

found in widely scattered portions of the state as an occasional weed. COLLECTION DATA: Pike Co., Jackson Twp., in an old field head of Toad Heaven Hollow; *Floyd Bartley*, May 17, 1947. Other collections from Greene, Lake, Lawrence, and Ottawa counties.—DEPARTMENT OF BOTANY, OHIO WESLEYAN UNIVERSITY, DELAWARE, OHIO

A TAXONOMIC STUDY OF THE GENUS *PHYSALIS* IN NORTH AMERICA NORTH OF MEXICO

U. T. WATERFALL

(Continued from p. 114)

KEY TO GROUPS OF SPECIES OR TO UNIQUE SPECIES

1. Corolla yellow, yellowish-green or white, with or without darker spots; plant surfaces without crystalline vesicles; enlarging ovules all of one kind.
 2. Corolla with broad shallow sinuses between the lobes; fruiting calyx reddish.....1. *P. Alkekengi*.
 2. Corolla truncate; fruiting calyces not red.
 3. Plants covered with stellate or variously branched trichomes, or glabrous with a few stellate hairs on the sepals or sometimes on the leaf margins.....GROUP I.
 3. Plants nearly glabrous, or variously hairy, but branched hairs, if present, very small and inconspicuous and usually much less numerous than the short unbranched hairs mixed with them.
 4. Anthers (2) 3–5 mm. long; perennials excepting *P. ixocarpa* and *P. Wrightii*.....GROUP II.
 4. Anthers (.5) 1–2.3 (2.8) mm. long; annuals
 5. Plants nearly glabrous, usually with a few short curved or appressed hairs on the sepals or young parts. GROUP III.
 5. Plants long-hairy, sometimes with shorter hairs or glands intermixed.....GROUP IV.
 1. Corolla blue to purple (rarely white), or yellow and with plump seedlike corky bodies mixed with the reniform seeds.
 6. Corolla blue to purple (rarely white), rotate; no corky bodies mixed with the seeds; herbage with few to many crystalline vesicles, sometimes giving it a scurfy look.....21. *P. lobata*.
 6. Corolla yellowish, funnelform; plump, rounded, corky seedlike bodies mixed with the reniform seeds.....22. *P. Carpenteri*.

GROUP I

1. Hairs stellate, each ray sometimes rebranched, the verticils sometimes in more than one series, and sometimes the branches irregularly arranged; or plant with a coat of short stellate hairs, plus either long-stiped branched hairs, or simple hairs.
2. Leaves ovate to narrowly linear, their blades mostly 2.5–6 times longer than the petiole, sometimes decurrent on it; corolla usually not dark spotted, or with spots not very prominent in herbarium specimens (rarely with prominent dark spots and more or less spatulate leaves); maritime

plants extending from southeastern Va. to the Gulf Coast of Texas.

3. Leaf blades ovate, spatulate, lanceolate or linear-lanceolate (sometimes linear in intergrades with *P. angustifolia*); mostly stellate-vestite, but nearly glabrous in one form of var. *Elliottii*.

4. Leaf blades ovate to spatulate.

5. Leaves with definite petioles usually about one-third to one-fourth the length of the blade; whole leaf (1.7) 2–3 (3.4) times longer than wide; se. Va. to Fla.

6. Leaf blades usually 2–4 (5) cm. wide.

2a. *P. viscosa*, var. *maritima*, f. *maritima*.

6. Leaf blades usually 5–7 cm. wide.

2a. *P. viscosa*, var. *maritima*, f. *latifolia*.

5. Leaves tapering to the base, or extending gradually into winged petioles; whole leaf (2) 2.5–4 (4.7) times longer than wide; Gulf Coast of Texas.

2c. *P. viscosa*, var. *spathulaefolia*.

4. Leaf blades lanceolate to linear-lanceolate; leaves mostly 2.5–10 times longer than wide.

7. Plants stellate-vestite . . . 2b. *P. viscosa*, var. *Elliottii*, f. *Elliottii*.

7. Plants glabrous except on the margins or the tips of the sepals, and sometimes on the leaf margins.

2b. *P. viscosa*, var. *Elliottii*, f. *glabra*.

3. Leaves linear, often ca. 8, but sometimes from 1–20 times longer than wide; plant glabrous except the tips or margins of the sepals . . . 3. *P. angustifolia*.

2. Leaves mostly ovate, sometimes reniform, ovate-deltoid, or ovate-lanceolate, their blades mostly (1.2) 1.5–2 (3) times as long as their petioles; corolla dark-spotted; mostly plants of the south central plains, but extending to the Gulf Coast of Texas.

8. Hairs 1–4 mm. long on at least the calyx or the base of the stem, in addition to stellate hairs covering herbage. . . 4. *P. variovestita*.

8. Plants without hairs 1–4 mm. long intermingled with shorter stellate ones.

9. Flowering calyces (6) 7–10 mm. long; vestiture forming a dense mat, at least beneath the leaves; leaves dentate.

2d. *P. viscosa*, var. *mollis*.

9. Flowering calyces mostly (3) 5–7 (9) mm. long; vestiture usually sparse; leaf margins dentate, undulate or entire.

2e. *P. viscosa*, var. *cinerascens*.

1. Hairs jointed, those of the stem mostly 1–2 mm. long and spreading at right angles to the stem giving it a bristly appearance; hairs 2- or 3-branched, not having a second coat of short stellate hairs. 5. *P. pumila*.

GROUP II

1. Long cord-like rhizomes present near the surface of the soil; found in Fla. and adjacent areas.

2. Plants with hairs short and antrorse, sometimes viscid.

6a. *P. arenicola*, var. *arenicola*.

2. Plants ciliate with jointed hairs 1.5–2 mm. long.

6b. *P. arenicola*, var. *ciliosa*.

1. Plants with deeply buried, seldom-collected rhizomes, or possibly other perennating structures, or, in one species, annual.
3. Anthers blue, ca. 3 mm. long; corolla blue- or purple-spotted; leaves lanceolate; perennials of s. Ariz. and adjacent Mexico.
11. *P. caudella*.
3. Anthers often yellow; if anthers blue, then plants not lanceolate-leaved perennials with purple-spotted corollas native to s. Ariz. and adj. Mexico.
4. Corolla usually dark-spotted near the base of its limb; flowering peduncles 3–15 mm. long; if corolla not noticeably dark-spotted, then flowering peduncles ca. 3–8 mm. long.
5. Flowering peduncles usually 10–15 mm. long; corolla limb usually not reflexed when fully open; plants primarily of the eastern and northern U. S.
6. Vestiture villous; hairs jointed.
7. Filaments as wide as the anthers to about one-third as wide, sometimes clavate; leaves blunt to pointed; anthers yellow to light blue.
8. Anthers (3) 3.5–4.5 mm. long; filaments often clavate.
9. Bases of stems not thickened and subligneous.
10. Vestiture of stems various, but not of abundant hairs 2–4 mm. long.
- 7a. *P. heterophylla*, var. *heterophylla*.
10. Vestiture of abundant hairs 2–4 mm. long; Ala. and Fla. 7c. *P. heterophylla*, var. *villosa*.
9. Bases of stems thickened and subligneous; se. Va. 7b. *P. heterophylla*, var. *clavipes*.
8. Anthers (2) 2.5 (3) mm. long; filaments not clavate. 9a. *P. virginiana*, var. *virginiana*.
7. Filaments slender; leaves acuminate; corolla spots and anthers deep blue-purple; introduced. *P. peruviana*.
6. Vestiture not villous.
11. Flowering calyx campanulate, the lobes spreading, 4–5 mm. wide at base and 15–20 mm. wide at tips.
- 9g. *P. virginiana*, var. *campaniforma*.
11. Flowering calyx not as above.
12. Hairs of stem short, retrorse.
- 9a. *P. virginiana*, var. *virginiana*.
12. Hairs not short and retrorse, often antrorse.
13. Anthers light blue, or tinged with light blue.
14. Fruiting calyx 2.5–3.5 cm. long and 2–3 cm. wide. 9b. *P. virginiana*, var. *subglabrata*, f. *subglabrata*.
14. Fruiting calyx 4–5 cm. long and 3–4 cm. wide. 9b. *P. virginiana*, var. *subglabrata*, f. *macrophyssa*.
13. Anthers yellow.
15. At least a few stiff spreading hairs about 1 mm. long on the flower buds, leaf margins or stems; thick-leaved plants of the prairie region westward, usually in sand.
- 9e. *P. virginiana*, var. *hispida*.

- 15. Plants without stiff spreading hairs.
- 16. Principal leaves ovate; plants nearly glabrous usually several-branched from the base, and spreading; s. Tex.
 - 9c. *P. virginiana*, var. *texana*.
- 16. Principal leaves usually lanceolate to linear, if ovate then plant not with several spreading branches from near the base.
- 17. Plants usually single-stemmed, erect; larger basal leaves usually 5–10 cm. long. 9d. *P. virginiana*, var. *sonorae*.
- 17. Plants usually branched from the base; larger basal leaves usually 4–5 cm. long; s. Colo. . . . 9f. *P. virginiana*, var. *polyphylla*.
- 5. Flowering peduncles usually 3–8 mm. long; corolla limb often reflexed when fully open; plants primarily of the southern Rocky Mts. and westward.
- 18. Plants with long jointed hairs mixed with shorter hairs, or with glandular ones, or with only long jointed hairs.
- 19. Flowering calyx 8–11 mm. wide; anthers 1.5–3 mm. long; leaf blades frequently rotund; mostly in the north central prairies extending west into the Rockies. 10b. *P. hederæfolia*, var. *comata*.
- 19. Flowering calyx 4–8 mm. wide; anthers 3–4 mm. long; sw. Tex. to Colo. and westward.
 - 10a. *P. hederæfolia*, var. *hederæfolia*.
- 18. Plants without long jointed hairs; short hairs, or glandular ones present.
- 20. Anthers yellow, not prominently twisted after dehiscence; perennials.
- 21. A few short stiff branched hairs with a spread of ca. 1 mm. present at least on the calyces, sometimes abundant; leaves ovate to lanceolate.
 - 10c. *P. hederæfolia*, var. *cordifolia*.
- 21. Small branched hairs not present; leaves mostly ovate. 10a. *P. hederæfolia*, var. *hederæfolia*.
- 20. Anthers blue, 3 mm. long; strongly twisted after dehiscing; annuals. 13. *P. ixocarpa*.
- 4. Corolla not dark spotted, or with slightly darkened spots which hardly show when dry, sometimes turning blue when dry.
- 22. Flowering peduncles 3–8 (10) mm. long, shorter than the flowers, or about equalling them.
- 23. At least some of the hairs short, stiff and branched.
 - 10c. *P. hederæfolia*, var. *cordifolia*.
- 23. None of the hairs short, stiff and branched.
 - 10a. *P. hederæfolia*, var. *hederæfolia*.
- 22. Flowering peduncles (10) 12–20 (50) mm. long, somewhat longer than the flowers to several times their length.

- 24. Corolla rotate, with 5 hairy pads exposed on its limb near the short tube; anthers blue, usually 2.5–3 mm. long; annuals. 14. *P. Wrightii*.
- 24. Corolla not rotate with 5 hairy pads exposed on its limb; anthers not blue and 3 mm. long; perennials.
- 25. Corolla remaining yellow when dried; leaves thick, often entire; flowering calyces usually 4–6 mm. long on peduncles from little longer than, to 6 or 7 times their length 12a. *P. crassifolia*, var. *crassifolia*.
- 25. Corolla often drying with a blue tinge; leaves thin, often toothed; flowering calyces usually 3–4 mm. long on peduncles 5–10 times their length.

12b. *P. crassifolia*, var. *versicolor*.

GROUP III

- 1. Fruiting calyx rather rounded, or 10-ribbed, but not strongly 5-angled.
 - 2. Leaves ovate to ovate-lanceolate; corollas usually 6–10 mm. long.
 - 3. Flowering peduncles usually 5–15 mm. long (as much as 3 times the length of the calyx); fruiting peduncles usually 20–30 mm. long, shorter than, to equalling, the fruiting calyces which are 25–35 mm. long; flowering calyces usually 4–5 mm. long with teeth 2–2.5 mm. long; s. U.S.
- 15a. *P. angulata*, var. *angulata*.
- 3. Flowering peduncles usually 15–40 mm. long (3–13 times the length of the calyces); fruiting peduncles usually 20–40 mm. long, equalling to 3 times as long as the shorter fruiting calyces which are 20–25 mm. long; flowering calyces usually ca. 3 (4) mm. long with teeth ca. 1 mm. long; s. cent. U. S. 15b. *P. angulata*, var. *pendula*.
 - 2. Leaves lanceolate to linear-lanceolate; corollas usually 4–5 mm. long; sw. U. S. 15c. *P. angulata*, var. *lanceifolia*.
 - 1. Fruiting calyx sharply and strongly 5-angled; corolla with 5 evident dark spots. 16b. *P. pubescens*, var. *glabra*.

GROUP IV

- 1. Corolla dark spotted; anthers usually some shade of blue or purple.
 - 2. Fruiting calyces 1.5–2.5 (3) cm. wide.
 - 3. Anthers (1.2) 1.5–2 mm. long; plants without capitate-glandular hairs, but sometimes viscid-glandular or with sessile glands.
 - 4. Leaves having a greyish surface, often with “mealy” or sessile glands; leaf blades usually toothed nearly to the base; mostly northeastern U. S. . . 16d. *P. pubescens*, var. *grisea*.
 - 4. Leaves not greyish, not having sessile glands.
 - 5. Leaves usually toothed nearly to the base with 5–8 teeth on each side of the seldom translucent blade; widespread. 16a. *P. pubescens*, var. *pubescens*.
 - 5. Leaves with few teeth, 3–4 on each side, or entire; blades mostly flaccid and translucent.
- 16a. *P. pubescens*, var. *integrifolia*.

3. Anthers (.3) 1–1.5 mm. long; capitate-glandular hairs usually mixed with long jointed ones. 17. *P. foetens*, var. *neomexicana*.
2. Fruiting calyces (2.5) 3–4 cm. wide; s. Ariz. 18. *P. latiphysa*.
1. Corolla yellow, unspotted, or sometimes slightly dark-tinged.
6. Flowering peduncles 2–5 mm. long, about equalling to twice as long as the calyces. 19. *P. missouriensis*.
6. Flowering peduncles mostly 15–20 (30) mm. long, 4–5 (7) times the length of the calyces. 20. *P. Greenei*.

1. ***Physalis Alkekengi* L.**, Species Plantarum 183. 1735; incl. *P. Francheti* Mast. in Gard. Chron. 2: 434 and 441. 1894.

Plants perennial, erect, usually unbranched, 30–60 cm. tall, glabrous or with a few scattered long hairs; leaves broadly ovate, or ovate-rhombic, the blades usually 5–12 cm. long and 4–9 cm. wide on petioles 2–4 cm. long; margins of the leaf blades from entire to irregularly few-toothed or undulate-dentate; flowers white, slightly 5-lobed with broad shallow sinuses about 2 mm. deep between the apices of the lobes; corollas 10–15 mm. long and 15–25 mm. wide; anthers 2.5–3 mm. long on slender filaments; flowering calyces 4–7 mm. long and 4–5 mm. wide, densely hairy with jointed trichomes about 1–1.5 mm. long; fruiting calyces reddish, 3–5 cm. long and 2.5–4 cm. wide, pendent on peduncles 2–3 cm. long.

TYPE: Not seen; Linnaeus states, "Habitat in Italia."

This species is cultivated or escaped, in northeastern U. S.; flowering in June; 19 sheets examined.

2. ***Physalis viscosa* L.**, Species Plantarum 183. 1753; other synonymy under the varieties to which the names are referred.

Perennials covered with stellate, or several-branched hairs, or nearly glabrous and having stellate hairs only on the calyces; leaves from ovate to linear-lanceolate, petiolate or with blade tapering to the stem; corolla yellowish, funnelform, with or without darker spots on the limb near its base, 8–20 mm. long; anthers yellow, about 3 mm. long; flowering calyx 3–10 mm. long on peduncles 10–20 mm. long; fruiting calyx 2–5 cm. long and 1.5–4 cm. wide on peduncles 1–4 cm. long.

***P. viscosa* L., ssp. *viscosa*.** *P. viscosa* L., loc. cit., as limited to the South American plants. Linnaeus cited *P. viscosa* from "Virginia, Bonaria." Since (1) only one element of this species, the part described by Chapman as *P. maritima*, barely extends into southeastern Virginia, since (2) it hardly matches the photographs of the Linnean types, and since (3) previous authors have restricted the application of the specific name, in its strictest sense, to the plants of South America, the present author believes that it is best to so delimit it.

South American material is usually more sparsely vestite with finer stellate hairs than most of ours, and has corollas slightly spotted to unspotted.

Occasionally in our populations of *P. viscosa*, *sens. lat.*, there appears a specimen which can hardly be distinguished from South American collections. Whether these are introductions from that continent, or represent gene combinations from within our population which produce phenotypes

similar to the South American plants, it is impossible for the author to determine.

Some examples are: ALABAMA: Alabama Co.: *Mohr* 26 (NY); TEXAS: Brazoria Co.: *Young* Apr. 22, 1918 (TEX); Houston Co.: *Fisher* July 25, 1914 (UC); Walker Co.: *Warner* 29 (NY).

P. fuscomaculata de Rouville ex Dunal, at least as to the few collections seen, is included here.

P. viscosa* ssp. *maritima (M. A. Curtis) Waterfall, comb. et stat. nov., based on *P. maritima* M. A. Curtis, Am. Journ. Sci. ser 2. 1: 407. 1849. Under this subspecies are included the maritime varieties listed below.

2a. ***P. viscosa* var. *maritima***; *P. Walteri* Nuttall, Journ. Acad. Nat. Sci. Phila. 7: 112. 1834; type from "South Carolina" (PH); *P. maritima* M. A. Curtis, loc. cit.; *P. viscosa* L., var. *maritima* (Curtis) Rydberg, Mem. Torr. Bot. Club 4: 357. 1896.

The varietal name is used above as a tautonym of ssp. *maritima*. However, since the author is utilizing the varietal concept for taxa with both morphological and distributional differences, taxa which he considers the principal subdivisions of complex species, and is using the subspecific category as an aggregation of similar varieties, he would prefer to transfer the specific name, in this case *maritima*, to the varietal status, letting the tautonym, without author citation, belong to the aggregate subspecies. This does not seem permissible under Article 15 of the International Rules.

Leaves ovate to spatulate, especially the upper ones; whole leaf (1.7) 2-3 (3.4) times longer than wide; from sparsely to usually densely vestite.

TYPE: M. A. Curtis, seacoast, North Carolina (GH); probable isotype, "sandy seacoasts" (NY).

This taxon grows on sandy seacoasts, southeastern Va. to Fla.; usually flowering in March, April and May, but sometimes in winter in the southern part of its range; 120 sheets of 93 collections seen.

Occasional is a large, broad-leaved form with leaf blades about 5-7 cm. wide as contrasted to the usual width of 2-4 (5) cm. in forma *maritima* (supra). It may be described as ***P. viscosa* f. *latifolia*** Waterfall, f. nov., laminae 5-7 cm. latis. The type is *Small, Mosier* and *DeWinkeler* 10892 (NY); isotype (GH); north part of Jupiter Island, Florida. Also seen from Florida were: Dade Co.: *Moldenke* 384 (DUKE), *Small* 2116 (NY).

2b. ***P. viscosa* var. *Elliottii*** (Kunze) Waterfall, comb. et stat. nov., based on *P. Elliottii* Kunze, *Linnaea* 20: 33. 1847.

Leaf blades lanceolate to linear-lanceolate; leaves mostly 2.5-10 times longer than wide; plants covered with stellate hairs, or nearly glabrous; corollas yellow, usually not dark-spotted, but sometimes prominently so.

TYPE: *Rugel* June 1843, "Ad ostium fluvii St. Marks in Florida" (NY). The type belongs to the vestite phase although it is only sparingly stellate on the leaf-surfaces and the stem.

This taxon grows in sands, Florida; apparently flowering throughout the year.

P. viscosa* f. *Elliottii. The following citations selected from 73 sheets of

58 collections: FLORIDA: Broward Co.: *Moldenke* 479 (DUKE, NY); Clay Co.: *Williamson* Aug. 1893 (PH); Dade Co.: *Small* and *Mosier* 5944 (DUKE, GH, NY); *Moldenke* 715 (NY); Hernando Co.: *McFarlin* 6079 (MICH); Highlands Co.: *Correll* and *McFarlin* 6219 (DUKE); Hillsboro Co.: *Churchill* Mar. 21, 1923 (GH, PH); Indian River Co.: *Small* 8894 (NY); Lee Co.: *Mosier* July 1928 (DUKE, NY); Manatee Co.: *Tracy* 7577 (GH, NY); Monroe Co.: *Sargent* 6417 (ARIZ); Pinellas Co.: *McFarlin* 3653 (MICH); St. John Co.: *Meredith* Feb. 4, 1899 (PH); Sarasota Co.: *McFarlin* July 1931 (MICH).

***P. viscosa* var. *Elliottii*.** f. *glabra* Waterfall, f. nov., foliis glabris, sepalis stellato-vestitis. Stellate hairs are found on the flowering sepals, or at least on their margins; a few are rarely present on the margins of the leaves. The TYPE is *Tracy* 7608, Sanibel Island, Lee County, Florida (NY), isotype (GH).

Selected from 42 sheets of 33 collections: FLORIDA: Collier Co.: *Deam* 60785 (DUKE); Dade Co.: *Small* 7410 (NY); Hillsborough Co.: *McFarlin* 5525 (MICH); Lee Co.: *Hitchcock* 237 (GH, NY); Monroe Co.: *Palmer* 376 (GH); Pinellas Co.: *Deam* 1948 (UC); Sarasota Co.: *McFarlin* 6091 (MICH).

An unusual, compacted short-leaved phase is sometimes found. It is represented by the following: *Small*, *Britton* and *DeWinkeler* 2328, pine-land-prairie, Tamiami trail west of Miami, Dade Co., Dec. 19, 1919; *Small* 8894, pinelands near Felsmere, Indian River Co., May 17, 1918; *Small* and *DeWinkler* 9979, Ancient sand dunes near Kuhiman, April 25, 1921, all in Florida. If there proves to be a population in this area, similar to the cited collections, it will probably justify nomenclatural recognition.

2c. ***P. viscosa* var. *spathulaefolia*** (Torr.) Gray, Proc. Amer. Acad. Arts and Sci. 10: 67. 1875. *P. lanceolata* Michx., var. *spathulaefolia* Torr., Bot. Mex. Bound. 153. 1859.

Leaf blades ovate to lanceolate to spathulate, tapering at base, or extending gradually into winged petioles; whole leaf (2) 2.5–4 (4.7) times longer than wide; corolla varying from apparently unspotted to having prominent dark spots; Gulf Coast of Texas; flowering irregularly throughout the year.

TYPE: *Schott* 30, seabeaches, Rio Bravo (Rio Grande?), Texas (NY).

The following selected from 65 sheets of 54 collections: LOUISIANA: Calcasieu Parish: *Palmer* 7707 (PH); TEXAS: Aransas Co.: *Tharp* 1620 (OKLA, TEX); Austin Co.: *Pennell* 10271 (NY, PH); Brazoria Co.: *Cory* 51057 (GH); Cameron Co.: *Clover* 1724 (MICH); Galveston Co.: *Nelson* Mar. 20, 1942 (TEX); Harris Co.: *Fisher* July 25, 1914 (NY); Jefferson Co.: *McVaugh* 6880 (MICH); Kenedy Co.: *Tharp* 48333 (OKLA, TEX); Matagorda Co.: *Wright* (GH); Nueces Co.: *Tharp*, *Johnson* and *Webster* Dec. 3, 1948 (TEX); San Patricio Co.: *Cory* 51249 (GH, US); Victoria Co.: *Tharp* 2512 (TEX, UC).

The following collections have prominently dark-spotted corollas: TEXAS: Austin Co.: *Tharp* Apr. 8, 1939 (TEX); Brazoria Co.: *Celerier* 51–41 (OKLA); Cameron Co.: *Lundell* 1073 (TEX); Kenedy Co.: *Lundell* 8714 (GH, MICH, NY, UC); Willacy Co.: *Johnston* 54169 (TEX).

P. viscosa* ssp. *mollis (Nuttall) Waterfall, comb. et stat. nov., based on *P. mollis* Nutt., Trans. Am. Phil. Soc. 5 (n.s.) 194. 1837. This is an inland population, here divided into two varieties, as compared with ssp. *maritima*, a maritime population divided above into three varieties.

2d. *P. viscosa* var. *mollis*. The varietal name is used here as a tautonym of ssp. *mollis*, hence it is listed without author-citation. However, the present author believes that the varietal category is best used as the principal division of a species, and that the subspecific category is most significantly used as a means of grouping varieties, just as a section may be utilized to group species within a genus.

TYPE: not seen; isotypes: *Nuttall*, Arkansas (NY, PH).

Leaves densely stellate-tomentose, at least beneath, dentate; plant usually erect; flowering calyces (6) 7–10 mm. long.

Growing in open woods, sandy areas and disturbed sites, western Arkansas, eastern Oklahoma and eastern Texas. There are many intermediates with var. *cinerascens*. Usually flowering in May and June, but specimens in flower have been collected in July and August.

Selected from 43 sheets of 34 collections; Arkansas: Franklin Co.: *Pennell 10621* (NY, PH); Pulaski Co.: *Merrill 1861* (UARK, OKLA); Sebastian Co.: *Bigelow* in 1853–54; Louisiana: Bossier Parish: *Correll 10058* (GH, DUKE, NY, PH); Jefferson Davis Parish: *Palmer 7629* (PH); Oklahoma: Choctaw Co.: *Houghton 4037* (GH, NY); Comanche Co.: *Clements 11767* (GH); Love Co.: *Hopkins 3429* (OKL); Marshall Co.: *Basler* Aug. 5, 1950 (OKL); Muskogee Co.: *Little 1515* (OKL); Texas: Callahan Co.: *Palmer 13811* (WIS); Denton Co.: *Whitehouse 15780* (MICH); Grayson Co.: *Gentry 51–392* (OKLA); Tarrant Co.: *Ruth 902* (WIS); Wilson Co.: *Rogers, Albers and Webster 6849* (TEX).

2c. *P. viscosa* var. *cinerascens* (Dunal) Waterfall, comb. nov., based on *P. pensylvanica* L. var. *cinerascens* Dunal, in De Candolle, *Prodromus* 13(1): 435. 1852; *P. mollis* Nutt., var. *cinerascens* (Dunal) Gray, *Proc. Amer. Acad. Arts and Sci.* 10: 66. 1875; incl. *P. mollis* Nutt., var. *parvifolia* Rydb., *Mem. Torr. Bot. Club* 4: 355. 1896.

Leaves dentate to entire, varying in size, probably due, at least in part, to seasonal heteromorphy; plants erect to spreading, or nearly procumbent; more or less densely covered with stellate hairs, but not tomentose; flowering calyx (3) 5–7 (9) mm. long; small-leaved forms have been segregated as var. *parvifolia*.

TYPE: Dunal cited "n. 83 et 2316 Berland. pl. exs. Mex." when he described var. *cinerascens*. Since he indicated no holotype, *Berlandier 2316*, circa Matamoros urbem, April 1831 (GH) is designated as Lectotype.

This taxon grows on prairies, plains and in disturbed habitats, primarily in Oklahoma and Texas, extending into Mexico; often flowering in May and June, but to some extent at any time during the growing season, which may be most of the year in southern Texas.

Four hundred twenty seven sheets of 365 collections of var. *cinerascens* (sens. lat.) have been examined. In addition to numerous Oklahoma and Texas collections, the following have been seen: ARKANSAS: Fulton Co.: *Bush 2518* (GH); Kansas: Barber Co.: *Rydberg and Imler 640* (NY); New Mexico: Chaves Co.: *Earle 283* (NY); Lea Co.: *Waterfall 7836* (GH, OKL).

P. pensylvanica L., *Species Plantarum*, ed 2, 1670, 1762, is not accounted for in the above synonymy. A tracing from the Linnean herbarium on a Canby sheet of *P. viscosa* in the Gray Herbarium bears the annotation

"pubescence very short stellate—same as in *P. viscosa* Hb. Linn." No stellate species is known from Pennsylvania. No disposition of it can be made from the photograph of the species from the Linnean Herbarium, other than to say that if it is indeed from North America, it might be a small, rotund-leafed phase of *P. viscosa*, var. *maritima*.

3. *Physalis angustifolia* Nuttall, Journ. Acad. Nat. Sci. Phila. 7: 113. 1834.

Perennial from a thick woody taproot, often with many branches; leaves linear, (8) 10–20 times longer than wide; plants glabrous except on the tips or margins of the sepals; corolla yellow, unspotted to apparently spotted, but only lightly so, 8–20 mm. long; flowering calyx 5–10 mm. long, on peduncles 10–20 mm. long; fruiting calyx 2–3 cm. long on peduncles 1–3 cm. long.

TYPE: Not seen; Isotype: *N. A. Ware* "west Florida" (PH). Its larger leaves are 6–8 cm. long and about 2–3 mm. wide.

P. angustifolia grows in coastal sands, coral soil, or pine woods, Alabama to Mississippi with one collection from Louisiana; it usually flowers from May to August, but a number of collections, particularly from Florida have been taken in flower in December, January and February.

Selected from 87 sheets of 65 collections: ALABAMA: Baldwin Co.: *Mohr* March 20, 1883 (GH, UARK); Mobile Co.: *Mohr* 1878 (NY, PH); FLORIDA: Bay Co.: *Banker* 3670, 3679 (NY); Collier Co.: *Moldenke* 1006 (DUKE, NY); Dade Co.: *Moldenke* 852 (DUKE, NY); Gulf Co.: *Correll* and *Oosting* 5630 (DUKE); Monroe Co.: *Curtiss* 114 (GH, MICH, NY, PH, UARK); Oskaloosa Co.: *Menzel* and *Menzel* 55–3 (WIS); Santa Rosa Co.: *Fassett* 21141 (WIS); Wakulla Co.: *Griscom* 21478 (GH); LOUISIANA: "seashore": *Carpenter*, July (PH); MISSISSIPPI: Jackson Co.: *Baker* July 25, 1897 (NY); Harrison Co.: *Demaree* 21911 (OKL, OKLA, TEX); *Tracy* May 8, 1898 (NY, MICH).

4. *Physalis variovestita* Waterfall, sp. nov. Planta bivestita, pilis elongatis, 1–4 mm. longis, articulatis, simplicibus vel furcatis, et brevo-stellatis; caulibus erectis; foliis petiolatis; laminis ovatis dentatis vel subsinuato-dentatis; pedunculis petiolis longioribus; corollis luteis, fundomaculatis; antheris luteis ca. 3 mm. longis.

The presence of abundant jointed hairs, 1–4 mm. long, in addition to a covering of stellate hairs, is the most obvious characteristic of this species. The long hairs are sometimes branched, sometimes simple. The plant is a perennial, 12–25 cm. tall, from a rhizome. The leaf blades are ovate, dentate to more or less sinuate-dentate, 2.5–3.5 cm. long and 2–3 cm. wide on petioles 1.5–2.3 cm. long. The nodding flowers are on peduncles 2–3 cm. long. The corolla is 1.5–2 cm. long and 2–3 cm. wide, with large dark markings on its limb near its junction with the tube. The flowering calyx is about 1 cm. long divided about one-third to one-half of the way into ovate-lanceolate, or lanceolate lobes. The anthers are yellow, ovate to ovate-oblong, about 3 mm. long.

TYPE: *Eula Whitehouse* 18179, back of Rockport Tourist cottages in sandy soil, live-oak belt, Rockport, Aransas Co., Texas, April 21, 1947 (MICH).

A number of collections radiating northward from this area have long articulated hairs present to a greater or lesser extent. These are found in specimens resembling both var. *mollis* and var. *cinerascens*, with a degree of variability in leaf size, margins, and stellate vestiture similar to that found in these two taxa.

Sheets approaching the type in vestiture are: Kenedy Co.: *Cory* 28408 (GH); Medina Co.: *Johnston*, *Tharp* and *Turner* 3401 (OKLA, TEX).

Collections more widely diverging from *P. variovestita*, but with several to few long jointed trichomes present in addition to the short stellate hairs are: Austin Co.: *Pennell* 10300 (NY, PH); Bexar Co.: *Metz* 477 (UC); Caldwell Co.: Coll. unknown (J. B. McB.) 1931 (TEX); Cameron Co.: *Tharp* 1206 (TEX); DeWitt Co.: *Reidel* Apr. 5, 1942 (GH, OKLA); Gillespie Co.: *Bray* 293 (TEX); Gonzales Co.: *Bogusch* 1868 (TEX); *Cory* 8366 (GH); *Turner* 3706 (TEX); Jim Hogg Co.: *Tharp* June 17, 1928 (TEX); Hidalgo Co.: *Cameron* 269 (TEX); Kenedy Co.: *Johnston* 53256.19 (TEX); *Lundell* 8715 (GH); Upshur Co.: *Reverchon* 3237 (NY); Victoria Co.: Coll. unknown Mar. 29, 1930 (TEX); Waller Co.: *Hall* 500 (GH, NY); Wilson Co.: *Cory* 7795 (GH); *Parks* 29530 (GH); Wood Co.: *McMullen* June 10, 1927 (TEX).

It is postulated that a population such as described above, and exemplified by the type collection, must exist in the area indicated in southern Texas, and that gene interchange has diluted its characteristics with those of *P. viscosa* var. *mollis* and var. *cinerascens* in an area radiating northward. Probably Edgar Anderson's method of extrapolated correlates (1949) could have been used to predict the occurrence of *P. variovestita* on the basis of the intergrades found in approaching the area in which it grows.

5. ***Physalis pumila*** Nuttall, Trans. Am. Phil. Soc. 5 (n.s.); 193, 1836; *P. lanceolata* Michx., var. *hirta* Gray, Proc. Amer. Acad. Arts and Sci. 10: 68. 1875.

Plants perennial, 15–45 cm. tall, often branched, usually covered with jointed hairs 1–2 mm. long, some of which are 1- to rarely 3-branched, and which spread at right angles from the stem. Leaf blades ovate to ovate-lanceolate, or rarely lanceolate, sometimes somewhat rhombic, tapering to a more or less winged petiole; larger blades (4) 6–9 cm. long and (2.5) 3–5 cm. broad, on petioles 1–3 cm. long; leaf margins usually entire, but sometimes lightly and irregularly sinuate-or repand-dentate; corolla 12–20 mm. long, and about 15–25 mm. wide at the top; anthers usually 2.5–3 mm. long, yellow; flowering calyx usually 10–15 mm. long with free lanceolate-deltoid sepal tips about one-third as long; flowering peduncles 15–30 mm. long; fruiting calyx usually 15–20 mm. wide and 3–4 cm. long, much inflated around the fruit, on reflexed peduncles 25–40 mm. long.

TYPE: Not seen; Isotype: *Nuttall*, Arkansas (PH). The isotype is representative of the extreme having few branched hairs. It was collected near the eastern limit of its range in this area.

P. pumila grows in prairies, open woods and disturbed habitats, primarily in western Missouri, eastern Kansas, eastern Oklahoma and adjacent Texas; it usually flowers in May, June, July and August, perhaps earlier in the southern part of its range, as fruiting specimens have been collected in May in Texas.

The 169 sheets of 146 collections examined include: ARKANSAS: Sebastian Co.: *Armstrong 186* (TEX, UARK); Carrol Co.: *Moore and Illis 204* (WIS); Washington Co.: *Hull 23* (UARK); ILLINOIS: Peoria Co.: *Chase 3570* (NY, UC).

6. *Physalis arenicola* Kearney, Bull. Torr. Bot. Club **21**: 485. 1894.

Plants perennial from cord-like rhizomes which are near the surface, usually 15–30 cm. tall, simple or branched; hairs short and antrorse, sometimes viscid, in var. *ciliosa* 1–2 mm. long, jointed, spreading and more or less abundant; leaf blades ovate to ovate-rhombic, the larger ones usually 2–6 cm. long and 2–4 cm. wide on petioles 1–3 cm. long; leaf margins irregularly dentate to sinuate or entire; corollas 10–20 mm. long, yellow with slightly darker spots on the limb near its base; flowering calyx 7–11 mm. long, its lobes 2–4 mm. long; flowering peduncle 10–25 mm. long; fruiting calyx 20–30 mm. long and 15–25 mm. wide, much inflated around the fruit.

TYPE: Kearney cited several collections of Nash's when he described *P. arenicola*. Since no holotype was designated, the author selects the following from among the cited collections: *George V. Nash 1170*, dry sandy soil, high pine land, vicinity of Eustis, Lake County, Florida, July 1–15, 1895 as the lectotype (GH); Isolectotypes: (NY, UC).

This species grows on sand dunes, ridges, sandy oak woods, pine woods and disturbed sandy areas, primarily in Florida, but also in adjacent Georgia and Mississippi; flowering March through August.

6a. *P. arenicola* var. *arenicola*. Selected from 28 sheets of collections: FLORIDA: Alachua Co.: *Wiegand and Manning 2810* (GH); Brevard Co.: *Curtiss 5713* (GH, UC); Duval Co.: *Curtiss 6644* (GH, NY, UC); Lake Co.: *Nash 1170* (GH, UC); Levy Co.: *Garber Nov. 1877* (GH); Marion Co.: *Moldenke 1090* (DUKE); Palm Beach Co.: *Small 8514* (DUKE, GH); Sumter Co.: *Curtiss 6634* (GH); Volusia Co.: *Small 8692* (DUKE, GH); Georgia: Lowndes Co.: *Harper 1594* (GH, NY).

6b. *P. arenicola* Kearney, var. *ciliosa* (Rydb.) Waterfall, comb. et stat. nov., based on *P. ciliosa* Rydb., Mem. Torr. Bot. Club **4**: 346. 1898.

TYPE: In describing *P. ciliosa*, Rydberg stated "Chapman (in Herb. J. Donnell Smith, Harvard University, Columbia College, and A. W. Chapman, type)." As Lectotype the author chooses a sheet (GH) showing both flowering and fruiting plants. Isolectotypes are: GH, a second sheet, NY and OKL.

Selected from 35 sheets of 33 collections: FLORIDA: Alachua Co.: *Walker 1917* (OKLA); Brevard Co.: *Small and DeWinkeler 2468* (NY); Gadsden Co.: *Berg* (NY); Hendry Co.: *Moldenke 1018* (DUKE, NY); Highlands Co.: *Small, Mosier and DeWinkeler 10906* (NY); Lee Co.: *Moldenke 946* (DUKE, NY); Levy Co.: *Oosting 139* (DUKE); Osceola Co.: *Singletary Apr. 28, 1938* (DUKE); Polk Co.: *McFarlane 5021* (MICH); Santa Rosa Co.: *McFarlane and Goertz June 17, 1905* (DUKE); Sarasota Co.: *Rusby April 1935* (NY); Sumter Co.: *Curtiss 6634* (UC); GEORGIA: Calhoun Co.: *Thorne 3321* (GH); Chatham Co.: *Gay* (GH); Charlton Co.: *Small June 12–15, 1895*; MISSISSIPPI: Jackson Co.: *Skehan May 10, 1895* (GH).

The following specimens, all from Florida, seem to be intermediate between var. *arenicola* and var. *ciliosa*: Collier Co.: *Small 10477* (NY);

Dade Co.: *Small* and *Small* 6825 (GH, NY); Volusia Co.: *Small* 8692 (GH, DUKE).

7. **Physalis heterophylla** Nees, *Linnaea* 6: 463. 1831; synonymy cited under the varieties.

Stems usually erect from a deeply buried rhizome, 15–90 cm. tall, simple or branched; herbage densely to sparsely covered with varying proportions of short usually viscid hairs and glandular hairs, together with long jointed hairs which are usually 1–2 mm. long; sometimes only a few long hairs are present; rarely, as in var. *villosa*, the stems are villous with long multicellular hairs; leaf blades usually broadly to narrowly ovate, or ovate-rhombic, the principal ones usually 5–10 cm. long and 3.5 to 6 cm. wide on petioles 3–6 cm. long; corollas 10–18 mm. long, yellow with brownish, sordid or blue-tinged spots on the limb near its base; flowering calyx 7–12 mm. long, its lobes 3–5 mm. long, lanceolate-triangular, sometimes acuminate; anthers usually 3–4.5 mm. long, yellow, sometimes tinged with blue; filaments thickened, often as wide as the anthers, frequently clavate; fruiting calyx usually 2.5–3 cm. long and 2–3 cm. wide, much inflated around the fruit, borne on peduncles 1.5–4 cm. long.

7a. **P. heterophylla** Nees, var. **heterophylla** *P. virginiana* Mill., var. *ambigua* Gray, *Proc. Amer. Acad. Arts and Sciences* 10: 65. 1875; *P. nyctaginea* Dunal, DeCandolle, *Prodromus* 13(1): 440–441. 1852; *P. ambigua* (Gray) Britton, *Mem. Torr. Bot. Club* 5: 287. 1894; *P. heterophylla*, var. *umbrosa* Rydberg, *Contr. U. S. Natl. Herb.* 3: 172. 1895; *P. heterophylla*, var. *ambigua* (Gray) Rydberg, *Mem. Torr. Bot. Club* 4: 349. 1896; *P. sinuata* Rydb., in *Small's Flora*: 986. 1913.

This is an extremely variable assemblage as indicated in the preceding description, which, with stated exceptions, covers var. *heterophylla*, only two other localized varieties being recognized. Forms (the species or varieties of earlier authors) might be distinguished on the basis of dentation of leaves, or of vestiture, but many specimens would be assignable only on an arbitrary basis, even if some of the extremes seem quite striking. An example is the densely stiff-haired form often found on sands at various localities in the range of the species.

TYPE: Not seen; "In collibus argillosis Pennsylvanicae Poeppig legit."

Habitat, range and flowering time: Open woods, prairies, hillsides, fields and other disturbed habitats, principally in the eastern United States and adjacent Canada, the prairie and plain region westward into the central and northern Rockies and the Great Basin; flowering from June to August in Canada and from April to September in Texas.

In examining 730 sheets of 664 collections, material has been seen from: Ontario and Quebec, Canada and from Alabama (Jackson and Tuscaloosa Cos.), Georgia (Chatham and Clark Cos.), Idaho (*Allen 1873*), Illinois, Indiana, Massachusetts, Michigan, Minnesota, Mississippi (Harrison Co.), Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota (Richland Co.), North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina (Oconee Co.) South Dakota, Tennessee (Davidson, Frank and Rutherford Cos.), Texas, Utah (Salt Lake Co.), Vermont, Virginia, Washington, D. C., West Virginia, Wisconsin, Wyoming (Big Horn and Crook Cos.).

7b. *P. heterophylla* Nees, var. *clavipes* Fernald, RHODORA 49: 178. 1947.

TYPE: Fernald, Long and Clement 15347, sandy woods near Darden's Pond, northeast of Courtland, Southampton Co., Virginia, (GH); isotype (NY). Known only from the type collection.

7c. *P. heterophylla* Nees, var. *villosa* Waterfall, var. nov., caulibus dense articulato-villosis, pilis 2–4 mm. longis.

The abundant, soft, long, jointed hairs, 2–4 mm. long, characterize this variety. The leaf size and margin vary in a manner comparable to var. *heterophylla*.

TYPE: Earle June 2, 1901, moist hillsides thick woods, Lee County, Alabama (NY).

Collections examined: ALABAMA: Lee Co.: Earle June 2, 1901 (NY); F. S. Earle May 10, 1896, Auburn (NY); FLORIDA: Gadsden Co.: Berg Summer (NY); Walton Co.: A. H. Curtiss June 1886, De Funiak Springs (NY); County undetermined: W. E. Buswell April 9, 1931, Pine Woods, East Fort Meyers (NY); TEXAS: doubtfully referred here is Tharp April 19, 1930, East Texas coast (TEX).

P. heterophylla appears to intergrade with *P. virginiana* in some areas, producing individuals with varying indument and leaf-shape, including lanceolate. Such specimens are found in South Carolina from which Michaux described his *P. lanceolata*, Flora Boreali-Americana 149. 1803. Examples are: Gibbes, in 1834, Columbia, S. Car. (NY); Gibbes Aug. 1835, South Carolina (NY); Ravenel, Aiken, South Carolina (NY). The photograph of the type of *P. lanceolata* in the Gray Herbarium appears to match these specimens fairly well. The author believes that it was on such a specimen that Michaux based his species. This leaves the population of the western prairies and plains, which has been passing under the name *P. lanceolata*, without a name. It will be treated under *P. virginiana*.

Other collections believed to be *P. heterophylla* intergrades are: CONNECTICUT: Bishop Sept. 1902, Norwich (GH); GEORGIA: Harper 93, Dry fields, Clarke Co., June 29, 1900 (NY); Coll. unknown (herb. Schw. sub nom. "*P. obscura* Baldw., Georgia") (PH); NORTH CAROLINA: Williamson Aug. 1900, Wilmington (PH); Small, July 1896, Summit of Paris Mt. (NY).

8. *Physalis peruviana* L., Species Plantarum, ed. 2, 1670. 1762. *P. peruviana*, var. *latifolia* (Lam.) Dunal, in DeCandolle, Prodrromus 13(1): 440. 1852, based on *P. latifolia* Lamarck, Tableau Encyclopédique et Méthodique . . . Bot. 2: 29. 1793, is the only synonymy that has been applied in the area under consideration.

An erect branching perennial, densely villous but not glandular; leaf blades ovate, extending into an acuminate tip; corolla blue-spotted; anthers about 3 mm. long, blue, on slender filaments. This species resembles *P. heterophylla*, but may be distinguished by the narrow filaments and the rather strongly acuminate leaves, as well as by the blue anthers (sometimes the anthers are violet-tinged in *P. heterophylla*) and by the darker, bluish spots of the corolla.

TYPE: Not seen; Linnaeus says "Habitat Limae".

This species is sometimes introduced, and may rarely escape. Some examples are: *Kidder* Oct. 3, 1926, Norfolk Co., Mass. (NEBC); *Martindale* Sept. 1879 Camden, New Jersey (NY); *Brinkley* 222, Sevier Co., Arkansas (TEX) ?; *Earle* June 26, 1899, Lawrence Co., Alabama (NY) ?.

9. *Physalis virginiana* Miller, *Gardener's Dictionary*, ed. 8: No. 4. 1768. The synonymy is given under the varieties.

Stems from a deep rhizome, simple or branched; plants nearly glabrous, or with long hairs, or short curved trichomes; leaf blades from ovate to linear-lanceolate; corolla from 15–25 mm. long, yellow, dark-spotted; anthers 2–4 mm. long, yellow or blue- or violet-tinged; filaments from one-third as wide to nearly equalling the width of the anthers; calyx from one-half to two-thirds as long as the corolla; flowering peduncles about equalling the flower to 1½ times its length; fruiting calyx inflated, usually 25–35 mm. long and ovate to ovate-oblong, but sometimes much larger, particularly in one forma.

The varieties described below seem to intergrade more or less with each other, making the disposition of individual specimens sometimes difficult. However they seem to represent natural populations, in some instances covering large geographic areas, which are fairly distinct as groups.

9a. *P. virginiana* Miller, var. *virginiana*. *P. virginiana* Mill., var. *intermedia* Rydb., *Mem. Torr. Bot. Club* 4: 345. 1895; *P. monticola* Mohr, *Bull. Torr. Bot. Club* 26: 119–120. 1899.

Plants villous with long jointed hairs, or having only short retrorse ones; leaf blades ovate to lanceolate (rarely narrowly so), their margins irregularly dentate to sinuate-dentate; corolla usually 15–20 mm. long; anthers yellow, or sometimes with a blue or violet tinge.

TYPE: None cited by Miller. It is supposed to be present in the Sloane Herbarium of the British Museum.

Habitat, distribution and flowering time: Growing in open woods, prairies and disturbed areas in most of the eastern United States, and adjacent Canada, extending, generally, into the eastern part of the prairie region, with a few collections from the central Rockies; flowering in June and July in the northern part of its range, and usually from April to June in the southern part.

(To be continued)

FURTHER NOTES ON THE ILLINOIS FLORA.—Field trips to southern Illinois in late September and in October, 1957, yielded two plants not previously collected in Illinois, a new station for the filmy fern in the state and some additional information on the height of big bluestem.

The slender-fruited primrose willow, *Jussiaea leptocarpa* Nutt., ranges from Florida to Texas and Mexico, north to Georgia and southeastern Missouri, according to the range given by Fernald in Gray's Manual, ed. 8. While botanizing on September 25 in the



Waterfall, U. T. 1958. "A taxonomic study of the genus *Physalis* in North America north of Mexico." *Rhodora* 60, 128–142.

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