

***DEUTZIA CRENATA* (HYDRANGEACEAE),
THE IDENTITY OF THE COMMON INVASIVE *DEUTZIA*
IN THE UNITED STATES**

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ABSTRACT

The identity of the invasive *Deutzia* in the USA is discussed. A brief overview of the typification history of *D. scabra* is provided, along with a key to distinguish *D. crenata* from *D. scabra*. An examination of herbarium specimens and wild material reveals ample taxonomic distinction of these occasionally synonymized species. Overreliance on cultivated material of hybrid origin has obscured the distinctiveness of these two taxa and led to misidentification errors in a recent phylogenetic analysis. *Deutzia crenata* is the correct identity of naturalized North American *Deutzia* populations.

Deutzia is a genus of shrubs with ca. 50 species native to East Asia and 4 to Mexico (Kim & al. 2015). Members of *Deutzia* are occasionally cultivated as ornamental shrubs in the USA, although this practice had become old-fashioned by the late 20th-century (McGregor 2016) and now it is seen mostly around older homesteads. *Deutzia* in the eastern USA is known to aggressively spread in forested locations, although its impact is still mostly locally concentrated (Weakley 2020).

Identification of cultivated *Deutzia* is problematic due to hybridization and selective breeding (Hembree et al. 2020). However, naturalized *Deutzia* in the USA shows only a slight level of morphological variation between populations, with the primary difference being typical corolla formation vs. stamens mutated into petals, producing a doubled corolla (the escaped “*plena*” cultivar). The forma *plena*, which outnumbers the typical form in naturalized populations, appears to differ from the typical only in this single trait. Examination of herbarium specimens of naturalized material has shown no evidence of the confounding morphological variation noted by researchers studying cultivated material, and the widespread naturalized North American *Deutzia* likely represents a single taxon.

Deutzia in North America has long been identified as *D. scabra* Thunb. Most North American botanists place *D. crenata* Sieb. & Zucc. as a synonym of *D. scabra* (McGregor 2016; Weakley 2020), but this synonymization is less typical for researchers within the native range of *Deutzia*, and the distinction of *D. scabra* and *D. crenata* is often maintained by researchers in East Asia (Ohwi 1965; Zaikonnikova 1975; Huang et al. 2001).

Typification history of *Deutzia scabra*

Photographs of the type specimens of *Deutzia crenata* and *D. scabra* are provided in Figure 1 and Figure 6 of this paper.

Deutzia scabra was first described by Carl Thunberg in 1784. Of the three specimens that exist in Thunberg's collection labeled as “*D. scabra*,” one corresponds to the modern concept of *D. scabra* (“ α ”) and two correspond to the modern species concept of *D. crenata* (“ β ”, “ γ ”). The true identity of *D. scabra* thus hinges on which specimen in the Thunberg collection is chosen for lectotypification. The first lectotype of *D. scabra* was designated by Rehder (1920), as Thunberg’s specimen “ β ”, which corresponds to the modern concept of *D. crenata*. Thunberg’s description and illustration contains mixed elements of both species, and Rehder based his selection of “ β ” on what he believed to be the

closest approximation of the majority of Thunberg's provided description. If accepted, this lectotypification would have rendered the name *D. crenata* a superfluous synonym, requiring the next name with priority (*D. sieboldiana*) to be adopted for the modern species concept of *D. scabra*.

Rehder's choice of lectotype, however, was superseded by Hara (1957), who noted that while Thunberg's description and illustrations undoubtedly contain elements of both taxa, his illustration appears to be modeled directly from a flowering branch from the left side of specimen "α". Hara argued that because of this, the designation of "β" was in conflict with the principle that a lectotype should most closely conform to the intentions of the protologue. Hara designated Thunberg specimen "α" as a new lectotype for *Deutzia scabra* — in this interpretation, *D. crenata* becomes the next available name for the "β" and "γ" material in the Thunberg collection.

Even accounting for the subjectivity of determining the true "best fit" of a protologue whose author was working with mixed material, the typification of *Deutzia scabra* should be considered resolved. The International Code of Nomenclature recommends that "when two or more heterogeneous elements were included in or cited with the original description or diagnosis, the lectotype should be so selected as to preserve current usage" (Turland et al. 2018). Hara's lectotypification has been widely adopted, with the respective species concepts of *D. crenata* and *D. scabra* used in literature for over 50 years.

Phylogenetic relationship of *Deutzia crenata* and *Deutzia scabra*

A phylogenetic study of *Deutzia* by Kim et al. 2015 provided a tentative interpretation of the distinctiveness of *D. crenata* and *D. scabra*. The authors concluded that *D. crenata* and *D. scabra* could be considered a "single variable species" but noted that that four accessions of *D. scabra* sequenced were paraphyletic. They suggested that "there may be cryptic species in this complex."

However, two specimens of *Deutzia scabra* sampled for the study (as noted in the supplementary materials) are available online, and re-examination of the sampled specimens reveal issues that may account for this odd phylogenetic result. First, the *Atha 8132* specimen is of likely cultivated material from the grounds of the New York Botanical Garden. Knowing that many *Deutzia* cultivars are of hybrid origin, its selection would likely not be representative of the populations of wild *D. scabra* of East Asia.

Secondly (and more importantly), both specimens observed online (*Atha 7464*, *Atha 8132*) appear to be misidentified *Deutzia crenata*. They lack the distinctive sessile to subclasping leaves on floral branches of *D. scabra*, diagnostic features as noted in the Flora of Japan (Ohwi 1965) and the most recent treatment of the genus (Zaikonnikova 1975). The two misidentified specimens of "*D. scabra*" are indeed two of the samples noted by the authors as embedded with *D. crenata* in their phylogenetic results. (The other specimen could not be observed online).

The distinctiveness of *Deutzia crenata* and *Deutzia scabra*

The morphological distinction of *Deutzia crenata* and *D. scabra* is summarized in the following key, adapted in part from Zaikonnikova (1975) and Ohwi (1965). Photographs of the diagnostic features of *D. scabra* are provided in Figures 2-4, and for *D. crenata* in Figures 7-9.

The segregate *Deutzia crenata* var. *heterotricha* (Rehder) H. Hara (syn. *Deutzia heterotricha* Rehder) is a distinct taxon with softly pilose abaxial pubescence. It is not included in this key as it has not been reported from North America.

1. Abaxial leaf pubescence of appressed stellate trichomes with 6-13 rays; leaves subtending the inflorescence petiolate with a rounded base; stamens transformed into petals, or when present with teeth-like lobes at apex of filaments; native to Japan, naturalized in temperate areas of North America, Asia, and Europe, commonly cultivated **Deutzia crenata** var. **crenata**

1. Abaxial leaf pubescence of elevated spreading trichomes with 3-4 rays; leaves subtending the inflorescence sessile with a truncate to clasping base; stamens present, filaments without teeth-like points at apex (occasionally with gently rounded lobes); native to Japan, very rarely seen in cultivation in North America **Deutzia scabra**

The distinctiveness of *Deutzia crenata* and *Deutzia scabra* in the wild was noted by the author during a trip to Japan in 2018 and confirmed by examination of herbarium specimens. Photographs of wild specimens of *D. scabra* and *D. crenata* growing in their native range in Japan are provided in Figures 5 and 10. Morphological distinctions between the two entities are described in the key above and noted by Ohwi (1965) and Zaikonnikova (1975).

Synonymization of *Deutzia crenata* with *D. scabra* (with no infraspecific taxa) was suggested by McGregor (2016) in his Flora of North America treatment, based on three reasons: (a) variation in historical interpretations of *D. crenata* and *D. scabra* by past authors; (b) the large number of named infraspecific taxa and synonyms within these species, and (c) the existence of cultivar hybrids between the two entities.

These lines of evidence are not persuasive. Based on my observations in the wild, the two taxa appear to maintain their morphological distinction. And although authors such as Ohwi have noted a number of named varieties, this may be evidence only of high infraspecific variation (or the possible presence of cryptic taxa), rather than the conspecificity of *D. crenata* and *D. scabra*. And finally, given what we know about phylogenetically wide hybridization among plants, the presence of artificially created hybrid cultivars should have little bearing on whether an entity deserves species rank.

Conclusion

Deutzia crenata and *D. scabra* are separate taxa. All herbarium specimens and iNaturalist photos of *Deutzia* from the USA examined by the author correspond to typical *D. crenata*, with a single exception — one specimen of typical *D. scabra* at MO collected from cultivation at the Arnold Arboretum grounds in the early 20th century. *Deutzia scabra* appears to be absent from the commercial horticultural trade in the USA, and there is no evidence that it has become naturalized in North America.

LITERATURE CITED

- Hara, H. 1957. Critical notes on some specimens of East-Asiatic plants in foreign herbaria (8). *J. Jap. Bot.* 32: 134–140.
- Hembree, H.G., T.G. Ranney, N.P. Lynch, and B.E. Jackson. 2020. Identification, genome sizes, and ploidy of *Deutzia*. *J. Amer. Soc. Hort. Sci.* 145: 88–94.
- Huang, S., H. Ohba, and S. Akiyama. 2001. Saxifragaceae: *Deutzia*. Pp. 379–395, in Z. Wu and P.H. Raven (eds.). *Flora of China*, Vol. 8. Scientific Press, Beijing.
- Kim, C., T. Deng, J. Wen, Z. Nie, and H. Sun. 2015. Systematics, biogeography, and character evolution of *Deutzia* (Hydrangeaceae) inferred from nuclear and chloroplast DNA sequences. *Mol. Phylogenet. Evol.* 87: 91–104.
- McGregor, R. 2016. *Deutzia*. In *Flora of North America* Editorial Committee (eds.). *Flora of North America North of Mexico*, Vol. 12 [Online].
- Ohwi, J. 1965. *Flora of Japan* (In English). Smithsonian Institution, Washington, D.C.
- Rehder, A. 1920. New species, varieties and combination from the herbarium and the collections of the Arnold Arboretum. *J. Arnold Arbor.* 1: 181–210

- Turland, N.J. et al. (eds.). 2018. International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress, Shenzhen, China, July 2017. *Regnum Vegetabile* 159. Koeltz Botanical Book, Glashütten.
- Weakley, A.S. 2020. Flora of the Southern and Mid-Atlantic States. Working draft of Oct. 20, 2020. Univ. of North Carolina Herbarium, North Carolina Botanical Garden, Chapel Hill. <<http://www.herbarium.unc.edu/flora.html>>
- Zaikonnikova, T.I. 1975. A key to the species of the genus *Deutzia* Thunberg (Saxifragaceae). (translated by H.K. Airy Shaw.). *Baileya* 19: 133–144.

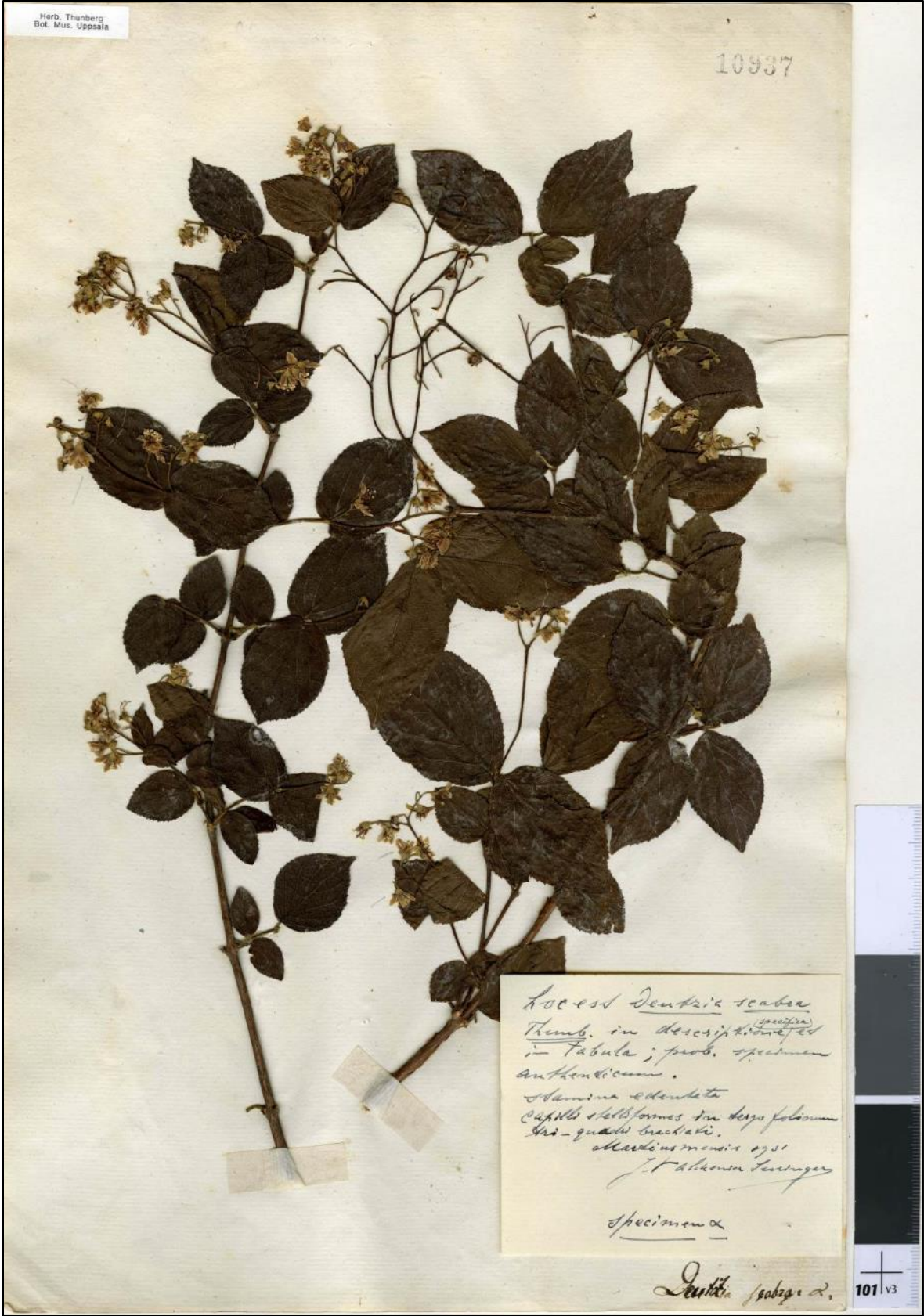


Figure 1. *Deutzia scabra*. Thunberg α (lectotype: UPS).



Figure 2. *Deutzia scabra*. Detail from lectotype — distinctly clasping leaf bases on leaves subtending the inflorescence.



Figure 3. *Deutzia scabra*. Detail from lectotype — filaments with rounded summit lobes.



Figure 4. *Deutzia scabra*. Brock 1929 (APSC). Abaxial leaf surface at 30x magnification, showing 3-4 rayed spreading trichomes.



Figure 5. *Deutzia scabra*. Wild specimen at edge of forest, Mount Ōyama, Isehara, Kanagawa, Japan.
Photo by Mason Brock, May 2018.

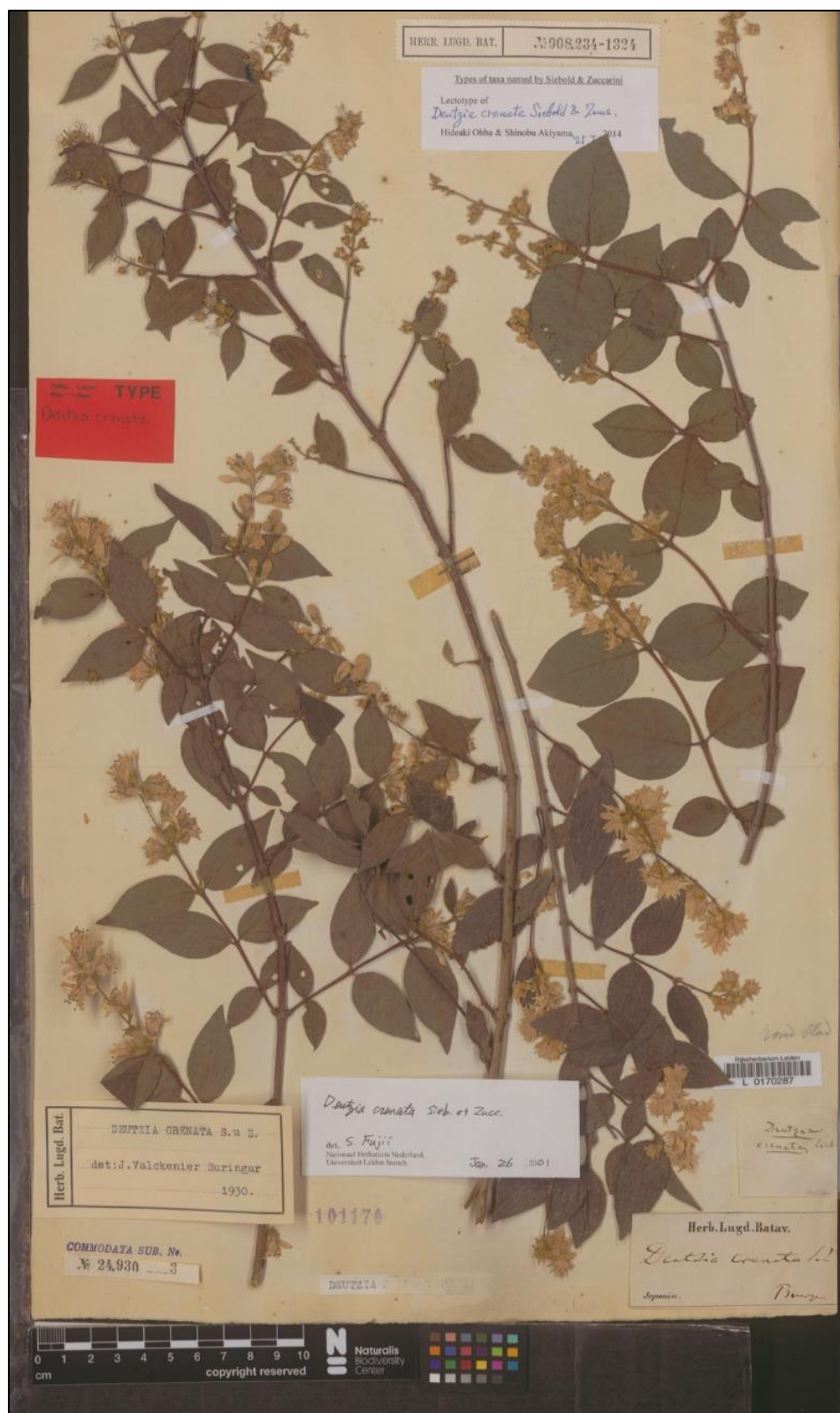


Figure 6. *Deutzia crenata*. Bürger s.n. (lectotype: L).



Figure 7. *Deutzia crenata*. Detail from lectotype — petiolate leaf bases on leaves subtending the inflorescence.



Figure 8. *Deutzia crenata*. Brock 1987 (APSC). Detail (20x) of stamens with prominent teeth at apex of filaments.



Figure 9. *Deutzia crenata*. Brock 253 (ASPC). Abaxial leaf surface at 30x magnification, showing many-rayed sessile stellate trichomes.



Figure 10. *Deutzia crenata*. Wild specimen in weedy roadside thickets, Hiraoka Park, Higashiōsaka, Osaka, Japan. Photo by Mason Brock, May 2018.