

Notes on the family Brassicaceae in China

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Abstract A critical revision of the collections of Brassicaceae in some Chinese (PE, XJA, XJBI, XJFA, XJNM, XJU) and foreign (LE, P) herbaria is made. One genus, *Neurotropis* (DC.) F. K. Mey., and 11 species, *Alyssum szarabiacum* Nyár., *Barbarea stricta* Andrz., *Erysimum czernjajevii* N. Busch, *Erysimum kotuchovii* D. German, *Erysimum mongolicum* D. German, *Lepidium karelinianum* Al-Shehbaz, *Matthiola superba* Conti, *Neurotropis platycarpa* (Fisch. & Mey.) F. K. Mey., *Ptilotrichum dahuricum* Peschkova, *Sisymbrium subspinescens* Bunge, and *Smelowskia micrantha* (Botsch. & Vved.) Al-Shehbaz & S. I. Warwick, are reported from China for the first time. Six species, *Aphragmus involucratus* (Bunge) O. E. Schulz, *Dontostemon perennis* C. A. Mey., *Goldbachia torulosa* DC., *Lepidium amplexicaule* Willd., *Neotorularia brevipes* (Kar. & Kir.) Hedge & J. Léonard, and *Parrya stenocarpa* Kar. & Kir., are confirmed to occur in China. Five species, *Dontostemon integrifolius* (L.) C. A. Mey., *Draba zangbeiensis* L. L. Lou, *Lepidium alashanicum* H. L. Yang, *Sinapis arvensis* L., and *Strigosella brevipes* (Bunge) Botsch., are reported as novelties for some provinces in China, and *Strigosella hispida* (Litv.) Botsch. occurs in Xinjiang, China. However, the occurrence of one genus, *Pseudoarabidopsis* Al-Shehbaz, O’Kane & Price, and four species, *Draba huetii* Boiss., *Eutrema halophilum* (C. A. Mey.) Al-Shehbaz & S. I. Warwick, *Galitzkyia spathulata* (Steph. ex Willd.) V. Bocz., and *Pseudoarabidopsis toxophylla* (Bieb.) Al-Shehbaz, O’Kane & Price, could not be confirmed in China. The occurrence of six species, *Aphragmus bouffordii* Al-Shehbaz, *Barbarea orthoceras* Ledeb., *Lepidium latifolium* L., *Ptilotrichum canescens* (DC.) C. A. Mey., *Strigosella hispida* (Litv.) Botsch., and *Strigosella scorpioides* (Bunge) Botsch., is not confirmed in certain provinces of China. All names follow the latest taxonomic treatment for relevant groups; detailed morphological descriptions of the newly recorded taxa are provided; and distinguishing characters from related species already known in China are discussed. Other comments are provided where needed.

Key words Brassicaceae, China, Cruciferae, distribution, new record.

While carrying out the programs “Joint investigation of Altay flora” (2004–2006) and “Investigation of diversity and geography of plants in mountains of northwest China” (2007), several Russian/Chinese expeditions in northwestern Xinjiang were organized. The treatment of the collected material revealed some floristic novelties, including three genera and approximately 20 species of vascular plants found in China for the first time (German et al., 2006; unpublished data, 2009). An additional focus of our work was the taxonomy, diversity and geography of Chinese Brassicaceae. For this purpose, the collections of some Chinese (PE, XJA, XJBI, XJFA, XJNM, XJU) and foreign (LE, P) herbaria of the family Brassicaceae were critically revised. Taxonomical novelties resulting from this revision are given elsewhere (German, 2008b) and floristic results are reported in the present paper. Among them, one genus and 11 species are recorded from China for the first time and

six species are confirmed as occurring in China. However, the occurrence of one genus and four species in China is not confirmed. The distribution of another 11 species (presence or absence in some provinces) is updated.

1 Newly recorded genus

Neurotropis (DC.) F. K. Mey. in Feddes Repert. 84(5–6): 452. 1973. — *Thlaspi* L. sect. *Neurotropis* DC. in Reg. Veg. Syst. Nat. 2: 377. 1821. Lectotype species: *N. orbiculata* (Steven ex DC.) F. K. Mey. (Meyer, l.c.: 452).

脉翼芥属 新拟

Annuals, glabrous throughout, glaucous. Stems erect, usually branched. Leaves entire; basal ones rosulate, shortly petiolate, ovate to suborbicular, soon withering. Cauline leaves sessile, ovate-cordate or oblong, base cordate-amplexicaul, apex obtuse. Fruiting pedicels stout, divaricate, usually straight. Flowers minute, white. Fruit a few seeded silicle, broadly obcordate to suborbicular, apex deeply emarginate, broadly

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winged throughout, wing prominently veined; style obsolete. Seeds ovoid, smooth, not margined.

Meyer (1973) separated *Neurotropis* and 10 other genera from *Thlaspi* L. s.l., but his treatment was not accepted by most authors when they treated *Thlaspi* s.l. for various Eurasian "Floras" (Koch & Mummenhoff, 2001). Recently some of Meyer's genera, including *Neurotropis*, have been supported by extensive molecular studies (summarized in Koch & Mummenhoff, 2001; Al-Shehbaz, 2002; Al-Shehbaz et al., 2006). Together with *Noccaea* Moench and *Microthlaspi* F. K. Mey., *Neurotropis* was included in a new tribe *Noccaeae* Al-Shehbaz, Beilstein & E. A. Kellogg (Al-Shehbaz et al., 2006) that is only remotely related to *Thlaspidae* DC.

The genus comprises three species, two of which are endemic to the Caucasus and E Turkey and the third, *Neurotropis platycarpa* (Fisch. & Mey.) F. K. Mey., is widely distributed from the Middle East through Iran, the Caucasus and Middle Asia to W Himalayas (Meyer, 2001). It is reported from China (Xinjiang) for the first time in this paper. Morphological differences between *N. platycarpa* and the other Chinese representatives of *Thlaspi* s.l. are discussed below.

2 Newly recorded species

1. *Alyssum szarabiacum* Nyár. in Bull. Grad. Muz. Bot. Cluj 18(1–4): 97. 1938. Type: [East Kazakhstan]. Semirechenskaya province: Lepsinsky distr., range Tarbagatai, Sarabiik peak, alpine meadow and tundra, 1915-07-16; *V. Sapozhnikov* & *T. Tripolitova* s.n. (holotype, TK!; isotypes, LE!, TK!).

萨拉比庭荠 新拟

Herbs perennial, caespitose, 10–15(20) cm tall, woody at base, canescent throughout with sessile, 10–20-rayed stellate trichomes. Stems ascending, several from caudex, sterile shoots usually present. Cauline leaves subsessile or with a petiole to 7 mm long, abaxially silvery, adaxially greenish; leaf blade oblong-ovate to broadly obovate, spatulate, (0.4)0.8–1.6 cm × (1.5)2.5–6 mm, base attenuate, apex rounded or obtuse, rarely subacute. Racemes corymbose, scarcely elongated in fruit, in a dense panicle terminating each stem. Fruiting pedicels divaricate, (2)3–5 mm, slender, straight, uniformly stellate. Sepals oblong, 1.8–2.5 × 0.8–1.2 mm, persistent until fruit maturity, stellate outside. Petals yellow, broadly spatulate, (3)3.5–4(4.5) × 1.2–2 mm, glabrous, caducous, base attenuate, apex obtuse or rounded. Filaments 1.8–2.5 mm long; median pairs unilaterally broadly winged, apically 1-toothed; lateral pair with a lanceolate or narrowly ob-

long basal appendage, apically obtuse or subacute; anthers oblong, 0.3–0.4 mm long. Ovules 1–2 per locule. Fruit rhomboid to broadly rhomboid, 3.5–4.5(5) × 2.5–3.5 mm, apex obtuse; valves not veined, scarcely inflated above seeds, moderately pubescent with stellate trichomes; style (1.5)2–2.8 mm long, slender, glabrous. Seeds 1–2 per locule, ovate, 1.2–1.5 × 0.9–1.1 mm, compressed, not margined.

Distribution: NW China, E Kazakhstan. Rocky slopes. Alt. 1250–1800 m.

China. Xinjiang (新疆): Emin (额敏), Anonymous 29; Anonymous 324 (XJBI, sub nom. *Alyssum dasycarpum* Steph. ex Willd.).

Alyssum szarabiacum is most closely related to *A. obovatum* (C. A. Mey.) Turcz. It differs from the latter species by a combination of corymbose inflorescences not or slightly elongated in fruit, sepals persistent until fruit maturity and rhomboid to broadly rhomboid, moderately pubescent silicles (Nyárady, 1949; German, 2003). Specimens of *A. obovatum* usually have inflorescences more or less elongated in fruit, caducous sepals and broadly elliptic, obovate or suborbicular, densely canescent silicles. Although sometimes separate characters typical for *A. szarabiacum* occur in some specimens of the highly polymorphic *A. obovatum*, the above combination is unknown in the latter species. Additionally, *A. szarabiacum* generally has bigger flowers and longer styles.

For a long time the species was not recognized in any floras, but recently its rank has been re-established (German, 2003). In addition to the morphological differences, *A. szarabiacum* is separated from *A. obovatum* geographically and ecologically. *Alyssum szarabiacum* has a very local distribution, being restricted to the southern slope of Tarbagatai (German, 2003, fig. 2) where it grows on rocks in the middle and lower parts of the higher mountain belt. In contrast, the southern distribution limit of *A. obovatum* is the northern slope of Tarbagatai and the species occurs in various kinds of petrophytic habitats at different altitudes; it has not yet been found in Xinjiang (Zhou et al., 2001).

In addition to the above new record, one more species of the section *Odontarrhena* (C. A. Mey.) C. Koch, *Alyssum fedtschenkoanum* N. Busch, should be included in the flora of China (German, 2003). The latter species was mentioned in the Flora RPS (An, 1987a: 125), but no specimens were found to confirm its distribution in China (Zhou et al., 2001). However, the locus classicus of *A. fedtschenkoanum* (Akkum and Blandykum sands at the left bank of the river Alkabek (right tributary of Irtysh) on the border with Kazakhstan) is situated in China and the species is still only known from a very few gatherings confined to

that small area (German, 2003: 51, fig. 2). Therefore, *A. fedtschenkoanum* is endemic to China and not to Kazakhstan as stated by Zhou et al. (2001) and its occurrence in Kazakhstan where it was previously reported as widely distributed in the northeast part of the country (Vassilyeva, 1961, 1969) still needs confirmation (German, 2003).

2. *Barbarea stricta* Andr. in Bess., Enum. Pl. Volhyn.: 72. 1822. Type: Podolia (lectotype, designated by Dorofeyev, 1996, Bot. Zhurn. (Moscou & St. Petersburg) 81(3): 132, LE!; isolectotypes, LE!, KW).

直立山芥 新拟

Herbs biennial or perennial, (30)50–100 cm tall. Stems erect, angled predominantly in the upper part, glabrous throughout, simple or few branched above middle. Basal and lower cauline leaves petiolate, petiole (1)3–6(8) cm, glabrous or ciliate basally; leaf blade (1.5)2–5(8) cm long, lyrate-pinnatifid with (1)2–3(4) lobes on each side of rachis, rarely unlobed; lateral lobes oblong or ovate, 2–10(15) × 1–4(6) mm, entire; terminal lobe considerably larger than lateral ones, up to 5 × 3.5 cm, broadly elliptic, margin entire or shallowly crenate. Middle cauline leaves usually lyrate-pinnatifid, short petiolate to subsessile, with 1–3(6) oblong or ovate, entire lateral lobes to 1.6 × 0.8 cm; terminal lobe much larger than lateral ones, up to 5 × 3.5 cm, broadly elliptic or ovate, entire, crenate, repand, or rarely dentate. Uppermost leaves coarsely toothed or crenate-repand, sessile, ovate, lateral lobes often absent; all cauline leaves conspicuously auriculate, with ovate to narrowly oblong ciliate entire auricles. Racemes ebracteate, elongated considerably in fruit. Sepals yellow, oblong, 2.5–2.8 × ca. 1 mm, erect, margin scarious, lateral pair slightly saccate. Petals light yellow, oblanceolate, rounded, (3)3.5–4.5 × 1–1.2 mm, attenuate to base. Filaments yellow, 3–4.2 mm long; anthers oblong, ca. 0.8 mm long. Fruiting pedicels erect or erect-ascending, (2)3–5 mm long, terete or subquadrangular, glabrous, stout, slightly narrower than fruit. Fruit linear, 2–3.5 cm × 1.2–1.5 mm, terete-subquadrangular, torulose, erect, usually appressed to rachis; valve apex obtuse to subacute; style stout, 0.5–1 mm. Seeds brown, ovate or oblong, 1.2–1.4 × 0.9–1 mm, uniseriate, somewhat plump, wingless.

Distribution: Europe, Caucasus, Turkey, Kazakhstan, NW China, Russia (European part, W and E Siberia), N Mongolia. Moist grassland, swamp, meadow. Sea level to 2000 m.

China. Xinjiang (新疆): Habahe (哈巴河), Anonymous 10253 (XJBI); Tacheng (塔城), Z. Z. Xu et al. (徐泽枝等) 93–401 (XJA); Xinyuan (新源), Anonymous 650450 (XJBI, sub nom. *B. orthoceras*

Ledeb.); Zhaosu (昭苏), Anonymous 650579 (XJBI, sub nom. *B. orthoceras*).

Barbarea stricta is the closest relative of *B. orthoceras* Ledeb., which is known from several provinces of N and E China. The former species differs from the latter in having smaller flowers with sepals 2.5–2.8 mm long, petals (3)3.5–4.5 mm long and shorter fruits 2–3.5 cm long appressed to the rachis even at maturity. In contrast, *B. orthoceras* has sepals (2.7)3–3.5 mm long, petals (4)4.5–6 mm long and fruits 3–5 cm long (rarely shorter) that are usually erect-ascending and not appressed to the rachis at maturity. *B. stricta* is also characterized by less dissected leaves, which usually have 1–3(6) lateral lobes, whereas leaves in *B. orthoceras* develop 2–6(10) lateral lobes. The two species occupy similar habitats (moist forests or grassy slopes, ditches, streamsides, river banks on the plain or the forest belt in the mountains) but are separated geographically: *B. stricta* is distributed from Europe to W Siberia with its easternmost occurrence in the western part of E Siberia; *B. orthoceras* is an E Asian species extending to N America. The new records from Xinjiang correspond to the SE distribution limit of *B. stricta*.

Excluding the two specimens of *B. stricta* cited above misidentified as *B. orthoceras*, all other samples of “*B. orthoceras*” from Xinjiang actually represent *Barbarea vulgaris* W. T. Aiton. Obviously, *B. orthoceras* does not occur in Xinjiang (see below).

3. *Erysimum czernjajevii* N. Busch in Fl. USSR 8: 115. 1939. — *E. divaricatum* Czern. in Bull. Soc. Nat. Moscou 27(4): 304. 1854. (non Wallr., 1840). Type: In arenosis Songoriae ad radicem montium Arganaty [*Karelin & Kiriloff*, 1841] (lectotype, LE!, designated by German & Ilyinskaya, in litt.; isolectotypes, LE!, MW!).

赞氏糖芥 新拟

Herbs biennial, occasionally short-lived perennial, (20)40–50(65) cm tall. Trichomes primarily malpighiaceus, 3–5(6)-fid ones also present. Stems erect, stout, much branched from the middle, usually angled, densely to moderately covered in the lower half with malpighiaceus trichomes, glabrescent above or sometimes throughout. Basal leaves rosulate; petiole 1–7 cm, persistent after leaf withering; leaf blade linear, linear-lanceolate, oblong or lanceolate, (2)4–8(10) cm × (3)5–8(11) mm, flat, base attenuate, margin entire, apex acute and often somewhat curved, pubescent with malpighiaceus trichomes mixed with fewer 3-fid ones; sometimes 3-fid trichomes are as numerous as 2-fid ones and single 4-fid trichomes also present. Cauline leaves shortly petiolate to sessile, entire, progressively

smaller upward. Racemes corymbose, densely flowered, ebracteate, elongated considerably in fruit. Fruiting pedicels strongly divaricate, often horizontally reflexed in fruit, (3)4–11 mm, thickened, slightly narrower than fruit, straight or nearly so, glabrescent, with few 2–3-rayed trichomes. Sepals oblong-linear or oblong, 5–7 × 1–2.5 mm, moderately to slightly pubescent with malpighiaceae and 3-fid trichomes, greenish, distally often purplish, pale margined, lateral pair slightly saccate. Petals yellow, oblong-obovate or narrowly elliptic, spatulate, (0.7)0.8–1(1.3) cm × (1.5)1.8–2(2.5) mm, apex rounded, glabrous; claw distinct, subequaling or longer than sepals. Stamens 4–7 mm; filaments of median ones uniformly dilated; anthers linear-sagittate, 2–2.5 mm. Fruit narrowly linear, terete-4-angled, 4–8.5 cm × 1–1.5 mm, divaricate to horizontally reflexed, straight or slightly curved; valves slightly pubescent outside with (2)3–4(6)-fid trichomes, glabrescent, glabrous inside; style obsolete or to 1 mm, cylindric, narrower than fruit; stigma capitate-bilobed. Seeds oblong, brown, 1–1.6 × 0.5–0.8 mm.

Distribution: NW China, Kazakhstan, N Kyrgyzstan, N Turkmenistan. Sandy desert, gentle gravelly slopes. Alt. 200–1200 m.

China. Xinjiang (新疆): Yumin (裕民), Anonymous Zao 48 (XJBI, sub nom. *E. hieracifolium* L.); Tacheng (塔城), H. L. Fen & Kelimu 352 (XJBI, sub nom. *E. diffusum* Ehrh.).

Erysimum czernjajevii is a distinct species that can be easily distinguished from other Chinese representatives of the genus by a combination of the following characters: biennial life form; basal leaves with persistent petioles; ramose stem branching; horizontally or nearly so reflexed siliques covered with many-branched trichomes; and sparse indumentum on at least the upper half of stems, pedicels and fruits so that the whole plant (except the leaves) usually appears glabrescent. At anthesis *E. czernjajevii* is somewhat reminiscent of *Erysimum canescens* Roth but even in this state it can be immediately identified by the ovary covered with (2)3–4(6)-fid trichomes, often considerable admixture of 3-fid trichomes on leaves, and glabrous petals (0.7)0.8–1(1.3) cm × (1.5)1.8–2(2.5) mm. In contrast, *E. canescens* is characterized by both ovary and leaves covered with exclusively 2-fid (rarely occasional 3-fid) trichomes and petals (1)1.2–1.5(1.7) cm × 2.5–3.5 mm puberulent outside with malpighiaceae trichomes. *E. czernjajevii* is widespread in the desert and semi-desert zone of Kazakhstan and adjacent areas of N Kyrgyzstan and N Turkmenistan, where it grows primarily in sandy or sometimes stony areas on the plain and at the foothills. Chinese localities represent the eastern limit of its range.

4. *Erysimum kotuchovii* D. German in Turczaninowia 7(2): 14. 2004. Type: Kazakhstan. East-Kazakhstanian province: Sarym-Sakty range, NW foothills, vicinities of Chingistai, valley of Bukhtarma, sandy and gravelly deposits, 1984-07-16, Yu. A. Kotukhov s.n. (holotype, ALTB!; isotype, Herbarium of Altai Botanical Garden, Ridder, Kazakhstan!).

考氏糖芥 新拟

Herbs biennial or short-lived perennial, covered throughout with appressed trichomes. Stems erect, single or several at base, to 52 cm tall. Basal leaves rosulate, petiolate; leaf blade linear-oblong to linear or narrowly linear, 30–70 × 2–4 mm, long-attenuate towards base, margin entire, longitudinally folded; cauline leaves similar to the basal ones, the middle and upper leaves smaller, short-petiolate to sessile, all rather densely covered with malpighiaceae and few 3-rayed trichomes. Sepals pale yellow, 6–11 × 1.8–3.2 mm, strongly saccate, narrowly pale-margined, pubescent with malpighiaceae and 3-rayed trichomes. Petals yellow, glabrous, 12–19 × 4–7 mm, claw 8–12 mm long, limb almost round. Stamens slightly tetradynamous, the lateral 8–13 mm long, the median 9.5–15.5 mm long; filaments of the median stamens expanded to 1 mm width; anthers linear, sagittate, 2–4.5 mm long. Pedicels (1)2–5 mm long, in fruit (2.5)5–7 mm long. Siliques linear, (14)24–39 × 1.5–2 mm, at base slightly (to 2.2 mm) widened, 4-angled, erect, moderately covered with a mixture of 3-fid and malpighiaceae trichomes oriented transversely, or parallel, or obliquely to the length of the silique (malpighiaceae trichomes of different orientation either mixed on one fruit, along the whole length or in certain parts, or only one type present), sometimes with few 4-rayed trichomes; valves with prominent, green, slightly keeled midvein; septum narrowly veined. Style slender, (3)4–6 mm long, with few 2- and 3-fid trichomes, stigma with divergent lobes 0.6–1 mm long. Seeds 0.6–1.2 × 0.7 mm, ovate or elliptic, often asymmetric, brown, biseriolate, 30–40 per locule.

Distribution: NW China, NE Kazakhstan, NW Mongolia. Steppe slopes, sandy and gravelly deposits on river banks. Alt. 1200–2400 m.

China. Xinjiang (新疆): Fuhai (福海), G. L. Zhu (朱格麟) et al. 6026 (PE, sub nom. *Syrenia siliculosa* (Bieb.) Andrz.).

Erysimum kotuchovii is restricted to the southern part of the Altai Mountains. Its relationships are discussed below together with the following closely related species.

5. *Erysimum mongolicum* D. German in Willdenowia 35(2): 307. 2005. Type: Mongolia. Khobdo (Hovd) aimak, Mongolian Altai, valley of

Bodonchijn-gol, 30–35 km NE [settlement] Altai, 46°05' N, 92°31' E, alt. 1650–1700 m, sandy bottom of dried stream between rocks, 2003-07-17. *D. A. German s.n.* (holotype, ALTB!; isotypes, B!, LE!, MW!, OSBU!).

银毛糖芥 新拟

Herbs biennial, covered throughout with appressed, predominantly malpighiaceae trichomes. Stems erect, few-branched, up to 60 cm tall. Leaves up to 80 × 8 mm; blades linear-lanceolate, margin entire, basal (rosulate) and lowermost cauline leaves with a petiole 2–3.5 cm long, middle and upper cauline leaves short-petiolate to sessile, smaller and narrower, all moderately covered with malpighiaceae trichomes mixed with few 3-fid ones. Sepals pale yellow, 8–9 mm long, strongly saccate at the base; the lateral sepals 3 mm wide, oblong-ovate; median sepals 1.8 mm wide, oblanceolate, narrowly pale-margined, pubescent with 2- and 3-fid trichomes. Petals yellow, glabrous, 14–18 mm long, claw 8.5–11.5 mm long, limb 5.5–6.5 mm wide, broadly elliptic or orbicular. Stamens slightly tetradynamous: lateral ones 9–10 mm long, the median ones 10.5–12 mm long; filaments of median stamens expanded to 1 mm width; anthers linear, sagittate, 2.5–4 mm long. Pedicels 2–4 mm long, in fruit somewhat thickened and 4.5–14 mm long. Siliques linear, (15)20–28 × 1.8–2.2 mm, occasionally shorter, base slightly (up to 2.5–2.8 mm) widened, very gradually narrowed towards apex, strongly 4-angled, suberect, densely covered with transversely oriented malpighiaceae trichomes intermixed with few 3-fid ones; valves with prominent, green, slightly keeled midvein; septum narrowly veined. Style (4)6–7(8) mm long, with few 2- and 3-fid trichomes; stigma with divergent lobes ca. 0.8 mm long. Seeds 1.6–2.2 × 0.8–1.1 mm, ovate, elliptic or oblong-elliptic, mostly asymmetric, brown, biseriate, ca. 30 per locule.

Distribution: NW China, W Mongolia. Desert, dry sandy beds of temporary spring streams (“sairs”). Alt. 1300–2000 m.

China. Xinjiang (新疆): Qinghe (青河), Anonymous ATZ 147 (XJA, sub nom. *Erysimum diffusum* and *Syrenia macrocarpa* Vass.).

The species occurs in the middle mountainous zone of the southern slope of the Mongolian Altai and neighboring Junggar Gobi.

Both *E. kotuchovii* and *E. mongolicum* are closely related to *Erysimum siliculosum* (Bieb.) DC., which is rather common in sandy habitats of NW Xinjiang. All three belong to the group of species unreasonably treated by some authors as a distinct genus *Syrenia* Andr. ex Bess. (e.g., Kuan, 1987; An, 1995). As well as

these three species, one more of this group, *Erysimum vassilczenkoi* Polatschek, occurs in China and is worth mentioning here. Although previous records of *E. vassilczenkoi* from China (Kuan, 1987, as *S. macrocarpa* Vass.) have proved to be misidentifications of *E. siliculosum* (Zhou et al., 2001), the species has been recorded from the sandy area along the river Alkabek and is still known from three old gatherings confined to Akkum and Blandykum sands (just as with *A. fedtschenkoanum*; German, 2005). For further details, including distribution maps, voucher specimens of *E. kotuchovii*, *E. mongolicum* and *E. vassilczenkoi*, and also the morphological justification for uniting *Syrenia* with *Erysimum* L., the reader is referred to German (2005). The four Chinese representatives of the former genus *Syrenia* can be distinguished as follows:

- 1a. Fruits (excluding styles) 5–16.5 mm long, shorter, equalling or up to 2 times longer than styles.
 - 1b. Fruits (excluding styles) (14)20–39 mm long (rarely single fruits on a plant shorter), (2.5)3–7 times longer than styles
 - 2a. Fruits (excluding styles) 5–12(14) × 2–3.5(4) mm; leaves linear to narrowly oblanceolate, (1)2–5(8) mm wide, apex mostly acute
 - 2b. Fruits (excluding styles) 15–16.5 × 3.5–5.5(6) mm; leaves narrowly obovate to oblanceolate, up to 15 mm wide, apex rounded
 - 3a. Fruit valve surface silvery, completely covered with very dense, exclusively transversally oriented 2-fid (or occasionally few intermixed 3-partit) trichomes
 - 3b. Fruit valve surface greenish grey, not completely covered with a mixture of 2-fid trichomes of different orientation, 3- and rarely 4-partit trichomes
- **E. siliculosum**
- **E. vassilczenkoi**
- **E. mongolicum**
- **E. kotuchovii**

6. *Lepidium karelinianum* Al-Shehbaz in Novon 12(1): 8. 2002. (non *Lepidium intermedium* A. Richard. 1847). — *Stroganowia intermedia* Kar. & Kir. in Bull. Soc. Nat. Moscou 15(1): 162. 1842. — *Lepidium kirilowii* Trautv. in Bull. Soc. Nat. Moscou 33(1): 130. 1860, nom. illeg. Type: In montosis apricis Alatau inter fluvios Baskan et Sarchan. 1841. *Karelin & Kiriloff 1263* (lectotype, LE!, designated by Botschantzev, 1984, Not. Syst. Pl. Vasc. 21: 81; isolectotypes, B!, LE!, M!, MW!, TK!, W!, WU!).

卡氏独行菜 新拟

Herbs perennial, (30)40–70 cm tall, glabrous throughout except for petiole margins of basal leaves, these sparsely ciliate with simple trichomes. Stems erect, stout, many branched above, rounded angular. Leaves thick leathery, entire. Petiole of basal leaves to 5(9) cm long, not winged, persisting in subsequent years as fibrous remains; leaf blade broadly lanceolate, oblong, or elliptic, (3)7–18(24) × 1.5–5.5(7.5) cm, with several palmate main veins more prominent abaxially, base attenuate, apex acute to subobtuse, margin often undulate. Cauline leaves sessile, ovate-lanceolate or oblong, base subamplexicaul with rounded auricles, apex acute; lowermost to 15 × 5.5 cm, middle and upper ones progressively much smaller. Inflorescence lax, paniculate. Fruiting pedicels thickish, 6–12 mm, angled, divaricate-ascending. Sepals deciduous, ovate to broadly ovate, 2–3.5 × 1.2–3 mm, glabrous or with few simple curved trichomes, with broad white margin and apex. Petals white, broadly obovate or suborbicular, 3.5–5.5 × 2–2.5(3) mm, apex rounded; claw to 2 mm. Filaments white, 2–3 mm long; anthers oblong, 0.7–0.8 mm long. Fruit obovate, (9)10–12(15) × 6–8 mm, obscurely carinate, with distinct midvein and obscure lateral veins, base and apex subacute; gynophore 0.1–0.3 mm long, stout; style 0.4–0.8(1) mm long. Septum broadly lanceolate to elliptic, to 3.5 mm wide. Seeds brown, ovoid, 4–5 × 2–3 mm; cotyledons predominantly incumbent.

Distribution: NW China, E & SE Kazakhstan. Sunny slopes, grassland. Alt. 600–1200 m.

China. Xinjiang (新疆): Xinyuan (新源), Anonymous 84–122 (XJU, sub nom. *Stroganowia brachyota* Kar. & Kir.).

Among Chinese *Lepidium* species, *L. karelinianum* is most closely related to *Lepidium brachyotum* (Kar. & Kir.) Al-Shehbaz with which it shares a robust habit, thick rounded angular stems covered at the base with fibrous petiolar remains of leaves of previous years, big entire leathery leaves with subamplexicaul bases, and comparatively big flowers, fruits and seeds. However, *L. karelinianum* can be easily distinguished by its broadly lanceolate to narrowly elliptic basal leaves to 18(24) cm

long on unwinged petioles to 5(9) cm long, and by its fruits (9)10–12(15) × 6–8 mm with seeds 4–5 × 2–3 mm. In contrast, *L. brachyotum* has obovate-spathulate or spatulate-orbicular basal leaves 3–8(12) cm long on broadly winged petioles to 2(3) cm long, and fruits (5)7–8 × 3–4.5(5) mm with seeds 2.5–3.5 × 1.5–2 mm.

Until recently, both species were treated as members of a distinct genus, *Stroganowia* Kar. & Kir. However, extensive molecular based studies (Mummenhoff et al., 2001; 2009) along with the re-evaluation of morphological characters provide a sound base for a broader concept of *Lepidium* that includes *Stroganowia* and some other genera (Al-Shehbaz et al., 2002).

7. *Matthiola superba* Conti in Mém. Herb. Boiss. 18: 23. 1900. Type: Songarei. Schrenk (holotype, G).

沙地紫罗兰 新拟

Herbs perennial, (20)25–60 cm tall, eglandular, tomentose throughout, more densely in the lower half, with finely branched dendritic trichomes, at fruit maturity becoming less hairy or rarely subglabrescent; simple trichomes sometimes present at the base of a stem and on leaf petioles. Caudex simple to many branched; stems single or several, erect, stout, usually simple, initially tomentose, later glabrescent in the upper part or throughout. Basal leaves subrotulate; petiole 3–7 cm long; leaf blade broadly to narrowly ovate, obovate, or elliptic, sometimes oblong-lanceolate, 3–9 × 1–5 cm, base cuneate, margin repand, coarsely and irregularly sinuate-dentate, or pinnatifid to pinnatisect, with oblong-linear entire or dentate lobes, apex acute or sometimes obtuse, densely to moderately tomentose, rarely glabrescent. Cauline leaves similar to basal, on shorter petioles, uppermost narrower and subsessile. Fruiting pedicels (1)2–5 mm long, stout, ascending to suberect, pubescent. Sepals linear, 9–11 × 2–2.5 mm, tomentose, bases of lateral pair strongly saccate. Petals dark greenish-purplish to brown-yellowish or brownish-yellow, dried usually becoming brown or brown-yellowish, (14)18–25(27) × 3–4.5(5) mm; limb linear-elliptic or oblong-lanceolate, somewhat crisped, 8–12 mm long, apex obtuse; claw linear, usually slightly longer than limb. Median stamen pair 9–10 mm long, lateral pair 7–7.5 mm long; anthers linear, 3.5–4 mm long. Fruit narrowly linear, 6–10 cm × (2)2.5–3 mm, terete-flattened, slightly torulose, erect or erect-ascending; valves moderately tomentose, with a prominent midvein; style to 1 mm long; stigma capitate-bilobed, lobes broad. Seeds elliptic or ovate, flattened, ca. 3.5 × 2 mm; wing 0.3–0.7 mm wide.

Distribution: Kazakhstan, Russia (European part, S Siberia). Desert grassland, dry steppes, open gravelly slopes, colored clays. Alt. 200–2000 m.

China. Xinjiang (新疆): Bole (博乐) (Bortala), Xizhi Xinjiang Exped. (西植新疆队) 3943 (XJBI, sub nom. *Matthiola odoratissima* (Pall. ex Bieb.) R. Br.); Ürümqi (乌鲁木齐), Anonymous 3175 (XJU, sub nom. *Matthiola stoddartii* Bunge).

Matthiola superba is a highly variable species in degree of leaf dissection, flower size, indumentum composition (presence or absence of simple hairs) and indumentum density. Plants may be silvery tomentose except for the inflorescence, grayish-green and glabrescent mostly in the upper half, or green and subglabrous throughout. The specimen from Bole mentioned and illustrated in Flora Xinjiangensis as *M. odoratissima* (An, 1995: 164–165) and later attributed to *Matthiola chorassanica* Bunge ex Boiss. (Zhou et al., 2001) represents “typical” *M. superba*. This is easily distinguished from *M. chorassanica* by denser indumentum in the lower part of the plant than in the upper part, dentate to pinnatisect (never entire) leaves 3–9 × 1–5 cm, petals with linear-elliptic or oblong-lanceolate (not involute) limb 3–4.5(5) mm wide, and subterete fruits (2)2.5–3 mm wide. In contrast, plants of *M. chorassanica* are uniformly densely tomentose, with sinuate to pinnatifid, often entire and never pinnatisect leaves (1)2–4.5(6) × 0.5–2(2.4) cm, petals with linear, circinate involute limb ca. 1.5 mm wide, and flattened fruits 1.5–2.5(2.7) mm wide. Within China, *M. chorassanica* occurs in SW Xinjiang and in adjacent Xizang, whereas *M. superba* is found only in NW Xinjiang (Tian-Shan and the western part of Chinese Junggar).

8. *Neurotropis platycarpa* (Fisch. & Mey.) F. K. Mey. in Feddes Repert. 84(5–6): 452. 1973. — *Thlaspi platycarpum* Fisch. & Mey. in Fisch., Mey. & Avé-Lall., Ind. Sem. Horti Petrop. 7: 57. 1840. Type: Cult. in hort. bot. Petrop. 1840 [seeds from Turkey, leg. Wiedemann] (holotype, LE!; isotype, K).

Thlaspi kotschyanum Boiss. & Hohen. in Boiss., Diagn. Pl. Nov. I. ser. viii: 39. 1849. — *Neurotropis kotschyana* (Boiss. & Hohen.) Czer. in Vasc. Pl. USSR: 140. 1981. Type: [Iran], In mt. Elburs supra pagum Passgala. 1843-05-06. Th. Kotschy. Pl. Pers. bor. 102 (holotype, G-BOISS; isolectotypes, B!, H, JE, K, W).

Thlaspi cardiocarpum Hook. fil. & Thoms. in J. Proc. Linn. Soc. Bot. 5: 176. 1861. Type: Afghanistan, coll. 1838–40, Griffith, 1402 Cat. Griff., 1144 Journal 1492 (lectotype, K, following Meyer, 2001, Haussknechtia 8: 49).

宽果脉翼芥 新拟

Herbs annual, (2)5–30(35) cm tall, glabrous throughout, glaucous. Stems erect, simple or branched. Basal leaves short petiolate, petiole to 8 mm long; leaf blade ovate or elliptic, 5–7 × 3–6 mm, base cuneate or

attenuate, margin entire, apex rounded, soon withering. Cauline leaves sessile, ovate-cordate or oblong, 0.5–3.5(4) cm × 2–15(20) mm, base cordate-amplexicaul, margin entire, apex obtuse. Fruiting pedicels 2.5–6 mm long, stout, divaricate, straight. Sepals ovate or oblong, (1)1.2–1.7 × 0.5–0.9 mm, not saccate, margin white. Petals white, spatulate or oblong, (1.5)1.7–2.5 × 0.5–1 mm, apex rounded. Filaments 0.9–1.7 mm long; anthers broadly ovate, 0.2–0.3 mm long. Ovules (4)5–8(10) per ovary. Fruit broadly obcordate to suborbicular, 6–12 × 6–12 mm, base obtuse, apex deeply emarginate and apical notch 2.5–3 mm deep; wings 3–4 mm wide, apically nearly as wide as at base, prominently veined throughout; style obsolete. Seeds yellow-brown, ovoid, 1.4–1.8 × 0.8–1 mm, smooth.

Distribution: Afghanistan, Azerbaijan, NW China, SE Greece, N India, Iran, S Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, S Turkey, Uzbekistan, SW Asia. Stony and gravelly steppe slopes. Alt. 1500–2700 m.

China. Xinjiang (新疆): Yining (伊宁): A. Regel s.n. (Sarybulak pr. Kuldscha, 4–6000 ft., 1878-04-22; LE, sub nom. *Thlaspi perfoliatum* L.).

This species is most widely known in Asia under the name *Thlaspi kotschyanum* (e.g., Vassilyeva, 1961; Vinogradova, 1974; Yunussov, 1978), a species epithet accepted in the most recent worldwide checklist of the Cruciferae (Warwick et al., 2006b). However, we apply the name *N. platycarpa* following the latest monograph of this *Thlaspi* L. s.l. segregate (Meyer, 2001).

The genus *Thlaspi* was accepted in the Flora of China, as in all previous Chinese and other Asian treatments, in a traditional (wide) sense. However, extensive molecular based studies have partly supported the split of the genus into 12 genera proposed by Meyer (briefly surveyed in Al-Shehbaz, 2002, and references therein). Four of these segregate, *Mictrothlaspi* F. K. Mey. (1 sp.), *Neurotropis* (DC.) F. K. Mey. (1 sp.), *Noccaea* Moench (5 spp.), and *Thlaspi* (1 sp.) occur in China. *N. platycarpa* is readily distinguished from other Chinese representatives of *Thlaspi* s. l. in having fruits with wings strongly veined throughout. It differs from species of *Noccaea* in life form (annual vs. perennial) and in its suborbicular, broadly margined fruits with sessile stigmas (vs. oblong or elliptic, narrowly or not margined fruits with distinct styles). It differs from *Thlaspi arvense* L. in its cordate-amplexicaul entire cauline leaves and non-striate seeds (vs. auriculate or sagittate, dentate cauline leaves and distinctly striate seeds). It differs from *Mictrothlaspi perfoliatum* (L.) F. K. Mey. in its much bigger, 6–12 mm diam., fruits winged all round (vs. smaller fruits 3–5.5(7) × 3–4(5.5) mm winged mostly in the upper part).

9. *Ptilotrichum dahuricum* Peschkova in Nov. Syst. Plant. Vasc. 15: 230. 1979. — *Alyssum dahuricum* (Peschkova) Al-Shehbaz in Novon 14(2): 153. 2004. Type: [Russia, Chita province], Transbaikal province, Akshinsky district. Onon river basin. Mountains along the river Bukukun near the settlement Bukukunsky, Rocky southern slope, 1913-07-18. *V. I. Smirnov 1986* (holotype and isotype, LE!).

达乌里燥原芥 新拟

Subshrubs, (10)15–30(40) cm tall, moderately to densely pubescent throughout with short-stalked trichomes lanceolate in outline and with 2, branched, principal rays from stalk apex; each ray with 1–3 pairs of short lateral branches. Stems erect, stramineous, often several from woody base, branched above middle, sterile shoots often present. Cauline leaves numerous, dense, sessile; leaf blade linear to narrowly oblanceolate, (0.5)1–2(3.5) cm × 0.5–2(3) mm, often grooved adaxially, base attenuate, apex usually acute. Fruiting pedicels slightly recurved, suberect at base, ascending above, 3–8 mm long, slender. Sepals oblong, 1.6–2.2 × 1–1.5 mm, deciduous, pubescent outside and sometimes inside. Petals white, broadly obovate or suborbicular, (3.5)4–5 × (2)2.5–3(3.5) mm, glabrous, caducous, apex rounded; claw often pink, minutely papillate at base. Filaments 1.2–2.5 mm long, dilated and papillate at base; anthers oblong-ovate, 0.4–0.5 mm long. Ovules 1–2 per locule. Fruit ovate, (3)4–5 × 2–3 mm, apex acute or acuminate, base rounded; valves not veined, somewhat inflated above seeds, densely pubescent; style (1)1.5–2.5(3.5) mm long, slender, glabrous. Seeds 1 per locule, ovate-elliptic, (1.8)2–2.4 × 1–1.5 mm, compressed, not margined.

Distribution: NE China, NE Mongolia, Russia (SE Siberia). Steppe slopes, grassland. Alt. 400–1200 m.

China. Heilongjiang (黑龙江): Z. Wang et al. (王战等) 1437 (PE, sub nom. *Ptilotrichum canescens* (DC.) C. A. Mey. and *Ptilotrichum elongatum* C. A. Mey.). **Jilin** (吉林): Baicheng (白城), Anonymous s.n. (*Stipa* slope. 1951-08-07; PE, sub nom. *P. canescens* and *P. elongatum*). **Nei Mongol** (内蒙古): Manzhouli (满洲里), Anonymous 876 (PE, sub nom. *P. canescens* and *P. elongatum*), Sino-German exped. (中德队) 8383 (PE, sub nom. *P. canescens* and *P. elongatum*), J. Sato 6251 (PE, sub nom. *P. canescens* and *P. elongatum*), P. Y. Fu et al. (傅沛云等) 1959 (PE, sub nom. *P. elongatum* and *P. canescens*); [Xing'anling, 兴安岭], Medical Plant Exped. (药植队) 1669 (PE, sub nom. *P. canescens*), Medical plant exped. (药植队) 1782 (PE, sub nom. *P. canescens*), S. Y. Li (李世英) 217 (PE, sub nom. *Ptilotrichum cretaceum* (Adams) Ledeb., *P. elongatum* and *P. canescens*).

Ptilotrichum dahuricum was recently assumed to occur in NE China (Rybinskaya, 1994: 107) but that information was not based on any voucher specimens. The species is most closely related to *Ptilotrichum tenuifolium* (Steph. ex Willd.) C. A. Mey. from which it differs in having stramineous stems, and early withering rosette and lowermost cauline leaves absent by fruiting time. In contrast, *P. tenuifolium* is characterized by greenish or often purplish stems and a basal rosette and lowermost cauline leaves persistent at fruit maturity. In addition, plants of *P. dahuricum* are in general less densely pubescent and often appear green or slightly grayish, whereas those of *P. tenuifolium* are usually grayish or rarely subsilvery.

Ptilotrichum dahuricum is the easternmost species of *Ptilotrichum* C. A. Mey.; it is the only representative of the genus occurring in the northern part of Nei Mongol and in neighboring Heilongjiang and Jilin. Previous records of *P. canescens* from the latter two provinces (e.g., Zhou et al., 2001) are based on misidentified specimens of *P. dahuricum* cited above. *Ptilotrichum canescens* evidently does not occur in either of these two provinces, and available data show that its eastern distribution limit is the Gobi.

Zhou et al. (2001) treated *Ptilotrichum* as congeneric with *Alyssum* but molecular data (e.g., Al-Shehbaz et al., 2006; Warwick et al., 2008) along with the distribution patterns (mostly Central/Eastern Asian vs. SW Asian) support their distinctness and assignment to different tribes, *Arabideae* DC. and *Alysseae* DC., respectively.

10. *Sisymbrium subspinescens* Bunge in Arb. Naturf. Ver. Riga 1(2): 151. 1847. Type: *Matthiola turcomanica* mihi n. sp. Turcomania bor., in promontorio Airakli [28] Mai 1840 [*Al. Lehmann*] (Reliquiae Lehmannianae. Herb. Al. de Bunge) [fr.] (lectotype, P!, designated by German in German et al., 2006, Not. Syst. Pl. Vasc. 38: 308; isolectotypes, LE!, P!, B!; syntypes, LE!, P!).

沙漠大蒜芥 新拟

Herbs perennial, (18)30–50(75) cm tall, glabrous and glaucous throughout. Stems usually several from the woody base, erect, stout, much branched, remains of bases of stems of previous year often present. All leaves fleshy, somewhat leathery; basal ones not rosulate; petiole broad, 0.5–2 cm long; leaf blade narrowly obovate, narrowly elliptic, broadly lanceolate or oblong, coarsely dentate, repand or runcinate-pinnatifid, (1)1.5–4(5.5) × (0.5)1–2(2.5) cm; lateral lobes if present 1–4(5) on each side, triangular to linear-triangular, entire, acute. Lower and middle cauline leaves similar to basal ones, short petiolate to subsessile, progressively smaller upward. Uppermost cauline leaves lanceolate to linear, sessile,

entire or minutely denticulate. Fruiting pedicels divaricate, stout, nearly as thick as fruit, (3)4–10(14) mm long. Sepals narrowly oblong, spreading, (6)8–10(12) × 1.5–2.5 mm, bases of lateral pair slightly saccate. Petals yellow, spatulate, (11)12–14 × 2–3 mm; claw subequaling sepals. Stamens 7–11 mm long; anthers linear-sagittate, 3.5–4 mm long. Ovules 30–70 per ovary. Fruit narrowly linear, terete, 3–8 cm × 1–1.3 mm, divaricate, straight or slightly curved; valves glabrous, torulose; style stout, 1–1.5 mm long; stigma capitate-bilobed. Seeds oblong, 1.5–2 × 0.6–0.7 mm, brown, slightly margined distally.

Distribution: NW China, Kazakhstan, W Mongolia, N Tajikistan, Uzbekistan. Sandy, clay and gravely desert. Alt. 300–1200 m.

China. Xinjiang (新疆): Qinghe (青河), Kelimu (克里木) 9291 (XJBI, sub nom. *Sterigmostemum matthioides* (Franch.) Botsch.); Tuo Li (托里), Kelimu (克里木) 9251 (XJBI, sub nom. *Sisymbrium altissimum* L.).

Sisymbrium subspinescens is not rare in the semi-desert zone of Kazakhstan (Vassilyeva, 1961) and also known from a few localities in Junggar Gobi in the very west of Mongolia (Grubov, 1982; Ebel & Rudaya, 2002). The new Chinese localities bridge this artificial gap. This species is clearly distinguished from other Chinese representatives of *Sisymbrium* L., by a combination of robust perennial habit with woody base, leathery glaucous leaves, big flowers and a distribution in desert and semidesert habitats of NW Xinjiang.

11. *Smelowskia micrantha* (Botsch. & Vved.) Al-Shehbaz & S. I. Warwick in Harvard Pap. Bot. 11(1): 97. 2006. — *Sophiopsis micrantha* Botsch. & Vved. in Not. Syst. Herb. Inst. Bot. Acad. Sci. Uzbek SSR 13: 9. 1952. Type: [Uzbekistan, Fergana valley], Kara-Tepe, saline soil, 1948-04-18, Shafeyev (holotype, TASH; paratype, LE!).

Yinshania albiflora Ma & Y. Z. Zhao var. *gobica* Z. X. An in Fl. Xinjiang. 2(2): 381. 1995. Type: [China, Xinjiang, Wusu], in the forest. 1980-05-02. *Hou Wen-hu* 008 (holotype, XJFA!).

小花芹叶芥 新拟

Herbs annual, 5–25 cm tall, moderately to sparsely pubescent with a mixture of soft short-stalked branched and fewer simple trichomes. Stems erect, simple or branched along lower half, pubescent throughout or distally glabrescent. Basal leaves withered by anthesis. Cauline leaves twice pinnatisect or almost so, elliptic or ovate in outline, 1.5–4(5) × 0.5–2.5 cm; petiole to 1 cm long; terminal lobe broadly lanceolate or oblong-elliptic in outline, 0.8–2 cm × 2–8 mm, proximally with 1–2(3) pairs of linear to lanceolate, entire or denticulate, acute or subacuminate, lateral lob-

ules 2–5 × 0.5–1.5 mm and terminal lobule to 10 × 2.5 mm; lateral lobes 2–3 on each side of midvein, resembling terminal lobe. Racemes ebracteate, initially corymbose, later rather lax, elongated to half of the length of a stem or more. Fruiting pedicels filiform, strongly divaricate, (6)7–9(10) mm long, straight, glabrous or sparsely pubescent. Sepals oblong, 1–1.3 × 0.3–0.4 mm, glabrous or sparsely pilose with simple and branched trichomes, not saccate. Petals pale yellow, spatulate, subequaling or shorter than sepals, to 0.2–0.3 mm wide, limb twice as long as claw, apex rounded. Filaments 0.8–1 mm long; anthers ovate, ca. 0.15 mm long. Ovules 10–12 per ovary. Fruit linear-oblongate, 4.5–5.5 × 0.8–1 mm, subterete, slightly torulose, ascending to suberect, forming slight angle with pedicel; valves thin, glabrous; style 0.2–0.3 mm long. Seeds light brown, elliptic, 0.5–0.7 × 0.4–0.5 mm, plump, biseriate.

Distribution: NW China, N Tajikistan, Uzbekistan. Riparian forests (tugais), saline places in desert. Alt. 250–450 m.

China. Xinjiang (新疆): Shawan (沙湾), Xinjiang Exped. (新疆采集队) 735 (LE); Wusu (乌苏), W. H. Hou (侯文虎) 005 (XJFA), X. Z. Zhang (张小珍) s.n. (alt. 250 m, 1985-05; XJU, sub nom. *Rorippa sylvestris* (L.) Bess.), X. Z. Zhang (张小珍) s.n. (near the field at alt. 252 m, 1985-05; XJU, sub nom. *R. sylvestris*).

Smelowskia micrantha belongs to the former genus *Sophiopsis* O. E. Schulz, recently united with *Smelowskia* (Al-Shehbaz & Warwick, 2006). It is most closely related to two other Chinese representatives of this segregate, *S. annua* Rupr. and *S. sisymbrioides* (Regel & Herd.) Lipsky ex Paulsen. Like these species, *S. micrantha* has yellow flowers but differs sufficiently from both in its ephemeral (vs. biennial) life form, minute flowers 1–1.3 mm long with petals as long as or shorter than the sepals (vs. 2.5–4 mm long and with petals ca. twice as long as the sepals), torulose (vs. not torulose) fruits and seeds 0.5–0.7 (vs. 1.2–2) mm long. *Smelowskia micrantha* is the only halophytic representative of *Smelowskia* s.l. growing on the plains or in foothills (other species are predominantly plants of rocks of the middle or higher mountain belt or of high latitudes).

The newly discovered Chinese localities of *S. micrantha* in China are situated ca. 1000 km distant from the next closest locality in Uzbekistan (Fergana valley). However, such a distribution is not surprising as it is known for some other Turanian ephemeral halophytes, e.g., *Neotorularia rossica* (O. E. Schulz) Hedge & J. Léonard also recently recorded from the Chinese Junggar (German, 2007). *S. micrantha* was re-described as a member of *Yinshania* Ma & Y. Z. Zhao by An (1995).

However, *Yishania* is unrelated to *Smelowskia* and no species of *Yinshania* is found in Xinjiang.

3 Species with confirmed occurrence in China

1. *Aphragmus involucratus* (Bunge) O. E. Schulz in Engler, Pflanzenreich, 86(4, 105): 198. 1924. — *Platypetalum involucratum* Bunge in Enum.: 58. 1836. Type: *Platypetalum altaicum*. Altai, 1832, Bunge s.n. (lectotype, LE!, designated by Ebel, 1998, Turczaniowia 1(4): 22, as “type”; isolectotype, LE!).

具苞寒原芥 新拟

Distribution: NW China, E Kyrgyzstan, W Mongolia, Russia (SW Siberia). Gravely stream-sides, talus slopes, below glaciers. Alt. 2350–3700 m.

China. Xinjiang (新疆): Fukang (阜康), Anonymous 651288 (XJBI, sub nom. *Eutrema edwardsii* R. Br.), Anonymus 998052 (XJA); Jinghe (精河), Anonymous s.n. (XJA, sub nom. *Eu. edwardsii*); [Tian-Shan, 天山] G. Merzbacher s.n. (LE).

Aphragmus involucratus was first reported for China by Ebel (1998) based on the above collection of Merzbacher, but that information was not taken into account in subsequent treatments (Al-Shehbaz, 2000, 2003; Zhou et al., 2001). The species is distributed in the alpine belt of the Russian and Mongolian Altai and the Tian-Shan of China and Kyrgyzstan (Ebel, 1998). It is very closely related to the recently described *Aphragmus bouffordii* Al-Shehbaz, from which it differs by broader, obovate to narrowly obovate, to 4 mm wide cauline leaves and bracts (vs. linear to narrowly oblanceolate, 1–2 mm wide in *A. bouffordii*). Although this difference is slight it is stable and supported by very disjunct geographical ranges (Altai and Tian-Shan vs. SE Tibet). It can therefore be accepted as sufficient for separating these two species.

In the protologue of *A. bouffordii*, a paratype from E Tian-Shan (vicinity of Tianchi lake) was cited. Although the present authors had no opportunity to study this collection, an examination of other gatherings of *Aphragmus* from different parts of Tian-Shan, including specimens collected around Tianchi lake, shows that the only species of the genus occurring there is *A. involucratus*. Obviously, this cited paratype of *A. bouffordii* must in fact be a specimen of *A. involucratus*, and the misidentification was probably due to an unsatisfactory specimen. The strange giant disjunction (ca. 1500 km) in the assumed distribution area of *A. bouffordii* was emphasized by its author (Al-Shehbaz, 2003). The above evidence removes this uncertainty: *A. bouffordii* is en-

demic to Tibet and should be excluded from the flora of Xinjiang. As for *A. involucratus*, besides Tian-Shan it can be expected in the highest part of the Chinese Altai on the border with Russia or Mongolia.

2. *Dontostemon perennis* C. A. Mey. in Ledeb. Fl. Alt. 3: 121. 1831. Type: In sterilissimis lapidosis deserti editi ad fluvium Tschuja, legit Dr. Bunge, May 1826 (lectotype, LE!, designated by German, 2005, Not. Syst. Pl. Vasc. 37: 239; isolectotypes, HAL!, LE!, M!, P!, W!).

多年生花旗杆

Distribution: NW China, Mongolia, Russia (S Siberia). Sunny slopes, rocks, dry steppes. Alt. 1200–2900 m.

China. Xinjiang (新疆): Hami (哈密), Anonymous s.n. (sunny slope at alt. 1200 m, 1987-06-12; XJU, sub nom. *D. senilis* Maxim.).

Before the publication of the relevant account of Flora of China, the species had been reported for four Chinese provinces (excluding Xinjiang) but none of those records were confirmed by Zhou et al. (2001: 140). However, the species is very common throughout Mongolia and was included in the Flora of China based on the high probability of its occurrence in Nei Mongol and NW China. The present finding confirms the presence of *D. perennis* in the flora of China and also represents a new record for Xinjiang.

3. *Goldbachia torulosa* DC., Reg. Veg. Syst. Nat. 2: 577. 1821. Type: [Cult. in hort. bot. Paris., seeds collected by Michaux in SW Asia]: “in Oriente. Michaux” (G).

念珠四棱芥 新拟

Distribution: Afghanistan, Caucasus, W China, N India, Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkey, Turkmenistan, Uzbekistan. Fields, roadsides, slopes in steppe. Sea level to 3900 m.

China. Xinjiang (新疆): Aksu (阿克苏), Tibet Exped. (西藏队) 3053 (XJBI, sub nom. *Goldbachia laevigata* (Bieb.) DC.); Kashi (喀什) D. A. Divnogorskaya 34 (LE); Wushi (乌什), D. A. Divnogorskaya s.n. (LE); Yengisar (英吉沙), D. A. Divnogorskaya s.n. (LE).

Goldbachia torulosa was first reported in China by Botschantzev (1963: 139) without precise locality as follows: “From Turkey through Transcaucasus and Iran to India and through Middle Asia to Kashgaria” based on the above specimens from LE. *G. torulosa* is closely related to two of the three species of Chinese *Goldbachia* DC., *G. laevigata* (Bieb.) DC. and *Goldbachia pendula* Botsch. and morphologically is somewhat intermediate between them. *G. torulosa* differs from *G. laevigata* (Bieb.) DC. by cauline leaves widest at the middle and with minute auricles at base, and by

sepals glabrous or bearing a few straight simple trichomes (these characters are typical of *G. pendula*). In contrast, *G. laevigata* is characterized by cauline leaves widest at the base (in the auriculate part), and by sepals covered with crisped trichomes. *G. torulosa* is distinguished from *G. pendula* by its horizontal to ascending fruits forming a distinct angle with the pedicels (as in *G. laevigata*); fruits in *G. pendula* are reflexed and form a straight line with the pedicels. The Chinese localities represent the eastern distribution limit of *G. torulosa*, as with *G. laevigata*.

In the same publication, Botschantzev (1963: 143) reported for China one more species of *Goldbachia*, *Goldbachia verrucosa* Kom., as follows: "From Afghanistan through Middle Asia to Chinese Junggar". However, both collections on which that report was based (Ad fl. Koksū, 4000–5000 ft., 1878-5-30; Dolonkara nördl. Borochudschir, 3000 ft., 1878-5-21, *A. Regel s.n.* – LE) originate from Kazakhstan. Thus this species is currently not confirmed in China, although its occurrence in Yili region is quite probable.

4. *Lepidium amplexicaule* Willd. in Sp. Pl. ed. 3: 436. 1800. Type: Siberia, *Stephan s.n.* (B).

毛抱茎独行菜 新拟

Distribution: NW China, Kazakhstan, Mongolia, E Russia (S Siberia). Riverbanks, ditches, roadsides, wastelands, saline meadows, fields, steppe and desert slopes. Alt. 100–2100 m.

China. Gansu (甘肃): Gaotai (高台), G. N. Potanin s. n. (1886-06-25; LE); Jinchang (金昌), M. P. Petrov s. n. (LE). **Nei Mongol** (内蒙古): Alxa (阿拉善), S. S. Chetyrkin s. n. (LE). **Sichuan** (四川): Martin s. n. (LE). **Xinjiang** (新疆): Barkol (巴里坤), Steppe 2nd Team (草原二队) 586 (XJBI), Anonymous 87-00373, 87-00054 and 87-208 (XJU, sub nom. *L. latifolium*); Hami (哈密), Anonymous 1512 (XJBI, sub nom. *L. latifolium* L.), K. C. Kuan (关克俭) 456 (XJBI, sub nom. *Lepidium latifolium* var. *affine* (Ledeb.) C. A. Mey.); Kashi (喀什), D. A. Divnogorskaya s. n. (1909-07-13; LE), O. E. Knorring 965 (LE); Turpan (吐鲁番), Anonymous 2103 (XJBI), Anonymous 5 (XJU, sub nom. *L. latifolium*); Yiwu (伊吾), Liu Guo-Jun (刘国均) 1899 (XJBI, sub nom. *L. latifolium* var. *affine*); without precise locality, near Hami, G. N. Potanin s. n. (1886-06-25) (LE).

Lepidium amplexicaule was previously recorded from China at least twice, by Maximowicz (1889: 70) and Thellung (1906: 163, as *L. latifolium* L. subsp. *amplexicaule* (Willd.) Thell.), and both cited voucher specimens (e.g., both authors cited the above collection "G. N. Potanin s. n. 1886-06-25"), but this information has not been used in any Chinese floras. The species be-

longs to the *L. latifolium* group which also includes *Lepidium cordatum* Willd ex Steven, *L. latifolium* and *Lepidium obtusum* Basin., all highly polymorphic and widespread in China. *Lepidium amplexicaule* is closest to and morphologically intermediate between *L. cordatum* and *L. latifolium*. It differs from *L. cordatum* in being green and usually pubescent (not glaucous and glabrous) with subamplexicaul or slightly amplexicaul lower cauline leaves (not deeply cordate-amplexicaul) and elliptic (not ovate or orbiculate) silicles. It can be distinguished from *L. latifolium* by its sessile cauline leaves with at least some amplexicaul or nearly so (vs. none amplexicaul and often attenuate at the base), and a usually not paniculate inflorescence with elongate main and abbreviated lateral branches (vs. paniculate inflorescence with all branches subequally elongate). As shown here, *L. amplexicaule* is rather widely distributed in the (semi)desert of NW China, especially of N Xinjiang.

5. *Neotorularia brevipes* (Kar. & Kir.) Hedge & J. Léonard in Bull. Jard. Bot. Belg. 56(3–4): 393. 1986. — *Malcolmia brevipes* (Kar. & Kir.) Boiss. Fl. Orient. 1: 226. 1867. — *Sisymbrium brevipes* Kar. & Kir. in Bull. Soc. Imp. Nat. Moscou 15: 154. 1842. Type: In fruticetis Songoriae ad fl. Ajagus frequens. 1841. *Karelin & Kiriloff 1234* (lectotype, LE!, designated by Gubanov et al., 1998; isolectotypes, LE!, MW!, P!).

短梗念珠芥

Distribution: Afghanistan, NW China, Kazakhstan, Kyrgyzstan, W Mongolia, Pakistan, Turkmenistan. Sandy, gravely and saline steppes and deserts, slopes. Alt. 200–2400 m.

China. Xinjiang (新疆): Mori (木垒), Anonymous Zao 67 (XJBI, sub nom. *Arabidopsis thaliana* (L.) Heynh.); Qinghe (清河), Xinjiang Exped. (新疆采集队) 10349 (PE, sub nom. *Malcolmia scorpioides* (Bunge) Boiss.); Taxkorgan (塔什库尔干), Anonymous s. n. (1980; XJA); Yining (伊宁), A. Regel s. n. (Prope Kuldscha. 1877-05; LE).

The species was included in the Flora of China based on the single collection cited as: "*Przewalski s. n.*, 2–14 May 1879 (LE)" (Zhou et al., 2001: 185). However, that gathering: "Planitis inter S Altai et Baityk. 2/14 Mai 1879. N. M. Przewalski" (LE!) originates from the Junggar Gobi of W Mongolia and not of China. The double date on its label refers to the same date, Julian 2 May = Gregorian 14 May 1879 (the Julian calendar was widely used in Russia until 1917). That day Przewalski worked between the lake Gashun-Nor and the spring Tsagan-Tunge (Komarov, 1920) in the Gobi between the Mongolian Altai and the Baitag-Bogdo range in Mongolia. Maximowicz (1889: 54) cited this collection as *Mal. brevipes* (Kar. & Kir.) Boiss. However, the species

was not included in any subsequent treatments on the flora of Mongolia until its occurrence in that country was recently confirmed, based on new collections from the same area (Smirnov et al., 2003). Another specimen cited by Maximowicz (l.c.) under the same name *Mal. brevipes* was collected in China ([NE foothills of E Tian-Shan], Kuku-Syrkhe mts., Przewalski 11/23 Mai 1879) but that specimen belongs to another species, *Strigosella brevipes* (Bunge) Botsch. Thus, the single specimen on which the record of *Neo. brevipes* from China was based until now in fact originates from Mongolia. However, occurrence of the species in China is confirmed here, based on the above cited four collections from quite different parts of Xinjiang.

6. *Parrya stenocarpa* Kar. & Kir. in Bull. Soc. Nat. Moscou 15(1): 147. 1842(3 I). — *Neuroloma stenocarpum* (Kar. & Kir.) Botsch. in Bot. Zhurn. (Moscou & Leningrad) 57(6): 673. 1972. — *Achoriphragma stenocarpum* (Kar. & Kir.) Soják in Sborn. Nar. Muz. Praha 1–2: 106. 1982. Type: In rupibus montium Alatau inter fl. Baskan et Sarchan; in glareosis summarum alpium Alatau ad fontes fl. Sarchan. 1841. *Karelin & Kiriloff 1197, 1199* (lectotype, LE!), designated by Botschantzev, 1972, Bot. Zhurn. (Moscou & Leningrad) 57(6): 673; isolectotypes, B!, LE!, M!, MW!, P!, TK!, W!, WU!).

Parrya stenoloma Schrenk in Fisch., Mey. & Avè-Lall., Ind. Sem. Horti Petrop. 8: 69. 1842(25 I). Type: *Parrya stenocarpa* Kar. & Kir. Alpen des Tarbagatai [Schrenk 1841] (Herb. Fischer) (lectotype, LE!), designated by German, in German & Cherneva, 2008, Nov. Syst. Pl. Vasc., 40: 305; isolectotypes, LE!, WU!).

狭条果芥 新拟

Distribution: NW China, Kazakhstan, Kyrgyzstan, Tajikistan. Rocky, gravely, stony and talus slopes, moraines. Alt. 1600–3200 m.

China. Xinjiang (新疆): Hoboksar (和布克赛尔), L. D. Yin (尹立东) 72068 (XJA, sub nom. *P. pulvinata* M. Pop.); Yining (伊宁), A. Regel s. n. (Sarybulak pr. Kuldscha, 4000 ft., 1878-04; LE); A. Regel s. n. (Almatythal pr. Kuldscha, 3–6000 ft., 1878-04-25; LE); Tian-Schan (天山), G. N. Potanin s. n. (Tian-Schan orientalis, declivitas australis ad limitum superiorum sylvarum et altius, 1877-06-11; LE), G. N. Potanin s. n. (Tian-Schan orientalis, declivitas australis ad limitum superiorum sylvarum et altius. 1879-06-05; LE).

Parrya stenocarpa was first reported for China by Maximowicz (1889: 42) based on several gatherings, including the two G. N. Potanin collections cited above. Later it was reported (without localities) by Botschantzev (1972a: 673) for Chinese Junggar. Although some specimens determined by Maximowicz

were later identified as other species, others in fact belong to *Par. stenocarpa* and the recent collection above by Yin Lidong from Saur confirms its occurrence and wider distribution in China.

Parrya stenocarpa is most closely related to *Parrya lancifolia* M. Pop., with which it shares habit, indumentum of glandular and sometimes simple trichomes, black many-headed root, comparatively small caudex not or slightly covered with petiolar remains of leaves from previous years, emarginate petals, and soft, often undivided leaves. *Par. stenocarpa* is distinguished from *Par. lancifolia* by narrower, 2.5–3.5 (vs. 4–6) mm wide fruits with oblong-elliptic (vs. orbicular) seeds margined predominantly distally and proximally (vs. uniformly all round), and at least some leaves incised to pinnatisect (vs. all entire or rarely single ones pinnate-dentate). In the Flora of China, *Par. stenocarpa* was treated as a synonym of *Parrya pinnatifida* Kar. & Kir., but such a treatment cannot be accepted. *Par. pinnatifida* is characterized by a well-developed caudex covered with numerous petiolar leaf remnants, subleathery leaves all or nearly all regularly runcinate-pinnatifid with up to 9 pairs of triangular to oblong-triangular lobes, and fruits (1.5)3–5(6.5) cm long. In contrast, *Par. stenocarpa* has a less developed caudex without or with few petiolar remnants, herbaceous leaves some of which are usually entire or subentire and others incised to pinnatifid with 1–3(4) pairs of oblong to linear lobes, and fruits (5)7–10(12) cm long.

Parrya stenocarpa is distributed in the mountains of Middle Asia (Pamir Alai, Tian-Shan, Tarbagatai, Saur) extending northward to the Altai of Kazakhstan (Vassilyeva, 1961). In Xinjiang (Saur Shan), the probability of finding the local endemic species, *Parrya saurica* (Pachom.) D. German & Al-Shehbaz is also very high. This most probably evolved from hybridization between *Par. lancifolia* and *Par. stenocarpa*.

4 Newly recorded/confirmed species for provinces

1. *Dontostemon integrifolius* (L.) C. A. Mey. in Ledeb. Fl. Alt. 3: 120. 1831. — *Sisymbrium integrifolium* L. Sp. Pl. 2: 660. 1753. Type: [Siberia]. Herb. Linn. No. 836.51 (lectotype, LINN, designated by Ebel in Cafferty & Jarvis, 2002, Taxon 51: 536).

线叶花旗杆

Distribution: China, Mongolia, Russia (E Siberia, Far East). Open grasslands, sandy and gravely slopes, meadows, pastures. Alt. 200–2300 m.

China. Xinjiang (新疆): Barkol (巴里坤), Anonymous 45 (XJBI, sub nom. *D. senilis*), W. J. Roborowski

338 (LE, sub nom. *Torularia glandulosa* (Kar. & Kir.) Vass.); Hami (哈密), Anonymous s. n. (sunny slope at alt. 1100 m, 1987-06-12; XJU, sub nom. *D. senilis*); Yiwu (伊吾), J. S. Li & Z. W. Li (李俊生, 李宅文) 058 (XJA, sub nom. *Dontostemon senilis*); [Eastern Tian-Shan, 东天山], W. J. Roborowski 411 (LE).

The localities cited above in the eastmost part of Eastern Tian-Shan correspond to the SW distribution limit of *D. integrifolius*, as with *Dontostemon perennis*.

2. *Draba zangbeiensis* L. L. Lou in Acta Phytotax. Sin. 25(4): 320. 1987. Type: [China]. Xizang (西藏), Karamiran Shankou (喀拉米兰山口), alt. 5000 m, 1976-07-31, *Gansu Univ. Exped. (甘农大) 118* (holotype, PE!).

藏北葶苈

Distribution: Endemic to China. Alpine slopes. 4100–5000 m.

China. Xinjiang (新疆): Wenquan (温泉), X. W. Zheng (郑新文) 60-038 (XJA, sub nom. *Draba melanopus* Kom.).

Zhou et al. (2001) have suggested that an illustration and description of *Draba melanopus* in the Flora Xinjiangensis (An, 1995: 129, 131) might be based on a plant of *Draba zangbeiensis*; which is confirmed by our study of the specimen cited above.

As for *Draba melanopus*, although no correctly determined specimens of this species were found in the Chinese herbaria, its occurrence in China is confirmed here based on two collections by A. Regel from the Yili region, “Kuldsha, in mont. Kokkamy, 9000 ft., 1878-07” and “Arystyn an d. N Seite d. Kasch, 1879-07-12” (both LE).

3. *Lepidium alashanicum* H. L. Yang in Acta Phytotax. Sin. 19(2): 241. 1981. Type: [China], Nei Mongol, Alxa Zuoqi, 1964-07-04, *Q. Zhang & B. S. Chen 0174* (holotype, LZD; paratype, PE!).

阿拉善独行菜

Distribution: endemic to NW China. Dry gravelly slopes. Alt. 1500–3000 m.

China. Xinjiang (新疆): Tuksun (托克逊), A. Regel s.n. (1500–1800 m, 1879-09-13; LE, sub nom. *Lepidium ruderale*); [Kun-Lun Shan, 昆仑山], V. I. Serpukhov 461 (LE, sub nom. *L. ruderale* L.).

The newly revealed localities of *L. alashanicum* considerably expand its distribution range westward. The species is known as a small plant 4–15 cm tall (Zhou et al., 2001) but the specimen of A. Regel indicates that it can reach 30 cm high.

4. *Sinapis arvensis* L. in Sp. Pl.: 663. 1753. Type: [In agris Europae]. Herb. Linn. No. 845.2” (lectotype, LINN, designated by Jafri, 1973, Fl. West Pakistan 55: 29).

新疆白芥

Distribution: Africa, Eurasia, N America; native to Mediterranean, naturalized elsewhere.

China. Nei Mongol (内蒙古): Manzhouli (满洲里), N. Semenov 181 (LE, sub nom. *Brassica campestris* L.).

Until now, this weedy species was recorded in China only from Xinjiang (Zhou et al., 2001) and thus is a novelty for NE China. It is likely to be found in other regions of the country.

5. *Strigosella brevipes* (Bunge) Botsch. in Bot. Zhurn. (Moscou & Leningrad) 57(9): 1041. 1972. — *Dontostemon brevipes* Bunge in Arb. Naturf. Veg. Riga 1(2): 149. 1847.

Malcolmia karelinii Lipsky in Vid. Medd. Dansk. Nat. Foren Kjöbenhavn 25: 139. 1903. Type: [Auf sterilen Lehmhügeln um Buchara 4 April (florens)]. Reliq. Lehmann. 100. *Dont. brevipes* m. [Bunge]” (lectotype, P!, designated by German in German et al., 2006, Nov. Syst. Pl. Vasc., 38: 292; isolectotypes, P!, LE!).

短梗糙涩芥 新拟

Distribution: Afghanistan, NW China, Iran, Kazakhstan, Kyrgyzstan, W Mongolia, Pakistan, Tajikistan, Turkmenistan, Uzbekistan.

China. Gansu (甘肃): Anonymous F288 (PE, sub nom. *Mal. scorpioides* (Bunge) Boiss.).

This first record of *Strig. brevipes* from Gansu is based on a single collection misidentified as *Strigosella scorpioides* (Bunge) Botsch. (= *Malcolmia scorpioides* (Bunge) Boiss.). Therefore, the occurrence of *Strig. scorpioides* in this province is not confirmed. This conclusion is supported by the fact that all collections seen of *Strig. scorpioides* in China are restricted to NW Xinjiang (Junggar), and that area obviously represents the eastern distribution limit of this species. In contrast, *Strig. brevipes* is more widely distributed in Xinjiang, is known from Nei Mongol (Zhou et al., 2001) and was recently also found in Mongolia (Smirnov et al., 2003).

Although Botschantzev (1972b) provided a sound morphological background for separating the group of Irano-Turanian species from predominantly Mediterranean *Malcolmia* W. T. Aiton and placed them into *Strigosella* Boiss. (糙涩芥属, 新拟), his opinion has been mainly disregarded by subsequent authors. *Strigosella* was accepted as a synonym of *Malcolmia* in all Chinese treatments. However, molecular studies (Warwick et al., 2007) completely support their distinctness; all Chinese species previously assigned to *Malcolmia* belong to the unrelated genus *Strigosella*.

6. *Strigosella hispida* (Litv.) Botsch. in Bot. Zhurn. (Moscou & Leningrad) 57(9): 1041. 1972. — *Malcolmia hispida* Litv. in Trav. Mus. Bot. Acad. Sci.

Pétersb. 1: 37. 1902. Type: [Turkmenistan]. Turcomania. In deserto pr. Ashabad, ad radices montium, 1898-04-20. *D. Litvinov 550* (LE!).

刚毛糙涩芥 新拟

Distribution: W China, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan. Foothills, sandy and stony slopes, wastelands, fields, roadsides. Alt. 350–2000 (3800) m.

China. Xinjiang (新疆): Akto (阿克陶), M. Chaffanjon 207 (Akheur [Akto] – Thibet. [18]95-04-21; P); Gongliu (巩留), Lin Yourun (林有润) 74352 (PE); Yining (伊宁), A. Regel s.n. (Pr. Kuldscha. 1877-05-13; LE).

Although *Strig. hispida* was reported in Flora RPS for three provinces of China including Xinjiang, Zhou et al. (2001) did not confirm any of those reports. Our study confirms that all specimens from Qinghai and Gansu and most from Xinjiang indeed belong to enormously hispid plants of *Strigosella africana* (L.) Botsch. (= *Malcolmia africana* (L.) W. T. Aiton). However, a few collections from the western part of this autonomous region do in fact represent *Strig. hispida*. Based on the collection by A. Regel, *Strig. hispida* was reported by Botschantzev (1972b: 1041) for “China (Junggar)”.

Zhou et al. (2001) reported *Strig. hispida* as a novelty for the flora of Xizang, based on the collection cited above by Chaffanjon. However, the species should be excluded from the flora of Xizang because this single collection was made in fact in Xinjiang. Chaffanjon during his Asian itinerary in 1895 passed from Middle Asia (“Russian Turkestan”) to Mongolia through Xinjiang (Tian-Shan, Junggar, Altai) and did not visit Tibet (Chaffanjon, 1897). The species was collected along the road Akto – Tibet and obviously not far from Akto. This conclusion is in congruence with the ecology of the species, which grows mostly on the plain and in foothills rarely higher than 2000 m; moreover, the time of collection (April) is also impossible for Tibet.

5 Species where occurrence in China is not confirmed

1. *Draba huetii* Boiss. in Diagn. Pl. Orient. ser. 2(5): 31. 1856. Type: In Anatolia ad Beybazar, *Aucher 4058*; In incultis prope Kochaponar. Maio 1853, *Huet s.n.* (syn-types, G, P!).

中亚葶苈

Distribution: Afghanistan, Iran, Kazakhstan, Kyrgyzstan, Russia (SW Siberia), Tajikistan, Turkey, Turkmenistan, Uzbekistan. Steppe slopes. Alt. 500–2300 m.

Draba huetii was reported for China for the first

time in Flora Xinjiangensis from three localities in Tian-Shan (An, 1995: 125). Study of all three collections showed that they represent small samples of *Draba eriopoda* Turcz. ex Ledeb., a related species common in Tian-Shan (Qitai county. Alt. 2500 m, under the *Picea* forest. 1963-07-04. *Anonymous 6174* (XJBI); Fukang county, Bogdo Feng, alpine meadow at alt. 3000 and 3200 m. 1969-06-30. *Anonymous s.n.* (XJU); Ürümqi, grassland at alt. 1200 m. 1981-07. *Anonymous s.n.* (XJU)). The plant pictured in Flora Xinjiangensis (p. 124) as “*Draba huetii*” also clearly represents *Draba eriopoda*. Zhou et al. (2001) neither commented on these misidentifications nor cited any correctly identified specimens of the species from China, and no such specimens have been seen by the present authors. Thus, although the presence of *Draba huetii* in NW Xinjiang is not impossible, its occurrence in China is currently not confirmed.

2. *Eutrema halophilum* (C. A. Mey) Al-Shehbaz & S. I. Warwick in Harvard Pap. Bot. 10(2): 133. 2005. — *Thellungiella halophila* (C. A. Mey.) O. E. Schulz in Engler, Pflanzenreich, 86(4, 105): 253. 1924. — *Sisymbrium halophilum* C. A. Mey. in Ledeb., Fl. Alt. 3: 143. 1831. Type: [Kazakhstan]. 1037. Altai. Legi locis salsis limosis humidis in deserti occidentalioribus trans fluvium Irtysch, sub finem Julii 1826 [C. A. Meyer] (lectotype, LE!, designated by German, 2005, Not. Syst. Pl. Vasc. 37: 239; isolectotypes, LE!, P!).

盐生山菜 新拟

Distribution: endemic to NW and Central Kazakhstan. Saline meadows, banks of salty lakes. Alt. 200–600 m.

Zhou et al. (2001) correctly assigned all previous reports of *Eu. halophilum* from Hebei, Henan, Jiangxi, Nei Mongol, and Shandong (Jilin should be added here too) to *Eutrema salsugineum* (Pall.) Al-Shehbaz & S. I. Warwick (= *T. salsuginea* (Pall.) O. E. Schulz), but reported the species for Xinjiang. However, a detailed study of the morphology and geography of all species previously assigned to *Thellungiella* O. E. Schulz (German, 2002, 2008a) showed that the description of *Eu. halophilum* in the *Flora of China* is based on plants later recognized as a new species, *Thellungiella botschantzevii* D. German (= *Eutrema botschantzevii* (D. German) Al-Shehbaz & S. I. Warwick), distributed in Kazakhstan and neighboring Russia, and that “true” *Eu. halophilum* is confined to Kazakhstan. The eastern limit of its distribution runs along the western foothills of Kazakhstani Altai and Tarbagatai at 81–81.5° E and its occurrence in China is not likely. Indeed, all revised collections of “*Eu. halophilum*” from Xinjiang in fact belong to *Eu. salsugineum* or represent other genera.

One more former member of *Thellungiella*, *Eutrema parvulum* (Schrenk) Al-Shehbaz & S. I. Warwick (= *Thellungiella parvula* (Schrenk) Al-Shehbaz & O'Kane) has a similar distribution in Kazakhstan and is not known to the east of 80–81° E in the Kazakh upland. We had no opportunity to study the specimen(s) on which a report of this species in China was based (Zhou et al., 2001) to confirm the absence of *Eu. parvulum* in the flora of China. However, the biogeographical facts above, along with the lack of any Chinese material of the species in any of the mentioned herbaria, is a strong argument favoring this consideration.

Thus, among three former representatives of *Thellungiella* (merged into *Eutrema* R. Br.: Al-Shehbaz & Warwick, 2005; Warwick et al., 2006a) reported in the Flora of China, only one (*Eu. salsugineum*) is confirmed as definitely occurring in China.

3. Galitzkya spathulata (Steph. ex Willd.) V. Bocz. in Bot. Zhurn. (Moscou & Leningrad) 64(10): 1442. 1979. — *Berteroa spathulata* (Steph. ex Willd.) C. A. Mey. in Ledeb. Fl. Alt. 3: 48. 1831. — *Alyssum spathulatum* Steph. ex Willd. in Sp. Pl. 3: 465. 1800. Type: [In montibus Altaicis Sibiriae], *Stephan s.n.* (lectotype, B!), designated by Cullen & Dudley, 1965, Feddes Repert. 71(1–3): 226, as “holotype”; isolectotype, LE).

匙叶翅籽芥

Distribution: Kazakhstan, Russia (southeast European part, SW Siberia). Dry rocky and gravelly slopes, open hilltops. Alt. 350–1000 m.

The only record of *Gal. spathulata* from China is based on “*Bunge 73*” (Zhou et al., 2001: 64; herbarium acronym was misprinted as F instead of P). The cited specimen (P, photo!) was collected by Alexander Lehmann during his well-known journey in 1841–1842 from Orenburg to Bukhara in NW Kazakhstan (Bunge, 1847: 141, as *Bert. spathulata*). The easternmost collections of this species are from western and central parts of the Zaissan depression and on the northern slope of Tarbagatai in E Kazakhstan. Hence there is some probability of its presence in the adjacent border area of China, but until now this is not confirmed by a single voucher specimen.

4. Pseudoarabidopsis toxophylla (Bieb.) Al-Shehbaz, O'Kane & Price in Novon 9(3): 304. 1999. — *Arabidopsis toxophylla* (Bieb.) N. Busch in Fl. Caucas. Crit. 3(4): 457, 466. 1909. — *Arabis toxophylla* Bieb. in Fl. Taur.-Caucas. 3: 448. 1819. Type: Plantae circa Catherinoslawensem, 1810 (lectotype, LE! designated by Dorofeyev, 1998, Turczaninowia 1(3): 23).

假鼠耳芥

Distribution: SE Europe (E Ukraine), N and Central Kazakhstan, Russia (south European part, SW Siberia). Saline habitats in steppe, gentle gravelly slopes, foothills. Alt. 200–600 m.

Data on the distribution of this steppe species remained highly controversial for a long time, especially regarding the southern and eastern limit of its range. This uncertainty first arose when Busch (1939: 79) stated that the general distribution of the species (as *Arabidopsis toxophylla*) is Afghanistan and W Tibet, although earlier he (Busch, 1926: 422) confined it to present-day Kazakhstan, adjacent parts of Russia and E Ukraine. A revision of all collections of Cruciferae from Central, Middle and SW Asia in LE revealed no specimens on which this strange range expansion could be based. Similarly, no collections confirming the presence of *Pseud. toxophylla* in either Afghanistan or Tibet were found by Hedge (1968: 333–334) or An (1987b: 287). Thus the occurrence of *Pseud. toxophylla* in China was not confirmed at that time.

Nevertheless, the species was soon reported for China again, firstly from a single locality in the vicinity of Hami in Tian-Shan (An, 1995: 146). However, the diagnosis of *Pseud. toxophylla* (= *Arabidopsis toxophylla*) in the *Flora Xinjiangensis* corresponds to another former *Arabidopsis* (DC.) Heynh. species, *Crucihimalaya mollissima* (C. A. Mey.) Al-Shehbaz, O'Kane & Price. The cited specimen, along with all other collections from Xinjiang determined as *Arabidopsis toxophylla* in fact represent *Cruc. mollissima* (Xinjiang, Hami. Sunny slope, alt. 1100 m. 1987-06-12. *Anonymous s.n.* (XJU, photo XJA); Xinjiang, mountains south of Barkol, dry slope. 1961-06-06. *Abdula Kelimu 1852* (XJBI); Xinjiang [without date, collector or number] (XJNM)). This is why *Cruc. mollissima*, which is not rare in NW China, is absent in *Flora Xinjiangensis*.

Finally, Zhou et al. (2001) reported *Pseud. toxophylla* (without localities) for both Xinjiang and Xizang. They provided accurate descriptions of both species and reported *Cruc. mollissima* for Xinjiang, but the above mentioned mistreatments were not noted, nor were any new collections cited confirming the occurrence of *Pseud. toxophylla* in Xinjiang and Xizang. As this last report was based on the previous data that turned out to be wrong, currently the species is not proved to grow in China.

The easternmost known localities of *Pseud. toxophylla* are situated in the western foothills of the Altai and Tarbagatai, and also in the western part of the Zaissan depression in Kazakhstan. The probability of its occurrence in adjacent Xinjiang is rather low and is absolutely impossible for Xizang.

6 Species where occurrence in certain provinces of China is not confirmed

1. *Aphragmus bouffordii* Al-Shehbaz in Harvard Pap. Bot. 8(1): 26. 2003. Type: China. Xizang (Tibet, 西藏): Zogang (左贡), Dongda La (pass), border of Markam and Zogang Xian on highway 318, 29°42'39"N, 98°0'9"E, alt. 5100–5300 m, scree slopes, rocky vegetated slopes and adjacent area at pass, mostly level gravelly areas around pass. 2003-07-16. *D. E. Boufford, S. L. Kelley, R. H. Ree & S. K. Wu* (武素功) 29463 (holotype, GH; isotypes, KUN, MO – photo!).

宽氏寒原芥 新拟

Aphragmus bouffordii is endemic to SE Tibet. It does not occur in Xinjiang because the single gathering from Xinjiang reported as *A. bouffordii* (Al-Shehbaz, 2003) is a specimen of *A. involucratus* (see discussion of *A. bouffordii* above).

2. *Barbarea orthoceras* Ledeb. in Index Sem. Hort. Dorpat.: 2. 1824. Type: Angara (holotype, LE?).

山芥

The occurrence of this species in Xinjiang (An, 1995; Zhou et al., 2001) is not confirmed because all collections from this province are misidentifications of two other species, *Barbarea stricta* and *Barbarea vulgaris* (see discussion of *B. stricta* above).

3. *Lepidium latifolium* L. in Sp. Pl.: 644. 1753. Type: [In Galliae, Angliae umbrosis, succulentis]. Herb. Linn. No. 824.11a (lectotype, designated by Jafri, 1973, Fl. West Pakistan 55: 60, LINN – photo!).

宽叶独行菜

Lepidium latifolium is excluded from the flora of Sichuan (Zhou et al., 2001) because the single collection from that province on which the record was based is a specimen of *Lepidium amplexicaule* (see discussion of *L. amplexicaule* above). In China, *L. latifolium* is predominantly represented by Central/Middle Asian and Siberian subsp. *sibiricum* (Schweigg.) Thell. (= *L. affine* Ledeb.), characterized by cauline leaves gradually narrowed (not attenuate) at base and usually a more compact inflorescence.

4. *Ptilotrichum canescens* (DC.) C. A. Mey. in Ledeb. Fl. Alt. 3: 66. 1831. — *Alyssum canescens* DC. in Reg. Veg. Syst. Nat. 2: 322. 1821. Type: [Altai, *Salessow?*] in rupestribus Sibiriae, Dahuriae et Kamtschatkae (G).

燥原芥

The occurrence of this species in Heilongjiang (An, 1987c; Zhou et al., 2001) and Jilin (Zhou et al., 2001) is not confirmed. All collections of *Ptilotrichum* from

these provinces belong to *Ptilotrichum dahuricum* (see discussion of *Ptilotrichum dahuricum* above).

5. *Strigosella hispida* (Litv.) Botsch.

刚毛糙涩芥

The occurrence of this species in Xizang (Zhou et al., 2001) is not confirmed. The single collection on which a record for Xizang was based originates in fact from Xinjiang (see discussion of the species above).

6. *Strigosella scorpioides* (Bunge) Botsch. in Bot. Zhurn. (Moscou & Leningrad) 57(9): 1041. 1972. — *Dontostemon scorpioides* Bunge in Arb. Naturf. Veg. Riga 1(2): 150. 1847. Type: Steppen um Kuwan-Darja 7 Mai [18]42 (Reliquiae Lehmannianae. Herb. Al. de Bunge) [fl., fr. submat.] (lectotype, P!, designated by German in German et al., 2006, Nov. Syst. Pl. Vasc., 38: 295).

卷果糙涩芥 新拟

The occurrence of this species in Gansu (Zhou et al., 2001) is not confirmed. The single collection on which a record for Gansu was based is in fact a specimen of *Strigosella brevipes* (see discussion of *Strigosella brevipes* above).

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