Gallionella nummuloides (Dillw.) Bory. (*Melosira nummuloides* Ag.) Frequent.
Melosira undulata (Ehrenb.) Kütz. Frequent.
" *sculpta* (Ehrenb.) Kütz. Common.
" *coronata* Grun. New Haven.
" *octogona* Grun. Frequent.
Paralia sulcata (Ehrenb.) Cleve. Rare, Leete's Island.
Cyclotella antiqua W. Sm. Very rare, Bristol only.
" *striata* (Kütz.) Grun. Silver Sands.
" *Kuetzingiana* Thw. Frequent.
Podosira dubia (Kütz.) Grun. Occasional.
Hyalodiscus subtilis Bail. Occasional.
" *stelliger* Bail. Occasional.
Actinoptychus undulatus (Bail.) Ralfs. Common.
" *velatus* Ehrenb. Occasional.

Bristol, Connecticut.

THE GENUS SUAEDA IN NORTHEASTERN AMERICA.

M. L. Fernald.

The genus *Suaeda* has long been for the American botanist a source of much confusion and difficulty, in part because it consists of unattractive plants of saline soils which are generally ignored by collectors, in part because of the very indefinite conception of the true *Suaeda maritima* of Europe — the species about which our studies, at least of the eastern coast forms, must largely center. It has long been known to many New England botanists that we have on our northeastern coast more than the single species alloted to this region in Gray's Manual; and the two species described and figured (as *Dondia*) in Britton & Brown's Illustrated Flora satisfactorily cover only the forms which occur on the salt marshes and sea beaches from southern New England southward. On the coast of Maine are other forms which in habit, flowering-season, and fruit-characters are unlike the plants of the more southern shores.

During the summer of 1898 Mr. J. C. Parlin and the writer spent a day (July 23) upon Wells Beach and the adjacent marshes in southern Maine. At that time a small depressed *Suaeda* (no. 1) with short subcylindric dark green leaves was in mature fruit. Another depressed

and very slender plant (no. 2) with longer semicylindric very glaucous foliage was in flower and with occasional mature seeds. A third but scarce plant (no. 3), then beginning to fruit, had much coarser purple-tinged ascending and slightly branching stems, and the leaves only slightly glaucous. Two other species not then in flower were common — one an erect or ascending profusely branched green plant (no. 4) a foot or two high, the elongate-linear leaves not glaucous; the other a depressed plant (no. 5), at that time showing no trace of flowering, generally with the coarse stems and slender leaves purplish. Late in the following September additional collections and field notes were made about Wells Beach by Miss Kate Furbish. The two slender depressed plants (nos. 1 & 2) which had been in fruit nearly two months earlier were, at the time of these later observations, over-ripe or quite shrivelled, and the tall erect very branching plant (no. 4) was in mature condition, but the coarse decumbent plant (no. 5) with its green or generally claret-colored stems and leaves was barely in fruit. Its habit, however, and the very dense elongate-spicate inflorescences distinguished it superficially from the other plants near which it grew. An exhaustive study of the Suaedas of eastern Massachusetts recently made by Mr. Wm. P. Rich has shown that two forms — the tall late-fruiting species (no. 4) and the ascending plant (no. 3) noted as scarce on Wells Beach — are generally distributed along the Massachusetts coast, while a third plant, the slender depressed very glaucous form (no. 2) occurs on the North Shore.

A detailed examination of these five plants shows that besides their marked habital characters and their different fruiting seasons, at least four of them possess good differential characters in their calyces and seeds. These five New England plants divide themselves naturally into two groups — the first, with the sepals thickened and strongly carinate upon the back, including the two late-flowering plants (nos. 4 & 5); the second group, with the sepals thinner and rounded or very slightly carinate upon the back, including the three plants (nos. 1, 2, and 3) found fruiting in late July. The former group includes the plants now generally passing as *Suaeda linearis* (Ell.) Moq. (*Dondia Americana* Britton in part); and the three plants with the sepals more rounded on the back are included under *Suaeda maritima* (L.) Dum. (*Dondia maritima* Druce).

In order to make a satisfactory disposition of these forms it is necessary first to gain a clear conception of the European *Suaeda*

maritima. This unfortunately is not easily accomplished. The specimens distributed as this species from European herbaria are very different from one another, and, like the American plant, they are probably a confusion of several distinct things. The descriptions too are confusing. When one refers, however, to the original description of the Linnaean *Chenopodium maritimum*, upon which *Suaeda maritima* was founded he finds an indication that the name belongs to the plant which of late has been so called in America. At least, judging from an excellent photograph secured by Dr. B. L. Robinson of the specimen preserved at the British Museum, the plant first cited by Linnaeus (the Hortus Cliffortianus specimen) is our bushy-branched plant with large calyces and the achenes 2 mm. broad. The maturer specimens in the Linnaean Herbarium, as photographed by Dr. Robinson, seem also to be like the plant of Hortus Cliffortianus. This species is fortunately the plant represented in the plates cited by Moquin in his description of *Chenopodina maritima a vulgaris* in DeCandolle's Prodromus. These plates are two [1] and they represent a plant well known in our herbaria both from Europe and America. In habit, color, calyx and seed it is closely matched by the third form mentioned from Wells Beach, and found very generally on the Atlantic coast of America.

Our conception of *Suaeda linearis* (Ell.) Moq. has also been very confused. From his description Elliott's *Salsola linearis* is apparently a tall erect freely branching plant (no. 4) which is common on the Atlantic coast from southern Maine to Texas. Elliott cited, however, as synonyms two plants — *Salsola salsa*? Michaux and *Chenopodium maritimum* Walter — neither of which seems clearly identified with the "nearly erect....much branched" plant which he described. The erect bushy plant with the flowers "spiked" and with the sepals "angled on the back," as described by Elliott, has small seeds, rarely 1.5 mm. broad. The portion of Walter's specimen of *Chenopodium maritimum* preserved in the Gray Herbarium shows a plant apparently not distinguishable from the common *Suaeda maritima* of Europe and our northeastern coast. The fragment has the large flowers subtended by leaves which are much longer than in the commoner tall southern plant with its "spiked" flowers, the larger sepals are not distinctly carinate, and the large seed (2 mm. broad) is not different

[1] Oeder, Fl. Dan. iii. t. 489 (1770); Sm. Engl. Bot. t. 633 (1799).

from that of the European *Chenopodium maritimum*. Moquin in his monograph of the *Chenopodiaceae* transferred the tall plant to *Suaeda*, as *S. linearis*, following very closely Elliott's description. In DeCandolle's Prodromus, however, he states that the seeds are a line long,— the size of those in Walter's plant and in the common *S. maritima*, but much larger than in the common southern plant which closely matches Elliott's and Moquin's original descriptions. This large-seeded plant, with the leaves of the flowering branches usually elongated and with thin rounded sepals was accepted by Dr. Watson in his early studies of the group as true *Suaeda linearis* Moq. (*Salsola linearis* Ell.), and the small-seeded plant with carinate sepals, described by Elliott was treated as a variety of the species, var. *ramosa*, though later, in the 6th edition of Gray's Manual, he considered the common erect plant with small seed true *S. linearis*.

Under his *Suaeda linearis*, var. *ramosa*, Dr. Watson apparently without hesitation included as a synonym *Salsola salsa* Michaux, from the mouth of the St. Lawrence, a plant which had been included with hesitation by Moquin and others under *Suaeda linearis*. From the original Michaux material it is impossible to determine with certainty the exact identity of that plant; but that it is the same as the erect branching small-seeded *Suaeda linearis* (var. *ramosa* Wats.) of the southern coast is open to serious doubt. So far as exploration on the Maine coast and the lower St. Lawrence has shown, the tall small-seeded *S. linearis* rarely occurs east of the mouth of the Kennebec, nor has it been collected in the maritime provinces of Canada. In fact, north of Cape Anne the three species (excepting the local *S. linearis* of southern Maine) which we know are low plants of procumbent or at least wide-spreading or loosely branching habit. Michaux supposed the lower St. Lawrence plant to be the European *Salsola salsa*, and his primary descripion might well be that of the Old World plant; but in the accompanying observation he states that his American specimen differs from the European in its more slender subdecumbent habit and more crowded flowers.[1] The Michaux plant was soon distinguished by Persoon from the erect *Salsola salsa* as a variety, "*β*? *americana*, humilior, subdecumbens, flor. confertioribus."[2]

[1] "A. Salsola quæ maritima circa *Hâvre de Grace* et *Dieppe* incolit, in eo tantum differt, quod humilior sit et subdecumbens, floribus confertioribus."— Michx. Fl. i. 174 (1803).

[2] Pers. Syn. i. 296 (1805).

Subsequently the Michaux plant, as already stated, has been doubtfully placed by Moquin and others under the more southern *Suaeda linearis*, and by Dr. Watson it was included as a synonym under his tall erect but later discarded var. *ramosa*. And more recently, in the Illustrated Flora, Dr. Britton has taken up for the well-known Atlantic coast plant with "stem erect, strict, 1°–3° tall," the name used by Persoon to designate a "low subdecumbent" plant; and regarding Michaux's subdecumbent plant from the lower St. Lawrence as identical with the more southern erect species, he makes the new combination *Dondia Americana* (Pers.) Britton.

In the summer of 1903 the writer examined the Michaux type and at that time made the note: "Loosely branching *Suaeda*, very immature, but from the crowding of the flowers seems to be the same as the Norwood Cove and Wells Beach species of late September and October." This plant of Norwood Cove and Wells Beach (no. 5 of the preceding notes) is well characterized not only by its late fruiting and subprostrate habit but by its densely crowded flowers on spiciform branches, its very irregular calyx, and its rich claret-color in autumn; and it is apparently the plant intended by Persoon as *Salsola salsa*, var. *americana*.

The northeastern maritime Suaedas as understood by the writer may be classified as follows —

* Seed 2 mm. broad.

SUAEDA MARITIMA (L.)Dumort. Comparatively low, 0.5–4 (rarely 5 or 6) dm. high, ascending or depressed, subsimple or with spreading-ascending or decumbent subsimple branches, often even forming depressed mats 5 dm. or less in diameter: leaves usually more or less glaucous, linear, acute or obtusish, semicylindric, flat above, convex beneath, 5 cm. or less long; those of the flowering branches slightly shorter than the others and much exceeding the 1–4 axillary flowers: sepals pale-green, rounded or obscurely keeled on the back: seed red-brown or black.— Fl. Belg. 22 (1827); Moq. Ann. Sci. Nat. xxiii. 308 (1831), and Chenop. Enum. 127 (1840). *S. maritima a vulgaris* Moq. Chenop. Enum. 128 (1840). *S. linearis* Watson, Proc. Am. Acad. ix. 87 (1874) in part; Wats. & Coult. in Gray, Man. ed. 6, 435 (1890) in part; not Moq. *Chenopodium maritimum* L. Sp. 221 (1753); Oeder, Fl. Dan. iii. t. 489 (1770); Walter, Fl. Car. 111 (1788); Sm. Engl. Bot. ix. t. 633 (1799). *Atriplex maritima* Crantz, Inst. i. 208 (1766). *Salsola maritima* Poir. Encyc. vii. 291 (1806). *Schoberia maritima* C. A. Meyer in Ledeb. Fl. Alt. i. 400 (1829). *Cheno-*

podina maritima Moq. in DC. Prodr. xiii. pt. 2, 161 (1849). *C. maritima, a vulgaris* Moq. l. c. *Dondia maritima* Druce, Ann. Scot. Nat. Hist. (1896) 42; Britton & Brown, Ill. Fl. i. 585, t. 1394 (1896).— Common on wet marshes along the coast from Anticosti to Connecticut, and occasionally southward to Louisiana. Eurasia.

Walter's specimen of his *Chenopodium maritimum* from the Carolina coast is not readily distinguished from this, though his description is cited by Elliott under *Salsola linearis*. On the Massachusetts coast and southward the ascending bushy form of the plant prevails, but from Ipswich northward along the coast of Maine and Eastern Canada it often gives way to a more depressed and usually more glaucous plant, which, however, cannot be clearly separated from the other form. Apparently the same forms in the British Isles have a distribution parallel with this, for, according to Syme "the erect variety is more common in the south, the procumbent in the north; but it is scarcely possible to draw any line of demarcation between them" (Engl. Bot. ed. 3, viii. 4.).

* * Seed 1.25 to 1.5 mm. broad.

+— Sepals rounded on the back, not carinate.

S. Richii. Stems procumbent, forming mats 5 dm. or less across (often fruiting when only 1 cm. or so long): leaves dark green, not at all glaucous, linear to linear-oblong, bluntish, subcylindric, dorsally compressed, the lower 1.5 cm. or less in length; those subtending the fascicles of flowers broader and shorter (4 or 5 mm. long): seed black. — Common on salt marshes and in damp spots at the edge of the beach, Wells, Maine, Aug., 1892 (*Anne E. Perkins*), Sept. 16, 1895 (*Walter Deane*), July 23, 1898, TYPE (*J. C. Parlin & M. L. Fernald*), Sept. 1898 (*Kate Furbish*); also on Great Cranberry Isle, Maine, Aug. 30, 1892 (*E. L. Rand*), and at Cutler, Maine, Aug. 27, 1902 (*M. L. Fernald*). A very distinct species, in its procumbent habit suggesting the depressed form of *S. maritima*, but, in the field, quickly distinguished by its short blunt dark (not glaucous) green foliage, as well as its small seed. From the other small-seeded species, *S. linearis*, it is distinguished by its procumbent habit and short blunt leaves, as well as by the rounded (not carinate) sepals. Unlike any other American plant, this Suaeda in habit strongly suggests *S. microsperma* (C. A. Meyer) Fenzl, but that Asiatic plant has much smaller seeds, and the sepals cucullate-carinate.

This procumbent small-seeded plant of the Maine coast is named for William Penn Rich, a discriminating student of salt marsh vegetation, who in April, 1898, pointed out in the herbarium of Mr. Walter Deane the peculiarities of the species here described.

+— +— Sepals (or some of them) carinate on the back.

++ Stems procumbent: 1 or 2 sepals more cucullate-carinate than the others.

S. americana (Pers.) n. comb. Stems procumbent, the branches 2 or 3 dm. long, only the abundant flowering ones ascending: lower leaves linear, acute, about 2 cm. long; those of the densely-flowered ultimate branches broader and much shorter: one or two sepals usually much more cucullate-carinate than the others: entire plant generally becoming, in the autumn, a rich crimson-lake or claret-color. — *Salsola salsa* ? Michx. Fl. i. 174 (1803), not L. *S. salsa*, *β.* ? *americana* Pers. Syn. i. 296 (1805). *Dondia americana* Britton in Britton & Brown, Ill. Fl. i. 584, merely as to name-bearing synonym (1896).— Salt marshes, maturing from late September to November. Known only from the original Michaux material from the lower St. Lawrence, and from two stations on the coast of Maine,— Norwood Cove, Southwest Harbor, September 18, 1892 (*M. L. Fernald*) and Wells Beach, late September, 1898 (*Kate Furbish*); but in its very procumbent habit, dense subspicate inflorescence, and generally irregular calyx, apparently a very distinct species.

++ ++ Stems erect or ascending: sepals equally carinate.

S. LINEARIS (Ell.) Moq. Erect or ascending, 2 to 9 dm. high, profusely branched; the slender branches ascending or sometimes wide-spread, but not procumbent: leaves narrowly linear, dark green (not glaucous), 4 cm. or less long, those of the slender elongated flowering branches much shorter: sepals equally carinate.— Chenop. Enum. 130 (1840); Wats. Proc. Am. Acad. ix. 87 (1874), at least in part; Wats. & Coult. in Gray, Man. ed. 6, 435 (1890), in part ; Chapm. Fl. ed. 3, 406 (1897). *S. linearis*, var. *ramosa* Wats. l. c. (1874), excluding syn. *Salsola salsa* Michx. & *S. salsa*, var. *americana* Pers. *S. maritima* Torr. (*Sueda*) Fl. N. Y. ii. 141 (1843); Gray, Man. 377 (1848); not Dumort. *Chenopodium maritimum* Pursh, Fl. 198 (1814), not *L. Salsola linearis* Ell. Sk. i. 332 (1817). *Chenopodina linearis* Moq. in DC. Prodr. xiii. pt. 2. 164 (1849). *C. maritima* Gray, Man. ed. 2, 366 (1856); Chapm. Fl. 378 (1860); not Moq. *Dondia Americana* Britton in Britt. & Brown, Ill. Fl. i. 584, t. 1393 (1896), excluding syn. *Salsola salsa*, var. *americana* Pers.— On the seacoast, chiefly in dryish sand or at the borders of marshes, from Maine to Texas; rare east of the Kennebec.

GRAY HERBARIUM.