

# A REVISION OF THE SUBGENUS CYCLOBOTHTRA OF THE GENUS CALOCHORTUS.

By JOSEPH H. PAINTER.

During a trip to Mexico in 1905, as assistant to Dr. J. N. Rose of the National Herbarium, I became much interested in the yellow-flowered species of *Calochortus* which occur throughout the plateau region. An especial effort was made to collect all forms, each from as many localities as possible, and also to send to Washington the living bulbs, a few of which have since flowered. There have been brought together with this material the collections of Dr. C. G. Pringle, Dr. E. Palmer, Dr. C. A. Purpus, and others, and these all together form a satisfactory basis for a review of the subgenus *Cyclobothra* to which these plants belong.

The history of the discoveries of the several species begins with Humboldt, who collected two upon the table-lands of central Mexico, and described them, in 1815, as belonging to the genus *Fritillaria*. Sweet, however, in 1828, having had flowers from bulbs that had been sent from the same region, removed the *Fritillaria barbata* H. B. K. and erected for it a new genus to which he gave the name *Cyclobothra*; but Schultes, in a monograph of the family two years later, refused to accept this segregate as distinct from the *Calochortus* of Pursh, to which he referred the two Humboldtian species, changing the specific name in each case. He furthermore described two other species, *Calochortus fuscus* and *Calochortus pallidus*. The following year Sweet transferred *Fritillaria purpurea* H. B. K. to *Cyclobothra* but ignored the two recent species published by Schultes, possibly because of lack of material. Lindley, however, three years later included all in *Cyclobothra* and added another to the growing list. Next, Hartweg, collected the most beautiful, as well as the largest-flowered species growing in Mexico, which was named in his honor by Bentham in 1840. Two years later Martens and Galeotti described *Cyclobothra grandiflora* from Michoacan. In 1847 S. Schauer published *Cyclobothra propinqua*, but with no definite locality; and I have been unable to recognize it as distinct from *Calochortus purpureus*.

Baker in his monograph of the Tulipeae (1875) published no new species but took up the specific name given by Humboldt for the

plant long known as *Calochortus bonplandianus*, calling it *Calochortus purpureus*, at the same time allowing the other of the two earliest, *Fritillaria barbata*, still to pass under the substitute name *Calochortus flavus*. Sereno Watson, four years later, described a yellow-flowered form from Oaxaca, dedicating it to the collector, Doctor Ghiesbreght, and in the same paper a second species, *Calochortus spatulatus*. The first of these is the southernmost species of the genus; the second I take to be nearly allied to the problematical *Calochortus fuscus* Schultes, which, however, I am not able to associate positively with *C. spatulatus* and have preferred to place as a *species inquirenda*.

Exploration of the Mexican flora by Americans led to the publication in the same year by both Dr. E. L. Greene and Doctor Watson of a form from northern Mexico. Under *Calochortus venustus* Doctor Greene published, in January, 1888, the diagnosis of a plant collected in Durango; and in May Doctor Watson published *Calochortus madrensis* based upon specimens collected in Chihuahua. Doctor Greene recognized the species of Watson to be his, and in November of that year, having come into possession of better material, he added to his previous description. A later species, one noted for the extremely dark color of the flowers, has been dedicated by Dr. B. L. Robinson to the veteran collector of Mexican plants, Dr. C. G. Pringle.

Of the two new species proposed here the first, *Calochortus exilis*, is a small plant from Hidalgo distributed by Doctor Pringle as *Calochortus ghiesbreghtianus* (a slip for *ghiesbreghtii*) to which it is closely related. I have taken the name from specimens collected by Ehrenberg and sent to the Gray Herbarium as "*Cyclobothra exilis* Kl." The other new one proposed is from the type locality of *Calochortus pringlei* and, like that species, is dark purple in color, but the flowers differ widely and the nodding habit separates it from all other purple forms. Of this unique species I have seen but one sheet, that in the Gray Herbarium, and Doctor Pringle knows of no other.

Species of other subgenera have been reported from northern Mexico and Lower California. Mr. T. S. Brandegee in 1889<sup>a</sup> reported two species which he called "*Calochortus luteus* Dougl. and *C. splendens* Dougl.," the former from Las Huevitas, the latter from San Pablo. I am told by him that these specimens are not in his collection but had perhaps found their way into that of the California Academy. He adds: "At least one of them is incorrectly named." Miss Eastwood, however, had two sheets from the peninsula, one from Ensanada, collected by Mr. F. E. Barkelew, and one from Vallederos Creek, San Pablo, collected by Mr. Brandegee, and also one from the Coronados Islands, collected by Dr. E. L. Greene, all bearing

<sup>a</sup> Proc. Calif. Acad. II. 2: 209. 1889.

the name *C. splendens* Dougl. *Calochortus weedii* Wood and *C. albus* Dougl. may be found in northern Lower California, for they have been collected by both Mr. Brandegee and Mr. Le Roy Abrams close to the border line.

In the preparation of this paper I am especially indebted to Dr. B. L. Robinson, curator of the Gray Herbarium, for the loan of the specimens in his charge, among them many types of Doctor Watson, and to Dr. J. N. Rose, Dr. E. L. Greene, and Mr. Wm. R. Maxon for many valuable suggestions as the work progressed.

## KEY TO THE SPECIES.

Flowers erect.

Petals yellowish or with a lilac tinge.

Sepals (and petals) yellow. North Mexican... 1. *C. venustulus*.

Sepals lilac or purplish. Central or South Mexican.

Plant 30 cm. or more high, capsule one-sixth as broad as long..... 2. *C. ghiesbreghtii*.

Plant under 25 cm. high, capsule one-third as broad as long..... 3. *C. exilis*.

Petals (and sepals) dark brown or almost black.... 4. *C. pringlei*.

Flowers horizontal or nodding at anthesis.

Cauline leaves dilated at base.

Inner surface of petals perfectly glabrous..... 5. *C. grandiflorus*.

Inner surface of petals more or less covered with hairs.

Hairs restricted to midvein and to margin. 6. *C. hartwegi*.

Hairs not restricted to midvein and to margin.

Flowers nodding at anthesis..... 7. *C. cernuus*.

Flowers horizontal at anthesis.

Anthers under 0.25 cm. long..... 8. *C. spatulatus*.

Anthers over 0.4 cm. long..... 9. *C. purpureus*.

Cauline leaves not dilated at the base.

Petals oval to rhombic, generally yellow throughout..... 10. *C. barbatus*.

Petals oblong, acuminate, purplish at base.... 11. *C. barbatus chihuahuanus*.

## 1. CALOCHORTUS VENUSTULUS Greene.

*Calochortus venustulus* Greene, Pittonia 1: 158. January, 1888. "On the higher Sierra Madre back of the city of Durango, Mexico, altitude 8,100 feet, A. Forrer, autumn of 1881."

*Calochortus madrensis* S. Wats. Proc. Amer. Acad. 23: 283. May, 1888. "On pine plains at the base of the Sierra Madre, Chihuahua, C. G. Pringle (n. 1382), September, 1887."

Stem 10 to 30 cm. high, branching, from a fibrous-coated corm 1 cm. in diameter; leaves all linear, the basal broader, generally single; flowers erect, yellowish, on slender peduncles about equaling the leaves; sepals oblong, obtuse, mucronulate, 1.2 to 2 cm. long; petals equaling the sepals, cuneate-obovate, naked above but hairy below and of the same color; gland obscure or obsolete; anthers 2 to 3 mm. long.

DISTRIBUTION: In the Sierra Madre of Chihuahua and Durango.

*Specimens examined:*

DURANGO: Sierra Madre, west of Durango, altitude 2,300 meters, September-October, 1881, *A. Forrer*; Sierra Madre, 15 miles north of Guanacevi, 2,100 to 2,300 meters, August 17, 1898, *E. W. Nelson*, 4761.

CHIHUAHUA: Base of the Sierra Madre, pine barrens, September 17, 20, 1887, *C. G. Pringle*, 1382; in the Sierra Madre near Colonia Garcia, July 20, 1899, *C. H. T. Townsend & C. M. Barber*, 155.

LOCALITY UNKNOWN: Cultivated from Pringle's bulbs at the Botanical Garden, Harvard University, August, 1888. (Origin not otherwise stated.)

## 2. CALOCHORTUS GHIESBREGHTII S. Wats.

*Calochortus ghiesbreghtii* S. Wats. Proc. Amer. Acad. 14: 268. 1879. "Chiapas, Ghiesbreght (Nos. 104, 661)."

Stem branching up to 40 cm. high; corm unknown; lower leaves narrowly linear, the upper linear-lanceolate graduating into lanceolate bracts; flowers one to several, erect on slender peduncles exceeding the leaves; sepals (of dried specimens) lilac, shading to lemon yellow on the margins, oblong, obtuse or slightly acute at apex, about 1.5 cm. long; petals tinged with lilac at base, cuneate-obovate, obtuse, hairy and with a distinct hairy gland below the middle, anthers 0.3 cm. long, shorter than the slender filaments, "capsule 1½ to 2 inches long." (S. Wats. loc. cit.; fruit lost from the specimens quoted by him.)

DISTRIBUTION: Chiapas. The southernmost species.

*Specimens examined:*

CHIAPAS: Without more specific locality, *Ghiesbreght* 661. "Terre froide. Fleurs jaunes pales. Fleuris in Août et Septembre. Croit sur les rochers;" also *Ghiesbreght* 104. Both in the Gray Herbarium, marked "n. sp."

## 3. CALOCHORTUS EXILIS Painter, sp. nov.

Stem simple or with a few branches, 8 to 15 cm. high from a fibrous-coated corm about 1 cm. in diameter; leaves narrowly linear, mainly basal; bracts lanceolate; flowers 1 or 2, erect, on slender peduncles shorter than the leaves; sepals purple to purplish or even yellowish, 1 cm. long, oblong, obtuse or sometimes mucronulate; petals lemon yellow, obovate, cuneate, obtuse; anthers 1.5 mm. long, shorter than the filaments; ovary ovate-lanceolate in outline; capsule unknown.

Type in the U. S. National Herbarium, no. 354467, collected on bare summits of the Sierra de Pachuca, altitude 3,000 meters, September 14, 1899, by *C. G. Pringle* (no. 8247).

DISTRIBUTION: In the mountains of Hidalgo.

*Specimens examined:*

HIDALGO: Cerro de los Navajos, Mineral del Monte, November, 1835, *C. Ehrenberg* 501; bare summits, Sierra de Pachuca, type collection.

## 4. CALOCHORTUS PRINGLEI Robinson.

*Calochortus pringlei* Robinson, Proc. Amer. Acad. 36: 472. 1901. "Collected by *C. G. Pringle* in thin soil on the top of the knobs of the Sierra de Tepoxtlán, State of Morelos, Mexico, altitude 2,300 meters, 15 September, 1900, no. 8435. Type in herb. Gray."

Stem simple or branched, somewhat flexuous, 30 to 50 cm. high from an ovoid fibrous-coated corm, surmounted by a mass of long, linear, dark brown scales; leaves linear, the basal 20 to 40 cm. long, cauline gradually smaller; bracts lanceolate, acuminate; flowers dark purple or almost black, erect, on slender pedicels exceeding the leaves; sepals "narrowly obovate, bluntly pointed or retuse, glabrous except at a small roundish area below the middle on the inner surface;" petals narrowly obovate,

cuneate, about 1.5 cm. long, externally glabrous, internally covered on all parts except the narrowed base by rather coarse violet or yellow hairs; ovary glabrous; capsule elliptic in outline, acute at both ends.

DISTRIBUTION: Morelos. Only known from type locality.

*Specimens examined:*

MORELOS: Sierra de Tepoxtlan (see above). Type in the Gray Herbarium and cotypes in the U. S. National Herbarium and the Philadelphia Academy of Natural Sciences.

##### 5. CALOCHORTUS GRANDIFLORUS (Mart. & Gal.).

*Cyclobothra grandiflora* Mart. & Gal. Bull. Acad. Sci. Brux. 9<sup>2</sup>: 384. 1842. "Border of Lake Patzcuaro, 7,000 feet, H. Gal. no. 5313."

Stem simple, 50 cm. high; basal leaves narrowly linear, the cauline broadly linear to lanceolate, clasping and dilated at base; axils bulbiferous; flowers few on stout peduncles, but little exceeding the leaves; sepals oblong, acute, yellowish, with an oval, slightly hairy gland near the base, 3.5 cm. long; petals larger, broadly elliptic, obtuse, ciliate, deeper colored and with a triangular gland near the base; anthers 5 mm. long.

DISTRIBUTION: In the Sierra Madre of Jalisco and Michoacan.

*Specimens examined:*

JALISCO: Barranca near Guadalajara, June, 1886, *Dr. E. Palmer* 580; vicinity of Rio Blanco, near Guadalajara, September 30, 1903, *J. N. Rose & Jos. H. Painter* 7445.

Bulbs of the last-cited collection flowered in Washington, May, 1905.

##### 6. CALOCHORTUS HARTWEGI Bentham.

*Calochortus hartwegi* Benth. Pl. Hartw. 26. 1840. "In pascuis montium prope Aguas Calientes."

*Cyclobothra hartwegi* Kunth, Enum. Pl. 4: 231. 1843. "Calochortus hartwegi Benth."

Stems 40 to 50 cm. high; leaves linear, vaginate, the upper ones dilated at base; flowers few, horizontal on stoutish peduncles exceeding the leaves; sepals oblong with no hairs on the inner surface, yellowish, about 5 cm. long; petals larger, broader, ciliate and with a row of hairs extending about two-thirds along the midvein, deeply colored, purplish at the base and shading to yellow at the tip, about 6 cm. long; anthers 0.6 cm. long.

DISTRIBUTION: In the Sierra Madre of Aguas Calientes and Jalisco.

*Specimens examined:*

AGUAS CALIENTES: *Hartweg* 230. (Gray Herbarium.)

JALISCO: In the Sierra Madre west of Bolaños, September 15-17, 1897, *J. N. Rose* 2949.

##### 7. CALOCHORTUS CERNUUS sp. nov.

Stem erect, simple or with a few branches, very straight, 20 to 40 cm. high, from a fibrous-coated corm surmounted by a cylindrical mass of dark brown scales; leaves linear, the basal 20 cm. or more long, 5 to 8 mm. broad, the cauline gradually shorter, becoming lanceolate, clasping, the axils bulbiferous, the bracts unequal; flowers nodding on slender upright peduncles; sepals dark brown, lanceolate-oblong, acute, glabrous, 1.5 to 3.8 cm. long; petals larger, purple, ovate, with long, scattered hairs above and a dark-colored gland below the middle, 2 to 2.7 cm. long; filaments 0.5 cm. long, slender; anthers 0.25 cm. long, apiculate.

Type in the Gray Herbarium, collected on Sierra de Tepoxtlan, Morelos, altitude 6,700 meters, September 12, 1900, by C. G. Pringle (no. 9341).

8. *CALOCHORTUS SPATULATUS* S. Wats.

*Calochortus spatulatus* S. Wats. Proc. Amer. Acad. 14: 267. 1879. "Oaxaca, Ghiesbreght."

Stem simple or branched, about 40 cm. high; basal leaves unknown; cauline leaves linear-lanceolate to lanceolate, dilated at base, clasping; axils bulbiferous; bracts lanceolate; flowers purple, horizontal, on peduncles much exceeding the cauline leaves; sepals and petals spatulate, with a hairy gland a little below the middle; filaments thread-like, 6 to 8 mm. long; anthers 2.5 to 3 mm. long.

DISTRIBUTION: Oaxaca.

*Specimens examined:*

OAXACA: Specific locality not stated, *Ghiesbreght* in 1842.

Type in the Gray Herbarium.

9. *CALOCHORTUS PURPUREUS* (H. B. K.) Baker.

*Fritillaria purpurea* H. B. K. Nov. Gen. & Sp. 1: 288. 1815. "Crescit locis apricis, aridis Novae Hispaniae prope Patzcuaro, alt. 1130 hexap."

*Calochortus bonplandianus* Schultes f. in Roem. & Schult. Syst. Veg. 7: 1532. 1830. "Humb. et Bonpl. nov. gen. red. Kunth III. p. 288, sub *Fritillaria purpurea*."

*Cyclobothra purpurea* Sweet, Brit. Fl. Gard. II. 1: pl. 20. 1831. "*Fritillaria purpurea* Humb. Bonpl. and Kth. nov. gen. et sp. 1 p. 288."

*Cyclobothra propinqua* Schauer, Linnaea 19: 701. 1847. "In Mexico Aschenb. exs. n. 374."

*Calochortus purpureus* Baker, Journ. Linn. Soc. 14: 308. 1875. "*Fritillaria purpurea*, H. B. K. Nov. Gen. 1: 288 ....."

Stem simple, 20 to 40 cm. high from a fibrous-coated corm; lower leaves narrowly linear, upper lanceolate, acuminate, dilated and clasping; flowers one or two, horizontal, on peduncles exceeding the leaves; sepals oblong-lanceolate, distinctly spotted at the base; petals of the same shape as the sepals and hairy near and on the margins; anthers 5 mm. long; pod erect.

DISTRIBUTION: On the table-lands of central Mexico.

*Specimens examined:*

GUANAJUATO: *A. Dugès* in 1880.

JALISCO: On the road between Huejuquilla and Mesquitec, August 25, 1897,

*J. N. Rose* 2589; slopes of canyons near Guadalajara, September 28, 1889,

*C. G. Pringle* 2329; Rio Blanco, August, 1886, *Dr. E. Palmer* 338.

10. *CALOCHORTUS BARBATUS* (H. B. K.).

*Fritillaria barbata* H. B. K. Nov. Gen. & Sp. 1: 288. 1815 "Crescit in montanis prope Guanajuato et Valladolid Mexicanorum, alt. 1,000-1,100 hexap."

*Cyclobothra barbata* Sweet, Brit. Fl. Gard. I. 3: 273. pl. 27. 1828. "*Fritillaria barbata* Humbl. et Bonpl. nov. gen. red. Kunth."

*Calochortus pallidus* Schultes f. Syst. 7: 1533. 1830. "In Mexico: D. de Karwinsky."

*Calochortus flavus* Schultes f. Syst. 7: 1535. 1830. "*Fritillaria barbata* Humbl. et Bonpl."

*Cyclobothra flava* Lindl. Bot. Reg. under pl. 1662. 1834. "*Calochortus flavus* Schultes fil. *Fritillaria barbata* Kunth."

*Cyclobothra pallida* Lindl. Bot. Reg. under pl. 1662. 1834. "*Calochortus pallidus* Schultes fil."

*Cyclobothra lutea* Lindl. Bot. Reg. pl. 1663. 1834. "*Cyclobothra barbata* Sweet, Fl. Gard. t. 273."

Stem 10 to 50 cm. high, simple or branching from a fibrous-coated corm about 1.5 cm. in diameter; leaves narrowly linear, the radical very long, the cauline shorter, somewhat clasping but not dilated at base; flowers yellow, nodding on long peduncles exceeding the leaves; sepals oblong-lanceolate, narrower than the petals but of the same length, somewhat hairy near the middle but not ciliate, acute, or mucronulate; petals rhombic-ovate, acute, or acuminate, with a densely hairy gland near the base, the hairs yellow or purple and in dried specimens sometimes extending beyond the margins giving the appearance of ciliation; anthers 3 to 4 mm. long, shorter than the filaments.

DISTRIBUTION: Throughout the plateau region of Mexico.

*Specimens examined:*

GUANAJUATO: Mountains, September, 1903, *A. Dugès* 3; 1880, *Prof. A. Dugès*.

SAN LUIS POTOSÍ: In montibus San Moquelito, ex convalle San Luis Potosí, *J. G. Schaffner* in 1876, no. 542; San Luis Potosí, *J. G. Schaffner* in 1879, no. 229; in the region of San Luis Potosí, altitude 1,800 to 2,400 meters, *Parry & Palmer* 891 in 1878.

HIDALGO: Near Real del Monte, *C. Ehrenberg* 18; between Pachuca and Real del Monte, August 31, 1903, *J. N. Rose & Jos. H. Painter* 6702; near El Salto, September 6, 1903, *J. N. Rose & Jos. H. Painter* 7084; on Sierra de Pachuca, July 20, 1905, *J. N. Rose, Jos. H. Painter & J. S. Rose*, no. 8774; between Somoriel and Las Lajas, August 5, 1905, *J. N. Rose, Jos. H. Painter & J. S. Rose* 9237.

MEXICO: Meadows and banks, Flor de Maria, August 1, 1890, *C. G. Pringle* 3185; near Salazar, September 14, 1903, *J. N. Rose & Jos. H. Painter* 7048.

FEDERAL DISTRICT: Valley of Mexico, Zacoalco, August 10, 1865-66, *Bourgeau* 687; near San Angle, August 15, 1905, *J. N. Rose, Jos. H. Painter, & J. S. Rose* 9485; near Tlalpam, August 20, 1903, *J. N. Rose & Jos. H. Painter* 6457; in 1905, 9440; same locality, August 20, 1896, *J. W. Harshberger* 161; hills above Santa Fé, September 4, 1901, *C. G. Pringle* 9302; grassy slopes near Eslaba, September 18, 1903, *C. G. Pringle* 11714; pedregal east of Ajusco, September 8, 1903, *J. N. Rose & Jos. H. Painter* 6842.

OAXACA: Cerro de San Filipe, September 23, 1895, *C. Conzatti* 703; same locality, October 2, 1894, *Charles L. Smith* 745; La Carbonera, September 20, 1895, *Lucius C. Smith* 791.

DURANGO: Papasquero, August 7, 1898, *E. W. Nelson* 4667.

SPECIFIC LOCALITY UNKNOWN: "Mexico" *Dr. Coulter* 1556, 1557, 1558; "Mexico" *C. Ehrenberg* 259, 754; "cultivated from Pringle's bulbs," 1891. (Gray Herbarium.)

**11. CALOCHORTUS BARBATUS CHIHUAHUANUS** Painter, subsp. nov.

Stem 20 to 30 cm. high, from a fibrous-coated corm about 1.5 cm. in diameter; leaves all linear, the basal broader, cauline clasping; flowers horizontal on long peduncles exceeding the leaves; sepals ovate, acuminate, externally glaucous and purple, internally with a hairy zone along the midvein, 1.5 to 1.8 cm. long; petals broadly ovate, acuminate, the upper half yellow, the basal half purple with a very hairy gland, the entire surface densely hairy; anthers 4 to 5 mm. long.

Type in the U. S. National Herbarium, no. 33323, collected in the Santa Eulalia Mountains, September, 1885, by *C. G. Pringle* (no. 328).

DISTRIBUTION: In the Sierra Madre of Chihuahua and Durango.

*Specimens examined:*

CHIHUAHUA: Santa Eulalia Mountains, type collection; same locality and date, *Wilkinson*.

DURANGO: Santiago Papasquiari, April and August, 1896, *Dr. E. Palmer* 415; near Guadalajara, September 28, 1903, *J. N. Rose & Jos. H. Painter* 7381.

MEXICO: Near Tlacotitlan, August 28, 1903, *J. N. Rose & Jos. H. Painter*, 6621; bluffs of barranca below Ozumba, September 24, 1904, *C. G. Pringle* 13223.

OAXACA: Ghiesbreght, 1842.

LOCALITY INDEFINITE: "Recue en Septembre, 1895, de Moro Leon sud del État de Guanajuato en mauvais état." (Communicated to Gray Herbarium by A. Dugés.) Cultivated from Pringle's bulbs, Gillet and Horsford, 1891. (Gray Herbarium.)