Laboratory 22: "Graminoid" Monocots

This is our final group of the semester, the "graminoid" monocots (grasses and their relatives). We will be dealing with just 4 families today, all of which are very distinctive. As in the Asteraceae (Compositae) lab, it will be important to learn some of the specific terminology used in this group of plants (particularly the grass family Poaceae). Much of this terminology will be covered in lecture, but please make sure that you can identify these structures in lab and for the final lab practical.

Family Poaceae (Gramineae) – Grass Family, ~10,000 spp.

Stems typically hollow but sometimes pithy to ± woody; leaves composed of a sheath and a blade (parallel venation); **ligule present** at the junction of the sheath and the blade; inflorescence is a specialized branching system; flowers = **spikelets** (the basic unit of the inflorescence); generally bisexual; stamens generally 3 (1-6+); ovary superior, generally 2 feathery stigmas present; fruit typically a caryopsis.

Bromus
Ehrarta
Festuca
Hordeum
Lolium
Melica
Panicum
Poa
Stipa
Vulpia

Family Cyperaceae – Sedge Family, ~4,000 spp.

Stems often 3 angled in cross-section ("sedges have edges"); leaves 3-ranked in a tuft at the base of the stem, have a closed sheath and a blade but **no ligule**; flowers bisexual or unisexual, subtended by bracts; perianth if present, represented by scales, bristles, or hairs; stamens generally 3 (1-6); ovary superior; 3 carpels, **1 ovule**, style divided (2-3 branches); some (*Carex*) with a **perigynium** (a sac around the ovary); fruit an **achene.**

Cyperus
Scirpus
Carex

Family Juncaceae – Rush Family, ~300 spp.

Leaves flat, linear, with a usually open sheath but lacking a ligule, alternate and 3-ranked, usually basal, **stems round and solid** ("rushes are round"); **inflorescence terminal but often subtended by a bract that appears to be a continuation of the stem**; flowers regular, bisexual or unisexual, **radial**; perianth green or red; **two series of 3 segments**; stamens 4-6, pollen shed as tetrads; ovary superior, 3 carpels, **ovules 3-many**, styles short, stigmas feathery; fruit a **capsule.**

Juncus
Luzula

Family Typhaceae – Cattail Family

Herbs, typically occurring in aquatic or wetland habitats; leaves alternate and 2-ranked, linear and simple, sometimes spongy, sheathing at the base; inflorescence determinate, terminal; **flowers unisexual, densely clustered into cylindrical spikes, staminate flowers above the carpellate flowers, often with a distinct separation between the two types**, often subtended by a bract; flowers radial, tepals 1-6; stamens 1-8, carpels 3 (1 functional); ovary superior; fruit a drupe.

Typha

Terms to Know

Perigynium	**Palea**
Spikelet	**Glume**
Floret	**Lemma**
Awn	**Ligule**

Figures from Zomlefer.1994. Flowering Plant Families

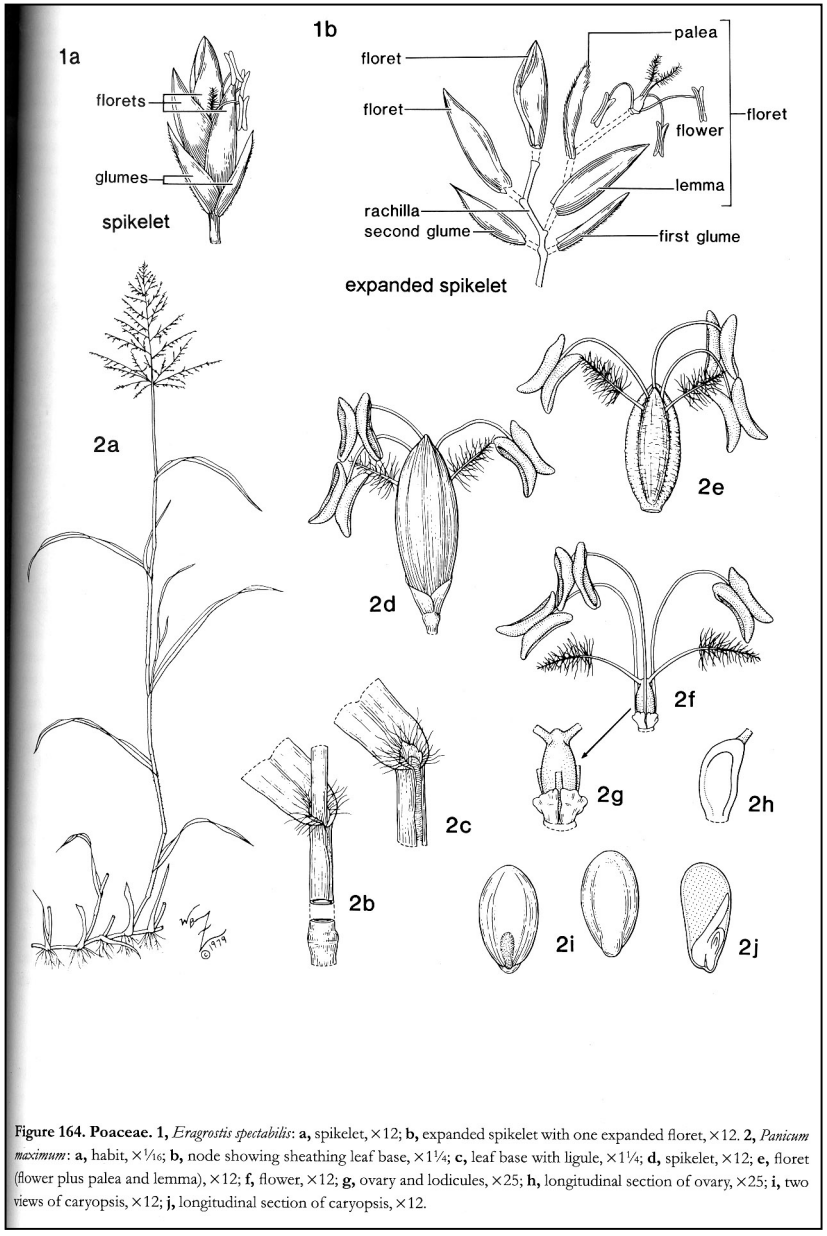

Figure 164. Poaceae. 1, *Eragrostis spectabilis*: **a,** spikelet, ×12; **b,** expanded spikelet with one expanded floret, ×12. **2,** *Panicum maximum*: **a,** habit, ×1/16; **b,** node showing sheathing leaf base, ×1¼; **c,** leaf base with ligule, ×1¼; **d,** spikelet, ×12; **e,** floret (flower plus palea and lemma), ×12; **f,** flower, ×12; **g,** ovary and lodicules, ×25; **h,** longitudinal section of ovary, ×25; **i,** two views of caryopsis, ×12; **j,** longitudinal section of caryopsis, ×12.

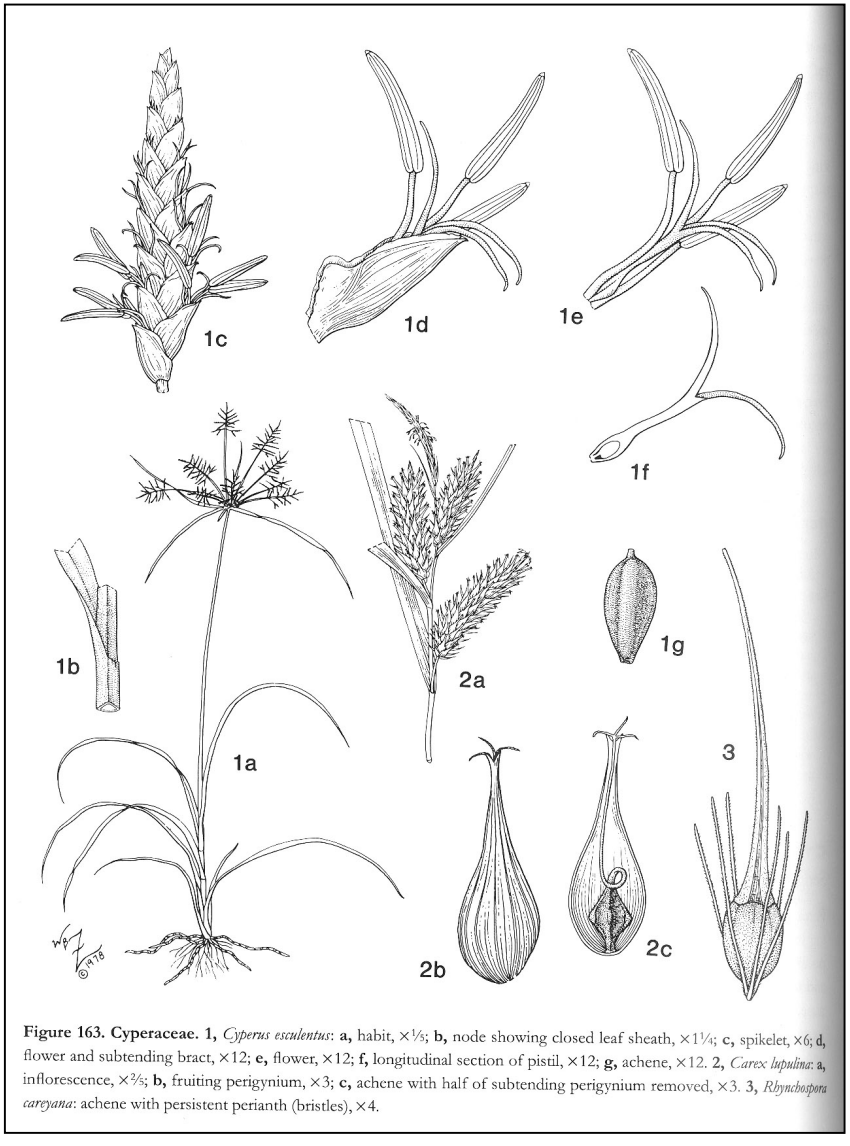

Figure 163. Cyperaceae. 1, *Cyperus esculentus*: **a,** habit, ×1/3; **b,** node showing closed leaf sheath, ×1¼; **c,** spikelet, ×6; **d,** flower and subtending bract, ×12; **e,** flower, ×12; **f,** longitudinal section of pistil, ×12; **g,** achene, ×12. **2,** *Carex lupulina*: **a,** inflorescence, ×2/3; **b,** fruiting perigynium, ×3; **c,** achene with half of subtending perigynium removed, ×3. **3,** *Rhynchospora careyana*: achene with persistent perianth (bristles), ×4.

Figures from Zomlefer.1994. Flowering Plant Families

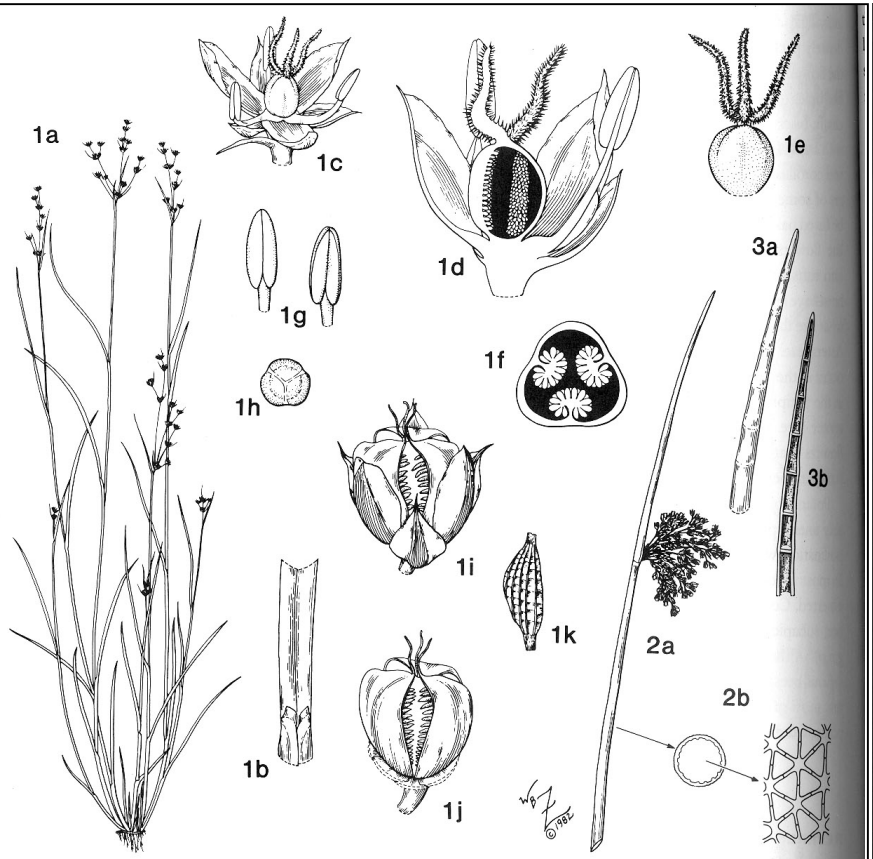

Figure 162. Juncaceae. 1, *Juncus marginatus*: **a,** habit, ×¼; **b,** sheathing leaf base, ×3; **c,** flower, ×8; **d,** longitudinal section of flower, ×15; **e,** pistil, ×12; **f,** cross section of ovary, ×22; **g,** two views of anther, ×15; **h,** pollen tetrad, ×270; **i,** loculicidal capsule with persistent perianth, ×10; **j,** loculicidal capsule (perianth removed), ×10; **k,** seed, ×45. **2,** *Juncus effusus*: **a,** inflorescence, ×½; **b,** cross section of stem, ×3, with detail of stellate cells of pith, ×100. **3,** *Juncus scirpoides*: **a,** leaf, ×3; **b,** longitudinal section of leaf, ×3.

TABLE 21. Traditional chart of characters used to separate the Juncaceae, Cyperaceae, and Poaceae—all plants with a "grass-like" habit. Only the most common character states for each family are listed; exceptions are not included.

CHARACTER	JUNCACEAE (RUSHES)	CYPERACEAE (SEDGES)	POACEAE (GRASSES)
GENERA/SPECIES	8/300	146/5,315	650–785/10,000
HABITAT	wet areas	wet areas or sterile soils	dry to moist areas
STEM CROSS SECTION	terete	triangular	terete or ellipsoid
INTERNODES	solid, with large pith	usually solid	usually hollow, or less commonly solid
NODES	not jointed	not jointed	jointed
LEAF RANKS	3	3	2
LEAF BLADE	flat to terete	flat	flat
LEAF SHEATH	open	closed	open and with ligule
INFLORESCENCE	basically cymose, and often congested	arranged in spikelets	arranged in spikelets
NUMBER OF BRACTS SUBTENDING EACH FLOWER	2 or more	1 (glume, scale)	usually 2 (palea and lemma)
PERIANTH	usually 6 chaffy tepals	absent, or reduced to a varying number of bristles or scales	reduced to 2 (or sometimes 3) lodicules
ANTHER ATTACHMENT	basifixed	basifixed	basifixed, but deeply sagittate and appearing versatile
POLLEN	in tetrads	single, but each grain ("pseudomonad") representing a degraded tetrad	single
FRUIT TYPE	loculicidal capsule	achene	caryopsis (grain)
EMBRYO	surrounded by endosperm	embedded in base of endosperm	outside of endosperm