

**Habitat characterization and assessment of the northern
range limit of the regionally rare *Crepidomanes intricatum* in
Northeast North America**

2019 Les Mehrhoff Botanical Research Award Final Report

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Laura Green gesturing towards the location of a newly documented station of *Crepidomanes intricatum*.

Introduction:

Crepidomanes intricatum (Syn. *Trichomanes intricatum*; weft fern), is a diminutive member of the filmy fern family (Hymenophyllaceae) known only from its gametophyte form. Weft fern is known to grow as single-cell thick filaments in dark crevices of ledges, rockhouses, talus, and glacial erratics throughout the Eastern United States from Alabama to Vermont (Natureserve Explorer). Lacking the ability to produce spores, reproduction is achieved asexually through the production of gemmae. *C. intricatum*'s stature and cryptic nature requires detailed observation, under 20x magnification or greater, to document the presence of rhizoids, gemmae, and gemmifer cells, which distinguish it from co-occurring algae and bryophyte protonemata. Vectors of distribution are currently unknown, though, research has indicated gemmae are too large to be wind dispersed (Don Farrar, Pers. Comm.).

Throughout its northern range in the eastern United States, *Crepidomanes intricatum* is considered rare by State Heritage programs (S1, NJ; S1, NY; S3, CT; S1, MA; S1, VT; S1/Historic NH; Natureserve Explorer) and categorized as a Division II, Regionally Rare Taxon, in the Flora Conservanda New England 2012 by Brumback and Gerke (2013), with 16 known stations at the time of publication. The rarity of *C. intricatum* is attributed to the small number of stations known throughout the region; New York: 4 stations, Connecticut: 3 stations, Massachusetts: 11 stations, Vermont: 4 stations (Massachusetts Natural Heritage and Endangered Species Program Data Release Agreement; New York Natural Heritage Program, Vermont Department of Fish and Wildlife, Connecticut Department of Energy and Environmental Protection, Pers. Comm.).

Assigned rankings of rarity are an important tool for conservation, serving as triage for both species and their habitats. However, rankings are a contrived metric and, being based upon scale of geographic extent and our best-knowledge, fundamentally imperfect. One key mechanism to improve the accuracy of these rankings is to continue improving our understanding species' distributions and abundance. Increasing our knowledge sensitive species an important step in our collective efforts towards biodiversity retention in a changing world.



Morphological features of *Crepidomanes intricatum* under 60x magnification

Left: A. Gemmifer cells **Right:** Rhizoids

Methods:

Habitat characteristics and locality information for all reported stations of *C. intricatum* were acquired with assistance from State Heritage Program Staff. *De novo* survey efforts, conducted by M. Charpentier in 2018 provided an additional 21 previously unrecorded stations throughout New England for reference.

Using our on-the-ground experience with *C. intricatum*, we developed a model of the species habitat preferences. Available ArcGIS data layers and aerial imagery were referenced to locate potentially suitable habitat to the north of the species' recorded distribution. A total of 23 candidate sites were identified, targeting those located on public property and accessible from recreational trails & roads to maximize survey area coverage.

Surveys:

From October 15-20, 2019 we traveled 300 miles northward (as the crow flies) of the northernmost recorded station of *Crepidomanes intricatum*. During that period, we surveyed 11 out of the 23 candidate sites. Using LED flashlights, we surveyed under ledges, talus, and within the cracks of erratics at each site. As we did not have permission to collect, identification of *C. intricatum* was made *in situ*. Suspect occurrences were reviewed for distinguishing characteristics under magnification. In sites allowing for easy access, 20x Iwamoto hand lenses were used. Where direct observation was not feasible, we used our personal cell phones with camera attachments (Easy-Macro®) to take magnified photographs for review.

Each location was surveyed until either (1) all reasonably accessible habitat had been searched, (2) after two hours of active surveying no observation of *C. intricatum* had been made, or, (3) *C. intricatum* was located. In scenarios 1 & 2, presence at a survey site was deemed unlikely: notes detailing associate species composition and environmental conditions were recorded, after which efforts at that site were ceased.



Left: *C. intricatum* as photographed *in situ* using Easy-Macro® cell phone attachment. Note the distinctive chain-like pattern of the single cell wide filaments characteristic of *C. intricatum* (pers. obs.). **Right:** *Betula alleghaniensis*-*Acer saccharum*-*Tsuga canadensis* forest. The ledge (center image) contains the population of *C. intricatum* photographed in the previous image.

In locations where *C. intricatum* was observed, notes relative to habitat characteristics (including GPS coordinates, associate species, aspect, and canopy structure and composition), geologic features, and population size (in square cm) were recorded. Representative photographs were taken of the

surrounding habitat and notable features topographic features to allow for relocation of observation sites. Individuals of *C. intricatum* were photographed *in situ* under magnification for documentation of distinguishing morphological characteristics.

Results & Continuing Efforts:

As a result of our surveys in October 2019, we located three new stations of *C. intricatum* up to 180 miles outside of the previously recorded distribution of the species. Survey results were conveyed to Heritage Program Staff and employees at parks where these stations were located. To date (11/27/2019), our targeted surveys have located a total of 35 previously unreported stations of *C. intricatum* across the region, inclusive of those located during the 2018 and 2019 field seasons.

In 2020, we intend to seek permission to collect specimens at sites located in 2019, for use as herbarium vouchers, and in genetic analysis. We anticipate continuing to survey for unreported stations of *Crepidomanes* across the region in an effort to gain a better understanding of this species' rarity. We are preparing the full results of this survey trip and others to submit for publication mid-late 2020.

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