

## 1. SPARGANIUM Linnaeus, Sp. Pl. 2: 971. 1753.

### 黑三棱属 hei san leng shu

Herbs, perennial, aquatic or in marshes, with creeping rhizomes. Stems simple or branched, robust or slender. Leaves alternate, distichous, emergent or floating, sheathed at base. Flowers minute, densely crowded in globose heads on upper part of stems and branches; several male and female heads in panicle, raceme, or spike, male heads above female. Perianth segments of 3–6 chaffy elongate scales. Male flowers with 3 or more stamens; anthers basifix, longitudinally dehiscent; filaments free or partly united. Female flowers bracteolate; ovary 1-loculed or rarely 2-loculed, narrow at base; styles simple or forked, with a unilateral stigma; ovule 1, pendulous. Fruit nutlike, indehiscent.

About 19 species: mainly in temperate and cool regions of the world, best represented in the N Hemisphere; 11 species (three endemic) in China.

- 1a. Stems floating or slightly prostrate in water; leaves usually floating, flattened.
  - 2a. Stems stout, 1.3–1.5 m tall; leaves ca. 10 mm wide; male heads 8–10 ..... 8. *S. yunnanense*
  - 2b. Stems slender, less than 70 cm tall; leaves 2–4 mm wide; male heads 1–4.
    - 3a. Styles absent or inconspicuous; fruit broadly obovoid ..... 11. *S. hyperboreum*
    - 3b. Styles conspicuous; fruit fusiform, elliptic, or lanceolate.
      - 4a. Stems floating, more than 20 cm; male heads 2–4 ..... 9. *S. angustifolium*
      - 4b. Stems slightly prostrate or rarely erect, less than 20 cm; male heads 1 or 2 ..... 10. *S. natans*
  - 1b. Stems erect; leaves aerial, not flattened.
    - 5a. Inflorescences paniculate, with conspicuous lateral branches with male and female heads; ovary sessile.
      - 6a. Panicles with 3–7 lateral branches; stigmas 3–4 mm ..... 1. *S. stoloniferum*
      - 6b. Panicles with 1(or 2) lateral branches; stigmas less than 2 mm.
        - 7a. Leaves 2–3 mm wide; main axis and lateral branch of panicles not zigzag; styles ca. 0.5 mm ..... 2. *S. subglobosum*
        - 7b. Leaves 4–5 mm wide; main axis and lateral branch of panicles usually zigzag; styles 1–1.5 mm ..... 3. *S. limosum*
    - 5b. Inflorescences racemose or spicate, degenerated into 1 female head or completely degenerated; ovary with short stalk.
      - 8a. Inflorescences spicate; perianth segments lobate to parted ..... 7. *S. confertum*
      - 8b. Inflorescences racemose; perianth segments serrate-lobate to lobate.
        - 9a. Axis of racemes curved; ovary attenuate toward base and forming an inconspicuous stalk ..... 4. *S. fallax*
        - 9b. Axis of racemes not curved; ovary with a conspicuous stalk.
          - 10a. Male heads 4–8, distinctly separate from female ones; stigmas 1.5–1.8 mm ..... 5. *S. emersum*
          - 10b. Male heads 1–3, not separate from female ones; stigmas ca. 0.5 mm ..... 6. *S. glomeratum*  
ca. 0.5 mm; fruit ca. 3.5 mm ..... 1b. subsp. *choui*

**1. Sparganium stoloniferum** (Buchanan-Hamilton ex Graebner) Buchanan-Hamilton ex Juzepczuk in Komarov, Fl. URSS 1: 219. 1934.

### 黑三棱 hei san leng

Stems emersed, erect, robust, 70–120 cm tall or more. Leaves (20–)40–90 cm × 7–16 mm, upper flattened, lower keeled or trigonous on abaxial side. Panicles (8–)20–60 cm, with 3–7 lateral branches, each with (1 or)7–11 male heads and 1 or 2 female heads; main axis consisting of 3–5 or more male heads. Male flowers: perianth segments spatulate, lobate at apex; filaments ca. 3 mm; anthers obconic, (0.5–)1–1.2 × ca. 0.5 mm. Female flowers: perianth segments 5–7 × 1–1.5 mm; ovary sessile; styles forked or simple, ca. 1.5 mm; stigmas 3–4 mm. Fruit obconic, (3.5–)6–9 mm, ribbed. Fl. and fr. May–Oct.

Lakes, ponds, swamps, streams; below 3600 m. ?Anhui, Gansu, Hebei, Heilongjiang, ?Henan, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shaanxi, ?Shandong, Shanxi, Xinjiang, Xizang, Yunnan, ?Zhejiang [Afghanistan, Japan, Kazakhstan, Korea, Mongolia, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia, North America].

- 1a. Panicles 20–60 cm, each branch with 7–11 male heads; anthers 1–1.2 mm; fruit 6–9 mm ..... 1a. subsp. *stoloniferum*
- 1b. Panicles 8–15 cm, each branch with only 1 male head; anthers

### 1a. *Sparganium stoloniferum* subsp. *stoloniferum*

#### 黑三棱(原亚种) hei san leng (yuan ya zhong)

*Sparganium ramosum* Hudson subsp. *stoloniferum* Buchanan-Hamilton ex Graebner in Engler, Pflanzenr. 2(IV. 10): 14. 1900; *S. arcuscaulis* D. Yu & G. T. Yang; *S. erectum* Linnaeus subsp. *stoloniferum* (Buchanan-Hamilton ex Graebner) H. Hara; *S. multiporcatum* D. Yu.

Panicles 20–60 cm, each branch with 7–11 male heads. Anthers 1–1.2 mm. Fruit 6–9 mm.

Lakes, ponds, swamps, streams; below 3600 m. Gansu, Hebei, Heilongjiang, Hubei, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Shaanxi, Xinjiang, Xizang, Yunnan [Afghanistan, Japan, Kazakhstan, Korea, Pakistan, Russia, Tajikistan, Uzbekistan; SW Asia].

Some specimens from Heilongjiang were respectively described as *Sparganium multiporcatum* (Bull. Bot. Res., Harbin 11(2): 20. 1991) and *S. arcuscaulis* (loc. cit.: 37), distinguished either by the female flowers with perianth segments slightly lobate, stigmas 1.5–2 mm, or by the stems arcuate at the upper part, fruit slightly small. They represent local variant individuals rather than distinct taxa.

Govaerts (2010. World Checklist of Typhaceae. The Board of Trustees of the Royal Botanic Gardens, Kew. Published on the Internet; <http://www.kew.org/wcsp/> accessed 16 Feb 2010) treats this as *Spar-*

*ganium erectum* subsp. *stoloniferum*.

**1b. *Sparganium stoloniferum* subsp. *choui* (D. Yu) K. Sun, comb. et stat. nov.**

周氏黑三棱 zhou shi hei san leng

Basionym: *Sparganium choui* D. Yu, Bull. Bot. Res., Harbin 12: 257. 1992.

Panicles 8–15 cm, each branch with only 1 male head. Anthers ca. 0.5 mm. Fruit ca. 3.5 mm.

• Nei Mongol.

**2. *Sparganium subglobosum* Morong, Bull. Torrey Bot. Club 15: 81. 1888.**

狭叶黑三棱 xia ye hei san leng

*Sparganium stenophyllum* Maximowicz ex Meinshausen.

Stems erect, 20–36 cm tall, slender. Leaves 25–35 cm × 2–3 mm, upper flattened, lower keeled or trigonous on abaxial side. Panicles 7–15 cm, main axis consisting of 5–7 male heads and 2 or 3 female heads, usually with 1 lateral branch at base; lateral branch 5–8 cm, with 2 or 3 male and 1 or 2 female heads. Male flowers: perianth segments spatulate, ca. 2 mm, lobate at apex; filaments ca. 2 mm; anthers oblong, ca. 1 × 0.3 mm. Female flowers: perianth segments spatulate, ca. 2 mm, lobate at apex; ovary sessile; styles ca. 0.5 mm; stigmas unilateral, ca. 1.5 mm. Fruit obovoid, ca. 4 mm. Fl. and fr. Jun–Sep.

Shallow water of lakes, swamps, and streams. Hebei, Heilongjiang, Jilin, Liaoning [Japan, Korea, Russia].

**3. *Sparganium limosum* Y. D. Chen, Acta Phytotax. Sin. 19: 52. 1981.**

沼生黑三棱 zhao sheng hei san leng

Stems emersed, erect, 33–57 cm tall. Leaves erect, 50–70 cm × 4–5 mm, upper flattened, lower keeled or trigonous on abaxial side. Panicles 7–16 cm, with 1 lateral branch at base, main axis and lateral branch usually zigzag; main axis with 5–8 male heads and 2 or 3 female heads; lateral branch with 3(–5) male and 1 female heads. Male flowers: perianth segments ca. 1.5 × 0.2 mm; filaments 3–4 mm; anthers oblong, ca. 1 × 0.2 mm. Female flowers: perianth segments 1.7–2.5 × ca. 1 mm, serrate-lobate at apex; ovary sessile; styles 1–1.5 mm; stigmas linear, 1–1.2 mm. Fl. and fr. Jun–Sep.

• Swamps; ca. 1800 m. NW Yunnan (Gaoligong Shan).

Govaerts (2010). World Checklist of Typhaceae. The Board of Trustees of the Royal Botanic Gardens, Kew. Published on the Internet; <http://www.kew.org/wcsp/> accessed 16 Feb 2010) treats this as a synonym of *Sparganium subglobosum*.

**4. *Sparganium fallax* Graebner in Engler, Pflanzenr. 2(IV. 10): 15. 1900.**

曲轴黑三棱 qu zhou hei san leng

Stems emersed, erect, 40–55(–80) cm tall. Leaves 45–65 cm × 4–10 mm, upper flattened, lower keeled or trigonous on abaxial side. Racemes 15–17 cm, basally curved; male heads

4–7, distinctly separated from female ones; female heads 3 or 4(–7), relatively widely separated, sessile or lowest pedunculate. Male flowers: perianth segments linear, 2–2.5 mm, serrate-lobate at apex; filaments 3–4.5 mm; anthers oblong, ca. 1.5 × 0.4 mm. Female flowers: perianth segments broadly spatulate, ca. 3 × 1–1.5 mm, serrate-lobate at apex; ovary attenuate toward base; styles short; stigmas 1.5–2 mm. Fruit broadly fusiform, 5–6 mm. Fl. and fr. Jun–Oct.

Shallow water of lakes, ponds, swamps, and streams. Fujian, Guizhou, Taiwan, Yunnan, Zhejiang [India, Indonesia (Sumatra), Japan, Myanmar, New Guinea].

**5. *Sparganium emersum* Rehmann, Verh. Naturf. Vereins Brünn 10: 80. 1872.**

小黑三棱 xiao hei san leng

*Sparganium simplex* Hudson, Fl. Angl., ed. 2, 2: 401. 1778, nom. illeg. superfl.

Stems emersed, erect, 30–70 cm tall, slender. Leaves 40–80 cm, aerial or floating, lower keeled on abaxial side. Racemes 10–20 cm; male heads 4–8, distinctly separate from female ones; female heads 3 or 4, relatively widely separated, sessile or lowest 1 or 2 pedunculate. Male flowers: perianth segments linear or spatulate, 2–2.5 mm, lobate at apex; filaments ca. 4 mm; anthers oblong, ca. 1.6 × 0.4 mm. Female flowers: perianth segments spatulate, ca. 3.5 mm, lobate at apex; ovary with short stalk; styles ca. 1 mm; stigmas 1.5–1.8 mm. Fruit fusiform. Fl. and fr. Jun–Oct. 2n = 30.

Margins of lakes, swamps, and streams. Gansu, ?Hebei, Heilongjiang, ?Henan, Jilin, Liaoning, Nei Mongol, ?Shaanxi, Xinjiang [Japan, Kazakhstan, Kyrgyzstan, Mongolia, Myanmar, Russia; Europe, North America].

**6. *Sparganium glomeratum* Laestadius ex Beurling, Öfvers. Kongl. Vetensk.-Akad. Förh. 9: 192. 1853.**

短序黑三棱 duan xu hei san leng

*Sparganium manshuricum* D. Yu.

Stems emersed, erect, 20–50 cm tall. Leaves 30–56 cm, lower keeled or trigonous on abaxial side. Racemes 6–15 cm; male heads 1–3, not separate from female ones; female heads 3 or 4(–8), relatively near each other, lowest one pedunculate. Male flowers: perianth segments ca. 1.5 mm, serrate-lobate at apex; filaments 3–3.5 mm; anthers oblong, ca. 1 mm. Female flowers: perianth segments 2–2.5 mm, lobate at apex; ovary fusiform, with short stalk; styles short; stigmas ca. 0.5 mm. Fruit broadly fusiform, ca. 3 mm. Fl. and fr. Jun–Sep. 2n = 30.

Margins of lakes, swamps, and slow-moving rivers. Heilongjiang, Jilin, Liaoning, Nei Mongol, Xizang, Yunnan [Japan, Mongolia, Russia; Europe, North America].

A specimen with seven or eight female heads and larger flowers from Heilongjiang, which was described as *Sparganium manshuricum* (Bull. Bot. Res., Harbin 12: 255. 1992) mainly according to some quantitative characters, perhaps represents a local variant suite of specimens rather than a distinct taxon.

**7. *Sparganium confertum* Y. D. Chen, Acta Phytotax. Sin. 19: 53. 1981.**

**穗状黑三棱** sui zhuang hei san leng

Stems emersed, erect, 15–45 cm tall. Leaves 25–55 cm × 3–5 mm, lower keeled on abaxial side. Spikes with many densely arranged heads, 6–11 cm; male heads (6–)8–12, deciduous; female heads 1–3, sessile or rarely lowest one sterile, pedunculate. Female flowers: perianth segments 3–5 × ca. 1.5 mm, lobate to parted at apex; ovary elliptic, with stalk 1.5–2 mm; styles ca. 1 mm; stigmas unilateral, 1–1.5 mm. Fruit 4–5 mm. Fl. and fr. Sep–Oct.

- Shallow water of rivers, swamps, and ponds; ca. 3100 m. NW Yunnan (Gaoligong Shan).

Govaerts (2010). World Checklist of Typhaceae. The Board of Trustees of the Royal Botanic Gardens, Kew. Published on the Internet; <http://www.kew.org/wcsp/> accessed 16 Feb 2010) treats this as a synonym of *Sparganium fallax*.

**8. *Sparganium yunnanense*** Y. D. Chen, Acta Phytotax. Sin. 19: 54. 1981.

**云南黑三棱** yun nan hei san leng

Stems floating, 1.3–1.5 m, stout. Leaves floating, ca. 1.5 m × 1 cm, flattened, spongy, lower slightly convex on abaxial side. Racemes 20–35 cm, lower part ?curved; male heads 8–10; female heads 3 or 4(–7), sessile or lowest 1 or 2 pedunculate. Male flowers: perianth segments spatulate, 3–3.5 mm; filaments 3–4 mm; anthers linear, ca. 2 mm. Female flowers: perianth segments white, spatulate, 4–5 mm, lobate at apex; ovary fusiform, attenuate toward base; styles ca. 1.5 mm; stigmas oblong to ovate, 1.5–2 mm, lacerate or forked. Fl. and fr. May–Sep.

- About 1500 m. SW Yunnan (Menghai).

Govaerts (2010). World Checklist of Typhaceae. The Board of Trustees of the Royal Botanic Gardens, Kew. Published on the Internet; <http://www.kew.org/wcsp/> accessed 16 Feb 2010) treats this as a synonym of *Sparganium fallax*.

**9. *Sparganium angustifolium*** Michaux, Fl. Bor.-Amer. 2: 189. 1803.

**线叶黑三棱** xian ye hei san leng

Stems floating, 30–50 cm, slender. Leaves floating, 25–40 cm × ca. 4 mm, flattened. Racemes 6–16 cm; male heads 2–4; female heads 2–4, relatively widely separated, sessile or lowest 1 or 2 pedunculate. Male flowers: perianth segments spatulate to obtriangular; filaments ca. 5 mm; anthers elliptic, 1–1.2 × ca. 0.5 mm. Female flowers: perianth segments linear to spatulate, serrate-lobate to parted; ovary fusiform, attenuate toward base and forming a short stalk; styles ca. 2 mm; stigmas narrowly elliptic. Fruit fusiform to elliptic, ca. 4 mm. Fl. and fr. Jul–Sep.  $2n = 30$ .

Lakes, streams, swamps; above 1500 m. Heilongjiang, Jilin, Xinjiang [India, Japan; Europe, North America].

**10. *Sparganium natans*** Linnaeus, Sp. Pl. 2: 971. 1753.

**矮黑三棱** ai hei san leng

*Sparganium minimum* Wallroth.

Stems slightly prostrate or rarely erect, to 20 cm, slender. Leaves aerial or floating, 20–25 cm × ca. 4 mm, flattened. Spikes or racemes 2–3.5 cm; male heads 1(or 2); female heads 2(or 3), lowest one sometimes pedunculate. Male flowers: perianth segments ca. 1.5 mm, lobate at apex; filaments ca. 2 mm; anthers oblong, ca. 1 mm. Female flowers: perianth segments spatulate, ca. 2 mm, lobate to parted at apex; ovary lanceolate, with or without short stalk; styles short; stigmas ca. 1 mm. Fruit broadly lanceolate. Fl. and fr. Jul–Sep.  $2n = 30$ .

Below 3500 m. Heilongjiang, Nei Mongol, Sichuan [Kazakhstan, Mongolia, Russia; Europe, North America].

Specimens described as *Sparganium amplexicaulium* D. Yu (Bull. Bot. Res., Harbin 12: 257. 1992) and *S. tenuicaule* D. Yu & L. H. Liu (Bull. Bot. Res., Harbin 11(2): 19. 1991) are similar to this species. Because the two species were mainly described according to some quantitative characters and based on only one specimen, respectively, their taxonomic positions need to be further studied.

**11. *Sparganium hyperboreum*** Laestadius ex Beurling, Öfvers. Kongl. Vetensk.-Akad. Förh. 9: 192. 1853.

**无柱黑三棱** wu zhu hei san leng

Stems floating, 30–50 cm or more, slender. Leaves floating, 30–40 cm × 1–3 mm, transverse section semilunate. Racemes 5–7 cm, axis straight; male heads 1 or 2, smaller; female heads 2 or 3, lowest one pedunculate. Male flowers: perianth segments 2–2.5 mm, attenuate toward base; filaments short; anthers oblong, ca. 1 × 0.5 mm. Female flowers: perianth segments linear to obtriangular, ca. 1.5 × 1–1.3 mm, serrate-lobate at apex; ovary elliptic; styles absent or inconspicuous; stigmas elliptic, ca. 1 mm. Fruit broadly obovoid, ca. 4 mm. Fl. and fr. Jul–Aug.  $2n = 30$ .

Lakes, ponds, swamps; ca. 1500 m. Heilongjiang, Jilin [Japan, Korea, Russia; Europe, North America].

