SOUTH AFRICAN FUNGI 9: PSILOCYBE NATALENSIS - A BLUEING HALLUCINOGENIC SPECIES FROM SOUTH AFRICA

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An account is given of the bluing, hallucinogenic *Psiocybe natalensis* which includes a description of the microcharacters based on an examination of the isotype; the microcharacters are illustrated. A more recent gathering from the same general geographical region is also fully described and illustrated for comparison.

**Key words:** *Psiocybe natalensis*, South Africa, bluing, hallucinogenic

**Introduction**

In January 1994 Jochen Gartz and Michael T. Smith discovered a large bluing *Psiocybe*, at O’Neils Cottage, KwaZulu-Natal; this locality is situated between Volksrust and Newcastle. The fungus was collected in cattle pasture recently fertilized with a mixture of ammonium nitrate and limestone, in full sunlight at temperatures of over 30 °C, at an altitude of 1500 m. However the fruitbodies were not growing directly on dung.

Subsequently the fungus was shown to represent a previously unknown species of *Psiocybe*, and it was described as *P. natalensis* Gartz, Reid, Smith & Eicker. However, publication of this new taxon was in the journal *Integration*, which is not always readily accessible to, or regularly scanned by mycologists with a taxonomic interest. As a result the species has been largely overlooked by mycologists, despite having both considerable interest and importance, by virtue of its hallucinogenic properties, and in having been shown to contain psilocybin, psilocin and baeocystin. However, it should be noted that *P. natalensis* was included by Stamets (1996) in his “Psilocybin Mushrooms of the World”.

It was, therefore, decided to provide a slightly revised account of the original material based on observations of the fresh material by Gartz and Smith and on a microscopic study by one of us (DAR) of the isotype collection in PRUM. Illustrations of the microcharacters, omitted from the original publication, are also provided.

Since the initial gathering of *P. natalensis* by Gartz and Smith during January 1994, at O’Neils Cottage in the Drakensberg range we are able to report the finding of an additional collection at a new site, about 250 km from the original locality. This new site,
also in the KwaZulu-Natal Drakensberg range, is at Hlalanathi Drakensberg Resort, Royal Natal National Park, Bergville District, 25 March 1998. The fruitbodies were again growing in an exposed situation, this time on a lawn exposed to full sunlight, but artificially irrigated. A detailed account of this most recent gathering is also included.

![Diagram of Psilocybe natalensis](image)


All from the Isotype in PREM. Bar = 10 µm.

**Description of *Psilocybe natalensis* based on the original material from O’Neills Cottage.** [Slightly modified from that of Gartz, Reid, Smith & Eicker (1995)].

**Pileus** 14 - 60 mm diam., obtusely conic to hemispheric, then convex to shallowly convex, sometimes with a small umbo, finally flattened with a spreading, non-striate margin, non-hygrophanous; when fresh, and also in the dried state, cream coloured, sometimes with a yellow-brown disc, or whitish, becoming pure white in older fruitbodies and then often showing discoloured blue-grey blotches or segments at the periphery, but not actually blueing on injury. Exsiccatum with a distinct sheen to the surface of the pileus, suggesting that the pileus might well have been viscid in damp conditions - this supposition is further supported by the microstructure of the pileipellis. **Lamellae** subdecurrent, at first buff, then dark purple-brown with a white edge. **Stipe** 40 - 120 mm high, 2 - 4 mm wide, narrowing toward the base or occasionally equal, dry, smooth, shining, white, lacking an annulus and without any velar traces, eventually hollow; on injury or when handled bruising blue-green, especially at the stem base after 5 to 10 minutes. **Smell** similar to that of other blueing
species of *Psilocybe*. **Pileal surface** comprising a zone to 50 μm thick (or more?), of densely organized, more or less horizontal, 2.5 - 3.0 μm wide, hyaline, slightly thick-walled, slightly agglutinated, clamp-bearing hyphae. Beneath this zone are the hyphae of the context to 8.3 μm wide, with thin to distinct hyaline walls, and bearing clamp-connections at the septa. **Lamellar trama** regular. **Cheilocystidia** lageniform, 16 - 22 μm long, with an enlarged base 5.5 - 8.0 μm wide, and a short neck 3.5 - 6.0 μm in length, terminating in an obtuse, often slightly enlarged apex, hyaline, thin-walled, sometimes capped by a small droplet of mucilage. **Pleurocystidia** 18 - 40 x 10 - 15 μm, abundant or in some fruitbodies very rare, clavate or lanceolate with a mucronate, rostrate or papillate apex, sometimes ovate or obpyriform, hyaline, thin-walled or very rarely with slightly thick-walled apex, sometimes capped with a small droplet of mucilage. **Caulocystidia at stem apex** lageniform, similar to the cheilocystidia, 10 - 30 μm long, with enlarged base 4.0 - 8.5 μm wide, and short neck 2 - 5 μm in length terminating in a slightly inflated or subcapitate apex, 2 - 4 μm diam. **Basidia** 25 - 32 x 9 - 11 μm, clavate, hyaline, thin-walled, mostly 4-spored, some fruitbodies with a high proportion of abnormal monosporous, bisporous or trisporous basidia. **Spore print** deep violet or purple. **Spores** (10.0-) 12.0 - 14.0 x (7.0-) 8.5 - 9.5 μm, brown, broadly elliptic to ovoid, thick-walled, with truncate germ pore. **Habitat**: scattered in fertilized cattle pasture, but not on dung; the pasture having been treated with a mixture of ammonium nitrate and limestone two months previously. O’Neils Cottage, between Volksrust and Newcastle, KwaZulu-Natal, 1500 m alt., 22 January 1994, J. Gartz & T. Smith.

The distinctive features of *P. natalensis* are:

- The robust size of the fruitbodies, which may reach 60 mm diam.
- The blueing at the base of the stipe on handling after 5 - 10 minutes.
- The pale cream coloured, non-hygrophanous pileus with a shiny surface in the dried condition, suggesting that the moist cap may be somewhat viscid. A suggestion enhanced by the structure of the pileipellis.
- Presence of lanceolate or clavate pleurocystidia with a rostrate or papillate apex.
- Large, rather broadly elliptic or ovate, thick-walled spores.
- Presence of caulocystidia.
- Occurrence in open pasture.

Using Guzmán’s (1983) monograph of the genus *Psilocybe*, *P. natalensis* would appear to belong in the section *Cyanescens* but differs from other species in this section in its remarkable size, overall whitish colour and non-hygrophanous pileus. It comes close to the Australian species, *P. eucalypta* Guzmán & Watling. However, that species differs from *P. natalensis* in having a pileus which is “hygrophanous, red-brownish to bright ochraceous, fading to dull fulvous or straw colour”; somewhat smaller, narrower spores (9.3-) 9.9 - 12.0(-13.0) x (6.0-)6.6 - 7.1 x 5.5 - 6.6 μm which are “subellipsoid both in face and side view”; and smaller, but very similarly shaped pleurocystidia.

*Psilocybe cyanescens* differs from *P. natalensis* in being less robust and in having both pileus and stipe bruising blue-green on handling. In contrast to the non-hygrophanous, non-striate, pale cream to whitish pileus of *P. natalensis* that of *P. cyanescens* is hygrophanous and strongly coloured when hydrated, ranging from fulvous to rusty tawny with striate margin, paling to buff or ochraceous only on drying. Further, whereas the stipe of *P. natalensis* is smooth, white and devoid of velar traces, that of *P. cyanescens* has a white silky-fibrillose surface, due to a thin cortinate veil. Another difference is that while *P. cyanescens* lacks pleurocystidia these organs are present, albeit sometimes sparsely so, in *P.*
*natalensis*. Again there is a spore difference between the two taxa; those of *P. cyanescens* being slightly smaller and somewhat lenticular “elliptic in side view, ovate in face view slightly flattened in side view” (Watling & Gregory, 1987). Finally, whereas *P. cyanescens* grows on herbaceous or woody debris, *P. natalensis* is found in open pasture or grassland.

Figs. 2 a-g. *Psilocybe natalensis*. a. Section through lamella showing basidia, parenchymatous subhymenium and lamella trama. b. Section through pileipellis. c. Caulocystidia from stipe apex. d. Pleurocystidia. e. Cheilocystidia. f. Basidia showing median construction. g. Spores.

All from Hlalanathi Holiday Resort. Bar = 10 μm.
An account of a more recent collection of *P. natalensis*.

During a visit to the Hlananathi Drakensberg Resort, Royal Natal National Park in March 1998, specimens of an ivory-white *Psilocybe* were collected, which, after a short interval of time, exhibited blue-green bruising at the base of the stem on handling. Since this locality is in the general area as that from which Gartz & Smith made their original collection of *P. natalensis*, and since both collections were made in exposed grassland, it was initially suspected, and later confirmed, that this recent find represented a second gathering of *P. natalensis*. A description follows:

Pileus to 25 mm diam., convex-campanulate, sticky, ivory-white with a slight ochraceous tint at the centre, non-hygropanous, non-striate; edge of pileus slightly exceeding the lamellae and somewhat crenulate, at extreme margin slightly sulcate. Lamellae adnate to broadly adnate, or emarginate with a tooth, very broad, yellowish in very young specimens, becoming ochre-grey, and finally blackish-brown with a white edge at maturity. Stipe 30-50 mm long, 3 - 5 mm wide at the apex, tapering downward, whitish, developing blue-green tints at the base where handled or bruised, dry, sparsely flecked or scurfy at extreme apex, but neither striate nor fibrillose; without annulus or cortinate zone, except in very young specimens which may show a yellow arachnoid veil. In section the stipe is solid, appearing whitish in the cortex, and yellow-brown in the medulla. Pileipellis a cutis formed of a layer 30 μm thick or more, comprising narrow, thin-walled, hyaline, radially repent, parallel hyphae, 2 - 3 μm diam., densely compacted and agglutinated. Pileal context of thin-walled, hyaline, interwoven hyphae to 16 μm diam., with clamp-connections at the constricted septa (but often difficult to demonstrate); oleiferous hyphae are also present, 3.0 - 6.6 μm wide, as very long vermiciform, branched elements, with subhyaline refractive contents. Stipe context of vertical, parallel, thin-walled hyphae, 3 - 12 μm wide, with clamp-connections at the septa. Lamellar trama regular, comprising a central stratum, flanked on either side by a parenchymatous subhymenium formed of thin-walled, rounded cells, 4 - 7 μm diam. Cheilocystidia 16.0 - 27.0 x 5.0 - 8.0(-9.5) μm, thin-walled, hyaline, varying from lageniform with an inflated base, 5 - 7 μm wide, prolonged above into a short obtuse neck, or lanceolate with a rostrate apex, up to 6 μm long, which may be almost subcapitate. Pleurocystidia from abundant to seemingly absent, intergrading with the cheilocystidia; others resembling chrysocystidia in shape and size, measuring 25.0 - 37.0 x 6.0 - 10.5 μm, thin-walled, hyaline, varying from fusoid to lancelolate with a short rostrate apex, not staining in cotton blue, or only weakly so. Caulocystidia present at the apex of the stipe and resembling the cheilocystidia; these organs often develop from a bifurcate base. They are thin-walled, 18 - 30 μm long, with a swollen ventricose base, 4 - 7(8) μm wide, prolonged above into a narrow neck up to 10(-15) μm long, and 1.0 - 1.5(-3.0) μm wide, terminating in an enlarged, often subcapitate apex, 2.0 - 3.5 μm diam. Basidia 27.0 - 31.0 x 9.5 - 10.5 μm, thin-walled, hyaline, clavate, 4-spored, sometimes with a slight median constriction. Spores (11.0-)11.2 - 14.0(-15.0) x 7.5 - 8.5(-9.5) μm, ellipsoid or broadly ellipsoid to ovoid with a conspicuous germ-pore, and thick brown wall. The wall comprises a pale outer layer and an inner brown layer. Habitat: On an irrigated lawn, Hlananathi Drakensberg Resort, Royal Natal National Park, Bergville District, 25 March 1998, PRUM 3920.

The collection from Hlananathi, described above, matches the account of the original material from O'Neill's cottage extremely closely, and there can be no doubt that the two gatherings are conspecific.
The finding of this second gathering of *P. natalensis* is very satisfactory, as although the new locality is in the same general area of KwaZulu-Natal, as that from which the original material was found, it extends its known distribution by about 250 km in a south westerly direction as the 'crow flies'. It is only by the accumulation, and publication, of such additional records of the species, that a true picture of its distribution in South Africa will become clear.

**Acknowledgements**

Financial support from the Foundation for Research Development is acknowledged. We thank Dr. G.C.A. van der Westhuizen for reviewing the manuscript.

**Literature cited**


