Phytotaxa 350 (1): 093–096
http://www.mapress.com/j/pt/

Correspondence

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

https://doi.org/10.11646/phytotaxa.350.1.11

A new combination in *Mononeuria* (Caryophyllaceae)

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The nomenclatural change *Mononeuria caroliniana comb. nov.* is proposed on the basis of molecular phylogenetic results analyzing the nuclear internal transcribed spacer.

Keywords: *Minuartia*, North America, taxonomy

Introduction

A recent molecular phylogenetic study of *Minuartia* Loefling in Linnaeus (1753: 89) *sensu* McNeill (1962) by Dillenberger & Kadereit (2014a) demonstrated that species formerly placed in *Minuartia* were members of 11 different lineages. The 33 North American species (north of Mexico; see Rabeler *et al.* 2005) are now part of *Cherleria* Linnaeus (1753: 425), *Mononeuria* Reichenbach (1841: 205), *Pseudocherleria* Dillenberger & Kadereit (2014b: 451), and *Sabulina* Reichenbach (1832: XXIV). The results by Dillenberger & Kadereit (2014a) was later accepted by several authors (e.g., Iamonico 2014, Hernández-Ledesma *et al.* 2015, Fedoronchuk & Mosyakin 2016, Iamonico 2016, Moore & Dillenberger 2017).

Mononeuria was first published by Reichenbach (1841: 118) as a generic synonym to *Alsine* unranked *Uninerviae* Fenzl in Endlicher (1840: 965). Dillenberger & Kadereit (2014a) included all of the species of *Minuartia* sect. *Uninerviae* (Fenzl in Endlicher 1840: 965) Mattfeld (1921: 28) in *Mononeuria*, based on McNeill (1962). To confirm the placement and position of all North American species thought to belong to the genus *Sabulina*, we sequenced several taxa not included in Dillenberger & Kadereit (2014a) and found an unexpected placement of *Sabulina caroliniana* (Walter 1788: 141) Small (1933: 1504) in *Mononeuria*.

Material & Methods

Nuclear internal transcribed spacer of two individuals of *Sabulina caroliniana* and one individual of *Mononeuria nuttallii* (Torrey & A. Gray 1838: 183) Dillenberger & Kadereit (2014a: 84) were sequenced according to the methods described by Legler & Dillenberger (2017). Material was obtained from three specimens at OSC, i.e. *S. caroliniana* Sab34: USA. Georgia: Richmond County, 08 May 1992, *Moore 1464* (OSC 181464, isovouchers at CM, GA), *M. nuttallii* Sab51: USA. Texas: Brazos County, 08 April 1992, *Wipff & Jones 2244* (OSC 203770, isovoucher at UTEP), and *S. caroliniana* Sab52: USA. North Carolina: Richmond County, 05 May 1967, *Bozeman & Logue 9124* (OSC 127623, isovouchers at CONV, CUH, DSC, FUGR, HTTU, KE, MISS, MUR, NBYC, NCU, PEMB, UBC, UNCC, USCH, USMS, VSC). The new sequences were included in a larger dataset of previously published sequences representing the entire Caryophyllaceae (128 samples and three outgroup samples; modified data set of Dillenberger & Kadereit 2014a, see TreeBASE to download the alignment). Sequences were aligned with MUSCLE v.3.8.31 (Edgar 2004) implemented in seaview v.4.3.0 (Gouy *et al.* 2010). Phylogenetic analysis was carried out using RAxML v.8.0.26 (Stamatakis *et al.* 2008) with the GTR+Γ substitution model and the fast bootstrap algorithm with automatic halt based on the autoMRE criterion. Sequences were submitted to GenBank (MG839540–MG839542); alignment and phylogenetic tree can be downloaded from TreeBASE (http://purl.org/phylo/treebase/phylows/study/TB2:S22236).

Isovouchers were located via consulting SEINet (http://swbiodiversity.org/seinet/) and type images were examined via JSTOR Plants (plants.jstor.org). Herbarium codes follow Thiers (2018+).

Accepted by Duilio Iamonico: 24 Apr. 2018; published: 17 May 2018

Results

The samples of *Sabulina caroliniana* are nested with high bootstrap support within *Mononeuria* (Fig. 1) being well-supported as sister to *M. groenlandica* (Retzius 1795: 107) Dillenberger & Kadereit (2014a: 84). The phylogeny unambiguously shows that *S. caroliniana* is not a member of *Sabulina* (Fig. 1).

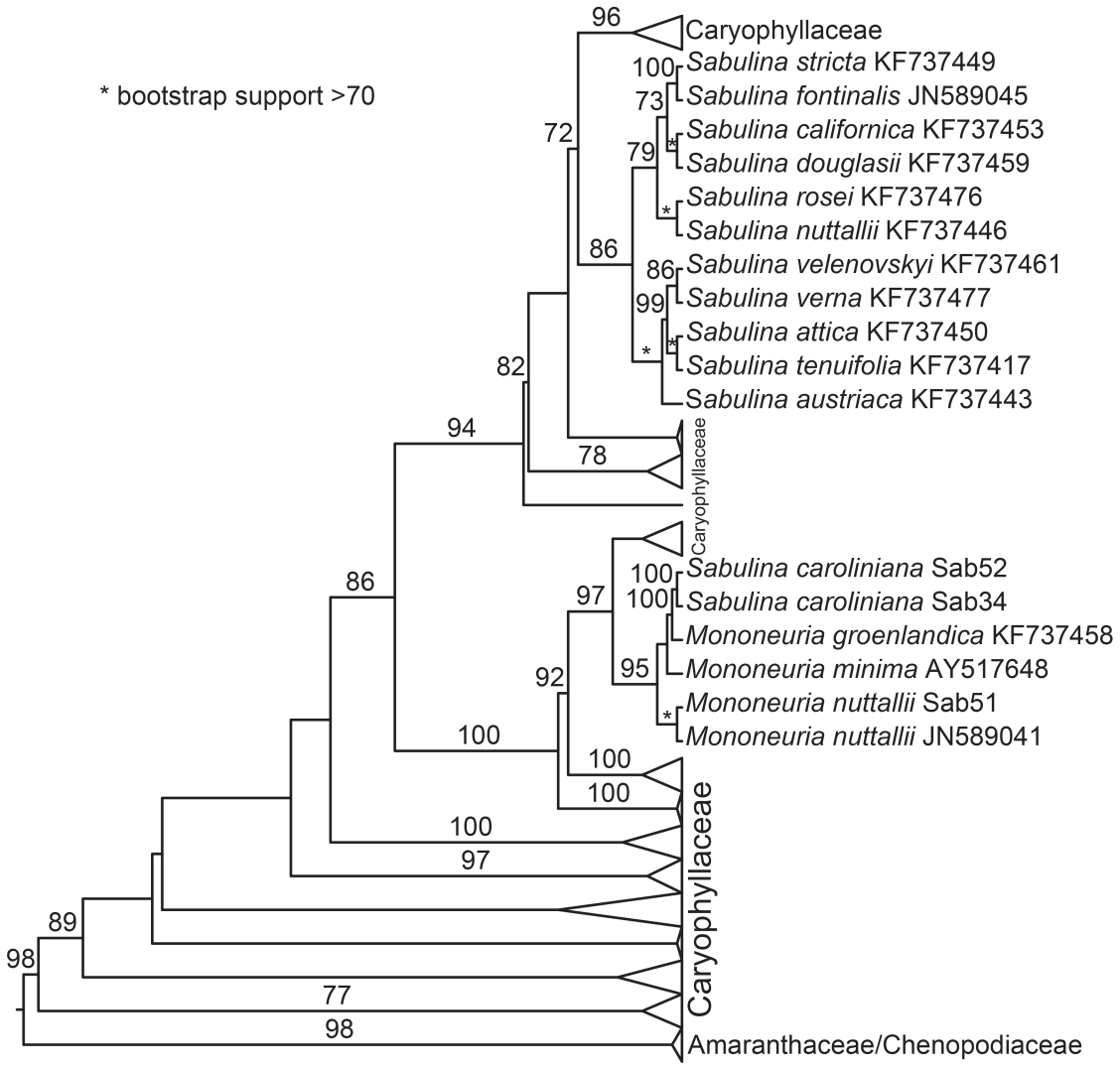

FIGURE 1. Maximum likelihood tree obtained with RAxML. All clades collapsed except for *Mononeuria* and *Sabulina*. Bootstrap support values above branches only shown if ≥70.

Discussion

Sabulina caroliniana had usually been considered unrelated to any of the species now placed in *Mononeuria*. Mattfeld (1922) recognized *S. caroliniana* in sect. *Sclerophylla* Mattf. (1922: 22), where he placed each of the three species into its own series, recognizing the heterogeneous nature of the section. Small (1933) proposed to transfer *S. caroliniana* to *Sabulina* along with the five members of sect. *Uninerviae* known at that time, but segregating *S. caroliniana* and *S. stricta* (Michaux 1803: 274) Small ex Rydberg (1932: 320) from the others in an unranked group based on leaves being linear-subulate in those species. Weber (1989) published the new genus *Minuopsis* Weber (1989: 426), based on Mattfeld's sect. *Sclerophylla*. Fig. 1 shows that the three members of Mattfeld's section (and later Weber's genus), i.e. *Sabulina stricta*, *Sabulina nuttallii*, and *Sabulina caroliniana*, although all perennials with woody taproots, are not closely related.

Mononeuria caroliniana is found along the coastal plain of eastern North America, occupying sandy areas and oak or pine woodlands from New York south to Florida. It is most closely related to *Mononeuria groenlandica*, a mat-forming perennial ranging from Tennessee north to Greenland (and one isolated report in Brazil); in the southeastern United States, it is found on granite outcrops at higher elevations (Rabeler *et al.* 2005).

Taxonomic Treatment

Mononeuria caroliniana (Walter) Dillenb. & Rabeler, *comb. nov.*

Basionym:—*Arenaria caroliniana* Walter (1788: 141).

≡ *Minuartia caroliniana* (Walter) Mattf. (1921: 28) ≡ *Sabulina caroliniana* (Walter) Small (1933: 1504).

Neotype (designated by Ward 2007):—USA. Georgia: Tattnall County, 3 mi W of Reidsville, 03 April 1948, *A. J. Cronquist 4932* (GH *non vidi*, isoneotypes, FLAS51686!, MO *non vidi*, NY01185415!, PH00090974!, US00955677!).

Acknowledgements

We would like to thank Melanie Link-Perez (OSC) for providing herbarium material.

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