



Botanical Notes

ISSN 1541-8626

A newsletter dedicated to dispersing taxonomic and ecological information useful for plant identification and conservation in New England

Available online at <http://www.woodlotalt.com/publications/publications.htm>

Number 9. 9 December 2003

30 Park Drive, Topsham, ME 04086

THE TAXONOMIC STATUS OF *BIDENS* *HETERODOXA*

Bidens is a large, familiar genus of yellow-flowered composites that inhabit a wide variety of low elevation plant communities in the northeastern United States. They are perhaps best known for their fruits—beggar ticks—small, seed-like fruits that are animal dispersed through attachment by a variable number of minutely barbed awns. Equally diagnostic are the dimorphic involucre bracts—an outer set of longer, herbaceous bracts and an inner set of shorter, non-herbaceous, striate bracts. *Bidens* is well known for taxonomic difficulty, and the species are phenotypically plastic (Fassett 1957). *Bidens heterodoxa* Fern. & St. John is a problematic taxon that has been variously interpreted (see references below). As described, it is closely related to *B. connata* Muhl. ex Willd., *B. eatonii* Fern., and *B. tripartita* L. Roberts (1982) studied this group of *Bidens* and presented a revised treatment of *B. heterodoxa*. This note summarizes the taxonomic identity of *B. heterodoxa* and discusses identifying characteristics of *B. connata* and *B. tripartita*.

Bidens connata (Figure 1) is a relatively common hydrophyte, found on river and lake borders, as well as in temporarily flooded/saturated depressions. The capitula are composed primarily of disk flowers; the ray flowers very inconspicuous. The petiolate leaves vary from simple to 3- to 7-lobed (but are not divided; Figure 2). When the leaf is lobed, the terminal segment (as well as

the lateral ones) is connected to the remainder of the leaf by broad green tissue (i.e., the lobes are without narrow petiolules that are found in compound leaves). Very important to later discussion is the morphology of the disk corolla. Apical to the ovary, the corolla begins as narrow, herbaceous tube that rapidly expands into a campanulate limb (Figure 3). The apical teeth are delicate and prominently pigmented with yellow to yellow-orange. After anthesis, the corolla somewhat collapses around the exerted anthers and becomes weakly attached to the summit of the ovary (i.e., it can be easily dislodged during dissection; Roberts 1982). This type of corolla is also found in *B. eatonii* and *B. frondosa* L.

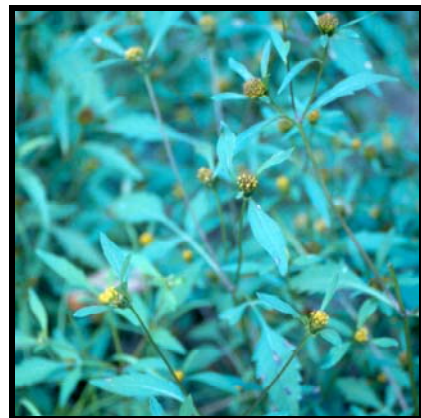
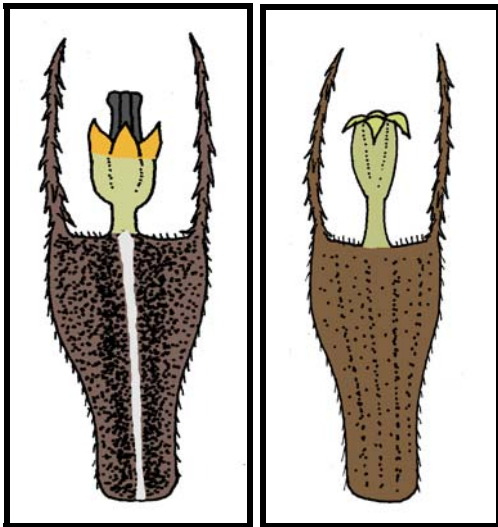


Figure 1. Habit of *Bidens connata*.



Figure 2. Lobed leaf of *Bidens connata*.



Figures 3 (left) and 4 (right). Flowers and cypselas of *Bidens connata* and *B. tripartita*. 3—*B. connata*, note that two of the awns are not shown in the illustration. 4—*B. tripartita*, note that one of the awns is not shown in the illustration.

Bidens tripartita (synonym = *B. comosa* L.) is also important to this discussion of *B. heterodoxa*. It superficially looks similar to *B. connata*, but differs in a number of ways, especially disk corolla morphology. *B. tripartita* has a more funnel-shaped corolla, the flare of the limb less pronounced (Figure 4). The entire corolla is more uniformly pale yellow and lacks the distinct basal herbaceous zone and pigmented apical zones found in *B. connata*. After anthesis, the corolla of *B. tripartita* dries more uniformly, becomes chartaceous (i.e., papery) in texture, and remains firmly attached to the summit of the ovary. The anthers are included within the corolla prior to and remain after anthesis. *B. vulgata* Greene is another New England *Bidens* with this type of disk corolla.

Gleason and Cronquist (1991) described *Bidens heterodoxa* as a series of rare and local populations that are, to some extent, estuarine and approach the morphology of *B. eatonii* but with larger and more

numerously flowered capitula. Fernald (1950) allied *B. heterodoxa* with *B. eatonii* (as evidenced from placement in identification key) due to the flattened cypselas. Fassett (1925) considered *B. heterodoxa* closely related to *B. connata* (based on the number of flowers in each capitulum) but noted that *B. heterodoxa* was a poorly understood plant. Such differences in opinion, combined with the fact *B. heterodoxa* has been described from very different habitats (tidal river shores vs. pond shores), have no doubt contributed to this species' questionable taxonomic rank (Brumback and Mehrhoff 1996).

Roberts (1982) carefully studied *Bidens heterodoxa* and its five varieties—var. *agnostica* Fern. (smooth awns and non-tidal habitat), var. *atheistica* Fern. (nearly awnless and tidal habitat), var. *heterodoxa* (antrorsely barbed awns and tidal habitat), var. *monardaefolia* Fern. (retrorsely barbed awns and non-tidal habitat), and var. *orthodoxa* Fern. & St. John (retrorsely barbed awns and tidal habitat). His research uncovered a number of interesting facts. First and foremost, all of the variation displayed by *B. heterodoxa* can be accommodated within other, previously described species (see below). Second, he found that the various varieties of *B. connata* and *B. eatonii*, based chiefly on awn morphology, may have little taxonomic worth. This statement is derived primarily from the fact that many of the varieties exist as intrapopulation awn polymorphisms (i.e., as many as three types of awn morphologies can be found mixed together in a single population).

It is now realized that *Bidens heterodoxa* was so problematic because it contained parts of three different species amalgamated into one artificial taxon (Roberts 1982). Both varieties *agnostica* and *monardaefolia*, described from Pocotopaug Lake in Connecticut, are best included in *B. tripartita*. They are similar in many features, including the funnelform disk corollas with included anthers (Figure 4), flattened cypselas, short raceme-like branching pattern of the capitulescence, winged petioles, and occasionally lobed leaf blades. Both varieties *heterodoxa* and *orthodoxa*, described from maritime Canada, are best included in *B. connata*. They share similarities in floral and fruiting morphology, including the campanulate and apically pigmented disk flowers of *B. connata* (Figure 3). The last variety, var. *atheistica*, described from the St. Lawrence River, is best included in *B. eatonii*, based on similarities in floral, fruiting, and vegetative morphology.

In summary, *Bidens heterodoxa* was an artificial taxon that contained elements of three different species. Various parts of *B. heterodoxa* have been transferred to the *B. connata*, *B. eatonii*, and *B. tripartita*. The New England population from Middlesex County, Connecticut, that was transferred to *B. tripartita*

(synonym = *B. comosa*) is believed extirpated due to shoreline development (Roberts 1982).

Acknowledgments

The librarians at the Botanical Libraries of the Harvard University Herbaria are thanked for their assistance. Arthur Gilman and Thomas Vining are thanked for editorial comments.

Literature Cited

Brumback, W.E. and L.J. Mehrhoff. 1996. *Flora Conservanda: New England*. The New England Plant Conservation Program list of plants in need of conservation. *Rhodora* 98: 233–361.

Fassett, N.C. 1925. *Bidens eatonii* and its varieties. *Rhodora* 27: 142–146.

_____. 1957. *A Manual of Aquatic Plants*. The University of Wisconsin Press, Madison, WI.

Fernald, M.L. 1950. *Gray's Manual of Botany*, 8th edition. Van Nostrand Reinhold Company, New York, NY.

Gleason, H.A. and A.C. Cronquist. 1991. *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*, 2nd edition. New York Botanical Garden, Bronx, NY.

Roberts, M.L. 1982. Systematic studies of North American *Bidens* section *Bidens* (Compositae). Ph.D. Thesis, Ohio State University, Columbus, OH.

Text, illustrations, and images contributed by Arthur Haines.

IDENTIFICATION OF *CAULOPHYLLUM GIGANTEUM*

Caulophyllum is a small genus of perennial herbs found in North America and Asia (Loconte 1997). It is perhaps best known by its seeds, which are large, blue, and naked at maturity (the seeds rupture through the ovary wall during development and are exposed at maturity).

Caulophyllum also has unusual flowers—the sepals are petaloid and relatively conspicuous compared with the short, flabellate (i.e., fan-shaped) petals that are nearly concealed by the stamens (Figure 1). In New England, *C. thalictroides* (L.) Michx. is well known from rich, mesic forests and high-terrace floodplain forests. It is an occasional component of the spring flowering flora of these plant communities. Fernald (1950) and Seymour (1982) listed *C. thalictroides* as the only species of

Caulophyllum occurring in New England. However, there is a second species that has gone largely undetected—*C. giganteum* (Farw.) Loconte & Blackwell. This note discusses identification of the two New England species of *Caulophyllum* and presents updated distributional information of *C. giganteum* based on recent herbarium surveys.



Figure 1. Flower of *Caulophyllum thalictroides*. Note the relatively large petaloid sepals and the short petals (noted by the white arrow) positioned behind the stamens.

Caulophyllum thalictroides is the more common and widely known blue cohosh and, therefore, discussion will begin with that species. *C. thalictroides* has nearly coetaneous flowers (i.e., the expansion of the flowers occurs simultaneously with the expansion of the leaves). The flowers are smaller than *C. giganteum* in most respects (see identification key) and are more numerous in each inflorescence (Figure 2). The sepals of *C. thalictroides* range in color from green-yellow to green tinted with purple (Figures 1 and 3). Rarely, the sepals will be entirely purple.



Figure 2. Inflorescences of *Caulophyllum thalictroides*.



Figure 3. Flowers of *Caulophyllum thalictroides* (yellow morph).

Caulophyllum giganteum appears very early in the spring (i.e., before *C. thalictroides*). At sites where the two species of *Caulophyllum* are sympatric, *C. giganteum* flowers ca. 10–15 days earlier than *C. thalictroides*. Field observations in Berkshire County, Massachusetts, revealed that the only spring-flowering forest herb preceding *C. giganteum* in flowering was *Anemone americana* (DC.) Hara (synonym = *Hepatica americana*). *C. giganteum* has subprecocious flowers (i.e., the expansion of the flowers slightly precedes the expansion of the leaves; Figure 4). The flowers are larger in most respects than those of *C. thalictroides* and the sepals are more consistently purple (Figure 5). *C. giganteum* also has a more sparsely flowered inflorescence than *C. thalictroides* (Figure 6).



Figure 4. Early spring habit of *Caulophyllum giganteum*. Note the subprecocious flowers.

Caulophyllum giganteum also differs subtly from *C. thalictroides* vegetatively. The leaves of *C. giganteum* tend to have longer ultimate segments (5–10 cm vs. 3–8 cm) and are usually fewer times divided (first leaf 2- or more commonly 3-times divided vs. 3- or more commonly 4-times divided). These differences are not absolute, but do allow for informed guesses when dealing with vegetative material.



Figure 5. Flower of *Caulophyllum giganteum*.



Figure 6. Inflorescence of *Caulophyllum giganteum*. Note the relatively sparsely flowered aspect.

Identification Key

- 1a. Flowers subprecocious, numbering mostly 4–18 per inflorescence; sepals mostly purple to purple-brown (rarely yellow), 6–9 mm long; filaments 1.5–2.5 mm long; carpels 3–5 mm long; styles 1–2 mm long *C. giganteum*
- 1b. Flowers nearly coetaneous, numbering mostly 5–70 per inflorescence; sepals variously yellow, green, or tinted with purple (rarely purple to purple-brown), 3–6 mm long; filaments 0.5–1.5 mm long; carpels 1–3 mm long; styles 0.25–1 mm long *C. thalictroides*

The following locations are based on specimens housed at GH, NEBC, and NHA.

Massachusetts

- Berkshire County, Lenox
- Berkshire County, Washington
- Berkshire County, Williamstown
- Franklin County, Buckland
- Middlesex County, Concord

New Hampshire

Cheshire County, Alstead
Grafton County, Hanover

Vermont

Addison County, Hancock
Addison County, Leicester
Addison County, Addison
Bennington County, Manchester
Bennington County, Shaftsbury
Chittenden County, Shelburne
Orange County, Brookfield
Orleans County, Westmore
Rutland County, Sherburne
Rutland County, Rutland City
Washington County, Northfield
Windham County, Wilmington
Windsor County, Reading
Windsor County, Windsor
Windsor County, Woodstock

As can be inferred from the following locations, *Caulophyllum giganteum* is most common in western New England. Though Loconte (1997) does not attribute Connecticut to the range of this species, it is expected from that state, particularly in the marble valley region of the Housatonic River.

Acknowledgments

The New England Wild Flower Society is thanked for permission to use information. Arthur Gilman and Thomas Vining are thanked for editorial comments.

Literature Cited

Fernald, M.L. 1950. Gray's Manual of Botany, 8th edition. Van Nostrand Reinhold Company, New York, NY.

Loconte, H. 1997. *Berberis*. Pages 274–275 in Flora of North America Editorial Committee (editors). Flora of North America, Oxford University Press, New York, NY.

Seymour, F.C. 1982. The Flora of New England. Phytologia Memoirs V, Plainfield, NJ.

Text and images contributed by Arthur Haines.