

ELEOCHARIS ELEGANS (CYPERACEAE) NEW TO FLORIDA AND A
POSSIBLE NATIVE ADDITION TO THE FLORA OF THE UNITED STATES

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ABSTRACT

Eleocharis elegans, a neotropical wetland sedge (Cyperaceae), is reported as new for the United States from a site in Hardee County, Florida. A number of factors suggest this represents a natural occurrence. We speculate that climate change-related factors such as increasingly frequent major storms offer the most logical explanation of its arrival in the United States.

RESUMEN

Eleocharis elegans (Cyperaceae), una cárice de humedales neotropicales, se cita como nueva para los Estados Unidos de una localidad en el condado de Hardee, Florida. Cierta número de factores sugieren que representa una existencia natural. Especulamos que factores relacionados con el cambio climático tales como el incremento en la frecuencia de tormentas serias ofrece la explicación más lógica de su llegada a los Estados Unidos.

KEY WORDS: *Eleocharis elegans*, Florida, Addition to the flora, native status, climate change

INTRODUCTION

A population of *Eleocharis elegans* (Kunth) Roem. & Schult. was discovered in Hardee County, south-central Florida. This represents the first report in the continental United States of a species native to Latin American and Caribbean wetlands. The population was first discovered in 1997 but mistaken for the similarly large, native *E. interstincta* (Vahl) Roem. & Schult. and was correctly identified in 2016. The continued existence of the Hardee County population was confirmed in March 2017.

Eleocharis elegans has been growing here and producing seed-bearing plants for at least 20 years. It is accordingly appropriate to question the local and regional status of the species. Is this a naturally established native species or an introduction? In other words, is it of considerable phytogeographic interest as a rare native or a potentially invasive and negatively impacting wetland “weed”? This study compares evidence for those dramatically contrasting conclusions with documentation of migrational possibilities of other southern/ neotropical vascular plants recently discovered in the southeastern United States.

RESULTS

Eleocharis elegans was found to be common in native swamp forest habitat along the bank of Charlie Creek in 1997. A count of the number of culms was not conducted at that time. In 2017 the largest and most mature specimens were found clumped on the west side of the creek. This 1 m² mat was floating in water 0.5 m deep. Specimens observed in this clump were about 80 cm tall, and there were about 400 culms. Only one clump was observed floating in water. Other individuals were observed sprouting on parts of the creek bed that were recently exposed due to the current dry season. In the most recently exposed areas, *E. elegans* seedlings were no taller than 10 cm. All of these individuals lacked inflorescences. We estimate that there were about a 1000 seedlings present in March 2017. No individuals were observed along the margins of the creek.

Specimens examined. **FLORIDA. Hardee Co.:** 27.5652°N 81.63760°W, N of Hwy 34 [sic, Hwy 64] on E side of Charlie Creek, 2.0 km [W of] SR 671 (Parnell Road; Old Town Creek Road), 13 Mar 1997, D.F. Brunton and K.L. McIntosh 13,099 (D.F. Brunton pers. herb, MICH, WIN) (Fig. 1); 27.5654°N 81.63777°W, Charlie Creek, 21 Mar 2017, J.R. Campbell 900 (UFS).



FIG. 1. Hardee County, Florida voucher specimen of *Eleocharis elegans* (D.F. Brunton and K.L. McIntosh 13,099, 13 March 1997)

DISCUSSION

Identification.—*Eleocharis elegans* is a distinctive, robust, mat-forming sedge standing 90–100 cm tall with individual culms being at least 5 mm wide (Fig. 2). It is one of a group of particularly robust aquatic members of the genus. The culms of this species are conspicuously cross-septate throughout. In North America, there are only three other species with cross-septate culms with which it can be readily confused: *E. equisetoides* (Elliott) Torr, *E. interstincta*, and *E. montana* (Kunth) Roem. & Schult. The achenes of *E. elegans* are distinctly finely reticulate (Fig. 3) as opposed to obscurely to boldly rugulose achenes of the others (Smith et al. 2002).

The key below concerning the robust species of Florida *Eleocharis* with hollow, cross-septate culms includes descriptive information taken from Acevedo-Rodriguez and Strong (2005), Smith et al. (2002), Socorro Gonzalez-Elizondo (2002), Socorro Gonzalez-Elizondo et al. (2007), and Wunderlin (1998).

1. Spike distinctly thicker than culm; culms less than 3 mm in diameter _____ **E. montana**
1. Spike not distinctly thicker than culm; culms 5 mm or more in diameter.
 2. Pistillate scales delicate, papery, purplish-brown with a wide greenish midrib but no other conspicuous nerves; achene faces finely, shallowly reticulate _____ **E. elegans**
 2. Pistillate scales (except for the hyaline margins) leathery, pale yellowish-brown, with numerous closely spaced parallel nerves; achene faces obscurely to boldly rugulose.
 3. Perianth bristles slender and flexuous, finely spinulose, shorter than to equalling the achene (to 2.5 mm long); achene faces \pm smooth or with fine transverse-rugulose lines; culm septae widely (>10 mm) and \pm evenly spaced _____ **E. equisetoides**
 3. Perianth bristles stiff and stout, coarsely spinulose, exceeding the achene (to 2.9 mm); achene faces with 20–40 bold transverse-rugulose lines; culm septae concentrated proximally (below spikelet) _____ **E. interstincta**

Natural habitat and distribution.—*Eleocharis elegans* is common in wetlands across Central America, the West Indies, and South America. The northern limit of its continuous range extends to eastern Mexico (Villasenor & Espinosa-Garcia 2004), Cuba (Menapace 1993), and Puerto Rico (Acevedo-Rodriguez & Strong 2005). The straight-line (aerial) distance from the Hardee County site to northwestern Cuba is approximately 500 km.

The natural habitat of *Eleocharis elegans* in the Caribbean includes “wet areas . . . [in] forest edges and openings, river banks, stream edges, creek and river beds and roadside ditches” (Acevedo-Rodriguez & Strong 2005). This plant is frequent in the more tropical and humid parts of Mexico and the Caribbean. In Mexico, it is typically on (usually open) stream and riverbanks, marshes and wet meadows, and seeps and springs (AAR, pers. obs.). It also in more disturbed sites such as pastures (generally converted marshes) and artificially wet sites such as ditches, wet roadsides, and banks of reservoirs (typically dammed streams). This compares well with the habitat observed in Hardee County, Florida, although plants in this population are concentrated within the swamp forest and not in the open or disturbed roadside. The specimens observed here in 2017 (JRC, pers. obs.) were sprouting in the dried creek bed (immature specimens) and in the remaining pool of water from the wet season (mature specimens with mature achenes and inflorescences). No species associated with roadside habitats were found in the immediate areas near where *E. elegans* specimens were observed. Weedy species were observed closer towards the reconstructed bridge but only in terrestrial habitat. No infestations of Water Hyacinth (*Eichhornia crassipes* (Mart.) Solms) or Water Lettuce (*Pistia stratiotes* L.)—both common in ruderal habitats with slow moving or stagnant water in this area (JRC, pers. obs.)—were evident.

These observations encourage speculation that the local hydrological regime consisting of wet and dry seasons may be important for this species’ survival. The largest specimens occurred in the remaining pool of water from the previous wet season, and the seedlings were only observed sprouting from the soils most recently exposed in the creek bed.

Native or non-native?—Somewhat surprisingly, despite *Eleocharis* species commonly occurring in disturbance-tolerant natural habitats such as shorelines, seepages, and riverbanks and, more recently, along artificial roadside ditches, gravel pits, etc., the ranges of only four of the 67 species in the *Flora of North America* area are considered to be at least partially defined by introduced populations (Smith et al. 2002). A fifth southern species, *E. acutangula* (Roxburgh) Schultes subsp. *brevista* D.J. Rosen, however, has been recently reported (from Lee County) as a new introduction to Florida (Rosen et al. 2007).



Fig. 2. Clump of *Eleocharis elegans* (by observer) at Hardee County, Florida site (March 2017) (Photo: D.N. Campbell).

Villasenor and Espinosa-Garcia (1998) state that *Eleocharis elegans* is introduced within part of its Mexican range and attribute its occurrence in at least western Mexico to being human-assisted. Bryson and Carter (2008) also note it as a weed of disturbed wetlands and agricultural areas (rice-fields) in South America and on Pacific islands but of 53 *Eleocharis* species they consider to be ‘weedy’ globally, only nine (not including *E. elegans*) are reportedly known or suspected to be dispersed by humans.

That relatively high-quality natural habitat conditions have been sustained at the Hardee County site over an extended period of time (since at least the 1940s) is also implied by collections of *Isoetes flaccida* Shuttlew. (R. Garrett 190, 30 Mar 1942 (FLAS), and R. Garrett s.n., 16 Feb 1947 (FLAS)) from here. That species typically is not tolerant of substantial site disturbance and water quality degradation (Brunton 2015). Further, there is no evidence of activity by mechanical vehicles (road maintenance vehicles, ATV traffic, etc.) nor access by domestic stock (especially cattle) at the Hardee County site.

Although waterfowl are commonly identified as potential vectors for the natural, long-distance distribution of plant propagules in general (Figuerola & Green 2002; Garcia-Alvarez et al. 2015) and Cyperaceae in particular (Bryson and Carter 2008), the Hardee County site does not seem especially suitable for concentrations of these animals. There are no extensive beds of aquatic vegetation here nor other potential food sources evident that would attract waterfowl.

Eleocharis elegans is one of a series of more southern wetland taxa reported to have become established in Florida in recent years. The others are considered non-native introductions, most recently including the Old World *Cyperus richardii* Steudl. (Carter et al. 2016). Jacono (2001) notes the establishment and spread of *Scleria lacustris* C. Wright in Florida, previously known from wetlands as far north as Cuba. She describes its invasive behavior and notes an association with cattle pastures, as with a number of other introductions such as *E. acutangula* (Wunderlin et al. 2017) and *Hymenachne amplexicaulis* (Rudge) Nees (Poaceae).

Colette Jacono speculates (pers. comm., 24 Mar 2017) that the recent discovery of a relatively large number of such introductions may be related to the same migrational factors. These may represent “northward

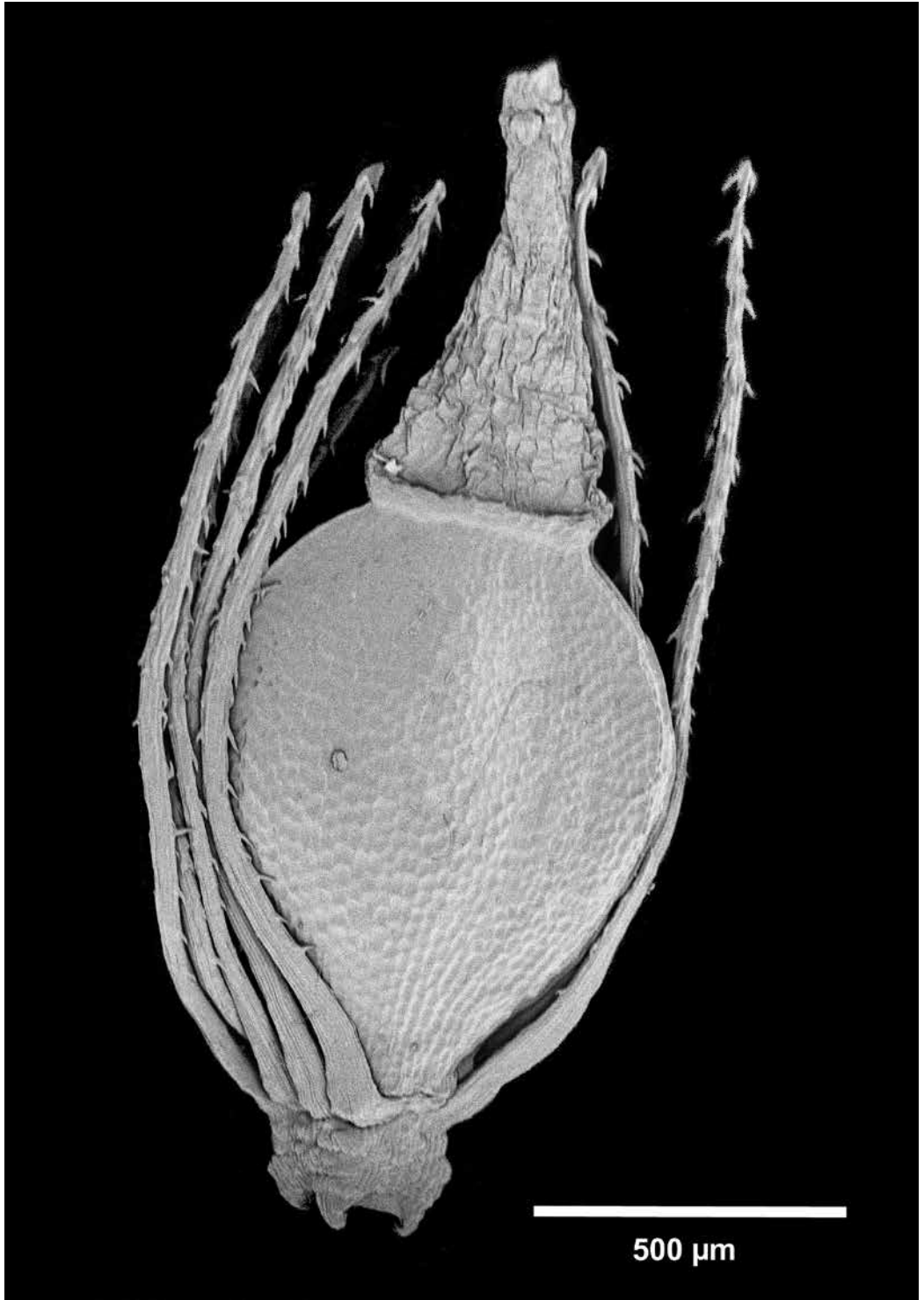


Fig. 3. SEM image of *Eleocharis elegans* achenes (Hardee County, Florida, D.F. Brunton & K.L. McIntosh 13,099) (Paul Sokoloff, Canadian Museum of Nature).

migration with climate change. Perhaps the environmental factors involved in changing climactic patterns paired with alterations in Florida hydrology are providing more favorable environments for neotropical species that have always been tossing their disseminules into the dispersal pathway and flyways from the Caribbean Basin, the northern region of South America, and parts of Central America.”

In their report over 25 years ago of the first occurrence of *Portulaca biloba* Urban in the southeastern United States, Matthews et al. (1991) presented a compelling argument for such storm dispersal. Severe major storms (in this case, tornados and over a much longer period of time) have also been proposed as a possible explanation for the occurrence of rare native granite outcrop species in small, widely dispersed areas of suitable habitat across the Piedmont Region of the southeastern United States (Brunton 2001).

There is insufficient evidence to categorically determine if *Eleocharis elegans* in Florida results from a natural long-distance dispersal event or if it was human-assisted. *Eleocharis*, however, is an only uncommonly introduced group of species, typically found to be weedy only in disturbed and/ or agricultural sites. While sustaining a healthy population in natural habitat at its Hardee County location for at least 20 years and producing an abundance of seed (all fruiting stems on the cited collections support only well-formed and seemingly viable achenes), *E. elegans* shows no sign of becoming weedy or invasive here.

On balance, it seems most likely that *Eleocharis elegans* is a recent natural arrival to the United States of Caribbean or Mexican origins, either incidentally carried as seed by waterfowl or more probably as propagules (seed, root fragments, entire plants) transported here by severe wind storms. Additional site investigations of natural swamp forest habitat in and around Hardee County would be beneficial for developing a better understanding of the regional distribution and abundance of this sedge. Further consideration of how climate change-associated events and changes to regional hydrology might influence the transport, establishment and maintenance of both native and non-native tropical organisms into Florida is warranted.

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