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A STIPE REDUCTION SERIES IN *LENTINUS SUBSTRACTUS* (= *POLYPORUS CILIATUS*) (*POLYPORACEAE*, *AGARICOMYCETES*)

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The theme of morphoses in agaricomycetes seems to be an important issue for two reasons. The first one, our knowledge on marginal and deviant forms sufficiently extends our understanding of intraspecific polymorphism, which makes the diagnostics procedure to be more accurate. The second one, the description of little-known ecotypes have a certain theoretical value, since highlighting ecological mechanisms of species divergence. The polyporoid fungus *Lentinus substrictus*, widely known also as *Polyporus ciliatus*, normally is characterized by polyporoid morphotype, i.e. basidiome differentiated into annual pileus with poroid hymenophore and more or less central stipe rooted in the wood substrate. However, the stipe can be eccentric or lateral, some specimens can appear a trametoid morphotype with subdorsal attachment. The purpose of the present communication is a description of such deviant form. A new form, *Lentinus substrictus* forma *subtrametoideus* was described basing on the Urals and Siberian material and its exhaustive characteristics was given. Some notes on polypores morphogeny were made.

Keywords: basidiome reduction, favoloid morphotype, intraspecific polymorphism, morphological rationalization, morphoses, new form, polyporoid fungi, polyporoid morphotype

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The theme of morphoses in agaricomycetes, raised in our previous report (Vlasenko et al., 2017), seems to be an important issue for two reasons. The first one, our knowledge on marginal and deviant forms sufficiently extends our understanding of intraspecific polymorphism, which makes the diagnostics procedure to be more accurate. The second one, the description of little-known ecotypes have a certain theoretical value, since highlighting ecological mechanisms of species divergence (Zmitrovich, 2017).

The polyporoid fungus *Lentinus substrictus* (Bolton) Zmitr. et Kovalenko, widely known also as *Polyporus ciliatus* Fr., was described by Bolton (1792) as *Boletus substrictus* Bolton and was considered within *Polyporus* genus for a long time (Fries, 1815, 1821; Ryvarden, Melo, 2014). Beginning with Krüger and Gargas (2004), a congeneric nature of *Lentinus* s. str. with some representatives of “large *Polyporus*”, as *Polyporus arcularius*, *P. brumalis*, *P. tricholoma*, etc. becomes obvious and a new combination, *Lentinus substrictus* (Zmitrovich, Kovalenko, 2016) was made to avoiding a homonym *Lentinus ciliatus* Lév.

Normally, this species is characterized by polyporoid morphotype, i.e. basidiome differentiated into annual pileus with poroid hymenophore and more or less central stipe rooted in the wood substrate. However, the stipe can be eccentric or lateral, some specimens can appear a trametoid morphotype with subdorsal attachment. The purpose of the present communication is a description of such deviant forms.

Species morphological analysis was carried out as it was described in our previous report (Vlasenko et al., 2017). Herbarium material of Komarov Botanical Institute RAS (LE), Saint Petersburg, Central Siberian Botanical Garden SB RAS (NSK), Novosibirsk, and Institute of Plant et Animal Ecology (SVER), Ekaterinburg was used. Stereomicroscope Carl Zeiss Stemi DV4 and light microscope Micmed-6 were used to the species identification. Detailed study of the anatomical and morphological features was performed on a light microscope Carl Zeiss Axioskop-40 and stereo microscope Carl Zeiss Stereo Discovery V 12. Photomicrographs were obtained with a microscope Leica DM1000 LED with color digital camera Leica DFC 295 (Leica Microsystems, Germany) and software for im-

age analysis ImageScope M (Russia; <http://www.micropscopy.ru>).

L. substrictus (Bolton) Zmitr. et Kovalenko, 2016, Int. J. Medicinal Mushrooms 18(1): 35; = *Boletus substrictus* Bolton, Hist. fung. Halifax, App. 3: 170, 1792; = *P. ciliatus* Fr., Observ. mycol. 1: 123, 1815; = *P. guarapiensis* Speg., Anal. Soc. cient. argent. 26(1): 6, 1888; = *P. saitoi* Lloyd, Mycol. Writ. 7: 1269, 1924; = *P. ustalis* Velen., České Houby 4–5: 671, 1922; = *P. zonatus* Velen., České Houby 4–5: 671, 1922.

Basidiomes annual, of polyporoid, rarely subtrametoid habit, usually centrally stipitate, in extremal cases subpendent, solitary, rarely joint in small clusters. Pileus circular to semicircular of fan-shaped, up to 10 cm in diam. and 10 mm thick at the base. Upperside hazel to clay-brown, then chestnut or umber-brown, matt, irregularly squamulose or cracked with formation of clay-yellow pattern, azonate. Margin even or lobate, usually incurved, ciliate or not. Hymenophore as a single tube layer 1–7 mm thick, slightly decurrent on the stipe; pore surface ivory to tan or ochraceous, pores circular, then angular, 5–8 (9) per mm. Context initially tough-fleshy, then suberous, white to ivory-white, 2–5 mm thick. Stipe usually central, rarely eccentric or absent, up to 8 cm long and 8 mm thick, hazel or cinnamon, with a fine tomentum that disappears with age.

Hyphal system dimitic. Generative hyphae 2–4(10) μm in diam., thin-walled, hyaline, with clamps, weakly amyloid in the stipe, dichotomously branched. Skeleto-binding hyphae 3–4 (12) in diam., thick-walled, with inflated body and subsolid appendages, hyaline to golden-brown. Leptocystidia fusoid, 10–25 $\times$ 4–5 μm . Basidia 15–27 $\times$ 4–6.5 μm , clavate, 4-spored, with a basal clamp. Basidiospores 5.1–8.5 $\times$ 2–2.3 μm , cylindrical, flattened at ventral side, in some projections slightly curved, hyaline, thin-walled, inamyloid, acyanophilous.

On dead wood (twigs, trunks, stumps, hollows, debris) of frondose (*Acer*, *Aesculus*, *Alnus*, *Betula*, *Corylus*, *Cornus*, *Crataegus*, *Eucalyptus*, *Fagus*, *Fraxinus*, *Ilex*, *Malus*, *Padus*, *Populus*, *Prunus*, *Pyrus*, *Rhamnus*, *Robinia*, *Quercus*, *Salix*, *Sorbus*, *Tilia*, *Ulmus*), rarely coniferous (*Abies*, *Picea*, *Pinus*) trees in Holarctic and South America. Causes a white rot (Ryvarden, Melo, 2014).

Lentinus substrictus forma *subtrametoideus* Zmitr., Vlasenko et Stavishenko f. nov. (MB 824134). — Fig. 1.

From a neutral morphotype differs by reduced strongly eccentric (to absent) stipe.

The material includes two specimens, one has a strongly eccentric stipe, whereas the second is devoid of stipe and has a subdorsal attachment. Both basidiomes of subtrametoid habit, pilei 3–6 cm in longest dimension, up to 1 cm thick at the base. Upperside matt, azonate, clay-buff to chestnut at the base, furnished by irregular dots and squamules stripes, the chestnut areas are cracked with exposure of clay-yellow subpellis. Margin rather thick, slightly lobate, without cilia. Hy-

menophore as a single tube layer, 0.5–3 mm thick, pore surface pale to ochraceous, pores angular, 7–9 per mm. Context thick, up to 0.9 cm at the base, suberous, ivory-white, Stipe strongly reduced to absent, up to 1 cm long and 0.5 cm thick, cinnamon, with collapsed tomentum.

Hyphal system dimitic. Generative hyphae 2.5–3.5 (7.5) μm in diam., thin-walled, hyaline, with clamps, weakly amyloid in the stipe area, dichotomously branched. Skeleto-binding hyphae 3–4.5 (11.5) in diam., thick-walled, with inflated body and subsolid appendages, hyaline to golden-brown. Leptocystidia fusoid, 12–20 $\times$ 4–5 μm . Basidia 17–25 $\times$ 4–6 μm , clavate, 4-spored, with a basal clamp. Basidiospores 5.1–8.3 $\times$ 2–2.2 μm , cylindrical, ventrally flattened, hyaline, thin-walled, inamyloid, acyanophilous.

Holotype (designated here): Russia, Novosibirsk Region, park of Academician city, on hollow of *Padus avium* trunk, 25.01.2015, V.A. Vlasenko and A.V. Vlasenko (LE 286751).

Isotype (designated here): Russia, Novosibirsk Region, park of Academician city, on hollow of *P. avium* trunk, 25.01.2015, V.A. Vlasenko and A.V. Vlasenko (NSK 1013113).

Paratype (designated here): Russia, Sverdlovsk Region, Visim State Reserve, on fallen log of *Betula* sp., 21.06.2004, I.V. Stavishenko (LE 287653).

The form described fills a morphological gap between polyporoid and trametoid morphotypes. As it turns out, the process of stipe reduction can be realized quite easy in polyporoid fungi, although so far there are not many taxa of the polyporoid-subtrametoid appearance. Among them we note such taxa as *Neofavolus alveolaris* (DC.) Sotome et T. Hatt., *Favolus grammcephalus* (Berk.) Imazeki, *F. pseudobetulinus* (Murashk. ex Pilát) Sotome et T. Hatt., *Cerioporus choseniae* (Vassilkov) Zmitr. et Kovalenko. Within the genus *Lentinus* s.str. the stipe reduction has not been noted so far, although Kreisel (1960, 1963) noted that a central stem in some representatives of the *Polyporus arcularius*-complex can vary in length.

Thus, the polyporoid and trametoid morphotypes are linked by transitional favoloid one and as a whole are morphogenetically plastic, easily allowing the processes of morphological rationalization (Fig. 2).

The hollows where the most of the morphoses of polyporaceous fungi are realized represent rather specific niche, which occupation may be associated with certain speciation processes (an establishment of a new mode of polymorphism). Therefore, all the reports on deviant forms represent an interest for new exploratory studies.

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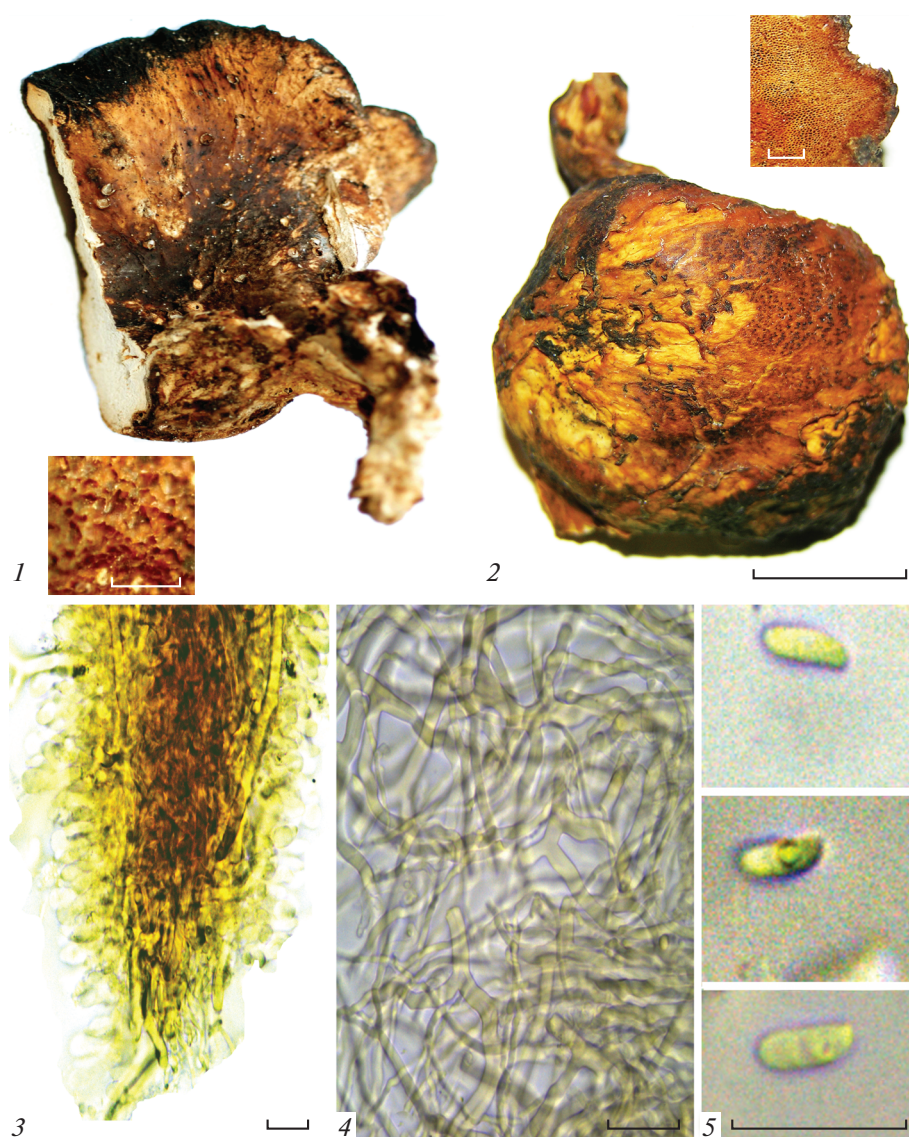


Fig. 1. *Lentinus substrictus* f. *subtrametoideus*: 1 – Holotype (upperside and hymenophore), 2–5 – Paratype (2 – upperside and hymenophore, 3 – hyphal texture of tube dissepiment, 4 – skeleto-binding hyphae, 5 – basidiospores). Scale bars – 1 cm (1, 2), 10 µm (3–5). On the sidebars – 1 mm (1, 2).

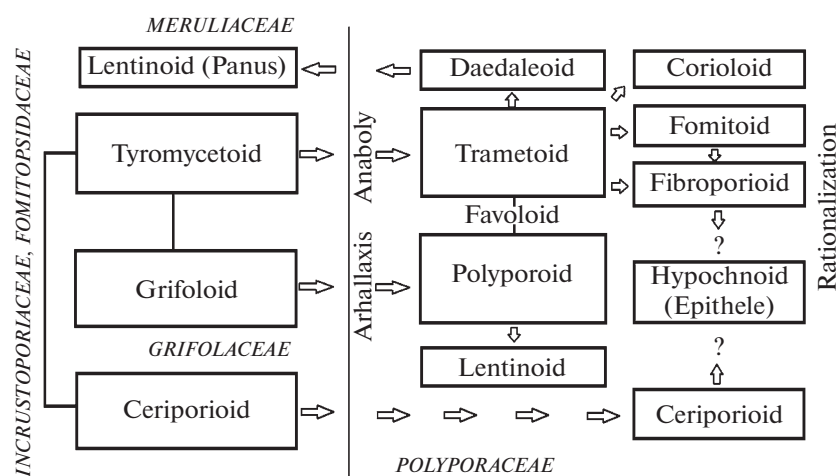


Fig. 2. Main modes of the *Polyporaceae* morphogeny (according to Zmitrovich, 2017).

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МОРФОЛОГИЧЕСКАЯ РЕДУКЦИЯ НОЖКИ У *LENTINUS SUBSTRICTUS* (= *POLYPORUS CILIATUS*) (*POLYPORACEAE*, *AGARICOMYCETES*)

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Изучение морфозов у агарикомисетов представляется важной проблемой по двум причинам. Во-первых, описание девиантных форм расширяет понимание внутривидового полиморфизма, что делает процедуру видовой диагностики более точной. Во-вторых, характеристика не известных ранее экотипов имеет самостоятельную теоретическую ценность, поскольку позволяет приблизиться к пониманию механизмов экологического видообразования. *Lentinus substrictus*, широко известный также как *Polyporus ciliatus*, обычно характеризуется полипоридным морфотипом, т.е. его базидиома дифференцирована на шляпку и более или менее центральную ножку, укорененную в древесном субстрате. Однако, как оказалось, ножка может быть эксцентрической или боковой, а у некоторых экземпляров может появиться траметоидный морфотип с субдорсальным (без ножки) прикреплением к субстрату. Целью настоящего сообщения является описание такой девиантной формы. На основе материала, собранного на Урале и в Сибири, была описана и морфологически охарактеризована новая форма *Lentinus substrictus* f. *subtrametoideus*. Обсуждаются некоторые вопросы морфогении полипоровых грибов.

Ключевые слова: внутривидовой полиморфизм, морфозы, морфологическая рационализация, новая форма, полипороидные грибы, полипороидный морфотип, редукция базидиома, фаволоидный морфотип