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Critical notes on Cruciferae

D. A. German

Altai State University, Lenin Ave., 61, Barnaul, 656049, Russia
E-mail: oreoloma@rambler.ru; ORCID iD: 0000-0001-7951-1644

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Summary. Generic name *Mutarda* is applied instead of the recently reinstated *Rhamphospermum*; the latter is lectotypified and synonymized with the prior, and the combinations *M. allionii*, *M. arvensis*, *M. carinata* along with *Ceratocnemum* × *mirabile* are validated. *Calepina irregularis* var. *pinnatifida*, neotypified *Erysimum minus* and *Tetracme glochidiata* are found conspecific with *Rorippa barbareifolia*, *Barbarea bracteosa* and *Tetracme bucharica*, respectively. *Lepidium culminicola* is recognized as *Noccaea rubescens* subsp. *culminicola*, comb. et stat. novi. *Klukia* Andrz. ex Bess., a synonym of *Sisymbrium* L., is shown to be validly published in 1822 thus threatening the homonymic name-in-use *Klukia* Racib. (fossil Schizaeaceae).

Критические заметки о крестоцветных (Cruciferae)

Д. А. Герман

Алтайский государственный университет, просп. Ленина, д. 61, г. Барнаул, 656049, Россия

Ключевые слова: номенклатура, приоритет, синонимика, систематика, типификация, *Barbarea*, Brassicaceae, *Klukia*, *Mutarda*, *Noccaea*, *Rhamphospermum*, *Rorippa*, *Sisymbrium*, *Tetracme*, *Velarum*.

Аннотация. Для недавно восстановленного рода *Rhamphospermum* принято приоритетное название *Mutarda*; обнародованы комбинации *M. allionii*, *M. arvensis*, *M. carinata*, а также *Ceratocnemum* × *mirabile*. Установлена конспецифичность *Calepina irregularis* var. *pinnatifida*, *Erysimum minus* и *Tetracme glochidiata*, соответственно, с *Rorippa barbareifolia*, *Barbarea bracteosa* и *Tetracme bucharica*. Для *Lepidium culminicola* предложен новый статус и родовая принадлежность – *Noccaea rubescens* subsp. *culminicola*, comb. et stat. novi. Показано, что забытое и почти никогда не использовавшееся родовое название *Klukia* Andrz. ex Bess., являющееся синонимом *Sisymbrium* L., действительно обнародовано в 1822 г. и имеет приоритет над находящимся в употреблении омонимом *Klukia* Racib., относящимся к ископаемому роду схизейных папоротников (Schizaeaceae). Название *Rhamphospermum* лектотипифицировано, а для *Erysimum minus* обозначен неотип.

Treatment of additional Cruciferae Juss. (Brassicaceae Burnett) collections and analysis of relevant literature sources enabled making further contribution to the taxonomy and nomenclature of certain representatives of the family, viz. establishing new synonyms, unravelling the case of homonymy leading to illegitimacy of the name being in use, proposing new combinations and type designations reported below.

Material and methods

Specimens were studied in BM, LE and TASH; some of them in addition and those from G and MPU – as images online accessible via the portals/databases CHG [2022]; Global Plants (2022); RECOLNAT [2022]; MNHN, Chagnoux (2022); NHM (2014); GBIF [2022]. Nomenclatural issues were treated following the Shenzhen edition of the Inter-

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national Code of Nomenclature… (Turland et al., 2018).

In typification of *Erysimum minus* Mill., approaches of works dealing with Miller's names (Reveal, 1991; Giacò et al., 2021) were considered.

Taxonomy

1. *Mutarda* vs. *Rhamphospermum*

When making a step in the direction of a long-awaited improving the generic assignment in *Brassiceae* DC., the most problematic tribe in this respect in the family, Al-Shehbaz (2021) proposed several adjustments including reinstatement of *Rhamphospermum* Andrz. and a transfer of several species into the latter genus, including *Sinapis nigra* L. [*Brassica nigra* (L.) W. D. J. Koch]. Despite my full support of this trend, a couple of critical notes may be put forward. First, some of the species placed into the expanded *Rhamphospermum* (*Sinapis pubescens* L. and *Trachystoma labasii* Maire) exhibit contrasting positions in cp and nr phylogenies (Arias, Pires, 2012; Koch, Lemmel, 2019). This seems to indicate their more complex relationship to the group in question and the need of further elucidation of generic placement of these species. Second, *Sinapis nigra* is the type of *Mutarda* Bernh. (Bernhardi, 1800: 184), a 22-years old name compared to *Rhamphospermum*. The following nomenclatural changes are therefore proposed.

Mutarda Bernh., 1800, Syst. Verz. Erfurt: 184.

Typus: *M. nigra* (L.) Bernh., 1800, Syst. Verz. Erfurt: 197.

= *Rhamphospermum* Andrz., 1822, in Bess., Pl. Volhyn.: 83, **syn. nov.**

Lectotypus (hic designatus): *Rh. arvense* (L.) Bess.

Mutarda allionii (Jacq.) D. A. German, **comb. nov.** ≡ *Sinapis allionii* Jacq., 1772, Hort. Bot. Vindob. 2: 79, tab. 168. ≡ *Brassica allionii* (Jacq.) Boiss., 1842, Ann. Sci. Nat. Bot., sér. 2, 17: 71. ≡ *Sinapis arvensis* subsp. *allionii* (Jacq.) Baillarg., 1985, Willdenowia 15(1): 69.

Mutarda arvensis (L.) D. A. German, **comb. nov.** ≡ *Sinapis arvensis* L., 1753, Sp. Pl. 2: 668. ≡ *Raphanus arvensis* (L.) Crantz, 1769, Class. Crucif. Emend.: 109. ≡ *Rhamphospermum arvense* (L.) Bess., 1822, Enum. Pl. Volhyn.: 83, 104. ≡ *Sinapistrum arvense* (L.) Spach, 1838, Hist. Nat. Vég. 6: 345. ≡ *Brassica arvensis* (L.) Rabenh., 1839, Fl. Lusit. 1: 184 (non L., 1767). ≡ *B. sinapistrum* Boiss., 1839, Voy. Bot. Espagne 2: 39. ≡ *Agrosinapis arvensis* (L.) Fourr., 1868, Ann. Soc. Linn. Lyon, ser. 2, 16: 329.

Mutarda carinata (A. Braun) D. A. German, **comb. nov.** ≡ *Brassica carinata* A. Braun, 1841, Flora 24(1): 267. ≡ *B. integrifolia* var. *carinata* (A. Braun) O. E. Schulz, 1919, in Engler, Pflanzenreich IV, 105 (Heft 70): 58.

Further generic synonyms are given by Al-Shehbaz (2021).

Alternative option might be recognition of both *Mutarda* and *Rhamphospermum*, which can be readily separated based on the fruit characters, but a more detailed study resolving fine relationships within this monophyletic group is needed for making a decision on which approach is better.

Unlike *Sinapis pubescens* and *Trachystoma labasii*, taxonomic position of *Trachycnemum* × *mirabile* Maire et Sam. is clear enough. Al-Shehbaz (l. c.) implicitly synonymized *Trachycnemum* Maire et Sam. with *Ceratocnemum* Coss. et Balansa but refrained from transferring its only member to the latter genus. It is done here to make the name available for use: ***Ceratocnemum* × *mirabile*** (Maire et Sam.) D. A. German, **comb. nov.** ≡ *Trachycnemum* × *mirabile* Maire et Sam., 1939, Ark. Bot. 29A(11): 9.

Some nomenclatural details concerning *Rhamphospermum* might also be noteworthy. The authorship of this generic name is usually cited as "Andrz. ex Bess.", but in the protologue both the name itself and the validating description are accompanied by the indication "Andrz." (Besser, 1822: 83), i. e. unambiguously ascribed to Andrzejowski who is, consequently, the sole author of the name (Turland et al., 2018: Art. 46.2). By contrast, none of the two proposed combinations, *Rh. arvense* and *Rh. orientale* (Besser, l. c.: 83, 104), is supplied with an author indication meaning that Note l of Art. 46.1 applies, i. e. both are authored by Besser. Since none of them is designated as type in the original publication (cf. Rollins, 1979) and the only subsequent such indication (mentioning *R. arvense* by Al-Shehbaz, l. c.) is not valid under Art. 9.23, *Rhamphospermum* is lectotypified here.

Similar case, although with automatic typification, is evidently demonstrated by *Guenthera* Andrz. and *G. elongata* (Ehrh.) Bess., established in the same work. One more genus also validated in Besser's (1822) "Enumeratio…", is worth separate mention.

2. *Klukia*

This name as referring to the genus of Cruciferae, usually as "*Klukia* Andrz. ex DC." or "*Klukia* Andrz. in DC.", can rarely be seen in the literature and nearly never as an accepted one. It is listed among synonyms of *Malcolmia* W. T. Aiton by Jackson (1895: 8) and Dalla Torre et Harms (1901: 190) or *Sisymbrium* L. by Schulz (1924: 46; 1936: 590). A few times it was mentioned in the context of purported nomenclatural conflict with / priority over *Chamaeplium* Wallr. [nom. illeg.] (Blonski, 1901) or homonymic *Klukia* Racib. [fossil genus of Schizaeaceae Kaulf.] (Reed, 1947, 1955; Paclt, 1973). However, since Candolle (1821b: 459) only noted "*Klukiae* sp. Andrz. cruc. ined." in synonymy of *Sisymbrium* sect. *Velarum* DC. and thus, did not validate it (conf. Endlicher, 1839: 875; Pfeiffer, 1875: 1817), no efforts to protect the well-established *Klukia* Racib. were found to be needed (Traverse, 1981); accordingly, only the latter name was listed in the *Index Nominum Genericorum* (Zijlstra, 1979). By any reason, out of four species of "*Klukia* Andrz." mentioned by Candolle (l. c.), all as synonyms, only one ("*K. rigida* Andrz. ex DC.") was included in *Index Kewensis* (Jackson, l. c.) and assigned to synonymy of *Malcolmia torulosa* (Desf.) Boiss. [presently *Neotorularia torulosa* (Desf.) Hedge et J. Léonard]. This viewpoint is reflected now in some global online resources (Freiberg et al., 2020; Govaerts et al., 2021; GBIF [2022]; POWO [2022]) and "*Klukia* Andrz. ex DC." is treated as a synonym of *Neotorularia* Hedge et J. Léonard.

Meanwhile, works where conditions of a valid publication of cruciferous *Klukia* are met, do exist, and this name has no relation to *Neotorularia*. Andrzejowski (1869: 65) reached it by publishing the generic description in Polish; although no species was indicated, it obviously referred to *Sisymbrium officinale* (L.) Scop. However, the earliest validation is found in Besser (1822: 104) who wrote "Klukia Andrz. (Sisymbrii Sect. I. DC.)", thus publishing a *nomen novum* for *Sisymbrium* sect. I. *Velarum* at the rank of a genus by providing indirect, but unequivocal reference to the replacement name. This was done exactly the same way *Syrenia* Andrz. ex Bess. was published (conf. Mosyakin, 2016), a generic name universally accepted as validated by Besser (1822). The authorship of *Klukia* is therefore "Andrz. ex Bess." while Besser alone, in the absence of any mention of Andrzejowski, is the author of the only combination validly published in this genus on the same page, namely *K. officinalis* (L.) Bess. "*Klukia juncea*" proposed on page 27 was not finally accepted for relevant species listed in the index (p. 104) as *Sisymbrium junceum* [(Willd.) M. Bieb.] and therefore, it remained *nomen invalidum*. Section *Velarum* initially included more than one species, what was indicated as "*Erysimum officinale* Lin., etc." in the protologue (Candolle, 1821a: 238) and subsequently specified by adding *Sisymbrium corniculatum* Cav. [*S. cavanillesianum* Castrov. et Valdés Berm.] (Candolle, 1821b: 461). *Sisymbrium officinale* was designated as lectotype of *S.* sect. *Velarum* [and thus of *Klukia* Andrz. ex Bess.] by Dorofeyev (2001: 128).

Two immediate consequences of this finding are the following. First, a six-years younger (1828) generic name *Velarum* (DC.) Reichenb. turns out to be unavailable for use on account of being necessarily homotypic with the predating *Klukia* Andrz. ex Bess. This has a moderate impact on nomenclature because *Velarum*, although sometimes treated as a distinct genus, is usually accepted as a synonym of *Sisymbrium* L., as amply proven by molecular phylogenetic studies (Warwick et al., 2002, 2006a; Žerdoner Čalasan et al., 2021). Second, and most important outcome is the finally confirmed illegitimacy of *Klukia* Racib., the name being in continuous use starting from the very time of its description in 1890. This circumstance seems to be essential for resuming an attempt to conserve the latter name (Paclt, 1973), but now based on a solid nomenclatural ground.

3. A new subspecies of *Noccaea rubescens*

Noccaea rubescens subsp. ***culminicola*** (Mouterde) D. A. German, **comb. et stat. nov.** ≡ *Lepidium culminicola* Mouterde, 1970, Nouv. Fl. Liban & Syrie 2: 84, "*culminicolum*".

Typus: "Liban. Qornet Saouda (près du sommet), eboulis fin calcaire. Alt. 3000–3050 m. 19. 7. [19]57. H. Pabot" (G: G00371858; https://plants.jstor.org/stable/10.5555/al.ap.specimen.g00371858; http://www.ville-ge.ch/musinfo/bd/cjb/chg/adetail.php?id=284579&base=img&lang=en).

To the best of my knowledge, *Lepidium culminicula*, described based on the single collection from the highest peak of Lebanon, has never been subjected to a critical taxonomic evaluation and so far, is globally accepted (Greuter et al., 1986; Warwick et al., 2006b; Marhold, 2011; Freiberg et al., 2020; Francis et al., 2021; Govaerts et al., 2021; COL [2022]; POWO [2022]; Tropicos [2022]; WFO [2022]) as originally defined by Mouterde (1970). However, morphology of its type does not support this viewpoint. Although I had no opportunity to study the specimen physically to check the number of

ovules per locule, etc. and could only make conclusion based on observation of the image online, it can be stated that it is certainly not a member of *Lepidium* L. Habitually Pabot's plant belongs to the group of low-growing alpine *Noccaea* Moench species with abbreviated, often subumbellate inflorescences such as *N. pumila* (Steven) Steud., *N. sintenisii* (Hausskn. ex Bornm.) F. K. Mey., *N. valerianoides* (Rech. fil.) F. K. Mey. and some others. By a combination of stout stems, thickish and exclusively alternate leaves, silicles with rounded apex and short styles, it most closely approaches *N. rubescens* (Boiss.) F. K. Mey., a species endemic to the alpine screes of Bolkar and Ala dağları (Parolly, 1995, as *Thlaspi sintenisii* subsp. *crassum* (P. H. Davis) Parolly; Meyer, 2006), two mountain knots in the eastern part of Central Taurus in southern Turkey and thus geographically closest to the only known locality of *L. culminicula*. Because neither the flowers, nor ripe fruits of the latter are known, a cautious approach of recognizing it as a subspecies of *N. rubescens* is adopted here based on somewhat shorter (0.2–0.4 vs. 0.6–1.1 mm, rarely less) styles and upper leaves equaling or exceeding the top of infructescence, i. e. covering it completely (vs. reaching fruiting pedicels and at maximum covering them, but not silicles) accompanied by geographic isolation. Additional collections of the Lebanon plant are required in order to get better understanding of its morphological variability, further clarify its taxonomic rank (and probably recognize it as a separate *Noccaea* species) and protection status.

There is one more gathering identified by Mouterde as *L. culminicula* collected by him in Jabal Saninne on 17. 05. 1937 (MPU: MPU078589; https://science.mnhn.fr/institution/um/collection/mpu/item/mpu078589; https://explore.recolnat.org/occurrence/06F05A8DEC284F0F8CB1002F377313A2), but it is morphologically very distant from the type and fits the alternative (original?) collector's identification "*L. nebrodense* (Rafin.) Guss." accompanying this specimen.

4. Three new synonyms

Barbarea bracteosa Guss., 1828, Fl. Sicul. Prodr. 2: 257.

Described from Sicily; type material possibly in NAP, lectotype likely not designated.

= *Erysimum minus* Mill., 1768, Gard. Dict., ed. 8: *Erysimum* nº 5, **syn. nov.**

Neotypus (hic designatus): "*Erysimum minus*. Mill. Dict. [Hort.]" (BM: BM000522264!; https://plants.jstor.org/stable/10.5555/al.ap.specimen.bm000522264; https://data.nhm.ac.uk/object/3d299c98-964b-4d42-9d71-d9b002c84c6a).

With the only exception of GBIF [2022], *Erysimum minus* is currently a universally unplaced/ambiguous/unresolved name (Freiberg et al., 2020; Govaerts et al., 2021; POWO [2022]; WFO [2022]), otherwise not included in the databases (Francis et al., 2021; COL [2022]; Tropicos [2022]) and generally missing in both old and modern taxonomic and floristic literature. This situation is to a large extent explained by the lack of any information on the origin of the plant (except for the indication that it is not native to England) in the protologue (Miller, 1768: *Erysimum*) as well as in the single work (Boerhaave, 1720: 16) referred to therein. This uncertainty (as "Hab. ?") was later reproduced by Jackson (1893: 893) who, in the lack of any information on *E. minus* other than that of Miller (1768), had to accept it.

The habit of relevant specimen confirms that annotation of its folder, "*Erysimum minus* Miller = *Barbarea*", also given at Global Plants (2022) as "*Barbarea* indet.", is correct, and such peculiarities as small (petals to 4.5 mm) flowers, erect to subappressed siliques and fully bracteate inflorescences allow its further identification as *Barbarea bracteosa*. The established conspecificity of *E. minus* and *B. bracteosa* does not affect the nomenclatural stability: despite Miller's binomial is 60 years earlier, it has no priority in *Barbarea* W. T. Aiton since the name is preoccupied by *B. minor* K. Koch validly published in 1846. Hence, *E. minus* becomes the first taxonomic synonym of *B. bracteosa* of the species rank.

The specimen designated here as the neotype very likely belongs to Miller's herbarium and might well represent original material of *E. minus*. It fits the characters mentioned by Miller, of which most noteworthy is a fully bracteate inflorescence: "… the single flowers proceeding from the sides of the stalks … the flowers come out single from the wings of the stalk the whole length", and bears an anonymous annotation "[Hort.]" on the sheet along with another one, "*Erysimum minus*. Mill. Dict.", also in pencil, presumably by D. C. Solander, similar to how specimens from herb. Miller are marked. On the other hand, it lacks the direct indication "Herb. Miller", although by itself, according to Britten (1913: 133), this might not necessarily mean otherwise. Most important, however, is the absence of author's labelling/annotations. Hence, evidence of being original material is not absolute which prevents selecting relevant specimen as lectotype.

Rorippa barbareifolia (DC.) Kitag., 1937, J. Jap. Bot. 13: 137. ≡ *Camelina barbareifolia* DC., 1821, Reg. Veg. Syst. Nat. 2: 517.

Typus: [Russia, Transbaicalia]: "Doroninsk. Vlassov, [acc. a] mr. Fischer 1819" (G-DC: G00203785; https://plants.jstor.org/stable/10.5555/al.ap.specimen.g00203785).

= *Calepina irregularis* var. *pinnatifida* O. E. Schulz, 1935, Repert. Spec. Nov. Regni Veg. 38(6–12): 108, **syn. nov.**

Typus: "Turcom. sept. / [Unknown locality; obtained via H. E. F.] Richter (1844)" (BM: BM000593498!; https://data.nhm.ac.uk/object/1721acd6-933c-4ded-b6ea-644c443a235f).

The type of *Calepina irregularis* var. *pinnatifida* is represented by the single plant collected at the very beginning of anthesis and initially identified as *C. corvini* (All.) Desv. [= *C. irregularis* (Asso) Thell.]. Schulz (1935) paid attention to the difference of the specimen from typical plants of the species (pinnate vs. repand-dentate cauline leaves and presence of hispid vs. absence of any indumentum), but retained the species identity and established taxonomic separation only at the varietal level. Meanwhile, in addition to the above-mentioned peculiarities, the type of *C. irregularis* var. *pinnatifida* is characterized by oblong-elliptic (vs. ovate) ovaries with distinctly stalked and slightly bilobed (vs. subsessile and entire) stigmas and equal (vs. unequal) petals and cannot therefore belong to the monotypic *Calepina* Adans. Instead, in all mentioned details and habitually it fits *Rorippa barbareifolia*, a NE Asian/NW North American species never found in "Turcomania" (i. e. Middle Asia). Based on the established species identity, indication of the collection area should be considered incorrect; unfortunately, I did not get any clue pointing to the actual origin of relevant plant.

Tetracme bucharica (Korsh.) O. E. Schulz, 1933, Bot. Jahrb. Syst. 66: 98. ≡ *Tetracmidion bucharicum* Korsh., 1898, Bull. Acad. Sci. Pétersb. 9(5): 421.

Typus: [Uzbekistan]: "Buchara, prov. Bajsun: prope Kokajty in collibus, solo arenoso solido. 5 V [18]97. № 380. S. Korshinsky" (LE!).

= *Tetracme glochidiata* (Botsch. et Vved.) Pachom., 1974, Consp. Fl. As. Med. 4: 144. ≡ *Tetracmidion glochidiatum* Botsch. et Vved., 1941, Not. Syst. Herb. Inst. Bot. Zool. Sect. Uzbek. Acad. Sci. URSS 3: 17, **syn. nov.**

Typus: [Uzbekistan]: "Ad declivia argillosa in promontorio montium Babatag pr. p. Kum-Tschoka. 28 V 1928. № 70. [A. I.] Vvedensky" (TASH!; iso (ibid., № 265) – TASH 40270!).

According to the diagnosis of *Tetracmidion glochidiatum* Botsch. et Vved., its only difference from the closely related *T. bucharicum* Korsh. is direction of fruit horns that are recurved instead of more or less ascending in the latter species. Botschantzev and Vvedensky (1941) also mentioned that these species may co-occur and intermediate specimens [with horizontal horns] of presumably hybrid origin are known. Subsequently accumulated information on distribution of the two species (Pachomova, 1974; Yunusov, 1978) and rich material on them (LE!) confirmed both similar eco-geographic patterns and presence of plants with horizontal horns recognized by V. P. Botschantzev as hybrids. In my opinion, the observed picture is better explained by a simpler assumption that just one species is involved here in which direction of fruit horns is a variable character. This version gets enough support by 1) the similarity of plants with differently directed horns in every other morphological aspect; 2) availability of "mixed populations"; and 3) wide range of the angle of both horn ascending and descending among or sometimes within individual plants. Finally, both ascending and slightly recurved horns are rarely found on the same plant, as demonstrated by the specimen collected 18 IV 1978 by V. P. Botschantzev and M. A. Mikhailova (№ 437) near Gaudrak, Turkmenistan. Summing the above-said up, I see no ground for recognition of two species within the former *Tetracmidion* Korsh. and consider them as forms of the same species, *Tetracme bucharica* (Korsh.) O. E. Schulz, not deserving taxonomic recognition despite indeed noticeable pattern of morphological variability.

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