

SYSTEMATICS, TRIBAL PLACEMENTS, AND SYNOPSES OF THE *MALCOLMIA* S.L. SEGREGATES (BRASSICACEAE)

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Abstract. The *Malcolmia* s.l. complex was so broadly delimited that it included at least five genera in four tribes. As delimited herein, it includes *Malcolmia* s.str. (12 taxa, 6 spp.) of the tribe Malcolmieae, *Maresia* (5 spp.) and the new genus *Marcus-Kochia* (4 spp.) of the tribe Anastaticae, *Strigosella* (23 spp.) of the tribe Euclidieae, and *Zuvanda* (3 spp.) of the tribe Conringieae. The new combinations *M.-K. arenaria*, *M.-K. littorea*, *M.-K. ramosissima*, and *M.-K. triloba* are proposed. Detailed generic descriptions, key to genera and their species, and data on type collections of all recognized taxa are provided. Second-step lectotypes are designated keys for *Strigosella hispida*, *S. scorpioides*, and *Zuvanda meyeri*. All taxa previously placed in *Malcolmia* are listed, and their current tribal, generic, and species assignments are given.

Keywords: Brassicaceae, Cruciferae, *Malcolmia*, *Marcus-Kochia*, *Maresia*, *Strigosella*, *Zuvanda*

The limits of *Malcolmia* W.T.Aiton (Brassicaceae or Cruciferae) have fluctuated a great deal during the past two centuries, starting with early works (e.g., de Candolle, 1821; Boissier, 1867; Schulz, 1936; Vassilczenko, 1939) and ending with more recent accounts (e.g., Greuter et al., 1986; Rich & Foster, 1992; Jalas & Suominen, 1994; Zhou et al., 2001; Georgiou, 2002). The genus was so broadly delimited by Boissier (1867) and Greuter et al. (1986) that it included species currently assigned by Al-Shehbaz (2012) and herein to seven genera: *Maresia* Pomel, *Neotorularia* Hedge & J.Léonard, *Sisymbrium* L., *Strigosella* Boiss., and *Zuvanda* (F.Dvořák) Askerova, as well as *Malcolmia* s.str. and the new genus *Marcus-Kochia* described below.

Ball (1963) was the first to recognize the heterogeneity of *Malcolmia* s.l., and he divided this complex into four informal groups readily distinguished morphologically, geographically, and cytologically. Dvořák (1970a, 1970b, 1972) conducted detailed morphological studies on the complex and basically reached conclusions comparable to Ball's. He recognized the Aegean group as *Malcolmia* s.str., the western and northern Mediterranean group as *Maresia*

subgen. *Maresia*, the Southwest Asian members as *Maresia* subgen. *Zuvanda* Dvořák, and Southwest-Central Asian species as *Fedtschenkoa* Regel. Although Dvořák placed a greater emphasis on petal venation and the cellular patterns of the fruit septum, modern students of the family put much less weight on these characters because they can be subject to considerable variation. However, his critical observations on trichomes and stigma morphology, coupled with Ball's earlier work, helped immensely in establishing the modern generic boundaries in this complex. Botschantzev (1972) reduced *Fedtschenkoa* to synonymy of *Strigosella*, and Askerova (1985) raised subgen. *Zuvanda* to the generic rank. By contrast, Stork (1971, 1972a–c) focused exclusively on the Aegean species and kept all of them in *Malcolmia* s.str.

The present study aims to clarify the generic boundaries and tribal assignments of the four groups variously assigned to *Malcolmia*, provides detailed generic description for each, enumerates the species currently assigned to them, and provides information on the types of all recognized taxa. It is based on the synthesis of published cytological, morphological, geographical, and molecular data.

GENERIC BOUNDARIES

All species previously assigned to the *Malcolmia* s.l. complex have tubular calyx with erect sepals, linear fruits, petals usually well-differentiated into blade and claw, branched trichomes, and decurrent stigmas. However, exceptions to the last two characters are important in the delimitation of *Zuvanda* and *Maresia*, respectively. The complex consists of five groups that belong to four tribes (see abstract).

The Aegean-Eastern Mediterranean group consists of six species of *Malcolmia*, including the generic type *M. maritima* (L.) W.T.Aiton, and these are referred to hereafter as *Malcolmia* s.str. They are diploids or tetraploids based on $x = 8$ (Stork, 1972c; Warwick & Al-Shehbaz, 2006) and have strongly decurrent and connivent stigmas, saccate lateral sepals, petiolate cauline leaves, and sessile, rigid, malpighiaceous (2-fid) trichomes parallel to the main axis

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of organ, sometimes mixed with cruciform (rarely 3-fid) trichomes with shorter or equal lateral rays. Although the group is centered in the Balkan Peninsula and Aegean Islands, individual species reach as far west as Italy (Stork, 1972d) and eastwards into all eastern Mediterranean countries (Cullen, 1965; Mouterde, 1970; Zohary, 1966).

Zuvanda includes three species centered in the Caucasus, Turkey, eastern Mediterranean countries, N Iraq, and NW Iran (Askerova, 1985). They too have strongly decurrent and connivent stigmas but are readily distinguished from all other members of the *Malcolmia* s.l. complex by being completely glabrous or only minutely puberulent with simple papillae, as well as by having auriculate leaves. Unfortunately, no *Zuvanda* species has been studied cytologically.

The third group consists of 23 species recognized by Dvořák (1970a) as *Fedtschenkoa* and later by Botschantzev (1972) as *Strigosella*. The genus is centered primarily in Central and Southwest Asia, with the distribution of some extending into eastern and southwestern Europe and northern Africa. *Strigosella* species are diploids or tetraploids based on $x = 7$, and they have a mixture of simple and distinctly stalked dendritic or forked, usually rigid trichomes, non-auriculate cauline leaves, non-saccate calyx, and decurrent and connivent stigmas.

Tremendous advancements to understanding the tribal classification of the Brassicaceae have been made during the past decade, and the interested reader should consult Al-Shehbaz et al. (2006) and Al-Shehbaz (2012) for leads. Nine species of the *Malcolmia* s.l. complex were studied molecularly by Warwick et al. (2007), and their results supported the recognition of *Strigosella* as a distinct genus assigned to the tribe Euclidieae and the placement of *Maresia* and *Malcolmia* s.str. in a separate tribe later recognized as the Malcolmieae (Al-Shehbaz & Warwick, 2007). They excluded two species of *Zuvanda* from the complex but without assigning them to a tribe. However, subsequent studies (German and Al-Shehbaz, 2008; German et al., 2009; Doğan et al., 2011) supported the placement of *Zuvanda* in the tribe Conringieae.

The sampling of additional genera of the above tribes (Couvreur et al., 2010; Warwick et al., 2010) suggested that

The fourth group consists of five Mediterranean species of *Maresia*, and they correspond to Dvořák's (1970b) *Maresia* sect. *Maresia* and sect. *Dibothrium* O.E.Schulz. All typically have entire or rarely obscurely lobed (but never connivent or decurrent) stigmas; soft, short-stalked, many-branched stellate trichomes; usually non-saccate calyx; non-auriculate cauline leaves, and (in one species) a base chromosome numbers of $n = 13$ or 14 . *Maresia* (Anastaticaceae) is often confused with *Neotorularia* (Euclidieae) because both have entire stigmas and branched trichomes. However, it differs from the latter by the lack of simple trichomes and by having stellate trichomes, slender pedicels, veined fruit septum, and straight fruits. By contrast, *Neotorularia* has a mixture of simple and forked trichomes, stout fruiting pedicels, veinless fruit septum, and often tortuose fruits.

The final group of four species, recognized hereafter as the genus *Marcus-Kochia*, corresponds to Dvořák's (1970b) *Maresia* sects. *Ballia* F.Dvořák, *Dibothriopsis* F.Dvořák, and *Malcolmiopsis* F.Dvořák, and they are restricted to Northwest Africa and Southwest Europe. They have strongly decurrent and connivent stigmas, minutely stalked, soft, 8–16-branched stellate trichomes, non-saccate calyx, non-auriculate cauline leaves, and three of the six species counted for chromosome numbers have $n = 10$ or 12 .

TRIBAL ASSIGNMENTS

the tribe Malcolmieae is indistinguishable from the earlier-published Anastaticaceae. However, a critical examination of the phylogenetic position of the Aegean *Malcolmia* s.str. compared to that of the Northwest African/Southwest European species of the "genus" (Khosravi et al., 2009; Moazzeni et al., in press) strongly suggest that what was recognized as one genus in the tribe Anastaticaceae (Warwick et al., 2010; Al-Shehbaz, 2012) should be changed to two genera in two remotely related tribes. The Aegean species should be kept in *Malcolmia* s.str. and placed in the unigeneric and reinstated tribe Malcolmieae. By contrast, the Southwest European/Northwest African taxa should be placed along with *Maresia* in the tribe Anastaticaceae. To sum up, what was recognized as a single genus in the most recent floristic and checklist accounts (e.g., Greuter et al., 1986; Jalas & Suominen, 1994; Zhou et al., 2001; Georgiou, 2002) actually represents five genera in four distant tribes.

TAXONOMIC ACCOUNT

Because of the continuous confusion in the most recent literature on limits of the five genera discussed above, a simplified key separating them, a detailed description for each, and enumeration and keys to their taxa are provided below.

KEY TO GENERA

- 1a. Plants glabrous or puberulent with simple minute papillae; cauline leaves auriculate or sagittate *Zuvanda*
- 1b. Plants variously pubescent with simple and/or branched trichomes; cauline leaves petiolate, neither auriculate nor sagittate 2
- 2a. Stigmas capitate, entire or if somewhat 2-lobed, then lobes neither connivent nor decurrent *Maresia*
- 2b. Stigmas conical, prominently 2-lobed, lobes strongly connivent and decurrent 3
- 3a. Branched trichomes sessile, rigid, malpighiaceae and usually (3 or)4-rayed, parallel to long axis of organ carrying them; sepals usually strongly saccate at base *Malcolmia*
- 3b. Branched trichomes long or short stalked, soft or rigid, not malpighiaceae, forked to subdendritic or many rayed stellate, not parallel to long axes of organs carrying them; sepals not or rarely subsaccate at base 4
- 4a. Indumentum of simple and distinctly stalked forked and dendritic, usually rigid trichomes; plants of SW and central Asia *Strigosella*
- 4b. Indumentum of minutely stalked, 8–16-rayed stellate soft trichomes; plants of SW Europe and NW Africa *Marcus-Kochia*

MALCOLMIA W.T.Aiton, Hortus Kew., ed. 2. 4: 121. 1812 (as *Malcomia*); *nom. et orth. cons.*

Type species: *M. maritima* (L.) W.T.Aiton, Hortus Kew. ed. 2, 4: 121. 1812.

Synonym: *Wilckia* Scop., Introd. Hist. Nat. 317. 1777, *nom. rej.* Type species: *W. maritima* (L.) Scop.

Tribe: Malcolmieae Warwick & Al-Shehbaz, Harvard Pap. Bot. 12: 432. 2007.

Herbs, annual or rarely biennial. *Trichomes* rigid, sessile, malpighiaceus (2-fid), parallel to the main axis of organ, sometimes mixed with cruciform (rarely 3-fid) trichomes with shorter or equal lateral rays. *Multicellular glands* absent. *Stems* erect to ascending or decumbent, simple or branched basally and apically. *Basal leaves* petiolate, rosulate or not, simple, entire or dentate, rarely lyrate or pinnatifid; cauline leaves petiolate or sessile, not auriculate at base, entire, dentate, or rarely sinuate. *Racemes* several to many flowered, ebracteate or lowermost flowers bracteate, lax, elongated in fruit; rachis straight or flexuous; fruiting pedicels ascending to divaricate, persistent, as thick as or narrower than fruit base. *Sepals* oblong, free, deciduous, erect, pubescent, unequal, base of lateral pair often distinctly saccate; petals pink, purple, violet, or rarely white, often with

a yellow region between claw and limb, erect at base with flaring blade, longer than sepals; blade obovate, apex retuse or emarginate; claw strongly differentiated from blade, subequaling or longer than sepals, glabrous, unappendaged, entire; stamens 6, slightly exerted or included, erect, tetradynamous; filaments wingless, unappendaged, glabrous, free; anthers oblong-linear, not apiculate; nectar glands lateral; median nectaries absent; ovules 30–80 per ovary. *Fruits* dehiscent, capsular siliques, linear, terete or latiseptate, not inflated, unsegmented; valves leathery, with a distinct midvein, pubescent, not keeled, smooth, wingless, unappendaged; gynophore obsolete; replum rounded, visible; septum complete, membranous, veinless; style distinct and often beaklike to 12 mm, persistent; stigma conical, strongly 2-lobed, the lobes connivent, decurrent, opposite replum, unappendaged. *Seeds* uniseriate, winged or wingless, oblong to ovoid, plump or slightly flattened; seed coat papillate to rugose, mucilaginous when wetted; cotyledons accumbent. $x = 8$.

Distribution: eastern Mediterranean, especially the Balkan Peninsula and Aegean Islands.

The generic description in Georgiou (2002) was rather broad and included features of *Malcolmia* (Malcolmieae), *Maresia* (Anastaticaceae) and *Strigosella* (Euclidieae).

KEY TO TAXA (SIX SPECIES AND SIX ADDITIONAL SUBSPECIES)

- 1a. Style in fruit 5–7–12 mm; sepals 10–18 mm 2
- 1b. Style in fruit 0.5–5(–7) mm; sepals 2.5–10 mm 3
- 2a. Raceme ebracteate or only basally bracteate. *M. macrocalyx* subsp. *macrocalyx*
- 2b. Raceme bracteate nearly throughout *M. macrocalyx* subsp. *scyria*
- 3a. Lowermost flowers bracteate 4
- 3b. Lowermost flowers ebracteate. 6
- 4a. Sepals 2.5–5 mm; petals 4–10 mm; fruit 2.5–3.5 cm *M. orsiniana* subsp. *orsiniana*
- 4b. Sepals 5–10 mm; petals 10–25 mm; fruit (2.5–)3.5–7.5 cm 5
- 5a. Stems and sepals primarily with appressed 2-rayed trichomes; basal leaves cuneate at base; fruits usually straight, with styles 1–2 mm *M. orsiniana* subsp. *serbica*
- 5b. Stems and sepals primarily with patent 3- or 4-rayed trichomes; basal leaves truncate to subcordate at base; fruits usually arcuate, with styles 1.6–3 mm *M. orsiniana* subsp. *angulifolia*
- 6a. Fruiting pedicels as thick as or broader than fruit base. 7
- 6b. Fruiting pedicels narrower than fruit base. 9
- 7a. Trichomes of lower leaves 2–4-rayed; fruiting pedicel 4–6 mm; sepals 2.5–5(–6) mm; petals 4–10(–12) × 1.5–3.5 mm *M. chia*
- 7b. Trichomes of lower leaves 2-rayed; fruiting pedicel 5–20(–25) mm; sepals 6–10 mm; petals 12–25 × 5–10 mm 8
- 8a. Raceme few flowered; petals 12–17 × 5–7 mm; style in fruit 1–2.3 mm *M. flexuosa* subsp. *flexuosa*
- 8b. Raceme many flowered; petals (12–)15–26 × (5–)7–10 mm; style in fruit 2.5–5(–7) mm *M. flexuosa* subsp. *naxensis*
- 9a. Petals 6–9 mm wide; sepals 6–8(–10) mm; style in fruit (2–)3–6 mm *M. maritima*
- 9b. Petals (1–)2–5 mm wide; sepals 3.5–6(–7) mm; style in fruit 0.5–2.5(–3) mm 10
- 10a. Leaves densely with primarily 4-rayed trichomes *M. graeca* subsp. *graeca*
- 10b. Leaves sparsely with primarily 2-rayed trichomes 11
- 11a. Racemes dense; petal blade often sparsely hairy outside; lateral sepals slightly saccate; basal leaves entire or serrulate. *M. graeca* subsp. *bicolor*
- 11b. Racemes lax; petal blade glabrous outside; lateral sepals strongly saccate; basal leaves lyrate or dentate *M. graeca* subsp. *hydraea*

1. **Malcolmia chia** (L.) DC., Syst. Nat. 2: 440. 1821.
Basionym: *Cheiranthus chius* L., Sp. Pl. 2: 661. 1753.

TYPE: “Habitat in Chio.” Lectotype designated by Stork (1972c: 18): “*Hesperis siliquis hirsutis, flore parvo rubello Boerh.*” The plate in Dillenius, Hortus Elthamensis p. 180, tab. 148, f. 178. 1732.

Distribution: Cyprus, Greece, eastern Mediterranean countries, Turkey.

2. **Malcolmia flexuosa** (Sm.) Sm. in Sibth. & Sm., Fl. Graeca 7: 33. 1831.

Basionym: *Cheiranthus flexuosus* Sm. in Sibth. & Sm., Fl. Graec. Prodr. 2: 24. 1813. TYPE: “In insula Cypro,” *Sibthorp s.n.* (lectotype designated by Stork (1972c: 30), OXF).

2a. subsp. **flexuosa**

Distribution: Cyprus, Greece, Turkey.

2b. subsp. **naxensis** (Rech.f.) Stork, Opera Bot. 33: 35. 1972.

Basionym: *Malcolmia naxensis* Rech.f., Ann. Naturhist. Mus. Wien 43: 297. 1929. TYPE: [Greece], "Cycladum insula Naxos, in rupestribus litoreis ad oppidum Naxos," 8–10 Apr 1927, *Karl H. Rechinger 140* (Lectotype designated by Stork (1972c: 35): WU; Isolectotypes: BM, LD, W).

Distribution: Greece, Turkey.

3. **Malcolmia graeca** Boiss. & Spruner in Boiss., Diagn. Pl. Orient. Ser. 1, 1: 71. 1843. TYPE: [Greece, Sterea Ellas], "Attica," *Wilhelm von Spruner s.n.* (Lectotype designated by Stork (1972c: 37): G-BOIS; Isolectotypes: BM, BR, E, K, L, P, W).

Distribution: all three subspecies are endemic to Greece.

3a. subsp. **graeca**

3b. subsp. **bicolor** (Boiss. & Heldr.) Stork, Opera Bot. 33: 39. 1972.

Basionym: *Malcolmia bicolor* Boiss. & Heldr. in Boiss., Diagn. Pl. Orient. Ser. 1, 6: 10. 1846. TYPE: [Greece, Peloponnisos], "in Taygeto, Hagios Elias, 6000–6500 pd.," Jun-Jul 1844, *T. H. H. von Heldreich Pl. Tayget exs. 240* (Lectotype designated by Stork (1972c: 39): G-BOIS; Isolectotypes: BM, E, GOET, JE, K, L, MO, OXF, P, W, WAG).

3c. subsp. **hydracea** (Heldr. & Halácsy) Stork, Opera Bot. 33: 40. 1972.

Basionym: *Wilckia hydracea* Heldr. & Halácsy, Österr. Bot. Z. 45: 176. 1895. TYPE: [Greece, Peloponnisos], "Ins. Hydra ad Argolidem, in saxosis Mt. Eros supra coenobium Prophetae Eliae, 1000 ft.," 1 May 1889, *Heldreich s.n.* (Lectotype designated by Stork (1972c: 40): W; Isolectotypes: BM, C, E, GB, K, LD, P, S, UPS).

4. **Malcolmia macrocalyx** (Halácsy) Rech.f., Ann. Naturhist. Mus. Wien 43: 299. 1929. TYPE: [Greece, W Aegean], "Insula Skopelos," 27 Apr–18 May 1896, *C. Leonis s.n.* (lectotype designated by Stork (1972c: 24): W; isolectotypes, LD, WU).

Distribution: both subspecies are endemic to Greece.

4a. subsp. **macrocalyx**

4b. subsp. **scyria** (Rech.f.) P.W.Ball, Feddes Repert. Sp. Nov. Regni Veg. 68: 181. 1963.

Basionym: *Malcolmia scyrica* Rech.f., Ann. Naturhist. Mus. Wien 43: 298. 1929. TYPE: [Greece, W Aegean], "Sporadum insula Skyros: in rupestribus maritimus, 29 Apr. 1927, *K. H. Rechinger 737* (Lectotype designated by Stork (1972c: 25): W; Isolectotypes: BM, LD).

5. **Malcolmia maritima** (L.) W.T.Aiton, Hort. Kew. Ed. 2, 4: 121. 1812.

Basionym: *Cheiranthus maritimus* L., Cent. Pl. 1: 19. 1755. TYPE: "Habitat in Europae australis maritimis," [Lectotype designated by Stork (1972c: 26): Herb. Linn. No. 839.21 (LINN)].

Distribution: Albania, Greece, [naturalized in Italy, Spain, and the New World].

6. **Malcolmia orsiniana** (Ten.) Ten., Fl. Napol. 5: 67. 1835.

Basionym: *Hesperis orsiniana* Ten., Succ. Relaz. Viaggio Abruzzo 78. 1830. TYPE: [Italy], "Abruzzi, Monte Corno," *M. Tenore s.n.* (Lectotype designated by Stork (1972d: 241): W; Isolectotypes: C, G, P).

6a. subsp. **orsiniana**

Distribution: Greece, Italy.

6b. subsp. **angulifolia** (Boiss. & Orph.) Stork, Svensk Bot. Tidskr. 66: 245. 1972.

Basionym: *Malcolmia angulifolia* Boiss. & Orph. In Boiss., Diagn. Pl. Orient. Ser. 2, 5: 19. 1856. TYPE [Greece, Sterea Ellas], "in m. Parnassi reg. abietina, Aug. 1855, *Guicciardi ex Heldreich, Fl. Graeca exs. 2975* (Lectotype designated by Stork (1972d: 241): G-BOIS; Isolectotypes: C, E, K, LD, P, W).

Distribution: Bulgaria, Greece, Macedonia.

6c. subsp. **serbica** (Pančić) Greuter & Burdet, Willdenowia 13: 94. 1983.

Basionym: *Malcolmia serbica* Pančić, Fl. Serbiae 129. 1874. TYPE: [SE Serbia], "Mt. Tupižnica," May 1870, *Pančić s.n.* (Lectotype designated by Georgiou (2002: 164): BEO).

Distribution: Albania, Bulgaria, Greece, Serbia.

MARCUS-KOCHIA Al-Shehbaz, *gen. nov.*

Type species: *Marcus-Kochia littorea* (L.) Al-Shehbaz.

Tribe: Anastatiaceae DC., Mém. Mus. Hist. Nat. 7(1): 236. 1821.

Herbs, annual or rarely perennial. *Trichomes* soft, short stalked, stellate with 8–16 ultimate branches, often dense, never malpighiaceous. *Multicellular glands* absent. *Stems* erect to ascending or decumbent, branched basally and apically. *Basal leaves* petiolate, rosulate or not, simple, entire or dentate, rarely sinuate or pinnatifid; cauline leaves petiolate or sessile, not auriculate at base, resembling basal or lowermost leaves. *Racemes* several or many flowered, ebracteate or rarely lower flowers bracteate, lax, elongated in fruit; rachis straight; fruiting pedicels ascending to divaricate, persistent, stout, as thick as or wider than fruit base. *Sepals* oblong, free, deciduous, erect, pubescent, equal or unequal, base of lateral pair saccate or rarely not; *petals* lilac, purple, or violet, erect at base with flaring blade, longer than sepals; *blade* obovate, apex retuse or emarginate; claw strongly differentiated from blade, subequaling or longer than sepals,

glabrous, unappendaged, entire; *stamens* 6, slightly exerted or included, erect, tetradynamous; filaments wingless, unappendaged, glabrous, free; anthers linear, not apiculate; nectar glands lateral; median nectaries absent; ovules 30–92 per ovary. *Fruits* dehiscent, capsular siliques, linear, terete, not inflated, unsegmented; *valves* leathery, with obscure midvein, pubescent, not keeled, smooth or rarely torulose, wingless, unappendaged; *gynophore* obsolete; *replum* rounded, visible; *septum* complete, thick, veinless or with a central broad band; *style* distinct and often beaklike to 8 mm, persistent; *stigma* conical, strongly 2-lobed, the lobes connivent, decurrent, opposite replum, unappendaged. *Seeds* uniseriate, narrowly winged, oblong to ovoid, plump or slightly flattened; cotyledons accumbent. $x = 10, 12$.

Eponymy: The genus is named after Dr. Marcus A. Koch

(28 January 1967), head of Department of Biodiversity and Plant Systematics, director of the botanical garden and herbarium of Heidelberg University in recognition of his outstanding contribution to the systematics and phylogeny of the Brassicaceae.

Distribution: Algeria, France, Italy, Morocco, Portugal, Spain, Tunisia.

Marcus-Kochia resembles *Maresia* in having soft, short-stalked stellate trichomes with 8–16 ultimate branches, but it is readily distinguished by the conical (vs. capitate), strongly and decurrently lobed connivent (vs. entire or obscurely lobed but neither decurrent nor connivent) stigmas, usually smooth (vs. usually torulose) fruits, and stout (vs. slender) fruiting pedicels as thick as or thicker (vs. narrower) than the fruit base.

KEY TO SPECIES

- 1a. Sepals 2.5–4.5 mm, not saccate at base; petals 4–6(–8) mm *M.-C. ramosissima*
 1b. Sepals (5.5–)6–11 mm, saccate at base; petals (8–)10–20(–25) mm 2
 2a. Perennials with a woody caudex and lower stems, densely canescent; leaves sessile *M.-C. littorea*
 2b. Annuals or rarely short-lived perennial, neither woody nor canescent; leaves short petiolate or subsessile 3
 3a. Fruits falcate; leaves entire; stigma 0.2–1 mm; style 0.5–1.5 mm; petals 8–12 mm *M.-C. arenaria*
 3b. Fruits straight; leaves pinnatifid, sinuate, dentate, or entire; stigma 2–3 mm; style (1.5–)2–6 mm; petals (10–)12–20 mm *M.-C. triloba*

1. *Marcus-Kochia arenaria* (Desf.) Al-Shehbaz, *comb. nov.*

Basionym: *Hesperis arenaria* Desf., Fl. Atlant. 2: 91. 1800. TYPE: [Algeria, Arzew], “Habitat in arenis ad maris littora prope Arzeau,” *R. L. Desfontaines s.n.* (Holotype: P).

Homotypic synonym: *Malcolmia arenaria* (Desf.) DC., Syst. Nat. 2: 442. 1821; *Maresia arenaria* (Desf.) F.Dvořák, Spisy Prirod. Fak. Univ. J. E. Purkyně v Brně 1969(501): 89. 1969.

Heterotypic synonyms:

Malcolmia arenaria var. *dasycarpa* Faure & Maire, Bull. Soc. Hist. Nat. Afr. Nord 22: 951. 1931. TYPE: Algeria, La Macta près Mostaganem, 28 Apr 1912, A. Faure s.n. (Holotype: MPU-002605).

Malcolmia arenaria var. *leiocarpa* Faure & Maire, Bull. Soc. Hist. Nat. Afr. Nord 22: 951. 1931. TYPE: Algeria, Falcon près d’Oran, 31 May 1929, A. Faure s.n. (Holotype: MPU-002603).

Malcolmia biloba Pomel, Bull. Soc. Sci. Phys. Algérie 11: 229. 1874; *M. arenaria* var. *biloba* (Pomel) Maire, Fl. Afr. Nord 14: 55. 1976. TYPE: Algeria, Oran, sable maritimes, Mar 1860, A. N. Pomel s.n. (Holotype: P).

Malcolmia heterophylla Caballero, Repert. Sp. Nov. Regn. Veg. 46: 126. 1916. TYPE: Morocco, Melilla, Apr 1912, A. Caballero s.n. (Holotype: MA-49820; Isotype: MA-49819).

Malcolmia versicolor Pomel, Bull. Soc. Sci. Phys. Algérie 11: 228. 1874; *M. arenaria* var. *versicolor* (Pomel) Maire, Fl. Afr. Nord 14: 55. 1976. TYPE: Algeria, Hautes steppes, Itima, J. A. Battandier s.n. (Holotype: P).

Distribution: Algeria, Morocco.

2. *Marcus-Kochia littorea* (L.) Al-Shehbaz, *comb. nov.*

Basionym: *Cheiranthus littoreus* L., Sp. Pl. ed. 2, 2: 925. 1763. TYPE: “Habitat in Maris Mediterranei littoribus,” [lectotype designated by P. W. Ball in Cafferty & Jarvis (2002: 532): Herb. Linn. No. 839.16 (LINN)].

Homotypic synonyms: *Malcolmia littorea* (L.) W.T.Aiton, Hort. Kew. Ed. 2, 4: 121. 1812; *Maresia littorea* (Desf.) F.Dvořák, Spisy Prirod. Fak. Univ. J. E. Purkyně v Brně 1969(No. 501): 89. 1969; *Wilckia littorea* (L.) Druce, List Brit. Pl. 6. 1908.

Heterotypic synonyms:

Hesperis alyssoides Pers., Syn. Pl. 2: 203. 1806; *Malcolmia alyssoides* (Pers.) DC., Syst. Nat. 2: 444. 1821. TYPE: “Hab. in Lusitania,” *R. L. Desfontaines s.n.* (Holotype: FI).

Malcolmia littorea var. *lingulata* H. Lindb., Acta Soc. Sci. Fenn. Ser. B., Opera Biol. 1(2): 64. 1932. TYPE: Morocco, Casablanca, in litore arenoso, 6 May 1926, Harald Lindberg 1775 (Lectotype designated by Väre (2012: 57): H-1512121; Isolectotypes: H-1512122, LD).

Malcolmia multicaulis Pomel, Nouv. Mat. Fl. Atlant. 371. 1875; *M. littorea* var. *multicaulis* (Pomel) Maire, Fl. Afr. Nord. 14: 62. 1976. TYPE: Algeria, Ain-Tédélis, May 1861, A. N. Pomel s.n. (Holotype: P; Isotype: US).

Distribution: Algeria, France, Italy, Morocco, Portugal, Spain.

3. *Marcus-Kochia ramosissima* (Desf.) Al-Shehbaz, *comb. nov.*

Basionym: *Hesperis ramosissima* Desf., Fl. Atlant. 2: 91. 1798. TYPE: [Algeria, Arzew]. “Habitat in arenis ad maris littora prope Arzeau apud Algeriensis,” *R. L. Desfontaines s.n.* (Holotype: P).

Homotypic synonyms: *Malcolmia ramosissima* (Desf.) Thell., Mém. Soc. Sci. Nat. Math. Cherbourg 38: 285. 1912; *Maresia ramosissima* (Desf.) F.Dvořák, Spisy Prirod. Fak. Univ. J. E. Purkyne v Brne 1969(No. 501): 82. 1969.

Heterotypic synonyms:

Hesperis parviflora DC. in DC. & Lamarck, Fl. Franc. Ed. 3, 4: 654. 1805; *Malcolmia parviflora* (DC.) DC., Syst. Nat. 2: 442. 1821; *Wilckia parviflora* (DC.) Halácsy, Österr. Bot. Z. 45: 215. 1895. TYPE: France, Perpignan bord de la mer, de Candolle 1804 (Holotype: G-DC 00202966).

Malcolmia parviflora var. *brachypoda* Emb. & Maire, Bull. Soc. Sci. Nat. Maroc 17: 211. 1937. TYPE: Morocco, Moyen Atlas, Ifrane, 1500–1600 m, 15 Jun 1936, R. Maire s.n. (Holotype: MPU-002711).

Malcolmia parviflora var. *leiocarpa* Maire, Bull. Soc. Hist. Nat. Afr. Nord 36: 95. 1946. TYPE: Algeria, C. La Calle, dunes près du lac Tonga, 27 Apr 1930, R. Maire s.n. (Holotype: MPU-004652).

Malcolmia parviflora var. *pachystylis* Maire, Bull. Soc. Hist. Nat. Afr. Nord 36: 95. 1946. TYPE: Algeria, Cap Matifou, Apr 1879, Allard s.n. (Holotype: MPU-004650; Isotype: MPU-004651)

Distribution: Algeria, France, Italy, Morocco, Portugal, Spain, Tunisia.

4. *Marcus-Kochia triloba* (L.) Al-Shehbaz, *comb. nov.*

Basionym: *Cheiranthus trilobus* L., Sp. Pl. 2: 662. 1753. TYPE: Lectotype designated by López González (1986: 319): Herb. Linn. No. 839.24 (LINN).

Homotypic synonym: *Malcolmia triloba* (L.) Spreng., Syst. Veg. 2: 899. 1825.

Heterotypic synonyms:

Malcolmia broussonetii DC., Syst. Nat. 2: 445. 1821, nom. illeg.; *M. lacera* subsp. *broussonetii* (DC.) Greuter & Burdet, Willdenowia 13: 94. 1983; *M. patula* DC. subsp. *broussonetii* (DC.) Maire in Jahandiez & Maire, Cat. Pl. Maroc. 309. 1932. TYPE: Morocco, Magador, 1807, P. A. M. Broussonet s.n. (Holotype: G-DC).

Malcolmia broussonetii var. *bicolor* Emb. & Maire, Bull. Soc. Sci. Nat. Afr. Nord 20(1): 452. 1929. TYPE: Morocco, in arenosis prope Castellum Tamri Prov. Haha, 4 Apr 1926, R. Maire s.n. (Holotype: MPU-001971).

Malcolmia broussonetii var. *mamorensis* H. Lindb., Acta Soc. Sci. Fenn. Ser. B., Opera Biol. 1(2): 63. 1932. TYPE: Morocco, prope opp. Rabat, Kenitra, in silva Mamora, solo arenoso, 20 Jun 1926, Harald Lindberg 1744 (Lectotype designated by Väre (2012: 57): H-1263177; Isolectotypes: H-1263165, MPU-008598).

Malcolmia broussonetii var. *tricolor* Emb. & Maire, Bull. Soc. Sci. Nat. Maroc. 13: 278. 1932. TYPE: Morocco, in planitiebus arenosis ditionis sous copiose, prope Biougra, 16 Mar 1931, R. Maire s.n. (Holotype: MPU-002815).

Malcolmia erosa (Lag.) DC., Syst. Nat. 2: 446. 1821; *Hesperis erosa* Lag., Gen. Sp. Pl. 20. 1814. TYPE: Spain, Sevilla, de Carmona, 1804, J. Rodriguez s.n. (Holotype: MA-49724).

Malcolmia gracilima Samp., Man. Fl. Portug. 195. 1910; *M. lacera* subsp. *gracilima* (Samp.) Franco, Nova Fl. Portugal 1: 551. 1971, comb. inval.; *M. lacera* subsp. *gracilima* (Samp.) Franco ex Greuter et al., Med-Checklist 3: 138. 1986; *Wilckia gracilima* (Samp.) Samp., Herb. Portug. 56: 1913. TYPE: PORTUGAL. Alentejo [«no Alemtejo»], “Areaes maritimos,» G. A. S. F. Sampaio s.n.? (Holotype: not seen).

Malcolmia patula DC., Syst. Nat. 2: 444. 1821; *M. lacera* subsp. *patula* (DC.) Rivas Martínez, Publ. Inst. Biol. Aplicada 42: 116. 1967; *M. triloba* subsp. *patula* (Lag. ex DC.) Rivas Mart. & C. Navarro, Rivasgodaya 6: 177. 1991; *Wilckia patula* (DC.) Samp., Herb. Portug. 55. 1913. TYPE: “Hab. In tracta Fuente Castellana et alibi circa Madritum in arenosis,” 1806, Lagasca & Segura s.n. (Holotype: G-DC).

Malcolmia patula var. *tenella* Lange, Pug. Pl. Hisp. 4: 70. 1866. TYPE: Spain, Andalucía, Reg., Jaén Prov., la Carolina, 11 May 1852, J. M. C. Lange s.n. (Holotype: C-10008866).

Malcolmia patula var. *longifolia* Pau ex Font Quer, Bol. Soc. Esp. Hist. Nat. 14: 427. 1914. TYPE: Morocco, El Araix, 20 m, 16 March 1930, P. Font Quer 261 (Holotype: BC-77766; Isotype: MPU-006760).

Distribution: Morocco, Portugal, Spain.

Malcolmia lacera (L.) DC. (Syst. Nat. 2: 445. 1821) was based on *Cheiranthus lacerus* L. (Sp. Pl. 2: 662. 1753), the type of which [“Habitat in Lusitania.” RCN: 4834. Lectotype designated by P. W. Ball in Cafferty & Jarvis (2002: 532): “*Leucoium lusitanicum purpureum*” in Hermann, Parad. Bat. 193. 1698. Epitype designated by P. W. Ball in Cafferty & Jarvis (2002: 532): Portugal, abundant in sandy places by the Douro, about Pinhão, 10 Jun 1889, R. P. Murray s.n. (BM-000576294)] was shown by López González (1986) to be based on a *Raphanus* L. material, not *Malcolmia*. Unfortunately, the last reference was overlooked by Ball (see above) and by Jarvis (2007). Therefore, the epitype above was erroneously designated, and a specimen of *Raphanus* (most likely *R. raphanistrum* L.) should have been selected for *C. lacerus*. Obviously, the homotypic synonyms *Hesperis lacera* (L.) L. (Syst. Veg. ed. 13: 501. 1774), *Maresia lacera* (L.) F.Dvořák (Spisy Prirod. Fak. Univ. J. E. Purkyne v Brně 1969(No. 501): 88. 1969), and *Wilckia lacera* (L.) Samp. (Herb. Portug. 56. 1913) should be synonymized with that *Raphanus*. Therefore, all records of *M. lacera* from the Iberian Peninsula and northwestern Africa (e.g., Maire, 1976; Grueter et al. (1986); Ball & Akeroyd, 1993; Ouyahya, 1999), as well as the epitype above, are based on plants of *M. triloba*.

Jalas & Suominen (1994) have correctly reduced all infraspecific taxa of *M. lacera* in the synonymy of *M. triloba*. By contrast, Nogueira (1993) tentatively recognized

three subspecies with highly overlapping and artificially delimited boundaries. The species is extremely variable in the division of leaves, density of indumentum, flower size, and style and stigma length. However, without thorough, population-based morphological and molecular studies on *M. triloba*, we prefer not to recognize any infraspecific taxa.

MAREZIA Pomel, *Nouv. Matér. Fl. Atl.* 228. 1874.

Lectotype species designated by Maire (1976: 93): *M. binervis* (C.A.Mey.) Pomel (= *M. nana* (DC.) Batt.)

Tribe: Anastaticaceae DC., *Mém. Mus. Hist. Nat.* 7(1): 236. 1821.

Herbs annual. *Trichomes* soft, minutely stalked, stellate, with (2-)4–12(–16) ultimate branches. *Multicellular glands* absent. *Stems* erect to ascending, sometimes prostrate, often several branched basally and/or apically. *Basal leaves* petiolate, rosulate or not, simple, entire, dentate, to pinnatifid; cauline leaves sessile, cuneate to attenuate, not auriculate, entire, dentate, or pinnatifid, sometimes absent. *Racemes* few to many flowered, ebracteate, corymbose, elongated slightly or considerably in fruit, rarely flowers solitary; rachis straight; fruiting pedicels slender, terete, ascending to divaricate, distinctly narrower than fruit base. *Sepals* oblong, free, deciduous, erect, pubescent, equal or not, base of lateral pair obscurely or rarely strongly saccate; petals white to pink or purple, erect at base and with flaring blade, longer than

sepals; blade obovate to spatulate, apex rounded; claw well differentiated from blade, glabrous, unappendaged, entire; stamens 6, slightly exserted, erect, strongly tetradynamous; filaments filiform, wingless, unappendaged, glabrous, free; anthers ovate to oblong, sagittate at base, not apiculate at apex; nectar glands 2, lateral, lunar or semiannular, median nectaries absent; ovules 14–32 per ovary. *Fruits* dehiscent, capsular siliques, narrowly linear, terete, not inflated, sessile, unsegmented; valves papery, with a distinct midvein, pubescent, not keeled, rounded, strongly torulose, wingless, unappendaged; gynophore obsolete; replum rounded; septum complete, membranous, with 2 thickened, broad midveins; style 0.5–3.5 mm long, stout or slender and filiform, persistent, glabrous; stigma capitate, entire or slightly 2-lobed, lobes not connivent or decurrent, unappendaged. *Seeds* uniseriate, wingless, oblong, plump; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent, entire. $x = 13, 14$.

Distribution: Mediterranean and Southwest Asian.

From all genera of the *Malcolmia* s.l. complex, *Maresia* is readily distinguished by its capitate, entire or rarely 2-lobed stigmas with the lobes never decurrent or connivent. In its indumentum, it resembles *Marcus-Kochia*, but it is further distinguished by having 14–32 (vs. 30–92) ovules/seeds by ovary/fruit and slender (vs. stout) fruiting pedicels narrower than (vs. as thick as or wider than) the fruit base.

KEY TO SPECIES

- 1a. Basal leaf rosette present; cauline leaves absent *M. pygmaea*
 1b. Basal leaf rosette absent; cauline leaves present 2
 2a. Petals (8–)10–15 mm long; fruiting pedicels (8–)10–23 mm long; lateral sepals strongly saccate *M. pulchella*
 2b. Petals 3–7(–8) mm long; fruiting pedicels 3–6(–8) mm long; lateral sepals obscurely saccate 3
 3a. Style 0.5–1 mm long; petals 3–4.5 mm long; fruit 0.5–0.6 mm wide *M. nana*
 3b. Style (1.5–)2–3.5 mm long; petals 5–8 mm long; fruit wider 4
 4a. Fruit apex gradually attenuate to a style slightly narrower than fruit; petals 1.5–2 mm wide *M. malcolmioides*
 4b. Fruit apex abruptly narrowed into a style much narrower than fruit; petals 2.5–3.5 mm wide *M. doumetiana*

1. **Maresia nana** (DC.) Batt. in Batt. & Trabut, *Fl. Algérie* 1: 68. 1888.

Basionym: *Sisymbrium nanum* DC., *Syst. Nat.* 2: 486. 1821.

TYPE: “Hab. in Sibiria orientali (Merk),” [on sheet: *Cheiranthus nanus* a Sibir. aut Amer. Bor., Merk, Ms. Steven 1820] (Holotype: G-DC 00203316).

Distribution: Mediterranean and Southwest Asian.

As correctly indicated by Boissier (1867: 222), the type locality is erroneous because the species does not grow anywhere eastward beyond SW Asia.

2. **Maresia malcolmioides** (Coss. & Dur.) Pomel, *Nouv. Mat. Fl. Atl.* 228. 1874.

Basionym: *Sisymbrium malcolmioides* Coss. & Dur., *Bull.*

Soc. Bot. France 9: 431. 1862. TYPE: [Tunisia], “In arenosis maritimis ad orientem urbis *La Calle* amnis *Messida* ad ostium (*Dr.*, *A. Letourneus*, *Lefrance*)” (Holotype: not seen).

Distribution: Algeria, Tunisia.

3. **Maresia doumetiana** (Coss.) Batt. in Batt. & Trabut, *Fl. Algérie* 1: 69. 1888.

Basionym: *Sisymbrium doumetianum* Coss., *Bull. Bot.*

Soc. France 27: 70. 1880. TYPE: “In arenosis ad *Hammamet* ab amicissimo Doumet-Adanson (maio 1874) detectum” (Holotype: not seen).

Distribution: Algeria, Libya, Tunisia.

4. **Maresia pulchella** (DC.) O.E.Schulz, *Pflanzenreich* IV. 105(Heft 86): 211. 1924.

Basionym: *Hesperis pulchella* DC., *Syst. Nat.* 2: 455. 1821.

TYPE: “Hab. in Oriente (Graeciâ aut Syriâ)(Olivier),” (Holotype: not seen).

Distribution: Eastern Mediterranean.

The sheet at the de Candolle’s herbarium (G-DC 00203051) was collected by G. A. Olivier in 1822, a year after the publication of the species and, therefore, does not belong to the type collection. Perhaps the type is in P, but that has not yet been located.

5. **Maresia pygmaea** (DC.) O.E.Schulz, *Pflanzenreich* IV. 105(Heft 86): 210. 1924.

Basionym: *Hesperis pygmaea* DC., *Syst. Nat.* 2: 455. 1821.

TYPE: Environs de Catis’k et Sahebbie au retour de Syrie, *J. C. Savigny s.n.* (Holotype: MPU-006949).

Distribution: Egypt and Syria eastward into Iran.

Almost all consulted works attribute the authorship of the basionym *Hesperis pygmaea* to Delile (Fl. Aeg. Illust. 19, 596, tab. 63. 1813), but that work did not include any plates with details nor with a description of the species. Therefore, Delile's name was invalid (see also Stafleu & Cowan (1976) and IPNI) and de Candolle (1821) should be credited of its authorship.

STRIGOSELLA Boiss., Diagn. Pl. Orient. Ser. 2, 1: 22. 1854.

Type species: *S. cabulica* Boiss.

Synonym: *Fedtschenkoa* Regel & Schmalh., Izv. Imp. Obsc.

Ljubit. Estestv. Moskovsk. Univ. 34(2); 8. 1882. Type species: *F. turkestanica* Regel & Schmalh.

Tribe: Euclidieae DC., Mém. Mus. Hist. Nat. 7(1): 236. 1821.

Herbs, annual. *Trichomes* a mixture of simple and stalked, forked and/or dendritic. *Multicellular glands* absent. *Stems* erect to ascending. *Basal leaves* petiolate, rosulate or not, simple, entire or variously dentate or pinnatifid; dentate leaves petiolate or subsessile, not auriculate, entire, entire, or rarely lobed. *Racemes* few to many flowered, ebracteate; fruiting pedicels ascending to divaricate, persistent, as thick as or narrower than fruit base. *Sepals* ovate or oblong, free, deciduous, erect, pubescent, equal, base of lateral pair not saccate; petals white, pink, or purple, erect, longer than sepals; blade spatulate, oblong, or oblanceolate, apex obtuse or rounded; claws differentiated from blade, subequaling

sepals, glabrous, unappendaged, entire; *stamens* 6, included, erect, tetradynamous; *filaments* wingless, unappendaged, glabrous, free or median 4 connate in 2 pairs; *anthers* ovate, oblong, apex apiculate or not; nectar glands 4, 1 on each side of lateral stamens, median glands absent; ovules 40–80 per ovary. *Fruits* dehiscent, capsular siliques, linear, terete or 4-angled, not inflated, unsegmented; *valves* with obscure or prominent midvein, glabrous or pubescent, not keeled, smooth or torulose, wingless, unappendaged; *gynophore* obsolete, replum rounded; *septum* complete, membranous or opaque; *style* obsolete; *stigma* conical, 2-lobed, lobes connivent, often connate, opposite replum, unappendaged. *Seeds* uniseriate, wingless, oblong or ovate, plump or slightly flattened; seed coat reticulate, not mucilaginous when wetted; cotyledons incumbent. $x = 7$.

Distribution: Species other than *Strigosella africana* are distributed primarily in central and southwestern Asia. In addition, *S. africana* is also native to North Africa (Algeria, Egypt, Libya, Morocco, Tunisia) and southern Europe (Greece, Spain, Sicily, Ukraine, and SW Russia). It is naturalized elsewhere in Europe (see Jalas & Suominen, 1994), North America and South America.

Botschantzev (1972) divided *Strigosella* into three sections based on Dvořák's (1970a) treatment of the genus as *Fedtschenkoa*. However, without a thorough molecular study of the entire genus, any infrageneric classification based strictly on morphology may well be artificial.

KEY TO SPECIES

- 1a. Petals 3–5 × longer than sepals 2
 1b. Petals 2–2.5 × longer than sepals 16
 2a. Filaments of median stamens free; fruits produced along entire length of plant 3
 2b. Filaments of median stamens connate; fruits developed on upper part of plant 5
 3a. Petals white or cream, rarely pale pink; anthers pale *S. longipetala*
 3b. Petals purple; anthers green 4
 4a. Pedicels ca. 1.5 mm; fruit ca. 4 cm *S. cabulica*
 4b. Pedicels to 4 mm; fruit to 1 cm *S. toppinii*
 5a. Lower leaves entire, rarely few toothed 6
 5b. Lower leaves dentate or pinnatifid, if entire then simple trichomes absent on lower parts of stem or mixed with branched ones 8
 6a. Stem base and lower leaves with rough simple long trichomes, sometimes lower leaves with a mixture of long-stalked forked ones; fruit flat, torulose; pedicels narrower than fruit *S. turkestanica*
 6b. Stem base and lower leaves with subsessile or short-stalked trichomes; fruit terete, slightly torulose; pedicels as thick as fruit.
 7a. Leaves and stems pubescent with subsessile or short-stalked forked trichomes (stalks shorter than rays) sometimes mixed with simple ones; pedicels glabrous; sepals glabrous or sparsely pubescent; fruits 4.8–9.2 cm, glabrous *S. tadzhikistanica*
 7b. Leaves and stems with stalked trichomes (stalks subequaling rays) sometimes mixed with simple ones; sepals and pedicels densely pubescent with simple and forked trichomes, fruit 2.8–6.5 mm, pubescent with simple trichomes sometimes mixed with forked ones *S. tenuissima*
 8a. Leaves and stems with subsessile forked and 3-rayed trichomes, simple trichomes absent, if present then leaves large toothed or lobed 9
 8a. Leaves and stems with forked and 3-rayed trichomes on stalks of various lengths, simple trichomes present and sometimes abundant on stems 13
 9b. Lower leaves pinnately parted with numerous obtuse lobes or leaves with numerous acute teeth; pedicels 1–2.5 mm long 10
 9b. Lower leaves with 2 or 3 pairs of small acute teeth, pedicels 9–16 mm long 12
 10a. Leaves pubescent usually along margin only *S. behboudiana*
 10b. Leaves pubescent on whole surface 11
 11a. Lower leaves pinnately parted with obtuse lobes; fruit usually spirally twisted; septum transparent; simple trichomes usually absent *S. circinata*
 11b. Leaves with large acute teeth; fruits straight; septum opaque; simple trichomes present on lower part of plant *S. hyrcanica*
 12a. Leaves pubescent with thick rough trichomes; pedicel (9–)10–16 mm long; fruit 1.5–2.5(–3.5) cm long, dehiscing from base, covered with simple trichomes or glabrous; seeds up to 1.5 mm long *S. leptopoda*
 12b. Leaves with thin soft trichomes; pedicels 9–16 mm long; fruit (5–)6–7 cm long, dehiscing apically, glabrous or with forked and 3-rayed hairs; seeds ca. 2 mm *S. spryginoides*

- 13a. Stem base densely pubescent with simple trichomes, rarely also with small forked ones; basal leaves oblong; fruit flat, strongly torulose *S. grandiflora*
- 13b. Stem base with forked trichomes of different sizes, sometimes with simple ones; basal leaves broadly lanceolate; fruit flat and strongly torulose, or terete and slightly torulose 14
- 14a. Basal leaves broadly lanceolate, with small forked and 3-rayed trichomes, sometimes with single simple ones *S. vvedenskii*
- 14b. Basal leaves ovate, with large forked and simple trichomes 15
- 15a. Pedicels narrower than fruit; fruit flat, strongly torulose; seeds ovate, ca. 1.2 × 0.9 mm *S. latifolia*
- 15b. Pedicels as thick as fruit; fruit terete, slightly torulose; seeds oblong-ovate, ca. 2 × 1 mm *S. malacotricha*
- 16a. Fruit straight, rarely sickle-curved, square, square-terete, or terete 17
- 16b. Fruit spirally twisted, sickle-curved or straight, flat or terete 22
- 17a. Stems and leaves with forked or 3–5-rayed trichomes, simple ones rarely found on petioles, rarely leaves and stems glabrous; filaments of paired stamens free 18
- 17b. Stems and leaves with forked and simple trichomes, rarely with 3-rayed trichomes; filaments of paired stamens connate to 2/3 length, sometimes only basally 20
- 18a. Corolla white; fruit 2–3 cm long, dehiscent from apex, produced along entire stem length; leaves and stems densely covered with small slender (3-) or 4- or 5-rayed trichomes with admixture of large forked hairs on stem *S. strigosa*
- 18b. Corolla lilac; fruits 4.5–7.5 cm, open at base or base and apex simultaneously, developed on upper part of stem; leaves and stems variously hairy or glabrous 19
- 19a. Fruit terete or terete-quadrangular, abruptly acute to stigma, dehiscent at base; leaves and stems with equally 3–5-rayed trichomes *S. trichocarpa*
- 19b. Fruit quadrangular, rarely terete-quadrangular, gradually acute to apex, dehiscent at apex and base simultaneously; leaves and stems with forked and 3-rayed trichomes, rarely glabrous *S. africana*
- 20a. Sepals persisting for a long time; corolla (4–)4.5–5.5(–6) × 0.5–0.6 mm *S. stenopetala*
- 20b. Sepals shed early; corolla (5.5–)6–9 × (0.8–)1–1.7 mm.
- 21a. Plants prostrate; fruits predominantly crowded at base of stem; leaves dentate; fruit clavate toward stigma, abruptly acute, valves almost smooth *S. intermedia*
- 21b. Plants erect; fruit spread on stem; leaves entire; fruit gradually acute to stigma; valves torulose *S. scorpioides* var. *multisiliqua*
- 22a. Plants covered with rigid subsessile forked and 3(4)-rayed trichomes, simple trichomes absent or rarely few; leaves dentate; fruit glabrous, rarely sparsely pubescent with forked and 3(4)-rayed trichomes, sometimes with simple ones, dehiscent usually from base *S. brevipes*
- 22b. Plants covered with simple or forked, short- or long-stalked trichomes, rarely only leaf margin and upper stem parts with 3-rayed hairs; leaves entire or dentate; fruit pubescent, dehiscent from apex 23
- 23a. Fruit flat, erect, more than 1 mm wide, gradually narrowed apically; filaments connate to 1/2 length or at base only; plants with predominantly simple trichomes *S. hispida*
- 23b. Fruit terete, erect, curved or spirally twisted, ca. 1 mm wide, with parallel margin; filaments of median stamens connected more than 1/2 length; plants predominantly with forked trichomes *S. scorpioides*

1. ***Strigosella africana*** (L.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1038. 1972.

Basionym: *Hesperis africana* L., Sp. Pl. 2: 663. 1753.
TYPE: "Habitat in Africa." Herb. Clifford: 335, *Hesperis* 3 (lectotype designated by Ball in Cafferty & Jarvis (2002: 533), BM-000545325).

Distribution: N Africa, S & E Europe, Asia, naturalized elsewhere in Europe, North America, and South America.

The typification by Botschantzev (1972: 1038) was shown by Ball (see above) to be based on material added to the Linnaean herbarium after the description of the species in 1753.

The species limits of *Strigosella africana* were broadly delimited by Rechinger (1968) to include both *S. intermedia* and *S. trichocarpa*.

2. ***Strigosella behboudiana*** (Rech.f. & Esfand.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1042. 1972.

Basionym: *Malcolmia behboudiana* Rech.f. & Esfand., Phytion (Horn) 3: 64. 1951. TYPE: Iran, Luristan, Pusht-I Kuh, Halat-e Mehran, 15 March 1948, *E. Behboudi* 109 (Holotype: W).

Distribution: Afghanistan, Iran, Iraq, Pakistan, Syria.

3. ***Strigosella brevipes*** (Bunge) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1041. 1972.

Basionym: *Dontostemon brevipes* Bunge, Arb. Naturf. Ver. Riga 1: 149. 1847. TYPE: [Auf sterilen Lehmhügeln um Buchara, 4 Apr. 1842, A. Lehmann] Reliq. Lehmann. 100. *Dontostemon brevipes* m. [A. Bunge] (Reliquiae Lehmannianae. Herb. Al. de Bunge) [fl., fr. prim.] (Lectotype designated by German in German et al. (2006: 292): P; Isolectotypes: KW, LE, P, W).

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

The species has recently been found in Mongolia (Smirnov et al., 2003) and recorded from the Chinese province Gansu (German and Chen, 2009). *Malcolmia humilis* Z.H. An described from NW Xinjiang was treated by Zhou et al. (2001) as a synonym of *S. scorpioides* (as *Malcolmia*), but examination of its type (XJA) proved that it is conspecific with *S. brevipes* (German, 2008).

4. ***Strigosella cabulica*** Boiss., Diagn. Pl. Orient. Ser. 2, 1: 22. 1854. TYPE: [Afghanistan], "Hab. in regno Cabulico propè Pushut (*W. Griffith* No. 13)" (Holotype: G-BOIS; Isotypes: K, LE).

Distribution: Afghanistan, Pakistan.

5. *Strigosella circinata* (Bunge) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1042. 1972.

Basionym: *Dontostemon circinatus* Bunge, Arb. Naturf. Ver. Riga 1: 148. 1847. TYPE: [Kazakhstan], Reliq. Lehmann. 99. *Dontostemon circinatus* m. [A. Bunge] (Reliquiae Lehmannianae. Herb. Al. de Bunge) / Steppe zwischen dem Kuwan-Darja und Jaxartes 9 Mai [18]42 [A. Lehmann] (Reliquiae Lehmannianae. Herb. Al. de Bunge) [fr.] (Lectotype designated by German in German et al. (2006: 294): P; Isolectotypes: P, W).

Distribution: Afghanistan, Kazakhstan, Turkmenistan, Uzbekistan.

The first unintended attempt of lectotypification was done by Jafri (1956: 111) by citing: "Type: Turkestan, Kisil Kum, Lehmann 94 (G – not seen)." Botschantzev (1972) did not take that typification into consideration and listed all three collections mentioned in the protologue as syntypes, including the gathering of 30 April 1842 from Kyzyl-Kum. However, we did not find the relevant material at G, and it appears that Jafri's information was based on his assumption that Boissier studied this collection at G but apparently it was most likely done in Bunge's herbarium at P. Furthermore, according to the enumeration in Bunge (1847), number 94 refers to *Malcolmia intermedia* C.A.Mey. [now *Strigosella intermedia* (C.A.Mey.) Botsch.], whereas *D. circinatus* was numbered 99 on labels of the lectotype and all syntypes at LE (see German et al., 2006). Hence, from any viewpoint, Jafri's typification cannot be accepted.

The lectotype consists of two fruiting plants collected on 9 April 1842, as stated in the protologue, with which are mounted plants that represent one of the two other gatherings (Kyzyl-Kum, 30 April; and between Kuwan-Darya and Syr-Darya, 4 May). The isolectotype represented by a fruiting plant has the label "In deserto Kisilkum 30 April 42" which is definitely a result of confusion and in fact this label belongs to one of the syntypes (German et al., 2006).

6. *Strigosella grandiflora* (Bunge) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1044. 1972.

Basionym: *Dontostemon grandiflorus* Bunge, Arb. Naturf. Ver. Riga 1: 147. 1847. TYPE: [Uzbekistan], Zwischen Agathma u. Karagata. 14 April [18]42 [A. Lehmann] (Reliquiae Lehmannianae. Herb. Al. de Bunge) (Lectotype designated by German in German et al. (2006: 295): P).

Distribution: Afghanistan, Iran, Kazakhstan, Tajikistan, Turkmenistan, Uzbekistan.

The lectotype is represented by a single plant mounted with the syntype, which consists of two plants collected on 25 April 1842 between Juss-Kuduk and Bakali (German et al., 2006).

7. *Strigosella hispida* (Litv.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1042. 1972,

Basionym: *Malcolmia hispida* Litv., Trav. Mus. Bot. Acad. Petersb. 1: 37. 1902. TYPE: [Turkmenistan]

In deserto pr. Ashabad, ad radices montium, 20 Apr 1898, *D. Litvinov 550* (Lectotype designated as type by Botschantzev (1972: 1041) and herein by German: LE; Isolectotypes: B, BRNM, JE, LE, P).

Distribution: China, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan.

Zhou et al. (2001) have shown that previously reported distribution in three provinces of China can not be confirmed and confined it to Xizang (Tibet). German & Chen (2009) demonstrated that relevant gatherings belong to Xinjiang and occurrence of *S. hispida* in China is restricted to the western part of this province.

By citing the collection at LE, Botschantzev (1972) made a first-step lectotypification, but he did not specify (either in the paper or in herbarium) between three duplicates stored at LE. The specimen supplied with the author's analytical table is designated here as a second-step lectotype.

8. *Strigosella hyrcanica* (Freyn & Sint.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1042. 1972.

Basionym: *Malcolmia hyrcanica* Freyn & Sint., Bull. Herb. Boissier Ser. II. 3: 688. 1903. TYPE: [Turkmenistan] Krasnowodsk, in montosis, 15 April 1901, [*P. Sintenis*] 1579, Herbarium J. Freyn (Holotype: BRNM; Isotypes: LD, LE).

Distribution: Iran, Turkmenistan.

The occurrence of the species in Iran needs verification because Botschantzev (1972) listed it from that country, whereas Rechinger (1968) did not.

The single sheet of this species in Freyn's herbarium at BRNM was annotated by his handwriting as "*Malcolmia hyrcanica* n. sp. 11/3 [19]02 J. Freyn." It has immature fruits, and their description as "siliquis (junioribus tantum notis)" in the original publication (Freyn, 1903) would suggest that Freyn based his description on that sole sheet, which agrees with the way he often worked with material of P. Sintenis (Sutorý, 2012). The duplicates at LD (one of two) and LE (two branches) have mature fruits, and their labels carrying "determ. J. Freyn" should not be treated as a sign that Freyn studied them. Therefore, the sheet at BRNM should be treated as a holotype in accordance with ICN Art. 9.1 (McNeill et al., 2012) and not as a lectotype.

9. *Strigosella intermedia* (C.A.Mey.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1040. 1972.

Basionym: *Malcolmia intermedia* C.A.Mey., Verz. Pfl. Casp. Meer. 186. 1831. TYPE: [Azerbaijan] In campis et collibus prope Baku, 4 Apr 1830, m. [C. A. Meyer] s.n. Enum. Cauc. Casp. No. 1635. Meyer (Lectotype designated by Rechinger (1968: 259): G; Isolectotypes: 7 at LE).

Distribution: Afghanistan, Armenia, Azerbaijan, Iran, Iraq, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Syria, Tajikistan, Turkey, Turkmenistan, Uzbekistan.

The species has recently been reported from Turkey by Ünal & Özgökçe (2008). Both Botschantzev (1972) and Dorofeyev (2012), who typified the species on specimens at LE, apparently overlooked Rechinger's earlier typification.

10. **Strigosella latifolia** Bondar. & Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1044. 1972. TYPE: Tajikistan, south, right bank of Vakhsh, 23 km downstream Kyzylkala, Ak-Dzhar upland, 500 m a.s.l. Denudated remnants of grey sandy massifs, in *Calligonum-Salsola-Zygophyllum* community, 12 Apr 1965, *Ju. Soksov & Z. Mironova* 82 (Holotype: LE; Isotype: LE).

Distribution: Tajikistan.

11. **Strigosella leptopoda** Bondar. & Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1043. 1972. TYPE: South Tajikistan, mountains near Bag on the river Pyandzh; red sandy massifs to the east of Bag, southern stony slopes, 31 May 1960, *V. P. Botschantzev & T. V. Egorova* 695 (Holotype: LE; Isotypes: LE).

Distribution: Tajikistan.

12. **Strigosella longipetala** (Gilli) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1039. 1972; *Malcolmia longipetala* Gilli, Feddes Repert. Spec. Nov. Regni Veg. 57: 223. 1955. TYPE: Afghanistan, Umbebund von Kabul, Scher Darwasah, 1800 m, 15 Jun 1949, *Alexander Gilli* 1032 (Lectotype listed as type by Rechinger (1968: 263) and as lectotype by Botschantzev [1972: 1039]: W).

Distribution: Afghanistan.

13. **Strigosella malacotricha** (Botsch. & Vved.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1042. 1972; *Malcolmia malacotricha* Botsch. & Vved., Bot. Mater. Gerb. Inst. Bot. Acad. Sci. Uzbekistan. 13: 11. 1952. TYPE: Turkmenistan, hills near Kelif, 25 March 1928, *A. Vvedensky* (Holotype: TASH 28820; Isotype: TASH 28821).

Distribution: Turkmenistan.

14. **Strigosella scorpioides** (Bunge) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1041. 1972; *Dontostemon scorpioides* Bunge, Arb. Nat. Ver. Riga 1(2): 150. 1847. TYPE: [Um Buchara, 23 März 1842, *Alexander Lehmann* s.n.] *Alexanderi* Lehmann Reliquiae botanicae. No. 101. *Dontostemon scorpioides* Bge. Zwischen Agatme und Karagata 14 Apr bei Tiumen-bai 18 Apr, bei Juss-Kuduk 24 April. Steppe um Kuwan-Darja 7 Maj 1842 [*Alexander Lehmann* s.n.] (Lectotype designated as type by Rechinger (1968: 261) and herein by German: LE (left plant with the first open flower); Isolectotypes: LE, P).

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

German (in German et al., 2006: 295) designated as lectotype a specimen in P (collected on 7 May 1842 along Kuwan-Darja) supplied with original label and author's note. Rechinger's earlier citation "Typus: Buchara, Lehm., LE" was not taken into consideration because all five syntypes (mounted on three sheets) at LE are supplied with later labels not specifying the locality and just repeating relevant part of protologue without mentioning Bukhara. However, the Bukhara gathering is the only one of five collections representing the original material of *S. scorpioides*, and it could easily be identified morphologically (relevant plants are

very young, small, mainly with buds while others are better developed plants with flowers and immature to submature fruits). Two such tiny plants are housed at LE (syntypes 3 and 5, according to German et al., 2006), each mounted on a separate sheet with a plant representing any of the rest four collections. Hence, Rechinger's citation should be treated as the first-step lectotypification narrowed herein to a single specimen (syntype 3, according to German et al., 2006).

Within China, the species is restricted to the single province (Xinjiang, western part), as its record from Gansu is based on the gathering of *S. brevipes* (German and Chen, 2009).

15. **Strigosella spryginoides** (Botsch. & Vved.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1044. 1972.

Basionym: *Malcolmia spryginoides* Botsch. & Vved., Bot. Mater. Gerb. Inst. Bot. Acad. Sci. Uzbekistan 13: 12. 1952. TYPE: Ad decliva rubra arenoso-petrosa in angustiis Surchi pr. p. Sina in promontoriis montium Tschulbair, 4 June 1930, *N. Nikiforova & M. Popov* s.n. (Holotype: TASH; Isotypes: BP, G, KW, LE, MHA, MW, P, PE, TASH, TK).

Distribution: Afghanistan, Uzbekistan.

Rechinger (1968) cited several collections from Afghanistan, but Botschantzev (1972: 1042) referred them to *S. tenuissima* and listed *S. spryginoides* as endemic to Uzbekistan.

16. **Strigosella stenopetala** (Fisch. & C.A.Mey.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1040.

Basionym: *Malcolmia africana* (L.) W.T.Aiton var. *stenopetala* Fisch. & C.A.Mey., Index Seminum (St. Petersburg) 1: 11, 33. 1835. TYPE: Cultivated in 1833 at the Botanical Garden in St. Petersburg from seeds by J. J. Bernhardt (Holotype: LE).

Distribution: Armenia, Azerbaijan, Kazakhstan, Russia, Tajikistan, Turkmenistan, Uzbekistan.

17. **Strigosella strigosa** (Boiss.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1039. 1972.

Basionym: *Malcolmia strigosa* Boiss., Ann. Sci. Nat., Bot. sér. 2, 17: 70. 1842. TYPE: Iran, Isfahan, 1835, *P. M. R. Aucher-Eloy* 4068 (Holotype: G-BOIS; Isotypes: BM, K, LE, P).

Distribution: Afghanistan, Iran, Turkmenistan, Pakistan.

18. **Strigosella tadjikistanica** (Vassilcz.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1043. 1972.

Basionym: *Malcolmia tadjikistanica* Vassilcz., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 9: 260. 1946. TYPE: Tajikistan, Shuroabad district, near Dzhida-Bulak. Clayey hills near the road. The belt of ephemerals. 1000 m, 2 Jun 1935, *I. A. Linchevsky & T. I. Maslennikova* 142 (Holotype: LE).

Distribution: Tajikistan.

19. **Strigosella tenuissima** (Botsch.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1042. 1972.

Basionym: *Malcolmia tenuissima* Botsch., Novosti Sist. Vyssh. Rast. 1965: 276. 1965. TYPE: South Tajikistan, near Kabadian, Khodzha-Kazian mts., loess deposits at western slopes, 29 May 1959, V. P. Botschantzev 276 (Holotype: LE; Isotypes: LE).

Distribution: Afghanistan, Tajikistan.

20. *Strigosella toppinii* (O.E.Schulz) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1039. 1972.

Basionym: *Malcolmia toppinii* O.E.Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 9: 1088. 1927. TYPE: Pakistan, Dorsh, Chitral, 4500 ft, Mar. 1908, S. M. Toppin 106 (Holotype: K; Fragments: B).

Distribution: Pakistan.

Jafri (1973) reduced the species (in *Malcolmia*) to a variety of *Strigosella cabulica*, but the differences in fruit and pedicel length are substantial to justify their recognition as different species.

21. *Strigosella trichocarpa* (Boiss. & Buhse) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1038. 1972.

Basionym: *Malcolmia trichocarpa* Boiss. & Buhse, Nouv. Mém. Soc. Imp. Naturalistes Moscou 12: 21. 1860. TYPE: Iran, "In deserto Persiae boreali-orientalis prope Djendak," 5–6 Apr 1849, F. Buhse (Lectotype designated by Rechinger (1968: 259) as type: G-BOIS; Isolectotype: LE).

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

22. *Strigosella turkestanica* (Litv.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1045. 1972.

Basionym: *Malcolmia turkestanica* Litv., Sched. Herb. Fl. Ross. 4: 32. 1902. TYPE: [Uzbekistan], Turkestan, Fergana, between Osch and Chodshewat, 17/29 May 1900, D. Litwinow & W. Tranzschel s.n. Herb. Fl. Ross. 1005 (Lectotype designated as type by Rechinger (1968: 253): W; Isolectotypes: B, BP, KFTA, KW, LE, MHA, MW, PRC, TK).

Distribution: Afghanistan, Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan.

The species was described based on the single collection issued as exiccates "Herbarium Florae Rossicae" (No. 1005) supplied with the printed label with detailed description and diagnosis in Russian and Latin with the dates 17 and 29 May, respectively, referring to the same day but reflecting the difference between Julian and Gregorian calendars. Rechinger cited such a duplicate at W as "Typus" thus designated it as lectotype. Botschantzev (1972: 1045), however, annotated and cited as type a specimen with a handwritten Litvinov's label and analytical table. Thus, Botschantzev's choice would be preferable according to ICN Rec. 9A.3 (McNeill et al., 2012) but Rechinger's earlier typification is accurate and should be followed.

23. *Strigosella vvedenskyi* Bondar. & Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1043. 1972. TYPE: South Uzbekistan, hills between Baysun and Shurchi, near

Sary-kamysh, destroyed grey sandy massifs, 20 Jun 1967, V. P. Botschantzev 187 (Holotype: LE; Isotype: LE).

Distribution: Uzbekistan.

ZUVANDA (F.Dvořák) Askerova, Bot. Zhurn. (Moscow & Leningrad) 70: 522. 1985.

Synonyms: *Maresia* Pomel subgen. *Zuvanda* F.Dvořák, Feddes Repert. 83: 271. 1972.

Type species: *Z. meyeri* (Boiss.) Askerova, Bot. Zhurn. (Moscow & Leningrad) 70: 523. 1985.

Tribe: Conringieae D.A.German & Al-Shehbaz, Harvard Pap. Bot. 13: 159. 2008.

Herbs, annual. *Trichomes* absent or simple, minute papillae. *Multicellular glands* absent. *Stems* erect to ascending, simple or most commonly branched basally. *Basal leaves* short petiolate to subsessile, not rosulate, simple, entire or dentate, soon withering; *cauline leaves* sessile, auriculate or sagittate at base, entire or dentate. *Racemes* few-flowered, ebracteate, corymbose, elongated slightly to considerably in fruit; *rachis* straight; fruiting *pedicels* ascending to divaricate, persistent, as thick as or narrower than fruit base. *Sepals* linear, free, deciduous, erect, glabrous or scabrous-papillate, unequal, base of lateral pair saccate, margin membranous; *petals* yellow, pink, or purple, erect at base with flaring blade, much longer than sepals; *blade* obovate, apex rounded; *claw* well-differentiated from blade, glabrous, unappendaged, entire; *stamens* 6, distinctly exerted, erect, strongly tetradynamous; filaments filiform, wingless, unappendaged, not dilated at base, glabrous, free; *anthers* linear, sagittate at base, subapiculate at apex, not coiled after dehiscence; *nectar glands* 2; median nectaries absent; lateral nectaries lunar or semiannular and intrastaminal; ovules 50–80 per ovary. *Fruits* tardily dehiscent, capsular siliques, long cylindrical, terete, not inflated, sessile, unsegmented; *valves* thickened, somewhat leathery, with an obscure midvein, glabrous or papillate, not keeled, rounded, smooth, wingless, unappendaged; *gynophore* absent; replum rounded, broad; septum complete, membranous, hyaline or thickened and opaque, not veined; *style* distinct, 5–15 mm long, stout, cylindrical-conical, persistent, glabrous; *stigma* conical, 2-lobed, lobes prominent, connivent, partially connate, opposite replum, not appendaged. *Seeds* uniseriate, wingless, oblong, plump; seed coat minutely reticulate, not mucilaginous when wetted; *cotyledons* incumbent.

Distribution: Armenia and Turkey southward into Sinai and eastward into Iran.

Zuvanda includes three species, the typification and synonyms of which is given in Askerova (1985). It is readily distinguished from all genera of the *Malcolmia* s.l. complex by having auriculate to sagittate cauline leaves and by lacking the branched trichomes. All three species were recently transferred by Dorofeyev (2002) to *Moricandia* DC. of the tribe Brassiceae, but neither molecular data (German et al., 2009) nor morphological data (German & Al-Shehbaz, 2008) support that tribal placement because *Zuvanda* has incumbent cotyledons whereas *Moricandia* has conduplicate cotyledons. An updated key to the three *Zuvanda* species is provided herein.

KEY TO SPECIES (THREE SPECIES)

- 1a. Flowering pedicels subequaling calyx; fruit 1–1.3 mm wide; septum hyaline *Z. meyeri*
 1b. Flowering pedicels shorter than calyx; fruit 2–4 mm wide; septum opaque 2
 2a. Petals purple; 1.8–2.4 cm long *Z. crenulata*
 2b. Petals yellow; 1.2–1.8 cm long *Z. exacoides*

1. ***Zuvanda crenulata*** (DC.) Askerova, Bot. Zhurn. (Moscow & Leningrad) 70: 523. 1985.

Basionym: *Hesperis crenulata* DC., Syst. Nat. 2: 456. 1821. TYPE: “Hab. in Oriente inter Alep et Mossul,” *G. A. Oliver s.n.* [& *Bruguère* on sheet] (Holotype: P-02272548; Fragments?: G-DC 00203050).

Distribution: Armenia and Turkey southward into Egypt and eastward into Iran.

2. ***Zuvanda exacoides*** (DC.) Askerova, Bot. Zhurn. (Moscow & Leningrad) 70: 524. 1985.

Basionym: *Sisymbrium exacoides* DC., Syst. Nat. 2: 463. 1821. TYPE: “Hab. in Libano loco dicto Zaale, *Labillardière*” (Holotype : G-DC 00203072).

Distribution: Eastern Mediterranean, Iraq, Turkey.

The species has recently been reported from Turkey (Özgökçe & Ünal, 2007).

3. ***Zuvanda meyeri*** (Boiss.) Askerova, Bot. Zhurn. (Moscow & Leningrad) 70: 523. 1985.

Basionym: *Malcolmia meyeri* Boiss., Ann. Sci. Nat., Bot. sér. 2, 17: 71. 1842. TYPE: [Azerbaijan] In campis et ad rivulorum margines pr. Swant d. 20 Junii m. 1830. Enum. pl. casp. No. 1641, [C. A.] *Meyer* (Lectotype designated as type by Rechinger (1968: 265) and herein by German: LE; Isolectotypes: K, LE).

Distribution: Armenia, Azerbaijan, Iran.

Even though Rechinger’s (1968: 265) citation of the type: “Typus: Talish, C. A. Mey., LE” does not fit any actual label, it unambiguously refers to a single collection deposited in one herbarium and thus represents the first-step typification which has priority over recent typification of Dorofeyev (2012: 376): “Caucasus, ...Swant..., Hohenacker (LE).” One of five duplicates of Meyer’s gathering with the label written by him is selected here as a second-step lectotype. The species has recently been reported from Iran (Akhani, 2003).

CURRENT STATUS OF TAXA PREVIOUSLY PLACED IN *MALCOLMIA*

Names in italics are synonyms of accepted taxa in boldface, followed by tribal names [in square brackets].

- Malcolmia aculeolata* (Boiss.) Boiss., Fl. Orient. 1: 226. 1867. = ***Sisymbrium aculeolatum*** Boiss., Ann. Sci. Nat. Ser. 2, 17: 75. 1842. [Sisymbrieae].
- M. aegyptiaca* Spreng., Syst. Veg. ed. 16, 2: 898. 1825. = ***Eremobium aegyptiacum*** (Spreng.) Asch. & Schweinf. ex Boiss., Fl. Orient. Suppl. 30. 1888. [Anastaticae].
- M. aegyptiaca* Spreng. var. *linearis* (Delile) Coss., Ill. Fl. Atlant. 1: 22. 1882. = ***Eremobium aegyptiacum*** (Spreng.) Asch. & Schweinf. ex Boiss., Fl. Orient. Suppl. 30. 1888. [Anastaticae].
- M. africana* (L.) W.T.Aiton, Hortus Kew., ed. 2. 4: 121. 1812. = ***Strigosella africana*** (L.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1038. 1972. [Euclidiae].
- M. africana* (L.) W.T.Aiton var. *divaricata* Fisch. & C.A.Mey., Index Seminum (St. Petersburg) 1: 33. 1835. = ***Strigosella stenopetala*** (Fisch. & C.A.Mey.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1040. 1972. [Euclidiae].
- M. africana* (L.) W.T.Aiton var. *intermedia* (C.A.Mey.) Boiss., Fl. Orient. 1: 223. 1967. = ***Strigosella intermedia*** (C.A.Mey.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1040. 1972. [Euclidiae].
- M. africana* (L.) W.T.Aiton var. *stenopetala* Fisch. & C.A.Mey., Index Seminum (St. Petersburg) 1: 33. 1835. = ***Strigosella stenopetala*** (Fisch. & C.A.Mey.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1040. 1972. [Euclidiae].
- M. africana* (L.) W.T.Aiton var. *trichocarpa* (Boiss. & Buhse) Boiss., Fl. Orient. 1: 223. 1967. = ***Strigosella trichocarpa*** (Boiss. & Buhse) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1038. 1972. [Euclidiae].
- M. alyssoides* (Pers.) DC., Syst. Nat. 2: 444. 1821. = ***Marcus-Kochia littorea*** (L.) Al-Shehbaz [Anastaticae].
- M. angulifolia* Boiss. & Orph., Diagn. Pl. Orient. ser. 2, 5: 19. 1856. = ***Malcolmia orsiniana*** subsp. ***angulifolia*** (Boiss. & Orph.) Stork, Svensk Bot. Tidskr. 66(3): 245. 1972. [Malcolmieae].
- M. arabica* Velen., Sitzungsber. Königl. Böhm. Ges. 11. 14. 1912. = ***Diplotaxis acris*** (Forssk.) Boiss., Fl. Orient. 1: 389. 1867. [Brassicaceae].
- M. arenaria* (Desf.) DC., Syst. Nat. 2: 442. 1821. = ***Marcus-Kochia arenaria*** (Desf.) Al-Shehbaz [Anastaticae].
- M. arenaria* var. *dasycarpa* Faure & Maire, Bull. Soc. Hist. Nat. Afr. Nord 22: 951. 1931. = ***Marcus-Kochia arenaria*** (Desf.) Al-Shehbaz [Anastaticae].
- M. arenaria* var. *leiocarpa* Faure & Maire, Bull. Soc. Hist. Nat. Afr. Nord 22: 951. 1931. = ***Marcus-Kochia arenaria*** (Desf.) Al-Shehbaz [Anastaticae].
- M. arenaria* var. *biloba* (Pomel) Maire, Fl. Afr. Nord 14: 55. 1976. = ***Marcus-Kochia arenaria*** (Desf.) Al-Shehbaz [Anastaticae].
- M. arenaria* var. *versicolor* (Pomel) Maire, Fl. Afr. Nord 14: 55. 1976. = ***Marcus-Kochia arenaria*** (Desf.) Al-Shehbaz [Anastaticae].
- M. auranitica* Post, J. Linn. Soc., Bot. 24: 420. 1888. Type specimen was not found in the Post Herbarium (BEI). The presence of glands on the leaves and fruits given in the original description suggests that the species may belong to *Chorispora*.
- M. bassarana* Petrov. ex Fritsch., Verh. Zool.-Bot. Ges. Wien 45: 376. 1895. = ***Malcolmia orsiniana*** subsp. ***serbica*** (Pančić) Greuter & Burdet, Willdenowia 13(1): 94. 1983. [Malcolmieae].

- M. behboudiana* Rech.f. & Esfand., *Phyton* (Horn) 3: 64. 1951. = **Strigosella behboudiana** (Rech.f. & Esfand.) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1042. 1972. [Euclidiaceae].
- M. bicolor* Boiss. & Heldr., *Diagn. Pl. Orient.* ser. 1, 6: 10. 1846. = **Malcolmia graeca** Boiss. & Spruner subsp. **bicolor** (Boiss. & Heldr.) Stork, *Opera Bot.* 33: 39. 1972. [Malcolmieae].
- M. bicolor* Boiss. & Heldr. var. *veluchensis* (Boiss. & Heldr.) Boiss., *Fl. Orient.* 1: 229. 1967. = **Malcolmia graeca** Boiss. & Spruner subsp. **bicolor** (Boiss. & Heldr.) Stork, *Opera Bot.* 33: 39. 1972. [Malcolmieae].
- M. biloba* Pomel, *Bull. Soc. Sci. Phys. Algérie* 11: 229. 1874. = **Marcus-Kochia arenaria** (Desf.) Al-Shehbaz [Anastatiaceae].
- M. binervis* (C.A.Mey.) Boiss., *Ann. Sci. Nat., Bot. sér.* 2, 17: 71. 1842. = **Maresia nana** (DC.) Batt. in Batt. & Trabut, *Fl. Algérie* 1: 68. 1888. [Anastatiaceae].
- M. binervis* Boiss. subsp. *confusa* (Boiss.) P. Fourn., *Quatre Fl. France* 429. 1936. = **Maresia nana** (DC.) Batt. in Batt. & Trabut, *Fl. Algérie* 1: 68. 1888. [Anastatiaceae].
- M. boissieriana* Jafri, *Notes Roy. Bot. Gard. Edinburgh* 22: 111. 1956. = **Strigosella circinata** (Bunge) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1042. 1972. [Euclidiaceae].
- M. brevipes* (Kar. & Kir.) Boiss., *Fl. Orient.* 1: 226. 1867. = **Neotorularia brevipes** (Kar. & Kir.) Hedge & J. Léonard, *Bull. Jard. Bot. Belg.* 56: 393. 1986. [Euclidiaceae].
- M. broussonetii* DC., *Syst. Nat.* 2: 445. 1821. = **Marcus-Kochia triloba** (L.) Al-Shehbaz [Anastatiaceae].
- M. broussonetii* var. *bicolor* Emb. & Maire, *Bull. Soc. Sci. Nat. Afr. Nord* 20(1): 452. 1929. = **Marcus-Kochia triloba** (L.) Al-Shehbaz [Anastatiaceae].
- M. broussonetii* var. *mamorensis* H. Lindb., *Acta Soc. Sci. Fenn. Ser. B., Opera Biol.* 1(2): 63. 1932. = **Marcus-Kochia triloba** (L.) Al-Shehbaz [Anastatiaceae].
- M. broussonetii* var. *tricolor* Emb. & Maire, *Bull. Soc. Sci. Nat. Maroc.* 13: 278. 1932. = **Marcus-Kochia triloba** (L.) Al-Shehbaz [Anastatiaceae].
- M. bucharica* Vassilez., *Fl. URSS* 8: 647. 1939. = **Strigosella grandiflora** (Bunge) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1044. 1972. [Euclidiaceae].
- M. bungei* Boiss., *Fl. Orient.* 1: 226. 1867. = **Strigosella grandiflora** (Bunge) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1044. 1972. [Euclidiaceae].
- M. bungei* Boiss. var. *assyriaca* Bornm., *Beih. Bot. Centralbl.* 28(2): 108. 1911. = **Strigosella behboudiana** (Rech.f. & Esfand.) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1042. 1972. [Euclidiaceae].
- M. bungei* Boiss. var. *glabrescens* Boiss., *Fl. Orient.* 1: 226. 1867. = **Strigosella behboudiana** (Rech.f. & Esfand.) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1042. 1972. [Euclidiaceae].
- M. bungei* Boiss. var. *lasiocarpa* Regel, *Bull. Soc. Naturalistes Moscou* 43: 271. = **Strigosella turkestanica** (Litv.) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1045. 1972. [Euclidiaceae].
- M. bungei* Boiss. var. *macrantha* Regel, *Bull. Soc. Naturalistes Moscou* 43: 271. = **Strigosella turkestanica** (Litv.) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1045. 1972. [Euclidiaceae].
- M. cabulica* (Boiss.) Hook.f. & Thomson, *J. Proc. Linn. Soc., Bot.* 5: 156. 1861. = **Strigosella cabulica** Boiss., *Diagn. Pl. Orient. Ser. 2, 1: 22.* 1854. [Euclidiaceae].
- M. cabulica* (Boiss.) Hook.f. & Thomson subsp. *longipetala* (Gilli) Podlech & K.Jarmal, *Mitt. Bot. Staatssamml. München* 13: 567. 1977. = **Strigosella longipetala** (Gilli) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1039. 1972. [Euclidiaceae].
- M. cabulica* (Boiss.) Hook.f. & Thomson var. *toppinii* (O.E.Schulz) Jafri, *Fl. W. Pakistan* 55: 222. 1973. = **Strigosella toppinii** (O.E.Schulz) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1039. 1972. [Euclidiaceae].
- M. calycina* Sennen, *Diagn. Nouv.* 178. 1936. = **Strigosella africana** (L.) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1038. 1972. [Euclidiaceae].
- M. castellana* Rouy, *Rev. Sc. Nat. Ser. 3(1): 72.* 1883. Status unknown.
- M. chia** (L.) DC., *Syst. Nat.* 2: 440. 1821. [Malcolmieae].
- M. ciliaris* Boiss., *Fl. Orient. Suppl.* 44. 1888. Status unknown.
- M. circinata* Hook.f. & Thomson, *J. Proc. Linn. Soc., Bot.* 5: 155. 1861, nom. illeg. superfl.; non (Bunge) Boiss., *Fl. Orient.* 1: 227. 1867. = **Strigosella grandiflora** (Bunge) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1044. 1972. [Euclidiaceae].
- M. circinata* (Bunge) Boiss., *Fl. Orient.* 1: 227. 1867, non Hook.f. & Thomson, *J. Proc. Linn. Soc., Bot.* 5: 155. 1861. = **Strigosella circinata** (Bunge) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1042. 1972. [Euclidiaceae].
- M. confusa* Boiss., *Fl. Orient.* 1: 221. 1867. = **Maresia nana** (DC.) Batt. in Batt. & Trabut, *Fl. Algérie* 1: 68. 1888. [Anastatiaceae].
- M. conringioides* Boiss., *Fl. Orient.* 1: 230. 1867. = **Zuvanda exacoides** (DC.) Askerova, *Bot. Zhurn.* (Moscow & Leningrad) 70: 524. 1985. [Conringieae].
- M. contortuplicata* (Stephan ex Willd.) Boiss., *Fl. Orient.* 1: 224. 1867. = **Neotorularia conturtuplicata** (Stephan ex Willd.) Hedge & J. Léonard, *Bull. Jard. Bot. Natl. Belg.* 56: 394. 1986. [Euclidiaceae].
- M. contortuplicata* Boiss. var. *curvata* Freyn & Sint. ex Freyn, *Bull. Herb. Boiss. Ser. 2, 3: 686.* 1903. = **Strigosella scorpioides** (Bunge) Botsch., *Bot. Zhurn.* (Moscow & Leningrad) 57: 1041. 1972. [Euclidiaceae].
- M. cossoniana* Rouy in Roy & Foucad, *Fl. France* 2: 7. 1895. = **Maresia malcolmiioides** (Cosson & Durieu) Pomel, *Bull. Soc. Sci. Phys. Algérie* 11: 228. 1874. [Anastatiaceae].
- M. cornuta* Stapf, *Denkschr. Akad. Wiss. Wien* 51: 32. 1886. = **Neotorularia torulosa** (Desf.) Hedge & J.Léonard, *Bull. Jard. Bot. Natl. Belg.* 56: 395. 1986. [Euclidiaceae].

- M. crenulata* (DC.) Boiss., Fl. Orient. 1: 229. 1867, non (C.A.Mey.) Vassilcz., Fl. URSS 8: 284. 1939. = **Zuvanda crenulata** (DC.) Askerova, Bot. Zhurn. (Moscow & Leningrad) 70: 523. 1985. [Conringieae].
- M. crenulata* (C.A.Mey.) Vassilcz., Fl. URSS 8: 284. 1939, nom. illeg.; non. (DC.) Boiss., Fl. Orient. 1: 229. 1867. = **Zuvanda meyeri** (Boiss.) Askerova, Bot. Zhurn. (Moscow & Leningrad) 70: 523. 1985. [Conringieae].
- M. cymbalaria* Heldr. & Sart. in Boiss., Fl. Orient. 1: 227. 1867, nom. illeg. = **Malcolmia orsiniana** subsp. **angulifolia** (Boiss. & Oroph.) Stork, Svensk Bot. Tidskr. 66(3): 245. 1972. [Malcolmieae].
- M. divaricata* (Fisch. & C.A.Mey.) Fisch., Index Seminum (St. Petersburg) 9: 30. 1843. = **Strigosella stenopetala** (Fisch. & C.A.Mey.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1040. 1972. [Euclidieae].
- M. doumetiana* (Coss.) Rouy in Rouy & Fouc., Fl. France 2: 7. 1895. = **Maresia doumetiana** (Coss.) Batt. in Batt. & Trabut, Fl. Algérie 1: 69. 1888. [Anastaticae].
- M. erosa* (Lag.) DC., Syst. Nat. 2: 446. 1821. = **Marcus-Kochia triloba** (L.) Al-Shehbaz [Anastaticae].
- M. exacoides* (DC.) Spreng., Syst. Veg. ed. 16, 2: 899. 1825. = **Zuvanda exacoides** (DC.) Askerova, Bot. Zhurn. (Moscow & Leningrad) 70: 524. 1985. [Conringieae].
- M. flexuosa** (Sm.) Sm. in Sibth., Fl. Graec. t. 634. 1831. [Malcolmieae].
- M. flexuosa* (Sm.) Sm. var. *cephallenica* Heldr., Fl. Céphalonie 22: 1882. = **Malcolmia maritima** (L.) W.T.Aiton, Hortus Kew., ed. 2. 4: 121. 1812. [Malcolmieae].
- M. flexuosa* (Sm.) Sm. var. *cuspidata* Raulin, Descr. Phys. Crête, Bot. 706. 1869. = **M. flexuosa** (Sm.) Sm. subsp. **naxensis** (Rech.f.) Stork, Opera Bot. 33: 35. 1972. [Malcolmieae].
- M. flexuosa** (Sm.) Sm. subsp. **naxensis** (Rech.f.) Stork, Opera Bot. 33: 35. 1972. [Malcolmieae].
- M. flexuosa* (Sm.) Sm. var. *naxensis* (Rech.f.) Rech.f., Fl. Aegaea 216. 1943. = **Malcolmia flexuosa** (Sm.) Sm. subsp. **naxensis** (Rech.f.) Stork, Opera Bot. 33: 35. 1972. [Malcolmieae].
- M. glaberrima* Rech.f. & Esfand., Phytion (Horn) 3: 63. 1951. = **Zuvanda crenulata** (DC.) Askerova, Bot. Zhurn. (Moscow & Leningrad) 70: 523. 1985. [Conringieae].
- M. gracilima* Samp., Man. Fl. Portug. 195. 1910. = **Marcus-Kochia triloba** (L.) Al-Shehbaz [Anastaticae].
- M. graeca** Boiss. & Spruner, Diagn. Pl. Orient. ser. 1, 1: 71. 1843. [Malcolmieae].
- M. graeca** Boiss. & Spruner subsp. **bicolor** (Boiss. & Heldr.) Stork, Opera Bot. 33: 39. 1972. [Malcolmieae].
- M. graeca** Boiss. & Spruner subsp. **hydraea** (Heldr. & Hal.) Stork, Opera Bot. 33: 40. 1972. [Malcolmieae].
- M. graeca* Boiss. & Spruner var. *integrifolia* Boiss., Fl. Orient. 1: 228. 1867. = **Malcolmia graeca** Boiss. & Spruner, Diagn. Pl. Orient. ser. 1, 1: 71. 1843. [Malcolmieae].
- M. graeca* Boiss. & Spruner var. *tenuior* Hausskn., Mitth. Thüring. Bot. Vereins, N.F. 3-4: 108. 1893. = **Malcolmia graeca** Boiss. & Spruner, Diagn. Pl. Orient. ser. 1, 1: 71. 1843. [Malcolmieae].
- M. grandiflora* (Bunge) Kuntze, Trudy Imp. S.-Peterburgsk. Bot. Sada 10: 167. 1887. = **Strigosella grandiflora** (Bunge) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1044. 1972. [Euclidieae].
- M. grandiflora* (Bunge) Kuntze var. *glabrescens* (Boiss.) Burt & Lewis, Kew Bull. 4: 293. 1949. = **Strigosella behboudiana** (Rech.f. & Esfand.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1042. 1972. [Euclidieae].
- M. halophila* Gilli, Feddes Repert. Spec. Nov. Regni Veg. 57: 224. 1955. = **Strigosella intermedia** (C.A.Mey.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1040. 1972. [Euclidieae].
- M. heterophylla* Caball., Bol. Roy. Soc. Esp. Hist. Nat. 12: 553. 1912. = **Marcus-Kochia arenaria** (Desf.) Al-Shehbaz [Anastaticae].
- M. hispida* Litv., Trav. Mus. Bot. Acad. Petersb. 1: 37. 1902. = **Strigosella hispida** (Litv.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1042. 1972. [Euclidieae].
- M. humilis* C.H.An, Fl. Xinjiangensis 2(2): 378. 1995. = **Strigosella brevipes** (Bunge) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1041. 1972. [Euclidieae].
- M. xhybrida* Hausskn., Mitth. Thur. Bot. Ver. N. Folge 3 & 4: 108. 1892. Said to be a hybrid between *Malcolmia flexuosa* and *M. graeca*, though Stork (1972c: 69) did not find any herbarium specimen of suspected hybrid origin.
- M. hydraea* (Heldr. & Halácsy) Heldr. & Halácsy, Bull. Herb. Boiss. 6: 234. 1898. = **M. graeca** Boiss. & Spruner subsp. **hydraea** (Heldr. & Hal.) Stork, Opera Bot. 33: 40. 1972. [Malcolmieae].
- M. hyrcanica* Freyn & Sint., Bull. Herb. Boissier Ser. II. 3: 688. 1903. = **Strigosella hyrcanica** (Freyn & Sint.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1042. 1972. [Euclidieae].
- M. illyrica* (Halácsy) Hayek, Denkschr. Akad. Wiss. Wien, Math.-Nat. 94: 150. 1917. = **M. orsiniana** subsp. **serbica** (Pančić) Greuter & Burdet, Willdenowia 13(1): 94. 1983. [Malcolmieae].
- M. incrassata* DC., Syst. Nat. 2: 441. 1821. = **M. flexuosa** (Sm.) Sm. in Sibth., Fl. Graec. t. 634. 1831. [Malcolmieae].
- M. intermedia* C.A.Mey., Verz. Pfl. Casp. Meer. 186. 1831. = **Strigosella intermedia** (C.A.Mey.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1040. 1972. [Euclidieae].
- M. karelinii* Lipsky, Trudy Imp. S.-Peterburgsk. Bot. Sada 23: 31. 1904. = **Strigosella brevipes** (Bunge) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1041. 1972. [Euclidieae].
- M. koelzii* Rech.f., Phytion (Horn) 3: 64. 1951. = **Strigosella cabulica** Boiss., Diagn. Pl. Orient. Ser. 2, 1: 22. 1854. [Euclidieae].

- M. komarovii* Vassilcz., Novosti Sist. Vyssh. Rast. 6: 107. 1970. = **Strigosella grandiflora** (Bunge) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1044. 1972. [Euclidieae].
- M. lacera* (L.) DC., Syst. Nat. 2: 445. 1821. = *Raphanus* sp., perhaps *R. raphanistrum* L. [Brassicaceae].
- M. lacera* (L.) DC. subsp. *broussonetii* (DC.) Greuter & Burdet, Willdenowia 13(1): 94. 1983. = **Marcus-Kochia triloba** (L.) Al-Shehbaz [Anastaticae].
- M. lacera* (L.) DC. subsp. *gracilima* (Samp.) Franco, Nova Fl. Portugal 1: 551, 207. 1971. = **Marcus-Kochia triloba** (L.) Al-Shehbaz [Anastaticae].
- M. lacera* (L.) DC. subsp. *patula* (DC.) Rivas Martínez, Publ. Inst. Biol. Aplicada 42: 116. 1967. = **Marcus-Kochia triloba** (L.) Al-Shehbaz [Anastaticae].
- M. laxa* (Lam.) DC., Syst. Nat. 2: 440. 1821. = **Strigosella africana** (L.) Botsch. var. **laxa** (Lam.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1038. 1972. [Euclidieae].
- M. ledebourii* Boiss., Fl. Orient. 1: 224. 1867. = **Neotorularia conturtiplicata** (Stephan ex Willd.) Hedge & J. Léonard, Bull. Jard. Bot. Natl. Belg. 56: 394. 1986. [Euclidieae].
- M. littorea* (L.) W.T.Aiton, Hortus Kew., ed. 2. 4: 121. 1812. = **Marcus-Kochia littorea** (L.) Al-Shehbaz [Anastaticae].
- M. littorea* var. *lingulata* H. Lindb., Acta Soc. Sci. Fenn. Ser. B., Opera Biol. 1(2): 64. 1932. = **Marcus-Kochia littorea** (L.) Al-Shehbaz [Anastaticae].
- M. littorea* var. *multicaulis* (Pomel) Maire, Fl. Afr. Nord. 14: 62. 1976. = **Marcus-Kochia littorea** (L.) Al-Shehbaz [Anastaticae].
- M. longipetala* Gilli, Feddes Repert. Spec. Nov. Regni Veg. 57: 223. 1955. = **Strigosella longipetala** (Gilli) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1039. 1972. [Euclidieae].
- M. lyrata* (Sm.) DC., Syst. Nat. 2: 443. 1821. = **Malcolmia chia** (L.) DC., Syst. Nat. 2: 440. 1821. [Malcolmieae].
- M. macrocalyx** (Halácsy) Rech.f., Ann. Naturhist. Mus. Wien 43: 299. 1929.
- M. malacotricha* Botsch. & Vved., Not. Syst. Herb. Inst. Bot. Acad. Sci. Uzbekistan. 13: 11. 1952. = **Strigosella malacotricha** (Botsch. & Vved.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1042. 1972. [Euclidieae].
- M. malcolmioides* (Coss. & Durieu) Greuter & Burdet, Willdenowia 13(1): 94. 1983. = **Maresia malcolmioides** (Coss. & Durieu) Pomel, Bull. Soc. Sci. Phys. Algérie 11: 228. 1874. [Anastaticae].
- M. maritima** (L.) W.T.Aiton, Hortus Kew., ed. 2. 4: 121. 1812. [Malcolmieae].
- M. maritima* (L.) W.T.Aiton var. *leucadiana* Stork, Opera Bot. 33: 29. 1972. = **Malcolmia maritima** (L.) W.T.Aiton, Hortus Kew., ed. 2. 4: 121. 1812. [Malcolmieae].
- M. maritima* (L.) W.T.Aiton var. *macrocalyx* (Halácsy) Hayek, Prodr. Fl. Penins. Balcan. 1: 418. 1925. = **Malcolmia macrocalyx** (Halácsy) Rech.f., Ann. Naturhist. Mus. Wien 43: 299. 1929. [Malcolmieae].
- M. maritima* (L.) W.T.Aiton var. *serbica* (Pančić) G. Beck, Glasn. Zmaljsk. Muz. Bosni Hercegovini 28: 103. 1916. = **M. orsiniana** subsp. **serbica** (Pančić) Greuter & Burdet, Willdenowia 13(1): 94. 1983. [Malcolmieae].
- M. meyeri* Boiss., Ann. Sci. Nat., Bot. sér. 2, 17: 71. 1842. = **Zuvanda meyeri** (Boiss.) Askerova, Bot. Zhurn. (Moscow & Leningrad) 70: 523. 1985. [Conringieae].
- M. micrantha* Boiss. & Reut. in Boiss., Fl. Orient. Suppl. 45. 1888. = **Malcolmia chia** (L.) DC., Syst. Nat. 2: 440. 1821. [Malcolmieae].
- M. mongolica* Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 422. 1880. = **Neotorularia korolkowii** (Regel & Schmalh.) Hedge & J. Léonard, Bull. Jard. Bot. Belg. 56: 394. 1986. [Euclidieae].
- M. multicaulis* Pomel, Nouv. Mat. Fl. Atl. 371. 1875. = **Marcus-Kochia littorea** (L.) Al-Shehbaz [Anastaticae].
- M. multisiliqua* Vassilcz., Fl. URSS 8: 647. 1939. = **Strigosella strigosa** (Boiss.) Botsch. var. **multisiliqua** (Vassilcz.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1039. 1972. [Euclidieae].
- M. musilii* Velen., Sitzungsber. Königl. Böhm. Ges. 11: 13. 1912., nom. conf. Based on mixed collections: flowering material of *Horwoodia dicksoniae* Turrill and fruiting material that Rechinger (1962) typified as a synonym of **Diplotaxis acris** (Forssk.) Boiss., Fl. Orient. 1: 389. 1867. [Brassicaceae].
- M. nana* (DC.) Boiss., Fl. Orient. 1: 222. 1867. = **Maresia nana** (DC.) Batt. in Batt. & Trabut, Fl. Algérie 1: 68. 1888. [Anastaticae].
- M. nana* (DC.) Pau, Not. Bot. Fl. Españ. 3: 20. 1889, nom. illeg. = **Maresia nana** (DC.) Batt. in Batt. & Trabut, Fl. Algérie 1: 68. 1888. [Anastaticae].
- M. nana* (DC.) Boiss. var. *glabra* Meikle, Fl. Cyprus 1: 806. 1977. = **Maresia nana** (DC.) Batt. in Batt. & Trabut, Fl. Algérie 1: 68. 1888. [Anastaticae].
- M. nana* (DC.) Boiss. subsp. *confusa* (Boiss.) Font Quer, Fl. Hispan. Cent. 1(3). 1944 (in sched.). = **Maresia nana** (DC.) Batt. in Batt. & Trabut, Fl. Algérie 1: 68. 1888. [Anastaticae].
- M. naxensis* Rech.f., Ann. Naturhist. Mus. Wien 43: 297. 1929. = **Malcolmia flexuosa** subsp. **naxensis** (Rech.f.) Stork, Opera Bot. 33: 35. 1972. [Malcolmieae].
- M. nefudica* Velen., Sitzungsber. Königl. Böhm. Ges. 11: 13. 1912. = **Eremobium aegyptiacum** (Spreng.) Asch. & Schweinf. ex Boiss., Fl. Orient. Suppl. 30. 1888. [Anastaticae].
- M. orsiniana** (Ten.) Ten., Fl. Napol. 5: 67. 1835. [Malcolmieae].
- M. orsiniana** subsp. **angulifolia** (Boiss. & Orph.) Stork, Svensk Bot. Tidskr. 66(3): 245. 1972. [Malcolmieae].
- M. orsiniana** subsp. **serbica** (Pančić) Greuter & Burdet, Willdenowia 13(1): 94. 1983. [Malcolmieae].
- M. pamirica* Botsch. & Vved., Not. Syst. Herb. Inst. Bot. Acad. Sci. Uzbekistan. 13: 10. 1952. = **Strigosella strigosa** (Boiss.) Botsch., Bot. Zhurn. (Moscow & Leningrad) 57: 1039. 1972. [Euclidieae].

- M. pancicii* Adamović, Österr. Bot. Z. 42: 405. 1892. = **M. orsiniana** subsp. **serbica** (Pančić) Greuter & Burdet, Willdenowia 13(1): 94. 1983. [Malcolmieae].
- M. parviflora* (DC.) DC., Syst. Nat. 2: 442. 1821. = **Marcus-Kochia ramosissima** (Desf.) Al-Shehbaz [Anastaticae].
- Malcolmia parviflora* var. *brachypoda* Emb. & Maire, Bull. Soc. Sci. Nat. Maroc 17: 211. 1937. = **Marcus-Kochia ramosissima** (Desf.) Al-Shehbaz [Anastaticae].
- Malcolmia parviflora* var. *leiocarpa* Maire, Bull. Soc. Hist. Nat. Afr. Nord 36: 95. 1946. = **Marcus-Kochia ramosissima** (Desf.) Al-Shehbaz [Anastaticae].
- Malcolmia parviflora* var. *pachystylis* Maire, Bull. Soc. Hist. Nat. Afr. Nord 36: 95. 1946. = **Marcus-Kochia ramosissima** (Desf.) Al-Shehbaz [Anastaticae].
- M. patula* DC., Syst. Nat. 2: 444. 1821. = **Marcus-Kochia triloba** (L.) Al-Shehbaz [Anastaticae].
- Malcolmia patula* var. *tenella* Lange, Pug. Pl. Hisp. 4: 70. 1866. = **Marcus-Kochia triloba** (L.) Al-Shehbaz [Anastaticae].
- Malcolmia patula* var. *longifolia* Pau ex Font Quer, Bol. Soc. Esp. Hist. Nat. 14: 427. 1914. = **Marcus-Kochia triloba** (L.) Al-Shehbaz [Anastaticae].
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