



## *Duhaldea lachnocephala* (Asteraceae: Inuleae: Inulinae), a new species from Yunnan, southwest China

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(Manuscript received 17 September 2021; Accepted 13 March 2022; Online published 27 March 2022)

**ABSTRACT:** *Duhaldea lachnocephala* Huan C. Wang & Feng Yang (Asteraceae: Inuleae) is described and illustrated as a new species. The new species is only known from the Luzhijiang valley, Yunnan Province, southwest China. It is characterized prominently by having dense arachnoid-lanate hairs on stems, leaves and phyllaries, and white marginal florets usually 2–3-seriate. Morphological comparisons with its closest relatives *D. nervosa*, *D. revoluta* and *D. simonsii* are presented. A preliminary conservation assessment of *D. lachnocephala* is also made under the IUCN criteria.

**KEY WORDS:** Compositae, *Duhaldea nervosa*, *D. simonsii*, endemism, Luzhijiang valley, marginal floret.

### INTRODUCTION

*Duhaldea* DC. is a small genus of the tribe Inuleae in the daisy family (Asteraceae). It was established by de Candolle in 1836 based on *Duhaldea chinensis* DC., now recognized as a synonym of *D. cappa* (Buch.-Ham. ex D. Don) Pruski & Anderberg. De Candolle (1836) suggested *Duhaldea* was similar to *Rochonia* and had affinities with *Chrysocoma* and *Solidago*, however the latter three genera are currently placed in the tribe Astereae instead of in tribe Inuleae by modern authors (Brouillet *et al.*, 2009; Jafari *et al.*, 2015). Subsequent authors, for example, Clarke (1876), Hooker (1881), Ling (1979), etc., have treated *Duhaldea* as a synonym of *Inula* L. Anderberg (1991) resurrected and redefined the genus *Duhaldea*, as well as transferring 13 species previously included in the genus *Inula* to this redefined genus. Recent molecular phylogenetic analyses have indicated that *Duhaldea* is in a clade sister to the rest of the Inuleae-Inulinae and its closest relatives being *Blumea* DC. and *Caesulia* Roxb. (Englund *et al.*, 2009; Nylinder and Anderberg, 2015).

*Duhaldea* consists of 12 to 15 recognised species (Anderberg, 1991; Chen *et al.*, 2011; Shekhar *et al.*, 2020). Plants in the genus are subshrubs or perennial herbs. Its capitula are usually solitary, or in corymb-like or racemose arrangements, involucre are campanulate, the phyllaries are multi-seriate, marginal florets are female and have yellow or white corollas, and the cypselas are sericeous with truncate apices. Species of *Duhaldea* occur in Central, South, East, and Southeast Asia, from Indian subcontinent to South China and to Java (Anderberg 1991; Chen *et al.*, 2011). There are seven species of *Duhaldea* known from China, including two endemics (Chen *et al.*, 2011). During herbarium studies and fieldwork, a putative new species of *Duhaldea* was encountered by us. After a detailed comparison with

morphologically similar species, it was found to be a new species, and it is herein described and illustrated as *Duhaldea lachnocephala* Huan C. Wang & Feng Yang.

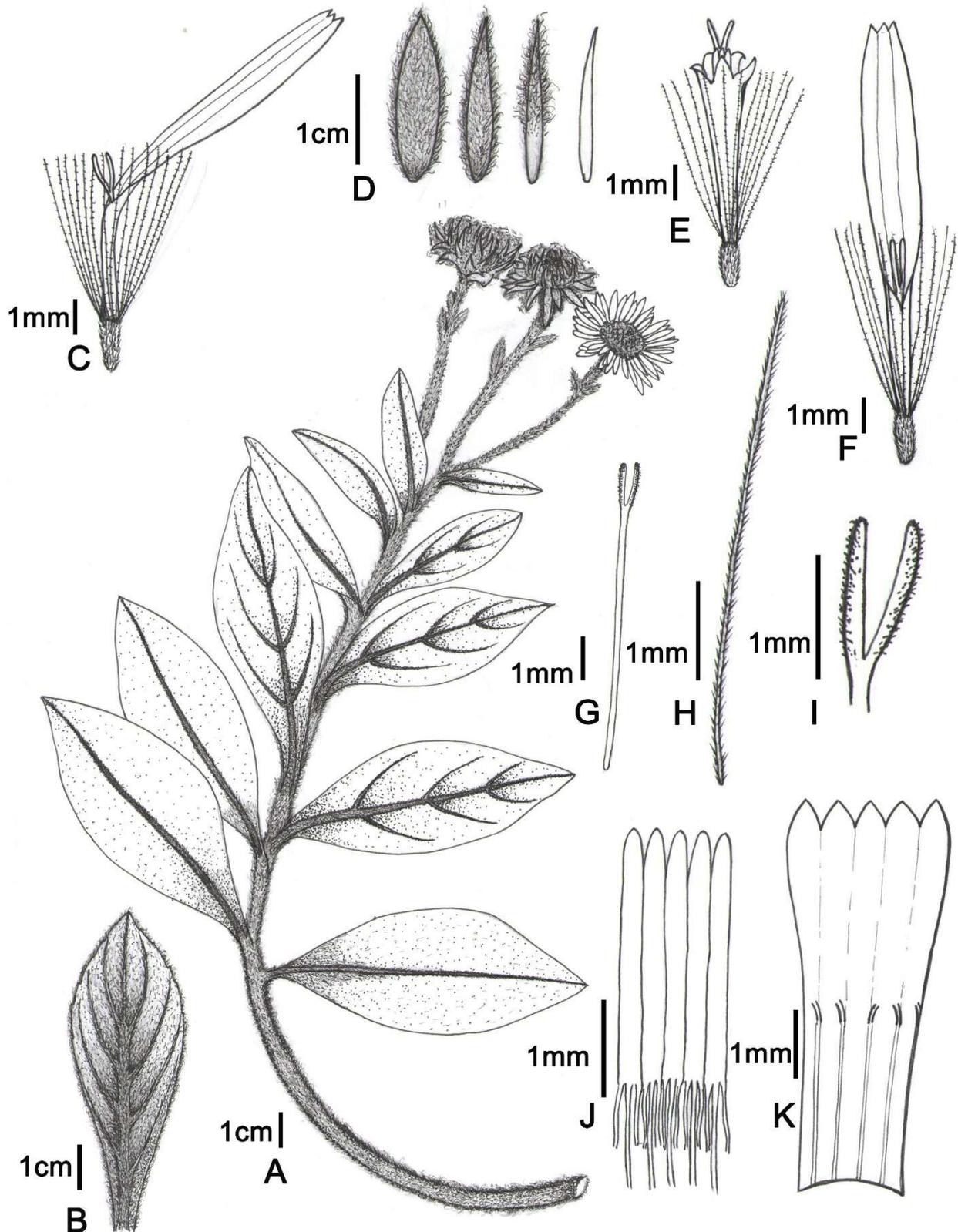
### MATERIALS AND METHODS

*Duhaldea lachnocephala* Huan C. Wang & Feng Yang, *sp. nov.* 毛苞羊耳菊 Figs. 1-2 & 3A-G

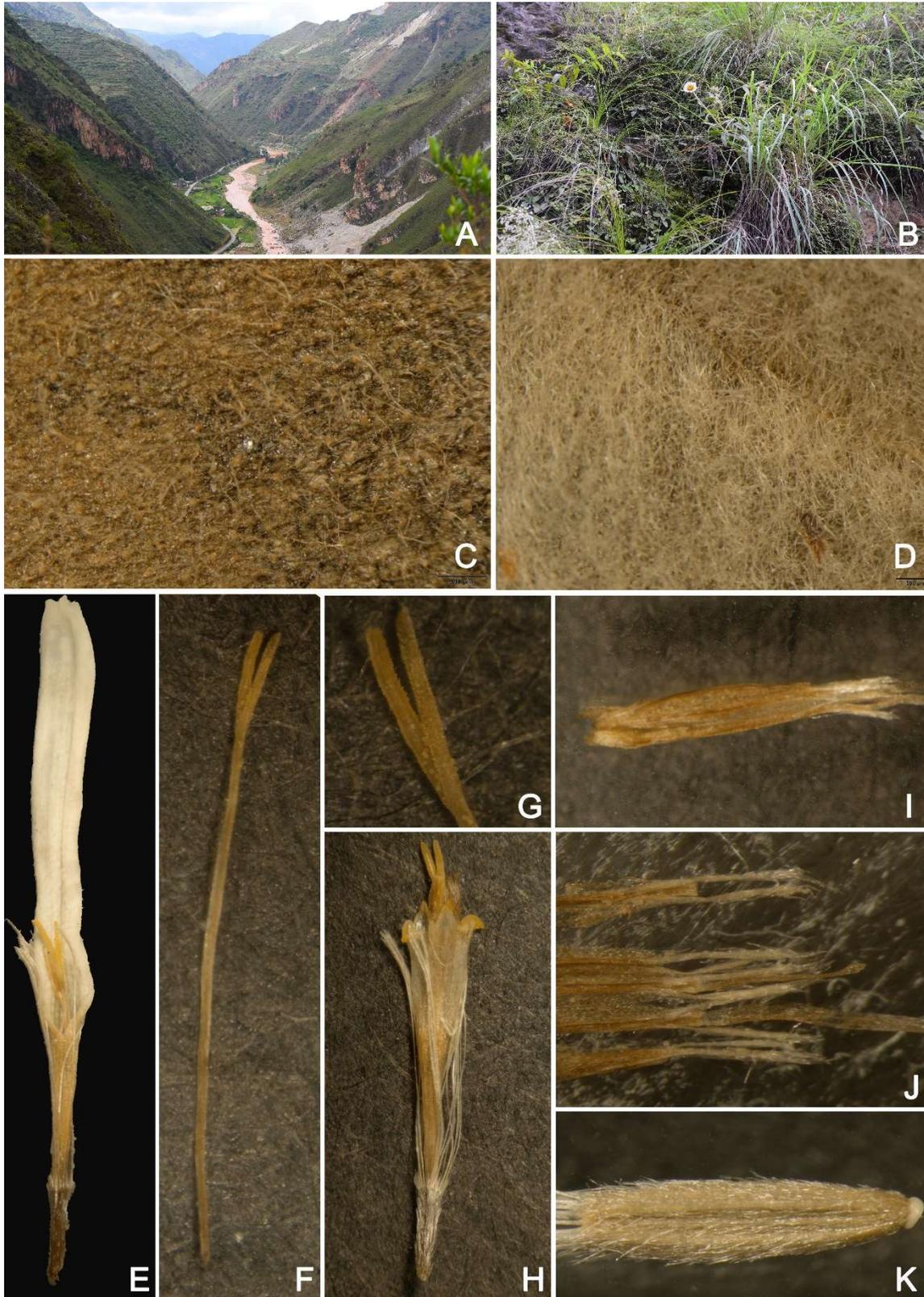
**Type:** CHINA. Yunnan Province: Yimen County, Luzhijiang valley, near Xiaoluzhi village, under the limestone thickets of the dry-hot valley, 24°40'36"N, 101°57'52"E, elev. 1320.7 m, 25 October 2015, H. C. Wang *et al.* YM1272 (holotype: YUKU [02074614]!, isotypes: KUN!, PE!, YUKU!).

**Diagnosis:** *Duhaldea lachnocephala* is most similar to *D. nervosa* (Wall. ex DC.) Anderb., but clearly differs from the latter by its whole plant with dense arachnoid-lanate (vs. usually pilose or strigose) hairs except for the adaxial surface of leaf, capitula larger, 3–4 cm (vs. 1.5–2.5 cm) in diameter, involucre hemispheric (vs. campanulate to broadly campanulate), phyllaries subequal (vs. outer series smaller), loose (vs. compressed) in arrays, 10–15 × 1–3 mm (vs. 7–10 × 0.7–1.2 mm), marginal florets 2- or 3-seriate (vs. usually uniseriate), corollas 10–12 × 1–3 mm (vs. 8–13.5 × 1.5–2.5 mm).

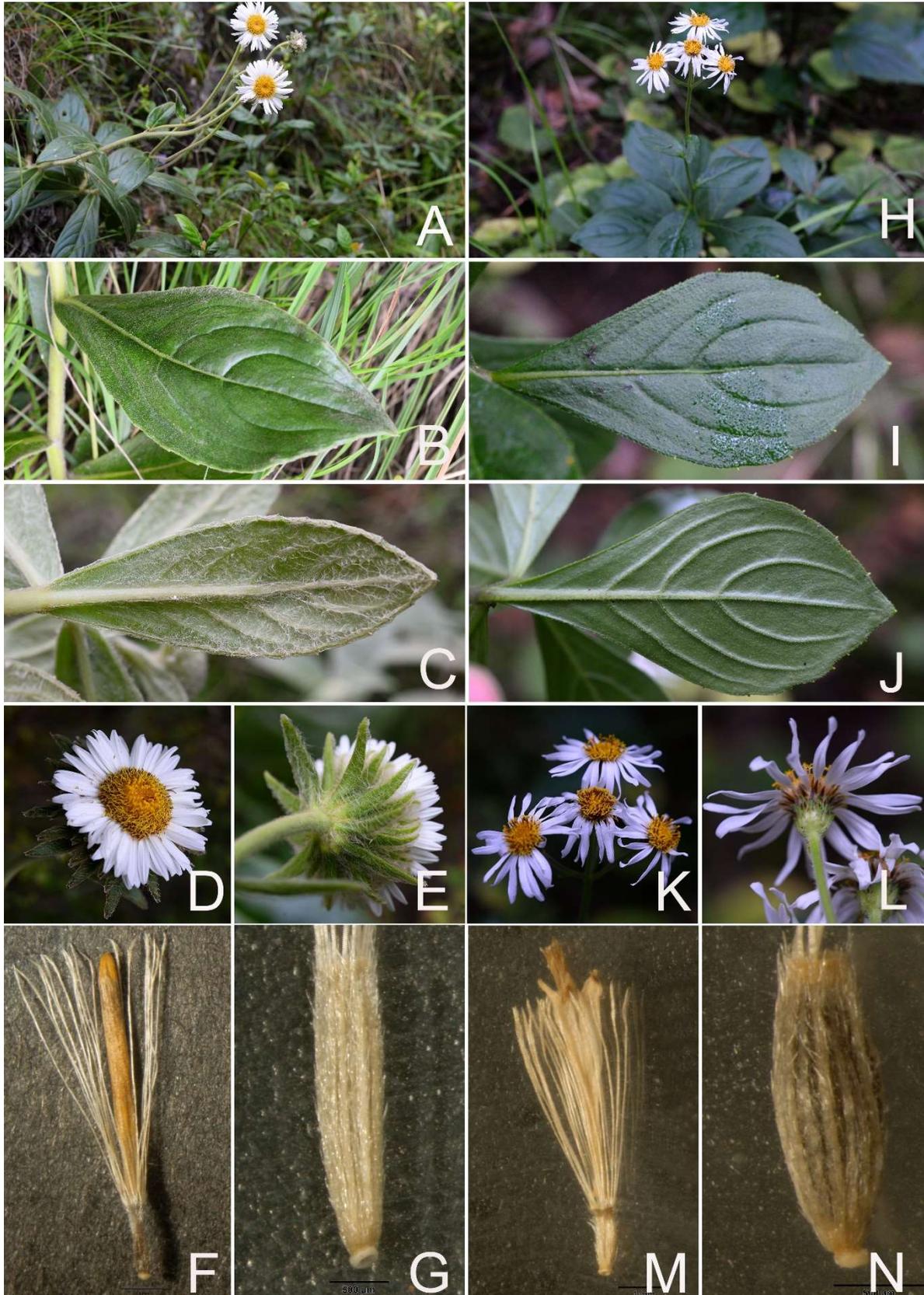
Perennial herbs or subshrubs, 30–50 cm tall. Rootstocks woody, short and stout; roots fasciated, fibrous. Stems simple, rarely branched, decumbent to ascending, striate, densely white curly arachnoid-lanate and tawny lanuginous, 2–4 mm in diam., internodes 1–5 cm long. Leaves simple, alternate, basal and lower ones usually withered at anthesis; petiole obsolete; leaf blades herbaceous, variable in shape, usually ovate to obovate, sometimes oblong, elliptic-lanceolate or oblanceolate, 4–8 (–11) cm long, 1–3 cm broad, with ratio of length to width from 2.5–5, cuneate at base, slightly clasping, apex usually acute, rarely acuminate or obtuse, margin distantly



**Fig. 1.** *Duhaldea lachnocephala*, sp. nov. (A–K). **A.** Habit. **B.** Abaxial surface of leaf. **C.** Marginal floret (lateral view). **D.** Phyllaries from outer (left) to inner (right). **E.** Disc floret (lateral view). **F.** Marginal floret (apical view). **G.** Style of disc floret. **H.** Plumose bristle. **I.** Style arms with acute sweeping hairs. **J.** Stamens showing tailed anthers. **K.** Disc floret corolla dissected (stamens removed) to showing attachment points of the filaments.



**Fig. 2.** *Duhaldea lachnocephala* sp. nov. **A–B.** Habitat. **C.** Adaxial view of a portion of leaf blade, which is covered by strigose and pubescent hairs. **D.** Abaxial view of a portion of leaf blade, which is covered by dense arachnoid-lanate and long, white multicellular hairs. **E.** Ray floret (apical view). **F.** Style of disc floret. **G.** Style arms with acute sweeping hairs. **H.** Disk floret (lateral view). **I.** Synandrous stamens. **J.** Tailed anthers. **K.** Cypsela, showing some persistent parts of pappus.



**Fig.3.** *Duhaldea lachnocephala* sp. nov. (A–G) and *D. nervosa* (H–N). **A, H.** Habit. **B, I.** Adaxial surface of leaf. **C, J.** Abaxial surface of leaf. **D, K.** Capitula (apical view). **E, L.** Capitula (dorsal view). **F, M.** Disk floret and pappus. **G, N.** Cypsela of disk floret.

**Table 1.** A morphological comparison of *Duhaldea lachnocephala* with its similar species.

Characters	<i>D. lachnocephala</i>	<i>D. nervosa</i>	<i>D. simonsii</i>
Stems	30–50 cm in length, with densely white curly arachnoid-lanate and tawny lanuginous	20–100 cm in length, with sparsely long tawny pilose or strigose	30–90 cm tall, hirsute with yellow glandular hairs
Leaf blades	oblong, elliptic-lanceolate or oblong-lanceolate, 4–8 (–11) × 1–3 cm, adaxial surfaces strigose, pubescent or arachnoid-lanate, densely villous along midrib, abaxial surfaces densely arachnoid-lanate	elliptic, lanceolate, oblanceolate, 5–13 × 2–4.5 cm, sparsely spreading pilose on both surfaces	oblong, 5–10 × 2–4 cm, hirsute on both surfaces
Petioles	sessile	0–6 mm	3 mm (sub-sessile)
Synflorescences	capitula solitary or 2–5 in cymes	capitula 1–15, usually in loosely corymbose arrays	capitula 4–12 in corymbose array
Peduncle	10–15 cm, thick	5–10 cm, slender	2–7 cm, slender
Capitula	hemispheric, 3–4 cm in diam., densely tawny villous	campanulate to broadly campanulate, 1.5–2.5 cm in diam., strigose	2–3 cm in diam., long peduncled
Phyllaries	10–15 × 1–3 mm, subequal, elliptic-lanceolate, ovate-lanceolate and linear-lanceolate	7–10 × 0.7–1.2 mm, outer similar inner, linear-lanceolate	involucral bracts linear to lanceolate, the outer shorter and inner larger, hirsute.
Marginal florets	10–12 × 1–3 mm, 2–3-seriate	8–13.5 × 1.5–2.5 mm, 1-seriate	1-seriate

and shallowly serrate or entire; adaxial surfaces of leaves strigose, pubescent or arachnoid-lanate, densely villous along midrib, abaxial surfaces densely arachnoid-lanate; midribs and lateral veins prominent abaxially. Synflorescences of a solitary capitulum, or corymbiform; rachides densely white or tawny arachnoid-lanate, 5–15 cm long; bracteal leaves 3–6, decrescent upwards. Capitula heterogamous, radiate, 3–4 cm in diam., peduncle densely white or tawny arachnoid-lanate, 5–15 cm long; involucre hemispheric, 1.5–3 cm in diam.; phyllaries 5–6-seriate, subequal, green, outer phyllaries lanceolate to linear-lanceolate, herbaceous, 10–15 mm long, 1–3 mm broad, apex acuminate, densely white or tawny arachnoid-lanate on both surfaces, middle phyllaries narrowly lanceolate, expanded or slightly reflexed below middle, lower part leathery, nearly glabrous, upper part herbaceous, arachnoid-lanate, inner phyllaries linear-lanceolate, ca. 1 mm wide, scarious, apex acuminate, margins ciliate; receptacle nearly flat, epaleate. Marginal florets female, 2–3-seriate, corollas glabrous, 12–15 mm long, ray limb white, elliptic-linear, 8–10 mm long, 1–3 mm broad, apex 3-toothed, style ca. 5 mm long. Disc florets hermaphrodite, fertile, numerous, corollas ca. 5 mm long, yellow, glabrous outside, 5-lobed, lobes triangular-lanceolate; anthers tailed, ca. 6 mm long, apical appendices truncate-emarginate, endothelial tissue polarized; style ca. 7 mm long, exerted. Cypselas of marginal and disc florets identical, cylindrical, sericeous, ca. 2 mm long, truncate at apex; plumose bristles 20–22, equal in length, 5–6 mm long, nearly equal to disc corolla at anthesis, uniseriate, white or slightly yellowish, persistent.

**Distribution and habitat:** *Duhaldea lachnocephala* appears to be a rare species endemic to Yunnan, southwest China. It was only collected from two localities in valley of the Luzhijiang River, an upper tributary of the Hong (Red) River which flows from Yunnan in southwest

China through northern Vietnam to the Gulf of Tonkin. The climate in Luzhijiang valley is semi-dry and hot, with an average temperature of 21.00°C and a total annual precipitation of 822.80 mm. *D. lachnocephala* occurs in the xerophilous scrubs or grasslands at elevations of 1200–1500 m, and its association includes *Phyllanthus emblica* Linn. (Phyllanthaceae), *Paliurus orientalis* (Franch.) Hemsl. (Rhamnaceae), *Dalbergia yunnanensis* Franch. (Fabaceae), *Symphoricarpos sinensis* Rehd. (Caprifoliaceae), *Pterygiella luzhijiangensis* Huan C. Wang (Orobanchaceae) (an endemic species of Luzhijiang valley recently discovered by Qiao *et al.* (2018)), *Silene otodonta* Franch. (Caryophyllaceae), *Spodiopogon sagittifolius* Rendle (Poaceae), *Heteropogon contortus* (Linn.) Beauv. ex Roem. et Schult. (Poaceae) and *Themeda caudata* (Nees ex Hooker et Arnott) A. Camus (Poaceae).

**Conservation status:** *Duhaldea lachnocephala* is a rare species with a restricted distribution and small population size. It is only known from in the upstream region of the Luzhijiang River in the Yimen and Lufeng counties, which is no protected area covering. The total population size is estimated at less than 500. According to the IUCN Standards and Petitions Subcommittee (2019), this new species should be considered as ‘Endangered’ (EN).

**Phenology:** Flowering and fruiting from September to December.

**Etymology:** The specific epithet *lachnocephala* is derived from the Greek words “*lachnos*” (soft and thick hairs) and “*kephale*” (head), referring to the capitula of this new species with dense arachnoid-lanate hairs.

**Additional specimens examined (paratypes):** CHINA. Yunnan Province: Yimen County, Luzhijiang valley, elev. 1250 m, 20 October 1965, *W. M. Zhu et al.* I398 (YUKU); same location, 3 October 2016, *H. C. Wang et al.* YM1338 (YUKU); same location, 12 November 2019, *H. C. Wang et al.* YM8307 (YUKU); Lufeng County, Xiaojiangkou village, 16 September 2017, *H. C. Wang et al.* LF2443 (YUKU).



**Notes:** *Duhaldea lachnocephala* is fairly easy to distinguish from similar species by the following combination of characteristics: plant densely covered with arachnoid-lanate hairs, marginal florets white, 2–3-seriate. Prior to the present study, only three species of *Duhaldea* have been recorded with white ray limbs, namely *D. nervosa* (Wall. ex DC.) Anderb., *D. revoluta* Anderb. and *D. simonsii* (C. B. Clarke) Anderb. Among them, *D. lachnocephala* is most similar to *D. nervosa* (Fig. 3: H – N), which is widely distributed from the Himalayas to southwest China, and southwards to Vietnam and Thailand. However, *D. lachnocephala* differs from the latter by its whole plant with dense arachnoid-lanate hairs except for the adaxial surface of leaf, larger capitula, 3–4 cm in diameter, involucre hemispheric, phyllaries subequal, loose in arrays, 10–15 × 1–3 mm, marginal florets 2- or 3-seriate, corollas 10–12 × 1–3 mm. In contrast, *D. nervosa* is characterized by having pilose or strigose stems, leaves and phyllaries, and smaller capitula usually 1.5–2.5 cm in diameter, campanulate to broadly campanulate involucre, phyllaries 7–10 × 0.7–1.2 mm, compressed in arrays, marginal florets usually uniseriate, and corollas 8–13.5 × 1.5–2.5 mm. *D. lachnocephala* is also morphologically similar to *D. simonsii*, but differs from the latter by its stems with white curly arachnoid-lanate and tawny lanuginous (vs. yellow glandular hairs), leaf blades cuneate (vs. rounded) at base, leaves sessile (vs. 3 mm petiole or sub-sessile), capitula larger (3–4 cm vs. 2–3 cm in diam.). A morphological comparison of *D. lachnocephala* with its similar species is provided in Table 1.

## ACKNOWLEDGMENTS

We are grateful to the editors of *Taiwania* and the anonymous reviewers for critical comments on the manuscript. This study was supported by grants-in-aid from the National Natural Science Foundation of China (NSFC) (Grant No. 31960040) and the Second Tibetan Plateau Scientific Expedition and Research (STEP) program (2019QZKK0502).

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