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The Genus *Callirhoe* (Malvaceae) in Texas

*U. T. Waterfall*¹

All species of *Callirhoe* known in the United States occur in Texas except *C. triangulata*. This statement is, of course, dependent on species concept. *Callirhoe Bushii*, perhaps better treated as a variety of another species, is also not known from Texas. The species *C. triangulata* has been reported from Texas, but all such material seen by me is referable to *C. alcaeoides*, since they have the lower leaves only crenate or dentate, rather than lobed or parted as is usual. Sheets of *C. triangulata* from the Gray Herbarium show Wisconsin, Illinois, Missouri and Alabama as the western limit of that species' range. Dr. Woodson tells me that the Missouri Botanical Garden has no material from any place west of Illinois. The new edition of *Gray's Manual* gives the range as "Ala. to Tex." Presumably the inclusion of Texas in the range is based on published reports. In any event, I have seen no herbarium material to substantiate this statement, and so drop this species from the flora of Texas.

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The following abbreviations are used to indicate herbaria where cited material may be found: (G) Gray Herbarium of Harvard University; (SMU) Southern Methodist University; (T) University of Texas; (OU) Bebb Herbarium of the University of Oklahoma; (OAM) Oklahoma A&M College; (NYBG) New York Botanical Garden.

A KEY TO CALLIRHOE IN TEXAS

- A. Calyx subtended by an involucl of 3 bracts.
 B. Involucl bracts separated from the calyx, at least one of them usually 1 to 3 mm. removed.
 C. Backs of carpels yellowish sericeous-pubescent; stem densely rough-pubescent with ascending, mostly 8-rayed hairs; fruiting peduncles 4-7 cm. long, stout (ca. 2 mm. in diameter)
 1. *C. scabriuscula*
 C. Backs of carpels glabrous; stems slightly pubescent with appressed, mostly 4-rayed hairs; peduncles 10-19 cm. long, ca. 1 mm. in diameter
 2. *C. Papaver*
 B. Involucl bracts not noticeably separated from the calyx
 D. Sinuses between leaf lobes extending to within 5-15 mm. of the petiole; stipules large, 7-15 mm. long by 6-14 mm. wide; carpels strigose
 E. Sinuses extending to within 5-10 mm. of the petiole
 3. *C. involucrata*, var. *involucrata*
 E. Sinuses extending to within 10-15 mm. of the petiole, lobes few-toothed
 3a. var. *involucrata*, forma *novomexicana*
 D. Sinuses between leaf lobes extending to within 2-4 mm. of the petiole; stipules smaller, 2-7 (10) mm. long by 1.5-4 (5) mm. wide; carpels glabrous, or with varying amounts of strigose pubescence
 3b. var. *lineariloba*
 A. Calyx not subtended by an involucl
 F. Carpels strigose-pubescent, at least on the beaks; carpel-beaks protruding above the body, forming the upper $\frac{1}{3}$ - $\frac{1}{4}$ of the compound fruit (as seen from the side)
 4. *C. alcaeoides*
 F. Carpels glabrous
 G. Carpel-beaks not, or only slightly, elevated above the body of the mature carpel, hardly visible above the body of the compound fruit when viewed from the side; back of the mature carpel-body not, or only slightly prolonged over the base of the beak; plant perennial
 H. Corolla reddish
 5a. *C. digitata*, var. *stipulata*
 H. Corolla white
 5b. *C. digitata*, var. *stipulata*, forma *alba*
 G. Carpel-beaks usually protruding above the body of the mature carpel to form about $\frac{1}{2}$ of the upper part of the fruit; back of the carpel-body prolonged about 1 mm. into a conspicuous whitish chartaceous "collar" covering the base of the beak; plant annual
 6. *C. leiocarpa*

1. *C. SCABRIUSCULA* Robinson, Syn. Fl. 1 (1) : 302. 1897.
 TYPE: *Sutton Hayes 80*, Colorado of Texas, El Paso and Ft. Yuma Wagon Road Expedition (G). When describing the species in the Synoptical Flora, Robinson says, "A single specimen in herb. Gray." The only other material I have

seen is *Cory 39266*, 3 miles southwest of Ballinger, Runnels County, June 1, 1942 (G, T).

Plant annual, erect, 40 cm. or more in height; stems, leaves, peduncles and calyces densely covered with mostly 8-rayed stellae, the rays ascending; leaf-blades 3 cm. long \times 4 broad at base to 4 cm. long \times 5.5 cm. wide, deeply 3 to 5-parted, the lobes oblong, oblanceolate or oblanceolate-linear, entire or somewhat toothed or lobed; lower petioles twice as long as the blades, becoming progressively shorter upward until they are almost sessile; subtending the lower peduncles are reduced sessile or subsessile leaves, often of three linear lobes 2-3 cm. long, plus two prominent lanceolate to linear-falcate stipules about 1 cm. long by 3 or 4 mm. wide; upward the leaf blades disappear, the two stipules became progressively more united until near the top of the inflorescence (*Cory 39266*, T) they form a subtending bract that is about 1 cm. long, oblong, and has a broad notch 3 mm. deep at the apex; inflorescence oblong, up to 25 cm. long; calyx 15-18 mm. long, lobes lanceolate, about 1 cm. long; subtending bracts 3, linear, 0.7 to 1 cm. long, 1 or 2 mm. removed from the calyx; petals 2-3 cm. long, red or purple; compound fruit about 1 cm. broad by 0.5 cm. high consisting of 14-16 carpels which are 4.5-5 mm. high and 3-3.5 mm. wide, with backs and exposed side-margins densely pubescent, sides reticulated and thin.

2. C. PAPAVER (Cav.) Gray, Mem. Amer. Acad., n. ser., 4:17. 1849. (Pl. Fendl.); *Malva Papaver* Cav., Diss. 2:64. 1786; *Nuttallia grandiflora* Paxt., Mag. Bot. V. 217, with plate, 1838; *Malva Nuttallioides* Croom, Am. Journ. Sci. XXVI: 313. 1834.

Perennial from a long (to 20 cm.) narrow (to 2.5 cm.) woody root; stems 30-60 cm. tall, ascending to decumbent, sparsely appressed-pubescent with mostly 4-rayed hairs, sometimes glabrate, rarely with the lower part of the stem pilose (*Moore 32642*, Marion Co. Arkansas, -T); leaf blades 3-8 cm. long and 4-9 cm. broad, hastate, cordate, triangular or ovate in outline, deeply 3-5 palmately or pedately cleft into mostly entire (sometime sinuate-toothed or lobed) linear-falcate to lance-falcate divisions; basal petioles many times longer than the blades (25 cm. in *Lindheimer 8210* - SMU) to about equalling the blades (2 cm. in *Cory 57090* - SMU); upper petioles mostly equalling to somewhat longer

than the blades; uppermost leaves reduced, sometimes to a single lobe; stipules ovate or rhombic-ovate to oblong, 3 mm. broad to 4 mm. long, to 7 mm. by 12 mm; peduncles long and slender, commonly 2 or 3 times as long as the subtending leaves; calyx 1-1.5 cm. long, lower $\frac{1}{3}$ united, lobes lanceolate, their tips somewhat attenuate; basal part of the calyx varying from slightly to rather densely hispid with simple hairs 1.5-3 mm. long; the 3 bracts, usually narrowly linear and about $\frac{1}{2}$ as long as the calyx, are mostly 1-3 mm. below the calyx; petals 2.5 to 3.5 cm. long, red; fruit about 1 cm. in diameter and 4 mm. high consisting of about 20 carpels which are glabrous on the backs, with beaks slightly strigose; each carpel is ca. 4 mm. high and 3.5 mm. long with reticulate sides.

This species is found in the eastern part of Texas in the Sandy Hills, Eastern Timbers and the eastern part of the Coastal Dark Prairie (Raisz, Map of the Landforms of the U.S., in Atwood, *Physiographic Provinces*).

3. CALLIRHOE INVOLUCRATA (Nutt. ex Torr.) Gray, var. INVOLUCRATA² Mem. Amer. Acad., N.S., 4:15. 1849 (Pl. Fendl.); *Nuttallia involucrata* Nutt. ex Torr., Ann Lyceum N.Y. 8:172. 1828; *Malva involucrata* (Nutt. ex Torr.) T.&G., Fl. N. Am. 1:226. 1838.

Perennial, mostly decumbent from an elongate to napiform root; principal cauline leaves 2.5-5 cm. long and 3-6 cm. broad, usually lacking about 5-10 mm. of being divided to the petiole; the leaf segments, usually 5 in number, are mostly cuneate at the base and variously toothed, incised, lobed or parted above with the central segment 5-10 mm. wide at the base; stipules large (7-15 mm. long and 6-14 mm. broad), ovate or ovate-rhombic to ovate-lanceolate, cordate; stems 10-60 cm. long usually vestite with long (ca. 2 mm.) strigose hairs in addition to stellae having 4

²I use the varietal designation *involucrata*, rather than *typica*, in accordance with Rickett's report on changes made by the International Congress at Stockholm in 1950 in the rules governing the naming of infraspecific taxa. I agree with Rickett, that a species must be the sum of its varieties, and that when a variety is named within a species there must be some nomenclatorial provision for designating the original variety containing the type of the species so it may be contrasted with, differentiated from, or referred to separately from the newly described variety. However, it seems that repetition of the specific epithet in the varietal category would be subject to the same objections that pertain to the repetition of the generic epithet as the specific designation. Objections in the latter case resulted in the tautonym rule of Article 68. If the Congress at Stockholm had seen fit to accept a designation such as *typica* (connoting the taxon containing the type, rather than being typical of the species in morphological or phylectic sense), this to have been written without author-citation, such inconsistency would have been avoided.

appressed rays (ca. 0.7-1.0 mm. across); involucrel contiguous with the calyx (rarely slightly removed), each of the 3 bracts 6-12 mm. long, linear or linear-obspatulate to narrowly ovate-rhombic; calyx 1-2.3 cm. long, divided ca. $\frac{4}{5}$ of the way to the base with the lobes mostly lanceolate, sometimes varying toward ovate-rhombic with attenuate tips; corolla 4-6 cm. in diameter; petals reddish-purple, cuneate to ovate-cuneate, truncate or somewhat rounded at apex and slightly fimbriate; fruit usually 16-20—carpellate, strigose.

The typical variety extends into northern Texas from Oklahoma, where it is common, and from states northward. I have seen material from Grayson, Montague and Dallas counties.

3a. *Forma novomexicana* (E. G. Baker) Waterfall, comb. nov., *C. involucrelata*, var. *novomexicana* E. G. Baker, Journ. Bot. 29:49. 1891, is a form with leaves less dissected. Some of the leaves are 3-lobed rather than 5-lobed, the sinuses extend to 10 to 15 mm. from the petiole, the lobes are few-toothed or have a few incisions. In the Gray Herbarium there is a tracing made by E. G. Baker of a leaf from the type. According to the note accompanying this tracing, the type was collected a few miles west of McNees Creek, New Mexico, *Fendler*, Aug. 25, 1847. There is a specimen in the Gray herbarium with leaves that are similar to Baker's tracing. It was collected by Fendler in 1847 as *Plantae Novo-Mexicanae* No. 77, and is probably an isotype. In *Plantae Fendlerianae* (p. 18) it is referred to as "77. *C. involucrelata*, var.; with the leaves less dissected, low and moist places, Rabbits Ear and McNees Creeks."

I have found neither of these creeks on present maps of New Mexico. Since Fendler collected only within a few miles of Santa Fe in the spring and summer (until August) of 1847 (according to Wootton, Contr. U.S. Natl. Herb. 13: 168. 1910), the type locality must be in that vicinity.

Referred to forma *novomexicana* are: *Mary Hynes*, June 2, 1926, Dallas, Texas (T); *Hopkins 5896*, Arbuckle Mts., Murray Co., Oklahoma. (OU). Probably the same form, but with narrower leaf lobes is *Waterfall 2934*, *Wichita Mts.*, Comanche Co., Okla. (OU).

3b. Var. *LINEARILOBA* (T.&G.) Gray, Proc. Acad. Nat. Sci. Phila. 161. 1862; *Malva involucrelata*, var. *lineariloba* T.&G.,

Fl. N. Am. 1:226. 1838; *Callirhoe lineariloba* (T.&G.) Gray Proc. Am. Acad. 19:74; *C. palmata* Buckley, Proc. Acad. Nat. Sci. Phila. 13:449. 1862; *C. involucrata*, var. *palmata* (Buckl.) Britt., Trans. N. Y. Acad. Sci. 9:183. 1890; *C. involucrata*, var. *tenuissima* Palmer ex E. G. Baker; Journ. Bot. 29:49. 1891; *C. geranioides* Small, Bull. N.Y. Bot. Gard. 1:283. 1889; *C. involucrata*, var. *parviflora* Hochreutiner, Ann. Conserv. & Jard. Genève 20:127. 1917.

Principal cauline leaves with blades dissected to within 2-4 mm. of the petiole, the central segment usually 2-3 mm. wide at the base, segments mostly deeply parted into oblong or linear divisions; stipules 2-7 (10) mm. long by 1.5-4 (5) mm. wide; stem indument consisting of varying amounts and proportions of strigose hairs and 4-rayed stellae 0.4-1.0 mm. wide, some specimens glabrescent; there is much more material either without, or with only a trace of long hairs, than is found in the typical variety; the 3 involucel bracts are 4-10 mm. long by 0.3-2.0 mm. wide; the calyx is 1-2 cm. long with narrowly lanceolate to lance-ovate segments which are often attenuate, and sometimes have the attenuate tips again slightly widened toward the apex; peduncles 3.5-15 cm. long, subtended by leaves 3-6 cm. long; corolla 3.5-5 cm. in diameter; petals reddish-purple to white, sometimes with a bluish tinge; fruit 12-20 carpelate, sometimes strigose pubescent, but mostly glabrous.

The distribution in Texas of var. *lineariloba* as here accepted is throughout most of the state. Little material has been seen from the Trans-Pecos area. The synonymy indicates the variability. There seems to be some tendencies within this taxon that could be used for setting up or accepting additional varieties. I find, however, little correlation of characteristics; and all attempts made to separate the several hundred sheets studied into further "stacks" of varieties have left more material that could not definitely be assigned to any group than the total so assigned. Such a procedure hardly seems clarifying.

Nevertheless, it might be interesting, from the standpoint of further study, to list some of the tendencies. One is characterized by having white flowers, strigose stems, a fruit with 12-14 carpels which are glabrous or have a trace of strigose pubescence on the beak; the carpels are wider than usual, frequently being 1.8-2 mm. wide; the peduncles

are 3.5-4.5 cm. long, subtended by leaves of about equal length. Representative are: BELL Co., *J. F. N.* April 21, 1929 (T); TRAVIS Co., *B. C. Tharp* 848, Austin, April 22, 1921 (T); *J. F. N.*, Austin, spring 1928 (T). Other material has the flowers bluish-purple, or stems with few long hairs. Much other white-flowered material perhaps could be cited here, but the fruit are undeveloped.

In north-central and central Texas, there are found specimens that are rather small (25-45 cm. tall) decumbent to ascending from a small (3.5 cm. long by 0.5-2.0 cm. in diameter) cylindrical to turnip-shaped tap root; stipules small (4-7 mm. long by 3-4 mm. wide); peduncles 8-14 cm. long with subtending leaves 3-9 cm. long; flowers magenta-red or wine-red to pink or whitish; carpels 14-18, glabrous or with a trace of pubescence, each carpel 1.0-1.7 mm. wide on the back. Characteristic are: DENTON Co., *Shinners 9203* (SMU); MASON Co., *McVaugh 8319* (T & SMU); TARRANT Co., *Shinners 9203* (SMU); LEE Co., *Cory 51667* (pink-flowered); LIMESTONE Co., *Cory 54198* (pink-flowered).

Along the Gulf coast and lower Rio Grande from Orange County to Maverick County, and inward, there are plants that are apparently procumbent in habit, have more elongated internodes with longer peduncles and relatively shorter leaves, and hence appear less leafy; stipules 4-10 mm. long by 2-4 mm. wide; peduncles 5-15 cm. long subtended by leaves 2.5-6 cm. long (one with longest peduncles, 15 cm., had short leaves, 3 cm.); flowers mostly "wine-red": carpels 14-23, glabrous or with a trace of pubescence, each 1.0-1.7 mm. wide on the back. Some characteristic collections are: MATAGORDA Co., *Crabhill*, Citrusgrove (T); KLEBERG Co., *Sinclair*, Ringswell (T); VAL VERDE Co., *Cory 41720*, Rio Grande bottoms, Del Rio (G); TRAVIS Co., *York 750*, near Riverbridge, Austin.

The peduncle-length is quite variable in this group. The Crabhill collection from Matagorda Co. has peduncles 4-5 cm. long subtended by leaves 2.5-3.5 cm. long. *Cory 44,663*, Aransas Co., has peduncles 15 cm. long subtended by leaves as small as 3 cm. long. *York 750* from Travis Co., has peduncles about 3.5 cm. long subtended by leaves about 2.5 cm. long. This particular specimen is young; the later peduncles might have been more elongated.

Since some of the species or varieties proposed within this group have been published where they may be somewhat difficult for the average reader to find, quotations from some of them may be helpful. They are, therefore, given below.

Malva involucrata, b. *lineariloba* l.c., supra. "segments of the leaves divided into 3-5 narrowly linear lobes . . . peduncle . . . 3-4 inches long." The TYPE, *Drummond, Coll. 3, 40* (N.Y.) shows these two characteristics quite well. The larger specimen on the right of the sheet has only a trace of strigose pubescence and few stellae; a smaller branch on the left has more long hairs, but few stellae. The stipules are rather small, 5-7 mm. long by 3-4 mm. wide. Peduncles (6-10 cm. long) are subtended by leaves 2.5-4 cm. long. Flowers are 4-5 cm. in diameter. There are about 15 carpels in each fruit. The carpels measure about 1.7 mm. across the glabrous backs; there is a trace of strigose pubescence on the beaks.

Callirhoe palmata Buckl. "Caule prostrata, parce strigosa, foliis longe petiolatis, reniformisque palmata 3-5 sectis, laciniis 3-5 fidis subobtusis acutis . . . calycis hirsutis, lanceolatis, acuminatis, petalis obovato-rotundatis, albis, vel parum caeruleis . . . Common on Brady's Creek north of Fort Mason. Stems from a small, long taproot, creeping . . . to the distance of 1-2 feet; leafy; radical and cauline leaves similar; flowers 1-1½ inches in diameter, generally white, rarely of a pale purple; peduncles 2½-3 inches long; petioles ½-2 inches long."

I take the TYPE* to be a small, flowering specimen in the Gray Herbarium mounted on the lower left hand corner of the sheet and labelled "'C. palmata, n. sp.' Buckley!" The description, however, could hardly have been drawn from this specimen alone. It is 14 cm. long and has no petioles longer than 2.5 cm. The flowers have a pale "purple" tinge.

The nearest approach to a correlation of white flowers with other characteristics is found in the group of variants first discussed above. White flowers are found, however, on material with almost glabrous stems, and on material with narrow-backed carpels. Collectors' labels indicate that

*Correctly, *isotype*; the Type is at the Philadelphia Academy of Natural Sciences. (Editor.)

(at least locally) white-flowered material may be abundant, or the only kind present.

C. involucrata, var. *tenuissima* Palmer ex E. G. Baker. "Caule breve tenue, foliis minoribus majus dissectis segmentis linearibus vel lanceolatis. Hab. North Mexico. E. of Salt-hills [error for Saltillo]. Alt. 10,000 feet, Dr. E. Palmer." This appears to be similar to the type of var. *lineariloba*. It is a more compact plant, has the leaf lobes much dissected, and has ovate involucre bracts. Much of the material from Southern Texas has leaf lobes similarly dissected.

C. geranioides Small. A description may be found in Small's Flora. The key characteristic is given as "leaf blades with crenate or cleft-crenate lobes," as compared with "leaf blades with remotely incised or pinnately parted segments" for other species. In this complex, leaf shape and dissection are so variable as to seem of little value in separating taxons, other than the two principal ones already indicated. Selected from the description in Small's Flora are: ". . . closely pubescent with very short hairs . . . leaves few; blades 2-2.5 cm. broad, pentagonal in outline, 5-lobed or 5-cleft, cordate, the lobes cuneate, coarsely toothed or cleft, mostly rounded or obtuse . . . peduncles surpassing the leaves, often 8-10 cm. long . . . calyx rather conspicuous, 10-12 mm. long . . . petals pinkish or pink-purple . . . 2-2.5 cm. long. In sandy bottoms, southern Texas."

I have not seen the type, A. Schott, March-April 1852.

C. involucrata, var. *parviflora* Hochreutiner. ". . . minus pilosa quam in typo; stipulae magnae, ad 10×4 mm. longae et latae; pedunculi ut in typo maximi 5-9 cm. longi; bractae eis typi conformes, lineares; calyx typo conformis, villosus sed minus quam in typo, florifer ca. 1.1 cm. longus. Petala parva ca. 1.3 cm. longa, verisim. alba . . . Carpidia ca. 20, ut in typo, valde reticulata, mutica et fere glabra. Hab. Texas, Abilene, May 20, 1902 (S. M. Tracy, Pl. of the Gulf States n. 7818 . . .)".

The primary distinction upon which this variety was based seems to be the size of the corolla. In areas where rainfall is more or less erratic it seems to me that corolla-size may, at least in some species, follow weather conditions, and should be used with care in erecting taxons. I have

before me two sheets of the type collection, neither, judging from corolla-size, being the one Hochreutiner had. The sheet in the Gray Herbarium has petals 1.8-1.0 cm. long. The sheet in the University of Texas Herbarium has petals 0.8-1.0 cm. long.

It is interesting to note that Hochreutiner (Ann. Conserv. & Jard. Bot. Genève 20:125-127. 1917) described a new species, *C. macrostegia* based on Edward Palmer 38, Saltillo, Coahuila, Mexico, Apr. 15-30, 1898 (TYPE in Gray Herb.) He placed emphasis on the broadly elliptical involucler bracts, and mentioned the ovate, long-attenuate calyx lobes with dark-colored middles, and "collared" carpels, having ligulate appendages ca. 0.5 mm. long.

Plants with broad involucler bracts, approaching but not equalling the type of *C. macrostegia* are: *Curtiss N. Am. Pl. 362*, Dallas (G); *C. L. and Amelia A. Lundell 9161*, near Bachman's Dam (SMU); *Hopkins, Nelson & Nelson 1944*, Cleveland Co., Okla. (OU). These collections (and several others with narrower involucler bracts) also have ovate-attenuate, dark-colored calyx lobes. *Cory 39182*, 7 $\frac{3}{4}$ miles northwest of Big Lake, Reagan Co., is representative of a few collections with ovate long-attenuate sepals, dark-colored on the back, having "collared," strigose-pubescent carpels, narrow involucler bracts and strigose-pubescent stems.

It seems that if *C. macrostegia* be accepted as a taxon growing in Coahuila, there must have been a good deal of introgression with Texas populations.

4. *C. ALCAEOIDES* (Michx.) Gray, Mem. Amer. Acad. n.s., 4:18, 1849 (Pl. Fendl.); *Sida alcaeoides* Michx., Fl. Bor. Amer. 2:44, 1803.

Perennial from an oblong or napiform root; stems several, 15-45 cm. tall, ascending, appressed pubescent, with 4-rayed hairs, sometimes glabrate; leaf-blades 5-9 cm. long and 4-10 cm. wide, mostly cordate or triangular-cordate; blades of basal leaves crenate or incised to palmately parted, the segments mostly laciniate-cleft, ultimate leaf divisions mostly oblong to linear; basal petioles equalling, to twice as long as the blades; cauline petioles mostly equalling the leaves, upper leaves sometimes almost sessile; inflorescence corymbose at anthesis, later elongating; peduncles 1-5 (8) cm. long; no bracts subtending the calyx; calyx ca. 1 cm. long, lower $\frac{1}{2}$ - $\frac{1}{3}$ united, lobes lanceolate, sometimes atten-

uate, pubescence of short (0.5-1 mm.) strigose, mostly appressed, simple hairs; fruit 7-8 mm. wide by 4-5 mm. high; carpels strigose-pubescent, their beaks protruding to form the upper $\frac{1}{3}$ - $\frac{1}{4}$ of the fruit; petals 1.5-2.2 cm. long, pink or white.

C. alcaeoides occurs in Texas mostly in the Grand Prairie. Specimens are at hand from Lamar, Grayson, Collin, Dallas, Kaufman, Ellis, Tarrant and Eastland counties.

5. CALLIRHOE DIGITATA Nutt. var. DIGITATA Journ. Acad. Phila. 2:181. 1821. *Nuttallia pedata* Nutt. ex Hook., Exot. Fl. 3:172, 1827.

Plant perennial, erect, (5.5) 7-13 cm. tall; stems glabrous and glaucous, lower petioles (7) 15-25 (30) cm. long, often with a trace of pilose-strigose hairs; leaf blades mostly cordate or ovate, 5-parted, with some of these divisions sometimes again parted into segments that are usually narrowly linear but occasionally vary toward linear lanceolate blades 6-8 (11) cm. long; stipules early deciduous (mostly absent at flowering time); peduncles 4-15 cm. long; petals 1-2 cm. long, red or purple; fruit 8-10 mm. wide by 4-5 mm. high; carpels glabrous, beak not, or only slightly, elevated above the body of the mature fruit.

Material seen shows the typical variety as occurring in southwestern Missouri, northwestern Arkansas, southeastern Kansas and northeastern Oklahoma in the western part of the Ozarks.

Some characteristic specimens are: MISSOURI: GREEN Co.: *Blankinship*, July 16, 1888 (G); BARRY Co.: *Bush 3258*, prairie, Purdy, Aug. 17, 1905 (G); ARKANSAS: BENTON Co.: *Blankinship*, Aug. 16, 1895 (G); KANSAS: CHEROKEE Co.: *Hitchcock 633*, prairie, 1896 (G); OKLAHOMA: DELAWARE Co.: *Waterfall 8230*, wooded creek side, July 8, 1948 (OU,OAM); ADAIR Co.: *Waterfall 9581*, wooded valley, 3 miles south of Kansas, July 7, 1950 (OAM); MUSKOGEE Co.: *Little 1284*, June 12, 1927 (OU); COUNTY UNDETERMINED: *Nuttall*, Arkansas Territory (TYPE, or isotype) NYBG; also possibly the Elias-Durand sheet of *C. digitata* collected by Nuttall in "Arkansa").

5a. CALLIRHOE DIGITATA Nutt., var. *stipulata* Waterfall, var. nov., a varietate typica differt stipulis majoribus non deciduis; caulibus et foliis minoribus.

Plant perennial, erect to reclining, 4-6 (8) dm. tall; stems glabrous to pilose-strigose; leaf-blades (3-5) 4-6 (8) cm. long, the lower ones varying from crenate through lobed to parted with linear segments as in the typical variety, but with the ratio between the length and the width of the segments usually less than in var. *digitata*; stipules per-

sistent, usually linear-lanceolate, sometimes varying to ovate-lanceolate, 5-10 (12) mm. long; petals red or purple; fruit as in the typical variety.

TYPE: *Cory* 54,373, 2 miles east of Birdville, Tarrant Co., Texas, April 16, 1948 (SMU).

Selected Specimens: OKLAHOMA: PONTOTOC Co.: *Robbins* 2540, 3 to 4 miles southeast of Fittstown, June 6, 1947 (OU); MURRAY Co.: *Hopkins* 5116, Arbuckle Mts., near Turner Falls, May 30, 1954 (OU); CARTER Co.: *Hopkins* 4980, Arbuckle Mts. May 29, 1940 (OU); TEXAS: DENTON Co.: *Cory* 53234, 2½ miles south of Sanger, May 24, 1946 (SMU); TARRANT Co.: *Whitehouse* 15187, southwest of Newark, April 7, 1946 (SMU); WISE Co.: *Shinners* 7920, 3½ miles northwest of Rhome, June 19, 1945 (SMU); ERATH Co.: *Whitehouse* 15417, ½ miles east of Bluff Dale, Apr. 21, 1946 (SMU); TAYLOR Co.: *Tofstead* 7303, 18 miles southwest of View on Edwards Plateau, May 27, 1943 (SMU,T); EDWARDS Co.: *McVaugh* 8264, 5 miles northeast of Rocksprings, May 10, 1947 (SMU).

The following are sheets of var. *stipulata* having unusually pilose-strigose lower petioles and lower stem internodes: TEXAS. DALLAS Co.: *Reverchon* (Curtiss, N. Am. Pl. No. 364) near Dallas (G); TRAVIS Co.: *Young*, Apr. 18, 1915 (T); BLANCO Co.: *Palmer* 33931, near Blanco, May 11, 1928 (G); KERR Co.: *Bray*, May 2, 1899 (T).

The range is thus shown to be in the Arbuckle Mts. of Oklahoma and the Black Prairies and Edwards Plateau of Texas.

5b. *C. DIGITATA* Nutt., var. *STIPULATA* Waterfall, forma *alba* Waterfall, forma nov., petalis albis.

TYPE: *Cory* 54375, 5½ airline miles east by north of Alvord, Wise Co., Texas, April 30, 1948 (SMU).

Selected Specimens: OKLAHOMA: CARTER Co.: *Waterfall* 706, 4 miles north of Springer, June 5, 1937 (OU); TEXAS: WILLIAMSON Co.: *Dyksterhuis, Johnson, Warnock & Barkley* 16108, west of Round Rock, April 10, 1946 (T; a duplicate at OU is not white-flowered); TRAVIS Co.: *Tharp*, edge of Edwards escarpment on country road south of Burnet hiway, Apr. 11, 1947 (T); EDWARDS Co.: *Cory* 41507, 25 miles northwest of Rocksprings, April 25, 1943 (G).

6. *C. LEIOCARPA* Martin, Journ. Wash. Acad. Sci. 28:107-109. 1938. *C. pedata* in the sense of Gray, Mem. Amer. Acad. n.s. 4:16, 1849, and later American authors, not *Nuttallia pedata* Nutt. ex Hook. Exot. Fl. 3:172. 1827.

Stems 30-75 cm. tall, erect, glabrous, slightly pubescent with small 4-rayed hairs (having a spread of 0.1-0.5 mm.), several from a slender annual tap root; leaf-blades reniform-cordate to ovate in outline, 1-6 cm. long by 1-8 cm. wide, crenate to 3-6 parted, segments cuneate, to oblong, lanceolate, falcate to linear, entire to lobed; in general the upper leaves are more deeply parted and have narrower lobes than the lower; petioles from 3 times the length of the blades to shorter than the blades; peduncles many, 3-10

(18) cm. long, in fruit diverging from the upper $1/3-2/3$ of the stem, fruiting calyx 9-15 mm. long and 5-8 mm. broad, lower $1/4-1/3$ united, lobes lanceolate to linear-lanceolate, somewhat attenuate; petals (5) 10-15 (23) mm. long, red-purple; fruit 4-5 mm. wide by 3-4 mm. high; carpels 10-12, glabrous, 3-4 mm. high by 2-2.5 mm. broad, smooth to slightly wrinkled on the back, sides thin, smooth to slightly reticulate, beak large, hollow, dehiscent, forming about $1/3$ of the carpel; back of the carpel-body prolonged about 1 mm. into a white chartaceous collar subtending the base of the beak.

This species ranges through the plains and prairies of the western third of Oklahoma, and in the Arbuckle Mts., southward into Texas through the prairies and plains situated roughly between the Edwards Plateau and the Eastern Timbers. Specimens were cited by Martin in 1938 (l.c., supra).

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Physiographic Influences of the Edwards Plateau on its Endemic Amphibian Fauna—a Résumé

Lawrence Curtis

It has long been known that the geographic ranges of certain plants and animals not only closely parallel each other, but also the physiography of their habitat. Indeed, plants and animals seem often to follow clearly certain intangible lines, in their distribution. A careful student perhaps half-consciously senses these associations, continuously. One's idea of a desert embraces a variety of peculiar associated plants and animals — cactus, sage brush, the horned toad, the rattlesnake, the road runner, the prairie dog. The idea of swamps brings to the mind luxuriant mosses, ferns, cypress, as well as mosquitoes, frogs, water moccasins. Darwin (1859, pp. 256-78) noted this phenomenon of "associations" of organisms, and considered it an important factor in the geographic distribution of animals. Other biologists went further; in 1899 W. L. and P. L. Sclater divided the land surface of the globe into six primary