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GENERAL NOTES

Variations in *Sphaerocarpos* (Marchantiopsida) in Arkansas

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Sphaerocarpos texanus Aust. is a very common winter liverwort of disturbed sites in North America, Europe, and occasionally elsewhere in the world. R. M. Schuster (The Hepaticae and Anthocerotae of North America, vol. 5, Field Museum of Natural History, p. 817, 1992) wrote "This is so 'weedy' a plant in disturbed sites that often I have not bothered to collect it." Schuster (op. cit., pp. 811-827) treats three species of *Sphaerocarpos* occurring in North America east of the hundredth meridian, but only *S. texanus* is listed for Arkansas. This species probably occurs in every county of the state, and the field botanist is prone to identify all occurrences of the genus in the state as belonging to that species.

During field studies undertaken in the winter of 1998-99, Golden noticed differences among clumps of *Sphaerocarpos* in the same community and began collecting material for examination in the laboratory. Some of the collections clearly matched Schuster's descriptions (op. cit.) of *S. michelii* Bellardi and *S. donnellii* Aust. Both of these species occur sympatrically with *S. texanus* in other areas. *S. michelii* is widespread in Europe and has been reported from Texas and Kansas. On both continents it usually occurs with *S. texanus*. *S. donnellii* is known from the Gulf Coastal Plain of the southeastern United States from South Carolina to Florida and Mississippi. In his 1992 publication Schuster noted that the species is "probably more widely spread than existing reports would indicate."

The three species may be distinguished to some extent by differences in the female involucre, but critical separation of the taxa requires microscopic examination of the spores. Spores differ in size and ornamentation. *S. donnellii* has relatively large spores (tetrads ca. 140-185 μm in diameter) and is coarsely areolate (6-7 areolae across the tetrad face). There is a tendency for some of the female involucre to have flared mouths, especially those not fertilized. Mature female involucre are often purplish tinged. Although Schuster states that the other two species never have purplish or reddish pigment in the female involucre, we observed such pigmentation in these species quite often in unshaded plants. The purplish color of the female involucre is more subtle than in the deep purplish color of the male "flasks." *S. texanus* has spores of intermediate size (tetrads ca. 120-175 μm in diameter), and there are 5-7 distinct areolae across the face. The angles of the areolae are not sharply elevated to give the spiny appearance displayed

by the spores of the other two species. *S. michelii* has the smallest spore (tetrads ca. 80-120 μm in diameter), and there are 8-10 distinct areolae across the face. The angles of the areolae are elevated as sharp spines in profile. Also the tetrads are more distinctly segmented into the component spores than in *S. texanus*.

Three sites were examined for this study. Variation in *Sphaerocarpos* was first noticed on December 5, 1998, in a community on a roadside bank and field across from Sullivan Cemetery near Spring Hill in Hempstead County. Variation in a second community was discovered on January 6, 1999 in a fallow corn field southwest of Boyd Hill in Lafayette County. Populations on the Henderson State University campus were selected for further comparison. Studies were continued through March, 1999.

In the laboratory sporangia were dissected out of the involucre and placed on slides in Frahm's Mounting Medium (1:1:1 mucilage, glycerine, water). This medium proved to be an excellent clearing agent enhancing microscopic examination of spore ornamentation.

Different spore types were found in material from each of the three study sites. The spore types correlated with variation in the morphology of the female involucre. Plants from Spring Hill and the Henderson campus were identified as *S. michelii* and *S. texanus*. The Boyd Hill site had some plants definitely identified as *S. donnellii*, as well as *S. texanus* and *S. michelii*. In all sites, some plants seemed to display intermediate traits. During examination of material from Boyd Hill, Golden discovered capsules from the same gametophyte thallus that had produced different spore types, strongly suggesting the occurrence of hybridization among the species. Subsequently, two different spore types were found in the same clumps from the Henderson site. Schuster (op. cit. p. 820) cited several cases of intergradation that was interpreted as evidence for hybridization between sympatric species. We believe that *S. michelii* is a common associate of *S. texanus* in southwestern Arkansas (and probably other parts of the state) and suspect that *S. donnellii* may also occur widely in the state. It is quite possible that three different hybrids may occur in a manner similar to the three sympatric species of *Lycopodiella* and their three hybrids (Peck et al., Proc. Arkansas Acad. Sci. 41:112-113, 1987).