Malacothamnus

Volume 3

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A Revised Treatment of the Genus *Malacothamnus* (Malvaceae) Based on Morphological and Phylogenetic Evidence

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A Revised Treatment of the Genus *Malacothamnus* (Malvaceae) Based on Morphological and Phylogenetic Evidence

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Author's Note

The three volumes of this *Malacothamnus* monograph mostly follow the three chapters of my PhD dissertation but with multiple revisions and additional peer review. The earlier dissertation version of this work should be viewed as an unfinished draft of what is presented here.

Three major goals in self-publishing my *Malacothamnus* research were to provide all the details future *Malacothamnus* researchers may need for their research, provide a large amount of color figures, and to make it all freely available to anyone who wanted it without spending thousands of dollars to do so. These goals are at odds with the way most academic publishing works at present and I could not find a journal that met the requirements necessary for these publications.

Regarding peer-review, I was faced with trying to satisfy multiple audiences that wanted different things out of these publications. Some people wanted all the details of the analyses and the evidence I used in making taxonomic decisions related to *Malacothamnus*. Some wanted a highly abridged form of this. Some just wanted the taxonomic treatment with lots of photos and some basic information about the genus. I can satisfy the first and last of those groups and I attempt to do so in this three-volume, open-access monograph of the genus. Those who want a highly abridged account can start with the abstracts and Volume 3, and then dig deeper into Volumes 1 and 2 if further interested.

Volume 1 is a morphological assessment of *Malacothamnus* to clarify how morphologically distinct previously described taxa and possible undescribed taxa are. These analyses resulted in specimen groupings with varying degrees of morphological and geographic cohesion, most of which align with previously described taxa.
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Volume 2 uses phylogenetic analyses to test the morphological groupings from Volume 1 as hypothesized lineages. The resulting evidence from both morphological and phylogenetic analyses are then used to make taxonomic decisions for the treatment in Volume 3. Areas where further research is needed are noted and three new species are described.
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Volume 3 is a new treatment of *Malacothamnus*, which includes preliminary conservation assessments of each taxon and natural history information related to the genus. It also summarizes some of the findings in Volumes 1 and 2 for those who do not wish to delve into the details in those volumes.
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ABSTRACT

The genus *Malacothamnus* (subfamily Malvoideae, Malvaceae) is composed of fire-following shrubs primarily found in the California Floristic Province and includes many taxa of conservation concern. The genus includes 21 species and 29 minimum-ranked taxa. Here I present a revised treatment of the genus incorporating data from recent morphological and phylogenetic studies (Volumes 1 and 2). This treatment includes information on life history, a discussion and illustrations of morphological characters useful for identification, and relevant conservation information. A key to all taxa recognized in this revision is presented and followed by morphological descriptions, synonymy, common names, distribution maps, blooming period, conservation status, additional notes, and photographs.

1 INTRODUCTION

Malacothamnus Greene (subfamily Malvoideae, Malvaceae) is a genus of generally short-lived fire-following shrubs found primarily in the California Floristic Province in North America. The name *Malacothamnus* is presumed to be derived from the Greek *malakos,* meaning soft (perhaps referring to the soft wood), or *malache,* meaning mallow, plus *thamnos,* meaning shrub (Bates 2015a).

Before *Malacothamnus* was published in 1906, those taxa now included in *Malacothamnus* were considered part of a broadly defined *Malvastrum* A.Gray, which was briefly supplanted by *Malveopsis* C.Presl in the late 1800s before the name *Malvastrum* was conserved (Greene 1906; Hill 1982). Greene distinguished *Malacothamnus* as being shrubs, the carpels of which are not very tomentose, without reticulation, one-seeded, and promptly dehiscent with the two distinct valves falling away separately with the ripe seed (Fig. 1 B & E). After *Malacothamnus* was published, many authors continued to place all taxa currently included in *Malacothamnus* within *Malvastrum* (Davidson and Moxley 1923; Munz and Johnston 1924, 1925; Estes 1925; Eastwood 1936a; McMinn and Schumacher 1939; Abrams 1951) and occasionally in *Sphaeralcea* A.St.-Hil. (Arthur 1921; Jepson 1925, 1936). Starting with Kearney's 1951 treatment, *Malacothamnus* has consistently been treated as a separate genus.

Based on chromosome numbers, *Malacothamnus* was placed with *Iliamna* Greene and *Phymosia* Desvaux in the *Malacothamnus* Alliance within the Malveae tribe (Bates 1963, 1968). *Malacothamnus* and *Phymosia* are the only genera in Malveae to have a chromosome number of $n = 17$. *Iliamna* has $n = 33$, which is one less than 17 doubled. Floral and vegetative anatomy are generally uniform between the three genera but do not indicate whether they are closely related or not (Buschman 1969). Phylogenetic analyses of Malveae shows *Malacothamnus*, *Phymosia*, and part of *Iliamna* to be a moderately to strongly supported clade (Tate et al. 2005). Phylogenetic analysis focusing on the *Malacothamnus* Alliance resolved *Malacothamnus* as monophyletic within the alliance (Slotta 2004). Both *Iliamna* and *Phymosia* are distinguished morphologically from *Malacothamnus* by having more than one seed per mericarp, whereas *Malacothamnus* only has a single seed per mericarp (Fryxell 1997). Additionally, Buschman (1969) found that some anatomical distinctions between these genera include wood anatomy, stipule trace number, and epidermal cell patterns.

Figure 1. Fruit, seed, and germination in *Malacothamnus*. A) Immature fruit of *M. fasciculatus* var. *nesioticus*. B) Mature fruit of *M. mendocinensis*. C) Empty calyx of *M. eastwoodiae* still attached to stem after carpels and seeds have fallen to the ground. D) Dried flowers containing seeds of *M. fremontii* that have fallen to the ground. E) Seed of *M. aboriginum* and the two carpel halves that contained it. F) Germinating seed of *M. orbiculatus*. Arrow points to where part of the seed coat was removed with a razor to induce germination. G) Seedlings of *M. aboriginum*.

Delineation of taxa within *Malacothamnus* has been controversial since Bates's 1993 treatment, which reduced the 28 taxa of Kearney (1951, 1955) to 11. Despite not being recognized in Bates's treatment, ten of the taxa subsumed by Bates retained a rare plant status in California due to Bates's lack of evidence that they should not be recognized (CNPS 2023). In a rare plant review discussion on the California Rare Plant Rank of *M. fasciculatus* var. *catalinensis*, Bates acknowledged that the differences between Bates's and Kearney's treatments were simply a matter of opinion and choosing to follow either treatment was equally defensible (Bates 2015b). A series of morphological and phylogenetic studies undertaken in recent years have contributed multiple lines evidence that some or all of the taxa subsumed by Bates should be recognized and has led to four additional species being described (Swensen et al. 1995; Slotta 2004; Morse and Chester 2019; Morse 2021, 2023a, 2023b).

Here I present a treatment of *Malacothamnus* as currently understood based on field studies, morphological analysis, and molecular analysis. Following the evidence shown in Volumes 1 and 2 of this monograph (Morse 2023a & 2023b) and the taxonomic decisions made in Volume 2, I recognize 29 minimum-rank taxa within 21 *Malacothamnus* species. As 15 of these taxa currently have a California Rare Plant Rank, I address conservation issues in the genus and provide comparative baseline data for all *Malacothamnus* taxa for use in future conservation assessments/decisions.

2 MATERIALS AND METHODS

2.1 Treatment measurements

Species and variety descriptions are based on measurements from the morphological analyses used in Volume 1 (Morse 2023a) with additional characters added and variation in character measures expanded when necessary based on review of additional herbarium specimens. Previous treatments (Kearney 1951; Fryxell 1988; Slotta 2004; Bates 2015a) were used to add additional information to the genus description. As measurements come from a sampling of specimens, it is possible that larger and/or smaller values than those in the descriptions and keys may not be represented by the sampling used. However, the sampling used should represent the variation seen in most specimens. Characters included in the descriptions and keys focus on those characters found most useful in distinguishing taxa. Some characters not used in the morphological analyses are excluded from descriptions due to a limited availability of material to measure (mature carpels and seed) and/or a limited availability of time to adequately measure them. Carpel and seed measurements are included in Kearney's 1951 treatment but are likely inadequately sampled to account for much variation within taxa based on the limited material available on herbarium specimens from that time period.

All measurements except plant height are from dried herbarium specimens that were not rehydrated. Sampling for these measurements comes from the distal ends of branches that are small enough to be included on herbarium sheets. Therefore, herbarium specimens and my measurements of them may not include variation in the stems and leaves seen in more proximal portions of branches.

As keys created from dry measurements are often problematic when used on fresh plants, I've provided estimated fresh measurements for some characters. These estimates are based on measures of calyx lobes, calyx bracts, and corolla lobes measured when fresh and remeasured after air-drying in a plant press. Calyx lobes and calyx bract length measured to the nearest 0.5 mm had fresh material with a mean value 1.2x the size of dry material. Calyx bract width measured to the nearest 0.1 mm had fresh material with a mean value 1.4x the size of dry material. Corolla lobe length measured to the nearest 0.5 mm had fresh material with a mean value of 1.05x the size of dry material.

Stellate trichome rays shouldn't change in size after drying as the cell walls are lignified. Glandular trichomes, however, do not have lignified cell walls in those taxa assessed and could possibly be smaller after drying. Attempts to assess this showed that some glandular trichomes may be smaller after drying but the measurements may just be confounded by some glandular trichomes curving as they dry.

2.2 Common names

As common names have contributed to confusion between taxa and misidentifications in the past, I include a suggested standard common name for each taxon that will hopefully reduce confusion. I include additional common names used for each taxon published in printed form and cite the publication where they were used or first used in the case of the multiple editions of the California Native Plant Society rare plant inventories. If not quite like scientific name synonyms, these additional common names may at least help provide clues to which taxa may have been referred to in past documents that do not include scientific names.

2.3 Life history and taxon ranges

Life history data, geographic location data, and voucher specimens were collected during ~350 surveys from February 2015 to June 2022 spanning most of the known range of *Malacothamnus*. Survey gaps in the known distribution were primarily in Baja California, MX, which should be explored further by future researchers. Beyond voucher specimens, taxon distribution was documented by uploading ~4,500 mapped locations to the Calflora website (www.calflora.org) both to document the current range of taxa and to provide easy access to plant locations for use as reference sites. Data collected in the field were supplemented by examination of herbarium specimens, observations with photographs on both iNaturalist (2022) and Calflora (2022), and data from the California Natural Diversity Database (CDFW 2022).

2.4 Seed viability tests

Seeds from ten herbarium specimens collected between 1931 and 1941 representing nine taxa in eight species were tested for viability by the staff of the California Seed Bank at California Botanic Garden (CalBG). Twenty-five seeds from each specimen, except for one specimen with just 15 tested, had the seed coat clipped using a fingernail clipper to allow penetration of water into the seed. The seeds were soaked for one minute in a sterilizing bleach-Tween solution to prevent mold contamination before being sown on a 0.5% agar solution on clear plastic examination plates. The plates were placed in a temperature-controlled germination chamber maintained at 11 hours of light cycle at 20° C and 13 hours of dark cycle at 12° C. Seeds were monitored once a week with each new germination being scored during monitoring. Once no new germinations were observed for at least three weeks, the germination tests were ended and a sample of ungerminated seeds were dissected to assess the quality of the embryo.

2.5 Conservation assessments

To aid in future conservation assessments, extent of occurrence (EOO) and area of occupancy (AOO) was calculated for each taxon. EOO and AOO are two measures used in assessing the extinction risks of taxa (IUCN Standards and Petitions Committee 2022). EOO represents the area bounded by the furthest extents of a taxon's range regardless of how much

of that area is occupied by the taxon. Taxa with populations spread over a larger area have a lower extinction risk from spatially explicit threats than those spread over a smaller area. AOO represents the area within the EOO that is occupied by the taxon. Taxa occupying larger areas, likewise, may have lower extinction risks related to spatially explicit threats than those occupying smaller areas. I calculated both EOO and AOO values for all *Malacothamnus* taxa as data for use in future conservation assessments of each taxon and as a means of quickly comparing possible spatially explicit extinction risks between the taxa. As *Malacothamnus* may lie dormant and undetectable in the soil seed bank for decades at a time, I assume historic locations in undeveloped areas persist and include these locations in the EOO and AOO assessments. Cultivated plants, recent introductions via plantings, hybrids, and questionable locations are excluded. EOO was calculated in QGIS 3.10.7 (QGIS Development Team 2020) using the *Minimum bounding geometry* tool to calculate a convex hull around the known locations of each taxon. One species (*M. mendocinensis*) did not have the necessary three locations to create a polygon for EOO calculation, so I use 1 km^2 x the number of known locations (2) as a substitute EOO value. AOO was calculated in QGIS by creating a 2x2 km grid and querying the number of grid squares overlapping known locations of each taxon.

2.6 Figures

Scatterplots were generated in R v. 4.1.2 (R Core Team 2021) using the package *ggplot2* v. 3.3.5 (Wickham 2016). Maps were generated in QGIS. Figures with photos were assembled in Adobe Photoshop, which was also used to edit the layout and enhance clarity of raw figures exported from R and QGIS.

3 LIFE HISTORY

3.1 Life cycle and life span

Malacothamnus are shrubs that generally germinate the winter or spring following a fire. In burned areas, large numbers of plants may germinate and become a short-term dominant species in these areas (Fig. 2). In their first year, plants may grow to exceed one meter in height and may bloom. Many or most plants may die after a few years due to being outcompeted by other returning vegetation, drought conditions, and/or perhaps just a naturally short life (Fig. 3).

Revisiting plants of *Malacothamnus enigmaticus* during the study of that species (Morse and Chester 2019), we found many plants had died in as short a period as three years after germination. In October 2016, three years after the Chariot Fire burned an area of the Laguna Mountains in San Diego County, Chester and I mapped and recorded the number of plants at 67 *M. enigmaticus* locations to revisit in a future year. In June 2021, we revisited 54 of these locations to assess how many plants still lived. Of those still alive in 2016, only 8% were still alive in 2021, eight years after the fire. Those plants that were persisting in 2021 had little competition from other shrubs and were in areas associated with moister soils during at least part of the year. Of those plants that were dead, only 15% still had the remains of dead plants visible, which indicates that 85% of those plants had likely been dead for at least a couple years and that the dead branches of this species do not persist very long. There is evidence that some taxa may live much longer. Some plants of *M. orbiculatus*, which grows in desert transition zones similar to *M. enigmaticus*, have presumably persisted for over 20 years post-fire, though those plants may only represent a small percentage of the plants that were there in the first few years following the fire.

Plants of some species living much longer may be associated with spreading by rhizomes (Fig. 4). Some species commonly spread by rhizomes, whereas others do not or only sporadically do. Spreading by rhizomes is most common in species occurring closer to coastal areas of the Pacific Ocean and less common in those further away from the coast. Plants of the rhizome-spreading *Malacothamnus jonesii* var. *gracilis* at Lopez Lake in San Luis Obispo County, CA are still alive 35 years after the last documented fire there, and no documentation of fires at the type locality of *M. eastwoodiae* on Vandenberg Space Force Base indicates plants currently there are possibly much older.

In the case of plants that spread abundantly by rhizomes, there is the question of how many genetic individuals a population represents. What could have been thousands of plants in the first few years after a fire could possibly be only a single clone 50 years later. In *Malacothamnus clementinus*, however, a study sampling five individuals per population showed the presence of nearly as many genotypes as individuals sampled and concluded that patches of closely adjacent individuals are not likely to represent the same genetic individual (Helenurm 1999). Whether older individuals in a clonal population represent a comparable genetic

diversity to a post-fire population is unknown. Likewise, it is unknown if assessing other taxa spreading by rhizomes in a similar study would have similar results to the study of *M. clementinus*. Casual observations of multiple species of plants spreading by rhizomes at CalBG over five years suggests that the number of clones from any individual plant or species may vary and that the progenitor of the clones may or may not persist.

Figure 2. Edge of a burn area one year after a fire. To the left is an unburned area of pinyon pine woodland where no plants of *Malacothamnus* could be found. To the right is the same habitat burned and now dominated by *M. orbiculatus*.

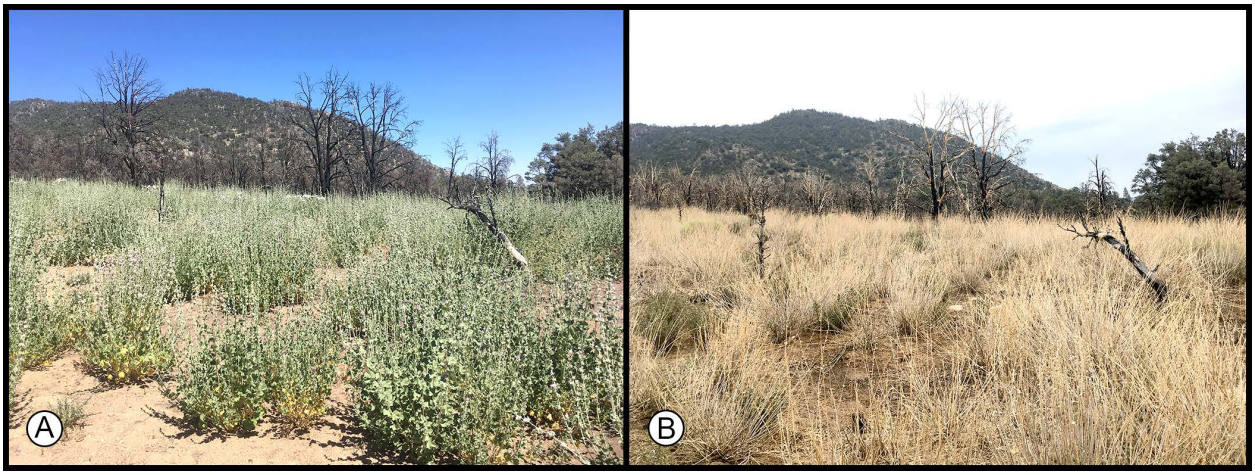

Figure 3. Comparison of *Malacothamnus orbiculatus* plants in a burn area at 1 and 4 years after the area burned. A) One year after the fire, *M. orbiculatus* is very healthy and the dominant species in the burn area. B) Four years after the fire, *M. orbiculatus* is still the dominant species, but many are dead or appear unhealthy, and other shrub species are starting to fill in openings between them.

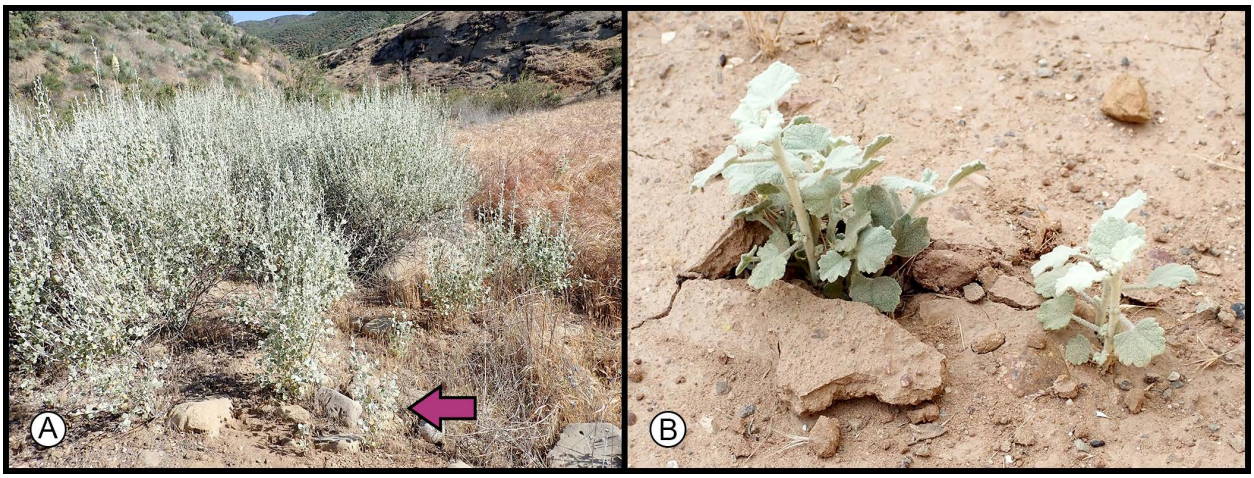

Figure 4. *Malacothamnus jonesii* var. *niveus* spreading by rhizome sprouts. A) Edge of clonal patch with arrow pointing to more recent rhizome sprouts. B) Recently emerged rhizome sprouts.

3.2 Seed viability

Mean fire return intervals of pre-Euro-American settlement fire regimes in habitats supporting *Malacothamnus* ranged from ~10–150 years with a maximum of ~250 years (Van de Water and Safford 2011). This indicates that viable *Malacothamnus* seed may reside in the soil seed bank in some areas where no live *Malacothamnus* plants have been observed for over a century. Keeley et. al. (2005) tested the effects of both smoke and heat on *M. fremontii* seeds using multiple smoke water concentrations and heat shock temperatures. This study showed *M. fremontii* to have no to little response to smoke water and higher germination with heat. It also showed loss of germination with exposure to too high temperatures. This could possibly indicate that in situations with a high burn intensity, seed in the soil seed bank could be destroyed if not buffered well by an insulating layer of soil. Germination tests at the California Seed Bank found mechanical scarification, especially penetrating the seed coat with a razor or nail clippers, to be the most effective germination treatment for all *Malacothamnus* taxa tested (Fig. 1 F & G, CalBG 2021). Most germination tests using clipping had > 50% germination and most tests using other germination treatments had < 50% germination. Occasional plants found along graded dirt road edges and other disturbed areas outside of burned areas indicates the possibility of germination in the wild caused by mechanical disturbance without fire. Sporadic germination without disturbance is possible as well, though possibly very rare. I have been observing the various taxa of *Malacothamnus* at CalBG for five years and, despite the thousands to possibly millions of seeds dropped under the plants there over the years since they have been planted, I have not found a single seedling. Two hybrid plants at the garden, one that came up under a parent plant, show that it does happen occasionally though. Likewise, I have not found any seedlings in the wild, except in recent burn areas. Searching for seedlings in the wild is, however, complicated by the fact that older seedlings that have lost their cotyledons may resemble recently emerged rhizome sprouts. Rhizomes sprouts are much

thicker stemmed than young seedlings though, so both are easily distinguishable when first emerging from the ground.

How long *Malacothamnus* seed remains viable is unknown but the pre-Euro-American settlement fire intervals indicate they may remain so for well over a century. Germination tests also indicate this is likely possible (Table 1). While browsing herbarium specimens at CalBG, I was fortunate to find *Malacothamnus* specimens collected by Carl B. Wolf between 1931 and 1941, several of which contained packets of seeds. Seeds from ten of these specimens representing nine taxa in eight species were tested for viability by the staff of the California Seed Bank at CalBG. Some seed from all specimens germinated with a germination rate of 8–100% per specimen and a mean of 50% germination. Three of the four specimens with seed having a germination rate of > 80% were 88 years old. Of the ungerminated seed that was dissected, 81% were mushy and presumed inviable and 19% were firm and presumed possibly viable. Historic storage and treatment of these specimens and how it may have affected the seed is unknown. Reassessing seed from these specimens in the future, perhaps in 25- or 50-year intervals, could prove interesting.

3.3 Flower Phenology and Reproductive Barriers

Malacothamnus inflorescences are cymose and vary in flower arrangement from capitate to spike-like to panicle-like, sometimes grading from one to another in the same population (Bates 1963). The flowers in these arrangements open in a progression with the bloom of a single plant lasting one week to multiple months. After the primary blooming period, some plants of many taxa may sporadically produce additional flowers or new inflorescences for months past the peak bloom. These sporadic flowers may be on a single plant or few plants in a population of hundreds of nonblooming plants, which makes phenology records of herbarium specimens and iNaturalist observations often unrepresentative of the general population phenology when the records are of sporadically blooming plants and not noted as such. While most *Malacothamnus* bloom in late spring and early summer, there is some variation possibly attributable to phenological divergence. The geographic ranges of the closely related *M. abbottii* and *M. jonesii* var. *jonesii* are adjacent to each other and may overlap. *Malacothamnus jonesii* var. *jonesii* is one of the earliest blooming *Malacothamnus* taxa, blooming well before the late-blooming *M. abbottii*, and is one of a few taxa that do not appear to sporadically bloom after the main blooming period. Likewise, *M. involucratus* blooms much earlier than *M. discombobulatus* with which it shares part of its range.

While disjunct bloom times creates at least a partial reproductive barrier between some sympatric and adjacent taxa, the primary reproductive barrier between *Malacothamnus* taxa is geographic isolation. Bates's crossing experiments (1963) coupled with clear morphologically intermediate plants in the transition zones between most taxa indicate that hybridization is possible and perhaps likely between all or most *Malacothamnus* taxa that bloom at the same time. In general, these transition zones are narrow and plants outside of transition zones can be easily assigned to a taxon. One exception is near Santa Clarita, CA where the ranges of three

species come together, and apparent intermediates of these species are more widespread. Another exception might occur in Baja California where further surveys are needed to determine the geographic extent of possible intermediates and if any of the possible intermediates may actually be undescribed taxa.

Table 1. Results of germination trials of *Malacothamnus* seed from herbarium specimens 78–88 years old. Dissection results refer to the state of the embryo of a sampling of seeds that did not germinate and whether it filled the entire seed coat or not.

Taxon	Herbarium accession	Specimen age	# Tested	# Germ.	Germ. rate	Dissection Results
Malacothamnus aboriginum	RSA30229	78 years old	25	22	88%	3/3 mushy, moist, white, partially filled
Malacothamnus arcuatus var. *arcuatus*	RSA3086	88 years old	15	13	87%	2/2 mushy, moist, white, partially filled
Malacothamnus davidsonii	RSA3153	88 years old	25	6	24%	5/5 mushy, moist, white, filled
Malacothamnus fasciculatus var. *fasciculatus*	RSA3145	87 years old	25	4	16%	2/5 mushy, moist, white, filled; 3/5 firm, moist, white, filled
Malacothamnus fasciculatus var. *laxiflorus*	RSA3155	88 years old	25	4	16%	N/A
Malacothamnus fremontii var. *fremontii*	RSA3011	88 years old	25	25	100%	N/A
Malacothamnus fremontii var. *fremontii*	RSA3019	88 years old	25	23	92%	2/2 mushy, moist, white, filled
Malacothamnus jonesii var. *niveus*	RSA25656	78 years old	25	2	8%	5/5 mushy, moist, white, filled
Malacothamnus marrubioides	RSA25867	78 years old	25	4	16%	4/5 firm, moist, white, filled; 1/5 mushy, moist, white, filled
Malacothamnus orbiculatus	RSA5401	87 years old	25	13	52%	5/5 mushy, moist, grey, partially filled

3.4 Seed dispersal

Little is known about seed dispersal in *Malacothamnus*. The seeds are unwinged and have no elaiosomes. Seed often falls directly to the ground from the dehisced carpels (Fig. 1C), where, if it is dispersed much at all beyond the mother plant, it is most likely to be dispersed by flowing water or extreme wind speeds. Occasionally, fully dried flowers with mature fruit fall intact (Fig. 1D). These may also be blown in the wind and disperse seed as the fruit breaks apart. I've seen little evidence of vertebrate animal browsing, though some limited browsing by rabbits, deer, and cattle indicate that they may occasionally be a vector for seed dispersal. I've seen no indication that birds eat the seeds.

3.5 Leaf Phenology

Presumably as a means of conserving water, *Malacothamnus* change their leaves twice a year (Fig. 5). During the wetter winter and spring months, the leaves are larger and thinner. Around July, smaller and thicker summer/fall leaves start to sprout from axillary buds as the winter/spring leaves are dropped. Larger and thinner leaves sprout again in the winter. Observation of *Malacothamnus* plants in the living collection at CalBG indicates that the amount of water received by a plant may control leaf size and thickness in summer/fall leaves of at least some species as those that were watered more regularly had larger and thinner leaves in summer/fall compared to those watered less. This change of leaves is one reason leaves may be somewhat problematic for use in identification. Not only does the size and thickness change, but the density of the trichomes and overall leaf color produced from the density of the trichomes changes. Fully expanded winter/spring leaves are often obviously bright green or ashy grey/green, the greyer color generally a result of denser stellate trichomes. In young leaves that aren't fully expanded and in the summer/fall leaves of plants that have bright green winter/spring leaves when fully expanded, a much higher trichome density may make these leaves appear greyer.

3.6 Associated Animals

More than 200 species of animals, primarily invertebrates, have been observed interacting with *Malacothamnus* (iNaturalist 2023). Of these, a few are notable in how commonly they associate with *Malacothamnus* (Fig. 6). Bees appear to be the most common pollinators with the genus *Diadasia* Patton, 1879 and feral honeybees (*Apis mellifera* L., 1758) being the most common. *Diadasia* are notable for spending the night in *Malacothamnus* flowers. Examining flowers in the evening, I've often found *Diadasia* inside all or most flowers of some plants. Other commonly encountered insects on *Malacothamnus* include *Brooksetta sp.* Kelton, 1979; *Parantonae hispida* Van Duzee, 1914; *Heliopetes ericetorum* (Boisduval, 1852); and at least five genera of weevils. Multiple species of *Brooksetta* are found on Malvaceae. Whether more than one is found on *Malacothamnus* is unknown. The type specimen of *Brooksetta malvastri* (Knight, 1968) was, however, collected from *Malacothamnus fasciculatus*

(Knight 1968). Presumably no animal species are strictly associated with *Malacothamnus* as plants may be reduced to just a soil seed bank for decades at a time.

Figure 5. Winter/spring vs. summer/fall leaves in *Malacothamnus*. A) Herbarium specimens of *M. marrubioides* representing larger leaves generally seen in winter and spring (left), smaller leaves summer/fall leaves after larger leaves dropped (middle), and an extreme example of small summer/fall leaves (right). B) Larger winter/spring leaves of *M. densiflorus* var. *viscidus* being replaced by smaller summer/fall leaves.

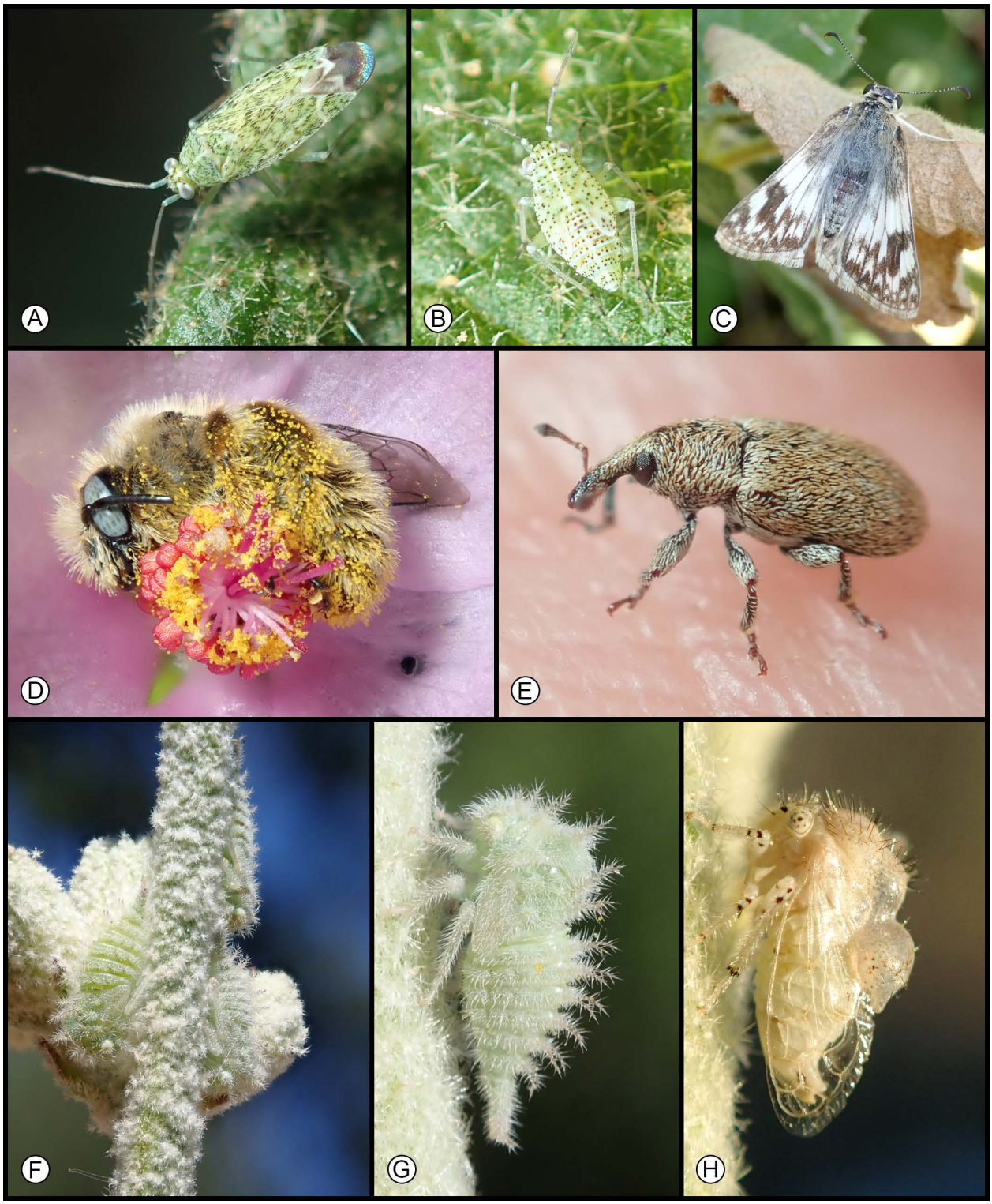

Figure 6. Invertebrate animals commonly associated with *Malacothamnus*. A & B) *Brooksetta sp*., adult (A) and nymph (B). C) *Heliopetes ericetorum*. D) *Diadasia sp*. covered in pollen E) *Macrorhoptus hispidus* - one of several weevils. F-H) *Parantonae hispida* - three camouflaged nymphs (F), nymph (G), and adult (H).

4 MORPHOLOGY

Single morphological characters in any particular *Malacothamnus* taxon may be highly variable and generally have a range of values that overlap with other taxa. Combinations of characters, however, are often effective in distinguishing many taxa. Key morphological characters include inflorescence type, calyx and calyx bracts (especially in combination), stipular bracts, length of stellate trichome rays, density of stellate trichomes, length of glandular trichomes, leaf shape, and whether corollas dry open or closed after anthesis.

4.1 Inflorescence

Inflorescences can range from capitate to subcapitate to spike-like to panicle-like with leaf-like to reduced bracts throughout (Fig. 7). While these inflorescence types fade into each other and some taxa may have more than one, occasionally even on the same plant, the fact that some taxa have only one or some of these inflorescence types is useful for identification. Flowers in *Malacothamnus* are often densely clustered. If an inflorescence is composed of only a single, terminal, roundish cluster of flowers, I consider this a capitate inflorescence. A subcapitate inflorescence has a second, often smaller cluster of flowers below the terminal cluster. I consider a spike-like inflorescence to be one without branches that has three or more dense flower clusters. The clusters of flowers are generally separated proximally in the spike, sometimes greatly separated, and are often touching in the distal part of the spike. Some plants with spike-like inflorescences may have additional axillary spikes or 1–2 flower clusters on an axillary branch or branches at the proximal end of the main spike. In the spike-like inflorescences, the highly reduced branch lengths in the flower clusters make the flower clusters dense. In panicle-like inflorescences, some of these branches are elongated making for a clearly branched inflorescence. In inflorescences somewhat intermediate between spike-like and panicle-like, which I call narrowly panicle-like, the inflorescence may appear ± spike-like distally, but the flower clusters often have elongated branches near the proximal end of the inflorescence.

4.2 Calyx

The calyx in *Malacothamnus* is connate with five lobes (Fig. 8). The length of the mature calyx as well as the size and shape of the calyx lobes can be useful in identification. The calyx lobes may be widest at their base to much wider above the base. Lobe shapes range from narrowly to widely triangular or ovate with apices ranging from obtuse to abruptly acuminate. In bud, the edges of the calyx lobes may protrude, often only slightly. In a few taxa (see *M. aboriginum*, *M. astrotentaculatus*, and *M. foliosus*), the lateral edge of the calyx lobes may greatly protrude in bud giving the bud a plicate to winged appearance.

4.3 Calyx bracts

All *Malacothamnus* flowers have a whorl of three bracts just below the calyx, which I refer to as the calyx bracts to reduce confusion with other bracts (Fig. 8). Collectively, the whorl

of three calyx bracts is referred to as the involucel or epicalyx. What I refer to as the calyx bracts have been called many names in past treatments including bracteoles (Eastwood 1936a), an involucel of bractlets (Jepson 1936; Kearney 1951; Munz and Keck 1959; Slotta 2012), involucral bracts (Bates 1963; Buschman 1969; Slotta 2004), and involucellar bractlets (Bates 2015a), often without these bract terms being disambiguated from other bracts in the inflorescence. The calyx bracts are generally very narrow and linear to subulate in shape. Wider calyx bracts such as the lanceolate to widely ovate ones in *M. aboriginum* are useful in distinguishing certain taxa. Length of calyx bracts and length relative to the length of the calyx are also useful in identification.

4.4 Corolla

Malacothamnus corollas may dry closed, partially open, or fully open after anthesis (Fig. 9). *Malacothamnus* petals are imbricate in bud. In most *Malacothamnus* taxa, they return to this state after anthesis and dry that way. Though similar to budding corollas, corollas that dried closed are generally easily distinguished on both live and herbarium specimens. After anthesis the corolla has a somewhat wrinkled and uneven appearance compared to its smooth and even appearance in bud. In a few taxa, the corollas remain completely or partially open when they dry. This is most easily observed on fresh specimens as the corollas are drying and can be somewhat difficult to assess on dry specimens where corollas have dried partially open. Rare aberrant plants of species that generally have corollas drying closed may dry somewhat open. Hybrids between species with corollas drying closed with those that dry open may produce plants resembling one species but having the corolla drying character matching the other species. In both cases, the character states of the population as a whole should be considered as well as whether the plants may be from a hybrid zone.

4.5 Leaves

The more proximal flower clusters in an inflorescence are generally subtended by what could arguably be called leaf-like bracts. For the most part, there is no clear transition between these leaf-like bracts and the more proximal leaves beyond the change from nodes without flowers to nodes with flowers. For simplicity, I refer to leaf-like bracts with blades as just leaves in the inflorescence. These leaves in the inflorescence are generally only at the proximal nodes but may extend distally to most or all nodes of an inflorescence. In general, leaves are larger proximally and smaller distally.

Leaves may be unlobed or 3- to 7-lobed (Fig. 10). Lobed leaves may be obscurely to moderately lobed, but the leaves are never deeply divided. By obscurely lobed, I mean there is the hint of lobing that distinguishes the lobes from the teeth, but they aren't obvious lobes. Moderate lobes are obvious. The ambiguous territory between these, often accompanied by high variation in leaves, is covered by using "obscurely to moderately lobed" in taxon descriptions. The lobes may be rounded to acute (rarely obtuse), some being roughly acute with a rounded tip.

Leaf bases range in shape from cuneate to obtuse to truncate to subcordate to cordate, sometimes all on a single stem (Fig. 10). When multiple base shapes are found on a single stem, the more cordate end of the shape spectrum is found more proximally, and the more cuneate end of the shape spectrum is found more distally.

See the leaf phenology section (3.5) for additional comments regarding change of size and color of leaves throughout the year.

4.6 Stipular bracts

Stipular bracts, stipule-like bracts with no blade or petiole, are found along the stem between the calyx bracts and blade-bearing leaves (Fig. 11). The character of stipular bract size, particularly width, can be very useful in distinguishing taxa with relatively large stipular bracts from the rest. For example, *Malacothamnus involucratus* has very wide stipular bracts that in many cases can easily distinguish it from the rest of the genus. Less obvious are the relatively wide stipular bracts of *M. aboriginum* and *M. enigmaticus* that help distinguish them from similar taxa. Stipular bracts can be highly variable even in a single plant and may be deciduous in those with smaller stipular bracts. They may be lobed, which is likely at least sometimes due to fusion of two bracts. For those with relatively wide but not obvious stipular bracts like in *M. enigmaticus*, the stipular bracts are most easily seen near the proximal end of a flower cluster when the flowers are in bud. As the inflorescence matures, flowers may hide them, and dissection of the inflorescence may be needed to see them well.

4.7 Trichomes

Malacothamnus trichomes may be either glandular or nonglandular (Fig. 12). All taxa appear to have both.

The glandular trichomes are simple, multicellular, do not have an enlarged tip, and often, but not always, have a droplet of exudate at the tip. In a few taxa, the glandular trichomes are relatively large (0.3–1.4 mm long) and very useful in identification. In the remaining taxa, they are rarely larger than 0.1 mm long. Scanning electron microscopy (SEM) of the stem of *Malacothamnus aboriginum* showed minute glandular trichomes as small as 0.03 mm long hidden beneath the stellate trichomes (Fig. 12 A & B). Hence, some glandular trichomes may be undetectable with a standard dissection microscope.

In general, the glandular trichomes appear to be uncolored. However, the exudate or the entire trichome may be colored at times. This is not consistent for all trichomes though, even on the same specimen. The glandular trichomes of *Malacothamnus palmeri* and *M. involucratus* are often only detectable as a clear to reddish droplet of exudate on the surfaces of the plant. Using SEM, I confirmed that these droplets indeed contain minute glandular trichomes smaller than the droplet itself. The glandular trichomes of *M. densiflorus* var. *viscidus* are often yellow to bright green, and occasionally reddish. The bright green coloration is particularly prominent in dried specimens and persists even in the type specimens that are over

100 years old. The glandular trichomes of *M. jonesii* var. *gracilis* are similar but often red in color (Fig. 12F). The exudate of at least some very old specimens is still in liquid form and in other specimens it is hardened. In *M. lucianus* and *M. densiflorus* var. *viscidus*, which have some of the longest glandular trichomes in the genus, the leaves often feel greasy from the exudate and smell somewhat rancid. Taste-tests of these leaves revealed no notable flavors.

The nonglandular trichomes may be simple, bifurcate, or stellate. The simple and bifurcate trichomes seem to be mostly limited to the inside of the calyx, with the exception of *Malacothamnus densiflorus*, which has them on the abaxial side of the calyx and on the calyx bracts. These simple and bifurcate trichomes, or some of them, may be a reduced form of the stellate trichomes. Stellate trichomes cover the stem, leaves, bracts, and calyx at various densities. The number of rays (branches from a central point) per trichome varies with some taxa having more than others. Regarding number of rays, only the relatively few rays of *M. densiflorus* is easy to assess for identification. The length of the rays is often variable even on a single trichome. The longest rays and the mean length of the rays are very useful in identification. The shortest rays are of no practical use however as even taxa with very long rays often have very short rays as well.

The stellate trichomes may or may not have a stipe/stalk (Fig. 12 A & D). The trichomes of some surfaces of some taxa are mostly without stipes but often with some scattered trichomes with stipes. Alternately, some surfaces may have a relatively balanced mix of both trichomes with and without stipes. In these cases, there is generally a layer of trichomes without or with very short stipes beneath those that have longer stipes.

A few species occasionally have filiform to branched trichome-like outgrowths that are covered with stellate trichomes. This is most apparent on the calyx of *Malacothamnus astrotentaculatus* (Fig. 33 C & D and Volume 2 Fig. 36) where these outgrowths can be greenish in color and up to ~2.5 mm long. In other taxa where they occur, they are also found on the calyx, but are colorless and much less common, or perhaps just smaller and more obscure. The smaller versions of these outgrowths look somewhat like a chain of stiped stellate trichomes, which argues for the outgrowths plus the stellate trichomes on them to be possibly considered some form of compound stellate trichome.

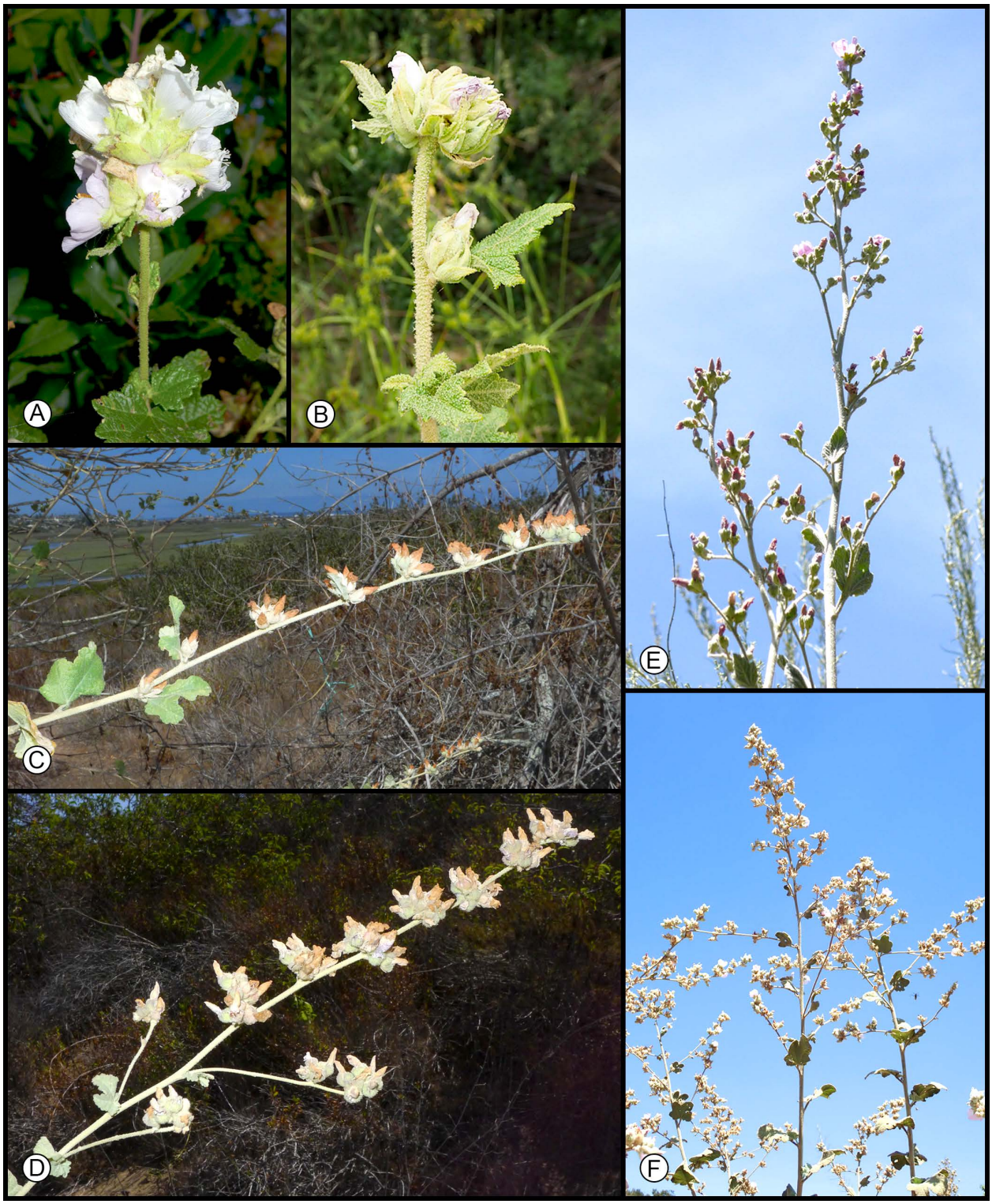

Figure 7. Inflorescence types. A) Capitate. B) Subcapitate. C) Spike-like. D) Spike-like with proximal axillary spikes, sometimes with only one or two sessile flower clusters on branches as shown here. E) Narrowly panicle-like. F) Widely panicle-like.

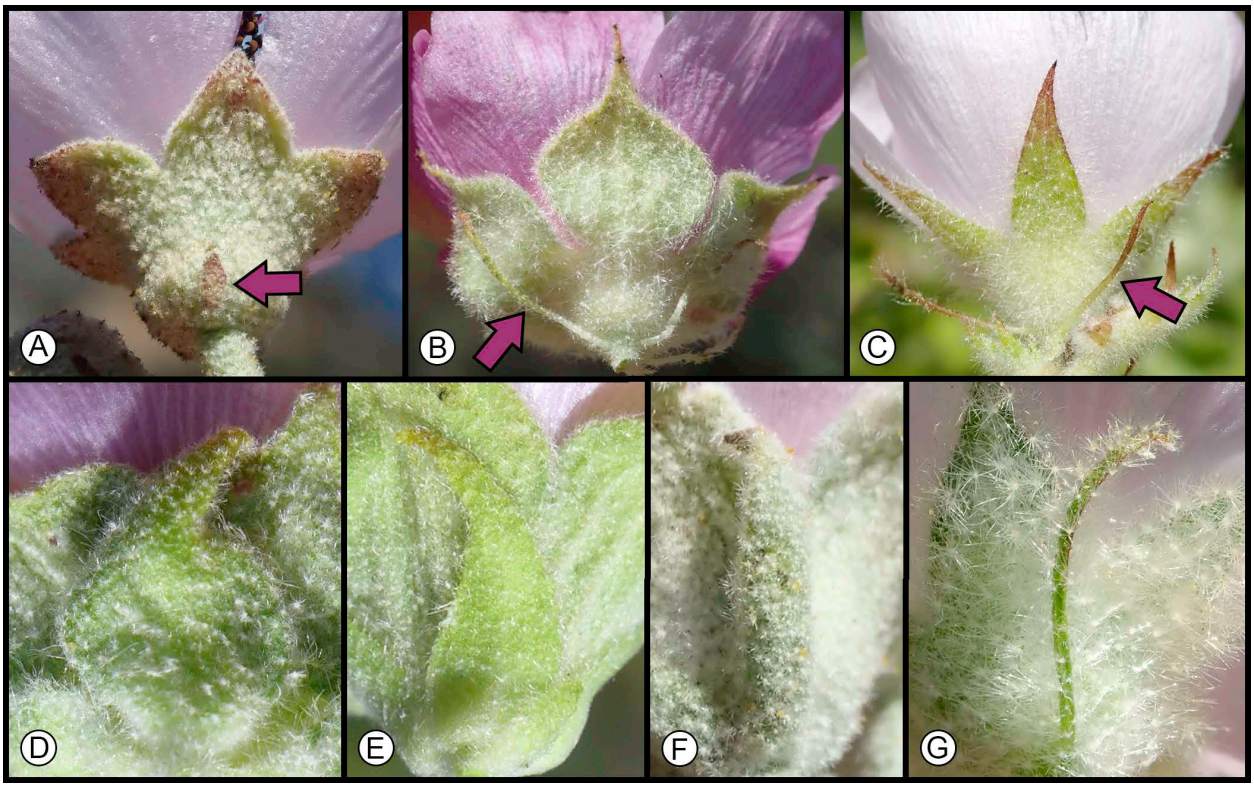

Figure 8. Calyx and calyx bract variation. A-C) Calyx with arrow pointing to one calyx bract. D-G) Calyx bracts. A) Calyx lobes borderline triangular/ovate, about as long as wide, and widest at base. Calyx bract length less than half of the calyx length. B) Calyx lobes widely ovate with an abruptly acuminate tip, somewhat longer than wide, and with lobes much wider above base than at base. Calyx bract length greater than half of calyx length. C) Calyx lobes roughly triangular, much longer than wide, and widest at base. Calyx bract length greater than half of calyx length. D) Ovate calyx bract. E) Lanceolate calyx bract. F) Oblong calyx bract. G) Linear calyx bract.

Figure 9. Corolla phenological stages of *Malacothamnus fremontii* var. *fremontii* (A-F) and *Malacothamnus jonesii* var. *jonesii* (G-I). A) Flowers in bud. B) Fresh corolla fully open. C) Corolla drying fully open. D) Corolla dried fully open. E-F) Corolla dried partially open. G) Flower bud (left), corolla drying closed (middle), corolla just before or after opening (right). H-I) Corollas dried closed.

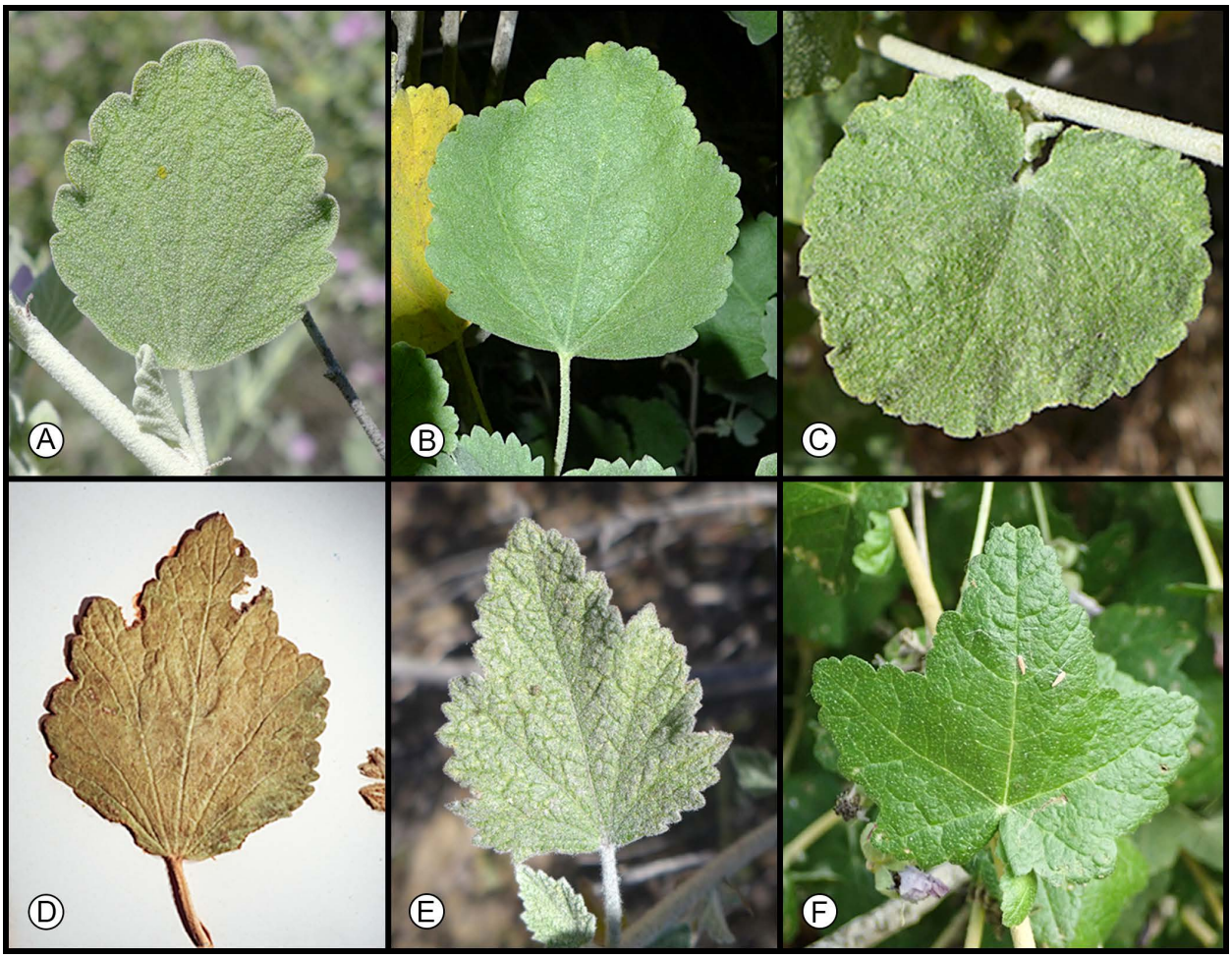

Figure 10. Leaf shape variation in *Malacothamnus*. Leaf bases obtuse (A & D), ± truncate (B & E), and cordate (C & F). Leaves unlobed (A & C), obscurely lobed (B, D, & E), and moderately lobed (F).

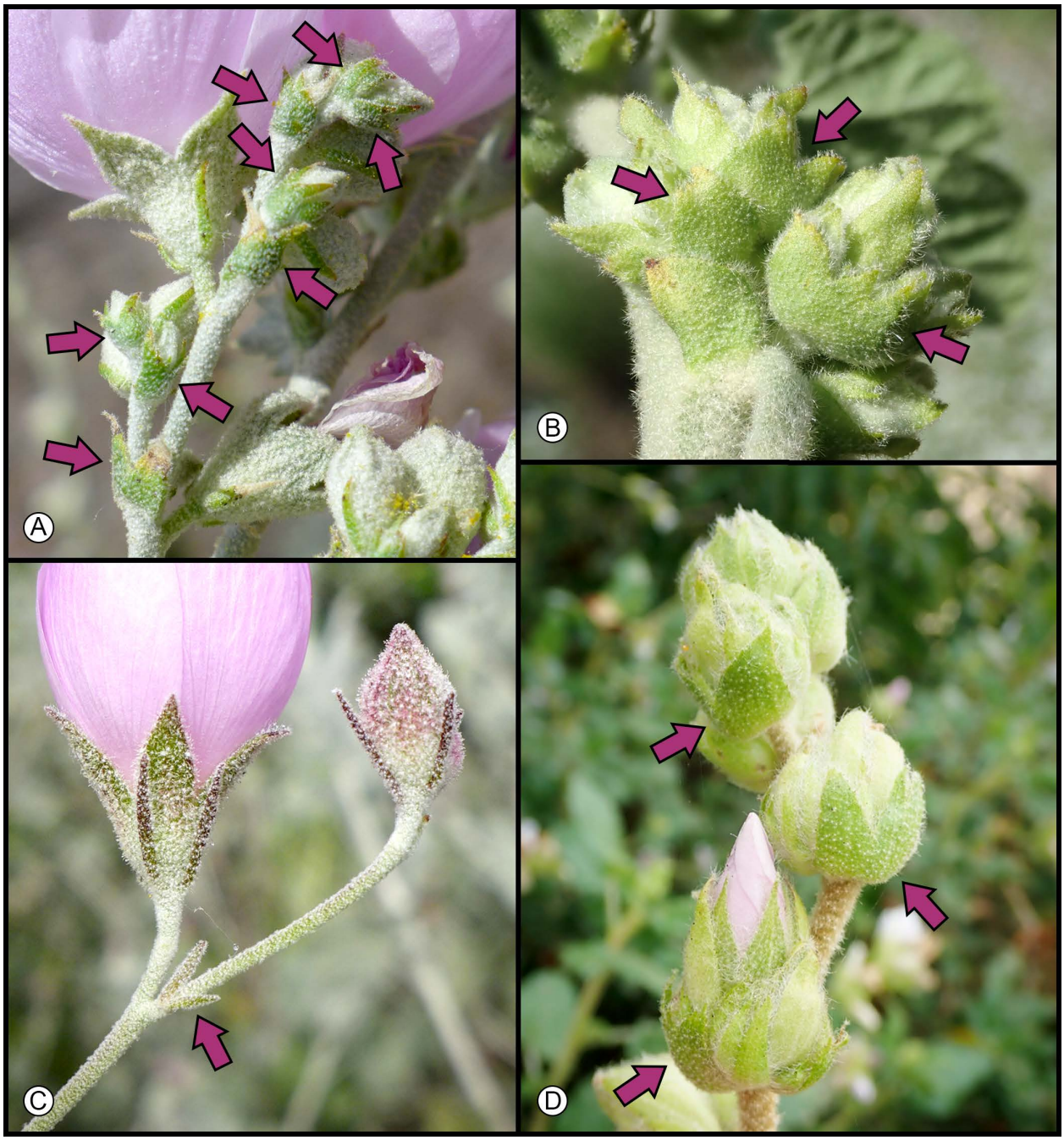

Figure 11. Stipular bracts of four *Malacothamnus* taxa are indicated by arrows. Stipular bracts are found in the inflorescence between the calyx bracts (Fig. 8) and leaves with blades. A) *M. fasciculatus* var. *laxiflorus*. B) *M. aboriginum* (note 2 stipules and a petiole below the stipular bracts). C) *M. jonesii* var. *gracilis*. D) *M. involucratus*.

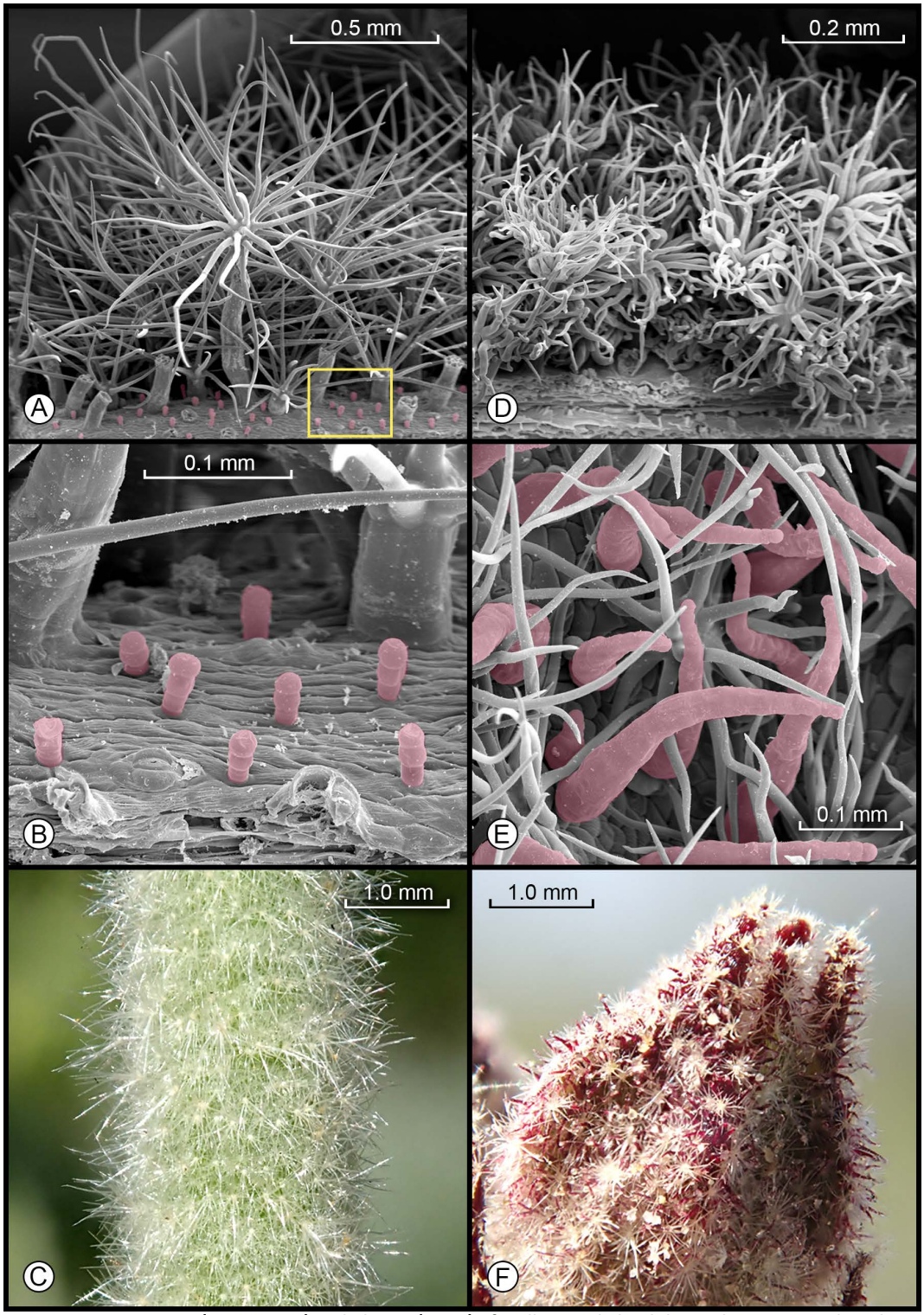

Figure 12. SEM images (A, B, D, & E) and photos (C & F) of stellate and glandular trichomes in *Malacothamnus.* Glandular trichomes in SEM images are colored reddish to distinguish them from the uncolored stellate trichomes. In most cases, glandular trichomes are actually white to yellowish under light microscopy. A-C) Trichomes on the stem of *M. aboriginum*, which have stellate trichomes with relatively long rays and stipes, and minute glandular trichomes. The yellow box in A outlines a magnified area of this image shown in B. The larger stump-like projections in A are broken off stipes of stellate trichomes. D-F) Trichomes on *M. jonesii* var. *gracilis*. D) Very dense and overlapping stellate trichomes on the stem with relatively short rays and short to no stipes. E & F) Relatively short stellate trichomes and relatively long glandular trichomes on the calyx. This is one taxon where the glandular trichomes often are reddish as seen in F.

5 CONSERVATION CONCERNS

Beyond the usual threats related to taxa having small geographic ranges such as habitat alteration and climate change, conservation threats specific to *Malacothamnus* can be associated with fire-related issues, hybridization, and possibly seed predation, all of which I discuss below. Threats to any particular taxon may also be increased by limited ranges or distribution of populations within a range (Mace et al. 2008). These spatially explicit threats may include local catastrophic events, demographic stochasticity, and loss of genetic diversity. To provide a baseline to compare spatially explicit threats across the full genus, I include current EOO and AOO values for each.

5.1 Fire-related Concerns

As *Malacothamnus* may lay dormant in the soil seed bank for decades until a fire allows for germination, knowledge of where plants occur is extremely limited in areas that have not been surveyed well following burns. Habitat modification of an area that has not had post-burn surveys to detect *Malacothamnus* could lead to the loss or reduction of undocumented populations.

In areas with *Malacothamnus*, the success of those plants in germinating after a fire and living to replenish the soil seed bank is likely crucial to their long-term persistence. It is unknown what percentage of viable *Malacothamnus* seed in a seed soil bank remains dormant after a burn but presumably a high percentage of seed that survives a burn could germinate following a fire. As fires burn unevenly and some seed buried deeper in soil may be buffered from temperatures needed to break dormancy, presumably some seed may remain dormant post-burn as well.

I've observed two possible threats to germinating *Malacothamnus* post-fire. In areas where nonnative annuals are abundant, germinating *Malacothamnus* may not be able to compete with the nonnative annuals. Factors increasing these nonnative annuals may include introductions from a variety of sources, overly frequent burns, and nitrogen deposition. Similarly, I observed one area of burned chaparral, adjacent to a small *Malacothamnus astrotentaculatus* population, which was sprayed with herbicide and then planted with pine trees. In both situations, if the *Malacothamnus* isn't allowed to survive long enough to replenish the soil seed bank, its chances of persisting in an area may be highly reduced. Fire fuel reduction practices such as mowing and chipping may also possibly inhibit growth of *Malacothamnus* seedlings.

Fire suppression may also be a concern, especially regarding documentation of *Malacothamnus* populations. As *Malacothamnus* germinate post-fire and are generally short-lived, adequate surveys to detect and document populations should ideally be undertaken in the first few years after a burn. Plants may only persist in large numbers for a few years and dense growth of other shrubs post-fire may quickly make access to some locations difficult or impossible. Environmental reviews for land development or management of areas that have

not been adequately surveyed post-fire may overlook populations of *Malacothamnus* that lie dormant in the soil seed bank. In areas with fire suppression, the post-fire conditions needed for adequate surveys may not have been met for decades. Similarly, agencies and landowners limiting access to burned areas for timely surveys in the first few years after a fire, which is a common problem, may also hinder documentation efforts. Whether people can actually suppress fires in an area for longer than the longevity of viable *Malacothamnus* seed in the soil seed bank is unknown but long-term fire suppression in an area could be problematic for its persistence.

5.2 Hybridization Concerns

As all *Malacothamnus* taxa with overlapping blooming periods will likely hybridize, introduction of taxa not native to a region into the range of other taxa could result in replacement of populations or an entire taxon with hybrids, especially if introduced into the ranges of taxa with very small geographic ranges like *M. eastwoodiae*. Several *Malacothamnus* taxa are in cultivation and planted for horticultural use. If planted near naturally occurring populations, this could lead to hybridization. Possibly more problematic is the use of poorly chosen *Malacothamnus* source material in native plant community restoration plantings within or adjacent to areas *Malacothamnus* naturally occurs. I've found several examples of this both during my field surveys and through other people's iNaturalist observations. This is likely at least partly due to taxonomic lumping and misidentifications, though decisions to not use plant material sourced from near where they will be planted are also very much to blame. Examples include *M. fasciculatus* var. *laxiflorus* introduced into the range of *M. nuttallii* (both treated as *M. fasciculatus* without varieties by Bates), *M. abbottii* introduced into the range of *M. jonesii* var. *niveus* (a confirmed case of misidentification), *M. densiflorus* var. *viscidus* introduced into the range of *M. fasciculatus* var. *laxiflorus* (presumably a case of misidentification), and *M. foliosus* introduced into the range of *M. fasciculatus* var. *laxiflorus* (an introduction from Mexico into the USA). All of these possibly problematic introductions could have been prevented by using locally sourced propagules or by just not planting *Malacothamnus*.

5.3 Seed Predation

While studying *Malacothamnus abbottii*, Elvin and Yadon (1996) noted severe predation of seeds by weevils at every occurrence they visited resulting in extremely low to no seed set. I have noticed weevil predation as well in some populations of other taxa. It appears to me that it is weevil larvae that eat the seeds, burrowing through the fruit from one carpel to another, possibly while the fruit is immature but perhaps in mature fruit as well. It is unknown whether these weevils are a natural predator, introduced, or both. Whether more than one species of weevil eat *Malacothamnus* seed is also unknown. Considering these weevils in the context of the relationship of *Malacothamnus* with fire, it is possible that fires will highly reduce the number of weevils in an area for an unknown period of time after the fire, perhaps allowing relatively little predation in the first few years after *Malacothamnus* germinate. Weevils may become more problematic in older plants as their numbers increase. If this is the case,

assuming larger numbers of seed are deposited in the soil seed bank in the first few years after germination and left undisturbed, high weevil predation in older plants may not harm the long-term viability of a population. This is, however, speculation that needs evidence to confirm. It has been shown that fire can reduce infestations of weevil and moth larvae in acorns in the first year following a burn (Halpern 2016), so it is perhaps plausible that the same may be true for *Malacothamnus.*

5.4 EOO and AOO

Extinction risk related to spatially explicit threats can be at least partly quantified using extent of occurrence (EOO) and area of occupancy (AOO). EOO represents the area bounded by the farthest extents of a taxon's range regardless of how much of that area is occupied by the taxon. Taxa with populations spread over a larger area have a lower extinction risk from spatially explicit threats than those spread over a smaller area. AOO represents the area within the EOO that is occupied by the taxon. Taxa occupying more areas within a range, likewise, may have lower extinction risks related to spatially explicit threats than those occupying less. One caveat is that this is a very rough gauge and by itself doesn't account for population sizes within any particular area. It can, however, be used to identify taxa that are possibly in need of conservation attention or in need of surveys to better document their range.

Table 2 indicates the EOO and AOO of each minimum-ranked *Malacothamnus* taxon, their current California Rare Plant Rank, and their California state and U.S. federal statuses. Only two taxa have the latter statuses. Both *M. clementinus* and *M. fasciculatus* var. *nesioticus* are listed as Endangered at both the state and federal level. Both of these taxa were listed partly due to heavy grazing, which has since been remedied, and *M. clementinus* is currently being considered for delisting at the federal level (USFWS 2021a, 2021b).

Figure 13 compares the current CRPR of each taxon relative to EOO and AOO to more easily visualize where possible inconsistencies lie in CRPR rankings of *Malacothamnus* relative to each other. The meaning of each CRPR value is noted in the caption of Table 2.

Malacothamnus mendocinensis and *M. eastwoodiae* are notable in having both very low EOO and AOO values that are smaller than both taxa that are Federally Endangered, which is clear in Figure 13B. *Malacothamnus mendocinensis* was presumed extinct until recently rediscovered and could possibly be more widespread than indicated here. *Malacothamnus eastwoodiae* is likely limited to a very small area, though its range may increase some with additional surveys.

Table 2. Comparison of current California Rare Plant Rank (CRPR), extent of occurrence (EOO), and area of occupancy (AOO) for all *Malacothamnus* taxa recognized in this treatment. EOO is the area in km^2 of a convex hull placed around the known range of the taxon or 1 km^2 x the number of locations for *M. mendocinensis*, which has less than 3 locations. AOO is number of 2x2 km squares in a grid placed over the range of a taxon that intersect with a known location of the taxon. Asterisks denote two taxa listed as Endangered by both the USA and California. CRPR 1B indicates plants rare, threatened, or endangered in California and elsewhere. CRPR 3 indicates plants taxonomically problematic. CRPR 4 indicates plants of limited distribution to be monitored for increased threats or rarity. Numbers behind the main CRPR indicate degree of threat within that rank (X.1 = high, X.2 = moderate, X.3 = low). *Malacothamnus foliosus* is endemic to Mexico, so CRPR is not applicable (NA).

Taxon (synonym/name with CRPR)	CRPR	EOO	AOO
M. abbottii	1B.1	131	11
M. aboriginum	1B.2	6,253	129
M. arcuatus var. *arcuatus* (*M. arcuatus*)	1B.2	1,620	57
M. arcuatus var. *elmeri* (*M. hallii*)	1B.2	4,646	73
M. astrotentaculatus	none	367	9
*M. clementinus**	1B.1	69	17
M. davidsonii	1B.2	291	64
M. densiflorus var. *densiflorus*	none	11,406	242
M. densiflorus var. *viscidus*	none	224	29
M. discombobulatus	none	952	25
M. eastwoodiae	none	4	3
M. enigmaticus	none	5,923	60
M. fasciculatus var. *catalinensis*	4.2	194	49
M. fasciculatus var. *fasciculatus*	none	16,763	517
M. fasciculatus var. *laxiflorus*	none	18,896	822
M. fasciculatus var. *nesioticus**	1B.1	71	7
M. foliosus	NA	989	68
M. fremontii var. *exfibulosus* (*M. helleri*)	3.3	1,905	29
M. fremontii var. *fremontii*	none	54,008	113
M. involucratus (*M. palmeri* var. *involucratus*)	1B.2	2,192	45
M. jonesii var. *gracilis* (*M. gracilis*)	1B.1	161	6
M. jonesii var. *jonesii* (*M. jonesii*)	4.3	586	25
M. jonesii var. *niveus*	none	2,444	46
M. lucianus (*M. palmeri* var. *lucianus*)	1B.2	520	18
M. marrubioides	none	1,998	85
M. mendocinensis	1B.1	2	2
M. nuttallii	none	5,375	155
M. orbiculatus	none	148,481	330
M. palmeri (*M. palmeri* var. *palmeri*)	1B.2	341	15

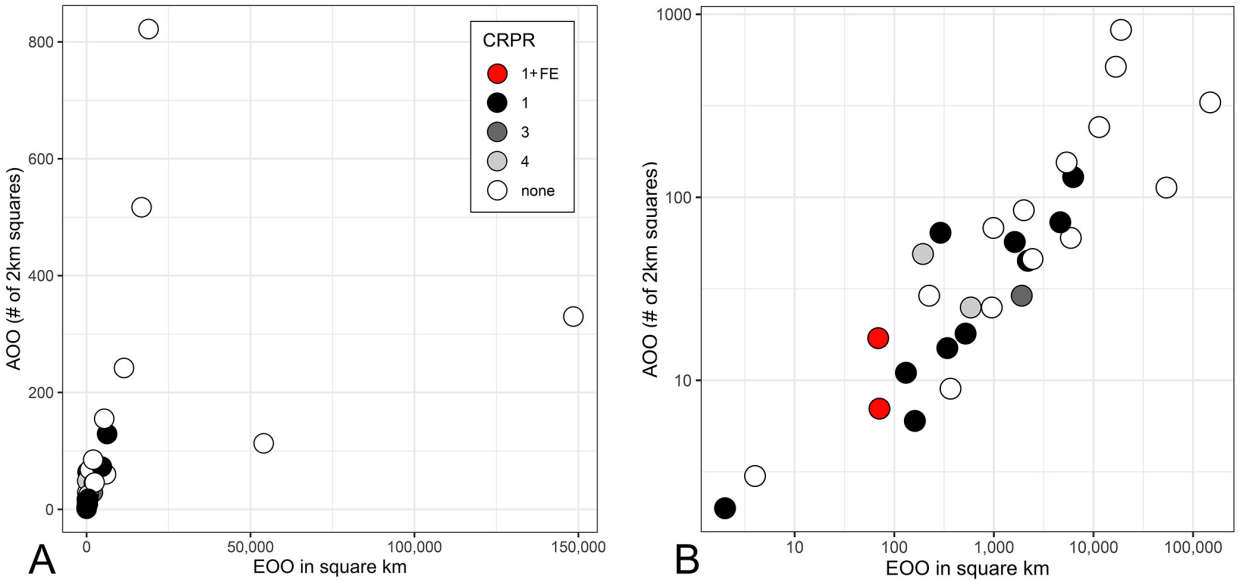

Figure 13. Current EOO and AOO plotted on a linear (A) and logarithmic (B) scale for all *Malacothamnus* taxa. Each taxon is colored by CRPR (see Table 2). Red indicates the two taxa that are CRPR 1 and Federally Endangered (FE).

Two taxa have a CRPR of 4 (*Malacothamnus jonesii* var. *jonesii* and *M. fasciculatus* var. *catalinensis*), which is the least threatened rank. These two taxa have smaller EOO and AOO values than several taxa with a CRPR of 1 (Table 2 and Fig. 13B), which are considered the most threatened. This may indicate that those with a CRPR of 4 may be more threatened than previously thought or that some CRPR 1 taxa with higher EOO and AOO values are possibly less threatened than previously thought. The CRPR 1 ranked *Malacothamnus aboriginum* is a clear example of a taxon that is less threatened than previously thought as many surveys done in the past decade have greatly increased the number of populations and plants known.

The four unranked taxa with the lowest EOO and AOO values, which stand out in Figure 16B relative to ranked taxa, show three different scenarios of why certain taxa may not have a CRPR. Both *Malacothamnus eastwoodiae* and *M. astrotentaculatus* are described in Volume 2 of this monograph and have not been considered for a rank yet. Likewise, *M. discombobulatus* was described in Volume 2 and split from *M. davidsonii*, which already has a CRPR of 1. *Malacothamnus densiflorus* var. *viscidus* represents a taxon that was considered for a rank in the past but rejected due to taxonomic issues, which are now resolved.

While EOO and AOO may be indicative of taxon conservation ranks that possibly need reassessing, additional threats or lack thereof associated with each should be also considered in any rankings. Known threats specific to each taxon are noted in their section of the treatment.

6 DISTRIBUTION MAPS

Distribution maps in this monograph show the full range of the genus and each taxon as currently known. Points on the maps come from herbarium specimens, Calflora, and iNaturalist observations I have assessed. Additional locations of specimens I have not seen are only included when the collection was within the confines of a single taxon's range. Introductions of taxa via plantings into the ranges of others are not shown. Figures 14 and 15 show the full range of the genus with Figure 14 showing the location of additional maps focused on smaller areas relative to the full range of the genus. Observations intermediate between species are included on some but not all maps. Note that morphologically intermediate plants may be possible wherever the ranges of any two taxa come together.

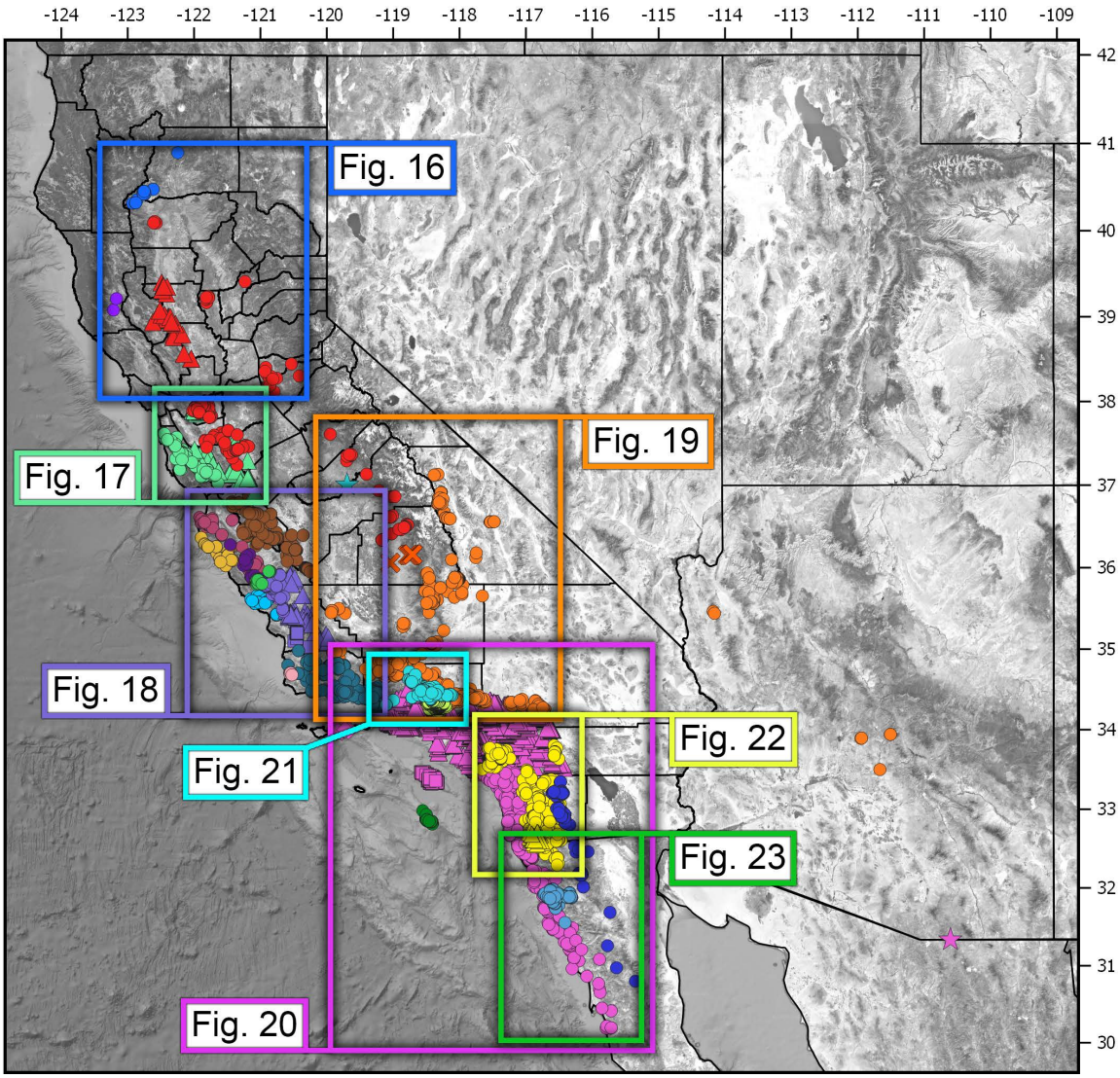

Figure 14. Map of the full range of *Malacothamnus* with rectangles showing boundaries and figure numbers of larger-scale maps focusing on specific regions and taxa.

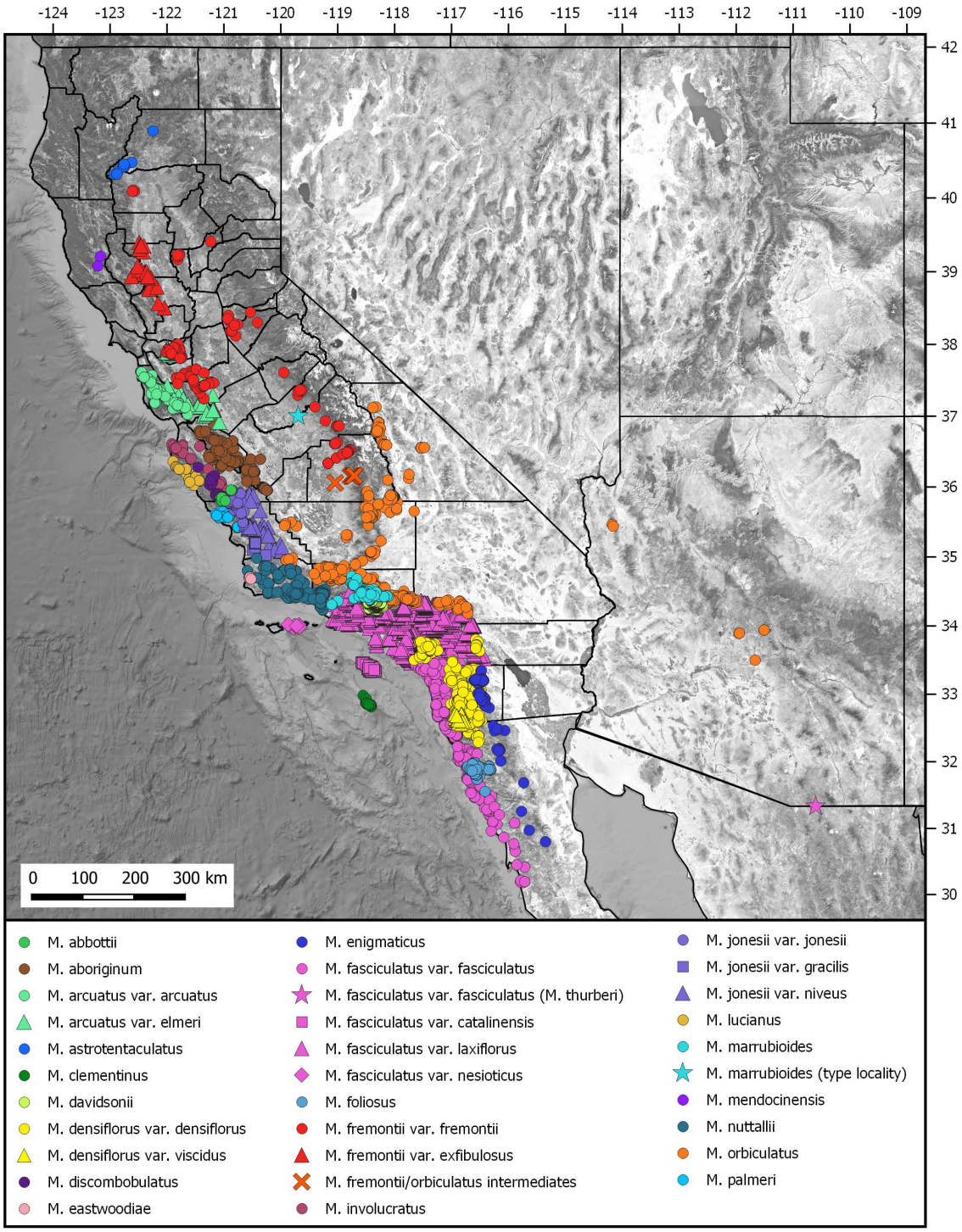

Figure 15. Map of the full native range of all taxa in the genus *Malacothamnus.* County boundaries are shown for the state of California. Species are distinguished by color. Varieties and other notable specimens are distinguished from the rest of its species by using different shapes. This is the only map included that contains the full range of *M. fasciculatus*, *M. fremontii*, and *M. orbiculatus*. The pink star on the Arizona/Mexico border is near the purported type locality of *Malvastrum thurberi*, recognized within *M. fasciculatus* var. *fasciculatus* in this treatment. The light blue star on west edge of the Sierra-Nevada Range is the purported type locality of *M. marrubioides*.

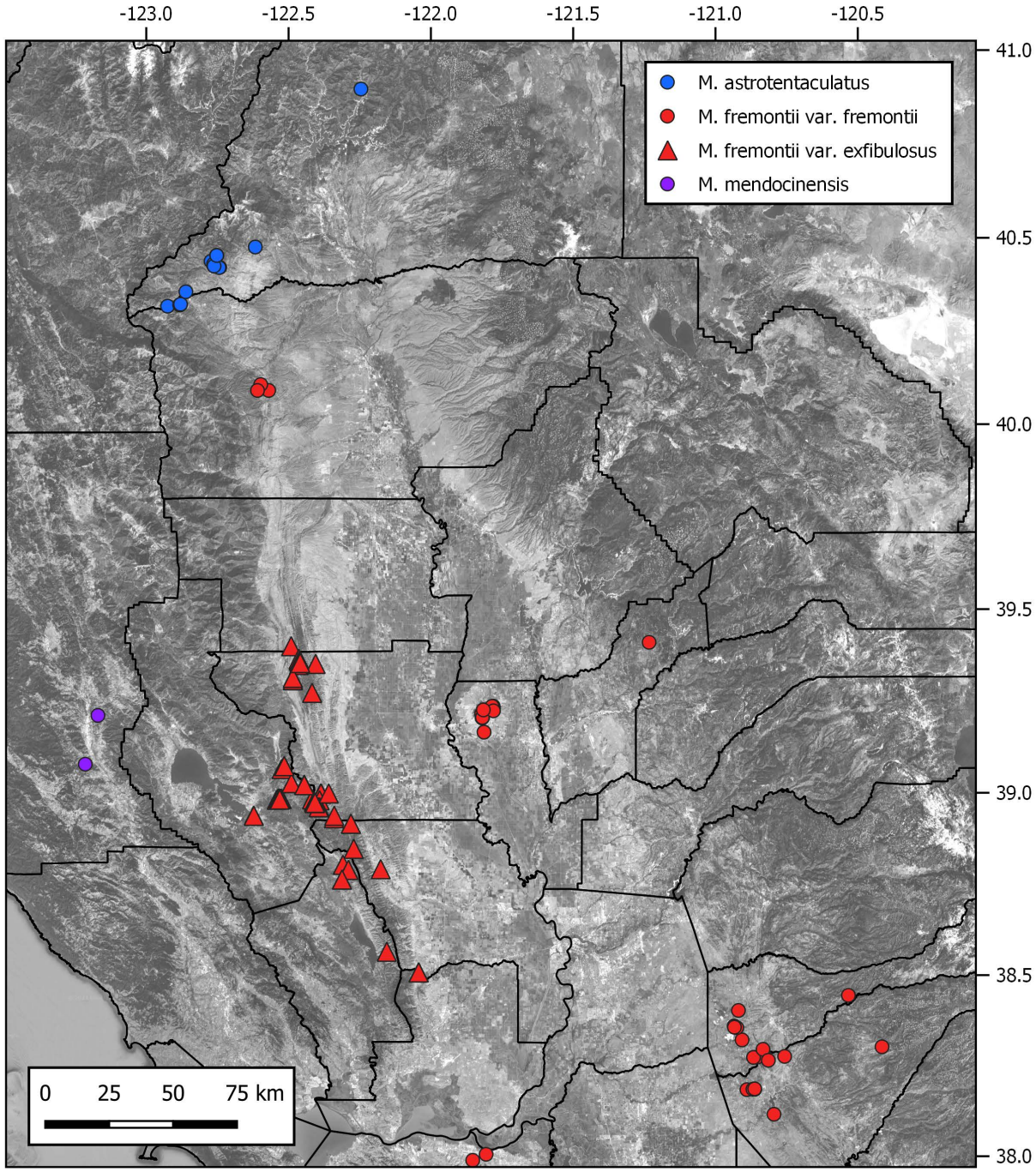

Figure 16. Distribution of *Malacothamnus* taxa in northern California. Colors represent different species. Different shapes of *M. fremontii* represent the different varieties.

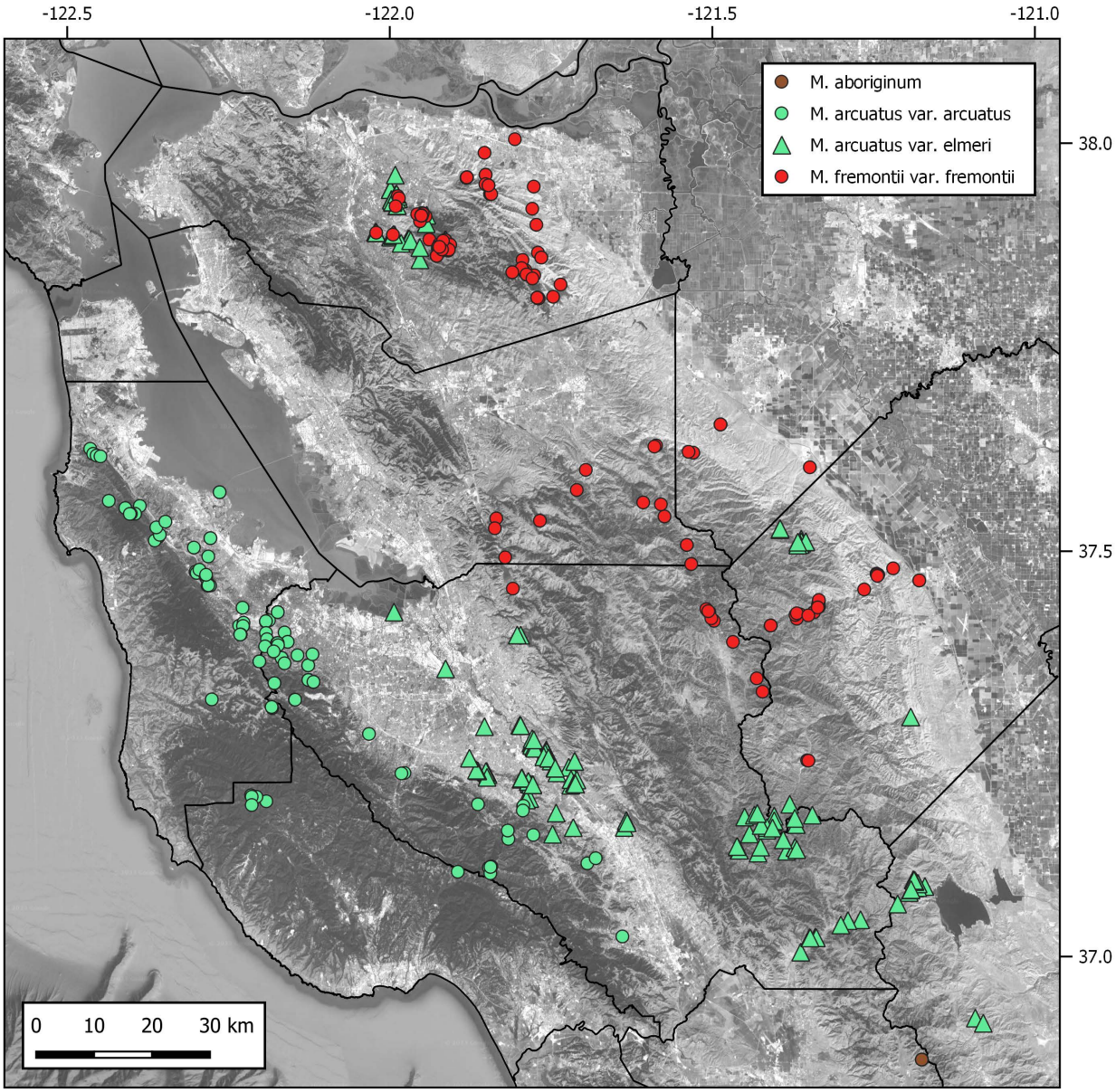

Figure 17. Distribution of *Malacothamnus* taxa in the San Francisco Bay Area region of California. Colors represent different species. Different shapes of *M. arcuatus* represent the different varieties.

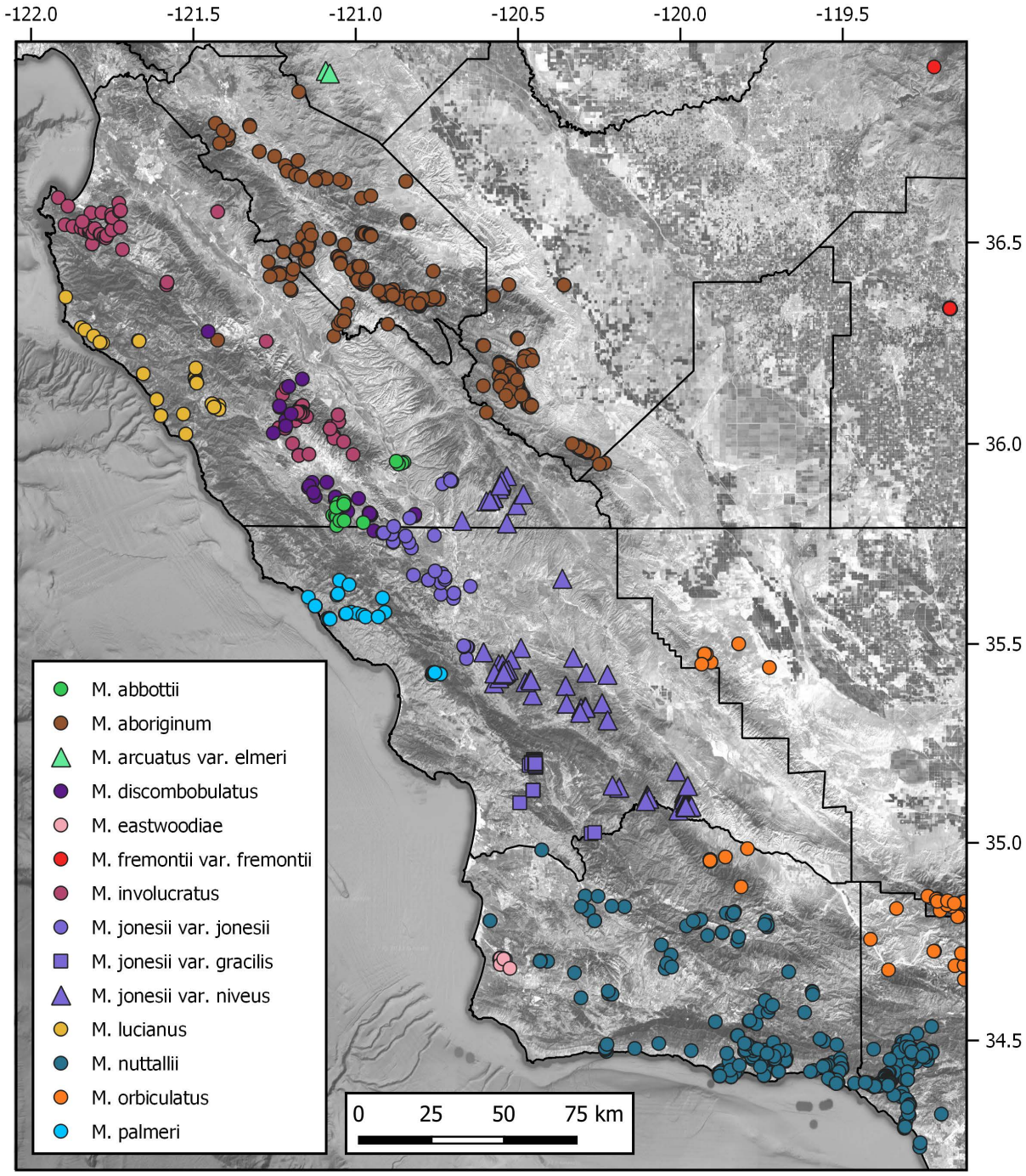

Figure 18. Distribution of *Malacothamnus* taxa in the central coastal region of California. Colors represent different species. Different shapes of *M. jonesii* represent the different varieties.

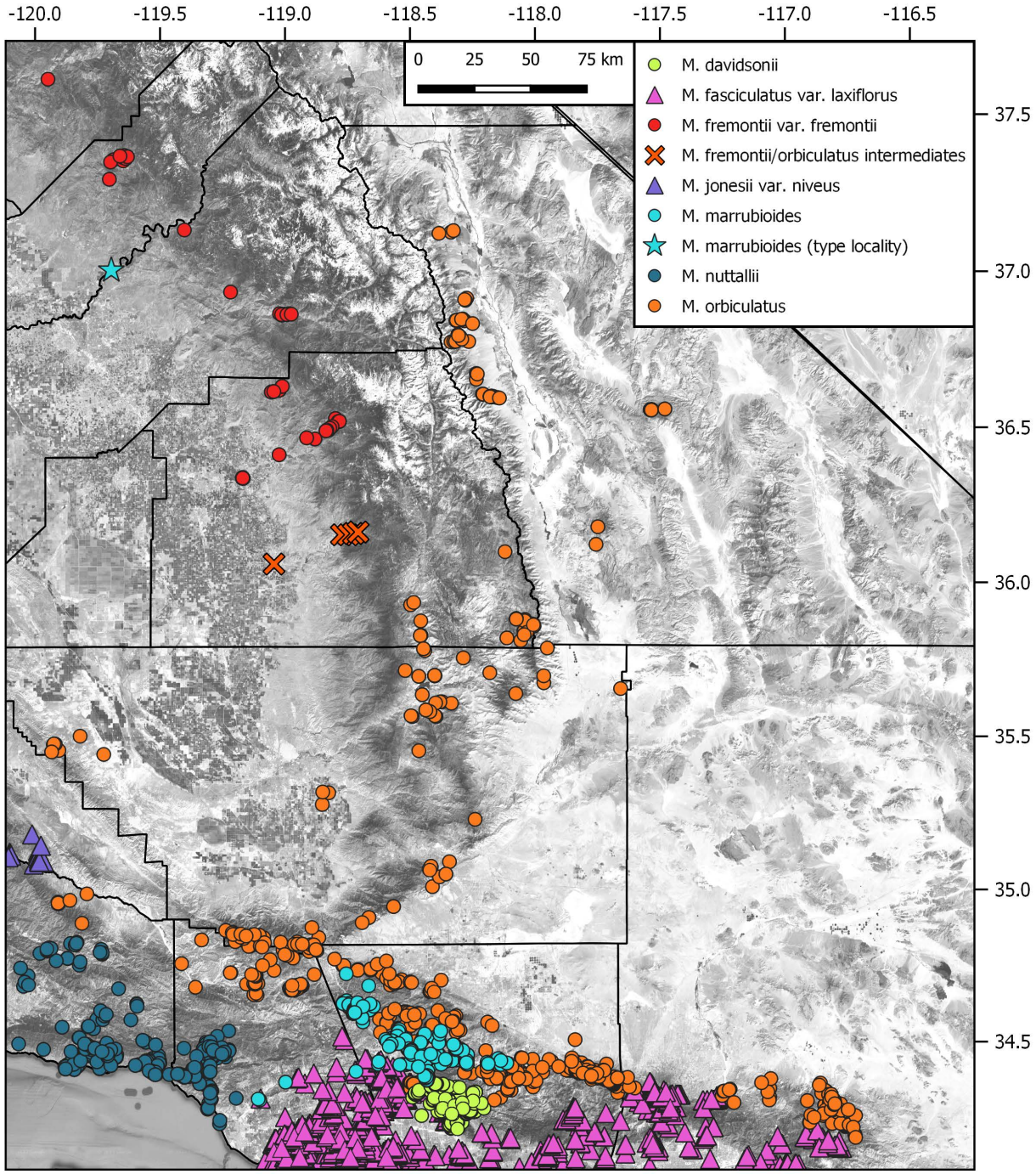

Figure 19. Distribution of *Malacothamnus* taxa focused on the California portion of the range of *M. orbiculatus*. Colors represent different species. The light blue star represents the highly disjunct purported type locality of *M. marrubioides*. Orange X's show an area of intermediates between *M. fremontii* and *M. orbiculatus*. How common intermediates may be north or south of this region is unknown.

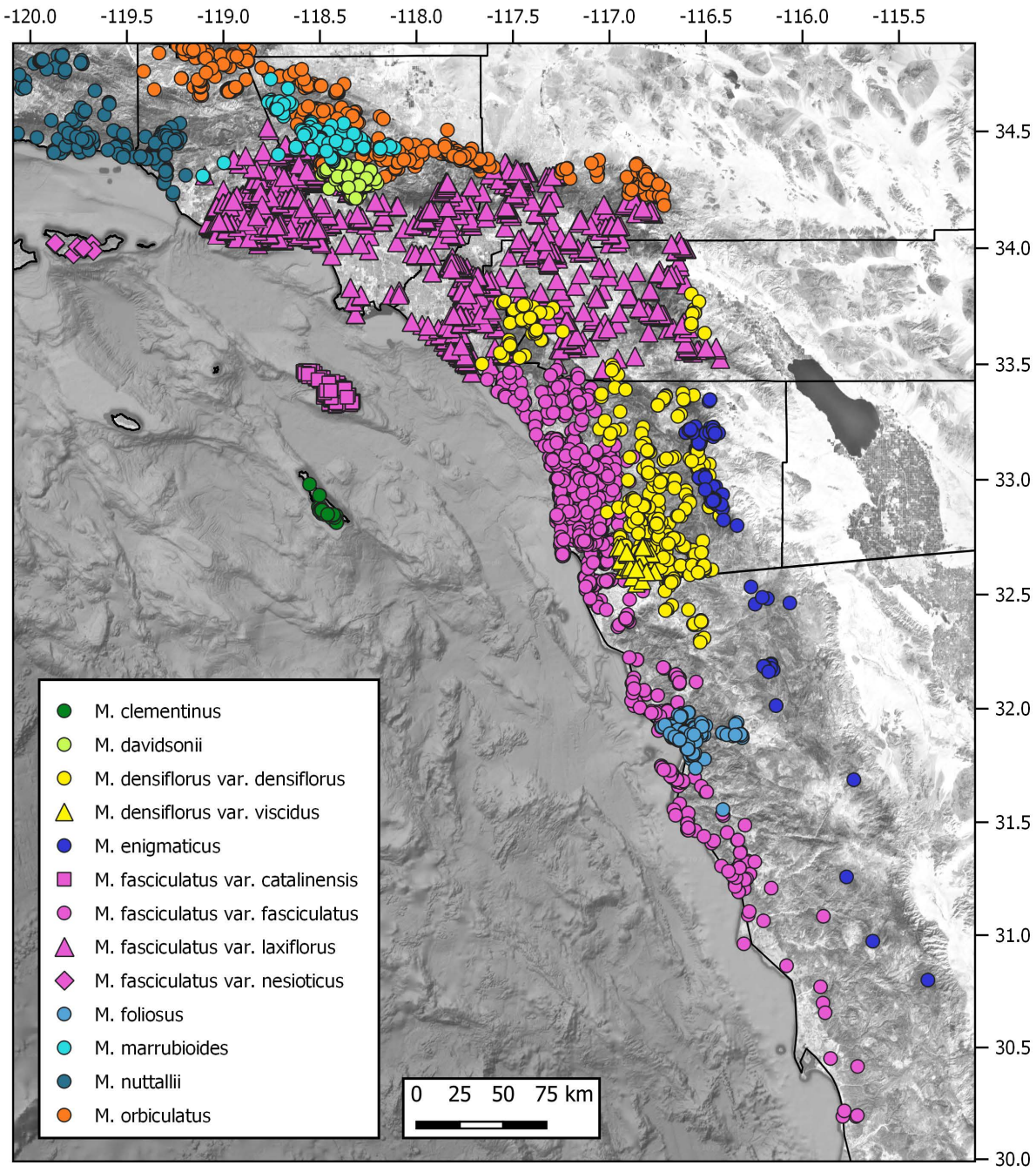

Figure 20. Distribution of *Malacothamnus* taxa focused on the range of *M. fasciculatus* excluding the disjunct type of *Malvastrum thurberi* (See Fig. 15 for full range). Colors represent different species. Different shapes of *M. densiflorus* and *M. fasciculatus* represent the different varieties.

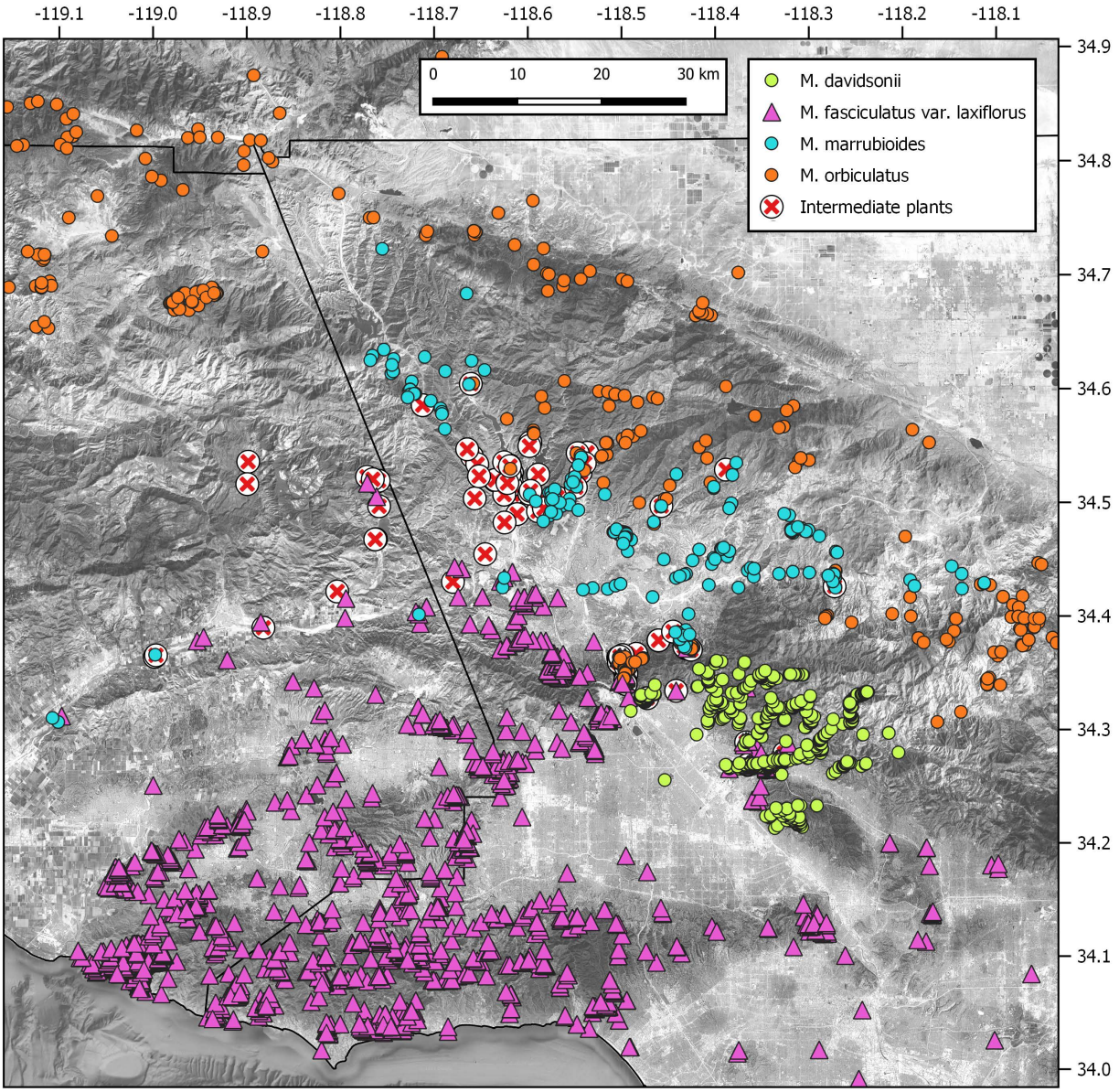

Figure 21. Distribution of *Malacothamnus* taxa focused on the ranges of *M. davidsonii and M. marrubioides* excluding the purported type locality of *M. marrubioides* (see Fig. 15 for full range). This region is one of the most problematic for intermediate plants, which are shown as red Xs on the map. The intermediates outside the range of *M. davidsonii* are mostly combinations of *M. orbiculatus*, *M. marrubioides*, and/or *M. fasciculatus* var. *laxiflorus* with possibly some influence from *M. nuttallii* as well. Within the range of *M. davidsonii*, all intermediates appear to be hybrids of *M. davidsonii* and *M. fasciculatus* var. *laxiflorus*. Phylogenetic analyses are needed to confirm the parentage of intermediates where more than two parent taxa are possible.

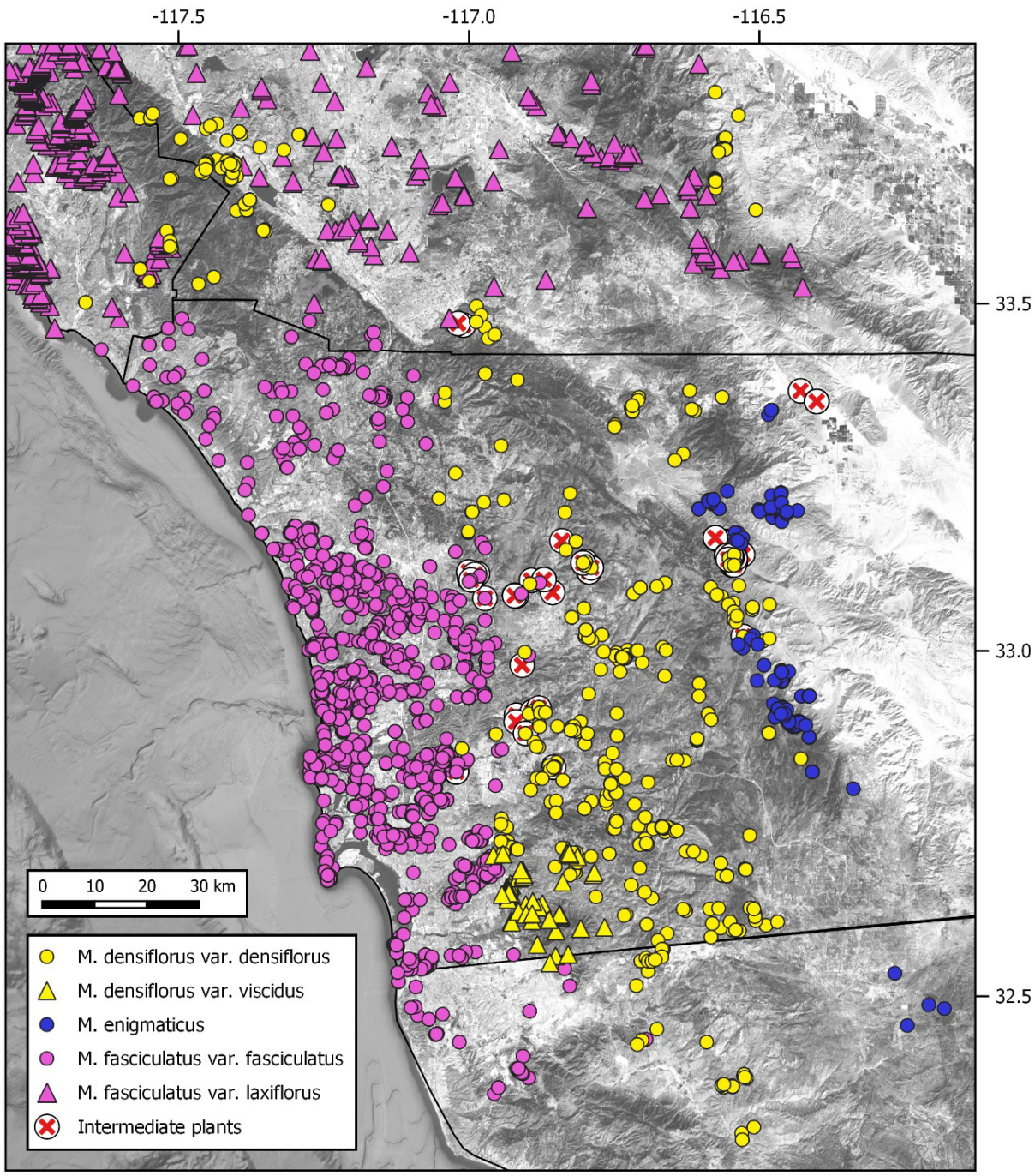

Figure 22. Distribution of *Malacothamnus* taxa focused on the range of *M. densiflorus*. Colors represent different species. Different shapes of *M. densiflorus* and *M. fasciculatus* represent different varieties. Morphological intermediates are intermediate between those taxa they are near. The intermediates at the northern end of the range of *M. enigmaticus* appear to be intermediate between *M. enigmaticus* and *M. fasciculatus* var. *laxiflorus*.

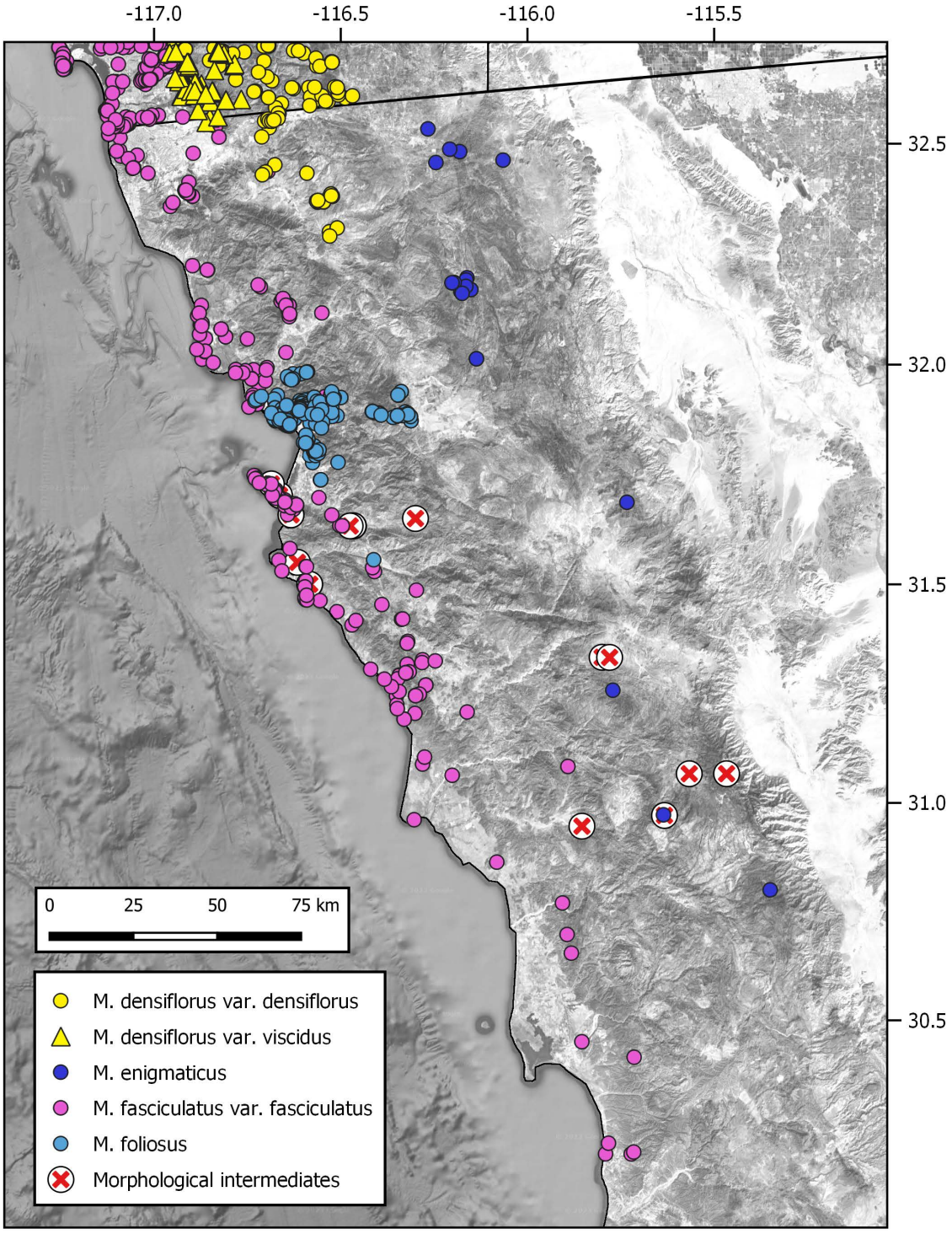

Figure 23. Distribution of *Malacothamnus* taxa in Baja California, Mexico. Colors represent different species. Different shapes of *M. densiflorus* represent different varieties. Morphological intermediates near *M. foliosus* are intermediate between *M. foliosus* and *M. fasciculatus*. Those near *M. enigmaticus* need further research. Note the need for further surveys and sampling in Baja California, especially in the range of *M. enigmaticus*, which is mostly represented by iNaturalist observations, and between the range of *M. enigmaticus* and the ranges of other species.

7 TAXONOMY

MALACOTHAMNUS Greene, Leafl. Bot. Observ. Crit. 1: 208 (1906). LECTOTYPE designated by Kearney, 1951: *Malacothamnus fasciculatus* (Nutt. ex Torr. & A.Gray) Greene.

Plants perennial, shrubby, sometimes spreading by rhizomes, stems erect to ascending. Stems, leaves, bracts, and calyces sparsely to densely covered in stellate and glandular trichomes, simple and bifurcate trichomes may also be found in flowers, stellate trichomes with or without a stipe and 3–40 rayed, glandular trichomes often much shorter than stellate trichomes. Leaves petiolate; blades ovate to round, rarely rhombic or somewhat reniform; unlobed or obscurely to moderately palmately 3- to 7-lobed; margins usually toothed; bases cordate to truncate to cuneate. Stipules subulate to lanceolate, linear, or falcate; transitioning into stipular bracts in inflorescence with loss of both petiole and blade. Stipular bracts linear, lanceolate, subulate, triangular, falcate, ovate, round, or oblong; occasionally shallowly to deeply 2–5 lobed, those that are 2-lobed appearing to be a fused pair of ± modified stipules. Inflorescences capitate to spike-like to panicle-like, the flowers ± congested in cymose clusters in the axils (rarely solitary), subsessile or pedicellate. Calyx bracts 3; distinct (occasionally basally connate in *M. aboriginum*); generally subulate to linear, occasionally oblong, narrowly elliptic, lanceolate, or ovate; green to all or partially red. Calyx shallowly to deeply 5-lobed, not accrescent, not inflated, lobes triangular to ovate with apex acute to acuminate. Petals various shades of pink to occasionally white, often varying within populations; exceeding calyx; asymmetrically obovate with rounded apex entire, emarginate, or somewhat errose; generally drying closed after anthesis but drying partially to fully open in some taxa. Staminal column ± included, filaments terminal and subterminal, ovary 7–14-carpellate, ovules 1 per cell, styles 7–14-branched (branches equal in number to carpels), stigmas capitate. Fruits schizocarps, erect, not inflated, disclike, subglobose-obovate in lateral view, not indurate, fragile, apically minutely stellate-hairy; mericarps 7–14, drying tan, 1-celled, asymmetrically suborbicular to obovoid-reniform, smooth-walled, without dorsal spur, apex muticous, dehiscence loculicidal, walls falling away as 2 fragile valves. Seeds 1 per mericarp, ascending, brown or black, obovoid-reniform, usually papillate-stellate or minutely stellate-hairy or rarely glabrous. Base chromosome number $x = 17$.

Distribution (Fig. 15). Populations primarily occur in the California Floristic Province of California, USA and Baja California, MX; the adjacent desert transition zones; and desert mountains just east of the Sierra-Nevada Range. Disjunct populations are known to occur near Kingman and Phoenix, AZ and possibly near the AZ/Mexico border. 0–2760 m.

Habitat. *Malacothamnus* taxa seem more aligned with specific geographic regions than any specific habitats within those regions. They are most commonly found in areas with recently burned subshrubs, shrubs, and/or trees. Some *Malacothamnus* plants are short-lived in these areas and others may persist for decades after a burn. *Malacothamnus* generally do not come up in areas without a recent history of woody perennials but may be common in the transition zone between forblands/grasslands and shrublands/woodlands. They do not appear

to grow in highly alkaline areas and areas with standing water year-round. They may, however, come up in areas where long-term water has receded such as reservoir margins.

Suggested common name: bushmallow (Abrams 1910; Powell 1974; Beauchamp 1986; Bates 1993, 2015a; Matthews 1997; Slotta 2004). The name bushmallow, sometimes with a space or hyphen between bush and mallow, has been consistently used as the common name for *Malacothamnus*, though common names have changed for *Malacothamnus* taxa when placed in other genera. Kearney (1951) suggested that the name chaparral mallow was a good choice as a common name for the genus *Malacothamnus*, but he did not use common names in his treatment, and it appears to only have been used as a common name for the single species *M. fasciculatus* in later treatments. McMinn and Schumacher (1939) treated *Malacothamnus* within *Malvastrum* using the common name globemallow and used bushmallow as the common name of *Sphaeralcea*. Globemallow is generally used as the common name for *Sphaeralcea* now.

Some indigenous names for *Malacothamnus* include kaukat and khman. Kaukat is the Luiseño name for *Malacothamnus* in their region (*M. fasciculatus* and *M. densiflorus*), which was used as an emetic (Sparkman 1908). Khman is the Barbareño name for *Malacothamnus* in their region (*M. nuttallii* and possibly *M. fasciculatus*), the stem fibers of which were occasionally used to weave sacks (Timbrook 2007).

Identification. Within its geographic range, the only genus *Malacothamnus* is likely to be confused with is *Sphaeralcea*, which is generally limited to desert habitats and desert transition zones. Most *Sphaeralcea* are easily distinguished from *Malacothamnus* by having orange rather than pink to white flowers. When the flowers are pink to white or only fruit is present, the fruit is the best way to confirm the genus. *Malacothamnus* have carpels that are fully dehiscent, are not net-veined, and are only 1-seeded (Fig. 24). *Sphaeralcea* have carpels that are partially dehiscent, net-veined (sometime obscurely so), and with 1–2 seeds per carpel. While carpels are commonly used to distinguish between species and groups of species in some other Malvaceae genera like *Sphaeralcea*, the lack of sculpturing on and relative homogeneity of *Malacothamnus* carpels limits their utility in taxon delimitation in this genus. Morphometric analyses of carpels could possibly find patterns between taxa as there is some variation in shape (Fig. 24 A & B). Like other morphological characters in the genus though, variation within species may significantly overlap with variation between species.

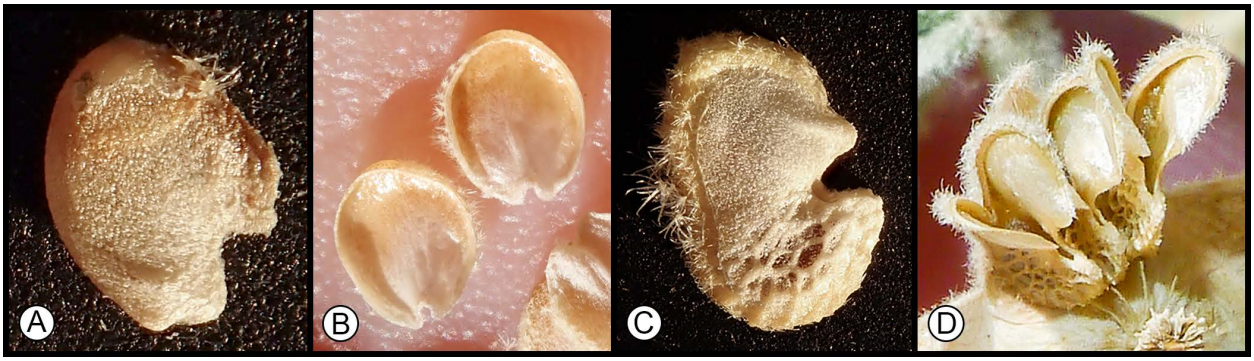

Figure 24. Comparison of carpels in *Malacothamnus* (A & B) and *Sphaeralcea* (C & D). A) *Malacothamnus* carpel without net-venation. B) Two halves of a fully dehiscent *Malacothamnus* carpel. C) *Sphaeralcea* carpel with net-venation. D) Partially dehiscent *Sphaeralcea* carpels opening only on one end.

Taxonomic Summary. Following the taxonomic decisions made in Volume 2 of this monograph (Morse 2023b), which are based on all currently available evidence, I recognize 21 species and 29 minimum-rank taxa within *Malacothamnus*. I follow the unified species concept and its companion subspecies concept in recognizing species as separately evolving metapopulation lineages and subspecies as incompletely separated lineages within a more inclusive lineage (de Queiroz 2007, 2020). De Queiroz (2020) argues that it is equally justifiable to call two incompletely separated lineages as subspecies (or varieties) of a single species where the infraspecific rank indicates the incompleteness of the separation, or to recognize them as separate species provided that there is some form of annotation noting the incomplete separation. As there is no consistency in how plant taxonomists apply the rank of variety versus subspecies (Hamilton and Reichard 1992), I consider these ranks to be essentially equivalent when not used together, both being incompletely separated lineages of a species. I use variety instead of subspecies to be most consistent with past *Malacothamnus* taxonomy. Some or all of those taxa I recognize as varieties are arguably better treated at the species rank, but I have chosen to use the rank of variety to allow for a more restrained approach until a future researcher can resolve lingering questions about the relationships between these taxa. Taxonomic questions related to specific taxa and future research needs are noted in the treatment for each.

Phylogenetic relationships. See Volume 2 (Morse 2023b) for phylogenetic trees and a detailed account of the results of the phylogenetic analyses. A brief summary of the findings follows.

Phylogenetic relationships within *Malacothamnus* are relatively clear in the northern parts of its range, where there is perhaps less geneflow between species, but less clear in the southern parts of its range, where geneflow is likely common in the transition zones between species. Analysis of RAD-seq data found two large clades corresponding to northern and southern regions of *Malacothamnus*, with some species forming one or two geographically intermediate clades between them, which varied depending on the analysis.

The northern clade always includes monophyletic *Malacothamnus abbottii*, *M. aboriginum*, *M. arcuatus*, *M. astrotentaculatus*, *M. discombobulatus*, *M. fremontii*, *M. involucratus*, *M. jonesii*, *M. lucianus*, *M. mendocinensis*, and *M. palmeri*. I recognize varieties within the clades of *M. arcuatus*, *M. fremontii*, and *M. jonesii* that are mostly morphologically and geographically distinct but not always monophyletic in phylogenetic analyses.

The southern clade always includes *Malacothamnus davidsonii*, *M. densiflorus*, *M. enigmaticus*, *M. fasciculatus*, *M. foliosus*, and *M. marrubioides*. This larger clade can be further divided into two regional clades. The southernmost clade contains most of *M. densiflorus* and all of *M. enigmaticus*, *M. fasciculatus* var. *fasciculatus*, and *M. foliosus*. The northern part of the southern clade contains *M. davidsonii*, *M. marrubioides*, San Jacinto Mountains plants of *M. densiflorus*, and the remaining varieties of *M. fasciculatus*. Of these species, only *M. davidsonii* and *M. marrubioides* are always monophyletic. Due to ambiguities in the phylogenetic analyses of the southern clade, likely related to geneflow and/or incomplete lineage sorting between taxa, taxon boundaries for this clade are primarily based on morphological and geographic evidence with some phylogenetic support. I recognize varieties in the polyphyletic *M. fasciculatus* and *M. densiflorus*, which further evidence may justify elevating to species or confirm to be reasonably treated as varieties.

Clades intermediate to the larger northern and southern clades include *Malacothamnus clementinus*, *M. eastwoodiae*, *M. nuttallii*, and *M. orbiculatus*. These species are generally monophyletic in phylogenetic analyses, though are sometimes split into multiple clades when hybrids are included in the analyses.

KEY TO TAXA WITHIN MALACOTHAMNUS

Due to the high amount of overlap in measures of morphological characters between *Malacothamnus* taxa, an accurate key to the full genus focusing strictly on morphology and trying to limit use of geographic ranges of taxa would be an exercise in torture for both the user and the author attempting to write it. As most *Malacothamnus* taxa are limited to only a single region, I provide a key that uses geographic range as a strong component of the couplets to both increase accuracy in identifications and to provide a more user-friendly experience. Currently known introductions of taxa outside of their ranges are considered in this key, but future introductions may not be accounted for. Consult maps of the geographic ranges of taxa (Chapter 6) when making identifications. If a specimen is from a transition zone between taxa, it may be morphologically intermediate and may not key well. Some guidance on intermediates is included in the notes about each taxon when applicable.

Primary measurements in the key are for dry specimens. Estimated measurements for fresh material is included in [underlined square brackets]. Superscripted numbers following a taxon indicate how many times it appears in the key. This key is based on blooming and fruiting specimens with stem trichomes measured from the first internode below the inflorescence. See the morphology discussion (Chapter 4) for explanations and images of characters used in this key.

1. Plants of Arizona, USA and Sonora, Mexico **2**
1’ Plants of California, USA and Baja California, Mexico **3**

2. Calyx lobes > 1.5x longer than wide; mean stellate trichome length on stem and calyx (0.3)0.4–0.7 mm; Maricopa and Mohave counties in AZ ..... ***M. orbiculatus*[4]**
2’ Calyx lobes < 1.5x longer than wide; mean stellate trichome length on stem and calyx 0.1–0.2(0.4) mm; known in this region only from a single collection in the 1800s near the Arizona–Mexico border..... ***M. fasciculatus* var. *fasciculatus*[2]**

3. Plants of the Channel Islands of California **4**
3’ Plants from elsewhere **6**

4. Stem stellate trichomes with rays ≤ 2.0 mm (mean per plant 0.5–1.2 mm); San Clemente Island ..... ***M. clementinus***
4’ Stem stellate trichomes with rays ≤ 0.8 mm (mean per plant 0.1–0.3 mm); other islands **5**

5. Inflorescence generally spike-like to rarely panicle-like; Santa Catalina Island ..... ***M. fasciculatus* var. *catalinensis***
5’ Inflorescence panicle-like; Santa Cruz Island ..... ***M. fasciculatus* var. *nesioticus***

6. Plants of the Sierra Nevada Mountains and Mojave Desert mountains including adjacent areas of the Central Valley and Mojave Desert **7**
6’ Plants from elsewhere **9**

7. Corollas drying open after blooming; west side of the Sierras .....***M. fremontii* var. *fremontii*[3]**
7’ Corollas drying closed after blooming; west or east sides of the Sierras..... **8**

8. Calyx bracts 6–14(18) [7–17(21.5)] mm long, ≥ 0.6x calyx; flower buds clearly pointed; most stellate trichomes without stipes; leaves and inflorescence often somewhat sticky due to glandular trichomes; leaves truncate to cordate at base; purportedly on the west side of the Sierras north of Springville .....***M. marrubioides*[2]**
8’ Calyx bracts 2.5–8 [3–9.5] mm long, ≤ 0.8x calyx; flower buds generally rounded to slightly pointed, occasionally clearly pointed; many stellate trichomes with stipes; leaves and inflorescence generally not sticky; leaves generally cordate at base, rarely truncate to oblique; east side of the Sierras and west side south of Springville .....***M. orbiculatus*[4]**

9. Plants from areas both west of the Sierra Nevada Mountains and north of Contra Costa County **10**
9’ Plants from elsewhere **13**

10. Calyx bracts ≤ 2[2.5] mm long; abaxial calyx stellate trichomes with rays ≤ 0.2 mm; Mendocino County.....***M. mendocinensis***
10’ Calyx bracts ≥ 3[3.5] mm long; many abaxial calyx stellate trichomes with rays > 0.2 mm; other counties **11**

11. Calyx lobe width at widest point ≥ 1.4x width at lobe base, lobe edges obviously protruding in bud; Shasta and Tehama counties .....***M. astrotentaculatus***
11’ Calyx lobe width at widest point ≤ 1.2x width at lobe base or widest at the base, lobe edges not obviously protruding in bud; Tehama County and south **12**

12. Stem stellate trichome rays ≤ 0.6 mm (mean per plant 0.1–0.4 mm); leaf bases often subcordate to obtuse, occasionally cordate or cuneate ..... ***M. fremontii* var. *exfibulosus***
12’ Stem stellate trichome rays ≤ 1.4 mm (mean per plant 0.3–0.7 mm); leaf bases often cordate, occasionally truncate to obtuse ..... ***M. fremontii* var. *fremontii*[3]**

13. Plants of Santa Cruz County and the San Francisco Bay Area south of Solano County **14**
13’ Plants from elsewhere **17**

14. Corollas drying partially to fully open; calyx lobes ≥ 6 [7] mm long. .....***M. fremontii* var. *fremontii*[3]**
14’ Corollas drying closed; calyx lobes < 6 [7] mm long. **15**

15. Leaf blades generally moderately 3–7 lobed with lobes acute, rarely obscurely or round lobed; stellate trichome rays on leaf blades mostly ≤ 0.2 mm; commonly planted ..... ***M. nuttallii*[3]**
15’ Leaf blades unlobed or obscurely (rarely moderately) 3–5 lobed with lobes rounded to approaching acute; stellate trichome rays on leaf blades mostly ≥ 0.2 mm; native to this region **16**

16. Calyx bract length ≥ 3 [3.5] mm and ≥ 1/2 of calyx length; rays of stellate trichomes on stem often distinct without magnification, longest stem hair rays generally > 0.5 mm ..... ***M. arcuatus* var. *arcuatus***
16’ Calyx bract length ≤ 3.5 [4] mm and ≤ 1/2 of calyx length; rays of stellate trichomes on stem generally not distinct without magnification, longest stem hair rays generally ≤ 0.5 mm ..... ***M. arcuatus* var. *elmeri***

17. Plants of Riverside, Orange, and San Diego Counties plus Baja California..... **18**
17’ Plants from elsewhere **26**

18. Inflorescence a narrow to wide panicle **19**
18’ Inflorescence spike-like, occasionally with axillary spikes near the base of the inflorescence **21**

19. Lobe width at widest 1–6x width at lobe base; calyx lobes 3–9.5 [3.5–11.5] mm wide; Baja California ..... ***M. foliosus*[3]**
19’ Lobe width at widest 1–1.5x width at lobe base; calyx lobes 2–4 [2.5–5] mm wide; California **20**

20. Stellate trichomes on calyx with most rays > 0.2 mm; introduced near the city of San Diego ..... ***M. jonesii* var. *niveus*[2]**
20’ Stellate trichomes on calyx with most rays ≤ 0.2 mm; native north of San Diego County and possibly near its northern border, planted elsewhere in San Diego County ..... ***M. fasciculatus var. laxiflorus*[3]**

21. Many glandular trichomes on both the stem and abaxial surface of calyx ≥ 0.3 mm; abaxial surface of calyx tube densely covered in stellate trichomes ..... ***M. densiflorus* var. *viscidus***
21’ Most glandular trichomes on stem ≤ 0.1 mm and all ≤ 0.3 mm, all glandular trichomes on abaxial surface of calyx ≤ 0.4 mm; abaxial surface of calyx tube densely to sparsely covered in stellate trichomes..... **22**

22. Abaxial surface of calyx tube generally sparsely covered in stellate trichomes and/or simple to bifurcate nonglandular trichomes; calyx stellate and bifurcate trichome rays ≤ 4 mm (mean per plant 0.5–2.3 mm) ..... ***M. densiflorus* var. *densiflorus***
22’ Abaxial surface of calyx tube densely covered in stellate trichomes; calyx stellate trichome rays ≤ 2 mm (mean per plant 0.1–0.6 mm) **23**

23. Calyx lobes 4.5–13.5 [5.5–16] mm long and 3–9.5 [3.5–11] mm wide; stem stellate trichome rays ≤ 1.4 mm (mean per plant 0.2–0.8 mm); many stem stellate trichomes with stipes, stipes ≤ 1.1 mm; Baja California. ..... ***M. foliosus*[3]**
23' Calyx lobes 2.5–12 [3–14.5] mm long and 2–5 [2.5–6] mm wide; stem stellate trichome rays ≤ 1.0 mm (mean per plant ranges from 0.1–0.4 mm); most stem stellate trichomes without stipes, stipes ≤ 0.4 mm; Baja California and California. **24**

24. Calyx lobes 3–12 [3.5–14.5] mm long; calyx bracts 3–13 [3.5–15.5] mm long; stipular bracts (0.5)1–8(12) [(0.5)1–9.5(14.5)] mm wide; desert transition zone of San Diego County extending southward to the Sierra de San Pedro Mártir in Baja California ..... ***M. enigmaticus***
24' Calyx lobes 2.5–5 [3–6] mm long; calyx bracts 1–5 [1–6] mm long; stipular bracts 0.5–2.5(4) [0.5–3(5)] mm wide; elsewhere **25**

25. Longest stellate trichome rays on stem below inflorescence ≤ 0.4 mm (mean per plant 0.1–0.2 mm), longest stellate trichome rays on calyx ≤ 0.5 mm (mean per plant 0.1–0.2 mm); near the northern boundary of San Diego County and northward, some planted in San Diego County ..... ***M. fasciculatus* var. *laxiflorus*[3]**
25' Longest stellate trichome rays on stem below inflorescence and on calyx ≥ 0.3 mm (mean per plant 0.1–0.4 mm); near the northern boundary of San Diego County and southward into Baja California ..... ***M. fasciculatus* var. *fasciculatus*[2]**

26. Plants of San Bernardino, Los Angeles, Kern, and Ventura counties **27**
26' Plants of Monterey, San Benito, San Luis Obispo, Santa Barbara, and western Fresno counties **32**

27. Calyx lobes 3–9.5 [3.5–11.5] mm wide, lobe width at widest 1–6x width at lobe base; known in this region only from Aliso Canyon Park in Los Angeles County ..... ***M. foliosus*[3]**
27' Calyx lobes 1.5–4 [2–5] mm wide, lobe width at widest 1–1.5x width at lobe base **28**

28. Calyx bracts ≤ 1/2 calyx length; rays of stellate trichomes on both the stem and calyx average 0.1–0.2 mm **29**
28' At least one of the above measures is not true **30**

29. Leaves pale grey-green to light green adaxially and not to slightly paler abaxially; adaxial leaf stellate trichome rays 0.1–0.2 mm and even in size; mostly north and west of the Santa Clara River and west of Santa Paula, commonly planted elsewhere ..... ***M. nuttallii*[3]**
29' Leaves generally bright green adaxially (occasionally grey-green), paler abaxially; adaxial leaf stellate trichome rays 0.1–0.4 mm and uneven in size with scattered trichomes having longer rays than most; mostly south of the Santa Clara River and/or east of Santa Paula, one presumably planted population to the west near Lake Casitas ..... ***M. fasciculatus* var. *laxiflorus*[3]**

30. Calyx bracts 6–14(18) [7–17(21.5)] mm long, ≥ 0.6x calyx; flower buds clearly pointed; most stellate trichomes without stipes; leaves and inflorescence often somewhat sticky due to glandular trichomes; leaves truncate to cordate at base ..... ***M. marrubioides***[2]

30' Calyx bracts 1.5–8 [2–9.5] mm long, ≤ 0.8x calyx; flower buds generally rounded to slightly pointed, occasionally clearly pointed in *M. orbiculatus*; many stellate trichomes with stipes; leaves and inflorescence generally not sticky; leaves generally cordate at base **31**

31. Calyx bracts 1.5–4.5 [2–5.5] mm long; calyx lobe length generally 1–2.3× width; plants generally 1–5 m tall; San Fernando Valley, nearby southern slopes of the San Gabriel Mountains, and the Verdugo Mountains ..... ***M. davidsonii***

31' Calyx bracts 2.5–8 [3–9.5] mm long; calyx lobe length generally 1.4–4× width; plants rarely > 2 m tall; northern slopes of the San Gabriel and San Bernardino Mountains and northwards ..... ***M. orbiculatus***[4]

32. Inflorescence capitate to subcapitate **33**

32' Inflorescence spike-like to panicle-like **35**

33. Many rays of stellate trichomes on stem 1–3 mm; many simple glandular trichomes on stem, leaves, and abaxial surface of calyx 0.3–1.4 mm, generally distinct at 20x magnification, occasionally sparse and difficult to detect; surface of stem and abaxial surface of calyx lobes generally easily visible through trichomes without magnification ... ***M. lucianus***

33' Most rays of stellate trichomes on stem < 1 mm; glandular trichomes on stem, leaves and abaxial surface of calyx ≤ 0.1 mm, often only apparent as a resinous dot, much smaller than and often obscured by adjacent stellate trichomes; surface of stem and abaxial surface of calyx lobes often hidden by dense trichomes **34**

34. Adaxial leaf surface of mature leaves densely stellate hairy, centers of stellate trichomes average ≤ 0.25 [0.35] mm apart, rays of adjacent stellate trichomes generally overlapping across entire leaf surface; inflorescence with stipular bracts linear to lanceolate (rarely ovate) and unlobed, widest stipular bracts ≤ 6.5(9) [8(11)] mm wide ..... ***M. palmeri***

34' Adaxial leaf surface of mature leaves sparsely stellate hairy or occasionally without stellate trichomes, if more densely hairy, centers of stellate trichomes average ≥ 0.5 [0.7] mm apart, rays of adjacent stellate trichomes not overlapping across entire leaf surface; inflorescence generally with lobed stipular bracts that are about as wide as long, widest stipular bracts ≥(5)7 [(6)8.5] mm wide measured below lobes ..... ***M. involucratus***[2]

35. Calyx bracts ≥ 1 [1.4] mm wide **36**

35' Calyx bracts < 1 [1.4] mm wide **38**

36. Calyx lobes ≥ 1.2x wider above base than at the base, ovate to widely ovate with abruptly acuminate apex; many stellate trichomes on stem with stipes, stipes ≤ 0.8 mm ..... ***M. aboriginum***

36' Calyx lobes ≤ 1.2(1.4)x wider above base than at the base, triangular to ovate; most stellate trichomes on stem without stipes, stipes ≤ 0.3 mm **37**

37. Adaxial leaf surface densely stellate hairy in mature leaves .....***M. abbottii***[2]
37’ Adaxial leaf surface glabrous to sparsely stellate hairy in mature leaves..... ***M. involucratus***[2]

38. Stem glandular trichomes ≤ 0.8 mm (mean per plant 0.1–0.5 mm); Vandenberg Space Force Base ..... ***M. eastwoodiae***
38’ Stem glandular trichomes ≤ 0.1 mm (mean per plant < 0.1 mm); Vandenberg Space Force Base and elsewhere **39**

39. Mature leaves ashy green to bright green adaxially and often paler abaxially, ± thinly yellowish to white stellate hairy, more densely so abaxially; leaf base generally deeply cordate, occasionally subcordate to truncate **40**
39’ Mature leaves pale ashy green to light green on both surfaces, though often somewhat paler abaxially; densely white stellate hairy on both surfaces; leaf bases generally subcordate to cuneate (sometimes more deeply cordate in *M. nuttallii*) **41**

40. Calyx bracts 1.5–3 [2–3.5] mm long; calyx stellate trichome rays ≤ 0.5 mm (mean per plant 0.2–0.3 mm); plants generally 1–5 m tall; Monterey County and northern edge of San Luis Obispo County .....***M. discombobulatus***
40’ Calyx bracts 2.5–8 [3–9.5] mm long; calyx stellate trichome rays ≤ 1.7 mm (mean per plant 0.3–1.0 mm); plants rarely > 2 m tall; Santa Barbara County and eastern edge of San Luis Obispo County .....***M. orbiculatus***[4]

41. Calyx stellate trichome rays average ≥ 0.5 mm .....***M. jonesii* var. *niveus***[2]
41’ Calyx stellate trichome rays average ≤ 0.4 mm **42**

42. Inflorescence spike-like; blooming March–May ..... ***M. jonesii* var. *jonesii***
42’ Inflorescence generally panicle-like, if spike-like, population includes panicle-like inflorescences; blooming May and later **43**

43. Calyx bracts and often flower buds reddish; leaves not lobed to obscurely 3-lobed ..... ***M. jonesii* var. *gracilis***
43’ Calyx bracts rarely and flower buds not reddish; leaves not lobed to clearly 3–7 lobed **44**

44. Calyx bracts ≤ 3.5(5) [4(6)] mm long and ≤ 0.5 [0.7] mm wide; leaves generally clearly lobed and with a smooth surface; Santa Barbara County and southern edge of San Luis Obispo County, also widely planted .....***M. nuttallii***[3]
44’ Calyx bracts ≥ 3.5 [4] mm long and ≥ 0.5 [0.7] mm wide; leaves not lobed to clearly lobed and with a rugose surface; Monterey County and introduced along southern border of San Luis Obispo County .....***M. abbottii***[2]

1. MALACOTHAMNUS ABBOTTII (Eastw.) Kearney, Leafl. W. Bot. 6: 129. 1951. *Malvastrum abbottii* Eastw., Leafl. W. Bot. 1: 215. 1936. TYPE: U.S.A. California: Monterey County, found among willows on the Salinas River, September to October 1889, *E. K. Abbott s.n.* (holotype: CAS52708!, isotypes: CAS52709 [photo!], P02286286 [photo!], GH00052891 [possible isotype, photo!]).

Shrubs up to 2 m tall, spreading by rhizomes. Stems with dense stellate trichomes, stem surface not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.4 mm (mean per plant ranges from 0.1–0.2 mm), mostly without stipes, stipes ≤ 0.3 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round, ovate, or widely ovate; length generally ≥ width; unlobed to obscurely or moderately 3–5 lobed with lobes rounded to acute; bases cuneate to cordate; pale ashy green to light green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.5 mm (mean 0.2 mm), mostly without stipes, stipes ≤ 0.1 mm, abaxial stellate trichome density 1–2x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence generally panicle-like, occasionally spike-like. Stipular bracts lanceolate, triangular, ovate, or widely ovate, occasionally slightly to deeply 2 lobed or V-shaped; 2–6 mm long, 1–3 mm wide, length 1.5–6x width. Calyx bracts oblong to subulate, 3.5–7.5 mm long, 0.5–1.8 mm wide, length 2.5–10.0x width and 0.4–0.7x calyx length, generally green or occasionally partly red. Calyx 8.5–12 mm long, lobes 5–8.5 mm long x 2–3.5 mm wide, lobe at base 2–3.5 mm wide, lobe widest at base or up to 2 mm above base, lobe length 1.7–3.3x width, lobes narrowly to moderately triangular or ovate with acuminate to narrowly acute apex; stellate trichomes on abaxial calyx surface with rays 0.1–0.6 mm (mean per plant ranges from 0.1–0.2 mm), mostly without stipes, stipes ≤ 0.3; glandular trichomes on abaxial calyx surface < 0.1–0.6 mm (mean per plant ranges from < 0.1–0.3 mm). Corolla drying closed, petals to ~2 cm. Figs. 25 & 26.

Phenology. Blooming May to October with peak bloom July to August.

Distribution (Fig. 18). Endemic to Monterey County in California. 135–485 m. A population of plants near the southern border of San Luis Obispo County along Highway 166 were misidentified as *Malacothamnus jonesii* s.l. and introduced in a 2015 roadside restoration project. EOO: 131, AOO: 11.

Conservation status. CRPR 1B.1. Mark Elvin and Vern Yadon did extensive surveys for *Malacothamnus abbottii* in 1996 including the use of an airplane to identify likely areas to survey (Elvin and Yadon 1996). All *M. abbottii* found was on private land. Elvin and Yadon suggested establishing preserves as the highest conservation priority for this species as it would allow for long-term protection of defensible sites. To my knowledge, this has not been done. They also noted very low seed set with no seeds being detected in most populations, mostly due to weevil infestations in the fruits. CalBG has ten accessions of *M. abbottii* in their living collection that spread abundantly by rhizomes and may be of conservation use.

Suggested common name: Abbott's bushmallow (Powell 1974; Bates 1993, 2015a; Matthews 1997; Slotta 2004). Additional common names: Abbott's malvastrum (Abrams 1951), Salinas globemallow (McMinn and Schumacher 1939).

Notes. *Malacothamnus abbottii* most closely resembles *M. jonesii*. When no flowers are present, it would be difficult to distinguish the two species, though their natural geographic ranges as currently known do not overlap. When flowers are present, the width of the calyx bract and length of calyx trichomes should be sufficient to distinguish the two species. *Malacothamnus jonesii* var. *jonesii* is the only variety of *M. jonesii* to have a geographic range close to *M. abbottii*. Were they to be found together, their peak bloom times do not overlap and could be useful in distinguishing them.

There is no clear evidence of naturally occurring hybrids of *Malacothamnus abbottii* with any other taxa. It does, however, flower at the same time as and is sympatric with *M. discombobulatus*, which is the sister species of *M. abbottii* in some molecular analyses (Morse 2023b). This indicates there may be or has been geneflow between these species.

Figure 25. *Malacothamnus abbottii* photos. A) Flower bud. B) Calyx and calyx bracts in flower. C) Flower in fruit. D) Stem. E) Summer/fall leaves. F) Full plant spreading by rhizomes. G) Spring leaves. H) Inflorescence.

Figure 26. Representative type specimen of *Malacothamnus abbottii*. Isotype CAS52709. Image courtesy of California Academy of Sciences.

2. MALACOTHAMNUS ABORIGINUM (B.L.Rob.) Greene, Leafl. Bot. Observ. Crit. 1: 208. 1906.
Malvastrum aboriginum B.L.Rob., in A. Gray, Syn. Fl. N. Amer. 1, pt. 1: 311. 1897.
Sphaeralcea aboriginum (B.L.Rob.) Jeps., Fl. Calif. [Jepson] 2: 498. 1936. TYPE: U.S.A. California: [probably Monterey County], Indian Valley, June 1885, *M. K. Curran s.n.* (holotype: CAS741!).

Shrubs up to 2.5 m tall, occasionally spreading by rhizomes (possibly rarely). Stems with dense stellate trichomes, stem surface occasionally visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.0 mm (mean per plant ranges from 0.3–0.6 mm), many with stipes, stipes ≤ 0.8 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round to widely ovate, length ≥ width; obscurely to moderately 3–7 lobed with lobes rounded, acute, or acuminate; bases generally cordate, rarely truncate to obtuse; ashy green to bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.6 mm (mean 0.3 mm), many with stipes, stipes ≤ 0.2 mm, abaxial stellate trichome density 0.5–1.5x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescences spikes of interrupted glomerules, sometime with spike-like branches proximally, rarely very narrowly panicle-like. Stipular bracts triangular, ovate, round, or oblong, occasionally shallowly to deeply 2-4 lobed; 5–11 mm long, 2.5–7.5 mm wide, length 1–3.5x width. Calyx bracts widely ovate to lanceolate, occasionally connate at base, 5–11.5 mm long, 1.6–7.5 mm wide, length 1–6x width and 0.6–1.1x calyx, generally green, occasionally partly red. Calyx 8–13 mm long, lobes 5–11 mm long x 3.5–8.5 mm wide, lobe at base 2.5–4 mm wide, lobe widest 1–3 mm above base, lobe length 0.9–1.9x width, lobes ovate to widely ovate with apex acuminate, sometimes abruptly so; stellate trichomes on abaxial calyx surface with rays 0.1–0.8 mm (mean per plant ranges from 0.1–0.3 mm), mostly without stipes, stipes ≤ 0.3 mm; glandular trichomes on abaxial calyx surface < 0.1 mm. Corolla drying closed, petals to ~2.5 cm. Figs. 12, 27, & 28.

Phenology. Blooming March to July with peak bloom May to June. Sporadic flowers after July.

Distribution (Fig. 18). Endemic to the southern Coastal Ranges of California, primarily in the southern half of the Diablo Range and the Gabilan Range. 135–1200 m. EOO: 6253, AOO: 129.

Conservation status. CRPR 1B.2. Surveys by Ryan O'Dell and others over the past decade have greatly increased the number of known plants and populations of this species (Calflora 2022). It currently has the sixth highest AOO of all *Malacothamnus* taxa and should be considered for delisting or a downgraded to CRPR 4 (Table 2). Grazing by cattle may be a threat. At one occurrence, it was noted that plants appear to be restricted to non-grazed areas (CDFW 2022).

Suggested common name: Indian Valley bushmallow (CNPS 1980; Bates 1993, 2015a; Matthews 1997; Slotta 2012). Additional common names: Indian globemallow (McMinn and Schumacher 1939), Indian mallow (Jepson 1936), Indian Valley malvastrum (Abrams 1951).

Notes. *Malacothamnus aboriginum* is distinct in the combination of wide calyx bracts, wide stipular bracts, the calyx lobes generally being much wider above the base than at the base, and long stellate trichome rays on the stem. It should not be confused with any other taxa. In the past *M. aboriginum* has been misapplied to plants in San Diego County, CA and Baja California described as *M. enigmaticus* in 2019.

There is no evidence of naturally occurring hybrids of *Malacothamnus aboriginum* with any other taxa.

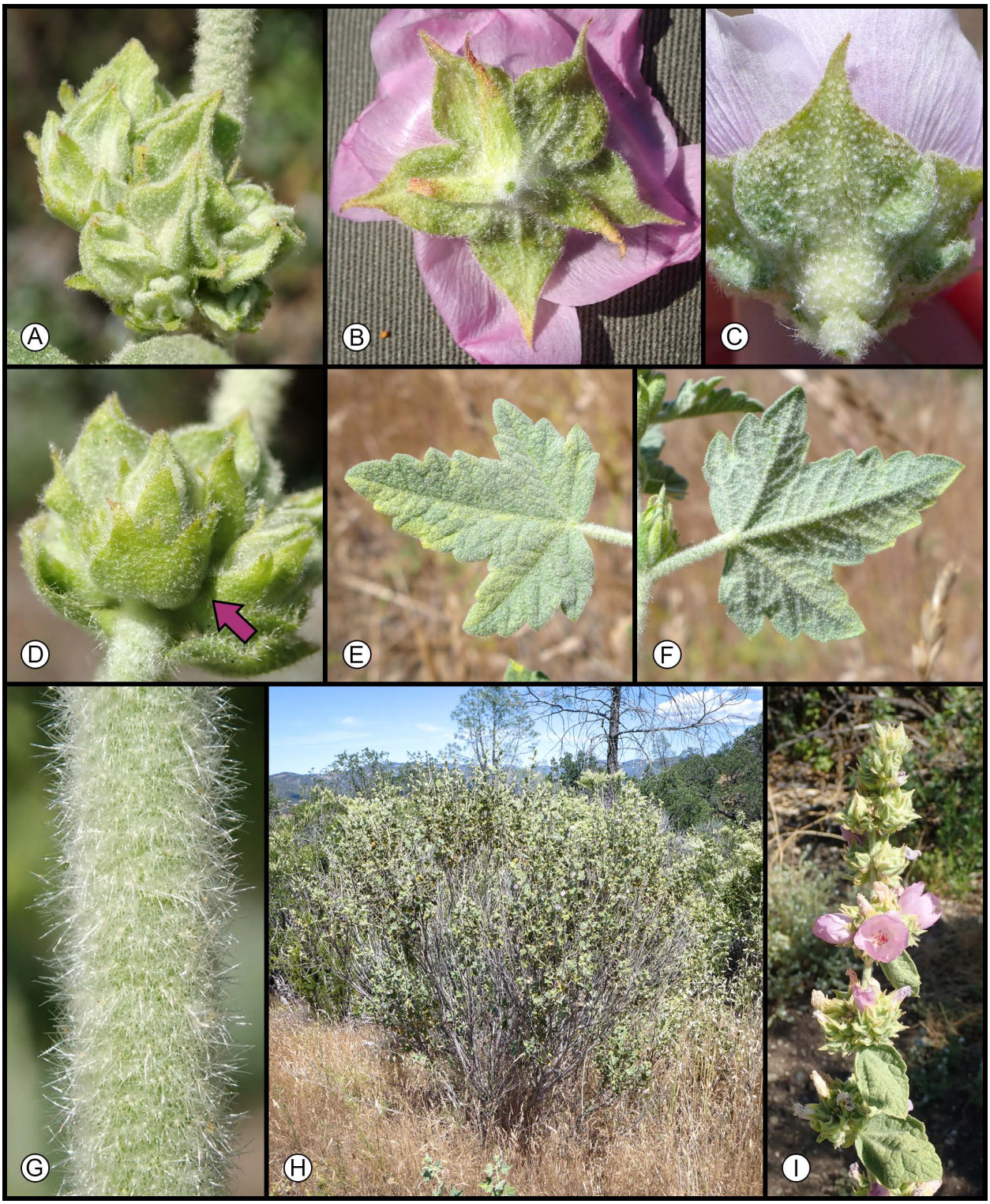

Figure 27. *Malacothamnus aboriginum* photos. A) Cluster of flower buds. B) Calyx and calyx bracts in flower. C) Calyx lobe shape with calyx bract removed. D) Stipular bract in cluster of flower buds. E) Adaxial leaf surface. F) Abaxial leaf surface. G) Stem. H) Full plant. I) Inflorescence.

Figure 28. Holotype of *Malacothamnus aboriginum.* CAS741. Image courtesy of California Academy of Sciences.

3. MALACOTHAMNUS ARCUATUS (Greene) Greene, Leafl. Bot. Observ. Crit. 1: 208. 1906. *Malveopsis arcuata* Greene, Man. Bot. San Francisco 66. 1894. *Malvastrum arcuatum* (Greene) B.L.Rob., Syn. Fl. N. Amer. 1(1.2): 311. 1897. *Sphaeralcea arcuata* (Greene) Arthur, Torreya 21: 11. 1921. TYPE: U.S.A. California: [San Mateo County], Belmont, 1886, *E. L. Greene s.n.* (lectotype designated by Kearney, 1951: UC191563 [photo!]).

Shrubs up to 3 m tall, occasionally spreading by rhizomes. Stems with dense stellate trichomes, stem surface generally not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.3 mm, mostly without stipes, stipes ≤ 0.7 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round to widely ovate (rarely elliptic or rhombic), length ≥ width, unlobed or obscurely (rarely moderately) 3–5 lobed with lobes generally rounded, occasionally borderline acute, bases cuneate to cordate, ashy green to bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 1.3 mm, mostly without stipes or many with stipes, stipes ≤ 0.3 mm, abaxial stellate trichome density 1–2x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence spike-like to panicle-like. Stipular bracts narrowly to moderately triangular or ovate, occasionally deeply 2-lobed, 1–7 mm long, 0.5–3 mm wide, length 1–9x width. Calyx bracts ovate, subulate, or linear; 1–6.5 mm long, 0.2–0.8 mm wide, length 2–17.5x width and 0.2–0.8x calyx, green to red. Calyx 4–9.5 mm long, lobes 2–5.5 mm long x 1.5–3.5 mm wide, lobe at base 1.5–3.5 mm wide, lobe widest at base or up to 1 mm above base, lobe length 0.8–2.0x width, lobes ovate to widely ovate or triangular, apex acute; stellate trichomes on abaxial calyx surface with rays 0.1–1.8 mm, mostly without stipes, stipes ≤ 0.3 mm; glandular trichomes on abaxial calyx surface < 0.1(0.3) mm (mean per plant ranges from < 0.1–0.1 mm). Corolla drying closed, petals to ~2 cm.

Notes. As treated here *Malacothamnus arcuatus* includes two varieties. Except for a transition zone of apparent intermediates, they are distinct both morphologically and geographically (Morse 2023a). *Malacothamnus arcuatus* var. *arcuatus* is distinguished from *M. arcuatus* var. *elmeri* by having longer calyx bracts and longer stellate trichome rays on the stem. These varieties together form a single clade in phylogenetic analyses with some analyses providing evidence supporting two taxa (Morse 2023b). Increased sampling of both specimens and loci is needed to confirm the degree of divergence between the varieties and whether *M. arcuatus* var. *elmeri* should perhaps be returned to the rank of species as *M. hallii*.

Some hybrids between *Malacothamnus arcuatus* var*. elmeri* and *M. fremontii* var. *fremontii* may key to *M. arcuatus* var. *arcuatus*. These hybrids occur near the parent taxa and do not occur within the geographic range of *M. arcuatus* var. *arcuatus*.

3a. MALACOTHAMNUS ARCUATUS var. **ARCUATUS**

Shrubs up to 2 m tall, occasionally spreading by rhizomes (possibly rarely). Stems with dense stellate trichomes, stem surface generally not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.3 mm (mean per plant ranges from 0.2–0.9 mm), mostly without stipes, stipes ≤ 0.6 mm; glandular trichomes on stem < 0.1 mm. Leaf

blades ± round to widely ovate (rarely elliptic or rhombic), length ≥ width, unlobed or obscurely (rarely moderately) 3-lobed with lobes generally rounded, occasionally borderline acute, bases cuneate to cordate, ashy green to bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 1.3 mm (mean 0.4 mm), many with stipes, stipes ≤ 0.3 mm, abaxial stellate trichome density 1–1.5x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescences spikes of interrupted glomerules. Stipular bracts narrowly to moderately triangular or ovate, occasionally deeply 2-lobed, 3–7 mm long, 0.5–2.5 mm wide, length 2–9x width. Calyx bracts subulate to linear, 3–6.5 mm long, 0.2–0.8 mm wide, length 5–17.5x width, 0.5–0.8x calyx, green to red. Calyx 5.5–9.5 mm long, lobes 2–5.5 mm long x 2–3.5 mm wide, lobe at base 2–3.5 mm wide, lobe widest at base or up to 1 mm above base, lobe length 1.0–2.0x width, lobes ovate to widely ovate or triangular, apex acute; stellate trichomes on abaxial calyx surface with rays 0.1–1.8 mm (mean per plant ranges from 0.2–0.6 mm), mostly without stipes, stipes ≤ 0.3 mm; glandular trichomes on abaxial calyx surface < 0.1(0.3) mm (mean per plant ranges from < 0.1–0.1 mm). Corolla drying closed, petals to ~1.5 cm. Figs. 29 & 30.

Phenology. Blooming April to July with possible sporadic flowers after July. Peak bloom likely in May.

Distribution (Fig. 17). Endemic to the Santa Cruz Mountains Bioregion of California. 5–1150 m. Cultivated and planted in this region, both for restoration and as a native garden plant. Possibly planted elsewhere as well. EOO: 1620, AOO: 57.

Conservation status. CRPR 1B.2. Most documented occurrences are near the urban wildland interface. Abundant potential habitat exists in preserved areas of the Santa Cruz Mountains. Much of this area has apparently not had any sizable burns in recent times (CALFIRE 2019), which indicates possible fire-suppression. These areas need to be surveyed post-fire to confirm where *Malacothamnus arcuatus* var. *arcuatus* occurs there and how abundantly. *Malacothamnus nuttallii* and *M. jonesii* var. *niveus* have been planted in the range of *M. arcuatus* var. *arcuatus* and may pose a threat from hybridization. Documented threats include development, lack of inclusion of a known population in a biological assessment for a development, and possible competition from invasive species (CDFW 2022).

Suggested common name: western bewildering bushmallow. Additional common names: cañon mallow (Jepson 1936), canyon globemallow (McMinn and Schumacher 1939), northern malvastrum (Abrams 1951), arcuate bushmallow (CNPS 1980). As none of the previous common names are very useful or accurate, and as plants of *M. arcuatus* var. *arcuatus* were treated as many different species in Slotta's treatments (2004, 2012), I suggest the common name bewildering bushmallow for *M. arcuatus* as a whole, western bewildering bushmallow for the more western *M. arcuatus* var. *arcuatus*, and eastern bewildering bushmallow for the more eastern *M. arcuatus* var. *elmeri*.

3b. MALACOTHAMNUS ARCUATUS (Greene) Greene var. **ELMERI** (Jeps.) K.Morse, Malacothamnus Volume 2: 27. 2023. *Sphaeralcea fasciculata* var. *elmeri* Jeps., Fl. Calif. [Jepson] 2: 501. 1936. TYPE: U.S.A. California: Contra Costa County, Mount Diablo, May 1903, *A. D. E. Elmer 4395* (Holotype: JEPS2868 [photo!], isotypes: DS65160 [photo!], GH00058121 [photo], NY00222084 [photo!], POM61908!).

Malacothamnus hallii (Eastw.) Kearney, Leafl. W. Bot. 6: 134. 1951. *Malvastrum hallii* Eastw., Leafl. W. Bot. 1: 216. 1936. TYPE: U.S.A. California: Contra Costa County, Mount Diablo, on westerly side north of Pine Canyon, altitude 275-290 m, 30 May 1916, *H. M. Hall and F. M. Essig 10131* (Holotype: CAS 143419 [photo!], isotypes: E00279450 [photo!], F678291 [photo!], LA41770 [photo!], MO931072 [photo!], NY00221825 [photo!], P02286283 [photo!], POM118243!, S13-21498 [photo!], UC198957 [photo!], UC311568!, US1328168 [photo!], WISv0255792 [photo!]).

Shrubs up to 3 m tall, occasionally spreading by rhizomes. Stems with dense stellate trichomes, stem surface not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.6 mm (mean per plant ranges from 0.1–0.4 mm), mostly with stipes, stipes ≤ 0.7 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round to widely ovate, length generally ≥ width, unlobed or obscurely (rarely moderately) 3–5 lobed with lobes generally rounded, occasionally borderline acute, bases obtuse to subcordate, ashy green to bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.6 mm (mean 0.3 mm), mostly without stipes or many with stipes, stipes ≤ 0.3,abaxial stellate trichome density 1–2x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence spike-like to panicle-like. Stipular bracts narrowly to moderately triangular or oblong, occasionally shallowly to deeply 2-lobed, 1–4.5 mm long, 0.5–3 mm wide, length 1–7x width; Calyx bracts ovate, subulate, or linear; 1–3.5 mm long, 0.3–0.8 mm wide, length 2–9x width, 0.2–0.5x calyx, green to red. Calyx 4–6.5 mm long, lobes 2–3 mm long x 1.5–2.5 mm wide, lobe at base 1.5–2.5 mm wide, lobe widest at base or up to 1 mm above base, lobe length 0.8–1.5x width, lobes ovate to widely ovate or triangular, apex acute; stellate trichomes on abaxial calyx surface with rays 0.1–0.7 mm (mean per plant ranges from 0.1–0.3 mm), mostly without stipes, stipes ≤ 0.2 mm; glandular trichomes on abaxial calyx surface < 0.1 mm. Corolla drying closed, petals to ~2 cm. Figs. 31 & 32.

Phenology. Blooming March to June with peak bloom in April and May.

Distribution (Fig. 17). Endemic to the southern Coastal Ranges of California, primarily in the northern half of the Diablo Range and areas in-between it and the Santa Cruz Mountains. 0–760 m. EOO: 4646, AOO: 73.

Conservation status. CRPR 1B.2. Threats may include inundation from a proposed reservoir, development, grazing, feral pig rooting, competition from nonnative plants, and off-road vehicle activity (CDFW 2022).

Suggested common name: eastern bewildering bushmallow. Additional common names: Hall's malvastrum (Abrams 1951), Hall's bushmallow (CNPS 1980; Slotta 2012). Past common names were from when *Malacothamnus arcuatus* var. *elmeri* was recognized as the species *M. hallii*. As *hallii* is not included in the scientific name when recognized as a variety, that may lead to some confusion. Additionally, it seems useful to have a common name that associates it with *M. arcuatus* var. *arcuatus*, for which I suggest the common name western bewildering bushmallow.

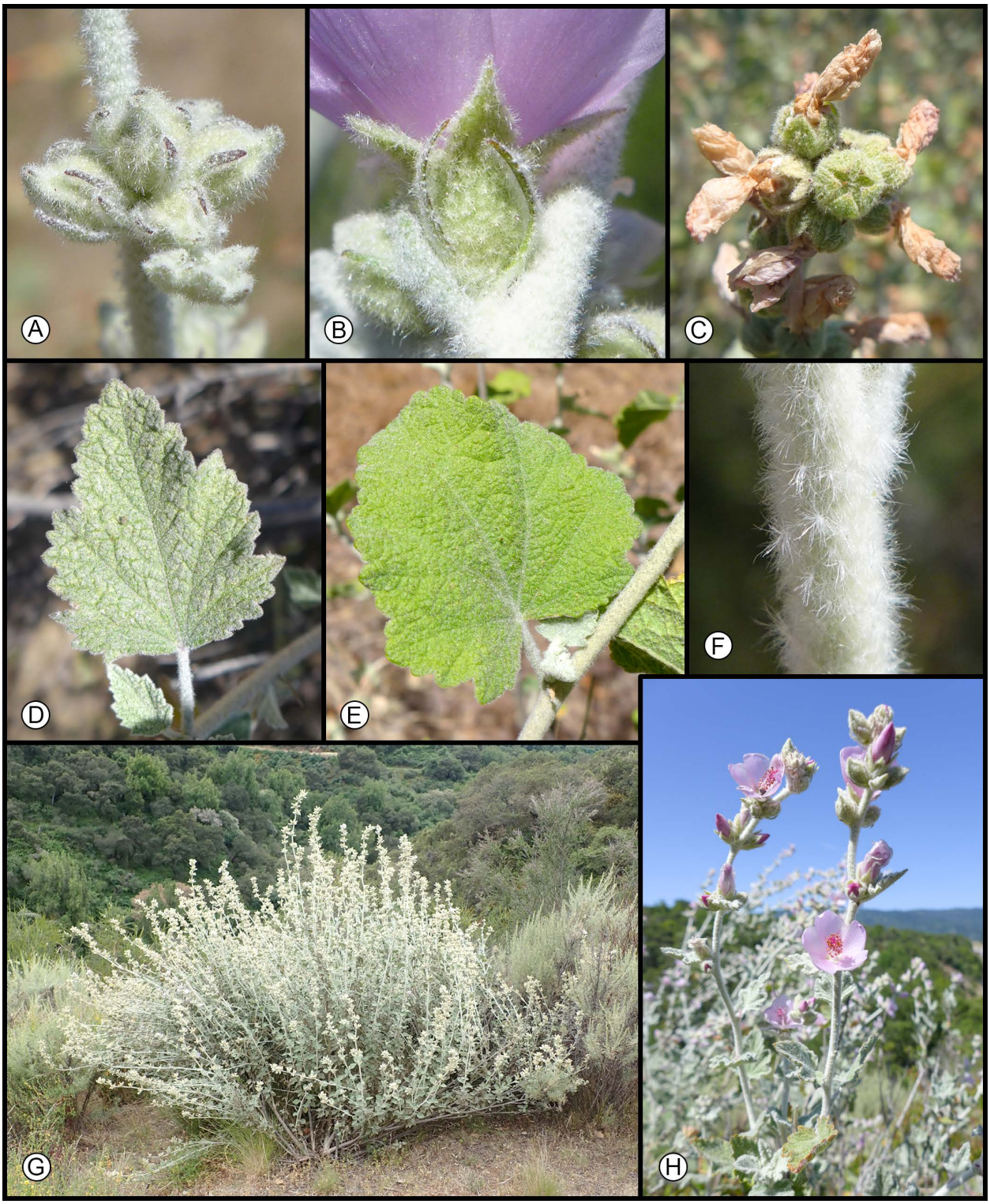

Figure 29. *Malacothamnus arcuatus* var. *arcuatus* photos. A) Flower buds. B) Calyx and calyx bracts in flower. C) Flowers in early fruit. D & E) Some leaf variation. F) Stem. G) Full plant. H) Inflorescence.

Figure 30. Lectotype of *Malacothamnus arcuatus.* UC191563. Image courtesy of University of California, Berkeley.

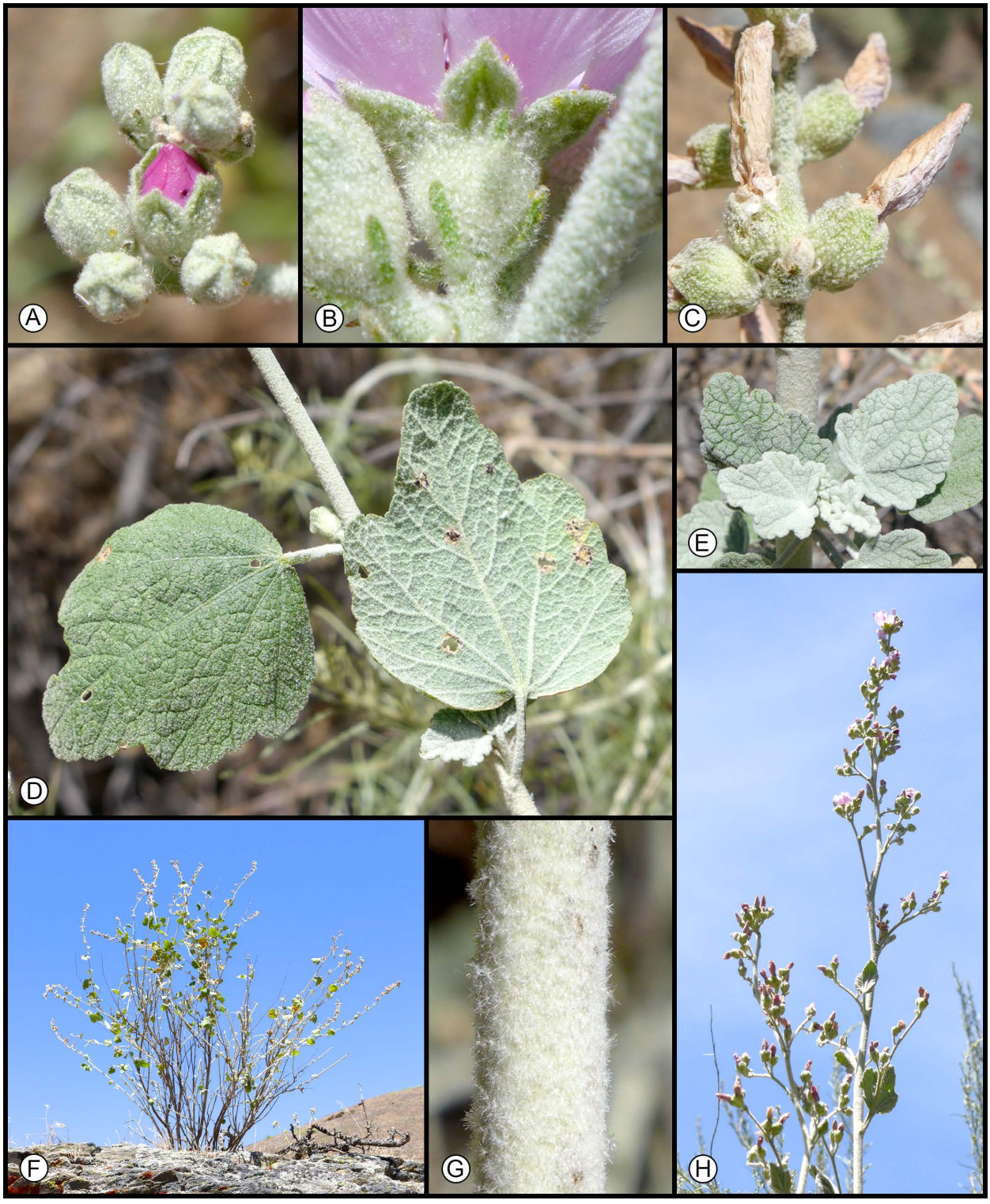

Figure 31. *Malacothamnus arcuatus* var. *elmeri* photos. A) Flower buds. B) Calyx and calyx bracts in flower. C) Flowers in fruit. D) Adaxial and abaxial surfaces of mature leaves. E) Immature leaves. F) Full plant. G) Stem. H) Inflorescence.

Figure 32. Holotype of *Malacothamnus arcuatus* var. *elmeri.* JEPS2868. Image courtesy of University of California, Berkeley.

4. MALACOTHAMNUS ASTROTENTACULATUS K.Morse, Malacothamnus Volume 2: 65–69. 2023. TYPE: U.S.A. California: Shasta County: Burned riparian woodland on south side of Platina Rd. between Platina and Ono, 40.4203°, -122.7446°, 412 m, 4 June 2018, *K. Morse M198* (holotype: RSA898960, isotypes: not yet distributed).

Shrubs up to 1.25 m tall, not or rarely spreading by rhizomes. Stems with sparse to dense stellate trichomes, stem surface often visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1 mm (mean per plant ranges from 0.2–0.4 mm), mostly without stipes, stipes ≤ 0.5 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round to widely ovate, length ±= width, obscurely to moderately 3–7 lobed with lobes rounded to acute, bases cordate, ashy green to bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.7 mm (mean 0.3 mm), mostly without stipes, stipes ≤ 0.1 mm, abaxial stellate trichome density 1–1.5x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescences spikes of conspicuously interrupted dense glomerules. Stipular bracts linear, subulate, or falcate; 3–10 mm long, 0.5–1.5 mm wide, length 4–14x width, calyx bracts linear, 6–11 mm long, 0.2–0.5 mm wide, length 20–40x width, 0.7–1.1x calyx, green to partially red. Calyx 8–14 mm long, lobes 5–10 mm long x 5–7 mm wide, lobe at base 2–4 mm wide, lobe widest 1–3.5 mm above base, lobe length 0.7–1.8x width, lobes widely ovate to widely ovate with apex abruptly acuminate; abaxial calyx veins with filiform and occasionally somewhat branched outgrowths to ~2.5 mm long covered in stellate trichomes; stellate trichomes on abaxial calyx surface with rays 0.1–1.2 mm (mean per plant ranges from 0.3–0.5 mm), mostly without stipes, stipes ≤ 0.5 mm; glandular trichomes on abaxial calyx surface < 0.1 mm. Corolla generally drying at least somewhat open, petals to ~1.5 cm. Figs. 33 & 34.

Phenology. Peak bloom apparently in June, likely in May and possibly July as well. A few flowers were observed in August and September when plants were mostly in fruit.

Distribution (Fig. 16). Endemic to Shasta and Tehama counties in California. 400–1070 m. *Malacothamnus astrotentaculatus* is the species with the northernmost range in the genus and the only species known from Shasta County. EOO: 367, AOO: 9.

Conservation status. None. Based on the limited number of known occurrences, this species should be considered for a conservation status. Threats at present appear to be minimal. Herbicide treatment adjacent to one known location used to convert post-fire chaparral to a pine plantation indicates the possible threat of vegetation management practices not allowing plants to reach maturity and replenish the soil seed bank. See Volume 2 for a more detailed discussion.

Suggested common name: starry-tentacled bushmallow (Morse 2023b). Named for the tentacle-like outgrowths covered in stellate trichomes located on the calyx.

Notes. *Malacothamnus astrotentaculatus* is distinct in having the combination of linear calyx bracts, calyx lobes generally much wider above the base than at the base, and a spike-like inflorescence. It should not be confused with any other taxa.

There is no evidence of naturally occurring hybrids of *Malacothamnus astrotentaculatus* with any other taxa. Intermediates with *M. fremontii* could possibly be found if their ranges meet.

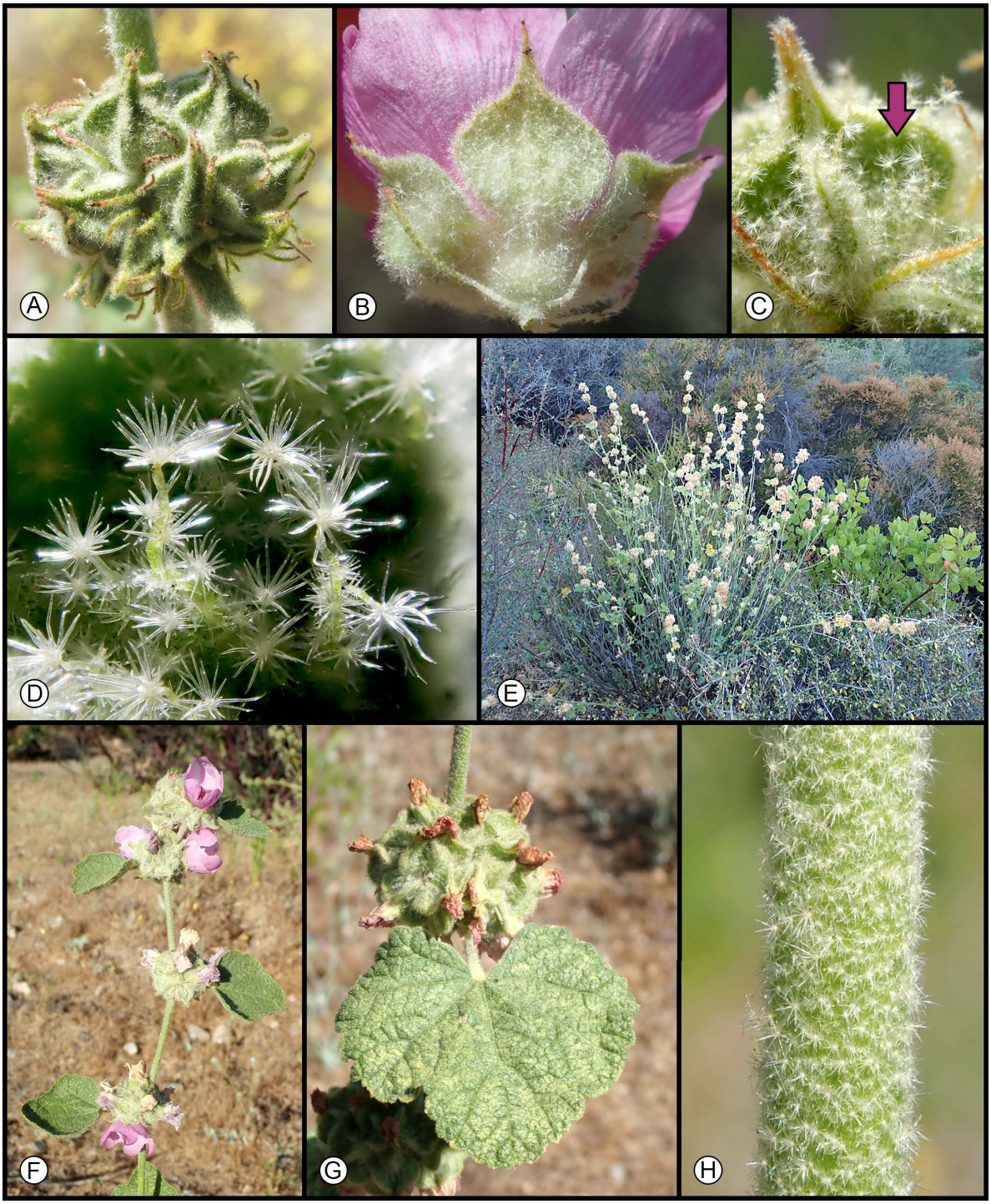

Figure 33. *Malacothamnus astrotentaculatus* photos. A) Flower buds. B) Calyx and calyx bracts in flower. C & D) Tentacle-like outgrowths covered in stellate trichomes found on calyx, which this species is named for. E) Full plant in fruit. F) Inflorescence. G) Leaf and flower cluster with flowers that have dried somewhat ambiguously partially open. H) Stem.

Figure 34. Holotype of *Malacothamnus astrotentaculatus.* RSA898960.

5. MALACOTHAMNUS CLEMENTINUS (Munz & I.M.Johnst.) Kearney, Leafl. W. Bot. 6: 127. 1951.
Malvastrum clementinum Munz & I.M.Johnst., Bull. Torrey Bot. Club 51: 296. 1924. *Sphaeralcea orbiculata* var. *clementina* (Munz & I.M.Johnst.) Jeps., Fl. Calif. [Jepson] 2(1): 499. 1936. *Sphaeralcea orbiculata* subsp. *clementina* (Munz & I.M.Johnst.) A.E.Murray, Kalmia 12: 24. 1982. *Malacothamnus orbiculatus* subsp. *clementinus* (Munz & I.M.Johnst.) A.E.Murray, Kalmia 13: 9. 1983. TYPE: U.S.A. California: San Clemente Island, rocky walls of canyon from Lemon Tank, 9 April 1923, P. A. Munz 6684 (holotype: POM20491!, isotypes: CAS358448 [fragment], DS152373, F678310, GH00052892, NY00221818, NY00221819, US1369336 [photo! of all isotypes]).

Shrubs up to 1 m tall, spreading by rhizomes. Stems with sparse to dense stellate trichomes, stem surface sometimes visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 2.0 mm (mean per plant ranges from 0.5–1.2 mm), many with stipes, stipes ≤ 0.8 mm; glandular trichomes on stem ≤ 0.1 mm (mean per plant < 0.1 mm). Leaf blades ± round to widely ovate, length ±= width, obscurely to moderately 3–5 lobed with lobes rounded to acute, bases truncate to cordate, ashy green to bright green adaxially and generally much paler abaxially; stellate trichomes on leaf blade with rays ≤ 1.0 mm (mean 0.4 mm), many with stipes, stipes ≤ 0.3 mm, abaxial stellate trichome density 1.5–6(14)x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescences spikes of interrupted glomerules. Stipular bracts linear, subulate, or narrowly triangular; 4–9 mm long, 0.5–1.5 mm wide, length 4–12x width. Calyx bracts linear, 4–8.5 mm long, 0.1–0.5 mm wide, length 12–37.5(80)x width, 0.4–1.3x calyx, green to red. Calyx 6–9.5 mm long, lobes (2)3.5–6 mm long x 1.5–3 mm wide, lobe at base 1.5–3 mm wide, lobe widest at base, lobe length 1.0–3.3x width, lobes triangular with apex generally acuminate (rarely acute); stellate trichomes on abaxial calyx surface with rays 0.1–2.3 mm (mean per plant ranges from 0.4–1.2 mm), mostly without stipes, stipes ≤ 0.4 mm; glandular trichomes on abaxial calyx surface < 0.1–0.2 mm (mean per plant ranges < 0.1). Corolla drying closed, petals to ~2 cm. Figs. 35 & 36.

Phenology. Blooming January to November with peak bloom March to April. Later blooms are generally sporadic flowers on plants that have already fruited.

Distribution (Fig. 20). Endemic to San Clemente Island. 5–385 m. Cultivated and primarily planted in gardens in southern California. EOO: 69, AOO: 17.

Conservation status. CRPR 1B.1, California Endangered, Federally Endangered. Currently proposed for federal delisting (USFWS 2021b). The most recent U.S. Fish and Wildlife Service species status assessment of *Malacothamnus clementinus* noted low genetic diversity and increased fire frequency to be the main threats (USFWS 2020). Genetic diversity may increase after post-fire germination but too frequent fires could reduce the soil seed bank or increase competition from nonnative plants. Additional threats may include climate change and military training.

Suggested common name: San Clemente Island bushmallow (Powell 1974; Bates 1993, 2015b; Slotta 2012).

Notes. *Malacothamnus clementinus* is generally distinguished from the rest of the genus by the combination of its small size; relatively long-rayed, white stellate trichomes on the stem, many of which have stipes; and its triangular calyx lobes. *Malacothamnus clementinus* is most similar morphologically to some plants of *M. orbiculatus*, particularly those *M. orbiculatus* from the San Gabriel and San Bernardino mountains with especially long stellate trichome rays.

Some specimens collected from North Verde Ranch, near the Mojave River east of Victorville in San Bernardino County, CA (Raven 16625) closely resemble *Malacothamnus clementinus*. These are likely *M. orbiculatus* or could possibly be plantings of *M. clementinus*. A DNA-based assessment may be needed to confirm. No *Malacothamnus* were found in this area during a 2020 survey. Naturally occurring *Malacothamnus* plants in this area would likely be the result of washed down seed from the San Bernardino Mountains.

There is no evidence of naturally occurring hybrids of *Malacothamnus clementinus* with any other taxa.

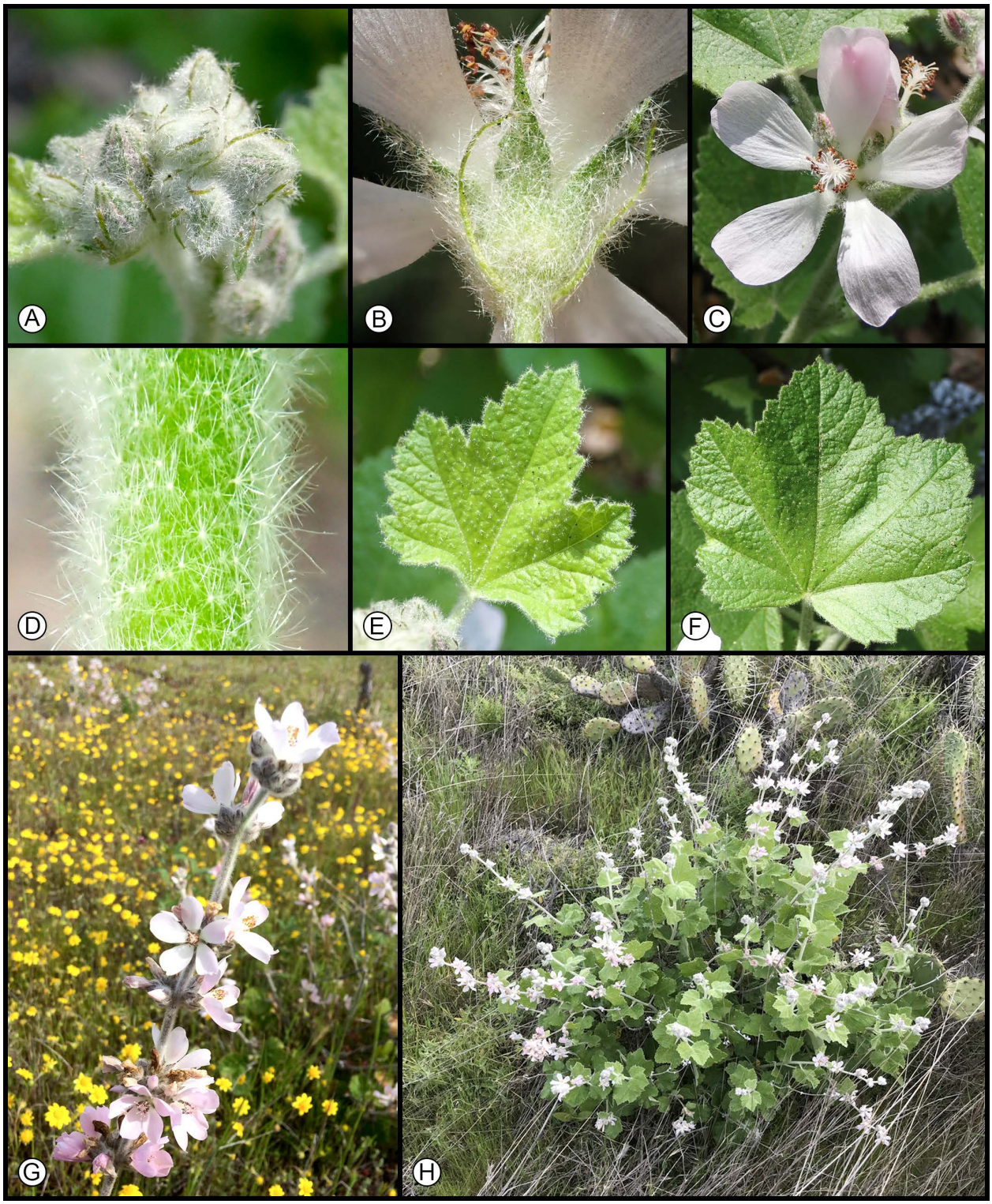

Figure 35. *Malacothamnus clementinus* photos. A) Flower buds. B) Calyx and calyx bracts in flower. C) Flower. D) Stem. E & F) Some leaf variation. G) Inflorescence. H) Full Plant. Photos G & H by Justyn Stahl (CC-BY-NC).

Figure 36. Holotype of *Malacothamnus clementinus.* POM20491. Image courtesy of California Botanic Garden.

6. MALACOTHAMNUS DAVIDSONII (B.L.Rob.) Greene, Leafl. Bot. Observ. Crit. 1: 208. 1906.
Malvastrum davidsonii B.L.Rob., in A. Gray, Syn. Fl. N. Amer. 1: 312. 1897. *Sphaeralcea davidsonii* (B.L.Rob.) Jeps., Man. Fl. Pl. Calif. [Jepson] 634. 1925. TYPE: U.S.A. California: [Los Angeles County], San Fernando, 24 June 1895, A. Davidson s.n. (lectotype designated by Kearney, 1951: GH00052893!, isolectotype: US236702 [photo!], syntypes: DS118300, GH420497, NDG31163 [photo!]).

Shrubs up to 6 m tall, not or rarely spreading by rhizomes. Stems with moderately dense to dense stellate trichomes, stem surface sometimes visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.2 mm (mean per plant ranges from 0.2–0.6 mm), many with stipes, stipes ≤ 1.5 mm; glandular trichomes on stem ≤ 0.3 mm (mean per plant < 0.1 mm). Leaf blades ± round to widely ovate, length ≥ width, obscurely to moderately 3–7 lobed with lobes rounded to acute, bases cordate (rarely truncate or obtuse), ashy green to bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.9 mm (mean 0.4 mm), many with stipes, stipes ≤ 0.8 mm. abaxial stellate trichome density 1–1.5x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence spike-like to panicle-like. Stipular bracts narrowly to moderately triangular to oblong, occasionally shallowly to deeply 2-lobed, 2–5 mm long, 1–3.5 mm wide, length 1–3.5x width, calyx bracts linear to subulate, 1.5–4.5 mm long, 0.2–0.6 mm wide, length 5–17.5x width, 0.2–0.5x calyx, green to partially red. Calyx (5)6.5–10 mm long, lobes 2.5–6 mm long x 2–4 mm wide, lobe at base 2–3.5 mm wide, lobe widest at base or up to 1.5 mm above base, lobe length 1.2–2.3x width, lobes triangular to ovate with apex acute; stellate trichomes on abaxial calyx surface with rays 0.1–0.9 mm (mean per plant ranges from 0.2–0.4 mm), mostly without stipes, stipes ≤ 0.4 mm; glandular trichomes on abaxial calyx surface < 0.1–0.4 mm (mean per plant ranges from < 0.1–0.1 mm). Corolla drying closed, petals to ~2 cm. Figs. 37 & 38.

Phenology. Blooming April to February with peak bloom June to August. Later blooms are generally sporadic.

Distribution (Figs. 20 & 21). Endemic to Los Angeles County, California in the San Fernando Valley, Verdugo Hills, and nearby areas of the San Gabriel Mountains. 275–1540 m. EOO: 291, AOO: 64.

Conservation status. CRPR 1B.2. Plants called *Malacothamnus davidsonii* from Monterey and San Luis Obispo counties were described as the new species *M. discombobulatus* in Volume 2 this monograph, which highly reduces the geographic range of *M. davidsonii* used in previous assessments. Davidson (1896) noted it was found “growing in the sand-washes and sandy plains of San Fernando Valley, where it is quite a conspicuous feature of the plains”. This suggests that it was perhaps once much more common in areas that are now developed. Documented threats include development, off-road vehicles, competition with nonnative plants, and possible effects of herbicide in treating nearby nonnative plants (CDFW 2022). Overly abundant fires in this region could possibly reduce the soil seed bank and increase competition from invasive species.

Suggested common name: Tujunga bushmallow. Additional common names: sand mallow (Jepson 1936), sand globemallow (McMinn and Schumacher 1939), Davidson's malvastrum (Abrams 1951), Davidson's bushmallow (CNPS 1980; Bates 1993, 2015a; Matthews 1997; Slotta 2012). As what has been called Davidson's bushmallow in the past is now split into two species, a new disambiguating common name seems appropriate. Big Tujunga Canyon, Little Tujunga Canyon, and Tujunga Wash make up much of the current range of *Malacothamnus davidsonii*, so using the common name Tujunga bushmallow gives this species a useful geographically based name.

Notes. *Malacothamnus davidsonii* and *M. discombobulatus* are generally separated from the rest of the genus based on the combination of relatively short calyx bracts, relatively long stellate trichome rays, often relatively large size of the fully grown plant, and a relatively late blooming period. Morphological separation of *M. davidsonii* and *M. discombobulatus* is difficult, so their geographic ranges are most easily used to separate them. The only species near the range of *M. davidsonii* that it could be confused with is *M. orbiculatus*, which sometimes look very similar when pressed as a specimen. *Malacothamnus davidsonii* is often taller and narrower in overall shape than *M. orbiculatus*, which is generally shorter and more rounded. While their ranges are close, they are not known to overlap. *Malacothamnus davidsonii* occurs on the south side of the San Gabriel Mountains and *M. orbiculatus* occurs primarily on the northern side.

Malacothamnus fasciculatus var. *laxiflorus* occurs within the range of *M. davidsonii*. In general, these two taxa are easily distinguished as *M. davidsonii* has much longer stellate trichome rays, is a much more robust plant overall, and mostly flowers later in the season. The bloom time of these two taxa does overlap though and morphological intermediates may be found where they occur together.

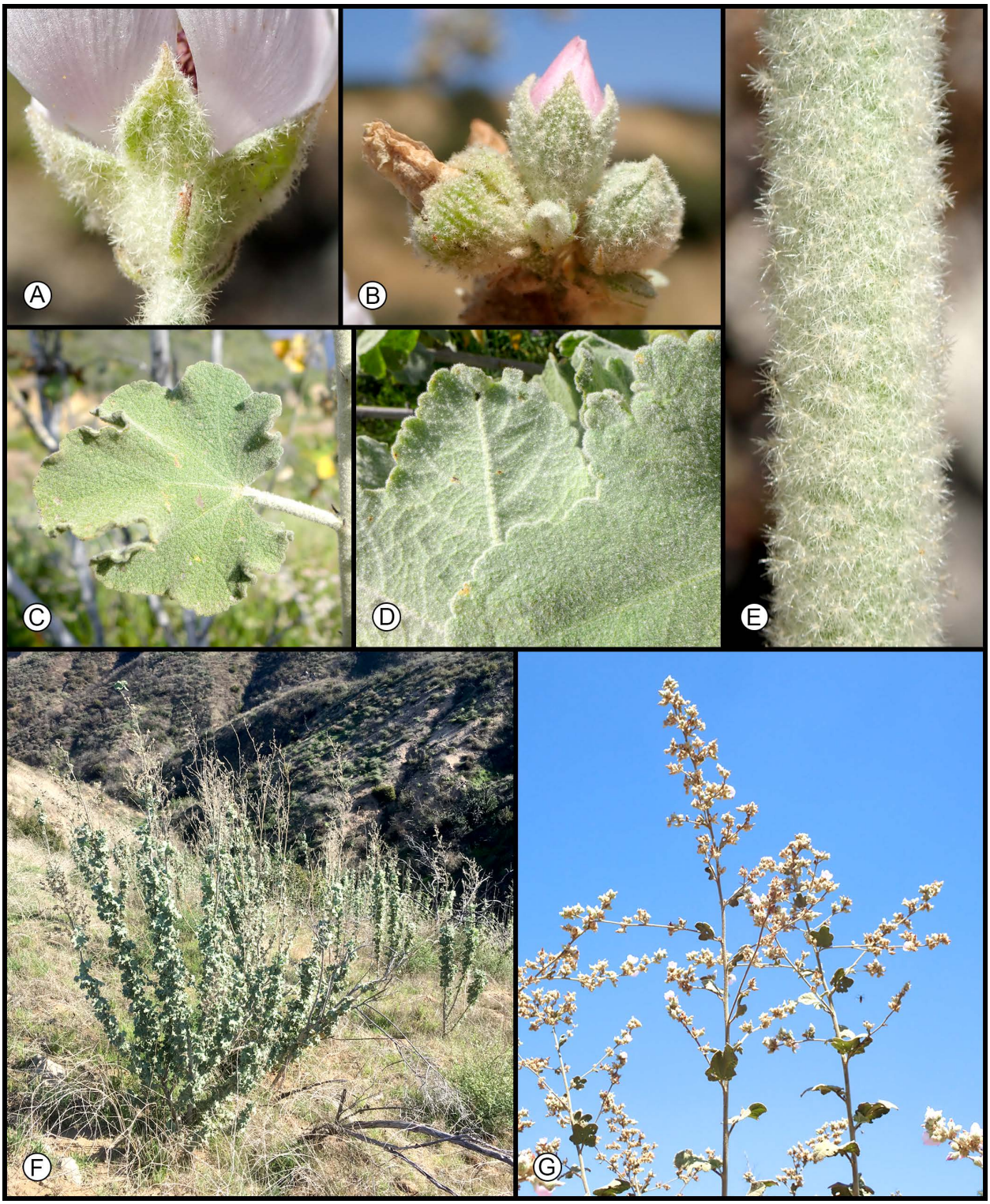

Figure 37. *Malacothamnus davidsonii* photos. A) Calyx and calyx bracts in flower. B) Flowers in bud and fruit. C) Adaxial leaf surface. D) Abaxial (left) and adaxial (right) leaf surfaces. E) Stem. F) Full plant. G) Inflorescence.

Figure 38. Lectotype of *Malacothamnus davidsonii.* GH00052893. Image courtesy of Harvard University Herbaria.

7. MALACOTHAMNUS DENSIFLORUS (S.Watson) Greene, Leafl. Bot. Observ. Crit. 1: 208. 1906.
Malvastrum densiflorum S.Watson, Proc. Amer. Acad. Arts 17: 368. 1882. *Sphaeralcea densiflora* (S.Watson) Jeps., Man. Fl. Pl. Calif. [Jepson] 633. 1925. TYPE: U.S.A. California: [Riverside County], near Agua Caliente [in the San Jacinto Mountains], 9 March 1881, *S. B. and W. F. Parish 738* (lectotype designated by Fryxell, 1988: GH00052894!, syntypes: GH00420504 [photo!], GH00420507 [photo!], POM48395! [photo of GH00420504 with specimen fragments]).

Shrubs up to 2.5 m tall, occasionally spreading by rhizomes. Stems with sparse to moderately dense stellate trichomes, stem surface often visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 3.3 mm, mostly without stipes, stipes ≤ 0.4 mm; glandular trichomes on stem ≤ 1.0 mm (mean per plant ranges from < 0.1–0.7 mm). Leaf blades ± round to widely ovate, length ≥ width, unlobed or obscurely to moderately 3–5 lobed with lobes rounded to acute, bases cordate to obtuse, rarely truncate or obtuse, bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 1.3 mm, mostly without stipes, stipes ≤ 0.3 mm, abaxial stellate trichome density 1–4(8.5)x adaxial; glandular trichomes on leaf blade ≤ 1.0 mm. Inflorescences spikes of interrupted glomerules, very rarely some capitate or panicle-like mixed in populations with spikes. Stipular bracts linear, lanceolate, subulate, falcate, or narrowly triangular, occasionally shallowly to deeply 2-4 lobed; 3–15(19) mm long, 0.5–3(6) mm wide, length 1–10(38)x width. Calyx bracts linear, 5.5–16.5(18) mm long, 0.2–1.0 mm wide, length 9–65x width, 0.5–1.5x calyx, green to partially red. Calyx 8–16(18) mm long, lobes 4–12 mm long x 2–5 mm wide, lobe at base 2–4.5 mm wide, lobe widest at base or up to 2.5 mm above base, lobe length 1.3–3.8(4.5)x width, lobes triangular to ovate with acuminate apex; stellate trichomes on abaxial calyx surface with rays 0.1–4.1 mm, mostly without stipes, stipes ≤ 0.3 mm; glandular trichomes on abaxial calyx surface < 0.1–1.1 mm (mean per plant ranges from < 0.1–0.7 mm). Corolla drying closed, petals to ~2.5 cm.

Notes. Prior to 2023, *Malacothamnus densiflorus* var. *viscidus* was distinguished from *M. d.* var. *densiflorus* primarily based on the length of the calyx and calyx bracts. Using these characters, Kearney (1951) noted that there was complete intergradation between varieties with intermediate plants being about as numerous as plants assigned to either variety. Morse (2023a) showed that these characters merely differentiated more or less robust plants and were not useful in distinguishing the varieties. Using the length and density of trichomes, however, perfectly differentiates the two varieties. The geographic range of each variety only slightly overlaps, and each taxon retains its distinctive characters when grown in a common garden. Likely due to geneflow between geographically adjacent taxa, phylogenetic analyses have not clearly differentiated the taxa of southern California and Baja California (Morse 2023b). Further research may reveal evidence justifying *M. densiflorus* var. *viscidus* be recognized at the species rank.

7a. MALACOTHAMNUS DENSIFLORUS var. **DENSIFLORUS.**

Shrubs up to 2.5 m tall, occasionally spreading by rhizomes. Stems with sparse to moderately dense stellate trichomes, stem surface often visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 2.1 mm (mean per plant ranges from 0.2–0.7 mm), mostly without stipes, stipes ≤ 0.4 mm; glandular trichomes on stem ≤ 0.1 mm (mean per plant < 0.1 mm). Leaf blades ± round to widely ovate, length ≥ width, unlobed or obscurely to moderately 3–5 lobed with lobes rounded to acute, bases cordate to obtuse, rarely truncate or obtuse, bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 1.3 mm (mean 0.3 mm), mostly without stipes, stipes ≤ 0.3 mm, abaxial stellate trichome density 1–4x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescences spikes of interrupted glomerules, very rarely some capitate or panicle-like mixed in populations with spikes. Stipular bracts linear, lanceolate, subulate, falcate, or narrowly triangular, occasionally shallowly to deeply 2-4 lobed; 3–14.5 mm long, 1–4.5 mm wide, length 1.5–10x width. Calyx bracts linear, 6–16.5 mm long, 0.2–1.0 mm wide, length 9–65x width, 0.7–1.5x calyx, green to partially red. Calyx 8–16 mm long, lobes 4.5–11.5 mm long x 2–5 mm wide, lobe at base 2–4 mm wide, lobe widest at base or up to 2.5 mm above base, lobe length 1.3–3.8(4.5)x width, lobes triangular to ovate with acuminate apex; stellate trichomes on abaxial calyx surface with rays 0.1–4.1 mm (mean per plant ranges from 0.5–2.3 mm), mostly without stipes, stipes ≤ 0.2 mm; glandular trichomes on abaxial calyx surface < 0.1–0.4 mm (mean per plant ranges from < 0.1–0.2 mm). Corolla drying closed, petals to ~2.5 cm. Figs. 39 & 40.

Phenology. Primarily blooming March to July with peak in April and May. Sporadic flowers possible the rest of the year.

Distribution (Figs. 20 & 22). Endemic to the Peninsular Ranges of southern California and adjacent Baja California. 40–2050 m. EOO: 11406, AOO: 242.

Conservation status. None. Appears relatively secure.

Suggested common name: few-rayed bushmallow. Additional common names: San Jacinto mallow (Jepson 1936), hispid globemallow (McMinn and Schumacher 1939), many-flowered malvastrum (Abrams 1951), many-flowered bushmallow (Beauchamp 1986), dense-flowered bushmallow (Bates 2015a), yellowstem bushmallow (Bates 2015a). The common name “yellowstem bushmallow” is best avoided as it causes misidentifications. *Malacothamnus densiflorus* occasionally has a yellow stem but it is often green, especially distally. The geographically adjacent *M. fasciculatus* var. *fasciculatus* almost always has a yellow stem. The suggested common name few-rayed bushmallow refers to the relatively few rays on the stellate trichomes of the calyx, which is a key character differentiating *M. densiflorus* from other species in the region.

Notes. *Malacothamnus densiflorus* var. *densiflorus* can be distinguished from the rest of the genus mostly by the nonglandular trichomes on the abaxial calyx surface, which are relatively long, relatively sparse (especially on the calyx tube), and simple to relatively few-

rayed. It is distinguished from *M. densiflorus* var. *viscidus* by having sparser nonglandular trichomes on the abaxial surface of the calyx tube and shorter glandular trichomes overall.

Morphological intermediates of *Malacothamnus densiflorus* var. *densiflorus* can be found where its range meets that of *M. fasciculatus* var. *fasciculatus*, *M. fasciculatus* var. *laxiflorus*, and *M. enigmaticus*. Intermediates that more closely resemble *M. densiflorus* may be distinguished from *M. densiflorus* var. *densiflorus* by having relatively dense stellate trichomes on the calyx tube, and from *M. densiflorus* var. *viscidus* by having relatively short glandular trichomes.

While plants of *Malacothamnus densiflorus* var. *densiflorus* from near its type locality in the San Jacinto Mountains are most morphologically similar to the rest of *M. densiflorus* var. *densiflorus*, they generally resolve within the clade of eastern *M. fasciculatus* var. *laxiflorus*, which also grows in the San Jacinto Mountains. This may indicate geneflow between these two taxa in this region. The only morphological character that stands out as possibly indicating geneflow between them is that the nonglandular trichomes of *M. densiflorus* var. *densiflorus* from the San Jacinto Mountains tend to be white, whereas they tend to be more yellowish elsewhere.

7b. MALACOTHAMNUS DENSIFLORUS var. **VISCIDUS** (Abrams) Kearney, Leafl. W. Bot. 6: 129. 1951.
Malvastrum viscidum Abrams, Bull. Torrey Bot. Club 34(5): 264. 1907. TYPE: U.S.A. California: San Diego County, dry hills, Harvey's Ranch, near El Nido, 19 May 1903, *L. Abrams 3528* (Holotype: DS60886!, isotypes: DS31561, F186750, GH00052913, K000659250, NY3898792, P02286287, PH534049, US614032 [photo! of all isotypes]).

Shrubs up to 1.5 m tall, spreading by rhizomes. Stems with sparse to moderately dense stellate trichomes, stem surface often visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 3.3 mm (mean per plant ranges from 0.2–0.6 mm), mostly without stipes, stipes ≤ 0.2 mm; glandular trichomes on stem ≤ 1.0 mm (mean per plant ranges from 0.2–0.7 mm). Leaf blades ± round to widely ovate, length ≥ width, obscurely to moderately 3–5 lobed with lobes rounded to acute, bases cordate to rarely truncate, bright green adaxially and paler abaxially, sometimes rancid smelling; stellate trichomes on leaf blade with rays ≤ 1.0 mm (mean 0.3 mm), mostly without stipes, stipes ≤ 0.2 mm, abaxial stellate trichome density 1–3.5(8.5)x adaxial; glandular trichomes on leaf blade ≤ 1.0 mm (mean per plant 0.3–0.4 mm). Inflorescences spikes of interrupted glomerules. Stipular bracts linear, subulate, falcate, or narrowly triangular, 3–15(19) mm long, 0.5–3(6) mm wide, length 1–7(38)x width. Calyx bracts linear, 5.5–12(18) mm long, 0.2–0.6 mm wide, length 10–55x width, 0.5–1.0x calyx, generally green, occasionally partly red. Calyx 8–13.5(18) mm long, lobes 4–12 mm long x 2–4.5 mm wide, lobe at base 2–4.5 mm wide, lobe widest at base or up to 2 mm above base, lobe length 1.3–3.4x width, lobes triangular to ovate with acuminate apex; stellate trichomes on abaxial calyx surface with rays 0.1–3.9 mm (mean per plant ranges from 0.3–1.1 mm), mostly without stipes, stipes ≤ 0.3 mm; glandular trichomes on abaxial calyx surface <

0.1–1.1 mm (mean per plant ranges from 0.2–0.7 mm). Corolla drying closed, petals to ~2 cm. Figs. 41 & 42.

Phenology. Blooming February to June with peak bloom April to May.

Distribution (Figs. 20 & 22). Endemic to San Diego County, California and adjacent Baja California on Otay Mountain northward to near the town of Jamul. 75–940 m. Introduced to Orange County via a restoration planting where it has possibly hybridized with *Malacothamnus fasciculatus* var. *laxiflorus*. EOO: 224, AOO: 29.

Conservation status. None. *Malacothamnus densiflorus* var. *viscidus* was previously rejected for a conservation status for taxonomic reasons (CNPS 2023). As the morphological characters distinguishing the two varieties of *M. densiflorus* have been clarified and as *M. densiflorus* var. *viscidus* has a small geographic range, *M. densiflorus* var. *viscidus* should be reconsidered for a conservation status. No threats other than a small range are documented at present.

Suggested common name: Emerald unicorn bushmallow. Additional common names: San Diego bushmallow (Beauchamp 1986). There are four taxa of bushmallows in San Diego County, so the name "San Diego bushmallow" could cause confusion. Emerald unicorn bushmallow is suggested as a common name for *Malacothamnus densiflorus* var. *viscidus* as some glandular trichomes, which arguably resemble unicorn horns, often dry to an emerald-green color on herbarium specimens. This coloration is very distinctive when viewing dried specimens using high magnification, though much more prevalent on some specimens than others. Note that it may take over a month of drying for the glandular trichomes to change from a yellowish-green to emerald-green and many may not change.

Notes. *Malacothamnus densiflorus* var. *viscidus* can be distinguished from most of the rest of the genus by the combination of a spike-like inflorescence and relatively long glandular trichomes. Differentiation from *M. eastwoodiae* ignoring geographic range can be difficult. Ignoring geographic range, *Malacothamnus eastwoodiae* is most easily distinguished from *M. densiflorus* var. *viscidus* by having relatively dense stellate trichomes on the stem and reddish colored calyx bracts (and often calyx lobe tips) whereas *M. densiflorus* var. *viscidus* has sparser stellate trichomes on the stem and rarely has reddish coloration on the calyx bracts or calyx lobe tips. *Malacothamnus densiflorus* var. *viscidus* is distinguished from *M. densiflorus* var. *densiflorus* by having denser nonglandular trichomes on the abaxial surface of the calyx tube and longer glandular trichomes overall.

There is no clear evidence of naturally occurring hybrids of *Malacothamnus densiflorus* var. *viscidus* with any other taxa within its native range.

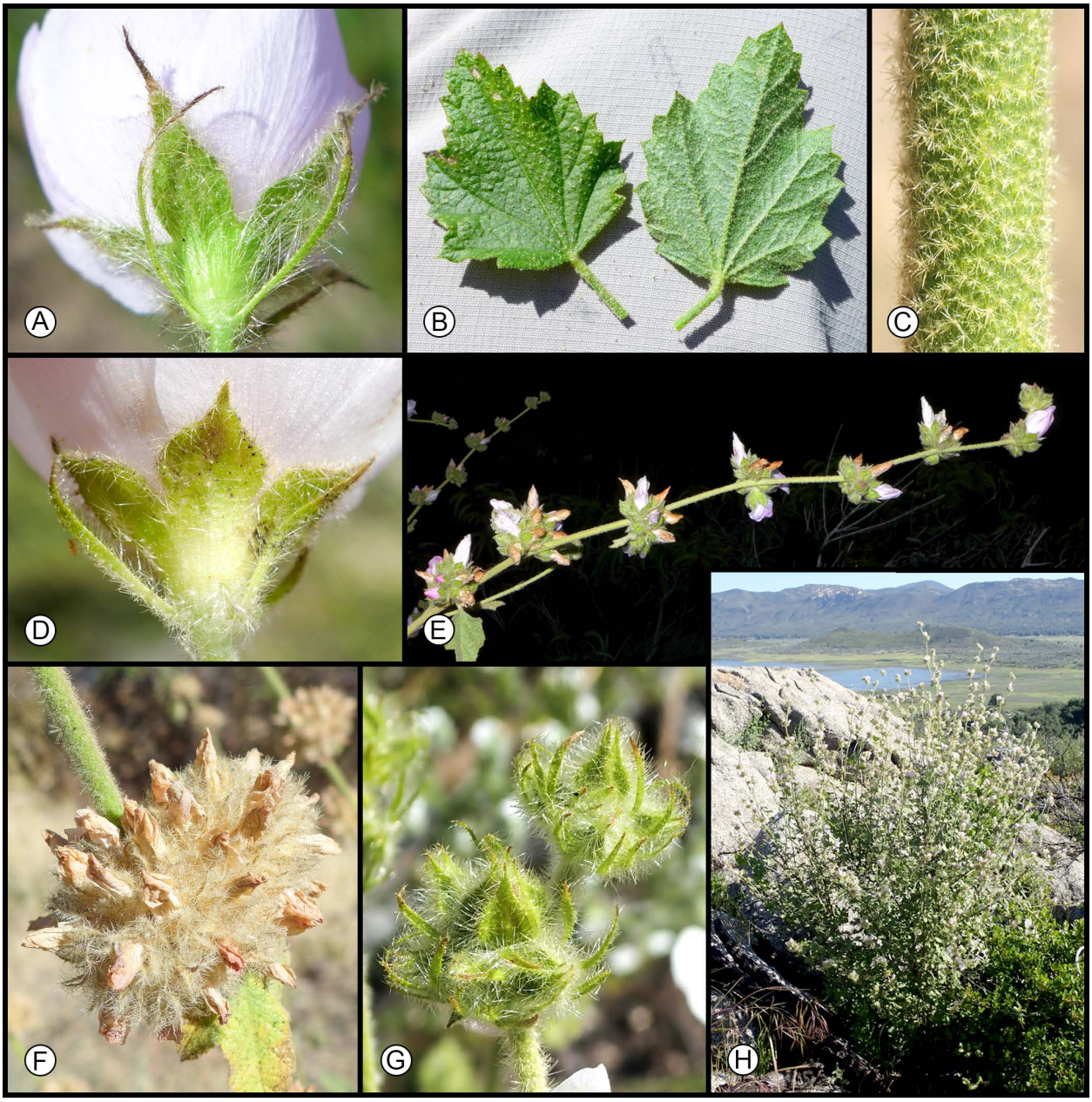

Figure 39. *Malacothamnus densiflorus* var. *densiflorus* photos. A & D) Calyx and calyx bracts in flower. B) Adaxial and abaxial leaf surfaces. C) Stem. E) Inflorescence. F) Flowers in fruit. G) Flowers in bud. H) Whole plant.

Figure 40. Lectotype of *Malacothamnus densiflorus.* GH00052894. Image courtesy of Harvard University Herbaria.

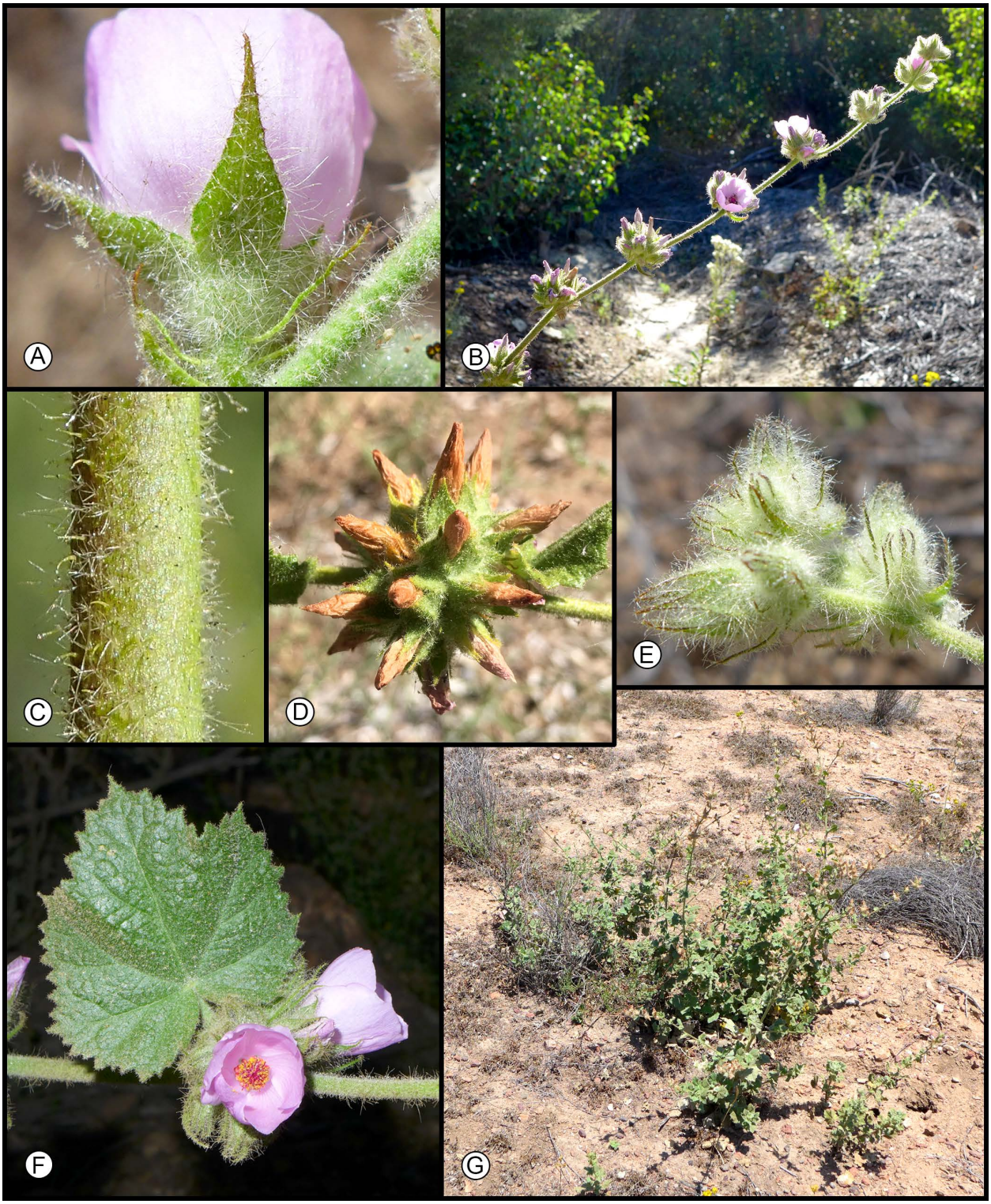

Figure 41. *Malacothamnus densiflorus* var. *viscidus* photos. A) Calyx and calyx bracts in flower. B) Inflorescence. C) Stem. D) Flowers in fruit. E) Flowers in bud. F) Flowers and adaxial leaf surface. G) Whole plant.

Figure 42. Holotype of *Malacothamnus densiflorus* var. *viscidus.* DS60886. Image courtesy of California Academy of Sciences.

8. MALACOTHAMNUS DISCOMBOBULATUS K.Morse, Malacothamnus Volume 2: 70–72. 2023. TYPE: U.S.A. California: San Luis Obispo County: On both sides of Interlake Road ~2.2 km west of its intersection with Nacimiento Lake Drive, 35.7777°, -120.9145°, 440 m, 15 August 2018, Keir Morse M266 (holotype: RSA899224, isotypes: not yet distributed).

Shrubs up to 5 m tall, occasionally spreading by rhizomes (possibly rarely). Stems with moderate to dense stellate trichomes, stem surface sometimes visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.7 mm (mean per plant ranges from 0.2–0.5 mm), many with stipes, stipes ≤ 1.1 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round to widely ovate, length ≥ width, obscurely to moderately 3–7 lobed with lobes rounded to borderline acute, bases cordate, ashy green to bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.6 mm (mean 0.3 mm), many with stipes, stipes ≤ 0.3 mm, abaxial stellate trichome density 1–1.5x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence narrowly to widely panicle-like, occasionally spike-like. Stipular bracts lanceolate, triangular, ovate, or widely ovate, occasionally shallowly to deeply 2-4 lobed; 1.5–4 mm long, 0.5–2.5 mm wide, length 1–4x width. Calyx bracts linear to lanceolate, 1–3 mm long, 0.3–0.6 mm wide, length 3–10x width, 0.1–0.4x calyx, green to partially or fully red. Calyx 6.5–9.5 mm long, lobes 4–6 mm long x 2–2.5 mm wide, lobe at base 2–2.5 mm wide, lobe widest at base or up to 1.5 mm above base, lobe length 1.6–3.0x width, lobes narrowly to moderately triangular or ovate with acuminate apex; stellate trichomes on abaxial calyx surface with rays 0.1–0.5 mm (mean per plant ranges from 0.2–0.3 mm), mostly without stipes, stipes ≤ 0.4 mm; glandular trichomes on abaxial calyx surface < 0.1 mm. Corolla drying closed, petals to ~2 cm. Figs. 43 & 44.

Phenology. Blooming May to October with peak bloom in July and August. Later blooms are generally sporadic flowers in the already fruited inflorescence.

Distribution (Fig. 18). Endemic to Monterey and San Luis Obispo counties in the Southern Coastal Ranges of California. 150–710 m. EOO: 952, AOO: 25.

Conservation status. None as *Malacothamnus discombobulatus*. CRPR 1B.2 as part of *M. davidsonii* s.l. Possible threats include competition from nonnative plants, feral pigs, livestock grazing, and military training (CDFW 2022). See Volume 2 for a more detailed discussion.

Suggested common name: discombobulating bushmallow (Morse 2023b). Named after the confusion sown from its morphological similarity to *M. davidsonii*.

Notes. *Malacothamnus discombobulatus* has historically been included in *M. davidsonii*, which it is morphologically very similar to but geographically ~330 km disjunct from. Phylogenetic evidence indicates that these two species are likely not closely related and perhaps an example of convergent evolution (Morse 2023b). Alternatively, these two species could have diverged in the past and geneflow with other species has masked phylogenetic signal of a common origin. See *M. davidsonii* for more information.

There is no clear evidence of naturally occurring hybrids of *Malacothamnus discombobulatus* with any other taxa. It does, however, flower at the same time as and is sympatric with *M. abbottii*, which is the sister species of *M. discombobulatus* in some molecular analyses (Morse 2023b). This indicates there may be or has been geneflow between these species.

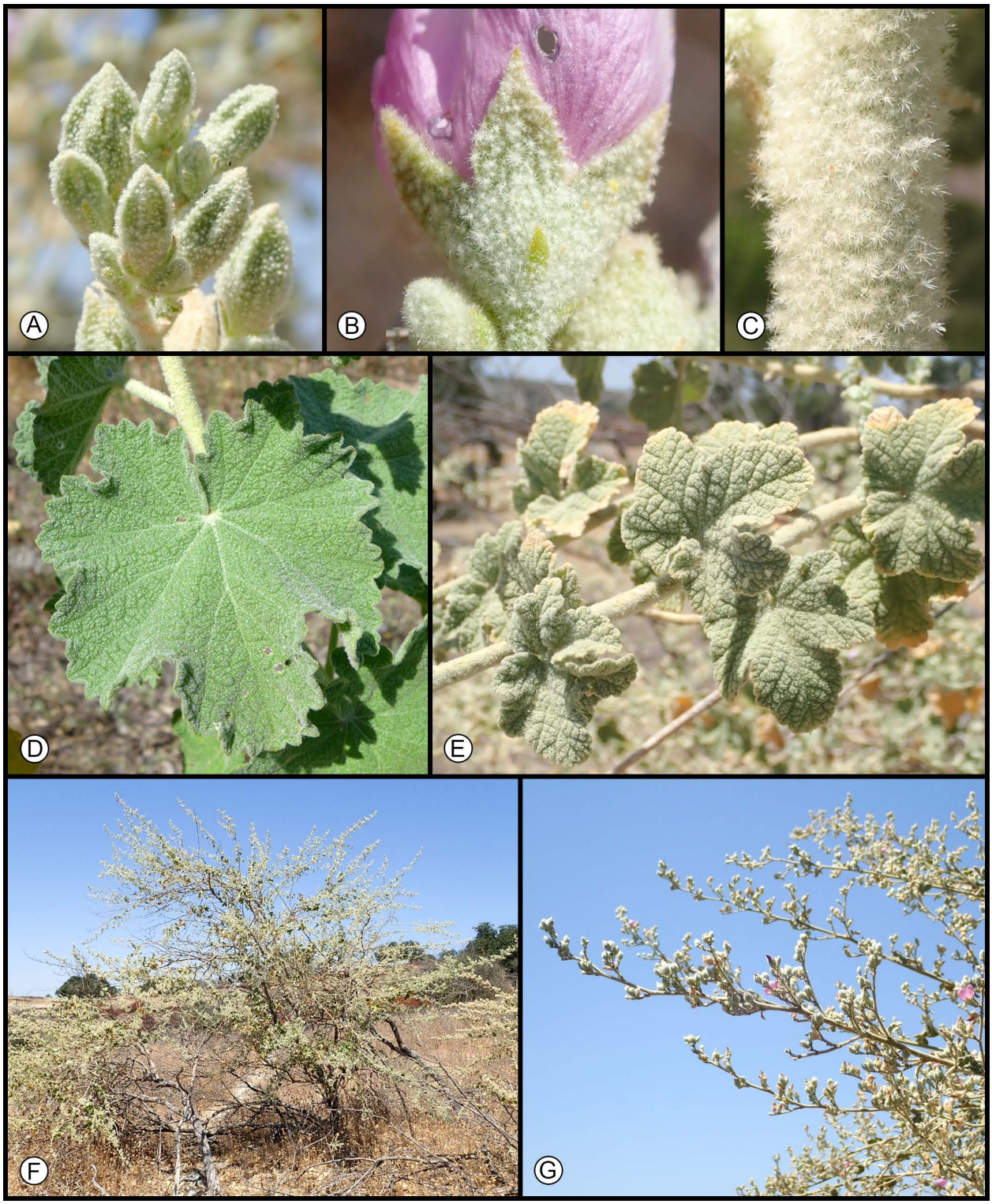

Figure 43. *Malacothamnus discombobulatus* photos. A) Flower buds. B) Calyx and calyx bract. C) Stem. D & E) Some variation in leaves. F) Whole plant. G) Inflorescences.

Figure 44. Holotype of *Malacothamnus discombobulatus.* RSA899224.

9. MALACOTHAMNUS EASTWOODIAE K.Morse, Malacothamnus Volume 2: 61–64. 2023. Type: U.S.A. California: Santa Barbara County: Vandenberg Space Force Base: SW quadrant of Snap Rd. and 15th St., 22 June 1987, *Austin P. Griffiths 18245* (holotype: OBI66675!, isotypes: CDA17924!, DAV222577!, RSA654733!, UCR148802!).

Shrubs up to 3 m tall, spreading by rhizomes. Stems with moderate to dense stellate trichomes, stem surface sometimes visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.4 mm (mean per plant ranges from 0.4–0.8 mm), many with stipes, stipes ≤ 0.6 mm; glandular trichomes on stem ≤ 0.8 mm (mean per plant ranges from 0.1–0.5 mm). Leaf blades ± round to widely ovate, length generally ≥ width, obscurely to moderately 3–7 lobed with lobes rounded to acute, bases cordate, generally bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 1 mm (mean 0.5 mm), many with stipes, stipes ≤ 0.3, abaxial stellate trichome density 1–2x adaxial; glandular trichomes on leaf blade ≤ 0.6 mm (mean per plant 0.1–0.3 mm). Inflorescences spikes of interrupted and loosely flowered glomerules, rarely with more proximal branches and/or pedicels elongated. Stipular bracts linear, subulate, or falcate; 4–7 mm long, 0.5–1.5 mm wide, length 2.5–15x width, calyx bracts linear, 4–11 mm long, 0.3–0.5 mm wide, length 10–28x width, 0.4–0.7x calyx, partially to fully red. Calyx 8.5–15.5 mm long, lobes 5–10 mm long x 2.5–4.5 mm wide, lobe at base 2–4 mm wide, lobe widest at base or up to 2 mm above base, lobe length 1.8–3(3.6)x width, lobes triangular to ovate with acuminate apex, lobe tip often reddish; stellate trichomes on abaxial calyx surface with rays 0.1–2.0 mm (mean per plant ranges from 0.5–0.8 mm), many with stipes, stipes ≤ 0.4; glandular trichomes on abaxial calyx surface 0.1–0.9 mm (mean per plant ranges from 0.3–0.7 mm). Corolla drying closed, petals to ~3.5 cm. Figs. 45 & 46.

Phenology. Peak bloom in May and June, possibly extending into July. A few flowers observed in August after most fruit dropped.

Distribution (Fig. 18). Endemic to Vandenberg Space Force Base in Santa Barbara County, California. 30–125 m. EOO: 4, AOO: 3.

Conservation status. None. *Malacothamnus eastwoodiae* should be considered for a conservation status. Its current known range is the smallest of all *Malacothamnus* taxa recognized in this treatment. Known threats include hybridization with other *Malacothamnus* species and possible competition from nonnative species. Nonnative species may be most problematic when *Malacothamnus* plants are germinating after burns. See Volume 2 for a more detailed discussion.

Suggested common name: Alice's lovely bushmallow (Morse 2023b). Named after Alice Eastwood, who described the most *Malacothamnus* taxa of any author, and her abundant use of the word "lovely" in her *Malacothamnus* treatment.

Notes. *Malacothamnus eastwoodiae* is distinguished from all other taxa, excluding *M. densiflorus* var. *viscidus*, by the combination of relatively long glandular trichomes and a spike-

like inflorescence. See *M. densiflorus* var. *viscidus* for distinguishing characteristics between it and *M. eastwoodiae*.

Only one other *Malacothamnus* taxon (*M. nuttallii*) is known to occur near the range of *M. eastwoodiae*. *Malacothamnus nuttallii* is easily distinguished from *M. eastwoodiae* by generally having a panicle-like inflorescence and having much shorter stellate trichomes (0.1–0.2 mm), whereas *M. eastwoodiae* has a spike-like inflorescence and many stellate trichome rays ≥ 0.5 mm. Morphologically-intermediate plants that appear to be hybrids between these taxa are currently known from only a single location.

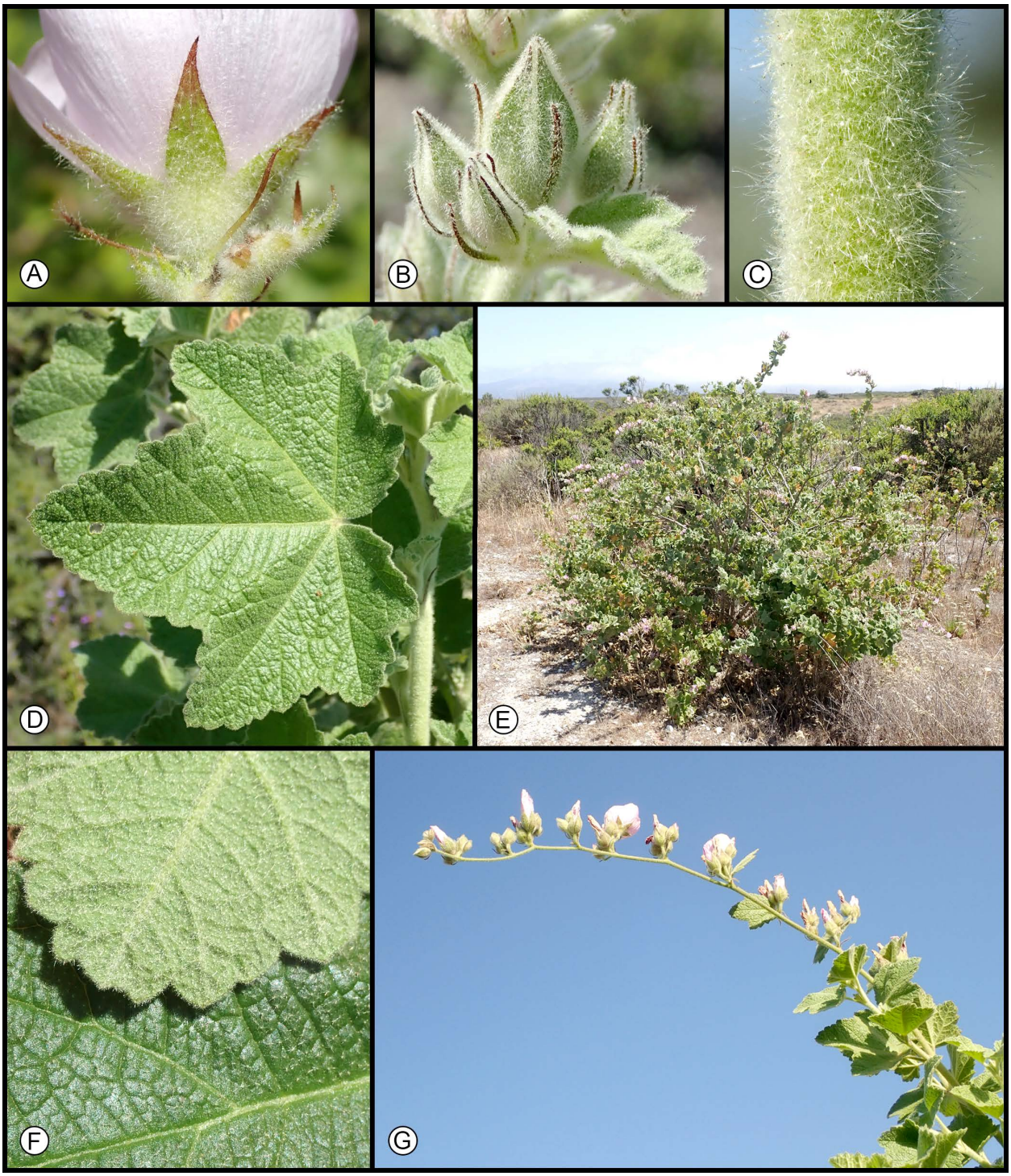

Figure 45. *Malacothamnus eastwoodiae* photos. A) Calyx and calyx bracts in flower. B) Flower buds. C) Stem. D) Adaxial leaf surface. E) Whole plant. F) Abaxial (top) and adaxial (bottom) leaf surfaces. G) Inflorescence.

Figure 46. Holotype of *Malacothamnus eastwoodiae*. OBI66675.

10. MALACOTHAMNUS ENIGMATICUS K.Morse & T.Chester, Madroño 66(3): 113. 2019. TYPE: U.S.A. California: San Diego County: Laguna Mountains, southernmost hill in Garnet Peak vicinity, in sandy soil of disturbed chaparral (fuel break), 32.9098°, -116.4638°, 1650 m, 23 June 1977, *Fred T. Sproul 170* (holotype: SD114895).

Shrubs up to 2 m tall, rarely spreading by rhizomes. Stems with dense stellate trichomes, stem surface not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.5 mm (mean per plant ranges from 0.1–0.2 mm), mostly without stipes, stipes ≤ 0.2 mm; glandular trichomes on stem ≤ 0.1 mm (mean per plant < 0.1 mm). Leaf blades ± round to widely ovate, length generally ≥ width, unlobed or obscurely to moderately 3–7 lobed with lobes rounded to acute, bases truncate to cordate (rarely obtuse), ashy green to bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.4 mm (mean 0.2 mm), mostly without stipes, stipes ≤ 0.2 mm, abaxial stellate trichome density 1–4.5x adaxial, glandular trichomes on leaf blade < 0.1 mm. Inflorescences spikes of interrupted glomerules, occasionally with axillary spikes at proximal nodes of inflorescence. Stipular bracts ovate, linear, falcate, occasionally shallowly to deeply 2+ lobed; 3–11 mm long, (0.5)1–8(12) mm wide, length 1–2(4.5)x width. Calyx bracts linear, 3–13 mm long, 0.3–1.5 mm wide, length 5.5–22x width, 0.6–1.1x calyx, generally green, occasionally partly red. Calyx 6–15 mm long, lobes 3–12 mm long x 2–5 mm wide, lobe at base 2–4 mm wide, lobe widest at base or up to 2.5 mm above base, lobe length 1.3–2.4(3)x width, lobes ovate with acuminate apex; stellate trichomes on abaxial calyx surface with rays 0.1–2.0 mm (mean per plant ranges from 0.1–0.6 mm), mostly without stipes, stipes ≤ 0.3 mm; glandular trichomes on abaxial calyx surface < 0.1–0.3 mm (mean per plant ranges from < 0.1–0.2 mm). Corolla drying closed, petals to ~2 cm. Figs. 47 & 48.

Phenology. Blooming early April to late December, rarely until March. Peak bloom June to August depending on elevation. Later blooms are generally sporadic flowers in the already fruited inflorescence.

Distribution (Figs. 20, 22, & 23). Endemic to the Peninsular Ranges of San Diego County, California and Baja California. 590–1900 m. EOO: 5923, AOO: 60.

Conservation status. None. No specific threats are known at this time.

Suggested common name: enigmatic bushmallow (Morse and Chester 2019).

Notes. *Malacothamnus enigmaticus* as originally described was limited to San Diego County, CA with the protolog noting that it may extend into Baja California, but further research was needed (Morse and Chester 2019). Additional morphological, phylogenetic, and geographic evidence indicates *M. enigmaticus* likely extends well into Baja California, but sampling is poor from Baja California plants that resemble San Diego County *M. enigmaticus* (Morse 2023a, 2023b). Here I tentatively include in *M. enigmaticus* plants from Baja California that both resemble the San Diego County *M. enigmaticus* and form a logical geographic extension

southward from the San Diego County range. Some or all of the Baja California plants could possibly be an undescribed variety of *M. enigmaticus* or an undescribed species.

Malacothamnus enigmaticus is generally distinguished from the rest of the genus based on the combination of very short and dense stellate trichomes, relatively long calyx bracts, and relatively wide stipular bracts. At the northern end of its range, *M. enigmaticus* appears to intergrade with *M. fasciculatus* var. *laxiflorus*. Plants from the Santa Rosa Mountains may be intermediate between these taxa, but evidence is needed to confirm this. Morphological intermediates of *M. enigmaticus* and *M. densiflorus* var. *densiflorus* are known where their ranges meet. These intermediates somewhat resemble *M. densiflorus* var. *densiflorus* but can be distinguished by denser nonglandular trichomes on the abaxial surface of the calyx tube. Little is known of the *M. enigmaticus* plants in Baja California, but several specimens from near the southern end of its range appear to be intermediate between the most southern form of *M. enigmaticus* and other taxa. Additional surveys and increased sampling in Baja California are needed to resolve questions of relationships between all taxa there.

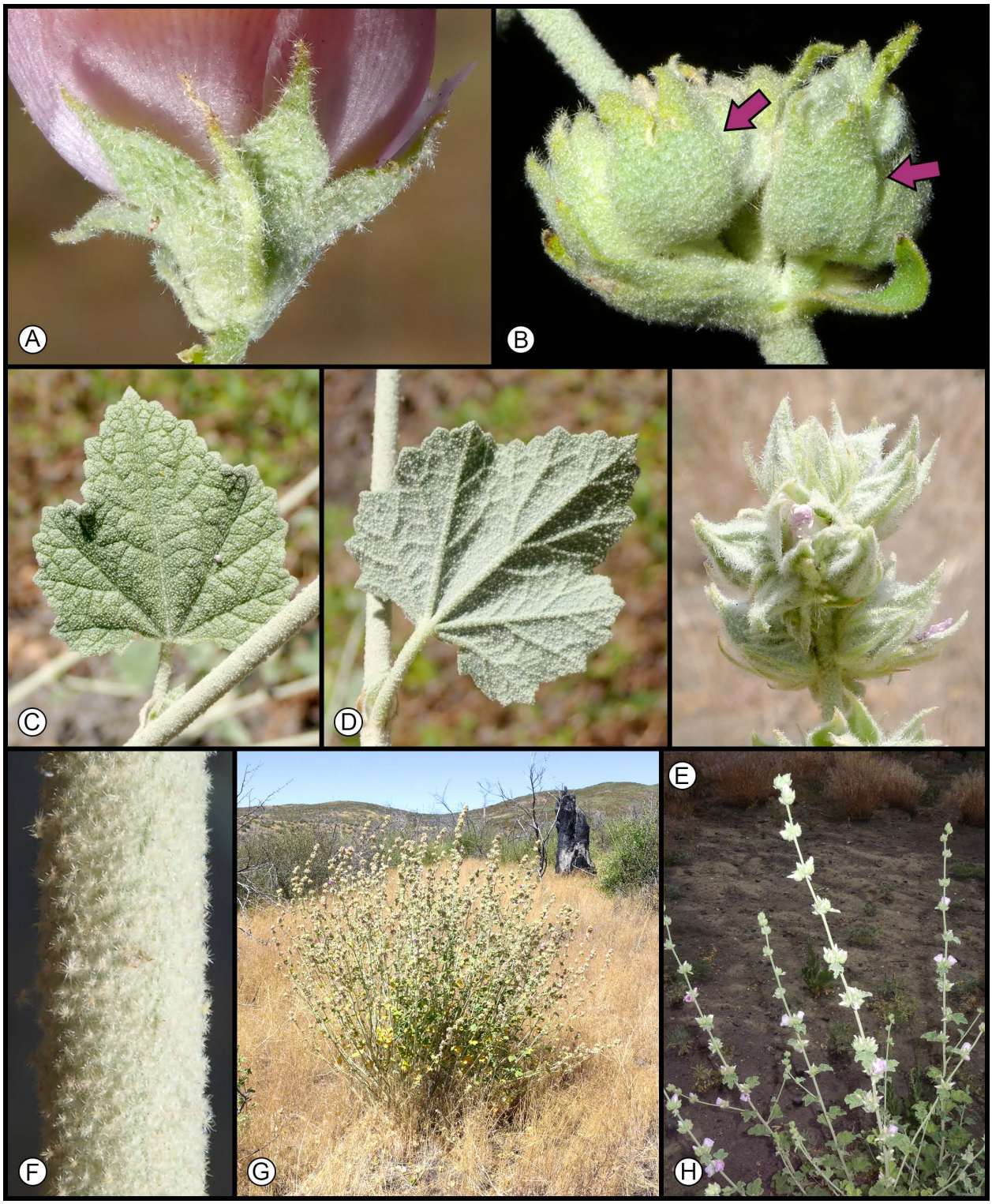

Figure 47. *Malacothamnus enigmaticus* photos. A) Calyx and calyx bracts in flower. B) Stipular bracts. C) Adaxial leaf surface. D) Abaxial leaf surface. E) Buds. F) Stem. G) Whole plant. H) Inflorescence.

Figure 48. Holotype of *Malacothamnus enigmaticus.* SD114895. Image courtesy of San Diego Natural History Museum.

11. MALACOTHAMNUS FASCICULATUS (Nutt. ex Torr. & A.Gray) Greene, Leafl. Bot. Observ. Crit. 1: 208. 1906. *Malva fasciculata* Nutt. ex Torr. & A.Gray, Fl. N. Amer. (Torr. & A. Gray) 1(2): 225. 1838. *Malvastrum fasciculatum* (Nutt. ex Torr. & A.Gray) Greene, Fl. Francisc. pt. 1: 108. 1891. *Malveopsis fasciculata* (Nutt. ex Torr. & A.Gray) Kuntze, Revis. Gen. Pl. 1: 72. 1891. *Sphaeralcea fasciculata* (Nutt. ex Torr. & A.Gray) Arthur, Torreya 21(1): 11. 1921. TYPE: U.S.A. California: Santa Barbara [location likely erroneous, see distribution of *M. fasciculatus* var. *fasciculatus*], no date on specimen, *T. Nuttall s.n.* (lectotype designated by Fryxell, 1988: NY00221803!, isolectotypes: K000659252 [photo!], GH00052895 [photo!], possible isolectotype: PH00016973 [photo!, ID on original label different from the other three specimens]).

Shrubs up to 6 m tall, occasionally spreading by rhizomes. Stems with dense stellate trichomes, stem surface generally not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.0 mm, mostly without stipes, stipes ≤ 0.4 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round to widely ovate; length generally ≥ width; unlobed or obscurely to moderately 3–7 lobed with lobes rounded, acute, or acuminate; bases truncate to cordate; generally bright green adaxially (occasionally ashy), somewhat to much paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.6 mm, mostly without stipes, stipes ≤ 0.2 mm, abaxial stellate trichome density 1–8x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence spike-like to panicle-like. Stipular bracts triangular to narrowly triangular or ovate, occasionally shallowly to deeply 2-lobed, 1–6 mm long,0.5–2.5(4) mm wide, length 0.5–6(10)x width. Calyx bracts linear to subulate, 1–6 mm long, 0.2–1.0 mm wide, length 2–20x width, 0.1–0.8x calyx, green to red. Calyx 4.5–9.5 mm long, lobes 2.5–5 mm long x 2–4 mm wide, lobe at base 2–4 mm wide, lobe widest at base or up to 1.5 mm above base, lobe length 0.8–2.3x width, lobes ovate to widely ovate or triangular, apex acute to acuminate; stellate trichomes on abaxial calyx surface with rays 0.1–1.4 mm, mostly without stipes, stipes ≤ 0.3 mm; glandular trichomes on abaxial calyx surface < 0.1–0.1 mm (mean per plant < 0.1 mm). Corolla drying closed, petals to ~2 cm.

Notes. I recognize four varieties of *Malacothamnus fasciculatus*. *Malacothamnus fasciculatus* var. *catalinensis* and *M. fasciculatus* var. *nesioticus* are both island endemics that are monophyletic in phylogenetic analyses (Morse 2023b). They are, however, often embedded in a clade including western plants of *M. fasciculatus* var. *laxiflorus*. These western plants of *M. fasciculatus* var. *laxiflorus* are geographically adjacent to and appear to morphologically intergrade with *M. fasciculatus* var. *fasciculatus* and eastern plants of *M. fasciculatus* var. *laxiflorus*, which phylogenetic analyses indicate may be more closely related to other species than the other varieties of *M. fasciculatus*. As geneflow between taxa in southern California and Baja California may have somewhat confounded the phylogenetic analyses, I take a conservative approach and retain these four taxa as varieties of *M. fasciculatus* until a future researcher can resolve the relationships both within the species and relative to other species.

Malacothamnus fasciculatus as a whole is generally distinguished from the rest of the genus by having the combination of relatively short calyx bracts, relatively short stellate trichome rays, generally cordate leaf bases, and leaves that are generally much greener adaxially than abaxially due to sparser trichomes.

Ignoring their mostly distinct geographic ranges, distinguishing the varieties of *Malacothamnus fasciculatus* is sometimes difficult based on morphological characters. Varieties *fasciculatus* and *catalinensis* tend to have longer stellate trichome rays than varieties *laxiflorus* and *nesioticus*. Varieties *catalinensis*, *nesioticus*, and sometimes *laxiflorus* tend to have more distinct leaf lobing than var. *fasciculatus*. Variety *nesioticus* has panicle-like inflorescences. Panicle-like inflorescences are rare in var. *catalinensis* and only in aberrant plants and hybrids of var. *fasciculatus*, each of which generally have spike-like inflorescences, sometimes with proximal axillary spikes. Both spike-like and panicle-like inflorescences are commonly found in var. *laxiflorus*.

11a. MALACOTHAMNUS FASCICULATUS var. **FASCICULATUS**.

Malvastrum thurberi A.Gray, Pl. Nov. Thurb. 307. 1854. TYPE: MEXICO: Sonora: Santa Cruz Valley [possibly in what is now Arizona, see Figure 15], July 1852, *G. Thurber 709* (lectotype designated by Kearney, 1951: GH00052911!, isolectotypes: BRU00073938 [photo!], F306264 [photo!], F494436 [photo!, fragment], GH00052912!, K000528412 [photo!], NY00221841 [photo!], NY00221842 [photo!]).

Shrubs up to 3 m tall, occasionally spreading by rhizomes. Stems with dense stellate trichomes, stem surface generally not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.0 mm (mean per plant ranges from 0.1–0.4 mm), mostly without stipes, stipes ≤ 0.4 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round to widely ovate, length generally ≥ width, unlobed or obscurely to moderately 3–5 lobed with lobes generally rounded, occasionally acute to acuminate, bases truncate to cordate, rarely obtuse to cuneate, generally bright green adaxially (occasionally ashy), paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.6 mm (mostly 0.2-0.3 mm), mostly without stipes, stipes ≤ 0.2 mm, abaxial stellate trichome density 1–3x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescences spikes of interrupted glomerules, occasionally with axillary spikes at proximal nodes of inflorescence. Stipular bracts triangular to narrowly triangular or ovate, occasionally shallowly to deeply 2-lobed, 1–6 mm long,0.5–2.5(4) mm wide, length 0.5–6(10)x width. Calyx bracts linear to subulate, 2–5 mm long, 0.3–0.7 mm wide, length 4–16.5x width,0.3–0.8x calyx, green to red. Calyx 5.5–8.5 mm long, lobes 2.5–4.5 mm long x 2–3.5 mm wide, lobe at base 2–3 mm wide, lobe widest at base or up to 1.5 mm above base, lobe length 0.8–1.8x width, lobes ovate to widely ovate or triangular, apex acute to acuminate; stellate trichomes on abaxial calyx surface with rays 0.1–1.4 mm (mean per plant ranges from 0.1–0.4 mm), mostly without stipes, stipes ≤ 0.3 mm; glandular trichomes on abaxial calyx surface < 0.1 mm. Corolla drying closed, petals to ~2 cm. Figs. 49 & 50.

Phenology. Primarily blooming March to July with peak April to June. Sporadic flowers documented in all other months.

Distribution (Figs. 20, 22, & 23). Likely endemic to areas within ~40 km of the Pacific Ocean in San Diego County, California and Baja California. Possibly also occurs near the border of Arizona and Sonora, Mexico. 0–715 m. EOO: 16763, AOO: 517.

The purported type locality of Santa Barbara County is very likely an error based the large availability of specimens and photographic observations from San Diego County to Santa Barbara County. The only plants in Santa Barbara County that resemble *Malacothamnus fasciculatus* var. *fasciculatus* appear to be introduced *M. fasciculatus* var. *laxiflorus*, likely from a restoration planting sourced from Orange County (Morse 2023b). Phylogenetic evidence from the type collection would likely be needed to confirm its origin. Thomas Nuttall, who collected the type specimen, visited both Santa Barbara and San Diego on the same trip, which allows for the possibility that he made a mistake when labelling the specimen (Coville 1889).

Conservation status. None. Much of the northern part of the range of *Malacothamnus fasciculatus* var. *fasciculatus* in San Diego County has been developed but it seems to persist as a relatively common taxon in the remaining undeveloped areas of its range there. The southern part of its range is much less developed.

Suggested common name: southern coastal bushmallow. Additional common names: false mallow (Parsons and Buck 1902; Armstrong and Thornber 1915), mesa mallow (Jepson 1936), bush globemallow and mesa globemallow (McMinn and Schumacher 1939), mesa malvastrum (Abrams 1951), mesa bushmallow (Beauchamp 1986), chaparral mallow (Bates 1993; Matthews 1997; Slotta 2012), coastal bushmallow (Lightner 2011), chaparral bushmallow (Bates 2015b). Common names with the word “chaparral” are probably best avoided as all *Malacothamnus* species grow in chaparral. I follow Lightner (2011) in using coastal bushmallow as the common name but add “southern” to disambiguate it from more northern coastal bushmallows.

Notes. Based on morphological analyses, I include *Malvastrum thurberi* within *Malacothamnus fasciculatus* var. *fasciculatus*. The purported type locality of *Malvastrum thurberi* is near the border of Arizona and Mexico, which is geographically disjunct from the rest of the genus. It has only been collected once in that area in 1852. As *M. orbiculatus* also has disjunct populations in Arizona, it is plausible that *M. fasciculatus* var. *fasciculatus* was once more widespread to the east of where it is currently known from. If additional plants from near the type locality of *Malvastrum thurberi* are ever found, *Malvastrum thurberi* should be reassessed. Including DNA from one of the type specimens of *Malvastrum thurberi* in future phylogenetic analyses may also prove informative.

Morphological intermediates of *Malacothamnus fasciculatus* var. *fasciculatus* are known where its range is adjacent to *M. fasciculatus* var. *laxiflorus*, *M. densiflorus* var. *densiflorus*, and *M. foliosus*. Intermediates with *M. fasciculatus* var. *laxiflorus* may be impossible to distinguish

morphologically as they perhaps form a morphological continuum. Population-level phylogenetic analyses could possibly clarify this. Intermediates with *M. densiflorus* var. *densiflorus* that more closely resemble *M. fasciculatus* are in geographically intermediate areas and tend to have longer and/or sparser stellate trichomes and/or longer calyx bracts than *M. fasciculatus*. See also *M. densiflorus* var. *densiflorus*. Intermediates with *M. foliosus* tend to resemble *M. fasciculatus* var. *fasciculatus* but with panicle-like inflorescences and/or relatively sparse stellate trichomes.

11b. MALACOTHAMNUS FASCICULATUS var. **CATALINENSIS** (Eastw.) Kearney, Leafl. W. Bot. 6: 138. 1951.
Malvastrum catalinense Eastw., Leafl. W. Bot. 1(18): 215. 1936. *Malvastrum fasciculatum* var. *catalinense* (Eastw.) McMinn, Man. Calif. Shrubs 348. 1939. *Malacothamnus fasciculatus* subsp. *catalinensis* (Eastw.) Thorne, Aliso 6: 55. 1967. TYPE: U.S.A. California: Santa Catalina Island, [near Avalon], 20-25 July 1917, *A. Eastwood 6442* (lectotype designated by Fryxell, 1988: CAS52692!, syntype: CAS52693 [photo!]).

Shrubs up to 4 m tall, occasionally spreading by rhizomes. Stems with dense stellate trichomes, stem surface not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.7 mm (mean per plant ranges from 0.1–0.3 mm), mostly without stipes, stipes ≤ 0.1 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round to widely ovate, length generally ≥ width, moderately 3-7 lobed with lobes generally acute, occasionally somewhat rounded, bases cordate, generally bright green adaxially (occasionally ashy), somewhat to much paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.6 mm (mean 0.2 mm) and without stipes, abaxial stellate trichome density 2–8x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence generally a spike of ± interrupted glomerules, rarely a narrow to wide panicle. Stipular bracts triangular to narrowly triangular, 2–5 mm long, 0.5–3.5 mm wide, length 1–6x width. Calyx bracts linear to subulate, 2.5–6 mm long, 0.2–1.0 mm wide, length 5.5–20x width, 0.3–0.7x calyx, red with or without green. Calyx 6–8.5 mm long, lobes 2.5–4.5 mm long x 2.5–3.5 mm wide, lobe at base 2.5–3.5 mm wide, lobe widest at base or up to 1 mm above base, lobe length 0.9–1.5x width, lobes ovate to widely ovate or triangular, apex acute to acuminate; stellate trichomes on abaxial calyx surface with rays 0.1–1.1 mm (mean per plant ranges from 0.1–0.4 mm), mostly without stipes, stipes ≤ 0.1 mm; glandular trichomes on abaxial calyx surface < 0.1 mm. Corolla drying closed, petals to ~2 cm. Figs. 51 & 52.

Phenology. Blooming March to September with peak bloom April to June.

Distribution (Fig. 20). Endemic to Santa Catalina Island, California. 0–505 m. EOO: 194, AOO: 49.

Conservation status. CRPR 4.2. Possibly threatened by fire suppression and nonnative herbivores such as bison and mule deer (CNPS 2023).

Suggested common name: Santa Catalina Island bushmallow (Slotta 2012)

Notes. There is no evidence of naturally occurring hybrids of *Malacothamnus fasciculatus* var. *catalinensis* with any other taxa, though phylogenetic evidence indicates possible past geneflow with *M. fasciculatus* var. *laxiflorus* and/or *M. fasciculatus* var. *nesioticus* (Morse 2023b).

11c. MALACOTHAMNUS FASCICULATUS var. **LAXIFLORUS** (A.Gray) Kearney, Leafl. W. Bot. 6: 137. 1951. *Malvastrum splendidum* Kellogg, Proc. Calif. Acad. Sci. 1: 65. 1855. *Malvastrum thurberi* var. *laxiflorum* A.Gray [homotypic with *Malvastrum splendidum* Kellogg], Proc. Amer. Acad. Arts 22: 291. 1887. *Malveopsis splendida* (Kellogg) Kuntze, Revis. Gen. Pl. 1: 72. 1891. *Malacothamnus fasciculatus* var. *splendidus* (Kellogg) Abrams, Bull. New York Bot. Gard. 6: 417. 1910, nom. superfl. *Malvastrum laxiflorum* (A.Gray) Davidson & Moxley, Fl. S. Calif. (Davidson & Moxley) 233. 1923, nom. superfl. *Malvastrum fasciculatum* var. *laxiflorum* (A.Gray) Munz & I.M.Johnst., Bull. Torrey Bot. Club 51: 296. 1924. *Sphaeralcea fasciculata* var. *laxiflora* (A.Gray) Jeps., Man. Fl. Pl. Calif. [Jepson] 634. 1925. *Malvastrum laxiflorum* (A.Gray) Eastw., Leafl. W. Bot. 1(18): 217. 1936, nom. superfl. *Malacothamnus fasciculatus* subsp. *laxiflorus* (A.Gray) Thorne, Aliso 9: 193. 1978. TYPE: U.S.A. California: near Los Angeles, 1855 or earlier, *W. A. Wallace s.n.?* (specimen lost since at least the late 1800s, illustration by A. Kellogg mentioned in protolog apparently lost as well). NEOTYPE: U.S.A. California: Los Angeles County, Santa Monica Mountains, Mulholland Hwy, 0.4 mi. E of Malibu Lake, 28 May 1961, *D. M. Bates 2493* (neotype designated by Fryxell, 1988: LA47326 [photo!]).

Malvastrum parishii Eastw., Leafl. W. Bot. 1: 216. 1936. *Malacothamnus parishii* (Eastw.) Kearney, Leafl. W. Bot. 6: 136. 1951. TYPE: U.S.A. California: San Bernardino County, vicinity of San Bernardino, alt. 1000–1500 ft., 20 July 1895, *S. B. Parish 3804* (Holotype: CAS52756!, isotypes: GH420468!, NDG30893 [photo!], P02286284 [photo!], UC18789).

Shrubs up to 6 m tall, occasionally spreading by rhizomes. Stems with dense stellate trichomes, stem surface not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.4 mm (mean per plant ranges from 0.1–0.2 mm), mostly without stipes, stipes ≤ 0.2 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round to widely ovate, length generally ≥ width, unlobed or obscurely to moderately 3–5 lobed with lobes rounded, acute, or acuminate, bases truncate to cordate, rarely obtuse, generally bright green adaxially (occasionally ashy), paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.4 mm (mostly 0.1-0.2 mm), mostly without stipes, stipes ≤ 0.1 mm, abaxial stellate trichome density 1–6x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence spike-like to panicle-like. Stipular bracts triangular to narrowly triangular or ovate, occasionally shallowly to deeply 2-lobed, 1–4 mm long, 0.5–2 mm wide, length 1–3(5)x width. Calyx bracts linear to subulate, 1–4 mm long, 0.2–0.8 mm wide, length 2–11.5x width, 0.1–0.5x calyx, green to partially red. Calyx 4.5–10 mm long, lobes 2.5–5.5 mm long x 2–4 mm wide, lobe at base 2–4 mm wide, lobe widest at base or up to 1.5 mm above base, lobe length 0.8–2.3x width, lobes ovate to widely ovate or triangular, apex acute to acuminate; stellate trichomes on abaxial calyx surface with

rays 0.1–0.5 mm (mean per plant ranges from 0.1–0.2 mm), mostly without stipes, stipes ≤ 0.2 mm; glandular trichomes on abaxial calyx surface < 0.1–0.1 mm (mean per plant < 0.1 mm). Corolla drying closed, petals to ~2 cm. Figs. 53–55.

Phenology. Primarily blooming March to July with peak April to June. Sporadic flowers documented in all other months.

Distribution (Figs. 20–22). Endemic to southern portions of the Transverse Ranges of California east of Oxnard and extending southward to near the San Diego County border. 0–2640 m. Plants near Lake Casitas in Ventura County likely introduced from plants originally sourced in or near Orange County based on DNA evidence (Morse 2023b). Possibly introduced in restoration plantings in San Diego County. EOO: 18896, AOO: 822.

Conservation status. None. While much of its range is developed, *Malacothamnus fasciculatus* var. *laxiflorus* is still common throughout its range in undeveloped areas. It has the highest AOO of all *Malacothamnus* taxa.

Suggested common name: splendid bushmallow. Additional common names: lax-flowered bushmallow (Beauchamp 1986). The name lax-flowered bushmallow, while helpful in remembering the variety *laxiflorus*, doesn't accurately describe the taxon and could cause misidentifications. I suggest splendid bushmallow as a common name that shouldn't cause confusion and ties it to the type specimen, the protolog of which notes its "splendid waving spikes" of flowers (Kellogg 1855). If *Malacothamnus fasciculatus* var. *laxiflorus* were recognized at the species rank, it would be *M. splendidus.*

Notes. Exactly what is *Malacothamnus fasciculatus* var. *laxiflorus* and its various synonyms has caused much confusion in the past as the type specimen was apparently lost early or never preserved. There was an illustration mentioned in the protolog as well, which may or may not have been preserved and is presumed lost or perhaps was destroyed in the 1906 San Francisco earthquake and fire. Davidson (1896) thought that he had finally figured out the mystery of *Malvastrum splendidum* when he discovered what would be later described as *M. davidsonii*. Botanists were so confused that Eastwood (1936a) even differentiated the homotypic *Malvastrum splendidum* and *Malvastrum laxiflorum* in her treatment. To resolve the issues, Bates (1963) suggested and Fryxell (1988) published a neotypification clarifying what should be called *M. fasciculatus* var. *laxiflorus.*

While *Malacothamnus fasciculatus* var. *laxiflorus* appears to be morphologically and geographically cohesive, phylogenetic analyses indicate a clade of more eastern plants could possibly be a separate species and more western plants could possibly be intermediate between these and the rest of *M. fasciculatus*. As the type locality of *M. fasciculatus* var. *laxiflorus* is in the western portion of the range, if the eastern plants were recognized as a separate taxon, they would possibly need a new name. Confounding this is *M. parishii*, which occurs within the range of the eastern plants of *M. fasciculatus* var. *laxiflorus*. *Malacothamnus parishii* is a presumed extinct species that I am tentatively treating as an extreme form of *M.*

fasciculatus var. *laxiflorus*. Population-level phylogenetic analyses of all of *M. fasciculatus* varieties plus *M. parishii*, and possibly other species, are likely needed to resolve these questions. If *M. parishii* and the eastern *M. fasciculatus* var. *laxiflorus* are not distinct from each other but distinct enough from western *M. fasciculatus* var. *laxiflorus* to recognize as a separate taxon, the name *M. parishii* would have taxonomic priority for the eastern clade of *M. fasciculatus* var. *laxiflorus*.

Malacothamnus fasciculatus var. *laxiflorus* appears to have morphological and geographic intermediates with *M. fasciculatus* var. *fasciculatus*, *M. densiflorus* var. *densiflorus*, *M. enigmaticus*, *M. orbiculatus*, and maybe *M. marrubioides* and/or *M. nuttallii*. All potential intermediates are in the transition zones between taxa and appear at least somewhat morphologically intermediate.

11d. MALACOTHAMNUS FASCICULATUS var. **NESIOTICUS** (B.L.Rob.) Kearney, Leafl. W. Bot. 6: 139. 1951.
Malvastrum nesioticum B.L.Rob., in A. Gray, Syn. Fl. N. Amer. 1(1): 312. 1897. *Malacothamnus nesioticus* (B.L.Rob.) Abrams, Bull. New York Bot. Gard. 6: 419. 1910. *Sphaeralcea nesiotica* (B.L.Rob.) Jeps., Man. Fl. Pl. Calif. [Jepson] 634. 1925. *Sphaeralcea fasciculata* var. *nesiotica* (B.L.Rob.) Jeps., Fl. Calif. [Jepson] 2: 501. 1936. *Malvastrum fasciculatum* var. *nesioticum* (B.L.Rob.) McMinn, Man. Calif. Shrubs 348. 1939. TYPE: U.S.A. California: Santa Cruz Island, July and August 1886, *E. L. Greene s.n.* (lectotype designated by Kearney, 1951: GH00052907!, isolectotypes: CAS743 [photo!], NDG31158 [photo!], NDG31160 [photo!], possible isolectotype: NDG31159 [photo!, no collection information on specimen], syntypes: CAS191723, DS31552, JEPS26397, UC168556!, possible syntype: POM48384! [photo of GH00052907 with fragment possibly from Brandegee 1888]).

Shrubs up to 3 m tall, spreading by rhizomes. Stems with dense stellate trichomes, stem surface not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.8 mm (mean per plant ranges from 0.1–0.3 mm), without stipes; glandular trichomes on stem < 0.1 mm. Leaf blades ± round to widely ovate, length generally ≥ width, obscurely to moderately 3–5 lobed with lobes rounded to acute or acuminate, bases truncate to cordate, generally bright green adaxially (occasionally ashy or reddish), somewhat to much paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.4 mm (mean 0.1 mm) and without stipes, abaxial stellate trichome density 2–7x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence panicle-like. Stipular bracts triangular to narrowly triangular,1–5 mm long, 0.5–2 mm wide, length 1.5–3.5x width. Calyx bracts linear to subulate, 1.5–4 mm long, 0.3–0.6 mm wide, length 3–11.5x width, 0.2–0.5x calyx, red with or without green. Calyx 6.5–9 mm long, lobes 3–4.5 mm long x 2.5–3.5 mm wide, lobe at base 2.5–3.5 mm wide, lobe widest at base, lobe length 0.9–1.5x width, lobes ovate to widely ovate or triangular, apex acute to acuminate; stellate trichomes on abaxial calyx surface with rays 0.1–0.6 mm (mean per plant ranges from 0.1–0.2 mm), mostly without stipes, stipes ≤ 0.1 mm; glandular trichomes on abaxial calyx surface < 0.1 mm. Corolla drying closed, petals to ~2 cm. Figs. 56 & 57.

Phenology. Blooming April to July with peak bloom in April and May.

Distribution (Fig. 20). Endemic to Santa Cruz Island, California. 0–250 m. EOO: 71, AOO: 7.

Conservation status. CRPR 1B.1, California Endangered, Federally Endangered. *Malacothamnus fasciculatus* var. *nesioticus* is known only from six natural populations on Santa Cruz Island (USFWS 2021). Additionally, seventeen outplanting sites have been established on the island incorporating plants from multiple natural populations. The most recent five-year review lists extirpation or extinction due to small population sizes, competition with non-native plants, and the potential effects of climate change as the primary threats to the species. The current small population sizes may just reflect a lack of recent fires as most or all *Malacothamnus* taxa germinate abundantly after fire. As such, any suppression of naturally occurring fires on the island should be considered a threat. Adequately assessing *Malacothamnus* abundance is best done in the first few years post-fire before plants start dying and populations return to dormancy in the soil seed bank. In lieu of using prescribed burns or waiting until areas of the island burn naturally, assessments of the abundance of *Malacothamnus* seed in the soil seed bank around known populations of *M. fasciculatus* var. *nesioticus* relative to populations of other *Malacothamnus* taxa could possibly be used in determining whether *M. fasciculatus* var. *nesioticus* is indeed as rare as currently suspected. Likewise, assessments of the soil seed bank where populations aren't currently known may reveal populations currently dormant in the soil seed bank. The feasibility of such an assessment would be best tested on more common taxa.

Suggested common name: Santa Cruz Island bushmallow (Powell 1974; Slotta 2012). Additional common names: insular malvastrum (Abrams 1951)

Notes. When visiting Santa Cruz Island, I got the impression that plants of *Malacothamnus fasciculatus* var. *nesioticus* may be more rounded in shape than the other varieties. Whether this is true, how consistent it is, and whether it is merely a result of the environmental conditions where the plants are growing needs to be assessed.

There is no evidence of naturally occurring hybrids of *Malacothamnus fasciculatus* var. *nesioticus* with any other taxa, though phylogenetic evidence indicates possible past geneflow with *M. fasciculatus* var. *laxiflorus* and/or *M. fasciculatus* var. *catalinensis* (Morse 2023b).

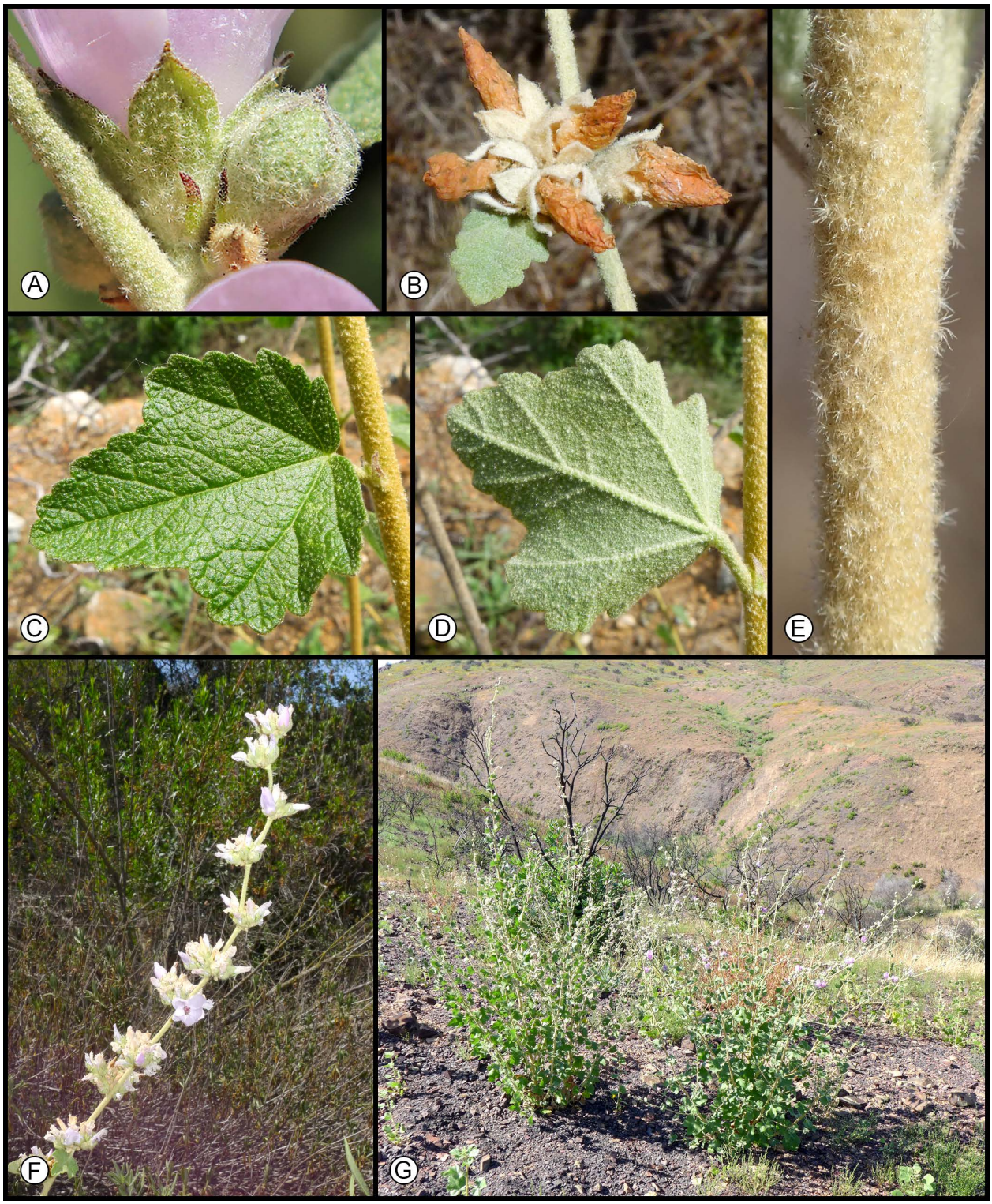

Figure 49. *Malacothamnus fasciculatus* var. *fasciculatus* photos. A) Calyx and calyx bracts in flower and bud. B) Flowers in fruit. C) Adaxial leaf surface. D) Abaxial leaf surface. E) Stem. F) Inflorescence. G) Whole plant. Photo A by Millie Basden (CC-BY).

Figure 50. Lectotype of *Malacothamnus fasciculatus* (rightmost stem). NY00221803. Image courtesy of New York Botanic Garden.

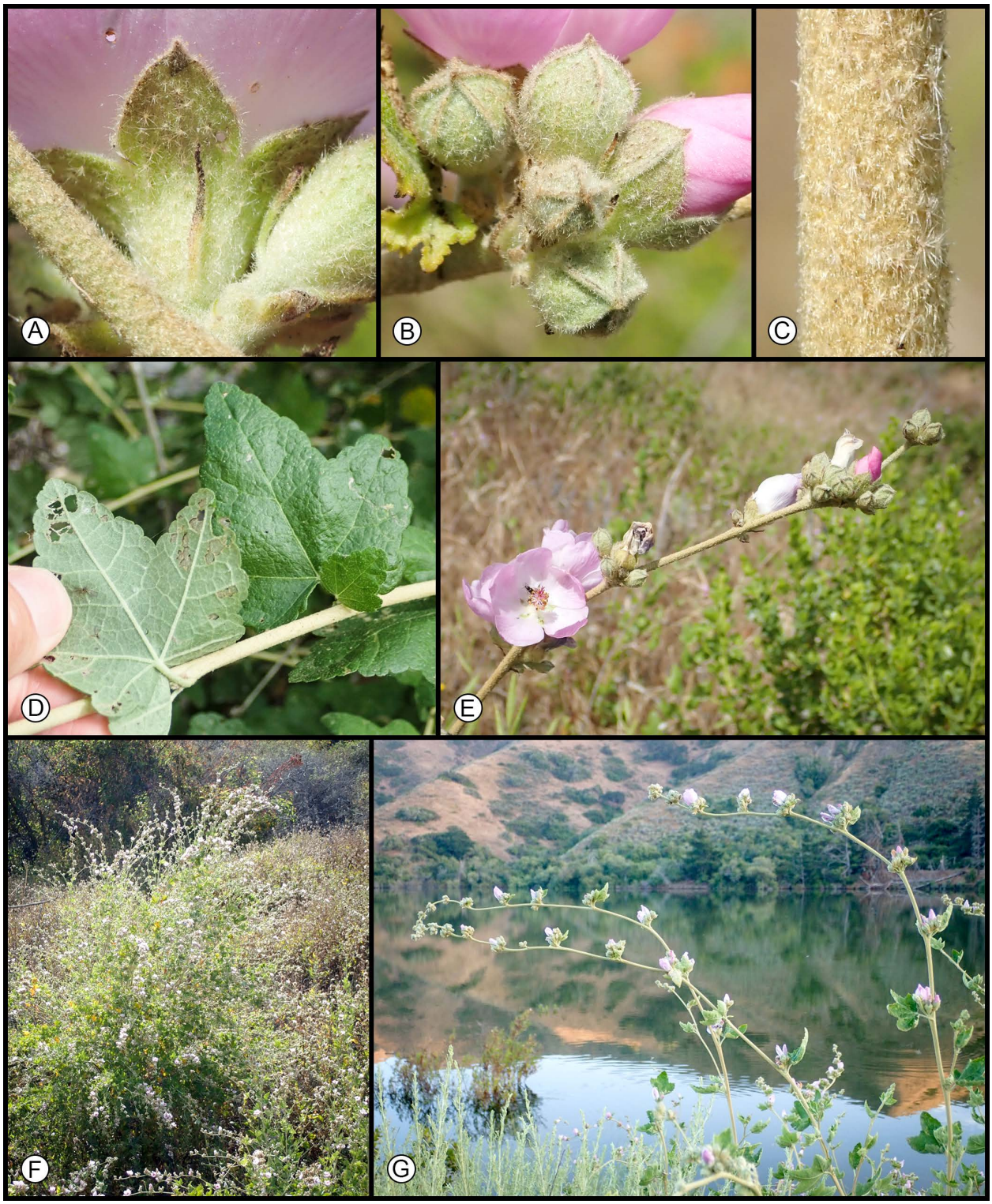

Figure 51. *Malacothamnus fasciculatus* var. *catalinensis* photos. A) Calyx and calyx bracts in flower. B) Flowers in bud. C) Stem. D) Abaxial (left) and adaxial (right) leaf surfaces. E) Part of inflorescence. F) Whole plant. G) Inflorescences.

Figure 52. Lectotype of *Malacothamnus fasciculatus* var. *catalinensis*. CAS52692. Image courtesy of California Academy of Sciences.

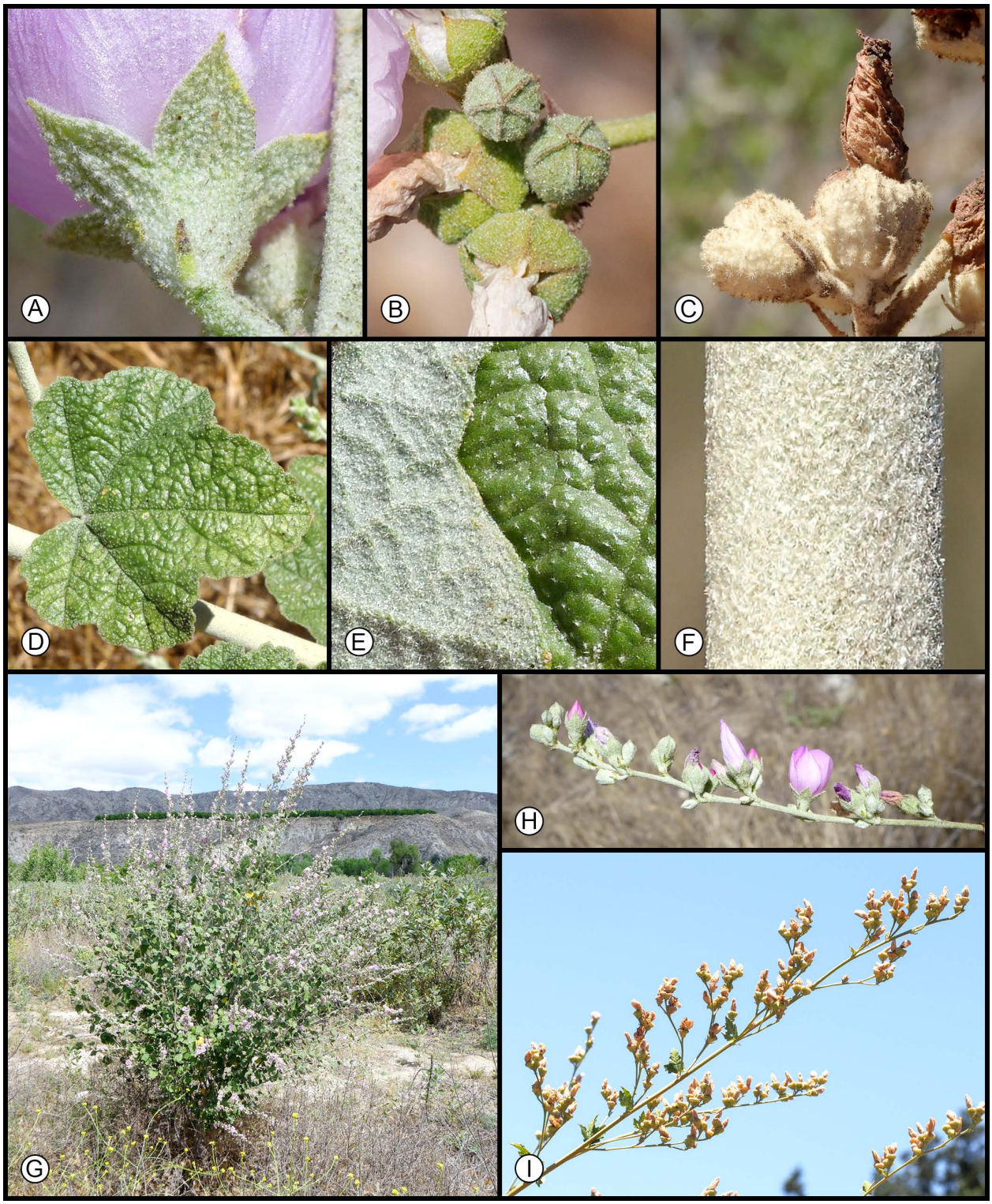

Figure 53. *Malacothamnus fasciculatus* var. *laxiflorus* photos. A) Calyx and calyx bracts in flower. B) Flowers in bud and fruit. C) Flowers in fruit. D) Adaxial leaf surface. E) Abaxial (left) and adaxial (right) leaf surfaces. F) Stem. G) Whole plant. H) Spike-like inflorescence. I) Panicle-like inflorescence.

Figure 54. Neotype of *Malacothamnus fasciculatus* var. *laxiflorus*. LA47326. Image courtesy of University of California, Los Angeles.

Figure 55. Holotype of *Malacothamnus parishii* recognized as a synonym of *M. fasciculatus* var. *laxiflorus* in this treatment. CAS52756. Image courtesy of California Academy of Sciences.

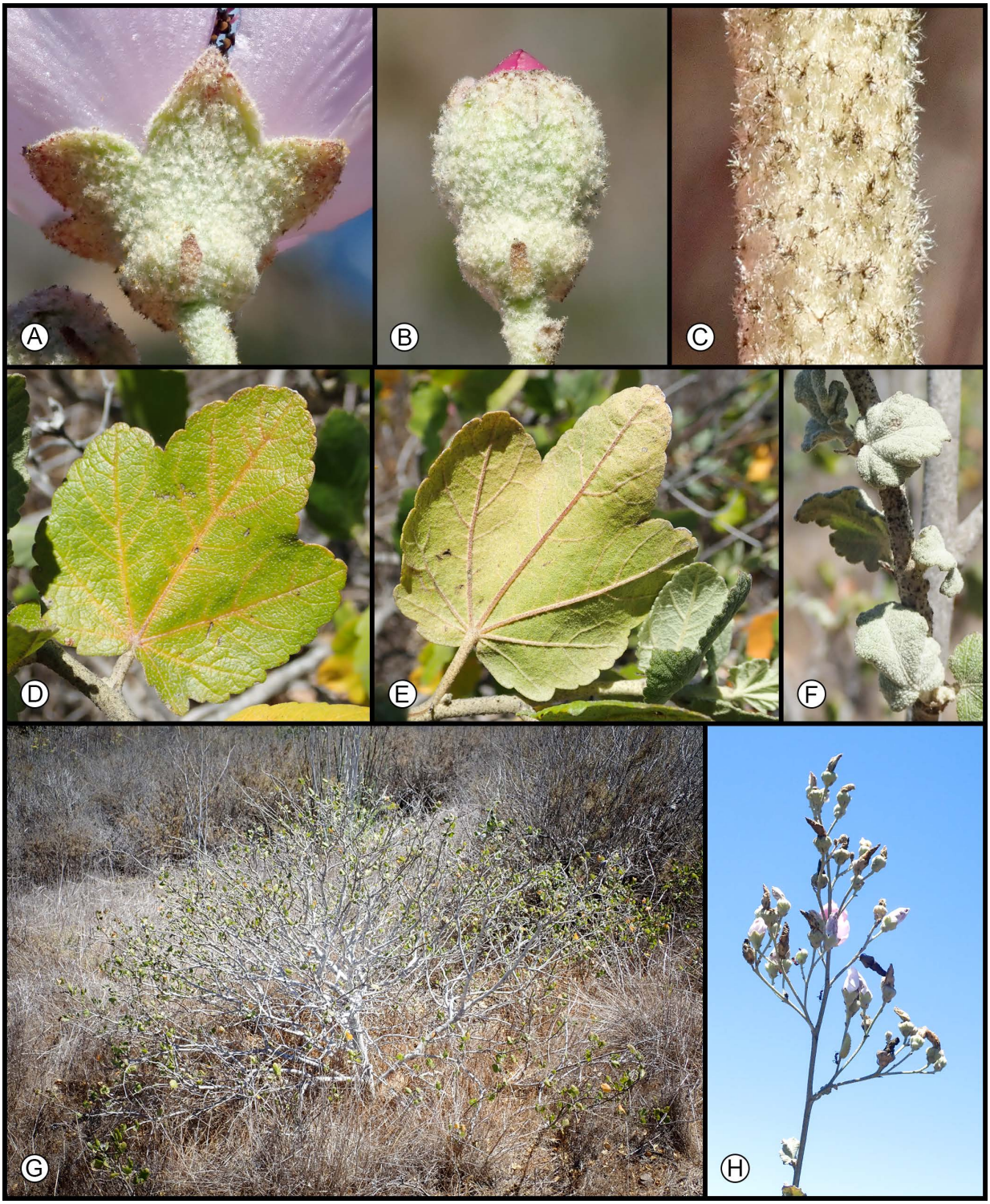

Figure 56. *Malacothamnus fasciculatus* var. *nesioticus* photos. A) Calyx and calyx bracts in flower. B) Flower in bud. C) Stem. D) Adaxial leaf surface. E) Abaxial leaf surface. F) Smaller summer leaves. G) Whole plant. H) Inflorescence.

Figure 57. Lectotype of *Malacothamnus fasciculatus* var. *nesioticus*. GH00052907. Image courtesy of Harvard University Herbaria.

12. MALACOTHAMNUS FOLIOSUS (S.Watson) Kearney, Leafl. W. Bot. 6: 122. 1951. *Malvastrum foliosum* S.Watson, Proc. Amer. Acad. Arts 20: 356. 1885. TYPE: MEXICO Baja California: Santo Thomas, September 1884, *C. R. Orcutt s.n.* (Holotype: GH00052896!, isotypes: CAS358449 [fragment, photo!], UC109091!, US47888 [photo!]).

Malvastrum marrubioides var. *paniculatum* A.Gray, Proc. Amer. Acad. Arts 22: 290. 1887. *Malvastrum paniculatum* (A.Gray) Wiggins, Madroño 10: 184. 1950. *Malacothamnus paniculatus* (A.Gray) Kearney, Leafl. W. Bot. 6: 123. 1951. TYPE: MEXICO Baja California: Ensenada de Todos Santos, 14 July 1885, *C. R. Orcutt s.n.* (Holotype: GH00052906!, isotypes: BM000603859 [photo!], BM000603860 [photo!], CAS796126 [fragment, photo!], UC109093 [photo!], US1381940 [photo!]).

Shrubs up to 2.5 m tall, occasionally spreading by rhizomes. Stems with sparse to dense stellate trichomes, stem surface sometimes visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.4 mm (mean per plant ranges from 0.2–0.8 mm), many with stipes, stipes ≤ 1.1 mm; glandular trichomes on stem ≤ 0.3 mm (mean per plant ranges from < 0.1–0.2 mm). Leaf blades ± round to widely ovate, length generally ≥ width, obscurely to moderately 3–5 lobed with lobes rounded to acute or acuminate, bases truncate to cordate, ashy green to bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.8 mm (mean per plant 0.3 to 0.4 mm), many with stipes on some plants and mostly without on others, stipes ≤ 0.8 mm, abaxial stellate trichome density 1–1.5x adaxial; glandular trichomes on leaf blade ≤ 0.3 mm (mean per plant < 0.1 mm). Inflorescence spike-like to panicle-like. Stipular bracts subulate, falcate, lanceolate, or oblong, occasionally shallowly to deeply 2-4 lobed; 2–8 mm long, 0.5–1.5 mm wide, length 2–5.5x width, calyx bracts linear to subulate, 2.5–10 mm long, 0.2–0.7 mm wide, length 6.5–27.5x width, 0.3–0.8x calyx, green to red. Calyx 7–14(17.5) mm long, lobes 4.5–13.5 mm long x 3–9.5 mm wide, lobe at base 1.5–4.5 mm wide, lobe widest at base or up to 3 mm above base, lobe length 0.8–3.1x width, lobes lance-ovate to widely ovate with apex acuminate, sometimes abruptly so; abaxial calyx veins rarely with some filiform to branched outgrowths covered in stellate trichomes; stellate trichomes on abaxial calyx surface with rays 0.1–1.2 mm (mean per plant ranges from 0.2–0.6 mm), mostly without stipes, stipes ≤ 0.8 mm; glandular trichomes on abaxial calyx surface < 0.1–0.3 mm (mean per plant ranges from < 0.1–0.2 mm). Corolla drying closed, petals to ~2 cm. Figs. 58–61.

Phenology. Primarily blooming March to June with peak April to May. Sporadic flowers documented in all other months.

Distribution (Fig. 20 & 23). Endemic to Baja California near Ensenada, east to Ojos Negros, and, if the type locality is correct, southward to Santo Tomás. 5–780 m. The coastal form was introduced to Aliso Canyon Park in Los Angeles County, CA, presumably via a restoration planting. EOO: 989, AOO: 68.

Conservation status. None. Most mapped locations are around Ensenada and could be affected adversely by land development as the city and possibly agriculture grows. That said, large areas around the city appear to be poorly surveyed and there may be many unaccounted-for populations in less developed areas further from the city boundaries. Surveys are needed to confirm.

Suggested common name: Ensenada bushmallow. Additional common names: Baja California bushmallow and monarch bushmallow (Rebman et al. 2016). As most known plants of *Malacothamnus foliosus* occur near Ensenada, the name Ensenada bushmallow may help increase awareness of this species in the region.

Notes. *Malacothamnus foliosus* s.l. needs further taxonomic work. There are two main morphological forms plus intermediates (Morse 2023a). The more coastal form, generally attributed to *M. paniculatus*, has panicle-like inflorescences, calyx lobes generally ≤ 1.5x longer than wide, and calyx stellate trichome rays < 0.6 mm long. More inland forms, generally attributed to *M. foliosus* s.s., have panicle to spike-like inflorescences, calyx lobes generally ≥ 1.5x longer than wide, and calyx stellate trichome rays ≥ 0.6 mm long. The type specimens of *M. foliosus* represent the morphological extreme most different from the coastal form and have spike-like inflorescences and calyx lobes > 2x longer than wide. The type specimens of *M. paniculatus* appear to represent intermediates between the coastal and inland forms of *M. foliosus*. Therefore, if the coastal form were recognized as a variety or species, it may be inappropriate to associate the *M. paniculatus* types with them. Somewhat problematic for phylogenetic and morphological analyses is that no plants representing the morphological extremes of *M. foliosus* s.s. have been documented since the 1800s. Further surveys, especially post-fire, should be done to assess the full potential geographic range of *M. foliosus* s.l. to document the patterns of morphological variation within that range. If morphological patterns indicate more than a single taxon should possibly be recognized, *M. foliosus* s.l. should be reassessed with phylogenetic analyses, probably using population-level sampling. If more than one taxon in *M. foliosus* s.l. were recognized, inclusion of type material from both *M. foliosus* and *M. paniculatus* in phylogenetic analyses may be needed to confirm whether *M. paniculatus* should be recognized as a separate taxon or as an intermediate between taxa.

Relationships within *Malacothamnus foliosus* s.l. may be further complicated by hybridization with other species. Morphological and phylogenetic evidence indicates likely geneflow between *M. foliosus*, *M. fasciculatus* var. *fasciculatus*, and possibly other taxa in Baja California (Morse 2023a, 2023b). Intermediates of *M. foliosus* with *M. fasciculatus* var. *fasciculatus* appear to be relatively common south of Ensenada and are most morphologically similar to *M. fasciculatus*. See *M. fasciculatus* var. *fasciculatus* for distinguishing characteristics.

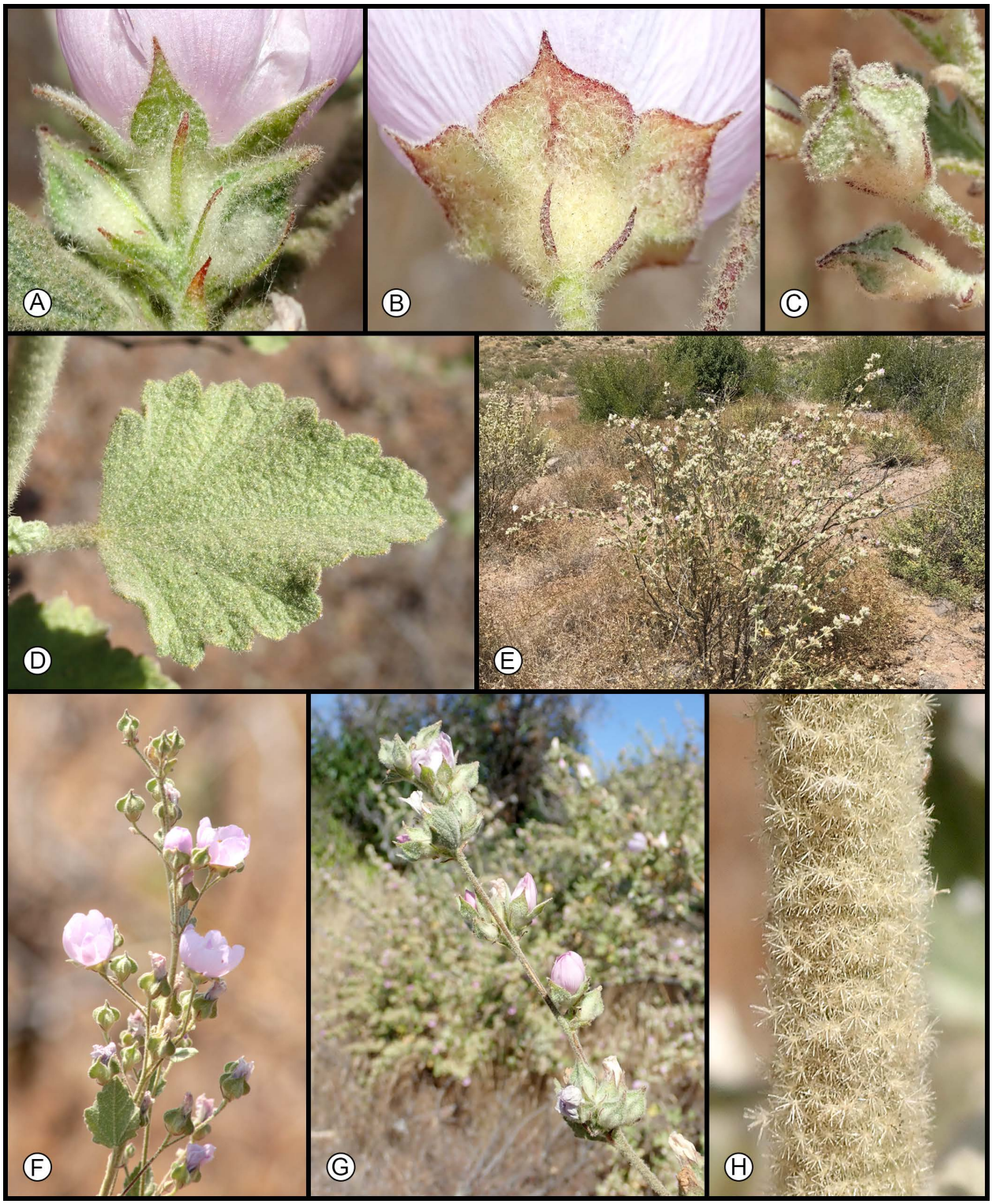

Figure 58. *Malacothamnus foliosus* photos. A) Calyx and calyx bracts in full flower and bud (inland form). B) Calyx and calyx bracts in flower (coastal form). C) Flower buds (coastal form). D) Adaxial leaf surface. E) Whole plant. F) Inflorescence (coastal form). G) Inflorescence (inland form). H) Stem. Photo E by Jon Rebman and photo F by Liliana Ortiz Serrato, both CC-BY-NC.

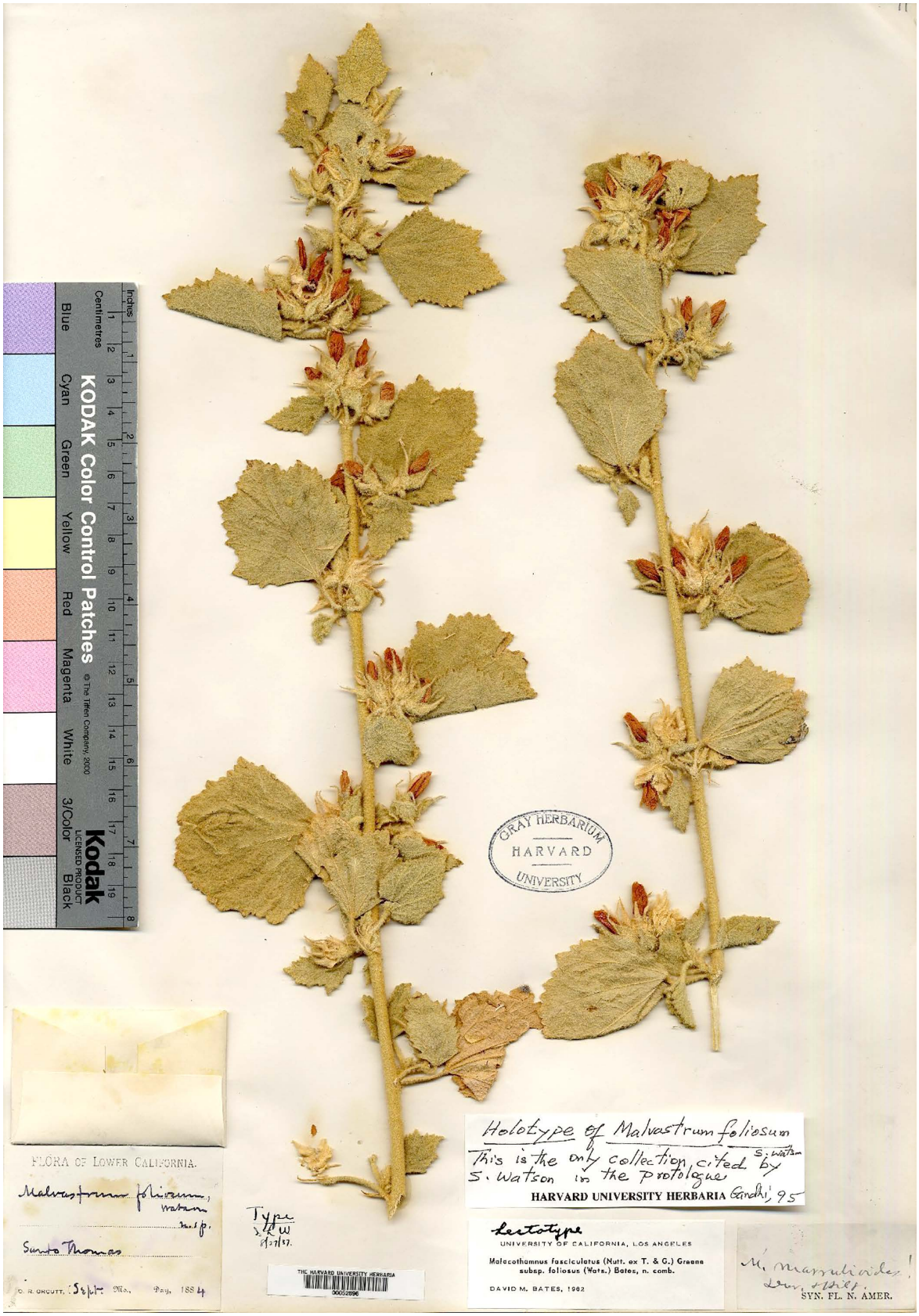

Figure 59. Holotype of *Malacothamnus foliosus*. GH00052896. Image courtesy of Harvard University Herbaria.

Figure 60. Holotype of *Malacothamnus paniculatus*. GH00052906. Recognized as a synonym of *M. foliosus* in this treatment. Possibly an intermediate of the more coastal and inland forms of *M. foliosus*. Image courtesy of Harvard University Herbaria.

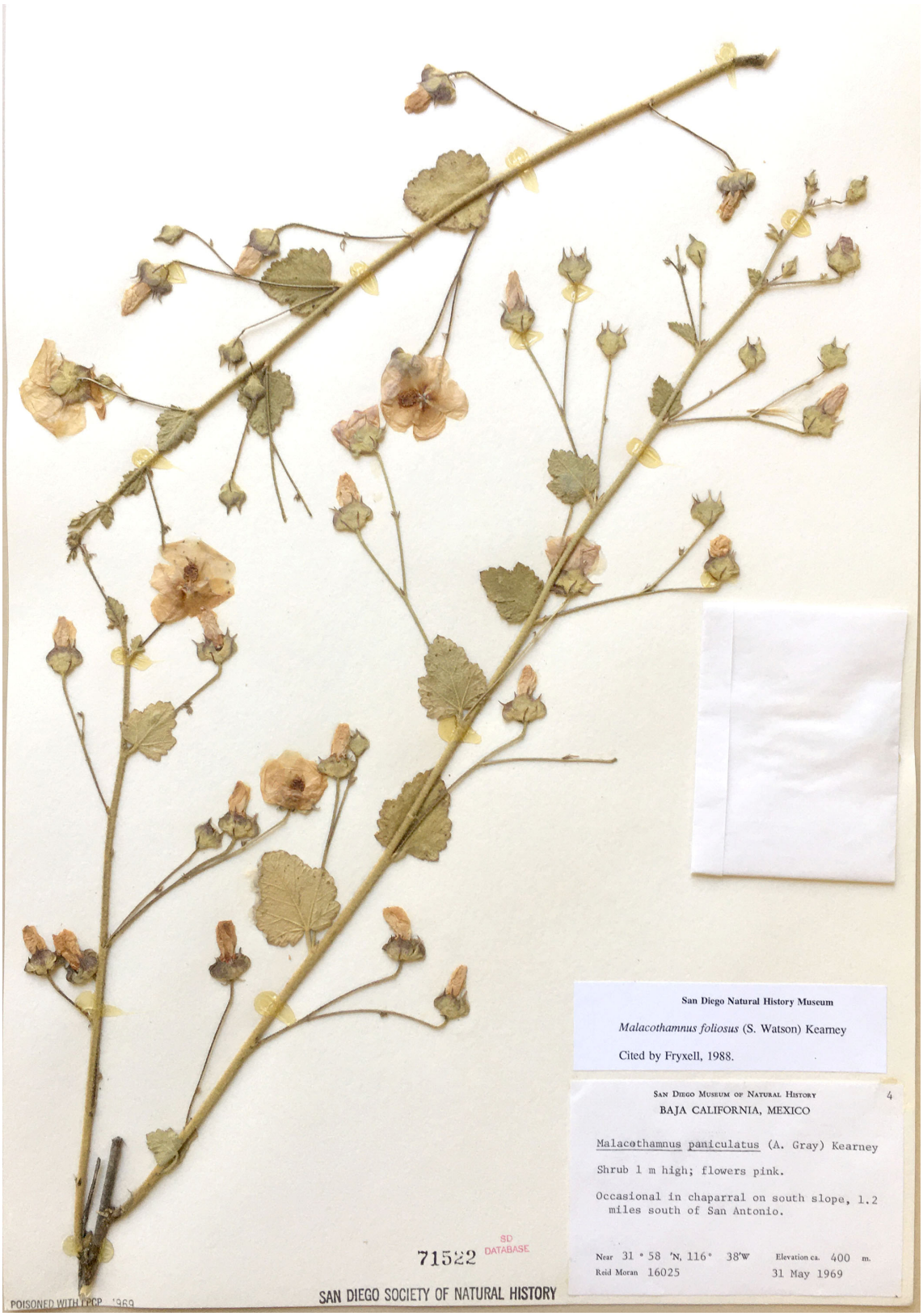

Figure 61. Specimen representing the coastal form of *Malacothamnus foliosus*, which is generally attributed to the synonym *M. paniculatus*. SD71522.

13. MALACOTHAMNUS FREMONTII (Torr. ex A.Gray) Greene, Leafl. Bot. Observ. Crit. 1(4): 208. 1906.
Malvastrum fremontii Torr. ex A.Gray, Mem. Amer. Acad. Arts ser. 2, 4(1): 21. 1849. *Malveopsis fremontii* (Torr. ex A.Gray) Greene, Erythea 1: 171. 1893. *Sphaeralcea fremontii* (Torr. ex A.Gray) Jeps., Man. Fl. Pl. Calif. [Jepson] 633. 1925. TYPE: U.S.A.: [Interior of] California, 1846, *J. C. Fremont 428* (lectotype designated by Kearney, 1951: NY00221823 [photo!], isolectotypes: GH00052927!, GH00052928!, K000659245 [photo!], K000659246 [photo!], MO134408 [photo!], P02286285 [photo!]).

Shrubs up to 6 m tall, occasionally spreading by rhizomes. Stems with dense stellate trichomes, stem surface sometimes visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.4 mm, many with stipes or mostly without stipes, stipes ≤ 2.1 mm; glandular trichomes on stem ≤ 0.1 mm (mean per plant < 0.1 mm). Leaf blades ± round to widely ovate or approaching reniform, length generally ≥ width, unlobed or obscurely to moderately 3–7 lobed with lobes rounded to acute, bases cuneate to cordate, ashy green to light green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 1.4 mm, many with stipes or mostly without stipes, stipes ≤ 1.5 mm, abaxial stellate trichome density 0.5–2x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence spike-like to panicle-like. Stipular bracts narrowly triangular, linear, falcate, or oblong, occasionally shallowly 2-lobed; 2–11 mm long, 0.5–2(3) mm wide, length 1.5–14(19)x width. Calyx bracts linear, 3–13 mm long, 0.2–1.0 mm wide, length 5–37.5x width, 0.4–1.2x calyx, generally green and red. Calyx 5–14.5 mm long, lobes 2.5–10.5 mm long x 2–5 mm wide, lobe at base 2–4(5) mm wide, lobe widest at base or up to 2 mm above base, lobe length 0.8–3.2x width, lobes triangular or ovate, apex acute to acuminate; abaxial calyx veins rarely with some filiform to branched outgrowths covered in stellate trichomes; stellate trichomes on abaxial calyx surface with rays 0.1–1.9 mm, many with stipes, stipes ≤ 1.8 mm; glandular trichomes on abaxial calyx surface < 0.1–0.4 mm (mean per plant ranges from < 0.1–0.2 mm). Corolla drying somewhat to fully open, petals to ~2 cm.

Notes. *Malacothamnus fremontii* needs further research. Morphological, geographic, and phylogenetic evidence indicates that there may be up to four lineages worth recognizing taxonomically within *M. fremontii* (Morse 2023a, 2023b). I tentatively recognize only two. What I consider *M. fremontii* consists of a single clade distinguished from the rest of the genus, excluding *M. astrotentaculatus* and aberrant plants of other taxa, by the corollas generally drying somewhat to fully open after anthesis rather than closed. *Malacothamnus fremontii* var. *exfibulosus* (*M. helleri* when treated as a species) is the most morphologically distinct of these lineages, appears to have a geographically distinct range, and often forms a clade within the broader *M. fremontii* clade in phylogenetic analyses. The remaining lineages are less clear.

Morphologically, *Malacothamnus howellii* (including *M. fremontii* subsp. *cercophorus*) and *M. fremontii* s.s. form two extremes of a spectrum with *M. howellii* having larger calyces and calyx bracts as well as a greater tendency to have panicle-like inflorescences. *Malacothamnus fremontii* s.s. has shorter calyces and calyx bracts and generally has spike-like

inflorescences (Morse 2023a). My attempts to create a relatively accurate morphological key distinguishing *M. fremontii* s.s. from *M. howellii* were unsuccessful. Geographically, M. *howellii* occurs in and near the Diablo Mountains on the west side of California's Central Valley with some plants apparently also on the eastern side of the Central Valley splitting *M. fremontii* s.s. into northern and southern regions. However, many plants on the eastern side of the Central Valley between the northern and southern *M. fremontii* s.s. regions appear to possibly be intermediate between *M. fremontii* s.s. and *M. howellii*, which further confounds morphological separation. Phylogenetic evidence indicates the southern region of *M. fremontii* s.s., *M. howellii*, and *M. fremontii* var. *exfibulosus* may form relatively distinct lineages but are confounded by the northern region of *M. fremontii* s.s. being possibly intermediate (Morse 2023b). The relationships between these taxa and regions needs further research. Large gaps in the geographic distribution of *M. fremontii* suggest further surveys in these gaps may be useful to better sample the full range of variation in the species. This may, however, be limited by available access to properties needing surveys, especially post-fire. A focused phylogenetic study on the *M. fremontii* clade with increased sampling is recommended. Inclusion of a type specimen in phylogenetic analyses is recommended as the type measured was morphologically intermediate in analyses and it is unclear where it was collected from.

Malacothamnus fremontii var. *fremontii* is distinguished from *M. fremontii* var. *exfibulosus* by having longer stellate trichome rays on the stem and a greater tendency towards cordate leaf bases, whereas *M. fremontii* var. *exfibulosus* has shorter stellate trichome rays on the stem and a greater tendency towards obtuse and truncate leaf bases. First year plants of *M. fremontii* var. *exfibulosus* may have longer stem trichomes and cause confusion.

13a. MALACOTHAMNUS FREMONTII var. **FREMONTII**

Malvastrum fremontii var. *cercophorum* B.L.Rob., in A. Gray, Syn. Fl. N. Amer. 1(1): 311. 1897. *Sphaeralcea fremontii* var. *cercophora* (B.L.Rob.) Jeps., Man. Fl. Pl. Calif. [Jepson] 634. 1925. *Malacothamnus fremontii* subsp. *cercophorus* (B.L.Rob.) Munz, Aliso 4: 94. 1958. TYPE: U.S.A. California: Alameda County, Arroyo del Valle, 14 June 1895, *E. L. Greene s.n.* (Holotype: UC18795 [photo!], isotype: GH00052898 [fragment, photo!]).

Malvastrum howellii Eastw., Leafl. W. Bot. 1: 220, 1936. *Malacothamnus howellii* (Eastw.) Kearney, Leafl. W. Bot. 6: 126. 1951. TYPE: U.S.A. California: Contra Costa County, Nortonville, 12 May 1931, *J. T. Howell 6470* (Holotype: CAS204366 [photo!], isotypes: A00052902 [photo!], F688547 [photo!], GH00420529 [photo!], MO1047528 [photo!], POM203315!, RSA434856!, US1434220 [photo!]).

Malvastrum howellii var. *cordatum* Eastw., Leafl. W. Bot. 1: 220. 1936. TYPE: U.S.A. California: western Stanislaus County, Junto del Puerto Canyon, summer 1935, C. Dudley s.n. (Holotype: CAS227909, isotypes: A00052903 [photo!], CAS301777 [photo!], NY00221827 [photo!], POM224013!).

Shrubs generally up to 2 m tall, rarely to 6 m, occasionally spreading by rhizomes. Stems with dense stellate trichomes, stem surface sometimes visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.4 mm (mean per plant ranges from 0.3–0.7 mm), many with stipes, stipes ≤ 2.1 mm; glandular trichomes on stem ≤ 0.1 mm (mean per plant < 0.1 mm). Leaf blades ± round to widely ovate, length generally ≥ width, unlobed or obscurely to moderately 3–7 lobed with lobes rounded to acute, bases often cordate, occasionally truncate to obtuse, ashy green to light green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 1.4mm (mean per plant ranges from 0.5–0.8 mm), many with stipes, stipes ≤ 1.5 mm, abaxial stellate trichome density 1–2x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence spike-like to panicle-like. Stipular bracts narrowly triangular, linear, falcate, or oblong, occasionally shallowly 2-lobed; 2.5–11 mm long, 0.5–2(3) mm wide, length 2.5–14(19)x width. Calyx bracts linear, 3–13 mm long, 0.2–1.0 mm wide, length 5–37.5x width, 0.4–1.2x calyx, generally green and red. Calyx 5–12.5(14.5) mm long, lobes (2.5)4–10.5 mm long x 2–5 mm wide, lobe at base 2–4(5) mm wide, lobe widest at base or up to 2 mm above base, lobe length 0.8–3.2x width, lobes triangular or ovate, apex acute to acuminate; abaxial calyx veins rarely with some filiform to branched outgrowths covered in stellate trichomes; stellate trichomes on abaxial calyx surface with rays 0.1–1.9 mm (mean per plant ranges from 0.4–1.1 mm), many with stipes, stipes ≤ 1.8 mm; glandular trichomes on abaxial calyx surface < 0.1–0.4 mm (mean per plant ranges from < 0.1–0.2 mm). Corolla drying somewhat to fully open, petals to ~2 cm. Figs. 9 & 62–64.

Phenology. Primarily blooming April to July with peak May to June. Sporadic flowers after July.

Distribution (Figs. 15–17 & 19). Endemic to California in the Sutter Buttes, the Diablo Range, foothills on the western side of the Central Valley in Tehama County, and on the west side of the Sierra-Nevada Range north of Springville. 50–1000 m. EOO: 54008, AOO: 113.

Conservation status. None. Further taxonomic work is needed to confirm whether what I recognize as *Malacothamnus fremontii* var. *fremontii* should be recognized as more than one taxon. If so, the resulting taxa should be assessed for conservation threats. As recognized here, *M. fremontii* var. *fremontii* has one of the largest ranges of the genus with populations throughout much of the range protected within federal, state, and regional parks.

Suggested common name: long-haired unfurled bushmallow. Additional common names: white-coat mallow (Jepson 1936), white-coat globemallow and Fremont globemallow (McMinn and Schumacher 1939), Fremont's malvastrum (Abrams 1951), Fremont's bushmallow (Bates 2015a). The namesake of *Malacothamnus fremontii* is John C. Fremont, who is known for leading massacres against Native American people (Madley 2016). For those who do not wish to honor such a person, I suggest the common name unfurled bushmallow. The corollas of all *Malacothamnus* unfurl when they bloom, however, the corollas of *M. fremontii* are notable in not furling back up when done blooming. I suggest the addition of the modifiers "long-haired"

for *M. fremontii* var. *fremontii* and "short-haired" for *M. fremontii* var. *exfibulosus*, each referring to the length of the stem hairs.

Notes. Intermediates of *Malacothamnus fremontii* var. *fremontii* with *M. orbiculatus* occur near California State Route 190 east of Springville, CA. Confirmed intermediates more closely resemble *M. fremontii* var. *fremontii* but with corollas drying mostly closed.

Intermediates of *Malacothamnus fremontii* var. *fremontii* with *M. arcuatus* var. *elmeri* occur near both parent taxa at Lime Ridge Open Space at the northern end of the Diablo Mountains. These plants are clearly intermediate when compared with both parents. Some plants more closely resembling *M. arcuatus* var. *elmeri* in this area have longer stellate trichome rays than typical and may have corollas drying somewhat open, both characters suggesting intermediacy with *M. fremontii* var. *fremontii*.

13b. MALACOTHAMNUS FREMONTII var. **EXFIBULOSUS** (Jeps.) K.Morse, Malacothamnus Volume 2: 33. 2023. *Sphaeralcea fremontii* var. *exfibulosa* Jeps., Fl. Calif. [Jepson] 2: 500. 1936. *Malvastrum fremontii* subsp. *exfibulosum* (Jeps.) Wiggins in Abrams, Ill. Fl. Pacific States 2: 95. 1951. TYPE: U.S.A. California: [western Yolo County], on the lower terrace of Putah Creek near Winters, 11 June 1934 [note on specimen says actually collected on June 18 according to Jepson's field notebook], W. L. Jepson 16741 (Holotype: JEPS2869 [photo!], isotype: RSA279363!).

Malvastrum helleri Eastw., Leafl. W. Bot. 1: 217. 1936. *Malvastrum fremontii* var. *helleri* (Eastw.) McMinn, Man. Calif. Shrubs 341 (1939). *Malacothamnus helleri* (Eastw.) Kearney, Leafl. W. Bot. 6: 124. 1951. TYPE: U.S.A. California: [Colusa County, "Lake County" on label presumably an error], near Ladoga in the blue oak belt, 8 June 1919, *A. A. Heller 13242* (Holotype: CAS52632!, isotypes: A52901, DS107397, F501240, GH52900, ILL6636, MO849148, NY221826, PH645624, PH1073802, US1086619, WIS255793 [photo! of all isotypes]).

Shrubs up to 2.5 m tall, not or rarely spreading by rhizomes. Stems with dense stellate trichomes, stem surface generally not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.6 mm (mean per plant ranges from 0.1–0.4 mm), mostly without stipes, stipes ≤ 0.5 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round to widely ovate or approaching reniform, length generally ±= width, unlobed or obscurely to moderately 3–5 lobed with lobes rounded to acute, bases cuneate to cordate (often obtuse to subcordate), ashy green to light green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.7 mm (mean 0.3 mm), mostly without stipes, stipes ≤ 0.3 mm; abaxial stellate trichome density 0.5–2x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence spike-like to panicle-like. Stipular bracts narrowly triangular, linear, falcate, or oblong, occasionally shallowly 2-lobed; 2–5 mm long, 0.5–2 mm wide, length 1.5–10x width. Calyx bracts linear, 3.5–7.5 mm long, 0.3–0.6 mm wide, length 6.5–20x width,0.5–0.9x calyx, generally green and red. Calyx 5.5–9 mm long, lobes 2.5–5 mm long x 2–3.5 mm wide, lobe at

base 2–3.5 mm wide, lobe widest at base or up to 1.5 mm above base, lobe length 1.1–2.0x width, lobes triangular or ovate, apex acute to acuminate; abaxial calyx veins rarely with some filiform to branched outgrowths covered in stellate trichomes; stellate trichomes on abaxial calyx surface with rays 0.1–1.6 mm (mean per plant ranges from 0.3–0.7 mm), many with stipes, stipes ≤ 0.8 mm; glandular trichomes on abaxial calyx surface < 0.1–0.1 mm (mean per plant < 0.1 mm). Corolla drying somewhat to fully open, petals to ~2 cm. Figs. 65 & 66.

Phenology. Blooming May to August with peak bloom in June.

Distribution (Fig. 16). Endemic to foothills and mountains on the western edge of California's Central Valley from Napa County northward to Glenn County. 45–640 m. EOO: 1905, AOO: 29.

Conservation status. CRPR 3.3 (as *Malacothamnus helleri*). The current CRPR rank of 3 indicates a need for further information due to taxonomic questions related to *M. fremontii* var. *exfibulosus* and what its geographic range would be if recognized (CNPS 2023). While further research is warranted for the full *M. fremontii* clade, *M. fremontii* var. *exfibulosus* appears to be both morphologically and geographically distinct from the rest of *M. fremontii* and has some support from phylogenetic evidence as well (Morse 2023a, 2023b). Based on this clarification and its relatively small geographic range, its CRPR should be reevaluated. No threats beyond its small range size are currently documented for this taxon.

Suggested common name: short-haired unfurled bushmallow. Additional common names: Heller's bushmallow for the synonym *Malacothamnus helleri* (CNPS 1980). As the only previously published common name of this taxon is associated with the namesake of a synonym, I suggest a hopefully more useful common name. See *M. fremontii* var. *fremontii* for further details.

Notes. There is no evidence of naturally occurring hybrids of *Malacothamnus fremontii* var. *exfibulosus* with any other taxa, though there may be some intermediates with *M. f.* var. *fremontii*.

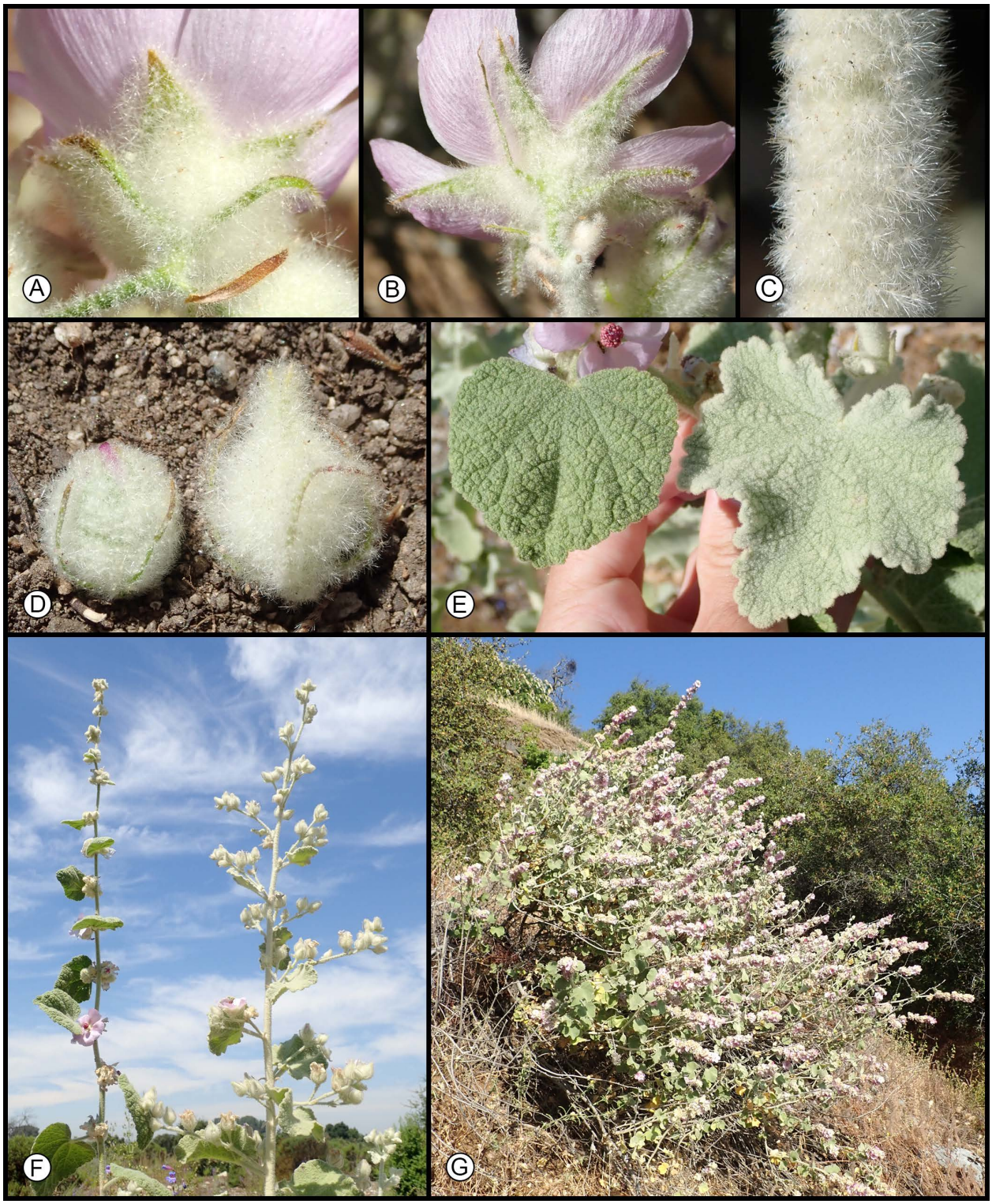

Figure 62. *Malacothamnus fremontii* var. *fremontii* photos with comparisons of typical *M. fremontii* var. *fremontii* to the synonym *M. fremontii* subsp. *cercophorus* (*M. howellii*). A) Calyx and calyx bracts in flower (typical). B) Calyx and calyx bracts in flower (*cercophorus*). C) Stem (*cercophorus*). D) Flower buds (typical on left, *cercophorus* on right). E) Adaxial leaf surface (typical on left, *cercophorus* on right). F) Inflorescence (typical on left, *cercophorus* on right). G) Full plant (typical). See Figure 9 for drying corollas. Side-by-side comparison photos are of plants grown at California Botanic Garden

Figure 63. Lectotype of *Malacothamnus fremontii*. NY00221823. Image courtesy of New York Botanic Garden.

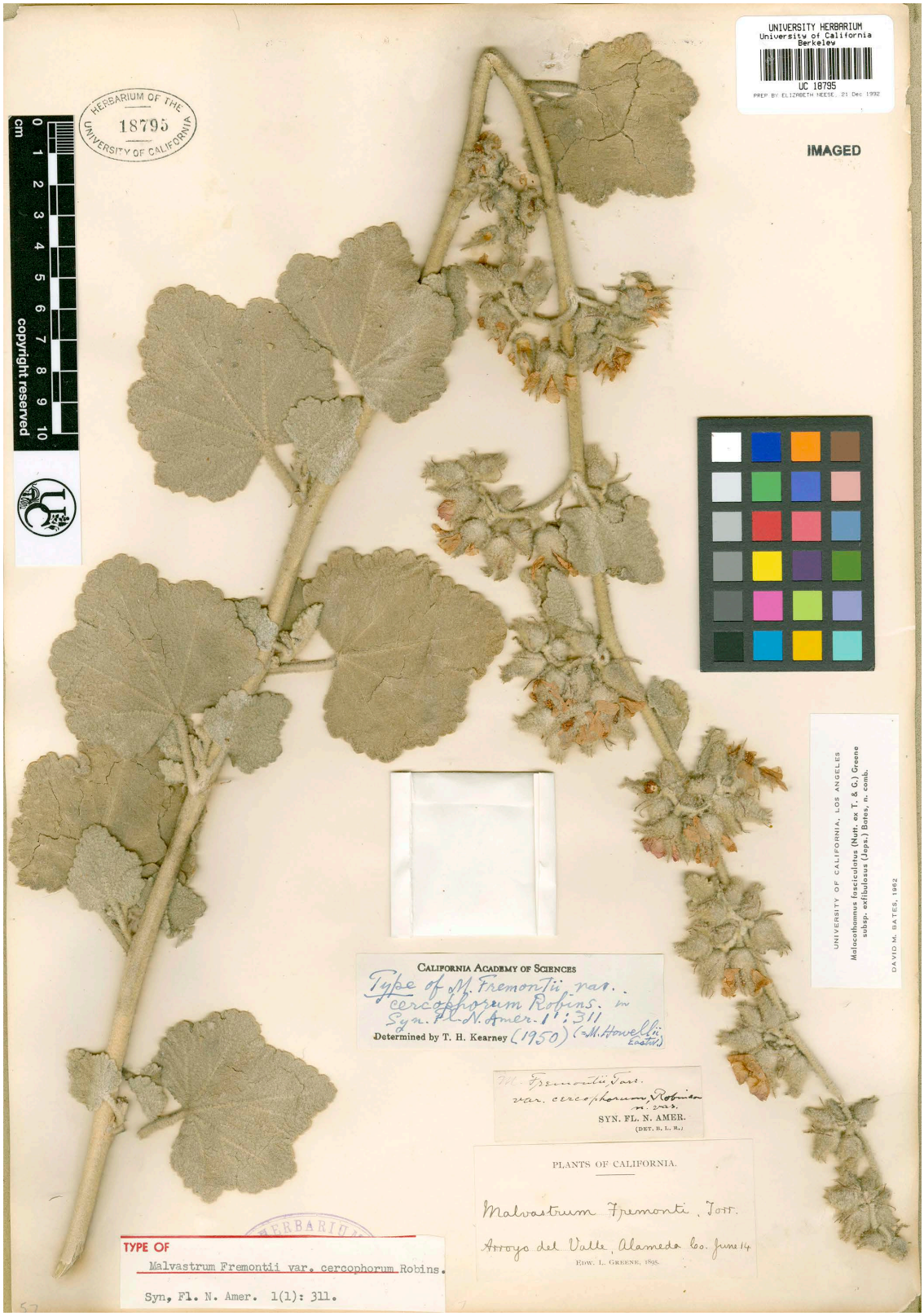

Figure 64. Holotype of *Malacothamnus fremontii* subsp. *cercophorus* recognized as a synonym of *M. fremontii* var. *fremontii* in this treatment. UC18795. Image courtesy of University of California, Berkeley.

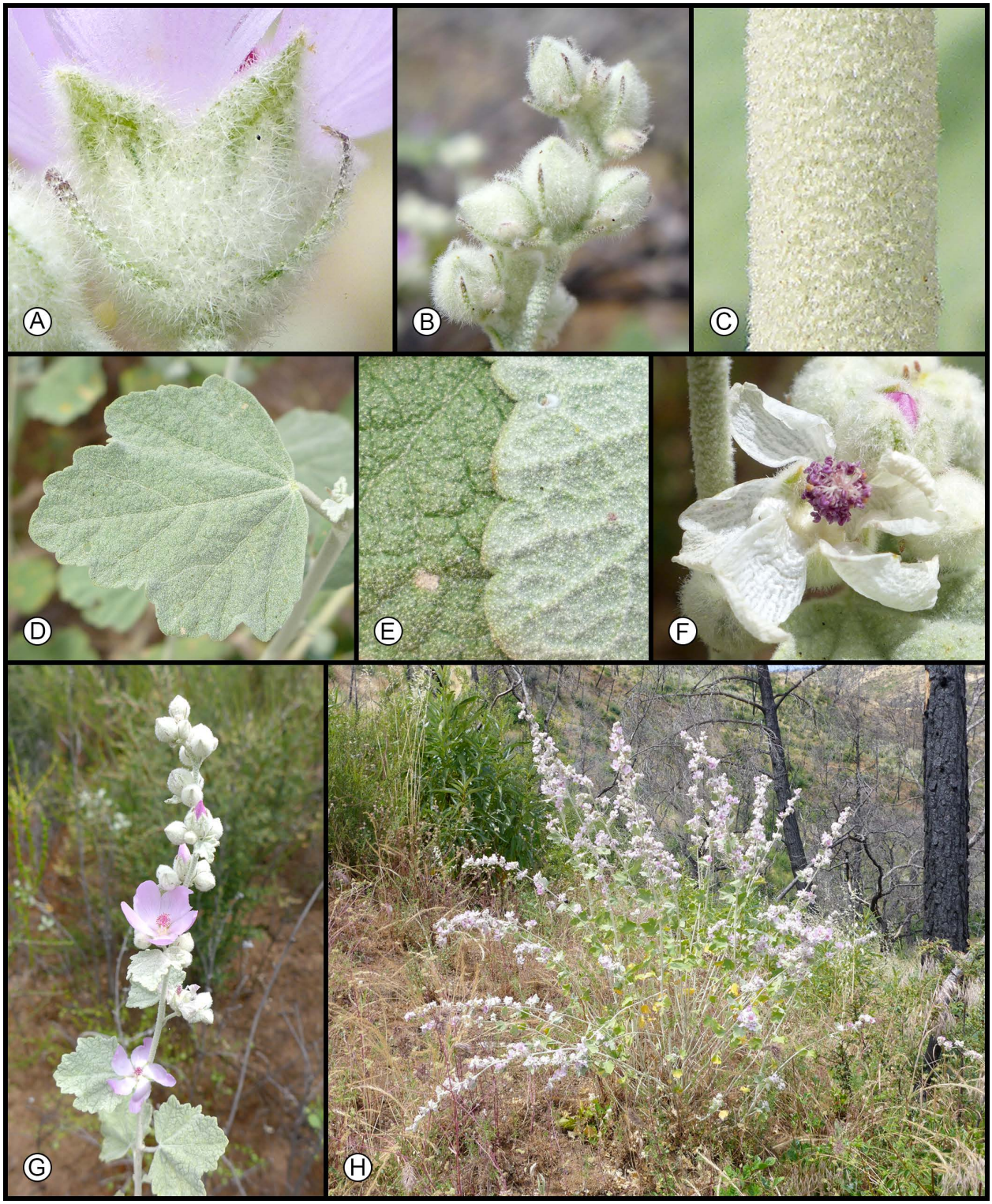

Figure 65. *Malacothamnus fremontii* var. *exfibulosus*. A) Calyx and calyx bracts in flower. B) Flower buds. C) Stem. D) Adaxial leaf surface. E) Adaxial (left) and abaxial (right) leaf surfaces. F) Corolla drying open. G) Inflorescence. H) Whole plant.

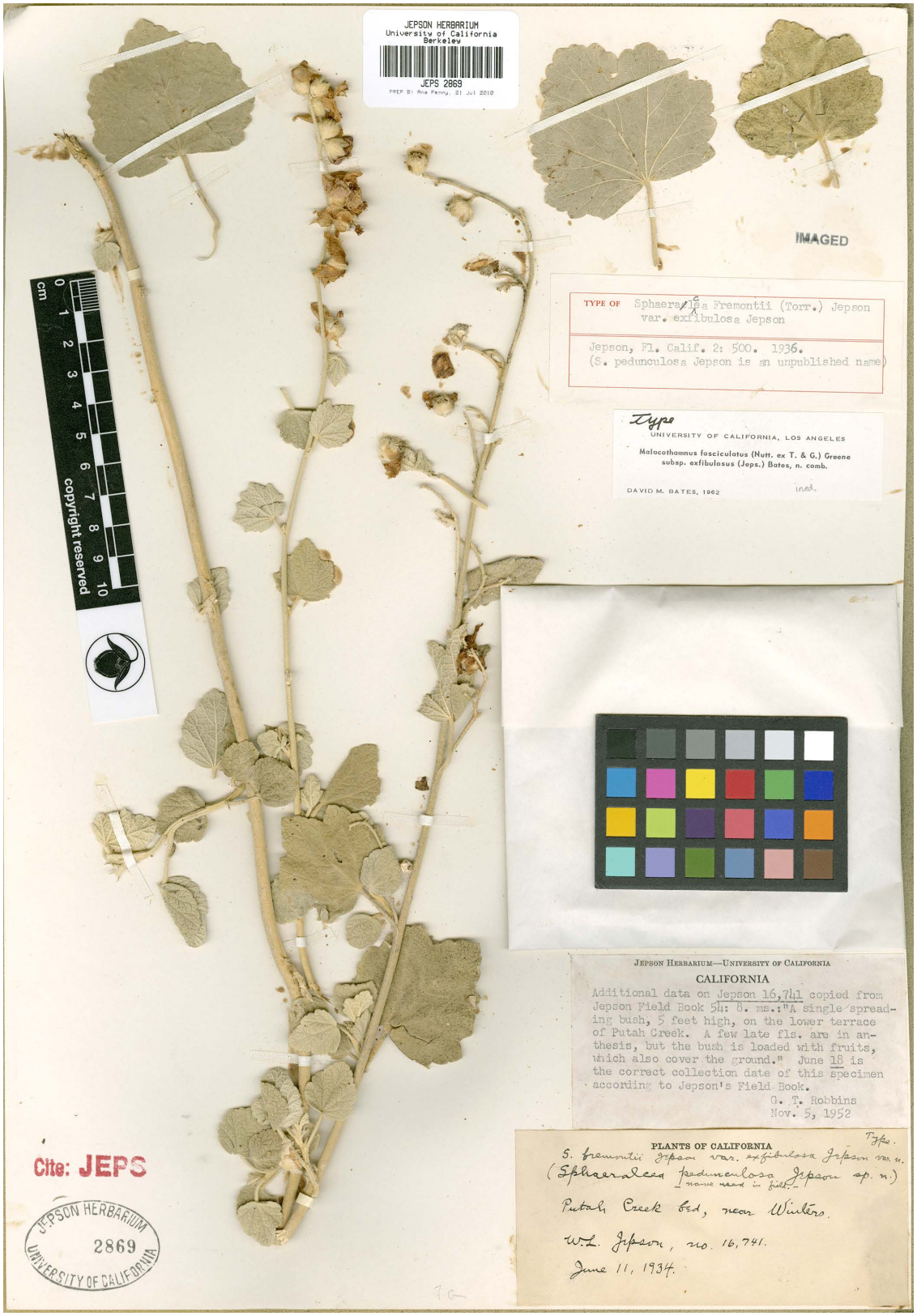

Figure 66. Holotype of *Malacothamnus fremontii* var. *exfibulosus*. JEPS2869. Image courtesy of University of California, Berkeley.

14. MALACOTHAMNUS INVOLUCRATUS (B.L.Rob.) K.Morse, Crossosoma 44(1-2): 22. 2021.
Malvastrum involucratum B.L.Rob., in A. Gray, Syn. Fl. N. Amer. 1(1): 310. 1897.
Malacothamnus palmeri var. *involucratus* (B.L.Rob.) Kearney, Leafl. W. Bot. 6: 121. 1951.
TYPE: U.S.A. California: [Monterey County], Jolon, no date on specimen, T. S. Brandegee s.n. (Lectotype designated by Kearney, 1951: GH52904!, syntypes: CAS744!, NY00221828 [photo!]).

Shrubs up to 2 m tall, spreading by rhizomes. Stems with sparse to dense stellate trichomes, stem surface sometimes visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.3 mm (mean per plant ranges from 0.2–0.6 mm), mostly without stipes, stipes ≤ 0.8 mm; glandular trichomes on stem ≤ 0.1 mm (mean per plant < 0.1 mm). Leaf blades ± round to (widely) ovate, length generally ≥ width, unlobed or obscurely to moderately 3-5 lobed with lobes rounded to acute, bases cordate to obtuse, generally bright green (occasionally ashy green) adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.6 mm (mean 0.3 mm), mostly without stipes, stipes ≤ 0.3 mm, adaxial surface rarely glabrous or abaxial stellate trichome density 2–50x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence capitate to spike-like. Stipular bracts lance-ovate, ovate, or round, some a fused pair of these shapes, some shallowly to deeply 2+ lobed, (6)9–20 mm long, 5–21(26) mm wide, length 0.5–2x width. Calyx bracts lanceolate to narrowly elliptic, 7–16 mm long, 1.0–5.0 mm wide, length 2.5–10x width, 0.7–1.5x calyx, green. Calyx 7.5–14.5 mm long, lobes 3.5–9 mm long x 2.5–5.5 mm wide, lobe at base 2.5–5 mm wide, lobe widest at base or up to 2.5 mm above base, lobe length 1.2–2.8x width, lobes ovate to triangular with apex acute to acuminate; stellate trichomes on abaxial calyx surface with rays 0.1–2.8 mm (mean per plant ranges from 0.1–0.2 mm), mostly without stipes, stipes ≤ 0.2 mm; glandular trichomes on abaxial calyx surface < 0.1–0.2 mm (mean per plant < 0.1). Corolla drying closed, petals to ~2.5 cm. Figs. 67 & 68.

Phenology. Primarily blooming February to July with peak bloom in April to May. Later blooms are generally sporadic flowers.

Distribution (Fig. 18). Likely endemic to Monterey County, California from Carmel Valley south to near Jolon and Williams Hill west of Salinas Valley plus a single location to the east of Salinas Valley in the hills east of Chualar. The location of a disjunct Dudley collection purported to be from Cuesta Pass in San Luis Obispo County (s.n. 1 May 1937) is possibly erroneous as all other Dudley collections from that day were attributed to the "S.W. part of Monterey Co." Surveys in 2018 and 2019 found no *Malacothamnus* in the Cuesta Pass area. 20–680 m. EOO: 2192, AOO: 45.

Conservation status. CRPR 1B.2 (as *Malacothamnus palmeri* var. *involucratus*). Very few *M. involucratus* populations have been documented in recent years including during my own surveys. This is presumably due to a lack of recent fires within its range, particularly near residential areas, which may indicate a threat of fire suppression. *Malacothamnus nuttallii* has been planted in the range of *M. involucratus* and may pose a threat from hybridization. Other

possible threats include development, grazing, and competition from nonnative plants (CDFW 2022). Regarding the threat of grazing, some records note that *Malacothamnus involucratus* are apparently not directly affected by the grazing, but that grazing has allowed the invasion of nonnative plants.

Suggested common name: Carmel Valley bushmallow (Powell 1974; Matthews 1997; Slotta 2012).

Notes. *Malacothamnus involucratus* is differentiated from all other *Malacothamnus* taxa by having the combination of a capitate to subcapitate inflorescence (occasionally spike-like), very wide stipular bracts, and very sparse trichomes on the adaxial leaf surface. See also *M. palmeri*.

There is no evidence of naturally occurring hybrids of *Malacothamnus involucratus* with any other taxa.

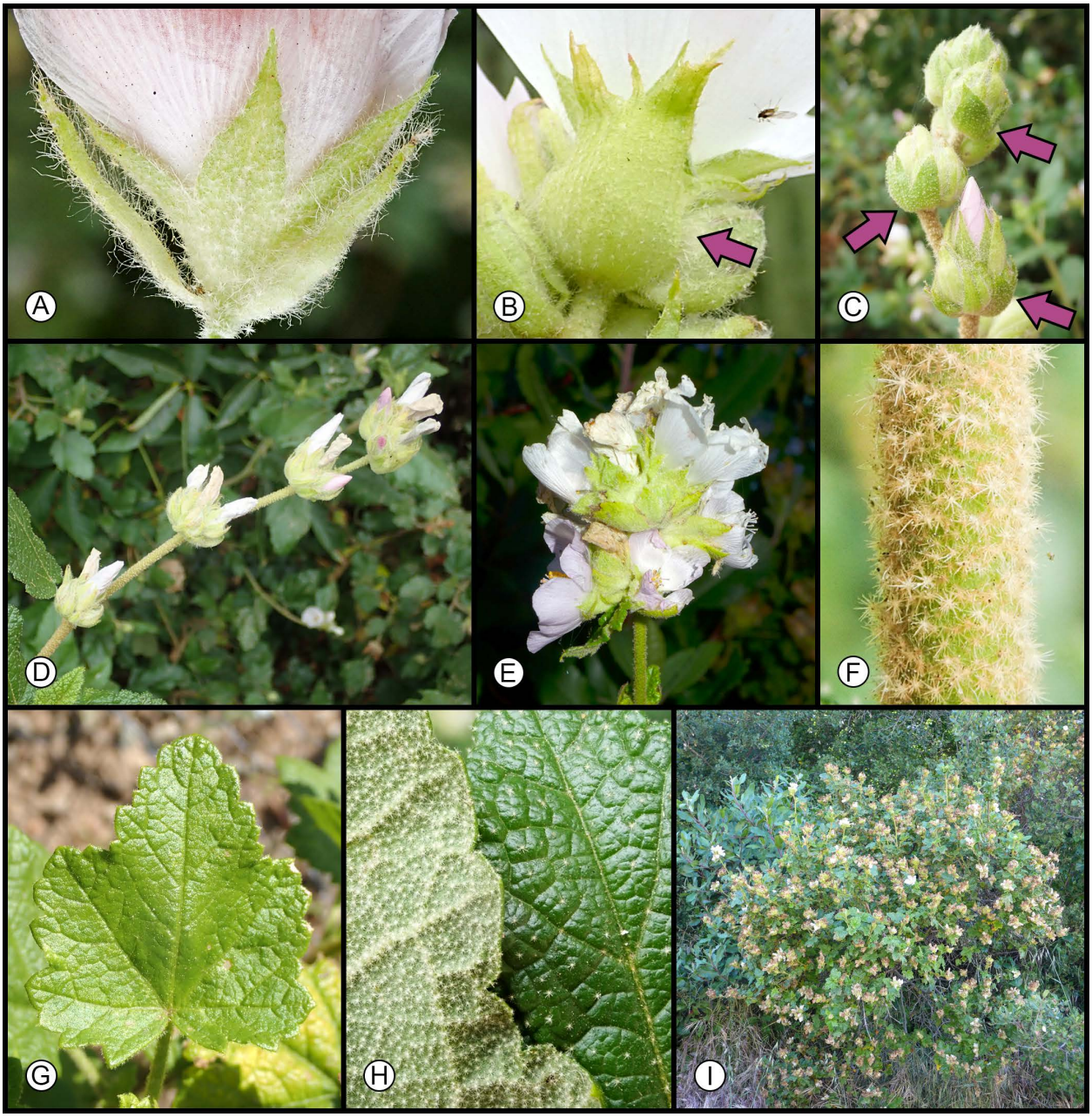

Figure 67. *Malacothamnus involucratus*. A) Calyx and calyx bracts. B & C) Stipular bracts. D) Spike-like inflorescence. E) Capitate inflorescence. F) Stem. G) Adaxial leaf surface. H) Abaxial (left) and adaxial (right) leaf surfaces. I) Whole plant.

Figure 68. Lectotype of *Malacothamnus involucratus*. GH52904.

15. MALACOTHAMNUS JONESII (Munz) Kearney, Leafl. W. Bot. 6: 135. 1951. *Malvastrum jonesii* Munz, Bull. S. Calif. Acad. Sci. 24: 88. 1925. TYPE: U.S.A. California: [San Luis Obispo County], Paso Robles, 26 June 1902, M. E. Jones 223 (Holotype: POM60429!).

Shrubs up to 3.5 m tall, spreading by rhizomes. Stems with dense stellate trichomes, stem surface generally not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.8 mm, mostly without stipes, stipes ≤ 0.3 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round, widely ovate, elliptic, or rhombic; length generally ≥ width, unlobed to obscurely 3–5 lobed, bases subcordate to cuneate, pale ashy green to light green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.6 mm, many with stipes, stipes ≤ 0.2 mm, abaxial stellate trichome density 0.5–1.5x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence spike-like to panicle-like. Stipular bract linear, subulate, or narrowly triangular, occasionally shallowly to deeply 2+ lobed; 1–5(7.5) mm long, 0.5–1.5 mm wide, length 1.5–9x width. Calyx bracts linear to subulate, 2.5–10 mm long, 0.2–0.7(1.4) mm wide, length 3–25x width, 0.3–0.9x calyx, green to red. Calyx 5–11.5 mm long, lobes 3–8 mm long x 2–4 mm wide, lobe at base 2–3.5 mm wide, lobe widest at base or up to 2 mm above base, lobe length 1.2–3x width, lobes ovate to widely ovate or triangular with apex acute; stellate trichomes on abaxial calyx surface with rays 0.1–1.3 mm, mostly without stipes or many with stipes, stipes ≤ 0.7 mm; glandular trichomes on abaxial calyx surface < 0.1–0.5 mm. Corolla drying closed, petals to ~2.5 cm.

Notes. I recognize three varieties of *Malacothamnus jonesii*, which have been treated as species in the past. These three varieties may represent species in the process of divergence as they form a single phylogenetic clade, are morphologically similar, and are geographically adjacent. In most cases they can be easily distinguished when in flower, however, there are morphological intermediates between the geographic ranges of the varieties, and they look almost identical when no calyces are present. In general, *M. jonesii* var. *niveus* is distinguished from the other two varieties by having longer stellate trichome rays, especially on the calyx. *Malacothamnus jonesii* var. *jonesii* is distinguished from *M. jonesii* var. *gracilis* by having a spike-like rather than a generally panicle-like inflorescence. Plants intermediate between *M. jonesii* var. *jonesii* and *M. jonesii* var. *niveus* are found near Atascadero. Plants intermediate between *M. jonesii* var. *gracilis* and *M. jonesii* var. *niveus* are found along the southern border of San Luis Obispo County between more typical populations of each variety.

Malacothamnus abbottii can be confused with *M. jonesii* when no flowers are present as the leaves are very similar to *M. jonesii*. *Malacothamnus abbottii* generally has much wider calyx bracts than all *M. jonesii* varieties, flowers much later than *M. jonesii* var. *jonesii*, and have much shorter stellate trichome rays on the calyx than *M. jonesii* var. *niveus*. While the native range of *M. abbottii* is adjacent to the north and west of the range of *M. jonesii*, *M. abbottii* has been introduced into the range of *M. jonesii* var. *niveus* near the southern border of San Luis Obispo County.

There is no evidence of naturally occurring hybrids of *Malacothamnus jonesii* s.l. with any other taxa.

15a. MALACOTHAMNUS JONESII var. **JONESII**

Malvastrum dudleyi Eastw., Leafl. W. Bot. 1: 218. 1936. TYPE: U.S.A. California: [San Luis Obispo County], Fern Canyon, 2 miles west of Paso Robles, June 1929, *C. Dudley s.n.* (Holotype: CAS146103!).

Shrubs up to 3 m tall, spreading by rhizomes. Stems with dense stellate trichomes, stem surface generally not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.4 mm (mean per plant ranges from 0.1–0.3 mm), mostly without stipes, stipes ≤ 0.2 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round, widely ovate, or rhombic; length generally ≥ width, unlobed to obscurely 3-lobed, bases truncate to cuneate (rarely subcordate), pale ashy green to light green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.5 mm (mean 0.2 mm), many with stipes, stipes ≤ 0.2 mm, abaxial stellate trichome density 1–1.5x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence spike-like, rarely very narrowly panicle-like. Stipular bracts linear, subulate, or narrowly triangular; 1.5–4.5 mm long, 0.5–1.5 mm wide, length 2–9x width. Calyx bracts linear to subulate, 3–5.5 mm long, 0.2–0.7 mm wide, length 5–25x width, 0.4–0.7x calyx, green to red. Calyx 5–8 mm long, lobes 3–5 mm long x 2–3 mm wide, lobe at base 2–3 mm wide, lobe widest at base or up to 1 mm above base, lobe length 1.2–2x width, lobes ovate to widely ovate or triangular with apex acute; stellate trichomes on abaxial calyx surface with rays 0.1–0.9 mm (mean per plant ranges from 0.2–0.4 mm), mostly without stipes, stipes ≤ 0.3 mm; glandular trichomes on abaxial calyx surface < 0.1–0.3 mm (mean per plant ranges from < 0.1–0.1 mm). Corolla drying closed, petals to ~2.5 cm. Figs. 69 & 70.

Phenology. Blooming March to May with peak bloom in April and May.

Distribution (Fig. 18). Endemic to California in San Luis Obispo County and southern Monterey County. 175–510 m. EOO: 586, AOO: 25.

Conservation status. CRPR 4.3 (as *Malacothamnus jonesii*). The CRPR rank of *M. jonesii* when last assessed in 2014 included both *M. jonesii* var. *jonesii* and *M. jonesii* var. *niveus* as synonyms (CNPS 2023). This ranking should be reevaluated to consider each variety separately as *M. jonesii* var. *jonesii* is much less common than *M. jonesii* var. *niveus* and has a smaller geographic range. No threats specific to *M. jonesii* var. *jonesii* are documented.

Suggested common name: Jones's bushmallow (CNPS 1980; Bates 1993, 2015a; Matthews 1997; Slotta 2012). Additional common names: sweet mallow (Jepson 1936), sweet globemallow (McMinn and Schumacher 1939), Jones's malvastrum (Abrams 1951).

Notes. Intergrades with *Malacothamnus jonesii* var. *niveus.*

15b. MALACOTHAMNUS JONESII var. **GRACILIS** (Eastw.) K.Morse, Malacothamnus Volume 2: 34. 2023. *Malvastrum gracile* Eastw., Leafl. W. Bot. 1: 219. 1936. *Malacothamnus gracilis* (Eastw.) Kearney, Leafl. W. Bot. 6: 130. 1951. TYPE: U.S.A. California: San Luis Obispo County, on road from Arroyo Grande to Huasna, 30 July 1927, *A. Eastwood 14996* (Holotype: CAS228727 [photo!], isotypes: CAS 228728 [photo!], F866403 [photo!], GH00052899 [photo!], K000659254 [photo!], NY00221824 [photo!], POM224487!, RSA77210!, US1678331 [photo!]).

Shrubs up to 3 m tall, spreading by rhizomes. Stems with dense stellate trichomes, stem surface generally not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.4 mm (mean per plant ranges from 0.1–0.2 mm), mostly without stipes, stipes ≤ 0.1 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round, widely ovate, elliptic, or rhombic; length generally ≥ width, unlobed to obscurely 3-lobed, bases truncate to cuneate (rarely subcordate), pale ashy green to light green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.4 mm (mean 0.2 mm), many with stipes, stipes ≤ 0.1 mm; abaxial stellate trichome density 1–1.5x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence panicle-like, rarely spike-like. Stipular bract linear, subulate, or narrowly triangular, occasionally shallowly to deeply 2+ lobed; 1–4 mm long, 0.5–(1.5) mm wide, length 1.5–8x width. Calyx bracts linear, 2.5–6.5 mm long, 0.2–0.6 mm wide, length 6.5–16.5x width, 0.3–0.7x calyx, generally red. Calyx 6–9.5 mm long, lobes 3.5–6 mm long x 2–3 mm wide, lobe at base 2–3 mm wide, lobe widest at base or up to 1.5 mm above base, lobe length 1.3–3x width, lobes ovate to widely ovate or triangular with apex acute; stellate trichomes on abaxial calyx surface with rays 0.1–0.5(0.9) mm (mean per plant ranges from 0.1–0.3 mm), mostly without stipes, stipes ≤ 0.2 mm; glandular trichomes on abaxial calyx surface < 0.1–0.5 mm (mean per plant ranges from < 0.1–0.3 mm), often red, especially on budding flowers. Corolla drying closed, petals to ~2 cm. Figs. 12, 71, & 72.

Phenology. Blooming May to January with peak bloom May to July. Later blooms are generally sporadic flowers on plants that have already fruited.

Distribution (Fig. 18). Endemic to California in San Luis Obispo County from the Lake Lopez area south to the border of Santa Barbara County. 150–375 m. EOO: 161, AOO: 6.

Conservation status. CRPR 1B.1 (as *Malacothamnus gracilis*). Possibly threatened by vineyard and housing development (CNPS 2023).

Suggested common name: Huasna bushmallow. Additional common names: slender globemallow (McMinn and Schumacher 1939), slender malvastrum (Abrams 1951), slender bushmallow (CNPS 1980). As there is nothing especially slender about *Malacothamnus jonesii* var. *gracilis* that isn't so in many other taxa, I suggest the common name Huasna bushmallow. The type locality is on the road to Huasna, which is in the center of the range of *M. gracilis*, as is Huasna Valley. Huasna is the spelling currently used in this area for the Chumash name of this region (Applegate 1974).

Notes. Intergrades with *Malacothamnus jonesii* var. *niveus.*

15c. MALACOTHAMNUS JONESII var**. NIVEUS** (Eastw.) K.Morse, Malacothamnus Volume 2: 34–35. 2023. *Malvastrum fragrans* Eastw., Leafl. W. Bot. 1: 218. 1936, nom. superfl., non *Malvastrum fragrans* A.Gray & Harv., Fl. Cap. (Harvey) 1: 159. 1860. *Malvastrum niveum* Eastw., Leafl. W. Bot. 1: 232. 1936. *Malvastrum fremontii* var. *niveum* (Eastw.) McMinn, Man. Calif. Shrubs 343. 1939. *Malacothamnus niveus* (Eastw.) Kearney, Leafl. W. Bot. 6: 123. 1951. TYPE: U.S.A. California: San Luis Obispo County, Santa Margarita, El Dorado School, 28 May 1933, *M. E. Wall s.n.* (Holotype: CAS204656!, isotypes: GH00052897 [photo!], K000659255 [photo!]).

Shrubs up to 3.5 m tall, spreading by rhizomes. Stems with dense stellate trichomes, stem surface generally not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.8 mm (mean per plant ranges from 0.2–0.4 mm), mostly without stipes, stipes ≤ 0.3 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round, widely ovate, or rhombic; length generally ≥ width; unlobed to obscurely 3–5 lobed; bases subcordate to cuneate; pale ashy green to light green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.6 mm (mean 0.3 mm), many with stipes, stipes ≤ 0.2 mm; abaxial stellate trichome density 0.5–1.5x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence spike-like to widely panicle-like. Stipular bracts linear, subulate, or narrowly triangular; 2–5(7.5) mm long, 0.5–1.5 mm wide, length 1.5–8x width. Calyx bracts linear to subulate, 3.5–10 mm long, 0.3–0.7(1.4) mm wide, length 3–25x width, 0.4–0.9x calyx, green to red. Calyx 6.5–11.5 mm long, lobes 3.5–8 mm long x 2–4 mm wide, lobe at base 2–3.5 mm wide, lobe widest at base or up to 2 mm above base, lobe length 1.2–3x width, lobes ovate to widely ovate or triangular, apex acute; stellate trichomes on abaxial calyx surface with rays 0.1–1.3 mm (mean per plant ranges from 0.5–0.8 mm), many with stipes, stipes ≤ 0.7 mm; glandular trichomes on abaxial calyx surface < 0.1–0.3 mm (mean per plant ranges from < 0.1–0.1 mm). Corolla drying closed, petals to ~2 cm. Figs. 4, 73, & 74.

Phenology. Blooming April to July with peak bloom in May and June.

Distribution (Fig. 18). Endemic to California in San Luis Obispo County, southern Monterey County, and northern Santa Barbara County. 290–1050 m. Cultivated and planted in the San Francisco Bay Area and San Diego County. Possibly naturalizing in Balboa Park in San Diego County. EOO: 2444, AOO: 46.

Conservation status. None. The CRPR of *Malacothamnus jonesii* var. *niveus* (then *M. niveus*) was removed in 2014 and included as a synonym of *M. jonesii* s.s., which has a CRPR of 4.3 (CNPS 2023). The ranking of each should be reevaluated separately. No threats specific to *M. jonesii* var. *niveus* are documented.

Suggested common name: fragrant-snow bushmallow. Additional common names: San Luis Obispo County bushmallow (CNPS 1980), white bushmallow (Matthews 1997). As several *Malacothamnus* taxa occur in San Luis Obispo County and as many of them could be described

as white, at least sometimes, the previously published common names seem more problematic than useful. I propose instead the somewhat-whimsical name fragrant-snow bushmallow. *Malacothamnus jonesii* var. *niveus* was originally named *Malvastrum fragrans* for the "delicious fragrance of tea roses that pervades the plants and persists for years after drying" (Eastwood 1936a). This name was already in use, and it was changed to *Malvastrum niveum* (meaning snowy) shortly after, which Eastwood said was "an equally appropriate name"(Eastwood 1936b). Combining the two original species names into a common name seems appropriate based on Eastwood's (1936a) fanciful description of the plant:

> "This is a lovely shrub. The whole plant is snowy white from the close dense tomentum. The graceful open panicles terminating the stems are decked with the lovely pink flowers and the beautiful large roundish buds. The filiform green bracteoles are conspicuous on the snowy buds."

Notes. Intergrades with *Malacothamnus jonesii* var. *jonesii and M. jonesii* var. *gracilis.*

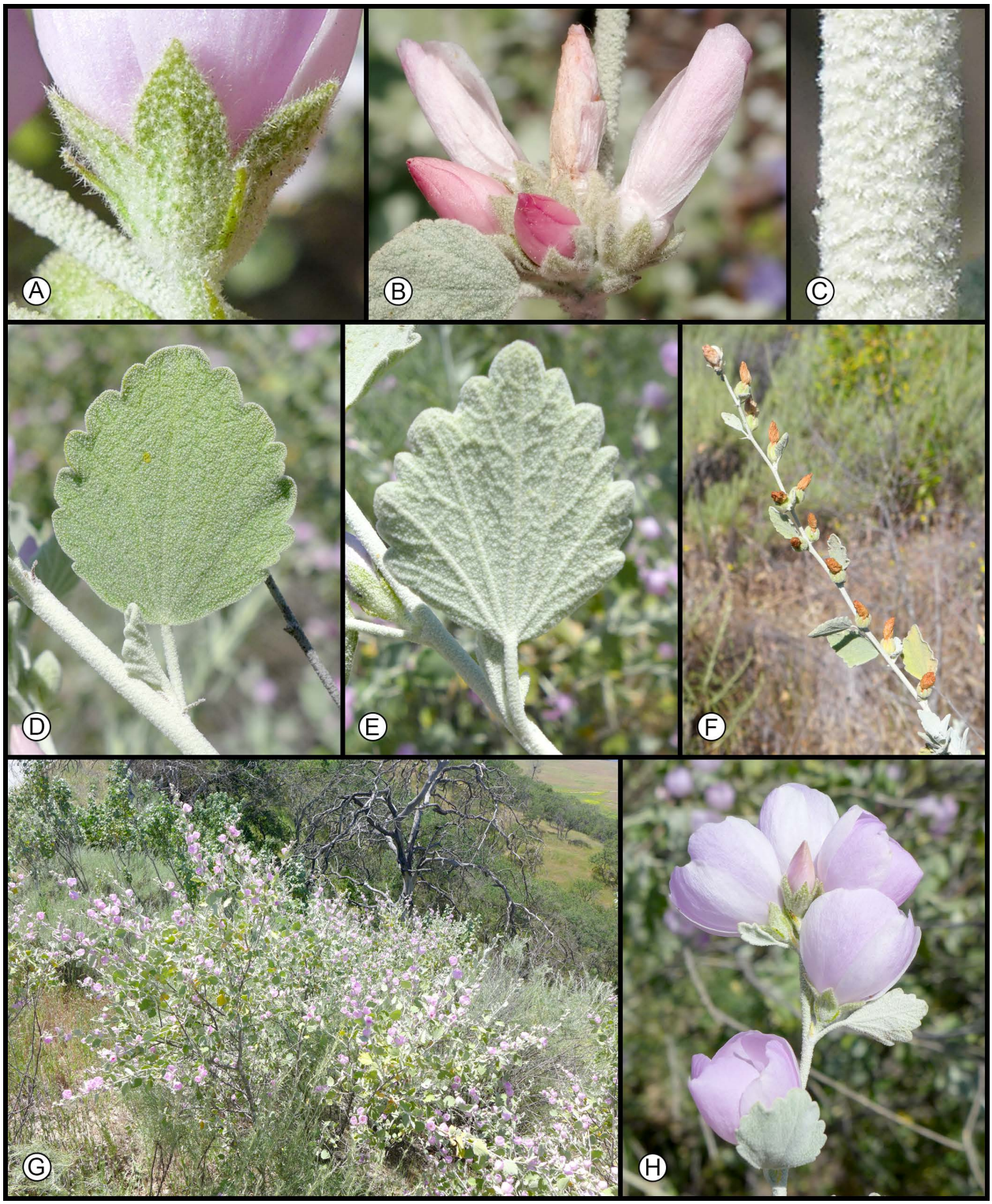

Figure 69. *Malacothamnus jonesii* var. *jonesii*. A) Calyx and calyx bracts. B) Flower buds (bottom left), corollas about to dry closed (upper left and middle), and a fresher corolla just before or after opening (right). C) Stem. D) Adaxial leaf surface. E) Abaxial leaf surface. F) Inflorescence in fruit. G) Whole plant. H) Tip of inflorescence in flower.

Figure 70. Holotype of *Malacothamnus jonesii*. POM60429. Image courtesy of California Botanic Garden.

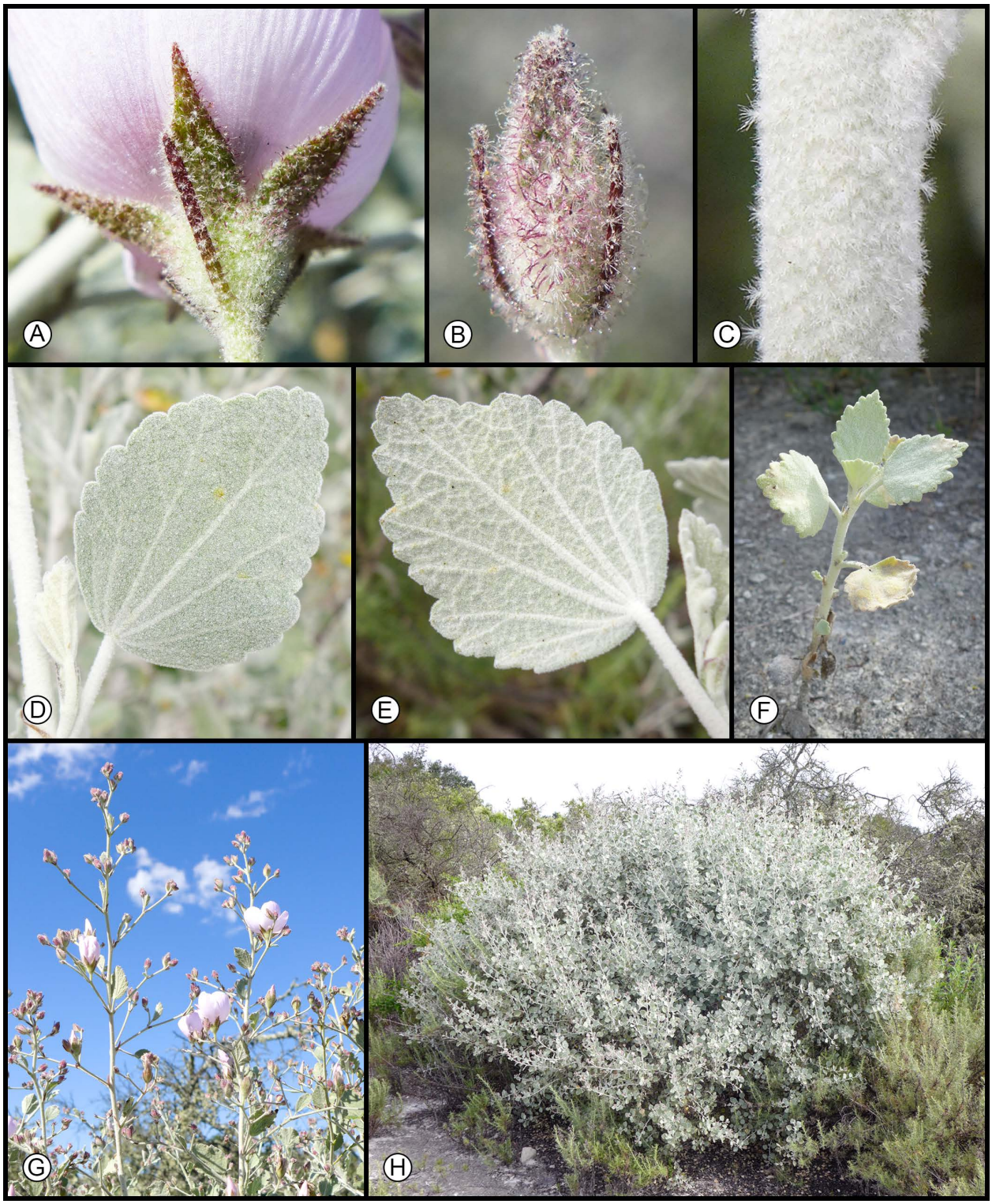

Figure 71. *Malacothamnus jonesii* var. *gracilis*. A) Calyx and calyx bracts in flower. B) Calyx and calyx bracts in bud. C) Stem. D) Adaxial leaf surface. E) Abaxial leaf surface. F) Sprouting stem from rhizome. G) Inflorescences. H) Whole plant.

Figure 72. Holotype of *Malacothamnus jonesii* var. *gracilis*. CAS228727. Image courtesy of California Academy of Sciences.

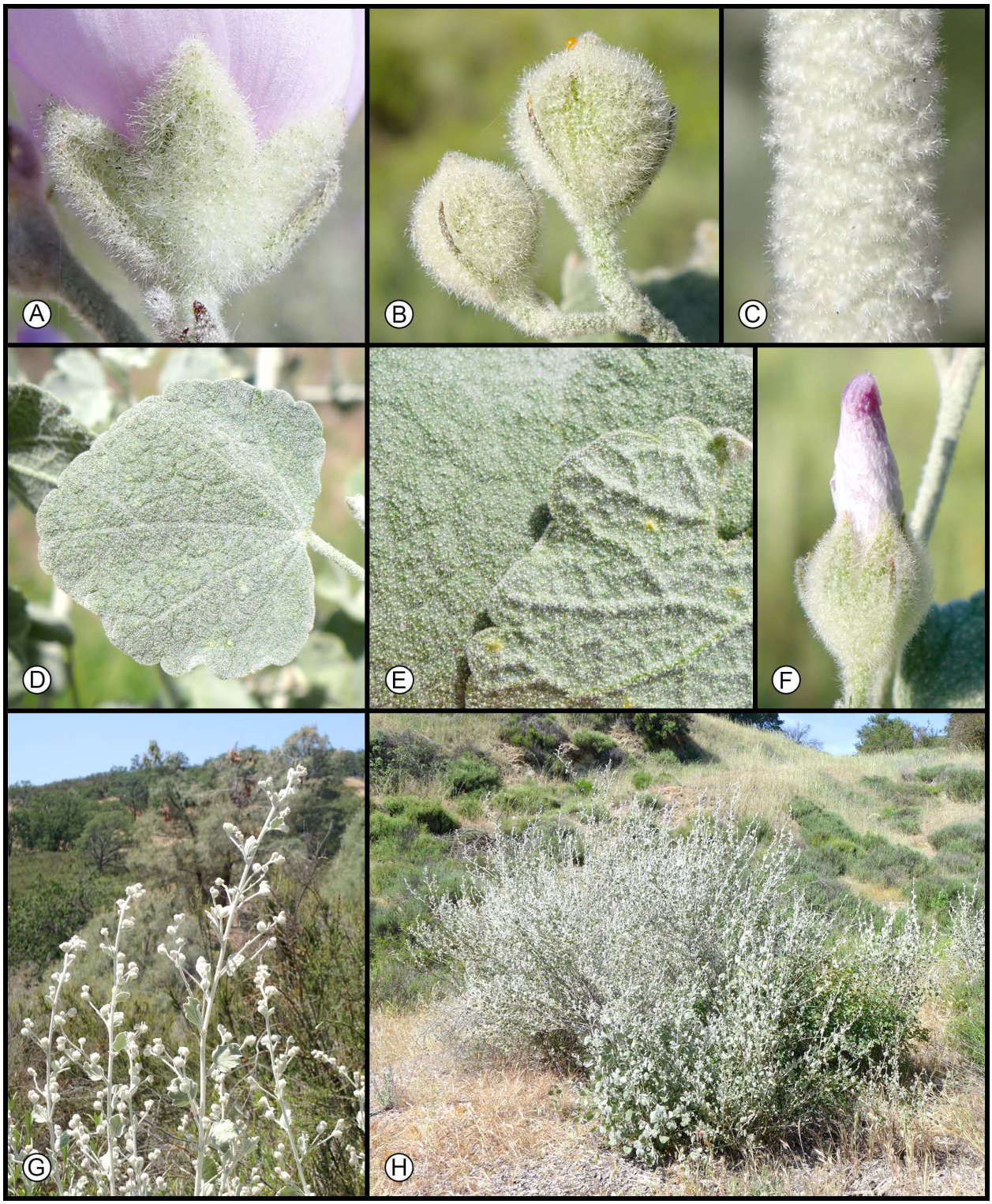

Figure 73. *Malacothamnus jonesii* var. *niveus*. A) Calyx and calyx bracts in flower. B) Calyx and calyx bracts in bud. C) Stem. D) Adaxial leaf surface. E) Adaxial (left) and abaxial (right) leaf surfaces. F) Drying flower in early fruit. G) Inflorescences. H) Whole plant.

Figure 74. Holotype of *Malacothamnus jonesii* var. *niveus.* CAS204656. Image courtesy of California Academy of Sciences.

16. MALACOTHAMNUS LUCIANUS (Kearney) K.Morse, Crossosoma 44(1-2): 22. 2021.

Malacothamnus palmeri var. *lucianus* Kearney, Leafl. W. Bot. 7: 289. 1955. TYPE: U.S.A. California: Monterey County, Santa Lucia Mountains, sandstone rocks on Arroyo Seco Road 3 miles from Escondido Camp, elevation 2600ft, 8 July 1955, *J. T. Howell 30642* (Holotype: CAS396251 [photo!], isotypes: CAS396252 [photo!], CAS396253!, CAS396254 [photo!], CAS396255 [photo!], CAS396256 [photo!], CAS396257 [photo!], CAS396258 [photo!], GH00052910 [photo!], K000659249 [photo!], MICH1104736 [photo!], NY00221798 [photo!], RSA127571!, S13-21537 [photo!], TEX00371880 [photo!], UC1177006!, US2326451 [photo!]).

Shrubs up to 5 m tall, spreading by rhizomes. Stems with sparse to moderately dense stellate trichomes, stem surface often visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 4.8 mm (mean per plant ranges from 0.7–2.6 mm), mostly without stipes, stipes ≤ 0.2 mm; glandular trichomes on stem ≤ 1.4 mm (mean per plant ranges from 0.3–0.7 mm). Leaf blades ± round to widely ovate, length generally ≥ width, obscurely to moderately 3–7 lobed with lobes rounded to borderline acute, bases cordate, bright green adaxially and paler abaxially, sometimes rancid smelling; stellate trichomes on leaf blade with rays ≤ 2.2 mm (mean 0.4 mm), mostly without stipes, stipes ≤ 0.1,abaxial stellate trichome density 1–2.5x adaxial; glandular trichomes on leaf blade ≤ 0.9 mm (mean per plant ranges from 0.2–0.4 mm). Inflorescence capitate to subcapitate. Stipular bracts linear, 12.5–26 mm long, 0.5–6 mm wide, length 3–15(30)x width, calyx bracts linear, 11.5–22(26) mm long, 0.4–1.4 mm wide, length 12–32.5x width, 0.8–1.4x calyx, green to partially red. Calyx 12.5–22 mm long, lobes 9–14.5(17.5) mm long x 3–5.5 mm wide, lobe at base 2.5–5 mm wide, lobe widest at base or up to 4.5 mm above base, lobe length 2.2–3.7x width, lobes narrowly ovate to ovate with acuminate apex; stellate trichomes on abaxial calyx surface with rays 0.1–4.3 mm (mean per plant ranges from 0.6–1.7 mm), mostly without stipes, stipes ≤ 0.1 mm; glandular trichomes on abaxial calyx surface 0.1–1.4 mm (mean per plant ranges from 0.3–0.8 mm). Corolla drying closed, petals to ~3 cm. Figs. 75 & 76.

Phenology. Blooming March to August with peak bloom April to June.

Distribution (Fig. 18). Endemic to the Santa Lucia Mountains in Monterey County, California. In cultivation elsewhere in California. 0–1160 m. EOO: 520, AOO: 18.

Conservation status. CRPR 1B.2 (as *Malacothamnus palmeri* var. *lucianus*). Possible threats include grazing and competition from nonnative plants (CDFW 2022).

Suggested common name: Santa Lucia bushmallow. Additional common name: Arroyo Seco bushmallow (Powell 1974; Matthews 1997). Cultivated under the name *Malacothamnus palmeri* 'Hanging Valley'. The name Santa Lucia bushmallow has been applied to *M. palmeri* and *M. palmeri* sensu Bates (including *M. lucianus* and *M. involucratus*) in the past (CNPS 1980; Bates 1993, 2015a). As *M. lucianus* was named for the Santa Lucia Mountains it was found in, it

seems best to tie these two names together, which will hopefully make it easier for people to remember both.

Notes. *Malacothamnus lucianus* is differentiated from all other *Malacothamnus* taxa by the combination of a capitate to subcapitate inflorescence and relatively long glandular trichomes on the stem and calyx. See also *M. palmeri*.

There is no evidence of naturally occurring hybrids of *Malacothamnus lucianus* with any other taxa.

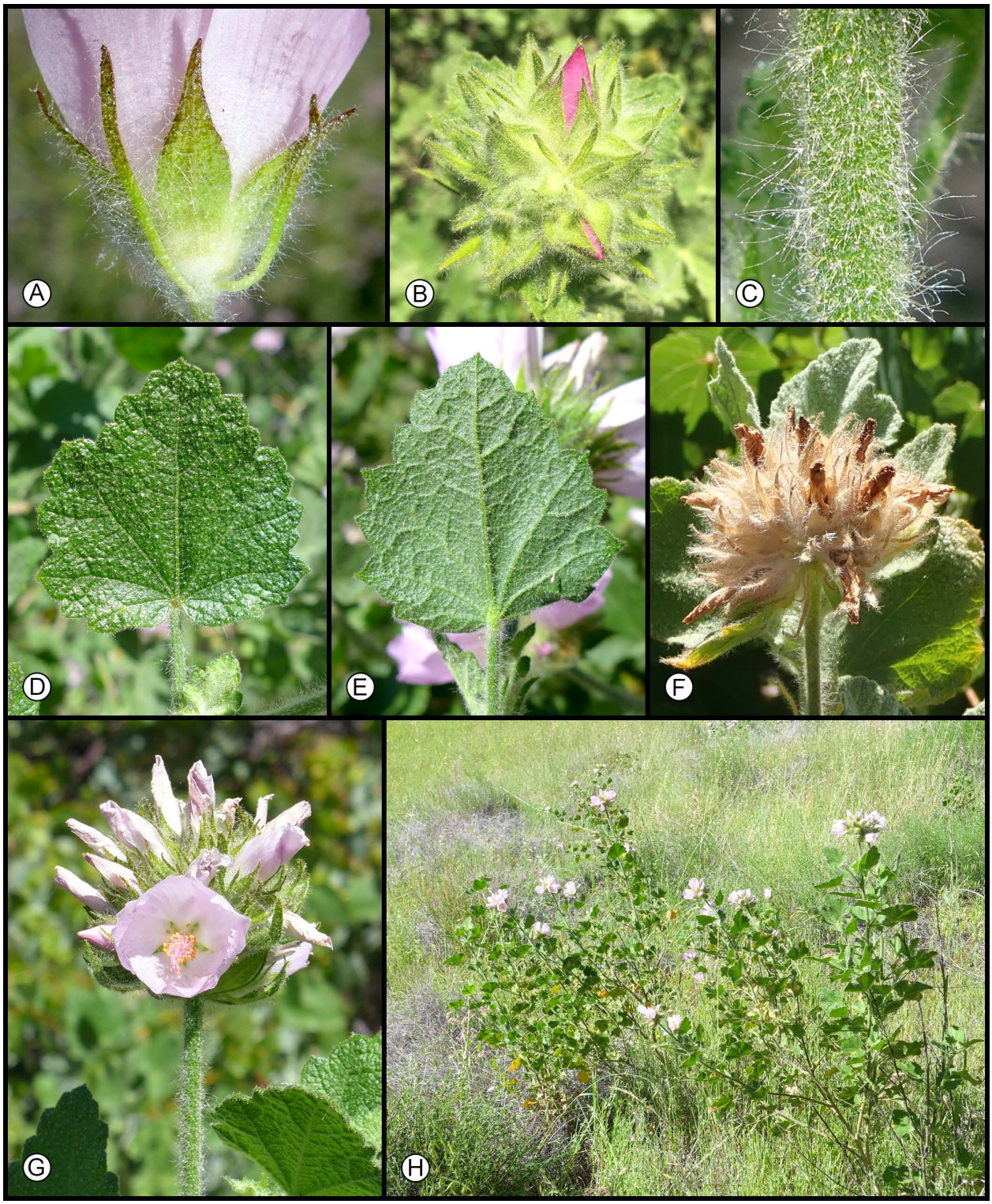

Figure 75. *Malacothamnus lucianus*. A) Calyx and calyx bracts in flower. B) Inflorescence in bud. C) Stem. D) Adaxial leaf surface. E) Abaxial leaf surface. F) Inflorescence in fruit. G) Inflorescence in flower. H) Whole plant.

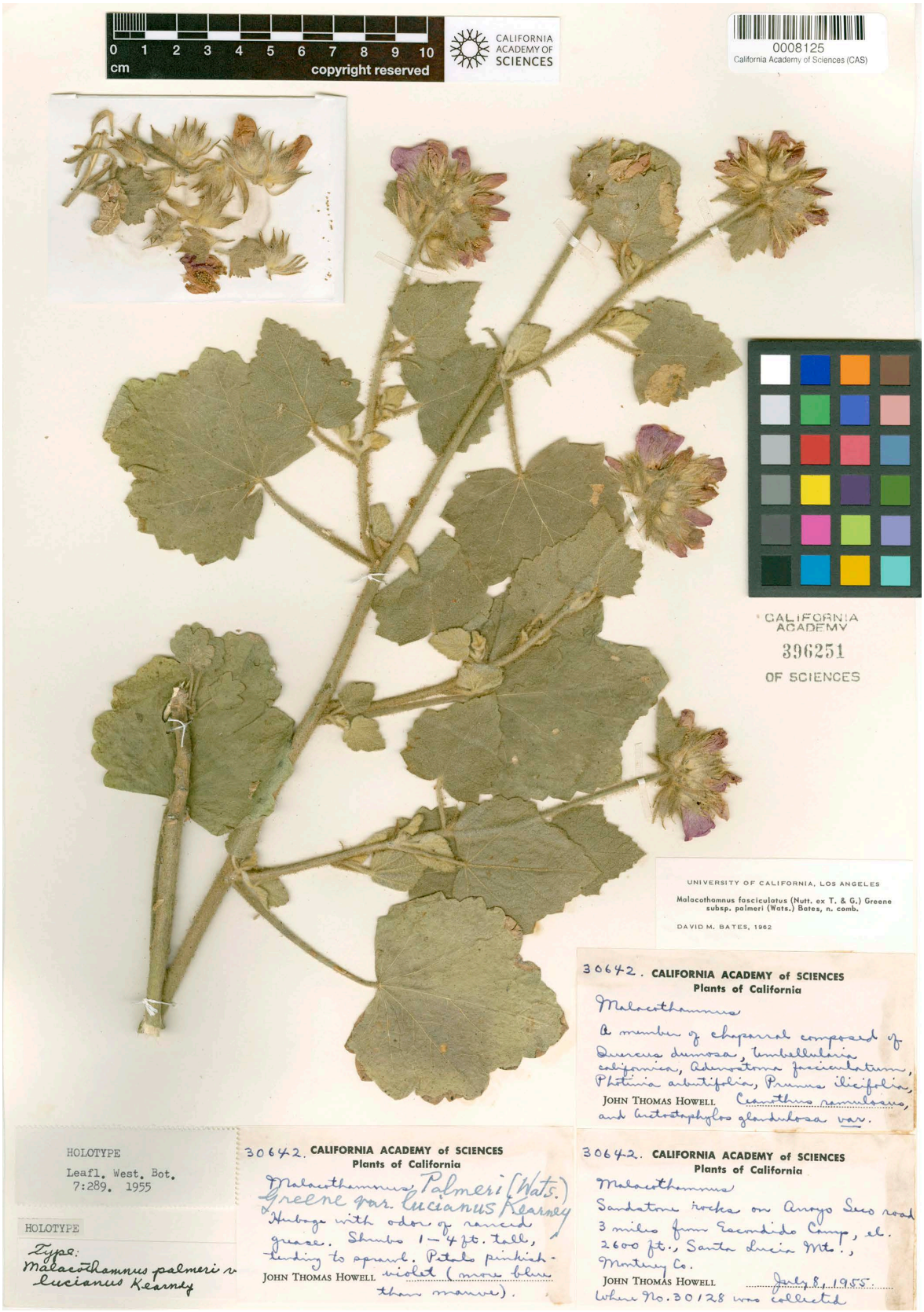

Figure 76. Holotype of *Malacothamnus lucianus.* CAS396251. Image courtesy of California Academy of Sciences.

17. MALACOTHAMNUS MARRUBIOIDES (Durand & Hilg.) Greene, Leafl. Bot. Observ. Crit. 1: 208. 1906.
Malvastrum marrubioides Durand & Hilg., Pl. Heermannianae 38. 1854. TYPE: U.S.A. California: [Madera or Fresno County], Fort Miller [location possibly erroneous, see distribution], July 1853, *A. L. Heerman s.n.* (lectotype designated by Fryxell, 1988: P02286281 [fragment and illustration, photo!], isolectotypes: CAS 1107043 [fragment, photo!], GH00052905 [fragment, photo!], PH00016991!, US49907 [photo!]).

Malvastrum gabrielense Munz & I.M.Johnst., Bull. Torrey Bot. Club 52(5): 223. 1925.
Sphaeralcea densiflora var. *gabrielensis* (Munz & I.M.Johnst.) Jeps., Fl. Calif. [Jepson] 2: 498. 1936. TYPE: U.S.A. California: Los Angeles County, San Gabriel Mountains, Arraster Creek, at 3100 ft., 1 July 1921, *F. W. Peirson 774* (Holotype: POM 9927!, isotypes: CAS358481 [fragment, photo!], JEPS26402, JEPS26408, RSA77206!, WTU216059 [photo!]).

Shrubs up to 2 m tall, occasionally spreading by rhizomes. Stems with dense stellate trichomes, stem surface not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.1 mm (mean per plant ranges from 0.1–0.5 mm), mostly without stipes, stipes ≤ 0.5 mm; glandular trichomes on stem ≤ 0.4 mm (mean per plant ranges from < 0.1–0.1 mm). Leaf blades ± round to widely ovate, length generally ≥ width, unlobed or obscurely to moderately 3–5 lobed with lobes rounded to borderline acute, bases truncate to cordate (occasionally obtuse to cuneate, especially in inflorescence), ashy green to bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.9 mm (mean 0.3 mm), mostly without stipes, stipes ≤ 0.2, abaxial stellate trichome density 1–2x adaxial; glandular trichomes on leaf blade ≤ 0.4 mm (mean per plant 0–0.2 mm). Inflorescence generally spike-like, sometimes with proximal axillary spikes or a narrow panicle. Stipular bracts linear, subulate, lanceolate, oblong, or V-shaped, occasionally shallowly to deeply 2-4 lobed; 4–11.5 mm long, 0.5–2.5 mm wide, length 2–11x width, calyx bracts linear, 6–14(18) mm long, 0.3–0.7 mm wide, length 12.5–35x width,0.6–1.1(1.4)x calyx, green to partially red. Calyx 8.5–15.5 mm long, lobes 6–10.5(13) mm long x 2–4 mm wide, lobe at base 2–3.5 mm wide, lobe widest at base or up to 2.5 mm above base, lobe length 1.7–3.7x width, lobe narrowly to moderately ovate or triangular with narrowly acute to acuminate apex; stellate trichomes on abaxial calyx surface with rays 0.1–1.6 mm (mean per plant ranges from 0.1–0.6 mm), mostly without stipes, stipes ≤0.5 mm; glandular trichomes on abaxial calyx surface < 0.1–0.6 mm (mean per plant ranges from 0.1–0.4 mm). Corolla drying closed, petals to ~1.5 cm. Figs. 77 & 78.

Phenology. Primarily blooming April to July with peak May to June. Later blooms are generally sporadic flowers in the already fruited inflorescence.

Distribution (Figs. 19–21). Possibly endemic to Los Angeles and Ventura counties in the Santa Clara River Valley and southern and western portions of the Liebre Mountains extending somewhat west of Interstate Highway 5 south of Pyramid Lake. 55–1170 m. The type locality of *Malacothamnus marrubioides* is purported to be from Fort Miller near the Fresno/Madera County border, which is now under Lake Millerton. This location, known only from a single

collection from July 1854, is disjunct by over 300 km from all other confirmed locations of *M. marrubioides*. The expedition in which the type specimen was collected also passed through the Santa Clara River watershed in September 1854, which could possibly be the true origin of the type collection (Williamson et al. 1856). Surveys in 2017 focusing on burn areas near Lake Millerton found no *Malacothamnus* but many areas in the Lake Millerton area have not been surveyed for *Malacothamnus* post-fire. EOO: 1998, AOO: 85.

Conservation status. None. Possibly moderately to highly threatened by a combination of development and hybridization. There has been recent heavy development in the core range *of Malacothamnus marrubioides* near Santa Clarita, CA. The range of *M. marrubioides* is surrounded by other *Malacothamnus* taxa and hybridization is common where their ranges meet. Continued expansion of development in the Santa Clarita area may reduce the number of areas where *M. marrubioides* populations are isolated by distance from other *Malacothamnus* taxa. *Malacothamnus marrubioides* should be assessed for a possible conservation ranking.

Suggested common name: Santa Clarita bushmallow. Additional common names: foothill malvastrum (Abrams 1951). As *Malacothamnus marrubioides* is primarily found near Santa Clarita where it may be in danger from development, I suggest the common name Santa Clarita bushmallow to help raise awareness of it in this area.

Notes. *Malacothamnus marrubioides* is generally distinguished from the rest of the genus by the combination of relatively short stellate trichome rays, long calyx bracts, clearly pointed flower buds, and an often-sticky inflorescence. It is most morphologically similar to some plants of the inland form of *M. foliosus*, which is it highly disjunct from.

Morphological intermediates of *Malacothamnus marrubioides* with *M. orbiculatus* and/or *M. fasciculatus* var. *laxiflorus* are common where their ranges meet. DNA analysis indicates geneflow with *M. nuttallii* may also be involved with some of these intermediates (Morse 2023b).

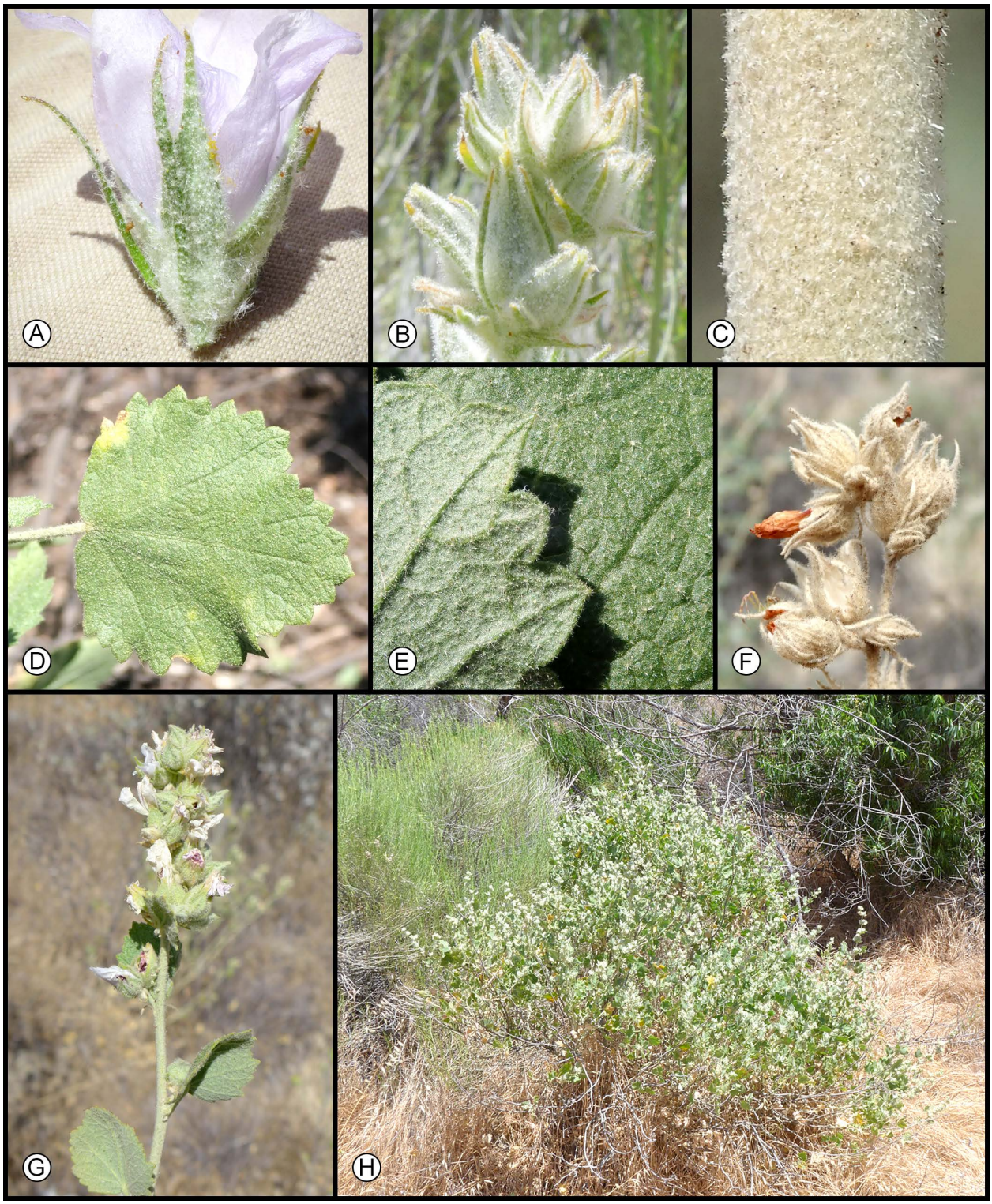

Figure 77. *Malacothamnus marrubioides*. A) Calyx and calyx bracts in flower. B) Flowers in bud. C) Stem. D) Adaxial leaf surface. E) Abaxial (left) and adaxial (right) leaf surfaces. F) Flowers in fruit. G) Inflorescence. H) Whole plant.

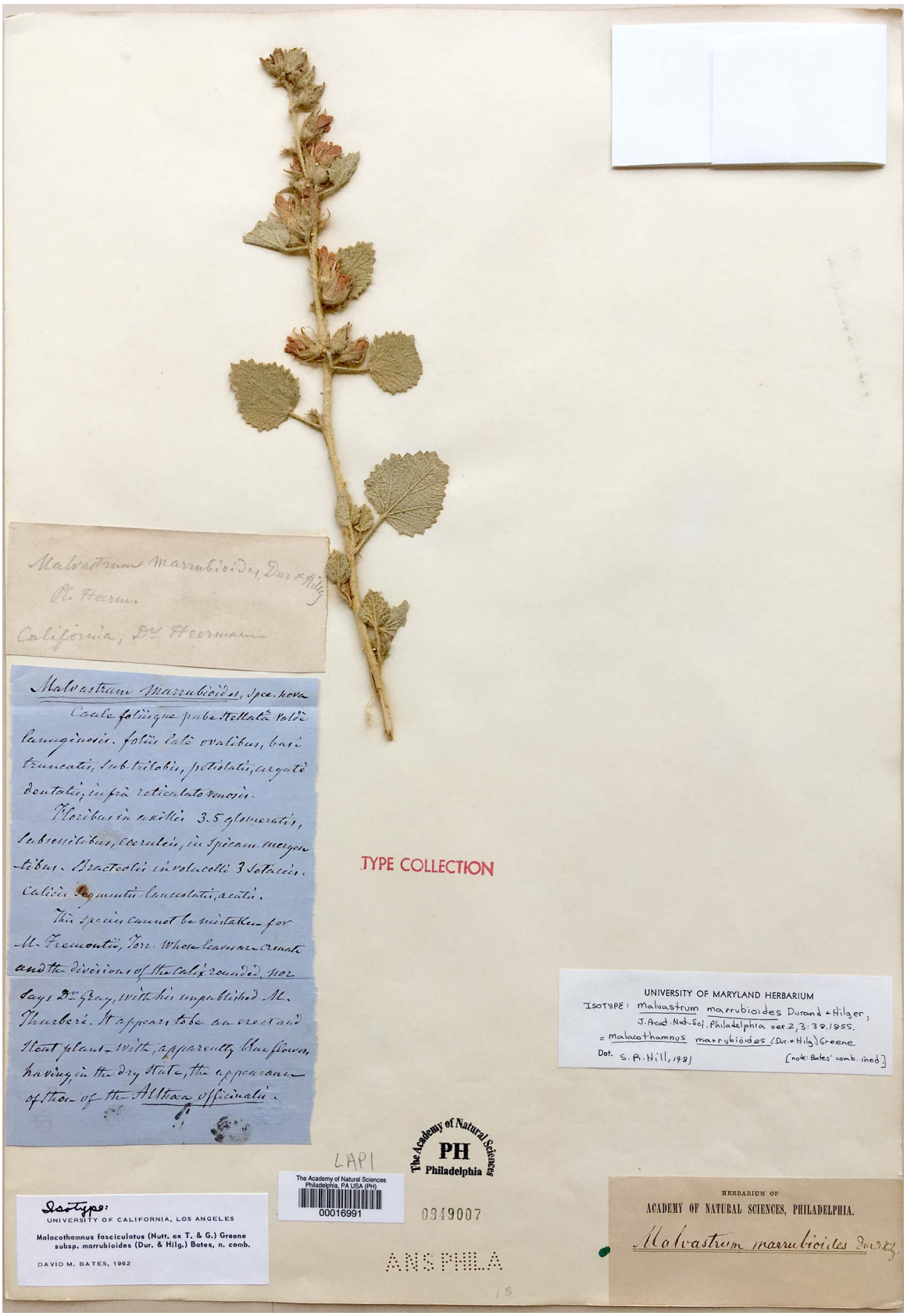

Figure 78. Isolectotype of *Malacothamnus marrubioides.* PH00016991.

18. MALACOTHAMNUS MENDOCINENSIS (Eastw.) Kearney, Leafl. W. Bot. 6: 133. 1951. *Malvastrum mendocinense* Eastw., Leafl. W. Bot. 2: 188. 1939. TYPE: U.S.A. California: Mendocino County, 5 miles from Ukiah on road to Boonville, 20 June 1937, *A. Eastwood and J. T. Howell 4582* (lectotype designated by Fryxell, 1988: CAS249530!, syntypes: CAS264211 [photo!], CAS264212 [photo!], DS268592!, K000659251 [photo!], NY00221831 [photo!], POM258878!).

Shrubs up to 2 m tall, unknown if spreading by rhizomes. Stems with dense stellate trichomes, stem surface not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.2 mm (mean per plant 0.1 mm), without stipes; glandular trichomes on stem < 0.1 mm. Leaf blades ± round to widely ovate, length generally ≥ width, obscurely to moderately 3–7 lobed with lobes rounded to borderline acute, bases cordate (rarely truncate), ashy green to bright green adaxially and paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.2 mm (mean 0.1 mm) and without stipes, abaxial stellate trichome density 1–1.5x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence spike-like to narrowly panicle-like. Stipular bracts triangular to oblong, occasionally shallowly to deeply 2-lobed, 1.5–3 mm long, 0.5–2 mm wide, length 1.5–3x width. Calyx bracts subulate, 1–2 mm long, 0.2–0.4 mm wide, length 3.5–5x width, 0.2–0.3x calyx, green. Calyx 5–7.5 mm long, lobes 2.5–5 mm long x 2–2.5 mm wide, lobe at base 2–2.5 mm wide, lobe widest at base or up to 1.5 mm above base, lobe length 1.0–2.0x width, lobes ovate to widely ovate or triangular with apex acute; stellate trichomes on abaxial calyx surface with rays 0.1–0.2 mm (mean per plant ranges from 0.1–0.2 mm) and without stipes; glandular trichomes on abaxial calyx surface < 0.1 mm. Corolla drying closed, petals to ~1.5 cm. Fig. 79 & 80.

Phenology. Blooming May and June with possible sporadic flowers after.

Distribution (Fig. 16). Endemic to Mendocino County, California and known from only two locations, one on the shore of Lake Mendocino and one ~10 km south of Ukiah along California State Route 253. ~230 m (likely higher and/or lower elevations as well). EOO: 2, AOO: 2.

Conservation status. CRPR 1B.1. Presumed extinct until Jim Xerogeanes discovered a small population on the shore of Lake Mendocino in 2016 near where a pile of wood was burned. This location expands the known range of the species and clarifies where future surveys should focus. Large areas of suitable habitat exist between the known locations, which apparently haven't burned in a long time. These should be surveyed for *Malacothamnus* following future fires in the area.

Suggested common name: Mendocino bushmallow (Powell 1974). Note that the common name Mendocino bushmallow was widely misapplied to *Malacothamnus fasciculatus* after Bates 1993 treatment included *M. mendocinensis* as a synonym of *M. fasciculatus*. I have contacted many websites to fix this error but there may still be many references that erroneously tie the name Mendocino bushmallow to *M. fasciculatus.*

Notes. *Malacothamnus mendocinensis* is distinguished from most of the rest of the genus by the combination of very short calyx bracts, very short stellate trichome rays, and generally moderately lobed leaves with a cordate base. It is most similar to *M. arcuatus* var. *elmeri* and *M. nuttallii*, both of which it is geographically disjunct from.

There is no evidence of naturally occurring hybrids of *Malacothamnus mendocinensis* with any other taxa.

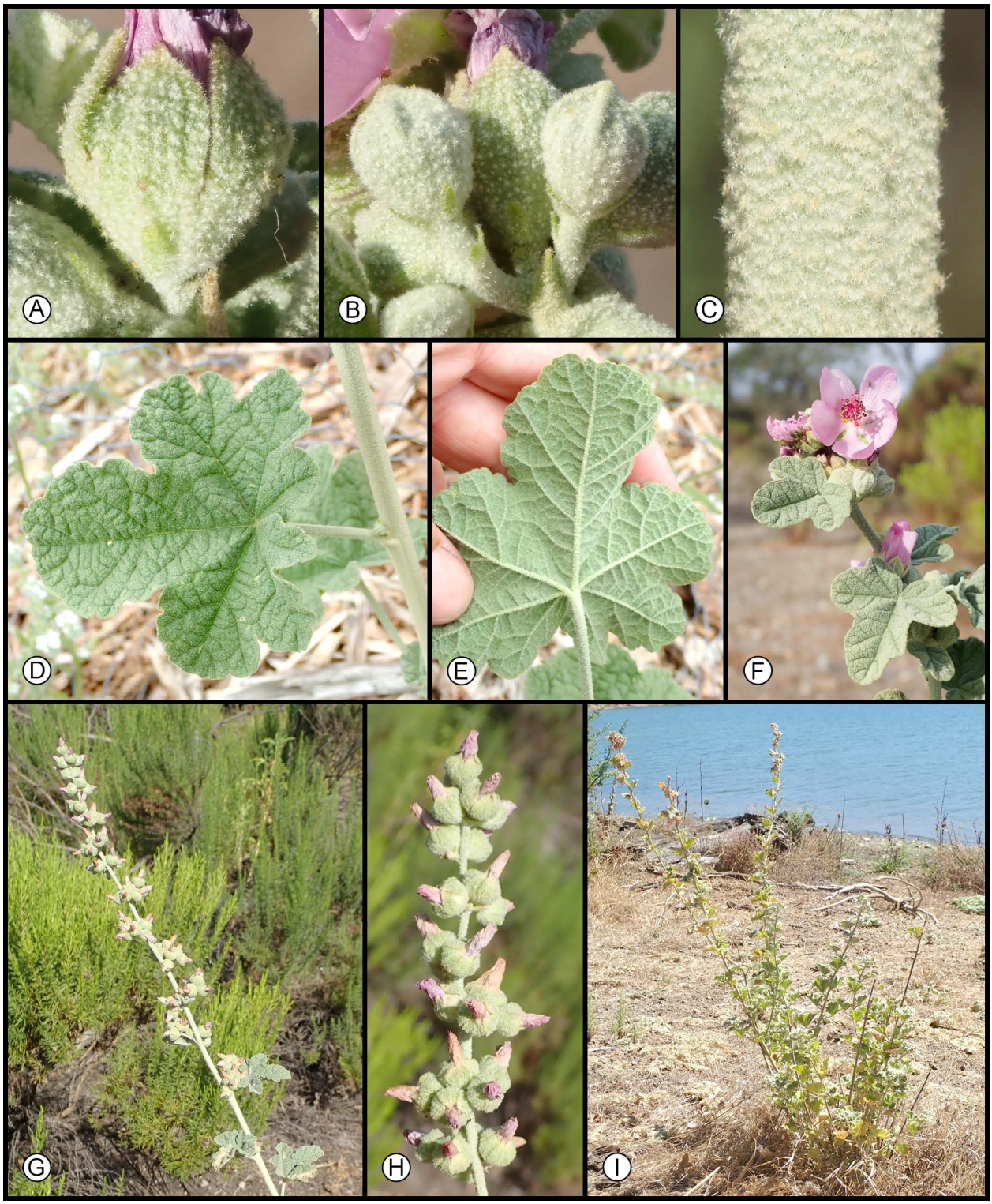

Figure 79. *Malacothamnus mendocinensis*. A) Calyx and calyx bracts in early fruit. B) Flowers in bud. C) Stem. D) Adaxial leaf surface. E) Abaxial leaf surface. F) Flowers and leaves. G) Inflorescence in fruit. H) Distal end of inflorescence in fruit. I) Whole plant.

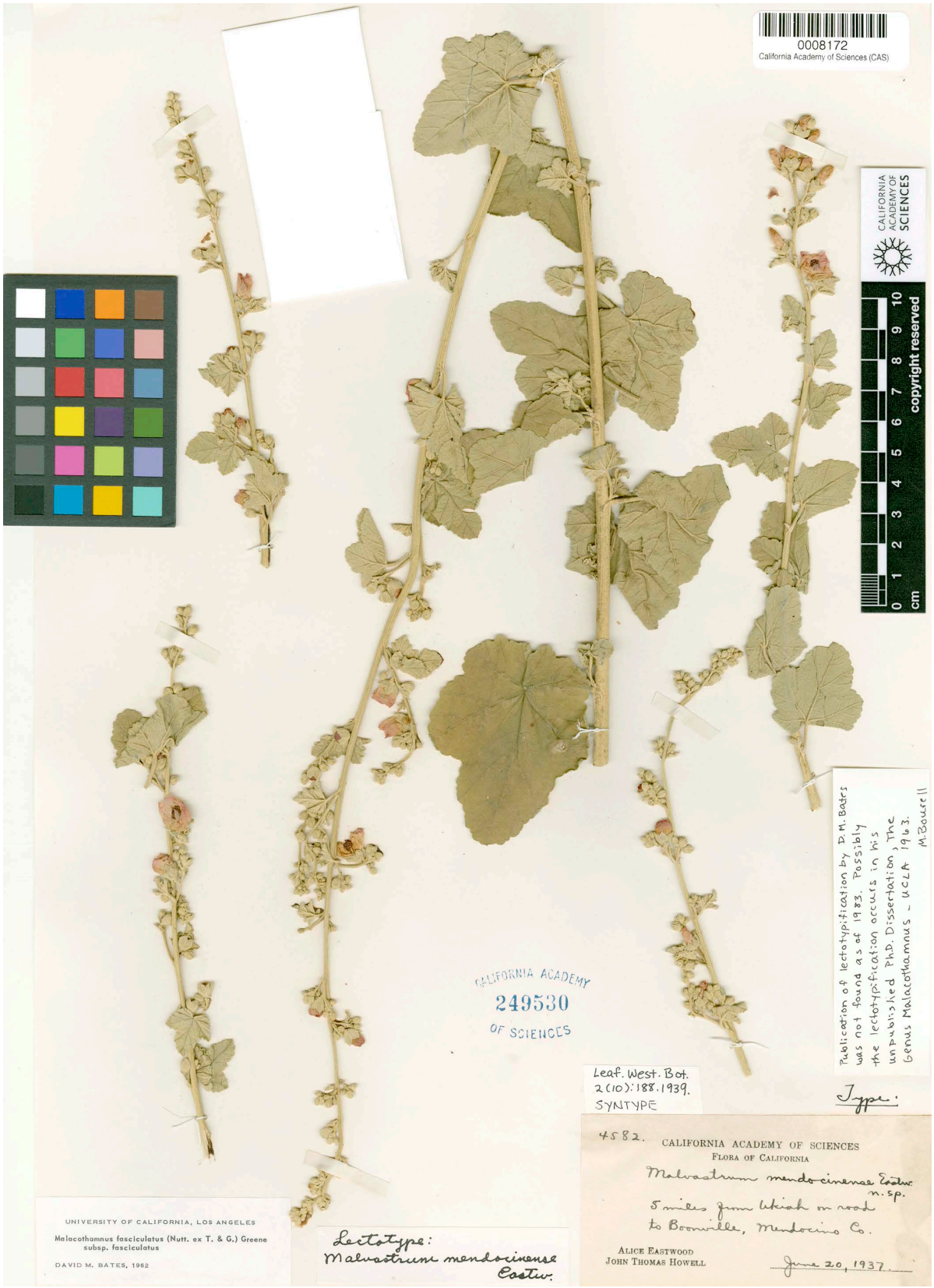

Figure 80. Lectotype of *Malacothamnus mendocinensis.* CAS249530. Image courtesy of California Academy of Sciences.

19. MALACOTHAMNUS NUTTALLII Abrams, Bull. New York Bot. Gard. 6: 417. 1910. *Malvastrum nuttallii* (Abrams) Davidson & Moxley, Fl. S. Calif. (Davidson & Moxley) 233. 1923. *Sphaeralcea fasciculata* var. *nuttallii* (Abrams) Jeps., Fl. Calif. [Jepson] 2: 501. 1936. *Malvastrum fasciculatum* var. *nuttallii* (Abrams) McMinn, Man. Calif. Shrubs 348. 1939. *Malvastrum nesioticum* subsp. *nuttallii* (Abrams) Wiggins in Abrams, Ill. Fl. Pacific States 3: 94. 1951. *Malacothamnus fasciculatus* var. *nuttallii* (Abrams) Kearney, Leafl. W. Bot. 6: 138. 1951. TYPE: U.S.A. California: Ventura County, Casitas Pass, 25 July 1908, *L. R. Abrams s.n.* (Holotype: DS60885! ("Type" in Abrams handwriting on this specimen), isotypes: DS31553!, DS31554 [photo!], GH00052908 [photo!]).

Shrubs up to 6 m tall, spreading by rhizomes. Stems with dense stellate trichomes, stem surface not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 0.4 mm (mean per plant ranges from 0.1–0.2 mm), mostly without stipes, stipes ≤ 0.1 mm; glandular trichomes on stem < 0.1 mm. Leaf blades ± round to widely ovate, length generally ≥ width, generally moderately 3–7 lobed with lobes acute, rarely obscurely or round lobed, bases cuneate to cordate (generally truncate to subcordate), pale ashy green to light green adaxially and not to slightly paler abaxially; stellate trichomes on leaf blade with rays ≤ 0.3 mm (mean 0.1–0.2 mm), mostly without stipes, stipes ≤ 0.1, abaxial stellate trichome density 1–2(3)x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence narrowly to widely panicle-like. Stipular bract triangular, subulate, or oblong, occasionally shallowly to deeply 2-lobed; 1–4 mm long, 0.5–2 mm wide, length 1–5x width. Calyx bracts linear to subulate, 1–3.5(5) mm long,0.2–0.5 mm wide, length 4–15x width, 0.2–0.6x calyx, green to partially red. Calyx 5.5–9.5 mm long, lobes 2–5.5 mm long x 2–3.5 mm wide, lobe at base 2–3.5 mm wide, lobe widest at base, lobe length 1.0–2.0x width, lobes triangular; stellate trichomes on abaxial calyx surface with rays 0.1–0.4 mm (mean per plant ranges from 0.1–0.2 mm), mostly without stipes, stipes ≤ 0.2 mm; glandular trichomes on abaxial calyx surface < 0.1 mm. Corolla drying closed, petals to ~2 cm. Figs. 81 & 82.

Phenology. Primarily blooming May to September with peak June to August. Sporadic flowers documented in all other months.

Distribution (Fig. 18 & 20). Endemic to California in Santa Barbara County, western Ventura County, and the southern boundary of San Luis Obispo County near Santa Maria. 0–1365 m. *Malacothamnus nuttallii* is the most widely planted of all *Malacothamnus* taxa and could possibly be naturalizing in places outside its native range. EOO: 5375, AOO: 155.

Conservation status. None. *Malacothamnus nuttallii* is abundant in many parts of its range and often a dominant species after fires. There is likely little threat to the persistence of this species, though an introduction of *M. fasciculatus* var. *laxiflorus* into its range in a restoration planting does indicate hybridization as a possible threat.

Suggested common name: Ojai bushmallow. Additional common name: in cultivation called *Malacothamnus fasciculatus* 'Casitas'. The common name Ojai bushmallow is suggested

for multiple reasons. First, *M. nuttallii* grows abundantly in the Ojai Valley. Second, Ojai is derived from the Chumash word ‘awha’y (A-HA-EE), meaning moon (Applegate 1974). This seems fitting as the often-grayish coloration of the leaves of *M. nuttallii* resembles the colors seen in a moonlit landscape.

Notes. *Malacothamnus nuttallii* is distinguished from all other species by the combination of its short calyx bracts, very short stellate trichome rays, generally moderately lobed leaves with pointed lobes, and roughly the same stellate trichome density across both leaf surfaces. The similar *M. fasciculatus* var. *laxiflorus* grows near *M. nuttallii* and has been introduced into its range. *Malacothamnus fasciculatus* var. *laxiflorus* generally has much sparser stellate trichomes on the adaxial leaf surface that are often more uneven in size than in *M. nuttallii*. *Malacothamnus fasciculatus* var. *laxiflorus* also blooms about a month earlier, though their blooming periods may overlap. It is unclear whether there are intermediates of *M. nuttallii* and *Malacothamnus fasciculatus* var. *laxiflorus*, but they may be possible where their ranges meet.

There are clear morphological and geographic intermediates of *Malacothamnus nuttallii* with *M. eastwoodiae* and *M. orbiculatus*, though some intermediates are much more like one species or another. Phylogenetic analyses also indicate that *M. nuttallii* may have been involved in intermediate plants from the Santa Clarita area even though no plants of *M. nuttallii* are currently known from that area (Morse 2023b).

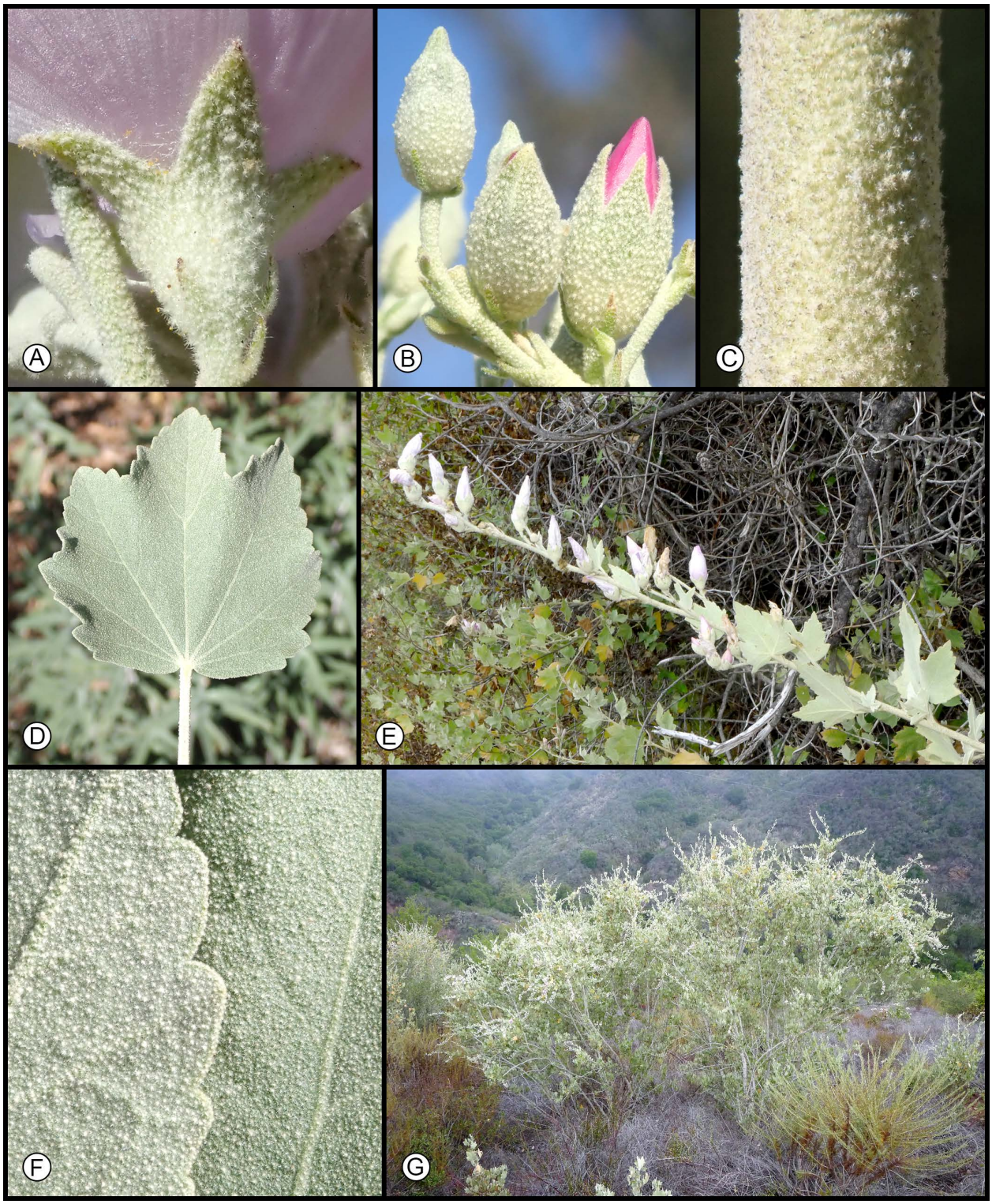

Figure 81. *Malacothamnus nuttallii*. A) Calyx and calyx bracts in flower. B) Flowers in bud. C) Stem. D) Adaxial leaf surface. E) Inflorescence. F) Abaxial (left) and adaxial (right) leaf surfaces. G) Whole plant.

Figure 82. Holotype of *Malacothamnus nuttallii.* DS60885. Image courtesy of California Academy of Sciences.

20. MALACOTHAMNUS ORBICULATUS (Greene) Greene, Leafl. Bot. Observ. Crit. 1: 208. 1906.
Malvastrum orbiculatum Greene, Fl. Francisc. pt. 1: 109. 1891. *Malvastrum fremontii* var. *orbiculatum* (Greene) I.M.Johnst., Pl. World 22: 109. 1919. *Sphaeralcea orbiculata* (Greene) Jeps., Fl. Calif. [Jepson] 2(1): 499. 1936. TYPE: U.S.A. California: [Kern County], Tehachapi, 24 June 1889, E. L. Greene s.n. (Lectotype designated by Kearney, 1951: NDG31177!, syntypes: K000659247 [photo!], K000659248 [photo!]).

Shrubs up to 2.5 m tall, rarely spreading by rhizomes. Stems with sparse to dense stellate trichomes, stem surface sometimes visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.5 mm (mean per plant ranges from 0.2–0.9 mm), many with stipes, stipes ≤ 1.0 mm; glandular trichomes on stem ≤ 0.1 mm (mean per plant < 0.1 mm). Leaf blades ± round to widely ovate, length ±= width, unlobed or obscurely (rarely moderately) 3–5 lobed with rounded lobes, bases cordate to oblique (often cordate), ashy green to bright green adaxially and often paler abaxially; stellate trichome rays ≤ 0.8 mm (mean 0.3 mm), many with stipes, stipes ≤ 0.7 mm, abaxial stellate trichome density 1–2x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence spike-like to panicle-like. Stipular bract triangular, subulate, or oblong, occasionally shallowly to deeply 2-lobed; 1.5–6 mm long, 0.5–2.5 mm wide, length 1–6x width. Calyx bracts linear, 2.5–8 mm long, 0.2–0.6 mm wide, length 6.5–27.5x width, 0.3–0.8x calyx, generally green to occasionally partly red. Calyx 6–11.5 mm long, lobes 3.5–7.5(9) mm long x 1.5–3.5 mm wide, lobe at base 1.5–3.5 mm wide, lobe widest at base or up to 2 mm above base, lobe length 1.4–3.7x width, lobes triangular to occasionally ovate with apex acute to acuminate; stellate trichomes on abaxial calyx surface with rays 0.1–1.7 mm (mean per plant ranges from 0.3–1.0 mm), many with stipes, stipes ≤ 0.8 mm; glandular trichomes on abaxial calyx surface < 0.1–0.1 mm (mean per plant < 0.1 mm). Corolla drying closed, petals to ~2 cm. Figs. 83 & 84.

Phenology. Blooming April to October with peak bloom May to July. Later blooms are generally sporadic flowers on plants that have already fruited.

Distribution (Figs. 15 & 19). Endemic to California and Arizona. In California *Malacothamnus orbiculatus* is found primarily on the northern slopes of the Transverse Ranges, in the Tehachapi Mountains, and the southern and eastern Sierra-Nevada Range. A few locations in desert mountains of California, and locations near Kingman and Phoenix, Arizona, indicate that *M. orbiculatus* was possibly much more widespread in those areas in the past. Large gaps in its eastern distribution suggest additional plants may be found in these gaps if surveyed post-fire. *Malacothamnus* surveys in Arizona in 2018, 2019, and 2020 were, however, mostly unsuccessful in finding plants. 180–2760 m. EOO: 148481, AOO: 330.

Conservation status. None. *Malacothamnus orbiculatus* is the most widespread of all *Malacothamnus* taxa and likely the most abundant. It is often the dominant species in burn areas on the desert side of mountain ranges. In Arizona, it is currently known from a few locations well outside the range of the rest of the genus. Post-burn surveys in Arizona are

needed to determine if *M. orbiculatus* is actually rare there, which would possibly make these peripheral populations of conservation concern.

Suggested common name: Tehachapi bushmallow. Additional common names: Tehachapi mallow (Jepson 1936), Tehachapi globemallow (McMinn and Schumacher 1939), round-leaved malvastrum (Abrams 1951). Common names like round-leaved bushmallow are best avoided as many species of *Malacothamnus* can have round leaves and *M. orbiculatus* doesn't consistently have this character. As no other *Malacothamnus* species grow near Tehachapi, CA and as Tehachapi is in the center of the California part of the distribution of *M. orbiculatus*, the common name Tehachapi bushmallow should cause no confusion with other taxa.

Notes. *Malacothamnus orbiculatus* is highly variable morphologically, which makes it virtually impossible to summarize how it is morphologically distinct from the rest of the genus. In morphological analyses, this variation does not seem to have a clear geographic pattern and, in phylogenetic analyses excluding obvious hybrids, *M. orbiculatus* is always monophyletic (Morse 2023a, 2023b). Its geographic range is adjacent to *M. fremontii* var. *fremontii*, *M. fasciculatus* var. *laxiflorus*, *M. marrubioides*, and *M. nuttallii*. Morphological and geographic intermediates can be found between *M. orbiculatus* and all these taxa. Despite this, *M. orbiculatus* can usually be easily distinguished from adjacent species. *Malacothamnus orbiculatus* has corollas drying closed, whereas *M. fremontii* has corollas drying open. *Malacothamnus orbiculatus* has generally longer stellate trichome rays and calyx bracts than both *M. fasciculatus* var. *laxiflorus* and *M. nuttallii*. *Malacothamnus orbiculatus* vs. *M. marrubioides* is the most difficult as there are large areas of intermediate plants near where they occur, but *M. orbiculatus* generally has a shorter calyx and calyx bracts, less-clearly pointed flower buds, a higher percentage of stellate trichomes with stipes, and a generally-less-sticky inflorescence.

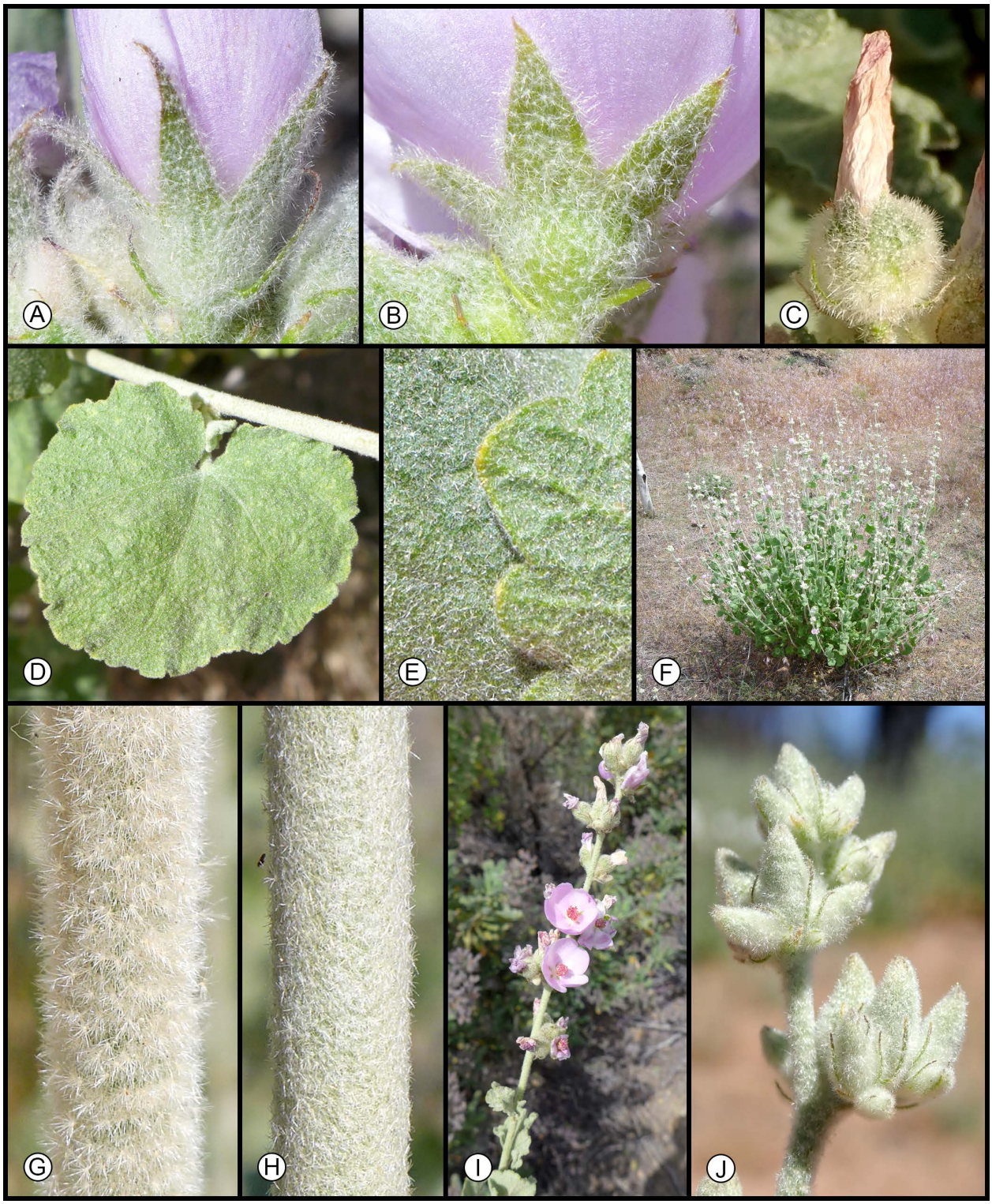

Figure 83. *Malacothamnus orbiculatus.* A & B) Some calyx and calyx bract variation. C) Flower in fruit. D) Adaxial leaf surface. E) Adaxial (left) and abaxial (right) leaf surfaces. F) Whole plant. G & H) Some stem hair variation. I) Whole plant. J) Flowers in bud.

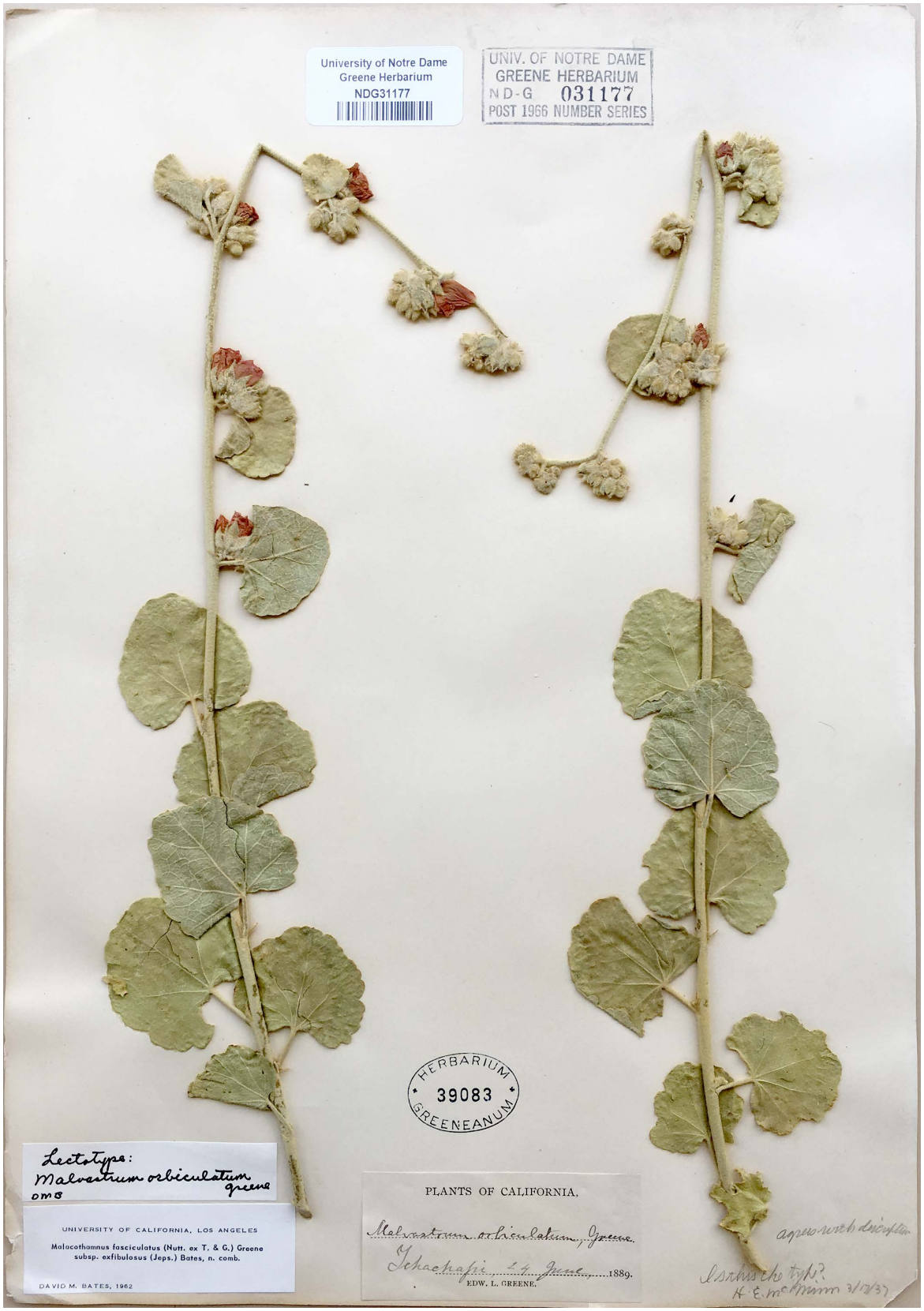

Figure 84. Lectotype of *Malacothamnus orbiculatus.* NDG31177.

21. MALACOTHAMNUS PALMERI (S.Watson) Greene, Leafl. Bot. Observ. Crit. 1: 208. 1906.

Malvastrum palmeri S.Watson, Proc. Amer. Acad. Arts 12: 250. 1877. Sphaeralcea palmeri (S.Watson) Jeps., Man. Fl. Pl. Calif. [Jepson] 633. 1925, nom. illeg. TYPE: U.S.A. California: [San Luis Obispo County], Cambria, [a mile from the sea-beach], 17 July 1876, *E. Palmer 50* (Holotype: GH00052909!, isotypes: AC19345 [photo!], CAS740 [fragments, photo!], F303379 [photo!], M0210333 [photo!], NY00221832 [photo!], NY00221833 [photo!], P02286282 [photo!], PH949005 [photo!], UC109096!, US15205 [photo!], YU066362 [photo!], Possible isotype: CAS739 [photo!]).

Shrubs up to 2 m tall, spreading by rhizomes. Stems with dense stellate trichomes, stem surface not visible through trichomes without magnification; stellate trichomes on stem with rays ≤ 1.4 mm (mean per plant ranges from 0.3–0.6 mm), mostly without stipes, stipes ≤ 0.8 mm; glandular trichomes on stem ≤ 0.1 mm (mean per plant < 0.1 mm). Leaf blades widely ovate, length generally ≥ width, unlobed or obscurely to moderately 3–5 lobed with rounded to acute lobes (may be acuminate in inflorescence), bases cordate to cuneate, ashy green to bright green (occasional somewhat tan) adaxially and paler abaxially; stellate trichome rays ≤ 0.8 mm (mean 0.3 mm), mostly without stipes, stipes ≤ 0.5 mm, abaxial stellate trichome density 0.5–1.5x adaxial; glandular trichomes on leaf blade < 0.1 mm. Inflorescence capitate to subcapitate. Stipular bracts narrowly elliptic, lanceolate, or ovate; 11–21 mm long, 2–6.5(9) mm wide, length 1–8x width. Calyx bracts linear to somewhat widened in the middle, 9–20 mm long, 0.6–3.0 mm wide, length 5.5–22.5x width, 0.7–1.2x calyx, green. Calyx 10.5–19 mm long, lobes 7.5–16 mm long x 4–7.5(9) mm wide, lobe at base 3–5.5 mm wide, lobe widest 2–4 mm above base, lobe length 1.4–3(3.6)x width, lobes ovate to widely ovate with apex acute to acuminate; abaxial calyx veins occasionally with some filiform to branched outgrowths covered in stellate trichomes; stellate trichomes on abaxial calyx surface with rays 0.1–2.9(3.6) mm (mean per plant ranges from 0.1–0.2 mm), mostly without stipes, stipes ≤ 0.9 mm; glandular trichomes on abaxial calyx surface < 0.1–0.1 mm (mean per plant ranges from < 0.1–0.1 mm). Corolla drying closed, petals to ~2 cm. Figs. 85 & 86.

Phenology. Blooming May to August with peak bloom May to July.

Distribution (Fig. 18). Endemic to San Luis Obispo County, California within ~20 km of the Pacific Ocean. Rarely planted elsewhere. 5–815 m. EOO: 341, AOO: 15.

Conservation status. CRPR 1B.2 (as *M. palmeri* var. *palmeri*). Possibly threatened by development and competition with invasive plants (CDFW 2022).

Suggested common name: Cambria bushmallow. Additional common names: Cambria mallow (Jepson 1936), Cambria globemallow (McMinn and Schumacher 1939), Palmer's malvastrum (Abrams 1951), Palmer's bushmallow (Powell 1974), Santa Lucia bushmallow (CNPS 1980; Bates 1993, 2015a; Slotta 2012) The name Santa Lucia bushmallow has been applied to *Malacothamnus palmeri* sensu Bates, which includes both *M. involucratus* and *M. lucianus*. It seems best to apply this name to just *M. lucianus* to reduce confusion. As *M. palmeri* is the only

Malacothamnus around Cambria, CA and as its range is mostly near Cambria, Cambria bushmallow seems an apt common name.

Notes. *Malacothamnus palmeri* can be distinguished from the rest of the genus by the combination of capitate to subcapitate inflorescences, relatively short glandular trichomes, and relatively dense stellate trichomes on the adaxial leaf surface.

Malacothamnus involucratus and M. lucianus were previously ranked as a varieties of *M. palmeri* based on purported intergradation but morphological analyses show them to be both morphologically and geographically distinct from *M. palmeri* (Morse 2021). Phylogenetic analyses, however, do provide evidence they are possibly more closely related to each other than to other species of *Malacothamnus* (Morse 2023b).

There is no evidence of naturally occurring hybrids of *M. palmeri* with any other taxa.

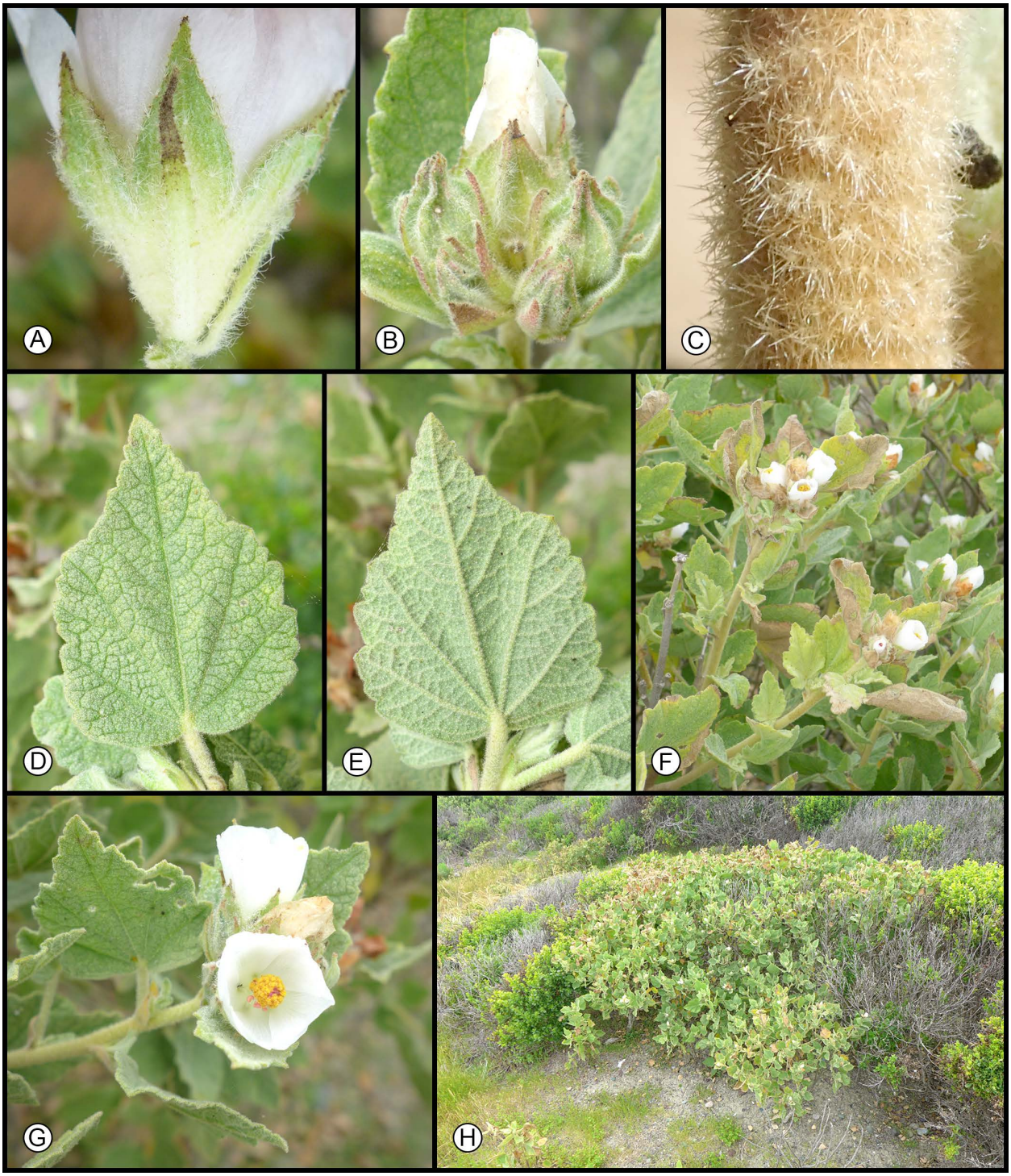

Figure 85. *Malacothamnus palmeri.* A) Calyx and calyx bracts in flower. B) Flower buds. C) Stem. D) Adaxial leaf surface. E) Abaxial leaf surface. F & G) Inflorescences. H) Whole plant.

Figure 86. Holotype of *Malacothamnus palmeri.* GH00052909.

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