

ZOSTERACEAE

大叶藻科 da ye zao ke

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Herbs, perennial, rarely annual, in saline water, rhizomatous, caulescent. Leaves alternate, submersed, sessile, sheath persisting longer than blade or decaying into bundles of fibers, blade linear. Inflorescences axillary or terminal, spadices surrounded by spathe, pedunculate. Plants monoecious or dioecious; flowers unisexual; subtending bracts often present; perianth lacking. Male flowers with single stamen, anthers dehiscing longitudinally. Female flowers with single pistil. Fruit achenelike. Seed 1 with straight embryo.

Three genera and 18 species: widely distributed in temperate and subtropical coastal waters worldwide; two genera and seven species in China.

Guo Youhao & Li Qingyi. 1992. *Zostera* and *Phyllospadix*. In: Sun Xiangzhong, ed., Fl. Reipubl. Popularis Sin. 8: 85–95.

- 1a. Plants monoecious; fruit usually ovoid 1. *Zostera*
1b. Plants dioecious; fruit usually curved 2. *Phyllospadix*

1. ZOSTERA Linnaeus, Sp. Pl. 2: 968. 1753.

大叶藻属 da ye zao shu

Rhizome monopodial, with 2 vascular bundles in cortex. Shoots short, with several leaves; flowering stems usually elongated, with several spathes. Leaves linear, with 3–11 parallel veins, margin entire or rarely minutely denticulate; sheaths membranous or subleathery, with an auricle, ligulate. Spadix axillary, sessile, axis flattened, without or only with inconspicuous projections (retinacula). Plants monoecious; flowers unisexual, small. Anthers 2-celled. Style short; stigmas 2, filiform or subulate. Fruit ovoid, with a short beak.

About 12 species: best represented along shores of N temperate regions; five species in China.

- 1a. Leaves 3-veined; sheaths open; projections present on each side of spadix axil 5. *Z. japonica*
1b. Leaves 5–11-veined; sheaths closed; projections usually absent.
2a. Rhizomes slightly erect, with very short internodes; sheaths slightly leathery, persistent; leaf apex retuse 2. *Z. caespitosa*
2b. Rhizomes creeping, internodes elongated; sheaths usually membranous, not persistent; leaf apex obtuse
or mucronate, rarely retuse.
3a. Seeds longitudinally ribbed; leaves 5–7-veined 1. *Z. marina*
3b. Seeds smooth on surface; leaves 5–11-veined.
4a. Leaves 5–8 mm wide, apex obtuse or mucronate; fruit ca. 4 mm 3. *Z. caulescens*
4b. Leaves 1–1.5 cm wide, apex truncate or retuse; fruit 5–6.5 mm 4. *Z. asiatica*

1. *Zostera marina* Linnaeus, Sp. Pl. 2: 968. 1753.

丛生大叶藻 cong sheng da ye zao

大叶藻 da ye zao

Alga marina (Linnaeus) Lamarck.

Rhizomes creeping, 2–4 mm in diam., with elongated internodes. Leaves on non-flowering shoots 5–8, linear, longer than 50 cm, 3–6 mm wide, 5–7-veined, margin entire, apex rounded or mucronate; sheaths closed, tubular, membranous, splitting irregularly when old; auricle ca. 1 mm; ligule ca. 0.5 mm; intravaginal squamules 2 or 4, linear. Flowering stems ca. 1 m, branched; spathes with flattened stalk, narrower than leaves; spadix without projections. Anthers 4–5 mm. Ovary 2–3 mm; style 1.5–2.5 mm; stigmas ca. 3 mm. Fruit ellipsoid, ca. 4 mm. Seeds longitudinally ribbed. Fl. and fr. Mar–Jul. $2n = 12$.

On fine gravel, sand, or mud near low tide mark. Coasts of Hebei, Liaoning, Shandong [coasts of Japan, Korea, Myanmar, Russia, Thailand; N Africa, Europe, North America].

2. *Zostera caespitosa* Miki, Bot. Mag. (Tokyo) 46: 780. 1932.

Rhizomes slightly erect, with very short internodes. Leaves on non-flowering shoots 3 or 4, linear, ca. 60 cm × 3–6 mm, 5–7-veined, margin entire or sometimes minutely denticulate, apex retuse; sheaths closed, tubular, slightly leathery, persistent, splitting irregularly when old; auricle ca. 1 mm; ligule ca. 0.5 mm; intravaginal squamules 2, linear. Flowering stems 30–60 cm, branched; spathes with flattened stalk, narrower than leaves; spadix without projections. Anthers 4–5 mm. Ovary ca. 2.5 mm; style ca. 2 mm; stigmas subulate, ca. 2 mm. Fruit ellipsoid, ca. 3.5 mm. Seeds with 16–20 longitudinal ribs. Fl. and fr. Apr–Jun. $2n = 12$.

Bottoms of shallow seas. Coast of Liaoning (Dalian) [coasts of Japan and Korea].

3. *Zostera caulescens* Miki, Bot. Mag. (Tokyo) 46: 779. 1932.

具茎大叶藻 ju jing da ye zao

Rhizomes creeping, 2–3.5 mm in diam., internodes 1–2

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cm. Leaves on non-flowering shoots several, linear, ca. 50 cm × 5–8 mm, 5–9-veined, margin entire, apex obtuse or mucronate; sheaths closed, tubular, membranous, splitting irregularly when old; auricle ca. 2 mm; ligule 1–1.5 mm; intravaginal squamules 2, linear. Flowering stems ca. 1 m, branched, usually lower branches with spathes, upper ones with leaves; spathes with flattened stalk, narrower than leaves; spadix without projections. Anthers 4.5–6 mm. Ovary ca. 2 mm; style ca. 2 mm; stigmas 2.5–3 mm. Fruit narrowly ellipsoid, ca. 4 mm. Seeds slightly smooth. Fl. and fr. Apr–Jun. $2n = 12$.

Bottoms of shallow seas. Coast of Liaoning [coasts of Japan and Korea].

4. *Zostera asiatica* Miki, Bot Mag. (Tokyo) 46: 776. 1932.

宽叶大叶藻 kuan ye da ye zao

Rhizomes creeping, internodes 1–2 cm. Leaves on non-flowering shoots several, linear, ca. 1 m × 1–1.5 cm, 7–11-veined, apex truncate or obtuse; sheaths closed, tubular, membranous, splitting irregularly when old; auricle obtuse; ligule very short; intravaginal squamules 2, linear. Flowering stems ca. 1 m, branched; spathes with flattened stalk, narrower than leaves, apex retuse; spadix without projections. Anthers ca. 4 mm. Ovary 2–3 mm; style 1–1.5 mm; stigmas ca. 2.5 mm.

Fruit narrowly ellipsoid, 5–6.5 mm. Seeds smooth. Fl. and fr. Jul–Mar. $2n = 12$.

Bottoms of shallow seas. Rarely along coast of Liaoning [coasts of Japan, Korea, Russia (Far East)].

5. *Zostera japonica* Ascherson & Graebner in Engler, Pflanzenr. 31(IV. 11): 32. 1907.

矮大叶藻 ai da ye zao

Nanozostera japonica (Ascherson & Graebner) Tomlinson & Posluszny.

Rhizomes creeping, 0.5–1.5 mm in diam., internodes 0.5–3 cm. Leaves on non-flowering shoots 2–4, linear, 5–35 × 1–2 mm, 3-veined, apex obtuse or retuse; sheaths open, 2–10 cm, margin membranous; auricle obtuse, ca. 0.5 mm; intravaginal squamules 2, lanceolate. Flowering stems 10–30 cm; spathes with flattened stalk, ca. as broad as or narrower than leaves, apex obtuse, mucronate, rarely retuse; spadix with projections. Anthers ca. 2 mm. Ovary ca. as long as style; stigmas subulate. Fruit ellipsoid to narrowly cylindrical, ca. 2 mm. Seeds smooth. Fl. and fr. Jun–Sep. $2n = 12$.

Bottoms of shallow seas. Coasts of Hebei, Liaoning, Shandong, Taiwan [coasts of Japan, Korea, Russia (Far East), Vietnam; Africa, Asia, Europe, North America].

2. PHYLLOSPADIX Hooker, Fl. Bor.-Amer. 2: 171. 1838.

虾海藻属 xia hai zao shu

Rhizome monopodial, with 2 vascular bundles in cortex. Erect stems absent or strongly abbreviated, with dense, persistent fibrous leaf bases. Leaves linear, usually leathery, with 3–7 parallel veins, margin irregularly minutely denticulate; sheaths with an auricle, ligulate. Spadix axillary, sessile, axis flattened, with a row of conspicuous flaplike projections (retinacula) on each side of axis. Plants dioecious; flowers unisexual, small. Anthers 2-celled. Female flowers consisting of 1 carpel, often with staminode; style short; stigmas 2, capillary. Fruit curved, with a short beak.

About five species: widely distributed along shores of the N Pacific Ocean; two species in China.

- 1a. Leaves 1.5–2.5 mm wide, apex usually retuse, 3-veined; persistent fibrous leaf bases blackish brown 1. *P. japonicus*
1b. Leaves 2–4.5 mm wide, apex obtuse, 5-veined (rarely 3-veined); persistent fibrous leaf bases reddish brown 2. *P. iwatensis*

1. *Phyllospadix japonicus* Makino, Bot. Mag. (Tokyo) 11: 137. 1897.

黑纤维虾海藻 hei xian wei xia hai zao

Rhizomes creeping, 3–4 mm in diam. Stems abbreviated, internodes 3–5 mm; persistent fibrous leaf bases blackish brown. Leaves alternate, linear, 25–100 cm × 1–2.5 mm, 3-veined, margin entire or irregularly denticulate toward apex, apex obtuse and retuse; sheaths 4–20 cm, amplexicaul. Spathe 1, with flattened stalk 1–3(–7.5) cm and shrimplike sheath; projections ovate-lanceolate, alternate with flowers. Anthers with 2 filiform thecae. Carpels sagittate to cordate at base. Fruit semilunate, 2–2.5 × 4–5 mm; beak apical. Fl. and fr. Mar–Aug. $2n = 16, 20$.

Fine gravel or sand near low tide mark; sea level to ca. 8 m. Coasts of Hebei, Liaoning, Shandong [coasts of Japan, Korea, and Russia (Far East)].

2. *Phyllospadix iwatensis* Makino, J. Jap. Bot. 7: 15. 1931.

红纤维虾海藻 hong xian wei xia hai zao

Rhizomes creeping, ca. 5 mm in diam. Stems abbreviated, internodes 4–5 mm; persistent fibrous leaf bases reddish brown. Leaves alternate, linear, 1–1.5 m × 2–4.5 mm, 5-veined, rarely 3-veined, margin entire basally, but irregularly denticulate toward apex, apex obtuse; sheaths ca. 25 cm, amplexicaul. Spathe 1, with flattened stalk 1.2–5(–8) cm and shrimplike sheath; projections obliquely ovate to lanceolate, alternate with flowers. Anthers with 2 filiform thecae. Carpels sagittate at base. Fruit compressed, semilunate, 2.2–3 × 4–5 mm; beak apical. Fl. and fr. Apr–Oct. $2n = 16, 20$.

Fine gravel or sand near low tide mark; sea level to ca. 8 m. Coasts of Hebei, Liaoning, Shandong [coasts of Japan, Korea, and Russia (Far East)].