BRYOPHYTES OF THE FLUME, FRANCONIA NOTCH STATE PARK, N.H.

JANICE M. GLIME

The Flume at Franconia Notch State Park is a welcome retreat for visitors who seek relief from the heat of the summer. Its steep walls and constant splash of mountain water plummeting over the waterfall at its summit provide a form of natural air conditioning sufficient to convince anyone that the heat of summer is far away. On these walls, one would expect bryophytes which are adapted to a cool, northern climate.

In 1908 the Sullivant Moss Society collected liverworts throughout the Franconia Mountains and reported on the liverworts of the Flume (Lorenz, 1908). There is no report of Flume mosses.

Our objectives were to establish a checklist for the mosses, to compare the liverworts to the 1908 study, and to determine if the cool, moist atmosphere of the Flume truly was inhabited by bryophytes with a northern distribution.

The Flume is about 210 m long, 3–5 m wide, and 18 m deep (Lorenz, 1908). The walls are of coarse granite and their faces, ledges, and crevices are constantly wet from the splash of the Flume Brook cascade. These walls are well-covered with a variety of bryophytes, and vegetation on ledges and in cracks is quite lush.

Three of us sampled extensively for two days to be certain that we had a representative of each species.

The Flume is a very good place to study northern bryophytes adapted to wet or moist rocks. Its flora is well developed and the species occurring there are predictable. All of the species we found are typical of the northern Coniferous Forest Zone (Howard, 1975; Schuster, 1953; Steere, 1978), though their ranges frequently extend farther north and south.

Several microhabitats can be identified, and the bryophytes which occupy them differ. We identified 34 species of mosses and 14 species of liverworts within the Flume. Table 1 separates these by vertical walls, cracks and crevices, and horizontal or sloping ledges.

All the liverworts but *Bazzania denudata* had been found in the Franconia Mountains by The Sullivant Moss Society in 1908 (Lorenz, 1908). Since most were common species, Lorenz did not cite the Flume specifically. Our only certain additions to the 1908

Table 1. **Presence of bryophytes on vertical walls, cracks and crevices, and ledges and bases within the Flume, Franconia Notch State Park, N.H.**

	Wall	*Crack*	*Ledge*
Andreaea rupestris Hedw.	———		
Fissidens osmundioides Hedw.	———		
Grimmia alpicola Hedw. var. *rivularis* (Brid.)Wahl.	———		
Grimmia apocarpa Hedw. var. *conferta* (Funck)Spreng.	———		
Isopterygiopsis muelleriana (Schimp.)Iwats.	———		
Isopterygium elegans (Brid.)Lindb.	———		
Mnium marginatum (With.)Brid. ex P.-Beauv.	———		
Plagiothecium denticulatum (Hedw.)B.S.G.	———		
Sematophyllum demissum (Wils.) Mitt.	———		
Anastrophyllum minutum (Cr.)Schuster	———		
Bazzania denudata (Torrey ex Gott. et al.)Trev.	———		
Bazzania tricrenata (Wahlenb.)Lindb.	———		
Blepharostoma trichophyllum (L.)Dumort.	———		
Marsupella emarginata (Ehr.)Dumort.	———		
Mylia anomala (Hook.)Gray	———		
Plagiochila asplenioides (L.)Dumort.	———		
Ptilidium pulcherrimum (Web.)Hampe	———		
Tritomaria exsecta(Schmid.)Schiffn.	———		
Bartramia pomiformis Hedw.	———	———	
Dicranella heteromalla (Hedw.)Schimp.	———	———	
Pohlia cruda (Hedw.)Lindb.	———	———	
Brachythecium plumosum (Hedw.)B.S.G.	———	———	———
Herzogiella striatella (Brid.)Iwats.	———	———	———
Hypnum imponens Hedw.	———	———	———
Scapania nemorosa (L.)Dumort.	———	———	———
Paraleucobryum longifolium (Hedw.)Loeske.	———	———	———
Philonotis fontana (Hedw.)Brid.	———	———	———
Amphidium mougeotii (B.S.G.)Schimp.		———	
Isopterygium distichaceum (Mitt.)Jaeg. & Sauerb.		———	
Mnium punctatum Hedw. var. *elatum* Schimp.		———	
Lepidozia reptans (L.)Dumort.		———	
Pogonatum alpinum (Hedw.)Rohl.		———	———
Rhabdoweisia crispata (With.)Lindb.		———	———
Atrichum undulatum (Hedw.)P.-Beauv.			———
Brotherella recurvans (Mx.)Fl.			———
Campylium chrysophyllum (Brid.)J. Lange			———
Dicranum scoparium Hedw.			———
Drepanocladus uncinatus (Hedw.)Warnst.			———
Hylocomium splendens (Hedw.)B.S.G.			———
Hygrohypnum luridum (Hedw.)Jenn.			———
Rhacomitrium aciculare (Hedw.)Brid.			———
Rhacomitrium heterostichum (Hedw.)Brid.			———
Sphagnum recurvum P.-Beauv. var. *tenue* Klinggr.			———

Sphagnum squarrosum Crowe ———
Thuidium delicatulum (Hedw.)B.S.G. ———
Bazzania trilobata (L.)S. Gray ———
Conocephalum conicum (L.)Dumort. ———
Pellia Raddi ———

Flume liverwort list are *Bazzania denudata* and *Mylia anomala.* Of greater interest is the list of liverworts we could no longer locate on the Flume walls: *Preissia quadrata* (Scop.) Nees; *Lejeunea cavifolia* (Ehrh.) Lindb. emend. Buch; *Aneura pinguis* (L.) Dum.; *Plectocolea hyalina* (Lyell) Mitt.; *Jungermannia pumila* With.; *Gymnocolea inflata* (Huds.) Dum.; *Tritomaria quinquedentata* (Huds.) Buch; *Scapania curta* (Mart.) Dum.; and *Scapania apiculata* Spruce.

Of the 17 bryophytes restricted to the vertical walls, 9 were liverworts. These were all leafy and mostly very small species. *Plagiochila asplenioides* stood out as shelves and was therefore the most conspicuous liverwort.

The mosses restricted to the vertical walls were either small cushion or tuft-forming acrocarpous species (5) or small mat-forming pleurocarpous ones (3). The relatively rare *Isopterygiopsis muelleriana* occurred here in long dripping strands. *Herzogiella striatella* was the most common moss, and *Andreaea rupestris* was also abundant. Larger acrocarpous species were invading near crevices or ledges, but these were often atypical, depauperate forms (*Bartramia pomiformis, Paraleucobryum longifolium, Philonotis fontana*).

The crevices had only four species restricted to them, but shared eight species with either vertical walls or ledges. *Amphidium mougeotii* was the most abundant of the restricted species. *Amphidium mougeotii* was the most abundant of the restricted species. *Isopterygium distichaceum* was found only on the ceiling of rock crevices. *Rhabdoweisia crispata* was the dominant crack and ledge species, although *Philonotis fontana* was dominant in the wettest places. *Pogonatum alpinum* formed large clumps where soil accumulated.

The strictly ledge species were all larger species and many of them could be found in the forest as well. *Campylium chrysophyllum* was found only on the floor of a small cave above the falls. *Hygrohypnum luridum* is a rare species and occurred only on the dripping, sloping rock faces. The only two thallose liverworts of the Flume,

Conocephalum conicum and *Pellia* sp., occurred at the base of the Flume wall.

The Flume Brook had *Rhacomitrium aciculare* on emergent rocks and *Scapania nemorosa* on bedrock near the edge. *Philonotis fontana* was abundant on wet rocks.

The species present, as expected, have northern distributions and high moisture requirements. Their abundance on the Flume walls provides a good lesson in bare rock succession.

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DEPARTMENT OF BIOLOGICAL SCIENCES
MICHIGAN TECHNOLOGICAL UNIVERSITY
HOUGHTON, MI 49931