A Revision of the Genus Calochortus

BY

CARL PURDY

Issued December 14, 1901

SAN FRANCISCO
Published by the Academy
1901
A REVISION OF THE GENUS CALOCHORTUS.

BY CARL PURDY.

PLATES XV–XIX.

INTRODUCTION.

The most widely diffused as well as the handsomest of the liliaceous plants of the Pacific Coast are the Calochorti. On the north they reach British America; one species is to be found as far east as Nebraska; several are natives of northern Mexico; and within these limits no considerable section of country is destitute of some species.

While the range of the genus is so immense, that of several of the species is also very extensive. What a diversity of conditions C. nuttallii meets in its range from the western side of the Sierra Nevada to Nebraska, and from the Snake River to Arizona. C. nitidus is found from the meadows of eastern Oregon to the shores of Yellowstone Lake, C. albus from San Diego to Tehama, and many others are scattered over hundreds of miles. A species distributed over a region so varied in soil, climate, and altitude cannot but be variable; and it hardly need be added that the genus Calochortus is a very difficult one for botanists to deal with.

I long since became convinced that it is only in the garden, where plants from different localities can be grown under identical conditions, that the relationship between apparently different forms can be satisfactorily determined. For some years I have grown a large variety of Calochorti in my grounds, and have had nearly every known species under cultivation, often in many forms. The culture of Calochorti is most interesting, though not unattended with cultural difficulties; but the beautiful flowers amply repay all efforts, and the garden has proved the identity of forms

[107]  November 27, 1901.
apparently different; here, also, variations attributed to environment are shown to be constant. In the garden, too, strains, which from a botanist's standpoint seem scarcely distinguishable, show marked differences in vigor, flowering time, or immunity from disease.

It is a peculiarity of our liliaceous plants, that as a rule in a given locality there is little variation from a well marked type, as little, indeed, as may be found between flowers growing upon the same plant. Hundreds and thousands of flowers may be picked, all conforming closely to this type. In another locality, the same species will be found markedly different. The difference between the forms in the two localities may be slight, consisting merely of a marking or a slightly varying leaf, habit, or gland; yet the variant, once noted, is found to be constant. In *Calochortus* color forms are frequent, the flowers from one bulb retaining the same tints under any and all conditions. The difference between forms from different localities is rather that which florists designate by the word "strain" than what is usually understood to constitute a botanical species or variety.

In cultivation it has frequently been found that a very slight variability in strains is accompanied by a marked constitutional difference. In two beds of *Calochortus venustus*, planted in the same soil, and separated only by a thin board, it would puzzle a botanist to state wherein the plants vary. They come from widely separated localities, and the difference is one more easily detected by the eye than conveyed by words. In one bed, two-thirds of the leaves are already destroyed by mildew (*Botrytis*), while in the other, not one leaf is injured; and such is the case whenever and wherever the two are planted. Many similar instances occur in other species, but a single one is sufficient to show that the slight variations which the eye detects are not the only ones.

Such strains are present in nearly every species of *Calochortus*. The range of a strain may be very local—a few miles square—or it may be found over half the length of a state. In *Calochortus venustus* one strain runs through all
the plants found for hundreds of miles along the Sierra; another strain is found in the same species occurring in the Coast Range and over an equal area. In some of the more variable species there are several strains.

In many of the Calochorti the gradations from one species to another are so slight that it is impossible to separate them. The extreme types on which the species are founded are easily distinguishable, but a perfect chain of variations links them closely together. There is no doubt that *C. weedii*, *C. plummerae*, and *C. obispoensis* are variations of a greater species.

While, as before stated, it is the rule that a given locality produces specimens conforming closely to a type, yet this is not always the case. In some localities the variations are bewilderingly numerous. I have seen places where hundreds of flowers of *C. venustus* could have been selected, each differing in color and markings from the rest. Why a species that remains so true to a type in some localities should vary so remarkably in others is a subject that will not be discussed at present. Hybridization will account for it in some instances, while in others it is hardly a tenable hypothesis.

I cannot say that I attribute any material share in the origin of the many strains or varieties to hybridization, although among the Calochorti it is not infrequent. Such crosses as *C. albus* and *C. benthami*, *C. maweanus* and *C. pulchellus* are frequently met with, but I have never yet seen one that was fertile. Again, varieties of a species, e.g., *C. luteus* var. *oculatus* and *C. luteus* var. *citrinus*, readily cross and produce fertile hybrids. Over a small area innumerable cross-breeds may be found, but a few miles away the two varieties will be found separate and varying as little as in any locality. Then again, hybridization often will not take place between two apparently very closely related species. I have often seen *C. vesta* in flower surrounded by large numbers of *C. luteus* var. *oculatus* or var. *citrinus*, but not a plant could be found that in any way indicated hybridization; while last summer, in the Sierra Nevada, I
visited a spot where *C. luteus* var. *oculatus* and *C. luteus* var. *citrinus* had hybridized to a remarkable degree. A few yards away, indeed mingling with them, were thousands of *C. venustus*. Within a quarter of a mile I do not doubt there were fifty thousand plants in flower, yet close search failed to reveal one that in any way suggested a cross of *C. venustus* with any of the variations of *C. luteus*.

In the "Botany of California," Vol. II, published in 1880, Watson described twenty-six species of *Calochortus*. The work was carefully done, though the material at command was meager as compared with that obtainable now; yet nearly every species recognized by Watson stands good to-day. Many new species have been added, but by the exploration of new territory rather than by the subdivision of old species.

The work of preparing the present paper has been facilitated by the courtesy of the California Academy of Sciences and the University of California, in allowing me to inspect their herbarium specimens. Mr. J. W. Congdon of Mariposa very courteously permitted an examination of his material, and to Mr. G. W. Hansen I am indebted for a set of specimens from Amador County. My personal collection, including both herbarium and living specimens, covers a wide range; still, with these facilities, probably as good as can be obtained anywhere, the material is painfully unsatisfactory in some species, several of which are represented in the best herbariums by a single specimen, if at all.

With each year appear many new forms, even from California. Last season brought three new species, and many striking variations of old species were added to the already large assortment. The field is immense and has never been properly worked over. In view of these facts, it seems the wisest course to disturb existing nomenclature as little as possible. As to whether a given degree of difference warrants a specific or a varietal name seems to me to be very largely a matter of personal opinion. While one can hardly agree with the author who designates a color form by a specific name, it will probably be consulting the convenience of
botanists to allow such a name to stand for the present, especially as a more extensive knowledge of the subject may result in still further changes. The pressing need is for a work containing descriptions of all known species of Calochorti, together with such grouping as will readily convey to the student the relationship of the various species.

In the "Botany of California," the types of the species known to Watson are usually very accurately described. The only criticism to be made is that in many instances he was acquainted with but a few representatives of the species. Nineteen years have added much to our knowledge of the range of the various forms of Calochorti, but it is still far from complete. In the notes on distribution of species, the range as I have accurate knowledge of it is given. A species may, and in many cases doubtlessly does, extend over a far wider range than that with which it is credited.

The measurements of any portion of a plant as given in published descriptions of Calochorti are of little value, and are apt to be misleading. Environment makes the greatest difference in the size of the plants. Take, for instance, those of the woods, such as *C. albina*, *C. pulchellus*, and the *elegans* group; the variations are almost limitless. Especially after a forest fire is growth luxuriant. Plants which under adverse conditions have leaves but a few inches in length, and few-flowered, slender stems, will, under more favorable circumstances, produce great leaves a foot or two long, stout stems eight inches to two feet in height, and a dozen or more fine flowers. Especially do the plants of the Mariposa section respond prolifically under fertile conditions. If the season be dry, the plants are sparsely scattered and but a few inches above ground; but let the season be one of great rainfall, they fairly hide the ground with tall, many flowered stems upholding numerous large blossoms. But while measurements based upon a series of specimens are almost valueless, proportional measurements of the parts of the same flower are often of great importance, the proportions between the parts being usually the same whatever the size of the flowers.
In the present paper I have departed from the usual method by describing a single type plant and indicating the variations in the notes. Personal experience has proven that the fuller a description is, the more value it has in the determination of specimens; details seemingly of little importance at the time when the specimen was described, are often indispensable in the work of later students, making it an absolute necessity for them to refer to the type specimen in order to determine what was really described. This brevity in some of the earlier descriptions makes them entirely valueless for determination.

Having no personal knowledge of the Mexican species outside of the herbarium, I have not included them in this revision, being unable to add anything of value. There is a large and almost unknown field in Arizona and western New Mexico which will probably yield several new species.

Only the description and when possible the locality (the original locality is quoted in nearly every instance) of the species have been given in the following pages, the synonymy having been omitted because of its often doubtful nature.

**Key to the Species of Calochortus.**

**Section I. Eucalochortus.**

Flowers or fruit nodding; petals incurved or strongly arched; gland transversely crested or hairy; capsule nodding, with thin acute or winged cells; leaves long and glossy, not channelled.

**Group I. Globe Tulips.**

Type of Group *C. albus.*

Flowers subglobose, nodding. Woodland plants; California.

Flowers white; petals covered with scattered silky hairs within.

1. *C. albus.*

Flowers rose color; petals silky within, partly opening out. Foot-hills of Fresno and Tulare counties, California. 2. *C. amoenus.*

Flowers light yellow; petals silky within, gland bordered with stiff hairs which cross each other. 3. *C. palchellus.*

Petals very strongly inarched, not silky within, but margin thickly set with short, stiff hairs; gland like last 4. *C. amabilis.*
Group 2. Star Tulips.

Type of Group *C. elegans*.

Flowers campanulate, erect or ascending; capsule nodding (except in No. 13); stem low and flexuous (In 14, 15, 16, stout and erect), not bulbiferous or very seldom so.

*Petals covered with hairs, and with a transverse scale covering upper part of the gland. Woodland plants.*

Flowers yellow. Foothills of the Sierra Nevada...5. *C. benthamii*.

Flowers white or purplish blue, covered with long erect hairs; capsule oblong-elliptical; stem branching........6. *C. maweanus*.

6a. *C. maweanus* var. major.

6b. *C. maweanus* var. roseus.

Flowers blue, covered with silky hairs, longer and slenderer than the last; capsule orbicular; inflorescence umbellate.

7. *C. cernulens*.

Flowers greenish white; petals with very narrow scale and covered with long hairs. Oregon and north...8. *C. elegans*.

8a. *C. elegans* var. morns.


**Petals with a transverse scale closely appressed over upper portion of gland, nude or nearly so. Woodland plants; in dry soil.**

Flowers white with a single tuft of a few hairs at each end of scale on petals; plants very low and slender. Sierra Nevada.

10. *C. nudus*.

Flowers white with scant hairs on lower third; plants taller than the last. Vicinity of San Francisco Bay........11. *C. umbellatins*.

***Petals nude or only lower portion hairy; flowers campanulate; plants growing in open wet meadows.***

Flowers lilac, hairy on lower third; one or several bulblets on stem below the ground..........................12. *C. uniflorus*.

Flowers white, not bulbiferous; capsules erect...13. *C. shastensis*.

****Petals covered with silky hairs; flowers and stems stout and erect. Closely related to Group 1 of Mariposa. Plants growing in open fields or hillsides. Mt. Shasta, California, and north.***

Flowers blue; petals without scale, covered with long silky hairs. Mt. Shasta, California (?), and Willamette Valley, Oregon.

14. *C. toluiici*.

Flowers white; petals with scale, otherwise the same as the last. Willamette Valley, Oregon.................15. *C. purdyi*.

Flowers straw color; petals without scale, otherwise like *C. toluiici*. Lake Pend d. Oreille, Idaho......16. *C. apiculatus*. 