

Elongate leaves 4–9 pairs, linear-lanceolate, 2–6 mm. wide, ascending high on the plant: primary peduncle and its flower  $1/5$ – $2/5$  (exceptionally  $-1/2$ ) the entire height of the plant, 5.5–13.5 cm. long: the 2 broad calyx-lobes subulate-acuminate at tip: filaments naked: ovary with stipe about 5 mm. long . . . . . *G. Victorinii* Fernald.  
(St. Lawrence River, Quebec Co. to L'Islet Co., Quebec.)

Elongate leaves 3–7 pairs, linear, 1.5–4 mm. wide, mostly confined to the lower half of the plant: primary peduncle and its flower  $2/3$ – $4/5$  the entire height of the plant, 0.6–2.1 dm. long: the 2 broad calyx-lobes merely acute or short-acuminate: filaments ciliate near the middle: ovary subsessile or with short thick stipe . . . . . *G. Macounii* Holm.  
(Montana and Alberta east to Minnesota and Rupert House, James Bay.)

B. Upper leaves oblong, spatulate or oblanceolate, obtuse or rounded at tip, mostly crowded at the lower third of the plant: the primary peduncle and its flower  $2/5$ – $9/10$  the entire height of the plant: calyx with glabrous keels; its 2 broad lobes obtuse or merely subacute: corolla-lobes merely dentate, divergent: ovary sessile or subsessile . . . . . *G. nesophila* Holm.  
(Western Newfoundland and Anticosti and Mingan Islands, Quebec.)

#### GRAY HERBARIUM.

#### EXPLANATION OF PLATE 139.

*Gentiana Victorinii*, n. sp. Fig. 1, large plant,  $\times 1/2$ ; fig. 2, small plant,  $\times 1/2$ ; fig. 3, calyx laid open,  $\times 1$ ; fig. 4, corolla laid open to show stipitate ovary and naked filaments,  $\times 1$ ; fig. 5, fruit,  $\times 1$ .

#### NOTES ON NEW ENGLAND HEPATICAE,—XVII.<sup>1</sup>

ALEXANDER W. EVANS.

(Continued from page 83.)

3. *BAZZANIA DENUDATA* (Torr.) Trevis. Mem. Ist. Lomb. 13: 414. 1877. *Mastigobryum denudatum* Torr., G. L. N. Syn. Hep. 216. 1845. *Jungermannia denudata* Torr. l. c., as synonym, not Nees. *Mastigobryum ambiguum* Lindenb. (in part) op. cit. 217. 1845. On rocks, more rarely on rotten logs. Maine: Greenville, A. W. E. (listed as *B. tricrenata* by the writer, RHODORA 14: 17. 1912); Round Mountain Lake, Franklin County, and Jordan Mountain, Mt. Desert, A. Lorenz. New Hampshire; base of Mt. Washington, J.

<sup>1</sup> Contribution from the Osborn Botanical Laboratory.



*A. Allen*; Flume, *James Herbarium*; Gorham and Franconia, *T. P. James*; Thompson's Falls, White Mountains, *Underwood & Cook* 19; the "Pool" and Shelburne, *W. G. Farlow*, Mt. Willard, *E. Faxon*; Mt. Prospect, Plymouth, *A. J. Grout*; Waterville, *A. Lorenz*; Ice Gulch, Randolph, and Howker's Trail, Mt. Madison, *A. W. E. Vermont*: Bolton, *A. W. E.*; Lake Dunmore, Salisbury, and Willoughby, *A. Lorenz*; Granville Notch, *C. A. Weatherby*; Downer's Glen, Manchester, *A. J. Grout*; Brandon, *D. L. Dutton* 1378, 1577. Massachusetts: Plainfield (part of the original material of *M. denudatum* from the Hooker Herbarium, now in the Mitten Herbarium); Middlefield, 1822, *Emmons* 120 (specimen in the herbarium of the New York Botanical Garden, labeled "*J. denudata* sp. nov."); Mt. Greylock, *A. L. Andrews* (listed as *B. triangularis* by the collector, *RHODORA* 6: 74. 1904); Everett Brook, Sheffield, *A. Lorenz*; Alandar, Berkshire County, *A. R. Northrop*. Connecticut: Salisbury, Beacon Falls,<sup>1</sup> Naugatuck, and Redding, *A. W. E.* (listed as *B. tricrenata* by Evans & Nichols, Connecticut Geol. & Nat. Hist. Surv. 11: 64. 1908). General reports of the species from Massachusetts and Connecticut have been published by the writer, the last reference including also a general report from Maine (*RHODORA* 5: 171. 1903, as *B. triangularis*; 10: 190. 1908, and 15: 23. 1913, as *B. tricrenata*).

Outside New England the following stations may be noted:—Newfoundland: Channel, *Howe & Lang*; Placentia Bay, *A. E. Waghorne* 21, 22. Nova Scotia: Louisburg, Cape Breton, *J. Macoun* 94, 108 (listed as *B. triangularis* by the collector, Cat. Canadian Pl. 7: 33. 1902); Port Clyde, *J. Macoun* 49; Purcell's Cove, Halifax Harbor, *Howe & Lang* 1542; near Indian Brook, mountains north of the Barrasois River, valley of the Barrasois, and Cape Dauphin, Cape Breton, *G. E. Nichols* 512, 592, 1141, 1322. New York, Catskill Mountains, *C. H. Peck* (listed as *Mastigobryum deflexum* by the collector, Ann. Rept. Reg. Univ. New York 19: 70. 1866); Rocky Falls, North Elba, Essex County, *C. H. Peck* 37 (listed as *B. deflexa* by the collector, Bull. New York State Mus. 6: 177. 1899); Little Falls, *C. F. Austin*; Clareyville, *C. H. Peck* 4; Chapel Pond Brook, Adirondack Mountains, *E. G. Britton*; Undercliff, Essex County, *C. C. Haynes* 338; Little Moose Lake, Herkimer County, *C. C. Haynes* (listed as *B. triangularis* by the collector, Bryologist

<sup>1</sup> A plant from this collection has been figured by the writer under the name *B. tricrenata*, Ann. Bot. 26: 20. f. 27. 1912.



9: 62. 1906, and distributed as *B. tricrenata* [corrected label] in Am. Hep. 39); East River Falls, above Lake Colden, and Lake Mohonk, A. Lorenz. Virginia: summit of White Top, 5678 ft. alt., E. G. Britton 1, J. K. Small 52, 55, 56, 79 (listed as *B. deflexa* by Small & Vail, Mem. Torrey Club 4: 193. 1894). West Virginia: Tibbs Run, Monongalia County, C. F. Millsbaugh (listed as *B. deflexa* by the collector in Prelim. Fl. West Virginia 496); road to Cheat View, E. M. Fling; Spruce, Pocohontas County, F. W. Gray 66. North Carolina: Grandfather Mountain, G. F. Atkinson 11579 (listed as *B. tricrenata* by Andrews, Bryologist 17: 60. 1914—the other specimens cited here are all referable to the same species in his opinion); Roan Mountain, 6000 ft. alt., A. L. Andrews 65.

Soon after the publication of this species in the Synopsis Hepaticarum, Lindenberg and Gottsche<sup>1</sup> redescribed and figured it, but subsequent writers, with few exceptions, have considered its claims for recognition unfounded. As early as 1856 Sullivant<sup>2</sup> expressed the opinion that *M. denudatum* was probably a form of *M. deflexum*, and Austin,<sup>3</sup> in 1873, went one step farther by citing it as a simple synonym of *M. deflexum*. Most later students, especially in America, have followed Austin's examples. In 1888, however, Stephani<sup>4</sup> reported *M. denudatum* from Miquelon Island, south of Newfoundland, basing his record on specimens collected by E. Delamare and designating the species as peculiar to America. Pearson<sup>5</sup> cited this record two years later, under *Bazzania denudata*, but called attention to Austin's divergent views, and Macoun<sup>6</sup> repeated Pearson's citation in his last publication on Canadian hepaticology. Apparently Stephani afterwards changed his mind regarding *B. denudata*, since he makes no mention of it whatever in his monograph of the genus *Mastigobryum*, published in 1908, not even including it among the synonyms of his *M. triangulare*. In all probability he placed it in the same category as the forma "*implexa*," to which allusion has already been made. The fact that Trevisan recognized the species by forming the combination "*Bazzania denudata*" does not mean that he actually studied it. He merely transferred all the species of *Mastigobryum*, as given in the Synopsis, to the genus *Bazzania*.

<sup>1</sup> Spec. Hepat. *Mastigobryum* 7. pl. 1, f. 1-4. 1851.

<sup>2</sup> In. Gray, Man. Bot. Ed. 2, 702. 1856.

<sup>3</sup> Hep. Bor.-Amer. 80. 1873.

<sup>4</sup> In Delamare, Renauld & Cardot, Fl. Miquelonensis 66. 1888.

<sup>5</sup> List Canadian Hepat. 9. 1890.

<sup>6</sup> Cat. Canadian Pl. 7: 33. 1902.



In its variability *B. denudata* is a close rival of *B. tricrenata*. It is perhaps advisable, therefore, to base our conception of the species on vigorous specimens, since these may be assumed to approach the typical condition more closely than delicate and poorly developed specimens. Even in well-developed material the plants grow in depressed mats, the individual stems being prostrate or slightly ascending but apparently never approaching a suberect position. The younger portions and sometimes the entire plants are green or yellowish green and do not show the brownish pigmentation of the cell-walls, which constitutes so striking a feature of *B. tricrenata*. In the older portions a dull brownish hue occasionally becomes apparent, but this seems to be associated with age and death rather than with an active process of pigmentation.

The stems, so far as the living portions are concerned, are mostly 1-1.5 cm. long and measure (with the leaves) 1-2 mm. in width. At irregular intervals branches of the *Frullania* type, diverging at a wide angle, are produced; while flagelliform branches, arising in the axils of the underleaves, are rare or abundant according to circumstances. Occasionally a flagelliform branch gradually becomes transformed into a leafy branch as it increases in length, and a leafy branch may sometimes spring directly from the axil of an underleaf, showing that the distinction between leafy and flagelliform branches is by no means stable. Rhizoids are sparingly produced; in most cases they grow out from the basal cells of the reduced leaves on the flagelliform branches, but in very rare cases may take their origin from the basal cells of ordinary underleaves.

The leaves are distant to somewhat imbricate. They spread widely, usually at a right angle, and lie in approximately the same plane. In most cases the leaves are flat but they are sometimes more or less convex when viewed from above. They vary in form from short-ovate to oblong-ovate, measuring in most cases 0.6-0.8 mm. in length by 0.4-0.6 mm. in width, and are slightly or not at all falcate. The upper margin is more or less arched from a scarcely rounded base, while the lower margin tends to be more nearly straight, in rare cases showing a vague basal expansion. The apices are so variable that it is difficult to determine what represents the most typical condition. In some cases the leaf tapers gradually to an acute or obtuse point, but it is much more usual for the apex to be broad and rounded or truncate. Under these circumstances there



may be no signs of apical teeth, and a long series of intermediate conditions may sometimes be found, even on a single individual, between this extreme and a three-toothed apex with sharp teeth separated by obtuse sinuses. The three-toothed condition, however, is rarely realized, most plants showing only one or two teeth, and these may be blunt or otherwise indistinct rather than acute. The leaf-cells average about  $27 \times 25 \mu$  in the middle of the leaf; their walls are thin, and their trigones are small and often indistinct, usually with straight or slightly concave sides. The cuticle seems to be smooth throughout.

The underleaves are almost as variable as the leaves. They are distant to approximate and may be slightly imbricate in the vicinity of the shoot-apices. Sometimes they are subappressed, but it is much more usual for them to spread more or less widely from the axis. On well-developed plants they usually measure 0.2–0.3 in length and 0.3–0.45 mm. in width, the shape being broadly quadrato-orbicular. The base is almost straight and shows no indications of auricles; while the straight or slightly bulging sides are usually entire, although vague crenations or sharper teeth may be present in rare instances. The broad and truncate apex may show four rounded or obtuse teeth separated by distinct sinuses. In most cases, however, the teeth are fewer or lacking altogether, the apex then being entire or slightly emarginate.

Although the perianths of *B. denudata* are still unknown, female branches with unfertilized archegonia are not infrequent. Branches of this character were detected by Gottsche, who described the involucreal leaves as ovate-cordate and crenulate at the apex with one or two teeth. Unfortunately the bracts and bracteoles of *B. tricrenata* and its allies do not attain their full size and development unless perianths and sporophytes are produced, so that Gottsche's account must not be accepted without reservations.

The most striking features of *B. denudata* are due to the production of caducous leaves and underleaves, and it is very unusual to find a patch of specimens in which this habit is not more or less in evidence. The throwing off of the leaves begins abruptly in most cases and then continues without interruption for a considerable period. Although in all probability the production of these leaves eventually brings the growth of the plant to an end, it is not unusual for an axis to fork two or three times after the caducous habit has been initiated.



Under such circumstances the forking and thread-like stems, tipped with rudimentary leaves but otherwise naked, except for the scanty vestiges left behind by the leaves and underleaves, present a very distinctive appearance. The caducous habit is sometimes more marked in the leaves than in the underleaves, and leafless stems with persistent underleaves are occasionally found. There are cases, too, where an axis recovers from the caducous habit and resumes its growth in a normal vegetative manner.

The caducous leaves are usually smaller than the ordinary leaves described above and may be reduced to a length of 0.2 mm. or even less, the caducous underleaves exhibiting a similar reduction in size. When a caducous leaf gives rise to a new stem the latter grows out directly, by a process of regeneration, from one of the leaf-cells, usually at or near the base. The stem elongates rapidly and produces a long series of minute leaves and underleaves, very similar to those on the flagelliform branches but somewhat firmer in texture and tending to spread more widely. Both leaves and underleaves are shortly bifid and essentially alike, the stem thus representing an almost radial structure and showing but little indication of the distinct dorsiventrality found in the normal leafy stems. The later stages in the development of these new stems have not been observed.

When typical plants of *B. tricrenata* and *B. denudata* are compared the differences between them are striking and have been brought out to a certain extent in the preceding account. In *B. tricrenata*, for example, the plants are more or less pigmented with brown, the stems tend to be suberect, the branches diverge at a narrow angle, and the persistent leaves are strongly convex; in *B. denudata*, on the contrary, the plants show no distinct brown pigmentation, the stems tend to be prostrate, the branches diverge at a wide angle, and the leaves are flat or only slightly convex and often caducous. When *B. denudata* is compared with "*Pleuroschisma tricrenatum* var. *implexum*" a closer approach is apparent, but in this latter plant the pigmentation is still present in a greater or less degree, the caducous habit is less marked and the caducous leaves themselves are less highly differentiated. It will be noted that "*Mastigobryum ambiguum* (in part)" is cited as one of the synonyms of *B. tricrenata*. This species was based on two specimens, as follows: "prov. Massachusetts (Asa Gray)" and "ad litora boreali-occidentalia (Hb. Hk.)." The first specimen has not been seen by the writer but there is little



doubt of its identity with *B. denudata*; the second specimen (according to a fragment in the Mitten Herbarium) represents a closely allied but apparently distinct species, widely distributed in the Pacific coast region from Alaska to Washington. This species, for which the specific name *ambiguum* may be retained, will be considered in another connection.

4. SCAPANIA NEMOROSA (L.) Dumort. Recueil d'Obs. sur les Jung. 14. 1835. *Jungermannia nemorosa* L. Sp. Plant. 1132. 1753. *Scapania nemorosa* is one of the commonest and most widely distributed of the leafy Hepaticae in Europe and North America. It is abundant in all the New England States, its range extending from the sea level to an altitude of five thousand feet or more. Although it attains its best development on moist rocks, it grows also on drier rocks, on banks in the woods, in swamps, and even on old logs; and it is not surprising that it occurs in numerous forms. Some of these are very different in appearance from one another, and yet it is difficult to distinguish them clearly on account of the existence of intermediate and intergrading forms. Within recent years, however, the attempt has been made to segregate out certain forms as distinct species. Of these segregates the following three occur in New England, and their claims for recognition may therefore be briefly considered: *S. Joergensenii* Schiffn., *S. Austinii* Warnst., and *S. recurvifolia* Warnst.

The first of these segregates, *S. Joergensenii*,<sup>1</sup> was based on material collected by the Norwegian botanist, E. Jörgensen, in the Blaamanden Mountains, near Bergen, Norway, at an altitude of 450–500 m. When Müller<sup>2</sup> published his monograph of the genus *Scapania* he gave a full description of *S. Joergensenii*, with illustrations, still citing the original material only and emphasizing the close relationship of the plant to *S. nemorosa*. He has since reduced it to varietal rank under *S. nemorosa* and has listed additional specimens from Alsace, Baden, Bohemia, the Fichtel and Harz Mountains of Germany, and the Thuringian Forest.<sup>3</sup> He has noted its occurrence also in North America, without citing definite stations, but the writer is able to supply the following from the specimens in the Yale Herbarium: Mt. Clinton, Mt. Pleasant and Tuckerman's Ravine, White Moun-

<sup>1</sup> See Müller, Bull. Herb. Boiss. II. 1: 607. 1901.

<sup>2</sup> Nova Acta Acad. Caes. Leop. Carol. 83: 180. pl. 23. 1905.

<sup>3</sup> Rabenhorst's Kryptogamen-Flora 6<sup>2</sup>: 503. 1915.



tains, New Hampshire, *A. W. E.*; Crawford Bridle Path, White Mountains, *G. E. Nichols*. These stations are all near or above the timber line. As Müller points out the deep purple color is the only important feature distinguishing *S. Joergensenii* from *S. nemorosa*, and this feature by itself seems insufficient to justify a specific separation,

The second segregate, *S. Austinii*,<sup>1</sup> was based on No. 18 of Austin's Hep. Bor.-Amer., distributed as "*Scapania nemorosa*, var. 3" and described as very common "in shady places, on rocks and on the ground," no definite localities being cited. This specimen is referred to *S. nemorosa* without question by Müller, but Warnstorf criticises him for doing so and compares his *S. Austinii* with *S. curta* (Mart.) Dumort., rather than with *S. nemorosa*. The plant under consideration is frequent in southern New England, where it grows on shaded banks in woods, and at first sight looks very different from the typical form of *S. nemorosa* on moist rocks. It is characterized, according to its author, by its smaller size, by the small number of teeth on the leaf-lobes, and by the absence of wings on the keels. In the writer's opinion these features are associated with unfavorable environmental conditions and *S. Austinii* represents a juvenile condition of *S. nemorosa*, in which certain peculiarities of the species fail to manifest themselves. It may be added that inconspicuous keels are occasionally present and that the gemmae, which are abundantly produced, are yellow, pyriform or elliptical, and unicellular, thus agreeing with those of *S. nemorosa* rather than with those of *S. curta*. Warnstorf's species, therefore, should be regarded as a synonym of *S. nemorosa* or perhaps as a variety.

The third segregate, *S. recurvifolia*,<sup>2</sup> was based on another specimen distributed by Austin in his Hep.-Bor.-Amer. This specimen is No. 16 and was designated "*Scapania nemorosa* var. 1." It was described as common on the "margins of rivulets, swamps, &c.," and was likewise referred to *S. nemorosa* without question by Müller. Warnstorf admits the close relationship of his species to *S. nemorosa* but emphasizes, as differential characters, its recurved and entire dorsal leaf-lobes and its thin-walled leaf-cells with poorly developed trigones. Here again the distinctive features, even if they were constant, are very slight and appear to be associated in some way

<sup>1</sup> Hedwigia 63: 79. 1921.

<sup>2</sup> Hedwigia 63: 115. 1921.



with the environment. The writer, therefore, would regard *S. recurvifolia* as nothing more than a simple synonym of *S. nemorosa*. This conclusion is supported by the fact that the ventral leaf-lobes, as brought out by the description, are densely dentate and by the further fact that the gemmae are unicellular and conform closely to the *S. nemorosa* type.

In the same paper where Warnstorff described the last two segregates he reported the occurrence of the arctic *S. spitzbergensis* (Lindb.) K. Müll. in Connecticut, basing his record on a specimen collected by the writer at Branford. He intimated also that Müller's *S. nemorosa* forma *purpureolimbat*,<sup>1</sup> based primarily on a specimen collected by T. P. James at the Flume, New Hampshire, might be referable to the same species. The writer has examined these two specimens with care and finds that they lack the strongly convex dorsal lobes of *S. spitzbergensis* and also the coarsely toothed wings on the keels of the leaves; the keels in fact are almost invariably quite entire. There seems to be no reason, therefore, for separating these specimens from *S. nemorosa*, although they represent an unusually well-developed form. The only known American station for the true *S. spitzbergensis* is in Greenland.<sup>2</sup>

5. *LEJEUNEA PATENS* Lindb. Acta Soc. Sci. Fenn. **10**: 482. 1875. On trees and wet rocks. Pemetic Mountain trail, 600 ft. alt., Green Mountain Gorge, 800 ft. alt., and Southwest Harbor, 90 ft. alt., Mt. Desert. Maine, July, 1921, A. Lorenz. New to New England. In 1902 the writer<sup>3</sup> reported *L. patens* for the first time from North America, citing specimens from Newfoundland and Nova Scotia. It has since been collected in the mountains of North Carolina by Andrews.<sup>4</sup> In Europe it is one of the so-called "Atlantic" species, its known range extending along the coast from Norway to Ireland. It is closely related to *L. cavifolia* (Ehrh.) Lindb., so closely in fact that Müller and others regard it as a "small" species. At the same time it can usually be distinguished without difficulty. It differs, for example, in its paler color; in its more convex leaf-blades, spreading more abruptly from the lobules; in its smaller and more nearly orbicular underleaves; and in the crenulate margins of its leaf-lobes and underleaves.

<sup>1</sup> Rabenborst's Kryptogamen-Flora **6**: 504. 1915.

<sup>2</sup> See Evans, Bryologist **14**: 87. 1911.

<sup>3</sup> Mem. Torrey Club **8**: 160. 1902.

<sup>4</sup> See Bryologist **24**: 53. 1922.



The following additions to local state floras, not already mentioned in the preceding Notes, may be recorded:—

For Maine: *Riccia arvensis*, Belfast (*A. Lorenz*).

For Vermont: *Jungermannia cordifolia*, Hartland (*A. Lorenz*); *Scapania dentata*, Manchester (*W. R. Taylor*); *S. glaucocephala*, Pawlet (*W. R. Taylor*).

For Rhode Island: *Cephaloziella Hampeana* and *Lophozia Mildeana*, Westerly (*A. Lorenz*).

The census of New England Hepaticae now stands as follows: total number of species recorded, 196; number recorded from Maine, 151; from New Hampshire, 154, from Vermont, 137; from Massachusetts, 121; from Rhode Island, 81; from Connecticut, 146; from all six states, 66.

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## THE NORTHERN VARIETY OF *GEUM VIRGINIANUM*.

M. L. FERNALD.

IN 1774 Johan Andreas Murray separated from *Geum virginianum* L. a Canadian plant which he described as *G. laciniatum*,<sup>1</sup> distinguishing it by its more lacinate basal leaves, more incised and smaller stipules and strictly glabrous fruits, the more southern *G. virginianum* having the fruits pilose (setose). The foliage- and stipule-characters emphasized by Murray seem to be of no special importance, but it is significant that the great bulk of northern plants of *G. virginianum* have quite glabrous carpels, while all the southern specimens have them bristly. This is clearly shown in the occurrence in New England and adjacent areas; all the specimens from northern, eastern and central Maine and northern New Hampshire have glabrous fruits, although this smooth-fruited plant extends very locally southward into the range of the bristly-fruited plant in eastern and extreme western Massachusetts. All material examined from the Mohawk Valley and from western New York and Ontario likewise has glabrous fruits.

On the other hand, all the more southern material seen, from Missouri, Illinois, Pennsylvania and Connecticut and nearly all from Massachusetts, southern New Hampshire and southwestern Maine,

<sup>1</sup> J. A. Murr. Comm. Novi. Gott. v. 30, t. 2 (1774).





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