
Some Clarifications, New Species, and New Combinations in American Cynanchinae (Asclepiadaceae)

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ABSTRACT. Two new species of *Cynanchum* in South America are described, *C. bifidum* Liede & Meve and *C. trollii* Liede & Meve. One South American *Cynanchum* species is transferred to *Oxypetalum*, fourteen to *Metastelma*, and four to *Ditassa*. *Stelmatocodon* and *Fontellaea* are recognized as synonyms of *Philibertia*.

The enormous variety of American Cynanchinae has puzzled even experienced specialists of the family. The difficulties presented by the often minute flowers and narrowly endemic ranges of the species are aggravated by the often insufficient descriptions without illustrations. While a thorough revision of *Cynanchum* and its relatives for the entire continent is not feasible at the moment, several new additions and clarifications are possible as a result of a long-term project of the first author.

MATERIALS AND METHODS

The holdings of A, AAU, B, BM, CTES, G, GA, GB, L, LIL, LPB, M, MO, MPU, P, S, SGO, SI, UC, and USZ have been studied. Dried material was supplemented by our own collections of living and spirit material from Argentina, Bolivia, Chile, Mexico, and the United States. For corona terminology, Liede and Kunze (1993) have been followed; for clarification of gynostegium structures, see Liede (1996).

NEW SPECIES

Cynanchum bifidum Liede & Meve, sp. nov.

TYPE: Ecuador. Azuay: 1–2 km N of Nieves, Ceja forest, 3000–3100 m, 16 Nov. 1988, *Harling* 25919 (holotype, GB). Figure 1.

C. intricato similis, sed differt in lobis coronae staminalis profunde bifidis.

Plants ascending, twining, 3–4 m high, richly branched, at least basally following a dichasially

branching pattern. Shoots perennial, herbaceous, densely covered with flexuous trichomes, 0.7–0.8 mm long; internodes 15–50 cm long. *Leaves* stipulate, with 1–2-mm-long petiole, 2 colleters at the base of the leaves; leaf blades herbaceous, 8–10 × 3–5 mm, ovate, basally rounded, apically acute, entirely glabrous. *Inflorescences* always one per node, extra-axillary, sessile, 4–10-flowered, all flowers open synchronously, sciadioid. Floral bracts ca. 0.7 × 0.3 mm, ovate, glabrous; pedicels 1–2 mm long, glabrous. Buds ca. 2.2 × 1.2 mm, globose, with imbricate aestivation. *Calyx* basally fused, abaxially glabrous, lobes ca. 1.2 × 0.5 mm, ovate, acute. *Corolla* cyathiform, basally fused, abaxially and adaxially greenish white, purple along the main nerves, glabrous; lobes 2.5–3 × 1–1.2 mm, oblong, apically obtuse, incurved. *Corona* gynostegial, white, 1.2–1.5 mm high, equaling the gynostegium in height, consisting of staminal and interstaminal parts just basally fused, staminal lobes laminar, deeply bifid, apically erect. *Gynostegium* ca. 0.8 × 0.8 mm, atop a stipe, ca. 0.6 mm long. Anthers about as high as broad, pentagonal, abaxially convex; anther wings 0.35 mm long, not extending along the whole length of the anther, consisting of a distal and a proximal ridge; adjacent anther wings parallel to each other, basally widened, in the same plane as the anther. Connective appendages 0.35–0.4 × 0.25–0.3 mm, ovate, narrower than the stamen, slightly inflexed. *Pollinarium*: corpusculum ca. 0.18 mm long, almost twice as long as broad, elliptical; caudicles ca. 0.075 mm long, cylindrical, straight, horizontal; pollinia apically attached to the caudicles, ca. 0.275 × 0.1 mm, ovoid, ovate in cross section. *Stylar head* ca. 0.5 mm diam., 0.375 mm high; upper part 0.125 mm high, tabular. *Fruits, seeds, and chromosome number* unknown.

This new species belongs in the *C. microphyllum* Kunth group, which is particularly diverse in the northeastern Andes. It is probably most closely re-

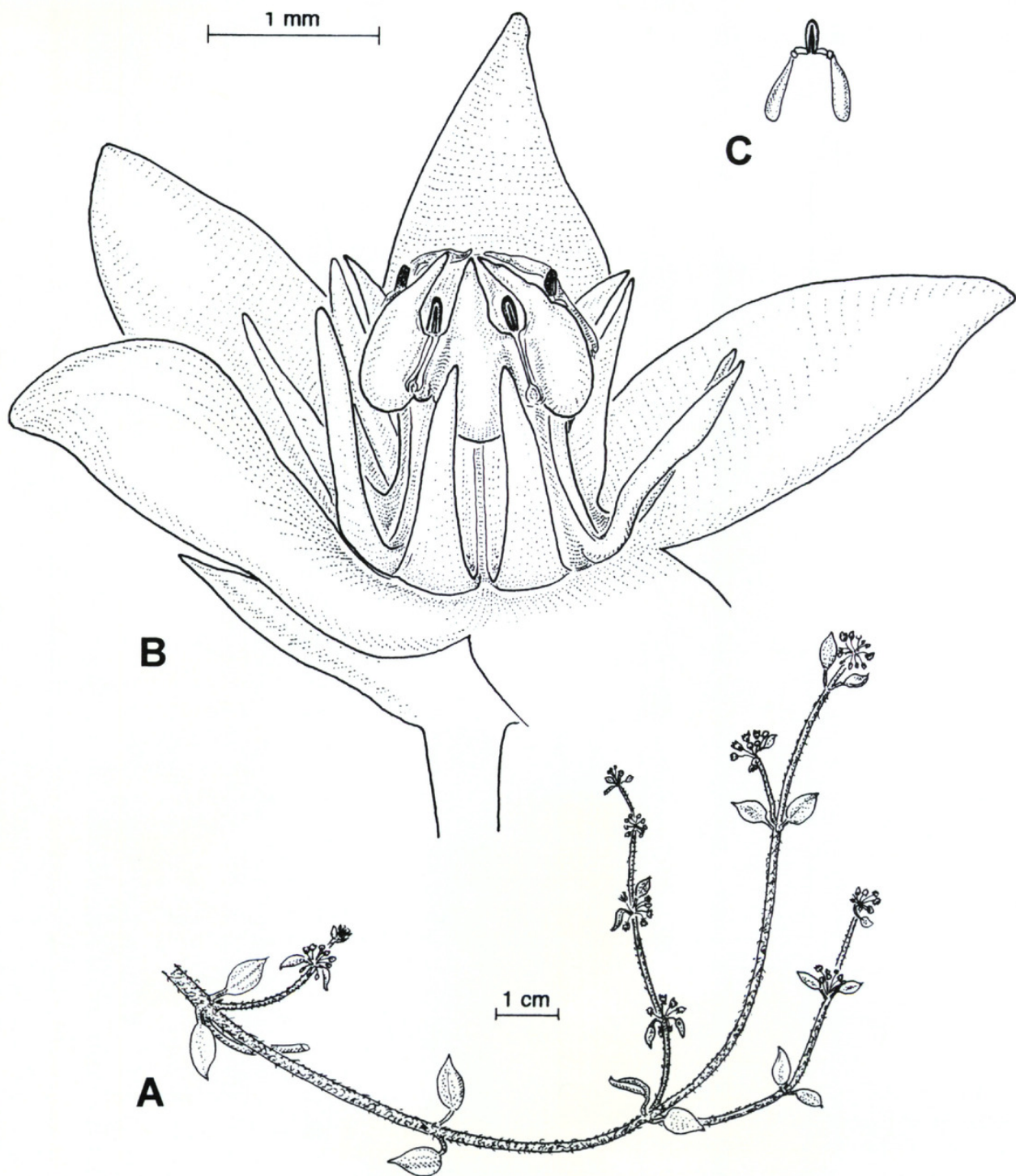


Figure 1. *Cynanchum bifidum* Liede & Meve. —A. Habit. —B. Flower. —C. Pollinarium. (From Harling 25919, GB; drawn by U. Meve.)

lated to *C. intricatum* K. Schumann from the Pichincha area in Ecuador, but is clearly different by the deeply bifid corona lobes and the stronger dichasial branching pattern.

Cynanchum trollii Liede & Meve, sp. nov. TYPE: Bolivia. Cañanema: Río de la Pax, 1260 m, dry forest, 18 Mar. 1928, *Troll 1675* (holotype, M). Figure 2.

Herba scandens, foliis cordatis, inflorescentibus racemiformibus, corolla pubescenti, sed corona corollae inserta.

Plants ascending, twining. Shoots perennial, herbaceous, densely covered with erect trichomes, ca. 0.25 mm long, arranged along a single line. Internodes 12–17 cm long. “*Stipules*” 5–10 mm long, ca. 6 mm wide, ovate. *Leaves* on a 10–40-mm-long petiole, 3 colleters at the base of

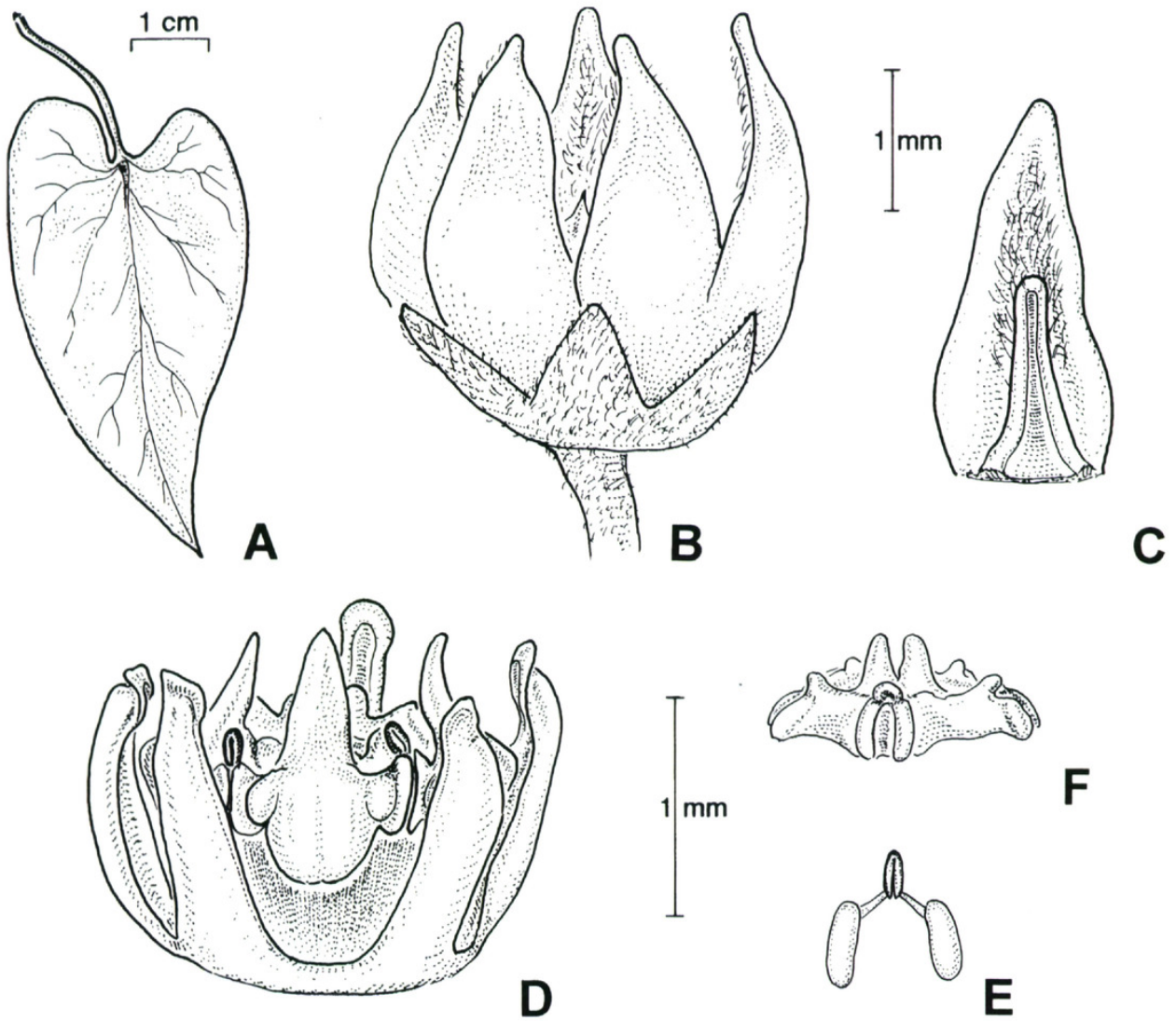


Figure 2. *Cynanchum trollii* Liedt & Meve. —A. Leaf. —B. Flower. —C. Adaxial side of corolla lobe with corona lobe inserted. —D. Gynostegium with corona. —E. Pollinarium. —F. Styler head. (From Troll 1675, M; drawn by U. Meve.)

the leaves; leaf blades herbaceous, 40–55 × 20–35 mm, ovate, basally lobate; lobes 5–7 mm long, apically acute, adaxially and abaxially almost glabrous. *Inflorescences* frondulose, 15–20-flowered, 4–6 flowers open at the same time, bostrychoid, basally with one or two bifurcations; partial inflorescences geminiflorous; peduncles 0–12 mm long, densely covered with flexuous trichomes, 0.2–0.3 mm long, arranged along a single line; rachis 8–15 mm long, angular. Floral bracts 0.5–1 × 0.25–0.5 mm, triangular. Pedicels 2–4 mm long, densely covered with flexuous, 0.1–0.15-mm-long trichomes arranged along a single line. Buds ca. 2 × 2 mm, globose, with imbricate aestivation. *Calyx* basally fused, abaxially with trichomes, lobes ca. 1.5 × 0.75 mm, ovate, apically obtuse. *Corolla* cyathiform, basally fused; lobes ca. 1.7 × 1 mm, oblong, apically

obtuse, incurved, abaxially with trichomes, adaxially with ca. 0.25-mm-long trichomes, concentrated on the apical and lateral parts. *Corona* corolline, oppositisealous, ca. 1.3 mm high, shorter than the corolla, lobes laterally connate, laminar, rounded (slightly cucullate), erect, with straight margins, glabrous. *Gynostegium* ca. 1.7 × 1.4 mm, atop a stipe, ca. 0.5 mm long. Anthers broader than high, rectangular, abaxially convex; anther wings ca. 0.35 mm long, not extending along the whole length of the anther; consisting of a distal and a proximal ridge with space between distal and proximal ridge glabrous; adjacent anther wings parallel to each other. Connective appendages ca. 0.6 × 0.3 mm, ovate, narrower than the stamen, erect. *Pollinarium*: corpusculum ca. 0.2 mm long, almost twice as long as broad, elliptical; caudicles ca. 0.15 mm

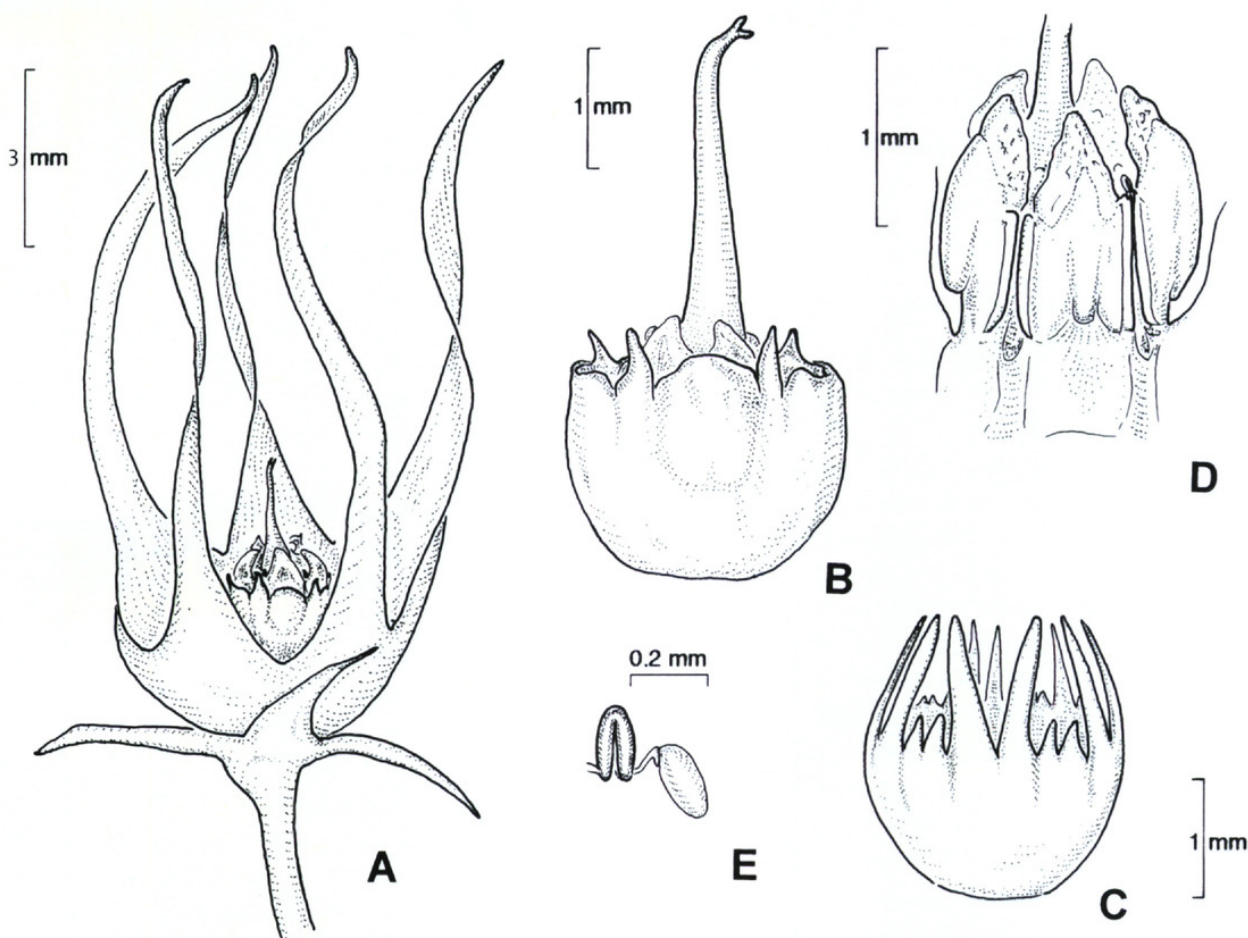


Figure 3. *Oxypetalum streptanthum* (Malme) Liede & Rua. —A. Flower. —B. Gynostegium with corona. —C. Corona. —D. Gynostegium. —E. Pollinarium. (A, B, D, E from *I. Holmgren* 950, S; C from *Hensen* 887, USZ; drawn by U. Meve.)

long, cylindrical, concavely recurved; pollinia subapically attached to the caudicles, ca. 0.4×0.125 mm, ovoid, ovate in cross section. *Stylar head* ca. 1.25 mm diam., 0.55 mm high; upper part ca. 0.25 mm high, bifurcate. *Fruits, seeds, and chromosome number* unknown.

In all other *Cynanchum* species known to us, the insertion point of the corona is situated exactly at the point of union of the gynostegium (filament tube) and the corolla, and is derived structurally from the gynostegium (e.g., Kunze, 1982). In *C. trollii*, the attachment has shifted clearly toward the corolla. In asclepiad taxonomy, corona insertion is usually regarded as a genus-defining character. However, as it seems unwise to describe a new genus on such scanty material, the preliminary inclusion of *C. trollii* in *Cynanchum* seems adequate, since it fits the concept of the genus in all other characters. The lack of fruits prevents an answer to the question of whether the species is more closely related to subgenus *Mellichampia* Sundell (forming one fol-

licle per flower) or to the *C. formosanum* N. E. Brown group of species (invariably forming two follicles per flower).

NEW COMBINATIONS

Oxypetalum streptanthum (Malme) Liede & Rua, comb. nov. Basionym: *Cynanchum streptanthum* Malme, Ark. Bot. 25A(7): 8. 1933. TYPE: Ecuador. Pichincha: Machachu, 2800 m, 12 Nov. 1920, *I. Holmgren* 950 (holotype, S). Figure 3.

Extension of known range: BOLIVIA. **Cochabamba:** Quillacollo, Chorojo, 3600 m, 28 Aug. 1990, *Hensen* 887 (USZ); Arque, Sihuyalla, 3300 m, 5 Jan. 1992, *Ibisch* 832 (LPB).

Malme's (1933) excellent description needs no update. He mentioned that the name written on the specimen was *Oxypetalum*, but described it under *Cynanchum* because caudicular appendages were lacking. However, in one subgenus of *Oxypetalum*, subg. *Cryptodus* (E. Fournier) T. Meyer, caudicular

appendages are small or absent. The species shares with *Oxypetalum* subg. *Cryptodus* the twisted corolla lobes, long styler head, and very erect twinned follicles, all features absent from other American members of *Cynanchum*.

METASTELMA R. BROWN

One of the most unfortunate decisions in the history of American *Cynanchum* was the inclusion of *Metastelma* within the genus (Woodson, 1941). Based on his experience of North American material only, Woodson did not appreciate the differences between *Cynanchum* and *Metastelma* as sufficient for generic recognition. *Cynanchum* is easily recognized by its gynostegial corona of fused staminal and interstaminal parts and its corolla lobes, which are either entirely glabrous or possess a few sparse, short, erect, verrucose trichomes on the adaxial side. *Metastelma*, in contrast, possesses a gynostegial corona that consists only of staminal parts and a densely bearded corolla. Leaf shape, which is invariably linear in *Metastelma*, and inflorescence structure, which is invariably sciadioid (denoting an umbelliform inflorescence derived from a dichasial one; see also Liede & Weberling, 1995) in *Metastelma*, though helpful in the field, do not constitute useful generic characters, because both characters are highly plastic in *Cynanchum*. Of the North American species with linear leaves, most conform to the concept of *Metastelma* (*M. barbigerum* Scheele, *M. blodgettii* A. Gray, *M. californicum* Benth, *M. latifolium* Rose, *M. minutiflorum* Wiggins, *M. northropiae* Schlechter, *M. palmeri* S. Watson, *M. pringlei* A. Gray, *M. watsonianum* Standley). However, *Cynanchum angustifolium* Persoon and a few related species (Liede, 1997), despite linear leaves and sciadioid inflorescences, show entirely glabrous corolla lobes and a ring-shaped corona of fused staminal and interstaminal parts and cannot be included in *Metastelma* according to this concept.

His ignorance of South American material further prevented Woodson (1941) from recognizing the close similarities between *Metastelma* and *Ditassa* R. Brown, which is different only in possessing a second staminal corona lobe and most likely constitutes the sister genus of *Metastelma*. As most South American workers have rather uncritically adopted Woodson's concept, several new combinations are necessary to clarify the concept of *Cynanchum* in the Americas.

Metastelma chimantense (Morillo) Liede, comb. nov. Basionym: *Cynanchum chimantense* Morillo, *Ernstia* 4: 5. 1981. TYPE: Venezuela. Bolívar: Chimantá massif, 2000–2150 m, *J. Steyermark* 75813 (holotype, VEN).

Metastelma eulaxiflorum (Lundell) Liede, comb. nov. Basionym: *Cynanchum eulaxiflorum* Lundell, *Wrightia* 5(9): 351. 1977. TYPE: Guatemala. Dept. Baja Verapaz: Union Barrios, E of km 154, 8 June 1975, *Lundell & Contreras* 19401 (holotype, LL).

Metastelma exasperatum (R. W. Holm) Liede, comb. nov. Basionym: *Cynanchum exasperatum* R. W. Holm, *Fieldiana* 28: 507. 1953. TYPE: Venezuela. Mérida: Quebrada of Cuesta del Barro, 2530–2715 m, 11 May 1944, *J. Steyermark* 56474 (holotype, SGO; isotype, MO).

Metastelma hirtellum (Oliver) Liede, comb. nov. Basionym: *Vincetoxicum hirtellum* Oliver, *Timahri* 5: 199. 1886. *Cynanchum hirtellum* (Oliver) Badillo in Pittier et al., *Cat. Fl. Venez.* 2: 312. 1947. TYPE: Venezuela. Roraima: *Im Turm* 144 (holotype, F; isotype, MO).

Cynanchum revolutum R. W. Holm, *Fieldiana* 28(3): 508. 1953. TYPE: Venezuela. Bolívar: vicinity of "Misia Kathy camp" on mesa between Ptari-Tepui and Sororopan-Tepui, *Steyermark* 60236 (holotype, F; isotype, MO). Synonym: Morillo, *Ernstia* 37: 6. 1986.

Metastelma huberi (Morillo) Liede, comb. nov. Basionym: *Cynanchum huberi* Morillo, *Ernstia* 4: 7. 1981. TYPE: Venezuela. Territorio Federal Amazonas: Dept. Atabapo, alrededores de Canaripó, 98 m, *O. Huber* 1867 (holotype, VEN; isotype, MY).

Metastelma liesnerianum (L. O. Williams) Liede, comb. nov. Basionym: *Cynanchum liesneriana* L. O. Williams, *Fieldiana* 34: 102. 1972. TYPE: Costa Rica. Guanacaste: vicinity of Cañas, 12 Dec. 1969, *Daubenmire* 406 (holotype, F).

Metastelma longicoronatum (L. O. Williams) Liede, comb. nov. Basionym: *Cynanchum longicoronatum* L. O. Williams, *Fieldiana* 32: 37. 1968. TYPE: Mexico. Chiapas: 3 km S of La Trinitaria, 1700 m, 14 Oct. 1965, *Breedlove & Raven* 13199 (holotype, F; isotype, DS).

Metastelma nubicola (Morillo) Liede, comb. nov.

Basionym: *Cynanchum nubicola* Morillo, *Ernstia* 2: 8. 1992. TYPE: Venezuela. Trujillo. Carache: carretera Carache-La Peña, 31.5 km E de Carache, 2000–2200 m, 28 Sep. 1988, *Morillo 10543* (holotype, VEN; isotype, MERF).

Metastelma ovalifolium (A. Richard) Liede,

comb. nov. Basionym: *Astephanus ovalifolius* A. Richard in Sagra, *Hist. Fis. Cuba, Bot.* 95. 1855. TYPE: Cuba. Prope Santiago, *Linden 1847* (lectotype, designated here, P).

Metastelma paraquense (Morillo) Liede, comb.

nov. Basionym: *Cynanchum paraquense* Morillo, *Ernstia* 4: 12. 1981. TYPE: Venezuela. Territorio Federal Amazonas: Cerro Paraque (Sipapo), 1600–1800 m, Feb. 1946, *K. Phelps 38* (holotype, VEN).

Metastelma pubipetalum (Alain) Liede, comb.

nov. Basionym: *Cynanchum pubipetalum* Alain, *Mem. Soc. Cubana Hist. Nat.* 22: 118. 1955, new name for *Astephanus cubensis* Kunth in Humboldt & Bonpland, *Nov. Gen. Sp.* 3: 206. 1818. TYPE: Cuba. Prope Regla, *Bonpland 5277* (lectotype, designated here, P).

Additional material seen. CUBA. 1861, *C. Wright 1665* (G, det. Alain, 1955)

Metastelma quitense (K. Schumann) Liede,

comb. nov. Basionym: *Cynanchum quitense* K. Schumann, *Bot. Jahrb. Syst.* 25: 728. 1898. SYNTYPES: Ecuador. Prope Quito, Dec. 1895, *Sodirol 107/16* and ad montem Chimborazo in declivibus ad Pallatango, *Sodirol 107/17* (syntypes, both presumably QPLS). Figure 4.

Additional material seen. ECUADOR. **Pichincha:** Vía mitad Mudo-Calacalí, 12 July 1950, *Rambo 47275* (AAU); Vía mitad Mudo-Calacalí, 7 Apr. 1979, *Jaramillo & Silva 920* (AAU); Pichincha, 2800 m, 16 Apr. 1920, *Holmgren 533* (G); Riobamba, NE of Riobamba, 2800 m, 17 Feb. 1934, *Schimpff 726* (M); prope Riobamba, *Sodirol s.n.* (G).

Material annotated by K. Schumann was traced in G (*Sodirol s.n.*, prope Riobamba), and so was the specimen on which Malme's (1933) amplified description was based (*I. Holmgren 533*, G). The species is slightly problematical because it possesses rather flat corona lobes, which seem basally fused in the poorly pressed *Sodirol* specimen. However, the better preserved *Holmgren* specimen shows that

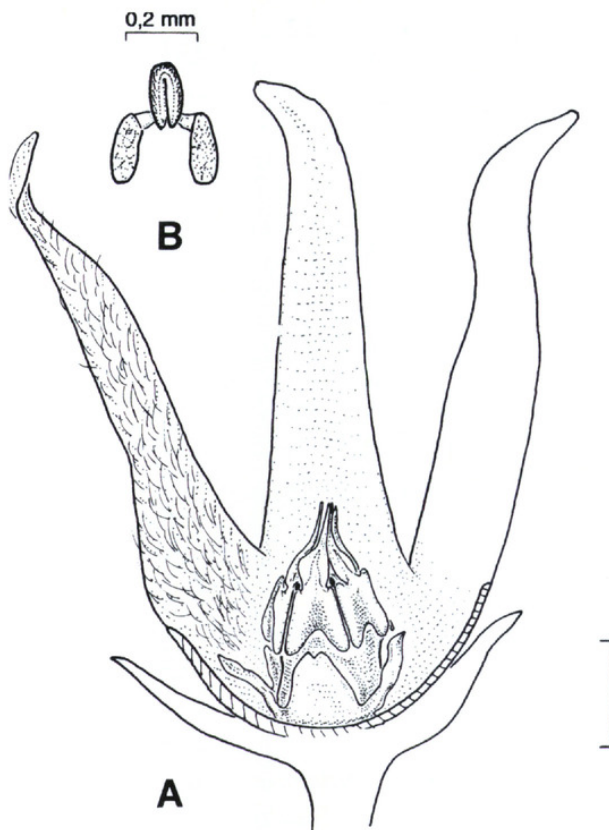


Figure 4. *Metastelma quitense* (K. Schumann) Liede. —A. Flower. —B. Pollinarium. (From *Jaramillo & Silva 920*, AAU; drawn by U. Meve.)

the corolla lobes, though flat, are fused to the gynostegium, but not to each other. In addition, the long-barbate corolla, which is more than twice as long as the gynostegium, fully corresponds with the concept of *Metastelma*.

Metastelma spruceanum (Morillo) Liede, comb.

nov. Basionym: *Cynanchum spruceanum* Morillo, *Ernstia* 2: 64. 1992. TYPE: Ecuador. Andes. 1857–59, *Spruce 5995* (holotype, G). Figure 5.

Metastelma stipitatum (Correll) Liede, comb. nov.

Basionym: *Cynanchum stipitatum* Correll, *J. Arnold Arbor.* 58: 44. 1977. TYPE: Bahamas. North Caicos: Bottle Creek Airstrip, 3 Sep. 1974, *D. S. Correll 43436* (holotype, A).

Two additional species are almost certainly members of *Metastelma*; however, no authentic material could be traced and the descriptions are not provided with drawings: *Cynanchum beatricis* Morillo, *Cynanchum manarae* Morillo (Morillo, 1978).

DITASSA R. BROWN

The genus *Ditassa* has never seriously been claimed to constitute part of *Cynanchum*. However,

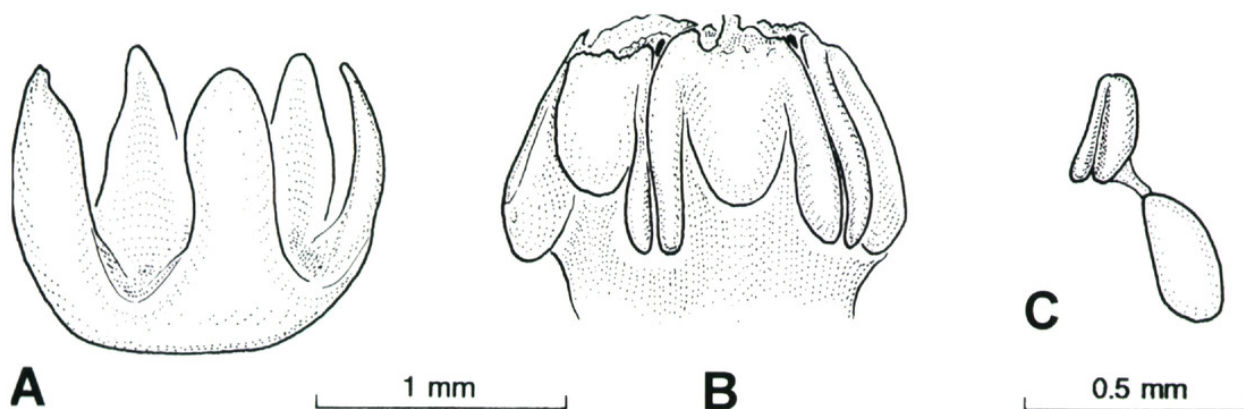


Figure 5. *Metastelma spruceanum* (Morillo) Liede. —A. Corona. —B. Gynostegium. —C. Pollinarium. (From Spruce 5995, G; drawn by U. Meve.)

in his early works, Morillo (e.g., 1981) did not recognize *Ditassa*. While most species have been transferred (e.g., Morillo, 1989), a few are still erroneously included in *Cynanchum*.

Ditassa buntingii (Morillo) Liede, comb. nov. Basionym: *Cynanchum buntingii* Morillo, *Ernstia* 51: 2. 1989. TYPE: Venezuela. Territorio Federal Amazonas: 11 km E de Maroa, 125 m, *Steyermark & Bunting 102 813* (holotype, VEN).

Additional material seen. VENEZUELA. Amazonas: 1 km E of Maroa, Río Guafínfa, 120–140 m, 25 Nov. 1953, *Maguire, Wurdack & Bunting 36410* (MO).

Ditassa franciscoi (Morillo) Liede, comb. nov. Basionym: *Cynanchum franciscoi* Morillo, *Ernstia* 51: 3. 1989. TYPE: Venezuela. Territorio Federal Amazonas: Dept. Rio Negro, Norte de Serranía de Unturan, 300–350 m, *Guanchez 860* (holotype, VEN; isotype, TFA).

Additional material seen. VENEZUELA. Amazonia, 35 km S of Samariapo, towards Río Sipapo, 26 June 1975, *Gentry & Berry 14622* (MO).

Ditassa jahnii (Morillo) Liede, comb. nov. Basionym: *Cynanchum jahnii* Morillo, *Ernstia* 2: 7. 1992. TYPE: Venezuela. Mérida: Mucurubá, 2600–2700 m, 3 July 1930, *Gehriger 289* (holotype, VEN; isotype, G).

Ditassa sobradoi (Morillo) Liede, comb. nov. Basionym: *Cynanchum sobradoi* Morillo, *Ernstia* 4: 13. 1981. TYPE: Venezuela. Territorio Federal Amazonas: 2 km NE de San Carlos de Río Negro, *Morillo, Morillo & Wood 3895* (holotype, VEN).

It is very possible that *Cynanchum leptostephan-*

um Diels from Ecuador, of which the holotype was destroyed in B and no isotypes were found, also constitutes a species of *Ditassa*.

PHILIBERTIA KUNTH

In the course of the present study, an isotype of *Stelmatodocon fiebrigii* Schlechter was found in M. The specimen can clearly be attributed to the genus *Philibertia* Kunth, so this monotypic genus can be placed in synonymy of *Philibertia*. This material corresponds to the plant recently published as *Fontellaea boliviana* Morillo (Morillo, 1994), the only species of the genus *Fontellaea* Morillo. Thus, *Fontellaea* Morillo constitutes a further synonym of *Philibertia*.

Philibertia fiebrigii (Schlechter) Liede, comb. nov. Basionym: *Stelmatodocon fiebrigii* Schlechter, *Bot. Jahrb. Syst.* 37: 618. 1906. TYPE: Bolivia. Soledad prope San Luis, 1500 m, Jan. 1904, *Fiebrig 2678* (lectotype, designated here, M).

Fontellaea boliviana Morillo, *Anales Jard. Bot. Madrid* 52(1): 36. 1994. Syn. nov. TYPE: Bolivia. La Paz: Quime, small town about 100 mi. from Oruro, 16 Mar. 1949, *W. Brooke 5295* (holotype, BM).

Additional material seen. BOLIVIA. La Paz: Larecaja, on the trail between Laripata and Sorata, 3000 m, 14 Mar. 1979, *Keel 463* (LPB); Sorata, 14 km hacia Quiabaya, 2970–3000 m, Mar., *Beck 1346* (LPB).

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Literature Cited

- Kunze, H. 1982. Morphogenese und Synorganisation des Bestäubungsapparates einiger Asclepiadaceen. *Beitr. Biol. Pflanzen* 56: 133–170.
- Liede, S. 1996. Anther differentiation in the Asclepiadaceae: Form and function. Pp. 221–235 in W. G. D'Arcy & R. C. Keating (editors), *The Anther: Form, Function and Phylogeny*. Cambridge Univ. Press, New York and Cambridge.
- . 1997. American *Cynanchum* (Asclepiadaceae)—A preliminary infrageneric classification. *Novon* 7.
- & H. Kunze. 1993. A descriptive system for corona analysis in Asclepiadaceae and Periplocaceae. *Pl. Syst. Evol.* 185: 275–284.
- & F. Weberling. 1995. Inflorescence structure in Asclepiadaceae. *Pl. Syst. Evol.* 197: 99–109.
- Malme, G.O.A. 1933. Asclepiadaceae austroamericanae praecipue andinae. *Ark. Bot.* 25A(7): 1–26; tab.1–3.
- Morillo, G. N. 1978. New taxa from the Avila and Naiguata Mountains, Venezuela. *Brittonia* 30: 47.
- . 1981. Asclepiadaceae nuevas o interesantes de la Guyana Venezolana. *Ernstia* 4: 1–20.
- . 1986. Estudio sobre la flora de las Guyanas. Asclepiadaceae. II. Especies nuevas o interesantes en Venezuela y Guyana. *Ernstia* 37: 1–42.
- . 1989. Contribución al conocimiento de las Asclepiadaceae suramericanas, principalmente de las Guyanas. *Ernstia* 51: 1–16.
- . 1994. *Fontellaea* gen. nov., y otros novedades o aportaciones en Asclepiadaceae andinas. *Anales Jard. Bot. Madrid* 52: 33–44.
- Woodson, R. E. 1941. The North American Asclepiadaceae. *Ann. Missouri Bot. Gard.* 28: 193–244.



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