

NOTES ON ASTERACEAE-CARDUEAE FROM PAKISTAN AND KASHMIR: SOME ADDITIONS AND CORRECTIONS

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Abstract

During the preparation of an account of the tribe Cardueae (Family Asteraceae) for the Flora of Pakistan two new species viz., *Lipschitzia congesta* Qaiser, A. Ghafoor & R. Abid and *Dolomiaea megacephala* Qaiser, A. Ghafoor & R. Abid and two varieties *Lipschitzia ceratocarpa* (Decne.) Kamelin var. *astorii* R. Abid & Qaiser and *Lipschitzia congesta* Qaiser, A. Ghafoor & R. Abid var. *pinnatisecta* R. Abid & Qaiser are described. A new combination *Himalaiella diffusa* (Lipschitz) A. Ghafoor, R. Abid & Qaiser and two status nova are also proposed in *Saussurea* DC. and *Tricholepis* DC. Moreover, eleven taxa representing the genera *Carduus* L., *Cousinia* Cass., *Echinops* L., *Jurinea* Cass. and *Tricholepis* DC., are recorded for the first time from Pakistan. For the new species line drawings, photographs of types and SEM micrographs of cypselas and pappus are also provided.

Key words: *Lipschitzia*, *Dolomiaea*, *Jurinea*.

Introduction

The tribe Cardueae (Thistles) is one of the largest in the family Asteraceae, representing 2400 species belonging to 73 genera, distributed throughout the world (Susanna & Garcia-Jacas, 2009). There seems to be no agreement on the number of genera in the tribe Cardueae. Recent molecular studies have resulted in the split of a number of satellite new genera. Members of this tribe occur mainly in temperate areas of Eurasia (Dittrich, 1977; Häffner, 2000). In our region mostly they are confined to the northern areas such as Chitral, Swat, Kurram valley, Gilgit, Astor, Baltistan, Kashmir, northern Baluchistan, and in the plains of Sindh and Punjab. The tribe is characterized by the presence of thickened hairy nodes below the branches of style. Various current reports of molecular studies are available to understand the phylogenetic relationship of the tribe Cardueae such as Bremer 1994; Karis *et al.*, 1992; Häffner, 2000; Raab-Straube, 2003; Kita *et al.*, 2004; Susanna & Garcia-Jacas 2007, 2009; Barres *et al.*, 2013). However, circumscription of taxa and their evolutionary relationship is ambiguous and still matter of debate in some groups viz., *Carduus-Circium* group, *Saussurea* group and *Jurinea* group. Lipschitz (1979) adopted a broader concept of the genus *Saussurea* DC. and recognized 390 species in his monograph of *Saussurea* DC. and divided the genus into six subgenera and twenty sections. Since then lot of new satellite genera splitted from *Saussurea* DC. (s.l.) were described. For instance section/ subgenus *Frolovia* (DC.) Lipschitz was raised to the level of the genus by Lipschitz (1954) which was also accepted by Raab-Straube (2003) and Shih & Raab-Straube (2011). Moreover, two new genera *Himalaiella* and *Shangwua* were also described by Raab-Straube (2003) and Wang *et al.*, (2013) by raising the subgenus *Saussurea* DC. sect. *Elatae* Hook. f. and sect. *Jacea* Lipschitz respectively. Similarly, Ling (1965) and Shih (1986) transferred many himalayan species of *Jurinea* Cass., under the genus *Dolomiaea* DC.

During the taxonomic revision of the tribe Cardueae (Asteraceae), for the forth-coming part of the Flora of

Pakistan, several herbarium specimens present in local and foreign herbaria drew the attention of authors which could not be identified under any known species. Some of them required new combinations as they were misfit under the present genera. In the present paper two new species belonging to *Lipschitzia* (Decne.) Kamelin, *Dolomiaea* DC. and a new subspecies of *Carduus acanthoides* L. subsp. *pakistanicus* R. Abid & Qaiser are described along with 3 new combinations / status nova are proposed. An attempt has also been made to clarify the taxonomic position of these genera. Beside this, there are 11 new records for Pakistan and Kashmir.

While preparing an account of the genus *Jurinea* Cass. (Cardueae- Asteraceae), the authors came across a very interesting taxon *Jurinea ceratocarpa* (Decne.) Benth. This species was originally described under *Saussurea* DC. as *Saussurea ceratocarpa* by Decaisne in 1843. It was transferred under *Jurinea* Cass. by Benth (1873) in spite of having very different i.e., horned cypselas which were not present in the genus *Jurinea* Cass. This species has unique cypselas morphology within the tribe Cardueae and can easily be distinguished by the long, sharp horns at the apices of the cypselas, it neither matched with any *Saussurea* DC. nor *Jurinea* Cass. species. Bailon (1886) noticed this unique character of cypselas and placed *Saussurea ceratocarpa* Decne. (*Jurinea ceratocarpa* (Decne.) Benth.) in a separate section *Jurinocera* of the genus *Jurinea* Cass. Lipschitz (1960) described a new subgenus *Stephanodotos* Lipschitz of the genus *Saussurea* and placed *Saussurea carducephala* (Iljin) Iljin under his new subgenus. However, later in his monograph of *Saussurea*, Lipschitz (1979) raised the section *Jurinocera* Bailon of *Jurinea* to subgeneric level and made a new combination and stat. nov. *Saussurea* subgenus *Jurinocera* (Bail.) Lipschitz and accommodated two species viz., *Saussurea carducephala* (Iljin) Iljin and *S. ceratocarpa* Decne. under subgenus *Jurinocera*. Though Lipschitz (1979) was convinced that these species should be treated under a separate genus but he never formally published it as an independent genus.

Kamelin (1993) agreed with the idea of Lipschitz (1979), described the new genus *Lipschitzziella*, named it after Lipschitz and placed both the species under the new genus. Häffner (2000) while studying the phylogeny of the subtribe Carduninae agreed with the justification of creating the new genus *Lipschitzziella* and considered long and sharp apical spines of the cypselas as an independent formation which were not homologous with the pericarp crown. Raab-Straube (2003) also accepted the genus while studying the phylogenetic relationship in

Saussurea, inspite of its close relationship with the section *Elatae* / *Himalailla* Raab-Straube. However, the characters of cypselas are so strong that it is fully justified to treat *Lipschitzziella* (= *Saussurea* subgenus *Stephanodontos* Lipschitz) as an independent genus. The present authors fully agree with Kamelin (1993) and accept the genus *Lipschitzziella* Kamelin as an independent and distinct genus from *Saussurea* DC. and *Jurinea* Cass.

A morphological comparison of all the three genera is given in Table 1. (Figs. 1 & 2).

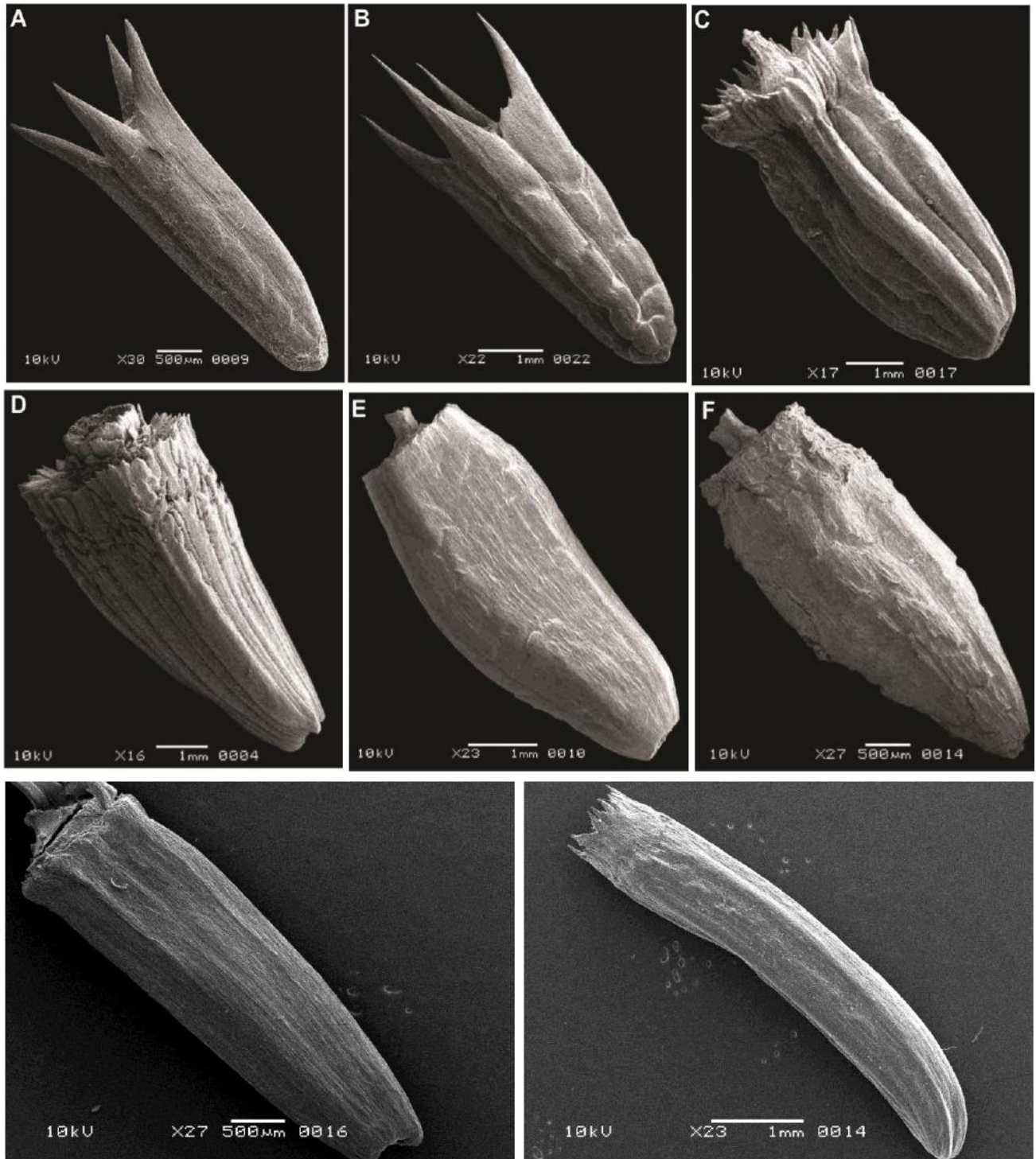


Fig. 1. Scanning Electron Micrographs (SEM) of the cypselas: A, *Lipschitzziella congesta*; B, *Lipschitzziella ceratocarpa*; C, *Jurinea mallophora*; D, *Jurinea radians* subsp. *radians*; E, *Dolomiaea megacephala*; F, *Dolomiaea macrocephala*, G, *Saussurea chondrilloides*, H, *Saussurea leptophylla*

Table 1. Comparison of morphological characters of *Lipschitzziella* (Decne.) Kamelin, *Saussurea* DC. and *Jurinea* Cass.

Characters	<i>Lipschitzziella</i>	<i>Saussurea</i>	<i>Jurinea</i>
Capitulum	broadly campanulate	campanulate-ovoid	obovoid–cylindrical to globose
Involucre	subtended by linear leafy bracts	subtended by linear leafy bracts	not subtended by linear leafy bracts
Florets	Purple-light pink	red, purple, violet, pink or white	lilac, pink or purple to whitish
Receptacle	Bristly	flat or convex, densely or laxly beset with subulate bristles or short papillae, rarely naked	flat, with long broad rigid acuminate scales or bristly
Cypsela	quadrangular, horned apically, without apical rim or crown	mostly not quadrangular nor horned apically, with apical rim or crown	neither quadrangular nor horned apically, with apical rim or dentate crown
Pappus	biseriate, outer short, deciduous, scabrid; inner broad plumose, connate at the base on a deciduous ring of tissue, exceeding the phyllaries	biseriate, outer scabrid; inner plumose, not connate, exceeding the phyllaries	Multiseriate, scabrid to barbellate or plumose, inner series of bristles not exceeding the phyllaries, few inner bristles broader at the base than the rest
Insertion of pappus	directly attached from upper edge of cypselas	attached within apical rim of cypselas	attached within apical rim of cypselas

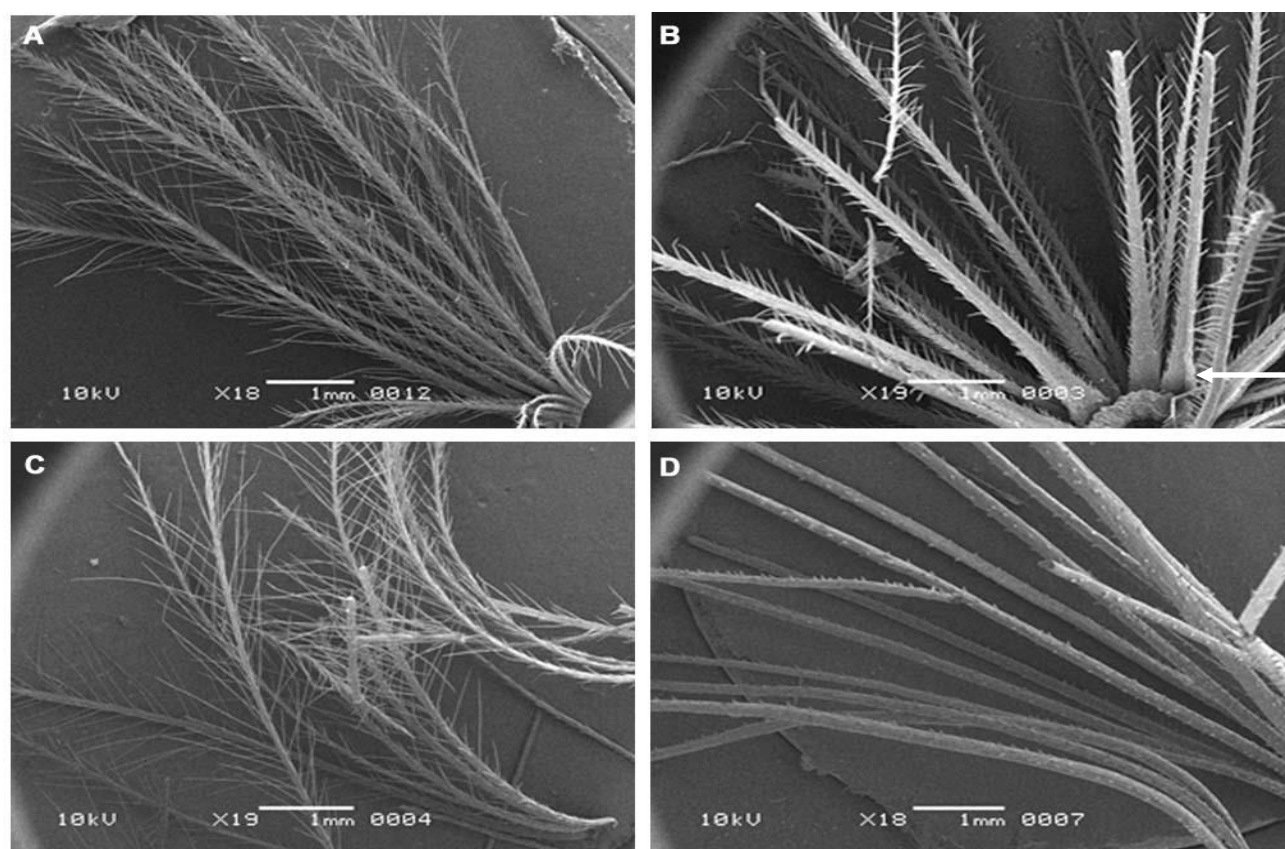


Fig. 2. Scanning Electron Micrographs (SEM) of the pappus: A, *Saussurea leptophylla* B, *Jurinea mallophora* (broad base of few inner bristles); C, *Lipschitzziella congesta* var. *congesta*; D, *Dolomiaea macrocephala*

Lipschitzziella

(Decne.) Kamelin in *Opred. Rast. Sred. Azii* 10: 632.1993

A small genus of 3 species, including the new one, distributed in Central Asia, Pakistan and India

The present authors, in addition to *L. ceratocarpa* (Decne.) Kamelin observed number of specimens which were placed under *Jurinea ceratocarpa* (Decne.) Benth.

var. *depressa* Clarke & Hook. f. These specimens clearly differed from typical *L. ceratocarpa* (Decne.) Kamelin in number of morphological characters, particularly in the habit, leaves and the solitary terminal capitula vs congested capitula (Table 2 Figs. 3 & 4) and did not deserve to be treated as the variety of *L. ceratocarpa*. Therefore, the latter taxon is raised to the level of species as *L. congesta* Qaiser, A. Ghafoor & R. Abid rather than a variety. The detailed description of new species and a key to both the species are given below:

Key to the species

- + Plants erect stout, upto 60 cm tall. Leaves cauline, not in rosettes. Capitula solitary, terminal. Cypselas distinctly squamate above, horns, pointed and sharp at apices **L. ceratocarpa**
- Plant acaulescent or stem very short, spreading caespitose. Leaves in basal rosettes. Capitula solitary but compactly arranged forming clusters. Cypselas smooth except faintly squamate at the base, horns neither pointed nor sharp at apices **L. congesta**

Table 2. Comparison of morphological characters of *L. ceratocarpa* (Decne.) Kamelin and *L. congesta* Qaiser, A. Ghafoor & R. Abid.

Characters	<i>L. ceratocarpa</i>	<i>L. congesta</i>
Habit	Caulescent, Erect	Acaulescent
Stem	Erect, upto 60 cm tall	Not erect, upto 4 cm tall spreading to caespitose
Leaves	Not in rosettes, cauline only	in rosettes
Cauline leaves	Present	Absent
Capitula	Solitary terminal	Solitary but compactly arranged forming clusters
Cypselas	7-8 mm long, distinctly squamate all over, horns pointed at the apex	4-5 mm long, smooth except faintly squamate at the base, horns not pointed at the apex

***Lipschitzia congesta* Qaiser, A. Ghafoor & R. Abid sp. nov.**

Syn: *Jurinea ceratocarpa* (Decne.) Benth. var. *depressa* Clarke ex Hook. f., Fl. Brit. Ind. 3:378.1881.

Type: Gilgit Dist.:8 km from Babusar village on way to Babusar top, erect with fruits, 5.9.1988, *S. Omer & Qaiser* 2638 (KUH)

Acaulescent or dwarf spreading caespitose perennial herbs, upto 4 cm tall. Leaves rosulate, petiolate, lamina pale green above, minutely scabrous (rough to touch), cobwebby-greyish, white hairy below lyrate deeply pinnatisect, subentire – serrate, distantly lobed, lateral lobes 1-5 (-7) on either side, ovate or triangular, entire or irregularly denticulate, terminal lobes large, (4-) 10-25 mm long, (3-) 5-10 mm wide, often hemispherical - obtuse or acute. cordate or somewhat rounded basally. Capitula solitary but compactly arranged forming clusters, ca 2 cm long, 2.5-4 (-5) cm across, broadly campanulate. Involucre semiglobose or cupuliform, 10-30 mm long, arachnoid hairy, surrounded by linear herbaceous bracts; phyllaries 4-5- seriate, outer and middle ones lanceolate-oblong, outspread-reflexed apically after anthesis, innermost scarious, linear, acuminate. Florets many, odourous. Corolla violet purple, ca 12 mm long, tube ca 7 mm long, limb ca 5 mm long including ca 2 mm long lobes, glandular or not. Anther light purple, filament hairy. Receptacular bristles off-white, 5-6 mm long.

Cypselas quadrangular, 4-5 mm long, smooth except faintly squamate at the base, horns ca 1 mm long, neither pointed nor sharp apically, dark greyish to black, without a distinct margin or rim, striations longitudinal, rugulose transversely. Pappus 11-12 mm long, dirty white, plumose, fragile, connate on a deciduous ring.

Affinities: *Lipschitzia congesta* Qaiser, A. Ghafoor & R. Abid is quite similar to *Lipschitzia ceratocarpa* (Decne.) Kamelin in general appearance of habit (unarmed, perennial habit), capitula (campanulate subtended by linear herbaceous spreading uppermost leafy bracts), cypselas (quadrangular with 4 apical horns; see Fig. 1A & B) and pappus (broadly plumose). However, it differs from *L. ceratocarpa* (Decne.) Kamelin by the following characters viz., plant acaulescent or very short stemmed, leaves in rosettes, cauline leaves absent and capitula solitary but compactly arranged forming clustered synflorescence. Whereas *L. ceratocarpa* (Decne.) Kamelin plants are caulescent, upto 60 cm tall, leaves not in rosettes only cauline leaves are present and capitula are solitary, terminal not in compact cluster.

Etymology: The name is given by having solitary capitula but congested forming cluster like look.

Two varieties have been recognized from our region on the basis of distinct variation in leaf characters.

Key to the varieties

- + Leaves simple-lyrate with 1-2 lobes on each side, glandular, terminal lobe large, 10-25 mm long, 5-10 mm wide, rounded or obtuse i) var. **congesta**
- Leaves deeply pinnatisect, 4-7 lobes on either side, eglandular with secondary lobes. All lobes including terminal lobe almost equal, 4-8 mm long, 3-5 mm wide, acute ii) var. **pinnatisecta**



Fig. 3. *Lipschitzziella congesta* var. *congesta*: habit



Fig. 4. Holotype of *Lipschitzziella congesta* var. *congesta* from the Karachi University Herbarium (KUH).

i. *Lipschitzziella congesta* Qaiser, A. Ghafoor & R. Abid var. *congesta* (Figs. 3 & 4).

Specimens examined: Burji la, Deosai, small perennial herb upto 2' tall, alt. 16000 ft., rare, 28.2.2002, *Jan Alam, Fazal Karim and Noor Kamal* 1644 (KUH); Upper Naltar, short stemmed perennial herb upto 4 cm tall, florets light yellow, very rare, ± 3400 m, grows in stony plain along water canal, 17.8.2005, *Jan Alam & Sher Sultan* 3408 (KUH); Naltar, Gilgit, 26-7-2018, *Jan Alam & Naik Alam* 2729 (KUH); Hunza Dist.: Shamullichish, Ghemesar, Hunza, stemless perennial herbs grows in dry and sunny gravel place, florets light violet, 3400 m, common, 4.8.2002, *Jan Alam* 187 (KUH); Nagar, Nilt above the agaicot, perennial herb, 6" in height, florets light pink, grows on moist gravel place, ± 2800 m, 28.7.2008, *Sajjad* 1113 (KUH); Sikandarabad, perennial herb, 4" in height, florets light pink, infrequent ± 3000 m, 3.7.2002, 1983 (KUH); Hunza (Gilgit) Home mountains, Karimabad, reduced stem, perennial herb, upto 5 cm tall, florets purple with mature achene; ± 3300 m, grows on sandy slope, 31.9.2007, *Jan Alam & Naik Alam* 4077 (KUH); *ibid*, small stemless perennial herb with white pappus, infrequent, ± 3500 m, 31.09.07, *Jan Alam & Naik Alam* 4077B (KUH); Kashmir, Matayan, 14 road miles south-west of Dras, 11000 ft, July-August, 1928, *F. G. Dickson* 1615 (NY); Kashmir, Thalle la, ± 10000 ft., 14.8.1940, *R. R. Stewart* s.n. (KUH); Marpol, Dras on rocks, 3000 ft., 9.8.1946, *R. R. Stewart* 22309 (NY). Lowari top, fairly, 5.10.1964, *Dr. Sabir* 151 (K); 6 km from Kanji, rock garden (Natural), just below tree line, *A. E. Brown & M. A. Rothera* C 25/34 (K).

Distribution: Pakistan (Gilgit and Kashmir) and India

Flowering period: July–September

Ecology: This type variety grows on rocky slopes, sandy slopes, moist gravel places, limestone and basic igneous screes, at high altitude between 2500–3500 m asl.

ii. *Lipschitzziella congesta* Qaiser, A. Ghafoor & R. Abid var. *pinnatisecta* R. Abid & Qaiser var. **nov.**

Type: Baltistan Dist: behind in grassland of Soesar, Deosai, stemless perennial herb upto 1.2 inch tall, purple heads, 12800 ft, infrequent of this area, August 2002, *Jan Alam & Fazal Karim* JA406 (KUH).

Specimens examined: Hunza Dist.: Shamuli Chish Ghamasar, Hunza, stemless herb, grows in dry and sunny, capitula violet, 2 cm across, 3400 m, fairly common, 4.8.2001, *Jan Alam* 188 (KUH); Leh, Ladakh, Kashmir, in wet ground, 10,500 ft., 10.8.1931, *Walter Koelz* 25970 (NY); 6 km from Kanji, rock garden (natural) just below tree line, July, 1984, *A. R. Brown & M. A. Rothera* J64/18, 19 (K); *ibid*, 27.6.1984, *A. R. Brown & M. A. Rothera* C25/34 (K).

Distribution: Pakistan and Kashmir.

Flowering period: July–August.

Ecology: A plant of high altitude, growing between 3200–4000 ft. in rocks and boulders.

2. *Lipschitzziella ceratocarpa* (Decne.) Kamelin in *Opred. Rast. Sred. Azii* 10:632.1993.

Saussurea ceratocarpa Decne. in *Jacquem. Voy. Bot.* 4: 93. Tab. 101. 1843.

Distribution: Pakistan and India.

A fairly common and highly variable species which can be further distinguished into two varieties:

Key to the varieties

- + Lower leaves (11-) 18 (-35) cm long including petiole, pinnately– pinnatifidely lobed or unlobed; lateral lobes 1–4 pairs, 6–12 mm broad. Terminal lobe ovate – lanceolate, lateral ovate – triangular or rhomboid i. var. **ceratocarpa**
- Lower leaves (5-) 9 (-12) cm long including petiole, deeply pinnatisect or dissected towards the midrib; lateral lobes 5–8 pairs, 1–3 mm broad. Terminal and lateral lobes linear ii. var. **astorii**

i. *Lipschitzziella ceratocarpa* (Decne.) Kamelin var. *ceratocarpa*

Type: India: Younedch Seussing ad Sounemeurgui, Cachemire, 2500 m, *V. Jacquemant* 951 (P).

ii. *Lipschitzziella ceratocarpa* (Decne.) Kamelin var. *astorii* R. Abid & Qaiser var. **nov.**

Holotype: Pakistan: Astor: Rayat nullah, Kala pani, 23.8.2009, *Ali Noor* 2063 (KUH)

Lower leaves (5–)–9 (–12) cm long including petiole, shallowly pinnatisectly lobed, lobes deeply dissected upto the midrib, entire– sinuate, acute, lateral lobes 5–8 pairs, triangular, 15 – 20 mm long and 1–3 mm

broad, terminal lobe 10–18 mm long and 2–4 mm broad, narrow linear, lyrate, acute. Cauline and upper most leaves akin to lower leaves, 2– 4 cm long, dissected, lobes 3 pairs, linear, sessile.

Specimens examined: Astor Dist: Reyat nullah, Kala pani, erect perennial herb upto 45 cm tall, common on hill slopes, c. 3200 m, 23.8.09, *Ali Noor* 2064 (KUH); Phalgam, on east Liddar river, 27 road miles N. of Islamabad, 9–11000 ft., July–Aug., 1927, *F. G. Dickason* 877 (MICH); Baltal road, 4 miles from Sonamarg, Kashmir, 9500 ft., July–Aug., 1928, *F. G. Dickason* 1616 (MICH); Tangala, Purig, Kashmir, 15–27.08.1933, *Walter Koelz* 6073 (NY); Kamri Pass, Kashmir, on rocks, often on big boulders, 9–10000 ft., 13.7.1946, *R. R. Stewart* 22726a (NY).

Distribution: Pakistan and Kashmir

Flowering period: July - September

Dolomiaea

DC., Guill. Arch. Bot. 2: 330. 1833

The genus *Dolomiaea* DC. was originally described by De Candolle (1833) and remained buried in literature for a very long time until resurrected by Ling (1965). Shih (1986) transferred many Himalayan species under *Dolomiaea* DC. originally described in the genus *Jurinea* Cass. The current comprehensive studies based on morphological and molecular evidences confirmed the status of the genus *Dolomiaea* DC. as an independent taxon or clade within the *Jurinea-Saussurea* complex (Häffner, 2000; Wang *et al.*, 2007; Susanna & Garcia-Jacas 2007, 2009; Shih & Raab-Straube, 2011; Chen & Raab-Straube, 2013). Presence of naked, alveolate receptacle and usually much longer, often yellowish, brownish or reddish (vs. white pappus) scabrid pappus, not inserted on a conical cupule distinguish *Dolomiaea* DC. from *Jurinea-Saussurea* complex (Chen & Raab-Straube, 2013; Susanna & Garcia-Jacas, 2007; Shih & Raab-Straube, 2011). The only species originally described by Royle 1835 as *D. macrocephala* Royle from our region was transferred to *Jurinea* by Clarke (1876) which was followed by latter workers such as Hooker (1881) and Hajra (1995). Boissier (1888) named it as *Jurinea dolomiaea* Boiss. due to the presence of another taxon *Jurinea macrocephala* DC. Stewart (1972) also considering it as a latter homonym, named *D. macrocephala* Royle as *Jurinea himalaica* R. R. Stewart.

While preparing an account of *Dolomiaea* DC. for Flora of Pakistan, the authors had an opportunity to examine large number of specimens identified as *Dolomiaea macrocephala* Royle. At a glance all the

specimens looked alike and the identification seemed to be correct. However, a close and careful examination revealed the existence of two distinct taxa, the true *D. macrocephala* Royle and a new taxon, differing in number of characters such as capitulum, involucre phyllaries, corolla, cypselas (Fig. 1E & F) and pappus. (Table 3 and Fig. 5 & 6). In order to accommodate these specimens it seemed necessary to describe a new species.

Dolomiaea megacephala Qaiser, A. Ghafoor & R. Abid **sp. nov.** (Figs. 1E, 5 (A-E) & 6)

Holotype: Shamushkur top, Deosai on sandy slope, ± 1350 ft., common, 18.8.2002, *Jan Alam, Fazal Karim and Noor Kamal* 1125 B (KUH).

Plant stemless. Perennial prostrate herb. Leaves in rosette, (15–) 20–35 cm long, 2.5–5.5 (–7) cm broad, discolorous, green, sparsely arachnoid above, white tomentose or densely arachnoid beneath, spinulose–denticulate at margin, dilated into narrowed, flattened, 3–8 cm long petioles, bipinnatifidly lobed, lobes 5–7 pairs, elliptic–oblong, irregularly incised, 2.5–5 cm long, (1.5–) 2.5–4 cm wide, obtuse. Capitula oblong–campanulate, 2.5–3.5 cm across. 8–15, forming compact cluster in centre of leaf rosette, sessile. Receptacle naked. Involucre herbaceous, arachnoid at the base. Phyllaries 4–5- seriate, acuminate, outer ones 15–16 mm long, 4–5 mm wide, lanceolate - ovate, middle 18–22 mm long, 5–6 mm wide, lanceolate - ovate, innermost phyllaries 28–32 mm long, 4–6 mm wide, lanceolate, acuminate, entirely setose. Corolla pink-purple, 28–32 mm long, glandular–strigose, corolla tube 19–22 mm long, limb 9–10 mm long including 5–6 mm long lobes. Cypselas 7–8 mm long, 2.5–4 mm wide, brown, oblong–oblanceolate, maculated (dark brown patches), hilum basal, umbo ca 1 mm long. Pappus 28–30 mm long, purplish – purplish brown, scabrid, connate, deciduous as a whole.

Table 3. Comparison of morphological characters of *D. macrocephala* Royle and *D. megacephala* Qaiser, A. Ghafoor & R. Abid.

Characters	<i>D. macrocephala</i>	<i>D. megacephala</i>
Capitula	Obconical – ovoid, 1.0 -2.5 cm in across	Oblong- campanulate, 2.5 -3.5 cm across
Involucre	Coriaceous	Herbaceous
outer phyllaries	10- 12 mm long, 3-4 mm wide, ovate, acute	15-16 mm long, 4-5 mm wide, lanceolate-ovate, acuminate
middle phyllaries	15-16 mm long, ovate-lanceolate acute	18-22 mm long, 5- 6 mm wide, lanceolate-ovate, acuminate
inner phyllaries	18-20 mm long, 1–2 mm wide, lanceolate-linear, acute-acuminate	28–32 mm long, 4-6 mm wide, lanceolate, acuminate
Corolla	17- 20 mm long	28 -32 mm long
Corolla tube, limb including lobes	9 -10 mm long, 8–11 mm long	19-22 mm long, 14- 16 mm long
Style	eglandular	glandular
Cypselas	Oblanceolate, 4-5 mm long, 1-2 mm wide	Oblong - oblanceolate, 7-8 mm long, 2.5-4 mm wide
Pappus	Brownish white, 15 – 20 mm long	Purplish -purplish brown, 28-30 mm long

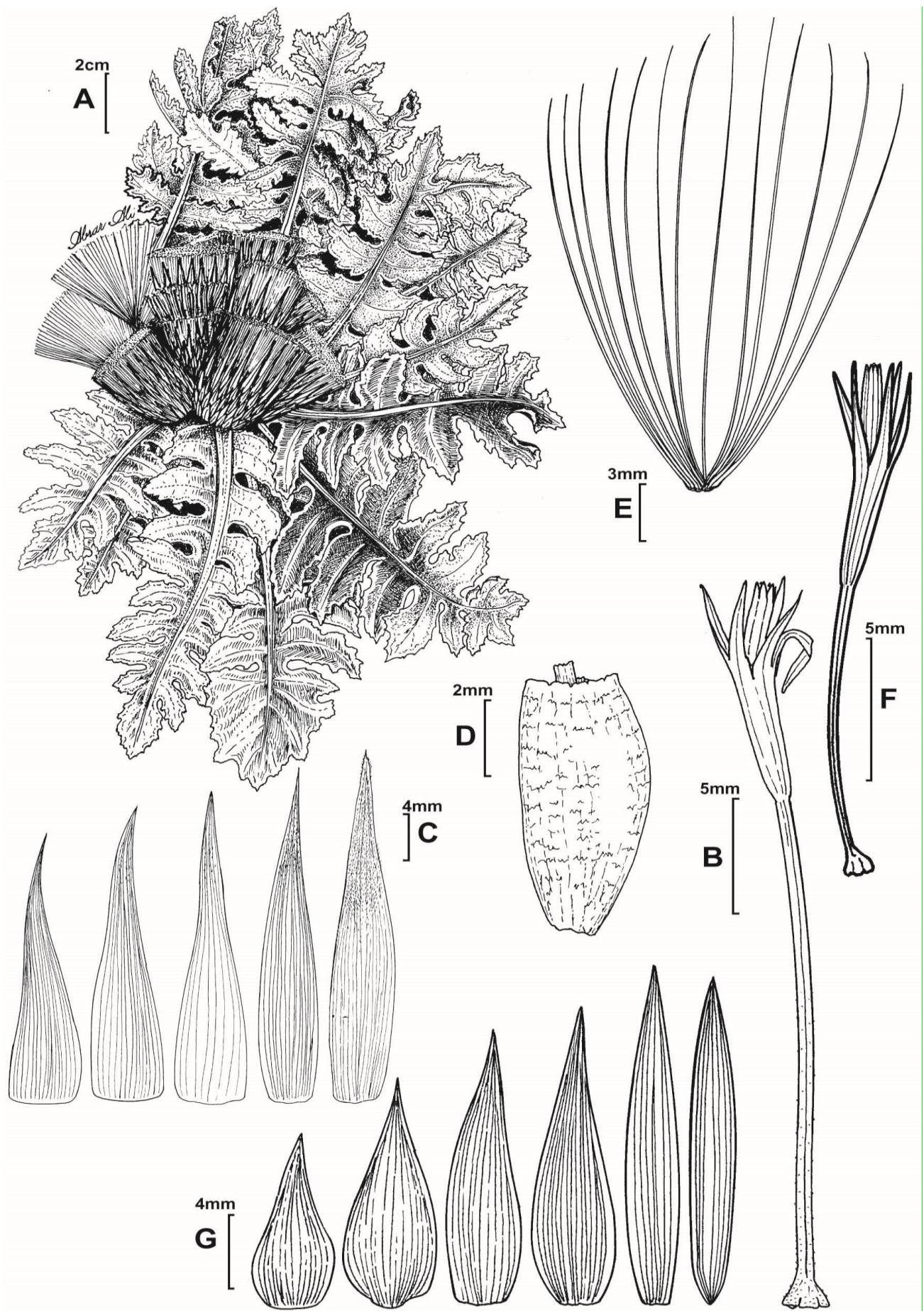


Fig. 5. *Dolomiaea megacephala*: A, habit; B, floret; C, phyllaries; D, cypsela; E, pappus. *Dolomiaea macrocephala*: F, floret; G, phyllaries.

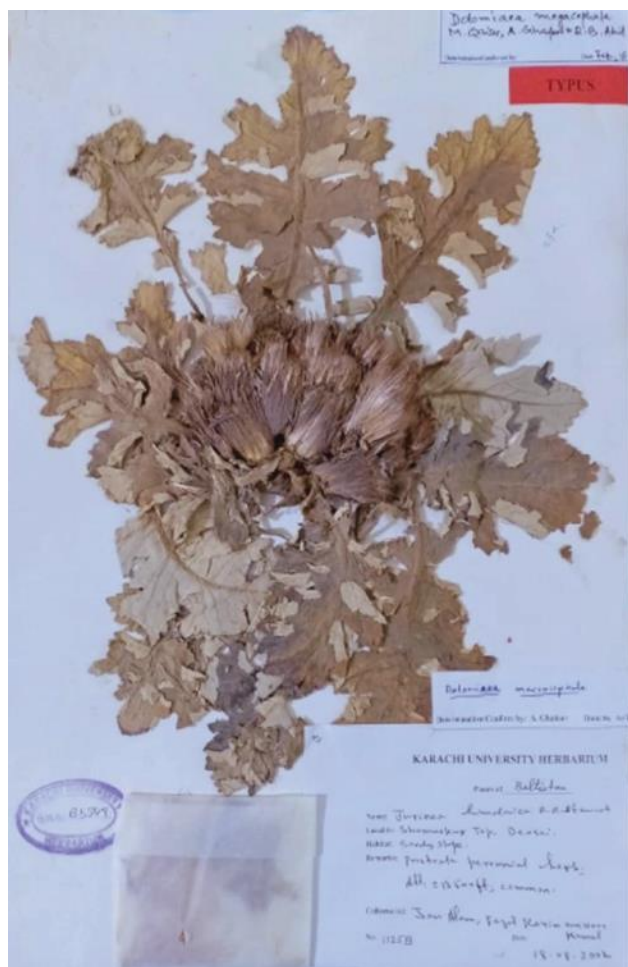


Fig. 6. Holotype of *Dolomiaea megacephala* (KUH).

Etymology: The name of this new taxon is given due to presence of large capitula.

Specimens examined: Rajdhangan Pass, 11–12000 ft, gregarious, 19.7.40, *R. R. Stewart* 19517 (NY); Kangi, Ladakh, Kashmir, on rock slope, flowers pink lavender, fragrant, 13000 ft, Sept. 5, 1931, *Walter Koelz* 2823 (NY); Parukar, Purig, Kashmir, 24-27, July, 1933, *Walter Koelz* 6055 (MICH); Kashmir: Neelum valley Azad Kashmir, on open alpine slope, 3695 m, 20.8.2017, *Shabir Ijaz* 441, 740 (KUH); Baltistan Dist.: Shamushkur top, Deosai, prostrate, perennial herb, pinkish pappus, on gravel slopes along water canal, 4040 m, 17.8.2002, *Jan Alam, Fazal Karim and Noor Kamal* 1425 (KUH); Baltistan from Bara Pani on way to Sheosar lake, on stony slope, ± 13000 ft, perennial herb, brownish–purple heads, 24.08.2003, *Jan Alam & Qaiser* 2189 (KUH).

Distribution: Endemic to Baltistan and Kashmir (Pakistan)

Flowering period: May–Aug

Affinities: This new species *D. megacephala* Qaiser, A. Ghafoor & R. Abid is similar in general appearance to *D. macrocephala* Royle and shares the following characters as being perennial, unarmed, herbs, leaves mostly in rosettes, capitula forming compact cluster in centre of leaf rosette, receptacle without or naked, cypselas maculated, with an apical rim having a distinct umbo and pappus bristles scabrid, united basally into a ring. However, the new species differs by its large capitulum, longer corolla and glandular tube which is almost twice as long as the limb, inner most phyllaries much longer and broader than *D. macrocephala* Royle and much large purplish – purplish brown pappus (Table 3 Figs. 5 & 6).

Key to the species

- + Capitula obconical–ovoid, 1.0–2.5 cm across; peduncle (3–) 7–10 cm long. Phyllaries thick, coriaceous; outer ones ovate, acute 8–12 mm long; innermost 18–20 mm long, 1–2 mm wide. Corolla 17–20 mm including 9–10 mm long tube and 8–9 mm long limb; limb almost equalling the corolla tube. Corolla tube eglandular. i. ***D. macrocephala***
- Capitula oblong-campanulate, 2.5–3.5 cm across, sessile. Phyllaries, herbaceous; outer ones lanceolate - ovate, acuminate 15–16 mm long; innermost 28–32 mm long, 4–6 mm wide. Corolla 28–32 mm long including 19–22 mm long tube and 9–10 mm long limb; limb 2 or more times shorter than the corolla tube. Corolla tube glandular. ii. ***D. megacephala***

New subspecies

A new subspecies of *Carduus acanthoides* L. subsp. *pakistanicus* R. Abid & Qaiser is described.

i. *Carduus acanthoides* L. Sp. Pl. 2: 821. 1753 subsp. *acanthoides*

Lectotype: Herb. Linn. 966/5 (LINN) fide Kazmi (1964)

ii. *Carduus acanthoides* L. *pakistanicus* R. Abid & Qaiser **subsp. nov.**

Type: Pakistan, Swat Dist.: Kalam, small, perennial herb, c. 25 cm tall, florets purple, c. 2500 m on sandy clayey soil, 2.7.1987, A. Ghafoor & S. Omer 3369 (KUH).

Perennial herb, c. 25 cm tall, flowering stem densely winged. Basal leaves rosette, 5–10 (–12) cm long, 1.5–4 cm wide, ovate-elliptic in outline, irregularly pinnatilobed, lobes 5–6 pairs, triangular, lobes and lobules with 6–8 mm long spines. Capitula solitary terminal, on a spiny winged peduncle, oblong-ovoid. Phyllaries lanceolate - linear, neither patent nor stiffer, outer and middle phyllaries with an elevated mid vein on a upper half, ending in a rather 2 mm long spinule, outer ones 8–10 mm long, 1–1.5 mm wide, median 13–15 mm long, 3–4 mm wide, inner 18–20 mm long, 3–4 mm wide, lanceolate-linear, acute. Corolla 18 mm long, purple, tube 8–9 mm long, limb 9–10 mm long including 5 mm long lobes. Pappus 10–12 mm long, smoky white.

Distribution: Pakistan (known from type locality only)

Flowering period: June – August

Key to the subspecies

1. + Leaves rosulate, spines 6-8 mm long. Phyllaries lanceolate - linear, neither patent nor stiffer, outer and median phyllaries with an elevated mid vein on the upper half, ending in a rather 2 mm long spinule, inner ones 3-4 mm wide. Corolla tube 8-9 mm long ii. **C. acanthoides** ssp. **pakistanicus**
- Leaves not rosulate, spines 3-5 mm long. Phyllaries subulate-linear, patent and stiffer, outer and median phyllaries without elevated mid vein on the upper half, inner ones 1-1.5 mm wide. Corolla tube 5-7 mm long i. **C. acanthoides** ssp. **acanthoides**

New combinations and status

Following new combinations and status are proposed:

Himalaiella diffusa (Lipschitz) A. Ghafoor, R. Abid & Qaiser, **comb. nov.**

Basionym: *Saussurea diffusa* Lipschitz, Gen. *Saussurea* 140. 1979.

Type: Kashmir, Junction of Jhelum and Kishenganga (Neelum) rivers (Muzaffarabad), Sept. 1937, *Falconer* s.n. (K000009623).

Tricholepis tibetica Hook. f. & Thomson ex. C. B. Clarke var. **nakoi** (Kitam.) R. Abid & Qaiser **stat. nov.**

Basionym: *Tricholepis nakoi* Kitamura, in *Phytotax Geobot* 19 (4-6): 105. Fig. 59. 1963.

Holotype: Pakistan, Northern Areas: Karakoram, near Nagir (Nagar), 2600 m, Flower purple (by Nakao), 20 Aug. 1955, *S. Nakao* (KYO0081207-digital image seen).

Saussurea stenophylla (Lipschitz) A. Ghafoor, **stat. nov.**

Basionym: *Saussurea roylei* (DC.) Sch.-Bip. subsp. *stenophylla* Lipschitz, *Novosti. Sist. Vyssh. Rast.* 225. 1968 et in *Rod Saussurea* 168. 1999.

Type: Kashmir, Anantnag, Lidder valley, Sousel Nullah, 4000 – 4267 m, 31 July, 1893, *J. F. Duthie* 13356 (LE – holo., BM-Iso.)

New records

Following taxa are reported for the first time from Pakistan and Kashmir:

Carduus acanthoides L., *Sp. Pl.* 2: 821. 1753.

Specimens examined: Abbottabad Dist.: Abbottabad, 30.6.1946, *B. B. Datta* s.n. (KUH). Astor Dist. (N.P.) Kala Pani Sunedap, erect perennial herb, upto 45 cm tall, common, flower violet, on sandy loam soils grows on foot hills, ± 3500 m, 3.9.2000, *Ali Noor* 247 (KUH); Aishah on way to Chilum, Astor, perennial herb, 40–60 cm, tall, florets pink, spiny, common, 5.8.2003, *Sher Wali Khan et al.*, 448 (KUH); Deosai-Baltistan: 3 miles from main road on way to Burila, grows on canyon like slope, erect, perennial branched herb, upto 40 inch, 13558 ft., corolla purple, infrequent, 19.08.2002, *Jan Alam, Fazal Karim & N. Kamal* 1550 (KUH); Astor (Gilgit) Mir Malik above Showdass, on foothill slope, erect perennial herb on sany

loam soil, flowers violet, less common, ± 3000 m, 15.8.2007, *Ali Noor* 917 (KUH); Kalapani on way to Kamri top, on hill slope, erect, perennial herb, flowers violet, common, 3486 m, 4.9.2007, *Ali Noor* 1011 (KUH); ibid, flower red-pine, alt. 3986 m, 4.9.2007, *Ali Noor* 1012 (KUH); Kalapani Mamodass, on plain area, erect perennial herb, red flower, 3585 m, N.34°48', 56.6, E. 74°55', 41.8, 4.9.2007, *Ali Noor* 1032 (KUH); Rayat nullah, Kalapani, on hill slope, erect, perennial herb, flower purple, 50 cm tall, ± 3200 m, 23.8.2009, *Ali Noor* 2076 (KUH).

Distribution: Europe, Turkey, Russia, China (Xinjiang, E. Xizang) and Pakistan.

Centaurea pulchella Ledeb., *Icon. Pl. Fl. Ross.* 1:22. T. 93. 1829; Kitam., *Fl. Afgh.* 397. 1960.

Specimens examined: Chitral Dist.: Sarighulbek, Chitral–Torikhoo, herb on rocky gentle slope, flowers purple, 16-08-2006, infrequent, *Haidar Ali* 5059 (KUH); Pushtemaza, Chitral–Yarkhoon, herb, on rock crevices, flower white, 25" in height, 2979 m, infrequent, 17-08-2006, *Haidar Ali* 5016 (KUH); Quetta Dist.: Quetta, on way to Ziarat, on sandy slopes, 6000 ft. common, flowers violets, 23-6-1953, *Jafri & Akbar* 2057 (B, E, KUH).

Distribution: Turkey, Iran, Turkmenistan, SW China (Xinjing), Afghanistan and Pakistan.

Cousinia koelzii Rech. f. *Dan. Biol. Skr.* 8, 2: 109. 1955; Rech. f., *Fl. Iran. Comp.* 1. *Cynareae* 90: 58. Tab. 16 & 176. Fig. 9. 1972.

Specimens examined: Chitral Dist.: Danespaw, Yarkhoon, Chitral, on undulating gentle slope, 21 inch in height, 2979 m, florets purple, perennial herb, common, 17.08.2006, *Haidar Ali* 5011 (KUH).

Distribution: Afghanistan and Pakistan (Chitral).

Cousinia turkmenorum Bornm., *Beih. Bot. Centrbl* 34, 2: 153. 1917 in note; Tscherneva in Schisch. & Bobrov, *Fl. USSR.* 27: 165. 1962; Rech. f., *Fl. Iran. Comp.* I, *Cynareae* 90:215. 1972 and 139a: 133. Tab. 125.

Specimens examined: Quetta Dist.: Between Beleli and Ghazaband to north of Quetta, spiny shrub with erect branches, flower pinkish-blue, 5.5.1985, *Abdul Ghafoor & Rizwan Yusuf* 1334 (KUH).

Distribution: Iran, Central Asia, Afghanistan and Pakistan.

Cousinia eriobasis Bunge, Mém. Acad. Sci. Petersbg. 7. Sér., 9(2): 37. 1865; Rech. f., Fl. Iran. Comp. 1. Cynareae 90: 101. Tab. 40. 1972.

Specimens examined: Chitral Dist.: Shagram gari Tirich, Lutkhoo, Chitral, perennial herb, on undulating stony gentle slope, 14 inch tall, florets light purple, 2900 m, 36°23'19.9", 72°05'14.9", very rare, 7.8.2003, *Haidar Ali* 2569 (KUH).

Distribution: Iran and Pakistan (Chitral)

Cousinia chlorothyrsa Rech. f. & Koeie, Dan. Biol. Skr. 8, 2: 86. 1955; Rech. f., Fl. Iran. Comp. I. Cynareae 90: 136. Tabs. 67 & 171. Fig. 7 & Tab. 178. Fig. 1. 1972.

Specimens examined: Sibi Distt. Near Governor's House, Ziarat, erect herb, ± 75 cm tall, flowers purple, 11. 9. 1970, *S. A. Faruqi & Qaiser* 2395 (KUH).

Distribution: Afghanistan and Pakistan (Baluchistan).

Echinops heteromorphous Bunge, Bull. Acad. Science. Petersbg. 6: 406. 1863; Rech. f., Fl. Iran. Comp. III, Cynareae 139a: 35. Tab. 23: 72. Fig. 3. 1979.

Specimens examined: c. 16 miles from Nushki-Quetta, herb, 30 cm, its fruits, grows in sandy loam, 30.8.1969, *Qaiser* 81 (KUH); c. 20 km from Panjgur on Panjgur-Turbat road, c. 30 cm tall, perennial, 6.10.1986, *A. Ghafoor & S. Omer* 1891 (KUH), Between Turbat and Buleda, erect ± 50-60 cm, florets bluish, 5.4.1988, *Tahir Ali* 951 (KUH).

Distribution: Iran and Pakistan.

Jurinea mallophora Rech. f. & Koeie, Dan. Biol. Skr. 8, 2: 174. Fig. 117. 1955; Rech. f. & Wagenitz, in Rech. f. Fl. Iran. Comp. III. Cynareae 139a: 202. Tabs. 197 & 269. Fig. 2. 1979.

Specimens examined: Chitral Dist: Sara Gulbek, Chitral-Yarkhooon, perennial herb, 3" in height, infrequent, on rocky gentle slope, 2991 m, 17-8-2006, *Haidar Ali* 5032 (KUH).

Distribution: Afghanistan and Pakistan.

Jurinea radians ssp. *radians* Boiss. Fl. Or. 3: 577. 1875; Rech. f., & Wagenitz, in Rech. f., Fl. Iran. Comp. III. Cynareae 139a: 189. Tabs. 183; 210. Fig. 2 & 269. Fig. 1 1979.

Specimens examined: Quetta Dist.: 36 miles from Quetta on way to Ziarat, 35 cm tall, flowers dark pink with fruit, 12. 5. 1978, *S. Nazimuddin, Hamidullah & S. Abedin* 658, 659 (KUH).

Distribution: Iran and Pakistan.

Jurinea ramosissima DC. Prodr. 6: 667. 1838. Rech. f. & Wagenitz in Rech. f., Fl. Iran. Comp. III. Cynareae 139a: 197. Tab. 191. 1979.

Specimens examined: Quetta Dist.: c. 16 miles from Nushki-Quetta, herb, on sandy loam, 30 cm tall, flowers with fruits, 30.8.1969, *Qaiser* 81 (KUH); ca 20 km from Panjgur on Panjgur-Turbat Road, c. 30 cm tall, perennial, 6.10.1986, *A. Ghafoor & S. Omer* 1891 (KUH); between Turbat and Buleda (Bit.), erect, 50-60 cm tall, florets bluish, 5.4.1988, *Tahir ali* 951 (KUH).

Distribution: Iran and Pakistan (N. Baluchistan).

Tricholepis eburnea Rech. f. Fl. Iran. Comp. III Cynareae 139b: 307. Tab. 296. 1980; Breckle et al. in Dittmann, Vasc. Pl. Afgh. Augm. Checklist 196. 2013.

Specimens examined: Balochistan, Quetta, 6000 ft., 27.4. 1888, *J. H. Lace* 3733 (E 00286708); Balochistan, Ziarat, 25.6.2006, *R. B. Tareen* s.n. (KUH).

Distribution: Afghanistan and Pakistan

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