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The Calochortus Society
Newsletter
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I. ANNOUNCEMENTS:

1. Your editor had the good fortume to be able to travel to Mexico with Mr. Frank Callahan this past autumn during the Calochortus season. We were able to see, photograph, and examine the habitats of almost all of the section Cyclobothra spp. on the Mexican plateau and the surrounding mountains. Many of these sp. had never been photographed, as far as is known, before. It was thrilling to see living specimens of many of these spp. for the first time, as well as to be able to correct certain errors, confusions, and gaps in the knowledge about these spp. As Mr. Callahan pointed out during the trip, there is no substitute for field work in any detailed examination of plant species. We will be using the information gathered during the trip in our treatment of section Cyclobothra beginning in V. III of MARIPOSA next year.

2. New range extention information has been provided by F. Callahan on Calochorti growing into Oregon. Previously, these spp. had not been located in Oregon. In Jackson Co. the following spp., previously known only from California, have been discovered: C. nudus and C. monophyllus. Nearby, C. coeruleus var. fimbriatus has been discovered. In Lake Co., C. Leichtlinii has been found at the north end of their Calif. stands in the Warner Mts. Finally, the pure white variety of C. macrocarpus, var. maculosus, was seen by Mr. Callahan in no. Wallowa Co., not far from the Washington state line.

II. Mixes: Fred Smith's Mix-

(Note: an article on Mr. Smith recently appeared in the gardening section of the L.A.Times (10/7/90). This is taken from that article, although Mr. Smith has written me that he tends to use a heavier soil in the boxes in which he grows the bulk of his bulbs. He believes that "any soil that has reasonable drainage and is well mixed will work." He uses plenty of water during the growing season, and a slow release Dutch bulb fertilizer (9-9-6 with trace elements). His mix consists in 40% loam soil, 30% sand, and 30% redwood sawdust.

III. Calochortus Germination Tests, 2nd. Installment: Dry cold stratification. (Note: This is the second in a series which will give the results of various germination and growing tests conducted in Alameda Co., Calif. from autumn 1989 onward (for details, see MARIPOSA II,1). Readers are again cautioned that these results are preliminary, and should not be taken as conclusive).

This test was set up to examine propagation of spp. from colder areas under mild conditions. The spp. tested included C. macrocarpus, a high desert sp. occupying USDA climate zones 4-6 (hardy to -30°F); and C. Gunnisoni, a montane sp. occupying USDA zones 4-7. The seed of both spp. were stored dry for various periods of time to determine whether cold dry storage of itself was sufficient to cause the seeds to germinate. Each sp. was stored in (1) shaded but uninsulated zone 10, (2) zone 9, (3) refrigeration at 32-38°F for eight weeks (Jan-Feb), (4) refrigeration for sixteen weeks (Nov-Feb), (5) refrigeration for twenty-one weeks (Nov-Mar), (6)refrigeration for four weeks followed by freezing for eight weeks (in the freezer section of the same refrigerator) again followed by four weeks refrigeration (simulates gradual cooling and freezing then thawing). As a 'control' we also (7) put some seed in damp vermiculite in the refrigerator, to determine if the combination of moisture and cold would initiate

germination (suggested by Farwig, et al.).

The results were clear-cut. Not one of the seeds stored dry, regardless of the length of storage time, germinated when it was planted in March or April. This held for both C. macrocarpus and C. Gunnisoni. By contrast, all of the seeds which were stored in moist-cold conditions (in the moist vermiculite) germinated. Generally, this took six weeks, although there were stragglers.

It is evident from this test that cold climate spp. require conditions similar to those they would receive in their native range in order to germinate. Neither spp. germinated without cold moisture, which no doubt substitutes for melting spring snow. Dry cold is not enough, but neither is mild moisture, as the spp. did not germinate after being watered when they had been removed from dry cold storage. In their native range this tendency probably protects seeds from being lost by germinating during a late summer or autumn rain, or a thaw. The seeds wait until the prolonged spring thaw to germinate, and avoid freezing in winter. Also, this allows maximum growing time for the spp. Mr. C. Baccus' extensive records of germination times for most Calochortus spp. will appear beginning in the summer '91 ed. of MARIPOSA.

IV. The Horticultural History of Calochortus--5th Installment.

Rockwell, F.F.,The Book of Bulbs, N.Y.: Macmillan, 1927.

[Note: This is a long selection, which includes a section on forcing. As a reprint of the entire section on Calochorti would easily take up an entire newsletter, this installment will be given in several newsletters.--ed.]

"...Some of the new varieties grow well over two feet tall, but the average is from one to one and a half feet; they flower during June, July and August, and as this gives them a considerable period of growth before blooming, they may be planted in spring more successfully than many of the half-hardy bulbs. For fall planting, put them in in September or October, or very early November, in full sun in rather open, gritty soil,but not too loose --the harder the subsoil the better. Place from four to eight inches apart, and cover three inches deep; mulch thoroughly, removing in early spring. Give abundance of water during growth, and then withhold entirely, as the bulbs need to dry and 'bake' in the soil to mature properly..." [p. 121]

[Forcing section] "These remarkably brilliantly colored flowers... are ideal for the cool greenhouse. Pot in September or October, root outside (Method Two)* and bring into cool temperature, with liberal watering. Excepting the "Globe" varieties [fairy lanterns --ed.], all should have full sun while growing. Dry thoroughly in full sun after foliage dies, and store in pots." [p. 220-1]

*"SECOND METHOD: FORCING OR GROWING IN SOIL" [p. 204ff.]

"...where a little outdoor space is available, and there is a shed or cellar in which it will be convenient to handle soil and to fill the pots, bulb pans, or boxes in which the bulbs are to be placed, the real gardener will not be content with any method except that which is really best--and that is, to force or grow them in soil, thereby getting the best possible root growth, out of doors, before allowing the bulbs to flower.

"As containers for the bulbs, ordinary pots, bulb pans--which are shallow pots--and bowls may be used for flowers to be brought into the house. Wooden boxes or 'flats,' four or five inches deep and a foot or so in width, and two to three feet in length, may be used for growing an extra supply for cut flowers, if one is so fortunate as to possess a heated frame, a small greenhouse, or even a sunny corner in the cellar or in a workroom,, where they may be brought into flower. Very beautiful early spring

effects are often obtained by planting bulbs in window boxes, burying them for the winter as described below, and bringing them out in the spring when all danger of frost is past. These bulbs will have finished flowering by the time it is safe to put out the ordinary window-box plants"

In what follows, Mr. Rockwell goes into some detail regarding suitable soil for forcing, planting of bulbs, rooting, and the proper time to bring the bulbs indoors. We will reprint these sections in the next several editions of MARIPOSA. This is the only article I know of on the forcing of Calochortus. Because he described the genus as "half-hardy" he was probably not familliar with the Great Basin and Rocky Mountain spp., which are nothing if not hardy (Carl Purdy's Nursery as the bulb source?). The mix he describes is a balanced soil-based mix.

V. Conservation: Calochortus westoni

The following article appeared in the Bulletin of the California Native Plant Society, V. 20, #3, summer, 1990, p. 5 (kindly brought to our attention by Dr. S. Yamaguchi)

"TIMBER SALE WITHDRAWN: The flat timber sale near Shirley Peak on the Sequoia N F was withdrawn due to an appeal filed by CNPS. The sale would have prescribed intensive timber harvest and tree plantations on about 40% of the known habitat of Calochortus westoni, a Category 1 candidate for federal listing [as rare and endangered; the area described is in Kern Co., Cal.--ed.]. Both CNPS and the US Fish and Wildlife Service expressed concern last fall that the sale would violate direction in the Species Management Guide and potentially jeopardized the species. CNPS was forced to appeal when the Forest Service went forward with the sale.

"Despite withdrawal of the sale, the Sequoia NF still wants to go ahead with the flat sale. They now have, however, developed an alternative which would have little effect upon the Calochortus.

VI. THE GENUS CALOCHORTUS AND SERPENTINE -by James and Georgie Robinett [The authors are avid growers of natives, especially native bulbs such as frittillarias, lilies, alliums, the brodiaea complex, and of course calochorti. Each year they produce an extensive list of seed of native bulb spp., collected in the wild. This has enabled them to observe the habitats of such spp., and particularly the often poor soils they grow in in their native range. The article will appear in two parts, in Jan. and Apr.]

While searching for various species in more than 35 counties of California and Oregon, it has been our observation that many of the Calochorti seem to be found most often on serpentine. To understand why that may be, it is important to appreciate what is unique about serpentine, and its relationship with the flora in general.

Accordingto Kruckeberg, serpentines are "ultramafic rock largely serpentinite and peridotite, which weather to soils of exceptional physical and and chemical properties." His definition of "ultramafic" is taken from Wyllie: "Ferromagnesian rocks containing more than 70% mafic [i.e. magnesium and iron] minerals. "Such remarkable concentrations of the oxides of iron and magnesium are at the expense, and even to the exclusion of most ordinary plant nutrients, especially calcium, but also nitrogen, phosphorus, potassium, etc.

The lack of nutrients produces habitats which at best appear "thin" and at their most extreme may look "sterile"--most plants simply cannot thrive there, because they quite literally starve. Sometimes the concentrations of magnesium and/or heavy metals reach the point of outright toxicity; plants common elsewhere are uncommon or even entirely lacking, because they cannot tolerate

the toxins.

But some plants are able to adapt to serpentine despite the lack of ordinary nutrients and even in the presence of toxins-indeed, they may even appear to thrive on it. They have evolved ways to deal with the low level of nutrients (by concentrating them in specialized plant parts, or by an increase in root system compared to size of the plant) and even with the toxins (often by restricting their uptake beyond the roots, or storing them in nonliving cell walls). The appearance of thriving on serpentine results from the lack of competition from commonly vigorous plants that in more friendly environments would drive them out. Also important is the unusual moisture-retention capacity of serpentine-based soils--nearly double that of the "chapparal soils" most commonly found nearby. This may well be a critical factor in the Mediterranean-type climates of the American West Coast, with long periods of drought.

It is now easier to see why bulbous plants in general--and the Calochorti in particular--might appear to be "serpentine-lovers." Bulbs have a long growth cycle. Most grow very slowly and in general do not compete well with aggressive, densely growing annual species. Further, the functional properties of a bulb allow it to tolerate a wet-season/dry-season type of climate in a barren or semi-barren environment. A bulb (or corm or fleshy-rooted plant--as a group called "geophytes") is a mechanism for storing food, and therefore life itself for the plant, underground, where it is protected from harsh climate extremes or other threats during dormancy. The dormant periods alternate with periods of vigorous growth and reproduction which may or may not come annually. (Woody perennials also have a period of dormancy, but they don't retreat underground, instead preserving life under a protective layer of thick, insulating bark.)

Thus bulbs which have evolved a tolerance for the nutrient-poor, sometimes toxic serpentine soils of the West Coast will enjoy a number of positives: there are few competing annuals; they already "know" how to concentrate and store food; and they are able to accommodate a wet-season/dry-season climate. They are in a good position to take advantage of serpentine's peculiar capacity for moisture retention.

VII. Species This Issue: C. venustus.

Range: A U-shaped area consisting in the So. Coastal Ranges of California, the Tehachapi Mts. to the south and the So. Sierra Nevada to the east.

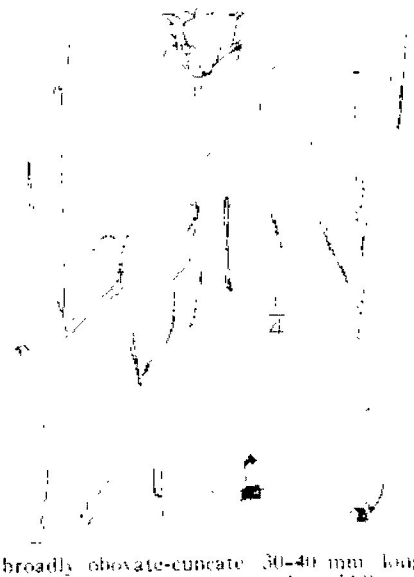
Botany: C. venustus, perhaps the most famous Calochortus of all, has been variously called "white mariposa," "square mariposa," and "mariposa tulip," although it is not always white, never square,and only has a tenuous relation to tulips (both liliaceae) It was placed in section Mariposa by Wood, and is the type sp. for the section. This section is differentiated from section Calochortus by its generally thinner, more grooved leaves; its tendency to bear bulbils in the axils of the leaves, or as offsets (section Calochortus is generally non-bulbiliferous); and its three-angled seed pods, with larger seeds. From section Cyclobothra it is differentiated by its membranaceous bulb coats (sect. Cyclobothra has a thicker, fibrous bulb coat), as well as genetic differences.

Prof. Ownbey divided the Mariposas into four subsections, the venusti, the macrocarpi, the nuttalliani, and the gunnisoniani. The venusti differ from the other subsections both genetically (haploid chromosome number of 7, with some exceptions), and by a morphological trait: the lack of a membrane surrounding the "gland," or "tepal nectary." The gland, a small area at the base

of the petal is important in the identification of Calochortus spp. (visible in the drawing below as a squarish area). This quadrate gland is what differentiates C. venustus from the other spp. in the subsection. (There may be another sp. in the section with a quadrate gland (C. simulans); the separation of this last sp. remains an open matter). The flowers are usually white, but there are cream, yellow, pink, lavender, purple, red, copper, and bi-color forms, often with differing colors on each side of the petal. There are an elaborate group of markings surrounding the gland at the base of the petal usually reddish, with a dense covering of hairs around the gland. Above this area is a blotch, in about the middle of the petal, and there is often an additional blotch located above the first (called "nectar-guides" by Farwig, and believed to aid pollinators in the search for nectar).

38. Calochortus venústus Dougl. Butterfly Mariposa Fig. 1094.

Calochortus venustus Dougl. Bentham Trans. Hort. Soc. II. 1: 312. pl. 15. 1835.
Calochortus venustus luteus Baker, Gard. Chron. II. 8: 70. 1877.
Calochortus venustus purpureus Baker, Gard. Chron. II. 8: 70. 1877.
Calochortus venustus purpurascens S. Wats. Proc. Am. Acad. 14: 266. 1879.
Calochortus venustus Purdy, Proc. Calif. Acad. III. 2: 139. 1901.
Calochortus venustus aliformis Purdy, Proc. Calif. Acad. III. 2: 141. 1901.
Calochortus venustus roseus Purdy, Proc. Calif. Acad. III. 2: 141. 1901.
Calochortus venustus sulphureus Purdy, Proc. Calif. III. 2: 141. 1901.
Calochortus venustus coeruleus Cockerell, Nature 67: 295. 1903.



Stem scarcely erect, usually branching, 1–8 dm. high, bulbiferous at base with 1–4 bulblets. Basal leaves 1 or 2, linear, 10–20 cm. long, 2–6 mm. wide, glaucous; cauline leaves 1 or 2 or sometimes none, 3–8 cm. long. flowers in a terminal 1–4-flowered umbel, and in large specimens a few scattered down the stem on lateral branches; bracts 3–7 cm. long, scarious margined below, pedicels rather stout, 5–20 cm. long; sepals oblong-lanceolate, long acuminate, the tips at length revolute, 25–35 mm. long with a brownish spot surrounded by yellow below the middle within, petals broadly obovate-cuneate, 30–40 mm. long, slightly rounded and erose at apex, white to lilac, with a prominent eye-spot in the middle and commonly with a reddish blotch near the apex, frequently penciled toward the base, with scattered hairs over the lower one-third of the inner surface; gland lunate, roundish or oblong, densely covered with ascending matted yellow hairs; filaments slightly dilated below; anthers oblong, obtuse, 7–8 mm. long, usually lilac; capsule linear, 5–7 cm. long.

Usually in light sandy soil, but also found in adobe or even alkaline situations. Upper Sonoran and Transition Zones, California Coast Ranges from Humboldt to Los Angeles Counties, also in the foothills of the Sierra Nevada, and the Sacramento-San Joaquin Valley.

C. venustus, from An Illustrated Flora of the Pacific States, by Leroy Abrams, Ph.D., Stanford Univ. Press, 1923, p.444.

History: This species was still another discovered by the botanical explorer D. Douglas, and published in 1834 by Bentham. The name has stuck, for the species is indeed 'beautiful.' Various color forms have received subspecific epithets, espcially by Carl Purdy, but none of these have stuck, as there seems to be no morphological difference between them. The earlier botanists describe the gland as oblong or round (Watson, Purdy) lunate (Abrams), or quadrate (Jepson, Ownbey and Munz). Ownbey's "more or less quadrate" is probably the best general description, but may mask endemic hybridization between C. venustus and C. superbus, at least in some cases (there may also be other crosses in the wild).

Horticulture: C. venustus receives from 15-40 inches (40-100cm.) of rain per year in its native range, and receives little or no rainfall from mid-May to about Nov. 1. It grows from sea level up above 8000 feet (2600m) in the Sierra Nevada Mts. It can often be found on steep hillsides, in what may seem like inhospitable soils (see VI above). It is hardy to 0°F in parts of its range.

In our trials, a half-sand half-peat mix proved better than other mixes ('peat' is finely chopped Canadian spagnum peat moss). The addition of a teaspoon of low-nitrogen complete bulb fertilizer proved beneficial. In the ground, a well-drained soil will do as long as it is kept dry summer to mid autumn. High altitude strains may require cold stratification. Low altitude strains may prefer alpine house conditions in cold temperate climates. Once a week give one inch of water, or the equivalent, e. g. rain. In pots, three per one gallon container is not too crowded.