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MASSOUD RANJBAR[1*] & KAZEM NEGARESH[1]

On the identity of *Centaurea paradoxa* (*Asteraceae*, *Cardueae*, *Centaureinae*) from Iran

Abstract

Ranjbar M. & Negaresh K.: On the identity of *Centaurea paradoxa* (*Asteraceae*, *Cardueae*, *Centaureinae*) from Iran. – Willdenowia 44: 13–20. 6 March 2014. – Version of record published online ahead of inclusion in April 2014 issue; ISSN 1868-6397; © 2014 BGBM Berlin-Dahlem.

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New findings and a revised description are presented for *Klasea* sect. *Leuzeopsis* (Boriss.) L. Martins (*Asteraceae*, *Cardueae*, *Centaureinae*). This previously monotypic section now contains one more species: *K. paradoxa* (Mozaff.) Ranjbar & Negaresh, which is proposed here as a new combination. Lectotypes are designated for *Leuzea serratuloides* Fisch. & C. A. Mey. ex DC. (*K. serratuloides* (Fisch. & C. A. Mey. ex DC.) Greuter & Wagenitz) and two of its synonyms. Descriptions, distributions, ecology and illustrations for both species are given, as is the conservation status for *K. paradoxa*. The differences between the two species are tabulated and an identification key is provided. The geographical distributions of the two species are mapped.

Additional key words: *Klasea*, new combination, lectotypification, *Compositae*

Introduction

Klasea Cass. is the second largest genus of *Asteraceae* subtribe *Centaureinae* in Iran. According to modern taxonomy, the genus includes eight sections in Iran: *K.* sect. *Coriaceae* L. Martins, *K.* sect. *Demetria* (Boriss.) L. Martins, *K.* sect. *Grandifoliae* L. Martins, *K.* sect. *Klasea*, *K.* sect. *Melanolepis* L. Martins, *K.* sect. *Nikitinia* (Iljin) L. Martins, *K.* sect. *Quinquefoliae* L. Martins and *K.* sect. *Schumeria* (Iljin) L. Martins (Martins 2006; Ranjbar & al. 2011). It has been reported that *Klasea* comprises 17 species in Iran (Dittrich & al. 1980; Mozaffarian 1992; Martins 2006; Ranjbar & al. 2011, 2012). The present study confirms that *K.* sect. *Leuzeopsis* (Boriss.) L. Martins is also present in Iran, increasing the number of *Klasea* sections in that country to nine and the number of species to 21.

During recent floristic studies in W Iran, a plant similar to *Centaurea* L. was collected that initially could not be identified to an existing species. After thorough consultation of the relevant floristic literature (Dittrich & al. 1980; Mozaffarian 1991, 1992; Martins 2006; Ranjbar & al. 2011, 2012), and comparison with specimens in the herbaria B, BASU, E, G, LD, TARI, W and WU, it was concluded that (1) this material as well as two specimens at B collected in the same area in W Iran in 1904 by Th. Strauss match what has been named *C. paradoxa* Mozaff. (Mozaffarian 1991) and (2) *C. paradoxa* in fact belongs to *Klasea*, in particular to *K.* sect. *Leuzeopsis*, and is most similar to *K. serratuloides* (Fisch. & C. A. Mey. ex DC.) Greuter & Wagenitz. It was therefore decided to transfer *C. paradoxa* to *Klasea*, as *K. paradoxa*. The main differences between the latter species and *K. serratuloides* are presented in Table 1.

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Table 1. Morphological comparison of *Klasea paradoxa* and *K. serratuloides*.

Character	*Klasea paradoxa*	*Klasea serratuloides*
Plant height [cm]	35–70	5–35
Leaf dissection	always divided, usually pinnatilobed, sometimes pinnatisect or pinnatifid	undivided or lyrate-pinnatisect
Leaf shape [in outline]	oblong, elliptic or ovate	oblong or obovate
Basal and lower cauline [B+LC] leaf length [cm]	18–40	10–17(–20)
B+LC leaf segments or lobes number	4-6 pairs of segments	2 or 3 pairs of lobes
B+LC leaf segments or lobes margin	dentate or lobed, rarely entire	irregularly crenate-toothed or sinuate-lobulate
Peduncle length [cm]	15–40	2–7
Phyllary indumentum	sparsely arachnoid to subglabrous	glabrous
Phyllary spine length [mm]	5–10	5–6
Floret length [mm]	35–47	30–33
Corolla tube length [mm]	20–27	up to 16
Achene colour	yellowish cream	brown
Achene shape	lanceolate or lanceolate-arcuate	ovate or oblong-ovate
Achene size [mm]	10–14 × 4–4.5	6–7(–7.5) × 2.5–3(–3.5)
Pappus length [mm]	20–24	11–15

Material and methods

The present study is mainly based on herbarium material. Several sheets have been examined for each species, either received on loan from the herbaria BASU, G, LD, W and WU or obtained as digitized type material from the herbaria B, BR, E, JE, LE and P. Moreover, during several excursions from 2008 to 2013 in W Iran, the authors have studied living plants in the field.

Results and Discussion

Klasea sect. ***Leuzeopsis*** (Boriss.) L. Martins in Bot. J. Linn. Soc. 152: 459. 2006 ≡ *Serratula* sect. *Leuzeopsis* Boriss., Fl. URSS 28: 607. 1963. – Type: *Serratula serratuloides* (Fisch. & C. A. Mey. ex DC.) Takht.

Description — *Herbs* perennial, monocephalous, 5–70 cm tall. *Leaves* undivided to pinnatilobed with 2–6 pairs of lobes or segments, oblong, elliptic, ovate or obovate in outline, 10–40 cm, coriaceous, with prominent veins mostly in proximal part, margin (crenate-)dentate or lobed, rarely entire, apex obtuse or acute. *Capitulum* large; *peduncle* short to long; *involucre* subglobose, 3–4 × 3–5 cm; *phyllaries* coriaceous, sparsely arachnoid to glabrous, with an often deflected spine; *spine* 5–10 mm long. *Florets* pink or mauve, 30–50 mm long; corolla tube to 27 mm long; apical anther appendages subacute to slightly emarginate. *Achenes* yellowish cream or brown, ovate to lanceolate, 6–14 × 2.5–4.5 mm, glabrous, abruptly narrowed toward base; *pappus* 11–24 mm long, c. 2 × as long as achene.

Distribution — Turkey, Armenia, Azerbaijan and Iran.

Key to species of *Klasea* sect. *Leuzeopsis*

1. Leaves always divided, usually pinnatilobed, sometimes pinnatisect or pinnatifid; florets 35–47 mm long; achenes yellowish cream, 10–14 mm long; pappus 20–24 mm long . . . . . 1. ***K. paradoxa***
– Leaves undivided or lyrate-pinnatisect; flowers 30–33 mm long; achenes brown, 6–7(–7.5) mm long; pappus 11–15 mm long . . . . . 2. ***K. serratuloides***

1. *Klasea paradoxa* (Mozaff.) Ranjbar & Negaresh, **comb. nov.** ≡ *Centaurea paradoxa* Mozaff. in Iran. J. Bot. 5: 30. 1991. – Holotype: Iran, Lorestan, Malavi to Eslamabad road, c. 5 km from Buluran to Eslamabad, 1330 m, 9 May 1988, *V. Mozaffarian 64381* (TARI!) – Fig. 1, 2.

Description — *Herbs* perennial, single-stemmed, usually green throughout, 35–70 cm tall. *Stem* erect, always simple, monocephalous, stout, 4–5 mm in diam. at base, sparsely leafy but leafless on peduncle, sulcate, loosely to densely covered with tomentose hairs. *Leaves* always divided, large, coriaceous, with prominent veins, ± loosely covered with tomentose hairs. *Basal and lower cauline leaves* long petiolate (petiole to 10 cm long), divided, usually pinnatilobed, sometimes pinnatisect or pinnatifid, oblong or ovate in outline, 18–40 × 6–14 cm; *segments* in 4–6 pairs, oblong, triangular-lanceolate or triangular, 2–6 × 0.8–3.5 cm, margin dentate or lobed, rarely entire, apex acute or shortly acuminate. *Median cauline leaves* petiolate, pinnatilobed, oblong or elliptic in outline, 7.5–12 × 3–7 cm; *segments* in 2–5 pairs, triangular, 0.5–2 × 0.2–1 cm, margin entire, rarely dentate, apex shortly acuminate. *Capitulum* solitary; *peduncle* leafless, 15–40 cm

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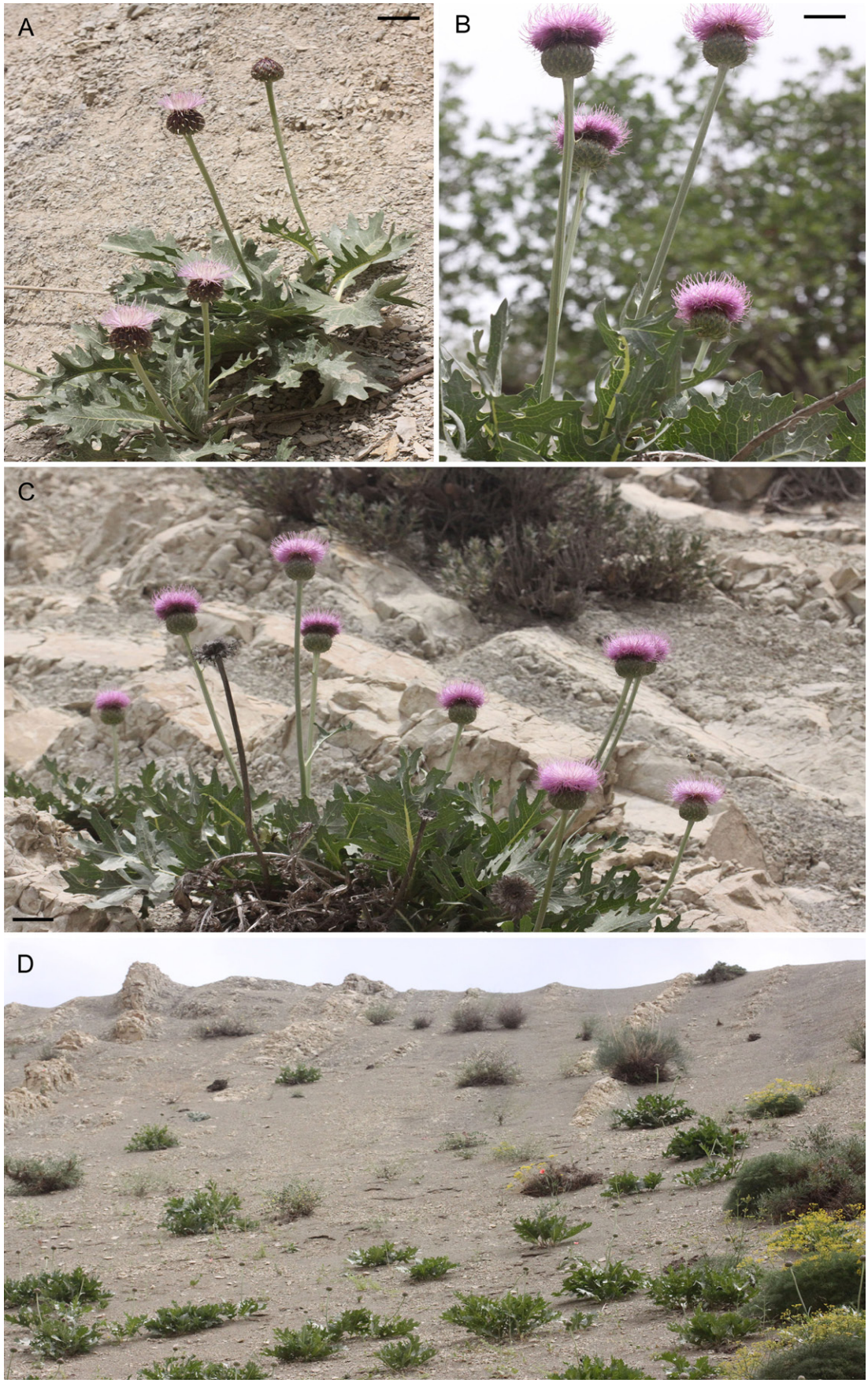


Fig. 1. *Klasea paradoxa* – A, C: habit; B: capitula with peduncles; C, D: habitat. – A–D: Iran, Lorestan, Malavi to Eslamabad, 25 Apr 2013, photographs by M. Ranjbar. – Scale bars: A = 5 cm; B = 4 cm; C = 6 cm.

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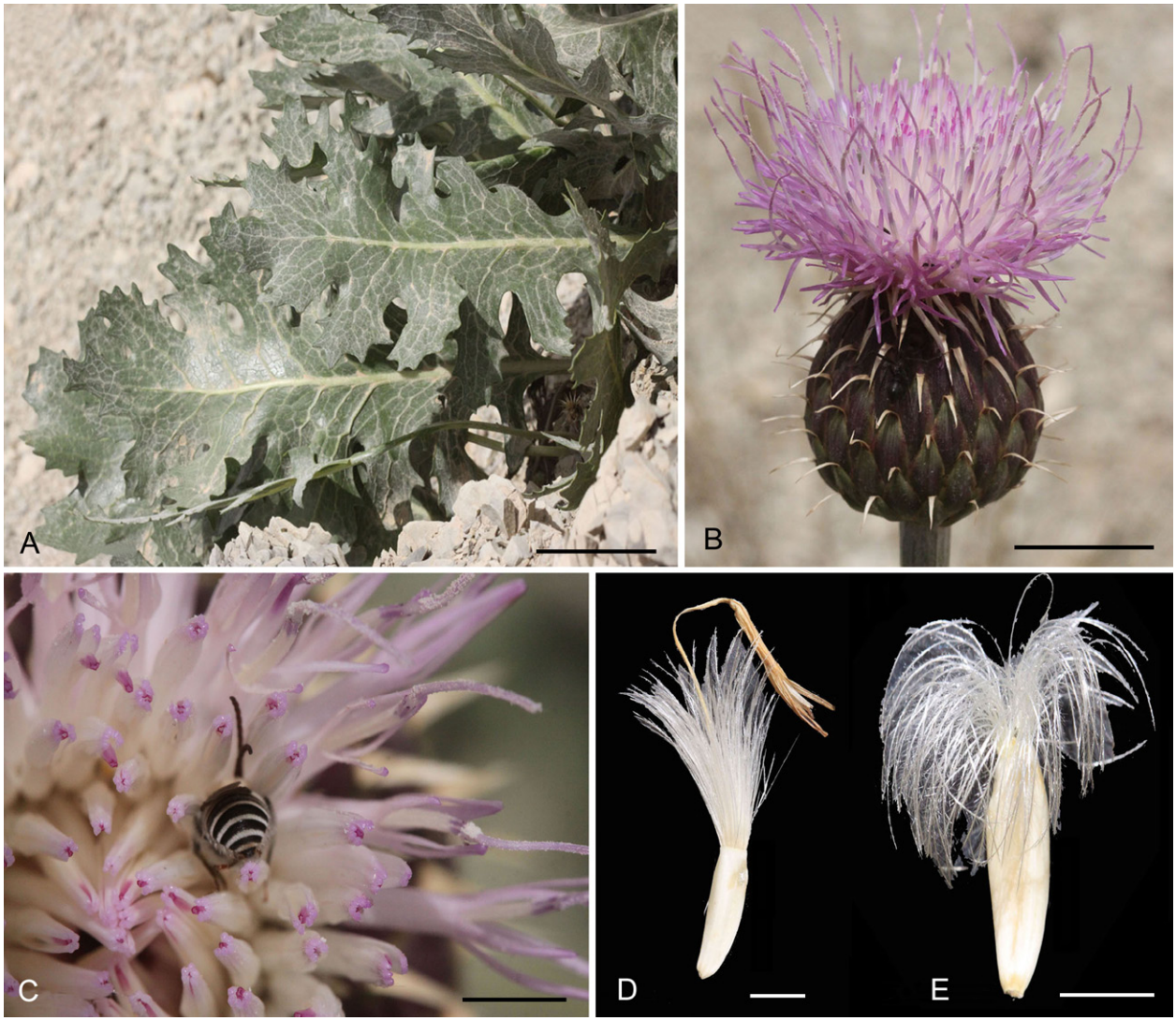


Fig. 2. *Klasea paradoxa* – A: leaves showing venation and indumentum; B: capitulum; C: florets with pollinator; D, E: achenes with pappus. – A–E: Iran, Lorestan, Malavi to Eslamabad, 25 Apr 2013, photographs by M. Ranjbar. – Scale bars: A = 10 cm; B = 2 cm; C = 10 mm; D, E = 5 mm.

long. *Involucre* subglobose, 30–40 × 30–50 mm. *Phyllaries* 8–10-seriate, imbricate, green, purplish distally, with longitudinal dark green veins, coriaceous, sparsely arachnoid to subglabrous, apex almost constricted, with a spine; *spine* often deflected, 5–10 mm long, scabrous; *outer phyllaries* lanceolate, 7–10 × 3.5–5 mm; *median phyllaries* oblong or oblong-ovate, 12–17 × 7–9 mm; *inner phyllaries* oblong or oblong-linear, 20–25 × 5–7 mm. *Receptacle* setose, with long smooth bristles. *Florets* pink or mauve when living, purplish yellow when dried, 35–47 mm long; *corolla tube* narrow, 20–27 mm long; *limb* 15–20 mm long; *lobes* 6–9 mm long; *anther tube* shorter than corolla; *filaments* glabrous; *apical anther appendages* slightly emarginate or subacute; *style and stigma* partly exserted from corolla, pubescent. *Achenes* yellowish cream, lanceolate or lanceolate-arcuate, 10–14 × 4–4.5 mm, glabrous, smooth and shiny; *pappus* deciduous, multiseriate, plumose, white, 20–24 mm long, bristles unequal.

Phenology — Flowering from April to May; fruit ripening from May to June.

Distribution and ecology — *Klasea paradoxa* is a Zagrosian element endemic to Lorestan province, W Iran (Fig. 3). It grows on dry rubbly and rocky slopes and talus in the mid-montane zone at altitudes of 1300–1400 m (Fig. 1C, D). Other plants observed to occur in the area include: *Ajuga chamaecistus* Ging. ex Benth., *Alyssum constellatum* Boiss., *Amygdalus scoparia* Spach, *Astragalus multijugus* DC., *Centaurea koieana* Bornm., *Euphorbia macroclada* Boiss., *Klasea cerinthifolia* (Sm.) Greuter & Wagenitz, *Matthiola longipetala* (Vent.) DC., *Onosma macrophylla* Bornm., *Quercus brantii* Lindl., *Salvia bracteata* Banks & Sol., *Silene chlorifolia* Sm., *Scrophularia* sp. and *Trigonella disperma* Bornm.

Conservation status — *Klasea paradoxa* is a narrow endemic with an estimated area of occupancy is less than

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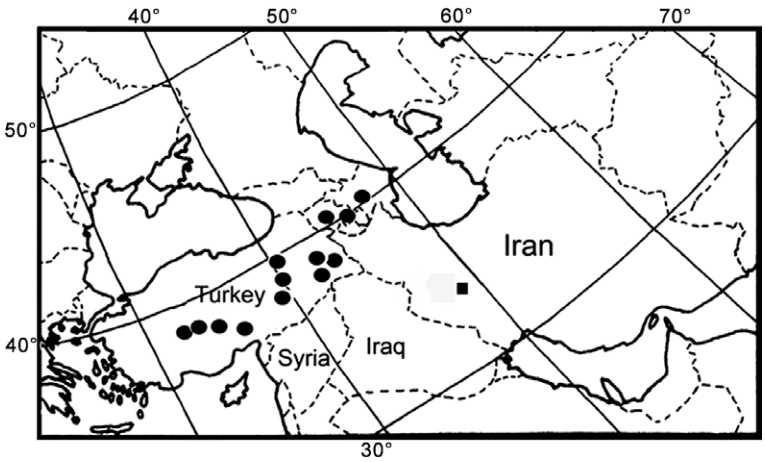


Fig. 3. Distribution of *Klasea paradoxa* (square) and *K. serratuloides* (circles).

10 km^2. The population is under continuous threat of excessive grazing. Therefore, the species should be categorized as Critically Endangered (CR) according to IUCN criteria B2ab(v) (IUCN 2012).

Remarks — *Centaurea paradoxa* is transferred here from *Centaurea* to *Klasea* because of its bisexual homogamous capitula with tubular florets and phyllaries with parallel veins. *Klasea paradoxa* belongs to *K.* sect. *Leuzeopsis*, which includes taxa that often have simple stems, large coriaceous leaves, large capitula (3–4 cm in diam.), deflected spines and apical anther appendages usually slightly emarginate. According to Borissova (1963) and Martins (2006), *K.* sect. *Leuzeopsis* contained a single species, namely *K.* (S*erratula*) *serratuloides*. *Klasea paradoxa* resembles *K. serratuloides* in life form, involucre size and floret colour (cf. Fig. 4), but differs from it in certain characters (see Table 1), notable among which are: leaf dissection always divided, usually pinnatilobed, sometimes pinnatisect or pinnatifid (vs undivided or lyrate-pinnatisect in *K. serratuloides*), corolla tube 20–27 mm long (vs up to 16 mm long), phyllaries sparsely arachnoid to subglabrous (vs glabrous), pappus 20–24 mm long (vs 11–15 mm long) and achenes 10–14 × 4–4.5 mm (vs 6–7(–7.5) × 2.5–3(–3.5) mm). Because of these differences, we recognize *K. paradoxa* and *K. serratuloides* as separate species. Moreover, because the original description of *C. paradoxa* (Mozaffarian 1991) is rather short, we give a more complete description here.

Additional specimens seen — Iran: Lorestan province: road from Eslamabad to Poldokhtar, 40 km to Kuhdasht, Buluran, 1350 m, 25 Apr 2013, *Ranjbar & Negaresh 33056*, *33057 & 33058* (BASU!); near Buluran, 65 km to Baba Zeyd, 1370–1400 m, 2 May 2013, *Ranjbar & Negaresh 33059 & 33060* (BASU!); Kuh Tarikha s.ö. v. [SE of] Kermanschah, 11 May 1904, *Th. Strauss* (B [2 sheets]!).

2. *Klasea serratuloides* (Fisch. & C. A. Mey. ex DC.) Greuter & Wagenitz in Willdenowia 33: 59. 2003 ≡ *Leuzea serratuloides* Fisch. & C. A. Mey. ex DC., Prodr. 6: 666. 1838 ≡ *Serratula serratuloides* (Fisch. & C. A. Mey. ex DC.) Takht. in Trudy Armyansk. Fil. Akad. Nauk S.S.S.R., Ser. Biol. 2: 90. 1937. – **Lectotype (designated here):** Azerbaijan, Nakitschiwan [Nakhichevan, on some labels Karabagh], in declivitatibus montium vallis Koschadara, *Szowits* (G-DC!; isolectotypes: K!, LE!, P!) – Fig. 4.

= *Leuzea sclerophylla* Boiss. & Heldr., Diagn. Pl. Orient., ser. 1, 10: 97. 1849 ≡ *L. serratuloides* var. *subindivisa* Boiss., Fl. Orient. 3: 607. 1875. – **Lectotype (designated here):** Turkey, in siccis vallis superioris Ermenek Ciliciae Tracheae prope pagum Betlam, 3 Jul 1845, *Heldreich* (G!; isolectotype: G!).

= *Phaeopappus freynii* Sint. ex Freyn in Oesterr. Bot. Z. 42: 235. 1892. – **Lectotype (designated here):** Turkey, Armenia turcica, Kharput, in declivibus mont. Karatasch, 12 Jun 1889, *Sintenis 761* (LD!; isolectotypes: B!, BR!, E!, JE!, K [two sheets]!, W!).

Description — *Herbs* perennial, 5–35 cm tall; root strong, woody. *Stem* simple, angled or ± straight, strong, usually short, less often somewhat surpassing lower leaves, leafless in upper part (2–7 cm), sulcate, sparsely or rarely densely pubescent. *Leaves* petiolate (petiole 3–6(–12) cm long), undivided or lyrate-pinnatisect, oblong or obovate in outline, 10–17(–20) × 6–10(–20) cm, thick, coriaceous, with prominent veins, thinly hairy on lower surface mostly along veins, subglabrous on upper surface; *lateral lobes* in 2 or 3 pairs, oblong, apex obtuse; *terminal lobe* ovate or ovate-oblong, larger than lateral lobes, margin irregularly crenate-toothed or sinuate-lobulate. *Capitula* solitary; *peduncle* leafless, to 7 cm long. *Involucre* subglobose, 3–4 × 4–5 cm. *Phyllaries* c. 8-seriate, moderately imbricate, green, yellow-brownish when dry, with longitudinal dark green veins, coriaceous, glabrous, margin narrowly membranous, apex with a spine; *spine* often deflected, 5–6 mm long; *outer phyllaries* ovate; *median phyllaries* oblong; *inner phyllaries* lanceolate-linear, apex acuminate. *Receptacle* setose. *Florets* light magenta or pale rose, 30–33 mm long; *corolla tube* narrow, to 16 mm long; *limb* 15–17 mm long; *lobes* c. 7 mm long; *anther tube* slightly shorter than or as long as corolla; *filaments* glabrous; *apical anther appendages* rounded or slightly emarginate; *style and stigma* exserted from corolla, usually shortly 2-lobed. *Achenes* brown, ovate or oblong-ovate, strongly compressed, distally narrowed, 6–7(–7.5) × 2.5–3(–3.5) mm, weakly sulcate or smooth, glabrous, base subacute; *pappus* multiseriate, plumose, white, 11–15 mm long, bristles connate at base into a ring.

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Fig. 4. Isolectotype of *Leuzea serratuloides* (≡ *Klasea serratuloides*) at P. – Image provided by Muséum National d'Histoire Naturelle, Paris.

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Phenology — Flowering from May to July; fruit ripening from July to August.

Distribution and ecology — *Klasea serratuloides* occurs in Turkey, Armenia and Azerbaijan (Fig. 3). It is an Irano-Turanian element known only from the mid-montane zone, occurring on dry rubbly and rocky slopes, talus, eroded shaly hills and banks in open forest of *Pinus brutia* Ten. at altitudes of 600–2000 m (Borissova 1963; Davis & Kupicha 1975).

Remarks — *Klasea serratuloides* has been subjected to controversial classification in either subtribe *Carduinae* (e.g. Dittrich 1977) or *Centaureinae* (Adylov & Zuckerwanik 1993). The affinity of *Serratula serratuloides* to *Klasea* has been shown by Susanna & al. (2002), Martins & Hellwig (2005) and Martins (2006).

Concerning reports of *Klasea serratuloides* in Iran, Borissova (1963) suspected that *Serratula serratuloides* occurred in Iran, and Davis & Kupicha (1975) stated that it occurred in Iran, but this taxon was not mentioned in Flora iranica (Dittrich & al. 1980). Martins (2006: Fig. 8) provided a distribution map recording *K. serratuloides* in W Iran. The basis for that record was presumably two specimens from the same area as the relevant dot on the distribution map: Kuh Tarikha s.ö. v. [SE of] Kermanschah, 11 May 1904, *Th. Strauss* (B), both determined by J. Bornmüller as *Leuzea serratuloides*, revised by G. Wagenitz in 1960 as *S. serratuloides* "var. ?" and revised by L. Martins in 2005 as *K. serratuloides*. We have examined digital photographs of these specimens and conclude that they in fact represent *K. paradoxa*.

Additional specimens seen — Armenia: montes "Gegamski khrebet", distr. Abovyan, inter monasterium Ge[g]hard et pagum Gokht, 1700–1800 m, 20 Jul 1975, *V. Vašák* (B!); Abovjan distr., near Geghard, 1650 m, steppe. 21 Jun 1996, *E. Gabrieljan & al.* (B!); Mikoian district, surroundings of Kavushug village [Hermon], left valley slope of Dzhaly-chai river, 1250 m, 17 Jun 1957, *Avetisian & al.* (W!); distr. Ararat, montes "Gegamski khrebet", loco Aruni Dzor dicto, 1500–1900 m, 11 Jul 1975, *V. Vašák* (B!); Azizbekov distr., 2 km to Khndzorut from road Martiros-Khndzorut, right side of road with tragacanth shrub vegetation, 23 Jun 1987, *Oganezova* (B!); Azizbekov, surroundings of Bartsruni village [Bardzruni] on lime and cement slopes, 20 Jun 1957, *Aslanian & al.* (W!).
Azerbaijan: Nakhichevan: pr. p. [prope pagum] Bitseh'enach, 18 Jun 1939, *L. Prilipko* (B!).
Turkey: B9 Van: 8 km from Van to Gürpinar (Havasor), *Davis 44592* (E!); Satak road, 2 km N of Micingersuyu river, 2000 m, 25 Jul 1954, *Davis 2389* (E!). C4 Konya: 1300 m, 23 Jul 1995, *Ayta 7227* (E!); 1000 m, 15 Aug 1949, *Davis 16208* (E!); Ermenek-Fariske, Brachfeld, linkes Ufer des Göksu, 16 km N Ermenek, 710 m, 12 Jun 1950, *Huber-Morath 10020* (E!). C5 Konya: Ereğli, Aydos Dağı, between Berendi and Kiraman village, 1400 m, 28 Jun 1976, *Erik 1756* (E!). C6 Maraş: Maraş to Göksun nr Yemiş Da., 600 m, 3 May 1957, *Davis & Hedge 27513* (E!).

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