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Botanica Pacifica plant chromosome data 4

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ABSTRACT

The chromosome numbers (CNs, 2*n*) and ploidy level (n*x*) according to the inferred basic chromosome number (*x*) are presented for 41 vascular plant taxa (including 39 species, 1 subspecies, and 1 hybrid) from 26 genera and 12 families: Amaryllidaceae: *Allium*; Apiaceae: *Angelica* and *Pleurospermum*; Asteraceae: *Doronicum* and *Leucanthemum*; Cannabaceae: *Humulus*; Fabaceae: *Asrtagalus*, *Caragana*, *Hedysarum*, *Medicago*, *Melilotus*, *Onobrychis*, *Oxytropis*, *Thermopsis*, and *Trifolium*; Lamiaceae: *Prunella*; Melanthiaceae: *Paris*; Primulaceae: *Primula*; Poaceae: *Brachypodium* and *Poa*; Ranunculaceae: *Aconitum*, *Anemonastrum*, *Anemone*, and *Eranthis*; Rosaceae: *Sanguisorba*; Violaceae: *Viola*. The studied specimens originated from Mongolia and Russia (Irkutsk Region, Republic of Buryatia and Republic of Khakassia). The CNs were for the first time established in four species: *Astragalus arkalycensis* (2*n* = 16), *A. ionae* (2*n* = 96), *Oxytropis ammophila* (2*n* = 16), and *Poa tshuensis* (2*n* = 28). For the other species, previously known CNs have been confirmed.

Keywords: diploid, polyploid, cytotype, nemoral relict, legumes, bluegrass, vascular plants

РЕЗЮМЕ

Кривенко Д.А. (ред.), Барсукова И.Н., Чепинога В.В., Гнутиков А.А., Гудкова П.Д., Леонова Т.В., Мякошина Ю.А., Олонова М.В., Павличенко В.В., Протопопова М.В. Botanica Pacifica: числа хромосом растений 4. Представлены числа хромосом (2*n*) и уровень плоидности (n*x*), в соответствии с предполагаемым базовым числом хромосом (*x*), для 41 таксона сосудистых растений (включая 39 видов, 1 подвид и 1 гибрид) из 26 родов и 12 семейств Amaryllidaceae: *Allium*; Apiaceae: *Angelica* и *Pleurospermum*; Asteraceae: *Doronicum* и *Leucanthemum*; Cannabaceae: *Humulus*; Fabaceae: *Asrtagalus*, *Caragana*, *Hedysarum*, *Medicago*, *Melilotus*, *Onobrychis*, *Oxytropis*, *Thermopsis* и *Trifolium*; Lamiaceae: *Prunella*; Melanthiaceae: *Paris*; Primulaceae: *Primula*; Poaceae: *Brachypodium* и *Poa*; Ranunculaceae: *Aconitum*, *Anemonastrum*, *Anemone* и *Eranthis*; Rosaceae: *Sanguisorba*; Violaceae: *Viola*. Исследованные образцы – происхождением из Монголии и России (Иркутская область, Республика Бурятия и Республика Хакасия). Впервые числа хромосом определены у четырех видов: *Astragalus arkalycensis* (2*n* = 16), *A. ionae* (2*n* = 96), *Oxytropis ammophila* (2*n* = 16) и *Poa tshuensis* (2*n* = 28). Для других видов были подтверждены ранее известные числа хромосом.

Ключевые слова: диплоид, полиплоид, цитотип, неморальный реликт, бобовые, мятлик, сосудистые растения

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Some species from the Khamar-Daban Ridge (Southern Baikal Region, Russia)

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AMARYLLIDACEAE

Allium schoenoprasum L.; **2*n* = 2*x* = 16**, ***x* = 8**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, upper course of the Saybat River, tributary of the Khara-Murin River, 2 km SW from the peak of Osinovskii Golets Mt., wet meadow on a stream bank, 1606 m a.s.l., 51°24'24.4197"N 104°7'54.9602"E, 02.08.2018, V.V. Pavlichenko & M.V. Protopopova C1705. – The species of the temperate zone of the Holarctic. The previously documented CNs are 2*n* = 16

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and 32, with the latter occurring rarely (Agapova et al. 1990, Rice et al 2015). In Baikal Siberia, a CN of $2n = 16$ has been recorded exclusively (Chepinoga 2014). Variable ploidy.

APIACEAE

Angelica sylvestris L.; **$2n = 2x = 22$**, **$x = 11$**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, left bank of the Snezhnaya River, lower course, 8 km S of Lake Baikal, floodplain willow woodland, 517 m a.s.l., 51°24'34.9604"N 104°38'17.4601"E, 05.08.2018, V.V. Pavlichenko et al. C1718. – The native range includes the temperate Palearctic, excluding the Pacific region. The CNs of $2n = 22$ and 26 were previously documented (Cannon 1968, Gutierrez Bustillo 1981, Rice et al. 2015), although the latter looks occasional and ambiguous. In Siberia, only the CN of $2n = 22$ is known (Agapova et al. 1990, Chepinoga 2014). The CNs are variable.

Pleurospermum uralense Hoffm.; **$2n = 2x = 18$**, **$x = 9$**. Irkutsk Region, Slyudyanskii District, the Khamar-Daban Ridge, the left bank of the Snezhnaya River lower course, 8 km S of Lake Baikal, floodplain willow woodland, 517 m a.s.l., 51°24'34.9604"N 104°38'17.4601"E, 05.08.2018, V.V. Pavlichenko et al. C1717. – The native range covers the temperate zone of Eurasia, including northeastern Europe, Central, North, and Northeast Asia. The CNs of $2n = 18$ and 22 were previously documented (Krogulevich 1976, Agapova et al. 1990, Chepinoga 2014, etc.). The CN is variable.

ASTERACEAE

Doronicum altaicum Pall.; **$2n = 2x = 60$**, **$x = 30$**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, upper course of the Saybat River, tributary of the Khara-Murin River, 2 km SW from the peak of Osinovskii Golets Mt., wet meadow on a stream bank, 1606 m a.s.l., 51°24'24.4197"N 104°7'54.9602"E, 02.08.2018, V.V. Pavlichenko & M.V. Protopopova C1707. – The native range covers the Siberia, Central Asia and N China. The CNs of $2n = 30$ and 60 were previously documented (Stepanov 1994a, Antipova 1997, Chen & Nordenstam 2011, Chepinoga 2014). Variable ploidy.

Leucanthemum vulgare Lam.; **$2n = 4x = 36$**, **$x = 9$**, Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, left bank of the Snezhnaya River, lower course, 9 km S of Lake Baikal, surroundings of the Warm Lakes, floodplain mixed forest, 484 m a.s.l., 51°23'30.0272"N 104°39'26.5981"E, 06.08.2018, V.V. Pavlichenko C1727. – The native range includes the temperate Palearctic, excluding the Pacific region. The CNs of $2n = 18$ and 36 were previously documented (Krogulevich 1976). In Baikal Siberia, only the CN of $2n = 36$ was reported (Chepinoga 2014). It has been suggested that *L. vulgare* is diploid ($2x$), while the closely related *L. ircutianum* DC. exhibits tetraploidy (Scholz & Uhlemann 2001). This has led to the conclusion that populations from Baikal Siberia should be classified as belonging to the latter species (Chepinoga 2014). Variable ploidy.

CANNABACEAE

Humulus lupulus L.; **$2n = 2x = 20$**, **$x = 10$**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, left bank of the Snezhnaya River, lower course, 9 km S of Lake Baikal, surroundings of the Warm Lakes, floodplain mixed forest, 484 m a.s.l., 51°23'30.0272"N 104°39'26.5981"E, 06.08.2018, V.V. Pavlichenko C1731. – The native range primarily includes Europe, the Caucasus, North Africa, Central and Southwestern Asia, and Siberia. CNs of $2n = 20$, 30, and 40 was previously documented (Stepanov & Muratova 1995, Grabowska-Joachimiak 2006, Probatova 2009), with most sources indicating diploid forms. Other ploidy levels are rare (Rice et al. 2015). Variable ploidy. The first CN count from Irkutsk Region accession.

FABACEAE

Trifolium lupinaster L.; **$2n = 4x = 32$**, **$x = 8$**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, left bank of the Snezhnaya River, lower course, 9 km S of Lake Baikal, surroundings of the Warm Lakes, floodplain mixed forest, 484 m a.s.l., 51°23'30.0272"N 104°39'26.5981"E, 06.08.2018, V.V. Pavlichenko C1729. – Eurasian temperate species. The CNs of $2n = 16$, 32, and 48 were previously documented (Krogulevich 1978, Chepinoga 2014, Rice et al. 2015). Variable ploidy.

LAMIACEAE

Prunella vulgaris L.; **$2n = 2x = 28$**, **$x = 14$**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, left bank of the Snezhnaya River, lower course, 8 km S of Lake Baikal, floodplain willow woodland, 517 m a.s.l., 51°24'34.9604"N 104°38'17.4601"E, 05.08.2018, V.V. Pavlichenko et al. C1722. – The species of the temperate and subtropical zones of the Holarctic. The most commonly documented CN is $2n = 28$ (Smith 1981, Agapova et al. 1990, Chepinoga 2014). However, earlier studies reported a CN of $2n = 32$ (Rice et al. 2015), which appears to be less reliable. The CN can be considered constant.

MELANTHIACEAE

Paris quadrifolia L.; **$2n = 2x = 10$**, **$x = 5$**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, left bank of the Snezhnaya River, lower course, 9 km S of Lake Baikal, surroundings of the Warm Lakes, floodplain mixed forest, 484 m a.s.l., 51°23'30.0272"N 104°39'26.5981"E, 06.08.2018, V.V. Pavlichenko C1724. – The native range includes the temperate Palearctic, excluding the Pacific region. Multiple ploidy variants were documented, including $2n = 10$, 15, 20, 25, and 30 (Agapova et al. 1993, Chepinoga 2014, Rice et al. 2015). In Baikal Siberia, the CNs of $2n = 10$ and 15 appear to be prevalent. Variable ploidy.

POACEAE

Brachypodium sylvaticum (Huds.) P. Beauv.; **$2n = 2x = 18$**, **$x = 9$**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, left bank of the Snezhnaya River, lower course, 8 km S of Lake Baikal, floodplain willow woodland, 517 m a.s.l., 51°24'34.9604"N 104°38'17.4601"E, 05.08.2018, V.V. Pavlichenko et al. C1713. – The native range primarily encompasses Europe, the Caucasus, North Africa, and Central, Northeastern, Southeastern, and Southern Asia, as well as Siberia. In South Siberia, the species is regarded as a nemoral relict and is classified as vulnerable or endangered (Chepinoga et al. 2017, Enushchenko 2020). Most counts indicate a CN of $2n = 18$ (Agapova et al. 1993, Gnutikov et al. 2020a, 2021), however, other ambiguous CNs were also documented (Rice et al. 2015). The CN can be considered constant. The first CN count from South Siberia, the Khamar-Daban Ridge and Irkutsk Region accessions.

RANUNCULACEAE

Aconitum septentrionale Koelle; **$2n = 2x = 16$**, **$x = 8$**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, left bank of the Snezhnaya River, lower course, 9 km S of Lake Baikal, surroundings of the Warm Lakes, floodplain mixed forest, 484 m a.s.l., 51°23'30.0272"N 104°39'26.5981"E, 06.08.2018, V.V. Pavlichenko C1726. – The species' range extends across North Europe and North Asia, including N China. The numbers of studies reported a CN of $2n = 16$ (Rice et al. 2015), which encompasses the South Siberian part of its range (Agapova et al. 1993, Chepinoga 2014). The CN is constant.

Anemonastrum narcissiflorum (L.) Holub s.l.; **$2n = 2x = 14$**, **$x = 7$**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, upper course of the Saybat River, tributary of the Khara-Murin River, 2 km SW from the peak of Osinovskii Golets Mt., wet meadow on a stream bank, 1606 m a.s.l., 51°24'24.4197"N 104°7'54.9602"E, 02.08.2018, V.V. Pavlichenko & M.V. Protopopova C1709. – In a broad sense the species found in the temperate and partially subarctic zones of the Holarctic. In South Siberia, the *A. narcissiflorum* complex is represented by two predominantly montane, closely related, and difficult-to-distinguish taxa: *A. narcissiflorum* subsp. *sibiricum* (L.) Á. Löve et D. Löve (≡ *A. sibiricum* (L.) Holub) and *A. narcissiflorum* subsp. *crinitum* (Juz.) Raus (≡ *A. crinitum* (Juz.) Holub). Some sources indicate that *A. narcissiflorum* subsp. *crinitum* is regarded as the easternmost of the Eurasian subtaxa of *A. narcissiflorum* (Raus 2011), thereby encompassing *A. narcissiflorum* subsp. *sibiricum* as well. We define the

current CN as specifically belonging to *A. narcissiflorum* subsp. *sibiricum*. Our findings align with numerous other studies that document the CN as $2n = 14$ (Chepinoga 2014, Gnutikov et al. 2020b). The CNs of $2n = 16$, 28 were also reported with $2n = 28$ documented only once (Agapova et al. 1993, Rice et al. 2015). Given the basic number of $x = 7$, the CN of $2n = 16$ appears to be unreliable. The CN can be considered constant.

ROSACEAE

Sanguisorba alpina Bunge; **$2n = 4x = 28$**, **$x = 7$**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, upper course of the Saybat River, tributary of the Khara-Murin River, 2 km SW from the peak of Osinovskii Golets Mt., wet meadow on a stream bank, 1606 m a.s.l., 51°24'24.4197"N 104°7'54.9602"E, 02.08.2018, V.V. Pavlichenko & M.V. Protopopova C1710. – The predominantly mountainous species of South Siberia, Central Asia, and N China, in the Irkutsk Region it is classified as vulnerable (Baritskaya & Chepinoga 2020). Our findings align with previous chromosome counts of $2n = 28$ (Sokolovskaya & Strelkova 1948, Zhukova 1967, Rice et al. 2015). The CN is constant. The first CN count from the Khamar-Daban Ridge and Irkutsk Region accession.

VIOLACEAE

Viola mauritii Tepl.; **$2n = 4x = 20$**, **$x = 5$**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, left bank of the Snezhnaya River, lower course, 8 km S of Lake Baikal, floodplain willow woodland, 517 m a.s.l., 51°24'34.9604"N 104°38'17.4601"E, 05.08.2018, V.V. Pavlichenko et al. C1716. – The species' range extends across East Europe and North Asia, including Mongolia. The previously reported CNs are $2n = 12$, ca. 16, 18 and 20 (Agapova et al. 1993, Chepinoga 2014, Elisafenko & Yakk 2023). The most reliable CN is $2n = 20$ (Espeut 2020).

Fabaceae from the Republic of Khakassia, Russia

Tatiana V. Leonova, Irina N. Barsukova & Denis A. Krivenko

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Vouchers are in the IRK.

FABACEAE

Astragalus arkalycensis Bunge; **$2n = 2x = 16$**, **$x = 8$**. Altaisky District, right bank of the Abakan River, 4 km W of Izykhskie Kopi settlement, forb-sagebrush-grass small-turf steppe, 282 m a.s.l., 53°32'17.34"N 91°12'26.76"E, 02.07.2023, T.V. Leonova 75156 (Fig. 1a); Shirinsky District, near Belyo Lake, slope of Chalpan Mt., 458 m a.s.l., 54°42'08.1"N 90°09'27.0"E, 04.08.2023, T.V. Leonova 75227; ib., 04.08.2023, id. 75229 (Fig. 1b); Ust-Abakansky District, right bank of the Abakan River, NW of Tigei settlement, forb-grass small-turf steppe, 349 m a.s.l., 53°36'24.42"N 91°06'54.90"E, 19.06.2023, T.V. Leonova 75157. – Mountain-steppe, mainly Central Asian species. The CN is documented for the first time in this study.

Astragalus ionae Palib. ex Gontsch. et Popov; **$2n = 12x = 96$**, **$x = 8$**. Shirinsky District, shore of Belyo Lake, 398 m a.s.l., 54°41'11.5"N 90°07'42.6"E, 04.08.2023, T.V. Leonova 75194 (IRK00026034). – Endemic of steppes adjacent to the Yenisei River. The CN is documented for the first time in this study.

Astragalus laxmannii Jacq.; **$2n = 4x = 32$**, **$x = 8$**. Tashtypsky District, vicinity of Tashtyp village, birch forest, 535 m a.s.l., 52°48'01.32"N 89°51'26.76"E, 20.07.2023, T.V. Leonova 75222; ib., 20.07.2023, id. 75223 (Fig. 1c); Ust-Abakansky District, 24 km E of Sorsk town, Kuten-Buluk tract, birch forest, 719 m a.s.l., 54°59'35.88"N 90°37'04.74"E, 22.08.2023, T.V. Leonova 75221 (Fig. 1d). – A very polymorphic steppe and edge-forest species. In Siberia and East Asia it is represented by the type subspecies *A. laxmannii* subsp. *laxmannii* (= *A. adsurgens* Pall., *A. austrosibiricus* Schischk., *A. inopinatus* Boriss., etc.), the other two subspecies are found in North America (Podlech & Zarre 2013). Two CNs $2n = 16$ and 32 are given for its synonymous names (Chepinoga 2014, Rise et al. 2015). Variable ploidy.

Astragalus mongholicus Bunge; **$2n = 2x = 16$**, **$x = 8$**. Ust-Abakansky District, 24 km E of Sorsk town, Kuten-Buluk tract, birch forest, 719 m a.s.l., 54°59'35.88"N 90°37'04.74"E, 22.08.2023, T.V. Leonova 75200 (Fig. 1e). – North and Central Asian forest-steppe species. The diploid ($2x$) CN in this species, including its taxonomic synonyms *A. membranaceus* Fisch. ex Bunge and *A. propinquus* Schischk., as well as in general in species *Astragalus* L. of the section *Cenantrum* Bunge, is constant (Podlech & Zarre 2013, Rice et al. 2015).

Astragalus testiculatus Pall.; **$2n = 2x = 16$**, **$x = 8$**. Ust-Abakansky District, 24 km E of Sorsk town, Kuten-Buluk tract, birch forest, 719 m a.s.l., 54°59'35.88"N 90°37'04.74"E, 22.08.2023, T.V. Leonova 75199. – Steppe species, distributed in Eastern Europe (Russia and Ukraine), the Russian Caucasus, Southern Siberia, Central Asia (Kazakhstan, Tajikistan, Turkmenistan and NW China) and Western Asia (NE Iran). Two CNs $2n = 2x = 16$ and $2n = 8x = 64$ are known for it, both obtained on material from the South-Eastern Altai (Plennik & Rostovtseva 1977, Krivenko et al. 2021). Further studies are needed. Probably, the octoploid ($8x$) cytotype represents a separate cryptic species.

Caragana pygmaea (L.) DC.; **$2n = 4x = 32$**, **$x = 8$**. Askizsky District, left bank of the Teya River, left tributary of the Abakan River, 4 km NNE of Lyrsy village, sagebrush-sedge meadow steppe, 620 m a.s.l., 53°00'31.74"N 89°52'20.82"E, 15.08.2023, T.V. Leonova 75158; ib., 15.08.2023, id. 75159; Ust-Abakansky District, left bank of the Enisei River, vicinity of Mokhov village, forb-grass coarse-turf steppe, 299 m a.s.l., 53°54'09.06"N 91°24'05.34"E, 27.08.2023, T.V. Leonova 75160; ib., 27.08.2023, id. 75161. – Polymorphic mountain-steppe species of Southern Siberia and adjacent areas of China and Mongolia. Most sources indicate a diploid ($2x$) cytotype for it (Rice et al. 2015). It is only recently that a tetraploid ($4x$) cytotype has recently been identified in Mongolia (An'kova et al. 2019). Further research is needed, as well as the use of molecular genetic methods.

Hedysarum gmelinii Ledeb.; **$2n = 4x = 32$**, **$x = 8$**. Shirinsky District, shore of Belyo Lake, real meadow, 435 m a.s.l., 54°42'02.04"N 90°10'11.88"E, 27.08.2023, T.V. Leonova 75192; ib., 27.08.2023, id. 75214 (Fig. 1f). – Eastern European, Siberian and Central Asian, mainly steppe species, sometimes entering forest and mountain belts. Morphologically polymorphic, varies in the degree of stems expression, the number of pairs of leaflets, the nature of their pubescence, as well as the corolla color. Two polyploid series ($2x$, $4x$ and $6x$) are known for *H. gmelinii*, at different x, at $x = 7$: 14, 28, 56 and $x = 8$: 16, 32, 48 (Yan et al. 1989, Agapova et al. 1993, Philippov et al. 2009, Cherkasova 2009, Chepinoga 2014, Rise et al. 2015, Yurkevich et al. 2022). Special systematic studies are required, as it is quite obvious that at present *H. gmelinii* is an aggregate species.

Medicago × varia Martyn.; **$2n = 4x = 32$**, **$x = 8$**. Beisky District, vicinity of Smirnovka village, Smirnovsky Bor Nature Monument, 420 m a.s.l., 53°22'26.10"N 91°23'35.88"E, 19.08.2023, T.V. Leonova 75205; ib., 19.08.2023, id. 75207 (Fig. 1g); Shirinsky District, shore of Belyo Lake, real meadow, 435 m a.s.l., 54°42'02.04"N 90°10'11.88"E, 27.08.2023, T.V. Leonova 75209; Ust-Abakansky District, 24 km E of Sorsk town, Kuten-Buluk tract, birch forest, 719 m a.s.l., 54°59'35.88"N 90°37'04.74"E, 22.08.2023, T.V. Leonova 75210; ib., 22.08.2023, id. 75211 (Fig. 1h). – This hybrid is cultivated in the North Temperate Zone, where it often runs wild and spreads through disturbed habitats. *Medicago × varia* is an amphiploid hybrid. Its progenitors are diploid species ($2x$) of the section *Falcago* Rchb.: *M. falcata* L. and *M. sativa* L. (Lesins & Lesins 1964, 1979).

Melilotus albus Medik.; **$2n = 2x = 16$**, **$x = 8$**. Beisky District, right bank of the Abakan River, 4 km N of Kirba village, 503 m a.s.l., 53°19'13.02"N 91°13'17.16"E, 19.08.2023, T.V. Leonova 75191 (Fig. 1i). – An almost cosmopolitan species, it is found in steppes, meadows, forest edges, fallow lands and roadsides. The CN is constant (Rice et al. 2015).

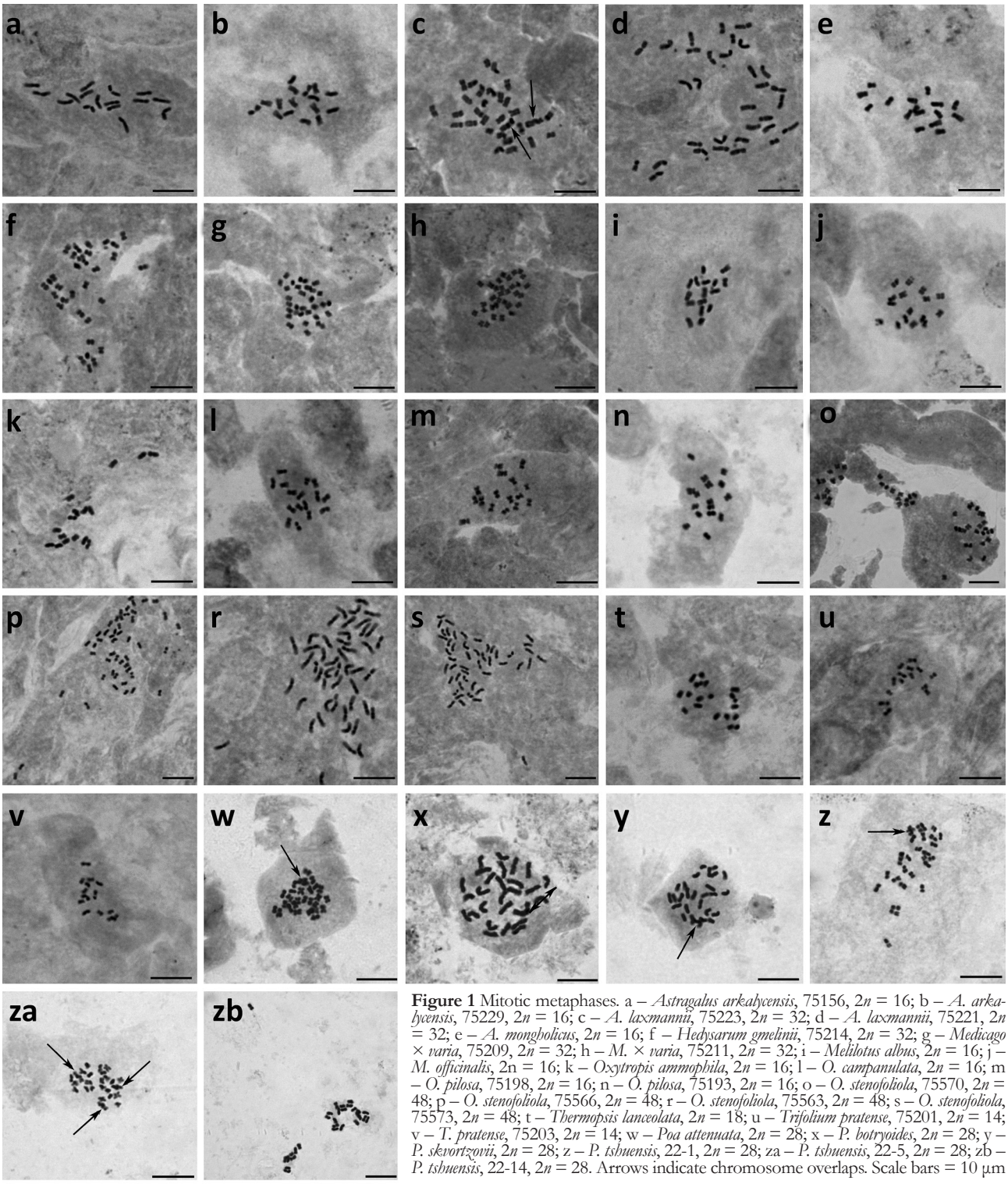

Figure 1 Mitotic metaphases. a – *Astragalus arkalycensis*, 75156, 2*n* = 16; b – *A. arkalycensis*, 75229, 2*n* = 16; c – *A. laxmannii*, 75223, 2*n* = 32; d – *A. laxmannii*, 75221, 2*n* = 32; e – *A. mongholicus*, 2*n* = 16; f – *Hedysarum gmelinii*, 75214, 2*n* = 32; g – *Medicago* × *varia*, 75209, 2*n* = 32; h – *M.* × *varia*, 75211, 2*n* = 32; i – *Melilotus albus*, 2*n* = 16; j – *M. officinalis*, 2n = 16; k – *Oxytropis ammophila*, 2*n* = 16; l – *O. campanulata*, 2*n* = 16; m – *O. pilosa*, 75198, 2*n* = 16; n – *O. pilosa*, 75193, 2*n* = 16; o – *O. stenofoliola*, 75570, 2*n* = 48; p – *O. stenofoliola*, 75566, 2*n* = 48; r – *O. stenofoliola*, 75563, 2*n* = 48; s – *O. stenofoliola*, 75573, 2*n* = 48; t – *Thermopsis lanceolata*, 2*n* = 18; u – *Trifolium pratense*, 75201, 2*n* = 14; v – *T. pratense*, 75203, 2*n* = 14; w – *Poa attenuata*, 2*n* = 28; x – *P. botryoides*, 2*n* = 28; y – *P. skvortzovii*, 2*n* = 28; z – *P. tshuensis*, 22-1, 2*n* = 28; za – *P. tshuensis*, 22-5, 2*n* = 28; zb – *P. tshuensis*, 22-14, 2*n* = 28. Arrows indicate chromosome overlaps. Scale bars = 10 μm

Melilotus officinalis (L.) Lam.; **2*n* = 2*x* = 16, *x* = 8**. Shirinsky District, shore of Belyo Lake, real meadow, 435 m a.s.l., 54°42'02.04"N 90°10'11.88"E, 27.08.2023, T.V. Leonova 75208 (Fig. 1j). – Almost cosmopolitan species, it is found in steppes, meadows, along the banks of water bodies, as part of segetal vegetation and roadsides. The CN is constant (Rice et al. 2015).

Onobrychis arenaria (Kit.) DC.; **2*n* = 2*x* = 16, *x* = 8**. Shirinsky District, shore of Belyo Lake, real meadow, 435 m a.s.l., 54°42'02.04"N 90°10'11.88"E, 27.08.2023, T.V. Leonova 75208 (Fig. 1j). – Almost cosmopolitan species, it is found in steppes, meadows, along the banks of water bodies, as part of segetal vegetation and roadsides. The CN is constant (Rice et al. 2015).

Oxytropis ammophila Turcz.; **2*n* = 2*x* = 16, *x* = 8**. Ust-Abakansky District, 24 km E of Sorsk town, Kuten-Buluk tract, birch forest, 719 m a.s.l., 54°59'35.88"N 90°37'04.74"E, 22.08.2023, T.V. Leonova 75212 (Fig. 1k). – Endemic of steppes adjacent to the Yenisei River. The CN is documented for the first time in this study.

Oxytropis campanulata Vassilcz.; **2*n* = 2*x* = 16, *x* = 8**. Tashtypsky District, vicinity of Tashtyp village, birch forest, 535 m a.s.l., 52°48'01.32"N 89°51'26.76"E, 20.07.2023,

T.V. Leonova 75224 (Fig. 1l). – Endemic to the meadow-steppes and pine or birch forests of the Altai-Sayan mountain country. Species with variable ploidy of 2*x* and 4*x* (Rise et al. 2015).

Oxytropis pilosa (L.) DC.; **2*n* = 2*x* = 16**, ***x* = 8**. Beisky District, right bank of the Abakan River, 4 km N of Kirba village, 503 m a.s.l., 53°19'13.02"N 91°13'17.16"E, 19.08.2023, T.V. Leonova 75198 (Fig. 1m); Shirinsky District, shore of Belyo Lake, real meadow, 435 m a.s.l., 54°42'02.04"N 90°10'11.88"E, 27.08.2023, T.V. Leonova 75193 (Fig. 1n). – Meadow-steppe species, distributed in Europe, the Caucasus, Western Asia (NW Iran) and southern Siberia. The CN is constant (Rice et al. 2015).

Oxytropis reverdattoi Jurtzev; **2*n* = 2*x* = 16**, ***x* = 8**. Altaisky District, right bank of the Abakan River, 4 km W of Izykhskie Kopi settlement, forb-grass small-turf steppe, 296 m a.s.l., 53°32'20.64"N 91°12'43.08"E, 12.07.2023, T.V. Leonova 75190. – Endemic of steppes adjacent to the Yenisei River. The previously known CN for this species is confirmed (Polozhij 1994).

Oxytropis stenofoliola Polozhij; **2*n* = 6*x* = 48**, ***x* = 8**. Altaisky District, right bank of the Abakan River, W of Izykhskie Kopi settlement, forb-feather grass-sedge small-turf steppe, 328 m a.s.l., 53°32'58.5"N 91°15'06.2"E, 01.07.2023, T.V. Leonova 74567; ib., 01.07.2023, id. 74568; ib., 01.07.2023, id. 74569; ib., 01.07.2023, id. 74570 (Fig. 1o); Altaisky District, right bank of the Abakan River, 3 km W of Izykhskie Kopi settlement, forb-feather grass-sedge small-turf steppe, 330 m a.s.l., 53°32'32.2"N 91°13'15.6"E, 02.07.2023, T.V. Leonova 74564; ib., 02.07.2023, id. 74565; ib., 02.07.2023, id. 74566 (Fig. 1p); Altaisky District, right bank of the Abakan River, 4 km WSW of Izykhskie Kopi settlement, forb-feather grass-sedge coarse-turf steppe, 308 m a.s.l., 53°32'12.5"N 91°12'26.2"E, 02.07.2023, T.V. Leonova 74563 (Fig. 1r); Ust-Abakansky District, between Krasnoe Lake and Tigei settlement, forb-grass small-turf steppe, 349 m a.s.l., 53°36'24.4"N 91°06'54.9"E, 02.07.2023, T.V. Leonova 74571; ib., 02.07.2023, id. 74572; ib., 02.07.2023, id. 74573 (Fig. 1s). – Endemic of steppes adjacent to the Yenisei River. The species is related to *O. intermedia* Bunge – endemic of the Altai-Sayan mountain country and *O. nuda* Basil. – endemic of steppes adjacent to the Yenisei River (sect. *Xerobia* Bunge). They are difficult to differentiate from each other: in *O. intermedia* and *O. stenofoliola* the rachis and peduncles are appressed-hairy and erect-hairy, while in *O. nuda* they are bare or with rare hairs, or the peduncles are hairy only in the upper part; in *O. intermedia* the calyx teeth are 2 times shorter than its tube, in *O. nuda* – 4–5 times, and in *O. stenofoliola* – 3 times; in *O. intermedia* the keel beak is 2–3 mm, in *O. nuda* – ca. 2.5 mm, and in *O. stenofoliola* – ca. 2 mm (Polozhij 1994). The results of the present study on a large factual material confirmed that *O. stenofoliola* is a hexaploid (An'kova et al. 2013). At the same time, *O. intermedia* is variable ploidy: 2*x* from the Republic of Tuva (Probatova et al. 2011) and 4*x* from the Republic of Altai (Plennik & Rostovtseva 1977), while *O. nuda* is a constant 2*x* (Plennik & Rostovtseva 1977, Probatova et al. 2016).

Thermopsis lanceolata R. Br.; **2*n* = 2*x* = 18**, ***x* = 9**. Beisky District, right bank of the Abakan River, 4 km N of Kirba village, 503 m a.s.l., 53°19'13.02"N 91°13'17.16"E, 19.08.2023, T.V. Leonova 75197 (Fig. 1t). – Steppe species, most of its range is in Southern Siberia and adjacent areas of China, Kazakhstan and Mongolia. The CN is constant (Rice et al. 2015).

Trifolium pratense L.; **2*n* = 2*x* = 14**, ***x* = 7**. Beisky District, right bank of the Abakan River, 4 km N of Kirba village, 503 m a.s.l., 53°19'13.02"N 91°13'17.16"E, 19.08.2023, T.V. Leonova 75201 (Fig. 1u); Ust-Abakansky District, 24 km E of Sorsk town, Kuten-Buluk tract, birch forest, 719 m a.s.l., 54°59'35.88"N 90°37'04.74"E, 22.08.2023, T.V. Leonova 75202; ib., 22.08.2023, id. 75203 (Fig. 1v). – Meadow and forest-edge species, often found in disturbed habitats, almost cosmopolitan. The vast majority of literature cites the same CN (Rise et al. 2015).

Some alpine *Poa* (Poaceae) from the Mongolian Altai

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Vouchers are in the ALTB & TK.

The Altai mountain system is situated in four countries: China, Kazakhstan, Mongolia, and Russia. Mongolian part to be the lest investigated in botanical respect. Nevertheless, this area is known to be very interesting, because as noted by Kamelin (2010), the Mongol-Tuva province of the Steppe subregion is distinguished by its high diversity and originality, both on species and intraspecific level. So the study of its species is of great interest. Our studies of the chromosome numbers of a number of xeromorphic *Poa* L. of the section *Stenopoa* Dumort. is a part of the work to study the taxonomy of this difficult group.

POACEAE

Poa albertii Regel; **2*n* = 5*x* = ca. 36**, ***x* = 7**. Khovd Province, 70 km to SW of Tugreg village, 47.060278°N 91.785833°E, 30.07.2022, P.A. Gudkova et al. 22-30.

Poa attenuata Trin.; **2*n* = 4*x* = 28**, ***x* = 7**. Khovd Province, 70 km to SW of Tugreg village, 47.060278°N 91.785833°E, 30.07.2022, P.A. Gudkova et al. 22-3 (Fig. 1w).

Poa botryoides (Trin. ex Griseb.) Kom.; **2*n* = 4*x* = 28**, ***x* = 7**. Uvs Province, 10 km N of Khokhtolgoy village, 49.368417°N 90.828167°E, 05.08.2022, P.A. Gudkova et al. 22-10 (Fig. 1x).

Poa skvortzovii Prob.; **2*n* = 4*x* = 28**, ***x* = 7**. Uvs Province, 10 km N of Khokhtolgoy village, 49.368417°N 90.828167°E, 05.08.2022, P.A. Gudkova et al. 22-7 (Fig. 1y).

Poa tshuensis (Serg.) Olonova; **2*n* = 4*x* = 28**, ***x* = 7**. Bayan-Ölgii Province, N shore of Tolbo Lake, 48.61175°N 89.99336°E, 28.07.2022, P.A. Gudkova et al. 22-1 (Fig. 1z); Khovd Province, 70 km SW of Tugreg village, 47.060278°N 91.785833°E, 30.07.2022, P.A. Gudkova et al. 22-5 (Fig. 1za); Khovd Province, 80 km SE of Tugreg village, 47.043806°N 91.772917°E, 30.07.2022, P.A. Gudkova et al. 22-14 (Fig. 1zb).

Analyzing the CNs of the section *Stenopoa* species, Probatova (2007) pointed out that the majority of species of the section, being variable in morphological respect, are usually tetraploids (4*x*) and hexaploids (6*x*). Thus, for *P. alberti* from the Pamirs were indicated 2*n* = 32 and 36 (Olonova et al. 2021), for *P. attenuata* Siberia and Mongolia – 2*n* = 28 (Murín et al. 1984, Tsvelev & Probatova 2019), for *P. botryoides* from Siberia and the Far East – 2*n* = 28, 35, 42 and 56 (Tsvelev & Probatova 2019), for *P. skvortzovii* from the Far East – 2*n* = 28, ca. 35, 42 and 56 (Tsvelev & Probatova 2019). Information on the Mongolian populations of these species, except for *P. attenuata*, as well as also data on *P. tshuensis* could not be found.

Our studies did not reveal a difference in chromosome numbers between *P. attenuata*, *P. botryoides*, *P. skvortzovii*, and *P. tshuensis*; all of them turned out to be tetraploid, but they differ quite satisfactorily in morphological characters (Table 1).

Nemoral relict taxa from Baikal Siberia (Russia)

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Vouchers are in the IRKU.

PRIMULACEAE

Primula elatior* subsp. *pallasii (Lehm.) W.W. Sm. et Forrest (≡ *P. pallasii* Lehm.); **2*n* = 2*x* = 22**, ***x* = 11**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, upper course of the Saybat River, tributary of the Khara-Murin River, 2 km SW from the peak of Osinovsky Golets Mt., subalpine meadow, 1579 m a.s.l., 51°24'22.0617"N 104°8'7.1498"E, 02.08.2018, V.V. Pavlichenko & M.V. Pro-

Table 1. Morphological characters of studied *Poa* spp.

Species	Voucher	Node	Rachilla	Callus	Surface of lemma between veins	Ligule length, mm
P. albertii	22-30	near the base	glabrous	glabrous	pilulose	2.00
P. attenuata	22-3	near the base	glabrous	glabrous	glabrous	1.60
P. botryoides	22-10	lower 1/3	glabrous	with tuft of hairs	glabrous	2.00
P. skvortzovii	22-7	lower 1/3	rare hairs	with tuft of hairs	glabrous	0.95
P. tshuensis	22-1	near the base	glabrous	glabrous	pilulose	1.60–2.00
P. tshuensis	22-5	near the base	glabrous	glabrous	pilulose	2.00
P. tshuensis	22-14	near the base	glabrous	with tuft of hairs	pilulose	2.00

topopova C1712. – The species with disjunctive range, including East Europe, the Caucasus, Anatolia, Central Asia, and Siberia. In South Siberia the species is considered as a nemoral relict (Chepinoga et al. 2017). From Baikal Siberia (the Khamar-Daban Ridge) four counts confirmed $2n = 22$ were documented (Rice et al. 2015, Gnutikov et al. 2016, 2017, 2018). The CN is constant.

RANUNCULACEAE

Anemonastrum baicalense (Turcz.) Mosyakin (≡ *Anemone baicalensis* Turcz.); **$2n = 4x = 28$, $x = 7$**. Republic of Buryatia, Kabansky District, Khamar-Daban Ridge, right bank of the Mishiha River, lower course, 461 m a.s.l., 51°38'43.9016"N 105°32'32.6809"E, 01.06.2022, M.V. Protopopova et al. G013 (IRKU094260). – The South Siberian endemic and nemoral relict (Chepinoga et al. 2017). In a broad sense, it encompasses some closely related Northeast Asian taxa, including *Anemone baikalensis* subsp. *glabrata* (Maxim.) Kitag. (≡ *A. baicalensis* var. *glabrata* Maxim., *Anemonastrum glabratum* (Maxim.) Chepinoga) and *Anemone baikalensis* subsp. *rossii* (S. Moore) Starod. (≡ *A. baicalensis* var. *rossii* (S. Moore) Kitag., *Anemonastrum rossii* (S. Moore) Chepinoga) among others. Within the South Siberian range, the CN is consistently $2n = 28$ (Agapova 1993, Stepanov 1994b, Chepinoga et al. 2012, Gnutikov et al. 2016, 2017, 2018, 2020b). For Northeast Asian races of Anemone baicalensis, the most common CN is $2n = 2x = 14$ (*A. baicalensis* subsp. *glabrata* and *A. baikalensis* subsp. *rossii*) while $2n = 3x = 21$ (*A. baikalensis* subsp. *rossii*) is observed less frequently (Starodubtsev 1983). The CN in Siberia remains constant.

Anemone altaica Fisch. ex C.A. Mey.; **$2n = 4x = 32$, $x = 8$**. Irkutsk Region, Slyudyansky District, the Khamar-Daban Ridge, the right bank of the Utulik River, lower course, 472 m a.s.l., 51°32'28.1769"N 104°2'49.5326"E, 05.06.2021, M.V. Protopopova & V.V. Pavlichenko G006 (IRKU094249); the Republic of Buryatia, Kabansky District, the Khamar-Daban Ridge, the left bank of the Elovka River, lower course, birch-aspen forest, 519 m a.s.l., 51°58'30.5551"N 106°30'16.9717"E, 31.05.2022, M.V. Protopopova et al. G011 (IRKU094252). – The species pertains to the tertiary boreo-nemoral vegetation complex and exhibits a disjunctive distribution, stretching from the Arctic regions of European Russia to Central China. It is sometimes regarded as an infraspecific taxon of European *A. nemorosa* L., and has close related and vicariant taxa in East Asia and North America, such as *A. amurensis* (Korsh.) Kom. and *A. quinquefolia* L. While the dominant CN is $2n = 4x = 32$, $2n = 4x = 16$ was also documented (Bolkhovskikh et al. 1969). In Baikal Siberia (the Khamar-Daban Ridge) all known counts correspond to $2n = 4x = 32$ (Gnutikov et al. 2016). Variable ploidy.

Eranthis sibirica DC. s.l. (incl. *E. tanhoensis* Erst); **$2n = 2x = 14$, $x = 7$**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, upper course of the Saybat River, tributary of the Khara-Murin River, 2 km SW from the peak of Osinovskii Golets Mt., wet meadow on a stream bank, 1606 m a.s.l., 51°24'24.4197"N 104°7'54.9602"E, 02.08.2018, V.V Pavlichenko & M.V. Protopopova C1706; Republic of Buryatia, Kabansky District, Khamar-Daban Ridge, right bank of the Bol'shoi Mamai River, lower course, 542 m a.s.l., 51°25'49.8008"N 104°48'11.8885"E, 02.06.2022, M.V. Protopopova et al. G014 (IRKU085079).

—— **$2n = 4x = 28$, $x = 7$**. Irkutsk Region, Shelekhovsky District, East Sayan Mts. foothills, around Shamanka village, Kuitun River, mouth, 459 m a.s.l., 52°3'39.1904"N 103°46'56.4147"E, 23.05.2022, M.V. Protopopova et al. G007.2 (IRKU085086); Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, Burovshchina River, lower course, 472 m a.s.l., 51°37'5.8809"N 103°49'16.3646"E, 30.05.2022, V.V. Pavlichenko & M.V. Protopopova G008.6; ib., 30.05.2022, iid. G008.8; Republic of Buryatia, Tunkinsky District, East Sayan Mts., Tunkinskie Goltsy Ridge, Kyngyrga River, upper course, 1390 m a.s.l., 51°58'34.9653"N 102°24'24.2944"E, 25.05.2019, M.V. Protopopova et al. C1733; ib., 25.05.2019, iid. C1734 (IRKU045872).

—— **$2n = 6x = 42$, $x = 7$**. Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, Burovshchina River, lower course, 472 m a.s.l., 51°37'5.8809"N 103°49'16.3646"E, 30.05.2022, V.V. Pavlichenko & M.V. Protopopova G008.2; ib., 30.05.2022, iid. G008.3; ib., 30.05.2022, iid. G008.5; Irkutsk Region, Slyudyansky District, Khamar-Daban Ridge, Utulik River, 453 m a.s.l., 51°32'45.3849"N 104°2'48.3086"E, 30.05.2022, M.V. Protopopova & V.V. Pavlichenko G009 (IRKU085080).

The species with South Siberian range, *E. sibirica* can be considered a species complex consisting of *E. sibirica* s.str. and *E. tanhoensis* Erst. Erst et al. (2020) proposed that the range of *E. sibirica* includes the western part of the Khamar-Daban Ridge, East Sayan, West Sayan, and Tannu-Ola Ridge, while *E. tanhoensis* is restricted to a narrow area in the central part of the Khamar-Daban Ridge. This division of the range between these closely related taxa was largely based on extrapolated phenotypic data. Our recent molecular data (Protopopova & Pavlichenko 2022) indicate that populations from the East Sayan and Tannu-Ola Ridge are more closely related to *E. tanhoensis* s.str. than to *E. sibirica* s.str. Additionally, populations from the West Sayan are distinct from both *E. tanhoensis* and *E. sibirica*. Consequently, *E. tanhoensis*, as defined by Erst et al. (2020), is nested within the clade of *E. sibirica*. Based on the currently accepted principles of monophyly in systematics and the polytypic species concept, we apply here a single-species model for South Siberian *Eranthis* Salisb. The CNs of $2n = 14$, 16, 28, 32, and 42 were previously documented for *E. sibirica* s.l. (Krogulevich 1976, Gnutikov et al. 2016, 2017, Erst et al. 2020, Mitrenina et al. 2021). The known basic chromosome number for other *Eranthis* species is $x = 8$. In this context, *E. sibirica* s.l. may be the only member of the genus with a base number of $x = 7$ (Mitrenina et al. 2021). The discrepancy between the reported CN of $2n = 14$ (Erst et al. 2020) and our previous findings of $2n = 16$ (Gnutikov et al. 2016, 2017) can be attributed to the inclusion of B chromosomes in the latter counts. The CN of $2n = 32$ was documented only once from the Tunkinskie Goltsy Ridge area (Krogulevich 1976), and our current findings from this region differ ($2n = 28$). Variable ploidy. A new CN ($2n = 28$) for the Tunkinsky District of the Republic of Buryatia accession.

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