NOTEWORTHY COLLECTIONS

THE REDISCOVERY OF *ELEOCHARIS GENICULATA* (L.) ROEM. & SCHULT. (CYPERACEAE) IN ILLINOIS WITH TAXONOMIC NOTES

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Significance of the Report. The first collections of *Eleocharis geniculata* in the state of Illinois since 1894.

Previous Knowledge. *Eleocharis geniculata* (L.) Roem. & Schult., commonly called Capitate Spike-rush (Figure 1), is a small, cespitose annual sedge that grows in brackish wetlands, calcareous swales and lakeshores, and marly fens in the Great Lakes region of the United States and Canada (Menapace 2003; MICHIGAN FLORA ONLINE 2011; Wilhelm and Rericha 2017). Its distribution in the Great Lakes region which is limited to a few counties near the northern edges of the states Pennsylvania, Ohio, Indiana, and Illinois and in southern Ontario, is disjunct from its general pantropical and warm-temperate distribution, including a widespread distribution in the southern United States (Menapace 2003; Lunkai and Strong 2010; Kartesz 2015). The plants occurring in the Great Lakes region have darker scales that are purplish, whereas the more tropical and warm-temperate individuals have straw-colored scales (Hill 1881; MICHIGAN FLORA ONLINE 2011). This has led some taxonomists to separate these individuals as a distinct, endemic Great Lakes species described as *Eleocharis dispar* E.J. Hill, or as a variety *Eleocharis geniculata* (L.) Roem. & Schult, var. *dispar* (E.J. Hill) Blake (Hill 1881; Hermann 1935). One suggested common name of the Great Lakes taxon is Inland Capitate Spike-rush. The name *Eleocharis caribaea* (Rottb.) Blake has been applied to this species (e.g., Gleason and Cronquist 1991; Voss 1972); however, Wilson (1990) showed that the earlier name, *Scirpus geniculatus* L., applies to the same species and therefore the specific epithet geniculata has priority.

The taxonomy of the *Eleocharis geniculata* complex remains complicated. The recent resurrection of *Eleocharis microformis* (O'Kennon and Taylor 2013)

FIGURE 1: *Eleocharis geniculata* at State Line Slag Prairie. August 9, 2023. Photo by Nathanael J. Pilla.

as a species distinct from *E. geniculata* challenges the taxonomic boundaries within the complex, while the status of the Great Lakes populations identified by E.J. Hill as a distinct species is still uncertain (A. A. Reznicek pers. comm.). Further research employing multi-disciplinary analyses will be crucial in resolving these taxonomic dilemmas. Unraveling the complexities of the *E. geniculata* complex will not only advance our understanding of plant diversity, but will also hold potential implications for conservation and ecological management. By clarifying the identities and relationships within this challenging group, we can better understand their distribution, habitat preferences, and potential threats.

Due to its late phenology in the Great Lakes region (July–September), successful establishment and persistence of the species is contingent upon the availability of open habitats with low competition from other plant species (Environment Canada 2016). It is considered a species of conservation concern in Indiana, Michigan, Ohio, Ontario, and Pennsylvania (NatureServe 2023).

Prior to this report, *Eleocharis geniculata* was presumed extirpated in Illinois (P. Marcum pers. comm.). There has been one historical collection in Illinois, which was in Cook County from the south side of Chicago on the border of Wolf Lake in 1894 (Hill s.n., F, accession number 462680). Occurrences of the species are documented frequently in northwestern Indiana, as evidenced by data on the Consortium of Midwest Herbaria (2024) portal.

Discussion. *Eleocharis geniculata* was discovered at three sites during floristic surveys of Calumet Slag Barrens in southeastern Cook County, Illinois in 2023. All three populations were growing in wet, calcareous habitats where slag was historically deposited in northeastern Illinois. Populations of *E. geniculata* were observed and collected in 2023 from three sites in a local novel ecosystem colloquially referred to as Calumet Slag Barrens in Cook County, Illinois. These were the Marian R. Byrnes Park (Marian Byrnes) on July 31, the Big Marsh Park (Big Marsh) on August 26, and 3300 & State Line Slag Prairie (State Line) on August 26. These sites, are in what Merwin et al. (2022) called the Chicagoland Slag Ecosystem, which is the spontaneous vegetation that has assembled and persisted on slag, which in turn is waste matter laden with heavy metal as a by-product of steel production. Calumet Slag Barrens harbors a diverse community of plant species consisting of a mix of common ruderal species of disturbed open ground and native calciphiles. Species of higher conservation value are at a greater density in areas of the slag ecosystem that harbor ephemeral wetlands (personal observation). Soils tend to be calcareous and with locally high concentrations of heavy metals such as chromium and lead (Kay et al. 1997; Piatak et al. 2019).

At Marian Byrnes, *Eleocharis geniculata* was scattered throughout the northwestern edge of a wetland stretching approximately 150 meters in water a little over three centimeters deep. This water depth was influenced by recent heavy rainfalls in a season of overall low average rainfall and a severe to moderate drought during the month of June and July (NIDIS 2024). At the time of the collection, only a few individuals had mature achenes necessary for proper identification. Several species of *Chara* dominated the adjacent submergent community.

No populations of *Eleocharis geniculata* were initially observed during the vegetation survey on August 1, 2023, at Big Marsh. However, subsequent observations of the species the following week directly across the border in Indiana prompted further exploration on the Illinois side. A targeted survey focused on *E. geniculata* was conducted on August 26 at both Big Marsh and the Illinois portion of State Line with the assistance of aspiring botanist Matteo C. Pilla.

The survey at State Line was on the small strip of the property that crosses into Illinois. Sixty tiny individual culms were observed in a wet swale west of a garbage dump pile. Thousands of additional individuals observed on the Indiana side of the property.

During the targeted survey at Big Marsh, two populations of *Eleocharis geniculata* were observed. The first consisted of approximately 46 culms where *Phragmites australis* was managed, and the second consisted of approximately 180 culms growing in gaps within thickets of *P. australis* on the wet edge of the slag barrens.

The scattered distribution, small stature, and potential for interannual variation in germination may have contributed to *Eleocharis geniculata* being previously overlooked at these sites. To comprehensively assess the distribution and abundance of *E. geniculata* in Illinois, targeted surveys are recommended in habitats with suitable ecological characteristics.

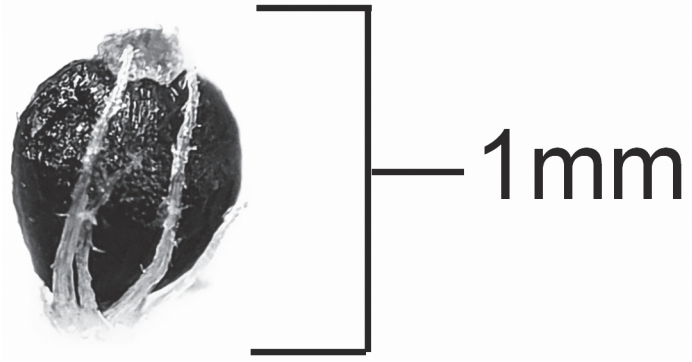

FIGURE 2: Achene of *Eleocharis geniculata* from collection at Marian Byrne. Photo by Nathanael J. Pilla.

Notably, the original discovery of *Eleocharis geniculata* in Michigan, Ontario, and three additional locations in Indiana all occurred in 1934 (Hermann 1935, Taylor 1935) during what was described by Cook et al. (2014) as the "the single most intense drought year of the last millennium." This raises the possibility of a link between the historical and recent (2023) droughts in the Chicago region and their influence on the germination of this species. While these environmental factors may influence the interannual dynamics of the seed bank in this annual species, more research should be done to understand the germination mechanisms of *E. geniculata*.

Diagnostic Characters. There are 67 species of *Eleocharis* recognized in North America north of Mexico excluding many unresolved taxa (Smith et al. 2002; Gibbons and McMullen 2019), twenty-three of which are documented in Illinois through a search of the Consortium of Midwest Herbaria (2024) portal. *Eleocharis geniculata* is distinct from other spike-rushes through the following combination of characters: tufted and lacking rhizomes; glossy-black achenes 0.5–1.0 mm long (Figure 2); two-sided, reddish-brown perianth bristles; two stigmas; somewhat conical tubercle; spikelet thicker than the culm; and tight summit of basal sheath (Rothrock 2009; MICHIGAN FLORA ONLINE 2013; Wilhelm and Rericha 2017).

Specimen Citations. ILLINOIS. COOK CO.: South Side, Chicago. 41.717354, –87.581361. Material collected at Marian R. Byrnes Park where it was scattered in water over 3 cm deep on slag flat stretching approximately 150 meters. Was dry until heavy rainfall over the weekend raised water depths. Charophytes were abundant in the area. Associated species: *Alisma subcordatum*, *Proserpinaca palustris*, *Schoenoplectus acutus*, *Typha ×glauca*. July 31, 2023, *Pilla NJP.2307.3115.* (ILLS).

ILLINOIS. COOK CO.: South Side, Chicago. 41.686903, –87.568266. Material collected at Big Marsh Park wetland. There were approximately forty-six individuals on the wet edge of slag prairie/marsh. Associated species: *Carex viridula*, *Cyperus acuminatus*, *Cyperus bipartitus*, *Cyperus squarrosa*, *Cyperus*

strigosus, *Leucospora multifidum*, and *Panicum virgatum*. August 26, 2023, *Pilla, Anastasio, & Pilla NJP.2308.2604.* (ILLS).

ILLINOIS. COOK CO.: South Side, Chicago. 41.652241, –87.524943. Material collected at 3300 and State Line Slag Prairie in wet swale right on the Illinois side of the property. There were approximately sixty tiny individuals observed on the Illinois side with thousands on the Indiana side where the water has dropped. Associated species: *Carex viridula*, *Euthamia graminifolia*, *Frangula alnus*, *Lycopus uniflorus*, *Lythrum salicaria*, *Panicum virgatum, Phragmites australis*, *Solidago gigantea*, *Sporobolus vaginiflorus*. August 26, 2023, *Pilla, Anastasio, & Pilla NJP.2308.2607.* (ILLS).

AUTHOR CONTRIBUTIONS

NJP and AA collectively engaged in the fieldwork survey for *Eleocharis geniculata* within the Calumet Slag Barrens. NJP primarily drafted the botanical sections of the report while AA focused on the ecological components. Both authors contributed to the overall manuscript structure and revisions.

ACKNOWLEDGMENTS

We thank Lauren Umek, Chicago Parks District, and Laura Merwin, Concordia University, for their support toward understanding the novel slag barren ecosystems of the Calumet Region, Paul Marcum, Illinois Natural History Survey, Anton A. Reznicek, University of Michigan Herbarium, and Gerould S. Wilhelm, Conservation Research Institute, for their input and willingness to share their data on and knowledge of the species, Matteo C. Pilla for providing assistance in data collection, and Bradford Slaughter, Orbis Environmental Consulting, for helping to improve this manuscript.

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