

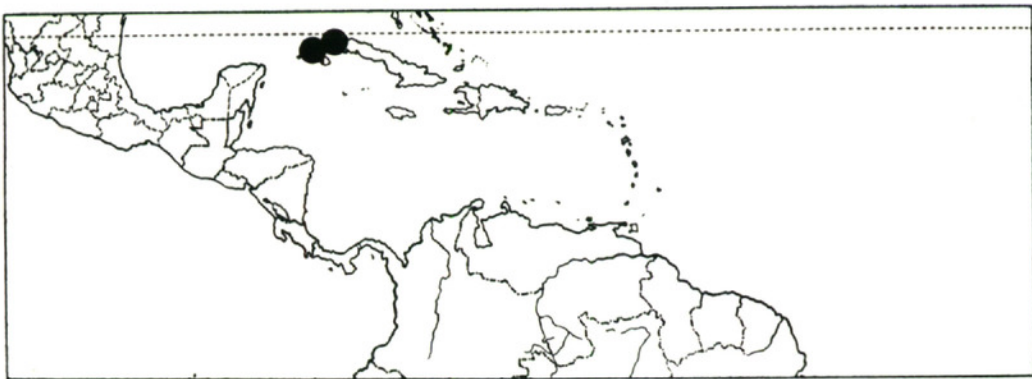
## ECHINODORUS IN THE AMERICAN TROPICS

NORMAN C. FASSETT

(Continued from p. 156)

7a. *E. BRACTEATUS* Micheli var. *BRACTEATUS*. Blades with stellate tuberculate-based hairs toward the base, and with pellucid dots and very short lines (Fig. 60).

**Panama:** around El Paraiso, Canal Zone, alt. 30–100 m., 24 January 1911, *Pittier 2531* (GH, NY, US); Gatun, November 1859, *Hayes 130* (GH); open swamp, between France Field, Canal Zone, and Catival, Prov. Colón, 9 January 1924, *Standley 30444* (US); wet forest, near the big swamp east of the Río Tecumen, Prov. Panamá, 11 December

Map 6. *Echinodorus ovalis*.

1923, *Standley 26724* (US); Mindi, 28 February 1905, *Cowell 177* (NY); Colón, Monkshill, 5 June 1874, *Kuntze* (NY). **Ecuador:** in water of swamp and mud, Prov. Guayas, Oil Camp between Guayaquil and Salinas, alt. 0–100 m., 21–24 June 1923, *Hitchcock 20084* (US, NY; sheet in GH is the variety below); in paludosis, Balao, January 1892, *Eggers 14216* (US); moist sandy creek bed, alt. 40 m., 20 km. southwest of Guayaquil, 29 August 1938, *Worth, Morrison & Horton 8935* (US).

7b. *E. BRACTEATUS* Micheli, var. *efenestratus* Fassett, n. var., foliorum laminis glabris, punctis lineisve pellucidis destitutis.—Leaf blades glabrous and without pellucid markings.—**Ecuador:** coast plain, on marshy ground, near water. Stem  $2\frac{1}{2}$  m. high. Flowers white. *A. Rimbach 90* (TYPE in F); coast plain, in swampy ground or open places. Perennial herb,  $2\frac{1}{2}$  m. high. Leaf blade as much as 40 cm. long and 30 cm. broad. Flowers white. July. *A. Rimbach 287* (US); swamp, in water, and in mud along edge, Prov. Guayas, Oil Camp between Guayaquil and Salinas, 21–24 June 1923, *Hitchcock 20084* (GH).

8. *ECHINODORUS OVALIS* Wright in Sauvalle, Fl. Cub. 564. 1871; Buch. in Engler, Pflanzenr. 4, fam. 15; 31. 1903; Small, N. Am. Fl. 17: pt. 1: 48. 1909.

I have seen but two collections of this little-known Cuban species. The pellucid marking of the blades (Fig. 61) is much like that of *E. cordi-*



*folius* (Fig. 54), but the pellucid lines are more abundant and the venation appears to be a little finer and more complex. The scape, also, is much like that of *E. cordifolius* and looks as if it might become prostrate as in that species. The sepals of *E. ovalis*, however, have smooth ribs quite unlike the muricate ribs of *E. cordifolius*. An immature nutlet is shown in Fig. 40; it looks as if it would be short beaked, with several ribs and facial glands.

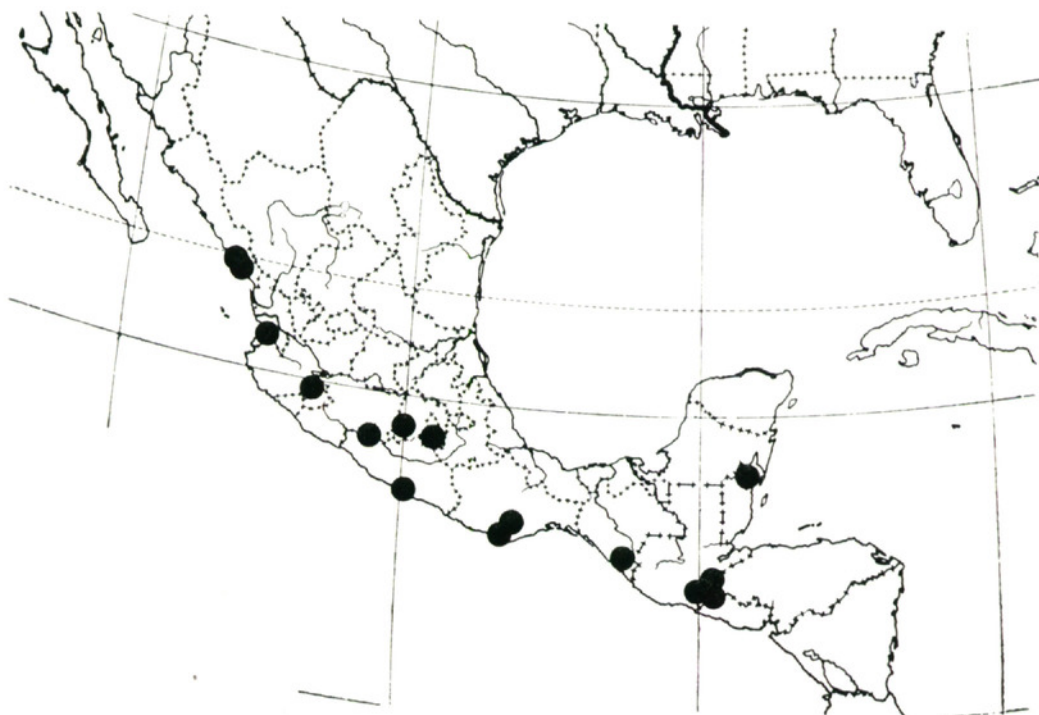
Western Cuba (Map 6). **Cuba:** *Wright*, without data (US); *Wright 3713*, without other data (GH); pond west of Batabanó, Habana, 8 November 1928, *León 13707* (GH). *E. ovalis* is listed by Buchenau from Pinar del Rio and Hato Salado, and these localities have also been plotted on Map 6.

9. *ECHINODORUS ANDRIEUXI* (Hook. & Arn.) Small, N. Am. Fl. 17, pt. 1: 46. 1909. *Alisma Andrieuxi* Hook. & Arn., Bot. Beech. Voy. 311. 1839. *Echinodorus ellipticus*  $\gamma$ , *ovata* Micheli in DC., Monogr. Phan. 3: 52. 1881, not *E. ellipticus* var. *ovatus* Hauman, Anal. Mus. Nac. Buenos Aires 27: 309. 1925. *E. ellipticus* f. *ovata* F. J. Meyer, Bot. Centralbl. Beihefte 49 (1): 331. 1932.

Leaves erect, long-petioled; blades narrowly elliptic (Fig. 14), to ovate (Fig. 15), mostly tapered to truncate at base, usually 15–20 cm. long but sometimes reaching 30 cm. or more, usually with very obscure pellucid lines; petiole 2-winged; inflorescence simple and wand-like or rarely with short weak branches at base, with many rather compact verticels; bracts slightly connate at base, long-acuminate at tip; pedicels from nearly lacking to 2 cm. in length; nutlets with body about  $\frac{1}{2}$  as wide as long, 4–7-ribbed, with usually one facial gland (Figs. 41–43); beak about  $\frac{1}{2}$  as long as the body.

Western Mexico to El Salvador (Map 7), and Nicaragua according to Micheli. **Sinaloa:** Bellavista, Mazatlán, March 1931, *Gonzales 6846* (F, US); Río Piaxtla, San Ignacio, alt. 20 m., 13 March 1918, *Narvaez 199* (US); Mazatlán, 6 April 1910, *Rose 14100* (NY, US); moist field, Villa Union, 2 April 1910, *Rose 13963* (US); Balboa, January 1923, *Ortega 4994* (US). **Nayarit:** Tepic, *Beechey*—TYPE (drawing in NY; fragment in MO); Tepic, 5 January–6 February 1892, *Palmer 1844* (F, GH, NY, US); Tepic, 12 February 1927, *Jones* (MO). **Jalisco:** in rain pools, forms dense clumps, 1 m., fl. white, alt. 20 m., Tuxpan, Palapar Redondo, 6 November 1926, *Mexia 1065* (F, GH, MO, NY, US). **Michoacán:** Tacupa, Huetamo, 22 March 1934, *Hinton 5817* (GH, NY). **Morelos:** swamps near Cuernavaca, 5000 ft., 29 September 1899, *Pringle 8256* (F, GH, MO, PH, NY, US); Tetecala, 7 October 1890, *Maury 4922* (NY). **Guerrero:** swamp, Acapulco, February 1895, *Palmer 530* (US). **Oaxaca:** Temascaltepec, 21 November 1932, *Hinton 2667* (GH, US); Juquila, 24 December 1921, *Conzatti 4512* (US); Tehuantepec, *Andrieux 91* (drawing in NY; fragment in MO). **Chiapas:** in marshy lakeside, 2 m. high, Aca-coyagna, 28 September 1947, *Matuda 17014* (F). **Guatemala:** Dept. Chiquimula, valley of Río Chiquimula,  $1\frac{1}{2}$  mi. northeast of Chiquimula, alt. 400 m., 21 October 1939, *Steyermark 30150* (F); Dept. Jutiapa, in





Map 7. *Echinodorus Andrieuxi*.

marsh on plain, between Jutiapa and La Calera, southeast of Jutiapa, alt. about 850 m., 2 November 1940, *Standley 76103* (F); Dept. Jutiapa, open marsh, between Jutiapa and La Burrere, northeast of Jutiapa, alt. 800–850 m., 1 November 1940, *Standley 75999* (F). **British Honduras:** Corozal district, *Gentle 373* (US). **El Salvador:** Dept. Santa Ana, shallow open pool, south of Texistepeque, 14 km. north of Santa Ana, alt. 1266 ft., 13 October 1950, *Fassett 28281* (F).

In the herbarium of the New York Botanical Garden are two beautifully detailed pencil drawings of specimens in the Kew Herbarium. One is *Andrieux 91*, "circa Tehuantepec, in ditone Oaxacana, Septembr." The other is the *Beechey* collection from Mexico. Both are marked as TYPE. "When no habitat is mentioned, the specimens are understood to have been collected at Tepic" (Hook. & Arn., p. 275), so the Beechey collection presumably came from there. Following the description of *Alisma Andrieuxi* is a citation of *Andrieux 91*, which would at first sight appear to be the type. But the next paragraph, stating that "the same species was found by M. Andrieux about Tehuantepec of Oaxaca," distinctly implies that the species is primarily based on the Beechey collection from Tepic, and that M. Andrieux also collected the same species. The Beechey collection should therefore be taken as type.



Micheli places *E. Andrieuxi* under *E. ellipticus* as  $\gamma$ , *ovata*, citing collections from Mexico, Nicaragua and Brazil, but I have seen nothing from South America that appears conspecific with the Mexican plants. Macbride, Field Mus. Pub. Bot. Ser. **11**: 4. 1931, states that *E. palaefolius* (Nees. & Mart.) Macbr. (= *E. ellipticus* (Mart.) Micheli) occurs in Mexico, probably basing this statement on that of Micheli. Actually, *E. ellipticus* and *E. palaefolius* are both described as having leaves with deeply cordate blades and angled petioles, while *E. ellipticus*  $\gamma$ , *ovata* (= *E. Andrieuxi*) is distinguished by having blades decurrent on the petiole. Its relationships are, then, rather with the *E. paniculatus*—*E. subalatus* complex.

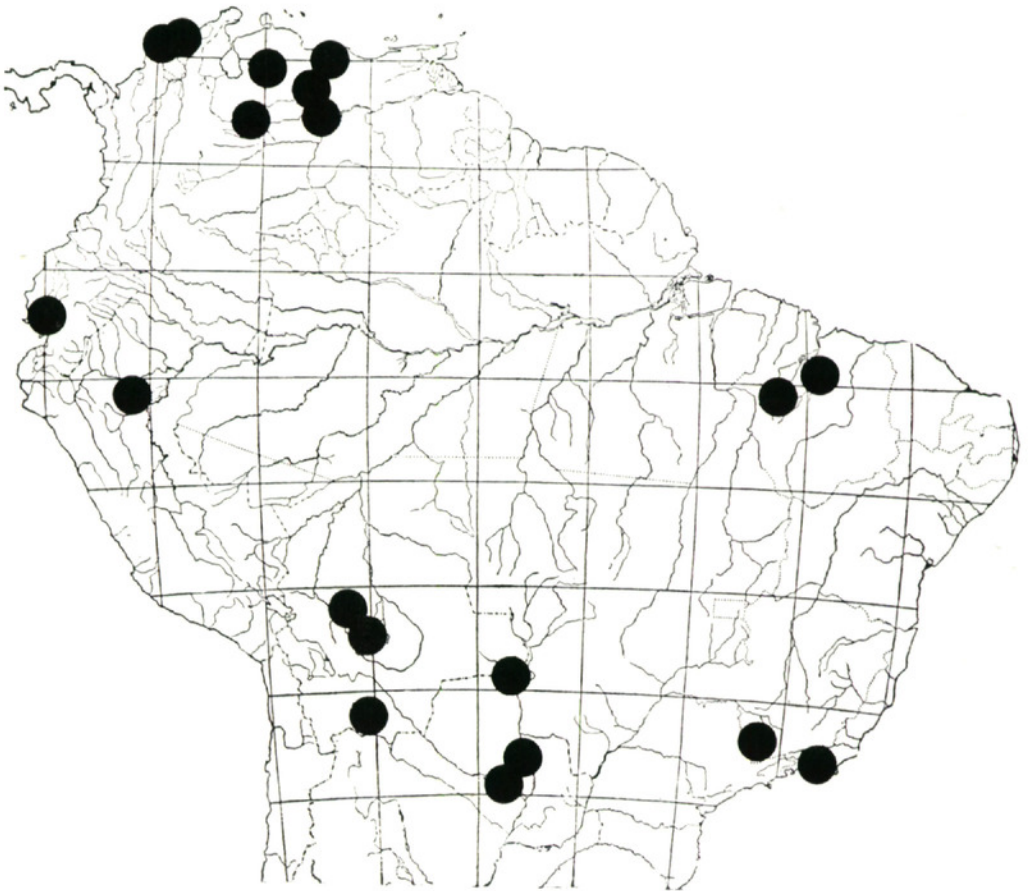
Micheli described the leaves of *E. ellipticus*, including *E. Andrieuxi*, as having "lineis pellucidis longis, raris, saepe fere inconspicuis." He was quite correct, but I find myself wondering just how he managed to see the lines. My own apparatus is without doubt better than any he had: my work-table has a 2½ inch square hole cut in the top, with a 60-watt bulb in the drawer below, shining up through the herbarium sheet into a modern binocular microscope. Only by waiting until after dark and turning off all overhead lights was I able to see dimly the pellucid lines in *E. Andrieuxi*. Micheli was right—they are there in most individuals. He must have been a very painstaking and thorough observer. Recently I have had opportunity to examine living plants in El Salvador; the pellucid lines are nearly invisible.

10. *ECHINODORUS PANICULATUS* Micheli in DC., Monogr. Phan. **3**: 51. 1881.

Blades varying from elliptic (Fig. 18) or ovate (Fig. 17) to linear-lanceolate (Figs. 19, 20), broadly cuneate or truncate to narrowly cuneate at base, acute at tip, sometimes reaching 30 cm. in length; petiole with a distinct wing on each side; inflorescence sometimes simple, but often with branches 20 cm. long; flowers long-pedicelled; nutlets (Figs. 44–49) very flat, mostly more than half as wide as long, with several narrow wing-like ribs, broadly keeled dorsally and ventrally, without facial glands, the beak short and stout or sometimes nearly absent.

10a. *E. PANICULATUS* Micheli var. *PANICULATUS*. Leaves ovate to linear-lanceolate, with pellucid lines very obscure or absent, and without pubescence. Colombia and Venezuela to Peru, Paraguay and southern Brazil (Map 8). **Colombia**: Santa Marta, 1899–1901, *Smith 2326* (F, GH, MO, NY, PH, US); Baranquilla, along shores of the Magdalena River, June, 1927, *Elias 202* (US); La Rubiera near Calabozo, Guárico, *Grisol 1*—



Map 8. *Echinodorus paniculatus*.

mixed with *E. muricatus* (NY, US). **Venezuela:** Sanare, 1358 m., Lara, May 1930, *Saer* 489 (F); Hato de Matapalo, in swamp, Llanos del Alto-Apure, alt. 150 m., 7 May 1911, *Jahn* 206a (US); Dist. Fed., Laguna Conejo Blanco, El Valle, 900 m., 17 August 1941, *Fernandez* 71 (US). **Ecuador:** dried up pond, Province Guayas, Milagro, alt. 50 m., 30 June—2 July 1923, *Hitchcock* 20278 (GH, NY, US). **Peru:** Alto Río Huallaga, alt. 360–900 m., Dept. San Martin, *Williams* 5815 (F, US). **Bolivia:** Santa Cruz, Chiquitos, *Cárdenas* 4466 (US); pampas near Lake Rogagua, alt. 1000 ft., 4 November 1921, *Rusby* 1649 (NY); Potero Largo in from Velasco, 200 m., July 1892, *Kuntze* (NY). **Brazil:** Prov. Piaui, *Gardner* 2741 (COTYPE—US); Province de Rio-Janeiro, *Glaziov* 13221 (F; photo ex Museo Botanico Berolinense, F, GH, US); in open field, low land, flooded in rainy season, region of River Mearin, State of Maranhao, 9 March 1933, *Krukoff* 2030 (GH, NY, US); Minas Geraes, 16 December 1864, *Regnell* 418 (US); Matto Grosso, 1891, 92, *Moore* 969 (NY). **Paraguay:** Pilcomayo River, *Morong* 1039 (NY, PH).

The nutlets are unmistakable (Figs. 44–49) and one can be reasonably sure of the conspecificity of fruiting individuals, despite variation in leaf-width and type of inflorescence. Micheli



described the nutlets as being multiglandular, but he had only young fruits which sometimes have a gummy appearance that falsely promises later development of glands.

I have placed in this group collections of heterogeneous aspect, and cannot be certain that a single entity is represented. There is variation in stamen number, from 9 to 20 or more. Two sheets show leaves slightly pseudopenninerved, while the rest are nerved from the base of the blade. Some plants have obscure pellucid lines in the leaves, and others no lines at all.

Of course, with such uncertainty concerning the taxonomic status of the sheets cited above, application of the name cannot be at all certain. I find great difficulty in placing some names used by Martius in *R. & S. Syst. Veg.*, and Martius himself expresses some doubts as to such names as *Alisma ellipticum*, *A. intermedium* and *A. subalatum*. Similar difficulties appear with Micheli's treatment of *Echinodorus Martii*, *E. intermedius*, *E. paniculatus*, *E. ellipticus* and *E. subalatus*.

10b. *E. PANICULATUS* Micheli, var. **dubius** Fassett, n. var., foliis laminis ovatis, ad basim obtusis vel truncatis, coriaceis, punctis pellucidis instructis; petiolis ad apicem et laminis ad basim cum pilis stellatis instructis; scapis paniculatis; fructus ignotus.—**Colombia**: Guanabanal, Dept. El Valle, 2 June 1922, Killip 6218 (TYPE in US; GH, NY, PH).

This individual, of uncertain status, is appended to *E. paniculatus* because its winged petiole and scarcely cordate blades will key it to that species. It could as well be placed with *E. grandiflorus* on account of its leathery blade with pin-point pellucid dots and stellate hairs. There are no fruits in the ample paniculate inflorescence. If future collectors do not show it to be a population in southern Colombia, with fruiting individuals to indicate its true relationships, it may then be considered as a hybrid of the two species whose characters it shares.

11. *ECHINODORUS trialatus*. Fassett, n. sp., foliorum petiolis alatis, laminis acuminatis subaequantibus, venis laminarum pseudopinnatis; scapi internodis late 3-alatis; pedicellis 3–6 mm. longis; fructibus subrostratis, costis filiformibus alatis ad apicem.—Leaves with blades about as long as the winged petioles and tapering into them (Fig. 21), long-tapered at tip, with the upper pair of veins paralleling the midrib and leaving it at some distance from the base; pellucid markings lacking (Fig. 62); inflorescence simple, its rachis with 3 green wings about 2 mm. wide; flowers subsessile or on pedicels up to 6 mm. long; fruit short-



Map 9. *Echinodorus trialatus*.

beaked (Fig. 50), with about 5 ribs winged toward the summit, and without facial glands.

Lowlands of Colombia (Map 9). **Colombia:** Río Casanare, Barranco de Atahuarpa, alt. 120 m., 30 October 1938, *Cuatrecasas* 4283 (TYPE—US); Sabanas de Santa Isabel, Meta, January 1937, *Gamía* 5117 (US); hierba sumergida, Comisaría del Vaupés, San José del Guaviare, en matas de monte, 240 m. alt., 4 November 1939, *Cuatrecasas* 7391 (US); desiccated pool, alt. 200–250 m., Chinu, Dept. Bolívar, *Pennell* 4096 (NY).

Map 10. *Echinodorus Grisebachii*.

12. *E. GRISEBACHII* Small, N. Am. Fl. **17**, pt. 1: 46. 1909. *E. intermedius* "var.," Griseb. Cat. Pl. Cub. 218. 1866. *E. intermedius* Micheli in DC., Monogr. Phan. **3**: 54. 1881, in part; not *Alisma intermedium* Mart.

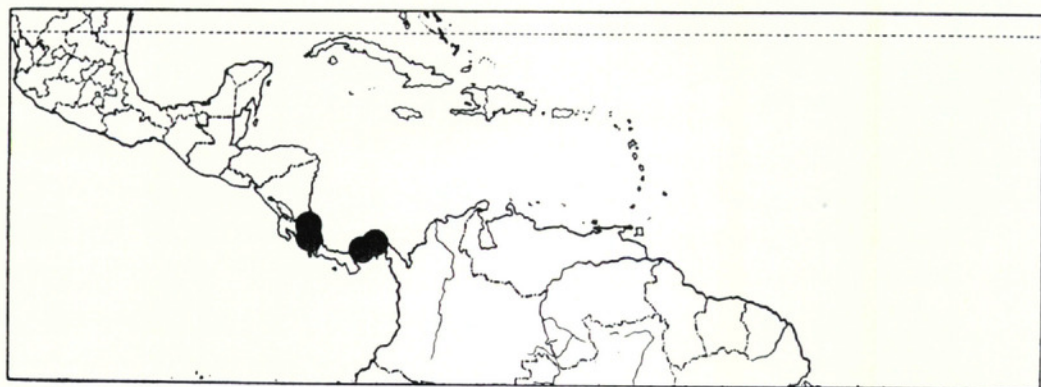
Leaves rather small, the winged petioles only slightly exceeding the blades which are 7–10 cm. long, ovate-oblong, with the upper pair of veins paralleling the midrib for some distance (Fig. 16), abundantly furnished with pellucid dots and lines of varying lengths (Fig. 63); scape simple or slightly branched, with close verticels of nearly sessile flowers; nutlet short-beaked (Fig. 51), more broadly winged on the dorsal edge than the ventral, with few ribs of which the outermost is wing-like, and with several glands.



Cuba and Costa Rica (Map 10). **Cuba:** Prov. Pinar del Rio, vicinity of Coloma, 8 March 1911, *Britton & Cowan 9849* (us); *Wright 3198*, without further data (TYPE number—us). **Costa Rica:** Colorado de Coto, 20 February 1936, *Valerio 1389* (f).

The name *E. intermedius* was applied to this plant by Micheli, who thought the same species grew in Brazil. Grisebach, transferring *Alisma intermedium* Mart. to *Echinodorus*, added "var.: lineolae folii pellucidae conformes; Wr. 3198"; this forms the basis for *E. Grisebachii* Small.

13. *ECHINODORUS TUNICATUS* Small, N. Am. Fl. **17**, pt. 1: 48. 1909. *E. longipetalus* sensu Woodson & Schery, Ann. Mo. Bot. Gard. **30**: 101. 1943, not Micheli.



Map 11. *Echinodorus tunicatus*.

Leaves with blades 15–30 cm. long, 10–20 cm. wide, deeply cordate at base, glabrous or sparsely muricate to somewhat pubescent with spreading flattened hairs toward the junction with the terete or costate petiole, the pellucid lines forming a network that is unrelated to the pattern of veins (Fig. 64); sepals pale yellow, firm, thick and brittle, about 30-ribbed or sometimes nearly smooth, enlarging and closely cupped about the fruiting head and about each other, the whole forming a flattened-globose head 1–1.5 cm. in diameter, the calyx much depressed at base about the pedicel; petals 5–6 mm. long (fide Woodson & Schery); stamens about 30; achenes wedge-shaped, 3 mm. long, 1 mm. wide at summit and 0.3–0.4 mm. wide at base, the corky summit narrowed to an erect or ascending beak that is nearly 1 mm. long (Fig. 52); facial ribs 3–4; glands several.

Panama and Costa Rica (Map 11). **Costa Rica:** Limón Province, palm swamp between Río Reventazón and Río Parismina on Castilla Farm, 10 m., 2 April 1930, *Dodge & Neverman 7185* (mo); from near sea-level creeks, Reventazón, *Lankester 947* (us). **Panama:** in low hollow, Marraganti and vicinity, alt. 10–100 ft., 3–9 April 1908, *Williams 991* (TYPE in NY); Agricultural Experiment Station at Matías Hernandez, Prov. Panamá, 25 December 1914, *Pittier 6894* (GH, NY, us); Old Experiment Station, 3 miles east of Panama City, 13 June 1923, *Maxon 7095* (GH, us); in mud, acaulescent, common, near the big swamp east of the Río Yecumen, Prov. Panamá, 11 December 1923, *Standley 26525* (us);



between Las Sabanas and Matías Hernández, Prov. Panamá, 21 January 1924, *Standley 31898* (US); Juan Díaz, Prov. Panamá, 11 January 1924, *Standley 30506* (US).

Woodson & Schery, l.c., include this under the Brazilian *E. longipetalus* Micheli. But *E. longipetalus*, while sharing the accrescent sepals and pellucid network of *E. tunicatus*, is a very different species with narrow elliptic-oblongate leaves, sepals not cupped together, and petals 3–3.5 cm. long.

A third species with accrescent sepals, also from Brazil, is *E. brevipedicellatus* (Kuntze) Buch. It has the general aspect of *E. longipetalus* but its much narrower leaves are obviously different. Buchenau separated these two species on fruiting characters; I have not seen mature fruit. *E. brevipedicellatus* is keyed by Buchenau under "lineae et puncta pellucida desunt"; actually it has a pellucid network like that of *E. tunicatus* and *E. longipetalus*, obscured by the thickness of the leaf, but becoming visible in a piece of leaf that has been boiled in alcohol.<sup>4</sup>

From Peru, *Schunke 279* (US), determined as *E. intermedius* by Standley, has a well-marked pellucid network, but the sepals are thin, about 16-nerved, and not accrescent; it is without doubt an undescribed species.

14. *ECHINODORUS NYMPHAEIFOLIUS* (Griseb.) Buch. Bot. Jahrb. **2**: 483. 1882. *Alisma nymphaeifolium* Griseb. Cat. Pl. Cub. 218. 1866; Micheli in DC. Monogr. Phan. **3**: 36. 1881. *Helianthium nymphaeifolium* Small, N. Am. Fl. **17**, pt. 1: 45. 1909.

Submersed leaves ribbon-like, thin and flaccid, 15–20 cm. long, about 1 cm. wide; emersed leaves long-petioled, the blades oval and deeply cordate, 3–12 cm. long and 1.5–9 cm. wide; pellucid markings scattered lines 0.2–0.8 mm. long (Fig. 65); inflorescence 2–4 times compound, forming an erect ovate or conic panicle; nutlets 1.4 mm. long, 1 mm. wide, with a beak 0.2 mm. long, flat-sided, with a broad crested keel, and with crested ribs and 1 or 2 long glands on each face (Fig. 53).

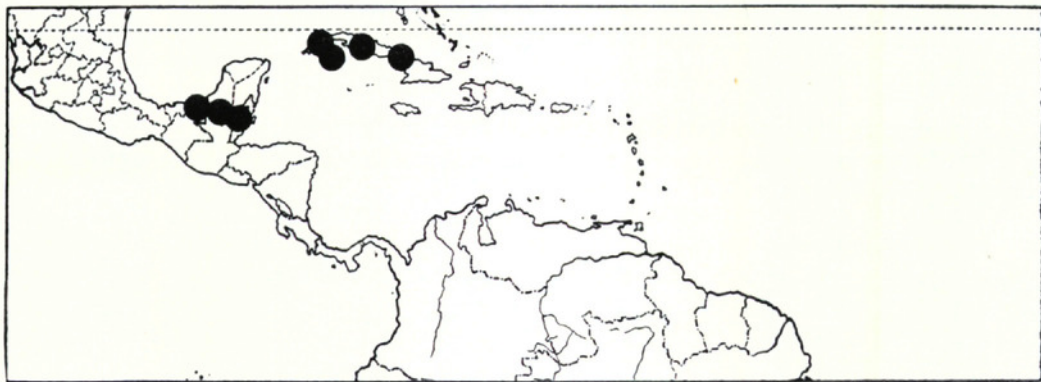
Cuba and Yucatan (Map 12). **Cuba**: without locality, *Wright 3196* (GH, US, MO); Los Palacios, Province of Pinar del Rio, 3, 4 January 1912, *Shafer 11664* (US); El Sábalo, Finca Salanalar, near sea level, 22 December 1937, *Killip 32286* (US); La Gloria, Camaguey, 3 February 1909, *Shafer 260* (F); Columbia, Isle of Pines, 19, 21 March 1916, *Britton, Britton & Wilson 15703* (US, F). **Mexico**: Ciudad del Carmen, Campeche, 15 April 1933, *Mell 2090* (US); Tuxpeña, Campeche, 30 January 1932, *Lundell 1270* (MO, US, GH, NY, F). **British Honduras**: Maskall Pine Ridge, January 1934, *Gentle 1109* (F, GH, MO, NY).

<sup>4</sup> I am indebted to my colleague, Prof. R. I. Evans, for help in this and other like problems.



15. *ECHINODORUS TENELLUS* (Mart.) Buch. Abh. Nat. Ver. Bremen **2**: 21. 1868; Micheli in DC. Monogr. Phan. **3**: 47. 1881; Buch. in Pflanz-enreich **4**, pt. 15: 1903. *Alisma tenellum* Mart. in Roem. & Schultes, L., Syst. **7**, pt. 2: 1600. 1830; Kunth, Enum. **3**: 149. 1841.

Robinson, Rhodora **5**: 85–89. 1903, points out a seeming inaccuracy in the illustration of this species in the Flora Brasiliensis: the carpels are shown in a single ring rather than in a head as they should be in the genus *Echinodorus*. However, some plants do give a definite impression of a ring of carpels, until closer examination shows them to be borne in a head, but being few in number they have been squeezed into a ring-like arrangement.



Map 12. *Echinodorus nymphaeifolius*.

#### VARIETIES OF *E. TENELLUS*

- a. Nutlet 0.9–1.1 mm. long; stylar beak absent or nearly so (Figs. 66–68); anther 0.2–0.6 mm. long; umbel usually single and terminating the scape.
- b. Blade of leaves tapered at each end so that the sides are slightly concave toward the tip (Fig. 75); anther 0.2–0.6 mm. long.
- c. Facial ribs well-developed (Fig. 66) . . . . 15a. *E. tenellus* var. *tenellus*.
- c. Facial ribs nearly or quite suppressed (Fig. 68).
  - 15b. *E. tenellus* var. *ecostatus*.
- b. Blade of leaves narrowed from the middle to an acute or obtuse base and tip (Figs. 73, 74); anther 0.2 (–0.3) mm. long.
  - 15c. *E. tenellus* var. *parvulus*.
- a. Nutlet 1.4–1.8 mm. long; stylar beak 0.2–0.5 mm. long (Fig. 76); anther 0.5–1.0 mm. long; umbels often 2, the terminal 3–6 cm. above the lower.
  - 15d. *E. tenellus* var. *latifolius*.

Two phases of *E. tenellus* appear in southern Brazil, the type region for this species. The smaller plant has a nearly beakless nutlet about 1 mm. long (Fig. 66) and leaves 1–3 mm. wide and long-tapered to both ends (Fig. 75); it is illustrated in Fl. Bras. **3**, pt. 1: pl. 13, fig. 2, plant to the right. The larger plant has a nutlet about 1.5 mm. long and a well-developed beak (Fig. 70), and leaves often with an elliptic blade (Fig. 76); this is illustrated in Fl. Bras., l.c., plant to the left.



In the original description of *Alisma tenellum* but one collection is cited, so this can be considered as TYPE: *In palmetis udis depressis Provinciae Minas geraës Brasiliae: Martius*. The description says "capsulis obsolete mucronulatis" and "Folia . . . utrinque angustata . . .  $\frac{1}{2}$ –1 pol.,  $\frac{3}{4}$ –1 $\frac{1}{4}$  lin. lata," so it is presumably the phase with beakless nutlets and narrow leaves, to be taken up in this treatment as var. *tenellus*.

In the Flora Brasiliensis some 5 collections are cited and the description is expanded to include forma *latifolia* with leaves up to 4 lines long. This is presumably what is illustrated by the drawing to the left on plate 13 referred to above. The only nutlet shown in detail is definitely beaked, in contradistinction to the original description, and is also presumably forma *latifolia*. Differing in leaves, fruit, anthers and inflorescence, forma *latifolia* will be taken up as a variety in the present treatment.

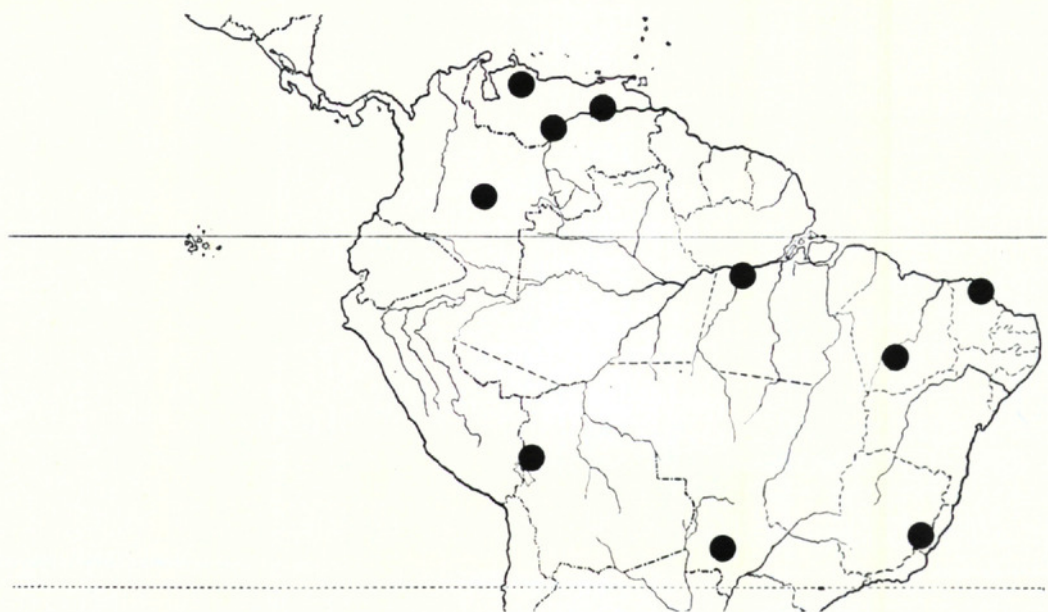
15a. E. TENELLUS var. TENELLUS. *Alisma tenellum* Mart. l.c.; Seubert in Mart. Fl. Bras. **3**, pt. 1: 105, t. 13, fig. 2, plant to right. 1848. *A. ranunculoides* L. var. *brasiliense* A. de St. Hilaire, Voy. Distr. Diam. **2**: 432. 1833.

South America, mostly in the Amazon basin, but occurring from Venezuela to southern Brazil (Map 13a). **Venezuela**: Laguna de la Culebra, near S. Carlos, Cojedes, in half-dried places, 6 April 1925, *Pittier 11707* (NY); Anzoátegui, Estanque de El Baño de El Tigrito, 26 January 1944, *Pittier 15168* (US); Apure, Cunavicha, 13 February 1941, *Chardon 252* (US). **Colombia**: low muddy bank of the Rio Muco, 150 m. alt., ca. 80 km. northwest of San José de Ocuté, Comisaria del Vichada, 13 January 1944, *Herman 10934* (GH, US); La Serranía entre los ríos Ariari y Meta, Llano Grande, 320 m. alt., 26 November 1939, *Cuatrecasas 7878* (US). **Brazil**: Santarem, Prov. Pará, July 1850, *Spruce* (GH, MO, NY); Minas Geraes, ex herb. Mart., probably fragments of TYPE (MO); Piauí, *Gardner 2740*, cited in Fl. Bras. (US); Lagoa Salgadinho, Sud-Piauí, 1913, *Luetzelburg 378* (NY); Ceará, low sandy flats about Açude João Lopez, Fortaleza, 10 September 1935, *Drouet 2453* (GH); Lagoinha, Campo Grande, Matto Grosso, 4 September (or 9 April?) 1936, *Archer & Gehrt 36327* (US); Habira do Campo, Prov. de Minas, 1887, *Glaziou 17299* (US). **Peru**: Prope Tarapoto, 1855–56, *Spruce 4491* (GH, NY). **Bolivia**: Reis, alt. 1500 ft., February 1886, *Rusby 555* (GH, MO, NY, US).

15b. E. TENELLUS var. *ecostatus*. Fassett, n. var., achaeneis 1.0–1.1 mm. longis, obsolete mucronatis, cum costulis obscuris aut nullus (Fig. 68).

This appears to be an extreme derived from var. *tenellus*, occurring at and beyond its northern limits. Var. *ecostatus* grades into var. *tenellus*, and on some individuals the nutlets are variable as to development of ribs.



Map 13a. *Echinodorus tenellus* var. *tenellus*.

Panama to Venezuela (Map 13b). **Panama:** on clay in dried up bed of pond, Peronome and vicinity, 23 February—22 March 1908, *Williams* 246 (US; NY). **Venezuela:** in drying lagoon near Ospino, Portuguesa, 26 December 1925, *Pittier* 12018 (US—TYPE; NY); Culebra Lagoon near S. Carlos, Cojedes, in half dried places, 6 April 1925, *Pittier* 11707 (US).

15c. *E. TENELLUS* var. **parvulus** (Engelm.) n. comb. *E. parvulus* Engelm. in Gray, Man. ed. 2; 438. 1856; Rand, *Rhodora* 5: 83–85. 1903; Robinson, *Rhodora* 5: 85–89. 1903. *E. subulatus* Engelm. in Gray,

Map 13b. *Echinodorus tenellus* var. *ecostatus*.

Man. ed. 1; 460. 1848, not *Alisma subulatum* L., *Helianthium tenellum* Britton, Man. ed. 2; 54. 1904. *H. parvulum* Small, N. Am. Fl. 17, pt. 1: 45. 1909.

Rare and local, from southern Mexico to Texas, Florida and Cuba, northward to Missouri and on the Coastal Plain to Massachusetts (Map 13c). **Massachusetts:** Winter Pond, Winchester, 7 August 1876, *Morong* (F), 8 August 1876, *Morong* (MO), 17 August 1876, *Morong* (NY,

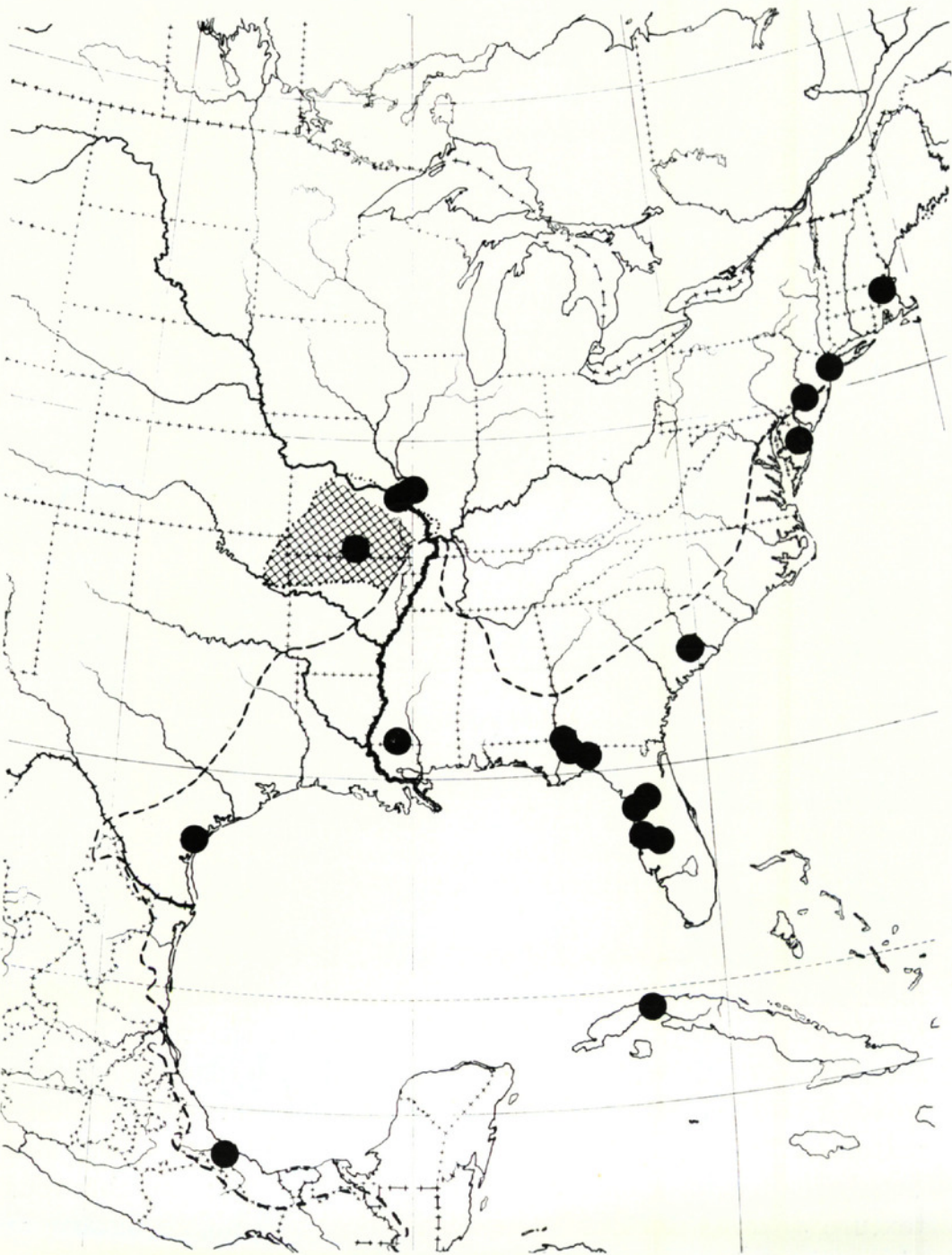


us); 28 August 1878, *Faxon* (GH, MO, NY, US); September 1878, *Morong* (F), 27 September 1916, *Ware 6524* (US), 10 September 1902, *Churchill* (MO); Mt. Auburn, Cambridge, August 1868, *James* (GH), August 1869, *James* (MO, NY, US); September 1869, *James* (MO). **New York:** Maple Grove, Long Island, 4 July 1904, *Bicknell* (NY); Queens, Long Island, 16 September 1921, *Ferguson 934* (NY); Queens, Long Island, 25 October 1928, *Ferguson 7378* (NY, US). **New Jersey:** Nullys Pond, Delanco, 19 September 1918, *Pennell 9917* (NY); Delanco, Burlington Co., 17 August 1907, *Van Pelt* (GH), 11 August 1908, *Van Pelt* (NY). **Delaware:** Canterbury, August 1874, *Canby* (GH, US, F). **South Carolina:** Santee Canal, July, *Ravanel* (GH). **Georgia:** Open Pond, Decatur Pond, 12 August 1901, *Harper 1202* (GH, MO, NY, US). **Florida:** Quincy, *Chapman* (NY); Tallahassee, 31 May 1925, *Harper* (NY, US); Dunnellon, Marion Co., 11 June 1900, *Curtiss 6658* (GH, MO, NY, US); Tampa, April, *Curtiss 2739* (GH, MO, NY, US); Fort Meade, 20 March 1880, *Smith* (US). **Illinois:** East St. Louis, 4 August 1892, *Eggert* (NY); St. Clair Co., 11 August 1892, *Eggert* (MO). **Missouri:** margin of ponds on the hills north of St. Louis, August 1845, *Engelmann* (MO); margins of ponds back of St. Louis, August 1845, *Engelmann* (F); St. Louis, August 1845, *Engelmann* (NY); margins of ponds in the hills west of town, St. Louis, September 1845, *Engelmann* (MO); in ponds northwest of St. Louis, August 1848, *Engelmann* (MO); St. Louis, August 1848, *Engelmann* (NY); common along open sedgy shoreline, Adobesee Pond (sink-hole pond now ruined by artificial disturbance), 9 mi. southeast of West Plains, Howell Co., 4 September 1949, *Steyermark 69124a* (F). **Mississippi:** borders of ponds near Osyka, July 1899, *Cocks* (Tulane). **Texas:** Horseshoe Lake, Jackson Co., 9 August 1920, *Drushel 4143* (MO, US). **Cuba:** Rancho Boyeros, Provincia de Habana, 22 July 1904, *Baker & Wilson 375* (NY); Mazorra, 23 November 1904, *Baker & Abarca 4210* (GH). **Mexico:** Vera Cruz, 1855, *Müller 2142* (NY).

Most of the range of this variety is on the Atlantic Coastal Plain and on low ground, geologically youthful, around the Gulf of Mexico (outlined with a broken line on Map 13c). From the Coastal Plain it extends its range northeastward to Winter Pond, Winchester, Massachusetts, whose assemblage of rare or isolated southern plants has long been a subject of comment.<sup>5</sup> In the Mississippi Valley, also, its range extends north of the Coastal Plain to the region of St. Louis. The recent collection by Dr. Steyermark from southern Missouri in the heart of the Ozark Plateau (cross-hatched on Map 13c) may be the clue to the ancestral area from which the North American phase of *Echinodorus tenellus* invaded the Coastal Plain.

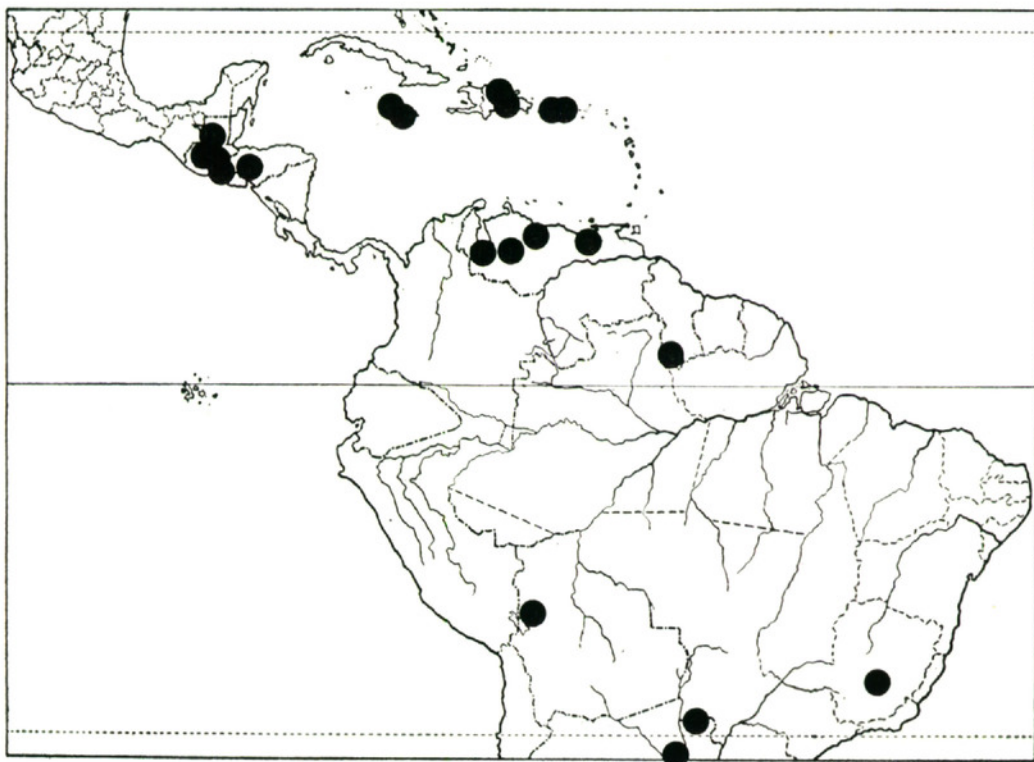
<sup>5</sup> Rand, *Rhodora* 5: 83. 1903; Sears, *Rhodora* 10: 42. 1908; Fernald, *Rhodora* 10: 143. 1908; *Rhodora* 13: 151. 1911.





Map 13c. *Echinodorus tenellus* var. *parvulus*.





Map 13d. *Echinodorus tenellus* var. *latifolius*.

*E. TENELLUS* var. *PARVULUS* f. **Randii** Fassett, n.f., plantae submersae, steriles aut fertiles; foliis linearibus, non petiolatis, membranaceis, 1–3 mm. latis.—**Massachusetts**: Winter Pond, Winchester, Oct. 10, 1901, *E. L. Rand* (TYPE in Gray Herbarium).

While it has been collected only at Winter Pond, the submerged form must surely be expected wherever the species grows. *E. tenellus* commonly grows on wet shores or at the water's edge; the leaves are more or less clearly petioled with blades narrowed to each end, of firm texture, feather-veined, narrowly callous-margined and callous-tipped. The submersed forms (see also var. *latifolius*) have leaves becoming linear, of thin membranous texture with lacunate tissue especially near the midrib, and more obscurely veined.

(To be concluded)

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