

© W. A. Spirin

Nizhegorod State University, 603024 Russia, Nizhnii Novgorod
e-mail: slava_spirin@mail.ru

Systematics of small-sized fleshy polypores: the modern perspective

The genus *Tyromyces*, described by Karsten (1881) with type *Polyporus chioneus* Fr., includes the white-rot polypores with mostly pileate, short lived, bright colored basidiocarps and clamped generative hyphae. Hyphal system is characterized as mono- or dimitic. Ryvarden (1991) compared *Tyromyces* with *Ceriporiopsis*, as since species of both genera have not neither true cystidia nor amyloid structures, and their spores are hyaline and thin-walled. Bondartseva (1998) placed *Tyromyces* in subfamily *Tyromycetoideae* of family *Poriaceae* and acknowledged this genus in comprehension of Ryvarden and Gilbertson (1994) except *Tyromyces taxi* (Bondartsev) Ryvarden et Gilb.

The aim of my research is to clarify taxonomy of genus *Tyromyces* and related groups of polypores.

Specimens examined

Abortiporus biennis: Russia, Nizhnii Novgorod region, reserve «Kilemarskii», on *Picea abies*, 24 VIII 2000, W. Spirin (LE 210068). — *Abortiporus fractipes*: Belarus, forestry «Vasilevichskoe», on *Alnus* sp., 6 VIII 1938, det. A. Bondartsev (LE 31528) [examined by I. Zmitrovich]. — *Ceriporiopsis aneirina*: Russia, Nizhnii Novgorod region, Lukoyanov district, on *Populus nigra*, 9 V 1998, W. Spirin (LE 211264); «Kerzhenskii» reserve, on *Populus tremula*, 16 V 1998, W. Spirin (LE 210691). — *Ceriporiopsis mucida*: Russia, Nizhnii Novgorod region, «Klenovik» reserve, on *Picea abies*, 12 VIII 1999, W. Spirin (LE 210879). — *Fibuloporia cremea*: Russia, Kamchatka, on *Populus suaveolens*, 18 VIII 1960, leg. & det. E. Parmasto (LE 206290: ISOTYPUS!, Nr. 13599 dupl. 1961; Herbarium Instituti Zoologici et Botanici Academiae Scientiarum Rei Publicae Sovieticae Socialisticae Estonicae) [examined by I. Zmitrovich]. — *Hapalopilus croceus*: Russia, Nizhnii Novgorod region, Lukoyanov district, on *Quercus robur*, 19 VII 1999, W. Spirin (LE). — *Radulodon erikssonii*: Russia, Nizhnii Novgorod region, «Kerzhenskii» reserve, on *Populus tremula*, 17 VIII 1997, W. Spirin (LE 211273). — *Sarcodontia crocea*: Russia, Nizhnii Novgorod region, Arzamas district, on *Malus domestica*, 5 VIII 1993, W. Spirin (LE 211206). — *Spongipellis spumeus*: Russia, Nizhnii Novgorod region, Naruksovo district, on *Quercus robur*, VIII 1960, T. Nikolaeva (LE 26982). — *Tyromyces chioneus*: Russia, Nizhnii Novgorod region, Lukoyanov district, on *Betula pubescens*, 17 VII 1998, W. Spirin (LE 208440). — *Tyromyces fissilis*: Russia, Nizhnii Novgorod region, Lukoyanov district, on *Betula pubescens*, 8 VIII 1998, W. Spirin (LE 208425). — *Tyromyces fumidiceps*: Russia, Nizhnii Novgorod region, Lukoyanov district, on *Populus tremula*, 17 VII 1998, W. Spirin (LE 208447). — *Tyromyces kmetii*: Russia, Nizhnii Novgorod region, Lukoyanov district, on *Tilia cordata*, 26 VII 1997, W. Spirin (LE). — *Tyromyces wynnei*: Russia, Nizhnii Novgorod region, «Kilemarskii» reserve, on debris, 24 VIII 2000, W. Spirin (LE 211214).

Discussion

Jahn (1973) transferred two species of *Tyromyces*, *T. alborubescens* (Bourdot et Galzin) Bondartsev and *T. fissilis* (Berk. et M. A. Curtis) Donk, to the genus *Aurantioporus* Murrill with type *Polyporus pilotae* Schwein. [= *Hapalopilus croceus* (Pers.: Fr.) Donk]. All these species are characterized by large sappy pileate basidiocarps, monomitic hyphal system with relatively wide clamped hyphae (4–7 µm in diam.) and broadly ellipsoid hyaline thin-walled spores. They are widespread predominantly in oak zone and cause a white rot of hardwoods. Ryvarden (1991) remarks, that the type species of *Aurantioporus*, *Polyporus pilotae*, is «... now commonly placed in *Hapalopilus* sharing with the type species of this genus, a colored basidiocarp reacting cherry red in KOH». Meanwhile the orange crystals staying red with KOH are observed also in the context of *T. alborubescens* (Ryvarden, Gilbertson, op. cit.). Moreover, the type species of *Hapalopilus*, *H. rutilans* (Pers.: Fr.) P. Karst., has a smaller basidia and spores than those of *Aurantioporus* species. Therefore, I am of opinion, that *Aurantioporus* is a homogeneous genus which is different from *Tyromyces* and *Hapalopilus* sensu stricto.

Probably, *Aurantioporus* is closely related with genera *Sarcodontia* and *Spongipellis*, those also have broadly ellipsoid spores and monomitic hyphal system with wide hyphae as well as similar type of rot (Stalpers, 1998). The basidiocarps of *Sarcodontia crocea* are turning reddish in KOH. Komarova (1964) proposed to transfer *Tyromyces fissilis* to the genus *Spongipellis*, basing this combination upon the structure of context and the shape of spores. However, spores of *Spongipellis* species are thick-walled and cyanophyllous, and so these species and *Tyromyces fissilis* must be placed in the separate genera. I suppose that *Spongipellis* is a taxonomic synonym of *Sarcodontia*. The specimens of both genera have broadly ellipsoid or globose thick-walled cyanophyllous guttulate spores and demonstrate other similar microstructures (table 1).

Stalpers (1998), examined *Sarcodontia*, drew conclusion about relationship of this genus to *Radulodon*, but kept both genera separately. His decision is based on a presence of very large hyphae with swellings («sclerocysts») from the «nodulose» structures of *Sarcodontia crocea*, which are unknown at *Radulodon*. Stalpers has not mentioned *Ceriporiopsis aneirina* (Sommerf.: Fr.) Domański in his discussion. In my opinion, this species could be compared with *Radulodon* and placed in this genus. *Radulodon* has spores with varying cyanophyllous reaction and thickness of walls, their size and shape are close to those of *Ceriporiopsis aneirina*. I have found persistent basidiocarps of the latter, whose hymenophore was agglutinate and

Table 1. – Morphological characters in the species of *Spongipellis* and *Sarcodontia*

Species	Type of basidiocarps	Diameter of hyphae	Cystidioles	Basidia	Size of spores
<i>Sarcodontia crocea</i>	resupinate to nodulose	3–7 μm	fusoid, 40–45 \times 5–7 μm	narrowly clavate (15) 30–45 \times 4.5–7 μm	4.5–6 \times 4–5 μm
<i>Spongipellis pachydon</i>	pileate to resupinate	3–6 μm	fusoid, 35–40 \times 5–6 μm	narrowly clavate, 40–45 \times 6–8 μm	5–6.5 μm diam
<i>S. delectans</i>	pileate	4–7 μm	—	clavate, 20–30 \times 7–9 μm	6–7 \times 5–6 μm
<i>S. spumeus</i>	pileate	2–9 μm	—	clavate, 20–30 \times 7–9 μm	6–8.5 \times 4.5–6 μm

lacerate like thick spines up to 8 \times 1.5 mm. *Ceriporiopsis aneirina* grows preferably on *Populus* as the boreal species of *Radulodon*. Micromorphological characters of both are summarized in table 2.

Table 2. – Micromorphological characters of «*Ceriporiopsis*» *aneirina* and boreal species of *Radulodon*

Taxon	Diameter of hyphae	Gloeocystidia	Basidia	Spores
« <i>Ceriporiopsis</i> » <i>aneirina</i>	2–5 μm	absent	clavate, 20–43 \times 5–8 μm	5–8 \times 3–5 μm
<i>Radulodon</i> sp.	2–5 μm	absent or indistinct	clavate, 20–40 \times 6–8 μm	5–7 \times 4–6 μm

It is necessary to say about a relationships of *Aurantioporus*, *Sarcodontia*, *Spongipellis*, *Radulodon* and «*Ceriporiopsis*» *aneirina* to genera *Abortiporus* and *Loweomyces*. A feature of *Abortiporus biennis* is the development of conidial state in context like that of *Tyromyces fissilis*. Basidia and spores of *Abortiporus biennis* remind of *Aurantioporus*, but

essential distinctions of the former are presence of gloeocystidia in hymenium and the duplex context. *Loweomyces fractipes* stands to *Sarcodontia*—*Radulodon*-complex slightly closer than *A. biennis*. Spores of *Loweomyces fractipes* are broadly ellipsoid to subglobose, slightly thick-walled and cyanophylous. Indistinct ventricose cystidia, presenting sometimes in hymenium, and contextual «contorted» hyphae are different from such structures of *Radulodon* («gloeocystidia» and «pseudo-binding» hyphae accordingly; see Stalpers, op. cit.). *Loweomyces fractipes* probably could be placed in genus *Sarcodontia* (incl. *Spongipellis*), so differs from the latter only by thin stipitate or effused-reflexed basidiocarps and shorter basidia.

The genus *Tyromyces* does not appear as monophyletic taxon even after the restriction of *Aurantioporus*. The type species, *Polyporus chioneus* Fr., has a dimitic hyphal system and cylindrical, slightly curved spores. Small clavate basidia (up to 15 μm long) are almost identical to those of *Antrodiella*, but the species of latter genus have thinner basidiocarps, which are di- or trimitic in all parts, whereas *Polyporus chioneus* has thicker basidiocarps with monomitic tubes.

The other species of *Tyromyces* such as *T. canadensis* (= *Antrodiella overholtsii* Ryvarden et Gilb.), *T. fumidiceps*, *T. galactinus*, *T. kmetii*, *T. wakefieldiae* share thin monomitic sessile basidiocarps, mostly consisting of relatively wide (up to 6–7 μm in diameter) thin-walled clamped generative and sometimes gloeopleroid hyphae. Spores of all these species are small (up to 4.5 μm in longest dimension), broadly ellipsoid to subglobose, often with one oil-drop. Renvall and Kaaro (1998) compared *Tyromyces fumidiceps*, *T. canadensis* and *T. galactinus* — all three species show some uncertain differences between each other. *Tyromyces kmetii* differs from this group by slightly thicker basidiocarps with orange upper surface. I suggest to place monomitic small-spored species of *Tyromyces* into separate genus *Leptoporellus* Spirin gen. nov. (see description below).

The special problem is a taxonomical position of *Polyporus wynnei* Berk. et Broome. This species was placed earlier into genera *Tyromyces* (Donk, 1933) or *Fibuloporia* (Bondarzew, Singer, 1941). Jülich (1982) described the genus *Fibuloporia* sensu Bondartsev et Singer anew (= *Porpomyces* Jülich) and transferred *Polyporus wynnei* into genus *Loweomyces*. I think, that this species must be compared with *Antrodiella*. The genus *Porpomyces* with type *Polyporus mucidus* Pers.: Fr. is closely related undoubtedly to genera *Tyromyces*, *Antrodiella* and *Leptoporellus*. I placed in this genus also *Ceriporiopsis balaene* Niemelä, that is a latter synonym of *Fibuloporia cremea* Parmasto. The comparison of *Ceriporiopsis balaene* and *Fibuloporia*

cremea is presented in table 3. In addition, both these species grow on wood of *Populus* and *Salix*.

Table 3. – A comparison of some characters of *Ceriporiopsis balaene* and *Fibuloporia cremea*

Taxon	Pores on 1 mm	Diameter of hyphae	Amyloid reaction of hyphae	Size of basidia	Size of spores
<i>Ceriporiopsis balaene</i>	(1) 2–3	2–4 µm	+	14–18 × 4–6 µm	4–5 × 2.5–3.5 µm
<i>Fibuloporia cremea</i>	1–2	2.5–5 µm	+	12–17 × 5–6 µm	4.5–5.5 × 2.5–3.5 µm

Taxonomy

SARCODONTIA S. Schulz. in Schulzer, Kanitz. et Knapp
Verh. Zool.-bot. Ges. Wien **16**: 41, 1866.

Type species: *Sarcodontia mali* S. Schulz., 1866 = *Hydnum croceum* Schwein.: Fr., 1828.

Species:

Sarcodontia crocea (Schwein.: Fr.) Kotl., 1953.

Sarcodontia delectans (Peck) Spirin comb. nov. — Basionym: *Polyporus delectans* Peck, Bull. Torrey Bot. Club **11**: 26, 1884.

Sarcodontia pachyodon (Pers.) Spirin comb. nov. — Basionym: *Hydnum pachyodon* Pers., Mycol. Europ. **2**: 174, 1825.

Sarcodontia spumea (Sowerby: Fr.) Spirin comb. nov. — Basionym: *Polyporus spumeus* Sowerby: Fr., Syst. mycol. **1**: 358, 1821.

RADULODON Ryvar den

Can. Journ. Bot. **50**: 2073, 1972.

Type species: *Radulodon americanus* Ryvar den, 1972.

Species:

Radulodon americanus Ryvar den, 1972.

Radulodon aneirinus (Sommerf.: Fr.) Spirin comb. nov. — Basionym: *Polyporus aneirinus* Sommerf.: Fr., Elench. **1**: 123, 1828.

Radulodon calcareus (Cooke et Masee) Jülich, 1978.

Radulodon casearius (Morgan) Ryvar den, 1972.

Radulodon copelandii (Pat.) N. Maekawa, 1993.

Radulodon pseudomucidus (Petch) Stalpers, 1998.

Radulodon subvinosus (Berk. et Broome) Stalpers, 1998.

LEPTOPORELLUS Spirin gen. nov.

Basidiomata annua, pileata vel effuso-reflexa, solitaria vel imbricata, ad 1 cm crassis, carnosa in vivo. Superficies hispido-strigosa ad tomentosa, vel velutina, cuticuli tenui colorati tecta. Poris rotundis ad angularis, 3–5 (6) per 1 mm. Systema hypharum monomiticum, hyphae generativae fibulatae, ad 8 µm in diam., tenuitunicatae ad crassitunicatae; hyphae gloeopleroidae adsunt vel desunt. Basidia 10–20 × 4–6 µm, clavata. Leptocystidia adsunt, 10–23 × 4–6 µm. Sporae ellipsoideae ad brevi cylindraceae, uniguttulatae, tenuitunicatae, 2.5–4.5 × 2–3 µm.

Putredo alba.

Typus: *Polyporus kmetii* Bres., Atti Accad. Sc. Ag. Rovereto **3** (3): 70, 1897.

Basidiocarps annual, pileate or effused-reflexed, solitary or imbricate, up to 1 cm thick, often sappy to fleshy. Upper surface hispid-strigose to tomentose, or velutinate to slightly warted, with thin colored cuticle. Pores circular to angular, 3–5 (6) per 1 mm. Hyphal system monomitic, generative hyphae with clamps, up to 8 µm diam., thin- to thick-walled. Gloeopleroid hyphae present or absent. Basidia clavate, 10–20 × 4–6 µm. Leptocystidia present, 10–23 × 4–6 µm. Spores ellipsoid to short-cylindrical, uniguttulate, thin-walled, not dextrinoid or amyloid, 2.5–4.5 × 2–3 µm.

Causes a white rot.

Species:

Leptoporellus canadensis (Overh. ex Lowe) Spirin comb. nov. — Basionym: *Tyromyces canadensis* Overh. ex Lowe, Mycotaxon **2**: 44–45, 1975.

Leptoporellus fumidiceps (G. F. Atk.) Spirin comb. nov. — Basionym: *Tyromyces fumidiceps* G. F. Atk., Ann. Mycol. **6**: 61, 1908.

Leptoporellus galactinus (Berk.) Spirin comb. nov. — Basionym: *Polyporus galactinus* Berk., Lond. J. Bot. **6**: 321, 1847.

Leptoporellus kmetii (Bres.) Spirin comb. nov. — Basionym: *Polyporus kmetii* Bres., Atti Accad. Sc. Ag. Rov. **3** (3): 70, 1897.

Leptoporellus wakefieldiae (Kotl. et Pouzar) Spirin comb. nov. — Basionym: *Tyromyces wakefieldiae* Kotl. et Pouzar, Česká Mykol. **43**: 39, 1989.

PORPOMYCES Jülich,

Persoonia **11** (4): 425, 1982.

Type species: *Poria mucida* Pers.: Fr., Syst. mycol. **1**: 382, 1821.

Species:

Porpomyces cremeus (Parmasto) Spirin comb. nov. — Basionym: *Fibuloporia cremea* Parmasto, Исследование природы Дальнего Востока: 254, 1963; syn.: *Ceriporiopsis balaene* Niemelä, Nat. Can. **112**: 449, 1985.

Porpomyces mucidus (Pers.: Fr.) Jülich, 1982.

ANTRODIELLA Ryvarden et Johan.

Prelim. Polyp. Flora of East Africa: 256, 1980.

Type species: *Polyporus semisupinus* Berk. et M. A. Curtis, *Grevillea* 1: 50, 1872.

This genus is not homogenous in interpretation by Ryvarden and Gilbertson (1993). *Irpex foliaceodentatus* Nikol., which was included by them in *Antrodiella*, is compared, maybe, with *Trichaptum* better. *Coriolus hoehnelii* and close relatives (*C. genistae*, *Polyporus onychoides*) have spores, hyphae and basidia, those are similar of *Diplomitoporus* and *Phyllotopsis* (*«Pleurotaceae»*). I do not comment the situation over *Antrodiella* in detail, and will be confined to proposition some new combinations merely.

Antrodiella wynnei (Berk. et Broome) Spirin comb. nov. — Basionym: *Polyporus wynnei* Berk. et Broome, *Ann. Mag. Nat. Hist.* 3 (3): 359, 1859.

Tyromyces fissiliformis (Pilát) Spirin comb. nov. — Basionym: *Poria fissiliformis* Pilát, *Stud. Bot. Chech.* 3: 1, 1940.

References

- Bondartsev A. S. [Polyporaceae of the European part of the USSR and of the Caucasus. Moscow—Leningrad: AS URSS, 1953. 1106 p. In Russian.]
- Bondarzew A., Singer R. *Zur Systematik der Polyporaceen // Ann. Mycol.* 1941. Vol. 39. P. 43—65.
- Bondartseva M. A. [Definitorium fungorum Rossiae. Ordo Aphyllophorales. Fasc. 2. Petropolis: Nauka, 1998. 391 p. In Russian.]
- Donk M. A. *Revision der Niederländischen Homobasidiomycetae. Aphyllophoraceae II // Medd. Bot. Mus. Univ. Utrecht.* 1933. N 9. 278 p.
- Jahn H. *Einige in West Deutschland (BRD) neu, seltene oder weniger bekannte Porlinge (Polyporaceae) // Westfal. Pilzbr.* 1973. H. 9. S. 81—120.
- Jülich W. *Notes on some Basidiomycetes (Aphyllophorales and Heterobasidiomycetes) // Persoonia.* 1982. Vol. 11. P. 421—428.
- Komarova E. P. [Key-book to the Polyporaceae of Byelorussia. Minsk: Nauka i tekhnika, 1964. 343 p. In Russian.]
- Renvall P., Kaaro J. *Tyromyces fumidiceps* — an addition to the polypore flora of North Europe // *Folia Cryptog. Estonica.* 1998. Fasc. 33. P. 123—126.
- Ryvarden L. *Genera of Polypores. Nomenclature and taxonomy // Synopsis Fung. 5. Oslo: Fungiflora,* 1991. 363 p.
- Ryvarden L., Gilbertson R. L. *European polypores. Part 1. Abortiporus—Lindtneria. Oslo: Fungiflora,* 1993. P. 1—387.
- Ryvarden L., Gilbertson R. L. *European polypores. Part 2. Meripilus—Tyromyces. Oslo: Fungiflora,* 1994. P. 388—743.
- Stalpers J. *On the genera Sarcodontia, Radulodon and Pseudolarobasidium // Folia Cryptog. Estonica.* 1998. Fasc. 33. P. 133—138.

Spirin W. A. *Tyromyces* P. Karst. and related genera. — *Mycena.* 2001. Vol. 1, N 1. P. 64—71. —*582.287.2.

SUMMARY: The taxonomy of genus *Tyromyces* P. Karst. and related taxa is considered in modern perspective. New genus *Leptoporellus* Spirin gen. nov. is described. Some new combinations in the genera *Sarcodontia* Schulz., *Radulodon* Ryvarden, *Porpomyces* Jülich, and *Antrodiella* Ryvarden et Johan. are proposed.

Key words: *Tyromyces*, *Leptoporellus*, *Sarcodontia*, *Radulodon*, *Porpomyces*, *Antrodiella*, taxonomy.

* The code of Universal Decimal Classification (URSS).

31 III 2001

Corticoid fungi on mosses in Belarus

© E. O. Yurchenko

V. F. Kuprevich Institute of Experimental Botany, Akademichnaya str. 27, BY-220072
Minsk, Belarus'
e-mail: fungi@biobel.bas-net.by

The close contact of alive and dead bryophytes with fungal fruitbodies and vegetative mycelium is widespread phenomenon in corticoid fungi

The bryophilous fungi in broad sense are all fungal organisms growing in tight contact with mosses and liverworts (Ainsworth and Bisby's dictionary ..., 1995, p. 66). Since many of corticoid fungi (*Corticaceae* s. l., *Basidiomycetes*) inhabit the same microtopes as epixyloous mosses and develop on decayed wood immersed in moss cover on ground they are expected to be commonly associated with *Bryophyta*. However, such associations are poorly documented. Among few known in literature bryophilous corticoid species are *Sistotrema octosporum* (J. Schröt. ex Höhn. et Litsch.) Hallenb. [= *S. commune* J. Erikss., *Corticium muscicola* Bres.], and *Ramaricium albochraceum* (Bres.) Jülich [= *R. occultum* J. Erikss.] (Eriksson, 1949, 1958; Parmasto, 1965). The first data about corticoid fungi on mosses in Belarus were published in our work (Yurchenko, 1998) where 3 fungal species on 3 species of mosses were reported.

The present work is based on study of corticoid fungi kept in Kuprevich Institute of Experimental Botany Herbarium, Minsk (MSK, Fungi or MSK—F), collected mostly in Byarezinski Biosphere Reserve. The group of fungi under consideration we accept in general as «non-poroid resupinate *Aphyllophorales*» following Jülich and Stalpers (1980). The specimens from the reserve were collected near villages Domzharytsy, Kvetcha, Perakhodtsy, Rozhna, and Stvol'na,