

### 33. LAPPULA Moench, Methodus 416. 1794.

鹤虱属 he shi shu

*Echinosperrum* Sweet ex Lehmann.

Plants annual or biennial, rarely perennial, pilose, strigose, rarely sericeous throughout, hairs tuberclelike or discoid at base. Leaves alternate. Inflorescence a drepanium, elongated after anthesis, bracteate. Calyx 5-parted nearly to base; lobes frequently enlarged in fruit. Corolla light blue, rarely white, campanulate or low salverform; tube short; throat appendages 5, trapeziform; limb 5-parted. Stamens included. Ovary globose, 4-parted. Style not exerted; stigma capitate. Gynobase subulate veined, ca. as long as or surpassing nutlets, rarely shorter. Nutlets 4, adherent to gynobase by entire adaxial rib or only by rib base, erect, homomorphic or heteromorphic; margin of abaxial surface usually with 1(–3) rows of glochids; bases of glochids separated or contiguous or confluent into a wing, rarely reduced to tubercles.

About 61 species: temperate regions of Africa, Asia, Europe, and North America; 36 species in China.

- 1a. Gynophore free end (vertical part of gynobase) rising above nutlets as thick tetrahedral mucro with short style at apex.
  - 2a. Nutlets 3–5 mm, lustrous, stonelike, tuberculate, with thick walls and without ribs or disc or anchorlike tip on tubercles ..... 1. *L. spinocarpos*
  - 2b. Nutlets 2–3 mm, finely tuberculate, with very short glochids on margin of inconspicuous disc, without glochids on margin of well-developed disc.
    - 3a. Calyx lobes exceeding fruit; pedicel always straight ..... 3. *L. occultata*
    - 3b. Calyx lobes short, appressed to base of much longer fruit; pedicel declining, sometimes recurved ..... 2. *L. sinaica*
- 1b. Gynophore entirely hidden between nutlets (gynophore should not be confused with the thin style sometimes elevated above nutlets as in *L. brachycentra* and *L. microcarpa*).
  - 4a. Developed nutlets 1, the other 3 aborting ..... 31. *L. monocarpa*
  - 4b. Developed nutlets 4.
    - 5a. Disc of nutlets narrow and nearly closed, marginal parts of nutlets involute on disc.
      - 6a. Glochids on margin of disc ca. 0.5 mm ..... 4. *L. balchaschensis*
      - 6b. Glochids on margin of disc ca. 1.5 mm ..... 5. *L. deserticola*
    - 5b. Disc of nutlets well developed, marginal parts of nutlets not involute on disc.
      - 7a. Disc margin of all or (1 or) 2 nutlets with well-developed mostly broad wing.
        - 8a. Perennial herbs.
          - 9a. Herbs forming small tufts of leaf rosettes, with several or sometimes many lateral ascending stems; nutlets 5–7 mm across ..... 33. *L. transalaica*
          - 9b. Cespitose herbs, with 1 or 2 straight stems; nutlets ca. 3 mm across ..... 15. *L. caespitosa*
        - 8b. Biennial or annual herbs (when uncertain, stems straight, tall).
          - 10a. Nutlet with entire wing, pubescent or not.
            - 11a. Nutlets tuberculate, densely pubescent, without prickles ..... 32. *L. lasiocarpa*
            - 11b. Nutlets neither tuberculate nor pubescent, 2 nutlets with a single row of marginal glochids ..... 30. *L. alata*
          - 10b. Nutlet with dentate wing, not pubescent.
            - 12a. Biennial or ?perennial herbs, with well-developed lateral rosette of leaves; stems (2 or) 3–5, few branched or not, straight ..... 27. *L. ferganensis*
            - 12b. Annual herbs without rosette of leaves after anthesis; stems usually branched.
              - 13a. All nutlets homomorphic, with narrow wings to 1 mm, sometimes 1 nutlet wingless, disc of nutlets granulose ..... 19. *L. granulata*
              - 13b. Nutlets heteromorphic, 2 with leathery wings and 2 with 2 rows of glochids on disc margin.
                - 14a. Corolla limb (5–)5.5–6 mm ..... 34. *L. lipskyi*
                - 14b. Corolla limb 2.5–3.5(–4) mm.
                  - 15a. Marginal glochids in 2 rows, uniform in length ..... 29. *L. heteromorpha*
                  - 15b. Marginal glochids in 1 row, some short glochids forming a second row near base of nutlets ..... 28. *L. anocarpa*
        - 7b. Disc margin of nutlets without well-developed wing, marginal prickles of disc sometimes widened and confluent into a very narrow winglike border.
          - 16a. Style projecting 1–1.5 mm above nutlets, filiform, persistent at fruiting.
            - 17a. Prickles along disc margin 0.5–0.9 mm, mostly developed in 1 row (sometimes a second row of prickles 0.1–0.2 mm, with very small tubercles and anchorlike tips) ..... 10. *L. microcarpa*
            - 17b. Prickles along disc margin 0.1–0.2 mm or absent and replaced by tubercles ..... 11. *L. brachycentra*

- 16b. Style hidden among apices of nutlets or projecting less than 0.5 mm above nutlet.
- 18a. Disc margin of nutlets with only 1 row of glochids (sometimes a medial row of glochids present).
- 19a. Perennial caespitose herbs, with several to many stems, branched only above  
..... 15. *L. caespitosa*
- 19b. Annual or rarely biennial herbs.
- 20a. Corolla sky blue, limb 5–8 mm ..... 35. *L. macrantha*
- 20b. Corolla blue or white, limb to 3.5 mm.
- 21a. Corolla white; nutlets with marginal glochids to 0.5 mm, disc with 1 or 2 medial rows of glochids on tubercles ..... 6. *L. macra*
- 21b. Corolla blue or white-blue; nutlets with longer marginal glochids or disc finely tuberculate.
- 22a. Heteromorphic nutlets present, 2 with short glochids, 2 with longer glochids; homomorphic nutlets sometimes also present.
- 23a. All nutlets heteromorphic, disc and adaxial surface smooth  
..... 16. *L. karelinii*
- 23b. Nutlets in lower part of inflorescences homomorphic, disc and adaxial surface tuberculate ..... 13. *L. duplicicarpa*
- 22b. All nutlets homomorphic.
- 24a. Marginal glochids slender, 0.5–0.9 mm ..... 9. *L. tenuis*
- 24b. Marginal glochids 1–2.5(–4.5) mm.
- 25a. Marginal glochids 1–2 mm; plants branched mainly on upper part of stems.
- 26a. Plants 25–40(–50) cm high; marginal spines 1–1.2 mm, disc not keeled ..... 8. *L. intermedia*
- 26b. Plants 15–20(–30) cm high; marginal spines ca. 1.5 mm, disc with protruding keel ..... 7. *L. stricta*
- 25b. Marginal glochids 2–2.5(–4.5) mm; plants usually branched basally.
- 27a. Marginal glochids hollow, terete ..... 36. *L. physacantha*
- 27b. Marginal glochids solid, or subglobose.
- 28a. Pedicel 1.5–4 mm, usually curved; nutlets 3.5–4 mm excluding prickles ..... 12. *L. semiglabra*
- 28b. Pedicel to 1 mm, straight; nutlets ca. 3 mm excluding prickles ..... 14. *L. patula*
- 18b. Disc margin of nutlets with 2 or 3 rows of glochids.
- 29a. Perennial herbs; stems several, 7–15 cm tall, ascending; basal leaves numerous, forming a rosette; glochids on disc 0.2–0.5 mm.
- 30a. Herbs silvery sericeous; basal leaves linear to filiform, to 4 cm × 1–2 mm; corolla ca. 5 mm; center line of disc of nutlet without glochids ..... 20. *L. sericata*
- 30b. Herbs green-gray pilose; basal leaves spatulate, to 3 cm × 2–4 mm; corolla 2–2.5 mm; center line of disc of nutlet with glochids ..... 21. *L. himalayensis*
- 29b. Biennial or annual herbs; stems few, usually 30–45 cm tall; basal leaves few, rarely forming a rosette; glochids on disc 1–3 mm, rarely smaller.
- 31a. Biennial herbs; corolla with spreading limb, 4–6(–8) mm across.
- 32a. About 2/3 of adaxial angle of nutlets affixed to gynobase; gynobase longer than nutlets ..... 25. *L. ramulosa*
- 32b. Entire adaxial angle of nutlets affixed to gynobase; gynobase shorter than nutlets.
- 33a. Corolla sky blue, limb to 6–8 mm across, throat appendages blue or dark blue ..... 22. *L. tianschanica*
- 33b. Corolla blue, limb to 4–5 mm across, throat appendages white, yellowish in herbarium specimens.
- 34a. Glochids on disc numerous but short, glochids of main row on margin of disc 1–1.5 mm; herbs to 30(–35) cm tall ..... 24. *L. pratensis*
- 34b. Glochids on disc usually 3 along center line, to 1 mm, glochids of main row on margin of disc 1.5–2.5 mm; herbs to 40–45 cm tall ..... 23. *L. tadshikorum*
- 31b. Annual herbs; corolla with campanulate limb, 2–3.5(–4) mm across.
- 35a. Calyx lobes stellate spreading in fruit, elongated to at least 7–8 mm;

- leaves light green or green, with sparse spreading hairs on large white tubercles; main marginal glochids with large anchorlike tip ..... 8. *L. intermedia*
- 35b. Calyx lobes spreading in fruit, not stellate, elongated to 4–5 mm; leaves usually densely appressed pubescent, grayish green; marginal glochids with small anchorlike tip.
- 36a. Upper part of nutlets separated by deep oval or elliptic pit; style protruding above nutlets (excluding glochids) 0.5–1 mm ..... 26. *L. consanguinea*
- 36b. Upper part of nutlets without pit; style protruding above nutlets to 0.2–0.3 mm.
- 37a. Main marginal prickles widened basally, confluent near base, 0.4–1.5(–2) mm ..... 18. *L. shanhsiensis*
- 37b. Main marginal prickles all separated, 1.5–2 mm (or more) ..... 17. *L. myosotis*

**1. *Lappula spinocarpos*** (Forsskål) Ascherson ex Kuntze, *Trudy Imp. S.-Peterburgsk. Bot. Sada* 10: 215. 1884.

石果鹤虱 shi guo he shi

*Anchusa spinocarpos* Forsskål, *Fl. Aegypt.-Arab.* 41. 1775; *Echinosperrum spinocarpos* (Forsskål) Boissier; *E. vahlianum* Lehmann; *Sclerocaryopsis spinocarpos* (Forsskål) Brand.

Herbs annual. Stems erect, frequently branched from base or above middle, 3–12 cm tall, densely short appressed white pubescent; branches ascending. Basal leaves grayish green, spatulate-linear, to 3 cm × 4 mm, strigose, hairs discoid at base, base attenuate, apex obtuse; stem leaves smaller. Pedicel short, stout. Calyx lobes 3–4 mm, to 5–6 mm in fruit, minutely hispid. Corolla blue-purple, 3–4 mm; limb appendaged below throat. Gynobase subulate, surpassing nutlets by ca. 1.5 mm. Style short, exceeding gynobase. Nutlets gray-white, ovoid, 3.5–4 mm, pericarp firm, shiny; adaxially coherent to gynobase by entire rib, not easily separated; disc expanded at base, lower part with a few rudimentary glochids. Fl. May–Jun, fr. Jun–Jul.

Marshes, *Anabasis* and *Nanophyton* thickets, occasionally mountain terraces. Xinjiang (Zhungeer Basin) [Afghanistan, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW and W Asia, E Europe].

**2. *Lappula sinaica*** (de Candolle) Ascherson & Schweinfurth, *Mem. Inst. Egypt* 2: 111. 1887.

短萼鹤虱 duan e he shi

*Echinosperrum sinaicum* de Candolle in A. de Candolle, *Prodr.* 10: 141. 1846; *E. divaricatum* Bunge, *E. kotschyii* Boissier.

Herbs annual. Stems erect or ascending, frequently branched from base, 15–40 cm tall, gray strigose or hispid, hairs white, tuberclelike at base. Basal leaves petiolate, oblong to oblong-lanceolate, 1.5–5 × 0.5–1.5 cm, sparsely short hispid, base attenuate, margin entire, apex obtuse; stem leaves sessile, shorter, narrower. Inflorescences elongated in fruit, usually 1- or 2-bracted. Fruiting pedicel erect, stout, 2–3 mm. Calyx lobes erect, oblong to linear, 1.5–2.5 mm, short hispid, hairs discoid at base, not enlarged in fruit, shorter than nutlets, subtending base of fruit. Corolla light blue, campanulate, ca. 3 mm; limb 2.5–3 mm wide. Gynobase surpassing nutlets by ca. 1 mm. Nutlets 2.5–3.5 mm; disc

narrowly oblong, densely granulose, margin prominent becoming a narrow rib, with a single sparse row of extremely short glochids or sometimes finely tuberculate; lateral surfaces tuberculate.

Fields, waste places. Xinjiang [Afghanistan, NW India, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; NE Africa, SW Asia].

**3. *Lappula occultata*** Popov, *Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR* 14: 331. 1951.

隐果鹤虱 yin guo he shi

*Lappula sinaica* (A. de Candolle) Ascherson & Schweinfurth var. *occultata* (Popov) Pavlov.

Herbs annual. Stems erect, frequently branched above, 30–40 cm tall, gray strigose. Basal leaves narrowly spatulate to oblanceolate, 3–7 cm × 3–5 mm, sparsely short gray strigose, base attenuate into a long petiole, apex obtuse; stem leaves sessile, linear-lanceolate to oblong, sometimes flexed along midvein. Inflorescences to 7–18 cm in fruit; bracts linear, shorter than nutlets. Fruiting pedicel erect, 2–5 mm. Calyx lobes erect, linear, 3–3.5 mm, to 4 mm in fruit, enclosing nutlets. Corolla light blue; tube slightly longer than calyx; throat appendages trapeziform, 0.6–0.8 mm; limb 5-parted; lobes spreading horizontally, 5–6 mm wide. Gynobase surpassing nutlets by ca. 0.5 mm. Fruit 2.5–3 mm, apex truncate; nutlets ovoid, shiny; disc oblong-ovate, densely rounded granulose, center line keeled, margin prominent and forming a narrow rib; lateral surfaces granular.

Exposed, rocky slopes; ca. 1400 m. Xinjiang (Yuli Xian) [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**4. *Lappula balchashensis*** Popov ex Pavlov, *Bot. Zhurn. SSSR* 30(4): 190. 1945.

密枝鹤虱 mi zhi he shi

Herbs annual, much branched, crowded, becoming globose, 4–8 cm tall, densely spreading white hispid. Basal leaves forming a rosette; leaf blade spatulate, ca. 1.5 mm, base attenuate into a long petiole, apex rounded; stem leaves linear-lanceolate, rarely spatulate, 2–2.5 cm × ca. 3 mm, spreading white hirsute, apex obtuse to mucronate. Inflorescences terminal, short, crowded; bracts linear-lanceolate. Fruiting pedicel ca. as long as calyx or slightly

shorter, erect to somewhat ascending. Calyx 5-parted; lobes oblong-linear, ca. 2 mm, to 3.5 mm in fruit, subtending nutlets. Corolla light blue, campanulate, 2.5–3 mm; tube ca. as long as calyx; limb ca. 1 mm wide; lobes vertical, suborbicular. Gynobase ca. as long as nutlets. Fruit subglobose, 2.5–3 mm; nutlets narrowly ovoid; adaxially shiny, wrinkled; disc narrow, small, white granulate; margin thick, prominent, ca. 0.5 mm wide, usually revolute, with a single row of glochids 3 or 4 each side; basal pair of glochids ca. 1 mm, spreading outward, slightly widened at base.

Deserts, semideserts; ca. 1400 m. Xinjiang (Turpan Xian) [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**5. *Lappula deserticola*** C. J. Wang, Bull. Bot. Res., Harbin 1(4): 81. 1981.

沙生鹤虱 sha sheng he shi

Herbs annual, densely caespitose, becoming depressed globose, 4–10 cm in diam. Stems usually several, caespitose, much branched at middle and above, 3–7 cm tall, densely spreading white hispid. Basal leaves forming a rosette; leaf blade spatulate, 1–1.3 cm including petiole, densely spreading hirsute, hairs discoid at base; stem leaves linear, 1–1.5 cm × ca. 2.5 mm, flexed along midvein, rarely flat, densely spreading white hirsute, base attenuate, apex acute. Inflorescences terminal, to 1.5–3 cm in fruit; bracts oblong, 3–5 mm. Fruiting pedicel erect, 1–1.5 mm. Calyx lobes erect, linear-oblong, ca. 1.5 mm, to 2–2.5 mm in fruit, 1/2–2/3 shorter than fruit, spreading white hirsute. Corolla light blue, campanulate, ca. 2.5 mm; throat appendages trapeziform, ca. 0.2 mm; limb 1–1.5 mm wide; lobes oblong. Gynobase not surpassing nutlets. Fruit subglobose, ca. 3 mm in diam.; nutlets triangular-ovoid, 2.5–3 mm; adaxially shiny, coherent to gynobase along 1/2 rib; disc narrow, sparsely granulate, margin thickened, forming a riblike wing; wing involute, usually covering apex of disc, with 4 or 5 marginal glochids along each side; glochids widened at base but not contiguous, basal pair 1.5–2 mm, gradually reduced toward apex of nutlet, smooth. Fl. and fr. May–Jun.

• Deserts. Gansu (W Hexi Corridor), Nei Mongol (Alxa Youqi).

**6. *Lappula macra*** Popov ex Pavlov, Bot. Zhurn. SSSR 30(4): 190. 1954.

白花鹤虱 bai hua he shi

Herbs annual. Stems frequently branched from base, 15–20 cm tall, pubescent. Basal leaves linear-spatulate, ca. 1.5 cm × 3–4 mm, pubescent; stem leaves sessile, oblong-linear, 1–2 cm × 3–5 mm, abaxially densely minutely hispid, hairs discoid at base, adaxially glabrous or sparsely short hispid, apex obtuse. Inflorescences to 7 cm in fruit, lax; bracts linear to narrowly ovate, slightly longer than fruit. Fruiting pedicel 0.5–1.5 mm. Calyx 5-parted; lobes linear, short hispid, enlarged, ca. 3 mm, longer than fruit. Corolla white, narrowly campanulate, ca. 2 mm; limb shorter than tube. Style not surpassing nutlets. Nutlets narrowly triangular-ovoid, ca. 2 mm, adaxially glabrous or with a few tubercles at base; disc narrowly ovate, with 1(–3) rows of glochids or finely tuberculate on middle, with 1 row of marginal glochids 0.2–

0.5 mm.

Deserts, arid slopes. Xinjiang [Kazakhstan, Mongolia].

**7. *Lappula stricta*** (Ledebour) Gürke in Engler & Prantl, Nat. Pflanzenfam. 4(3a): 107. 1897.

劲直鹤虱 jin zhi he shi

Herbs annual. Stems erect, usually branched below, 15–30 cm tall, spreading or subappressed, white hispid; branches ascending; stem leaves oblong to linear, 1–3.5 cm × 2–5 mm, spreading hirsute, hairs discoid at base, usually flexed along midvein, rarely flat, apex obtuse. Inflorescences terminal, to 5–8 cm in fruit; bracts linear. Fruiting pedicel ca. 3.3 mm, erect. Calyx 5-parted; lobes spreading, linear, ca. 2.5 mm, 4–5 mm in fruit. Corolla blue-purple, campanulate, ca. 3 mm; tube ca. as long as calyx; limb spreading horizontally, 2.5–3 mm wide. Style ca. 0.5 mm, slightly surpassing nutlets. Nutlets oblong-ovoid, ca. 3 mm, adaxially wrinkled-tuberculate; disc narrowly lanceolate, center line keeled, with a single row of marginal glochids; glochids erect, rarely spreading horizontally, 1.2–2 mm, somewhat widened and contiguous toward nutlet base.

Roadsides, farms, hillside meadows, deserts, arid canyons. Gansu, Nei Mongol, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Tajikistan, Turkmenistan, Uzbekistan].

- 1a. Abaxial surface of nutlet granulate, adaxially wrinkled-tuberculate ..... 7a. var. *stricta*
- 1b. Adaxial and abaxial surfaces of nutlet glabrous and shiny ..... 7b. var. *leiocarpa*

**7a. *Lappula stricta* var. *stricta***

劲直鹤虱 (原变种) jin zhi he shi (yuan bian zhong)

*Echinosperrum strictum* Ledebour, Fl. Altaic. 1: 200. 1829.

Adaxial surface of nutlets wrinkled-tuberculate, abaxially granulate.

Roadsides, farms, hillside meadows. Nei Mongol, Xinjiang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**7b. *Lappula stricta* var. *leiocarpa*** Popov in Komarov, Fl. URSS 19: 440. 1953.

平滑果劲直鹤虱 ping hua guo jin zhi he shi

Abaxial and adaxial surfaces of nutlets glabrous and shiny.

Deserts, arid canyons. Gansu (Minqin Xian), Xinjiang (Qinghe Xian) [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**8. *Lappula intermedia*** (Ledebour) Popov in Komarov, Fl. URSS 19: 440. 1953.

蒙古鹤虱 meng gu he shi

*Echinosperrum intermedium* Ledebour, Fl. Altaic. 1: 199. 1829.

Herbs annual. Taproots stout, conical, ca. 7 cm. Stems erect, usually single, much branched above middle, to 60 cm tall, gray hispid; branches ascending; stem leaves somewhat crowded, erect, linear to narrowly lanceolate, 2–5 cm × 2–4 mm, flat or flexed along midvein, hirsute, hairs discoid at base, adaxially sparser, apex obtuse. Inflorescences terminal on stem and branches, to 5–20 cm in fruit; bracts leaflike, slightly longer than fruit, apex gradually reduced. Pedicel erect, slightly elongated after anthesis, 2–3 mm. Calyx 5-parted; lobes spreading, linear, ca. 3 mm, to 5 mm in fruit. Corolla blue-purple or light blue, campanulate, ca. 3–3.5 mm, somewhat longer than calyx; tube ca. 1 mm; throat constricted, appendages attached at middle of corolla tube; limb ca. 3 mm wide; lobes oblong. Style ca. 0.5 mm, not surpassing nutlets. Fruit broadly ovoid to subglobose, ca. 3 mm; nutlets broadly ovoid, 2.5–3 mm, granulose, adaxially wrinkled; disc ovate with a single row of marginal glochids; glochids spreading horizontally, 1–1.5 mm, bases slightly wider and contiguous or free. Fl. and fr. May-Aug.

Waste places, fields, grasslands, sandy areas, arid slopes. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, NW Sichuan, Xinjiang, Xizang [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**9. *Lappula tenuis*** (Ledebour) Gürke in Engler & Prantl, Nat. Pflanzenfam. 4(3a): 107. 1897.

细刺鹤虱 xi ci he shi

*Echinospermum tenue* Ledebour, Fl. Altaic. 1: 201. 1829.

Herbs annual. Stems slender, frequently branched above, 17–20 cm tall, spreading or appressed gray-green hispid; branches ascending. Leaf blade linear to linear-lanceolate, 1.5–3 cm × 2–4 mm, flat and erect, obtuse to ± acute, abaxially densely strigose, adaxially green, sparsely strigose. Inflorescences 4–6 cm in fruit; bracts linear, slightly longer than fruit. Fruiting pedicel 1–1.5 mm. Calyx 5-parted; lobes spreading, linear, ca. 2.5 mm, to 4 mm in fruit. Corolla light blue, ca. 3 mm, campanulate; limb 2.5–3 mm wide; lobes oblong, ca. 1 mm. Gynobase somewhat surpassing nutlets. Fruit ca. 2.5 mm; nutlets broadly ovoid, ca. 2 mm, adaxially granulose or smooth, glabrous or sparsely tuberculate at base; disc ovate, without keel, smooth or granulose; marginal glochids in a single row, 4–7 on each side, 0.6–1 mm, fine, free at base.

Sunny slopes, desert communities of *Haloxylon ammodendron* and *Anabasis aphylla*; ca. 1500 m. Xinjiang (N Zhungeer Basin) [Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**10. *Lappula microcarpa*** (Ledebour) Gürke in Engler & Prantl, Nat. Pflanzenfam. 4(3a): 107. 1897.

小果鹤虱 xiao guo he shi

*Echinospermum microcarpum* Ledebour, Fl. Altaic. 1: 202. 1829; *E. oligacanthum* Ledebour; *E. stylosum* Karelin & Kirilov; *Lappula microcarpa* var. *heterogenea* X. D. Wang & C. J. Wang.

Herbs annual or biennial, erect. Stems much branched

above middle, 20–45 cm tall, white strigose. Basal leaves forming a rosette, withered in fruit; leaf blade oblong, 3–4 cm, base attenuate, apex obtuse; stem leaves linear, 2–3 cm × 2–4 mm, flexed along midvein, gray-white hispid, hairs discoid at base, margin spreading ciliate. Inflorescences terminal on branches, elongated in fruit; bracts linear. Fruiting pedicel erect, ca. 2 mm. Calyx 5-parted; lobes linear, ca. 3 mm, not enlarged in fruit. Corolla light blue, campanulate, ca. 5 mm; tube slightly longer than calyx; limb ca. 4.5 mm wide; lobes ovate-orbicular. Style surpassing nutlets 0.8–1.5 mm. Nutlets ovoid, 2.5–3 mm; adaxially granulose, sometimes with 2 rows of glochids below; disc narrowly ovate, granulose, center line keeled and with short glochids; marginal glochids in a single row, 0.8–1 mm.  $2n = 22, 24$ .

Sunny slopes, low mountain canyons; 700–2500 m. N Xinjiang, S and SE Xizang [Afghanistan, N India, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW and W Asia].

**11. *Lappula brachycentra*** (Ledebour) Gürke in Engler & Prantl, Nat. Pflanzenfam. 4(3a): 107. 1897.

短刺鹤虱 duan ci he shi

*Echinospermum brachycentrum* Ledebour, Fl. Altaic. 1: 203. 1829.

Herbs biennial, gray appressed pubescent. Taproots straight, dark brown. Stems much branched above middle, 20–35 cm tall. Basal leaves forming a rosette, mostly withered in fruit; leaf blade oblong to spatulate, 2–4 cm, abaxially densely gray appressed sericeous, adaxially green and sparsely long appressed pubescent, base attenuate into a short petiole, apex obtuse; stem leaves sessile, linear, 1–2.5 cm, margin spreading ciliate, apex obtuse. Inflorescences terminal on branches, elongated in fruit; bracts linear. Fruiting pedicel erect, 1–2 mm. Calyx 5-parted; lobes linear, ca. 2 mm, slightly enlarged in fruit. Corolla light blue; tube ca. 2 mm; limb ca. 4–5 mm wide; lobes ovate. Style surpassing nutlets, 1–1.5 mm. Fruit ovoid, ca. 2.5 mm; nutlets triangular-ovoid, adaxially granulose; abaxially granulose, sometimes obscurely keeled along center line; marginal glochids in 1 or 2 rows, protruding, ca. 0.5 mm.

Sunny slopes, arid terraces, semideserts, mountain meadows; 800–2800 m. Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan].

*Lappula ramulosa* C. J. Wang & X. D. Wang may be a synonym of *L. brachycentra*.

**12. *Lappula semiglabra*** (Ledebour) Gürke in Engler & Prantl, Nat. Pflanzenfam. 4(3a): 107. 1897.

狭果鹤虱 xia guo he shi

Herbs annual. Stems much branched, 15–30 cm tall, white hispid. Basal leaves numerous, forming a rosette, sessile, spatulate to narrowly oblong or linear-lanceolate, 2–3 cm × 2–4 mm, abaxially densely spreading white hispid, hairs discoid at base, adaxially glabrous or sometimes sparsely hispid, base attenuate, margin entire, apex obtuse; stem leaves narrowly oblong to oblanceolate. Inflorescences short at anthesis, to 12 cm in fruit; bracts lanceolate to narrowly ovate. Fruiting pedicel usually curved, ca. 3 mm. Flowers short

pedicellate. Calyx 5-parted; lobes oblong, 1–1.5 mm, to 3 × 0.5 mm in fruit, hispid. Corolla light blue, campanulate, ca. 3 mm; limb ca. 2 mm wide; lobes obtuse. Gynobase not surpassing nutlets. Nutlets homomorphic or heteromorphic, narrowly lanceolate, 3–4 mm, adaxially tuberculate or glabrous; disc with scattered tubercles, center line keel usually with short prickles or tubercles; marginal glochids in a single row, bases slightly wider and contiguous. Fl. and fr. Jun-Sep.

Alluvial fans, gravelly slopes, dunes, deserts. Gansu, Qinghai, Xinjiang [Afghanistan, NW India, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

- 1a. Nutlets homomorphic ..... 12a. var. *semiglabra*
- 1b. Nutlets heteromorphic ..... 12b. var. *heterocaryoides*

**12a. Lappula semiglabra var. semiglabra**

狭果鹤虱 (原变种) xia guo he shi (yuan bian zhong)

*Echinosperrum semiglabrum* Ledebour, Fl. Altaic. 1: 204. 1829; *Lappula caspicum* Fischer & C. A. Meyer. Nutlets homomorphic, marginal glochids 4–5 mm.

Alluvial fans, gravelly slopes, dunes, deserts. Gansu, Qinghai, Xinjiang [Afghanistan, NW India, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

**12b. Lappula semiglabra var. heterocaryoides** Popov ex C. J. Wang, Bull. Bot. Res., Harbin 1(4): 83. 1981.

异形狭果鹤虱 yi xing xiao guo he shi

Nutlets heteromorphic, 2 with marginal glochids 4–5 mm and 2 with marginal glochids 0.3–0.8 mm.

Alluvial fans, gravelly slopes, dunes, deserts. Gansu, Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**13. Lappula duplicicarpa** Pavlov, Vestn. Akad. Nauk SSSR 5: 90. 1952.

两形果鹤虱 liang xing guo he shi

Herbs annual. Stems much branched above base, 15–30 cm tall, densely retrorse strigose or long hispid. Basal leaves sessile, linear-lanceolate, 0.8–2.5 cm × 2–6 mm, abaxially densely hispid, hairs discoid at base, adaxially glabrous or sparsely hispid, base attenuate, margin entire, apex obtuse. Inflorescences to 12 cm in fruit; bracts lanceolate to narrowly ovate. Fruiting pedicel ca. 3 mm, mostly curved. Calyx 5-parted, long retrorse strigose; lobes lanceolate, ca. 1.5 mm, to 2.5 mm in fruit. Corolla light blue, campanulate, 2–5 mm; limb 1.5–3.5 mm wide; lobes narrowly oblong to suborbicular, 0.5–2.5 mm. Style short, not surpassing nutlets. Nutlets homomorphic or both homomorphic and heteromorphic, oblong-ovoid, ca. 3 mm, adaxially tuberculate; disc tuberculate, narrowly ovate, center line with extremely short glochids; glochids 0.2–0.5 mm, bases complanate and contiguous.

Sunny slopes, rocky hills, sandy areas, deserts, desert marshes.

Gansu, Qinghai, Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan].

- 1a. Plants ca. 7 cm, whole plant pubescent; nutlets homomorphic ..... 13c. var. *brevispinula*
- 1b. Plants 15–30 cm, mainly stems pubescent; nutlets dimorphic.
  - 2a. Stems strigose; corolla 2–2.5 mm, limb 1.5–2 mm wide, lobes narrowly oblong, ca. 0.5 mm ..... 13a. var. *duplicicarpa*
  - 2b. Stems densely long hispid; corolla ca. 5 mm, limb ca. 3.5 mm wide, lobes suborbicular, 2–2.5 mm ..... 13b. var. *densihispida*

**13a. Lappula duplicicarpa var. duplicicarpa**

两形果鹤虱 (原变种) liang xing guo he shi (yuan bian zhong)

Plants branched from base, stems retrorse strigose. Corolla ca. 2.5 mm; limb 1.5–2 mm wide; lobes narrowly oblong, ca. 0.5 mm. Nutlets of lower part of inflorescences homomorphic; nutlets of upper part heteromorphic, (1 or) 2 (or 3) nutlets with glochids 0.2–0.5 mm, other nutlet(s) with glochids 2–4 mm. Fl. and fr. Jun-Aug.

Sunny slopes, rocky hills, desert communities of *Haloxylon ammodendron* and *Anabasis salsa*. Qinghai (Golmud Xian), N Xinjiang [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**13b. Lappula duplicicarpa var. densihispida** C. J. Wang, Bull. Bot. Res., Harbin 1(4): 83. 1981.

密毛两形果鹤虱 mi mao liang xing guo he shi

Plants branched from base, stems densely long hispid. Corolla ca. 5 mm; limb ca. 3.5 mm wide; lobes suborbicular, 2–2.5 mm. Nutlets of lower part of inflorescences with 4 homomorphic nutlets; nutlets of upper parts heteromorphic, (1 or) 2 (or 3) nutlets with glochids 0.2–0.5 mm, other nutlet(s) with glochids 2–4 mm. Fl. and fr. Jun-Aug.

- W Gansu (Ejina River Basin), N Xinjiang (Fuhai Xian).

**13c. Lappula duplicicarpa var. brevispinula** C. J. Wang, Bull. Bot. Res., Harbin 1(4): 84. 1981.

小刺两形果鹤虱 xiao ci liang xing guo he shi

Plants densely branched from base, ca. 7 cm, entire plant hispid. Nutlets homomorphic, disc with marginal glochids 0.2–0.5 mm, sometimes a few nutlets with glochids to 2 mm. Fl. and fr. May-Jul.

- Desert marshes, sandy areas; ca. 400 m. N Xinjiang (Burqin Xian).

**14. Lappula patula** (Lehmann) Ascherson ex Gürke in Engler & Prantl, Nat. Pflanzenfam. 4(3a): 107. 1897.

卵果鹤虱 luan guo he shi

*Echinosperrum patulum* Lehmann, Pl. Asperif. Nucif. 2:

124. 1818; *Lappula redowskii* (Hornemann) Greene var. *patula* (Lehmann) Nelson & J. F. Macbride; *Myosotis redowskii* Hornemann.

Herbs annual. Stems branched above middle, 20–35 cm tall, with finely appressed white hairs. Basal leaves forming a rosette, sessile; leaf blade linear to spatulate, 2.5–3 cm × 2–4 mm, spreading gray-white hispid, hairs discoid at base, adaxially more sparsely hispid, margin entire, apex obtuse; stem leaves similar to basal leaves, narrow, mostly linear, smaller. Inflorescences numerous, frequently secund, to 20(–23) cm in fruit; bracts leaflike, linear. Flowers sessile or short pedicellate. Calyx spreading hispid; lobes spreading, linear to narrowly oblong, 1–1.5 mm at anthesis, to 5 mm in fruit. Corolla light blue, campanulate, ca. 2.5 mm; limb 1.5–2 mm wide. Style ca. 0.5 mm, somewhat surpassing nutlets. Fruit orbicular-ovoid; nutlets homomorphic, ovoid, ca. 3 mm, base with 4 or 5 small prickles on each side; disc narrowly lanceolate, tuberculate, not keeled; marginal glochids in a single row, 1.5–2.5 mm, with slightly widened but free bases.

Waste places, field margins, valley terraces. N Xinjiang [Afghanistan, NW India, Kazakhstan, Kyrgyzstan, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; N Africa, SW Asia].

**15. *Lappula caespitosa*** C. J. Wang, Acta Phytotax. Sin. 18: 521. 1980.

密丛鹤虱 mi cong he shi

Herbs perennial. Taproots brown, straight, stout. Stems 4 to numerous, cespitose, branched above, 11–18 cm tall, brownish below, stiff, slightly spreading gray-white villous; branches ascending. Basal leaves numerous, forming a rosette, frequently persistent in withered state, sessile; leaf blade linear-spatulate to linear, 1–3 cm × 1.5–3 mm, flat or longitudinally flexed, densely gray-white villous, base attenuate, apex obtuse; stem leaves linear-spatulate to linear, 1–2 cm × 1–1.5 mm. Inflorescences 2–5 cm in fruit; bracts linear, 3–5 mm. Pedicel 1.5–2 mm. Calyx 5-parted; lobes erect, linear, ca. 2.5 mm in fruit, densely villous. Corolla light blue, campanulate, 3–3.5 mm; tube ca. as long as calyx; throat appendages 5, trapeziform; limb 2–2.5 mm wide; lobes obovate. Anthers oblong, inserted on middle of corolla tube. Style slightly surpassing nutlets, not surpassing upper prickles of nutlets; stigma subglobose. Fruit ovoid; nutlets narrowly ovoid, 2.5–3 mm, adaxially wrinkled or glabrous; disc lanceolate, sparsely finely white granulate; marginal glochids in a single row, 1–1.5 mm, bases slightly widened, not contiguous. Fl. and fr. Jun–Aug.

• Alluvial, sandy, gravelly areas, arid ravines; ca. 4200 m. SW Xizang.

*Lappula caespitosa* is probably identical to *L. alata* (Popov) Goloskokov (Fl. Pl. Resour. Kazhakstan 78. 1975).

**16. *Lappula karelinii*** (Fischer & C. A. Meyer) Kamelin, Novon 3: 263. 1993.

光胖鹤虱 guang pan he shi

*Echinosperrum karelinii* Fischer & C. A. Meyer, Ind. Sem. Hort. Petrop. 11: 67. 1845; *Lappula xinjiangensis* C. Y.

Yang ex C. J. Wang.

Herbs biennial, densely cespitose. Taproots conical, stout, to 8 cm. Stems numerous, short branched above, 11–15 cm tall, gray-white pilose. Basal leaves numerous, forming a rosette, frequently persistent in withered state; petiole 1–1.5 cm; leaf blade spatulate to linear, 0.5–1.5 cm × 5–7 mm, abaxially densely gray-white pilose, adaxially glabrous or pubescent, dark green, base attenuate, apex rounded and emarginate; stem leaves sessile, linear, 1–2.5 cm × 1.5–2 mm. Inflorescences terminal on branches, many flowered. Pedicel ca. 2 mm; bracts oblong, ca. 3 mm, somewhat shorter than fruit. Flowers crowded. Calyx 5-parted; lobes oblong, to 1.5 mm in fruit, much shorter than nutlets. Corolla campanulate, 1.5–2 mm; tube 1–1.5 mm; limb 1–1.5 mm wide; lobes obovate, ca. 0.5 mm. Style not surpassing nutlets; stigma capitate. Fruit light yellow, 2.5–3 mm. Nutlets heteromorphic, ovoid, glabrous, shiny; disc narrowly ovate, frequently dark greenish; marginal glochids in a single row, 2–2.5 mm on 2 nutlets and 0.3–0.5 mm, lanceolate on other nutlets. Fl. and fr. May–Aug.

• Sandy river banks; ca. 400 m. Xinjiang (Burqin Xian).

**17. *Lappula myosotis*** Moench, Methodus 417. 1794.

鹤虱 he shi

*Myosotis lappula* Linnaeus, Sp. Pl. 1: 131. 1753; *Echinosperrum lappula* (Linnaeus) Lehmann; *Lappula echinata* Gilibert.

Herbs annual or biennial. Stems erect, much branched, 30–60 cm tall, densely short white hispid. Basal leaves oblong-spatulate, densely white hirsute, hairs discoid at base, base attenuate to long petiole, to ca. 7 cm × 3–9 mm (including petiole), margin entire, apex obtuse; stem leaves sessile, lanceolate to linear, shorter, narrower, flat or longitudinally flexed along midvein, base attenuate, apex acute. Inflorescences to 17 cm in fruit; bracts linear, slightly longer than fruit. Pedicel erect, ca. 3 mm in fruit, pubescent. Calyx lobes spreading or reflexed, linear, 2–3 mm at anthesis, to 5 mm in fruit, becoming lanceolate, pubescent, apex acute. Corolla light blue, funnelform to campanulate, ca. 4 mm; throat appendages trapeziform; limb 3–4 mm wide; lobes oblong-ovate. Style surpassing nutlets but not apical prickles. Nutlets ovoid, 3–4 mm, adaxially with spiny emergences or tuberculate; disc narrowly ovate to oblong-lanceolate, usually granulate, rarely smooth or keeled, with fine spiny emergences along center line; marginal glochids in 2 rows; inner glochids 1.5–2 mm, separated at base; outer row of glochids slightly shorter, usually erect. Fl. and fr. Jun–Sep.  $2n = 48$ .

Hillside meadows. Gansu, Hebei, W Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Xinjiang [NW Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; S Africa, SW Asia, C and E Europe, North America].

The fruit are used as an antiphlogistic and insecticide in Heilongjiang, Jilin, Liaoning, Ningxia, and Xinjiang.

**18. *Lappula shanhsiensis*** Kitagawa, Acta Phytotax. Geobot. 20: 48. 1962.

山西鹤虱 shan xi he shi

Herbs annual. Taproot dark brown, terete. Stems erect or ascending below, much branched from base or apex, 15–45 cm tall, sparsely spreading villous, densely appressed short white pubescent. Leaves sessile, linear-spatulate to linear-oblong, 2–4(–5) cm × 2–5 mm, densely appressed white villous, hairs inflated leathery discoid at base, base attenuate, margin entire, villous, apex obtuse. Inflorescences on stem branches, to 20–25 cm in fruit; bracts leaflike, linear-lanceolate to narrowly lanceolate, 0.8–2.5 cm × 1.5–6 mm, base attenuate to rotund, apex ± acute. Flowers opposite. Pedicel 1.5–2 mm, to 3–5 mm in fruit. Calyx 2–2.5 mm; lobes linear-lanceolate, to 5 mm in fruit, villous outside, sparsely short pubescent inside. Corolla blue, 2.5–3 mm; tube ca. 2 mm, ca. as long as calyx; throat appendages trapeziform, ca. 0.3 mm; lobes of limb elliptic, ca. 1 mm. Anthers broadly ovoid, ca. 3 mm. Style surpassing nutlets, ca. 0.3 mm. Nutlets broadly ovoid, ca. 3 mm, with milky white tubercles; disc ovate-triangular; marginal glochids in (1 or) 2 rows; inner glochids 0.4–2 mm, base somewhat widened, confluent, rarely free, frequently with short fine glochids between them; outer glochids 0.2–0.5 mm. Fl. and fr. Jun-Sep.

• Hillside meadows, fields near villages. Gansu, Hebei, Nei Mongol, Shanxi, Xizang.

**19. *Lappula granulata*** (Krylov) Popov in Komarov, Fl. URSS 19: 426. 1953.

粒状鹤虱 li zhuang he shi

*Lappula marginata* (M. Bieberstein) Gürke var. *granulata* Krylov, Fl. Zap./West Sib. 9: 2248. 1937; *L. gansuensis* X. D. Wang & C. J. Wang; *L. platyacantha* W. T. Wang ex C. J. Wang.

Herbs annual. Stems erect, branched above, 30–50 cm tall, spreading or subappressed gray pilose. Basal leaves forming a rosette; leaf blade oblong, 2–7 cm × 3–8 mm, spreading or slightly spreading gray hispid, hairs discoid at base, base attenuate, margin entire, apex obtuse; stem leaves sessile, shorter, narrower. Inflorescences widely spaced, strongly elongated in fruit; bracts linear, longer than fruit on lower part of inflorescences. Pedicel erect, elongated in fruit, 3–5 mm on lower part of inflorescence, stout above, thin at base; pubescent. Calyx lobes erect at anthesis, often spreading in fruit, linear, 2–3 mm, to 5 mm in fruit. Corolla light blue, campanulate, 3–3.5 mm; throat white or light yellow, appendages trapeziform; limb 2–4 mm wide. Style not surpassing upper prickles of nutlets. Nutlets ovoid, 3–3.5 mm, adaxially tuberculate; disc oblong-lanceolate, finely tuberculate; marginal glochids in 2 rows; inner glochids yellow, 1.5–2 mm, bases expanded and confluent into a narrow wing; outer glochids 0.5–1 mm, usually only on lower part. Fl. and fr. Jun-Sep.

Meadows, hillsides, fields on loess plateau, margins of cultivated land. Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi [Kazakhstan, Mongolia].

The fruit are used as an antiphlogistic and insecticide in NE China.

**20. *Lappula sericata*** Popov, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 14: 320. 1951.

绢毛鹤虱 juan mao he shi

Herbs perennial or biennial, densely caespitose. Stems usually 4–10, ascending or diffuse, branched above, 7–15 cm tall, densely gray-white sericeous. Basal leaves numerous, forming a rosette, sessile; leaf blade linear to filiform, to 4 cm × 1–2 mm, apex obtuse; stem leaves similar to basal leaves, 0.5–1.5 mm. Inflorescences terminal on branches, 3–6 cm in fruit; bracts linear, usually ca. as long as fruiting pedicel. Fruiting pedicel erect, stout, 1.5–2 mm. Calyx 5-parted; lobes linear, densely sericeous, 2–2.5 mm in fruit, subtending fruit. Corolla blue; tube ca. 2 mm; throat appendages trapeziform, ca. 0.6 mm; limb ca. 5 mm wide; lobes oblong, 1.5–2 mm. Style surpassing nutlets by 0.3–0.5 mm. Fruit ovoid-globose, ca. 2.5 mm; nutlets ovoid, 2–2.5 mm, densely granulose with spines; disc ovate; marginal glochids in 2 rows, inner glochids 0.2–0.5 mm, base erect or curved, outer glochids ca. 0.2 mm.

Hillsides. Xinjiang (Yuli Xian) [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**21. *Lappula himalayensis*** C. J. Wang, Acta. Phytotax. Sin. 18: 521. 1980.

喜马拉雅鹤虱 xi ma la ya he shi

Herbs annual. Main roots black-brown, straight, terete. Stems 4–6, caespitose, ascending or erect, branched above, 7–15 cm tall, densely appressed pubescent; branches spreading. Basal leaves forming a rosette, sessile; leaf blade linear-spatulate to linear, 2–3 cm × 2–4 mm, longitudinally flexed along midvein, pubescent, adaxially with fewer hairs, base attenuate, apex obtuse; stem leaves similar to basal leaves, narrower, shorter. Inflorescences terminal on branches, 3–7 cm in fruit; lower bracts similar to stem leaves; upper bracts linear, slightly shorter than fruit. Fruiting pedicel erect, 1.5–2 mm. Calyx lobes linear, ca. 1.5 mm, pubescent outside, enlarged in fruit, usually shorter than nutlets. Corolla light blue, campanulate; tube ca. 1 mm; limb 2–2.5 mm wide; throat appendages trapeziform, ca. 0.5 mm; lobes oblong to obovate. Style surpassing nutlets by 0.5 mm. Nutlets ovoid, ca. 2.5 mm, densely granulose, disc with 3 or 4 short glochids along center line; marginal glochids in 2 rows; inner glochids 0.5–0.8 mm, often curved; outer glochids ca. 0.2 mm. Fl. and fr. Jun-Aug.

• Hillsides; 3700–4200 m. S Xizang.

**22. *Lappula tianschanica*** Popov & Zakirov, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 14: 317. 1951.

天山鹤虱 tian shan he shi

Herbs biennial or perennial. Stems usually single, erect, much branched above, 40–60 cm tall, densely gray-white strigose. Basal leaves numerous, lanceolate to spatulate, 5–8 cm, withered in fruit; stem leaves lanceolate to linear-



lanceolate, 3–6 cm × 4–10 mm, flat, sparsely hirsute, hairs discoid at base, sometimes densely light gray pilose, apex ± acute. Inflorescences widely spaced, 10–15 cm, elongated and secund in fruit; bracts linear to linear-lanceolate, usually shorter than fruit. Fruiting pedicel 3–10 mm, erect or recurved. Calyx lobes spreading, linear, 2–3 mm, to 4 mm in fruit, apex acute. Corolla light blue, ca. 4 mm; tube ca. as long as calyx; throat appendages trapeziform, dark blue, ca. 0.8 mm; limb 5–6 mm wide; lobes divaricate, obovate. Style surpassing nutlets by ca. 1 mm, not surpassing prickles. Fruit ovoid-globose, 3–4 mm; nutlets ovoid, adaxially finely tuberculate; disc narrowly ovate, tuberculate, center line with unequal glochids; marginal glochids in 2 rows; inner glochids 1.5–2.5 mm, bases slightly widened but free; outer glochids on lateral surface below, 0.4–0.6 mm. Fl. and fr. Jul-Aug.

Hillside meadows; 1800–2500 m. Xinjiang [Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan].

- 1a. Herbs large, perennial; main root conical; stems many, unequal ..... 22c. var. *altaica*
- 1b. Herbs small, biennial; main root not conical; stems single.
  - 2a. Fruiting pedicel often recurved, 3–5 mm ..... 22a. var. *tianschanica*
  - 2b. Fruiting pedicel erect, 5–10 mm ..... 22b. var. *gracilis*

**22a. *Lappula tianschanica* var. *tianschanica***

天山鹤虱 (原变种) tian shan he shi (yuan bian zhong)

Herbs biennial, small. Main root not conical. Stems usually single, branched above middle; branches spreading. Basal leaves forming a rosette. Fruiting pedicel recurved, 3–5 mm.

Hillside meadows; ca. 1800 m. Xinjiang (Yuli Xian) [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**22b. *Lappula tianschanica* var. *gracilis* C. J. Wang, Bull. Bot. Res., Harbin 1(4): 86. 1981.**

细枝天山鹤虱 xi zhi tian shan he shi

Herbs biennial, small. Main root not conical. Stems usually solitary; branches slender, becoming reclinate, 10–15 cm. Basal leaves not forming a rosette. Fruiting pedicel erect, 5–10 mm.

- Hillside meadows; ca. 2500 m. N Xinjiang (Qinghe Xian).

**22c. *Lappula tianschanica* var. *altaica* C. J. Wang, Bull. Bot. Res., Harbin 1(4): 86. 1981.**

阿尔泰鹤虱 a er tai he shi

Herbs perennial, large. Main root conical. Stems many, unequal in size; branches spreading. Basal leaves forming a rosette. Fruiting pedicel often recurved, 3–5 mm.

- Hillside meadows; ca. 2500 m. N Xinjiang (Qinghe Xian).

**23. *Lappula tadshikorum* Popov, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 14: 319. 1951.**

短梗鹤虱 duan geng he shi

Herbs biennial. Stems erect, much branched from base, ca. 45 cm tall, densely gray-white spreading or appressed hispid; branches slender, obliquely spreading. Basal leaves numerous, forming a rosette, sessile; leaf blade linear to lanceolate, 2–3 cm × ca. 5 mm, densely gray-white hirsute, apex obtuse. Inflorescences to 7–15 cm in fruit; bracts 1 or 2, leaflike, basal, other bracts extremely small. Pedicel erect, to 1–2(–3) mm in fruit, densely hispid. Calyx lobes spreading, linear, ca. 1 mm, to 2 mm in fruit. Corolla light blue, campanulate, ca. 2.5 mm; tube ca. as long as calyx; throat appendages light yellow, trapeziform, ca. 0.5 mm; limb (3–)4–5 mm wide; lobes suborbicular. Style slightly surpassing nutlets but not surpassing prickles. Fruit globose, 2.5–3 mm; nutlets ovoid, adaxially with dense fine tubercles; disc narrowly ovate, tuberculate, center line keeled and with 3 or 4 glochids; marginal glochids in 2 rows; inner glochids 1.5–2.5 mm, bases slightly widened but free; outer glochids ca. 0.5 mm. 2n = 22.

Mountainsides; ca. 1800 m. Xinjiang (Wuqia Xian) [Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**24. *Lappula pratensis* C. J. Wang, Bull. Bot. Res., Harbin 1(4): 87. 1981.**

草地鹤虱 cao di he shi

Herbs biennial. Main root dark brown, straight, stout. Stems usually single, branched above, 10–35 cm tall, gray-white hispid; branches erect. Basal leaves numerous, forming a rosette, surrounded by persistent withered leaves; leaf blade spatulate to oblanceolate, 3–7 cm × 5–10 mm, gray-white hispid, abaxially with more numerous longer hairs, base attenuate, apex obtuse; midvein distinctly protruding; stem leaves widely spaced, linear. Inflorescences terminal on branches, elongated to 20 cm in fruit, with 1 or 2 leaflike bracts at base, other bracts small, slightly longer or shorter than pedicel. Pedicel 2–3 mm, or shorter above. Calyx lobes linear, ca. 1.5 mm, to 3 mm in fruit. Corolla light blue, ca. 4.5 mm; tube longer than calyx; throat appendages trapeziform, ca. 0.8 mm; limb 4–5 mm wide; lobes divaricate, oblong, ca. 2.5 mm. Style slightly surpassing nutlets by ca. 1 mm. Fruit broadly ovoid, ca. 3 mm; nutlets ovoid to narrowly ovoid, 2.5–3 mm, adaxially with dense fine tubercles; disc triangular-ovate to narrowly ovate, sparsely granulose, center line keeled and with several short glochids; marginal glochids in 2 rows; inner glochids 1–2 mm, bases slightly widened and contiguous; outer glochids 0.3–0.7 mm. Fl. and fr. Jul-Aug.

- Sunny hillside meadows in coniferous forest zone, meadows in valleys; 2300–2800 m. Xinjiang.

**25. *Lappula ramulosa* C. J. Wang & X. D. Wang, Acta Phytotax. Sin. 30: 367. 1992.**

多枝鹤虱 duo zhi he shi

Plants annual or biennial, densely appressed strigose. Stems numerous, cespitose, branched at base, ca. 35 cm tall; branches ascending. Basal leaves withered at fruiting time; stem leaves sessile, linear, 0.7–1.5 cm × 1–3 mm, ± appressed

strigose, adaxially sparsely pubescent, apex obtuse. Inflorescences terminal on branches, densely branched; bracts narrowly ovate, lower bracts longer to slightly shorter than pedicel, upper bracts much shorter. Pedicel 4–7 mm, appressed strigose. Calyx ca. 2 mm at anthesis, to 3.5 mm in fruit; lobes erect or appressed to nutlets. Corolla funnelform, blue, ca. 4 mm; tube ca. 2 mm; throat appendages trapeziform; limb 4–5(–7) mm wide; lobes oblong. Gynobase 1.5–2 mm, longer than nutlets. Nutlets triangular-ovoid, tuberculate, inner angle united with gynobase for 2/3 length; disc center line keeled with a few glochids; marginal glochids in 2 rows; inner glochids 0.3–0.6 mm; outer glochids 0.1–0.2 mm. Fl. and fr. Aug.

• Mountain meadows. Xinjiang.

**26. *Lappula consanguinea*** (Fischer & C. A. Meyer) Gürke in Engler & Prantl, Nat. Pflanzenfam. 4(3a): 107. 1897.

蓝刺鹤虱 lan ci he shi

Herbs annual or biennial, over 60 cm tall. Stems usually single, rarely 2- or 3-fascicled, branched above, strigose or spreading hispid. Basal leaves oblong-lanceolate, to 5 cm, densely white hirsute, withered in fruit; stem leaves lanceolate to linear, 2–5 cm × 3–6 mm, flat or longitudinally folded along midvein, densely hirsute, hairs discoid at base, base attenuate, apex obtuse; midvein distinctly protruding. Inflorescences terminal on stems and branches, 7–25 cm in fruit; bracts linear. Fruiting pedicel erect, 1–3 mm, strigose. Calyx lobes spreading, linear, 2.5–3 mm, to 4–5 mm in fruit. Corolla light blue-purple, campanulate, 3.5–4 mm; throat appendages ca. 0.5 mm; limb 2.5–3 mm wide; lobes oblong to broadly obovate. Style surpassing nutlets by ca. 1 mm. Fruit broadly ovoid, 2.5–3 × ca. 3 mm, above with spaces between nutlets; nutlets acute ovoid, adaxially with scattered tubercles; disc narrowly ovate, granulose; marginal glochids in 3 rows; inner glochids ca. 1.5 mm, thin, hard, ascending to erect, bases somewhat widened and free; middle glochids shorter, somewhat clavate; outer glochids extremely short, adaxial in lower part.

Waste areas, rocky slopes, mountain terraces, roadsides; 600–2200 m. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Xinjiang [N India, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; Europe].

- 1a. Nutlets homomorphic throughout ..... 26a. var. *consanguinea*
- 1b. Nutlets heteromorphic in upper part of inflorescences ..... 26b. var. *cupuliformis*

**26a. *Lappula consanguinea* var. *consanguinea***

蓝刺鹤虱 (原变种) lan ci he shi (yuan bian zhong)

*Echinospermum consanguineum* Fischer & C. A. Meyer, Ind. Sem. Hort. Petrop. 5: 35. 1838.

Nutlets homomorphic throughout. Fl. Jun-Jul, fr. Jul-Sep.

Waste areas, rocky slopes, mountain terraces; 800–2200 m. Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Xinjiang [N India, Kashmir, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan, Turkmenistan, Uzbekistan; Europe].

**26b. *Lappula consanguinea* var. *cupuliformis*** C. J. Wang, Bull. Bot. Res., Harbin 1(4): 88. 1981.

杯翅蓝刺鹤虱 bei chi lan ci he shi

Heteromorphic nutlets on upper part of inflorescences, 2 nutlets with inner marginal glochids of disc distinctly widened at base and confluent into a broad wing; wing usually erect, ± cupular. Fl. and fr. Jul-Sep.

• Dry mountain terraces, roadsides; ca. 600 m. Xinjiang.

**27. *Lappula ferganensis*** (Popov) Kamelin & G. L. Chu in G. L. Chu, Kamelin, R. R. Mill, & M. G. Gilbert, Novon 5: 17. 1995.

费尔干鹤虱 fei er gan he shi

*Lepechiniella ferganensis* Popov in Komarov, Fl. URSS 19: 713. 1953; *Lappula platyptera* C. J. Wang.

Herbs biennial; rhizomes ± horizontal, producing stems from nodes. Stems not branched or few branched, ca. 30 cm tall, sparsely gray fine pilose. Basal leaves fascicled, forming a rosette, sessile; leaf blade linear to linear-oblongate, 1.5–4.5 cm × 2–4 mm, abaxially densely sericeous, becoming silvery, adaxially gray-green, sparsely sericeous, base attenuate, apex obtuse; stem leaves sparse, sessile, linear to narrowly ovate, 0.5–2 cm × 1.5–2 mm, sparsely sericeous. Inflorescences terminal, few flowered, elongated in fruit; bracts narrowly ovate to linear, ca. as long as nutlets. Fruiting pedicel erect, 2–4 mm, slightly thickened. Calyx lobes linear-oblong, ca. 2 mm, to 3 mm in fruit, sericeous, apex obtuse. Corolla light blue, ca. 3 mm; tube ca. as long as calyx; throat appendages trapeziform, ca. 0.5 mm; limb ca. 3 mm wide; lobes oblong, 1–1.2 mm. Style included between nutlets. Fruit depressed globose, 4–4.5 × 6–7 mm; nutlets 3.5–4 × ca. 7 mm, wrinkled, granulose, disc ovate, marginal glochids in 2 rows; inner glochids unequal, 0.5–1.5 mm, confluent into a broad wing; wing subleathery, 1.5–2 mm wide, usually spreading horizontally; outer glochids 0.2–0.8 mm. Fl. and fr. Jun-Sep.

• Mountainsides; ca. 3300 m. SW Xinjiang (Wuqia Xian).

**28. *Lappula anocarpa*** C. J. Wang, Bull. Bot. Res., Harbin 1(4): 93. 1981.

畸形果鹤虱 ji xing guo he shi

Herbs annual. Roots single, conical, straight, stout. Stems much branched above, 35–48 cm tall, somewhat spreading or appressed hispid; branches ascending. Basal leaves few, withered in fruit; leaf blade spatulate, to 7 cm × 5–7 mm, base attenuate, apex obtuse; stem leaves sessile, lanceolate, 3–5 cm × 4–6 mm, spreading or appressed hirsute, adaxially with fewer hairs, base attenuate, apex acute. Inflorescences terminal on branches, elongated to 20 cm in fruit; bracts linear-lanceolate, much longer than fruit. Flowers widely spaced. Pedicel 2.5–3.5 mm in fruit. Calyx lobes spreading, linear, 3–3.5 mm, to 5–6 mm in fruit, hirsute. Corolla light blue, ca. 4 mm; tube slightly shorter than calyx; throat appendages trapeziform, ca. 0.8 mm; limb 2.5–3 mm wide; lobes erect-spreading, oblong. Style surpassing nutlets by 0.5 mm, not surpassing prickles. Fruit broadly ovoid,

homomorphic along lower part of inflorescences; nutlets narrowly ovoid, densely tuberculate, disc with 2 rows of glochids along margin; inner glochids 1.5–2 mm, base somewhat widened but free; outer glochids ca. 0.5 mm, usually at base of vertical surface. Fruit of upper part of inflorescences heteromorphic, 2 nutlets with a broad wing; inner glochids of disc margin 1–2 mm, bases strongly widened and confluent into a wing 0.6–1 mm; outer glochids ca. 0.5 mm, on base of nutlets, other 2 nutlets wingless. Fl. and fr. Jul–Sep.

• Fields, waste areas, slopes on loess plateau. C and NE Gansu.

**29. *Lappula heteromorpha*** C. J. Wang, Bull. Bot. Res., Harbin 1(4): 95. 1981.

异形鹤虱 *yi xing he shi*

Herbs annual. Stems much branched above, to 65 cm tall; branches ascending, spreading hispid. Lower stem leaves withered in fruit; leaf blade narrowly spatulate to linear-lanceolate, 4–6 cm × 3–5 mm, strigose, adaxially less so, base attenuate, apex obtuse; upper stem leaves narrower, shorter. Inflorescences terminal on branches, to 20 cm in fruit, becoming widely spaced; with leaflike bracts on lower part of inflorescences, longer than fruit; upper bracts linear, slightly longer than fruit. Calyx lobes spreading or revolute, linear, ca. 4 mm, to 6 mm in fruit, hispid, apex acute. Corolla blue-purple, ca. 4.5 mm; tube ca. 3 mm; throat appendages trapeziform, ca. 0.6 mm; limb ca. 4 mm wide; lobes spreading horizontally, oblong, 1–1.5 mm. Style slightly surpassing nutlets. Fruit broadly ovoid, 4–4.5 in diam., nutlets homomorphic along lower part of inflorescences, wingless, narrowly ovoid, 4–4.5 mm, densely granulose; disc with short glochids on keel along center line, with 2 rows of glochids along margin; inner glochids 1–2.5 mm, bases somewhat widened but free, outer glochids 1–1.2 mm. Nutlets heteromorphic in upper part of inflorescences, 2 with inner glochids on disc margin 1.5–2 mm, bases strongly widened and confluent into a divaricate wing; outer glochids 1–1.8 mm; 2 other nutlets with homomorphic prickles. Fl. and fr. Jul–Sep.

• Fields, waste places, near villages. Nei Mongol (Otog Xi Xian), Shanxi (Wutai Xian).

**30. *Lappula alatavica*** (Popov) Goloskokov, Fl. Rast. Res. Kaz. 78. 1975.

阿尔套鹤虱 *a er tao he shi*

*Lappula rupestris* (Schrenk) Gürke var. *alatavica* Popov in Komarov, Fl. URSS 19: 457. 1953; *L. scleroptera* C. J. Wang.

Herbs biennial. Main root conical, stout. Stems 5 or 6, diffuse, slightly branched above, 10–14 cm tall, gray strigose. Basal leaves forming a rosette; leaf blade linear-spatulate, rarely linear-lanceolate, 1–3 cm × 2–4 mm, strigose, abaxially more densely pubescent, base attenuate, margin ciliate, apex obtuse; stem leaves smaller, oblong, 5–10 × 2–3 mm. Inflorescences to 12 cm in fruit; bracts leaflike on lower part of inflorescences, oblong, ca. 5 mm; upper bracts linear, ca. 0.3 mm. Fruiting pedicel 1.5–2.5 mm. Calyx lobes linear, 2–2.5 mm, to 3–4 mm in fruit, apex obtuse. Corolla light blue,

4–5 mm; tube ca. as long as calyx; throat appendages trapeziform, ca. 0.8 mm; limb 5–6 mm wide; lobes divaricate, obovate. Nutlets 2.5–3 mm, heteromorphic, granulose; 2 nutlets with a single row of glochids along disc margin; glochids leathery, 1–1.5 mm, bases widened and confluent into a narrow wing, sometimes with several short glochids along center line; remaining 2 nutlets wingless, with few glochids or glabrous along disc. Gynobase surpassing nutlets by ca. 0.8 mm. Fl. and fr. Jul–Aug.

Arid alluvial mountain terraces; ca. 2500 m. Xinjiang (Hejing Xian) [Kazakhstan, Russia, Tajikistan, Turkmenistan, Uzbekistan].

**31. *Lappula monocarpa*** C. J. Wang, Bull. Bot. Res., Harbin 1(4): 98. 1981.

单果鹤虱 *dan guo he shi*

Herbs annual. Stems stout, branched above, spreading and appressed hirsute; stem leaves linear, 1.5–3.5 cm × 2–3 mm, flat or longitudinally flexed along midvein, spreading white hirsute, hairs discoid at base. Inflorescences terminal on branches, elongated in fruit; bracts leaflike, much longer than fruit. Calyx lobes linear, 2–2.5 mm, slightly enlarged. Corolla light blue, ca. 3 mm; tube somewhat shorter than calyx; throat appendages ca. 0.5 mm; limb ca. 2 mm wide; lobes divaricate, suboblong. Ovary globose, 4-parted, with 1 mericarp developing into a nutlet. Gynobase ca. as long as nutlet, usually horizontal but somewhat raised at apex. Developed nutlet 1, acute ovoid, ca. 2 mm, usually horizontal, granulose, adaxial base coherent to gynobase, disc margin with a single row of glochids; glochids 0.5–1 mm. Fl. and fr. Jul–Aug.

• Sunny hillside meadows; ca. 1100 m. NW Xinjiang (Jeminay Xian).

**32. *Lappula lasiocarpa*** (W. T. Wang) Kamelin & G. L. Chu in G. L. Chu, Kamelin, R. R. Mill, & M. G. Gilbert, Novon 5: 18. 1995.

翅鹤虱 *chi he shi*

*Lepechiniella lasiocarpa* W. T. Wang, Bull. Bot. Res., Harbin 4: 7. 1984; *Lappula betpakdalensis* Nabiev; *L. omphaloides* (Schrenk) Popov var. *balchaschensis* Popov; *Lepechiniella balchaschensis* Popov, not *Lappula balchaschensis* Popov ex N. Pavlov.

Herbs annual. Stems frequently branched from base, 6–20 cm tall, spreading hispid. Basal leaves few, usually withering early, narrowly obovate, 1–2 cm; stem leaves sessile or lower leaves attenuate at base to thin petiole, spatulate-linear, 0.8–2.5 cm, white hispid, apex acute or obtuse. Inflorescences to 8 cm; bracts linear to linear-lanceolate, 2–5 mm. Flowers short pedicellate, widely spaced. Calyx ca. 2.3 mm; lobes linear, densely minutely hispid. Corolla light blue, ca. 4 mm; tube shorter than calyx, ca. 1.2 mm; throat appendages trapeziform, ca. 0.7 mm, apex obtuse; limb 5-parted; lobes obovate, ca. 2 mm. Stamens inserted above middle of corolla tube; anthers oblong, ca. 0.5 mm. Style short terete, ca. 0.6 mm; stigma discoid. Nutlets brown, narrowly ovoid, ca. 3 mm, tuberculate; disc wing constricted upward, becoming yellowish, saccate, densely pubescent, margin entire. Fl. and fr. May–Jun.

Dunes. N Xinjiang [Kazakhstan].

**33. *Lappula transalaica*** (B. Fedtschenko ex Popov) Nabiev, Consp. Fl. As. Med. 8: 198. 1986.

隐柱鹤虱 yin zhu he shi

*Lepechiniella transalaica* B. Fedtschenko ex Popov in Komarov, Fl. URSS 19: 714. 1953.

Herbs perennial; caudex few branched, forming small tufts of leaf rosettes. Stems several to many, laterally ascending, 10–25 cm tall. Basal leaves in rosettes, elongated linear or spatulate-linear, 4–6(–10) cm × 2–5 mm, gray sericeous; stem leaves linear, 1–3 cm × 1–3 mm, apex obtuse. Inflorescences leafless, loose, to 5–6 cm in fruit. Pedicel short, smaller, to 3–5 mm in fruit. Calyx ca. 2 mm. Corolla light blue or white; limb flat, 5–8 mm wide; lobes rounded-ovate; appendages trapeziform-ovate, ca. 1 mm. Nutlets with wings wider than long, rounded-ovoid, 5–7 mm wide; disc finely tuberculate, keeled, winged; wing yellowish, wide, leathery, undulate-plicate, generally flat, margin turning blue, with 3–5 glochids on each side, densely papilliform-aculeate adaxially. Gynophore and very short style hidden. Fl. Jun-Jul, fr. Aug.

Stony places in mountains. W Xinjiang (Transalai Range west of Uluggat and Pamir) [Kyrgyzstan, Tajikistan].

**34. *Lappula lipskyi*** Popov, Bot. Mater. Gerb. Bot. Inst. Acad. Nauk SSSR 14: 311. 1951.

短柱鹤虱 duan zhu he shi

Herbs annual. Stems 20–35 cm, branched from base or above. Leaves oblong-spatulate, 1–3(–4) cm × 5–10 mm, abaxially somewhat grayish with large white tubercles and spreading pubescent or bristly, adaxially green and subglabrous. Inflorescences loose. Pedicel erect, 1–2 mm. Calyx ca. 2 mm; lobes oblong-linear, white tuberculate and strigose, apex obtuse. Corolla sky blue; limb flat, (5–)5.5–6 mm; lobes ovate-rounded. Nutlets heteromorphic, 3.5–4 mm, with or without a leathery dentate wing, with 5–7 upright triangular teeth on each side along wing margin or with short glochids along disc margin; disc with protruding keel. Style short, hidden. Fl. Jun-Jul, fr. Jul-Aug.

Slopes of hills, mainly acidic soils. NW Xinjiang (Altay Shan) [Kazakhstan, W Mongolia].

**35. *Lappula macrantha*** (Ledebour) Gürke in Engler & Prantl, Nat. Pflanzenfam. 4(3a): 107. 1897.

大花鹤虱 da hua he shi

*Echinosperrum macranthum* Ledebour, Fl. Altaic. 1: 205. 1829.

Herbs annual. Stems 20–40 cm, usually branched from base; branches ascending, sparsely spreading pubescent. Leaves light green, lanceolate-spatulate or oblong, wide and flat, 2–4 cm × 5–10 mm, abaxially densely spreading pubescent, apex obtuse. Infructescences branches 3–8 cm, not very loose; bracts small lanceolate. Pedicel 1–2 cm, pubescent. Calyx 1.5–2 mm, elongated in fruit; lobes

lanceolate. Corolla sky blue; limb slightly funnellform, 5–8 mm wide; lobes ovate-rounded. Nutlets 4–5 mm; disc with keel of small anchorlike spines and tuberculate, margin with flat whitish yellow glochids 2–3 mm; glochids 4–6 on each side of disc. Style completely hidden. Fl. Apr-Jun, fr. May-Jul.

Sandy and acidic soils of mountain slopes. NW Xinjiang (Ertix He River, Altay Shan) [Kazakhstan, Mongolia].

It is doubtful that this species belongs in *Lappula*. The short style hidden by the nutlets and the comparatively short attachment scar of the nutlets are more characteristic of *Lepechiniella*.

**36. *Lappula physacantha*** Goloskokov, Bot. Mater. Gerb. Inst. Bot. Akad. Nauk. Kazahsk. SSR 10: 34. 1977.

囊刺鹤虱 nang ci he shi

Herbs annual. Stems (10–)20–40 cm, branched from base, pubescent, glaucous green. Basal leaves early deciduous; stem leaves oblong or lanceolate, 2–4 cm × 3–8 mm, reflexed, acute, with tubercle-based setae. Inflorescences leafy, to (5–)10–20(–30) cm. Corolla blue; limb to ca. 3.5 mm. Nutlets 4, homomorphic; gynophore hidden between nutlets; disc margin wingless, not involute; marginal glochids 2–2.5 mm, terete, hollow, in 1 row.

Stony deserts. Xinjiang (Tien Shan) [Kyrgyzstan].

