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Dumortier's Liverwort, *Dumortiera hirsuta* (Sw.) Nees (Hepaticophyta: Marchantiales: Dumortieraceae) in Arkansas

Chris T. McAllister

Eastern Oklahoma St. College, cmcallister@se.edu

Henry W. Robison

Retired, hwrobison@yahoo.com

Paul G. Davison

University of North Alabama, pgdavison@una.edu

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Cover Page Footnote

The Arkansas Game and Fish Commission (AG&F) and USDA, Ouachita National Forest, provided Scientific Collecting Permits to CTM and HWR. CTM thanks B. Crandall-Stotler (Southern Illinois Univ., Carbondale, Illinois) for information on *D. hirsuta*. We also thank B. Serviss (Henderson State Univ.) for providing herbarium records (HEND) of *D. hirsuta*.

Dumortier's Liverwort, *Dumortiera hirsuta* (Sw.) Nees (Hepaticophyta: Marchantiales: Dumortieraceae) in Arkansas

C.T. McAllister^{1,*}, H.W. Robison², and P.G. Davison³

¹Science and Mathematics Division, Eastern Oklahoma State College, Idabel, OK 74745

²9717 Wild Mountain Drive, Sherwood, AR 72120

³Department of Biology, University of North Alabama, Florence, AL 35632

*Correspondence: cmcallister@se.edu

Running Title: *Dumortiera hirsuta* in Arkansas

Dumortier's Liverwort, *Dumortiera hirsuta* (Sw.) Nees is a relatively common thalloid liverwort that is widely distributed in the tropics of both hemispheres and also in the more humid and warmer regions of the temperate zones of India, Nepal, Japan, Brazil, México, Jamaica, North and South America, Europe, British Isles, New Zealand, Hawaii and Africa (O'Hanlon 1934; Nair *et al.* 2005). In the Western Hemisphere, it ranges southward to southcentral México and further south to Argentina; it is also found in some Caribbean islands (Stotler and Crandall-Stotler 1977). The species is found in several states in the USA including: Alabama, Arkansas, Florida, Georgia, Hawaii, Illinois, Kansas, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Oklahoma, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia (CNABH 2019). It is generally found in shaded damp forests, on rocks near watercourses, on submerged rocks, on exposed roots of higher plants, and in semi-evergreen, evergreen and shola forests. *Dumortiera hirsuta* is likely a species complex, comprising several genetically distinct siblings (Bischler-Causse *et al.* 2005; Forrest *et al.* 2011). We follow Piippo and Koponen (2013) in treating *D. hirsuta* as a single species. *Dumortiera hirsuta* is the only species currently recognized in the genus (Stotler and Crandall-Stotler 2017).

Apparently, Branner and Coville (1891) were the first to report *D. hirsuta* in Arkansas when they reported specimens from the vicinity of Salado Creek near Batesville (Independence County). Since then, several have reported this liverwort in the state, including Evans (1919), Wittlake (1950a,b, 1954), Redfearn (1964, 1966, 1968, 1970, 1979), Schuster (1992), and Timme and Redfearn (1997, 2005). Here, we provide a summary of vouchered collections of *D. hirsuta* as well as an interesting new population we discovered in the Ouachitas of the state.

We searched the Consortium of North American

Bryophyte Herbaria (CNABH 2019) for previous records of *D. hirsuta* from Arkansas. In addition, collections from the herbarium at Henderson State University (HEND) were obtained. Field observations and collections were done by the authors in Montgomery County between 1972 and 1979 and again between 2010 and 2019. Vouchers are housed in the plant collections of the University of North Alabama (UNAF). Latitude and longitude (WGS 84) or township, section, and range are reported when known for all samples.

Description (derived from Schuster 1992)

One of the most distinguishing features of the genus is that the thalli are large, dark green, and translucent. Plants occur in large patches of overlapping thalli, individual thalli usually 7.0 to 15 cm long × 1.0 to 1.5 cm wide. Thalli are sparsely dichotomously branched with a broad midrib projecting ventrally, thallus margins hirsute; dorsal surface sometimes with a faint network of pale ridges; ventral scales hyaline, vestigial. Plants in the genus are monoicous, androecial disks and archegonial disks are borne at the thallus apex on short stalks, the female disk eventually elevated by an elongated stalk, stalk with 2 rhizoid furrows; capsule ovate.

Populations of *D. hirsuta* are known from 21 of 75 (28%) counties of the state, including Baxter, Benton, Cleburne, Conway, Crawford, Faulkner, Franklin, Garland, Hot Spring, Independence, Johnson, Madison, Marion, Montgomery, Newton, Pike, Pope, Pulaski, Searcy, Stone, and Van Buren counties (Fig. 1).

It appears this liverwort is mostly restricted to the uplands of the state being concentrated in the Ozarks with numerous other populations in the Ouachitas, particularly Montgomery County (Fig. 1, Appendix). There are no records from the West Gulf Coastal or Mississippi Alluvial plains of the state. Select field notes from collectors list deciduous woods (oak-hickory) with

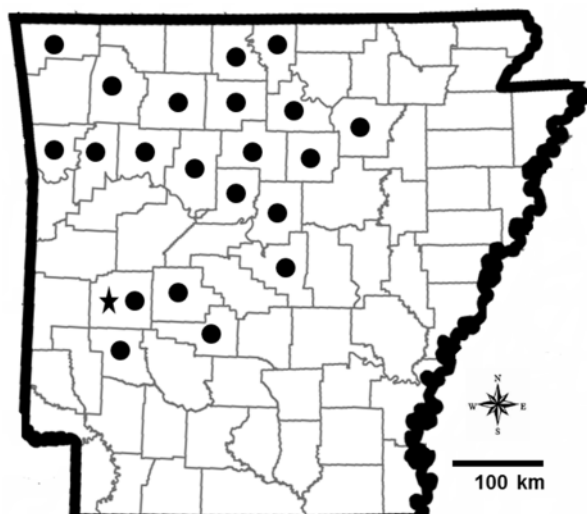


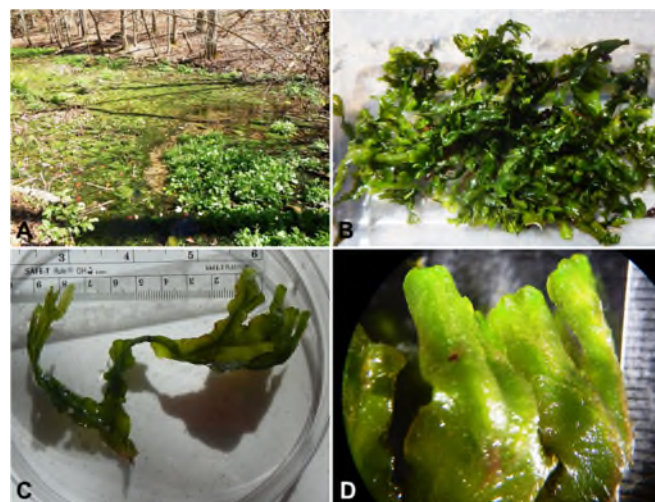
Figure 1. County map of Arkansas showing 21 counties supporting populations of *Dumortiera hirsuta*. Some dots in counties equal more than 1 population (see Appendix). Star = new locale.

shale and sandstone near creek, common on rocks in deep canyons, riparian habitat, seepy hillsides, abundant on shale near seep, near tributaries, slopes near or underside of sandstone ravines, and at various springs.

History of Discovering New Population

An interesting population of *D. hirsuta* was found on 6 Mar. 1972 by one of us (HWR) at Boxx Spring, Montgomery County (Sec. 33, T4S, R26W). Immediately upon arriving at this locale, HWR noticed the abundance of the liverwort and eventually told Dr. Daniel L. Marsh (DLM), late bryologist of Henderson State University (Tumlison and Robison 2010), of the site. However, it was more than 7 yr later on 16 Jun. 1979 that HWR and DLM went to Boxx Spring and observed the liverwort. On that eventful visit, DLM immediately identified the large liverwort as *D. hirsuta*. Later, another one of us (PGD) went to Boxx Spring and noted the population was of particular interest because the plants formed large, buoyant masses of several square meters in the shallow spring (Figs. 2A–D). Sexual reproductive structures were not observed in this population, and we are unaware of any other populations of *Dumortiera* that occur as extensive, buoyant mats in springs.

The study site covers 9.92 ha (24.8 acres) and is a mixture of pines (*Pinus* spp.) and upland hardwood forest including white oak (*Quercus alba*), black oak (*Q. velutina*), and southern red oak (*Q. falcata*) together with mockernut hickory (*Carya tomentosa*) and shagbark hickory (*C. ovata*) in the Ouachita National



Figures 2. *Dumortiera hirsuta*. (A) Boxx Spring study site looking to the northeast showing extensive cover of liverworts. (B) Mass of *D. hirsuta* from spring. (C) Individual thallus of *D. hirsuta* in Petri dish. Note mm scale. (D) Stereoscopic view of *D. hirsuta*. Note mm scale. Photos by CTM on 15 Mar. 2019.

Forest. The surface geology of the area is closely folded ridges and valleys of Ordovician and Silurian novaculite, sandstone and shale (Branner 1937).

A summary of the collection parameters of 53 previous collections of *D. hirsuta* from Arkansas is provided in the Appendix. We expect additional populations of this bryophyte to be discovered in the state, particularly in the western Ouachitas.

Acknowledgments

The Arkansas Game and Fish Commission (AG&F) and USDA, Ouachita National Forest, provided Scientific Collecting Permits to CTM and HWR. CTM thanks B. Crandall-Stotler (Southern Illinois Univ., Carbondale, Illinois) for information on *D. hirsuta*. We also thank B. Serviss (Henderson State Univ.) for providing herbarium records (HEND) of *D. hirsuta*.

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Appendix. County locations of 53 vouchered specimens of *Dumortiera hirsuta* from 21 Arkansas counties (locality, latitude/longitude in decimal degrees or township, section, and range [if known], date of collection, collector name and number, herbarium code. Abbreviations: Paul L. Redfearn, Jr. (= PLR), herbarium codes follow Thiers (2019).

BAXTER COUNTY (N = 1)

- (1) N. Sylamore Creek. 22 May 2001. P. E. Hyatt 10299. UNAF

BENTON COUNTY (N = 2)

- (1) Martins Bluff. May 1948. E.B. Whittlake 89. UARK.
- (2) Above Beaver Reservoir, ca. 12.9 km NE of Springdale (Sec. 12, T18N, R29W). 3 Mar. 1965, PLR 16830. MO.

CLEBURNE COUNTY (N = 1)

- (1) Above Red River at Shirley. Dec 1967; W.L. Graham s.n. MICH

CONWAY COUNTY (N = 1)

- (1) Along small creek leading to Carpet Rock, Petit Jean State Park (Sec. 33, T6N, R18W). 8 Jun. 1965. PLR 17457. MO.

CRAWFORD COUNTY (N = 1)

- (1) Wittlake (1954), no specimen located.

FAULKNER COUNTY (N = 1)

- Boston Mts., UARK From: Timme and Redfearn (1997), (specimen not located)

FRANKLIN COUNTY (N = 3)

- (1) Cass. (35.687581°N, 93.819361°W). 15 Jul. 1938. E.L. Braun s.n. CINC.
- (2) Lower end of Spy Rock Hollow (Sec. 20, T12N, R26W). 14 Jun. 1973. PLR 28663, MO.
- (3) Summit of White Rock Mountain (Sec. 22, T12N, R28W). 24 Apr. 1988. PLR. 34520. MO.

GARLAND COUNTY (N = 6)

- (1) Hot Springs. 15 Feb. 1942. D. Demaree 22718. TENN.
- (2) Hot Springs National Park. 26 Mar. 1942. D. Demaree 22742. TENN.
- (3) Bonanza Springs. Apr. 1949. E.B. Whittlake 390. UARK.
- (4) Ca. 8.0 km NE of Hot Springs, vicinity of Thousand Dripping Springs. 19 Mar. 1965. PLR 17028. MO.
- (5) 4.8 km S of Lake Hamilton along Sorrells Creek W of St. Hwy 7. 2 Jul. 1968. PLR 24339. MO.
- (6) 0.6 km N Charlton Recreation Area, Ouachita National Forest. 4 Jul. 1968. PLR 24520. MO.

HOT SPRING COUNTY (N = 5)

- (1) Magnet Cove. 21 May 1938. D. Demaree 17477. TENN.
- (2) Ca. 6.4 km NE of Bismarck along tributary of Prairie Bayou (Sec. 27, T4S, R20W). 1 Jul. 1968. PLR 24228. MO.
- (3) Tributary of Valley Creek, Needle Eye Mt. (Sec. 26, T4S, R21W). 7 Nov. 1988. T. Bennett s.n.. HEND.
- (4) Trap Mts., W/SW of Needle Eye Mt. "Needle Eye Branch" tributary of Valley Creek (Sec. 26, T8S, R21W). 7 Nov. 1988. B.W. Cowling s.n. HEND.
- (5) Trap Mts., W/SW of Needle Eye Mt. (Sec. 26, T4S, R21W). 7 Nov. 1988. A. McKinnon s.n. HEND.

INDEPENDENCE COUNTY (N = 1)

- (1) Salado Creek. 30 Jul. 1887. F.V. Corville 1. YU.

JOHNSON COUNTY (N = 3)

- (1) Along Ozarks Highlands Trail near Hurricane Creek, Hurricane Creek Wilderness, Ozark National Forest (35.71624°N, 93.22375°W). 6 Jul. 2013. J.C. Brinda 4630 MO.
- (2) Ca. 8.0 km NE of Fort Douglas, tributary to Big Piney River (Sec. 12, R21W, T12N). 19 Feb. 1965. PLR 16697. MO.
- (3) Ca. 0.8 km E of Dillen (Sec. 12, T12N, R21W). 13 Jun. 2013. PLR 19025. MO.

MADISON COUNTY (N = 2)

- (1) 3.7 km SE of St. Hwy 16, at Beech Hurricane Ravine below Muddy Gap on co. rd. 105, Ozark

National Forest(35.8°N, 93.6°W). 9 Jun. 2000. B. Allen 22285. MO.

- (2) 3.7 km SE of St. Hwy 16, at Beech Hurricane Ravine below Muddy Gap on co. rd. 105, Ozark National Forest (35.8°N, 93.6°W). 9 Jun. 2000. W.R. Buck 37347. NY.

MARION COUNTY (N = 1)

- (1) Buffalo Point, Buffalo National River. R.M. Schuster 83-1945. F.

MONTGOMERY COUNTY (N = 10)

- (1) Joplin. Apr. 1949. E.B. Whittlake 455. UARK.
- (2) Joplin. 10 Jan. 1963. D. Demaree 47051. TENN.
- (3) Vicinity of Collier Spring (Sec. 17, T3N, R24W). 20 Mar. 1965. PLR 17242. MO.
- (4) Albert Pike Recreational Area, Little Missouri River (Sec. 27, T4S, R27W). 25 Mar. 1967. PLR 21215. MO.
- (5) Ca. 0.6 km upstream of low water bridge, Little Missouri River, Camp Albert Pike. 16 Apr. 1980. R. Davis 16. MO.
- (6) Albert Pike campground (Sec. 27, T4S, R27W, 34° 22'37"N, 93° 52'48"W). 19 Jun. 1983. M.L. Sargent 3221. ILL.
- (7) On creek, near road FR 517, east end of Sulphur Mt. (Sec 23 T43 R26W), 20 Sept. 1986. T. Sligh s.n. HEND.
- (8) Bluff Mt., FR 517A (S Section 25, N Section 36, TFS R27), 16 Mar. 1997. S. King s.n. HEND.
- (9) Caney Creek Wildlife Management Area, Blocker Creek, N edge, Pryor Mts. (Sec. 27, T4S R27W), 20 Sept. 1986. K. Golden s.n. HEND.
- (10) Boxx Spring off St. Hwy 8 (Sec. 33, T4S, R26W). 9 Jul. 2011. P.G. Davison & H.W. Robison 8130. UNAF.

NEWTON COUNTY (N = 5)

- (1) Mt. Judea (35.921466°N, 93.060174°W). 2 Aug. 1913. W.H. Emig 1013. YU.
- (2) 4.0 km NW of Boxley (Sec. 4, T16N, R23W). 4 Jun. 1968. PLR 23756. MO.
- (3) 1.6 km SE of Ponca, Leatherwood Creek (Sec. 30, T16N, R22W). 2 May 1971. PLR 27389. MO.
- (4) 0.6 km E of jct. St. Hwys 43 and 74 at Ponca, Leatherwood Creek (Sec. 30, T16N, R22W). 2 Feb. 1974. P.A. Thomas 169. MO.
- (5) 0.6 km E of jct. St. Hwys 43 and 74 at Ponca, Leatherwood Creek (Sec. 30, T16N, R22W). 2 Feb. 1974. W.A. Weber 74-168. MO.

Dumortiera hirsuta in Arkansas

POPE COUNTY (N = 1)

- (1) 4.8 km SW of Sandgap, tributary of Indian Creek (Sec. 16, T21N, R12W). 7 Mar. 1968. PLR 21485. MO.

PIKE COUNTY (N = 1)

- (1) Bell Bluff area (Sec. 8, T9S, R24W). 3 Dec. 1988. A. McKinnon s.n. HEND.

PULASKI COUNTY (N = 1)

- (1) Ferndale. Apr. 1950. D.M. Moore 1750. UARK.

SEARCY COUNTY (N = 1)

- (1) 2.4 km of Morning Star, vicinity of Scott's Springs. 24 Jun. 1964. PLR 15237. MO.

STONE COUNTY (N = 7)

- (1) Blanchard Springs Recreation Area, Ozark National Forest (Sec. 5, R11W, T15N). 6 Jul. 1964. PLR 15381, 15541. MO.
- (2) Barkshed Recreation Area (Sec. 15, R12W, T16N). 27 Jun. 1966. PLR 19336. MO.
- (3) 6.4 km N of Allison at Partee Springs (Sec. 26, T16N, R11W). 16 Apr. 1968. PLR 23324. MO.
- (4) Vicinity of Gunner Pool Recreation Area, Ozark National Forest (Sec. 25, T16N, R12W). 7 Mar. 1968. PLR 22816, 22820. MO.
- (5) Blanchard Springs Trail. 5 Apr. 1996. P. Majestyk s.n. HEND.

VAN BUREN COUNTY (N = 1)

- (1) Bluffs S of Shirley. No date. PLR 16865. MO.