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WASHINGTON UNIVERSITY

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Name of Author DAVID JAMES ROGERS

Candidate for the Degree of MASTER OF ARTS

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WASHINGTON UNIVERSITY  
Department of Botany

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STILLINGIA IN NORTH AND CENTRAL AMERICA

by  
David James Rogers

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## STILLINGIA IN NORTH AND CENTRAL AMERICA

### INTRODUCTION

Three previous systematic studies<sup>1,2,3</sup> of the genus Stillingia have been based upon few specimens, little distribution data, and practically no habitat information. As a result, the species have remained indistinct or split into ill-defined groups. An examination of annotations borne by herbarium specimens demonstrates the confusion concerning the identity of any one species.

Pax and K. Hoffman<sup>3</sup> have described 26 species of Stillingia: thirteen in North and Central America, nine in South America, three in Madagascar, and one in the Fiji Islands of the southern Pacific. The present revision undertakes to reexamine the North and Central American species with the purpose of effecting a more natural organization. The standard methods of the herbarium systematist have been employed for interpretation of the species. In order to present a more integrated treatment, a conservative concept of species is used. No infra-specific entities are recognized since there are insufficient data for delimitation and description of the variants. There are no species of South American affinity known to occur north of the Panama Canal

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<sup>1</sup>Beillon, *Etud. Gen. Euphorb.* 510. 1858, ex parte.

<sup>2</sup>Mueller, DC. *Prodr.* 15<sup>2</sup>: 1155. 1866.

<sup>3</sup>Pax & K. Hoffman, in Engler, *Pflanzentr.* IV, Fam. 147, V: 180. 1912.

Zone, and probably none of North and Central America south of the same region. Since this is the case, no unnatural separation of the species is necessary for the sake of convenience.

#### GENERIC AND SUBGENERIC RELATIONSHIPS

The genus Stillingia is commonly referred<sup>4</sup> to the subtribe Stillingiinae, tribe Hippomaneae, subfamily Crotonoideae of the family Euphorbiaceae. The tribe Hippomaneae, composed of 26 genera, is divided into eight subtribes. In the subtribe Stillingiinae, Marrounea and Sapium are the genera most closely related to Stillingia. Flowering specimens of Marrounea are very easily distinguished from Stillingia by the compact inflorescence of the former which appears almost as a capitulum, whereas the inflorescence of Stillingia is much more elongate and spiciform. There is no difficulty in separating either Sapium or Marrounea from Stillingia when mature fruiting specimens are available. In Stillingia, an abscission layer forms above the base of each of the cocci so that after dehiscence of the cocci, a three- or two-rayed hardened portion of the pericarp remains attached to the pedicel. The hardened portion of the pericarp is called the gynobase in this study. There is no such abscission layer in either Marrounea or Sapium and the cocci of these two genera leave no remnants of the pericarp after dehiscence of the cocci.

As Pax points out,<sup>4</sup> it is slightly more difficult to

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<sup>4</sup>Pax and K. Hoffm., in Engler, Pflanzenr. IV, Fam. 147, V: 180. 1912.

separate Stillingia from Sapium when only flowering specimens without mature fruits are available. Both genera have the same type of inflorescence, but that of Sapium is generally larger and more elongate than that of Stillingia. <sup>Insert</sup> In Sapium, some of the species have <sup>united sepals</sup> a definite calyx in the pistillate flower whereas in Stillingia, the sepals <sup>are separate</sup> ~~never~~ are united. Sapium is a genus of trees and shrubs only rarely becoming suffrutescent. The species of Stillingia, by comparison, largely are shrubs, subshrubs and herbs, and only occasionally become trees.

The subgenus Eustillingia based on the section Eustillingia Kl.<sup>5</sup> emend. Muell. Arg.<sup>6</sup> includes those species of Stillingia with three to thirteen staminate flowers in a cymule, three to two definite sepals in the pistillate flower, and a well defined caruncle on the seed. Species with a single staminate flower in a cymule, sepals and caruncle absent are referred to Gynostillingia S. Watson.<sup>7</sup> This subgeneric epithet is accredited doubtfully to S. Watson since he made no definite statement of preference, but said "---Mueller's Gynostillingia, which may be considered a section or subgenus---". Pax<sup>8</sup> cited Gynostillingia S. Wats. as

<sup>5</sup>Klotzsch, in Richs. Arch. VII, 1: 187. 1841.

<sup>6</sup>Mueller, in Linnaea 32: 87. 1863.

<sup>7</sup>S. Watson, in Proc. Am. Acad. 14: 298. 1879.

<sup>8</sup>Pax & K. Hoffman in Engler, Pflanzenr. IV, Pan. 147, v: 180. 1912.

section in synonymy under his section Leptostachyae. The subgeneric rank is used here rather than the section because the characters involved are sufficiently distinct to justify a higher category than the section. There is a sufficient overlap of characters between the two subgenera, however, to prevent the establishment of distinct genera.

Reorganization is necessary since the sections established by Pax and K. Hoffman in the 1912 monograph are not natural, but are based on superficial characters. For example, S. zelavensis, with subherbaceous stems and woody rhizomes of Pax's section Fruticosae has more in common with his section <sup>than</sup> Sylvaticae, whose species also have subherbaceous stems and woody rhizomes, than with Fruticosae. In the section Oppositifoliae, S. sanguinolenta occasionally has subalternate stems and leaves; S. aquatica and S. bicarpellaria in section Fruticosae have opposite branches.

#### GEOGRAPHICAL DISTRIBUTION

Stillinia is largely tropical or subtropical in the Old World and the New. Three species occur in temperate regions, two in the north temperate, and one in the south temperate zone. S. sylvestica and S. texana are the northern species, but their ranges extend somewhat into subtropical zones, the former growing to the southern tip of Florida and the latter extending its range into northern Mexico. The northern limit of S. sylvestica is about 36° north latitude, and of S. texana about 35° north. S. natanica is found in

South America as far south as the 50th parallel in Argentina.

In Mexico and Central America, S. melavensis, S. sanguinolenta and S. bicarpellaris are confined to upland regions, from about 500 to about 4000 meters altitude. S. microcarpa, S. diphtherina and S. acutifolia are largely upland plants from Chiapas, Guatemala and Honduras. The South American species of tropical and subtropical affinity grow from Venezuela to southern Brazil and northern Argentina.

Stillingia Freculiana, S. paucidentata, S. linearifolia and S. spinulosa form an interesting group of desert plants of narrow ranges in the southwestern United States and the dry states of northern Mexico.

So far as is known, S. aquatica is the only species of Stillingia living in wet regions, <sup>places</sup> marshy savannahs and <sup>as</sup> vernal ponds, in Florida and south Georgia.

The three species from the islands of Madagascar, Mauritius, and Reunion (Bourbon) are found in mountain forests. One species is from the Fiji Islands of the southern Pacific.

#### MORPHOLOGY

The genus Stillingia is a diverse group of perennial herbs, subshrubs, shrubs and small trees. The tree habit is not predominant in the North and Central American species; S. acutifolia from southern Mexico and Guatemala <sup>and S. acutifolia from S.E. Brazil</sup> is the only species which has sufficient height and diameter of trunk to

be called trees.

Although seldom found on herbarium specimens, the ~~root system and underground portions of the stem~~ woody ~~stems~~ of S. mexicana, S. sylvestris and S. toana <sup>Sens. Sylvania</sup> is a good definitive character. All other species arise directly from a tap root. The roots of S. sylvestris are <sup>secondary</sup> ~~those of the former~~ and <sup>and S. aquatica</sup> distinctive, being elongate-fusiform, arising at several points along the ~~stems~~ <sup>primary</sup> ~~stems~~ <sup>those of the latter</sup> ~~stems~~ <sup>very closely set on the primary.</sup>

The stems may be terete, striate or angled, the striations occurring as a result of <sup>age and drying</sup> ~~the decurrent leaves~~. The branching systems are opposite to alternate to fascicled, the latter being a result of shortened internodal regions and accordingly having <sup>these present have</sup> a somewhat whorled appearance. The fascicled branching pattern gives the upper portions of the plant an umbelliform appearance. The bark of the shrubby species is lenticellate in varying degrees. S. sanguinolenta has a very rough bark due to the presence of a large number of enlarged lenticels. <sup>Succession of stem and leaf is</sup> ~~a definitive character of the species of series~~ <sup>Dissection</sup> The outline, margin, venation and texture of the leaves

are important key characters. The leaves of the Mexican, <sup>+ South</sup> Central American species of the subgenus Stillingia <sup>with a few exceptions</sup> are provided with two to several cup-shaped glands at the base of the blade. This is not a constant feature of each leaf, but generally more than one leaf of a specimen will have these modified serrations. <sup>The condition of leaf base equal</sup> ~~in Stillingia~~ <sup>with the exception of S.</sup> ~~thin to firmly membranaceous, dimpled, coriaceous, and~~ ~~in Stillingia~~ <sup>all species have membranaceous leaves; the</sup> ~~succulence or fleshyness~~ <sup>these conditions are characteristic</sup> ~~excepted species has coriaceous leaves.~~

of whole groups of species, with the <sup>exception of the</sup> ~~coriaceous~~ <sup>character</sup>.

So far as is known, only S. diptera is as characteristic

The organization of the inflorescence, a spiciform  
thyrses, is essentially the same throughout the genus. The  
flowers are monoecious, with the pistillate flowers always  
single in the cymule, but the number of staminate flowers  
in a cymule varies. The pistillate flowers are attached  
toward the base of the peduncle, and either immediately  
adjacent to the lowest staminate cymule or with a distinct  
space on the peduncle separating the pistillate and stami-  
nate cymules. The <sup>inflorescence</sup> peduncle may be <sup>pedunculate</sup> ~~elongate~~ below the point  
of insertion of the lowest pistillate flower or <sup>sessile and</sup> bear pistil-  
late flowers beginning at its point of origin. Both the  
pistillate and staminate cymules are subtended by a more  
or less ~~cuneate~~ <sup>the shape of which is of some importance in species differences</sup> bract, which has ~~patelliform~~ or ~~cyathiform~~  
~~glands basally and laterally attached~~; one gland on each  
side of the bract. These glands are considered the homo-  
logues of the cup-shaped serrations at the base of the leaves  
of the Mexican species. The staminate flowers are borne  
either three to thirteen, or singly in the axil of a bract  
toward the apex of the inflorescence. This inflorescence  
structure is assumed to be derived from a more primitive  
inflorescence by reduction. The inflorescence structure of  
Hayea, for example, with several pistillate flowers on the  
main and secondary axes might represent a more primitive  
condition than that observed in Stillingia where the pistil-  
late flowers are single in the cymules. A reduction series  
is evident within the genus Stillingia in the staminate  
floral structure. The species of the subgenus Stillingia

are characterized by three to many staminate flowers in each cymule, but the subgenus *Gynnostillingia* has only one staminate flower for each cymule.

In the sepals of the pistillate flower is found a good method and a strengthening feature for the distinction between the two subgenera. All the species of *Eustillingia* have three (or two in *E. bicarrollaria*) well marked sepals, the remnants of which are occasionally apparent at the base of the gynobase even at maturity of the fruit. The name *Gynnostillingia* is derived from the absence of sepals, and all species of the subgenus except *E. acutifolia* are completely lacking them. *E. acutifolia* is a transition species in this respect, with very small and fugacious sepals.

<sup>Primary</sup>  
No (key) importance has been attached to the staminate flowers since these organs are rather uniform and present no readily observed differences. On the other hand, relative density of the staminate cymules and the total number of staminate flowers on an individual inflorescence are used in the diagnostic treatment.

The measurement of lobe length of the mature gynobase is consistently given in the descriptions, the length being that from the central column to the apex of the lobe. The variability of this character within a species prevents inclusion as a key character.

Seed size, contour and surface are constant for the most part. Again, variation occurs particularly in the extreme southern range extension of *E. sylvatica*, where there

EXPLANATION OF THE PLATE

PLATE 2.

SEEDS OF STILLINGIA all figures, X 5.

1. *S. sanguinolenta*
2. *S. microcarpa*
3. *S. bicarpellaria*
4. *S. melavensis*
5. *S. texana*
6. *S. sylvatica*
7. *S. aquatica*
8. *S. acutifolia*
9. *S. Traculiara*
10. *S. paucidentata*
11. *S. spinulosa*
12. *S. linearifolia*

EXPLANATION OF THE PLATE

PLATE 1.

INFLORESCENCES AND FLOWER STRUCTURES OF STILLINGIA

Figs. 1-3 Inflorescence and flower structure of  
S. selavensis, typical of the subgenus  
Eustillingia. Fig. 1, X 1; Figs. 2 & 3,  
X 5.

Figs. 4-6 Inflorescence and flower structure of  
S. raucidentata, typical of the subgenus  
Gymnostillingia. Fig. 4, X 1½; Figs. 4 & 5,  
X 5.

may be a problem of intergression with E. aquatica.<sup>no</sup> The measurement of length in the seed is the distance from micropylar end to the basal end, and the width is perpendicular to the length at the broadest portion of the seed. The presence or absence of the caruncle is one of the best supporting characters for the division of the genus Stillin-<sup>causes in the</sup>  
gia into two subgenera. <sup>subgenus</sup> Stillingia is characterized by <sup>of both</sup> the presence of a well defined caruncle in all species. <sup>species</sup> Gymnostillingia is not completely without this body, and a very definite caruncle appears in E. Treculiana. E. paucidentata is a transitional species in this respect, with a very minute and fugacious, but nevertheless definite, caruncle. E. acutifolia, E. annulosa and E. linearifolia are oocarunculate.

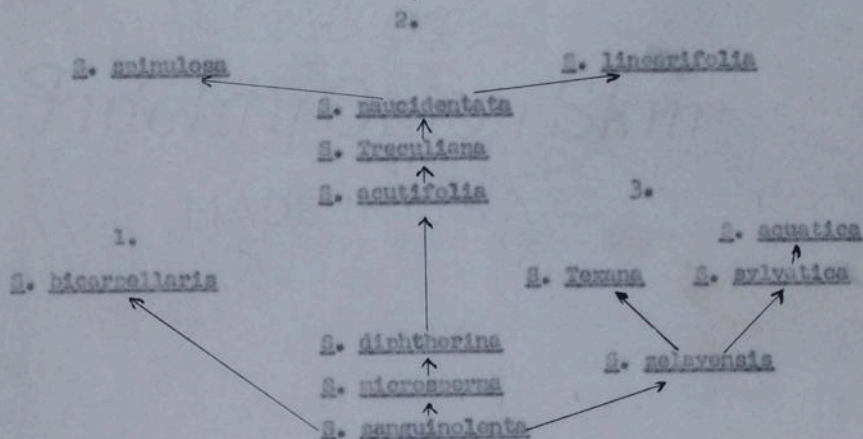
#### EVOLUTIONARY TENDENCIES AND INTERSPECIFIC RELATIONSHIPS

The possibilities for study of evolution in Stillingia are good. There is a definite reduction series to be found in the number of staminate flowers in a cyme, in the sepals of the pistillate flower, in the caruncle, in the number of carpels, and in the habit of the plant.

(I generally have followed the dicta established by Bessey<sup>2</sup> for determination of primitive and advanced characters.) The shrubs with three to many staminate flowers,

<sup>2</sup>Bessey, The Phyllogenetic Taxonomy of Flowering Plants, Ann. Mo. Bot. Gard. II, 2: 109. 1914.

well defined sepals in the pistillate flower, a definite caruncle present, and growing in a mesophytic habitat are considered the most primitive. From the primitive species, three lines of divergence and reduction are apparent, as follows:



1. Reduction from three carpels to two; reduction of sepals from three to two. There is evidence of advance in this species to some extent although the only manifestation has been in the reduction, in number of carpels and sepals, and this not consistently. The species maintains the shrubby habit and nearly the same climatic requirements as the primitive species.

2. Reduction of number of staminate flowers, the caruncle, sepals and transition from shrubs to herbs. The species included in this group show the greatest advance. From the shrubs, there is reduction first in the number of staminate

flowers to one in each cymule, and from well defined and persistent sepals to minute and fugacious sepals, but maintaining the woody habit, as in S. acutifolia. By further reduction, the plants have become perennial herbs with no sepals in the pistillate flower. The most advanced species are those which in addition to the above reductions, have lost the caruncle from the seed.

3. Reduction from woody to subherbaceous habit. In this group all of the primitive floral structures have been maintained, but the subherbaceous habit shows a definite advance.

The herbaceous and subherbaceous species of Groups 2 and 3 are assumed to have arisen from the primitive shrubby species as a response to changed climatic conditions.

#### HISTORY OF STILLINGIA

Stillingia, named by Garden,<sup>10</sup> was dedicated to Benjamin Stillingfleet, an English botanist who lived from 1702 to 1771. Endlicher<sup>11</sup> first placed Stillingia in the Euphorbiaceae, as a member of the tribe Euphorbieae.

Baillon<sup>12</sup> (made the first systematic study of the genera allied to Stillingia, employing such a broad interpretation that most of those genera of the presently recognized tribe

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<sup>10</sup>Garden ex L. Mant. 19. 1767.

<sup>11</sup>Endlicher, Gen. Pl. II: 1110. 1836-1840 ex parte.

<sup>12</sup>Baillon, Etud. Gen. Euphorb. 510. 1898, ex parte.

Hippomaneae appear as sections of Stillingia. His section Eustillingia, in part, is the genus Stillingia. Mueller<sup>13</sup> placed Stillingia in the tribe Hippomaneae and established Gymnostillingia as a separate genus, based on the species G. scutifolia. He maintained the same status in his treatment for De Candolle's 'Prodromus'.<sup>14</sup>

Bentham and Hooker<sup>15</sup> placed Gymnostillingia <sup>without rank</sup> within the genus Stillingia, recognizing for the first time the importance of the gynobase as the most important generic character. Mueller had previously<sup>14</sup> noted the occurrence of this structure, but failed to appreciate its importance as a linking character between Stillingia and Gymnostillingia. S. Watson<sup>16</sup> placed the herbaceous species of the southwestern United States and northern Mexico in the subgenus Gymnostillingia, but Pax and E. Hoffman<sup>17</sup> established a new section, Leptostachyae, for the four species of this region.

Pax and E. Hoffman<sup>17</sup> were the first to divide the tribe Hippomaneae; Stillingia appears as a member of the subtribe Stillingiinae. These authors have given the limits of the genus as it is known today, dividing it into six sections,

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<sup>13</sup>Mueller, in Linnaea 32: 87. 1863.

<sup>14</sup>Mueller, DC. Prodr. 15<sup>2</sup>: 1155. 1866.

<sup>15</sup>Bentham, in Benth. et Hook. f. Gen. Pl. 3: 334. 1880.

<sup>16</sup>S. Watson in Proc. Am. Acad. 14: 298. 1879.

<sup>17</sup>Pax & E. Hoffman, in Engler, Pflanzenr. IV, Fam. 147, V: 180. 1912.

based largely on vegetative characters.

I have not altered the generic limits of Stillingia in this study since there is no confusion with the allied genera. Within the genus it has been necessary to regroup the species to present a more concise picture of <sup>physiologic</sup> specific tendencies. An examination of the species of South America, Madagascar and the Fiji Islands does not alter the subgeneric divisions.

#### ECONOMIC IMPORTANCE

1. Stillingia sylvatica. The medicinal values of this species have been explored and reported in several journals. An alcohol or water extract of the root was, and occasionally still is, used by doctors and laymen, in South Carolina particularly, in the treatment of syphilis, in cutaneous diseases, chronic hepatic infections, and in the composition of diet drinks.<sup>18</sup> As late as 1944,<sup>19</sup> this plant was mentioned as of minor drug importance, particularly as a sialagogue and expectorant.
2. Stillingia neutifolia. According to information from a labeled specimen, the acrid milky sap of this species is used as a caustic in the treatment of sores and boils.

#### VERNACULAR NAMES

1. Stillingia sylvatica. Queen's delight, Queen's root, silverleaf, nettle potato, yau-root, marcory, and cockup-hat.
2. Stillingia texana. Narrow-leaved queen's delight.

<sup>18</sup>C. F. Millsaugh, Medicinal Plants 151. 1892.

<sup>19</sup>Hoel L. Allport, The Chemistry and Pharmacy of Vegetable Drugs Tab. XVII. 235. 1944.

3. S. acuminata. Corkwood.
4. Stillingia Troculiana. Yerba del Sapo (Mexico).

#### STUDY MATERIAL

I have been able to examine specimens from several of the major herbaria of the United States, but have seen only type material from the European herbaria. Recent collections made by American botanists have contributed greatly to the knowledge of habitat and distribution.

The herbaria where specimens have been obtained for study, together with the symbols employed in their citation are as follows:

- AA - Arnold Arb.
- FIA - Agricultural Experiment Station Herbarium, University of Florida, Gainesville, Florida.
- AN - Herbarium Anchietae, Colegio Anchieta, Porto Alegre, RS, Brazil.
- OKL - Bobb Herbarium, University of Oklahoma, Norman.
- ~~U~~ C - Copenhagen, Universitetets Botaniske Museum, (Museum Botanicum Hannianse)
- ~~U~~ D - Delessert Herbarium, Conservatoire Botanique, Geneva.
- G - Gray Herbarium of Harvard University, Cambridge, Mass.
- ICH - Herbarium of Chicago Natural History Museum.
- MBG - Missouri Botanical Garden, St. Louis.
- P - Muséum National d'Histoire Naturelle, Paris.
- NY - New York Botanical Garden, New York City.
- K - Royal Botanic Gardens, Kew.
- S - Stockholm, Naturhistoriska Riksmuseet
- UC - University of California, Berkeley. — ZIL - Tucuman, Instituto Miguel Lillo
- UM - University of Michigan, Ann Arbor.
- TEX - University of Texas, Austin.
- US - United States National Herbarium, Washington.

I wish to acknowledge my indebtedness to the curators of these institutions, and to the Director of the Missouri Botanical Garden where this study was made.

TAXONOMY

STILLINGIA Garden, ex L. Mant. 19. 1767; <sup>Raf.</sup> Endl. Gen. Pl. II: 1110. 1836-1840; <sup>Torr.</sup> Baillon, Stud. Gen. Rumphorb. 510. 1858, ex parte; Benth. in Benth. et Hook. f. Gen. Pl. 3: 334. 1880; Pax, in Engl. & Prantl, Nat. Pflanzenf. III. 5. 96. 1890; Pax & K. Hoffm. in Engl. Pflanzenr. 4, Fam. 147, V: 180. 1912.

Stillingia Raf. Atl. Journ. 146. 1832, sphalm.

Seborium Raf. Sylva Tellur. 63. 1838.

Ditrisynia Raf. loc. cit. 64.

Stillencia Torr. in Emory, Notes Milit. Rec. 151. 1848, sphalm.

Glabrous perennial herbs, shrubs, or small trees. Leaves simple, alternate, opposite, <sup>decussate, subopposite, verticillate</sup> or spiral, sessile to petiolate, usually with 2 to several filiform, glandular stipules, <sup>the margins with callus</sup> entire to crenulate to serrate, the serrations glandular or callose or occasionally the glands in the sinuses of the serrations. Inflorescence a terminal, spiciform thyrse, the cymes bracteate, the bracts cuneate, <sup>to 1/2 inch to 1/4 inch in width</sup> biglandular, the glands laterally and basally attached; flowers monoecious, monochlamydeous or naked. Pistillate flowers solitary, <sup>subsessile to pedicellate</sup> borne toward the base of the peduncle; sepals 3 or absent, imbricate; ovary superior, 3- to 2-celled, a single pendulous, anatropous ovule in each cell; styles 3, more or less coalescent at the base, the stigmas more or less recurved. Staminate flowers solitary or 3 to 13 in a cysule, occupying the upper portion of peduncle, <sup>subsessile to</sup> pedicellate, the calyx always present, 2- or infrequently 3-lobed; stamens 2, exserted, the filaments

coalescent at the base, the 2 thecae adnate, extrorse, longitudinally dehiscent; <sup>yellow stippled, adherent to all果皮, with 1-2 pores, the</sup> Fruit a 3- to 2-celled, dry septici- <sup>seeds</sup> daily dehiscent capsule, the accrescent gynobase 3-lobed, <sup>reticulate to granular</sup> hardened and persistent after dehiscence of carpels; seeds <sup>to spines</sup> one in each carpel, with or without a micropylar caruncle, the embryo central, the cotyledons broad and flattened, the endosperm mealy.

Standard species: E. sylvatica Garden, ex L. Mant. 19.  
1767. (The only species known at time of general description)

#### KEY TO THE SUBGENERA

A. Staminate flowers in clusters of 3 or more; sepals of pistillate flowers present, persistent; caruncle present.

##### I. Eustillingia (p. 16)

AA. Staminate flowers single; sepals of pistillate flowers absent or minute and fugacious; caruncle absent (except in E. Freculiana and E. paucidentata).

##### II. Gynostillingia (p. 19)

#### I. EUSTILLINGIA (Kl.) D. J. Rogers, stat. nov.

Sept. Eustillingia Kl. in Ericks. Arch. VII, 1: 187. 1841  
emend. Muell. Arg. in Linnaea 32: 87. 1863.

#### KEY TO THE SPECIES

- A. Subshrubs, shrubs, or small trees of well-drained soils; seeds ellipsoid to ovoid, 3-6 mm. long, rugulose or smooth; leaves usually broadest at the middle or above.
- B. Shrubs from a tap root; stems woody, terete, lenticels obvious; branches alternate or opposite,

not fasciated; inflorescences relatively slender.

C. Pistils 3-carpellate; leaves elliptic; seeds relatively small, 5 mm. long or less.

D. Mature fruits deeply 3-lobed; bark of stems roughened, with many lenticels.

1. *S. sanguinolenta*

DD. Mature fruits nearly spherical; bark of stems smooth, with occasional lenticels.

E. Leaves membranaceous, acuminate, 7.9-(9.1\*)-12.8 cm. long, 2.3-(3.1)-4.0 cm. broad, petioles of mature leaves 0.4-(0.7)-1.1 cm. long; inflorescences crowded, the cymes congested, relatively many-flowered.

2. *S. microcarpa*

EE. Leaves coriaceous, acute, 1.8-(3.0)-3.5 cm. long, 0.6-(1.15)-1.8 cm. wide, petioles short, 0.1-0.3 cm. long; inflorescences open, the cymes distant, relatively few-flowered.

3. *S. diantharina*

CC. Pistils 2-, rarely 3-carpellate; leaves linear-lanceolate; seeds larger, 6 mm. long.

4. *S. bicarpellaris*

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\*The approximate mean is given in parentheses.

BB. Subshrubs from a woody rhizome; stems subherbaceous, more or less striate, angled above, lenticels not obvious; branches alternate, somewhat fascicled; inflorescences relatively stout.

F. Leaves usually with 2 or more cup-shaped marginal glands at base of blade, callose-serrulate; seeds 5.5-6.5 mm. long, 5.5-7.0 mm. broad, rounded at the base, smooth; Mexico and Central America.

5. S. zelayensis

FF. Leaves without cup-shaped glands at base of blade, crenulate or glandular-crenulate.

G. Seeds 3-4 mm. long, 2-3 mm. wide, truncate at base, rugose; leaves linear, 1-7 cm. long, 0.3-0.7 cm. broad; southern Oklahoma, central Texas and northeastern Mexico.

6. S. texana

GG. Seeds 6-8 mm. long, 4.5-7.0 mm. wide, rounded at base, rugulose; leaves spatulate, elliptic or ovate, 3.2-11.5 cm. long, 0.3-4.8 cm. wide; southern Virginia to Florida to Texas and New Mexico.

7. S. sylvatica

AA. Shrubs of marshy places or shallow vernal ponds; seeds subspherical, 2-3 mm. in diameter, rugose; leaves usually broadest toward the base; Georgia and Florida.

8. S. aquatica.

II. GYMNOSTILLINGIA (Muell. Arg.) S. Wats. in  
Proc. Am. Acad. 14: 298. 1879.

Gymnostillingia Muell. Arg. in Linnaea 32. 89. 1863, as genus.

KEY TO THE SPECIES

- A. Shrubs or small trees; leaves 2.8-(7.0)-15.0 cm. long,  
1-(1.5)-4.3 cm. wide, the pinnate venation prominent,  
the petiole distinct.

9. G. acutifolia

- AA. Herbs; leaves 1-(2)-5 cm. long, 0.1-(0.5)-1.5 cm. wide,  
the venation not prominent (except G. spinulosa, with  
palmate venation), sessile to subsessile.

- B. Caruncle present; glands of pistillate bracts  
nearly sessile.

- C. Leaves obovate-spathulate, rounded or broadly  
acute, coarsely incised-dentate; sepals  
minute, fugacious; styles about 1 mm. long.

10. G. Treculiana

- CC. Leaves linear, acuminate or acute, sparsely  
setulose-denticulate; sepals absent; styles  
about 4 mm. long.

11. G. paucidentata

- BB. Caruncle absent; glands of pistillate bracts long-  
pedicellate.

- D. Leaves elliptic-spathulate, acuminate, finely  
callose-dentate, conspicuously 3-costate;  
stems striate.

12. G. spinulosa

DD. Leaves linear, acute, entire or sparsely denticulate, venation not prominent; stems terete.

13. A. linearifolia

1. STILLINGIA SANGUINOLENTA Muell. Arg. in Linnaea 32: 88.

1863. (T.: Mexico, Ehrenberg s.n.)

Stillingia sanguinolenta  $\alpha$  lanceolata Muell. Arg., loc.

cit. 1863.

Stillingia sanguinolenta  $\beta$  angustifolia Muell. Arg., loc.

cit. 1863. (T.: Mexico, Caracol de Atolon, Schiede?

[Ehrenberg] 1245).

Much branched shrubs 1-3 m. tall, the branches opposite to subalternate, terete, the lenticellate bark roughened, the sap milky. Leaves petiolate, elliptic to ovate, acuminate to acute, base acute, usually with two cyathiform glands, 1.7-(4.9)-8.6 cm. long, 1.0-(1.52)-2.6 cm. wide, membranaceous, not decurrent, the midrib and secondary venation prominent; petiole 0.2-(0.46)-1.0 cm. long. Inflorescence open, the staminate cymes not crowded on the axis, 3.0-(4.84)-6.3 cm. long, the bracts cuspidate, about 1.5-2.0 mm. long, 1.5-2.0 mm. wide, the cyathiform glands sessile. Pistillate flowers solitary, sepals 3, cuneate, serrulate, about 2 mm. long; styles 2-4 mm. long, united below. Staminate flowers 7-9 in a cyme, the individual flower about 2 mm. long, the shallowly 2-lobed calyx serrulate. Fruit 6-8 mm. wide, deeply 3-lobed, the central column more or less persistent,

the lobes of the gynobase 3-4 mm. long; seeds about 4.5-5.0 mm. long, 4 mm. wide, the testa slightly rugulose, the micropylar end slightly flattened, the base flattened, the caruncle small.

Distribution and habitat: in deep leaf mould, among rocks, dense oak woods of canyon floor; openly wooded arroyos, on lower slopes; river gravel; hills, and occasionally in desert regions, at altitudes from 500 to 1000 m. Flowers from about the middle of March through June, and sometimes in October, and fruits from about the first of June through the last of August.

MEXICO: TAMAULIPAS: Sierra de San Carlos, vic. of San Miguel, Bartlett 10570 (US, CH); Sierra de San Carlos, vic. of El Milagro, Bartlett 11025 (US, <sup>GH</sup>X, CH). NUEVO LEON: Municipio de Villa Santiago, Mueller 2026 (MBG, CH, UM, TEX); Canyon Biento, near Monterrey, Mueller 2668 (N, <sup>GH</sup>UC); on Pan American Highway, Monterrey, Frye and Frye 2491 (US, MBG, <sup>GH</sup>N, NY); Montemorelos, Nelson 6695 (N, <sup>GH</sup>US); Sierra Madre, Monterrey, C. H. & M. E. Mueller 462 (TEX, CH); Guajuco, 27 mi. SE of Monterrey, E. Palmer 1255 (N, <sup>GH</sup>US); hills near Monterrey, Pringle 2070 (N, <sup>GH</sup>CH); river gravel near Monterrey, Pringle 13256 (N, <sup>GH</sup>UM, US); river gravel, Monterrey, Pringle 2534 (US, UC, CH, <sup>GH</sup>N, NY, MBG). <sup>B</sup><sub>1</sub> SAN LUIS POTOSI: Guascaná, Purpus 4980 (CH, <sup>GH</sup>N, UC, MBG, US); Sierra Tablon, Purpus 5164 (UC, NY, <sup>GH</sup>N, US, MBG, CH); Alvarez, E. Palmer 234 (N, <sup>GH</sup>US, NY). HIDALGO: Zimapan, Kenoyer s.n. (MBG, UM); foot of Chipique (Hidalgo?), Kenoyer 266 (CH). CHIAPAS: Comitán,

Goldman 902 (US). PUEBLA: vic. of San Luis Tultitlanapa, Puebla, near Oaxaca, Purpus 1521 (US). State and locality unknown, Goulter 1502 <sup>SH</sup> (S).

The identity of the collector of the type specimen of B. sanguinolenta  $\beta$  angustifolia is doubtful. Mueller cites "Schiede? 1245", but Pax, in Engl. Pflanzentr. 4, Fam. 147, V: 191. 1912 cites Ehrenberg 1245, with the same locality as Mueller's. Since this specimen was in the Berlin Herbarium, it is safe to assume that Pax cited the correct collector.

Although the specimens cited by Mueller for  $\alpha$  lanceolata and  $\beta$  angustifolia were unavailable, it is evident from his descriptions that his varieties are based on leaf variations. In the material available for this monograph, are specimens which show that there is no definite break from the smallest to the largest leaf, and no geographical basis for separating the varieties from the parent species. In addition, the floral structure is rather stable in all specimens examined, without sufficient evidence for maintaining any entities other than the species.

2. STILINGIA MICROSPERMA Pax & K. Hoffm. in Engl. Pflanzentr. 4, Fam. 147, V: 187. 1912. (T.: Howe & Lux 4265).

Open shrubs 1.0-2.5 m. tall, the terete branches opposite to fascicled, the bark smooth, with occasional lenticels, the sap milky. Leaves petiolate, elliptic, acuminate to acute, usually with 2 cyathiform glands, 7.9-(9.1)-12.8 cm. long, 2.3-(3.1)-4.0 cm. wide, membranaceous, finely serrate, pale green

above, lighter beneath, not decurrent, the second <sup>an</sup> venation prominent; petiole 0.4-(0.7)-1.1 cm. long. Inflorescence crowded, the staminate cymes overlapping, 3-(6.2)-8.7 cm. long, the peduncle elongate and somewhat thickened below the lowest pistillate flower, the bracts about 1.5 mm. long, cuspidate; sepals 3, about 1 mm. long; styles about 2 mm. long. Staminate flowers 7-9 in a cyme, the individual flower about 1.5 mm. long, the deeply 2-lobed calyx serrate. Fruit about 8 mm. wide, globular, not deeply 3-lobed, the central column deciduous, the lobes of the gynobase about 4 mm. long; seeds about 5 mm. long, 4 mm. wide, smooth or slightly rugulose, the micropylar end slightly flattened, the base slightly flattened, the caruncle small.

Distribution and habitat: in open creek beds; oak woods, mountains, at altitudes from 1400 to 3000 m. on south facing slopes; scrub oak hillides. Flowers from July through August, and fruits from August through November, and the first of January. Shrub said to have a disagreeable odor.

BRITISH HONDURAS: El Ceyo District, in open creek bed, San Agustin, Ludell 6740 <sup>GH</sup> (R, NY, US, TEX, CH, US) <sup>S.C.</sup>

GUATEMALA: HUEHUTENANGO: along Agucatan road east of Huehutenango at km. 13-14, Standley 82012 (CH); Cumbre Papal, on south facing slopes between Cuileo and Imoqui, Steyermark 50912 (CH). JALAPA: La Laguna, at base of Volcan Juncal, 1 mi. north of Jalapa, Steyermark 12291 (CH); mountains along the road between Jalapa and Paraiso, Standley

27230 (CM); no locality, Ruano 1178 (CM). SANTA ROSA:  
Santa Rosa, Hayda & Lux 4265 (US, <sup>GH</sup>X).

3. *STILLINGIA* diphtherina D. J. Rogers, spec. nov. Frutices  
diffusi 1-2 m. alti, ramis rigidis teretibus oppositis vel  
fasciculatis, cortice glabro aliquando lenticellato. Folia  
brevi-petiolata lanceolata vel anguste elliptica acuta vel  
subrotundata basi anguste obtusa plerumque cum glandulis 2  
cyathiformibus 1.6-(3.0)-3.5 cm. longa 0.6-(1.15)-1.8 cm.  
lata, crenulata pallide viridia non decurrentia resinacea cum  
odore resinae, venis secundariis non prominentibus. Inflo-  
rescentia tenuis patens cymulis distantibus compositae 3-5 cm.  
longa sub flore inferiore femineo parum elongata crassataque,  
bracteis cuspidatis circiter 2 mm. longis 2 mm. latis parum  
serrulatis glandulis patelliformibus brevi-pedicellatis.  
Flores feminei solitarii, sepalis 3 rotundis 1 mm. longis  
minime serrulatis. Flores masculi in cymula 7-9 quisquis  
circiter 1 mm. longi, calyce breviter 2-lobato serrulato,  
columna centrali plus minusque decidua, gynobasis lobis  
circiter 3-4 mm. longis; seminibus 4 mm. longis 3 mm. latis  
extremo micropylari parum complanato testa laevi basi rotundis,  
caruncula parva.

TYPE: W-27230 m. 10005 m. 26  
Distribution and habitat: in barrancos in pine barrens,  
rocky limestone slopes at altitudes from 800 to 1400 m.  
Flowers in July, and fruits from August to the first of  
October.

GUATEMALA: HUEHUETENANGO: between Nenton and Las Palmas,  
via Yalisjao Rincon Chiquito, Chiquial, Guaxacana, in Sierra

EXPLANATION OF THE PLATE

PLATE 3.

*STILLINGIA diphtherina* D. J. Rogers, sp. nov.

Fig. 1 Habit, X 1.

Fig. 2 Top view of gynobase, X 1.2.

Fig. 3 Basal portion of inflorescence, after dehiscence  
of fruit, X 1.5.

Fig. 4 Seed of *S. diphtherina*: adaxial surface  
above; abaxial surface below, both X 5.

de los Cuchumatanes, Steyermark 51649 (CM). QUICHE: without locality, Aguilar 760 (CM), 1106 (CM).

HONDURAS: MORAHAN: west of Guinope, Williams & Molina 10603 (MBO: TYPE, CM, UC); Tanque, Rodriguez 860 (CM); Zamorano, Rodriguez 2158 (CM); San Antonio de Oriente, Rodriguez 1130 (CM, MBO).

This species is most closely related to S. microsperma from which it may easily be distinguished by its small, leathery, short-petiolate leaves, the slender open inflorescence and the stiff terete branches. Although none of the specimens cited have an attached fruit, it is apparent from the fragments contained in packets that the fruit is shallowly 3-lobed.

4. STILLINGIA BICARPELLARIS S. Wats. in Proc. Am. Acad. 21: 455. 1886. (T.: Pringle 128).

Profusely branched shrubs about 1.5-3.0 m. tall, the branches alternate to subopposite, terete, the bark slightly roughened, the leaf bases prominent. Leaves shortly petiolate to subsessile, lanceolate to linear, acute, base acute with occasional cyathiform glands, 1.7-(3.25)-5.5 cm. long, 0.2-(0.5)-0.8 cm. wide, the petiole about 1 mm. long, the midrib prominent, not decurrent. Inflorescence slender, 1.5-(2.2)-2.9 cm. long, bracts <sup>broadly elliptic, mucronulate</sup> about 1 mm. long, slightly cuspidate, cyathiform glands sessile. Pistillate flowers solitary, sepals <sup>to broadly elliptic</sup> 2-3, cuneate, about 1.5 mm. long, very slightly serrulate; cells of the ovary 2, rarely 3; styles 2-3, about

2-3 mm. long, united below. Staminate flowers 5-7 in a cyme, the individual flowers about 1 mm. long, 1.5 mm. wide, deeply 2-lobed, the lobes cuspidate, entire. Fruit 6-8 mm. wide, slightly 2-3 lobed, the central column deciduous, the lobes of the gynobase 3-4 mm. long; seeds about 6 mm. long, 5.5 mm. wide, the testa smooth, shiny, the micropylar end very slightly flattened, the base rounded, the caruncle small.

Distribution and habitat: thick underbrush in woodland associations of pines, oaks and junipers, in mountains, at altitudes up to 3100 m. Flowers and fruits from the last of June through October.

MEXICO: COAHUILA: summit of Mt. Jimulco, 13 kilo. east of Jimulco, Stanford, Retherford & Northcraft 94 (NY, UC, MGG); mountains, Jimulco, Pringle 128 (CH, NY, <sup>B</sup>CHAA). HIDALGO: near Imiquilpan, Rose, Painter & Rose 8951 (US); Imiquilpan, Purpus 1494 (MGG, UC, CH, NY, <sup>CH</sup>). GUANAJUATO: "sur la montagne pres de Guanajuato", Purpus s.n. (US, CH). PUEBLA: rocky places, Tehuacan, Purpus 1320 (UC).

It is unusual to find a species of Stillingia with two carpels and two sepals. If the dimerous structures were constant features, a third subgenus might well be established for this species. Since, however, both dimerous and trimerous pistillate flowers are found on the same plant, I have not considered this procedure to be advisable.

5. *STILLINGIA MELAYANENSIS* (HBK.) Muell. Arg. in Linnaea 32:  
87. 1863.

*Sarum melayense* HBK. Nov. Gen. et Spec. 2: 51. 1817 (T.):

Mexico, "prope Zelaya", Humboldt & Bonpland a.n.). <sup>argued to be</sup>  
Erect to <sup>Spreading</sup> ~~erect~~ subshrubs 0.5-1.5 m. tall, the <sup>subherbaceous, show ground</sup> fascicled stems  
<sup>a perennial, woody underground base</sup> arising from an ~~enlarged woody rhizome~~, stems terete below,  
angled-above, the older stems hollow, woody, the secondary  
branches opposite or fascicled, solid or with a small pith,  
subherbaceous, without lenticels. Leaves petiolate, <sup>minutely serrated,</sup> ellip-  
tic to oblanceolate to spatulate, acute to acuminate, base  
acute, usually with 2 or more cyathiform glands, 2.8-(6.4)-  
12.5 cm. long, 1.2-(2.5)-4.0 cm. wide, callose-serrulate,  
membranaceous, slightly decurrent, the secondary venation  
prominent; petiole 0.1-(0.4)-0.9 cm. long. Inflorescence  
5.3-(10.35)-16.0 cm. long, crowded, the staminate cymes  
overlapping, the peduncle elongate and somewhat thickened  
below the lowest pistillate flower, the bracts about 1.5 mm.  
long, 1.5-2.0 mm. wide, the cuspidate tip glandular, the  
patelliform glands sessile. Pistillate flowers solitary,  
the sepals 3, about 2 mm. long, cuspidate, serrulate; styles  
about 3 mm. long. Staminate flowers 3-5 in a cyme <sup>sessile!</sup> about  
3 mm. long, the deeply 2-lobed calyx serrulate, <sup>Pollen grains with</sup> Fruits 0.6-  
1.0 cm. wide, shallowly 3-lobed, the <sup>staminal</sup> central column more or  
less deciduous, the lobes of the gynobase 0.3-0.9 cm. long;  
seeds about 5.5-6.5 mm. long, 5.5-7.0 mm. wide, testa  
smooth, shiny, flattened at the micropylar end, the basal

*unf. pores*

and rounded to slightly flattened, the caruncle small.

Distribution and habitat: pine woods and barrancas, rocky <sup>sandy open slopes, on edge of cultivated areas</sup> hills, <sup>from about 1200 to 4000 m. altitude.</sup> Flowering mostly from about the last of March through the last of August, but occasional flowers in January and in October, and fruiting from June through October and occasionally in January.

MEXICO: CHIAPAS: Hacienda Monserrate, Purpus 9174 <sup>GH</sup> (N, MBO, CH, UC, US, NY), 9121 (UC); without locality Purpus s.n. (US); pine and oak forest, Fenix Chiapas? Purpus 10134 (NY). FEDERAL DISTRICT: east of Transfiguracion, Russell & Souriron 205 (US). JALISCO: Santa Cruz, H. E. Jones 22 <sup>MBO</sup> (US); Rio Blanco, E. Palmer 71 (US, NY); near Guadalajara, Pringle s.n. (CM). <sup>C, LIL</sup> MEXICO: district of Tamascattepec, Penon, Hinton 1402 <sup>GH</sup> (N); district of Tamascattepec, Tamascattepec, Hinton 1127 <sup>GH</sup> (US, CH, N, NY). MORELOS: rocky hill near El Mirador, road from Cuernavaca to Mexico, Williams 3814 <sup>GH</sup> (N); Valle del Tepeite, Lyonnnet 988 (US); barranco near Cuernavaca, Pringle 7266 <sup>GH</sup> (N); pine woods about Cuernavaca, Pringle 6886 <sup>GH</sup> (N, CH, UC, US, MBO, NY). <sup>B</sup> NICHUACAN: vic. of Morelia, Arsene 6672 (US, MBO); vic. of Morelia, Arsene 5236 <sup>GH</sup> (N, MBO, US); Tancitaro region, above Acahualt, Munic. Apatzingan, Leavenworth & Hoogstraal 1821 <sup>GH</sup> (CH, N); hills near Tepitonga, between Telara and Morelia, Gress 727 (MBO). PUEBLA: Cerro Topoxuchil, pres Puebla, Nicolas s.n. <sup>LIL</sup> (NY); vic. of Puebla, Cerro Tepoxuchil, Arsene 1400 (US, MBO, N) <sup>GH</sup>; Rancho Losada, vic. of Puebla, Arsene 282 (CH).

SAN LUIS POTOSI: 22° N. Lat., Alt. 6000-8000 ft., Parry & Palmer 823 (MBG, US, <sup>GH</sup>\*) State and locality unknown, Pavon <sup>G</sup>E.N. (S, photos in CH, <sup>GH</sup>S).

GUATEMALA: GUATEMALA: without locality, Aguilar 91 (CH).

QUICHE: without locality, Aguilar 1314 (CH). SANTA ROSA: Zamorora, Herde & Lux 4579 (US); without locality, Dunn 6074 (NY, US, MBG, UN, CH, <sup>GH</sup>).

PANAMA: CHIRIQUI: Boquete District, savannah, alt. 4000 ft., Davidson 250 (CH, US, MBG). <sup>Araola Arb</sup>

The type specimen of Stillinia selavensis, collected by Humboldt & Bonpland, was labelled for locality "prope Zelaya". The actual locality is Celaya, Guanajuato, Mexico.

6. STILLINIA TEXANA I. M. Johnston, in Contrib. Gray Herb. <sup>68</sup>  
Rev. n.s. <sup>68</sup>91: 91. 1923.

Sanium sylvaticum var. linearifolia Torr. in Smory, Rep. U. S. & Mex. Bound. Surv. 2: 201. 1859 (T.: "Valley of the Rio Grande", Schott E.N.).

Stillinia sylvatica & linearifolia (Torr.) Muell. Arg. in DC. Prodr. 15<sup>2</sup>: 1158. 1866.

Stillinia angustifolia Engelm. ex S. Wats. in Proc. Am. Acad. 18: 154. 1883 (T.: E. Palmer 1256), not S. sylvatica C. angustifolia Muell. Arg.

Stillinia linearifolia Small, Fl. S. E. United States 704. 1903; not S. Wats. in Proc. Am. Acad. 14: 297. 1879.

Stillinia texana var. synica Waterfall, in Rhodora 50: 95. 1948.

Stillinia texana var. latifolia Waterfall, loc. cit.

\* Tlax., Huamantla: alt. 8,500 ft. Sandy open slopes on edges of cultivation, etc. Loose shrubby growth. Slender stems to 2 ft. Digitized by the Hunt Institute for Botanical Documentation, 1938.

1943 (T.: Waterfall 6521).

Loose erect subshrubs, 2.5-6.0 dm. tall, the fascicled stems arising from an enlarged woody <sup>root crown</sup> ~~rhizome~~; terete below, <sup>above ground</sup> ~~serrate above~~, unbranched, or if branched, the branches fascicled near the apex of the main axis. Leaves sessile, <sup>membranaceous</sup> linear to slightly lanceolate, acute, base narrowly obtuse, without cyathiform glands, 1-7 cm. long, 0.3-1.0 cm. wide, <sup>pinnately</sup> crenulate or glandular-crenulate, the glands either at the apex or in the sinus of the serrulation, <sup>slightly decurrent.</sup> membranaceous, the midrib prominent, ~~marked~~. Inflorescence 3.0-(5.5)-8.0 cm. long, crowded, the pistillate flowers borne to the base of the peduncle; bracts narrowly cuspidate, net-glandular, sharply denticulate, about 3 mm. long, the patelliform glands sessile. Pistillate flowers solitary; sepals 3, <sup>elliptic</sup> about 2.5 mm. long, <sup>away from</sup> serrulate; style about 3 mm. long. Staminate flowers 3-5 in a cyme, the individual flower about 2.5 mm. long, the deeply 2-lobed calyx slightly serrulate, <sup>shallowly 3-lobed, not 5-lobed</sup> Fruits 4-6 mm. wide, shallowly 3-lobed, the central column more or less deciduous, the lobes of the gynobase 2-3 mm. long; seeds 3-5 mm. long, 2.5-4.0 mm. wide, testa slightly rugulose, with a very slight depression at the micropylar end, the base <sup>truncate</sup> flattened, the caruncle small. Distribution and habitat: on limestone soils, mostly in open prairie lands, occasionally on loamy black soils, in rolling country. Flowers from about the last of April through the middle of July, and fruits from the first of June through September.

UNITED STATES: OKLAHOMA: Murray County. TEXAS: Bell, Bexar, Bosque, Burnet, Comal, Concho, Erath, Fort Bend, Gillespie, Hays, Kendall, Kerr, Lampasas, Mills, Nolan, Parker, Real, Shackelford, Tarrant, Taylor, Travis, Washington, Williamson, Wilson, and Valverde counties.

MEXICO: COAHUILA: Municipio de Musquis, near Puerto Santa Ana, Ward & Mueller 225 (US, G, HBG, NY); Hacienda San Rafael, along the Sabinas River, Ward 205 (NY, HBG, US); Musquis, Marsh 80 (TEX, CH); Musquis, Yerba Spring, Marsh 221 (TEX).

One specimen was collected by C. Wright in New Mexico, without locality.

The nomenclatural problems of Stillingia texana are discussed by I. M. Johnston (in Contrib. Gray Herb. Harv. Univ. n.s. 67: 91. 1923), but it is not completely clear that Engelmann merely intended to raise Mueller's variety angustifolia to specific rank.

7. STILLINGIA SYLVATICA Garden, in L. Mant. I. 19. 1767

(T.: "in Carolina meridionali", Garden n.n.).

Stillingia sylvatica var. salicifolia Torr. in Ann. Lyc. N.Y.

2: 245. 1826 (T.: "on the Canadian Riv." [Arkansas], James n.n.).

Stillingia salicifolia (Torr.) ~~Raf.~~ in Atl. Journ. 1(4); 146. 1832.

Stillingia lanceolata Nutt. in Trans. Am. Phil. Soc. n.s.

V: 176. 1837 (T.: "Arkansas", Pitcher n.n.).

in herb. BM,  
A

Stillinicia sylvatica  $\alpha$  spathulata Muell. Arg. in DC. Prodr.

15<sup>2</sup>: 1158. 1866 (T.: "Carolina", Rose s.n.).

Stillinicia sylvatica  $\beta$  genuina Muell. Arg. loc. cit. 1866.

Stillinicia sylvatica  $\gamma$  angustifolia Muell. Arg. loc. cit.

1866 (T.: "Florida" Mitchill s.n.).

Stillinicia spathulata <sup>(Muell. Arg.)</sup> Small, Fl. S. E. United States 704.

1903.

Stillinicia salicifolia Small, loc. cit. 1903.

Stillinicia Smallii Wootton & Standley, in Contrib. U. S. Nat.

Herb. 19: 405. 1915.

~~Semi-Erect~~ <sup>herb.</sup> subshrubs 2.0-13.0 dm. tall. Roots fusiform.

~~Stems~~ <sup>herbaceous, annual or</sup> arising singly or fascicled from an enlarged woody

~~rhizome~~ <sup>rootstock</sup>, terete or slightly striate, unbranched, or if

branched the secondary branches fascicled near the apex of

the main axis, ~~angled or striate to terete~~.

Leaves sessile or petiolate, <sup>membranous</sup> elliptic or ovate, <sup>ob</sup> ~~linear~~ to spatulate, <sup>acute</sup> ~~acute~~,

rounded or emarginate, base narrowly obtuse without cyathiform glands, 3.2-(6.1)-11.5 cm. long, 0.3-(1.7)-4.8 cm. wide,

serrate to crenulate, ~~membranaceous~~, slightly decurrent, the

midrib prominent; petiole when present 0.1-0.8 cm. long.

Inflorescence 3.0-(~~8.5~~)-13.3 cm. long, usually crowded, <sup>secreting latex</sup> the

staminate cymes overlapping or distinct, the pistillate

flowers inserted to the base of the peduncle, the bracts

<sup>bracts</sup> ~~shortly cuspidate~~, <sup>bracts</sup> ~~shortly cuspidate~~, <sup>bracts</sup> ~~shortly cuspidate~~, <sup>bracts</sup> ~~shortly cuspidate~~, slightly dentate, about

2.5-3.0 mm. long, 2.5-3.0 mm. wide, the glands patelliform

or cyathiform, sessile. Pistillate flowers solitary;

sepals 3, about 1.8-2.0 mm. long, ~~1.5-2.0 mm. wide~~, <sup>elliptic</sup> slightly cuspidate, serrulate; style 3-5 mm. long, ~~united below~~.

Staminate flowers 7-9 in a cysule, the individual flowers about 1.5 mm. long, the shallowly 3-lobed calyx entire to <sup>shallowly elliptical to orboid</sup>, slightly serrulate. Fruits 0.6-1.2 cm. wide, shallowly <sup>with one to three</sup>

3-lobed, the lobes of the gynobase 3-6 mm. long; seeds 6-8 mm. long, 4.5-7.0 mm. wide, testa rugose, the micropylar end flattened, the base rounded, the caruncle large.

Distribution and habitat: coastal plain, well drained sands, in open pine woods and sometimes on limestone, occasionally on roadsides and railroad banks. Flowers from March through June (in southern Florida from about the first of January) and fruits from April through September.

UNITED STATES: VIRGINIA: Isle of Wight, Nansemond, Sussex, and Southampton Counties. NORTH CAROLINA: Buncombe, Harnett, Iredell, Moore, Richmond, and Scotland Counties.

SOUTH CAROLINA: Aiken, Beaufort, Berkeley, Charleston, Clarendon, Georgetown, Hampton, Horry, and Lancaster Counties.

GEORGIA: Bullock, Columbia, Gwinnett, Habersham, Jasper, Macon, Meriwether, Richmond, and Wayne Counties. FLORIDA: Alachua, Baker, Bradford, Brevard, Broward, Charlotte, Citrus, Clay, Columbia, Dade, DeSoto, Dixie, Duval, Flagler, Gadsden, Gilchrist, Hardee, Hendry, Hernando, Highlands, Hillsborough, Jefferson, Lafayette, Lake, Lee, Leon, Levy, Liberty, Manatee, Marion, Monroe, Nassau, Orange, Palm Beach, Pasco, Pinellas, Polk, Putnam, St. John's, Sumter, Suwanee, Walton, Wakulla, Union, and Volusia Counties. ALABAMA: Dale, Henry,

Lee, and Mobile Counties. LOUISIANA: Natchitoches, and Rapides Parishes. MISSISSIPPI: Holmes County. TEXAS: Anderson, Angelina, Aransas, Austin, Bailey, Bastrop, Bexar, Brazos, Caldwell, Childress, Dallas, Denton, Dewitt, Dimmit, Erath, Fayette, Fort Bend, Galind, Gonzales, Gregg, Guadalupe, Hardin, Hemphill, Houston, Hutchinson, Jackson, Jefferson, Kendall, Kenedy, Lamb, Lee, Leon, Lubbock, Medina, Montgomery, Nacogdoches, Newton, Rueses, Parker, Tarrant, Terry, Travis, Upshur, Walker, Waller, Washington, Wichita, Wilson, and Wood Counties. ARKANSAS: Crawford, Jefferson, and Miller Counties. KANSAS: Cowley, Harper, Montgomery, Morton, Sedgwick, and Stafford Counties. OKLAHOMA: Beaver, Beckham, Blaine, Caddo, Comanche, Cleveland, Ellis, Greer, Kingfisher, Kiowa, Logan, McClain, McCurtain, Muskogee, Oklahoma, Osage, Payne, and Roger Mills Counties. NEW MEXICO: Chaves, Harding, and Roosevelt Counties.

As is <sup>Frequently to be</sup> expected at the edge of a range, the species has differences which are notable, and specimens collected in the areas near the edge of the range appear quite different from the typical species, especially in vegetative characters, but also in some floral and seed characters.

I suspect that in Florida some variation may be due to intergression with Stillingia aquatica, but no data are available for delimitation and description.

It is not feasible to maintain an entity unless it may be accurately defined morphologically and geographically, at least. Accordingly I have not recognized variants, but have

recorded the extremes of variation in the species description.

8. *STILLINGIA AQUATICA* Chapm. Fl. South. U.S. 405. 1865.

(T.: Apalachicola, <sup>MSG.</sup> Chapman & L.V.).

*Stillingia tenuis* Small in Bull. N. Y. Bot. Gard. 3: <sup>429</sup> ~~387~~.

1905 (T.: Small & Wilson 1880).

Loose, erect shrubs 5.0-11.6 dm. tall, arising from a tap root, the single terete stems tapering gradually from the base, leafless below the branches, the secondary branches fascicled near the apex of the main axis, the leaf bases prominent on the older <sup>branches</sup> stems. Leaves petiolate, lanceolate to linear, acuminate to acute, the base narrowly obtuse, without cyathiform glands, 3.5-(5.9)-8.5 cm. long, 0.4-(1.15)-1.7 cm. wide, irregularly crenulate-serrate, membranaceous, slightly decurrent, the midrib prominent; petiole 0.1-(0.25)-0.6 cm. long. Inflorescence 3.0-3.6 cm. long, crowded <sup>sessile</sup> the upper staminate and lower pistillate regions distinctly separate upon the peduncle, the bracts sharply cuspidate, about 2 mm. long, entire, the crateriform glands pedicellate. Pistillate flowers crowded at the base of the peduncle; sepals 3, rounded, slightly crenulate, about 1.5 mm. long, 1.0 mm. wide; styles about 4 mm. long. Staminate flowers 11-13 in a cymule, the individual flowers <sup>subsessile</sup> about 1.0 mm. long, the shallowly 2-lobed calyx entire. Fruit 5-6 mm. wide, deeply 3-lobed, the lobes of the gynobase 2.5-3.0 mm. long; seeds 2-4 mm. in diameter, testa strongly rugose, the flattened

micropylar and hippocrepiform, the base rounded, the caruncle small.

Distribution and habitat: in shallow ponds, wet pine barrens, edges of flat-woods ponds, swamps, wet sandy soils, moist ditches, in the Everglades.

UNITED STATES: GEORGIA: Sumter County. FLORIDA: Brevard, Collier, Dade, Franklin, Gadsden, Hendry, Lee, Palm Beach, Wakulla, and Washington Counties.

209. *STILLINGIA ACUTIFOLIA* (Benth.) Benth. ex Hemsl. Biol. Centr.-Amer. Bot. 3: 135. 1883.

*Sapium acutifolium* Benth. Pl. Hartweg. 90. 1842 (T.: Hartweg 614).

*Gymnostillingia acutifolia* (Benth.) Muell. Arg. in Linnaea 32: 89. 1863.

*Gymnostillingia macrantha* Muell. Arg., loc. cit. 90. 1863 (T.: "Nueva Espana", Pavon B.N.).

*Stillingia macrantha* (Muell. Arg.) Benth. ex Hemsl. Biol. Centr.-Amer. Bot. 3: 135. 1883.

*Stillingia procera* Brandg. in Univ. of Cal. Pub. Bot. 6: 185. 1915 (T.: Purpus 2341).

Compact shrubs or small trees 1-(1.5)-7 m. tall, the trunk up to 12.5 cm. in diameter below the lowest branches; branches alternate to fascicled, terete below, angled above, the older branches sparsely lenticellate, the sap milky. Leaves petiolate, ovate or lanceolate to elliptic, acuminate, the base acute, without cyathiform glands, 2.8-(7.5)-15.0 cm. long, 1.0-(1.5)-4.3 cm. broad, membranaceous, dark green

above, paler beneath, the secondary venation prominent; petiole distinct, about 2-5 mm. long. Inflorescence 2.5- (3.5)-4.2 cm. long; bracts about 1.5 mm. long, cuspidate, the glands patelliform, sessile. Pistillate flowers solitary, with minute or rudimentary sepals, styles about 2 mm. long. Staminate flowers solitary, <sup>new short, pedicellate</sup> about 2 mm. long, the calyx lobes entire. <sup>Pollen ellipsoid, triangular in view, w/ pores, exine finely punctate</sup> Fruit 3-4 mm. wide, deeply 3-lobed, the central column persistent, the lobes of the gynobase 1.5-2.0 mm. long; seeds about 3.5 mm. long, 2.5-3.0 mm. wide, with a slight depression on each side of the raphe at micropylar end, the base rounded, the testa smooth, the caruncle absent.

Distribution and habitat: mountainous regions of Chiapas and Guatemala in damp wooded regions, open banks, barrancas in pine forests, white sand slopes, at altitudes from 1400 to 3000 m. Flowers from late June to the first of September, and fruits from the first of August to the last of December. <sup>Young ovaries, stigmas + fruits maroon (Sketch, 554)</sup>

MEXICO: CHIAPAS: Cerro del Boqueron, <sup>CH</sup> Purpus 2342 (MBO, NY, CM); Siltepec, <sup>Ann. Arb.</sup> Matuda 1483 (NY, CM).

GUATEMALA: CHIMALTENANGO: Volcan Acatechango, <sup>554, (Ann. Arb.)</sup> Kellerman 6576 (CM); Chichavac, <sup>Ann. Arb.</sup> Sketch 22 (US); west of Patzún, <sup>Ann. Arb.</sup> Williams & Molina 11844 (CM, MBO); Alameda, J. R. Johnston 251 (CM, NY); near Rio Pixcayo, between Chimaltenango and San Martín Jilotepeque, <sup>Ann. Arb.</sup> Standley 64330 (CM); Barranco de La Sierra, <sup>Ann. Arb.</sup> southeast of Patzún, <sup>5127g (Ann. Arb.)</sup> Standley 61510 (CM, NY); near Parramos, <sup>Ann. Arb.</sup> Standley 59880 (CM); region of Los Positos, above Las

80132 (AA)  
Arr. Arb.

Calderas, region of Las Calderas, Standley 57801 (CH).  
GUATEMALA: Ruano 1258 (CH); Aguilar 220 (CH). HUEHUETE-  
NANCO: Todos Santos, Melhus & Goodman 3612 (CH); San Juan  
Atitan, Snutch 1165 (US, CH). <sup>Arr. Arb.</sup> JALAPA: between Jalapa and  
Montana Niramundo, Stevenson 12895 (CH). QUEREZALTENANGO:  
Aguas Calientes, Seler 2741 (US, V, NY); <sup>GH</sup> <sup>AA</sup> Cumbre de Tuilacan,  
southwest of San Martin Chile Verde, Standley 67787 (CH);  
region of Boxmтин, southeast of San Martin Chile Verde,  
Standley 81827 (CH). SACATEPEQUEZ: along Rio Guacalate, on  
road between Antigua and Chimaltenango, Standley 81010 (CH).  
SAN MARCOS: mountains along the road between San Marcos and  
Gerchil, Standley 85127 (CH); El Boqueron, near border of  
Dept. Quetzaltenango, Standley 66284 (CH); El Boqueron, in  
the mountains at the summit of the road between San Antonio  
Sacatepequez and Palestina, Standley 85280 (CH); roadside,  
above Rio Tacana, near San Antonio, Standley 66165 (CH).  
SANTA ROSA: Santa Rosa, Heyde & Lux 3473 <sup>GH</sup> (V, CH, US, NY).  
SOLOLA: Encuentros, L. B. Williams 13150 (CH); Los Encuen-  
tros, Seler 2181 <sup>GH</sup> (N, US). TOTONICAPAN: along road between  
San Francisco El Alto and Momostenango, Standley 84033 (CH).  
ZACATEPEQUEZ: Bernoulli & Gario 2499 <sup>S</sup> (K). Dept. unknown,  
Hacienda de Argueta, Hartweg 614 <sup>CM</sup> (K).

2116. *STILLINGIA TRICULIANA* (Muell. Arg.) I. M. Johnston, in  
Contrib. Gray Herb. Herbar. Univ., n.s. 67: 91. 1923.  
Sapium annuum, var. dentatum Torr. in Emory, Rep. U.S. & Mex.  
Bound. Surv. 2: 201. 1859 (T.: Eagle Pass, 1852, Rice,  
A.R.).

Gynanthes Treculiana Muell. Arg. in Linnaea 34: 216. 1865

(T.: Trecul 1458).

Sebastiania Treculiana (Muell. Arg.) Muell. Arg. in DC.

Prodr. 15<sup>2</sup>: 1160. 1866.

Stillinia Torreana S. Wats. in Proc. Am. Acad. 14: 293.

1879 (T.: Eagle Pass, 1852, Biselow a.n.).

Stillinia dentata (Torr.) Britt. & Rusby, in Trans. N.Y.

Acad. 7: 14. 1887.

Spreading perennial herbs 1.0-4.5 dm. tall, the elongate tap root woody, the fascicled branches arising from the ground level, striate, green. Leaves sessile, spiral, obovate-spathulate, rounded to broadly acute, base narrowly cuneate, without cyathiform glands, coarsely incised-dentate, 1.0-3.8 cm. long, 0.6-1.5 cm. wide, membranaceous, decurrent, the midvein prominent. Inflorescence 2.5-(4.4)-7 cm. long, bracts about 1 mm. long, 0.8 mm. wide, cuspidate, the patelliform glands nearly sessile. Pistillate flowers solitary, sepals minute, fugacious; styles about 1 mm. long. Staminate flowers solitary, about 1.5 mm. long; calyx deeply lobed, the margin incurved, entire. <sup>pollen spheroid, in segments, 3-4 mm.</sup> Fruit deeply 3-lobed, the central column persistent, the lobes of the gynobase 0.8-1.0 mm. long; seeds about 2.5 mm. long, 1.5-2.0 mm. wide, with a slight depression on each side of the raphe at the micropylar end, the base rounded, the testa smooth or slightly rugulose, the caruncle present.

Distribution and habitat: sandy soils with limestone base, gravel, hills, mesas, grasslands, along railroads and road-

deeply 3-segmented  
exine coarse  
hirsute

sides in southwestern Texas and northeastern Mexico. Flowers from the last of February to the first of June, and fruits from the last of March through the first of August.

UNITED STATES: TEXAS: Bexar, Cameron, Concho, Crockett, Dimmit, Duval, El Paso, Hidalgo, Kimble, Kleberg, Maverick, Presidio, Star, Tom Green, Val Verde and Webb Counties.

MEXICO: COAHUILA: Allende, Marph 1768 (CH); Musquis, Marph 1116 (CH); Cuatro Ciénegas, Shreve 8454 (UC); Sabinas, M. E. Jones 29115 (HBO, UC). NUEVO LEON: Mosas, Garcia, Pringle 2504 (NY, HBG, <sup>GH</sup>US, UC, CH); 100 kilo. south of Nuevo Laredo, on road to Monterrey, Payson & Payson 2175 (US, <sup>GH</sup>N, HBO, NY); near Santa Catarina, Alonis, Johnson & Barkley 15189H (<sup>GH</sup>N, CH, TEX, HBG); 23 miles north of Sabinas Hidalgo, Barkley & Webster 14492 (HBO, TEX, UC); canyon 12 miles west of Monterrey, Painter & Barkley 14253 (HBO, <sup>GH</sup>N, TEX); 10 miles west of Monterrey, Shreve & Tinkham 9572 (<sup>GH</sup>N); Rancho Resendes, Lampazos, Edwards 389 (HBO, CH, UC, TEX); Monterrey, E. Palmer 1248 (<sup>GH</sup>N, US). TAMAULIPAS: San Miguel, Pringle 2071 (CH).

There has been some confusion concerning E. Treculiana as to whether it is an annual or perennial. This confusion arose from the original description of Sanium annuum var. dentatum made by Torrey. He could easily have called this plant an annual since the specimen used as a type was a small fragment, without roots. Mueller however, definitely states in his description of Gymnanthes Treculiana that the plant is perennial. Examination of material from several

herbaria amply corroborates his observation.

2221. *STILLINGIA PAUCIDENTATA* S. Wats. in Proc. Am. Acad. 14:  
298. 1879 (T.: H. Palmer 327).

*Stillingia linearifolia* var. *paucidentata* (S. Wats.) Jepson,  
Fl. Cal. 2<sup>1</sup>: 422. 1936.

Compact, erect perennial herbs 2.5-3.5 dm. tall, the  
elongate tap root woody, the fascioled, striate branches  
arising from ground level. Leaves sessile, <sup>mucronate</sup> linear, <sup>2-4 cm., 0.1-0.2</sup> acuminate  
or acute, not narrowed at the base, without cyathiform glands,  
2-(3.5)-4 cm. long, 0.1-(0.25)-0.3 cm. wide, sparsely setu-  
lose-denticulate to entire, the midvein prominent, decurrent.  
Inflorescence 2.3-(4.6)-7.0 cm. long, bracts about 1 mm. long,  
the patelliform glands short-pedicellate (less than 1 mm.).  
Pistillate flowers solitary; sepals absent; styles about  
4 mm. long. Staminate flowers solitary, about 1.5 mm. long;  
calyx shallowly 2-lobed, slightly serrulate, <sup>pollen spheroid, shallowly 3-segmented</sup> Fruit deeply <sup>3-4 mm.</sup> 3-lobed,  
the central column persistent, the lobes of the gy-  
nobase 1.5-2.0 mm. long; seeds about 3 mm. long, 2 mm.  
wide, testa smooth, the caruncle small.

Distribution and habitat: in sandy washes, plains, bare  
arid hills and gravel, up to 4000 ft. altitude. Flowers  
from the first of April through the end of May, and fruits  
from about the first of May through the middle of June.  
UNITED STATES: CALIFORNIA: Kern, Los Angeles, and San  
Bernardino Counties.

23-12. STILLINGIA SPINULOSA Torr. in Emory, Notes Milit.  
Reconn. 151. 1848 (T.: in sandy desert w. of the Colo-  
rado, California, Emory S.D.).

Sapium annuum Torr. in Emory, Rep. U. S. & Mex. Bound. Surv.  
2: 201. 1859 (T.: idem.). *Based on S. spinulosa*

Stillingia annua (Torr.) Muell. Arg. in DC. Prodr. 15<sup>2</sup>;  
1160. 1866.

Compact perennial herbs 0.5-(1.0)-2.0 dm. tall, the  
elongate tap root woody, the fascicled striate branches aris-  
ing from ground level. Leaves sessile, elliptic-spathulate,  
acuminate, base narrowly cuneate without cyathiform glands,  
finely callose-dentate, 1.5-4.0 cm. long, 0.5-1.7 cm. wide,  
membranaceous, decurrent, prominently 3-costate. Inflores-  
cence 1.3-2.0 cm. long; bracts about 1 mm. long, cuspidate,  
somewhat 3-lobed, the patelliform glands pedicellate, 1.5-  
2.0 mm. long. Pistillate flowers solitary, sepals absent; *anthers 3-lobed*  
styles about 3 mm. long. Staminate flowers solitary, *subumb*  
1.5 mm. long; calyx shallowly 2-lobed, entire. *Pollen ellipsoid, 2 in X-sec. 3-flower,*  
3-lobed, central column persistent, the lobes of the gyno-  
base about 2 mm. long; seeds 3.0-3.5 mm. long, the testa *coarsely*  
smooth, sometimes mottled, the caruncle absent. *coarsely*  
*mutate*

Distribution and habitat: sandy open desert. Flowers from  
late December to late March, and fruits from March to June.

UNITED STATES: ARIZONA: Yuma County. CALIFORNIA: San  
Diego, Riverside, Imperial and San Bernardino Counties.

MEXICO: BAJA CALIFORNIA: Mesa near Cerro Brato, Cucapa  
Mts., MacDougal 206 (NY). SONORA: Colonia Lerdo, MacDougal

S.N. (NY); Buena Mesa near Col. Riv., MacDougal S.N. (NY);  
Pineria Alta, Schott S.N. (NY).

Torrey described Stillingia spinulosa in 1848, but changed  
the name in 1859 to Sapium annuum, using the same specimens.  
No explanation was given for this change.

243. STILLINGIA LINNARIIFOLIA S. Wats. in Proc. Am. Acad. 14:  
297. 1879 (T.: E. Palmer 449).

Stillingia gymnocha Pax & K. Hoffm. in Engl. Pflenzschr. 4,  
Fam. 147, V: 196. 1912 (T.: idem.). Based on S. linnariifolia Skott.

Diffuse perennial herbs 1.5-(5.8)-9.0 dm. tall, the  
elongate tap root woody, the fascicled, terete branches  
arising from ground level. Leaves sessile, linear, acute,  
base narrowly acute, without cyathiform glands, entire or  
sparsely denticulate, 1.2-3.2 cm. long, 0.1-0.3 cm. wide,  
membranaceous, shortly decurrent, the venation not prominent.  
Inflorescence 1.6-(3.95)-7.0 cm. long, the bracts cuspidate,  
entire, about 1 mm. long, the cyathiform glands pedicellate,  
about 1 mm. long. Pistillate flowers solitary; sepals ab-  
sent; styles about 2 mm. long. Staminate flowers solitary,  
about 1 mm. long, calyx shallowly 2-lobed, entire or slightly  
serrulate. <sup>Pollen placed to irregularly ellipsoid, barely 4 in x. sec.</sup> Fruit deeply 3-lobed, the central column decid-  
uous, the lobes of the gynobase about 1 mm. long; seeds  
about 1.8-2.5 mm. long, 1.5-1.8 mm. wide; testa smooth,  
sometimes mottled, the scaruncle absent.

Distribution and habitat: desert sands, lava rocks, chap-  
arral, dry sandy washes, and sandy roadsides. Flowers from  
the first of March to the end of April, and fruits from the

middle of March to the middle of June.

UNITED STATES: CALIFORNIA: Imperial, Los Angeles, Riverside, San Bernardino, and San Diego Counties. NEVADA: Clark County.

MEXICO: BAJA CALIFORNIA: sandy arroyo margin, San Augustin, Gentry 4004 (MBC, UC, <sup>GH</sup>); 11 km. southeast of San Augustin on road to Catavina, Carter, Alexander & Kellogg 1877 (MBC); lagoon head, Guadalupe Island, E. Palmer 785 (<sup>GH</sup>), US, CM); 37 mi. S. of Pozo Aleman, Shreve 7018 (UM, US, CM); 12 mi. E. of San Ignacio, Shreve 7038 (UM, US, CM); sandy plains, Calmalli, Purpus 25 (US, CM); Tecate, Orcutt S.R. (MBC, CM); Socorro, Orcutt S.R. (MBC, CM); coast near Ascension Island, Brandes S.R. (UC); Cordon Grande, Brandes S.R. (<sup>GH</sup>), CM); lava rocks, San Quintin, Engel & Stewart S.R. (CM, US); south slope 8 mi. from Rosario on road to El Marmol, Wiggins 4137 (<sup>GH</sup>), US); sandy wash at junction of El Marmol and San Fernando roads, 25 mi. from El Marmol, Wiggins 4354 (UM, UC, <sup>GH</sup>, US, NY); sandy flats 32 mi. S. of Pozo Aleman, Wiggins 7880 (UM, UC, CM, US, NY); sandy wash 11 mi. E. of San Ignacio, Wiggins 7213 (UM, UC, CM, US, NY); along Rio Santo Domingo about 4 miles above the Mission, Wiggins & Denaree 4778 (<sup>GH</sup>), UC, UM, NY, US, CM). SONORA: 30 mi. SW of Sonoyta on road to Punta Penasco, Shreve 7591 (US, CM, MBC, UM); llano 30 mi. from Sonoyta, Wiggins 8359 (UM, UC, US); 28 mi. S. of Sonoyta on road to Punta Penasco, Keck 4183 (NY).

DOUBTFUL SPECIES

Stillingia cruenta Standl. & Steyer. in Field Mus. Pub.

Bot. 23: 125. 1944. (T.: \_\_\_\_\_)

\* Stillingia haematantha Standl. in Ann. Mo. Bot. Gard. 27:

314. 1940. (T.: \_\_\_\_\_)

Since these two species have been collected only in flower, without mature fruit, their status is doubtful. Their floral structures, particularly the nature of the staminate flowers, indicate affinities with Sapium, but until the mature fruit is known, it is impossible to assign them to species.

EXCLUDED SPECIES

Stillingia appendiculata Muell. Arg. in Linnaea 32: 87.

1863 = Sapium appendiculatum (Muell. Arg.) Pax & K.

Hoffm. in Engler, Pflansenr. 4, Fam. 147, V: 214. 1912.

Stillingia fruticosa Bartr., Trav. 474. 1791 = Sebasti-

nia fruticosa (Bartr.) Fern. in Rhodora 46: 45. 1944.

→ Stillingia ligustrina Michx., Fl. Bor. Amer. II: 213. 1893 =

the preceding.

\* Stillingia haematantha Standl. = Sapium maritimum

*S. angustifolia* Engelman, although ~~having~~  
having a description and type citation, places  
in synonymy *S. sylvatica* var. *angustifolia* +  
v. *lineatifolia*. It <sup>seems</sup> best to consider this a  
new combination, follow Johnston's interpretation,  
that <sup>Watson</sup> Engelman was ~~creating~~ making a  
new combination.

Place subgeneric names at proper  
place in text to avoid confusion.

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Italicized numerals refer to collector's numbers, a.n. (sine numero) to unnumbered collections; parenthetical numerals refer to the numerals of taxonomic entities conserved in this revision.

- Abrams, L. 3222 (<sup>23</sup>3).
- Abrams, L., & McGregor, E.A. 512 (<sup>21</sup>3).
- Aguilar, I. 91 (<sup>16</sup>5); 220 (<sup>19</sup>5); 260, 1106 (<sup>6</sup>8); 1114 (<sup>16</sup>7).
- Albers, C.C. 12031 (<sup>18</sup>5); 14044 (<sup>16</sup>7); 14045 (<sup>18</sup>6); 14046 (<sup>18</sup>7); 14042 (<sup>17</sup>5); 18012 (<sup>17</sup>6); 19052 (<sup>18</sup>7).
- Alexander, A.M., & Kellogg, L. 1372 (<sup>23</sup>13); 2164 (<sup>22</sup>12); 2240 (<sup>23</sup>13).
- Alonis, T., Johnson, J.C., & Barkley, F.A. 15189M (<sup>20</sup>10).
- Angier, B.S. 12, 138 (<sup>23</sup>17).
- Arnold, B.G., & L.E. 16026 (<sup>18</sup>7).
- Arnold, L.E. 16021, 16022, 41514 (<sup>18</sup>7).
- Arnold, L.E., & West, E. 16012, 16018, 41527 (<sup>18</sup>7).
- Arsene, Bro. G. 1400, 5236, 6629 (<sup>16</sup>5).
- Arsene, Bro. G., & Nicolas, Bro. 282 (<sup>16</sup>5).
- Acho, W.W. a.n. (<sup>18</sup>7); a.n. (<sup>18</sup>8).
- Ayers, H. a.n. (<sup>18</sup>7).
- Barkley, F.A. 1205 (<sup>18</sup>7); 13306, 14521C (<sup>17</sup>6).
- Barkley, F.A., & Painter, J.T. 14251 (<sup>20</sup>19).
- Barkley, F.A., & Webster, G. 14497 (<sup>20</sup>19).
- Barnhart, J.H. 2571, 3113 (<sup>18</sup>7).
- Bartlett, H.H. 10572, 11025 (<sup>4</sup>1).
- Beck, E. a.n. (<sup>18</sup>7).

- Berg, H.K. <sup>15</sup> S.N. (7).
- Bernoulli, G. & Cairo, -. <sup>19</sup> 2499 (9).
- \* → Beyrich, H.C. <sup>18</sup> 194, <sup>18</sup> 1853 (7).
- Bigelow, J.M. <sup>17</sup> S.N. (5); <sup>18</sup> S.N. (7); <sup>20</sup> S.N. (10).
- Biltmore Herb. <sup>18</sup> 3522 S.N.; <sup>18</sup> 14932 (7); <sup>17</sup> 6954 S.N. (6); <sup>18</sup> 35256 (8).
- Bishop, F.M. <sup>22</sup> S.N. (14).
- Blackey, H.L. <sup>18</sup> 32 (7).
- Blankenship, L.A. <sup>18</sup> S.N. (9).
- Blanton, F.S. <sup>18</sup> 6419 (7); <sup>18</sup> 6559 (8).
- Bodin, J.E. <sup>17</sup> S.N. (4).
- Bogue, E.E. <sup>18</sup> S.N. (7).
- Bogusch, E.R. <sup>18</sup> S.N., <sup>18</sup> 3236 (7).
- Boon, S. <sup>18</sup> S.N. (7).
- Brandegge, T.E. <sup>23</sup> S.N. (13); <sup>22</sup> S.N. (12).
- Bray, W.L. <sup>18</sup> 116 (7); <sup>17</sup> S.N. (6); <sup>20</sup> S.N., <sup>18</sup> 342 (10).
- Britton, N.L. <sup>140</sup> 102 (7); <sup>18</sup> 326 (8).
- Britton, N.L., & Wilson, P. <sup>18</sup> 54 (7).
- Brown, -. & West, E. <sup>18</sup> S.N. (7).
- Buckley, S.B. <sup>18</sup> S.N. (7); <sup>20</sup> S.N. (10).
- Burger, O.F., & West, E. <sup>18</sup> S.N. (7).
- Bush, B.F. <sup>18</sup> 561, <sup>18</sup> 652, <sup>18</sup> 1245 (7); <sup>20</sup> 342 (10).
- Butler, O.D. <sup>18</sup> 49, <sup>18</sup> 1129h (7).
- Canby, W. <sup>18</sup> 2516 (7); <sup>18</sup> S.N. (8).
- Carleton, H.A. <sup>18</sup> 17832 (7).
- Carter, A., Alexander, A.M., & Kellogg, L. <sup>23</sup> 1927 (13).
- Chamberlain, L.T. <sup>21</sup> S.N. (11).
- \* Berry, E. ~~A~~ (A) 97 (8).

- Chapman, A.W. 191, <sup>18</sup> S.N. (7); S.N. (8).  
Churchill, J.R. S.N. (7).  
Clary, B.L. 266 <sup>22</sup> (12).  
Clemens, M.K. S.N. <sup>23</sup> (13).  
Clemens, J. 522 (6); 515, S.N. <sup>20</sup> (10); 1166 <sup>18</sup> (7).  
Clifton, R.L. 3087 <sup>15</sup> (7).  
Cohn, J. 231 <sup>17</sup> (8).  
Cole, J. 943 <sup>(+23)</sup> (23).  
Cooper, J.G. S.N. (2); S.N. <sup>22</sup> (12).  
Correll, D.S. 5643 (8).  
Cory, V.L. 5725, 13510, 21776, 37486, 48920 <sup>18</sup> (7); 11914,  
35050, 45264, 44276 <sup>17</sup> (8); A1, A2, A3, 522, 1871 <sup>20</sup> (10).  
Coulter, T. 1502 <sup>4</sup> (1).  
Croft, M.B. S.N., 24 <sup>20</sup> (10).  
Cummings, E.J. S.N. <sup>16</sup> (7).  
Curtiss, A.H. 2508, 4276, 4351 <sup>16</sup> (7); 2502, 5892 (8).  
Cuthbert, A. S.N., 1316 <sup>18</sup> (7).  
Cutler, H.C. 3211 <sup>18</sup> (7); 3252 <sup>17</sup> (8).  
Davidson, M.E. 750 <sup>16</sup> (5).  
Davis, J.H. S.N. (8).  
Dean, C.C. 6074 <sup>16</sup> (5); S.N. (8).  
Degener, G. 4572 <sup>21</sup> (11); 5053 <sup>17</sup> (6).  
Demaree, D. 7761, 12564, 12772, 13071, 18712 <sup>15</sup> (7).  
Dixon, R.A. 144 <sup>18</sup> (2).  
Dodson, W.R. S.N. <sup>15</sup> (7).  
Drummond, T. 38 (8); 222 <sup>18</sup> (2).  
Drushel, J.A. 2562, 10437 <sup>18</sup> (7).  
Duckett, F. S.N. <sup>18</sup> (8).

Dugas, A. <sup>7</sup>242 (4).

Duran, V. <sup>23</sup>1212 (23).

Earle, F.S., & Baker, C.F. <sup>18</sup>242 (7).

Earle, F.S., & Underwood, L.H. <sup>18</sup>242 (7).

Eastwood, A. <sup>23</sup>2752, <sup>23</sup>2972, <sup>23</sup>3042 (13); <sup>22</sup>3052 (12).

Edwards, Dr., & Eaton, Maj. <sup>20</sup>"G" (16).

Edwards, H.T. <sup>20</sup>189 (10).

Eggert, H. <sup>17</sup>242 (7); <sup>18</sup>242 (7); <sup>20</sup>242 (10).

Egleston, W.W. <sup>18</sup>20197 (7).

Elmer, A.D.E. <sup>21</sup>1675 (11).

Emm-Meyer, -. <sup>18</sup>242 (7).

Emory, W.H. <sup>22</sup>242 (12).

Engelmann, G. <sup>18</sup>231 (7); <sup>23</sup>242 (13).

Epling, C. <sup>22</sup>242 (12).

Epling, C., Ellison, L., & Anderson, H. <sup>22</sup>242 (12).

Epling, C., & Robinson, W. <sup>23</sup>242 (13).

Epling, C., & Stewart, W. <sup>23</sup>242 (13).

Eskew, C.T. <sup>18</sup>1604 (7).

Byles, D.E., & H.S. <sup>18</sup>242 (7).

Fennell, J.L. <sup>18</sup>161 (7).

Ferguson, A.M. <sup>18</sup>242 (7).

Fernald, H.L., Grisson, L., & Long, B. <sup>18</sup>6627 (7).

Fernald, H.L. & Long, B. 2502, 2117, 2118, 10118, 10119,

10460, 12124, 12125, 12327 (7).

Ferris, R.S. <sup>23</sup>2022 (13); <sup>22</sup>2119 (12).

Ferris, R.S., & Rossbach, R.P. <sup>22</sup>2521 (12).

- Farris, R.S., & Duncan, C.D. <sup>16</sup>3411 (?).  
Fosberg, F.R. <sup>23</sup>35020 (23).  
Fraser, -. R.R. <sup>18</sup>(?).  
Fredholm, A. <sup>18</sup>5122, <sup>18</sup>5934 (?); <sup>18</sup>5628 (8).  
Frye, O.E. R.R. <sup>18</sup>(?).  
Frye, T.C., & H.M. <sup>20</sup>2175 (20); <sup>4</sup>2423 (4).  
Gaizer, -. Butts, -. & Arnold, -. <sup>18</sup>26728 (?).  
Gander, F.P. <sup>23</sup>3005 (23).  
Garber, A.P. R.R. <sup>18</sup>(?).  
Garrett, R. R.R. <sup>18</sup>(?).  
Gentry, H.S. <sup>22</sup>4004 (22).  
Gibbes, L.R. R.R. <sup>18</sup>(?).  
Gilman, M.F. <sup>22</sup>372 (22).  
Godfrey, R.K. <sup>18</sup>4595, <sup>18</sup>5664 (?).  
Godfrey, R.K., & Shunk, I.V. <sup>18</sup>4212 (?).  
Godfrey, R.K., & Tryon, R.M. Jr. <sup>18</sup>235, <sup>18</sup>1033 (?).  
Goldsmith, G.W. R.R. <sup>18</sup>(?).  
Goodman, G.J. <sup>18</sup>2122, <sup>18</sup>2603 (?).  
Goodman, G.J., & Hitchcock, C.L. <sup>18</sup>1121 (?).  
Gough, L.C. R.R. <sup>18</sup>(?).  
Gould, C.H. R.R. <sup>18</sup>(?).  
Graves, E.W. <sup>18</sup>6223 (?).  
Gray, A. R.R. <sup>23</sup>(23).  
Gress, J. <sup>16</sup>222 (?).  
Griffiths, D. <sup>18</sup>5626 (?); <sup>20</sup>6342 (20).  
Groth, B.H.A. <sup>17</sup>113 (?).  
Hall, B.B. R.R. (8).

- Hall, E. <sup>17</sup>561 (<sup>17</sup>6).
- Harper, R.M. R.R.; <sup>18</sup>460, <sup>18</sup>571 (8); <sup>18</sup>244 (<sup>18</sup>7).
- Harris, B.B. R.R. (<sup>18</sup>2).
- Hartweg, T. <sup>19</sup>614 (<sup>19</sup>9).
- Harvey, P.L. <sup>18</sup>11 (<sup>18</sup>9).
- Hasse, H.E. R.R. (<sup>23</sup>13).
- Havard, V. <sup>20</sup>15 (<sup>20</sup>19).
- Hawkins, S. R.R. (8).
- Heller, A.A. <sup>15</sup>921, <sup>15</sup>1532 (<sup>15</sup>8); <sup>17</sup>1714 (<sup>17</sup>6).
- Heyde, E.T., & LARK, E. <sup>19</sup>3471 (<sup>19</sup>8); <sup>5</sup>4265 (<sup>5</sup>2); <sup>16</sup>4522 (<sup>16</sup>8).
- Hilyand, E. R.R. (<sup>18</sup>9).
- Hinton, G.B. <sup>16</sup>1127, <sup>16</sup>4402 (<sup>16</sup>5).
- Hitchcock, A.S. <sup>18</sup>110, <sup>18</sup>814, R.R. (<sup>18</sup>7).
- Hitchcock, C.L. <sup>23</sup>5800 (<sup>23</sup>13).
- Holdeman, A.P. <sup>26</sup>44151 (<sup>26</sup>10).
- Hood, S.C. <sup>18</sup>24611, <sup>18</sup>24612, <sup>18</sup>24613, <sup>18</sup>24614, <sup>18</sup>24615 (<sup>18</sup>9).
- Hooks, -. R.R. (<sup>18</sup>8).
- Hopkins, H. <sup>18</sup>112 (<sup>18</sup>8).
- Houghton, H.W. <sup>18</sup>3837 (<sup>18</sup>8).
- House, H.D. <sup>18</sup>2626 (<sup>18</sup>7).
- Howard, D.V. <sup>17</sup>4 (<sup>17</sup>6).
- Hubricht, L., Sheep, C., & Heinso, D.D. <sup>18</sup>81382, <sup>18</sup>81392 (<sup>18</sup>7).
- Huger, A.M. <sup>18</sup>21 (<sup>18</sup>8).
- Hume, R.C. R.R. (<sup>18</sup>8).
- Hyams, H.E. <sup>18</sup>4271, R.R. (<sup>18</sup>8).
- James, E. R.R. (<sup>18</sup>8).
- Jerry, G. R.R. (<sup>17</sup>8); <sup>20</sup>237 (<sup>20</sup>19).

- Jewett, A. <sup>18</sup> S.E. (7).  
Johnston, J.R. <sup>19</sup> 251 (9).  
Jones, M.E. <sup>16</sup> 22 (5); <sup>20</sup> 26012, <sup>21</sup> 29115 (19); <sup>23</sup> S.E. (31); S.E. (13).  
Joof, J.F. <sup>17</sup> S.E. (6).  
Kee, J.W. <sup>18</sup> 16012, 16025 (7).  
Keck, D.D. <sup>23</sup> 4183 (13).  
Keck, J. <sup>23</sup> 1842 (13).  
Keeler, H.D. <sup>15</sup> S.E. (7).  
Kellerman, W.A. <sup>19</sup> 6576 (9).  
Kellog, W.H. <sup>17</sup> 1 (6).  
Kenoyer, L.A. <sup>4</sup> 266, S.E. (3).  
Kerr, H. <sup>21</sup> S.E. (11).  
Keyser, M. <sup>18</sup> 6022 (7).  
? { Millian, O.L. <sup>17</sup> S.E. (6).  
Millin, O.L. <sup>18</sup> S.E. (9).  
Kirk, B. <sup>18</sup> S.E. (8).  
Knight, R.A. <sup>18</sup> S.E. (7); S.E. (8).  
Leavenworth, M.C. S.E. (8).  
Leavenworth, W.C., & Hoogstraal, H. <sup>16</sup> 1821 (5).  
Lehmann, V. <sup>18</sup> S.E. (2).  
Lemon, J.C. <sup>22</sup> 232 (12).  
LeRoy, P.V. <sup>23</sup> S.E. (13).  
Lesueur, H. <sup>18</sup> S.E. (7).  
Lettermann, G.W. <sup>18</sup> S.E. (7); <sup>17</sup> S.E. (6).  
Lighthips, L.H. <sup>18</sup> 421 (7).  
Lindheimer, F. <sup>15</sup> 62, 162 (7); <sup>17</sup> 61, 244, 512, 682, 712, 1152,  
1153 (8).

- Lundell, C.L. <sup>16</sup>6240 (5).  
Lundell, C.L., & A.A. <sup>18</sup>8754, <sup>18</sup>9482 (2); <sup>17</sup>8862, <sup>17</sup>9152, <sup>17</sup>10614 (6);  
<sup>20</sup>9810 (14).  
Lyonnnet, E. <sup>16</sup>908 (5).  
MacDougal, D.T. <sup>22</sup>206, <sup>21</sup>E.N. (14).  
MacFadden, F.A. <sup>18</sup>13609 (11).  
MacKenzie, E.K. <sup>17</sup>4071 (5).  
March, B. <sup>17</sup>80, <sup>17</sup>291 (4); <sup>20</sup>1116, <sup>18</sup>1768 (14).  
Martin, DeVall, & Arnold E.N. (7).  
Mason, H.L. <sup>17</sup>2122 (11).  
Mathias, M.E. <sup>21</sup>862 (11).  
Matuda, E. <sup>19</sup>1681 (9).  
McBryde, J.B. <sup>18</sup>E.N. (2).  
McClatchie, A.J. <sup>23</sup>E.N. (11).  
McFarlin, J.B. <sup>18</sup>868, <sup>18</sup>7614, <sup>18</sup>8132, <sup>18</sup>8210, <sup>18</sup>8122 (7).  
McHullen, E. <sup>18</sup>E.N. (2).  
Mearns, E.A. <sup>23</sup>1122 (11).  
Nellus, I.E., & Goodman, G.J. <sup>19</sup>3612 (9).  
Nell, C.D. <sup>18</sup>E.N. (8).  
Nellichamp, J.H. <sup>18</sup>E.N. (7).  
Nets, M.C. <sup>17</sup>141 (5); <sup>18</sup>712 (7).  
Miller, K. <sup>17</sup>E.N. (5).  
Mitchill, H. <sup>18</sup>E.N. (7).  
Mohr, C. <sup>18</sup>E.N. (8).  
Moldenke, H.H. <sup>18</sup>208, <sup>18</sup>242, <sup>18</sup>572a, <sup>18</sup>1102, <sup>18</sup>3632, <sup>18</sup>5770, <sup>18</sup>5952 (7);  
<sup>21</sup>206, <sup>21</sup>1152 (8).  
Morso, F.P. <sup>21</sup>E.N. (11).

- Mueller, C.H. <sup>4</sup>2026; <sup>4</sup>2668 (1).  
 Mueller, C.H., & H.T. <sup>4</sup>467 (1).  
 Munn, P.A. <sup>23</sup>8204 (13).  
 Munn, P.A., & Hitchcock, C.L. <sup>22</sup>12112 (12).  
 Munn, P.A., & Keck, D. <sup>21</sup>7881 (11).  
 Murrill, W.A. <sup>18</sup>S.H. (9).  
 Myers, S.E. <sup>18</sup>S.H. (9).  
 Nash, G.V. <sup>18</sup>364; <sup>18</sup>1879; <sup>18</sup>2428 (9); S.H. <sup>20</sup>(10).  
 Neally, G.C. <sup>20</sup>216 (10); S.H. <sup>18</sup>(9).  
 Nelson, E.W. <sup>4</sup>6621 (3).  
 Nicholson, A.J. <sup>17</sup>S.H. (6).  
 Nicolas, P. <sup>16</sup>S.H. (5).  
 Nolan, R.E. <sup>18</sup>S.H. (9).  
 Norris, J.C. <sup>23</sup>560 (13).  
 Ohlinger, L.B. <sup>18</sup>418 (7).  
 Olive, E.W. <sup>18</sup>119 (9).  
 O'Neill, H. <sup>18</sup>S.H. (9).  
 Orest, C.R. <sup>20</sup>7282 (10); <sup>17</sup>6068 (4); S.H. <sup>23</sup>(13).  
 Oyster, J.H. <sup>17</sup>S.H. (6); S.H. <sup>18</sup>(9).  
 Palmer, E. <sup>4</sup>234; <sup>18</sup>1251 (1); 21 (5); <sup>17</sup>1256 (6); <sup>16</sup>311; <sup>17</sup>495; <sup>17</sup>496;  
<sup>18</sup>2515 (9); <sup>18</sup>2512 (8); <sup>20</sup>1257; <sup>20</sup>1258 (10); <sup>21</sup>512 (11); <sup>18</sup>142;  
<sup>23</sup>442; <sup>23</sup>781 (13).  
 Palmer, E.J. <sup>18</sup>2524; <sup>18</sup>2976; <sup>18</sup>11645; <sup>18</sup>14120; <sup>18</sup>14272; <sup>18</sup>41898 (9);  
<sup>17</sup>6512; <sup>17</sup>6564; <sup>17</sup>11518; <sup>17</sup>13760 (6).  
 Pammel, L.H. <sup>18</sup>S.H. (5).  
 Parish, S.B. <sup>23</sup>3992; <sup>23</sup>3652; <sup>23</sup>4652; S.H. <sup>22</sup>(11); <sup>22</sup>4142 (12); <sup>22</sup>2452;  
<sup>21</sup>3731; <sup>21</sup>11846 (11).

- Parish, S.B., & W.F. 206, 1171<sup>22</sup> (17); 1372<sup>21</sup> (21).
- Parks, H.B. 1022<sup>17</sup> (8); 1534<sup>18</sup> (8).
- Parry, C.C. 222<sup>20</sup> (22); 223<sup>23</sup> (23).
- Parry, C.C., Bigelow, J.M., Wright, C., & Schott, A. 222<sup>20</sup> (20).
- Parry, C.C., & Lemon, J.G. 176<sup>23</sup> (23); 177<sup>22</sup> (22).
- Parry, C.C., & Palmer, E. 821<sup>16</sup> (8).
- Pavon, J. 2121<sup>16</sup> (8); 2122<sup>19</sup> (8).
- Perkins, J.R. 222<sup>18</sup> (8).
- Pickell, L.W. 250<sup>18</sup> (8).
- Pilant, E.J. 222<sup>18</sup> (8).
- Pitcher, E. 222<sup>18</sup> (8).
- Plank, E.R. 222<sup>20</sup> (20).
- Pollard, C.L., & Collins, G.H. 222<sup>18</sup> (8).
- Porter, T.C. 222<sup>18</sup> (8).
- Pringle, C.C. 128<sup>7</sup> (7); 1284<sup>16</sup> (16); 2022<sup>16</sup> (16); 2514<sup>16</sup> (16); 11756<sup>4</sup> (4); 2021<sup>20</sup> (20); 2514<sup>20</sup> (20).
- Purpus, C.A. 21<sup>23</sup> (23); 1271<sup>13207</sup> (7); 1280<sup>4</sup> (4); 1282<sup>21</sup> (21); 2141<sup>19</sup> (19); 2174<sup>1</sup> (1); 10114<sup>16</sup> (16).
- Ramires, M. 1221<sup>19</sup> (19).
- Ramsey, R.L. 222<sup>18</sup> (8).
- Randolph, F.R. 1<sup>18</sup> (7).
- Randolph, F.R., & Small, J.K. 70<sup>20</sup> (8).
- \* > Reverchon, J. 131<sup>17</sup> (7); 1312<sup>20</sup> (20); 2522<sup>18</sup> (18); 856<sup>18</sup> (18); 866<sup>18</sup> (18); 865<sup>18</sup> (18).
- Reynolds, W.C. 222<sup>18</sup> (8).
- Rhoads, A.S. 222<sup>18</sup> (8).
- Richter, L. 222<sup>17</sup> (8).
- \* Behder, A. 971<sup>18</sup> (8).

- <sup>18</sup>  
 Riedel, M. 2.2. (9).  
 Rodrigues, J.V. 860, 2158, 3130 (8). <sup>6</sup> Should be Valerio  
 Rolfs, P.H. 418, 2.2. (9). <sup>18</sup>  
 Rose, J.H. 24123 (6). <sup>17</sup>  
 Rose, J.H., Painter, J.H., & Rose, J.S. 8253 (4). <sup>7</sup>  
 Rose, L.S. 34404, 36840 (23); 36774, 38141, 2.2. (22); <sup>23</sup>  
40310 (21). <sup>21</sup>  
 Rose-Innes, B., & Moon, B. 295 (7); 1227 (19); 1317 (6). <sup>18 20 17</sup>  
 Ruano, J.M. 1256 (9); 1358 (8). <sup>19</sup>  
 Rugel, F. 326, 2.2. (7); 525, 2.2. (8). <sup>18</sup>  
 Runyon, R. 330, 1063 (16). <sup>20</sup>  
 Russell, P.G., & Souvireu, M.J. 205 (4). <sup>16</sup>  
 Ruth, A. 178, 2.2. (6); 518, 2.2. (8). <sup>17</sup>  
 Rydberg, P.A., & Isler, R. 104, 624, 225 (8). <sup>18</sup>  
 Saurman, B.F. 2511 (8). <sup>18</sup>  
 Schallert, P.O. 1390 (7); 2.2. (12). <sup>18 22</sup>  
 Schott, A. 2.2. (5); 2.2. (10); 2.2. (12). <sup>17 20 22</sup>  
 Scull, L.E. 2.2. (8).  
 Seibert, R.J. 1212 (8).  
 Selser, E. 2381, 2741 (9). <sup>19</sup>  
 Sesse, Mocino, Castillo and Maldonado 4241, 4242 (8); <sup>16</sup>  
4240 (4); 4283 (8). <sup>19</sup>  
 Shepard, H. 15, 2.2. (8). <sup>18</sup>  
 Shreve, F. 2018, 2038, 2322, 2521 (23); 5454 (10). <sup>20 20</sup>  
 Shreve, F., & Tinkham, S.R. 2572 (10). <sup>20</sup>  
 Sinclair, J.F. 2.2. (14). <sup>20</sup>  
 Skutch, A.F. 22, 514, 1165 (9). <sup>19</sup>  
 Small, J.K. 4061, 8344 (8); 2260, 2701, 2.2. (7). <sup>1901, 7973. 18</sup> ~~8344~~, 8385, 8910(25)

Small, J.K., & Carter, J.J. 65, 515, 716, 1054, 1438, 1439,  
2505, 2528 (S); 1095, 1272, 1440 (8).<sup>18</sup>

Small, J.K., Carter, J.J., & Small, G.K. 3241 (9).<sup>18</sup>

Small, J.K., & DeWinkeler, J.B. 2161, 2515, 2662 (8);  
2581 (7).<sup>18</sup>

Small, J.K., DeWinkeler, J.B., & Mosier, C.A. 11235 (8).

Small, J.K., & Mosier, C.A. 5900, 6608 (2).<sup>18</sup> 6397, 2535, 2937, 3083,  
3109(8).<sup>18</sup>

Small, J.K., Mosier, C.A., & Small, G.K. 6600, 6724 (7);  
5965 (8).<sup>18</sup>

Small, J.K., & West, R. 16034, 16035 (X); 16008 (8).<sup>18</sup>

Small, J.K., & Wherry, R.T. 12012 (16).<sup>20</sup>

Small, J.K., & Wilson, P. 1580 ~~1580~~.<sup>18a</sup>

Smith, C. 2102 (8).<sup>18</sup>

Spencer, H.F. 245 (14); 311 (14); 1459 (17).<sup>22</sup> <sup>23</sup> <sup>21</sup>

Standley, J.P. 16, 471 (7).<sup>18</sup>

Standley, P.C. 57801, 59879, 59880, 60018, 61510, 64110,  
66165, 66202, 67787, 80118, 81010, 81827, 84031, 85280,  
85327 (X); 77210, 82031 (S).<sup>18</sup> <sup>5</sup>

Stanfield, S.W. 2-n. (8).<sup>18</sup>

Stanford, L.R., Rotherford, K.L., & Northcraft, R.D. 24 (4).<sup>7</sup>

Stason, H. 2-n. (14).<sup>23</sup>

Stevens, G.W. 851, 1196, 1922 (8).<sup>18</sup>

Steyermark, J. 32201, 40912 (X); 32895, 34390, 36377 (8);  
51648 (X).<sup>18</sup> <sup>5</sup> <sup>19</sup>

Stratton, R. 342 (X).<sup>18</sup>

Straub, F.C. 151 (8).<sup>18</sup>

Strandtmann, R.W. 2-n. (X).<sup>17</sup>

- Taylor, K.A. A.R. (X).<sup>18</sup>  
Thackery, F.A. 252 (13).<sup>23</sup>  
Tharp, B.C. 104, 2206, 44210, A.R. (X);<sup>17</sup> 592, 622, 628,  
6302, A.R. (X);<sup>18</sup> A.R. (18).<sup>20</sup>  
Thurber, G. A.R. (X).<sup>17</sup>  
Thurrow, F.W. A.R. (X).<sup>18</sup>  
Tisdale, W.B. A.R. (X).<sup>18</sup>  
Tolstead, W.L. 2108, 2241 (X).<sup>17</sup>  
Torrey, J. A.R. (X).<sup>18</sup>  
Tracy, S.M. 1272, 6555, 7854, 7856, 2411 (X);<sup>18</sup> 2228 (8);  
2864 (X);<sup>17</sup> 2005 (19).<sup>20</sup>  
Train, P. 1746 (13).<sup>23</sup>  
Trecul, H. 1458 (10).<sup>20</sup>  
Trelase, W. 11, A.R. (X).<sup>18</sup>  
Tweedy, F. A.R. (X).<sup>17</sup>  
Underwood, L.M. A.R. (X).<sup>18</sup>  
Usell, P.B. 110 (10).<sup>20</sup>  
Valerio, J. Rodriguez<sup>17</sup>  
Von Schrenk, H. A.R. (X).<sup>17</sup>  
Ward, L.F. A.R. (X).<sup>17</sup>  
Warms, L.R. A.R. (X).<sup>18</sup>  
Warnock, B.H. 1051 (X);<sup>17</sup> 20672 (X).<sup>18</sup>  
Warnock, B.H., & Krodell, W.J. 13, 21 (X).<sup>17</sup>  
Waterfall, U.T. 4445, 6521, 6741 (X).<sup>17</sup>  
Watkins, O.M. A.R. (X).<sup>18</sup>  
Watson, J.R. A.R. (X).<sup>18</sup>  
Wagh, F.A. A.R. (X).<sup>18</sup>

Webber, H.J. 111 (8); 519 <sup>18</sup> (X).

Weber, G.F. E.N. (X).

West, E. 152, 640, 16082 <sup>18</sup> (X); 42216 (8).

West, E., & Arnold, L.B. 30323, 31378, 41512, 41513, 41515,  
41516, 41517, 41519, 41522, 41524, 41526, 41528, 41888,  
44174, 44014 <sup>18</sup> (X).

White, H. 214 <sup>18</sup> (X).

Whitehouse, E. 534, 535, 537 <sup>18</sup> (X); 536, E.N. <sup>17</sup> (X).

Wiechmann, C. 22 <sup>18</sup> (X).

Wiegand, K.H., & Manning, W.B. 1815, 1816, 1817, 1818 <sup>18</sup> (X).

Wiggins, I.L. 4112, 4154, 2880, 2913, 3152, 2705 <sup>23</sup> (X);  
2615 <sup>22</sup> (X).

Wiggins, I.L., & Demaree, D. 4228 <sup>23</sup> (X).

Wild, E. E.N. <sup>17</sup> (X).

Wilkinson, E.H. 2 <sup>17</sup> (X).

Williams, C.B. 122 <sup>18</sup> (X).

Williams, L.O. 1014 <sup>16</sup> (X); 13150 <sup>19</sup> (X).

Williams, L.O., & Molina, A. 10603 <sup>6</sup> (X); 11844 <sup>19</sup> (X).

Wilnot, R.J., & Merrill, W.A. E.N. (X).

Wolf, C.B. 2284 <sup>22</sup> (X); 2460 <sup>23</sup> (X); 6524 <sup>21</sup> (X).

Wood, A. 2508 <sup>17</sup> (X); E.N. <sup>18</sup> (X).

Woodcock, F.G. 1813, 1814 <sup>23</sup> (X).

Woodson, R.E. Jr., & Anderson, E.S. 1602 <sup>18</sup> (X).

Woodson, R.E. Jr., and Schery, R.W. 96 <sup>18</sup> (X).

Wright, C. 182 <sup>23</sup> (X); 1792 <sup>17</sup> (X); E.N. <sup>20</sup> (X).

Wynd, F.L. 205 <sup>17</sup> (X).

Wynd, F.L., & Mueller, C.H. 325 (6)<sup>17</sup>.  
York, C.L. 46102, 46112, 46122 (X)<sup>17</sup>.  
York, H.H. 66, H.H. (6); H.H. (V)<sup>18</sup>.  
Young, H. 22, H.H. (6); H.H. (V)<sup>18</sup>.  
Young, V. 159a (V)<sup>18</sup>.

STILLINGIA IN NORTH AMERICA ROGERS, A. M. 1949

WASHINGTON UNIVERSITY  
Department of Botany

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STILLINGIA IN NORTH AND CENTRAL AMERICA

by

David James Rogers

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Graduate Board of Washington  
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June, 1949

Saint Louis, Missouri

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## STILLINGIA IN NORTH AND CENTRAL AMERICA

### INTRODUCTION

Three previous systematic studies<sup>1,2,3</sup> of the genus Stillingia have been based upon few specimens, little distribution data, and practically no habitat information. As a result, the species have remained indistinct or split into ill-defined groups. An examination of annotations borne by herbarium specimens demonstrates the confusion concerning the identity of any one species.

Pax and K. Hoffman<sup>3</sup> have described 26 species of Stillingia; thirteen in North and Central America, nine in South America, three in Madagascar, and one in the Fiji Islands of the southern Pacific. The present revision undertakes to reexamine the North and Central American species with the purpose of effecting a more natural organization. The standard methods of the herbarium systematist have been employed for interpretation of the species. In order to present a more integrated treatment, a conservative concept of species is used. No infra-specific entities are recognized since there are insufficient data for delimitation and description of the variants. There are no species of South American affinity known to occur north of the Panama Canal

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<sup>1</sup>Baillon, Etud. Gen. Euphorb. 510. 1858, ex parte.

<sup>2</sup>Mueller, DC. Prodr. 15<sup>2</sup>: 1155. 1866.

<sup>3</sup>Pax & K. Hoffman, in Engler, Pflanzenr. IV, Fam. 147, V: 180. 1912.

Zone, and probably none of North and Central America south of the same region. Since this is the case, no unnatural separation of the species is necessary for the sake of convenience.

#### GENERIC AND SUBGENERIC RELATIONSHIPS

The genus Stillingia is commonly referred<sup>4</sup> to the subtribe Stillingiinae, tribe Hippomaneae, subfamily Crotonoideae of the family Euphorbiaceae. The tribe Hippomaneae, composed of 26 genera, is divided into eight subtribes. In the subtribe Stillingiinae, Maprounea and Sapium are the genera most closely related to Stillingia. Flowering specimens of Maprounea are very easily distinguished from Stillingia by the compact inflorescence of the former which appears almost as a capitulum, whereas the inflorescence of Stillingia is much more elongate and spiciform. There is no difficulty in separating either Sapium or Maprounea from Stillingia when mature fruiting specimens are available. In Stillingia, an abscission layer forms above the base of each of the cocci so that after dehiscence of the cocci, a three- or two-rayed hardened portion of the pericarp remains attached to the pedicel. The hardened portion of the pericarp is called the gynobase in this study. There is no such abscission layer in either Maprounea or Sapium and the cocci of these two genera leave no remnants of the pericarp after dehiscence of the cocci.

As Pax points out,<sup>4</sup> it is slightly more difficult to

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<sup>4</sup>Pax and K. Hoffm., in Engler, Pflanzenr. IV, Fam. 147, V: 180. 1912.

separate Stillingia from Sapium when only flowering specimens without mature fruits are available. Both genera have the same type of inflorescence, but that of Sapium is generally larger and more elongate than that of Stillingia. In Sapium, some of the species have a definite calyx in the pistillate flower whereas in Stillingia, the sepals never are united. Sapium is a genus of trees and shrubs only rarely becoming suffrutescent. The species of Stillingia, by comparison, largely are shrubs, subshrubs and herbs, and only occasionally become trees.

The subgenus Eustillingia based on the section Eustillingia Kl.<sup>5</sup> emend. Muell. Arg.<sup>6</sup> includes those species of Stillingia with three to thirteen staminate flowers in a cymule, three to two definite sepals in the pistillate flower, and a well defined caruncle on the seed. Species with a single staminate flower in a cymule, sepals and caruncle absent are referred to Gymnostillingia S. Watson.<sup>7</sup> This subgeneric epithet is accredited doubtfully to S. Watson since he made no definite statement of preference, but said "----Mueller's Gymnostillingia, which may be considered a section or subgenus----". Pax<sup>8</sup> cited Gymnostillingia S. Wats. as

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<sup>5</sup>Klotzsch, in Erichs. Arch. VII, 1: 187. 1841.

<sup>6</sup>Mueller, in Linnaea 32: 87. 1863.

<sup>7</sup>S. Watson, in Proc. Am. Acad. 14: 298. 1879.

<sup>8</sup>Pax & K. Hoffman in Engler, Pflanzenr. IV, Fam. 147, V: 180. 1912.

section in synonymy under his section *Leptostachyae*. The subgeneric rank is used here rather than the section because the characters involved are sufficiently distinct to justify a higher category than the section. There is a sufficient overlap of characters between the two subgenera, however, to prevent the establishment of distinct genera.

Reorganization is necessary since the sections established by Pax and K. Hoffman in the 1912 monograph are not natural, but are based on superficial characters. For example, *S. zelayensis*, with subherbaceous stems and woody rhizomes of Pax's section *Fruticosae* has more in common with his section *Sylvaticae*, whose species also have subherbaceous stems and woody rhizomes, than with *Fruticosae*. In the section *Oppositifoliae*, *S. sanguinolenta* occasionally has subalternate stems and leaves; *S. aquatica* and *S. bicarpellaris* in section *Fruticosae* have opposite branches.

#### GEOGRAPHICAL DISTRIBUTION

*Stillingia* is largely tropical or subtropical in the Old World and the New. Three species occur in temperate regions, two in the north temperate, and one in the south temperate zone. *S. sylvatica* and *S. texana* are the northern species, but their ranges extend somewhat into subtropical zones, the former growing to the southern tip of Florida and the latter extending its range into northern Mexico. The northern limit of *S. sylvatica* is about 36° north latitude, and of *S. texana* about 35° north. *S. patagonica* is found in

South America as far south as the 50th parallel in Argentina.

In Mexico and Central America, S. zelayensis, S. sanguinolenta and S. bicarpellaris are confined to upland regions, from about 500 to about 4000 meters altitude. S. microsperma, S. diphtherina and S. acutifolia are largely upland plants from Chiapas, Guatemala and Honduras. The South American species of tropical and subtropical affinity grow from Venezuela to southern Brazil and northern Argentina.

Stillingia Treculiana, S. paucidentata, S. linearifolia and S. spinulosa form an interesting group of desert plants of narrow ranges in the southwestern United States and the dry states of northern Mexico.

So far as is known, S. aquatica is the only species of Stillingia living in wet regions, marshy savannahs and vernal ponds, in Florida and south Georgia.

The three species from the islands of Madagascar, Mauritius, and Reunion (Bourbon) are found in mountain forests. One species is from the Fiji Islands of the southern Pacific.

#### MORPHOLOGY

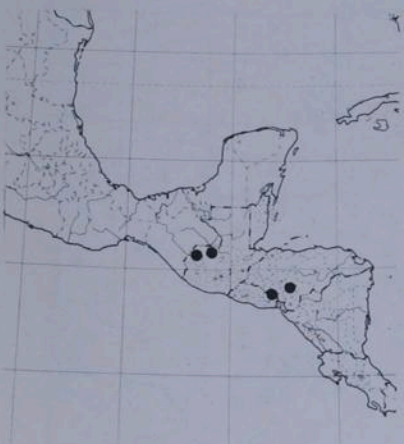
The genus Stillingia is a diverse group of perennial herbs, subshrubs, shrubs and small trees. The tree habit is not predominant in the North and Central American species; S. acutifolia from southern Mexico and Guatemala, is the only species which has sufficient height and diameter of trunk to



1. *S. SANGUINOLENTA*



2. *S. MICROSPERMA*



3. *S. DIPHTHERINA*

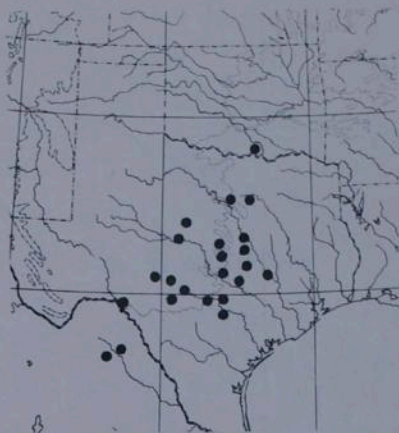


4. *S. BICARPELLARIS*

FIG. 1.  
RANGES IN STILLINGIA



5. *S. ZELAYENSIS*

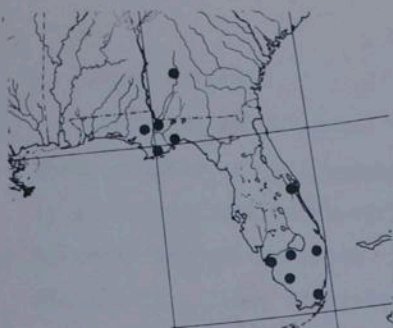


6. *S. TEXANA*

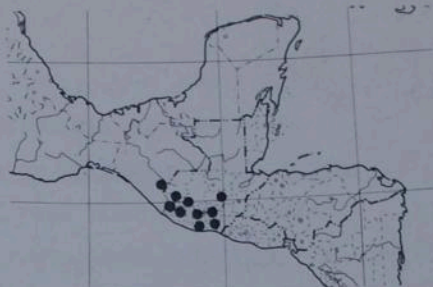


7. *S. SYLVATICA*

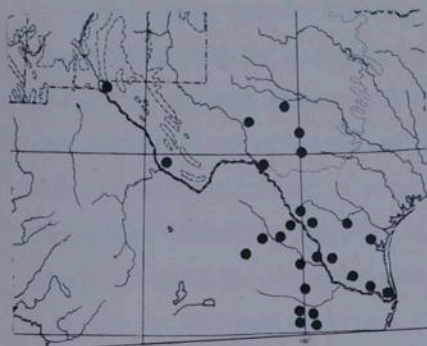
FIG. 2.  
RANGES IN *STILLINGIA*



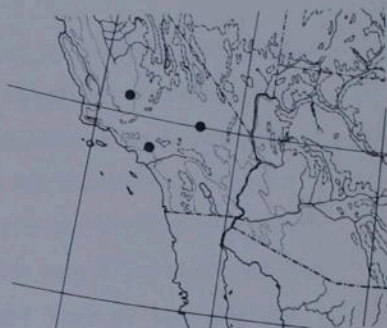
8. *S. AQUATICA*



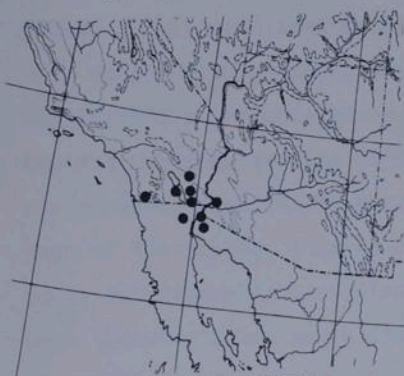
9. *S. ACUTIFOLIA*



10. *S. TRECULIANA*



11. *S. PAUCIDENTATA*



12. *S. SPINULOSA*



13. *S. LINEARIFOLIA*

FIG. 3.  
RANGES IN *STILLINGIA*

be called a tree.

Although seldom found on herbarium specimens, the woody rhizome of E. selavensis, E. sylvatica and E. texana is a good definitive character. All other species arise directly from a tap root. The roots of E. sylvatica are distinctive, being elongate-fusiform, arising at several points along the rhizome.

The stems may be terete, striate or angled, the striations occurring as a result of the decurrent leaves. The branching systems are opposite to alternate to fascicled, the latter being a result of shortened internodal regions and accordingly having a somewhat whorled appearance. The fascicled branching pattern gives the upper portions of the plant an umbelliform appearance. The bark of the shrubby species is lenticellate in varying degrees. E. sanguinolenta has a very rough bark due to the presence of a large number of enlarged lenticels.

The outline, margin, venation and texture of the leaves are important key characters. The leaves of the Mexican and Central American species of the subgenus Eustillingia usually are provided with two to several cup-shaped glands at the base of the blade. This is not a constant feature of each leaf, but generally more than one leaf of a specimen will have these modified serrations. With the exception of E. diphtherina, all species have membranaceous leaves; the excepted species has coriaceous leaves.

The organization of the inflorescence, a spiciform thyrses, is essentially the same throughout the genus. The flowers are monoecious, with the pistillate flowers always single in the cymule, but the number of staminate flowers in a cymule varies. The pistillate flowers are attached toward the base of the peduncle, and either immediately adjacent to the lowest staminate cymule or with a distinct space on the peduncle separating the pistillate and staminate cymules. The peduncle may be elongate below the point of insertion of the lowest pistillate flower or bear pistillate flowers beginning at its point of origin. Both the pistillate and staminate cymules are subtended by a more or less cuneate bract which has patelliform or cyathiform glands basally and laterally attached, one gland on each side of the bract. These glands are considered the homologues of the cup-shaped serrations at the base of the leaves of the Mexican species. The staminate flowers are borne either three to thirteen, or singly in the axil of a bract toward the apex of the inflorescence. This inflorescence structure is assumed to be derived from a more primitive inflorescence by reduction. The inflorescence structure of Nevea, for example, with several pistillate flowers on the main and secondary axes might represent a more primitive condition than that observed in Stillingia where the pistillate flowers are single in the cymules. A reduction series is evident within the genus Stillingia in the staminate floral structure. The species of the subgenus Eustillingia

are characterized by three to many staminate flowers in each cymule, but the subgenus *Gymnostillingia* has only one staminate flower for each cymule.

In the sepals of the pistillate flower is found a good method and a strengthening feature for the distinction between the two subgenera. All the species of *Eustillingia* have three (or two in *E. bicarrellaris*) well marked sepals, the remnants of which are occasionally apparent at the base of the gynobase even at maturity of the fruit. The name *Gymnostillingia* is derived from the absence of sepals, and all species of the subgenus except *E. acutifolia* are completely lacking them. *E. acutifolia* is a transition species in this respect, with very small and fugacious sepals.

No key importance has been attached to the staminate flowers since these organs are rather uniform and present no readily observed differences. On the other hand, relative density of the staminate cymules and the total number of staminate flowers on an individual inflorescence are used in the diagnostic treatment.

The measurement of lobe length of the mature gynobase is consistently given in the descriptions, the length being that from the central column to the apex of the lobe. The variability of this character within a species prevents inclusion as a key character.

Seed size, contour and surface are constant for the most part. Again, variation occurs particularly in the extreme southern range extension of *E. sylvatica*, where there

EXPLANATION OF THE PLATE

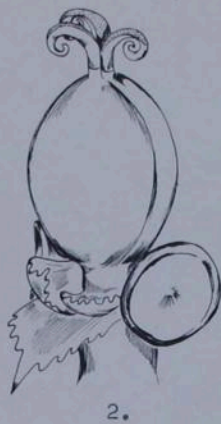
PLATE 1.

INFLORESCENCES AND FLOWER STRUCTURES OF STILLINGIA

Figs. 1-3 Inflorescence and flower structure of  
S. zelavensis, typical of the subgenus  
Eustillingia. Fig. 1, X 1; Figs. 2 & 3,  
X 5.

Figs. 4-6 Inflorescence and flower structure of  
S. paucidentata, typical of the subgenus  
Gymnostillingia. Fig. 4, X  $1\frac{1}{2}$ ; Figs. 4 & 5,  
X 5.

PLATE 1.



2.



3.



4.



5.



6.

EXPLANATION OF THE PLATE

PLATE 2.

SEEDS OF STILLINGIA all figures, X 5.

1. S. sanguinolenta
2. S. microsperma
3. S. bicarbellaris
4. S. zelayensis
5. S. texana
6. S. sylvatica
7. S. aquatica
8. S. acutifolia
9. S. Treculiana
10. S. naucidentata
11. S. spinulosa
12. S. linearifolia

PLATE 2.



1.



2.



3.



4.



5.



6.



7.



8.



9.



10.



11.



12.

may be a problem of intergression with S. aquatica. The measurement of length in the seed is the distance from micropylar end to the basal end, and the width is perpendicular to the length at the broadest portion of the seed. The presence or absence of the caruncle is one of the best supporting characters for the division of the genus Stillingia into two subgenera. Eustillingia is characterized by the presence of a well defined caruncle in all species. Gymnostillingia is not completely without this body, and a very definite caruncle appears in S. Treculiana. S. paucidentata is a transitional species in this respect, with a very minute and fugacious, but nevertheless definite, caruncle. S. acutifolia, S. spinulosa and S. linearifolia are ecarunculate.

#### EVOLUTIONARY TENDENCIES AND INTERSPECIFIC RELATIONSHIPS

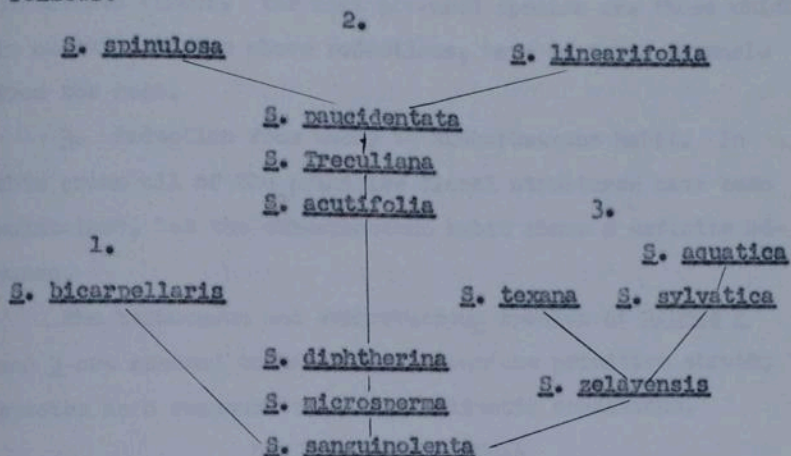
The possibilities for study of evolution in Stillingia are good. There is a definite reduction series to be found in the number of staminate flowers in a cymule, in the sepals of the pistillate flower, in the caruncle, in the number of carpels, and in the habit of the plant.

I generally have followed the dicta established by Bessey<sup>9</sup> for determination of primitive and advanced characters. The shrubs with three to many staminate flowers,

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<sup>9</sup>Bessey, The Phyllogenetic Taxonomy of Flowering Plants, Ann. Mo. Bot. Gard. II, 2: 109. 1914. 5

well defined sepals in the pistillate flower, a definite caruncle present, and growing in a mesophytic habitat are considered the most primitive. From the primitive species, three lines of divergence and reduction are apparent, as follows:



1. Reduction from three carpels to two; reduction of sepals from three to two. There is evidence of advance in this species to some extent although the only manifestation has been in the reduction in number of carpels and sepals, and this not consistently. The species maintains the shrubby habit and nearly the same climatic requirements as the primitive species.

2. Reduction of number of staminate flowers, the caruncle, sepals and transition from shrubs to herbs. The species included in this group show the greatest advance. From the shrubs, there is reduction first in the number of staminate

flowers to one in each cymule, and from well defined and persistent sepals to minute and fugacious sepals, but maintaining the woody habit, as in S. acutifolia. By further reduction, the plants have become perennial herbs with no sepals in the pistillate flower. The most advanced species are those which in addition to the above reductions, have lost the caruncle from the seed.

3. Reduction from woody to subherbaceous habit. In this group all of the primitive floral structures have been maintained, but the subherbaceous habit shows a definite advance.

The herbaceous and subherbaceous species of Groups 2 and 3 are assumed to have arisen from the primitive shrubby species as a response to changed climatic conditions.

#### HISTORY OF STILLINGIA

Stillingia, named by Garden,<sup>10</sup> was dedicated to Benjamin Stillingfleet, an English botanist who lived from 1702 to 1771. Endlicher<sup>11</sup> first placed Stillingia in the Euphorbiaceae, as a member of the tribe Euphorbieae.

Baillon<sup>12</sup> made the first systematic study of the genera allied to Stillingia, employing such a broad interpretation that most of those genera of the presently recognized tribe

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<sup>10</sup>Garden ex L. Mant. 19. 1767.

<sup>11</sup>Endlicher, Gen. Pl. II: 1110. 1836-1840 ex parte.

<sup>12</sup>Baillon, Etud. Gen. Euphorb. 510. 1858, ex parte.

Hippomaneae appear as sections of Stillingia. His section Eustillingia, in part, is the genus Stillingia. Mueller<sup>13</sup> placed Stillingia in the tribe Hippomaneae and established Gymnostillingia as a separate genus, based on the species G. acutifolia. He maintained the same status in his treatment for De Candolle's 'Prodromus'.<sup>14</sup>

Bentham and Hooker<sup>15</sup> placed Gymnostillingia within the genus Stillingia, recognizing for the first time the importance of the gynobase as the most important generic character. Mueller had previously<sup>14</sup> noted the occurrence of this structure, but failed to appreciate its importance as a linking character between Stillingia and Gymnostillingia. S. Watson<sup>16</sup> placed the herbaceous species of the southwestern United States and northern Mexico in the subgenus Gymnostillingia, but Pax and K. Hoffman<sup>17</sup> established a new section, Leptostachyae, for the four species of this region.

Pax and K. Hoffman<sup>17</sup> were the first to divide the tribe Hippomaneae; Stillingia appears as a member of the subtribe Stillingiinae. These authors have given the limits of the genus as it is known today, dividing it into six sections,

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<sup>13</sup>Mueller, in Linnaea 32: 87. 1863.

<sup>14</sup>Mueller, DC. Prodr. 15<sup>2</sup>: 1155. 1866.

<sup>15</sup>Bentham, in Benth. et Hook. f. Gen. Fl. 3: 334. 1880.

<sup>16</sup>S. Watson in Proc. Am. Acad. 14: 298. 1879.

<sup>17</sup>Pax & K. Hoffman, in Engler, Pflanzenr. IV, Fam. 147, V: 180. 1912.

based largely on vegetative characters.

I have not altered the generic limits of Stillingia in this study since there is no confusion with the allied genera. Within the genus it has been necessary to regroup the species to present a more concise picture of specific tendencies. An examination of the species of South America, Madagascar and the Fiji Islands does not alter the subgeneric divisions.

#### ECONOMIC IMPORTANCE

1. Stillingia sylvatica. The medicinal values of this species have been explored and reported in several journals. An alcohol or water extract of the root was, and occasionally still is, used by doctors and laymen, in South Carolina particularly, in the treatment of syphilis, in cutaneous diseases, chronic hepatic infections, and in the composition of diet drinks.<sup>18</sup> As late as 1944,<sup>19</sup> this plant was mentioned as of minor drug importance, particularly as a sialagogue and expectorant.
2. Stillingia acutifolia. According to information from a labeled specimen, the acrid milky sap of this species is used as a caustic in the treatment of sores and boils.

#### VERNACULAR NAMES

1. Stillingia sylvatica. Queen's delight, Queen's root, silverleaf, nettle potato, yaw-root, marcory, and cockup-hat.
2. Stillingia texana. Narrow-leaved queen's delight.

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<sup>18</sup>C. F. Millspeugh, Medicinal Plants 151. 1892.

<sup>19</sup>Noel L. Allport, The Chemistry and Pharmacy of Vegetable Drugs Tab. XVII. 235. 1944.

3. S. aquatica. Corkwood.
4. Stillinsia Treculiana. Yerba del Sapo (Mexico).

#### STUDY MATERIAL

I have been able to examine specimens from several of the major herbaria of the United States, but have seen only type material from the European herbaria. Recent collections made by American botanists have contributed greatly to the knowledge of habitat and distribution.

The herbaria where specimens have been obtained for study, together with the symbols employed in their citation are as follows:

- FIA Agricultural Experiment Station Herbarium, University of Florida, Gainesville, Florida.
- OKL Bebb Herbarium, University of Oklahoma, Norman.
- D Delessert Herbarium, Conservatoire Botanique, Geneva.
- G Gray Herbarium of Harvard University, Cambridge, Mass.
- CM Herbarium of Chicago Natural History Museum.
- MBG Missouri Botanical Garden, St. Louis.
- P Museum National d'Histoire Naturelle, Paris.
- NY New York Botanical Garden, New York City.
- K Royal Botanic Gardens, Kew.
- UC University of California, Berkeley.
- UM University of Michigan, Ann Arbor.
- TEX University of Texas, Austin.
- US United States National Herbarium, Washington.

I wish to acknowledge my indebtedness to the curators of these institutions, and to the Director of the Missouri Botanical Garden where this study was made.

TAXONOMY

*STILLINGIA* Garden, ex L. Mant. 19. 1767; Endl. Gen. Pl. II: 1110. 1836-1840; Baillon, Stud. Gen. Euphorb. 510. 1858, ex parte; Benth. in Benth. et Hook. f. Gen. Pl. 3: 334. 1880; Pax, in Engl. & Prantl, Nat. Pflanzenf. III. 5. 96. 1890; Pax & K. Hoffm. in Engl. Pflanzenr. 4, Fam. 147, V: 180. 1912.

Stilingia Raf. Atl. Journ. 146. 1832, sphalm.

Seborium Raf. Sylva Tellur. 63. 1838.

Ditrisynia Raf. loc. cit. 64.

Stillengia Torr. in Emory, Notes Milit. Rec. 151. 1848, sphalm.

Glabrous perennial herbs, shrubs, or small trees. Leaves simple, alternate, opposite, or spiral, sessile to petiolate, usually with 2 to several filiform, glandular stipules, entire to crenulate to serrate, the serrations glandular or callose or occasionally the glands in the sinuses of the serrations. Inflorescence a terminal, spiciform thyrse, the cymules bracteate, the bracts cuneate, biglandular, the glands laterally and basally attached; flowers monoecious, monochlamydeous or naked. Pistillate flowers solitary, borne toward the base of the peduncle, sepals 3 or absent, imbricate, ovary superior, 3- to 2-celled, a single pendulous, anatropous ovule in each cell; styles 3, more or less coalescent at the base, the stigmas more or less recurved. Staminate flowers solitary or 3 to 13 in a cymule, occupying the upper portion of peduncle, pedicellate, the calyx always present, 2- or infrequently 3-lobed; stamens 2, exserted, the filaments

coalescent at the base, the 2 thecae adnate, extrorse, longitudinally dehiscent. Fruit a 3- to 2-celled, dry septically dehiscent capsule, the accrescent gynobase 3-lobed, hardened and persistent after dehiscence of carpels; seeds one in each carpel, with or without a micropylar caruncle, the embryo central, the cotyledons broad and flattened, the endosperm mealy.

Standard species: S. sylvatica Garden, ex L. Mant. 19. 1767.

#### KEY TO THE SUBGENERA

A. Staminate flowers in clusters of 3 or more; sepals of pistillate flowers present, persistent; caruncle present.

I. *Eustillingia* (p. 16)

AA. Staminate flowers single; sepals of pistillate flowers absent or minute and fugacious; caruncle absent (except in S. Treculiana and S. paucidentata).

II. *Gynostillingia* (p. 19)

I. *EUSTILLINGIA* (Kl.) D. J. Rogers, stat. nov.

Sect. *Eustillingia* Kl. in Erichs. Arch. VII, 1: 187. 1841

emend. Muell. Arg. in Linnaea 32: 87. 1863.

#### KEY TO THE SPECIES

A. Subshrubs, shrubs, or small trees of well-drained soils; seeds ellipsoid to ovoid, 3-6 mm. long, rugulose or smooth; leaves usually broadest at the middle or above.

B. Shrubs from a tap root; stems woody, terete, lenticels obvious; branches alternate or opposite,

not fascicled; inflorescences relatively slender.

C. Pistils 3-carpellate; leaves elliptic; seeds relatively small, 5 mm. long or less.

D. Mature fruits deeply 3-lobed; bark of stems roughened, with many lenticels.

1. S. sanguinolenta

DD. Mature fruits nearly spherical; bark of stems smooth, with occasional lenticels.

E. Leaves membranaceous, acuminate, 7.9-(9.1\*)-12.8 cm. long, 2.3-(3.1)-4.0 cm. broad, petioles of mature leaves 0.4-(0.7)-1.1 cm. long; inflorescences crowded, the cymes congested, relatively many-flowered.

2. S. microsperma

EE. Leaves coriaceous, acute, 1.8-(3.0)-3.5 cm. long, 0.6-(1.15)-1.8 cm. wide, petioles short, 0.1-0.3 cm. long; inflorescences open, the cymes distant, relatively few-flowered.

3. S. diaphtherina

CC. Pistils 2-, rarely 3-carpellate; leaves linear-lanceolate; seeds larger, 6 mm. long.

4. S. bicarpellaris

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\*The approximate mean is given in parentheses.

BB. Subshrubs from a woody rhizome; stems subherbaceous, more or less striate, angled above, lenticels not obvious; branches alternate, somewhat fascicled; inflorescences relatively stout.

F. Leaves usually with 2 or more cup-shaped marginal glands at base of blade, callose-serrulate; seeds 5.5-6.5 mm. long, 5.5-7.0 mm. broad, rounded at the base, smooth; Mexico and Central America.

5. S. zelayensis

FF. Leaves without cup-shaped glands at base of blade, crenulate or glandular-crenulate.

G. Seeds 3-4 mm. long, 2-3 mm. wide, truncate at base, rugose; leaves linear, 1-7 cm. long, 0.3-0.7 cm. broad; southern Oklahoma, central Texas and northeastern Mexico.

6. S. texana

GG. Seeds 6-8 mm. long, 4.5-7.0 mm. wide, rounded at base, rugulose; leaves spatulate, elliptic or ovate, 3.2-11.5 cm. long, 0.3-4.8 cm. wide; southern Virginia to Florida to Texas and New Mexico.

7. S. sylvatica

AA. Shrubs of marshy places or shallow vernal ponds; seeds subspherical, 2-3 mm. in diameter, rugose; leaves usually broadest toward the base; Georgia and Florida.

8. S. aquatica.

II. GYMHOSTILLINGIA (Muell. Arg.) S. Wats. in  
Proc. Am. Acad. 14: 298. 1879.

Gymnostillingia Muell. Arg. in Linnaea 32. 89. 1863, as genus.

KEY TO THE SPECIES

- A. Shrubs or small trees; leaves 2.8-(7.0)-15.0 cm. long,  
1-(1.5)-4.3 cm. wide, the pinnate venation prominent,  
the petiole distinct.

9. S. acutifolia

- AA. Herbs; leaves 1-(2)-5 cm. long, 0.1-(0.5)-1.5 cm. wide,  
the venation not prominent (except S. spinulosa, with  
palmate venation), sessile to subsessile.

- B. Caruncle present; glands of pistillate bracts  
nearly sessile.

- C. Leaves obovate-spathulate, rounded or broadly  
acute, coarsely incised-dentate; sepals  
minute, fugacious; styles about 1 mm. long.

10. S. Treculiana

- CC. Leaves linear, acuminate or acute, sparsely  
setulose-denticulate; sepals absent; styles  
about 4 mm. long.

11. S. paucidentata

- BB. Caruncle absent; glands of pistillate bracts long-  
pedicellate.

- D. Leaves elliptic-spathulate, acuminate, finely  
callose-dentate, conspicuously 3-costate;  
stems striate.

12. S. spinulosa

DD. Leaves linear, acute, entire or sparsely denticulate, venation not prominent; stems terete.

13. S. linearifolia

1. STILLINGIA SANGUINOLENTA Muell. Arg. in Linnaea 32: 88.  
1863. (T.: Mexico, Ehrenberg s.n.)

stillingia sanguinolenta  $\alpha$  lanceolata Muell. Arg., loc.  
cit. 1863.

stillingia sanguinolenta  $\beta$  angustifolia Muell. Arg., loc.  
cit. 1863. (T.: Mexico, Caracol de Atolon, Schiede?  
[Ehrenberg 1245]).

Much branched shrubs 1-3 m. tall, the branches opposite to subalternate, terete, the lenticellate bark roughened, the sap milky. Leaves petiolate, elliptic to ovate, acuminate to acute, base acute, usually with two cyathiform glands, 1.7-(4.9)-8.6 cm. long, 1.0-(1.52)-2.6 cm. wide, membranaceous, not decurrent, the midrib and secondary venation prominent; petiole 0.2-(0.46)-1.0 cm. long. Inflorescence open, the staminate cymules not crowded on the axis, 3.0-(4.84)-6.3 cm. long, the bracts cuspidate, about 1.5-2.0 mm. long, 1.5-2.0 mm. wide, the cyathiform glands sessile. Pistillate flowers solitary, sepals 3, cuneate, serrulate, about 2 mm. long; styles 2-4 mm. long, united below. Staminate flowers 7-9 in a cymule, the individual flower about 2 mm. long, the shallowly 2-lobed calyx serrulate. Fruit 6-8 mm. wide, deeply 3-lobed, the central column more or less persistent,

the lobes of the gynobase 3-4 mm. long; seeds about 4.5-5.0 mm. long, 4 mm. wide, the testa slightly rugulose, the micropylar end slightly flattened, the base flattened, the caruncle small.

Distribution and habitat: in deep leaf mould, among rocks, dense oak woods of canyon floor; openly wooded arroyos, on lower slopes; river gravel; hills, and occasionally in desert regions, at altitudes from 500 to 1000 m. Flowers from about the middle of March through June, and sometimes in October, and fruits from about the first of June through the last of August.

MEXICO: TAMAULIPAS: Sierra de San Carlos, vic. of San Miguel, Bartlett 10570 (US, CM); Sierra de San Carlos, vic. of El Milagro, Bartlett 11025 (US, G, CM). NUEVO LEON: Municipio de Villa Santiago, Mueller 2026 (MBG, CM, UM, TEX); Canyon Diente, near Monterrey, Mueller 2668 (G, UC); on Pan American Highway, Monterrey, Frue and Frue 2491 (US, MBG, G, NY); Montemorelos, Nelson 6695 (G, US); Sierra Madre, Monterrey, C. H. & M. T. Mueller 467 (TEX, CM); Guajuco, 27 mi. SE of Monterrey, E. Palmer 1255 (G, US); hills near Monterrey, Pringle 2070 (G, CM); river gravel near Monterrey, Pringle 13756 (G, UM, US); river gravel, Monterrey, Pringle 2534 (US, UC, CM, G, NY, MBG). SAN LUIS POTOSI: Guascama, Purpus 4980 (CM, G, UC, MBG, US); Sierra Tablon, Purpus 5464 (UC, NY, G, US, MBG, CM); Alvarez, E. Palmer 234 (G, US, NY). HIDALGO: Zimapan, Kenoyer s.n. (MBG, UM); foot of Chipique (Hidalgo?), Kenoyer 266 (CM). CHIAPAS: Comitán,

Goldman 902 (US). PUEBLA: vic. of San Luis Tultitlanapa, Puebla, near Oaxaca, Purpus 1523 (UC). State and locality unknown, Coulter 1502 (S).

The identity of the collector of the type specimen of S. sanguinolenta & angustifolia is doubtful. Mueller cites "Schiede? 1245", but Pax, in Engl. Pflanzenr. 4, Fam. 147, V: 191. 1912 cites Ehrenberg 1245, with the same locality as Mueller's. Since this specimen was in the Berlin Herbarium, it is safe to assume that Pax cited the correct collector.

Although the specimens cited by Mueller for a lanceolata and angustifolia were unavailable, it is evident from his descriptions that his varieties are based on leaf variations. In the material available for this monograph, are specimens which show that there is no definite break from the smallest to the largest leaf, and no geographical basis for separating the varieties from the parent species. In addition, the floral structure is rather stable in all specimens examined, without sufficient evidence for maintaining any entities other than the species.

2. STILLINGIA MICROSPERMA Pax & K. Hoffm. in Engl. Pflanzenr. 4, Fam. 147, V: 187. 1912. (T.: Heyde & Lux 4265).

Open shrubs 1.0-2.5 m. tall, the terete branches opposite to fascicled, the bark smooth, with occasional lenticels, the sap milky. Leaves petiolate, elliptic, acuminate to acute, usually with 2 cyathiform glands, 7.9-(9.1)-12.8 cm. long, 2.3-(3.1)-4.0 cm. wide, membranaceous, finely serrate, pale green

above, lighter beneath, not decurrent, the second venation prominent; petiole 0.4-(0.7)-1.1 cm. long. Inflorescence crowded, the staminate cymules overlapping, 3-(6.2)-8.7 cm. long, the peduncle elongate and somewhat thickened below the lowest pistillate flower, the bracts about 1.5 mm. long, cuspidate; sepals 3, about 1 mm. long; styles about 2 mm. long. Staminate flowers 7-9 in a cymule, the individual flower about 1.5 mm. long, the deeply 2-lobed calyx serrate. Fruit about 8 mm. wide, globular, not deeply 3-lobed, the central column deciduous, the lobes of the gynobase about 4 mm. long; seeds about 5 mm. long, 4 mm. wide, smooth or slightly rugulose, the micropylar end slightly flattened, the base slightly flattened, the caruncle small.

Distribution and habitat: in open creek beds; oak woods, mountains, at altitudes from 1400 to 3000 m. on south facing slopes; scrub oak hillsides. Flowers from July through August, and fruits from August through November, and the first of January. Shrub said to have a disagreeable odor.

BRITISH HONDURAS: El Cayo District, in open creek bed, San Agustín, Lundell 6740 (G, NY, UM, TEX, CM, US).

GUATEMALA: HUEHUETENANGO: along Agucatan road east of Huehuetenango at km. 13-14, Standley 82033 (CM); Cumbre Papal, on south facing slopes between Cuilco and Imoqui, Steyermark 50912 (CM). JALAPA: La Laguna, at base of Volcan Jumay, 1 mi. north of Jalapa, Steyermark 32291 (CM); mountains along the road between Jalapa and Paraiso, Standley

77230 (CM); no locality, Ruano 1358 (CM). SANTA ROSA:  
Santa Rosa, Hayde A. Lax 4265 (US, G).

3. *STILLINGIA diphtherina* D. J. Rogers, spec. nov. Frutices  
diffusi 1-2 m. alti, ramis rigidis teretibus oppositis vel  
fasciculatis, cortice glabro aliquando lenticellate. Folia  
brevi-petiolata lanceolata vel anguste elliptica acuta vel  
subrotundata basi anguste obtusa plerumque cum glandulis 2  
cyathiformibus 1.8-(3.0)-3.5 cm. longa 0.6-(1.15)-1.8 cm.  
lata, crenulata pallide viridia non decurrentia resinacea cum  
odore resinae, venis secundariis non prominentibus. Inflo-  
rescentia tenuis patens cymulis distantibus compositae 3-5 cm.  
longa sub flore inferiore femineo parum elongata crassataque,  
bracteis cuspidatis circiter 2 mm. longis 2 mm. latis parum  
serrulatis glandulis patelliformibus brevi-pedicellatis.  
Flores feminei solitarii, sepalis 3 rotundis 1 mm. longis  
minime serrulatis. Flores masculi in cymula 7-9 quisquis  
circiter 1 mm. longi, calyce breviter 2-lobato serrulato,  
columna centrali plus minusque decidua, gynobasis lobis  
circiter 3-4 mm. longis; seminibus 4 mm. longis 3 mm. latis  
extremo micropilari parum complanato testa laevi basi rotundis,  
caruncula parva.

Distribution and habitat: in barrancos in pine barrens,  
rocky limestone slopes, at altitudes from 800 to 1400 m.  
Flowers in July, and fruits from August to the first of  
October.

GUATEMALA: HUEHUETENANGO: between Menton and Las Palmas,  
via Yalisjao Rincon Chiquite, Chisquial, Guaxacana, in Sierra

EXPLANATION OF THE PLATE

PLATE 3.

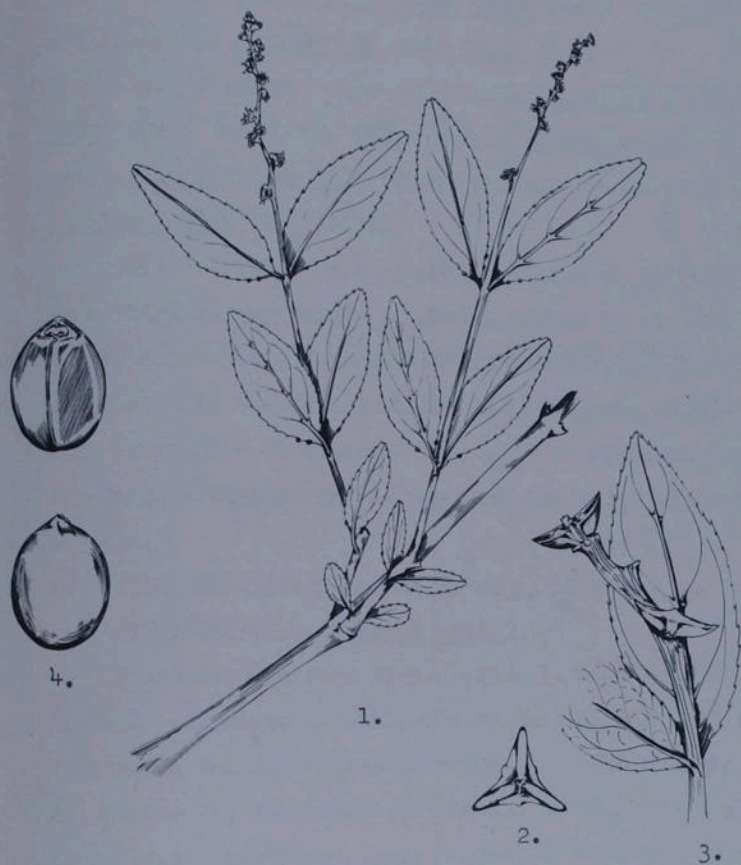
*STILLINGIA diphtherina* D. J. Rogers, sp. nov.

Fig. 1 Habit, X 1.

Fig. 2 Top view of gynobase, X 1.2.

Fig. 3 Basal portion of inflorescence, after dehiscence  
of fruit, X 1.5.

Fig. 4 Seed of *S. diphtherina*: adaxial surface  
above; abaxial surface below, both X 5.



de los Cuchumatanes, Steevermark 51648 (CM). QUICHE: without locality, Aguilar 760 (CM), 1106 (CM).

HONDURAS: MORAZAN: west of Guinope, Williams & Molina 10603 (MBG: TYPE, CM, UC); Tanque, Rodriguez 860 (CM); Zamorano, Rodriguez 2158 (CM); San Antonio de Oriente, Rodriguez 3130 (CM, MBG).

This species is most closely related to S. microsperma from which it may easily be distinguished by its small, leathery, short-petiolate leaves, the slender open inflorescence and the stiff terete branches. Although none of the specimens cited have an attached fruit, it is apparent from the fragments contained in packets that the fruit is shallowly 3-lobed.

4. *STILLINGIA BICARPELLARIS* S. Wats. in Proc. Am. Acad. 21: 455. 1886. (T.: Pringle 128).

Profusely branched shrubs about 1.5-3.0 m. tall, the branches alternate to subopposite, terete, the bark slightly roughened, the leaf bases prominent. Leaves shortly petiolate to subsessile, lanceolate to linear, acute, base acute with occasional cyathiform glands, 1.7-(3.25)-5.5 cm. long, 0.2-(0.5)-0.8 cm. wide, the petiole about 1 mm. long, the midrib prominent, not decurrent. Inflorescence slender, 1.5-(2.2)-2.9 cm. long, bracts about 1 mm. long, slightly cuspidate, cyathiform glands sessile. Pistillate flowers solitary, sepals 2-3, cuneate, about 1.5 mm. long, very slightly serrulate; cells of the ovary 2, rarely 3; styles 2-3, about

2-3 mm. long, united below. Staminate flowers 5-7 in a cymule, the individual flowers about 1 mm. long, 1.5 mm. wide, deeply 2-lobed, the lobes cuspidate, entire. Fruit 6-8 mm. wide, slightly 2-3 lobed, the central column deciduous, the lobes of the gynobase 3-4 mm. long; seeds about 6 mm. long, 5.5 mm. wide, the testa smooth, shiny, the micropylar end very slightly flattened, the base rounded, the caruncle small.

Distribution and habitat: thick underbrush in woodland associations of pines, oaks and junipers, in mountains, at altitudes up to 3100 m. Flowers and fruits from the last of June through October.

MEXICO: COAHUILA: summit of Mt. Jimulco, 13 kilo. east of Jimulco, Stanford, Retherford & Northercraft 94 (NY, UC, MBG); mountains, Jimulco, Pringle 128 (CM, NY, G). HIDALGO: near Ixmiquilpan, Rose, Painter & Rose 8953 (US); Ixmiquilpan, Purpus 1454 (MBG, UC, CM, NY, G). GUANAJUATO: "sur la montagne pres de Guanajuato", Duges s.n. (US, CM). PUEBLA: rocky places, Tehuacan, Purpus 1320 (UC).

It is unusual to find a species of Stillingia with two carpels and two sepals. If the dimerous structures were constant features, a third subgenus might well be established for this species. Since, however, both dimerous and trimerous pistillate flowers are found on the same plant, I have not considered this procedure to be advisable.

5. *STILLINGIA ZELAYENSIS* (HBK.) Muell. Arg. in *Linnaea* 32: 87. 1863.

*Sapium zelayense* HBK. Nov. Gen. et Spec. 2: 51. 1817 (T.: Mexico, "prope Zelaya", Humboldt & Bonpland s.n.).

Erect subshrubs 0.5-1.5 m. tall, the fascicled stems arising from an enlarged woody rhizome. Stems terete below, angled above, the older stems hollow, woody, the secondary branches opposite or fascicled, solid or with a small pith, subherbaceous, without lenticels. Leaves petiolate, elliptic to oblanceolate to spatulate, acute to acuminate, base acute, usually with 2 or more cyathiform glands, 2.8-(6.44)-12.5 cm. long, 1.2-(2.5)-4.0 cm. wide, callose-serrulate, membranaceous, slightly decurrent, the secondary venation prominent; petiole 0.1-(0.4)-0.9 cm. long. Inflorescence 5.3-(10.35)-16.0 cm. long, crowded, the staminate cymules overlapping, the peduncle elongate and somewhat thickened below the lowest pistillate flower, the bracts about 1.5 mm. long, 1.5-2.0 mm. wide, the cuspidate tip glandular, the patelliform glands sessile. Pistillate flowers solitary, the sepals 3, about 2 mm. long, cuspidate, serrulate; styles about 3 mm. long. Staminate flowers 3-5 in a cymule, about 3 mm. long, the deeply 2-lobed calyx serrulate. Fruits 0.6-1.8 cm. wide, shallowly 3-lobed, the central column more or less deciduous, the lobes of the gynobase 0.3-0.9 cm. long; seeds about 5.5-6.5 mm. long, 5.5-7.0 mm. wide, testa smooth, shiny, flattened at the micropylar end, the basal

end rounded to slightly flattened, the caruncle small. Distribution and habitat: pine woods and barrancas, rocky hills, from about 1200 to 4000 m. altitude. Flowering mostly from about the last of March through the last of August, but occasional flowers in January and in October, and fruiting from June through October and occasionally in January.

MEXICO: CHIAPAS: Hacienda Monserrate, Purpus 9174 (G, MBG, CM, UC, US, NY), 9323 (UC); without locality Purpus s.n. (US); pine and oak forest, Fenix Chiapas? Purpus 10334 (NY). FEDERAL DISTRICT: east of Transfiguracion, Russell & Souvireu 205 (US). JALISCO: Santa Cruz, M. E. Jones 22 (US); Rio Blanco, E. Palmer 73 (US, NY); near Guadalajara, Pringle s.n. (CM). MEXICO: district of Tamasaltepec, Penon, Hinton 4409 (G); district of Tamasaltepec, Tamasaltepec, Hinton 1127 (US, CM, G, NY). MORELOS: rocky hill near El Mirador, road from Cuernavaca to Mexico, Williams 3814 (G); Valle del Tepetit, Lyonnnet 988 (US); barranco near Cuernavaca, Pringle 7266 (G); pine woods about Cuernavaca, Pringle 6886 (G, CM, UC, US, MBG, NY). MICHOACAN: vic. of Morelia, Arsene 6679 (US, MBG); vic. of Morelia, Arsene 5236 (G, MBG, US); Tancitaro region, above Acahuato, Munic. Apatzingan, Leavenworth & Hoogstraal 1821 (CM, G); hills near Tepitenga, between Toluca and Morelia, Greene 727 (MBG). PUEBLA: Cerro Tepoxuchil, pres Puebla, Nicolas s.n. (NY); vic. of Puebla, Cerro Tepoxuchil, Arsene 1400 (US, MBG, G); Rancho Losada, vic. of Puebla, Arsene 282 (CM).

SAN LUIS POTOSI: 22° N. Lat., Alt. 6000-8000 ft., Parry & Palmer 823 (MBG, US, G). State and locality unknown, Pavon s.n. (D, photos in CM, G).

GUATEMALA: GUATEMALA: without locality, Aguilar 93 (CM).

QUICHE: without locality, Aguilar 1314 (CM). SANTA ROSA: Zamorora, Heyde & Lux 4579 (US); without locality, Dean 6074 (NY, US, MBG, UN, CM, G).

PANAMA: CHIRIQUI: Boquete District, savannah, alt. 4000 ft., Davidson 750 (CM, US, MBG).

The type specimen of Stillingia zelayensis, collected by Humboldt & Bonpland, was labelled for locality "prope Zelaya". The actual locality is Celaya, Guanajuato, Mexico.

6. STILLINGIA TEXANA I. N. Johnston, in Contrib. Gray Herb. Univ. n.s. 67: 91. 1923.

Sanium sylvaticum var. linearifolia Torr. in Emory, Rep. U. S. & Mex. Bound. Surv. 2: 201. 1859 (T.: "Valley of the Rio Grande", Schott s.n.).

Stillingia sylvatica & linearifolia (Torr.) Muell. Arg. in DC. Prodr. 15<sup>2</sup>: 1158. 1866.

Stillingia angustifolia Engelm. ex. S. Wats. in Proc. Am. Acad. 18: 154. 1883 (T.: E. Palmer 1256), not S. sylvatica - angustifolia Muell. Arg.

Stillingia linearifolia Small, Fl. S. E. United States 704. 1903; not S. Wats. in Proc. Am. Acad. 14: 297. 1879.

Stillingia texana var. typica Waterfall, in Rhodora 50: 95. 1948.

Stillingia texana var. latifolia Waterfall, loc. cit.

1948 (T.: Waterfall 6523).

Loose erect subshrubs, 2.5-6.0 dm. tall, the fascicled stems arising from an enlarged woody rhizome, terete below, striate above, unbranched, or if branched, the branches fascicled near the apex of the main axis. Leaves sessile, linear to slightly lanceolate, acute, base narrowly obtuse, without cyathiform glands, 1-7 cm. long, 0.3-1.0 cm. wide, crenulate or glandular-crenulate, the glands either at the apex or in the sinus of the serrulation, membranaceous, the midrib prominent, decurrent. Inflorescence 3.0-(5.5)-8.0 cm. long, crowded, the pistillate flowers borne to the base of the peduncle; bracts narrowly cuspidate, not glandular, sharply denticulate, about 3 mm. long, the patelliform glands sessile. Pistillate flowers solitary; sepals 3, about 2.5 mm. long, serrulate; style about 3 mm. long. Staminate flowers 3-5 in a cymule, the individual flower about 2.5 mm. long, the deeply 2-lobed calyx slightly serrulate. Fruits 4-6 mm. wide, shallowly 3-lobed, the central column more or less deciduous, the lobes of the gynobase 2-3 mm. long; seeds 3-5 mm. long, 2.5-4.0 mm. wide, testa slightly rugulose, with a very slight depression at the micropylar end, the base flattened, the caruncle small. Distribution and habitat: on limestone soils, mostly in open prairie lands, occasionally on loamy black soils, in rolling country. Flowers from about the last of April through the middle of July, and fruits from the first of June through September.

UNITED STATES: OKLAHOMA: Murray County. TEXAS: Bell, Bexar, Bosque, Burnet, Comal, Concho, Erath, Fort Bend, Gillespie, Hays, Kendall, Kerr, Lampasas, Mills, Nolan, Parker, Real, Shackelford, Tarrant, Taylor, Travis, Washington, Williamson, Wilson, and Valverde counties.

MEXICO: COAHUILA: Municipio de Muzquiz, near Puerto Santa Ana, Wynnd & Mueller 225 (US, G, MBG, NY); Hacienda San Rafael, along the Sabinas River, Wynnd 705 (NY, MBG, US); Muzquiz, Marsh 80 (TEX, CM); Muzquiz, Yerba Spring, Marsh 291 (TEX).

One specimen was collected by C. Wright in New Mexico, without locality.

The nomenclatural problems of Stillingia texana are discussed by I. M. Johnston (in Contrib. Gray Herb. Harv. Univ. n.s. 67: 91. 1923), but it is not completely clear that Engelmann merely intended to raise Mueller's variety angustifolia to specific rank.

7. STILLINGIA SYLVATICA Garden, in L. Mant. I. 19. 1767.

(T.: "in Carolina meridionali", Garden s.n.).

Stillingia sylvatica var. salicifolia Torr. in Ann. Lyc. N.Y.

2: 245. 1826 (T.: "on the Canadian Riv." [Arkansas],

James s.n.).

Stillingia salicifolia (Torr.) Rafin. in Atl. Journ. 1(4); 146. 1832.

Stillingia lanceolata Nutt. in Trans. Am. Phil. Soc. n.s.

V: 176. 1837 (T.: "Arkansas", Fitcher s.n.).

stillingia sylvatica  $\alpha$  spathulata Muell. Arg. in DC. Prodr.  
15<sup>2</sup>: 1158. 1866 (T.: "Carolina", Bosc S.N.).

stillingia sylvatica  $\beta$  genuina Muell. Arg. loc. cit. 1866.

stillingia sylvatica  $\gamma$  angustifolia Muell. Arg. loc. cit.  
1866 (T.: "Florida" Mitchill S.N.).

stillingia spathulata Small, Fl. S. E. United States 704.  
1903.

stillingia salicifolia Small, loc. cit. 1903.

stillingia smallii Wootton & Standley, in Contrib. U. S. Nat.  
Herb. 19: 405. 1915.

Erect subshrubs 2.0-13.0 dm. tall. Roots fusiform. Stems arising singly or fascicled from an enlarged woody rhizome, terete or slightly striate, unbranched, or if branched the secondary branches fascicled near the apex of the main axis, angled or striate to terete. Leaves sessile or petiolate, elliptic or ovate, linear to spathulate, acute, rounded or emarginate, base narrowly obtuse without cyathiform glands, 3.2-(6.1)-11.5 cm. long, 0.3-(1.7)-4.8 cm. wide, serrate to crenulate, membranaceous, slightly decurrent, the midrib prominent; petiole when present 0.1-0.8 cm. long. Inflorescence 3.0-(7.35)-13.3 cm. long, usually crowded, the staminate cymes overlapping or distinct, the pistillate flowers inserted to the base of the peduncle, the bracts shortly cuspidate, not glandular, slightly dentate, about 2.5-3.0 mm. long, 2.5-3.0 mm. wide, the glands patelliform or cyathiform, sessile. Pistillate flowers solitary;

sepals 3, about 1.8-2.0 mm. long, 1.5-2.0 mm. wide, slightly cuspidate, serrulate; style 3-5 mm. long, united below. Staminate flowers 7-9 in a cyme, the individual flowers about 1.5 mm. long, the shallowly 2-lobed calyx entire to slightly serrulate. Fruits 0.6-1.2 cm. wide, shallowly 3-lobed, the lobes of the gynobase 3-6 mm. long; seeds 6-8 mm. long, 4.5-7.0 mm. wide, testa rugose, the micropylar end flattened, the base rounded, the caruncle large. Distribution and habitat: coastal plain, well drained sands, in open pine woods and sometimes on limestone, occasionally on roadsides and railroad banks. Flowers from March through June (in southern Florida from about the first of January) and fruits from April through September.

UNITED STATES: VIRGINIA: Isle of Wight, Nansemond, Sussex, and Southampton Counties. NORTH CAROLINA: Buncombe, Harnett, Iredell, Moore, Richmond, and Scotland Counties.

SOUTH CAROLINA: Aiken, Beaufort, Berkeley, Charleston, Clarendon, Georgetown, Hampton, Horry, and Lancaster Counties.

GEORGIA: Bullock, Columbia, Gwinnett, Habersham, Jasper, Macon, Meriwether, Richmond, and Wayne Counties. FLORIDA: Alachua, Baker, Bradford, Brevard, Broward, Charlotte, Citrus, Clay, Columbia, Dade, DeSoto, Dixie, Duval, Flagler, Gadsden, Gilchrist, Hardee, Hendry, Hernando, Highlands, Hillsborough, Jefferson, Lafayette, Lake, Lee, Leon, Levy, Liberty, Manatee, Marion, Monroe, Nassau, Orange, Palm Beach, Pasco, Pinellas, Polk, Putnam; St. John's, Sumter, Suwanee, Walton, Wakulla, Union, and Volusia Counties. ALABAMA: Dale, Henry,

Lee, and Mobile Counties. LOUISIANA: Natchitoches, and Rapides Parishes. MISSISSIPPI: Holmes County. TEXAS: Anderson, Angelina, Aransas, Austin, Bailey, Bastrop, Bexar, Brazos, Caldwell, Childress, Dallas, Denton, DeWitt, Dimmit, Erath, Fayette, Fort Bend, Goliad, Gonzales, Gregg, Guadalupe, Hardin, Hemphill, Houston, Hutchinson, Jackson, Jefferson, Kendall, Kenedy, Lamb, Lee, Leon, Lubbock, Medina, Montgomery, Nacogdoches, Newton, Nueces, Parker, Tarrant, Terry, Travis, Upshur, Walker, Waller, Washington, Wichita, Wilson, and Wood Counties. ARKANSAS: Crawford, Jefferson, and Miller Counties. KANSAS: Cowley, Harper, Montgomery, Morton, Sedgwick, and Stafford Counties. OKLAHOMA: Beaver, Beckham, Blaine, Caddo, Comanche, Cleveland, Ellis, Greer, Kingfisher, Kiowa, Logan, McClain, McCurtain, Muskogee, Oklahoma, Osage, Payne, and Roger Mills Counties. NEW MEXICO: Chaves, Harding, and Roosevelt Counties.

As is to be expected at the edge of a range, the species has differences which are notable, and specimens collected in the areas near the edge of the range appear quite different from the typical species, especially in vegetative characters, but also in some floral and seed characters.

I suspect that in Florida some variation may be due to intergression with Stillinia aquatica, but no data are available for delimitation and description.

It is not feasible to maintain an entity unless it may be accurately defined morphologically and geographically, at least. Accordingly I have not recognized variants, but have

recorded the extremes of variation in the species description.

8. *STILLINGIA AQUATICA* Chapm., Fl. South. U.S. 405. 1865.  
(T.: Apalachicola, Chapman S.M.).

*stillingia tenuis* Small in Bull. N. Y. Bot. Gard. 3: <sup>429</sup>~~279~~.  
1905 (T.: Small & Wilson 1580).

Loose, erect shrubs 5.0-11.6 dm. tall, arising from a tap root, the single terete stems tapering gradually from the base, leafless below the branches, the secondary branches fascicled near the apex of the main axis, the leaf bases prominent on the older stems. Leaves petiolate, lanceolate to linear, acuminate to acute, the base narrowly obtuse, without cyathiform glands, 3.5-(5.9)-8.5 cm. long, 0.4-(1.15)-1.7 cm. wide, irregularly crenulate-serrate, membranaceous, slightly decurrent, the midrib prominent; petiole 0.1-(0.25)-0.6 cm. long. Inflorescence 3.0-3.8 cm. long, crowded, the upper staminate and lower pistillate regions distinctly separate upon the peduncle, the bracts sharply cuspidate, about 2 mm. long, entire, the crateriform glands pedicellate. Pistillate flowers crowded at the base of the peduncle; sepals 3, rounded, slightly crenulate, about 1.5 mm. long, 1.0 mm. wide; styles about 4 mm. long. Staminate flowers 11-13 in a cymule, the individual flowers about 1.0 mm. long, the shallowly 2-lobed calyx entire. Fruit 5-6 mm. wide, deeply 3-lobed, the lobes of the gynobase 2.5-3.0 mm. long; seeds 2-4 mm. in diameter, testa strongly rugose, the flattened

micropylar end hippocrepiform, the base rounded, the caruncle small.

Distribution and habitat: in shallow ponds, wet pine barrens, edges of flat-woods ponds, swamps, wet sandy soils, moist ditches, in the Everglades.

UNITED STATES: GEORGIA: Sumter County. FLORIDA: Brevard, Collier, Dade, Franklin, Gadsden, Hendry, Lee, Palm Beach, Wakulla, and Washington Counties.

9. *STILLINGIA ACUTIFOLIA* (Benth.) Benth. ex. Hemsl. Biol. Centr.-Amer. Bot. 3: 135. 1883.

*Sapium acutifolium* Benth. Pl. Hartweg. 90. 1842 (T.: Hartweg 614).

*Gymnostilllingia acutifolia* (Benth.) Muell. Arg. in Linnaea 32: 89. 1863.

*Gymnostilllingia macrantha* Muell. Arg., loc. cit. 90. 1863 (T.: "Nueva Espana", Pavon s.n.).

*Stillingia macrantha* (Muell. Arg.) Benth. ex Hemsl. Biol. Centr.-Amer. Bot. 3: 135. 1883.

*Stillingia propria* Brandg. in Univ. of Cal. Pub. Bot. 6: 185. 1915 (T.: Purnue 2343).

Compact shrubs or small trees 1-(1.5)-7 m. tall, the trunk up to 12.5 cm. in diameter below the lowest branches; branches alternate to fascicled, terete below, angled above, the older branches sparsely lenticellate, the sap milky. Leaves petiolate, ovate or lanceolate to elliptic, acuminate, the base acute, without cyathiform glands, 2.8-(7.0)-15.0 cm. long, 1.0-(1.5)-4.3 cm. broad, membranaceous, dark green

above, paler beneath, the secondary venation prominent; petiole distinct, about 2-5 mm. long. Inflorescence 2.5-(3.5)-4.2 cm. long; bracts about 1.5 mm. long, cuspidate, the glands patelliform, sessile. Pistillate flowers solitary, with minute or rudimentary sepals; styles about 2 mm. long. Staminate flowers solitary, about 2 mm. long, the calyx lobes entire. Fruit 3-4 mm. wide, deeply 3-lobed, the central column persistent, the lobes of the gynobase 1.5-2.0 mm. long; seeds about 3.5 mm. long, 2.5-3.0 mm. wide, with a slight depression on each side of the raphe at micropylar end, the base rounded, the testa smooth, the caruncle absent.

Distribution and habitat: mountainous regions of Chiapas and Guatemala in damp wooded regions, open banks, barrancas in pine forests, white sand slopes, at altitudes from 1400 to 3000 m. Flowers from late June to the first of September, and fruits from the first of August to the last of December.

MEXICO: CHIAPAS: Cerro del Boqueron, Purpus 2243 (MBG, G, NY, CM); Siltepec, Matuda 1693 (NY, UM).

GUATEMALA: CHIMALTENANGO: Volcan Acatenango, Kellerman 6576 (CM); Chichavac, Skutch 29 (US); west of Patzum, Williams & Molina 11844 (CM, MBG); Alameda, J. R. Johnston 951 (CM, NY); near Rio Pixcayo, between Chimaltenango and San Martin Jilotepeque, Standley 64330 (CM); Barranco de La Sierra, southeast of Patzum, Standley 61510 (CM, NY); near Farramos, Standley 59880 (CM); region of Los Positos, above Las

Calderas, region of Las Calderas, Standley 57801 (CM).  
GUATEMALA: Ruano 1258 (CM); Aguilar 220 (CM). HUEHUETE-  
NANGO: Todos Santos, Melhus & Goodman 3617 (CM); San Juan  
Atitan, Skutch 1165 (US, CM). JALAPA: between Jalapa and  
Montana Miramundo, Steevermark 32895 (CM). QUEZALTENANGO:  
Aguas Calientes, Seler 2741 (US, G, NY); Cumbre de Tuilacan,  
southwest of San Martin Chile Verde, Standley 67787 (CM);  
region of Boxantin, southeast of San Martin Chile Verde,  
Standley 81827 (CM). SACATEPEQUEZ: along Rio Guacalate, on  
road between Antigua and Chimaltenango, Standley 81010 (CM).  
SAN MARCOS: mountains along the road between San Marcos and  
Serchil, Standley 85327 (CM); El Boqueron, near border of  
Dept. Quezaltenango, Standley 66284 (CM); El Boqueron, in  
the mountains at the summit of the road between San Antonio  
Sacatepequez and Palestina, Standley 85280 (CM); roadside,  
above Rio Tacana, near San Antonio, Standley 66165 (CM).  
SANTA ROSA: Santa Rosa, Heyde & Lux 3473 (G, CM, US, NY).  
SOLOLA: Encuentros, L. Q. Williams 13150 (CM); Los Encuen-  
tros, Seler 2381 (G, US). TOTONICAPAN: along road between  
San Francisco El Alto and Momostenango, Standley 84033 (CM).  
ZACATEPEQUE: Bernoulli & Cario 2499 (K). Dept. unknown,  
Hacienda de Argueta, Hartweg 614 (K).

10. *STILLINGIA TRECULIANA* (Muell. Arg.) I. M. Johnston, in  
Contrib. Gray Herb. Harv. Univ., n.s. 67: 91. 1923.  
*Sapium annuum*, var. *dentatum* Torr. in Emory, Rep. U.S. & Mex.  
Bound. Surv. 2: 201. 1859 (T.: Eagle Pass, 1852, Bigelow,  
S.N.).

Gynanthes Treculiana Muell. Arg. in Linnaea 34: 216. 1865  
(T.: Trecul 1458).

Sebastiania Treculiana (Muell. Arg.) Muell. Arg. in DC.  
Prodr. 15<sup>2</sup>: 1160. 1866.

Stillingia Torreyana S. Wats. in Proc. Am. Acad. 14: 298.  
1879 (T.: Eagle Pass, 1852, Biselow s.n.).

Stillingia dentata (Torr.) Britt. & Rusby, in Trans. N.Y.  
Acad. 7: 14. 1887.

Spreading perennial herbs 1.0-4.5 dm. tall, the elongate tap root woody, the fascicled branches arising from the ground level, striate, green. Leaves sessile, spiral, obovate-spathulate, rounded to broadly acute, base narrowly cuneate, without cyathiform glands, coarsely incised-dentate, 1.0-3.8 cm. long, 0.6-1.5 cm. wide, membranaceous, decurrent, the midvein prominent. Inflorescence 2.5-(4.4)-7 cm. long, bracts about 1 mm. long, 0.8 mm. wide, cuspidate, the patelliform glands nearly sessile. Pistillate flowers solitary, sepals minute, fugacious; styles about 1 mm. long. Staminate flowers solitary, about 1.5 mm. long; calyx deeply lobed, the margin incurved, entire. Fruit deeply 3-lobed, the central column persistent, the lobes of the gynobase 0.8-1.0 mm. long; seeds about 2.5 mm. long, 1.5-2.0 mm. wide, with a slight depression on each side of the raphe at the micropylar end, the base rounded, the testa smooth or slightly rugulose, the caruncle present.

Distribution and habitat: sandy soils with limestone base, gravel, hills, mesas, grasslands, along railroads and road-

sides in southwestern Texas and northeastern Mexico. Flowers from the last of February to the first of June, and fruits from the last of March through the first of August.

UNITED STATES: TEXAS: Bexar, Cameron, Concho, Crockett, Dimmit, Duval, El Paso, Hidalgo, Kimble, Kleberg, Maverick, Presidio, Star, Tom Green, Val Verde and Webb Counties. MEXICO: COAHUILA: Allende, Marsh 1268 (CM); Muzquiz, Marsh 1116 (CM); Cuatro Ciénegas, Shreve 8454 (UC); Sabinas, M. E. Jones 29115 (MBG, UC). NUEVO LEON: Mesas, Garcia, Pringle 2504 (NY, MBG, G, US, UC, CM); 100 kilo. south of Nuevo Laredo, on road to Monterrey, Frye & Frye 2175 (US, G, MBG, NY); near Santa Catarina, Alonis, Johnson & Barkley 15189M (G, CM, TEX, MBG); 23 miles north of Sabinas Hidalgo, Barkley & Webster 14497 (MBG, TEX, UC); canyon 12 miles west of Monterrey, Painter & Barkley 14253 (MBG, G, TEX); 10 miles west of Monterrey, Shreve & Tinkham 9572 (G); Rancho Resendez, Lampazos, Edwards 389 (MBG, CM, UC, TEX); Monterrey, E. Palmer 1258 (G, US). TAMAULIPAS: San Miguel, Pringle 2071 (CM).

There has been some confusion concerning S. Treculiana as to whether it is an annual or perennial. This confusion arose from the original description of Sanium annuum var. dentatum made by Torrey. He could easily have called this plant an annual since the specimen used as a type was a small fragment, without roots. Mueller however, definitely states in his description of Gymnanthes Treculiana that the plant is perennial. Examination of material from several

herbaria amply corroborates his observation.

11. *STILLINGIA PAUCIDENTATA* S. Wats. in Proc. Am. Acad. 14: 298. 1879 (T.: E. Palmer 512).

stillingia linearifolia var. paucidentata (S. Wats.) Jepson, Fl. Cal. 2<sup>1</sup>: 422. 1936.

Compact, erect perennial herbs 2.5-3.5 dm. tall, the elongate tap root woody, the fascicled, striate branches arising from ground level. Leaves sessile, linear, acuminate or acute, not narrowed at the base, without cyathiform glands, 2-(3.5)-4 cm. long, 0.1-(0.25)-0.3 cm. wide, sparsely setulose-denticulate to entire, the midvein prominent, decurrent. Inflorescence 2.3-(4.6)-7.0 cm. long, bracts about 1 mm. long, the patelliform glands short-pedicellate (less than 1 mm.). Pistillate flowers solitary; sepals absent; styles about 4 mm. long. Staminate flowers solitary, about 1.5 mm. long; calyx shallowly 2-lobed, slightly serrulate. Fruit deeply 3-lobed, the central column persistent, the lobes of the gynobase 1.5-2.0 mm. long; seeds about 3 mm. long, 2 mm. wide, testa smooth, the caruncle small.

Distribution and habitat: in sandy washes, plains, bare arid hills and gravel, up to 4000 ft. altitude. Flowers from the first of April through the end of May, and fruits from about the first of May through the middle of June. UNITED STATES: CALIFORNIA: Kern, Los Angeles, and San Bernardino Counties.

12. *STILLINGIA SPINULOSA* Torr. in Emory, Notes Milit.  
Reconn. 151. 1848 (T.: in sandy desert w. of the Colorado, California, Emory S.R.).

*Senium annuum* Torr. in Emory, Rep. U. S. & Mex. Bound. Surv.  
2: 201. 1859 (T.: idem.).

*stillingia annua* (Torr.) Muell. Arg. in DC. Prodr. 15<sup>2</sup>;  
1160. 1866.

Compact perennial herbs 0.5-(1.0)-2.0 dm. tall, the elongate tap root woody, the fascicled striate branches arising from ground level. Leaves sessile, elliptic-spathulate, acuminate, base narrowly cuneate without cyathiform glands, finely callose-dentate, 1.5-4.0 cm. long, 0.5-1.7 cm. wide, membranaceous, decurrent, prominently 3-costate. Inflorescence 1.3-2.0 cm. long; bracts about 1 mm. long, cuspidate, somewhat 3-lobed, the patelliform glands pedicellate, 1.5-2.0 mm. long. Pistillate flowers solitary, sepals absent; styles about 3 mm. long. Staminate flowers solitary, about 1.5 mm. long; calyx shallowly 2-lobed, entire. Fruit deeply 3-lobed, central column persistent, the lobes of the gynobase about 2 mm. long; seeds 3.0-3.5 mm. long, the testa smooth, sometimes mottled, the caruncle absent.

Distribution and habitat: sandy open desert. Flowers from late December to late March, and fruits from March to June.

UNITED STATES: ARIZONA: Yuma County. CALIFORNIA: San Diego, Riverside, Imperial and San Bernardino Counties.

MEXICO: BAJA CALIFORNIA: Mesa near Cerro Breto, Cucapa Mts., MacDougal 206 (NY). SONORA: Colonia Lerdo, MacDougal

S.M. (NY); Buena Mesa near Col. Riv., MacDougal S.M. (NY);  
Pimeria Alta, Schott S.M. (NY).

Torrey described Stillingia spinulosa in 1848, but changed  
the name in 1859 to Sapium annuum, using the same specimens.  
No explanation was given for this change.

13. STILLINGIA LINEARIFOLIA S. Wats. in Proc. Am. Acad. 14:  
297. 1879 (T.: E. Palmer 449).

Stillingia cyanogyna Pax & K. Hoffm. in Engl. Pflanzenr. 4,  
Fam. 147, V: 196. 1912 (T.: idem.).

Diffuse perennial herbs 1.5-(5.8)-9.0 dm. tall, the  
elongate tap root woody, the fascicled, terete branches  
arising from ground level. Leaves sessile, linear, acute,  
base narrowly acute, without cyathiform glands, entire or  
sparsely denticulate, 1.2-3.2 cm. long, 0.1-0.3 cm. wide,  
membranaceous, shortly decurrent, the venation not prominent.  
Inflorescence 1.6-(3.95)-7.0 cm. long, the bracts cuspidate,  
entire, about 1 mm. long, the cyathiform glands pedicellate,  
about 1 mm. long. Pistillate flowers solitary; sepals ab-  
sent; styles about 2 mm. long. Staminate flowers solitary,  
about 1 mm. long, calyx shallowly 2-lobed, entire or slightly  
serrulate. Fruit deeply 3-lobed, the central column decid-  
uous, the lobes of the gynobase about 1 mm. long; seeds  
about 1.8-2.5 mm. long, 1.5-1.8 mm. wide; testa smooth,  
sometimes mottled, the caruncle absent.

Distribution and habitat: desert sands, lava rocks, chap-  
arral, dry sandy washes, and sandy roadsides. Flowers from  
the first of March to the end of April, and fruits from the

middle of March to the middle of June.

UNITED STATES: CALIFORNIA: Imperial, Los Angeles, Riverside, San Bernardino, and San Diego Counties. NEVADA: Clark County.

MEXICO: BAJA CALIFORNIA: sandy arroyo margin, San Augustin, Gentry 4004 (MBG, UC, G); 11 km. southeast of San Augustin on road to Catavina, Carter, Alexander & Kellogg 1877 (MBG); lagoon head, Guadalupe Island, E. Palmer 785 (G, US, CM); 37 mi. S. of Pozo Aleman, Shreve 7018 (UM, US, CM); 12 mi. E. of San Ignacio, Shreve 7018 (UM, US, CM); sandy plains, Calmalli, Purpus 25 (US, CM); Yecate, Orcutt s.n. (MBG, CM); Socorro, Orcutt s.n. (MBG, CM); coast near Ascension Island, Brandes s.n. (UC); Cordon Grande, Brandes s.n. (G, CM); lava rocks, San Quintin, Engel & Stewart s.n. (CM, US); south slope 8 mi. from Rosario on road to El Marmol, Wiggins 4337 (G, US); sandy wash at junction of El Marmol and San Fernando roads, 25 mi. from El Marmol, Wiggins 4354 (UM, UC, G, US, NY); sandy flats 32 mi. S. of Pozo Aleman, Wiggins 7880 (UM, UC, CM, US, NY); sandy wash 11 mi. E. of San Ignacio, Wiggins 7913 (UM, UC, CM, US, NY); along Rio Santo Domingo about 4 miles above the Mission, Wiggins & Demaree 4778 (G, UC, UM, NY, US, CM). SONORA: 30 mi. SW of Sonoyta on road to Punta Penasco, Shreve 7591 (US, CM, MBG, UM); llano 30 mi. from Sonoyta, Wiggins 8159 (UM, UC, US); 28 mi. S. of Sonoyta on road to Punta Penasco, Keck 4183 (NY).

DOUBTFUL SPECIES

Stillingia cruenta Standl. & Steyerl. in Field Mus. Pub.  
Bot. 23: 125. 1944.

Stillingia haematantha Standl. in Ann. Mo. Bot. Gard. 27:  
314. 1940.

Since these two species have been collected only in flower, without mature fruit, their status is doubtful. Their floral structures, particularly the nature of the staminate flowers, indicate affinities with Sapium, but until the mature fruit is known, it is impossible to assign them to species.

EXCLUDED SPECIES

Stillingia appendiculata Muell. Arg. in Linnaea 32: 87.

1863 = Sapium appendiculatum (Muell. Arg.) Pax & K.

Hoffm. in Engler, Pflanzenr. 4, Fam. 147, V: 214. 1912.

Stillingia fruticosa Bartr., Trav. 474. 1791 = Sebasti-  
ania fruticosa (Bartr.) Fern. in Rhodora 46: 45. 1944.

Stillingia ligustrina Michx., Fl. Bor. Amer. II: 213. 1803 =  
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- Chapman, A.W. 191, s.n. (7); s.n. (8).  
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Croft, M.B. s.n., 24 (10).  
Cummings, E.J. s.n. (7).  
Curtiss, A.H. 2508, 4276, 4851 (7); 2509, 5892 (8).  
Cuthbert, A. s.n., 1316 (7).  
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Dean, C.C. 6074 (5); s.n. (8).  
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- Ferris, R.S., & Duncan, C.D. 3413 (7).  
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Frye, T.C., & E.M. 2375 (10); 2493 (1).  
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- Hall, E. 561 (6).  
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Leavenworth, M.C. s.n. (8).  
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- Mueller, C.H. 2026, 2668 (1).  
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Nash, G.V. 366, 1850, 2428 (7); s.n. (10).  
Neally, G.C. 216 (10); s.n. (7).  
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- Parish, S.B., & W.F. 706, 1371 (12); 1372 (11).  
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- Riedel, M. s.n. (7).
- Rodriguez, J.V. 860, 2158, 3130 (3).
- Rolfs, P.H. 418, s.n. (7).
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- Rose, J.N., Painter, J.H., & Rose, J.S. 8953 (4).
- Rose, L.S. 34494, 36840 (13); 36794, 38343, s.n. (12);  
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- Rose-Innes, R., & Moon, B. 295 (7); 1297 (10); 1317 (6).
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- Schallert, P.O. 1390 (7); s.n. (12).
- Schott, A. s.n. (6); s.n. (10); s.n. (12).
- Scull, L.E. s.n. (8).
- Seibert, R.J. 1219 (8).
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- Shreve, F. 7018, 7038, 7392, 7591 (13); 8454 (10).
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- Sinclair, J.F. s.n. (10).
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- Small, J.K. 4061, 8344 (8); 7260, 8591, s.n. (7).

- Small, J.K., & Carter, J.J. 65, 515, 716, 1054, 1438, 1439,  
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- Small, J.K., Carter, J.J., & Small, G.K. 3241 (7).
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- Small, J.K., DeWinkeler, J.B., & Mosier, C.A. 11235 (8).
- Small, J.K., & Mosier, C.A. 5900, 6698 (7).
- Small, J.K., Mosier, C.A., & Small, G.K. 6600, 6724 (7);  
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- Small, J.K., & West, E. 16034, 16035 (7); 16008 (8).
- Small, J.K., & Wherry, E.T. 12012 (10).
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- Stanfield, S.W. s.n. (7).
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