

NOTEWORTHY COLLECTIONS

NOTABLE RECORDS OF *HOMALOSORUS PYCNOCARPOS* AND *DRYOPTERIS EXPANSA* FOR THE EASTERN UPPER PENINSULA OF MICHIGAN

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Homalosorus pycnocarpus (Spreng.) Pic. Serm.
Diplaziopsidaceae
Narrow-leaved spleenwort, glade fern

Significance of the Report. The second known record for the eastern Upper Peninsula of Michigan and the third Upper Peninsula record overall; the first since 1965, though there is some ambiguity regarding the location of the 1965 record.

Previous Knowledge. In Michigan, *Homalosorus pycnocarpus* is found in rich, moist deciduous woods, particularly near seeps and small streams and at the base of slopes (MICHIGAN FLORA ONLINE 2011; Palmer 2018). It has a coefficient of conservatism of 10 (Reznicek et al. 2014), indicating a high fidelity to habitat remnants that have remained relatively free of human disturbance since European settlement (Swink and Wilhelm 1994).

This species is known from most states and provinces of eastern North America (NatureServe 2022). According to MICHIGAN FLORA ONLINE (2011), it is known in Michigan from most of the counties in the southern Lower Peninsula, a scattering of counties in the northern Lower Peninsula, and one county in the Upper Peninsula. The Michigan Flora online database contains 69 records of the species. Though not State Threatened, State Endangered, or of Special Concern, this suggests it is relatively uncommon. For comparison, the familiar lady fern (*Athyrium filix-femina*) and spinulose woodfern (*Dryopteris carthusiana*) are represented in the database by 307 and 294 records, respectively. Several of the known localities of *Homalosorus pycnocarpus* are among those most cherished by southern Michigan botanists—Russ Forest, Warren Woods, Sharon

Hollow, Sanford Woodlot, and Brandt Woods—illustrating its affinity for quality habitats.

A search of the Consortium of Midwest Herbaria (2022) database revealed 113 Michigan collections of *Homalosorus pycnocarpus*, including some not found in the MICHIGAN FLORA ONLINE (2011) database. Notably, this includes what would be a Chippewa County record, if verified by the Michigan Flora Project. That collection was made on July 10, 1965 along M-123 along Whitefish Bay north of Paradise (*C. Vander Mark and S. Russell 272*, GVSC). The determination is accurate based on the first author's examination of a digitized image of the herbarium sheet. However, the habitat is noted as "northern white cedar-bog birch seepage" and "Black Creek roadside ditch." This sunny boreal disturbed setting seems inconsistent with the known habitat of *Homalosorus pycnocarpus*: high-quality hardwood forests. Furthermore, the location is listed as "T49N, R6W, Sect. 3 (SE ¼)" and "s. of Paradise," but Section 3 of T49N, R6W is north of Paradise, and it contains not the crossing of M-123 with Black Creek but the crossing of N Whitefish Point Rd. with the Shelldrake River. Though Vander Mark and Russell were active elsewhere in Luce and Mackinac Counties on July 10, 1965, Russell's collection numbers from that day are not sequential: 208–211, 216–217, 261, 272, and 274. Finally, the record within the Consortium of Midwest Herbaria (2022) database is noted as being from Charlevoix County and not, as the herbarium sheet label indicates, Chippewa County. It seems conceivable that some sort of label mixup occurred. Regardless, the present collection was made from Chippewa County, 47 km (29 miles) south-southeast of the reported location of the 1965 collection (i.e., the crossing of M-123 with Black Creek). The other Upper Peninsula record is from Chatham in Alger County in 1900 (MICHIGAN FLORA ONLINE 2011). Suitable habitat does exist near Chatham. No Upper Peninsula observations have been submitted to iNaturalist (2022). The Pteridophyte Collections Consortium (2022) does not list any additional Upper Peninsula collections.

This species has also been known under the following names: *Asplenium pycnocarpon* (Spreng.), *Athyrium pycnocarpon* (Spreng.) Tidestr., *Diplaziopsis pycnocarpa* (Spreng.) M.G.Price, and *Diplazium pycnocarpon* (Spreng.) M.Broun, among others.

Discussion. While apparently rare in northern Michigan, particularly in the Upper Peninsula, *Homalosorus pycnocarpus* was found in great abundance at the present site (Figure 1). Even a conspicuous plant growing in abundance can lurk undiscovered in remote areas.

Though at first it appeared that the first author had found a disjunct county record, examination of the Consortium of Midwest Herbaria database (2022) revealed that this may not be the case. Ambiguities about habitat and specific location notwithstanding, it is possible Vander Mark and Russell collected *Homalosorus pycnocarpus* somewhere in Chippewa County, as suitable habitat can be found in much of the county. For example, Vander Mark and Russell collected at Tahquamenon Falls State Park on the same date recorded on the *Homalosorus* sheet, and rich northern hardwoods exist at that state park.

This case study illustrates the importance of databases other than MICHIGAN FLORA ONLINE (2011), as well as the importance of small herbaria.



FIGURE 1. Narrow-leaved spleenwort (*Homalosorus pycnocarpus*) was robust and abundant in an area of about 1/8 ha in a moist slippery elm–silver maple–sugar maple woods in the Hiawatha National Forest 3 km NE of Ozark, Michigan. Photo by Scott M. Warner.

While the Michigan Flora Project is the gold standard for documenting the habitat and distribution of Michigan plants, its agents cannot examine every collection taken from the state. Additional sources can sometimes provide further information. GVSC is home to 3500 specimens (Thiers continuously updated). Had a local herbarium not been available to the collectors of the previous Chippewa County record they might not have collected the specimen. Had the data not been digitized and added to the Consortium of Midwest Herbaria database, the present authors would not have known about the record.

Diagnostic Characteristics. *Homalosorus pycnocarpus* is a large fern, one of Michigan's few ferns with both once-pinnate fronds and entire to crenulate pinnules. Among these few species, it is the only one with sori linear along the veins. It is weakly dimorphic (Figure 2), with the fertile fronds bearing narrower pinnae than those of the sterile fronds (Palmer 2018).

Specimen Citation. MICHIGAN. Chippewa County: Hiawatha National Forest, 1/8 km E of Boaz Lake, 3 km NE of town of Ozark. 46.163378°, –84.931728°. Locally abundant. Covering ca. 1/8 ha with minor satellite patches just beyond. Under sugar maple in moist slippery elm–silver maple–sugar maple woods. Ground associates: *Circaea canadensis*, *Allium tricoccum*, *Sambucus racemosa*, *Fraxinus pennsylvanica*, *Adiantum pedatum*, *Dryopteris carthusiana*,

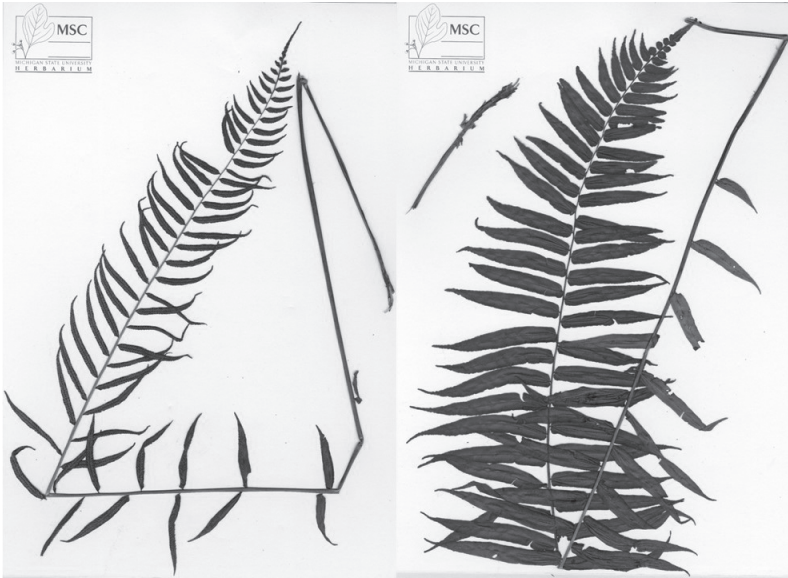


FIGURE 2. Voucher from the present observation of narrow-leaved spleenwort (*Homalosorus pycnocarpus*) prior to mounting. The species shows weak dimorphism between fertile fronds (left) and sterile fronds (right). Photo by Scott M. Warner.

Elymus hystrix, *Rubus occidentalis*, *Rubus strigosus*, *Agrimonia gryposepala*, *Prunus serotina*, *Galeopsis tetrahit*, *Carex intumescens*, and *Athyrium filix-femina*. Vigorous sori production. August 30, 2022, Scott M. Warner 1190 (MSC; duplicates to be distributed to CMC, MICH, and MSC).

Dryopteris expansa (C. Presl) Fraser-Jenk. & Jermy
 Dryopteridaceae
 Expanded Woodfern; Spreading Woodfern

Significance of the Report. The first documented record in Michigan's eastern Upper Peninsula, constituting a marked extension of the state range. We also note an additional Mackinac County collection made farther east three months after the record reported here. Though this report is not prompt, there have been no additional collections since 2011, and we hope to stimulate further search efforts by reporting these collections.

Previous Knowledge. *Dryopteris expansa* (C. Presl) Fraser-Jenk. & Jermy is a distinctive boreal woodfern known previously in Michigan from five counties in the western Upper Peninsula (including records in Keweenaw County from both mainland and Isle Royale National Park), where it occurs in northern hardwood forests, mixed northern hardwoods, and pine forests (MICHIGAN FLORA ONLINE 2011). More specifically, as detailed by Palmer (2018), in Michigan this species is found in cool moist woodlands, and especially near or at the base

of rocky slopes, in canyons, and in shaded, damp ravines, and not uncommonly near the edge of shrubby wetlands and along wooded shorelines. It has a high coefficient of conservatism rank of 9 (Reznicek et al. 2014), indicating a strong association with high quality habitats remaining relatively intact following European migration and settlement.

Dryopteris expansa is a circumboreal species, occurring broadly in two large areas of North America (NatureServe 2022). In the northeast, it ranges from the upper Midwest (in the northern regions of Minnesota, Wisconsin, and Michigan) northeast through northern Ontario and northern Quebec into Newfoundland and Labrador and extending to the extreme southwestern edge of Greenland. In western North America this species ranges from southern and western Alaska to central coastal California, where it appears to occur primarily in cool moist woods and on rocky slopes (Montgomery and Wagner 1993). MICHIGAN FLORA ONLINE (2011) lists a total of 42 collections of *Dryopteris expansa* and an additional 15 collections determined to be hybrids between *D. expansa* and the more common and widespread woodferns *D. marginalis* (five collections) and *D. intermedia* (ten collections).

Discussion. Although no longer listed as a Special Concern species in Michigan, *Dryopteris expansa* is nevertheless a relatively uncommon species. We suspect that, based on our current knowledge of the distribution and on the type of habitat available, this species is at least somewhat overlooked, especially in the forested terrain of the central and eastern Upper Peninsula where there is considerable potential for it to occur. A notable feature of its distribution in Michigan is that the vast majority of collections are from Marquette (18) and Keweenaw (12) Counties, which comprise 71% of collections. Furthermore, there is only one mainland collection in Keweenaw County, as 11 of the 12 records derive from island collections (nine from the Isle Royale Archipelago and two from Manitou Island). Interestingly, there is no record of this species from Houghton County, which comprises the largest area on the Keweenaw Peninsula and extends considerably inland, and only two records are known from each of Ontonagon County and Baraga County, which likely have significant amounts of potential habitat for *D. expansa*.

A population of *Dryopteris expansa* was discovered on June 21, 2011 by the second author during biological surveys of the eastern unit of the Hiawatha National Forest with Michigan Natural Features Inventory colleague David Cuthrell. The new location, which is in Mackinac County, extends the known range of this species in the Upper Peninsula by about 216 km (134 miles) eastward. The initial determination was confirmed by Anton Reznicek in 2014. A subsequent collection of this species was made on September 24, 2011 by Will MacKinnon 16 km (10 miles) east of the initial county discovery. In a 2011 determination, Robert Preston asserts that the initial determination was likely correct, however the possibility of the specimen being a hybrid cannot be ruled out. Based on these discoveries, we suggest that there is widespread habitat for this species throughout the Upper Peninsula and that it is possible that *D. expansa* may be present in the northern Lower Peninsula as well. Unlike most homosporous ferns, *D. expansa* has the ability to self-fertilize (Soltis and Soltis 1987).

Thus, if a single spore disperses and germinates a long distance from the sporophyte, a single gametophyte can theoretically lead to a viable population.

Woodferns are widespread in Michigan and are classic “look-alikes,” often not easily distinguished, and thus the genus *Dryopteris* is a legitimately challenging group. Identification may be further complicated by a tendency to hybridize, as discussed and well-illustrated by Carlson (1979). *Dryopteris expansa*, however, has some distinctive if not very striking features, as detailed below, that are well described and illustrated in the thorough modern treatment of Michigan’s ferns and lycophytes of Palmer (2018).

Diagnostic Characters. *Dryopteris expansa* is a relatively large, clump-forming, and broad-leaved woodfern with very dense scales on the lower portion of the leaf rachis. Although superficially similar to *D. marginalis* or *D. intermedia*, with which it may commonly occur, it can be distinguished from them by the large striking downward-pointing pinnules adjacent to the rachis on the lower side of the basal pinnae. These large lower (basioscopic) pinnules are in strong contrast to the two smaller (acroscopic) pinnules immediately above and are also attached noticeably farther from the leaf rachis (Palmer 2018).

Specimen Citations. MICHIGAN. Mackinac County: T43N R4W Sec 22. Lat: 46.10326°, Long: -84.79288°. Very local, only a few stems noted, occurring in second-growth mesic northern forest dominated by *Acer saccharum*, *Tilia*, and *Fraxinus*. *Penskar 1537 and Cuthrell*, June 21, 2011 (MICH). T43N R2W Sec. 20. Lat: 46.103402°, Long: -84.58896°. Gentle NW slope in wet-mesic to mesic mixed hardwood stand in transition to lowland conifer. *Acer rubrum*, *Betula papyrifera*, *Acer saccharum*, *Abies balsamea*, *Corylus cornuta*, *Aralia nudicaulis*, *Oryzopsis asperifolia*, *Cornus canadensis*, *Huperzia lucidula*, *Oxalis acetosella*. *William A. MacKinnon 2983*, Sept. 24, 2011 (MICH).

AUTHOR CONTRIBUTIONS

SMW and MRP independently discovered and collected the *Homalosorus* and *Dryopteris* records, respectively, and decided to combine the reports. Each species report was primarily written by the collector of that species. Both authors contributed ideas and revisions to the entire manuscript.

ACKNOWLEDGMENTS

We wish to thank the Hiawatha National Forest for providing support for Michigan Natural Features Inventory to conduct biological surveys on the forest, and we are grateful to the volunteers and staff at MSC and MICH for curating our specimens and generously allowing use of their facilities; Matt Chansler was particularly helpful. We appreciate the trenchant suggestions from editor Michael Huft and two anonymous reviewers, which substantially strengthened the article. We commend Will MacKinnon for his discovery of a second eastern Upper Peninsula population of *D. expansa*.

LITERATURE CITED

- Carlson, T. J. (1979). The comparative ecology and frequencies of interspecific hybridization of Michigan woodferns. *The Michigan Botanist* 18: 47–56.
- Consortium of Midwest Herbaria. 2022. Available at <https://midwestherbaria.org/portal/index.php> (Accessed December 8, 2022).
- iNaturalist. (2022). Available at <https://www.inaturalist.org>. Accessed November 17, 2022.

- MICHIGAN FLORA ONLINE. A. A. Reznicek, E. G. Voss, and B. S. Walters. January (2011). University of Michigan. Available at <http://michiganflora.net/home.aspx> (Accessed December 8, 2022).
- Montgomery, J. D., and W. H. Wagner, Jr. (1993). *Dryopteris*. Pp. 280–288 in Flora of North America. Volume 2: Pteridophytes and Gymnosperms. Flora of North America Editorial Committee, editors. Oxford University Press, New York, N.Y. Available online at <http://beta.floranorthamerica.org>. Accessed (December 14, 2022).
- NatureServe. (2022). NatureServe Network Biodiversity Location Data accessed through NatureServe Explorer (web application). NatureServe, Arlington, Virginia. Available at <https://explorer.natureserve.org/>. (Accessed November 17, 2022).
- Palmer, D. D. (2018). Michigan ferns and lycophytes: A guide to the species of the Great Lakes region. University of Michigan Press, Ann Arbor.
- Pteridophytes Collections Consortium (2022). Available at <https://www.pteridoportal.org/>. (Accessed November 17, 2022).
- Soltis, D. E. and P. S. Soltis. (1987). Breeding system of the fern *Dryopteris expansa*: Evidence for mixed mating. *American Journal of Botany*. 74: 504–509.
- Swink, F., and G. Wilhelm. (1994). *Plants of the Chicago Region*, 4th edition. Indiana Academy of Science, Indianapolis.
- Reznicek, A. A., M. R. Penskar, B. S. Walters and B. S. Slaughter (2014). Michigan floristic quality assessment database. Herbarium, University of Michigan. Available at <https://michiganflora.net/home.aspx> (Accessed November 15, 2022).
- Thiers, B. (continuously updated). Index herbariorum: A global directory of public herbaria and associated staff. Available at <http://sweetgum.nybg.org/ih/> (Accessed November 17, 2022).