# TAXONOMIC REVISION OF GENTIANACEAE IN NEW JERSEY

By

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ABSTRACT OF THE THESIS

Taxonomic Revision of Gentianaceae in New Jersey

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Chapter 1: Identification and Descriptions of Gentianaceae in New Jersey

New Jersey holds unique ecological implications for the flora of North America, containing habitats from the coastal zone to the inland highlands, and as a transition zone between the more boreal and austral zones to the north and south, respectively. Presented here are identification keys and descriptions to the genera and species of Gentianaceae (Asteridae: Gentianales) that are native to or naturalized in the state of New Jersey, USA. This information will be used by the Flora of New Jersey Project, a collaboration among botanists to provide modern nomenclature, identification, description, distribution, abundance, and phenology data for all vascular plant species occurring naturally within the state. Keys to all genera and species are included, along with descriptions of morphological, ecological, distributional, and conservation information. These data were gathered from more than 1,650 herbarium specimens at The New York Botanical Garden (NY), Brooklyn Botanic Garden (BKL), the Academy of Natural Sciences of Philadelphia (PH), and the Chrysler Herbarium of Rutgers University (CHRB). In total, eight genera and 19 species were treated, and *Schenkia spicata* (L.) G. Mans. Is a new species and genus record for the state.

Chapter 2: Nomenclature and Taxonomy of Gentianaceae in New Jersey

Presented here are complete generic and specific nomenclature, typifications, and taxonomic updates on all of the species of Gentianceae (Asteridae: Gentianales) occurring naturally in the state of New Jersey, USA. Complete synonymy is provided, along with all known information on typification. The gentianaceous species found in New Jersey include two *Bartonia* species, one *Centaurium*, seven *Gentiana* species, one *Gentianella*, one *Gentianopsis*, one *Obolaria*, five *Sabatia* species, and one *Schenkia* species. A clarification on the typification of *Centaurium pulchellum* (Sw.) Hayek ex Hand.-Mazz. et al. is provided, as well as neotype designations for *Gentiana clausa* Raf. and *Gentiana linearis* Froel., and a lectotypification for *Sabatia stellaris* Pursh.

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Finally, I would like to thank my husband, family, and friends for providing unending support while I completed this research.

## ACKNOWLEDGEMENT OF CO-AUTHORSHIP

Both chapters of my Master's Thesis are co-authored by James S. Pringle and Lena Struwe. In the first chapter, Identification and Descriptions of Gentianaceae in New Jersey, I wrote the Introduction. Methods, and Discussion, created Figures 1 and 2 using the data sources cited, and created Tables 1 – 4 based on my own recorded information. I examined and databased all 1,652 specimens through loan requests and travel to the regional herbaria (BKL, CHRB, NY, PH). I redetermined many specimens, put determination labels on all specimens that I saw, and recorded morphological characteristics while examining the specimens. James S. Pringle wrote the original generic and specific descriptions of morphology as well as all dichotomous keys, and I adapted these descriptions and keys based on my findings of New Jersey specimens. I composed the locality, conservation, ecology, habitat, and bloom time descriptions for the species. I chose the specimens for the illustrations in Figures 4 – 7, and also compiled Appendices 1 – 3, including the Exsiccate List. Lena Struwe provided funding for the illustrations (Figures 4 – 7), edited both chapters, and provided guidance on how to undertake this research project.

In the second chapter, Nomenclature and Taxonomy of Gentianaceae in New Jersey, I compiled nomenclatural synonyms and their references for all species to the best of my ability. James S. Pringle corrected and edited this nomenclature list, and Lena Struwe provided feedback, comments, reference material, and trouble-shooting guidance. James S. Pringle composed the discussion section of this chapter, after both he and I

worked together to determine the neotypes, lectotype, and "clarification" material. I created Figure 4 and Figures 8 – 11, with photographs from CHRB, S, GH, and PH.

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# Chapter 1: Identification and Descriptions of Gentianaceae in New Jersey

## Introduction

From mountainous northern hardwood forests to lowland sandy pinelands, and from the rich Delaware River valley to the salty marshes of the Atlantic Ocean, New Jersey occupies a unique position in North America by virtue of its diverse range of habitats, despite its small size. It is home to approximately 2,800 species of vascular plants, including many threatened and vulnerable species (Kartesz 2011). New Jersey is either the northern or southern range limit of a large number of vascular plant species, making it a particularly important area to study speciation patterns and taxonomic migration, especially in response to climate change, non-native introductions, and habitat degradation and reclamation.

Being within easy traveling distance from both Philadelphia and New York City, the flora of New Jersey has long been studied by prominent botanists, starting with Peter Kalm in the early 1700s (see Fairbrothers 1964 for a review). Although a few checklists and catalogs have been published, such as *A Preliminary Catalogue of the Flora of New Jersey* (Britton 1881), *The Plants of Southern New Jersey* (Stone 1911), and *New Jersey Wild Plants* (Hough 1983), as well as various manuals for the northeastern United States (Britton and Brown 1913, Gleason and Cronquist 1991, Haines 2011), a comprehensive manual and atlas of all vascular plant species in New Jersey has yet to be published.

The Flora of New Jersey Project (FNJP 2012) aims to provide up-to-date information on nomenclature, identification, distribution, abundance, and phenology for all naturally occurring vascular plants in New Jersey. It is a non-profit organization that

was started in 2004 by regional field botanists who recognized the need for a modern statewide floristic manual. Floristic data are currently being compiled by FNJP volunteers from both field observations and collections from regional herbaria. The floristic treatments will be available via a free-access internet site (http://www.njflora.org/), and a hard-copy manual will be published when the flora is complete.

**New Jersey Physiography**

New Jersey has four physiographic provinces that roughly follow the elevational gradient across the state (Fig. 1).

*Valley and Ridge Province* – This province begins in the northwest corner of the state and occupies much of Sussex and Warren Counties (Fig. 2). This province is about 17 miles wide (536 square miles total) and consists of a series of steep, linear ridges and valleys with altitudes ranging from 300 ft. to 1,803 ft. above sea level (Dalton 2003). It has a northeast to southwest orientation, extending into mountainous regions in both Pennsylvania and New York (Poconoe Mountains and Catskill Mountains, respectively).

*Highlands Province* – The Highlands province is located to the southeast of the Valley and Ridge province and occupies about 980 square miles, ranging from 10 to 25 miles wide (Dalton 2003). This province is known for rugged, rounded ridges up to 1,490 ft. above sea level and deep, narrow valley bottoms, less than 400 ft. above sea level (Dalton 2003). The Highlands province occupies areas in Bergen, Hunterdon, Morris, Passaic, Somerset, Sussex, and Warren Counties.

*Piedmont Province* – The next province, the Piedmont, is located to the southeast of the Highlands province and occupies about 1,600 square miles, consisting of a low, rolling plain, mostly of sedimentary rock, ranging from 100 ft. to 914 ft. in altitude (Dalton 2003). This province occupies areas of Bergen, Essex, Hudson, Hunterdon, Mercer, Middlesex, Morris, Passaic, Somerset, and Union Counties.

*Coastal Plain Province* - The boundary between the Piedmont and the Coastal Plain provinces is known as the Fall Line, and is marked by a series of waterfalls and rapids, as well as a change in tidal influences. The Coastal Plain province, made up of unconsolidated sand and gravel, is the largest province in New Jersey (4,667 square miles, about 3/5 of the state; Dalton 2003). It extends from sea level to a maximum altitude of 391 ft. (Dalton 2003). Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Middlesex, Monmouth, Ocean, and Salem Counties are included in the Coastal Plain.

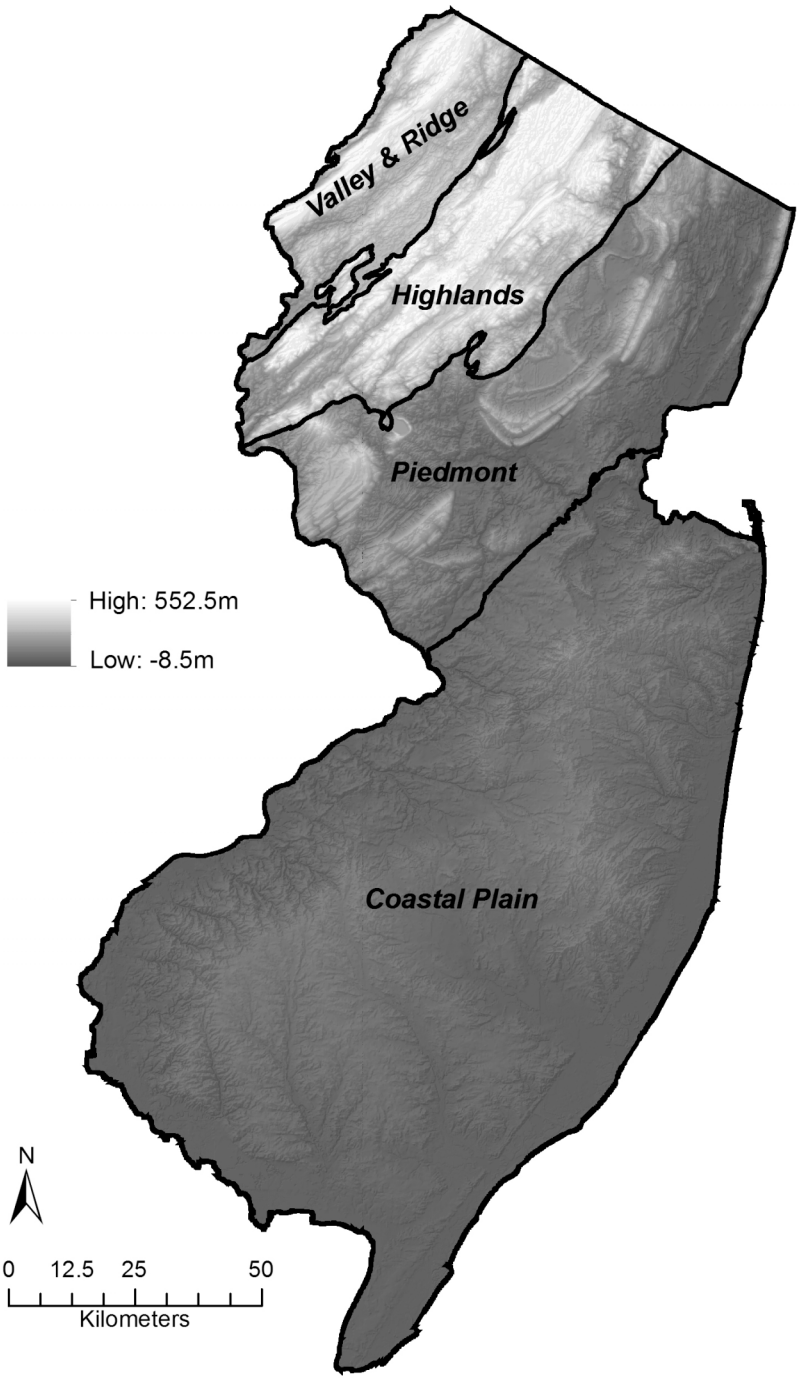


Fig. 1. Physiographic provinces and elevation of New Jersey (Data sources: Physiographic provinces – New Jersey Department of Environmental Protection (NJDEP) and New Jersey Geological Society (NJGS); 10-meter resolution digital elevation model mosaic of New Jersey – U.S. Geological Survey (USGS)).

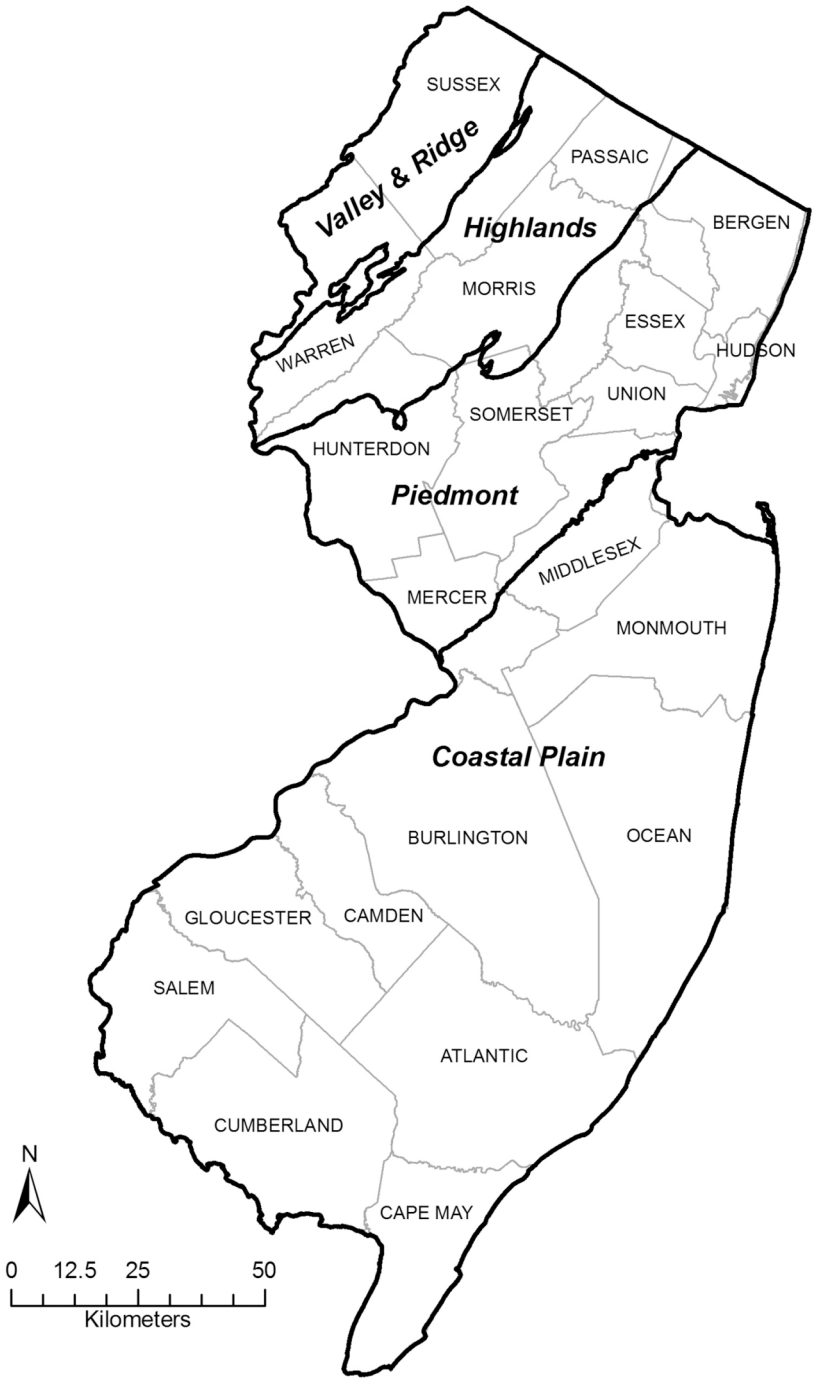


Fig. 2. Physiographic provinces and counties of New Jersey (Data Sources: Physiographic provinces – New Jersey Department of Environmental Protection (NJDEP) and New Jersey Geological Society (NJGS); New Jersey counties – New Jersey Office of Information Technology (NJOIT) and Office of Geographic Information Systems (OGIS)).

**Gentians of New Jersey**

We present information here on the 19 species that occur in New Jersey (eight genera) of Gentianaceae (Asteridae: Gentianales). These species fall into two different tribes, Chironieae and Gentianeae (Struwe et al. 2002) (see Table 1). Commonly used or recent synonyms are provided in the species descriptions. For complete synonymy, nomenclature, and typifications, see Chapter 2.

| Tribe | Subtribe | Genus |
|---|---|---|
| Chironieae | Chironiinae | *Centaurium* |
| | | *Sabatia* |
| | | *Schenkia* |
| Gentianeae | Gentianinae | *Gentiana* |
| | Swertiinae | *Bartonia* |
| | | *Gentianella* |
| | | *Gentianopsis* |
| | | *Obolaria* |

Table 1. Tribal and subtribal taxonomy of genera of Gentianaceae that occur in New Jersey.

Seventeen of these gentianaceous species are native to New Jersey (two *Bartonia* spp., seven *Gentiana* spp., one *Gentianella* sp., one *Gentianopsis* sp., the monotypic *Obolaria* sp., and five *Sabatia* spp.), while only two are introduced non-natives from Eurasia (*Centaurium pulchellum* (Sw.) Hayek ex Hand.-Mazz. et al and *Schenkia spicata* (L.) G. Mans. [formerly *Centaurium spicatum*]). One species, *Gentiana linearis* Froel., is listed as being endangered in the state of New Jersey by the NJDEP (2011). The species of Gentianaceae found in New Jersey are typically hydrophytic plants, all being either facultative or obligate wetland species (FAC, FACW, or OBL, National Wetland Plant List 2012). Some species are adapted to the low nutrient, acidic, sandy environments of

the Pine Barrens in the south-central part of the state (ie., *Gentiana autumnalis* L., *Sabatia campanulata* (L.) Torr., *S. difformis* (L.) Druce, etc.), while others prefer the rich soils of the Piedmont, Highlands, and Valley and Ridge regions (ie., *Gentiana clausa* Raf., *Gentianella quinquefolia* (L.) Small subsp. *quinquefolia*, etc.).

**Methods**

A dichotomous key to all species was developed, followed by a detailed description of each species that includes rarity, habitat, and locality information within New Jersey. All information is based on 1,652 herbarium specimens seen by the authors from Chrysler Herbarium of Rutgers University (CHRB), Philadelphia Herbarium at the Academy of Natural Sciences of Drexel University (PH), The New York Botanical Garden (NY), and Brooklyn Botanic Garden (BKL) (see Appendix 3, Exsiccate List). Habitat and bloom times are based on label information and the presence of flowers and/or fruits on specimens, and were checked with existing regional floras (Hough 1983, Gleason and Cronquist 1991, Rhoads and Block 2007).

Rarity is based on rankings by the New Jersey Natural Heritage Program (2010) and the New Jersey Department of Environmental Protection's State Status Codes (NJDEP 2011) (see Table 2). Regional rarity status is also reported as listed by the Highlands Water Protection and Planning Act (New Jersey Highlands Council 2004) and the Pinelands Commission (New Jersey Pinelands Commission 2007). The Highlands Water Protection and Planning Act is effective within the jurisdiction of the Highlands province (parts of Bergen, Hunterdon, Morris, Passaic, Somerset, Sussex, and Warren Counties), as shown in Fig. 2. The Pinelands Commission lists 54 plant species that are

threatened or endangered in the Pinelands region, which covers about 1.1 million acres across Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, and Ocean Counties (New Jersey Pinelands Commission 2007).

The National Wetland Plant List (2012) was consulted for Wetland Indicator Status of the species included in this treatment (Table 3).

**Key to the Gentianaceae Genera of New Jersey**

1. Leaves and stems weakly chlorophyllous, yellowish green or purplish; leaves scalelike, to 5 mm long and scarcely wider than stem diameter ….……...…...…….. *Bartonia*

1. Leaves and usually stems medium to deep green; some or all leaves more than 5 mm long and/or distinctly wider than stem diameter

2. Corollas with projecting appendages between true lobes ……..… *Gentiana*

2. Corollas without appendages between lobes

3. Corollas rotate, tube much shorter than lobes; styles cleft deeper than 1 mm, style branches and stigmas often helically coiled ……..……..… *Sabatia*

3. Corollas salverform, funnelform, campanulate, or cylindric, tube about as long as or longer than lobes; styles not cleft or cleft to 1 mm or less, neither style branches nor stigmas coiling

4. Flowers subtended by 2 separate, leaf-like bracts but without a calyx (the two bracts at base of flower sometimes interpreted as a calyx)..……...…….……. *Obolaria*

4. Flowers with a calyx of 4--12(--14) sepals, sepals united at least near base

5. Corollas pink to rose-violet or rarely white, tube narrowly cylindric, less than 2 mm in diameter, lobes entire or minutely erose near apex; anthers coiling helically

6. Inflorescence a dichasial cyme, ± flat-topped ..... *Centaurium*

6. Inflorescence largely spikelike, elongated, only 1 or 2 proximal divisions dichasial .....…… *Schenkia*

5. Corollas blue, violet, or rarely white, tube narrowly funnelform or if ± cylindric more than 5 mm in diameter and lobes fringed; anthers not coiling

7. Corollas 25--60 mm long, lobes 10--25 mm long, margins fringed ……*Gentianopsis*

7. Corollas 10--23 mm long, lobes 3.5--8 mm long, margins entire…..... *Gentianella*

**Key to the Gentianaceae Species of New Jersey, Genus Descriptions, and Species Descriptions**

***Bartonia*** Muhl. ex Willd., Neue Schriften Ges. Naturf. Freunde Berlin 3: 444. 1801.

"screwstem"

**Annuals** weakly chlorophyllous, glabrous. **Leaves** cauline, opposite or alternate, scalelike. **Inflorescences** dichasial or racemoid cymes or reduced thyrses. **Flowers** 4-merous; calyx lobed nearly to base; corolla white to yellowish or greenish white, sometimes purple-tinged, narrowly campanulate, glabrous, lobes longer than tube, margins entire or erose, appendages absent; stamens inserted in corolla sinuses, anthers free; ovary sessile or subsessile; style absent; stigma bilobed; nectaries absent. **Capsules** compressed-cylindric. $\underline{x}$ = 11, 13 (Rork 1949).

1. Corolla lobe margin entire, corolla apices acute or acuminate, not mucronate; style stout, stigmas spreading ……..…… *Bartonia paniculata*

1. Corolla lobe margin erose-serrate, corolla apices rounded or abruptly acute, mucronate; style slender, stigmas connivent ..... *Bartonia virginica*

***Bartonia paniculata*** (Michx.) Muhl., Cat. Pl. Amer. Sept. 16. 1813.

"twining screwstem"

*Centaurella paniculata* Michx., Fl. Bor.-Amer. 1: 98. 1803.

*Bartonia virginica* var. *paniculata* (Michx.) B. Boivin, Naturaliste Canad. 93: 1059. 1966.

**Plants** yellowish green to purplish, decumbent to erect or ± twining, 3--52 cm tall. **Leaves** all alternate or occasionally most leaves opposite or subopposite, 0.5--3.0 mm long. **Inflorescences** racemoid to compound cymes or thyrses with branching variable often arcuate-ascending. **Flowers:** calyx lobes lanceolate to ovate, 1.0--3.2 x 0.3--1.1 mm, acute to acuminate; corolla white or occasionally pale yellow to green, often purple-tinged apically, 2.0--6.2 mm long, lobes oblong-lanceolate, 1.5--4.0 x 0.7--2.0 mm, margins entire, apices acute to acuminate; anthers yellow or purple, 0.3--0.9 mm long, not recurving or coiling, apices rounded to acute or mucronate; style stout, stigmas spreading. **Capsule** dehiscing from apex.

***Bartonia paniculata*** subsp. ***paniculata***

"twining screwstem"

*Bartonia lanceolata* Small, Fl. S.E. U.S. 932. 1336. 1903.

**Plants** yellowish green, sometimes purple in the lower parts, decumbent to erect or ± twining, 10--45 cm tall. **Flowers:** calyx lobes 1.5--2.9 x 0.5--1.0 mm, all separate nearly to base; corolla 2.9--5.0 mm long; anthers yellow, 0.3--0.5 mm long, apex rounded. 2n = 52 (Rork 1949).

Native, found infrequently throughout central and southern New Jersey, including the Pine Barrens. Obligate wetland plant (OBL, National Wetland Plant List 2012), rarely found in uplands. **Counties:** Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Middlesex, Monmouth, Ocean, Salem. **Habitat:** moist, open, sandy areas; bogs; swamps; edge of ponds and salt marshes; wet woods. **Blooms** August through October.

***Bartonia virginica*** (L.) Britton, Sterns, & Poggenb., Prelim. Cat.: 36. 1888.

"yellow screwstem"

*Sagina virginica* L., Sp. Pl. 2: 128. 1753.

**Plants** yellowish green, often purplish in the lower parts or occasionally more extensively, ± erect, 3--45 cm tall. **Leaves** all opposite or lower leaves (rarely all) sometimes alternate, 0.9--4.7 mm long. **Inflorescences** racemoid

cymes or thyrses with strongly ascending branches. **Flowers:** calyx tube 0.1--0.3(--0.5) mm long, lobes lanceolate, 2.0--4.5 x 0.4--1.1(--1.4) mm, acuminate; corolla white to yellowish green, upper parts or occasionally more extensively often purple-tinged especially at a later age, 2.3--4.4 mm long, lobes oblong, 1.6--3.2 x 0.7--1.4 mm, margins erose-serrate distally, apex rounded to abruptly acute, mucronate; anthers yellow or purple, 0.5--1.2 mm long, often recurving in age but not coiling, mucronate to short-acuminate; style slender, stigmas connivent. **Capsule** dehiscing medially.

Native, found frequently almost throughout the entire state. Facultative wetland species (FACW, National Wetland Plant List 2012), mostly found in hydrophytic conditions, although occasionally found in uplands. **Countie:s** Atlantic, Bergen, Burlington, Camden, Cape May, Cumberland, Essex, Gloucester, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Salem, Sussex, Union, Warren. Only two specimens found from Hudson County, both collected by William Leggett, one dating from 1864 and the other from 1867. Only one specimen from Hunterdon County was located, collected by Bayard Long in 1938. This species is most likely extirpated from these two counties. **Habitat:** moist, open, and sandy areas; bogs; swamps; edges of ponds and rivers; often with *Sphagnum* spp.; wet woods. **Blooms** July to September.

***Centaurium*** Hill, Brit. Herb. 62. 1756.

“centaury”

**Annuals or biennials** [perennials], glabrous [stems papillose-puberulent]. **Leaves** cauline, opposite, often also basal. **Inflorescences** dichasial or partly monochasial cymes. **Flowers** 5-merous; calyx deeply lobed; corolla pink to rose-violet or occasionally white [or salmon, yellow], with a whitish "eye" in center, salverform, glabrous, lobes elliptic-oblong, entire or erose-tipped; stamens inserted in upper half of corolla tube; anthers free, coiling helically at dehiscence; ovary sessile; style distinct, shallowly cleft, deciduous; stigmas 2, ovate, elliptic, or orbiculate; nectaries absent. **Capsules** cylindric.

***Centaurium pulchellum*** (Sw.) Hayek ex Hand.-Mazz. et al., Oesterr. Bot. Z. 56: 70. 1906.

“branched centaury”

*Gentiana pulchella* Sw., Kongl. Vetensk. Acad. Nya Handl. 4: 85. 1783.

**Annuals**, 2--25(--30) cm. **Stems** 1-5 (sometimes appearing more numerous because of near-basal branching), branching throughout or in small plants often only above middle. **Leaves:** obovate to elliptic-oblong, 5--25 x 2--6 mm, basal leaves withered or occasionally persistent at flowering time; cauline elliptic-oblong (lower) to lanceolate (upper), 5--15(--25) x 1--5(--12) mm, usually

acute to acuminate, occasionally obtuse. **Inflorescences** dense to ± open, dichasial or occasionally distally monochasial cymes, usually not distinctly corymboid; pedicels 1--5(--11) mm long. **Flowers:** calyx (3--)5--9(--11) mm long; corolla (5--)10--15(--17) mm long, lobes (1--)2--5 mm long; anthers 0.7--1.1 mm long; stigmas widely ovate to elliptic or orbiculate. **Seeds** dark brown or reddish brown. 2n = 36 (Zeltner 1970, 1987, 1991).

*Centaurium pulchellum* is originally native to Eurasia, being widely distributed throughout Europe (except the extreme north), Madeira, North Africa, Krym, the Caucasus, Asia Minor, and west and central Asia, extending to the Punjab (Melderis 1972). It has been known as a naturalized species in North America for about two centuries (Pringle 2007). It is found infrequently, although perhaps locally abundant, along the Outer Coastal Plain (Atlantic and Cape May counties) and near the major cities of Philadelphia (Camden County) and New York (Bergen and Hudson counties). It can be found in both hydrophytic and upland conditions (FAC, National Wetland Plant List 2012). **Counties:** Atlantic, Bergen, Camden, Cape May, Hudson, Ocean. Only one record from Camden County was found (collector Albrecht Jahn, 1900), but this species is likely to have spread and established new populations. **Habitat:** open, damp, grassy areas; sandy areas near the sea or slightly inland; brackish marshes; disturbed areas. **Blooms** July through September.

***Gentiana*** L., Sp. Pl. 1: 227. 1753.

"gentian"

**Perennials, [biennials, or annuals],** glabrous or stems and calyces puberulent. **Stems** solitary or clustered, terminating caudices [or lateral from persistent rosettes; caudices not developing in monocarpic species]. **Leaves** cauline, opposite [whorled], sometimes also basal. **Inflorescences** terminal and sometimes axillary cymes (often condensed into heads) or flowers solitary. **Flowers** 5-merous [4--8 merous]; calyx tube cylindric to narrowly campanulate; bracts paired, subtending each flower in all species found in New Jersey (except *Gentiana autumnalis*); corolla blue, violet, rose-violet, or white [red, orange, yellow], diverse in shape, glabrous within, lobes shorter [longer] than tube, entire or minutely erose-serrate, alternating with projecting [rarely truncate] appendages; stamens inserted in proximal half of corolla tube, anthers connate or free; ovary stipitate; style short or indistinct, erect, persistent; stigmas 2; nectaries as many as corolla lobes, on gynophore. **Capsules** compressed-ovoid to compressed-cylindric or short-obovoid.

1. Flowers solitary or, if 2 or 3, each terminal on a short branch, not subtended by paired bracts; corolla open; leaves linear, to 5 mm wide …..... *Gentiana autumnalis*

1. Flowers usually clustered, solitary only on smallest stems, each subtended by a pair of bracts; corollas opening narrowly or remaining closed; leaves mostly more than 5 mm wide

2. Leaves linear to narrowly lanceolate, less than 15 mm wide and more than 6 times as long as wide (appendages between corolla lobes always obliquely triangular) ……..... *Gentiana linearis*

2. Leaves mostly ± ovate to elliptic or obovate, at least upper leaves wider than 15 mm and/or less than 6 times as long as wide

3. Lower (and often mid-stem) leaves obovate to spatulate; corolla violet or pale green with violet suffusion; appendages between lobes obliquely triangular, entire or minutely ± erose, sometimes shallowly bifid ..... *Gentiana villosa*

3. Leaves lanceolate, ovate, or elliptic; corolla appendages cleft or bifid with both segments of approximately equal height, or toothed

4. Corolla lobes minute projections, much exceeded by appendages ..…….……..... *Gentiana andrewsii*

4. Corolla appendages shorter than or about as long as lobes; lobes triangular or semicircular to ovate or obovate

5. Calyx lobes elliptic to orbicular, mostly less than 2.5 as long as wide; corolla lobes 0.7--2.5 mm long, about as long as appendages; corollas remaining tightly closed ..... *Gentiana clausa*

5. Calyx lobes lanceolate to oblanceolate, more than 3 times as long as wide; corolla lobes more than 2.5 mm long and/or exceeding appendages; corollas loosely closed or opening narrowly

6. Leaves usually ovate, widest near base; calyx lobes mostly longer than tube; corolla lobes 5--10 mm long, 2--4 mm longer than appendages ……..... *Gentiana catesbaei*

6. Leaves linear to elliptic, widest near middle; calyx lobes shorter than or about as long as tube; corolla lobes 3--6 mm long, less than 2 mm longer than appendages ……..... *Gentiana saponaria*

***Gentiana andrewsii*** Griseb. in Hook., Fl. Bor. Amer. (Hooker) 2: 55. 1837.

"closed bottle gentian," "closed gentian," "bottle gentian,"

**Stems** 1--20, 1--12 dm tall, decumbent to erect, glabrous or rarely puberulent. **Leaves** ± evenly spaced, elliptic-oblong to lanceolate or narrowly ovate, 3--16 x 1--5 cm, acuminate. **Inflorescences** heads of 1--25 flowers, often with additional flowers at 1--6(--9) nodes or on short branches. **Flowers:** calyx 9--29 mm, lobes lanceolate to ovate or occasionally oblanceolate, 2--15 mm, margins ciliate; corolla blue, white, or rarely rose-violet, tubular, completely closed, 28--45

mm, lobes reduced to a mucro or ± triangular, to 2(--3) mm, appendages oblong, shallowly and nearly symmetrically bifid, apex truncate, erose; anthers connate. **Seeds** winged.

***Gentiana andrewsii*** var. ***andrewsii***

"closed bottle gentian," "Andrew's bottle gentian"

*Dasystephana andrewsii* (Griseb.) Small, Fl. S.E. U.S. 930, 1336. 1903.

*Pneumonanthe andrewsii* (Griseb.) W.A. Weber, Phytologia 33: 105. 1976.

**Stems** glabrous. **Corolla** lobes reduced to a mucro or at most minutely triangular, less than 1 mm. 2n = 26 (Rork 1949).

This species is ranked as being imperiled in New Jersey primarily due to habitat destruction (Table 1, New Jersey Natural Heritage Program 2010). It is protected by the Highlands Water Protection and Planning Act (New Jersey Natural Heritage Program 2010). Native and infrequent, usually found as a hydrophyte (FACW, National Wetland Plant List 2012). **Counties:** Bergen, Burlington, Camden, Hunterdon, Mercer, Middlesex, Morris, Somerset, Sussex, Union. **Habitat:** open, wet areas; swamps; wet meadows; calcareous soils. **Blooms** September to October.

***Gentiana autumnalis*** L., Cat. Edwards' Nat. Hist. 11. 1776.

"pine barren gentian"

*Gentiana porphyrio* J.F. Gmelin, Syst. 2:462. 1791.

**Stems** 1(--3), 1.5--5.5 dm,decumbent to erect, glabrous. **Leaves** gradually more distantly spaced distally, linear to narrowly oblanceolate, 20--100 x 0.5--5 mm, obtuse (lower leaves) to acute. **Inflorescences:** flowers solitary, occasionally also terminating 1 or 2 branches. **Flowers:** calyx 17--40(--53) mm, glabrous, lobes linear, 10--25(--36) mm, margins not ciliate; corolla deep blue with greenish-yellow dots adaxially on lobes or occasionally rose-violet or white, funnelform, open, 30--65 mm, lobes widely ovate, 10--20 mm, appendages shallowly to deeply deeply divided into 2 subequal, lacerate, attenuate segments; anthers free. **Seeds** winged. $2\underline{n} = 26$ (Rork 1949).

This species is considered rare globally (G3) and statewide (S3), and is the most severely threatened (in a global sense) of all Gentianaceae species in New Jersey (Table 1). Within New Jersey, which is its northern limit, it is restricted to the coastal plain Pine Barrens region in the south-central part of the state (Gleason and Cronquist 1991; Bien et al. 2009). It is listed by the Pinelands Commission as being threatened or endangered and is also protected by the Highlands Water Protection and Planning Act (New Jersey Natural Heritage Program 2010).

Native, scattered throughout the Pine Barrens, usually as a hydrophyte, but occasionally in upland areas (FACW, National Wetland Plant List 2012). **Counties:** Atlantic, Burlington, Camden, Cape May, Cumberland, Ocean. **Habitat:** wet or dry sandy, open areas; moist open woods; roadsides; bogs; swamps; moist coastal plain pine barrens. **Blooms** September to October.

***Gentiana catesbaei*** Walter, Fl. Carol.: 109. 1788.

"Catesby's gentian", "Elliott's gentian"

*Gentiana elliotti* Chapm. Fl. S. U.S. 356. 1860; *non G. elliottea* Raf. 1832.

*Dasystephana parvifolia* (Chapm.) Small, Fl. S.E. U.S. 930, 1336. 1903.

**Stems** 1--5, 1--7 dm, erect or nearly so, usually puberulent, occasionally glabrous. **Leaves** ± evenly spaced, usually ovate, occasionally elliptic, 15--75 x 4--30 mm, acute. **Inflorescences** ± dense cymes or heads of 1--10 flowers, sometimes with additional flowers at 1--several nodes or on branches. **Flowers:** calyx 17--55 mm, glabrous, lobes lanceolate, 10--35 mm, often ± foliaceous, margins ciliate; corolla blue or occasionally rose-violet, tubular, slightly to fully but narrowly open, 35--55 mm, lobes deltoid-ovate, 5--10 mm, appendages divided half or more of their length into 2 ± triangular, lacerate segments; anthers connate. **Seeds** winged. 2n = ca 26 (Pringle 1963).

Only one historic record of this species occurring in New Jersey exists

(Moldenke 3105 [NY] collected in Watchung, Somerset County on September 20, 1926). This location and other potential habitats have been checked and no extant occurrences have been located (New Jersey Natural Heritage Program 2010). This species is therefore believed to be extirpated from New Jersey. It is an obligate wetland species (OBL, National Wetland Plant List 2012). **County:** Somerset. **Habitat:** moist open areas and woods. **Blooms** September to October.

***Gentiana clausa*** Raf., Med. Fl. 1: 210. 1828.

"bottle gentian"

**Stems** 1--10, 2--8 dm, erect or decumbent, glabrous. **Leaves** ± evenly spaced, ovate, 30--150 x 10--45 mm, acuminate. **Inflorescences** heads of 1--20 flowers, sometimes with additional flowers at 1--3 nodes, rarely on short branches. **Flowers:** calyx 8--22 mm, glabrous, lobes broadly obovate to orbiculate, 2--6(--10) mm, margins ciliate; corolla blue or occasionally violet or white, tubular, completely closed, 23--40 mm, lobes ovate-triangular to semicircular, 0.7--2.0 mm, appendages oblong, deeply and unequally bifid, apex erose; anthers connate. **Seeds** winged. 2n = 26 (Rork 1949).

*Gentiana clausa* is native and found throughout the state, except for the Pine Barrens, as a hydrophyte or non-hydrophyte (FAC/FACW, National Wetland Plant List 2012). **Counties:** Bergen, Burlington, Essex, Gloucester, Hunterdon, Middlesex, Monmouth, Morris, Passaic, Somerset, Sussex, Union,

Warren. **Habitat:** moist, rich meadows, thickets, and woods in noncalcareous soils; edges of streams and wet areas. **Blooms** August to October.

***Gentiana linearis*** Froel., Gent. 37. Fig. 10. 1796.

"narrowleaf gentian"

*Gentiana saponaria* L. var. *linearis* (Froel.) Griseb. in Hook., Fl.-Bor. Amer. 2:55. 1837.

*Dasystephana linearis* (Froel.) Britt. in Britt.& Brown, Ill. Fl. N. U.S., ed. 2, 3: 13. 1913.

**Stems** 1--30, 1--9 dm, erect, glabrous. **Leaves** evenly spaced or somewhat more widely spaced distally, linear to lanceolate, 40--90 x 3--14 mm, acute. **Inflorescences** ± dense cymes of 1--7 flowers, sometimes with additional flowers at 1--several nodes or on short branches. **Flowers:** calyx 8--28 mm, glabrous, lobes linear to oblong, 2--12(--15) mm, margins not ciliate; corolla blue or occasionally violet or white, tubular, loosely closed or slightly open, 25--50 mm, lobes semicircular, 2.5--5.0 mm, appendages between corolla lobes obliquely triangular, entire or shallowly erose, with a minute second segment; anthers connate. **Seeds** winged. 2n = 26 (Rork 1949; Pringle 1969).

Very few historic records of *Gentiana linearis* in New Jersey exist (see Appendix 3, Exissicate List). No extant occurrences are known. Although some

potential locations and habitats have been explored, not all historic occurrences have been surveyed and potential habitats still exist, according to the New Jersey Natural Heritage Program (2010). Diligent searching may provide location of this species in New Jersey, making this a top conservation priority in the state (New Jersey Natural Heritage Program 2010). *Gentiana linearis* is the only species in the Gentianaceae in New Jersey that has a state status of Endangered, meaning that its survival within the state is in immediate danger (NJDEP 2011). It is also listed by the Pinelands Commission as being threatened or endangered, and is protected by the Highlands Water Protection and Planning Act (New Jersey Natural Heritage Program 2010). Usually found as a hydrophyte (FACW/OBL, National Wetland Plant List 2012). **Counties:** Burlington, Passaic. **Habitat:** moist, open areas; bogs, swamps, and meadows. **Blooms** July to September.

***Gentiana saponaria*** L., Sp. Pl. 1: 228. 1753.

"soapwort gentian"

*Gentiana cherokeensis* (W.P. Lemmon) Fernald, Rhodora 41: 487. 1939.

*Dasystephana latifolia* (Chapm.) Small, Fl. S.E. US, ed. 1, 930, 1336. 1903.

**Stems** 1--5, 0.7--6.5 dm, decumbent to erect, glabrous or occasionally puberulent,. **Leaves** ± evenly spaced, linear to widely elliptic, 15--120 cm x 3--30

mm, obtuse to acute. **Inflorescences** ± dense cymes or heads of 1--8 flowers, sometimes with additional cymules on short branches. **Flowers:** calyx 9--32 mm, glabrous or occasionally puberulent, lobes narrowly oblanceolate, 4--17 mm, margins ciliate; corolla blue or rarely rose-violet, tubular, loosely closed to slightly or occasionally (in southernmost part of range) almost fully but narrowly open, 30--50 mm, lobes ovate-triangular, 3--7 mm, appendages divided half or more of their length into 2 ± triangular, lacerate segments; anthers connate. **Seeds** winged. 2n = 26 (Rork 1949).

*Gentiana saponaria* is listed as rare in New Jersey, with the potential of becoming imperiled (S3, New Jersey Natural Heritage Program 2010). It is protected by the Highlands Water Protection and Planning Act (New Jersey Natural Heritage Program 2010), and is a facultative wetland species, mostly occurring as a hydrophyte, but occasionally found in uplands (FACW, National Wetland Plant List 2012). It is found infrequently throughout much of New Jersey outside of the Pine Barrens. **Counties:** Atlantic, Bergen, Burlington, Camden, Cape May, Cumberland, Essex, Gloucester, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Passaic, Salem, Somerset, Union. **Habitat:** moist open areas; open wet woods; swamps; swales; bogs. **Blooms** September to November.

***Gentiana villosa*** L., Sp. Pl. 1: 228. 1753.

"striped gentian"

*Gentiana deloachii* (W.P. Lemmon) Shinners, Sida 1: 107. 1962.

**Stems** 1--5, 0.7--6 dm, erect, glabrous. **Leaves** ± evenly spaced, obovate to elliptic, 25--100 x 10--40 mm, proximal leaves retuse or truncate to obtuse, distal leaves ± acute. **Inflorescences** ± dense cymes of 1--10 flowers, often with additional flowers at 1--several nodes or on branches. **Flowers:** calyx 11--50 mm, glabrous, lobes linear to oblanceolate, 5--35 mm, margins not ciliate; corolla largely white or greenish white with veins outlined in green, sometimes suffused with violet, or grayish violet ± throughout, tubular, narrowly open, 30--55 mm, lobes ovate-triangular, 4--10 mm, appendages obliquely triangular, erose, occasionally shallowly bifid; anthers connate or free. **Seeds** not winged. 2n = 26 (Rork 1949).

This species is believed to extirpated from New Jersey. There is only one historic report of it being in found in New Jersey (*N. L. Britton s.n.* [CHRB] collected in Bridgeton, Cumberland County, on September 23, 1881). This location, and other potential habitat, has been searched with no other positive identifications (New Jersey Natural Heritage Program 2010). Although extirpated species are not current conservation priorities, this species is still protected by the Highlands Water Protection and Planning Act (New Jersey Natural Heritage Program 2010). **County:** Cumberland. **Habitat:** dry open woods and serpentine barrens. **Blooms** September to October.

***Gentianella*** Moench, Meth.: 482. 1794, nom. cons.

"dwarf gentian"

**Annuals** or **biennials** [perennials], glabrous. **Leaves** cauline, opposite [whorled], sometimes also basal. **Inflorescences:** flowers in cymes [solitary]. **Flowers** 4- or 5-merous; calyx tube cylindric to narrowly campanulate [or sometimes very short, rarely cleft and spathiform]; corolla blue-violet or rarely rose-violet, pink, white, or pale yellow [red, orange, bright yellow, green], funnelform [tubular, campanulate, or nearly salverform], glabrous [or adaxially with or without a fringe of trichomes or paired, deeply fringed scales near base of each lobe], lobes shorter than tube [or about as long as or longer than tube], entire or nearly so, no appendages between lobes; stamens inserted near or below [above] middle of corolla tube, anthers free; ovary sessile or short-stipitate; style short or indistinct, erect, persistent; stigmas 2; nectaries on inside of corolla tube near base, 1 [rarely 2] per petal. **Capsules** compressed-cylindric to compressed-ovoid.

***Gentianella quinquefolia*** (L.) Small, Fl. S.E. U.S., ed. 1: 929. 1903.

"agueweed"

*Gentiana quinquefolia* L., Sp. Pl. 1: 230. 1753.

*Gentiana amarelloides* Michx., Fl. Bor.-Amer. 1: 175. 1803.

**Annuals or biennials,** 2--80 cm. **Stems** erect, usually branched distally but without long branches near base. **Leaves:** basal usually withered by flowering time, spatulate to oblanceolate, 5--35 x 2--12 mm; cauline ovate, 5--60(--80) x 2--35(--45) mm. **Inflorescences** terminal and often axillary, dichasial or partly umbelloid cymes; pedicels 1--17 mm. **Flowers** 5-merous; calyx 2--15 mm, lobes usually subequal, subulate to lanceolate, 1--8(--10) mm; corolla narrowly funnelform, opening narrowly, violet, violet-blue, blue, or occasionally pale yellow or white, 10--25 mm, lobes incurved, ovate-triangular, 3.5--8.0 mm, bristle-tipped, no scales or fringes.

***Gentianella quinquefolia*** subsp. ***quinquefolia***

"agueweed," "stiff dwarf-gentian"

Larger **plants** usually with extensive primary and secondary branching. **Flowers:** calyx 2--6(--8) mm, lobes subulate to linear-oblong, 1--4(--6) mm; corolla 10--23 mm, lobes 3--7 mm. $2\underline{n} = 36$ (Rork 1949).

This species is native and found infrequently scattered throughout northwestern New Jersey. It imperiled in New Jersey (S2, New Jersey Natural Heritage Program 2010) and is protected by the Highlands Water Protection and Planning Act (New Jersey Natural Heritage Program 2010). Its range in New Jersey is becoming more restricted (Hough 1983). **Counties:** Morris, Passaic, Sussex, Warren. **Habitat:** wet or mesic rich

meadows and forest edges; roadsides, open woods. **Blooms** September to October.

***Gentianopsis*** Ma, Acta Phytotax. Sin. 1: 7. 1951.

"fringed gentian"

**Annuals, biennials, or perennials,** glabrous or with peduncles and calyces papillate-scabridulous. **Leaves** basal (sometimes withering before flowering time) and cauline, opposite. **Inflorescences:** flowers solitary, terminating main stem and each of any branches. **Flowers** 4-merous; calyx with 2 outer lobes usually ± longer and narrower than inner lobes, tube usually about as long as inner lobes; corolla blue to blue-violet, or occasionally rose-violet or white, rarely pale yellow, tube widely tubular or tubular-campanulate, adaxially glabrous or with minute trichomes near insertion of stamens, lobes about as long as or shorter than corolla tube, spreading, often tardily reflexed, margins usually distinctly toothed and/or fringed, rarely subentire, no appendages between lobes; stamens inserted in proximal half of corolla tube, anthers free; ovary subsessile or stipitate; style short, indistinct or rarely slender and distinct, erect, persistent; stigmas 2; nectaries on inside of corolla tube near base, 1 per petal. **Capsules** compressed-ovoid.

***Gentianopsis crinita*** (Froel.) Ma, Acta Phytotax. Sin. 1: 15. 1951.

"greater fringed gentian"

*Gentiana crinita* Froel., Gentiana 112. 1796.

*Gentianella crinita* (Froel.) Bercht. & J. Presl., Prir. Rostlin 1 (Gentian.): 21. 1823.

*Anthopogon crinitum* (Froel.) Raf., Fl. Tellur. 3: 25. 1837 ("1836").

**Annuals or biennials**, (0.3--)1--6(--10) dm. **Stems** except those of smallest plants with branches or peduncles arising from nodes distinctly above base, rarely from base. **Leaves** basal often withered by flowering time, spatulate to oblanceolate, 8--40 x 1--11 mm, apices rounded to acute; cauline (narrowly to) widely lanceolate to widely ovate, 10--80 x (4--)7--25 mm, apices acute. **Peduncles** 1--15(--20) cm. **Flowers:** calyx 14--40(--50) mm, outer lobes lanceolate, inner lobes ovate-oblong, apices short-acuminate; corolla deep blue or rarely rose-violet or white, 25--60(--75) mm, lobes elliptic-obovate, 10--25 x 5--15 mm, margins with fringes to 6 mm long laterally and around apex; ovary distinctly stipitate. **Seeds** papillate, not winged. $2\underline{n} = 78$ (Rork 1949).

This species is not listed with any rarity status in New Jersey. It is native and found frequently throughout much of New Jersey, although usually not in sandy areas such as the Pine Barrens. It is usually found as a hydrophyte, but sometimes in drier situations (FACW/OBL, National Wetland Plant List 2012). **Counties:** Bergen, Camden, Cape May, Essex, Gloucester, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Passaic, Somerset, Sussex, Union, Warren.

**Habitat:** moist, rich, open meadows in calcareous soils; roadsides; boggy swales; marshes. **Blooms** September to October.

***Obolaria*** L., Sp. Pl. 2: 632. 1753.

"obolaria"

**Perennials**, glabrous. **Leaves** cauline, opposite. **Inflorescences:** flowers terminal and axillary, solitary or in cymules of 3. **Flowers** 4-merous; calyx absent; corolla white to pale violet, narrowly campanulate, glabrous, lobes slightly longer than tube, ascending, entire or erose, 2 minute scales per petal on proximal part of tube, no appendages between lobes; stamens inserted in corolla sinuses, anthers free; ovary sessile; style short, erect, persistent; stigmas 2; nectaries in a ring at base of ovary. **Capsules** compressed-ovoid, rupturing irregularly.

***Obolaria virginica*** L., Sp. Pl. 2: 632. 1753.

"Virginia pennywort"

**Plants** 4--17(--25) cm. **Stems** 1--3. **Leaves** in inflorescence fan-shaped to spatulate-obovate or orbiculate, 4--16 x 3--11 mm; all or most leaves below inflorescence minute, scalelike. **Flowers:** corolla 6--15 mm, lobes obovate-oblong, apex acuminate. $2\underline{n} = 56$ (Kondo 1970).

*Obolaria virginica* is imperiled in New Jersey due its rarity, with less than 20 occurences known, and it is protected by the Highlands Water Protection and Planning Act (S2, New Jersey Natural Heritage Program 2010). New Jersey is the northern limit of this species, with it mostly occurring in the northwest highlands and on the Inner Coastal Plain in the southern part of the state. **Counties:** Camden, Cumberland, Essex, Gloucester, Hunterdon, Mercer, Morris, Salem, Somerset, Sussex, Union. **Habitat:** wet or dry woods with rich, loamy soil; shaded edges. **Blooms** April to June.

***Sabatia*** Adans., Fam. Pl. 2:503. 1763.

"rose gentian," "marsh-pink"

**Perennials, biennials, or annuals**; perennials sometimes stoloniferous, individual crowns then sometimes biennial; glabrous. **Leaves** cauline, opposite, often also basal. **Inflorescences** cymes [or heads] or flowers solitary, cymes dichasial in species with opposite branching, monochasial in species with alternate branching. **Flowers** (4--)5--12(--14)-merous; calyx tube hemispheric to turbinate, lobes longer or shorter than tube; corolla pink or white, often with a distinct "eye," rotate, glabrous, lobes much longer than tube, entire, appendages absent; stamens inserted in or near corolla sinuses; anthers free, straight, recurved or recoiling circinately or curving helically; ovary sessile; style distinct, deciduous, deeply cleft, initially deflexed to one side or less often erect; stigmas

2; nectaries 5 at base of ovary, not clearly differentiated. **Capsules** cylindric to ovoid or globose.

1. Flower parts in 7--12(--14)'s ..... *Sabatia dodecandra*

1. Flower parts in (4--)5(--6)'s

2. Pedicels (above bracteoles) 1--8 mm long ..... *Sabatia difformis*

2. Pedicels 10--150 mm long

3. Stems 4-winged, wings distally 0.2--0.3 mm high ……. *Sabatia angularis*

3. Stems terete or nearly so, wings absent or less than 0.2 mm high.

4. Cespitose perennials; leaves widest at or below middle, rounded at base; calyx more than 0.8 times as long as corolla; corolla lobes oblanceolate ..... *Sabatia campanulata*

4. Single-stemmed annuals or biennials; leaves widest distally to middle, cuneate at base; calyx less than 0.8 times as long as corolla; corolla lobes obovate ..... *Sabatia stellaris*

***Sabatia angularis*** (L.) Pursh, Fl. Amer. Sept. 1: 137. 1813.

“rosepink,” “square-stemmed centaury,” “common rose-gentian,” “common

marsh-pink”

*Chironia angularis* L., Sp. Pl. 1: 190. 1753.

**Biennials**. **Stems** 4-angled and winged, (0.5--)3--7.5(--9) dm, lower branches mostly opposite, upper mostly alternate. **Leaves** cauline and often also basal; basal oblong-spatulate to ovate-orbiculate, cauline lanceolate to widely ovate, 10--40 x 5--30(--40) mm. **Inflorescences** open cymes; pedicels 1--6 cm. **Flowers** 5(--6)-merous; calyx tube shallowly campanulate, low-ridged along mid- and commissural veins, 1--2 mm, lobes linear to narrowly oblong-lanceolate or occasionally ± foliaceous, 4--15(--18) mm; corolla pink [white], [basal spots triangular, greenish yellow, usually with dark red border], tube 4--7 mm, lobes ± narrowly spatulate-obovate, 6--22 x 2--9(--11) mm, apices rounded to subacute; anthers coiling circinately. 2n = 38 (Perry 1971).

This species is found infrequently throughout much of New Jersey. It is found in both wet and dry conditions (FAC/FACW, National Wetland Plant List 2012). **Counties:** Atlantic, Bergen, Burlington, Camden, Cape May, Cumberland, Essex, Gloucester, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Somerset, Union, Warren. **Habitat:** moist, open meadows and woods; edge of fresh and salt marshes. **Blooms** July to September.

***Sabatia campanulata*** (L.) Torre., Fl. N. Middle- United States. 1: 217. 1824.

"slender rose gentian," "slender sea pink," "slender marsh-pink"

*Chironia campanulata* L., Sp. Pl. 1: 190. 1753.

*Sabbatia gracilis* (Michx.) Salisb., Parad. Lond. t. 32. 1806.

*S. campanulata* var. *gracilis* (Michx.) Fernald, Rhodora 39: 444. 1937.

**Perennials**. **Stems** terete or 4-ridged in the upper regions, 1.5--6(--9) dm, branching all or mostly alternate. **Leaves** cauline, narrowly lanceolate or oblong (lower) to linear (all or upper), 10--40 x 1--7(--12) mm. **Inflorescences** few-flowered cymes or flowers solitary at ends of branches; pedicels (2--)4--7(--9) cm. **Flowers** 5-merous; calyx tube turbinate to shallowly campanulate, not ridged or with low ridges along mid- and commissural veins, 1--3 mm, lobes setaceous to narrowly linear, 7--15 mm; corolla pink or rarely white, basal spots oblong, yellow, usually with red border, tube 2--6 mm, lobes oblanceolate, 6--24 x 3--9(--11) mm, apices obtuse; anthers coiling circinately. $2\underline{n} = 34$ (Perry 1971).

*Sabatia campanulata* is native and rare in the state of New Jersey, with potential of becoming imperiled if current trends continue, and it is protected by the Highlands Water Protection and Planning Act (S3, New Jersey Natural Heritage Program 2010). It is found infrequently in the Outer Coastal Plain, including the Pine Barrens, usually as a hydrophyte (FACW, National Wetland Plant List 2012). **Counties:** Atlantic, Burlington, Cape May, Cumberland, Monmouth, Ocean, Salem. **Habitat:** sandy, peaty bogs; wet meadows; edges of

fresh and salt marshes. **Blooms** July to August.

***Sabatia difformis*** (L.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 3: 423. 1914. "lanceleaf rose gentian," "lance-leaved centaury"

*Swertia difformis* L., Sp. Pl. 1: 226. 1753.

*Sabbatia corymbosa* Baldw. ex Ell., Sketch Bot. S. Carolina & Ga. 1: 283. 1817.

*Sabbatia lanceolata* (Walter) Raf., Fl. Tellur. 3: 30. 1837 ("1836").

**Perennials**. **Stems** 4-angled, 2.5--10.5 dm, branching opposite throughout. **Leaves** cauline, linear-lanceolate to narrowly or occasionally widely elliptic-ovate, 10--40(--60) x 3--14(--22) mm. **Inflorescences** corymboid dichasia of compact cymules; pedicels 1--8(--15) mm. **Flowers** 5(--6)-merous; calyx tube shallowly campanulate, slightly keeled dorsally, 1--2(--3) mm, lobes lance-subulate, (2--)4--9(--14) mm; corolla white (when dry, sometimes cream to yellow), tube 2.5--6.0 mm, lobes oblanceolate, (5--)7--21 x 2.5--8.0 mm, apices rounded; anthers recurving. 2n = 36 (Perry 1971).

This species is native to New Jersey and is found frequently throughout the Pine Barrens in wet conditions (OBL, National Wetland Plant List 2012). New Jersey is the northern limit of this Coastal Plain species. **Counties:** Atlantic, Burlington, Camden, Cape May, Cumberland, Ocean. **Habitat:** wet,

open meadows; bogs; open woods; old cranberry bogs; acidic Pine Barren woods. **Blooms** July to August.

***Sabatia dodecandra*** (L.) Britton, Sterns & Poggenb., Prelim. Cat. 36. 1888.

"marsh rose gentian," "sea pink," "large marsh centaury"

*Chironia dodecandra* L., Sp. Pl. 190. 1753.

*Chironia chloroides* Michx., Fl. Bor.-Amer. 1: 147. 1803.

*Sabbatia chloroides* (Michx.) Pursh, Fl. Amer. Sept. 1: 138. 1813 ("1814").

**Perennials**. **Stems** terete or 4-ridged in the upper regions, 0.8--6 dm, branching all or mostly alternate. **Leaves** cauline, elliptic- or oblong-lanceolate, 15--70 x 4--12(--16) mm. **Inflorescences** open, few-flowered monochasia or flowers solitary at ends of branches; pedicels 1--9(--11) cm. **Flowers** 7-12(-14)-merous; calyx tube turbinate to campanulate, not ridged, 1.5--4.0 mm, lobes linear to oblong-lanceolate or occasionally narrowly spatulate or ± foliaceous, 4--20 mm; corolla purplish pink or rarely white, basal spots oblong, sometimes shallowly 3-lobed, yellow, usually with red border, tube (3--)4--8 mm, lobes oblanceolate to narrowly spatulate-obovate, (10--)12--25 x 3--11 mm, apices rounded to subacute; anthers coiling circinately. $2\underline{n} = 34 + 8b$ (Perry 1971).

*Sabatia dodecandra* is listed as imperiled in New Jersey due to rarity and

is protected by the Highlands Water Protection and Planning Act (S2, New Jersey Natural Heritage Program 2010). It is an obligate wetland species (OBL, National Wetland Plant List 2012) found rarely along the coast of New Jersey. **Counties:** Atlantic, Bergen, Burlington, Cape May, Hudson, Middlesex, Ocean. **Habitat:** salt marshes; wet, open areas. **Blooms** July to September.

***Sabatia stellaris*** Pursh, Fl. Amer. Sept. 1: 137. 1813.

"rose of Plymouth," "salt marsh pink," "annual rose gentian"

*Chironia amoena* Raf., Med. Repos. II. 5: 359. 1808, illegitimate homonym, non Salisb., 1796.

*Chironia stellaris* (Pursh) Eaton, Man., ed. 2, 204. 1818.

*Sabbatia amoena* (Raf.) G. Don, Gen. Hist. 4: 207. 1838.

*Sabbatia maculata* (Benth.) A. Gray, Proc. Amer. Acad. Arts 22: 438. 1887.

*Sabbatia maritima* Raf., Med. Fl. 2: 77. 1830.

*Sabatia simulata* Britton, Bull. N.Y. Bot. Gard. 3: 448. 1905.

**Annuals or biennials**. **Stems** terete or distally 4-angled, 0.2--5(--8) dm, branching alternate. **Leaves** cauline, linear to elliptic or obovate, 5--60(--90) x (1--)2--10(--15) mm. **Inflorescences** open, few-flowered cymes or flowers solitary; pedicels (1--)4--10(--15) cm. **Flowers** (4--)5-merous; calyx tube turbinate, not

ridged or obscurely ridged along midveins, 1.5--6.0 mm, lobes setaceous to linear, (4--)6--11(--22) mm; corolla pink or rarely white, basal spots 3-lobed, yellow, usually with red border, tube 3--8 mm, lobes oblanceolate or narrowly to medium-widely spatulate-obovate or elliptic, 5--20 x 2--10 mm, apices rounded to obtuse; anthers coiling circinately. $2\underline{n} = 36 + 0$--4b (Perry 1971).

This species is found frequently along the Outer Coastal Plain and Delaware Bay shore of New Jersey, usually in wet conditions (FACW/OBL, National Wetland Plant List 2012). **Counties:** Atlantic, Bergen, Burlington, Camden, Cape May, Cumberland, Hudson, Middlesex, Monmouth, Ocean, Salem. **Habitat:** salt marshes and meadows; open, sandy areas; swamps; brackish tidal marshes. **Blooms** July to September.

***Schenkia*** Griseb., Bonplandia 1: 226. 1853.

**Annuals or biennials**, glabrous. **Leaves** basal and cauline, opposite. **Inflorescences** spikelike [racemoid], monochasial cymes, sometimes dichasial at base. **Flowers** parts in 5's; calyx deeply lobed; corolla pink to rose-violet, salverform, glabrous, lobes elliptic-oblong, shorter than [about as long as] tube, entire or erose-tipped, appendages absent; stamens inserted in or near corolla sinuses, diverging radially; anthers free, coiling helically at dehiscence; ovary sessile; style distinct, erect, deciduous; stigma 2 or 1, bilobed; nectaries absent. **Capsules** ellipsoid.

***Schenkia spicata*** (L.) G. Mans., Taxon 53: 726. 2004.

"spiked centaury"

*Gentiana spicata* L., Sp. Pl.: 230. 1753.

*Centaurium spicatum* (L.) Fritsch, Mitt. Naturwiss. Vereins Univ. Wien 5: 97. 1907.

**Plants** 4--55 cm. **Stems** 1--several, branching throughout. **Leaves** basal often withered or absent by flowering time, widely ovate to elliptic, 6--30 x 2--17 mm, obtuse to acute; cauline elliptic (lower) to lanceolate (upper), (6--)10--30(--45) mm x 3--8(--12) mm, acute. **Inflorescences** spikelike, a central flower at the proximal 1 or 2 divisions, otherwise all or most flowers sessile or subsessile. **Flowers** calyx (4--)7--11 mm; corolla 10--15 mm, lobes 3.5--5.5 mm; anthers 1.0--1.5 mm; stigmas 2, widely fan-shaped. **Seeds** dark reddish brown to black. 2n = 22 (Zeltner 1970, 1991).

Originally from western Europe, eastern Asia, and northern Africa, this species was recently introduced in North America and has so far been found in Delaware, Maryland, Massachusetts, New Jersey, and Virginia (Mansion 2004, USDA Plants Database 2013). It has been found in one location in New Jersey, along Arthur Kill in Elizabeth, Union County. It was first found in this location in 2009 and was recollected from the same locality in September 2012 (voucher

specimen collected by Linda Kelly s.n., August 29, 2012). This is a new record for the state and is not yet listed in USDA-Plants Database (2013) (Fig. 3).

This species was recently moved from the genus *Centaurium* Hill to the genus *Schenkia* Griseb. based on molecular work performed by Mansion and Struwe (2004).

**County:** Union. **Habitat:** damp, sandy and grassy places near the ocean; disturbed areas; saline marshes. **Blooms** July to September.


Fig. 3. Herbarium specimen of *Schenkia spicata*, first New Jersey collection (Kelly s.n., 29 Aug 2012 [CHRB]).

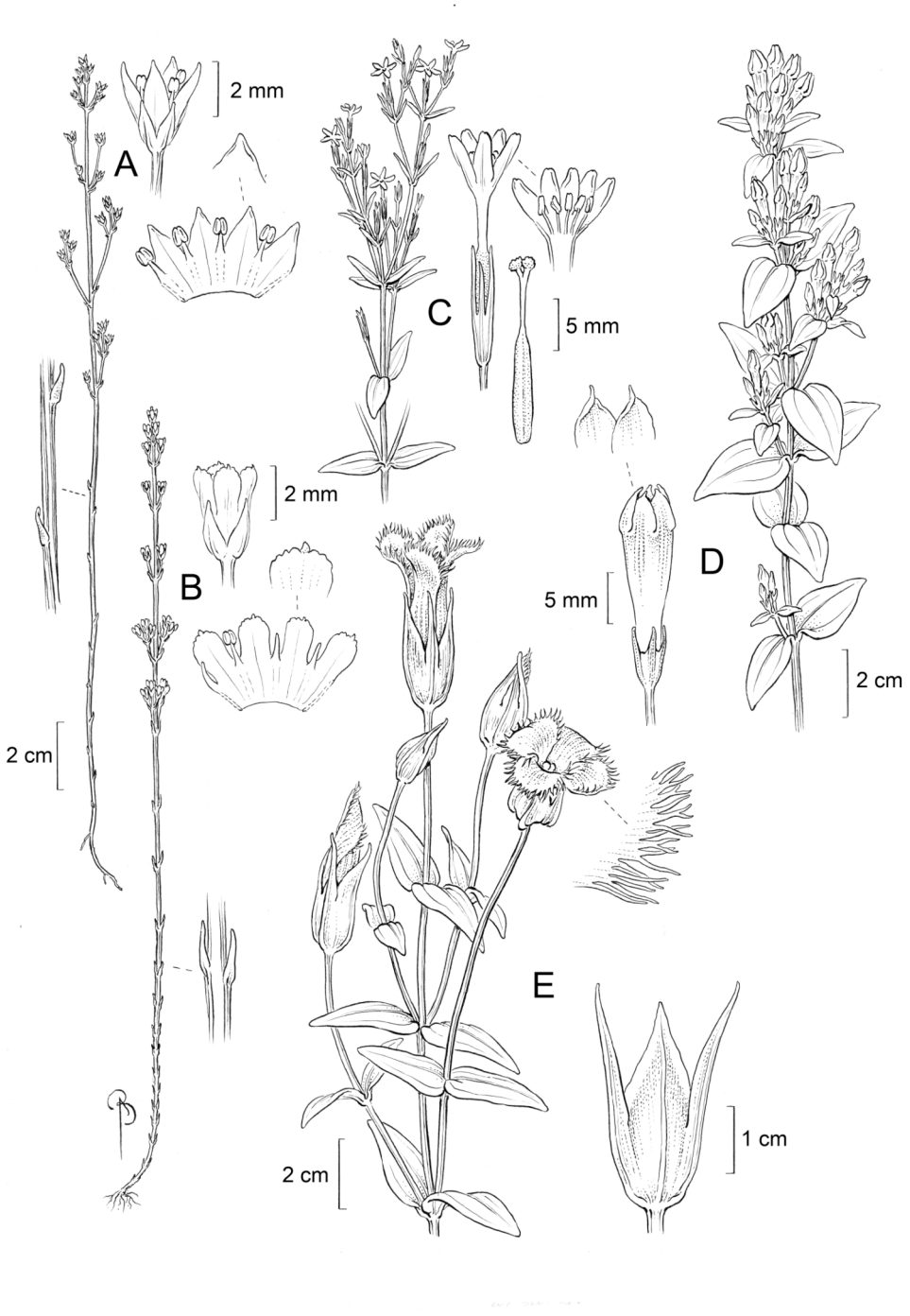


Fig. 4. **A.** *Bartonia paniculata* subsp. *paniculata*: B. Long 57253 (CHRB, dup. in PH). **B.** *Bartonia virginica*: M. A. Chrysler s.n., 30 July 1942 (CHRB). **C.** *Centaurium pulchellum*: B. Long 9162 (CHRB, dup. in PH). **D.** *Gentianella quinquefolia* subsp. *quinquefolia*: C. S. Williamson s.n., 29 September 1906 (PH). **E.** *Gentianopsis crinita*: S. S. Van Pelt s.n., 19 September 1902 (PH).

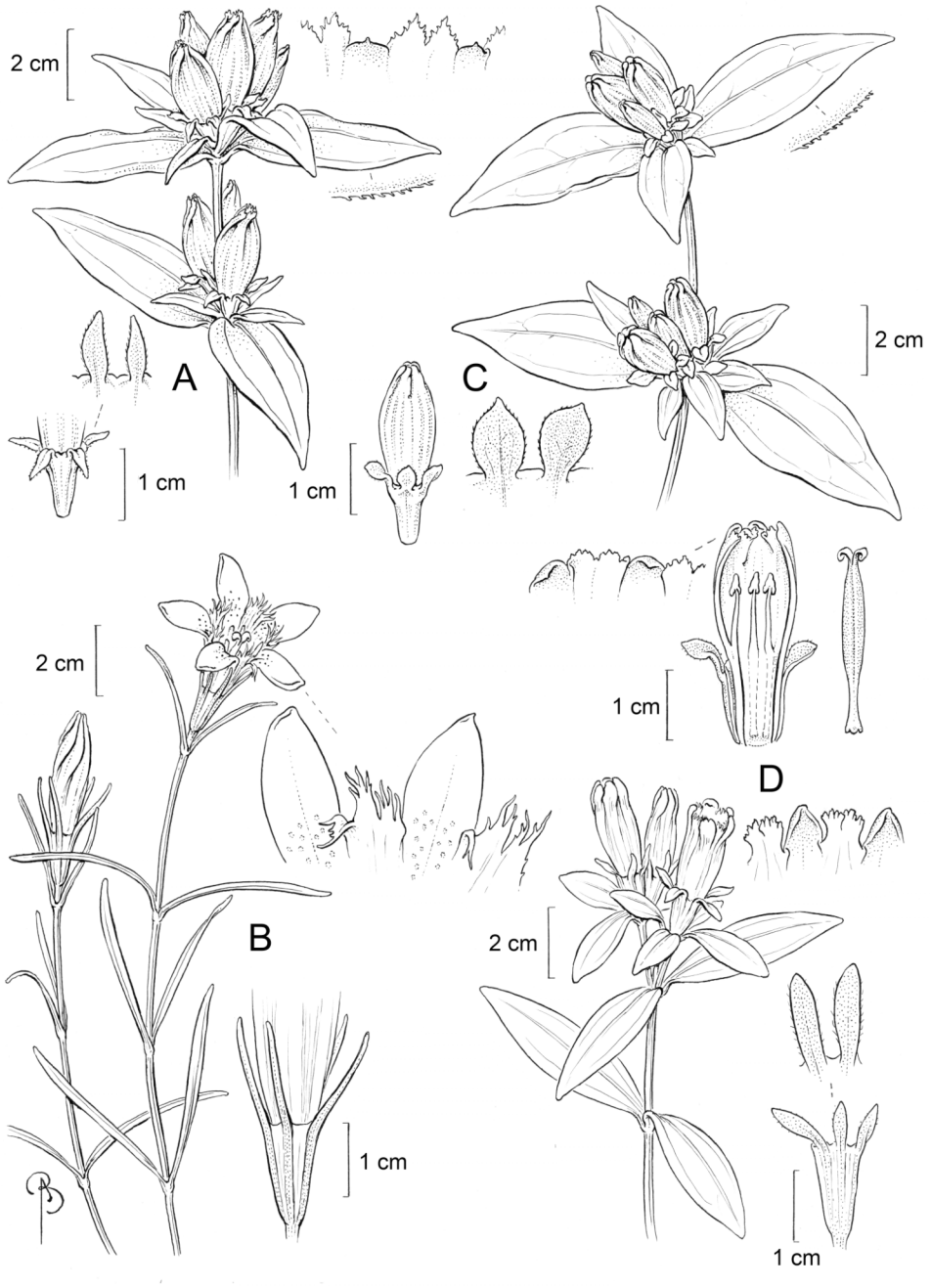


Fig. 5. **A.** *Gentiana andrewsii* var. *andrewsii*: E. A. Laport s.n., 8 October 1969 (CHRB). **B.** *Gentiana autumnalis*: B. Long 55175 (PH). **C.** *Gentiana clausa*: D. E. Fairbrothers s.n., 26 September 1978 (CHRB). **D.** *Gentiana saponaria*: D. B. Snyder 791-5RU (CHRB).

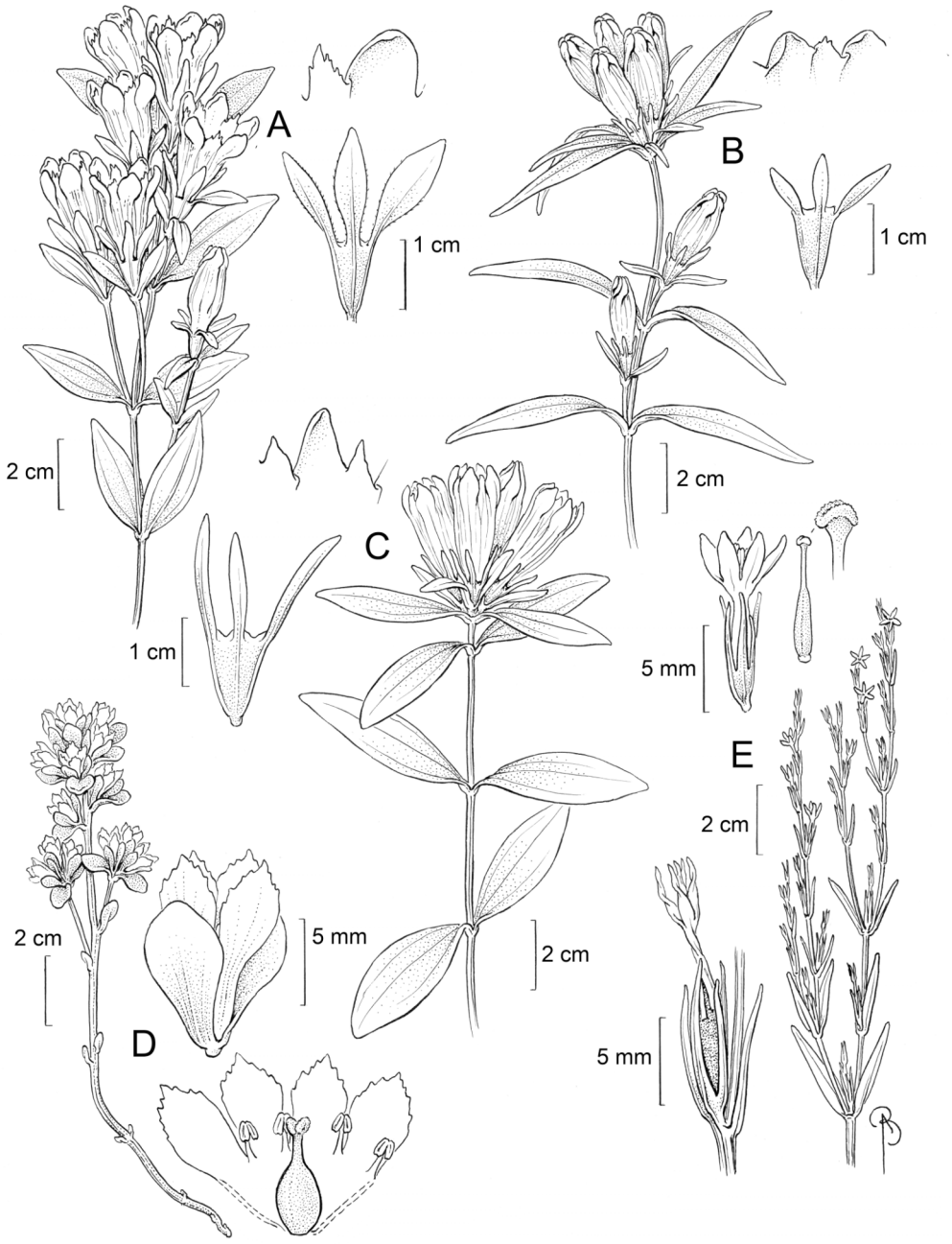


Fig. 6. **A.** *Gentiana catesbaei*: S. W. Leonard and A. E. Radford 2187 (CHRB). **B.** *Gentiana linearis*: Mori et al. 27467 (NY). **C.** *Gentiana villosa*: E. J. Grimes 3417 (NY). **D.** *Obolaria virginica*: B. Long 48720 (PH). **E.** *Schenkia spicata*: F. C. MacKeever 1033 (NY).

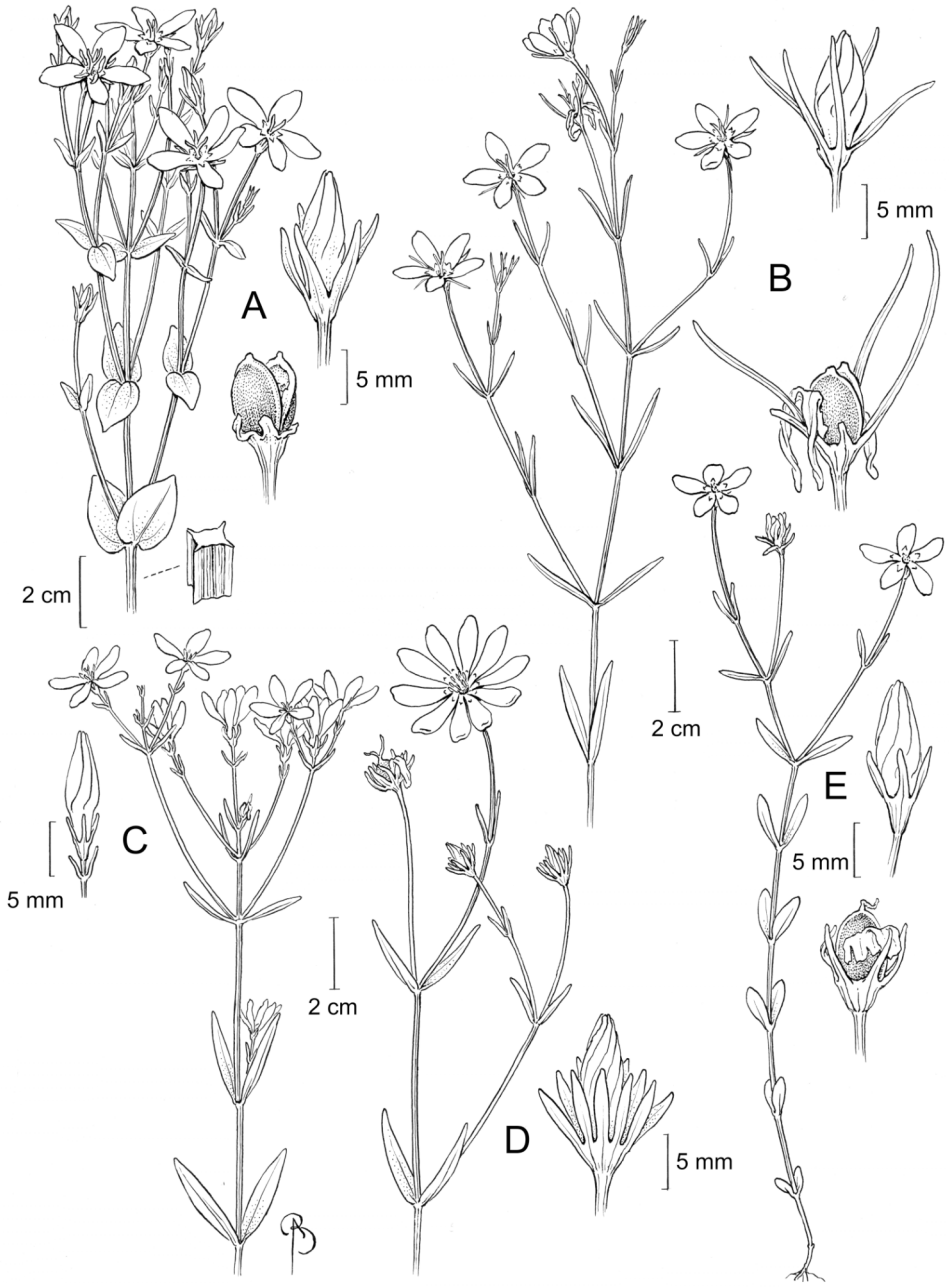


Fig. 7. **A.** *Sabatia angularis*: B. Long 10436 (PH), J. M. Fogg, Jr. 11638 (PH). **B.** *Sabatia campanulata*: C. S. Williamson s.n., 18 August 1907 (PH), J. M. Fogg, Jr. 4908 (PH, dup. in NY). **C.** *Sabatia difformis*: Morton 813 (NY). **D.** *Sabatia dodecandra*: J. A. Small s.n., 4 Augut 1937 (CHRB). **E.** *Sabatia stellaris*: M. A. Chrysler and M. A. Johnson s.n., 12 August 1936 (CHRB), W. Stone 7524 (PH)

**Discussion**

The nineteen gentianaceous species of New Jersey presented here make up an important group of mostly native wildflowers that occur in a wide range of habitats. With many instances of rarity in the state of New Jersey, along with the introductions of two non-native species, this group should be monitored closely for population stability and potential extinction and migration.

Two species (*Gentiana catesbaei* and *G. villosa*) are believed to be extirpated from New Jersey, each with only one record of each being recorded within the state (from 1926 and 1881, respectively). Although there are very few historic records of *Gentiana linearis* in New Jersey (from 1941), this species is not yet believed to be extirpated and there is still hope that the species may be located with diligent searching (New Jersey Natural Heritage Program 2010). Therefore, it is the only species in the Gentianacaeae family to have a state listing of Endangered (Table 2).

Some of the other native Gentianaceae also exhibit restricted ranges and narrow-niche requirements in New Jersey. *Gentiana autumnalis* is strongly limited to the Pine Barrens region of the Coastal Plain province, with occurrence in only six counties. *Sabatia campanulata*, *S. difformis*, and *S. dodecandra* also show strong adaptations to the conditions of the Pine Barrens, occurring in seven, six, and seven counties, respectively. Further research could be conducted to determine if the traits of these niche-specific species are plesiomorphic ancestral-niche constraints or more recent adaptations. *Sabatia difformis* is found relatively frequently in these areas, but the other species (*G. autumnalis*, *S. campanulata*, and *S. dodecandra*) should be monitored for population

health and stability due to low occurrences, and their habitats should continue to be protected from development and destruction.

Some Gentianaceae appear to be widespread throughout the state of New Jersey, such as *Bartonia virginica* (19 counties), *Gentiana saponaria* (18 counties), *Sabatia angularis* (17 counties), and *Gentianopsis crinita* (15 counties). These generalist species are found in a variety of habitats across New Jersey's diverse ecological setting.

Many Gentianaceae species in New Jersey seem to be in decline. *Gentianella quinquefolia* subsp. *quinquefolia* was reported to occur in eight counties in *New Jersey Wild Plants* (Hough 1983), but only records from four counties could now be located. It is suspected that *Gentianopsis crinita*, although historically found in 15 counties in New Jersey, is now mostly gone from the Coastal Plain province and restricted to Sussex and Warren Counties in the Valley and Ridge province in the northwestern part of the state (Snyder, pers. comm.).

Despite the rarity and uniqueness of species in the Pine Barrens, and the Pine Barrens habitat itself, this region houses the highest diversity of gentianaceous species in New Jersey (Table 4). Of the 19 species of Gentianaceae, 12 occur in Burlington County, 11 in Camden and Cape May counties, and 10 species occur in Atlantic, Cumberland, and Ocean counties. The Pine Barrens region includes all of these counties.

Non-native gentianaceous species do not appear to be a problem as of yet in New Jersey. *Schenkia spicata* was recently found in Union County, New Jersey for the first time and is first reported here (see Appendix 3). *Centaurium pulchellum*, which has been known to exist in North America for about two centuries, occurs in only six counties, mostly along the coastline of the Atlantic Ocean and the Delaware Bay. Because *C.*

*pulchellum* prefers sandy soils and coastal habitats, it will most likely not become a problem further inland, however, its populations along the coast should be monitored for invasiveness and competition with native species.

The presence or absence of these gentian species in the counties of New Jersey, as reported here, differ markedly from the most recent county checklist (Hough 1983). Hough (1983) based location information for these species on herbarium specimens only from the Chrysler Herbarium of Rutgers University (CHRB), her own field observations, and those of other reputable botanists. For this paper, location information is based solely on herbarium specimens from four regional herbaria (BKL, CHRB, NY, PH) and does not include undocumented field observations (see Methods). This paper reports 13 of the 19 gentianaceous species as occurring in more counties than Hough (1983), with five species occurring in the same number of (though not necessarily the same) counties. Hough reports only one species, *Gentianella quinquefolia* subsp. *quinquefolia*, as occurring in more counties than reported here.

The revision of the Gentianaceae family for the Flora of New Jersey Project contributes to providing the first comprehensive manual of all vascular plants occurring in New Jersey. The combination of full species descriptions, nomenclature lists, and a user-friendly online will provide data important information on the plant biodiversity of New Jersey.

Table 2. Conservation status for some Gentianaceae of New Jersey (New Jersey Natural Heritage Program 2010, see Appendix 1 for definitions of ranks and status)

| Scientific name | Common name | Global Rank | NJ State Rank | Federal Status | NJ State Status | Regional Status |
|---|---|---|---|---|---|---|
| *Gentiana andrewsii* var. *andrewsii* | Closed bottle gentian | G5?T5? | S2 | None | None | HL |
| *Gentiana autumnalis* | Pine barren gentian | G3 | S3 | None | None | LP, HL |
| *Gentiana catesbaei* | Catesby's gentian | G5 | SX.1 | None | None | HL |
| *Gentiana linearis* | Narrow-leaf gentian | G4G5 | SH | None | E | LP, HL |
| *Gentiana saponaria* var. *saponaria* | Soapwort gentian | G5T5 | S3 | None | None | HL |
| *Gentiana villosa* | Striped gentian | G4 | SX.1 | None | None | HL |
| *Gentianella quinquefolia* var. *quinquefolia* | Agueweed | G5 T4T5 | S2 | None | None | HL |
| *Obolaria virginica* | Virginia pennywort | G5 | S2 | None | None | HL |
| *Sabatia campanulata* | Slender marsh-pink | G5 | S3 | None | None | HL |
| *Sabatia dodecandra* var. *dodecandra* | Large marsh centaury | G5? T4T5 | S2 | None | None | HL |

Table 3. 2012 National Wetland Indicator Status (National Wetland Plant List 2012, see Appendix 2 for status definitions)

| Scientific Name | Common Name | Northcentral & Northeast Region (incl. NJ) | Eastern Mountains and Piedmont Region (incl. NJ) | Atlantic and Gulf Coastal Plain Region (incl. NJ) |
|---|---|---|---|---|
| *Bartonia paniculata* | Twining screwstem | OBL | OBL | OBL |
| *Bartonia virginica* | Yellow screwstem | FACW | FACW | FACW |
| *Centaurium pulchellum* | Branched centaury | FAC | FAC | FACU |
| *Gentiana andrewsii* | Closed bottle gentian | FACW | FACW | FACW |
| *Gentiana autumnalis* | Pine barren gentian | -- | FACW | FACW |
| *Gentiana catesbaei* | Catesby's gentian | -- | OBL | OBL |
| *Gentiana clausa* | Bottle gentian | FACW | FACW | FAC |
| *Gentiana linearis* | Narrow-leaf gentian | FACW | OBL | OBL |
| *Gentiana saponaria* | Soapwort gentian | FACW | FACW | FACW |
| *Gentianella quinquefolia* | Agueweed | FAC | FAC | FACW |
| *Gentianopsis crinita* | Greater fringed-gentian | FACW | OBL | FACW |
| *Obolaria virginica* | Virginia pennywort | -- | -- | -- |
| *Sabatia angularis* | Rose-pink | FAC | FAC | FACW |
| *Sabatia campanulata* | Slender marsh-pink | FACW | FACW | FACW |
| *Sabatia difformis* | Lanceleaf rose gentian | -- | OBL | OBL |
| *Sabatia dodecandra* | Large marsh centaury | OBL | OBL | OBL |
| *Sabatia stellaris* | Rose-of-Plymouth | FACW | FACW | OBL |
| *Schenkia spicata* | Spiked centaury | FACW | -- | FACW |

Table 4. Number of Gentianaceae Species by County in New Jersey

| New Jersey County | Number of Species (Gentianaceae) |
|---|---|
| Atlantic | 10 |
| Bergen | 9 |
| Burlington | 12 |
| Camden | 11 |
| Cape May | 11 |
| Cumberland | 10 |
| Essex | 6 |
| Gloucester | 7 |
| Hudson | 4 |
| Hunterdon | 7 |
| Mercer | 6 |
| Middlesex | 9 |
| Monmouth | 8 |
| Morris | 8 |
| Ocean | 10 |
| Passaic | 6 |
| Salem | 6 |
| Somerset | 7 |
| Sussex | 6 |
| Union | 8 |
| Warren | 5 |

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Appendix 1. Conservation Classification and Endangerment Codes (Table 1)

**Global and State Ranks:** The Nature Conservancy developed a ranking system for use in identifying elements (rare species and ecological communities) of natural diversity most endangered with extinction. Each element is ranked according to its global, national, and state rarity. These ranks are used to prioritize work so that the most endangered elements receive attention first. Definitions for element ranks are after The Nature Conservancy (1982: Chapter 4, 4.1-1 through 4.4.1.3-3).

*Note:* To express uncertainty, the most likely rank is assigned and a question mark added (e.g., G2?). A range is indicated by combining two ranks (e.g., G1G2, S1S3).

*Global Element Ranks*

G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range; with the number of occurrences in the range of 21 to 100.

G4 = Apparently secure globally; although it may be quite rare in parts of its range, especially at the periphery.

G5 = Demonstrably secure globally; although it may be quite rare in parts of its range, especially at the periphery.

T = Element ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species.

*State Element Ranks*

S2 = Imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically many of these elements may have been more frequent but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences.

S3 = Rare in state with 21 to 50 occurrences. Includes elements that are widely distributed in the state but with small populations or elements with restricted distribution, but locally abundant. Not yet imperiled in state but may soon be if current trends continue. Searching often yields additional occurrences.

SH = Elements of historical occurrence in New Jersey. Despite some searching of historical occurrences and/or potential habitat, no extant occurrences are known. Since not all of the historical occurrences have been field surveyed, and unsearched potential habitat remains, historically ranked taxa are considered possibly extant, and remain a conservation priority for continued field work with the expectation they may be rediscovered.

SX = Elements that have been determined or are presumed to be extirpated from New Jersey. All historical occurrences have been searched and a reasonable search of potential habitat has been completed. Extirpated taxa are not a current conservation priority.

.1 = Elements only ever documented from a single location.

**State Status Codes:** According to the Endangered and Nongame Species Conservation Act of 1973 (NJDEP 2011).

E = Endangered species – an endangered species is one whose prospects for survival within the state are in immediate danger due to one or many factors – a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow.

**Regional Status Codes:**

LP – indicates taxa listed by the Pinelands Commission as endangered or threatened within their legal jurisdiction (New Jersey Pinelands Commission 2007).

HL – indicates taxa or ecological communities protected by the Highlands Water Protection and Planning Act within the jurisdiction of the Highlands Preservation Area (New Jersey Highlands Council 2004).

Appendix 2. Categories for National Wetland Indicator Status (Table 3, National Wetland Plant List 2012)

| Indicator Code | Indicator Status | Comment |
|---|---|---|
| OBL | Obligate Wetland | Almost always is a hydrophyte, rarely in uplands |
| FACW | Facultative Wetland | Usually is a hydrophyte but occasionally found in uplands |
| FAC | Facultative | Commonly occurs as either a hydrophyte or non-hydrophyte |
| FACU | Facultative Upland | Occasionally is a hydrophyte but usually occurs in uplands |
| UPL | Obligate Upland | Rarely is a hydrophyte, almost always in uplands |

Appendix 3. Exsiccate List of Specimens by County

(* = only specimen record of this species from this county; ** = only specimen record of this species from the state of New Jersey)

***Bartonia paniculata*** (Michx.) Muhl. subsp. ***paniculata***

Atlantic: *B. Long 52956* (PH)

Burlington: *H. Koster E4-5-1* (PH)

Camden: *W. Stone 7584* (PH)

Cape May: *F. Pennell s.n.*, 2 Sept 1915 (NY)

Cumberland: *S. Heckscher 4* (PH)

Gloucester: *B. Long 25066* (CHRB, PH)

Mercer: *E. B. Bartram s.n.*, 19 Sept 1913 (PH)

Middlesex: *K. Mackenzie 2929* (NY)

Monmouth: *B. Long 57253* (CHRB)

Ocean: *G. Moore 8151* (BKL)

Salem: *Beals and Bassett 948* (NY, PH)

***Bartonia virginica*** (L.) Britton, Sterns & Poggenb.

Atlantic: *F. Pennell 8164* (PH)

Bergen: *K. Mackenzie 2479* (NY)

Burlington: *B. Long 70763* (CHRB, PH)

Camden: *B. Long* 54950 (PH)

Cape May: *H. Wilkens 4887-a* (PH)

Cumberland: *G. Moore 6721* (BKL)

Essex: *P. Wilson s.n.*, 3 July 1905 (NY)

Gloucester: *B. Long 28130* (PH)

Hudson: *W. Leggett s.n.*, 9 Nov 1867 (CHRB) *

Hunterdon: *B. Long 52993*, 1938(PH) *

Middlesex: *W. Miller 1350* (NY, CHRB)

Monmouth: *W. Miller 1347* (NY)

Morris: *K. Barringer 15812* (BKL)

Ocean: *E. B. Bartram 3681* (PH)

Passaic: *H. Denslow s.n.*, 2 Aug 1929 (NY)

Salem: *J. Fogg, Jr. 9457* (PH)

Sussex: *R. Clausen and J. Edwards 3542* (CHRB)

Union: *K. Barringer 19265* (BKL)

Warren: *R. Schaeffer, Jr. 41547* (PH)

***Centaurium pulchellum*** (Sw.) Hayek ex Hand.-Mazz. et al.

Atlantic: *V. Abraitys s.n.*, 1 July 1974 (CHRB)

Bergen: *C. F. Austin s.n.*, 1857 (CHRB) **most recent collection 1865

Camden: *A. Jahn s.n.*, 10 July 1900 (PH)

Cape May: *K. Mackenzie 6133* (CHRB, PH)

Hudson: *K. Barringer* 12143 (BKL)

Ocean: *B. Long* 9162 (PH, CHRB)

***Gentiana andrewsii*** Griseb. var. ***andrewsii***

Bergen: *Kenneth K. Mackenzie 7445* (NY)

Burlington: *Kenneth K. Mackenzie 6849*, 1915 (NY) *

Camden: *Alex McElwee 678* (PH)

Hunterdon: *Gasper A. Loughridge and W. E. Roever 462* (CHRB)

Mercer: *Bayard Long 17838* (PH)

Middlesex: *Arthur Pierson Kelley 709* (CHRB)

Morris: *James Kezer s.n.*, 21 Sept 1926 (NY)

Somerset: *Arthur Pierson Kelley s.n.*, 25 Sept 1926 (CHRB) *

Sussex: *Henry Svenson 11682* (BKL)

Union: *Waldron DeWitt Miller 1351* (NY) *

***Gentiana autumnalis*** L.

Atlantic: *James C. Lendemer 1439* (PH, BKL)

Burlington: *Robert T. Clausen and W. Wilson 2371* (BKL, NY)

Camden: *William H. Witte s.n.*, 21 Sept 1929 (PH)

Cape May: *Bayard Long 5176* (PH)

Cumberland: *James R. Pennell s.n.*, 11 Sept 1924 (BKL, NY, PH)

Ocean: *Robert T. Clausen 5656* (NY)

***Gentiana catesbaei*** Walter

Somerset: *Harold N. Moldenke 3105* (NY) **

***Gentiana clausa*** Raf.

Bergen: *Francis W. Pennell s.n.*, 12 Sept 1915 (NY)

Burlington: *Bayard Long 17807* (PH)

Essex: *H. H. Rusby s.n.*, Aug 1879 (CHRB) *

Hunterdon: *Walter M. Benner 9015* (PH)

Middlesex: *S.J. Ewer s.n.*, 3 Oct 1931 (CHRB)

Monmouth: *Bayard Long 22471* (PH)

Morris: *Harold N. Moldenke 6426* (NY)

Passaic: *H. M. Denslow s.n.*, 17 Sept 1923 (NY)

Somerset: *J. Kezer 10* (CHRB)

Sussex: *Kerry Barringer 7355* (BKL)

Union: *J. Kezer s.n.*, 28 Sept 1940 (CHRB) *

Warren: *E.T. Moul 63-198* (CHRB)

***Gentiana linearis*** Froel.

Passaic: *Robert T. Clausen 5568* (NY) **

***Gentiana saponaria*** L.

Atlantic: *Bayard Long 18346* (CHRB, PH)

Bergen: *C. Ericson 2255* (BKL)

Burlington: *Hollis Koster E4-3-2* (PH)

Camden: *John M. Fogg, Jr. 604* (PH)

Cape May: *Bayard Long 7972* (PH)

Cumberland: *Gerry Moore 7712* (BKL)

Essex: *Charles Ericson 1375* (BKL)

Gloucester: *Bayard Long 18291* (NY, CHRB)

Hunterdon: *Bayard Long 55685* (CHRB, PH)

Mercer: *Walter M. Rankin s.n.*, 10 Oct 1884 (CHRB)

Middlesex: *Kenneth K. Mackenzie 3912* (NY)

Monmouth: *Kenneth K. Mackenzie 8209* (NY, CHRB)

Morris: *Waldron DeWitt Miller 1358* (NY)

Ocean: *John M. Fogg, Jr. 13955* (PH) *

Passaic: *Geo. V. Nash 463* (NY)

Salem: *John M. Fogg, Jr. 6203* (PH)

Somerset*: Lewis Lighthipe s.n.*, 19 Sept 1919 (BKL)

Union: *J. Kezer s.n.*, 6 Oct 1940 (CHRB)

***Gentiana villosa*** L

Cumberland: *N. L. Britton s.n.*, 23 Sept 1881 (CHRB) **

***Gentianella quinquefolia*** (L.) Small subsp. ***quinquefolia***

Morris: *Thomas C. Porter s.n.*, 26 Sept 1869 (CHRB) *

Passaic: *H. M. Denslow s.n.*, 13 Oct 1922 (NY)

Sussex: *A. J. Hoiberg 920* (CHRB)

Warren: *Harold W. Pretz 9220* (CHRB, PH)

***Gentianopsis crinita*** (Froel.) Ma

Bergen: *Norman Taylor 451* (BKL)

Camden: *Witmer Stone 13709* (CHRB)

Cape May: *Bayard Long 25034* (PH, CHRB)

Essex: *M.W. Travis s.n.*, 20 Oct 1936 (CHRB)

Gloucester: *Bayard Long 38895* (PH)

Hunterdon*: E.A. Laport s.n.*, 23 Sept 1969 (CHRB)

Mercer: *W. L. Dix s.n.*, 22 Sept 1946 (PH)

Middlesex: *Charles Ericson 3073* (BKL)

Monmouth: *Anonymous s.n.*, 28 Sept 1958 (CHRB) *

Morris: *M.A. Chrysler s.n.*, 12 Oct 1934 (CHRB)

Passaic: *J.A Small s.n.*, 24 Sept 1933 (CHRB) *

Somerset: *M.A. Chrysler s.n.*, 6 Oct 1933 (CHRB)

Sussex: *Steven Glenn 5146a* (BKL)

Union: *Frank Tweedy s.n.*, Sept 1889 (CHRB) *

Warren: *R. L. Schaeffer, Jr. 36979* (PH)

***Obolaria virginica*** L.

Camden: *Lee P. Hynes s.n.*, 23 Apr 1938 (PH) *

Cumberland: *Bayard Long 42928* (PH) *

Essex: *Kenneth K. Mackenzie s.n.*, 29 Apr 1923 (NY)

Gloucester: *Frank Hirst s.n.*, 9 May 1961 (PH)

Hunterdon: *Gasper A. Loughridge 2270* (PH)

Mercer: *H. M. Denslow s.n.*, 7 June 1924 (NY)

Morris: *David B. Snyder 424-2RU* (CHRB)

Salem: *Jacy A. Waddington s.n.*, 5 May 1888 (PH) *

Somerset: *Harold N. Moldenke 11068* (NY)

Sussex: *H. H. Rusby s.n.*, s.d. "Franklin" (NY) *

Union: *Helen Baldwin s.n.*, 1923 (NY) *

***Sabatia angularis*** (L.) Pursh

Atlantic: *Bayard Long 10436* (PH)

Bergen*: C. F. Austin s.n.*, 4 Jan 1883 (CHRB)

Burlington: *R.E. Good and W. R. Ferren 435* (CHRB) *

Camden: *Lee P. Hynes 1430* (PH)

Cape May: *Bayard Long 4424* (PH, CHRB)

Cumberland: *Bayard Long 44581* (PH)

Essex: *Kenneth K. Mackenzie 355* (NY)

Gloucester: *Bayard Long 28345* (PH)

Hunterdon: *Walter M. Benner 6787* (PH)

Mercer: *Bayard Long 48888* (PH)

Middlesex: *Waldron DeWitt Miller 1361* (NY)

Monmouth: *Vernon L. Frazee s.n.*, 4 Aug 1952 (PH) *

Morris: *Charles Hall s.n.*, Sept 1875 (BKL)

Ocean: *J. H. Grove 762* (PH)

Somerset: *Harold N. Moldenke 6173* (NY)

Union: *Charles Ericson 1698* (BKL)

Warren: *R. L. Schaeffer, Jr. 29686* (PH)

***Sabatia campanulata*** (L.) Torr.

Atlantic: *C. A. Gross s.n.*, 4 Aug 1887 (NY)

Burlington: *Bayard Long 10669* (CHRB)

Cape May: *Witmer Stone 16300* (PH)

Cumberland: *Bayard Long 47155* (CHRB, PH)

Monmouth: *Kenneth K. Mackenzie 5144* (CHRB, NY, PH)

Ocean: *John M. Fogg, Jr. 4908* (NY, PH)

Salem: *Bayard Long 47088* (PH)

***Sabatia difformis*** (L.) Druce

Atlantic: *Witmer Stone 14360* (PH)

Burlington: *Kerry Barringer 12259* (BKL, PH)

Camden: *Bayard Long 54939* (PH)

Cape May: *Daniel W. Hamm 1267* (CHRB)

Cumberland: *Bayard Long 51297* (CHRB, PH)

Ocean: *T. W. Edmondson 4868* (NY)

***Sabatia dodecandra*** (L.) Britton, Sterns & Poggenb.

Atlantic: *Bayard Long 10486* (NY, PH)

Bergen: *Geo. V. Nash 46* (NY)

Burlington: *David B. Snyder 818-3RU* (CHRB)

Cape May: *Witmer Stone 9148* (CHRB)

Hudson: *William Van Sickle s.n.*, 28 July 1894 (BKL)

Middlesex: *Charles Ericson 3374* (BKL)

Ocean: *John M. Fogg, Jr. 11110* (PH)

***Sabatia stellaris*** Pursh

Atlantic: *John M. Fogg, Jr. 4574* (PH)

Bergen: *H. H. Rusby s.n.*, July 1879 (NY) *

Burlington: *Harold N. Moldenke 3270* (NY)

Camden: *C.F. Parker s.n.*, 26 Aug 1969 (CHRB)

Cape May: *Flora S. Fender 803* (PH)

Cumberland: *J. W. Adams 1124* (PH)

Hudson: *Kenneth K. Mackenzie 6765* (CHRB, PH)

Middlesex: *Charles Ericson 3308* (BKL)

Monmouth: *Kenneth K. Mackenzie 1839* (NY)

Ocean: *Kenneth K. Mackenzie 2388* (NY)

Salem: *John M. Fogg, Jr. 6098* (PH)

***Schenkia spicata*** (L.) G. Mans.

Union: *Linda Kelly s.n.*, 29 Aug 2012 (CHRB) **

## Chapter 2: Nomenclature and Taxonomy of Gentianaceae of New Jersey

### Introduction

This paper supplements the treatment of the Gentianaceae in the Flora of New Jersey series (Chapter 1). It provides a list of the accepted names for the gentianaceous species native to or naturalized in New Jersey, U.S.A., with bibliographical data and both homotypic and heterotypic synonymy and typifications. It includes neotypifications for the names *Gentiana clausa* Raf. and *G. linearis* Froel., a lectotypification for *Sabatia stellaris* (Pursh), and a clarification of the typification of *Centaurium pulchellum* (Sw.) Hayek ex Hand.-Mazz. et al.).

***Bartonia*** Muhl. ex Willd., Ges. Naturf. Freunde Berlin Neue Schriften 3: 444. 1801.

TYPE: *Bartonia tenella* Muhl. ex Willd. (= *B. virginica* (L.) Britton, Sterns & Poggenb.)

*Centaurella* Michx., Fl. Bor.-Amer. 1: 97. 1803. TYPE: *Centaurella verna* Michx. (= *Bartonia verna* (Michx.) Raf. ex Barton).

*Centaurium* (Michx.) Pers., Syn. Pl. 1: 137. 1805, illegitimate homonym, non Hill, Brit. Herb. 62. 1756.

*Andrewsia* Spreng., Anleit. Kenntn. Gew., ed. 2, 2(1): 474. 1817, superfluous name, included type of *Centaurella* Michx.; non *Andreusia* Vent., Jard. Malmaison t. 108. 1805 ("1804").

***Bartonia paniculata*** (Michx.) Muhl., Cat. Pl. Amer. Sept. 16. 1813.

*Centaurella paniculata* Michx., Fl. Bor.-Amer. 1: 98. 1803; *Andrewsia paniculata* (Michx.) Barton ex Steud., Nomencl., ed, 2, 1: 87. 1841, pro syn.; *Bartonia virginica* var. *paniculata* (Michx.) B. Boivin, Naturaliste Canad. 93: 1059. 1966. LECTOTYPE: *A. Michaux s.n., s.d.*, U.S.A.: Carolina (P-Michx. [photo DAO, M25/5, IDC microfiche]). Lectotypified by J.M. Gillett, Rhodora 61: 53. 1959.

New Jersey plants are:

***Bartonia paniculata*** subsp. ***paniculata***

*Bartonia tenella* Muhl. ex Willd. [var.] β *brachiata* Alph. Wood, Class-book Bot., ed. 41 revised, 586. 1866, sensu Alph. Wood, non quoad typum; based on *B. moseri* (Steud. & Hochst. ex Griseb.) B.L. Rob. & Schrenk ex Gilg..

*Bartonia lanceolata* Small, Fl. S.E. U.S. 932. 1336. 1903. TYPE: *A.W.Chapman s.n, s.d.,* U.S.A.: Florida: Calhoun Co.: Ocheesee (NY [image online]).

***Bartonia virginica*** (L.) Britton, Sterns & Poggenb., Prelim. Cat. 36. 1888.

*Sagina virginica* L., Sp. Pl. 2: 28. 1753. LECTOTYPE*: J. Clayton 649, s.d.* U.S.A.: Virginia (lectotype BM [image online, photo DAO]). Lectotypified by J.M. Gillett, Rhodora 61: 49. 1959.

*Bartonia tenella* Muhl. ex Willd., Ges. Naturf. Freunde Berlin Neue Schriften 3: 444. 1801; TYPE: *G.H.E. Muhlenberg s.n., s.d.*, U.S.A.: Pennsylvania (B-Willd. [photo DAO]).

*Centaurella autumnalis* Pursh, Fl. Amer. Sept. 1: 100. 1813 ("1814"), superfluous name, included type of *Sagina virginica* L.; *Andrewsia autumnalis* (Pursh) Spreng., Syst. Veg. 1: 428. 1825.

*Centaurella autumnalis* [var.] β *brachysepala* Griseb., Gen. Sp. Gent. 308. 1838 ("1839"). TYPE: Not designated; two syntypes cited by Grisebach; *T. Drummond s.n, s.d.,.* from U.S.A.: "pr[ope] Covington" (probably Pennsylvania) was cited as the type by J.M. Gillett, Rhodora 61: 49. 1959, but the repository of any such specimen, if any is extant, is not known; *C.J. Moser s.n., s.d.*, from U.S.A.: Pennsylvania was also cited by Grisebach, but the repository of any extant specimen that might be designated the type is likewise unknown.

*Centaurella moseri* Steud. & Hochst. ex Griseb., Gen. Sp. Gent. 308. 1838 ("1839');

*Bartonia moseri* (Steud. & Hochst. ex Griseb.) B.L. Rob. & Schrenk ex Gilg in Engl. & Prantl, Nat. Pflanzenf. 4, abt. 2: 76. 1895. TYPE: Not designated; two syntypes cited by Grisebach, both probably having several replicates; *T. Drummond s.n, s.d.,*. from U.S.A.: "Covington" (probably Pennsylvania) cited by J.M. Gillett, Rhodora 61: 49. 1959, replicate not specified; *C.J. Moser s.n., s.d.*, from U.S.A.: Pennsylvania: Salzburg Township (replicate at MO [image online]) cited in Tropicos.

*Bartonia tenella* Muhl. ex Willd. [var.] β *brachiata* Alph. Wood, Class-book Bot., ed. 41 revised, 586. 1861, excluding description; based on *B. moseri* (Steud. & Hochst. ex Griseb.) B.L. Rob. & Schrenk ex Gilg.

*Bartonia virginica* (L.) Britton, Sterns & Poggenb. forma *abortiva* Vict., Proc. & Trans. Roy. Soc. Canada, Ser. III. Sect. V, 13: 113. 1919. TYPE: *Marie-Victorin 19570*, 9 Aug 1918, Canada: Québec: Saint-Hubert (MT, n.v.).

***Centaurium*** Hill, Brit. Herb. 62. 1756.

LECTOTYPE: *Gentiana centaurium* L. (= *Centaurium littorale* (Turner) Gilmour). Lectotypified by N.L. Britton & A. Brown, Ill. Fl. N. U.S., ed. 2, 3: 1. 1913.

*Erythraea* Borkh., Arch. Bot. (Leipzig) 1(1): 30. 1796, superfluous name, included type of *Centaurium* Hill.

*Centaurodes* Möhring ex Kuntze. Rev. Gen. Pl. 426. 1891, superfluous name, included type of *Centaurium* Hill.

***Centaurium pulchellum*** (Sw.) Hayek ex Hand.-Mazz. et al., Oesterr. Bot. Z. 56: 70. 1906.

*Gentiana pulchella* Sw., Kongl. Vetensk. Acad. Nya Handl. 4: 85. 1783; *Erythraea pulchella* (Sw.) Fr., Novit. 74. 1814; *E. ramosissima* [var.] β *pulchella* (Fr.) Griseb. (attrib. to Fr.), Gen. Sp. Gent. 137. 1838 ("1839"). LECTOTYPE: *Swartz s.n., s.d.,* "Ålandia, paroecia Finstroem" (= prov. Auland, Finland) (holotype S, S10-26105 [image online], isotype UPS). See discussion.

*Chironia gerardii* F.W. Schmidt, Fl. Boëm. 2: 33. 1793, "*gerardi."* TYPE: Not designated.

*Erythraea ramosissima* Pers., Syn. Pl. 1: 283. 1805, superfluous name, included type of *Chironia gerardi* F.W. Schmidt; non *Centaurium ramosissimum* (Vill.) Druce, Rep. Bot. Exch. Club Brit. Isles 4: 274. 1916 ("1915"). See discussion.

***Gentiana*** L. Sp. Pl. 1: 227. 1753.

LECTOTYPE: *Gentiana lutea* L. Lectotypified by N.L. Britton & A. Brown, Ill. Fl. N. U.S., ed. 2. 3: 8. 1913.

*Pneumonanthe* Gled., Syst. Pl. 238. 1764. LECTOTYPE: *Pneumonanthe vulgaris* F.W. Schmidt (= *Gentiana pneumonanthe* L.). Lectotypified by J. Holub, Folia Geobot. Phytotax. 8: 161. 1973.

*Xolemia* Raf., Fl. Tellur. 3: 22. 1837 ("1836"). LECTOTYPE: *Gentiana saponaria* L. Lectotypified by J.S. Pringle, Sida 7: 176. 1977.

Numerous additional generic names are usually considered to be heterotypically synonymous with *Gentiana* L., but, as the proposed segregates have generally been circumscribed, at least during the past six decades, none of the New Jersey species would be included in those segregates.

***Gentiana andrewsii*** Griseb. in Hook., Fl. Bor.-Amer. 2: 55. 1837.

*Dasystephana andrewsii* (Griseb.) Small, Fl. S.E. U.S. 930, 1336. 1903; *Pneumonanthe andrewsii* (Griseb.) W.A. Weber, Phytologia 33: 105. 1976. LECTOTYPE: *R. Cleghorn s.n., s.d.*, Canada: Québec: Probably near Montréal or Sorel (K). Lectotypified by J.M. Gillett, Res. Branch, Canada Dept. Agric. Publ. 1180: 19. 1963.

New Jersey plants are:

***Gentiana andrewsii* var. *andrewsii***

***Gentiana autumnalis*** L., Cat. Edwards' Nat. Hist. 11. 1776.

LECTOTYPE: Plate 255 in J. Edwards, Gleanings of Natural History. 1758. Lectotypified by J.S. Pringle, Brittonia 19: 2. 1967.

*Gentiana porphyrio* J.F. Gmel., Syst. 2:462. 1791; *Hippion porphyrio* (J.F. Gmel.) F.W. Schmidt, Arch. Bot. (Leipzig) 1: 11. 1796; *Dasystephana porphyrio* (J.F. Gmel.) Small, Fl. S.E. U.S. 931, 1336. 1903. Based on *G. purpurea* Walter, Fl. Carol. 109. 1788, non *G. purpurea* L., 1753. TYPE: Not designated; no specimen representing Walter's concept of *G. purpurea* is known to exist.

*Gentiana angustifolia* Michx., Fl. Bor.- Amer. 1:177. 1803, illegitimate homonym, non Vill., Hist. Pl. Dauphiné 2: 526. 1787; *Diploma angustifolia* (Michx.) Raf., Fl. Tellur. 3: 27. 1837 ("1836"); *Ericala angustifolia* (Michx.) G. Don, Gen. Syst. 4: 190. 1837.

*Gentiana stoneana* Fernald, Rhodora 41:555. 1939. TYPE: M.L. *Fernald & B.H. Long 9611,* 13 Oct 1938, U.S.A.: Virginia: Nansemond Co.: north of Factory Hill, (holotype GH, isotypes F, MO, NY, PH, US [images of MO, NY, and US specimens online]).

***Gentiana catesbaei*** Walter, Fl. Carol. 109. 1788.

LECTOTYPE: *T. Walter s.n., s.d,* U.S.A.: South Carolina (BM [microfiche MO, photos Rhodora 49: pl. 1076, figs. 1 and 2. 1947, and Mus. Bull. S. Carolina Mus. Commission 5: 21. 1980). Lectotypified by D.B. Ward, J. Bot. Res. Inst. Texas 1: 414. 2007.

*Gentiana elliotti* Chapm., Fl. South. U.S. 356. 1860, not *G. elliottea* Raf., Med. Fl. 1: 212. 1828. Based on *G. catesbaei* Walter sensu Elliott, Sketch Bot. S. Carolina 1: 359, 1817, which appears to be correctly applied, so Chapman's name is superfluous. (The identity of *G. elliottea* Raf. is uncertain, but it was probably based on plants of *G. saponaria*.)

*Gentiana elliottii* var. *parvifolia* Chapm., Fl. South. U.S. 356. 1860; *Dasystephana parvifolia* (Chapm.) Small, Fl. S.E. U.S. 930, 1336. 1903; *Pneumonanthe parvifolia* (Chapm.) Greene, Leafl. Bot. Observ. Crit. 1: 71. 1904, non *Gentiana parvifolia* Gilg. TYPE: Not designated.

***Gentiana clausa*** Raf., Med. Fl. 1(41): 210. 1828.

*Pneumonanthe clausa* (Raf.) Greene, Leafl. Bot. Observ. Crit. 1: 71. 1904

*Dasystephana clausa* (Raf.) A. Heller, Cat. N. Amer. Pl., ed. 3, 284. 1813.

NEOTYPE: U.S.A.: New Hampshire: Coos Co.: *J.S. Pringle 2732*, 11 Sept 2006, Whitefield, west side of trail (former railroad bed) between trailhead parking lot and power line crossing (site now in Pondicherry Wildlife Refuge), ca. 345 m, ca. 44°26'N, 71°32'W, (neotype GH, isotype HAM). See discussion.

***Gentiana linearis*** Froel., Gentiana 37. 1796.

*Ciminalis linearis* (Froel.) Bercht. & C.Presl,, Prir. Rostlin 1(Gentian.): 11. 1823; *Gentiana saponaria* [var.] β *linearis* (Froel.) Griseb. in Hook., Fl. Bor.-Amer. 2: 55. 1837; *Ericala linearis* (Froel.) G. Don, excl. descr.; *Pneumonanthe linearis* (Froel.) Greene, Leafl. Bot. Observ. Crit. 1 : 71. 1904; *Dasystephana linearis* (Froel.) Britt. in Britt. & Brown, Ill. Fl. N. U.S., ed. 2, 3: 13. 1913. NEOTYPE: *A.F. Rhoads & T.A. Block s.n.*, 26 Aug 2010. U.S.A.: Pennsylvania: Carbon Co.: Albrightsville, 2.5 km SW, Hickory Run State Park, wetland in the headwaters of Panther Run, latgps 40.9945070000 longps -75.6306600000 (neotype MOAR). See discussion.

*Gentiana pseudopneumonanthe* Schult. in Roem. & Schult, Syst. Veg. 6: 146. 1820, "*Pseudo-Pneumonanthe.*" Based on *G. pneumonanthe* L. sensu Michxaux, Fl. Bor.-Amer. 1:146. 1803 and Pursh, Fl. Amer. Sept. 1: 185. 1813 ("1814"). TYPE: Not designated. *A. Michaux s.n., s.d.*, Canada or U.S.A. without specific locality [P-Michx., M40/4, IDC microfiche] represents Michaux's application of the name *Gentiana pneumonanthe* to North American plants.

*Pneumonanthe media* Raf., Fl. Tellur. 3: 19. 1837 "1836"). Based on *Gentiana pneumonanthe* L. sensu North American botanists and *G. pseudopneumonanthe* Schult. (above).

*Diploma hudsonica* Raf., Fl. Tellur. 3: 27. 1837 "1836"). Based on *Gentiana pneumonanthe* L. sensu Michaux, Fl. Bor.-Amer. 1:146. 1803. See *G. pseudopneumonanthe* Schult. (above).

*Gentiana michauxii* G. Don, Gen, Syst. 4: 194. 1837. Based on *G. pneumonanthe* L. sensu Michaux, Fl. Bor.-Amer. 1:146. 1803. See *G. pseudopneumonanthe* Schult., above.

*Gentiana saponaria* [var.] β *froelichii* Torr. & A. Gray in A. Gray, Man., ed 1, 360. 1848. Based on *G. linearis* Froel.

***Gentiana saponaria*** L., Sp. Pl. 1:228. 1753.

*Pneumonanthe saponaria* (L.) F.W. Schmidt, Arch. Bot. (Leipzig) 1: 10. 1796; *Ciminalis saponaria* (L.) Bercht. & J. Presl., Prir. Rostlin 1 (Gentian.): 11. 1823; *Dasystephana saponaria* (L.) Small, Fl. S.E. U.S. 930. 1336. 1903. LECTOTYPE: *P. Kalm s.n.,*1749*,* U.S.A.: "Virginia" [probably actually New Jersey or Pennsylvania] (LINN 328.8 [image online, photos BM, DAO, GH]). Lectotypified by J.S. Pringle, Brittonia 19: 2. 1967.

*Gentiana elliottii* var. *latifolia* Chapm., Fl. South. U.S. 356. 1860; *Dasystephana latifolia* (Chapm.) Small, Fl. S.E. US, ed. 1, 930, 1336. 1903; *Pneumonanthe latifolia* (Chapm.) Greene, Leafl. Bot. Observ. Crit. 1:71. 1904. TYPE: Not designated.

*Dasystephana cherokeensis* W.P. Lemmon, Bartonia 17: 4. 1935; *Gentiana cherokeensis* (W.P. Lemmon) Fernald, Rhodora 41: 487. 1939. TYPE: *W.P Lemmon s.n.,*1935*,* U.S.A.: Georgia: Cobb Co.: north end of Black Jack Mountain (holotype PH, isotype GH).

Several other "species" described by C.S. Rafinesque from Kentucky and adjacent states may have been based on specimens of *G. saponaria*, but because of the brevity of the descriptions and absence of nomenclaturally significant specimens, their identity remains uncertain (see list in Pringle 1967).

***Gentiana villosa*** L., Sp. Pl. 1:228. 1753.

*Pneumonanthe villosa* (L.) F.W. Schmidt, Arch. Bot. (Leipzig) 1: 10. 1796; *Dasystephana villosa* (L.) Small, Fl. S.E. U.S. 931, 1336. 1903. LECTOTYPE: *J. Clayton 605, s.d.*, U.S.A.: Virginia (BM [image online]). Lectotypified by J.L. Reveal & C.E. Jarvis, Taxon 58: 979. 2009.

*Gentiana ochroleuca* Froel., Gentiana 35. 1796; *Ciminalis ochroleuca* (Froel.) Bercht.

& J. Presl., Prir. Rostlin 1 (Gentian.): 11. 1823; *Pneumonanthe ochroleuca* (Froel.) G. Don, Gen. Hist. 4: 195. 1837. TYPE: Not designated.

*Gentiana incarnata* Sims, Bot. Mag. 43: pl. 1856. 1816; *Pneumonanthe incarnata* (Sims) G. Don, Gen. Hist. 4: 195. 1837. TYPE: Pl. 1856, Bot. Mag.

*Gentiana intermedia* Sims, Bot. Mag. 49: pl. 2303. 1822; *Pneumonanthe intermedia* (Sims) G. Don, Gen. Hist. 4: 195. 1837. TYPE: Pl. 2303, Bot. Mag.

*Gentiana heterophylla* Raf., Med. Fl. 1: 211. 1828; TYPE: Not designated.

*Dasystephana deloachii* W.P. Lemmon, Bartonia 19: 18. 1938; *Gentiana deloachii* (W.P. Lemmon) Shinners, Sida 1: 107. 1962. TYPE: *W.P. Lemmon s.n*, 25 Oct 1936, U.S.A.: Georgia: Effingham Co.: near Clyo (PH).

***Gentianella*** Moench, Methodus: 482. 1794, nom. cons.

TYPE: *Gentianella tetrandra* Moench (= *Gentianella campestris* (L.) Börner).

*Amarella* Gilib., Fl. Lit. Inch. 1: 36. 1782, nom. rej.

*Aloitis* Raf., Fl. Tellur. 3: 21. 1837 (“1836”). TYPE: *Aloitis quinquefolia* (L.) Raf.,

"*5flora*" (= *Gentianella quinquefolia* (L.) Small).

*Pneumonanthe* Gled., Syst. Pl. 238. 1764. Lectotypified by N.L. Britton & A. Brown, Ill. Fl. N. U.S., ed. 2. 3: 8. 1913.

Several additional generic names now usually considered to be heterotypically synonymous with *Gentianella* Moench have been applied to Asian, Australian, and South American species, but none is typified by a North American species, nor would any North American species likely be considered referable to such segregates.

***Gentianella quinquefolia*** (L.) Small, Fl. S.E. U.S., ed. 1: 929. 1903.

*Gentiana quinquefolia* L., Sp. Pl. 1: 230. 1753; *Hippion quinquefolium* (L.) F.W. Schmidt, Arch. Bot. (Leipzig) 1: 11. 1796; *Aloitis quinquefolia* (L.) Raf., Fl. Tellur. 3: 22. 1837 ("1836"). LECTOTYPE: *P. Kalm s.n.,*1749*,* U.S.A.: Pennsylvania (LINN 328.31 [image online, photos A, DAO, MO]). Lectotypified by J.M. Gillett, Ann. Missouri Bot. Gard. 44: 243. 1957. *Gentiana quinqueflora* auctt., orthographic error.

*Gentiana amarelloides* Michx., Fl. Bor.-Amer. 1: 175. 1803; *Amarella amarelloides* (Michx.) Greene, Leafl. Bot. Observ. Crit. 1: 53. 1904. TYPE: *A. Michaux s.n., s.d.,* U.S.A.: Kentucky (P-Michx., photo MO, 40/6 in IDC microfiche).

New Jersey plants are:

***Gentianella quinquefolia* subsp. *quinquefolia***

*Aloitis parviflora* Raf., Fl,. Tellur. 3: 21. 1837 ("1836"). TYPE: Not designated.

***Gentianopsis*** Ma, Acta Phytotax. Sin. 1: 7 (1951).

TYPE: *Gentianopsis barbata* (Froel.) Ma

*Andropogon* Raf., Fl. Tellur. 3:25. 1837 ("1836), incorrectly attributed pro gen. to Neck., illegitimate homonym, non Nutt., Gen. N. Amer. Pl. 1: 81. 1818.

***Gentianopsis crinita*** (Froel.) Ma, Acta Phytotax. Sin. 1: 15. 1951.

*Gentiana crinita* Froel., Gentiana 112. 1796; *Gentianella crinita*(Froel.) Bercht. & J. Presl., Prir. Rostlin 1 (Gentian.): 21. 1823; *Anthopogon crinitus* Raf., Fl. Tellur. 3: 25. 1837 ("1836"), "*crinitum.*" NEOTYPE*: P. Kalm s.n.,*1749*,* U.S.A.: Pennsylvania (LINN 328.38 [image online]). Neotypified by J.S. Pringle, Michigan Bot. 46: 122. 2008.

***Obolaria*** L., Sp. Pl. 2: 632. 1753.

TYPE: *Obolaria virginica* L.

***Obolaria virginica*** L., Sp. Pl. 632. 1753.

LECTOTYPE: *J. Clayton 286, s.d.*, U.S.A.: Virginia (BM [image online]). Lectotypified by J.M. Gillett, Rhodora 61: 61. 1959.

***Sabatia*** Adans., Fam. Pl. 2: 503. 1763.

LECTOTYPE: *Sabatia dodecandra* (L.) Britton, Stearns, & Poggenb. Lectotypified by N.L. Britton, E.E. Stearns, & J.F. Poggenburg, Prelim. Cat. 36. 1888. *Sabbatia* auctt., orthographic variant.

*Pleienta* Raf., Fl. Tell. 3: 30. 1837 ("1836"). Superfluous name, included type of *Sabatia* Adans.

*Neurola* Raf., New Fl. 4: 92. 1838. TYPE: *Neurola arkanzica* Raf. (specific name not validly published; = *Sabatia campestris* Nutt.).

***Sabatia angularis*** (L.) Pursh, Fl. Amer. Sept. 1: 137. 1813 ("1814"), "*Sabbatia*."

*Chironia angularis* L. Sp. Pl., 1: 190. 1753. LECTOTYPE: *P. Kalm s.n.,* 1749. Virginia, USA (LINN 252.5 [image online]). Lectotypified by R.L. Wilbur, Rhodora 57: 20. 1955.

***Sabatia campanulata*** (L.) Torr., Fl. N. Middle United States 1: 217. 1824.

*Chironia campanulata* L., Sp. Pl. 1: 190. 1753. LECTOTYPE: *P. Kalm s.n.,* 1749. Canada (LINN 252.4 [image online]). Lectotypified by S.F. Blake, Rhodora 17: 52. 1915.

*Chironia gracilis* Michx., Fl. Bor.-Amer. 1: 146. 1803; *Sabbatia gracilis* (Michx.) Salisb., Parad. Lond. t. 32. 1806; *S. campanulata* var. *gracilis* (Michx.) Fernald , Rhodora 39: 444. 1937. TYPE: *A. Michaux s.n., s.d.,* U.S.A.: in Carolina inferiore (P-Michx. [M35/9, IDC microfiche]).

*Sabbatia tracyi* Gand., Bull. Soc. Bot. France 65: 61. 1918.
TYPE: *S.M. Tracy 6468*, 22 June 1899*,* U.S.A.: Mississippi: Harrison Co.: Biloxi (holotype LY, n.v., isotype US [image of US specimen online])

***Sabatia difformis*** (L.) Druce, Rep. Bot. Exch. Club Soc. Brit. Isles 3: 423. 1914.

*Swertia difformis* L. Sp. Pl. 1: 226. 1753. LECTOTYPE: *J. Clayton 171*, *s.d.,* U.S.A.: Virgina (BM [image online]). Lectotypified S.F. Blake, Rhodora 17: 50-51. 1915.

*Chironia lanceolata* Walter, Fl. Carol. 95. 1788; *Sabbatia lanceolata* (Walter) Raf., Fl. Tellur. 3: 30. 1837 ("1836"), "*lanceol.*"; *S. lanceolata* (Walt.) Torr. & A. Gray ex A. Gray, Manual 356. 1848, superfluous combination if Rafinesque's is accepted as having been based on *C. lanceolata* Walter. TYPE: Not designated.

*Chironia cymosa* Lam., Tabl. Encyc. 1: 479. 1793, illegitimate homonym, non N.L. Burm., Fl. Indica 5. 1768.; *Sabbatia cymosa* (Lam.) G. Don, Gen. Hist. 4: 207. 1838, as to basionym only.

*Chironia paniculata* Michx., Fl. Bor.-Amer. 1: 146. 1803; *Sabbatia paniculata* (Michx.) Pursh, Fl. Amer. Sept. 1: 138. 1813 ("1814"). TYPE: *A. Michaux s.n., s.d.,* Georgia and Carolina (P-Michx. [M35/6,7, IDC microfiche]).

*Sabbatia corymbosa* Baldw. ex Ell., Sketch Bot. S. Carolina 1: 283. 1817, illegitimate name, included *Chironia lanceolata* Walter.

*Sabbatia corymbosa* var. *angustifolia* Ell., Sketch Bot. S. Carolina 1: 283. 1817. TYPE: Not designated; Elliott expressed uncertainty as to which variety of *S. corymbosa* was equivalent to *Chironia lanceolata* Walter.

***Sabatia dodecandra*** (L.) Britton, Sterns & Poggenb., Prelim. Cat. 36. 1888.

*Chironia dodecandra* L., Sp. Pl. 190. 1753. LECTOTYPE: *J. Clayton 120, s.d.,* U.S.A.: Virginia (BM [image online]). Lectotypified by R.L. Wilbur, Rhodora 57: 56. 1955.

*Chironia chloroides* Michx., Fl. Bor.-Amer. 1: 147. 1803, superfluous name, *C. dodecandra* L. cited in synonymy. *Sabbatia chloroides* (Michx.) Pursh, Fl. Amer. Sept. 1: 138. 1813 ("1814"), illegitimate, based on a superfluous name.

***Sabatia stellaris*** Pursh, Fl. Amer. Sept. 1: 137. 1813 ("1814"), "*Sabbatia*."

*Chironia stellaris* (Pursh) Eaton, Man., ed. 2, 204. 1818. LECTOTYPE: Probably collected by *F. Pursh,* U.S.A.: New Jersey, sheet 1 of specimen numbered 1439 in PH-Muhl., numbered 41 by Muhlenberg in herb. and in ms. (copy attached to herbarium sheet), also numbered 329 by Pursh; PH accession number 01091081. See discussion.

*Sabbatia simulata* Britton, Bull. N.Y. Bot. Gard. 3: 448. 1905. TYPE: *N.L. Britton 58*, 7--8 April 1904, Bahamas: New Providence, near South Beach (NY [image online]).

*Chironia amoena* Raf., Med. Repos. II. 5: 359. 1808, illegitimate homonym, non Salisb., 1796. *Sabbatia amoena* (Raf.) G. Don, Gen. Hist. 4: 207. 1838; *Sabbatia campanulata* var. *amoena* (Raf.) Monachino, Torreya 41: 99. 1941. TYPE: Not designated.

*Sabbatia maritima* Raf., Med. Fl. 2: 77. 1830. TYPE: Not designated.

*Sabbatia nana* Featherm., Rep. Bot. Surv. S. & Central Louisiana 71-72: 102. 1871. TYPE: Not designated.

*Eustoma maculata* Benth., Pl. Hartw. 292. 1848; *Sabbatia maculata* (Benth.) A.Gray, Proc. Amer. Acad. Arts 22: 438. 1887. TYPE: *Hartweg 1615,* 1835, Mexico: Jalisco: Lagos de Moreno (K).

*Sabbatia palmeri* A. Gray, Proc. Amer. Acad. Arts 22: 438. 1887. TYPE: *E.J. Palmer 668,* Oct 1886, Mexico: Jalisco: Rio Blanco (GH).

*Sabbatia purpusii* Brandegee, Univ. Calif. Publ. Bot. 4: 275. 1912. TYPE: *C.A. Purpus 5345*. MEXICO: San Luis Potosi: Minas de San Rafael, Mexico. July 1911 (holotype UC, isotype NY [images of both specimens online]).

***Schenkia*** Griseb., Bonplandia 1: 226. 1853.

*Erythraea* sect. *Spicaria* Griseb., Gen. Sp. Gent. 147. 1839; *Centaurium* sect. *Spicaria* (Griseb.) Ronniger, Mitt. Naturwiss. Vereines Steiermark 52: 321. 1916. TYPE: *Schenkia sebaeoides* Griseb.

***Schenkia spicata*** (L.) G. Mans., Taxon 53: 726. 2004.

*Gentiana spicata* L., Sp. Pl.: 230. 1753; *Hippion spicatum* (L.) F.W. Schmidt, Arch. Bot. (Leipzig) 1: 11. 1796; *Chironia spicata* (L.) Willd., Sp. Pl. 1(1): 1069. 1797; *Erythraea spicata* (L.) Pers., Syn. Pl. 1: 283. 1805; *Centaurodes spicatum* (L.) Kuntze, Revis. Gen. Pl. 2: 426. 1891; *Centaurium spicatum* (L.) Fritsch, Mitt. Naturwiss. Vereins Univ. Wien 5: 97. 1907. LECTOTYPE: *Bauhin s.n., s.d.*, "In montibus Euganensis Monspelii" (UPS [image online]). Lectotypified by G. Mansion, Taxon 53: 726. 2004.

Some local European variants previously treated as varieties of *Schenkia spicata* (as *Centaurium*) were not considered appropriate for taxonomic recognition by Mansion (2004). As it is doubtful that any North American plants would have been referable to thosc varieties, their names are not included in the synonymy given here.

## Discussion

The following clarification and typifications are being submitted for publication by Pringle, Poster, and Struwe (2013).

### *Centaurium pulchellum*

Swartz (1783) distinguished *Gentiana pulchella* from *G. centaurium* (which in his concept was probably equivalent to present-day *Centaurium erythraea* Rafn perhaps combined with *C. littorale* (Turner) Gilmour) by its single, unbranched stem terminating in a solitary flower. He cited only one locality, Åland, Finland, from which he had seen plants of this species. In Swartz's herbarium, now at S, there is only one specimen of *Centaurium* from that locality (Fig. 8). As it conforms to the description, that specimen should be considered the type, and it has been so annotated at S. Some recent authors, however, have questioned the existence and/or the repository of a type specimen for this name. It is, therefore, desirable to point out that this specimen exists and has been designated the type in herb.

At S, this collection comprises five plants collected by Swartz in prov. Åland, Finland, mounted on one sheet. All of them are small, less than 1.3 cm from the base of the unbranched stem to the base of the solitary terminal flower. Such plants, which occur occasionally in several species of *Centaurium* in which the plants are usually taller and several- to many-flowered, are not ideally representative of any species, and their identification is often difficult or uncertain.

Because the plants comprising the Swartz collection differ in several respects from the usual morphology of *Centaurium pulchellum* and have not been widely recognized as being the type of that name, it is appropriate to consider whether this collection actually represents the species to which the name *C. pulchellum* is currently applied. Larger plants of *C. pulchellum* are usually much branched, with the lowest branching occurring near the base, whereas plants of *C. erythraea* Rafn, which likewise occurs in Finland, are less diffusely branched, with the lowest branches usually near or above mid-stem. Consequently, some early authors did not immediately identify the small plants described by Swartz with the species now called *C. pulchellum.* Instead, the name *Erythraea ramosissima* Pers. was widely used for this species, until the conspecificity of the plants known by these names was recognized by Grisebach (1838) and accepted by Gray (1856). Several other authors recognized the occurrence of such minute plants in *C. pulchellum* and in some cases named them as formae of that species (Ronniger 1916). Until a uniform code of botanical nomenclature became widely adopted, Gray and other American botanists continued for many years to accept the name *E. ramosissima* while listing *Chironia pulchella* in synonymy.

As *Centaurium erythraea* and *C. pulchellum* have traditionally been distinguished, the basal rosette of leaves in *C. erythraea* is usually well developed, and is usually persistent at flowering time, whereas in *C. pulchellum* the rosette is less well developed, comprising fewer leaves, and is often withered or absent by flowering time (Melderis 1972). The plants in the Swartz collection, which were collected in flower, have distinct basal rosettes. Also, it has been said that in *C. pulchellum* the calyx is about as long as the corolla tube, whereas in *C. erythraea* the corolla tube is much longer than

the calyx. In Swartz's plants and as shown in his illustrations, there is a basal rosette and the corolla tube is about twice as long as the calyx.

From studies of *Centaurium* for the *Flora of North America North of Mexico* (Pringle in press), involving specimens at many herbaria, notably, in the present context, those at HAM, MICH, and OAC, some modifications of the traditional contrasts became appropriate. Branching sometimes varies greatly within a population of *C. pulchellum*. The plants that attain "normal" size are generally much branched, but if a combination of habitat and seasonal parameters such as photoperiod dictate flora initiation almost immediately upon germination, they may not branch. Swartz's specimens were collected near the northernmost part of the range of the species, in a cold, high-altitude site that was inundated until relatively late in the season. Delayed germination due to seasonal inundation often leads to the formation of abnormally minute, one-flowered plants in *Centaurium* and related genera. Plants of *C. pulchellum* initially have a basal rosette. Often it soon withers, but if conditions dictating floral initiation quickly follow those permitting germination, flowering can occur while the basal leaves are still present. The basal leaves of Swartz's specimens are small enough, and appear to have been sufficiently thin-textured, to be consistent with *C. pulchellum*. Also, even on a single plant, among flowers with the corolla lobes fully expanded but not withered, there can be great variation in how far the corolla tube extends beyond the tips of the calyx lobes.

A more reliable character for distinguishing *Centaurium pulchellum* from *C. erythraea* and certain other related species is that of the pedicels (Pringle 2008, in press). In *C. erythraea* the flowers are sessile, borne immediately above the subtending bracts, whereas in *C. pulchellum* there is a short but distinct pedicel between the bracts and the

flower. In Swartz's specimens and in his drawings (Fig. 8) there is consistently a distinct pedicel, consistent in length with those of *C. pulchellum* (as the name is now applied) and long enough to eliminate *C. erythraea* and the closely related *C. tenuiflorum* Hoffmanns. & Link from consideration. Therefore, although in some respects Swartz's specimens do not exhibit the usual morphology of *C. pulchellum*, they do appear to be referable to the species currently known by that name.

Several additional names, all based on European plants, have been regarded as heterotypic synonyms of *Centaurium pulchellum, Erythraea pulchella,* or *E. ramosissima* for over a century. Because none of these names has been used in recent literature or ever been associated with North American plants, and in all cases the specific epithet *pulchellum* would have priority, their synonymy has not been investigated in the present study.

On the valid publication of the name *Centaurium pulchellum*, which has been attributed to several different authors, see Pringle (2008).

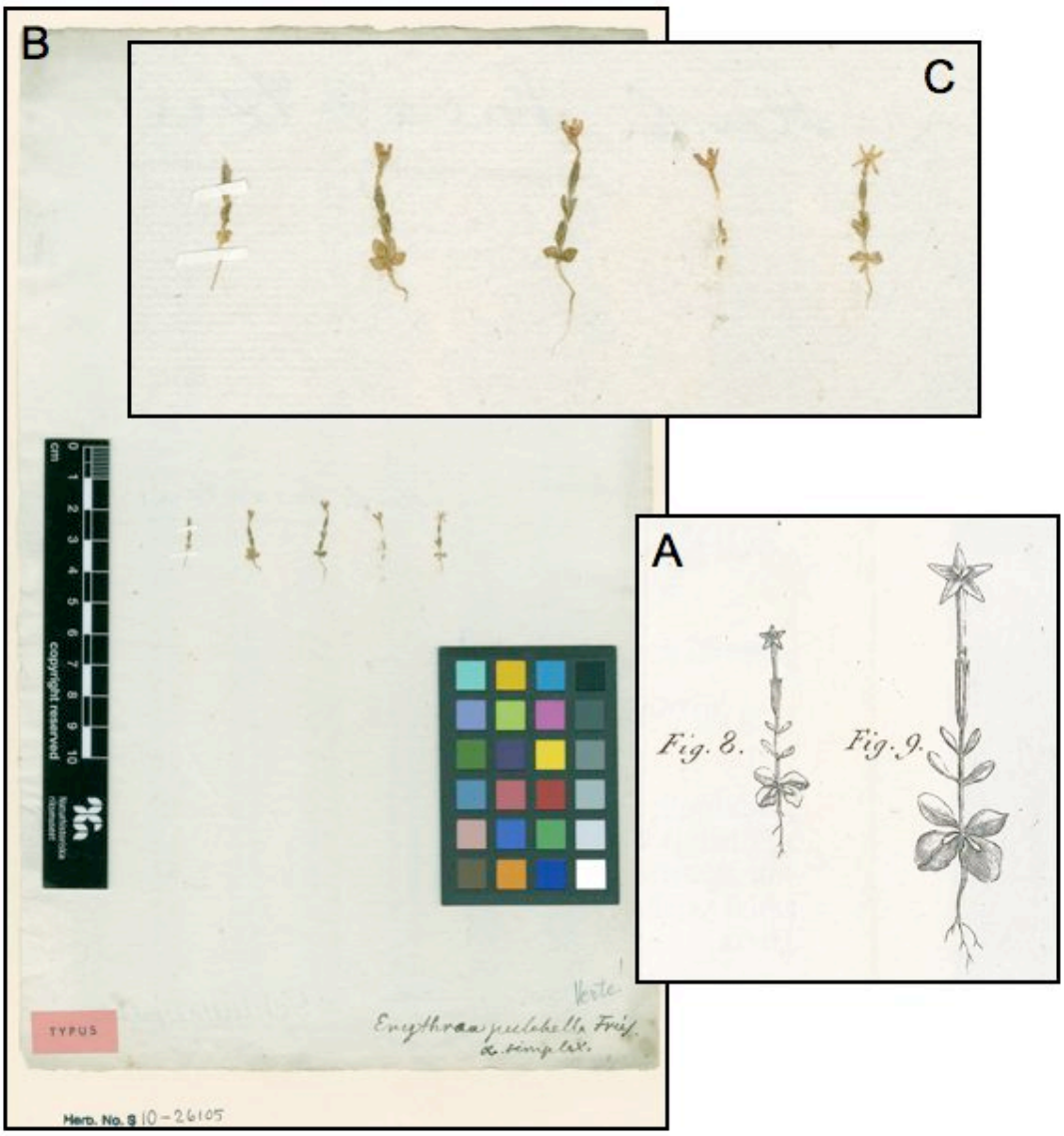


Fig. 8. **A.** Illustration from original description of *Gentiana pulchella*, now known as *Centaurium pulchellum* (Swartz 1783). **B.** Type specimen of *Centaurium pulchellum* (S). **C.** Enlargement of plant specimens on type herbarium sheet of *Centaurium pulchellum*.

***Gentiana clausa***

When Rafinesque (1828) described *Gentiana clausa* he neither cited any specimens nor stated where he had seen specimens that he had identified as that species. He said that the species occurred in the "Taconick and Green mountains," ranges that, if correctly designated by Rafinesque, extend, respectively, from the Massachusetts-New York border north-northeast into southwestern Vermont, and in central Vermont from the southern border nearly to the northern border. Rafinesque did not visit the Green Mountains, and his closest approach to the Taconic range was the Hudson Valley, through which he traveled in 1806 as far as Saratoga Springs, New York, and "Ticonderoga in Vermont." (Ticonderoga and the site of Fort Ticonderoga are in New York, across the narrow southern tip of Lake Champlain from Vermont. The boundary was the same in Rafinesque's time.)

Fernald called attention to the distinctness of *Gentiana clausa* Raf. from *G. andrewsii* Griseb. in 1917, but he did not designate a lectotype or neotype. Gillett (1957) did not include *G. clausa* in his treatment of the Gentianaceae of Canada, although there are a few records from Québec.

Rafinesque, apparently in preparation for a supplement to or an expanded edition of his *Medical Flora* that was never published, examined and annotated specimens of North American gentians in the herbarium of John Torrey, now at NY (Pennell 1919; Pringle 2003). Some of the names, or the specific epithets, in those annotations were subsequently published in works by Rafinesque; other names and epithets remained unpublished. Of chronological significance is a specimen of *Gentianopsis virgata* (Raf.) Holub that Rafinesque had annotated as *Gentiana virgata*, which had been collected by

James McNab in 1834. As there is no indication that Rafinesque studied Torrey's specimens on more than one occasion, he probably did not see those specimens until after his *Medical Flora*, including his description of *G. clausa*, had been published. No specimen annotated by Rafinesque as *Gentiana clausa* is among those from Torrey's herbarium at NY, nor is there any extant specimen of *G. clausa* from Torrey's herbarium that Rafinesque might have seen before or after 1828 without having annotated it.

Another repository of specimens associated with Rafinesque is PH. Among its historic specimens of *Gentiana*, only one, now in the general herbarium at PH, was annotated by Rafinesque. This was annotated "*Gentiana saponaria* Rafinesque M fl [Medical Flora] presented by W. Hembel Esq." According to Charles A. Pickering (annotation), this specimen had been in the herbarium of L.D. de Schweinitz under the name *G. saponaria*, and had been collected in New York by John Torrey. This specimen would still be identified as *G. saponaria* L., and there is no indication that Rafinesque ever identified it otherwise. The Barton Herbarium at PH contains a specimen of *G. clausa* collected by Frederick Pursh in 1807 at Rutland, Vermont, which is near the Green Mountains, but according to Alfred E. Schuyler, a noted scholar of Pennsylvania botanical history, there is no evidence that Rafinesque ever saw any specimens collected by Pursh. There are no specimens of *G. clausa* associated with Rafinesque at DWC.

As no original material related to the publication of the name *Gentiana clausa* Raf. has been found, a neotype has been designated (Fig. 9).


Fig. 9. Neotype specimen of *Gentiana clausa* Raf. (Pringle 2732 [GH, isotype HAM]).

***Gentiana linearis***

Froelich's (1796) description of *Gentiana linearis* was based on, and supplemented by, a lengthier description of the species from a manuscript by J.C.D. von Schreber. Schreber's description had been based on a specimen or specimens collected by J.D. Schöpf at "The Glades" in Pennsylvania. Schreber did not state where he had seen the specimen(s).

"The Glades," as a proper name for a place, and other names that include the word "Glade," have been used for several localities in Pennsylvania and adjacent states. These include localities near Philadelphia and Pittsburgh, Pennsylvania, in both of which areas Schöpf is known to have botanized (Kremers 1903). No specimens of *Gentiana* associated with Schöpf have been found at PH, where some specimens collected by him have been deposited, nor has a search of the databases of other herbaria reported to house specimens associated with Froelich, Schöpf, or Schreber indicated the existence of any specimens upon which the original description of *G. linearis* might have been based. A neotype has therefore been designated (Fig. 10). This specimen was collected in Pennsylvania, near "glades" that might have been visited by Schöpf.

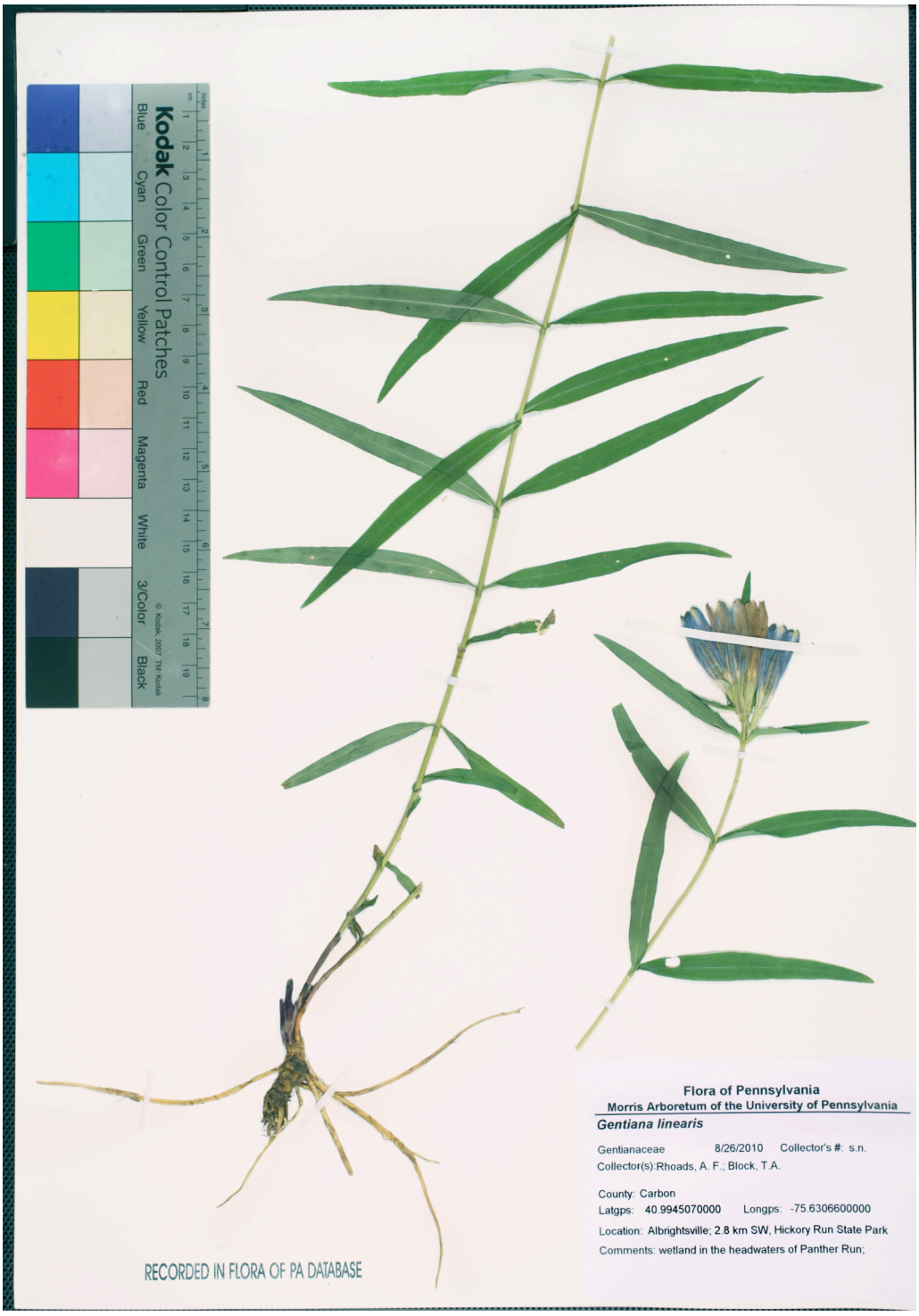


Fig. 10. Neotype specimen of *Gentiana linearis* Froel. (Rhoads and Block s.n., 28 Aug 2010 [MOAR]).

***Sabatia stellaris***

Pursh (1813), when he described *Sabatia stellaris* (as "*Sabbatia*"), did not cite any specimen of this species or state where he had seen any such specimens. He said that *S. stellaris* grew in salt marshes in New York and New Jersey, but mentioned no specific localities. His mention of the salt-marsh habitat indicates that he applied the name *S. stellaris* to the halophytic species with which that name is now associated (Bicknell 1915; Fernald 1916). No type specimen was cited by Wilbur (1955) in his taxonomic revision of the genus.

In the Muhlenberg herbarium at PH there is a collection of the species now known as *Sabatia stellaris* Pursh, occupying two sheets, numbered 1439 and enclosed in a folder bearing the same number. Affixed to one of these sheets is a copy of a portion of a manuscript flora by G.H.E. Muhlenberg, with the following wording in Muhlenberg's handwriting:

*Chironia stellaris* Pursh n. 41 Muhl. ms.

*Chironia stellaris* 329 N. Jersey Pursh's label.

This is followed by a description of the species by Muhlenberg. Pursh's number 329 appears on both herbarium sheets. (Early authors, including Linnaeus, had included *Sabatia* in *Chironia* L.) Sheet 1 also bears the following annotation by former PH curator James A. Mears:

Muhl. had this from Pursh, poss. authentic *Sabbatia stellaris* Pursh JAM 9/83

As the labels and annotations indicate, this is a collection of *Sabatia* to which Pursh himself had applied the specific epithet *stellaris*. He had done so before he adopted the name *Sabbatia* [sic] for the genus, which he used when he described the species in 1813. It may not have been the only material of that species that Pursh saw prior to 1813, but it was evidently part of what he had seen, i.e., part of Pursh's original material, and probably the only extant component unequivocally associated with the specific epithet *stellaris*. It is, therefore, appropriate for designation as the lectotype (Fig. 11).


Fig. 11. Lectotype specimen of *Sabatia stellaris* Pursh (Probably Pursh 329 / 1439 PH-Muhl / 41 Muhl. [PH]).

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