Perityleae B.G.Baldwin (Asteroideae):
A catalogue of natural history, taxonomy, and morphology of the rock daisy tribe

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ABSTRACT

Tribe Perityleae includes eight genera and 90 taxa of rock daisies distributed in arid to semi-arid environments in North and South America, many of which grow on steep, vertical cliffs and bare, rocky outcrops in canyons and sky islands. Due in part to their diversity, morphological complexity, and growth in difficult-to-access terrain, rock daisy taxonomy has been in flux for over a century. Recent molecular studies and extensive fieldwork have helped to resolve much uncertainty in this group, but the process of formalizing new insights into codified nomenclatural changes has only begun. As a first step towards an updated monograph of the rock daisies, we present a comprehensive account of all validly published taxonomic names applied to tribe Perityleae in the form of a nomenclator and annotated checklist, and for each taxon we summarize recent discoveries from the field. In total, 273 names are accounted for here, including 81 accepted species, 10 varieties, 125 homotypic synonyms, 53 heterotypic synonyms, and 5 names that apply to taxa in other tribes of Compositae. We also elevate two infraspecific taxa to species level (*Perityle cuneata* and *Perityle marginata*), place five names in synonymy (*Galinsogeopsis stevensii* [a synonym of *G. canescens*], *G. pennellii* [a synonym of *G. hofmeisteria*], *G. scopulorum* and *G. pseudociliata* [both synonyms of *G. coronopifolia*], and *Perityle trichodonta* [a synonym of *P. rosei*], and we reinstate basionyms with nomenclatural priority in four cases (*Galinsogeopsis microglossa*, *G. microglossa* var. *saxosa*, *Laphamia toumeyi*, and *Villanova anemonifolia*). Our review of recent discoveries from the field uncovers ten cases where rock daisies were recently rediscovered by field botanists following many decades of being "lost" and 16 cases where taxa have recently been photographed for the first time. Despite abundant efforts on the part of field biologists to relocate populations of rock daisies, there are still at least ten "lost" rock daisy taxa for which knowledge of current population persistence in the wild is unconfirmed.

Keywords: cliff plants; collaborative monography; Compositae; field work; Heliantheae alliance; nomenclator; taxonomy.

INTRODUCTION

Rock daisies (Perityleae) are an enigmatic tribe of Compositae comprising 81 currently recognized species and ten varieties in eight genera distributed in mostly arid, rocky environments from western North America south to the Atacama Desert in Peru and Chile (Lichter-Marck & Baldwin, 2022; see map on page 33). Most species of rock daisies are extreme habitat specialists that grow on bare, rocky outcrops and cliffs in mountains and canyons; however, this group also includes seasonally-abundant herbaceous

annuals, shrubs, and rhizomatous perennials (Lichter-Marck & Baldwin, 2023). Botanical collections from steep, rough terrain in recent decades have led to new insights into rock daisy diversity, including new species, new collections, and the first photographs of many rock daisies previously known only from type specimens. Recent molecular phylogenetic studies have also illuminated the evolutionary history of rock daisies and resolved long-standing uncertainty in their classification (Lichter-Marck et al., 2020; see page 36). Here, we synthesize the latest knowledge about rock daisy natural history and taxonomy to provide a panorama of this fascinating group of composites and a taxonomic framework for upcoming new species descriptions and detailed monographic studies.

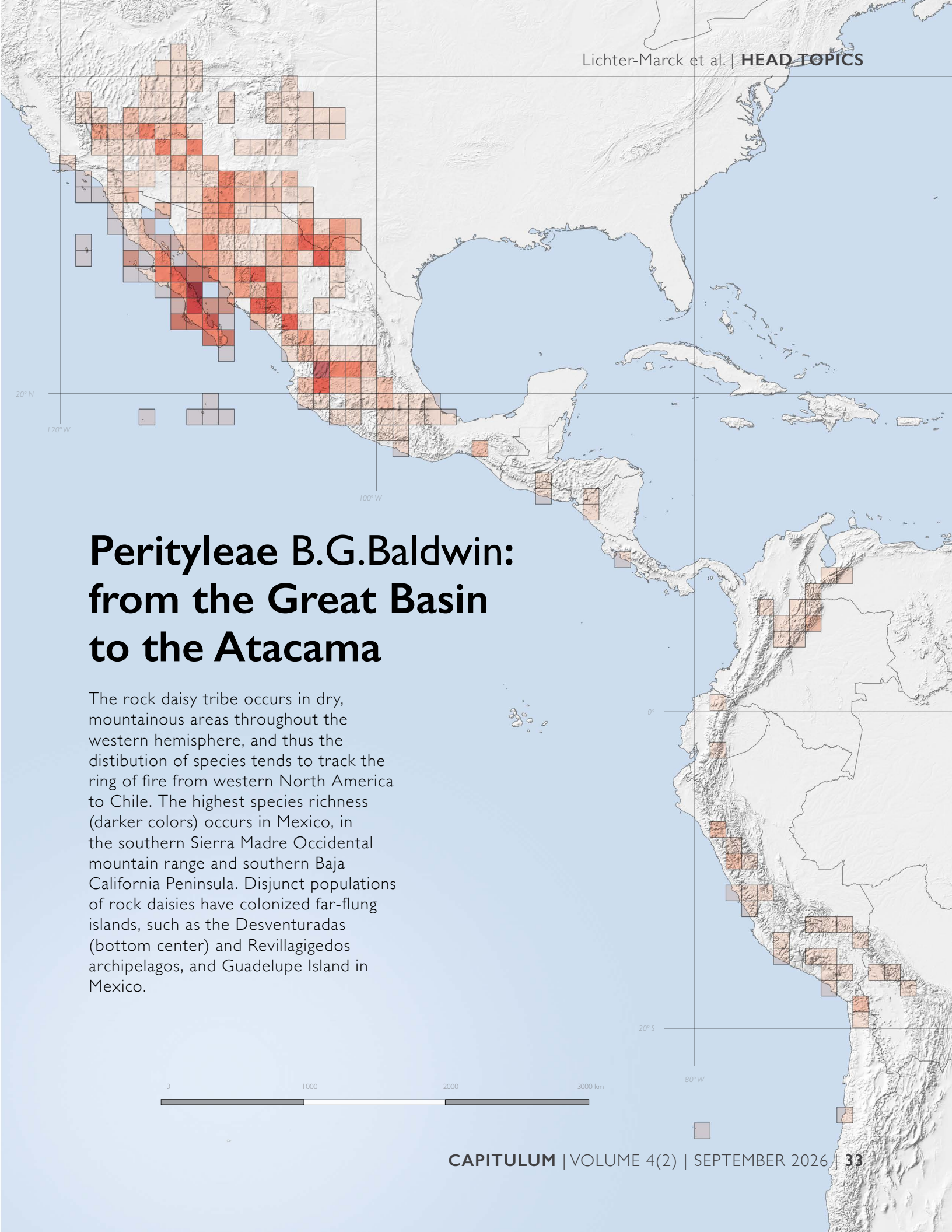
As currently recognized, tribe Perityleae mostly conforms to subtribe Peritylinae (sensu Robinson (1981), ca. 77 species), a group which had long been acknowledged based on distinctive morphological traits (Figure 1 & Figure 2; see also page 37-43), including epaleate heads, four-lobed disc corollas, and one or two series of subequal, naviculate (boat-shaped) phyllaries (Baldwin, 2009). Early molecular studies (Baldwin et al., 2002; Panero and Funk, 2008; Schilling et al., 2013, 2015) supported the monophyly of Peritylinae with the minor expansion of tribe Perityleae to encompass two additional subtribes, Lycapsinae H.Robinson, with only 1 species, *Perityle tenuifolius* (Phil.) Lichter-Marck, endemic to the desolate Desventuradas Archipelago in Chile, and Galeaninae Panero & B.G.Baldwin, which includes two genera, *Galeana* La Llave and *Villanova* Lag., with ca. four species (Panero, 2007). Perityleae occupy a prominent phylogenetic position among the epaleate tribes of the Heliantheae alliance (Helenieae sensu Bentham), because it is the sister lineage to the hyper-diverse, mostly tropical boneset tribe Eupatorieae (~2,500 spp.) (Baldwin, 2008). Perityleae and Eupatorieae in turn belong to a clade of mostly temperate epaleate tribes within the Heliantheae alliance that includes Madieae, Bahieae, and Chaenactideae (Baldwin et al., 2002, Mandel et al. 2019, Zhang et al. 2024).

Uncertainty surrounding the delimitation of genera within subtribe Peritylinae has been a perennial theme of rock daisy classification over the past 150 years (Shinners, 1959; Niles, 1970; Powell, 1968, 1973b, 1973c; Powell & Turner, 1974; Lichter-Marck & Baldwin, 2022; see page 34). First, as western botanists explored the vast roadless terrain of western North America that rock daisies call home, new species were described in the taxonomic literature, and successive taxonomists proposed new genera to accommodate their growing diversity (Niles, 1968). Then, Shinners (1959) boldly lumped most rock daisies into the single, drastically expanded, heterogeneous genus *Perityle* Benth. Niles (1970) did not initially adopt this radically expanded concept of *Perityle* when a few years later, he monographed cliff-endemic rock daisies in genus *Laphamia* A.Gray sensu Rydberg. However, A. Michael Powell did adopt Shinners' broader circumscription of *Perityle* when he monographed the rock daisies in the early 1970s (Powell, 1969, 1973a, 1974). To account for the clear polyphyletic nature of *Perityle* sensu Shinners, Powell proposed three subgeneric sections, *Perityle* sect. *Perityle*, *Perityle* sect. *Laphamia* (A.Gray) A.M.Powell, and *Perityle* sect. *Pappothrix* (A.Gray) A.M.Powell, and created informal groupings of related species (Powell, 1974). Powell's insightful phylogenetic inferences were based on artificial hybridizations, chemotaxonomy, cytology, morphology, and ecological observations made during his exhaustive field work. In recent years, whole-genome scale DNA sequence data has been used to test, and in most cases substantiate Powell's hypotheses, including the polyphyly of *Perityle* sensu Shinners (Lichter-Marck et al., 2020; Lichter-Marck & Baldwin, 2023). With phylogenomic-scale data in hand, a stable generic taxonomy based on natural groups for Perityleae has finally been proposed (Lichter-Marck & Baldwin, 2022; see page 36). This classification of rock daisies recognizes a much narrower circumscription of *Perityle* (~12 taxa) incorporating the three taxa of the Baja California-endemic genus *Amauria* Benth. and the single species of the Desventuradas Islands-endemic genus *Lycapsus* Phil. The recent classification also reinstates the monotypic Guadalupe Island-endemic genus *Nesothamnus* (A.Gray) Rydb. and restores the genera *Galinsogeopsis* Sch.Bip. and *Laphamia* to accommodate two independent radiations of sky island rock daisies found in the Sierra Madre Occidental of Mexico and the Basin and Range province of western North America, respectively (Lichter-Marck & Baldwin, 2022).

Most species of rock daisies are extreme ecological specialists that grow exclusively on vertical, bare rocky cliffs in arid environments (see page 43). As in many other diverse groups of plants where

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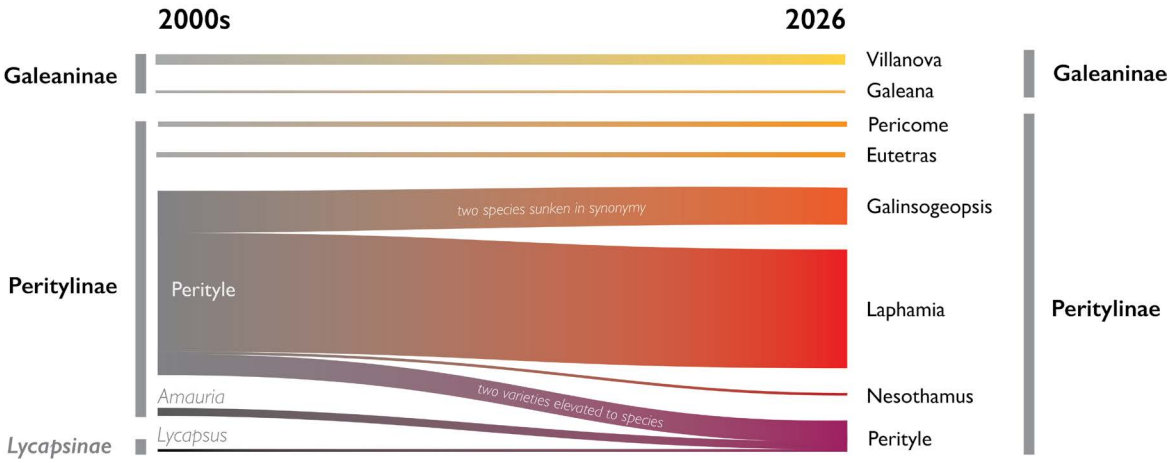
Perityleae B.G.Baldwin: from the Great Basin to the Atacama



The rock daisy tribe occurs in dry, mountainous areas throughout the western hemisphere, and thus the distibution of species tends to track the ring of fire from western North America to Chile. The highest species richness (darker colors) occurs in Mexico, in the southern Sierra Madre Occidental mountain range and southern Baja California Peninsula. Disjunct populations of rock daisies have colonized far-flung islands, such as the Desventuradas (bottom center) and Revillagigedos archipelagos, and Guadelupe Island in Mexico.

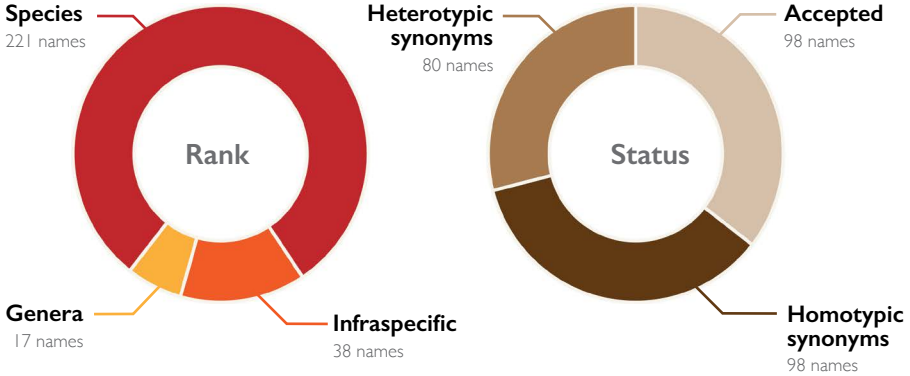
Recent changes in the classification of Perityleae

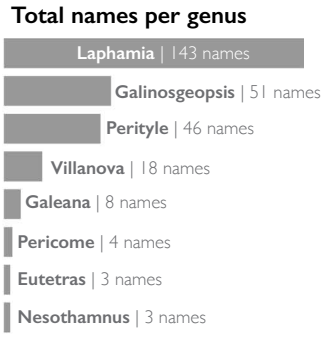
Prior to 2022, the vast majority (72) of rock daisy species were classified within heterogeneous *Perityle*, with the remaining species split among a constellation of distinctive smaller rock daisy genera. Molecular phylogenetic analyses revealed *Perityle* to be non-monophyletic with respect to *Amauria*, *Eutetras*, *Lycapsus* and *Pericome*, prompting a reclassification of tribe Perityleae at the generic level.



Nomenclator of Perityleae

276 total names treated (see page 109-107)



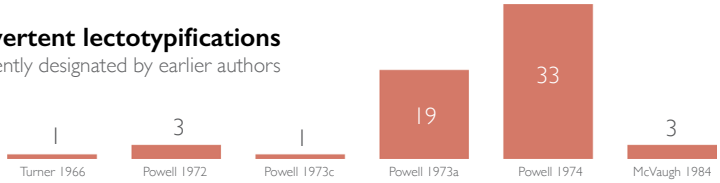


Lectotypifications

20 lectotypes designated here for the first time; this includes 3 second step lectotypifications.

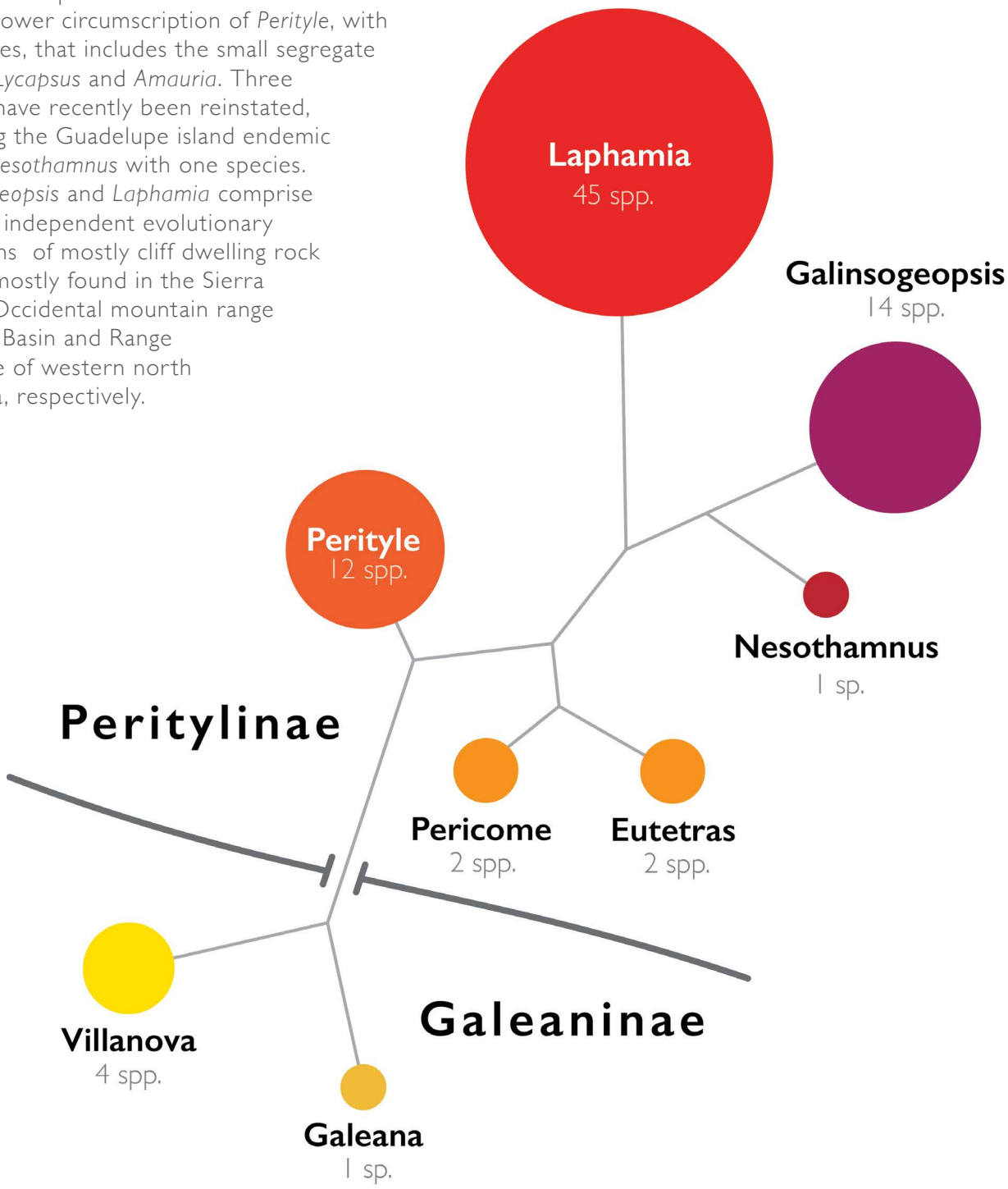
Inadvertent lectotypifications

62 lectotypes inadvertently designated by earlier authors



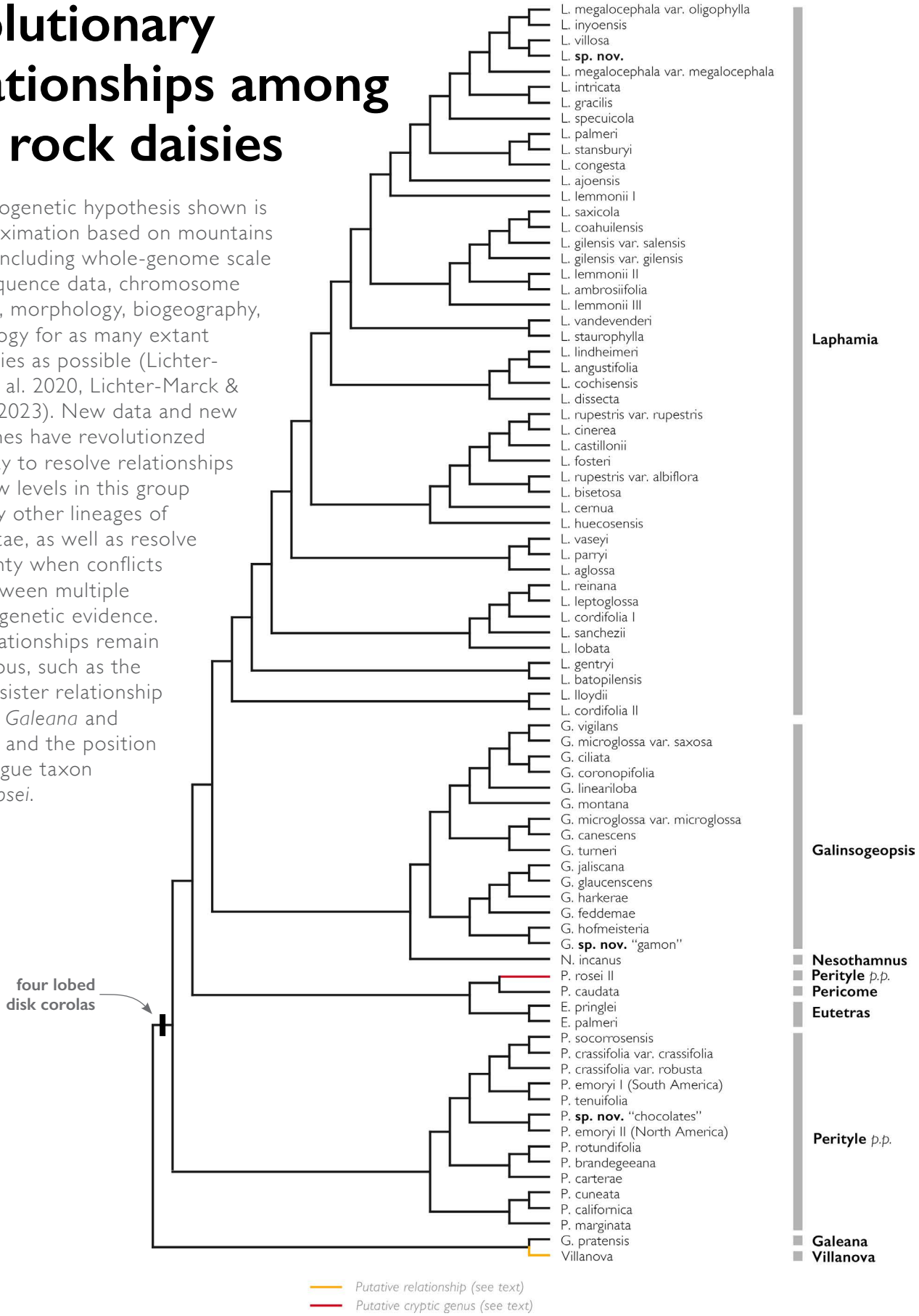
Classification of Perityleae

The updated classification of the rock daisies recognizes six genera within the heterogeneous and diverse subtribe Peritylinae. A key change compared to previous classification schemes is a narrower circumscription of *Perityle*, with 12 species, that includes the small segregate genera *Lycapsus* and *Amauria*. Three genera have recently been reinstated, including the Guadelupe island endemic genus *Nesothamnus* with one species. *Galinsogeopsis* and *Laphamia* comprise diverse, independent evolutionary radiations of mostly cliff dwelling rock daisies mostly found in the Sierra Madre Occidental mountain range and the Basin and Range province of western north America, respectively.



Evolutionary relationships among the rock daisies

The phylogenetic hypothesis shown is an approximation based on mountains of data, including whole-genome scale DNA sequence data, chromosome numbers, morphology, biogeography, and ecology for as many extant rock daisies as possible (Lichter-Marck et al. 2020, Lichter-Marck & Baldwin 2023). New data and new approaches have revolutionized our ability to resolve relationships at shallow levels in this group and many other lineages of compositae, as well as resolve uncertainty when conflicts arise between multiple types of genetic evidence. Many relationships remain contentious, such as the putative sister relationship between *Galeana* and *Villanova*, and the position of the rogue taxon *Perityle rosei*.



Morphology of Perityleae

Fruit and Pappus

Pappus scales

Hyaline scales vary in number and when present, form a crown at the fruit apex

Pappus awns

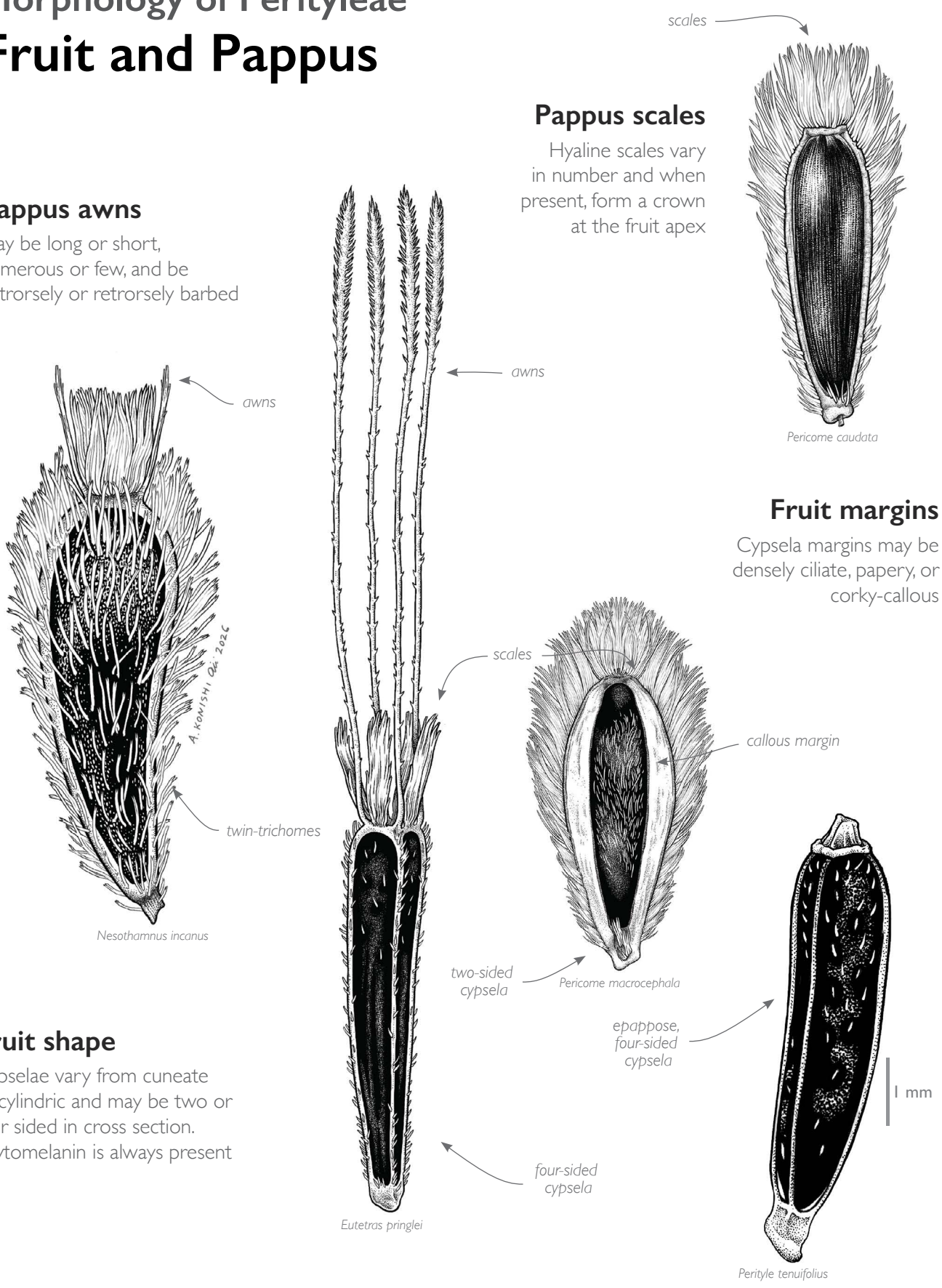
May be long or short, numerous or few, and be antrorsely or retrorsely barbed

Fruit margins

Cypsela margins may be densely ciliate, papery, or corky-callous

Fruit shape

Cypselae vary from cuneate to cylindric and may be two or four sided in cross section. Phytomelanin is always present



Morphology of Perityleae

Habit and capitulescences

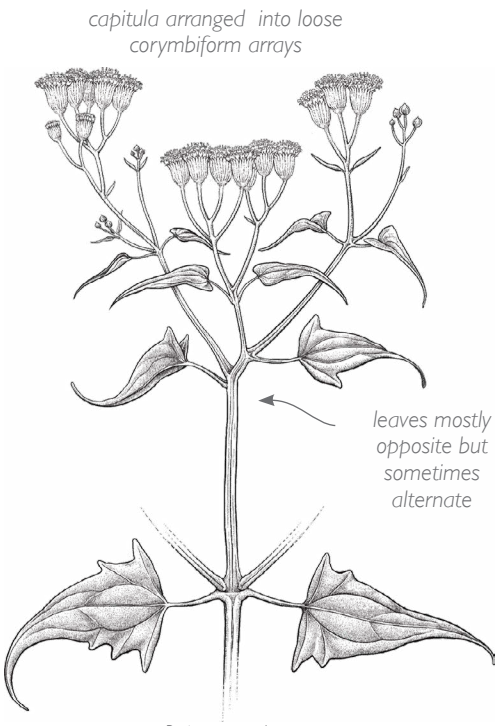
Habit

Rock daisies can be woody shrubs, suffrutices, perennial or annual herbs with slender herbaceous stems

Capitula

Capitula are often borne solitary but may be arranged into loose or dense corymbiform capitulescences





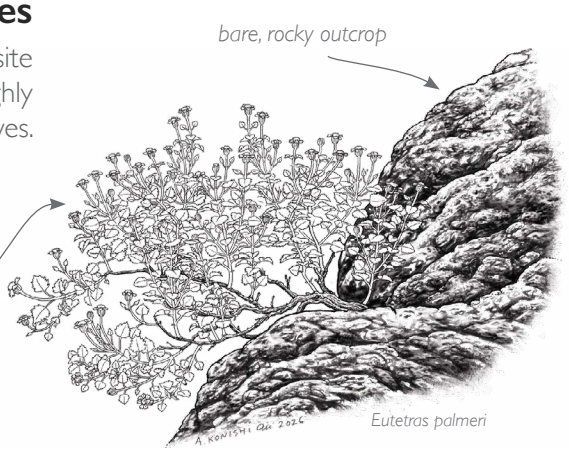


Cliff dwellers

The vast majority of rock daisies occur as extreme ecological specialists on vertical cliffs of consolidated bedrock

Leaves

Most rock daisies have opposite or sub-opposite entire or highly dissected leaves.



Wood

A gnarled woody caudex occurs in many species, acting both as a grappling hook for cliffy rock faces and as a site to form adventitious shoots after the long desert dry season.



Morphology of Perityleae

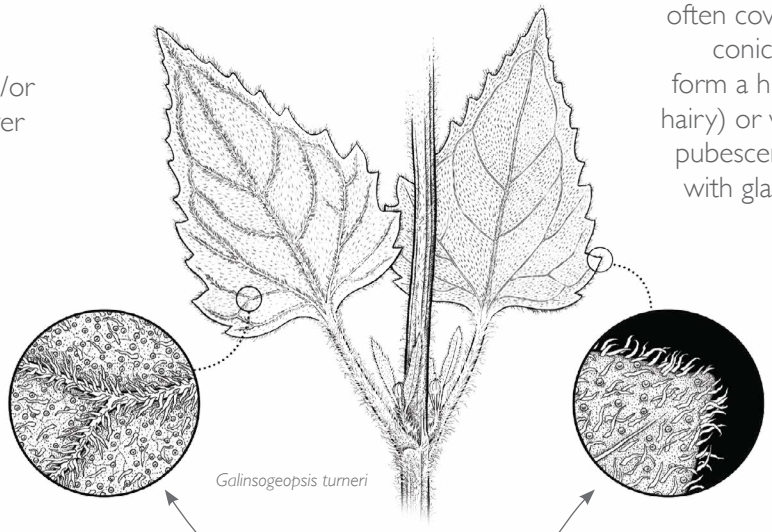
Indument

Trichomes

An abundance of glandular and/or non-glandular trichomes are ever present in Perityleae on leaves, stems, florets, and fruits

Simple conical trichomes

Leaves and stems are often covered with simple conical trichomes that form a hirtellous (coarse-hairy) or villous (long-soft) pubescence, interspersed with glandular trichomes

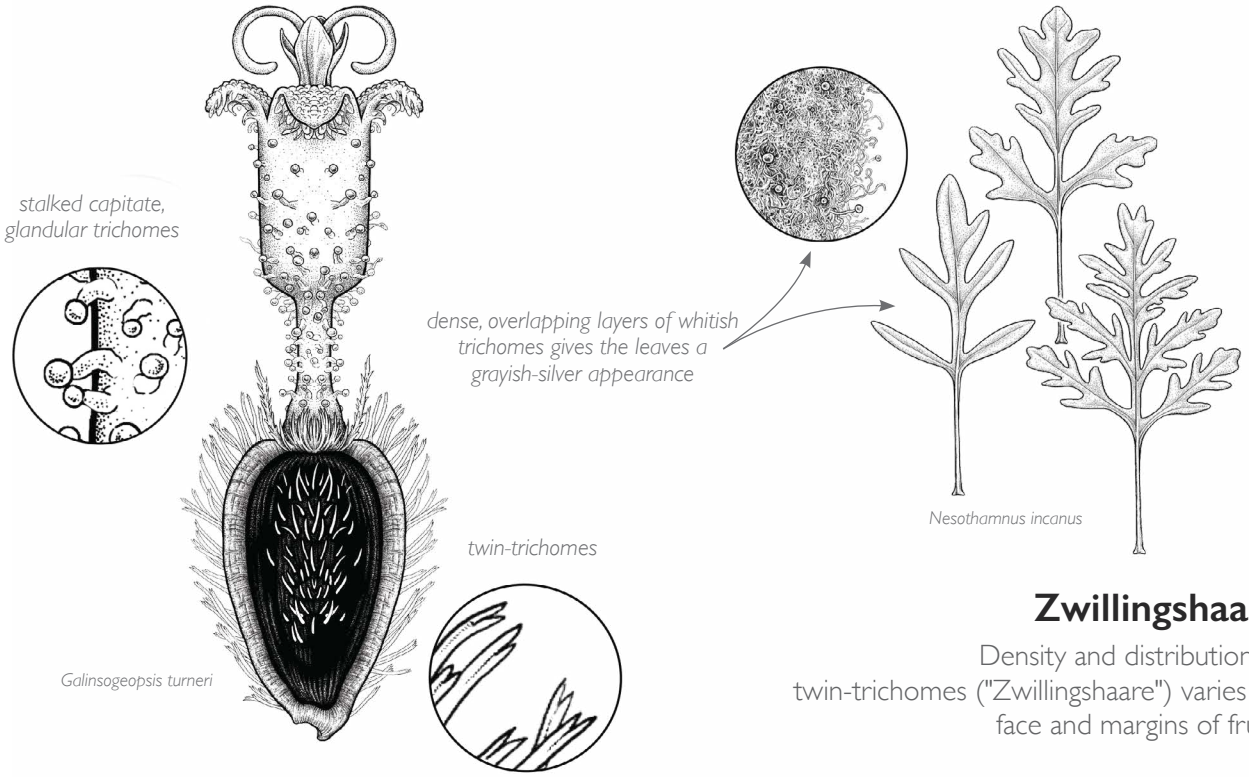


Glandular trichomes

Simple, biseriate glandular trichomes, with a clearly differentiated stalk and head, often densely cover corollas.

Flagellate trichomes

Some rock daisies have a more densely tomentose-canescent appearence that comes from having long and twisted unicellular flagellate trichomes densely matted on the surface



Zwillingshaare

Density and distribution of twin-trichomes ("Zwillingshaare") varies on face and margins of fruits

Morphology of Perityleae

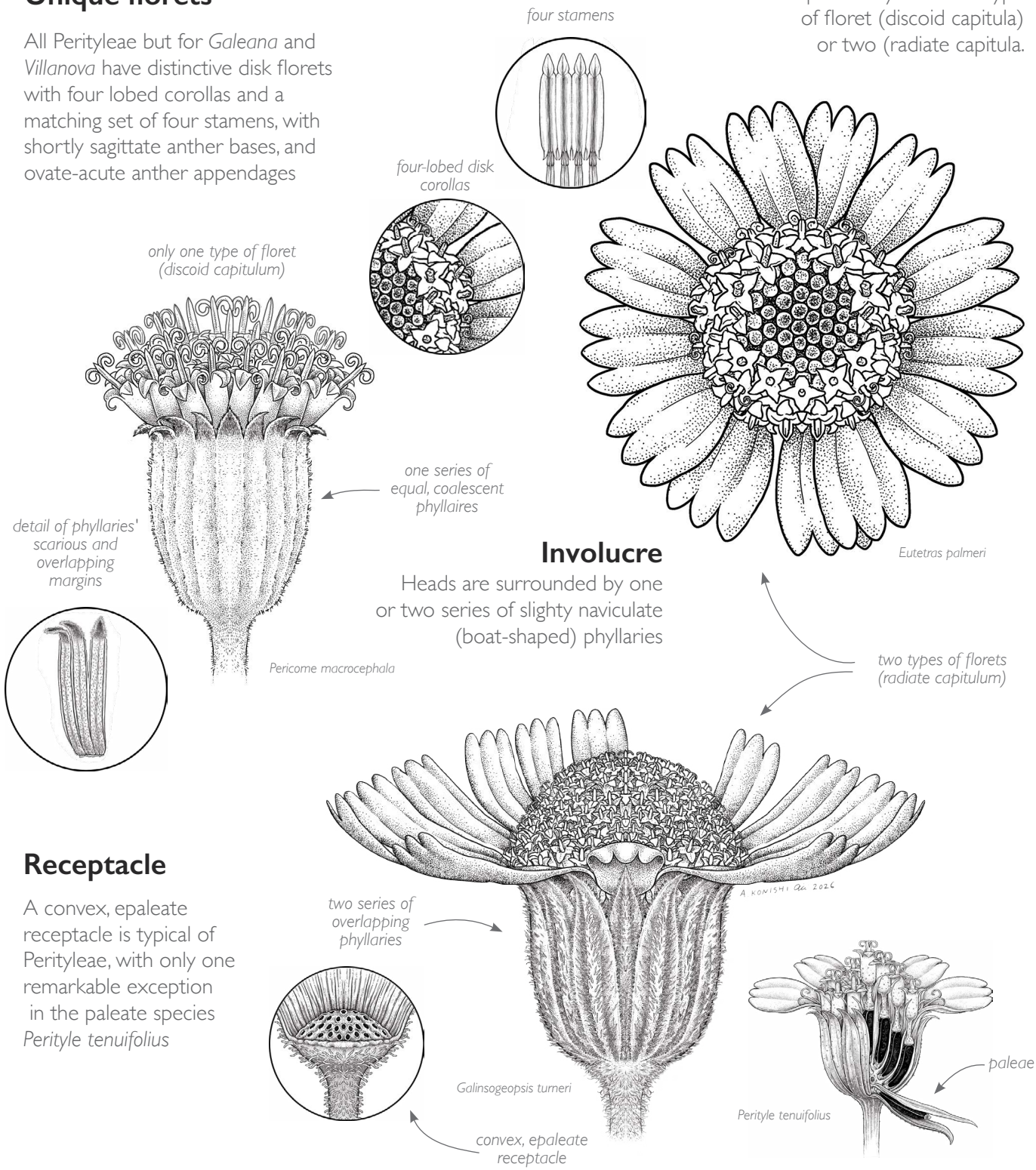
Florets and capitula

Unique florets

All Perityleae but for *Galeana* and *Villanova* have distinctive disk florets with four lobed corollas and a matching set of four stamens, with shortly sagittate anther bases, and ovate-acute anther appendages

Capitula

Capitula may have one type of floret (discoid capitula) or two (radiate capitula.



Involucre

Heads are surrounded by one or two series of slighty naviculate (boat-shaped) phyllaries

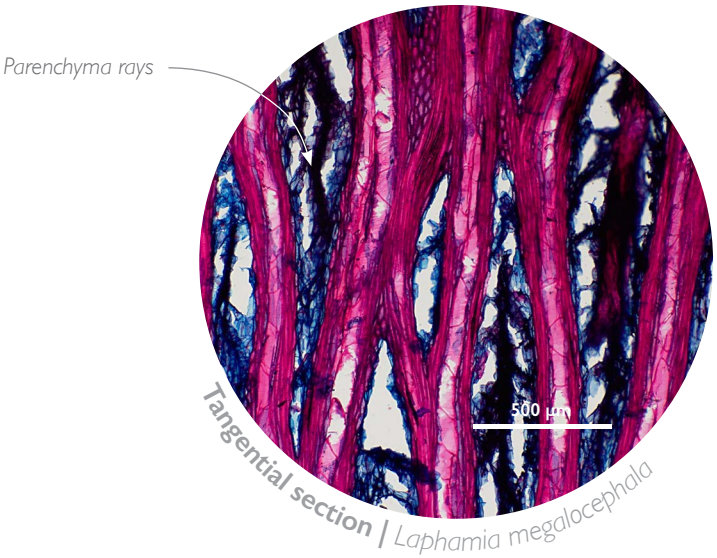
Receptacle

A convex, epaleate receptacle is typical of Perityleae, with only one remarkable exception in the paleate species *Perityle tenuifolius*

Anatomy of Perityleae
Stem wood

A specialized stem

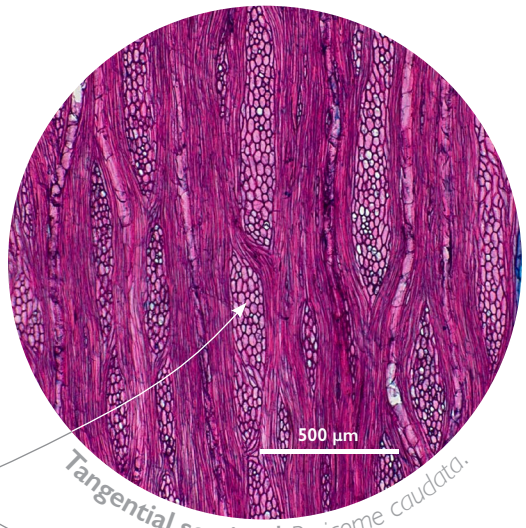
The gnarled, woody base present in most species of rock daisies serves both for rooting in minute cracks or crevices of vertical cliffs and as a site to form adventitious shoots after the long desert dry season.



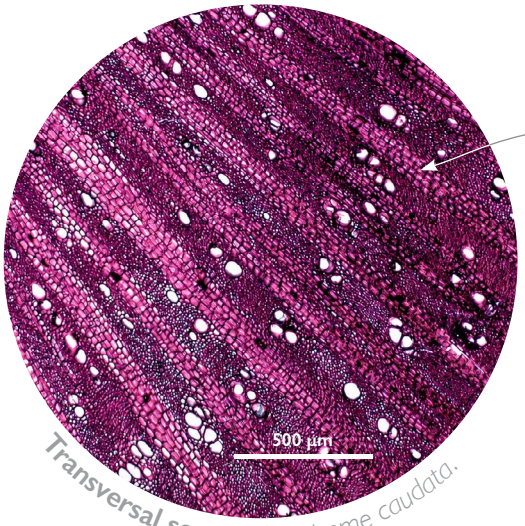
Tangential section | *Laphamia megalocephala*

Fishnet Stockings

The convoluted wood anatomy of the caudex is the result of massive parenchyma rays. These structures may offer an ecological advantage under water stress conditions by acting as water reservoirs.



Tangential section | *Pericome caudata.*



Transversal section | *Pericome caudata.*



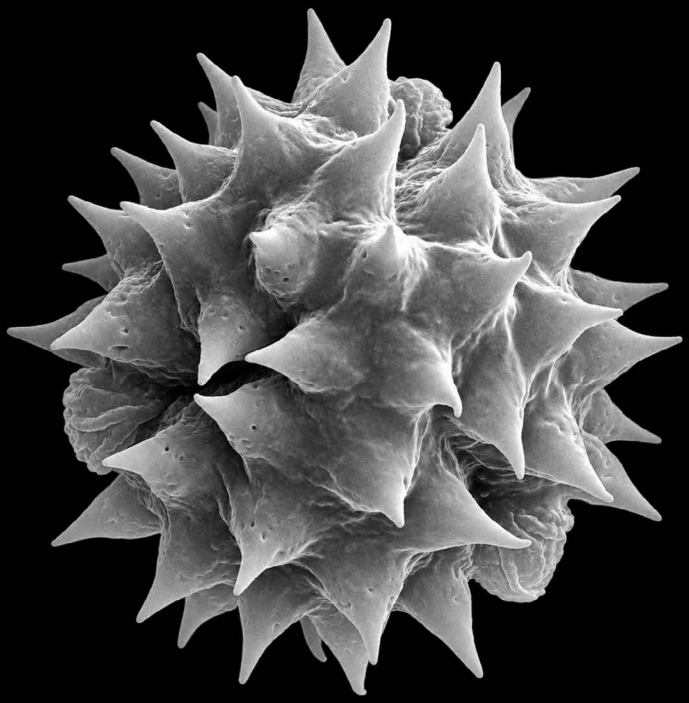
Radial section | *Pericome caudata.*



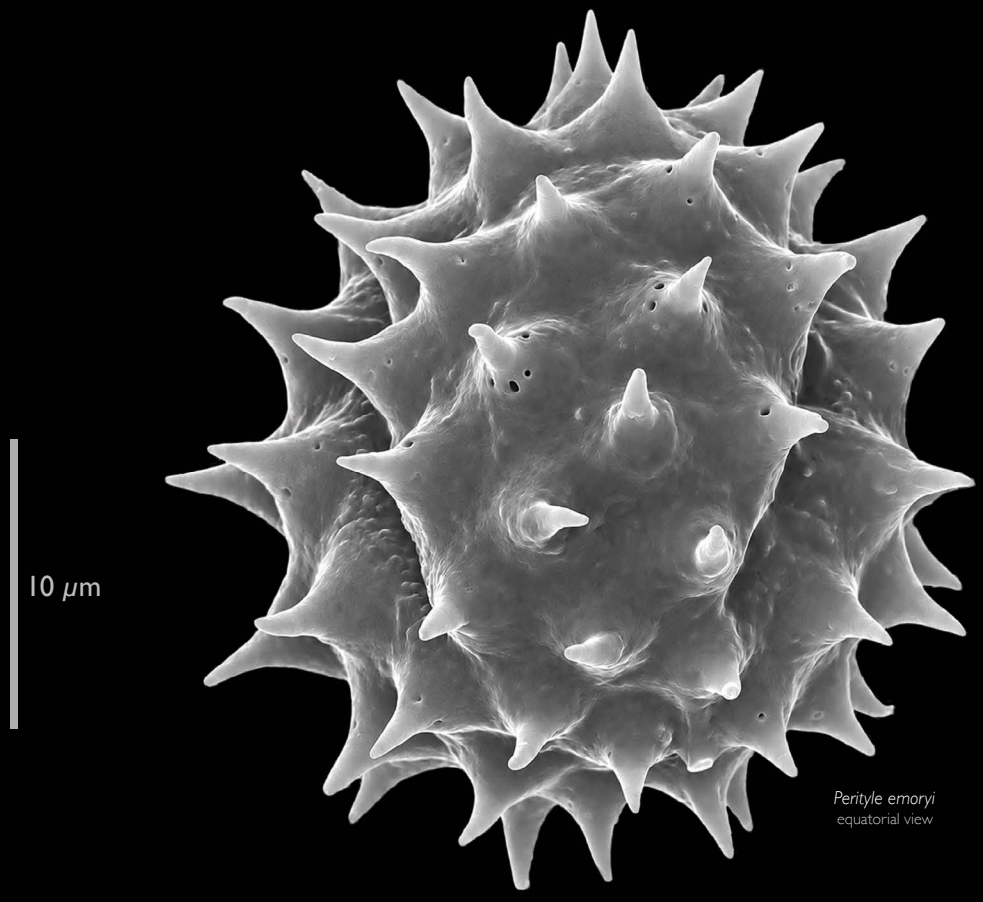
Photos by Fabio Andrés Avila.

A closer look at Perityleae pollen

SEM images of rock daisy pollen reveal the typical shape and ornamentation of Asteroideae. The grains are generally spherical and tricolporate, with the apertures arranged equidistantly into three furrows. As in most other members of the subfamily, the outer layer of the pollen wall is covered in spike-like projections called echinae. These sculpture elements function as hooks, helping the pollen hitch a ride on animals to a distant stigma.



Perityle emoryi
polar view



Perityle emoryi
equatorial view

Photos by Ciara Casas.



The ecosystem that doesn't exist

Cliffs are an ecosystem that doesn't exist. Invisible on any map. They are the boundaries of ecosystems, not ecosystems themselves. Geological processes are paused there. Physical laws are defied. A cliff is a paradox. It is both a dynamic, eroding fell-field and a static, stable refugium. At the end of our imagination of what a viable home for a food web would be is a cliff. Who would want to live and reproduce and evolve there?

Big Hatchet Mountains, New Mexico, USA. Photo by Isaac Lichter-Marck

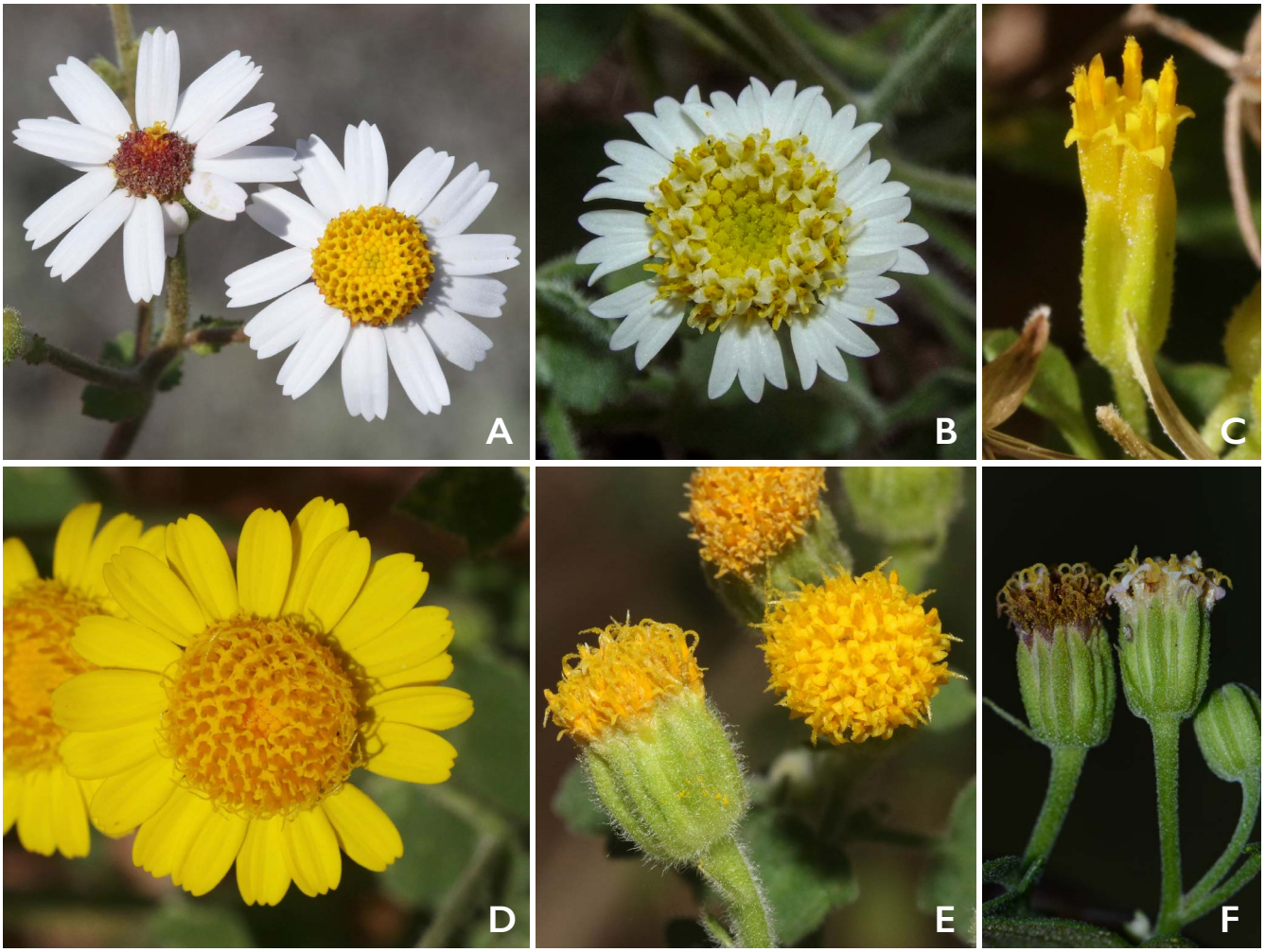


Figure 1. Floret number and corolla color varies among Perityleae and can be useful characteristic for distinguishing between groups. **A.** *Perityle brandegeeana* Rose, with white ray corollas and yellow tubular ones that fade to dark red. **B.** *Eutetras pringlei* Greenm., white ray corollas and cream-white tubular ones. **C.** *Laphamia quinqueflora* Steyerm. has discoid heads with 4 to 5 (-8) florets with bright yellow tubular corollas. **D.** *Laphamia parryi* (A.Gray) Benth & Hook. ex. Hemsl., with both ray and and tubular corollas yellow. **E.** *Laphamia ajoensis* (Todsen) Lichter-Marck, has discoid heads with florets with yellow corollas. **F.** *Galinsogeopsis glaucescens* (B.L.Turner) Lichter-Marck, has discoid heads with florets with white tubular corollas that fade to lilac. *Photos by James Bailey (A–E), Pablo Carrillo Reyes (F).*

ecological specialization is common, we still know little about the life history and ecology of rock daisies beyond what can be gleaned from a few, often old and fragmented specimens stored in natural history museums. The value of these specimens, especially for taxa that cannot be relocated in the field or may have gone extinct, is incalculable. Yet new collections and new observations of rock daisies made during field work, often as part of regionally focused floristic studies, have incredible potential to illuminate key aspects of rock daisy biology that cannot be gleaned from herbaria. The accomplishments and discoveries of field botanists often go overlooked. In recognition of the new understanding of rock daisy natural history provided by these recent field discoveries and of the cascading consequences that changes in taxonomy will have on collections and online databases, here we compile a comprehensive nomenclator as a reference guide to Perityleae taxonomy and present an annotated checklist in which we summarize notable recent records, ecological observations, and novel phylogenetic insights. We also include photographs of enigmatic rock daisies known previously only from specimens. This nomenclator is the result of intensive review of taxonomic publications, specimens in herbaria, and online databases, especially the Global Biodiversity Information Facility (GBIF), the Southwest Environmental Information Network (SEINet), iNaturalist, and the Global Compositae Database (GCD) as well as extensive collaborative fieldwork by a diffuse informal network of field

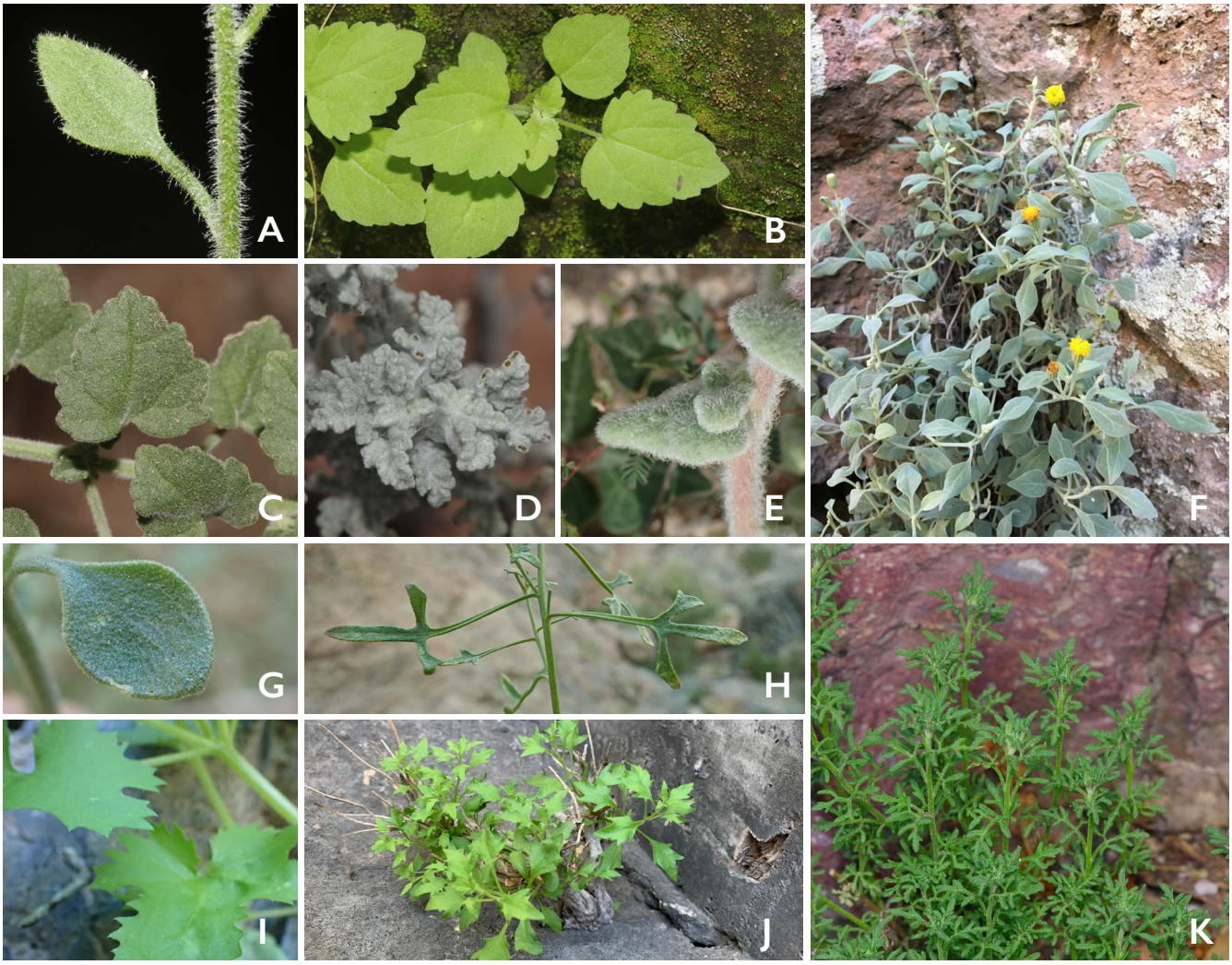


Figure 2. Leaf morphology varies widely in Perityleae and can be a informative trait to identify species. **A.** Simple, long-spatulate leaf of *Laphamia inyoensis* Ferris. **B.** Membraneous deltate leaves with crenate margins of *Galinsogeopsis microglossa* (Benth.) Lichter-Marck var. *microglossa*. **C.** Waxy, delatet leaves with crenate margins in *Laphamia ajoensis* Todsen. **D.** Dissected, white-tomentose leaves of *Laphamia vandevenderi* (B.L.Turner) Lichter-Marck. **E.** Pilose-villous, cordate leaves of *Perityle crassifolia* Brandegee. **F.** Ovate, densely white-pubescent leaves of *Galinsogeopsis harkerae* (P.Carrillo) Lichter-Marck. **G.** Simple elliptic leaf of *Laphamia megalocephala* S.Watson. **H.** Cruciform leaf of *Laphamia staurophylla* Steyerm. **I.** Glabrous, 3-lobed, cordate leaves of *Laphamia lobata* (Rydb.)Lichter-Marck. **J.** lanceolate, 3- or 5-lobed leaves of *Laphamia angustifolia* A.Gray. **K.** Simple, pinnately lobed leaves of *Galinsogeopsis coronopifolia* (A.gray) Lichter-marck. *Photos by James Bailey (A-C), Sue Carnahan (D), Isaac Lichter-Marck (E-J), Michelle Wong (K):*

biologists, herbarium staff, and community scientists throughout western North America and Chile. Bibliographic information for all valid names is listed according to the format used by the International Plant Names Index (IPNI). Type information with localities and notes have been gleaned from the literature and when possible, from scouring herbarium collections or digitized images available on JSTOR Global Plants. As part of this effort we have updated the GCD, a living taxonomic resource for Compositae, where one can stay up to date with rock daisy taxonomy (Gostel & Bonifacino, 2020).

In the process of compiling the checklist and nomenclator, several taxonomic issues in need of resolution were recognized. These include corrections to new combinations presented in Lichter-Marck & Baldwin (2022), as well as cases where older basionyms were placed incorrectly in synonymy and need to be reinstated according to nomenclatural rules of priority. After evaluating the status of each accepted name in Perityleae, we found several cases where taxa are clearly conspecific. In these cases, we make the necessary taxonomic adjustments and provide a detailed justification.

ANNOTATED CHECKLIST

Perityleae B.G.Baldwin, Syst. Bot. 27(1): 192-193, 2002. **TYPE: Perityle** Benth.

Annuals, perennial herbs, shrubs, mostly rupicolous suffrutices. Herbage viscid or hirsute with stipitate or sessile glandular and non-glandular trichomes. **Leaves** opposite, subopposite, or alternate, usually petiolate, blades entire or lobed, linear, ovate, deltate, or hastate, rarely dissected, usually petiolate, often with simple conical trichomes interspersed with capitate or sessile glandular trichomes, occasionally densely covered with unicellular flagellate trichomes. **Capitula** discoid or radiate, solitary or loosely to tightly arranged in paniculiform or corymbiform arrays. **Involucres** cylindrical, obconic, urceolate, campanulate, or hemispheric. **Phyllaries** in 1–2 series, bracts linear to ovate, naviculate, fused or free. **Receptacles** flat to convex, epaleate or, rarely, paleate. **Ray florets** pistillate, fertile, corollas white or yellow, sometimes fading to red or lilac. **Disc florets** monoclinous, corollas tubulose, lobes 4 (5), yellow, white or cream, often fading to red or lilac, corolla throats typically covered in sessile or stipitate glandular trichomes and short cylindrical trichomes. **Athers** 4(5) fused, ecalcarate and ecaudate, appendages ovate to acute, eglandular, not blackened, anther bases shortly sagittate, filament with a collar at the apex. **Style** branch appendages when present shorter than the stigmatic lines, rarely fusing at apices, apices tapered to acute or round, adaxial surface with a dense covering of papillae. **Cypselae** carbonized, without striations, compressed, tetramerous, or obpyramidal, with 2-4 angles separated by thick, callous margins, sometimes corky, or winged, or tuburculate, often ciliate. **Pappus** present or absent, made of 1 to 30 erose, non-costate scales and/or awns, often reduced to a crown.

Perityleae comprise 8 genera, 81 species and 10 varieties. Distributed throughout western North America (United States and Mexico), South America (Ecuador, Chile, Colombia, and Peru), and Hawai'i (introduced). Most of Perityleae can be distinguished by four lobed disc corollas. Most are also subshrubby edaphic specialists that inhabit bare, rocky outcrops and cliff faces in arid and subtropical regions. Populations isolated onto sky islands in the Basin and Range Province follow a pattern of geographic speciation. Widespread annuals of *Perityle* may be among the most abundant annuals during a good rain year in low deserts.

Key to the genera of Perityleae

1a. Disc corollas pentamerous

2a. Ray cypselae with corky wings; Mexico..... **Galeana**

2b. Ray cypselae without wings; Mexico & South America..... **Villanova**

1b. Disc corollas tetramerous

3a. Capitula in congested corymbiform cymes, multi-stemmed woody shrubs

4a. Leaves dissected; Guadelupe Island, Mexico..... **Nesothamnus**

4b. Leaves hastate; western North America ..... **Pericome**

3b. Capitula solitary, or in loose corymbiform arrays; annuals perennials, woody shrubs, or suffrutices

5a. Cypselae four-angled in cross section

6a. Pappus of four scales alternating with awns; mainland Mexico. ..... **Eutetras**

6b. Pappus absent; baja California and Chile ..... **Perityle**

5b. Cypselae two-angled in cross section

7a. Heads discoid

9a. Cypselae with a well-defined crown of fused or free squamellae (scales); Jalisco & Zacatecas states, Mexico ..... **Galinsogeopsis (p.p.)**

9b. Cypselae without a crown of squamellae (scales) or with only a weakly defined, vestigial crown of free scales; Sonora, Sinaloa, Baja California and southwestern U.S..... **Laphamia (p.p.)**

7b. Heads radiate

10a. Ray corollas white

11a. Sub-shrubby suffrutices of rock cliffs ..... **Galinsogeopsis (p.p.)**

11b. Delicate to robust annuals or perennial herbs with thin or fleshy taproots

12a. Cypselae with a well-defined crown of fused or free squamellae (scales) and 2(1) robust awns with antrorse barbs along their entire length ..... **Galinsogeopsis (p.p.)**

12b. Cypselae without a well-defined crown of squamellae (scales) or only weakly defined, and 1(2) delicate awns, irregularly or retrorsely barbed at the apex. ..... **Perityle (p.p.)**

10b. Ray corollas yellow

13a. Sub-shrubby suffrutices of rock cliffs ..... **Laphamia (p.p.)**

13b. Delicate to robust annuals or perennial herbs with thin or fleshy taproots

14a. Pedicel recurving upon maturity of the fruits, cypselae narrowly oblong, the margins nearly parallel ..... **Laphamia (p.p.)**

14b. Pedicel not recurving upon maturity of the fruits, cypselae obovate, wider at the apex than at the base ..... **Perityle (p.p.)**

Galeaninae B.G.Baldwin & Panero, Fam. Gen. Vasc. Pl. [Kubitzki] 8: 508 (2007). **TYPE: Galeana** La Llave. Map on page 48.

Notes: The genera *Galeana* and *Villanova* constitute subtribe Galeaninae, one of two subtribes of Perityleae. These two genera are outliers within tribe Perityleae as they lack a four-lobed disc floret corolla and show inflorescence and fruit characteristics that are not present elsewhere in the group. Together they form what is informally known as the "Villanova clade," which has been sometimes been treated as *incertae sedis* within the Heliantheae alliance. Molecular studies based on nuclear ribosomal and chloroplast genes resolved the *Villanova* clade as the earliest diverging lineage within the rock daisy tribe and an important evolutionary link to its hyper-diverse sister group, the Eupatorieae (ca. 2500 spp.) (Baldwin et al., 2002; Panero and Funk, 2008; Schilling et al., 2013; Schilling et al., 2015). However, morphology and recent phylogenomic datasets suggests other possible, more robust links between this group and other epaleate tribes of the Heliantheae alliance, such as Bahieae and Eupatorieae.

1 **Galeana** La Llave, Nov. Veg. Descr. [La Llave & Lexarza] 1:12 (1824). **TYPE: Galeana hastata** La Llave.

Chlamysperma Less. Syn. Comp. 256 (1832). **TYPE:** *Chlamysperma pratense* Less.

1.1 **Galeana pratensis** (Kunth) Rydb., N. Amer. Fl. 34: 42, 1914. *Unxia pratensis* Kunth Nov. Gen. Sp. [H.B.K.] 4: 279, 1820. *Chlamysperma pratense* (Kunth) Less., Syn. Comp. 256, 1832. *Villanova pratensis* (Kunth) Benth. & Hook.f., Gen. Pl. 2: 405, 1873. **TYPE:** Mexico, Michoacan, Pazcuaro. *Bonpland A.J.A, F.W.H.A. Humboldt s.n.* (lectotype: P00320270 [photo!] [designated by McVaugh 1984]). Figure 3; map on page 48.

Galeana hastata La Llave, Nov. Veg. Descr. [La Llave & Lexarza] 1: 12, 1824. **TYPE:** Mexico, Veracruz, S. Jose de Corral, *La Llave s.n.* (lectotype: G00300001 [photo!] [**here designated**]).

Chlamysperma arenarioides Hook. & Arn., Bot. Beech. Voy. P. 300, 1838. *Galeana arenarioides* (Hook. & Arn.) Rydb., N. Amer. Fl. 34(1): 43, 1914. **TYPE:** Mexico, Nayarit, Tepic, *T. Beechey s.n.* (lectotype: K000502329 [photo!] [designated by McVaugh 1984], isolectotype: E00369141 [photo!]).

Melampodium minutiflorum M.E.Jones, Cont. W. Bot. 18: 72, 1933. **TYPE:** Mexico, Jalisco, Guadalajara, La Barranca, 17 November 1930, *M.E.Jones s.n.* (lectotype: POM [RSA0001418] [photo!][designated by McVaugh 1984], isolectotypes: GH00002557 [photo!], LL00373910 [photo!], UC522228!, US00128445!).



Figure 3. *Galeana pratensis* (H.B.K) Rydb. **A.** Capitula with dense indumentum of soft-hairy, glandular trichomes and boat shaped phyllaries. **B.** Mature capitululm showing slightly reflexed phyllaries and the tuburculate, carbonized cypselae. *Photos by Isaac Lichter-Marck.*

The *Villanova* clade: to be or nor to be

Two genera of annuals, *Galeana* La Llave and *Villanova* Lag. comprise subtribe Galeaninae, also known as the *Villanova* clade. This clade is an outlier in tribe Perityleae and its position within the Heliantheae Alliance has been a topic of debate in the past. Both genera occur in Mexico, but *Villanova* also occurs in western South America, where it is both a common weed in urban centers such as Bogota, Colombia, and a rare annual in arid environments in Peru, Bolivia, and Chile.



2 **Villanova** Lag., Gen. Sp. Pl. [Lagasca] 31, 1816. **TYPE: Villanova oppositifolia** Lag. Figure 4; map on page 48.

Vasquezia Phil. Fl. Atacam. 31, 1860. **TYPE:** *Vazquezia biternata* Phil.

2.1 **Villanova anemonifolia** (Kunth) Less., Syn. Gen. Compos. 256, 1832. *Unxia anemonifolia* Kunth, Nov. Gen. Sp. [H.B.K.] 4(18): 219, t. 402 (ed. fol.), 1818. *Vasquezia anemonifolia* (Kunth) S.F.Blake, Contr. U.S. Natl. Herb. 26: 261, 1930. **TYPE:** Mexico, *A.J.A. Bonpland & F.W.H.A. von Humboldt s.n.* (lectotype: P00320271 [photo!] [**here designated**]).

Villanova achilleoides (Less.) Less, Syn. Gen. Compos. 256, 1832. *Unxia achilleoides* Less., Linnaea 5(1): 159, 1830. *Melampodium achilleoides* (Less.) Hemsl. Biol. Centr.-Amer., Bot. 2(8) 145, 1881. **TYPE:** Mexico, Veracruz, Llanos de Perote, *C.J.W. Scheide 354* (lectotype: HAL0017700 [photo!] [**here designated**], isolectotypes: HAL0111590 [photo!], GH00014050 [fragment] [photo!]).

Notes: *Villanova anemonifolia* is accepted here over *V. achilleoides* because its basionym, *Unxia anemonifolia,* is older, dating to 1818, whereas *Unxia achilleoides* was named in 1830 (Govaerts, pers. comm., senior content editor of the Plants of the World Online [POWO] database). *Villanova* (4 taxa) and *Galeana* (1 taxon) make up the subtribe Galeaninae, which possess a five-lobed disk corolla (rather than four-lobed as in all other Perityleae). Although the fruits and floral features clearly set this species apart, the single series of boat-shaped phyllaries is like other members of Perityleae. The four taxa of *Villanova* are distributed in Mexico and western South America.

2.2 **Villanova oppositifolia** Lag., Gen. Sp. Pl. [Lagasca] 31, 1816. *Vasquezia oppositifolia* (Lag.) S.F.Blake, J. Wash. Acad. Sci. 27: 387, 1937. **TYPE:** Peru, Lima, *H. Cuming 1082* (lectotype: K000502237 [photo! [**here designated**], isolectotypes: E00312229 [photo!], E00335060 [photo!]).

Villanova perpusilla Phil., Anales Mus. Nac., Santiago de Chile 1891: 47, 1891. **TYPE:** Chile, Lima, *Phillipi s.n.* (syntypes: SGO [pending lectotypification once a closer examination is possible]).

Villanova alternifolia Lag., Gen. Sp. Pl. [Lagasca] 31, 1816. *Unxia alternifolia* (Lag.) Spreng., Syst. Veg. ed. 16 [Sprengel] 3: 620, 1826. **TYPE:** Peru, "cerca Limam" (type: unknown).

Notes: *Villanova oppositifolia* is a widespread annual in western South America and even occurs within the city limits of Bogota, Colombia, where it was seen growing in a moist habitat in an urban park with ferns and moss by Felipe Zapata in 2023.

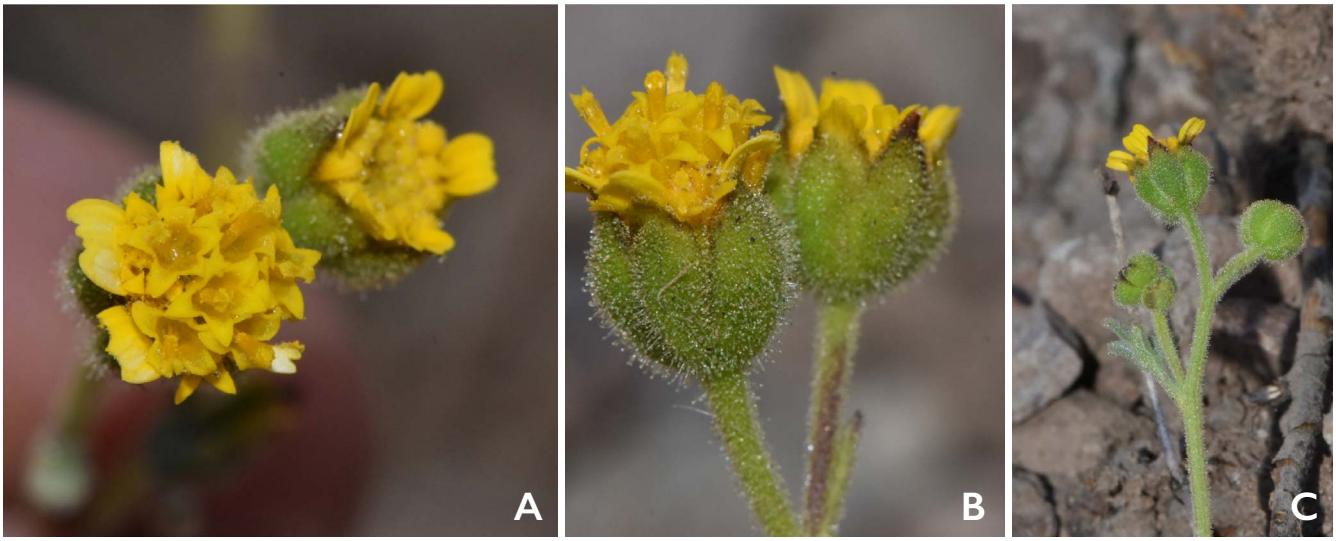


Figure 4. *Villanova robusta* Phil. is a rare annual species that occurs in semi-arid canyon of the high andes in northern Chile. **A.** Superior view of capitulum showing the five lobed disc floret corollas and short limbs of ray corollas. **B.** Lateral view of capitulum showing the single series of mostly coalescent phyllaries covered in a dense glandular indumentum. **C.** Capitulescence in lateral view, showing capitula organized into loose corymbiform arrays. *Photos by Joey Santore.*

Based on photos taken by Zapata, the phyllaries appear to partially enclose the ray fruit ovary and bend back upon maturity, which is a trait that we have observed in several species of genus *Perityle,* including *P. californica*, *P. crassifolia*, and *P. rotundifolia*. *Villanova alternifolia* is tentatively recognized as a heterotypic synonym here because the type locality listed is identical to that of *V. oppositifolia*, but we have so far not been able to locate the type.

2.3 **Villanova robusta** Phil., Anales Mus. Nac., Santiago de Chile 1891: 47, 1891. **TYPE:** Chile, Tarapaca, Jaina, *A.R. Philipi s.n.* (syntypes: SGO [pending lectotypification once a closer examination is possible]). Figure 4.

Notes: *Villanova robusta* is a scarce annual found in mid to high elevation arid sites in the north of Chile. It is the only species of *Villanova* endemic to Chile.

2.4 **Villanova titicacensis** (Meyen & Walp.) Walp., Nov. Actorum Acad. Caes. Leop.-Carol Nat. Cur. 19 (Suppl. 1): 296, 1843. *Wedelia titicacensis* Meyen & Walp., Nov. Actorum Acad. Caes. Leop.-Carol Nat. Cur. 19(Suppl. 1): 296, 1843. *Vasquezia titicacensis* (Meyen & Walp.) S.F.Blake ex Herrera, Proc. Soc. Biol. Washington 27(9): 387, 1937. **TYPE:** Peru, *Meyen s.n.* (lectotype: B[F0BN015423] [photo!] [**here designated**]).

Notes: *Villanova titicacensis* is an annual found in high elevation sites in Peru. As with other species of *Villanova*, its phylogenetic relationships and distinctness as a taxon separate from other *species* of *Villanova* has yet to be evaluated using morphological or phylogenetic data.

Peritylinae Rydb., N. Amer. Fl. 34: 11, 1914. **TYPE: Perityle** Benth.

Amauriinae Rydb., N. Amer. Fl. 34: 11. 1914. **TYPE:** *Amauria* Rydb.

Lycapsinae H. Rob. Phytologia 46(2): 120 (1980). **TYPE:** *Lycapsus* Phil.

Notes: Subtribe Peritylinae includes the majority of species in tribe Perityleae and is comprised by six currently recognized genera, *Eutetras*, *Galinsogeopsis*, *Laphamia*, *Nesothamnus*, *Pericome*, and *Perityle*. This group differs from Galeaninae in having a four-lobed disc corolla, two or four-sided cypseleae, and a single series of typically linear-oblong, naviculate (boat-shaped) phyllaries. Subtribes Amauriinae and Lycapsinae are included in Peritylinae here, as the type genera for those subtribes, *Amauria* and *Lycapsus* respectively, are now subsumed into the genus *Perityle*.

3 **Eutetras** A.Gray, Proc. Amer. Acad. Arts 15: 39, 1800. **TYPE: Eutetras palmeri** A.Gray. Figure 5 & Figure 6.

Notes: *Eutetras* is a genus of two allopatric species endemic to the southern portion of the Mexican Plateau. Its distribution follows a series of scattered peaks and small *sierras*, especially along the southern transition of the Mexican Plateau into the more rugged neighboring regions of the Sierra Madre Oriental, the Trans-Mexican Volcanic Belt and the Sierra Madre Occidental. *Eutetras* grows directly out of emergent bare, rocky outcrops and cliffs of volcanic substrates within a heterogeneous matrix of semi-arid oak/pine forest and xerophilous scrub. The genus is closely related to *Pericome* and to an anomalous lineage (*Perityle rosei* Greenm.) that is currently retained tentatively in *Perityle* pending further study. Large capitula and tetramerous cypselae with an erect crown of four alternating pappus scales and barbs are diagnostic for *Eutetras*.



Figure 5. Geographic distribution and species richness in *Eutetras* A.Gray. Darker colors indicate areas of overlap between the two extant species, *Eutetras palmeri* and *Eutetras pringlei.*

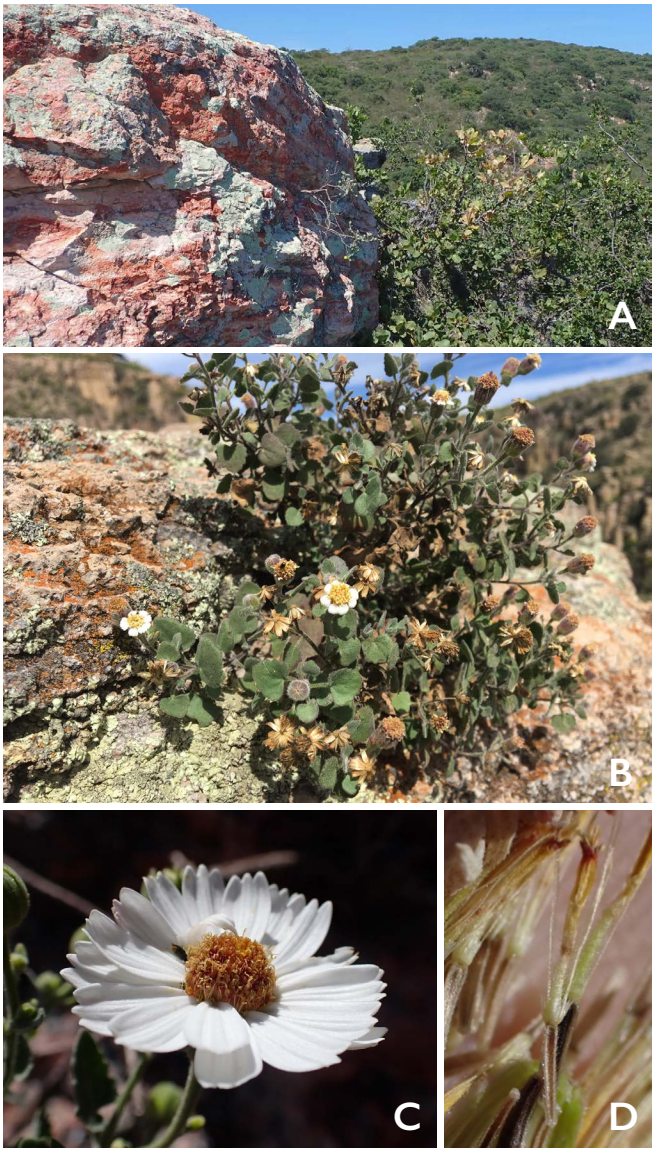


Figure 6. *Eutetras* A.Gray. **A.** The long-recognized *Eutetras* includes two distinctive species of rock daisies that grow exclusively on mostly volcanic rocky outcrops and cliffs surrounded by a matrix of *Quercus* L. (Fagaceae) and *Ipomoea* L. (Convolvulaceae) forests in central Mexico. **B.** *Eutetras palmeri* A.Gray, shown here growing out of a solid slab of igneous rock, has short ray corollas and cream white disc corollas. **C.** *Eutetras pringlei* Greenm. has long ray corollas and yellow disc corollas that fade to orange or red. **D.** The cypselae of *Eutetras* are square in cross section, and crowned by a set of four alternating squamellae (scales) and awns. *Photos by Isaac Lichter-Marck.*

3.1 **Eutetras palmeri** A.Gray, Proc. Amer. Acad. Arts 15: 40, 1880. **TYPE:** Mexico, San Luis Potosi, near Angostura, 100 miles east of San Luis Potosi, 1878, *C.C. Parry & E. Palmer 520 ½* (lectotype: GH00008092 [photo!], [designated by Turner 1966], isolectotypes: K000502204 [photo!], ISC0000112 [photo!]). Figure 6A & 6B.

Notes: *Eutetras palmeri* represents the northern half of the distribution of the genus. It is found southwards from central Zacatecas, towards neighboring regions in Aguascalientes, Jalisco and San Luis Potosí to the north of Guanajuato at elevations between 1,700 and 2,800 m. Morphological features that clearly distinguish *E. palmeri* are fewer (40 to 60) and white disk florets (instead of more than 100 and yellow florets in *E. pringlei*); sometimes absent rays of no more than 4 mm long (instead of ever present rays of 6 to 15 mm length in *E. pringlei*); and an involucre of less than 14 mm wide (instead of an involucre of more than 14 mm wide in *E. pringlei*) (Turner, 1966; Villarreal Q. *et al*., 2006). This plant is common around its distribution area where it grows along a wide variety of rock associated plants, including Asparagaceae, Cactaceae, Pteridaceae and Crassulaceae as well as Fagaceae, Pinaceae, Fabaceae and Poaceae which dominate the most common plant associations in the landscape. Collections from recent decades have expanded our knowledge of the distribution area of *E. palmeri* towards western Zacatecas along the limits of the Mexican Plateau with the Sierra Madre Occidental. This species harbors variation in vegetative and reproductive characters throughout its distribution that are especially evident in western populations. For example, longer and much denser foliar tomentum (HUAA – *G. García R. 2485*), cypselae with glandular trichomes (HZAC – *E. J. Rodríguez P. 3297*), and yellow disk florets (CHAPA - *L. Hurtado R. 186*). Further study is needed to determine if these represent localized environmental responses or new taxa.

3.2 **Eutetras pringlei** Greenm., Proc. Amer. Acad. Arts 41: 266, 1905. **TYPE:** Mexico, Guanajuato, about basaltic cliffs near Acambaro, 6 October 1904, *C.G. Pringle 8813* (holotype: GH00008093 [photo!], isotypes: CM2388 [photo!], E00433208 [photo!], E00433209 [photo!], E00433210 [photo!], F0050214 [photo!], GOET001542 [photo!], K000502203 [photo!], LL00374162 [photo!], M0030102 [photo!], MEXU01220321 [photo!], MEXU01220319 [photo!], MEXU01220320 [photo!], MIN1001158 [photo!], NY00169288 [photo!], PH00013960 [photo!], S08-596 [photo!], UC84199!, US00124702!, US00931231!, UVMVT027525 [photo!]). Figure 6C & 6D.

Notes: *Eutetras pringlei* is found from the east of Guanajuato through Querétaro to the west of Hidalgo, Mexico, at elevations between 1,600 and

2,200 m. This species exhibits variation regarding leaf size and indument between populations but is distinct from *E. palmeri* (Turner, 1966). The habitat of *E. pringlei* is like that of *E. palmeri* with the exceptions of a few collections which were found on sedimentary instead of volcanic rock outcrops (e.g., MEXU – *L. Paray 2969*). Representing the southern half of the distribution of the genus, it is separated from *E. palmeri* by the Sierra de Guanajuato and the Río Laja basin. The Sierra de Guanajuato has been cited as central in understanding tectonics of Central Mexico as it is considered the limit between the Mexican Plateau and the Trans-Mexican Volcanic belt. It experienced its most recent uplift event, relative to the surrounding basin, from the Late Miocene to the Quaternary (del Río Varela *et al.*, 2020). This overlaps with the onset of aridification of the Late Miocene which is recognized as a driver of evolution within the Perityleae tribe (Lichter-Marck & Baldwin, 2023). This raises questions regarding how the interplay of orogeny and climate change may influence population differentiation in *Eutetras* as well as in other rupicolous plant lineages of the Mexican Plateau and similar areas.

4 Galinsogeopsis Sch.Bip. Bot. Voy. Herald [Seemann] 7-8: 307 (1856). **TYPE:** *Galinsogeopsis spilanthoides* Sch.Bip. Figure 7-17.

Correllia A.M.Powell, Brittonia 25: 226 (1973). **TYPE:** *Correllia montana* A.M.Powell

4.1 Galinsogeopsis canescens (Everly) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle canescens* Everly, Contr. Dudley Herb. 3: 393, tab. 71, figs. 7 & 8, 1947. **TYPE:** Mexico, Sinaloa, Capadero, Sierra Tacuichamona, 12 February 1940, *H.S. Gentry 5588* (holotype: DS[CAS0003923]! , isotypes: ARIZ0004460 [photo!], 0004461 [photo!], ARIZ0004462 [PHOTO!], GH00011104 [photo!], MEXU00138033 [photo!], NY00231053 [photo!], RSA0001473 [photo!], UC651747!, US00124595!).

Galinsogeopsis stevensii (B.L.Turner) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle stevensii* B.L.Turner, Phytologia 69: 298, 1990. **TYPE:** Mexico, Sinaloa, Municipio San Ignacio, 2.6 km from Highway 15 on road to microwave tower, ca. 17 mi. E of Emcosa, 10 September 1973, *W.D. Stevens & M. Fairhurst 2040* (holotype: NY00231074 [photo!], isotype: TEX00374417 [photo!]).

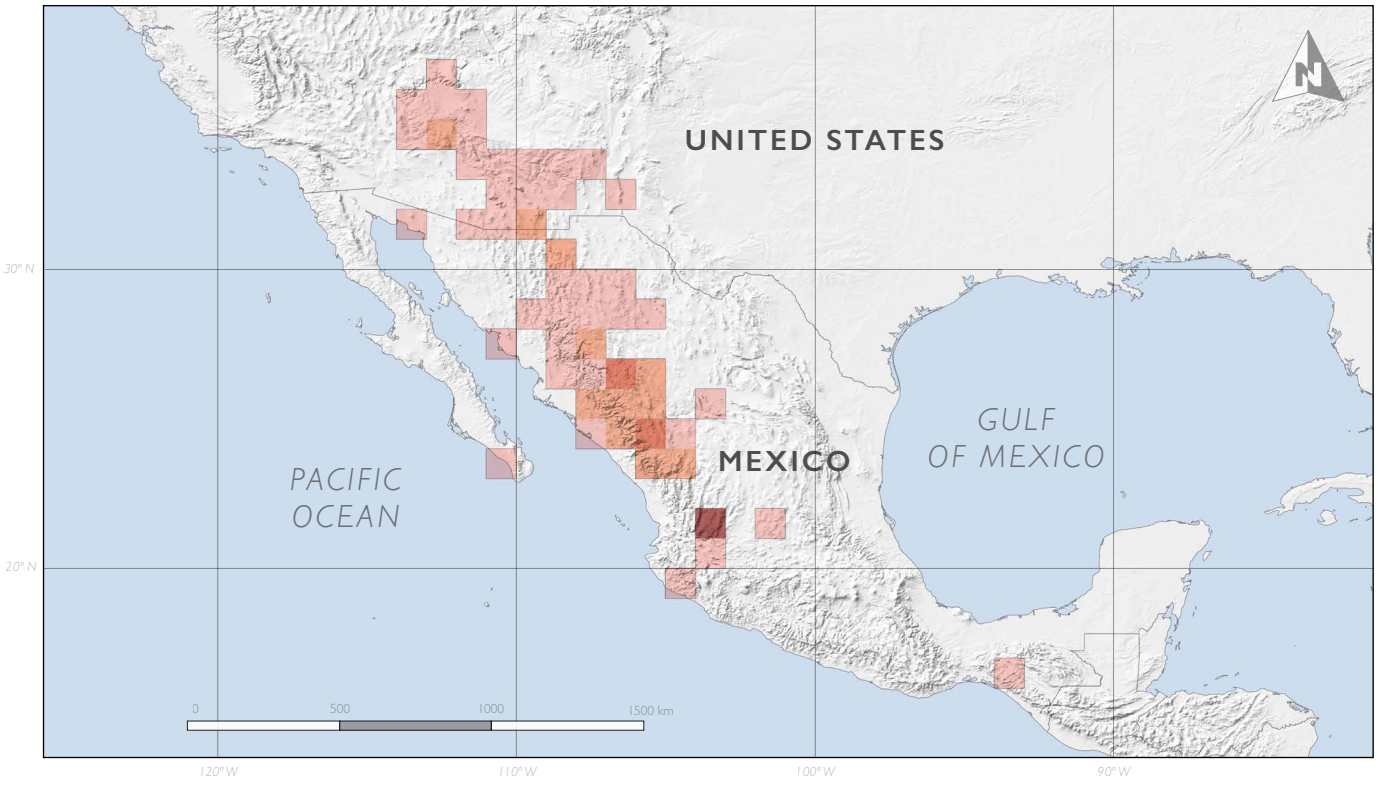


Figure 7. Geographic distribution and species richness in *Galinsogeopsis* Sch. Bip. Peak diversity (darkest colors) occur in near the southern extent of the genus in the Sierra Madre Occidental, but the range reaches as far north as Arizona, in the U.S. and as far south as Chiapas state, Mexico.

Notes: *Galinsogeopsis canescens* and *G. stevensii* are here treated as conspecific for the first time. Until recently both taxa were known only from type specimens, collected in 1940 and 1973 in the western foothills of the Sierra Madre Occidental in Sinaloa. Collections made by Rito Vega and deposited in the herbarium in Culiacán, and more recently, photographs taken by J.F. Pio León and uploaded to *iNaturalist* show overlapping leaf morphological variation displayed by the two taxa. In addition, the type location described by Turner (1990) for *G. stevensii,* "Mpio. San Ignacio, ca. 2.6 mi. from highway 15 along road to microwave tower, ca. 17 mi S of Emcosa," was in error, as the locality mentioned is in Culiacán not San Ignacio. This updated locality places the only known location for *G. stevensii* only 17 km to the east of the type locality for *G. canescens* (Pío-León et al., 2023).

4.2 **Galinsogeopsis ciliata** (L.H.Dewey) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Laphamia ciliata* L.H.Dewey, Bot. Gaz. 20: 425, 1895. *Perityle ciliata* (L.H.Dewey) Rydb., N. Amer. Fl. 34: 23, 1914. **TYPE:** USA, Arizona, rocks along Pine Creek near Pine, 26 August 1891, *D.T. MacDougal 676* (lectotype: US00124597! [**here designated**], isolectotype: US01105962!). Figure 8.

Notes: *Galinsogeopsis ciliata* is one of two species of *Galinsogeopsis* found in the southwest U.S. (along with *Galinsogeopsis coronopifolia*), where they sometimes co-occur with *Laphamia*. *Galinsogeopsis ciliata* and *G. coronopifolia* are obligately associated with bare, rocky outcrops, but unlike most species of cliff dwelling *Laphamia*, they can be found on minor outcrops, such as boulder fields or barrens, and thrive on diverse substrates, including sandstone, limestone, and granite.



Figure 8. *Galinsogeopsis ciliata* (L.H.Dewey) Lichter-Marck is one of the most common rock daisies on cliffs at mid to high elevations in Arizona, U.S.A. **A.** side view of capitula showing the sparse pubescence, and single series of linear, naviculate (boat-shaped) phyllaries. **B.** Abaxial view of ray floret corolla. **C.** Cypsela, showing the elongated shape, long twin-trichomes on face and margin and 2(1) pappus awns. *Photos by Isaac Lichter-Marck.*

4.3 **Galinsogeopsis coronopifolia** (A.Gray) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle coronopifolia* A.Gray, Smithsonian Contr. Knowl. 5(6): 82–83, 1853. *Laphamia coronopifolia* (A.Gray) Hemsl., Biol. Cent.Amer. Bot. 2: 210, 1881. **TYPE:** USA, New Mexico, Grant Co., copper mines of Santa Rita del Cobre, September 1851, *C. Wright 1196* (lectotype: GH00011072 [photo!] [designated by Powell 1974], isolectotypes: GH00011073 [photo!], GH00011074 [photo!], K001079926 [photo!], K001079927 [photo!], NY00231038 [photo!], PH00021253 [photo!], TCD0090359 [photo!], US00124601 [photo!]). Figure 9.

Laphamia scopulorum M.E.Jones, Contr. W. Bot. 12: 48, 1908. *Perityle scopulorum* (M.E.Jones) A.M.Powell & B.L.Turner, Phytologia 66: 505, 1989. *Galinsogeopsis scopulorum* (M.E.Jones) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. **TYPE:** Mexico, Chihuahua: Colonia Juarez. Sierra Madre mts. 12 September 1903, *M.E. Jones s.n.*, (lectotype: POM [RSA0001355]! [designated by Powell 1974], isolectotype: US00124653!).

Perityle pseudociliata A.M.Powell & Yarborough, Phytologia 82: 326, fig. 1, 1998. *Galinsogeopsis pseudociliata* (A.M.Powell & Yarborough) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. **TYPE:** Mexico, Chihuahua: 26 km NW of Colonia Juarez in the "Tinaja", a canyon thru the foothills of the Sierra Madre Occidental, 30°22' N, 108°12', 28 July, 1972, *W. Wilson, M.; Wilson, E; Johnston, L.A.; Johnston, M.C., 8480* (holotype: TEX00031083 [photo!], isotype: MEXU00479519 [photo!]).

Notes: Phylogenetic data supports the synonymy of *G. pseudociliata* and *G. scopulorum* with *G. coronopifolia* (Lichter-Marck & Baldwin 2023). Both species are known only from their type localities, about 26 km from each other near Colonia Juárez in Chihuahua, Mexico. *Galinsogeopsis coronopifolia* is a widespread taxon found throughout the southwest United States. *G. scopulorum* has bounced in and out of synonymy multiple times. Originally described by Marcus Jones as *Laphamia scopulorum*, it was considered a synonym of *Laphamia coronopifolia* by Rydberg (1914). Blake (1945) then reinstated *L. scopulorum* as a distinct taxon from *L. coronopifolia*. Powell (1973a) however, placed *L. scopulorum* back in synonymy with *Perityle coronopifolia*. Turner (1989) again recognized the species and made the necessary transfer to *Perityle*. Both *G. scopulorum* and *G. pseudociliata* have been understood to be geographically disjunct, from the remainder of *G. coronopifolia* with reduced marginal cypsela cilia, but more field research in northern Chihuahua will likely infill the geographic disjunctions and morphological gradations between these former taxa and other members of the widespread *G. coronopifolia*.

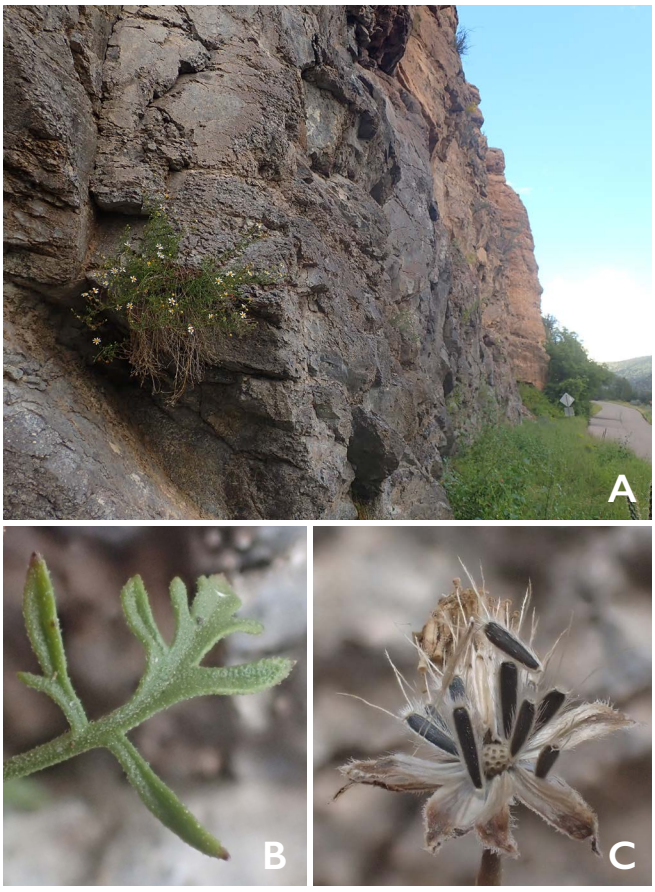


Figure 9. *Galinsogeopsis coronopifolia* (A.Gray) Lichter-Marck is a widespread rock daisy that grows on boulders, cliffs, and canyons in sky island mountain ranges of southeast Arizona and New Mexico. **A.** This species is a suffrutescent perennial with a woody caudex that roots into minute cracks and crevices in rock faces of various lithologies. **B.** The leaf is pinnately dissected and covered in a short-hirsute pubescence. **C.** The cypselae spill out of the capitula upon maturity, and disperse to far flung rock faces by virtue of a pappus that consists of a crown of scales and two pappus awns. *Photos by Isaac Lichter-Marck.*

4.4 **Galinsogeopsis feddemae** (McVaugh) Lichter-Marck, Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle feddemae* McVaugh, Contr. Univ. Michigan Herb. 9: 431, fig. 35, 1972. **TYPE:** Mexico, Jalisco, Rancho Viejo, 10 km ENE of Huejuquilla el Alto, rock crevices, open oak-woodland, 1900 m, 31 October 1963, *C. Feddema 2278* (holotype: MICH1107599 [photo!], isotypes: CAS0003924!, LL00208159 [photo!], NY00231057 [photo!], PH00021279 [photo!], TEX00374219 [photo!]). Figure 10.



Figure 10. *Galinsogeopsis feddemae* (McVaugh) Lichter-Marck is a rare rock daisy with discoid, cream white disc corollas that fade lilac and trilobed leaves that occurs on rocky mesas at two known points in the southern Sierra Madre Occidental. Shown here is an individual growing out of a boulder on Mesa de Caballos in Zacatecas state. *Photo by Isaac Lichter-Marck.*

Notes: In 1963 and 1969 this species was collected at two localities, the type location near Huejuquilla el Alto, Jalisco and from approximately 50 km to the west in Zacatecas state near the town of Valparaiso. This species was not collected again for over thirty years until the initiation of Pablo Carrillo-Reyes floristic inventory of the Cuixtla-Patitos river basin, in Jalisco and Zacatecas, in which a disjunct population of *G. feddemae* was discovered approximately 350 km south of the type on the ledge of an emergent mesa near the hamlet of San Cristóbal de la Barranca. These disjunct plants conform to McVaugh's (1984) description of *G. feddemae* in that they possess leaves that are glabrate (not canescent) with oblong lobes. Molecular phylogenetic data suggests that these recently discovered plants are more closely related to distinctive species of rock daisies found in the southern Sierra Madre Occidental than to conspecific populations to the north; therefore, closer study of morphological characters is warranted to see if these constitute a new species.

4.5 **Galinsogeopsis glaucescens** (B.L.Turner) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle glaucescens* B.L.Turner, Phytologia 75: 176, 1993. **TYPE:** Mexico, Zacatecas, km 8 along the road to El Teul and Florencia, "Rupícola, en acantilado de exposición oeste", 2000 m, 17 October 1992, *J.A. Lomelí-Sención s.n.* (holotype: TEX00208144 [photo!]).

Notes: *G. glaucescens* is a micro-endemic species known from only two neighboring locations, Teúl de González Ortega and Pueblo Viejo, in the southern Sierra Madre Occidental, where it grows on ledges and cliffs surrounded by a matrix of pine-oak forest.

4.6 **Galinsogeopsis harkerae** (P.Carrillo) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle harkerae* P.Carrillo, Syst. Bot. 33: 459 (461, fig. 1), 2008. **TYPE:** Mexico, Zacatecas, Municipio de Teúl de González Ortega, puente sobre el Río Patitos, camino de El Conejo a Milpillas Allende, 21°21'06"N, 103°33'55"W, 1580 m, 26 December 2004, *P. Carrillo-Reyes & R. Ramírez-Delgadillo 4462* (holotype: IBUG0180698, isotypes: IEB000204867 [photo!], KANU369177 [photo!], MEXU01262019, MU000065559 [photo!], NY00888423 [photo!], TEX00208662 [photo!], UAMIZ0067921 [photo!], WIS0262865 [photo!], XAL). Figure 11.

Notes: An attractive micro-endemic described in 2008 by Pablo Carrillo-Reyes and still known only from the type locality in the municipality of Teúl de González Ortega,

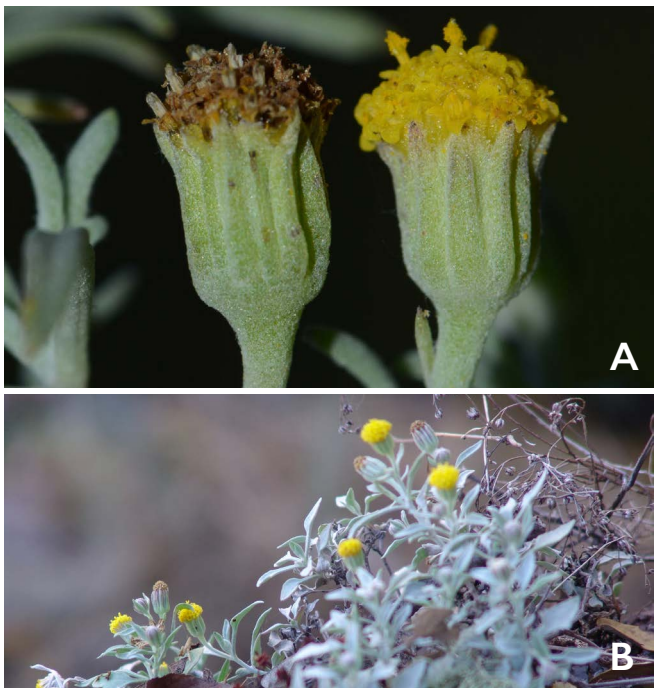


Figure 11. *Galinsogeopsis harkerae* (P. Carrillo) Lichter-Marck is a rare rock daisy known from only one location in the southern Sierra Madre Occidental, where it grows on rocky outcrops along with a diverse cliff flora of lichens, succulents, orchids, agaves and many other plants. **A.** Lateral view of head. **B.** The leaves and stems of this species are densely covered in a white indumentum that makes the yellow discoid heads stand out with added contrast. *Photos by Pablo Carrillo-Reyes.*

Zacatecas, and two additional locations, close by and across the border in Jalisco (*P. Carrillo-Reyes 8570*), and in the Municipality of Arandas, ca. 140 km southeast (*Puga 15963*).

4.7 **Galinsogeopsis hofmeisteria** (Rydb.) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle hofmeisteria* Rydb., N. Amer. Fl. 34(1): 18, 1914. **TYPE:** Mexico, Durango, vicinity of Durango, April–November 1896, *E. Palmer 28* (holotype: NY00231058 [photo!], isotypes: GH00011123 [photo!], K000502190 [photo!], US00124618!). Figure 12.

Galinsogeopsis pennellii (B.L.Turner) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle pennellii* B.L.Turner, Phytologia 69: 298, 1990. **TYPE:** Mexico, Durango, Cerro de Mercado, N of Cd. Durango, crevices of ferruginous rocks, 2000–2100 m, 24–25 August 1934, *F. W. Pennell 18160* (holotype: NY00231074 [photo!], isotype: TEX00374417 [photo!]).

Notes: The type specimens of *G. hofmeisteria* (*Palmer 28*) and *G. pennellii* (*Pennell 18160*) are similar and were probably collected at the same location, therefore *G. pennellii* is here recognized as a heterotypic synonym of *G. hofmeisteria*. Pennell lists the collecting locality as Cerro Mercado, the prominent rocky hill to the immediate north of Ciudad Durango, while Palmer's much earlier specimen states only "city of Durango and vicinity." Many of Palmer's types were likely collected on Cerro Mercado, which was an accessible cliffy habitat within the city's limits. The growing city of Durango now engulfs Cerro Mercado, which has been severely impacted, as it was developed for mineral resources.



Figure 12. *Galinsogeopsis hofmeisteria* (Rydb.) Lichter-Marck is a rare species known from only a handful of occurrences in Durango, Mexico, where it grows on igneous rock outcrops and cliffs at mid elevations in scattered sky island mountains. *Photo by Isaac Lichter-Marck.*

New records for *G. hofmeisteria* have surfaced since this taxon was last treated by Powell (1974). New populations have been found for example in limestone mountains to the southwest of Mapimi (*Wendt, Chiang, & Johnston 10017* and @idlegrraphics 38850112 (iNaturalist)) and metamorphic cliffs along the route to Nombre de Dios (*Pinkava 9598*). These populations share the vestiture of the type collections but reveal greater variation in leaf margin lobing than mentioned in the original descriptions of either *G. hofmeisteria* or *G. pennellii*. Atypical plants collected by Arturo Castro-Castro in the isolated Sierra de Gamón, Durango likely constitute an undescribed taxon of rock daisy and are currently under further study.

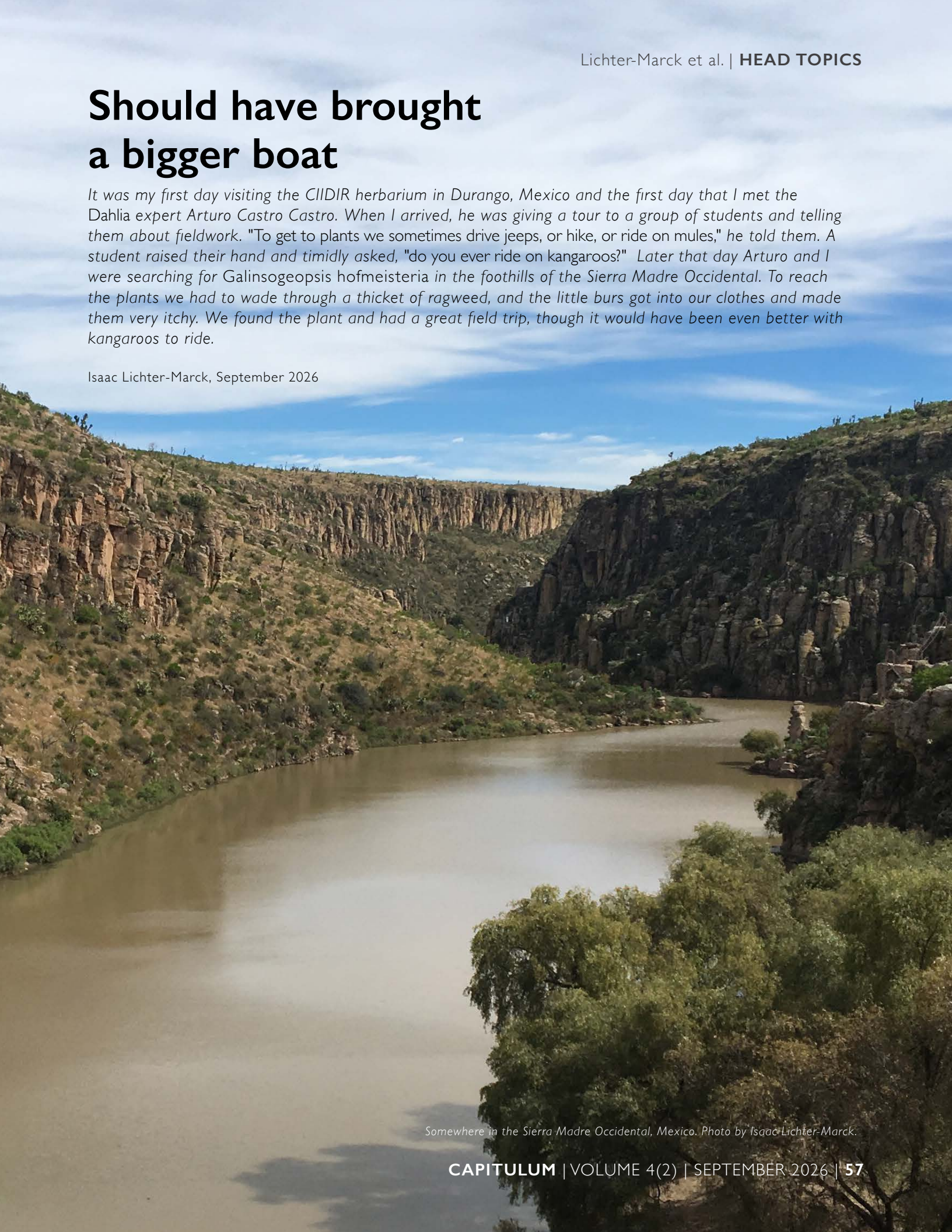
4.8 **Galinsogeopsis jaliscana** (A.Gray) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle jaliscana* A.Gray, Proc. Amer. Acad. Arts 22: 431, 1887. **TYPE:** Mexico, Jalisco, Río Blanco, ca. 10 mi. NW of Guadalajara, 17–23 September 1886, *E. Palmer 554* (lectotype: GH00011125 [photo!] [designated by Powell 1974] , isolectotypes: MEXU01220286 [photo!], MO934172 [photo!], NY00231065 [photo!], PH00021282 [photo!], US00124623!, YU002284 [photo!]). Figure 13.

Notes: *Galinsogeopsis jaliscana* has been collected more frequently than most other cliff-dwelling rock daisies in the southern Sierra Madre Occidental due to its proximity to an urban area (Guadalajara) with an active herbarium (IBUG). Nevertheless, it has only been found within a relatively narrow range along the banks of the Río San Isidro on rock outcrops and ledges in the Sierra de San Esteban. An easy place to see *G. jaliscana* is on bare, rocky outcrops at a popular recreational climbing site on the outskirts of Guadalajara known as "El Diente," where it grows on granodiorite chimneys in a matrix of oak forest.

Should have brought a bigger boat

It was my first day visiting the CIIDIR herbarium in Durango, Mexico and the first day that I met the Dahlia *expert Arturo Castro Castro. When I arrived, he was giving a tour to a group of students and telling them about fieldwork.* "To get to plants we sometimes drive jeeps, or hike, or ride on mules," *he told them. A student raised their hand and timidly asked,* "do you ever ride on kangaroos?" *Later that day Arturo and I were searching for* Galinsogeopsis hofmeisteria *in the foothills of the Sierra Madre Occidental. To reach the plants we had to wade through a thicket of ragweed, and the little burs got into our clothes and made them very itchy. We found the plant and had a great field trip, though it would have been even better with kangaroos to ride.*

Isaac Lichter-Marck, September 2026



Somewhere in the Sierra Madre Occidental, Mexico. Photo by Isaac Lichter-Marck.



Figure 13. *Galinsogeopsis jaliscana* (A.Gray) Lichter-Marck. **A.** Habit and habitat: plant growing from a minute crack in a rock face at a popular climbing destination outside of Guadalajara known as el Diente. It is a suffrutescent perennial with a woody caudex that roots in minute cracks in vertical rock outcrops in the mountains of Jalisco, Mexico. **B.** Sideview of discoid capitula showing the linear, naviculate (boat-shaped) phyllaries and white disc corollas that fade to dark lilac. *Photos by Isaac Lichter-Marck (A) and Pablo Carrillo Reyes (B).*

4.9 Galinsogeopsis lineariloba (Rydb.) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle lineariloba* Rydb., N. Amer. Fl. 34(1): 18, 1914. **TYPE:** Mexico, Durango, San Ramon, 21 April–18 May 1906, *E. Palmer 89* (holotype: NY00231067 [photo!], isotypes: CM2490 [photo!], GH00011126 [photo!], K000502197 [photo!], K000502196 [photo!], UC298455!, UC145620!, US00124627!).

Notes: This species, previously only known from the type collection made by Palmer in the state of Durango, at San Ramón in 1906, was recently rediscovered and photographed for the first time by Jesús Sánchez-Escalante in Sonora, near the town of Nacozari de García. This new locality is over 700 kilometers north of Palmer's collecting locality; however, additional collecting in the Sierra Madre Occidental may show that its distribution is continuous throughout low to mid elevations around the mountain range. Other rock daisies show similar disjunctions in the Sierra Madre Occidental (e.g. *Galinsogeopsis feddemae, Pericome macrocephala* B.L.Rob.) and it is too soon to tell whether these disjunctions merely reflect collecting bias.

4.10 Galinsogeopsis microcephala (A.Gray) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle microcephala* A.Gray. Proc. Amer. Acad. Arts 21: 391, 1886. **TYPE:** Mexico, Chihuahua, rocky hills near Chihuahua, 8 October 1885, *C.G. Pringle 571* (lectotype: GH00011132 [photo!] [designated by Powell 1974], isolectotypes: US00124635!, UVMVT027699 [photo!]).

Notes: Some uncertainty surrounding disc corolla color in *G. microcephala*, a character that does not preserve well in specimens, has been resolved by photographs from across the range of this species in the northern Sierra Madre Occidental. Disc corollas appear cream to cream-yellow and show deeper hues of lilac, red, and blue as they age. This disc corolla color occurs in other *Galinsogeopsis,* such as *G. jaliscana, G. feddemae*, as well as other rock daisies (e.g. *Eutetras palmeri, Laphamia rupestris* var. *albiflora,* and *Perityle rosei*).

4.11 Galinsogeopsis microglossa (Benth.) Lichter-Marck **comb. nov.** *Perityle microglossa* Benth. Bot. Voy. Sulphur [Bentham] 119, 1845. **TYPE:** Nicaragua, Realejo, 1844, *D. Sinclair s.n.* (lectotype: K000502195 [photo!] [**here designated**]). Figure 14.

Galinsogeopsis spilanthoides Sch.Bip., Bot. Voy. Herald [Seemann] 7-8: 307, 1856. *Pericome spilanthoides* (Sch.Bip.) Benth. & Hook.f. ex. Hemsl., Biol. Centr.-Amer., Bot. 2(9): 215, 1881. *Perityle spilanthoides* (Sch.Bip.) Rydb., N. Amer. Fl. 34: 23, 1914. **TYPE:** Mexico, Sinaloa, Sierra Madre, 1849, *B. Seeman 1982* (lectotype: K [designated by Powell 1974], isolectotypes: K000502193 [photo!], P02140850 [photo!], P02140851 [photo!]).

Perityle acmella Harv. & A.Gray, Mem. Amer. Acad. Arts ser. 2, 4: 77, 1849. **TYPE:** Mexico, "California," *Coulter 278* (lectotype: GH00014292 [photo!] [designated by Powell 1974], isolectotypes: K001079924 [photo!], K001079925 [photo!], TCD0090357 [photo!]).

Perityle microglossa var. *effusa* A.Gray, Proc. Amer. Acad. Arts 19: 19, 1883. *Perityle effusa* (A.Gray) Rose, Contr. U.S. Natl. Herb. 1(4): 104–105, 1891. **TYPE:** USA, Arizona, Pima Co., Santa Catalina Mtns., 5 June 1882, *C.G. Pringle s.n.* (lectotype: GH00011088 [photo!] [designated by Powell 1974], isolectotypes: US00124636!, UVMVT027702 [photo!]).



Figure 14. *Galinsogeopsis microglossa* (Benth.) Lichter-Marck var. *microglossa*, the only self-compatible, weedy annual in the genus; it grows on both decomposed and rocky soils in rural and urban settings **A.** Superior view of compact capitulum with short (1.5–3 mm) ray limbs. **B.** Plant growing out of a 1000 year old pre-colombian structure at Plazuelas, in Guanajuato, Mexico. **C.** Plant as an agricultural weed in a plantation of *Agave angustifolia* Haw. (Asparagaceae) in the town of Tequila, Mexico. *Photos by Isaac Lichter-Marck.*



Figure 15. *Galinsogeopsis microglossa* var. *saxosa* (Brandegee) Lichter-Marck is a delicate annual that grows in decomposed substrates in the western Sierra Madre Occidental mountain range. **A.** Lateral view of capitulescence **B.** Superior view of capitulum with white ray floret corollas, showing limbs typically larger than 3.5 mm. *Photos by Isaac Lichter-Marck.*

4.11 A **Galinsogeopsis microglossa** var. **saxosa** (Brandegee) Lichter-Marck **comb. nov**. *Perityle saxosa* Brandegee, Zoe 5: 225, 1905. *Perityle microglossa* var. *saxosa* (Brandegee) A.M.Powell, Rhodora 76: 273, 1974. *Galinsogeopsis spilanthoides* var. *saxosa* (Brandegee) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. **TYPE:** Mexico, Sinaloa, vicinity of Culiacán, Cerro Colorado, 5 November 1904, *Brandegee s.n.* (holotype: UC90478!, isotypes: GH00011134 [photo!], RSA0001475!). Figure 15.

Perityle urticifolia Rydb., N. Amer. Fl. 34(1): 18, 1914. **TYPE:** Mexico, Nayarit, Tepic, 5 January–6 February 1892, *E. Palmer 1960* (holotype: NY00231078 [photo!], isotype: US00124660!).

Notes: new combinations for varieties of *Galinsogeopsis microglossa* (Benth.) Lichter-Marck are needed, with *G. spilanthoides* Sch.Bip. in heterotypic synonymy because the oldest basionym for this taxon at specific rank *Perityle microglossa* Benth., validly published in 1845, has priority.

4.12 Galinsogeopsis montana (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle montana* (A.M.Powell) B.G.Baldwin, Syst. Bot. 27: 181, 2002. *Corellia montana* A.M.Powell, Brittonia 25: 116, fig. 1, 1973. **TYPE:** Mexico, Chihuahua, in mats on boulders, summit of Sierra Mohinora, 10,000–10,300 ft., 16–17 October 1959, *D.S. Correll & H.S. Gentry 23185* (holotype: LL00374150 [photo!], isotypes: BRIT23475 [photo!], GH00006217 [photo1], , UC1396197!, US00124680!). Figure 16.

Notes: Between the collection of the type by Correll & Gentry (23185) on Sierra Mohinora, Chihuahua state, in 1959 and the present, this extremely rare montane rock daisy has only been reported a handful of times. Powell (1973b) originally placed this species in its own monotypic genus *Corellia* on the basis of the distinctive shape of its stalked glands. In the 1980s, Guy Nesom, Paul Lewis, and Andrew McDonald collected *G. montana* on a series of trips to Turuachi, in the municipality of Guadalupe and Calvo, also in the state of Chihuahua. DNA sequence data from these specimens was amplified for nuclear ribosomal DNA by Baldwin et al. (2002), which resolved its phylogenetic position as nested within *Perityle* sensu lato, leading to a new combination within that genus. More recently, phylogenomic-scale data has provided evidence for its recent divergence from *Galinsogeopsis* species that occur nearby in the Sierra Madre Occidental but that are very different morphologically and grow in very different habitats from the one inhabited by *G. montana*. *Galinsogeopsis montana* is unlike any other rock daisy in that it is found on moist, high elevation mountains, where it forms a dwarf, herbaceous ground cover. In September of 2019, the first photographs of *G. montana* were uploaded to iNaturalist from Sierra Mohinora by two observers, María de Los Ángeles Olvera (@ angie_olvera) and Aarón González Máruqez (@



Figure 16. *Galinsogeopsis montana* (A.M.Powell) Lichter-Marck. **A.** Habit and habitat on a mix of shallow volcanic tuff. Bare, exposed outcroppings of volcanic bedrock form a unique habitat in the Sierra Madre Occidental and when they occur, typically host a unique, endemic flora. These photographs suggest for the first time that the unique morphological traits of this species may have arisen as a result of selection driven by this unique microclimate. **B-C.** Close up view of the capitulum showing the four lobed disc corollas. and broad, 3-lobed ray florets corollas. *Photos by María de los Ángeles Olvera (A,C) and Aaron Gonález Márquez (B).*

Living in the city

There are few niches in cities where wild plants can thrive. Cliff plants might be a rare exception. They establish on old rock walls and cracks in concrete. Most rock daisies are ecological specialists with narrow ranges, but a few species have expanded their territory and make their living in cities. *Galinsogeopsis microglossa* is a widespread, self-compatible annual that establishes in urban zones, and thrives on sidewalks, ditches, and old rock walls. The plants that co-athor Sophia WInitsky is pointing to here were photographed on a break from field work in Tequila, Jalisco, growing out of an old cathedral on the day of the dead.



Tequila, Jalisco. Photo by Isaac Lichter-Marck

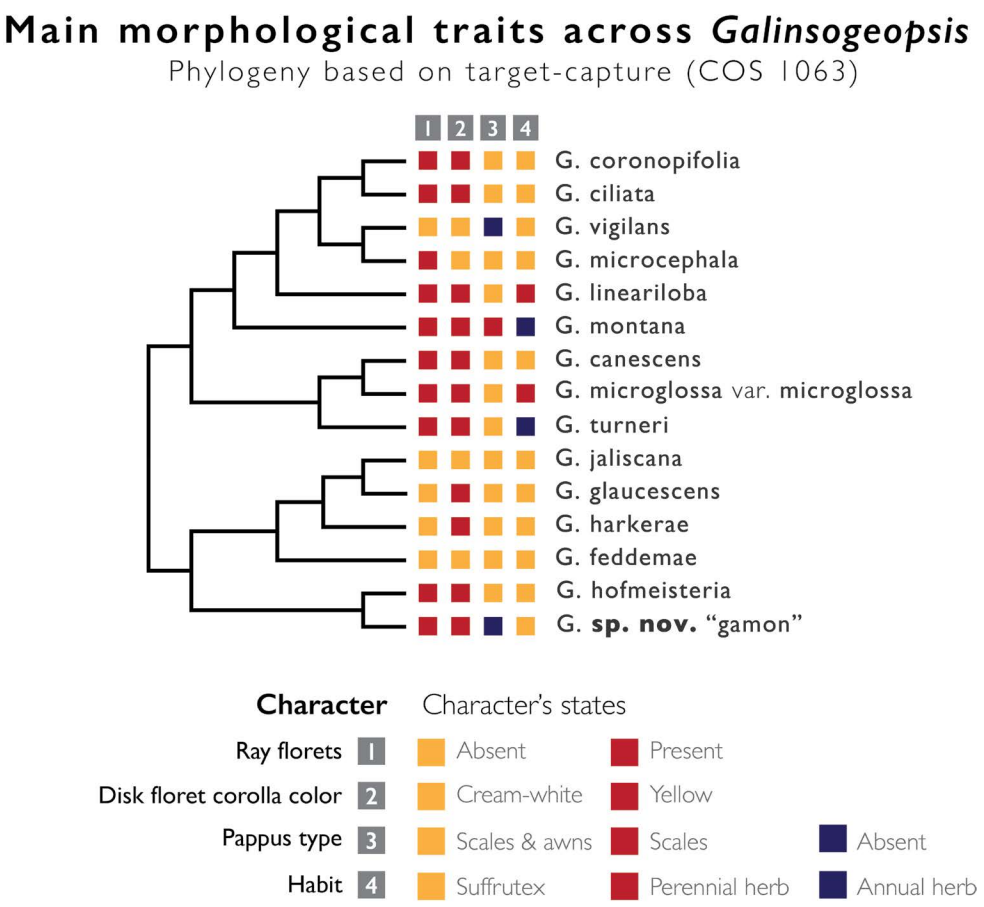


Figure 17. Some morphological characters useful in the identification of *Galinsogeopsis* species plotted onto a phylogeny based on Target Capture sequencing (Lichter-Marck & Baldwin 2023).

aaronbalam_tutor). These reveal *G. montana* growing on volcanic mudflow deposits, a distinctive habitat in the Sierra Madre Occidental that has a patchy distribution and often harbors a unique dwarf herb flora. In Yécora, Sonora, floristic surveys of mudflow deposits resulted in the discovery of four species new to western science, and further exploration of these moist, edaphic islands could yield more novelties in the future (Van Devender & Reina-Guerrero, 2016).

4.13 Galinsogeopsis turneri (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle turneri* A.M.Powell, Madroño 21: 456, 1972. **TYPE:** Mexico, Durango, 3.4 mi. east of El Palmito, 2 April 1970, *A.M.Powell 1858* (holotype: TEX00374226 [photo!], isotypes: ASU0017130 [photo!], COLO00397638 [photo!], DES00017701 [photo!], F0050939 [photo!], NY00231077 [photo!], MEXU00398021 [photo!], MO-193722 [photo!], OS0000272 [photo!]).

Notes: *G. turneri* is a rhizomatous perennial found in moist, high elevation temperate forests. It is common along Highway 40 between the cities of Durango and Mazatlán, in Sinaloa, Mexico. The habit and habitat, combined with its delicate creeping stem, and large heads show remarkable convergence with temperate Astereae (e.g. *Erigeron*).

4.14 Galinsogeopsis vigilans (Spellenb. & A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle vigilans* Spellenb. & A.M.Powell, Syst. Bot. 15: 252, fig. 1, 1990. **TYPE:** Mexico, Chihuahua, Municipio Maguarichi, on igneous rocks at Maguarichi and to 3 mi. NE along road, just below oak zone, 1700 m, 27°52'30"N, 107°59'30"W, 25 April 1985, *Spellenberg, Soreng, Corral & Todsen 8104* (holotype: NMC096179, isotypes: MEXU00481849 [photo!], NY231079 [photo!], SRSC00001245!, TEX00374228 [photo!], UC1555785!).

Notes: Collections of this species remain limited to the type material collected by R. Spellenberg et al. in the 1980s from the "gate-like" rock formations lining the road to Maguarichi, Chihuahua, Mexico. The Latin name for this taxon means "to stand watch." Sadly, as Maguarichi has grown from a small town in the Copper Canyon country into a bustling city catering to mining exploration, the rock formations along the road have been bulldozed and limited recent exploration of cliffs in the area have not turned up more plants, despite ample suitable habitat (R. Spellenberg, pers. comm.). Recently, a photograph from approximately 40 km to the east near San Rafael, in Bocoyna municipality, Chihuahua, was uploaded to iNaturalist by @eduardovillalobos and shows an individual plant in mostly vegetative condition that resembles *G. vigilans*. This plant differs from previous collections of *G. vigilans* in that it has glabrate, greenish foliage, and does not appear to be densely covered in a grayish layer of fine hairs (Spellenberg & Powell, 1990). It is possible that there is considerable variability in this group that has been difficult to appreciate with only a few, spotty collections. It is also possible that this outlier may represent an additional undescribed taxon of rock daisies for this particularly cliffy and understudied part of the Sierra Madre Occidental.

5 **Laphamia** A.Gray, Smithsonian Contr. Knowl. 3(5): 99, 1885. **TYPE: Laphamia lindheimeri** A.Gray. Figure 18-40.

Leptopharynx Rydb. N. Amer. Fl. 34(1): 21, 1914. **TYPE:** *Leptopharynx parryi* (A.Gray) Rydb.

Monothrix Torr., Expl. Surv. Great Salt Lake 389, 1852. **TYPE:** *Monothrix stansburyana* Torr.

Pappothrix (A.Gray) Rydb. N. Amer. Fl. 34(1): 26, 1914. **TYPE:** *Pappothrix rupestris* (A.Gray) Rydb.

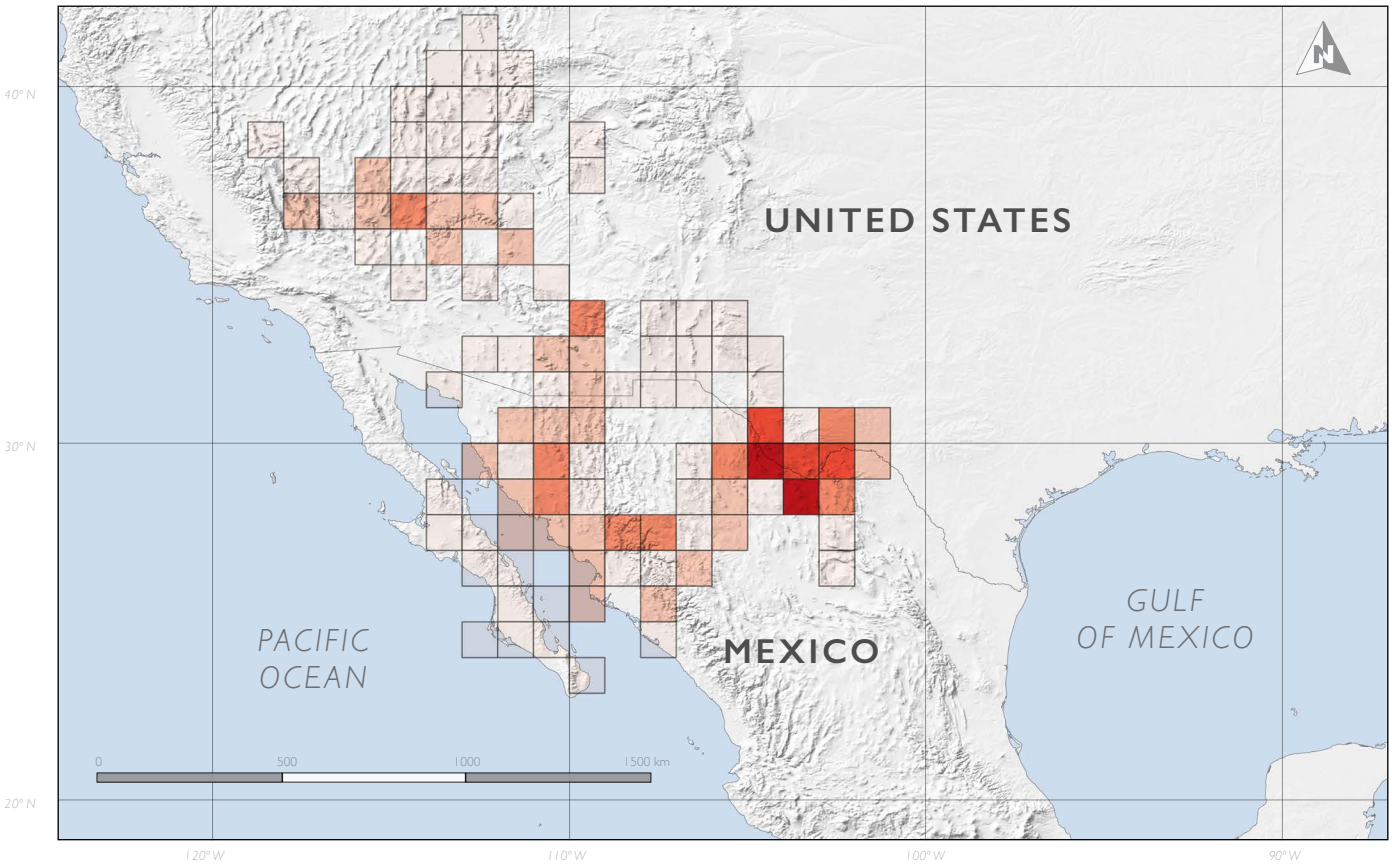


Figure 18. Geographic distribution of species diversity in *Laphamia* based on a vetted dataset of digitized herbarium specimen records. Centers of diversity (darker colors) include sky island archipelagos in the northern Chihuahuan, Sonoran, and Great Basin deserts. High species richness is also found in association with bare, rocky outcrops in tropical deciduous forests in northwest Mexico, where the earliest diverging *Laphamia* lineages are found.

Evolutionary structure of *Laphamia* radiation

Phylogeny based on target-capture (COS 1063) loci

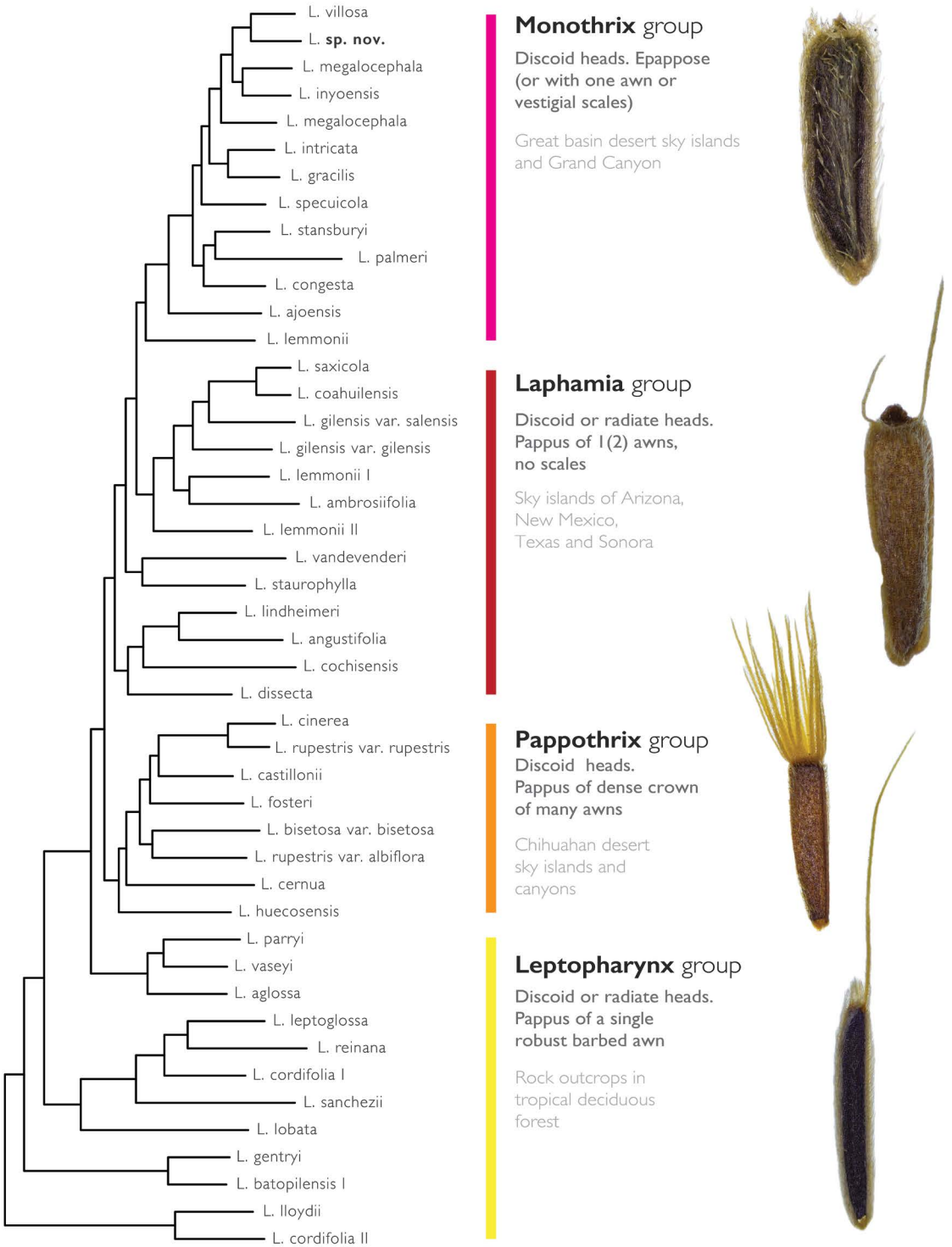


Figure 19. Phylogenetic hypothesis of evolutionary relationships among extant taxa in *Laphamia* A.Gray, based on target capture data using the *COS 1061* loci (adapted from Lichter-Marck et al. 2020, Lichter-Marck & Baldwin 2023). Colored lines indicate informal groupings of monophyletic groups that correspond to morphology, geography, and ecology. Photos of fruits were taken using a Leica™ dissecting microscope with focus stacking..

5.1 **Laphamia aglossa** (A.Gray) Benth. & Hook.f. ex Hemsl., Biol. Cent-Amer., Bot. 2: 210, 1881. *Perityle aglossa* A.Gray, Smithsonian Contr. Knowl. 5(6): 107, 1852. *Leptopharynx aglossa* (A.Gray) Rydb., N. Amer. Fl. 34: 24. 1914. **TYPE:** U.S.A., Texas, Río Grande below Presidio del Norte, August 1852, *C.C. Parry s.n.* (lectotype: GH00011066 [photo!] [designated by Powell 1974], isolectotypes: NY00231052 [photo!], NY00231049 [photo!]).

Notes: The discoid-headed *L. aglossa* grows on bare, rocky outcrops of limestone in the Sierra del Caballo Muerto (Dead Horse Mountains) in western Texas, and in river cut cliffs as far east along the Río Grande as San Rosendo Canyon. Occasionally, *L. aglossa* establishes on talus slopes below cliffs and these individuals may develop into larger sub-shrubs than those that anchor in consolidated rock. Variability in leaf shape, especially in the degree of marginal lobes, appears to follow a cline northward from Boquillas Canyon to the Black Gap Wildlife Management Area, with individuals found further to the north having more irregular leaf margins. Among close relatives, *L. parryi* has radiate heads and is found on decomposed and consolidated volcanic substrates in the Chisos Mountains to the east. *Laphamia vaseyi* has radiate heads and tripartite leaves, is found on decomposed calcareous substrates, and is sympatric with *L. aglossa* at the easternmost edge of its range (e.g. in Ernst Tinaja). These three species of rock daisies provide a compelling example of eco-geographic speciation on the mosaic of mountains and rock types found in the Big Bend region.

5.2 **Laphamia ajoensis** (Todsen) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle ajoensis* Todsen, J. Ariz. Acad. Sci. 9(1): 35, 1974. **TYPE:** U.S.A, Arizona, crevices in a seeping, north-facing volcanic cliff, about 3000 ft., above marker 14, Bull Pasture Trail, Organ Pipe Cactus National Monument, Ajo Mtns., Pima Co., 22 October 1972, *T.K. Todsen 2292* (holotype: NY00231037 [photo!], isotypes: ARIZ0004458 [photo!], ARIZ184596, SRSC00001225!).

Notes: *Laphamia ajoensis* is a rare rock daisy that grows on exposed, consolidated cliffs of rhyolite in the Ajo Mountains in southwestern Arizona. It is a single sky-island endemic and disjunct from other rock daisies in *Laphamia*. Close by, *Galinsogeopsis coronopifolia* has been documented in the Baboquivari Mountains to the east, and *Perityle emoryi* grows as an ephemeral spring annual in neighboring low elevation environments. Phylogenetic data confirm Todsen's (1974) hypothesis that *L. ajoensis* is closely related to rock daisies in the southwest alliance clade (e.g. *L. megalocephala* var. *megalocephala*) in eastern California, Nevada, and Utah than to other rock daisies found in southern Arizona. The Ajo Mountains are part of Organ Pipe National Monument, and to the west of the mountains is a vast roadless expanse where it is possible that more populations of *L. ajoensis* can be found.

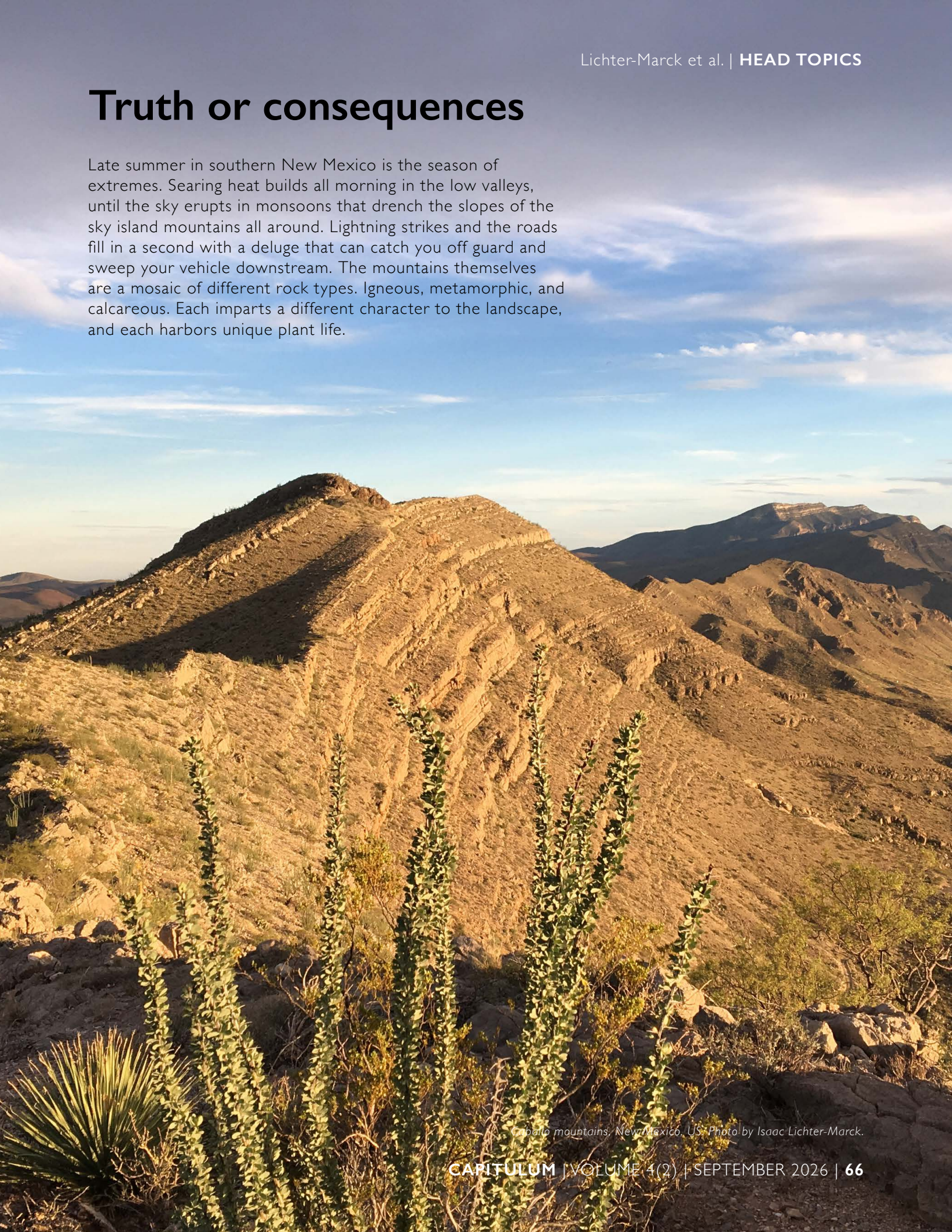
5.3 **Laphamia ambrosiifolia** (Greene ex A.M.Powell & Yarborough) Lichter-Marck, Syst. Bot. 47(3): 807, 2022. *Perityle ambrosiifolia* Greene ex A.M.Powell & Yarborough, Phytologia 76: 325–327, fig., 1994. **TYPE:** U.S.A., Arizona, Greenlee Co., with *Prosopis*, *Euphorbia*, on face of conglomerate cliff, above San Francisco River bank, S. Clifton, 5 June 1935, *B. Maguire, B.L. Richards Jr. & T Moeller 11787* (holotype: NY00039620 [photo!], isotypes: SRSC00065860 [photo!], SRSC00065861 [photo!], SRSC00065862 [photo!], SRSC00065863 [photo!], SRSC00064221 [photo!], UTC00064687 [photo!], US00432995!).

Notes: *Laphamia ambrosiifolia* is a distinctive narrowly endemic rock daisy that was singled out for description as a new species by E.L. Greene around the turn of the 20th century but never validly published until Powell and Yarborough (1994). Plants grow in cliffs of sandstone and hanging gardens along streams, in association with other hanging garden species such as *Erythranthe guttata*. This species has been highlighted as of conservation concern, because the only populations documented to date occur in Morenci, Greenlee Co., Arizona in the shadow of one of the most active mining operations in the southwest U.S. A photograph posted to iNaturalist (@cbruner:120672373) from the Galiuro Mountains of a rock daisy that slightly resembles *L. ambrosiifolia* may warrant further study as a potential range extension or new taxon because it is morphologically distinctive and geographically isolated from all known populations of *L. ambrosiifolia*.

5.4 **Laphamia angustifolia** A.Gray, Pl. Wright. 1: 100–101, 1852. **TYPE:** U.S.A., Texas, between Texas and El Paso, 1851, *C. Wright 1194* (lectotype: GH00011068 [photo!] [designated by Powell 1974], isolectotypes: BM000810790 [photo!], GH00011067

Truth or consequences

Late summer in southern New Mexico is the season of extremes. Searing heat builds all morning in the low valleys, until the sky erupts in monsoons that drench the slopes of the sky island mountains all around. Lightning strikes and the roads fill in a second with a deluge that can catch you off guard and sweep your vehicle downstream. The mountains themselves are a mosaic of different rock types. Igneous, metamorphic, and calcareous. Each imparts a different character to the landscape, and each harbors unique plant life.



Caballo mountains, New Mexico, US. Photo by Isaac Lichter-Marck.

[photo!], GH00011069 [photo!], K001079920 [photo!], K001079921 [photo!], NY00180451 [photo!], NY00180453 [photo!], NY00180454 [photo!], PH00016867 [photo!], US00124589!). Figure 20.

Laphamia angustifolia var. *laciniata* Torr., Rep. U.S. Mex. Bound. 2(1): 82, 1859. *Laphamia laciniata* (Torr.) Rydb., N. Amer. Fl. 34: 25, 1914. **TYPE:** U.S.A., Texas, crevices of rocks along the Río Grande, October, *Bigelow s.n.* (lectotype: NY00180454 [photo!] [**here designated**], isolectotypes: NY00180453 [photo!], US00124588!).

Notes: *Laphamia angustifolia* grows on bare, rocky outcrops of limestone in the western Edwards Plateau in Texas. Closely related taxa include *L. lindheimeri,* which is found on limestone outcrops as far east as the hill country of Texas, and *L. heucosensis*, a rare rock daisy known only from limestone outcrops around El Paso, Texas and in the mountains above Juarez, Mexico. *Laphamia angustifolia* shows much variability in the degree and number of leaf margin lobes, but it is unclear whether there is an underlying geographic pattern to this morphological variation.

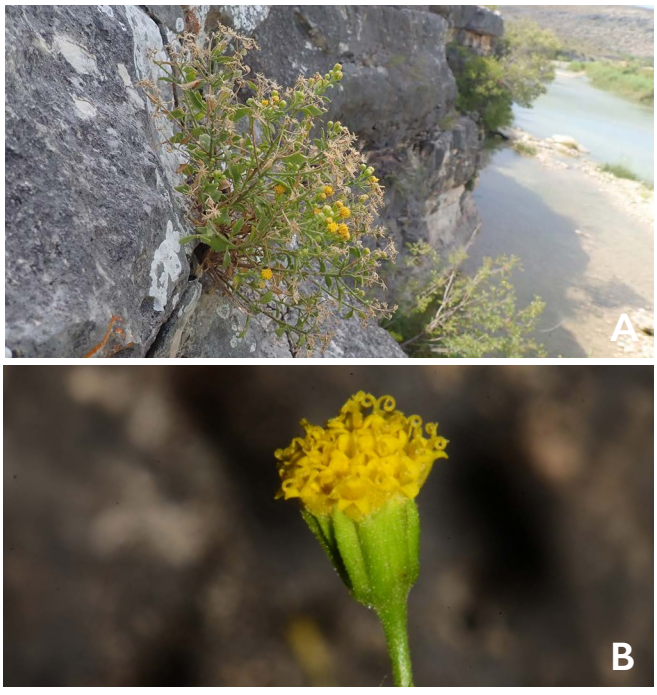


Figure 20. *Laphamia angustifolia* A.Gray. **A.** This species is a suffrutescent perennial with a woody caudex that roots into cliffs and caves of Cretaceous limestone on the eroded, western edge of the Edwards Plateau in trans-pecos Texas. **B.** Lateral view of discoid capitulum showing the sparsely glandular, linear, boat-shaped phyllaries and yellow disc floret corollas. *Photos by Isaac Lichter-Marck (A) and Joey Santore (B).*

5.5 Laphamia batopilensis (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 808, 2022. *Perityle batopilensis* A.M.Powell, Madroño 30: 221–223, fig., 1983. **TYPE:** Mexico, Chihuahua, Municipio Batopilas, N side of Barranca de Batopilas between La Bufa and Quirare, 1590 m, 26 March 1979, *Bye et al. 9276* (holotype: COLO00397604 [photo!], isotypes: AD98614096 [photo!], COLO00397612 [photo!], CM2488 [photo!], GZU000267237 [photo!], MEXU00838932 [photo!], UCR0000086 [photo!]).

Notes: *Laphamia batopilensis* is found on isolated outcroppings of volcanic rocks (mostly rhyolitic tuff) in the transition zone between tropical deciduous scrub and oak forests in the Batopilas (Copper Canyon) region of the Sierra Madre Occidental in Chihuahua, Mexico. To our knowledge, *L. batopilensis* has been collected or photographed only rarely. Photos by R. Spellenberg, C. Alexander, and W. Anderson posted to the CalPhotos webpage reveal the heads bending back and self-sowing the fruits in the cliff. Based on its similarity to *L. gentryi,* Turner (2013) considered these taxa conspecific, but *L. batopilensis* is recognized as distinct here (see comments under *L. gentryi*).

5.6 Laphamia bisetosa Torr., Smithsonian Contr. Knowl. 6(6): 106, 1853. *Perityle bisetosa* (Torr.) Shinners, Southw. Naturalist 4: 205, 1959. **TYPE:** U.S.A., Texas, Brewster Co., crevices of rocks in a canyon of the Río Grande below Presidio del Norte, October 1852, *C.C. Parry 579* (lectotype: GH00011071 [photo!] [designated by Powell 1974], isolectotypes: NY00180457 [photo!], NY00180456 [photo!]). Figure 21.

Notes: Thus far, only one variety of *L. bisetosa* has been included in phylogenetic analyses, where it was nested among rock daisies in *Laphamia* found in neighboring habitats that were also included in Powell's (1969) *Perityle* sect. *Pappothrix* based on having a crown of typically 10–20 pappus barbs. *Laphamia bisetosa* usually has 1–2, flattened barbs, but shows similarities with these distinctive rock daisies, including being a caespitose, suffrutescent perennial with white corollas and discoid heads that grows on Cretaceous limestone outcrops. The varieties of *L. bisetosa* are all rare and found in an area with difficult access due to private land and the shifting political landscape of the highly militarized U.S.-Mexico border.

5.6 A Laphamia bisetosa var. **appressa** (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 808, 2022. *Perityle bisetosa* var. *appressa* A.M.Powell, Sida 3: 178–180, 1967. **TYPE:** U.S.A., Texas, Brewster Co., E face of the limestone caprock of a small mountain peak on the N rim of San Francisco Creek canyon, 5 July 1966, *J. Scudday, S. Sikes & A.M.Powell 626* (lectotype: SRSC00001228 [**here designated**] [photo!], isolectotypes: BRIT23895 [photo!], 00011070 [photo!], SRSC00001227 [photo!], SRSC00001229 [photo!], TEX00374213 [photo!], US00124593!).

5.6 B Laphamia bisetosa var. **scalaris** (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3:) 808, 2022. *Perityle bisetosa* var. *scalaris* A.M.Powell, Sida 3: 177–178, 1967. **TYPE:** U.S.A., Texas, Brewster Co. in crevices of lower limestone bluffs, Black Gap Game Preserve, ca. 4 mi S of headquarters, Cave Hill, E side, along Stairstep Mtn., 25 September 1965, *A.M.Powell & T. Watson 1394* (holotype: SRSC00001230!, isotypes: BRIT23896!, TEX00374214 [photo!]).



Figure 21. *Laphamia bisetosa* var. *bisetosa* (A.M.Powell) Lichter-Marck is a rare rock daisy found on bare, rocky outcrops of limestone along the Río Grande in western Texas. The individual pictured here was growing as a compact mat, out of a solid calcareous bedrock. Notice the single series of phyllaries and foliage, as well as the discoid capitulum with white disc florets corollas. *Photos by Isaac Lichter-Marck.*

5.6 C Laphamia bisetosa var. **spathulata** (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 808, 2022. *Perityle bisetosa* var. *spathulata* A.M.Powell, Sida 5: 85, fig. 4, 1973. **TYPE:** Mexico, Coahuila, limestone bluffs in large, dead-end, Boquilla Canyon, Sierra de la Encantada, ca. 92.5 mi NW of Musquiz, 22 May 1968, *A.M.Powell & D. Patterson 1588* (holotype: SRSC00001231!, isotypes: BRIT735555 [photo!], LL00059826 [photo!], LSU00210015 [photo!], TEX00374215 [photo!]).

5.7 Laphamia carmenensis (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 808, 2022. *Perityle carmenensis* A.M.Powell, Sida 6(4): 311, 1976. **TYPE:** Mexico, Coahuila, Maderas del Carmen, 102° 36' 30" W, 0.5 mi. N of El Dos on trail to El Tres, 2325 m, along stream, on overhanging cliff of igneous rock (rhyolite?) in thin soil, 7 August 1974, *A. Adamcewicz & T. Wendt 525* (holotype: TEX00374216 [photo!], isotype: MEXU00253514 [photo!]).

Notes: *Laphamia carmenensis* remains known only from the type location in the Sierra del Carmen, in Coahuila, Mexico, where it was last collected in 1989. Label data indicates that this species grows on consolidated rhyolitic rock cliffs, including in the shade of overhangs. The presence of ray florets suggests it might represent a close relative of *L. coahuilensis,* which itself is more closely related to rock daisies found in Arizona than species distributed close by in Mexico or Texas. So far, this species has not been included in molecular analyses.

5.8 Laphamia castillonii (I.M.Johnst.) Everly, Contr. Dudley. Herb. 3: 378, 1947. *Perityle castillonii* I.M.Johnst., J. Arnold Arbor. 22: 122, 1941. **TYPE:** Mexico, Coahuila, Cañón del Indio Felipe, Sierra Hechiceros, frequent in crevices of cliffs in deep canyon, 18 September 1940, *Johnston & Muller 1359* (lectotype: GH00011101 [photo!] [**here designated**], isolectotypes: F0050935 [photo!], GH00011103 [photo!]).

Notes: This species was last collected in the 1970s and is known from igneous cliffs at only two locations, including the type locality in the Sierra Hechiceros (Johnston & Muller 1359), and an isolated peak to the immediate SE called Picacho de Noche Buena (Chiang, Wendt, & Johnston 9640-B).

5.9 Laphamia cernua Greene, Bull. Torrey Bot. Club 25(3): 122, 1898. *Pappothrix cernua* (Greene) Rydb., N. Amer. Fl. 34: 27, 1914. *Perityle cernua* (Greene) Shinners, Southw. Naturalist 4: 20, 1959. **TYPE:** U.S.A., New Mexico, Doña Ana Co., Organ Mts., 6500 ft., 4 September 1897, *E.O. Wooton 476?* (lectotype: NDG00247 [photo!] [designated by Powell 1969], isolectotypes: MO-714504 [photo!], MIN1001582 [photo!], NY00180459 [photo!], US00124596!, US00931224!). Figure 22.

Notes: *Laphamia cernua* has only been documented in the Organ Mountains of southern New Mexico where it grows on difficult to reach, bare, rhyolitic cliffs and overhangs. Recent photographs taken in a natural community context show for the first time that *L. cernua* exhibits "self-sowing" behavior, in which the heads recurve toward the rock face at maturity, releasing fruits back into cracks in the cliff.

5.10 Laphamia cinerea A.Gray, Rep. U.S. Mex. Bound. 2(1): 82, 1859. *Pappothrix cinerea* (A.Gray) Rydb., N. Amer. Fl. 34: 27, 1914. *Perityle cinerea* (A.Gray) A.M.Powell, Sida 3: 278, fig. 20, 1968. **TYPE:** U.S.A., Texas, on rocks near Escondido Creek, September, *Bigelow s.n.* (lectotype: GH00011106 [photo!] [designated by Powell 1969], isolectotypes: NY00180458 [photo!], US00124598!).

Notes: Although *L. cinerea* is presumably a common species on limestone outcrops and ledges throughout the Edwards Plateau, access to populations of this plant are severely restricted by private land holdings. The last time this species was collected was in 1977 by Mary Butterwick and Emily Lott. In 2026, Saunders Drucker uploaded the first photos of this species to inaturalist. the first time this plant had been observed in over 49 years. Much of the range of *L. cinerea* is under heavy use for resource extraction of fossil fuels, and exploitation has probably negatively affected the species, but no data on population trends exists.

5.11 Laphamia coahuilensis (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 808, 2022. *Perityle coahuilensis* A.M.Powell, Sida 5: 10, fig. 9, 1973. **TYPE:** Mexico, Coahuila, deep narrow canyon, ca. 2 km SE of Puertecito, W end of Sierra de la Madera, ca. lat. 27.15° N, 21 September 1941, *I.M.Johnst. 9311* (holotype: GH00011109 [photo!], isotypes: GH00011107 [photo!], LL00374218 [photo!]).



Figure 22. *Laphamia cernua* Greene is a rare rock daisy endemic to a single mountain range in southern New Mexico, the organ mountains, where it grows as an extreme edaphic specialist on vertical cliffs of solid rhyolite. **A.** Lateral view of capitulum showing the linear phyllaries and discoid heads with yellow disc floret corollas. Capitula in this species show self-sowing behavior, in which the head bends back toward the cliff upon maturity of the cypselae. **B.** Close up of the cypselae, which have a distinctive pappus characteristic of the *Pappothrix* group within *Laphamia*, that is cylindrical, with callous margins and a dense corona of 15 to 20 antrorsely serrated awns. *Photos by Isaac Lichter-Marck.*

Notes: *Laphamia coahuilensis* occurs in association with bare limestone cliffs in three mountain ranges in Cuatro Cienegas Municipality, Coahuila, Mexico. These include the Sierra del Carmen and Sierra San Marcos, and in the Cañón Ojo de Agua near Las Delicias, off the Federal Highway 30. *Laphamia coahuilensis* is an outlier among rock daisies of the Chihuahuan Desert sky islands for its sub-cruciform leaf shape, radiate heads, fruits lacking conspicuous pappus scales, and a tetraploid chromosome



Figure 23. *Laphamia cochisensis* W.E.Niles is endemic to a single sky island, the Chiricahua mountain range in south eastern Arizona, where it is an extreme edaphic endemic growing on vertical cliffs of rhyolite at mid to high elevations. This photograph captures the compact habit and extreme habitat of the plant, as well as its glabrous, deltate leaves with irregular lobes, and discoid capitula with yellow disc floret corollas. *Photo by Isaac Lichter-Marck.*

number. Until recently, phylogenetic relationships of *L. coahuilensis* have remained a head-scratching mystery. To quote Powell (1973a), "this rare and unusual species has commanded special attention regarding systematic studies in sect. *Laphamia*. In the first place, it has not been possible to realize any certain interspecific relationship for *P. coahuilensis*." Molecular phylogenetic data resolved at long last the mystery of *L. coahuilensis* and show that it is more closely related to three geographically distant rock daisies, *Laphamia gilensis* var. *gilensis*, *Laphamia gilensis* var *salensis*, and *Laphamia saxicola*, all endemic to the Superstition Mountains in Arizona. *Laphamia coahuilensis* is morphologically similar to all three of these species. Thus, *L. coahuilensis* constitutes a remarkable case of long-distance dispersal between sky islands 1000 kilometers apart in the Basin and Range province of western North America.

5.12 Laphamia cochisensis W.E.Niles, Mem. N.Y. Bot. Gard. 21: 47–49, 1970. *Perityle cochisensis* (W.E.Niles) A.M.Powell, Sida 5: 10, 1973. **TYPE:** U.S.A., Arizona, Cochise Co., north facing cliffs of Echo Canyon, elev. ca. 2000 m, Chiricahua Nat'l Mon., 5 October 1964, *Niles 377* (holotype: ARIZ0004421 [photo!], isotype: TEX00374188 [photo!]). Figure 23.

Notes: *Laphamia cochisensis* is an endemic of the Chiricahua Mountains, a sky island in southeast Arizona, USA, where it grows exclusively on consolidated rock outcrops and cliffs of rhyolite. Populations in the northern Chiricahua Mountains are found within the Chiricahua National Monument and differ in leaf shape and leaf pubescence from populations found at the southern end of the mountain range, amongst the spires of Cave Creek. Northern populations have glabrate leaves that are usually deeply lobed, while plants in the southern portion of the range have appressed-short-villous leaves that are not deeply lobed. An abundance of variation is present overall across both populations, and more study of this rare plant is needed.

5.13 Laphamia cordifolia (Rydb.) Lichter-Marck, Syst. Bot. 47(3): 809, 2022. *Leptopharynx cordifolia* Rydb., N. Amer. Fl. 34: 22, 1914. *Perityle cordifolia* (Rydb.) S.F.Blake, Contr. U.S. Natl. Herb. 23: 1602. 1926. **TYPE:** Mexico, Sinaloa, Vicinity of Topolobampo, 23 March 1910, *J.N. Rose, P.C. Standley & P.G. Russell 13294* (holotype: NY00180531 [photo!], isotypes: GH00011110 [photo!], US00124600!). Figure 24.

Notes: *Laphamia cordifolia* is found exclusively on bare rocky outcrops of volcanic bedrock and rhyolitic tuff surrounded by moist, tropical deciduous forests in the foothills of the Sierra Madre Occidental in Sonora and Sinaloa. The capitula exhibit self-sowing behavior, in which the heads bend back upon maturity and effectively plant their fruits into the cliff face below the broad, cordate leaves. The samples included to date in molecular phylogenies do not support the monophyly of this taxon, with scattered populations that have been documented between Ciudad Obregón, in Sonora, and Culiacán, in Sinaloa, forming one group, and the populations documented along the road to Yécora (*Reina 98-256*, *Reina 2001-159*) forming another. More detailed morphological study may reveal that the populations from along Highway 16 constitute a new taxon as these are phylogenetically distinct, geographically disjunct, and found at a higher elevation.



Figure 24. *Laphamia cordifolia* (Rydb.) Lichter-Marck. **A.** Habit and habitat: This rock daisy grows exclusively on bare, rocky outcrops of volcanic substrates surrounded by a matrix of tropical deciduous forest in northwestern Mexico. **B.** Superior view of an individual showing the large capitula with yellow corollas, ray corollas with long-linear (10–15mm) limbs, as well as the broad, green, cordate leaves with a dense glandular indumentum. *Photos by Isaac Lichter-Marck.*

5.14 Laphamia dissecta Torr., Smithsonian Contr. Knowl. 5(6): 81, 1853. *Perityle dissecta* (Torr.) A.Gray, Syn. Fl. N. Amer. 1(2): 320–321, 1884. *Leptopharynx dissecta* (Torr.) Rydb., N. Amer. Fl. 34(1): 24, 1914. **TYPE:** U.S.A., Texas, Presidio Co., Presidio Del Norte, August 1852, *J.M. Bigelow 77* (lectotype: NY [designated by Powell 1974], isolectotypes: GH00011116 [photo!], US!).

Notes: *Laphamia dissecta* is found exclusively on bare outcrops of limestone on isolated sky islands across a large geographic range in western Texas and may constitute a species complex. *Laphamia dissecta* is associated with calcareous cliffs, such as those found along the Río Grande near Santa Elena Canyon in Big Bend National Park, however populations have also been found on flat karst outcroppings in the Chinati Mountains in western Texas. The population at Santa Elena Canyon was observed in the 1970's and not observed again for 50 years until its recent re-discovery by C. Frasch. The phylogenetic position of *L. dissecta* is unclear. Limited sampling so far has resolved *L. dissecta* in three equally supported positions, as the sister clade to those taxa found in Big Bend NP (*L. vaseyi, L. parryi,* and *L. aglossa*), those of the Edwards Plateau further east (e.g. *L. angustifolia, L. lindheimeri, L. cinerea*), and the rock daisies found in sky islands of New Mexico and Arizona (e.g. *L. staurophylla* and *L. lemmonii*). More dense population and genomic sampling may be needed to help solve the equivocal placement of this taxon.

5.15 Laphamia fosteri (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 809, 2022. *Perityle fosteri* A.M.Powell, Madroño 30: 217–219, fig., 1983. **TYPE:** U.S.A., Texas, Culberson Co., Apache Mts., Panther Canyon, limestone boulders and bluffs, 3 July 1978, *A.M.Powell 3365* (holotype: SRSC00001233 [photo!], isotypes: NY231040 [photo!], MO101406562 [photo!], TEX00374220 [photo!]).

Notes: Four decades after it was described, *L. fosteri* is still known only from the type location in Panther Canyon, in the Apache Mountains of western Texas. The plant was named by A. M. Powell for a prominent rancher who had owned the property where the plant was found. Ironically, efforts to relocate the plant have been unsuccessful because of strict private property rules. Phylogenetic data obtained from leaf tissue on specimens is supportive of *L. fosteri* as a distinctive taxon closely related to rock daisies found in neighboring sky islands in western Texas.

5.16 Laphamia gentryi (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 809 (2022). *Perityle gentryi* A.M.Powell, Sida 5: 10, 1973. **TYPE:** Mexico, Sonora, Saguaribo, Río Mayo, transition pine country, 5500 ft., 2 November 1935, *H.S. Gentry 2109* (holotype: GH00011117 [photo!], isotypes: ARIZ0004463 [photo!], ARIZ0005301 [photo!], MEXU01220284 [photo!], PH00021280 [photo!], TEX00060074 [photo!], UC576839!, US00124611!). Figure 25.

Perityle alamosana B.L.Turner, Phytologia 74: 265, 1993. **TYPE:** Mexico, Sonora, Rancho San Pedro and upper entrance of the cañón, *P.S. Martin, C. Lindquist, S. Meyer s.n.* (holotype: TEX00374212 [photo!], isotype: ARIZ297838 [photo!]).



Figure 25. *Laphamia gentryi* (A.M.Powell) Lichter-Marck. **A.** Habit and habitat: This rare rock daisy grows as a suffrutescent perennial subshrub on bare, rocky outcrops and at the entrance to bat caves in tropical deciduous forests and mid-elevation oak forests in northwestern Mexico. Individuals shown here are hanging from rock. **B.** Close up of radiate capitulum showing yellow corollas. *Laphamia gentryi* is one of the rock daisies that show a unique "self-sowing" behavior in which the heads bend back upon maturity, self seeding in the cliff face. *Photos by Isaac Lichter-Marck (A) and Alejandro Sigala Chávez.*

Notes: *Laphamia gentryi* is found on isolated outcroppings of volcanic rocks in tropical deciduous and mid-elevation oak forests on the western slopes of the Sierra Madre Occidental in Sonora, Mexico. *Laphamia batopilensis* was considered conspecific with *L. gentryi* by Turner (2013) but is retained here as a distinct taxon. Ray florets are present in *L. gentryi* and absent *in L. batopilensis*, and *L. batopilensis* is found on eastern slopes of the Sierra Madre Occidental while all known populations of *L. gentryi* thus far known occur on western slopes. Photos taken by R. Villa at Rancho Santa Bárbara in Álamos, show that *L. gentryi* self-sows its seeds by bending of the peduncle back upon maturity. These taxa are resolved as sister taxa in phylogenies.

5.17 Laphamia gilensis M.E.Jones, Zoe 2: 15, 1891. *Leptopharynx gilensis* (M.E.Jones) Rydb., N. Amer. Fl. 34(1): 24, 1914. *Perityle gilensis* (M.E.Jones) J.F.Macbr., Contr. Gray Herb. 56: 39, 1918. **TYPE:** U.S.A., Arizona, growing among rocks at Putnam's ranch, near the Gila River, 23 May 1890, *M.E.Jones s.n.* (lectotype: POM[RSA0001349] [photo!] [designated by Powell 1973a], isolectotypes: UC90442!, US00124612!). Figure 26.

Laphamia arizonica Eastw., Proc Calif. Acad. Sci. ser. 4, 20: 159, 1931. **TYPE:** U.S.A., Arizona, Maricopa Co., Fish Creek, Apache Trail, 18 May 1919, *A. Eastwood 8753* (holotype: CAS00123290!, isotype: US00124590!).

Laphamia dura A.Nelson, Amer. J. Bot. 23: 266, 1936. **TYPE:** U.S.A., Arizona, Maricopa Co., Salt River Valley, near Canyon Lake, 3 May 1925, *A.Nelson 10323* (lectotype: RM138006 [designated by Powell 1974]).

Notes: *Laphamia gilensis* var. *gilensis, L. gilensis* var. *salensis* and *L. saxicola* are distinctive evolutionary lineages of rock daisies all found within the geologically complex Superstition Mountains in central Arizona. All three taxa are found exclusively on bare outcrops of volcanic bedrock and cliffs, which are common in the Superstition range. A fourth taxon, *L. coahuilensis* is phylogenetically nested within the Superstition Mountains clade and represents an example of long-distance dispersal across a huge expanse of desert to sky island habitats in Coahuila, Mexico. Populations of *L. gilensis* var. *gilensis* found around Oak Flat, Arizona are in danger of habitat loss due to mining expansion.



Figure 26. *Laphamia gilensis* var. *gilensis* M.E.Jones. Lateral view of the radiate capitulum shows the linear phyllaries, as well as the yellow ray and disc corollas. This is a rock daisy species restricted a single mountain range, the Superstition Mountains in Arizona, where it occurs at low elevations on bare, rocky outcrops and cliffs. *Photo by Isaac Lichter-Marck.*

5.17 A **Laphamia gilensis** var. **salensis** (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 809, 2022. *Perityle gilensis* var. *salensis* A.M.Powell, Sida 5(2): 104–106, 1973. **TYPE:** U.S.A., Arizona, Gila Co., Salt River canyon between Globe and Show Low, 18 August 1869, *S. Sikes 428* (holotype: SRSU00001235 [photo!], isotype: TEX00374221 [photo!]).

Laphamia gilensis subsp. *longiloba* W.E.Niles, Mem. New York Bot. Gard. 21(1): 51, fig. 30, 1970. *Perityle gilensis* var. *longiloba* (W.E.Niles) A.M.Powell & Yarb. Phytologia 82: 328, 1997. **TYPE:** U.S.A., Arizona, Gila Co., lowermost, north-facing cliffs of Salt River canyon, near crossing of Highway 60, ca. 915 m, 13 October 1964, *W.E.Niles 453* (holotype: ARIZ0004422!).

Notes: This variety is still only known from the type locality at the crossing of Highway 60 over the Salt River in the Superstition Mountains of Arizona. Future work via raft may uncover additional populations downstream.

5.18 **Laphamia gracilis** M.E.Jones, Proc. Calif. Acad. Sci. ser. 2, 5: 703–704, 1895. *Perityle gracilis* (M.E.Jones) Rydb., N. Amer. Fl. 34(1): 19, 1914. **TYPE:** U.S.A., Arizona, below Nagle's Ranch, edge of Buckskin Mtns., crevices of limestone rocks, 7000 ft, in very dry places. 15 September 1894. *M.E.Jones 6050c* (lectotype: POM[RSA0001350]! [designated by Powell 1974], isolectotype: US00124613!).

Laphamia fastigiata Brandegee, Bot. Gaz. 27: 450, 1899. *Monothrix fastigiata* (Brandegee) Rydb., N. Amer. Fl. 34(1): 21, 1914. *Perityle fastigiata* (Brandegee) Shinners, Southw. Naturalist 4: 204, 1959. **TYPE:** U.S.A. Nevada, Sheep Mtns., 4–5000 ft, May-October 1898, *C.A. Purpus 6142* (lectotype: UC90434! [designated by Powell 1974], isolectotypes: E00417410 [photo!], M0030096 [photo!], US00931225!, US00124609!).

Notes: *Laphamia gracilis* is a species complex that includes morphologically diverse populations of rock daisies found in sky islands across a huge area of Great Basin Desert from Clark County, Nevada in the east, to Great Basin National Park in the west, and the Kaibab Plateau of northern Arizona to the south. Although the type of *L. gracilis* was apparently collected in the Buckskin Mountains of Arizona by Marcus Jones, the type location has not been recollected, and the species had not been documented again in Arizona until recently, when a disjunct population was found in Diablo Canyon and posted to iNaturalist by J. Santore in 2019. At least three distinct morphological forms fall under *L. gracilis* and these are supported as distinct lineages in molecular analyses. The common apomorphy of three-lobed (more or less) or sub-cruciform leaves with an attenuate leaf base is present in all of these, but the leaves of plants found in eastern Nevada (e.g. in Condor Canyon) are broader and more glandular hairy than populations in western Nevada. These plants also differ in odor and phyllary shape. The more western populations that conform to the descriptions in the Intermountain Flora and Flora of North America may be assignable to the name *L. fastigiata,* which was described from a type specimen collected in the Sheep Mountains, Nevada. The obstacle in recognizing these as separate from *L. gracilis* is confusion surrounding Marcus Jones' type collection from the Buckskin Mountains in Arizona, which

resembles neither of the morphological forms mentioned above. Phylogenetic analyses support a close relationship between the population found in Diablo Canyon and the rock daisies that occur in the Superstition Mountains in Arizona, suggesting it may represent an undescribed taxon, pending further study.

5.19 Laphamia grandifolia (Brandegee) Everly, Contr. Dudley Herb. 3: 379, 1947. *Perityle grandifolia* Brandegee, Zoe 5: 224–225, 1905. *Leptopharynx grandifolia* (Brandegee) Rydb., N. Amer. Fl. 34: 23. 1914. **TYPE:** Mexico, Sinaloa, Cerro Colorado, vicinity of Culiacán, 5 November 1904, *T.S. Brandegee s.n.* (lectotype: UC90479! [designated by Powell 1973a], isolectotypes: GH00011118 [Photo!], US00124614!). Figure 27.

Notes: Following its description by T.S. Brandegee in 1904, *L. grandifolia* was "lost" and not documented again for 116 years. In 2020, as part of Fernando Pio Leon's floristic work in Sinaloa, this species was rediscovered near the type locality and photos were uploaded to iNaturalist, where they selected as the "observation of the day." Photos reveal that the plant grows on bare outcrops of volcanic bedrock surrounded by tropical deciduous forests. The heads are borne on long peduncles that are arranged in a paniculiform array, and the capitula appear to bend back towards the rock, "self-sowing" upon maturity. An additional population has been posted to iNaturalist by @mar_y_sierra_silvestre (obs. 264893492) in Palmarito de San Javier, Sinaloa that extends the known range by about 40 km.

5.20 Laphamia huecoensis (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 809, 2022. *Perityle huecoensis* A.M.Powell, Madroño 30: 219–221, fig., 1983. **TYPE:** U.S.A., Texas, El Paso Co., North Hueco Mts., Hueco Tanks area, Navar Ranch, ca. 31°54'N, 106°07'W, 24 September 1977, *McCarten & Van Devender 2508* (holotype: SRSC00001236!, isotypes: BRIT329199!, NY00231042 [photo!]).

Notes: Recent attempts to access the type location of *L. huecosensis* have so far been unsuccessful due to private land restrictions. A second population uncovered by R. Spellenberg in the Sierra Juarez in 1993 is the only other known location for this species. Phylogenetic data supports its close relationship to *L. cernua* in the neighboring, yet geochemically distinct, Organ Mountains, in New Mexico.



Figure 27. *Laphamia grandifolia* (Brandegee) Everly. **A.** Superior view of the radiate capitulum showing the yellow corollas. **B.** Lateral view of the capitulum revealing the linear, pilose phyllaries. **C.** A single individual found growing on a bare rocky outcrop with signs of calcareous caliche; this unique species has the largest leaves (5–7cm long) of any rock daisy. *Photos by @mar_y_sierra_silvestre (A), J. Fernando Pío León (B), and Efraín Payán Cázarez @licepayan (C) on iNaturalist.*

5.21 Laphamia intricata Brandegee, Bot. Gaz. 27: 450, 1899. *Monothrix intricata* (Brandegee) Rydb., N. Amer. Fl. 34(1): 20, 1914. *Laphamia megacephala* subsp. *intricata* (Brandegee) D.D.Keck, Aliso 4: 101, 1958. *Perityle intricata* (Brandegee) Shinners, Southw. Naturalist 4: 204, 1959. *Perityle megalocephala* var. *intricata* (Brandegee) A.M.Powell, Sida 5: 94, 1973. **TYPE:** U.S.A., Nevada, Sheep Mountain, on rocks, May–October, 1898. *C.A. Purpus 6134* (lectotype: [designated by Powell 1973a], UC90437!, isolectotypes: CAS00123292!, PH00016865 [photo!], US01101414!). Figure 27.

Notes: *Laphamia intricata* grows on bare outcrops of calcareous bedrock in desert sky islands in the Great Basin and Mojave deserts. Phylogenetic data support the recognition of *L. intricata* at species rank, rather than as a subspecific variety of *L. megalocephala,* as has been suggested in the past. It is the sister lineage to *L. gracilis* and distinguished by its heads arranged in tight corymbiform arrays.



Figure 28. *Laphamia intricata* Brandegee is a suffrutescent perennial rock daisy that roots into bare, rocky outcrops of limestone and cliffs in sky islands of the Great Basin desert. The discoid capitula are sparsely short-hairy, have yellow corollas, and are typically aggregated into loose corymbiform arrays. *Photo by Isaac Lichter-Marck.*



Figure 29. *Laphamia inyoensis* Ferris is a rock daisy endemic to the southern Inyo mountains in California, where it is threatened by the encroachment of resource extraction (gold mining). Superior view of discoid capitulum shows the yellow, four-lobed disc corollas with exserted style-branches. *Photo by Isaac Lichter-Marck.*

5.22 Laphamia inyoensis Ferris, Contr. Dudley Herb. 5(4): 104–106, f. 2, 1958. *Perityle inyoensis* (Ferris) A.M.Powell, Sida 3(4): 278, 1968. **TYPE:** U.S.A., California, Inyo Co., Cerro Gordo peak, 8200ft. 7 July 1942. *A. Alexander & L. Kellogg 3056a* (holotype: DS[CAS00123294]!, isotypes: CAS00123293!, GH00011078 [photo!], LL00374222 [photo!], NY00180468 [photo!], RSA0001351!, US00124622!). Figure 29.

Notes: In ten years, our knowledge of *L. inyoensis* has grown tremendously, in part because its narrow range is the center of controversy. It is the site of a proposed gold mining exploration project, the so-called Mojave Project by the Canadian gold corporation K2. In 2016 when the project was in its initial planning phases, *L. inyoensis* was known only from a couple of collections near the type locality on Cerro Gordo, in the southern Inyo Mountains. In 2018 and 2019, additional occurrences of *L. inyoensis* were documented further south and throughout the area proposed for mining. Most of these new occurrences were documented by Maria Jesus, Duncan Bell, Naomi Fraga and other botanists from California Botanical Garden as part of Jesus' masters thesis on the Conglomerate Mesa flora (Jesus, 2021). Katy Allerton and I also documented populations throughout Conglomerate Mesa and just north of Cerro Gordo as part of general collecting for phylogenetic studies of Perityleae. In addition to her excellent flora, Maria Jesus also completed

a detailed conservation plan for *L. inyoensis,* which formed the basis for her petition to list *L. inyoensis* as a state endangered species. After reviewing detailed ecological, evolutionary, and occurrence data, California CDFW approved this petition, effectively protecting the mesa from proposed mining activities until the project could undergo a detailed review and approval process, which is ongoing.

5.23 Laphamia lemmonii A.Gray, Proc. Amer. Acad. Arts 16: 101, 1880. *Leptopharynx lemmonii* (A.Gray) Rydb., N. Amer. Fl. 34(1): 24, 1914. *Perityle lemmonii* (A.Gray) J.F.Macbr., Contr. Gray Herb. 56: 39, 1918. **TYPE:** U.S.A., Arizona, Pima Co., near Camp Lowell, Tucson, 1880. *Lemmon s.n.* (lectotype: [designated by Powell 1973a] GH00011079 [photo!]; isolectotypes: MO100507844, NDG61179 [photo!]). Figure 29.

Laphamia lemmonii var. *pedata* A.Gray, Proc. Amer. Acad. Arts 16: 101, 1880. **TYPE:** U.S.A., Arizona, Pima Co., Santa Catalina Mountains, near Camp Lowell, Tucson, *Lemmon s.n.* (lectotype: [designated by Powell 1973a], GH00011079 [photo!]).

Notes: *Laphamia lemmonii* grows on bare rocky outcrops of various lithologies (substrate types). This taxon is a widespread complex found on isolated sky islands throughout southeast Arizona and southwest New Mexico. Morphological variation in leaf shape and vestiture appears to track geography and ecology in terms of elevation and rock substrate type. Limited phylogenetic data have thus far shown that the populations referred to as *L. lemmonii* do not form a monophyletic group, and a detailed morphometric and genetic study is underway.



Figure 30. *Laphamia lemmonii* A.Gray represents a rock daisy species complex that occurs on isolated sky island mountain ranges throughout southeastern Arizona and southern New Mexico, where it shows variability in leaf moprphology and ecology across its range. Molecular phylogenetic data suggests the complex does not form a monophyletic group, and therefore needs further attention. **A.** Habit and habitat on a granite cliff face in the Graham mountain range, Arizona. **B.** Habit and habitat on igneous rock outcrops in the Rincon mountain range. **C.** Lateral view of the discoid capitulum with yellow disc corollas. The phyllaries found in this population differ from the typically dense pubescence found in most populations of *L. lemmonii. Photo by Isaac Lichter-Marck.*

5.24 Laphamia lindheimeri A.Gray, Smithsonian Contr. Knowl. 3(5): 101, 1852. *Perityle lindheimeri* (A.Gray) Shinners, Southw. Naturalist 4: 205, 1959. **TYPE:** U.S.A., Texas, Comal Co., perpendicular rocks on the banks of the Guadalupe River, Comanche Spring, near New Braunfels, May 1850, *Lindheimer 937* (lectotype: GH00011084 [photo!] [designated by Powell 1973a], isolectotypes: BR0000005491209 [photo!], F0050513F [photo!], GH00011085 [photo!], MEXU01220318 [photo!], NY00180469 [photo!], NY00180470 [photo!], PH00016863 [photo!], PH00016864 [photo!], US00124626!).

Laphamia rotundata Rydb. N. Amer. Fl. 34: 25, 1914. *Perityle rotundata* (Rydb.) Shinners, Southw. Naturalist 4: 205, 1959. **TYPE:** U.S.A., Texas, San Esteban, 3 September 1852, *Bigelow s.n.* (holotype: NY00180472 [photo!]; isotypes: DS [photo!], GH, NY, UC!, US!).

5.24 A Laphamia lindheimeri A.Gray var. **halimifolia** (A.Gray) Lichter-Marck, Syst. Bot. 47(3): 809, 2022. *Laphamia halimifolia* A.Gray, Pl. Wright. 1: 100, 1852. *Perityle halimifolia* (A.Gray) Shinners, Southw. Naturalist 4: 205, 1959. *Perityle lindheimeri* var. *halimifolia* (A.Gray) A.M.Powell, Sida 3: 278, 1968. **TYPE:** U.S.A., Texas, Val Verde Co., crevices of rocks, on the summit of hills, near the San Pedro River, July 1849, *C. Wright 301* (lectotype: GH00263133 [photo!][designated by Powell 1973a], isolectotypes: BM000810787 [photo!], BM000810788 [photo!], CAS0012329!, GH00263134 [photo!], GH00263135 [photo!], GH00011081 [photo!], GH00011082 [photo!], GH00011083 [photo!], K001079919 [photo!], NY00180465 [photo!], PH00016866 [photo!], US00124617!, WIS0256922 [photo!]).

Notes: *Laphamia lindheimeri* grows on bare outcrops of calcareous rock in the Edwards Plateau and is one of the most extensively documented species of *Laphamia*, although no detailed studies of its ecology or population structure have yet been carried out. This species was the first described for *Laphamia* by A.Gray in 1852 and is therefore the type species for this genus.

5.25 Laphamia leptoglossa (Harv. & A.Gray ex A.Gray) Lichter-Marck, Syst. Bot. 47(3): 810, 2022. *Perityle leptoglossa* Harv. & A.Gray ex A.Gray, Mem. Amer. Acad. Arts ser. 2, 4(1): 77, 1849. *Leptopharynx leptoglossa* (Harv. & A.Gray ex A.Gray) Rydb., N. Amer. Fl. 34: 22, 1914. **TYPE:** Mexico, Sonora, vicinity of Hermosillo, 1829–1830, *Coulter 277* (lectotype: GH00011080 [photo!] [designated by Powell 1973a], isolectotypes: K001079928 [photo!], K000502187 [photo!], RSA0037659!, TCD0090360 [photo!], RSA0037660!, US00131458!). Figure 31.

Notes: *Laphamia leptoglossa* occurs on bare outcrops of volcanic substrates throughout the sky islands and lowlands of northern Sonora. Wide geographic range and morphological variability, especially in leaf shape and indument, raise the possibility that *L. leptoglossa* is a species complex. Phylogenetic data thus far support the monophyly of *L. leptoglossa* with respect to two closely related rock daisies, *L. sanchezii* and *L. reinana*. *Laphamia reinana* often occurs sympatrically with *L. leptoglossa* but tends to be associated with granitic outcrops and lacks ray florets. *Laphamia sanchezii* is a succulent (not woody) perennial and differs from *L. leptoglossa* and *L. reinana* in having broader leaves that are glandular hairy, not canescent. All three species self-sow.



Figure 31. *Laphamia leptoglossa* (Harv. & A.Gray ex A.Gray) Lichter-Marck is a relatively wide ranging rock daisy that grows as a suffrutescent perennial on rocky cliffs and outcrops through out northern Sonora, Mexico. The individual illustrated here was found on an urban hill within the city limits of Hermosillo (Sonora). The radiate heads have yellow corollas, and they bend back upon maturity to self-sow the cypselae in the cliff face. *Photo by Isaac Lichter-Marck.*

5.26 Laphamia lloydii (B.L.Rob. & Fernald) Lichter-Marck, Syst. Bot. 47(3): 810, 2022. *Perityle lloydii* B.L.Rob. & Fernald, Proc. Amer. Acad. Arts 30: 118, 1894. *Leptopharynx lloydii* (B.L.Rob. & Fernald) Rydb., N. Amer. Fl. 34: 22, 1914. **TYPE:** Mexico, Sonora, Badehuaci, 2 December 1890, *C.E. Lloyd 400* (lectotype: GH00011127 [photo!] [designated by Powell 1973a], isolectotypes: K000502186 [photo!], F0050937 [photo!], NY00231068 [photo!], PH00021284 [photo!], UC90480!, US00124629!, US00124630!).

Notes: *L. lloydii* occurs on bare outcrops of rock of an unknown substrate type in lowland tropical thornscrub in Sonora, Mexico. This species was "lost" for over a hundred years after its description, but was rediscovered by Ana Lilia Reina, Tom Vandevender, and M.J. Galaz during field work on a ranch property along Arroyo Bacadehuachi. The locality on the type "Badéhuachi" does not exist in Sonora and was likely a misspelling. Phylogenetic data supports the relationship of *L. lloydii* to other rock daisies found in Sonora, which are one of the least understood groups of rock daisies.



Figure 32. *Laphamia lobata* (Rydb.) Lichter-Marck is a common rock daisy on rocky substrates and decomposed soils at the base of cliffs in the Sierra de la Giganta of Baja California Sur, Mexico. The capitula are radiate and have yellow corollas, and the heads reflex upon maturity as seen here, presumably to self sow their cypselae back into the rock face. *Photo by Isaac Lichter-Marck.*

5.27 Laphamia lobata (Rydb.) Lichter-Marck, Syst. Bot. 47(3): 810, 2022. *Leptopharynx lobata* Rydb., N. Amer. Fl. 34: 23, 1914. *Perityle lobata* (Rydb.) I.M.Johnst., Proc. Calif. Acad. Sci. ser. 4, 12: 1205, 1924. **TYPE:** Mexico, Baja California, Commondu, 19 February 1889, *T.S. Brandegee* s.n. (holotype: GH00011128 [photo!], isotypes: UC90481!, US00124631!). Figure 32.

Notes: *Laphamia lobata* occurs on bare rocky outcrops of volcanic substrates and decomposed soils usually in open habitats in the tropical Cape Region and Sierra Giganta of Baja California Sur. It is the only *Laphamia* that occurs in Baja California, although *Perityle aurea*, which has not yet been included in phylogenetic analyses, may turn out to be a close relative. *Laphamia lobata* is closely related to *Laphamia* species found in Sonora and represents a case of recent dispersal over the Gulf of California. Like its Sonoran relatives, *L. lobata* self-sows its seeds in the rock by bending back of the peduncle upon maturity.

5.28 Laphamia megalocephala S.Watson, Amer. Naturalist 7: 301, 1873. *Monothrix megalocephala* (S.Watson) Rydb., N. Amer. Fl. 34(1): 20, 1914. *Perityle megalocephala* (S.Watson) J.F.Macbr., Contr. Gray Herb. 56: 39. 1918. **TYPE:** U.S.A., Nevada, 1872, *Wheeler s.n.* (lectotype: US00124634 [photo!] [designated by Powell 1973a], isolectotypes: GH00011129 [photo!], LE00017999 [photo!], PH00016862 [photo!], YU064510 [photo!]). Figure 33A-B.

5.28 A Laphamia megalocephala var. **oligophylla** (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 810, 2022. *Perityle megalocephala* var. *oligophylla* A.M.Powell. Sida 5: 91, 1973. **TYPE:** U.S.A., California, Inyo Co., Lost Burro Gap, Cottonwood Mtns., Death Valley Nat'l Monument., 17 September 1957, *R.S. Ferris & W.R. Ernst 13162* (holotype: DS[CAS0006614]!, isotypes: CAS0006615!, DAV32954 [photo!], RSA0001474 !, NY00231043 [photo!], TEX00374223 [photo!]). Figure 33C.

Notes: *Laphamia megalocephala* is one of the most widespread rock daisies in the Great Basin region, and phylogenetic data show it to be a non-monophyletic species complex; however, its reduced morphology and growth in a difficult to access landscape have so far limited the data available to accurately delimit taxa.

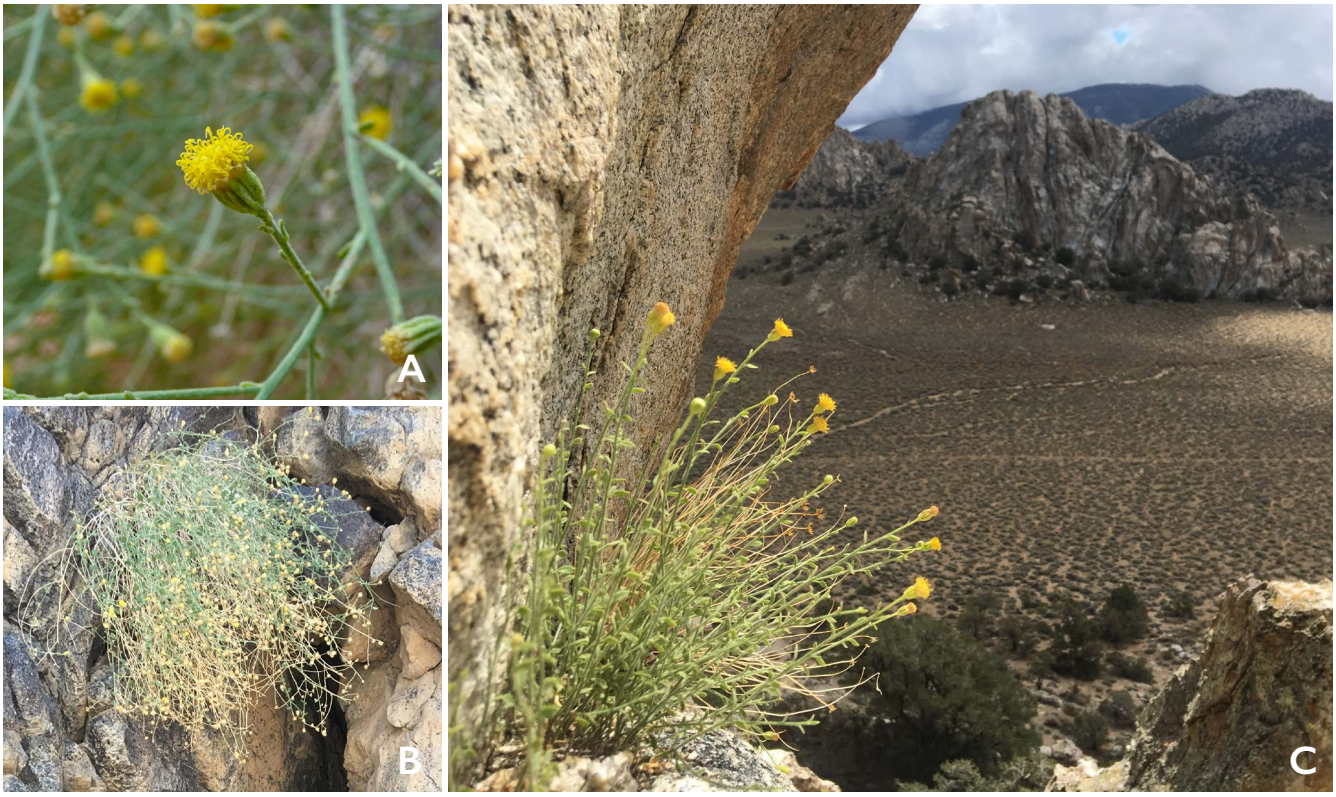


Figure 33. The two varieties of *Laphamia megalocephala* S.Watson grow as cliff dwelling perennials in sky island mountain ranges surrounded by Great basin Desert in western Nevada and eastern California. **A.** Lateral view of the discoid capitulum of *Laphamia megalocephala* var. *megalocephala* showing the yellow corollas with exserted style branches. **B.** *Laphamia megalocephala* var. *megalocephala* growing out of a cliff of limestone in the White mountains, California. **C.** *Laphamia megalocephala* var. *oligophylla* growing on granite outcroppings on Papoose flat, a secret destination for hardcore climbers in the Inyo mountains, California. *Photos by Isaac Lichter-Marck.*

Laphamia megalocephala var. *megalocephala* occurs in the White Mountains and in the foothills of desert mountains in western Nevada. *Laphamia megalocephala* var. *oligophylla* occurs in the Inyo Mountains and on isolated sky islands throughout the Death Valley region. Most populations occur on bare outcrops of rocks of various substrates; however, in parts of the White Mountains, individuals of *L. megalocephala* var. *megalocephala* have successfully established on talus slopes, where they tend to grow into some of the largest rock daisies (> 2 m) found anywhere. In the southern Inyo Mountains, near Talc city on the Darwin Plateau, are putatively hybrid populations that show intermediate morphology between *L. megalocephala* var. *oligophylla* and *L. inyoensis.*

5.29 Laphamia palmeri A.Gray, Proc. Amer. Acad. Arts 13: 372–373, 1878. *Monothrix palmeri* (A.Gray) Rydb., N. Amer. Fl. 34(1): 21, 1914. **TYPE:** U.S.A., Arizona, at Beaverdam, in crevice of rock canyons, 1877, *E. Palmer 199* (lectotype: GH00009570 [photo!] [designated by Powell 1973a], isolectotypes: AC00319466 [photo!], K001079915 [photo!], K001079916 [photo!], ISC0000126 [photo!], MO714497 [photo!], NY00180474 [photo!], NY00180475 [photo!], NY00180476 [photo!], NY00180477 [photo!], NY00180473 [photo!], NDG61181 [photo!], PH00016861 [photo!], RSA0001353!, US00124640!, US00124641!). Figure 34.

> *Laphamia palmeri* var. *tenella* M.E.Jones, Proc. Calif. Acad. Sci. ser. 2, 5: 703, 1895. *Perityle tenella* (M.E.Jones) J.F.Macbr., Contr. Gray Herb. n.s. 56: 39, 1918. **TYPE:** U.S.A., Utah, Springdale, in crevices of sandstone rocks, 4000 ft, 16 May 1894, *M.E.Jones 5249aa* (lectotype: POM [RSA0001353] [designated by Powell 1973a], isolectotype: US00124641!).

Notes: *Laphamia palmeri,* which includes what has recently been referred to as *Perityle tenella,* grows on bare outcrops of limestone and sandstone. At least some of the populations growing on sandstone are associated with calcareous deposits of caliche created by water filtering though the sandstone.

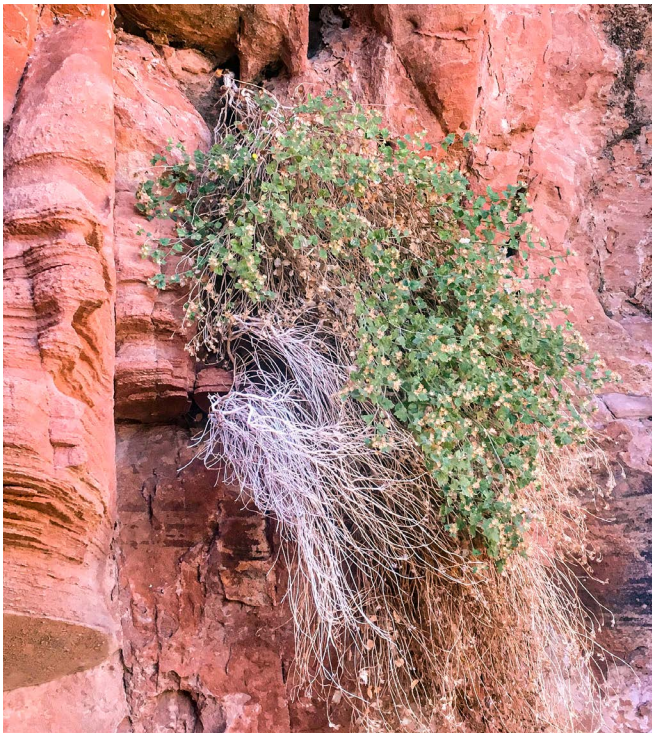


Figure 34. *Laphamia palmeri* A.Gray is a cliff dwelling species found in sandstone and limestone canyons of the colorado plateau in Utah and Nevada. Image shows individual growing out of a dry waterfall sculpted from Navajo sandstone on the eroded edge of an ancient reef. *Photo by Isaac Lichter-Marck.*

5.30 Laphamia parryi (A.Gray) Benth. & Hook.f. ex Hemsl., Biol. Cent-Amer., Bot. 2: 210, 1881. *Perityle parryi* A.Gray, Smithsonian Contr. Knowl. 2: 106, 1853. *Perityle parryi* A.Gray, Smithsonian Contr. Knowl. 2: 106, 1853. **TYPE:** U.S.A., Texas, Canyon of the Río Grande, August 1852, *C.C. Parry 521* (lectotype: POM [RSA0001353] [designated by Powell 1973a], isolectotype: US00124641!).

Leptopharynx trisecta Rydb. N. Amer. Fl. 34: 23. 1914. *Perityle trisecta* (Rydb.) J.F.Macbr., Contr. Gray Herb. 56: 39, 1918. **TYPE:** Mexico, Chihuahua, dry cliffs, rocky hills near Chihuahua, 20 March 1885, *C.G. Pringle 183* (holotype: NY00180532 [photo!], isotypes: BR0000005490516 [photo!], CAS0003162!, K000502188 [photo!], NY00180533 [photo!], WIS0256928 [photo!], US00124659!).

Notes: *Laphamia parryi* is one of the only rock daises that grows both in decomposed soils as well as consolidated, solid rock. Discoid populations are known to occur at the eastern edge of its range, and recent observations by C. Frasch also show that some small-rayed intermediates occur in the vicinity. Phylogenetic data supports *L. parryi* as closely related to *L. vaseyi* and *L. aglossa*. Populations in Chihuahua show elements of both *L. parryi* and *L. vaseyi,* and with more study might be worthy of recognition using as basionym the existing name *Leptopharynx trisecta* Rydb., which was based on a type specimen from Chihuahua.

5.31 Laphamia quinqueflora Steyerm., Ann. Missouri Bot. Gard. 19: 392–393, 1932. *Pappothrix quinqueflora* (Steyerm.) Everly, Contr. Dudley Herb. 3: 379, 1947. *Perityle quinqueflora* (Steyerm.) Shinners, Southw. Naturalist 4: 205, 1959. **TYPE:** U.S.A., New Mexico, Culberson Co., niches in exposed limestone cliffs, lower McKittrick Canyon, Guadalupe Mts., alt. 1900 m., 20 July 1931, *Moore & Steyermark 3547* (holotype: GH00061913 [photo!], isotypes: CAS00123295!, MICH1107496 [photo!], MIN1001583 [photo!], MO714305 photo!], NY00180471 [photo!], PH00016860 [photo!], US00931226!, US00124644!). Figure 35.



Figure 35. *Laphamia quinqueflora* Steyerm. is a narrowly endemic rock daisy that grows in solid rock faces of cliffs and canyons in the Guadalupe and Brokeoff mountains. The common name of this species, the five flowered rock daisy, refers to the capitula having only 5(8) florets; capitula are discoid and florets have yellow corollas. *Photo by Isaac Lichter-Marck.*

5.32 Laphamia reinana (B.L.Turner) Lichter-Marck, Syst. Bot. 47(3): 810, 2022. *Perityle reinana* B.L.Turner, Phytologia 88(1): 94–96, 2006. **TYPE:** Mexico, Sonora, Municipio de Ures, Cañada de Mazatán, oak woodland on granite, 1383 m, *T.R. Van Devender, Reina-G, Sanchez-E., Ferguson, Anderson & Johnson 2004-476* (holotype: TEX00208166 [photo!], isotypes: ARIZ0004464!, MEXU01240489 [photo!]).

Notes: *Laphamia reinana* is a discoid species of rock daisy that mostly grows on bare outcrops of granite. Until recently, *L. reinana* was known only from the Sierra Mazatan, a sky island outside of Hermosillo, Sonora. In 2019, a new population was uncovered during a Madrean Discovery expedition to the Sierra los Locos, about 100 km to the north. The new population was in a similar habitat as the type locality, mostly on granite boulders along a steep arroyo in mid-elevation, sky island oak forest. A couple of populations found lower on the Sierra los Locos were growing out of volcanic substrates and occurred in the same area as populations of *L. leptoglossa*. A third population of this rare species was uncovered in April of 2023, again during a Madrean Discovery expedition, in a deep narrow canyon just north of Huépari, Sonora. Overall, *L. reinana* and *L. leptoglossa* are very similar and the range of *L. leptoglossa* encompasses the isolated populations discovered thus far of *L. reinana.* This raises the question of whether *L. reinana* should be recognized as a species or merely as a variety or populational variant of *L. leptoglossa*. However, phylogenomic data sequenced from multiple populations of *L. leptoglossa* and *L. reinana* do not support lumping these taxa together: the disjunct populations of *L. reinana* were supported as more closely related to each other than to *L. leptoglossa* populations found in their immediate vicinity.

5.33 Laphamia rupestris A.Gray, Smithsonian Contr. Knowl. 3(5): 100, 1852. *Pappothrix rupestris* (A.Gray) Rydb., Fl. N. Amer. 34: 26, 1914. *Perityle rupestris* (A.Gray) Shinners, Southw. Naturalist 4: 205, 1959. **TYPE:** U.S.A., Texas, Jeff Davis Co., crevices of rocks, on mountains, in the pass of the Limpia, August 1849, *C. Wright 300* (lectotype: GH00011090 [photo!] [**here designated**], isolectotypes: BM000810786 [photo!], GH00011091 [photo!], GH00011092 [photo!], K001079912 [photo!], NY00180478 [photo!], PH00016859 [photo!], US00124648!, WIS0256923 [photo!]). Figure 36A-B.

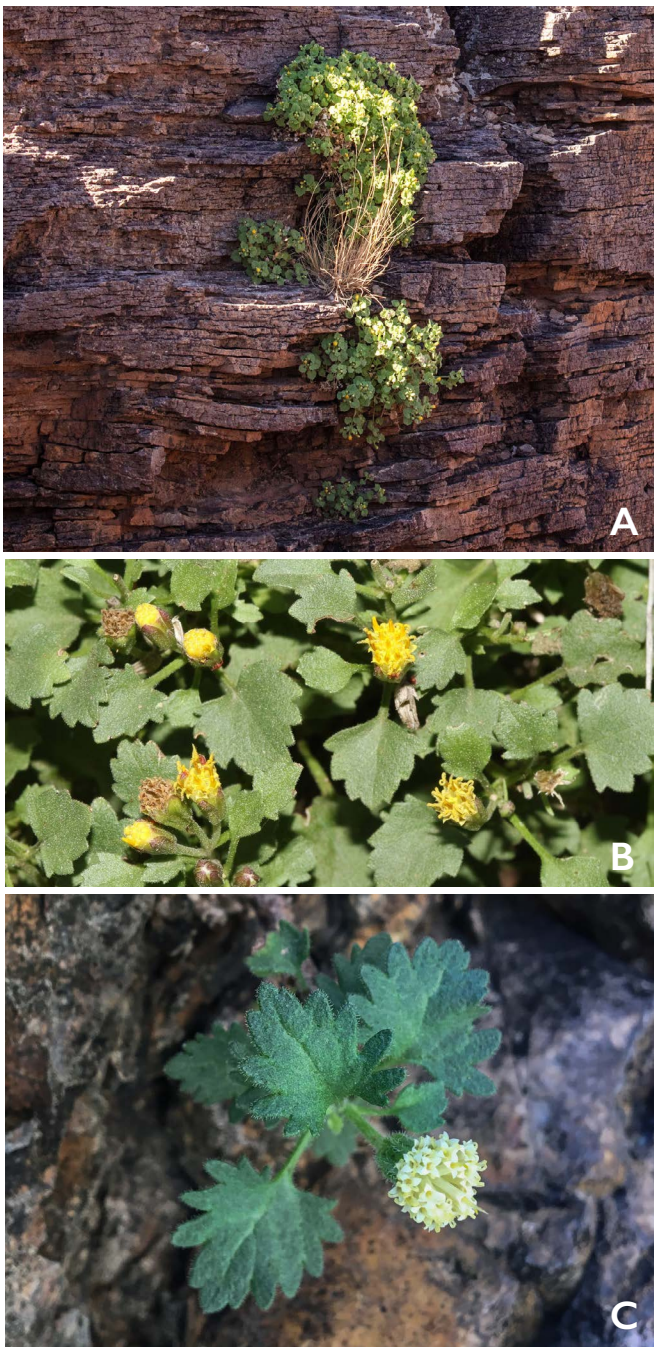


Figure 36. *Laphamia rupestris* A.Gray is a heterogeneous species complex with two varieties found on cliffs in sky islands of the chihuahuan desert in western Texas. **A.** *Laphamia rupestris* var. *rupestris* occurs on igneous and calcareous rock substrates and is a complex polyploid species. **B.** Habit of *L. rupestris* var. *rupestris; notice* discoid heads and florets with yellow corollas; leaves are entire, deltoid with serrate margins. **C.** *Laphamia rupestris* var. *albiflora* (A.M. Powell) Lichter-Marck shown here growing from a tiny crack in igneous rocks along the window trail in the Chisos mountains, Big Bend national Park. The superior view of the capitulum shows the white disc corollas. Molecular data do not support the monophyly of this species complex, thus further work is needed. *Photos by Steven Wang (A), James Bailey (B), and Isaac Lichter-Marck (C).*

5.33 A Laphamia rupestris var. **albiflora** (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 810, 2022. *Perityle rupestris* var. *albiflora* A.M.Powell, Sida 3: 180, 1967. **TYPE:** U.S.A., Texas, Brewster Co., in crevices of igneous bluffs, ca. 3 mi. W of Alpine in Tronto Pass, 3 June 1965, *A.M.Powell & S. Sikes 1320* (holotype: SRSC, isotypes: BRIT23897 [photo!], MO714535 [photo!], OS0000271 [photo!], TEX00374224 [photo!], US00124649!). Figure 36C.

Notes: Both varieties of *Laphamia rupestris* grow on bare outcrops of volcanic, limestone, and novaculite rocks in western Texas. These taxa show complex patterns of polyploidy, with documented tetraploids, hexaploids, and octoploids (Powell 1969). Phylogenetic data do not support the monophyly of *L. rupestris* with respect to the two recognized varieties, but molecular phylogenetic analyses can be misleading when whole genome duplications are present.



Figure 37. *Laphamia sanchezii* Lichter-Marck is an herbaceous perennial rock daisy with radiate heads that bend back at maturity to self sow. This is one of only a few species that grows both on solid rock faces and decomposed substrates. It occurs in an arid part of western Sonora, Mexico that borders the Gulf of California and overlaps with the territory of the Comcaac indigenous peoples, who have called the plant "*hee cotopl*", which translates to "*the one who clings.*" *Photo by Anna Laura Botello.*

5.34 Laphamia sanchezii Lichter-Marck, Syst. Bot. 47(3): 810, 2022. *Perityle palmeri* S.Watson, Proc. Amer. Acad. 24: 57, 1889. *Leptopharynx palmeri* (S.Watson) Rydb., N. Amer. Fl. 34: 23. 1914. **TYPE:** Mexico, Sonora, Guaymas, October 1887, *E. Palmer 308* (lectotype: GH00011135 [photo!] [designated by Powell 1974], isolectotypes: C10007750 [photo!], K000502287 [photo!], MEXU01220311 [photo!], NDG61172 [photo!], NY00231072 [photo!], PH00021285 [photo!], UC90483!, US00124639!, US00124638!, US00124637!, YU002285 [photo!]). Figure 37.

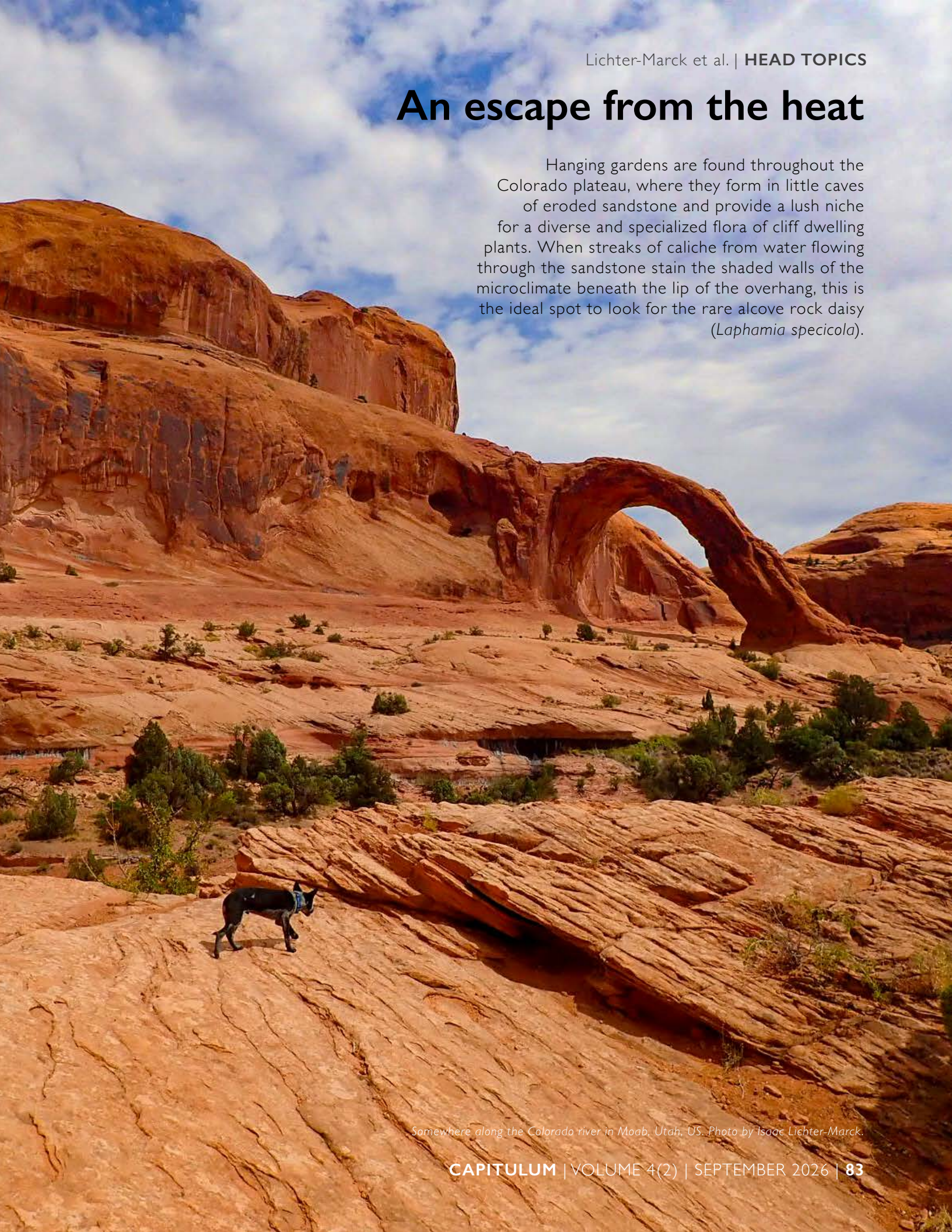
Notes: *Laphamia sanchezii* grows on bare rocky outcrops and decomposed talus of volcanic substrates in western Sonora and the Comca'aq (Seri) nation. *Laphamia sanchezii* is a new name that needed to be chosen when making a new combination for *Perityle palmeri* in *Laphamia*, because *Laphamia palmeri* A.Gray was already taken (see *Laphamia palmeri* above). Populations in west-central Sonora, near Desemboque, differ in leaf shape, which may be a plastic response to the drier more exposed habitats present there. According to Chloe Novak, one of the names for rock daisies in the Comca'aq language Cmiique iitom (pronounced Kween-keh ee-tom) is *Hee Cotopl*, which translates roughly to "the one who clings."

5.35 Laphamia saxicola Eastw., Proc. Calif. Acad. Sci. ser. 4, 20: 159–160, 1931. *Perityle saxicola* (Eastw.) Shinners, Southw. Naturalist 4: 205, 1959. **TYPE:** U.S.A., Arizona, Maricopa Co., near the Roosevelt Dam on the road to Fish Creek, Apache Trail, 22 May 1929, *A. Eastwood 17401* (holotype: CAS00123296!, isotypes: CAS00123297 US00124652 [photo!], GH00011093 US00124652 [photo!], K001079917 [photo!], LL00374190 NY00180481 US00124652 [photo!], RSA0001354!, US00124652 [photo!], WIS0256924 [photo!]).

5.36 Laphamia specicola (S.L.Welsh & Neese) Lichter-Marck, Syst. Bot. 47(3): 810, 2022. *Perityle specicola* S.L. Welsh & Neese, Great Basin Naturalist 43: 373, 1983. **TYPE:** U.S.A., Utah, T25S, R21E, S24, 2 mi. due NNE of Moab, Grandstaff Canyon, 1220 m, Navajo sandstone, hanging garden community. 6 October 1977, *S.L. Welsh 16365* (holotype: BRY0001333, isotypes: NY00231045 [photo!], SRSC00064232, WTS0015798). Figure 38.

An escape from the heat

Hanging gardens are found throughout the Colorado plateau, where they form in little caves of eroded sandstone and provide a lush niche for a diverse and specialized flora of cliff dwelling plants. When streaks of caliche from water flowing through the sandstone stain the shaded walls of the microclimate beneath the lip of the overhang, this is the ideal spot to look for the rare alcove rock daisy (*Laphamia specicola*).



Somewhere along the Colorado river in Moab, Utah, US. Photo by Isaac Lichter-Marck.



Figure 38. *Laphamia specicola* Welsh & Neese, the alcove or hanging-garden rock daisy, seen here on steep sandstone cliffs in Arches National Park in Moab, Utah, is a pendent subshrubby rock daisy with discoid heads and yellow disc corollas. This species occurs in communities known as hanging gardens, found throughout the Colorado plateau, that form in vertical or overhanging walls of eroded sandstone and provide a lush niche for a diverse and specialized flora of cliff dwelling plants. *Photo by Isaac Lichter-Marck.*

Notes: *Laphamia specicola* grows on bare vertical exposures along river-cut canyons, where it often forms parts of hanging gardens, in southeastern Utah and the Navajo nation. It was recently documented for the first time in Canyonland National Park by an observer on INaturalist (@Blazeclaw 217838875). According to Arnold Clifford, Dine botanist and curator of the Carrizo Mountain Herbarium, these alcove rock daisies have ceremonial importance for the practice of manipulating the wind.

5.37 **Laphamia stansburyi** A.Gray, Smithsonian Contr. Knowl. 3(art. 5): 101, 1852 [as "stansburii"]. *Monothrix stansburyana* Torr., In Stan. Utah Exped. 389, t. 390, 1852, **nom.illeg.** *Monothrix stansburyi* (A.Gray) Rydb. N. Amer. Fl. 34(1): 21, 1914. *Perityle stansburyi* (A.Gray) J.F. Macbr,, Contr. Gray Herb. 56: 39, 1918. **TYPE:** U.S.A., Utah, Tooele Co., crevices of limestone rocks, Stansbury's Island, 26 June 1850, *Stansbury s.n.* (lectotype: NY00180482 [photo!] [designated by Powell 1973a], isotype: GH00263142 [photo!]).

Notes: *Laphamia stansburyi* is a widespread rock daisy that grows on bare, rocky outcrops, mostly of limestone, throughout northwest Utah.

5.38 **Laphamia staurophylla** Barneby, Leafl. W. Bot. 8: 168, fig., 1957. *Perityle staurophylla* (Barneby) Shinners, Southw. Naturalist 4: 205. 1959. **TYPE:** U.S.A., New Mexico, Otero Co., limestone bluffs in La Luz Canyon below High Rolls, western slope of Sacramento Mts., 2 September 1956, *R.C. Barneby 12889* (holotype: CAS00123298!, isotypes: GH00011095 [photo!], K001079922 [photo!], NY00180483 [photo!], RSA0001356!, UNM00122 [photo!], US00124656!).

5.38 A **Laphamia staurophylla** Barneby var. **homoflora** (Todsen) Z. S. Rodgers & Spellenb. Novon 31(1): 155, 2023. *Perityle staurophylla* Barneby var. *homoflora* Todsen, Madroño 30: 116, 1983. **TYPE:** U.S.A., New Mexico, Sierra Co., San Andres Mtns., Rhodes canyon, 17 km of Rhodes canyon range center in S13 R03E T13S, locally common on limestone bluffs, 1650 m, 7 August 1971, *R. W. Spellenberg & T. K. Todsen 2637* (holotype: NY [currently lost], isotype: NMC036973 [photo!], SRSC).

Notes: *Laphamia staurophylla* is a fascinating rock daisy found on several of the north-south oriented mountain ranges in southern New Mexico, where its typical growth is directly out of consolidated limestone or rhyolite subtrates. The rare, discoid *L. staurophylla* var. *homoflora* is found within the closed portion of the White Sands Missile Range. Rodgers and Spellenberg (2023) put together a strong justification for its recognition and status as a rare plant. The holotype of *L. staurophylla* var. *homoflora* at NY is apparently lost, but an isotype is retained at NMSU. This taxon is ripe for a focused study of eco-geographic speciation as it occurs on a variety of isolated habitats and lithologies.

5.39 **Laphamia toumeyi** B.L.Rob. & Greenm., Amer. J. Sci. ser. 3, 50: 176, August 1895. *Monothrix toumeyi* (B.L.Rob. & Greenm.) Rydb., N. Amer. Fl. 34(1): 21, 1914. *Perityle toumeyi* (B.L.Rob. & Greenm.) J.F.Macbr., Contr. Gray Herb. 56: 39, 1918. **TYPE:** U.S.A., Arizona, in the Grand Canyon, 12 July 1892, *J.W. Toumey 645l* (lectotype: US00124657!, [designated by Powell 1973a], isolectotypes: DS [CAS00123299]!, GH00009569 [photo!])

Laphamia congesta M.E.Jones, Proc. Calif. Acad. Sci. ser. 2, 5: 703, November 1895. *Monothrix congesta* (M.E.Jones) Rydb., N. Amer. Fl. 34(1): 21, 1914. *Perityle congesta* (M.E.Jones)

Shinners, Southw. Naturalist 4: 204, 1959. **TYPE:** U.S.A., Arizona, in clefts of rocks in mesa below the Buckskin Mountains, 7000 ft, 21 September 1894, *M.E.Jones 6063* (lectotype: POM [RSA0001347] [photo!][designated by Powell 1973a], isolectotypes: BM000810789 [photo!], MO714505 [photo!], NY00180460 [photo!], RSA0001348 [photo!], RM0001206 [photo!], US00124599 [photo!])

Notes: *Laphamia toumeyi* is recognized here as the correct name for plants treated under *Perityle congesta* (M.E.Jones) Shinners, Southw. Naturalist and *Laphamia congesta* M.E.Jones. A typesetting error in Lichter-Marck and Baldwin (2022) put *Laphamia toumeyi* into heterotypic synonymy with *L. cochisensis*. instead of *L. congesta,* where it belongs. Both leaf characteristics (entire, ovate, and lacking lobes) and location ("Grand Canyon") of the type of *L. toumeyi* conform with *L. congesta* better than with *L. cochisensis,* which is an endemic taxon of the Chiricahua Mountain range in southeastern Arizona. In addition, a closer review of type material of *L. toumeyi* has called attention to the fact that original publication of the name was in the same year as Marcus Jones' *L. congesta* (1895), with *L. toumeyi* published in August and *L. congesta* published in November. *Laphamia toumeyi* is conspecific with *L. congesta* and is the older name, therefore it has priority and is reinstated here as the first validly published basionym for this taxon.

5.40 Laphamia vandevenderi (B.L.Turner) Lichter-Marck, Syst. Bot. 47(3): 810, 2022. *Perityle vandevenderi* B.L.Turner, Phytologia 66: 504, 1989. **TYPE:** Mexico, Sonora, Palm Canyon, 17 mi SE of Magdalena on road to Cucurpe, "Sierra Baviso," 6 September 1976, *N.F. McCarten 2315* (holotype: ARIZ0004465 [photo!], isotypes: ARIZ0004466 [photo!], TEX00374227 [photo!]). Figure 39.

Notes: Until recently, this rare rock daisy was known only from the type location in Magdalena Palm Canyon in the Sierra Baviso of Sonora, Mexico, where it has not been revisited in nearly 50 years. While clearly a *Laphamia*, *L. vandevenderi* stands out from the rest of the genus with its densely lanate foliage. Individual plants grow in minute cracks and crevices of solid rock and eventually develop a conspicuous gnarled, woody base that makes them appear ancient.In 2018, an additional occurrence of *L. vandevenderi* was discovered by Sky Jacobs during a Madrean Discovery expedition,



Figure 39. *Laphamia vandevenderi* (B.L.Turner) Lichter-Marck is a unique rock daisy whose leaves, stems and involucre are densely covered in tomentose trichomes. This species is rare, and until recently was known only from the type location in Magdalena palm canyon in northern Sonora. In recent years photographs, and new collections documenting a much broader range have greatly increased the natural history information available about this mysterious rock daisy species. *Photo by Joey Santore.*

on a cliff face in the neighboring Sierra Cucurpe. Molecular data sequenced from leaf material collected from this population showed that *L. vandevenderi* is nested within the core radiation of arid-adapted *Laphamia* and supports a provocative biogeographic link to the desert sky islands of the southwest U.S. as *L. vandevenderi* is more closely related to rock daisies found in the sky islands of southeastern Arizona and southern New Mexico, than it is to rock daisies found in nearby sky islands in Sonora, Mexico. In 2019, ILM revisited the type locality and found only a small population of approximately 10 bedraggled plants persisting on rhyolite rock outcrops about ¼ mile upstream a side arroyo that intersects the mouth of the Magdelena Palm Canyon. During a recent Madrean Discovery Expedition (MDE) in September 2023, the largest population of *L. vandevenderi* yet, consisting of approximately 100 individuals, was discovered in the Sierra Alacran, just south of the city of Cananea. As in the previous cases, plants at this site were found exclusively growing on cliffs and outcrops of extrusive igneous rock and were attached to solid, consolidated cliff faces by virtue of a hefty, wooden root base, sometimes forming a "trunk" and giving them the appearance of miniature old growth rock daisy trees. This new discovery extends the range of this species northward by over 100 km. More populations of *L. vandevenderi* might occur in the

heterogeneous landscape between these two localities, especially on rocky mountain slopes or canyons that have exposed igneous bedrock.

5.41 Laphamia vaseyi (J.M.Coult.) Lichter-Marck, Syst. Bot. 47(3): 811, 2022. *Perityle vaseyi* J.M.Coult., Contr. U.S. Natl. Herb. 1: 42, 1890. **TYPE:** U.S.A., Texas, Brewster Co., Chisos Mts. 1889, *G.C. Nealley 245* (lectotype: US00124661 [photo!] [designated by Powell 1973a]).

Notes: *Laphamia vaseyi* is an herbaceous perennial rock daisy that occurs on decomposed calcareous soils and talus in western Texas, where it is sympatric with two similar and closely related rock daisies, *L. parryi* and *L. aglossa*. Abundant variation in leaf morphology is present in the populations recognized as *L. vaseyi*. In Chihuahua there are populations that appear to show overlapping variation with *L. vaseyi* and *L. parryi* yet are mostly suffrutescent perennials, and these may need to be recognized with a new combination using an older name proposed by Rydberg, *Leptopharynx trisecta*. See notes under *L. parryi* for more details.

5.42 Laphamia villosa S.F.Blake, Proc. Soc. Biol. Washington 45: 142, 1932. *Perityle villosa* (S.F.Blake) Shinners. Southw. Naturalist 4: 205, 1959. **TYPE:** U.S.A., California, Inyo Co., Middle Fork Hanaupah Canyon, Panamint Mtns., 2090 m, 22 September 1931. *F.V. Coville & A.F. Gilman 108* (lectotype: US00124662 [photo!] [designated by Powell 1973a], isolectotype: US00931227 [photo!]). Figure 40.

Notes: *Laphamia villosa* is a mysterious and understudied rock daisy found on vertical limestone cliffs in the Panamint Range in Death Valley National Park, mostly within the jagged contours of Hanaupah Canyon, which descends roughly 3350 vertical meters from Telescope Peak to Badwater Basin in less than 8 km. *Laphamia villosa* is also apparently found in the Grapevine Mountains in Nevada, across the expansive Death Valley, but is only known from one collection on Mt. Palmer (*Kurzius 1588*) collected in 1980. Collections of this species made by Mary Dedecker in the Cottonwood Mountains about 80 km to the north have been alternatively determined as *L. inyoensis* and, in fact, constitute an unrecognized new species of rock daisy in the process of being described. These populations are on Tin Mountain, a calcareous caprock sky island that is only accessible by a near-vertical hiking route that climbs ~2600 meters from low desert to the summit. The original collections by Dedecker were made via helicopter.



Figure 40. *Laphamia villosa* S.F.Blake is a rare species of rock daisy endemic to the Panamint mountains and neighboring sky islands in Death Valley National Park in California, where it is a cliff dwelling subshrub found on limestone slopes of steep canyons. The foliage of the individual shown here is covered in glandular trichomes and the discoid heads are borne singly, with yellow disc corollas that fade to red. *Photo by Isaac Lichter-Marck.*

5.43 Laphamia vitreomontana (Warnock) Lichter-Marck, Syst. Bot. 47(3): 811, 2022. *Perityle vitreomontana* Warnock, Southw. Naturalist 12(4): 475–476, 1967. **TYPE:** U.S.A., Texas, Brewster Co., limestone bluffs, W slopes of Old Blue, Glass Mtns., ca. 4500 ft., 22 September 1963, *B.H. Warnock & A.M.Powell 19111* (holotype: SRSC00001239 [photo!], isotypes: BRIT23898 [photo!], GH00011096 [photo!], NY00231046 [photo!], TEX00374229 [photo!]).

Notes: *Laphamia vitreomontana* has not been recently collected or photographed and is still known only from the type locality in the Glass Mountains in Trans-Pecos Texas, where it apparently grows abundantly on limestone cliffs. Phylogenetic results support Powell's hypothesis that *L. vitreomontana* is closely related to *L. rupestris* var. *albiflora*. Despite

resemblance in leaf morphology to *L. bisetosa, L. vitreomontana* possesses abundant pappus elements, which is a trait seen in *L. rupestris* var. *alibflora* and a few other rock daisies from Trans-Pecos Texas and southern New Mexico.

5.44 Laphamia warnockii (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 811, 2022. *Perityle warnockii* A.M.Powell, Sida 3: 177, 1966. **TYPE:** U.S.A., Texas, Val Verde Co., NW part of county, in crevices and small pockets of solid Cretaceous limestone exposures, ca. 40–50 mi. NE of Dryden, ca. 1 mi E of Pecos River, 11 October 1964, *A.M.Powell 1311* (holotype: SRSC00001241 [photo!], isotypes: NY00231047 [photo!], SRSC00001240 [photo!], TEX00374230 [photo!]).

Notes: *Laphamia warnockii* has only been collected a handful of times since its original discovery and description by A.M Powell in the 1960s and no photographs of this species are available. It is a small rock daisy, reaching a maximum of 6 cm, and a suffrutescent perennial that grows on Cretaceous caprock (limestone) in the Edwards Plateau of Trans-Pecos Texas. *Laphamia warnockii* was collected in 1995 by Burford L. Westlund ("Cactus Bur") in Val Verde Co. on Rancho de los tres Ninos, and again in 1999 by Grady Webster and Westlund, in the same location.

6 Nesothamnus (A.Gray) Rydb. N. Amer. Fl. 34(1):12 (1914). **TYPE: Nesothamnus incanus** (A.Gray) Rydb. Figure 41 & Figure 42; see map on page 88.

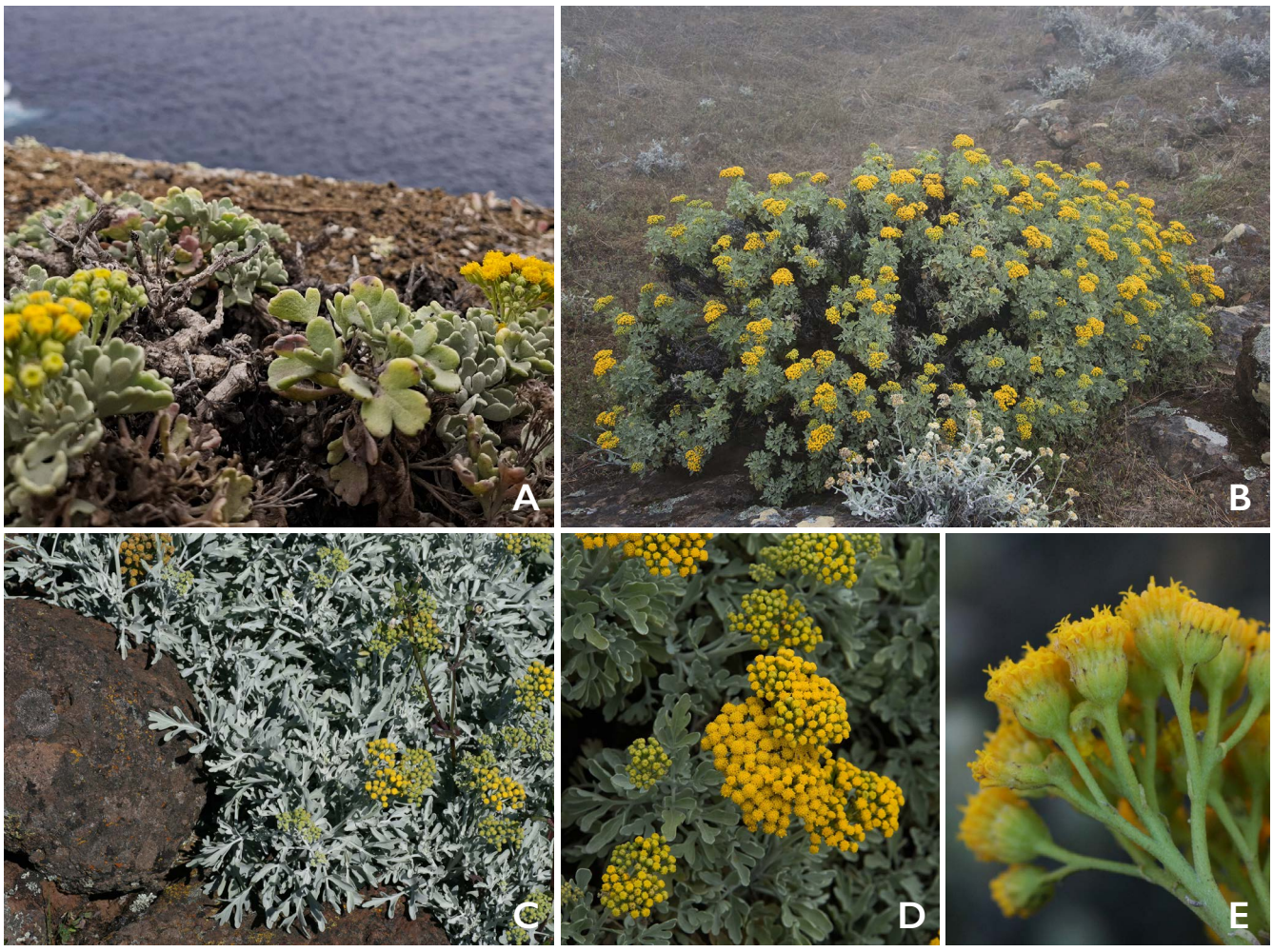
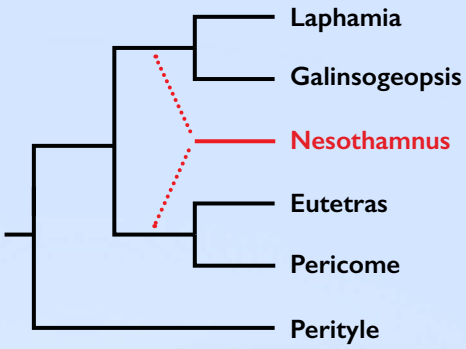


Figure 41. *Nesothamnus incanus* (A.Gray) Rydb., Guadelupe island endemic shrub. **A-B.** Habit: sprawling individual, robust and woody with a convoluted multi stemmed trunk. **C.** This unique rock daisy has large, highly dissected leaves that are covered in a densely matted layer of canescent trichomes. **D.** Superior view of dense corymbiform capitulescence. **E.** Lateral view of the discoid capitula. *Photos by Norma Castillo (A) and Jon Rebman (B-E).*

Nesothamnus: island evolution in action:

Nesothamnus incanus, the rock daisy endemic to Guadalupe Island—250 km off Baja California and ringed by great white sharks—is an anomaly within tribe Perityleae, morphologically closer to island Compositae from other tribes than to its mainland relatives. The puzzle may lie in its genome: hexaploid, triple the typical diploid chromosome count, apparently formed through allopolyploid fusion of distantly related lineages that met via independent long-distance dispersal to the island. Current research targets the timing of this fusion to explain the plant's rapid adaptation to island conditions.







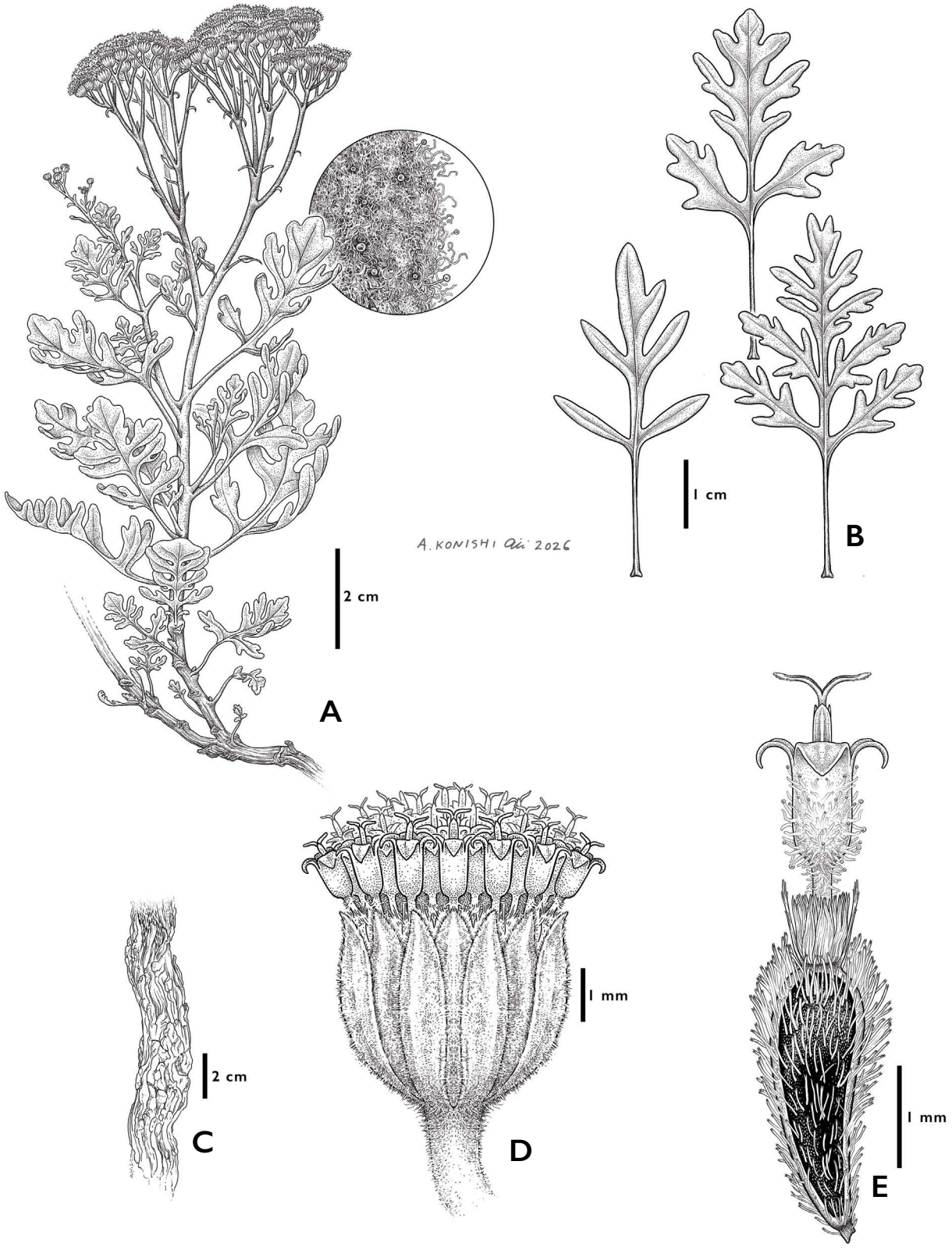


Figure 42. *Nesothamnus incanus* (A.Gray) Rydb. **A.** Habit, with indumentum in detail. **B.** Leaf. **C.** Detail of woody branch. **D.** Capitulum. **E.** Floret. Illustrations by Amanda Konishi from specimens in the CAS herbarium (A: CAS 382510, B: CAS 38212, C: CAS 382512, D: CAS 382505, and E: CAS 382506).

6.1 **Nesothamnus incanus** (A.Gray) Rydb., N. Amer. Fl. *Perityle incana* A.Gray, Proc. Amer. Acad. Arts 11: 78, 1876. **TYPE:** Mexico, Baja California, Guadalupe Island, *E. Palmer 43* (lectotype: GH00011124 [photo!] [designated by Powell 1974], isolectotypes: CM2489 [photo!], F13929 [photo!], K000502198 [photo!], MO5116267 [photo!], NY00231060 [photo!], NY,00231059 [photo!] PH0021281 [photo!], US00124619 [photo!], YU002283 [photo!]).

Notes: The genus *Nesothamnus* Rydb. was reinstated in 2022 following phylogenetic results supporting the island-endemic species *N. incanus* as an outlier in the higher-level classification of the rock daises. *Nesothamnus incanus* is one of the most morphologically distinctive rock daisies, with densely silver-tomentose foliage, shrubby habit, and heads clustered into a dense capitulescence. It is entirely endemic to Guadalupe Island, a volcanic island 240 km off the coast of Baja California. *Nesothamnus incanus* is of allopolyploid hybrid origin and may represent a paleopolyploid that was once more widespread before going extinct on the mainland and persisting on the island, or an insular neoendemic that was produced when distantly related rock daisies met and hybridized following transoceanic dispersal to Guadalupe Island. Genetic data and new bioinformatic approaches for teasing apart the evolutionary histories of hybrids are a promising avenue for weighing the evidence for these two scenarios.

7 **Pericome** A.Gray, Smithsonian Contr. Knowl. 5(6): 82. 1853. **TYPE: Pericome caudata** A.Gray. Figure 43-45.

7.1 **Pericome caudata** A.Gray, Smithsonian Contr. Knowl. 5(6): 82, 1853. **TYPE:** U.S.A., New Mexico, Among rocks, mountainsides, at the copper mines, Santa Rita del Cobre, October 1851, *C. Wright 1195* (lectotype: GH00263234 [photo!] [designated by Powell 1973c], isolectotypes: GH00011062 [photo!], NY00231035 [photo!], PH00021259 [photo!], US00124664!). Figure 43.

Pericome glandulosa Goodman, Rhodora 39: 209 (t. 459, fig. 1), 1937. *Pericome caudata* var. *glandulosa* (Goodman) H.D.Harr., Man. Pl. Colorado 589, 641, 1954. **TYPE:** U.S.A., Oklahoma, Cimarron Co., 3 miles E of Kenton, 27 August 1934, *G.J. Goodman 2291* (holotype: GH00011064 [photo!], isotypes: CAS0006617 [photo!], ISC-v-0000141 [photo!], MO1118435 [photo!], RM0001303 [photo!], US00124665 [photo!]).



Figure 43. *Pericome caudata* A.Gray is a widespread species found in scattered sky island environments in the southwest U.S. and extreme northern Mexico. **A.** Habit: multistemmed shrub that thrives on talus slopes and along riparian corridors. **B.** Lateral view of the discoid capitulum showing the yellow corollas, which appear to spill out of the involucre. **C.** Involucre with single series of coalescent (laterally fused) phyllaries. **D.** Detail of androecium, notice four anthers and conspicuous connectival appendix. *Photos by Isaac Lichter-Marck.*



Figure 44. This herbarium specimen of *Pericome macrocephala* B.L. Rob. collected by Molly Harker in an urban habitat island in Guadalajara represents the first known collection (and first photographs) of this rare species since its original collection by Edward Palmer in 1906. The plant is a shrub that resembles the more common sister species *P. caudata,* but heads are larger, ovoid-shaped, fruits have broad winged margins, and the foliage is covered in a dense mate of silvery trichomes.

In search of lost rock daisies

Two days earlier Pablo Carrillo Reyes and I were in the IBUG herbarium staring at one of the only specimens of Pericome macrocephala *ever collected. It was Molly Harker, a local legend, who had found it ten years earlier on an urban hillside on the outskirts of Guadalajara. Spontaneously, a group of graduate student including myself assembled to visit the Cerro del Colli and hopefully find the first individual of this plant that had not been seen in over 100 years. Our trek took us through a lush forest of oaks, figs, plumerias, and ceiba trees where we found orchids,* Pinguicula, *and* Verbesina sphaerocephala. *When we arrived at Molly Harker's point, we found only houses and disturbed vegetation. To this day the lost* Pericome macrocephala *remains to be found.*

Isaac Lichter-Marck,October 2019

Cerro del Colli, Guadalajara, Jalisco, Mexico. Photo by Isaac Lichter-Marck

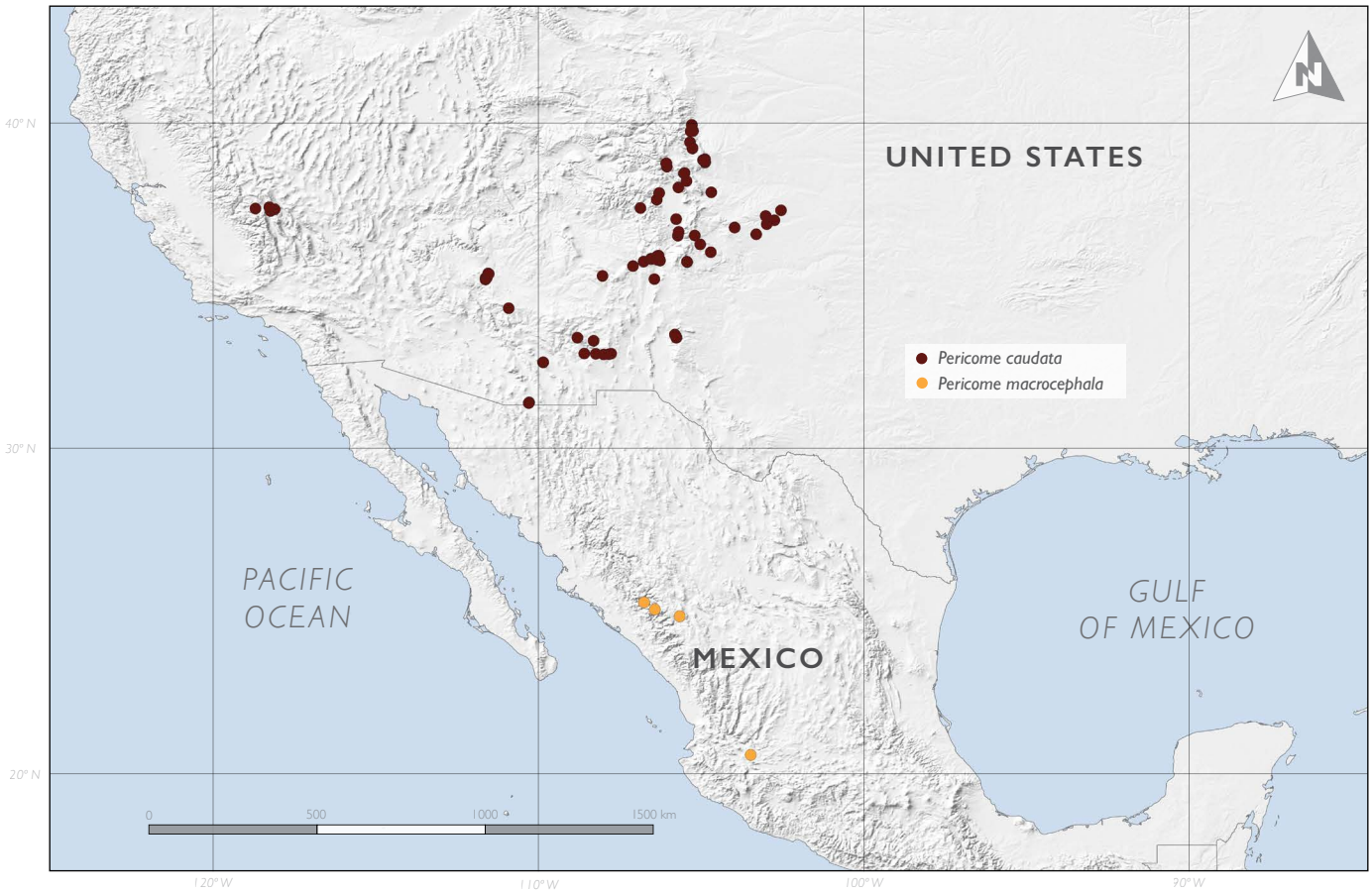


Figure 45. Geographic distribution map of *Pericome* occurrences based on digitized herbarium records. Both species show a disjunction in their distribution, although this may be due to how infrequently the species is collected. The collection of *Pericome macrocephala* by Molly Harker extends the range of this species south by over 600 km, but it is likely that populations occur within that gap that have yet to be documented.

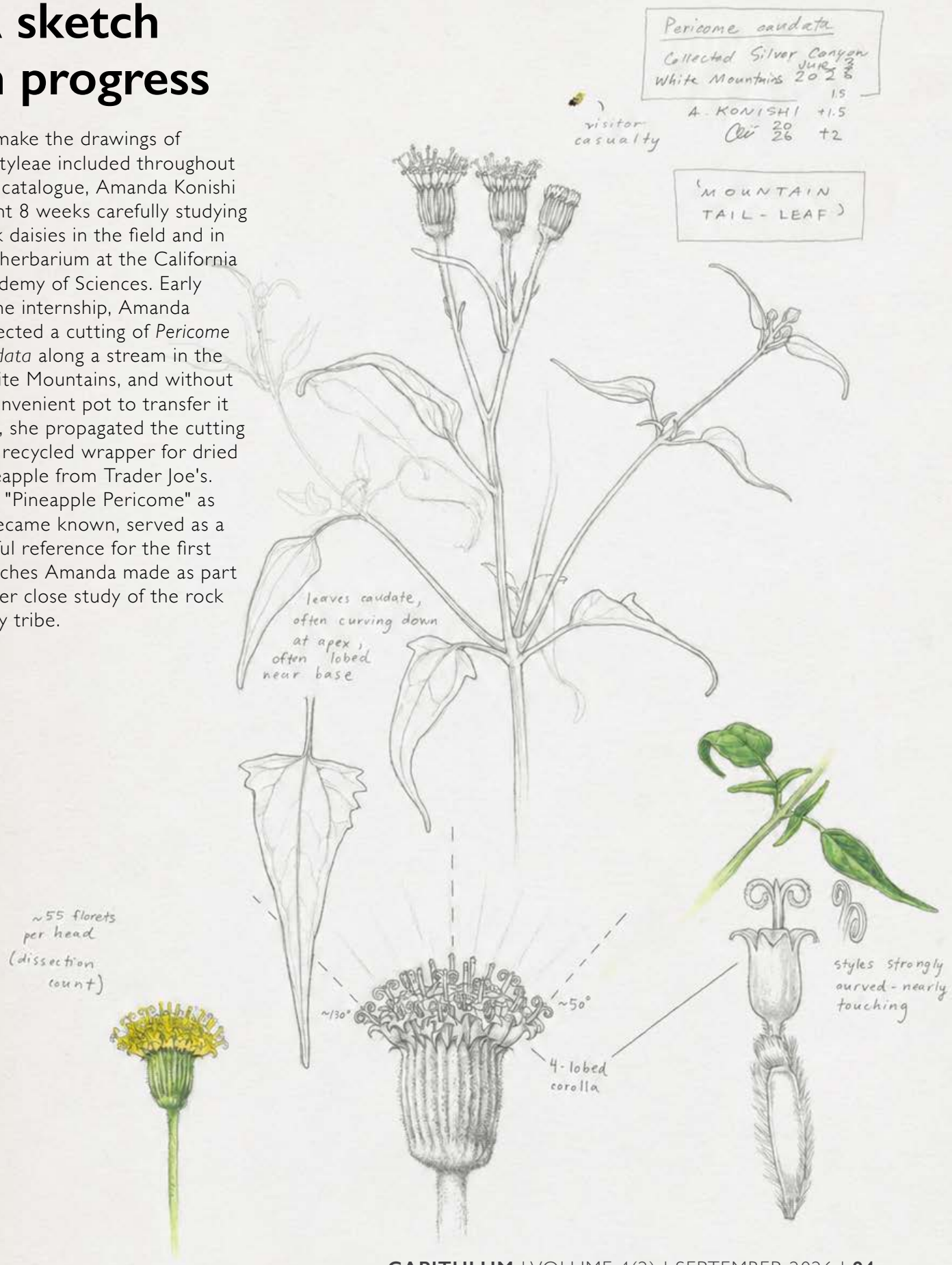
Notes: *Pericome caudata* is a widespread shrub found in mid-elevation, mesic micro-habitats across western North America (Powell, 1973c). Specimens of *P. caudata* collected by Ana-Lilia Reina *et al.* around Yécora (e.g., *Reina 2000-782*) are indistinguishable from *P. caudata* specimens collected in the far eastern or western parts of the species range, and convincingly extend the range of this species to the Sierra Madre Occidental, where it may be sympatric, or come close to, *Pericome macrocephala*.

7.2 **Pericome macrocephala** B.L.Rob., Proc. Amer. Acad. Arts 43: 42, 1907. **TYPE:** Mexico, Durango, near San Ramon, 21 April – 18 May 1906, *E. Palmer 69* (lectotype: GH00011065 [photo!] [designated by Powell 1973c], isolectotypes: CM2487 [photo!], F212870 [photo!], K000502331 [photo!], NY00231036 [photo!], UC148553 [photo!], US00124666!).

Notes: After Palmer's type collection in 1906, *P. macrocephala* was not documented again for over 100 years. In 2009, Molly Harker rediscovered and collected (*Harker 3959*) this 2 m tall, locally abundant shrub on the Cerro del Colli, a small hill on the outskirts of Guadalajara, in Jalisco. The rediscovery of *P. macrocephala* by Harker extends the range of this species tremendously, by over 500 km and provides convincing evidence of its distinctiveness from *P. caudata*. In 2019, I visited the Cerro del Colli with Dr. Juvenal Aragon-Parada, but unfortunately we did not locate *P. macrocephala* in the cerro, and instead found the specific location mentioned by Harker "adelante la colonia 'Colinas de la Primavera'" developed into an urban housing development.

A sketch in progress

To make the drawings of Perityleae included throughout this catalogue, Amanda Konishi spent 8 weeks carefully studying rock daisies in the field and in the herbarium at the California Academy of Sciences. Early in the internship, Amanda collected a cutting of *Pericome caudata* along a stream in the White Mountains, and without a convenient pot to transfer it into, she propagated the cutting in a recycled wrapper for dried pineapple from Trader Joe's. The "Pineapple Pericome" as it became known, served as a useful reference for the first sketches Amanda made as part of her close study of the rock daisy tribe.



8 **Perityle** Benth. Bot. Voy. Sulphur [Bentham] 23, 1844. **TYPE: Perityle californica** Benth. Figure 46-47; see map on page 96.

Amauria Benth. Bot. Voy. Sulphur [Bentham], 31, 1844. **TYPE:** *Amauria rotundifolia* Benth.

Closia J.Rémy. Fl. Chil. [Gay] 4(1): 119, t. 46, f. 2, 1849. **TYPE:** *Closia cotula* J.Rémy.

Lycapsus Phil. Phil., Bot. Zeitung (Berlin) 28: 499, t. 8, 1870. **TYPE:** *Lycapsus tenuifolius* Phil.

8.1 **Perityle aurea** Rose, Contr. U.S. Natl. Herb. 1: 84. 1890. **TYPE:** Mexico, Baja California, Santa Rosalia, 24 February – 3 March 1889, *E. Palmer 185a* (lectotype: US00124592! [designated by Powell 1974], isolectotypes: CAS0003920!, K000502199[photo!], GH00011097[photo!], NY00231050 [photo!], UC90499!).

Notes: *Perityle aurea* is a rare, annual rock daisy endemic to gypsum substrates on the Baja California Peninsula. This species remains an evolutionary outlier within the rock daisy tribe that has been retained provisionally in the genus *Perityle* pending detailed study. Meiotic chromosome numbers reported by Powell for this species (*n*=17) as well as morphological traits such as yellow ray florets and heads bending back at maturity are similar to traits of *Laphamia,* including the sympatric *L. lobata.* On the other hand, *P. aurea* has an annual life history and fruits with pappus squammellae (scales) and a single pappus awn that terminates in a retrorse barb that matches the "grappling hook" also found in nearby *Perityle,* such as *P. robusta.* As noted by Powell (1974), there are two distinct growth forms of this species, one more succulent, robust, and glabrous, the other ephemeral, lower-statured, and puberulent. There is a possibility that *P. aurea* represents a homoploid hybrid species formed in situ on the Baja California Peninsula persisting in part due to a hybrid advantage associated with the extreme rock substrate of gypsum.

8.2 **Perityle brandegeeana** Rose, Bot. Gaz. 15: 114, pl. 13, 1890. *Amauria brandegeeana* (Rose) Rydb., N. Amer. Fl. 34(1): 30, 1914. **TYPE:** Mexico, Baja California, Lagoon Head, 6-15 March 1889, *E. Palmer 800* (lectotype: US00124594! [designated by Powell 1974], isolectotypes: BKL00000174 [photo!], CAS0003922!, GH00011099 [photo!], NY00231051 [photo!]).

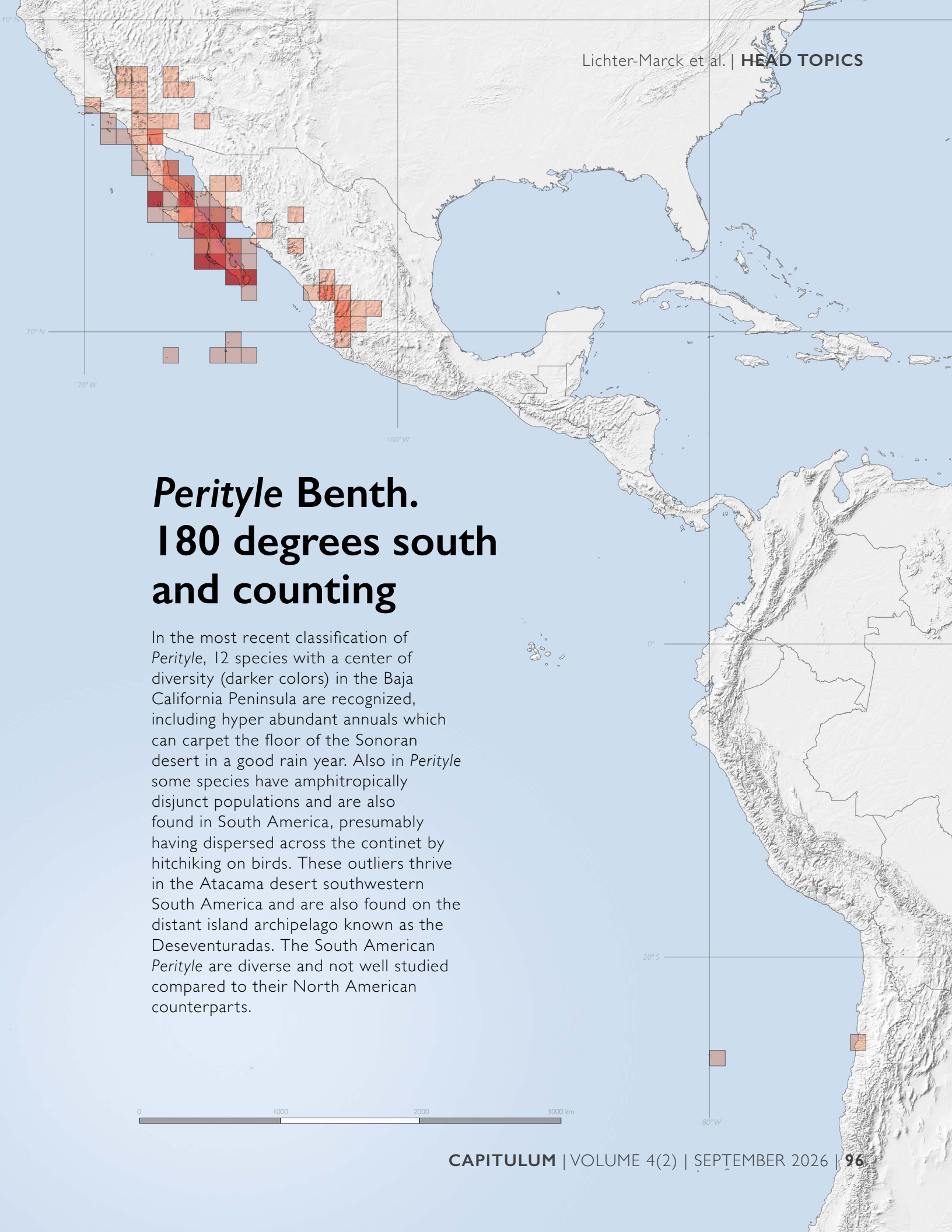
Notes: In a good year on the Baja California Peninsula, *Perityle brandegeeana* is one of the most abundant annuals in low deserts from the Magdalena Plateau to the Vizcaino Peninsula. In poor rain years, however, it is scant and difficult to find. The combination of white rays and yellow disks, pungent glandular foliage, and herbaceous life history is typical of many of the *Perityle* on the peninsula. Until recently, *P. brandegeeana, P. carterae,* and *P. rotundifolia* were recognized in a different genus *Amauria,* endemic to the Baja California Peninsula, which had been a subject of fierce contention among rock daisy taxonomists for nearly a century. Townshend Brandegee was the first to submerge *Amauria* into *Perityle*, writing "the long doubtful genus *Amauria* disappears from our flora at last!" The genus was reinstated by Rydberg and has stood the test of time until now by virtue of the unique fruit characters that set these three species apart from other *Perityle*. The fruit is tetramerous with two wide sides and two narrow sides, giving it a rectangular shape in cross section. In *P. brandegeeana* the faces of the fruit are adorned with short, stubby cylindrical glands, which are found in no other *Perityle.*

8.3 **Perityle californica** Benth., Bot. Voy. Sulphur [Bentham] 23, t. 15, 1844. **TYPE:** Mexico, Baja California Sur, Magdalena Bay, 1837, *R.B. Hinds s.n.* (lectotype: K000502285 [photo!] [designated by Powell 1974]).

Perityle plumigera Harv. & A.Gray ex A.Gray, Mem. Amer. Acad. Arts ser 2, 4(1): 77, 1849. **TYPE:** Mexico, Sonora, California, *T. Coulter 279* (lectotype: GH [designated by Powell 1974], isolectotypes: TCD0090361 [photo!], UC, US00124643).

Perityle deltoidea S.Watson, Proc. Amer. Acad., 24: 57, 1889. **TYPE:** Mexico, Baja California, Los Angeles Bay, 1887, *E. Palmer 568* (lectotype: GH00257541 [photo!] [designated by Powell 1974], isolectotypes: C10007749[photo!], NDG61159[photo!], NY00124605 [photo!], PH00021278[photo!], UC90503!, US00124605!, YU002282[photo!]).

Notes: *Perityle californica* is the type species for the genus *Perityle* and is a ubiquitous annual in low desert environments in a good rain year in Baja California Sur and Sonora, Mexico, where it grows on decomposed soils, talus, and occasionally consolidated rocky outcrops. Phylogenetic data supports the monophyly



Perityle Benth. 180 degrees south and counting

In the most recent classification of *Perityle*, 12 species with a center of diversity (darker colors) in the Baja California Peninsula are recognized, including hyper abundant annuals which can carpet the floor of the Sonoran desert in a good rain year. Also in *Perityle* some species have amphitropically disjunct populations and are also found in South America, presumably having dispersed across the continet by hitchiking on birds. These outliers thrive in the Atacama desert southwestern South America and are also found on the distant island archipelago known as the Deseventuradas. The South American *Perityle* are diverse and not well studied compared to their North American counterparts.

of this widespread species complex, which is unique among rock daisies for possessing chromosome number variation in a descending dysploid series (*n* = 13, 12, 11, 10; Powell 1974). In the Cape RegionCape Region, *P. californica* shows a parapatric distribution with *P. marginata* and *P. cuneata*, two close relatives that have been recognized as conspecific in the past but which are elevated as species in this work. *P. californica* is difficult to distinguish from each of these species based on inflorescence or vegetative characters but possesses a distinctive pappus of scales and a single awn with spreading barbs on the distal end.

8.4 **Perityle carterae** (A.M.Powell) Lichter-Marck, Syst. Bot. 47(3): 811, 2022. *Amauria carterae* A.M.Powell, Madroño 21: 457, 1972. **TYPE:** Mexico, Baja California Sur, Sierra de la Giganta, Cerro Mechudo, 600 m alt., ca lat. 25° 55'N, long. 110° 45''W, 21 February 1970, *A. Carter 5439* (holotype: UC1367544!, isotypes: MEXU00158031 [photo!], TEX00000368 [photo!], US01049790 [photo!]).

Notes: *Perityle carterae* is known only from areas surrounding the type locality on Cerro Mechudo, deep in the jagged backcountry of the Sierra la Giganta in Baja California Sur, Mexico. *Perityle carterae* is also the only woody suffrutescent perennial *Perityle* on the peninsula and grows on consolidated, volcanic rocks and cliffs. It was first collected by and named after Annetta Carter, a botanist based at the University Herbarium at U.C. Berkeley, who spent decades exploring and studying the flora of the rugged Sierra la Giganta, often on her own. Carter's herbarium specimens are a work of art and include exquisitely detailed (and sometimes whimsical) habitat information. Jose Luis León de la Luz, who worked closely with Carter for many years, has carried on studies of the Sierra, recollecting *P. carterae* on Cerro Mechudo in 2004 and making many other important discoveries, such as *Ambrosia humi* Leon de la Luz & Rebman. Following a rugged hike bushwacking through tropical thornscrub, I was able to observe and photograph *P. carterae* at Mesa las Tinajas, a prominent ridge near the type locality in 2018.

8.5 **Perityle crassifolia** Brandegee, Proc. Calif. Acad. Sci. ser. 2, 3: 147, 1891. **TYPE:** Mexico, Baja California Sur, San Jose del Cabo, 6 October 1891, *T.S. Brandegee s.n.* (lectotype: UC90493! [designated by Powell 1974], isolectotypes: GH0001112[photo!], US00124603!).

Notes: *Perityle crassifolia* var. *crassifolia* is a robust succulent perennial or annual that grows on coastal sand dunes, rocky sites, and saline decomposed soils in the Cape Region of Baja California Sur, Mexico where it is threatened by coastal development. Questions have been raised about the efficacy of the arachnoid-villous leaf pubescence to distinguish this variety from *P.* var. *robusta*, which is a hypervariable taxon. Leaves of *P.* var. *crassifolia* are generally highly dissected and crisped, giving a crumpled appearance, and the heads of *P. crassifolia* var. *crassifolia* become swollen around their equator upon maturity.

8.5 A **Perityle crassifolia** var. **robusta** (Rydb.) Everly, Contr. Dudley Herb. 3: 382, 1947. *Perityle robusta* Rydb. N. Amer. Fl. 34(1): 16. 1914. **TYPE:** Mexico, Baja California Sur, Cerralvo island, 19 April 1911, *J.N. Rose 16880* (lectotype: NY00231075 [photo!] [designated by Powell 1974], isolectotypes: UC415560!, US00124645[photo!]).

Perityle incompta Brandegee, Univ. Calif. Publ. Bot. 6: 503. 1919. **TYPE:** Mexico, Baja California Sur, Los Dolores, *W.E. Bryant s.n.* (lectotype: UC90513! [designated by Powell 1974].

Perityle macromeres S.F.Blake, Proc. Biol. Soc. Washington 37: 59. 1924. **TYPE:** Mexico, Baja California Sur, La Paz, *E.W. Nelson & E.A. Goldman 7483* (lectotype: US00124632! [designated by Powell 1974]).

Notes: *Perityle crassifolia* var. *robusta* is a widespread herbaceous annual or perennial that grows in a wide variety of substrates and habitats in Baja California Sur, Mexico. It is a variable taxon that spans the range from individuals resembling *P. crassifolia* var. *crassifolia,* a silvery-pubescent and glandular coastal form, and *P. emoryi,* which is generally distributed further north and has greenish, glandular foliage, and smaller heads. Both varieties of *P. crassifolia* form a natural group with *P. socorrosensis,* which is endemic to the Revillagigedo archipelago, a group of four volcanic islands approximately 500 km south of the southern Baja California Peninsula.

8.6 **Perityle cuneata** Brandegee, Zoe 1: 54, 1890. **TYPE:** Mexico, Baja California Sur, Sierra de la Laguna, near Todos Santos, 26 January 1890, *T.S. Brandegee s.n.* (lectotype: UC90467! [designated by Powell 1974], isolectotype: US00124604!).

Notes: *Perityle cuneata* is found in the Sierra la Laguna of Baja California Sur, where it grows in decomposed soils and occasionally rock outcrops in tropical thorn scrub and oak forest habitats. The heads and leaves of *P. cuneata* tend to be larger than in *P. marginata* and the fruits differ from them in being cuneate, rather than obovate.

8.7 **Perityle emoryi** Torr., Notes Milit. Reconn. [Emory] 142, 1848. **TYPE:** U.S.A., California, mountains east of San Diego, 29 November 1846, *W.H. Emory s.n.* (lectotype: NY00231039[photo!] [designated by Powell 1974]). Figure 46.

Perityle nuda Torr. ex A.Gray, Pacific Railr. Rep. 4(5, no. 4) [Whipple]. 100, 1857. *Perityle californica* var. *nuda* (Torr. ex A.Gray) A.Gray, Syn. Fl. N. Amer. 1(2): 321. 1884. *Perityle emoryi* var. *nuda* (Torr. ex A.Gray) A.Gray, Bot. California [W.H. Brewer] 1: 397, 1876. **TYPE:** U.S.A., California, Williams Fork, 7 February 1853–1854, *J.N. Bigelow s.n.* (lectotype: NY00231048[photo!] [designated by Powell 1974], isolectotype: GH00106295[photo!]).

Closia cotula J.Rémy, Fl. Chil. [Gay] 4(1): 120. 1849. **TYPE:** Chile, Copaipo, *C. Gay s.n.* (lectotype: P04337380[photo!] [**designated here**], isolectoptype: NY00167578[photo!]).

Closia chilensis Regel & Korn., Index Seminum [St. Petersburg (Petropolitanus)] 39, 1857. **TYPE:** Chile, Paposo, *R.A. Phillipi s.n.* (type: unknown)

Closia pusilla Phil., Fl. Atacam. 31, 1860. **TYPE:** Chile, Pan de Azucar, no date, *R.A. Phillipi s.n.,* (type: unknown).

Closia discoidea Phil., Fl. Atacam. 31, 1860. *Perityle discoidea* (Phil.) I.M.Johnst. Contr. Gray Herb. 85: 128, 1929. **TYPE:** location unknown (type: unknown).

Closia anthemoides Phil., Fl. Atacam. 31, 1860. **TYPE:** Chile, *R.A. Philippi s.n.* (lectotype: SGO000005249! [**designated here**], isolectotypes: B, F[photo!]).

Closia elata Phil., Fl. Atacam. 31, 1860. *Closia cotula var. elata* (Phil.) Reiche, Anales Univ. Chile 112: 159, 1903. *Perityle emoryi var. elata* (Phil.) I.M.Johnst. Contr. Gray Herb. 85: 128, 1929. **TYPE:** Chile, no date, *A.R. Philippi s.n.* (lectotype: SGO000005255! [**designated here**]).

Perityle fitchii var. *palmeri* A.Gray, Syn. Fl. N. Amer. 1(2): 321, 1884. *Perityle grayi* Rose, Bot. Gaz. 15: 114, 1890. **TYPE:** Mexico, Baja California, Guadalupe Island, *E. Palmer 44* (lectotype: GH00011120 [photo!] [designated by Powell 1974], isolectotypes: US, NY).

Perityle rothrockii Rose, Bot. Gaz. 15: 114, 1890. **TYPE:** U.S.A., Nevada, *G.M. Wheeler s.n.*(lectotype: US00124647! [designated by Powell 1974]).

Perityle greenei Rose, Bot. Gaz. 15: 114, 1890. **TYPE:** U.S.A., California, Santa Cruz Island, Jul–Aug 1886, *E.L. Greene s.n.* (lectotype: NDG61165 [designated by Powell 1974], isolectotypes: GH00011122[photo!], NY00231041, UC, US00124615[photo!]).

Perityle emoryi var. *orcuttii* Rose, Bot. Gaz. 15: 114, 1890. **TYPE:** Mexico, Baja California, Sierra Juarez, Cantillas Canyon, *C. R. Orcutt 1102* (lectotype: US01101238! [designated by Powell 1974], isolectotype: GH00011077[photo!]).

Closia brachypetala Phil., Anales Univ. Chile, 87: 711, 1894. **TYPE:** Chile, no date, *R.A. Philippi s.n.* (lectotype: SGO065342! [**designated here**]).

Closia digitata Phil., Anales Univ. Chile 87: 711, 1894. **TYPE:** Chile, no date, collector unknown (lectotype: SGO000005253! [**designated here**]).

Closia elata var. *nana* Phil., Anales Univ. Chile 87: 711, 1894. **TYPE:** Chile, no date, collector unknown (type: unknown).

Closia foliosa Phil., Anales Univ. Chile 87: 711, 1894. **TYPE:** Chile, no date, *R.A. Philippi s.n.* (lectotype: SGO000005257! [**designated here**]).

Closia viridis Phil., Anales Univ. Chile 87: 711, 1894. **TYPE:** Chile, no date, *R.A. Philippi s.n.* (syntypes: B, F[photo!], SGO).

Closia villosa Phil., Anales Univ. Chile 87: 711, 1894. **TYPE:** Chile, Cordilleras east of Copaipo, no date, R.A. *Phillipi s.n.* (type: unknown).

Notes: *Perityle emoryi* is the most widespread species complex in tribe Perityleae and is found throughout low desert environments in northern Mexico and the southwest U.S. as well as the Atacama Desert in northern Chile and southwestern Peru. *Perityle emoryi* grows in a wide variety of habitats including decomposed soils, seeps, and rocky outcrops. It ranges from a minute ephemeral



Figure 46. *Perityle emoryi* Torr. is a self compatible annual that grows in both decomposed and rocky substrates. it is one of the most widespread species of rock daisies, occurring both in North and South America. **A.** Habit; this individual germinated and it is thriving despite it being an extremely dry year in the Atacama desert. **B.** Lateral view of the compact, urceolate involucre, and the densely glandular and non-glandular trichomes on the phyllaries. **C.** Superior view of the radiate capitulum showing white ray corollas and yellow disc floret corollas. **D.** Close up of two-sided carbonized cypselae with callous, ciliate margins. *Photos by Isaac Lichter-Marck.*

annual to a robust herbaceous perennial, especially where it is found growing on maritime islands or in perennially moist places. Phylogenetic data show *P. emoryi* to have a complex evolutionary history as an allopolyploid hybrid species. South American populations long referred to this species do not form a monophyletic group with populations of *P. emoryi* from North America and are more closely related to *P. crassifolia*. The South American populations therefore constitute at least one, and possibly several, unrecognized taxa. In the past, the hypervariable populations of *P. emoryi* found in the Atacama Desert had been classified in a separate genus *Closia* with fourteen species. In addition to clarifying the nomenclatural complexity of *Closia,* recent field and herbarium work in Chile has aimed at resolving the appropriate number of taxa to reinstate for Chilean *Perityle*. The Desventuradas Islands endemic rock daisy *Perityle tenuifolius* is phylogenetically nested within samples from the Atacama Desert, suggesting that Chilean *Perityle* are the result of both intercontinental and trans-oceanic long distance dispersal events.

8.8 **Perityle marginata** Rydb., N. Amer. Fl. 34(1): 14, 1914. *Perityle cuneata* var. *marginata* (Rydb.) I.M.Johnst., Proc. Calif. Acad. Sci. ser. 4, 12: 1204, 1924. **TYPE:** Mexico, Baja California Sur, San Jose del Cabo, 25 March 1911, *J.N. Rose 16349* (lectotype: NY00231069[photo!] [designated by Powell 1974], isolectotypes: UC415558!, US00124633!). Figure 47.

Notes: Phylogenetic, biogeographic, morphological, and cytological data all support recognition of *P. cuneata* and *P. marginata* as distinct entities at the species rank. *Perityle marginata* is a widespread



Figure 47. *Perityle marginata* Rydb. is an herbaceous annual that grows in decomposed substrates at low elevations of the cape region of Baja California Sur. **A.** Habit; an individual showing the weedy habit, growing in decomposed granite at the edges of a road. **B.** Lateral view of capitulum. **C.** Superior view of radiate capitulum showing the yellow corollas. **D.** Involucre phyllaries of this species and many close relatives reflex at maturity, exposing the cypselae, which have two-sided with ciliate margins and a crown of scales and awns. *Photos by Isaac Lichter-Marck.*

annual that grows in decomposed soils at low elevations in the Cape Region of Baja California Sur, Mexico, occurring in arid thornscrub and coastal environments, and has 12 chromosomes. *Perityle cuneata* occurs at mid to high elevations in the Sierra de la Laguna and has 16 chromosomes. Populations of these plants included in phylogenetic analyses form a grade, with *P. californica* sister to *P. cuneata* sensu stricto, and *P. marginata* shows a parapatric (non-overlapping but neighboring) distribution with both *P. californica* and *P. cuneata*.

8.9 **Perityle rosei** Greenm., Proc. Amer. Acad. Arts 40: 45, 1904. **TYPE:** Mexico, Jalisco, Bolaños, 15-17 September 1897, *J.N. Rose 2947* (lectotype: US00124646! [designated by powell 1974], isolectotypes: GH00011136[photo!], K000502191[photo!], NY00231076).

Perityle trichodonta S.F.Blake, Soc. Biol. Washington 37: 60, 1924. **TYPE:** Mexico, Jalisco, Sierra Madre west of Bolaños, 15–17 September 1897, *J.N Rose 2978* (Lectotype: US00124658!, [designated by Powell 1974], isolectotypes: GH00011139[photo!], K000502189[photo!]).

Notes: *Perityle rosei* and *P. trichodonta* are recognized as one species here, as suggested by Powell (1974). Both were described based on type specimens collected in the village of Bolaños, Jalisco, in the southern Sierra Madre Occidental, and the nearly identical type locality and similarity between the two taxa has made them difficult to distinguish in collections made elsewhere, where the two names have been used interchangeably. Phylogenetic data suggests that *P. rosei* in the new, expanded sense, along with an anomalous population of rock daisy collected in the Sierra la Primavera by Pablo Carrillo Reyes and ILM, may constitute a cryptic undescribed genus more closely

related to *Eutetras* than to *Perityle* or *Galinsogeopsis*. *Perityle rosei* is similar to species of *Galinsogeopsis* found nearby, such as *G. harkerae, G. feddemae*, and *G. glaucescens*, but also shares habitat characteristics and an abutting distribution with members of *Eutetras*. Although fruits of *P. rosei* are typically two-sided, occasionally on herbarium specimens fruits have been observed that are tetramerous (square in cross section), a trait typical of *Eutetras*. These plants need to be studied in more detail.

8.10 Perityle rotundifolia (Benth.) Brandegee, Zoe 4: 210, 1893. *Amauria rotundifolia* Benth., Bot. Voy. Sulphur [Bentham], 31, 1844. **TYPE:** Mexico, Baja California, San Quintin, 1841, *R.B Hinds s.n.* (lectotype: K000502240[photo!] [designated by Powell 1972]).

Perityle fitchii Torr. ex. A.Gray Pacif. Railr. Rep. 4 (5 no. 4) [Whipple]. 100, 1857. **TYPE:** Mexico, Baja California, *Rev. A. Fitch s.n.* (lectotype: NY [designated by Powell 1972], isolectotype: US00124610[photo!]).

Laphamia peninsularis Greene, Bull. Calif. Acad. Sci. 1(1): 8, 1884. **TYPE:** Mexico, Baja California, Scammon's Lagoon, *collector unknown* (lectotype: US00124642! [designated by Powell 1972], isolectotype: GH).

Notes: *Perityle rotundifolia* is a widespread annual or herbaceous perennial rock daisy that is common in a good rain year in Baja California Sur. At the southern end of its range it can be an abundant ephemeral annual, and in the north it is typically a more robust perennial. This taxon is one of the species that until recently has been classified in a separate genus, *Amauria*. The fruits are of the *Amauria* type. They are tetramerous, with two of the sides notably wider than the others. The fruit is epappose and lacks the cylindrical glands present on the cypsela surface in *P. brandegeeana.*

8.11 Perityle socorrosensis Rose, Bot. Gaz. 15: 118 pl. 13, 1890. **TYPE:** Mexico, Colima, Revillagigedo archipelago, Socorro Island, March 1889, *G.H. Townshend s.n.* (lectotype: US00124654! [designated by Powell 1974], isolectotypes: GH, K, NY).

Notes: *Perityle socorrosensis* is endemic to the Revillagigedo archipelago approximately 500 km south of the Baja California Peninsula. This species has been photographed and collected recently by Jon Rebman and Sula Vanderplank, showing the variability within and between islands. Further sampling might support recognizing these entities as distinct taxa. An interesting evolutionary question concerns the progressive loss of pappus elements, which correlated with dispersal limitation, on the more distant islands. Phylogenetic data thus far have shown that all island populations are closely related to populations of *P. crassifolia* found the Baja California Peninsula, and that these in turn are sister to populations from the Atacama Desert, suggesting a possible link to trans-oceanic dispersal to coastal northern Chile.

8.12 Perityle tenuifolius (Phil.) Lichter-Marck, Syst. Bot. 47(3): 811, 2022. *Lycapsus tenuifolius* Phil., Bot. Zeitung (Berlin) 28: 499, t. 8, 1870. *Alomia tenuifolia* (Phil.) Benth. & Hook.f. ex Reiche, Flora de Chile 3(59): 255–330, 1901. **TYPE:** Chile, Islas Desventuradas, rocas al sur de San Ambrosio, 1869, *Simpson s.n.* (syntypes: GH00009901 [photo!], K, SGO, US!).

Notes: *Perityle tenuifolius* is so distinct from other rock daisies that it has been classified as a separate, monotypic genus, *Lycapsus*, and at times has been placed in its own subtribe, Lycapsinae. Phylogenetic data robustly supports this species as nested within the genus *Perityle,* suggesting that its unique traits evolved as adaptations to its insular environment. This same pattern of insular endemics to the Desventuradas Islands being found to be nested within a more widespread genus has also been found for *Sanctambrosio* (Caryophyllaceae), in contrast to *Thamnoseris* (Compositae), which is the sister lineage to the diverse Juan Fernandez endemic genus *Dendroseris* (Kool and Thulin 2017; Cho et al. 2024). Recent field work on the island of San Felix and San Ambrosio by Lukas Mekis has revealed new aspects of the ecology of this species that may have accelerated its morphological evolution. It is a derived woody perennial that forms large clumps on sea cliffs, where it is regularly used as nesting and roosting shelter for seabirds. The leaves are deeply divided and succulent, and presumably aide in drought tolerance or fog capture. Four-lobed florets match this species to tribe Perityleae; however, the heads appear more open because they possess paleae throughout the receptable, a trait not seen in any other rock daisy. Some questions remain regarding the reproductive mode of *P. tenuifolius.* It is unclear if the disk florets are

Somewhere over the rainbow

Rock daisies grow in scattered locations across thousands of kilometers of mostly road-less, arid terrain. As you explore further and further into the desert, the stakes at play get higher and higher. Eventually you get to a point when you become walking a fine line. It's the line between possibly finding the discovery of a lifetime, or possibly getting into a situation that could end it. The landscape is harsh, unforgiving, desolate. The brief periods of good weather that produce flowers are short, far and in between. Help, if you need it, is often far away. But when all the stars align, and the rains arrive on time and produce outstanding blooms, you can experience the most amazing phenomena.



Somewhere in Baja California Norte, Mexico. Photo by Isaac Lichter-Marck

monoclinouos or functionally staminate and sterile, as they do not appear to produce fruit despite possessing a gynoecium.

UNCERTAIN NAMES:

Chlamysperma polygama Triana, Ann. Sci. Nat. Bot., ser. 4 9: 40, 1858. **TYPE:** Colombia, Cundinamarca, Anapoima, *Triana J.J. 1525* (lectotype: COL000004839[photo!] [**here designated**]).

Notes: *Chlamysperma polygama* was collected as part of J Triana's expedition in Colombia 1851-1857. It is a sparse specimen with few leaves and minute heads. From the photograph of the type specimen available online it is difficult to confirm the identity with certainty but the determination of Santiago Diaz of *Galeana pratensis* is probably in error given that *G. pratensis* is only known to occur in Mexico.

Villanova pinnatifida Lag., Gen. Sp. Pl. [Lagasca] 31, 1816. **TYPE:** Argentina, Falkland (Malvinas) Islands, *collector unknown* (type: unknown).

Notes: *Villanova pinnatifida* is described in *Genera et Species Plantarum* as being from the Falkland Islands. No mention of the species could be found in contemporary floristic work from the islands and we assume it refers to a different accepted name of a taxon of another genus; however, the type still needs to be located and investigated before any definitive assignment is given.

EXCLUDED NAMES:

Amauria dissecta A.Gray, Mem. Amer. Acad. Arts n.s., 4: 104, 1849. ≡ **Hymenothrix dissecta** (A.Gray) B.G.Baldwin, Taxon 65(5): 1074, 2016 (tribe Bahieae).

Villanova bipinnatifida Ortega, Nov. Rar. Pl. Descr. Dec. 47, 1797. = **Parthenium hysterophorus** L., Sp. Pl. 2: 988, 1753 (tribe Heliantheae).

Villanova biternata (A.Gray) Wooten & Standl., Contr. U.S. Natl. Herb. 19: 725, 1915. ≡ **Hymenothrix biternata** (A.Gray) B.G.Baldwin, Taxon 65(5): 1074, 2016 (tribe Bahieae)

Villanova chrysanthemoides A.Gray, Smithosnian Contr. Knowl. 5(6): 96, 1853. = **Hymenothrix biternata** (A.Gray) B.G.Baldwin, Taxon 65(5): 1074, 2016 (tribe Bahieae).

Villanova dissecta (A.Gray) Rydb., Bull. Torrey Bot. Club 37: 333, 1910. ≡ **Hymenothrix dissecta** (A.Gray) B.G.Baldwin, Taxon 65(5): 1074, 2016 (tribe Bahieae).

DISCUSSION

Taxonomic overview

The 90 currently recognized minimum-rank taxa in tribe Perityleae include dramatic examples of plant insular diversification and disparity that continue to beguile those of us who study them. The common name "rock daisy" for the North and South American representatives of the tribe Perityleae was most likely inspired by the species that grow on consolidated barren rock outcrops and vertical to overhanging cliffs. This tendency is most common in the genera *Laphamia* and *Galinsogeopsis*, which are two clades that have speciated extensively onto far-flung, and often geologically distinct, canyons, and sky islands. The recent eco-geographic evolution of these highly specialized cliff-dwelling rock daisies occurred in parallel with the radiation of the genus *Perityle,* which occurs widely across the Americas and is distributed over a wide range of habitats and soils in tropical forests, hyper-arid deserts, and high alpine tundra.

Most rock daisies are rare plants found in difficult-to-access habitats scattered across thousands of miles of roadless terrain, and our knowledge of the basic biology and natural history of taxa in this group has in many cases been assembled from few collections and observations. The goal of this collaborative work was to spark the process of gathering those scattered bits of knowledge into one location as a first step on the path to building a comprehensive understanding of Perityleae. Besides stimulating monographic work, our hope is that the list of accepted names and synonyms for specific and infraspecific taxa in Perityleae compiled for the first time here also serves as a resource for herbarium curators, field biologists, and dedicated naturalists. The detailed notes on recent discoveries and taxonomic puzzles are meant to inspire collaborative

Risk it for a biscuit

The bare, rocky outcrops on which many Perityleae are found, are hotspots for unique plant diversity, but botanists have to risk their lives to study these rare species. Many botanists have met their end while collecting on cliffs. In 1932, the botanist Ralph Hoffman famously fell to his death while collecting a rare *Dudleya* Britton & Rose (Crassulaceae) species on a steep cliff in the California channel islands. Legend has it that they found his body still clutching the succulent in hand, and after colleagues pressed the plant and studied it in detail, it was named in his honor.

Mesa de Caballos, Jalisco, Mexico. Photo by Isaac Lichter-Marck

efforts to scour collections, organize expeditions to collect new specimens and take photos, and make carefully documented observations in the field to learn whatever we can about these rare, specialized, and sometimes endangered plants.

Contributions to our understanding of rock daisies

To our knowledge, the nomenclator and checklist presented here accounts for all taxonomic names that have been validly published and applied to the tribe Perityleae. In total, 273 names are accounted for, including 90 accepted minimum rank taxa, 125 homotypic synonyms, 53 heterotypic synonyms, and 5 names that apply to taxa in other tribes of Compositae. Type specimen details are given for the vast majority of the 143 designated basionyms in Perityleae; however, types have not yet been located for some names, especially those in the strictly South American genus *Closia*, which is now recognized as being included in *Perityle*. Some types are lost; for example, Rodgers and Spellenberg (2023) were unable to locate the holotype of *Laphamia staurophylla* var. *homoflora*, which was supposedly deposited in the Steere Herbarium at the New York Botanical Garden.

The vast majority of validly published names applicable to Perityleae were published before 1958, when the International Code of Nomenclature first required that new species descriptions designate an explicit holotype. Most, though not all, of these pre-1958 names instead had multiple specimens, or an entire gathering, designated as types. Powell's monographic work on Perityleae (1969, 1973a, 1974) listed type information for each taxon, specifying a single herbarium as holding the holotype — thereby inadvertently lectotypifying the majority of names in the tribe. Here, we follow articles 9.11, 9.17, 9.19 and recommendation 9C of the Madrid Code (Turland et al. 2025). Where Powell's lectotypification was incomplete, or unclear because more than one specimen was held in the herbarium he indicated, we have completed the process with a second step lectotypification.

The 90 accepted minimum-rank taxa of Perityleae were grouped into three subtribes by Panero (2007). The monotypic subtribe Lycapsinae however, is nested within Peritylinae. Here, and going forward, we therefore recognize only two subtribes, Galeaninae and Peritylinae. In total, the tribe Perityleae includes 8 currently recognized genera with the following number of minimum rank taxa: *Eutetras* (2), *Galeana* (1), *Galinsogeopsis* (15), *Laphamia* (52), *Nesothamnus* (1), *Pericome* (2), *Perityle* (13), and *Villanova* (4). Future work needs to carefully consider the generic placement of two taxa, *Perityle aurea* and *Perityle rosei*. *Perityle aurea* is a rare species found on gypsum outcrops in Baja California Sur, Mexico where it is threatened by mining exploitation. This species has not yet been included in molecular phylogenies and shows similarities with two genera, *Perityle* and *Laphamia*. *Perityle rosei,* which is here treated broadly to include *Perityle trichodonta*, was included in molecular studies and found to be more closely related to long recognized species in the genus *Eutetras* than to any of the taxa in *Perityle*, suggesting it may constitute a cryptic ninth genus of rock daisies.

In the aftermath of recent taxonomic rearrangements and in the process of compiling this nomenclator, several minor but significant nomenclatural changes needed to be made. Since the main goal of this nomenclator was to account for all previously published scientific names applied to tribe Perityleae and not to create new ones, we refrained from making novel combinations and describing new species here. Instead, the changes presented here are cases where the synonymy has been previously published. To summarize taxonomic novelties presented here, we elevated two infraspecific taxa to species level (*Perityle cuneata* and *Perityle marginata*), we placed five names in synonymy (*Galinsogeopsis stevensii* [synonym of *Galinsogeopsis canescens*], *G. pennellii* [synonym of *G. hofmeisteria*], *G. scopulorum* and *G. pseudociliata* [both synonyms of *G. coronopifolia*], and *Perityle trichodonta* [synonym of *P. rosei*], and we reinstated basionyms with nomenclatural priority in three cases, involving two new combinations and four names (*Galinsogeopsis microglossa* var. *migroglossa*, *G. microglossa* var. *saxosa*, *Laphamia toumeyi,* and *Villanova anemonifolia*). New names and new combinations will no doubt need to be published in the near future to account for the full diversity in tribe Perityleae. One benefit moving forward is that this nomenclator clarifies all previously proposed names, reducing confusion about when and where new names are needed, and helping to avoid duplicated effort.



Adaptation on the sharp edge

Sheer cliffs are among the world's most iconic landmarks but our knowledge of the enigmatic plants that live in them is as fragmented as a chossy rock face. Plants of many distantly related families live on cliffs, some extravagant and others cryptic. Wherever they are coming from, these plants converge on similar traits, specialized root structures, drought tolerant leaves, reductions in dispersability, and so on. A remarkable case of convergence between rock daisies and rock nettles (*Eucnide aurea* (A.Gray) H.J.Thomps. & W.R.Ernst in the Loasaceae shown here) occurs on cliffs in Baja California. The leaves are sometimes so similar that they are difficult to distinguish in the absence of blooms. The flowers couldn't be more distinct, but one of the most remarkable things occurs as the fruits mature. Both species have independently evolved self-sowing behaviors, in which the heads bend back towards the cliff upon maturity, dispersing seeds back into the nooks and crannies.

Sierra de la Giganta, Baja California Sur, Mexico. Photo by Isaac Lichter-Marck

The lost rock daisies and recent discoveries from the field

The annotated taxonomic checklist presented here is accompanied by general notes about ecology and distribution, and where relevant, highlights of recent fieldwork that has expanded our natural history knowledge of rock daisies. We uncovered ten cases in which rock daisies that had been "lost" for decades, or in some cases over a century, were recently "rediscovered" through the efforts of dedicated field botanists. Most of these rediscoveries have been in the difficult-to-access and understudied Sierra Madre Occidental in northwest Mexico or in adjacent thornscrub habitats in Sonora, Mexico. These include *Galinsogeopsis canescens*, *G. feddemae*, *G. lineariloba*, *G. montana*, *Laphamia grandifolia*, *L. lloydii, L. vandevenderi,* and *Pericome macrocephala*. Most of these rediscoveries have occurred when field botanists revisited notable collecting localities of early collectors such as Edward Palmer from which the type specimens of numerous taxa were originally described. In most cases, individual plants at these locations have been relatively well conserved but not studied in detail in decades. In contrast, new populations of *Galinsogeopsis lineariloba* and *Pericome macrocephala,* two taxa that were previously known only from century-old collections, have been rediscovered hundreds of kilometers away from the type locality, drastically expanding the range for these understudied taxa.

First photographs of rock daisies have surfaced for dozens of species and have been critical for clarifying the ecology of rare species, including their preferences for bare, rocky habitats and particular rock substrate types (lithologies). Based on publicly available data and the information compiled here, first photographs have surfaced for 16 taxa. These include *Galinsogeopsis canescens, G. feddemae, G. lineariloba, G. montana, G. vigilans, Laphamia bisetosa* var. *bisetosa, L. bisetosa* var. *scalaris, L. dissecta, L. gentryi, L. gilensis* var. *salensis, L. grandifolia, L. vandevenderi, L. villosa, Perityle carterae, P. socorrosensis*, and *Villanova robusta* (Fig. 3). Photographs of rare rock daisies have most often surfaced along with new collections made by professional field botanists, thanks in part to the greater ease and availability of digital photography. In other cases, photographs submitted to iNaturalist by dedicated observers have turned out to be significant rock daisy discoveries. For example, from Sierra Mohinora, an isolated peak in the Sierra Madre Occidental, two iNaturalist users, Maria de Los Angeles Olvera (@angie_olvera) and Aaron Balam (@aaronbalam_tutor), uploaded the first photographs to our knowledge of the rare, enigmatic *Galinsogeopsis montana*, which is so distinct from other rock daisies that it was once recognized within its own monotypic genus, *Correllia.* These photographs revealed for the first time that *G. montana* represents one of a specialized and highly endemic assemblage of plant species in the Sierra Madre Occidental that grow on mud-flow deposits in mesic forests, a unique edaphic environment that presumably drove the recent evolution of this species' unique morphological features.

Despite the extensive efforts by botanists of all backgrounds to document rock daises, we found that there are still at least ten rock daisy taxa that remain "lost," meaning that we lack information about their contemporary status and whereabouts. For these taxa, we often have been able to study herbarium collections made decades in the past to assess their validity as distinct taxa of rock daises but have not been able assess the current state of these taxa in terms of their persistence, demographics, or ecology. The lost rock daisies include *Laphamia bisetosa* var. *appressa, Laphamia bisetosa* var. *spathulata*, *L. carmenensis, L. castillonii, L. cinerea, L. fosteri, L. huecosensis, L. vitreomontana, L. warnockii*, and *Villanova titicacaensis*. Apart from *V. titicacaensis*, which occurs in Peru and Bolivia, all the lost rock daises are narrowly distributed taxa on private land in western Texas. Texas is a majority privately-owned state, with 93% of the territory in the hands of ranchers and other private interests, and access for field biologists has been severely restricted in this biodiverse region for decades.

New observations of rock daisies that in the past were known from few collections has clarified many aspects of the biology of rare species, but in many cases it has also revealed taxonomic complexities that will need closer study before they are resolved. A priority focus for ongoing research on rock daisies is to resolve taxonomic puzzles in the following species complexes: *Galinsogeopsis feddemae, G. hofmeisteria, Laphamia ambrosiifolia, L. cordifolia, L. gracilis, L. lemmonii, L. megalocephala , L. parryi, L. villosa*, *Perityle emoryi,* and *P. rosei*. For instance, ongoing research in the Atacama Desert in Chile on amphitropically disjunct populations of *Perityle*

On the origins of cliff species

How did so many species of plants that grow on vertical cliffs evolve? This has been a topic of debate among botanists for decades. The most common families tend to be the ones that are good at living in other stressful environments like deserts, Composites, succulents, xeric ferns, spiny, drought-tolerant shrubs, etc. This makes sense, since cliff environments really are a lot like micro-deserts. Yet deserts are young biomes on a geological time scale, whereas rocky outcrops have been a perennial feature of the earth's landscape through time. This raises the possibility that cliffs might be a special type of stressful environment for plants: the original place where the ancient ancestors of stress tolerant plant lineages evolved.



Igneous cliffs in the Gila Mountains, New Mexico. Photo by Sophia Winitsky.

emoryi will greatly benefit from the accounting of synonyms for South American *Perityle* compiled here. In the past, populations of *Perityle* found in Chile were recognized in a separate genus *Closia* with more than a dozen distinct species. Currently all this previously recognized species diversity is lumped into one extremely widespread species complex, *Perityle emoryi,* found both in North and South America. Sampling in the field and herbarium in 2024 is aimed at circumscribing distinct species of the South American *Perityle* into readily diagnosable taxonomic units and testing these using molecular data.

The rock daisy tribe is only moderately diverse by the standards of other tribes of Compositae, yet it is a group where description of new species has continued without reaching an apparent plateau. This is due in part to the difficult-to-study terrain in which rock daisies grow, and the insular nature of these habitats, which makes these plants prone to diversify locally into many narrow endemics that can be difficult to find. Anomalous populations of rock daisies that may meet the criteria for new species once they can be studied in detail are common. Field botanists and naturalists are encouraged to document rock daisies wherever they are found, especially those encountered while exploring difficult to reach vertical rock habitats in arid or subtropical terrain. All are welcome to join the collaborative effort to learn as much as we can about these eccentric plants and their fascinating natural history.

NOMENCLATOR

Accepted names are in **bold**.
Homotypic synonyms marked with ≡
Heterotypic synonyms marked with =

Alomia tenuifolia (Phil.) Benth. & Hook.f. ex Reiche
≡ **Perityle tenuifolius** (Phil.) Lichter-Marck
Amauria Benth. = **Perityle** Benth.
Amauria brandegeeana (Rose) Rydb.
≡ **Perityle brandegeeana** Rose
Amauria carterae A.M.Powell
≡ **Perityle carterae** (A.M.Powell) Lichter-Marck
Amauria dissecta A.Gray,
≡ **Hymenothrix dissecta** (A.Gray) B.G.Baldwin (tribe Bahieae)
Amauria rotundifolia Benth.
≡ **Perityle rotundifolia** (Benth.) Brandegee
Chlamysperma Less. = **Galeana** La Llave
Chlamysperma arenarioides Hook. & Arn.
= **Galeana pratensis** (Kunth) Rydb.
Chlamysperma polygama Triana **insertae sedis**
Chlamysperma pratense (Kunth) Less.
≡ **Galeana pratensis** (Kunth) Rydb.
Closia J.Rémy = **Perityle** Benth.
Closia anthemoides Phil. = **Perityle emoryi** Torr.
Closia cotula J.Rémy = **Perityle emoryi** Torr.
Closia brachypetala Phil. = **Perityle emoryi** Torr.
Closia chilensis Regel & Körn. = **Perityle emoryi** Torr.
Closia digitata Phil. = **Perityle emoryi** Torr.
Closia elata Phil. = **Perityle emoryi** Torr.
Closia elata var. *nana* Phil. = **Perityle emoryi** Torr.
Closia foliosa Phil. = **Perityle emoryi** Torr.
Closia viridis Phil. = **Perityle emoryi** Torr.
Closia villosa Phil. = **Perityle emoryi** Torr.
Corellia A.M.Powell = **Galinsogeopsis** Sch.Bip.
Corellia montana A.M.Powell
≡ **Galinsogeopsis montana** (A.M.Powell) Lichter-Marck
Eutetras A.Gray
Eutetras palmeri A.Gray
Eutetras pringlei Greenm.
Galeana La Llave
Galeana hastata La Llave
= **Galeana pratensis** (Kunth) Rydb.
Galeana pratensis (Kunth) Rydb.
Galinsogeopsis Sch.Bip.
Galinsogeopsis canescens (Everly) Lichter-Marck
Galinsogeopsis ciliata (L.H.Dewey) Lichter-Marck
Galinsogeopsis coronopifolia (A.Gray) Lichter-Marck
Galinsogeopsis feddemae (McVaugh) Lichter-Marck
Galinsogeopsis glaucescens (B.L.Turner) Lichter-Marck
Galinsogeopsis harkerae (P.Carrillo) Lichter-Marck
Galinsogeopsis hofmeisteria (Rydb.) Lichter-Marck
Galinsogeopsis jaliscana (A.Gray) Lichter-Marck
Galinsogeopsis lineariloba (Rydb.) Lichter-Marck
Galinsogeopsis montana (A.M.Powell) Lichter-Marck
Galinsogeopsis microcephala (A.Gray) Lichter-Marck
Galinsogeopsis microglossa (Benth.) Lichter-Marck
Galinsogeopsis microglossa var. **saxosa** (Brandegee) Lichter-Marck
Galinsogeopsis pennellii (B.L.Turner) Lichter-Marck
= **Galinsogeopsis hofmeisteria** (Rydb.) Lichter-Marck
Galinsogeopsis pseudociliata (A.M.Powell & Yarborough) Lichter-Marck = **Galinsogeopsis coronopifolia** (A.Gray) Lichter-Marck

Galinsogeopsis scopulorum (M.E.Jones) Lichter-Marck
= **Galinsogeopsis coronopifolia** (A.Gray) Lichter-Marck
Galinsogeopsis spilanthoides var. *saxosa* (Brandegee) Lichter-Marck ≡ **Galinsogeopsis microglossa** var. **saxosa** (Brandegee) Lichter-Marck

Galinsogeopsis spilanthoides Sch.Bip. in B.Seemann var. *spilanthoides* = **Galinsogeopsis microglossa** (Benth.) Lichter-Marck var. **microglossa**
Galinsogeopsis stevensii (B.L.Turner) Lichter-Marck
= **Galinsogeopsis canescens** (Everly) Lichter-Marck
Galinsogeopsis turneri (A.M.Powell) Lichter-Marck
Galinsogeopsis vigilans (Spellenb. & A.M.Powell) Lichter-Marck
Laphamia A.Gray
Laphamia aglossa (A.Gray) Benth. & Hook.f. ex Hemsl.
Laphamia ajoensis (Todsen) Lichter-Marck
Laphamia ambrosiifolia (Greene ex A.M.Powell & Yarborough) Lichter-Marck
Laphamia angustifolia A.Gray
Laphamia angustifolia var. *laciniata* Torr.
= **Laphamia angustifoli**a A.Gray
Laphamia arizonica Eastw.
= **Laphamia gilensis** M.E.Jones var. **gilensis**
Laphamia batopilensis (A.M.Powell) Lichter-Marck
Laphamia bisetosa var. **appressa** (A.M.Powell) Lichter-Marck
Laphamia bisetosa Torr. var. **bisetosa**
Laphamia bisetosa var. **scalaris** (A.M.Powell) Lichter-Marck
Laphamia bisetosa var. **spathulata** (A.M.Powell) Lichter-Marck
Laphamia carmenensis (A.M.Powell) Lichter-Marck
Laphamia castillonii (I.M.Johnst.) Everly
Laphamia cernua Greene
Laphamia ciliata L.H.Dewey
≡ **Galinsogeopsis ciliata** (L.H.Dewey) Lichter-Marck
Laphamia cinerea A.Gray
Laphamia coahuilensis (A.M.Powell) Lichter-Marck
Laphamia cochisensis W.E.Niles
Laphamia congesta M.E.Jones
= **Laphamia toumeyi** B.L.Rob. & Greenm.
Laphamia cordifolia (Rydb.) Lichter-Marck
Laphamia dissecta Torr.
Laphamia dura A.Nelson
= **Laphamia gilensis** M.E.Jones var. **gilensis**
Laphamia fastigiata Brandegee
= **Laphamia gracilis** M.E.Jones
Laphamia fosteri (A.M.Powell) Lichter-Marck
Laphamia gentryi (A.M.Powell) Lichter-Marck
Laphamia gilensis subsp. *longiloba* W.E.Niles
= **Laphamia gilensis** var. **salensis** (A.M.Powell) Lichter-Marck
Laphamia gilensis M.E.Jones var. **gilensis**
Laphamia gilensis var. **salensis** (A.M.Powell) Lichter-Marck
Laphamia gracilis M.E.Jones
Laphamia grandifolia (Brandegee) Everly
Laphamia halimifolia A.Gray
≡ **Laphamia lindheimeri** *var.* **halimifolia** (A.Gray) Lichter-Marck
Laphamia huecoensis (A.M.Powell) Lichter-Marck
Laphamia intricata Brandegee
Laphamia inyoensis Ferris
Laphamia laciniata (Torr.) Rydb. = **Laphamia angustifolia** A.Gray
Laphamia lemmonii A.Gray
Laphamia lemmonii var. *pedata* A.Gray = **Laphamia lemmonii** A.Gray
Laphamia leptoglossa (Harv. & A.Gray ex A.Gray) Lichter-Marck
Laphamia lindheimeri A.Gray
Laphamia lindheimeri var. **halimifolia** (A.Gray) Lichter-Marck
Laphamia lloydii (B.L.Rob. & Fernald) Lichter-Marck
Laphamia lobata (Rydb.) Lichter-Marck
Laphamia megalocephala subsp. intricata (Brandegee) D.D.Keck
≡ **Laphamia intricata** *Brandegee*
Laphamia megalocephala S.Watson var. **megalocephala**
Laphamia megalocephala var. **oligophylla** (A.M.Powell) Lichter-Marck
Laphamia palmeri A.Gray
Laphamia palmeri var. *tenella* M.E.Jones
= **Laphamia palmeri** A.Gray
Laphamia parryi (A.Gray) Benth. & Hook.f. ex Hemsl.
Laphamia peninsularis Greene
= **Perityle rotundifolia** (Benth.) Brandegee
Laphamia quinqueflora Steyerm.
Laphamia reinana (B.L.Turner) Lichter-Marck
Laphamia rotundata Rydb.
= **Laphamia lindheimeri** A.Gray var. **lindheimeri**
Laphamia rupestris A.Gray var. **rupestris**
Laphamia sanchezii Lichter-Marck
Laphamia saxicola Eastw.
Laphamia scopulorum M.E.Jones
= **Galinsogeopsis coronopifolia** (A.Gray) Lichter-Marck
Laphamia specicola (S.L.Welsh & Neese) Lichter-Marck
Laphamia stansburyi A.Gray
Laphamia staurophylla Barneby
Laphamia toumeyi B.L.Rob. & Greenm.
Laphamia vandevenderi (B.L.Turner) Lichter-Marck

Laphamia vaseyi (J.M.Coult.) Lichter-Marck
Laphamia villosa S.F.Blake
Laphamia vitreomontana (Warnock) Lichter-Marck
Laphamia warnockii (A.M.Powell) Lichter-Marck
Leptopharynx Rydb. = **Laphamia** A.Gray
Leptopharynx aglossa (A.Gray) Rydb.
≡ **Laphamia aglossa** (A.Gray) Benth. & Hook.f. ex Hemsl.
Leptopharynx cordifolia Rydb.
≡ **Laphamia cordifolia** (Rydb.) Lichter-Marck
Leptopharynx dissecta (Torr.) Rydb.
≡ **Laphamia dissecta** Torr.
Leptopharynx gilensis (M.E.Jones) Rydb.
= **Laphamia gilensis** M.E.Jones var. **gilensis**
Leptopharynx grandifolia (Brandegee) Rydb.
≡ **Laphamia grandifolia** (Brandegee) Everly
Leptopharynx lemmonii (A.Gray) Rydb.
≡ **Laphamia lemmonii** A.Gray
Leptopharynx leptoglossa (Harv. & A.Gray ex. A.Gray) Rydb.
≡ **Laphamia leptoglossa** (Harv. & A.Gray ex A.Gray) Lichter-Marck
Leptopharynx lloydii (B.L.Rob. & Fernald) Rydb.
≡ **Laphamia lloydii** (B.L.Rob. & Fernald) Lichter-Marck
Leptopharynx lobata Rydb.
≡ **Laphamia lobata** (Rydb.) Lichter-Marck
Leptopharynx palmeri (S.Watson) Rydb.
≡ **Laphamia sanchezii** Lichter-Marck
Leptopharynx trisecta Rydb.
= **Laphamia parryi** (A.Gray) Benth. & Hook.f. ex Hemsl.
Lycapsus Phil. = **Peritule** Benth.
Lycapsus tenuifolius Phil.
≡ **Peritule tenuifolius** (Phil.) Lichter-Marck
Melampodium achilleoides (Less.) Hemsl.
= **Villanova anemonifolia** (Kunth) Less.
Melampodium minutiflorum M.E.Jones
= **Galeana pratensis** (Kunth) Rydb.
Monothrix Torr. = **Laphamia** A.Gray
Monothrix congesta (M.E.Jones) Rydb.
= **Laphamia toumeyi** B.L.Rob. & Greenm.
Monothrix fastigiata (Brandegee) Rydb
= **Laphamia gracilis** M.E.Jones
Monothrix intricata (Brandegee) Rydb.
≡ **Laphamia intricata** Brandegee
Monothrix megalocephala (S.Watson) Rydb.
≡ **Laphamia megalocephala** S.Watson var. **megalocephala**
Monothrix palmeri (A.Gray) Rydb.
≡ **Laphamia palmeri** A.Gray
Monothrix stansburyi (A.Gray) Rydb.
≡ **Laphamia stansburyi** A.Gray
Monothrix toumeyi (B.L.Rob. & Greenm.) Rydb.
≡ **Laphamia toumeyi** B.L.Rob. & Greenm.
Nesothamnus (A.Gray) Rydb.
Nesothamnus incanus (A.Gray) Rydb.
Pappothrix (A.Gray) Rydb. = **Laphamia** A.Gray
Pappothrix cernua (Greene) Rydb.
≡ **Laphamia cernua** Greene
Pappothrix cinerea (A.Gray) Rydb.
≡ **Laphamia cinerea** A.Gray
Pappothrix quinqueflora (Steyerm.) Everly
≡ **Laphamia quinqueflora** Steyerm.
Pappothrix rupestris (A.Gray) Rydb.
≡ **Laphamia rupestris** A.Gray var. **rupestris**
Pericome A.Gray
Pericome caudata A.Gray
Pericome glandulosa Goodman = **Pericome caudata** A.Gray
Pericome macrocephala B.L.Rob.
Pericome spilanthoides (Sch.Bip.) Benth. & Hook.f. ex. Hemsl.
= **Galinsogeopsis microglossa** (Benth.) Lichter-Marck var. **microglossa**
Peritule Benth.
Peritule sect. *Laphamia* = **Laphamia** A.Gray
Peritule sect. *Pappothrix* = **Laphamia** A.Gray
Peritule acmella Harv. & A.Gray
= **Galinsogeopsis microglossa** (Benth.) Lichter-Marck var. **microglossa**
Peritule aglossa A.Gray
≡ **Laphamia aglossa** (A.Gray) Benth. & Hook.f. ex Hemsl.
Peritule aurea Rose
Peritule ajoensis Todsen
≡ **Laphamia ajoensis** (Todsen) Lichter-Marck
Peritule alamosana B.L.Turner
= **Laphamia gentryi** (A.M.Powell) Lichter-Marck
Peritule ambrosiifolia Greene ex A.M.Powell & Yarborough
≡ **Laphamia ambrosiifolia** (Greene ex A.M.Powell & Yarborough) Lichter-Marck
Peritule angustifolia (A.Gray) Shinners
≡ **Laphamia angustifolia** A.Gray
Peritule batopilensis A.M.Powell
≡ **Laphamia batopilensis** (A.M.Powell) Lichter-Marck
Peritule bisetosa var. *appressa* A.M.Powell
≡ **Laphamia bisetosa** var. **appressa** (A.M.Powell) Lichter-Marck
Peritule bisetosa var. *bisetosa* (Torr.) Shinners
≡ **Laphamia bisetosa** Torr. var. **bisetosa**
Peritule bisetosa var. *scalaris* A.M.Powell
≡ **Laphamia bisetosa** var. **scalaris** (A.M.Powell) Lichter-Marck

Perityle bisetosa var. *spathulata* A.M.Powell
≡ **Laphamia bisetosa** var. **spathulata** (A.M.Powell) Lichter-Marck
Perityle brandegeeana Rose
Perityle californica var. *nuda* (Torr. ex A.Gray) A.Gray
= **Perityle emoryi** Torr.
Perityle canescens Everly
≡ **Galinsogeopsis canescens** (Everly) Lichter-Marck
Perityle carmenensis A.M.Powell
≡ **Laphamia carmenensis** (A.M.Powell) Lichter-Marck
Perityle carterae (A.M.Powell) Lichter-Marck
Perityle cernua (Greene) Shinners
≡ **Laphamia cernua** Greene
Perityle ciliata (L.H.Dewey) Rydb.
≡ **Galinsogeopsis ciliata** (L.H.Dewey) Lichter-Marck
Perityle cinerea (A.Gray) A.M.Powell
≡ **Laphamia cinerea** A.Gray
Perityle coahuilensis A.M.Powell
≡ **Laphamia coahuilensis** (A.M.Powell) Lichter-Marck
Perityle cochisensis (W.E.Niles) A.M.Powell
≡ **Laphamia cochisensis** W.E.Niles
Perityle congesta (M.E.Jones) Shinners
= **Laphamia toumeyi** B.L.Rob. & Greenm.
Perityle cordifolia (Rydb.) S.F.Blake
≡ **Laphamia cordifolia** (Rydb.) Lichter-Marck
Perityle coronopifolia A.Gray
≡ **Galinsogeopsis coronopifolia** (A.Gray) Lichter-Marck
Perityle crassifolia var. **robusta** (Rydb.) Everly
Perityle cuneata Brandegee
Perityle cuneata var. *marginata* (Rydb.) I.M.Johnst.
≡ **Perityle marginata** Rydb.
Perityle deltoidea S.Watson
= **Perityle californica** Benth.
Perityle dissecta (Torr.) A.Gray
≡ **Laphamia dissecta** Torr.
Perityle effusa (A.Gray) Rose
= **Galinsogeopsis microglossa** (Benth.) Lichter-Marck var. **microglossa**
Perityle emoryi Torr.
Perityle emoryi var. *elata* (Phil.) I.M.Johnst.
= **Perityle emoryi** Torr.
Perityle emoryi var. *nuda* (Torr. ex A.Gray) A.Gray
= **Perityle emoryi** Torr.
Perityle emoryi var. *orcuttii* Rose
= **Perityle emoryi** Torr.
Perityle fastigiata (Brandegee) Shinners
= **Laphamia gracilis** M.E.Jones
Perityle feddemae McVaugh
≡ **Galinsogeopsis feddemae** (McVaugh) Lichter-Marck
Perityle fitchii Torr. ex. A.Gray
= **Perityle rotundifolia** (Benth.) Brandegee
Perityle fitchii var. *palmeri* A.Gray
= **Perityle emoryi** Torr.
Perityle fosteri A.M.Powell
≡ **Laphamia fosteri** (A.M.Powell) Lichter-Marck
Perityle gentryi A.M.Powell
≡ **Laphamia gentryi** (A.M.Powell) Lichter-Marck
Perityle gilensis (M.E.Jones) J.F.Macbr.
≡ **Laphamia gilensis** M.E.Jones var. **gilensis**
Perityle gilensis var. *salensis* A.M.Powell
≡ **Laphamia gilensis** var. **salensis** (A.M.Powell) Lichter-Marck
Perityle glaucescens B.L.Turner
≡ **Galinsogeopsis glaucescens** (B.L.Turner) Lichter-Marck
Perityle gracilis (M.E.Jones) Rydb.
≡ **Laphamia gracilis** M.E.Jones
Perityle grandifolia Brandegee
≡ **Laphamia grandifolia** (Brandegee) Everly
Perityle greenei Rose
= **Perityle emoryi** Torr.
Perityle halimifolia (A.Gray) Shinners
= **Laphamia lindheimeri** A.Gray var. **lindheimeri**
Perityle harkerae P.Carrillo
≡ **Galinsogeopsis harkerae** (P.Carrillo) Lichter-Marck
Perityle hofmeisteria Rydb.
≡ **Galinsogeopsis hofmeisteria** (Rydb.) Lichter-Marck
Perityle huecoensis A.M.Powell
≡ **Laphamia huecoensis** (A.M.Powell) Lichter-Marck
Perityle incana A.Gray
≡ **Nesothamus incanus** (A.Gray) Rydb
Perityle incompta Brandegee
= **Perityle crassifolia** var. **robusta** (Rydb.) Everly
Perityle intricata (Brandegee) Shinners
≡ **Laphamia intricata** Brandegee
Perityle inyoensis (Ferris) A.M.Powell
≡ **Laphamia inyoensis** Ferris
Perityle jaliscana A.Gray
≡ **Galinsogeopsis jaliscana** (A.Gray) Lichter-Marck
Perityle lemmonii (A.Gray) J.F.Macbr.
≡ **Laphamia lemmonii** A.Gray
Perityle leptoglossa Harv. & A.Gray ex A.Gray
≡ **Laphamia leptoglossa** (Harv. & A.Gray ex A.Gray) Lichter-Marck
Perityle lindheimeri (A.Gray) Shinners
≡ **Laphamia lindheimeri** A.Gray var. **lindheimeri**
Perityle lindheimeri var. *halimifolia* (A.Gray) A.M.Powell
= **Laphamia lindheimeri** A.Gray var. **lindheimeri**
Perityle lloydii B.L.Rob. & Fernald
≡ **Laphamia lloydii** (B.L.Rob. & Fernald) Lichter-Marck

Perityle lobata (Rydb.) I.M.Johnst.
≡ **Laphamia lobata** (Rydb.) Lichter-Marck
Perityle marginata Rydb.
Perityle megalocephala (S.Watson) J.F.Macbr. var. *megalocephala*
≡ **Laphamia megalocephala** S.Watson var. **megalocephala**
Perityle megalocephala var. *oligophylla* A.M.Powell
≡ **Laphamia megalocephala** var. **oligophylla** (A.M.Powell) Lichter-Marck
Perityle microcephala A.Gray
≡ **Galinsogeopsis microcephala** (A.Gray) Lichter-Marck
Perityle microglossa Benth.
≡ **Galinsogeopsis microglossa** (Benth.) Lichter-Marck var. **microglossa**
Perityle microglossa var. *effusa* A.Gray
= **Galinsogeopsis microglossa** (Benth.) Lichter-Marck var. **microglossa**
Perityle microglossa var. *saxosa* (Brandegee) A.M.Powell
= **Galinsogeopsis microglossa** var. **microglossa** (Benth.) Lichter-Marck
Perityle montana (A.M.Powell) B.G.Baldwin
≡ **Galinsogeopsis montana** (A.M.Powell) Lichter-Marck
Perityle nuda Torr. ex A.Gray
= **Perityle emoryi** Torr.
Perityle parryi A.Gray
≡ **Laphamia parryi** (A.Gray) Benth. & Hook.f. ex Hemsl.
Perityle palmeri S.Watson
≡ **Laphamia sanchezii** Lichter-Marck
Perityle pennellii B.L.Turner
= **Galinsogeopsis hofmeisteria** (Rydb.) Lichter-Marck
Perityle plumigera Harv. & Gary ex. A.Gray
= **Perityle californica** Benth.
Perityle pseudociliata A.M.Powell & Yarborough
= **Galinsogeopsis coronopifolia** (A.Gray) Lichter-Marck
Perityle quinqueflora (Steyerm.) Shinners
≡ **Laphamia quinqueflora** Steyerm.
Perityle reinana B.L.Turner
≡ **Laphamia reinana** (B.L.Turner) Lichter-Marck
Perityle rosei Greenm.
Perityle robusta Rydb.
≡ **Perityle crassifolia** var. **robusta** (Rydb.) Everly
Perityle rothrockii Rose= **Perityle emoryi** Torr.
Perityle rotundata (Rydb.) Shinners
= **Laphamia lindheimeri** A.Gray var. **lindheimeri**
Perityle rotundifolia (Benth.) Brandegee
Perityle rupestris (A.Gray) Shinners
≡ **Laphamia rupestris** A.Gray
Perityle rupestris var. *albiflora* A.M.Powell
≡ **Laphamia rupestris** var. **albiflora** (A.M.Powell) Lichter-Marck
Perityle saxicola (Eastw.) Shinners
≡ **Laphamia saxicola** Eastw.
Perityle saxosa Brandegee
≡ **Galinsogeopsis microglossa** var. **saxosa** (Brandegee) Lichter-Marck
Perityle scopulorum (M.E.Jones) A.M.Powell & B.L.Turner
= **Galinsogeopsis coronopifolia** (A.Gray) Lichter-Marck
Perityle socorrosensis Rose
Perityle specicola S.L.Welsh & Neese
≡ **Laphamia specicola** (S.L.Welsh & Neese) Lichter-Marck
Perityle spilanthoides (Sch.Bip.) Rydb.
= **Galinsogeopsis microglossa** var. **microglossa** (Benth.) Lichter-Marck
Perityle stansburyi (A.Gray) J.F.Macbr.
≡ **Laphamia stansburyi** A.Gray
Perityle staurophylla (Barneby) Shinners
≡ **Laphamia staurophylla** Barneby
Perityle stevensii B.L.Turner
= **Galinsogeopsis canescens** (Everly) Lichter-Marck
Perityle tenella (M.E.Jones) J.F.Macbr.
= **Laphamia palmeri** A.Gray
Perityle tenuifolius (Phil.) Lichter-Marck
Perityle toumeyi (B.L.Rob. & Greenm.) J.F.Macbr.
≡ **Laphamia toumeyi** B.L.Rob. & Greenm.
Perityle trichodonta S.F.Blake
= **Perityle rosei** Greenm.
Perityle trisecta (Rydb.) J.F.Macbr.
= **Laphamia parryi** (A.Gray) Benth. & Hook.f. ex Hemsl.
Perityle turneri A.M.Powell
≡ **Galinsogeopsis turneri** (A.M.Powell) Lichter-Marck
Perityle urticifolia Rydb.
= **Galinsogeopsis microglossa** var. **saxosa** (Brandegee) Lichter-Marck
Perityle vandevenderi B.L.Turner
≡ **Laphamia vandevenderi** (B.L.Turner) Lichter-Marck
Perityle vaseyi J.M.Coult.
≡ **Laphamia vaseyi** (J.M.Coult.) Lichter-Marck
Perityle vigilans Spellenb. & A.M.Powell
≡ **Galinsogeopsis vigilans** (Spellenb. & A.M.Powell) Lichter-Marck
Perityle villosa (S.F.Blake) Shinners
≡ **Laphamia villosa** S.F.Blake
Perityle vitreomontana Warnock
≡ **Laphamia vitreomontana** (Warnock) Lichter-Marck
Perityle warnockii A.M.Powell
≡ **Laphamia warnockii** (A.M.Powell) Lichter-Marck
Unxia achilleoides Less.
= **Villanova anemonifolia** (Kunth) Less.

Unxia alternifolia (Lag.) Spreng.
= **Villanova oppositifolia** Lag.
Unxia anemonifolia Kunth
≡ **Villanova anemonifolia** (Kunth) Less.
Unxia pratensis Kunth
≡ **Galeana pratensis** (Kunth) Rydb.
Vasquezia Phil. = **Villanova** Lag.
Vasquezia anemonifolia (Kunth) S.F.Blake
≡ **Villanova anemonifolia** (Kunth) Less.
Vasquezia oppositifolia (Lag.) S.F.Blake
≡ **Villanova oppositifolia** Lag.
Vasquezia titicacensis (Meyen & Walp.) S.F.Blake ex Herrera
≡ **Villanova titicacensis** (Meyen & Walp.) Walp.
Villanova Lag.
Villanova achilleoides (Less.) Less
= **Villanova anemonifolia** (Kunth) Less.
Villanova alternifolia Lag.
= **Villanova oppositifolia** Lag.
Villanova anemonifolia (Kunth) Less.
Villanova bipinnatifida Ortega
=**Parthenium hysterophorus** L.
(tribe Heliantheae).
Villanova biternata (A.Gray) Wooten & Standl
≡ **Hymenothrix biternata** (A.Gray) B.G.Baldwin
(tribe Bahieae)
Villanova chrysanthemoides A.Gray
= **Hymenothrix biternata** (A.Gray) B.G.Baldwin
(tribe Bahieae).
Villanova dissecta (A.Gray) Rydb.
≡ **Hymenothrix dissecta** (A.Gray) B.G.Baldwin
(tribe Bahieae).
Villanova oppositifolia Lag.
Villanova perpusilla Phil.
= **Villanova oppositifolia** Lag.
Villanova pinnatifida Lag. **insertae sedis**
Villanova pratensis (Kunth) Benth. & Hook.f.
≡ **Galeana pratensis** (Kunth) Rydb.
Villanova robusta Phil.
Villanova titicacaensis (Meyen & Walp.) Walp.
Wedelia titicacensis Meyen & Walp.
≡ **Villanova titicacensis** (Meyen & Walp.) Walp.

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