vate, usually lanceolate to linear, commonly broadest at the base, usually acute and frequently entire: involucre 10–14 mm. long: mature achenes 5–6 mm. long: pappus 5–7 mm. long.

HIERACIUM FLORIBUNDUM Wimm. & Grab. This is the common introduced *Hieracium* of the fields and roadsides in southeastern Washington County, Maine, and has been collected as far east as St. John, New Brunswick. It is now established in great abundance around Passamaquoddy Bay, but was first recorded from America by Dr. Kennedy (RHODORA, iv. 25) who found it sparingly at Cutler in 1901.

EXPLANATION OF PLATE 84.

Fig. a. *Montia fontana*, plant and seed, natural size, and seed × 15.
Fig. b. *M. rivularis*, portion of plant and seed, natural size, and seed × 15.
Fig. c. *M. lamprosperma*, plant and seed, natural size, and seed × 15.

NOTES ON CONNECTICUT MOSSES.

G. E. NICHOLS.

SINCE the publication a little over a year ago of "The Bryophytes of Connecticut"[1] a number of additions have been made to the mosses known to occur within the state and, as will appear in the present paper, it has been found necessary to make several changes in the list of species given in the catalogue.

REVISION OF THE EPHEMEREAE.

During the past fall the writer devoted especial attention to the study of the *Ephemereae*, a sub-family of the *Funariaceae* which, according to the classification of Brotherus,[2] contains the two North American genera *Nanomitrium* Lindb.[3] (= *Micromitrium* Aust.[4]

[1] Evans, A. W., and Nichols, G. E. Conn. Geol. and Nat. Hist. Surv. Bull. 11. 1–203. Hartford. 1908.
[2] Engler-Prantl's Natürliche Pflanzenfamilien Part 1. **3**:512. 1903.
[3] Notis. pro Fauna et Flor. Fenn. **13**:408. 1874.
[4] Musci Appal. Exsic. 1870.

not Spruce[1]) and *Ephemerum* Hampe.[2] In both of these genera the leafy shoot is very short and consists merely of a small, bud-like cluster of leaves borne on an exceedingly short stem and surrounding the diminutive sporophyte. The whole plant in *Nanomitrium* is scarcely more than 1 mm. in height, and even in the larger forms of *Ephemerum* rarely exceeds 2 mm. From closely related forms the *Ephemereae* are distinguished by the fact that the green protonema from which the leafy shoots arise persists throughout the life of the plant. In some species, for example in *E. cohaerens*, the protonema becomes discolored with age and is not conspicuous at the time the spores mature; but in many cases, especially in species which, like *E. spinulosum*, grow in very wet places, this structure forms a conspicuous, dark green mat covering the substratum about the leafy shoots. All of the species of *Nanomitrium* and *Ephemerum* are annuals. For the most part they grow in wet or moist localities, particularly in the beds of dried up ponds, and usually in open situations. Although some species occur on gravelly soil, loamy clay or humus appear to afford the most favorable substrata.

As pointed out by Salmon,[3] *Nanomitrium* differs from *Ephemerum* primarily in the fact that in the former genus certain cells of the capsule-wall are differentiated in such a way that the capsule possesses a well marked rudimentary lid. The presence of a lid is indicated in Austin's original description of the genus and is clearly shown in Sullivant's *fig. 6* of his plate of *N. Austini* (Sull.) Lindb.[4] In *Ephemerum*, on the other hand, no traces of such a structure are apparent, but the capsule dehisces irregularly. In *Nanomitrium*, moreover, during the development of the sporophyte the "spore-sac" breaks down, and in the mature capsule the spores are enclosed only by the thin and delicate outer layer of the capsule-wall. In *Ephemerum*, on the contrary, the "spore-sac" persists, so that the ripe spores are enveloped by a firm, double wall of cells. Even under a dissecting microscope this difference in the walls of the mature capsules is easily demonstrated, for while in *Nanomitrium* the capsule is easily broken, it usually requires considerable picking with a needle to release the spores in *Ephemerum*. Other differences between the two genera are the

[1] Catalog. Musc. Amaz. et Andes. 2. 1867.
[2] Flora **20**:285. 1837.
[3] Journ. Linn. Soc. Bot. **34**:163–170. 1899.
[4] Icones Musc. Suppl. *pl. 12*. 1874.

presence of stomata in the capsule-wall of *Ephemerum*, their absence in *Nanomitrium*, and a marked difference in the size of the spores, which are sometimes 80 μ in diameter in *Ephemerum* but rarely more than 35 μ in *Nanomitrium*.

Nanomitrium Austini was described by Sullivant[1] from material collected by Austin at Closter, New Jersey, in 1865. Later, in 1878, Austin found it at Rockland, New York, and these two stations appear to have been the only localities known for this minute moss until the fall of 1909 when the writer collected it in the town of Hamden, Connecticut.[2] The plants there grew on the clayey banks of a ditch and were scarcely perceptible without the aid of a lens. These specimens agree closely with those distributed by Austin.[3] Between *N. Austini* and *N. synoicum* (James) Lindb., our other native species, however, the differences are not great. The spores of *N. synoicum* are said to be more papillose than those of *N. Austini*, and the leaves of the former are often nearly entire, while in the latter they are serrate. One of the most striking differences that the writer has noted between the two is in their size and habit. In *N. Austini* the axis of the leafy shoot is in most cases very short and the whole plant appears almost sessile. In *N. synoicum*, on the other hand, the axis is often 0.65 mm. in length, so that the sporophyte with its enveloping cluster of leaves is perceptibly raised above the level of the ground.

The species of *Ephemerum* appear to be much more widely distributed than those of *Nanomitrium*, yet it is impossible to get any satisfactory idea of their range, partly owing to the fact that on account of their small size they are seldom collected, but principally because the characters which separate the various species are inadequately understood. For example, in "The Bryophytes of Connecticut" *E. serratum* is listed from five stations. The specimens from these various localities were determined by five different authorities. Yet upon careful examination all five specimens were found to be, not *E. serratum*, but *E. spinulosum*.

The classification of species in *Ephemerum* is based primarily on leaf characters, and two general groups may be defined. In one group are placed those forms in which the leaves do not possess a midrib,

[1] Icones Suppl. 21. *pl. 12.* 1874.

[2] Specimens from this station distributed by Holzinger, Musci Acro. Bor.-Amer. No. 268.

[3] Musci. Appal. Exsic. No. 45. 1870.

but consist throughout of a single layer of cells. To this group belong *E. megalosporum* (Aust.) Salm. and *E. serratum* (Schreb.) Hampe. These two species are readily distinguished. In *E. megalosporum* the leaves are obscurely serrulate, and stomata are present in the upper, as well as in the lower, part of the capsule-wall. In *E. serratum* the leaves are strongly serrate, while the stomata are restricted to the base of the capsule.

The second group includes all species in which the leaves possess a midrib. The midrib, however, even when present may easily be overlooked, since it is very poorly defined and in most species consists of little more than a double layer of cells which are similar in size and form to the ordinary cells of the leaf. The species in this group may be further divided into two well defined sub-groups. In the first, of which *E. cohaerens* (Hedw.) Hampe appears to be the only North American representative, the leaves are ovate-lanceolate in shape and are smooth or nearly smooth, except on the midrib. *E. cohaerens* is the most robust of our native *Ephemereae*. To the second sub-group belong *E. crassinervium* (Schw.) C. Müll., *E. papillosum* Aust., *E. spinulosum* Schimp., *E. sessile* (Br. & Sch.) C. Müll., and *E. hystrix* Lindb., of which the first three have been found in Connecticut. These differ from *E. cohaerens* in their more delicate habit and narrower, more lanceolate leaves which are always more or less papillose on one or both surfaces. Cardot [1] considers *E. papillosum*, *spinulosum*, *sessile*, and *hystrix* simply as well marked varieties of *E. crassinervium*. But after a careful examination of a considerable number of specimens of the three Connecticut species the writer has arrived at the conclusion that these, at any rate, are worthy of specific rank.

The characters which distinguish *E. crassinervium* from *E. spinulosum* are difficult to describe. Often some of the leaves of an *E. spinulosum* plant are indistinguishable from leaves of *E. crassinervium*, so that it is only after a careful examination of all the leaves of a specimen that its identity can be established. In both species the leaves taper gradually to the apex and are serrate, especially in the upper half. In typical leaves of *E. crassinervium*, the teeth are relatively short and are produced by the slight protrusion of the upper ends of some of the marginal cells. In *E. spinulosum*, on the

[1] Bull. Herb. Boissier **7**:361–363. 1899.

other hand, the teeth are much longer and as a rule a much greater portion of the tooth-producing cell protrudes; in many cases, in fact, almost the entire cell projects outward in the form of a tooth, and frequently the whole upper half of the leaf is little more than an excurrent midrib from which long teeth project in all directions. *E. papillosum* differs from the two species above mentioned in its broader, much more papillose leaves, and in the structure of its calyptra which is rendered markedly papillose by the projection of the outer walls of its cells. According to Austin's description [1] the leaves of *E. papillosum* are narrower than those of *E. crassinervium* but an examination of Austin's specimens of both species has failed to verify this observation. The character of the leaf margin is intermediate between that of *E. crassinervium* and *E. spinulosum*.

The revised list of *Ephemerum* species found in Connecticut is here given.

E. megalosporum: Orange (Evans, 1891).

E. cohaerens: East Haven (Evans, 1891), New Haven (G. E. N.).

E. crassinervium: Branford (G. E. N., 1909).

E. papillosum: New Haven and North Haven (G. E. N., 1909).

E. spinulosum: Hartford (Miss Lorenz), East Haven (Evans), New Haven (G. E. N.), Orange (J. A. Allen, 1879), Oxford (Harger), Portland (G. E. N.), and Norwich (Setchell).

For the sake of convenience the diagnostic characters of these five species are summed up in the following key.

1.	Leaves without a midrib	2
	Midrib present, although often indistinct	3
2.	Leaves obscurely serrulate; stomata present in upper half of capsule	*E. megalosporum.*
	Leaves strongly serrate; stomata restricted to base of capsule.	*E. serratum.*
3.	Leaves ovate-lanceolate, smooth except on the midrib	*E. cohaerens.*
	Leaves narrowly lanceolate, distinctly papillose	4
4.	Calyptra conspicuously papillose	*E. papillosum.*
	Calyptra smooth or nearly so	5
5.	Teeth in apical half of leaves usually short	*E. crassinervium.*
	Teeth in apical half of leaves usually long	*E. spinulosum.*

The writer is about to undertake a revision of the North American species of *Nanomitrium* and *Ephemerum*, and a considerable amount of material for study is already at hand. Since, however, it is desired to make the work as thorough and comprehensive as possible, it will be greatly appreciated if American bryologists will cooperate through the loan or exchange of specimens.

[1] Musci Appal. Exsic. No. 50. 1870.

Recent Additions.

Physcomitrium immersum Sull. Three stations for this interesting North American species were found during the autumn of 1909, viz.— Hartford (Evans), Wethersfield (Miss Lorenz), and Portland (G. E. N.). In all three localities the plants grew on damp sand or clay in places which are usually flooded during the spring by the water of the Connecticut river. Although not heretofore reported from New England it is probable that *P. immersum* is not uncommon here, at least in the valley of the Connecticut river. Outside of New England it has been found as far north as Quebec [1] and ranges south and west to Delaware and Colorado respectively. This species is frequently confused with *Aphanorrhegma serratum* (Hook. & Wils.) Sull., to which it bears a close resemblance. Even in the field, however, the two may be separated from one another with reasonable certainty, *P. immersum* being somewhat more robust than the *Aphanorrhegma*, and where abundant occurring in lax tufts which are quite different from the more or less depressed tufts of *Aphanorrhegma*. Moreover, as pointed out by Mrs. E. G. Britton,[2] in *Aphanorrhegma* the capsule splits exactly in the middle and the cells of the capsule-wall possess pronounced collenchymatous thickenings at their angles, while in *P. immersum* the line of dehiscence is invariably situated above the middle of the capsule and the cells of the capsule-wall are relatively thin-walled throughout.

Aulacomnium androgynum (L.) Schw. This species has been collected in New York (Miss Marshall), Maine (J. F. Collins), and Massachusetts (C. E. Faxon, and others), but the writer has been unable to find references to its occurrence in other eastern states. The Connecticut station is in the town of Branford (G. E. N., 1909), where the plants grow in considerable abundance in crevices of gneissoid ledges at the border of a salt marsh. *A. androgynum* apparently does not fruit in eastern North America, but it may readily be distinguished from other species of Aulacomnium by its peculiar organs of vegetative reproduction. These consist of fusiform, multicellular gemmae borne on short stalks and produced in great numbers at the tips of slender pseudopodia. The densely crowded masses of gemmae

[1] Macoun, J., Cat. Can. Plants. **6**:120. 1892.
[2] Bull. Torr. Bot. Club. **21**:190, 191. 1894.

have the shape of minute balls. *A. palustre* (L.) Schw. also produces pseudopodia which bear at their apices gemmiform "Brutblätter," but the latter are obviously merely small metamorphosed leaves and are not at all like the gemmae of *A. androgynum*.

PHILONOTIS MARCHICA (Willd.) Brid. (= *P. Muhlenbergii* Schw.) Although *P. fontana* (L.) Brid. is the only species of the genus credited to Connecticut in the 1908 list, *P. marchica* should also have been included. This had been reported from the state (as *P. Muhlenbergii*) by Renauld and Cardot,[1] but the reference was overlooked. The specimens upon which this report was based were collected in Cornwall (1887) by Prof. H. A. Green and were determined by Cardot. The writer has recently collected it in Salisbury also. In the opinion of both Cardot [2] and Dismier [3] *P. Muhlenbergii* is not distinct as a species from *P. marchica*. *P. marchica* ranges throughout the northern United States and Canada and has been reported from all the New England states except New Hampshire.

PHILONOTIS CAESPITOSA Wils. In connection with a revision of the North American species of *Philonotis* which he has just completed, Dismier has kindly examined all the available Connecticut material of this genus and finds that a number of specimens which have passed as *P. fontana* should be referred to *P. caespitosa*. Previous to Dismier's critical study of the genus this species had not been recognized as occurring at all on the North American continent, although it was known to be not uncommon in Europe and had been reported from Greenland. Apparently, however, it is widely distributed, at least through the eastern half of the continent. Dismier reports it from all the New England states but Vermont, and in the herbarium of the New York Botanical Garden are specimens from New York, New Jersey, Pennsylvania, Ohio, and Wisconsin, as well as from Newfoundland and New Brunswick. The Connecticut stations are: Salisbury and Stafford (G. E. N.), Canterbury (Mrs. Hadley), Easton (Eames), Huntington and Hamden (G. E. N.), New Haven (Eaton, 1856), and Ledyard (G. E. N.).

The characteristics by which the Connecticut species of *Philonotis* may be distinguished are indicated in the following key:

1. Marginal teeth of stem leaves always simple and sharp; papillae situated at the upper angles of the leaf cells . . . . . *P. marchica*.

[1] Musci Amer. Sept. 32. 1893.
[2] Bull. Herb. Boissier **7**:307. 1899.
[3] Rev. Bryol. **34**:50, 51. 1907.

Marginal teeth of stem leaves double, at least in the lower part of the leaf; papillae, at least in the basal half of the leaf, situated in the lower angles of the cells, or in the middle 2

2. Stem leaves falciform, not plicate, margin plane; perigonial leaves acute . . . . . *P. caespitosa.*

Stem leaves rarely falciform, plicate at base, margin revolute below middle of leaf; inner perigonial leaves obtuse . . . . . *P. fontana.*

PTERIGYNANDRUM FILIFORME (Timm) Hedw. According to Dr. Grout[1] this moss is not uncommon, but it had apparently been overlooked in Connecticut until the fall of 1909 when the writer happened to discover a few sterile, depauperate specimens growing on a dry ledge in the town of Bethany. In its general aspect, as remarked by Grout, *P. filiforme* resembles some of the species of *Leskea*. The plants ordinarily have, however, a marked yellowish cast, the branches are usually numerous and are all curved at the tip, pointing in the same direction, while frequently slender flagelliform branches are developed. The leaf cells are considerably longer than in *Leskea*, except on the flagelliform branches where they are often quite short.

POGONATUM BRACHYPHYLLUM (Michx.) Beauv. This typically southern seaboard species has been collected in most of the states bordering on the coast from Texas to New Jersey, but heretofore it has not been reported from New England. During the past fall the writer had the good fortune to find it in the town of Branford. The plants grew on earth underneath a large bowlder near the shore of Long Island Sound, the entire colony being restricted to an area less than five feet in length by one in width. A search of the adjacent shore line for several miles has as yet failed to reveal further traces of this interesting form. The plants first collected bore either immature or old sporophytes, but a recent collection shows that the spores are ripe in this latitude about the middle of April. *P. brachyphyllum* resembles somewhat the common *P. tenue* (Menz.) E. G. Britton, but it is readily distinguished by its blunt, entire leaves.

DREPANOCLADUS ADUNCUS (L.) Warnst.

All specimens listed in "The Bryophytes of Connecticut" as *Drepanocladus aduncus* (L.) Warnst. (p. 168) must be referred to *D. subaduncus* Warnst. (p. 168). *D. aduncus* has not yet been found in Connecticut, although it is probable that it occurs in the more northern,

[1] Mosses with Hand Lens and Microscope. 255. 1908.

hilly parts of the state. Concerning the identity of the true *D. aduncus* (=*Hypnum aduncum*) the most varied opinions have been and are still held by bryologists. What appears to the writer to be the most satisfactory solution of the problem has been offered by Warnstorf, and the views of this author, as stated in a recent letter, will be presented briefly. That the binomial *Hypnum aduncum* was first used by Linnaeus [1] is universally admitted. Hedwig,[2] however, misunderstood the application of the name as used by Linnaeus and described as *H. uncinatum* the same moss to which Linnaeus had already given the name *H. aduncum*, while at the same time [3] he misapplied the latter name to a collective group of *Harpidium* (=*Drepanocladus*), forms having falcate leaves, with the diagnosis: "Trunco erecto, ramis patulis, foliis ovato-acuminatis incurvis summitatum secundis...." From this group several species, viz.— *H. Kneiffii* Schimp., *H. Sendtneri* Schimp., etc., have since been split off, and at the present time opinion is divided as to the identity of Hedwig's *H. aduncum*. In view of these facts, and with the hope of clearing up matters, Warnstorf, following the procedure of S. O. Lindberg,[4] has dropped the Hedwigian combination *H. uncinatum*, which had been retained by most bryologists, in favor of the original Linnaean name *H. aduncum*, while he has designated as *Drepanocladus subaduncus* a *Harpidium* form which Hedwig certainly included in his *H. aduncum* group. To sum up, *Hypnum aduncum* Hedw. of American bryologists should be called *Drepanocladus subaduncus* Warnst., while *Hypnum uncinatum* Hedw. of American bryologists should be called *Drepanocladus aduncus* (L.) Warnst., the binomial *H. uncinatum* being thus dropped altogether.

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[1] Species Plantarum 1126. 1753.
[2] Descr. et Adumbr. Musc. **4**:65. *pl. 25*. 1797.
[3] L. c. 62. *Pl. 24*.
[4] Musci Scandinavici. 33. 1879.