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JUNCUS MARGINATUS AND ITS VARIETIES.*

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Juncus marginatus has long been known as a species well distinguished from all others, but widely variable within its own limits. Writers on American botany in the early part of the present century gave different names to various forms of the plant, and not until 1866, when Dr. Engelmann published the first part of his Revision of the North American species of the genus Juncus, were they comprehensively treated as forms of *Juncus marginatus*.

The examination of the literature of *Juncus marginatus*, together with a large series of specimens, has brought the writer to separate the species into three forms, namely, *Juncus marginatus* (type form), *Juncus marginatus aristulatus*, and *Juncus marginatus setosus*, which may be presented as follows:

Juncus marginatus Rostk.

Juncus marginatus Rostk. Monog. Junc. 38, t. 2, f. 3 (1801). Type specimen from Pennsylvania.

Juncus cylindricus Curtis, Amer. Journ. Sci. xliv. 83 (1843). Type specimen from Lincolnton, North Carolina.

Juncus marginatus vulgaris Engelm. Trans. St. Louis Acad. ii. 455 (1866). Type locality not given.

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Juncus marginatus paucicapitatus Engelm. Trans. St. Louis Acad. ii. 455 (1866). Type specimen from Long Branch, New Jersey.

Stems in close tufts, seldom exceeding 50 cm. in height; leaf blades 1 to 2.5 mm. broad; inflorescence commonly bearing 5 to 15 heads; heads usually 5- to 10-flowered; inner perianth parts broadly obtuse; seed narrowly oblong, 0.4 to 0.5 mm. in length, short-stalked at the base, attenuate-apiculate at the apex, marked with 12 to 16 conspicuous longitudinal costæ, the intercostal spaces minutely and closely translineolate, usually with an occasional transverse line similar to the costæ.

Specimens examined:

Ontario: Near Sandwich, J. M. Bigelow, September 2, 1866.

Maine: York, M. L. Fernald, July 16, 1891; Cumberland, J. Blake.

New Hampshire: East Jaffrey, Walter Deane, July 17, 1889.

Massachusetts: Ipswich, William Oakes; South Framingham, E. L. Sturtevant, 1890; Cambridge, M. L. Fernald, September 11, 1891; Chelsea Beach Island, William Boott, September 10, 1853.

Connecticut: Plainville, J. N. Bishop, 1888.

Rhode Island: Providence, George Thurber, June, 1845.

New York: Mariners Harbor, Staten Island, Arthur Hollick, September 5, 1886; Pine Plains, Lyman Hoysradt.

New Jersey: Long Branch, C. W. Short, 1856.

Pennsylvania: Lancaster county, T. C. Porter, July 31, 1886; Germantown, Thomas Meehan, 1867; Grays Ferry, Philadelphia, C. E. Smith; Wysox, John Carey, 1841; Westmoreland county, P. E. Pierron, August 11, 1866; Chester county, W. M. Canby, July, 1866; Tinicum, Bucks county, T. C. Palmer, August, 1892.

Delaware: W. M. Canby; Newcastle, Alexander Commons, 1866.

Illinois: Athens, Elihu Hall, 1864; Beardstown, C. E. Geyer.

Kentucky: Lexington, C. W. Short, 1835.

Missouri: Carter county, B. F. Bush, July 21, 1891.

District of Columbia: Near Washington, L. F. Ward, July 9, 1876, June 23, 1878, July 21, 1878, and June 14, 1879; Washington, M. S. Bebb, 1864.

Virginia: Between Princess Anne and Berkeley, A. A. Heller, No. 1074, July 13, 1893; along New River, Carroll county, altitude, 2,200 feet, J. K. Small, July 12, 1892; Colonial Beach, F. V. Coville, July 6, 1890; Ocean View, Norfolk county, F. V. Coville, June 21, 1890,

North Carolina: Lincolnton, Lincoln county, M. A. Curtis; near Salisbury, Rowan county, A. A. Heller, June 21, 1890; Carolina Beach, New Hanover county, F. V. Coville, June 27, 1890.

Florida: A. W. Chapman; Duval county, A. H. Curtiss, No. 2975 in part.

Juncus marginatus aristulatus (Mx.).

Juncus aristulatus Mx. Fl. i. 192 (1803). Type specimen from either the Carolinas or Georgia.

Juncus aristatus Pers. Syn. Pl. i. 385 (1805). Type specimen the same as that of *Juncus aristulatus*.

Juncus biflorus Ell. Bot. i. 407 (1817). Type locality, ten miles from Savannah, on the road to Augusta, Georgia.

Juncus marginatus odoratus Torr. Fl. Nor. U. S. i. 362 (1824). Type specimen from "Bloomingdale, near New York."

Juncus heteranthos Nutt. Trans. Amer. Phil. Soc. new ser. v. 153 (1832–37). Type specimen collected along the Arkansas River.

Juncus canaliculatus Liebm. Mex. Junc. 43 (1850). Type specimen collected near San Antonio Huatusco, in the state of Vera Cruz, Mexico, at the altitude of 1,370 meters.

Juncus odoratus Steud. Syn. Pl. Glum. ii. 304 (1855). Type locality the same as that of *Juncus marginatus odoratus*.

Juncus marginatus biflorus Engelm. Trans. St. Louis Acad. ii. 455 (1866). Type locality the same as that of *Juncus biflorus*.

Stems single or in loose tufts, usually exceeding 50 cm. in length; leaf blades 1 to 5 mm. broad; inflorescence usually bearing 20 to 100 heads, in depauperate plants sometimes fewer; heads usually 2- to 5-flowered, becoming occasionally 10-flowered; inner perianth parts broadly obtuse; seed as in the type form, but 0.5 to 0.6 mm. long.

Specimens examined:

New York: New York, at Bloomingdale, John Torrey.

New Jersey: Near Atsion, C. F. Parker, July 31, 1866; near Princeton, John Torrey, July, 1830; Burlington county, C. F. Parker, August 19, 1867; Dennisville, Cape May county, C. F. Parker, July 15, 1866.

Pennsylvania: West Chester, William Darlington, 1827.

Delaware: Ellendale, W. M. Canby, September 16, 1891; near Wilmington, Alexander Commons, July 7 and 24, 1866.

Maryland: Garrett county, J. D. Smith, July, 1879; Salisbury, Alexander Commons, July 27, 1865; Salisbury, W. M. Canby, June, 1864.

Virginia: Virginia Beach, Princess Anne county, Arthur Hollick and N. L. Britton, September 26 and 27, 1890; near Virginia Beach, A. A. Heller, No. 1053, July 12, 1893; Colonial Beach, F. V. Coville, July 6, 1890; Ocean View, Norfolk county, F. V. Coville, June 21, 1890.

District of Columbia: Near Washington, Lester F. Ward, July 21, 1878.

North Carolina: Wilmington, M. A. Curtis; near Wilmington, F. V. Coville, June 26, 1890.

South Carolina: Aiken, H. W. Ravenel, June 12 and 25, 1866, and August, 1869.

Florida: Duval county, A. H. Curtiss, No. 2975, in part; Fort Meade, Polk county, J. D. Smith, March, 1880; Gadden county, A. W. Chapman.

Alabama: Alexander Winchell, No. 162; Montgomery, Gerald McCarthy, 1888; Fly Creek, Baldwin county, Charles Mohr, June 13, 1890.

Mississippi: Starkville, S. M. Tracy, Nos. 1420, 1421, June 20, 1890; Ocean Springs, S. M. Tracy, No. 1648, July 10, 1891.

Louisiana: Josiah Hale.

Texas: Hardin county, G. C. Nealley, 1888; Houston, F. Lindheimer, 1842.

Michigan: Near Fort Wayne, J. M. Bigelow, July 28 to September 9, 1866.

Kentucky: Lexington, C. W. Short, 1835.

Kansas: Cherokee county, W. S. Newlon, 1893.

Missouri: St. Louis, C. A. Geyer, May, 1842.

Arkansas: F. L. Harvey, 1882 to 1884; Little Rock, H. E. Hasse, May 25, 1886.

Indian Territory: Choctaw agency, J. M. Bigelow.

Guatemala: Coban, Alta Vera Paz, altitude, 4,300 to 4,400 feet, H. von Turckheim, No. 431, April, 1886, and April, 1879.

Brazil: "Brasilia meridionali," Sellow.

Juncus marginatus setosus var. nov.

Stems apparently in loose tufts, 30 to 75 cm. high; leaf blades 1 to 5 mm. broad; inflorescence and heads as described in *Juncus marginatus aristulatus;* inner perianth parts narrowly ovate to lanceolate, 0.3 to 0.4 mm. in length, reticulated in 12 to 16 longitudinal rows, the areolæ nearly isodiametrical, transversely plurilineolate.

Type specimen in the United States National Herbarium, collected June 4, 1882, in the Santa Catalina mountains, Arizona, by C. G. Pringle.

Specimens examined:

Kansas: Stafford and Kingman counties, M. A. Carlton, 1891.

Nebraska: Minden, Kearney county, June, 1891, intergrading with the type form.

Arizona: Santa Catalina mountains, C. G. Pringle, June 4, 1882, and April 14 and May 16, 1881; Lowell, W. F. Parish, May 24, 1884; Apache Pass, J. G. Lemmon, No. 313, 1881.

New Mexico: Charles Wright, No. 1923 in part, 1851.

Indian Territory: Colbert, C. S. Sheldon, No. 37, June 19, 1891; Russell Creek, W. S. Newlon, 1893.

Texas: Drummond, F. Lindheimer, No. 193, 1843; Corpus Christi, H. W. Ravenel, April 30, 1869; Houston, Elihu Hall, Pl. Tex. No. 657, April 20, 1872.
Arkansas: Little Rock, F. L. Harvey, June, 1880.
Louisiana: Port Eads, on ballast ground, A. B. Langlois, May 6, 1885.
Mexico: Near Morales, San Luis Potosi, J. G. Schaffner, No. 500, 1876; Rio Blanco, Jalisco, Edward Palmer, No. 13, June 8, 1886.

The considerations which have led to the disposition of the species formulated above may be given in sufficient detail to aid the future student who goes over the same ground.

The type specimen of *Juncus marginatus*, which is probably at Berlin, it has not been possible to consult, but Rostkovius's excellent figure, as well as his description of the plant, "*culmus erectus pedalis vel sesquipedalis*," "*corymbus terminalis simplex*," and "*capitula octo- vel decemflora*," besides the type locality, Pennsylvania, leave no doubt as to the identity of the type form. The type specimen of *Juncus cylindricus*, a fragment of which I have been able to examine in the Engelmann herbarium, bears heads with abnormally elongated axes and many flowers. It belongs clearly to some form of *Juncus marginatus*, probably to the type form. Dr. Engelmann, following a practice in common European use, gave to what he considered the type form a varietal name, *vulgaris*, which, by reference to No. 33 of his Herbarium Normale, is seen clearly to be identical with Rostkovius's plant. An examination of the type specimen of *Juncus marginatus paucicapitatus* in the Engelmann herbarium shows that it belongs to the type form of *Juncus marginatus*, and indeed closely resembles Rostkovius's original figure of the species.

The plant for which the name *Juncus marginatus aristulatus* is here adopted has been known currently as *Juncus marginatus biflorus*. Michaux's *Juncus aristulatus* has been referred by various authors to *Juncus marginatus* without particular comparison with any of its forms, but an examination of his description leaves no doubt regarding the plant he was describing, for in the expression "*glomerulis trifloris*" he names the most conspicuous external feature of this variety. Persoon's specific name *aristatus* is an error for *aristulatus*, for Persoon cited Michaux as the author of the name, with reference to the page of publication, and quoted his description with but slight changes. Regarding *Juncus biflorus*, it should be said that Elliott included in his book descriptions of two plants of the *marginatus* group,

one, which he referred to *Juncus aristulatus* Mx. (citing it by error, apparently from Pursh, *Juncus aristatus*, and modifying Michaux's description to some extent), and another, which he described as a new species, *Juncus biflorus*, with the diagnosis "*Juncus culmo tripedali, tereti; foliis linearibus, planis; panicula decomposita, elongata; glomerulis bifloris.*" There can be no doubt that this plant is referable to true *Juncus aristulatus*, and that Elliott incorrectly transferred Michaux's name to some other form, perhaps the type form, of *Juncus marginatus*. Torrey's *Juncus marginatus odoratus*, the original specimen of which I have examined in the Columbia College herbarium, is *Juncus marginatus aristulatus*, with 3- to 5-flowered heads, and has now lost the pleasant odor, probably accidental, attributed to it by Dr. Torrey. Nuttall's *Juncus heteranthos* can be nothing else than *Juncus marginatus biflorus*, for although his type specimen appears to have been lost he states explicitly in his description that the flowers are mostly in threes, and that the inner perianth parts are obtuse. In describing the plant, therefore, he appears to have been distinguishing it from the common typical eastern form of *Juncus marginatus* and not to have had in mind Elliott's *Juncus biflorus*. The form ascribed to the inner perianth parts precludes its reference to *Juncus marginatus setosus*. The type specimen of Liebmann's *Juncus canaliculatus* has been examined by Dr. Franz Buchenau, who refers it unhesitatingly to *Juncus marginatus*.* Since he does not say that its inner perianth parts are acute, I judge that it is not *Juncus marginatus setosus*, which, indeed, is very unlikely to occur in the humid climate of Vera Cruz. Neither is Liebmann's plant referable to the type form of *Juncus marginatus*, for that plant does not range so far south. The *Juncus odoratus* of Steudel is based on *Juncus marginatus odoratus* Torr., to which reference has already been made, and Engelmann's *Juncus marginatus biflorus* is based upon *Juncus biflorus* Ell.

The variety described above as new could not, from its range, have been referable to any of the plants whose names have been cited above as synonyms of *Juncus marginatus* or its variety, with the exception of *Juncus heteranthos* and *Juncus canaliculatus*, and the reasons for the reference of these two plants to *Juncus marginatus aristulatus* have been given in the last paragraph.

The localities of specimens examined in the preparation of

*Abh. Naturw. Ver. Bremen, iii. 343–344 (1873).

this paper have been taken from the labels in the herbaria of Harvard University, Columbia College, the Missouri Botanical Garden, and the Academy of Natural Sciences of Philadelphia, the private herbaria of Mr. William M. Canby and Captain John Donnell Smith, and the National Herbarium.

The disposition which is here made of the type form and varieties of *Juncus marginatus* may serve as a general illustration of a method of dealing with species and varieties which is in accord with our present knowledge of the evolution of species and of the geographic relationship of these plants with each other. The writer, having first secured a considerable amount of material, separated the specimens into the three groups which their examination naturally suggested. Next the names which have been published for any one of these forms were taken up and the original descriptions and the type specimens examined. In some cases the types were not accessible, and under those circumstances it was necessary to identify the plant either by description alone or by the aid of collateral evidence. In this manner it is believed that the earliest name applied to each of these forms has been ascertained, one of them, as it proved, having never before received a distinctive name. The next step was to bring together a still larger number of specimens, identifying each one according to the facts already known, ascertaining the locality in which it was collected, and marking its position upon a map. It was found that the type form of *Juncus marginatus* merges by a full series of intergrades into *Juncus marginatus aristulatus*, and that in the states of Nebraska and Kansas it seems to intergrade also with *Juncus marginatus setosus*. The latter shows a close relationship with the variety *aristulatus*, but, so far as indicated by the specimens examined, does not fully intergrade with it. The differences between these two, however, are so slight that there is reason to expect the occurrence of intergrades. The type form of *Juncus marginatus* ranges from Maine southward through the Atlantic States to Florida, and occurs again at a point in the province of Ontario opposite Detroit. The variety *aristulatus* ranges from New York city southward along the coastal plains to Florida, westward through all the States bordering the Gulf of Mexico, and northward, in the Mississippi valley, in apparently isolated localities, to southern Michigan. South of the United States it follows the eastern coast at least as far as Coban, Guatemala, and one specimen is reported to have

been found in southern Brazil. The variety *setosus* occurs in the southern Great Plains region, ranging over western Kansas, Indian Territory, interior Texas, Arizona, and New Mexico, and southward in Mexico to the states of San Luis Potosi and Jalisco. An isolated locality is also known on ballast ground in Louisiana and another in Arkansas. The ranges of the type form and the variety *aristulatus* appear to overlap in the Atlantic States over a considerable area, but in reality they are pretty well distinguished, for the latter characteristically inhabits sandy plains, particularly those along the coast, while the type form grows more abundantly in upland moist areas.

The most widely diffused and probably the mother form of *Juncus marginatus* is its variety *aristulatus*, which is characteristic of the coastal plains from New York to Texas, and extends far up the Mississippi valley, occurring among the coast mountains of Mexico southward to Guatemala. *Juncus marginatus* proper is an outlying and probably derivative form, extending farther north and farther inland, and presents a variation in the direction of smaller size, more reduced inflorescence, and larger heads. *Juncus marginatus setosus* is a second derivative, with acute, more papery perianth parts, and smaller seeds, characteristic of moist places in the subarid regions westward from the range of the mother form.

This test by geographic range has checked and emphasized the results obtained by a merely morphological examination of specimens, and brings our knowledge of these plants into a form more clearly expressive of their developmental relations. The same method may without doubt be applied to any group of plants with highly important results.



Coville, Frederick V. 1893. "Juncus marginatus and its varieties." *Proceedings of the Biological Society of Washington* 8, 121–128.

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