosome numbers 2001–2003 (P. Goldblatt & D. E. Johnson, eds.) 2006. *Ibid.* 106:1–242.
- Index to plant chromosome numbers 2004–2006 (P. Goldblatt & D. E. Johnson, eds.) 2010. *Regnum Vegetabile* 152:1–256.
- Gritsenko, P. P. & N. N. Gurzenkov 1983. Karyosystematic investigation of onions species from the Russian Far East. *Abstracts of 7th Congress of the Russian Botanical Society*. Donezk, p. 16 (in Russian). [Гриценко П.П., Гурзенков Н.Н. 1983. Карносистематическое изучение дальневосточных видов лука // Тез. докл. 7-го делег. съезда Всесоюз. бот. общ-ва. Донецк. С. 16.]
- Grubov, V. I. 1977. *Asparagus* L. In: *Plants of the Central Asia*. Vol. 7. *Liliaceae – Orchidaceae* (V. I. Grubov, ed.), pp. 77–82, Nauka, Leningrad (in Russian). [Грубов В.И. 1977. Растения Центральной Азии. Ленинград: Наука. С. 77–82.]
- Gubanov, I. A. 1996. Check-list of the flora of the Outer Mongolia (vascular plants). *Walang, Moscow*, 136 pp. (in Russian). [Губанов И.А. 1996. Конспект флоры Внешней Монголии (сосудистые растения). Москва: Валанг. 136 с.]
- Hongguan, T., L. Meng, S. Ao & J. Liu 2005. Origin of the Qinghai-Tibetan Plateau endemic *Milula* (Lilaceae): further insights from karyological comparisons with *Allium*. *Caryologia* 58(4):320–331.
- Kartashova, N. N., L. A. Malakhova & A. A. Kozlova 1974. Studies on chromosomes in some plants of Ob' region. 1. Chromosome number of some plant species from Tomsk Oblast'. *Nauchnie Doklady Vysshoi Shkoly. Biol. Sci.* 4:114–119 (in Russian). [Карташова Н.Н., Малахова Л.А., Козлова А.А. 1974. Изучение хромосом представителей Приобья. 1. Число хромосом некоторых видов растений Томской области // Научные доклады высшей школы. Биологические науки. Т. 4. С. 114–119.]
- Krahulcová, A. 1982. Cytotaxonomic study of *Chelidonium majus* L. s.l. *Folia Geobotanica et Phytotaxonomica* 17:237–268.
- Krasnikov, A. A. 1985. Chromosome numbers in some species of *Alliaceae* from Altai and Tuva ASSR. *Botanicheskii Zhurnal* 70(6):858–859 (in Russian). [Красников А.А. 1985. Числа хромосом представителей семейства *Alliaceae* с Алтая и Тувинской АССР // Бот. журн. Т. 70, № 6. С. 858–859.]
- Krivenko, D. A., V. V. Kotseruba, S. G. Kazanovsky, A. V. Verkhovina & N. V. Stepanov 2011. In: IAPT/IOPB chromosome data 11 (K. Marhold, ed.). *Taxon* 60(4):1222; E12–E13.
- Krogulevich, R. E. 1976. Chromosome numbers in some plant species from Tunkinskii Ridge (East Sayan Mts.). *Izvestiya Sibirskogo otdeleniya AN SSSR. Ser. Biol. Nauk* 15(3):46–52 (in Russian).

- [Крогулевич Р.Е. 1976. Числа хромосом некоторых видов растений Тункинских альп (Вост. Саян) // Изв. СО АН СССР. Сер. биол. наук. Т. 15, № 3. С. 46–52.]
- Krogulevich, R. E. 1978. Karyological analysis of the flora of the East Sayan Mts. In: *Flora of the Cisbaikalia*, pp. 19–48. Nauka, Novosibirsk (in Russian). [Крогулевич Р.Е. 1978. Кариологический анализ видов флоры Восточного Саяна // Флора Прибайкалья. Новосибирск: Наука. С. 19–48.]
- Krogulevich, R. E. & T. S. Rostovtseva 1984. Chromosome numbers of the flowering plants in Siberia and Far East. Nauka, Novosibirsk, 286 pp. (in Russian). [Крогулевич Р.Е., Ростовцева Т.С. 1984. Хромосомные числа цветковых растений Сибири и Дальнего Востока. Новосибирск: Наука. 286 с.]
- Löve, Å. & D. Löve 1982. In: IOPB chromosome reports LXXV (Å. Löve, ed.). *Taxon* 31(2):344–360.
- Probatova, N. S. & A. P. Sokolovskaya 1989. Chromosome numbers in vascular plants from Primorskii Krai, the Amur region, Sakhalin, Kamchatka and the Kuril Islands. *Botanicheskii Zhurnal* 74(1):120–123 (in Russian). [Пробатова Н.С., Соколовская А.П. 1989. Числа хромосом сосудистых растений из Приморья, Приамурья, Сахалина, Камчатки и Курильских островов // Бот. журн. Т. 74, № 1. С. 120–123.]
- Probatova, N. S., E. G. Rudyka, A. V. Shatokhina, V. Yu. Barkalov, M. V. Krjukova & D. Yu. Tzyrenova 2006. Chromosome numbers of some plant species of the Primorsky Territory and the Amur River basin. *Botanicheskii Zhurnal* 91(5):785–804 (in Russian). [Пробатова Н.С., Рудыка Э.Г., Шагохина А.В., Баркалов В.Ю., Крюкова М.В., Цыренова Д.Ю. 2006. Числа хромосом видов флоры Приморского края и Приамурья // Бот. журн. Т. 91, № 5. С. 785–804.]
- Probatova, N. S., A. A. Gnutikov, E. G. Rudyka & V. V. Chepinoga 2008a. Chromosome numbers of some plant species from Baikal Siberia. *Botanicheskii Zhurnal* 93(1):162–181 (in Russian). [Пробатова Н.С., Гнутиков А.А., Рудыка Э.Г., Чепинога В.В.] [Числа хромосом видов растений из Байкальской Сибири // Бот. журн. Т. 93, № 1. С. 162–181.]
- Probatova, N. S., E. G. Rudyka, V. P. Seledets & V. A. Nechaev 2008b. In: IAPT/IOPB chromosome data 6 (K. Marhold, ed.). *Taxon* 57(4):1268–1271; E4–E12.
- Probatova, N. S., V. P. Seledets, A. A. Gnutikov & A. V. Shatokhina 2008c. In: IAPT/IOPB chromosome data 6 (K. Marhold, ed.). *Taxon* 57(4):1272–1273; E12–E16.
- Probatova, N. S., V. P. Seledets & E. G. Rudyka 2008d. In: IAPT/IOPB chromosome data 5 (K. Marhold, ed.). *Taxon* 57(2):558–562; E16–E24.
- Probatova, N. S., V. P. Seledets, E. G. Rudyka, A. A. Gnutikov, Z. V. Kozhevnikova & V. Y. Barkalov 2009. In: IAPT/IOPB chromosome data 8 (K. Marhold, ed.). *Taxon* 58(4):1284–1288; E11–E20.
- Probatova, N. S., Z. V. Kozhevnikova, E. G. Rudyka, A. E. Kozhevnikov & V. A. Nechaev 2010. Chromosome numbers of vascular plant species from the Russian Far East. *Botanicheskii Zhurnal* 95(7):1008–1020 (in Russian). [Пробатова Н.С., Кожевникова З.В., Рудыка Э.Г., Кожевников А.Е., Нечаев В.А. 2010. Числа хромосом сосудистых растений с Дальнего Востока России // Бот. журн. Т. 95, № 7. С. 1008–1020.]
- Probatova, N. S., S. G. Kazanovsky, E. G. Rudyka, V. Y. Barkalov, V. P. Seledets & V. A. Nechaev 2011. In: IAPT/IOPB chromosome data 12 (K. Marhold, ed.). *Taxon* 60(6):1790–1794; E49–E59.
- Rostovtseva, T. S. 1977. Chromosome numbers of some plant species from the South Siberia. II *Botanicheskii Zhurnal* 72(7):1034–1042 (in Russian). [Ростовцева Т.С. 1977. Числа хромосом некоторых видов растений юга Сибири, 2 // Бот. журн. Т. 72, № 7. С. 1034–1042.]
- Rudyka, E. G. 1984. Chromosome numbers in vascular plants from southern part of the Soviet Far East. *Botanicheskii Zhurnal* 69(12):1699–1700 (in Russian). [Рудыка Э.Г. 1984. Числа хромосом сосудистых растений из южной части советского Дальнего Востока // Бот. журн. Т. 69, № 12. С. 1699–1700.]
- Safronova, I. N. 1991. Chromosome numbers in some species of Papaveraceae. *Botanicheskii Zhurnal* 76(6):904–905 (in Russian). [Сафронова И.Н. 1991. Числа хромосом некоторых видов семейства Papaveraceae // Бот. журн. Т. 76, № 6. С. 904–905.]
- Sokolovskaya, A. P. 1966. Geographic distribution of polyploid plant species. The study on the flora of the Primorskii Krai. *Vestnik Leningradskogo Gos. Univ.* 1(3):92–106 (in Russian). [Соколовская А.П. 1966. Географическое распространение полиплоидных видов растений. Исследование флоры Приморского края // Вестн. ЛГУ. Вып. 1, № 3. С. 92–106.]
- Stepanov, N. V. 1994. Chromosome numbers in some nemoral species from West Sayan Mts. (Krasnoyarskii Krai) *Botanicheskii Zhurnal* 79(3):125–128 (in Russian). [Степанов Н.В. 1994. Числа хромосом некоторых неморальных видов Западного Саяна (Красноярский кр.) // Бот. журн. Т. 79, № 3. С. 125–128.]
- Teppner, H. 2003. Erfahrungen mit Ex-situ-Erhaltung im Botanischen Garten des Institutes für Botanik der Universität Graz. *Fritschiana (Graz)* 39:1–22.
- Teppner, H., W. Schuehly & A. S. Weakley 2009. The chromosome numbers of *Waldsteinia* (Rosaceae, Coluriceae) in North America. *Phyton* 48(2):225–238.
- Tolgor, X.-G., D.-R. Kang Zhang & T.-S. Zou 1993. Study on *Allium* of northeast China. *Journal of Jilin Agricultural University* 15(4):44–48.
- Vlassova, N. V. 1981. Genus *Asparagus* L. in Siberia. In: *New information about plant geography in Siberia.*, pp. 79–104, Nauka, Novosibirsk (in Russian). [Власова Н.В. 1981. Род *Asparagus* L. в Сибири // Новые данные о фитогеографии Сибири. Новосибирск: Наука. С. 79–104.]
- Vlassova, N. V. 1989. The *Asparagus* in Siberia. Systematics, anatomy, chorology. Nauka, Novosibirsk, 80 pp. (in Russian). [Власова Н.В. 1989. Спаржи Сибири. Систематика, анатомия, хорология. Новосибирск: Наука. 80 с.]
- Vlassova, N. V. 2001. *Asparagus* L. In: *Flora of Siberia. Vol. 4. Araceae–Orchidaceae* (L. I. Malyshev & G. A. Peshkova, eds.), pp. 99–101, Science Publishers, Enfield (USA) & Plymouth (UK).
- Xu, J. & R. V. Kamelin 2000. *Allium* L. In: *Flora of China. Vol. 24. Flagellariaceae through Marantaceae* (Zh. Wu & P. H. Raven, eds.), pp. 165–202, Science Press, Beijing & Missouri Botanical Garden Press, St. Louis.
- Yang, L., J.-M. Xu, X.-L. Zhang & H.-Q. Wan 1998. Karyological studies of six species of the genus *Allium*. *Acta Phytotaxonomica Sinica* 36(1):36–46.
- Zakharieva, O. I. & L. M. Makushenko 1969. Chromosome numbers of monocotyledons from the families Liliaceae, Iridaceae, Amaryllidaceae and Araceae. *Botanicheskii Zhurnal* 54(8): 1213–1227 (in Russian). [Захарьева О.И., Макушенко Л.М. 1969. Хромосомные числа однодольных растений из семейств Liliaceae, Iridaceae, Amaryllidaceae и Araceae // Бот. журн. Т. 54, № 8. С. 1213–1227.]
- Zhang, Y.-X. 1994. Studies on chromosomes of some plants from Guandi Mountain, Shanxi. *Journal of Wuban Botanical Research* 12(2):201–206.
- Zi, D. S. 1995. Genus *Tournefortia* L. In: *Flora of China. Vol. 16. Gentianaceae through Boraginaceae* (Zh. Wu & P. H. Raven, eds.), pp. 341–342, Science Press, Beijing & Missouri Botanical Garden Press, St. Louis.

BOTANICA PACIFICA

(ISSN 2226-4701)

Contents Volume 1, No. 1

Editorial Introduction

P. V. Krestov, V. A. Bakalin, E. O. Box & A. N. Gillison
Exploring the Flora of Pacifica and Its Evolution 3–4

Survey paper

E. O. Box & K. Fujiwara
A Comparative Look at Bioclimatic Zonation, Vegetation Types, Tree
Taxa and Species Richness in Northeast Asia 5–20

Opinion paper

L. N. Vasilyeva & S. L. Stephenson
The Hierarchy and Combinatorial Space of Characters in Evolutionary
Systematics 21–30

Monograph paper

S. S. Choi, V. A. Bakalin & B.-Y. Sun
Scapania and *Macrodiplophyllum* in the Russian Far East 31–95

Research papers

A. N. Gillison
Circumboreal Gradients in Plant Species and Functional
Types 97–707

A. M. Omelko, P. V. Krestov & A. N. Yakovleva
A Topography-Based Model of the Vegetation Cover of the
Lanzhinskie Mountains 109–119

Chromosome numbers

N. S. Probatova, V. Yu. Barkalov & E. G. Rudyka
Chromosome Numbers for Vascular Plant from Sakhalin, Moneron
and the Kuril Islands (North-East Asia) 121–126

V. V. Chepinoga, A. A. Gnutikov & P. I. Lubogoschinsky
Chromosome Numbers of Some Vascular Plant Species from the
South Baikal Siberia 127–132