

**LOWRYANTHUS RUBENS (COMPOSITAE: ATHROISMEAE),
A NEW GENUS AND SPECIES FROM SOUTHEASTERN MADAGASCAR**

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ABSTRACT

The new genus and species *Lowryanthus rubens* Pruski (Compositae) from Madagascar is described. By paleate clinanthia, tailed anthers, 2-banded styles branches, and especially by the strange carbonized, obcompressed, geniculate-rostrate cypselae, *Lowryanthus* Pruski is placed in African-centered tribe Athroismeae, which contains only 3 subtribes, 7 genera, and about 60 species. Although the epappose long-ciliate cypselae and open paniculate capitulescence make confident placement of *Lowryanthus* in either subtribe Anisopappinae or Athroisminae difficult, the carbonized obcompressed cypselar character of *Lowryanthus* is used here to place the new genus in Athroisminae. However, the three other genera of Athroisminae are totally different and characterized by glomerate capitulescences and typically white corollas.

Exploration in Madagascar by a team of botanists from the Missouri Botanical Garden has resulted in the discovery of a hitherto unknown, red-flowered, discoid-capitulate Compositae. This striking plant (Fig. 1) was brought to my attention in 2007 by Porter P. (Pete) Lowry II (MO) and is described here as monotypic *Lowryanthus* Pruski and placed in tribe Athroismeae, which is characterized in part by its strange, carbonized, obcompressed, geniculate-rostrate cypselae (Figs. 2, 5D). An early draft of this manuscript was reviewed in 2007 by Henk Beentje (K) and Arne Anderberg (S), but validation of the plant was withheld pending examination of possible newer collections, the existence of which I was alerted to in 2008 by Pete Lowry. In 2013 this second suite of collections, made by J. Rabenantoandroin in 2008, were processed and mounted at MO. These 2008 specimens were seen recently during routine herbarium specimen filing, and their mature, black, carbonized, geniculate-rostrate cypselae confirm this important character as given in original draft description of *Lowryanthus*. I do not anticipate that possible additional collections will change drastically either the description or circumscription of the plant, and it now appears appropriate to validate the new genus and species, apparently endemic to Madagascar.

LOWRYANTHUS RUBENS Pruski, gen. et sp. nov. TYPE: MADAGASCAR. Toliara. Anosy Région, Bemangidy Forest, ca. 3 km W of Antsotso, along RN 12a, 65 km N of Ft. Dauphin, humid evergreen forest on steep slope, E of Ivohibe peak, 24° 35' 02" S, 47° 12' 44" E, 100–250 m, 7 Feb 2006, P.P. Lowry II, J. Rabenantoandro, F. Randriatafika, E. Lowry, E. Ramisy, & B. Mara 6648 (holotype: MO; isotypes: P [photograph: MO], S, TAN). Figs. 1–5.

Plantae herbaceae perennes vel fruticosae 1–4 m altae; caules rubri subtereti hirsutuli; folia simplicia alterna petiolata, lamina oblanceolata vel anguste obovata 5–19(–25) × 2–7.5(–9.5) cm chartacea pinnativenia eglandulosa hirsutula denticulata, trichomatibus patentibus uniseriatis multicellularibus, petiolo 2–3.5(–5) cm longo; capitulescentia terminalis corymbiformis vel paniculata, pedunculis 7–20 mm longis; capitula discoidea paleacea, involucrem turbinatum vel campanulatum 7–9 × 4.5–8.5 mm, phyllaria 5–8 circiter 2-seriata oblanceolata vel obovata 6.5–8 × 2–5.5 mm, chartacea rubra; clinanthium paleaceum; paleae late lanceolatae vel oblanceolatae 7–11 × 1.5–2.5 mm stramineae vel rubrae; flosculi disci 10–15, corolla anguste campanulata quinquelobata 4–5.8 mm longa rubra vel rosea, tubo 1.5–2.1 mm longo glanduloso necnon piloso, glandulis biseriatis brevistipitatis, limbo anguste ampliato, lobis 1.2–1.5

mm longis subsessile-glandulosis, antherae basi caudatae, styli ramuli bilineati 1.2–1.3 mm longi; cypselae obcompressae obovoidae 3.7–5 × usque 2 mm rostratae epapposae longiciliatae.

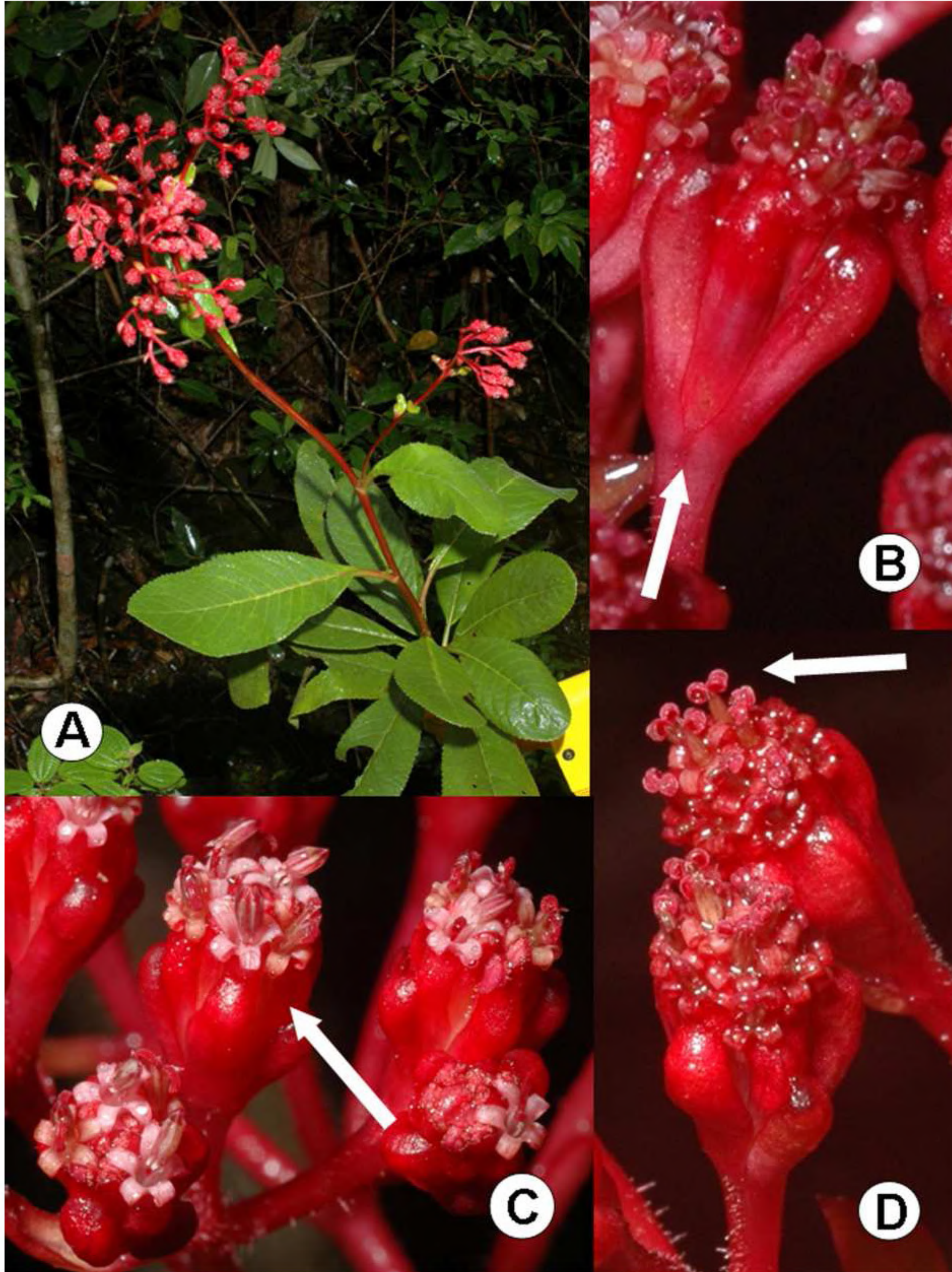


Figure 1. Field photographs of *Lowryanthus rubens*. A. Habit. B. Capitulum showing base of involucre (arrow) and ca. 2-seriate phyllaries. C. Capitula showing reflexed pinkish disk corolla lobes (arrow) and exerted anther cylinders with styles yet to protrude. D. Close up of two capitula showing recurved style branches (arrow) and the patent trichomes of the peduncles. (Lowry *et al.* 6648; photographs by P.P. Lowry II).



Figure 2. SEM micrograph of convex abaxial face of an immature cypsela of *Lowryanthus rubens* showing geniculate rostrum (upper right) (*Antilahimena et al.* 4801, MO; sample preparation method is as given in Pruski 2012).

Perennial herbs to shrubs, 1–4 m tall; stems ascending to erect, few-branched distally, striate, subterete to angled or even somewhat flattened in capitulescence, reddish, slightly hirsutulous distally, leafy in the proximal half with somewhat congested internodes, these becoming well-spaced distally, internodes 1–4(–12) cm long, pith solid. **Leaves** simple, alternate, petiolate; blade progressively reduced in size distally, oblanceolate to narrowly obovate, 5–19(–25) × 2–7.5(–9.5) cm, chartaceous to stiffly so, venation pinnate, secondary veins departing from midrib at angles of 45° or greater, third order venation obscure, surfaces eglandular, hirsutulous, trichomes patent, uniseriate, multicellular, without well-developed subsidiary cells, abaxial surface of immature leaves sometimes densely hirsute, blade base attenuate onto petiole, margins denticulate, the closely spaced callous-tipped teeth usually ca. 0.5 mm long, apex obtuse to rounded; petiole narrowly winged to base, 2–3.5(–5) cm long, canaliculate, rose-colored, broadened basally and subclasping (subamplexicaul) the stem. **Capitulescence** mostly terminal, pluricapitulate, open, corymbiform-paniculate, branching

alternate appearing more or less divaricate, branches reddish, often 1-bracteolate, slightly hirsutulous, bracteoles typically positioned toward proximal half of branch, oblanceolate, $5-8 \times 1-2$ mm wide; peduncles reddish, somewhat stout, 7–20 mm long, slightly hirsutulous, often 1(–4)-bracteolate, bracteoles resembling those of the capitulescence branches, often positioned (0–)2–4 mm proximal to subtended capitulum. **Capitula** discoid, 10–15-flowered, 10–12 mm tall; involucre turbinate to narrowly campanulate, $7-9 \times 4.5-8.5$ mm, sometimes appearing double by closely subtending peduncular bracteoles; phyllaries 5–8, oblanceolate to obovate, $6.5-8 \times 2-5.5$ mm, subequal or slightly graduated, loosely imbricate, ca. 2-seriate, erect, reddish, bracteoles and outer phyllaries not articulated basally, stiffly chartaceous, obscurely ca. 5–7-nerved, glabrous or short-ciliate distally, apex somewhat cucullate especially in bud, disk corollas partly exerted from top of involucre; clinanthium paleate, hemispherical to clavate, $1.5-4.5 \times 1-2.5$ mm; paleae broadly lanceolate to oblanceolate, $7-11 \times 1.5-2.5$ mm, nearly planar grading to the inner ones somewhat conduplicate, chartaceous, stramineous with rose-colored apices, 3–5-nerved, glabrous or short-ciliate distally, apically rounded to less commonly truncate. **Ray florets** none. **Marginal pistillate florets** apparently none. **Disk florets** 10–15, bisexual, 5-merous, the outermost sometimes aborted; corolla actinomorphic, narrowly campanulate, 5-lobed, 4–5.8 mm long, tissue moderately thick, tube 1.5–2.1 mm long, reddish with pinkish lobes, broadened basally around nectary, with short-stipitate biseriateglandular trichomes (similar to those in Eriksson 1995: 118, Fig. 4), also often pilose, the limb moderately ampliate, throat glabrous or stipitate-glandular, lobes 5, 1.2–1.5 mm long, reflexed to slightly so, subsessile-glandular, 2-nerved, nerves intramarginal; filaments 1.2–1.5 mm long, glabrous, collar same diam. as filaments, shorter than the tails, collar cell walls evenly thick, anthers often fully exerted, ca. 2.2 mm long, pinkish, caudate (sterile-tailed) or calcarate-caudate (tails partly polleniferous), thecae ca. 1.5 mm long, endothecial tissue polarized, thecae and connectives somewhat discoloured, tails ca. 0.7 mm long, distal tail surface short-papillose, papillae apices rounded, tails of adjacent thecae appressed to slightly connate, apical anther appendage elliptic-ovate, ca. 0.3 mm long, longer than wide, well-differentiated from thecae, slightly concave longitudinally, non-sculptured; pollen markedly echinate, white; style 4.7–6 mm long, red, exappendiculate, trunk 3.5–4.2 mm long, basally glabrous, non-enlarged, branches 1.2–1.3 mm long, broadly linear, tangentially spreading to recurved, each with a 2-banded stigmatic surface, apically acute to obtuse, with short sweeping papillae, papillae apices rounded, style immersed in basal nectary, nectary ca. 0.6 mm long, commonly positioned asymmetrically atop rostrum. **Cypselae** obcompressed (tangentially flattened), obovate in outline, $3.7-5 \times$ to 2 mm, rostrate, epappose, body and rostrum black-carbonized, eglandular, faces finely roughened, phytomelanin deposits first manifest in spots, glabrous to sparsely pilose distally, abaxial face convex, adaxial face concave, body ultimately with 2 well-developed lateral shoulders, the rostrum thus appearing as arising from a slight recession on the top of the fruit, margins to 0.4 mm broad, sometimes brownish when maturing, spreading-antrorse long-ciliate, trichomes multicellular, biseriateglandular, to ca. 2.5 mm long, falsely resembling pappus (nearly as to position on the technically epappose cypselae), but ontogenetically not homologous and not borne upon the apical annulus, terminal trichome cells erect and non-diverging, rostrum broad, ca. 0.7 mm tall, strongly deflected (geniculate) abaxially, annulus a minute ring atop rostrum; carpodium nearly annular, ca. 0.3 mm long, somewhat broadly triangular in cross-section, stramineous. **Chromosome number** unknown.

Paratypes. MADAGASCAR. Toliara. Bemangidy, Commune Iabakoko, Fokontany Antsontso, Ivohibe forest, $24^{\circ} 34' 13''$ S, $47^{\circ} 12' 01''$ E, 286 m, 23 May 2006, *Antilahimena et al.* 4801 (MO, P, S, TAN, TEF); Anosy, Fort Dauphin, Iabakoho, Antsotso, $24^{\circ} 34' 15''$ S, $47^{\circ} 12' 05''$ E, 280 m, 2 Apr 2008, *Rabenantoandro et al.* 1895 (MO, P, TAN); Anosy, Tolagnaro, Iabakoho, Antsotso avaratra. Forêt dense humide de basse altitude d'Ivohibe. $24^{\circ} 34' 03''$ S, $47^{\circ} 12' 09''$ E, 270 m, 3 Apr 2008, *Rabenantoandro et al.* 1903 (MO, P, TAN); Fort-Dauphin, Iabokoko, Antsotso, Forêt Ivohibe, $24^{\circ} 33' 52''$ S, $47^{\circ} 14' 25''$ E, 112 m, 26 Nov 2005, *Razakamalala et al.* 2369 (MO, P, S, TAN).



Figure 3. Holotype of *Lowryanthus rubens* (Lowry et al. 6648, MO).

Etymology. I am both pleased and privileged to dedicate this new genus to Porter P. (Pete) Lowry II (MO), director of MBG's Madagascar program and collector of the type material. Pete kindly and enthusiastically showed me photographs of his then-unrecognized, red-flowered Compositae collection and shortly thereafter routed the initial collections from 2005 and 2006 to me for identification. The epithet refers to the crimson-red branchlets, phyllaries, and corollas.

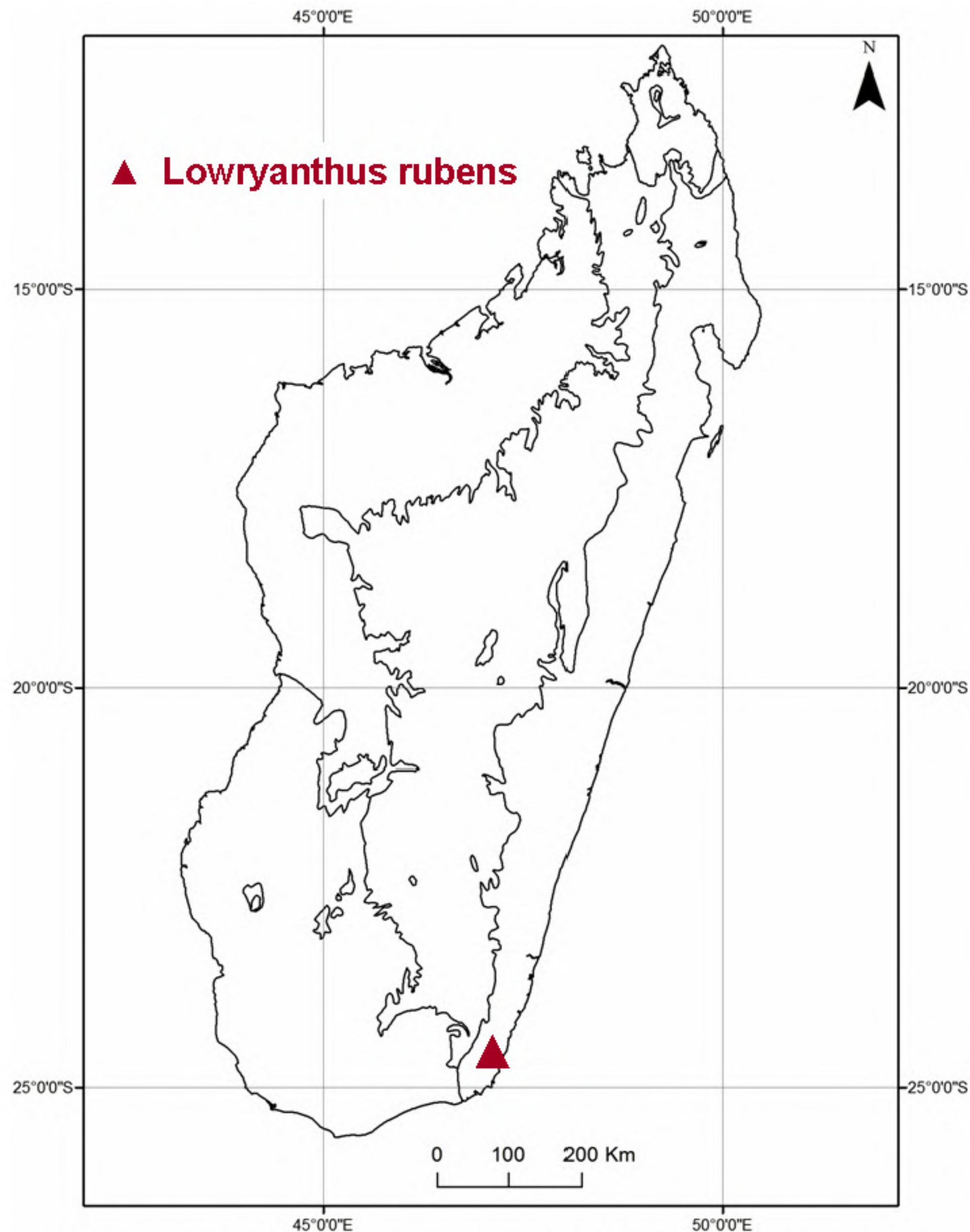


Figure 4. Distribution map (with the five major biozones of Madagascar indicated) of *Lowryanthus rubens*.

Habitat and ecology. *Lowryanthus rubens* is known from only a handful of collections made within a few kilometers of each other in the Bemangidy-Ivohibe forest, downhill from Ivohibe peak and about 50 kilometers north of Fort Dauphin in southeastern Madagascar. *Lowryanthus rubens* occurs between about 100–286 meters elevation in low-elevational humid evergreen forests on the eastern slope of the Tsitongambarika range, the easternmost mountain chain in southern Madagascar and basically bordering the Indian Ocean. The Bemangidy-Ivohibe forest is of special interest as it is among the few remaining regional low-elevational wet forests. The species has been collected in flower from November to May and is pollinated possibly by insects. I do not know the soil type where the plants grow. Five of the seven known genera of Athroismeae occur in Madagascar, but only *Lowryanthus* is endemic there.

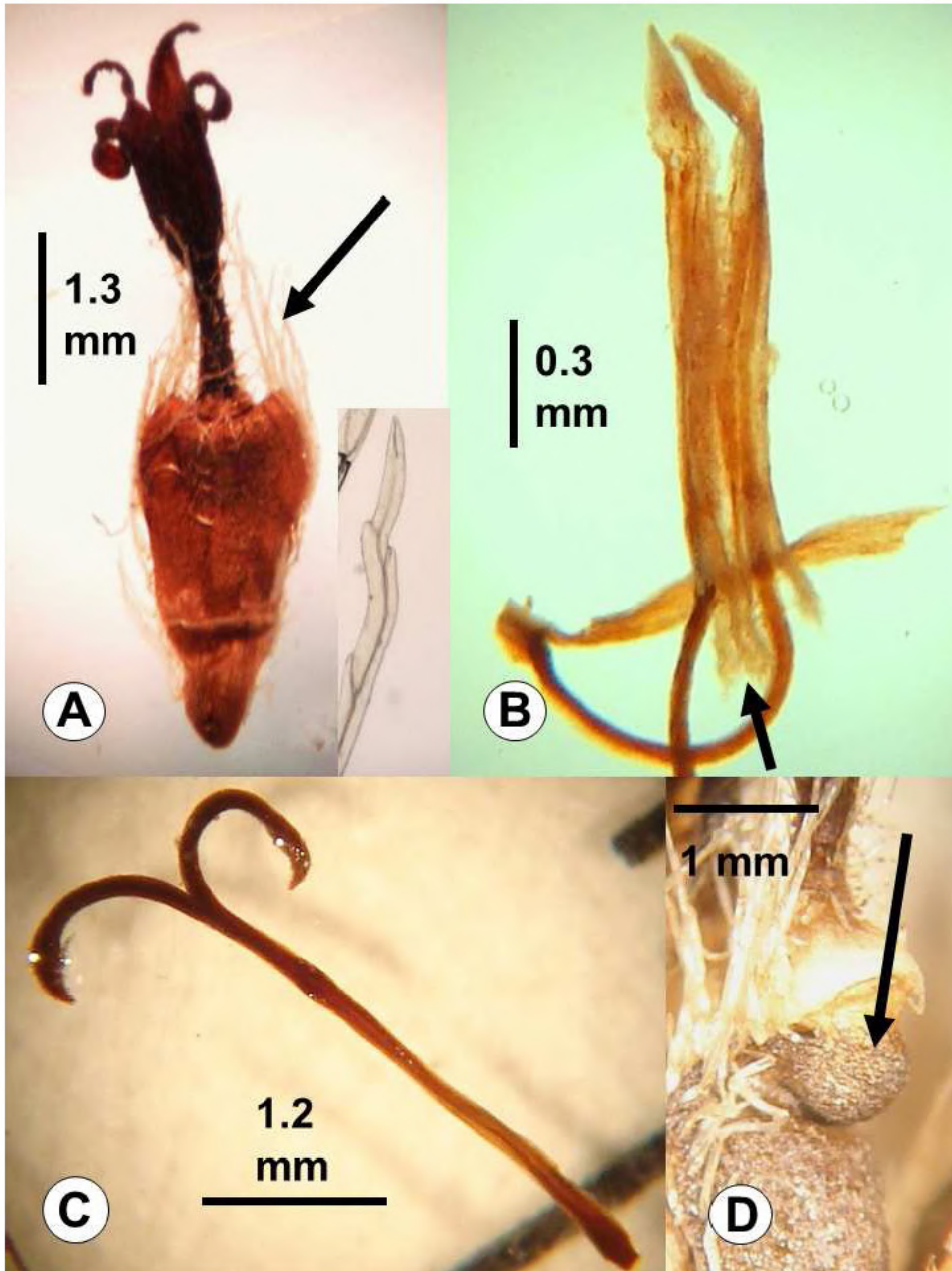


Figure 5. Microscopic features of *Lowryanthus rubens*. A. Disk floret showing corolla and immature cypsela. The arrow points toward trichomes which in the close-up are seen as biseriate with erect non-diverging apical cells. B. Two post-anthesis stamens showing tailed anthers (arrow points toward the end of tails). C. Bifid style. D. Close-up of obcompressed nearly mature cypsela showing abaxial geniculate rostrum (arrow) (Lowry *et al.* 6648, MO).

Malagasy *Lowryanthus* has paleate clinanthia, tailed anthers, style branches with 2-banded stigmatic surfaces, and obcompressed carbonized geniculate-rostrate cypselae (Figs. 2, 5D) and is a member of the Heliantheae Alliance (subfamily Asteroideae sensu Bremer 1994; Panero 2007a), but upon first dissection its tribal placement was not at all immediately apparent to me. Within Asteroideae, Inuleae (including Plucheeae) is the only traditionally recognized tribe characterized in part by consistently tailed anthers. It was basically similar to Inuleae, from which African-centered Athroismeae Panero, Cuban Feddeae Pruski et al., and cosmopolitan Gnaphalieae Anderberg were segregated (viz Anderberg 1991; Cariaga et al. 2008; Panero 2005, 2007a, 2007b), and that is where the affinities of *Lowryanthus* were sought. *Lowryanthus* would be clearly anomalous, however, in either Feddeae or Gnaphalieae.

Although the character of tailed anthers only places *Lowryanthus* somewhere in the general vicinity of Inuleae sensu lato (sensu Merxmüller et al. 1977) and segregate tribes, it is the very strange, obcompressed, carbonized, asymmetrically rostrate cypselae character (viz Eriksson, 1990, 1992, 1995; Figs. 2, 5D; described by Eriksson in 1990 as "abaxially curved") that specifically allows *Lowryanthus* to be placed near the genera of the African-centered *Blepharispermum* group, treated earlier by Merxmüller et al. (1977) as Inuleae.

The three genera of the *Blepharispermum* group (*Athroisma* DC., *Blepharispermum* Wight ex DC., *Leucoblepharis* Arn.) since have been placed in Heliantheae subtribe Ecliptinae (Eriksson 1990, 1991) as "unassigned to a subtribe" within tribe Helenieae (Karis and Ryding 1994: 536) and based on molecular studies were placed in the newly described Athroismeae (viz Panero 2005, 2007a, 2007b). Panero (2005) expanded Athroismeae from 3 to 5 genera by adding the new monogeneric Centipedinae Panero and Anisopappinae Panero. Panero (2007b) added epaleate *Welwitschiella* O. Hoffm. to Anisopappinae, but Brouillet et al. (2009) placed this genus in Astereae. Ortiz (2010) described *Cardosoa* S. Ortiz, a sixth genus of Athroismeae. The present addition of *Lowryanthus* raises to 7 the number of genera (each monographed) recognized in the relatively small African-centered Athroismeae (Table 1), which contains 3 subtribes, 7 genera, and about 60 species. Subtribes, genera, species numbers, distributions, primary references, and a key to subtribes and genera of tribe Athroismeae follow.

Table 1. The subtribes, genera, species numbers, and distributions of Athroismeae.

I. Athroisminae	1. <i>Athroisma</i> DC. [as <i>Polycline</i> Oliv. in Humbert 1960–1963]	12 species; Africa, Madagascar, 1 sp. in Asia. (Eriksson 1995).
	2. <i>Blepharispermum</i> Wight ex DC.	15 species; Africa, Madagascar, Asia. (Eriksson 1992).
	3. <i>Leucoblepharis</i> Arn.	1 species; India. (Eriksson 1990).
	4. <i>Lowryanthus</i> Pruski	1 species; Madagascar. (Pruski 2014, present paper).
II. Anisopappinae	5. <i>Anisopappus</i> Hook. & Arn. [as <i>Epallage</i> DC. in Humbert 1960–1963]	17–40 species; Africa, Madagascar, 1 sp. in Asia. (Wild 1964; Eldenäs and Anderberg 1996; Ortiz et al. 1996; Ortiz 2005; Panero 2005).
	6. <i>Cardosoa</i> S. Ortiz	1 species; Africa. (Ortiz 2010).
III. Centipedinae	7. <i>Centipeda</i> Lour.	10 species; mostly circumaustral, also Madagascar. (Walsh 2001; Nylinder et al. 2013).

Key to subtribes and genera of tribe Athroismeae (modified from Panero 2007b)

1. Cypselae brown to black, not carbonized, subterete to compressed.
 2. Capitula disciform, epaleate; innermost disk florets 4-merous; cypselae epappose; (Centipedinae, 1 genus) **Centipeda**
 2. Capitula radiate, paleate; disk florets 5-merous; cypselae pappose; (Anisopappinae, 2 genera).
 3. Capitulescence lax corymbiform; marginal florets radiate; disk corollas strictly actinomorphic; anther appendage acute apically; cypselae 10–20-costate **Anisopappus**
 3. Capitulescence racemiform-cymose; marginal florets subbilabiate; disk corollas slightly zygomorphic, anther appendage apiculate apically; cypselae < 10-costate **Cardosoa**
1. Cypselae black, carbonized, obcompressed; (Athroisminae, three core genera + *Lowryanthus*).
 4. Capitulescence open; capitula discoid; corollas red **Lowryanthus**
 4. Capitulescence of globose glomerules; capitula discoid or disciform; corollas mostly white.
 5. Capitula 4–6-flowered; inner florets functionally staminate; cypselae pappose **Blepharispermum**
 5. Capitula 4–47-flowered; disk florets bisexual; cypselae epappose.
 6. Capitula short-bracteate; twin trichomes of cypselae with diverging or recurved apices **Athroisma**
 6. Capitula long-bracteate; twin trichomes of cypselae with erect apices **Leucoblepharis**

Within Athroisminae, the non-glomerate, red-flowered *Lowryanthus* is very different from the three other genera, each of which has densely glomerate, globose capitulescences and typically white corollas. However, by long marginal and apical twin trichomes on the epappose cypselae *Lowryanthus* is somewhat similar to *Athroisma* and *Leucoblepharis*. Additionally, *Leucoblepharis* has trinervate (vs. pinnately veined) leaves; *Blepharispermum* has occasionally thorny (vs. unarmed) stems, unisexual (vs. bisexual) disk florets, and cypselae with (vs. without) a true pappus of awns or scales; and *Athroisma* has diverging to recurved (vs. erect) apical cells of the twin trichomes of the cypselae, further distinguishing these three genera from *Lowryanthus*. The two non-typical subtribes have non-carbonized cypselae and either radiate capitula or innermost disk florets 4-merous, thereby differing from *Lowryanthus*.

I should also note here that the combination of morphological characters diagnostic for *Lowryanthus* is unmatched in any of the detailed regional treatments of Humbert (1923, 1960–1963), Hind et al. (1993), Beentje (2000, 2002), Beentje et al. (2005), and nothing similar can be found in the family overview of Bremer (1994). Thus, the striking *Lowryanthus rubens* is described as a new genus and species and placed in tribe Athroismeae. Molecular support of the affinities of *Lowryanthus* awaits study, which I suspect will show that a new subtribe is needed to accommodate *Lowryanthus*.

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