= Xeromphalina setulipes =

Xeromphalina setulipes is a species of fungus of the family Mycenaceae . First collected in 2005 , it was described and named in 2010 by Fernando Esteve @-@ Raventós and Gabriel Moreno , and is known only from oak forests in Ciudad Real Province , Spain . The species produces mushrooms with dark reddish @-@ brown caps up to 15 millimetres (0 @.@ 59 in) across , dark purplish @-@ brown stems up to 45 millimetres (1 @.@ 8 in) in height and distinctive , arched , brown gills . The mushrooms were found growing directly from the acidic soil of the forest floor , surrounded by plant waste , during November .

Morphologically , the dark colour of the gills and stem , lack of a strong taste , and characters of the cystidia (large cells found on the mushrooms) are the most distinguishing characteristics of X. setulipes . These features allow the species to be readily distinguished from other , similar species , including X. cauticinalis and X. brunneola . Its ecology and habitat are also distinct , but it is unclear whether they can serve as certain identifying characteristics . Within the genus Xeromphalina , X. setulipes is classified in the section Mutabiles , along with several other species . It seems most closely related to X. fraxinophila , X. cornui , X. campanelloides and X. cauticinalis , but , according to Esteve @-@ Raventós and colleagues , further analysis is required to accurately judge the relationships between the species of Xeromphalina .

= = Taxonomy = =

Xeromphalina setulipes was first described in 2010 in an article in Mycological Progress by Fernando Esteve @-@ Raventós and Gabriel Moreno , both of the University of Alcalá . The description was based on specimens collected during 2005 field work in Ciudad Real Province , Spain . The type specimen was collected on 17 November , and was found 770 metres (2 @,@ 530 ft) above sea level . The specific epithet setulipes is from the Latin setula , meaning " stiff hair " , and pes , meaning " foot " , in reference to the bristly hairs that cover the stem .

Within Xeromphalina , X. setulipes is part of the section Mutabiles , which also contains X. campanelloides , X. cauticinalis , X. cirris , X. cornui , and X. fraxinophila . Phylogenetic analysis performed by Esteve @-@ Raventós and colleagues concluded that X. setulipes appears to be most closely related to X. fraxinophila , X. cornui , X. campanelloides and X. cauticinalis , the five of which are clearly separate from the group containing X. campanella , X. kauffmanii , X. brunneola , and , possibly , X. junipericola . Data from the large subunit (60S) of the nuclear ribosomal RNA gene suggests that the species is most closely related to X. campanelloides , while internal transcribed spacer (ITS) data place it closest to a clade containing X. cauticinalis and X. aff. parvibulbosa (an unidentified species similar , but not identical , to X. parvibulbosa) . Further research , analysing the ITS or RPB2 loci , could serve to help clarify the precise relationships of species and positions of clades within the genus .

= = Description = =

Xeromphalina setulipes produces basidiocarps in the form of mushrooms . Each mushroom has a flattened @-@ convex cap of between 8 and 15 millimetres (0 @.@ 31 and 0 @.@ 59 in) in diameter with a depressed centre . It is not particularly hygrophanous (it does not change color as it loses or absorbs water) , and , unlike the caps of related species , is neither grooved nor translucent at the margin . The cap is dark brown , sometimes with reddish colouration . It becomes paler , turning tobacco @-@ brown , when it dries ; this change is more noticeable at the cap margin . The caps of young mushrooms are smooth and hairless , but they wrinkle as they age ; however , fine , soft hairs are sometimes visible towards the margin (which is rolled inwards) when the cap is dry . The margin is typically not smooth ; instead , it undulates .

The cylindrical stem measures between 30 and 45 mm (1 and 2 in) in length by 1 and 2 mm (0 @.@ 04 and 0 @.@ 08 in) in width , though it is slightly thicker at the very bottom . It is stiff , but can be somewhat flexible . The colour is a dark brown , sometimes approaching black , with purplish

hints . It appears smooth , but is actually covered in minute tufts . The hairs at the base of the stem are somewhat more visible , and are an amber colour . The gills are subdistant (neither close to , nor distant from , one another) and are of a distinctive shape ; they are decurrent , that is , they extend down the stem , and are noticeably arched . The gills can be up to 2 mm (0 @.@ 08 in) thick , and sometimes split into two . The gills are a tobacco @-@ brown no matter the age of the mushroom , though the edges can be paler (sometimes whitish) and crenulate . The flesh is firm but flexible , and the same colour as the surface . It has an indistinct smell , and a taste that is not bitter .

= = = Microscopic characteristics = = =

Xeromphalina setulipes has smooth , ellipsoid to somewhat cylindrical spores that measure from 5 @.@ 0 to 7 @.@ 3 micrometres (?m) by 2 @.@ 9 to 3 @.@ 7 ?m . They are amyloid , meaning that they stain a dark colour in Melzer 's reagent or Lugol 's solution , and have thin cell walls . The four @-@ spored (occasionally two @-@ spored) basidia are shaped like narrow clubs , sometimes approaching cylindrical , and measure between 21 and 30 ?m long by 4 @.@ 5 to 5 @.@ 5 ?m wide . The sterigmata , the narrow prongs that connect the spores to the basidia , can measure up to 3 ?m in length . The edge of the gill is primarily made up of cheilocystidia (cystidia on the gill edge) but there are also some basidia . The hyaline (translucent) cheilocystidia have an irregular , sometimes vaguely cylindrical shape , and measure between 30 and 80 ?m by 3 to 7 ?m . They are packed together , extending outwards from the gill in a manner reminiscent of coral , as is sometimes seen in members of the genus Mycena . The abundant caulocystidia (cystidia on the stem) project prominently , and are visible to the naked eye as the minute hairs on the stem . They measure between 30 and 60 ?m by 5 to 10 ?m . They are swollen in the middle , tapering at each end , but are irregular in shape and are often curved . The particularly thick cell walls can be as much as 2 @.@ 5 ?m wide . The caulocystidia are yellowish @-@ brown . There are a large number of circumcystidia (cystidia found on the margin of the cap) , which are similar to the cheilocystidia . They typically have thick cell walls , and numerous projections of various sorts grow from their sides . The circumcystidia form a mass reminiscent of coral .

The flesh in the gills is composed of cylindrical hyphae measuring between 4 and 8 ?m thick that run parallel to one another . The hyphae typically have fairly thin , smooth walls , but they can have a small amount of brown pigment , which stains orange @-@ brown in potassium hydroxide . The pileipellis , the uppermost layer of hyphae in the cap , forms a cutis made up of cylindrical , slightly thicker @-@ walled hyphae of between 5 and 10 ?m wide . They can be interwoven or primarily extending from the margin to the centre . The pigmentation is yellowish @-@ brown and stains reddish @-@ brown in potassium hydroxide . The hyphae below the pileipellis run parallel to one another and measure between 4 and 8 ?m in width . Their yellowish @-@ brown pigment stains orange @-@ brown in potassium hydroxide . The stipitipellis , the uppermost layer of hyphae on the stem , also forms a cutis . The cylindrical hyphae run parallel to one another and have thick cell walls . They have a dark red @-@ brown pigment , which stains darker still in potassium hydroxide . Clamp connections are present .

= = = Similar species = = =

Xeromphalina setulipes shows some similarities to X. cauticinalis . They share the amber @-@ coloured hair towards the base of the stem and both grow on soil , as opposed to directly onto wood . Further , X. cauticinalis can display caulocystidia of the same distinctive shape as those of X. setulipes (though these are mixed with the other shapes more typical of the genus) . X. cauticinalis mushrooms are typically of a different colour ; for instance , the area at the top of the stem is paler than the rest , compared to the entirely dark stem of X. setulipes . Furthermore , X. cauticinalis has a very bitter taste . X. setulipes shares with X. brunneola its dark colouration and some microscopic traits . However , the two clearly differ in the shape of both the cheilocystidia and the pileocystidia , the width of the spores (the spores of X. brunneola measure between 2 and 3 ?m in width) and the

fact it is found specifically in softwood woodland . Furthermore , the two do not appear to be closely related .

Other species within Mutabiles include X. campanelloides , which can be differentiated by the shape of the thin @-@ walled caulocystidia and yellow flesh in the stem . X. cornui grows in softwood forests with Sphagnum moss . Both the cap and the top of stem sport yellow grains . X. fraxinophila produces larger mushrooms and has yellow gills . X. parvibulbosa , while potentially featuring similar caulocystidia to X. setulipes , has a bitter or sour taste .

= = Habitat , distribution and ecology = =

Xeromphalina setulipes is only known from the type locality in the province of Ciudad Real , Spain . Members of the Mycenaceae are saprotrophic , and X. setulipes was found in woodland made up of cork oak (Quercus suber) and Portuguese oak (Quercus faginea) , with undergrowth consisting of gum rockrose (Cistus ladanifer) , prickly juniper (Juniperus oxycedrus) , and various heathers (Erica species) . The mushrooms were growing in clusters on the forest floor from acid soil , surrounded by dead plant matter . The species 's ecological patterns may be useful identifying characteristics , distinct from other , similar species . The mushrooms were found in autumn , and collected in November .