THE DELIMITATION OF THE SOUTH AFRICAN HELIOPHILA BRACHYCARPA AND TWO RELATED SPECIES (BRASSICACEAE)

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Abstract. Typification of Heliophila brachycarpa, H. florulenta, H. glauca, and H. sclerophylla is established. The second species has been erroneously synonymized with the first for the past 50 years, and the first three are recognized as distinct, whereas the last is reduced to synonymy of the third.

Keywords: Brassicaceae, Cruciferae, Heliophila, Lesotho, Namibia, South Africa, Swaziland.

The genus Heliophila L. (Brassicaceae or Cruciferae) includes 81 species (Brassibase, 2019) all of which are native to South Africa (65 spp. endemic), with 16 species also native to Namibia (12 spp.), Lesotho (5 spp.), and Swaziland (1 sp.; author’s compilation). In his excellent account of the genus for the floras of these countries, Marais (1970) recognized 71 species in Heliophila, two each in Cyclopychis E. Mey. ex Sond. and Thlaspeocarpa C. A. Sm., and one each in Brachycarpaea DC., Schlechteria Bolus, and Silicularia Compton. Based on molecular phylogenetic studies on this complex of six genera by Mummenhoff et al. (2005), the last five genera were united by Al-Shehbaz et al. (2005) into a more inclusive Heliophila s.l.

The present author has been involved in the past decade in monographing Heliophila s.l. in its entire range. As a result of examining well over 10,000 specimens on loan, many novelties are discovered and a large number of nomenclatural adjustments are needed. These will be published in separate papers. However, the present article deals with resolving the circumscription of four closely related species described in the nineteenth century. The first (H. glauca Burch. ex DC.) was described by de Candolle (1821), the next two (H. sarcophylla Meisn. and H. brachycarpa Meisn.) by Meisner (1842), and the last (H. florulenta Sond.) by Sonder (1846). Some duplicates of the type collections of all four species and their varieties were not examined, but their digital images were carefully checked in JSTOR (2019). Marais (1970) examined only the type collections at K, PRE, and SAM and did not study those of the two species described by Meisner (1842). As a result, the delimitations two of the three species below differ significantly from the conclusions reached by Marais. Meisner’s types were not identified prior to the present study, and their images (Fig. 1–2) are shown here for the first time. Because the limits of H. florulenta and H. brachycarpa have been confused since the account of Marais some fifty years ago, detailed descriptions and examined specimens are given below for the three species recognized.

1. Heliophila glauca Burch. ex DC., Syst. Nat. 2: 690. 1821. TYPE: SOUTH AFRICA. Western Cape: Garden Route, George, Langkloof, 1 March 1839, C. F. F. Von Krauss 1245 (holotype: K [000230571]; isotypes: G [00207088], PRE [0408604-0, image seen].

Heterotypic synonyms: Heliophila glauca var. purpurascens DC., Syst. Nat. 2: 690. 1821. TYPE: SOUTH AFRICA. Western Cape: Garden Route, George, Uniondale, 14 March 1814, W. J. Burchell 4969 (holotype: K [000230571]; isotypes: G [00207088], PRE [0408604-0, image seen].

Heliophila sarcophylla Meisn., London J. Bot. 1: 463. 1842. TYPE: SOUTH AFRICA. Western Cape: Garden Route, George, Langkloof, 1 March 1839, C. F. F. Von Krauss 1245 (holotype: NY [03468226]; isotypes: BAS [image seen], FI [005864, image seen], MO [0108058], TUB [000635, 000636, images seen], W [0009170], Fig. 1.

Plants subshrubs or shrubs, glaucous. Trichomes absent. Stems woody at least along lower parts, 40–200 cm tall, smooth, terete, erect to ascending, virgate, simple or branched, glabrous. Leaves cauline, fleshy; petiole absent; blade simple, oblong to narrowly lanceolate, 0.8–1.5 cm × 1.5–4.0 mm, entire, unsegmented, minutely auriculate at base, without a pair stipule-like glands at node, glabrous, base articulate, not decurrent. Racemes terminal, lax, 15–35-flowered, elongated in fruit, not secund; rachis straight, glabrous; fruiting pedicels without a pair of basal bract-like glands at node, glabrous, lateral strongly saccate at base, median not saccate, all cucullate. Base, without a pair stipule-like glands at node, glabrous, base articulate, not decurrent. Racemes terminal, lax, 15–35-flowered, elongated in fruit, not secund; rachis straight, glabrous; fruiting pedicels without a pair of basal bract-like glands, articulate at base, glabrous, slender, erect and subapressed to rachis, straight, persistent, lowermost 5–11(–14) mm long; buds oblong. Sepals ascending, oblong, 4.0–6.5 mm long, glabrous, caducous, lateral strongly saccate at base, median not saccate, all cucullate. Petals purple, mauve, or white, obovate, 7–12(–14) × (3–)4–6(–8) mm, ascending, rounded at apex, unappended, not papillate; claw 0.5–1.0 mm long. Stamens tetradynamous; filaments 2.5–7.0 mm long, glabrous, unappended, anthers oblong, 1.5–2.0 mm long, not apiculate at apex. Nectar glands lateral, lunar, median glands absent. Ovary glabrous; ovules 4–10 per ovary. Fruit dehiscent siliqua, capsular, narrowly oblong or subelliptic, (0.9–)1.5–2.8(–3.5) cm × 3.5–5.0 mm, latiseptate, glabrous, not moniliform, straight along replum, smooth, erect and appressed to rachis; valves...
Figure 1. Holotype of *Heliophila sarcophylla* Meisn. (C. F. Von Krauss 1245, NY).
papery, coarsely reticulate veined, midvein distinct, margin not thickened; gynophore 0.2–1.0 mm long; style in fruit 2–6 mm long, cylindrical tapering to apex, stout, glabrous; stigma entire. Seeds uniseriate, suborbicular; flattened, margined, 2.5–4.0 mm in diam.

**Phenology:** flowering August–April.

**Habitat:** well-drained clay stony grounds, rocky ridges, fynbos vegetation; 450–1590 m.

**Distribution:** South Africa, Western Cape (Cape Winelands, Central Karoo, and Garden Route districts) and Eastern Cape (Nelson Mandela Bay and Sarah Baartman districts).


The holotype of *Heliophila sarcophylla* consists of two branches on the left of sheet with a small label in the middle handwritten by Krauss and a fully detailed label on the left hand written by Meisner. The FI and M sheets of the type collection lack the collection number, but all of the other gathering data are identical to that of the holotype and, therefore, they are recognized here as isotypes.


A controversial specimen of Krauss in the Bernhardi Herbarium, MO [1925794], has a label that reads “N. 1245. *Heliophila sarcophylla* n.sp. Meiss. In Landekloof, George, Mart.” The label is identical to that of the holotype above, but the plant definitely belongs to *H. florulenta*. Clearly, there is a mix-up of the label and the plant, and the specimen is not a type material of any taxon. It has the characteristic gland pairs at the bases of leaves and pedicels that *H. glauca* (including *H. sarcophylla*) lacks.

*Heliophila galauca* is easily distinguished among the shrubby members by having articulate leaves and fruiting pedicels lacking the basal pair of glands, minutely auriculate leaves, fruit and fruiting pedicels appressed to rachis, and narrowly oblong to subelliptic fruit.


**TYPE:** SOUTH AFRICA. Eastern Cape: Zwartkopsriet, 1829, C. F. Ecklon (lectotype designated by Nordenstam (1980: 262): S [G8767]; isolectotypes: B [100153871, 100299439], C, GOET [002608, image seen], K, M [0108069], MO [925695], P [00739545], PRC [451618], PRE, SAM [0028064-0, UPS, W [0009167, 1889030895]).


Plants shrubs or small trees, glaucous. Trichomes papillate on stamens and petal claws, absent elsewhere. Stems woody. 0.5–2.2 m tall, striate, ridged and with contiguous papilla-like tubercles, erect to ascending, branched above, glabrous. Leaves cauline, fleshy; petiole undifferentiated; blade simple, linear to oblanceolate, 1.5–5.0 cm × 1–4 mm, entire, not auriculate at base, with a pair stipule-like subulate glands at node, glabrous, base decurrent, apex attenuate into pointed apicula. Racemes terminal on lateral branches, corymbose, 5–30-flowered, elongated slightly and remaining subcorymbose in fruit, not secund; racchi straight, papillate or smooth; fruiting pedicels with a pair of basal bract-like glands, not articulate at base, glabrous, slender or slightly stout, much expanded at receptacle, ascending to divaricate, straight, persistent, lowermost 5–10(–15) mm long; buds oblong. Sepals erect to ascending, oblong, 3–5 mm long, glabrous, caducous, lateral pair strongly saccate at base, median not saccate, all not cucullate. Petals white to creamy white, ovobovate-spatulate, 6–8 × 1.0–2.5 mm, ascending, rounded at apex, unappended; claw 2–4 mm long, strongly differentiated from blade, papillate. Stamens subequal; filaments 3.5–5.0 mm long, densely papillate at least along proximal half or third, unappended; anthers oblong, 0.6–0.8 mm long, not apiculate at apex. Nectar glands lateral, lunar; median...
glands absent. **Ovary** glabrous; ovules 4–6 per ovary. **Fruit** dehiscent silique, capsular, elliptic-lanceolate, 2.0–3.7 cm × (3.0–)4.5–6.0 mm, latisepitate, glabrous, not moniliform, straight along replum, smooth, ascending to divaricate; valves papery, midvein and lateral veins prominent, forming a reticulum, margin not thickened, apex attenuate into style; gynophore (0.5–)1.0–3.0 mm long; style in fruit (0.7–)1.0–2.0(–2.7) mm long, attenuate, glabrous; stigma entire. **Seeds** uniseriate, subobcordate, flattened, minutely reticulate, wingless, not margined, 2.5–4.0 mm in diam.

**Phenology:** flowering in July through August, rarely as early as May or as late as December.

**Habitat:** barren mountain slopes, scrubland, sandy soil on rocky ridge, rocky loams soil in arid fynbos; 50–1200 m.

**Distribution:** South Africa, Western Cape (Garden Route District) and Eastern Cape (Nelson Mandela Bay and Sarah Baartman districts).


Sonder (1846) listed two collections by Ecklon and Zeyher from Zwartkopsrivier and Bethelsdrop. However, as indicated by Nordenstam (1980), both collections were distributed mixed in all isotype sheet records as **Ecklon & Zeyher 101**, and it is impossible to tell which specimen on a given sheet belongs to which locality.

Sonder (1846) had an isotype of *Heliophila brachycarpa* in his herbarium and recognized the species as distinct from the material he described in the same work as *H. florulenta*. Indeed, he placed the two species in different sections and indicated in the species descriptions that former has short-clawed, oblong-spulate petals 2 lines wide, whereas the latter has puberulent long claws and ovate [actually obovate] petal blades 1 line wide. In that, Sonder’s description of *H. brachycarpa* was more detailed than and fully in agreement with original of Meisner (1842). Despite these very significant differences in petal morphology, Marais (1970), who did not examine any specimen in Sonder’s herbarium or authentic material of *H. brachycarpa*, reduced *H. florulenta* to synonymy of the earlier-published former species. Unfortunately, this misinterpretation by Marais continues for the past 50 years, and one still finds the two distinct species united in all herbaria of the world.

The entire species description of *Heliophila brachycarpa* in Marais (1970) is a perfect fit for *H. florulenta*, and his description of the floral and fruit morphology do not apply to the type collection of the former, which he never studied.

Both Meisner (1842) and Sonder (1846) did not describe the mature fruit of *H. brachycarpa*, and that may have misled Marais to overlook the fact that the two species have very different fruit morphology, as evidenced from his 1 March 1962 annotation and his (Marais, 1970: 68) citation of the isotype sheet of *H. florulenta* (K) as *H. brachycarpa*. This sheet consists of a flowering branch of the isotype on the right and a fruiting branch near its base, and it is a mixed collection with MacOwan 845 that includes two large flowering branches of *H. florulenta* (one on the left and the other in the center center) and a smaller fruiting branch of *H. brachycarpa*. I have not examined all of the specimens cited by Marais under his *H. brachycarpa*, but for at least two collections, *Compton 196649 (BOL, NBG)* and *Fourcade 2272 (K)*, the plants definitely belong to *H. florulenta*. He cited *Compton 11216* (perhaps in NBG) from Whitehill that I did not examine. However, from the same locality he annotated on 8 Oct. 1963 *Compton 108880* (NBG), but this one has glabrous filaments and petal claws and definitely belongs to *H. brachycarpa* (sensu this author, not Marias; see below). Therefore, in order to avoid any future confusion, all material of the two species examined for this study are cited below. MacOwan’s collection is a good indication that the two species grow sympatrically, at least for part of their ranges.

*Heliophila florulenta* is easily distinguished from *H. brachycarpa* in flower, fruit, and young sterile stems. It has white to creamy white, spathulate-ovate petals 6–8 × 1.0–2.5 mm, papillate petal claws strongly differentiated from blade and 2–4 mm long, densely papillate filaments along at least proximal half or third, anthers 0.6–0.8 mm long, elliptic-lanceolate fruit (3.0–)4.5–6.0 mm wide, and gradually attenuate styles (0.7–)1–2(–2.7) mm long (Fig. 3A, B, C). By contrast, *H. brachycarpa* has pale mauve to pink, obovate petal blades 9–14 × (2.5–)3.0–5.0 mm, glabrous petal claws 1–2 mm long and hardly differentiated from blade, glabrous filaments, anthers 1.2–1.5 mm long, ovate-lanceolate fruit (6–)7–9 mm wide, and cylindrical style (4–)5–10 mm long, abruptly terminating fruit apex (Fig. 3D, E, F). When lacking both flower and fruit, plants *H. florulenta* are distinguished by having young stems with contiguous, minute, papilla-like tubercles that *H. brachycarpa* lacks.


Plants small trees or scrambling shrubs, not glaucous. **Trichomes** absent. **Stems** woody, 1–2 m tall, slightly striate, ridged, without papilla-like tubercles, erect to ascending, many branched, glabrous throughout. **Leaves** cauliine, not fleshy; blade simple, linear to linear-oblancoate, (1.3–)2.5–6.0 cm × 1–2 mm, attenuate to petiole-like base, margin entire, not auriculate at base, with a pair of stipule-like glands at node, glabrous, base not articulated, somewhat decurrent. **Racemes** terminal and lateral, not intercalary,
Figure 2. Holotype of *Heliophila brachycarpa* Meisn. (C. F. F. Von Krauss 1254, NY).
Meisner's annotation on the label of the holotype of *Heliophila brachycarpa* reads “H. (Carpopodium) brachycarpa, nobis Hook. Lond. Journ. 1 p. 465.” The above isotypes at M and the Bernhardi Herbarium (MO) have the exact locality data as that of the holotype but without the collection number.

**Phenology:** flowering March, July–Aug; fruiting September into October.

**Habitat:** arid areas in shale, rocky places, flats at foot of mountains; ca. 600 m.

**Distribution:** South Africa, Western Cape (Central Karoo District) and Eastern Cape (Nelson Mandela Bay and Sarah Baartman districts).


**Literature Cited**


APPENDIX
INDEX TO NUMBERED COLLECTIONS

J. P. H. Acocks 20023 (1); 20391 (1).
R. Allarice 1698 (1).
W. F. Barker 7901 (1).
R. D. A. Bayliss 2257 (3); 4314 (2); 7124 (1).
P. A. Bean 1090 (1).
P. A. Bean & J. H. T. Volk 2045 (1).
P. Bond 222 (1).
A. F. Boshoff P174 (1).
E. Brink 188 (3).
L. L. Britten 7045 (3).
W. J. Burchell 4782 (1); 4969 (1).
P. Cattell & J. Cattell 43 (1).
R. H. Compton 10880 (3); 19649 (2).
R. M. Cowling 776 (2).
T. Dold & A. D. Booi 380 (2).
J. F. Drège 1711 (2); Drège 9283 (2); s.n. [no date] (2).
C. F. Ecklon s.n. [no date] (2).
C. F. Ecklon & C. L. P. Zeyher 102 (1).
[?] Erasmus 131 (1).
E. Esterhuysen 6942 (1); 19459 (1); 32859 (1).
H. G. Fourcade 2106 (1); 2272 (2); 4241 (1).
E. E. Galpin 3742 (1).
C. F. F. Von Krauss 1245 (1); 1254 (3).
M. R. Levyns 6468 (3).
R. Marloth 1703 (2).
G. C. Matthews 1236 (1).
A. Mauve et al. 42 (1).
D. J. McDonald 2369 (1); 2448 (1).
J. J. Meyer 437 (1).
E. G. H. Oliver 5454 (1).
R. Storey 2490 (2).
H. C. Taylor 898 (1); 9627 (1).
M. F. Thompson 3352 (1).
G. A. Verboom 7 (1).
J. Volk 948 (1); 1786 (1).
E. West 312 (2).
J. M. Wurts 1306 (1); 1356 (1); 1514 (1); 1635 (1).