mation of other collections, either in the field or from herbaria, with data which may verify not only its occurrence here but may determine its status as indigenous or as "cultivated and escaped eastward."

Dorchester, Massachusetts.

A CRITICAL REVISION OF HYDRANGEA ARBORESCENS.

Harold St. John.

Through the discriminating field observations of Mr. Charles C. Deam, the writer has had his attention directed to the conspicuously different plants that are now treated as *Hydrangea arborescens* L. The tendency of the present day authors is to withhold any recognition of these various forms. On the other hand, the writers of the early floras of eastern North America were familiar with some of them and gave them names. Rafinesque, for instance, made eight species out of the plant now considered to be *H. arborescens*. The others were more conservative. As was the case in a previous study of the variations of a polymorphic species,[1] a treatment very similar to that here presented is found in Torrey and Gray's Flora of North America. Within the species itself are recognized several subdivisions, which in most cases are clearly distinguishable by definite characters and by having different ranges, but they are shown to be of less than specific value by the existence of specimens having intermediate characters, and by the fact that their ranges overlap.

Linnaeus in founding *H. arborescens*[2] based it solely on HYDRANGEA. Anonymos floribus albis parvis, etc. of Gronovius.[3] This description was drawn from the Clayton specimen, no. 79, from Virginia. It is a low shrub with large cordate acuminate glabrous leaves. By using a hand lens it appears that the leaves of this shrub of the stream-banks of Virginia are essentially but not absolutely glabrous, for the principal nerves bear on the lower surface a short puberulence. This same character holds throughout the species and its varieties; in all cases the leaves are puberulent on the prin-

[1] *Lathyrus venosus* Muhl., see Butters and St. John, Rhodora xix. 156 (1917).
[2] Sp. Pl. i. 397 (1753).
[3] Fl. Virginica i. 50 (1739).

cipal nerves of the under surface. Just such a plant as that described by Linnaeus occurs from New York southward to Georgia and westward to Illinois, Missouri, and Oklahoma.

Another *Hydrangea* has flowers, fruit, and the pubescence of the leaves identical with those of *H. arborescens* L., but differs from it in having lance-ovate or lance-elliptic leaves that are oblique at base. This is exactly the plant separated as γ *oblonga* by Torrey and Gray.[1] Its range is somewhat more extensive than that of *H. arborescens*, reaching from New York southward to Georgia and Alabama and westward to Illinois, Missouri, Oklahoma, and Louisiana. In most cases this plant is strikingly different from *H. arborescens*, but there are frequent intermediate specimens. These show in some cases the lance-elliptic leaves oblique at base on the lower part of the plant, while the upper one or two pairs of leaves may be cordate-ovate exactly as in *H. arborescens*. In other cases the leaves of the entire plant are intermediate in shape between the two just described. In other cases the leaves show a pubescence on the lower surface on the secondary as well as the primary nerves. Because of the existence of these intermediate specimens it is felt that Torrey and Gray were quite right in maintaining the plant with narrow lance-elliptic leaves as a variety of the species. It should be known as *H. arborescens* L., var. *oblonga* T. & G.

Another variant of the species, though strikingly different from the others, has never received a name. It has often been collected, but it has always been identified either as *H. arborescens* L. or as *H. cinerea* Small.[2] Identical flowers and fruits clearly show that its true re-

[1] Fl. N. Am. i. 591 (1838–1840).

[2] By studying the original material the author has determined that *H. cinerea* Small is a mixture. Dr. Small cites five specimens in the original publication but does not indicate at this place that any particular one was designated as the type. One of these was of his own collection and on that sheet in the Columbia College Herbarium is written, "Type". This is a vigorous specimen with large cordate, acuminate leaves well coated on the lower surface with a dense gray short puberulence. This specimen represents exactly what is described here as *Hydrangea arborescens* L., var. *Deamii* St. John. The F. L. Scribner specimen from White Cliff Springs, Tennessee, has the same short crisp puberulence on the under surface of the leaves, but they differ in shape and size, being smaller and oblong-lanceolate. This is one of the specimens considered to be intermediate between var. *oblonga* T. & G. and var. *Deamii* St. John of *Hydrangea arborescens* L. In the original description of *H. cinerea* Small, the leaves are said to be "gray tomentose * * * beneath." Two of the cited specimens, both from the same region, Chilhowee Mountains and Chilhowee Gap, Tennessee, A. H. Curtiss, no. 833, and Kearney, June 24, 1893, have this gray tomentose pubescence. It is exactly like the heavy coat of fine white tomentose

lationship is with *H. arborescens* L. It also has the large cordate-ovate acuminate leaves of that species, but they are more coriaceous and are densely puberulent beneath owing to the fact that all of the nerves, even the smallest secondary ones, bear puberulence. This variant is not found in the northern Appalachians, occurring only from Ohio to Illinois and southward to Oklahoma, Tennessee, and Georgia. As in the previous case there are intermediate specimens. Such a one as that from Kennesaw Mt., Georgia, May 16, 1885, R. N. Larrabee has the leaf form of var. *oblonga* but the pubescence of the more western pubescent plant. Then there are plants with the pubescence so sparse on the secondary nerves, that it becomes a matter of fine judgment whether or not the plant should be considered *H. arborescens* L., or the pubescent plant under discussion. Again, this plant seems to be properly treated as a variety of *H. arborescens* L. Mr. Charles C. Deam, who has recently collected this variety in Indiana, has noticed that it differed from the essentially glabrous *H. arborescens* L., and has called my attention to it. Consequently I take pleasure in dedicating this new variety to him.

There is a sterile or radiant form of each one of these three plants, although they have been found but a few times in the wild state. Their rarity is well brought out by a note on a specimen of *H. arborescens* L., var. *oblonga* T. & G. in the Gray Herbarium collected at Bedford, Virginia, June 25, 1871, by A. H. Curtiss. He writes, "I have for seven years in N. & S. Va. searched for radiant flowers on this sp[ecies] but never till this year found them & these on a single bush. So I conclude they are of very rare occurrence." This specimen has only a few of its marginal flowers radiant and would not in the present classification be considered as of the radiant form, which has all of its flowers sterile and radiant. In classifying these showy forms it is necessary to give one new name and to make one new combination.

pubescence characteristic of *H. radiata* Walt., except for the color. A careful examination of these two sheets shows that the leaves seen from above have the great blotches of brownish or blackish color which are characteristic of poorly dried specimens or those dried under unfavorable conditions. Also both specimens have been poisoned with a solution of corrosive sublimate as is shown by the yellowish stains on the sheets. Consequently, it seems evident to the writer that the gray color of the pubescence is due to the poor drying and the poisoning and that these two specimens are without question *H. radiata* Walt. The remaining one, Scribner, July, 1894, of the five specimens on which *H. cinerea* Small was based has not been seen by the author.

In the course of this study the author has used the collections of the Gray Herbarium, the Arnold Arboretum, Columbia College Herbarium, the Herbarium of the New York Botanical Garden, the California Academy of Sciences, and the private herbaria of Mr. C. C. Deam, Mr. Walter Deane, and Mr. F. W. Hunnewell. To Dr. B. L. Robinson, Dr. J. K. Small, Mr. C. C. Deam, and Mr. J. C. Nelson, he is indebted for extended loans of specimens or books. Specimens are cited from each state where they have been collected, but in most cases only one from each state is listed.

The following notation is used to indicate the location of a cited specimen:

(C) = Columbia College Herbarium
(Cal) = California Academy of Sciences
(D) = Herbarium of Mr. C. C. Deam
(G) = Gray Herbarium of Harvard University
(N) = Herbarium of the New York Botanical Garden

KEY TO HYDRANGEA ARBORESCENS AND ITS VARIATIONS.

A. Leaves nearly glabrous beneath, the scanty puberulence confined to the principal nerves.
  B. Leaves cordate or rounded at base, broadly ovate or suborbicular with an acuminate tip.
    C. Some or all of the flowers fertile.....1. *H. arborescens* L.
    C′. All of the flowers sterile and radiant.....2. f. *grandiflora* Rehder.
  B′. Leaves oblique at base, lance-ovate or lance-elliptic.
    D. Some or all of the flowers fertile.....3. var. *oblonga* T. & G.
    D′. All of the flowers sterile and radiant...4. f. *sterilis* (T. & G.) St. John
A′. Leaves closely short-puberulent beneath, all of the secondary nerves bearing hairs, cordate or rounded at base, broadly ovate or suborbicular, acuminate at tip.
  E. Some or all of the flowers fertile.....5. var. *Deamii* St John
  E′. Most all of the flowers sterile and radiant.....6. f. *acarpa* St. John

1. HYDRANGEA ARBORESCENS L., Sp. Pl. i. 397 (1753); *H. vulgaris* Michx., Fl. Bor.-Am. i. 268 (1803); *H. cordata* Pursh, Fl. Am. Sept. i. 309 (1816); *H. vulgaris* Michx., β *cordata* (Pursh) Torr., Ann. Lyc. N. Y. ii. 205 (1827); *H. arborescens* L., var. *vulgaris* (Michx.) Ser., DC. Prodr. iv. 14 (1830); *H. arborescens* L., β *cordata* (Pursh) T. & G., Fl. N. Am. i. 591 (1838–1840); *H. arborescens* L., f. *typica* Schneider, Ill. Handb. d. Laubholzk. i. 387 (1905); *H. arborescens* L., f. *vulgaris* (Michx.) Schneider, l. c. 387; *H. arborescens* L., var. *typica* Schneider, Ill. Handb. d. Laubholzk. ii. 943 (1912).

DISTRIBUTION: NEW YORK: Wellsburg Narrows, Chemung Co., July 2, 1896, September 17, 1897, *T. F. Lucy*, no. 5,490 (N). PENNSYLVANIA: Nescopec, Luzerne Co., July 2, 1889, *A. A. Heller* (G.).

District of COLUMBIA: in silvis frequens prope Washington, July 15, 1888, *Th. Holm* (Cal). WEST VIRGINIA: Banks of Blackwater River, Hendricks, Tucker Co., *J. M. Greenman*, no. 213 (G). NORTH CAROLINA: Blowing Rock, August 9, 1893, *B. L. Robinson*, no. 134 (G). GEORGIA: ravines, Madison Springs, September, *H. W. R*[*avenel*] (G). INDIANA: rocky wooded ravine just west of Aurora, *C. C. Deam*, no. 6,842 (D). KENTUCKY: Big Black Mountains, Harlan Co., *T. H. Kearney, Jr.*, no. 154 (G). TENNESSEE: bluffs along Tennessee River, Knoxville, *A. Ruth*, no. 336 (G). ALABAMA: riverbank, Montgomery, June 1, 1897, *C. F. Baker* (N). ILLINOIS: shady rocks, St. Clair Co., June 29, 1877, *H. Eggert* (G). MISSOURI: along bluffs, Noel, *B. F. Bush*, no. 4,987 (G). OKLAHOMA: in ravine, north side Rich Mt., near Page, Leflore Co., *G. W. Stevens*, no. 2,749 (G).

2. H. ARBORESCENS L., f. GRANDIFLORA Rehder, Mitt. Deutsche Dendrolog. Gesell. 71 (1907).

DISTRIBUTION: Found wild in Ohio and introduced into cultivation. OHIO: specimen from this source cultivated at the Arnold Arboretum, June, 1907, *Alfred Rehder* (G). TENNESSEE: Nashville, *Wilkinson* (G).

3. H. ARBORESCENS L., var. OBLONGA T. & G., Fl. N. Am. i. 591 (1838–1840); *H. cinerea* Small, Bull. Torrey Bot. Club xxv. 148 (1898), in part; *H. arborescens* L., f. *oblonga* (T. & G.) Schneider, Ill. Handb. d. Laubholzk. i. 387 (1905).

DISTRIBUTION: NEW YORK: near Painted Post, Steuben Co., July 24, 1884, *Miss I. S. Arnold* (G). NEW JERSEY: rocky woods, Phillipsburg, August 15, 1909, *K. K. Mackenzie*, no. 4,281 (D). PENNSYLVANIA: near Smithville, Lancaster Co., *Heller* & *Halbach*, no. 541 (G). DISTRICT OF COLUMBIA: Herb. *A. Gray* (TYPE G). WEST VIRGINIA: rocky woods, White Sulphur Springs, Greenbrier Co., *K. K. Mackenzie*, no. 412 (D). VIRGINIA: on Round Top Mountain, west of Seven Mile Ford, Smyth Co., July 2, 1892, *J. K. Small* (G). NORTH CAROLINA: rich shady woods, Biltmore, June 21, & September 28, 1897, *Biltmore Herbarium*, no. 1,339 b (G). GEORGIA: rich shady woods, Athens, June 25, 1900, *R. M. Harper*, no. 35 (G. & N.). INDIANA: on a wooded hillside about three miles west of New Albany, Floyd Co., *C. C. Deam*, no. 9,374 (D). ALABAMA: Greensboro, 1857, *S. Watson* (G). KENTUCKY: Kuttawa, Lyon Co., June 2–18, 1909, *W. W. Eggleston*, no. 4,756 (N). TENNESSEE: rich woods, Knoxville, *A. Ruth*, no. 2,025 (N). ALABAMA: Auburn, Lee Co., August 2, 1897, *Earle* & *Baker* (N). MISSISSIPPI: Waynesboro, Wayne Co., *C. L. Pollard*, no. 1,244 (G). ILLINOIS: rocky banks, Athens, Menard Co., 1861, *E. Hall* (G). MISSOURI: Meramec Heights, *E. E. Sherff*, no. 69 (G). ARKANSAS: Benton

Co., 1899, *E. N. Plank* (N). LOUISIANA: deciduous woodland, Baines, West Felicia Parish, August 23, 1912, *F. W. Pennell* (N). OKLAHOMA: at edge of thicket, near Mannsville, Johnston Co., *Florence Griffith*, distributed by *G. W. Stevens*, no. 3,447 (G).

4. H. ARBORESCENS L., var. OBLONGA T. & G., f. **sterilis** (T. & G.) comb. nov., *H. arborescens* L., δ *sterilis* T. & G., Fl. N. Am. i. 591 (1838–1840); not *H. arborescens* L., var. *oblonga* T. & G., f. *sterilis* (Rehd.) Schneider, Ill. Handb. d. Laubholzk. ii. 943 (1912). Torrey & Gray's var. *sterilis* differs from the var. *oblonga* only in having the "flowers all sterile and radiate." It is then better treated as a form under that variety than as of equal rank. Although the original collection was made before 1840, no subsequent ones have been seen.

DISTRIBUTION: PENNSYLVANIA: Wysox, *J. Carey* (TYPE in G).

5. H. ARBORESCENS L., var. **Deamii** var. nov., *H. vulgaris* Nutt., Gen. N. Am. Pl. i. 284 (1818), not Michx.; *H. cinerea* Small, Bull. Torrey Bot. Club xxv. 148 (1898), as to type specimen, not as to description and cotypes; *H. cinerea* Gray's Man. ed. 7, 450 (1908), in part, ab forma typica differt foliis grandis cordato-ovatis acuminatis coriaceis, subtus valde puberulentis, nervis primariis secundariisque etiam locis inter nervos pilos ferentibus.

Differing from *H. arborescens* L., in having its large cordate-ovate acuminate leaves more coriaceous and with the under surface clothed with a dense puberulence borne from the primary and secondary veins and even from the spaces between veins.

DISTRIBUTION: GEORGIA: rich shady woods, Whitfield Co., *R. M. Harper*, no. 243 (G). OHIO: Cincinnati, *R. Buchanan*, no. 832 (N). INDIANA: on an exposed place of the rocky slope of White River, one mile east of Sparksville, Jackson Co., July 15, 1919, *Charles C. Deam*, no. 28,122 (TYPE in G). TENNESSEE: rocky hillsides, altitude 2,300 feet, Lookout Mountain, July 1903, *H. A. Gleason* (G). ILLINOIS: shaded bluff, Homer, Champaign Co., A. *S. Pease*, no. 13,028. MISSOURI: limestone bluffs, Neosho, *E. J. Palmer*, no. 3,999 (G). ARKANSAS: Benton Co., 1899, *E. N. Plank* (N). OKLAHOMA: along streams, Page, Leflore Co., *E. J. Palmer*, no. 12,640 (Cal).

6. H. ARBORESCENS L., var. DEAMII St. John, f. **acarpa** forma nova, praecedenti similis sed differt floribus omnibus infertilibus radiatisque.

Differs from *H. arborescens* L., var. *Deamii* St. John by having all of its flowers sterile and radiant.

DISTRIBUTION: MISSOURI: woods, Monteer, August 6, 1910, *B. F. Bush*, no. 6,116 (TYPE in G).

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