

flowers greenish, as large as in the last; sepals awl-shaped, but not so rigid; capsule mostly tapering; seeds large ($\frac{1}{4}$ – $\frac{3}{8}$ " long), with short white membranous appendages, not reticulated. — Conn. to Penn. and Ga.

Var. *brachycéphalus*, Engelm. Stem slender ($1\frac{1}{2}$ – $2\frac{1}{2}$ ' high), bearing numerous small 3–5-flowered heads in a large spreading panicle; flowers greenish or light brown ($1\frac{1}{4}$ – $1\frac{1}{2}$ " long); sepals mostly obtuse, shorter than the brown abruptly short-pointed capsule; style longer than in other forms; seeds smaller ($\frac{1}{4}$ – $\frac{1}{2}$ " long), slender, with rather short appendages. — Penn. and western N. Y., to Wisc. and Ill.

Var. *coarctatus*, Engelm. Stem slender, shorter (9–18' high), bearing fewer deep-brown 3–5-flowered heads in a somewhat erect contracted panicle; flowers as large as in the last; sepals acute, or rarely obtusish, much shorter than the prismatic abruptly pointed deep-brown capsule; seeds as in the last. — N. Eng. to N. J., N. Minn., and westward.

+ + Stamens 6.

27. *J. áper*, Engelm. Stems tufted, erect (2–3° high), terete, stout, rigid, and with the rigid leaves rough; panicle with rigid slightly spreading branches, bearing scattered few- (2–6-) flowered heads; flowers greenish with brown ($2\frac{1}{4}$ " long); sepals ovate-lanceolate, awl-pointed, rigid and strongly nerved, the outer much shorter than the inner, these a little shorter than the triangular-ovoid beaked incompletely 3-celled brown capsule; ovary tapering into a conspicuous style; seeds large, oblong, with white or often reddish appendages ($1\frac{1}{4}$ " long). — Sphagnous swamps, N. J. Aug.

2. LŪZULA, DC. WOOD-RUSH.

Capsule 1-celled, 3-seeded, one seed to each parietal placenta. — Perennials, often hairy, usually in dry ground, with flat and soft usually hairy leaves, and spiked-crowded or umbelled flowers. (From *Gramen Luzula*, or *Luzula*, dim. of *lux*, light, — a name given to one of the species from its shining with dew.)

* Pedicels 1-flowered, in a loose compound cyme or umbel.

1. *L. vernalis*, DC. Plant 6–9' high; leaves lance-linear, hairy; umbel mostly simple; sepals pointed, shorter than the obtuse capsule; seeds with a curved appendage. (*L. pilosa*, Willd.) — Woods and banks, Newf. to the mountains of N. C., west to Minn. (Eu.)

2. *L. spadicea*, DC., var. *melanocarpa*, Meyer. Nearly smooth (1–3° high); leaves broadly linear; corymb decomposed, loose; pedicels drooping; sepals pointed, straw-color, about the length of the minutely pointed and brown capsule; seeds not appendaged. (*L. parviflora*, var. *melanocarpa*, Gray.) — Mountains of Maine, Vt., and northern N. Y., to Mich. and N. Minn. (Eu.)

** Flowers crowded in spikes or close clusters. (Plants 6–12' high.)

3. *L. campéstris*, DC. Leaves flat, linear; spikes 4–12, somewhat umbelled, ovoid, straw-color, some of them long-peduncled, others nearly sessile; sepals bristle-pointed, longer than the obtuse capsules; seeds with a conical appendage at base. — Dry fields and woods, common. May. (Eu.)

4. *L. arcuata*, Meyer. Leaves channelled, linear; spikes 3–5, on unequal often recurved peduncles, ovoid, chestnut-brown; bracts ciliate-fringed; sepals

taper-pointed, longer than the obtuse capsule; seeds not appendaged. — Alpine summits of the White Mts. and far northward. (Eu.)

5. *L. spicata*, Desvaux. Leaves channelled, narrowly linear; flowers in sessile clusters, forming a nodding interrupted spiked panicle, brown; sepals bristle-pointed, scarcely as long as the abruptly short-pointed capsule; seeds merely with a roundish projection at base. — With the last, and more common. (Eu.)

ORDER 122. TYPHACEÆ. (CAT-TAIL FAMILY.)

Marsh or aquatic herbs, with nerved and linear sessile leaves, and monœcious flowers on a spadix or in heads, destitute of proper floral envelopes. Ovary 1–2-celled, with as many persistent styles and (usually elongated) 1-sided stigmas; cells 1-ovuled. Fruit nut-like when ripe, 1-seeded, rarely 2-seeded. Seed suspended, anatropous; embryo straight in copious albumen. Root perennial.

1. *Typha*. Flowers in a cylindrical compact terminal spike; spathe-like bract deciduous.
2. *Sparganium*. Flowers in globular heads with foliaceous bracts.

1. TYPHA, Tourn. (CAT-TAIL FLAG.)

Flowers in a long and very dense cylindrical spike terminating the stem; the upper part consisting of stamens only, inserted directly on the axis, and intermixed with long hairs; the lower part consisting of stipitate 1-celled ovaries, the stipes bearing club-shaped bristles, which form the copious down of the fruit. Nutlets minute, very long-stalked. — Spathes merely deciduous bracts, or none. Root-stocks creeping. Leaves long, sheathing the base of the simple jointless stems, erect, thickish. Flowering in summer. (Τύφη, the old Greek name.)

1. *T. latifolia*, L. (COMMON CAT-TAIL.) Stout and tall (4–6° high), the flat sheathing leaves 3–10' broad, exceeding the stem; the staminate and dark brown pistillate parts of the spike (each 3–6' long or more) usually contiguous, the latter at length 1' in diameter; pistillate flowers without bractlets; stigma rhombic-lanceolate; pollen-grains in fours. — In marshes, throughout N. Am. (Eu.)

2. *T. angustifolia*, L. Leaves narrower (3–6" broad), taller, somewhat convex on the back; pistillate and staminate inflorescence usually separated by a short interval, the light brown spike becoming 5–6" in diameter; pollen-grains simple; pistillate flowers with a linear stigma and a hair-like bractlet slightly dilated at the summit. — N. Eng. to N. J., west to Mich. and Mo.; less frequent, and mainly near the coast. (Eu.)

2. SPARGANIUM, Tourn. BUR-REED.

Flowers collected in separate dense and spherical leafy-bracted heads, which are scattered along the summit of the stem; the upper sterile, consisting merely of stamens, with minute scales irregularly interposed; the lower or fertile larger, consisting of numerous sessile 1–2-celled pistils, each surrounded by 3–6 scales much like a calyx. Fruit wedge-shaped or club-shaped, more or less corky toward the summit, the hard endocarp perforated at the apex. —

Rootstocks creeping and stoloniferous; roots fibrous. Stems simple or branching, sheathed below by the base of the linear leaves. Flowering through the summer. (Name from *σπάργανον*, a fillet, from the ribbon-like leaves.)

* Fruit sessile, broad and truncate, often 2-seeded; stigmas often 2, elongated; scales rigid, nearly equalling the fruit; erect, with branched inflorescence.

1. *S. eurycarpum*, Engelm. Stems stout, erect (2-4° high); leaves mostly flat and merely keeled; pistil attenuate into a short style bearing 1 or 2 elongated stigmas; fruit-heads 2-6 or more, 1' wide; fruit many-angled (3½-4" long) when mature, with a broad and depressed or retuse summit abruptly tipped in the centre. — Borders of ponds, lakes, and rivers, N. Eng. to Va., west to the Pacific.

** Fruit comparatively narrow, and mostly somewhat stipitate, 1-celled, longer than the scales.

2. *S. simplex*, Huds. Stems slender, erect (½-2° high); leaves more or less triquetrous (2½-4" wide); fertile heads (1-4) of the usually simple inflorescence often above the axils, sessile or peduncled, 6-8" wide in fruit; stigma linear, equalling the rather slender style or shorter; nutlets pale, fusiform or narrowly oblong (about 2" long), more or less contracted in the middle. — N. Eng. to N. J., west to Mich., Minn., and northward. (Eu.)

Var. *androcladum*, Engelm. Stouter (1½-3° high), with usually broader leaves (4-9") and branching inflorescence, the head or peduncles axillary or nearly so; fruiting heads (1-7) often larger (6-12" broad), the nutlets 2-3" long. (*S. androcladum*, Morong.) — In bogs or shallow water, common; N. Eng. to Fla., west to Minn. and Mo.

Var. *angustifolium*, Engelm. Very slender; leaves floating, long and narrow (½-2½" wide), flat; inflorescence simple; heads (4-6" broad) and nutlets smaller. — Mountain lakes and slow streams, N. Y., N. Eng., and northward; sometimes nearly out of water, dwarf and with shorter erect leaves.

Var. *fluitans*, Engelm. Floating in deep water, with long slender stems and flat narrow leaves; inflorescence usually short, sparingly branched; style stout with a short oval stigma; fruiting heads 4-6" broad; nutlets dark, as large as in the type. (*S. androcladum*, var. *fluctuans*, Morong.; not *S. fluitans*, Fries.) — Ponds, Penn., W. Conn., White Mts., N. Minn., and northward.

3. *S. minimum*, Fries. Usually floating, with very slender stems and thin flat narrow leaves; fertile heads 1 or 2, axillary, sessile or peduncled (4-5" wide); stigma oval, about as long as the short style, scarcely surpassing the oval or obovate denticulate scales; fruit oblong-obovate (1-2" long), pointed, somewhat triangular, the stipe very short or none. — N. Eng. to Penn., N. Ind., Minn., north and westward. — Stems 3-6' high when growing out of water, much longer when submerged. (Eu.)

ORDER 123. ARACEÆ. (ARUM FAMILY.)

Plants with acrid or pungent juice, simple or compound often veiny leaves, and flowers crowded on a spadix, which is usually surrounded by a spathe. — Floral envelopes none, or of 4-6 sepals. Fruit usually a berry. Seeds with fleshy albumen, or none, but filled with the large fleshy em-

bryo. A large family, chiefly tropical. Herbage abounding in slender raphides. — The genuine Araceæ have no floral envelopes, and are almost all monœcious or diœcious; but the genera of the second section, with more highly developed flowers, are not to be separated.

* Spathe surrounding or subtending the spadix; flowers naked, i. e. without perianth.

1. *Arisæma*. Flowers monœcious or diœcious, covering only the base of the spadix.

2. *Peltandra*. Flowers monœcious, covering the spadix; anthers above, ovaries below.

3. *Calla*. Flowers perfect (at least the lower ones), covering the whole of the short spadix. Spathe open and spreading.

** Spathe surrounding the spadix in n. 4, none or imperfect in the rest; flowers with a calyx or perianth and perfect, covering the whole spadix.

4. *Symplocarpus*. Spadix globular, in a fleshy shell-shaped spathe. Stemless.

5. *Orontium*. Spadix narrow, naked, terminating the terete scape.

6. *Acorus*. Spadix cylindrical, borne on the side of a leaf-like scape.

1. ARISÆMA, Martius. INDIAN TURNIP. DRAGON ARUM.

Spathe convolute below and mostly arched above. Flowers monœcious or by abortion diœcious, covering only the base of the spadix, which is elongated and naked above. Floral envelopes none. Sterile flowers above the fertile, each of a cluster of almost sessile 2-4-celled anthers, opening by pores or chinks at the top. Fertile flowers consisting each of a 1-celled ovary, tipped with a depressed stigma, and containing 5 or 6 orthotropous ovules erect from the base of the cell; in fruit a 1-few-seeded scarlet berry. Embryo in the axis of albumen. — Low perennial herbs, with a tuberous rootstock or corm, sending up a simple scape sheathed with the petioles of the simple or compound veiny leaves. (Name from *ἀρίς*, a kind of arum, and *αἷμα*, blood, from the spotted leaves of some species.)

1. *A. triphyllum*, Torr. (INDIAN TURNIP.) Leaves mostly 2, divided into 3 elliptical-ovate pointed leaflets; spadix mostly diœcious, club-shaped, obtuse, much shorter than the spathe, which is flattened and incurved-hooded at the ovate-lanceolate, pointed summit. — Rich woods, N. Scotia to Fla., west to Minn. and E. Kan. May. — Corm turnip-shaped, wrinkled, farinaceous, with an intensely acrid juice; spathe with the petioles and sheaths green, or often variegated with dark purple and whitish stripes or spots.

2. *A. Dracóntium*, Schott. (GREEN DRAGON. DRAGON-ROOT.) Leaf usually solitary, pedately divided into 7-11 oblong-lanceolate pointed leaflets; spadix often androgynous, tapering to a long and slender point beyond the oblong and convolute pointed greenish spathe. — Low grounds, N. Eng. to Fla., west to Minn., E. Kan., and Tex. June. — Corms clustered; petiole 1-2° long, much longer than the peduncle.

2. PELTÁNDRA, Raf. ARROW ARUM.

Spathe elongated, convolute throughout or with a dilated blade above. Flowers monœcious, thickly covering the long and tapering spadix throughout (or only its apex naked). Floral envelopes none. Anther-masses sessile, naked, covering all the upper part of the spadix, each of 4-6 pairs of cells imbedded in the margin of a thick and shield-shaped connective, opening by terminal pores. Ovaries at the base of the spadix, each surrounded by 4-5 distinct, scale-like, white staminodia, 1-celled, bearing 1-few amphitropous

ovules at the base; stigma truncate. Fruit a leathery or fleshy berry, 1-3-seeded. Seed obovate, surrounded by tenacious jelly, the base empty, the upper part filled with a large fleshy spherical embryo; no albumen. — Stemless herbs, with arrow-shaped or hastate leaves, palmately 3-nerved and pinnately veined, and simple scapes from a thick-fibrous or subterranean root. Fruit in a globose cluster, enclosed by the persistent fleshy base of the spathe. (Name from *πέλτη*, a target, and *ἄνθη*, for stamen, from the shape of the latter.)

1. *P. undulata*, Raf. Root of thick tufted fibres; scape 1-1½ high, about equalling the leaves; basal lobes of the leaves rather long and often acutish; spathe convolute throughout, wavy on the margin, mostly green, 4-7' long; sterile portion of the spadix several times longer than the pistillate; ovules several; fruit green; seeds 1-3. (P. *Virginica*, Kunth, and most authors.) — Shallow water, New Eng. to Fla., west to Mich. and Ind. June.

2. *P. alba*, Raf. Rootstock tuberos, covered with thick-fleshy roots and propagating by offshoots; lobes of the leaves mostly short and broad, obtuse; spathe 3-4' long, the blade broader, acuminate, somewhat expanded, white; sterile part of the spadix scarcely longer than the pistillate; ovules and seeds solitary; berry scarlet, 5-6" long. (P. *Virginica*, Schott. *Xanthosoma sagittifolia*, Chapm., not Schott. *Caladium glaucum*, Ell. *Arum Virginicum*, L., in part?) — Marshes, S. Va. (?) and N. C. to Fla.

3. CÁLĪA, L. WATER ARUM.

Spathe open and spreading, ovate (abruptly pointed, the upper surface white), persistent. Spadix oblong, entirely covered with flowers; the lower perfect and 6-androus; the upper often of stamens only. Floral envelopes none. Filaments slender; anthers 2-celled, opening lengthwise. Ovary 1-celled, with 5-9 erect anatropous ovules; stigma almost sessile. Berries (red) distinct, few-seeded. Seeds with a conspicuous raphe and an embryo nearly the length of the hard albumen. — A low perennial herb, growing in cold bogs, with a long creeping rootstock, bearing heart-shaped long-petioled leaves, and solitary scapes. (An ancient name, of unknown meaning.)

1. *C. palustris*, L. — Cold bogs, N. Scotia to N. J., west to Mich. and Minn., and northward. June. — Seeds surrounded with jelly. (Eu.)

4. SYMPLOCÁRPU, Salisb. SKUNK CABBAGE.

Spathe hooded-shell-form, pointed, very thick and fleshy, decaying in fruit. Spadix globular, short-stalked, entirely and densely covered with perfect flowers, their 1-celled or abortively 2-celled ovaries immersed in the fleshy receptacle. Sepals 4, hooded. Stamens 4, opposite the sepals, with at length rather slender filaments; anthers extrorse, 2-celled, opening lengthwise. Style 4-angled and awl-shaped; stigma small. Ovule solitary, suspended, anatropous. Fruit a globular or oval mass, composed of the enlarged and spongy spadix, enclosing the spherical seeds just beneath the surface, which is roughened with the persistent fleshy sepals and pyramidal styles. Seeds filled by the large globular and fleshy corm-like embryo, which bears one or several plumules at the end next the base of the ovary; albumen none. — Perennial herb, with a strong odor like that of the skunk, and also somewhat alliaceous; a very thick rootstock, bearing a multitude of long and coarse fibrous roots,

and a cluster of very large and broad entire veiny leaves, preceded in earliest spring by the nearly sessile spathes, which barely rise out of the ground. (Name from *συμπλοκή*, connection, and *καρπός*, fruit, in allusion to the coalescence of the ovaries into a compound fruit.)

1. *S. fœtidus*, Salisb. Leaves ovate, cordate, becoming 1-2° long, short-petioled; spathe spotted and striped with purple and yellowish-green, ovate, incurved; fruit (in autumn) 2-3' in diam., in decay shedding the bulblet-like seeds, which are 4-6" long. — Bogs and moist grounds, N. Scotia to N. C., west to Minn. and Iowa.

5. ORÓNTIUM, L. GOLDEN-CLUB.

Spathe incomplete and distant, merely a leaf-sheath investing the lower part of the slender scape, and bearing a small and imperfect bract-like blade. Flowers crowded all over the narrow spadix, perfect; the lower with 6 concave sepals and 6 stamens; the upper ones with 4. Filaments flattened; anthers 2-celled, opening obliquely lengthwise. Ovary 1-celled, with an anatropous ovule; stigma sessile, entire. Fruit a green utricle. Seed without albumen. Embryo thick and fleshy, "with a large concealed cavity at the summit, the plumule curved in a groove on the outside." (Torr.) — An aquatic perennial, with a deep rootstock, long-petioled and entire oblong and nerved floating leaves, and the spadix terminating the elongated scape; its rather club-shaped emerged apex as thick as the spadix. (Origin of the name obscure.)

1. *O. aquaticum*, L. — Ponds, Mass. to Fla. May.

6. ÁCORUS, L. SWEET FLAG. CALAMUS.

Spadix cylindrical, lateral, sessile, emerging from the side of a simple 2-edged scape which resembles the leaves, densely covered with perfect flowers. Sepals 6, concave. Stamens 6; filaments linear; anthers kidney-shaped, 1-celled, opening across. Ovary 2-3-celled, with several pendulous orthotropous ovules in each cell; stigma minute. Fruit at length dry, gelatinous inside, 1-few-seeded. Embryo in the axis of albumen. — Pungent aromatic plants, especially the thick creeping rootstocks (*calamus* of the shops), which send up 2-edged sword-like leaves, and scapes somewhat like them, bearing the spadix on one edge; the upper and more foliaceous prolongation sometimes considered as a kind of open spathe. (*Ἄκωρος*, the ancient name, of no known meaning.)

1. *A. Calamus*, L. Scape leaf-like and prolonged far beyond the (yellowish-green) spadix. — Margins of rivulets, swamps, etc., N. Scotia to Fla., west to Minn., Iowa, and E. Kan.

ORDER 124. LEMNACEÆ. (DUCKWEED FAMILY.)

Minute stemless plants, floating free on the water, destitute of distinct stem and foliage, being merely a frond, producing one or few monœcious flowers from the edge or upper surface, and commonly hanging roots from underneath; ovules rising from the base of the cell. Fruit a 1-7-seeded utricle. Seed large; the apex or radicular extremity of the seed-coat separable as an operculum or lid (as in *Cabomba*, etc.). Embryo straight, surrounded by fleshy or sometimes very scanty albumen. — The simplest, and

some of them the smallest of flowering plants, propagating by the profuse growth of a new individual from a cleft in the edge or base of the parent frond, remaining connected for some time or separating, also by autumnal fronds in the form of minute bulblets, which sink to the bottom of the water, but rise and vegetate in spring; the flowers (in summer) and fruit scarce, in some species hardly ever seen. Frond more or less cavernous; the upper surface furnished with stomata. — These plants may be regarded as very simplified Araceæ.

1. **Spirodela**. Frond 7-11-nerved, with several rootlets.
2. **Lemna**. Frond 1-5-nerved, with a single rootlet.
3. **Wolffia**. Frond thick, very minute ($\frac{1}{4}$ - $\frac{3}{8}$ " broad), without rootlets.

1. SPIRODELA, Schleiden.

Anther-cells bilocellate by a vertical partition and longitudinally dehiscent. Ovules 2. Frond 7-11-nerved or more; rootlets several, with axile vascular tissue. Otherwise as Lemna. (From *σπείρα*, a cord, and *ἄλος*, evident.)

1. **S. polyrrhiza**, Schleid. Fronds round-ovate (2-4" long), thick, purple and rather convex beneath, dark green above, palmately (mostly 7-) nerved. (Lemna polyrrhiza, L.) — Very common in ponds and pools, throughout N. Am., but very rarely found in flower or fruit. (Eu.)

2. LEMNA, L. DUCKWEED. DUCK'S-MEAT.

Flowers produced from a cleft in the margin of the frond, usually three together surrounded by a spathe; two of them staminate, consisting of a stamen only; the other pistillate, of a simple pistil; the whole therefore imitating a single diandrous flower. *Ster. Fl.* Filament slender; anther 2-celled, didymous; the cells dehiscent transversely; pollen-grains large, spherical, muricate. *Fert. Fl.* Ovary 1-celled; style and truncate or funnel-shaped stigma simple. Ovules and seeds 1-7. — Fronds 1-5-nerved, producing a single rootlet beneath (which is destitute of vascular tissue), proliferous from a cleft in the margin toward the base, and at length stipitate; the tissue abounding with bundles of raphides. (An old Greek name of uncertain meaning.)

* Ovule solitary, orthotropous or nearly so; frond 1-3-nerved, thin.

+ Fronds oblong, stalked at base, remaining connected.

1. **L. trisulca**, L. Fronds oblong to oblong-lanceolate (6-9" long), attenuate at base into a slender stalk, denticulate at the tip, very obscurely 3-nerved, often without rootlets, usually several series of offshoots remaining connected; spathe sac-like; seeds ovate, amphitropous, with small round operculum. — Ponds and springy places, N. Scotia to N. J., west to the Pacific. (Eu.)

+ Fronds oblong to elliptical or round-ovate, sessile, soon separating.

2. **L. Valdiviana**, Philippi. Fronds elliptic-oblong, small (about 1" long), rather thick, usually somewhat falcate, obscurely 1-nerved; spathe broad-reniform; utricle long-ovate, pointed by the long style; seed orthotropous, oblong, with a prominent acute operculum. (L. Torreyi, Austin.) — Pools, N. J. and southward, westward across the continent. (S. Am.)

3. **L. perpusilla**, Torr. Fronds obovate or roundish-obovate, oblique (1-1½" long), obscurely 3-nerved; utricle ovate; style rather long; seed orthotro-

pous, ovate or oval, obtuse, with scarcely apiculate operculum. — N. Y. and N. J., west to Mich. and Wisc. — Var. *TRINÉRVIS*, Austin, has larger, distinctly 3-nerved fronds, and an unequally cordate seed.

4. **L. minor**, L. Fronds round- to elliptic-obovate (1-2½" in diameter), rather thick, very obscurely 3-nerved; spathe sac-like; utricle short-urn-shaped, tipped with a short style; seed oblong-obovate, amphitropous, with prominent rounded operculum. — Stagnant waters, throughout N. Am. (Eu.)

** Ovules 2-7, anatropous; fronds very thick and spongy, flat above, very obscurely 5-nerved (1½-3" long).

5. **L. gibba**, L. Fronds obovate-elliptic to nearly orbicular, almost hemispherical, soon separating; bract sac-like. — Mo. (?) to Ariz. and Calif.

3. WOLFFIA, Horkel.

Flowers central, bursting through the upper surface of the globular (or in some foreign ones flat) and loosely cellular frond, only 2; one consisting of a single stamen with a 1-celled 2-valved anther; the other of a globular ovary, tipped with a very short style and a depressed stigma. Ovule orthotropous, rather oblique in the cell. Utricle spherical. Albumen thin. — Fronds rootless, proliferous from a cleft or funnel-shaped opening at the base, the offspring soon detached; no raphides. — The simplest and smallest of flowering plants, from $\frac{1}{4}$ - $\frac{3}{8}$ " long (an African and Cuban species much larger), floating as little grains on the water. (Named for John Fred. Wolff, who wrote on Lemna in 1801.)

1. **W. Columbiæna**, Karsten. Globose or globular, $\frac{1}{4}$ - $\frac{3}{8}$ " long, very loosely cellular, light green all over, not dotted; stomata 1-6; the opening at the base circular and with a thin border. — Floating rather beneath the surface of stagnant waters, Conn. to N. J., west to Minn. and La.

2. **W. Brasiliensis**, Weddell. Oblong, smaller and more densely cellular, flattish and deep green with many stomata above, tumid and pale below, brown-dotted all over, anterior edge sharp, opening at base circular. — Growing with the last, but floating on the surface.

ORDER 125. ALISMACEÆ. (WATER-PLANTAIN FAMILY.)

Marsh herbs, with scape-like stems, sheathing leaves, and perfect or monœcious or diœcious flowers; perianth of 3 herbaceous persistent sepals and as many (often conspicuous) white deciduous petals, which are imbricate or involute in bud; stamens 6 or more, included; ovaries numerous, distinct, 1-celled and mostly 1-ovuled, becoming achenes in fruit (in our genera); seeds erect; campylotropous. — Roots fibrous; leaves radical, petiolate and strongly nerved with transverse veinlets, the earlier sometimes without blade; flowers long-pedicellate, mostly verticillate, in a loose raceme or panicle, with lanceolate scarious bracts slightly connate at base.

1. **Alisma**. Flowers perfect, usually 6-androus. Carpels flattened, in one whorl.

2. **Sagittaria**. Flowers mostly unisexual. Stamens rarely few. Carpels flattened, in dense heads, winged.

3. **Echinodorus**. Flowers perfect. Stamens 6 or more. Carpels capitate, turgid and ribbed, often beaked.

1. *ALÍSMÁ, L.* WATER-PLANTAIN.

Flowers perfect. Petals involute in the bud. Stamens definite, mostly 6. Ovaries many in a simple circle on a flattened receptacle, forming flattened coriaceous achenes, which are dilated and 2-3-keeled on the back. — Roots fibrous. Leaves all from the root, several-ribbed, with connected veinlets. Scape with whorled paniced branches. Flowers small, white or pale rose-color. (The Greek name; of uncertain derivation.)

1. *A. Plantago, L.* Perennial by a stout proliferous corm; leaves long-petioled, ovate, oblong, or lanceolate or even linear, acute, mostly rounded or heart-shaped at base, 3-9-nerved; panicle loose, compound, many-flowered (1-2° long); carpels obliquely obovate, forming an obtusely triangular whorl in fruit. — Shallow water and ditches, across the continent. Very variable as to foliage, but the leaves usually more broadly cordate-ovate than in Old World forms (var. *Americánum, R. & S.*); when growing under water thinner and narrowly lanceolate. (Eu., etc.)

2. *SAGITTÁRIA, L.* ARROW-HEAD.

Flowers monœcious, or often dicecious in n. 1 and 4, and polygamous in n. 7. Petals imbricated in the bud. Stamens indefinite, rarely few. Ovaries many, crowded in a spherical or somewhat triangular depressed head on a globular receptacle, in fruit forming flat membranaceous winged achenes. — Marsh or aquatic, mostly perennial, stoloniferous herbs, with milky juice and fibrous roots; the scapes sheathed at base by the bases of the long cellular petioles, of which the primary ones, and sometimes all, are flattened, nerved, and destitute of any proper blade (i. e. are phyllodia); when present the blade is arrow-shaped or lanceolate, nerved and with cross-veinlets as in *Alisma*. Flowers produced all summer, whorled in threes, with membranous bracts; the sterile above. (Name from *sagitta*, an arrow, from the prevalent form of the leaves.)

§ 1. *SAGITTARIA* proper. Flowers monœcious, with the lower whorls pistillate, or dicecious; stamens few or numerous, covering the receptacle; sepals spreading or reflexed in fruit.

* Filaments numerous, narrow, as long as or longer than the linear-oblong anthers; bracts 3, distinct; fruiting heads larger.

1. *S. variabilis, Engelm.* Scape ($\frac{1}{2}$ -4° high) angled, with one or more of the lower whorls fertile; leaves very various, almost always sagittate; bracts mostly pointed; pedicels of the fertile flowers at least half the length of the sterile ones; petals wholly white; filaments glabrous, nearly twice the length of the anthers; achenes obovate (about 1" long), winged on both margins, with a long curved or usually horizontal beak $\frac{1}{2}$ - $\frac{3}{4}$ its length. (*S. sagittifolia, L.*, var. *variabilis, M. Micheli.*) — In water or wet places, very common; exceedingly variable in size and foliage, ordinarily with narrow halberd-shaped or sagittate leaves, — sometimes dicecious, with large, broad and obtuse leaves (var. *obtusá*), or monœcious, with large, broad and acute leaves (var. *latifolia*), or the narrow leaves with long and linear diverging lobes (var. *angustifolia*), or with some leaves lanceolate or ovate-lanceolate, others more or less sagittate (var. *diversifolia*), etc. Root propagating by stolons tuberiferous at the extremity. — The European species has the fertile pedicels only

$\frac{1}{2}$ or $\frac{1}{3}$ the length of the sterile; claws of the petals purple-tinged; filaments not longer than the anthers; and achenes almost orbicular, very broadly winged and with a short straight beak.

Var. *pubescens, Engelm.* Upper part of petiole and scape and especially the orbicular-ovate obtuse bracts and sepals pubescent or woolly; beak of fruit horizontal. — N. J. and Penn. to Ga.

Var. (?) *gracilis, Engelm.* Lobes of the sagittate leaves very narrowly linear ($\frac{1}{2}$ -2" wide); achene narrowly cuneate-obovate (2" long), the beak long, stout, and strongly recurved, the sides usually strongly 1-3-crested. (*S. cristata, Engelm.?*) — Mass. to western N. Y.; Iowa.

2. *S. lancifolia, L.* Scape 2-5° high, with several of the lower whorls fertile; leaves lanceolate or lance-oblong, rarely linear, all with a tapering base, thick or coriaceous (6-18' long and on a long and stout petiole, never sagittate), the nerves mostly arising from the very thick midrib; bracts ovate, acute or acuminate; pedicels slender, the fertile scarcely shorter than the sterile ones; filaments pubescent; achenes falcate, winged on the back, pointed with an incurved beak. — Swamps, Md. to Ky., Mo., and southward. (W. Ind.)

* * Filaments very short, with enlarged mostly glandular base; anthers ovate or short-oblong; fruiting heads small; bracts more or less connate; leaves very rarely sagittate.

3. *S. heterophylla, Pursh.* Scape weak (3'-2° high), at length procumbent; leaves lanceolate or lance-oval, entire, or with one or two narrow basal sagittate appendages; bracts roundish, obtuse; flowers of the lowest whorl fertile and almost sessile; the sterile on long pedicels; filaments glandular-pubescent; achenes narrowly obovate with a long erect beak. — N. Eng. to Fla., west to Minn. and Mo. Varies as to foliage, the leaves being broad (var. *ELLÍPTICA, Engelm.*), or rigid and narrowly lanceolate with stout petioles (var. *RÍGIDA, Engelm.*), or nearly linear (var. *ANGUSTIFÓLIA, Engelm.*)

4. *S. graminea, Michx.* Scape 3'-2° high; phyllodia flat, mostly broadly linear, acuminate; leaves ovate-lanceolate to linear, on long slender petioles, sometimes reduced to the petiole merely; bracts rather obtuse; whorls of flowers often few, all staminate or the lower fertile; pedicels slender, spreading, nearly equal; filaments 15-20, glandular-pubescent; achene small ($\frac{1}{2}$ " long), narrowly obovate, almost beakless, winged on the back, flat and scarcely costate on the sides. — N. Eng. to Minn., south to the Gulf; very variable.

5. *S. tères, Watson.* Phyllodia terete, very acutely attenuate upward, 3-12' long, very rarely bearing a narrow blade; scape $\frac{1}{2}$ -1 $\frac{1}{2}$ ° high; bracts connate at base; pedicels in 1-3 whorls, all very slender and spreading, 1 or 2 fruiting, $\frac{1}{2}$ -1' long; filaments 12, dilated, pubescent; achene obovate, 1" long, with an erect beak, the margins and sides crenately several-crested. — In shallow water, S. New Eng. to N. J. (Hyannis, Mass., Deane; Wading River, L. I., Miller; barrens of N. J., Torrey.) Phyllodia usually very strongly nodose.

6. *S. natans, Michx.*, var. *lorata, Chapm.* Usually dwarf; leaves linear, strap-shaped, obtuse or acutish, 1-6' long, equalling or shorter than the scape, very rarely with a narrow blade; pedicels in 1-3 whorls, only 1 or 2 fruiting, stouter and recurved; bracts connate or spathe-like; filaments 6-8, glabrous; achene obovate, short-beaked, 1" long, the margins and sides crenately

crested. (S. pusilla, Pursh.)—In mud or shallow water, near the coast; N. Y. to Fla.

Var. (?) *gracillima*, Watson. Scape and the almost or wholly bladeless leaves very slender and greatly elongated (2-4° long, 1" wide); pedicels all elongated, in usually distant whorls, the lower pistillate, slender and spreading; fruit unknown. (S. natans, Engelm. in Torr. Bull. ix. 4.)—In deep water of streams in E. Mass. (Hitchings, Boott, C. E. Faxon, etc.) Wholly submerged, only 1 or 2 flowers appearing at a time, floating on the surface. The fruit, maturing under water, has not yet been collected.

§ 2. *LOPHIOCARPUS*. Fertile flowers perfect; stamens 9-15, at the base of the receptacle; sepals erect and embracing the fruit.

7. *S. calycina*, Engelm. Scape weak (3-9' high), at length mostly procumbent; usually only the lowest whorl fertile, with pedicels as long as those of the sterile flowers, recurved in fruit; bracts orbicular, obtuse or rarely pointed; filaments slightly rough, as long as the anthers; achenes obovate with a short horizontal style; leaves broadly halberd-shaped, obtuse or acutish, with wide spreading lobes, often wider than long, or lanceolate or sometimes reduced to linear phyllodia.—Maine to Del., west to Wisc., Mo., and Tex. Quite variable, several forms being enumerated, as var. *SPONGIOSA*, with spongy texture and bladeless submerged leaves, eastward; and westward, var. *FLUITANS*, with lance-linear floating leaves.

3. *ECHINÓDORUS*, Richard.

Flowers perfect. Petals imbricated in the bud. Stamens 6-21 or more. Ovaries several or many, imbricated in a head, forming thick and ribbed achenes in fruit, often beaked with a projecting persistent style.—Mostly annuals, with the habit of *Sagittaria*, the naked stems sparingly branched or simple, and the flowers on rather short pedicels, in whorls of 3-6 or more. Fl. summer and autumn. (Name from *ἐχινός*, prickly, or from *ἐχίμος*, and *δορός*, a leathern bottle, applied to the ovary, which is in most species armed with the persistent style, so as to form a sort of prickly head of fruit.)

1. *E. parvulus*, Engelm. Scapes 1-3' high; shoots often creeping and proliferous; leaves lanceolate or spatulate, acute ($\frac{1}{4}$ - $1\frac{1}{2}$ ' long, including the petiole); umbel single, 2-8-flowered; pedicels reflexed in fruit; flower 3" broad; stamens 9; styles much shorter than the ovary; achenes beakless, obtusely few-ribbed.—In mud, Mass. to Mich. and E. Minn., south to Fla. and Tex. (S. Am.)

2. *E. rostratus*, Engelm. Scape erect, 3'-2° high, longer than the leaves; leaves broadly ovate, cordate or truncate at base, obtuse (the blade 1-3' long); umbel proliferous, in a branched panicle; flower 5" broad; stamens 12; styles longer than the ovary; achenes beaked, acutely many-ribbed.—Swamps and ditches, Ill. to Fla., Mo., and Tex.—A low form (var. *LANCEOLATUS*, Engelm.) has the leaves lanceolate with an acute base. Ill., Mo.

3. *E. radicans*, Engelm. Stems or scape prostrate, creeping (2-4° long), proliferous, bearing many whorls of flowers; leaves somewhat truncately broadly heart-shaped, obtuse (2-8' broad), long-petioled; flowers 6-9" broad; stamens about 21; styles shorter than the ovary; achenes short-beaked, the keeled back denticulate.—Swamps, Ill. to N. C. and Fla., west to Mo. and Tex.

ORDER 126. NAIADACEÆ. (PONDWEED FAMILY.)

Marsh or mostly immersed aquatic herbs, with stems jointed and leafy or (in *Triglochin*) naked and scape-like, leaves sheathing at base or stipulate, and flowers perfect or unisexual, often spathaceous, with perianth of 4 or 6 herbaceous distinct valvate segments, or membranous and tubular or cup-shaped, or none. Stamens 1, 2, 4 or 6, with extrorse anthers. Ovaries 1-6, distinct or more or less coherent, 1-celled, usually 1-ovuled, in fruit follicular or capsular or an indehiscent berry or utricle.

SUBORDER I. *Juncagineæ*. Marsh plants, with terete bladeless leaves; flowers perfect, spicate or racemose, with herbaceous 6- (rarely 3-) lobed perianth; carpels 3 or 6, more or less united, separating at maturity. Seeds anatropous; embryo straight.

1. *Triglochin*. Ovaries 3-6, united until maturity. Leaves radical. Flowers bractless, in a spike-like raceme terminating a jointless scape.
2. *Scheuchzeria*. Ovaries 3, nearly distinct, at length divergent. Flowers bracteate in a loose raceme upon a leafy stem.

SUBORDER II. *Naiadeæ*. Immersed aquatics, with flat leaves; ovaries solitary or distinct, 1-ovuled.

+ Flowers perfect, spiked or clustered; anthers 4 or 2, sessile; leaves alternate.

3. *Potamogeton*. Spike peduncled. Sepals 4, herbaceous. Anthers 4. Ovaries 4, sessile.
4. *Ruppia*. Flowers on an enclosed spadix, at length long-exserted, without perianth. Anther-cells 4, distinct. Ovaries 4, becoming stipitate.
- + + Flowers monœcious or dioecious, axillary, naked, monandrous; leaves opposite (alternate in n. 6).
5. *Zannichellia*. Monœcious. Pistils (2-5) from a cup-shaped involucre or sheath.
6. *Zostera*. Pistils and stamens alternate in 2 vertical rows on the inner side of a leaf-like enclosed spadix. Stigmas 2, linear. Stem creeping.
7. *Najas*. Dioecious; pistil solitary, naked. Stamen enclosed in a membranous spathe. Stems floating, with opposite or ternate leaves.

1. *TRIGLOCHIN*, L. ARROW-GRASS.

Sepals and petals nearly alike (greenish), ovate, concave, deciduous. Stamens 3-6; anthers oval, on very short filaments. Pistils united into a 3-6-celled compound ovary; stigmas sessile; ovules solitary. Capsule splitting when ripe into 3-6 carpels, which separate from a persistent central axis.—Perennials, with rush-like, fleshy leaves, below sheathing the base of the wand-like naked and jointless scape. Flowers small, in a spiked raceme, bractless. (Name composed of *τρεῖς*, three, and *γλῶχιν*, point, from the three points of the ripe fruit in n. 1 when dehiscent.)

* Fruit of 3 carpels.

1. *T. palustris*, L. Scape (6-18' high) and leaves slender; sepals and stamens 6; fruit linear-club-shaped; carpels when ripe separating from below upward, leaving a triangular axis, awl-pointed at base.—Marshes, western N. Y. to Ill., Minn., and westward. Aug. (Eu., Asia, etc.)

2. *T. striata*, Ruiz & Pav. Scape (6-12' high) and leaves slender; flowers very small; sepals and stamens 3; fruit globose-triangular, or when dry 3-lobed. (*T. triandra*, Michx.)—Sea-shore, Md. to Fla. (S. Am., etc.)