= Inocybe saliceticola =

Inocybe saliceticola is a fungus found in moist habitats in the Nordic countries . The species produces brown mushrooms with caps of varying shapes up to 40 millimetres (1 @.@ 6 in) across , and tall , thin stems up to 62 millimetres (2 @.@ 4 in) long . At the base of the stem is a large and well @-@ defined " bulb " . The species produces unusually shaped , irregular spores , each with a few thick protrusions . This feature helps differentiate it from other species that would otherwise be similar in appearance and habit .

Inocybe saliceticola grows in mycorrhizal association with willow trees , and it is for this that the species is named . However , particular species favoured by the fungus are unclear and may include beech and alder taxa . The mushrooms grow from the ground , often among mosses or detritus . I. saliceticola was first described in 2009 , and within the genus Inocybe , the species is a part of the section Marginatae . The species has been recorded in Finland and Sweden and is relatively common in some areas .

= = Taxonomy = =

Inocybe saliceticola was first described in 2009 by Jukka Vauras and Katri Kokkonen in the journal Karstenia , based on around 20 specimens from Finland , the majority of which were collected by the authors . The holotype was collected from the shore of lake Pahakala , near Nurmes . The specific name saliceticola is in reference to the fact that the species grows among willow (Salix) . Within the genus Inocybe , I. saliceticola belongs to the section Marginatae , as defined by Rolf Singer . The section has been defined in several ways . It was established in 1933 by Robert Kühner , who identified two key characteristics : a stem which does not feature a cortina (a fragile , cobweb @-@ like partial veil) but is entirely covered by cystidia , and the presence of a marginate " bulb " at the base of the stem . Singer emended the section in 1986 to take into account that a bulb is not always present . A slightly different infrageneric taxonomy was offered by Thom Kuyper in 1986 . He , like Singer , grouped Marginatae under Inocybe subg . Inocybe , but he labelled it a " supersection " . However , phylogenetic studies have indicated that neither Singer 's section Marginatae nor Kuyper 's " supersection " Marginatae truly form monophyletic groups , but that Singer 's section comes closer to doing so . Species within Marginatae similar to I. saliceticola include I. obtusiuscula , I. dunensis , I. salicis @-@ herbaceae , I. substellata , I. praetervisa , I. salicis and I. mixtilis . These species are all known to associate with willow , and all have macroscopic similarities .

= = Description = =

Incoybe saliceticola produces mushrooms with caps of between 7 and 40 millimetres (0 @.@ 28 and 1 @.@ 57 in) in diameter . The shape of the cap varies , depending on the age of the mushroom . In younger specimens , they are conical or nearly so , but as the mushroom matures , the caps flatten into a more convex or flat shape . As such , the height of the cap varies from 4 to 11 millimetres (0 @.@ 16 to 0 @.@ 43 in) . The cap features an umbo that is usually very prominent . Around the umbo , the cap surface is smooth , but towards the cap margin , the surface is defined by fibrils running from the margin towards the umbo . The cap sometimes splits along these . The cap 's colour varies from yellow @-@ brown to pale brown , and is palest at the margins . The umbo contrasts to this somewhat , being a grey @-@ brown or red @-@ brown . The slender stem measures from 0 @.@ 7 to 6 @.@ 2 centimetres (0 @.@ 3 to 2 @.@ 4 in) long by 1 @.@ 5 to 6 @.@ 5 millimetres (0 @.@ 059 to 0 @.@ 256 in) thick . It thickens slightly towards the base , where it joins a large , well @-@ defined " bulb " that can be up to 11 millimetres (0 @.@ 43 in) across . Shallow grooves run up the surface of the stem , which is covered in a fine white powder . In one case , however , an atypical specimen was recovered with an almost completely smooth stem , free of striations or powder . The stem varies in colour , with whitish , pale yellow @-@ brown , pale red @-@ brown , pale brown and grey @-@ brown all observed , while the base is white . No

veil or ring is visible .

The fairly crowded gills are adnate , meaning that they attach to the stem through their entire depth . They are a pale grey to pale grey @-@ brown when young , darkening to grey @-@ brown as they mature . The gill edges , which are slightly fimbriate , are the same colour or paler . The flesh lacks any strong or distinctive smell or taste , and is described in the original description as " fungoid " . In the cap , the flesh varies in colour from whitish to a pale brown @-@ grey or pale yellow , while in the stem , it is the same colour as the stem surface or slightly paler .

= = = Microscopic characteristics = = =

The irregularly shaped spores measure from 7 @.@ 2 to 11 @.@ 6 by 5 @.@ 1 to 7 @.@ 9 micrometres (?m) , each featuring a few thick protusions . Abnormal spores of a different shape , sometimes with protrusions more distinct from the actual spore than is typical , can sometimes form ; this is perhaps due to poor weather . The club @-@ shaped basidia measure 25 to 40 by 9 to 14 ?m , and each basidium bears four spores . The yellowish pleurocystidia (cystidia on the face of the gill) are ventricose or occasionally club @-@ shaped , measuring 41 to 89 by 12 to 23 ?m , including a cell wall up to 4 @.@ 5 ?m thick . The tip often bends and is encrusted with crystal @-@ like structures , while the base tapers , or narrows into a small stalk . The cheilocystidia (cystidia on the edge of the gill) are much the same , but they are typically somewhat shorter and stouter . The longer caulocystidia (cystidia on the stem) occur all the way down the stem and measure up to 99 ?m in length with a more variable shape . The mushrooms also feature " paracystidia " , club @-@ shaped cystidia @-@ like structures on the gills lacking crystals , as well as " cauloparacystidia " on the stem . In Inocybe saliceticola , the paracystidia are fairly abundant , with thin cell @-@ walls , while the abundant cauloparacystidia can have slightly thicker walls and are often arranged in clusters .

= = = Similar species = = =

Of the species of Marginatae associated with willow , five (I. salicis @-@ herbaceae , I. substellata , I. praetervisa , I. salicis and I. mixtilis) can be readily distinguished from I. saliceticola as their spores feature distinct , strongly protruding excrescences . In addition , they are found in vastly different habitats : I. mixtilis and I. praetervisa favour willow only in montane habitats , while I. salicis @-@ herbaceae and I. substellata grow exclusively in montane habitats . I. salicis is rare in Nordic countries , and is typically collected from dunes . Of the other two listed by Vauras and Kokkonen , the spores of I. dunensis are distinctly larger and of a different shape to those of I. saliceticola , and the cystidia are shorter . While the species is typically found on the beach , it grows on fine sand , and has not been recorded in Finland . I. obtusiuscula also has larger spores of a different shape , and they are a darker colour , owing to their thick cell walls . Phylogenetic analysis of the respective internal transcribed spacer sequences has confirmed that I. obtusiuscula and I. saliceticola are separate species .

Inocybe alnea and I. ochracea , regarded by some as the same species , can also be distinguished from I. saliceticola by the presence of protruding nodules on the spores . DNA analysis confirmed that they were separate from I. saliceticola , and , in any case , it is possible that they do not grow in association with willow . I. hirculus has been recorded growing near I. saliceticola , but can be differentiated both macroscopically and microscopically ; the mushrooms of I. hirculus have a much more fibrillose cap , and the stem does not join a bulb , while the spores are larger . Macroscopically , I. rivularis , which could grow in similar habitats to that of I. saliceticola , produces larger mushrooms and has powder only towards the top of the stem . It also differs microscopically .

= = Distribution and habitat = =

Inocybe saliceticola grows in a mycorrhizal association with willow (Salix) . Precise favoured species are unclear ; at least one of the tea @-@ leaved willow (Salix phylicifolia) or the dark @-@

leaved willow (S. myrsinifolia) is a possible symbiont , while other trees that the species has been found near include the bay willow (S. pentandra) , the grey willow (S. cinnerea) , the grey alder (Alnus incana) and species of birch (Betula) . I. saliceticola is found most typically in moist thickets or woodland close to shores , but recordings have also been made in other moist habitats . Mushrooms are encountered on the ground , growing from detritus or amongst moss , such as the heart @-@ leaved spear @-@ moss (Calliergon cordifolium) , the spiky @-@ bog moss (Sphagnum squarrosum) and species of Mnium . They are typically near plants such as the tufted loosestrife (Lysimachia thyrsiflora) , the creeping buttercup (Ranunculus repens) , the common marsh @-@ bedstraw (Galium palustre) , the purple marshlocks (Comarum palustre) and the purple small @-@ reed (Calamagrostis canescens) , and share the habitat with other Inocybe , including I. acuta and I. lacera var. helobia .

Inocybe saliceticola has been recorded in several locations around Finland , ranging from the hemiboreal zones in the east and the south of the country , to boreal areas in the north , and it has also been found in Sweden , close to the Klarälven . At least in North Karelia , Finland , it is relatively common in the right habitats . It is one of over 150 species of Inocybe found in the Nordic countries , and fruit bodies can be encountered between late July and early October .