

C. splendens

MARIPOSA

the newsletter of the CALOCHORTUS SOCIETY

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Species of the issue – the *luteus-superbus* complex, Part II

We discussed *C. luteus* in the last issue (Vol. X, No. 4), so turn now to *C. superbus*. It was formally identified as a separate species in 1932 by John Thomas Howell, almost 100 years after the first publication of *C. luteus* in 1833. The long gap between these two “type” descriptions is probably the result of confusion about whether *C. superbus* was indeed a separate species, given its variations in gland shape, markings, and color. Certainly its frequency of occurrence, which rivals that of *C. luteus*, would seem sufficient to produce a much earlier identification as a separate species. It was certainly noticed – and collected – much earlier than 1932 by naturalists and botanists exploring the California flora. Carl Purdy seems to have been the first (in 1901) to set it apart from other mariposas, but he called it “*C. luteus* var. *oculatus*.” Earlier authors (when they were aware of it) apparently included it under their descriptions of *C. venustus*. Jepson’s original **Flora** (1921) appears to have returned its classification to *C. venustus*, as did Abrams’ 1924 key; both listed “oculated” mariposas as *C. venustus* var. *oculatus*. Only with Howell’s publication in 1932 – followed by Ownbey’s acceptance of it in 1940 – was *C. superbus* acknowledged finally by the botanical world as being “its own thing.”

Range and habitat – Ownbey describes its range as follows: “Sierra Nevada, from Shasta county southward to Kern county, and in the North Coast Ranges from Shasta county southward to Lake county; also apparently in the Palomar Mountains, San Diego county.” We have seen *C. superbus* stands at the north end of the Central Valley, west, north, and east of Redding in Shasta county, then south well inland in the Coast Ranges to Butts Canyon just south of Detert Reservoir in Lake county and along Geysers Road in northernmost Sonoma county. These southernmost Coast Range populations almost always include at least a few (and sometimes many) *C. luteus* and may be primarily hybrid swarms. In the Sierras we have seen *C. superbus* as far south as the Greenhorn Mountains in Kern county. Ownbey’s citation for San Diego county – “edge of dry meadow, Doane Valley, Palomar Mts., 1500 m. alt., June 23, 1924, *Munz* 8319 (P)” – we have not traced. (If any reader is able to confirm this or other extending locations, we would be most interested to hear of it.) Leaving aside the San Diego county citation, we have seen *C. superbus* from about 35° 40' in the Sierras north to about 40° 45' in the Cascades, then south along the Coast Ranges to about 38° 40'. We’ve seen stands as low as 700 or 800 feet (200-250 meters) at the north end of its range, to more than 4000 feet (1250 meters) growing on a granite slab along Peterson Road in northeastern Fresno county.

The preferred habitat of this sun-loving mariposa is grassy clay meadows, either level or gently sloped, extending occasionally into very open grassy woodlands. It is often found growing on serpentine soils. This is a habitat also preferred by *C. luteus* – a quite different one from the moderately open woodlands and steep banks preferred by *C. venustus*.

Markings and coloration – The basic color of *C. superbis* petals is most commonly a creamy white, with “penciling” marks at the base in deep red-brown (some authors say “purple”), and a conspicuous mid-petal reddish-brown (or purple) blotch or “eye-spot” surrounded by an oculation or zone of bright yellow. Markings can be variable; we have seen stands of *C. superbis* with oculations but no eye-spots in Tehama county (County road A-6 northeast of Red Bluff); and with eye-spots but no oculations in Tulare county (Highway 245 northeast of Visalia). There is a very odd stand of *C. superbis* along Highway 49 immediately north of Coulterville in Mariposa county which seems to be missing one (or more?) “red” genes; instead of red-brown, their markings are a deep charcoal color.

Petal color may be even more variable. The “type locality” cited by Howell was an area known as “Hell Hollow” in the Merced River canyon – now partially flooded by the waters of Lake McClure. However, there is a large, vigorous population of *C. superbis* just north of the lake along Highway 49, growing in a serpentine clay meadow, with the majority of the flowers lightly blushed pink or lavender. Other stands can be found in the Sierra and Cascade foothills with some to many plants of similar pastels, and even occasional plants with flowers of a rich purple or rose. Examples include Fern Road east of Redding in Shasta county, the Spanish Flat area along Highway 193 north of Placerville in El Dorado county, and along Highway 168 northeast of Fresno in Fresno county. Interestingly, such color variants seem to be much more rare *west* of the Central Valley; the only place we have seen a few pastel lavender flowers is along Platina Road west of Redding in Shasta county. Otherwise, *C. superbis* in the North Coast Ranges is a “plain Jane” white – except where it has hybridized with *C. luteus* (see below).

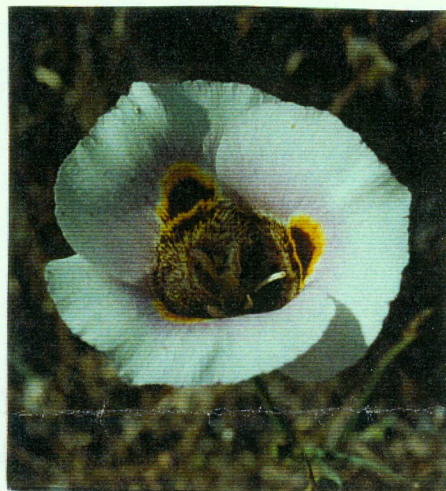
Gland shape – Howell’s original publication described the gland as an “inverted V-shape,” and that in our experience is the most common form. The distinction between an “inverted V” (or chevron) and the “lunate” (inverted crescent) gland of *C. luteus* seems clear enough, but in nature plants otherwise resembling the markings and coloration of *C. superbis* show at least four major types of glands, according to the research and field work of Vic Girard and Stan Farwig. Vic wrote as follows:

- (1) a lunate gland forming a relatively narrow inverted arc across the base of the petal, the widest part of the gland being at the apex of the arc;
- (2) an inverted V-gland forming approximately a 45° angle, the base of this isosceles triangle being only approximately one-half the length of either of the two sides;
- (3) a narrow transverse gland, approximately as wide as the lunate gland, but showing no arching whatsoever, the left and right sides being less than a quarter the length of the top and bottom sides;
- (4) a quasi-square gland, the left and right sides of which are straight, the top and bottom sides arched in parallel.

We would add a fifth variant: the *C. superbis* along Highway 245 northeast of Visalia have a gland that is little more than a “squiggle” line across the lower petal. Vic also noted this variant gland shape “north of Lemoncove,” and his field notes speculated, “Seem to show influence of old crosses with *C. luteus*.”

Subsequent to the summary quoted above, we went with Stan and Vic to look at a number of locations of mariposas with glands as described in (3), and all satisfied ourselves that this plant deserved the separate species status given to it by California Polytechnic Institute-San Luis Obispo botanist Robert Hoover in 1944 – *C. argillosus*. Philip Munz refused to accept *C. argillosus* as a separate species in either his original California **Flora** (1959) or its **Supplement** (1968); but the new **Jepson Manual** (1993) does. As Vic added in his writings, however, “No one to date has had the temerity to deal with those white-flowered plants with (1) lunate glands or (4) distinctly quadrate glands with arched upper and lower sides.” Vic noted also that chromosome studies had produced counts varying from $n=6$, $6+f$ (Mariposa county), $n=10$ (Butte and Yuba counties), and $n=13+f$ (Tulare county). *C. luteus* results have been more

CALOCHORTUS SUPERBUS
in its many faces –
plus a few hybrids



consistent – mostly $n=7$. Vic concluded that plants with inverted-V glands were qualitatively distinct from those with inverted lunate glands, without any “intermediate forms” (whose occurrence was suggested by Ownbey, apparently in order to account for those *C. superbis* from the North Coast Ranges which have inverted lunate glands). Vic’s work raises for us the question of whether all these are a single species, or whether there may be other new species or variants to be identified and separated, as Hoover did with *C. argillosus*. Certainly the “plain Jane” *C. superbis* common in the North Coast Ranges, but also occurring in the north central Sierra foothills on both sides of the Yuba-Butte county line, look very different from the larger, more colorful plants to the north and south in the Sierras and Cascades.

Hybridization – The challenges presented by the *luteus-superbis* complex are compounded by the free hybridization which seems to occur between *C. superbis* and *C. luteus* wherever the two are found together, which is fairly frequently, given their overlapping ranges and habitats. The results – whether in the North Coast Ranges, the Cascades, or the Sierras – are mixed stands of creamy white flowers, yellow flowers, and every possible shade in between. Petal markings and gland shapes are extremely variable in such populations, seeming to follow no particular pattern. In fact, in southern Mendocino county (Mountain House road) we once saw three flowers blooming less than 5 inches apart – one yellow, one white, and one pale yellow, with identical petal markings and identical gland shapes (in this case inverted lunate). Southern Lake county is famous for its hybrids, but extensive hybrid stands can also be found both east and west of Redding, east of Chico and Oroville, and at various places along Highway 49 in the Sierras. Chromosome studies of a “hybrid swarm” have yielded $2n=12, 14$ (Beal and Ownbey) and $2n=28$ (Cave). Clearly, the frequency of such hybrids and the variations they present confused early botanists and naturalists, and this has not changed. More than once in our travels we have encountered people (usually weighed down by their new **Jepson Manual**) puzzling over a stand of hybrids, who ask us, “Do you know what these mariposas are?” Yes, we do – more or less !!

Cultivation – Jim has found the cultivation of *C. superbis* essentially the same as that for *C. luteus* – except that he does best by planting *C. superbis* seeds about 4 weeks earlier than *C. luteus*; it seems to prefer more cold-weather stratification. He keeps both well watered during their growing season, then withholds water when the plants begin to turn yellow in early summer. Both species bloom more quickly if given half-strength Mira-Gro® every 10 to 14 days during the growth period. Both species reproduce vegetatively by stem bulbils near or just below ground level.

Summary – Vic Girard wrote: “The problem with *C. luteus* is identical to the problem with *C. superbis*. In the field, throughout the state, one finds stands of plants quite different morphologically from each other, but all “united” by the fact that they share more or less the same gland shape. One begins to wonder whether the Watsonian criterion of gland shape over *any* other morphological features is realistic?” In our experience, there appear to be at least two basic types of *C. luteus* – those with eye-spots and those without; and at least two basic types of *C. superbis* – the “plain Jane” whites of the North Coast Ranges and some Butte-Yuba county locations, and the often-but-not-always slightly to richly colored and usually larger form of the Cascades and elsewhere in the Sierras. All this is complicated by the existence of many hybrid swarms. Two species? Three or four or more species or variants or races? We can only hope that detailed DNA studies provide us with answers.

Interestingly, Stan Farwig (who reviews every issue for us in advance of publication) reports seeing an herbarium sheet at the Academy of Sciences in San Francisco some years ago, with a penciled note by Marion Ownbey on a folder of *C. superbis* that came from the Stanford Herbarium. Stan does not recall the exact words, but the note indicates that after further field experience, Ownbey had concluded

his description of *C. superbis* was "too narrow," or could no longer separate out the species. Stan adds: "It is a shame Ownbey didn't elaborate, or what considerations led to his brief comment – and that he discontinued working with *Calochortus* following his early work." We certainly agree.

Some Thoughts on Seed Collection ...

Seed collection time is upon us – in fact, it may already be too late for early species. Nevertheless, we would like to share our ideas about *responsible* seed collection.

- (1) If you are collecting from nature, please remember that natural stands may become depleted and even die out if they are not allowed to reseed themselves. Maintaining a naturally diverse and viable gene pool within a single population is important to long-term survival of the stand. These are the "rules of thumb" we follow –
 - (a) Never remove more than a maximum of 5% of the seed from any given stand.
 - (b) If you (or to your knowledge other collectors) return to collect from the same stand year after year, then never remove more than 2% of the seed in any one year. We like to rotate among different stands, collecting from a given stand no more often than every third or fourth year. And when we know others collect from the same stand, we are not above scattering a good part of the seed on the ground, to assure that some natural reseeding occurs.
 - (c) Try not to remove all the seed from any one plant. If something should happen to the bulb itself before the next season, that bulb's genes would be "lost" to the stand permanently. The ideal method, in our opinion, is to collect after the majority of the pods are ripe, open, and spilling. This allows you to collect a few seed each from many plants, thus obtaining a broad sample of the genes available in the stand. Also, if we are concerned about the survival of the specific stand, this approach lets us scatter seed on the ground, to assure natural reseeding.
- (2) Obviously, if you are collecting seed from your own garden or greenhouse, then you do not have to worry about numbers and the gene pool. All you have to worry about is whether any of your plants have hybridized with other species! If you send seed for *Mariposa* readers from your own resources, please indicate whether or not there is a chance of hybridization with other species.

Because we are in the process of moving to Oregon, we have much less time than usual to devote to seed collection this year, so we're hoping to receive contributions from readers who have access to vigorous, healthy stands of *Calochortus* species, or are enjoying success with growing them. We ask that, if possible, readers send from 500 to 2000 seed of any one species, preferably by early September, to facilitate listing in the October issue of *Mariposa*.

Readers' Forum

A number of readers have asked about an update on Tom Patterson's DNA work with Calochortus. We happened to be in Madison, Wisconsin the end of May and tried to reach him, but he has reportedly finished his thesis and moved to Chicago. We are now trying to track him down there. – Eds.

- ✿ In the last issue, we asked readers to let us know about any range extensions for *C. luteus*. In response, Jeanette Sainz of Los Alamos (Santa Barbara county) sent us a slide of a yellow mariposa from Prefumo Canyon Road in San Luis Obispo county (west of the city) – about 25 air miles south of the furthest south location we had seen *C. luteus* in the Coast Ranges, west of Paso Robles. It is a rather odd *C. luteus* – with an unusually “thick” (top to bottom) inverted lunate gland, a prominent blotch mid-petal, and very heavy transverse “squiggle lines” on each side of the blotch.

Except for the blotch, the markings are more reminiscent of C. clavatus than of C. luteus. In reviewing our draft of the last issue, Stan Farwig pointed out to us that these two species “can’t” hybridize. Yet here is another example of a puzzling combination of characteristics, like the C. luteus stand we know along J-21 in San Benito county with deeply depressed glands, so that the flowers are shaped much more like C. clavatus. Interestingly, we drove Prefumo Canyon Road several years ago, in July, and saw both C. clavatus and C. obispoensis in bloom there. But it probably would have been too late for any C. luteus to be blooming.

- ✿ With her renewal, Lottie Jenvey of Mountain View (Santa Clara county) sent us a gorgeous photo of *C. plummerae* from her garden last year – obviously, she has found a way to grow Southern California species in the Bay Area! Last year Wim de Goede of The Netherlands sent an amazing photo of a huge field of *C. luteus* blooming.

We would love to share quality pictures from readers with all of you, and will try to find a way to do that.

- ✿ Debra Dight of Atascadero (San Luis Obispo county) writes, “My *Calochorti* are sad this year. After 2 days of 11° [Brrrr!] and no rain I lost a few. They are still in containers which didn’t help. I hope I will be able to pick up replacements at the CNPS / Merritt sale [in Alameda county] in October.”

In Sebastopol we had another wet but mild winter – almost 39 inches of rain, and no night below about 28°F. Our catsears, star tulips, and globe lilies have bloomed well this year, and the fact that the rains continued through March and into April bodes well for most of our mariposas – they’re looking very vigorous this year!

- ✿ Edward Furukawa of San Mateo (San Mateo county) says, “Still struggling to grow *Calochorti* in clay pots after 2 wet winters.”

Jim has used wooden or plastic pots/tubs/bins more successfully than clay pots. They’re cheaper, too!

- ✿ Norman Young of Dorking, Surrey, tells us, “At the moment I am trying to grow my bulbs in clay pots on capillary matting but it is not very successful. I will try with plastic pots when I repot in the autumn, and hope that will be an improvement.”

Another factor is the size of the container. The larger the container, the easier it is to control soil temperature and moisture. But there is a “price” for larger containers – as many will attest, the larger the container, the harder it is to move around!

We truly appreciate the enthusiasm expressed by many of our readers with their renewals. Some have even included extra money in support of the newsletter. But one of the nicest communications we received was the following: “Just a note to say I will not be renewing my subscription. My interests have shifted. Be assured it was not due to the price increase or the quality of the newsletter.” The writer’s concern that we understand why he was not renewing touched us.