

# A REVISION OF THE BORAGINACEAE OF WEST PAKISTAN AND KASHMIR \*

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## 15. *Lappula* Gilib. Fl. Lithuan. 25. 1781.

*Echinospermum* Sw. ex Lehm. Asperif. 1: 113. 1818.

TYPE SPECIES: not indicated.

Annuals, rarely biennials or perennials. Leaves alternate. Inflorescence bracteate. Calyx divided to the base, lobes after flowering not at all to slightly enlarged. Corolla blue or white, funnelform to salverform. Fau- cal appendages present. Anthers included. Gynobase narrowly pyramidal. Style short, filiform; stigma capitate. Nutlets 4, attached throughout their length to the gynobase, sometimes apices free on the inner face, appendic- ulate, appendages glochidiate to aculeate.

About 45 species, usually distributed in temperate Europe and Asia, few in Africa, one in America.

### KEY TO THE SPECIES

- a. Nutlets smooth, tuberculate all over their surface; tubercles large, thorn- like, neither prickly nor bearing glochidia at their apices.
  - b. Nutlets pyramidal to ovate-pyramidal in outline, usually longer than broad, tubercles less unequal, basal ones not much enlarged. . . . . 1. *L. spinocarpos*.
  - b. Nutlets broadly pyramidal in outline, usually broader than long, tubercles very unequal, basal ones much enlarged. . . . . 2. *L. ceratophora*.
- a. Nutlets usually rough, appendiculate at the margins, appendages bearing glochidia at their apices, usually tuberculate, on the dorsal and ventral sur- faces, tubercles small, very rarely tuberculate only.
  - c. Nutlets usually not, or only rarely, indistinctly margined with few glo- chidiate appendages; usually indistinctly verruculose, more or less smooth. . . . . 3. *L. sinaica*.
  - c. Nutlets distinctly margined with appendages, appendages glochidiate.
    - d. Flowers and fruits sessile, fruits pyramidal, nutlets triangular, mar- ginal appendages usually dilated at base, bases joined to form a narrow marginal wing. . . . . 4. *L. sessiliflora*.
    - d. Flowers and fruits with short to long pedicels, fruits ovate, nutlets ovate to oblong, marginal appendages not at all to slightly dilated at base, bases not joined to form a marginal wing.
      - e. Nutlets with uniseriate marginal appendages.
        - f. Inflorescence strongly elongated; nutlets small, 2-3 mm. long; marginal appendages always less than 1 mm. long; leaves linear; bracts small. . . . . 5. *L. microcarpa*.

\* Continued from volume 51, p. 402.



- f. Inflorescence elongate to more or less contracted; nutlets usually large, 3–4(–5) mm. long; marginal appendages always longer than 1 mm., usually 1.5–2 mm. long; leaves lanceolate; bracts usually large.
- g. Leaves on the lower surface subglabrous. . . . . 6. *L. semiglabra*.
- g. Leaves on the lower surface densely pubescent. . . . . 7. *L. patula*.
- e. Nutlets with multiseriate marginal appendages.
- h. Nutlets with three series of appendages. . . 8. *L. consanguinea*.
- h. Nutlets with two series of appendages.
- i. Corolla funnelform to salverform, 3.5–7 mm. in diameter; stem covered with soft, white, appressed trichomes. . . . . 9. *L. barbata*.
- i. Corolla salverform, 3–4 mm. in diameter; stem covered with stiff, spreading trichomes.
- j. Appendages of the inner series much longer than those of the outer series. . . . . 10. *L. heteracantha*.
- j. Appendages of the inner series more or less equalling those of the outer series. . . . . 11. *L. myosotis*.

1. *L. spinocarpos* (Forssk.) Ascherson & O. Kuntze, Acta Horti Petrop. 10: 215. 1887; Riedl in Rechinger, Fl. Iranica 48: 69. 1967.

*Anchusa spinocarpos* Forssk. Fl. Aegypt.-Arab. 41. 1775.

*Echinospermum vahlium* Lehm. Asperif. 1: 132. 1818.

*E. tuberosum* Ledeb. in Eichw. Pl. Casp.-Cauc. 2: 11. 1831.

*E. spinocarpos* (Forssk.) Boiss. Fl. Orient. 4: 249. 1875.

*Sclerocaryopsis spinocarpos* (Forssk.) Brand, Pflanzenr. IV. 252 (Heft 97): 98. 1931.

TYPE: Alexandria, *Forsskål*, s. n. (c).

ICON.: Brand l.c. fig. 1 B. 1931, under *Sclerocaryopsis spinocarpos*.

Annual herb, usually decumbent or sometimes erect, branched at the base, 5–20 cm. tall. Stem and branches covered densely with appressed to subappressed white trichomes, arising from tiny bulbous bases. Basal leaves usually linear-spathulate, entire, obtuse, 15–35 mm. long, 1–3 mm. broad, covered densely on both surfaces with white subappressed trichomes; cauline leaves shorter and narrower, sometimes narrowly lanceolate, not much attenuated towards the base. Inflorescence lax, bracteate; pedicels in flower about 1 mm. long, in fruit elongated to 4 mm. Calyx divided to the base, lobes in flower 1–2 mm. long, to 0.75 mm. broad, erect, covered with white appressed trichomes, in fruit enlarged, to 7 mm. long and 1.5 mm. broad, with subpatent trichomes arising from prominent tuberculate bases. Corolla infundibuliform, 3–4 mm. long, tube white, limb blue, more or less campanulate. Nutlets pyramidal to ovate-pyramidal, usually longer than broad, 3–5 mm. long, tuberculate, tubercles large, thorn-like, not prickly, very rarely glochidiate, less unequal, basal ones not much enlarged, surface smooth to verruculose or rarely minutely aculeate-tuberculate.



DISTRIBUTION: North Africa, Sinai, Palestine, Iraq, Iran, Afghanistan, central Asia, Tien Shan, Pamir Alaj, West Pakistan.

**West Pakistan:** DERA GAZI KHAN DIST.: Fort Munro, 1800 m., *Kazmi 1862a* (PES); *Rechinger 29727* (W). QUETTA DIST.: 45 miles from Sibi to Quetta in Bolan Pass, *Kazmi 1398b* (PES); ZHOB DIST.: between Zhob and Sambaza, 1500 m. *Kazmi 1923b* (PES); *Rechinger 29845* (W); 30 km. N. Fort Sandeman, *Rechinger 29858* (W). Reported from: Sibi, *Banerji in Williams 55*; Nai Ublo, *Harsukh 20603*.

The leaves of *Lappula spinocarpos* vary from linear to linear-spathulate, to narrowly lanceolate, or sometimes to oblong-ovate. The surface of the nutlets and of the large tubercles varies from shining and smooth to rough, to minutely verruculose, or even to minutely aculeate. Similarly the trichomes on the leaves are very dense and appressed in some cases (Persia, May, 1869, Bunge (GH)), while loose and erect in others (specimens from Kasakistan, Caucasus, Egypt, and Iraq).

2. *L. ceratophora* (M. Pop.) M. Pop. Fl. URSS 19: 417. 1953; Riedl in *Rechinger, Fl. Iranica* 48: 70. 1967.

*Echinospermum ceratophorum* M. Pop. in Korov. Kultiasow Pop. Descr. Pl. Nov. Turk. 67. t. 17. 1916.

TYPE: In provinciis bucharicis Karschi et Burdalyk Turkestaniae, *I. I. Sprygin & M. V. Kultiasow s. n.* (LE).

ICON.: M. Pop. l. c. 67. t. 17. 1916; M. Pop. l. c. t. 20. fig. 1. 1953.

Annual, usually decumbent sometimes erect, to 15 cm. tall, much branched at the base. Stem and branches densely covered with white, short, depressed trichomes. Leaves linear to linear-spathulate, obtuse, entire, 20–40 mm. long, 1–3 mm. broad, both surfaces covered with white appressed to subappressed short trichomes, margins (especially towards the base) bearing some scattered long trichomes. Inflorescence lax, bracteate; pedicels in flower up to 1 mm. long, in fruit elongated to 4 mm. Calyx divided to the base, lobes in flower 1–2 mm. long and 0.75 mm. broad, erect, in fruit enlarged to 3–6 mm. long and 1.5 mm. broad, erect or slightly curved towards the fruit, covered densely with subappressed trichomes, arising from prominent tuberculate bases. Corolla blue with a white eye, infundibuliform, slightly dilated at the throat, lobes erect or patent. Nutlet broadly pyramidal, usually broader than its length, tuberculate, tubercles large, thorn-like, usually smooth and shining at the surface, rarely rough, very unequal, basal ones much enlarged, to 2 mm. long.

DISTRIBUTION: Iran, Afghanistan, West Pakistan, Syr-Darya, Amu Darya, Kara Kum, Pamir Alaj.

**West Pakistan:** QUETTA DIST.: Quetta to Chaman, 30 km. northeast of Quetta, *Kazmi 1468b* (PES); *Lamond 958* (E); *Rechinger 28866, 28908b* (W).

The only difference between *Lappula spinocarpos* and *L. ceratophora*



is in the form of the fruit and the length of the tubercles. In *L. spinocarpus* the nutlets are longer than broad with comparatively shorter tubercles, varying in length from the top to the base of the nutlet. Usually the middle ones are the longest, but this character is not very constant and sometimes the lower tubercles are longer than the middle ones, thus bringing this species very close to *L. ceratophora* in this respect. In *L. ceratophora* the nutlets are broader than long with comparatively longer tubercles, increasing in their length, more or less gradually, from the top towards the base, the basal tubercles are the longest. This character is more stable in *L. ceratophora*. For distinguishing the two species from one another it is necessary to consider and correlate the ratio of the length and breadth of the nutlets and the length ratio of the tubercles from the top to the base of the nutlets. There is little difference in the form of leaves or floral parts in the two species. After examination of more material *L. ceratophora* may prove to be a subspecies or variety of *L. spinocarpus*.

3. *L. sinaica* (DC.) Ascherson ex Schweinf. Mem. Inst. Egypt 2: 111. 1887; Brand, Pflanzenr. IV. 252 (Heft 97): 144. 1931; M. Pop. Fl. URSS 19: 475. 1953; Riedl in Rechinger, Fl. Iranica 48: 76. 1967.

*Echinosperrum sinaicum* DC. Prodr. 10: 141. 1846; Boiss. Fl. Orient. 4: 251. 1875.

*E. kotschyi* Boiss. Diagn. Pl. Orient. 7: 29. 1846.

*E. divaricatum* Bunge, Reliq. Lehm. 410. 1851 *ex descr.*; Mem. Acad. Sci. St. Pétersb. 7: 410. 1851.

*Lappula divaricata* B. Fedtsch. Rast. Turk. 663. 1915.

TYPE: Sinai, *Aucher* 118 (G).

Annual erect to more or less decumbent, less branched herb, 6–50 cm. tall. Stem and branches flexuose, slender, covered with white, appressed to subpatent trichomes arising from minute white tuberculate bases. Basal leaves petiolate, oblong to elliptic-oblong, entire, obtuse, (including petioles) 15–50 mm. long, 5–15 mm. broad, covered on both surfaces loosely to densely with equal to unequal long, subappressed trichomes in the old leaves sometimes arising from white tuberculate bases; cauline leaves sessile, gradually decreasing in size upwards. Inflorescence in flower long, very much elongated in fruit; pedicels lacking to very short in flower, elongated to 5 mm. and reflexed in fruit. Calyx divided to the base, lobes linear-oblong in flower, 1–1.5(–2) mm. long, hairy, erect, not much enlarged in fruit. Corolla bluish-purple with a white or yellowish eye, infundibuliform,  $\pm$  3 mm. long,  $\pm$  2.5 mm. in diameter; faucal appendages trapeziform. Nutlets oblong-ovoid, 2–2.5 mm. long, indistinctly margined, tuberculate to quite smooth, sometimes indistinctly verruculose or bearing few short glochidiate appendages, totally attached to the gynobase.

DISTRIBUTION: Sinai, Iraq, Iran, Caucasus, Afghanistan, Turkestan, Pamir Alaj, Tien Shan, West Pakistan, northwest India.



**West Pakistan:** CHITRAL STATE: Chitral village, 2 miles south, on gravel slope, 1500 m., *Stainton* 2213 (BM). KALAT STATE: between Kalat and Mastung, 40 km. from Kalat, 2000 m., *Kazmi* 1278b (PES); *Rechinger* 28377 (w). QUETTA DIST.: Quetta, *Lace s. n.* (E); Spin Karez, 1900 m., *Kazmi* 1632c (PES); *Rechinger* 29235 (w); between Qila Abdullah and Sheila Bagh, 2300 m., *Kazmi* 1529 (GH, PES); Bolan Pass, 2000 m., *Kazmi* 1407b (PES); *Rechinger* 28423 (w); between Kolpur and Machh, 900 m., *Kazmi* 1401b (PES); *Rechinger* 28431 (w). Reported from Baluchistan: Khojak, 2300 m., *Rechinger* 29067 (w); Inter Bostan et Saran Tangai, 1800 m., *Rechinger* 29192 (w); Ziarat, 2100 m., *Rechinger* 29361 (w); Tak, 30 km. S. Quetta, 2100 m., *Rechinger* 28395 (w); 10 miles S. Kalat, 1900–2200 m., *Rechinger* 28362 (w).

4. *L. sessiliflora* (Boiss.) Gürke in Engl. & Prantl, Nat. Pflanzenfam. IV. 3a: 107. 1893; Brand, Pflanzenr. IV. 252 (Heft 97): 144. 1931; M. Pop. Fl. URSS 19: 477. 1953; Riedl in Rechinger, Fl. Iranica 48: 78. 1967.

*Echinosperrum sessiliflorum* Boiss. Diagn. Pl. Orient. 11: 124. 1849; Fl. Orient. 4: 253. 1875.

*Heterocaryum divaricatum* Stocks ex Boiss. Fl. Orient. 4: 253. 1875.

*Cynoglossospermum sessiliflorum* O. Kuntze, Rev. Gen. Pl. 2: 437. 1891.

TYPE: Persia: Esfahan, *Aucher* 5017 (G).

ICON.: Brand, l. c. fig. 15. F–J. 1931.

Annual, erect or decumbent herb, branched at the base, 5–20(–25) cm. tall. Branches divaricate, curved. Stem and branches densely covered with short, white to brownish, appressed trichomes. Basal leaves petiolate, linear-oblong to oblong-spathulate, entire, obtuse, (including petioles) 15–25 mm. long, 1–2.5 mm. broad, covered on both surfaces uniformly with thin, patent, white trichomes to 0.5 mm. long, intermixed with scattered thick trichomes, to 1 mm. long, arising from white tuberculate bases; cauline leaves sessile, narrower and shorter, covered uniformly with trichomes 0.5–0.75 mm. long, arising from prominent, white, tuberculate bases. Inflorescence long, bearing distant sessile flowers or fruits, bracteate, bracts leaflike, oblong to oblong-ovate. Calyx divided to the base, lobes oblong, hairy, erect, not enlarged in fruit, to 2 mm. long. Corolla blue, infundibuliform-campanulate, 2–2.5 mm. long; faucal appendages minute to inconspicuous. Nutlets broadly triangular, 2.5–3 mm. long, margined with uniseriate appendages, appendages glochidiate at their apex, free to confluent at base, sometimes forming quite broad scarious wings at margins, dorsal and ventral surfaces tuberculate to tuberculate-verruculose, rough, totally attached to the gynobase.

**DISTRIBUTION:** Iraq, Iran, Caucasus, Pamir Alaj, Tien shan, Turkestan, Afghanistan, West Pakistan.

**West Pakistan:** KALAT STATE: Between Kalat and Mastung, 2000 m., *Kazmi* 1273 (PES); *Rechinger* 28386 (w). QUETTA DIST.: West of Ziarat, 2200 m., *Kazmi* 1669b (PES); *Rechinger* 29285 (w); Spin Karez 1900 m., *Kazmi* 1641b (PES); *Rechinger* 29234 (w); between Quetta and Ziarat, *Kazmi* 1574b (PES);



near Kolepur, *Kazmi 1400b* (PES). Reported from: Quetta, inter Qila Abdullah et Sheila Bagh, 1600–1900 m., *Rechinger 29011* (w); inter Dulai et Kanak, 1600 m., *Rechinger 29095* (w). Baluchistan, *Stocks s. n.* (GH-type of *Heterocaryum divaricatum* Stocks ex Boiss.).

The sessile fruits and triangular nutlets of *Lappula sessiliflora* distinguish this species from allied species having nutlets with appendaged margins. The appendages on the margins of the nutlets of *L. sessiliflora* are very variable in length and breadth. Sometimes they are quite distant to slightly confluent at their bases, while in other cases they are so strongly joined together that they form a broad scarious wing at the margins. These wings may be turned vertically to give the nutlets a cup-like appearance. Usually narrowly winged and broadly winged nutlets are found on the same plant at different stages of development.

5. *L. microcarpa* (Ledeb.) Gürke in Engl. & Prantl, Nat. Pflanzenfam. IV. 3a: 107. 1893; Brand, Pflanzenr. IV. 252 (Heft 97): 142. 1931, excl. syn. *E. rigidum* DC. [ex Persia]; M. Pop. Fl. URSS 19: 462. 1953; Riedl in Rechinger, Fl. Iranica 48: 74. 1967.

*Echinospermum microcarpum* Ledeb. Fl. Alt. 1: 202. 1829; Icon. Fl. Rossica 2: t. 183. 1830; DC. Prodr. 10: 140. 1846; Boiss. Fl. Orient. 4: 251. 1875. *E. stylosum* Kar. & Kir. Bull. Soc. Nat. Moscou 14: 715. 1841; DC. Prodr. 10: 140. 1846.

*E. oligacanthum* Ledeb. Fl. Rossica 3: 161. 1846–1851.

*Heterocaryum inconstans* Vatke, Zeitschr. Ges. Naturw. 11: 129. 1875.

TYPE: Habitat in lapidosis montium Arkaul, versus cacumen, in montibus ad rivulum Urmuchaika prope Buchtarminsk, *Ledebour s. n.* (LE?).

ICON.: Brand, l. c. fig. 15. A–E. 1931; Ledeb. l. c. t. 183. 1830, under *Echinospermum microcarpum*.

Annual or biennial, erect herb, 15–55 cm. tall. Stem solitary or many, simple or usually branched above, branches long, divaricate; stem and branches covered with white, appressed trichomes, 0.5–0.75 (–1) mm. long on the lower part of the stem, usually intermixed with longer and stouter trichomes arising from prominent, white, tuberculate bases. Basal leaves oblong, obtuse, gradually attenuated towards the base, 30–45 mm. long, 2–3 mm. broad, forming a rosette, covered densely or loosely on both surfaces with spreading trichomes to 2 mm. long, arising from prominent white tuberculate bases; cauline leaves sessile, linear-oblong, narrower and shorter. Inflorescence short, bearing closely set, subsessile flowers, later much elongated, with pedicellate fruits up to 5 mm. apart; pedicels hairy, stout, erect, to 2 mm. long; bracts small. Calyx divided to the base, lobes 1–2 mm. long, erect, not much enlarged in fruit. Corolla bluish-white, infundibuliform, 2.5–3 mm. long, 2–3 mm. in diameter; faucal appendages 0.5–0.75 mm. long. Nutlets ovoid, 2.5–3 mm. long, with a single series of short, not glochidiate appendages at the margin (not more than 1 mm. long), dorsal and ventral surface tuberculate or granulate.



DISTRIBUTION: Iran, Caspian Arals, Turkestan, Tien shan, Pamir Alaj, Afghanistan, West Pakistan, Kashmir.

West Pakistan: CHITRAL STATE: Agram, Arkari Gol, west of Tirich Mir, 3000 m., *Stainton 2616* (BM); Kafiristan, Rumbur, hillside facing south, 2400 m., *Bowes Lyon 675* (BM). GILGIT AGENCY: Baltistan, Kasurmik to Doghani, 2500 m., *R. R. Stewart 20799* (GH). KALAT STATE: near Mastung, *Kazmi 1324c* (PES). QUETTA DIST.: Quetta, *Kazmi s. n.* (PES); West of Ziarat, 2400 m., *Kazmi 1654b* (PES); Ziarat, 2400 m., *Jafri & Akbar 2071* (BM); between Hindu Bagh and Quetta, *Jafri & Akbar 2357* (BM).

Kashmir: LADAK: Bod Kharbu, *Koelz 6239* (GH, US).

6. *L. semiglabra* (Ledeb.) Gürke in Engl. & Prantl, Nat. Pflanzenfam. IV. 3a: 104. 1893; M. Pop. Fl. URSS 19: 430. 1953; Riedl in Rechinger, Fl. Iranica 48: 75. 1967.

*Echinospermum semiglabrum* (Ledeb.) Fl. Alt. 1: 204. 1829; Icon. Fl. Rossica 1: t. 28. 1829; Fl. Rossica 3: 158. 1847; DC. Prodr. 10: 138. 1846; Boiss. Fl. Orient. 4: 251. 1875; C. B. Clarke in Hook. f. Fl. Brit. India 4: 163. 1883.

*Lappula redowskii* (Hornem.) Greene var. *patula* (Lehm.) Nels. & Macbr. subvar. *semiglabra* (Ledeb.) Brand, Pflanzenr. IV. 252 (Heft 97): 149. 1931.

*Echinospermum caspicum* Fisch. & C. A. Mey. Index Sem. Hort. Petrop. 5: 34. 1838; DC. Prodr. 10: 138. 1846.

TYPE: Habitat in sabulosis ad fl. Irtysh, *Ledebour s. n.* (LE).

ICON.: Ledeb. l. c. 1: t. 28. 1829; M. Pop. l. c. 19: t. 21. fig. 2. 1953.

Annual, erect herb, 15–50 cm. tall. Stem simple or branched above; stem and branches covered with short, appressed white trichomes. Basal leaves petiolate, oblong-spathulate, obtuse, entire, (including petioles) 40–50 (–60) mm. long, 6–9 mm. broad, upper surface usually glabrous or sometimes with few scattered trichomes, lower surface usually loosely, sometimes, especially in the old leaves, densely covered with white, spreading trichomes to 1 mm. long, arising from prominent white tuberculate bases; cauline leaves gradually decreasing in size upwards, sessile, more or less lanceolate, acutish. Inflorescence short in flower, much elongated later in fruit, flexuose, bracteate, bracts small. Flowers subsessile, fruits pedicellate; pedicels hairy, erect, to 3 mm. long. Calyx divided to the base, lobes oblong, hairy, erect, 1–1.5 mm. long in flower, enlarged in fruit to 3 mm. long,  $\pm$  0.5 mm. broad. Corolla bluish-white to light blue, campanulate, 3–3.5 mm. long, 3–4 mm. in diameter; faucal appendages trapeziform. Nutlets narrowly ovoid 4–5 mm. long, margined with uniseriate glochidiate appendages 2–3 mm. long, slightly dilated at base, dorsal middle area carinate, usually aculeate, outer surface slightly tuberculate.

DISTRIBUTION: URSS, Afghanistan, West Pakistan, Kashmir, northwest India.



**West Pakistan:** GILGIT AGENCY: Baltistan, Thalle La, 2200 m., *R. R. Stewart* 20584a (GH); rocky barren slopes near south end of Satpura Lake, ca. 4.5 miles south of Skardu, 3000 m., *Webster & Nasir* (GH), Satpura Nullah, above Skardu, 2700 m., *R. R. Stewart* 20368 (GH). MAKRAN DIST.: between Hushab and Panjgur, 20–30 km. from Panjgur, *Kazmi* 1190b (PES); *Lamond* 567 (E). 20 miles from Panjgur towards Nag, *Kazmi* 1243c (PES). ZHOB DIST.: Shingarh, 50 km. north of Fort Sandeman, 2000 m., *Rechinger* 29894 (W); *Harsukh* 20595 (K). Reported from: Kharan and Quetta *Haughes Buller* 23159.

**Kashmir:** Miscellaneous: Hab. Tibet Occ. regio temp. 10,000 ped., Herb. Ind. Or. Hook. f. & Thoms., *Thomson* 10 (GH); 11,000–12,000 ped., Herb. Ind. Or. Hook. f. & Thoms., *Thomson s.n.* (GH).

7. *L. patula* (Lehm.) Ascherson ex Gürke in Engl. & Prantl, Nat. Pflanzenfam. IV. 3a: 107. 1893; M. Pop. Fl. URSS. 19: 436. 1953. Riedl in Rechinger, Fl. Iranica 48: 76. 1967.

*Echinospermum patulum* Lehm. Asperif. 124. 1818; Ledeb. Fl. Alt. 1: 200. 1829; DC. Prodr. 10: 137. 1846; Boiss. Fl. Orient. 4: 250. 1875.

*Lappula redowskii* (Hornem.) Greene var. *patula* (Lehm.) Nels. & Macbr. Bot. Gaz. 61: 39. 1916; I. M. Johnston, Contr. Gray Herb. 70: 49. 1924.

TYPE: In deserto Caucasico-Caspico, ad Kuman et Terek nec ad Wolgam inferiorem area Sareptanam colonium et urbem Astrachan, *Lehmann s. n.* (HBG).

ICON.: Hegi, Ill. Fl. Mitt.-Eur. 5: 3. fig. 3098a. 1927.

Annual, branched near the base, to 50 cm. tall; branches long-divaricate. Stem and branches covered with short appressed white trichomes. Basal leaves linear-oblong to linear-spathulate, gradually attenuated towards the base, obtuse, entire, 40–60 mm. long, 6–9 mm. broad, covered on both surfaces, usually densely, (sometimes loosely) with short, white, appressed trichomes, intermixed, more or less, with longer ones, arising from white tuberculate bases; cauline leaves gradually reduced in size upwards. Inflorescence short in flower, later much elongated, lax, bracteate, bracts small, leaflike. Flowers subsessile to short pedicellate; pedicels erect, hairy, to 1.5 mm. long in flower, elongated to 2.5 mm. in fruit. Calyx divided to the base, lobes linear to oblong, 1–2 mm. long in flower, much enlarged to 5 mm. long in fruit. Corolla bluish-white to blue, campanulate, 3–3.5 mm. long, 3–4 mm. diameter; faucal appendages trapeziform, prominent. Nutlets ovoid, 3–4 mm. long, margined with uniseriate appendages, appendages 1.5–3 mm. long, glochidiate at apex, dorsal middle area tuberculate, rarely aculeate, externally slightly tuberculate.

DISTRIBUTION: URSS, Iran, Afghanistan, West Pakistan, Kashmir, northwest India, China.

**Kashmir:** LADAK: Tsaka La, 5000 m., *Koelz* 2368 (GH); Kharbu to Dras, 3000 m., *R. R. Stewart* 2115 (GH). Miscellaneous: Hab. Tibet Occ. regio temp., 12,000–14,000 ped., Herb. Ind. Or. Hook. f. & Thoms. Herb. no. 2496849, 2500079 (US); *s.n.* (GH).



Only two collections of *Lappula patula* have been made from Kashmir, but the species is to be expected throughout the northern parts of Kashmir and West Pakistan. *Lappula patula* is very closely related to *L. semiglabra* from which it may be distinguished by its habit of branching near the base, by its leaves densely hairy on both surfaces, and by its smaller and broader nutlets. In *L. semiglabra* the stems are branched in the upper part, the leaves are usually glabrous on the upper surface, and the nutlets are narrowly ovoid, 4–5 mm. long, margined with appendages 2–3 mm. long.

8. *L. consanguinea* (Fisch. & C. A. Mey.) Gürke in Engl. & Prantl, Nat. Pflanzenfam. IV. 3a: 107. 1893; M. Pop. Fl. URSS 19: 447. 1953.

*Echinosperrum consanguineum* Fisch. & C. A. Mey. Index Sem. Hort. Petrop. 5: 35. 1838; DC. Prodr. 10: 137. 1846; Ledeb. Fl. Ross. 3: 157. 1847.

*E. lappula* var. *consanguineum* (Fisch. & C. A. Mey.) Regel, Bull. Soc. Nat. Moscou 41(1): 89. 1868.

*Cynoglossospermum consanguineum* O. Kuntze, Rev. Gen. Pl. 2: 438. 1891.

*Lappula echinata* var. *consanguinea* (Fisch. & C. A. Mey.) Brand, Pflanzenr. IV. 252(Heft 97): 140. 1931.

TYPE: Hab. in regionibus altaicus, *Bunge s. n.* (LE).

ICON.: M. Pop. l. c. t. 22. fig. 9. 1953.

Annual or biennial, erect, up to 50 cm. tall, usually branched above, branches flexuose, to 25 cm. long. Stem and branches covered with unequal, subappressed to patent trichomes to 1.5 mm. long. Basal leaves oblong-lanceolate, entire, obtuse, narrowed towards the base, to 7 cm. long, 11 mm. broad, nerves sunken on the upper surface, prominent below, both surfaces covered with scattered, white, spreading trichomes, to 1 mm. long, arising from prominent tuberculate bases; cauline leaves lanceolate, acutish, gradually reduced in size upwards. Inflorescence lax, short, elongated in fruit, bracteate. Flowers subsessile to very short pedicellate, pedicels of old fruits pubescent, erect, to 2 mm. long. Calyx divided to the base, lobes linear-oblong, in flower up to 2 mm. long, 0.5 mm. broad, in fruit slightly enlarged, to 3 mm. long and 0.7 mm. broad. Corolla blue with a white eye, infundibuliform, 2.5–3 mm. long; faucal appendages prominent. Nutlets ovate, 2–2.5 mm. long, 1–1.5 mm. broad at the base, margined with three series of appendages, appendages glochidiate at apex, slightly dilated at base, rarely confluent to form a wing, appendages of the inner series longest, to 1.5 mm. long; dorsal middle area tuberculate.

DISTRIBUTION: Turkestan, Altai, West Pakistan, Kashmir.

West Pakistan: GILGIT AGENCY: Lower Rupal Nullah, Nanga Parbat, 2700 m., R. R. Stewart 18862 (GH).

The three series of appendages at the margin of the nutlets distinguish *Lappula consanguinea* from the closely related species *L. barbata*, which



has two series of appendages on its nutlets. Sometimes the appendages of the outermost series are very short, but they are always conspicuous. The specimen cited above is identical to the specimens collected from Altai and Turkestan. Brand (*l. c.* 1931) gives the distribution of *L. consanguinea* as extending to Eastern Europe, but I did not find any specimen from that area in the European collections.

9. *L. barbata* (M. Bieb.) Gürke in Engl. & Prantl, Nat. Pflanzenfam. IV. 3a: 107. 1893; Brand, Pflanzenr. IV. 252 (Heft 97): 140. 1931 excl. var. *arragonensis*; M. Pop. Fl. URSS. 19: 461. 1953; Riedl in Rechinger, Fl. Iranica 48: 72. 1967.

*Myosotis barbata* M. Bieb. Fl. Taur.-Cauc. 1: 121. 1808.

*Echinospermum barbatum* Lehm. Asperif. 1: 128. 1818; DC. Prodr. 10: 137. 1846; Ledeb. Fl. Rossica 3: 156. 1847; Boiss. Fl. Orient. 4: 250. 1875; C. B. Clarke in Hook. f. Fl. Brit. India 4: 163. 1883.

*Myosotis saxatilis* Pall. Nova Act. Petrop. 306. 1792, *nomen nudum*.

*Echinospermum filiforme* Godet in DC. Prodr. 10: 140. 1846.

*Lappula saxatilis* (Pall.) Kusn. Mat. Fl. Kauk. 4(2): 183. 1930.

TYPE: Habitat in Tauriae montibus calcareis circa Karassubasar et ad Caucasum, without citation of collector's name, *s. n.* (LE).

ICON.: M. Bieb. Cent. Pl. Rar. t. 36. 1810.

Erect annual or biennial, to 65 cm. tall. Stem simple to branched, branches sometimes divaricate; stem and branches covered with white, soft, appressed to subappressed trichomes. Basal leaves numerous, forming a compressed rosette, lanceolate to linear-lanceolate, entire, obtuse to acutish, gradually tapering towards the base, to 7 mm. long and 10 mm. broad, covered on both surfaces with short appressed to subpatent white trichomes, arising from white tuberculate bases; cauline leaves sessile, linear, to 3 mm. broad, in length gradually reduced upwards. Inflorescence axillary or terminal, short in flower, later much elongated. Flowers bracteate, subsessile to short pedicellate; pedicels hairy, erect to 1.5(–2) mm. long in fruit. Calyx divided to the base, lobes linear-oblong, erect, hairy, 2.5–3 mm. long in flower, enlarged to 5 mm. long in fruit. Corolla white to light blue with a white or yellow eye, infundibuliform-campanulate, 3.5–7 mm. in diameter, faucal appendages oblong. Nutlets 3–4 mm. long, margined with two series of appendages, appendages glochidiate at apex; middle area tuberculate or rarely aculeate.

*Lappula barbata* is variable in the size of flower and the length of the marginal appendages of the nutlets. Two varieties may be distinguished.

#### 9a. Var. *barbata*

Corolla 5–7 mm. in diameter; marginal appendages of the nutlets more or less equal in length.



DISTRIBUTION OF VAR: Turkey, Caucasus, Turkestan, Iraq, Iran, Afghanistan.

- 9b. Var. *cariensis* (Boiss.) Brand, Pflanzenr. IV. 252 (Heft 97): 141. 1931; Riedl in Rechinger, Fl. Iranica 48: 72. 1967.

*Echinospermum cariensis* Boiss. Diagn. Pl. Orient. 4: 40. 1844; DC. Prodr. 10: 141. 1846.

*Echinospermum barbatum* (M. Bieb.) Lehm. var. *cariensis* (Boiss.) Boiss. Fl. Orient. 4: 250. 1875.

*Lappula echinata* Gilib. var. *cariensis* O. Kuntze, Acta Horti Petrop. 10: 214. 1887.

TYPE: Hab. Anatolia, in collibus argillosis ad meridiem Cadmi et ad orientem urbis Danisleh, without citation of collector's name, *s. n.* (G).

Corolla 3.5–5 mm. in diameter, marginal appendages of the outer series of nutlets much shorter than those of the inner series.

DISTRIBUTION: Turkey, Syria, Armenia, Iraq, Iran, USSR, Afghanistan, West Pakistan, Kashmir, northwest India.

West Pakistan: CHITRAL STATE: Barum Gol, above Shokor Shal, 3600 m., *Wendelbo s.n.* (BERG). QUETTA DIST.: Urak near Quetta, 1800 m., *R. R. Stewart 602b* (MICH.); near Ziarat, 2500 m., *Kazmi 1672b* (PES), *Rechinger 29392* (W), *Fernandes 6269* (GH); Ziarat, Zarghun, *Santapau 6419* (GH). WAZIRISTAN AGENCY: Razani, 2500 m., *Lester Garland s.n.* (E). Miscellaneous: Scind, *Stocks s.n.* (GH); Baluchistan, *Elliott s.n.* (K).

Kashmir: Mitsahoi on Ladak Road, 3300 m., *R. R. Stewart 9993* (GH); Zaskar, Lagong, 4000 m., *Koelz 5408* (GH, US); Kargia, 4000 m., *Koelz 5454* (GH, US).

10. *L. heteracantha* (Ledeb.) Gürke in Engl. & Prantl, Nat. Pflanzenfam. IV. 3a: 107. 1897; M. Pop. Fl. URSS 19: 427. 1953; Riedl in Rechinger, Fl. Iranica 48: 72. 1967.

*Echinospermum heteracanthum* Ledeb. Suppl. Index Sem. Hort. Dorpat. 3. 1823; Fl. Rossica 3: 157. 1847; DC. Prodr. 10: 137. 1846; Boiss. Fl. Orient. 4: 249. 1875.

*Lappula echinata* Gilib. var. *heteracantha* (Ledeb.) O. Kuntze in Acta Horti Petrop. 10: 214. 1887; Brand, Pflanzenr. IV. 252 (Heft 97): 139. 1931, *pro parte*.

*Echinospermum semicinctum* Stev. Bull. Soc. Nat. Moscou 24: 605. 1851.

TYPE: Habitat in Astrachan, cultivated from the seed collected from Astrachan, without citation of collector's name.

ICON.: Ledeb. in Eichw. Pl. Casp.-Cauc. t. 21. 1831–1833.

Annual or biennial herb, to 50 cm. tall. Stems solitary to many, simple to branched, branches long, divaricate; stem and branches covered with stiff, short or long, usually spreading sometimes subappressed, grayish or white trichomes arising from prominent tuberculate bases; trichomes on



the lower part of the stem falling off with age. Basal leaves usually forming rosettes, oblong, gradually narrowed towards the base, entire, obtuse, 2–7 cm. long, 3–8(–12) mm. broad, covered on both surfaces with stiff, short or long, patent or subpatent grayish trichomes arising from tuberculate bases; cauline leaves gradually reduced in size upwards; upper leaves sessile, broader than the lower ones, acutish. Inflorescence lax, bracteate, much elongated in fruit. Flowers subsessile to short pedicellate; pedicels much elongated in fruit, to 3 mm. long, pubescent, erect, tapering towards the base. Calyx divided to the base, lobes in flower erect, 1.5–2 mm. long, in fruit spreading, to 3.5 mm. long. Corolla light blue with a white or yellowish eye, salverform, 3–4 mm. long, limbs 3–4 mm. diameter; faucal appendages oblong, conspicuous. Nutlets 2–3 mm. long, margined with two series of appendages, appendages glochidiate at their apices, appendages of the outer series much shorter than those of the inner series; middle dorsal and ventral surfaces tuberculate to minutely aculeate.

**DISTRIBUTION:** Eastern Europe, Iran, USSR, Central Asia, West Pakistan, Kashmir, northwest India.

**West Pakistan:** GILGIT AGENCY: Nomal, 1700 m., *R. R. Stewart* 26337 (BM); Naltar, 3000 m., *R. R. Stewart* 26338 (BM); Astor valley, 2700–3000 m., *R. R. Stewart* 22024 (GH); near Chorit, Rupal Nullah, 2700 m., *R. R. Stewart* 22844 (GH, US); Baltistan, Chatpani Nulla, 3500 m., *Duthie* 13859 (K). Miscellaneous: Baluchistan: Sinkachh, *Harsukh* 20594 (K).

**Kashmir:** Zoji Pass, 3300 m., *R. R. Stewart* 21199a (GH), 21247 (GH, US); Zoji Pass to Matayan, 3300 m., *R. R. Stewart* 7403 (K); Dras to Tibet, 3000 m., *Gammie* (3. 8. 1891) *s.n.* (K); Dras to Mistahoi, Ladak Road, *R. R. Stewart* 22340 (GH); Shingo valley near Gulteri, *R. R. Stewart* 22231b (GH). Miscellaneous: Hab. Tibet Occ. Regio temp., 12000–14000 ped., Herb. Ind. Or. Hook. f. & Thoms., *Thomson s.n.* (GH).

11. *L. myosotis* Moench, *Meth.* 417. 1794; Riedl in Rechinger, *Fl. Iranica* 48: 71. 1967.

*Myosotis lappula* L. *Sp. Pl.* 131. 1753.

*Lappula echinata* Gilib. *Fl. Lithuan.* 25. 1781, *nomen illegitimum*.

*Echinosperrum squarrosum* Reichenb. *Fl. Germ. Excurs.* 345. 1834.

*Echinosperrum ispahanicum* Boiss. *Diagn. Pl. Orient.* 11: 123. 1849.

*E. lappula* (L.) Lehm. *Asperif.* 1: 121. 1881.

*Lappula echinata* Gilib. var. *eu-echinata* Brand, *Pflanzenr.* IV. 252 (Heft 97): 138. 1931.

**TYPE:** Habitat in Europae argillosis nudis, ruderatis Herb. No. 180.9 (LINN).

**ICON.:** Reichenb. *Icon. Fl. Germ.* 18: *t.* 128. *fig.* 2 and 7–19. 1858.

Erect annual or biennial herb. Stems solitary or many, usually simple, sometimes branched above; stem and branches covered with short, white trichomes, arising from tuberculate bases. Basal leaves oblong-spathulate, entire, obtuse, gradually or abruptly attenuated into a long petiole, to 7



cm. long and 3–12 mm. broad, covered on both surfaces, loosely or densely, with thin, long, white trichomes, arising from white tuberculate bases; cauline leaves shorter, narrower, acutish. Inflorescence short in flower, later, in fruit, elongated, lax and bracteate. Flowers short pedicellate; pedicels elongated in fruit to 3 mm., erect, hairy. Calyx divided to the base, lobes linear, acutish, hairy, in flower 2–3 mm. long, in fruit narrow-lanceolate, to 4–5 mm. long and 1 mm. broad, spreading to sometimes reflexed. Corolla blue, salverform, ca. 4 mm. long, limbs 3–4 mm. in diameter; faucal appendages oblong. Nutlets 2.5–3 mm. long, margined with two series of appendages, appendages of both series more or less equal in length, glochidiate at apex, middle dorsal area verruculose-granulate, externally more or less tuberculate.

**DISTRIBUTION:** Central and Eastern Europe, Caucasus, Siberia, Aral-Caspian, Dsungare-Tarbagatai, Persia, Afghanistan, West Pakistan, North America.

**West Pakistan:** KURRAM AGENCY: Kurram Valley, *Aitchison* 198 (GH); Reported from: Quetta Dist.: Ziarat, *R. R. Stewart* 600; Urak, *Crookshank* 104; Zarghun, *Crookshank* 368, 384.

The closest relative of *Lappula myosotis* is *L. heteracantha*, from which it may be easily distinguished by the appendages at the margins of the nutlets being essentially equal in length in both series.

#### 16. *Lepechiniella* M. Pop. Fl. URSS 19: 713. 1953.

**TYPE SPECIES:** *L. transalaica* (B. Fedtsch.) M. Pop. (lectotype species).

Annual or perennial herbs. Calyx divided nearly to the base; lobes 5, various, not at all to slightly enlarged in fruit. Corolla white or blue, tubular-infundibuliform, tube short, limbs patent; faucal appendages developed. Stamens included, below the faucal appendages. Gynobase narrowly prismatic, tetragonous. Nutlets appendiculate, at the margins appendages free at base or confluent and forming a marginal wing; nutlets ventrally keeled above the minute sub-basal, areola, attached to the gynobase, free at apex. Style shorter, equalling or little exceeding the apices of nutlets.

Species about 14, distributed from Iran to Central Asia, in mountains.

#### KEY TO THE SPECIES

- a. Flowers white, nutlets appendiculate at the margins, appendages free at base, not forming a marginal wing. . . . . 3. *L. albiflora*.
- a. Flowers blue, nutlets appendiculate at the margins, appendages partly or completely confluent at base, forming a narrow or broad marginal wing.
  - b. Nutlets broadly winged at margins, wings folded inside, inner margins of the wings scarious, entire to sometimes dentate. . . . . 2. *L. microcarpa*.



- b. Nutlets narrowly winged at margins, wings not folded inside, inner margins of the wings not scarious, usually dentate, teeth bearing glochidia at their apices. . . . . 1. *L. inconspicua*.

1. *L. inconspicua* (Brand) Riedl, Oesterr. Bot. Zeitschr. 110: 517. 1963; in K  ie & Rechinger, Biol. Skr. 13(4): 203. 1963; in Rechinger, Fl. Iranica 48: 81. 1967.

*Paracaryum inconspicuum* Brand, Repert. Sp. Nov. 13: 549. 1915; Pflanzenr. IV. 252 (Heft 78): 46. 1921.

TYPE: Afghanistan, *Griffith 5976* (K-holotype, GH-isotype).

ICON.: Riedl, l. c. 48: t. 18. fig. 1. 1967.

Annual, decumbent to ascendent herb. Stems many from the base, up to 20 cm. long, simple to little branched, slender; stem and branches covered with soft, retrorsely appressed to subpatent trichomes ca. 0.2 mm. long, not arising from tuberculate bases. Basal leaves forming a rosette; basal and lower cauline leaves petiolate, petioles up to 20 mm. long, slender, hairy, with some thick, spreading trichomes at the margins to 2 mm. long, lamina oblong-ovate, to 30 mm. long and 15 mm. broad, gradually or sometimes abruptly narrowed towards the base, obtuse to roundish, loosely covered with white, soft, appressed trichomes to 0.2 mm. long on the upper surface, densely so on the lower surface, on the upper surface these intermixed with scattered long, stout, white trichomes arising from tuberculate bases; upper cauline leaves sessile, gradually reduced in size. Inflorescences short in flower, elongated in fruit, bracteate. Pedicels short in flower, elongated in fruit, bracteate. Pedicels in flower 1–2 mm. long, in fruit elongated to 10 mm., slender, hairy, recurved. Calyx divided nearly to the base, lobes 1.5 mm. long, hairy, erect, enlarged in fruit, oblong to broadly lanceolate, 2–3 mm. long, 1 mm. broad, pubescent on both sides and margins. Corolla blue, subtubular, 2 mm. long, lobes broadly ovate, patent; faucal appendages subquadrate. Stamens included; filaments very short, inserted at the middle of the corolla tube. Nutlets not more than 2 mm. long, ovoid, narrowly winged and denticulate at the margins, dorsal middle area tuberculate, tubercles short to long and glochidiate at apex. Style ca. 0.5 mm. long.

DISTRIBUTION: Iran, Afghanistan, West Pakistan.

**West Pakistan:** CHITRAL STATE: Brumboret Gol. N. of Drosh, 1500 m., *Bowes Lyon 647* (BM); *Stainton 2228* (BM); *Harriss 16387* (K); Chitral Mastuj tract, Kaghosi, 1500 m., *Stainton 2403* (BM).

The specimens cited above differ in some minor details from the type (*Griffith 5976*) collected in Afghanistan. In the type specimen the stems, petioles, and pedicels are all densely covered with short trichomes, which are not retrorsely appressed but spreading. Sepals in fruit are 3–4 mm. long, oblong, more or less obtuse at apex. In the specimens cited above the short trichomes on the stems, petioles, and pedicels are evidently re-



trorsely appressed and the sepals in fruit do not usually exceed 2.5 mm. (or rarely) 3 mm. They are broadly lanceolate and acutish at their apices.

Brand (l. c.) and Riedl (l. c.) have considered the species to be annual, but specimens collected by *Stainton* (2403, 2228) appear to me to be perennials. On examining more material from the area the West Pakistan plants may prove to be a variation worthy of recognition.

2. *L. microcarpa* (Boiss.) Riedl, Oesterr. Bot. Zeitschr. 110: 517. 1963; in Køie & Rechinger, Biol. Skr. 13(4): 203. 1963; in Rechinger, Fl. Iranica 48: 80. 1967.

*Paracaryum microcarpum* (Boiss.) Diagn. Pl. Orient. 3: 139. 1856; Fl. Orient. 4: 255. 1875; C. B. Clarke in Hook. f. Fl. Brit. India 4: 162. 1883; Brand, Pflanzenr. IV. 252 (Heft 78): 46. 1921.

TYPE: Afghanistan: Hab. in regio Cabulico circa Choky et in sylvaticis Bharowul, *Griffith* 5975 (K-holotype, GH-isotype).

Perennial, procumbent to ascendent herb. Stems many, 10–45 cm. long, simple or branched; stem and branches covered densely with white, patent trichomes to 2 mm. long, arising from prominent tuberculate bases. Basal leaves petiolate, petioles slender, pubescent to 50 mm. long; lamina oblong-lanceolate to oblong-ovate, entire, obtuse or sometimes acutish, to 50 mm. long and 20 mm. broad, covered on both surfaces with white, long, subappressed or, in the old leaves, more or less patent trichomes arising from white tuberculate bases; cauline leaves subsessile to sessile, gradually reduced in size upwards. Inflorescence short in flower, much elongated in fruit, lax, bracteate. Pedicels very short in flower, elongated to 13 mm. in fruit, slender, hairy, more or less reflexed. Calyx divided nearly to the base, lobes 1.5–2.5 mm. long and ca. 0.7 mm. broad in flower, oblong, erect, densely hairy, in fruit oblong-ovate, obtuse or sometimes acutish, enlarged to 4 mm. long and 1.7 mm. broad, pubescent externally, more or less glabrous inside, reflexed. Corolla blue, campanulate, 3–4 mm. long, tube equalling the limb, lobes broadly ovate, spreading, 1 mm. long, 1.7 mm. broad. Anthers included, inserted below the faucal appendages on the corolla tube. Nutlets brown, ovate, 2 mm. long, ca. 1.5 mm. broad, winged at the margins, wings inflexed and again folded outside, inner margins of the wings scarious, entire or sometimes dentate, middle dorsal area tuberculate, tubercles short (to sometimes long), bearing glochidia at apex, external surface smooth to slightly tuberculate. Style 1 mm. long, exceeding the nutlets by 0.5–0.7 mm.

DISTRIBUTION: Afghanistan, West Pakistan, Kashmir.

West Pakistan: CHITRAL STATE: Ziarat, Lowari Pass, 2500 m., *Stainton* 2558 (BM); Jambatai, *Harriss* 16385 (K); Lowari Pass, *Siddiqui* in R. R. Stewart 25448 (BM). KURRAM AGENCY: Kurram Valley, *Aitchison* 106, 117, 197 (GH). SWAT STATE: mountains east of Kalam, 25 miles above Bahrain, 2200 m.,



*Rodin* 5683 (us); Bahrain to Kolaila, 1600–2200 m., *Lamond* 1761 (E); *Rechinger* 30693 (w). Reported from Baluchistan hills, *Stocks* 738, 758; Fort Sandeman, *Duthie* 18931; *Harsukh* 20601; Khyber Agency, Jamrud hills, *Siddiqui* 2460.

**Kashmir:** Kishenganga Valley, Kiran Nullah, 1800–2000 m., *R. R. Stewart* 17538 (GH); Kiran to Reshna, 1800 m., *R. R. & I. D. Stewart* 17689 (GH); Islampur, *Kazmi* 293a (PES); Chinari, *Kazmi s.n.* (PES). Miscellaneous: Herb. Ind. Or. Hook. f. & Thoms., *Thomson s.n.* (GH). Reported from: Uri, *Meebold* 4237; Padar, *R. R. Stewart* 2916; Ferozpur Nullaha, *Nath* 907.

3. *L. albiflora* Riedl in *Rechinger, Fl. Iranica* 48: 83. 1967.

TYPE: Afghanistan: Kataghan, near Salang, 3000 m., *Neubaur* 4496 (w).

ICON.: Riedl, l. c. t. 16. fig. 12; t. 18. fig. 5. 1967.

Perennial, shrubby herb, to 15 cm. tall. Stems numerous, prostrate, to 25 cm. long, simple or slightly branched, covered loosely or densely with appressed or subpatent trichomes. Basal leaves oblanceolate to spathulate-lanceolate, entire, acute to obtusish, 30–50 mm. long, 3–6 mm. broad, gradually narrowed towards the petioles; petioles  $1/3$ – $1/2$  the length of lamina; lower cauline leaves more or less like the basal leaves, upper cauline leaves abruptly reduced in size, sessile, lanceolate to linear-lanceolate, 12–20 mm. long, 2–4 mm. broad; all the leaves at first densely, later loosely covered with trichomes. Inflorescence usually terminal, rarely lateral, binate or ternate, congested, short in flower, elongated in fruit to 24 cm., bracteate, lower bracts to 9 mm., upper bracts to 2.5 mm. long, linear-lanceolate. Pedicels 1–1.5 mm. long in flower, elongated in fruit to 4.5 mm. Calyx divided to the base, lobes ca. 3 mm. long in flower, enlarged to 5(–5.5) mm. in fruit, 0.5 mm. broad, linear, acute, hairy, trichomes subappressed. Corolla white, infundibuliform-campanulate, 4–4.5 mm. long, tube 1 mm. long, limbs subpatent, 4 mm. in diameter, lobes suborbicular, 2 mm. long; faucal appendages 0.7 mm. long, narrow, rounded at apex. Nutlets 2–2.5 mm. long, ovate-pyramidal, brownish, appendiculate at margins, appendages few, free at base, 0.5–0.8 mm. long, erect, bearing glochidia at apex, dorsal middle area distinctly carinate, otherwise tuberculate. Style 1 mm. long.

DISTRIBUTION: Afghanistan, West Pakistan.

**West Pakistan:** Reported from: Kurram Valley: Mont. Sikaram, 3000 m., *Aitchison* 107 (Riedl, l. c. 48: 83. 1967).

I did not see any specimen of *Lepechiniella albiflora*, but from its original description it appears to be a well distinguished species. In our area it is related to *L. inconspicua* in the size and form of the nutlets, but differs in having much shorter (up to 4.5 mm.) pedicels in fruit, compared to the much longer (to 10 mm.) pedicels in *L. inconspicua*, much longer (5 mm.) and narrower (0.5 mm.) calyx lobes compared to



those of the latter species (2–3 mm. long and 1 mm. broad), and large, white corollas.

Both *Lepechiniella inconspicua* and *L. albiflora* may easily be distinguished from *Lepechiniella microcarpa* by their wings not folded at the margins of the nutlets.

# 17. *Heterocaryum* A. DC. in DC. Prodr. 10: 144. 1846.

*Echinosperrum* Lehm. Sect. 1. *Heterocaryum* (A. DC.) Boiss. Fl. Orient. 4: 247. 1875.

*Lappula* § 2. *Heterocaryum* (A. DC.) Post & Kuntze, Lexicon 216. 1914.

TYPE SPECIES: *H. laevigatum* (Kar. & Kir.) A. DC. (lectotype species).

Annual decumbent or erect herbs. Stem, branches, and leaves covered loosely or densely with trichomes usually arising from tuberculate bases, rarely subglabrous. Inflorescence bracteate, elongating in age. Calyx divided to the base, lobes enlarged in fruit. Corolla infundibuliform to campanulate with 5 distinct trapeziform faucal appendages. Style very short, stigma capitate. Nutlets 4, homo- or heteromorphic, attached to a narrow columnar gynobase throughout their length, not separable, variously appendiculate or aculeate at margins.

Species 7, distributed from Turkey to central Asia.

## KEY TO THE SPECIES

- a. Fruits sessile to indistinctly short pedicellate. . . . . 1. *H. subsessile*.
- a. Fruits distinctly pedicellate, pedicels longer than the fruits, thick, fleshy.
  - b. Plants with few scattered trichomes on the stem and leaf-margins; leaves ovate to oblong-ovate; pedicels usually recurved in fruit; nutlets with two series of appendages at the margins, dorsal middle area pubescent. . . . . 2. *H. laevigatum*.
  - b. Plants usually densely pubescent on stems, branches, and leaves; leaves linear to linear-lanceolate; pedicels usually erect in fruit; nutlets with a single series of appendages at the margins, dorsal middle area not pubescent.
    - c. Plants robust, one pair of the long decurrent nutlets appendiculate at the margins and the middle dorsal area, appendages of the middle area sometimes longer than the marginal ones. . . . . 3. *H. rigidum*.
    - c. Plants weak, one pair of the long decurrent nutlets appendiculate at the margins, middle dorsal area plicate, plicae beaded, smooth, rarely appendiculate, appendages (if present) always shorter than the marginal ones. . . . . 4. *H. szovitsianum*.

- 1. *H. subsessile* Vatke, Zeitschr. Ges. Naturw. 11: 129. 1875; Riedl in Rechinger, Fl. Iranica 48: 85. 1967.

*Echinosperrum oligacanthum* Boiss. Fl. Orient. 4: 248. 1875, non Ledeb. 1846–1851.



*Lappula echinophora* var. *sessilis* O. Kuntze, Acta Horti Petrop. 10: 215. 1887.  
*Cynoglossospermum oligacanthum* (Boiss.) O. Kuntze, Rev. Gen. Pl. 2: 436. 1891.

*Echinospermum echinophorum* (Pall.) Bernm. var. *sessile* Lipsky, Acta Horti Petrop. 26: 539. 1910.

*Heterocaryum echinophorum* (Pall.) Brand var. *oligacanthum* (Boiss.) Brand, Pflanzenr. IV. 252 (Heft 97): 95. 1931.

*Heterocaryum oligacanthum* (Boiss.) Bornm. Beih. Bot. Centralbl. 59-B: 306. 1939; M. Pop. in Fl. URSS. 19: 546. 1953.

TYPE: In Persia orientali prope Shahrud et Ssertschah, *Bunge s.n.* (B).

Annual, erect herb to 35 mm. tall. Stems simple or divaricately branched; stem and branches pubescent, trichomes stiff, spreading. Basal and lower cauline leaves short petiolate, linear to linear-lanceolate, obtuse to acutish, 10–40 mm. long, 1–3 mm. broad, covered on both surfaces with stiff, appressed to patent, white trichomes arising from tuberculate bases, upper cauline leaves sessile, shorter, and narrower. Inflorescence leafy, short in flower, much elongated in fruit. Flowers sessile, fruits subsessile to very short (to 1.5 mm.) pedicellate. Calyx divided to the base, lobes in flower ca. 1 mm. long, linear, in fruit enlarging to ca. 5 mm. long, 1 mm. broad. Corolla blue, campanulate, ca. 2 mm. long. Fruits narrowly prismatic, 3–(4–5) mm. long, 2–3 mm. in diameter; nutlets heteromorphic, one pair of opposite nutlets longer, decurrent to the short pedicel, ca. 3.5 mm. long, 0.5–0.7 mm. broad, bearing 2–3 appendages at the lateral margins and 3–6 at apex, appendages 1–2 mm. long, glochidiate at apex, middle dorsal area longitudinally plicate, plicae swollen, beaded, glabrous or rarely with 1 or 2 prickles; the other pair of nutlets, excluding wings 2–2.5 mm. long, 0.5–1 mm. broad, not decurrent to the pedicels, bearing usually 2 appendages on the lateral margins and one at apex, appendages 1–2.5 mm. long, broadly triangular, confluent at base, forming marginal wings 0.2–1 mm. broad, puberulous, glochidiate at apex; wings dentate to aculeate at the margins, puberulous on both surfaces; dorsal middle area carinate, glabrous or sometimes slightly tuberculate to aculeolate. Style conspicuous, ca. 0.3 mm. long, stigma capitate.

DISTRIBUTION: Iran, Afghanistan, Turkestan, Pamir Alaj, West Pakistan.

West Pakistan: KALAT STATE: Chauki Guru, between Kalat and Mastung, *Jafri & Akbar 1820* (E). QUETTA DIST.: Chiltan mountains, between Dulai and Kanak, 1600 m., *Kazmi 1547* (PES); *Rechinger 29101* (W); Quetta to Chaman, 30 km. northeast of Quetta, low stony slopes, *Lamond 958b* (E).

2. *H. laevigatum* (Kar. & Kir.) DC. Prodr. 10: 145. 1846; Ledeb. Fl. Rossica 3: 164. 1847; Brand, Pflanzenr. IV. 252 (Heft 97): 97. 1931; M. Pop. in Fl. URSS. 19: 539. 1953; Riedl in Rechinger, Fl. Iranica 48: 88. 1967.

*Echinospermum laevigatum* Kar. & Kir. Bull. Soc. Nat. Moscou 15: 411. 1842; Bunge in Reliq. Lehm. 411. 1851; Boiss. Fl. Orient. 4: 248. 1875.



TYPE: In montosis apricis Songoriae ad rivulum Ai, nec non in fossis arenosis, prope fontem Sassyk-pastan, *Karelin & Kiriloff s.n.* (LE-holotype, GH-isotype).

ICON.: M. Pop. l. c. 19: t. 26. fig. 2. 1953.

Annual herb to 40 cm. tall. Stem simple or divaricately branched, glabrous or with few scattered, short, subappressed trichomes. Basal leaves few, ovate, subsessile, 15–20 mm. long, 8–12 mm. broad; lower cauline leaves, sessile, oblong-ovate, obtuse, 20–30 mm. long, 6–10 mm. broad, lower surface usually glabrous, upper surface, (especially at the margins) with few, scattered, short, soft, white trichomes arising from minute tuberculate bases; upper cauline leaves similar to the lower, shorter, narrower and acutish. Inflorescence short in flower, later much elongated, bracteate, bracts small. Pedicels 1–3 mm. long in flower, to 16 mm. long in fruit, horizontally patent or later recurved. Calyx divided to the base, ca. 1.5 mm. long in flower, enlarged in fruit, ca. 2.5 mm. long. Corolla blue, minute. Fruits ovoid, to 6 mm. long; nutlets 4, strongly heteromorphic, one pair of opposite nutlets much larger than the other, all nutlets similar in shape and bearing two series of appendages at their margins, the outer series composed of 3–4(–5) appendages at the lateral margins and one at the apex, sometimes with one or two very small ones between, appendages more or less dilated at base, 0.5–2 mm. long, reduced in length from the base of the nutlet to the apex, glochidiate at apex; inner series composed of numerous closely set appendages, not exceeding 0.5 mm. in length, more or less dilated at base, sometimes confluent and forming a narrow lacerated wing, dorsal middle area densely pubescent, carinate. Style very short; stigma capitate.

DISTRIBUTION: Iran, Afghanistan, USSR, West Pakistan.

West Pakistan: QUETTA DIST.: Sheila Bagh, on rocky slopes, *Kazmi 1538b* (PES); between Bostan and Saran Tangi, 1800 m., *Kazmi 1503b* (PES); *Rechinger 29196* (W).

The presence of two series of appendages at the margin and the densely pubescent middle dorsal area of the nutlets of *Heterocaryum laevigatum*, distinguish this species from all the others in our area.

3. *H. rigidum* DC. Prodr. 10: 145. 1846; Ledeb. Fl. Rossica 3: 163. 1847; M. Pop. Fl. URSS 19: 540. 1953; Riedl in Rechinger, Fl. Iranica 48: 87. 1967.

*Echinosperrum heterocaryum* Bunge in Mem. Acad. Sci. St. Pétersb. 7: 411. 1854.

*E. szovitsianum* Boiss. Fl. Orient. 4: 248. 1875, *pro parte* non Fisch. & C. A. Mey. 1835.

*E. minimum* sensu C. B. Clarke in Fl. Brit. India 4: 162. 1883, non Lehm.

*Heterocaryum echinophorum* (Pall.) Brand var. *minimum* (Lehm.) Brand Pflanzenr. IV. 252 (Heft 97): 95. 1931, *pro parte*.



TYPE: *Sibiria altaica orientalis*, *Karelin & Kiriloff 1951* (g-isotype).

ICON.: M. Pop. l. c. t. 26. fig. 3. 1953.

Annual, erect or decumbent herb, branched above the base, 15–36 cm. tall. Stem and branches brown, to 2 mm. in diameter, covered with antrorsely appressed, white trichomes to 0.5 mm. long, intermixed with stiff, patent trichomes, arising from tuberculate bases, 1–1.3 mm. long. Basal leaves sessile, linear, to 40 mm. long and 5 mm. broad, obtuse, covered loosely on both surfaces with white, stiff, patent trichomes 0.5–1.3 mm. long, arising from tuberculate bases; middle and upper cauline leaves similar to the basal ones, shorter and narrower. Inflorescence short in flower, much elongated in fruit, bearing fruits 5–15 mm. apart. Pedicels very short in flower, elongated in fruit to 10 mm., 1 mm. thick, gradually attenuated towards the base. Calyx divided to the base, lobes 1.5–2 mm. long, hairy, elongated in fruit to 3–5 mm. Corolla blue, campanulate, 2–2.5 mm. long, slightly exceeding the calyx. Fruits ovoid, 5–6 mm. long, 3–4 mm. broad; nutlets 4, heteromorphic, one pair of opposite nutlets oblong, ca. 5 mm. long, 1–1.5 mm. broad, decurrent to the pedicel, bearing 3–5 appendages at the lateral margins, 3–5 at their apices, dorsal middle area with two to three parallel rows of 3–7 appendages, appendages to 1.5 mm. long, not at all to slightly dilated at base, puberulous on the lower half, bearing glochidia at apex; nutlets of the other opposite pair, ovate, 3–4 mm. long, 1.5–2 mm. broad, not decurrent, bearing 3–4 appendages on the lateral margins, 1–3 at apex and 1 at base, appendages 0.5–1.5 mm. long, dilated at base, sometimes confluent, forming a narrow wing, glochidiate at apex, dorsal middle area carinate, tuberculate to minutely aculeate, not appendiculate; both types of nutlets usually tuberculate externally. Style very short, stigma capitate.

DISTRIBUTION: Iran, Afghanistan, USSR, West Pakistan.

West Pakistan: PESHAWAR DIST.: Peshawar, *Deane s.n.* (K). QUATTA DIST.: Khanai, 1800 m., *Duthie s.n.* (K); Sariat Road, 5 km. from Quetta, *Lamond 926* (E); Quetta, Pishni forest nursery and surroundings, *Kazmi 1435b* (PES). RAWALPINDI DIST.: Hurroo, *Aitchison 1085* (K).

*Heterocaryum rigidum* is closely related to *H. szovitsianum* from which it is distinguished by its decurrent pair of opposite nutlets which are appendiculate in the middle dorsal area, with appendages more or less the same as those on the margins.

4. *H. szovitsianum* (Fisch. & C. A. Mey.) DC. Prodr. 10: 145. 1846; Ledeb. Fl. Rossica 3: 163. 1847; M. Pop. Fl. URSS 19: 546. 1953; Riedl in Rechinger, Fl. Iranica 48: 86. 1967.

*Echinospermum szovitsianum* Fisch. & C. A. Mey. Index Sem. Hort. Petrop. 2: 36. 1835; Boiss. Fl. Orient. 4: 247. 1875, *pro parte*.

*Heterocaryum pachypodum* DC. Prodr. 10: 144. 1846.

*H. pachypodum* DC. var. *kotschyianum* DC. Prodr. 10: 145. 1846.



*H. minimum* (Lehm.) DC. var. *Szovitsianum* Regel, Acta Horti Petrop. 6: 344. 1880.

*Lappula echinophora* var. *szovitsiana* O. Kuntze, Acta Horti Petrop. 10: 214. 1887.

*L. echinophora* var. *pachypoda* O. Kuntze, *Ibid.*

*L. szovitsiana* (Fisch. & Mey.) Druce, List Brit. Pl. 50. 1908.

*Heterocaryum echinophorum* (Pall.) Brand var. *minimum* (Lehm.) Brand, Pflanzenr. IV. 252 (Heft 97): 95, 96. 1931, *pro parte*.

*H. echinophorum* (Pall.) Brand var. *pachypodum* (DC.) Brand, *loc. cit.* 96.

TYPE: In Persia boreali ad marginis agrorum, *Szovits s.n.* (LE).

ICON.: M. Pop. l. c. 19: t. 26. fig. 1. 1953.

Annual, erect to subdecumbent branched herb, to 30 cm. tall. Stem and branches covered with stiff, usually patent to sometimes subappressed trichomes to 1.5 mm. long. Basal leaves linear, oblong-spathulate or sometimes ovate, obtuse, petiolate, petioles equalling the lamina, (including petioles) 10–30 mm. long, 3–6 mm. broad, covered loosely on both surfaces with stiff, usually patent, white trichomes to 1.5 mm. long, arising from tuberculate bases; cauline leaves sessile, lanceolate to linear-lanceolate, obtuse, to 40 mm. long and 7 mm. broad; upper cauline leaves shorter and narrower. Inflorescence leafy, elongating in age; pedicels 1–3 mm. long in flower, elongated in fruit to 11 mm., hairy. Calyx divided to the base, lobes 3–4 mm. long and 0.5 mm. broad in flower, linear, enlarging in fruit to 11 mm. long and 1.5 mm. broad. Corolla blue, campanulate 2.5–3.5 mm. long. Fruits ovoid, 4–8 mm. long, to 5 mm. broad; nutlets 4, heteromorphic, one pair of opposite nutlets, oblong, decurrent to the pedicel, 6–7 mm. long, 1–1.5 mm. broad, bearing 2–4 appendages at the lateral, thickened margins and 1–5 at the apices, appendages 0.5–1 mm. long, distant, not dilated at base, glochidiate at apex, dorsal middle area carinate, plicate, plicae swollen irregularly at places, glabrous; the other pair of opposite nutlets not decurrent, nutlets oblong, 5–6 mm. long, ca. 1.5 mm. broad, bearing 4–5 appendages at the lateral margins and usually 1 at apex, appendages 1–3 mm. long, much dilated and confluent at base, forming an irregular wing up to 1 mm. broad, glochidiate at apex, marginal wing and lower part of appendages pinkish brown, puberulous; dorsal middle area carinate, tuberculate, tubercles arranged longitudinally, glabrous or puberulous, rarely aculeolate. Style short, stigma capitate.

DISTRIBUTION: Turkey, Syria, Iraq, Iran, south and southwest USSR, Tien Shan, Afghanistan, West Pakistan, Kashmir.

West Pakistan: CHITRAL STATE: Birmogh Lasht, 2600 m., *Bowes Lyon 719* (BM); Drosh, 1200 m., *Stainton 2271* (BM). QUETTA DIST.: Pishni Forest Nursery and surrounding fields, *Kazmi 1425* (PES); environ de Quetta, *Schmid 1568* (MICH); Ziarat to Manna, 2600 m., *Jafri & Akbar 2192* (E). Reported from: NORTH WAZIRISTAN AGENCY: Datta Khel, *Blatter & Fernandes s.n.*

Kashmir: Miscellaneous: Himal. Bor. Occ., 6000 ped., Herb. Ind. Or. Hook. f. & Thoms., *Thomson s.n.* (GH). Reported from: Sumbal, *Meebold 4197*.



Riedl (in Rechinger, Fl. Iranica 48: 89. 1967) has described *Heterocaryum*  $\times$  *irregulare*, a hybrid between *H. rigidum* DC. and *H. macrocarpum* Zak. The new hybrid is based on a specimen (Kabul, Sher Darwasa, 1840m., Gilli 3158) collected in Afghanistan while the only other specimen cited is (Quetta, Sariab, 1700 m., Rechinger 28840) from West Pakistan. I did not see Rechinger 28840 but have examined Kazmi 1435b and Lamond 926, which were collected at the same time and from the same locality with Professor Rechinger. These specimens are *H. rigidum* and show no affinity with *H. macrocarpum*. Moreover, as I did not find the other parent in this area, the presence of the hybrid in West Pakistan appears to be quite doubtful.

[To be continued]





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