

NOTEWORTHY PLANT COLLECTIONS FROM DELAWARE, MARYLAND, AND VIRGINIA

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ABSTRACT

Field surveys conducted from 2013 to 2020 in the Piedmont province of Delaware, as well as the Coastal Plain province of Delaware, the Eastern Shores of Maryland and Virginia (collectively known as the Delmarva Peninsula), have revealed noteworthy discoveries. Discoveries include state and county records, rediscoveries of historical taxa, and range extensions.

Collections described below are arranged alphabetically by family, then by genera within each family. Nomenclature follows Weakley (2020).

CACTACEAE

Opuntia mesacantha* Raf. subsp. *mesacantha

The specimen cited below marks either a new record for the state of Delaware, or a rediscovery for the state. Based on a recent specimen search (MAHC 2021), the author found two specimens that may be *Opuntia mesacantha* subsp. *mesacantha*. Both specimens contain spiny and spineless cladodes (23 May 1876, A. Commons s.n., PH, as *Opuntia opuntia* (L.) Coult., “dry sandy soil, Millsboro, Delaware;” 15 Aug 1895, A. Commons s.n., PH, as *Opuntia opuntia* (L.) Coult., “dry sandy soil, Rehoboth, Delaware”). Due to the Covid-19 pandemic, PH is closed to researchers and the author has not been able to examine the specimens more closely to make a confident determination. *Opuntia mesacantha* subsp. *mesacantha* ranges from southern New Jersey, the Western Shore of Maryland, to southeast Virginia, south to Georgia, and west on the Panhandle of Florida to Louisiana (Majure et al. 2017). The Delmarva Peninsula is not included in the overall distribution.

Voucher specimen. **Delaware. Sussex Co.:** W side of Rte 1, N side of Savage Ditch Rd, Delaware Seashore State Park, about a 1-meter square patch on sand, in flower, full sun, shrubby inner-dune, 15 Jun 2020, McAvoy 7990 (DOV).

CYPERACEAE

***Carex floridana* Schwein.**

Carex floridana is primarily a southeastern species, ranging from east Texas, east to Florida, and north to southeast Virginia and southern New Jersey (Naczi et al. 2015), with inland stations in Arkansas and Missouri (Kartesz 2015; Naczi et al. 2015). Being on the northern edge of its range, the species is classified as “vulnerable” (S2) in Virginia (Townsend 2020), and “critically imperiled” (S1) in New Jersey (Snyder 2016). On the Delmarva Peninsula, the species was first collected from the Eastern Shore of Virginia in southern Northampton Co. in 2005 by Chris Frye and Wes Knapp (*Knapp 1143*, TAWES, as *Carex nigromarginata* Schwein., det. W.A. McAvoy as *C. floridana* 2021). The species was collected farther north in Northampton Co. in 2013 (*Fleming 15767*, VPI), about 15 mi (24 km) north of Knapp's *1143*. In 2014, the species was then met by the author in Accomack Co., Virginia, about 50 mi (80 km) north of Fleming's *15767*, where it marked a new county record for the state and what was thought at the time to be a northern range extension.

Naczi, however (pers. comm. 2015), had recently annotated specimens labeled as *Carex nigromarginata* from southern Cape May Co., New Jersey, as *C. floridana* (Naczi et al. 2015), with the most recent specimen being collected in 1932 (7 May 1932, *Witte s.n.*, PH; Naczi et al. 2015). *Carex floridana* is still extant in southern Cape May Co. (11 Jun 2015, *McAvoy 7513*, DOV), but New Jersey state botanist David Snyder has been monitoring the known population periodically from 2015 to 2020 and has found it to be declining due to impacts from non-native invasive plants (pers. comm. 2021). Habitat for *C. floridana* on the Delmarva Peninsula, as well as in southern New Jersey is forested maritime dunes and ridges, both along the Chesapeake Bay (Northampton Co., Virginia) and the Atlantic coast (Accomack Co., Virginia, and Cape May Co.). The author, knowing that such habitat exists at Cape Henlopen State Park in Sussex Co., Delaware along the Atlantic coast, began searching for *C. floridana* in potential areas in the park in 2014. In 2017 the species was discovered, representing a new addition to the flora of Delaware. The author's collection *7513* from New Jersey is about 15 mi (24 km.) northeast of the Cape Henlopen station across the mouth of the Delaware Bay. The author has searched without success for *C. floridana* at Assateague Island in Worcester Co., Maryland, which is between the Accomack Co. and Sussex Co. stations and supports potential maritime habitat for the species.

Voucher specimens. **Virginia. Accomack Co.:** Chincoteague National Wildlife Refuge, rare on sandy slopes of forested maritime sand ridge, forming colonial patches, 6 Jul 2014, *McAvoy 7408* (DOV); same location, 19 Apr 2015, *McAvoy 7486* (DOV); same location, 19 May 2015, *McAvoy 7500* (DOV). **Delaware. Sussex Co.:** Cape Henlopen State Park, 3 distinct colonies all covering a broad area, at mid-slope and base of slope of a tall maritime forested sand dune, 26 Sep 2017, *McAvoy 7721* (DOV); same location, 18 May 2018, *McAvoy 7746* (DOV).

Carex lucorum Willd.

Carex lucorum was first collected in Delaware by William Canby (1831-1904) in 1862 [*Canby s.n.* (NY), as *C. pensylvanica* Lam., det. as *C. lucorum* var. *lucorum*, J. Rettig 1988; det. as *C. lucorum*, R. Naczi 2011]. The only locational data on the specimen label is “New Castle Co., Delaware.” Canby again collected *C. lucorum* in 1863 (*Canby s.n.*, NY, as *C. pensylvanica*, det. as *C. lucorum* var. *lucorum*, J. Rettig 1988; det. as *C. lucorum*, R. Naczi 2011). Canby gave the location of this collection as “Point Lookout, Delaware.” Point Lookout – a locally well-known prominent highpoint [about 300 ft. (91 m.)] above the Brandywine Creek – is in Delaware Co., Pennsylvania, not the state of Delaware. Canby made several collections (DOV, NY, PH) of various taxa from Point Lookout between the 1860’s to the 1890’s, and he incorrectly labeled them as being from New Castle Co., Delaware. For example, Canby collected *Dichantheium columbianum* (Scribn.) Freckmann (30 May 1896, *Canby s.n.*, DOV, as *D. nitidum* Michx., det. as *D. columbianum*, R. LeBlond 2012), and labeled the specimen: “dry rocky shelves, Point Lookout, New Castle Co., Delaware.” Canby described the habitat at Point Lookout accurately but was wrong about its actual geographic location. Another example involves a Canby collection of *Carex tonsa* (Fern.) Bickn. (20 May 1899, *Canby s.n.*, DOV, as *C. umbellata* Schkuhr ex Willd., det. as *C. tonsa*, R. Tatnall, no date). Canby labeled the specimen: “Point Lookout, northern Delaware,” which would be New Castle Co., Delaware. An annotation by Robert Tatnall (1870-1957), noted that the collection was “Probably from The Knob [most likely Point Lookout] in Delaware Co., Pa.” Why Canby confused the true location of Point Lookout for so many years is a mystery.

The specimen cited below represents a rediscovery of *Carex lucorum* in Delaware after 158 years. In the northeastern USA, *C. lucorum* ranges from Maine south to Pennsylvania, New Jersey, and Maryland (Crins & Rettig 2002), seemingly in the Mountain and Piedmont provinces. A rare inner Coastal Plain collection of the species in 2003 from Cecil Co., Maryland (*McAvoy 5832*, DOV, confirmed by R. Naczi 2003), would mark the southern extreme for the species. *Carex lucorum* is still extant at Point Lookout, Delaware Co., Pennsylvania (1 Jul 2020 *McAvoy 8000*, NY, confirmed by R.

Naczi 2020). In the checklist and atlas of Pennsylvania (Rhoads & Klein 1993), there is no dot in Delaware Co. to indicate that *C. lucorum* had been vouchered for this county. Perhaps Canby's 1863 collection from Point Lookout was the first documentation of the species from Delaware Co., but Rhoads and Klein (1993) would have had no reason to examine this specimen when compiling data for the atlas because the specimen was labeled as being collected from the state of Delaware. Furthermore, the specimen was labeled as *C. pensylvanica*, which is vouchered for Delaware Co. (Rhoads & Klein 1993), undoubtedly with a specimen from Pennsylvania.

Voucher specimen. **Delaware.** New Castle Co.: 0.5 mi SW of Point Lookout, Pennsylvania, 0.2 mi S of Del/Penn state line, E of Rte 100, NE of Centerville, dense rhizomatous patch covering about a 15'x10' area, on a steep wooded slope, dry-rocky-acid ground, under a partial canopy gap, with *Quercus montana* and *Danthonia spicata*, *Carex pensylvanica* nearby, 8 Jul 2020, *McAvoy 8003* (NY), confirmed by R. Naczi 2020.

Carex louisianica Bailey

This collection marks a new addition to the flora of Delaware. Reznicek included Delaware in the distribution of the species in his treatment of *Carex* section *Lupulinae* in the Flora of North America (Reznicek 2002), but no voucher specimen from Delaware could be found by the author. The author collected the species in 2000 in Caroline Co., Maryland (*McAvoy 4785*, DOV), about 4.5 miles (7 km) south of the specimen cited below (7776), which is also along the same river system (Marshyhope Creek) as 7776. It seems plausible that the species would extend northward into Delaware where very similar habitat exists. The northern limit for the species is northern New Jersey (Kartesz 2015).

Voucher specimen. **Delaware.** Sussex Co.: Marshyhope State Wildlife Area, SW of Greenwood, S of Woodenhawk Bridge, W of Sand Hill Rd, S of Trinity Church Rd, 6 colonies of various sizes along a 0.4 mi stretch of a swampy floodplain along the E side of Marshyhope Creek, 9 Jul 2018, *McAvoy 7776* (DOV).

Eleocharis aestuum Hines & A. Haines

Eleocharis aestuum, a species of freshwater tidal systems, is tracked by NatureServe (2021) as a globally "vulnerable" species (G3), and is known from Maine, Vermont, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, and Delaware (NatureServe 2021). Based on recent searches of the collections at DOV, GH, NY, and PH (MAHC 2021), the specimen cited below appears to be the most recent collection of the species in the extreme southern limit of its range. Prior to this collection, the species had only been collected in the lower Delaware River of Camden and Gloucester counties, New Jersey, Delaware Co., Pennsylvania, and New Castle Co., Delaware, 13 times between 1916 and 2006 (DOV, GH, NY, PH). In Delaware, the species was first collected in 1972 (*Ferren 1109*, PH), and prior to this collection, the species had only been collected three times, the last being in 1983 (*Naczi, s.n.*, DOV).

Voucher specimen. **Delaware.** New Castle Co.: Delaware River, north of Fox Point State Park, north of Wilmington, 3 plants growing on exposed tidal mud at low tide at Bellevue Cove, *E. obtusa* collected on mud-flats the same day about 50 m S of here (*McAvoy 7706A*, DOV), 14 Sep 2017, *McAvoy 7706* (DOV).

ISOETACEAE

Isoetes appalachiana D.F. Brunton & D.M. Britton

This collection documents a new addition to the flora of Delaware and fills an eastern distributional gap between north-central New Jersey and southeast Virginia. Prior to this discovery, the species was unknown from the Delmarva Peninsula. *Isoetes appalachiana* ranges from Pennsylvania and New Jersey, south through Virginia and the Carolinas, Georgia, and the Panhandle

of Florida, and southeastern Alabama, and is disjunct in northeast Mississippi and eastern Tennessee (Brunton & Britton 1997; Brunton 2021, unpublished data).

Figure 1 (Sokoloff & Brunton 2021) is a scanning electron microscope (SEM) image of the megaspore of *Isoetes appalachiana*, and shows the ragged, reticulate megaspore ornamentation, as well as an obscure equatorial band of spines. Additionally, the tuberculate pattern on the surface of the megaspore will distinguish *I. appalachiana* from the morphologically similar *I. engelmannii*.

Voucher specimens. **Delaware.** Sussex Co.: S side of the Gravelly Branch, 0.4 mi E of Coverdale Rd, NE of Seaford, 10 plants in seepage pools at base of slope in an Atlantic white cedar swamp, in canopy gaps, 19 Aug 2013, *McAvoy 7215* (DOV), det. Daniel Brunton 3/1/2021.

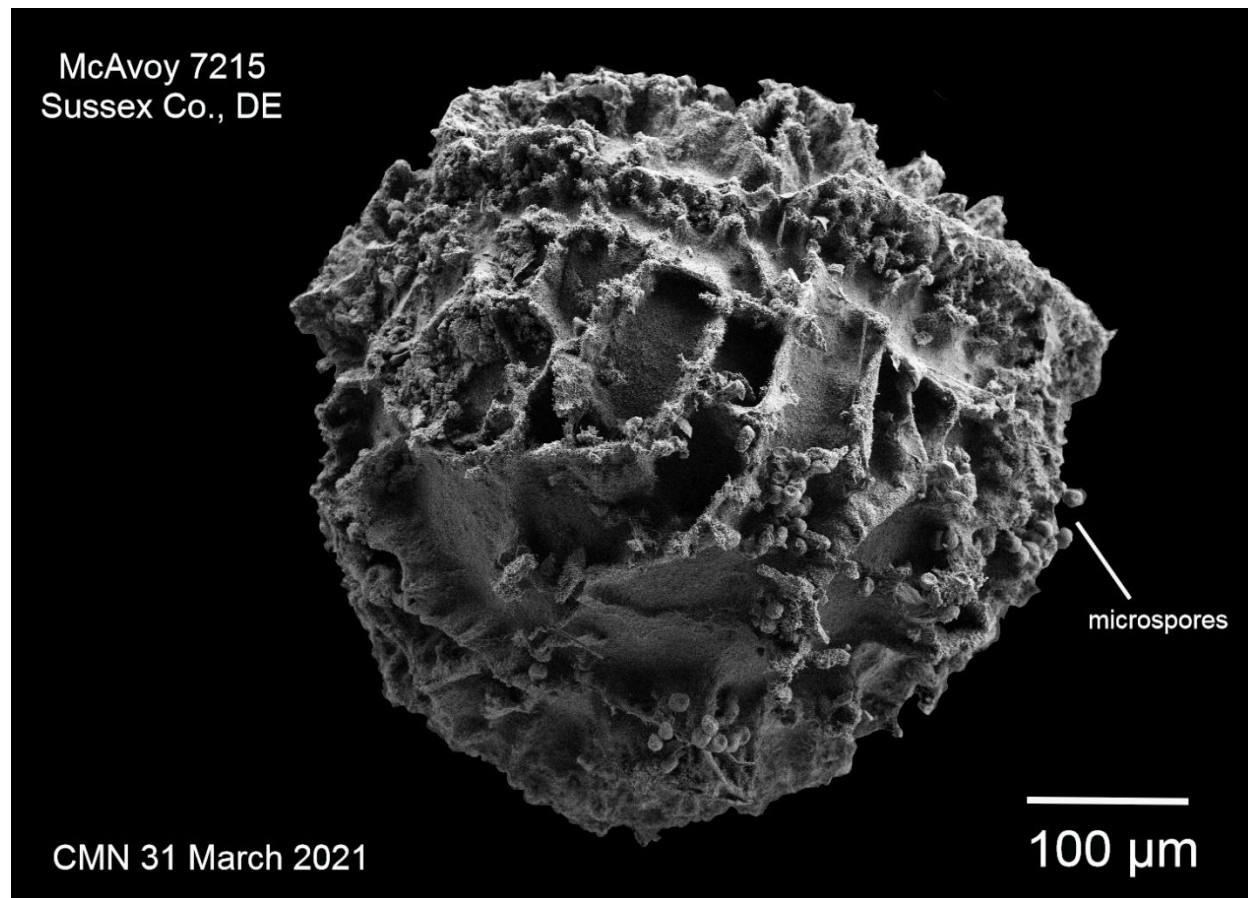


Figure 1. Scanning electron microscope image (Sokoloff & Brunton 2021) of *Isoetes appalachiana* megaspores (19 Aug 2013, *McAvoy 7215* PH).

***Isoetes hyemalis* Brunton**

The collection cited below extends the eastern Virginia distribution of *Isoetes hyemalis* about 84 miles (135 km) northeast of the species's closest occurrence in New Kent Co. (VBA 2021). This collection also documents a new county record for Virginia (VBA 2021) and represents the species northern extreme in distribution. The species, uncommon to rare throughout its range, is found from south-central Virginia, North Carolina, and South Carolina, and is disjunct in southwest Georgia, southeastern Alabama, and the western Panhandle of Florida (Brunton et al. 1994; Brunton 2021, unpublished data). NatureServe (2021) tracks the species as globally “imperiled” (G2).

Figure 2 (Sokoloff & Brunton 2021) shows the “fuzzy-topped” walls of *Isoetes hyemalis* megaspores and highlights the intricate, nearly echinate megaspore ornamentation pattern exhibited by this species, as well as the conspicuous equatorial band of spines.

Voucher specimens. **Virginia. Accomack Co.:** Assawoman Creek, 50-75 plants in a localized area of an acidic seepage fen, 5 Oct 2013, *McAvoy 7263* (DOV), det. Daniel Brunton 3/1/2021.

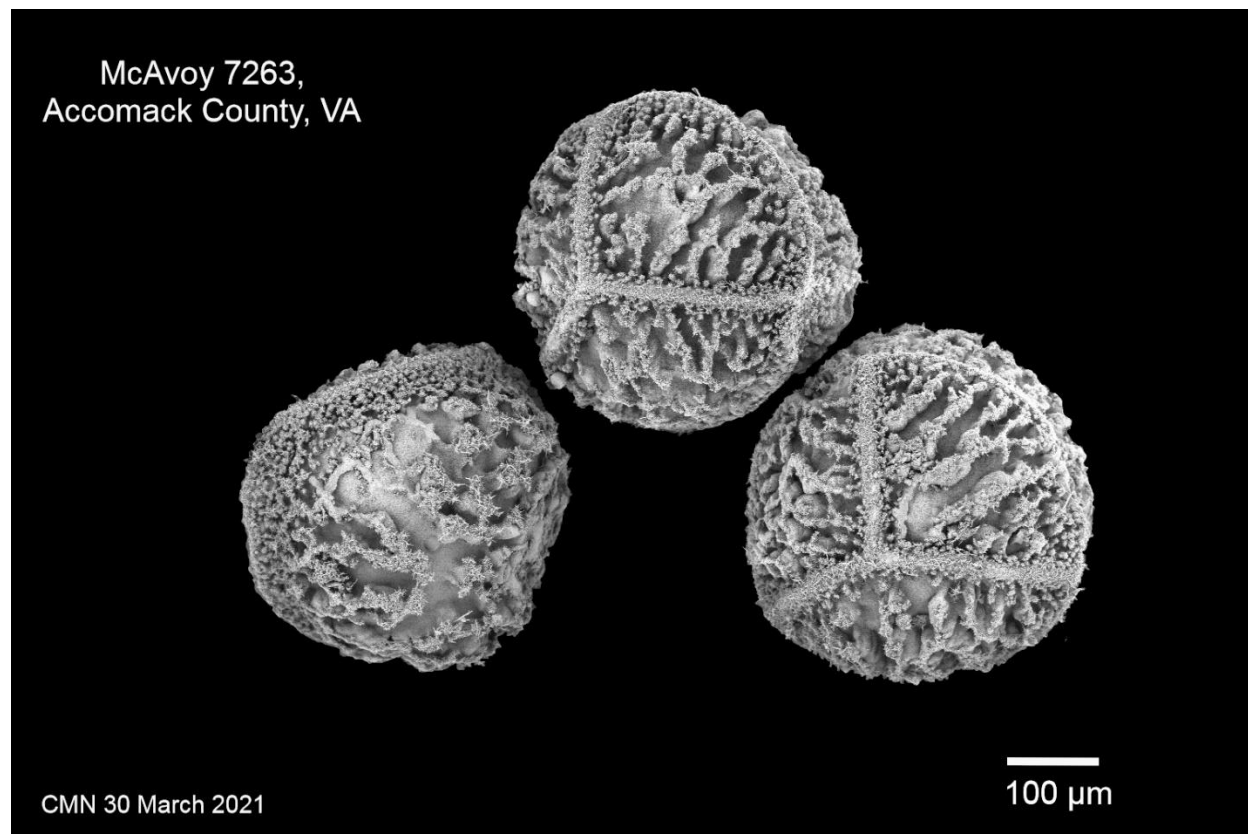


Figure 2. Scanning electron microscope image (Sokoloff & Brunton 2021) of *Isoetes hyemalis* megaspores (5 Oct 2013, *McAvoy 7263* DOV).

Isoetes valida (Engelm.) Clute

Isoetes valida is distributed in eastern North America from Pennsylvania and Delaware, south to Alabama (Brunton & Britton 1996; Weakley 2020). The species primarily occurs in the Mountain and Piedmont provinces (Brunton & Britton 1996; Weakley 2020), with infrequent Coastal Plain occurrences in Delaware, North Carolina, Georgia, and Alabama (Weakley 2020).

Isoetes valida was collected several times in Delaware between 1866 and 1895, in both the Piedmont and upper Coastal Plain provinces of the state. It is probable that the specimens cited below are from the same site where it was last collected in the state in 1895 (“springhead in woods, Ruthby Station,” 10 Jun 1895, *Commons s.n.*, PH, as *I. engelmannii* A. Braun, det. as *I. valida*, D. Brunton 1995). The collection site is just west of the area where the historical Ruthby Station railroad stop once existed. The site contains an extensive forested groundwater seepage wetland (“springhead”), supporting a high diversity of native plants. The collections cited below from 2017 to 2020, were taken from a single plant. The author carefully dissected a single leaf in each of these years until mature megaspores were found (7 Oct 2020, *8071*). These dissections did not appear to stress the plant, as it came back and flourished each of these years. Most of the historical collection sites for *I. valida* in

Delaware are from highly populated areas, and most of these sites have either been destroyed or are severely degraded, including one site that constitutes a syntype of the species (23 Jul 1866, *W. Canby s.n.*, PH; Brunton & Britton 1996]. The site for the collections below, lies within a suburban/urban area, which is fragmented from other natural areas and stream corridors within the general vicinity.

Voucher specimens. **Delaware.** New Castle Co.: E side of unnamed tributary of White Clay Creek, N side of Rte 273, W of Ruthar Rd, N of Rte 273 and S of RR tracks, about 2.0 mi E of Newark, about 0.8 mi S of the fall-line, just W of historical Ruthby Station RR stop, 1 sterile plant in groundwater seepage wetland, 16 Aug 2017, *McAvoy 7684* (DOV); same location, 2 Oct 2018, *McAvoy 7831* (DOV); same location, 8 Aug 2019, *McAvoy 7872* (DOV); same location, 7 Oct 2020, *McAvoy 8071* (DOV), det. Daniel Brunton 3/1/2021.

LAMIACEAE

Scutellaria nervosa Pursh

These collections document a new record for the Eastern Shore of Maryland as well as a new record of the known flora of the Native American shell-middens of the Delmarva Peninsula (McAvoy & Harrison 2012). *Scutellaria nervosa* is rare in Maryland and ranked as S1S2 by the Maryland Natural Heritage Program (MDNHP 2021).

Voucher specimens. **Maryland.** Kent Co.: SW of Betterton, dense 5x5 meter patch on shell bearing soil, 15 Jul 2017, *McAvoy 7657* (DOV); same location, no change to habitat or population size from 2017, 15 Jul 2020, *McAvoy 8013* (DOV).

ORCHIDACEAE

Hexalectris spicata (Walt.) Barnh.

Prior to the date of the first collection cited below (2017), this species was thought to be historical in the state of Maryland (MNHP 2016). It was collected only once in the state in 1955 [Maryland. Anne Arundel Co., “1.5 mi. N of Galesville, growing in shell marl near shore of West River,” 24 Jul 1955, *Gessenden & Macurdy 5719A* (US)], and was reported by Reed (1964). In addition to these collections being a rediscovery of a rare plant for Maryland, they represent a new record for the Eastern Shore of Maryland and a new addition to the known flora of the Native American shell-middens of the Delmarva Peninsula (McAvoy & Harrison 2012). Range-wide (Maryland south to Florida, west to east-central Texas; Goldman et al. 2003), growing conditions for *Hexalectris spicata* are variously described as calcareous soils in dry forests and limestone glades, on humus, and typically in mesic to dry soil over limestone or sandstone (Goldman et al. 2003). The site where these collections were made is recognized as a Native American shell-midden (McAvoy & Harrison 2012). The soils of these middens are high in calcium due to the decomposition of oyster shells that are abundant on the soil surface and deep into the sub-surface. The collection site had been visited by the author periodically from 2001 to 2011, and *H. spicata* had never been found until a visit in 2017. Encouragingly, the species was seen again three years later in 2020.

Voucher specimens. **Maryland.** Kent Co.: SW of Betterton, 3 patches within an 8x8 meter area, ca. 20 plants in tight bud, growing on humus over shells, this voucher is a portion of a stem that was broken off from a branch that fell from an overhanging tree, 15 Jul 2017, *McAvoy 7662 with R. Elliott* (DOV); same location, 3 stems with many tight buds, 2 in full flower, population down from 20 plants in 2017, no change in habitat, 15 Jul 2020, *McAvoy 8015*, specimen represented by digital images (DOV).

POACEAE***Oplismenus undulatifolius* (Arduino) Roemer & J.A. Schultes**

Oplismenus undulatifolius (wavyleaf basketgrass) – an invasive species in the USA – is native to southern Europe and southeast Asia (VADCR 2019). It was first discovered in the USA near Baltimore, Maryland, in 1996 (Beauchamp & Koontz 2013) and is now known to cover 1000's of acres of public and private land in Maryland and Virginia (MDNHP 2020). Prior to this collection, the species was known only from Maryland and Virginia (NatureServe 2021) and was first discovered in Delaware by Kate O'Hanlon in 2018 in White Clay Creek State Park, New Castle County, Piedmont province. The identification was confirmed by the author and the population was then destroyed by state park personnel. The trailside where this species was found growing is a popular area for mountain bike riders. Members of the mountain bike community are known to travel within the region (Delaware, Maryland, Virginia, Pennsylvania) to ride the many public trails. It is possible that the viscid awns of the spikelets could have become attached to the tires or clothing of a rider who visited one of the Maryland and/or Virginia parks, and then carried them to Delaware.

Voucher specimen. **Delaware. New Castle Co.:** White Clay Creek State Park, NE side of Thompson Station Rd, N side of Paper Mill Rd, S of Nine Foot Rd, N of Newark, N 39 43.251 - W 75 44.412, about a 2 square meter patch along hiking trail (Whitley Farms Trail), in shade on rich moist forest soil, a few fruiting culms present, 10 Aug 2018, *McAvoy 7791* (DOV).

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