

ERIOCAULACEAE OF CONTINENTAL NORTH AMERICA NORTH OF MEXICO

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The Eriocaulaceae comprise 12 genera and more than 1200 species, predominantly tropical American. Of these, but three genera and sixteen species are presently known to occur in continental America north of Mexico (*Eriocaulon*, 10 species; *Lachnocaulon*, 5 species; *Syngonanthus*, 1 species). The warmer and more humid parts of the southeastern United States, with their vast acreages of wet, acid, arenaceous soils provide especially favorable habitats, with the state of Florida leading in number of species (10). All of the species not found in Florida are *Eriocaulons*. Two (*Eriocaulon cinereum*, *E. microcephalum*) are representatives of Australasia and continental Latin America respectively, two (*E. parkeri*, *E. septangulare*) are primarily of the east-central and northeastern United States and Maritime Provinces, and two (*E. texense*, *E. kornickianum*) are of the Gulf Coastal Plain, with the latter extending northward into the Interior Highlands. It is of interest to note that *E. septangulare* occurs in Great Britain and is the sole European representative of the family. Cain (1944) and other plant geographers opine that the species represents further evidence of a Tertiary land bridge between northern Europe and America.

In both Mexico and the Caribbean Islands there are many species of Eriocaulaceae, some very similar in morphology to certain of our own species, and one is led to assume a migration into the continental United States from both of these regions.

Many of the species of the Coastal Plain of the United States show weedy tendencies, quickly occupying mechanically disturbed (wet) soils, they produce heavy quantities of seed, they are essentially heliophytes, and they therefore tend to be crowded out by later successional levels of herbs. In short most of these species exhibit sufficient vigor to maintain or even increase their areas in the face of disturbance providing there is no excessive drainage. I have seen very heavy development of *Eriocaulads* on such areas as wet ditchbanks, roadbanks, bulldozed pine flatwoods and savannas, or particularly on recently burned low, acid savanna.

Thus far I have not observed insect pollination of the flowers in Eriocaulaceae. In most of the species the anthers are well exerted from the heads by flowering time, as are the elongated style branches. Probably most, if not all, of the species are wind pollinated.

Few organisms appear to feed heavily upon Eriocaulaceae. I have ob-

served what appears to be a smut fungus in the capsules of *Eriocaulon texense* and *E. compressum*, and puparia of dipteran insects are frequently found in the seedheads. Therefore the limited economic utility of the family is not surprising. A few species of tropical American *Syngonanthus*, because of the durable, lustrous character of their chaffy heads, are gathered, dyed, and sold in commercial quantity as "everlasting" flowers.

Fossil evidence of the Eriocaulaceae is extremely limited. Moldenke (1949) cites one species, *Eriocaulon porosum* Lesq., from Eocene deposits in Colorado.

ACKNOWLEDGEMENTS

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MORPHOLOGY OF THE ERIOCAULACEOUS FLOWER

All of the Eriocaulaceae of North America are easily recognized by their star-like rosettes of linear leaves surmounted by slender but rigid scapes which terminate in chaffy, button-like heads. Common names applied to these plants (Bog-bachelor's-buttons, Pipewort, Hat-pin, Shoe-button, Bantam-button, Button-rod) are at once indicative of a conspicuous and fairly uniform habit.

The Head. In the Eriocaulaceae the inflorescence is directly subtended by and usually invested in involucreal bracts which are in few to several, imbricate series and chaffy. The very outermost are often the smallest and hardest but these grade into broader and thinner bracts which in

turn grade into narrower, equally thin receptacular bracts. All are achlorophyllous, usually somewhat translucent and scarious at least toward their margins. If trichomes are present they are usually more abundant on the inner bracts and appear to represent terminal, multicellular, strandlike outgrowths of the chains of cells making up the matrix of a bract. Often the uppermost few cells will be more swollen than the basal cells, and the hairs are clavate. Sometimes a mealy, whitened substance accumulates in such trichomes and is of considerable diagnostic value by the extent and location of its occurrence. The surface of the receptacle supports large numbers of chaffy, unisexual flowers, each usually subtended by a receptacular bract or two, these characteristically narrower and darker than the outer, involueral, bracts. The development of flowers in the heads is progressive toward the centre of the inflorescence. Actually, a series of flat spirals of flowers of one sex will be in almost simultaneous bloom, this followed by a series of flowers of the other sex in the same inflorescence.

The Flower of Eriocaulon. The greatest diversity of form of male flowers appears in *Eriocaulon*. The parts appear in twos or threes or small multiples thereof. The sepals are two, with divergent lobes save for the short-tubular base (*E. decangulare*, *E. septangulare*, *E. kornickianum*, *E. lineare*, *E. texense*, *E. parkeri*, *E. ravenelii*) or three and joined into a 3-lobed spathelike scale (*E. microcephalum*, *E. cinereum*). The male corolla of *Eriocaulon* is primarily of two or three units fused about a central stalk which bears the anthers; this stalk terminates in two or three lobes, which may be almost equal or very dissimilar in size, shape and indument. Toward the apex of the inner face of each petal lobe is a dark gland. The stamens are four in number (save for *E. microcephalum*, *E. cinereum* which have six) and arise from the summit of a claviform structure called an "androphore" which is seemingly a combination of androecium and corolla tube. The longer filaments are opposite petals. All filaments terminate in short-oblong, two-chambered anthers which split longitudinally. The colour of the anthers is jet black in all species treated here save one (*E. cinereum*) and in that regard are very similar to the glands of the petals. At the very center and apex of the androphore are located two or three sessile or short-stalked glands, coloured the same as the stamens and petal glands. By their location they are suggestive of either an internal, reduced cycle of stamens or of a vestigial gynoecium.

The female flower of *Eriocaulon* shows less diversity between species. The calyx is comprised of two or three, usually curvate-and-keeled, scales which are joined at their bases into a very short tube. The petal scales, of the same number as the sepals, but usually paler in colour and narrower, are distinct for most of their length but do join below into a short tube which surrounds the stipe-like base of the ovulary (called "gyno-

phore" by some). The female petals are sparingly or densely hairy, usually with white-mealy matter in the trichome tip, usually without prominent keels, and bear subapical glands similar to those on the male petals. As mentioned above, the gynoecium is raised above the perianth tube by a stalk. The ovulary is two or three-locular, the style two or three-branched. There is, in the Eriocaulaceae, but one ovule per locule, this dangling from the roof of each chamber.

The Flower of Lachnocaulon. Less diversity appears to exist between flowers of species of *Lachnocaulon*. The male flowers are comprised of three, chaffy, almost distinct sepals which are usually curvate and dark coloured. The receptacle of the flower is pilose with the same sort of multicellular, uncongested hairs that appear densely on the receptacle of the head; groups of these which alternate with the sepals have sometimes been referred to petals but, in view of the fact that there exist many more hairs identical to these save in position would make such proof difficult without internal anatomical study. An androphore exists in this genus also, this terminating in two or three stamens, and having two or three, usually appendaged (fimbriate) appendages at the very central portion of its apex. The anthers, at anthesis exerted from the head, are usually yellow in colour. The female flower has the same number of sepals, and a carpel number corresponding to the number of stamens. Its sepals are characteristically keeled and curvate, approximately equal, and usually connivent about the ovulary. In at least one species (*E. anceps*) they are definitely accrescent. The gynoecium is elevated above the sepals on a short, usually pilose, stalk (the gynophore) and from the summit of two or three-lobed ovularly there arises a slender style which has two or three branches which may be branched themselves. The character of the seeds is similar to that of *Eriocaulon*. Both male and female sepals may be smooth or equipped with clavate, multicellular hairs. The degree of clearness of these cells, and the relative copiousness and size of hairs comprise important distinguishing characters. Central appendages exist in both male and female flowers of *Lachnocaulon*; those in the centre of the male flower are usually fimbriate-glandular, those in the centre of the female are unappendaged.

The Flower of Syngonanthus. Only one species of this rather large tropical genus exists within the area here treated and therefore any comments about *Syngonanthus* are extremely limited in scope. The flower of *Syngonanthus flavidulus* essentially differs from both *Lachnocaulon* and *Eriocaulon* in that it has an inner male perianth which is corona-like, and its three style branches are simple. Vegetative differences serve at least as well to distinguish it.

Remarks on Classification. This writer finds it difficult to locate a genuine basis for distinguishing between the three genera of *Eriocaul-*

aceae here treated. For one matter, he has studied specimens of but 16 species, these representing the very uppermost branches of a huge, circumtropical base. Next to no cytological studies are in progress with any of the genera. Thus the genetic basis for genera remains unknown and a conservative treatment appears in order until such evidence is consulted. It might be appropriate here to cite some existing morphological problems which crop up within our few species. It is difficult to find sufficient morphological differences between certain *Lachnocaulon* and *Eriocaulon*. *Lachnocaulon digynum* is two-carpellate, a characteristic supposedly of *Eriocaulon*, while certain *Eriocaulons* such as *E. microcephalum*, *E. cinereum* are three-carpellate. Some *Eriocaulon* (*E. parkeri*, *E. ravenelii*) have such reduction of petal blades in the male flowers that the glands which ordinarily distinguish petals are not evident. If the tufts of hair between the sepals of *Lachnocaulon* are indeed to be interpreted as petals, another hitherto accepted generic difference from *Eriocaulon* is reduced to inconsequence. Cogent interpretation must properly be the role of the tropical botanist.

ERIOCAULACEAE (PIPEWORT FAMILY)

Rosulate, monoecious or dioecious, biennial or perennial, the roots fibrous, thickened-spongy, or thickened-septate, the stems short, simple or sparingly branched, the leaves linear, often long-tapering. Inflorescence capitate, involucrate, the head terminating a sheathed, fluted scape, the receptacle of the head smooth, hairy, or chaffy; flowers unisexual, actinomorphic or zygomorphic, the perianth members chaffy; sepals 2 or 3, distinct or fused; petals 2 or 3, usually fused at least at the bases, sometimes fused to the apices. Androecium of 2 to 4 (-6) stamens, the anthers introrse, splitting longitudinally, the filaments epipetalous (their bases plus the petal bases comprising an androphore); gynoecium of 2 to 3 carpels, the ovary superior, the locules 2 or 3, raised upon a gynophore and with style branches equalling or doubling the carpel number, the style branches themselves often branched; ovules pendulous, one per locule. Fruit a thin-walled loculicidal capsule. Embryo small, apical in copious endosperm.

KEY TO GENERA

1. Lacunar tissue (air spaces) in the leaves evident to the naked eye; the larger roots thickened, pale, septate, appearing unbranched; perianth parts in 2's (3's in the two California species), the sepals distinct or united into a spathe, the petals united for most of their length into a corolla tube which is 2 (-3) lobed above, each lobe adaxially bearing a jet black gland; trichomes of the perianth clavate, multicellular, at least some of the cells congested with a white, mealy substance; stamens (3-) 4 (-6), the ripe anther surfaces of all the native species black; carpels 2, styles 2-branched, the gynoecium on a conspicuous gynophore (carpels

3, styles 3-branched in the California species) . . . *Eriocaulon*, p. 290

1. Lacunar tissue of the leaves not evident to the naked eye; roots either fibrous and evidently branched or, if thickened and fleshy, not septate or evidently branched; perianth parts in 3's the petals if present eglandular; stamens 2 or 3, yellowish or pale; carpels 2 or 3, most commonly 3, the gynophore conspicuous or inconspicuous.

2. Roots dark, slender, fibrous, evidently branched; scapes smooth or hairy, the hairs neither swollen nor glandular apically; rosette leaves ascending or spreading; inflorescence in the bud turbinate or subglobose, pale gray or whitened; inflorescence when expanded globose or short-cylindrical, the outermost involucre bracts reflexed and obscured by the rest of the inflorescence; corolla lobes absent or vestigial; trichomes of the perianth tips clavate; filaments of the yellowish anthers fused to the rim of an androphore; style branches bifid.

Lachnocaulon, p. 315.

2. Roots pale, thickened, spongy, appearing unbranched; scapes hairy, at least some of the hairs swollen at the tips; rosette leaves forming a recurved mat on the substratum; inflorescence in the bud ellipsoidal or narrowly ovoid, flavescent; inflorescence when expanded hemispherical, the straw-coloured outer bracts not obscured by the rest of the inflorescence; corolla and calyx both evident, the male corolla tubular, lacerate-dentate at the apex; trichomes of the perianth tapering, acute, not clavate; filaments of the pale anthers separating from the tubular corolla below its rim; style branches simple. . . .

Syngonanthus, p. 327.

ERIOCAULON L. Sp. Pl. 87. 1753; Gen. Pl. ed. 5. 38. 1754.

Rosulate, scapose, often tufted, herbs, the roots evidently cross-partitioned, the leaves linear, arranged in a close spiral toward the apex of a short or elongated, sometimes sparingly branched stem. Perennation by means of lateral offshoots or by rhizomes or stolons (the latter two most often observed when plants are submersed). Inflorescence an involucre head or contracted spike comprised of an outer involucre and a bracteate mass of scaly, unisexual flowers, the plants being either monoecious or dioecious. Leaves linear, often linear-attenuate, gradually or abruptly flaring toward a clasping base, pale and noticeably aerenchymatous basally, greener and less distinctly lacunate above, the chlorenchymatous proportion of the leaves increasing with extent and duration of emergence. Outer bracts of the inflorescence of few to several imbricate series, broad, green, gray-green or paler, at least the margins translucent. Bracts within the inflorescence usually 1 per flower, chaffy or almost membranaceous, pale to brownish, greenish, or gray, entire or ciliate, the surfaces glabrous or producing multicellular trichomes at least the terminal cells of which are usually congested with a farinose, white material. Sepals 2, scarious, pale or coloured, often translucent,

boat-shaped, often covered toward the tips with farinose or clear, multicellular trichomes. Petals 2, fused at least toward the bases, equal or unequal, similar to the sepals but generally narrower and separated from them by a pronounced tubular stalk (which is partly petal and, in staminate flowers, partly stamen) and distinguished from the sepals by a dark gland on the inner, distal surface of each; outer and sometimes inner surfaces frequently with multicellular, clear or congested, trichomes; the margins frequently ciliate; distal end of the male perianth tube concave, sometimes bearing 2-3 dark coloured glands in its centre, these suggestive of the glands of the corolla lobes. (Sepals and petals 3 in California species). Stamens 3 to 4 or 6, 2 or 3 opposite the petals, introrse, but versatile, the anthers dehiscing longitudinally and well-exserted from the inflorescence at anthesis. Carpels 2, locules 2, the ovary stipitate (on a gynophore), the style 2-branched (carpels 3, locules 3 in the California species); ovules 1 per locule, pendulous from the summit of the locules. Fruit a loculicidal capsule, the pericarp thin, often velum-like, the style persisting on the fruit. Seeds ovoid, ellipsoidal or broadly fusiform, variously lined, ridged or papillate; embryo small, at the funicular end; endosperm copious, mealy.

Primarily plants of wet, acid situations with most of the species confined, within the area treated, to the Atlantic or Gulf coastal plain. Of the 10 species described here, two are adventive in California, two are on the western Gulf coastal plain, two are of the northeastern United States and southeastern Canada, and the remainder of the southeastern United States.

One species, *E. decangulare* may be found on relatively dry soils of pine flatwoods as well as in wet situations; the rest are efficient indicators of boggy, very high hydroperiod soils. Of the native species *E. compressum*, *E. ravenelii*, and *E. texense* are winter or spring bloomers while *E. lineare*, *E. decangulare*, *E. septangulare*, *E. parkeri*, *E. kornickianum* are summer and fall bloomers.

Eriocaulon may be distinguished in the rosette stage from either *Lachnocaulon* or *Syngonanthus* by the coarsely lacunar character of its leaf bases and by the septate character of its roots, both of which may be associated with the definitely more aquatic habitat.

KEY TO ERIOCAULON

1. Surface of the receptacle and/or the bases of the florets copiously trichomiferous; some or most of the receptacular bractlets and perianth parts with chalk-white trichomes, thus the heads very conspicuously white; diameter of the heads, when in full flower or fruit, at least 0.5 cm., usually more.
2. Heads, soft, much compressed in drying; sheathes of the scape seeming to exceed all or most of the leaves in length; involucrel

bracts usually grayish, rounded, the receptacular bractlets grayish and acute; inner surface of the female petals villous; all cells of the clavate trichomes of the perianth whitened, opaque; winter, spring or early summer flowering and fruiting species of aquatic or wet situations.

3. Heads seldom less than 1 cm. broad at flowering time on scapes seldom shorter than 2 dm. which are subtended by leaves seldom shorter than 5 cm., thus the plants robust; roots seldom less than 1 mm broad; lobes of staminate corolla conspicuously unequal. 4. *E. compressum*, p. 299
3. Heads usually between 0.5 and 1.0 cm. broad at flowering time on scapes seldom as long as 2 dm. which are subtended by leaves seldom as long as 5 cm., thus the plants low; roots seldom 1 mm. broad; lobes of staminate corolla subequal, though inconspicuous. 6. *E. texense*, p. 305
2. Heads hard, very slightly compressed in drying; sheathes of the scape usually exceeded in length by most of the leaves; involucrel bracts stramineous, acute, the receptacular bracts pale, acuminate; inner surfaces of the female petals smooth; terminal cells of the clavate trichomes of the perianth whitened, but some or all of such hairs with basal cells uncongested, transparent; flowering in late spring, or summer and fruiting in summer and fall; a plant of moist but seldom aquatic or permanently wet situations. 5. *E. decangulare*, p. 302
1. Surface of the receptacle of the head lacking trichomes or but sparingly trichomiferous; receptacular bractlets and/or perianth parts smooth or clavate-hairy, thus the heads either dark gray or white; diameter of the heads, when in full flower or in fruit, seldom more than 0.75 cm.
4. Stamens 6, carpels 3 on an elongate gynophore.
5. Anthers yellow, receptacular bractlets acute. 9. *E. cinereum*, p. 311
5. Anthers black, receptacular bractlets obtuse. 10. *E. microcephalum*, p. 312
4. Stamens 4, carpels 2, on a short gynophore.
6. Heads between 0.5 cm. and 1 cm. broad at maturity, the outer involucrel bracts usually reflexed and hidden by the conspicuously white-hairy bractlets and perianth parts.
7. All outer involucrel bracts and all bracts and sepals save for sepals of male flowers and receptacular bractlets of some populations whitened or stramineous, thus the heads appearing very pale even when young; seed faintly rectangular-reticulate, often with longitudinal lines of papillae; sandy or peaty lakeshores, ditches or pondshores, southern Georgia,

Florida, west to southern Alabama. . . . 7. *E. lineare*, p. 307

7. All bracts and perianth parts save for outermost involucre bracts and petals darkened, usually gray to almost black, thus the young heads dark; seed very faintly reticulate, not at all papillate; bogs, sandy or peaty lakeshores, banks or ditches, eastern Canada south in the mountains to North Carolina. 8. *E. septangulare*, p. 309

6. Heads seldom as broad as 0.5 cm., the outer involucre bracts, if reflexed, not hidden by conspicuously white-hairy bractlets and perianth parts.

8. Bractlets very dark, very lustrous, all subentire and narrowly acute; scapes filiform; plants of the southeastern U. S. or the southwestern U. S.

9. All perianth parts dark, usually smooth; seed coat conspicuously rectangular-reticulate, the lines made up of close-set diagonal bars of a white mealy substance. (Occasionally the inner surface of the linear female petals have a few white, clavate trichomes); plants of disturbed sandy peats toward the coast, S. C. to Fla. 1. *E. ravenelii*, p. 293

9. All perianth parts, often bractlets, with some white-clavate hairs at least on the margins, thus imparting a dark and *white-banded* appearance to the mature heads; inner surface of the broadly spatulate female petals hairy; plants of the interior highlands and the southwestern gulf coastal plain.

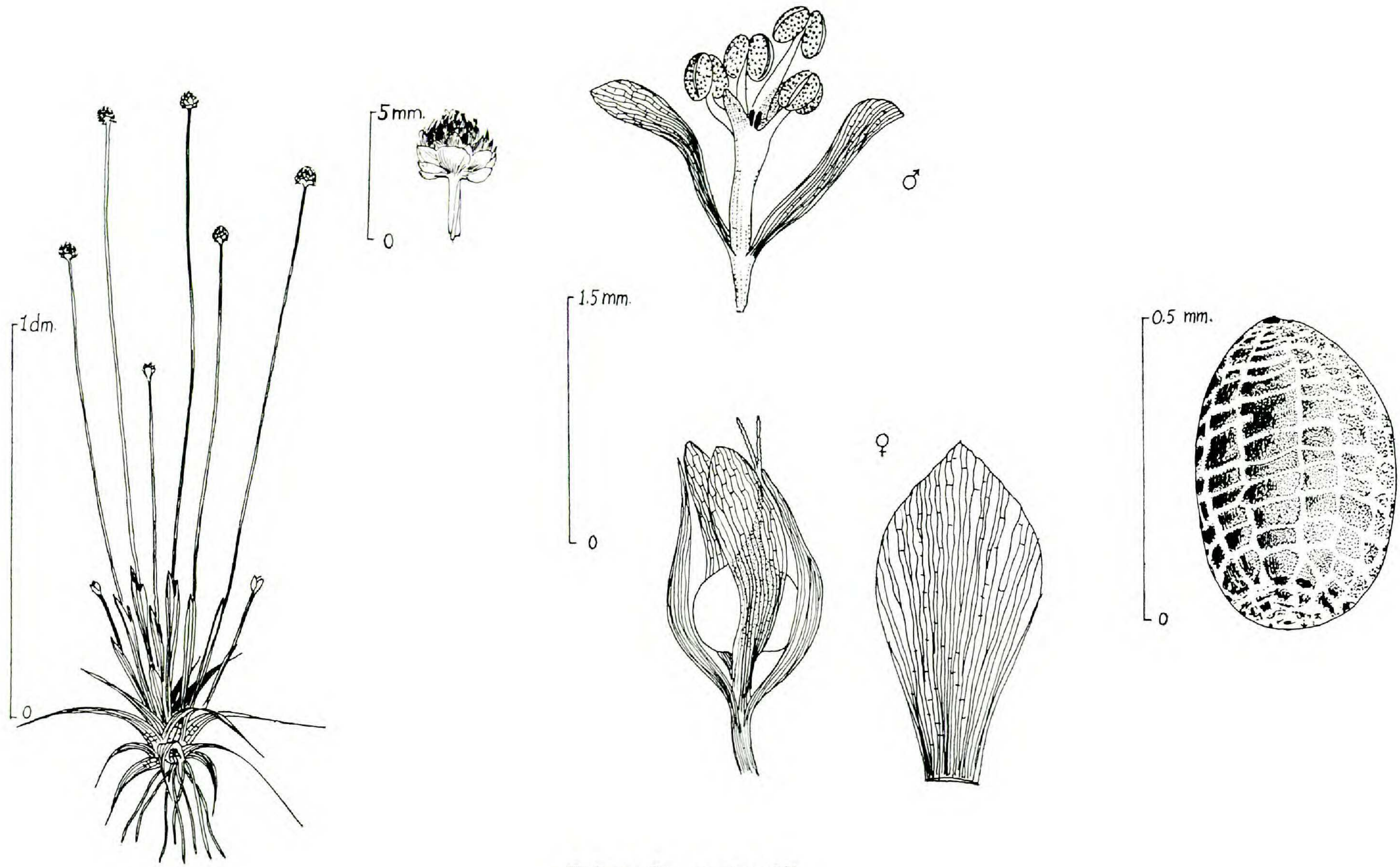
. 3. *E. kornickianum*, p. 297

8. Bractlets stamineous or gray, dull, often evidently erose or lacerate, broadly acute to obtuse; scapes linear; plants of marshy, estuarine areas of the central or northern Atlantic coasts.

. 2. *E. parkeri*, p. 295

1. ERIOCAULON RAVENELII Chapm., Fl. S. US. 503. 1860.

Perennial (biennial?), glabrous, the stem short and unbranched, the plants low, with scapes seldom exceeding 2 dm. Leaf bluish-green, linear-attenuate (save on drier situations where leaves become shorter, more acute-tipped), aerenchymatous tissue evident almost to the tip, 3.0-7.0 (15.0) cm. long. 3.0-5.0 mm. broad at the base, longer than the sheath of the scape. Sheath of the scape loose, gradually widening above to a deeply slit apex. Scape 10-20 cm. long, slightly twisted, 4-5 (-6) ribbed. Head gray-brown, rarely charcoal gray, subglobose, 3-4 mm. broad. Receptacle of the head smooth or with sparse, clear trichomes. Outer bract oblong-ovate or broadly cuneate, 2 mm. long, pale gray, translucent, rounded to acute. Inner bract and receptacular bractlet cuneate, ca. 2 mm. long, a darker gray, translucent, shining, acute to acuminate or lacerate. Male flower: sepals separate, oblong to oblanceolate, gray, usually acute; corolla tubular, very slightly expanded



Eriocaulon ravenelii

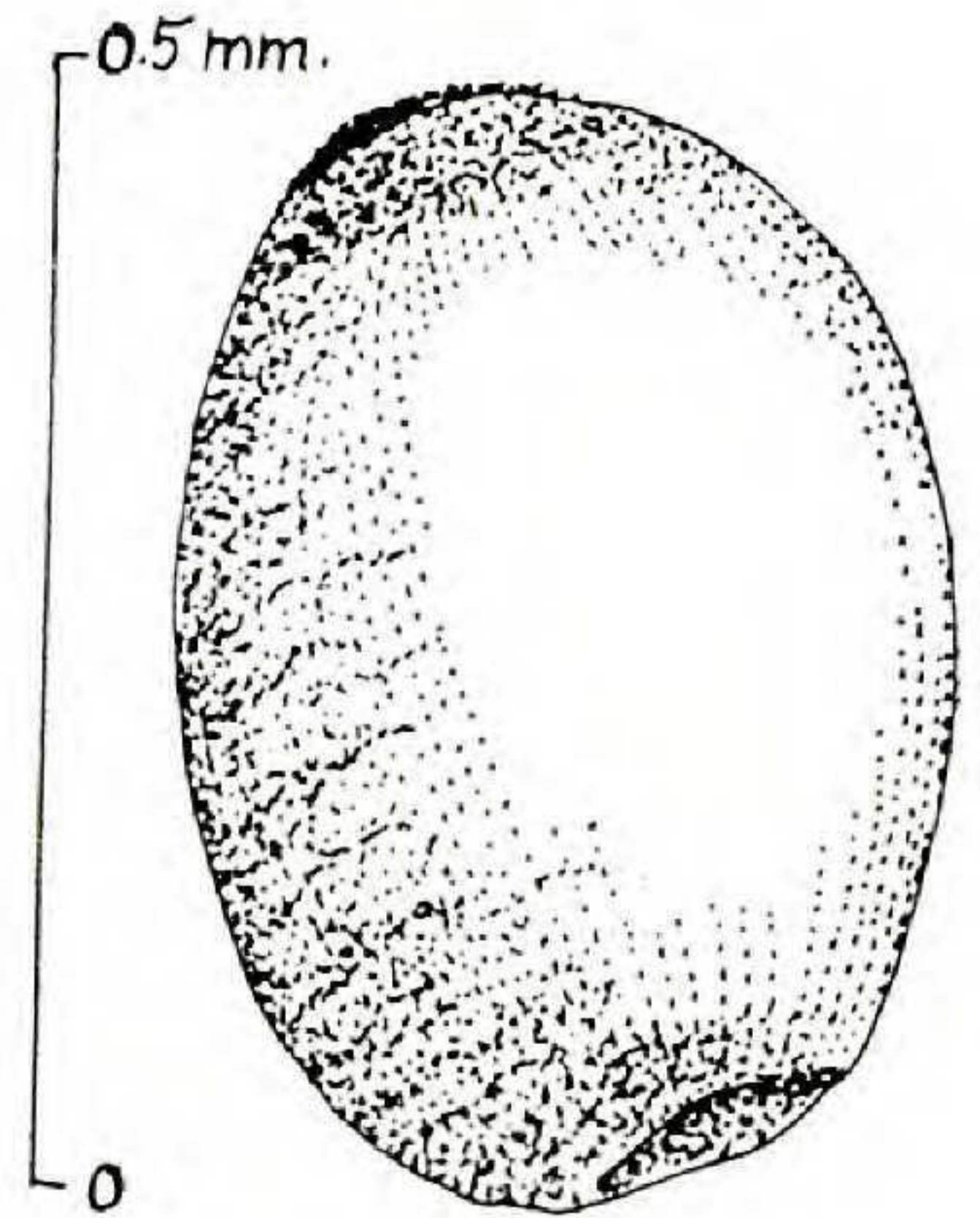
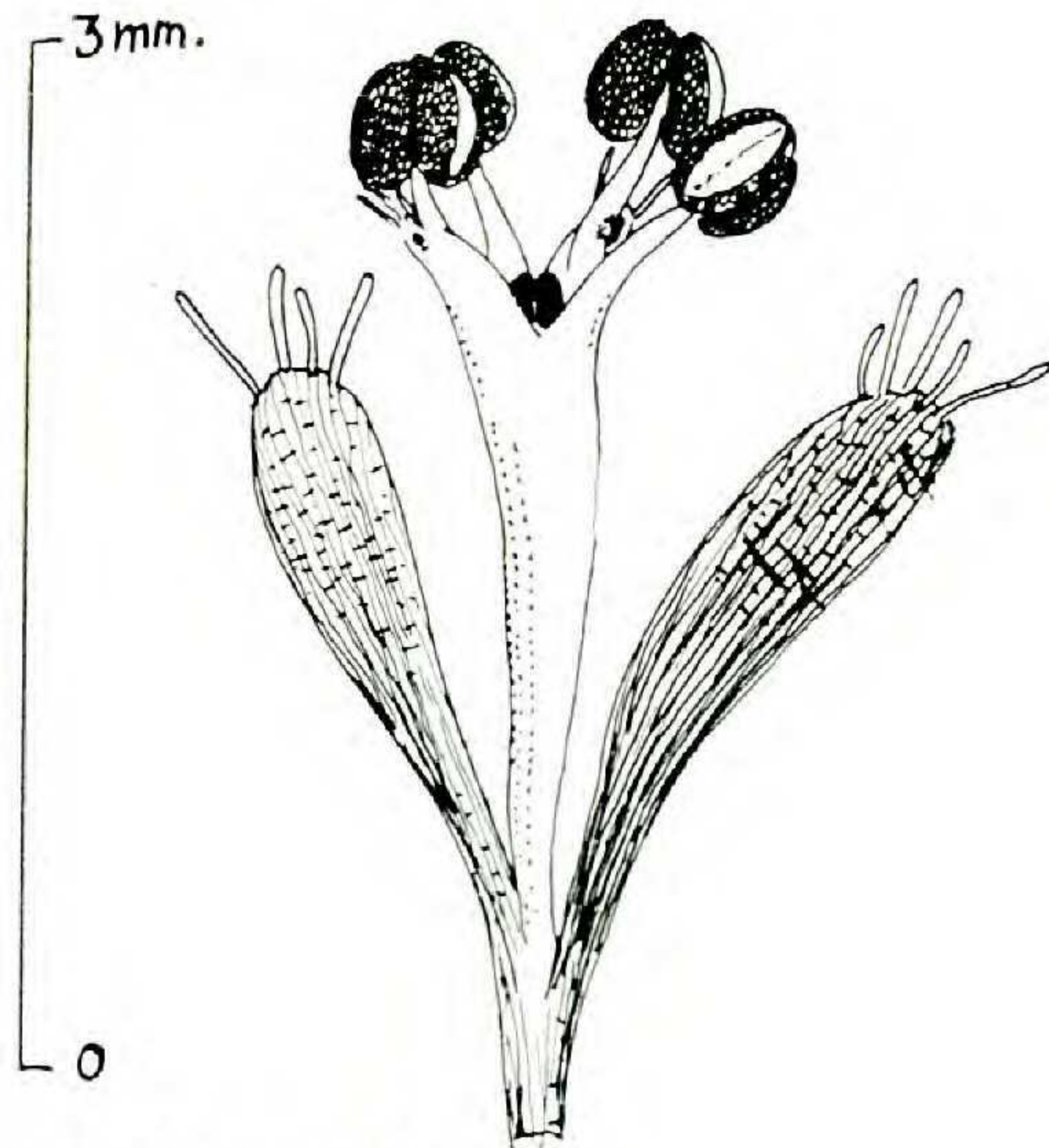
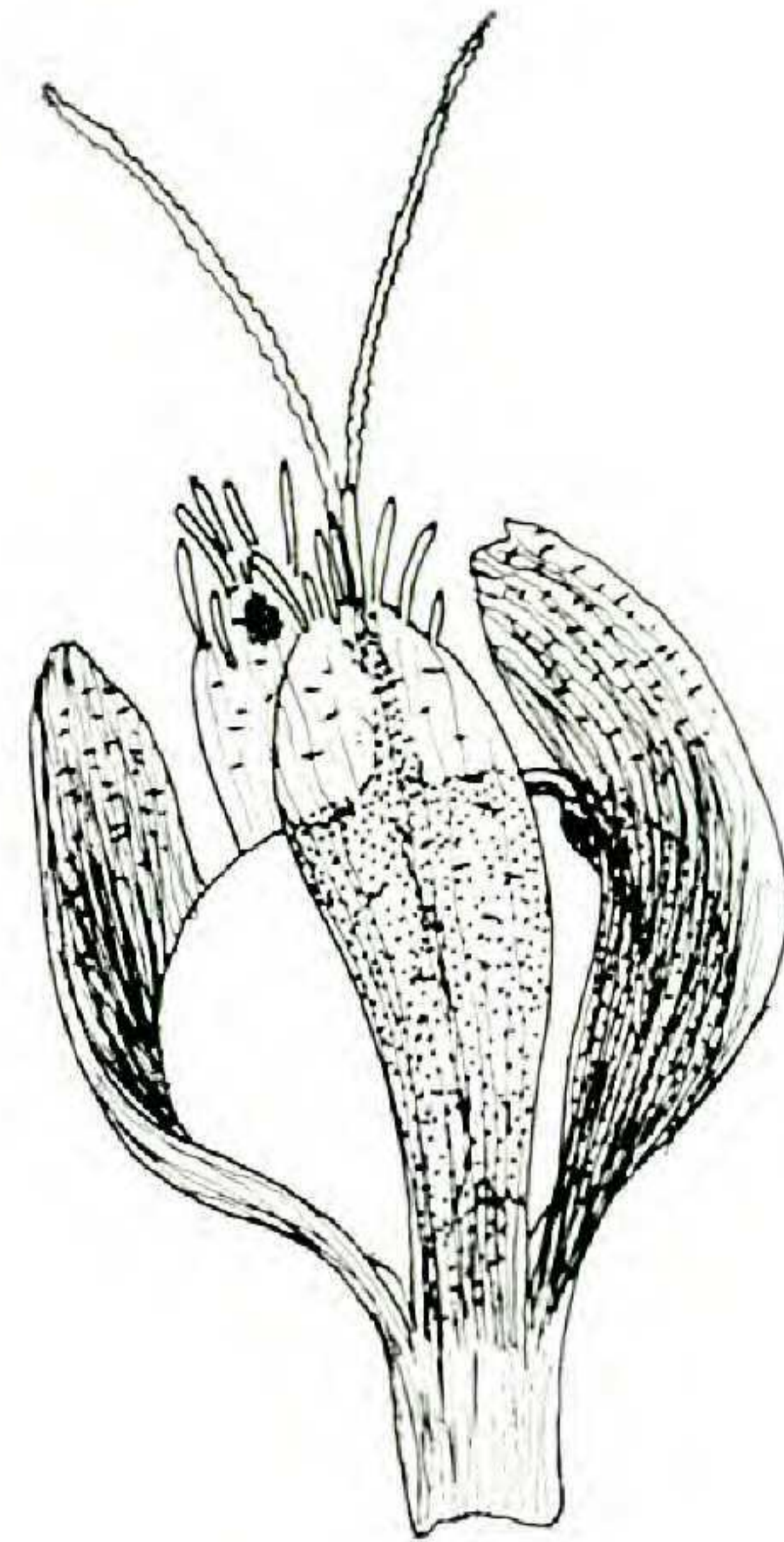
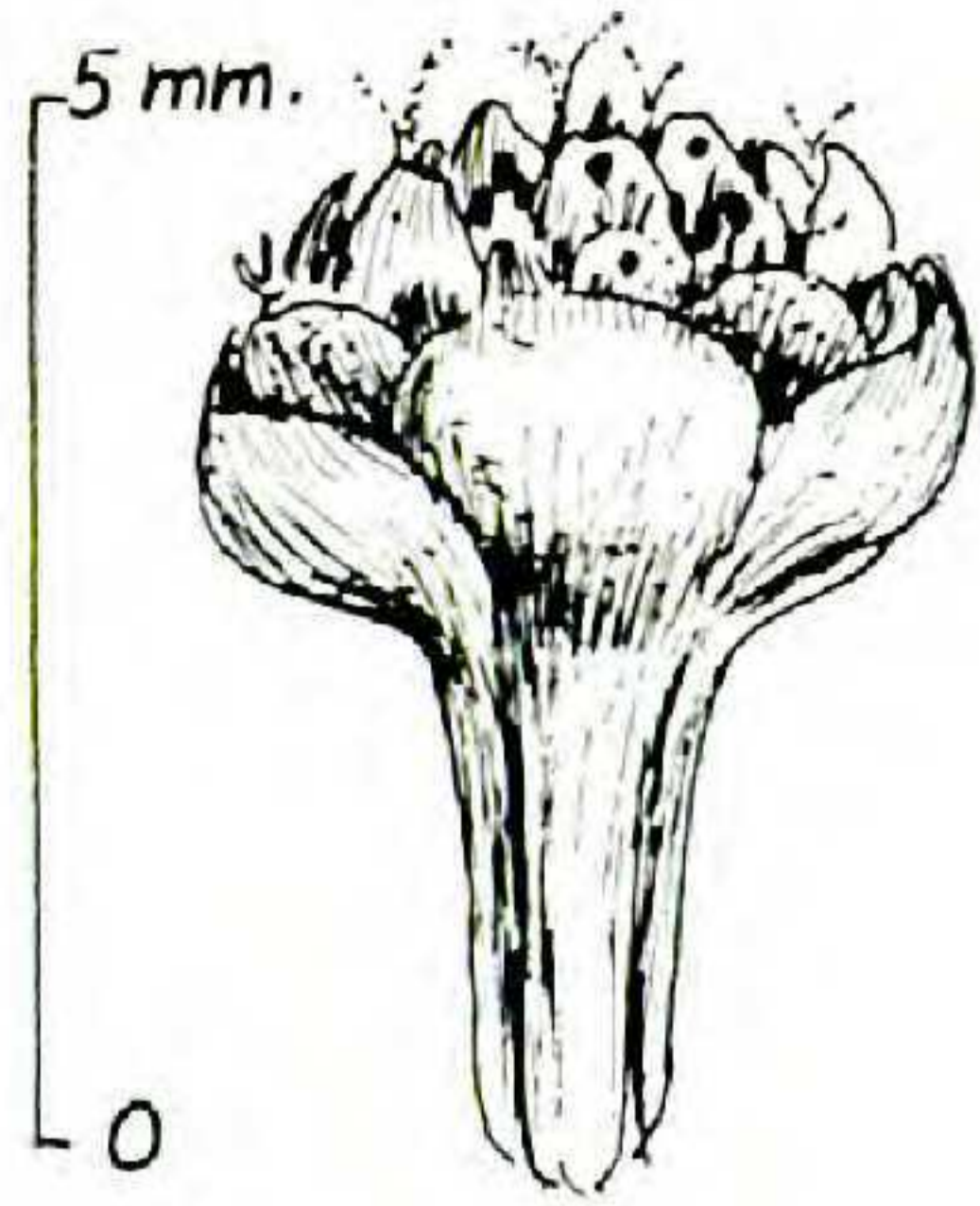
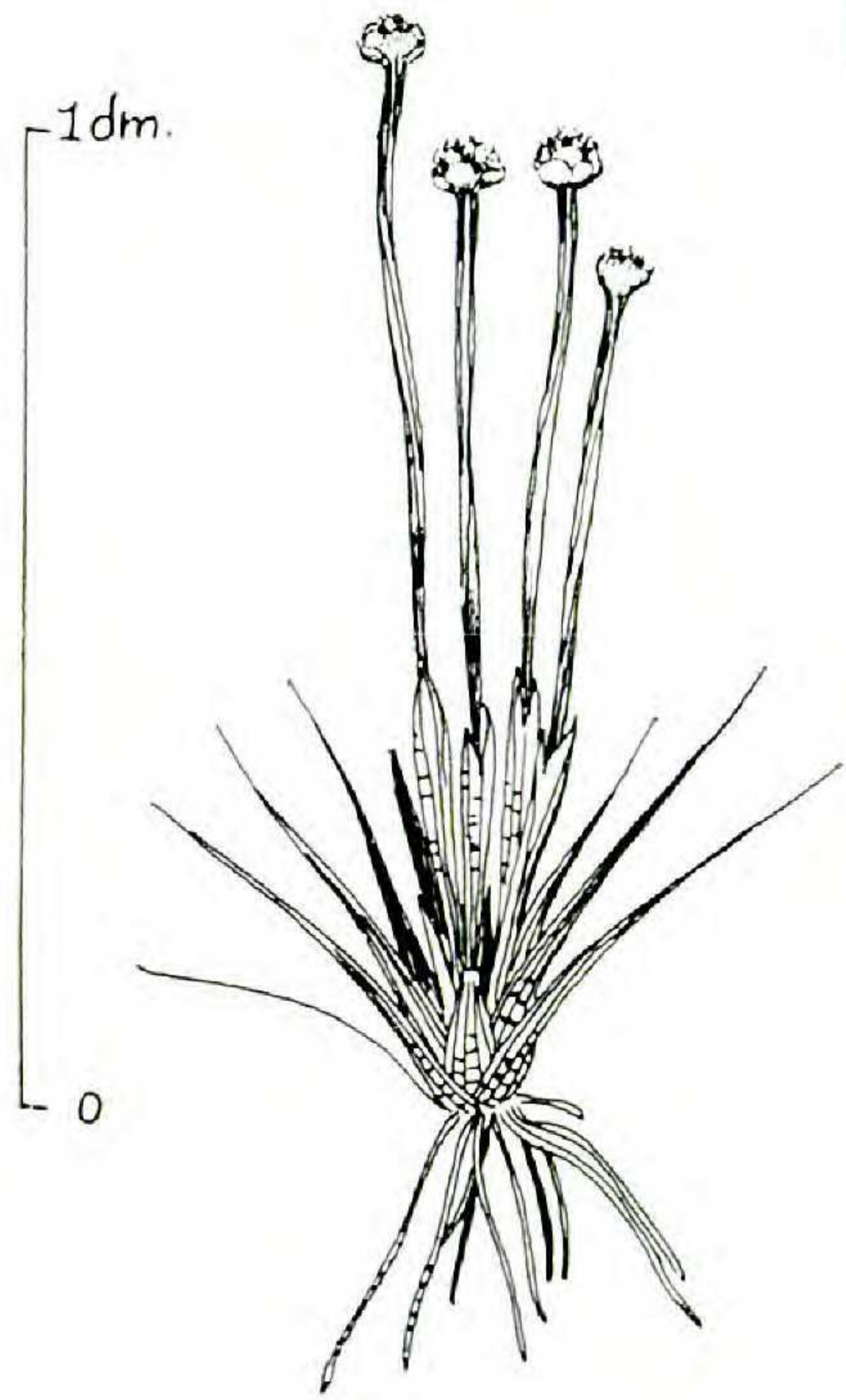
above, the two corolla lobes very small, pale, scale-like, with inconspicuous glands; anthers 4, round, black, about the same length as the filaments. Female flower: sepals narrowly oblong, narrowly cuneate, or linear, the apex acute to mucronate; petals narrowly cuneate or oblanceolate or oblong, acute, smooth or with a few trichomes on the inner surface or terminally, the glands inconspicuous; ovary on a short gynophore. Seeds dark brown, somewhat lustrous, broadly ellipsoidal, ca. 0.5 mm. long, irregularly alveolate, the individual alveolae mainly rectangular.

Mildly acid sandy pineland swamps, particularly on wet disturbed areas toward the Atlantic coast, eastern South Carolina south to Florida, west to Mississippi.

Type. Wet places, Northampton Field, St. John's, Berkeley Co., South Carolina, Ravenel. At NY.

Eriocaulon ravenelii appears to be one of the rarer species of Eriocaulaceae of the southeastern United States; at least it is scarce in the larger collections. However, it is locally abundant in the lower peninsula of Florida, generally being found on sweeter soils than those occupied by the other Eriocaulons of the area. I have seen it in but three localities and in each case it was growing on moist exposed pine flatwoods sands bordering *Typha-Cladium-Spartina* marsh near the Florida coast. It actually seems to occupy the ecotone between the two abovementioned vegetational types. It comes in quickly on disturbed sands or sandy peats but appears not to compete well with the grasses and sedges which also rapidly invade such areas; therefore it does not persist long on a site. It appears to be most abundant on intermittently but shallowly flooded sands and, where I have seen it, is associated with such herbs as *Cyperus flavescens*, *C. haspan*, *C. odoratus*, *C. polystachos* var. *texensis*, *Lipocarpa maculata*, *Hemicarpha micrantha*, *Eleocharis albida*, *E. geniculata*, *E. atropurpurea*, *Fimbristylis caroliniana*, *F. diphylla*, *F. schoenoides*, *Rhynchospora inundata*, *R. microcarpa*, *R. schoenoides*, *R. tracyi*, *Dichromena colorata*, *Fuirena breviseta*, *F. scirpoidea*, *Psilocarya nitens*, *P. schiediana*, *Panicum hemitomom* (and several *Dichanthelium panicums*), *Manisuris rugosa*, *Juncus megacephalus*, *J. scirpoides*, *Asclepias lanceolata*, *Proserpinaca pectinata*, *Amannia latifolia*, *Lythrum lanceolatum*, *Rhexia cubensis*, *Sabatia grandiflora*, *Hydrolea corymbosa*, *Litrisa carnosus*, *Liatris garberi*, *Flaveria linearis*, *Coreopsis leavenworthii* and *Cacalia lanceolata*, etc. Even when present in abundance *E. ravenelii* is seldom conspicuous, being a low plant and lacking the startling white masses of trichomes possessed by some of the other Eriocaulons. Both in habit and in its ecology it appears to be very similar to *E. parkeri*, a coastal species further north, this fact commented on sometime ago by B. L. Robinson (1903).

While all descriptions of this species contain no definitive statement



Eriocaulon parkeri

about trichomes, there are some examples in which a very few trichomes are present on bractlets and perianth parts. When such do appear, they are similar in shape, size and colour to those of *E. lineare*.

2. ERIOCAULON PARKERI B. L. Robinson, Rhodora 5: 175. 1903.

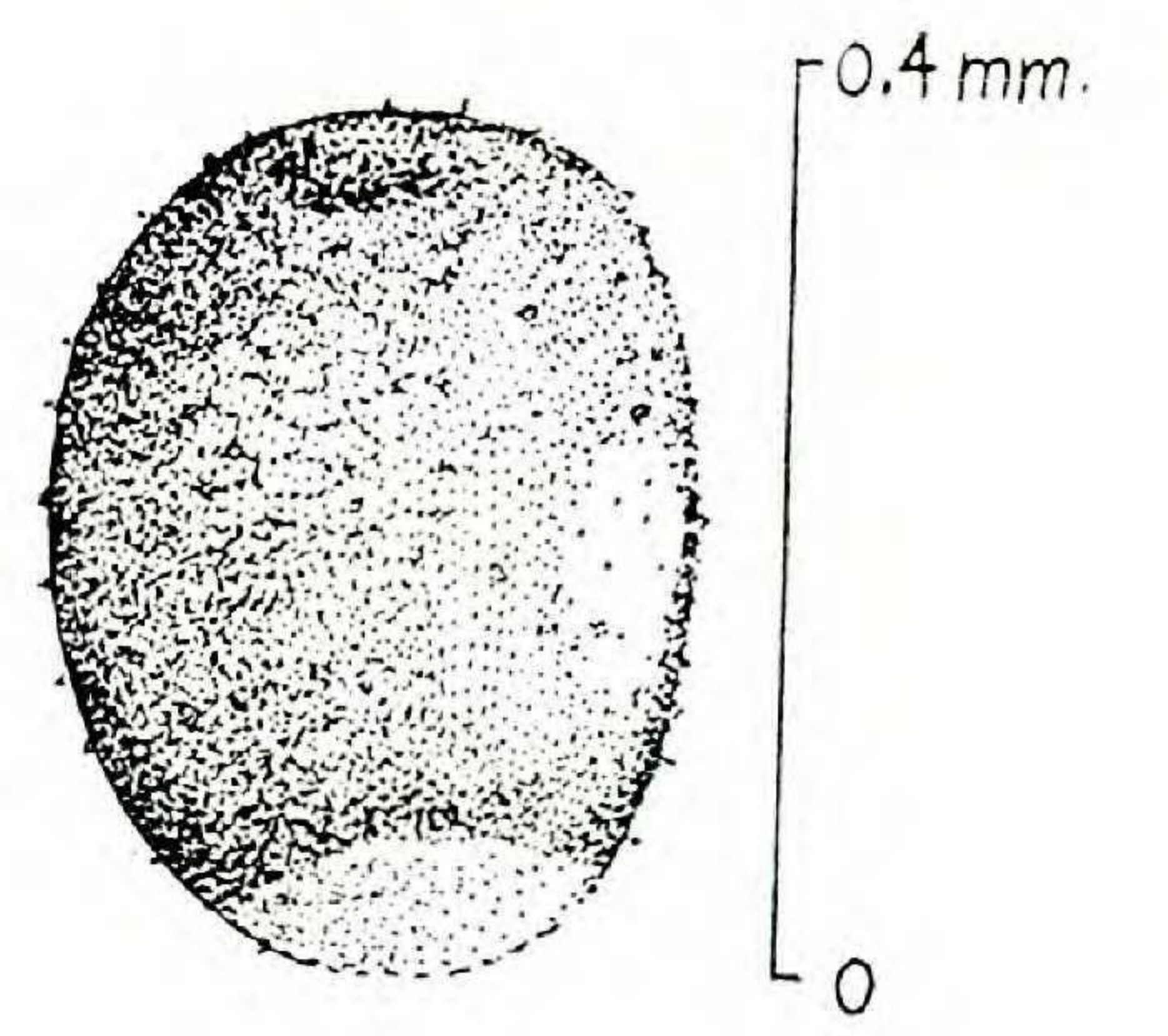
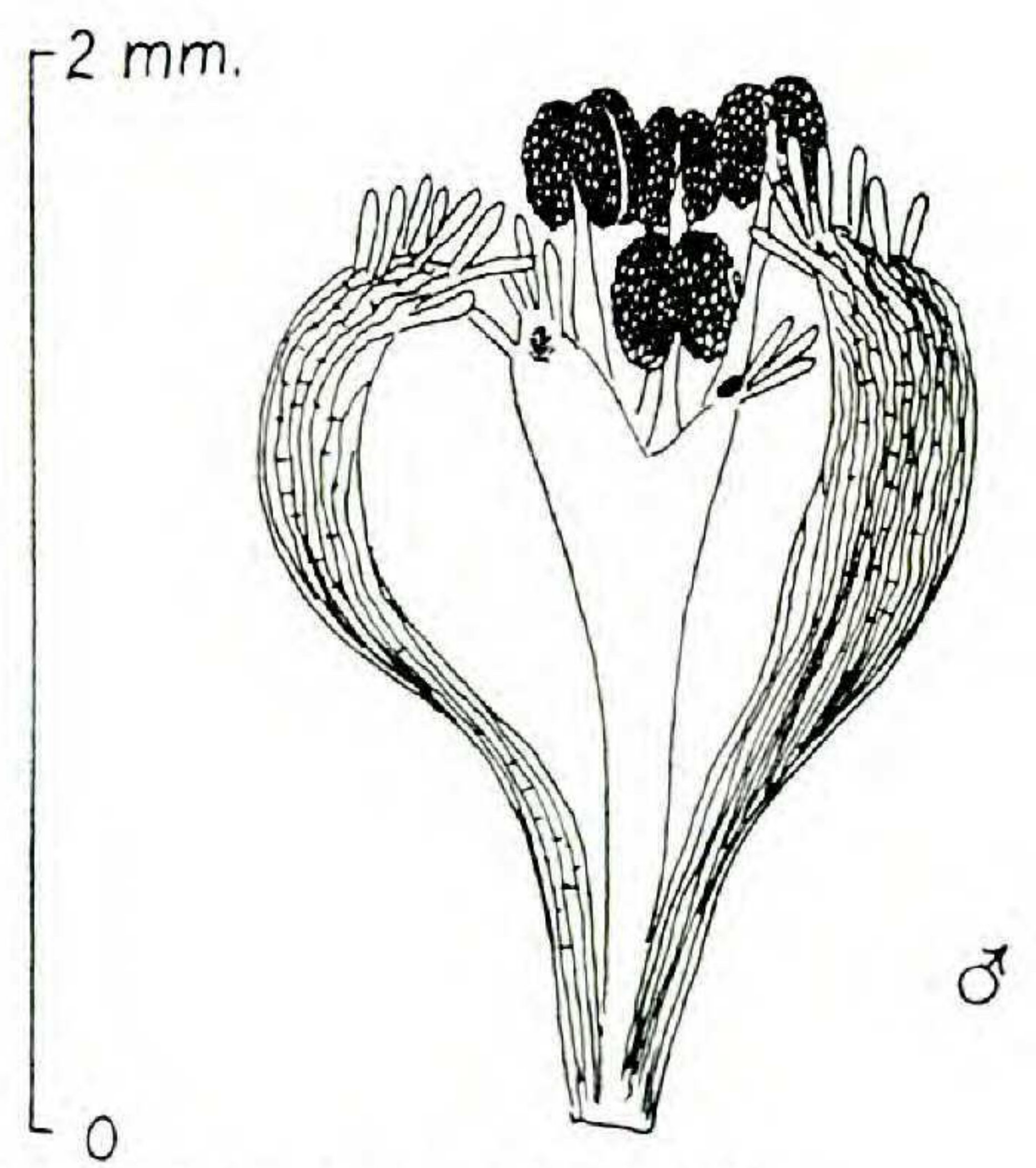
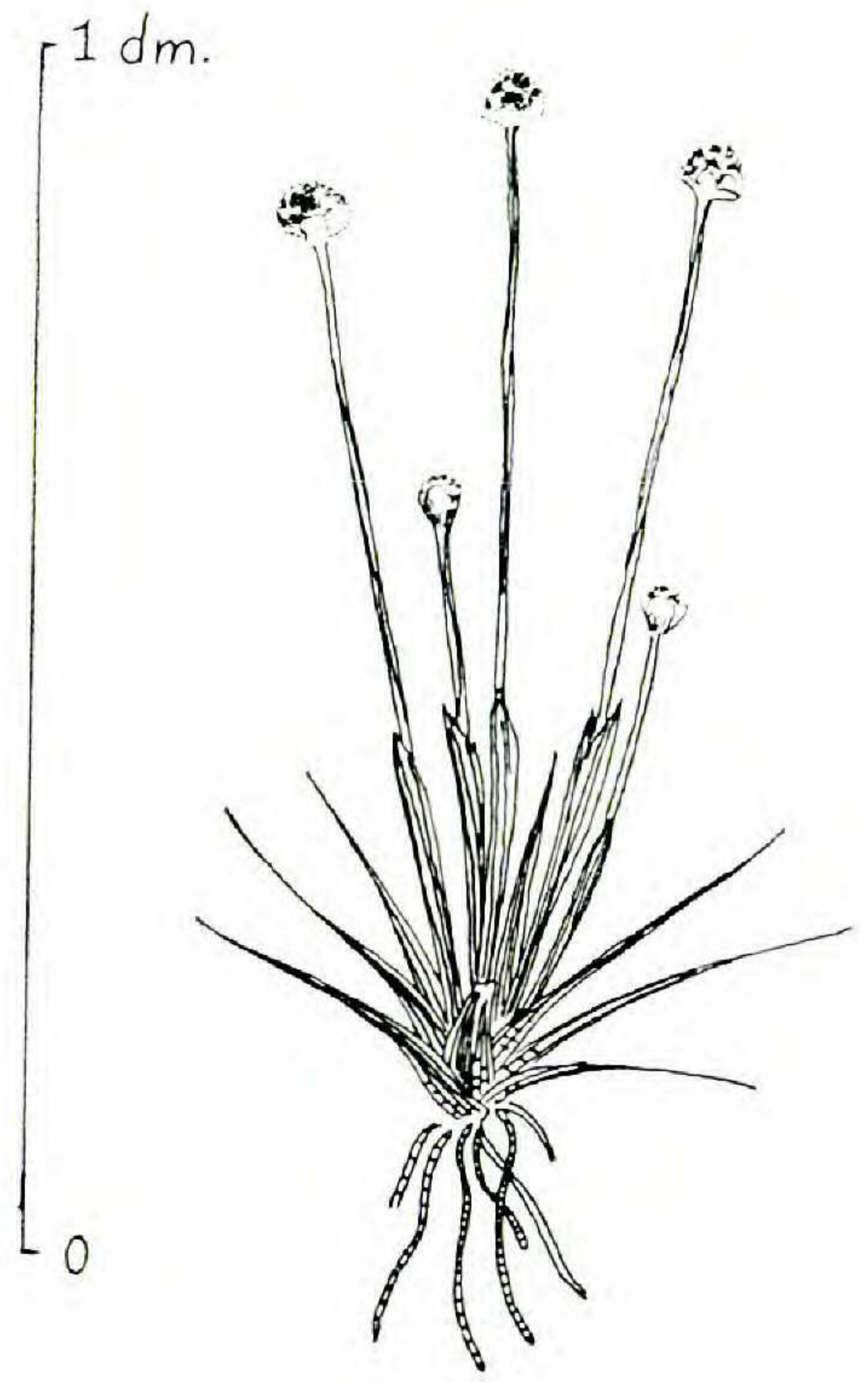
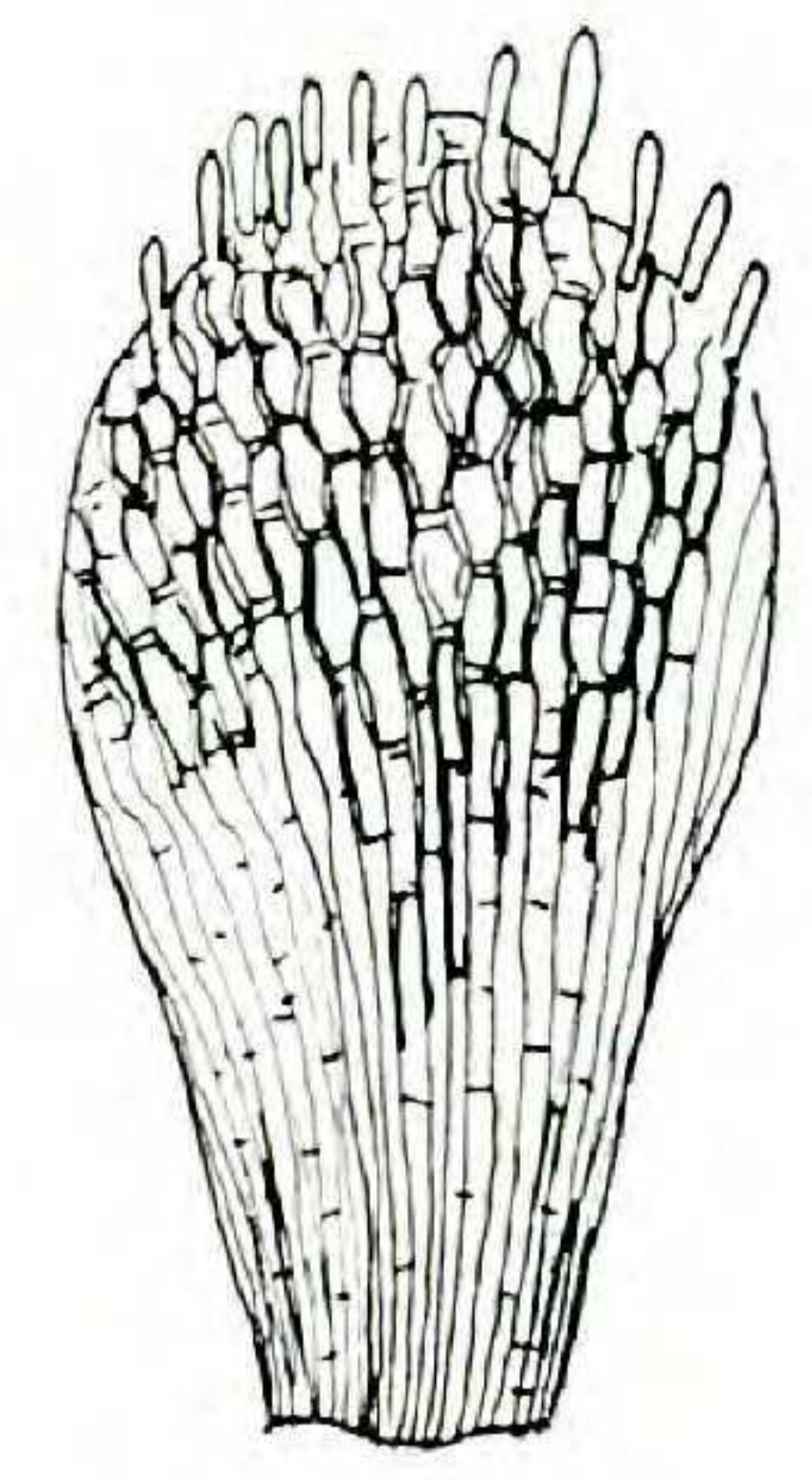
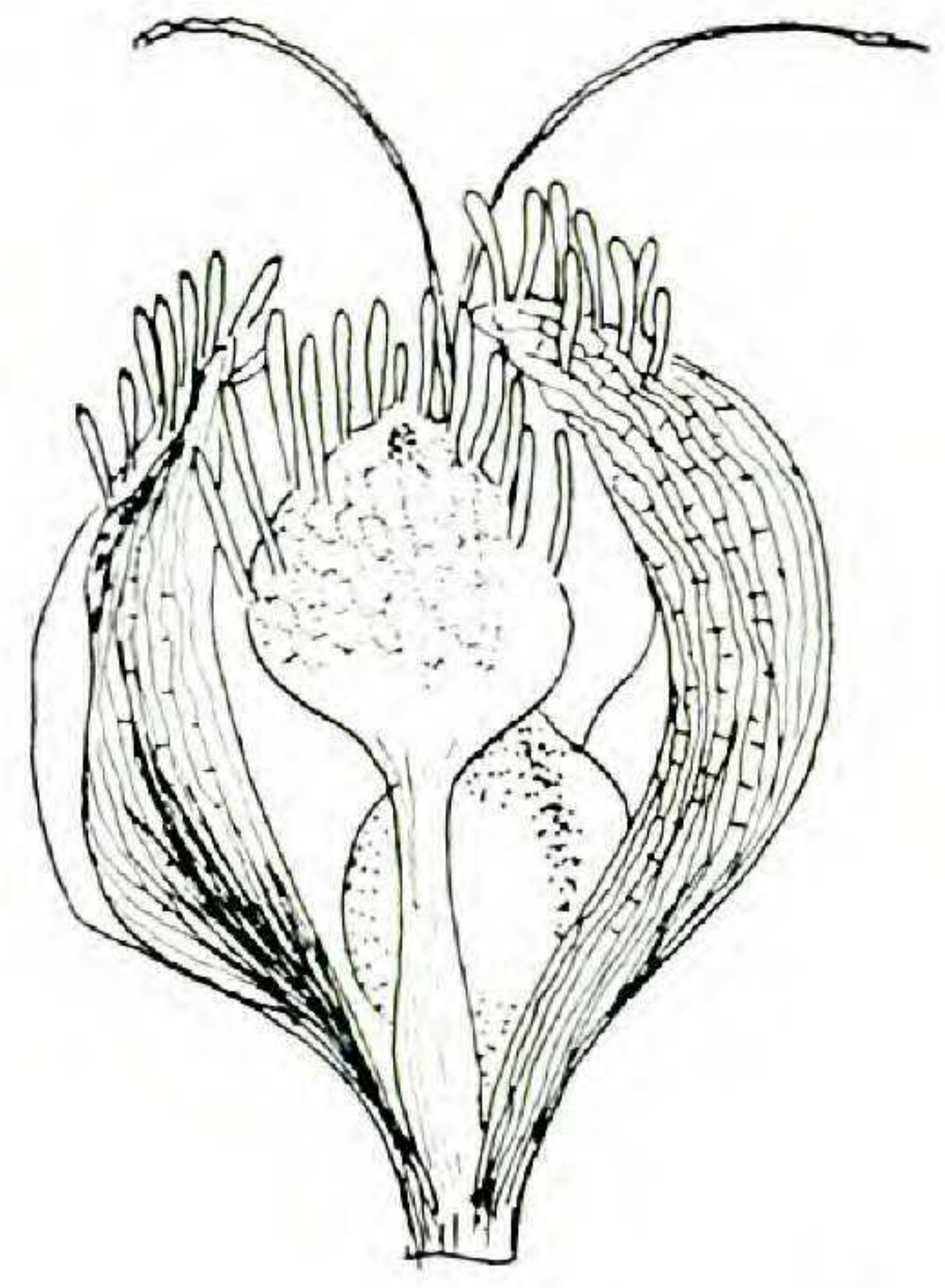
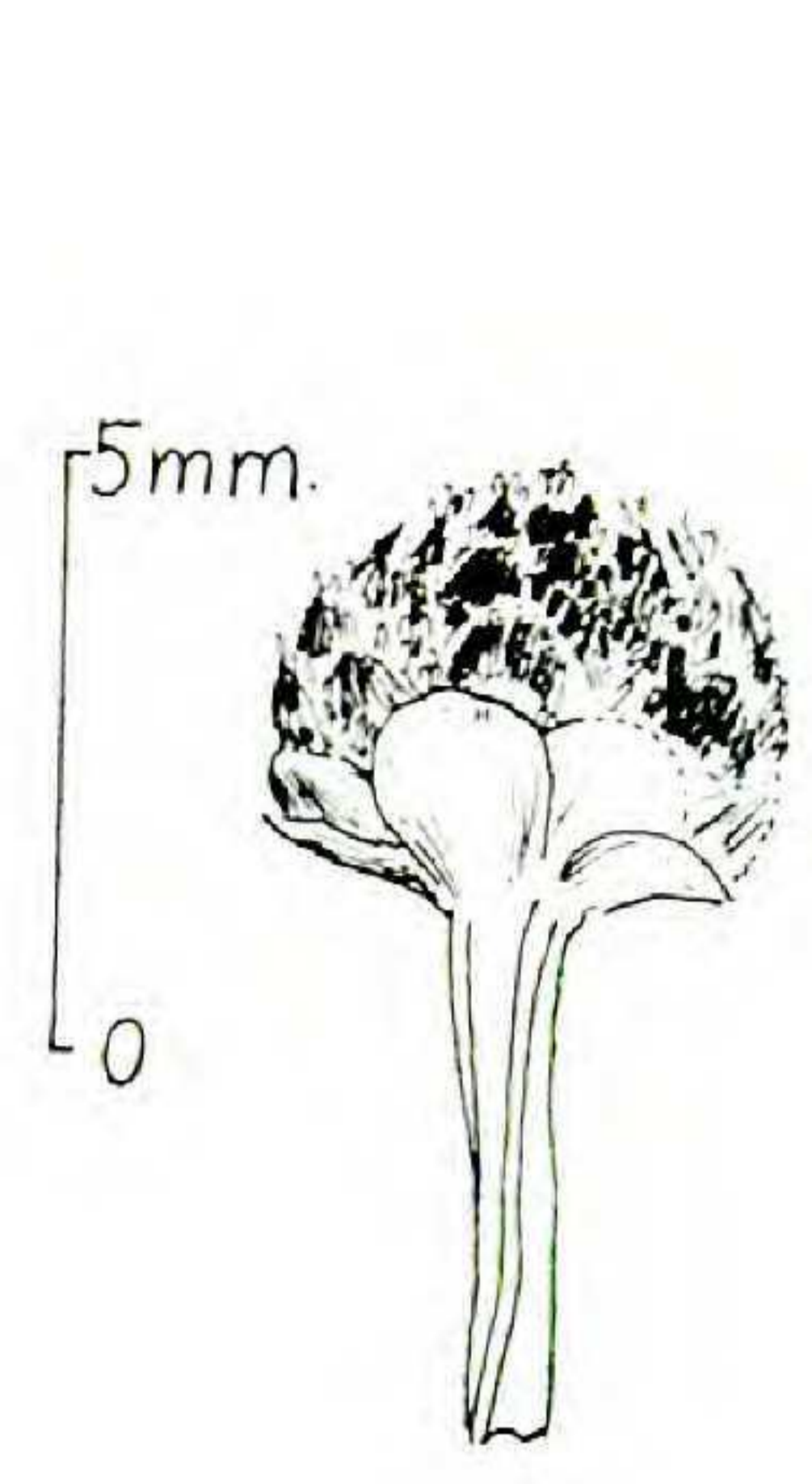
Low plants, solitary or in small tufts from short lateral offshoots. Leaf linear attenuate, 2-6 cm. long, tapering to a filiform-terete tip, pale green. Sheath of the scape somewhat shorter than to the same length as the leaves, inflated, bifid-acute. Mature scape filiform, to 30 cm. long, ca 1 mm. broad, very slightly twisted, 4-5 ridged. Mature heads hemispherical, dull gray or stramineous, 3-4 mm. broad. Outer involucrel bract ovate to suborbicular or obovate, ca. 2 mm. long, scarious, stramineous to lead coloured, glabrous. Inner involucrel bract cuneate to narrowly obovate, ca 2 mm. long, acute, gray-scarious, translucent, smooth or with white-clavate trichomes on the back of the apex. Surface of the receptacle of the head smooth. Male flower: sepals linear-curved, keeled, ca. 2 mm. long, gray, translucent, smooth or with a few white trichomes on the back apically; petals fused into a narrowly obcylindrical, yellowish-white, tube, the corolla lobes reduced to 2 very small triangular, white-hairy appendages. Female flower: sepals oblong or oblanceolate, ca. 2 mm. long, curved keeled, gray, translucent; petals about the length of the sepals, spatulate, yellowish-white, smooth or with a very few white-clavate hairs apically and on the inner surface. Seeds ovoid, ca. 0.5 mm. long, rarely to 0.7 mm. long, the base truncate, reddish-brown, with a very delicate reticulum of horizontally oriented rectangles.

Muddy tidewater riverbanks, southeastern Canada to eastern North Carolina.

Type. Shore of Delaware River near Cooper's Creek, New Jersey, T. P. James. At GH.

This species has been most often confused with *E. septangulare* but may be distinguished from it by the following criteria:

- a. Scape tending to be straight rather than twisted, and with fewer ridges.
- b. Head narrower (seldom more than 0.4 mm.), hemispherical, the outer involucrel bracts a very pale, dull-gray or stramineous, in contrast to the broader, when mature subglobose, heads of *E. septangulare* the outer involucrel bracts of which are much darker and more lustrous.
- c. Bracts and perianth parts sparingly clavate-hairy, often some perianth parts smooth, in contrast to the more pubescent perianth and bractlets of *E. septangulare*.
- d. Involucrel bracts tending to remain ascending even on the fruiting heads, thus mainly concealing the bractlets and florets while, on *E. septangulare*, the involucrel bracts tend to be reflexed in the



Eriocaulon kornickianum

flowering and fruiting heads and are themselves partly concealed by the hairy florets.

3. *ERIOCAULON KORNICKIANUM*, Van Heurck & Muell.-Arg. in Van Heurck, Obs. Bot. 101. 1870.

Solitary or in small tufts, reproducing vegetatively by short lateral offshoots. Leaf pale green, very thin, linear-attenuate, 1-5 cm. long, tapering evenly from a thin, pale, aerenchymatous base, the margin slightly incrassate. Sheath of the scape about the length of most of the leaves (ca. 2-3 cm.) loose, somewhat inflated and scarious above, bifid. Mature scape filiform, 5-8 cm. long, about 0.5 mm. broad, twisted, 3-4 ridged. Mature head subglobose or short-oblong, 3-0-4.0 mm. broad, dark gray or gray-green save for pale "rims" of the white-ciliate perianth parts and bracts and the pale, scarious, outer bracts. Outer involucral bracts broadly oblong to suborbicular, reflexed at maturity, 1.0-1.25 mm. long, smooth, very thin, stramineous, translucent, the apex rounded. Receptacular bractlet oblong to cuneate, ca. 1.5 mm. long, gray or gray-green, acute to obtusely angled, translucent, acute to obtusely angled, concave and unequilaterally keeled, smooth save for a scattering of white, clavate, trichomes along the somewhat erose upper margin. Surface of the receptacle of the head smooth. Male flower: sepals linear-curved, concave, ca. 1 mm. long, grayish-translucent, with a few white, clavate, trichomes on the backs apically. Corolla members subequal, yellowish, primarily consisting of a narrowly obpyramidal androphore which terminates in two low, glanduliferous, tooth-like lobes whose apices have a few white-clavate trichomes. Female flower: sepals linear-curved, ca. 1 mm. long, gray-translucent save for the pale, clawed bases, smooth or with a scattering of hairs on the backs apically; petals spatulate, curved, the blades broadly rhombic and opaque, the bases clawed, ca. 1 mm. long or slightly longer, yellowish-white, the inner surface and upper margin with white-clavate trichomes. Seeds broadly ovoid, ca. 0.5 mm. long, deep reddish brown, the surfaces papillate or rugose.

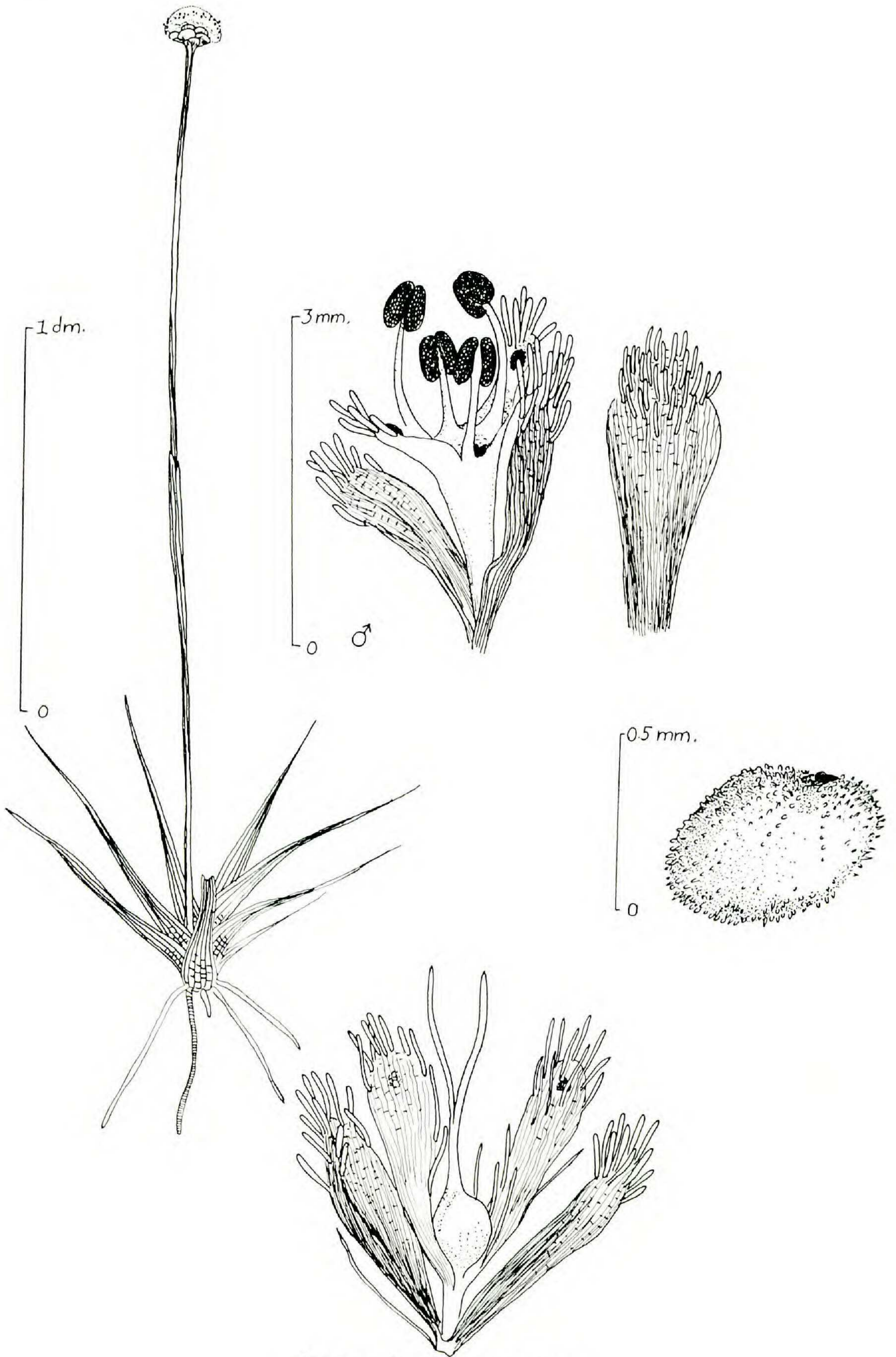
Upland seepage areas and bogs, from the Interior Highlands (Magazine Mt., Arkansas) south and west to Oklahoma and Texas.

I have never seen living examples of this apparently rare, diminutive, *Eriocaulon*. Superficially it is closest to *E. ravenelii* of the eastern Coastal Plain, differing from it primarily in its smaller stature, its trichomiferous bractlets and perianth parts, and its smaller, rugose rather than alveolate, seeds.

4. *ERIOCAULON COMPRESSUM* Lam., Encycl. 3: 276. 1789.

Eriocaulon gnaphalodes Michx. Fl. Bor. Am. 2: 165. 1803.

Perennial, flaccid-leaved, sometimes tufted, reproducing vegetatively either by short lateral offshoots or by pale, short rhizomes or by leafy stolons (stolons most often produced in summer). Leaves pale green,



Eriocaulon compressum

linear-attenuate, 5.0-30.0 cm. long, tapering rather evenly from the broad (1.0-4.0 cm.) pale, evidently lacunate, base, smooth. Mature scapes usually solitary, 20.0-70.0 cm. long, pale green, 1.0-3.0 mm. broad just below the head, glabrous, twisted, with several ridges, the tissue of the grooves very evidently lacunary. Sheath of the scape very loose, usually longer than the mature leaf, slightly flaring above toward the bifid, acute or acuminate apex. Mature head hemisphaerical or globose, 1.0-2.0 cm. broad, soft, tending to contain flowers of but one sex, chalk-white save for the dark gray or almost blackish exerted tips of the receptacular bracts and anthers. Receptacle of the head with multicellular, narrow, translucent trichomes. Outer involucre bracts grayish-translucent (sometimes the very outermost flavescent), 2-3 mm. long, broadly ovate or oblong or elliptic, the tips rounded or obtusely angled, frequently squarrose; bracts within the inflorescence (receptacular bractlets) a dark gray, 2-3 mm. long, spatulate-linear or oblong, acute with clavate white trichomes on the dorsal apical surface. Male flower: sepals separate, translucent, linear or linear-spatulate, smooth and pale basally, the apex acute to acuminate, with a scattering of white, clavate trichomes on the back; corolla tube clavate, with 2 unequal oblong lobes, the larger of which has an apical fringe of white clavate trichomes and the smaller of which is either smooth or with a very few clavate trichomes on the tip; stamens 3 or 4, the anthers black, ca. 0.5 mm. long, on filaments of unequal lengths but usually slightly exerted at anthesis; central glands (staminodia?) 3 or 4, sessile or short-stalked, short-oblong, black, slightly shorter than the anthers. Female flowers: sepals oblong-spatulate, acute, translucent but dark, the outer and inner surfaces smooth or hairy, the inner hairs long, multicellular, transparent, the outer ones (particularly toward the sepal tip) clavate, white; corolla tube short, the two petal lobes subequal, oblong-spatulate, acute, pale, translucent, the inner surface with long, filiform, multicellular clear trichomes, the outer surface with white, clavate, trichomes, particularly toward the apex. Seeds broadly ovoid to almost as broad as long, ca. 0.5 mm. long, slightly compressed, a dark and lustrous brown, the surface sometimes echinate.

Sands or sandy peats of shallow pineland ponds, lakeshores, seepage bogs, savannas, ditches or low flatwoods, coastal plain, eastern Texas e. to Florida and n. to New Jersey.

Type. South Carolina, Fraser. (At P?).

In stature and habit *E. compressum* somewhat resembles *E. decangulare*, a tall summer and fall flowering *Eriocaulon*, but differs from it in having a more spongy foliage, softer heads, a less-hairy receptacle, and darker coloured bracts the tips of which are acute or rounded rather than acuminate. In fact, it is closest in appearance to a shorter plant, *E. lineare*, which also has soft, white, usually hemisphaerical heads, but

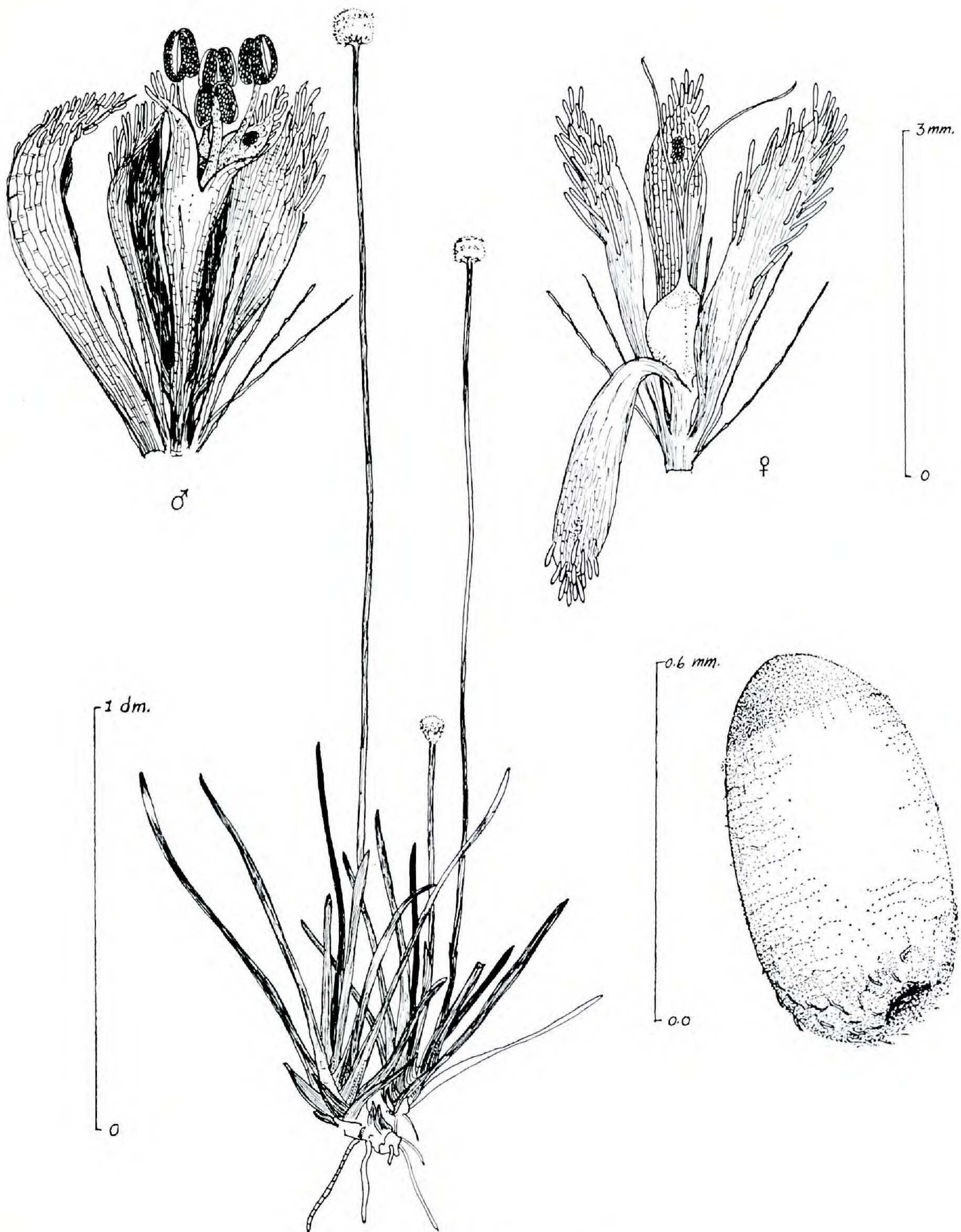
differs from that species in having larger, often unisexual (rather than bisexual) heads, the receptacular surfaces of which have at least sparse hairs (those of *E. lineare* are smooth). Also, the surface of the seed of *E. compressum* is smoothish while that of the seed of *E. lineare* is indistinctly cancellate, sometimes papillate.

This is perhaps the showiest of all the Eriocaulaceae of the southeastern United States, in springtime so abundantly decorating the shallow waters of pinelands as to appear like a shower of white confetti.

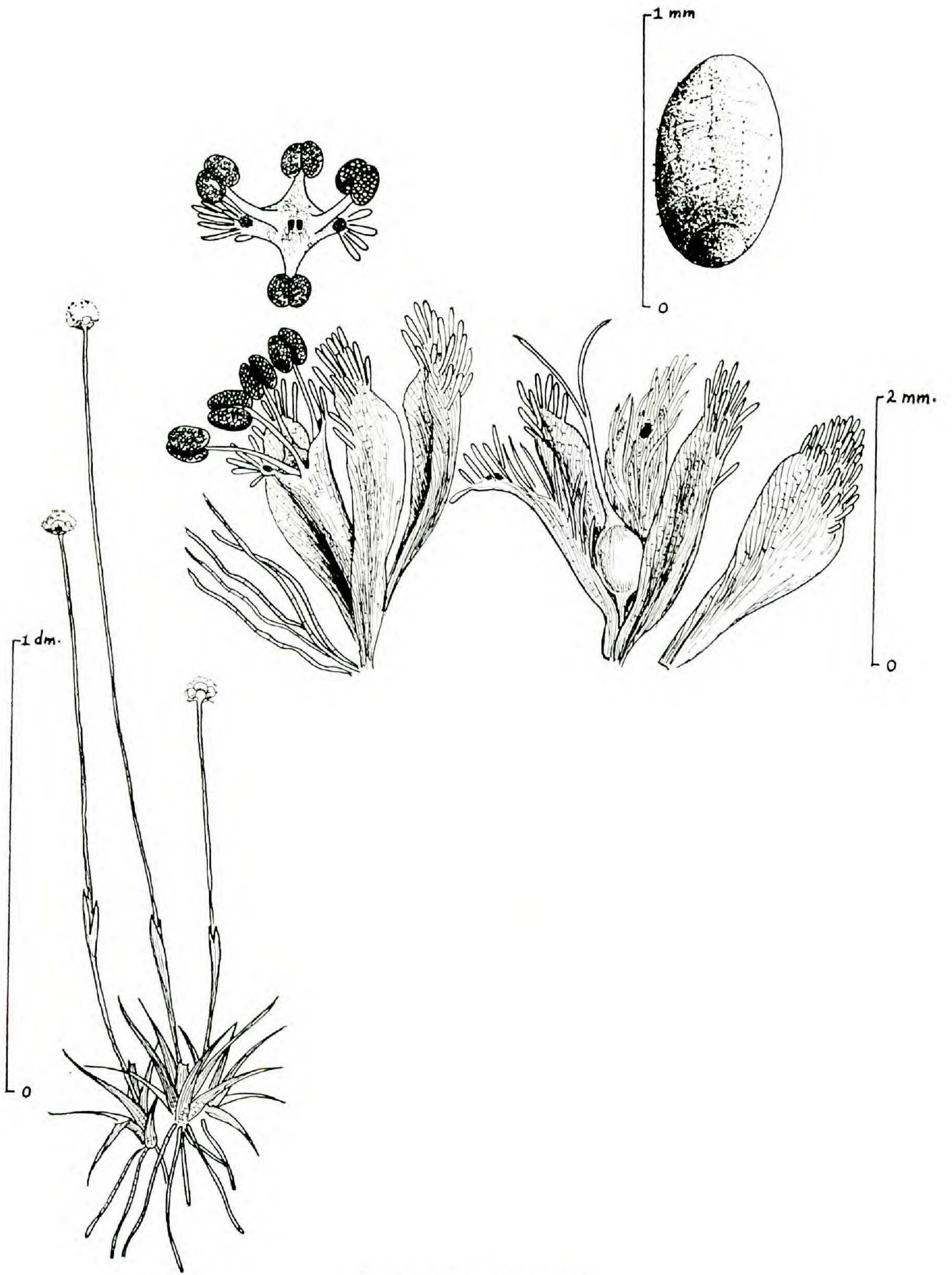
5. ERIOCAULON DECANGULARE L., Sp. Pl. 87. 1753.

Eriocaulon serotinum Walt., Fl. Car. 83. 1788.

A clump former, but reproducing vegetatively either by short lateral offshoots or by very stout, branching rhizomes. Leaf linear-attenuate to linear-acute (the wetter the site, the greater the taper), 10.0-40.0 cm. long, smooth, a rich green, tapering evenly from the broad (1.0-4.0 cm.) pale green or yellowish, spongy, translucent base into a narrow but blunt, sometimes callused, tip. Sheath of the scape loose, shorter than the leaves, flaring slightly toward the bifid orifice (which, when young, is oblique and acute). Mature scape 30.0-110.0 cm. long, 1.0-3.0 mm. broad just below the head, twisted, with several (8-12) pale green ridges, the grooves a paler green and narrower than the ridges. Mature head subglobose, 1 to 2 cm. broad, hard (little compressed in pressing), a dull white, the lowermost flowers and bractlets reflexed, thus obscuring the subtending involucre bracts. Surface of the receptacle villous, the trichomes long and multicellular, usually clear. Outer involucre bracts narrowly ovate to lanceolate, 2.0-4.0 mm. long, stramineous, acute, with clavate white hairs on the backs apically. Bracts of the receptacle linear to oblong-lanceolate, 3.0-4.0 mm. long, pale, narrowly acute to acuminate, sometimes exserted enough to give the head a slightly echinate appearance, with clavate white hairs on the backs or glabrous at the exserted tips. Male flower: sepals linear, about 3.0 mm. long, yellowish-white, translucent, slightly curvate, narrowly keeled, the keel and apex with white-clavate trichomes the basal cells of which are clear; petals fused into an elongate tube $\frac{2}{3}$ the length of the sepals but produced ultimately into 2 triangular or linear lobes about 1 mm. long, translucent, whitish-yellow; each bearing a small tuft of white and clavate hairs on the back apically; anthers broadly ellipsoidal, exserted on filaments about 3 mm. long. Female flower: sepals linear, 2.0-3.0 mm. long, keeled, yellowish-white, slightly curvate, acute, clavate-hairy on the backs toward the apices; petals spatulate or with narrowly elliptic blades on claws about half the length of the blades, pale, glabrescent or with long clear hairs on the backs basally, short-clavate hairs on the backs terminally; seeds ellipsoidal, 0.75-1.0 mm. long, very finely cancellate or sometimes the cancellate concealed by rows of delicate subappressed hairs.



Eriocaulon decangulare



Eriocaulon texense

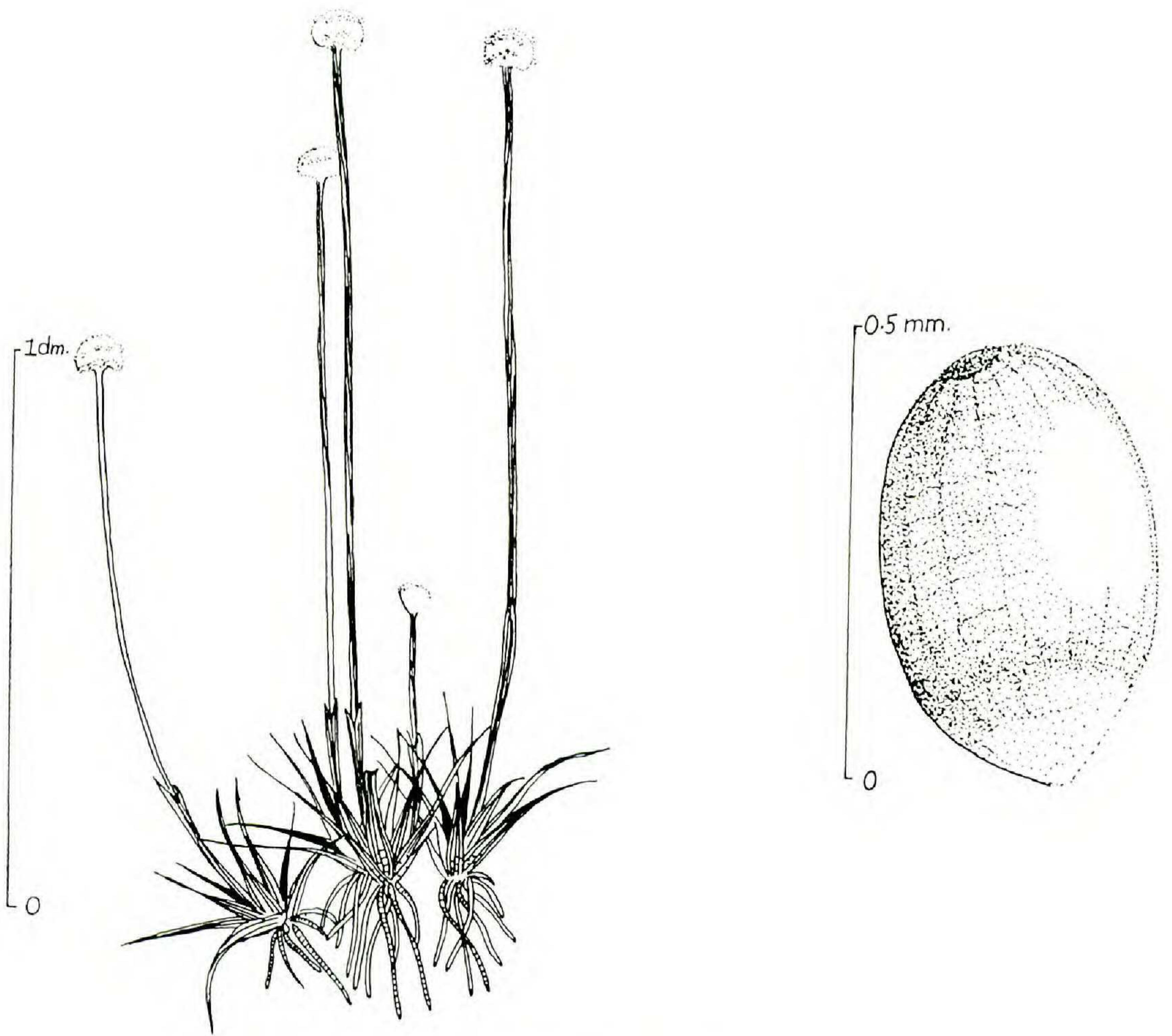
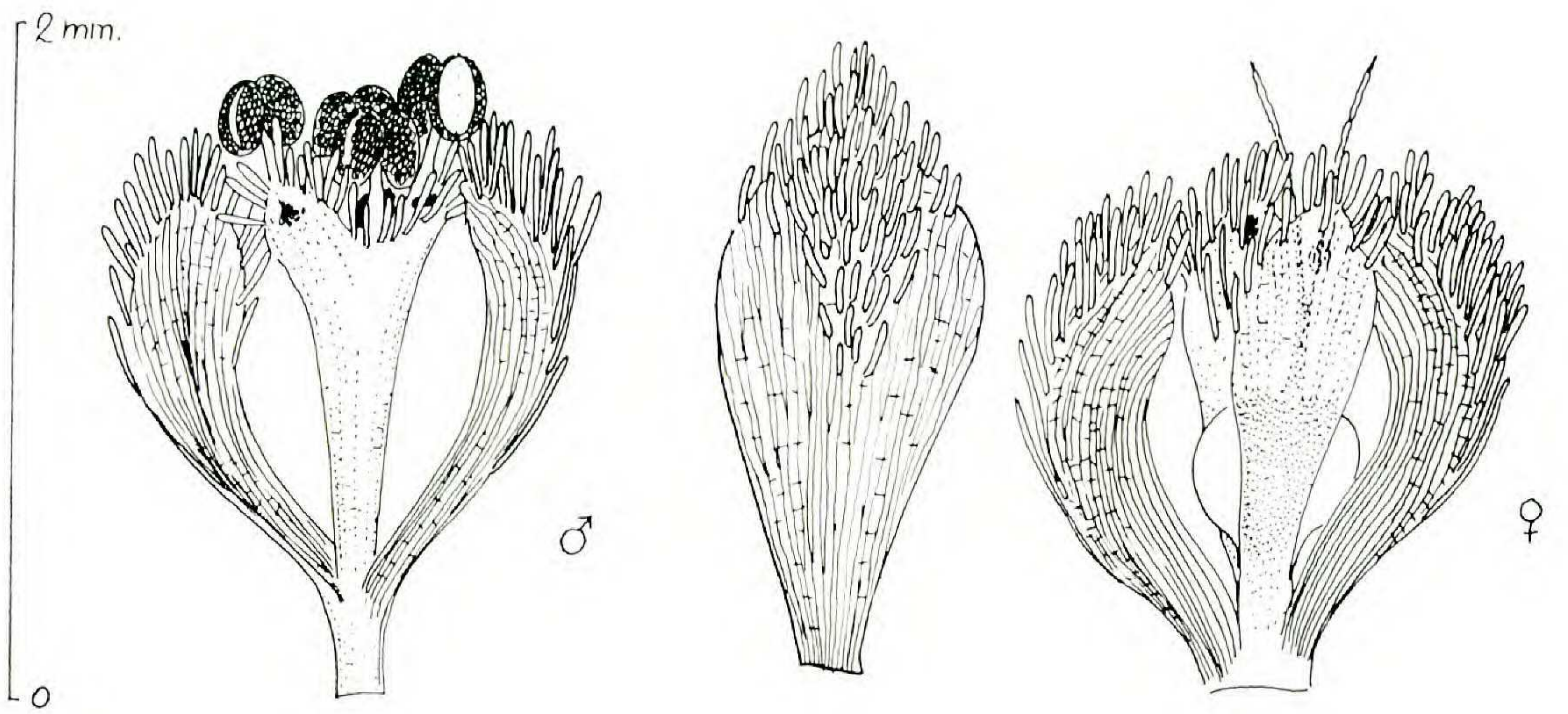
Sandy or peaty lakeshores, pine flatwood, ditches, margins of cypress domes, or savannas, primarily in the coastal plain, Florida north to New Jersey, west to eastern Texas.

Type. In Swamps, North America. Not seen by this writer.

This is the most robust of the Eriocaulons of the southern United States and it is certainly one of the more conspicuous floral elements in the midsummer and fall savannas, its white "buttons" providing a pleasing contrast in a sea of grass and sedge. It is also to be distinguished from sympatric Eriocaulons by its narrowly acute to acuminate receptacular bractlets, the pale tips of which are noticeably exerted from the heads, and by the firmer character of its foliage and inflorescences. The stature, leaf length and breadth, and the head size of *E. decangulare* all tend to be less as one travels west toward Texas or north along the Atlantic coastal plain. The largest examples of this species are to be found in northwest Florida (*E. decangular* L. var. *latifolium* Chapm. ex Moldenke).

6. ERIOCAULON TEXENSE Korn., *Linnaea* 27: 494. 1856.

A clump former, perennating by means of short lateral offshoots. Leaf pale green, linear-attenuate, 1.0-5.0 cm. long, tapering evenly from a fleshy, pale, often trichomiferous, aerenchymatous base, the inner surfaces often noticeably papillose. Sheath of the scape usually about the length of the leaf or somewhat longer (on drier sites very conspicuously longer), 3-5 cm. long, the orifice expanded oblique, bifid. Mature scape 5-30 cm. long, slightly twisted, 4-7 ridged. Mature head hemispherical, ca. 5 mm. broad, rarely subglobose, gray save for the white exerted trichomes of the bractlets and perianth parts and for the outer bracts of the involucre which are stramineous. Surface of the receptacle densely beset with long tapering, clear, sometimes exerted, multicellular trichomes. Outer involucral bracts suborbicular to broadly obovate, apiculate to rounded, ca. 1.5 mm. long, stramineous, smooth, scarious, reflexed at maturity and usually hidden by the florets, grading gradually into the dark gray, translucent, narrowly obovate to cuneate, acute, receptacular bractlets whose margins are ciliate, with white-clavate trichomes. Male flower: sepals 2, linear-spatulate, keeled, scarious, pale and translucent basally, dark gray and opaque apically, ca. 1.5 mm. long, acute, white-clavate-hairy on the backs and margins apically. Petals 2, largely fused into a clavate-cylindrical yellowish structure (the androphore), the base of which has long, tapering, transparent multicellular trichomes and apex of which is divided into 2 unequal, narrowly triangular lobes whose apices are primarily made up of clavate, white hairs. Anthers black, broadly ellipsoidal, ca. 0.5 mm. long, exerted at anthesis from the heads on yellowish filaments about 1.0 mm. long. Female flower: sepals narrowly oblong-obovate, ca. 1.5 mm. long, sharply curvate-keeled, dark gray, the backs white-clavate



Eriocaulon lineare

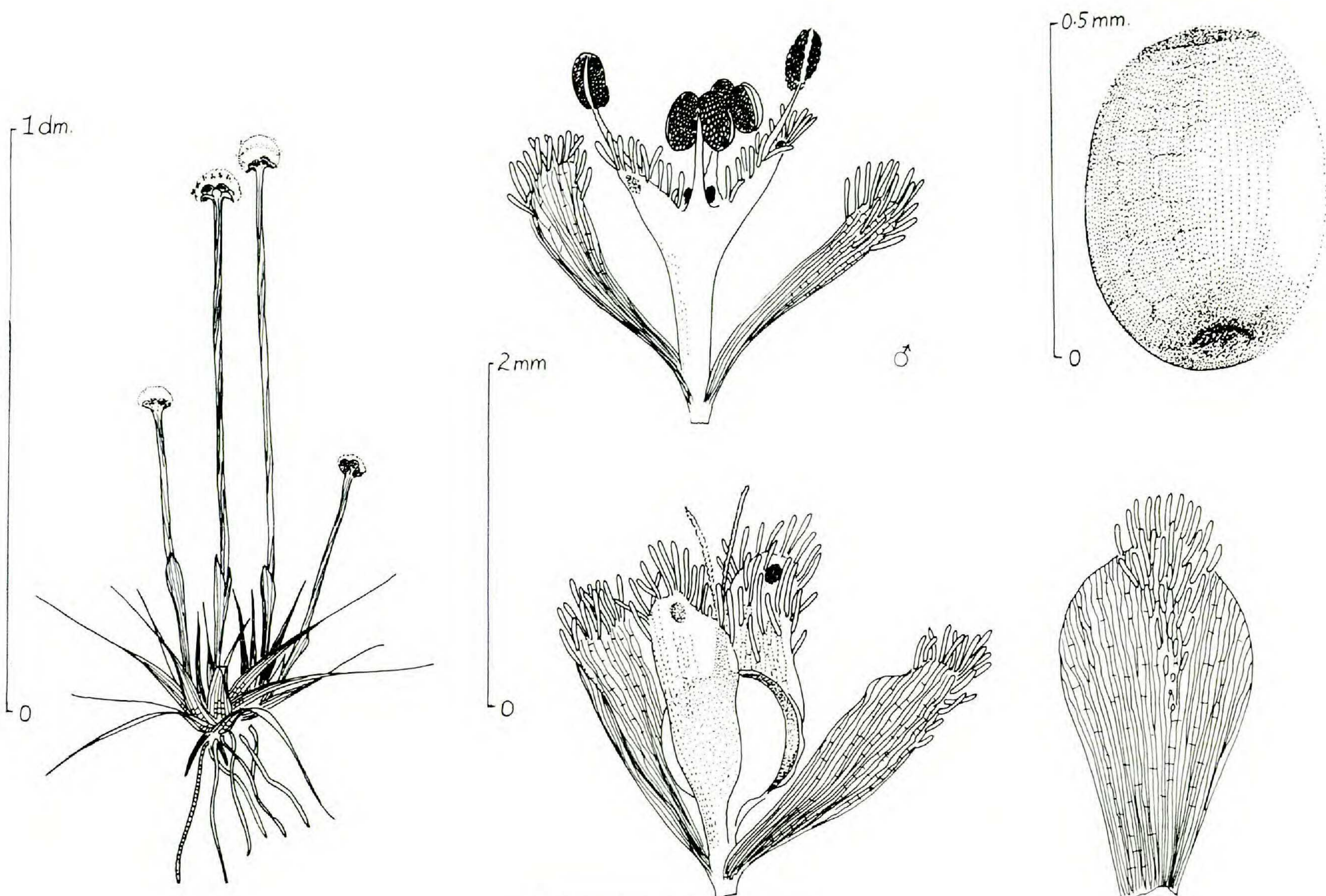
hairy apically along the keel, the margin eciliate; petals equal or unequal, linear to oblong or obovate, ca. 1.0-1.5 mm. long, yellowish-white, acute, the inner surfaces pilose with a mixture of clear tapering and opaque-clavate, multicellular trichomes, the outer surface sparingly clavate-hairy, the margin clavate-hairy. Seeds ovoid, ca. 0.6 mm. long, obscurely and shallowly alveolate, brownish with frequent, pale, narrow tubercles along the low ridges.

Acid, sphagnous (*Sarracenia*-type) bogs, coastal plain, southwestern Alabama west to eastern Texas.

This rather rare *Eriocaulon* is part of the complex including *E. lineare*, *E. septangulare* (see discussion under those species). I have not seen it in other than sphagnous *Sarracenia*-type bogs, and hence have no idea what habitat changes it expresses when submersed. It is locally abundant in central Louisiana, coating bog potholes with its small but showy white heads. Unlike the two other species of the complex, this *Eriocaulon* is a spring bloomer; by early summer no trace of it is to be seen, even the leaves appearing to vanish. The type locality for this species is Texas (Drummond 409, an isotype at NY) where it often is to be found in association with *E. decangulare*. In fact small specimens of Texas *E. decangulare* are often identified as *E. texense*. However, the heads of *E. texense* are soft in contrast to the harder heads of *E. decangulare*; the involucral bracts of *E. texense* are rounded to acute, sometimes squarrose, and quite dark in contrast to the more rigid, stramineous, narrowly acute to acuminate, bracts of *E. decangulare*; the scapes of *E. texense* are more slender and with less ridges than those of *E. decangulare*; *E. texense* has usually flowered, set fruit, and is dying back by the time the heads of *E. decangulare* are full.

7. ERIOCAULON LINEARE Small, Fl. SE. U.S. 236. 1328. 1903.

A clump former, but reproducing vegetatively either by short lateral offshoots (on moist situations) or by pale, elongated, leafy rhizomes (on submersed or wet situations). Leaf bluish-green, linear attenuate, 1.0-10.0 cm. long, tapering evenly from a fleshy, pale, aerenchymatous base 1.5-4.0 mm. broad. Sheath of the scape slightly longer than or about as long as the leaf, the oblique orifice acute or bifid-acute. Mature scape 6.0-15.0 (-40.0) cm. long, about 1 mm. thick below the head, (longest and thickest when the plants are submersed), slightly twisted, with 4 to 7 slightly elevated, dark green ridges, the shallow grooves yellowish or at least a paler green. Mature heads hemisphaerical or globose, rarely short-cylindrical, 4.0-6.0 mm. broad, whitish. Surface of the receptacle of the head smooth. Outer involucral bracts orbicular or ovate, 2.0-2.5 mm. long, pale, the tips rounded, entire, sometimes squarrose, the margin often scarious. Receptacular bractlets obovate or cuneate, ca. 2 mm. long, the bases scarious save for a slightly darkened midrib, the apices hairy on the backs with white, clavate hairs. Male flower: sepals translucent,



Eriocaulon septangulare

grayish, concave-curved, oblong-linear, 1.5-2.0 mm. long, acute, the outer surfaces with white-clavate hairs apically; petals largely fused into a narrowly cylindrical structure 1.0-1.5 mm. long, solid at the basal, slightly narrower end, gradually broadened above at which point the two short (ca. 0.5 mm.) ciliate corolla lobes depart, and on the concave inner surface of which are two sessile black glands; anthers black, broadly ellipsoidal, ca. 0.5 mm. long, exerted from the heads on white filaments 1.0-1.5 mm. long. Female flower: sepals oblanceolate, ca. 2 mm. long, keeled, curved, greenish or grayish-brown, the apices rounded and with a covering or fringe of white-clavate hairs on the backs; petals spatulate, 1.5-2.0 mm. long, flat, yellowish-white, the apices rounded and white-hairy on both sides, the inner surfaces often with a mixture of clear and opaque hairs. Seeds ovoid or ellipsoid, 0.5-0.75 mm. long, indistinctly longitudinally lined with fine connecting striae.

Sandy or peaty lakeshores, margins of pineland ponds, ditches, and savannas, coastal plain, Florida north to North Carolina, west to Alabama.

Type. Eocene geologic formation overlain by Lafayette and Columbia, Bullock County, Georgia, *R. M. Harper* 830. At NY.

This species is locally abundant, being commonest in the limesink country of northern Florida, where in midsummer its white "buttons" ring the sandy sinkhole lakes and ponds. Length and breadth of leaf and scape vary drastically within the species, this directly related to degree or extent of submersion. Thus, a perfect continuum of habit may be found if one would run a cross contour line through a population. Those furthest from the shore would be the shortest leaved and have the shortest, narrowest scapes, while submersed forms have extremely elongated, spongy, leaves and scapes. Difficulties in identification of *E. lineare* stem from partial samples from such populations, the larger specimens having some resemblance to *E. compressum*.

Cursorily, *E. lineare* most closely resembles *E. septangulare*, whose range it may contact to the north and northwest, and *E. texense*, whose range it does contact to the west. A detailed examination of the Eriocaulons comprising this complex may well result in a far more conservative treatment of them than now exists. *E. lineare* is the only one of the three to have a perfectly smooth receptacular surface and flavescent outer bracts. On the other hand, *E. septangulare* has some populations in which the surface of the receptacle has trichomes, others in which it does not.

8. ERIOCAULON SEPTANGULARE With., Arr. Veg. Brit. 784. 1776.

Nasmythia articulata Huds., Fl. Angl. ed. 2,415. 1778.

Eriocaulon pellucidum Michx., Fl. Bor. Am. 2: 166. 1803.

Ericaulon articulatum Morong., Bull. Torrey Club 18: 353. 1891.

A clump former but reproducing vegetatively either by short lateral offshoots (on moist situations) or by pale, elongated, leafy rhizomes



Eriocaulon cinereum

(on submersed or wet situations). Leaf pale green, linear-attenuate, 1.0-8.0 cm. long, tapering evenly from a fleshy, pale, aerenchymatous base. Sheath of the scape usually shorter than the leaf if the plant is submersed, longer than the leaf if the plant is emergent, 2.0-6.0 cm. long, the orifice oblique, bifid. Mature scape 4-21 (-100 submersed) cm. long, about 1 mm. broad, slightly twisted, (4-) 5-7 ridged. Mature heads hemisphaerical or globose, 4.0-5.0 mm. broad, gray save for the exerted white-hairy tips of perianth parts and bractlets. Surface of the receptacle of the head smooth or very rarely with a few tapering multicellular, clear trichomes. Outer involucre bracts broadly oblong, narrowly ovate or broadly obovate, 1.0-1.5 mm. long, smooth, dark gray, the tips rounded to obtusely angled and often scarious. Receptacular bractlets about 1.5 mm. long, oblanceolate or cuneate, slightly and unequilaterally keeled, whitish or yellowish basally, becoming dark gray apically, the apical portion white-clavate-hairy on the backs. Male flower: sepals gray-translucent, oblong-linear or linear-oblanceolate, ca. 1.5 mm. long, concave-curved with an obscure keel, acute to rounded, the outer apex and upper margin white clavate hairy. Petals subequal, pale, largely fused into a narrowly cylindrical structure about 1.2 mm. long, acute, the inner surfaces around the glands and upper margin of the petal lobes with white-clavate hairs. Anthers black, broadly ellipsoidal, ca. 0.5 mm. long, very slightly exerted or not at all exerted from the head on short white filaments. Female flower: sepals oblong to narrowly obovate, prominently curved-keeled, ca. 1.5 mm. long, gray-translucent or almost opaque save for the pale base, white-clavate hairy on the backs distally and often ciliate. Petals linear-oblong or linear-oblanceolate, ca. 1.5 mm. long, acute to obtuse, the upper inner surfaces and upper margins white-clavate hairy. Seeds ovoid, ca. 0.5 mm. long, obscurely longitudinally lined with fine connecting striae or very obscurely and shallowly alveolate.

Sandy or peaty lakeshores, margins of ponds, ditches, muskeg, and sphagnous bogs, the Canadian Shield of southern Canada, the Great Lakes region, New England, and south in the Appalachians into mountainous North Carolina.

Type locality: Lakes on the Island of Skye, Scotland, Walker.

In habit, habitat, and floral character this species most closely resembles *E. lineare* and *E. texense*, entities with which it may someday be considered as identical. However, it does differ from *E. lineare* by its darker, grayish or sooty bracts, bractlets, and sepals and from *E. texense* by its much smoother receptacle.

9. ERIOCAULON CINEREUM R. Br., Prodr. 254. 1810.

Solitary or in small tufts, the leaves narrow, linear-attenuate, to 9 cm. long, green, thin, tapering very gradually to a filiform tip. Scape of the sheath 2-4 cm. long, definitely shorter than the leaves, scarious and

bifid-acute above. Mature scape filiform, 15-30 cm. long, slightly twisted, 6-8 ridged. Mature head subglobose to very broadly ovoid, about 4 mm. broad, silvery-gray, somewhat chaffy in appearance. Outer involucral bracts ranging from obovate to lanceolate, ca. 2 mm. long, scarious, pale, the tips acute, often lacerate or erose. Receptacular bractlets linear-oblong, ca. 2 mm. long, scarious, pale save for a grayish mid-region, the tips acute. Surface of the receptacle of the head with a few long, very slender, transparent, multicellular trichomes. Male flower: sepals united into a single spatulate, lustrous, scarious, 3-lobed scale which is gray-translucent toward the apex, pale toward the clawed, tubular base, glabrous save for a few white, short-linear trichomes at or toward the tip. Petals 3, joined into a yellowish tubular-clavate androphore ca. 2 mm. long whose base is enveloped by the calyx tube and whose apex is divided into 3 small, scale-like, white-hairy (the hairs tapering) glanduliferous lobes. Central glands 3, white or yellowish-white. Stamens six. Anthers broadly ellipsoidal, ca. 0.25 mm. long, yellow, on white filaments about as long as the corolla lobes. Female flowers: perianth consisting of 2 or 3 (if 3, one much narrower and shorter) linear, flat, pale, translucent scales ca. 1.5 mm. long whose margins or connivent, acute tips may bear a few multicellular clear trichomes. Gynophore at least 1 mm. long, usually somewhat longer, smooth. Gynoecium 3-carpellary; style branches 3. Seeds ovoid, slightly less than 0.5 mm. long, pale brown, reticulate, the rectangular compartments of the reticule oriented perpendicularly to the axis of the seeds.

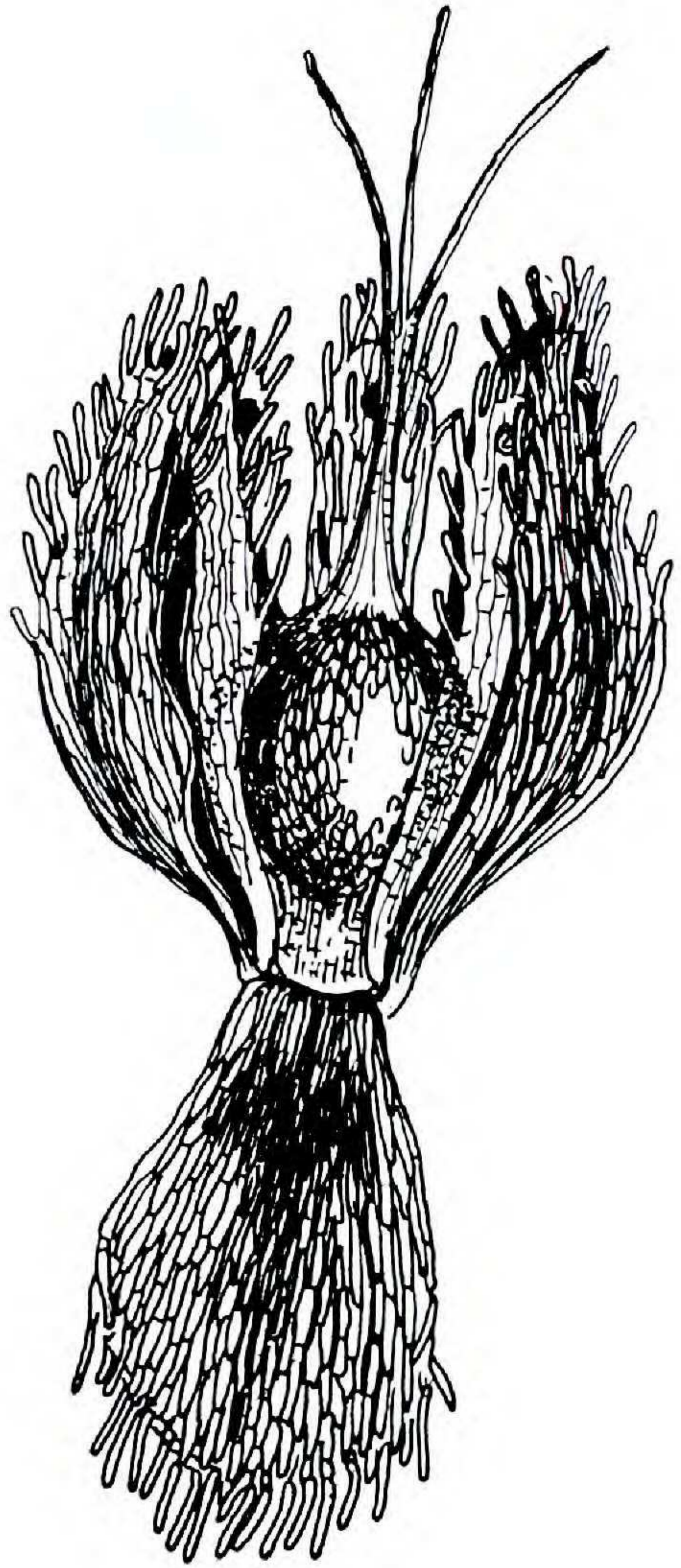
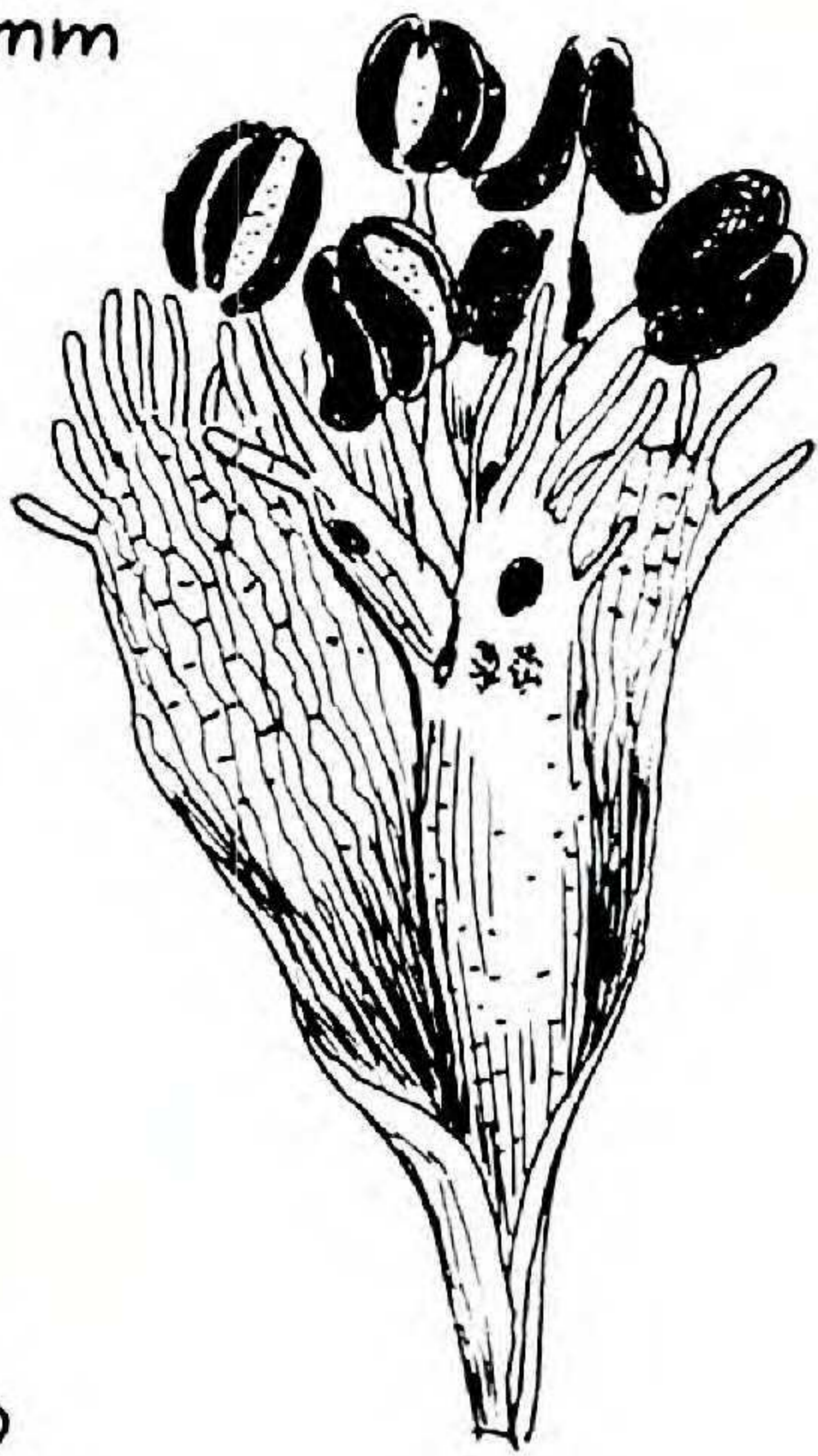
Adventive in rice paddies, Stanislaus County, California. Reported as native in northern Australia and in the rice growing regions of the south Pacific.

I have so far examined only one U.S. collection of this species, the citation for it being: "Krause rice fields, Modesto. Plants submersed except for upper part of flowering stems, Stanislaus County, California, Basil G. Markos, Sept. 18, 1947". I visited the rice areas around Modesto during the summer of 1964 but was unable to find the plants.

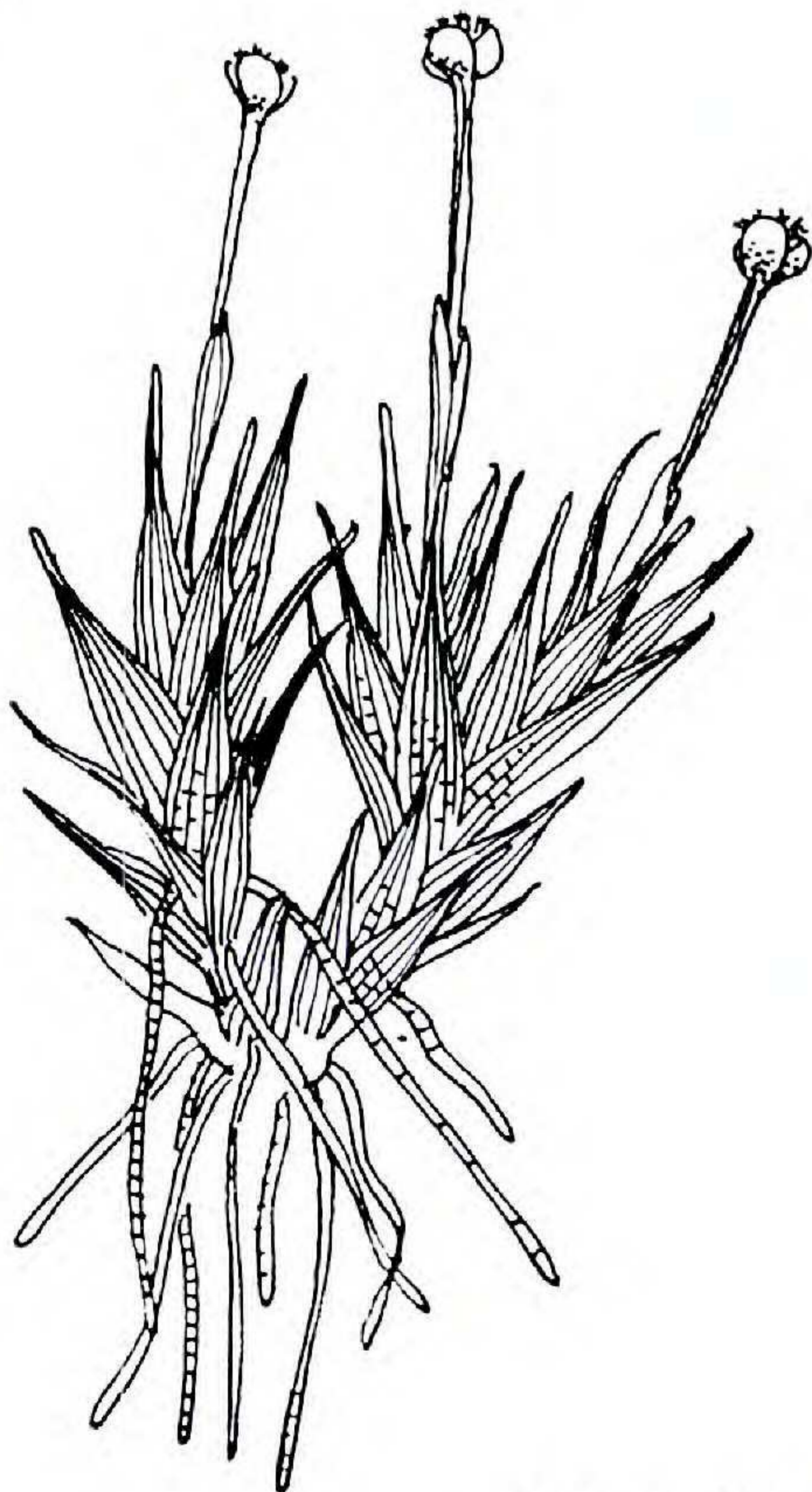
10. *ERIOCAULON MICROCEPHALUM* H.B.K., Nov. Gen. & Sp. I: 253. 1816.

A clump-former, each clump composed of many, short-ascending, densely leafy, frizzly-pilose shoots, the leaves stubby and overlapping in close spirals. Leaf pale green, narrowly triangular-acuminate, 1.5-3.0 cm. long, the broad base pale, with a very evident reticulum of air spaces, sometimes hairy on its inner surface, the apex acuminate terminating in a blunt tip whose upper surface is spooned-out and whose lower surface bears a lustrous callus. Sheath of the scape shorter than the longer leaves and often concealed by them, the orifice loose, thin, papillose, usually bifid. Mature scape to 5 cm long, usually shorter, slightly twisted, 4-5 ridged. Mature heads hemisphaerical, ca. 3-4 mm.

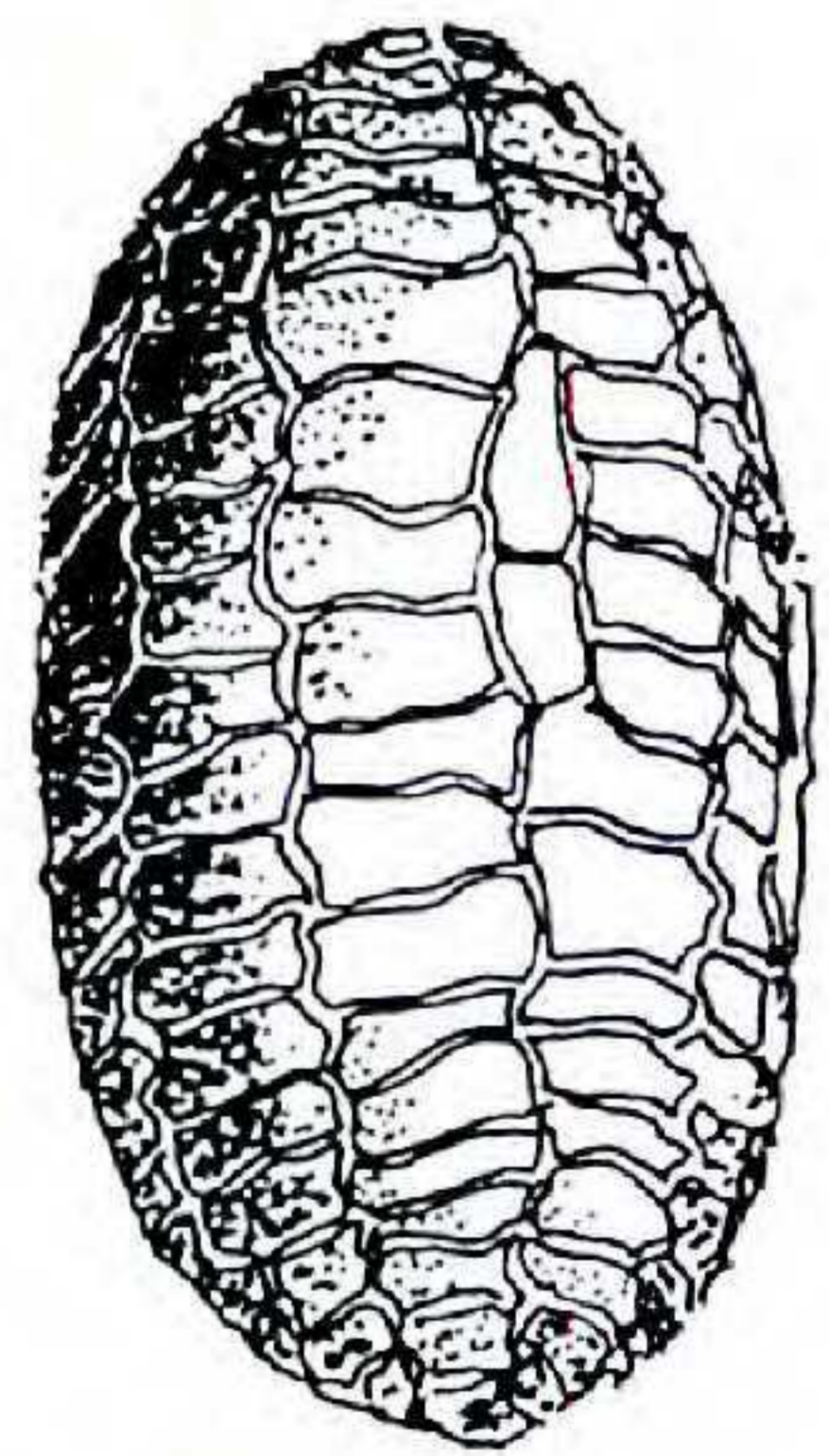
2 mm



6 cm.



1 mm



Eriocaulon microcephalum

broad, pale, the surface of the receptacle smooth or with a very few long, slender, multicellular trichomes. Outer involucral bracts broadly obovate to suborbicular, ca. 2 mm. long or slightly less, smooth, thin, yellowish-white or yellowish-brown, the apex rounded, sometimes squarrose, the margin entire (aging erose) and very thin, grading into somewhat narrower, darker (usually obovate) inner bracts whose apices are obtusely angled and whose backs and margins bear a scattering of pale, stubby but multicellular trichomes. Male flower: Asymmetrically curvate; sepals 3, joined into a cuneiform, gray spathe-like, trifid blade, ca. 2 mm. long whose apex shows three nerves, each forming a low ridge which terminates in a low sepal-point, the apex ciliate and the backs hairy toward the tips with white, stubby, multicellular trichomes; (these conceal all of the rest of the flower save for the tips of the petals and the exerted anthers); petals 3, unequal, tubular for most of their length, pale yellow or dull white, terminating in 3 unequal short-linear or oblong lobes, two of which bear a few multicellular hairs apically and all of which have conspicuous dark, subapical glands; stamens 6, the 3 longest opposite the petals, the anthers dark, well exerted at anthesis. Central glands 3, dark, short-oblong. Female flower: slightly asymmetrical, the very conspicuously keeled sepals connivent about and concealing the developing ovulary and petals save for the petal trichomes and the exerted styles; sepal curvate-keeled, obovate, ca. 2 mm. long, grayish-translucent, the margin and back toward the apex with a scattering (particularly along the keel) of white, multicellular, blunt trichomes, the apex itself rounded and slightly apiculate; petal oblong or spatulate, about the length of the sepal but flat, a dull yellowish-white, glanduliferous, the inner surface pilose with clear, multicellular hairs, the margin of the rounded apex ciliate with white trichomes; carpels 3, the styles 3, branched from above the middle; seeds ovoid, ca. 0.6-0.8 mm. long, a rich reddish-brown with a pale gridwork of faintly raised rows of horizontally aligned rectangles.

Moist, boggy upland meadows, Kern Co. California s. through Mexico into Costa Rica, Equador.

Type. Between Loja and Mt. Pulla, at 2770 meters altitude, Loja, Ecuador. Humboldt & Bonpland. (According to Moldenke, 1937). The writer has not seen the type.

I have seen only one specimen from the United States. This, collected by L. J. Xantus de Vesey in 1857-58 in the vicinity of Fort Tijon (now called "Tejon") in what is presently Kern County, California, differs in no evident way from material from far to the south in America. I visited the area during the summer of 1964 in hopes of finding this population but a search of the marshy ground about springs in that area was fruitless. The station may well have been destroyed, since the Fort has become considerable of a tourist attraction and much of the stream

which used to provide water for the soldiers at the old fort has been "landscaped."

The most characteristic features of the plants which I have examined appear to be the densely caespitose habit, the stubby, rigid, ascending and imbricate leaves whose bases are partly concealed by ramentum, and the spathe-like character of the male sepals.

LACHNOCAULON Kunth, Enum. Pl. 3: 497. 1841

Perennial, rosulate, scapose, often tufted, herbs, the roots branched, slender, fibrous, the leaves linear, arranged in a close spiral toward the apex of a short, or elongated, sparingly-branched, stem on which the old leaf bases persist as scales. Perennation by means of lateral offshoots or by short-ascending rhizomes. Leaves linear, acute or attenuate, spirally arranged, the bases clasping, crowded, none of the leaf evidently lacunate. Inflorescence and involucre head or contracted spike comprised of an outer involucre of few to many series and of a bracteate mass of scaly, unisexual flowers. Receptacle of the inflorescence covered by pale or yellowish, multicellular, filiform trichomes. Each flower subtended by, and partly enfolded by, a scarious bract (or two), the tip of which is sparingly equipped with translucent or opaque, usually clavate, multicellular trichomes. Sepals 3, distinct, scarious, smooth or sparingly clavate-hairy, particularly toward the apex. Petals absent or reduced to hairs or small scapes. Stamens 2-3, elevated upon a tubular, stipe-like androphore which is at least the length of the stamens; filaments linear, anthers oblong-linear, 2-locular, yellowish or pale, exerted from the heads at flowering time; staminodia 3, lance-ovoid or peg-like, often with fimbriate appendages. Gynoecium on a short, usually comose, gynophore, 3-carpellate, 3-locular, 3-ovulate (2-merous in *L. digynum*), the ovules attached distally in the locules; styles (2-) 3, joined for more than half their length; ovary wall thin, velum like. Fruit a (2-) 3-chambered, loculicidal capsule. Seeds ellipsoidal, striate or reticulate or papillose.

Dr. Moldenke (1937) treats 8 species for the United States. However, species such as *L. floridanum* Small, *L. glabrum* Korn, and *L. eciliatum* Small are based on such intrapopulation variables as sepal length (accrecence is here suspected), peduncular trichomes, and amount of pubescence on bracts and sepals. Therefore, in this work, such entities are treated as extremes of either *L. anceps* or *L. minus* which appear to be the two nuclei for all these variants.

In the United States, *Lachnocaulon* may be distinguished readily from either *Eriocaulon* or *Syngonanthus* by its fine, evidently branched root system in contrast to the relatively unbranched-septate systems of *Eriocaulon* and the unbranched and fleshy systems of *Syngonanthus*.

Lachnocaulons of the United States may be divided into two groups on

the basis of habitat. One, comprised of *L. engleri* and *L. minus*, is usually found on such ephemeral habitats as fluctuating lake and pondshores, roadbank seepage, borrow pits, ditches, spoilage, and geologically recent sandy sloughs, particularly along the seacoast. Thus such species tend to be aspect dominant one summer in a given locale, seemingly absent the next. It would appear in such case that their seeds must have to remain viable over extended periods of time, for some of the ephemeral Florida lakes about which they often abound are periodically bone dry. The other group, comprised of *L. anceps*, *L. beyrichianum*, and *L. digynum*, appears in more stable situations inland within the coastal plain province as well as along the coast and on disturbed situations. They usually are on what appears to be much more acid substrata such as those provided by hillside bogs in the longleaf pine hills, peaty savannas, pine-palmetto flatwoods, and sphagnous bogs. Both *L. beyrichianum* and *L. anceps* have a wide range of tolerance to soil moisture in that they may be found on quite dry sandy sites, sometimes even in association with turkey oak (*Quercus laevis*).

KEY TO LACHNOCAULON

1. Trichomes of the apices of the receptacular bractlets and perianth parts congested with a milk-white substance, this imparting a pale gray or whitish colour to the heads; plants very often long-lived, forming large convex mats of hairy-leaved rosettes, each rosette terminating an elongate-ascending, scaly stem; scapes hairy.
 2. Leaves narrowly linear; mature heads seldom broader than 4 mm.; seeds dark reddish-brown, very lustrous, the longitudinal ribs obscure. 1. *L. beyrichianum*, p. 317
 2. Leaves linear; mature heads seldom as narrow as 4 mm. and usually paler than the above; seeds not as lustrous, the longitudinal lines evident. 2. *L. anceps*, p. 319
1. Trichomes of the apices of the receptacular bractlets and perianth parts not congested with a milk-white substance, thus translucent so that the brown bractlets and/or perianth parts impart their own colour to the heads; the plants either relatively short-lived and short-stemmed or, if long-stemmed, with diminutive, *Polytrichum*-like leaves.
 3. Scapes with ascending hairs; heads a dull gray-brown, the hairs of the receptacle and of the flowers so copious as to at least partly obscure the florets (old heads may lose some of their hairs). 3. *L. minus*, p. 321
 3. Scapes smooth; heads either chocolate brown or dull brown, but, if dull brown, with female sepals yellowish-white and hardly obscured by the receptacular hairs and with the gynoecium 2-carpellary.

4. Heads dark chocolate-brown or reddish brown, usually oblong by seeding time; gynoecium 3-carpellate; leaves seldom shorter than 2 cm., the sheathes of the scapes shorter than to about the length of, the leaves. 4. *L. engleri*, p. 323
4. Heads pale brown, usually globose by seeding time; gynoecium 2-carpellate; leaves seldom as long as 2 cm., the sheathes of the scapes longer than the leaves or at least rising above them. 5. *L. digynum* Korn., p. 325

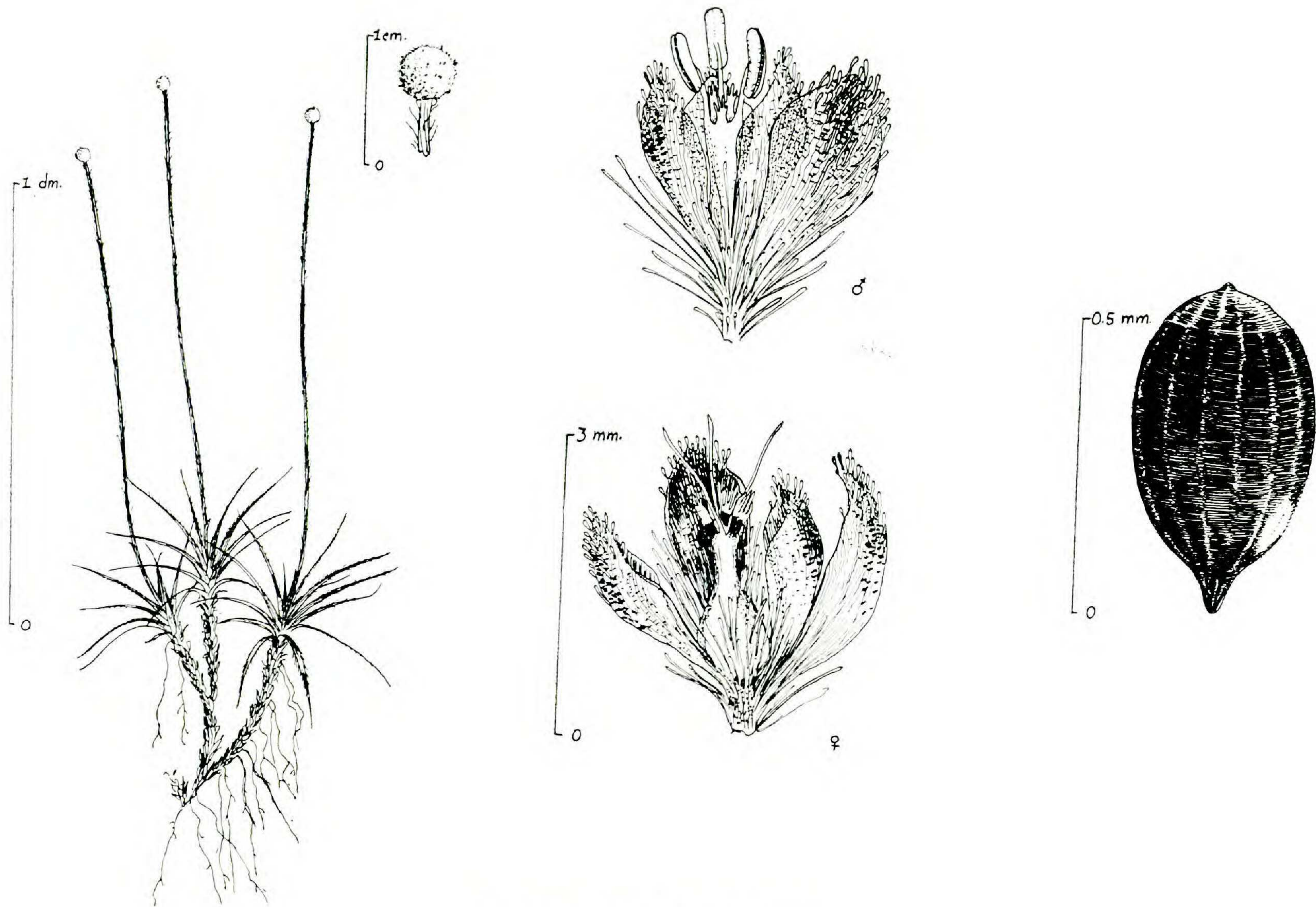
1. LACHNOCAULON BEYRICHIANUM Sporleder ex Korn., Linnaea 27: 567. 1856.

A clump-former, the tufts of leaves aggregated into dense mats of rosettes, the length of the subterranean, ascending stems chaffy with persistent old leaf bases (those plants on driest sites having the longest stems). Leaf narrowly linear-attenuate, 1.5-4.0 cm. long, grayish-green, gradually broadening, then abruptly flaring to a sheathing base 2.5-4.0 mm. broad; upper and lower surfaces pilose, the margins hairy or smooth. Sheath of the scape attenuate-tipped, pilose, slightly longer or slightly shorter than the leaves. Scale 15.0-23.0 cm. long, twisted, obscurely ridged, pilose, with long, ascending, translucent, multicellular trichomes. Mature heads globose or short-oblong, pale-gray, 3.5-4.0 (-5.0) mm. broad. Outer involucre bracts ovate, about 1 mm. long, castaneous, glabrous or sparingly clavate-ciliate on the backs toward the apex. Receptacular bracts pandurate, 1.5-2.0 mm. long, obtuse, brownish, smooth toward the base, hairy on the back distally, the hairs clavate, milk-white. Male flower: sepals linear-spatulate, 1.5-2.0 mm. long, obtuse, castaneous or paler brown, smooth basally, white-hairy on the back and margin distally, the hairs clavate; androphore smooth, clavate, as long as or slightly longer than the sepals; anthers yellowish, short-oblong, on filaments slightly exserted from the head. Female flower: sepals linear or linear-spatulate, about as long as but broader than the male sepals, obtuse, tan or pale brown, the backs and margins pilose, the hairs toward the apex white and clavate; gynophore short, subtended by a dense coma; gynoecium, 3-carpellate, 3-locular, 3-ovulate, the styles 3, bifid. Seeds ellipsoidal, somewhat flattened, reddish-brown, about 0.5 mm. long, the longitudinal and connecting striae faint, the seed coat therefore highly lustrous.

Sands, sandy peats and peat of pine flatwoods, moist pineland savannas, pineland pond margins, lakeshores and rather dry oak-pine barrens, central Florida north to southern North Carolina (Bladen Co.).

Type. "edges of a swamp near Ebenezer, Effingham Co., Georgia, Beyrich".

The affinities of this species to *L. anceps* are at once evidenced by its habit, habitat, leaf and scape indument and, especially by its white-clavate perianth trichomes. Yet the leaves of *L. beyrichianum* are con-



Lachnocaulon beyrichianum

sistently narrower, and its seeds comparatively smooth and lustrous. Such differences, though seemingly minor, appear to hold even in mixed populations of the two.

2. *LACHNOCAULON ANCEPS* (Walt.) Morong, Bull. Torrey Bot. Club 18: 360. 1891.

Eriocaulon anceps Walt., F. Car. 82. 1788.

Eriocaulon villosum Michx., Fl. Bor. Am. 2: 166. 1803.

Lachnocaulon michauxii Kunth., Enum. Pl. 3: 397. 1841.

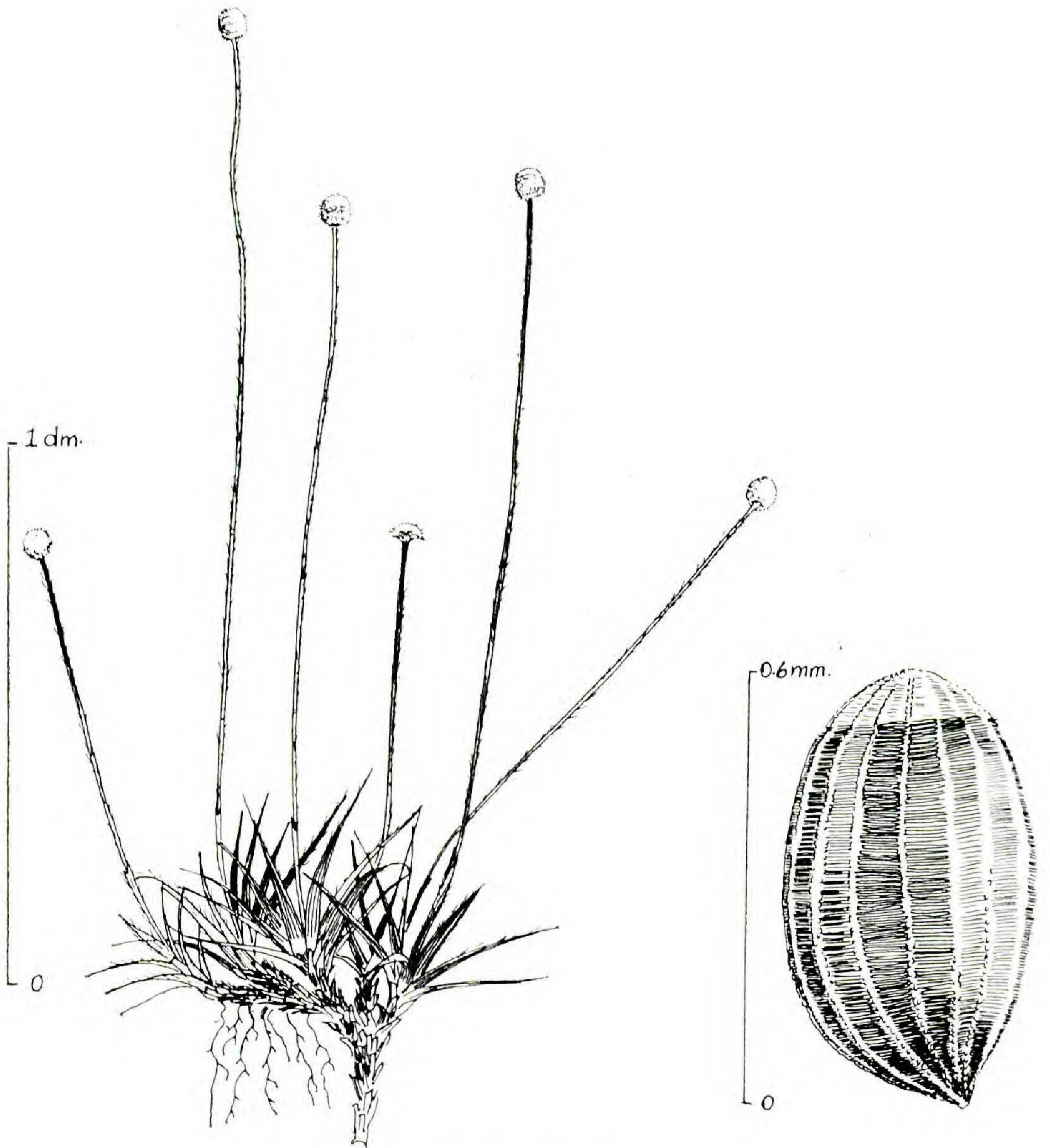
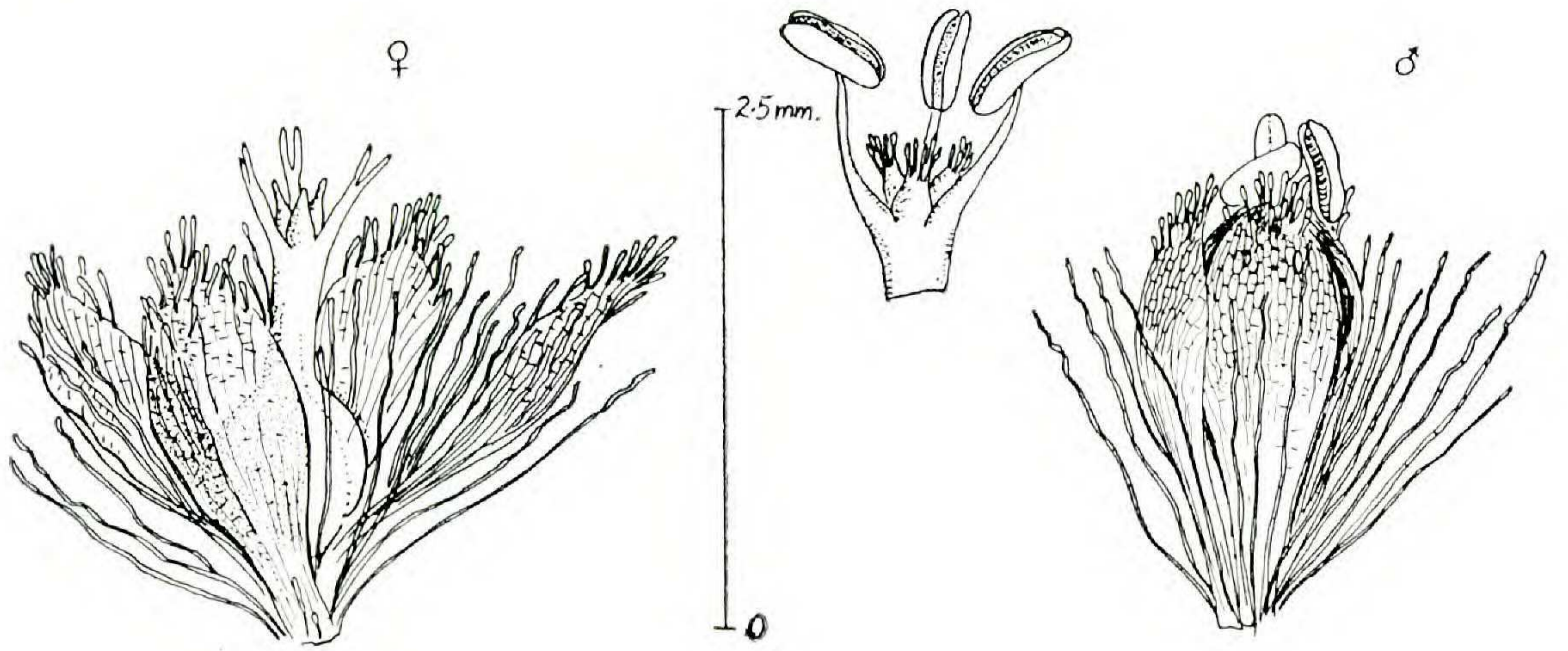
Lachnocaulon glabrum Korn., Linnaea 27: 568. 1856.

Lachnocaulon floridanum Small, Fl. SE. U.S. 235, 1328. 1903.

A clump former, the tufts of leaves aggregated into mats of rosettes, the length of the subterranean stems which support the rosettes variable with age of the plant and conditions of soil texture and moisture, but stems closely beset by fibrous, overlapping old leaf bases, these often bearing hairs. Fresh leaves narrowly to broadly linear, attenuate or acute, 2.5-5.5 mm. long, broadening evenly to a sheathing base 2.0-3.5 mm. broad, pale green or gray-green; leaf surfaces smooth, ciliate or with a scattering of multicellular, translucent trichomes. Sheath of the scape acuminate, slightly shorter or slightly longer than the leaves, smooth to pilose. Scape 15.0-40.0 cm. long, twisted, obscurely ridged, smooth or sparingly to densely ascending-pilose. Mature head globose to short-cylindric, 4.0-7.0 mm. broad, whitish or pale gray. The longer of the outer involucral bracts brownish, oblong or obovate, 1.0-1.5 mm. long, obtuse, the upper margin characteristically fringed with white clavate hairs. Receptacular bracts narrowly pandurate, spatulate or oblanceolate, 1.5-2.0 mm. long, obtuse or acute, slightly curvate, brownish or grayish, smooth toward the base, white clavate-hairy on the backs distally or at least ciliate. Male flower: sepals linear-spatulate, slightly curvate-concave, 1.5-2.0 mm. long, acute and with white, clavate hairs on the backs toward the apex; receptacle comose, with translucent trichomes; androphore smooth, narrowly obpyramidal; anthers yellowish or pale, oblong, very slightly exserted on short filaments. Female flower: sepals oblong to linear, 2.0-3.0 mm. long, acute, scarious, yellowish or pale brown, smooth or pilose on the backs distally, the trichomes clavate, white; receptacle and base of gynophore copiously pilose with pale, linear, translucent hairs, the gynophore short; gynoecium 3-carpellate, 3-locular, 3-ovulate, the styles 3, bifid. Seeds ellipsoidal, 0.5 mm. or slightly longer, pale to dark brown, longitudinally lined with pale or sharp ridges, these connected by less conspicuous cross-lines.

Moist to fairly dry sands, sandy peats or peat of pine flatwoods, savannas, upper edges of pinelands, pond margins, ditchbanks, lakeshores, and bogs, coastal plain, Florida north to New Jersey, west to eastern Texas.

Type. "Carolina" Walter.



Lachnocaulon anceps

There are difficulties in distinguishing smaller-headed versions of *L. anceps* from *L. minus* or from *L. beyrichianum*. These, however, will have the clavate-whitened, hair on the bracts and sepals to distinguish them from the former, and a definitely ridged-and-striate seed to distinguish them from the latter. Also, none of the other *Lachnocaulons* have, in their older, "seeding" heads, the property of well-exserted bracts and female sepals. This imparts a "chaffy" look to late summer inflorescences.

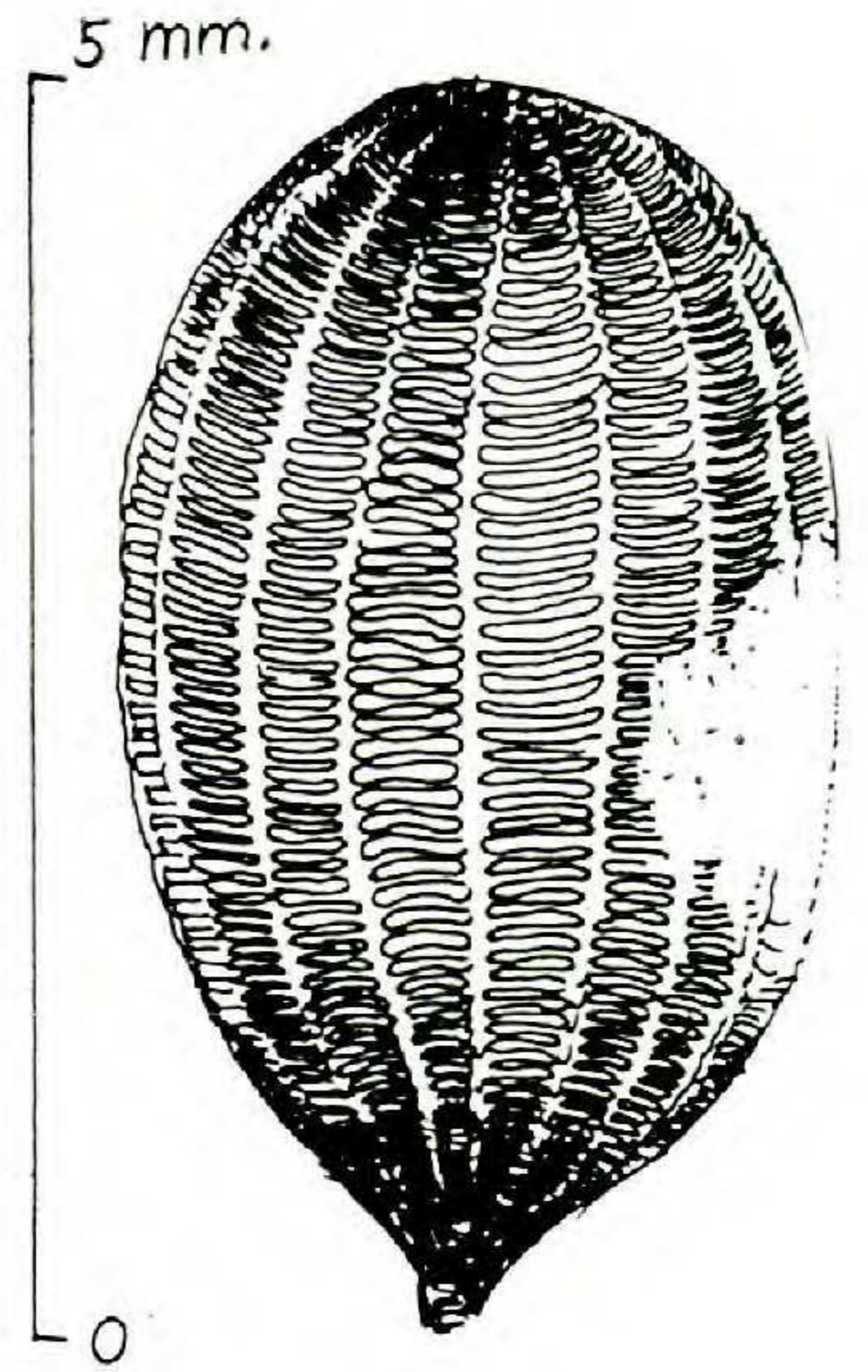
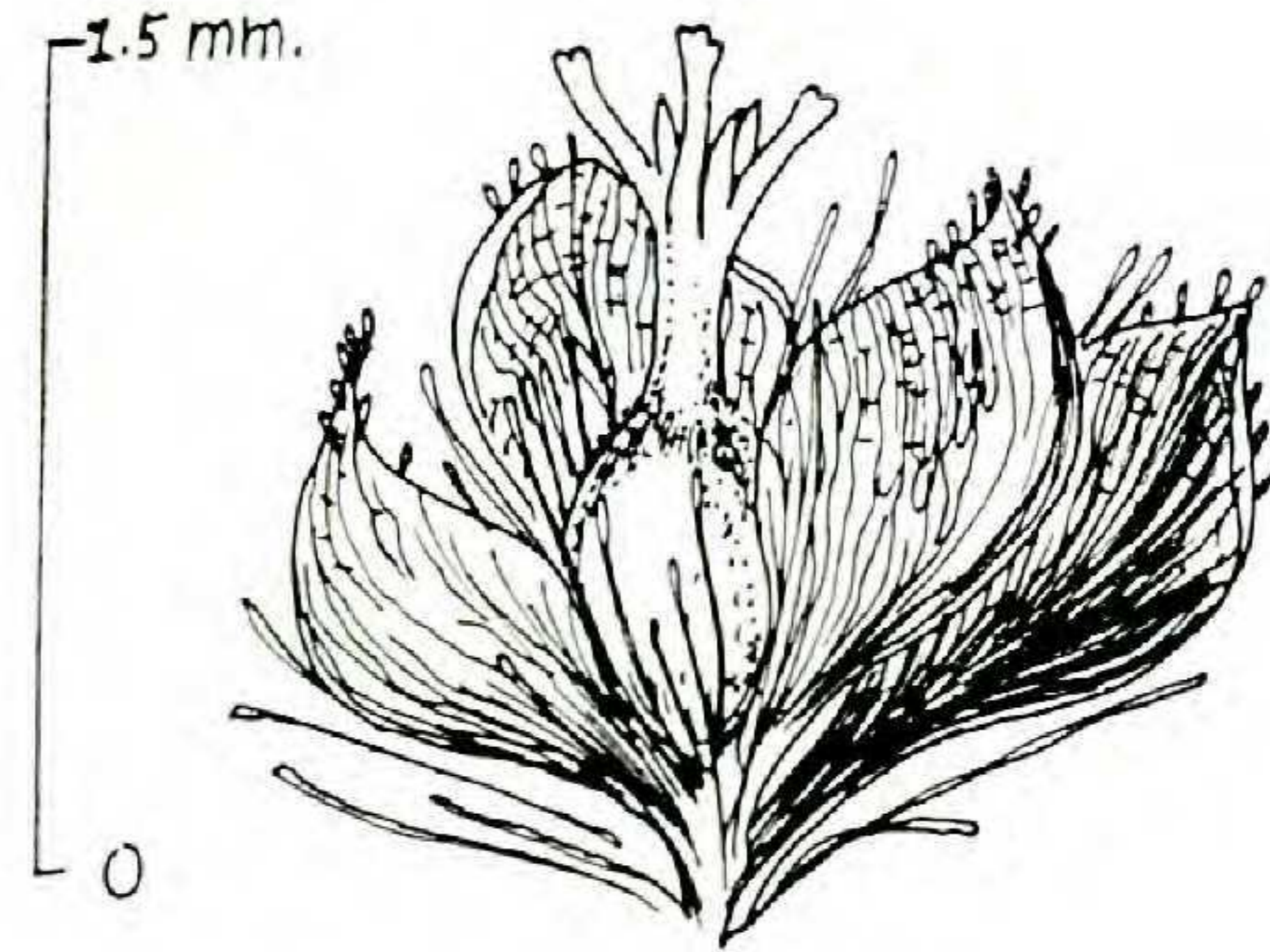
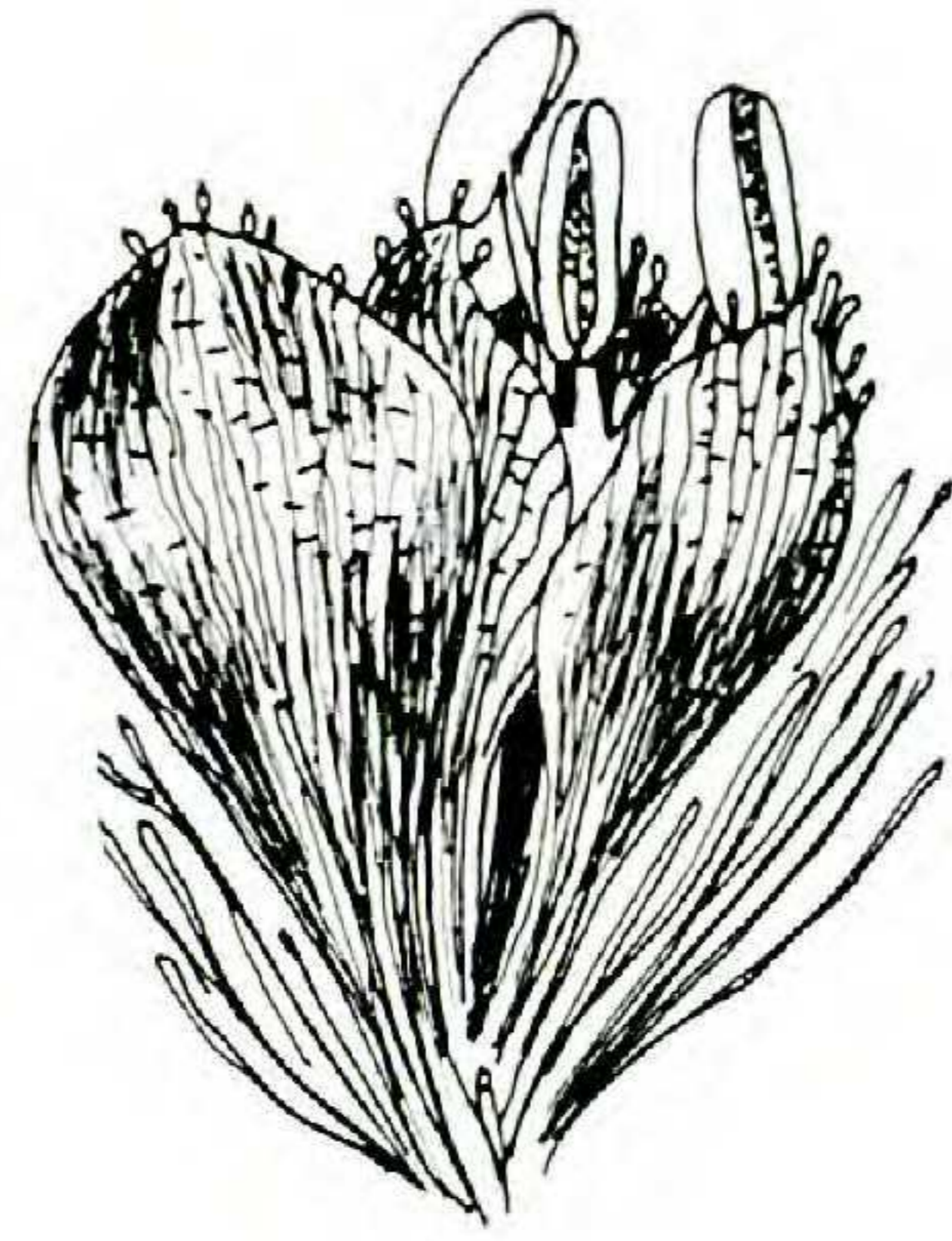
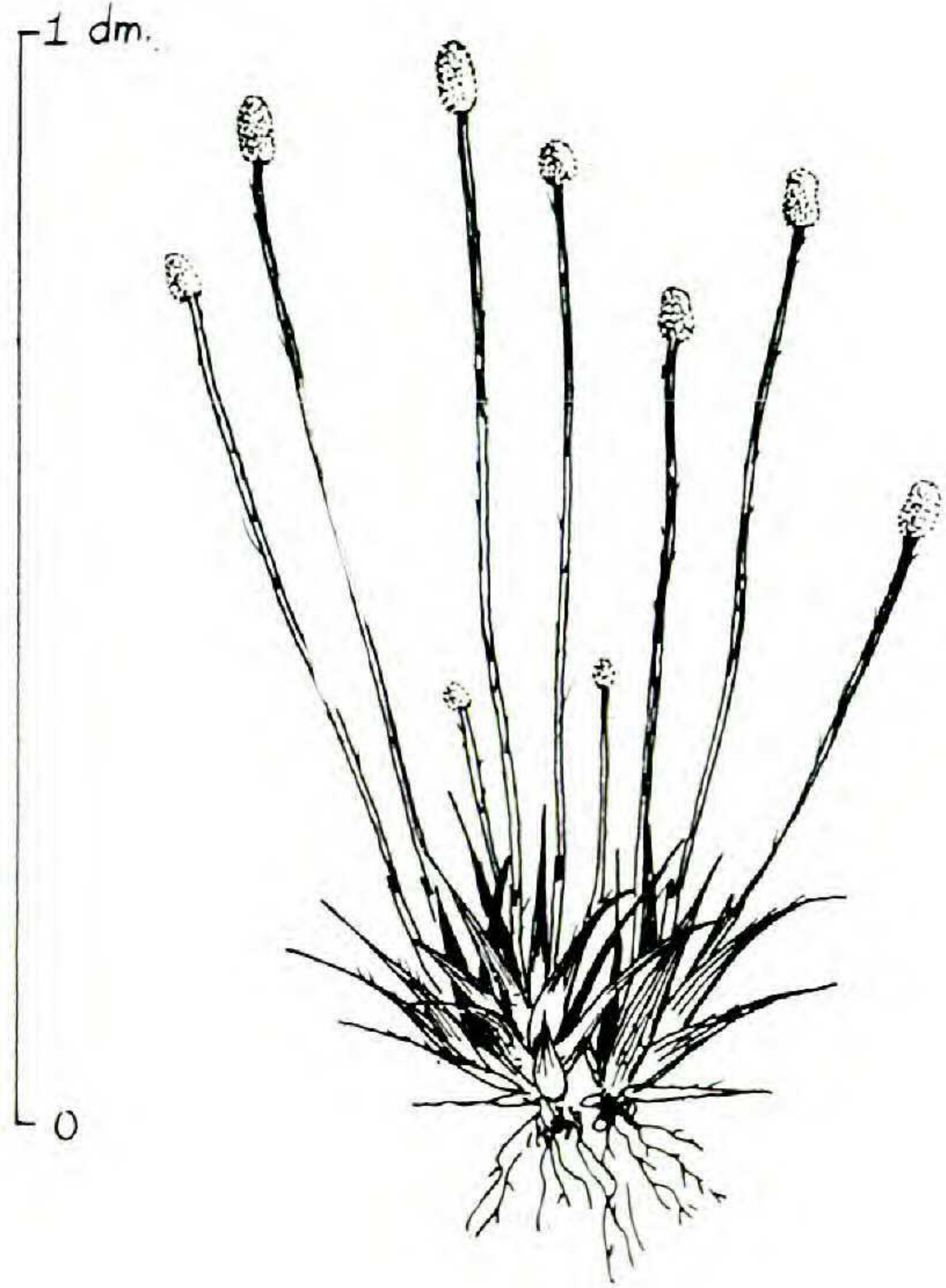
J. K. Small (1903) described *L. floridanum* as a species distinct from *L. anceps* on the basis of its glabrous scapes and smaller, grayer, heads. Examination of specimens so identified as well as the type ("Fla. Lake Co.: lake, Eustis, Nash 1981") together with a field study of populations of south Florida *Lachnocaulon* have served to convince me that such differences are not consistent, in that they may vary broadly within a single population. Such is the case in populations of these in Manatee, Martin, Sarasota, St. Lucie, De Soto and Charlotte counties in peninsular Florida. The type specimen is itself an immature example, hence the anther measurements which are used as one basis for distinguishing the species are of young, accrescent, structure. The glabrous peduncles which are supposed to distinguish *L. glabrum* from *L. anceps* are not consistently glabrous in the above mentioned counties of Florida.

3. LACHNOCAULON MINUS (Chapm.) Small, Fl. SE. U.S. 235, 1328. 1903.

Lachnocaulon michauxii Kunth var. *minor* Chapm., Fl. S. U.S., ed. 3. 531. 1897.

Lachnocaulon eciliatum Small, Fl. SE. U.S. 235, 1328. 1903.

A clump former or solitary, the tufts of leaves developing from short lateral offshoots. Leaf yellowish-green, linear-acute or linear-attenuate, 2.0-3.0 cm. long, evenly narrowing from a base 2.0-4.0 mm. broad, smooth or with a scattering of multicellular, filiform, trichomes. Sheath of the scape acuminate, slightly longer or shorter than the leaf, pilose, at least toward the orifice. Mature scape 6.0-15.0 cm. long, twisted, obscurely 3-ridged, with ascending, dense or scattered, multicellular trichomes or smooth. Mature head globose to cylindrical, 4.0-6.0 mm. long, 3.0-4.0 mm. broad, grayish or pale gray-brown. The longer of the outer involucrel bracts ovate, 1.0- mm. long or slightly longer, obtusely angled, pale brown, somewhat scarious, ciliate with clavate, translucent hairs. Receptacular bracts broadly spatulate or pandurate, 1.0 mm. long or slightly longer, slightly rounded or obtusely angled, curvate, sometimes slightly keeled, pale brown to castaneous, the surfaces smooth and scarious basally, hairy on the backs apically or ciliate, at least some of the hairs clavate and all of the hairs translucent. Surface of the receptacle densely comose, with linear, long, multicellular and translucent hairs. Male flower: sepals broadly spatulate, curvate, about 1.0 mm.



Lachnocaulon minus

long or slightly longer, the apex rounded or obtusely angled, castaneous, sparingly to copiously clavate-hairy on the backs, the base greenish or pale, smooth; receptacle hairy; androphore obpyramidal, smooth, about the length of the sepals; anthers barely exerted on filaments shorter than themselves or of about the same length, oblong, pale or yellowish. Female flower: sepals broadly linear or narrowly spatulate, approximately the length of the male sepals, scarious and pale or greenish-tan below, dark to pale brown and sparingly clavate-hairy or ciliate (rarely smooth) on the back above. Receptacle and gynophore densely pilose with stramineous hairs, the gynophore very short. Gynoecium 3-carpellate, 3-locular, 3-ovulate, the styles 3, bifid. Seeds ellipsoidal, about 0.5 mm. long, a deep clear brown, longitudinally striate with pale lines, the connecting striae evident.

Sands, sandy-peats and peatmuck of margins of pineland ponds, ditchbanks, lakeshores, or moist exposed sands of mildly acid seepage areas and mildly acid marshes along the seacoast, coastal plain, Florida, n. to North Carolina.

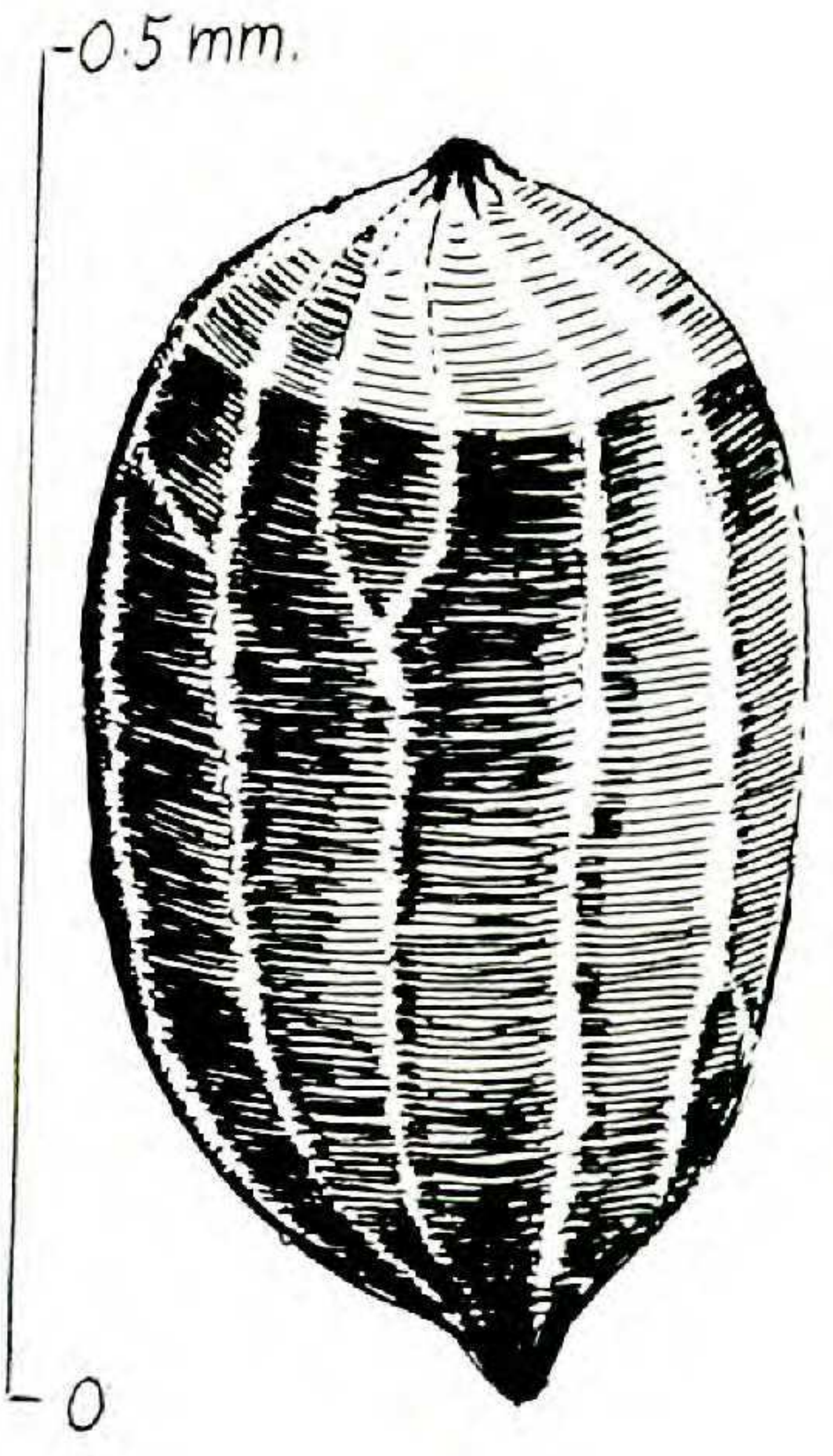
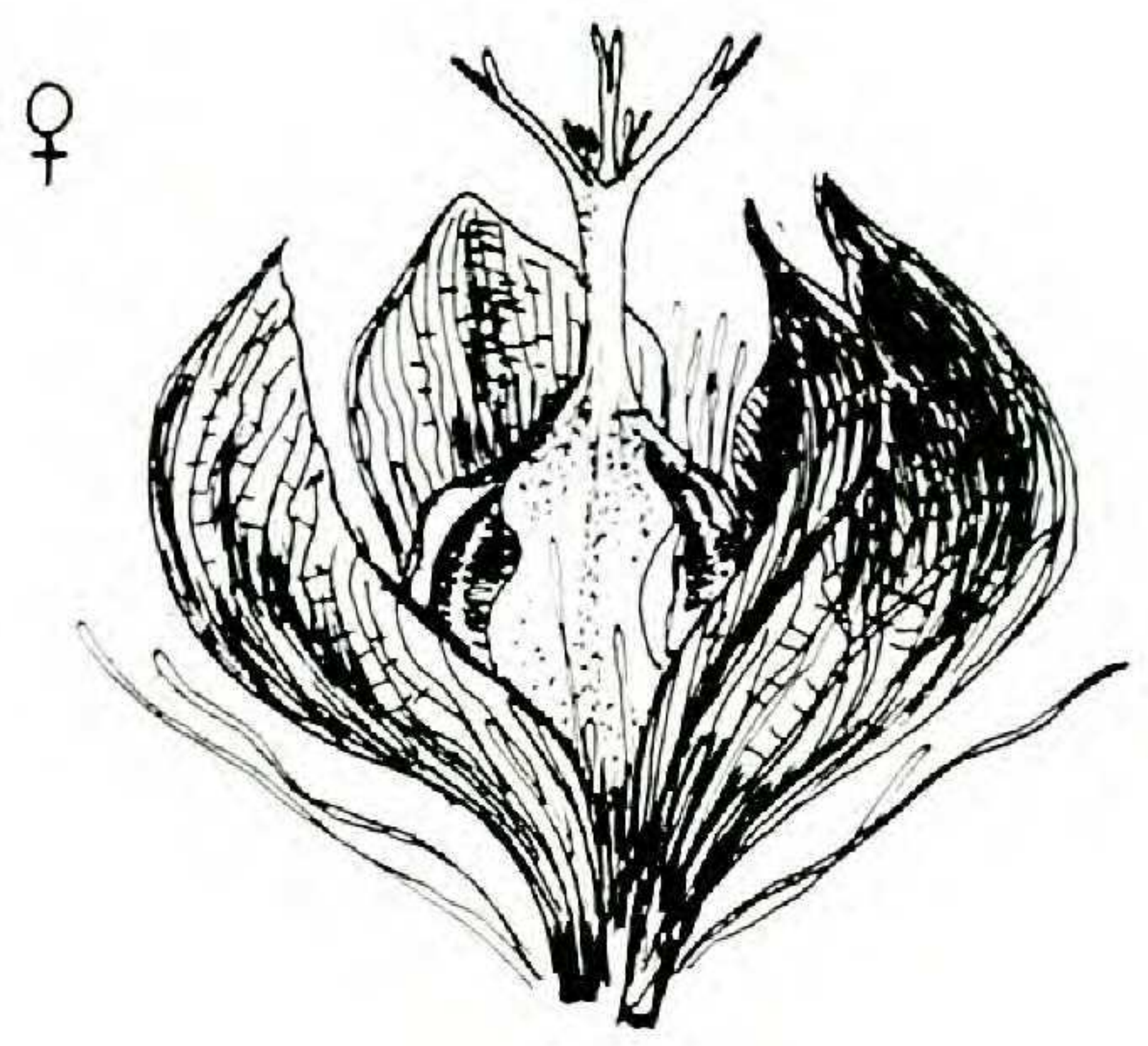
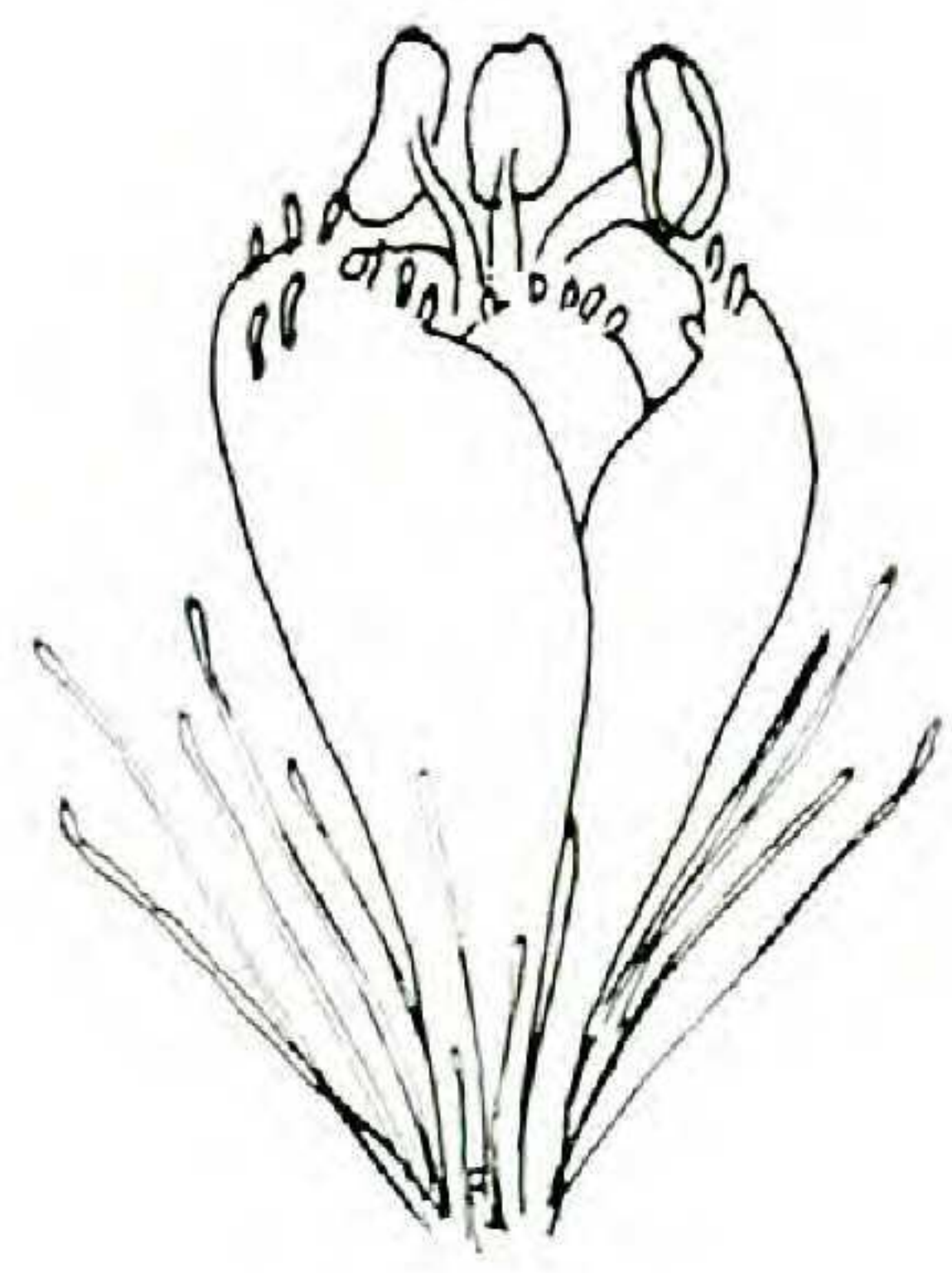
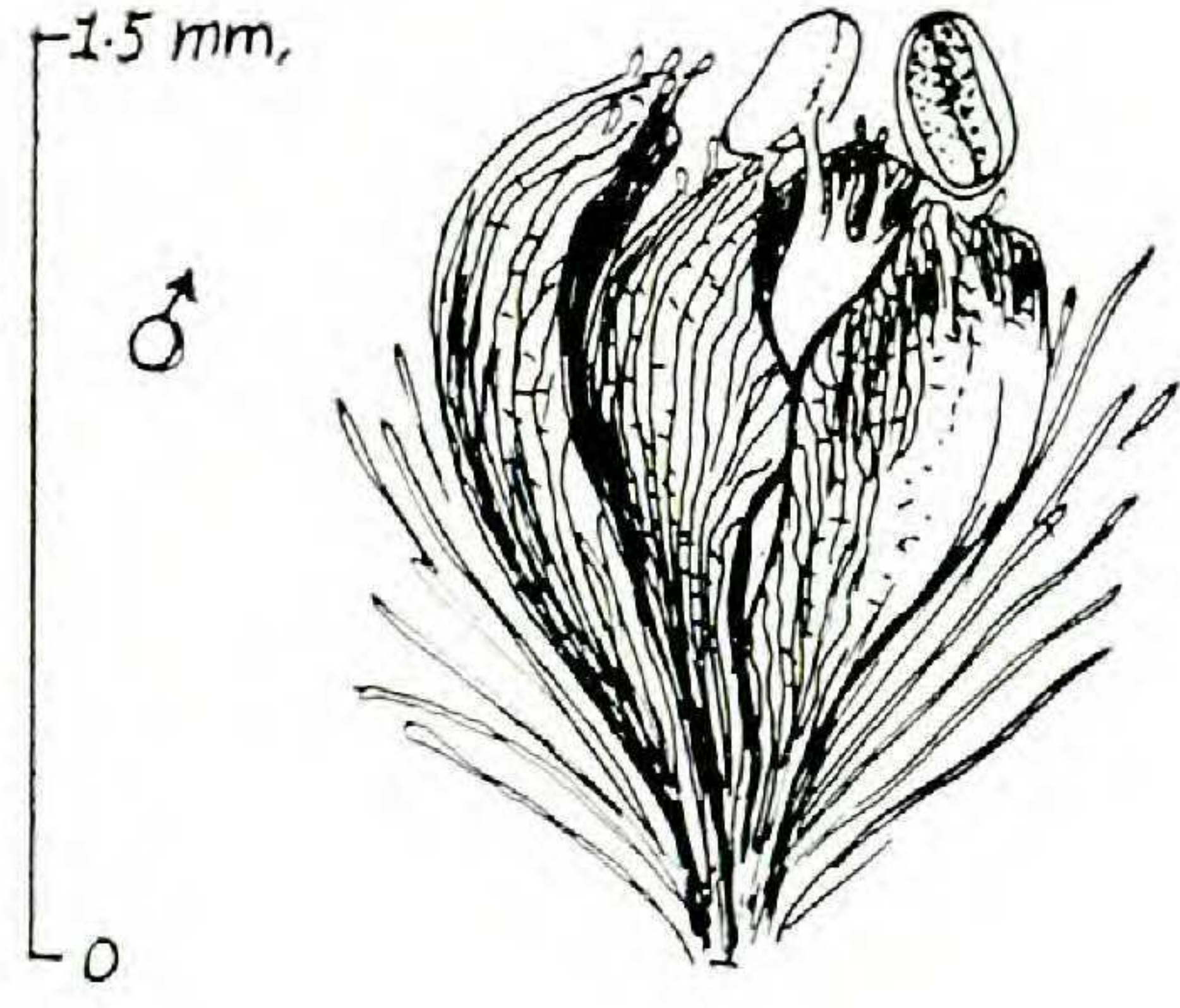
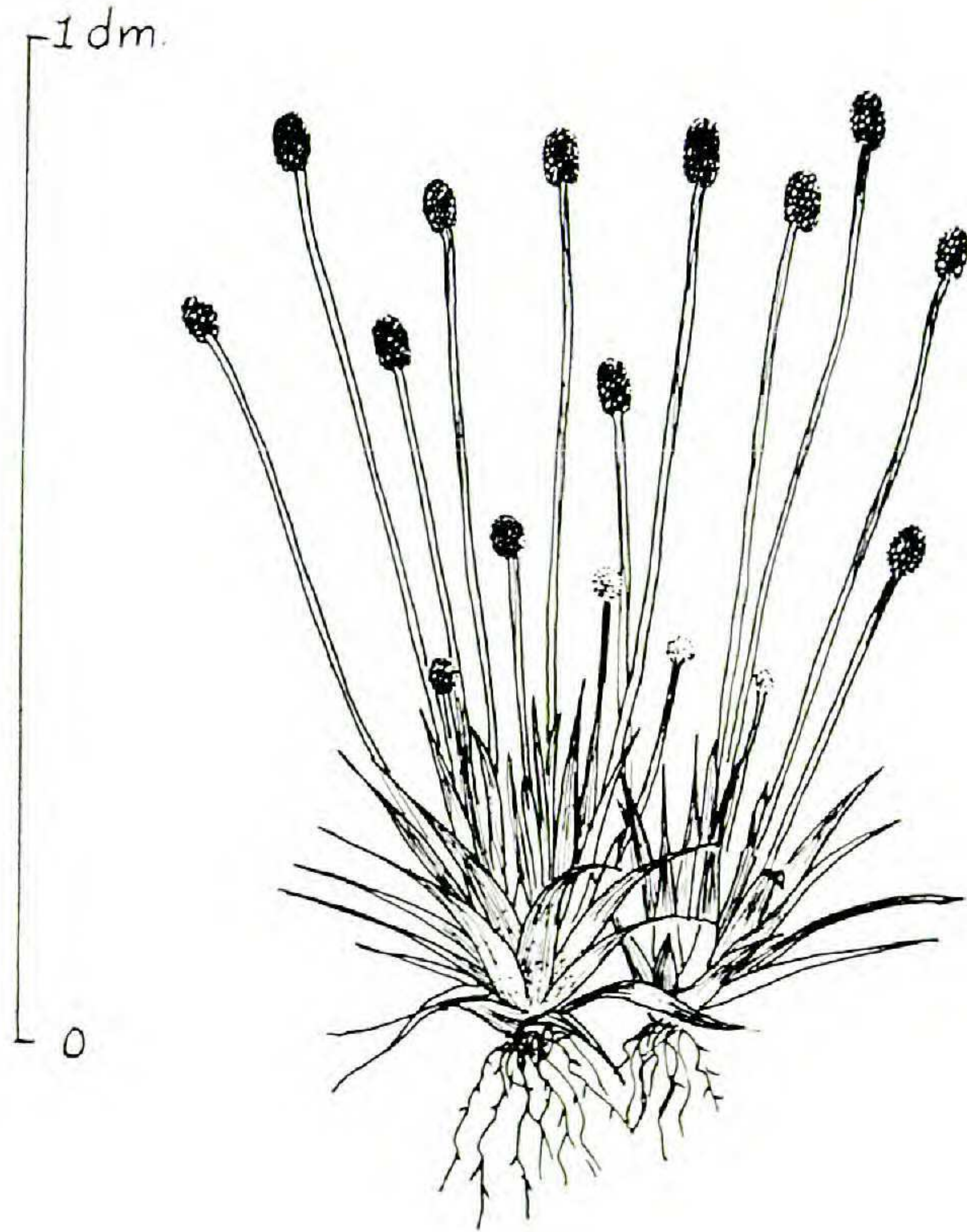
Type. "low pine barrens, Bristol, Liberty Co., Florida, Chapman." At NY.

This species may occur in mixed populations with *L. anceps* or *L. engleri*. It is distinguished from the former by its smaller stature, smaller, darker heads, and by the translucent rather than white-opaque, clavate trichomes on bracts and sepals. It is distinguished from the latter by its paler-brown heads and by its usually hairy scapes. *L. minus* appears to require more moisture than *L. anceps*; I have yet to find it in drier flatwoods localities in which *L. anceps* may abound.

Examination by this writer of the type of *L. eciliatum* Small (*Curtiss, N.A. Pl., no. 3022*) resulted in a decision to treat such material as *L. minus*, in that the only difference appears to be one of degree of pubescence on bracts and sepals of female flowers together with slight differences in length of parts (all of which are accrescent in Eriocaulaceae).

4. LACHNOCAULON ENGLERI Ruhl. in Engler, *Pflanzenreich* 430: 241. 1903.

A clump former or solitary, the tufts of leaves developing from short lateral offshoots. Leaf linear-acute to linear-attenuate, yellowish-green, 2.0-3.0 cm. long, evenly narrowing from a clasping base 2.5-4.0 mm. broad, the upper and lower surface smooth or with a very distant scattering of clear, multicellular, filiform trichomes. Sheath of the scape acuminate, smooth, sometimes split, the same length as or slightly shorter than, the leaf. Mature scape 6.0-15.0 cm. long, twisted, evidently 3-carinate, smooth. Mature head globose to short-cylindric, 3.0-8.0 mm. long, 3.0-4.0 mm. broad, dark brown, appearing smooth in contrast to the heads of other *Lachnocaulon*. The longer of the outer involucre bracts



Lachnocaulon engleri

broadly ovate, 1.0-1.5 mm. long, obtuse or broadly acute, ciliate, castaneous or light brown. Receptacular bractlets oblong or obovate, 1.0-1.5 mm. long, concave-curved, pale below and translucent, castaneous distally, the obtuse tips smooth or with a few stramineous, clavate, clear hairs. Surface of the receptacle of the head pilose, the hairs filiform, translucent, yellowish. Male flower: sepals linear or oblong-curved, about 1.0 mm. long, concave, glabrous and pale toward the narrowed bases, the lateral sepals evidently keeled, rounded or obtusely angled, dark brown and with a few stramineous, clavate hairs on the backs distally; receptacle comose, with filiform trichomes; androphore smooth, obpyramidal, slightly shorter than the sepals, rarely tipped with small, clavate hairs; anthers 2 or 3, short-oblong, very slightly exerted from the head at anthesis, yellowish. Female flower: sepals oblong, about the same length as the male sepals, concave-curved and smooth or with a few multicellular, clavate trichomes on the backs distally, brownish; receptacle and gynophore copiously pilose with pale brownish, filiform hairs; gynoecium 3-carpellate, 3-locular, 3-ovulate, the styles 3, bifid. Seed ellipsoidal, about 0.5 mm. long, a rich transparent brown, the longitudinal lines conspicuous, the cross lines evident to form narrowly oblong cancellae.

Moist sands, sandy-peats or peat-muck of pineland pond margins, lakeshores, and mildly acid marshes along the seacoast, coastal plain, the lower Pleistocene terraces, Florida.

Type: Ditches and lakeshores in the vicinity of Eustis, Lake Co., Florida, Nash 1184.

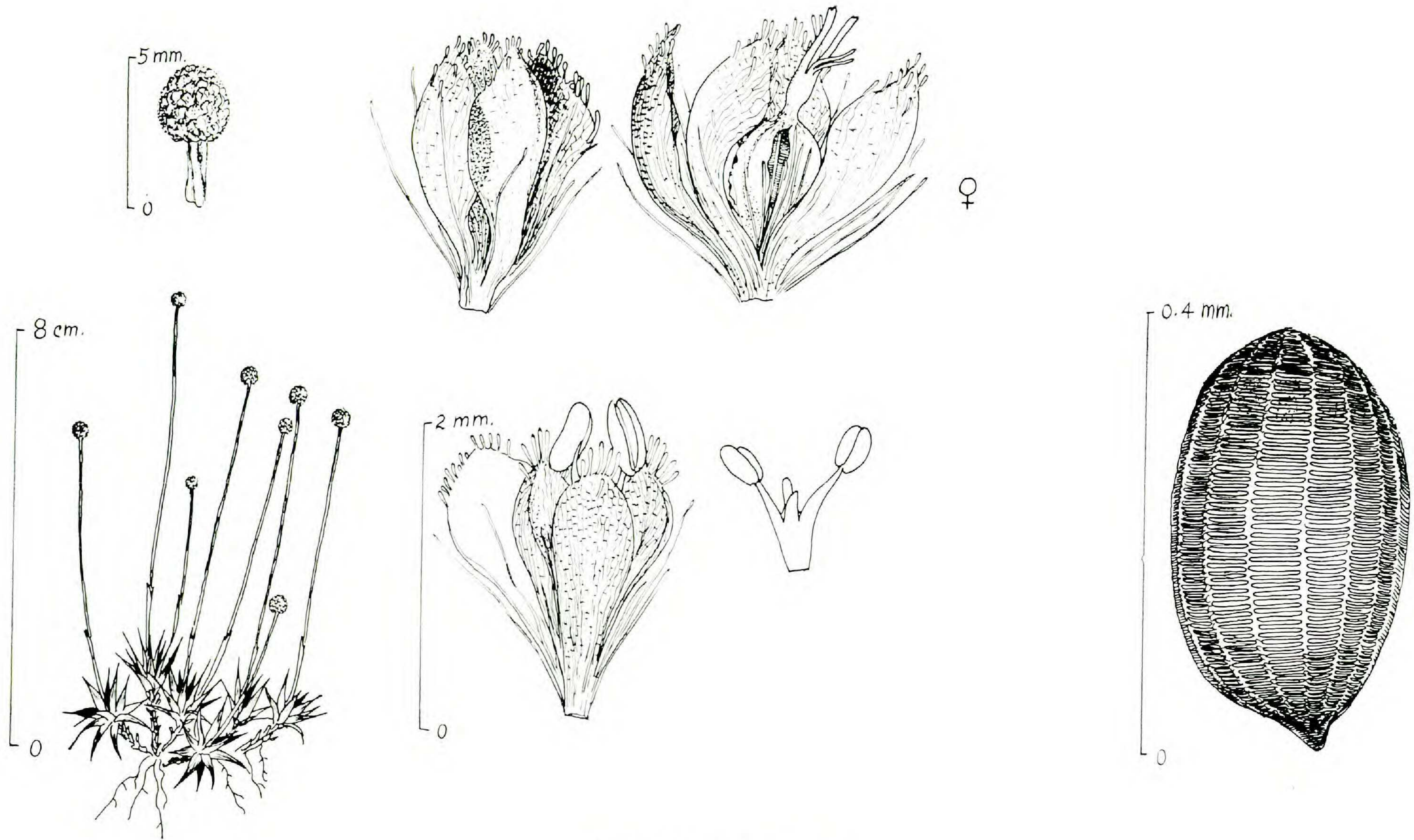
The dark brown inflorescence, glabrous scape, and deep-brown, lustrous seed of this species distinguish it from all others of the genus that have been found in Florida.

The almost "spontaneous" development of large numbers of this species on recently disturbed wet sands or upon the drying peat left by fluctuating lake and pond margins in Florida makes one wonder whether any habitat of relative permanence is occupied by this species. Certainly its seed must have an inherent capacity to remain dormant for such extended periods of times as necessary for such ephemeral habitats to recur. A similar behavior is noted for *L. minus*, a species with which *L. engleri* most frequently is found.

5. LACHNOCAULON DIGYNUM Korn., Linnaea 27: 570. 1856.

Lachnocaulon diandrum Van Heurck & Muell.-Arg. in Van Heurck, Obs., Bot. 1: 108. 1870.

A clump former, dense tufts of rosettes forming from slender ascending rhizomes which develop from axillary buds. Leaf linear-acute, 0.6-1.0 (2.0) cm. long, bright yellowish-green, evenly narrowing from a clasping base 1.0-2.5 mm. broad, almost smooth or with a scattering of multicellular trichomes, these usually most abundant toward the margins. Sheath



Lachnocaulon digynum

of the scape acute, or bifid, longer than the leaves, smooth or sparingly ciliate toward the orifice. Scape 5.0-10.0 cm. long, slightly twisted, 3-ridged, smooth or with a distant scattering of filiform, multicellular trichomes. Head grayish or dull gray-brown, globose, or hemisphaeric, 2.0-3.5 mm. broad. The longer of the involucre bracts triangular, ca. 1.0 mm. long, brownish, with translucent clavate trichomes on the backs distally. Receptacular bracts spatulate, 1.0-1.3 mm. long, acute or obtusely angled, a rich brown, clavate-hairy on the backs apically. Receptacular surface densely hairy, but the hairs not so long as to obscure the female sepals. Male flower: sepals linear-spatulate, ca. 1.0 mm. long, curvate, a rich brown, sparingly clavate-hairy on the backs apically; receptacle hairy; androphore smooth, obpyramidal, about the length of the sepals, the apices oblique; anthers 3, yellowish, oblong, slightly exerted on filaments about as long as themselves. Female flower: sepals broadly spatulate to narrowly obovate, ca. 1.0 mm. long, keeled, and curvate, hence connivent over the ovulary, whitish-yellow, smooth or with a few marginal hairs distally; receptacle and short gynophore copiously pilose with pale, translucent, multicellular, slightly clavate, trichomes; gynoecium 2-carpellate, 2-locular, 2-ovulate, the styles 2, bifid. Seeds ovoid to ellipsoidal, about 0.5 mm. long, longitudinally striate, the connecting striae finer, almost obscure.

Wet acid exposed sands and sandy peats or seepage bogs, pineland pond margins, ditches and roadbanks, coastal plain, northwestern Florida west to southern Mississippi.

Type: Alabama.

This species, which is particularly abundant in the wet pine flatwoods country about Pensacola, Florida, has the smallest leaves of all the *Lachnocaulon* of the United States. The small rosettes, densely aggregated on slender ascending rhizomes into bright green, convex tufts of sometimes hundreds of individuals, remind one of some of the larger *Polytrichums*. The 2-carpellate condition of the gynoecium is consistent throughout all samples of this species so far examined, there being no evidence at all of any aborted third carpel either in the ovulary or in the style branching. The only other species of *Lachnocaulon* which I have found in association with this one is *L. anceps*, from which it is readily distinguished in the field by its glabrous or almost glabrous scapes, its shorter stature, and its darker, smaller heads.

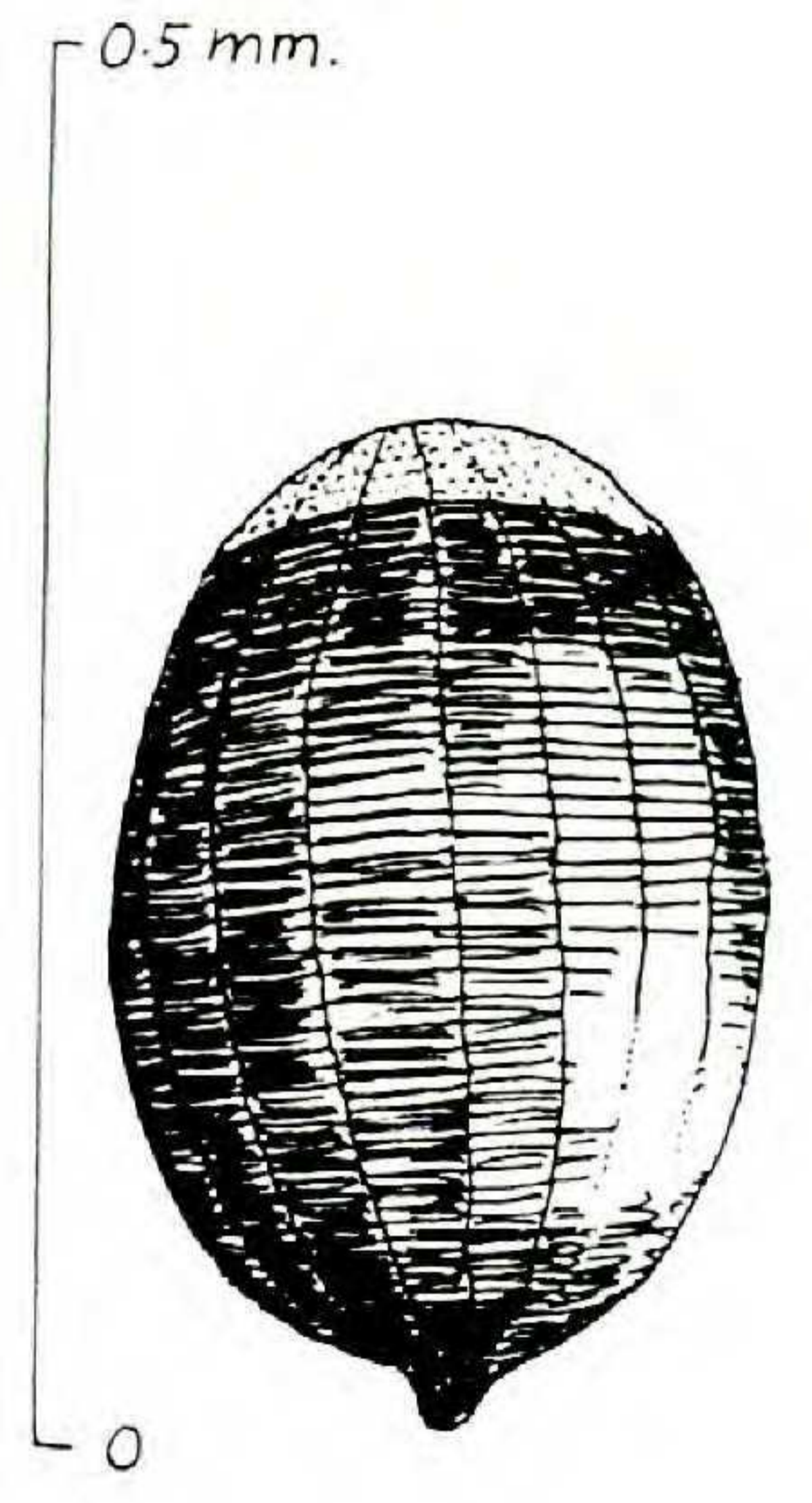
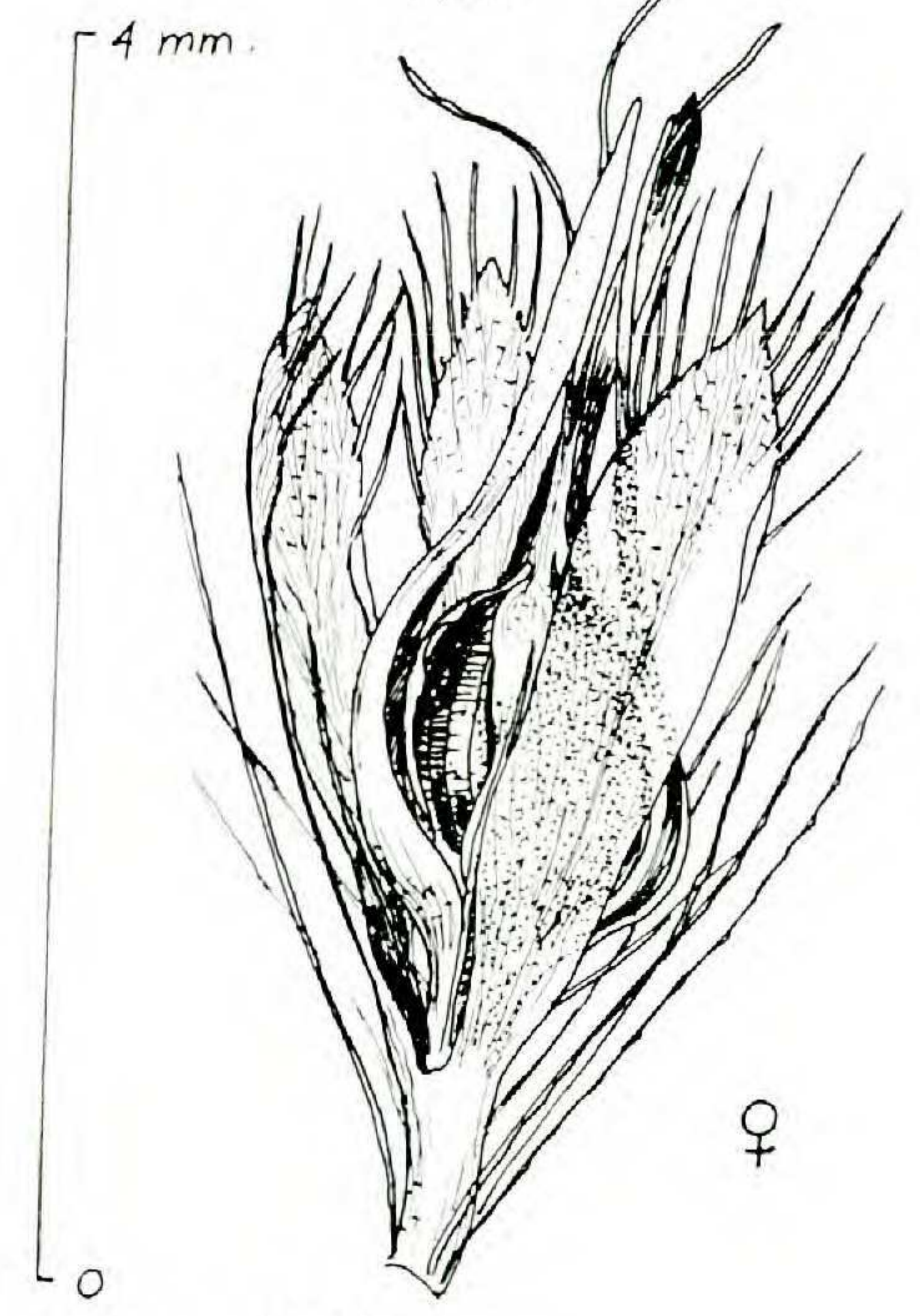
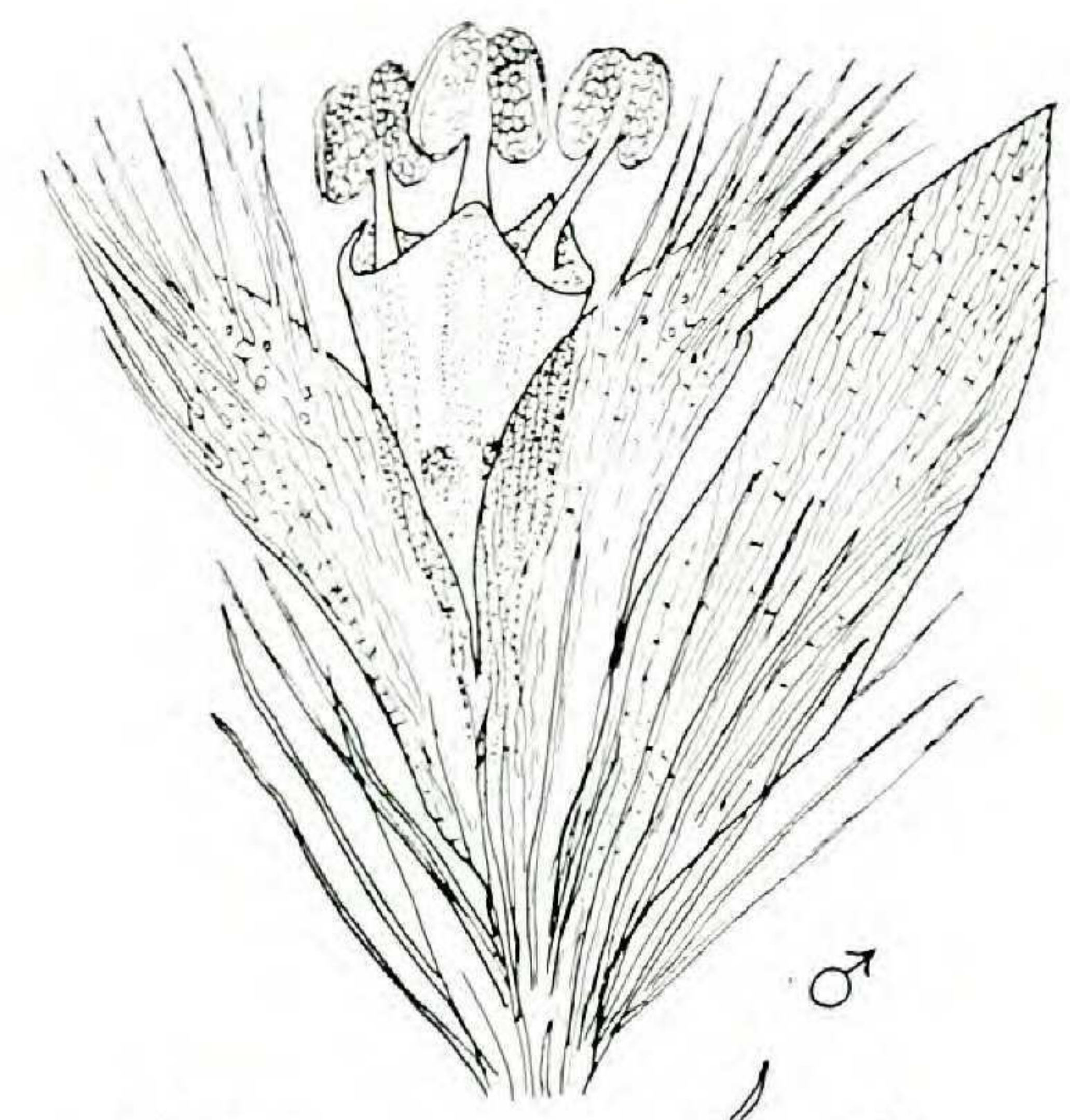
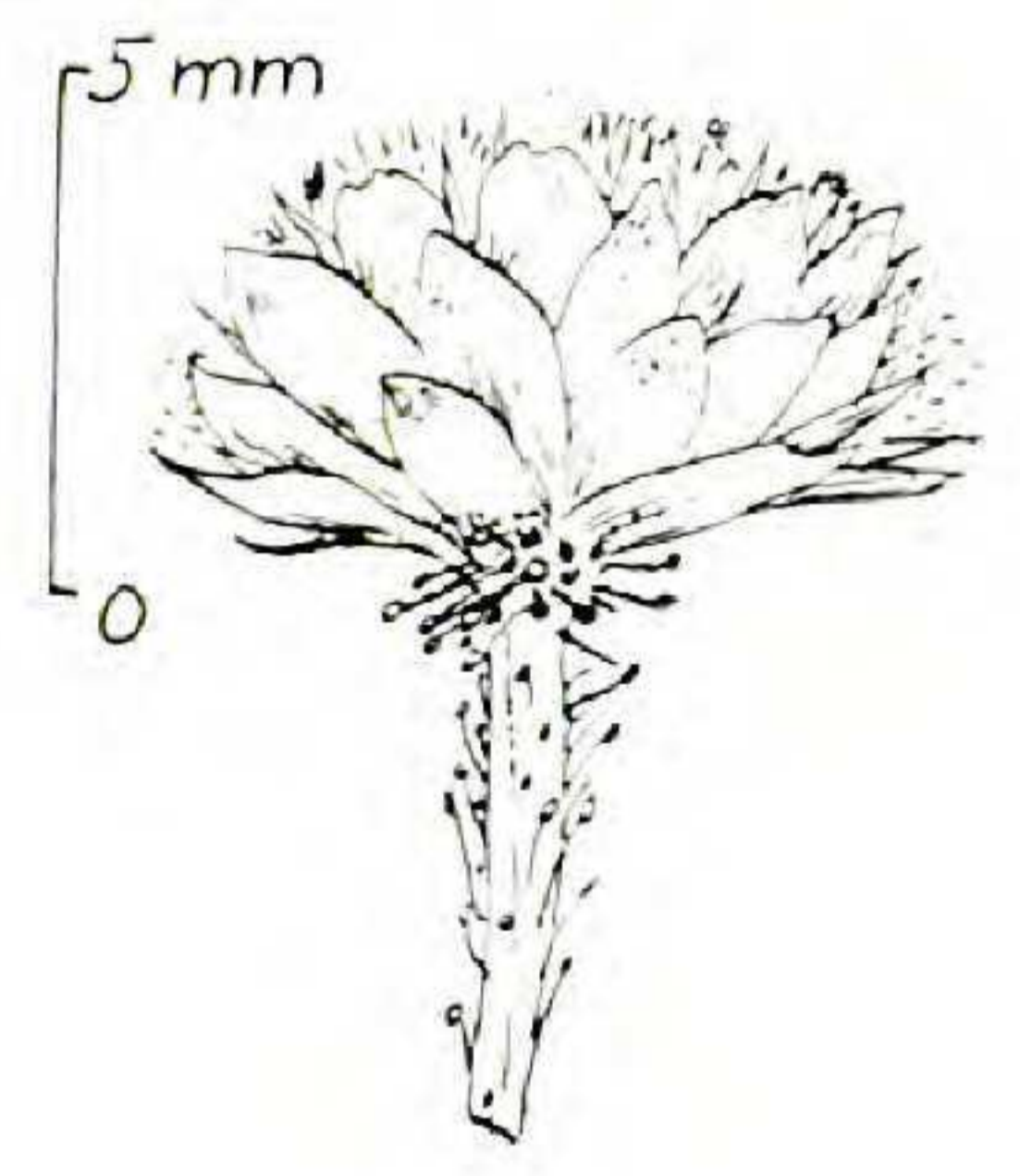
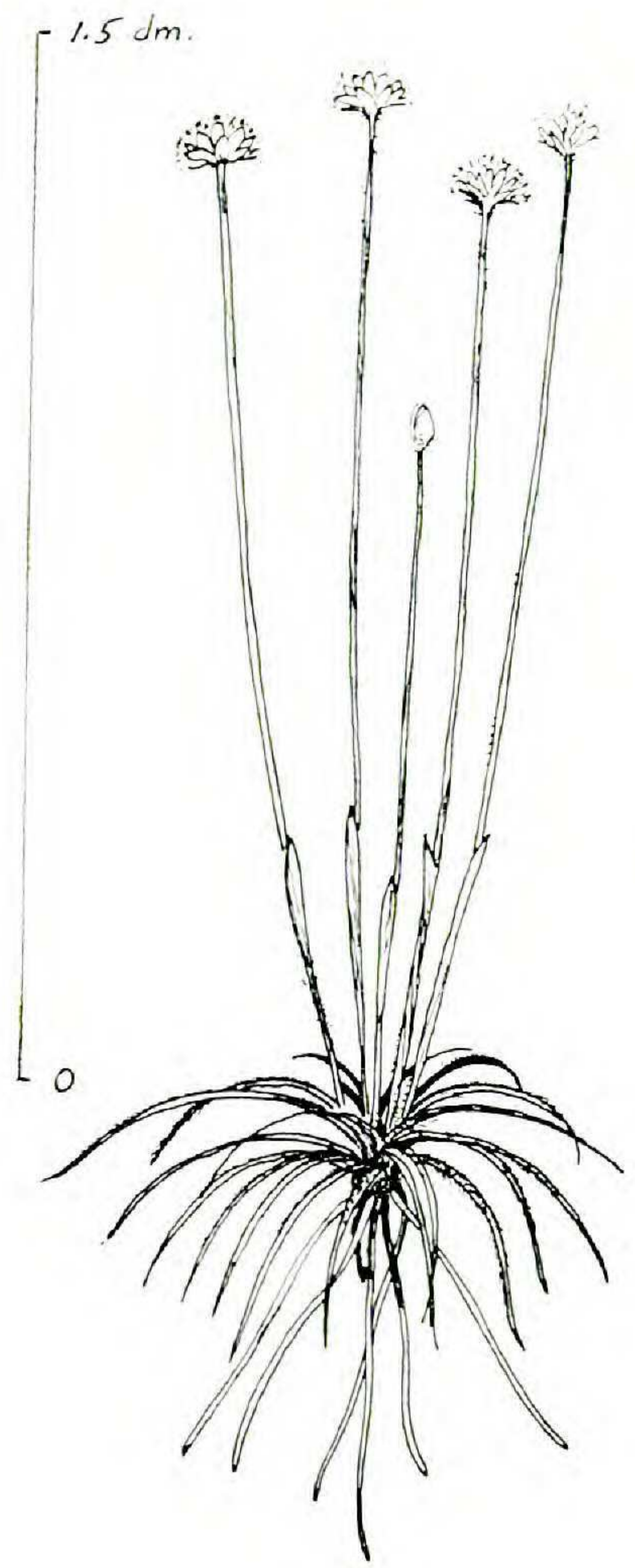
SYNGONANTHUS Ruhl. in Urb., Symb. Ant. 1: 487. 1900

1. SYNGONANTHUS FLAVIDULUS (Michx.) Ruhl., in Engler, Pflanzenreich IV. 30: 256. 1903.

Eriocaulon flavidulum Michx., Fl. Bor. Am. 2: 166. 1803.

Paepalanthus flavidulus Kunth, Enum. Pl. 3:532. 1841.

A clump former or solitary, the dense, recurved-leaved, rosettes of



Syngonanthus flavidulus

crowded leaves on short stems which develop from lateral buds, the roots pale and spongy-thickened, but lacking septae. Leaf bluish-green, narrowly linear, 2.0-6.0 cm. long, attenuate, broadening gradually toward, then flaring abruptly at the clasping base, almost smooth to densely pubescent with long, pustular-based, multicellular trichomes. Sheath of the scape exceeding the leaf (actually very slightly but seemingly considerably, for the leaves are usually recurved and flattened against the substratum while the scapes are erect), acute or bifid, ascending-pilose, many of the hairs gland-tipped or clavate. Scape 5.0-30.0 cm. long, slightly twisted, 5-ridged, with ascending, slight to copious pubescence of long, multicellular, translucent trichomes, many of which have glandular tips. Young flowering heads hemisphaerical, mostly obscured by the straw-coloured outer bracts, later becoming globose, gray, chaffy, 5.0-10.0 mm. broad. Receptacle densely pilose with long, filiform-acute, translucent trichomes. Longer receptacular bracts oblanceolate, about 2.5-3.5 mm. long, straw-coloured, acute, sparingly ciliate with filiform, multicellular, acute trichomes. Male flower: sepals 3, spatulate or oblanceolate, ca. 2.0-3.0 mm. long, pale, acute, equipped on the backs distally with slender, acute, multicellular, translucent trichomes; receptacle slightly hairy; petals 3, fused into a narrowly funnelform tube ca. 2.5 mm. long, pale yellow, the short lobes alternating with the filaments of the stamens; stamens 3, the filaments originating at a disc midway the length of the corolla tube and slightly extending past the corolla rim, the anthers short-oblong, yellowish, seemingly bilocular but actually with 4 locules; staminodia 3, obovoid, yellowish. Female flower: sepals 3, linear, acuminate, ca. 3 mm. long, pale, translucent, accrescent, smooth or the backs glabrescent; petals 3, narrowly linear, acute, about the length of the sepals, the tips connivent above the gynoecium, smooth; receptacle and gynophore smooth or hairy, the gynoecium 3-carpellate, 3-locular, 3-ovulate (1 often aborting), the ovules pendulous, the styles 3, unbranched; seeds ellipsoidal, evidently longitudinally and vertically striate, ca. 0.5 mm. long, the connecting vertical striae faint but forming evident ladders of alveolae, lustrous.

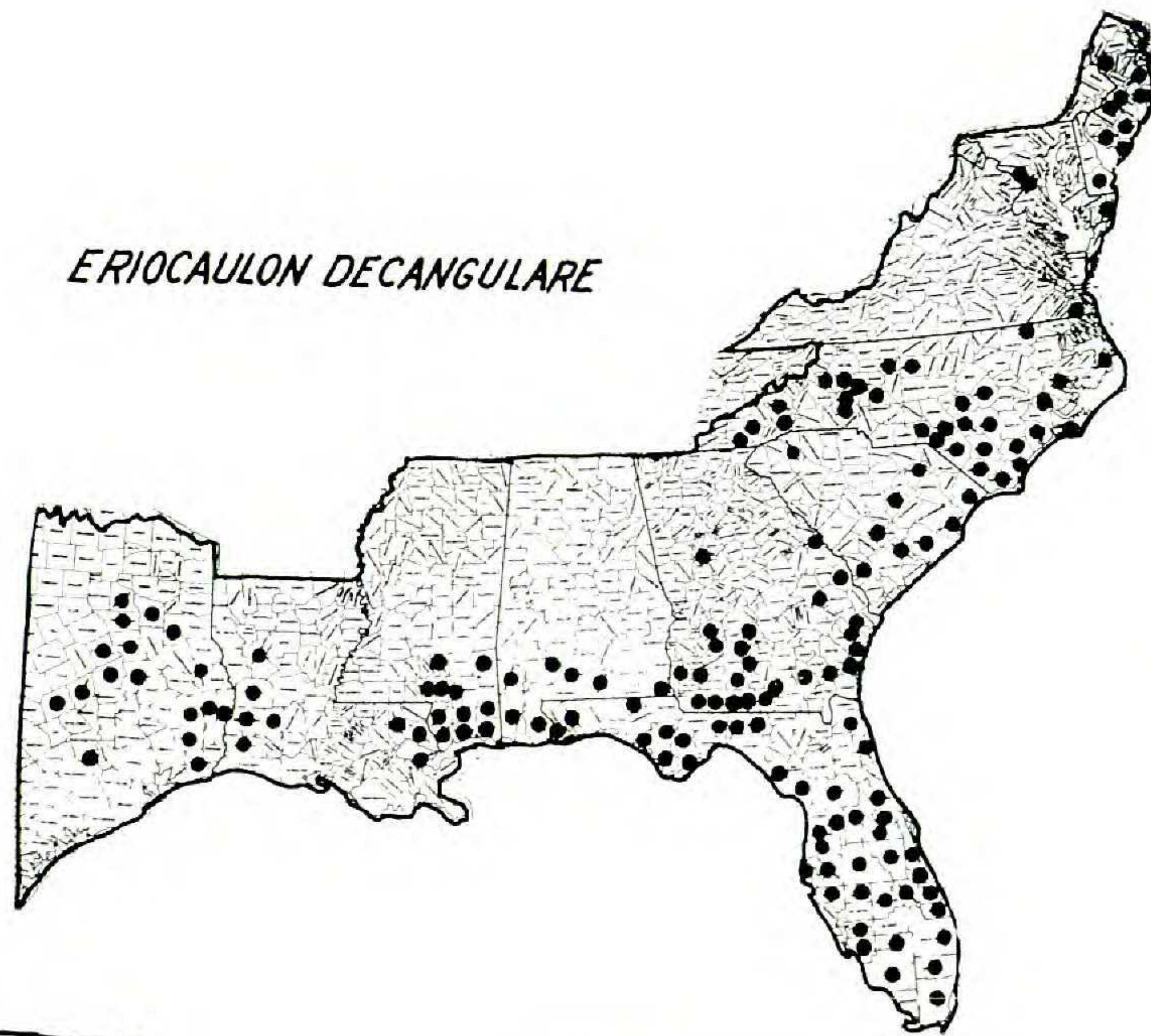
Moist to rather dry sands, sandy peats or peats of pine flatwoods, lake or pond margins, seepage bogs, ditches, ditchbanks and savannas, coastal plain, particularly the lower terraces, Florida north to southeastern Virginia (?), west to southern Alabama.

Characteristics which distinguish this species from other Eriocaulaceous plants of the United States and Canada are as follows:

1. Roots unbranched, spongy-thickened, non-septate . . . this in contrast to roots branched and slender-fibrous in *Lachnocaulon* and roots thickened-septate in *Eriocaulon*.

2. Leaves of the rosette very copious, very narrowly linear, and def-

ERIOCAULON DECANGULARE



ERIOCAULON KORNICKIANUM



ERIOCAULON CINEREUM ●
E. MICROCEPHALUM ●

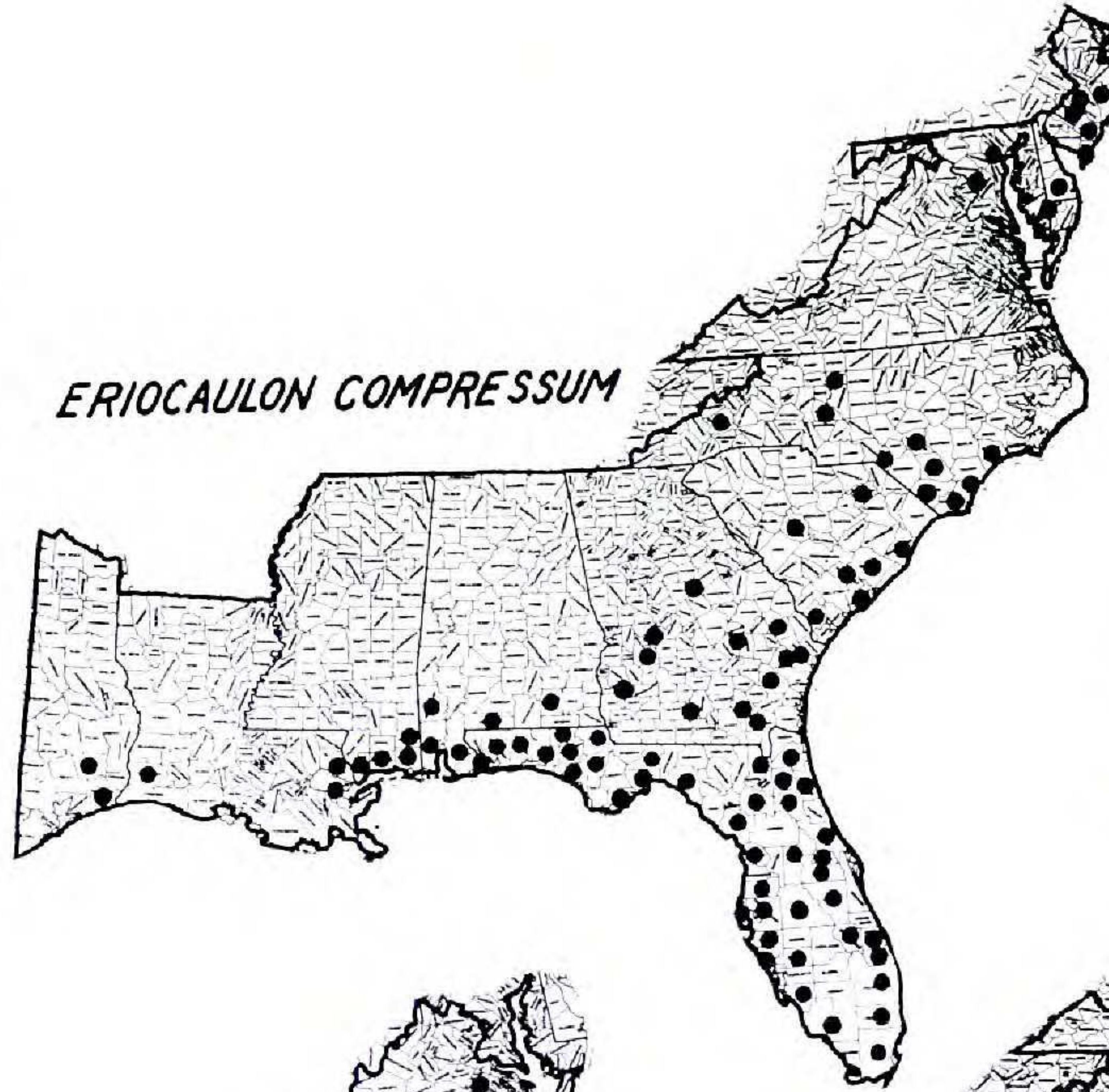
ERIOCAULON SEPTANGULARE ▲
E. LINEARE ○
E. TEXENSE ●



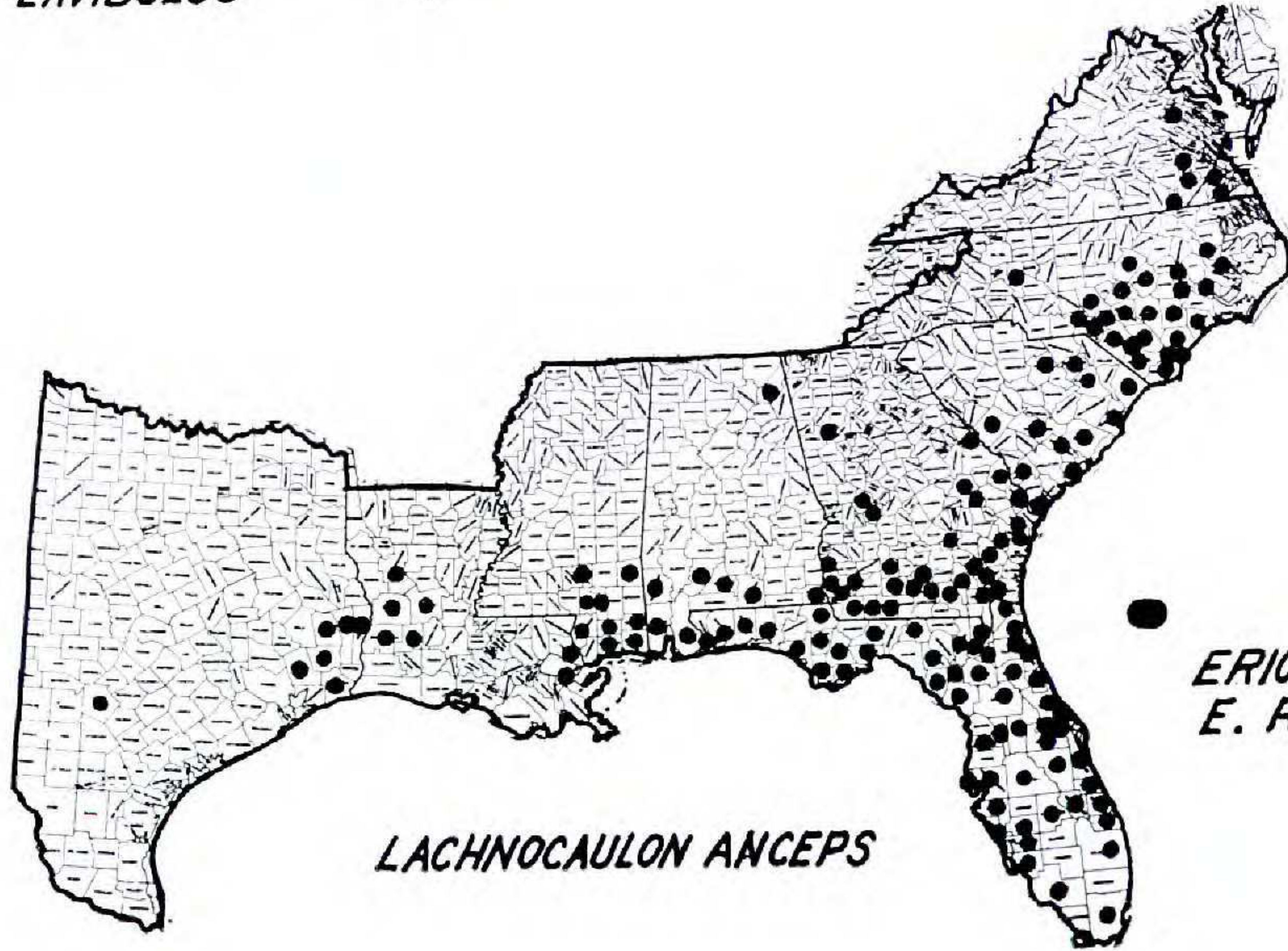
*SYNGONANTHUS
FLAVIDULUS*



ERIOCAULON COMPRESSUM



LACHNOCAULON ANCEPS



ERIOCAULON PARKERI ●
E. RAVENELII ▲



LACHNOCAULON MINUS ●
L. BEYRICHIANUM +



initely recurved to flatten against the substratum . . . this in contrast to the ascending-spreading leaf habit of sympatric Eriocaulaceae.

3. Trichomes of the leaves tending to be pustular based, a characteristic not found on sympatric Eriocaulaceae; at least some of the trichomes of the upper scape clavate or glandular-tipped.

4. Both sets of perianth parts present, the flowers seemingly actinomorphic . . . this in contrast to *Lachnocaulon*, in which only one set of parts is present or *Eriocaulon*, in which zygomorphy is apparent.

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