TAXONOMY OF *FLYRIELLA* (ASTERACEAE-EUPATORIEAE)

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ABSTRACT

A taxonomic treatment of the genus *Flyriella* is rendered including information relating to its generic relationship, phyletic arrangement of its four species, chromosomal, and chemical dara. Illustrations of the species are presented along with a map showing distributions.

INTRODUCTION

Flyriella King & Robinson is a North American genus of four species which is largely confined to north central and northeastern México, but extends into the United States in the border regions of Trans-Pecos Texas. The genus was proposed by King & Robinson (1972b). It is named in honor of Dr. David Flyr, plant systematist from The University of Texas (Turner 1972), who placed the generitype (*Eupatorium parryi*) in the genus *Brickellia* (as *B. shineri*) after removing it from its original position in *Eupatorium*. This placement by Flyr (1968) was based upon a number of morphological features which he took to be brickellioid. Flyr noted that *B. shineri* did, however, differ from other species of *Brickellia* (with the exception of *B. fendleri* Gray) in having only five-ribbed rather than ten-ribbed achenes as is typical of *Brickellia*.

The dissociation of *Eupatorium parryi* from *Brickellia* by King & Robinson left *B. fendleri* as anomalous in *Brickellia* in possessing five-ribbed achenes. Gray, as noted by Flyr, was uncertain as to the proper placement of *B. fendleri;* it remained for King & Robinson (1972a) to place the latter in a newly erected monotypic genus, *Brickelliastrum*. In their establishment of *Flyriella*, King & Robinson recognized five species: *F. chrysostyla, F. sphenopoda, F. leonensis, F. parryi,* and *F. stanfordii*. In 1982, they added an additional species, *F. harrimanii*.

In the present treatment we have recognized only four species: 1) *F. parryi*, a wide-ranging, variable, taxon that includes *F. chrysostyla* and *F.*

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sphenopoda; 2) *F. leonensis*, a weakly differentiated taxon from near Monterrey, México; 3) *F. stanfordii*, a species along the Sierra Madre Orientale; and 4) *F. harrimanii*, a very distinct local endemic in the lower montane regions about Gómez Farías, Tamaulipas.

CHROMOSOMAL STUDIES

Chromosome counts are available for only two species, *F. leonensis* and *F. parryi*, both diploid, as indicated in Table 1. The base number $x = 10$, is not known to occur in *Brickellia* (King et al. 1976). The latter genus has a base chromosome number of $x = 9$. *Eupatorium* has a base number of $x = 10$, as does *Alomia* (Mabry et al. 1981), near which we would position *Flyriella*.

FLAVONOID STUDIES

Mabry et al. (1981) have made the only chemical study of *Flyriella*. They examined three of the four species, (*F. parryi, F. leonensis*, and *F. stanfordii*) as shown in Figures 1 and 2. Unfortunately, only two populations of *F. parryi* were examined and only one population each of *F. leonensis* and *F. stanfordii*. All the species examined produce glycylated quercetins. *Flyriella stanfordii* differs significantly from *F. parryi* and *F. leonensis* in producing only monoglycosidic forms.

Mabry et al. (1981) treated *F. sphenopoda* as a distinct taxon, and the chromatographic profiles of plants referable to this name lacked the monoglucosides (Fig. 1). However, in view of the considerable morphological variability in its flavonoid components, no significant taxonomic import is given the chromatographic profile concerned.

SPECIES RLATIONSHIPS WITHIN *FLYRIELLA*

Flyriella parryi, a wide-ranging variable species, appears to be most closely related to *F. leonensis* and is sympatric with it in the vicinity of

TABLE 1. Chromosome Numbers in *Flyriella*

Species	Chromosome Number (2n)	Location and Voucher
F. leonensis	20	MÉXICO: Nuevo León. 17 mi by road W of Horsetail Falls. *Turner 10037* (LL).
F. parryi	20	MÉXICO: Coahuila. Above Las Delicias. *Powell 2699* (TEX)
F. parryi	20	MÉXICO: Nuevo León. 5 mi W of El Alamo. *Turner 10007* (LL).

Monterrey, Mexico. Additional work in this area is needed to ascertain if they grow in close proximity which might occasion hybridization. Chemical analysis reveals that *F. leonensis* is almost identical with *F. parryi*, sharing three of the four flavonoids concerned: quercetin 3-arabinoside, ombuoside, and tamarixetin 3-rhamoglucoside (Mabry et al. 1981, Figs. 1, 2).

Flyriella stanfordii is believed to be more closely related to *F. harrimanii* than are *F. parryi* and *F. leonensis*. Both *F. stanfordii* and *F. harrimanii* possess short glandular trichomes and winged petioles and both occur in the more mesic habitats of southern Tamaulipas. Nevertheless, *F. stanfordii* is probably more closely related to *F. parryi* and *F. leonensis* than it is to *F. harrimanii* to judge from its involucral characters.

Relationships among the four species are shown in Figures 3 and 4. This is largely derived from consideration of hypothetical polarized character states as shown in Table 2. That is, we have erected an imaginary primitive state for the characters concerned, based on a wide experience with what appears to be specialized characters in the tribe Eupatorieae generally. We do not believe that arbitrary selection of an out-group for cladistic analysis

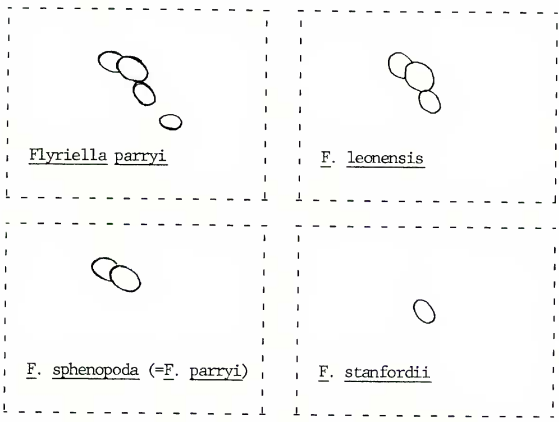

Fig. 1. Two-dimensional chromatographic flavonoid patterns for *Flyriella* (modified from Timmerman 1980).

TABLE 2. Hypothetical primitive versus advanced character states in *Flyriella* (P = *F. parryi*; L = *F. leonensis*; S = *F. stanfordii*; H = *F. harrimanii*).

PRIMITIVE (0)	ADVANCED (1)	SPECIES
		P L S H
1. Leaves with glandular trichomes	1. Leaves without glandular trichomes	0 1 0 0
2. Petioles alate (clearly winged)	2. Petioles not alate (poorly winged)	1 1 0 0
3. Involucral bracts not scarious	3. Involucral bracts scarious	1 1 1 0
4. Outer involucral bracts leafy	4. Outer involucral bracts reduced	1 1 1 0
5. Involucral bracts numerous	5. Involucral bracts reduced	1 1 1 0
6. Numerous florets/head 50 – 100 = 0 30 – 49 = 1 10 – 29 = 2	6. Fewer florets/head	2 2 1 0
7. Corolla flared	7. Corolla tubular or constricted	1 1 0 0
8. Carpopodia mostly not contorted	8. Carpopodia mostly contorted	1 1 0 0
9. Habitat mesic	9. Habitat xeric	2 1 0 0
	Totals	10 10 4 0
Mesic = 0 Sub-mesic = 1 Desert = 2		

at this time would be a meaningful phyletic exercise, although it might reduce the circularity of our premise.

Based upon the characters in Table 2, *F. harrimanii* appears to be the most primitive species in the genus. Its leafy involucral bracts as well as other "primitive" or less advanced features suggest that the remaining taxa evolved out of similar ancestral prototypes, culminating in the more xeric *F. parryi* (Fig. 4) whose involucre and florets evolved so as to "mimic" species of *Brickellia*.

As can be seen from the cladogram (Fig. 4), character states 2, 6, 7, 8, and 9 are synapomorphies linking *F. leonensis* and *F. parryi*. Character states 9[2] and 1 are automorphies for *F. parryi* and *F. leonensis* respectively. Character states 3, 4, 5, and 6 are synapomorphies for the three species *F. leonensis*, *F. parryi*, and *F. stanfordii*. *Flyriella harrimanii* appears to be, as noted above, the most primitive species.

It will be interesting to obtain additional chemical data for *F. stanfordii* and *F. harrimanii*, for it appears from current analyses that the more highly evolved diglycosidic flavonoids might be missing from the latter species, substantiating the suggestions made here, which are largely based upon morphological data.

GENERIC RELATIONSHIPS OF *FLYRIELLA*

In his transfer of *Eupatorium parryi* into the genus *Brickellia*, Flyr (1968) largely emphasized its narrow, erect-lobed, constricted corollas and

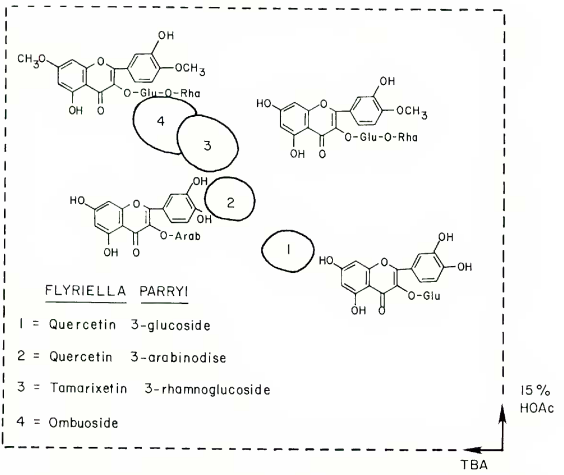

Fig. 2. Two-dimensional chromatographic profile of *Flyriella parryi*: TBA = t-BuOH-HOAc-H_2O, 3:1:1 (modified from Mabry et al. 1981).

narrow, green and white, seriate phyllaries. Indeed, in these and in certain microfeatures, chiefly the hirsute stylar node, it is very similar to *Brickellia*. *Flyriella*, however, lacks fringed pappus setae and, of course, possesses fewer ribs on its achenes and has a base chromosome number of $x = 10$. Nevertheless, *Flyriella* shares a close relationship with *Brickellia* and both genera are placed in the subtribe Alomiinae by Robinson & King (1977).

Mabry et al. (1981), upon completion of a series of chemical analyses, found no support for a close link between *Flyriella* and *Brickellia*. They note that the flavonoid chemistry of *Flyriella parryi* and *Brickellia laciniata* (Timmerman et al. 1979) reveal very different patterns. *Brickellia* species contain 6-methoxylated glycosides, sulfates, and aglycones, none of which is found in *Flyriella* (Figs. 2, 3).

Turner, in Mabry et al. (1981), suggest that *Flyriella* is more closely related to *Alomia* rather than *Brickellia*. There is much evidence to support this hypothesis, and it comes from several lines of investigation, as noted below.

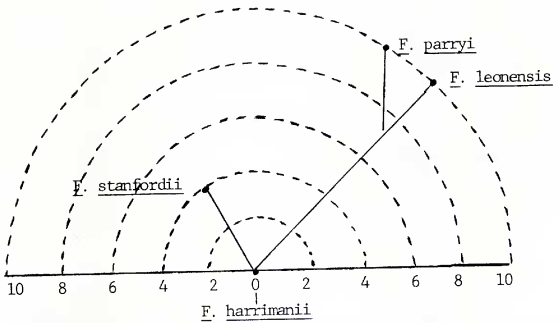

Fig. 3. Wagnerian diagram showing hypothetical relationships among the four species of *Flyriella*. Character states for the construction shown in Table 2.

In addition to the chemical data, two of the four species of *Flyriella* have been shown to be diploid with $2n = 20$ or $x = 10$ (Table 1). This base number also characterizes *Alomia* (Mabry et al. 1981). *Brickellia*, on the other hand, has a base chromosome number of $x = 9$.

Both *Flyriella* and *Alomia* are spring-flowering. *Brickellia* is predominately a fall-flowering genus as are the majority of its close relatives. Because most Eupatorioid genera of the Chihuahuan Desert region are fall-flowering, it can be suggested that *Flyriella harrimanii*, which appears to be the most primitive member of the genus on morphological grounds, is the species which lies geographically nearest the hypothetical center-of-origin of the group. The more advanced features of *F. parryi* are perhaps adaptations to drier habitats. Even so, label data and observations in the field by the junior author show the species to be largely confined to more mesic sites in the desert regions (along perennial streams mostly in cool, moist canyons).

In short, since *Flyriella* appears not to be closely related, phyletically speaking, to *Brickellia*, and since it has no extant desert relatives from which it might have evolved, the most likely ancestral candidate at this time appears to be *Alomia* or a close relative of the latter (Table 3). *Alomia* may have had a double origin, partly Ageratoid and partly Trichonioid, as noted by both B. L. Robinson (1913) and Robinson and King (1977). Indeed, the junior author has suggested that *Flyriella* and *Alomia* might be better positioned in the subtribe Ageratinae. This implies that the

TABLE 3. Comparison of selected characters of *Alomia* and *Flyriella*. *Brickellia* is not compared here since it is exceedingly variable and such a litany would be beyond the scope of this study. If compared, it would differ from *Alomia* and *Flyriella* largely by its base chromosome number, $x = 9$, fall-flowering, and more xeric habitats.

	ALOMIA	FLYRIELLA
Distribution	Subtropical regions of México & South America	Subtropical to drier temperate regions of north central and northeastern México
Habitat	Mesic	Mesic to semi-xeric
Habit	Perennial herbs	Perennial herbs
Stem vestiture	Long non-glandular trichomes or glandular trichomes	Long non-glandular trichomes or glandular trichomes
Leaves	Mostly opposite	Mostly opposite
Petiole	Alate or non-alate	Alate or non-alate
Phyllary shape	Mostly acute to acuminate	Mostly acute to acuminate
Corolla	Flaring or tubular	Flaring, or tubular with or without apical constriction
Stylar node	None	Present
Carpopodium	Contorted	Contorted or "turbinate"
Achene	4 – 5-ribbed	4 – 5-ribbed
Pappus bristles	None or reduced	Well-developed
Chromosome no.	$x = 10$	$x = 10$
Anthesis	Spring	Spring

morphological characters which relate it to *Brickellia* (discussed above) are convergent. Additional study, especially chemical, is needed to confirm or refute the close relationship of *Flyriella* and *Alomia*.

TAXONOMY

FLYRIELLA K. & R., Phytologia 24:69. 1972.

Perennial herbs, 0.5 – 2.0 m tall; stems erect, puberulent to viscid from a tap root or short rhizome. Leaves opposite below, often becoming alternate above. Capitulescence a terminal corymboid panicle. Heads turbinate to hemispheric, the florets yellowish-white. Involucral bracts in 3 – 5 imbricated series, striated green and white, occasionally tinged with purple. Receptacle plane, naked. Corollas tubular, gradually flaring upward but often constricted just below the lobes. Lobes 5, short, narrowly triangular. Anthers included, appendages ovate. Style branches linear, yellowish-white, sometimes turning rusty colored upon drying. Achenes 4 – 5-ribbed, sparsely pubescent, carpopodium short to elongate, often contorted. Pappus of 20 – 40, white, ciliate setae. Base chromosome number, $x = 10$.

TYPE SPECIES: *Eupatorium parryi* A. Gray

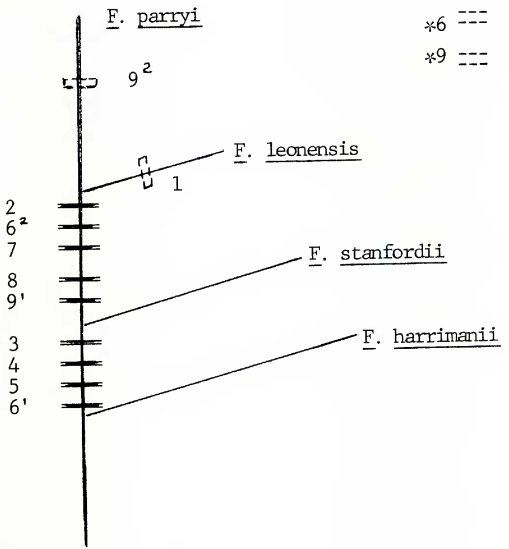

Fig. 4. Cladogram constructed from results obtained from computerized method (Wagner 78, Version 25/8/79, James Farris, State University of New York, Stony Brook, IBM 370/178 Computer). Data utilized based on character states from Table 2.
*Change in characters number 6 & 9 from character states 1 & 2.

KEY TO SPECIES

A. Outer involucral bracts somewhat leaf-like, as long or longer (10 – 15 mm) than the innermost bracts; florets 70 – 100 per head ..... 1. *F. harrimanii*
A. Outermost involucral bracts not leafy, much reduced (3 – 6 mm long); florets 10 – 49 per head (B)
  B. Corolla throat narrowly funnelform, not constricted below the lobes; petioles conspicuously winged throughout; montane subtropical areas of southern Tamaulipas and Nuevo León ..... 2. *F. stanfordii*
  B. Corolla throat tubular (ca 0.5 mm across), not conspicuously constricted below the lobes; petioles only partially winged, if at all; montane mostly desert areas of north central México (C)

C. Stems and branches of capitulescence with glandular trichomes or these intermixed with long, straight mostly stiff hairs; widespread variable species of north central México and adjacent areas of Texas ..... 3. *F. parryi*

C. Stems puberulent, without glandular trichomes, the hairs crisped and variously recumbent; restricted species about Monterrey, México ..... 4. *F. leonensis*

1. Flyriella harrimanii K. & R., Phytologia 50:380. 1982. Type: MÉXICO. Tamaulipas: on route B-5, 3 mi E of Gómez Farías, across from gravel pit, 600 ft, woods on pitted limestone, 31 Mar 1975, *Harriman et al. 10698* (holotype: US!).

Erect perennial herb to 200 cm tall. Leaves opposite; blades ovate-deltoid, 4.0 − 13.5 cm wide, 5 − 17 cm long, irregularly serrate, both surfaces glandular; petioles 3 − 11 cm long, glandular pubescent, winged. Capitulescence in ultimate pedunculate units of 1 − 3 heads, each head on a bracteolate pedicel 1 − 3 cm long. Involucre campanulate, 1.5 − 2.0 cm long, ca 2 cm wide; bracts herbaceous, imbricate in 3 − 5 series, glandular, 10 − 15 mm long, ca 1.4 mm wide. Florets 70 − 100; corolla white, funnelform, ca 4 mm long, ca 1 mm wide; lobes narrowly triangular, acute, 0.5 − 0.7 mm long, 0.2 − 0.4 mm wide. Anthers ca 2.2 mm long. Style branches (when dried) amber, linear-oblanceolate, 1.0 − 1.5 mm long, sometimes unequal. Achenes 4 − 5-ribbed, ca 4 mm long, brown-black, very sparsely pubescent throughout; pappus 5.0 − 5.5 mm long, composed of 30 − 35, filiform, ciliate setae.

Distribution and Habitat (Fig. 5): Subtropical, lower montane regions in the area of Gómez Farías in Tamaulipas. Flowering Mar. and Nov.

Additional specimen examined: MÉXICO. Tamaulipas: Gómez Farías area: Rancho Del Cielo below Aguacates turnoff, 24 Nov 1968, *Richardson 958* (TEX).

Flyriella harrimanii is readily distinguished from other species in the genus by its larger, fewer heads that are composed of 70 − 100 florets and by its larger leafy outer involucral bracts (Fig. 6). Nevertheless, it is presumably most closely related to *F. stanfordii*, as noted in the section on Species Relationships.

2. Flyriella stanfordii K. & R. Phytologia 24:69. 1972. Type: MÉXICO. Tamaulipas: 4 km W of Miquihuana in canyon with luxuriant vegetation, 4 Aug 1941, *Stanford et al. 675* (holotype: GH!).

Erect "rhizomatous" herb, 50 − 100 cm tall. Leaves becoming alternate above; blades deltoid, 2.0 − 8.5 cm wide, 3 − 11 cm long, irregularly serrate, short-glandular on both surfaces; petioles 2 − 5 cm long, winged throughout; capitulescence in ultimate pedunculate units of 10 − 25 heads, each head on a bracteolate, glandular, pedicel, 3.0 − 6.5 mm long.

Involucre campanulate, 6.0 – 8.0 mm long, 5.0 – 7.0 mm wide; bracts imbricate in 3 – 5 series, glandular, tinged with purple, lanceolate-ovate, 2.5 – 6.5 mm long, ca 1 mm wide. Florets 20 – 30; corolla white, tinged with purple, tubular to narrowly funnelform, 4 – 5 mm long, 0.4 – 0.6

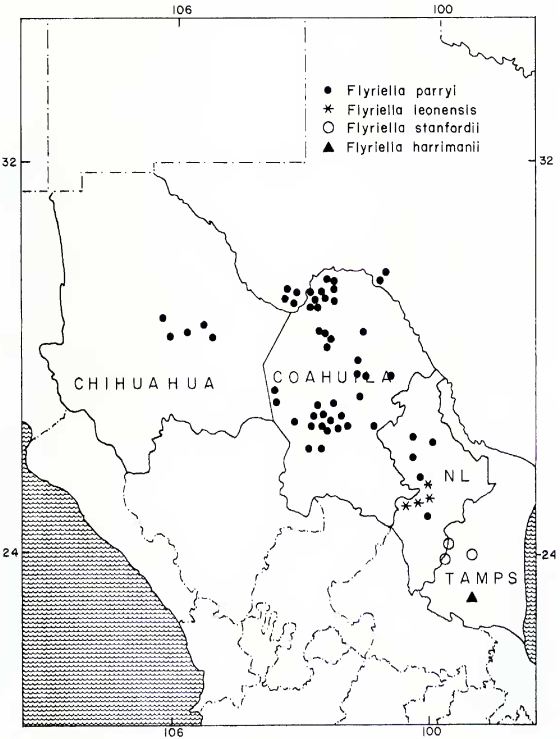

Fig. 5. Distribution of the four species of *Flyriella*.

mm wide, not constricted near the apex, glabrous; lobes narrowly triangular, acute, ca 0.3 mm long, minutely atomiferous-glandular. Anthers ca 1.2 mm long. Style branches linear-oblanceolate, brownish-yellow, ca 0.4 mm long. Achenes 4 – 5-ribbed, ca 2.3 mm long, black, sparsely pubescent throughout. Pappus 4 – 5 mm long, composed of 25 – 35 filiform, ciliate setae.

Distribution and Habitat (Fig. 5): Subtropical montane areas along the Sierra Madre Oriental from 1850 – 2320 m. In limestone along crags, in oak-pine forest clearings and along stream beds. Flowering: Jun – Jul.

Additional specimens examined: MÉXICO. NUEVO LEÓN/TAMAULIPAS: Nuevo León and just E into border of Tamaulipas, 28 Jun 1948, *Meyer & Rogers 2687* (US); Dulces Nombres, 20 Jul 1948, *Meyer & Rogers 2831* (MO, US); Zarogoza, Encantada, 17 Jun 1979, *Hinton 17544* (TEX); ca 10 km SSW of Zaragoza, Jul 1977, *Wells & Nesom 554* (LL).

Flyriella stanfordii is distinguished from other species in the genus largely by its narrowly funnelform corolla throat that is not abruptly constricted and by its conspicuously winged petioles (Fig. 7). Additional comments on its relationship are given in the section on Species Relationships.

3. FLYRIELLA PARRYI (A. Gray) K. & R. Phytologia 24:69. 1972. *Eupatorium parryi* A. Gray, *In* Torr. Bot. Mex. Bound. 75. 1859. TYPE: MÉXICO. CHIHUAHUA: "Sierra de Carmel", probably an error for Sierra del Carmen in Coahuila, 16 Nov 1852, *Parry 3* (HOLOTYPE: GH!).

Eupatorium chrysostylum Robinson, Proc. Amer. Acad. Arts. 41:274. 1905. TYPE: MÉXICO. CHIHUAHUA: dry ledges, rocky hills near Chihuahua City, 17 Apr 1885, *Pringle 135* (HOLOTYPE: GH!; ISOTYPES: DS!, MICH!, NY!, US!). *Flyriella chrysostyla* (Robinson) K. & R. Phytologia 24:69. 1972.

Eupatorium sphenopodum Robinson, Proc. Amer. Acad. Arts. 43:35. 1907. TYPE: MÉXICO. COAHUILA: above Monterrey on shaded cliffs of limerock, 16 Jul 1906, *Pringle 10259* (HOLOTYPE: GH!; ISOTYPES: CAS!, F!, LL!, MO!, US!). *Flyriella sphenopoda* (Robinson) K. & R. Phytologia 24:69. 1972.

Brickellia shineri M. E. Jones ex Flyr, Sida 3:254. 1968. TYPE: MÉXICO. NUEVO LEÓN: "Sabinal", Ojo de Agua, ca 2.5 mi W Sabinas Hidalgo, [26] 25 Mar 1932, *M. E. Jones 29411* (HOLOTYPE: POM; PHOTOHOLOTYPE: US!; ISOTYPE: UC!). (date and specific locality from Blake 1945). *Brickellia shineri* M. E. Jones, Contr. W. Bot. 18:22. 1933. Nom. illegit., with out Latin diagnosis.

Erect herb from perennial tap root, 0.5 – 1.0 m tall. Leaves mostly opposite, alternate and reduced just below the capitulescence; blades predominately deltoid to cordate, 3 – 10 cm wide, 5 – 11 cm long, irregularly serrate, dentate to lobed, glandular on both surfaces, especially along edges and veins; petioles 3 – 7 cm long, glandular, abruptly winged, just below blade. Capitulescence in ultimate pedunculate units of 3 – 16 heads, each head on bracteolate pedicel 3 – 7 mm long. Involucre turbinate, 8 – 10 mm long, 4 – 5 mm wide; bracts in 3 – 5 series, ovate to

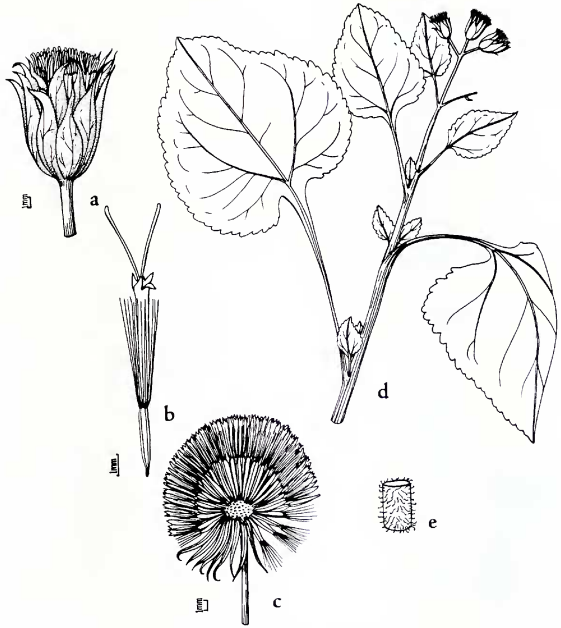

Fig. 6. *Flyrella harrimanii*: a) flowering head; b) floret; c) mature fruiting head, longitudinal section; d) flowering branch; e) portion of stem showing glandular trichomes.

linear lanceolate, 2.5 − 9.5 mm long, ca 1 mm wide, the apices acute to acuminate. Florets 10 − 25; corolla yellowish-white or tinged with purple, tubular with constriction ca 1.0 mm long, 0.2 mm wide at top of tube; lobes narrowly triangular-acute, ca 0.2 mm long, ca 0.1 mm wide. Anthers ca 1 mm long. Style branches yellowish-white, linear oblanceolate, 5 − 7 mm long. Achenes 4 − 5-ribbed, ca 3.5 mm long, black, sparsely pubescent throughout; pappus 4 − 5 mm long, composed of 20 − 30 ciliate setae. Chromosome number, $n = 10$ pairs.

Distribution and Habitat (Fig. 5): wide ranging, highly variable species occurring in mesic habitats of the Chihuahuan desert regions of north central Mexico and adjacent Trans-Pecos areas of Texas, mostly in calcareous soils at elevations from 900 – 2200 m. Flowering: Apr – Jul.

Additional specimens examined: UNITED STATES. Texas. **Brewster Co.**: end of Pine Canyon Trail, 12 Nov 1976, *Correll 35402* (LL, MO); Cattail Falls, 9 Nov 1964, *Correll & Correll 30592* (LL); Juniper Canyon, 16 Jun 1964, *Correll et al. 29721* (LL); Big Bend National Park, Chisos Mts., Pine Canyon, 17 Jun 1963, *Correll & Wasshausen 27865* (CAS, LL, MO); Chisos Mts. Aug 1935, *Marsh 149* (F); Cattail Springs, 7 Jul 1931, *Moore & Steyermark 3408* (CAS, GH, LL, MO, US); Chisos Mts., 5 Aug 1931, *Mueller 8179* (GH, TEX, US); Pine Canyon, near waterfall under oaks and pines, 24 Sep 1977, *Powell et al. 3229* (LL, US); Lower Pulliam Canyon, 4 Jul 1936, *Sperry 193* (LL, US); Lower Pulliam Canyon, 26 Aug 1936, *Sperry 293* (LL, US); Cattail Falls, 19 Apr 1955, *Wallmo 7* (LL); waterfalls in Pine Canyon, 1 Jul 1937, *Warnock 760* (GH, TEX, US); mid Green Gulch, 23 Jul 1950, *Warnock 9146* (LL); upper Green Gulch, 28 Jun 1941, *Warnock 20975* (GH, LL, MO, TEX); Green Gulch, 22 Aug 1947, *Warnock & Tharp 4005* (US). **Val Verde Co.**: 3.5 mi S of Pandale, 9 May 1967, *Correll 34150* (GH, LL); Eagle Cave Canyon E of Langtry, 21 Apr 1966, *Correll & Rollins 32610* (GH, LL, UC); 5 mi N of Langtry on Ozona road, 8 May 1947, *McVaugh 8232* (F, GH).

MEXICO. Chihuahua: Mouth of Majalca Canyon, 11 May 1959, *Correll & Johnston 21758* (LL); near Chihuahua, 22 Jun 1936, *LeSueur 963* (F); vicinity of Chihuahua, 8 – 27 Apr 1908, *Palmer 40* (F, GH, NY, US); Mapula Mts., 27 Apr 1887, *Pringle 1595* (MICH, MSC, UC).

Coahuila: Sierra Mojada, just S of Esmeralda, above Sociedad Cooperative Minera, 1 Sep 1972, *Chiang et al. 9070f* (LL); middle of upper reaches of Canon de la Hacienda, almost due S of Rancho Cerro de la Madera, N slope of Sierra de la Madera, 21 Sep 1972, *Chiang et al. 9449* (LL); ca 32 air mi NE of San Pedro, 1 mi SW of Las Delicias, 27 Aug 1971, *Henrickson 6072* (LL); ca 64 air mi SE of Big Bend National Park basin along highway 22 towards Múzquiz, 4 Aug 1976, *Henrickson & Prigge 14910* (LL); ca 35 air mi W of Cuatro Ciénegas, in mid-canyon de la Hacienda of Sierra de la Madera, 6 Aug 1973, *Henrickson & Wendt 11988* (LL); SW end of Sierra de la Fragua, 1 – 2 km N of Puerto Colorado, 2 Sep 1941, *Johnston 8784* (LL); Canon de Jara, 30 – 40 km W of Cuatro Ciénegas, 4 – 5 Sep 1941, *Johnston 8857* (LL); Río Grande, side canyons at upper Madison Falls, 10 Apr 1973, *Johnston et al. 10611* (LL); Sierra San Marcos, N part jutting into Cienegas basin, higher slopes, just reaching the lowest ponderosa pines, 9 May 1973, *Johnston et al. 10943* (LL); ca 5 km SW of Mina El Popo, dissected E slope of Sierra del Carmen, 28 Jul 1973, *Johnston et al. 11891* (LL); El Popo, ca 2 km S of Cañon El Diablo, 29 Jul 1973, *Johnston et al. 11929j* (LL); southern part of Sierra de los Organos, 8 Aug 1973, *Johnston et al. 12132* (LL); Múzquiz, Spring 1935, *Marsh 203* (TEX); Múzquiz, 8 Jul 1936, *Marsh, Jr. 346* (TEX); Múzquiz, 1939, *Marsh s.n.* (F); Múzquiz, 12 – 13 Apr 1936, *Marsh 2136* (GH, TEX); 92.5 mi NW of Múzquiz on highway 53 to Boquillas del Carmen, 29 Jun 1982, *Poole & Watson 2531* (TEX); near the spring (pool) above Las Delicias at base of bluffs, 20 May 1974, *Powell & Turner 2699* (TEX); canyons in the Sierra del Sobaco, a few km W of Las Delicias, 1 Oct 1942, *Santos 2804* (GH); Sierra Mojada, above San Salvador Mine near Esmeralda, 4 Aug 1941, *Stewart 1078* (F, GH, LL); Cañon del Milagro, ca 12 Km W of Hacienda de la Encantada, 10 – 16 Sep 1941, *Stewart 1717* (GH, LL); Sierra del Carmen, Pico de Cerda, 12 Aug 1974, *Wendt 578* (LL); Cañon de la Barrica at base of

southern cliffs of Picacho El Pajarito, 28 Aug 1975, *Wendt & Lott 1366* (LL); Sierra de la Fragua, 6 Jan 1976, *Wendt et al. 1428* (LL); Sierra de la Gloria, Cañon Obscuro Chiquillo, 7 Sep 1976, *Wendt & Riskind 1720* (LL); Múzquiz, Hacienda Mariposa, E slope of the Sierra de Puerto Santa Ana, 23 June 1936, *Wynd & Mueller 254* (GH, MICH, MO, MSC, NY, US).

Nuevo León: Sabinas Hidalgo, Ojo de Agua, 16 Jun 1939, *Chase 7020* (GH, NY); Sabinal, 26 Mar 1932, *Jones 29411* (CAS); Sierra Madre above Monterrey, 25 May 1908, *Pringle 15615* (LL, US); 5 mi W of El Alamo, 1 Jun 1978, *Turner 10007* (F, LL).

Flyriella parryi is readily distinguished from other species by its glandular trichomes which are often interspersed with long straight eglandular

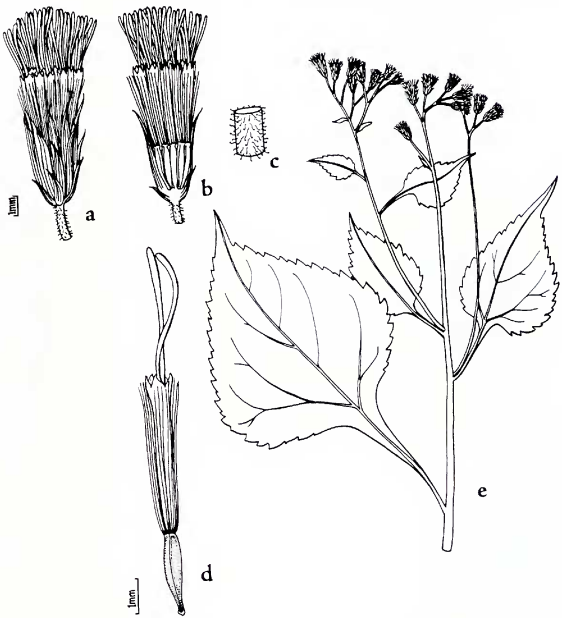

Fig. 7. *Flyriella stanfordii*: a) flowering head; b) longitudinal section of head; c) portion of stem showing glandular trichomes; d) floret; e) flowering branch.

hairs. In addition, as noted by King and Robinson (1972b), it is marked by its conspicuously constricted corolla throat and relatively few-flowered heads (Fig. 8).

Flyriella parryi is quite similar to *F. leonensis* , but the latter does not possess glandular trichomes. No doubt the two species are closely related and perhaps hybridize in the area of Monterrey since both species have been collected on Chipinque Mesa to the west of the city. *Flyriella parryi* occurs at lower, more xeric, habitats in this region, while *F. leonensis* occurs at more elevated mesic habitats (e.g., the *Quercus* -dominated forest at ca 2000 meters above Chipinque Mesa).

4. Flyriella leonensis (Robinson) K. & R. Phytologia 24:69. 1972.
Eupatorium leonensis Robinson, Proc. Amer. Acad. Arts. 36:479. 1901. Type: MÉXICO. Nuevo León: on the Sierra Madre near Monterrey, 16 Jun 1887, *C. G. Pringle 2277* (holotype: GH!).

Eupatorium chrysostyloides Robinson, Proc. Amer. Acad. Arts. 43:30. 1907. Type: MEXICO. Nuevo León: Sierra Madre above Monterrey, limerock, 915 m, 27 Apr 1906, *C. G. Pringle 10231* (holotype: GH!; isotype: US!).

Erect perennial herb 25 − 50 cm tall. Leaves mostly opposite, alternate and reduced just below the capitulescence; blades predominately deltoid, 3 − 6 cm wide, 3.5 − 7.0 cm long; irregularly serrate to lobate, minutely puberulent on both surfaces, often glabrate; petioles 3 − 8 cm long, puberulent, abruptly winged just below the blade. Capitulescence of ultimate pedunculate units of 10 − 25 heads, each head on a bracteolate pedicel, 2 − 8 mm long. Involucre narrowly campanulate, 5 − 7 mm long, ca 5 mm wide; bracts imbricate in 3 − 5 series, linear-lanceolate, 3 − 7 mm long, 1 mm wide or less. Florets 30 − 40; corolla "yellowish-white", tubular throughout, ca 5 mm long, 0.5 mm wide, glabrous; lobes narrowly triangular, acute, ca 0.3 mm long, minutely atomiferous glandular. Anthers ca 1 mm long. Style branches linear-oblanceolate, yellowish-white, smooth, 5 − 8 mm long. Achenes 4 − 5-ribbed, 2.0 − 2.5 mm long, black, sparsely pubescent mostly near the apex; pappus 4 − 5 mm long, composed of 40 − 50 filiform, ciliate setae. Chromosome number, $n = 10$ pairs.

Distribution and Habitat (Fig. 5): Mostly eastern Nuevo León along the front range of the Sierra Madre Oriental from 600 − 1700 m where it occurs in limestone soils mostly in mesophytic habitats, along streams and cool moist areas. Flowering: Apr − Jul.

Additional specimens examined: MÉXICO. Nuevo León: Chipinque Park, N facing slopes in pine-oak forest, 11 Jun 1978, *Poole & Watson 1394* (TEX); Horsetails Falls, ca 35 km SSE of Monterrey, 26 Apr 1976, *Sanders & Harborne 76060* (TEX); Cola de Caballo, 6 Apr 1971, *Siegler & Becker D13133* (MSC); Cola de Caballo, 31 May 1970, *Siegler et al.*

DS-2570 (MSC); Monterrey, 22 May 1960, *Smith M219* (TEX); Chipinque Mesa, slopes just above morel, ca 6000 ft, 2 Jun 1978, *Turner 10019* (LL); 17 mi by road W of Horsetail Falls, 2 Jun 1978, *Turner 10037* (CAS, LL).

Flyriella leonensis is readily distinguished from other species in the genus by its puberulent, non-glandular, foliage. In addition, it can be distinguished by its sparsely ciliate achenes (mostly near apex) and generally smaller and broader heads (Fig. 9).

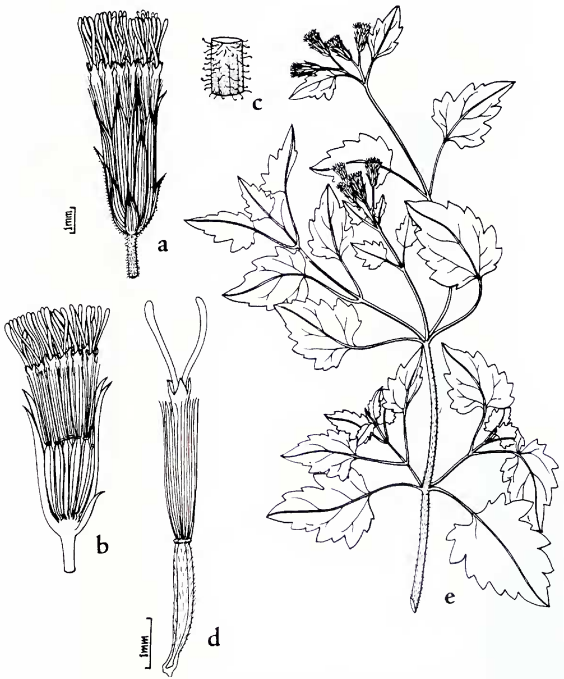

Fig. 8. *Flyriella parryi*: a) flowering head; b) longitudinal section of head; c) a portion of stem showing glandular trichomes; d) floret; e) flowering branch.

Eupatorium chrysostyloides Robinson (not to be confused with *E. chrysostylum* Robinson, which is a synonym of *Flyriella parryi*), clearly belongs to this species. King and Robinson (1972) also treated these as synonymous. According to B. L. Robinson, in his original description, *E. chrysostyloides* is distinguished by its "mixed pubescence." Actually the pubescence is puberulous, much as in *Flyriella leonensis*.

As noted above, *F. leonensis* appears to occur at higher elevations, up to 1700 m, and in more mesic habitats than *F. parryi*, at least in the Monterrey area.

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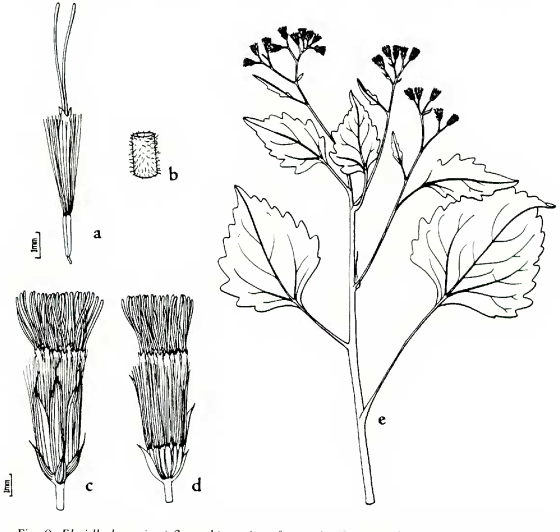

Fig. 9. *Flyriella leonensis*: a) floret; b) portion of stem showing eglandular trichomes; c) flowering head; d) longitudinal section of head; e) flowering branch.

help with the cladistic analysis. Dr. Guy Nesom, as reviewer, added assorted pungent criticisms which proved helpful.

This study is based upon approximately 130 specimens deposited in the following herbaria: CAS (2); DS(1); F (10); GH (19); LL (38); MICH (6); MO (6); MSC (5); NY (7); TEX (20); US (16).

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