

## 8. CALLIGONUM Linnaeus, Sp. Pl. 1: 530. 1753.

沙拐枣属 sha guai zao shu

Bao Bojian (包伯坚); Alisa E. Grabovskaya-Borodina

Shrubs or subshrubs, much branched; woody branches without spines; herbaceous branchlets of current year with leaves and flowers. Leaves simple, opposite, nearly sessile, linear or scale-like, united with ocrea at base or free; ocrea membranous. Inflorescence axillary. Pedicel slender, jointed. Flowers bisexual. Perianth persistent, 5-parted, not accrescent in fruit. Stamens 12–18; filaments connate at base. Ovary tetragonous. Styles 4, short; stigmas capitate. Achenes trigonous, ellipsoid or oblong-ovoid, woody; ribs with wings or bristles, rarely overgrowing a thin bladderlike membrane on surface of reduced wings or bristles.

About 35 species: N Africa, Asia, S Europe; 23 species (eight endemic) in China.

The reader can refer to Borodina (Rast. Tsentral. Azii 9: 122–130. 1989) for taxa in adjacent Central Asian countries.

- 1a. Fruit with wings or bristles membranous-saccate ..... 1. *C. calliphysa*
- 1b. Fruit with wings or bristles not membranous-saccate.
  - 2a. Fruit with wings along ribs; not with bristles; wings entire.
    - 3a. Old branches light gray or yellow; wings nearly membranous, softer ..... 2. *C. leucocladum*
    - 3b. Old branches dark in color, gray-brown, purple-brown, or dark red; wings not membranous.
      - 4a. Old branches gray-brown; wings nearly membranous; perianth white ..... 3. *C. aphyllum*
      - 4b. Old branches dark red or purple-brown; wings subleathery; perianth pink or red ..... 4. *C. rubicundum*
  - 2b. Fruit with bristles on ribs or narrow wings with bristles at margin.
    - 5a. Fruit narrowly winged with bristles; bristles flat at base.
      - 6a. Wings submembranous, entire; bristles soft, simple or forked at tips, slender, setose ..... 5. *C. cordatum*
      - 6b. Wings stiffly subleathery, margin narrowing to bristles; bristles stiff, forked at tips, thick.
        - 7a. Fruit globose or subglobose, densely bristly; achenes coniform ..... 6. *C. densum*
        - 7b. Fruit ovoid or subglobose, sparsely bristly; achenes ellipsoid, ovoid, or oblong.
          - 8a. Fruit less than 1.3 cm in diam.; achenes with bristles and wings at base of ribs, unarmed at apex; bristles ca. as long as or shorter than width of achenes; perianth spreading in fruit ..... 8. *C. squarrosum*
          - 8b. Fruit more than 1.5 cm in diam.; achenes with bristles and wings on entire rib; ca. as long as or longer than width of achenes; perianth reflexed in fruit.
            - 9a. Fruit dark brown, subglobose; wings 1–2 mm wide ..... 7. *C. colubrinum*
            - 9b. Fruit yellow or yellowish brown, rarely red-brown, broadly ovoid; wings 2–3 mm wide ..... 9. *C. klementzii*
      - 5b. Fruit not winged, with bristles on ribs, often not flat at base.
        - 10a. Fruit 1.5–3 cm in diam.
          - 11a. Fruit globose or subglobose, bristles dense ..... 20. *C. caput-medusae*
          - 11b. Fruit ovoid or broadly ovoid, bristles sparse.
            - 12a. Fruit broadly ovoid; achenes ovoid, with 2 or 3 rows of bristles per rib ..... 15. *C. alashanicum*
            - 12b. Fruit ovoid; achenes ellipsoid, with 2 rows of bristles per rib ..... 19. *C. arborescens*
        - 10b. Fruit less than 1.5 cm in diam.
          - 13a. Bristles slender, hair-shaped, breakable or deciduous; fruit ca. 1 mm in diam.
            - 14a. Bristles in 1 row; achenes coiled ..... 13. *C. pumilum*
            - 14b. Bristles in 2 or 3 rows; achenes not coiled.
              - 15a. Fruit broadly ellipsoid; perianth ovate, spreading in fruit; pedicel 1–2 mm, jointed below ..... 10. *C. mongolicum*
              - 15b. Fruit subglobose; perianth broadly elliptic, reflexed in fruit; pedicel 2–4 mm, jointed at middle ..... 18. *C. jeminaicum*
          - 13b. Bristles thick, spiniform; fruit ca. 15 mm in diam.
            - 16a. Bristles in 1 row per rib.
              - 17a. Fruit ellipsoid, less than 1 mm in diam.; bristles shorter than width of achenes, branched from middle; pedicel 1–2 mm, jointed near base ..... 23. *C. yengisaricum*
              - 17b. Fruit broadly ovoid, more than 15 mm in diam.; bristles longer than width of achenes, branched from upper portion; pedicel 3–4 mm, jointed below middle .... 22. *C. korlaense*
            - 16b. Bristles in 2 or 3 rows per rib.
              - 18a. Bristles in 3 rows per rib.
                - 19a. Fruit subglobose, broadly ellipsoid, or ellipsoid; achenes ellipsoid or broadly ellipsoid; pedicel jointed at middle ..... 12. *C. chinense*

- 19b. Fruit broadly ovoid or ovoid; achenes ovoid or oblong; pedicel jointed below middle ..... 16. *C. trifarium*
- 18b. Bristles in 2 rows per rib.
  - 20a. Achenes with long beak; ribs often not prominent; bristles sparse, not enlarged at base, soft ..... 17. *C. ebinuricum*
  - 20b. Achenes without long beak; ribs prominent; bristles dense, enlarged at base, stiff.
    - 21a. Achenes oblong, not or slightly coiled; bristles in 2 rows at margin of rib ..... 11. *C. gobicum*
    - 21b. Achenes broadly ovoid or broadly ellipsoid, usually coiled; bristles in 2 rows at middle of rib.
      - 22a. Bristles slender, breakable; flowers dense ..... 14. *C. zaidamense*
      - 22b. Bristles thick, stiff; flowers sparse ..... 21. *C. roborowskii*

**1. *Calligonum calliphysa*** Bunge, Hort. Bot. Dorpat. 8. 1839.

泡果沙拐枣 pao guo sha guai zao

*Calligonum horridum* E. Borszczow.

Shrubs 40–100 cm tall, much branched, spreading. Old branches yellowish gray or light brown; herbaceous branchlets of current year gray-green, jointed; joints 1–3 cm. Leaves linear, 3–6 mm; ocrea light yellow, not united with leaf. Pedicel 3–5 mm, jointed below middle. Flowers often 2–4 at leaf axils, slightly dense. Tepals green with a broad white margin abaxially, ovate, unequal, outer ca. 3 mm. Fruit light red or red when young, light yellow, yellow-brown, or red-brown when mature, membranous-saccate, globose, or broadly ellipsoid, 0.9–2 cm × 7–10 mm. Achenes ellipsoid, not coiled; ribs broad; bristles in 3 rows per rib, dense, soft, membranous. Fl. Apr–Jun, fr. May–Jul.  $2n = 18^*$ .

Sandy deserts, steppes; 300–800 m. Nei Mongol, Xinjiang [Kazakhstan, Mongolia, Russia (SE European part, W Siberia), Tajikistan, Turkmenistan; SW Asia].

**2. *Calligonum leucocladum*** (Schrenk) Bunge, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 7: 485. 1851.

淡枝沙拐枣 dan zhi sha guai zao

*Pterococcus leucocladus* Schrenk, Mélanges Biol. Bull. Phys.-Math. Acad. Imp. Sci. Saint-Petersbourg 3: 211. 1845; *Calligonum anfractuosum* Bunge; *P. aphyllus* Karelin & Kirilov (1842), not Pallas (1773).

Shrubs 50–120 cm tall. Old branches yellow-gray or gray, tortuous, often inclined-spreading; herbaceous branchlets of current year gray-green, slender; joints 1–3 cm. Leaves easily deciduous, linear, 2–5 mm; ocrea light yellow, not united to leaf. Pedicel 2–4 mm, jointed below middle. Flowers dense, 2–4 at leaf axils. Tepals green with broad white margin, broadly elliptic, 1.2–1.8 × 1–1.6 cm. Fruit narrowly ellipsoid, 1.2–1.8 cm. Achenes narrowly ellipsoid, not or slightly coiled; ribs 4, each with 2 wings; wings light yellow or yellow-brown, submembranous, finely veined. Fl. Apr–May, fr. May–Jun.  $2n = 18^*$ .

Semimobile or stable sand dunes, deserts; 500–1200 m. Xinjiang [Kazakhstan, Russia (W Siberia), Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

**3. *Calligonum aphyllum*** (Pallas) Guerke, Pl. Europ. 2: 111.

1897.

无叶沙拐枣 wu ye sha guai zao

*Pterococcus aphyllus* Pallas, Reise Russ. Reich. 2: 332. 1773; *Calligonum pallasia* L'Héritier; *C. polygonoides* Pallas (1773), not Linnaeus (1753); *C. rigidum* Litvinov.

Shrubs 0.8–2 m tall. Old branches flexuous, grayish brown or purple-brown; herbaceous branchlets of current year green, slender; joints 1–3 cm. Leaves easily deciduous, linear, 2–4 mm; ocrea not united to leaf. Pedicel red, 4–5 mm, jointed below middle. Flowers 1–3, at leaf axils. Tepals white, green, or red, ovate, with broad white margin abaxially, unequal, ca. 3 mm. Fruit yellow or red when young, yellow-brown or dark purple when mature, subglobose or broadly ovoid, 1.5–2 × 1.2–2 cm. Achenes ellipsoid, with 4 obtuse ribs; not or slightly coiled; each rib with 2 wings; wings subglobose, often smooth. Fl. and fr. Jun.  $2n = 36^*$ .

Mobile or semimobile sand dunes; 500–600 m. Xinjiang [Kazakhstan, Russia (SE European part, W Siberia), Tajikistan, Turkmenistan, Uzbekistan; SW Asia].

**4. *Calligonum rubicundum*** Bunge, Hort. Bot. Dorpat. 8. 1839.

红果沙拐枣 hong guo sha guai zao

*Calligonum affine* Popova; *C. crispum* Bunge; *C. songaricum* Endlicher; *Pterococcus songaricus* C. A. Meyer var. *rubicundum* C. A. Meyer.

Shrubs 0.8–1.5 m tall. Old branches dark red, reddish brown, or gray-brown; herbaceous branchlets of current year gray-green, jointed; joints 1–4 cm. Leaves linear, 2–5 mm; ocrea united to leaves. Pedicel 4–6 mm, glabrous. Flowers 2 or 3 in leaf axil. Tepals reflexed in fruit, pink or red, linear-lanceolate, 2.5–4 mm. Fruit light green, light yellow, or bright red when young, yellow-brown or dark red when mature, ovoid, broadly ovoid, or subglobose, 1.4–2 × 1.4–1.8 cm. Achenes coiled, with ribs; wings on ribs leathery, with veins. Fl. May–Jun, fr. Jun–Jul.  $2n = 36^*$ .

Semimobile or stable sand dunes, sandy lands; 400–1000 m. Xinjiang [Kazakhstan, Mongolia, Russia (W Siberia)].

**5. *Calligonum cordatum*** Korovin ex N. Pavlov, Repert. Spec. Nov. Regni Veg. 33: 154. 1933.

心形沙拐枣 *xin xing sha guai zao*

Shrubs 0.6–2 m tall. Old branches grayish yellow; herbaceous branchlets of current year light green, slender. Leaves linear, 2–3 mm. Flowers 2 or 3, at leaf axils. Tepals reflexed in fruit. Fruit light yellow or red-yellow, cordate-ovoid or ovoid, 1.3–1.8 × 1.1–1.6 cm. Achenes ovoid-oblong, slightly coiled, 8–9 × 4–5 mm, sharply ribbed with wings; wings 2–4 mm wide, submembranous, base subcordate, margin slightly involute; margin of wing toothed; teeth elongating to bristles; bristles somewhat soft, nearly as long as width of wings, not branched or forked at tips. Fl. Apr–May, fr. May.  $2n = 18^*$ .

Sand dunes; 500–600 m. Xinjiang [Tajikistan, Turkmenistan].

**6. *Calligonum densum*** E. Borszczow, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 3(1): 36. 1860.

密刺沙拐枣 *mi ci sha guai zao*

Shrubs 1–2 m tall. Old branches light gray or yellow-gray, slightly twisted; herbaceous branchlets of current year gray-green; joints 1–5 cm. Leaves scale-like, 1–2 mm. Pedicel 2–4 mm, jointed below middle. Flowers usually 2–4, at leaf axil, small. Perianth reflexed in fruit, broadly ovate. Fruit globose or subglobose, 1–2 mm in diam. Achenes coniform, coiled, apex acute, prominently ribbed with 2 row wings; wings 2–3 mm wide, somewhat stiff, with bristles at margin; bristles dense, flat, somewhat stiff, forked at middle, slender at apices, including achenes. Fl. May–Jun, fr. Jun–Jul.  $2n = 18^*$ .

Semimobile sand dunes; ca. 600 m. Xinjiang [Kazakhstan, Turkmenistan].

**7. *Calligonum colubrinum*** E. Borszczow, Mém. Acad. Imp. Sci. Saint Pétersbourg, Sér. 7, 3(1): 38. 1860.

褐色沙拐枣 *he se sha guai zao*

Shrubs 1.5–2 m tall, much branched, spreading. Old branches light gray, rough; herbaceous branchlets of current year light green, smooth, jointed; joints 1–3 cm. Leaves scale-like, 1–2 mm, united with ocrea. Pedicel 5–8 mm, jointed below middle. Flowers small, 2 or 3 at leaf axils. Tepals reflexed in fruit. Fruit dark brown, subglobose, 1.4–2 cm in diam. Achenes ellipsoid, ca. 10 × 5 mm, coiled, ribbed with wings; wings narrow, 1–2 mm wide, somewhat stiff, margin of wings gradually splitting into bristles; bristles 4–6 mm, ca. as long as or longer than width of achenes, slightly stiff, forked at middle or above. Fl. May–Jun, fr. Jun–Jul.

Semimobile or stable sand dunes; ca. 600 m. Xinjiang [Kazakhstan, Turkmenistan].

**8. *Calligonum squarrosom*** N. Pavlov, Repert. Spec. Nov. Regni Veg. 33: 152. 1933.

粗糙沙拐枣 *cu cao sha guai zao*

Shrubs 50–80 cm tall, rarely above 1 m tall, much branched, spreading. Old branches light gray; herbaceous branchlets of current year light green; joints 2–5 cm. Leaves linear, curved, 2–5 mm; ocrea light brown, united to leaf. Pedicel 5–10 mm. Flowers 1–3, at leaf axil. Tepals spreading in fruit, red, broadly elliptic, usually 3–4 × 1–3 mm. Fruit broadly ovoid, 1–

1.3 × 1.1–1.4 cm. Achenes broadly ellipsoid or broadly ovoid, 1–1.3 cm × 4–5 mm; ribs obtuse, with wings only at base of achenes; wings narrow, 1–2 mm wide, stiff, leathery; margin of wings narrowing to bristles; bristles sparse, flat, ca. as long as or shorter than width of achenes, but 3–5 × as long as width of wings, stiff, spreading and forked at middle or above, apices very short and divaricate. Fl. Jun, fr. Jun–Jul.

Sand dunes; ca. 600 m. Xinjiang [Kazakhstan, Turkmenistan, Uzbekistan].

**9. *Calligonum klementzii*** Losinskaja, Izv. Glavn. Bot. Sada SSSR 26: 595. 1927.

奇台沙拐枣 *qi tai sha guai zao*

Shrubs 50–90 cm tall, rarely 1–1.5 m tall, much long branched. Old branches yellow-gray or gray, much flexuous; herbaceous branchlets of current year jointed; joints 1–3 cm. Leaves linear, 2–6 mm; ocrea united to leaf. Pedicel 2–4 mm. Flowers 1–3, at leaf axil. Tepals reflexed in fruit, dark red, broadly elliptic. Fruit light yellow, yellow-brown, or red-brown, broadly ovoid, 1–2 × 1.2–2 cm. Achenes oblong, slightly coiled, not prominently ribbed; wings ca. 2–3 mm wide, nearly leathery, prominently veined; margin of wing irregularly lobate and gradually narrowing to bristles; bristles sparse or dense, flat, ca. as long as or longer than width of achenes, 2.5–3.5 × as long as width of wing, stiff, forked, apices short. Fl. May–Jun, fr. Jun–Jul.  $2n = 18^*$ , (24\*).

• Sand dunes; 600–700 m. Xinjiang.

**10. *Calligonum mongolicum*** Turczaninow, Bull. Soc. Imp. Naturalistes Moscou 5: 204. 1832.

沙拐枣 *sha guai zao*

*Calligonum dielsianum* K. S. Hao; *C. potaninii* Losinskaja.

Shrubs 25–150 cm tall. Old branches spreading, flexuous, grayish white or light yellow-gray; herbaceous branchlets of current year gray-green, jointed; joints 0.6–3 cm. Leaves linear, 2–4 mm; ocrea united to leaf. Pedicel 1–2 mm, slender, jointed below middle. Flowers 2 or 3, at leaf axil, white or light red. Tepals spreading in fruit, ovate, ca. 2 mm. Fruit broadly ellipsoid, 0.8–1.2 cm × 7–11 mm. Achenes linear, narrowly ellipsoid, or broadly ellipsoid, not to very coiled; ribs prominent or not, each with 2 or 3 rows of bristles; bristles dense, ca. as long as or slightly longer than width of achenes, slender, breakable, not or slightly enlarged at base, 2- or 3-branched from middle. Fl. May–Jul, fr. Jun–Aug.  $2n = 18^*$ , (27\*).

Mobile, semimobile, or stable sand dunes, deserts; 500–1800 m. Gansu, Nei Mongol, Xinjiang [Mongolia].

**11. *Calligonum gobicum*** (Bunge ex Meisner) Losinskaja, Izv. Glavn. Bot. Sada SSSR 26: 598. 1927.

戈壁沙拐枣 *ge bi sha guai zao*

*Calligonum mongolicum* Turczaninow var. *gobicum* Bunge ex Meisner in Candolle, Prodr. 14(1): 29. 1856; *C. kostlovii* Losinskaja.

Shrubs 80–100 cm tall. Older branches long, straight.

Herbaceous branchlets of current year gray-green; joints 1.5–3 cm. Leaves linear, 1–5 mm; ocrea united to leaf. Pedicel 2–3 mm, slender, jointed below middle. Flowers red. Tepals reflexed in fruit, broadly elliptic. Fruit broadly ovoid, 1.1–1.8 × 1–1.5 cm. Achenes oblong, not or slightly coiled; ribs obtuse, somewhat broad, deeply canaliculate; bristles in 2 rows at margin of ribs, sparse, ca. as long as or slightly longer than width of achenes, thick, breakable, slightly enlarged, 2-branched from middle or above. Fl. May–Jul; fr. Jun–Aug.

Mobile, semimobile, or stable sand dunes, deserts; 600–1600 m. Gansu, Nei Mongol, Xinjiang [SW Mongolia].

**12. *Calligonum chinense*** Losinskaja, Izv. Glavn. Bot. Sada SSSR 26: 601. 1927.

甘肃沙拐枣 gan su sha guai zao

Shrubs 50–100 cm tall. Old branches light gray; herbaceous branchlets of current year gray-green, jointed; joints 1–3 cm. Leaves linear, 2–3 mm; ocrea united to leaf. Pedicel 3–4 mm, jointed at middle. Flowers 1–3, at leaf axil. Tepals reflexed in fruit, dark or light red, broadly elliptic. Fruit red-brown or light red when young, brown or yellow-brown when mature, subglobose, broadly ellipsoid or ellipsoid, 1–1.5 × 1–1.4 cm. Achenes ellipsoid or broadly ellipsoid, coiled, 8–11 × 3–5 mm, with ribs and deeply canaliculate; ribs broad, each with 3 rows of bristles, rarely 2 rows. Bristles of margin rows dense, enlarged at base, flat, slightly united or not, thick, stiff, often ca. as long as or shorter than width of achenes, 2- or 3-forked from middle or above; apical branches spreading, short, acute. Fl. May, fr. Jun–Jul.

● Mobile or semimobile sand dunes, stony deserts; 1000–1500 m. Gansu, ?Nei Mongol, Xinjiang.

One of us (Grabovskaya-Borodina) regards this as a synonym of *Calligonum litvinovii* Drobow (see Borodina, Rast. Tsentral. Azii 9: 122–130. 1989).

**13. *Calligonum pumilum*** Losinskaja, Izv. Glavn. Bot. Sada SSSR 26: 600. 1927.

小沙拐枣 xiao sha guai zao

*Calligonum juochiangense* Liou f.

Shrubs 30–50 cm tall. Old branches gray or light yellow-gray; herbaceous branchlets of current year gray-green; joints 1–3.5 cm. Leaves 2–3 mm, lanceolate, apex acute. Pedicel 3–4 mm. Flowers 2 or 3 at leaf axil. Tepals reflexed in fruit, light red, broadly ovate. Fruit broadly ellipsoid, 7–12 × 6–8 mm. Achenes ovoid, coiled, permanently ribbed; each rib with 1 row of bristles; bristles free at base, 2- or 3-branched below middle. Fl. Apr–May, fr. May–Sep.  $2n = 18^*$ .

Sandy and stony deserts; 700–1500 m. Xinjiang [Mongolia].

**14. *Calligonum zaidamense*** Losinskaja, Izv. Glavn. Bot. Sada SSSR 26: 601. 1927.

柴达木沙拐枣 chai da mu sha guai zao

Shrubs 0.6–2 m tall. Old branches light gray or yellow-gray; herbaceous branchlets of current year gray-green; joints 2–3 cm; branches upward spreading. Flowers dense, 2 or 3 at leaf axil. Fruit broadly ellipsoid, 1–1.7 × 0.8–1.5 cm. Achenes

ovoid, coiled or not; ribs obtuse; bristles in 2 rows at center of ribs, breakable, sparse or dense, flat at base, slightly enlarged, somewhat united or not, 2-forked from middle. Fr. Jul.

● Mobile sand dunes; 1500–2700 m. Qinghai, Xinjiang.

One of us (Grabovskaya-Borodina) regards this as a synonym of *Calligonum litvinovii* Drobow (see Borodina, Rast. Tsentral. Azii 9: 122–130. 1989).

**15. *Calligonum alashanicum*** Losinskaja, Izv. Glavn. Bot. Sada SSSR 26: 600. 1927.

阿拉善沙拐枣 a la shan sha guai zao

*Calligonum przewalskii* Losinskaja.

Shrubs 1.5–3 m tall. Old branches gray or yellow-gray; herbaceous branchlets of current year gray-green. Leaves 3.3–4 mm, lanceolate, apex acute. Pedicel 2–3 mm, slender. Flowers 2 or 3 in axis. Tepals reddish, broadly elliptic or subglobose, 2–3 mm. Fruit broadly ovoid, rarely subglobose, 1.8–2.6 × 1.7–2.5 cm. Achenes ovoid, coiled, very permanently ribbed; bristles in 2 or 3 rows on each rib, dense or slightly sparse, longer than width of achenes, slender, flat at base, slightly inflated, free or slightly united, secondarily 2- or 3-branched; apically spreading. Fl. May, fr. Jun–Aug.

● Mobile sand dunes, deserts; 500–1500 m. Gansu, Nei Mongol.

**16. *Calligonum trifarium*** Z. M. Mao, Acta. Phytotax. Sin. 22: 148. 1984.

三裂沙拐枣 san lie sha guai zao

Shrubs 30–80 cm tall. Old branches light gray; herbaceous branchlets of current year jointed; joints 2–3 cm. Leaves linear, 2–3 mm; ocrea united to leaf. Pedicel 2–4 mm, jointed below middle. Flowers 1–3, at leaf axil. Tepals reflexed in fruit, light red, broadly elliptic. Fruit broadly ovoid, 1–2 × 0.8–1.8 cm. Achenes ovoid, coiled, 7–11 × 4–5 mm, beaked at end; ribs obtuse, inconspicuously with 3 rows (rarely 2 rows) of bristles on each. Bristles dense, stiff, free, not enlarged at base, 2-forked from middle or below, dense or slightly so to bundled at apices of achenes. Fl. May–Jun, fr. Jun–Jul.

● Sand dunes, deserts; ca. 500 m. Xinjiang.

**17. *Calligonum ebinuricum*** N. A. Ivanova ex Soskov, Izv. Akad. Nauk Turkm. SSSR, Ser. Biol. 5, 6: 55. 1969.

艾比湖沙拐枣 ai bi hu sha guai zao

Shrubs 0.8–1.5 m tall, laxly branched, spreading; young plants subglobose; old plants pyramidal. Leaves linear, 2–4 mm, slightly curved; ocrea united with leaf. Pedicel 3–6 mm, jointed below middle. Flowers 1–3, at leaf axil. Tepals reflexed in fruit, light red, elliptic. Fruit broadly ovoid or ovoid, 1–1.5 × 1–2 cm. Achenes ovoid or oblong, with one 2–4 mm beak, very coiled; ribs not prominent, with 2 rows of bristles on each; bristles 5–7 in each row, very free, slender, soft, secondarily 2- or 3-forked; apical branches straight; bundled at apices of achenes. Fl. Apr–May, fr. May–Jul.  $2n = 18^*$ .

Semimobile sand dunes, sandy deserts; 500–600 m. Xinjiang [Mongolia].

**18. *Calligonum jemaiaicum*** Z. M. Mao, Acta Phytotax. Sin. 22: 148. 1984.

吉木乃沙拐枣 *ji mu nai sha guai zao*

Shrubs ca. 50 cm tall, much branched, subglobose. Old branches gray or yellow-gray; branchlets of current year light green, with joints 2–3 cm. Leaves linear, 1–2 mm; ocrea united to leaf. Pedicel 2–4 mm, jointed at middle. Flowers 1–3, at leaf axil. Tepals reflexed in fruit, light red or white, broadly elliptic. Fruit subglobose, 10–12 cm in diam. Achenes narrowly ellipsoid or ovoid, 8–10 × 2–3 mm, slightly coiled, not prominently ribbed; bristles in 2 rows per rib, yellow-brown, slender, soft, not at base, free, secondarily 2- or 3-forked; apical branches erect, short. Fl. Jun, fr. Jul.

- Semimobile sand dunes; ca. 900 m. Xinjiang.

**19. *Calligonum arborescens*** Litvinov, Sched. Herb. Fl. Ross. 2: 28. 1900.

乔木沙拐枣 *qiao mu sha guai zao*

Shrubs 2–4 m tall, often 3- or 4-branched at base of stem. Old branches yellow-white, often longitudinally splitting and with brown stripes; herbaceous branchlets of current year gray-green. Leaves scale-like, 1–2 mm, with a brown mucro; ocrea united with leaf. Pedicel ca. 3 mm, jointed below middle. Flowers 2 or 3, at leaf axil. Tepals broadly linear, apex rounded, reflexed in fruit. Fruit yellow or red when young, becoming light yellow or light brown, ovoid, 1.5–2.5 × 1–2 cm. Achenes ellipsoid, strongly coiled, prominently 4-ribbed; bristles in 2 rows per rib, slightly flat and separate at base, denser and longer at summit, 2- or 3-forked above middle, divaricate, not including achenes. Fl. Apr–May, fr. May–Jun.  $2n = 18^*$ .

Desert sand dunes; 500–600 m. Gansu, Ningxia, Xinjiang [Kazakhstan, Turkmenistan, Uzbekistan].

**20. *Calligonum caput-medusae*** Schrenk, Enum. Pl. Nov. 1: 9. 1841.

头状沙拐枣 *tou zhuang sha guai zao*

Shrubs 1–3 m tall, 2–8 cm in diam., branched from base. Old branches light gray or yellow-gray, often longitudinally splitting; herbaceous branchlets of current year gray-green; joints 1–4 cm. Leaves linear, ca. 2 mm; ocrea united with leaf. Flowers 2 or 3, at leaf axil. Tepals reflexed in fruit, purple, ovate, 2–3 mm. Fruit yellow-green, red-brown, or red when young, becoming light yellow, yellow-brown, or red-brown, subglobose, 1–3 cm in diam. Achenes ellipsoid, coiled, prominently ribbed; bristles dense, 2 rows per rib, slightly flat at base, separate or somewhat united, 2- or 3-forked below middle, then repeatedly 2- or 3-forked, spiniform, stiff; apically spreading. Fl. Apr–May, fr. May–Jun.  $2n = 36^*$ .

Sand dunes, steppes; 300–900 m. Gansu, Ningxia, Xinjiang [Kazakhstan, Turkmenistan].

**21. *Calligonum roborowskii*** Losinskaja, Izv. Glavn. Bot. Sada SSSR 26: 603. 1927.

塔里木沙拐枣 *ta li mu sha guai zao*

Shrubs 30–80 cm tall, rarely to 1.5 m. Old branches gray-white or light gray; herbaceous branchlets of current year light green; joints 1–3 cm. Leaves scale-like, ca. 1 mm; ocrea united to leaf. Pedicel short, ca. 2 mm, jointed at base. Flowers 1 or 2, at leaf axil. Tepals reflexed in fruit, light red or gray-white, broadly elliptic. Fruit yellow or yellow-brown, broadly ovoid or broadly ellipsoid, 0.8–1.5 × 0.8–1.4 cm. Achenes ovoid, coiled, prominently ribbed; bristles in 2 rows per rib, short, slightly longer than width of achenes, stiff, enlarged at base, separate or somewhat united, 2- or 3-branched from middle or above and then repeatedly branched; apical branches spiniform, short. Fl. May–Jun, fr. Jun–Jul.  $2n = 36^*$ .

Sandy deserts, stony slopes of foothills; 1500–3000 m. Gansu, Xinjiang [Mongolia].

One of us (Grabovskaya-Borodina) regards this as a synonym of *Calligonum litvinovii* Drobow (see Borodina, Rast. Tsentral. Azii 9: 122–130. 1989).

**22. *Calligonum korlaense*** Z. M. Mao, Acta Phytotax. Sin. 22: 150. 1984.

库尔勒沙拐枣 *ku er le sha guai zao*

Shrubs ca. 80 cm tall. Old branches gray-white; herbaceous branchlets of current year green; joints 1–4 cm. Pedicel red, 3–4 mm, jointed below middle. Flowers 1–3, at leaf axil. Tepals reflexed in fruit, red, broadly elliptic. Fruit yellow-brown, broadly ovoid, 1.6–1.8 × 1.4–1.6 cm. Achenes narrowly ovoid; apically elongated, coiled, obtusely ribbed; bristles in 1 row per rib, sparse, longer than width of achenes, flat at base, slightly enlarged, separate, 2- or 3-forked and crossed; apical branches short, slender, breakable. Fl. May, fr. May–Jun.

- Stony slopes of foothills; ca. 900 m. Xinjiang.

**23. *Calligonum yengisaricum*** Z. M. Mao, Acta Phytotax. Sin. 22: 149. 1984.

英吉沙沙拐枣 *ying ji sha sha guai zao*

Shrubs 30–50 cm tall. Old branches yellow-gray; herbaceous branchlets of current year grayish green; joints short, 1–2 cm. Leaves very small, ca. 1 mm, scale-like; ocrea united to leaf. Pedicel red, short, 1–2 mm, jointed at base. Flowers 1 or 2, at leaf axil. Tepals reflexed in fruit, red. Fruit ellipsoid, small, 7–9 × 6–8 mm. Achenes narrowly ellipsoid, coiled, prominently 4-ribbed; bristles in 1 row per rib, yellow, shorter than width of achenes, stiff, flat and enlarged at base, separate or somewhat united, 2- or 3-forked from middle, spiniform. Fl. and fr. Jun–Jul.

- Stony slopes; ca. 1400 m. Xinjiang.

