

Noteworthy Collections: First Record of the Non-native Plant *Portulaca amilis* (Portulacaceae) in Tennessee

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ABSTRACT

We report the first record of *Portulaca amilis* in Tennessee. A native of South America, *P. amilis* is a weedy plant that has been introduced to and naturalized in the southeastern United States. Previously this species has only been reported from the Atlantic Coastal Plain and Piedmont. This suggests a range expansion either west over the Appalachian Mountains from the Carolinas, or north from Georgia, Alabama, or Mississippi into the Ridge and Valley region of east Tennessee.

Key words: collections, flora, non-native, Tennessee, vascular plants

Portulaca amilis Speg. (Portulacaceae)

Knox County: Behind the Parking Services Building on University of Tennessee-Knoxville campus, off of Neyland Drive. Near abandoned railroad tracks running along the backside of soccer fields. Growing in sandy soil in an open, disturbed area near black top. Growing away from taller plants with 15–20 plants in the population. (N 35.946742° W -83.931401°) 2 October 2018, J.M. Budke #296 with N.H. Kingsley (TENN-V-0245398, TENN-V-0245399, TENN-V-0245400, duplicate specimen deposited at UNCC).

Significance: This is the first record of *Portulaca amilis* growing west of the Appalachian Mountains in east Tennessee. This species is listed as non-native and naturalized in six states along the southeast Atlantic coast and Piedmont (AL, FL, GA, SC, NC, VA; Matthews 2003; USDA, NRCS 2020). *Portulaca amilis* is thought to have been introduced in North Carolina around 1932, potentially resulting from a military exercise in South America (Matthews and Levins 1985). From North Carolina, *P. amilis* spread along the Coastal Plain, but recognition of the invasion was delayed due to specimens being misidentified as the Southeast native *P. pilosa* L. (Judd and Wunderlin 1981, Matthews and Levins 1985). In 1981, Judd and Wunderlin corrected the identification of specimens from FLAS and USF herbaria expanding the known range of *P. amilis* to include Florida, Georgia, and South Carolina. Since then, *P. amilis* has also been reported from Maryland, Virginia, Alabama, Mississippi, Louisiana, and Texas (Figure 1; iNaturalist 2020, SERNEC 2020). The westernmost states, in particular Texas and Louisiana, have relatively few observations, which may be due to its more recent introduction, under-collection, and/or misidentification. Thus, this species could be more widespread than these records indicate.

Native to the lower Amazon basin, including Brazil, Paraguay, Uruguay, and Argentina, *Portulaca amilis* (Paraguayan purslane) is a prostrate to suberect succulent annual (Judd and Wunderlin 1981). The succulent leaves are flattened-spathulate in shape with sharply pointed apices and are 5–30 mm long and 2–12 mm wide with dense trichomes at the nodes (Matthews 2003). *Portulaca amilis* thrives in disturbed areas with sandy, well-drained soil, including fields and granitic outcrops (Matthews 2003). Overall the plants can reach 5–25 cm in height and have reddish-purple flowers that can be 5–20 mm wide (Matthews 2003). Flowers bloom in late spring to early fall (Figure 2; Whitson 2010). While in the United States *P. amilis* is only known to have

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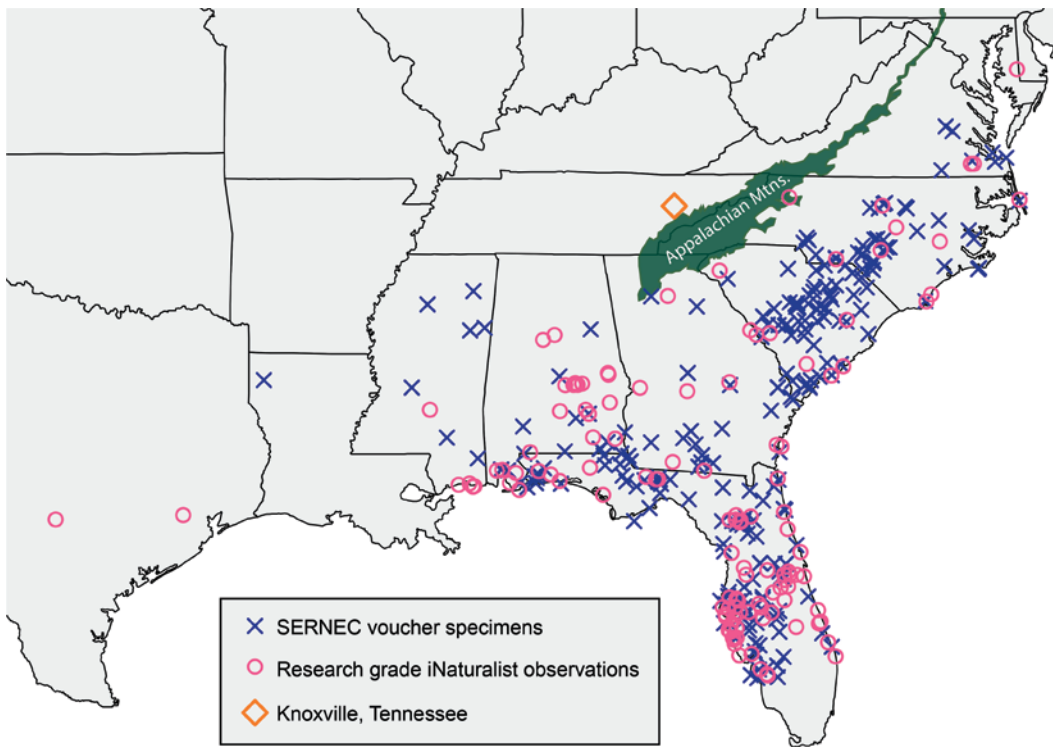


Figure 1. Localities of *Portulaca amilis* voucher specimens (SERNEC 2020) and research grade observations made through iNaturalist (2020) downloaded from the Global Biodiversity Information Facility (GBIF.org 2020) in the southeastern United States. The outline of the Appalachian Mountains was adapted from the Blue Ridge shapefile in Level III ecoregions of the continental United States (US EPA 2013). Map produced using RStudio (RStudio Team 2020) and Adobe Illustrator version 24.1.3.

reddish-purple petals, there are reports of yellow petals in its native range (Matthews and Levins 1985). The flowers open from several hours up to a full day in ideal conditions, and in suboptimal conditions may not open; flowers that do not open are reported to self-pollinate (Matthews and Levins 1985).

Historically, many specimens were misidentified as *Portulaca pilosa* (Judd and Wunderlin 1981) and some may still be misidentified. *Portulaca amilis* is most often confused with *P. grandiflora* Hook. and *P. pilosa*. These three species are annual plants that are prostrate to suberect with many conspicuous trichomes at the nodes and can have pink to purple petals (Matthews 2003, Weakley 2015). *Portulaca pilosa* is native to the southeastern United States, while *P. grandiflora* is an introduced non-native that is commonly sold and planted as an ornamental garden plant. These species can be distinguished by morphological differences in flower color and size, leaf shape and width, and seed color and size (Table 1). It has also been noted that immature plants of *P. pilosa* can exhibit wider, longer, and flatter leaves compared to mature individuals (Matthews 2003), making their immature leaf morphology more similar to *P. amilis*. Thus, caution should be taken when identifying young individuals. We re-examined the 55 *Portulaca* specimens collected in the United States and housed at the TENN herbarium and did not locate any current misidentifications. We have one *P. amilis* specimen from North Carolina that was historically misidentified as *P. pilosa*, but this specimen identification was updated via annotation by Matthews in 1984 (E.E. Terrell #2981, TENN-V-0092064).

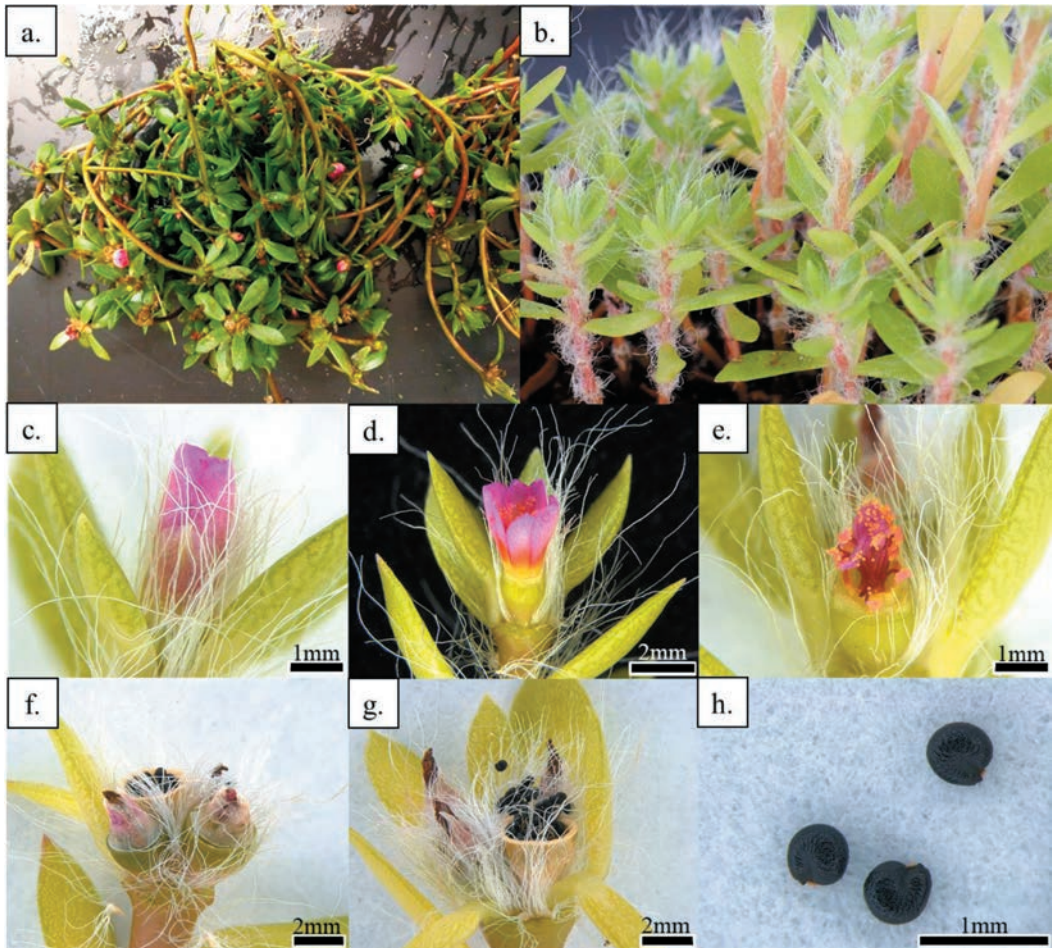


Figure 2. *Portulaca amilis* morphology. **a.** Field collected individuals with both mature flowers and fruits from the same collection site in Knox Co. as Budke #296. **b–h.** Plants grown in the greenhouse from seeds collected from voucher specimen Budke #296 (TENN-V-0245398). **b.** Stems with long trichomes in the leaf axils. **c.** Unopened flower with trichomes intact. **d.** Open flower with apical leaves and trichomes removed. **e.** An unopened flower with sepals/petals removed to reveal self-pollen adhering to the stigma. **f.** Two fruit capsules before dehiscence (front) and one dehiscent (rear). **g.** Fruit capsule after dehiscence filled with seeds. **h.** Individual seeds that are potentially the result of self-pollination.

We grew seeds from the Tennessee collections of *P. amilis* in the greenhouse as a secondary confirmation for our identification and to photograph fresh morphological features for illustration (Figure 2). The plants flowered in the greenhouse, however, the majority of flowers were not observed open. The flowers appear to have autonomously selfed and set seeds within the greenhouse in the absence of pollinators (Figure 2). The ability to produce self-pollinated seeds is a reproductive assurance strategy that may aid *P. amilis* in colonizing new areas, thereby expanding its range (Razanajatovo et al. 2016). Our findings suggest that *P. amilis* has the potential to spread and become established from a single seed.

Despite the production of viable seeds in the field, the population of *P. amilis* reported here appears not to have survived the winter in east Tennessee. We revisited the collection site several times over the year and a half following our initial collection and did not find any additional *P. amilis* individuals. This suggests that the naturalized range of *P. amilis* in the United States may

Table 1. Morphological differences between native and naturalized populations in the U.S. of three species of *Portulaca* (Matthews 2003, Weakley 2015).

	<i>Portulaca amilis</i>	<i>Portulaca grandiflora</i>	<i>Portulaca pilosa</i>
Petal Color & Flower Diameter	Petals pink to purple 5–20 mm	Petals pink, red, purple, yellow, bronze, or white 25–55 mm	Petals dark pink to purple 5–12 mm
Leaf Shape & Width	Flattened Obovate to Spatulate 2–12 mm	Terete to Hemispherical Linear to Lanceolate 1–5 mm	Terete to Hemispherical Linear to Lanceolate 1.5–3 mm
Seed Color & Diameter	Black 0.4–0.6 mm	Steel Gray 0.75–1.0 mm	Black 0.5–0.6 mm

be limited by seed survival over winter, rather than dispersal ability and appears to correspond with hardiness zones 7a or warmer (USDA Plant Hardiness Zone Map 2012). Thus, it may be prudent to watch for range expansion of this species as mean winter temperatures continue to rise due to climate change.

Given the fact that this species is widely naturalized across the Southeast, we recommend that botanists watch for additional populations of this species expanding into Arkansas, West Virginia, and further west into Tennessee. It may also be helpful to re-examine additional herbarium specimens of *Portulaca* that have not been reannotated since the early 1980s to check for misidentifications that may enhance our understanding of the historical distribution and spread of this non-native plant in the southeastern United States.

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