

ART. XX.—*Studies in the Cyperaceæ*; by THEO. HOLM.
XXXI. *Carices acrostachyæ*: *Crinitæ* nob., *Apertæ* nob., and *Magnificæ* nob. (With 8 figures drawn from nature by the author.)

Crinitæ.

This section is a small one, comprising only *C. crinita* Lam., *C. gynandra* Schw., and *C. maritima* O. F. Muell. Characteristic of these is the light-green or yellowish color (*C. maritima*), and the aristate scales. *C. crinita* is widely distributed from Newfoundland, Quebec and Ontario south to Florida, Louisiana, west to Minnesota and Texas; *C. gynandra* is distributed from Newfoundland to Wisconsin, and in the mountains to Georgia; they inhabit swales and damp thickets. *C. maritima*, on the other hand, grows in brackish or saline shores from Labrador to Massachusetts, and in Europe along the coast of Sweden and Norway to the White Sea.

Carex crinita is a stately species reaching a height of about 1.5 m.; the rhizome is cæspitose, and develops several purely vegetative shoots, beside the floral, which are phyllopodic, flowering already in the first year, and surrounded by several green leaves at the base. The staminate spikes are generally two, the pistillate from three to six, remote and quite long, narrowly and evenly cylindric, dense-flowered, long-pedunculate and pendulous.

With regard to the distribution of the sexes, this is very variable; the terminal spike is not always purely staminate, but very frequently it is androgynous, i. e. staminate above, pistillate below; or, though seldom, gynæcandrous with pistillate flowers at the apex. In many specimens, collected near Clinton, Md. the terminal spike was only staminate in the middle, pistillate at the apex and base; in a few specimens from Quebec the terminal spike was purely pistillate. The pistillate spikes vary from purely pistillate, the most frequent, to androgynous; both types may occur on the same specimen. A somewhat peculiar structure was observed in a few specimens from Clinton, where there was a bract below the terminal, staminate spike subtending a single pistillate flower; sometimes the



FIG. 1. Inflorescence of *Carex aperta* Boott; specimen from Columbia River, Washington; natural size.
 FIG. 2. Inflorescence of *C. aperta* forma *concinnula* nob.; specimen from Mt. Paddo, Washington; natural size.
 FIG. 3. Inflorescence of *C. aperta* forma *hydroessa* nob.; specimen from Columbia River, Washington; natural size.
 FIG. 4. Perigynium and squama of typical *C. aperta*; enlarged.
 FIG. 5. Pistillate squama from near the base of the lowermost spike of *C. crinita* Lam.; enlarged.
 FIG. 6. Perigynium of same; enlarged.
 FIG. 7. Pistillate squama from near the base of the lowermost spike of *C. gynandra* Schw.; enlarged.
 FIG. 8. Perigynium of same; enlarged.

rhachilla had grown out bearing a small staminate spike similar to the case we have described and figured in this journal (1896, p. 214, fig. 4).

The squamæ of both sexes vary from oblong ovate, acuminate to emarginate, and the midrib is extended into a thick, rough arista of variable length; the arista is always much longer in the scales of the basal flowers than in the apical, and much longer in the pistillate spikes than in the staminate. The small perigynium is thin, green, granular, inflated, ovate to obovate, with a short entire beak; only the two marginal nerves are present, and the perigynium is spreading at maturity, longer and broader than the body of the subtending scale. The very small caryopsis is deeply constricted at the middle.

Carex gynandra was first described by Lewis D. de Schweinitz¹ as a distinct species, but in his monograph of the North American species of *Carex*, edited by John Torrey,² it is enumerated as a variety of *C. crinita* with the remark, however, that "it may prove to be a distinct species." Its characters are pretty constant, but sometimes it appears to pass into the ordinary *C. crinita*. It has much the appearance of *C. miliacea*, but it is easily distinguished. By Boott³ it was accepted as a species. It resembles *C. crinita* in habit and size, in the number and length of the spikes, but the perigynia are ascending, less inflated, more or less elliptic, and distinctly nerved, i. e. there are two marginal nerves, and three shorter, rather faint between these on both faces of utriculus; the arista of the scales is much shorter than in the former species, beside the body of the scale being entire instead of emarginate. The number of staminate spikes is mostly 2, and they are very seldom androgynous; the pistillate spikes are mostly four, and they are commonly androgynous. It represents undoubtedly a distinct species.

Carex maritima has a stoloniferous rhizome, and the culms are phyllopodic, but develop in the second year;

¹ An analytical table to facilitate the determination of the hitherto observed North American species of the genus *Carex*. (Ann. New York Lyc. Nat. Hist., Vol. 1, p. 70, 1824).

² Ibidem Vol. 1, p. 360, 1825.

³ Illustrations of the genus *Carex* Vol. 1, 1858, p. 18, t. 50.

thus they are at the base surrounded by long, withered leaves from the previous year. It is strange that Kükenthal⁴ attributes an aphyllopodic culm to these species as well as to *C. salina*, *C. subspathacea*, etc., which certainly depends on an error. It is of lower stature than the two former, but of a similar, graceful habit with the oblong-cylindric to clavate, pistillate spikes drooping on very thin peducles. The scales resemble those of *C. crinita*, and the arista attains a considerable length; the perigynium is shorter, but broader than the body of the scale, mostly erect, membranaceous, ovate to obovate with a short, emarginate beak; the perigynium has several, but faint nerves; the nut is constricted at the middle.

Among twenty-three specimens from Europe and this country the distribution of the sexes was as follows:

14 specimens had	2	staminate	spikes.
8	“	“	1 “ “
1	“	“	3 “ “
9	“	“	4 pistillate “
9	“	“	3 “ “
5	“	“	2 “ “

In nineteen of these the pistillate spikes were androgynous, and in six of these all the spikes showed this structure. The terminal spike was androgynous in five specimens. Furthermore two pistillate spikes may be developed from the axil of the same bract, which, however, seems to be a rare occurrence.

Apertæ.

Carex aperta Boott and *C. pruinosa* Boott are the only members of this section.

C. aperta (Figs. 1. and 4).

The original diagnosis⁵ reads as follows:

“Spica mascula 1-2 oblongo-cylindrica, acuta, foem. 2-4 oblongis superioribus approximatis sessilibus apice masculis inferiori remota pedicellata saepe toto foeminea, stigm. 2, perig. orbiculatis stipitatis enerviis pellucide punctatis abrupte brevi-rostratis ore

⁴ Cyperaceæ-Caricoideæ in Engler's Das Pflanzenreich Leipzig, 1909, p. 357.

⁵ Flora Boreali-Americana, vol. 2, 1840, p. 218.

bidentato squama ferruginea lanceolata acuta latioribus brevioribusque. Hab. Columbia River. Dougl. Scouler."

Howell⁶ calls the species "*bovina*", and some points in his description deserve mention, viz. "densely matted and forming extensive meadows of many acres". "Spikes all peduncled or the upper one sessile, lower more or less cernuous". "On lands that are overflowed by the Columbia River".

The species is aphyllopodic, and the rhizome is densely matted, slightly stoloniferous. With regard to the number of spikes and the distribution of the sexes, we observed in 54 specimens, kindly presented to the writer by Messrs. Louis F. Henderson, James M. Macoun and Wilhelm N. Suksdorf: they were collected in British Columbia, Vancouver Island, Idaho and Washington State:

36	specimens	with	1	staminate	spike.
15	"	"	2	"	spikes.
3	"	"	3	"	"
39	"	"	3	pistillate	"
12	"	"	2	"	"
2	"	"	4	"	"
1	"	"	1	"	spike.

In fourteen of these some of the pistillate spikes were androgynous: six with two, and eight with one; in four specimens there were a few (1-3) pistillate flowers at the base of the terminal, staminate. The species is known to be abundant at several stations in British Columbia, Vancouver Island, Washington, Oregon and Idaho; it prefers low grounds, but occurs also in the mountains, for instance on Mt. Paddo, where Mr. Suksdorf collected it on borders of ponds at an elevation of 2,000 m.

Characteristic of the species are the turgid perigynia with the surface very prominently papillose, by Kükenthal (l. c. p. 319) interpreted as "*utriculi resinosi*," which of course is not correct; all the cells of the epidermis are extended into obtuse, thick-walled papillæ. Only two nerves, the marginal, are present. The caryopsis is small, obovate, and not constricted. In the material, which has been examined, we have been able to distinguish the forms as follows:

⁶ A Flora of Northwest America. Portland, 1903, p. 702.

forma 1. *concinna* nob. (fig. 2) Culmus tenuis, 50-80 cm. altus, inflorescentia brevis, 6-9 cm. longa. Spiculæ 2-3 cm. longæ, graciles, capillari-pedunculatæ, fere cernuæ. Washington: Mount Paddo, border of a pond; alt. c. 2,000 m.; collected by Mr. Suksdorf.

forma 2. *hydroessa* nob. (fig. 3.) Culmus 40-60 cm. altus, strictus, tenuis. Spiculæ ♀ minores, valde remotæ, sessiles vel ima pedunculata. Washington: Bottom-land, Columbia River, after high water; collected by Mr. Suksdorf.

forma 3. *mimetica* nob. Rhizoma stoloniferum, Culmus 50-60 cm. altus, scaberrimus. Spiculæ ♀ breviores, $\frac{1}{2}$ -1 $\frac{1}{2}$ cm. longæ, nigricantes, sessiles, erectæ ± remotatæ, bracteæ foliaceæ, ima spicam masculam valde superans. Habitum *Microrhyncharum* (e. g. *C. aquat.*) simulans. Washington: Among boulders 5 km. west of Bingen; collected by Mr. Suksdorf.

C. pruinosa.

Boott's diagnosis⁷ reads as follows:

“Spica mascula 1 subclavata; foemineis 4 cylindricis pedunculatis evaginatibus erectis contiguis superioribus apice masculis inferioribus longissime bracteatis, stigmatibus 2, perigyniis ovatis rostellatis emarginatis obsolete nervosis albo-tuberculatis squama lanceolata mucronata longioribus latioribusque.

Hab. In Java, Dr. Horsfield.

Culmus tripedalis, glaber; pars spicas gerens biuncialis, scabra. Folia glauca, 1 $\frac{1}{2}$ -2 lin. lata, culmo breviora, superne serrato-scabra; ligula obtusa brunnea. Bracteæ binæ inferiores foliaceæ 8-10 poll. longæ; reliquæ setaceæ spicis suis breviores, evaginatae. Spica mascula 1 poll. longa, 1 $\frac{1}{2}$ lin. lata, basi attenuata, subsessilis, squamis ferrugineis. Spicae foemineae 4, superiores plus minus apice masculae, contiguæ, 8-14 lin. longæ, 2-3 lin. latae; superior sessilis; squamis brevi-hispido-mucronatis. Perigynium 1 6/9 lin. latum, ovatum, rostellatum, emarginatum, obsolete 3-4 nervosum, tuberculis albis minimis conspersum, quasi pruinatum. Achenium orbiculatum, compressum, basi styli aequali terminatum.

C. glaucescenti Elliott (quæ tamen stigmatibus 3 gaudet), habitu et aspectu similis.”

⁷ Caricis species novæ, vel minus cognitæ. (Transact. Linn. Soc., vol. 20, p. 131, 1845-46).

In Ill. gen. *Carex* (l. c. vol. 1, 1858, p. 65) Boott regarded the species as being an ally of *C. crinita*. The species differs from *C. aperta* by the long-peduncled pistillate spikes, by the scales being distinctly mucronate and by the perigynium showing several nerves beside the marginal: but the peculiar, epidermal structure of utriculus is common to both.

A very different classification is proposed by Kükenthal (l. c. p. 345), who places *C. pruinosa* in a subsection *Praelongæ* Kükenth. of the *Acutæ* Fr., including Drejer's *Microrrhynchæ* and *Acorastachyæ*. This author considers the affinity of *C. pruinosa* to be with such species as *C. torta* Boott, *C. Sitchensis* Prescott, *C. phacota* Spreng. etc. However, when this author cites Fries as the author of the section *Acutæ* we must remember that Fries established this section in the year 1835,⁸ and only for *C. acuta* L., *C. stricta* Good. and *C. cæspitosa* L. In the year 1846⁹ Fries classified the Scandinavian *Carices* in a more elaborate manner, and we see from this that he segregated *C. stricta*, *C. cæspitosa* and *C. turfosa* from "*Phyllopodæ: Prolixæ: C. acuta, C. prolixa, etc.*"; according to Fries the *Aquatiles*, *Salinæ*, *Rigidæ* and *Bicolores* were sections distinct from the *Prolixæ* and the aphyllopodic *Spiculosa* and *Cæspitosa* (*C. stricta*, etc.). It is therefore absolutely incorrect to credit a section "*Acutæ*" to Fries, when this author had no intention whatever to make it include his other sections, viz. *Rigidæ*, *Bicolores*, etc. As this section *Acutæ* is outlined by Kükenthal it cannot possibly be credited to Elias Fries, but to Pastor Kükenthal himself. We have several years ago¹⁰ suggested the advisability of independent classification rather than combining the systems proposed by Elias Fries, Kunth. and several other authors, which leads only to misinterpretations, as in the case stated above.

Magnificæ.

To this section we have referred *C. magnifica* Dew., *C. Schottii* Dew., and *C. lacunarum* nob.

⁸ Corpus florarum provinciarum Sueciæ, p. 191.

⁹ Summa Vegetabilium Scandinaviæ, p. 71.

¹⁰ Greges Caricum, this Journal, vol. 16, p. 449, 1903.

The history of Dewey's unpublished *C. magnifica* we have mentioned in some previously published papers,¹¹ stating that C. B. Clarke called our attention to the fact that the species had for many years passed for *C. Sitchensis* Prescott. *C. magnifica* is a robust species with the culm reaching a height of about 1.5 m.; the rhizome is stoloniferous, the culms phyllopodic; the latter character is seldom to be seen in herbarium-specimens, but an excellent specimen collected by Mr. E. P. Sheldon in Oregon shows this structure very plainly. The leaves are shorter than the culm, relatively broad, glaucous and thick. Spikes 3-8; the upper was staminate, seldom androgynous, the lower pistillate, mostly androgynous, cylindric, 3-15 cm. long., thick, dense-flowered, sessile or nearly so, contiguous, spreading or drooping, often curved. The bracts subtending the pistillate spikes are leaflike, much longer than the inflorescence; squamæ of pistillate flowers elliptic, acuminate, dark purple with midrib of lighter color; perigynium spreading, coriaceous, obovate, turgid, deep brown, scabrous along the upper margin, terminated by a short emarginate beak. The species is not very variable except with reference to the number of spikes, and, to some extent, the distribution of the sexes, as may be seen from the following table, drawn from 31 specimens:

15 specimens had	2 staminate spikes.
11 " "	3 " "
3 " "	1 " "
2 " "	4 " "
19 " "	3 pistillate "
8 " "	2 " "
4 " "	4 " "

Only in 5 specimens the pistillate spikes were all purely pistillate; in the remaining 26 some or all were androgynous; in 6 specimens one or two of the lateral male spikes were androgynous, and one specimen had a simple, terminal androgynous spike. Some specimens of gigantic size were collected by Professor Piper in Alaska (Astoria, June 21st, 1904); in these the entire inflorescence measured from 23 to 24 cm.; the staminate spikes varied from 5 to 10 cm. in length, and the pistillate from 10 to 15 cm.

¹¹ This Journal, vol. 17, p. 316, 1904, and vol. 26, p. 486, 1908.

Carex magnifica is distributed from Alaska, following the coast, south to California.

Carex Schottii Dew.

Dewey's original diagnosis has been cited in our paper dealing with the structure and affinities of some of Dewey's *Carices*¹² and the species was accepted by C. B. Clarke as identical with *C. obnupta* Bailey, but distinct from *C. Barbaræ* Dew. Nevertheless Kükenthal (l. c. p. 305) refers the species, as a mere synonym, to *C. Barbaræ*. Mr. S. B. Parish.¹³ however, holds the opinion that they are distinct.

Carex Schottii resembles *C. magnifica* in many respects, but the spikes are longer and more slender, drooping on long peduncles and remote.

Carex lacunarum nob.¹⁴

As may be seen from the diagnosis (l. c.) and the figures (l. c. p. 303) the species is very distinct from the others of this section, especially on account of the lighter color and structure of the perigynium and squama; as a matter of fact the squamæ of the basal pistillate flowers are very prominently aristate; moreover the perigynia are appressed, not spreading.

In these sections: *Crinitæ*, *Apertæ* and *Magnificæ* the distribution of the sexes thus shows a variation well marked. In *C. crinita* the terminal spike is sometimes gynæcandrous, or it consists of a pistillate portion above and below the staminate; or there may be a single pistillate flower subtended by a bract below the terminal, staminate spike; the pistillate are often androgynous. In *C. maritima* the terminal spike may be androgynous, and in some cases two pistillate spikes may be developed in the axil of the same bract. In *C. aperta* there may be from one to three pistillate flowers at the base of the terminal, staminate spike. Androgynous staminate spikes occur in *C. magnifica*; the pistillate are mostly androgynous; furthermore the terminal may also be

¹² This Journal, vol. 26, p. 478, 1908.

¹³ A preliminary synopsis of the Southern California Cyperaceæ. (Bull. South. Calif. Acad. Sc., 1904, p. 108.)

¹⁴ This Journal, vol. 17, p. 316, 1904.

androgynous. In other words the species of these sections illustrate to some extent the inflorescerial structure of the more evolute types of the grex: *Ternariæ*. In the *Salinæ* and *Cryptocarpæ*¹⁵ the pistillate spikes are often androgynous, and in *C. Lyngbyei* the terminal, staminate spike is sometimes androgynous; otherwise the distribution of the sexes is more regular than the sections discussed in the present paper.

Clinton, Md., July, 1921.

¹⁵ This Journal, vol. 49, and 50, 1920.