

LOPHOTOCARPUS ON THE NORTH-EASTERN
RIVER-ESTUARIES.

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(Plate 137.)

IN Gray's Manual, edition 5 (1867), Engelmann described *Sagittaria calycina*, growing from Maine to Delaware, Wisconsin, and southward, and added "var. *spongiosa*, with a loose or spongy texture and linear bladeless leaves submersed, occurs eastward." In 1894 J. G. Smith transferred *S. calycina* to the genus *Lophotocarpus*¹, keeping var. *spongiosa* as a synonym of *L. calycinus* Smith. Later he described Engelmann's variety as a species². The characters relied upon were as follows:

L. calycinus.

Leaves floating or ascending,

[Leaves] 1.5–4 dm. high.

Blades entire, hastate, sagittate, or triangular crescent-shaped, dorsal lobes usually widely divergent, 8–16 cm. long⁴, 5–25 cm. wide, rounded, obtuse or acute at the apex. Basal lobes often much longer than the middle one.

Scape shorter than the petioles, simple, weak, at length decumbent.

Verticils 2–6; fertile pedicels very thick, recurved in fruit, equaling or longer than the slender sterile ones.

Achenes obcuneate, truncate, 2–2.5 mm. long, narrowly winged on the margins, with a short, horizontal, triangular beak.

L. spongiosus.

Submersed aquatic, with thick, spongy, nodose petioles and scapes³.

Petioles 1–2 dm. long.

Blades spatulate and obtuse, or elliptical and truncate, or hastate, or sagittate, with the narrow, acute, falcately divergent lobes 2.5–10 mm. wide, sometimes 8 cm. long.

Scape simple; not more than half as long as the petioles, spongy, weak, at first ascending, at length decumbent, bearing two verticils of one to three flowers each.

Fertile pedicels much thickened, 1–2 or 3 cm. long, 3–5 or 6 mm. in diameter.

Sepals broadly ovate, obtuse, scarious at the tip and margins, 10–12 mm. long.

Fruiting head depressed-globose, 7–10 mm. in diameter.

Achene 2–2.5 mm. long, obcuneate, with a narrow dorsal wing and a very short, ascending or horizontal beak.

¹ Mem. Torr. Bot. Club, v. 25 (1894).

² Rev. of the Spec. of Loph. of the U. S., 4 (1899) and Rep. Mo. Bot. Gard. xi. 148 (1900).

³ Much of the material of *L. calycinus* has thick, spongy petioles, and nearly all of the petioles are nodose.

⁴ Many apparently normal specimens in the Gray Herbarium have the leaves only 4 cm. long.

The chief difference, according to these descriptions, seems to be that the leaves of *L. spongiosus* average a little smaller than those of *L. calycinus*, and examination of specimens bears this out. The achenes of the two are identical in size and shape except for a little individual variation in both species.

In an attempt to determine to what extent the foliage-characters can be relied upon many plants have been studied, and sketches, shown in plate 137, have been made to illustrate the variations observed.

Fig. 1 shows a characteristic leaf of *Lophotocarpus calycinus* from Webb City, Missouri; fig. 2 is a type occasionally found, and is from the same herbarium sheet as fig. 1. The leaves are often much larger, sometimes a decimeter long, or as large as 12 × 25 cm. in var. *maxima* (Engelm.) Robinson. Fig. 3 is of a similar leaf of *L. calycinus* from Delaware City, Delaware. Figs. 4 and 5 show two leaves from co-type material of *L. spongiosus* from the tidal mud-flats of the Delaware River at Wilmington, Delaware. The only difference between this and *L. calycinus* is that the leaves of the former are a little smaller—hardly enough ground for making a species. Figs. 6, 7 and 8 are from three other specimens from the same station, showing how variable a plant may be without having any character sufficiently constant to set off a species. Figs. 9 and 10 show leaves from Milford, and Figs. 11 and 12 from Old Lyme, in Connecticut, and for both stations exhibit the most nearly hastate leaves found on the specimens in the Gray Herbarium. These also begin to show the tendency which I wish to point out, namely that the leaves of *L. spongiosus*, while everywhere variable, tend less and less to be hastate in the northern stations for the plant. This is more pronounced in specimens from the Mystic River, Massachusetts, which was tidal until the dam was built at Medford. On these plants a stump of a basal lobe is rarely present (figs. 13 and 14). At the mouth of the Merrimac River at Newburyport, Massachusetts, the leaves are of the forms shown in figs. 15 and 16, with all vestiges of the basal lobes lost. The blades are reduced, short and strap-like, and the petioles are thick and spongy¹. At Winnegance Creek, Phippsburg, Maine (figs. 17 and 18) the leaves become more compressed-subulate; on the Moulies River in Kent County, New Brunswick (figs. 19 and 20) and at Newcastle, New Brunswick, on the Mirimichi River (figs. 21, 22, and 23) the blades are almost lost and the petioles are tapering, very thick and spongy.

¹ The plant of the Merrimac River mud-flats was described by Smith as *L. spatulatus*, but it may readily be seen how the plant fits into this series of variations of *L. spongiosus*.

A leaf like that shown in fig. 4 is certainly most unlike the one shown in fig. 20, but the transition between the two is perfect. Nearly all the leaf-forms occur at Wilmington, and at each station as the plant goes up our coast, where it seems to be confined to the tidal mud of river-estuaries, the extreme form tends to be less hastate but more subulate.

Lophotocarpus spongiosus, then, grades into *L. calycinus* where the ranges of the two are coincident, but at the parts of its range more remote from *L. calycinus* it shows well-marked extremes. It seems therefore to be better treated as a variety, just as Engelmann first described it, but under *Lophotocarpus* it becomes

L. CALYGINUS (Engelm.) J. G. Smith, var. **spongiosus** (Engelm.) n. comb. *Sagittaria calycina* var. *spongiosa* Engelm., Gray's Manual ed. 5, 493 (1867). *Lophotocarpus calycinus* J. G. Smith, Mem. Torr. Bot. Club, v. 25 (1894). *L. spongiosus* (Engelm.) J. G. Smith, Rev. of the Spec. of Loph. of the U. S., 4. (1899) and Rep. Mo. Bot. Gard., xi. 148 (1900). *L. spatulatus* J. G. Smith, Rev. of the Spec. of Loph. of the U. S., 5 (1899) and Rep. Mo. Bot. Gard., xi. 148 (1900). *Lophiocarpus calycinus* Micheli, DC. Monog. Phan. iii. 61 (1881).

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EXPLANATION OF PLATE 137.

Figures 1-3. *Lophotocarpus calycinus* $\times \frac{1}{3}$.

Figures 4-23. *Lophotocarpus calycinus*, var. *spongiosus* $\times \frac{1}{3}$.

VARIATIONS OF *CAREX ANNECTENS*.

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WHILE collecting in a field in which *Carex vulpinoidea* and *C. annectens* were very abundant, the writer was troubled by a third form that, though less abundant than either of the others, was represented by many fine clumps. An inspection of the manuals gave no help, and the problem was later taken up for study at the Gray Herbarium. It was possible to separate the material into two rather well marked, though somewhat intergrading strains, which accorded well with the observations in the field. On looking through the literature it was soon found that these two forms of *C. annectens* had already been distinguished by Bicknell in 1896. The two plants should be treated as follows: