New combinations and taxonomic notes for *Tarenaya* (Cleomaceae)

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ABSTRACT
*Tarenaya* clade includes 37 species based on phylogenetic relationships and on the stipular spine synapomorphy, however only 10 species thought to belong to the genus have had names established in *Tarenaya*. Besides the two new species are being described, we present 25 new combinations for the species and refine the typification of 13 species. Ten lectotypes and three neotypes are designated here. One generic synonym is also typified.

Keywords: *Cleome*, *Hemiscola*, nomenclature, *Tarenaya*, type

Introduction
*Tarenaya* was segregated from *Cleome* by Rafinesque (1838) with one species, *T. spinosa* (based on *Cleome spinosa*), because he did not agree with the broad concept of *Cleome*. He based his proposal on the habit, type of leaf, number of leaflets, number of stamens, presence and morphology of nectaries, length of gynophore, and geographic distribution. *Tarenaya* was generally not adopted in taxonomic treatments and was instead considered to be a synonym of *Cleome* for the next ~170 years. In 1952, when Iltis [unpublished] revised the New World *Cleome* species, the genus was treated as a section, *Cleome* sect. *Tarenaya*, comprising 24 species and characterized by spines and prickles of epidermal origin (characters not shared by three species and one subspecies, currently recognized under *Cleoserrata* Iltis and unarmed forms in various species), seeds with an aril and a large cleft. Later, Jacobs (1960), Iltis (1967), Iltis & Zapata (1997), and Costa-e-Silva (2000) used *Tarenaya* informally in their classifications, and the name was finally formally established as a section by Iltis (2005) when he described a new species of *Cleome* from the Andes. By that time Iltis (2005) considered section *Tarenaya* to comprise a group of 40 species from the New World and one from East Africa.

The recognition of *Cleome* as a paraphyletic genus (Hall et al. 2002; Sanchez-Acebo 2005; Hall 2008; Inda et al. 2008; Feodorova et al. 2010, Patchell et al. 2014) has led to the deconstruction of *Cleome* s.l., and consequently multiple genera have been segregated and reorganized (Iltis & Cochrane 2007; 2014; 2015; Cochrane & Iltis 2014; Roalson et al. 2015; Thuill & Roalson 2017; Barrett et al. 2017; Roalson & Hall 2017; Soares Neto et al. 2017), including *Tarenaya* (Iltis & Cochrane 2007). This taxonomic reorganization was based on morphology, chromosome number, and phylogenetic relationships, and specific nomenclatural recombinations were made for Flora of North America (Iltis & Cochrane 2007) and Flora Mesoamericana (Iltis & Cochrane 2014; 2015).

The *Tarenaya* clade is defined by an easily recognized synapomorphy: a pair of spines at the base of the petioles (stipular spines) and is well supported in all phylogenetic studies of the family (Hall et al. 2002; Sanchez-Acebo 2005; Hall 2008; Inda et al. 2008; Feodorova et al. 2010, Patchell et al. 2014; Barrett et al. 2017). Not all of the presumed species of *Tarenaya* have been sampled for molecular phylogenetic
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Another segregate genus recognized (lectotype, designated here: W 0060314 (Jacq.) Raf., Sylva Tellur. 111. 1838. Scolosperma is the oldest name for this taxon. Iltis Raf., Sylva Tellur. 111. 1838. Type: The species commonly known as . We also include combinations necessary (lectotype, designated by Neocleome (holotype: BR 88677575 [image!]; isotypes: (Jacq.) Small, Man. S.E. Fl., Sylva Tellur. 577. 1933. Type, ) are assigned to the Cleome aculeata (L.) Raf., Sylva Tellur. 111. 1838. Type: Habitat in America, D. Zoega s.n. (lectotype, designated by Al-Shhehbaz (1988): BM-LINN 850.17 [image!]). = Hemiscola aculeata (L.) Raf., Sylva Tellur. 111. 1838.


Notes—The species commonly known as Cleome dendroides requires the application of an older name. Here we make the combination Tarenaya atropurpurea, as Cleome atropurpurea is the oldest name for this taxon. Iltis considered this name “nom. subnud.” as annotated on the syntype Schott 4442; however, Schott clearly presents a

Materials and methods

Type specimens that have been examined in person by the authors are annotated with exclamation marks. Images of type specimens examined online are annotated as “[image!]”, and a barcode number, if available, is given. Original protologues were studied for all names treated here.

Results and discussion


Notes—Small (1933), when delimiting the genus Neocleome, made two new combinations, N. spinosa and N. serratia, but did not designate a type species for the new genus. One of these species is now placed in Tarenaya (N. spinosa), but the other (N. serratia) is assigned to the genus Neocleome. We believe Small intended to include in Neocleome a broader diversity of Tarenaya (he states: “... about 70 species, natives, mainly, of tropical regions.”) and we therefore typify Neocleome based on Tarenaya spinosa.

Herbs to subshrubs or shrubs, annual or perennial, branched from the base; pubescent to puberulent-glandular indument at branches or totally glabrous; stipular spines at the base of petals; leaves palmately-compound with 3–7(–12) leaflets; racemes corymbiform, flowers bracteate, the lower with leaf-like bracts with 3–5 leaflets, becoming 1-foliolate in the inflorescence axis; flowers tetramerous, zygomorphic petals unguiculate, white or white becoming pink or purplish at apex, pink to purplish, or a pair of each color; nectary annular; stamens 6, elongated by a short androgynophore enrolled by the nectary; mature capsules cylindrical, ellipsoid, fusiform, oblanceoloid, sessile or short to long elongated stalks; seeds horseshoe-shaped, longitudinally striate and transversely ridged, cleft covered by a membrane attaching both tips (cotyledonar and radicular “claws”).


Notes—The species commonly known as Cleome dendroides requires the application of an older name. Here we make the combination Tarenaya atropurpurea, as Cleome atropurpurea is the oldest name for this taxon. Iltis considered this name “nom. subnud.” as annotated on the syntype Schott 4442; however, Schott clearly presents a
diagnosis of this species with his publication of *Cleome atropurpurea*. For this reason, we apply that name here. There are two original collections of Schott at W, and we designate W 0060314 as the lectotype as it is the more complete specimen with leaves and flower buds. The other syntype material is of significant importance, though, as it includes mature fruits, which are lacking from the lectotype.

*Cleome arborea* Weinm. was described based in an individual cultivated in the Horto Imperiali Paulowskieni, near St. Petersburg, from seeds from Brazil. Schultes *filicus* (1829) renamed *Cleome arborea* as *C. dendroides*, taking into account the earlier homonym, *C. arborea* Kunth. Schultes *filicus* cited one collection of Weinmann’s, probably the type, which was not found in LE nor in any other herbarium. Hooker (1834) in Curtis’s Botanical Magazine presented notes about this *Cleome*, improving its description and also presenting a beautiful illustration highlighting the stipular spines, purple flowers, fruits, and seeds. This illustration is here chosen as the neotype for this name.


**Notes**—*Gardner 309* has a large number of known duplicates designated only as “typus” without any herbarium holding a clear holotype. Many of these specimens are good representatives of the species, bearing flowers and mature fruits, characters useful in recognizing this species. The specimen BM000573983, however, is from the Gardner herbarium and is labeled with Gardner’s handwriting and, therefore, is being designated as the lectotype.


**Notes**—According to the protologue, the description of this species was based on an individual growing in the gardens of Geneva from seeds from Uruguay. No specimen was found in any herbaria matching the type, and, therefore, the illustration presented together with the original description is being here designated as the lectotype.

We are also correcting here the authorship of *Cleome crenepetala* that has been erroneously attributed to Augustin de Candolle, but was in fact described by Alphonse de Candolle, as can be seen at the end of the original description.


11. **Tarenaya guarantica** (Chodat & Hassl.) Soares Neto & Roalson, stat. & comb. nov. *Cleome rosea* Vahl
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Notes—De Candolle described Cleome latifolia based on a specimen seen in the Vahl herbarium; however, we have found no records of such specimen in C (Olof Ryding, pers. comm.), nor in G-DC. Given such, we are designating as the neotype Sagot 1170, one of the specimens studied by Eichler (1865) for Flora Brasiliensis and Ilits (1952) in his revision of New World Cleome.


Notes—HBG-522391 is being designated as lectotype, because of the two collections seen by Ule, the collection at HBG is the one labeled as “Cleome microcarpa s. n.v.”, while the specimen at B was labeled first as “Cleome viridiflora s. n.v.” (crossed off) and later as C. chlorantha s. n. (inéd.).


Notes—We here designate specimen BR 698554 as the lectotype for several reasons. The B specimen label bears three names, each in a different script, entered in the sequence Cleome rosea, C. polygama (scratched), and then C. regnellii, the latter in a fancy penmanship that does not appear to be that of Eichler. On that label in this same calligraphy also appears a full citation of the place of publication of Eichler’s species, making it unlikely that this annotation pre-dated the publication of his 1870 paper. These facts impede the selection of the B specimen as lectotype. However, two sheets in BR, BR 698554 and BR 698555, are annotated as C. regnellii in Eichler’s handwriting. Eichler, who with Urban completed the Flora Brasiliensis, certainly saw Martius’s herbarium, which included specimens collected by many others and which is now at BR.
For these reasons, it seems plausible that the BR collections, having been seen by Eichler, are the proper type material. BR 698554 is a better, more complete specimen than BR 698555 and is therefore chosen as the lectotype.


Notes—As with the type of C. regnellii above, it is most likely that the BR specimen represents material used by Eichler, and we therefore lectotypify C. siliculifera with BR 698586.


Notes—The Spegazzini type collection at LP does not appear to include the type of Cleome titubans, as expected. Costa-e-Silva (2000) also referenced her inability to type the species for her review of Brazilian Cleome. Because no original material of C. titubans has been found among Spegazzini’s collections, a neotype is designated here.


Notes—Both specimens of Werdermann 2597 at B are good representatives for this species, but B 100242682 is chosen as the lectotype, because it is labeled “typus” in Ernst’s hand.

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References


