

THE TYPIFICATION AND TAXONOMIC STATUS OF *SPARTINA CAESPITOSA* A. A. EATON

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In 1898 Alvah Augustus Eaton described a new species of *Spartina* growing in the salt marshes of New Hampshire and Massachusetts (Eaton, 1898). It was similar to *Spartina patens* (Ait.) Muhl. but somewhat larger and with a distinctive caespitose growth habit, thus its name *Spartina caespitosa* A. A. Eaton. He had discovered it two years earlier as stated in his original text:

“On August 26, 1896 while collecting the peculiar large form of *Spartina patens* growing on the border of the salt marsh at Seabrook, N.H. I noticed a taller, more slender plant growing in a clump of bushes.” (Eaton, 1898, pg. 338)

A recent assessment of the taxonomy of this species for the Flora of New Hampshire Project revealed a problem with the typification of *Spartina caespitosa*. While examining the supposed type specimen at the Gray Herbarium the senior author noted that it was collected from Seabrook, N.H. on September 29, 1896, rather than August 26, as described by Eaton. This supposed type has “TYPE” stamped on it, but there is no evidence from the label data that Eaton regarded it as the type specimen (Fig. 1A). The specimen was stamped “TYPE” by a member of the Gray Herbarium staff at some later date during a period in which all the type specimens in the herbarium were being located. The discrepancy between the published date and the date on the supposed type has apparently gone unnoticed until now.

In an effort to resolve the confusion an attempt was made to locate all of Eaton's specimens of *Spartina caespitosa* in hopes that the true type specimen would be found.² A total of 17 specimens of

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²Specimens were sought from NEBC, NHA, HNH, MASS, and CONN and from those listed in *Index Herbariorum: Part II., Collectors* (Lanjouw & Stafleu, 1957) as having specimens of A. A. Eaton: BUF, COCO, GH, NY, and US. *Index Herbariorum* also lists MANCH as having A. A. Eaton specimens but upon inquiry it was found they do not. There appears to have been some confusion between MANCH (Manchester Museum, Manchester, England) and the Institute of Arts and Science, Manchester, N.H., U.S.A. which did have A. A. Eaton specimens. These specimens are now in the Hodgdon Herbarium of the University of New Hampshire (NHA).

S. caespitosa collected by Eaton were located. No specimen could be found which agreed completely with the collection site or date published in the original description.

The only specimen (*Eaton 501*, NEBC) collected on August 26, 1896, agrees well with Eaton's original description and has "TYPE SPECIMEN" printed on the label (Fig. 1B). But hand written on the label is: "First collection, one root in Hampton Falls, N.H." The original description however, states that it was first collected in Seabrook, N.H., on this date.

The earliest collection from Seabrook, N.H. (*Eaton 505*, US), was on August 27, 1896, one day after the date cited by Eaton as the original collection of *Spartina caespitosa* (Fig. 1C). Eaton (1898) does state that he made an extended search of this area on August 27, the day after the original discovery. This specimen has two culms, one of which is the typical *S. caespitosa* Eaton described, but the other does not fit his original description. The date of this specimen was misinterpreted by Merrill (1902) as 1891. Eaton apparently did not collect specimens from Seabrook, N.H., again until September of 1896.

The fact that the Hampton Falls specimen (*Eaton 501*, NEBC) collected on Aug. 26, 1896, has "TYPE SPECIMEN" printed on the label would seem to suggest that Eaton regarded this as a type specimen regardless of the location and date published with the original description. However, the matter is further complicated as Eaton also had "TYPE SPECIMEN" printed on the label of a specimen (*Eaton 898*, NY) of *Spartina caespitosa* collected from Salisbury, Mass. in October, 1896 (Fig. 1D). It is clear that Eaton held a broad type concept. It is also possible that "TYPE SPECIMEN" may have meant "typical" (R. Tryon, personal communication, 1978).

A critical analysis of all of Eaton's specimens reveals that his original description does not refer to any one specimen but is based on all the specimens he had collected up to that time. In light of this and the subsequent confusion over the actual type specimen a lectotype must be designated.

Research into the early land records and field studies of the Hampton Falls-Seabrook salt marshes provided valuable insight into the discrepancy between the published account of the original collection of *Spartina caespitosa* and the label data on Eaton's specimens. It appears that Eaton first collected *S. caespitosa* in the

upper edges of the salt marsh surrounding Brown's Creek. This creek forms the boundary between Hampton Falls and Seabrook, N.H. Field studies revealed that *S. caespitosa* occurs on both sides of the creek. In view of this there is apparently little difference between the Seabrook and Hampton Falls sites. Thus the one specimen Eaton collected on August 26, 1896 (*Eaton 501*, NEBC), which agrees well with the original description and has "TYPE SPECIMEN" printed on the label, is here designated the lectotype for *Spartina caespitosa* A. A. Eaton (Fig. 1B).

Since Eaton's original description of *Spartina caespitosa* its taxonomic status has been the center of much controversy. Merrill (1902), in the first monograph on North American *Spartinas*, felt it looked sufficiently like *Spartina juncea* (Michx.) Willd. (= *S. patens* (Ait.) Muhl. var. *monogyna* (M. A. Curtis) Fern.) to place it in that taxon. Hitchcock (1906; 1935, pg. 493) relegated it to varietal status under *S. patens* (*S. patens* var. *caespitosa* (A. A. Eaton) Hitchc.) while stating: "An ambiguous form resembling *S. patens* but growing in large tufts without rhizomes." Robinson and Fernald (1908) and Blomquist (1948, pg. 109) used Hitchcock's treatment, the latter stating it "... should perhaps be considered an ecological form rather than a distinct entity". Swallen (1939) and Chase (*in* Hitchcock, 1950) on the other hand treat it as a distinct species.

Church (1940), on the basis of cytological studies, was the first to suggest that *Spartina caespitosa* was of hybrid origin. He felt it arose from a cross between the hexaploid segment of the *S. patens* complex and the hexaploid *S. pectinata* Link. Recent studies by Reeder and Singh (1971), Marchant (1968, 1970) and Gould (1968) have shown that *S. patens* is not a polyploid and that this species, *S. pectinata*, and *S. caespitosa* all have a chromosome count of $2n = 40$.

Fernald (1950), apparently noticing the similarities between *Spartina caespitosa* and its putative parents, *S. patens* and *S. pectinata*, was the first to give it hybrid status ($\times$ *S. caespitosa* (A. A. Eaton) Fern.).

Marchant (1970), studying the cytology and breeding behavior of *Spartina caespitosa* and its putative parents, found that all three exhibited regular meiotic pairing and high pollen stainability. He went on to state that regular meiotic pairing is by no means unique in interspecific hybrids. In crossing experiments between *S. patens* and *S. pectinata* he was able to produce plants similar to *S.*

caespitosa. However, during these experiments he found that self-pollination can take place in this protandrous grass genus, causing him some uncertainty about the results. Marchant (1970, pg. 188) concludes:

“... it is clear that *S. × caespitosa* is by no means unique in its almost regular cytological behavior and fertility but at the same time the data give only small support for a hybrid origin. Indeed the taxon behaves as a discrete species in many characteristics.”

Among the most convincing evidence for the hybrid origin of *Spartina caespitosa* is Mobberly's (1956) hybrid index, based on twenty different morphological characteristics discernible from herbarium specimens. The distribution of the hybrid index scores generated showed *S. caespitosa* to be distinctly intermediate between *S. patens* and *S. pectinata*. In contrast, we found from a preliminary analysis of the readily distinguishable characteristics of *S. caespitosa* and its putative parents that *S. caespitosa* does not exhibit morphological characteristics distinctly intermediate between *S. patens* and *S. pectinata*. Instead there is a gradation in morphological characteristics from the smaller *S. patens* to the slightly larger *S. caespitosa* and finally to the large *S. pectinata*. The differences between *S. caespitosa* and *S. patens* are, at times, very difficult to perceive.

The most distinct characteristics of *Spartina caespitosa* are its caespitose habit and the fact that it does not produce elongate rhizomes. However, an examination of over 50 specimens of *S. caespitosa* from throughout its range revealed that some plants do in fact produce elongate rhizomes. As Hitchcock (1935) noted, those in the southern portion of the range (Chesapeake Beach, Md., and Virginia Beach, Va.) commonly produce elongated rhizomes, but these rhizomes are thick and more closely resemble those of *S. pectinata* than *S. patens*. In addition the floral morphology of the *S. caespitosa* plants at the southern end of the range differs somewhat from the northern plants in having more spikelets per spike, smaller first glumes, and more acuninate second glumes. One possible explanation for this difference between the northern and southern forms is that the plants exhibit different morphological characteristics depending on which putative parent was the female. Dore and Marchant (1968) observed this type of variability in *S. caespitosa* populations growing in Charlottetown, P.E.I., Canada.

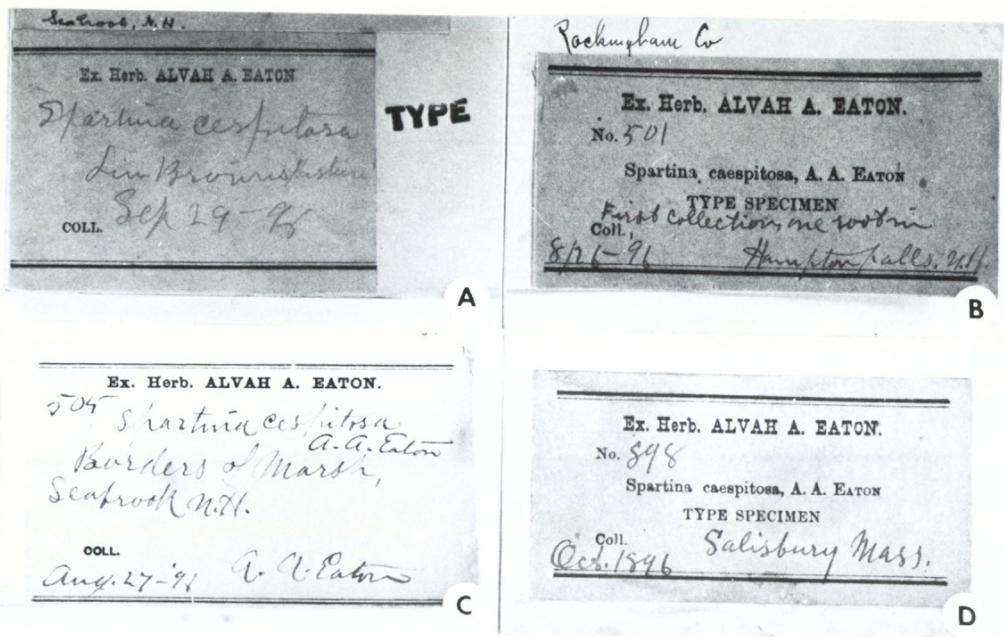


Figure 1. Labels from original collections of *Spartina caespitosa* by A. A. Eaton. A. Specimen in Gray Herbarium which was previously considered the "TYPE" specimen (GH). B. Earliest collection of this species, dated August 26, 1896 (NEBC). C. Earliest collection from Seabrook, N.H., dated August 27, 1896 (US). D. A specimen from Salisbury, Mass., which also has "TYPE SPECIMEN" on the label (NY).

The caespitose habit, therefore, appears to be the one characteristic which holds *Spartina caespitosa* apart from both *S. patens* and *S. pectinata*. But herbarium specimens and field studies revealed a number of plants with the morphological characteristics of *S. patens* which exhibited a tall caespitose habit. Indeed, some of the herbarium specimens had been incorrectly determined as *S. caespitosa*. It is interesting to note that many of the *S. patens* specimens from the southern states, especially Florida, Mississippi, and Louisiana, have short, clustered, developing shoot tips and a caespitose habit characteristic of *S. caespitosa*. Also occurring in the southern United States is *Spartina bakeri* Merr., which is separated from *S. patens* solely by the fact that it has a taller caespitose habit and grows in both fresh and brackish marshes. As Mobberly (1956) stated, it is extremely difficult to separate herbarium specimens of this species from *S. patens* unless the particular habit has been noted on the label. This species, like all the other *Spartinas* in this complex, has a chromosome count of $2n = 40$ (Marchant, 1968). A subsequent examination of the morphology of *S. bakeri* revealed that except for the caespitose habit it was more closely aligned with *S. patens* than *S. caespitosa*.

SUMMARY

While providing few answers this study has produced a number of new insights into the taxonomy of *Spartina caespitosa*. An analysis of herbarium specimens of *S. caespitosa* and its putative parents, *S. patens* and *S. pectinata*, from throughout their ranges revealed that the morphological criteria used to distinguish *S. caespitosa* are not as clear cut as previously described. The current taxonomic treatment of *S. caespitosa* appears unsatisfactory. A more complete analysis of the chemistry, morphology, cytology, ecology, and taxonomy of *S. caespitosa*, its putative parents and such related species as *S. bakeri*, needs to be done in order to obtain a better understanding of this entire complex.

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