

Research

The names of *Dipterygium glaucum* and *Rorida cornus-africani* in *Cleome* (Cleomaceae), and on the identity of Forsskål's *Bunias orientalis*

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Cleome pallida is the name to be used for *Dipterygium glaucum*, widespread in desert habitats of northeastern Africa and southwestern Asia, when this species is treated as a *Cleome*. A comprehensive synonymy is provided and all names are typified. The record of *Bunias orientalis* made by Forsskål in Yemen is shown to be based on misidentified material of *C. pallida*. The new combination *C. cornus-africani* is made for a species endemic to northeastern Somalia that was first described as a *Rorida*.

Keywords: *Cleome*, *Dipterygium*, lectotypification, *Rorida*, taxonomy



Introduction

Cleomaceae is a family comprising some 270 species (Roalson 2021) and is distributed mainly in tropical and warm temperate parts of the world. The family is well supported as sister to Brassicaceae (Hall et al. 2002, Hall 2008, Iltis et al. 2011), but its generic subdivision is controversial. Based on various molecular phylogenetic results, as well as morphological data, more than 25 genera have at times been proposed within this relatively small family. Roalson and Hall (2017), for example, had to recognize 13 genera in Africa for the sake of monophyly, and only 22 species remain in *Cleome* sensu stricto after its disintegration (Roalson 2021). Still, most of these 22 species have not been included in any molecular phylogenetic study, and further changes can be anticipated for this reason.

Practically all species in Cleomaceae have at times been placed in *Cleome* L., and Mabberley (2017) proposed a taxonomy for the family recognizing this single genus only, albeit with a query for *Dipterygium* Decne. Also, the Plants of the World Online website (POWO 2022) treats all species of Cleomaceae, including the monotypic *Dipterygium*, as a monophyletic *Cleome*. An intermediate position was taken by Christenhusz and Byng (2018), who recognized *Cleome*, *Cleomella* DC., *Peritoma* DC. and *Rorida* J.F.Gmel.

POWO (2022) gives the previously almost totally unused *Cleome pallida* Kotschy as the name to be used for *Dipterygium glaucum* Decne., when this is treated as a *Cleome*. Below a synonymy for *C. pallida* is provided, including the typification of all names involved, and the variation and distribution of this widespread species are



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briefly discussed. Forsskål's record of *Bunias orientalis* L. from Yemen is found to refer to material of *Cleome pallida* collected by him already in 1763.

Finally, the recently described *Rorida cornus-africani* Thulin (Thulin and Roalson 2017), endemic to northeastern Somalia, is below transferred to *Cleome*. This is one of very few remaining members of Cleomaceae for which a combination in *Cleome* has been wanting.

***Cleome pallida* Kotschy (Kotschy 1838, p. 262, tab. VI B)**

Type: Saudi Arabia, Asir, 'crescit in confinis montanis provinciae Asyr', 1838, [Anonymous collector] 53 (W [W0070757], lectotype, designated here).

According to the protologue, there are two elements available for lectotypification, a cited specimen and the illustration in Kotschy (1838, tab. VI B). However, the cited specimen takes precedence according to Art. 9.12 in the ICN (Turland et al. 2018). The lectotype, which was cited as holotype by Roalson and Hall (2017), is part of a collection of Arabian plants in W made by an unknown German medical doctor ('medico germanico nomine ignoto') in 1836–1838.

Taxonomic synonyms

Dipterygium glaucum Decne. (Decaisne 1835, p. 67, pl. 3), non *Cleome glauca* DC. (Candolle 1824, p. 239)

Type: Saudi Arabia, 'près Djedda', 1832, Bové s.n. (L [L0940241], lectotype, designated here).

The type material of *Dipterygium glaucum* was collected by Bové from 'près de Djedda' according to the protologue. Roalson and Hall (2017) designated Bové s.n. [P00741552] as lectotype, stating that the specimen is from 'YEMEN: near Djedda'. However, Djedda [Jiddah] is situated in Saudi Arabia of today, and the only information of locality on this particular specimen is 'Yemen'. According to ICN Art. 9.17 (Turland et al. 2018), a lectotype can be superseded if 'it is in serious conflict with the protologue and another element is available that is not in conflict with the protologue'. The Yemeni origin of the lectotype proposed by Roalson and Hall (2017) is here regarded as serious conflict with the protologue as Jiddah has never belonged to Yemen. The Bové specimen in L here designated as the new lectotype was originally housed in P and has the locality information 'Arabie près Djedda' in agreement with the protologue.

Possible isolectotypes in P are the Bové specimens P00741551 from 'Arab. fel.', P00741553 from 'Hedjaz' and P06775790 from 'Arabia felici'. Hedjaz is an old name for a region where Jiddah is situated, and the ancient concept Arabia felix, or 'Arabie-Heureuse' according to Decaisne (1835), could also include Jiddah.

Pteroloma arabicum Hochst. & Steud. (Hochstetter and Steudel 1837), non *Cleome arabica* L. (Linnaeus 1755, p. 20)

Type: Saudi Arabia, 'ad aggeres arenosos ante portam Meccanam oppid. Dschedda, 6 Nov 1835, Schimper 851 (P [P00741559], lectotype, designated by Roalson and Hall (2017, p. 931)).

Numerous isolectotypes exist, many of which were cited by Roalson and Hall (2017).

Dipterygium glaucum var. *scabrum* Boiss. (Boissier 1867, p. 417)

Type: 'Persiâ australi vel regno Mascate', Aucher-Eloy 4150 (G-BOIS [G00797663], lectotype, designated here, isolectotypes: BM [BM013412574], K [K000643967], P [P00741563, P00741564, P00741565, P00741566]).

The lectotype in G-BOIS has no information about precise locality or collection date, but the isolectotype P00741564 gives the locality as 'Mekran' (or Makran), an area north of the Gulf of Oman in southeastern Iran and southwestern Pakistan. Another isolectotype, P00741565 gives the year as 1837, but this seems to be a mistake. According to Aucher-Eloy's posthumously published travel description (Jaubert 1843), the only time that he visited Makran was in April 1838 at his return to Iran from Muscat, just a few months before he died near Isfahan on the 6 October.

Roalson and Hall (2017) designated P00741564, a specimen obviously not seen by Boissier, as lectotype of *Dipterygium scabrum* Decne. ex Boiss., but this name was not validly published.

Dipterygium glaucum var. *macrocarpum* Blatter (Blatter 1919, p. 30, as 'macrocarpa')

Type: Saudi Arabia, Jiddah, Aug 1881, Zohrab 95 (K, lectotype, designated here).

Two syntypes were cited by Blatter (1919), Zohrab 95 and Zohrab 206, both collected in 'Jeddah' in August 1881 and both extant in K. Zohrab 95 has well developed fruits and is here designated as lectotype.

Not validly published names

Isatis spartioides Edgew. ex Hook.f. & Thoms. (Hooker and Thomson 1861, p. 179)

This is a nomen nudum published in synonymy of *Dipterygium glaucum* on the basis of material from Pakistan.

Dipterygium scabrum Decne. ex Boiss. (Boissier 1867, p. 417 as '*D. glabrum*', corrected in p. 958)

This is a nomen nudum published in synonymy of *Dipterygium glaucum* var. *scabrum*.

Distribution, habitat and taxonomic notes

Cleome pallida is widespread in desert and semi-desert habitats in northeastern Africa and southwestern Asia and is known from Egypt, Sudan, Eritrea, Ethiopia, Djibouti, Somalia (Somaliland), Saudi Arabia, Yemen (incl. Socotra), Oman, United Arab Emirates, Qatar, Iran, Pakistan and northwestern India. It has long been placed in *Dipterygium*, a genus sometimes believed to be a member of Brassicaceae. It has flowers with four sepals and petals and six stamens (Fig. 1A), and is, along with *Puccinonia macradenia* Chiov. (*C. puccinonia* Christenh. & Byng when treated as a *Cleome*) in Somalia, the only member of Cleomaceae with fruits in the form of 1-seeded nuts (Thulin 1993) (Fig. 1A). It is a very variable species, often a woody-based herb or subshrub, usually more or less erect or spreading (Fig. 1B), but sometimes growing completely flat on the ground. The type of *C. pallida* is a small and seemingly annual herb, apparently flowering in the first year. Nyberg (1996) was the first to cite *C. pallida* in synonymy of *Dipterygium glaucum*, but it is not until in

POWO (2022) that the name is taken up as the correct name for the species.

The identity of Forsskål's *Bunias orientalis*

From the synonymy above it may seem as if Bové, in 1832, was the first person to collect material of *Cleome pallida*. However, the species was collected already in 1763 in Yemen by Forsskål, something that has been unnoticed until now. Forsskål (1775) recorded *Bunias orientalis* from three localities in northern Yemen (Hepper and Friis 1994) and with vernacular names in Arabic, but no specimen collected by him under this name could be found by Hepper and Friis.

Bunias orientalis is a species of Brassicaceae that is native mainly to eastern Europe and adjacent parts of Asia (Hultén and Fries 1986, Koch et al. 2017). It has also been introduced in, for example, most of western and central Europe and in North America, but it has never again been recorded from Arabia.



Figure 1. *Cleome pallida* from W of Jaisalmer, Rajasthan, India. (A) Portions of flowering and fruiting branches, (B) habit of plant. Photographs by Ori Fragman-Sapir.

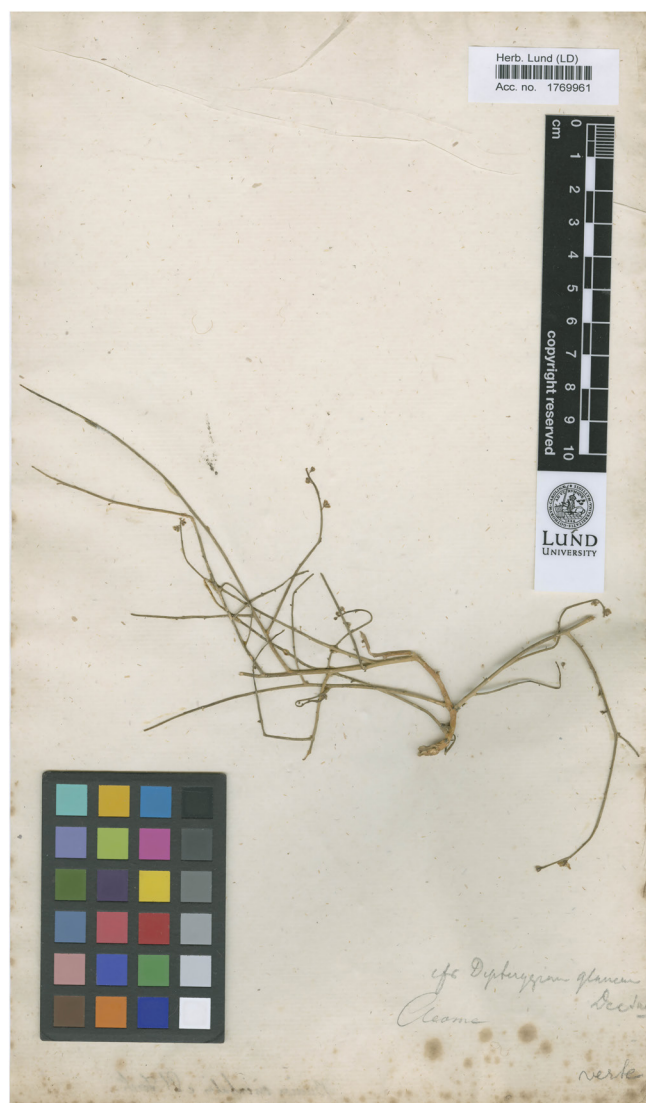


Figure 2. Specimen of *Cleome pallida* from Yemen collected by Forsskål (LD1769961). The text on the back of the sheet reads '*Bunias orientalis* e Pl. Forsk.'. Image reproduced with permission from the Botanical Museum of Lund University.

According to Hepper and Friis (1994), the work mostly used by Forsskål to identify the collections made during the expedition was the 10th edition of *Systema Naturae*, with plants in vol. 2 (Linnaeus 1759). In this work, *B. orientalis* is found under 'Tetradynamia. Siliculosae' and the entry reads 'B. siliculis ovatis gibbis verrucosis', a description that Forsskål easily could have mistaken for a specimen of *Cleome pallida*. Clear evidence that this is what has happened is that a specimen of *C. pallida* is found in LD (Fig. 2) that was collected by Forsskål under the name *B. orientalis*.

***Cleome cornus-africani* (Thulin) Thulin, comb. nov.**

Basionym: *Rorida cornus-africani* Thulin in *Syst. Bot.* 42: 573 (2017).

Type: Somalia, Bari Region, Biyo Kulule, 11°15'N, 49°16'E, 31 Dec 1999, Thulin, Abdi Dahir & Ahmed Osman 10043 (holotype: UPS [V-104047], isotype: K).

Taxonomic notes

When *Rorida* was resurrected as a genus by Thulin and Roalson (2017), its clade had been retrieved by Patchell et al. (2014) as sister to all other members of Cleomaceae, except for the North American cleomoid clade (*Cleomella* sensu Roalson et al. 2015). However, the topology is instable and in the phylogeny presented by Barrett et al. (2017), it is *Cleome* s. str. that is sister to all other Cleomaceae, whereas the *Rorida* clade is sister to the *Cleomella* clade.

Cleome cornus-africani is a perennial herb or shrublet, densely pubescent with spreading eglandular hairs, and with prominent leaf-like bracts (Fig. 3). It is restricted to the



Figure 3. *Cleome cornus-africana*. Flowering branch from holotype in UPS. Photograph by Mats Hjertson.

northeasternmost tip of Somalia, where it grows in semidesert open scrub, often on gypsum (Thulin and Roalson 2017).

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Data availability statement

Apart from citations of herbarium specimens, there are no new data in this paper.

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