wild marsh has resulted in a succession, which although appearing natural, yet is really brought about by man's activities.

These observations were made while the author held a HENRY FELLOWSHIP at Harvard University.

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A NEW SPECIES OF NAJAS FROM THE HUDSON RIVER

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(Plate 455)[1]

IN a recent paper (1), the writer suggested that both *Najas flexilis* and *N. guadalupensis* seem to represent aggregate species, but that his attempts to break up these two populations into species or varieties had been quite unsuccessful. At the time of that writing, he had before him only a few sheets of the species to be discussed below, and on only two plants were mature seeds available. By expanding the definitions of the two species mentioned above, it was possible to take care of all of this material under the one or the other. Now, with a copious suite of specimens collected from up and down the Hudson River over an area of 100 miles, from Waterford, Saratoga Co., New York to Iona Island, Rockland Co., this previously considered atypical material emerges as the dominant form, quite constant in its characters, and except for *N. minor*, practically the only species of Najas in the river. Certainly such a population can not easily be treated as a minor form of another species.

This tidal river plant is here proposed as a new species. In general appearance (PLATE 455) it is most similar to *N. guadalupensis*, but is even more slender and graceful. The internodes are greatly elongated,

[1] The publication of the PLATE has been made possible through the kindness of DR. L. H. BAILEY.

to 6 cm. long. The leaves are mostly about 1 cm. long by 1 mm. wide, minutely serrate, and somewhat ascending, but never tending to be recurved, as is slightly the case in *N. flexilis*, and the typical condition in *N. minor*. The leaf bases are broader than in either *N. flexilis* or *N. guadalupensis*, but not auricled as in *N. gracillima*. The seeds (FIG. 1) are the most striking feature of this new species. They are long and slender as in *N. gracillima*, with a slight tendency to be somewhat curved. The seed-coat is very finely reticulate, with 50–60 longitudinal rows of areolae around the seed, the areoles rectangular in shape and much smaller than in either *N. flexilis* or *N. guadalupensis*. The testa is usually opaque, rarely lustrous, and quite rough, since the areoles are sunken as in *N. guadalupensis*. The raphe is more prominent than in other Najas species, producing a distinct ridge or keel on the one side of the seeds. The rather stout styles are intermediate in length between those of *N. flexilis* and *N. guadalupensis*.

As set forth above, it will be seen at once that in several respects this Hudson River material represents a recombining of the essential characters of *N. flexilis* and *N. guadalupensis*, with the slender type of seed of *N. gracillima*, but with the reticulation of the testa different from that of all of these species. With *N. guadalupensis* it agrees somewhat in habit, in the rather stout style, in the usually opaque quality of the seed-coat, and in the sunken areoles. It approaches *N. flexilis* in the length of the style, but not even remotely in the very fine reticulations of the testa. Actually, the only available specimen of this population which at all suggests *N. flexilis* is the collection by Muenscher and Clausen (4273) from the mouth of the Mohawk River where it enters the Hudson at Waterford, Saratoga Co., New York. This material has the lustrous seed-coats and slender styles of *N. flexilis*, but in habit, the shape and size of the seeds, and particularly in the reticulation of the testa, is clearly to be referred to the new species.

The possibility that all of the characteristic Hudson River plants may be hybrids has been considered, but there seems no basis for such an assumption. The fact that in the greater part of the river surveyed, neither of the supposed parent species were present, would seem to indicate that if this is a hybrid between *N. flexilis* and *N. guadalupensis*, the crossing must have taken place in the remote past. Further, the plants fruit abundantly, much more abundantly than the writer has ever observed *N. guadalupensis* to fruit in the north. Besides, if

these plants really were hybrids, we should not expect the seeds to be entirely different (not intermediate) from both parents in size and shape as well as in the nature of the reticulation of the testa. Certainly at the present time this population has all the earmarks of a good species. To consider it a variety of any one of the previously described forms of the section *Americanae* does not seem possible, for the seed characters are too distinct and individual.

The writer takes pleasure in dedicating this species to Dr. W. C. MUENSCHER, who has contributed probably more than any other botanist to our knowledge of the aquatic vegetation of New York.

NAJAS **Muenscheri**, sp. nov. Planta gracilis atroviridis ramosissima radicibus fibrosis; rami valde ascendentes; caules tenues durique; virgae ad 50 cm. longae; folia recta, fere ascendentia, non rigida, 1 cm. longa 1 mm. lata, acute serrata, plus vel minus 50 dentibus in margine, bases lati et aliquid lobati; flores fertiles stylis aliquid validis, 0.7–1.2 (1.5) mm. longis; semina flavo-fulva; testa fere opaca et minute reticulata, 50–60 seriebus longitudinalibus areolarum circum semen; areolae fere rectangulares, plus vel minus 43 μ longae 29 μ latae, submersae, ita ut summa testa asperrima videatur; semina prominente carina longitudinali, saepe aliquatenus curvata, ad basin obtusa, ad apicem acuta; flores staminei incogniti.

NAJAS **Muenscheri**, n. sp. Slender, dark green herb with fibrous roots, much branched, with the branches strongly ascending; the stems thin and wiry, the shoots to 50 cm. long; the leaves straight, usually ascending, not rigid, 1 cm. long by 1 mm. wide, finely serrate, 50± teeth on a margin, the bases broad and somewhat lobed. Pistillate flowers with the styles rather stout, .7–1.2 (1.5) mm. long; the seeds yellowish-brown, with the testa usually opaque and finely recticulate, with 50–60 longitudinal rows of areolae around the seed, these typically rectangular, averaging 43 μ by 29 μ, and sunken, giving the surface of the seed-coat a decidedly roughened appearance; seeds with a prominent longitudinal ridge, often somewhat curved, obtuse at the basal end, acute at the apex; staminate flowers unknown. TYPE in the Cornell University Herbarium, COTYPE in the Gray Herbarium. Tidal mudflats of Hudson River, Imbocht Bay, Greene Co., NEW YORK, Sept. 3, 1936, *W. C. Muenscher and O. F. Curtis, jr.* 5495.

The following specimens, all in the Cornell University Herbarium, may also be cited: ALBANY Co.: Coeymans, *W. C. Muenscher and R. T. Clausen* 4287. COLUMBIA Co.: Hudson River, mouth of Stockport Creek, *M. & C.* 4289. DUTCHESS Co.: South Bay, Hudson River, *M. & O. F. Curtis, jr.* 5494. GREENE Co.: tidal mudflat between Hudson and Athens, *M. & R. T. C.* 4272 and 4286; Imbocht Bay, *M. & O. F. C.* 5496, 5498, 5499 & 5500. ROCKLAND Co.: Iona Island, *M. & O. F. C.* 5492 and 5493. SARATOGA Co.: Waterford,

M. & R. T. C. 4283. Putnam Co.: tidal mudflats, Constitution Island, *M. & C.* 5506. Ulster Co.: Kingston, *M. & C.* 5504. Westchester Co.: Roa Hook, *M. & C.* 5507.

M. & R. T. C. nos. 4283, 4286, 4287 & 4289 were previously cited (1) under *N. guadalupensis*, as which they should now be deleted. All other New York specimens of *N. guadalupensis* which have been cited by the writer have been reëxamined and remain as originally determined.

Further examination of the available material of *Najas Muenscheri* now makes possible the description of the staminate flowers, which are borne singly in the axils of the upper leaves. These consist of a single anther subtended by two membranous envelopes, the inner of which is 2 mm. long, while the outer is 3 mm. long by .8 mm. wide, with the apex developed into three short lobes. Better material must be secured before it is possible to give the minute details concerning the very small anther.

1. Clausen, R. T. Studies in the genus Najas in the northern United States. Rhodora **38:** 333–345. 1936.

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POLLINATION OF VACCINIUM PENNSYLVANICUM

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(Plate 456)

The lowbush blueberry, *Vaccinium pennsylvanicum* Lam., grows wild over large areas of pastureland in Southern Maine. Farmers improve the natural conditions under which it produces fruit by removing other shrubs and trees and occasionally burning over the land. As according to the census of 1930 there are 13,888 acres of wild blueberries in Maine, or four times the area found in the other New England states, Maine offers an excellent opportunity for the study of the ecology of this species of the heath family.

Although the ecology of the highbush blueberry, *V. corymbosum* L., has been studied by Coville, no critical studies have been made on the pollination of the lowbush blueberries. Phipps[1] has reported an extensive investigation on the insect pests of the blueberries and huck-

[1] Phipps, C. R., Me. Agri. Exp. St. Bu. 356, 1930.