

INTRODUCTION

Whilst accepting Kreisel's (1992) incorporation of the genus *Langermannia* Rostk. into *Calvatia* Fr., we, like others (e.g. Calonge & Martin 1990; Demoulin 1993; Lange 1993; Calonge 1998), are not convinced of the generic status of his segregate genus *Handkea* (Kreisel 1989). Kreisel (1989) referred to *Handkea* those members previously placed in *Calvatia*, but characterized by 'aseptate, slit-like, pitted capillitium', and included species with sterile bases (compact or cellular) and without.

For the same reasons as expressed in Lange (1993), and from conclusions based on our own comparative morphological and anatomical studies of the Lycoperdaceae of southern Africa (to be reported elsewhere), we agree with Lange (1993) in treating *Handkea* as a section of *Calvatia*. To that purpose Lange (1993) relegated the genus *Handkea* Kreisel to sectional rank under the name *Calvatia* sect. *Handkea* (Kreisel) M.Lange. Lange's sectional name was not validly published, however, since the requirements of ICBN Art. 33.3 (Greuter *et al.* 2000) were not met. Moreover, Lange apparently overlooked the fact that, long before the establishment of the genus *Handkea*, Kreisel (1962) had established *Calvatia* sect. *Macrocalvatia* Kreisel, to which he assigned *Calvatia excipuliformis* (Scop.: Pers.) Perdeck [= *Handkea excipuliformis* (Scop.: Pers.) Kreisel] and *Calvatia utrififormis* (Bull.: Pers.) Jaap [= *Handkea utrififormis* (Bull.: Pers.) Kreisel], the latter being the type species of the genus *Handkea*. *Calvatia* sect. *Macrocalvatia* is thus also pertinently cited as an earlier synonym of *Handkea* by Kreisel (1989). Therefore, if the latter two species, (and a number of other species of *Handkea*) are to be accommodated in *Calvatia*, there already exists a section for them, namely *Calvatia* sect. *Macrocalvatia*.

A problem arises, however. The original diagnosis for *Calvatia* sect. *Macrocalvatia*, as defined by Kreisel (1962: 163), is unambiguous: '*Subgleba distincte cellulosa. Capillitium non septatum.*' This diagnosis clearly provides for species with fruit bodies characterized by cellular sterile bases only and excludes those with compact bases as well as those without sterile bases. *Calvatia* sect. *Macrocalvatia* in the sense of Kreisel can therefore

neither accommodate all of the species assigned to *Handkea* by Kreisel (1989) nor all of those assigned to *Calvatia* sect. *Handkea* by Lange (1993). Instead of establishing yet another new section to accommodate the excluded species, however, we here emend the circumscription of *Calvatia* sect. *Macrocalvatia* to accommodate also those *Handkea* species currently excluded by the original diagnosis.

Emended sectional description

***Calvatia* sect. *Macrocalvatia* Kreisel** in Feddes Repertorium 64: 163 (1962), emend. *J.C.Coetzee, Eicker & A.E.van Wyk*. Type species: *Calvatia excipuliformis* (Scop.: Pers.) Perdeck.

Handkea Kreisel: 282 (1989); *Calvatia* sect. *Handkea* (Kreisel) M.Lange: 143 (1993), nom. inval.

Fruit bodies with sterile base or not. *Capillitial septa* extremely rare to essentially absent, easily missed; capillitial threads fragmenting at septa or more commonly by irregular rupturing of walls; capillitial walls fragile, with small perforations and conspicuous slit-like fissures, often between perforations.

New combination in Calvatia

The inclusion of *Handkea* into *Calvatia* necessitates the following new combination (description based on dry herbarium material; colour codes and colour terms follow Kornerup & Wanscher 1981):

Calvatia capensis* (Lloyd) *J.C.Coetzee, Eicker & A.E.van Wyk, comb. nov. Type: South Africa, Stellenbosch, *A.V. Duthie 403* (Lloyd Myc. Coll. 7567 in BPI 706162, holo.!; Herb. v.d. Byl in PREM 31472, iso.!).

Lanopila capensis Lloyd in Mycological Writings 7: 1177 (1923); Verwoerd: 25 (1925); Bottomley: 579 (1948).

Handkea capensis (Lloyd) Kreisel & G.Moreno: 84 (1996).

Illustrations: Lloyd: t. 230, fig. 2352 (1923); Kreisel & G.Moreno: 86, figs 1–7 (1996).

Basidiocarp epigeous, with prominent rooting base, \pm globose (sensu Verwoerd 1925; Bottomley 1948), holotype appearing to have been \pm 30 mm wide and 25–30 mm high, dehiscing by irregular fragmentation of peridium. *Peridium* very thin, 0.09–0.2 mm, rigid but brittle and extremely fragile, differentiated into an exo- and endoperidium (two layers not discernible from type material, however). *Exoperidium* dark brown with reddish tinge (7F6) to paler and concolorous with endoperidium, fugacious, remaining as tiny, weft-like mycelial patches on some specimens. *Endoperidium* consisting of a thin, amorphous crust overlaying a slightly thicker hyphal layer, surface colour various shades of pale to darker brown [\pm 5C5 (topaz) and 5D5 (clay) to 6E6 (cocoa brown/leather brown/tan) to almost 7D5], with an evanescent metallic gloss, disappearing with time (persistent only in folds on holotype), leaving surface dull brown, colour of inside surface \pm 5D6 (honey yellow/oak brown) to 5E6 (mustard brown), outer surface of holotype ornamented with numerous, tiny, off-white, stellate ridges. Hyphal layer of endoperidium composed of cyanophilic, branched hyphae mostly up to 5 μ m diam., but inflated in places, especially at branches and apices, moderately thick-walled (mostly 0.75–1 μ m), not tapering but ending in rounded to often inflated tips, true septa infrequent but not uncommon, often perforated with slit-like pits but much less conspicuously so compared to capillitium. *Gleba* cottony to powdery, very fragile, brown (5D5 to 6E6) consisting of spores and capillitium. *Capillitium* golden brown in clear lactophenol, strongly cyanophilic in lactophenol with aniline blue, inamyloid in Melzer's solution, dichotomously branched, commonly up to 7 (rarely up to 11) μ m diam., gradually tapering to thin-walled, rounded tips, as little as 1 μ m diam., often undulating towards apices, very fragile, breaking up into fragments of varying length, septa not observed; capillitial wall smooth, moderately thickened, mostly varying between 0.5 and 1.25 μ m, L/H averaging 0.69 ($n = 18$) for hyphae 5–7 μ m diam., with numerous, very conspicuous, small to large fissures or slit-like pits. *Paracapillitium* absent. *Basidiospores* golden brown in clear lactophenol, cyanophilic reaction variable, inamyloid in Melzer's solution, globose, with short hyaline apiculus mostly less than 1 μ m long, but up to \pm 1.3 μ m not uncommon, uniguttulate, radial symmetric, isopolar, 3–5 μ m diam., generally appearing to have a diameter slightly less than much of capillitium; spore wall \pm 0.5 μ m thick, glabrous under light microscope but distinctly verruculose under SEM, verrucae not more than 0.2 μ m high. *Subgleba* present, small (up to 10 mm high), yellowish brown in holotype (5D5) to brown in isotype (6E6), compact, composed of yellow-brown, cyanophilic, branched, much contorted and bent hyphae, commonly up to 7.5 μ m diam., tapering like capillitial hyphae, moderately thick-walled (mostly between 1.0–1.5 μ m), apparently aseptate, false septa observed but rare; diaphragm absent, boundary with gleba poorly defined.

Distribution: Western Cape, South Africa.

Habitat: soil in a temperate climatic zone with mild, wet winters and hot, dry summers (Mediterranean climate). Fynbos Biome.

Discussion: the material from which Lloyd (1923) first described this fungus consists of one half of a longitudinally bisected specimen sent to him by Miss A.V.

Duthie from Stellenbosch, South Africa. In his original description Lloyd made no mention of the subgleba, a feature first described from the other half (the isotype) by Verwoerd (1925). In a footnote to his often overlooked work (in Afrikaans) on South African Gasteromycetes, Verwoerd (1925) had the following to say regarding this puffball (our translation): 'According to Lloyd ... it does not have a sterile base. The half in my possession, however, clearly shows one. Lloyd described it from the other half.' The half described by Lloyd does have a sterile base, however, and it is difficult to understand how he could have overlooked this structure. Contrary to the statement by Kreisel & Moreno (1996), Bottomley (1948) also acknowledged the presence of a sterile base. The holotype is in a very poor state, consisting only of the sterile base with very little gleba still attached to it; the peridium has disintegrated almost completely into tiny fragments.

Although Verwoerd (1925) did not recognize the numerous, very conspicuous slit-like perforations in the capillitial walls of *Lanopila capensis* for what they really were, he did notice the resultant appearance of the capillitium, which he described as '... with a marbled surface', emphasizing the diagnostic value of this character. Bottomley (1948) described the capillitium as having 'a watered appearance'.

Numerous long, thin, angular, needle-shaped crystals, not visible with the naked eye but very conspicuous under the SEM, occur on the peridial surface of the holotype. These crystals were not observed on the isotype, however, and are assumed to be an artefact of unknown origin.

Although Ponce de Léon (1981) excluded this fungus from *Lanopila* Fr., he did not designate it to another genus. On a slip dated 1991, inserted with the type specimen, he assigned it to *Calvatia* Fr., however, albeit with a question mark. Calonge, also on a herbarium slip dated 1992, placed it in *Langermannia*. Based on Bottomley's description of the gleba being 'septate but fragmenting at the septa', Kreisel (1992, 1994) reduced *Lanopila capensis* to synonymy under *Calvatia flava* (Massee) Kreisel. After having examined the holotype, however, he recognized it as a distinct species and placed it in the genus *Handkea* Kreisel on the basis of its slit-like capillitial perforations (Kreisel & Moreno 1996). We prefer to retain it in *Calvatia*, however, assigning it to sect. *Macrocalvatia* emend.

Prior to this study *Calvatia capensis* was known from the type collection only, but a re-examination of the puffballs in the E.L. Stephens collection, recently transferred from BOL to PREM, as well as some specimens from the Lloyd collection in BPI, brought to light at least five more collections of this fungus.

Specimens examined

WESTERN CAPE.—3318 (Cape Town): Rietvlei, 10 June 1951, (–CD or DC), herb. Stephens 925 (PREM); Rietvlei, (–CD or DC), herb. Stephens 1931 (PREM); Devil's Peak near wattles, 7 July 1962, (–CD), Chapman s.n. sub herb. Stephens 4301 (PREM); Stellenbosch, Papegaaiberg, 19 June 1921, (–DD), A.V. Duthie 304 sub herb. Lloyd 7567 (BPI706162, holo., PREM31472, iso.), 3418 (Simonstown): Smitswinkel Bay, by roadside, 28 April 1937, (–AD), R.S. Adamson s.n. sub

herb. Stephens 452 (PREM). Locality unknown: South Africa, A.V. Duthie s.n. sub herb. Lloyd 51765 (BPI709920).

The following specimens, all with slit-like capillitial pores and semblances of sterile bases are very similar to *C. capensis*, but the material is too scanty to allow for definite identification:

WESTERN CAPE—3318 (Cape Town): Glen, in grass, 12 May 1954, (–CD), Chapman 424 sub herb. Stephens 1387 (PREM); between Klipheuwel and Bellville, 17 July 1955, (–DA to DC), herb. Stephens 1500 (PREM). Locality unknown: herb. Stephens 2032 (PREM).

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