

Short Communication

Erysimum kamelinii, a new species from Middle Asia, and further additions to Polatschek's revision of the genus *Erysimum* (Cruciferae), part 1

D.A. German*

Abstract

Miscellaneous updates to the first part of the world-wide treatment of *Erysimum* (Cruciferae) by A. Polatschek are presented. Additional information on synonymy of several taxa is provided along with the distinguishing characters of some species which taxonomical status was questioned. Contribution also includes the description of a new species, *E. kamelinii*, and correction of distribution of several taxa.

Key Words: Flora of Asia, flora of former USSR; *Cruciferae*, *Erysimum*; taxonomy.

Introduction

Polatschek's revision of the genus *Erysimum* (POLATSCHEK 2010) is an important step forward in the taxonomy of this difficult genus, obtaining new data on nomenclature, diversity, and karyology of many taxa, as well as clarifying confusing names. As inevitably in such a broad-scale treatment, it may happen that publications in narrow spread journals did not come to the knowledge of the author and not all collections, including type material of certain taxa, were accessible for his revision. Therefore some additions and clarifications are reported here.

Results and discussion

The title should be extended. Mongolia, Nepal and Bhutan are omitted both in the title and in the summary. However, none of these countries are of the former Soviet Republics, nor are they parts of any other mentioned state, but they all are treated in the revision.

Updates to the contents can be split onto three basic parts: 1) geography; 2) synonymy; and 3) species delimitation.

1. Geography

The problems are revealed in **geographical attribution of specimens** which sometimes distorts information on the general distribution of taxa. Most often the case is the attribu-

* Dmitry A. German, Centre for Organismal Studies, Heidelberg University, Im Neuenheimer Feld 345, 69120 Heidelberg, Germany; & South-Siberian Botanical Garden, Altai State University, Lenina Str. 61, 656049 Barnaul, Russia

tion of collections of A.G. Schrenk, I.P. Kirilov and G.S. Karelin to China instead of Kazakhstan. In fact, Schrenk spent the major part of his expeditions in the present-day Kazakhstan and only slightly touched China in the higher part of Dzungarian Alatau and the southern foothills and slope of the Tarbagatai (LIPSKY 1903); his collections from China are scarce and are usually supplied with precise information while labels of incomparably more numerous collections from Kazakhstan duplicates of which are now deposited in various herbaria worldwide are often reduced to just "Songaria. Schrenk". In other cases precise localities are given, none of them are from China; in general, none of the cited specimens of Schrenk is from China. Karelin and Kirilov did not reach China at all. This applies also to some other collections (of C.A. Meyer, C.F. Ledebour, A.A. Bunge, A. Lehmann, Politow, etc.). As a result, most or even all cited specimens reported for the certain states were in fact collected elsewhere: *E. leucanthemum* (STEPH. ex WILLD.) B. FEDTSCH. – all specimens reported for China and Mongolia are from Kazakhstan; *E. sisymbrioides* C.A. MEY., China and Russia – actually Kazakhstan; *E. perofskianum* FISCH. & MEY., Mongolia – one of the two cited specimens is from China, the second, "Mongolia austr.", obviously from Inner Mongolia, i. e. also from China; I personally revised all Mongolian material on the family in LE and MW, where the most abundant collections on Mongolia are deposited, and not a single specimen of *E. perofskianum* was found; for the species reported under the name *E. vitellinum* M. POP. (see below), China – actually Kazakhstan; *E. czernjajevii* N. BUSCH, China – actually Kazakhstan; "*E. alaicum*" (*E. kamelinii* D. GERMAN, see below), China – actually Kazakhstan; *E. ledebourii* D. GERMAN, Russia – actually Kazakhstan. While most of these species are known from relevant countries based on other gatherings, for *E. leucanthemum* and *E. perofskianum* this would mean their first records from China and Mongolia (prior) and Mongolia (latter), but in both cases this cannot be confirmed as well as the occurrence of *E. siliculosum* (M. BIEB.) DC. in Mongolia. Obviously, the single reports of predominantly Arctic *E. redowskii* WEINM. and North-East Asian/North American *E. boreale* (C.A. MEY ex RUPR.) C.A. MEY. ex TRAUTV. for Altai are occasional mistakes. The problem of an actual distribution area of *E. vassilczenkoi* POLATSCHEK (there are strong evidences that it is endemic to North-West China and not to Kazakhstan) has been debated recently (GERMAN 2005).

My revision of relevant collections in LE and MW also confirms, in agreement with previous reports (ADYLOV 1974, YUNUSSOV 1978, GERMAN 2004), the occurrence of some species in certain countries. These are: *E. gypsaceum* BOTSCH. et VVED. and *E. violascens* M. POP. – also Tajikistan; *E. alaicum* NOVOPOKR. ex E. NIKIT. – Tajikistan and Kyrgyzstan (the latter is described from Kyrgyzstan and not from Kazakhstan); *E. czernjajevii* – Kyrgyzstan; and *E. samarkandicum* M. POP. – Uzbekistan.

Besides, the **spelling of localities** is not always accurate. It is often difficult to read the locality correct especially as many labels are written in Cyrillic and by hand. An important case is the type locality of *E. vassilczenkoi* mentioned as "Golanbij. Kul-Kumblis", but correct is "Blandy-Kul-Kum". *Erysimum humillimum* (C.A. MEY.) N. BUSCH was described from Altai and not from vicinities of the lake Baikal.

2. Synonymy.

Some names are absent in the work though they were either widely used in relevant literature, or even validated based on material from the territory in question:

Erysimum canum (PILL. et MITT.) POLATSCHKEK is being widely applied (usually as *Syrenia cana* (PILL. et MITT.) NEILR.) in floristic treatments on Kazakhstan, Russia, and Ukraine (e.g. ADYLOV 1974, KOTOV 1979, DOROFYEV 2002, ILJINSKA & al. 2007; and references therein); a similar concept is adopted in JALAS & SUOMINEN (1994) and previous European treatments. Based on the assignment of the closest taxon, *S. talijevii* KLOK., to synonymy of *E. quadrangulum* (L'HERITIER) DESF., it can be admitted that the same is meant for previous reports of *E. canum* from the discussed area.

Other names of the species rank are not mentioned in the work (except homotypic synonyms which can be found elsewhere), are:

Erysimum brevifolium Z.X. AN (in Fl. Xinjiangensis, 2(2): 379. 1995) = *E. cheiranthoides* L. subsp. *transiliense* (M. POP.) D. GERMAN (GERMAN 2008);

E. esepatum Z.X. AN (l. c.: 379) = *E. hieraciifolium* sensu ZHOU & al. (2001) and because of having short appressed fruits it can be assigned to *E. marschallianum* ANDRZ. ex M. BIEB.;

Syrenia aucta KLOK. (in Fl. UkrSSR 5: 505. 1953) = *E. quadrangulum* (KOTOV 1979, as *S. montana* (PALL.) KLOK.);

S. dolichostylos KLOK. (l. c.: 505) = *E. quadrangulum* (KOTOV l. c., as *S. montana*);

S. praevisa KLOK. (l. c.: 504) ~ *E. quadrangulum*; and

S. ucrainica KLOK. (l. c.: 504) = *E. canum* auct. plur. ross. et sovj. (KOTOV l. c., as *S. cana*) – correct name needs clarification.

3. Species delimitation.

Species delimitation is the most subjective matter and experts are free to accept broader or narrower concepts unless they are limited by outer requirements (e.g. project strategy, editorial approach, etc.). Therefore, I do not intend to criticize the author in this respect. Instead, I would give few samples below showing how some species reduced to synonymy in the discussed treatment can be separated if an alternative viewpoint is adopted. This concerns the taxa given under the accepted names *Erysimum cyaneum* M. POP., *E. quadrangulum*, *E. violascens*, *E. virgatum* ROTH and *E. vitellinum*. These samples are only given to demonstrate that taxonomy of the genus within the outlined area is not yet fully resolved.

Erysimum cyaneum:

- | | | |
|----|--|-------------------------------------|
| 1 | Plant perennial. Petals 11–12 mm long, yellow (claw sometimes becoming violet upon drying). Pedicels and fruits erect, (sub)appressed to rachis. Style 3–4 mm long. North-West Pamir-Alai (South Uzbekistan) | <i>E. jodonyx</i> BOTSCH. & VVED. |
| 1* | Plant biennial. Petals 13–16 mm long, orange or violet. Pedicels and fruits divaricate-ascending. Style to 1 mm long. West Tian-Shan (North-East Uzbekistan, Kyrgyzstan) | 2 |
| 2 | Petals ca. 13 mm long, orange. Plant to 25 cm high | <i>E. tianschanicum</i> POLATSCHKEK |
| 2* | Petals 14–16 mm long, violet. Plant to 85 cm high | <i>E. cyaneum</i> |

Erysimum quadrangulum (*E. canum* which is absent in synonymy is also treated because of the argumentation given above):

- 1 Seeds uniseriate, unilaterally margined. Fruits narrowly linear, without style 3.5–6.8 cm long, slightly latiseptate. Style 1.5–2 mm long. Anthers pubescent with 2–3-fid trichomes. Admixture of 3-rayed trichomes on leaves conspicuous *E. ucranicum* J. GAY
- 1* Seeds biseriate, not margined. Fruits oblong to narrowly linear, without style 0.5–3.9 cm long, not compressed or slightly angustiseptate. Style 3–12 mm long. Anthers glabrous. Admixture of 3-rayed trichomes on leaves inconspicuous 2
- 2 Valve surfaces greyish because of not very dense cover of a mixture of 2-partite trichomes of different (transversal to longitudinal) orientation and usually considerable admixture of 3-, rarely also 4-partite trichomes. Middle and upper belt of south-western part of Altai mts. *E. kotuchovii* D. GERMAN
- 2* Valve surfaces silvery canescent because of very dense cover of exclusively transversely oriented 2-fid trichomes with usually inconspicuous admixture of 3-fid trichomes. Steppe on the plain and in foothills within western part of Eurasian steppe belt 3
- 3 Fruits oblong to oblong-linear, angustiseptate and slightly winged (wing to 0.5 mm wide), without styles 6–12 mm long; styles subaequaling fruits. Leaves linear, greenish-grey *E. quadrangulum*
- 3* Fruits predominantly linear to narrowly linear, square in cross section, prominently veined but not winged, without styles (5–) 10–35 mm long; styles half of the fruit length or shorter. Leaves narrowly linear, grey 4
- 4 Fruits without styles (5–) 10–25 × 1.5–2.5 mm, abruptly narrowed to style. Pedicels 2 (–3) mm long. Predominantly sandy steppe in Ukraine, North-West Kazakhstan and European Russia (to south-westmost Siberia) *E. canum* auct. plur. ross. et sovj.
- 4* Fruits without styles 15–35 × 1.2–1.5 mm, gradually narrowed to style. Pedicels 2–5 mm long. Endemic to cretaceous slopes of Seversky Donetz basin (East Ukraine and adjacent Russia) *E. talijevii* KLOK.

***Erysimum violascens*:**

- 1 Petals 10–11 mm long. Pedicels as thick as fruits. Fruits 2.5–3 cm x ca. 1 mm, appressed to rachis *E. nuratense* M. POP. ex BOTSCH. & VVED.
- 1* Petals 13–17 mm long. Pedicels narrower than fruits. Fruits 1.5–7 cm x ca. 1.5 mm, strongly divaricate *E. violascens*

***Erysimum virgatum*:**

- 1 Pedicels exceeding sepals, in fruit strongly, almost horizontally divaricate. Petals 3–5 (–6.5) mm long. Fruits acute-tetragonal in cross section. Valves densely pubescent from the inside *E. cheiranthoides* subsp. *transiliense*
- 1* Pedicels shorter than sepals, in fruit ascending to appressed. Petals 8–13.5 mm long. Fruits terete-tetragonal in cross section. Valves glabrous or sparsely to moderately pubescent from the inside 2
- 2 Petals yellow, with obovate to oblong-obovate limb. Fruits 3–5.5 cm long. Seeds ca. 1 mm long. Xeromesic habitats of temperate Eurasia and North America *E. virgatum*
- 2* Petals orange, with broadly obovate to round limb. Fruits 3.5–8.5 cm long. Seeds ca. 2 mm long. Coniferous forest belt of North Tian-Shan *E. croceum* M. POP.

Erysimum vitellinum (as soon as many specimens reported under this name represent *E. diffusum* EHRH. s. l., the latter species is also included into the key; in relevant literature it is often treated as *E. canescens* ROTH):

- 1 Fruits smooth, sharply 4-angled, with silvery canescent surfaces divided by (sub) glabrous bright-green stripes representing replum margins and valve midveins. Petals pubescent outside. Plants usually 50–100 cm tall. Central and East Europe through Kazakhstan and Middle Asia to North-West China, Mongolia and South-East Siberia *E. diffusum* s. 1.
- 1* Fruits somewhat torulose, terete or terete-4-angled, uniformly pubescent. Petals glabrous. Plants 10–40 cm tall. Central and South Kazakhstan and adjacent Uzbekistan 2
- 2 Stems usually branched. Siliques greyish canescent with exclusively malpighiaceus trichomes. Kazakh upland (Central Kazakhstan)
..... *E. kazakhstanicum* BOTSCH. (incl. *E. grubovii* BOTSCH.)
- 2* Stems usually simple. Siliques greenish, moderately covered with 2–3 (–4)-fid trichomes. West Tian-Shan (South Kazakhstan and North-East Uzbekistan)
..... *E. vitellinum*

Similarly, the group of *E. gypsaceum* BOTSCH. & VVED. can be split, where, for example, *E. michaelis* ADYL. is distinct in having terete (vs. 4-angled) siliques with a style to 4 mm long (vs. reduced or to 1 mm). However, this group needs further study and definitely some synonyms proposed by Polatschek should be accepted as such.

Another critical taxon is *E. alaicum* whose concept is clarified below:

- 1 Plant biennial or short-leaved perennial, (15–) 30–50 (–80) cm tall, not or slightly caespitose, caudex absent or inconspicuous. Stems erect, simple or branched. Leaves bright green, (3–) 4–15 mm wide, lanceolate to linear-lanceolate basal often narrowly obovate, not folded. Petals orange, glabrous or along with anthers pubescent. Fruits subappressed to rachis. Style 0.7–1.5 mm long. Pamir-Alai (Kyrgyzstan and Tajikistan) *E. alaicum*
- 1* Plant perennial, (5–) 10–25 cm tall, distinctly caespitose, with well-developed caudex. Stems erect or ascending, simple. Leaves green or green-greyish, 1–3 (–5) mm wide, all narrowly linear to linear or linear-oblongate, ±folded. Petals yellow, glabrous as well as the anthers. Fruits ascending to divaricate-ascending, rarely suberect. Style 1.5–5 mm long. Tarbagatai, Tian-Shan, Pamir-Alai (China, Kazakhstan, Kyrgyzstan and Tajikistan) *E. kamelinii*

Erysimum kamelinii D. GERMAN, sp.n.

Type: [Kazakhstan, Almaty province, Dzungarian Alatau:] Dshabyk, Gerölle, Abhänge, [fl., fr. immat.], 20 Julii 1841, A. Schrenk [LE, isotypes AA, LE].

Paratype: Kazakhstan, Zhambyl province, North Tian-Shan, Kirghis Alatau, northern slope, basin of Merke, valley of its upper tributary Kumbel, ca. 3000 m a.s.l., talus slope, [fl., fr. immat.,] 17 July 2010, D.A. & E.L. German, D.L. Belkin, M.V. Skaptzov, P.V. Veselova, PWTk 35 [AA, ALTB].

Description: Perennial caespitose herb (5–) 10–20 (–25) cm tall. Caudex distinct, branched; stems erect, ascending or prostrate-ascending, simple, (2–) 3–8 (–25) from the base. All parts of plant, except for petals and stamens, densely pubescent with malpighiaceus trichomes, often with an inconsiderable admixture of 3-fid ones on leaves, pedicels, sepals and fruits. Leaves 10–70 × 1–3 (–5) mm, narrowly linear to linear-oblongate, integerrime, grooved adaxially, subacute to obtusate; basal numerous, at-

tenuated into a long petiole; cauline (3–) 5–12, lowermost short petiolate, others sessile. Racemes (3–) 6–15 (–20)-flowered, initially corymbose, moderately elongated by anthesis. Pedicels divaricate to ascending, in flower 2–3 mm, in fruit (2–) 3–5 (–7) mm long, stout, narrower than fruit, straight. Sepals linear-lanceolate, (5–) 7–11 × 1.5–2.5 mm, pale-yellow throughout or violet-hinted distally. Petals yellow, with linear claw subaequaling or slightly exceeding sepals and broadly obovate blade, (10–) 12–16 (–18) × (3–) 4–6 mm, glabrous, apex rounded. Fruits (20–) 25–45 (–60) × 1.5–2 mm, terete-quadrangular, sometimes inconspicuously lati- or angustiseptate, straight or somewhat curved upward, torulose. Style distinctly narrower than fruit, (1,5–) 2–4 (–5) mm long. Seeds (16–) 20–40 (–50) per fruit, oblong or oblong-elliptic, brown, 1.6–2 × 0.8–1.2 mm.

Erysimum kamelinii is most closely related to *E. altaicum* C.A. MEY., and especially reminds the high mountain xerophytic form of the latter, *E. altaicum* var. *humillimum* C.A. MEY., which is sometimes treated as a distinct species, *E. humillimum*. *Erysimum kamelinii* differs from *E. altaicum* (incl. *E. humillimum*) in being caespitose long-leaved perennial with well-developed, often many-branched caudex, erect to prostrate-ascending stems to 25 cm long and a style which is often (especially in the northern part of distribution area) much longer (to 5 mm) than in *E. altaicum*. The latter species is not or slightly caespitose biennial to perennial but with less developed caudex, erect stems to 60 cm long, and style 0,5–2 mm long. Such features as occasional stem branching and wider range of fruit length ((3–) 4–8 (–10) cm) with proportionally higher number of seeds in *E. altaicum* could be used as additional characters for distinguishing the species.

Erysimum kamelinii occupies open stony and gravelly habitats in the highest portion of steppe belt and probably meets ecological optimum on talus and gravelly slopes where it can be very common providing a yellow aspect when flowering. Being confined to the Middle Asian region, it is geographically separated from the predominantly South Siberian/Mongolian *E. altaicum*.

The idea to distinguish the two entities, Siberian and Middle Asian, is not new: in fact, the true *E. humillimum* is traditionally not accepted as a distinct species in Siberia (e.g. KRYLOV 1931, POLOZHJI 1979, DORONKIN 1994) while it is treated as such in the Middle Asia (e.g. ADYLOV 1974, YUNUSSOV 1978; and references therein). Earlier, POPOV (1940) applied for the plants from that region the name “*E. tianschanicum*” (nom. nud.). EBEL (2000: 28) emphasized that “reports of *E. humillimum* from Middle Asia probably refer to another taxon” though no taxonomical actions were undertaken because of paucity of distinguishing characters. POLATSCHEK (2010) apparently came to the same conclusion but application of the name *E. altaicum*, as evident from the above key, is impossible for the discussed taxon. Reports of *E. altaicum* for Afghanistan and Pakistan (POLATSCHEK l.c.) should be also referred to *E. kamelinii*.

The species is named after Rudolph Vladimirovich Kamelin, a famous investigator of and expert in the flora and vegetation of Middle and Central Asia.

Acknowledgements

Visits of the author to LE and MW were financially supported by the Russian Foundation for Basic Research (project 11-04-90702). The curators of these and other mentioned herbaria are thanked for providing the opportunity of studying the material. I am also grateful to Nadezhda A. Usik and Alexander P. Shalimov for help with specimens from ALTB. Field works in Kazakhstan which enabled the observation in nature of

some species including the newly described one were supplied by the National Geographic Foundation of U.S.A. (project 8773-10). The editorial help of Ernst Vitek is much appreciated.

Literature

- ADYLOV T.A., 1974: *Erysimum* L., *Syrenia* ANDRZ. – In: VVEDENSKY A.I. & PACHOMOVA M.G. (eds.): *Conspectus florum Asiae Mediae* 4: 69–80. – Tashkent: Academiae Scientiarum UzSSR.
- DOROFYEV V.I., 2002: Cruciferae of European Russia. – *Turczaninowia* 5/3: 5–114. DORONKIN V.M., 1994: *Erysimum* L. – In: MALYSHEV L.I. & PESCHKOVA G.A. (eds.), *Flora of Siberia* 7: 66–70. – Science Press, Novosibirsk.
- EBEL A.L., 2000: Notes on taxonomy and geography of Brassicaceae of Altai flora. – *Turczaninowia* 3/3: 18–43.
- GERMAN D.A., 2004: New taxa of the genus *Erysimum* L. (Cruciferae) from the Kazakhstaniai Altai. – *Turczaninowia* 7/2: 14–18.
- GERMAN D.A., 2005: *Erysimum mongolicum*, a new species from Mongolia, and notes on *E. vassilczenkoi* and *E. kotuchovii* (Brassicaceae). – *Willdenowia* 35 (2): 305–313.
- GERMAN D.A., 2008: Six new synonyms in the central Asian Cruciferae (Brassicaceae). – *Nordic J. Bot.* 26 (1–2): 38–40.
- ILJINSKA A., DIDUKH YA., BURDA R. & KOROTCHENKO I., 2007: Brassicaceae Burnett (Cruciferae Juss.). – In: DIDUKH YA. (ed.): *Ecoflora of Ukraine* 5: 7–538. – Kyiv: Phytosociocentre.
- JALAS J. & SUOMINEN J. (eds.), 1994: *Atlas Florae Europaeae* 10: Cruciferae (*Sisymbrium* to *Aubrieta*). – Helsinki: University Printing House.
- KOTOV M.I., 1979: Brassicaceae (Cruciferae). – In: FEDOROV AN.A. & GUSEV YU.D. (eds.): *Flora partis Europaeae URSS* 4: 30–148. – Leningrad: Science Press.
- KRYLOV P.N., 1931: *Flora of West Siberia* 6: 1229–1448. – Tomsk.
- LIPSKY V.I., 1903: *Flora Asiae Mediae. Pars II. Historia florum exploratae*, pp. 249–337. – Gerold: St. Petersburg.
- POLATSCHKEK A., 2010: Revision der Gattung *Erysimum* (Cruciferae): Teil 1: Russland, die Nachfolgestaaten der USSR (excl. Georgien, Armenien, Azerbaidzan), China, Indien, Pakistan, Japan und Korea. – *Ann. Naturhist. Mus. Wien, B*, 111: 181–275.
- POLOZHJ A.V., 1979: To the study of *Erysimum* sect. *Altaicae* N. Busch in Siberia. – *Animadv. Syst. Herb. Univ. Tomsk.* 86: 1–3.
- POPOV M.G., 1940: Flora of Alma-Ata state reserve. – In: *Proceedings of Alma-Ata state reserve* 3: 1–50. – Alma-Ata.
- YUNUSOV S.YU., 1978: *Erysimum* L. – In: OVCZINNIKOV P.N. (ed.): *Flora of Tajik SSR.* 5: 60–69. – Leningrad: Science Press.
- ZHOU T.Y., LU L.L., YANG G., DOROFYEV V.I. & AL-SHEHBAZ I.A., 2001: *Erysimum* Linnaeus. – In: WU Z.G. & RAVEN P.H. (eds.): *Flora of China.* – 8 (Brassicaceae through Saxifragaceae): 163–169. – Beijing: Science Press, and St. Louis: Missouri Botanical Garden Press.