A harried past for a glabrous lettuce:

Resurrection of *Lactuca sanguinea* Bigelow (Cichorieae), the wood lettuce from Nantucket Island, Massachusetts, USA

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DOI: http://dx.doi.org/10.53875/capitulum.02.2.05

ABSTRACT

We resurrect from synonymy *Lactuca sanguinea* based on morphological analysis of herbarium specimens and field observations. We report recent populations of *Lactuca sanguinea* occurring in several locations across Nantucket Island in Massachusetts, USA, and provide the first collections in over fifty years within the state. The species consistently has predominantly dark purple-red stems and leaves and crimson corollas, which together with its glabrous nature sets it apart from *Lactuca hirsuta*. We designate a lectotype, present an expanded morphological description and taxonomic history for the species and provide line drawings and images.

Keywords: Asteraceae, collections, Compositae, herbarium, synonym, taxonomy.

INTRODUCTION

In the second edition of *Florula Bostoniensis*, Bigelow (1824) described a new lettuce species, *Lactuca sanguinea* Bigelow (Cichorieae). Following its publication, this taxon has taken a somewhat tortuous journey from a distinct species to being currently synonymized under *L. hirsuta* Muhl. ex Nutt., the tall hairy lettuce (e.g., Strother, 2006; Haines 2011; Weakley 2022).

Recently, while conducting fieldwork on Nantucket Island, Massachusetts, USA, we came across a dark, purple-red, mostly glabrous lettuce mainly in the sandplain grasslands and open heathlands in the southern and western outwash plain areas of the island. These habitats are characterized by sandy soils and little to no shade cover with high salt spray and wind influence. We consider this entity to be Bigelow's *L. sanguinea*. In the summer of 2018, we traveled to Nantucket Island to collect samples for genetic and morphological work and to increase herbarium collections. We found *L. sanguinea* growing in five locations each consisting of over twenty individuals. Additional plants have been found at Head of the Plains and documented with vouchers and with iNaturalist records (2021-2022).

Interestingly, *Lactuca hirsuta* and *Lactuca sanguinea* (treated as *L. hirsuta* var. *sanguinea* [Bigelow] Fernald) are considered rare, endangered, or watch-listed across many parts of their ranges, which occupy the eastern United States and Canada, west to Texas, north to Ontario, south to Georgia, and east to

Prince Edward Island (Lebeda et al. 2019; Strother 2006). Our objectives in this contribution are to resurrect *L. sanguinea* as a distinct entity, to present an account of its taxonomic history, description and illustration.

MATERIALS AND METHODS

We studied herbarium material conserved at CONN, GH, MEM, MT, NHA, NMMA, NY (acronyms according to Thiers, 2023), and analyzed type material and protologues of closely related and morphologically similar species *Lactuca hirsuta* (Nuttall, 1818). Fieldwork was conducted to obtain information on habitat and morphological features usually lost in dried specimens and not present in descriptions, such as plant architecture, involucre shape, and stems, leaves and corolla color.

We photographed plants in their habitat, with details of various morphological parts. The illustrations were prepared based on herbarium material, using a camera lucida attached to a Wild M5 stereoscope, and later edited digitally in Adobe Illustrator and Photoshop. Geographic distribution was obtained from herbarium material and recently collected specimens.

TAXONOMIC HISTORY

According to the preface of the second edition of Florula Bostoniensis (Bigelow, 1824), the first edition mainly contained plant species near the Boston area (Massachusetts), but in the second edition Bigelow indicated he had included, "all such plants I have formerly collected and described in any part of the New-England states." Therein, Bigelow described a new lettuce species, *Lactuca sanguinea,* as having a smooth stem of dark, reddish-purple color, leaves glaucous underneath with the midrib hairy, calyx [involucre] dark purple, and ligulate corollas crimson. He listed the habitat as dry woods, flowering from July to August (Bigelow, 1824, page 287).

Torrey and Gray (1843) synonymized *Lactuca sanguinea* with *L. hirsuta* and treated them as a as a variety of *L. elongata* Muhl. ex Willd. (i.e., *Lactuca elongata var. sanguinea* (Bigelow) Torr. & A.Gray), noting the leaves mostly hirsute-pubescent (as well as the stems) throughout or on the midrib. They described the corollas as yellow-purple, dark-red with a yellowish center, saffron-color, or purple. Interestingly they mention branches and involucres often also purplish.

Nearly a century later, in Noteworthy Plants of Southeastern Virginia, Fernald (1938) gave a detailed and captivating description of *Lactuca hirsuta*, adding information from his own collections made along with Bayard Long, member of the Academy of Natural Sciences of Philadelphia and Herbarium Curator of the Philadelphia Botanical Club, from Southampton and Sussex Counties. Particularly noteworthy in the context of this paper, Fernald (1938) remarked how in typical *Lactuca hirsuta*, the highly pubescent nature of the plant was rare both in nature and collections. However, he and Long collected a specimen with leaves that were "almost velvety to the touch" and exhibited densely villous stems. In seeking to give a more inclusive description of *L. hirsuta*, Fernald examined more than 90 specimens including the type of *L. hirsuta* and also Bigelow's specimen conserved at GH (GH 00009502) and ascribed to *L. sanguinea*. He noted that material from eastern Canada and New England was consistent in having glabrous stems or very rarely sparsely hirsute lower internodes and mostly glabrous leaf surfaces, very rarely pilose. To further investigate variation in pubescence, Fernald assessed *L. hirsuta* and other varietal material from the Academy of Natural Sciences of Philadelphia and noted a continuum of pubescence, ranging from densely hairy as typical of *L. hirsuta* to glabrous as characteristic of *L. sanguinea*. Fernald also noted the capitulescence type of these specimens, describing often in his notes the southern *L. hirsuta* as having to racemiform capitulescences while the Canadian and New England specimens tended to have corymbiform ones. Also notable in Fernald's account, was the footnote on page 479, where he wrote "*Lactuca hirsuta* has yellow flowers" (Fernald, 1938) since the indication of color of any part of the plant in the descriptions of *L. hirsuta* is often lacking (see below).

Based on his studies, Fernald (1938) concluded that the differences between *L. hirsuta* and *L. sanguinea* didn't warrant recognition at the species level and

I went to the woods...

Besides living deliveratedly, Thoreau collected plant specimens, and *Lactuca sanguinea* Bigelow was among them.

At Gray Herbarium of Harvard University, one of the specimens determined as *L. elongata* var. *sanguinea* (Bigelow) Torr. & A. Gray and cited in Flora of North America was likely collected by Henry David Thoreau, but with no data or locality listed. Ray Angelo, Harvard University Herbaria Associate, notes in the Vascular Flora of Concord, Massachusetts (Angelo 2022) that there are four references to *Lactuca* L. in Thoreau's Journal while he was in Concord. Angelo also provides a link to what he considers is a Thoreau's specimen in the herbarium

See specimen here https://www.flickr.com/photos/huh/33316385534/in/album-72157680747810871/

Strafford, New Hampshire
Photo by Kelly Omand

decided to organize the diversity he observed at a lower rank and thus he described two varieties and a form inside *L. hirsuta*: 1) *Lactuca hirsuta* var. *genuina* Fernald. nom. ill. (correct name *Lactuca hirsuta* var. *hirsuta*) with stems densely villous and leaves copiously pilose on both sides, found from Pennsylvania to Virginia and Louisiana, 2) *Lactuca hirsuta* var. *sanguinea* with stems glabrous and lower leaves with midrib villous beneath, from Prince Edward Island and New York, to Virginia, but rare in Texas and Louisiana, and 3) *Lactuca hirsuta* f. *calviofolia* Fernald with leaves and stems glabrous throughout and circumscribed within *Lactuca hirsuta* var. *sanguinea* distributional range.

It is important to note that color of stems, leaves, involucres, and corollas were not included in Fernald's descriptions of the infra taxa he recognized, with the main diagnostic character being the presence or absence of trichomes on the stems and leaves.

TAXONOMIC TREATMENT

Lactuca sanguinea Bigelow, Fl. Bost. Ed 2: 287, 1824 ≡ *Galathenium sanguineum* (Bigelow) Nutt. Trans. Amer. Philos. Soc. Ser. 2, 7: 444, 1841 ≡ *Lactuca elongata* var. *sanguinea* (Bigelow) Torr. & A. Gray, Fl. N. Amer. (Torr & A. Gray) 2: 496, 1843 ≡ *L. hirsuta* var. *sanguinea* (Bigelow) Fernald, Rhodora 40: 481, 1938. **TYPE:** [Boston], *Bigelow s.n. july* (Lectotype here designated: GH 00009502!) Figure 1, Figure 2.

Biennial herbs 45-130 cm tall, stems purple (but often drying to dark brown), basally pubescent, glabrous towards the apex. **Leaves** alternate, sessile, 4 – 20 (-70) × 6-20 cm, pinnatisect, lobes acute, midrib of basal leaves villose, green to purple. Capitulescences paniculiform, capitula 20 to 100 (-850), peduncles short, up to ca. 2 cm long. **Involucres** 14-18 × 4.5 mm, cylindric, phyllaries arranged in 4-5 series, purple; outer phyllaries 2.3-3.4 × 1.5-2.4 mm, triangular to narrowly ovate, herbaceous, inner phyllaries 9.5-13 × 2 mm, oblong to narrowly ovate, membranose, parallelly veined. **Receptacles** alveolate. **Florets** 18 to 26; corollas ligulate, tube ca. 9 mm long, slightly broadened apically, provided with ca. 2 mm long trichomes towards the apex, limb 6-6.2 × 1.5-1.6 mm, oblong, purple to orange-reddish. Anthers ca. 1.9 mm long, apical appendages obtuse. Styles 15-16 mm long, style branches 1.5-1.8 mm long, linear, apex acute. **Achenes** ca. 6.8 mm long, seed part ca. 4 × 2 mm, fusiform, flattened, beak ca. 2.8 mm long, surface black to brown with scales arranged in wavy rows horizontally oriented. **Pappus** ca. 9 mm long, elements capillary bristles tapering towards the end, arranged in a single series.

Nomenclatural note: when describing the new species, Bigelow (1824) did not cite specimens nor a precise location and collector. However, although this information is not given in the protologue, the species was introduced in a larger treatment describing Boston plants. Therefore, the locality could be safely assumed to be Boston or the Boston area as indicated by Bigelow himself in the introduction of his flora, and also collected by him, as he also mentioned in the introduction that he collected plants for the flora in a period of two seasons. Bigelow did mention that the plant was found in "dry woods" in "July, August". At GH there is a specimen (#00009502; Figure 3) that matches the description and was collected by Bigelow himself and has a note in Bigelow's handwriting, identifying it as *Lactuca sanguinea* with a "Jl." written next to "Boston" interpreted as indicating the month of July. Based on all this evidence, the specimen #00009502 at GH could be considered original material and is therefore selected as lectotype, following article 9.3 of the current code (Turland et al. 2018).

Distribution and Ecology: although described by Bigelow from woods, we observed *Lactuca sanguinea* occurring in multiple open, heathland or grassland habitats on the island of Nantucket. This discrepancy in habitat types, however, is common to the flora of Nantucket Island, where plants of woodland openings such as *Cypripedium acaule* Ait, *Anemone quinquefolia* L., and *Epigaea repens* L. are often found in more open habitats, especially low shrublands that offer some late-season shading. Plants in areas excluded from deer browsing were the most robust, e.g., with greater plant height and larger numbers of branches and capitula. Associated plants included *Gaylussacia baccata* (Wangenh.) K. Koch, *Liatris scariosa* (L.) Willd. var. *novae-angliae* (Lunell) Gandhi, S.M.Young & P.Somers, *Cirsium pumilum* Spreng., *Rosa rugosa* Thunb. ex Murray, *Sisyrinchium fuscatum* Bickn., *Baptisia tinctoria* (L.) R.Br., and *Polygala polygama* Walter.

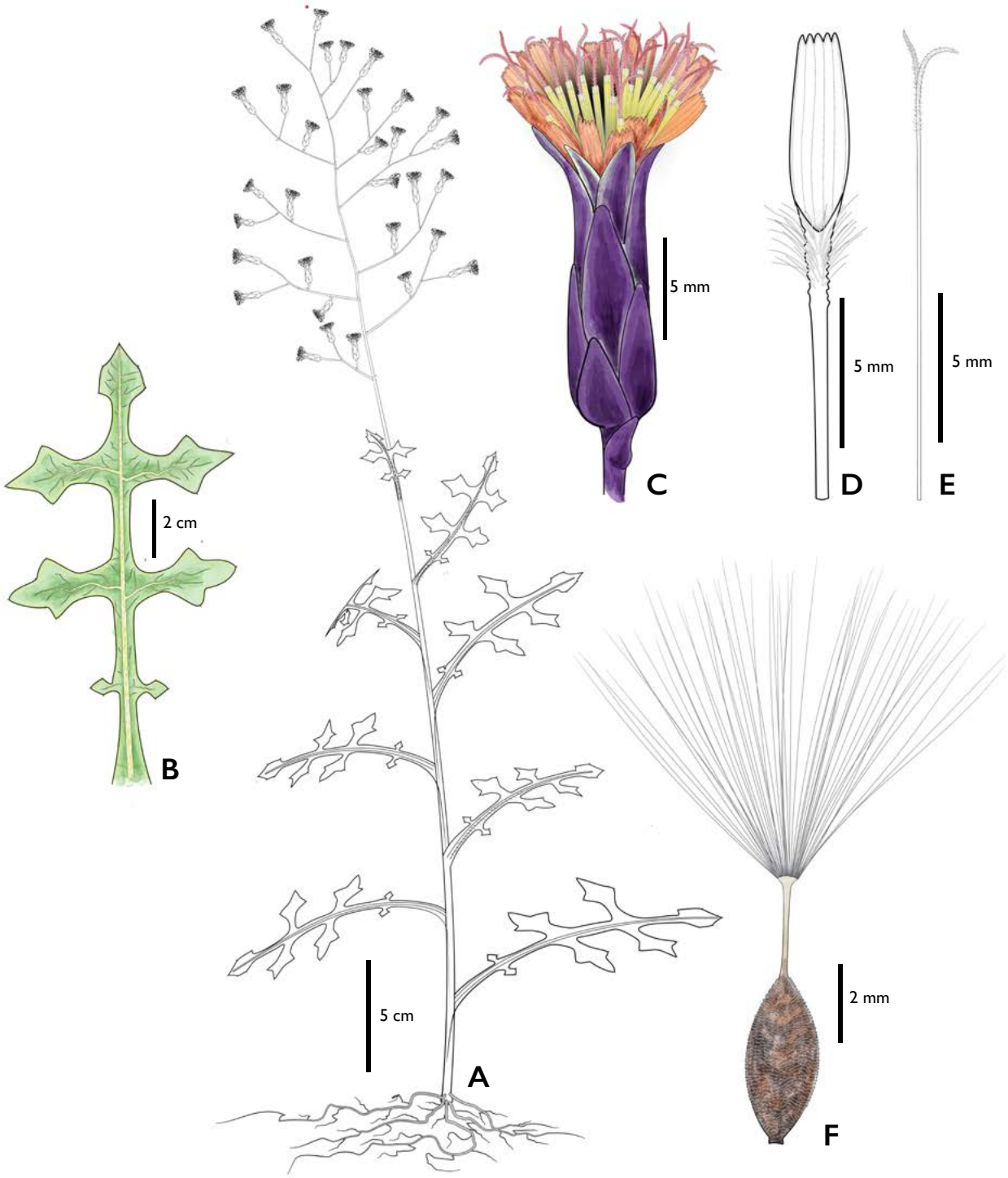

Figure 1. *Lactuca sanguinea* Bigelow. **A.** Habit. **B.** Leaf. **C.** Capitulum. **D.** Corolla. **E.** Style. **F.** Achene with pappus (from *Ballou s.n.* MEM021509).

Figure 2. *Lactuca sanguinea* Bigelow. **A.** Habitat. **B.** Habit. **C.** Leaf. **D.** Capitulum, notice purple involucre and reddish corollas. *Photos by: Kelly Omand.*

Additional specimens examined: CANADA. **Québec.** Pierre-De Saurel, Tracy, près des Grèves, *A. Sabourin & A. Nault 2087*, 28 July 2000 (MT). **USA. Connecticut.** New Heaven County. West Rock Ridge State Park, *E. H. Eames s.n.*, 17 July 1925 (CONN 27927). **Massachusetts.** Essex County. S.I. *W. Oakes s.n.*, 1850 (NY 2201097). Nantucket County. Nantucket, plains N of rail road about 3rd mile, *E. P. Bicknell 9419*, 7 August 1906 (NY); Nantucket, Smooth Hummocks Coastal Preserve, *S. M. Ballou Jr. s.n.*, 15 July 2018 (MEM 21509); id., *P. L. Murin s.n.*, 14 July 2018 (MEM 21508); Nantucket, J. *B. Garner s.n.*, 25 July 1910 (NMMA 524); Head of the Plains, *K. A. Omand s.n.*, 28 July 2017 (NMMA 533). **New Hampshire**. Cheshire County. S.I., *C. F. Batchelder 4700*, 3 August 1918 (NHA). Grafton County. Woodstock, Watershed No. 5, *G. E. Crow & J. A. Crow 8864*, 30 August 1995 (NHA). Hillborough County. Peterborough, *C. F. Batchelder s.n.,* 5 July 1931 (NHA). Strafford County. Strafford, above Power Bridge across Salmon Falls River, *A. R. Hodgdon 6384*, 29 June 1949 (NHA); Strafford, near Newmarket line, near Great Bay, *A. R. Hodgdon 5142*, 25 August 1945 (NHA).

Most modern-day floras and online databases have synonymized *Lactuca sanguinea* with *L. hirsuta*, including Flora of North America (Strother 2006), the Compositae Global Database (CWG 2021), and the World Flora Online (WFO 2022). In fact, Strother (2006) mentioned neither the trichomes on the stems nor color variation, except to say that sometimes the yellow corollas dry bluish. In volume 2 of Steyermark's Flora of Missouri, Yatskievych (1999, page 366) notes *L. hirsuta* stem color ("often purple-streaked or purplish-tinged") and corolla color ("yellow to orangish yellow, sometimes turning blue with age or upon drying"). Yatskievych (1999) remarked that the varieties *Lactuca hirsuta* var. *hirsuta* and *L. h.* var. *sanguinea* did not seem worthy of formal recognition describing the presence of trichomes, or not, respectively, without mention of color for either variety.

An interesting twist to our story is that the specimens we collected, currently conserved at MEM and NMMA lost almost all their red coloration (especially that of the capitulescence) upon drying, though the specimens retained some dark coloration on the lower parts of the stems, almost to brown to black. If this is typical, we suspect that Bigelow (1824) must have described his *L. sanguinea* from living specimens and that most botanists in the nearly two centuries after him have missed these beautiful dark pigments thereby supporting the various synonym designations.

NANTUCKET HISTORICAL CONTEXT

The island of Nantucket has long been an object of interest botanically, with a number of well-known botanists visiting the island during the late 1800s and early 1900s (neither Bigelow nor Fernald among them, however). The first comprehensive list of Nantucket plant species, *A Catalogue of Plants Growing Without Cultivation in the County of Nantucket, Mass.* was prepared by island botanist Maria L. Owen in 1888 and includes *Lactuca elongata var. sanguinea* listed as a synonym of *Lactuca hirsuta.*

From 1908-1918, New York botanist Eugene P. Bicknell provided a more expansive list of the island flora in a set of twenty volumes published in the Bulletin of the Torrey Botanical Society based on his four visits to the island (1899-1907). Bicknell included *Lactuca hirsuta,* but uncharacteristically did not provide detailed comments about any distinctive characteristics of the plants he encountered on Nantucket, stating only habitat, distribution, and flowering time (Bicknell 1905).

Sorrie and Dunwiddie (1996) included the taxon in *The Vascular Flora of Nantucket, Tuckernuck, and Muskeget* as *Lactuca hirsuta* Muhl. ex Nutt. var. *sanguinea* (Bigelow) Fernald, rather than simply listing it as *Lactuca hirsuta*, indicating that they felt this distinction was important, having observed the plants themselves on island. They noted that the taxon was also present on Tuckernuck and described habitat as coastal heathland and shrubland, including near Sheep Pond, at the western end of island (Head of the Plains) one of the areas where we have been observing this taxon.

Based upon our recent detailed observations of the Nantucket plants included here, and upon reexamination of Bigelow's 1824 description and collection, we assert that the populations occurring on Nantucket Island are distinct enough to deserve recognition at species level and therefore we are hereby resurrecting *Lactuca sanguinea* from its synonymy under *L. hirsuta*. The glabrous nature of the plant added to the distinguishing purple color of stems, leaves and corollas make *Lactuca sanguinea* very distinctive and easily differentiable from *L. hirsuta*.

Figure 3. Lectotype of *Lactuca sanguinea* Bigelow, collected by the Bigelow himself (GH00009502). Image courtesy of the Gray Herbarium, Harvard University.

Finally, regarding the genetics of this interesting group, previous work in *Lactuca* L. has revealed low levels of genetic diversity, e.g., by Jones et al. (2018), though recent work using whole plastomes has revealed some genetic differentiation (Chu et al. 2022). Further studies at the population level, including genomic-level studies employing nuclear loci, across the distribution range of both *Lactuca sanguinea* and *L. hirsuta* may shed light on the relationship of these closely related species.

ACKNOWLEDGEMENTS

We thank Noah Karberg for aiding with collections and Dr. Robert Wernerehl, the State Botanist for Massachusetts, for help with obtaining permits and providing location data for plants. We especially thank Paige Murin for her efforts in collecting and measuring specimens, as well as her input on an earlier version of this manuscript. We thank Harvard University herbaria for granting use of specimen GH00009502 image. We also thank Samantha Drewry for assistance in describing specimens, Kanchi Gandhi for clarifying nomenclatural issues, Ed Schilling for comments and suggestions on the manuscript, and Ray Angelo for his insight into Lactuca's references from Thoreau's journals.

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