

## What is *Polyporus burkillii* Lloyd and how should it be spelled?

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A study of the holotype (BPI) and isotype (SING) of *Polyporus burkillii* Lloyd shows that this material is homogeneous and does not belong to a species of the genus *Polyporus* as assumed by Ryvarden (1990) and Hattori (2001), but that Corner (1987) was correct in combining the name in *Microporellus*. At the specific level Corner however misinterpreted the taxon which should be included in *M. clemensiae* (Murrill) Ryvarden s.l. Further studies of *Microporellus* are needed and may show that this is a good species antedating other infudibuliform ones, especially *M. inusitatus* (Lloyd) Corner. The spelling of the name is discussed, the conclusion being that it should be corrected to *Polyporus burkilliae*. *Microporellus burkillii* (Lloyd) Corner ss. Corner is a good species that apparently lacks a name.

**Key words:** *Polyporus*, *Microporellus*, type, Lloyd, SE Asia.

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Studium holotypu (BPI) a izotypu (SING) druhu *Polyporus burkillii* Lloyd ukázalo, že typový materiál je homogenní a druh nepatří do rodu *Polyporus*, jak tvrdí Ryvarden (1990) a Hattori (2001), ale že Corner (1987) měl pravdu, když ho přeřadil do rodu *Microporellus*. Na druhové úrovni ho ovšem Corner interpretoval chybně a druh ve skutečnosti patří do okruhu *M. clemensiae* (Murrill) Ryvarden s.l. Další studie rodu *Microporellus* jsou nutné a možná vyřeší to, zda je *P. burkillii* dobrý samostatný druh, jehož jméno by pak mělo prioritu před jmény dalších chorošů s nálevkovitými plodnicemi, zejména před *M. inusitatus* (Lloyd) Corner. Správná ortografická varianta jména je *Polyporus burkilliae*. *Microporellus burkillii* (Lloyd) Corner ss. Corner představuje dobrý, patrně nepopsaný druh.

### INTRODUCTION

C.G. Lloyd (1859–1926) described a number of new species of polypores from South-East Asia, based on specimens sent to him by curators of the Singapore Botanic Gardens. The holotypes are preserved at BPI (herbarium acronyms follow Holmgren et al. 1990) and have been revised by Ryvarden (1989, 1990, 1992), who proposed several synonymies. The material sent to Lloyd is however part of larger

collections kept in SING, the study of which may be helpful in interpreting taxa which have often been based on just a few fruitbodies (Demoulin 2011).

In revising the polypores of the Singapore herbarium I met an especially interesting taxonomic problem concerning the interpretation of *Polyporus burkillii* Lloyd, a species maintained in *Polyporus* by Ryvarden (1990) and Hattori (2001), while Corner (1987) transferred it to *Microporellus*. A study of five more fruitbodies than the two received by Lloyd helped me conclude that the species had been misinterpreted. I also noted that the orthography of the epithet is in need of correction.

#### MATERIAL AND METHODS

The holotype of *Polyporus burkillii* (Fig. 1) was borrowed from the US National Fungus Collection (BPI) and the isotype (Figs. 2, 3) was studied during my stays at the Singapore Botanic Gardens (SING). Given the extremely collapsed state of those specimens, only strong swelling mounting media were used for microscopic preparations: potash, Melzer's reagent and chloral hydrate (chloral 2 : water 1). Boiling was used for the last two media. Good observations nonetheless remained limited to the spores.

In the description of spores, L/W refers to the length/width ratio. Measurements for the isotype collection were carried out in Singapore with an accuracy of 0.5  $\mu\text{m}$ , while for the holotype, the measurements were made in my home laboratory in Liège with an accuracy of 0.1  $\mu\text{m}$ .

#### RESULTS AND DISCUSSION

*Polyporus burkillii* Lloyd, Mycol. Writ. VI, Mycol. Not. 65 (May 1921): 1061, fig. 1995

#### Type specimens

The species was "based on E.M. Burkill's 347 in the Botanical Garden at Singapore". It is exceptional for Lloyd to have the exact collector and collecting place mentioned. Usually Lloyd gave the name of the person who provided him the collection and his city of residence (T.F. Chipp, Singapore in this case). As usual (Demoulin 2011) a large part of the collection has been kept in Singapore (5 fruitbodies, which recently received the number SING 32695), while the holotype in Beltsville consists of two fruitbodies (number BPI 302174, Lloyd catalogue 43 262). The original label tells us this was Ethel M. Burkill 347, collected on 26th

DEMOULIN V.: WHAT IS *POLYPORUS BURKILLII* LLOYD AND HOW SHOULD IT BE SPELLED?

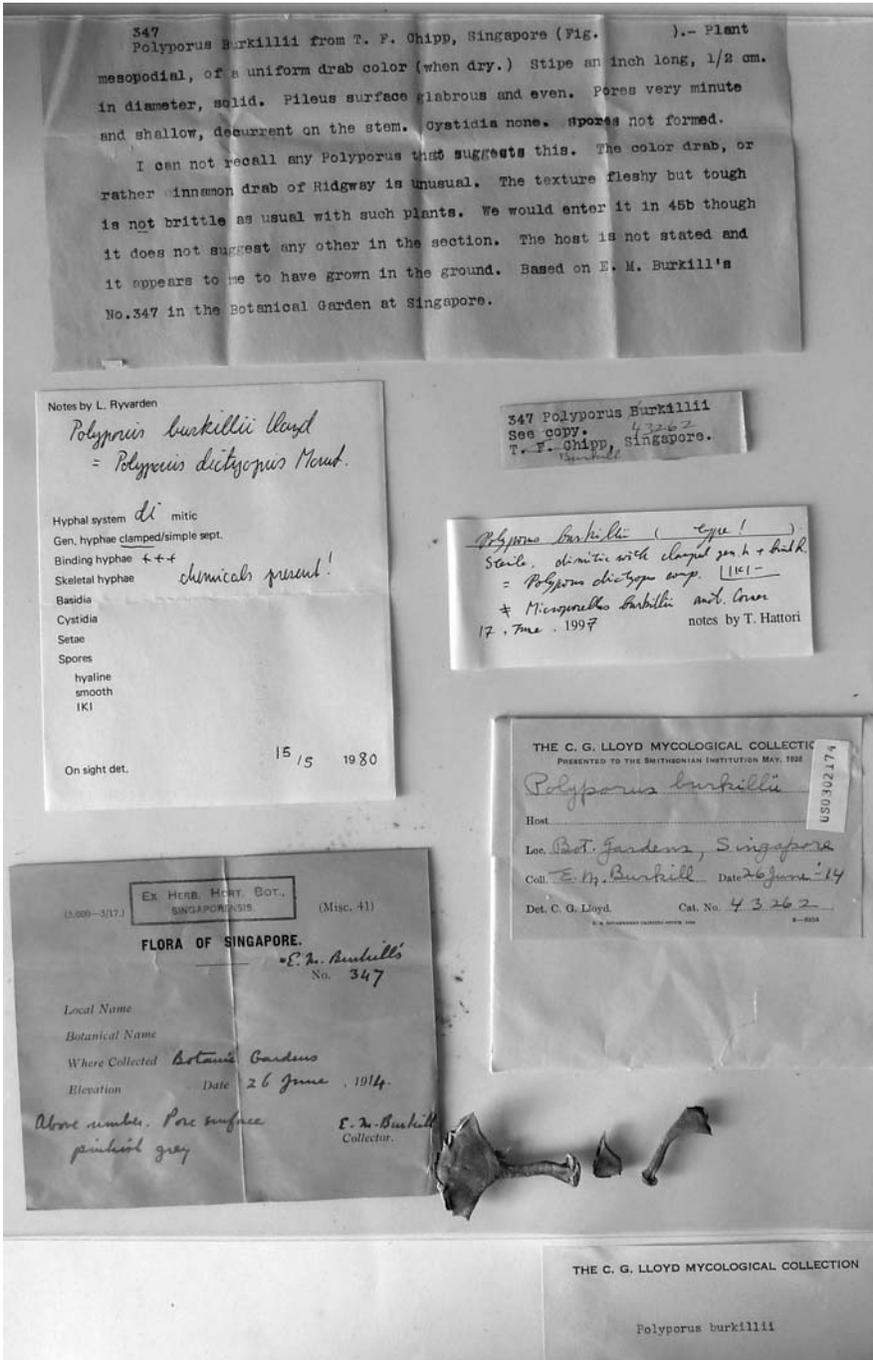


Fig. 1. *Polyporus burkilliae*, holotype collection (BPI 302174).



**Fig. 2.** *Polyporus burkilliae*, isotype collection (SING 32695). For enlargement of the two left-hand fruitbodies, see Fig. 3.



**Fig. 3.** *Polyporus burkilliae*, enlargement of the two left-hand fruitbodies of the isotype collection (SING 32695). For the whole collection, see Fig. 2.

June 1914 on a fallen trunk near the Maranta Avenue, and that the fungus was umber above and pinkish grey below. The label made up by Chipp for Lloyd only mentioned the Botanic Gardens as origin, the colours, the date and E.M. Burkill.

Maranta Avenue is an alley in the middle of the Singapore Botanic Gardens, neighbouring the Garden's jungle. It was of course useful to mention that the collection was made in the garden, but omitting the ecology could have some significance and abbreviating the given name of the collector may have led to the problem discussed later.

### **Type study with remarks on earlier studies**

The two fruitbodies present in the holotype collection (Fig. 1) are strongly collapsed, discoloured (darkened) and impregnated, probably with mercuric chloride. The bad preservation of the specimens may have led to the misinterpretation of the name. If, however, the whole collection is studied and attention is given to Mrs Burkill's original label, a better idea of the identity of the fungus can be obtained.

The most important microscopical character that can be retrieved from the specimens is the type of spores. Those are of irregular abundance but occur in fruitbodies of both the holotype and isotype collections. They are in fact the only cells that can be correctly observed, since even with the strongest swelling agents, tissues do not revive up to a point that their structure can be observed. One can only see that thick-walled hyphae occur beside generative ones.

Both Ryvarden (1990) and Hattori (2001), in their annotations of the holotype, interpret this as a dimitic structure with clamped generative hyphae and binding hyphae. I have not been able to confirm this interpretation and did not want to multiply sections of a limited fragile historical material. I have, however, no reason to doubt the observation of clamps on generative hyphae. It is more doubtful whether one deals with a dimitic (generative and binding hyphae) or trimitic (generative with binding and skeletal hyphae) structure. The existence of binding hyphae is quite possible, given the considerable variation of diameter of the thick-walled hyphae. I doubt, however, that considering the state of the specimens both in SING and BPI, it is possible to trace the hyphae to the point of excluding the existence of skeletal hyphae. If Ryvarden and Hattori were lucky enough to trace some hyphae and clearly interpret them as binding hyphae, it is probable they were observing the stipe (possibly less collapsed than the cap) in which binding hyphae had developed as described by Corner in his interpretation of *Microporellus burkillii* (1987, pp. 100–101, fig. 11).

The presence of binding hyphae in *Microporellus*, which develop late but then become very profuse in the stem and older parts of the pileus, has been ignored or summarily dismissed in treatments of the genus by recent authors (Decock &

Ryvarden 2002, Decock 2007). Corner however reports them not only in his interpretation of *M. burkillii*, but also in *M. inusitatus* (Lloyd) Corner var. *latiporus* Corner (1987, pp. 114–115, misnamed *parvisporus* on p. 113) and var. *roseibrunneus* Corner (pp. 94, 115).

The spores are broadly ellipsoid, dark yellowish and thick-walled. On the fruitbody of the holotype collection pictured by Lloyd a single spore could be measured (in chloral hydrate) with the dimensions  $7.2 \times 5.1 \mu\text{m}$  (L/W: 1.4). More spores could be measured on the second fruitbody, with the dimensions (in  $\mu\text{m}$ , in chloral hydrate)  $6.4 \times 5.0$ ,  $6.6 \times 5.0$ ,  $6.6 \times 5.1$ ,  $6.7 \times 4.8$ ,  $7.0 \times 5.8$ ,  $7.2 \times 4.8$ . Mean:  $6.75 \times 5.1$ . L/W: 1.21–1.50, mean 1.33. In these measurements I had an accuracy of  $0.1 \mu\text{m}$ .

For a fruitbody from the isotype collection in SING ten measurements in Melzer's reagent were made with an accuracy of  $0.5 \mu\text{m}$ :  $6.5 \times 4$ ,  $6.5 \times 5$ ,  $7 \times 4.5$ ,  $7 \times 4.5$ ,  $7 \times 5$  (five times),  $8 \times 6$ . Mean:  $7.0 \times 4.9$ . L/W: 1.30–1.60, mean 1.40.

Other interesting features are the small size of the fruitbodies, rather uniformly about 4 cm high, with an infundibuliform cap of 3 cm in diameter and a stipe of  $2 \times 0.4$  cm. The pores are decurrent on the stipe, stopping abruptly, and are irregular in shape and size. They vary in size between 5–7/mm and can be elongated and arranged in rows, in which case they may be 3–4/mm in the longest dimension. Their diameter in the holotype is about  $240 \mu\text{m}$ , if isodiametric, and  $320 \times 150 \mu\text{m}$ , if elongated. In the isotype, measurements on sections give a smaller diameter (100–120  $\mu\text{m}$ ) than in the holotype, undoubtedly because swelling was carried out with Melzer's reagent, which has a lower concentration of chloral.

A last feature to be noted is that the abrupt base of the stem shown on Lloyd's picture is not a rooting base broken off, as suggested by Corner (1987), but an inconstant mycelial pad, not unusual for a fungus growing on rotten wood.

It should be noted that if *Microporellus* species are frequently growing on roots or buried wood, Corner (1987) cites dead trunks or dead wood for *M. burkillii* var. *rufescens* Corner and the unnamed var. B, *M. nigripes* Corner, and *M. subincarnatus* Corner.

### **Identity of *P. burkillii* and comments on similar taxa**

The conclusion based on study of the 5 fruitbodies of the isotype and 2 fruitbodies of the holotype collections is that they are very homogeneous. There is no reason to believe this is a mixed collection. The striking characters are the yellowish colour of the spores (the colour intensity could be influenced by preservation conditions, but it is obvious that they were not hyaline), their thick wall and broadly ellipsoid shape, not being truncated. This clearly precludes attribution to the genus *Polyporus* as assumed by Ryvarden (1990) and Hattori (2001), who did not observe the spores. Such spores in a centrally stipitate polypore indicate that

one is dealing with a *Microporellus* (syn.: *Cystostiptoporus*), even if dextrinoidity could not be observed due to the preservation status of the type collections. The combination in *Microporellus* by Corner (1987) is thus perfectly justified. As explained below, his interpretation at the specific level is however erroneous.

*Microporellus* is a genus of which only a few species are well characterised. Those are the type species, *M. dealbatus* (Berk. & M.A. Curtis) Murrill, from the Americas, and *M. violaceocinerascens* (Petch) A. David & Rajchenb. (David & Rajchenberg 1985), a synonym of *Cystostiptoporus indicus* Dhanda & Ryvardeen (Ryvardeen & Dhanda 1975). Several species were added or discussed by Corner (1987), Ryvardeen (1990), Decock & Ryvardeen (2002) and Decock (2007). A clear synopsis of the species however is lacking, since Corner's key uses as the main character "spores above or below 7 µm in length", while, even from his own descriptions, it is clear that 7 µm is the most common size in the genus. Decock (2007) does not discuss all the potential species.

My personal experience of more than thirty years of studies in polypores in SE Asia and New Guinea is that there are three groups of species of *Microporellus* in that area. The group around *M. violaceocinerascens* consists of dark-coloured species with a distinct violaceous tinge, pubescent fruitbodies and large pores (1–3 /mm). *M. indicus* (Dhanda & Ryvardeen) Ryvardeen and *M. pahangensis* Corner belong here and are probable synonyms of *M. violaceocinerascens*, but this should be investigated with a better knowledge of the variability of these rare fungi.

Another group is that of *M. papuensis* Decock and *M. burkillii* (Lloyd) Corner ss. Corner. The present type study shows that Corner misinterpreted the second species. It is not clear if, despite having it at hand in Singapore, Corner studied the collection of which he wrote that it "seems to be this fungus [the one he describes] though Lloyd wrote that it had no cystidia and his figure shows an abrupt base to the stem (probably with the rooting base broken off)". The reference to Lloyd's picture reinforces the idea that Corner did not look at the isotype collection. Perhaps he studied it in the thirties, without taking adequate notes, while his publication dates from 1987. He continues by stating: "My description refers to the fungus that used to occur regularly every fungus season in the Singapore Botanical Gardens Jungle and must surely have been collected by Mrs Burkill".

Considering the richness of the polypore flora of the Singapore Botanic Gardens and the erratic fruiting of some species, Corner's assumption was not very wise. I did indeed collect in the Garden's Jungle what he calls *M. burkillii*, but only once (8th Aug. 1981, V. D. 6137, LG, SING). It must have been more common in the seventies, as Mrs Chang, the curator of the Herbarium at the time, had taken several pictures of it. This taxon and *M. papuensis* are light-coloured and have small regular pores. Just like *M. violaceocinerascens* they have abundant and typical cystidia.

The third group is represented by *M. clemensiae* (Murrill) Ryvarden s.l. Those are small fungi which may have infundibuliform fruitbodies. Pores can be irregular and intermediate in size between those of the two other groups. Cystidia have only been observed in the type of *Amauroderma clemensiae* Murrill by Decock & Ryvarden (2002), who qualified them as being very rare.

*Amauroderma clemensiae* Murrill, Bull. Torrey Bot. Club 35(8): 408, 1908, has not been much discussed except for the original description, its combination in *Microporellus* by Ryvarden (1985), and the notes on the type by Decock & Ryvarden (2002). In the last publication the authors use the word lectotype, apparently erroneously instead of holotype, and one finds a discrepancy in the size of the pores, given as (5)6–7/mm, against the original description (4–5/mm). This name, being the oldest one, can be used at the moment for what is probably a group of species. Among those, the species described in greatest detail is *M. inusitatus* (Lloyd) Corner. Corner (1987) made the combination in *Microporellus* three years before Ryvarden (1990) did. Ryvarden however gives a good description of the holotype of *Polyporus inusitatus* Lloyd, Mycol. Writ. VII, Mycol. Not. 74 (March 1925): 1334, fig. 3071. This is very useful for the correct interpretation of *P. inusitatus*, as Corner (1987) may have had a collective concept. He cites a number of specimens and describes four varieties in addition to the type variety. His plate 5, apparently based on four collections, shows a great variability of colour, from deep brown to whitish, and of shape, from infundibuliform to flabelliform. In *Microporus*, infundibuliform collections would refer to other species than the laterally stipitate ones, as for example with *Microporus xanthopus* (Fr.: Fr.) Kuntze and *M. affinis* (Blume et T. Nees: Fr.) Kuntze. When the good description of the type by Ryvarden is taken into consideration, I personally think that *Polyporus inusitatus* is the same species as *P. burkillii*, even if I have not yet been able to locate the isotype of *P. inusitatus* in SING.

A third species of Lloyd's, which I believe is the same as *P. burkillii*, is *P. sembilanii*, Mycol. Writ. VII, Not. 70 (September 1923): 1223, fig. 2506. This synonymy was proposed with doubt by Corner (1987), while Ryvarden (1990, as "*P. semibilanti*") considered *P. sembilanii* a synonym of *Microporellus clemensiae*. The type collection is very limited with scarce material both in BPI (a single fruitbody according to Lloyd) and SING, where fragments of what seems to be a second fruitbody occur (SFN 9834). They show that the pores are not minute as stated by Lloyd, but large (3/mm) and angular. Two thick-walled spores were about  $5.5 \times 4.5 \mu\text{m}$ . Despite the fact that Corner had an erroneous concept of *Polyporus burkillii*, I believe the two names are synonyms, even in a restricted sense. Since I consider *Microporellus clemensiae* another synonym, at least in a broad sense, there is no fundamental discrepancy between Corner's, Ryvarden's and my synonymy.

Another possible synonym is *Microporellus fuliginosus* Corner, Beih. Nova Hedwigia 86 (Ad Polyporaceas IV) (1987): 109. The “angular pores, often diamond shape” and absence (according to Corner) or rarity (according to Hattori 2001) of cystidia do not fit well a “fuliginous variety of *M. burkillii*”, as suggested by Corner, in Corner’s interpretation of *M. burkillii*. Hattori (2001) considered this the correct name for *M. burkillii* ss. Corner. I am however not convinced of this and consider *M. burkillii* ss. Corner a good species which lacks an adequate name.

Further studies of well-preserved collections allowing to understand the variability of the species related to *P. burkillii* should be performed before further nomenclatural action. Unfortunately, these *Microporellus* species do not seem to be common anymore and it may take time to assess the value of the following characters:

- size and shape of the pores
- hyaline or yellowish colour of the spores
- dimensions and L/W ratio of the spores
- abundance of cystidia
- colour of the fruitbody
- position of the stipe and shape of the cap

In the meantime I find it safe to call all the *Microporellus* collections with small fruitbodies, irregular pores and rare or absent cystidia *M. clemensiae* s.l. Further studies may show if *M. clemensiae* should be limited to laterally stipitate fungi and *M. burkillii* is the earliest name (predating *M. sembilanii* and *M. inusitatus*) for the infundibuliform ones.

### ***Polyporus burkillii* or *P. burkilliae*?**

Corner (1987, p.102) noted that *Polyporus burkillii* had been named after its collector, Mrs Ethel M. Burkill, and the spelling was “perhaps to be corrected to *P. burkilliae*”. He did however not do so.

Even if it is a rule I do not fully approve of, for it implies biographical knowledge which may be external to the original publication, it is certain that with the Code as it stands (McNeill et al. 2006), Art. 60.11, with Note 4 and Example 30, exactly fits the present situation and the name must be corrected to *P. burkilliae*.

The only possible argument against the correction would be that Lloyd did not intend to dedicate the species to Mrs Burkill, but to her husband, I.M. Burkill, the director of the Garden. One could understand this if I.M. Burkill had been Lloyd’s correspondent. However, it was the assistant director, T.F. Chipp, who was this correspondent. Since Ethel was not written in full on the label received by Lloyd, he may not have known that the initials E.M. were those of a lady.

I thus suggest that we should write the name as *Polyporus* (and *Microporellus*) *burkilliae*. This will be a well-deserved tribute to a person who has been a pioneer in the collecting of fungi in Singapore. It is also advantageous in case *Microporellus burkilliae* is recognised as distinct from *M. clemensiae*: authors who use the corrected spelling will be identified as having a more recent concept than that of Corner's (1987).

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DEMOULIN V.: WHAT IS *POLYPORUS BURKILLII* LLOYD AND HOW SHOULD IT BE SPELLED?

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