

7-13-flowered; flowering glume oblong, obtuse, or the scarious tip acutish, entire or obscurely 3-lobed, usually rather longer than the blunt palet. — Shallow water; common. June-Aug.

8. *G. acutiflora*, Torr. Spikelets 5-12-flowered, few and scattered; flowering glume oblong-lanceolate, acute, shorter than the long tapering point of the palet. — Wet places, Penn. to Maine; rather rare. June. — Resembles the last; but the erect leaves smaller, the separate flowers twice the length (4" long), and less nerved.

68. PUCCINÉLLIA, Parl. (Pl. 15.)

Characters as in *Glyceria*, but the flowering glumes inconspicuously or obsoletely 5-nerved; squamulae thin and distinct; stigmas sessile and simply plumose; grain compressed, often broadly furrowed. — Mostly saline species; perennial. (Named for Prof. Benedetto Puccinelli, an Italian botanist.)

1. *P. maritima*, Parl. (GOOSE-GRASS. SEA SPEAR-GRASS.) Root stoloniferous; culms erect, 1-1½° high; leaves involute, acute or pungent; lower branches of the narrow panicle often solitary or in pairs, appressed or more or less spreading; spikelets 3-6" long, oblong or linear, 4-9-flowered; flowering glumes rounded at the summit, 1½" long. (*Glyceria maritima*, Wahl. *Atropis maritima*, Griseb.) — Marshes along the coast; not rare, and somewhat variable in the form of the panicle and size of the glumes. (Eu.)

Var. (?) *minor*, Watson. Culms low and slender, from very slender creeping rootstocks; leaves very narrow and involute; ligule long; panicle short and very narrow; spikelets 2-4-flowered, the flowers 1" long or less. — Shore of Mt. Desert Island (*E. L. Rand*); Labrador (*J. A. Allen*). — Probably rather a form of the western *P. airoides* (*Poa airoides*, Nutt.).

2. *P. distans*, Parl. Not stoloniferous; culms rather stout, geniculate below; leaves mostly flat, short; ligule short; lower branches of the panicle in fours or fives, usually more or less naked at base, soon spreading and at length deflexed; spikelets 2-3" long, 3-6-flowered; flowering glume truncate-obtuse, ½-1" long. (*Glyceria distans*, Wahl. *Atropis distans*, Griseb.) — Salt marshes along the coast and on ballast; apparently much rarer than the last, and perhaps not native. (Eu.)

69. FESTÛCA, L. FESCUE-GRASS. (Pl. 10.)

Spikelets 3-many-flowered, paniced or racemose; the flowers not webby at base. Lower glumes unequal, mostly keeled. Flowering glumes chartaceous or almost coriaceous, roundish (not keeled) on the back, more or less 3-5-nerved, acute, pointed, or often bristle-awned from the tip, rarely blunt; the palet mostly adhering at maturity to the enclosed grain. Stamens 1-3. — Flowers, and often the leaves, rather dry and harsh. (An ancient Latin name of some kind of grass, of uncertain meaning.)

* Flowers awl-shaped, bristle-pointed or awned from the tip; panicle contracted.

+ Annuals or biennials, slender, 5-18' high; leaves convolute-bristle-form.

F. Myurus, L. Panicle spike-like, one-sided; spikelets about 5-flowered; lower glumes very unequal; awn much longer than the flowering glume, fully 6" in length; stamen 1. — Dry fields, Nantucket, Mass., to Del., and southward. July. (Nat. from Eu.)

1. *F. tenella*, Willd. Panicle spike-like, one-sided, or more compound and open; spikelets 7-13-flowered; awn 1-3" long or more, usually shorter than or about equalling the glume; stamens 2. — Dry sterile soil, especially southward. June, July.

+ Perennial, tufted, 6-24' high; stamens 3.

2. *F. ovina*, L. (SHEEP'S FESCUE.) Glaucous, ½-2° high; leaves mostly radical, very narrow and convolute; panicle somewhat one-sided, short, usually more or less compound, open in flowering; spikelets 3-8-flowered; awn not more than half the length of the flower, often much shorter or almost wanting. — Indigenous in northern New Eng., about Lake Superior, and northward; naturalized farther south as a pasture grass. June. — Varies greatly. — Var. *vivipara*, L. (which with us has running rootstocks), a state with the spikelets partially converted into leafy shoots, is found on the alpine summits of the White Mts., and high northward. — Var. *duriuscula*, Koch, is a tall form, with spikelets rather larger, usually in a more compound panicle; culm-leaves often flat or less convolute, and the lower with their sheaths either smooth or hairy. New Eng. to Va., and westward, as a naturalized plant, and indigenous northward. A native form of this variety with a lax panicle, 2-4-flowered spikelets, and slender awns nearly as long as the glume (var. *rubra*, of last ed.), is found on Keweenaw Peninsula (*Robbins*) and Isle Royale, L. Superior (*Gilman*). (Eu.)

* * Flowers oblong or lanceolate, awnless or nearly so (1½-4" long); grain often free! (Root perennial; culms mostly tall; leaves flat.)

3. *F. nutans*, Willd. Culm 2-4° high, naked above; leaves broadly linear, taper-pointed, dark green, often rather hairy; panicle of several long and slender spreading branches, mostly in pairs, drooping when old, rough, naked below, bearing near their extremity a few ovate 3-5-flowered spikelets (3" long) on pretty long pedicels; flowers ovate-oblong, rather obtuse, close together, coriaceous, smooth, very obscurely 5-nerved. — Rocky woods and copses. July. — A common form with the panicle more or less contracted and somewhat erect has been distinguished as *F. Shortii*.

F. elatior, L. (TALLER OR MEADOW FESCUE.) (Pl. 10, fig. 1-3.) Panicle narrow, contracted before and after flowering, erect, with short branches; spikelets crowded, 5-10-flowered; flowers rather remote, oblong-lanceolate; flowering glume 5-nerved, scarious-margined, blunt, acute, or rarely with a distinct but very short awn. — The type is large, 3-4° high; spikelets about 6" long, in an ample and compound panicle. Rich grass-land. — Var. *pratensis*, Gray (*F. pratensis*, Huds.), is lower (1-3° high), with a simpler or close panicle of smaller or narrower spikelets, and abounds in grass-lands. June-Aug. (Nat. from Eu.)

F. gigantea, Vill. Erect, glabrous, 3-4° high; leaves bright green, 3-6" broad; panicle very loose, nodding; spikelets 3-6-flowered; flowering glumes 3" long, with a slender awn of twice the length. — Of rare occurrence near the coast. (Nat. from Eu.)

70. BRÔMUS, L. BRÔME-GRASS. (Pl. 10.)

Spikelets 5-many-flowered, paniced. Glumes unequal, membranaceous, the lower 1-5, the upper 3-9-nerved. Flowering glume either convex on

the back or compressed-keeled, 5-9-nerved, awned or bristle-pointed from below the mostly 2-cleft tip; palet at length adhering to the groove of the oblong or linear grain. Stamens 3. Styles attached below the apex of the ovary. — Coarse grasses, with large spikelets, at length drooping, on pedicels thickened at the apex. (An ancient name for the Oat, from *βρόμος*, food.)

§ 1. Flowering glume oblong, turgid, and convex on the back; the flowers imbricated over one another before expansion; lower empty glume distinctly 3-5-nerved, the upper 5-9-nerved.

* Perennial; indigenous. Lower glume strongly 3-nerved, the upper 5-nerved.

1. **B. Kálmii**, Gray. (WILD CHESSE.) Culm slender ($1\frac{1}{2}$ -3° high); leaves and sheaths conspicuously or sparingly hairy; panicle simple, small (3-4' long); spikelets drooping on capillary peduncles, closely 7-12-flowered, densely silky all over; awn only one third the length of the lance-oblong flower; flowering glume 7-9-nerved, much longer and larger than the palet. — Dry ground, N. Eng. to Penn., Mo., Minn., and northward. June, July.

** Annuals or biennials, introduced into grain-fields, or rarely in waste grounds.

B. SECÁLINUS, L. (CHEAT OR CHESSE.) (Pl. 10, fig. 1, 2.) Panicle spreading, even in fruit, the drooping peduncles little branched; spikelets oblong-ovate, turgid, smooth, of 8-10 rather distant flowers; glume rather longer than the palet, short-awned or awnless; sheaths nearly glabrous. — Too common in wheat-fields. June, July. (Adv. from Eu.)

B. MÓLLIS, L. (SOFT CHESSE.) Whole plant downy; panicle more erect, contracted in fruit; spikelets conical-ovate, somewhat flattened; flowers closely imbricated; glume acute, equalling the awn. — Wheat-fields, N. Y. to Va.; scarce. June. (Adv. from Eu.)

B. RACEMÓSUS, L. (UPRIGHT CHESSE.) Very similar to the last, but nearly glabrous or the sheaths sometimes hairy; glumes glabrous and shining. (Adv. from Eu.)

§ 2. Flowering glume somewhat convex, but keeled and laterally more or less compressed, at least above; flowers soon separating from each other; lower empty glume 1-nerved, the upper 3-nerved, or with an obscure additional pair.

* Perennial, tall (3-5° high); flowers oblong or lanceolate.

2. **B. ciliátus**, L. Panicle compound, very loose, the elongated branches at length divergent, drooping; spikelets 7-12-flowered; flowering glume tipped with an awn $\frac{1}{2}$ - $\frac{3}{4}$ its length, silky with appressed hairs near the margins, at least below (or rarely naked), smooth or smoothish on the back; — or, in var. **PÚRGANS**, Gray, clothed all over with short and fine appressed hairs. — River-banks and moist woodlands; common. July, Aug. — Culm and large leaves (3-6" wide) smooth or somewhat hairy; the sheaths in the larger forms often hairy or densely downy near the top. Variable, comprising several forms.

B. ÁSPER, L. Culm slender and panicle smaller; spikelets 5-9-flowered; glume linear-lanceolate, scarcely keeled, hairy near the margins, rather longer than the awn; sheaths and lower leaves hairy or downy. — N. Brunswick to Mich. and Ky. (Nat. from Eu.)

** Annual or biennial; flowers slender; palet pectinate-ciliate on the nerves.

B. STÉRILIS, L. Culm glabrous; leaves rather downy; panicle open; spikelets on elongated nearly straight simple peduncles, of 5-9 rather distant 7-nerved roughish linear-awl-shaped long-awned flowers (awn 1' long). — Waste places and river-banks, E. Mass. to Penn.; rare. June. (Nat. from Eu.)

B. TECTÓRUM, L. Leaves short; panicle lax, somewhat 1-sided, the more numerous pubescent spikelets on very slender curving pedicels. — More common, N. Eng. to Penn. and N. Y. (Adv. from Eu.)

71. LÓLIUM, L. DARNEL. (Pl. 11.)

Spikelets many-flowered, solitary on each joint of the continuous rhachis, placed edgewise; empty glumes, except in the terminal spikelet, only one (the upper) and external. Otherwise nearly as in *Agropyrum*. (Ancient Latin name.)

L. PERÉNNE, L. (COMMON DARNEL, RAY- or RYE-GRASS.) Root perennial; glume shorter than the spikelet; flowers 8-15, awnless or sometimes short-awned. — Fields and lots; eastward. June. (Nat. from Eu.)

L. TEMULÉNTUM, L. (BEARDED DARNEL.) Root annual; culm taller; outer glume fully equalling the 5-7-flowered spikelet; awn longer than the flower ($\frac{1}{2}$ long). — Grain-fields; rare. (Adv. from Eu.)

72. AGROPÝRUM, Gaertn. (Pl. 11.)

Spikelets 3-many-flowered, compressed, 2-ranked, alternate on opposite sides of a solitary terminal spike, single at each joint (the lowermost, or all, rarely in pairs) and sessile with the side against the axis. Glumes transverse (i. e. right and left), nearly equal and opposite, lanceolate, herbaceous, nerved. Flowering glumes rigid, convex on the back, 5-7-nerved, pointed or awned from the tip; palet flattened, bristly-ciliate on the nerves, adherent to the groove of the grain. Stamens 3. — Our species rather coarse perennials, of difficult definition. (Name from *ἀγρός*, a field, and *πυρός*, wheat.)

* Multiplying by long running rootstocks; awn shorter than the flower or none.

1. **A. repens**, Beauv. (COUCH, QUITCH, or QUICK-GRASS.) Spikelets 4-8-flowered, glabrous or nearly so; glumes 3-7-nerved; rhachis glabrous, but rough on the edges; awns when present straight; leaves flat and often roughish or pubescent above. (*Triticum repens*, L.) — Nat. from Europe in cultivated grounds, fields, etc., and very troublesome; indigenous in some of its forms northwestward and on the coast. — Varies greatly. The ordinary form has a narrow spike, with 3-5-flowered spikelets, the glumes merely acute and rigid-cuspidate, or acuminate, or short-awned. A tall form, rather bright green, bears awns nearly as long as the glumes. Other forms abound, especially on or near the coast. A maritime variety, much resembling var. *glaucum*, Boiss. (*A. glaucum*, R. & S.), with large crowded 5-10-flowered spikelets and glumes very blunt or mucronate, glaucous and the leaves rather rigid and pungent, occurs on the coast of Maine (Cape Elizabeth, Tuckerman). In the more usual form of this variety, with the large spikes often elongated (3-9') and the leaves less rigid, the glumes are acuminate or rarely short-awned. The rhachis or the whole inflorescence and the lower sheaths are sometimes very pubescent. The glabrous state, or a very similar glabrous variety, is also abundant in the western region, from Kan. and Neb. to the Dakotas, and westward, where it is known as *Blue-joint* or *Blue-stem*. (Eu.)

2. **A. dasystachyum**, Vasey. Resembling the last; glaucous; leaves narrow and often involute; the 5-9-flowered spikelets densely downy-hairy all over; glumes thinner with scarious margins, mostly long-acuminate. (*Triticum dasystachyum*, Gray.) — Sandy shores of Lake Huron and Superior, and northward. Aug.

* * No obvious running rootstocks, glabrous, or the flat and roughish leaves sometimes hairy above; glumes as well as flowers mostly awned or awn-pointed.

3. **A. violaceum**, Lange. Spike short, dense, strict and rigid, usually tinged with violet or purple; spikelets 3-5-flowered; glumes conspicuously 5-nerved, rather abruptly narrowed into a cusp or short awn. (*Triticum violaceum*, Hornem.)—Alpine region of the White Mts., L. Superior, north and westward. (Eu.)—Passing into a variety with longer usually pale narrow spikes and attenuate often long-awned glumes, which sometimes approaches *A. caninum*. N. Brunswick, White Mts., N. H., Penn. (Porter), L. Superior, and westward.

4. **A. caninum**, R. & S. (AWNED WHEAT-GRASS.) Spike usually more or less nodding, at least in fruit, rather dense (3-6' long); spikelets 3-5-flowered; glumes 3-5-nerved; awns straight or somewhat bent or spreading, fully twice the length of the palet. (*Triticum caninum*, L.)—Sparingly naturalized in cultivated ground and meadows. Indigenous along our northern borders, and westward. (Eu.)

5. **A. tenerum**, Vasey. Culms 1-3° high; leaves narrow; spike very narrow, 2-7' long; spikelets 3-5-flowered; glumes short-acuminate. — Minn. to Kan., and very common westward.

73. LEPTURUS, R. Br.

Spikelets 1-2-flowered, solitary and alternate upon the opposite sides of a narrow spike, sessile and appressed in the concave joints. Empty glumes transverse, narrow, rigid, 5-nerved, the flowering much shorter, thin and hyaline. — Low annuals, branching at the base, with narrow leaves and rigid often curved spikes. (Name from *λεπτός*, narrow, and *οὐρά*, tail, or spike.)

L. incurvatus, Trin. Much branched, decumbent, 6' high or less; spikes terminal and lateral, 1-4' long, the base included in the broad sheath. — Borders of brackish marshes, Md. to S. Va., and on ballast northward. (Nat. from Eu.)

74. HORDEUM, Tourn. BARLEY. (Pl. 11.)

Spikelets 1-flowered, with an awl-shaped rudiment on the inner side, three at each joint of the rhachis of a terminal spike, but the lateral ones usually imperfect or abortive, and short-stalked. Empty glumes side by side in front of the spikelets, 6 in number, forming a kind of involucre, slender and awn-pointed or bristle-form. Flowering glume and palet herbaceous, the former (anterior) convex, long-awned from the apex. Stamens 3. Grain oblong, commonly adherent. — Spike often separating into joints. Ours annuals or biennials, or scarcely perennial. (The ancient Latin name.)

1. **H. jubatum**, L. (SQUIRREL-TAIL GRASS.) (Pl. 11, fig. 1, 2.) Low; lateral flowers abortive, on a short pedicel, short-awned; the perfect flower bearing a capillary awn (2' long) about equalling the similar capillary glumes, all spreading. — Sandy sea-shore, upper Great Lakes, and westward. June.

2. **H. pratense**, Huds. Low (6-18' high); lateral flowers imperfect or neutral, awnless or merely pointed; perfect flower with awn as long as those of the glumes (3-6"); spike linear, 1-2' long. — Plains, especially in saline soil, Ohio to Ill. and westward; also sparingly introduced, Va., and southward along the coast. May, June. (Eu.)

75. ELYMUS, L. LYME-GRASS. WILD RYE. (Pl. 11.)

Spikelets 2-4 at each joint of the rhachis of a terminal spike, all fertile and alike, sessile, each 1-7-flowered. Glumes conspicuous, nearly side by side in front of the spikelets, 2 for each spikelet, forming an involucre to the cluster. Flower coriaceous; the glume rounded on the back, acute or awned at the apex. Grain adherent to the involving glume (whence the name, an ancient one for some grain, from *ἐλβω*, to roll up).

* Glumes and flowers firm or rigid, all or only the latter awned; spikelets 1-5-flowered; slender perennials, with rather harsh and broad flat leaves.

+ Spike large and stout.

1. **E. Virginicus**, L. (Pl. 11, fig. 1-3.) Culm stout, 2-3° high; spike rigidly upright, dense (2-3' long, 6" thick), the short peduncle usually included in the sheath; spikelets 2-3 together, 2-3-flowered, smooth, rather short-awned, about the length of the thickened strongly-nerved and bristle-pointed lanceolate glumes. — River-banks; common. Aug.

2. **E. Canadensis**, L. Spike soon nodding (5-9' long), on an exserted peduncle; spikelets mostly in pairs, of 3-5 long-awned rough or rough-hairy flowers; the awl-shaped glumes tipped with shorter awns. — Var. *GLAUCIFOLIUS*, Gray, is pale or glaucous throughout, the flowers with more spreading awns (1½' long). — Var. *INTERMEDIUS*, Vasey, has the awns scarcely longer than the glumes. — River-banks; common.

+ + Spike and culm more slender.

3. **E. striatus**, Willd. More or less pubescent; spike dense and thickish (2-4' long), upright or slightly nodding; spikelets mostly in pairs, 1-2- (or rarely 3-) flowered, minutely bristly-hairy; glumes awl-shaped, bristle-awned, 1-3-nerved, about thrice the length of the flowers, which are only 3" long exclusive of the capillary awn (1' long). — Var. *VILLOsus*, Gray, has very hairy flowers and glumes, and villous sheaths. — Rocky woods and banks. July, Aug.

4. **E. Sibiricus**, L., var. *Americanus*. Glabrous; spike wand-like (2-6' long, 2-3" thick), often somewhat nodding; spikelets in pairs, 3-6-flowered; glumes linear-lanceolate, 3-5-nerved, acuminate and smooth or often scabrous on the nerves, short-awned, shorter than the flowers, which bear an erect awn of once or twice their length. — Marquette, Mich. (Porter), N. Minn., and westward.

* * Glumes and palet awnless and soft in texture; reed-like perennials.

5. **E. mollis**, Trin. Culm (3° high) velvety at top; spike thick, erect (8' long); spikelets 2 or 3 at each joint, 5-8-flowered; the lanceolate pointed 5-7-nerved glumes (1' long) and the pointed flowers soft-villous; rhachis of the spikelets separating into joints. — Shore of the Great Lakes, Maine, and northward. (Near *E. arenarius*.)

* * * Empty glumes very narrow, and all very long-awned; spike disarticulating at maturity.

6. **E. Sitanion**, Schultes. Low (½-2° high), stout; spike 1-4' long, the peduncle slightly exserted; the spreading scabrous awns 2-3' long. — Central Minn. to Kan., and westward.

76. ASPRÉLLA, Willd. BOTTLE-BRUSH GRASS. (Pl. 11.)

Spikelets 2-3 or sometimes solitary on each joint of the rhachis of a terminal spike, raised on a very short callous pedicel, loosely 2-4-flowered (when solitary flatwise on the rhachis). Glumes none! or small, awn-like, and deciduous. Otherwise nearly as in *Elymus*. (Name a diminutive of *asper*, rough or prickly.)

1. *A. Hystrix*, Willd. Perennial; culms 3-4° high; leaves and sheaths smoothish; spike loose (3-6' long); the spreading spikelets 2-3 together, early deciduous; flowers smoothish or often rough-hairy, tipped with an awn thrice their length (1' long). (*Gymnostichum Hystrix*, Schreb.)—Moist woodlands. July, Aug.

77. ARUNDINÀRIA, Michx. CANE. (Pl. 11.)

Spikelets flattened, 5-14-flowered; the flowers somewhat separated on the jointed rhachis. Empty glumes very small, membranaceous, the upper one larger. Flowering glumes and palet herbaceous or somewhat membranaceous, the glume convex on the back, many-nerved, tapering into a mucronate point or bristle. Squamulæ 3, longer than the ovary. Stamens 3. Grain oblong, free.—Arborescent or shrubby grasses, simple or with fascicled branches, and with large spikelets in panicles or racemes; blade of the leaf jointed upon the sheath; flowers polygamous. (Name from *arundo*, a reed.)

1. *A. macrosperma*, Michx. (LARGE CANE.) (Pl. 11, fig. 1, 2.) Culms arborescent, 10-40° high and $\frac{1}{2}$ -3' thick at base, rigid, simple the first year, branching the second, afterwards at indefinite periods fruiting, and soon after decaying; leaves lanceolate (1-2' wide), smoothish or pubescent, the sheath ciliate on one margin, stoutly fimbriate each side of the base of the leaf; panicle lateral, composed of few simple racemes; spikelets 1-3' long, purplish or pale, erect; flowering glume lanceolate, acute or acuminate, glabrous or pubescent, fringed (5-12" long).—River-banks, S. Va. (?), Ky., and southward, forming cane-brakes. April.

Var. *suffruticosa*, Munro. (SWITCH CANE. SMALL CANE.) Lower and more slender (2-10° high), often growing in water; leaves 4"-1' broad; spikelets solitary or in a simple raceme at the summit of the branches, or frequently on leafless radical culms. (*A. tecta*, Muhl.)—Swamps and moist soil, Md., S. Ind. to S. E. Mo., and southward. Sometimes fruiting several years in succession.

SERIES II.

CRYPTOGAMOUS OR FLOWERLESS PLANTS.

VEGETABLES destitute of proper flowers (i. e. having no stamens nor pistils), and producing instead of seeds minute one-celled germinating bodies called *spores*, in which there is no embryo or rudimentary plantlet.

CLASS III. ACROGENS.

Cryptogamous plants with a distinct axis or stem, growing from the apex, and commonly not with later increase in diameter, usually furnished with distinct leaves; reproduction by antheridia and archegonia, sometimes also by gemmation.

SUBCLASS I. VASCULAR ACROGENS, OR PTERIDOPHYTES.¹

Stems containing woody fibre and vessels (especially scalariform or spiral ducts). Antheridia or archegonia, or both, formed on a minute prothallus which is developed from the spore on germination, the archegonium containing a nucleus, which after fertilization becomes an oöspore and at length grows into the conspicuous spore-bearing plant.

ORDER 130. EQUISETACEÆ. (HORSETAIL FAMILY.)

Rush-like, often branching plants, with jointed and mostly hollow stems from running rootstocks, having sheaths at the joints, and, when fertile, terminated by the conical or spike-like fructification composed of shield-shaped stalked scales bearing the spore-cases beneath.—A single genus.

¹ The orders of this Subclass have been elaborated anew for this edition by Prof. DANIEL C. EATON of Yale University.