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LIVERWORTS AND HORNWORTS OF GARDEN OF THE GODS, SHAWNEE NATIONAL FOREST, SALINE COUNTY, ILLINOIS

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ABSTRACT

Exposed rock outcrops with hill prairie vegetation, moist vertical sandstone canyon walls, mesic woodlands and shaded stream banks within Garden of the Gods provide microhabitats for 38 liverwort and two hornwort taxa. This flora comprises species common to the Interior Highlands, including well established populations of *Nowellia curvifolia* (Dicks.) Mitt. and *Trichocolea tomentella* (Ehrh.) Dum. Thirty-two taxa are reported for the first time from Saline County, and *Lophozia bierenata* (Schmid. ex Hoffm.) Dum., an often abundant species in disturbed lands of eastern North America, is reported for the first time from Illinois. A previous report of *Jungermannia hyalina* Lyell from this region could not be verified.

INTRODUCTION

The exposed rock outcrops for which Garden of the Gods, a widely visited scenic area of the Shawnee National Forest, is famous are comprised of Pounds Sandstone of Pennsylvanian strata. Strangely contorted, circular rock formations with various shapes and patterns result from differential weathering of the uniquely intermixed resistant iron oxide bands and sandstone layers of this deposition. In addition to a bold, often rugged relief, the natural beauty of this small region in the unglaciated region of the Shawnee Hills is enhanced by moist ravines and a gradient of mesic to xeric woodlands. Such topographic and macroflora variability

provide microenvironments that support an equally well established hepatic/anthocerote flora that is both abundant and floristically diverse.

Located in the southeast corner of Saline County, Garden of the Gods has a continental climate typical of Southern Illinois. Low pressure fronts which bring about frequent, often rapid changes in humidity, temperature, solar radiation and wind direction are characteristic of the region, and annual precipitation averages 41″. As in other canyons of the area this type of regime supports the establishment of a mixture of southern Appalachian, temperate and boreal species of both vascular and nonvascular plants.

Previous reports of liverwort or hornwort taxa from Garden of the Gods and Saline County are few. Seven liverwort species were recorded by Hague and Drexler (1938) from Stillhouse Hollow in Saline County, including the relatively rare *Scapania undulata* (L.) Dum., a species likewise collected in this study. Skorepa (1968) listed six common Illinois species from Garden of the Gods in his general treatment of liverworts of Southern Illinois.

This investigation was then undertaken to examine the diversity of liverworts and hornworts in this floristically rich yet relatively unexplored area. Specimens were collected on numerous sampling trips over the course of three years. Previous collections made by Redfearn, Skorepa, Zehr and Skorepa and Sharp were examined and annotated where appropriate. All collections are deposited in the herbarium of Southern Illinois University [SIU].

RESULTS AND DISCUSSION

Thirty-eight liverwort and two hornwort taxa were found in the Garden of the Gods. Of these, one species *Lophozia bicrenata* (Schmid. ex Hoffm.) Dum. is new to the Illinois flora. In fact, this is the first report of this genus in the State. Several essentially "northern" species, such as *Nowellia curvifolia* (Dicks.) Mitt. and *Trichocolea tomentella* (Ehrh.) Dum., occur abundantly on decorticate logs and shaded creek banks, respectively. Exposed sandstone outcrops provide suitable habitats for typically Appalachian species like *Frullania tamarisci* (L.) Dum. subsp. *asagrayana* (Mont.) Hatt., while moist, vertical sandstone canyon walls support a mix of taxa common to southern Illinois, including circumboreal to montane elements like *Bazzania tricrenata* (Wahlenb.) Lindb. and *Marsupella sphacelata* (Gieske) Dum., low elevation Appalachian species like *Jungermannia fossombronioides* Aust., *Lophocolea bidentata* (L.) Dum. and *Leucolejeunea clypeata* (Schwein.) Evans, as well as ubiquitous forms like *Jamesoniella autumnalis* (DC.) Steph., *Pellia epiphylla* (L.) Corda and *Plagiochila porelloides* (Torrey ex Nees) Lindb. Markedly southern affinities are further suggested within the morphotypes of *Lophocolea heterophylla* (Schrad.) Dum. and *Cephalozia catenulata* (Hüb.) Lindb. In the former, one well developed population produces abundant gemmae in chain-like filaments, a trait which Schuster (1980) has segregated in *L. heterophylla* subsp. *cladogyna* Schust., a taxon "known only from the southeastern Coastal Plain" (Schuster, 1980). Unlike members of this subspecies, however, the Garden of the Gods population does not possess abbreviated female branches, and thus appears intermediate between *L. heterophylla* subsp. *heterophylla* and *L. heterophylla* subsp. *cladogyna*. Intermediacy likewise exists in *C. catenulata* populations, which are vegetatively of typical form but reproductively possess the long, leafy gynoecial axes of the southern Appalachian genotype, *C. catenulata*

fo. *grandiretis*. Examination of specimens upon which earlier reports were based showed that *Plectocolea hyalina* (Lyell) Mitt. (= *Jungermannia hyalina* Lyell) reported by Skorepa (1968) was a misidentified *Jungermannia gracillima* Sm.

Of the 40 taxa included in the checklist that follows, 32 indicated by *, are being reported for the first time from Saline County and one, designated by **, is being reported for the first time from Illinois. The nomenclature used in the list is that of the most recent checklist of American hepatics and anthocerotes (Stotler & Crandall-Stotler, 1977).

Checklist of Taxa in Garden of the Gods, Shawnee National Forest, Arranged Alphabetically

Division Anthocerotophyta (hornworts)

* 1. *Anthoceros punctatus* L. — Occasional on moist soil in lowland areas or along creek banks, localized populations mixed with *Phaeoceros laevis*: *Renzaglia 160, 416*.

2. *Phaeoceros laevis* (L.) Prosk. — Common on soil in moist lowland and creek banks, intermixed with *Anthoceros punctatus; Renzaglia 161, 414*.

Division Hepatophyta (liverworts)

* 3. *Asterella tenella* (L.) Beauv. — Occasional on soil along trail or mixed with hornworts along banks of creek; *Renzaglia 162, 170; Crandall-Stotler 2001*.

* 4. *Bazzania tricrenata* (Wahlenb.) Lindb. — Rare on vertical shaded sandstone, mixed with *Odontoschisma prostratum* and *Scapania nemorea; Skorepa 4835*.

* 5. *Calypogeja muelleriana* (Schiffn.) K. Müll. subsp. *muelleriana* — Abundant in a variety of habitats such as soil along trails and shaded sandstone cliffs; *Renzaglia 407 p.p.; Redfearn 20432; Skorepa s.n.*

* 6. *Cephalozia catenulata* (Hüb.) Lindb. — Common on moist decorticate logs in lowland woods. These populations are intermediate between the common variety and the southern Appalachian form *C. catenulata* fo. *grandiretis*; i.e., the vegetative plants are as in typical *C. catenulata* but the female branches are elongate as in *C. catenulata* fo. *grandiretis; Renzaglia 183, 205*.

* 7. *Cephaloziella divaricata* (Sm.) Schiffn. var. *divaricata* — Occasional on exposed soil along upland path, intermixed with *Lophozia bicrenata; Renzaglia 206, 417 p.p.*

* 8. *Cololejeunea biddlecomiae* (Aust.) Evans — Common on rocks and decaying logs in creek beds: *Renzaglia 180, 185 p.p., 191, 195, 406*.

* 9. *Conocephalum conicum* (L.) Lindb. — Occasional on soil along creek beds in ravine; *Renzaglia 193*.

*10. *Diplophyllum apiculatum* (Evans) Steph. — Abundant along vertical sandstone cliffs in lowland areas., intermixed with *Odontoschisma prostratum, Scapania nemorea* and *Jubula pennsylvanica; Renzaglia 175, 413; Redfearn 20453; Skorepa s.n.*

*11. *Fossombronia* (Raddi) *c.f. foveolata* — Common on exposed soil along trails in upland areas, sometimes intermixed with *Calypogeja muelleriana* or *Asterella tenella; Crandall-Stotler 2002, 2003*.

*12. *Frullania eboracensis* Gott. — Abundant on tree bark and decaying logs; *Renzaglia 171, 172, 185 p.p., 186, 403, 410.*

*13. *Frullania inflata* Gott. — Common on *Juniperus* in xeric upland woods; *Renzaglia 190, 402, 418; Crandall-Stotler 2003.*

*14. *Frullania riparia* Hampe ex Lehm. — Rare, only one population found, growing on base of *Fraxinus; Skorepa* & *Sharp 3762.*

15. *Frullania tamarisci* (L.) Dum. subsp. *asagrayana* (Mont.) Hatt. — Occasional on vertical sandstone in dry upland woods and on exposed rock outcrops; *Renzaglia 203; Skorepa* & *Sharp 3776.*

*16. *Jamesoniella autumnalis* (DC.) Steph. — Abundant on moist rocks and decaying logs; *Renzaglia 201, 202.*

17. *Jubula pennsylvanica* (Steph.) Evans — Common on moist vertical sandstone cliffs and rocks in creeks; *Renzaglia 177, 184, 196, 400, 407; Skorepa 4032.*

*18. *Jungermannia crenuliformis* Aust. — Common on rocks in stream and on moist sandstone bluffs; *Renzaglia 400, 405; Crandall-Stotler 2005; Skorepa 4033.*

*19. *Jungermannia fossombronioides* Aust. — Occasional on moist sandstone bluff and on wet rocks along creeks; *Renzaglia 189, 415.*

*20. *Jungermannia gracillima* Sm. — Occasional on exposed soil along upland trails; *Renzaglia 174; Crandall-Stotler 2006, 2007; Skorepa 4033.*

*21. *Leucolejeunea clypeata* (Schwein.) Evans — Common on vertical sandstone; *Redfearn 20427.*

*22. *Lophocolea bidentata* (L.) Dum. — Locally abundant on rocks in creeks, associated with *Jubula pennsylvanica; Crandall-Stotler 2007; Renzaglia 187.*

23. *Lophocolea heterophylla* (Schrad.) Dum. — Common in a variety of habitats including rocks and decaying logs. One population, represented by *Renzaglia 182*, shows characters that are intermediate between *L. heterophylla* subsp. *heterophylla* and the southern Coastal Plains genotype, *L. heterophylla* subsp. *cladogyna*, in being paroicous and possessing typical, terminal gynoecia of the former but numerous single-celled gemmae of the latter. This combination of characters further illustrates the north-south mixture of the flora; *Renzaglia 181, 182, 185 p.p., 191 p.p.; Crandall-Stotler 2008; Skorepa* & *Sharp 3774.*

*24. *Lophocolea minor* Nees — Rare, one population encountered on moist, shaded vertical sandstone in canyon. This gemmiparous species differs from the gemma-producing population of *L. heterophylla* in being dioicous and much smaller, with the gemmae produced in globose masses along the consequently eroded leaf margins; *Crandall-Stotler 2010.*

**25. *Lophozia bicrenata* (Schmid. ex Hoffm.) Dum. — Rare, one large population on exposed soil along trail in the upland area; although this species has "weedy" propensities, it has not been previously reported in Illinois nor has it been collected at similar sites in Southern Illinois; *Renzaglia 172, 412, 417.*

26. *Marsupella sphacelata* (Gieske) Dum. — Occasional on vertical, shaded sandstone; *Sharp* & *Skorepa 3767* as *M. sullivantii* (De Not.) Evans (= *M. sphacelata*).

*27. *Metzgeria conjugata* Lindb. — Occasional, large populations in seepage areas of vertical sandstone cliffs; *Renzaglia 198.*

*28. *Metzgeria furcata* (L.) Dum. — Rare in moist, shaded areas on vertical sandstone; *Renzaglia 171, 196 p.p.*

*29. *Nowellia curvifolia* (Dicks.) Mitt. — Occasional, large populations on decorticate logs in shaded lowland forest; *Renzaglia 178.*

*30. *Odontoschisma prostratum* (Sw.) Trev. — Abundant on vertical sandstone in lowland forests; *Renzaglia 176; Redfearn 20425; Skorepa 4835 p.p.*

*31. *Pellia epiphylla* (L.) Corda — Common on moist sandstone and soil in ravine areas; *Renzaglia 194, 197, 407 p.p.; Skorepa s.n.*

*32. *Plagiochila porelloides* (Torrey ex Nees) Lindenb. — Abundant on rocks in creek beds and on vertical sandstone; *Renzaglia 173, 196 p.p., 407 p.p., 408 p.p.; Redfearn 20424.*

33. *Porella pinnata* L. — Occasional on rocks along creeks and seepage areas of sandstone outcrops, associated with *Frullania eboracensis* and *Cololejeunea biddlecomiae; Renzaglia 179, 204.*

*34. *Porella platyphylloidea* (Schwein.) Lindb. — Common on decorticate logs and bark of trees, associated with *Cololejeunea biddlecomiae, Lophocolea heterophylla* and *Frullania eboracensis; Renzaglia 185, 401, 402, 404.*

*35. *Radula obconica* Sull. — Occasional on rocks in creek beds; *Renzaglia 173 p.p., 205; Redfearn 20427 p.p.; Skorepa 4034.*

*36. *Riccia dictyospora* M.A. Howe — Rare in small pools of water on bluff tops; *Renzaglia 200.*

*37. *Riccia hirta* (Aust.) Underw. — Rare on bluff tops; *Renzaglia 188.*

38. *Scapania nemorea* (L.) Grolle — Common in numerous habitats including soil and sandstone; *Renzaglia 409; Crandall-Stotler 2015; Redfearn 20473; Skorepa 11018, 40835 p.p.; Zehr s.n.*

39. *Scapania undulata* (L.) Dum. — Abundant in localized areas on rocks in creek, periodically submerged; *Renzaglia 199; Zehr s.n.*

*40. *Trichocolea tomentella* (Ehrh.) Dum. — Abundant on soil along creek bed, localized populations; *Renzaglia 192.*

CONCLUSIONS

The liverwort/hornwort flora of Garden of the Gods, Shawnee National Forest, Saline County, Illinois, is a rich blend of phytogeographically diverse elements of boreal, Appalachian, Costal Plain and eastern deciduous forest affinities. As in other natural sandstone gorges of the Ozark Hills formation, a variable, unglaciated terrain provides the microniches necessary for the maintenance of floristic heterogeneity. With a composition of 40 taxa, 32 newly reported for Saline County, this area is floristically more or less comparable to Ferne Clyffe State Park, Johnson County (Zehr & Stotler, 1980 [1981]), Lusk Creek Canyon Nature Preserve, Pope County (Crandall-Stotler & Stotler, 1978 [1979]), and Little Grand Canyon, Jackson County (Stotler, 1976), and is more polymorphic than Panther's Den, Union County (West & Stotler, 1977). Of most interest is the discovery of *Lophozia bicrenata*, a species not encountered in any of these other gorges and, in fact, not previously reported for the state even though its occurrence in our geographic region is not unexpected.

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