

= *Leccinum holopus* =

*Leccinum holopus* , commonly known as the white birch bolete , white bog bolete , or ghost bolete , is a species of bolete fungus in the family Boletaceae found in northern Asia , Europe , and northeastern North America . It associates with birch trees and is typically found in boggy or swampy areas , often growing among sphagnum moss .

Fruitbodies ( mushrooms ) of *L. holopus* have convex caps measuring up to 10 cm ( 4 in ) in diameter . Often pure white ? especially in young fruitbodies ? the caps sometimes become flushed with buff or brownish tints . The whitish surface of the stipe is covered with small , stiff , projecting scales ( scabers ) that become tan or darker in age . Some varieties of *Leccinum holopus* have been described that vary in cap color or staining reaction , but DNA evidence suggests that most are the same taxon . Although the fruitbodies are edible , opinions vary as to their culinary desirability .

= = Taxonomy = =

Initially named as a species of *Boletus* by German mycologist Friedrich Rostkovius in 1844 , the fungus was later transferred to *Leccinum* by Roy Watling in 1960 . Synonyms resulting from transfer to different genera include : *Krombholzia holopoda* and *K. holopus* ( both published by Albert Pilát in 1951 ) ; *Krombholziella holopus* ( Josef ?utara , 1989 ) ; *Trachypus holopus* ( Paul Konrad and André Maublanc , 1952 ) , and *Trachypus scaber* f. *holopus* ( Henri Romagnesi , 1939 ) . Other synonyms , according to Index Fungorum , include *Leccinum olivaceosum* , described from France in 1994 , and *Leccinum aerugineum* ( 1991 ) . *Leccinum holopus* is classified in section *Scabra* of genus *Leccinum* , a grouping that includes Northern Hemisphere species associating exclusively with birch .

The specific epithet *holopus* is Greek for " with perfect stalk " . Common names given to the fungus include white birch bolete , white bog bolete , and ghost bolete .

Several subtaxa of *Leccinum holopus* have been described . In form *aerugineum* , described by Josef ?utara in 2009 , the flesh discolours green after injury . The variety *americanum* , described by Alexander H. Smith and Harry Delbert Thiers in 1971 from collections made in Michigan , injured flesh stains reddish . Lannoy & Estadès described *Leccinum nucatum* in 1993 , a taxon that was later ( 2007 ) published as variety *nucatum* of *L. holopus* ; no molecular evidence was found supporting the existence of this as a distinct taxon , and it is therefore placed into synonymy with *L. holopus* . *Leccinum holopus* var. *majus* , described by Rolf Singer in 1966 ( originally published by Singer as *Krombholzia scabra* f. *majus* ) , is another historical variety without independent taxonomic significance .

= = Description = =

Fruitbodies of *Leccinum holopus* have convex to flattened caps measuring 3 ? 10 cm ( 1 @. @ 2 ? 3 @. @ 9 in ) in diameter , with a narrow band of sterile tissue surrounding the margin . The caps are initially whitish , but can develop gray , buff , tan , or pinkish tints during maturity ; the color may also darken and become greenish with age . The cap surface is initially covered with very fine hairs , but later becomes more or less smooth , often with a sticky texture in age or in moist conditions . The flesh is white and lacks any distinct odor or taste ; it can have either little or no bruising color reaction with injury , or may become light pink in variety *americanum* . On the cap underside is a porous surface comprising pores numbering 2 to 3 per millimeter , each of which is the end of a tube that extends to 2 @. @ 5 cm ( 1 @. @ 0 in ) deep . The color of the pore surface ranges from whitish to grayish to dingy brown , and has little color reaction to injury , although it may discolor yellowish or brownish . There is a depression where the pores meet the stipe . The stipe measures 8 ? 14 cm ( 3 @. @ 1 ? 5 @. @ 5 in ) long by 1 ? 2 cm ( 0 @. @ 4 ? 0 @. @ 8 in ) wide . Its whitish surface is covered with scabers that darken in age to tan or darker . The stipe base often stains bluish .

*Leccinum holopus* produces a brown spore print . Spores are somewhat fusoid ( spindle @-@ shaped ) and measure 14 ? 20 by 5 ? 6 @. @ 5 µm . The basidia ( spore @-@ bearing cells ) are

four @-@ spored and measure 28 @.@ 5 ? 36 @.@ 5 by 11 @.@ 5 ? 12 @.@ 5  $\mu\text{m}$  . Cystidia on the pores are flask @-@ shaped ( lageniform ) to fusiform , and 39 @.@ 0 ? 45 @.@ 5 by 7 @.@ 5 ? 9 @.@ 0  $\mu\text{m}$  , while those of the stipe ( caulocystidia ) are fusiform , club @-@ shaped , or cylindrical , measuring 39 @.@ 0 ? 54 @.@ 5 x 9 @.@ 1 ? 13 @.@ 5  $\mu\text{m}$  . There are no clamp connections present in the hyphae of *L. holopus* . The cap cuticle is arranged in the form of a cutis ? with hyphae that run parallel to the cap surface .

Several chemical tests can be used to help verify an identification of *L. holopus* . A drop of ammonium hydroxide solution turns the cap cuticle a pinkish color , but has no reaction with the flesh . A drop of dilute potassium hydroxide ( KOH ) has no reaction on the cap surface , and either no reaction or a brownish reaction with the flesh . Application of iron ( II ) sulphate solution does not have a reaction on the cap surface , and either no reaction to slightly olive coloration on the flesh .

= = = Similar species = = =

*Leccinellum albellum* is similar in appearance to *L. holopus* , but grows in association with oak and has a more southerly distribution . *L. scabrum* is a widely distributed lookalike that can be distinguished from *L. holopus* by its larger size and generally darker colors .

= = Edibility = =

Although commonly considered edible , opinions vary on the culinary appeal of *Leccinum holopus* fruitbodies . Michael Kuo , writing in 100 Edible Mushrooms , considers it a good edible ; Peter Roberts and Shelley Evans in The Book of Fungi say " it is edible , but is said to be tasteless and pappy , so is not recommended . " Fruitbodies are optimally harvested when they are young , before the flesh becomes too spongy , and before insect larvae establish themselves . Minimal cleaning is required in the field . The mushroom has a mild , somewhat sweet flavor that is enhanced after brief sauteeing . Drying the mushrooms enhances the flavor , but diminishes the sweetness of fresh mushrooms .

= = Habitat and distribution = =

*Leccinum holopus* is a mycorrhizal species . It fruits on the ground ( often among Sphagnum moss ) , singly to scattered in wet areas like cedar swamps , bogs , or soggy forests . Like most *Leccinum* species , the fungus is highly host @-@ specific and associates with birch ( *Betula* ) . In North America , the range of *Leccinum holopus* extends from eastern Canada to New York , extending west to the northern Rocky Mountains , roughly coinciding with the distribution of the paper birch ( *Betula papyrifera* ) . In this range , it is common and fruits from August to October . *L. holopus* var. *americanum* is known only from North America . The fungus is rare in southern Europe , but more common in the Sphagnum swamps in the north . In Asia , it has been recorded from Taiwan and Qinghai ( China ) .

Fruitbodies of *L. holopus* are a source of food for fly species such as *Pegomya winthemi* ( family Anthomyiidae ) and *Megaelia pygmaeoides* ( family Phoridae ) .