

## NEW SPECIES AND NEW COMBINATIONS IN THE TRIBE VERNONIEAE (ASTERACEAE)

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### ABSTRACT

*Chresta hatschbachii*, *Critoniopsis diazii*, *C. macrofoliata*, *Lepidaploa irwinii* and *Vernonanthura cabralensis* are described as new and the combinations *Gymnanthemum triflorum*, *Hilliardiella sutherlandii*, *Leiboldia guerrereana*, and *Linzia accommodata* are made.

**KEY WORDS:** Vernonieae, *Chresta*, *Critoniopsis*, *Gymnanthemum*, *Hilliardiella*, *Leiboldia*, *Lepidaploa*, *Linzia*, *Vernonanthura*, Asteraceae.

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Examination of Vernonieae specimens since publication of the general treatment of the American members (Robinson, 1999a) and the limited treatment of Paleotropical members (Robinson, 1999b) has revealed various species that need to be described and combinations that need to be validated. These include species from Mexico, Peru, Brazil, and Africa. The present validations will allow proper identifications and annotations of specimens. This will also help to avoid the continued misuse of the generic name *Vernonia* for non-*Vernonia* species where a proper alternative is readily available.

Measurements of floral parts and pollen were taken from material in Hoyer's solution.

***Gymnanthemum triflorum*** (Bremek.) H.Rob., **comb. nov.**, basionym *Vernonia triflora* Bremek., Ann. Transvaal Mus. 15: 262 (1933). S. Africa.



Fig. 1. *Chresta hatschbachii* H. Robinson, Isotype, United States National Herbarium.



There is reason to believe that the concept of *Gymnanthemum* in Robinsom (1999b) was much too broad, but the present species is evidently in the typical element of the genus.

***Hilliardiella sutherlandii*** (Harv.) H.Rob., **comb. nov.**, basionym  
*Vernonia sutherlandi* Harv. in Harv. & Sond., Fl. cap. 3: 52  
(1865). S. Africa.

The species has the T-shaped hairs on the stems, leaves, involucre and corollas that are characteristic of the genus (Robinson 1999b). The abaxial pubescence of the leaf is less dense than that in most species of the genus.

Further study of *Vernonia leopoldii* Vatke, which was transferred to *Hilliardiella* by Robinson (1999b), indicates that it does not belong to the genus. Its proper placement is still unresolved.

***Leiboldia guerreroana*** (S.B.Jones) H.Rob., **comb. nov.**, basionym  
*Vernonia guerreroana* S.B. Jones, Castanea 44: 233 (1979).  
Mexico.

The species has the glabrous, rather turbinate, 5-ribbed achenes of the *Lepidonia* group of the Vernonieae (Robinson and Funk 1987). It has the slightly enlarged base of the style and elongate raphids characteristic of *Leiboldia* in that group. The ring inside the pappus is poorly defined, but it is most evident in the way the pappus bristles are clearly inserted below the rim of the apical callus of the achene.

***Linzia accommodata*** (Wild) H. Rob., **comb. nov.**, basionym *Vernonia accommodata* Wild, Kirkia 5: 82 (1965). Zimbabwe.

The species has narrower leaves than most *Linzia* species. Nevertheless, the corollas are the blue color characteristic of the *Centrapalus/Linzia* alliance, and the pollen is lophate with spurs into the colpi, a type characteristic of *Linzia*. The involucre bracts have the characteristic numerous stiff marginal cilia of the genus, but not the obvious teeth seen distally in some species. The species seems to lack



the characteristic lines of idioblasts along the costae of the achene, but there are rows of thin-walled cells in those positions distinguished by their reddish pigment before the specimens were cleared in Hoyer's solution.

***Chresta hatschbachii* H. Rob., sp. nov.** TYPE: BRAZIL. Bahia:

Mun. Oliveira dos Brejinhos, Estr. Cana Brava a Chapadão de Cima, prox. Ao Alto da Serra Geral, Campo rupestre, afloramentos rochosos e no solo arenoso junto as roches, erva perene 50 cm, flor lilás, 16 Mar. 1998, G. Hatschbach, M. Hatschbach e E. Barbosa 67804 (holotype MBM, isotype US). (Fig. 1).

*A Chrestam harleyi similis sed in pedunculis brevibus valde differt.*

Perennial herbs 0.5-1.0 m tall, from stout creeping rootstock; stems essentially terete, weakly costate, densely white-tomentose with T-shaped hairs. Leaves alternate, lower leaves with petioles 0.5-1.0 cm long, upper leaves sessile, blades 2.0-3.5 cm long, 0.4-0.9 cm wide, lanceolate, pinnatifid with 6 or 7 blunt, rather oblong lobes on each side, sinuses reaching halfway to midrib, upper surfaces canescent with coarse T-shaped hairs, lower surface white-sericeous with T-shaped hairs. Peduncles mostly 1.0-2.5 cm long above distal reduced leaves. Heads sessile, 8-12 in clusters ca. 15 mm high, with crowded, minute, puberulous bracteoles at base of cluster of heads, individual involucre narrowly cylindrical, ca. 12 mm high, 2 mm wide, with ca. 20 ovate to narrowly linear bracts in 5-6 series, stramineous with dark median line and narrowly scarious margins, 2-9 mm long, acute with a short mucro. Florets 5 in a head; corollas lavender, ca. 14 mm long, with cylindrical capitate glands outside, mostly near throat, basal tube ca. 12 mm long, filiform below, narrowly funnelform above, sparsely pilosulous below, throat 0.1-0.2 mm long, lobes 5, linear, 2.5 mm long, ca. 0.5 mm wide; anther thecae ca. 1.3 mm long, spurs and collars ca. 0.4 mm long, no tail; apical appendages oblong-elliptic, ca. 0.35 mm long, 0.19 mm wide, with median crease, cells thin-walled. Achenes 1.2-1.5 mm long, sericeous with long, dense setulae, raphids elongate; pappus white, outer series of linear scales 0.7-1.0 mm long, inner flattened bristles 4-



6 mm long. Pollen sublophate (Type A), tricolporate, echinate, ca. 50  $\mu$ m in diam

PARATYPE: BRAZIL. Bahia: Mun. Oliveira dos Brejinhos, Estrada Oliveira dos Brejinhos/Agua Quente, ca. 6 km a partir de Oliveira dos Brejinhos, afloramentos no interior da floresta, Mata decidua, erva ca. 1.0 m alt., folhas cinéreas em ambas as faces, capítulos roxos, vistosos, frequente entre as pedras, 15 Apr 1999, A.M. Amorin, R.C. Forzza, C.B. Costa & S.C. Sant'Ana 2867 (CEPEC, US).

The paratype label is entitled "Herbário Centro de Pesquisas do Cacau-CEPEC, Projeto Mata Atlantica Nordeste, Convênio CEPLAC/Jardim Botânico de Nova Iorque", and footnoted "Projeto Financiado pela Fundação John D. & Catherine T. MacArthur"

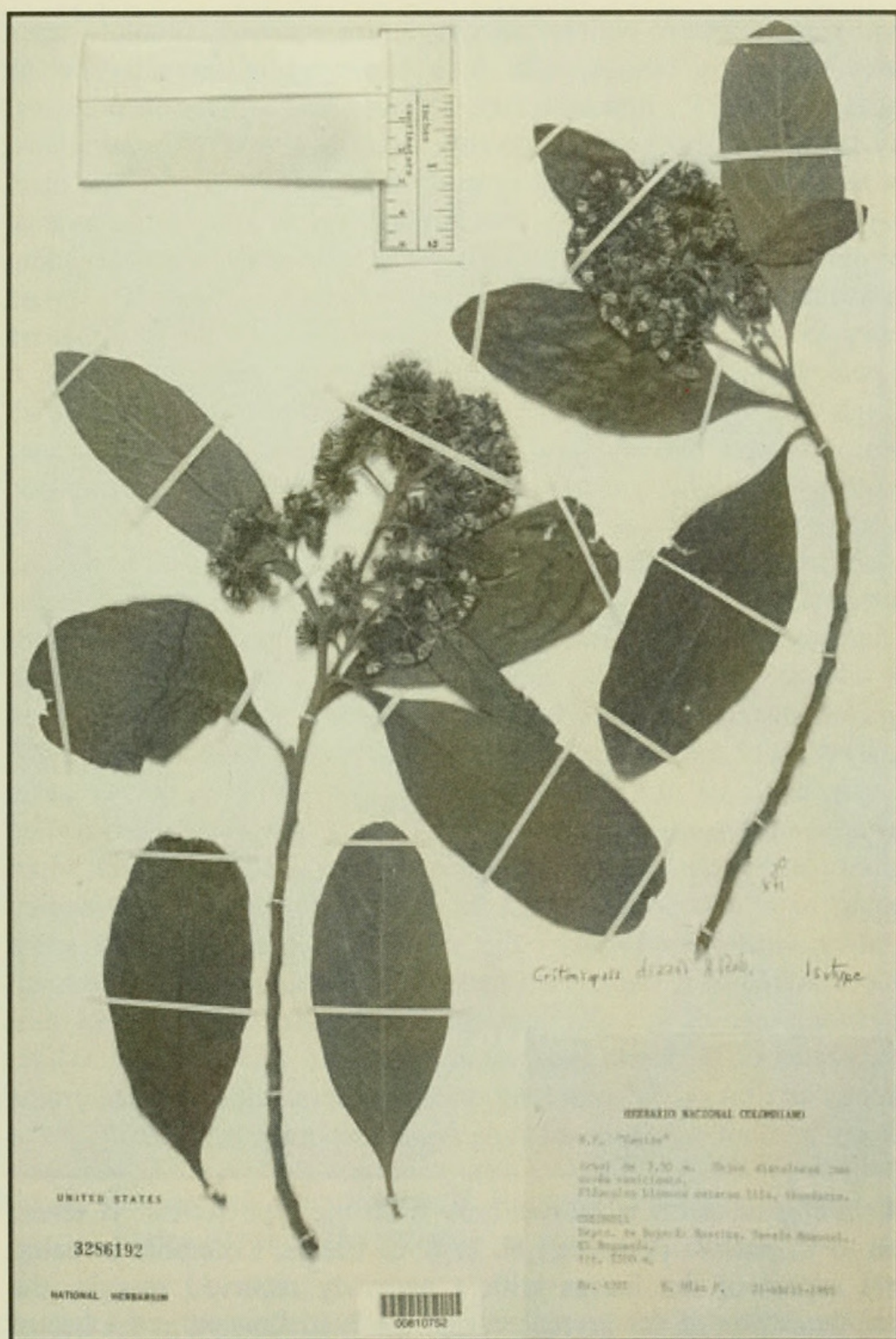
*Chresta hatschbachii* has narrow leaves with lobed margins reminiscent of *C. harleyi* H. Rob. but the leaves are generally much shorter and the sinuses of the blades reach nearer the midvein resulting in a narrower blade. The peduncles of *C. harleyi* are particularly distinctive, mostly about 30 cm long above the uppermost leaves, compared to the much shorter ones of the new species. .

***Critoniopsis diazii* H. Rob., sp. nov.** TYPE: COLOMBIA. Boyaca: Boavita, Vereda Mamonal, El Boquerón, 2200 m; arbol de 3.5 m, hojas discoloras con envés ceniciento, flósculos blancos, anteras lila, abundante; 21 abril 1991; S. Díaz P. 4381 (holotype COL, isotype US)(Fig. 2).

*A speciebus congeneribus in foliis apice obtusis vel rotundatis in pilis abaxialiter foliorum elongatis ultra basem simplicibus in inflorescentiis subthyrsiformibus in bracteis involucris interioribus brevibus apice obtusis et in floribus 8-10 in capitulo distincta.*

Trees to 3.5 m tall; distal stems to 4 mm wide, weakly 5-angled, striate, puberulous with small, irregularly lobed or pointed, glomerulate-stellate hairs; internodes short, mostly 0.3-0.6 cm long. Leaves alternate; petioles 0.8-1.5 cm long, blades rather stiffly herbaceous, oblong-elliptic, ca. 11 cm long, 4-5 cm wide, base





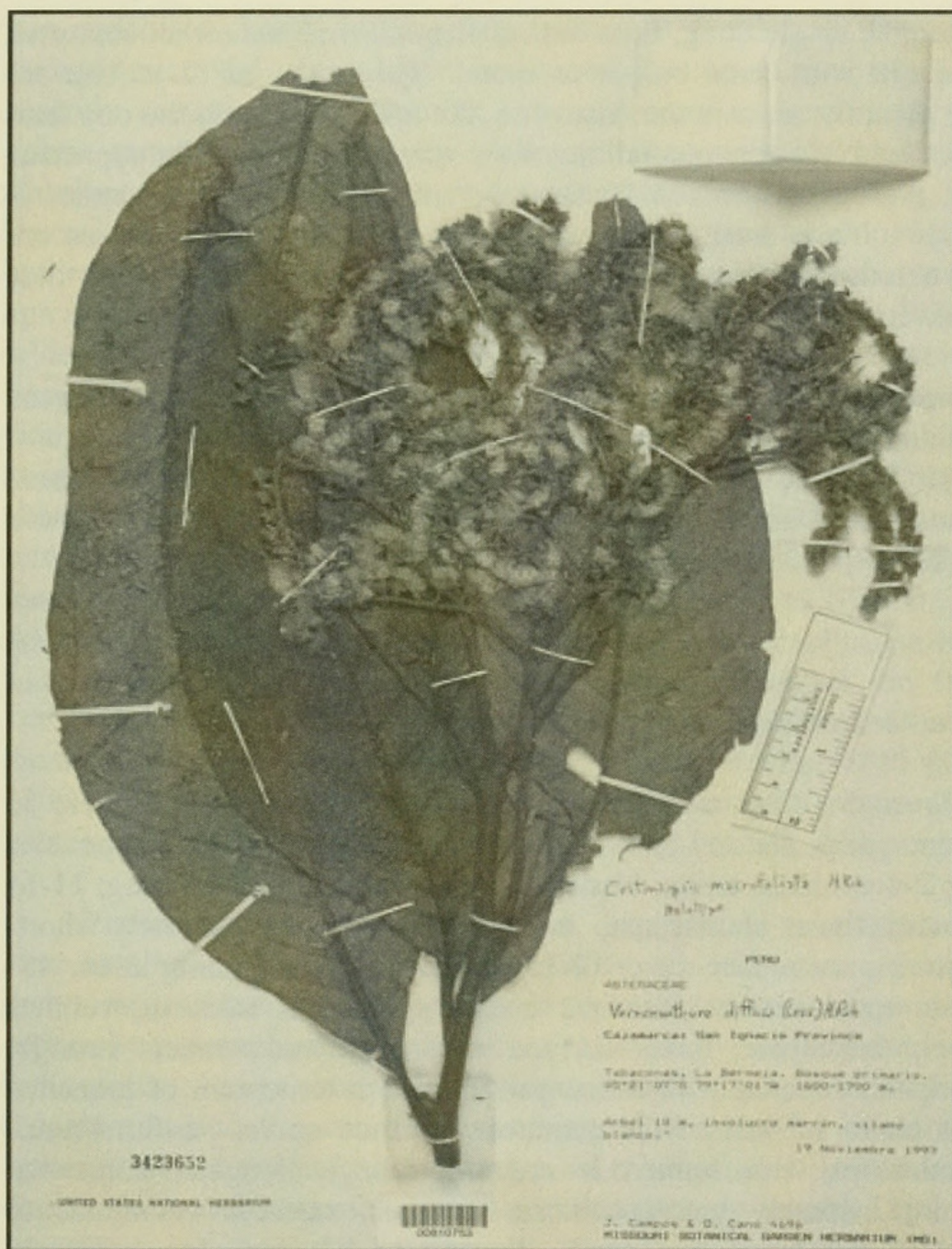
**Fig. 2.** *Critoniopsis diazii* H. Robinson, Isotype, United States National Herbarium.



gradually acuminate to petiole, margins entire, narrowly revolute, apex rounded to shortly obtuse, with 6 to 8 ascending secondary veins spreading at ca.  $35^{\circ}$ , upper surface glabrous, pilosulous on proximal parts of midvein and secondary veins, veinlets scarcely prominulous, lower surface softly, somewhat sparsely tomentose with slender, pale, mostly unbranched but basally lobed or spurred hairs. Inflorescence rather oblong-thyrsoid, 9-10 cm high, 5.5-8.5 cm wide, with ascending to spreading branches diverging at  $30-60^{\circ}$  angles, tomentellous with pale slender hairs; heads ca. 8 mm high, in small corymbiform clusters with peduncles 0-2 mm long; involucre broadly campanulate, ca. 5 mm high and 4 mm wide; bracts at base minute, congested, greyish puberulous, larger bracts 35-40 in 4 to 5 gradate series, with appressed tips, 1.0-3.5 mm long, 1-2 mm wide, tips mostly obtuse, with exposed parts appearing short and rather semicircular, outside pale-brownish with dark median glanduliferous spot near tip, surfaces with few or no hairs especially on upper bracts, innermost bracts somewhat deciduous, with narrowed bases and moderately reflexed basal margins. Florets 8-10 in a head; corollas white, 6.5-7.0 mm long, mostly glabrous, with few glands distally, basal tube broad, ca. 3 mm long, throat ca. 1 mm long, lobes ca. 2.5 mm long, 0.5 mm wide; anther thecae lilac, ca. 2.5 mm long, spurs ca. 0.7 mm long, blunt with sterile margin at base; apical appendages ca. 0.4 mm long, 0.18 mm wide, with firm-walled marginal cells; style base with annular disk; style branches with blunt sweeping hairs. Achenes ca. 2.5 mm long, generally 3- or 4-angled with some weak ribs between the angles, without hairs, with some glands clustered near base, with numerous idioblasts on surface, with short-oblong raphids in walls; pappus with an outer series of brownish, narrow scales ca. 0.35 mm long, inner pappus of ca. 45 slender, white, deciduous bristles ca. 5.5 mm long, with broadened tips. Pollen grains ca.  $47\text{ }\mu\text{m}$  in diam, sublophate (Type A), tricolporate, echinate.

*Critoniopsis diazii* is known only from the type series. It seems closest to *C. pallida* (Cuatrec.) H. Rob. of Cauca, Colombia in habit, general aspect of the leaves with a narrowly recurved margin, the campanulate form of the involucre, and the 8-16 flowers in the heads. The inflorescence of the latter is more broadly corymbiform, the secondary veins of the leaves more prominent and more spreading, and





**Fig. 3.** *Critoniopsis macrofoliata* H. Robinson, Holotype, United States National Herbarium.

the hairs on the undersurface of the leaves are granular, not at all elongate. In contrast, the new species can be immediately distinguished by its slender hairs with two short, thin-walled basal



cells, and a single, long, firm-walled, flagelliform, somewhat contorted apical cell with basal bulges or spurs. The leaves of *C. pallida* are more abruptly acute at the base, and the apex is acute in the one least broken leaf. The involucral bracts are more pubescent with appressed hairs, the heads have 15-16 flowers, and the outer pappus series is mostly 1.5 mm long, white, and more irregular. Both species are known only from the types, and some of the lesser characters may prove variable when more specimens are found.

***Critoniopsis macrofoliata*** H. Rob., **sp. nov.** TYPE: PERU. Cajamarca: San Ignacio Prov., Tabaconas, La Bermeja, bosque primerio; 05°21'07"S, 79°17'01"W, 1600-1799 m; arbol 10 m, involucro marrón, vilano blanco; 19 Nov. 1997; *J. Campos & O. Cano 4696* (holotype US, isotype MO). (Fig. 3, 6A).

*A speciebus ceteris generis in foliis alternis in laminis plerumque 25-30 cm longis abaxialiter dense tomentosis et in pilis tomenti ramosis et base armatis differt.*

Trees 8-10 m tall, distal stems 7-12 mm in diam., terete to subpentagonal, densely brownish-velutinous. Leaves alternate, petioles stout, 2-4 cm long, terete; blades oblong-elliptic, 25-30 cm long, 11-14 cm wide, base short-acute, margins entire, apex narrowly short-acuminate; secondary veins 11-12 on each side, ascending at ca. 45° angles; upper surface glabrous except puberulous midvein, veinlets scarcely insculcate; lower surface with veins and veinlets strongly exsculpate, covered with dense pale-brownish tomentum of branched hairs, bases of hairs with numerous retrorse spurs. Inflorescence corymbiform with numerous erect-spreading, elongate, somewhat scorpioid, densely seriate-cymose branches; surfaces velutinous to tomentellous, bracteoles small, linear, 2.5-3.0 mm long, densely tomentellous, scattered on seriate-cymose branches. Heads mostly 3-7 mm apart on branch, ca. 12 mm high, to 10 mm wide in fruit; outer mostly persistent involucral bracts ca. 50, erect-spreading, ovate, 1-3 mm long, tips straight, acute, outside unicostate, densely pilosulous with pale hairs; deciduous inner involucral bracts 12-17, narrowly elliptic, 5.0-6.5 mm long, ca. 1 mm wide at middle, base narrowed,



non-auriculate, basal margins not reflexed, distal half lanceolate, strongly recurved, pilosulous to tomentellous, apex narrowly acute, scarcely costate. Florets ca. 25; only old corollas seen in the plant debris, purple?, ca. 6 mm long, glabrous below, with scattered glands distally on lobes, basal tube ca. 3 mm long, throat ca. 1 mm long, lobes linear, ca. 2 mm long, 0.45 mm wide, coiling backwards with age; anther thecae ca. 2.4 mm long, spurs ca. 0.9 mm long, without tails, apical appendages narrowly triangular, ca. 0.55 mm long, 0.2 mm wide, glabrous, cells with slightly thickened porose walls, Achenes brown to blackish, ca. 4 mm long, 2- or 3-angled, nearly smooth on side toward involucre, 3- or 4-costate on side toward center of head, nearly glabrous, with idioblasts scattered or in short series, raphids short-rhomboidal; pappus white, outer series of linear scales ca. 0.5 mm long, inner series of 35-40 deciduous, slender bristles ca. 4.5 mm long, broadened distally. Pollen ca. 40  $\mu$ m in diam., sublophate (Type A), tricolporate, echinate.

PARATYPE: PERU. Cajamarca: San Ignacio Prov, Chirinos, localidad de Pacasmayo, bosque primerio, 05°15'00"S, 78°55'00"W, 1700-1800 m; arbol 8 m, involucro pardusco, aquenio negro, vilano blanco, 23 Oct 1997; J. Campos & Z. Garcia 4524 (MO, US).

*Critoniopsis macrofoliata* has a superficial resemblance to *Vernonanthura diffusa* (Less.) H. Rob. of Brazil, and was provisionally determined as that some years ago in spite of considerable evidence, especially geographical, that it was not. Ultimately, it is not even in the same genus. Easily observed differences include the lack of setulae on the achenes and the complex branching of the abaxial hairs of the leaves. Another feature indicative of *Critoniopsis* is the easily deciduous inner bracts of the involucre with strongly recurved tips.

***Lepidaploa irwinii* H. Rob., sp. nov.** TYPE: BRAZIL. Minas Gerais: Serra do Espinhaço; ca. 29 km SW of Diamantina on road to Gouveia, rocky slopes; elev. 1300 m; herb ca. 50 cm tall, heads lilac-magenta, common; 14 Jan 1969; H.S. Irwin, R. Reis dos Santos, R. Souza & S.F. da Fonseca 21902 (holotype UB, isotypes NY, US)(Fig. 4).



*A Lepidaploam rufogriseam similis sed in floribus 20-25 in capitulo et in corollis non piliferis distincta.*

Perennial herbs 0.5-1.5 m tall; stems and leaves covered with dense, short, bottle-shaped hairs attached near broader, rounded, lower end, forming dense, often brownish felt on upper stem and branches; stems weakly 10-costate. Leaves alternate; lower leaves with petioles ca. 1 mm long, with blades oblong-elliptic, to 3.5 cm long, 1.2 cm wide, base cuneate, margins 7- or 8-serrate, apex acute, upper surface greyish-green, puberulous with minute hairs and many glandular dots, lower surface densely whitish subsericeous; upper leaves sessile, linear to narrowly elliptic, 1-2 cm long, 0.2-0.5 cm wide, often infolded and complicate, margins subserrulate to entire, surfaces as in lower leaves. Inflorescence with many arching, seriate-cymose branches, with bracteoles mostly linear as in upper leaves; mature heads mostly 1-2 cm apart, 8-10 mm high and wide; involucre bracts 37-40 in ca. 6 series, all appressed, short-ovate to oblong-lanceolate, 0.5-5.5 mm long, acute to short-acuminate, margins narrowly scarious, outer surface brownish or pale reddish and densely pilosulous, with many glandular dots distally. Florets 25-30 in a head; corollas lilac to magenta, 6-8 mm long, without hairs, with glandular dots especially distally on lobes, basal tube 2-3 mm long, throat ca. 1 mm long, lobes 3-4 mm long, 0.5-0.6 mm wide; anther thecae ca. 2.4 mm long, basal spurs 0.7 mm long, no tails; apical appendage narrowly triangular, 0.6-0.7 mm long, ca. 0.23 mm wide. glabrous, with thin-walled cells. Achenes ca. 2 mm long, densely sericeous with long setulae, with scattered idioblasts, raphids not seen in either specimen; pappus white, outer series of oblong-lanceolate scales 2.0-2.3 mm long, inner series of ca. 45 bristles 4.5-6.0 mm long, tapering from broadened bases to tips. Pollen ca. 55  $\mu$ m in diam., echinolophate, tricolporate with crosswalls in colpi above and below pores (Type D).

PARATYPE: BRAZIL. Minas Gerais: Mun. Serro, Cabeceiras do rio Jequitinhonha, Cascata Moinho de Esteira, campo rupestre; arbusto ramoso, 1.5 m, capitulo lilás; 25 Oct 1999; G. Hatschbach, R. Spichiger, A.C. Cervi & E. Barbosa 69727 (MBM, US).





Fig. 4. *Lepidaploa irwinii* H. Robinson, Isotype, United States National Herbarium.



The type of *Lepidaploa irwinii* was determined by Barroso as *Vernonia eremophila* Mart. ex DC., a synonym of *Lepidaploa rufogrisea* (St. Hil.) H. Rob. The latter species seems to be the closest relative, having similar arching branches in the inflorescence and the same type of bottle-shaped hair on the stems and leaves. The pollen with the crosswalls in the colpi is also characteristic of this group of *Lepidaploa*. The new species is most easily distinguished by the shorter, broader, less cylindrical involucre with more closely imbricated bracts, and by the ca. 20 rather than ca. 10 florets in the heads. The paratype, which lacks lower leaves, has a superficial resemblance to *L. tombadorensis* (H. Rob.) H. Rob. which is immediately distinct in its involucre bracts with denser pubescence and rounded to subtruncate tips.

***Vernonanthura cabralensis* H. Rob., sp. nov. TYPE: BRAZIL.**

Minas Gerais: Mun. Joaquim Felício, Serra do Cabral; campo rupestre, solo arenoso; alt. 950-1000 m; ereta, 1 m, flor lilás; 15 May 2001; G. Hatschbach, M. Hatschbach & E. Barbosa 72044 (holotype MBM, isotype US)(Fig. 5, 6B, C, D).

*A Vernonanthuram lucidam in foliis abaxialiter non tomentosis et non sericeis similis sed in capitulis majoribus, in floribus ca. 15 in capitulo et in pilis abaxialibus foliorum plerumque T-formibus distincta.*

Perennial herbs 0.4-1.0 m tall, apparently with woody rootstock; stems with many weak costae, hirsute near base, puberulous above, glabrescent. Leaves alternate, essentially sessile but sometimes slender at base, bases cuneate to acuminate, margins serrate, apices acute, upper surface scabrid, lower surface with numerous glandular dots and slender T-shaped hairs, lower leaves obovate to oblanceolate, 3.5-6.0 cm long, mostly 1.5-2.0 cm wide, median leaves narrowly elliptic to linear-lanceolate, 5-15 cm long, 0.5-2.5 cm wide, upper leaves and lower bracts of inflorescence linear, 1.2-3.0 cm long, 0.2-0.4 cm wide. Inflorescence corymbiform to broadly thyriform with strongly ascending cymose branches; peduncles 4-14 mm long; heads 10-14 mm high, with involucre 6-9 mm wide, mostly obconic to funnelform,





Fig. 5. *Vernonanthura cabralensis* H. Robinson, Isotype, United States National Herbarium.



usually with small bracts continuing onto upper half of peduncle; involucre bracts more than 50, in 6 or more series, mostly yellowish brown with darker tips, hairless and mostly glabrous outside, with clusters of glands distally, lower bracts scale-like, ca. 1.5 mm long, sharply acute, inner bracts to 6 mm long, narrowly oblong-elliptic, short-acute. Florets ca. 15 in a head; corollas 7-9 mm long, hairless, basal tube 4-5 mm long, throat 1.5 mm long, lobes 2.5-3.0 mm long, 0.5-0.8 mm wide, with ca. 6 longitudinal lines or ducts, with few glandular dots distally; anther thecae ca. 3 mm long, spurs ca. 0.9 mm long, with short tails; apical appendages oblong-elliptic, 0.7 mm long, 0.28 mm wide, appendages and connectives with scattered glands. Achenes ca. 2.6 mm long, 8-10-costate, with numerous short spreading setulae and glandular dots, raphids subquadrate; pappus white, outer series of many narrow scales 0.3-0.5 mm long, inner bristles 50-55, 3.5-4.0 mm long, not or scarcely broadened distally. Pollen ca. 50  $\mu$ m in diam., sublophate (Type A), tricolporate, echinate.

PARATYPES: BRASIL. Minas Gerais, Mun. Joaquim Felício, Serra do Cabral, Córrego Veado Esfolado; campo rupestre, solo arenoso, ereta, 40 cm, capitulo lilás; 14 Mar 1997; *G. Hatschbach*, *M. Hatschbach* & *E. Barbosa* 66230 (MBM, US); Mun. Joaquim Felício, Serra do Cabral, estrada para Francisco Dumont; 950 m; campo cerrado; ereta, 70 cm, capitulo lilás, 16 May 2001, *G. Hatschbach*, *M. Hatschbach* & *E. Barbosa* 72087 (MBM, US); Mun. Francisco Dumont, Serra do Cabral, estrada para Francisco Dumont, próximo do Rio Imbalaçaia; 950 m; campo cerrado, capitulo lilás; 16 May 2001; *G. Hatschbach*, *M. Hatschbach* & *E. Barbosa* 72101 (MBM, US).

*Vernonanthura cabralensis* would key generally in Stutts (1988) to *Vernonia* (*Vernonanthura*) *lucida* Less. which also lacks dense pubescence on the underside of the leaves. Instead, the underside of the leaves of *V. cabralensis* have scattered T-shaped hairs. The heads of the new species are also larger than those of *V. lucida* and its closest relatives, with mostly ca. 15 rather than mostly ca. 8-10 florets.

There are very unusual hairs or hair-like structures abaxially on the leaves that have a swollen, capsule-like base with many small cells





**Fig. 6.** Scanning Electron photographs of Vernoniaceae trichomes. A. Detached hairs of *Critoniopsis macrofoliata* showing some branching and basal spurs. B, C, D. *Vernonanthura cabralensis*; B. Abaxial surface showing numerous infected hairs; C, D. Bases of infected hairs showing lateral insertion.

inside and a proliferated tip with small-celled filaments. The latter “hairs” are on the leaves of all four specimens, and they often occur rather regularly dispersed. SEM investigation of the hairs shows that the attachment is L- or T-shaped. In the March 1997 collection (Hatschbach et al. 66230) the hairs are sparse and glandular dots are numerous. In the May 2001 collections (Hatschbach et al. 72044, 72087, 72101) the “hairs” are more common and they seem to replace the glands. Such structures are considered here as real hairs or glands that are infected with some fungus. If true, the fungus is widespread in the species. Such hairs have not been seen on other species, but a complete survey has not been made.



The longitudinal lines or ducts in the corolla lobes are the type seen thus far only in the genera *Trepadonia* (Robinson, 1994), *Vernonanthura*, and *Vernonia*.

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Marjorie Knowles has helped extensively with loans and other specimens, SEM sessions, and proofreading. Scott Whittaker, head of the SEM Laboratory is thanked for operating the Leica stereoscan 440 SEM microscope with a Lanthanum hexaboride (LaB<sub>6</sub>) electron source. The type specimens were scanned by Ingrid Lin.

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