

**ON *SOLIDAGO BARTRAMIANA*, *S. BRENDAE*, AND *S. CANADENSIS*
(ASTERACEAE: ASTEREAE)**

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ABSTRACT

Solidago bartramiana Fernald is conspecific with *S. brendae* Semple and has priority. The original collection of *S. bartramiana* from central Newfoundland is a very short gracile member of the *S. canadensis* complex while the original collections of *S. brendae* are large robust plants from the northern Gaspé Peninsula in Québec.

Solidago bartramiana Fernald (1915) was first described from a collection of small plants from Grand Falls, Newfoundland.

Ledges and talus on the north bank of the Exploits River below the falls, 22 Jul 1911, *Fernald & Wiegand* 6303 (holotype: GH! [Figs. 1-2]; isotypes: CAN!, GH!, MT! [Figs. 3-4], NY!, PH! via SERNEC 2023).

The species was included in Fernald (1950) and Rouleau & Lamoureux (1992), but not in Scoggan (1979). The MT isotype of *S. bartramiana* was first examined in 1987 by this author and annotated as "*Solidago canadensis* (n=9) × *S. uliginosa* (n=9) / It does not appear to be "pure" *canadensis* / Both species occur in region." Based on this identification of the MT isotype, Semple & Cook (2006) treated Fernald's taxon as *Solidago* × *bartramiana* Fernald and considered it to be a hybrid between *S. canadensis* and *S. uliginosa*, noting that its "growth form and array are more like those of the latter."

Semple (2013) published a new species, *Solidago brendae* Semple (Fig. 5), based on mostly robust collections from Québec and western Newfoundland and the results of a multivariate morphometric study by Semple et al. (2013) that included specimens of *S. brendae*, *S. canadensis* L., *S. elongata* Nutt., *S. fallax* (Fern.) Semple, and *S. lepida* DC., but not *S. bartramiana*. Erroneously, Semple (2013) stated that Fernald had not published a new taxon in the *S. canadensis*-*S. lepida* complex based on collections that Fernald had made in Newfoundland, but Fernald (1915) did in fact do that when he published *S. bartramiana*. The error was in treating *S. bartramiana* as *S. ×bartamiana* and thus excluding it as a valid species in the *S. canadensis*-*S. lepida* complex. Semple & Chmielewski (2022) excluded Newfoundland from the range of *S. canadensis*. Based on recent re-examination of the holotype and isotype collections, *S. bartramiana* Fern. is now accepted as a valid species and a name with nomenclatural priority over *S. brendae*. The reasons why and implications of this nomenclatural change for Brenda's Goldenrod are presented below.

Morphology

The morphological limits of *Solidago brendae* were significantly expanded after 2013 and particularly during the examination of the cytovouchers of all the M. Melville collections from Ontario in WAT and all the J.K. Morton collections from Ontario, Quebec and Newfoundland in TRT that were listed in Semple and Chmielewski (2022; Appendix 2). In 1987 I considered the MT isotype of *Solidago bartramiana* to be a hybrid due to the short stature of the shoots, the nearly toothless stem leaves with relatively weakly pronounced lateral veins, and the open inflorescence (left shoot) with ascending branches, which is not normal in *S. canadensis*. The inflorescence of the left shoot on the holotype in GH is similar. In the last three years I have seen a much larger number of specimens of *S. brendae*, including some with rather short stems and small stem leaves with small or

no serrations. I have also seen a range of inflorescence sizes and branching patterns that are similar to the inflorescence of the left shoot on the MT isotype of *Solidago bartramiana*. What I interpreted as a leafy inflorescence of a hybrid, I now view as a small inflorescence of a very small plant (ca. 37 cm tall) of *S. brendae*, which the protologue listed as 60–100–162 cm in height. The traits of the MT isotype of *Solidago bartramiana* fit into the modified range of traits of *S. brendae*, and this means that *S. bartramiana* and *S. brendae* are names for the same species, with the type collections of the two representing the extremes in stem height and robustness of the inflorescence. The name *S. bartramiana* has priority and *S. brendae* belongs in synonymy.

Fernald (1915) described *Solidago bartramiana* as having involucre “2.5-3 mm. high, their few narrowly linear thin green phyllaries in only 1-2 series.” Semple (2013) described *S. brendae* as having involucre (2–)2.6–3.2–3.8(–6) mm high and phyllaries in “3–4 series, deltate-lanceolate to linearly oblong, unequal (outer 1/4 – 1/3 length of inner).” Phyllaries in all species of *Solidago* are really arranged in a spiral around the involucre with the shortest being the outer most and the longest being the innermost. It is arbitrary to divide the spiral into distinct series. In some species, the phyllaries grade into peduncle bracts below and in other species peduncle bracts are either absent or few in number and arise well below the involucre. Outer phyllaries in most species are much shorter compared to inner phyllaries and in a few the outer phyllaries are three quarters or more the length of the involucre (e.g. *S. multiradiata*). Figure 2E shows six involucre of the holotype of *S. bartramiana*; the phyllaries grade from short outer ones to long inner ones and can only arbitrarily be divided into 1-2 or 3-4 series.

Cytology

Beaudry (1970) published a diploid report of $2n=18$ under the new combination *Solidago canadensis* var. *bartramiana* (Fernald) Beaudry, based on a collection (*Beck 60-209-5* MT) from Grand Falls, Newfoundland, and cultivated in Montréal, Québec. Beaudry (1970) reported that he had successfully crossed the cultivated var. *bartramiana* plants with *S. canadensis* and had obtained fertile F1 plants that he used in backcrosses to both parental taxa. The Beck collection was included in a loan to J.K. Morton from MT, which was not seen by me until August 2023, while preparing the long-held loan for return to MT. The Beaudry count is thus the first report of *S. bartramiana*, but was not cited as such in the cytogeography review of *Solidago* ser. *Canadenses* by Semple and Chmielewski (2022), which did not include *S. bartramiana* or *S. ×bartramiana*.

The cytogeography map for *Solidago brendae* in Semple & Chmielewski (2022) includes 70 chromosome count reports for the species and a dot symbol for a single diploid count from Newfoundland (Grand Falls), but there is no voucher listed for the count in Appendix 2. The master CorelDraw graphic file from which the cytogeography map data were generated includes hidden data on the cytovouchers indicating that the Newfoundland collection was *J. Beck s.n.* MT, which Beaudry (1970) used to obtain his diploid chromosome count reported under *S. canadensis* var. *bartramiana*. I updated my *S. brendae* cytogeography map to include Beaudry’s report after the raw data file including specimen information on approximately 20,000 *Solidago* collections had been searched for *S. brendae*. The *J. Beck s.n.* collection had been entered into the database originally from the literature using Beaudry’s name (*S. canadensis* var. *bartramiana*), and then this was changed to *S. ×bartramiana* following Semple & Cook (2006), with the result that the collection was not found when searching for *S. brendae* and was not included in Appendix 2 of Semple & Chmielewski (2022). A second collection, *Morton & Venn NA12258* WAT, is a diploid cytovoucher ($2n=18 + 3$ Bs) also from Grand Falls, Newfoundland, but was not included in Semple & Chmielewski (2022) because it was listed in my collections data file under the name *S. ×bartramiana* in 2013. Morton had originally labeled the collection as *S. bartramiana* in 1979 and sometime later added in ink “canadensis aff. var.” I had annotated it as *S. lepida* var. *fallax* in 2012 and in pencil above the original collection label “? can × ulig” likely in 2012. Re-examination of the collection in 2023

resulted in its identification being changed to *S. brendae* first and then to *S. bartramiana* recently. The nomenclatural conclusion that *S. brendae* is a later synonym of *S. bartramiana* means that the cytogeography map for *S. brendae* in Semple & Chmielewski (2022; Fig. 1) is now the cytogeography map for *S. bartramiana*.

Experimental crossings

Beaudry (1970) concluded that the ability to cross his cultivated plants of *Solidago bartramiana* with *S. canadensis* meant that the two parent plants belonged in the same species. However, the ability to form hybrids should not be used dogmatically to set species limits in *Solidago*. Semple (2016) documented a naturally occurring *Solidago brendae* × *S. bicolor* L. hybrid from Nova Scotia and (2020) a wild *S. brendae* × *S. sempervirens* L. hybrid from Québec. No one is going to rationally propose the merger of *S. bicolor* or *S. sempervirens* into *S. canadensis* based on the ability of these very distinct species in different subgenera or sections to form viable hybrids. The nomenclatural conclusion that *S. brendae* is a later synonym of *S. bartramiana* means the *S. bartramiana* × *S. bicolor* and *S. bartramiana* × *S. sempervirens* are the correct labels for these two documented cases of interspecific hybridization.

Phylogenetics

Semple et al. (2023) included a single specimen of *Solidago brendae* (Semple 11434 WAT from the Gaspé Peninsula, Québec) in their polygenomic phylogeny of 77 diploid species of *Solidago*. The correct identification of the Semple 11434 WAT specimen is here changed to *S. bartramiana*. In Fig. 3 (3rd portion of the figure in Semple et al. 2023) the specimen of *S. bartramiana* (*S. brendae*) is the sister clade to one including just *S. canadensis* var. *canadensis* and *S. fallax* var. *molina*. This three taxon clade was sister to a clade with two specimens of *S. canadensis* var. *hargerii*. The four taxon clade was sister to a clade with three samples of *S. lepida* from the Northwest Territories, Canada. This five taxon clade was sister to a clade with two samples of *S. altissima* var. *gilvocanescens*. This six species clade was sister to a clade including a specimen of *S. lepida* var. *salebrosa* from Montana and four specimens of *S. elongata*. All six species were included in *Solidago* ser. *Canadenses* Semple & Beck (Semple & Beck 2021). *Solidago bartramiana* was not included in Semple & Beck (2021) but can now be added to ser. *Canadenses*, replacing *S. brendae*.

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Figure 1. Holotype of *Solidago bartramiana*, Fernald & Wiegand 6303 (GH).



Figure 2. Details of the morphology of the holotype of *Solidago bartramiana*, Fernald & Wiegand 6303 (GH). **A-B.** Lower and mid stems. **C.** Mid stem leaf. **D.** Inflorescence and upper stem leaves. **E.** Heads. Scale bar = 1 mm in A-B, E; = 1 cm in C-D.



Figure 3. Holotype of *Solidago bartramiana*, Fernald & Wiegand 6303 (MT).



Figure 4. Details of the morphology of the isotype of *Solidago bartramiana*, Fernald & Wiegand 6303 (MT). **A.** Rootstock and lower stems. **B.** Lower stem. **C.** Mid stem leaf with small serrations and slightly pronounced pair of lateral veins. Scale bar = 1 mm in B; = 1 cm in A and C.



Figure 5. Large shoots of *Solidago bartramiana*, Semple & B. Semple 11435 (WAT), from Marsoui, northern Gaspé Peninsula, Québec, labeled and annotated as varieties of *S. lepida* in 2012 and included in *S. brendae* in 2013 (Semple 2013).