

MONOGRAPHIC STUDIES IN THE GENUS *ELEOCHARIS*

H. K. SVENSON

(continued from page 191)

26. *E. Lindheimeri* (C. B. Clarke), n. comb. FIG. 31. Culms matted, 3–8 cm. high, light green, soft and spongy, striate: root-stocks slender and extensively creeping, white or light brown; roots fibrous, white: sheaths membranous, closely investing the culm, fugacious: spikelets ovate, acute, 3–4 mm. long, 6–12-flowered: scales ovate-lanceolate, the lower blunt, green, striate, the upper often strongly keeled at the tip: style 3-fid: stamens 3; anthers 0.3–0.4 mm. long: achenes narrowly obovate, yellowish, about 0.7 mm. long (excluding the narrow conical beak), with elevated longitudinal ridges and about 30–40 close trabeculae in a longitudinal series: bristles usually 4, very slender, white, retrorsely toothed, exceeding the achene.—*E. acicularis* var. *Lindheimeri* C. B. Clarke ex Britton, Journ. N. Y. Micr. Soc. v. 105 (1889) in syn.; *E. acicularis* var. *nana* Torr. acc. to Britton, Journ. N. Y. Micr. Soc. v. 105 (1889) in syn.; *E. acicularis* var. *radicans*¹ Britton, Journ. N. Y. Micr. Soc. 105 (1889); perhaps *S. radicans* Poir.—Michigan, Oklahoma and eastern Texas, west to northern Mexico and southern California. MICHIGAN: Olivet, H. L. Clark in 1905 (as *S. nanus*). OKLAHOMA: moist creek banks, Weathersford, Custer Co., G. W. Stevens 910. TEXAS: C. Wright; *Lindheimer* 315 (without locality) TYPE COLL.; in a small stream, Hantsville, Walker Co., R. A. Dixon 364. CALIFORNIA: Cocomungo, J. M. Bigelow in 1854 (as *E. pygmaea* Torr.); San Bernardino, W. G. Wright in 1880; Red Hill, Upland, I. M. Johnston in 1916 and no. 1176; Claremont, I. M. Johnston in 1916 (P); San Antonio Mts., I. M. Johnston 1735; sandy bed of Santa Ana River, San Bernardino Co. and vic. of San Bernardino, alt. 1000 ft., S. B. Parish 5284. MEXICO: Fronteras, Sonora, C. V. Hartman 989; sandy margin of Rio Sonora, G. Thurber in 1851; vic. of Fuerte,

¹ This plant, as Britton has noted, may be identified with *Scirpus radicans* Poiret, Encyc. vi. 751 (1804), which was antedated by *S. radicans* Schkuhr (1793), a valid European species. Poiret's plant came from Porto Rico and was characterized by sheaths "membraneus, très-mince, glabre, d'un pourpre-rougâtre, un peu striée, tronquée obliquement à son orifice, ou prolongée en une pointe subulée." The spikelet "presqu'ovale, obtus d'un vert-pale, . . . les deux inférieures [écailles] en forme de spathe, & presque de la longueur des fleurs." Kunth, Enum. ii. 142 (1837) referred to *E. radicans* the *Sc. radicans* Poir. excl. syn., i.e. excluding *S. atropurpureus*. There are, however, some difficulties involved. The achene clearly places Kunth's plant among the *Aciculares*; but the Mauritius plant with achene "turgide biconvexum" is clearly something else. *E. radicans* Kunth is to be identified as one of the Peruvian species allied to *E. acicularis*. The critical descriptive characters are "squamis carinatis, . . . carina viridi, lateribus hyalino-albidis, omnibus fertilibus; . . . achenio (immaturo) elliptico-oblongo, teretiusculo, transverse striatulo, ecostulato, stramineo-flavido, nitido, basi styli conica fuscescente rostrato; pericarpio membranaceo, laxo; setis 5, retrorsim spinulosus, albidis." I have seen no South American material which approaches the Texan plant.

Sinaloa, *Rose, Standley & Russell* 13586 (U. S.); vic. of Magdalena, Sonora, *Rose, Standley & Russell* 15104.

Readily distinguished by the spongy culm, wholly green scales, and long bristles.

27. *E. CANCELLATA* S. Wats. FIG. 30. Annual?; dwarf, cespitose: culms 1.5–4 cm. high, radiating from a vertically branched root-stock, capillary, striate and sulcate, light-green: sheaths closely investing the culm, fugacious: spikelets 2–4 mm. long, ovate to ovate-lanceolate, acute; flowers numerous: scales obtuse, striate, green, with a narrow brown line on each side, with margin and tip hyaline, at maturity often exposing the achenes: style 3-fid: anthers 0.2–0.3 mm. long: achenes broadly obovate-pyriform, 0.6–0.7 mm. long (including the small conical style-base), white and shining, with 6 longitudinal ribs and about 15 trabeculae in each longitudinal series, and with conspicuous translucent fenestration between the trabeculae: bristles lacking.—*Proc. Am. Acad.* xviii. 170 (1883); *Hem-sley, Biol. Cent. Am. Bot.* iii. 455 (1885); *Britton, Journ. N. Y. Micr. Soc.* v. 105 (1889).—New Mexico to central Mexico. NEW MEXICO: *C. Wright* 1937. This specimen is a dwarf form not more than 1.5 cm. high. It is the "small form" of *E. acicularis* cited by *Britton* (l. c.) and by *Torr. Mex. Bound. Surv.* 228 (1859), collected by *C. Wright* in 1851. MEXICO: In paludosis Morales, San Luis Potosi, *Schaffner* 575 (in part) (1876) (the specimen labeled by *S. Watson* in the Gray Herbarium may be considered as the TYPE); region of San Luis Potosi, alt. 6000–8000 ft., *Parry & Palmer*, 912; wet hollows of mesas near San Luis Potosi, *Pringle* 3269.

In habit similar to *E. bella*, from which it is readily distinguished by the smaller, coarsely trabeculate achenes.

28. *E. brachycarpa*, n. sp. (fig. 34), non cespitosa; culmis 1–7 cm. longis, capillaribus, obscure angulatis; spicula 2–4 mm. longa, ovata, multiflora; squamis viridibus vel fusce stramineis, lanceolatis attenuatis, striatis, in margine scariosis; stylo 3-fido; antheris 0.7 mm. longis; achaenio 0.4–0.5 mm. longo, obovato, fere tereti, longitudinaliter circa 15-trabeculata; stylobasi anguste conica, brunne-scente; setis nullis.—MEXICO, in the region of the lower Rio Grande. The following specimens are in the Gray Herbarium: *Berlandier* 2496 "in locis paludosis, Matamoras, April 1834" (TYPE in Gray Herbarium); *Berlandier* 2324, "in locis humidis inter San Fernando et Matamoras Feb. 1831"; *Berlandier* 894 "in locis humidis prope Matamoras, Feb. 1831"; *Berlandier* 996, "in locis paludosis de Matamoras a Mueres, April 1834."

This species differs from *E. cancellata* in its non-cespitose habit, flexuous culms, long-attenuate scales, long anthers, and shorter, narrower achenes. *Berlandier* 2324 and 894 are dwarf plants only 1–1.5 cm. high.

29. *E. bella* (Piper), n. comb. FIG. 29. Annual ?; rootstock very short, the plant forming dense round tufts 5–10 cm. in diameter: culms ascending, 2–6 cm. high, light-green, capillary, soft, sometimes angled and sulcate: sheaths loose, inflated at the summit, acute: spikelets 2–3 mm. long, blunt or acute, ovate, many-flowered: scales ovate-lanceolate, keeled at summit, acute, with a broad green midrib and purple-striated sides: style 3-fid: anthers 0.4 mm. long: achene yellowish or white, linear-obovate, 0.7–0.8 mm. long, obtusely 3-angled, with 3 primary and many secondary longitudinal ridges and about 30 trabeculae in each longitudinal series: bristles none.—*E. acicularis* var. *bella* Piper, Fl. Palouse Region, 35 (1901) and Contrib. U. S. Nat. Herb. xi. 160 (1906). *E. acicularis* var. *minima* Torr. in Britton, Journ. N. Y. Micr. Soc. v. 104 (1889). *E. acicularis* Jepson, Fl. Calif. pt. vi. 195, fig. 16 (1922).—Idaho and Washington, south to New Mexico and California. The following specimens have been examined. IDAHO: Forks of St. Mary's River, *Leiberg* 1139. NEVADA: Truckee River, alt. 4000 ft., *S. Watson* 1211; Silver Mts. 30–40 miles east of Carson City, *Bolander*. NEW MEXICO: Mogollon Mts., West Fork Gila River, *O. B. Metcalf* 588. ARIZONA: Rucker Valley, *Lemmon* 481. CALIFORNIA: Red Clover Valley, Plumas Co., *A. A. Heller & P. B. Kennedy* 8693; Hayden Survey, coll. *Hooker & Gray*; Moulton, Warren Mts. *Griffiths & Hunter* 478; Headwaters of Chico Creek, Butte Co., *A. A. Heller* 11596; 40 miles north of Mt. Shasta, *E. L. Greene* 936; Big Trees, *Hillebrand* 2332; Cayumaca Lake, San Diego Co., *Abrams* 3848, *Munz & Harwood* 7200; Palomar Mts. San Diego Co., *P. A. Munz* 8268 (G. P.); Eshom Valley, Tulare Co. *Clemens* in 1910; Burton Flats, San Bernardino Mts. *Munz* 6317 (P); Soda Springs, Nevada Co., *M. E. Jones* in 1881; Prattville, *M. E. Jones* in 1897; Emigrant Gap, *M. E. Jones* 2905; Kenworthy, San Jacinto Mts. *Munz* 5472; Sisson, *C. F. Baker* 3825. OREGON: near Fort Klamath, alt. 1470 m., *J. B. Leiberg* 650; Swan Lake Valley, Klamath Co., *E. I. Applegate* 769; *E. Hall* 566 (as *E. acicularis* var. *minima* Torr.); muddy flats of the Columbia river, *T. Howell* 609. WASHINGTON: Pullman, *C. V. Piper* 3055 (G. P.) (TYPE coll.); Spokane, *C. V. Piper* 2642; Waitsburg, *R. M. Horner* in 1897; Pullman, *Elmer* 11417 (P) and 24 (P); springs, W. Klickitat Co., Cascade Mts., *Tweedy* 42.

This species is readily distinguishable from *E. acicularis* by the cespitose habit and the minute anthers, and from *E. cancellata*, of similar cespitose habit, by the larger achenes and close trabeculae. *E. Hall* 566 seems to have had the tops chewed off, forming unusually dwarf plants.

30. *E. WOLFII* A. Gray. FIG. 36. Culms sparsely caespitose, from slender creeping rhizomes, 1.5–3 dm. high, about 1 mm. in diameter, two-edged, often concavo-convex or inrolled, lightly striate:

sheath oblique and scarious at the apex: spikelets slender-ovoid, acute, 5–9 mm. long: scales oblong-ovate, acute, purple-striate, with scarious margin: style 3-fid: anthers 3, 1 mm. long: achene pyriform, light-brown, shining, 1 mm. long, strongly costulate with 9 longitudinal ribs and about 40–45 trabeculae in each longitudinal series: style-base depressed-truncate, with an apiculate center: bristles lacking.—A. Gray in Patterson, Cat. Pl. Ill. 46 (1876); Britton, Journ. N. Y. Micr. Soc. v. 105 (1889); Britton & Brown, Ill. Fl. i. 252, fig. 588 (1896); Robinson & Fernald in Gray, Man. ed. 7: 183, fig. 251 (1908). *Scirpus Wolfii* A. Gray, Proc. Am. Acad. x. 77 (1875).—Margins of ponds and in wet meadows, Indiana to Kansas and Louisiana. INDIANA: Hanover, Jefferson Co., C. C. Deam 38893; ILLINOIS: Canton, J. Wolf (TYPE in Gray Herbarium); E. Hall in 1861; Wady Petra, V. H. Chase 1451, and 191 in Kneucker Cyp. and Junc. Exs. IOWA: Emmett Co., I. A. Cratty in 1882. LOUISIANA J. Hale. KANSAS: Cherokee Co., A. S. Hitchcock 1050.

Approached in size only by *E. bonariensis* to which it is united by C. B. Clarke, but readily distinguished by the rigid ancipital culms which are usually provided with minute tooth-like elevations at the margins. This condition is unique in the genus, and resembles to some extent the toothed culms of *Fimbristylis*. These ancipital culms may become inrolled to such an extent that they appear almost cylindrical in cross-section.

31. *E. ACICULARIFORMIS* Greenman. FIG. 37. Rhizome 1–2 mm. in diameter, branching, light-brown: culms 5–8 cm. high, 0.5 mm. thick, rigid, sulcate, tufted at the nodes of the rhizome; sheaths reddish, striate below, green above, with acute scarious apex: spikelets elliptic-ovate, 4–6 mm. long, about 12-flowered; scales ovate, obtuse, reddish-brown, with green keel and scarious margin: style 3-fid: stamens 3; anthers about 1.2 mm. long: achene oblong-obovate, 1.2 mm. long, rather sharply narrowed at the summit, somewhat compressed, with numerous longitudinal ribs, and about 60–70 very close trabeculae in each longitudinal series: style-base conical, about $\frac{1}{3}$ as broad as the achene: bristles 3, white, retrorsely toothed, slightly exceeding the achene.—Proc. Am. Acad. xxxiv. 566 (1899).

Known only from a single collection, Pringle 6818, Federal District, Mexico, May 7, 1898. It differs from *E. acicularis* in stouter habit and thickened rhizome, more conspicuously sheathed culms, and white, more closely toothed bristles, and in the larger achenes. It might be confused with *E. bonariensis*, of similar large stature, but may be readily distinguished from that species by the scarious sheath-apices.

32. *E. BONARIENSIS* Nees. FIG. 32. Rootstocks creeping, 1–1.5

mm. thick: culms fascicled, somewhat rigid, 1.5–4 dm. high, about 0.5 mm. wide, bright-green or yellowish, striate and sulcate: sheaths yellow or brown, often reddish at the base; the firm apex obtuse, elongated and spreading: spikelets lanceolate, 4–8 mm. long, the lowest scale about half the length of the spikelet: scales ovate-lanceolate, obtuse or acute, green, with reddish sides: style 3-fid: stamens 3, anthers 1.5 mm. long: achene elliptic to narrowly obovate, 1–1.3 mm. long, with many longitudinal ribs and about 50–60 trabeculae in each longitudinal series; style-base small, conical, $\frac{1}{3}$ as wide as the achene: bristles 3 or 4, white, sharply toothed, equalling the achene, or somewhat shorter.—Nees in Hook. Journ. Bot. ii. 398 (1840); Hauman & Vanderveken, Phanerog. Arg. i. 208 (1917); Barros, Ciperac. Arg. 19, t. 2, fig. 8 (1925). *E. striatula* Desv. in C. Gay, Fl. Chil. vi. 173, t. 71, fig. 3 (1853); Boeckl. Linnaea, xxxvi. 432 (1869–1870). *E. oxyneura* Durieu, Bull. Soc. Bot. France, ii. 609 (1855). *E. amphibia* Durieu, Act. Soc. Linn. Bord. xxi. 487, t. 2 (1858); C. B. Clarke, Journ. Bot. xxv. 270 (1887); Beille, Bull. Soc. Bot. France, xlix. p. xl., t. 4 (1902); Husnot, Cyperac. t. xvii. (1905–1906).—The following specimens have been seen. ARGENTINA: Pergamino, Prov. Buenos Aires, hab. in lagunas, *Parodi* 7167 (*E. bonariensis* det. Barros). CHILE: Limache prov. Valparaíso, agua del río, *Looser* 124; Jorquera, Dept. Copiapo, Atacama, *Gijoux* in 1886; Valdivia, *O. Buchtien* in 1896 (*E. striatula* det. Buchtien). FRANCE: near Bordeaux, *E. Cosson* in 1859; vases de la Gironde submergées à chaque marée à La Bastice, vis-a-vis Bordeaux, *L. Mately* in 1860; Bordeaux, *C. J. Pittard* in 1903.

Britton, Journ. N. Y. Micr. Soc. v. 105 (1889) cites *Mueller* 1973 from Orizaba, Mexico, as this species.

According to Desvaux (l. c.) *E. striatula* differs from *E. costulata* in size and softness of the culms; the spikelets of the former are much larger, almost linear; the achenes elliptic, $1\frac{1}{2}$ times larger; the style is much larger and the linear elongate anthers are twice as large. *E. amphibia* was discovered in 1851 in the environs of Bordeaux by Durieu de Maissonneuve, and in 1859 was recognized by Cosson as probably identical with *E. striatula* Desv. "This American species has been introduced by shipping" (Beille, l. c. p. xlii), and has become naturalized on the shores of the Garonne near Bordeaux. The original name, *E. oxyneura*, was changed by its author to *E. amphibia*.

Equalled in size only by *E. Wolfi*, from which it is readily distinguished by the softer culms, and by the achenes.

33. ***E. Reverchonii***, n. sp. (FIG. 27), gracillima culmis capillaribus, elongatis, 8–20 cm. longis, sulcatis: spiculis 2–4 mm. longis, purpureo-brunneis, ovatis vel ovato-lanceolatis, acutis multifloris: squamis

ovatis, obtusis, purpurascentibus, in carina fuscis et in margine hyalinis; achaenio 0.5 mm. longo, obovato, basi et apice angustate longitudinaliter 9-striato, inter singulas strias transversim ca. 20-trabeculato; stylobasi conica; setis nullis.—WESTERN TEXAS: *E. Reverchon* (TYPE in Gray Herb.); in locis humidis de Goliad a Bexar, Maio 1834, *Berlandier* 2435 and 1005; San Antonio, *J. Clemens* 382 (P); Dallas, *Reverchon*, and Dalton, *Reverchon* 2451 (both at Mo. Bot. Gard.).

This species may be recognized by the long capillary culms, purple ovoid spikelets, and the minute achenes. None of the *Berlandier* plants have mature fruit. *Reverchon's* specimens at the Missouri Botanic Garden, which Dr. J. M. Greenman has kindly loaned me, are all shorter than the plant here illustrated.

34. *E. nervata*, n. sp. (FIG. 33), rhizomatibus elongatis, gracilibus, albidis; culmis non-rigidis, 3–9 cm. longis, obscure striatis angulatisque; vaginis superioribus adpressis, membranaceis et marcescentibus, flavidulis, ad apicem hyalinis; spiculis ovatis, 2–3 mm. longis, 3–5-floris; glumis ovatis, acutis vel obtusis, maturitate divergentibus, carinatis, prominenter striatis, viridibus vel interdum lateribus rufescentibus; stylo 3-fido; staminibus 3; antheris 0.7 mm. longis; achaenio 1.5 mm. longo, anguste obovato, longitudinaliter costulato, et inter singulas costas ca. 60–70-trabeculato; stylobasi conica; setis 3, achaenio vix aequilongis.—MEXICO: vicinity of Puebla, September 30, 1906, *Arsène* 217 (from which the present description is drawn); vic. of Puebla, *Arsène* 1159 (a dwarf form); San Luis Tultilanapa, Puebla, *Purpus* 3593; Orizaba, *Botteri* 771 (young specimens). ECUADOR: vicinity of Huigra, *Rose* 22415.

This species is characterized by extensive white rootstocks, few-flowered spikelets, and spreading prominently striate scales. Although the achene is of approximately the same size and shape as in *E. aciculariformis*, the plant appears distinct from that species. Much of the Mexican material which I have seen and which is possibly referable to this species, is not satisfactorily determinable due to poor material or the lack of sufficiently developed fruit, and it is probable that when a large amount of good material has been studied, the conception of the species will require modification.

35. *E. COSTULATA* Nees & Meyen. FIG. 28. Dwarf; culms 2–4 cm. high, rigid, striate and sulcate, sometimes recurved: sheaths scarious at the apex, dilated, often 2-lobed: spikelets 2–3 mm. long, ovate or lanceolate, 3–6-flowered: scales oblong, blunt or acute, striate, green (rarely with a brown strip on each side): style 3-fid: stamens 3; anthers about 0.5 mm. long, with a constricted apex: achenes 1 mm. long, oblong-obovate, yellowish-green, shining, triangular,

with about 12 elevated longitudinal ribs, and about 40 trabeculae in each longitudinal series: style-base narrow, conical, acute: bristles 2, white, slender, half as long as the achene, sometimes wanting.—Nees & Meyen ex Kunth, Enum. ii. 142 (1837); Desv. in C. Gay, Fl. Chil. vi. 172, t. 71, fig. 2 (1853); Boeckl. Linnaea, xxxvi. 433 (1869–1870) in part.¹ *Chaetocyperus costulatus* Nees & Meyen in Mart. Fl. Bras. ii.¹ 95 (1842) and Nees, Nov. Act. Acad. Caes. Leopold Nat. Cur. xix. Suppl. i. 96 (1843). *Scirpus costulatus* (Nees & Meyen) Kuntze, Rev. Gen. i. 757 (1891). *E. acicularis* C. B. Clarke in Engler, Bot. Jahrb. xxx. Beibl. 68: 21 (1901); Barros, Anal. Mus. Hist. Nat. Buenos Aires, xxxiv. 448, fig. 10 (1928).²—The following have been examined. CHILE: Raucagua, in turfosis inundatis paludosisque, *Bertero* 620 (1835); Valdivia, *Philippi* (U. S.); Bureo, *Claude Joseph* 3480 (U. S.). BOLIVIA: Mapiri, *Bang* 1503; Prov. Larecaja, vic. Sorata, alt. 3100 m., *Mandon* 1413 (not *E. nubigena* as cited by C. B. Clarke in Engler, Bot. Jahrb. xxxvii. 518 (1906)); Comarapa, Dept. Santa Cruz, alt. 2800 m., *J. Steinbach* 8521.

The type locality is in the Andes of Chile “in Cordillera de St. Fernando ad Flumen Tinguiririca . . . 3000' altit.”

Distinguished from *E. acicularis* by the dwarf, rigid, light-green culms, prominent sheaths, striate green scales, short apiculate anthers, and elevated longitudinal ribs on the achene. The style-base sometimes shows a tendency to become falcate. *E. rivularis* Phil. may be a synonym.

36. *E. stenocarpa*, n. sp. (fig. 35), rigida; culmis 6–9 cm. longis, striatis et sulcatis, glaucescentibus; vaginis in apice hyalinis, obliquis, attenuatis; spiculis 3–5 mm. longis, ovatis, acutis, 4–6-floris, glumis maturitate divergentibus; glumis viridibus, oblongis, striatis, ca. 3 mm. longis, carinatis; stylo 3-fido; staminibus 3, antheris ca. 1 mm. longis; achaenio anguste obovato, 1.5–1.8 mm. longo (cum stylobasi), flavescenti, longitudinaliter multicostato et inter singulas costas transversim ca. 60–70-trabeculato; stylobasi falcato, ca. 0.5 mm longo; setis 2 vel 3, crassis, albis, achaenium superantibus.—COLOMBIA: Dept. Santander, Rio Surata Valley above Surata, alt. 2000 ft., *Killip & Smith* 16708 (TYPE in Gray Herbarium). VENEZUELA: Merida, *Pittier* 12881 (U. S.).

¹ Boeckeler cites it from “Chili. Peruvia. Brasilia. America boreal., Boston (Greene, sub. ‘*Scirp. submersus*’).” *Scirpus submersus* is merely a manuscript name, and the plant is presumably *E. acicularis*, with the remote possibility of its being the submersed state of *E. Robbinsii*.

² “In *E. aciculari* Europaea, culmi in rhizomate repente distanter fasciculati, setacei aut capillacei videntur; forma, in Chili rarior, in herb. Philippi adest. *E. costulata* (Neesii! exemplum typicum) ab exemplis debilibus *E. acicularis* Europaeae nullo modo differt. In *E. costulata* Desv., culmi dense caespitosi, robustiores, glumae non maculatae; forma in Chile frequens ab Argentina usque ad Texas et Californiam sparsa.”—Clarke, l. c. 22.

Most closely related to *E. costulata* from which it may be recognized by larger size, and by the larger achenes with elongated falcate beak and coarse elongated bristles. The Columbian *E. stenocarpa* was collected on the Eastern Cordillera, whereas *E. exigua* HBK. and *E. trichoides* HBK., closely related to *E. stenocarpa* and possibly identical with it, were collected on the Middle Cordillera.

SPECIES DOUBTFUL OR NOT SEEN

E. RIVULARIS Philippi, *Linnaea*, xxxiii. 270 (1864–1865). Differs from *E. striatula* Desv. in lower culms, shorter spikelets (4–7-flowered), and dark-purple scales; bristles 5–6, much longer than the achene.—At the banks of the R. Aconcagua near S. Rafael below Santa Rosa, Chile (*Philippi*).

E. EXIGUA (HBK.) R. & S. Syst. ii. 154 (1817). *Scirpus exiguus* HBK. Nov. Gen. et Sp. i. 225 (1816).

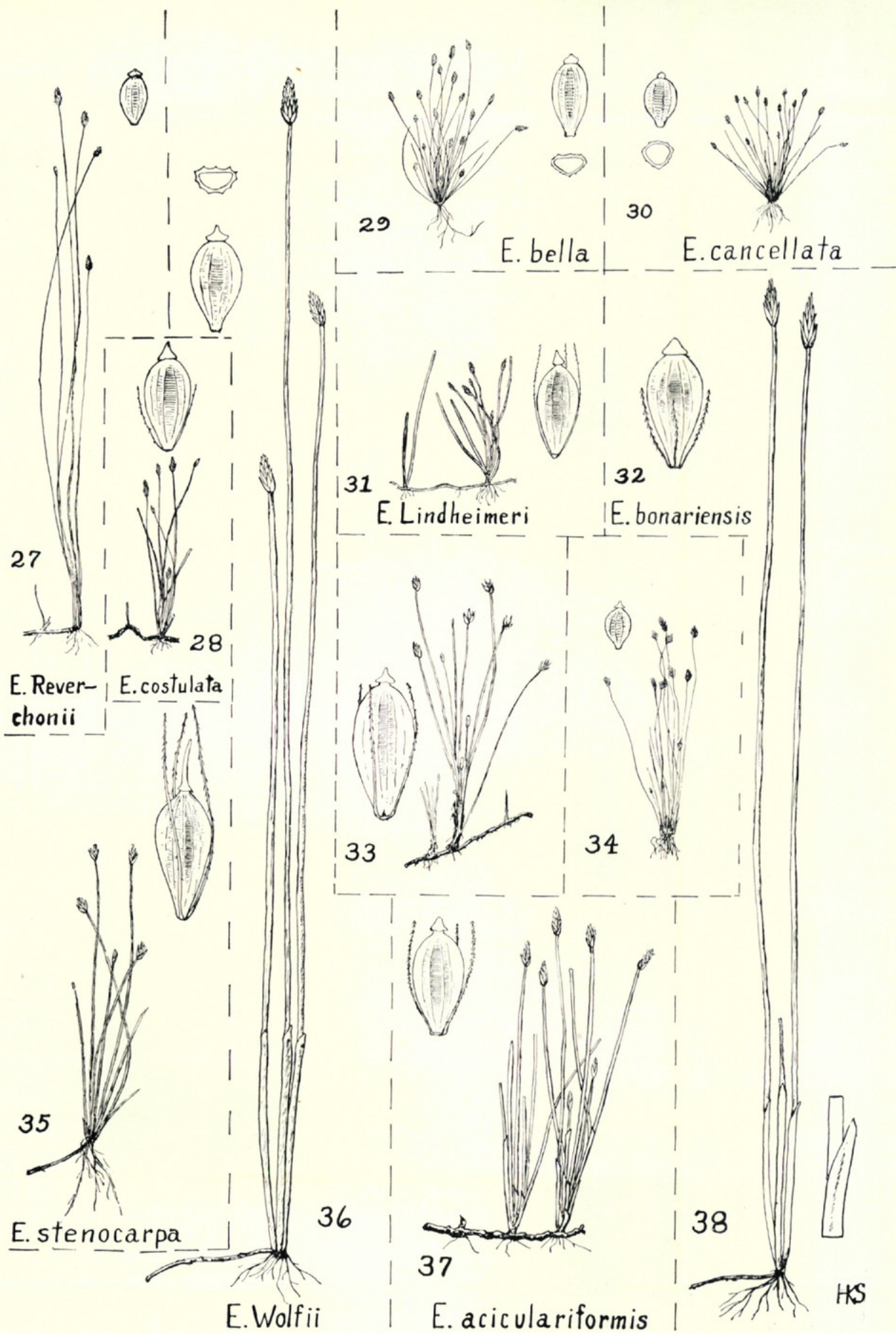
E. TRICHOIDES (HBK.) Kunth, Enum. ii. 141 (1837). *Scirpus trichoides* HBK. Nov. Gen. et Sp. i. 225 (1816), not *S. trichodes* Elliott, Sk. 76 (1816)¹ nor *S. trichodes* Muhl. Desc. Gram. 30 (1817).

E. PUSILLA R. Br. Prod. 225 (1810), and *E. ATRICHA* R. Br. l. c. (1810). C. B. Clarke, Kew Bull. Add. Ser. viii. 105 (1908) includes both of these under the *Aciculares*, but from the description by Mueller, Frag. Phytog. Austr. viii. 252 (1874), *E. atricha* would seem to belong to some other group.

GEOGRAPHICAL DISTRIBUTION OF SERIES ACICULARES

This series has its great development in southwestern United States, Mexico, and the Andes, where all of the species of the series are found, with the exception of the questionable *E. pusilla* R. Br. of Australia. Extending, at least in a varietal category, through nearly the whole of the United States and Canada, *E. acicularis* penetrates beyond the Arctic Circle in the Mackenzie Valley and in Greenland and spreads through a large part of Eurasia. A single specimen

¹ *Scirpus trichodes* Elliott is *E. acicularis*. A spikelet from the type has been examined through the kindness of Miss Laura M. Bragg of the Charleston Museum. Although 1821 appears on the title page of Elliott's work, the actual date of issue of the parts was earlier (See Barnhart, Bull. Torr. Bot. Club xxviii. 680 (1901)). *Scirpus trichoides* H. B. K. appeared in May, 1816; *Scirpus trichodes* was published by Elliott in September, 1816. The effective publication of *E. trichodes* Muhl. dates from 1817. Although there is a difference in spelling, both specific names are derived from the same source, and should be considered as homonyms. *Scirpus trichodes* Muhl. has been identified by Torrey, Ann. Lyc. N. Y. iii. 308 (1836) with *S. acicularis*. *S. capillaceus* Michx., "*Hab. in nova Anglia*," has been identified in the Michaux herbarium by Professor Fernald as an aquatic state of *E. acicularis*. *S. trichoides* was included by Nees in the mixed species, *Chaetocyperus polymorphus* Nees, *Linnaea*, ix. 289 (1834).



H. K. Svenson del.

ELEOCHARIS, SERIES ACICULARES

(Achenes $\times 15$)

FIG. 27, *E. REVERCHONII*; 28, *E. COSTULATA*; 29, *E. BELLA*; 30, *E. CANCELLATA*; 31, *E. LINDHEIMERI*; 32, *E. BONARIENSIS*; 33, *E. NERVATA*; 34, *E. BRACHYCARPA*; 35, *E. STENOCARPA*; 36, *E. WOLFII*; 37, *E. ACICULARIFORMIS*; 38, *E. BONARIENSIS*.

which I have seen from Australia seems to be the same as the European plant, and may possibly have been introduced. *E. bonariensis*, widely distributed in South America (in Argentina and Chile), is apparently naturalized in the region of Bordeaux (as *E. amphibia*), and has a counterpart in *E. Wolfii* of the Mississippi Valley. I have seen only one specimen (*E. Lindheimeri*) of this series from the West Indies, and the group is poorly represented in, if not entirely absent from eastern South America. *E. retroflexa* (Poir.) Urban has frequently been incorrectly determined as *E. acicularis*.

EXPLANATION OF PLATE 190

(Achenes $\times 15$)

Fig. 27, *ELEOCHARIS REVERCHONII*, Texas, *Reverchon*; 28, *E. COSTULATA*, Chile, *Bertero* 620; 29, *E. BELLA*, Washington, *Piper* 3055; 30, *E. CANCELLATA*, Mexico, *Pringle* 3269; 31, *E. LINDHEIMERI*, Texas, *Lindheimer* 315; 32, *E. BONARIENSIS*, Chile, *Barros* 7167 (achene); 33, *E. NERVATA*, Mexico, *Arsène* 217; 34, *E. BRACHYCARPA*, Mexico, *Berlandier* 2426; 35, *E. STENOCARPA*, Colombia, *Killip & Smith* 16,708; 36, *E. WOLFII*, Illinois, *Wolf*; 37, *E. ACICULARIFORMIS*, Mexico, *Pringle* 6818; 38, *E. BONARIENSIS*, Chile, *Buchtien* (habit).

Series OVATAE¹

- a. Tubercle (style-base) nearly or quite as broad as the achene; stamens 3. . . . b.
- b. Spikelets broadly ovoid to cylindric, obtuse to subacute; scales obtuse; tubercle depressed or deltoid, rarely $\frac{1}{2}$ as high as the body of the achene. . . . c.
- c. Tubercle deltoid, compressed (lamelliform), the sides usually concave, $\frac{1}{3}$ —nearly $\frac{1}{2}$ as high as the body of the achene; bristles (wanting in var. *Peasei*) much exceeding the achene. 41. *E. obtusa*.
- c. Tubercle lamelliform, very low, not more than $\frac{1}{4}$ as high as the body of the achene; summit of achene appearing truncate; bristles equaling the achene or rudimentary. 38. *E. Engelmanni*.
- b. Spikelets lanceolate, acuminate; scales acute; tubercle elongate-deltoid, $\frac{1}{2}$ as high as the body of the achene. . . . 37. *E. lanceolata*.
- a. Tubercle less than $\frac{2}{3}$ as broad as the achene; stamens 2 or 3. . . . d.
- d. Tubercle depressed-turban-shape, broader than high; bristles wanting or rudimentary; scales greenish or dull-brown; stamens 2. . . . 39. *E. diandra*.
- d. Tubercle deltoid, higher than broad; bristles much exceeding the achene; scales purplish-brown; stamens 2 or 3. . . . 40. *E. ovata*.

37. *E. LANCEOLATA* Fernald. Culms slender, almost capillary, erect, 2 dm. high: spikelets many-flowered, 5–8 mm. long, narrowly ovate-lanceolate, acuminate; scales scarious, acute, light-brown, with a greenish midrib: achene broadly obovate, 1 mm. long, light-brown: style-base as broad as the summit of the achene, compressed, elon-

¹ Since the species of Series *Ovatae* were illustrated in Fernald, Proc. Am. Acad. xxxiv. no. 19—Contrib. Gray Herb. n. s. no. xv. (1899), it is unnecessary to illustrate them here.

gate-deltoid, half as high as the body of the achene: bristles 6-7, brown, coarse, exceeding the achene.—Proc. Amer. Acad. xxxiv. 493, figs. 27-29 (1899); Small, Fl. Se. U. S. 183 (1903). *Trichophyllum lanceolatum* House, Am. Midl. Nat. vi. 205 (1920). ARKANSAS: Central Arkansas, July, 1882, *F. L. Harvey* 8 (TYPE in Gray Herb.). TEXAS: Texarkana, *A. A. & E. G. Heller* 4102; near Texarkana, alt. 3000 ft., *A. A. Heller* 4144 (P). This little-known species is apparently restricted to Arkansas and Texas.

38. *E. ENGELMANNI* Steud. Resembling *E. obtusa* in habit; the culms 1-4 dm. long: spikelets brownish, cylindric, 5-16 mm. long, usually acute: scales obtuse, appressed: achenes similar to those of *E. obtusa* but appearing truncate, due to the depressed tubercle not more than $\frac{1}{4}$ the height of the body of the achene: bristles about equalling the achene, retrorsely toothed.—Steud. Cyp. 79 (1855); Britton and Brown, Ill. Fl. i. 251, fig. 585 (1896); Fernald, Proc. Amer. Acad. xxxiv. 495, figs. 37-40 (1899); Robinson & Fernald in Gray, Man. ed. 7: 183, fig. 248 (1908). *E. obtusa* var. β . Torr. Ann. Lyc. N. Y. iii. 304 (1836). *E. ovata* var. *Engelmanni* Britton, Journ. N. Y. Micr. Soc. v. 103 (1889). *Trichophyllum Engelmanni* Farwell, Rep. Mich. Acad. Sci. xxi. 359 (1920).—In clay and on sandy pond-shores, rather rare, from southern Maine to Oklahoma and Missouri. MAINE: exsiccated depressions in clay fields, Falmouth, *Fernald, Long & Norton* 12793. MASSACHUSETTS: Sluice Pond, Lynn, *H. A. Young* in 1880; Winter Pond, Winchester, *A. S. Pease* 11349 (N. E. B. C.); hill at Waltham, *E. Tuckerman* (N. E. B. C.); West Somerville, *C. E. Perkins* in 1881 (N. E. B. C.); Needham, *T. O. Fuller* (N. E. B. C.); pond at Mill Street, Westwood, *Wiegand & Heatley* in 1908 (N. E. B. C.); clay pit, West Barnstable, *W. P. Rich* in 1911. RHODE ISLAND: Westerly, *Fernald & Ware* in 1919. CONNECTICUT: West Hartford, *C. H. Bissell* in 1906; Wethersfield, *C. Wright*. NEW YORK: Cypress Hills, Long Island, *W. C. Ferguson* in 1924.¹ DISTRICT OF COLUMBIA: near Deanwood, *C. F. Wheeler* in 1905; vic. of Washington, *E. S. Steele* in 1897. VIRGINIA: Williamsburg, *E. J. Grimes* 3707. INDIANA: Pilot Knob Hill, Crawford Co., *C. C. Deam* 27833. KENTUCKY: near Mammoth Cave, *H. K. Svenson* 163 (in part). MISSOURI: Genevieve, *F. P. Metcalf* 762; St. Louis, *Engelmann* in 1845 (TYPE collection); Forest Mill, Jasper Co., *E. J. Palmer* 3770; near Asbury, Jasper Co., *E. J. Palmer* 34663 (in herb. *E. J. Palmer*). OKLAHOMA: Shawneetown, McCurtain Co., *H. W. Houghton* 3835.—Of the same general range, but apparently extending farther northward in the Mississippi Valley and southwestward to Arizona is

Forma **detonsa** (Gray), n. comb. Bristles absent or represented only by their short naked bases.—*E. Engelmanni* var. *detonsa* A. Gray in Patterson, Cat. Fl. Illinois, 46 (1876) and Bot. Gaz. iii. 81

¹ Collected by the writer, since this was in type, on serpentine barrens, Nottingham, PENNSYLVANIA.

(1878); Fernald, Proc. Am. Acad. xxxiv. 495 (1899); Robinson & Fernald in Gray Man. ed. 7: 183 (1908).—MASSACHUSETTS: Winter Pond, Winchester, *E. H. Hitchings* in 1878, and many subsequent collections [a monstrous form with compound spikelets, *C. W. Swan* in 1884, *C. W. Jenks* in 1884].¹ PENNSYLVANIA: Conewago, *A. A. Heller* in 1901; damp sandy ground, Tinicum, Delaware Co., *A. H. Smith*. MICHIGAN: Jackson, *S. H. Camp* in 1893; Detroit, *Wm. Boott*. INDIANA: two miles north of Culver, Marshall Co., *C. C. Deam* 45400; Laporte, *E. J. Hill* in 1875. ILLINOIS: Oquawka, *Patterson* (TYPE in Gray Herb.); in a cold bog, Illinois River bottom, Peoria, *F. E. McDonald* in 1904. ARIZONA: Flagstaff, *M. E. Jones* 4058 (P).

I have seen no specimens from Nebraska and Oklahoma, but such are cited from these states by Fernald (l. c.). It has seemed desirable to reduce this to formal rank since it has no distinct geographical range.

Var. **ROBUSTA** Fernald. Culms stout, about 3 dm. high: the pale, oblong-lanceolate heads becoming 2 cm. long: achenes distinctly larger than in the other forms; the thicker tubercle less flattened.—Proc. Amer. Acad. xxxiv. 496, figs. 41–44 (1899).—MISSOURI: Montier, *B. F. Bush* 585. Fernald (l. c.) cites several additional specimens from Missouri, and also a collection by D. Griffiths from western South Dakota.

Var. **monticola** (Fernald), n. comb. Differs from typical *E. Engelmanni* in the pale-brown, ovate-lanceolate to oblong-lanceolate spikelets, with the less appressed scales often becoming acute.—*E. monticola* Fernald, Proc. Amer. Acad. xxxiv. 496, figs. 45–50 (1899); Piper, Contrib. U. S. Nat. Herb. xi. 160 (1906); Jepson, Fl. Calif. pt. vi. 195, fig. 15 (1922). *E. ovata* var. *Engelmanni* Britton, Journ. N. Y. Micr. Soc. v. 103 (1889) in part. *Trichophyllum monticolum* House, Am. Midl. Nat. vi. 205 (1920). *E. Engelmanni* Britton in Abrams, Ill. Fl. i. 263 (1923) in part, not as to fig. 628. *E. monticola* var. *pallida* St. John, Nw. Sci. ii. 81 (1928).—Idaho to Washington and Arizona. IDAHO: Nampa, Canyon Co., alt. 2000 ft., *Nelson & Macbride* 1061; Falk's Store, Canyon Co., alt. 2200 ft., *J. F. Macbride* 330. ARIZONA: White Mts., *D. Griffith* 5271. CALIFORNIA: Plumas Co., *Mrs. Pulsifer Ames* in 1876 (TYPE in Gray Herbarium); northern Sierra Nevada, *J. G. Lemmon* 485. OREGON: Multnomah Co., *T. J. Howell* 408; Salem, *J. C. Nelson* 1605 (resembling typical *E. Engelmanni* in its dark appressed scales); Sullivan's Gulch, Portland, *E. P. Sheldon* 10882. WASHINGTON: low muddy shores of ponds and river, near Bingen, *W. N. Suksdorf* 2583; Parker, Yakima Co., August 8, 1901, *A. D. Dunn*; Montesano,

¹ In these specimens there seems to have been a proliferous development of scales, with no trace of either pistils or stamens.

June 24, 1892, *L. F. Henderson*; Columbia River, W. Klickitat Co., *W. N. Suksdorf* 89.—The form with bristles lacking or rudimentary may be considered as

Var. **monticola** forma **leviseta** (Fernald), n. comb. *E. monticola* var. *leviseta* Fernald, Proc. Amer. Acad. xxxiv. 496, figs. 51, 52 (1899).—Manitoba to New Mexico and westward. MANITOBA: Killarney, *Macoun* 16365. NORTH DAKOTA: wet fields, Leeds, *J. Lunell* 10. IDAHO: valley of Coeur d'Alene River, Kootenai Co., *Sandberg*, *MacDougall & Heller* 649; northern Idaho, *Sandberg* in 1892. NEW MEXICO: Mogollon Mts., Socorro Co., alt. 8000 ft., *C. B. Metcalf* 589. CALIFORNIA: Yosemite Valley, *Bolander* 6230, *Abrams* 4631; Prattville, alt. 4500 ft., *M. E. Jones* in 1897 (P). WASHINGTON: shore of Lake Calispell, *F. O. Kreager* 332a and 332b.

The achene of *E. monticola* is identical with that of *E. Engelmanni* and, since the two are scarcely separable in the upper Mississippi Valley and in the Southwestern States, it seems best to treat the plant of the western United States, with light-brown, ovate-lanceolate spikelets (*E. monticola*) as a variety of *E. Engelmanni*. Indeed the Patterson collection, which is the type of *E. Engelmanni* var. *detonsa*, has scales as light in color as those of *E. monticola*, and the scales are not firmly appressed. In the original description of *E. monticola* the scales were said to be darker than those of *E. Engelmanni*, but in all except one of the specimens cited they are decidedly lighter. The plants with rudimentary bristles fall naturally into the category of "forms," and since they are not geographically segregated this classification seems a proper one.

39. *E. DIANDRA* C. Wright. Erect or depressed, culms 0.1–5 dm. long: sheaths usually brown at base; the apex firm: spikelet ovoid, 2–7 mm. long, many-flowered: scales membranous, somewhat spreading, ovate to ovate-oblong, obtuse, greenish or pale-brown, with a green midrib: style bifid: stamens 2: achene light-brown, obovoid or inverted-pyriform: tubercle flattened, depressed, $\frac{1}{2}$ to $\frac{2}{3}$ as wide as the achene: bristles lacking or rudimentary.—Bull. Torr. Bot. Club x. 101 (1883); Fernald, Proc. Am. Acad. xxxiv. 496, figs. 53–58 (1899); Fernald, RHODORA ii. 60, incl. var. *depressa* Fernald (1900); Robinson & Fernald in Gray, Man. ed. 7: 182, fig. 245 (1908); Long, Barton, 1927–1928, 40 (1929). *E. ovata* Britton, Journ. N. Y. Micr. Soc. v. 102 (1889), in part.—Maine to Pennsylvania: sandy shores or estuaries of the Androscoggin, Kennebec, Merrimac, Connecticut, Hudson, and Delaware Rivers, and on Lake Champlain, Vermont, and Oneida Lake, New York. MAINE: Topsham, *C. H. Bissell* in 1911 (N. E. B. C.); Bowdoinham, *N. C. Fassett* 117 (N. E. B. C.), *Fernald & Long* 12786; Gardiner, *N. C. Fassett* 1030 (N. E. B. C.); Brunswick, *K. Furbish* in 1912 (N. E. B. C.), *C. A. Davis* in

1894. NEW HAMPSHIRE: Manchester, *F. W. Batchelder* in 1906 and 1908; Walpole, *E. Brainerd* in 1899. VERMONT: Westminster, *E. Brainerd* in 1899; Colchester, *E. Brainerd* in 1903. MASSACHUSETTS: Northampton, *E. Brainerd* in 1899. CONNECTICUT: Hartford, *C. Wright* in 1880; East Windsor, *C. H. Bissell* in 1899 and 1900; *C. H. Bissell* in Plant. Exs. Gray. 135; Wethersfield, *C. Wright* in 1880 (TYPE in Gray Herbarium); Lyme, *C. B. Graves* in 1900. NEW YORK: Lansingburgh (*E. C. Howe*, 41st Rept. N. Y. State Mus. 58 (1888)); Baker's Falls, *S. H. Burnham* (*Torrey*, xix. 126 (1919)); Hudson, *H. K. Svenson* in 1923; Oneida Lake, *J. V. Haberer* in 1900, *H. D. House* 2807. NEW JERSEY: Delair, Camden Co., *Van Pelt & Long* in 1907 (*Bartonia* 1927-28, 40 (1929)). PENNSYLVANIA: Tullytown, Bucks Co., *Long* 33492 (*Bartonia*, l. c.).

E. diandra was first collected by Charles Wright on the Connecticut River between Wethersford and Hartford. It is very close to *E. ovata*, from which it may be an offshoot; and, except for the lack of bristles and the marcescent character of the scales it is at times almost indistinguishable from that species. Its distribution, however, is limited to a few river systems. When diurnally submersed in estuaries the culm is erect, and both culm and scales remain green. In a collection which I made on the Hudson River under such conditions, the culms arose from successive nodes at the base, giving the effect of a rhizome. By the depressed tubercle and two stamens, *E. diandra* can be readily distinguished from the bristleless variety of *E. obtusa* which I am describing on a succeeding page. In *E. diandra*, which has two stamens, the median stamen along the outer face of the achene is missing. Dr. N. C. Fassett discusses this species in his interesting paper on the Vegetation of Estuaries, Proc. Boston Soc. Nat. Hist. xxxix. 73-130 (1928). I have not seen the specimens which I have listed from Lansingburgh and Baker's Falls, New York, nor those from New Jersey and Pennsylvania, but the records are beyond doubt.

40. *E. OVATA* (Roth) R. & S. In habit similar to *E. obtusa*, but usually less coarse: culms 0.3-5 dm. long: spikelet globose-ovoid to ovoid-cylindric, obtuse or acute, many-flowered, 2-8 mm. long: scales oblong to narrowly ovate, obtuse, purplish-brown, with pale midrib and base and a white scarious margin: achene obovoid or inverted-pyriform, light-brown, shining, 1 mm. long, excluding the deltoid-conic style-base, which is half as broad as the summit of the achene: bristles light-brown, 6-7, exceeding the achene.—Syst. ii. 152 (1817); C. B. Clarke, Journ. Bot. xxv. 268 (1887); Terrac. Malpighia, ii. 310 (1888); Fernald, Proc. Am. Acad. xxxiv. 494, figs. 8-10 (1889);

C. B. Clarke in Hook. f. Fl. Brit. Ind. vi. 628 (1893); Hegi, Ill. Fl. Mitteleur. ii. 39, fig. 196 (1909 ?); Rouy, Fl. France, xiii. 363 (1912). *Scirpus ovatus* Roth. Tent. Fl. Germ. ii.² 562 (1793) and Catal. i. 5 (1797); Aschers. & Graebn. Syn. ii.² 292 (1904). *S. capitatus* Schreb. Spic. Fl. Lips. 60 (1771),¹ not L. *S. compressus* Moench. Meth. 349 (1794), not Pers.² *S. annuus* Thuill. Fl. Paris, ed. 2: 22 (1799). *S. soloniensis* Dubois, Meth. 295 (1803). *S. nutans* Bergeret, Fl. Pyr. i. 43 (1803).³ *S. turgidus* Pers. Syn. i. 66 (1805). *S. multicaulis* Gmel. Fl. Badens. i. 96 (1805), not Sm. *Bulbostylis ovata* Steven, Mém. Soc. Imp. Nat. Mosc. v. 355 (1813). *Clavula ovata* Dumort. Fl. Belg. 143 (1827). *Eleogenus ovatus* Nees, Linnaea, ix. 294 (1834). *Cyperus ovatus* Missbach & Krause in Sturm, Fl. Deutsch. ed. 2, ii. 25, t. 5, fig. 1 (1900). *Trichophyllum ovatum* Farwell, Rep. Mich. Acad. Sci. xxi. 358 (1920). *Eleocharis annua* House, N. Y. State Mus. Bull. no. 243-244: 58 (1923).⁴ ILLUSTRATIONS: T. G. Nees, Gen. Fl. Germ. ii. t. 18, figs. 17-20; Fl. Dan. t. mdccci; Host. Gram. Austr. iii. t. 56; Reichb. Ic. Fl. Germ. viii. t. 295, figs. 700-701; Anderss. Cyp. Scand. t. 2, fig. 25; Fernald, Proc. Am. Acad. xxxiv. 494, figs. 8-10; Hegi, Ill. Fl. Mitteleur. ii. fig. 196; Sturm, Fl. Deutsch. ed. 2, ii. t. 5; Husnot, Cyp. t. 18; Robinson & Fernald in Gray, Man. ed. 7, fig. 246; Syreitschikov, Ill. Fl. Moscow, 170.—In North America locally from Newfoundland and eastern Quebec south to central Maine, Vermont, Connecticut and Massachusetts; also in Michigan, Wisconsin, Minnesota and Washington. NEWFOUNDLAND: Rushy Pond, Valley of Exploits River, Fernald & Wiegand 4696. QUEBEC: Lac Tremblant, Terrebonne Co., J. R. Churchill in 1922; Black Lake, Megantic Co., Fernald & Jackson 12030. NEW BRUNSWICK: Campbellton, Macoun in 1882. MAINE: Fort Kent, Fernald in Pl. Exsicc. Gray. 55^a; Masardis, Fernald 2837, 2834; Van Buren, Fernald in Pl. Exs. Gray. 55; Island Falls, Fernald 2835; St. Francis, Fernald 2836; Blanchard, Fernald 2833. VERMONT: Spectacle Pond, Wallingford, Eggleston & Ross 638, and Eggleston in 1900; Abby Pond, Ripton, Brainerd in 1889; Brainerd & Eggleston 2140; Middlebury, Brainerd in 1878. MASSACHUSETTS: Dedham, E. H. Hitchings in 1878.⁵ CONNECTICUT: East Windsor, C. H. Bissell in 1903. MICHIGAN: Keweenaw Co., O. A.

¹ I have not seen this reference.

² This is referred by Moench to Ehrhart, Beiträge v. 155. The correct citation is apparently Ehrhart, Beiträge iv. 155 (1789), but here Ehrhart makes no definite publication, but merely states that *Scirpus capitatus* L. (i. e. the Gronovian plant) differs from *Scirpus capitatus* of Schreber, Krockner and Roth (i. e. *Eleocharis ovata*) in that the latter is characterized by "Culmum compressum . . . Stamina duo, und ein Stylum bifidum."

³ Bubani, Fl. Pyr. iv. 204 (1901) refers this to *E. multicaulis*.

⁴ House makes this new combination because of prior publication of *Scirpus ovatus* by Gilibert, Exercit. Phytol. (1792), which *Index Kewensis* refers to *E. palustris*. I have not seen the publication by Gilibert.

⁵ This fragmentary specimen is apparently the only basis for Massachusetts. It should perhaps be referred to *E. obtusa* var. *jejuna*.

Farwell 547. WISCONSIN: Marinette, *J. H. Schuette* in 1891 and 1892. MINNESOTA: streambed 2 miles east of Fort Ripley, Crow Wing Co., *Rosendahl & Butters* 3605. WASHINGTON: "Oregon," *E. Hall* in 1871 (probably collected in Washington); springs near Vancouver Lake, *Suksdorf* 2328; muddy shores of ponds near Bingen, *Suksdorf* 2582.

The Connecticut record is based upon a single collection by Bissell, from the banks of the Connecticut River at E. Windsor in 1903. The remainder of the material which was cited by Fernald (l. c.) from eastern Massachusetts, under *E. ovata* var. *Heuseri*, is here included under *E. obtusa* var. *jejeuna*.

In Europe (the type locality is Germany) *Eleocharis ovata* is likewise scattered in occurrence. According to Ascherson & Graebner (l. c.), it is rare or scattered through the greater part of central Europe; lacking in the Netherlands, West Prussia and the Tyrol; rare in the northwest German lowlands, Mecklenburg, Pomerania, East Prussia, Switzerland and the coniferous region of the Mediterranean and not ascending more than 500 meters in the mountains. They list it also from France, Northern Italy, south and central Russia, Transcaucasia, Siberia, India, eastern Asia, North America and the Hawaiian Islands.

However, all the Hawaiian material, so far as I have come in contact with it, is *E. obtusa*. The Indian reference is based wholly upon Wallich Cat. 3487 (in part) which C. B. Clarke, Journ. Bot. l. c. queries with "an revera in India lecta." Clarke (l. c.) cites it from Java (*Zollinger*) but Koorders, Excurs, Fl. Java, i. 197 (1911), questions its presence there, and Clarke makes no further reference to it in Hook. f. Fl. Brit. Ind. Ledebour, Fl. Ross. iv. 245 (1852), cites it from central Russia (Lithuania, Kursk); Caucasian provinces (Iberia = Georgia) and Davuria (*Turcz.*). Clarke also cites it from Troy (h. Calcutta.); and by Maximowicz, Fl. Amur. 298 (1859) it is listed from several stations in Amur. *E. ovata*, cited by Hemsley, Biol. Central. Am. Bot. iii. 456 (1885), from southern Mexico, based on *Coulter* 1624, is unquestionably a different plant.

In North America *E. ovata* is rather boreal and apparently confined to calcareous regions, supplanting *E. obtusa* in the calcareous regions of Northern Maine. It has been confused with *E. obtusa*, from which it may be distinguished by the narrower achene, with its slender tubercle one-half as broad as the achene, and by the softer texture of the scales, which are usually reddish-brown.

Var. *HEUSERI* (Uechtritz) Garcke. Plants dwarf (not exceeding 10 cm. in height), loose or spreading; culms often prostrate or arched: spikelets smaller (2–3 mm. long), deep-brown, almost spherical: scales darker with small membranous margin (= var. *minima* Beck. von Man.).—Garcke, Ill. Fl. Deutsch. Aufl. 17: 625 (1895); Fernald, Proc. Am. Acad. xxiv. 494 (1889);¹ Hegi, Ill. Fl. Mitteleur. ii. 39 (1909 ?). *Scirpus ovatus* var. *Heuseri* Uechtritz, Jahresber. Schles. Ges. Vater. Cult. 1866. *E. ovata* β *minima* Beck von Man. Fl. Nieder-Oestr. i. 126 (1890); Rouy, Fl. France, xiii. 363 (1912).

Terraciano, Malpighia, ii. 310 (1888) divides the species into α . *normalis* and β . *italica*; and under the latter describes forma *sessitensis* and var. *humifusa*.

41. *E. OBTUSA* (Willd.) Schultes. Annual, usually erect: culms numerous, 0.3–5 dm. long, yellowish-green, capillary to 1.5 mm. in diameter: sheaths purplish at base, at the apex firm and somewhat oblique: spikelets globose-ovoid to ovoid-cylindric, obtuse, many-flowered, 2–13 mm. long, closely or loosely flowered: scales ovate-oblong to suborbicular, brown, with a narrow scarious margin and usually a greenish midrib: style 3- or 2-cleft: achene 1–1.5 mm. long, turbinate-obovoid, narrowed at the base, pale- to deep-brown, smooth and shining: style-base strongly flattened, deltoid, acute, nearly as wide as the achene: bristles 6 or 7, dark brown, coarse, exceeding the achene, retrorsely toothed.—Mant. ii. 89 (1824); Torr. Ann. Lyc. Nat. Hist. N. Y. iii. 302 (1836) excl. Syn. Gron. Fl. Virg.; Fernald, Proc. Am. Acad. xxxiv. 492, figs. 1–7 (1899); Robinson & Fernald in Gray, Man. ed. 7: 182, fig. 247 (1908); Britton & Brown, Ill. Fl. ed. 2, i. 313, fig. 766 (1913). *E. ovata* C. B. Clarke, Jour. Bot. xxv. 268 (1887) and many earlier authors, in part; Britton, Journ. N. Y. Micr. Soc. v. 102 (1889). *Scirpus obtusus* Willd. Enum. Hort. Berol. i. 76 (1809). *S. capitatus* Walt. Fl. Car. 70 (1788); Pursh, Fl. Am. Sept. i. 55 (1814); Elliott, Sk. i. 77 (1816) ?; and many other authors, not L. *S. ovatus* Pursh, Fl. Am. Sept. i. 54 (1814), not Roth. *S. elegantulus* Steud. Cyp. 317 (1855). *E. ovata* var. *obtusa* Kükenth. in Skottsberg, Medd. Göteborgs Bot. Trädgård, ii. 212 (1925–1926).

The type locality of *Eleocharis obtusa* is Pennsylvania. Abundant in muddy or wet places in eastern North America from Cape Breton and eastern New Brunswick (although lacking in the calcareous areas of northern Maine) westward to Nebraska and southward to the Gulf of Mexico, the species appears again in the Northwest, from California to British Columbia; also in the Hawaiian Islands. The

¹ Prof. Fernald informs me that he now considers the American plants which he has so named merely trivial forms, which probably do not represent var. *Heuseri* of Europe.

citation from Australia by Mueller is to be referred to *E. cylindrostachys* Benth. & Mueller, Fl. Austr. vii. 294 (1878).

From a very abundant representation the following are cited as typical. QUEBEC: Lac William, Megantic Co., *Victorin* 11296 (bristles rudimentary); Massauwippi R., Sherbrooke Co., *C. H. Knowlton* in 1923; Dudswell, Wolfe Co., *C. H. Knowlton* in 1923; Longueuil, *Victorin* 1036; North Wakefield, *Macoun* in 1893. PRINCE EDWARD ISLAND: Tignish, *Fernald, Long & St. John* 6951. NEW BRUNSWICK: Bathurst, *S. F. Blake* 5468. NOVA SCOTIA: Sydney, Cape Breton Island, *Fernald* in 1902; and many collections thence south to SOUTH CAROLINA: Charleston, *B. L. Robinson* 257. GEORGIA: Augusta, *J. Metcalf* 104; Stone Mt., *Munz* 1339 (P); Athens, *R. M. Harper* 11. FLORIDA: *Chapman* (without locality). MISSISSIPPI: Saratoga, *S. M. Tracy* 8662. LOUISIANA: New Orleans, *Drummond* 405 (type of *S. elegantulus*). West to ONTARIO: Ottawa, *Macoun* 86,439. MICHIGAN: Menominee, *Schuette* in 1891. WISCONSIN: St. Croix Co., *T. J. Hale* in 1861. MINNESOTA: St. Paul, *Rosendahl* in 1917. IOWA: Grinnell, *M. E. Jones* in 1877 (P). NEBRASKA: Nemaha, *J. M. Bates* 5298. OKLAHOMA: Tonkawa, *Kay Co., Stevens* 1888. KANSAS: Pottawatomie Co., *J. B. Norton* 545. COLORADO: Platte River, south of Englewood, alt. 5300 ft., *I. W. Clokey* 3297. IDAHO: Coeur d'Alene Riv., Kootenay Co., *Sandberg, MacDougall & Heller* 649 (P). OREGON: Lakeside, Coss Co., *Peck* 9012; Columbia Riv., Hood Co., *Henderson* 966 in 1924; Eagle Creek, Clackamas Co., *Abrams* 8802 (P); Portland, *E. P. Sheldon* 10882 (P); Clackamas, *Elmer* 1610 (P). WASHINGTON: Green Lake, Seattle, *Congdon* in 1903; Waitsburg, *R. M. Horner* 510 in 1897; Manor, Clarke Co., *Piper* 3076; Montesano, Chehalis Co., *Heller* 4073 (G, P); Olympia, *Abrams* 9286 (P). BRITISH COLUMBIA: Chilliwack Valley, *Macoun* 34772. HAWAIIAN ISLANDS: Kauai, *A. A. Heller* 2488; Oatui, *Remy* 128; *Seemann* 1708; *Mann & Brigham* 27.

Var. *JEJUNA* Fernald. Culms capillary, suberect or generally decumbent or spreading, 1 (rarely 2) dm. or less high: heads smaller, fewer-flowered, 2–5 mm. long: scales more spreading, membranous, often tinged with purple: achene somewhat smaller, obovate, with the tubercle about three-sevenths its height.—Proc. Am. Acad. xxxiv. 492, figs. 13, 14 (1899). *E. ovata* var. *Heuseri* Fernald (l. c.) in part.—The following specimens may be included under this variety; although there is a considerable amount of variation and transition to the typical form. NOVA SCOTIA: peaty and muddy dried-out pond-hole, Springhaven, Yarmouth Co., *Fernald & Linder* 20131. MAINE: Milo Junction, *Fernald* 2838; North Berwick, *Fernald* in 1897 (TYPE in Gray Herb.). NEW HAMPSHIRE: Hampton, *E. F. Williams* in 1901; Lebanon, *G. G. Kennedy* in 1890. VERMONT: Westminster, *Brainerd* in 1899. MASSACHUSETTS: in black mud near Winter Pond, *G. G. Kennedy* 9; muddy margin of pond, *Purga-*

tory Swamp, Norwood, *Fernald, Floyd & Robinson* in *Plant. Exsicc.* Gray, 138 "spikes more elongated and tubercle narrower than in the extreme form of the species" (transition to typical *E. obtusa*); bog, south of Annursnack Hill, Concord, *E. F. Williams* in 1897; White Pond, Maynard, *C. A. Weatherby* 2843. RHODE ISLAND: Clay Head, Block Island, *Fernald, Long & Torrey* 8882. CONNECTICUT: East Windsor, *C. H. Bissell* 888; Griswold, *C. B. Graves* 281.

This variety seems to be an ecological phase which occurs when the plant is growing in muddy inundated places, and, except for the accompanying change in the character of the achene, should have been inclined to omit it from consideration. The extreme is reached in a plant collected by Prof. Fernald and myself in a dried out mill-pond at Weymouth, Massachusetts, Oct. 9, 1928 (to be issued in *Plantae Exsiccatae Grayanae*). The erect capillary culms of the Weymouth plant are 4–10 cm. high and form a turf covering the entire muddy bottom; the elliptic to ovate spikelets are 2–3 mm. long, 6–10-flowered; the appressed-ascending scales are rather membranous, green, with dusky-purple sides and scarious margins; the obovate achenes are only 1 mm. long, pale green to light brown, strongly biconvex (approaching orbicular in cross-section), with a greenish acute tubercle as wide as the achene and nearly half as high. On a second visit to this locality the mill-pond was found to be filled with water; and it appears that there is a weekly fluctuation of the exsiccated and submerged conditions. Although at first sight appearing like a distinct species, the Weymouth plant is approached by some other collections from eastern Massachusetts, notably *C. A. Weatherby* 2843 and *E. F. Williams*, Annursnack Hill, Concord. Some of the specimens cited from northern New England closely approach *E. ovata*.

Var. GIGANTEA (Clarke) Fernald. Culms stout and tall, 5–8 dm. high: spikelets ovate-oblong, 9 or 10 mm. long, 5 mm. broad: scales ovate, dark-brown; achenes as large as in the species; the broad obcordate tubercle not depressed, about five-eighths as high as the achene.—*Proc. Am. Acad.* xxxiv. 493, figs. 11, 12 (1899). *E. ovata* var. *gigantea* C. B. Clarke in Britton, *Journ. N. Y. Micr. Soc.* v. 103 (1889) *nomen nudum*; *E. obtusa* Watson, *Bot. Calif.* ii. 222 (1880) in part, not Schultes.—WASHINGTON: Cascade Mts., "Oregon," 49° N. Lat. *Lyell* in 1859. BRITISH COLUMBIA: New Westminster, *Macoun* 7557.

This variety was founded by C. B. Clarke on a very large specimen of *E. obtusa* (*Lyell*, Cascade Mts.), the culms of which are over 7 dm.

long. This is approximately twice the size of any other specimen that I have seen from the Pacific Coast. *Macoun* 7557 (of which only the upper portions of a few culms are represented in the Gray Herbarium) has heads as large and culms as stout as in the Lyell plant, and may approach it in size. There is a tendency in *E. obtusa* from the Pacific States to have somewhat larger, darker spikelets than material from the East and the tubercles tend to be larger and higher than in the eastern plant, thus approaching var. *gigantea*. This is true for practically all the specimens from the Pacific States; but, on the other hand, there are all sorts of gradations to the typical form, and scattered throughout the eastern and central states we may find plants with spikelets equally as large as those of the Pacific States. In a widespread annual species, such as *E. obtusa*, many local tendencies to slight variation occur, and the writer does not feel that all of these numerous and complex variations can be definitely set apart.

Var. **Peasei**, n. var., setis nullis.—This variety occurs on the sandy shores of ponds in New Hampshire, Maine, and in Quebec, and has previously been identified either as *E. Engelmanni* or as *E. diandra*. Three stamens are always present, and the tubercle is of the typical form found in *E. obtusa*. NEW HAMPSHIRE: wet sandy shore, Ossipee Lake, Ossipee, Aug. 23, 1923, A. S. Pease 19233. (This may be considered as the TYPE in Gray Herb.), 19236 (N. E. B. C.) and Aug. 10, 1921, 18107 (N. E. B. C.). MAINE: damp sandy beach, Lovewell Pond, Fryeburg, Aug. 17, 1927, A. S. Pease 17901 (N. E. B. C.). QUEBEC: Ste. Anne de Beaupré, *Macoun* 69304.

Some of these plants show the remarkable phenomenon of developing leafy appendages from the apices of the upper sheaths. These are best developed in the plants with capillary culms, and reach their finest development in *Macoun* 69304, where many of the sheaths have foliar extensions 1 cm. in length. These seem to be in the nature of true leaves, flattened for a short distance from the culm, and then becoming cylindrical by inrolling. Absence of leaves is one of the generic characters of *Eleocharis*, and it is the more remarkable to find such a condition, supposedly atavistic, occurring toward the northern outpost of an annual species, in which, moreover, the perianth is deficient. However, in plants collected by Ezra Brainerd, in a "dried-up swale at Knights Island, Vermont," we have the same capillary aspect of the culms and, to a lesser extent, the presence of foliaceous sheaths, but the achenes are, as in typical *E. obtusa*,

equipped with bristles exceeding the achenes. What I have considered as the type of *E. obtusa* var. *Peasei* (Pease 19233) has thickened culms like typical *E. obtusa* and the sheaths merely end in a mucro less than a millimeter in length. However, there are gradations to plants with capillary culms (Pease 17901 and 19236) which show well developed foliaceous sheaths.

Var. **ellipsoidalis** Fernald, n. var. in herb., culmis saepe inaequalibus; spiculis ellipsoidalibus; squamis valde adpressis.—Eastern Massachusetts to Virginia, on the coastal plain. MASSACHUSETTS: Great Pond, Weymouth, *G. G. Kennedy* in 1908; Hawk's Nest Pond, Harwich, *Fernald* 16306 and 16307; Great Sandy Pond, Pembroke, *St. John & Hunnewell* in 1916 (N. E. B. C.); Shallow Pond, Falmouth, *Fernald & Long* 18021 (TYPE in Gray Herb.); Crooked Pond, Falmouth, *Fernald & Long* 18020; Sparrow Young's Pond, Chatham, *Fernald* 16308; Cole's Pond, East Dennis, *Fernald & Long* 18018; Upper Simmons Pond, Dennis, *Fernald & Long* 16309; Cliff Pond, Brewster, *Fernald & Long* 16310; Buck Pond, Harwich, *Fernald & Long* 16311; Half-way Pond, Barnstable, *Fernald & Long* 16312; No-Bottom Pond, Brewster, *Fernald & Long* 16313; Griffith's Pond, Brewster, *Fernald* 16314. RHODE ISLAND: Beach Pond, Exeter, *Collins & Fernald* 11297; Long Pond, South Kingston, *Collins & Fernald* 11298; Little Sandy Pond, Warwick, *Collins, Fernald & York* 11299. NEW JERSEY: Quaker Bridge, *C. F. Austin* in 1845; Winslow Junction, *Gershoy* 141^a. DELAWARE: Greenbank, *Commons* in 1881; Centreville, *Commons* in 1864. VIRGINIA: East Williamsburg, *E. J. Grimes* 3709.

This variety has been noted by Prof. Fernald for many years, and is found in quagmires at the borders of ponds on the coastal plain. It is recognized by the ellipsoid spikelet, ascending lower bracts and closely appressed scales, and somewhat sprawling habit.

Several other variations have come to hand in this complex species. Among them is a plant resembling *E. obtusa* var. *jejuna* in habit but with straw-colored scales, *C. C. Deam* 45541, Bloomington, Indiana. The bristles are rather weak, usually only 4 or 5. Material collected by *D. Pretz*, Bristol, Bucks Co., Pennsylvania in 1886, has loose spikelets and the achenes have 2-4 bristles. Specimens collected by *Holm*, Bunker Hill Road, D. C., September 1, 1915, have capillary culms and loose-flowered spikelets.

GEOGRAPHICAL DISTRIBUTION OF SERIES OVATAE

A small series of five annual species, chiefly in North America. *E. ovata*, of scattered distribution from the Amur westward into



Svenson, Henry K. 1929. "Monographic studies in the genus *Eleocharis* [I - cont. 3]." *Rhodora* 31, 199–219.

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