

TAXONOMIC RESURRECTION OF TWO ENDEMIC TAXA OF *ACMELLA* (ASTERACEAE: HELIANTHEAE)

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ABSTRACT

The taxonomy of the genus *Acmella* Rich. (Asteraceae) in Mexico has been dominated by a conservative view that lumps broad morphological variability under the *Acmella repens* (Walter) Rich. complex. In the Flora Novo-Galiciana area of western Mexico, this broad circumscription has obscured the existence of endemic taxa with distinctive morphology and ecology. Based on a critical review of nomenclatural types (83 specimens) and original material from 33 international herbaria, alongside a detailed morphological analysis, two taxa are resurrected: ***Acmella disciformis*** (B.L. Rob.) Carvajal & A. Vázquez, **comb. nov.**, and ***Acmella phaneractis*** (Greenm.) Carvajal & A. Vázquez, **comb. nov.** That these taxa differ consistently from *A. repens* and *A. radicans* in habit, stem succulence, peduncle dimensions, and floral structures. The lectotype designated by Jansen for *Spilanthes phaneractis* is recognized, and the biogeographical and conservation implications of recognizing these taxonomy-based endemics are discussed.

The taxonomy of the genus *Acmella* Rich. (Asteraceae: Heliantheae) has been the subject of debate and reconfiguration over the last century, marked by a complex history of synonymy and generic transfers from *Spilanthes* Jacq. While Moore (1907) recognized a wide diversity of species under *Spilanthes*, his delimitation based on variable vegetative characters was criticized early on by authors such as Nash (1976), who pointed out the urgent need for a thorough revision. This heterogeneity was formally evidenced by Jansen (1981), who detected that *Spilanthes sensu lato* included numerous species discordant with the generic concept. Consequently, a crucial milestone in the understanding of the group was the subsequent monograph by Jansen (1985), who established *Acmella* as an independent genus, segregating it from *Spilanthes sensu stricto* based on morphological and chromosomal characters.

Although Jansen's generic redefinition has been widely accepted (Karis & Ryding 1994; Panero 2007), his treatment at the specific level, particularly for North and Central American species, resulted in the grouping of numerous taxa under very broad and polymorphic species concepts. A paradigmatic case is the *Acmella repens* (Walter) Rich. ex Pers. complex (treated on several occasions under the synonym *A. oppositifolia*), to which Jansen subordinated many historical names, arguing a continuous morphological variability that did not justify taxonomic segregation.

In the context of the Flora Novo-Galiciana (western Mexico), this “lumping” view of *Acmella* has generated notable inconsistencies. McVaugh (1984) had already warned about distinctive forms in the Santiago River valley with characteristics that did not fit comfortably into a single entity, referring to them as variants of *Spilanthes oppositifolia*. Historically, taxa such as *Spilanthes disciformis* B.L. Rob. and *S. disciformis* var. *phaneractis* Greenm. were described from material from this region, characterized by specific morphological and ecological traits. However, these names have remained “dormant” in the synonymy of *A. repens* for the last four decades, masking the real diversity and endemism of the zone.

The present study arises as a partial result of an ongoing critical review of the nomenclatural types of *Acmella* species in Nueva Galicia. This comprehensive treatment, which includes the revision of nomenclatural types for all species recognized in the Flora Novo-Galiciana, will be published separately. Said analysis has revealed that populations in western Mexico do not conform to a morphological continuum. On the contrary, there are discrete entities that consistently differ from *A. repens sensu stricto* by diagnostic characters of habit, stem succulence, foliar morphology, and floral structures, in addition to occupying specialized ecological niches.

The specific objective of this contribution is to reevaluate the taxonomic status of the taxa historically associated with the *Acmella repens* complex in the region. To this end, an exhaustive review of all available type and original material in international collections was carried out, corresponding not only to the entities treated here but to all involved names (both accepted species and their synonyms). Based on morphological, ecological, and chorological evidence, the resurrection of two endemic taxa, *Acmella disciformis* and *Acmella phaneractis*, is proposed, clarifying their distinction compared to the widely distributed species *A. repens* and *A. radicans*. Likewise, the precise identity of the types and their correspondence with natural populations is clarified, which is essential for the nomenclatural stability of the genus in Mexico.

MATERIALS AND METHODS

1. Literature review and nomenclature. An exhaustive review of historical and contemporary taxonomic treatments of the genera *Spilanthes* Jacq. and *Acmella* Rich. was conducted, with emphasis on the seminal works of Moore (1907), McVaugh (1984) for the Flora Novo-Galiciana, and the monograph by Jansen (1985). The nomenclature and validity of names were verified by consulting the International Plant Names Index (IPNI), Tropicos (Missouri Botanical Garden), and World Flora Online (WFO) databases. All taxonomic proposals and nomenclatural acts presented herein were made in strict adherence to the articles and recommendations of the International Code of Nomenclature for algae, fungi, and plants (Madrid Code, Turland et al. 2025). Original protologues and diagnoses were consulted in digitized publications to compare original descriptions with herbarium material.

2. Examination of type specimens. The study was based on the critical analysis of 83 high-resolution digital images of type specimens (holotypes, isotypes, lectotypes, syntypes, and neotypes), accessible primarily through the JSTOR Global Plants platform and, in specific cases, through institutional digital portals. Material deposited in 33 international herbaria was consulted, including key collections for Mexican botany such as GH, G-DC, F, LE, MEXU, US, P, BM, K, and NY, among others. For the correct interpretation of types, herbarium labels were analyzed in detail, including the handwriting of historical collectors (e.g., Pringle, Berlandier) and previous annotations by determiners (Moore, Jansen, and others), in order to reconstruct the nomenclatural history of each sheet.

3. Morphological analysis and taxonomic criteria. We follow the Unified Species Concept (De Queiroz 2007), treating morphology and ecology as independent lines of evidence for lineage separation. Diagnostic vegetative characters (habit, stem consistency and morphology, leaf shape, indumentum) and reproductive characters (peduncle length, capitulum characteristics, presence and size of ray florets, achene morphology) were evaluated. Descriptive terminology follows the illustrated glossary for Compositae by Roque et al. (2009). Although the fruit in Asteraceae is technically a cypsel — a complex fruit derived from an inferior ovary and involving extracarpelar tissues (Marzinek et al. 2008) — we follow Wagenitz (1976) and Jeffrey (2007) in adopting the more widespread term ‘achene’ in its broad sense. These characters were contrasted with descriptions of *Acmella repens* and *A. radicans* in the literature to establish consistent morphological discontinuities.

RESULTS

Critical analysis of nomenclatural types and evaluation of diagnostic characters support the recognition of two discrete entities (Table 1), whose nomenclature, typification, and description are formalized below. Morphological, ecological, and geographical comparisons among species of the *Acmella* complex in western Mexico are presented in Table 1.

Table 1. Morphological, ecological, and geographical comparison among species of the *Acmella* complex in Western Mexico.

Character	<i>Acmella disciformis</i>	<i>Acmella phaneractis</i>	<i>Acmella repens</i>	<i>Acmella radicans</i>
Habit / Cycle	Perennial, prostrate/decumbent; floating, helophytic.	Perennial; Floating aquatic, helophytic.	Perennial, creeping (reptant); stoloniferous. Terrestrial.	Annual, erect or decumbent; Terrestrial weed.
Stems	Terete (cylindrical), fleshy and succulent; pink to purple; unbranched; fasciculate rooting at basal nodes.	Fleshy but thin/slender, non-woody; distinctive pink to purple color; very sparsely branched; with fasciculate roots at basal nodes.	Non-fleshy, frequently woody at base; branching; rooting at nodes.	Non-fleshy, woody, sometimes verrucose; branched from base.
Leaves	Fleshy; entire or shortly dentate, narrow and trinervate.	Slightly fleshy; entire; narrowly lanceolate.	Membranaceous; ovate-lanceolate, serrate.	Membranaceous; ovate, margins crenate-serrate.
Peduncles	Short to medium (5–8 cm).	Very long (12–15 cm or more); thin and striated, erect.	Variable length, generally erect.	Variable (short to long), filiform.
Ligules (Rays)	Inconspicuous/Reduced; almost imperceptible to naked eye (capitulum appears discoid).	Conspicuous; very long, intensely yellow-orange.	Present, moderate size; yellow.	Absent, rarely present, but short, white or very pale yellow.
Habitat	Subaquatic; flood-prone zones, river banks and dams (mud).	Aquatic; swamps, marshes, and slow-moving streams; wet or flooded clay soils.	Terrestrial wet; roadsides, ditches, meadows. Never helophytic.	Ruderal and agrestal; roadsides, crops, forest clearings.
Distribution	Strict endemic; South of Jalisco and North of Michoacán (Chapala-Santiago Basin).	Endemic; Jalisco and Michoacán (possibly south of Sinaloa).	Wide distribution; From southern USA to South America.	Wide distribution; Mexico, Central America, introduced in Asia/Africa.



Figure 1. Nomenclatural types of the *Acmella* complex. A. Holotype of *Acmella disciformis* (Pringle 3489, GH), showing erect/deccumbent habit and discoid heads. B. Lectotype of *Acmella phaneractis* (Pringle 8637, GH), highlighting the long peduncles and conspicuous rays. C. Neotype of *Acmella repens* (Walter) Rich., showing its characteristic creeping habit.

1. **ACMELLA DISCIFORMIS** (B.L. Rob.) Carvajal & A. Vázquez, **comb. nov.** *Spilanthes disciformis* B.L. Rob., Proc. Amer. Acad. Arts 27: 176. 1892. [Table 1]. **TYPE: MEXICO. Jalisco.** Near Guadalajara, 17 May 1890, C.G. Pringle 3489 (holotype: GH 00012613 digital image!, Fig. 1A; isotypes: F, VT).

Diagnosis: Similar to *Acmella repens* (Walter) Rich. in its prostrate or decumbent habit, but differing by its aquatic or subaquatic habitat, its fleshy and almost cylindrical (terete) stems, and primarily by its extremely reduced, almost imperceptible ray florets that give the capitula a discoid appearance (to which the epithet *disciformis* refers).

2. **ACMELLA PHANERACTIS** (Greenm.) Carvajal & A. Vázquez, **comb. nov.** *Spilanthes disciformis* var. *phaneractis* Greenm., Proc. Amer. Acad. Arts 39(5): 108. 1903. *Spilanthes phaneractis* (Greenm.) A.H. Moore, Proc. Amer. Acad. Arts 42: 543. 1907. [Table 1]. **LECTOTYPE** (designated by Jansen, Syst. Bot. Monogr. 8: 32. 1985): **MEXICO. Michoacán.** Swamps, Zamora, 1540 m, 24 Jul 1902, C.G. Pringle 8637 (GH 00012615, digital image, Fig. 1B; isolectotypes: BM, BRU, C, CAS, CM, E, F, G, GOET, K, L, LE, M, MEXU, MICH, MIN, MSC, NY, P, PH, RSA, S). Syntype: **MICHOACAN.** Swamps, Zamora, 24 May 1901, Pringle 9539 (GH 00012614); isosyntypes: C, G, US, VT.

Diagnosis: Similar to *Acmella disciformis* (B.L. Rob.) Carvajal & A. Vázquez in its fleshy stems and subaquatic habitat, but differing by its delicate and slender nature and clearly distinguished by its exceptionally long peduncles (12–15 cm) and conspicuous, intensely yellow-orange ray florets (to which the epithet *phaneractis* refers).

DISCUSSION

Jansen's (1985) monograph represented a great advance by segregating *Acmella* from *Spilanthes*, but his treatment of *Acmella repens* (under the name *A. oppositifolia*) assumed an extremely broad intraspecific morphological variability, interpreting phenotypic differences as plastic responses to the environment or minor polymorphisms. However, our analysis in western Mexico demonstrates that this interpretation masks clear and consistent morphological discontinuities.

1. Morphology, geography, and ecology. Unlike the generalist creeping habit of typical *Acmella repens*, *A. disciformis* and *A. phaneractis* exhibit specialized and stable morphological syndromes associated with helophytic environments. In both species, stem succulence (terete and fleshy) and fasciculate adventitious roots represent fixed adaptations to flood zones — traits entirely absent in the non-fleshy, terrestrial *A. repens*. Furthermore, *A. disciformis* is distinguished by its extremely reduced, almost imperceptible ligules, while *A. phaneractis* differs radically due to its exceptionally long peduncles (12–15 cm) and conspicuous, intensely colored ray florets.

The occurrence of these taxa in sympatry with *Acmella repens* and *A. radicans* within the Lerma-Santiago basin further supports their taxonomic validity. Despite this geographic overlap, the consistent absence of intermediate forms or morphological intergradation in contact zones indicates robust reproductive or ecological barriers. Since *A. repens* lacks the specialized syndrome necessary to colonize these helophytic niches, these discrete lineages remain stable even in shared environments. This reinforces the conclusion that these taxa represent distinct evolutionary lineages rather than plastic phenotypic variants of a single polymorphic species.

2. The value of reviewing historical types. One of the probable reasons for the previous synonymization of these taxa was the incomplete evaluation of original materials. Our review of 83 type specimens revealed critical details often lost in general descriptions. For instance, analysis of *Acmella phaneractis* isotypes (e.g., Pringle 8637) allowed for the identification of the pink to purple coloration of the stem and its delicate nature, characters that Pringle noted on fresh material and that

Greenman corroborated a year later. These are traits that, remarkably, are still appreciable in these historical specimens after superficial inspection.

Likewise, the clarification of the identity of *Spilanthes beccabunga* var. *parvula* and the resolution of Berlandier's types for *S. subhirsuta* and *S. orizabaensis* — consistent with our broader ongoing review of Novo-Galician *Acmella* types — reinforce the need to refine the synonymy of *A. repens*. By disentangling this historical web of names potentially misplaced in synonymy, it becomes evident that the taxonomic diversity in Mexico has been underestimated by a conservative interpretation of morphological variability.

3. Biogeographical and conservation implications. The resurrection of these taxa has profound implications for conservation. While *Acmella repens* and *A. radicans* are widely distributed species, frequently behaving as disturbance-tolerant weeds, *A. disciformis* and *A. phaneractis* show endemism restricted to the Lerma-Santiago basin and adjacent zones in Jalisco and Michoacán.

Treating these endemic entities as simple synonyms of an abundant pan-American species (*A. repens*) carries the risk of “silent extinction.” Populations of these species, linked to specific riparian habitats, face severe threats from hydrological degradation and pollution in western Mexico. Although their population sizes have not been investigated, their preference for the aforementioned habitats confers a certain vulnerability. Their formal recognition as valid species is an indispensable requirement for evaluating their risk status and including them in red lists of species with conservation problems. This confirms what was pointed out by Ferrer-Gallego and Laguna (2015), who highlight that correct typification and taxonomic delimitation are the fundamental and prior step without which it is impossible to implement effective legal strategies for the protection of threatened biodiversity.

4. Limitations and future perspectives. We recognize the value that DNA sequence analyses contribute to modern systematics. While this study is based on a morphological and nomenclatural review, the exact phylogenetic position of *Acmella disciformis* and *A. phaneractis* within the *Acmella* clade remains a priority of investigation. Future molecular studies may corroborate whether these species are sister taxa to *A. repens* or if they represent older divergent lineages associated with the Trans-Mexican Volcanic Belt. Nonetheless, the phenotypic and ecological evidence presented here is sufficient and robust to reestablish their taxonomic status and facilitate their immediate conservation.

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