

A TAXONOMIC REVISION OF INDIAN *MICROULA* BENTH. (BORAGINACEAE)

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ABSTRACT

***Microula* sensu lato** (Boraginaceae—Eritrichieae) is a genus with about twelve species mainly occurring at high altitudes in the Himalayas, Tibet and Western China. Four species are described here from India and Sikkim including *M. duthei* which is a new species from Sikkim added by the senior author.

INTRODUCTION

In *Genera Plantarum* Bentham (1876) erected the genus *Microula*. He described the plants: *Herba nana subacaulis* and nutlets as dorsally compressed with pits, attached by a small scar above the middle. As regards the species under the genus Bentham mentioned: *Species 1, Tibetica*, at the end of the generic description. By this he did not actually name any species but simply the place of its occurrence, as is evident in his citations under other genera. Maximowicz (1880) first described *M. tibetica*, so the authorship should be attributed to him. C. B. Clarke (1883) in *The Flora of British India* described only one species *M. benthami* from Western Tibet, which has been treated here as synonymous with *M. tibetica*. Clarke described this species as almost stemless but he cited one example of the species with a distinct stem of three inches (7.5 cm). This feature is also examined by the present authors in plants from Western Tibet collected by Dr. Stoliczka. Considering this and the character of the nutlets as most characteristic of this genus, both subcaulescent and caulescent species like *M. trichocarpa*, *M. pustulosa* and *M. duthei*, originally described under other genera are treated under *Microula*. Brand (1931) treated *Microula* as monotypic including *M. tibetica* only and formed the section *Microulastrum* under the genus *Eritrichium* to include *E.*

pustulosum and *E. younghusbandii*. But nutlets of both the species are characterised by the presence of epidorsal annulate crests and supra-median attachment scar, characteristic of *Microula*. *M. younghusbandii* Duthei (1912) is restricted to Eastern Tibet and is not reported from the area under study.

Recently, Kazmi (1970) in his studies on *Microula* referred to the works of Johnston (1924) and Brand (1931) without any critical comment regarding its composition. He enumerated one species—*M. tibetica* from the area under his studies. But the author for this species should be Maximowicz and not Bentham, as stated earlier.

Maximowicz (1881) erected the genus *Tretocarya* which has been subsequently considered synonymous with *Microula* by Hemsley (1898), Johnston (1924, 1928), Brand (1931) and Kazmi (1970). *Tretocarya* was considered as a monotypic genus until Oliver (1893) transferred *Anchusa sikkimensis* of Clarke (1883) under *Tretocarya* and remarked that *Microula* was the genus most nearly allied to *Tretocarya*. Hemsley (*l.c.*) confirmed from further material, as Oliver suspected, "that the original *Microula* and the original *Tretocarya*, are the same plant." Therefore, *T. sikkimensis* Oliver becomes *M. sikkimensis* (Clarke) Hemsl., which has been treated here under *M. trichocarpa* (Maxim.) Johnst.

MICROULA Benth.

Microula Benth. in Benth. et Hook. f. Gen. Pl. 2: 853. 1876; Gurke in Engler et Prantl. Pflanzenf. IV. 3a: 111. 1897; Brand in Engl. Pflanzenr. Heft. 97: 24. 1931; Kazmi in Journ. Arnold Arbor. 51: 400. 1970. (Type species: *M. tibetica* Maxim.) *Eritrichium* Sect. *Microulastrum* Brand in Engl. Pflanzenr. Heft. 97: 187. 1931. *Tretocarya* Maxim. in Bull. Acad. Petersb. 27: 505. 1881; Gurke in Engl. et Prantl. Pflanzenf. IV. 3a: 111. 1897.

Herbs, perennial, sub-acaulescent or caulescent, pubescent. Leaves simple, alternate, entire, exstipulate, scabrous, often rosulate, reticulate unicostate, midvein prominent, radical leaves long-petioled, alternate. Flowers small in dense, multifid cincinni, subsessile among the leaves, bracteate. Sepals deeply 5-partite, lanceolate, acute. Petals 5-lobed, tubular, tube short, lobes ovate-obtuse, spreading, imbricate in bud, throat of corolla with 5 obtuse scales. Stamens 5, included, filaments short, adnate to the middle of the corolla tube. Ovary deeply 4-lobed, superior, style gynobasic, gynobase pyramidal, stigma small, capitate. Fruit of 4 hard nutlets, nutlets not obviously and regularly tetrahedral, much surpassing the stout pyramidal gynobase, attached obliquely supra-medially by a deltoid or ovate areola, surpassing the style, some nutlets of each fruit with a thick epidorsal, annulate crest, shortly tuberculate or muriculate but unarmed.

KEY TO THE SPECIES

- A¹ Sepals 3-4 mm and petals 5-6 mm long
 B¹ Leaves oblong-spathulate stems unbranched ... 1. *M. duthei*
 B² Leaves ovate-lanceolate. Stems with many short lateral branches ... 2. *M. trichocarpa*
 A² Sepals 1-1.5 mm and petals 2-3 mm long
 C¹ Leaves elliptic-lanceolate, acute, distant and alternate on diffuse stem ... 3. *M. pustulosa*
 C² Leaves oblong-spathulate, obtuse, crowded and rosulate on condensed stem. ... 4. *M. tibetica*

1. ***Microula duthei*** S. P. Ban. in Ind. For 92(10): 644, t. 1.f. A-F. 1966.

Hispid herbs; branches 3-4, arising from suffrutescent base, 15-32 cm long, hispid; hairs 1-1.5 mm long, denser towards the tips; internodes 2-6 cm long near the middle of the branches. Radical leaves 7-9 × 1.5-3 cm, ciliate, acute, rosulate, lanceolate to oblong-spathulate, hispid-hairy (glistening white), nerves prominent below only; petioles 5-6 cm long, slender, somewhat sheathing at base; cauline leaves 3.5-9 × 8-12 mm, oblong to oblong-spathulate, sessile or lamina prominently attenuate upto the base of short petiole. Flowers in dense, terminal, helicoid, bracteate cymes; bracts: lower ones leafy, upper ones minute, scaly, densely hispid. Sepals 5-lobed, 4 mm, deeply cleft upto the base, ovate-obtuse, ciliate, hispid, imbricate. Petals campanulate, 6 mm long, tube short, 2 × 2 mm, 5-lobed, imbricate, lobes upto 4 mm long, orbicular, nerved, throat of corolla closed with 5 obtuse scales. Stamens 5, inserted below the throat of the corolla, filaments short, anthers subsessile, bilobed, 1 mm long, ovate-oblong, obtuse. Ovary superior, deeply 4-lobed style gynobasic, 1 mm long, stigma capitate. Nutlets 4, 2 mm with epidorsal depression, glabrate (immatured); attachment scar supra-median.

Fl. & Fr.: July-Aug.

Specimens examined: Sikkim: On Teesta Valley above Tangu, 4114 m, 6th July, 1903, *F. E. Younghusband* 1538 A, Acc. No. 308324, HOLOTYPE, (CAL), *F. E. Younghusband* 1538 B-D, Acc. No. 308325, 308326, 308327, Paratypes (CAL).

2. ***M. trichocarpa*** (Maxim.) Johnst. in Contr. Gray Herb. Harv. n.s. 81: 83. 1928. *Omphalodes trichocarpa* Maxim. in Bull. Acad. St. Petersb. 26: 500. 1880; Diels in Engl. Bot. Jahrb. 36: 93. 1905; Brand. in Engl. Pflanzenr. Heft. 78: 105. 1921. (Type from Kansu, China, Przewalski.). *Microula sikkimensis* (Clarke) Hemsl. in Hook. Icon. 8 (ser. 4): sub. t. 2562. 1898; John-

ston in Contr. Gray Herb. Harv. n.s. 73: 62. 1924. *Anchusa sikkimensis* Clarke in Hook. f. Fl. Brit. Ind. 4: 168. 1883. (Type from Alpine Sikkim, 3350-3660 m, J. D. Hooker, Isotype in Herb. CAL.) *Tretocarya sikkimensis* Oliver in Hook. Icon. 3 (Ser 4), t. 2255. 1893.

Herbs annual, slender, erect, hispid-hirsute, laxly branched, 10-25 cm high. Leaves, acute at apex, coriaceous, hirsute, midvein prominent; radical leaves upto 3×1.8 cm, obtuse at apex, lanceolate, gradually confluent with the petiole, sometimes sessile; petioles upto 2.5 cm long, hirsute. Flowers in few-flowered cincinnus arising from the axils of the leaf like bracts. Sepals deeply 5-partite, upto 3 mm long, spreading, lobes 5, 4-5 mm in diam., lanceolate, acute, uninerved, throat of corolla almost closed by obtuse glabrous scales. Ovary 4-lobed, style slender, shorter than calyx. Fruits of 2-3 nutlets, 2-3 mm long, revolute margins of the nutlets nearly entire; crests epidorsal, annulate, attachment scar triangular, nearly or slightly above the middle of the nutlet.

Fl. & Fr.: Sept.-Oct.

Specimens examined: Sikkim: Alpine Sikkim, 3350-3660 m, J. D. Hooker, Acc. No. 30831 (CAL); Lachen, 2440 m, Ribu 3017 (CAL); Sikkim Himalaya, fls. blue, Kings collector, Acc. No. 308320 (CAL); Phari, 4267-5000 m, B. J. Gould 16 (CAL); Samdong, Prain, Acc. No. 308318 (CAL); Boktupasture, Prain's collector 72 (CAL); Chowpub-La, King's collector, Acc. No. 308316 (CAL); Sumthang, King's collector, Acc. No. 308315 (CAL); Tongu, 410 m, Smith & Cave 2376 (CAL), ibid., 4420 m, Smith & Cave 2379 (CAL); Lhasal, 4267 m, fls. blue, King's collector, Acc. Nos. 308172, 308173, 308174 (CAL); Tongshung, Dunghoo 4639 (CAL).

Distribution: Eastern and Central Asia; Sikkim and adjacent Tibet, China.

3. *M. pustulosa* (Clarke) Duthie in Kew Bull. 1912: 39. 1912; Johnst. in Contr.

Gray Herb. Harv. n.s. 73: 62. 1924. *Eritrichium pustulosum* Clarke in Hook. f. Fl. Brit. Ind. 4: 164. 1883; Smith in Rec. bot. Surv. India 4: 225. 1911; Brand in Engl. Pflanzenr. Heft. 97: 187. 1931. (Type from Alpine Sikkim, *Eritrichium* sp. n. 14, Herb. Ind. Or. Hook. f. & Thoms., Isotype in Herb. CAL.) *Microula ovalifolia* (Bur. et. Franch.) Johnston l.c. *Schistocaryum ovalifolium* Bur. et Franch. in Journ. Bot. 5: 105. 1891.

Herbs, weak, diffuse, strigose, perennial. Stems numerous, cylindrical, herbaceous, adpressed-strigose, 5-30 cm long. Leaves $1-4 \times 5-12$ cm, elliptic-lanceolate, uninervate, attenuate. Flowers in terminal or lateral bracteate racemes. Sepals 5-lobed 1-2 mm long, linear-obtuse, densely strigose. Petals 3 mm long, subrotate, tube short, lobes 5, 1 mm long, ovate-obtuse, pale-blue. Stamens 5, included, anthers bilobed, ovate-obtuse, almost sessile. Ovary 4-loculed, style gynobasic, stigma small, capitate. Nutlets 4, 2 mm long, rhomboid-ovate, tuberculate; tubercles appearing as tufts of minute hairs, dorsally compressed, attached by a small scar above their middle, with a prominent subapical cuplike depression with slightly elevated margin.

Fl. & Fr.: June-August.

Specimens examined: Sikkim: Alpine Sikkim, *Eritrichium* sp. n. 14, Herb. Ind. Or. Hook. f. & Thoms., Isotype (CAL); near Jongri, King's collector, Acc. No. 307546 (CAL); Swamp of Sherabthang, 3962 m, Smith & Cave (CAL); Neygo la, W. Gongri, King's collector Acc. No. 307547 (CAL); below Jongri, King's collector, Acc. No. 307541 (CAL); Zemu Valley, 4110 m, Smith & Cave 1237 (CAL); Llonakh, 4420 m, Smith & Cave 2052 (CAL); Nakula, top of Pass, 5420 m, Smith & Cave 1955 (CAL); Choksaoomg, King's Collector, Acc. No. 308567 (CAL); Geagong, 4800 m, Smith & Cave 2440 (CAL); N. W. Himalayas: Kumaon, Duthie 3206 (DD).

Distribution: Western Himalayas (N. Kumaon), Eastern Tibet (Chumbi) and Sikkim.

Notes: Duthie in Kew Bull. (1912) mentioned that this plant, which was originally discovered by J. D. Hooker in Sikkim at elevations between 4000 m and 4500 m, is the *Eritrichium* No. 14 of J. D. Hooker, and the type of *E. pustulosum* Clarke. Duthie considers the nutlets very similar to those of *M. sikkimensis*, having the same characteristic tubercles tipped with minute hairs. From the remarks left by W. W. Smith on the species covers of his materials from Sikkim in Herb. CAL. it is evident that on the characters of the nutlets he is inclined to refer his species under the genus *Microula*. Brand (1931) has described it under *Eritrichium* but nutlet attachment is below the middle, almost basal in *Eritrichium* and above the middle in *Microula*. As the nutlets of this species show more resemblance to *Microula*, we are in favour of referring this species under it. The nutlets of *M. pustulosa* are similar to *M. younghusbandii* Duthie, differing from it in that, the nutlets are tuberculate in *M. pustulosa* but glabrate in *M. younghusbandii*. The most characteristic feature of the nutlets is the presence of a prominent, subapical cuplike depression with raised margins (epidorsal annulate crest).

4. ***M. tibetica*** Maxim. in Bull. Acad. St. Petersb. 26: 501. 1880 et Mel. Biol. 10: 682. 1880; Hemsley in Hook. Icon. 26: t. 2562. 1898 et in Journ. Linn. Soc. (Bot.) 35: 192. 1902; Johnston in Contrib. Gray Herb. Harv. n.s. 73: 62. 1924; Brand in Engl. Pflanzenr. Heft. 97: 25. 1931; Kazmi in Journ. Arnold Arbor 51: 400. 1970. *M. benthami* Clarke in Hook. f. Fl. Brit. India 4: 167. 1883; Oliver in Hook. Icon. 23: t. 2257. 1893; W. W. Smith in Rec. bot. Surv. India 4: 226. 1911. [Type: from Parang Pass, W. Tibet, Thomson (K), Iso-type in Herb. CAL.]. *M. tangutica* Maxim. in Bull. Acad. St. Petersb. 26: 500. 1880.

Tretocarya pratensis Maxim. in Bull. Acad. St. Petersb. 27: 505. 1881 et Mel. Biol. 11: 272. 1881. (Type from Kansu, China, Przewalski).

Herbs, perennial, almost stemless, scabrous pubescent with vertical tap root, crowned by tuft of rosulate leaves. Leaves 30-70 × 8-20 mm, obovate-oblong to oblong-spathulate, densely adpressed-strigose on both surfaces with a few stouter adpressed hairs, attenuate, midrib impressed. Flowers in dense, many-fid, cincinni, subsessile among the leaves, bracteate. Sepals campanulate, lobes 5, 1-1.5 mm long, lanceolate-acute, ciliate. Petals 2-3 mm long, tubular, lobes 5, ovate-obtuse, spreading, imbricate in bud. Stamens 5, included, anthers ovate oblong obtuse, filaments short, adnate to middle of the corolla tube. Ovary deeply 4-lobed, style short, gynobasic, stigma small, capitate. Fruit of 4 nutlets, nutlets 1-1.5 mm long, ovoid-oblong, dorsally compressed, attached by a small scar above their middle, rugose, with minute tufts of sparsely distributed hairs.

Fl. & Fr.: Aug.-Sept.

Specimens examined: Sikkim, Top of Nakula, 5335 m, Smith & Cave 1949 (CAL.); Giagong, 4877 m, Smith & Cave 2395 (CAL.);

Distribution: Pakistan, India (Jammu-Kashmir and Sikkim), Tibet.

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