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DUES NOTICE

MEMBERSHIP FEES ARE DUE BY JULY, THE START OF A NEW PUBLISHING YEAR. This will be the only notice. We are forced by proposed mailing cost increases, other expenses, and a deficit balance the first year (we were warned last year to charge a higher rate!) to increase rates. The new rates are: \$3./year, U.S. and Canada; \$5./yr (or equivalent) overseas.

We're Growing!

We're up to 152 members, and new members, especially from overseas, keep trickling in. Special thanks to V. Girard for mention in the ARGS mag.

16. *Calochortus uniflorus* Hook. & Arn.
Large-flowered Star Tulip. Fig. 1072.

Calochortus uniflorus Hook. & Arn. Bot. Beechey 398. pl. 94. 1841.

Calochortus illicinus Kell. Proc. Calif. Acad. 2. 5. 1858.

Stem 10-25 cm. high, flexuous, usually branched, bulbiferous near the base. Umbels 1-3, and usually 1-4 flowered, sepals ovate to oblong-lanceolate, 12-16 mm. long, greenish lilac; petals lilac often with a purple spot on each side of the gland, cuneate, nearly truncate-denticulate, 20-25 mm long, naked above, sparingly hairy just above the gland; gland shallow, not pit-like, with a narrow appressed triangular scale; filaments slender, twice the length of the anthers; anthers oblong, 4 mm long, obtuse, lilac; capsule obovate rounded at both ends, 10-15 mm long, nodding.

Wet meadows, Upper Sonoran and Humid Transition Zones, Coast Ranges, from the Siskiyou Mountains, near Grants Pass, Oregon, to Monterey, California. Type locality Monterey, California.



C. uniflorus,
from An Illustrated Flora of the Pacific States, by Leroy Abrams, Ph.D., Stanford Univ. Press, 1923, p. 437.

I. SPECIES THIS ISSUE: CALOCHORTUS UNIFLORUS

In this issue, we will cover C. uniflorus. The species is a study in how botanists can disagree.

RANGE: From SW Oregon down through the N. Coastal Ranges of California to about Monterey. Many stands in the southern portion of its range extinct or threatened.

BOTANY: *C. uniflorus* belongs to section *Calochortus*, one of three sections of the genus *Calochortus*. While M. Ownbey believed that the sp. is tetraploid, with a haploid chromosome count of 20, Brian Ness has determined that both diploid and tetraploid populations exist. The diploid populations lie generally to the north of Lake Co., Cal, while the tetraploids are to the south of these. Thus there are *C. uniflorus* stands with both haploid #10 and 20. There may be a triploid population as well, according to Frank Callahan and Ray Godfrey. In Oregon, there are stands which are sterile, but reproduce vegetatively, by bulbils. *C. uniflorus* is also unusual in that unlike most members of sect. *Calochortus* (not the genus), it produces bulbils in its leaf axils (bulbilifery, Fiedler) i.e. where the leaf joins the stem.

C. uniflorus is assigned to the "nudi" subsection of sect. *Calochortus* in Ownbey's monograph of the genus. As with the pussy ears, the flowers tend to be upright, rather than nodding. Unlike the former, they tend to produce glabrous, i.e. nearly hairless petals. The seed capsule is elliptic and nodding. The common names, "star tulips" and "meadow tulips," reflect the similarity of their form to what may be a closely related genus, *Tulipa*. The bowl shaped flowers with outwardly extended sepals looks like a tulip surrounded by a three pointed star.

C. uniflorus is differentiated from the other star tulips partly by form, partly by habitat, and partly by its bulbiliferous habit. From *C.*

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nudus and C. minimus it is distinguished by gland shape and stem shape as well as by its bulbiferous habit. Bulbiferous also separates C. uniflorus from C. umbellatus, an otherwise closely related species. C. umbellatus is "very rarely" bulbiferous according to Ownbey, whereas C. uniflorus is consistently so. C. uniflorus is further differentiated from the other star tulips by habitat. It tends to grow in wet meadows at low elevations, rather than hillsides, alpine clearings or woodlands; sun, not part shade.

Other botanical differences are less clear-cut. If one dips into the botanical literature, one will find a bewildering array of contrary descriptions of the sp. For example, Prof. Abrams describes its color as "white to lilac," while Profs. Jepson and Ownbey describe it as "lilac," and Dr. Niehaus as "pink" (A Field Guide to Pacific States Wildflowers, p. 252). Bryan Ness thinks that this reflects the diversity of color forms of a sp. with a relatively large range. He does not think that there are any truly white ones however.

The petals of C. uniflorus are wedge- or fan shaped, and the anthers can be obtuse or acute. The gland is oblong (Niehaus) or convex (Jepson, Ownbey) and covered with a triangle-shaped scale, or membrane. The stem is often low, and usually not branched according to Prof. Ownbey.

HISTORY: The species was discovered early in the nineteenth century, and described by Hooker and Arnott. It is not "one-flowered," as its botanical name would imply. Although some botanists placed it in sect. Cyclobothra, this was later revised, and it is now recognized as an early and well-established species. A separate sp., C. lilacinus (Kellogg, 1863) proved to be C. uniflorus upon later examination.

HORTICULTURE: In the wild, C. uniflorus grows in meadows which are wet for part of the year (late autumn to spring), gets 15-30 inches of rain a year in normal years, and prefers sun. However, it is often cloudy or foggy in its habitat for much of the year. In its native range it is hardy to 0 F. in its northern stands, and will probably endure more with protection. Its southern stands, on the other hand, receive almost no frost. The basal leaf appears from mid- to late winter, while the blooms appear from early to mid-spring, and is often the first sp. of the genus to bloom. Like the others in its section, it is a hypogeal germinator, without a cotyledon leaf (Robinette, Farwig).

For pot culture, a light, friable mix is recommended. This can vary from soil based mixes (1/3 loam, 1/3 humus, 1/3 sand) to organically based mixes (2/3 humus, 1/3 sand), to soilless mixes (e.g., U.C. Davis soilless: 1/3 vermiculite, 1/3 perlite, 1/3 sphagnum peat moss). While drainage is important, this sp. probably gets more water than almost any other Calochortus in the wild. During its dormancy in summer and early autumn, it should be kept dry, but according to Mrs. Schmidt, it will tolerate some summer water. It prefers sun, but would probably appreciate part shade in hot locations.

In the ground, C. uniflorus is one of the least fussy in the genus, tolerating almost pure sand (Kline-Oregon) to heavy clay (Hayward). Some humus or sand added to poorly drained soils may aid growth, although this sp. will tolerate poor drainage better than most others. Fertilizer results in my field trials are not in yet, but Farwig uses lime; Baccus, ammonium nitrate; and Robinette, Miracle-Grow.

Propagation is both from bulbils and from seeds (for seed care see V.I, #2). There is the advantage of bulbiferous with this sp., which makes vegetative propagation an option. Pests include rodents, who eat the bulbs, and damping off of seedlings. Landscape positions include naturalized meadows, beds of natives (Cal., Or., Wash.), and areas set aside for Mediterranean climate sp.

II. ANNOUNCEMENTS:

1. Bryan Ness of Pacific Union Coll. in Angwin, Ca. has agreed to

act as a consultant to Mariposa on biological aspects of Calochortus, e.g. taxonomy. Mr. Ness is completing his Ph.D. work at St. University of Washington at Pullman, where Marion Ownbey taught. His dissertation is on Calochorti, including a re-examination of the "nudi" subsection.

2. Stan Farwig and Vic Girard, our well-known advisors, are doing the write-up on the genus Calochortus for the Jepson manual revision.

3. Another new species of Calochortus, C. umpquaensis, was (re-?) discovered near Roseburg, Or. It was noticed by Ray Godfrey that a specimen identified as a known sp. was in fact distinctive. Ray brought it to the attention of Nancy Fredericks, who published it. It will be discussed in more detail in a future issue.

III. The Horticultural History of Calochortus—3rd Installment.

Sanders, T.W., Bulbs and their Cultivation, London, W.H.&L. Collingridge, 1908.

"There is quite a large number of species in cultivation...All the species are more or less tender, coming as they do from California, and therefore can only be successfully grown outdoors in the warmer parts of the (United) kingdom. Some of the species require partial shade, and others plenty of sun. In all cases a rockery is a good position for growing them; failing this, then a well-drained bed or border should be provided for them...some require loam or peat, others a gravelly or a sandy soil, and their individual requirements must be studied. Messrs. Wallace and Co., the bulb specialists, however, state that they can be grown successfully in a compost of road grit, leaf-mold and sand, so where peat is difficult to obtain, their advice may be safely followed

"Planting should be carried out from September to November, and in the case of such species as clavatus, Kennedyia (sic), macrocarpa, and Plumeræ in March. Plant three inches deep and four inches apart. Cover the surface of the soil with bracken or leaves, and remove these in March. As soon as the bulbs have flowered cover those planted in groups on the rockery with a bell-glass or cloche, and those in beds with a frame light, supported at each corner by a brick. This precaution is necessary to ensure the thorough ripening of the bulbs. In this case, the bulbs may be allowed to grow undisturbed for three years, when lift and replant in fresh soil. Where frames or cloches are not available, lift the bulbs annually as soon as the leaves wither, and store them until September, then replant. During the growing see the soil is kept moist. Increased by offsets, also by seeds. Seedlings, however, do not flower until they are three to six years old."

--pp. 56-57

There is an additional description of Calochortus culture in the chapter on growing them in a "cold greenhouse:"

"Five inch pots, or pans 6 in. deep and 8 in. to 12 in. in diameter may be used to grow Calochorti. The compost should consist of equal parts of peat, leaf-mold, sandy loam and coarse silver sand. Good drainage must be provided. Plant the bulbs in October or early November, placing them two inches deep and three inches apart in the pans, or four in a 5 in. pot. Store under fiber refuse in a cold frame until growth begins, then remove them to a greenhouse. Water carefully until growth is active, then give a liberal supply until the leaves begin to fade, when gradually discontinue the supply withholding it entirely in autumn and winter. These bulbs must have full exposure to the sun both when growing and ripening their bulbs. Store in a cold frame in autumn, and repot in November. A little weak liquid manure may be given during the growing stage. Increased by offsets."

--p. 144

A chart is also provided listing, for a number of spp., such factors as color, flowering period, soil type, exposure, etc.

In this article, of British origin, more attention has been paid to differences between winter and spring growing sp., different growing media, and the like. The selection on greenhouse culture is the first explicit treatment of the topic I know of. As British growing conditions are what the author has in mind, his comments may be less useful to Mediterranean- or Western-climate growers. They may be useful to Eastern growers, however.

IV. Conservation: CALL FOR VOLUNTEERS

Chuck Baccus has suggested the establishment of seed sources on members' land. His idea is to build a frame filled with a suitable medium and use seed of a single sp., appropriate to the area. The member would tend to the species, trade seed with other members, and help to reestablish wild stands. Such pure sources would also aid in conservation, by establishing new, pure, relatively undisturbed stands. Volunteers with a small space to spare on their land are urged to submit their names.

Stan Farwig suggested that knowledgeable members aid in conservation by reestablishing Calochorti, or spreading them in areas where they once grew. The idea is to gather seed in the spring, care for it over the summer, and plant or spread it just before the autumn rains, in suitable spots. This applies particularly to extinct stands, where Calochortus, once abundant, has now vanished. If and only if there is no genetically similar nearby source, seed from other areas, but the same species, could be spread. The range of the genus could be expanded through deliberate reseeding and spreading.

V. Mixes: U.C.Davis Mix, $\frac{1}{2}$ sand, $\frac{1}{2}$ sphagnum peat moss, by volume.

This mix was developed by U.C.Davis as an all-purpose mix, balancing water retention with aeration and drainage. It was meant to be used with supplemental fertilizers. It echoes the recommendations for sandy soil modification, viz., 50% organic matter amendment of sandy soil. It works fine for the Mariposa section even without fertilization. The Calochortus section don't seem to like it as much (too lean?).

VI. In Ground Culture

Because the Calochorti bloom from April to September, one could, in theory grow a garden of the genus which would be in continuous bloom all spring and summer into the fall. Beginning with the Calochorti in early spring, the Mariposas bloom in late spring, the spring growers in early summer, and the Cyclobothras in late summer and early autumn. Yet the different spp. have different horticultural requirements, and thus would have to be separated into at least three groups. The Mexican spp. require summer water, while the California spp. must be kept dry in summer. Depending upon where you live, and which spp. you wish to try, growing all of the spp. in the ground may be impossible.

Nothing is easier, of course, for Western growers than to scatter seed of local spp., leave them be, and watch them grow to maturity, without ever watering, fertilizing, or caring for them in any way, except at the seedling stage. Most parts of the West have four-five spp. which will grow under local conditions, and California has many more. The locals will survive on nothing but normal rainfall once established, and usually will adapt to local soils without amendment, although they may not bloom during drought years. Yet the lure of the beauty of non-local spp. is hard to resist.

In the ground, Calochortus will do well in most soils which are well-drained. Though some spp. grow in almost pure clay in the wild, which is generally poorly drained, these may represent the survivors of unchecked rodent predation, as both rodents and rabbits use the bulbs as a source of food. Clay gets rock-hard during the dry summers of the Pacific Coast,

making it difficult for the rodents to get at the bulbs. Predation may also account for the tendency of wild montane stands to grow in extremely rocky habitats, and for the high desert spp. growth between the roots of sagebrush. In any case, modifying heavy clays with sand or gypsum (for the Mariposas and Cyclobothras); and compost or leaf-mold (for the Calochorti) will improve drainage, as well as soil structure and aeration. In pure clay up to fifty per cent amendment is recommended, with proportionally less for soils with less clay. The soil should be thoroughly mixed with the amendment to avoid pockets of unmixed clay or sand, which can stratify the water supply. Another way to handle clay soils is to water less, or not at all (in areas of sufficient rainfall) to compensate for lack of drainage. But your results may be mixed. Growing the plants on banks or mounds will also increase drainage.

Sandy or gritty soils should be modified with up to 50% organic matter, such as well aged leaf-mold, or compost. While drainage is less of a problem in such soils, maintaining even moisture, especially for the seedlings, can be more of a problem.

The bulbs should be planted 3-4 inches deep, and 4-6 inches apart. Unless it rains, they should receive water at regular intervals: twice a month for the desert spp., and once a week for the others. During dormancy they should be kept dry. Those who receive rain all year round should dig the bulbs after dormancy, or cover them thoroughly.

VII. Corrections:

1. In Mariposa #2, I suggested baking the potting medium for 2 hours, at 200°F to prevent damping-off. Prof. Watson, whose field is plant pathology, suggests instead 180°F, i.e., "pasteurization," not "sterilization." This eliminates damping-off pathogens, but preserves spores of their enemies in the medium. As the latter is easily recontaminated, it is better to preserve biological controls within the medium.

2. Bryan Ness thinks the stand in the letter section of #2, in Marin Co., is most likely C. uniflorus, not my guess, C. umbellatus.

3. The section Eucalochortus is now called section Calochortus. The convention in adding the prefix to sections of a genus to distinguish them has recently been dropped, according to B. Ness.

4. Dr. P. Fiedler has drawn a useful distinction between bulbifery, i.e., division of the parent bulb; and bulbilifery, or offset bulbils formed in the leaf axils of certain liliaceae, incl. Calochorti. While all Calochorti, as far as is known, divide (some very slowly), not all produce bulbils.

VIII. Letter to Mariposa

"We are wondering whether you got Calochortus gunnisoni to germinate. Harold Dahnke... stratified it in vermiculite in the refrigerator, getting germination in about 30 days; then he planted it in a mixture of sand and peat with the actual seeds lying in a bed of vermiculite. He says it is important not to be too moist. So far it has just broken through the soil and standing up." --William A. Weber, F.L.S. Professor Emeritus and Curator, Herbarium Colo. (also a former student of M. Ownbey) (This method of germinating spp. from cold climates in warm areas was used for years by Stan Farwig. The seed and vermiculite should be just slightly moist, not wet. It should be placed in a sealed "ziploc" bag in the vegetable crisper at about 35-40°F. In my experience the germination time is longer, 6-12 weeks. Following the advice of Dr. P. Fiedler, I transplant the seedlings, which germinate in the vermiculite, to another medium. Thus the vermiculite is eliminated. The method works for all cold climate spp. (I have tried it successfully on C. apiculatus, C. elegans, C. greenii, C. eurycarpus, C. macrocarpus, C. flexuosus, C. bruneauensis, C. nuttallii, and C. gunnisoni). It is also advisable for montane Ca. spp., e.g., C. Kennedyi v. Munzii.

--Ed.)