= Pulveroboletus bembae =

Pulveroboletus bembae is a species of fungus in the Boletaceae family that was first described in 2009 . It is known only from the rainforest of northern Gabon , a region known for its high level of species diversity . Like all boletes , P. bembae has fleshy fruit bodies that form spores in tubes perpendicular to the ground on the underside of the cap . These yellowish tubes form a surface of pores , each about 1 ? 2 mm in diameter . The brownish caps may reach up to 3 @.@ 5 cm (1 @.@ 4 in) wide , and rest atop pale brown stems up to 5 @.@ 5 cm (2 @.@ 2 in) long . The stems have a woolly , whitish yellow ring of tissue that is short @-@ lived , and may be absent in older specimens . The spores of P. bembae are spindle- or fuse @-@ shaped , and have rough surfaces ? a detail observable when viewed with scanning electron microscopy . The fungus grows in a mycorrhizal relationship with Gilbertiodendron dewevrei , the dominant tree species of the Guineo @-@ Congolian rainforest . Other similar Pulveroboletus species in the area include P. annulus and P. croceus , which may be differentiated from P. bembae by a combination of macro- and microscopic characteristics .

= = Discovery and classification = =

The specimens of Pulveroboletus bembae upon which the species description is based were collected in April , 2008 from three locations in Gabon : in Ogooue @-@ Ivindo Province at the Ipassa @-@ Makokou Research Station ; in the Minkébé National Park near Minvoul , and in Bitouga , both locations in the northerly province of Woleu @-@ Ntem . Until the report of this species and the related Pulveroboletus luteocarneus , 12 species of Pulveroboletus had been reported in tropical Africa . According to Degreef & De Kesel , who described the species in a 2009 publication , P. bembae belongs to the section Pulveroboletus of the genus Pulveroboletus . This section , defined by Singer in 1947 , is characterized by the presence of a pulverulent @-@ arachnoid veil (covered with fine , powdery wax granules and cobwebby) and fruit bodies that are sulphur @-@ yellow , greenish , or yellowish @-@ brown in color .

The specific epithet is derived from the word bemba , a name used by the Baka people for the tree Gilbertiodendron dewevrei that is associated with the fungus .

= = Description = =

The cap is initially convex ? sometimes with a small rounded elevation in the center ? and flattens out in maturity . It reaches 30 ? 35 mm (1 @.@ 2 ? 1 @.@ 4 in) in diameter , and the color is almost uniformly rust @-@ brown to reddish brown , although young specimens have a slightly paler margin (edge) . The cap surface is dry and dull , but develops a sheen with age . In older specimens , the texture of the margins is described as rimulose ? a condition in which a surface is cracked , but the cracks do not intersect one another to form a network and mark out areas . The cap cuticle extends slightly over the edge of the cap and curves downward , and is partly covered with remnants of the universal veil . The flesh at the center of the cap is less than about 5 mm (0 @.@ 20 in) thick , and gradually becomes very thin towards the margin . It is cream @-@ colored to pale yellow with pale reddish @-@ brown to light brown shades under the cuticle and down the stem .

The yellowish tubes on the underside of the cap are slightly swollen on one side , slightly depressed around the area of attachment to the stem . They are fused to the stem , in an adnate attachment ; rarely , some tubes will have a decurrent " tooth " (tissue that runs slightly down the length of the stem) that is less than 5 mm (0 @.@ 20 in) long . The pores formed by the tube ends are angular to round , and are more elongated near the stem . Their diameters are typically less than 1 ? 2 mm in diameter , and are they are the same color as the tubes , or slightly greener . The stem is 37 ? 55 mm (1 @.@ 5 ? 2 @.@ 2 in) by 4 ? 5 mm (0 @.@ 16 ? 0 @.@ 20 in) thick , cylindrical , with a narrow base measuring 2 ? 4 mm , and sometimes attached to yellow mycelia . It is solid , but as it ages it becomes stuffed (as if filled with cotton) and eventually almost completely

hollow . The stem surface is dull , dry , pale brown , and entirely covered with tiny brown to reddish brown squamules (small scales) . The flesh of the stem is cream @-@ colored , streaked with pale reddish brown to light brown from the upper third towards the base , while the base is light brown . The ring is located on either the stem or the margin of the cap . This woolly , whitish yellow ring of tissue is fragile and short @-@ lived , and has usually weathered away in older specimens . The odor of the mushroom is described as " mildly fungoid to earthy " , and the taste " mildly fungoid " .

= = = Microscopic characteristics = = =

The color of the spore print is unknown . The spores are somewhat spindle @-@ shaped , boletoid (long , lean , and fuse @-@ shaped) , with a pronounced suprahilar depression (a surface indentation formed where the spore was attached to the spore @-@ bearing cells , the basidia) , and typically measure 9 @.@ 3 ? 11 @.@ 3 by 3 @.@ 9 ? 4 @.@ 7 µm . They are weakly pigmented , and their rough surfaces can be seen under scanning electron microscopy . The spores are inamyloid , meaning they will not absorb iodine stain from Melzer 's reagent . The basidia are 26 @.@ 9 ? 39 @.@ 3 by 9 @.@ 0 ? 12 @.@ 0 µm , cylindrical to narrowly club @-@ shaped , hyaline (translucent) , and have four sterigmata (extensions that attach the spores) . The pleurocystidia (cystidia on the gill face) are 57 @.@ 4 ? 92 @.@ 6 by 9 @.@ 4 ? 17 @.@ 4 µm , spindle @-@ shaped , moderately frequent , and extend beyond the surface of the hymenium . They have thin , hyaline walls , and are colored the same as the hymenium , without any crystals or encrustations . The cheilocystidia (cystidia on the gill edge) , which measure 50 @.@ 6 ? 75 @.@ 1 by 12 @.@ 2 ? 16 @.@ 1 µm , are more abundant than the cheilocystidia , but otherwise share the same characteristics . The cap cuticle is made of a thin physalo @-@ palisadoderm ? a type of tissue where the ends of the hyphae reach the same length and form a palisade of cells ; these short anticlinal hyphae are 20 ? 40 by 5 ? 8 µm , and support one or two inflated , brownish , spherical to spheropedunculate (somewhat spherical with a stem) terminal elements that are 25 ? 45 µm wide , non @-@ amyloid , thin @-@ walled , and do not have any encrustations . The cuticle of the stem is made of smooth parallel hyphae . The squamules on the cap surface have a physalo @-@ palisadodermic arrangement made of short anticlinal hyphae that support elongated inflated elements of 15 ? 30 by 10 ? 15 µm and some scattered basidia . The flesh is made of hyaline , thin @-@ walled hyphae , measuring 10 ? 15 µm wide , and organized in a parallel fashion . These hyphae do not have an associated mediostratum ? a central strand of parallel hyphae from which other hyphae diverge sideways . Clamp connections are absent in the hyphae of P. bembae .

= = = Similar species = = =

Although the fruit bodies of P. bembae are roughly similar to those in Xerocomus , species in this genus do not have the powdery veil characteristic of P. bembae . Two similar species in the same area include P. annulus and P. croceus , described in 1951 by Belgian mycologist Paul Heinemann , based on specimens collected in the Congo . Although the identity of these two species is not fully clarified because of insufficient collections , P. bembae differs from both in its larger cystidia , its cream @-@ colored flesh with pale reddish @-@ brown to light brown tones under the cap cuticle (compared to white in P. annulus and P. croceus) , its yellow mycelium (white in P. annulus and P. croceus) , and differences in ecology .

= = Habitat and distribution = =

The species has been found growing in small groups in the Guineo @-@ Congolian rainforest . This forest is dominated by the single canopy tree species Gilbertiodendron dewevrei . Not only does this tree provide food in the form of edible seeds for a wide variety of large mammals , it forms mycorrhizal relationships with P. bembae . This is a mutually beneficial relationship where the hyphae of the fungus grow around the roots of the plant , enabling the fungus to receive moisture , protection and nutritive byproducts of the tree , and affording the tree greater access to soil nutrients

. The ectomycorrhizal symbiosis is thought to contribute to the success of the dominant species , by allowing it access to nutrients otherwise unavailable . The Congolian forests encompass an ecoregion known for its species richness and endemism , which is spread across four countries : Cameroon , Gabon , Republic of Congo , and the Central African Republic .