NEW TAXA IN PECTIS (COMPOSITAE: PECTIDINAE) FROM MEXICO AND THE SOUTHWESTERN UNITED STATES¹

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This paper is the first of a series of investigations on the systematics of *Pectis* L., the largest genus in the subtribe Pectidinae of the tribe Helenieae. *Pectis* consists of about one hundred species of annual or perennial, glandular-dotted, yellow-rayed herbs that are widespread in the warmer parts of the New World. In the present report three previously unrecognized taxa from Mexico and the southwestern United States are described as new, and a new combination also is made.

***Pectis minutiflora* Keil, sp. nov. Fig. 1**

Plantae annuae. Caules usque ad 15 cm longi, ramosissimi, saepe pseudodichotomi, 6-angulosi, glabri, plerumque glandibus oleosis ellipticis vel ovatis in seriebus verticalibus punctati. Folia linearia vel anguste oblanceolata, 0.5–2.5 cm longa, 1–2.5 mm lata, uninervia, mucronata, prope bases 2–4 paribus ciliis usque ad 2 mm longiorum ciliata, margine scaberula vel glabrata, in superficiebus ambabus glabra, supra atrovirentia, subtus pallentia, glandibus oleosis circularibus 0.2–0.3 mm diametro in seriebus submarginalibus (interdum cum aliquot glandibus additis dispersis) punctata. Pedunculi filiformes, 8–15 mm longi, interdum glandibus oleosis ovatis vel ellipticis punctati, bracteolati; bracteolae 3–6, alternae, lanceolatae, 0.5–2 mm longae, attenuatae, hyalinae, interdum margine purpurascens, saepe 1–2 glandibus oleosis punctatae. Capitula solitaria vel pauca, terminalia aut axillaria, campanulata, 2.5 mm alta, 1.5–2.5 mm diametro. Phyllaria 5, uniserialia, obovata, 2 mm longa, 1 mm lata, marginibus imbricatis, ad apices hyalinis, purpurascens, ciliolatis, costis incrassatis, basi gibbosis, in costis et prope apices 3–6 glandibus oleosis ellipticis punctata. Flosculi radii 5; corollae flavae, 1.2 mm longae, tubis 0.5 mm longis et ligulis 0.7 mm longis, glabrae, ad apices tridenticulatae; styli cum stigmatibus linearibus usque ad 1.2 mm longi. Flosculi disci 14–19; corollae flavae, 1–1.2 mm longae, glabrae, subbilabiatae, lobis erectis 0.05–0.15 mm longis; stigmata minute bifida, vix exserta. Achenia cylindrica vel anguste clavata, 1.2–1.3 mm longa, glabra vel strigillosa. Pappus fimbriato-coroniformis vel absens. Chromosomatum numerus ignotus.

TYPE: MEXICO: CHIAPAS: Jalisco [Jalisco Arriaga, 16° 14' N, 93° 53' W; 65 m (Sousa Sánchez, 1969)], Sep 1923, *C. A. Purpus* 9162 p. p. maj. (HOLOTYPE: GH; ISOTYPES: F, MO, NY, UC, US).

Distribution: Known only from two collections from the coastal plain of southeastern Oaxaca and southwestern Chiapas.

Pectis minutiflora is unique in the genus in having both tiny heads and numerous

FIG. 1. *Pectis minutiflora* (drawing based on *Purpus 9162*): A, habit; B, head; C, ray floret; D, disc floret; E, leaf, abaxial surface.

minute disc florets. This new species is most similar to *P. bonplandiana* H.B.K. and to *P. swartziana* Less., but *P. minutiflora* differs from both in having smaller heads and florets, fewer phyllaries and ray florets, and submarginal rather than scattered foliar oil glands. The differences among these species are summarized below:

	<i>P. bonplandiana</i>	<i>P. minutiflora</i>	<i>P. swartziana</i>
Foliar oil glands	scattered	submarginal	scattered
Phyllary number	6-8	5	6-8
Phyllary length (mm)	4-4.5	2	4
Ray floret number	6-8	5	6-8
Ray corolla length (mm)	2-3	1.2	2.5-4
Disc floret number	12-15	14-19	4-9
Disc corolla length (mm)	2	1-1.2	2
Disc pappus	2 series of bristles, ex- panded at base	fimbriate crown or absent	0-2 bristles & fimbriate crown

The type of *P. minutiflora*, C. A. Purpus 9162, is a mixed collection including a diminutive form of *P. uniaristata* DC. The collection was originally identified and distributed by T. S. Brandegees as this latter taxon. Although all sheets examined contain mixtures of the two taxa, *P. minutiflora* is easily distinguished from *P. uniaristata* by its obtuse rather than acute phyllaries, smaller and more numerous disc florets, and submarginal oil glands. *King 1830* is also a mixed collection of the same two taxa.

Additional specimen examined: MEXICO: OAXACA: Open grazed areas 10-12 km E of Niltpec along Rte 190, 18 Jul 1959, *King 1830* p.p. (TEX).

Pectis papposa Harv. & Gray in Gray, Mem. Amer. Acad. Arts 4: 62. 1849. var. ***grandis*** Keil, var. nov.

Plantae annuae, glabrae. Caules usque ad 30 cm longi. Folia linearia, 2-6 cm longa, 1-2 mm lata. Pedunculi 1-3 cm longi, bracteolis 2-6. Capitula numerosa, 10-15 mm alta, 10-15 mm diametro. Phyllaria 8 (raro 7, 9, vel 10), 5-8 mm longa, 1-1.7 mm lata, anguste hyalino-marginata, glandibus 1-5 subterminalibus etiam 4-10 submarginalibus punctata. Flosculi radii 8 (raro 7, 9, vel 10); corollae 5-8 mm longae, glabrae vel parce glanduloso-puberulae. Flosculi disci 12-24 (-34); corollae 3-5 mm longae, glabrae vel glanduloso-puberulae. Achenia cylindrica, 3-5.5 mm longa. Pappus acheniorum radii coroniformis, ca. 0.2 mm longus, raro 1 vel pluribus angustis paleis aut setis usque ad 2 mm longis compositus. Pappus acheniorum disci setaceus vel raro coroniformis; setae 16-24, barbellatae, (2-)3-4 mm longae. Chromosomatum numerus: $n = 12$.

TYPE: UNITED STATES: TEXAS: Presidio Co.: 3 mi E of jctn US Rte 67 on Texas Rte 170, E of Presidio, 15 Aug 1971, *L. A. McGill & D. Keil 7768* (HOLOTYPE: US; ISOTYPES: ARIZ, ASU, ENCB, F, GH, MICH, MO, NY, OS, RSA, SMU, TEX, UC).

Distribution: Known from southern New Mexico and southwestern Texas to northern Coahuila and Chihuahua; disjunct populations also occur in northern and southern Arizona and in northeastern New Mexico (Fig. 2).

Plants of *Pectis papposa* var. *grandis* are usually larger and less densely branched than those of var. *papposa*. The heads of var. *grandis* are longer-peduncled, usually contain more disc florets, and have larger phyllaries and florets than those of var. *papposa*. There is some overlap between the larger extremes of var. *papposa* and the smaller extremes of var. *grandis*, but usually the two varieties are easy to distinguish. The dissimilarities between the two varieties persist in plants grown from

FIGS. 2, 3. Distribution of *Pectis papposa* and *P. purpurea*. Fig. 2. Open circles, *P. papposa* var. *papposa*, pappose individuals; open squares, var. *papposa*, epappose individuals; closed circles, var. *grandis*, pappose individuals; closed squares, var. *grandis*, epappose individuals; half-filled circles, intermediates between var. *papposa* and var. *grandis*; triangles, hybrids between var. *grandis* and *P. angustifolia*. Fig. 3. Circles, *P. purpurea* var. *sonorae*; triangle, var. *purpurea*; square, var. *lancifolia*.

seed under controlled environmental conditions (Keil, unpubl.), which suggests that the differences observed are under genetic control. Contrasting characteristics of the two varieties are listed below:

	var. <i>papposa</i>	var. <i>grandis</i>
Peduncle length (mm)	3-10 (-25)	10-40
Phyllary length (mm)	3-5	5-8
Ray corolla length (mm)	3-6	5-8
Ray achene length (mm)	2.5-4.5	4-5.5
Disc floret number	6-14 (-18)	12-24 (-34)
Disc corolla length (mm)	2-3.5 (-4)	(3-) 3.5-5.5
Disc pappus length (mm)	1.5-2.5	2.5-4

Pectis papposa var. *grandis* has a more easterly distribution than does var. *papposa*. With the exception of three disjunct populations of var. *grandis* in Arizona, the varieties occupy different geographic ranges. Typical *P. papposa* occurs mostly in the Sonoran and Mojave Deserts, whereas var. *grandis* is for the most part restricted to the Chihuahuan Desert. A few specimens from southeastern Arizona and southwestern New Mexico (McGill & Keil 8456; Mulford 1079; Sherff s.n., 5 Sep 1908) appear to be somewhat intermediate between the two varieties and cannot easily be assigned to either.

TABLE I
NEW CHROMOSOME COUNTS FOR *Pectis*

Taxon	Locality and Voucher*	Chromosome number (<i>n</i>)
<i>P. papposa</i> Harv. & Gray var. <i>grandis</i> Keil	NEW MEXICO: Dona Ana Co.: 1 mi N of Hatch exit on I-25, <i>Keil 7653</i>	12
	TEXAS: Presidio Co.: 3 mi E of jctn US 67 on Texas 170, <i>McGill & Keil 7768</i>	12
	TEXAS: Presidio Co.: 15.2 mi NW of Lajitas, <i>McGill & Keil 7786</i>	12
	CHIHUAHUA: 24.5 mi N of Janos, <i>McGill & Keil 8431</i>	12
<i>P. purpurea</i> Brandeg. var. <i>sonorae</i> Keil	SONORA: 1.9 mi NW of Vicam, <i>Canne & Keil 8644</i>	12
	SINALOA: 14.5 mi S of Sonora-Sinaloa boundary, <i>Canne & Keil 8737</i>	12
	SINALOA: 10 mi NW of Río Sinaloa on Mexico 15, <i>Canne & Keil 8777</i>	12

* Voucher specimens are deposited in the Herbarium of the Ohio State University (OS).

In New Mexico, Texas, and northern Mexico, *Pectis papposa* var. *grandis* is sympatric with *P. angustifolia* Torr. These taxa may usually be distinguished by a number of features, including shape of leaf bases, length of peduncles, and presence or absence of a setose pappus. Sometimes, however, essentially epappose forms of *P. papposa* (e.g., *Waterfall 5203*) have been confused with *P. angustifolia*. Additionally, hybridization apparently is occurring in several Texas localities (Keil, unpubl.), which obscures the usually consistent differences between the two taxa.

Chromosome numbers reported by Powell & Sikes (1970) for *Pectis papposa* ($n = 12$, plus a regularly occurring centric fragment in some populations) were made from plants referable to var. *grandis*. The counts made in the present study (Table I) agree with this previous report, although no fragments were observed. Other counts reported previously for *P. papposa* ($n = 12$; Raven & Kyhos, 1961) are from plants of var. *papposa*.

Additional specimens examined: UNITED STATES: ARIZONA: Coconino Co.: Havasupai Canyon, 17 Jul 1940, *Clover 5192* (SMU, TEX); Gila Co.: Mesa near Rock & Rye Creeks, 15 Aug 1935, *Collom 538* (ND); Pima Co.: Santa Rita Mts, 29–31 Aug 1904, *Griffiths 7003* (MO). NEW MEXICO: Dona Ana Co.: 1 mi N of Hatch exit on I-25, 13 Aug 1971, *Keil 7653* (ASU, GH, OS, TEX, US); Lincoln Co.: Near Hondo, 2 Aug 1967, *Cole, Minckley, & Pinkava 3010* (ASU); Luna Co.: Pancho Villa State Park, 1 Aug 1967, *Cole, Minckley, & Pinkava 3068* (ASU). TEXAS: Brewster Co.: Tornillo Flats, 28 Jun 1941, *Warnock 21681* in part (F, NY, PH, SMU, TEX); Culberson Co.: S of Van Horn, 23 Aug 1962, *Jackson 3162* (SMU); El Paso Co.: 2 mi W of Clint, 31 Aug 1967, *Massey 1825* (SMU, TEX); Hudspeth Co.: 6 mi W jctn Hwys. 54 & 62, 20 Jul 1943, *Waterfall 5203* (ARIZ, F, GH, MO, NY, SMU, TEX); Presidio Co.: 15.2 mi NW of Lajitas, 15 Aug 1971, *McGill & Keil 7786* (DS, ENCB, OS, RSA, SMU, US). MEXICO: CHIHUAHUA: 37.7 mi N of Cd. Camargo, 25 Aug 1971, *McGill & Keil 8254* (ASU, F, NY, OS, POM, US); 24.5 mi N of Janos, 29 Aug 1971, *McGill & Keil 8431* (ARIZ, DS, OS, UC); Vicinity of Fierro, Sierra de Encinillas, 8 July 1941, *Stewart 742* (GH). COAHUILA: Near Rancho Las Norias, 21 Aug 1966, *Powell, Scudday, & Sikes 1445* (TEX).

Pectis purpurea Brandeg. Zoe 5: 225. 1905. var. **sonorae** Keil, var. nov.

Plantae annuae, glabrae vel dense puberulae. Caules usque ad 50 cm longi. Folia linearia vel lanceolata, 1.5–6 cm longa, 2.5–9 mm lata, obtusa vel acuta, mucronata, basi 1–3 paribus ciliis ciliata, subtus glandibus oleosis submarginalibus punctata. Pedunculi 4–13 cm longi, bracteolis 4–20. Capitula 10–15 mm alta, 10–20 mm diametro. Phyllaria 8, obtrullata, 5–6.5 mm longa, 1.8–3 mm lata, 4–12 glandibus dispersis punctata. Flosculi radii 8; corollae flavae, interdum rubro-nervatae, 9–11.5 mm longae, glanduloso-puberulae. Flosculi disci 40–50; corollae flavae, 4–5 mm longae, glanduloso-puberulae. Achenia 3–4 mm longa, pilosa vel strigillosa. Pappus acheniorum radii biserialis; series interior setacea, setis 2, rigidis, usque ad 3 mm longis, series exterior squamosa, brevior, squamellis 1–4, angustis, interdum in 5–10 setis brevibus gracilibus divisus. Pappus acheniorum disci biserialis; series interior setacea, setis 5–10, rigidis, 4–5 mm longis, antrorse scaberulis, series exterior setacea, brevior, setis 8–20, gracilibus. Chromosomatum numerus: $n = 12$.

TYPE: MEXICO: SONORA: 1.9 mi NW of Vicam on Mexico Rte 15, ca. 66 mi SE of Guaymas, 7 Sep 1971, J. M. Canne & D. Keil 8644 (HOLOTYPE: US; ISOTYPES: ARIZ, ASU, DES, DS, ENCB, F, GH, MICH, MO, NY, OS, RSA, SD, SMU, TEX, UC).

Distribution: Known from the coastal plain of southern Sonora and northern Sinaloa (Fig. 3).

Pectis purpurea var. *sonorae* is similar to but readily distinguished from *P. purpurea* var. *purpurea* by its larger heads and florets, more numerous disc florets, and setaceous rather than coroniform pappus. This last character, under the somewhat artificial systems of Gray (1850) and Fernald (1897), would have necessitated placement of the two taxa into different sections of the genus. However, var. *sonorae* and var. *purpurea* are so similar in habit, leaf shape, gland arrangement, and phyllary morphology that, in my opinion, they cannot be regarded as more than varietally distinct. Variety *sonorae* has a more northerly distribution than the typical variety, which is known only from the vicinity of its type locality in central Sinaloa.

Pectis purpurea var. *sonorae* and *P. rusbyi* Greene ex Gray are superficially similar. In fact, two collections, here placed in *P. purpurea* var. *sonorae* (Palmer 765, Flyr 107), have been cited as *Pectis palmeri* Wats. (Fernald, 1897; Turner & Flyr, 1966), a species recently found to be conspecific with *P. rusbyi* (Keil, unpubl.). Both *P. purpurea* var. *sonorae* and *P. rusbyi* have linear to lanceolate leaves, 8-rayed heads, and a pappus of capillary bristles. *P. rusbyi*, however, has marginal rather than submarginal foliar oil glands, shorter peduncles, and smaller heads. The phyllaries of *P. rusbyi* are oblong, longitudinally striate, with corky midribs extending nearly to the tips, and with large subterminal oil glands. The phyllaries of *P. purpurea* var. *sonorae* are angular-obovate, without striae, with the midribs corky only about half the length of the phyllary, and seldom with enlarged subterminal glands. The oils of *P. rusbyi* have a spicy odor, whereas those of *P. purpurea* var. *sonorae* are distinctly fetid.

The chromosome counts reported here (Table I) agree with that previously reported for this taxon (as *P. palmeri*: Turner & Flyr, 1966).

Additional specimens examined: MEXICO: SINALOA: 14.5 mi S of Sonora-Sinaloa boundary on Mexico 15, 10 Sep 1971, Canne & Keil 8737 (ASU, NY, OS, RSA, TEX, US); 10 mi NW of Río Sinaloa on Mexico 15, 11 Sep 1971, Canne & Keil 8777 (ARIZ, DS, ENCB, F, GH, OS); Los Mochis, 22 Sep 1957, Condit s.n. (SD); 57 mi S of Los Mochis on Mexico 15, 28 Jan 1964, Flyr 107 (TEX, WIS). SONORA: Agiabampo, 1890, Palmer 765 (GH, MICH, MO); Oroz, near Río Yaqui,

7–8 Sep 1935; *Pennell 20220* (MICH, NY, PH); 28 mi SE of Guaymas, 18 Aug 1956, *Waterfall 12828* (GH).

Pectis purpurea Brandeg. *Zoe* **5**: 225. 1905. var. ***lancifolia*** (Greenm.) Keil, comb. nov.

Pectis sinaloensis Fern. var. *lancifolia* Greenm. Proc. Amer. Acad. Arts **40**: 50. 1904.

Pectis lancifolia (Greenm.) Rydb. North Amer. Flora **34**: 203. 1916.

TYPE: MEXICO: TERRITORIO DE TEPIC [NAYARIT]: Between Concepción & Acaponeta, 19 Jul 1897, *J. N. Rose 1893* (LECTOTYPE: GH!; ISOTYPES: GH! US!).

The recognition of *Pectis purpurea* var. *sonorae* necessitates a reevaluation of the status of *P. lancifolia*. Prior to the discovery of the new variety, the differences between *P. purpurea* and *P. lancifolia* seemed sufficient to maintain them as distinct species. The two taxa differ in pubescence, leaf shape, head size, number of disc florets, and in pappus structure. However, the new variety, *P. purpurea* var. *sonorae*, was found to be much more similar to *P. lancifolia* than is the typical *P. purpurea*. The former two taxa have similar sizes of heads and numbers of disc florets, but they differ in leaf shape and in pappus structure. The most pubescent extremes of *P. purpurea* var. *sonorae* approach *P. lancifolia* in this respect. Because the differences between these taxa seem insufficient for the recognition of distinct species, *P. lancifolia* is here reduced to varietal rank under *P. purpurea*.

As an aid to understanding the relationships just discussed, the following key is provided to help differentiate the three varieties of *Pectis purpurea*:

1. Pappus in one series, coroniform, ca. 0.3 mm long; phyllaries 4–4.8 mm long; disc florets 20–40 var. *purpurea*.
1. Pappus in two series, the inner of stiff bristles to 4.5 mm long, the outer of slender bristles or flattened fimbriate pales to 2 mm long; phyllaries 5–6.5 mm long; disc florets 40–50 (2)
 2. Outer pappus of slender bristles; leaves with 1–3 pairs of marginal cilia; foliar oil glands in submarginal rows var. *sonorae*.
 2. Outer pappus of flattened fimbriate pales; leaves usually with 4–6 pairs of marginal cilia; foliar oil glands submarginal and scattered var. *lancifolia*.

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