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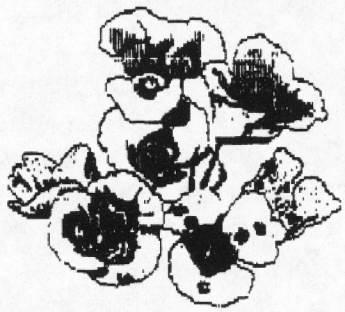

THE *CALOCHORTUS* SOCIETY NEWSLETTER

JANUARY, 1995

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News and Announcements

1. Division in *Calochortus*: Three types of division are exhibited in Calochorti, bulb, stem and leaf axil. Bulb division occurs in certain species from all of the sections, but particularly the spp. which do not produce stem or leaf axil bulbils. In this type, the bulb itself divides over the course of the annual growth cycle. Usually, a larger and also a smaller bulb are produced, as in some tulips. Sometimes more than two bulbs are "offset" by the parent bulb; this is the basis of the bulb industry as the larger offset is sold, while the smaller ones are kept for further cultivation, more growth, new offsets, etc. which begins the cycle all over again. While no *Calochortus* species produces annual offset bulbs from division, many are known to divide more slowly, over the course of several years (Prof. Ownbey claims they all divide in this manner). This has been noted for some time of Subsection *Weediani*, which often has two or more bulbs wrapped in one bulb coat. Other *Calochortus* spp. which exhibit this type of division are *C. howellii* and *C. greenei*, of Subsection *Nitidi*.

Stem division involves the production of small "offset" bulbs on the stem above the parent bulb, but below the ground. This type is exhibited in some lilies and all but three of the spp. from section *Mariposa*. (*C.striatus* and *C. gunnisoni* were believed to be exceptions, but produce offsets in some stands as well as under cultivation). *C. uniflorus* and *C. longebarbatus*, from **Section** *Calochortus* also produce stem offsets. The most prolific producers of stem offsets among Calochorti are *C. argillosus* and *C. vestae*, both of which produce up to four offsets per year. Most of the others produce only one, and the desert spp. may not produce any in dry years.

Finally, there are leaf axil bulbils. The divide between these and stem bulbils is, perhaps, arbitrary, as both are produced on the stem. However, in leaf axil bulbilifery the offset bulbs are produced not at the base of the plant, often underground, but along the upper stem. This type also occurs in *Lilium*, often in plants which produce basal offsets as well. The offsets form where the cauline (stem) leaves meet the stem. Among Calochorti, this type of division is exhibited most profusely in the Mexican spp. (There are only two exceptions, *C. venustulus* and *C. pringlei*). Often these are produced in such abundance that more offsets are produced than seed, as in *C. spatulatus*. In others only a few are produced, as in *C. fuscus*.

II. Trips

[The second installment of Dr. Bob Werra's unholy quest for the grail-shaped flower said to grow in the wilds of the West.--ed.]

Day 2: Rising early from our mosquito infested campground [maybe they liked him!--ed.], we backtracked to a reported site of *Calochortus bruneaunis* above French Glen, but found no sign of it. We then drove up into central Oregon and, in Grant County, the purple spotted *C. eurycarpus* came down to the road from a hillside meadow at about 4000 feet. The handsome open-bowled flower ranged from white to pink to lavender and was locally abundant.

North of Enterprise we found *Calochortus elegans* in an open conifer forest at the precise location described by a botanist some 60 years ago. Hugh found an added bonus across the road: the gorgeous

white *Cypripedium montanum* [native orchid-ed.] hiding among the thick conifers. This was a first for all of us.

Day 3: 100 large lavender-pink cups with little yellow mustaches at the base: *Calochortus nitidus*. These rare plants were grown from seed and were in full bloom in Ross Watson's garden in Idaho. In addition, he grows a host of other Calochorti plus a large vegetable and fruit garden. His house itself is surrounded by a myriad of well trimmed roses. Ross, a retired professor, moves slowly with his trusty staff, but accomplishes more in his later years than the rest of us in our prime.

Ross took us 30 miles out of town to the 160 acre non-profit Mariposa Foundation Preserve which he catalyzed. He has developed a very large pond as a water source and home for a number of ducks. Some plants have been started but much development remains to be done. Some younger members could go to Moscow to help him create a preserve for the northern Calochorti.

Before this he took us to a special location near the Snake River to see the unusual white form of *Calochortus macrocarpus*, i.e. var. *maculosus*. It is hard to conceive that white could equal or surpass in beauty the purple [form] of *C. macrocarpus*. However, seeing the largest of the Calochorti in white makes it appear more delicate. Some pale shades of pink in the same stand were equally appealing. They also appealed to the grasshoppers who scalloped most of the blossoms.

The best treat came after dark when Hugh gave a slide show of the 200+ *Calochortus* slides he brought up and gave to Ross for use in Ross's proposed book on *Calochortus* and *Camassia*. This was the first slide show illustrating all but two of the 67 known Calochorti of the U.S., Canada and Mexico. What a show! We have most of them in our slide show available to members.

III. Horticultural Tests--18th Installment, Germination of Undersized, Irregular and Misshapen Seed

(In this section, we have been presenting the results of various germination and growing tests which have been conducted to increase the knowledge of how to grow the species, and thus to increase their use in gardens.)

This test was set up to investigate the viability of misshapen and undersized seed. It is to determine whether smaller seed germinates at the same rate as normal seed. Also, what effect, if any, does shriveling, twisting or curling of the seed have on germination rates? Seed of section *Mariposa* is normally flat and often oval in shape. For this test we deliberately separated and set aside irregularly shaped seed--twisted, curled, shriveled or otherwise misshapen--as well as seed which is smaller on average than "normal" sized seed. For this study, "normal" seed of a section *Mariposa* species is defined as (nearly) flat seed, 4 mm. or more long, and 3mm. or more wide and with an ovoid shape. (*Calochortus catalinae* was used; section *Calochortus* seeds are normally irregular in shape, although they often differ in size; section *Cyclobothra* was not tested). It is deemed "normal" as most seed of this species is of this size and shape. Small or undersized seed is 3 mm. or less long and 2 mm. or less wide and (nearly) flat. Misshapen seed is not flat but twisted, curled or shriveled out of shape. Often these can be found near the top or the bottom of a seed capsule, where the incurved shape of the capsule leaves less room for seed development, and often results in smaller or misshapen seed. An organic medium was used as it was known to be suitable for growing the species [as it turned out, it was not as suitable as then believed; see Mariposa V, 4 and VI, 1. Fortunately, however, this did not affect the outcome.] As a 'control,' the "normal" sized/shaped seed, which had also been separated out in the process of separating the irregular seed, was also sown. Watering was based on average precipitation rates and was applied equally to all three types, small, irregular and "normal."

The test was conducted in Hayward, Ca., USDA Zone 9b.

This test constitutes evidence for whether irregular seed and undersized seed used in germination tests will throw off the results, by not germinating, or by germinating at significantly different rates than "normal" sized/shaped seed. Also, it will provide a guide for cultivation and purchase of seed

should irregular seed not be counted in sowing? Should it be discounted in purchasing?

The results were that the small seed emerged at exactly the same rate as the larger, normal sized seed. It also grew to maturity at the same rate and its parts were of normal size. There is apparently no relation between seed and plant or flower size.

The irregularly shaped seed did not emerge at the same rate, but only in very small numbers and none survived to maturity. However, there were other factors which may have affected the outcome, such as the unusually cold winters in 1989 and again in 1991. Yet this did not affect the small and normal sized seed.

These results are only preliminary evidence, not proof. Only a small quantity of seed was tested, of one species, in a cold year, out of the range of the plant, in pots rather than the ground, in a medium which later proved to be inferior for pot culture, and only once. The test would have to be tried over many times with these and other variables taken into account for any reliable results.

IV. The Horticultural History of *Calochortus*--19th Installment

[2nd. part of the article by Allen Chickering from 1938--ed.]

"All that has been said about *C. amoenus* applies to the Sierra *C. albus*. It is an equally persistent grower. It is readily grown from seed or will seed itself. I have not set out any new bulbs for at least ten years, yet I have a good supply which comes up every year. With this variety as with *C. amoenus*, the main object of growing seeds in boxes is to be sure that the young plants are not pulled up when pulling weeds.

"...A form of *C. albus* is found in Santa Barbara County and south into San Diego County which looks to me more like the Sierra variety than the Coast variety.

"The Coast *C. albus* occurs in the Coast Range of Northern California to San Francisco Bay...it is white with brown or pink reflections in the petals at times. The outside of the petals is quite apt to have a brownish tinge. The flowers are larger than those of the Sierra strain and the tips of the three petals are pointed instead of rounded as in the Sierra strain. This strain is quite frequently found in the woods where there is heavy shade and in places where the soil is not rocky. It also grows in the open and in places where the soil is rocky. It is very strong and hardy and grows so readily in the open from seed that I have not considered it necessary to grow it in boxes. The bulbs which are set out not only persist from year to year but a thick growth of young plants surrounds them if the seed is allowed to scatter itself or if it is first gathered and later scattered and raked in by the grower. It is also a heavy seeder, producing a quantity of seed. In short, it is also one of the most satisfactory of all Calochorti to grow in Piedmont. So far as I have noticed, none of the Globe Tulips are subject to mildew. As I have not grown this species in boxes, I am not certain as to the time required before seed will grow a bulb sufficiently strong to flower, but believe from my observation that they will flower the fourth year.

"...*C. pulchellus* is confined to a very localized area; the Mt. Diablo region... *C. amabilis*, on the other hand has a wide range. I have found it from Marin, Napa and Solano Counties north to Humboldt and Trinity Counties. At one time I planted approximately one-hundred bulbs of *C. pulchellus* and the same of *C. amabilis* in the same general situation as that in which the Coast *C. albus* and *C. amoenus* have done well for some years. Nearly all of these bulbs produced flowering plants the first year. Most of the *C. pulchellus* never flowered again, while *C. amabilis* did but little better. On the other hand, some *C. pulchellus* bulbs, planted where it is more shady and the soil is looser and better drained, have bloomed for years, and some *C. amabilis* bulbs planted six or seven years ago in a rocky slope under a small redwood tree are still doing well. In an effort to increase my stock of *C. pulchellus*, I have saved all seeds possible and planted them in a box with soil about ten inches deep composed of about two parts of ordinary garden soil, one part of gravel, one of sand and two of oak leaf-mold. I placed the box in the open but in a

situation where it is pretty well shaded. The seeds have done well and from the growth which they have made to date I anticipate that they will reach blooming size in the fourth year. It was my hope that bulbs grown from seed in my garden might do better than collected bulbs. I have not grown *C. amabilis* from seed but from my observation of it, I feel certain that it should do well, if planted under the same conditions as those above described in connection with *C. pulchellus*.

"To summarize, the Globe Tulips may be readily grown, both from seed and bulbs, should have a little slope, part shade, some leaf-mold and a well drained soil. The yellow varieties tend to die out with me, but there are enough exceptions to this rule to indicate that one could do well with them, provided the soil is well enough drained, has enough leaf mold and is properly shaded."

V. Conservation

Rare, threatened and endangered: reflections upon the categories of botanical scarcity. (Part One)

The CNPS has recently published a new edition of the *Inventory of Rare and Endangered Plants of California*. This book lists all the known plants in the state which are rare, threatened, endangered, presumed extinct, or in need of monitoring so that their populations do not decline to the point at which they will become rare.

What is a rare plant? How few individuals of a species must there be such that a plant should be considered rare? Where is the borderline at which a plant in decline moves from threatened to rare? What is the borderline between threatened and endangered? Is rarity a human convention or a feature of certain species? Is it a standard or a concept?

Rarity is defined in the *Inventory*, following legal codes, as "when, although not presently threatened with extinction, it [a species] is in such small numbers throughout its range that it may become endangered if its present environment worsens." This is primarily a quantitative criterion or standard of rarity, as the number of plants of a species is the decisive factor in determining its rarity. However, qualitative factors are also recognized in the definition. [Continued next issue].

VI. Species This Issue: *C. macrocarpus* var. *maculosus*

Genus *Calochortus* Key

I. Section *Calochortus*

II. Section *Mariposa*

A. Subsection *Venusti*

B. Subsection *Macrocarpi*

1. Bulbs ovoid with membrane coat; stems long, bulbiferous, rarely branched; leaves grooved, often grey-green in color; flowers large, erect, open; petals often with a median blotch or transverse stripe on the interior, above the trichomes on the lower petal, and with a longitudinal green stripe on the outside, purple, blue, lavender, pink or grayish; nectary chevron-shaped and covered with yellow trichomes; anthers narrow, linear.....*C. macrocarpus*

a. Petals white with a maroon or red-purple blotch .....var. *maculosus*

[For the botany and horticulture of *C. macrocarpus* see Mariposa Vol. II, #4, 4/91]

Range: This variety is confined to Nez Perce Co. Idaho, and Asotin Co., Washington. Outside this area, the range of the more typical, predominant variety, var. *macrocarpus* completely surrounds the white form. Why the white variety emerged in this localized area is a mystery. One possible explanation is that it is an albino, or a cross between an albino form and the normal variety. Another is that in the low lying areas in which the variety is to be found, var. *macrocarpus* would be at a disadvantage. The variety *macrocarpus* is a high desert sp. which will tolerate considerable heat in

summer, but perhaps not so much as is produced by a narrow river valley surrounded by high peaks which trap the air at the bottom. The Snake River Valley is a banana belt, relative to the surrounding area, and gets extremely hot in summer. White tends to reflect light better; color absorbs it: white flowers reflect the sun's light, and thus absorb less of its heat. This may give them an advantage in areas of great heat and at lower altitudes. Just as the color forms of *C. venustus* tend to grow at higher altitudes and the white form at lower, so perhaps white forms of *C. macrocarpus* var. *maculosus* can better withstand the blazing heat of summer in this area. The drawback of this explanation is that there are color forms of other species in the desert, e.g. the vermilion *C. kennedyi*. Yet *C. kennedyi* tends to bloom earlier in the year, before the intense heat of summer.

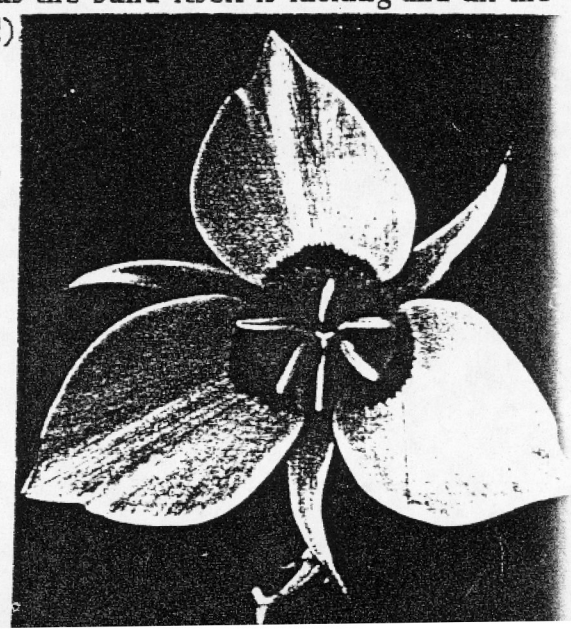
Still another explanation is that there are one or more local pollinators--bees, crickets, beetles, etc.--which have an eye for white rather than blue tones. The insect has, in effect, selected out the white variety from blue-toned ancestors by pollinating lighter and lighter shades. In this hypothesis, there is a localized insect species which is partial to white, for whatever reason.

Whatever the explanation, var. *maculosus* is considered to be only a variety, and not a distinct species. A variety is a form which differs from the species significantly enough to merit distinction, but not enough to merit species status. In the case of *C. macrocarpus* var. *maculosus* the distinction which is the basis for varietal status is weak. It is based primarily on color. The variety is not only white, but "locally constant," according to Prof. Ownbey. This means that no white forms are to be found outside the range of var. *maculosus* as far as is known; and almost all the plants within the range of var. maculosus are white. (I say almost as this summer past we found 2 plants with blue tones at a large stand of var. *maculosus*; one was blue and the other pale lavender-pink. All the others were pure white.)

Also, the plant produces fertile crosses with var. *macrocarpus*, the predominant variety. This indicates that it is not a distinct species, as it is cross fertile.

It is a 'weak' variety because its distinction is based primarily on color. Color is a feature which is usually variable in species and not a mark of specific difference. *Calochortus venustus*, for example, is very variable in color, but the color forms are intermixed in the same stand. Only because the white form of *C. macrocarpus* has separated itself out geographically is it worthy of varietal status at all. Only one botanical feature separates the white form: its slightly smaller seed capsules. The latter feature may be a reflection of climate; only if cultivated in the same ground could this be determined.

Usually, a 'strong' variety exhibits some botanical feature which sets it apart. An example is provided By *Calochortus palmeri*, which normally produces stem bulbils, but lacks this feature in Riverside Co. In the latter area, it is separated as var. *munzii* due to this constant and distinctive morphological feature. A borderline example is provided by *C. nuttallii*. Normally, this species has a brown band above the nectary on the lower part of the inner petal. In an area of southeastern California, the plant lacks this band and is known botanically as var. *panamintensis*. Although this is partly a difference in color, it is also a difference in morphology as the band itself is lacking and all the plants in the area exhibit this feature (or rather, fail to exhibit it!).



Varieties which are later determined to have more differences with the regular or predominant form as first conceived are often separated as distinct species. An example is, again, *C. nuttallii*, which had two varieties which were later separated as species in their own right, *C. bruneaunis* and *C. aureus*. These were thought to be minor morphological variants with, respectively, a distinct range or color. Later, after genetic testing, it was determined that they were genetically distinct as well, and they were recognized as species.