

The genus *Duhaldea* (Asteraceae) in India

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Abstract: Based on the field and herbarium data, six species of the genus *Duhaldea* (*sensu stricto*) are recognized in India. A key to the Indian species, brief descriptions and illustrations are provided along with data on phenology, distribution, ecology, chromosome numbers and ethnobotanical uses.

Keywords: Inuleae–Inulinae, Phenology, Taxonomic treatment.

Introduction

The genus *Duhaldea* DC. (Inuleae–Inulinae) includes *c.* 14 species mainly distributed in Central Asia (Anderberg, 1991, 2009; Chen & Anderberg, 2011; Shekhar, 2012). Working with the phylogenetic relationships within the Inuleae, several species belonging to *Inula* L., were found to be in other clades than the type of the genus (Anderberg, 1991; Shekhar *et al.*, 2011, 2013). Consequently, genera such as *Limbarda* Adans., *Dittrichia* Greuter (Greuter, 1973) were recognized, and one species of *Inula* was also moved to *Iphia* Cass. According to Anderberg (1991) a number of Asian species of *Inula*, differed from the rest in several morphological features such as anthers with polarized endothelial wall thickenings, capitula with scale-like ridges on the receptacle, and truncate or emarginated anther appendages. The truncate anther appendages constituted a unique feature in *Duhaldea*, whereas polarized endothelial tissue was also present in other genera of the tribe, but not in

Inula (*sensu stricto*). Anderberg (1991) moved species of *Inula* to the genus *Duhaldea* with the above character states and concluded that *Duhaldea* was most closely related to genera such as *Dittrichia* Greuter and *Blumea* DC. The systematic position of *Duhaldea* is in a clade that is sister to the rest of the Inuleae–Inulinae and its closest relatives being *Blumea* and *Caesulia* Roxb. (Englund *et al.*, 2009; Nylander & Anderberg, 2015). The genus has an entirely Asian distribution and the previous tentative inclusion of the African *Inula stuhlmannii* O. Hoffm., with polarized endothelial tissue, in *Duhaldea* has been shown to be wrong, as this species is a member of *Anisopappus* Hook. & Arn. in the tribe Athroismeae (Bengtson *et al.*, 2017).

In this paper, a taxonomic account of all the recognized species of *Duhaldea* in India is provided. A key to the species, brief taxonomic descriptions and illustrations are provided along with data on phenology, distribution, ecology, chromosome number and ethnobotanical uses.

Taxonomic treatment

***Duhaldea* DC.**, Prodr. 5: 366. 1836; Anderb., Pl. Syst. Evol. 176: 103. 1991. *Amphirhapis* DC., Prodr. 5: 343. 1836. *Inula* L. sect. *Cappa* DC., Prodr. 5: 469. 1836; Benth. & Hook.f., Gen. Pl. 2: 330. 1873; C.B. Clarke, Compos. Ind. 118. 1876; Hook.f., Fl. Brit. Ind. 3: 295. 1881; Rech.f., Fl. Iran. 145: 80. 1980; Kumar in Hajra *et al.*, Fl. India 13: 11. 1995. *Type: Duhaldea chinensis* DC.

Perennial shrubs. Stems usually unbranched. Leaves herbaceous, membranous or leathery, alternate, simple, small to very large, hairy. Capitula

heterogamous, radiate to shortly-radiate, disciform or homogamous discoid, solitary to a few on dense terminal branches, or in terminal corymbs. Receptacle epaleate, with scale-like ridges. Involucral bracts 3–5-seriate, imbricate, inner rigid and narrow, outer usually herbaceous. Ray florets female, radiate–shortly radiate, at apex, 2–3-toothed. Central florets hermaphrodite, tubular, 5-toothed. Corolla yellow to white, radiate to shortly-radiate. Disc-florets perfect. Anthers tailed, apical appendices truncate-emarginate, endothelial tissue polarized; cells of the filament collar longer than wide; pollen spines with a cavity. Style with acute sweeping hairs not reaching the furcation. Cypselae terete to sub-terete, above non attenuate, usually thick-walled and ribbed, ellipsoid, hairy, epidermis with elongated crystals. Pappus bristles uniseriate, persistent, numerous (>20).

Distribution: Fourteen species in Central and East Asia; six species in India (Fig. 1).

Key to the species in India

- 1a. Herbs; ray florets white 2
- 1b. Shrubs; ray florets yellow 3
- 2a. Leaf base cuneate; heads 1–1.5 cm
..... *D. nervosa*
- 2b. Leaf base rounded; heads 2–3 cm
..... *D. simonsii*
- 3a. Leaves glabrous; nerves parallel to the margins; heads not more than five in panicles
..... *D. rubricaulis*
- 3b. Leaves pubescent or scabrous; nerves not parallel to the margins; heads many or always more than 5 in corymbs or panicles 4
- 4a. Heads discoid/ homogamous; leaves covered with dense silky woolly hairs on lower surface
..... *D. cappa*
- 4b. Heads radiate/ heterogamous; leaves not covered with dense silky woolly hairs on lower surface 5
- 5a. Leaves membranous; petioles slender; ray-florets 5–10 mm long *D. cuspidata*

- 5b. Leaves rigid, leathery/coriaceous, much-reticulated venation beneath; petiole stout; ray-florets up to 5 mm long *D. eupatorioides*

Duhaldea cappa (Buch.–Ham. ex D.Don) Pruski & Anderb., *Compositae Newslett.* 176: 104. 2003. *Conyza cappa* Buch.–Ham. ex D.Don, *Prodr. Fl. Nep.* 176. 1825. *Inula cappa* (Buch.–Ham. ex D.Don) DC., *Prodr.* 5: 469. 1836; C.B.Clarke., *Comp. Ind.* 124. 1876; Hook.f., *Fl. Brit. India* 3: 295. 1881; Collett, *Fl. Siml.* 282. 1902; Blatt., *Beaut. Fl. Kash.* 1: 160. 1927; Stewart in Nasir & Ali, *Fl. W. Pakistan Annot. Cat.* 752. 1972; Duthie, *Fl. Gangetic Plain* 1: 423. 1960 (Rep. ed.); Babu, *Herb. Fl. Dehra Dun* 271. 1977; N.C.Nair, *Fl. Bashahr Himal.* 154. 1977; Sharma & Kachroo, *Fl. Jammu* 1: 190. 1981; Kitamura & Gould in Hara *et al.*, *Enum. Fl. Pl. Nep.* 3: 30. 1982; Sharma & Kachroo, III. *Fl. Jammu* 2: 129. 1983; H.J.Chaudhary & B.M.Wadhwa, *Fl. Himachal Pradesh* 2: 394. 1984; Naithani, *Fl. Chamoli* 1: 329. 1984; Deb & Dutta, *J. Econ. Taxon. Bot.* 10: 42. 1987; Kumar in Hajra *et al.*, *Fl. India* 13: 13. 1995. *Type:* Nepaliae superioris, ad Suembu, 07.07.1802, *F. Hamilton s.n.* (BM [BM000070246] digital image!).

Duhaldea chinensis DC., *Prodr.* 5: 366. 1836.

Fig. 2

Erect, stout, aromatic shrubs or under-shrubs, 1–2.5 m tall. Stems branched; branches thick, terete, densely white tomentose. Leaves thick, leathery, oblong-lanceolate; petioles short 0.5–0.7 mm long, acute-obtuse at base, margins glandular-dentate, 5–20 × 1–5 cm, densely silky woolly on lower surface, dark green and hairy on upper surface. Heads in corymbs, compact, 0.5–1 cm in diam., densely silky; peduncles up to 12 cm long. Involucral bracts imbricate, 4-seriate, pale green, very variable in size and number; outer bracts shorter than inner, elliptic, lanceolate to linear-ensiform, herbaceous to thin papery, 1–5 mm long, rigid; hairs white, dense, silky tomentose. Ray florets absent or very few, shortly radiate. Disc florets yellow, tubular, 4.2 mm long, 5-toothed, prominently ribbed; corolla campanulate, papillate at the tip. Cypselae 1.5–2 × 0.25–0.5 mm, yellowish

brown, narrowly obovate-oblong, densely sericeous, silky hairy, with a prominent base, 8–10-ribbed. Pappus bristles 22–24, 1-seriate, 5–6 mm long, off-white.

Flowering & fruiting: Flowering and fruiting from August to late February.

Chromosome number: $2n = 20, 40$ (Kumar & Subramaniam, 1987).

Habitat: Frequent along road-sides, among rock crevices and boulders, between 850–3500 m elevation.

Distribution: China, India, Java, Nepal, Pakistan and

Thailand.

Specimens examined: INDIA, Arunachal Pradesh, Lohit district, near Porshuram Kund, 21.12.1993, A.S. Chauhan 99440 (ASSAM); near Paya to Mara, 17.11.1957, R.S. Rao 10673 (ASSAM); near Shoeliang to Paya, 15.11.1957, R.S. Rao 10592 (CAL); Lower Subansiri district, 40 miles from Kimin, 28.09.1959, G. Panigrahi 19708 (CAL); Yazali, on roadside, 16.01.1997, K.P. Singh 59982 (ASSAM); ± 9 miles from Ziro, 11.11.1964, A.R.K. Shastry 40523 (ASSAM); Tawang district, Near eastern Bhutan, *s.d.*, *s.n.* (ASSAM); West Kameng district, Bomdila Bumla road, 24.04.1996, K.P.

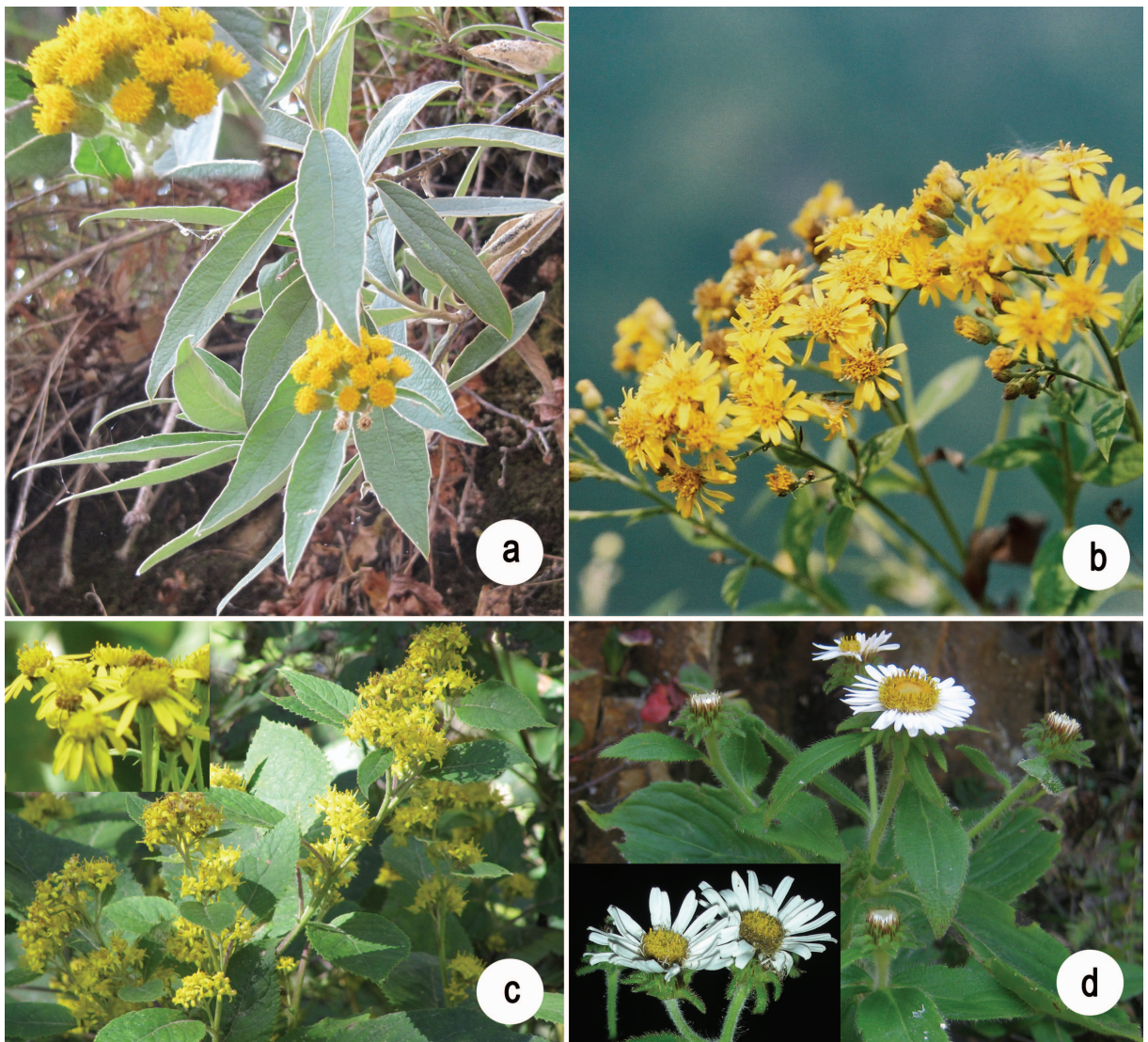


Fig. 1. Selected species of *Duhaldea* DC. in India: **a.** *Duhaldea cappa* (Buch.-Ham. ex D. Don) Pruski & Anderberg; **b.** *D. cuspidata* (DC.) Anderberg; **c.** *D. eupatorioides* (DC.) Anderberg; **d.** *D. nervosa* (Wall. ex DC.) Anderberg (photos a. & b. by S. Shekhar, c. & d. by A.K. Pandey).

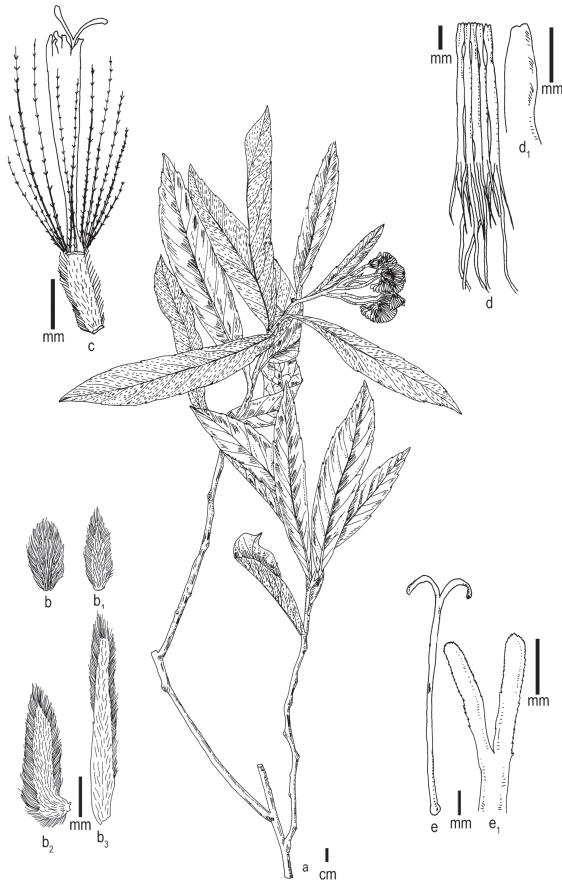


Fig. 2. *Duhaldea cappa* (Buch.-Ham. ex D. Don) Pruski & Anderberg: **a.** Habit; **b-b₃**, Phyllaries (from outer to inner); **c.** Disc floret; **d & d₁**, Anthers; **e & e₁**, Style & stigma (**a** from *S. Shekhar* 102 [DUH], **b & c** from *S. Shekhar* 506 [DUH], **d & e** from *S. Shekhar* 1011 [DUH]; drawn by *S. Shekhar*; scale bars: **a** 1 cm; **b-e**, 1 mm).

Singh 101458 (ASSAM); Kalaktang F.D., 21.05.1958, *G. Panigrahi* 15958 (ASSAM); near Salari village, on open places, 07.11.1997, *A.A. Mao* 101907 (ASSAM); West Siang district, near Kombong, 23.03.1958, *G.K. Murthy* 13040 (ASSAM); *Ibid.*, 23.03.1958, *R.S. Rao* 13101 (CAL); *s.loc., s.d.*, *S.K. Katari* 32138 (ASSAM). *s.loc.*, 16.10.1955, *R.S. Rao* 1339, 1678 (ASSAM). **Assam**, Cachar district, on the way to Rongba forest, Motinagar, 19.11.1962, *S.K. Kar* 29597 (ASSAM); Jashigong hills, on the slope of the hills, 09.03.1965, *N.P. Balakrishnan* 41224 (ASSAM); Khongsnong in open grassland, 22.08.1968, *N.P. Balakrishnan* 46949 (ASSAM); *s.loc., s.d.*, *Kanjilal* 38371 (ASSAM); Dima Hasao district, N.C. Hills near Haflong, 13.01.1915, *Kanjilal* 467 (ASSAM); Wood sand, 09.1960, *G.K. Deka* 23055, 23056 (ASSAM);

Lakhimpur district, Ritugaon, 01.1942, *R.N. De* 15594, 15595, 15615 (ASSAM); Tinsukia district, Marghirita, 04.02.1939, *G.K. Deka* 18036 (ASSAM). **Bihar**, West Champaran district, Champaran, on the way to Someswas, 16.11.1963, *Snelg* 363 (CAL). **Himachal Pradesh**, Chamba district, 24.09.1985, *Harender* 103706, 90518 (BSD); Dalhousie, 26.09.1874, *s.coll.* 23119 (CAL); *Ibid.*, 1883, *C.B. Clarke* 236964 (CAL); Kangra district, Pong Dam catchment, 03.11.2000, *S.K. Srivastava* 104311 (BSD); Kullu district, 27.05.1924, *Mimikeri* 38291 (DD); Mandi District, Chindi, way to Kewsong, 02.10.1985, *S.K. Srivastava* 83214 (BSD). **Jammu & Kashmir**, Kauda, Northwest Himalaya, 10.1898, *J.S. Gamble* 27434 (DD); N.W. Himalaya, 06.1905, *A. Meebold* 1045 (CAL); Gaura, N.W. Himalaya, 10.1964, *Brandis* 4067 (CAL); Nandani, 11.10.1969, *B.M. Sharma* 98 (KASH); Palma, Rajouri, 02.10.1987, *G.H. Hassan Dar* 9452 (KASH); Ujhan, Rajouri, 15.10.1987, *G.H. Hassan Dar* 9433 (KASH); Kheora, 19.10.1988, *G.H. Dar* 9795 (KASH); 14 km from Sunderbani, Akhnoor road, on slopes, 21.09.1969, *B.P. Uniyal* 100599 (BSD). **Manipur**, Bishnupur district, Bishanpur, 20.11.1943, *s.coll.* 93838 (DD); Chandel district, On the way to Kongal thana, 1882, *G. Watt* 7326 (CAL); Kowpom, 11.1907, *A. Meebold* 5900 (CAL); *s.loc.* Common on clay hills, 1982, *George Watt* 5003 (CAL); Litang, 15.11.1942, *N.L. Bor* 93109 (DD); Kangpokpi district, Kangpokpi, 02.10.1943, *s.coll.* 93690 (DD). **Meghalaya**, East Khasi hills district, Shillong, 01.07.1913, *Kanjilal* 2239 (ASSAM); *Ibid.*, 01.07.1913, *Kanjilal* 236989 (CAL); Peak forest, 20.09.1930, *P.C. Kanjilal* 8579 (ASSAM); Khasia & Jaintia hills, Barapani, 01.11.1930, *Ram Saran* 8775 (ASSAM); near Burni, 12.02.1932, *Ram Saran* 9893a (ASSAM); Mawplong, 15.10.1932, *Nandi* 236986 (CAL); Peak forest, 20.09.1938, *G.K. Deka* 18816 (ASSAM); On the way to Cherrapunji, 24 miles from Shillong, 24.09.1956, *G. Panigrahi* 3708 (ASSAM); Near Cherapunji, 23.09.1958, *G.K. Deka* 17168 (ASSAM); Wood land, Shillong, 09.1960, *s.coll.* 21900 (CAL); Shillong, 26.11.1962, *S. Chaudhary* 25220 (CAL); *Ibid.*, 24.12.1962, *R. Dutta* 25546 (CAL); towards Bishop falls, 10.12.1962,

R.M. Dutta 25431 (ASSAM); Shola forest, 29.11.1962, *S. Choudhary* 25124 (ASSAM); At the Shillong peak, 10.1963, *G.K. Deka* 35897 (ASSAM); Sehari forest, 15.09.1964, *J. Joseph* 40016, 15608 (ASSAM); Shillong, near Nagar Bhanj campus, 23.10.1975, *P. Markongon* 580 (NEHU); East Khasi Hills District, Beadon falls area, 26.11.1962, *R.M. Dutta* 25220 (ASSAM); Stream side in between Beadon & Bishop falls, 24.12.1962, *R.M. Dutta* 25546 (ASSAM); 5 miles from check post, 09.01.1963, *S. Chowdhary* 29630 (ASSAM); Ri-Bhoi district, Nongpoh, 15.11.1959, *V.N. Naik* 19251 (ASSAM); Cherrapunji, 12.07.2011, *S. Shekhar* 1117 (DUH); West Jaintia Hills district, near Jowai at open & shaded places, in pine forest, 14.11.1969, *N.P. Balakrishnan* 49816 (ASSAM); West Khasi hills district, Khasi & Jaintia hills, near Nongkhlaus, 15.06.1958, *G. Panigrahi* 16202 (ASSAM); Khasi Hills, near Mawphlong, 28.01.1978, *s.coll.* 78 (NEHU); Chera bridge at higher elevation, 24.11.1999, *Papia Ray Choudhary* 106151 (ASSAM); Barapani, Meghalaya, 09.07.2009, *A.K. Pandey* 10022 (DUH); NEHU campus, Shillong, 9.07.2009, *A.K. Pandey* 10040 (DUH). **Mizoram**, Aizwal district, Aizwal to Champhai, 17.01.1963, *D.B. Deb* 38184, 38185 (ASSAM); Champhai district, Champhai-Zote, 10.10.1989, *D.K. Singh*, 94578 (ASSAM). **Nagaland**, Naga Hills district, Naga Hills, 12.10.1936, *N.L. Bor* 19954 (ASSAM). **Punjab**, Gurdaspur district, Thein Dam, 02.10.1983, *Charanpreet* 77054, 77055 (BSD); Hoshiarpur district, Hoshiarpur [Hoshiarpore], 1878, *Aitchison* 236956 (CAL); Kapurthala district, Bishanpur, N.W. Himalaya, 02.1906, *A. Meebold* 5257 (CAL); Kalka, 14.11.1959, *T.A. Rao* 13965 (BSD); Kalka, 14.11.1959, *T.A. Rao* 13965 (BSD). **Sikkim**, West Sikkim district, Rinchengpong, 02.10.1862, *T. Anderson* 742 (CAL); Mendong, 23.10.1869, *C.B. Clarke* 10209 (CAL); *s.loc., s.d., N.C. Mazumdar & R.M. Dutta* 421 (CAL). **Tripura**, West Tripura district, near M.B.B. College, Agartala, *s.d., D.B. De* 1331 (CAL); Agartala, 10.04.1956, *s.coll.* 240, 241 (CAL). **Uttarakhand**, Almora district, Ganai, 17.10.1912, *D. Hooper* 38959 (CAL); Gabini, Riskal, 20.11.1913, *Hira Singh* 12485 (DD); On the northern side of Dhaulchina hills, Almora, Kumaon, division 24.09.1950, *D.D. Awasthi* 1386 (DD); Dehradun district, *s.loc.*, 09.1941, *M.B. Raizada* 89613 (DD); Above Thadiar, Chakrata forest division, 29.09.1958, *K.C. Sahni* 27070 (DD); Rajpur, Dehradun, along road side, 25.12.1960, *Hari Om Singh* 187 (DD); Rispana, 27.09.1964, *C.R. Babu* 40305 (BSD); Timli pass, on hilly slopes, 10.1984, *K.S. Murthy & A.K. Goel* 82286 (BSD); Sati Manvar market Dehra Dun, 15.12.1995, *Kanjilal s.n.* (DD); Nainital district, Haldwani, Chakrata, 23.02.1914, *Raghubir Singh* 11201 (DD); Bhilkia range, 20.04.1914, *J. Singh* 9793 (DD); Kalifihat walla, 21.10.1914, *Hira Singh* 14074 (DD); Pauri Garhwal district, Adwani road, Pauri Garhwal, 20.10.1975, *H.B. Naithani* 152479 (DD); Buwakkhal, 20.02.2009, *S. Shekhar* 1001, 1002, 1003 (DUH); Bhyundar valley, Garhwal, 19.10.1962, *U.C. Bhattacharyya* 24499 (BSD); Garhwal, 13.03.1915, *G.E. Oswaston* 11350 (DD); Near Dhari Devi temple, Srinagar Garhwal, 21.02.2009, *S. Shekhar* 1005 (DUH); 4 km away from Khirsu, Srinagar-Garhwal, 22.02.2009, *S. Shekhar* 1009 (DUH); On the way to Gopeshwar, 22.09.2009, *S. Shekhar* 1048, 1050 (DUH); On the way to Dhanaulti, 25.05.2010, *S. Shekhar* 1070, 1072 (DUH); Srinagar-Garhwal, 27.10.2011, *S. Shekhar* 1092, 1093 (DUH); on rocky surface, Mandal, Garhwal, 01.10.1970, *B.D. Naithani* 47626 (BSD); Nainital District, Corbett National Park, near Mailani Tal, 24.11.1970, *P.C. Pant* 43418 (BSD); Corbett National Park, near Phulai on hills ridges and slopes, 16.11.1970, *P.C. Pant* 43285 (BSD); Kumaon, 22.09.1971, *G.M. Arora* 58263 (BSD); 2 km ahead of Gairan on Sarpduli road, 19.11.1972, *K.P. Janardhanan* 51102 (BSD); Pithoragarh district, Didihat Narayan Nagar bridle path, along road side, Pithoragarh, 30.09.1975, *C.M. Arora & R. Prasad* 61507 (BSD); Tehri Garhwal district, Pratapnagar, Tehri, 23.02.1979, *A.K. Goel* 70698 (BSD); Uttarkashi district, On the way to Mahidanda, 27.10.1966, *M.A. Rau* 39251 (BSD). **West Bengal**, Jalpaiguri district, Apalchand, Jalpaiguri, 26.02.1975, *J.K. Sikdar* 169, 170 (CAL).

Medicinal uses: Whole plant including roots is used as an expectorant, anodyne, carminative and for asthma, cold, rheumatism and weeping ulcers. Roots are also given in suppressed urination (Wang *et al.*, 2010, 2012; Gairola *et al.*, 2014).

Duhaldea cuspidata (Wall. ex DC.) Anderb., Pl. Syst. Evol. 176: 104. 1991. *Solidago cuspidata* Wall., Numer. List no. 3244. 1831, *nom. nud.* *Amphirhapis cuspidata* DC., Prodr. 5: 343. 1836. *Inula cuspidata* (DC.) C.B. Clarke, Compos. Ind. 125. 1876; Hook.f., Fl. Brit. India 3: 296. 1881; Collett, Fl. Siml. 258. 1902; Duthie, Fl. Gangetic Pl. 121. 1976; N.C. Nair, Fl. Bashahr Himal. 155. 1977; Babu, Herbac. Fl. Dehra Dun 271. 1977; B.D. Naithani, Fl. Chamoli 1: 329. 1984; Kumar in Hajra *et al.*, Fl. India 13: 15. 1995. *Type:* INDIA, **Srinagar**, *s.d.* Wallich 3224 (K [K001118849 digital image!])

Fig. 3

Erect, stout shrubs, 50–100 cm tall; branches terete, brownish-purple, glabrous or scarcely pubescent. Leaves elliptic, ovate to lanceolate, 3.15–14 × 1.5–6 cm, acute or shortly acuminate at apex, attenuate at base, glandular, petiolate, margin dentate, membranous, upper surface dark green, glabrous, rough, lower surface pale, pubescent, serrulate. Heads heterogamous, polycephalous but not compact, radiating, in terminal corymbs, pedunculate. Capitula 1–1.5 cm in diam. Involucral bracts imbricate, 1–5 mm long, 5-seriate, elliptic, lanceolate, linear to ligulate/herbaceous to thin papery, pubescent and rarely glandular above, with prominent mid-rib, dark green. Ray florets radiate, yellow, 5–10 mm long, 3-toothed. Disc florets 6–8 mm long, campanulate, 5-toothed, yellow. Cypselae narrowly obovate-oblong, 1.5–2 × 0.25–0.5 mm, reddish brown with sparsely white pubescent surface, silky-hairy, 8–10-ribbed. Pappus bristles 22–26, 1-seriate, 4–5 mm long, cream-golden.

Flowering & fruiting: Flowering from June to early December.

Chromosome number: 2n = 20 (Kumar & Subramaniam, 1987).

Habitat: Common in open places, steep hill slopes, along the edges of the forests, river banks and among rock crevices, from 900–2000 m elevation.

Distribution: Bhutan, China, India, Nepal and Pakistan.

Specimens examined: INDIA, **Himachal Pradesh**, Bilaspur district, Near Bhakra Nangal, 13.11.1959, T.A. Rao 13924 (BSD); Chamba district, Saho, 06.10.1874, C.B. Clarke 23563 (CAL); Between Chamba and Rakh, 08.09.1896, G.A. Gammie 18541, 18449 (DD); In rocks near Chamba, 15.06.1919, R.N. Parker 21621 (DD); Kinnur district, Sholdung, 01.10.1964, N.C. Nair 62491 (BSD); Tapri, 13.10.1971, K.P. Janardhanan 46665, 59549 (BSD); Mandi district, Near Mandi-Kullu, on steep rocky place, 29.07.1970, U.C. Bhattacharyya 40310, 40314 (BSD); Aut, on rocky slopes, 27.08.1977, S.K. Murthy & R. Prasad 64202 (BSD); Karsog valley, 23.02.1985, S.K. Srivastava 83208 (BSD); On the way to Solari pass, 09.1994, Bipin Balodi 95160 (BSD); Shimla district, Shimla, 05.09.1879, K. Chaudhary 452 (CAL); Sirmour district, Renuka lake, Jhamu hill slopes, 13.02.2002, S.K. Srivastava 104767 (BSD). **Jammu & Kashmir**, Kishtwar district, 20.09.1876, C.B. Clarke 31437, 31447 (CAL); Batote/Chenab valley, 10.09.1958, T.A. Rao 13248 (BSD); Udhampur district, 08.10.1986, Ajai Swami 87034 (BSD); *s.loc.*, 01.10.1926, C.B. Clarke *s.n.* (CAL); *s.loc.*, 09.1864, Brandis 4063, 4065 (CAL); Jaunsar, 10.1894, J.S. Gamble 15102 (CAL). **Meghalaya**, East Khasi Hills district, Shillong peak, 07.09.2009, A.K. Pandey 10034, 10039, 10133, 10134, 10135 (DUH). **Punjab**, Punjab Himalaya, 08.1897, H. Collett 237074 (CAL); Solan district, Kasauli [Kasuli], 15.11.1959, T.A. Rao 14045 (BSD); Rupnagar-Shivalik forests, 10.2000, Surendra Singh 101929 (BSD). **Uttarakhand**, Almora district, Gannath, 28.10.1975, S.N. Vohra 58241 (BSD); Chamoli district, Anusuyia area, 05.10.1970, B.D. Naithani 47722 (BSD); Chamoli, on hill slopes, 09.1993, Bipin Balodi 94011 (BSD); Bhuyandar valley, 19.10.1962 U.C. Bhattacharya 25806 (BSD); Dhaul Ganga valley, Dam site, 11.09.1985, H.J. Chaudhary

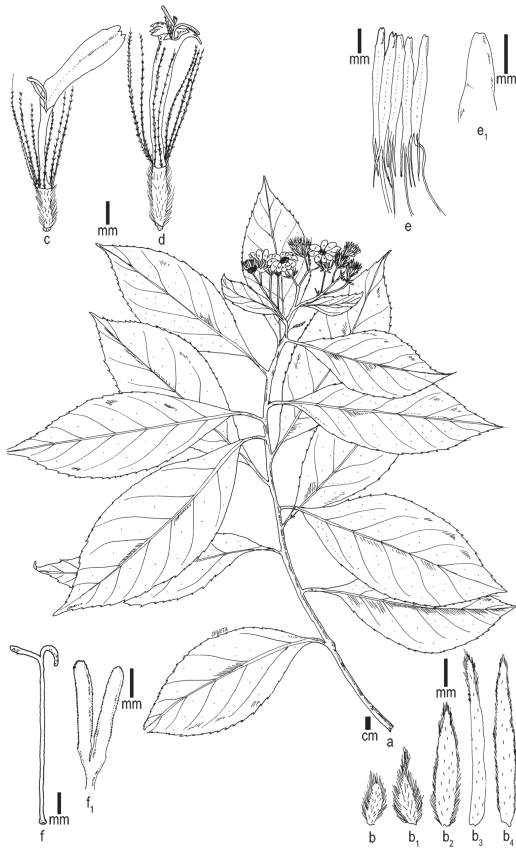


Fig. 3. *Duhaldea cuspidata* (DC.) Anderberg. **a.** Habit; **b-b₄**. Phyllaries (from outer to inner); **c.** Ray floret; **d.** Disc floret; **e & e₁**. Anthers; **f & f₁**. Style & stigma (**a, b & c** from *S. Shekhar* 101 [DUH], **d, e & f** from *S. Shekhar* 1045 [DUH]; drawn by *S. Shekhar*; scale bars: **a** 1 cm; **b-e, f** 1 mm).

79618 (BSD); Joshimath, Badrinath, 3.10.1959, *M.A. Rau* 12354 (BSD); *Ibid.*, 22.02.2009, *S. Shekhar* 1065, 1066 (DUH); Nanda Devi National Park, inside the forest in shady places, 01.09.1981, *P.K. Hajra* 80679, 80680 (BSD); Nanu to Bantoli, 15.09.1997, *M.S. Pundhir* 100039 (BSD); Dehradun district, 01.1890, *J.S. Gamble s.n.* (CAL); Near Kandli, Dehradun, 1938, *M.B. Raizada* 78143 (DD); Near Kempty fall, Mussoorie, 26.05.2010, *S. Shekhar* 1074, 1075 (DUH); on the way to gun-hill, Mussoorie, 27.05.2010, *S. Shekhar* 1086, 1087 (DUH); Mussoorie, 12.1896, *P.W. Mackinnon* 237076 (CAL); *Ibid.*, 1939, *M.B. Raizada* 78831 (DD); Rajpur, on the way to Dehradun, Mussoorie road, 10.12.1956, *G.S. Puri* 10171 (CAL); Near Jharipani, on hill side, Mussoorie, 22.01.1960, *Hari Om Saxena* 136720 (DD); Bridle path, Mussoorie,

22.05.1960, *Hari Om Saxena* 136585 (DD); Jabbarkhet, Mussoorie, 05.10.1960, *Hari Om Saxena* 13787, 137898 (DD); on the way to Mussoorie, 17.12.1960, *U.C. Bhattacharya* 15951 (BSD); Dehra Dun, 10.1961, *Rabindra Nath Banerjee* 17 (CAL); Sahasradhara, common on steep rocky slopes, 15.10.1962, *S.K. Malhotra* 43941 (BSD); Sahasradhara, along the stream, 12.12.1964, *C.R. Babu* 40304 (BSD); Rovers cave, Dehra Dun, 15.11.1966, *C.R. Babu* 40303 (BSD); Idgah, near petrol pump, Chakrata road, Dehra Dun, 1969, *Ram Dyal* 145076 (DD); Nainital district, 10.1905, *A. Meebold* 1043 (CAL); Nainital, 10.2006, *C.M. Bisht* 111838 (BSD); Bhabar valley, 14.10.1890, *J.H. Lace* 655 (CAL); Bharti-Ratighat forest, 26.10.1975, *B.M. Wadhwa* 57756 (BSD); Ranchi range, Nainital, 17.10.1960, *P.C. Pant* 15730 (BSD); Pauri Garhwal district, Buwakhil, 20.02.2009, *S. Shekhar* 1004 (DUH); Gauri Kund, Garhwal, 02.10.1958, *M.A. Rau* 9337 (BSD); Near Dhari Devi temple, Srinagar Garhwal, 21.02.2009, *S. Shekhar* 1006, 1007, 1008 (DUH); 4 km away from Khirsu & Pauri, Srinagar-Garhwal, 22.02.2009, *S. Shekhar* 1011, 1012, 1045 (DUH); on the way to Gopeshwar, 22.02.2009, *S. Shekhar* 1049 (DUH); Srinagar-Garhwal, 28.10.2011, *S. Shekhar* 1090, 1091 (DUH); Govind Ghat, 05.10.1964, *B.V. Shetty* 36454 (BSD); Adwani road, 20.10.1975, *H.B. Naithani* (DD); Pithoragarh district, Pithoragarh, 15.09.1983, *Bipin Balodi* 80090 (BSD); on the way to Chaya Lake, 09.1986, *C.L. Malhotra & Bipin Balodi* 96587 (BSD); Rudraprayag district, Nala near Gupt Kashi, 13.10.1938, *Kirat Ram* 80509 (DD); Tehri Garhwal district, 09.1883, *Durga Mathur* 810 (CAL); Genwali, on open slope, Tehri, 25.09.1948, *Walter N. Koelz* 101773 (DD); Urni-Jhala, 02.10.2000, *B.P. Uniyal & M.S. Pundhir* 102637 (BSD); Lambgaon, Tehri, 02.03.1979, *A.K. Goel* 70702 (BSD); on the way to Naitwar, Uttarkashi, 01.10.1995, *Bipin Balodi* 98126 (BSD).

Medicinal uses: Roots are used in the preparation of local beverages and 'sur' by the hill people. It is also used in decoction against dyspepsia and colic. Essential oil obtained from leaves shows good antifungal activity against different species of

Aspergillus (Verma et al., 2014).

Duhaldea eupatorioides (Wall. ex DC.) Anderb., Pl. Syst. Evol. 176: 104. 1991. *Conyza eupatorioides* Wall., Numer. List no. 2993. 1831, *nom. nud.* *Inula eupatorioides* Wall. ex DC., Prodr. 5: 469. 1836; Hook.f., Fl. Brit. India 3: 295. 1881; C.E.C.Fisch., Rec. Bot. Surv. India 12: 105. 1938; Kumar in Hajra et al., Fl. India 13: 17. 1995. *Type*: NEPAL, *s.loc.*, *s.d.*, Wallich 2993 (K [K001118365 digital image!])

Fig. 4

Stout shrubs, 1–3 m tall. Stem pubescent, terete; branches brownish-purple. Leaves spirally arranged, rigid, leathery, shortly petioled; lamina elliptic-oblong or lanceolate-acuminate, 5–25 × 1.5–7.5 cm, coriaceous, irregularly toothed, cuneate or rounded at base, dark green above, scabrid, pale green below, pubescent, dense towards nerves, sometimes glandular, lateral nerves prominent, shorter, with much-reticulated nervation beneath. Corymbs polycephalous. Heads terminal or in upper axillary panicles; capitula crowned with short peduncles, 0.5–1.0 cm in diam. Involucral bracts 2–4 × 0.5–1.0 mm long, 4-seriate, lax, imbricate, lanceolate to linear-lanceolate, brownish, villous to velutinous, sometimes glandular at tip. Ray florets a few, shortly radiate. Disc florets tubular, 5-toothed. Cypselae narrowly obovate-oblong, 1.5–2.0 × 0.25–0.5 mm, yellowish brown, sparsely white pubescent, 8–10-ribbed. Pappus uniseriate, bristles 22–24, 4–5 mm long, cream-golden.

Flowering & fruiting: Flowering and fruiting from August to February.

Chromosome number: 2n = 20 (Kumar & Subramaniam, 1987).

Habitat: Grows on rocky slopes, between 1700–1800 m elevations.

Distribution: Bhutan, China, India, Laos, Myanmar, Nepal, Pakistan, Thailand and Vietnam.

Specimens examined: INDIA, **Arunachal Pradesh**, Anjaw district, Hayuliang, 25.11.1957, *R.S. Rao* 10807 (CAL); Western side of Kalaktang, on hill slope in open places, 26.10.1973, 54550 (ASSAM).

Assam, Notring forest, 10.11.1838, *K. Biswas* 3849 (CAL); **Himachal Pradesh**, Shimla district, *s.d.*, *s.coll.* 237089 (CAL); Shimla, 15.10.1877, *Tara Devi* 5647 (CAL). **Jharkhand**, Ranchi district, Kachapahar, 17.12.1957, *G. Panigrahi* 11936 (ASSAM). **Manipur**, West Imphal district, Khongal, on the frontier, 12.881, *George Watt* 6610 (CAL). **Meghalaya**, East Khasi Hills district, Khasia hills, 5.04.1894, *G.A. Gammie* 373 (CAL); Khasia hills, 23.10.1913, *Upendranath Kanjilal* 2836 (CAL); Khasia & Jaintia Hills, 9.11.1915, *Upendranath Kanjilal* 6169 (CAL); Khasia, 1816, *s.coll.*, 275 (CAL); Khasi hills, 22.10.1871, *C.B. Clarke* 15582 (CAL); Khasi hills, 28.10.1871, *C.B. Clarke* 16434 (CAL); Khasi hills, 02.11.1872, *Sohan Rai* 17785 (CAL); 30 mile from Cherrapunji road, 20.10.1914, *Upendranath Kanjilal* 4639 (CAL); Near I.B. of Jowai, Khasi & Jaintia Hills, 28.10.1956, *G. Panigrahi* 4038 (CAL); Between Sorarim and Mawphlong at north facing slope on rocky soils, 17.10.1967, *A.S. Rao* 45058, 45059 (ASSAM); Khasi hills, *s.d.*, *Upendranath Kanjilal* 19775 (DD); Khasi hills, 23.10.1913, *Upendranath Kanjilal* 13342 (DD), 15625 (ASSAM); Khasi hills, 20.10.1914, *Upendranath Kanjilal* 4639 (DD); Gorge Laithynkot, 09.11.1915, *Upendranath Kanjilal* 6169 (ASSAM); near Jowai, Khasi & Jaintia Hills, 28.10.1956, *G. Panigrahi* 4038 (ASSAM); Khasi & Jaintia Hills, 30 miles from Cherrapunji, 20.10.1914, *Upendranath Kanjilal* 4639 (ASSAM); Khasi & Jaintia Hills near Mynkrem forest, 05.11.1938, *G.K. Deka* 17175 (ASSAM); Khasi & Jaintia Hills, Heyhliang to Barapani, 25.11.1957, *Rolla Sheshagiri Rao* 10807, 15621, 15623, 15624 (ASSAM); Umdingpoh, 31 km from Shillong, 03.03.2009, *S. Shekhar & A.K. Pandey* 10041, 10043, 10127, 10130, 10131 (DUH), East Jaintia Hills district, towards Jaintea, 19.10.1867, *s.coll.* 5992 (CAL); West Jaintia Hills district, Jowai, 10.1892, *King's Collectors* (CAL); Jowai, 28.10.1956, *G. Panigrahi* 4038 (CAL); *s.loc.*, *s.d.*, *S.N. Bal* 771 (CAL); *s.loc.*, *s.d.*, *A.B. Royle* 237088 (CAL); *s.loc.*, *s.d.*, *V. Narayanaswami* 136 (CAL). **Mizoram**, Lawngtlai, Blue mountain, 10.11.1999, *A.A. Mao* 61972 (ASSAM); *Ibid.*, 14.11.1999, *A.A. Mao* 63611 (ASSAM); **Nagaland**, Naga Hills



Fig. 4. *Duhaldea eupatorioides* (DC.) Anderberg: **a.** Habit; **b-b₃**, Phyllaries (from outer to inner); **c.** Ray floret; **d.** Disc floret; **e & e₁**, Anthers; **f & f₁**, Style & stigma (**a** from *D. Prain* 237068 [CAL], **b, c & d** from *S. Shekhar* 10041 [DUH], **e & f** from *S. Shekhar* 10041 [DUH]; drawn by *S. Shekhar*; scale bars: **a** 1 cm; **b-f₁** 1 mm).

district, Kegwinia, Naga hills, 02.10.1885, *C.B. Clarke* 41144 (CAL); Naga hills, 1886, *D. Prain* 237068 (CAL); Towards north Naga hills, 12.1907, *A. Meebold* 6920 (CAL); Naga hills, Dalhousie valley, 1939, *N.L. Bhor* 90610 (DD); Banrew forest, 06.02.1999, *A.A. Mao* 106305 (ASSAM). **Sikkim**, *s.loc.*, 02.1882, *J.S. Gamble* 10249 (CAL); Near Jowai, 28.10.1956, *G. Panigrahi* 25515. **Uttarakhand**, Dehradun district, Sahasradhara, 04.10.1963, *S.K. Malhotra* 33827 (BSD); on the way to Ghat, Chamoli district, 09.1993, *Bipin Balodi* 77755 (BSD). **West Bengal**, Darjeeling district, Mirick lake, 24.10.1841, *K. Biswas* 5899 (CAL); Kurseong, on the way to Darjeeling, 15.11.1870, *C.B. Clarke* 13862 (CAL); growing at top of the hills in Kuhi near Mahananda Wildlife Sanctuary, Darjeeling, 10.03.1995, *S. Chandra & K.L. Maity* 21594 (CAL).

Notes: This species is similar to *D. cuspidata*, but differs in much stouter habit, shorter and stouter-petioles, more rigid leaves with much reticulated nervation beneath and narrower ligules.

Duhaldea nervosa (Wall. ex DC.) Anderb., *Pl. Syst. Evol.* 176 (1-2): 104. 1991. *Inula nervosa* Wall. ex DC., *Prodr.* 5: 471. 1836; Hook.f., *Fl. Brit. India* 3: 293. 1881; C.E.C.Fisch., *Rec. Bot. Surv. India* 12: 105. 1938; Kumar in *Hajra et al.*, *Fl. India* 13: 20. 1995. *Type:* NEPAL, *s.loc.*, 01.07.1821, *Wallich* 2960 (K [K001118279 digital image!]).

Inula nervosa var. *purpurascens* Hook.f., *Fl. Brit. India* 3: 293. 1881. Grierson & Long, *Fl. Bhutan* 2(3): 1496. t. 124b. 2001. *Duhaldea nervosa* var. *purpurascens* (Hook.f.) Karthik. & Moorthy, *Fl. Pl. India* 226. 2009. *Type:* INDIA, **Sikkim**, Khasia mts., *s.d.*, *Clarke s.n.* (not seen) **Fig. 5**

Perennial, pubescent-hirsute or villous, glandular, erect, herbs, 30–90 cm tall. Stems flexuous, simple or branched, young parts densely hairy. Leaves sessile to sub-sessile, elliptic or elliptic-lanceolate, 5–13 × 1–4 cm, cuneate at base, margins distantly serrate, membranous, scaberulous or scabrid above, midrib prominent, nerves sub-parallel with margins. Heads white with a yellow centre, solitary or corymbose, 1–1.5 cm in diam., long peduncled. Involucral bracts 4–9 mm long, 5-seriate, oblong to oblong-lanceolate, herbaceous to membranous, erect or recurved, dark brown, dense sericeous and pilose, multicellular hairs, outer phyllaries with very prominent mid vein and nerves. Ray florets radiate, white, 11–12 mm long, 3-lobed; lobes *c.* 7 × 2 mm. Disc florets yellow, 5-toothed, campanulate. Cypselsae narrowly obovate-oblong, 1–2 × 0.25–0.5 mm, dark brown, pubescent, 8–10-ribbed. Pappus uniseriate, bristles 22–25, 4–5 mm long, reddish brown.

Flowering & fruiting: Flowering and fruiting from August to October.

Habitat: Common along roadsides and often in forests up to 1500–2600 m elevation.

Distribution: Bhutan, China, India, Myanmar, Nepal, Thailand and Vietnam.

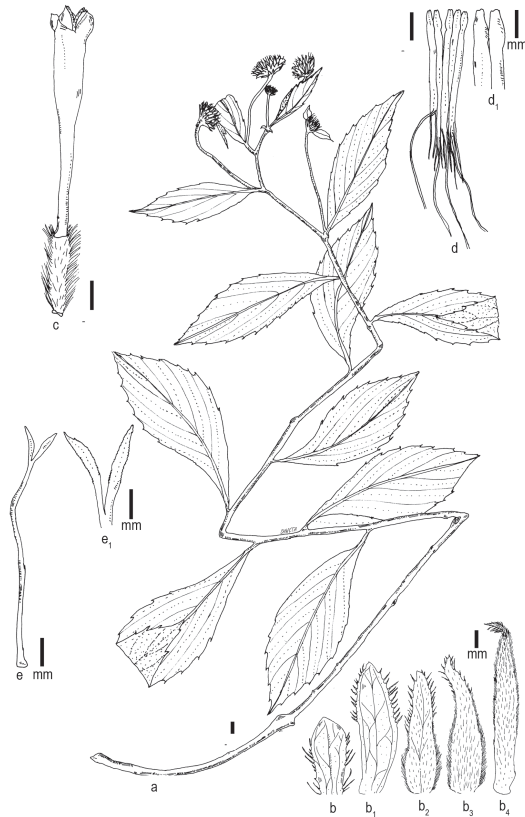


Fig. 5. *Duhaldea nervosa* (Wall. ex DC.) Anderberg: **a.** Habit; **b-b₄.** Phyllaries (from outer to inner); **c.** Disc floret; **d & d₁.** Anthers; **e & e₁.** Style & stigma (**a** from Joseph 40008 [CAL], **b, c, d & e** from S. Shekhar 1082 [DUH]); drawn by S. Shekhar; scale bars: **a** 1 cm; **e-e₁** 1 mm).

Specimens examined: INDIA, **Arunachal Pradesh**, West Kameng district, Selari forest, 15.09.1964, J. Joseph 40008 (CAL); *s.loc.*, 1.10.1926, V. Narayanaswami 236844 (CAL). **Manipur**, Ukhrul district, Sirohee, 19.09.1948, S.K. Mukherjee 3509 (CAL). **Meghalaya**, East Khasi Hills district, Cherra road, 17.10.1867, Wallich 6345 (CAL); Khasi, *s.d.*, C.B. Clarke 236863 (CAL); Maophlong, 18.10.1872, Wallich 18590 (CAL). **Nagaland**, Naga Hills district, Naga Hills, 9.11.1885, C.B. Clarke 41831 (CAL). **Uttarakhand**, Chamoli district, Tapowan area, 09.1980, B.D. Naithani 70946 (BSD); on the way to Sital, 09.1993, Bipin Balodi 77121, 77178, 77782 (BSD). Dehradun district, Near Mussoorie, 1869, G. King 236850 (CAL); *Ibid.*, 1870, G. King 1026 (CAL); Mussoorie, 7.10.1904, W. Gallan *s.n.* (DD); *Ibid.*, 1919, K. Biswas 236845 (CAL); *Ibid.*,

09.1927, B.L. Gupta 46107 (DD); on the way to Mussoorie, 04.10.1960, Hari Om Saxena 1335 (DD); Jaunsar, 10.1894, J.S. Gamble 25198 (DD, CAL); Chakrata, 06.1898, J.S. Gamble 27452 (DD); Sahasradhara, Dehra Dun, 8.09.1964, S.K. Malhotra 34842 (BSD); Bindal, Dehra Dun, 01.09.1982, C.R. Babu 40308 (BSD); Kempty fall, Mussoorie; 26.05.2010, S. Shekhar 1073 (DUH); Nainital district, Nainital, 10.10.1828, A.E. Oswaston 1406 (DD); *s.loc.*, 11.02.1853, Duthie 4119 (DD); Kali valley, 16.09.1984, J.F. Duthie 3112 (DD); Pithoragarh district, near Pithoragarh, 16.08.1886, J.F. Duthie 5688 (DD); Mandoli, Garhwal, 27.09.1963, U.C. Bhattacharyya 30832 (BSD); Tehri Garhwal district, Near Ringalgarh, 25.09.1954, K.C. Sahni 21445 (DD); Tehri Garhwal, 10.1881, *s.coll.* 1748 (DD); Rudraprayag district, on way to Kedarnath, Garhwal, 09.1958, M.A. Rau 8595 (BSD).

Duhaldea rubricaulis (Wall. ex DC.) Anderb., Pl. Syst. Evol. 176 (1–2): 104 1991. *Amphiraphis rubricaulis* DC., Prodr. 5: 343. 1836. *Inula rubricaulis* (DC.) C.B. Clarke, Compos. Ind. 126. 1876; Hook.f., Fl. Brit. India 3: 296. 1881; C.E.C. Fisch., Rec. Bot. Surv. India 12: 105. 1938; Babu, Herbac. Fl. Dehra Dun 271. 1977; Naithani, Fl. Chamoli 1: 330. 1984; Kumar in Hajra *et al.*, Fl. India 13: 25. 1995. *Type:* NEPAL, *s.loc., s.d.*, Wallich 3223 (K [K001118848 digital image!]).

Fig. 6

Erect shrubs, 1–2 m tall. Stems with long, slender, flexuous branches. Leaves sessile, elliptic–lanceolate, 10–15 × 2.5–4 cm, acuminate at apex, serrulate at margins, membranous, glabrous, nerves parallel to margins. Heads yellow, heterogamous, 0.5–2.0 cm in diam., 3–5 together in very short axillary racemes, forming a lax paniced raceme; peduncle stout, tomentose. Involucral bracts 4-seriate, imbricate, in whorls of unequal length, elliptic–lanceolate to linear–lanceolate, membranous, golden–yellow, densely pubescent with glandular tip. Ray florets radiate, 11–12 mm long, 3-lobed. Disc florets tubular, 7–8 mm long, 5-toothed, campanulate. Cypselae oblanceolate–elliptic, 1–1.5 × 0.25–0.5 cm, golden–yellow, pubescent, 10–12-ribbed. Pappus

uniseriate, bristles 25–30, 5–7 mm long, golden-brown, hairs not thickened at tips.

Flowering & fruiting: Flowering and fruiting from February to October.

Habitat: On shady ravines or rocky slopes, rare in sheltered places, ascending up to 1500–2500 m elevation.

Chromosome number: $2n = 20$ (Kumar & Subramaniam, 1987).

Distribution: Bhutan, China, India, Myanmar and Nepal

Specimens examined: INDIA, Arunachal Pradesh, West Kameng district, on way to Thungri village, 07.04.1957, *G. Panigrahi* 6589 (CAL); Thungri village to Rupa, 07.04.1957, *G. Panigrahi*, 13997, 13998 (ASSAM); Sela pass, along the road side,

21.09.1964, *J. Joseph* 40228 (CAL). Assam, Sibsagar district, Dullang, 06.04.1895, *s.coll.* 10492 (CAL). Manipur, *s.loc.*, 1869, *G. King* 237104 (CAL). Meghalaya, East Khasi Hills district, Bishop's fall, Shillong, 30.12.1885, *C.B. Clarke* 42625 (CAL); Khasia, 1873, *C.B. Clarke* 21894 (CAL); Shillong, 07.04.1886, *C.B. Clarke* 43346 (CAL); Shillong, Namdu to Sigri, 02.04.1958, *Rolla Sheshagiri Rao* 29955 (ASSAM); 6 km to Seha, 21.09.1964, *J. Joseph* 39836, 39837, 40228 (ASSAM). Nagaland, Naga Hills district, *s.d.*, *F. Kingdom Ward* 11121 (CAL). Sikkim, 12.02.1885, *G.A. Gammie* 1205 (CAL); North Sikkim district, Punkabaree, 23.02.1871, *Wallich* 13903 (CAL); *s.loc.*, 03.02.1876, *G. King* 237111 (CAL); *s.loc.*, 04.1878, *J.L. Lister* 237112 (CAL); *s.loc.*, 1879, *G. King* 237114 (CAL). Uttarakhand, Dehradun district, Mussoorie, 20.04.1897, *P.W. Mackinmon* 237101 (CAL); Ravine below Govt. Botanical Garden, Arnigarh, Mussoorie, 11.03.1904, *Banwari Lal* 33641 (DD); near Dhobhi ghat stream, Mussoorie, 10.04.1948, *Robert L. Fleming* 100835 (DD); near Kamptee fall, 19.04.1961, *Hari Om Saxena* 137229 (DD); Mussoorie, 22.04.1961, *Hari Om Saxena* 137904 (DD); Pauri Garhwal district, Ragsi reserve, North Garhwal, 09.04.1919, *A.E. Osmaston* 1039 (DD); Garhwal, 20.01.1920, *C.F.C. Anon* 1039 (CAL); Pithoragarh district, near Lilan, Pithoragarh, 23.04.1965, *N.C. Nair* 38705, 38706 (BSD); near Garjia, along the road side, Pithoragarh, 14.04.1984, *Bipin Balodi* 75528 (BSD); *s.loc.*, 23.09.1998, *B.P. Niyal* 93532 (BSD).

Duhaldea simonsii (C.B. Clarke) Anderb., *Pl. Syst. Evol.* 176 (1-2): 104. 1991. *Inula simonsii* C.B. Clarke, *Compos. Ind.* 121. 1876; Hook.f., *Fl. Brit. India* 3: 293. 1881. Kumar in Hajra *et al.*, *Fl. India* 13: 25. 1995. **Type:** INDIA, Assam, *s.loc.*, *s.d.*, *Nuttall s.n.* (K [K000250059 digital image!]) **Fig. 7**

Perennial herbs, 30–90 cm tall. Stems hirsute with yellow glandular hairs. Leaves oblong, base rounded, acute, denticulate, 5–10 × 2–4 cm, hirsute on both surfaces, rigid, petiole 3 mm (sub-sessile). Heads 2–3 cm in diam., long peduncled. Involucral bracts linear to lanceolate, the outer shorter and



Fig. 6. *Duhaldea rubricaulis* (Wall. ex DC.) Anderberg: **a.** Habit; **b–b₃.** Phyllaries (from outer to inner); **c.** Ray floret; **d.** Disc floret; **e & e₁.** Anthers; **f & f₁.** Style & stigma (**a** from *Clarke* 10492 [CAL], **b, c & d** from *Panigrahi* 6589 [CAL], **e & f** from *Balodi* 75528 [BSD]; drawn by S. Shekhar; scale bars: **a** 1 cm; **b–f₁** 1 mm).



Fig. 7. *Duhaldea simonsii* (C.B. Clarke) Anderberg. Habit (from Nuttall s.n. [K000250059]; drawn by S. Shekhar; scale bar: 1 cm).

inner larger, hirsute. Ray florets yellow, ligulate, ligules long. Cypselae narrowly oblong, silky. Pappus white, a little shorter than disc corollas, bristles whitish with brown tips.

Flowering & fruiting: Flowering and fruiting from October to January.

Distribution: Bhutan and India.

Notes: Clarke (1876) described this taxon as being very near to *I. nervosa*, but differs only in having larger heads and leaves rounded at the base. Hooker (1881) stated that he had observed no specimens of this species. The present account is based on the digital image of type specimen housed at K, available online.

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Literature Cited

- ANDERBERG A.A. 1991. Taxonomy and phylogeny of the tribe Inuleae (Asteraceae). *Plant Systematics and Evolution* 176: 75–123. <https://doi.org/10.1007/BF00937905>
- ANDERBERG A.A. 2009. Inuleae. In: FUNK V.A., SUSANNA A., STUESSY T.F. & R.J. BAYER (eds.), *Systematics, evolution and biogeography of Compositae*. International Association for Plant Taxonomy, Vienna. pp. 667–680.
- BENGTSON A., ENGLUND M., PRUSKI J.F. & A.A. ANDERBERG 2017. Phylogeny of the Athroismeae (Asteraceae), with a new circumscription of the tribe. *Taxon* 66: 408–420. <https://doi.org/10.12705/662.8>
- CHEN Y.S. & A.A. ANDERBERG 2011. Inuleae. In: WU Z.Y., RAVEN P.H. & D.Y. HONG (eds.), *Flora of China (Asteraceae)*. Volume 20–21, Science Press, Beijing & Missouri Botanical Garden Press, St. Louis. pp. 820–850.
- CLARKE C.B. 1876. *Compositae Indicae*. Thacker, Spink & Co., Calcutta.
- ENGLUND M., PORNPONGRUNGRUENG P., GUSTAFSSON M.H.G. & A.A. ANDERBERG 2009. Phylogenetic relationships and generic delimitation in Inuleae subtribe Inulinae (Asteraceae) based on ITS and cpDNA sequence data. *Cladistics* 25: 319–352. <https://doi.org/10.1111/j.1096-0031.2009.00256.x>
- GAIROLA S., SHARMA J. & Y.S. BEDI 2014. A cross-cultural analysis of Jammu, Kashmir and Ladakh (India) medicinal plant use. *Journal of Ethnopharmacology* 155: 925–986. <https://doi.org/10.1016/j.jep.2014.06.029>
- GREUTER W.R. 1973. *Dittrichia graveolens* (L.) Greuter. In: *Exsiccatorum Genavensium e Conservatorio Botanico Distributorum Fasciculus*. Volume 4. Geneva. p. 71.
- HOOKE J.D. 1881. *The flora of British India*. Volume 3. L. Reeve & Co., London. pp. 291–297.
- KUMAR S. 1995. Tribe Inuleae. In: HAJRA P.K., RAO R.R., SINGH D.K. & B.P. UNIYAL (eds.), *Flora of India*. Volume 13. Botanical Survey of India, Kolkata. pp. 1–27.
- KUMAR V. & B. SUBRAMANIAM 1987. *Chromosome Atlas of flowering plants of the Indian Subcontinent: Dicotyledons*. Botanical Survey of India, Kolkata.
- NYLINDER S. & A.A. ANDERBERG. 2015. Phylogeny

- of the Inuleae (Asteraceae) with special emphasis on the Inuleae-Plucheinae. *Taxon* 64: 110–130. <https://doi.org/10.12705/641.22>
- SHEKHAR S. 2012. *Taxonomic studies on Inula L. and related genera in India*. Ph.D. Thesis, University of Delhi, Delhi (unpublished). pp. 79–96.
- SHEKHAR S., PANDEY A.K. & A.A. ANDERBERG 2011. Cypselae Morphology and anatomy in some genera formerly placed in *Inula* (Asteraceae: Inuleae-Inulinae). *Rheedea* 21(1): 13–22.
- SHEKHAR S., PANDEY A.K. & A.A. ANDERBERG. 2013. The genus *Inula* (Asteraceae) in India. *Rheedea* 23(2): 113–127.
- VERMA R.S., PADALIA R.C. & A. CHAUHAN. 2014. Leaf essential oil composition of *Inula cuspidata* (Wall. ex DC.) C.B. Clarke from India. *Journal of Essential Oil Research* 26(4): 233–237. <https://doi.org/10.1080/10412905.2014.891264>
- WANG Y.L., LI Y.J., WANG A.M., HE X., LIAO S.G. & Y.Y. LAN. 2010. Two new phenolic glycosides from *Inula cappa*. *Journal of Asian Natural Products Research*. 12: 765–769. <https://doi.org/10.1080/10286020.2010.503188>
- WANG F.Y., LI X.Q., SUN Q.I., YAO S., KE C.Q., TANG C.P., LIU H.C., GENG M.Y. & Y. YANG. 2012. Sesquiterpene lactones from *Inula cappa*. *Phytochemistry Letters* 5: 639–42. <https://doi.org/10.1016/j.phytol.2012.06.012>