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STUDIES IN THE *LEPIDAPLOA* COMPLEX (VERNONIEAE: ASTERACEAE). III. TWO NEW GENERA, *CYRTOCYMURA* AND *EIRMOCEPHALA*

Harold Robinson

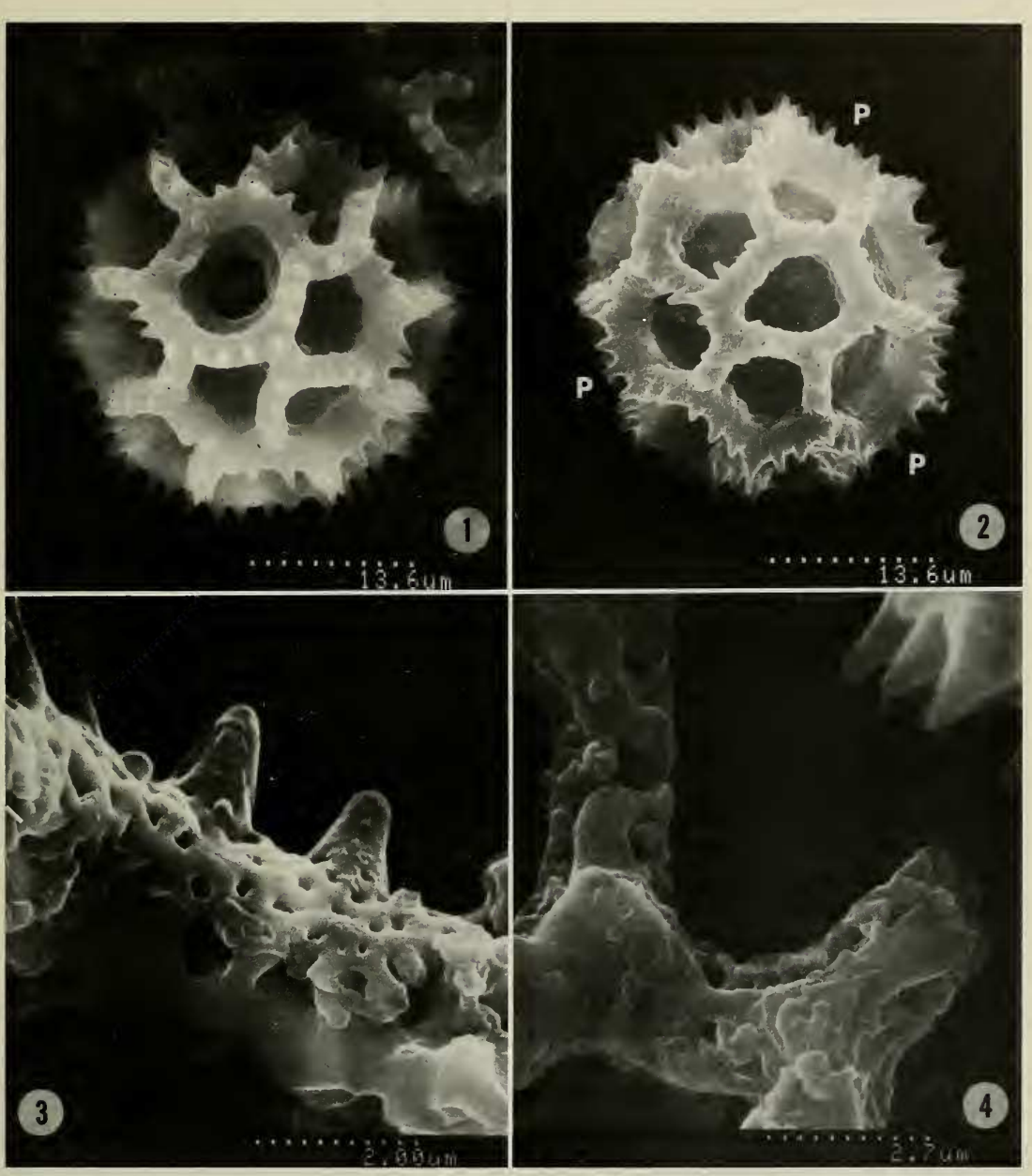
Abstract.—The *Vernonia* series *scorpioides* proves to consist of at least three distinct elements. The elements showing strongly scorpioid tips on their cymes are recognized as two new genera, the *V. scorpioides* group as *Cyrtocymura* and the *V. brachiata* group as *Eirmocephala*. The two differ in the bases of their leaves, persistence of their heads, structure of their pappus bristles, elaboration of the bases of their anther thecae, and surface of their achenes. The latter genus also shows an isolated occurrence of rhizomatous lophate pollen in one species. The rejection of the previous arbitrary selection of *V. scorpioides* as lectotype of *Lepidaploa* is confirmed.

The present paper continues a series of studies aimed at the resolution of the *Lepidaploa* group in the tribe Vernonieae. This study deals with a group that has been consistently associated with *Lepidaploa* due to its scorpioid cymes, and which is also nomenclaturally entwined with the latter genus. One of the species also shows the rhizomatous lophate pollen form that is otherwise unique to the *Lepidaploa* complex. The actual interrelationships of the scorpioid group need careful revision, and some of the species concepts have proven to need correction.

Historically the scorpioid group has been closely tied to the name *Lepidaploa*. *Vernonia scorpioides* was one of the seven species included by Cassini in 1823 in his subgenus *Lepidaploa*. Unfortunately, *V. scorpioides* was the first listed. In spite of the fact that it is generically distinct from the other species and is very unrepresentative of the series, four of which form a related group, it was later arbitrarily and rather incidentally selected as lectotype of the genus by Gleason (1906:162). The lectotypification was overturned and the more appropriate *V. albicaulis* Pers. was selected by Robinson et al. (1980). Many lectotypifications such as that made by Gleason have had to be overturned because they were made strictly on the basis of first-listed even if they were totally unrepresentative of the original concept. In the present concept, *V. scorpioides* is not the lectotype of *Lepidaploa,* or congeneric with the latter genus, and it is the type of a new and distinct genus of Vernonieae.

Both the names *Lepidaploa* and *Scorpioideae* have become widely used for subgroups of *Vernonia,* the former as the broader concept with *Scorpioideae* as a subgroup. Both concepts were applied so widely as to be undefinable, as seen in Baker (1873), where the *Scorpioideae* included such diverse species as *V. geminata* Less., *V. platensis* Less., *V. tweedieana* Baker, *V. westiniana* Less., *V. mariana* Mart., and *V. eupatoriifolia* DC.

The refined concept of the series *Scorpioides* of Jones (1979), provided the first sound basis for discussion of the group. The species included are *V. cainarachiensis* Heiron., *V. diffusa* Less., *V. ignobilis* Less., *V. megaphylla* Hieron., and *V. scorpioides* (Lam.) Pers. cited with type A pollen (Figs. 5–12), and *V. brachiata* Benth. cited with type D pollen (Figs. 1–4), using the pollen



Figs. 1–4. Pollen of *Eirmocephala brachiata* (Bentham ex Oersted) H. Robinson. 1, 2, Dotted lines = 13.6 μm; 3, dotted line = 2 μm; 4, dotted line = 2.7 μm. 1, Whole grain showing colpus with crosswalls above and below pore; 2, Polar view showing polar areole, P marks positions of pores; 3–4, Crests of exine stripped from foot layer showing rhizome and weak basal attachments.

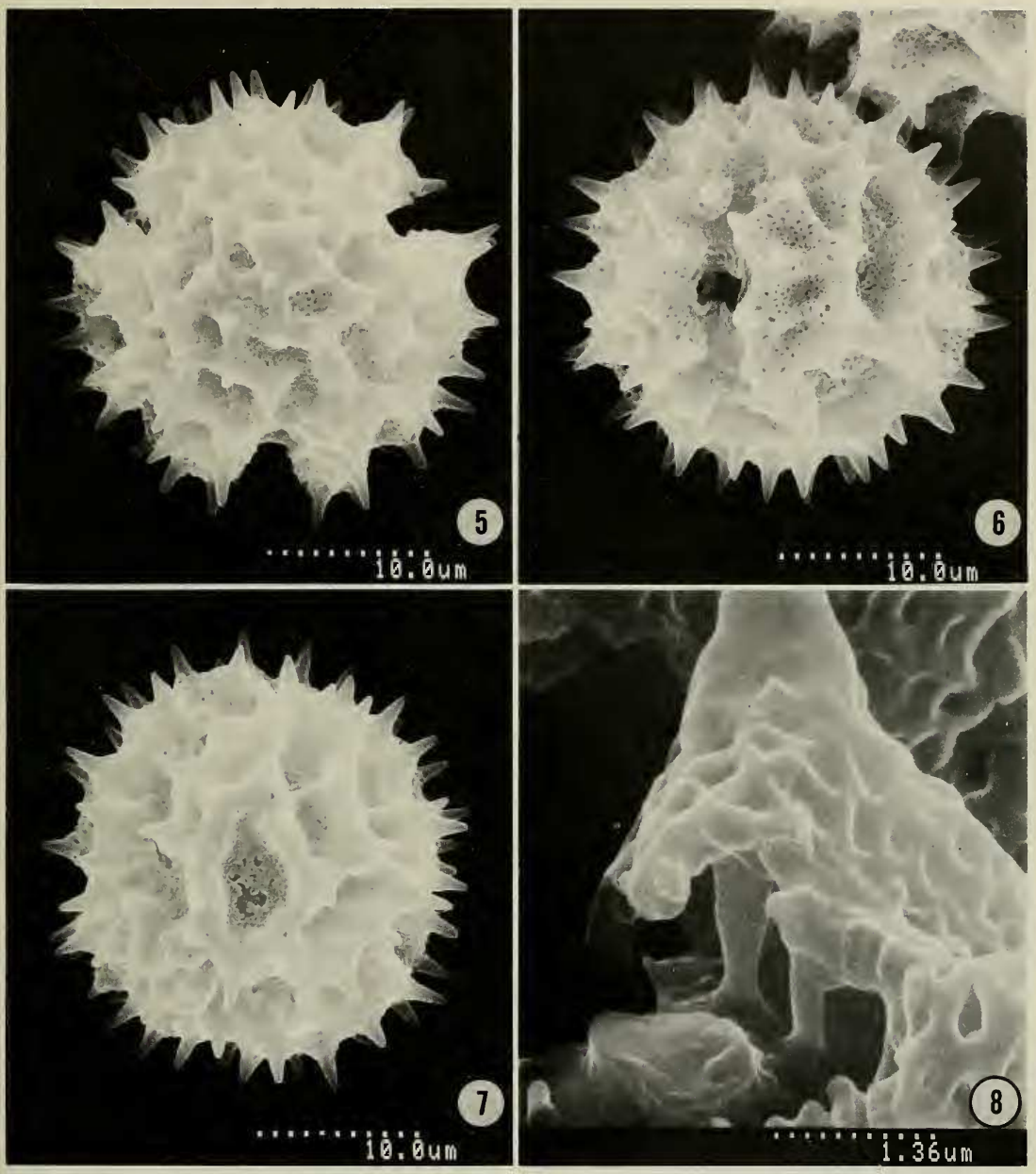
types defined by Jones (1979). With the exception of the unrelated *V. ignobilis,* all the species listed show the uninterrupted cymose branches that have lost all trace of their basically proliferated nature. All of these have reason to be considered as a possibly closely related group.

The seriate-cymose condition is particularly well-developed in the general section *Lepidaploa,* and reaches its extreme in the

present series. This character has been the primary reason for the continuing close association between the groups. In both groups the cymose branches have to be recognized as an evolutionary derivative of a repeatedly proliferating branching series, each segment of the branch being technically a lateral innovation from below the preceding head. Only in this way is the sequence of maturation of the heads maintained from the base upward. In true *Lepidaploa* the original form is more obvious and some deflection of the branch at each head is often evident. This is true even in such species as *V. geminata,* which has the subtending bracts reduced and only partially displaced laterally. In the more restricted *Scorpioides* group all trace of the innovating basic structure is lost, and the subtending bracts are shifted almost completely to one side. The two rows of heads are nearly fused into one. The branch appears as one continuous rachis and the tip is sometimes truly scorpioid as in a Boraginaceous inflorescence. The inflorescence of the scorpioid group must be considered one of the most highly derived forms in the Vernonieae; it is undoubtedly derived from the more generalized type of *Lepidaploa* inflorescence, which is distributed more widely in the tribe than the immediate *Lepidaploa* complex.

The series *Scorpioides* has one marked distinction from the true *Lepidaploa* complex in its pollen. The character presents several problems in interpretation, but the *Lepidaploa* complex is one of the largest groups in the Vernonieae that has almost consistently lophate-pollen, while the series *Scorpioides* has type A pollen in all but one species. The one example is not particularly close in any other character to *Lepidaploa* and does nothing to support the idea of close relationships between the groups. The least specialized of the species listed by Jones (1979) is *V. diffusa,* and that species has type A pollen like the large related series containing such species as *V. patens* H.B.K., *V. tweedieana, V. brasiliana* Druce, and *V. polyanthes* Less. If the type A pollen is a reversion type as now seems likely in the Vernonieae (Robinson and Kahn 1986), the reversion seems to have occurred before the origin of the series *Scorpioides.*

The one example of type D pollen in the series *Scorpioides* does require an explanation. The pollen of *V. brachiata* is not just lophate (Figs. 1, 2), but is the rhizomatous type that otherwise seems to be restricted in the tribe to the true *Lepidaploa* complex (Figs. 3, 4). The pollen type will be discussed more fully in the treatment of *Lepidaploa.* The pollen is totally unlike that seen in other members of the series *Scorpioides,* such as *V. megaphylla* (Figs. 5–8) and *V. scorpioides* (Figs. 9–12). This occurrence of rhizomatous lophate pollen in *V. brachiata* cannot be a relict, but other explanations also encounter difficulties. The general distribution of pollen types in the group does not suggest the degree of instability of types that is found in such genera as *Distephanus* (Robinson and Kahn 1986), although something certainly caused instability within the limited relationship of *V. brachiata.* Hybridization is personally regarded as a major factor in the evolution of the American Vernonieae. However, *V. brachiata* does not show the degree of difference from its close relatives, especially *V. megaphylla,* that would be expected if hybridization with a remote relative were involved in one species and not the others. The present conclusion is that the group of three species shares a hybrid history between an ancestor more like *V. diffusa* and one that was a *Lepidaploa.* The resulting hybrid could have the instability of pollen characters that on further evolution distributed differently to the derived species. There are many members of *Lepidaploa* in the geographical area of the *V. brachiata* group that could have furnished the genes for rhizomatous lophate pollen with polar areoles (Figs. 1–4). SEM views of the pollen of *V. megaphylla,* although it is type A, give further support to the hybrid ancestry for the



Figs. 5–8. Pollen of *Eirmocephala megaphylla* (Hieron.) H. Robinson. 5–7, Whole grains, dotted lines = 10 μm; 5, Polar view showing irregularity and areole at pole; 6, Colpar view showing variable sizes of areoles in adjacent intercolpus; 7, Oblique view showing intercolpus, pole at lower end of large areole; 8, Broken surface, dotted line = 1.36 μm, showing two smaller basal columellae and large scar of central columella of missing spine.

group by showing structures interpreted as polar areoles (Fig. 5). The latter character is found in the regularly lophate grains of *V. brachiata,* but is lacking from the type A grains of *V. scorpioides* (Fig. 9) of the non-hybrid group. Light microscope examination of some *V. cainarachensis* pollen also shows evidence of such irregular polar areoles.

The probable existence of a hybrid an-

cestry with *Lepidaploa* for only part of the series *Scorpioides* raises the question of other possible evidence of disunity in that group. Initially it can be noted that the differences between the two main groups of the series, recognized here as genera, the *V. scorpioides* group (*Cyrtocymura*) and the *V. brachiata* group (*Eirmocephala*), cannot be accounted for simply by the hybridization of the latter with *Lepidaploa.* It should also be noted that the third group involved, *V. diffusa* shows clear evidence of relationship to the large and widespread *V. patens-V. brasiliana* group. Finally it must be noted that the *V. brachiata* (*Eirmocephala*) and *V. scorpioides* (*Cyrtocymura*) groups each show more characters in common with the *V. diffusa* than with each other. The characters involved include the leaf bases, persistence of heads, corolla form, anther bases, resiniferous cells on the achene surface, carpopodium, and pappus.

In *Eirmocephala,* in all but a few specimens of *E. cainarachiensis,* the lamina of the leaf extends as a wing to the base of the petiole. Even where it is narrowed at the base it broadens again at the insertion. This differs from both *Cyrtocymura* and *V. diffusa,* where the petiole is always distinct and often long. This is one character in *Eirmocephala* that may trace to a *Lepidaploa* parentage. The leaves of the latter genus are characteristically sessile or short-petiolate, although not with the winged or pseudopetiolate form seen in *Eirmocephala.*

The tendency for whole older heads on the cymose branches to dehisce is restricted in the groups under discussion to *Cyrtocymura.* The older branches ultimately become completely bare except for the single small bract at the base of each head. The loss of heads limits the ability to check old receptacles on the specimens. The condition is regarded as a specialized characteristic of the genus.

The corolla lobes of *Cyrtocymura* seem characteristically more erect and less distorted than those of the other groups under discussion. *Eirmocephala* and the *V. diffusa* group seem to have more recurved or distorted lobes on the open corollas. The corolla lobes of *Cyrtocymura* also have rather distinctive sericeous pilosity on the outer surface in all but one species, the latter being an evident reversion.

In *Eirmocephala* the bases of the anther thecae are sclerified and form dentate appendages. In this respect the genus falls outside the technical limits of traditional *Vernonia,* but the character has been widely ignored by previous students of the tribe. The anther bases of *Eirmocephala* may relate the genus to *V. diffusa,* where strongly developed sclerified appendages are also present. Similar basal appendages also occur in close relatives of *V. diffusa,* such as *V. discolor* Less. and *V. piresii* H. Robinson, but they do not occur in most other members of that group, such as *V. patens* or *V. brasiliana.* There are no sclerified cells at the base of the thecae in *Cyrtocymura.* In contrast, the tissue is very indistinct at the base and more like the condition found in most Vernonieae.

In *Vernonia diffusa* and its relatives, and in *Cyrtocymura,* the surface of the achene bears distinct specialized cells that are referred to here as resiniferous. These are idioblasts that seem to contain some special substance, but they have no obvious structure such as a raphid inside. In *Cyrtocymura* the cells are intermixed with other cells that seem similarly shaped and mamillose but are not enlarged or colored. In contrast, *Eirmocephala* has no resiniferous cells on the surface. Raphids are present in other cells of the achene walls. They are elongate in *Eirmocephala,* short-oblong in *Cyrtocymura,* and very short in *V. diffusa.*

The carpopodium in two species of *Eirmocephala* is greatly enlarged and has very thick-walled oblong cells. In spite of the larger size, the detailed structure of the carpopodia is similar to that of *V. diffusa* and its relatives. The third species of *Eirmocephala, E. megaphylla,* has a shorter an-

nuliform carpopodium with essentially quadrate cells. The narrow, small-celled form of carpopodium seen in *Cyrtocymura* is undoubtedly neotic in its unenlarged, usually thin-walled cells, but it is clearly less developed than the unexpanded form of *Eirmocephala* carpopodium seen in *E. megaphylla.*

The pappus of *Cyrtocymura* differs from others in the series *Scorpioides* by the structure of both the bases and the tips. The bases have a longer, narrow, fragile area with numerous transverse walls, and the tips are more spreading-scabridulous with no evident clavate enlargement. The capillary bristles of the *Cyrtocymura* type can be easily distinguished from the clavate, erectly scabridulous and somewhat more persistent types of *Eirmocephala* and the *V. diffusa* group. No intergrading forms have been seen.

The variations in pollen within *Eirmocephala* would seem to be greater than the variations between members of that genus and *Cyrtocymura,* and the presence of type A pollen in both genera would be expected to minimize the possibility of meaningful differences. The most common type of substructure is found under the spines of both genera, a large central post with a few additional small basal columellae (Figs. 8, 12). Nevertheless, the genera seem to differ by the presence of polar areoles in *Eirmocephala* (Figs. 2, 5), even in the type A grains, and their lack in *Cyrtocymura* (Fig. 9). The pollen in *Eirmocephala* also shows variations in size that contrast with the apparent uniformity in *Cyrtocymura.* The pollen of the latter genus measures between ca. 35–37 μm in fluid in all species that have been examined. *Eirmocephala* also has grains that size, but *E. megaphylla* shows pollen that may be one of the consistently smallest in the tribe at ca. 30 μm in fluid. The sizes are smaller in SEM preparations than in fluid, but the comparative differences are still evident (Figs. 5–7, 9–11).

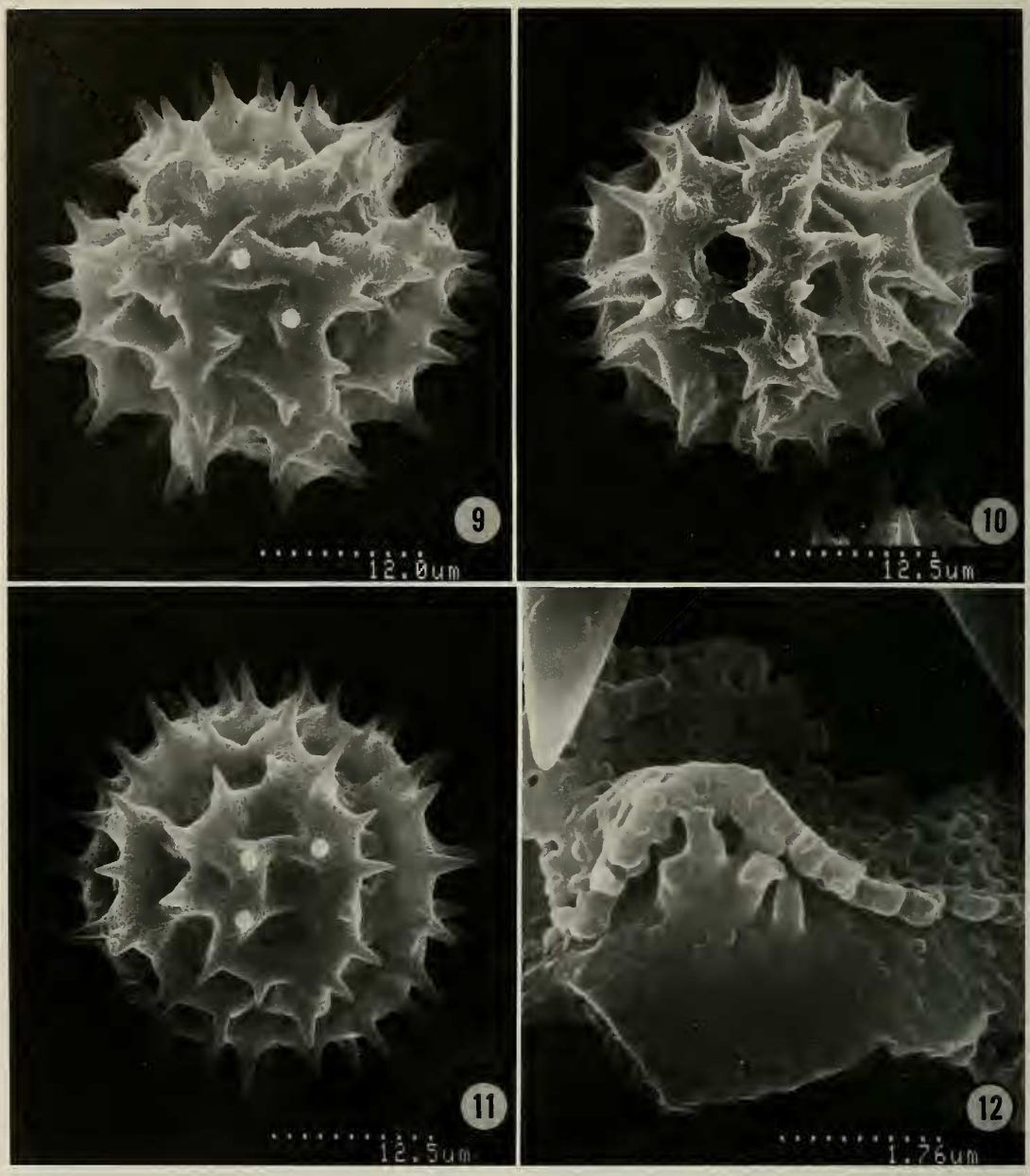
The evidence of the above characters indicates that the members of the series *Scorpioides* are generically distinct from the true *Lepidaploa* complex, and that they, in addition, form three distinct elements among themselves. The superficially similar extreme development of the scorpioides cymes in *Cyrtocymura* and *Eirmocephala* proves misleading since each of those groups proves to be related separately to a form more like *V. diffusa* or even more remote elements among the South American Vernonieae with type A pollen. The relationship of *V. diffusa* is left for treatment at a future time. The two other elements of the series *Scorpioides* are here described as the new genera *Cyrtocymura* and *Eirmocephala.*

Key to the Genera *Cyrtocymura* and *Eirmocephala*

1. Leaves distinctly petiolate with narrow insertions onto the stem; older heads at bases of cymes deciduous leaving only reduced subtending bracts on branch; pappus bristles not clavate distally, distinctly scabridulous at tip; anther thecae without sclerified dentate basal appendages; achene surface with bulging enlarged resiniferous cells .. *Cyrtocymura*
1. Leaves almost always broadly winged to the base, broadly inserted at base on the stem; older heads at bases of cymes not deciduous, with at least outer involucral bracts persistent; pappus bristles distinctly broadened near tips, with erect nonspreading indistinct scabridulae; anther thecae with sclerified basal appendages; achene surface without differentiated resiniferous cells ... . *Eirmocephala*

Cyrtocymura H. Robinson, gen. nov.

Plantae herbaceae perennes laxe ramosae 0.1–1.5 (–3.0) altae. Caules teretes vel leniter angulati. Folia alterna petiolata base anguste inserta; laminae late ovatae vel late



Figs. 9–12. Pollen of *Cyrtocymura scorpioides* (Lam.) H. Robinson. 9–11, Whole grains; 9, dotted line = 12 μm; 10, 11, dotted lines = 12.5 μm; 9, Polar view showing lack of polar areole; 10, Colpar view showing part of intercolpar region; 11, Intercolpar view; 12, Broken spine, dotted line = 1.76 μm, showing branching of central columella and one nearby smaller basal columella.

lanceolatae integrae vel dentatae subtus leniter vel dense tomentosae et glandulo-punctatae. Inflorescentiae terminales in ramis elongatis seriate cymosis scorpioideis divaricate proliferatae. Capitula in seriebus subduplicibus densis lateralibus sessilia demum decidua; bracteae involucri ca. 20–30 subimbricatae ca. tri-seriatae inaequilongae graduatae in apice breviter acutae vel filiforme attentuatae. Flores in capitulo 14–30;

corollae inferne plerumque glabrae, lobis plerumque erectis et plerumque sericeo-pilosulis; thecae antherarum base non appendiculatae non scleroideae, cellulis endothecialibus in scutis scleroideis multo noduliferae; appendices apicales antherarum glabrae; basi stylorum discoideo-nodati. Achaenia 10-costata inter costam dense sericeo-setulifera, raphidis elongatis, cellulis superificialibus mamillosis et saepe in partibus resiniferis; carpopodia anguste annulata, cellulis subquadratis in parietibus leniter incrassatis; setae pappi interiores capillares facile deciduae in partibus basilaribus transversaliter septatis elongatae apice non clavatae distincte scabridulae, squamae pappi exteriores lineares. Grana pollinis in diametro ca. 40 μm non vel leniter lophata (typus A).

Type: *Conyza scorpioides* Lamarck.

The genus includes six species, four concentrated in eastern Brasil and adjacent Bolivia, and a fifth widely distributed as far north as Mexico. A sixth species is in the West Indies.

Key to the Species of *Cyrtocymura*

1. Involucres covered by a dense, whitish tomentum; bracts without hairs inside at the apex; bases of leaf blades truncate, leaf apex obtuse or rounded, the margins distinctly crenate or crenate-serrate ... *C. harleyi*
1. Involucres appearing brownish, without a dense, whitish tomentum; bracts with hairs on inner surface at the apex; bases of leaf blades obtusely to acuminately angled; leaf apex acute or acuminate, the margins remotely serrulate to dentate, not crenate 2
2. Tips of inner involucral bracts and the persistent bract at the base of the head subulate to short acuminate 4
3. Leaves rounded-ovate with shortly apiculate tips; petioles 5 mm or less long, terminating rather abruptly at the rounded base of the leaf blade ..... *C. saepia*
3. Leaves ovate with acute tips; petioles up to 10 mm long, terminating distally in the acuminate base of the blade ..... *C. scorpioides*
2. Tips of all involucral bracts and the persistent bract at the base of the head flagelliform 3
4. Stems and branches of the inflorescence with a short pubescence, yellowish in younger parts; heads mostly 5–6 mm high; corolla lobes with few or no long hairs; leaf blades serrulate ..... *C. mattos-silvae*
4. Stems and branches of the inflorescence with a deep grayish or whitish tomentum; heads mostly 7–9 mm high; corolla lobes with many sericeous hairs on the outer surface .. 5
5. Leaf blades with rounded bases, abruptly narrowly decurrent on the petiole, the margins remotely serrulate to strongly serrate or dentate ..... *C. lanuginosa*
5. Leaf blades narrowly acute or acuminate at the base, the margins closely serrulate ..... *C. cincta*

Cyrtocymura cincta (Griseb.) H. Robinson, comb. nov.

Vernonia cincta Griseb., Symb. Fl. Argent. 162. 1879.

Cacalia cincta (Griseb.) Kuntze, Rev. Gen. Plant. 3(2):138. 1898.

Vernonia scorpioides var. *cincta* (Griseb.) Cabrera, Darwiniana 6:338. 1944.

Argentina, Bolivia.

The species is restricted to the eastern slopes of the Andes in Bolivia from Santa Cruz southward into northern Argentina. As in the case of all the close relatives of *C. scorpioides,* the present species has been reduced to varietal level (see Cabrera above). Some specimens of *C. scorpioides* seem intermediate in the tips of their involucral

bracts, but they are easily assigned on the basis of their darker and less dense pubescence and by their more nearly entire leaves. The species distinctions seem strongest in the Bolivian material.

Cyrtocymura harleyi (H. Robinson) H. Robinson, comb. nov.

Vernonia harleyi H. Robinson, Phytologia 44:287. 1979.

Brazil (Bahia).

The species is the only member of the genus sufficiently distinct to avoid any broadened concept of *V. scorpioides.* The appearance of the leaves is totally different and the involucral bracts have no hairs on the inner surface at the tip.

Cyrtocymura lanuginosa (Gardn.) H. Robinson, comb. nov.

Vernonia lanuginosa Gardn., Lond. J. Bot. 5:219. 1846.

Brazil (Minas Gerais).

The species was originally distinguished from *C. scorpioides* by the more acuminated and 3-nerved involucral bracts, the glabrous receptacle, and the shorter more paleaceous external pappus (Gardner 1846). An isotype (US) also shows a thicker pubescence on the stems, leaf undersurfaces, and involucres, a condition that was evidently the basis of the species name. The species was subsequently reduced to synonymy by Baker (1873) under *Vernonia sororia* DC. which was treated as a variety of *V. scorpioides.* The species was resurrected and extended to include in its synonymy *V. mattos-silvae* of Bahia by Robinson (1980). At present, in spite of failure of some of the original distinctions such as the receptacle character, the species is regarded as distinct from *V. scorpioides, V. sororia,* and *V. mattos-silvae,* being restricted to Minas Gerais. Although related to *C. mattos-silvae* in the flagelliform tips of its bracts and in its closely serrulate leaf margins, it is distinct in the deeper, more grayish pubescence, the more truncate base of its leaf blades, and the presence of numerous hairs on the corolla lobes. The species is actually more closely related to *C. cincta* of Argentina and Bolivia, from which it differs in the leaf base and margin. The older species with which it has been synonymized, *V. sororia* DC., proves in microfiche to be a totally different entity, matching in its type locality of Rio de Janeiro, its nearly sessile leaves, and its sparser heads that sometimes have small foliose bracts, the later described *V. coulonii* Sch. Bip. ex Baker, which is a true *Lepidaploa.*

Cyrtocymura mattos-silvae (H. Robinson) H. Robinson, comb. nov.

Vernonia mattos-silvae H. Robinson, Phytologia 44:288. 1979.

Brasil (Bahia).

The species was originally described (Robinson 1979) in ignorance of the existence of *V. lanuginosa* Gardn. which was then in synonymy under a variety of *V. scorpioides.* Discovery of the latter caused an over-reaction, with reduction of the new species to synonymy (Robinson 1980). The species is accepted here on the basis of the attenuate bases of its leaf blades, its shorter pubescence, its smaller heads, and its nearly or completely hairless corolla lobes. The species is the only member of the genus lacking numerous hairs on the corolla lobes. The descriptions consistently refer to the corollas as violet, but in most of the specimens the corollas seem to dry with a more reddish or orange color.

Cyrtocymura scorpioides (Lamarck) H. Robinson, comb. nov.

Conyza scorpioides Lamarck, Encycl. Méthod. 2:88. 1786.

Vernonia scorpioides (Lamarck) Pers., Syn. Plant. 2:404. 1807.

Vernonia subrepanda Pers., Syn. Plant. 2: 404. 1807.

Vernonia tournefortioides H.B.K., Nov. Gen., folio ed. 4:27. 1818.
Lepidaploa scorpioides (Lamarck) Cassini, Dict. Sci. Nat. 26:16. 1823, comb. inval. due to author's failure to recognize *Lepidaploa* at generic rank at the time.
Chrysocoma repanda Vellozo, Fl. Flum. 8: pl. 13. 1825.
Vernonia centriflora Link & Otto, Ic. Plant. Select. pl. 55. 1828 Dec/or Jan 1829.
Staehelina solidaginoides Willd. ex Lessing, Linnaea 4:281. 1829.
Vernonia longeracemosa Martius ex DC., Prodr. 5:42. 1836, nom. inval. in synon.
Vernonia flavescens Lessing, Linnaea 6:657. 1831.
Cacalia scorpioides (Lamarck) Kuntze, Rev. Gen. Plant. 1:971. 1891.

First described from Brazil. Widely distributed in South America from Argentina north to Trinidad and Tobago, and in Central America north to Mexico.

The species has been interpreted widely by most recent taxonomists, with *C. cincta, C. lanuginosa,* and *C. saepia* being reduced to its synonymy. The present concept shows a comparative lack of regional variation in spite of its wide distribution. The species overlaps geographically with all other members of the genus except *C. saepia* of Hispaniola.

Cyrtocymura saepia (Ekman) H. Robinson, comb. nov.

Vernonia saepia Ekman Ark. för Bot. 17(7): 63. 1921, as "*saepium.*"

Haiti.

The species has been reduced to synonymy under *Vernonia scorpioides* by Keeley (1978), and geographical considerations might at first seem to support the idea. It is the only species of the genus to be found entirely outside the center of diversity in eastern Brazil and Bolivia. Still, there are precedents for such distribution patterns in such groups as the Eupatorieae, and bird flight paths could explain such a northward extension from a Brasilian center. In any case, the species is distinctively densely foliate without intermediate forms, and it is geographically isolated in the Greater Antilles.

Eirmocephala H. Robinson, gen. nov.

Plantae herbaceae perennes saepe suffrutescentes vel subarborescentes laxe ramosae ad 1.5–3.0 (–6) m altae. Caules angulati. Folia alterna base alata vel breviter pseudopetiolata in caulibus late inserta; lamina ovata vel lanceolata margine serrata variabiliter pubescentia et subtus glandulopunctatae. Inflorescentiae terminales in ramis numerosis elongatis seriate cymosis divaricate proliferatae interdum apice scorpioideae. Capitula in seriebus subduplicibus lateralibus sessilia demum plerumque persistentia; bracteae involucri ca. 24–65 dense subimbricatae multiseriatae inaequilongae in apicibus late scariosae. Flores in capitulo 7–35; corollae inferne glabrae, lobis tenuibus distaliter pauce glanduliferis et interdum pauce piliferis; thecae antherarum base distincte scleroideae et dentatae; cellulae endotheciales in scutis scleroideis multo noduliferae; appendices apicales antherarum glanduliferae vel non glanduliferae; basi stylorum discoideo-nodati. Achaenia 10-costata intercostate erecto-patentiter setulifera base glandulifera, raphidis minutis breviter oblongis, cellulis superficialibus resiniferous nullis; carpopodia annuliformia vel gongyliformia; setae pappi interiores capillares subpersistentes in partibus basilaribus transversaliter septatis abbreviatae apice distincte latiores dense ascendentiter scabridulae, squamae pappi exteriores lineares. Grana pollinis in diametro ca. 30–45 μm lophata et rhizomatifera vel non lophata (typi A et C).

Type: *Vernonia brachiata* Benth. ex Oersted.

The genus contains three species that are distributed geographically from Costa Rica

and Colombia in the north to Bolivia in the south.

Key to the Species of *Eirmocephala*

1. Branches of inflorescence densly tomentose, the surface not visible; heads containing ca. 60 involucral bracts and 35 flowers, the inner bracts of the involucre linear, with long narrowly acute tips; achenes with narrow, annuliform carpopodia; apical anther appendages narrowly rounded at the tip ..... *E. megaphylla*

1. Branches of inflorescence with costae obvious, not completely covered by pubescence; heads containing 24–45 involucral bracts and ca. 7–21 flowers, the inner involucral bracts with rounded or shortly pointed tips; achenes with large, swollen carpopodia; apical anther appendages sharply acute at the tip 2

2. Involucres mostly wider than high, the pale or rarely reddish bracts bearing a dark median costa, acute or apiculate at the apex; heads containing ca. 45 involucral bracts and 21 flowers; apical anther appendages glabrous ..... *E. brachiata*

2. Involucres as high as wide or higher, the dark bracts lacking a darker median line, usually rounded at the apex, sometimes mucronate; heads containing 24–28 involucral bracts and 7–15 flowers; apical anther appendages glanduliferous ..... *E. cainarachiensis*

Eirmocephala brachiata
(Bentham ex Oersted)
H. Robinson, comb. nov.
Figs. 1–4

Vernonia brachiata Bentham ex Oersted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852:67. 1852. Costa Rica, Panama, Colombia, Venezuela, northwestern Ecuador (Manabí).

Eirmocephala cainarachiensis (Hieron.)
H. Robinson, comb. nov.

Vernonia cainarachiensis Hieron., Verh. Bot. Vereins. Prov. Brandenburg 48:196. 1906. Peru, Ecuador (Napo).

Eirmocephala megaphylla (Hieron.)
H. Robinson, comb. nov.
Figs. 5–8

Vernonia megaphylla Hieron., Verh. Bot. Vereins Prov. Brandenburg 48:195. 1906.
Vernonia digitata Rusby, Bull. New York Bot. Gard. 8:125. 1912.

The species has been placed in the synonymy of *Vernonia brachiata* in the recent treatment of the Peruvian species by Jones (1980), in spite of the previous observation by Jones (1979) that the two species differ in the form of their pollen. The species differ additionally in the density of the pubescence on their inflorescence branches and involucres, the shape of the involucral bracts, the numbers of bracts and flowers in the heads, the shape of the apical anther appendages, and the expansion of the carpopodia. Also, the outer squamae of the pappus in the present species are longer (often over 1 mm). In the carpopodia and the shape of the anther appendage the northern *E. brachiata* shows a closer relationship to *E. cainarachiensis* than to *E. megaphylla.* The two species that were synonymized are completely separated geographically. The present species occurs only in Peru and Bolivia.

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Literature Cited

Baker, J. G. 1873. Compositae I. Vernoniaceae. *In* Martius, C. F. P., Flora Brasiliensis 6(2):2–179.

Cassini, H. 1823. Lépidaple, *Lepidaploa. In* G. Cuvier, ed., Dict. Sci. Nat. 26:16–24. [Reprinted in R. M. King and H. W. Dawson, editors, 1975, Cassini on Compositae. 3 volumes. New York: Oriole Editions.]

Gardner, G. 1846. Contributions towards a flora of Brazil, being the distinctive characters of some new species of Compositae belonging to the tribe Vernoniaceae.—London Journal of Botany 5: 209–242.

Gleason, H. A. 1906. A revision of the North American Vernonieae.—Bulletin of the New York Botanical Garden 4:144–243.

Jones, S. B. 1979. Synopsis and pollen morphology of *Vernonia* (Compositae: Vernonieae) in the New World.—Rhodora 81:425–447.

———. 1980. Tribe Vernonieae. *In* Macbride, J. F., Flora of Peru.—Fieldiana: Botany, n. s. 5:22–69.

Keeley, S. C. 1978. A revision of the West Indian Vernonias (Compositae).—Journal of the Arnold Arboretum 59:360–413.

Robinson, H. 1979. New species of Vernonieae (Asteraceae). II. Five new species of *Vernonia* from Bahia.—Phytologia 44:287–299.

———. 1980. New species of Vernonieae (Asteraceae). V. Additions to *Vernonia* from Brasil.—Phytologia 45:166–208.

———, F. Bohlmann, and R. M. King. 1980. Chemosystematic notes on the Asteraceae. III. Natural subdivisions of the Vernonieae.—Phytologia 46:421–436.

———, and B. Kahn. 1986. Trinervate leaves, yellow flowers, tailed anthers, and pollen variation in *Distephanus* Cassini (Vernonieae: Asteraceae).—Proceedings of the Biological Society of Washington 99:493–501.

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