

Contribution to morphology and ecology of *Polyporus rhizophilus*

JANUSZ ŁUSZCZYŃSKI and BOŻENA ŁUSZCZYŃSKA

Department of Botany, Institute of Biology, Jan Kochanowski University
Świętokrzyska 15, PL-25-406 Kielce, jluszcz@ujk.kielce.pl

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The distribution and ecological conditions of the occurrence of *Polyporus rhizophilus* in Poland are discussed. The species was previously known from only one locality in Dwikozy near Sandomierz. Further localities were found on the roots of *Stipa capillata* in the Skorocice reserve near Busko Zdrój and at an anthropogenic site among *Dactylis glomerata*, *Poa annua* and *P. trivialis* grasses in an urban park in Końskie. The latter locality is noteworthy as it is situated outside the occurrence range of xerothermic grasslands in the Wyżyna Kielecko-Sandomierska upland. This locality is isolated ecologically from the two remaining Polish localities situated in the xerothermic grasslands.

Key words: graminicolous fungi, *Polyporus rhizophilus*, threatened fungi, steppe fungi

INTRODUCTION

Fungi of the genus *Polyporus* Fr. are saprobes or, less frequently, parasites. They inhabit plants with wooded shoots (mostly species of deciduous trees, less often coniferous trees), causing white rot of wood and, exceptionally, of grasses. A total of 59 widespread species, of which a large number are species typical of tropical areas, are known worldwide (Domański et al. 1967; Domański 1984; Kirk et al. 2008). The genus is represented in Poland by 11 species, the majority of which are widespread in the country (Wojewoda 2003). Four species: *P. brumalis*, *P. ciliatus*, *P. squamosus* and *P. varius*, are common, while other species are rare. *Polyporus rhizophilus* is one of the rarest species, with interesting ecology and geographical distribution (Łuszczynski, Łuszczynska 2009).

MATERIAL AND METHODS

The results are part of long-term mycocoenological research conducted by authors in the Wyżyna Małopolska upland between 1986 and 2008 and are supplemented by literature data (Sałata 1977; Wojewoda 2003). Biocoenotic and habitat conditions of the occurrence of *Polyporus rhizophilus* were characterised using phytosociological relevés and habitat descriptions. Phytosociological relevés were conducted with the commonly used Braun-Blanquet method. The nomenclature of vascular plants follows Mirek et al. (2002).

Microscopic characters of the fruit-bodies, such as spores, basidia and hyphae, were measured using a micrometric scale. The drawings of such elements were based on photographs taken with a light microscope.

Herbarium specimens were deposited in the Fungarium of the Department of Nature and Mathematics, Jan Kochanowski University of Humanities and Sciences, Kielce.

RESULTS

Polyporus rhizophilus (Pat.) Sacc.

Fig. 1

Syll. fung. (Abellini) 11: 82 (1895) – *Polyporaceae*, Polyporales, Incertae sedis, Agaricomycetes, Basidiomycota, Fungi (Kirk et al. 2008).

Syn.: *Leucoporus rhizophilus* (Pat.) Pat., *Melanopus rhizophilus* Pat., *Polyporellus rhizophilus* (Pat.) Pilát.

MORPHOLOGY. *Polyporus rhizophilus* produces single fruit-bodies that consist of a pileus and a stem. It grows at the base of living grasses on which the fungus parasitizes. Pileus from 5 to 10 mm in diam., sometimes larger, even up to 4 cm (Domański et al. 1967), flat, slightly convex at centre. Upper surface light beige, light ochre, with traces of fine squamules. Pileus margin concolourous with the pileus, acute, flat or slightly incurved in dry specimens. Hymenophore tubular. Pores ellipsoidal-rhomboidal, more rounded and smaller at the margin, 2–3 per 1 mm, white or cream-coloured, subdecurrent. Stem centric or slightly eccentric, suberose, elastic, thin, smooth, 1 to 2–5 mm in diam. and up to 3 cm long, white at top, becoming dull brown to blackish at base.

Hyphae dimitic, hyaline; generative hyphae thin-walled, 3-5(-7) μm in diam., septae with clamps; skeletal hyphae thick-walled, branched, without septae, 2-5 μm in diam. Basidia 15-25 \times 4.5-6 μm , with a basal clamp. Spores ellipsoidal 6-10 \times (2-) 3-4 μm (Fig. 1).

LOCALITIES IN POLAND. Prior to this paper, *Polyporus rhizophilus* was known only from one locality in Dwikozy in the Wyżyna Sandomierska upland (geographic coordinates: 50°44'N and 21°47'E; ATPOL square Ef 82), where it produced fruit-bodies on the roots of *Stipa capillata* in the *Sisymbrio-Stipetum capillatae* association (Sałata 1977; Wojewoda 2003). Two new localities were found in the Wyżyna

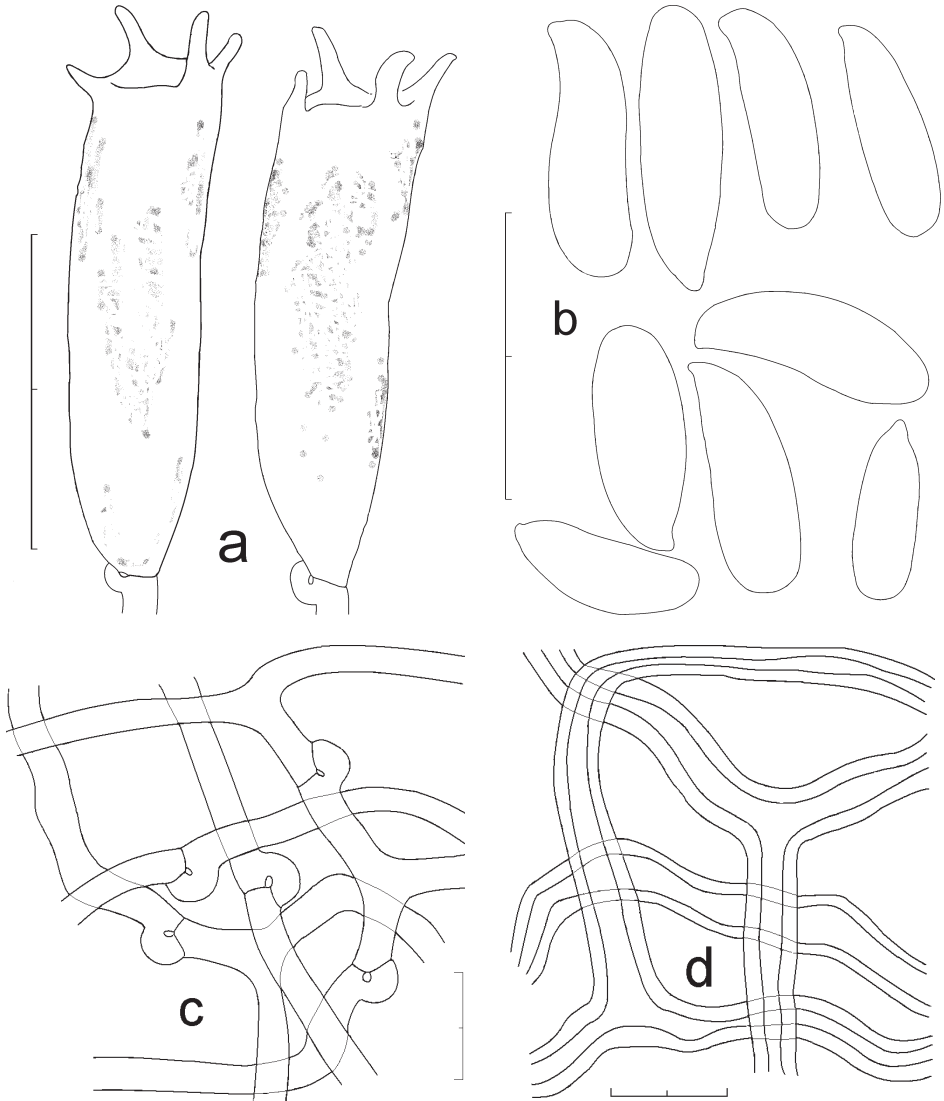


Fig. 1. *Polyporus rhizophilus*: a – basidia; b – spores; c – generative hyphae; d – skeletal hyphae (KTC 3296). Scale bar = 10 μ m.

Małopolska upland: one in the town of Końskie and one in the Skorocice reserve near Busko Zdrój (Fig. 2).

The locality in Końskie is situated in the NE part of an urban park (geographic co-ordinates: 51°12' N and 20°25' E; ATPOL square – Ee 32). A phytosociological relevé was performed to examine the plot in which *Polyporus rhizophilus* occurred (400 m²). The tree layer sparse, crown density up to 50%, the shrub layer absent, the cover of the herb layer 85%, the moss layer scarce. Grass in the herb layer mown regularly; participation of few perennials. Grass-mowing considerably hindered the identification of the trophic relationship between the fungus and the grass species.

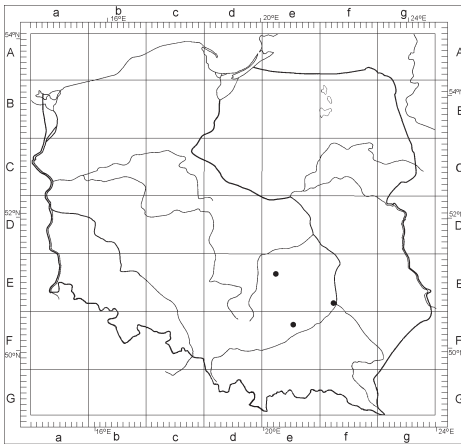


Fig. 2. Distribution of *Polyporus rhizophilus* in Poland.

Fruit-bodies of *Polyporus rhizophilus* were found on 10 Sept. 2001 while the phytosociological relevé was performed on 17 May 2002. The composition of the phytocoenosis of the patch was as follows: trees - *Acer saccharinum* 1.2, *Quercus robur* 3.2, *Q. rubra* 2.3; herb layer: *Acer platanoides* (c) +, *Aegopodium podagraria* 1.2, *Chelidonium majus* +.2, *Dactylis glomerata* 1.2, *Festuca altissima* 1.2, *Ficaria verna* 1.2, *Geranium robertianum* 1.2, *Geum urbanum* +, *Glechoma hederacea* 1.2, *Heracleum sibiricum* +.2, *Impatiens parviflora* +, *Lamium album* +, *Moehringia trinervia* +.2, *Myosotis sylvatica* +.2, *Poa annua* 1.2, *P. trivialis* 3.3, *Plantago major* +.2, *Polygonum aviculare* +, *Quercus robur* (c) +, *Ranunculus acris* 1.2, *Rumex obtusifolius* +.2, *Stellaria media* 1.2, *Taraxacum officinale* 1.2, *Urtica dioica* 1.2, *Veronica chamaedrys* 1.2.

The second new locality is situated in the rock-steppe Skorocice reserve near Busko Zdrój (geographic co-ordinates: 50°24' N, 20°39' E; ATPOL square – Fe 24). Fruit-bodies were found on 15 June 2007 in the central part of the reserve in *Stipa capillata* tufts in the *Sisymbrio-Stipetum* grassland on the SW wall of the gorge.

Description of the locality. SW exposure; incline 20°; herb layer cover 90 %; relevé surface: 25 m², 15 June 2007. Soil belongs to initial gypsum rendzinas. Floristic composition: *Anthericum ramosum* +, *Anthyllis vulneraria* 1.2, *Artemisia campestris* +, *Astragalus danicus* 1.2, *Campanula sibirica* +, *Carex humilis* +.2, *Euphorbia cyparissias* 1.1, *Euphrasia stricta* +, *Festuca valesiaca* 1.2, *Galium verum* 1.2, *Gypsophila fastigiata* 1.2, *Koeleria macrantha* +, *Medicago falcata* +.2, *Pimpinella saxifraga* +, *Poa bulbosa* var. *vivipara* 1.2, *Orthanta lutea* +, *Oxytropis pilosa* 1.2, *Potentilla arenaria* +.2, *Sisymbrium polymorphum* 1.2, *Stipa capillata* 4.4, *Thymus marschallianus* +.2.

GEOGRAPHIC DISTRIBUTION. *Polyporus rhizophilus* is known mostly from scattered localities in central, southern and eastern Europe as well as from northern Africa and Asia (Rauschert 1962; Kotlaba 1984). It was recently recorded in South America (Silveira, Wright 2005; Gomes-Silva, Gibertoni 2009). *Polyporus cryptopus*, a species with a very similar morphology, biology and ecological requirements, occurs on prairie grasses of the Great Plains in North America. However, relationships of phylogenetic affinity between *Polyporus rhizophilus* and *P. cryptopus* are not clear and it is unknown if both are the same species or two different ones (Gilbertson, Ryvar-den 1987; Ryvar-den, Gilbertson 1994). The distribution of *P. rhizophilus* in Europe and the history of recent records are given by Kreisel (2006). It is a rare component

of the mycobiota everywhere. *Polyporus rhizophilus* is limited to continental and sub-Mediterranean thermophilous steppe grasslands and extrazonal xerothermic communities within its range (Ryvarden, Gilbertson 1994; Leshan 2008). It occurs on roots of numerous grass species belonging to genera such as *Bothriochloa*, *Calamagrostis*, *Chrysopogon*, *Cynodon*, *Digitaria*, *Elymus*, *Festuca*, *Poa* and *Stipa* (Jülich 1984; Ryvarden, Gilbertson 1994). However, it has mostly been recorded on *Stipa* and is usually thought to be connected with this genus.

DISCUSSION

Polyporus rhizophilus usually occurs in steppe and xerothermic grasslands that develop in the continental climate. It is therefore interesting that the fungus was recorded in an urban park in the town of Końskie outside the northern range limit of the species where conditions are different from its ecological requirements. The occurrence of *P. rhizophilus* at an anthropogenic locality in which grasses connected with xerothermic habitats are absent may suggest that other factors enabling the development of the fungus are responsible for it. Global warming and climate continentalisation in some regions seem to play a role. The influence of climatic changes on the range extension of some fungal species is discussed by Kreisel (2006). According to Kreisel (l.c.), the geographic range of the species has considerably expanded northwards in the last few years, which may be related to global warming. *Polyporus rhizophilus* remains either a rare or very rare component of the mycobiota worldwide despite this tendency.

While conditions favourable for range broadening have been observed, serious threats to the species are also recorded. They result from adverse biocoenotic changes that have been taking place in xerothermic grasslands and transformations of the usage type. Overgrowing and excessive burning of grassy xerothermic communities cause the displacement and disappearance of grasses on which *Polyporus rhizophilus* grows and, consequently, the disappearance of its localities. Threats to and protection of *Polyporus rhizophilus* in Poland are related to the development dynamics, existence and protection of xerothermic biocoenoses. *Polyporus rhizophilus* is a very rare component of the mycobiota in Poland and its natural localities must be actively protected *in situ*. It is included in the red list of fungi threatened in Poland as Endangered species (E) (Wojewoda, Ławrynowicz 2006).

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Dane do morfologii i ekologii *Polyporus rhizophilus*

Streszczenie

Polyporus rhizophilus należy do rzadkich grzybów związanych z trawami stepów i kserotermicznych muraw rozwijających się w klimacie kontynentalnym. Na stanowiskach naturalnych notowany był głównie na korzeniach wielu gatunków traw, jednak najczęściej z rodzaju *Stipa*. W Polsce znany był do tej pory z jednego stanowiska w Dwikozach koło Sandomierza. Kolejne jego stanowiska zostały odszukane w rezerwacie Skorocice koło Buska Zdroju, na korzeniach *Stipa capillata* oraz w Końskich, w parku miejskim, na siedlisku antropogenicznym, wśród traw *Dactylis glomerata*, *Poa annua* i *P. trivialis*. Interesującym jest stanowisko w Końskich, leżące poza północną granicą zasięgu *Polyporus rhizophilus*, poza obszarem występowania muraw kserotermicznych na Wyżynie Kielecko-Sandomierskiej. Występowanie tego gatunku grzyba na izolowanym stanowisku być może należy wiązać z globalnym zjawiskiem ocieplenia klimatu. Na ten problem zwracał już uwagę Kreisel (2006), który zalicza m.in. *Polyporus rhizophilus* do grupy grzybów ciepłolubnych rozszerzających swój areał na północ w kontekście aktualnych zmian klimatycznych.