

SOME NOTES ON *DICERANDRA* (LAMIACEAE)

ROBERT KRAL

*Herbarium, Department of Biology, Vanderbilt University
Nashville, TN 37325*

Nineteen years ago Dr. Lloyd Shinnars (1962) did a synopsis of *Dicerandra* in which he described a new, shrubby species, *D. frutescens*, from peninsular Florida. In 1963 still another new woody Floridean species, *D. immaculata* was added by Olga Lakela. Thus, what for years was thought to be a genus of three annuals turned out to be a much more complex group.

My practical interest in *Dicerandra* was stimulated by having to write descriptions, together with forest management implications, for the three species that are federally listed as threatened or endangered. As a result of this, involving some field work on the plants going back to 1975, I came to have enough information to add to Dr. Shinnars' synopsis and had written up what appeared to be yet another new *Dicerandra* from Florida. I have, however, been informed that this same taxon has been published in advance of my own, under the name *D. cornutissima* by Ms. Robin Huck (1981). However, it was gratifying to know that my opinion was arrived at independently by a full-time student of the genus.

In that a full study has been planned for *Dicerandra* by Ms. Huck, my own necessarily is confined to remarks on morphology, distribution and habitat.

Most of the funds for field work have been provided through cooperative agreements # 42-4750, # 42-272, and # 42-283 between the Forest Service and Vanderbilt University and this aid is gratefully acknowledged, as is that from curators and staffs of FLAS, FSU, GA, NCU and US, who provided either loans or facilities.

MORPHOLOGY AND ECOLOGY

Dicerandra has a rather uniform morphology very similar to other mints with hairy-annulate calyces such as *Calamintha*, *Conradina*, *Micromeria*. It is distinguishable mostly by the cornute anthers. In the annuals a pathogen stimulates a fusiform gall in the root; however the plants that develop such galls are larger, more vigorous than are those that do not. All annuals tend to show a small "crook" of stem just above the taproot but are otherwise erect. The shrubs, on the other hand, produce dimorphic shoots, floriferous ones which are erect or ascending and which die back to base at the end of a season, and non-floriferous ones which are more densely leafy and which as a rule are lower, spreading, decumbent or sprawling, and last through the

winter. From the latter arises the floriferous and sterile shoots for the next season. All species produce axillary leafy shoots at most nodes; these, suppressed in most cases, give most nodes the appearance of having leafy fascicles.

The fundamental inflorescence is a symmetrical, simple or compound, dichasium, ascending and convex inside (Fig. 1). The most complex cyme (Fig. 1-a) is one with seven flowers (more buds may form but these rarely reach flowering size), and is sessile or has a basal peduncle which terminates in a pair of bracts and three axes, the central one bractless, terminating in a single flower, the laterals each forming bibracteate simple dichasia. From this seemingly more primitive type there may be reduction to six flowers or five (Fig. 1-b), where the lateral dichasia do not develop, or at the end of the line (Fig. 1-e) to a single, bibracteate flower. All species exhibit some range in flower number but *D. linearifolia*, *D. densiflora*, *D. odoratissima* and *D. immaculata* tend to vary the most and *D. frutescens* and *D. cornutissima* definitely trend toward few-flowered cymes.

While the basic plan of the flower in this genus is fairly uniform as to character of the whole inflorescence, calyx, corolla lobing, character of stamen, gynoecium and fruit, there are remarkable differences in general pigmentation, insect guide mottlings, indument. On the basis of corolla design and stamen orientation *D. odoratissima* stands strongly apart from all others and probably should be considered as a distinct, monotypic, section (for detail, see description!) While all species have cornute anthers it is of interest to note that one, *D. densiflora* has very reduced anther horns and at the same time shares more characteristics with the wide-ranging *D. linearifolia* than it does with any other. Morphological relationships within the genus will be taken up briefly later.

All *Dicerandra* are confined to the Coastal Plain with only one (*D. linearifolia*) approaching the Fall Line Hills. Their habitat is rather uniformly droughty, mostly the yellow or white sands of sandhills or disturbed open areas whose soil is high in sand. The commonest forest types in which these mints abound are longleaf pine-turkey oak, sand pine-evergreen scrub oak, or live oak-pine. Common shrub associates are in genera *Serenoa*, *Yucca*, *Quercus*, *Polygonella*, *Ceratiola*, *Persea*, *Rubus*, *Chrysobalanus*, *Prunus*, *Ilex*, *Ximinea*, *Opuntia*, *Lyonia*, *Vaccinium*, *Bumelia*, *Chionanthus*, *Calamintha*, *Conradina*, *Chrysoma*, *Garberia*. Associated herbs are mostly those occupying lower seral stages of sandhills or sandy soil succession, characterized by influences of fire and wind which reduce the woody competition and maintain sandy openings. All *Dicerandra* appear readily to invade adjacent mechanically disturbed sites or those in which fire management of longleaf pine is practised. The remarkable fact is that, while they do display weedy tendencies, they show little signs of spreading, nor have I yet seen examples of mixed populations.

The genus is mostly fall-flowering, entirely insect-pollinated. Various

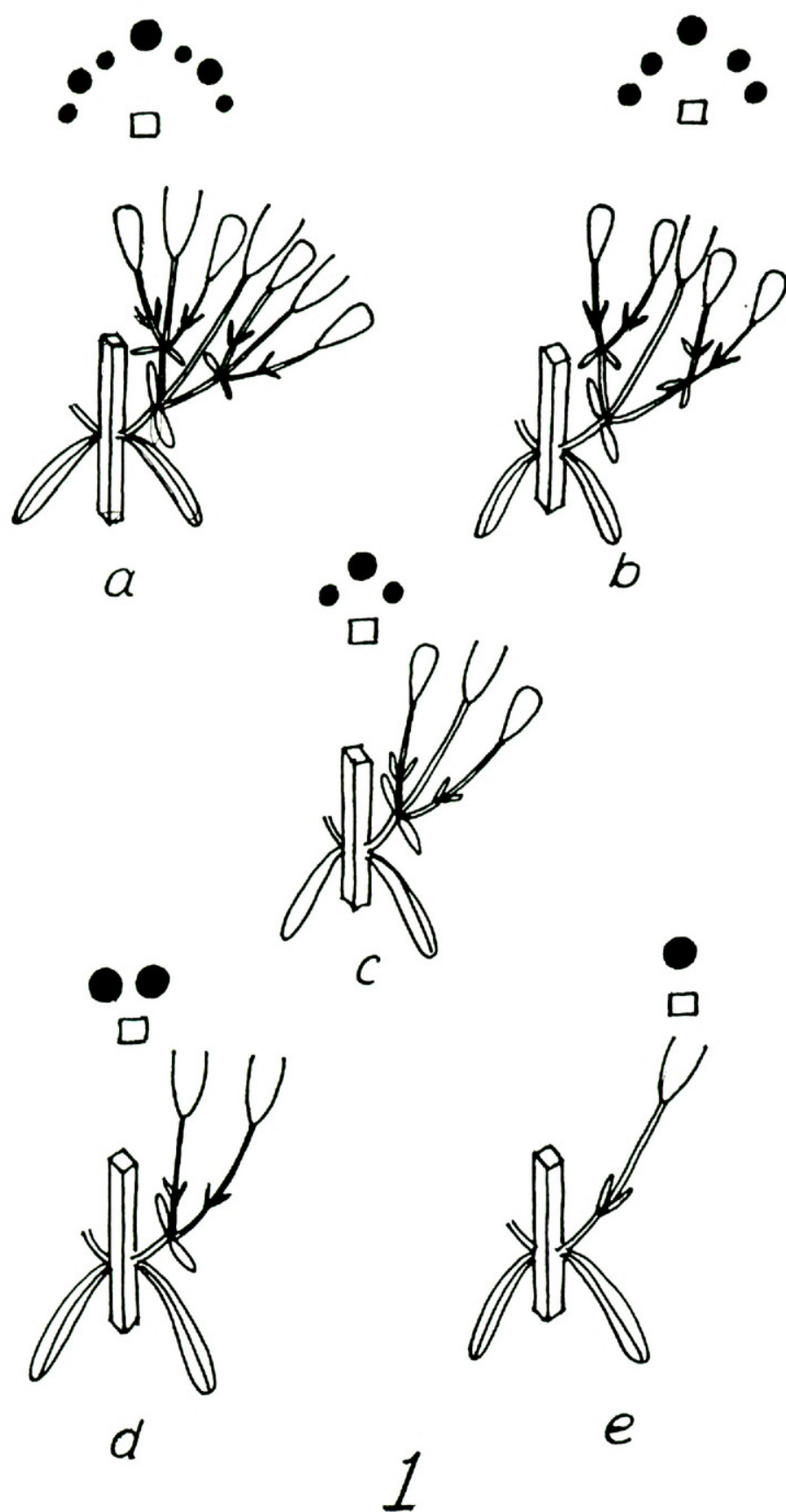


Fig. 1. Inflorescence types of *Dicerandra*.

long-tongued flies, particularly hoverflies, moths (especially small sphinx moths, clearwings) and a wide spread of bees such as megachilids, andrenids, honeybees and bumblebees visit the flowers, the larger bees often parking on the lower corolla lip, depressing the flower as they thrust their heads into the corolla throat. Pollen exchange between plants appears to be heavy. There are as yet no reports of hybrids between species, perhaps not surprising in that, while sometimes two species may occupy sandy habitat in the same county (i.e. *D. linearifolia* and *D. odoratissima* in some Georgia counties, *D. densiflora* and *D. linearifolia* in some Florida counties) no two species appear to occupy the same site. Results of test crosses made in a full study should be of real interest.

Some speculation as to species relationships based on morphology and geology history seems appropriate here.

Of the six species, three (*D. immaculata*, *D. cornutissima*, *D. frutescens*) are very narrowly endemic shrubs confined to peninsular Florida. The other three, as stated earlier, are annuals (*D. linearifolia*, *D. densiflora*, *D. odoratissima*) with *D. linearifolia* the most expressive morphologically and covering the next-largest area, and *D. densiflora* with the smallest geographic area of the annuals and with the greatest character overlap with extremes of *D. linearifolia*.

If one studies carefully the cymes of all the species two observations become significant. First, there does appear to be a reduction series as to number of flowers developed in a cyme (Fig. 1 and discussion). Second, there are buds developed in cymes of all species that do not ever reach flowering size. This sort of evidence weights toward the idea that the *Dicerandra* inflorescence arose from an ancestor that had axillary cymes with more flowers than are now developed in the genus, and that this sort of reduction has culminated in the largely single-flowered cyme of *D. frutescens*. Such trends are present in many other genera of Lamiaceae.

Maps of the species (Fig. 8) show that *D. linearifolia* and *D. odoratissima* in addition to being found on younger Coastal Plain terraces and covering the largest geographic areas, are found also on land with an older history. The story best borne out by a combination of morphology and geography is that *D. linearifolia* and *D. odoratissima* are the oldest species, derived from a common ancestral complex. It is of interest to note that these two have substantial range overlap, yet do not seem to produce intermediates. These sorts of data support the idea that, while the opportunity for genetic traffic between the two is greater than it is for the other species, it does not happen, and the two seem to have been isolated reproductively for some time. *Dicerandra odoratissima* in fact has diverged enough to constitute a distinct section of the genus or even enough to have become a genus (consistent with some generic concepts in Lamiaceae). *Dicerandra linearifolia*, being the most diverse morphologically as well as being the most wide-ranging species, is closest to the type from which the remaining four species

could have arisen. Such appears to have been the case in *D. densiflora*.

Field work in the Suwannee River system of Florida reveals that populations of *D. linearifolia* there are consistently broader-leaved and pinker flowered than is the case with populations north and west of the system. However, southward along the Suwannee there is a break, and what may appear from a distance to be more stands of broadish-leaved, lavender-rose-flowered *D. linearifolia* on closer inspection have the white, nearly hornless anther and the sessile cymes of *D. densiflora*. There is no doubt about the affinities of these two taxa.

The suffruticose peninsular Floridean *Dicerandra* must also have a comparatively recent derivation, with *D. immaculata* having arisen from eastern peninsular *D. linearifolia*, which is mostly pink-flowered, and *D. cornutissima* and *D. frutescens* isolated from a pale-flowered "*linearifolia*" type of connecting morphology that once was more continuous in the Central Highlands. If trends of inflorescence reduction have any significance along a time scale, it would seem that *D. cornutissima* and *D. frutescens* arose comparatively recently, and along the highlands axis.

NOMENCLATURAL HISTORY

The name *Dicerandra* is based on a specimen sent to Hooker by Stephen Elliott of a plant he had described (Sk. Bot. S.C. & G. 2: 1822) as *Ceranthra linearifolia*. Unfortunately A. M. F. J. Palisot-de-Beauvois (Flore d'Oware et de Benin en Afrique, Vol. II, p. 10, 1807) had already applied *Ceranthra* to a violaceous plant, while C. S. Rafinesque (Am. Monthly Mag. & Crit. Rev. 1818) had applied it to a genus of Solanaceae. Thus, *Ceranthra* being preoccupied, Bentham applied to the Elliott specimen a new name, *Dicerandra* (Bot. Reg. 15. 1830). As Shinnars stated (1962) "Elliott's only species, *C. linearifolia*, is automatically the type." The name Bentham chose is apt reference to the cornute anther. The holotype has been determined by Dr. Stuckey (see discussion under *D. linearifolia*).

TAXONOMIC TREATMENT

DICERANDRA Bentham, Bot. Reg. 15: 5. 1300. 1830; Benth. in DC. Prodr. 12: 242. 1848.

Ceranthra sensu Ell. (1822), not Beauv. (1807), not Raf. (1818).

Shrubs or annual herbs, mostly from a taproot or branched taproot, the foliage and flowers glandular-atomiferous and strong smelling. Stems equally or unequally quadrate, smooth or puberulent, mostly erect, simple or profusely and oppositely branched. Leaves decussate, entire or nearly so, sessile or short-petiolate, narrow, from nearly filiform to linear, oblong-linear, linear-elliptic, lanceolate or oblanceolate. Flowers bisexual, bilabiate, in sessile or pedunculate, bracteate, 1-7-flowered axillary cymes, the whole inflorescence narrow, elongate, dense or interrupted regularly, indeterminate

or with central cymes opening first. Calyx tubular-funnelform, with 13 strong ribs, 2 strongest, lateral and distally alate on the somewhat flattened upper side, externally dotted with clear sessile glands over the thin intervals, internally with an annulus of stiff, long, pale, erect hairs, also often strigose on the inner surface of the lower lip; upper calyx lip curved upward, ciliate, broadly rounded, but with 2-3 low and convergent teeth, slightly shorter than the lower lip, this triangular, projecting forward, cleft halfway or more to form 2 teeth, these narrowly triangular, sharp, divided by a sharp, narrow sinus, strigo-ciliate. Corolla bilabiate, the tube erect in the calyx, narrow, in all but one species internally villous throughout, at varying levels from just beyond calyx orifice to well beyond it either (a.) expanding to a short, wide funnelform throat and here bent outward with the floor of the throat base developing a shallowly bilobed palate, or (b.) gradually dilated into an excurved throat and limb; upper corolla lip slightly shorter than the lower, curved upward or forward, usually oblong or broadly ovate, apically either narrowly rounded or broadly rounded-emarginate, internally smooth or with a subapical villous style clamp; lower corolla lip directed downward, broadly obovate, deeply 3-lobed, the central lobe emarginate, the lateral lobes variously spreading or declinate; corolla color white, yellowish-white, lavender or rose with all but one species producing on the limb purple lines or maculations. Stamens 4, didynamous, the filaments smooth, terete, linear, arising in the lower throat, the shorter pair departing laterally to and just below the upper lip, the longer pair departing lateral to the lower lip, all either bending forward at the throat geniculation, thus at anthesis projecting forward and exerted, or arching upward under a hooded upper corolla lip and included; anther sacs 2, divergent, ovoid, joined by a broad and somewhat flattened, dorsally concave, connective, with the narrowed locular ends convergent and each chamber producing toward the broad end or medially a prominent, curved spur or at least a papillate dome, the sporangial dehiscence an oblique slit external to the spur. Ovary deeply 4-lobed, the lobes set like molars into a fleshy, unilaterally lobed, gynobase; style slender, lineal, terete, pilose or nearly smooth, erect in the corolla tube base, then ascending to the roof of the corolla, thence to the upper corolla lip, there either jutting forward or downward, prominently exerted or hugging the roof of the upper lip with only the apex protruding; stigmas 2, narrowly triangular-linear, sharp, mostly equal, at anthesis excurvate, external surface rounded, internal (receptive) surface either flat or concave. Nutlets 4, rather uniform, mostly broadly ovoid, ca 1 mm long, tumid, with attachment scar oblique at base.

A small genus confined to the southeastern U.S.A. Type species: *Dicerandra linearifolia* (Ell.) Benth.

KEY TO DICERANDRA

1. Plants herbaceous, annual, taprooted; stem faces subequal.

2. Upper corolla lip bent upward, flattish, not hooded; stamens and style tip conspicuously exserted; corolla geniculate at junction of tube and throat and with distinct palate; lower calyx lip not over 2.5 mm long; odor strongly minty.
3. Primary cymal peduncle well over 1 mm long; anthers pink or white with horns at least 1 mm long; corolla lavender-rose to white 1. *D. linearifolia*
3. Primary cymal peduncle obsolete or less than 1 mm long, thus cymes sessile or subsessile; anther sacs white, the horns reduced to papillate domes 2. *D. densiflora*
2. Upper corolla lip arching forward, folded, hooded; stamens and stylar tip barely projecting; corolla not geniculate, without a palate; lower calyx lip seldom less than 3.0 mm long; plants with strong but un-minty scent 3. *D. odoratissima*
1. Plants shrubby; one set of stem faces narrower, more deeply concave than the other.
 4. Flowering inflorescence barely interrupted; leaves mostly 2–5 mm wide; calyx deeply purple or rose-tinted; pinkish around the thin orifice; corolla limb and throat lavender-rose, spotless; southeastern peninsular Florida 4. *D. immaculata*.
 4. Flowering inflorescence regularly interrupted, the internodes conspicuously longer than the inflorescences; leaves rarely 3 mm wide, mostly narrower; calyx tube mostly green or tinged with purple distally, white around the orifice; corolla strongly geniculate, the limb and throat white or yellowish-white, always with purple lines and maculations; central peninsular Florida.
 5. Cymes prevalently 1–2-flowered; leaf blades mostly oblong-linear, 2–3 mm wide; corollas 1.9–2.0 cm long 5. *D. frutescens*
 5. Cymes prevalently 3-flowered; leaf blades narrowly linear to nearly filiform, rarely over 1.5 mm wide; corollas 1.2–1.3 cm long 6. *D. cornutissima*.

1. *DICERANDRA LINEARIFOLIA* (Ell.) Benth., Bot. Reg. 15, t. 1300. 1830.

Ceranthera linearifolia Ell., Sk. Bot. S. C. & Ga. 2: 94. 1822.

Taprooted annual to 6 dm, mostly lower, with stem faces scabro-puberulent, particularly along the acute to rounded angles. Leaves narrowly elliptic through linear-oblongate and linear-lanceolate to narrowly linear, spreading to nearly erect, (1-) 2–4 (-5) cm long, acute to narrowly rounded, tipped by a pale blunt callus, completely smooth to scabridulous toward and on margins above. Cymes in bloom usually shorter than the subtended internode, 1–5 (mostly 3)-flowered, on peduncles 2–5 (-10) mm long. Calyx 6.5–7.0 mm long, with upper lip 1.5–1.7 mm long, lower lip 2.0 mm long, with 2 narrowly triangular-subulate teeth having a sinus ca 1 mm deep; outer surface pale green to maroon, the orificial area whitish to pink, Corolla 1.5–1.7 cm long, tube ca 5 mm long, villous internally, geniculate, the throat ca 5 mm long, villous at base inside and with a palate, the upper lip ca 5 mm long, broadly ovate, upswept and emarginate; lower lip ca 6–7 mm long, broadly obovate, the lateral lobes oblong to broadly spatulate, ca 5 mm long, spreading, the central lobe obovate, emarginate; surface white, yellowish-white, or lavender-rose, with throat and limb dotted and lined concentrically with purple maculation. Filaments 10–15 mm long, anther horns 0.7–1.0 mm long, smooth. Figs. 2 and 2a.



Fig. 2. *Dicerandra linearifolia*. a. habit sketch; b. two views of node and cymule; c. mid-cauline leaf; d. side view of floret; e. front view of corolla; f. nutlet. From Kral 64458.

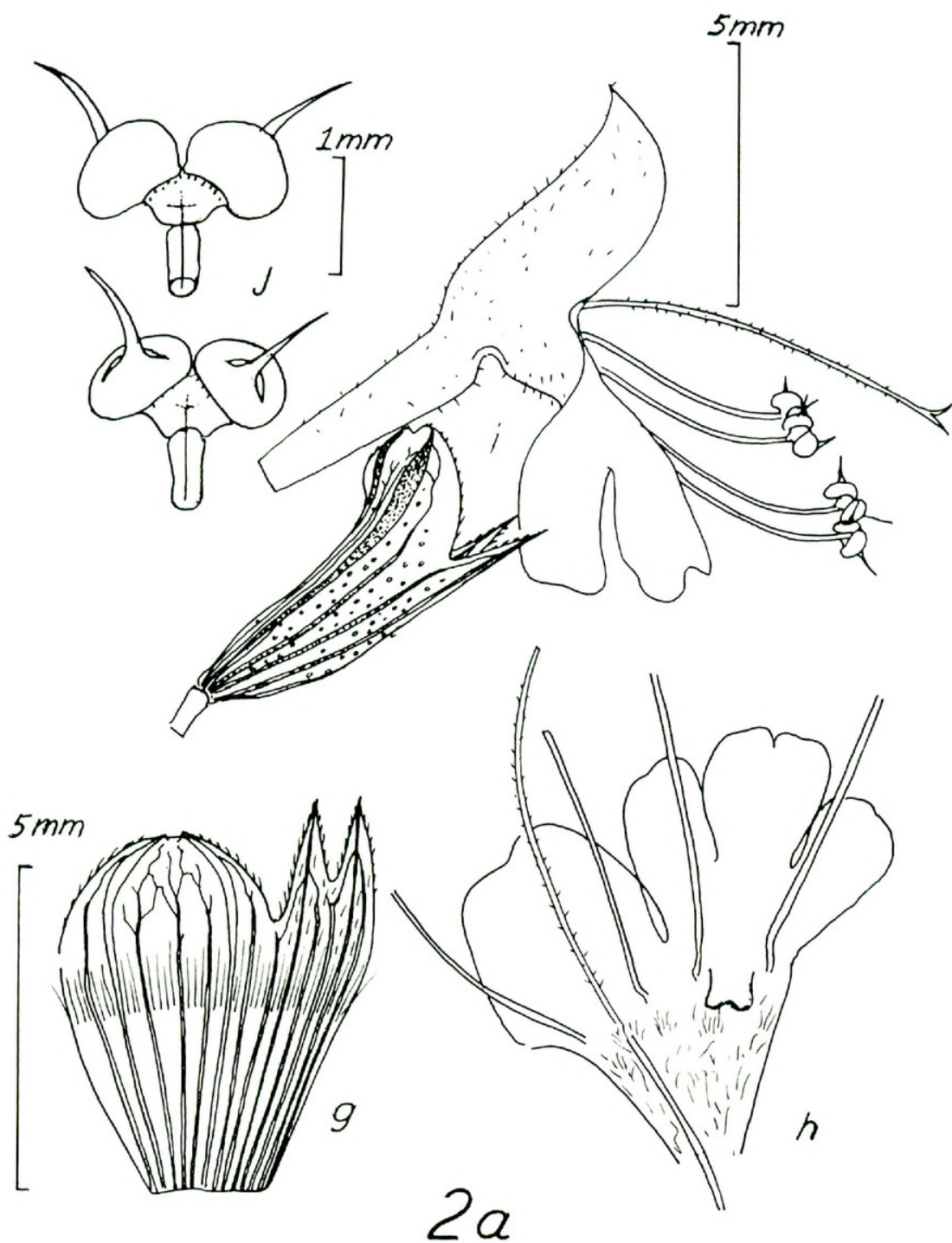


Fig. 2a. *Dicerandra linearifolia*. g. spread calyx; h. spread corolla; i. side view of upper corolla tube, corolla throat and limb; j. anterior (top) view and posterior (bottom) view of anther. From Kral 61354.

Sand ridges and sandy barrens, Coastal Plain, eastern Georgia south to northern Florida, west into southern Alabama and far western Florida. Fig. 8a.

TYPE: Shinnery (l.c.) reported that Weatherby (1942) could find no specimens of *D. linearifolia* in the Elliott Herbarium. However Stuckey (1979) reported an Elliott specimen of *D. linearifolia* in the Schweinitz Herbarium at PH, presumably sent by Elliott to Schweinitz. Stuckey's photograph is unmistakable and his annotation of the specimen as the type for both species and genus should be accepted. Elliott (l.c.) stated that it "grows abundantly in the high pine barren ridges between Flint and Chatahouchie Rivers", and it grows there today. The remark is fortunate evidence in that no other *Dicerandra* are in that part of Georgia.

2. *DICERANDRA DENSIFLORA* Benth. in DC., Prodr. 12: 243. 1848.

Ceranthera densiflora (Benth.) Gray, Syn. Fl. N. A. 2, pt. 1: 365. 1878.

Similar in habit and in most ways to *D. linearifolia* but leaves mostly broader, narrowly lanceolate, oblanceolate, or oblong, 2–5 cm long, 3–8 mm wide. Inflorescence internodes more contracted, the cymes sessile or nearly so, the whole inflorescences more dense, the pedicels shorter (mostly 2–3 mm long), the larger inflorescences often 7-florous. Corollas mostly 1.0–1.2 cm long, nearly all pink, but with maculation as in *D. linearifolia*. Anthers whitish, lacking horns, these having been reduced to low-triangular or dome-shaped, papillose-tuberculate, pale processes. Figs. 3, 3a.

Sand ridges and sandy barrens in oak-pine scrub, northern Florida, mostly along the Suwannee but also northeastern peninsular Florida. Flowering mostly from September into November. Fig. 8b.

TYPE: "In Florida orientali" (h. Torr. at NY). Type not seen by writer, but original description unmistakable in that no other *Dicerandra* has reduced anther horns.

Small (1933) indicated that the species is in Georgia but I have not found it there. There are, along the Suwannee in Hamilton County Florida and adjacent Lowndes County Georgia many large populations of *D. linearifolia* which are consistently broad-leaved, mostly with lavender-rose corollas, which cursorially could be mistaken for *D. densiflora*. However, these populations have strong cymal peduncles and well developed anther horns, the anther sacs consistently purplish. As stated, southward along the Suwannee such populations abruptly stop, to be replaced by large populations of *D. densiflora*.

Sandy clearings, both natural and artificial, in the high live oak-slash pine-saw palmetto hammock or in the longleaf pine-scrub oak-live oak along the Suwannee from Branford to Oldtown and west within the drainage are good habitat for the species, which by mid-October lights up the landscape with "Liatris-like" spires of lavender-rose.

3. *DICERANDRA ODORATISSIMA* Harper, Bull. Torr. Bot. Club 28: 479. 1901.

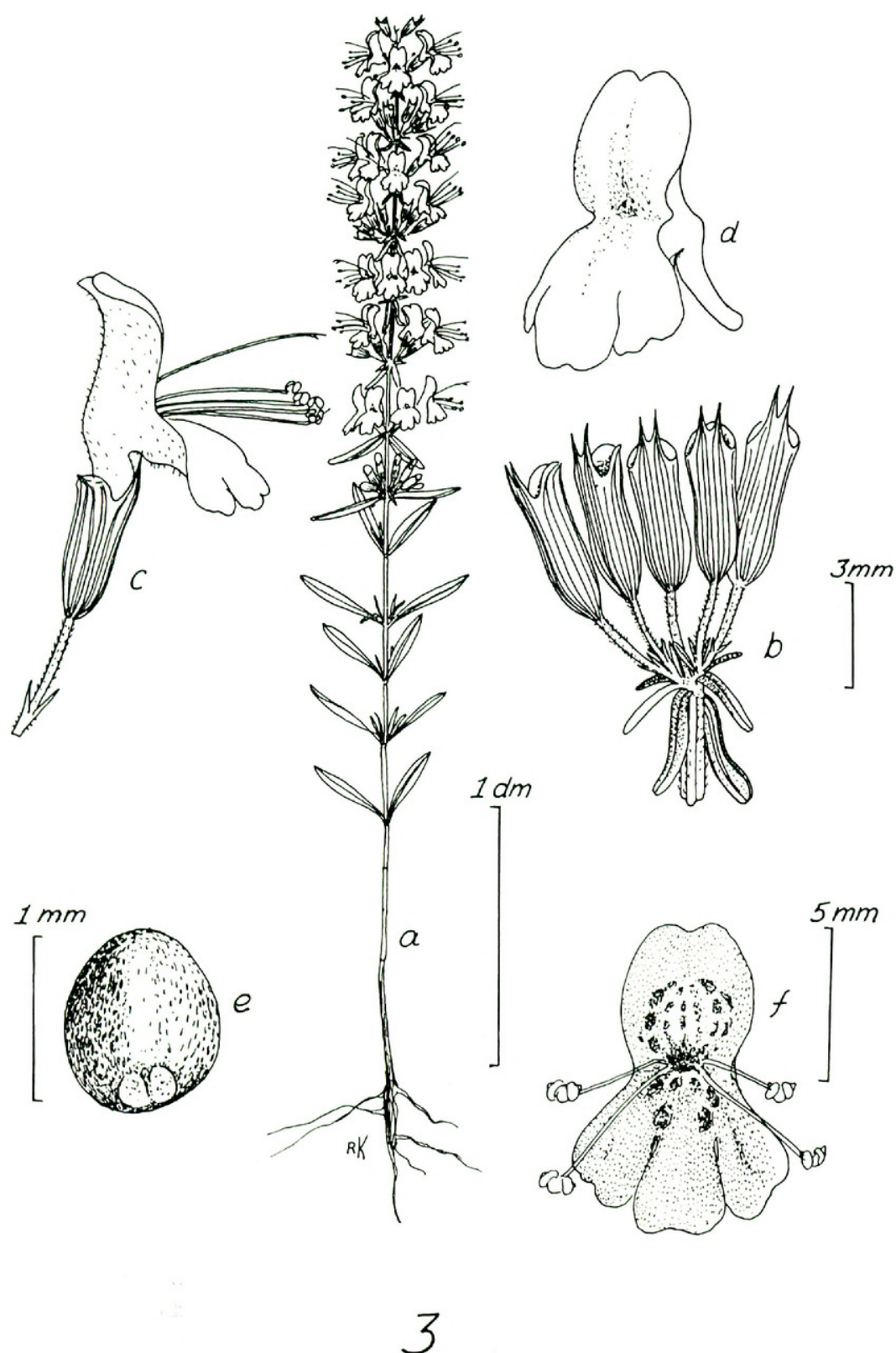


Fig. 3. *Dicerandra densiflora*. a. habit sketch; b. cymule; c. side view of flower; d. oblique view of corolla; e. nutlet; f. front view of flower. From Kral 64511.

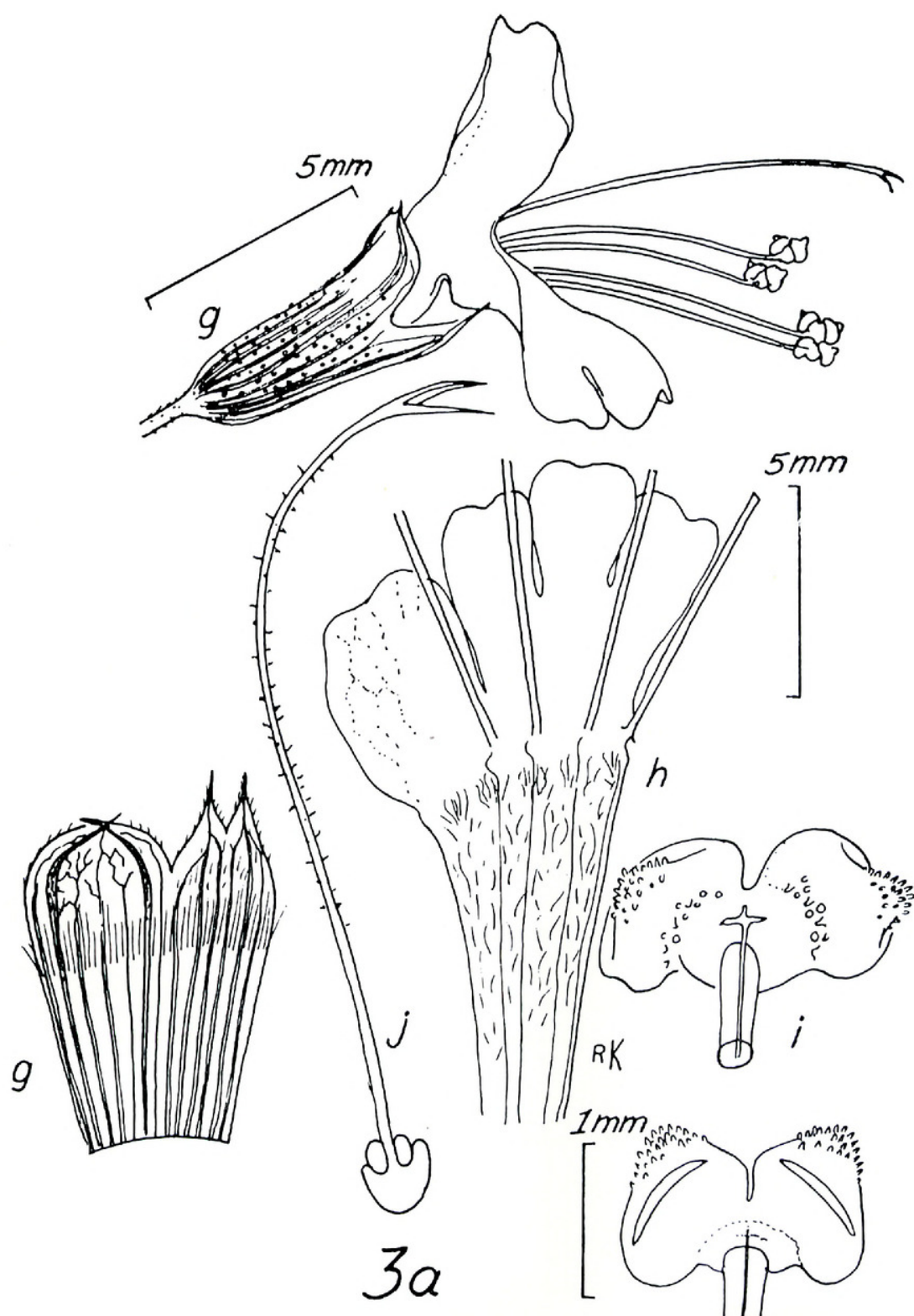


Fig. 3a. *Dicerandra densiflora*. g. spread calyx (below) and side view of calyx with corolla; h. spread corolla; i. anther, two views; j. gynoecium. From Kral 64511.

Taprooted annual with a pungent, un-mintlike odor. Stems rigidly erect or ascending, simple to profusely branched, mostly 1–4 dm high, the faces subequal, rounded-angled, incurved-gray-puberulent. Leaves narrowly linear to narrowly elliptic, lanceolate or oblanceolate, 2–4 cm long, 1–2 (–4) mm wide, narrowly rounded or obtuse-angled apically, frequently emarginate, in inflorescence and on upper stem often reflexed, otherwise spreading or ascending, the upper surface green to maroon, usually scabrid along the revolute margin, the lower surface paler, smooth save along the midrib where scabridulous or puberulent. Inflorescence dense, the numerous cymes sessile or nearly so, mostly overlapping at anthesis, the flowers 3–7, the calyces at anthesis erect or strongly ascending, the longest (9–10 mm) in the genus, apically very strongly whitened or roseate, the tube 5.0–5.5 mm to lip sinus, the upper lip 2.5–3.0 mm long, the lower lip 3.5–4.0 mm long, the sinus fully 3 mm deep, the teeth narrowly triangular-subulate. Corolla erect or ascending, 1.5–1.7 mm long, tube gradually dilating into throat, this and the limb excurvate but not geniculate, a palate lacking, the upper lip ca 4 mm long, hooded, ovate, acute or narrowly rounded, the lower lip slightly longer, broadly obovate, directed downward, with central lobe emarginate, the laterals shorter, spreading laterally, oblique; external surface from near white to deep lavender-rose, rather coarsely pilose or hirsute toward apex and marginally, stipitate-glandular-puberulent and villous toward base, medially and distally marked with dots and lines of purple, within villous and capitate-hairy toward tube base, otherwise smooth or papillose save for a tuft of arachnoid pilosity in the fold of the upper lip distally and another villous patch below it on the lower lip, the upper tuft appearing to serve as a style clamp. Stamens largely concealed by upper corolla lip, the short pair of filaments ca 3.0–3.5 mm long, long pair ca 5 mm long, all pinkish; anther sacs usually purplish, the horns ca 0.5 mm long, directed downward. Style bristly-hairy at least toward apex. Fig. 4, 4a.

Sandhills and sandy clearings, sometimes in light shade, mostly uplands along major streams, Coastal Plain, Jasper County South Carolina southward to southern central and southeastern Georgia; flowering from August to frost. Fig. 8c.

TYPE: GEORGIA. Coffee Co.: dry sand-hills near Seventeen Mile Creek, 24 Sep 1900, R. M. Harper 695 (HOLOTYPE: NY; ISOTYPE: MO!).

Dr. Harper (op. cit.) commented succinctly and accurately on the distinctness of this species, noting that to include it in *Dicerandra* meant considerable amplification of the generic description. Its corollas are not geniculate, lack a palate completely; orientation of the anthers is very different and the subapical tuft of arachnoid hairs internally on the corolla roof is likewise distinctive. Chemically the species must be as apart as are the flowers, in that the odor of the plants is disagreeably powerful, quite unlike the consistently strong minty smell of all of the other species.

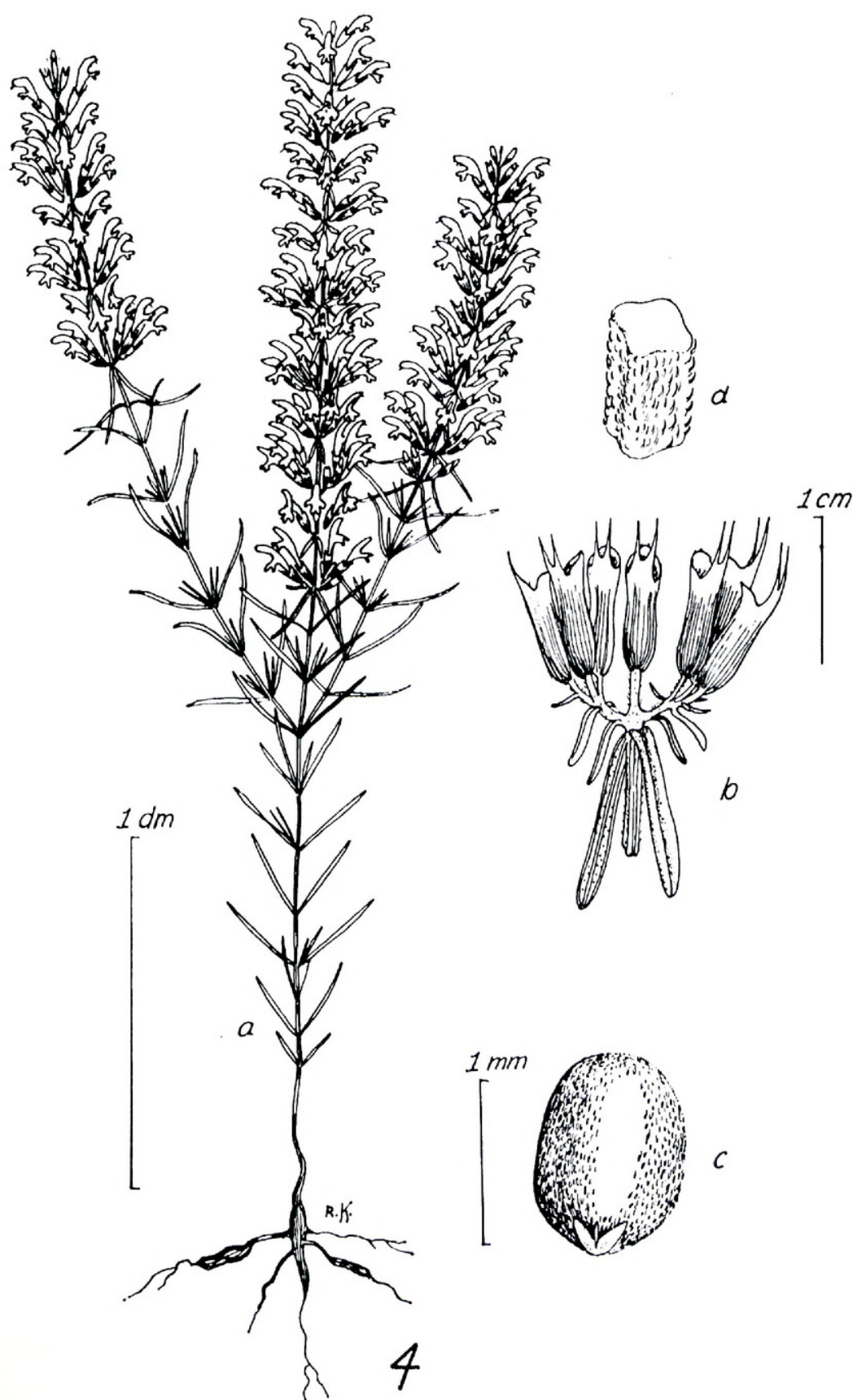


Fig. 4. *Dicerandra odoratissima*. a. habit sketch; b. cymule; c. nutlet d. oblique view of small section of stem. From Kral 59143.

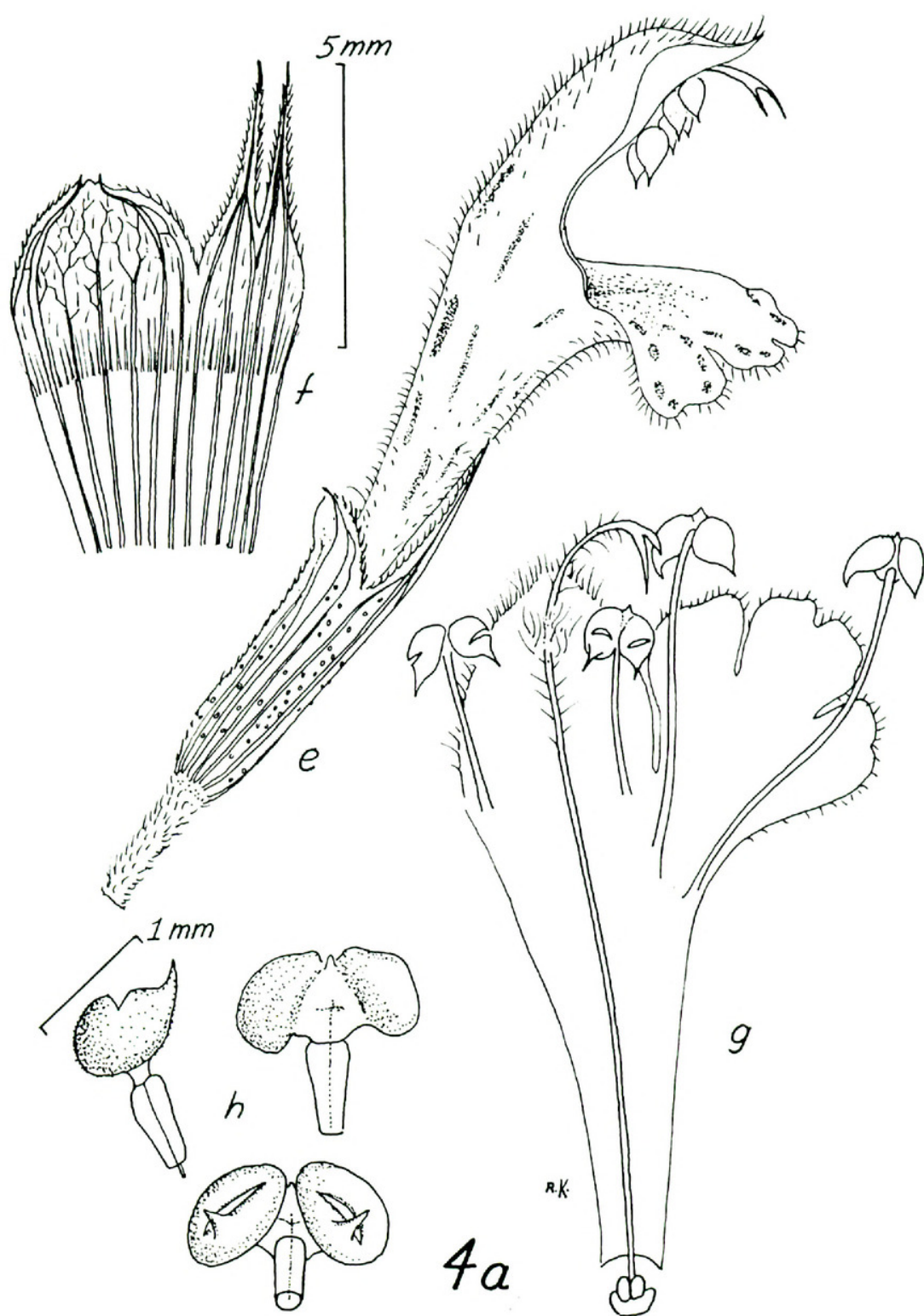


Fig. 4a. *Dicerandra odoratissima*. e. side view of flower; f. spread calyx; g. spread corolla; h. three views of pistil. From Kral 59143.

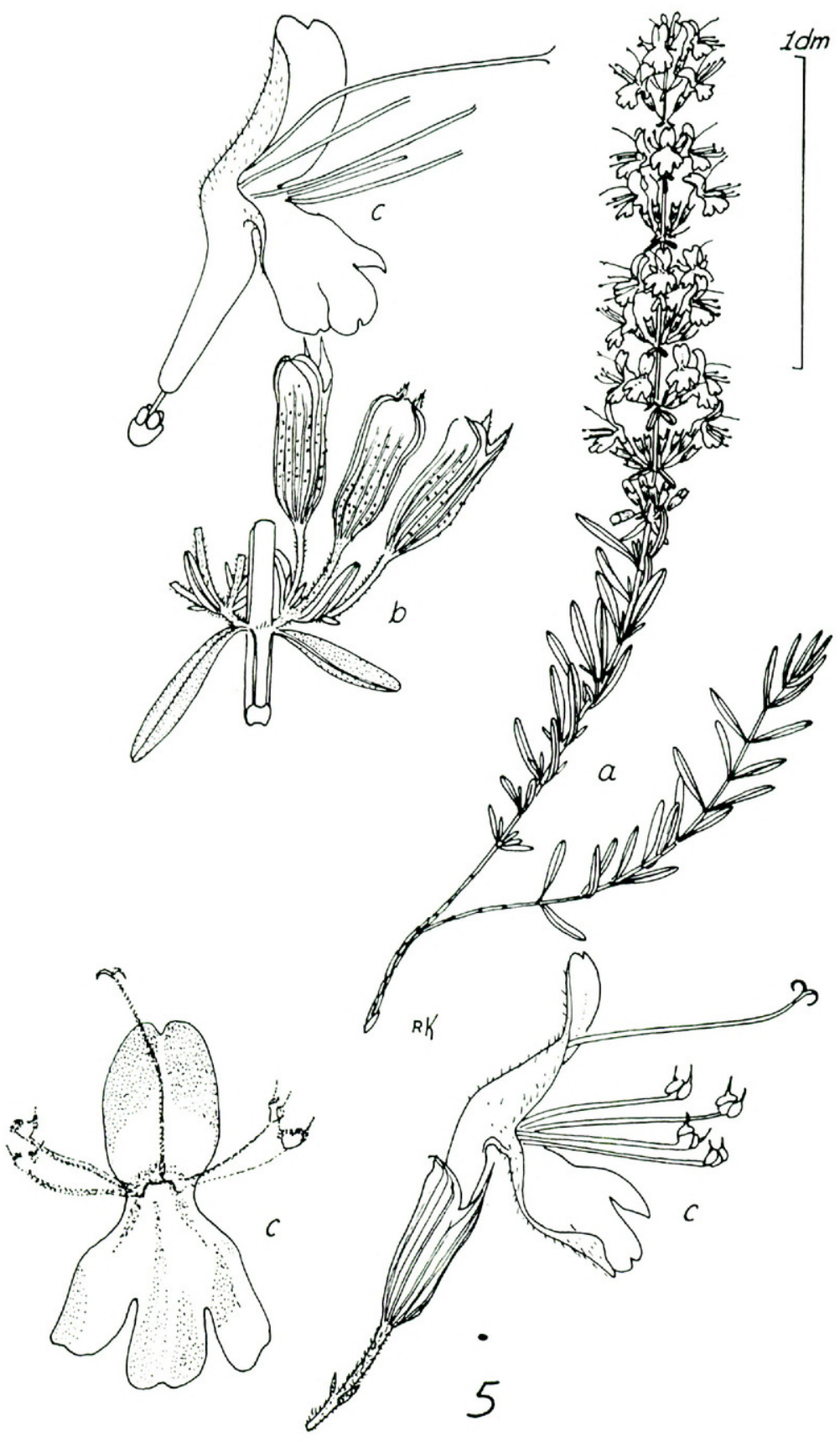
4. *DICERANDRA IMMACULATA* Lakela, Sida 1(3): 184–185. 1963.

Bushy or lax (sun vs. shade) shrub to 5 dm high, forming small mats or domes of ascending to spreading or sprawling branches, the several primary branches arising from a stout, deep, woody-branched taproot. Innovations numerous, arising from spreading or sprawling older growth, decumbent based, otherwise erect, smooth or nearly so, green to purplish, unequally quadrate with faces subtending leaves broader and low-convex alternating with narrower, strongly concave faces, the sharp, incurved angles margined by a narrow costa or wing. Main leaves spreading or ascending, in inflorescence sometimes reflexed, all subsessile, linear, oblong-linear, linear-elliptic, linear-lanceolate or linear-oblongate, 2–3 cm long, 2–4 mm wide, smooth, flattened, apically narrowly rounded, often slightly emarginate, entire or in larger leaves minutely serrulate apically. Inflorescence mostly 1.5–2.5 dm long, with flowering cymes overlapping, (1-) 3 (-5) flowered, the primary peduncle 1.0–1.5 mm long, the secondary branches as long, the pedicels 1–3 mm long, nearly erect. Calyx 7–8 mm long, smooth, the reflexed tipped upper lip 2 mm long, lower lip ca 2.5 mm long, sinus between teeth ca 1 mm deep, the body usually purplish, toward orifice becoming white or roseate. Corolla 1.9–2.0 cm long, tube ca 6 mm long, internally villous here and at throat base, with a strong palate just above geniculation; upper corolla lip broadly ovate to obovate, ca 7 mm long, apically upswept, broadly rounded-emarginate, lower lip broadly obovate, trilobate, 9–10 mm long, downswept, with lateral lobes spreading, oblong, broadly rounded or oblique-truncate, and medial lobe emarginate; external surface of throat and limb bright lavender-rose, immaculate, puberulent. Posterior filaments ca 12 mm long, anterior pair ca 12 mm long, the much exerted anthers with horns 1.5–2.0 mm long, minutely papillate-tuberculate. Style projecting, becoming downcurved, hirtellous distally, the two subequal stigmas presented beyond the anthers. Figs. 5, 5a.

White and yellow sands of old dunes, duneswales, southeastern peninsular Florida; flowering from late September into November. Fig. 8d.

TYPE: FLORIDA. Indian River Co.: on disturbed sandscrub. West of U.S. 1, near South boundary of Indian River County, 30 Sep 1962, O. Lakela 25440 (HOLOTYPE: USF; ISOTYPE: SMU!). Topotypes collected 2 Oct 1976 (Kral 59209 at VDB and to be distributed).

This is distinguished from other shrubby *Dicerandra* by its roseate, unspotted corollas. Other woody *Dicerandra* have more sharply geniculate corollas that are whitish or yellowish-white with purple maculation. Also, *D. immaculata* calyces are usually very purple-tinged with orifices usually deeper in color. The cymes are shorter-peduncled, the pedicels shorter, the inflorescence thus more dense. The effect is more that of a shrubby *D. densiflora*. The plants are abundant locally within a small area encompassing southeastern Indian River County and northeastern St. Lucie County along



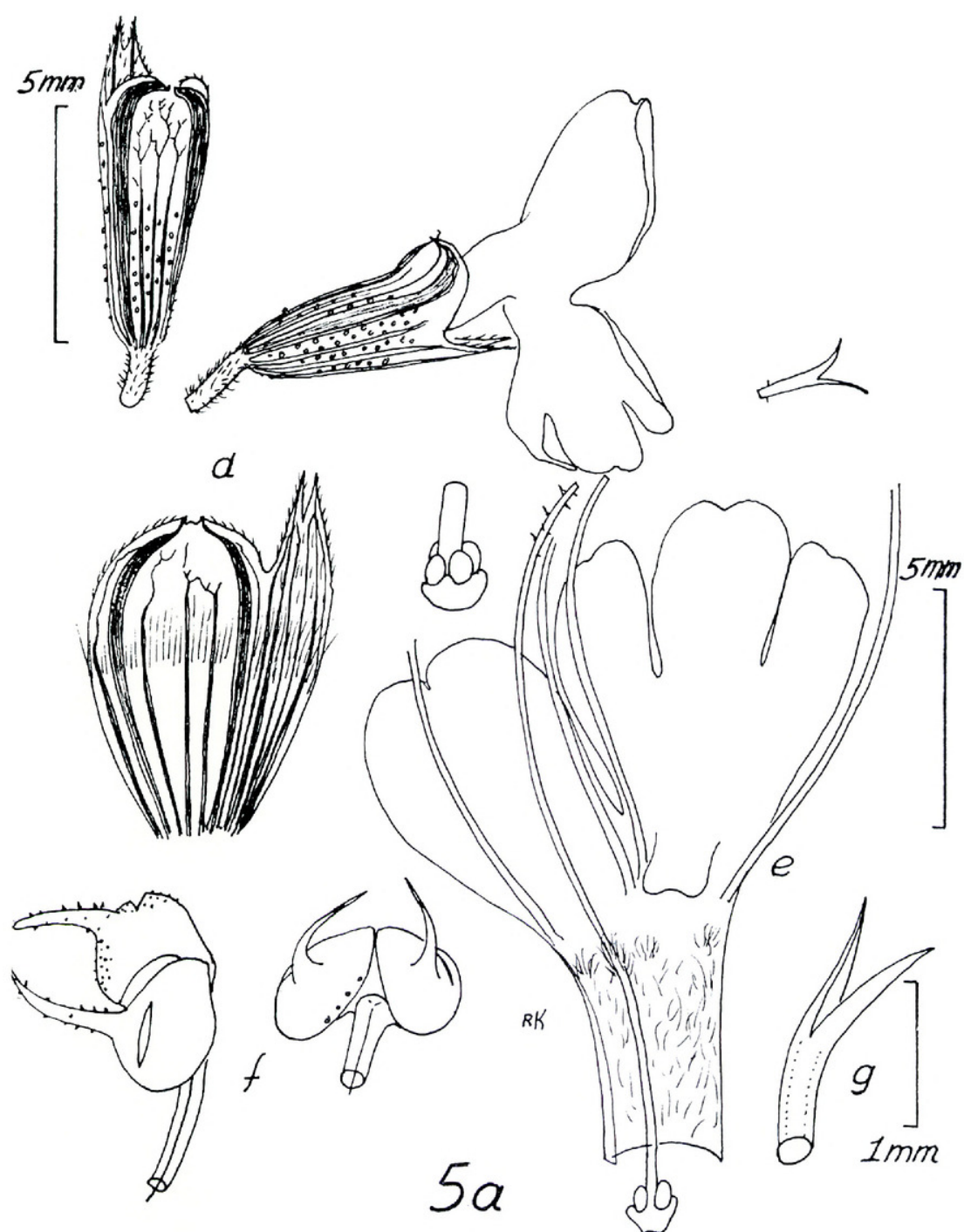


Fig. 5a. *Dicerandra immaculata*. d. calyx; e. spread corolla with lower part of tube removed; f. two views of anther; g. stigmatic zone. From Kral 95309.

Fig. 5. *Dicerandra immaculata*. a. habit sketch; b. one cymule and node; c. oblique view of corolla (upper left), front view of flower (lower left), side view (lower right). From Kral 59309.

a line of ancient dunes largely forested by evergreen scrub oak, sand pine and Florida hickory. They particularly abound in sandy open areas such as blowouts or artificial or natural clearings but become much more straggly and weak as woody plants and saw palmetto invade. Historically, fire and wind action must have provided and maintained area for the plants. In mass, *D. immaculata* is perhaps the showiest in the genus and, in that all plants known are on private land in a highly developing part of Florida, its future is doubtful.

5. *DICERANDRA FRUTESCENS* Shinnars, Sida 1 (2): 89-90. 1962.

Dense or straggly low shrub to 5 dm, with branches elongate from a deep, stout, spreading-branching taproot, the older branches mostly spreading, even prostrate. Shoots dimorphic, one type strictly leafy and overwintering, the other type developing from latent axillary shoots on the former and floriferous, dying back toward base after fruiting; internodes as in *D. immaculata* but longer, thus the inflorescence more interrupted. Larger shoot leaves narrowly oblong-elliptic, linear-elliptic or linear-oblongate, subsessile, 1.5-2.5 cm long, 2-3 cm wide, flattish but somewhat fleshy, apically narrowly or broadly rounded, entire, not revolute, the upper surface dark green with midrib slightly impressed, the lower surface slightly paler with midrib slightly raised. Inflorescence elongated, interrupted, with internodes longer than subtending cymes at anthesis, at least 1/2 of the flowering shoot floriferous and cymules reduced to 1 (-3) flowers, the primary peduncle mostly 1-2 (-3) mm long, the pedicels slender, uparching, 4-8 mm long, these and peduncles finely puberulent, greenish. Calyx at anthesis ca 9-10 mm long, nearly erect, proximally and medially green, distally tinged with red and with a broad white zone around the orifice, the upper lip broadly rounded, shorter than the lower, which is 2.2-2.5 mm long, the sinus between the narrowly triangular-acuminate teeth ca 1 mm deep, the surface smooth save for annulus and lower lip within. Corolla 1.9-2.0 cm long, with tube erect, ca 7 mm long, internally villous, bent abrupt at junction with throat, sometimes at nearly a right angled or downward, with palate strongly raised at floor of lower throat between the anterior filaments, the upper lip broadly oblong or ovate, ca 8-9 mm long, emarginate or retuse, apically usually recurved, the lower lip downcurved, broadly obovate, 9.0-9.5 mm long with lateral lobes oblong, spreading and recurved, the medial lobe emarginate, angling downward or slightly recurved; external surface of throat and limb white or yellowish white, the upper lip marked internally with a trellis pattern of lines and dots of deep purple, the lower lip maculate with larger, concentric spots from lobe bases to base of lip. Filaments white, the short pair ca 12 mm, the longer pair ca 13 mm long, the anthers long-exserted, purplish, with horns smooth, 0.8-1.0 mm long. Style near white, above the middle hirtellous, bent forward or curved downward beyond the usually above the anthers, the stigmatic branches recurved, subequal. Figs. 6, 6a.

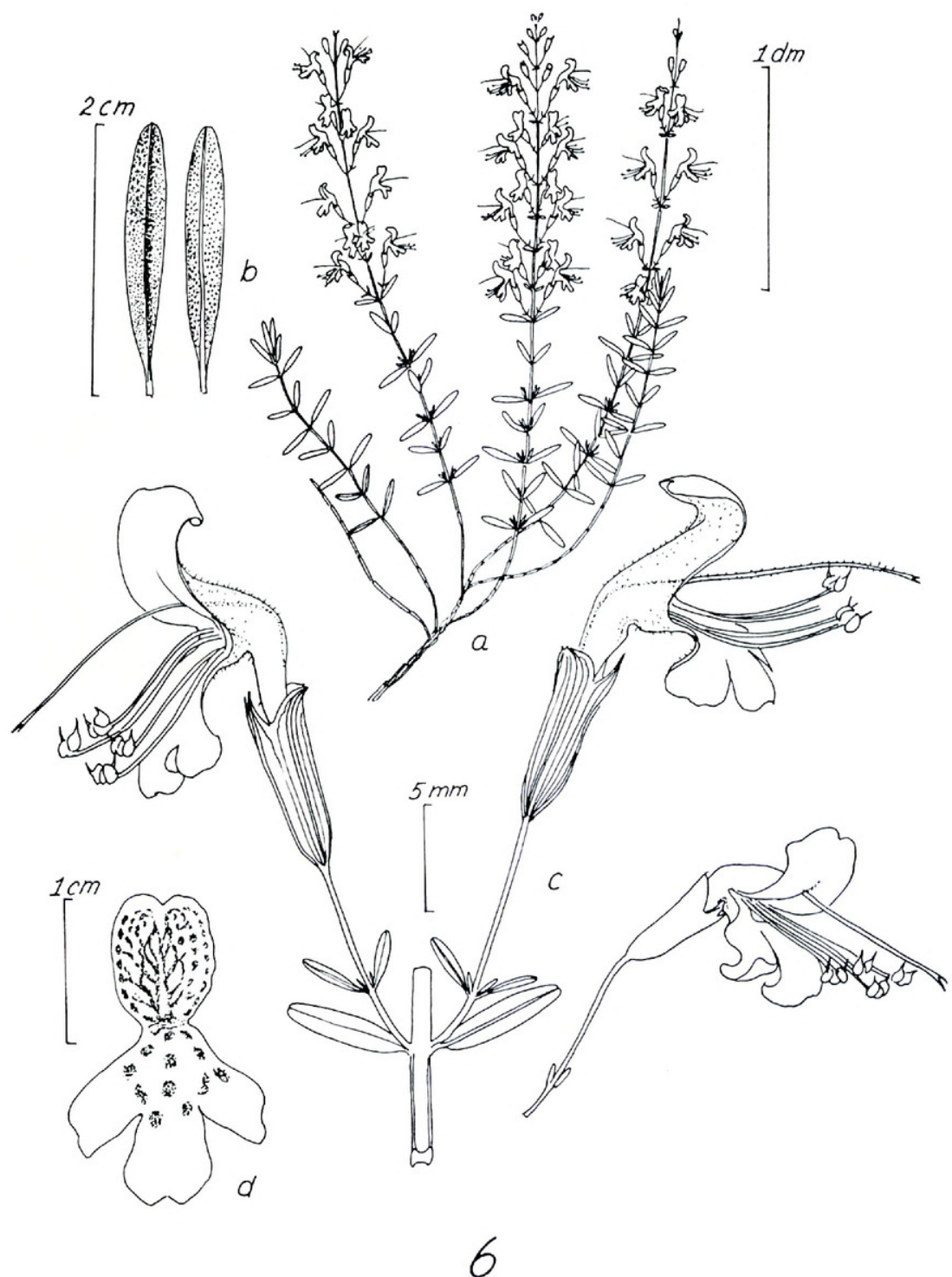


Fig. 6. *Dicerandra frutescens*. a. habit sketch of branch; b. leaf; c. flowering node, side and oblique view of flowers; d. front view of corolla. From Kral 66201.

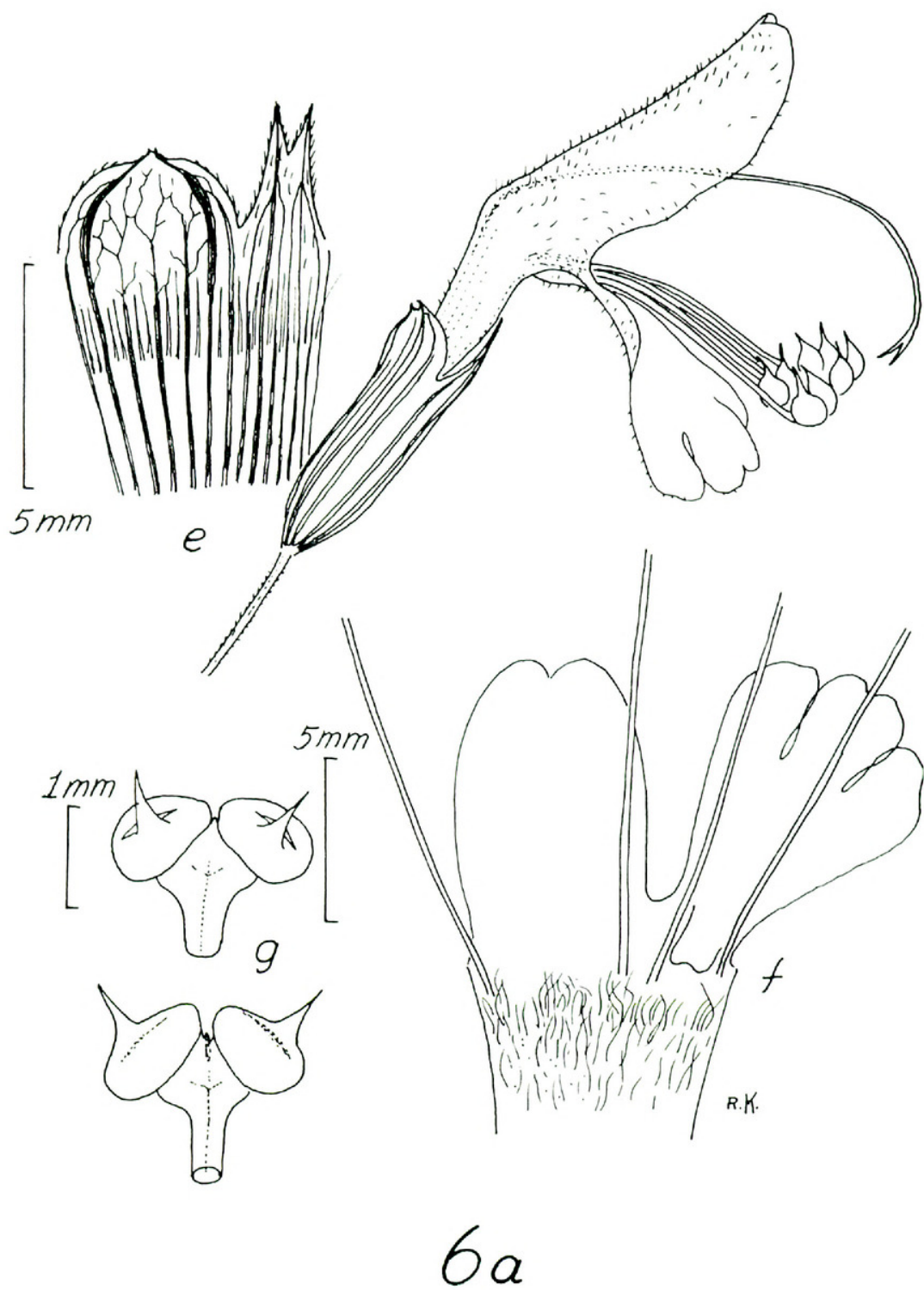


Fig. 6a. *Dicerandra frutescens*. e. spread calyx, side view of flower; f. spread corolla with lower tube removed; g. two views of anther. From Kral 66201.

Sand pine-evergreen scrub oak sandhills, usually in small clearings, southern peninsular Florida south of Sebring. Flowering from August to February. Fig. 8d.

TYPE: FLORIDA. Highlands Co.: sandy scrub 20 mi S of Sebring along Rt. 27, 28 Aug 1953, *F. H. Sargent* 6600 (HOLOTYPE: SMU; ISOTYPE: GA!).

Additional material examined: sandhills near Lake Stearns, 8 Jun 1925, *Small & Matthaus* 11613 (US!—plant in late fruit, showing overwintering leafy shoots); very abundant on roadsides in sandscrub, rte 8-A, Hicoria, 16 Feb 1945, *Brass* 14646 (US); gregarious locally in sandscrub, Lake Placid, 9 Sep 1945, *Brass* 15604 (US); ca 1 mi E Childs and ca 1/2 N of Fla. 70; sandy ridge, edge of sand pine wood, 20 Aug 1980 *Kral* 66201 (VDB; sample to be distributed).

The sandhills scrub around Lake Placid and Childs where this shrub once was locally abundant is so rapidly being converted to orange groves and housing developments that the species is definitely endangered!

6. *DICERANDRA CORNUTISSIMA* Robin Huck, *Phytologia* 47(4): 313–315. 1981.

Shrubby as in *D. frutescens* but sterile innovations more numerous, on healthy specimens forming dense low mats, these overtopped by the numerous, more erect, floriferous shoots. Leaves narrowly linear, mostly ascending, the larger ones mostly 1.5–2.5 cm long, 0.8–1.5 mm wide, firm, apically notched, the margin entire or very slightly wavy, the base nearly sessile. Flowers (1–) 3 (–5) per cyme, the calyx ca 9–10 mm long, the corolla less exserted, ca 13 mm long, the tube ca 6 mm long, there sharply bent below the throat, with limb usually declinate, the upper lip bent upward or reflexed, 5.0–5.5 mm long, the lower lip obovate, ca 8 mm long, directed downward, the lobes at tips recurved, the surface white, externally puberulent above the tube, internally with upper lip strongly maculate with concentric, trellis pattern, dots and lines of purple, the lower lip with fewer and larger spots medially and proximally. Anthers white, the horns ca 1.5 mm long. Fig. 7.

Sandy clearings in sand pine-evergreen scrub oak scrub, northern peninsular Florida; flowering from August to early October. Fig. 8d.

TYPE: FLORIDA. Marion Co.: 0.8 mi W of intersection of Fl. 484 and I-75 on Fl. 484, north-south ridge, oak scrub, 19 Sep 1980, *Huck* 2436 (HOLOTYPE: NCU).

Additional collections: Marion Co.: forming circular mats on sandy clearings in sand pine by I-75, 6 mi S jct. Fla. 200, S of Ocala, 4 Oct 1976 *Kral* 59258 (VDB); shrubby plants, strongly aromatic, on sandy clearings in sand pine-evergreen scrub oak by I-75, 4 mi S jct. Fla. 200 (ca 8 mi S Ocala), 16 Oct 1975, *Kral* 57175 (VDB—series to be distributed); Sumter Co.: low shrub of sandy clearings in scrub, ca 5 mi W Wildwood, live oak-saw palmetto type, 21 Oct 1977, *Kral* 61257 (VDB, and to be distributed).

My own collections of this from Marion County appeared to me at first merely to be northern extremes of *D. frutescens* Shinn. Sumter County

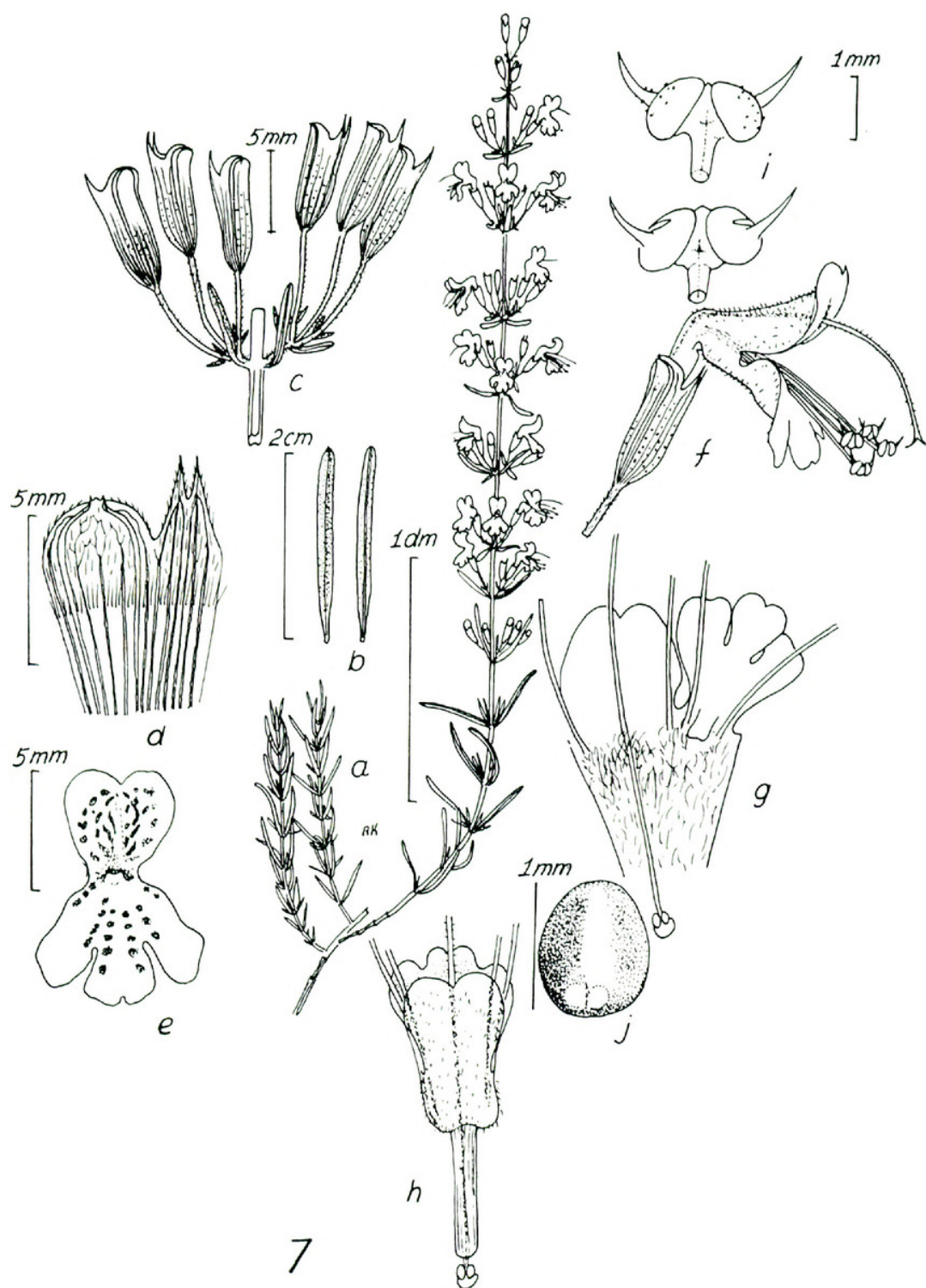
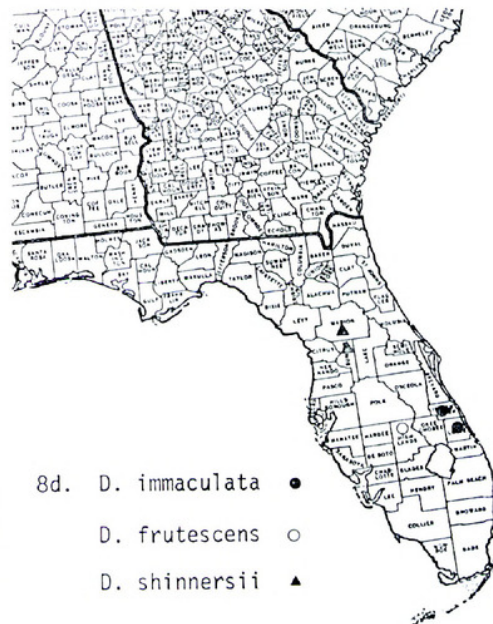
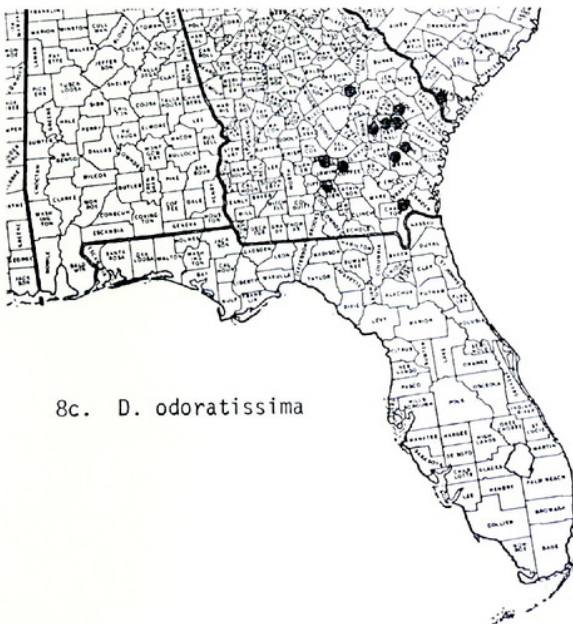
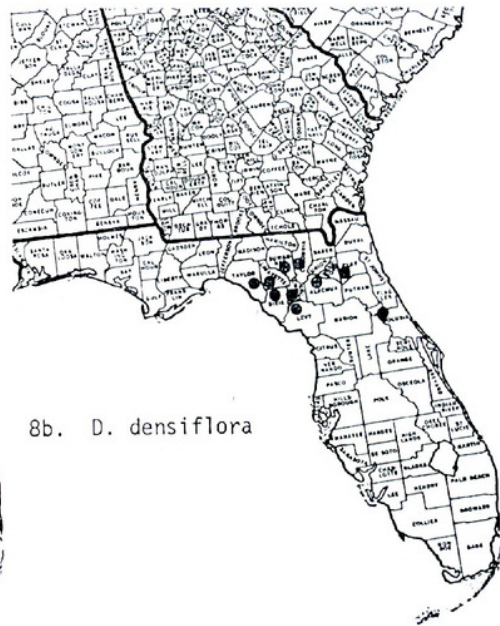
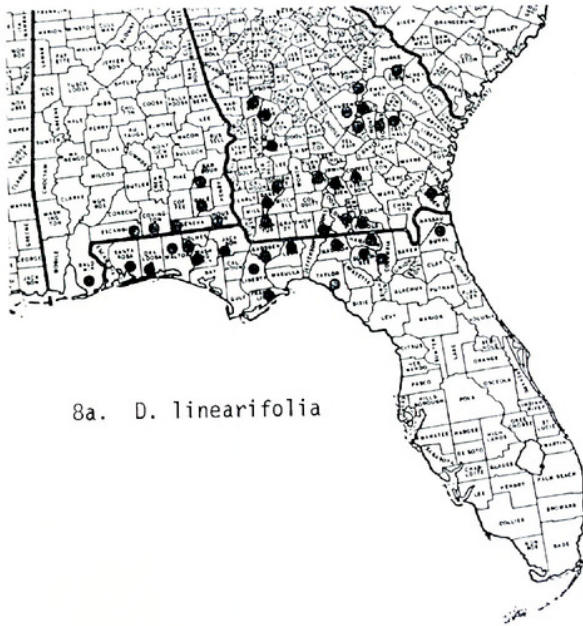


Fig. 7. *Dicerandra cornutissima*. a. habit sketch; b. leaf; c. pair of cymules; d. spread calyx; e. front view of corolla; f. side view of flower; g. spread corolla; h. corolla viewed from beneath; i. two views of anther; j. nutlet. From Kral 59258, 61257.



specimens at FLAS cited by Dr. Shinniers looked the same. However the Marion and Sumter county specimens were from shrubs consistently denser in foliage, with narrower leaf blades, a more compact habit than true for Highlands County shrubs from which the holotype comes. While Highland County shrubs have cymes predominantly uniflorous, the "northern" popula-

tions are prevalently triflorous, with smaller corollas less exerted from the calyx, with more red pigment in the calyx, and with petals more heavily maculate. My own efforts during the 70's to find *Dicerandra* shrubs in the sandhills that extend ca 100 miles between Sumter County and Highlands County were not successful. The question then became one of deciding whether the northern shrubs are varietally or specifically distinct, or if the description rendered by Dr. Shinnars simply would require some amplification. I finally decided that, while the ecological system in which the Highlands, Sumter and Marion County populations grow is essentially the same, the lack of evidence of populations intermediate in morphology and range was in itself evidence that a sufficient isolation existed to define a new species. Ms. Huck came more swiftly and independently to the same conclusion.

This shrub appears to react well to disturbance, is increasing along sandy cleared highway right-of-way, in powerline clearings, along firebreaks and in freshly clearcut areas.

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