perennial; rhizomatous; lvs ensiform, 2-ranked infl raceme (open or closed) or lateral units are dichasia; (2)3-membered calyculus below flw flw bisexual, T free; G3 (ovaries connate, styles free); triradiate infralocular septal nectaries + or fr septicidal capsule; seeds with terminal appendages; steroidal saponins SE USA, northern S. Am., N temp. (to Japan, Tibet)

infl of large ± petal-like bract (= spathe) and spadix (densely spicate often with large, terminal, sterile part) flw uni- or bisexual, sessile, ebracteate; T + or -; A1-6, G1-3(∞) (monomerous or connate); fr berry; often storage cotyledon (nonphotosynthetic)

fresh or brackish water; cormose, stoloniferous; laticiferous lvs petiolate (except submerged spp.), prominent midrib paralleled by veins running from base linked by fine transverse veins flw uni- or bisexual; C crumpled in bud, of flw usu. with many extrorse anthers, pollen pantoporate embryo strongly bent

lvs petiolate or (usu.) undifferentiated infl subtended by 2 often connate bracts flw unisexual, ♀ usu. with staminodia, ♂ with carpellodes G inferior; stigma branched; fr often ± fleshy, dehiscence irregular

> lvs long, 3-angled infl axillary, scapose, umbel-like

flw perfect : fr follicle temp. Eurasia, naturalized in NE N Am.

seagrasses; roots in two groups/rows

lvs midrib/cross veins (broadleaved spp.

(basal) ligule usu. +; infl densely spicate or not

T small (seemingly on back of A) or – carpels often stipitate; worldwide, esp. temp.

flw uni- or bisexual

freshwater; laticifers +

northern temp. to Arctic

infl colored, often densely spicate with long scape; spathe + (inconspicuous) flw bisexual, monosymmetric, rather small, T2 ± conspicuous; bracts/bracteoles trop. and warm temp., esp. S Africa

> bogs and freshwater infl closed raceme with large, leafy bracts SCHEUCHZERIACEAE

> > **J**UNCAGINACEAE

BUTOMACEAE

TOFIELDIACEAE

**ARACEAE** 

ALISMATACEAE

**H**YDROCHARITACEAE

**A**PONOGETONACEAE

**M**AUNDIACEAE

ZOSTERACEAE

**POTAMOGETONACEAE** 

**Posidoniaceae** 

RUPPIACEAE

CYMODOCEACEAE

perennial; rhizomatous/tuberous; mostly terrestrial, some climbing, some epiphytes, rarely aquatic (e.g., Lemnoideae laticifers common, sap pungent / irritant / poisonous; Ivs usu. petiole and blade terrestrial to aquatic herbs rhizomatous infl ± scapose endosperm helobial G occ. apocarpous pentacyclic 3-merous flw rare lateral flw with floral prophylls stamens in pairs (node support weak) petaloid clade placentation diffuse-laminar (sepals + petals, (when more than 1 ovule) ovary locules with except in reduced secretions lineages) intravaginal squamules storage embryo aquatic or wetland intravaginal squamules transformed into hairs; lvs blade with apical pore tepaloid clade (perianth of tenals, flw bisexual, all parts (except bases of carpels) free; pollen in permanent dyads absent in reduced lineages) lys usu, 2-ranked lys distichous (unifacial, ensiform lys only in Tetroncium) infl scapose, racemose or spicate; flw parts free, outer A inserted outside inner T or outer A between P whorls carpels usu. in 2 whorls, ± united; bracts/bracteoles – cosmopolitan, largely coastal (or ephemeral pools), most spp. AUS nectaries rosettes; coastal swamps, lagoons, dams, channels, creeks or shallow freshwater lvs expanded, 2 per module, long, isobifacial, base narrow, cataphylls +, sheath closed flw bisexual, sessile, monosymmetric; bracts/bracteoles – nollination abjotic pollen inaperturate P2, clawed; A6, thecae separated; G[(3-)4], laterally ± free; fr schizocarp, T persistent Freie Universität Berlin filaments infl branched, axes (spadices) flattened with flw on one surface carpels ascidiate flw in two ranks; T1 small opposite A1 or –; pollen filiform Theodor C. H. Cole, Dipl. Biol. ovule 1/carpel floral boundaries ambiguous; G1, ± asymmetrical, stigmatic branches 2, long, abscise carpels as Dahlem Centre of Plant Sciences (DCPS) dispersal unit Institute of Biology - Botany ovule pendent and roots unbranched Freie Universität Berlin orthotropous lvs with apical pore Altensteinstr. 6, D-14195 Berlin, Germany ОСУДАРСТВЕННЫЙ marine; lvs fibrous sheaths persisting along monopodial rhizome (> seaballs infl branched (of several spikelets) aquatic lvs submerged or flw bisexual, usu. perfect, A3 (persistent connective), deciduous; pollen filiform; G1 floating Dmitry D. Sokoloff, Ph.D. fr 1-seeded, fleshy, buoyant; seed coat photosynthetic Margarita V. Remizowa, Ph.D. lvs on elongate

• 14 families, 166 genera, ca. 4800 spp.

• tree topology based on Ross TG et al. (2015)

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· branch lengths deliberate, not expressing actual time scale

numbers of genera/species (in gray) are approximate

COLE, SOKOLOFF, REMIZOWA (2019) ALISMATALES - Relationships and Features

References: Kubitzki (1998) FGVP IV; Ross et al. (2015), Sokoloff et al. (2013), Stevens (2019) APweb

infl 2-3 flw'd spike, peduncle long; flw bisexual, G2-15(-∞) fr long-stipitate; stone operculate; prim. root lateral

perianth -

shoots emerging

above substrate

stomata on carpel

surface absent

carpels free

lvs serrulate fr achene/drupelet

marine; stems erect flw unisexual usu. A(2), ± connate; pollen filiform

lvs 1-veined (midrib), sheathing base; internodes ++

G2, stigmatic branches long ± trop. (to warm temp.), esp. AUS

marine to inland saline/brackish