

Genus revisions and new combinations of some North European polypores

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Two new genera of polypores (Basidiomycota) are described, *Erastia* Niemelä & Kinnunen, and *Rhodonía* Niemelä & K.H. Larsson. The following new combinations are presented: *Antrodiella canadensis* (Overh.) Niemelä, *Erastia salmonicolor* (Berk. & M.A. Curtis) Niemelä & Kinnunen, *Oligoporus balsaminus* (Niemelä & Y.C. Dai) Niemelä, *Oligoporus immitis* (Peck) Niemelä, *Oligoporus persicinus* (Niemelä & Y.C. Dai) Niemelä, *Porodaedalea laricis* (Jacz. ex Pilát) Niemelä, and *Rhodonía placenta* (Fr.) Niemelä, K.H. Larsson & Schigel. *Porodaedalea niemelaei* M. Fischer is considered to be synonymous with *P. laricis*, and *Sarcoporia polyspora* P. Karst. was found to be an older name for the species commonly known as *Parmastomyces transmutans* (Overh.) Ryvarden & Gilb. or *P. mollissimus* (Maire) Pouzar.

Key words: Basidiomycota, *Antrodiella*, *Erastia*, *Parmastomyces*, *Phellinus*, *Porodaedalea*, *Rhodonía*, *Sarcoporia*, polypore, taxonomy

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Introduction

In this paper two genera are described and new combinations are made in order to make these names available for a forthcoming book on Finnish polypores (Niemelä 2005).

Materials and methods

The authors' names of this paper are abbreviated as TN, JK, KHL, DSS and EL, respectively.

Some of the results derive from our literature and herbarium studies, but a considerable part has accumulated during the preparation of a phylogenetic analysis of the generic complex *Postia/Oligoporus*. In that study KHL and EL sequenced and analyzed a large set of species and specimens mostly provided by TN, JK and DSS. That extensive phylogenetic revision will be fully presented and discussed in another, forthcoming paper.

Taxonomy

Antrodiella canadensis (Overh.) Niemelä, **comb. nova**

[*Polyporus canadensis* Overh., *Mycologia* 33:97, 1941, nomen inval.]

Basionym: *Polyporus canadensis* Overh. in Lowe, *Mycotaxon* 2:45, 1975. – Holotype: 'Polyporus canadensis sp. nov., Ottawa, Dow's Swamp, on spruce stump, 16.IX.1933 J.W. Groves 16860' (PAC, studied).

There has been some controversy on the validity of the description of this species. Ryvarden and Gilbertson (1984) considered that in the article in *Mycotaxon* 2:44–45 Lowe described the species twice in different genera (*Polyporus*, *Tyromyces*), which would be against the Code, and

hence a nomen novum *Antrodiella overholtsii* Ryvarden & Gilb. was created. Niemelä (1985) accepted the publication of *Polyporus canadensis* as valid and legitimate, because Overholts was explicitly given as its author and Overholts' description was separated into a footnote apart from Lowe's running text.

After reconsidering the case TN came to the conclusion that the validating description in Lowe (1975) is an authentic, posthumously printed text by Overholts with original wording, and should be accepted as such. This accords with the interpretation in Index of Fungi 5(9): 360, 1985 ("L. O. Overholts apud Lowe"). A discussion on this matter with Dr. Teuvo Ahti (Helsinki) is gratefully acknowledged.

Niemelä (1985) kept this species in the heterogeneous genus *Tyromyces*. Johannesson et al. (2000) compared it and several *Antrodiella* species with ribosomal DNA sequences, and showed that they make a natural, monophyletic clade, thus supporting the idea of Ryvarden and Gilbertson (1984) that this is a member of *Antrodiella*. Hence the new combination is made here; TN thanks P. Renvall (Kuopio, Finland), the second author of the Johannesson et al. (2000) paper, for discussions concerning *Antrodiella* and this species.

Erastia Niemelä & Kinnunen, **genus novum**

Carpophorus annuus, effusus, poroideus, succulentus, salmonicolor. Systema hypharum monomiticum, hyphae tenuitunicatae, fibulatae. Sporae ellipsoideae.

Type: *Polyporus salmonicolor* Berk. & M.A. Curtis.

Etymology: Dedicated to Prof. Erast Parmasto (Tartu, Estonia), the eminent researcher of fungal taxonomy and cladistics.

Basidiocarp annual, effused, poroid, soft juicy, pale salmon coloured, when dry discoloured but not turning dark purple-red in bruised parts or elsewhere. KOH reaction almost nil at pore surface, or light cherry red in ochraceous-coloured mycelium of basidiocarp margins and subiculum. Hyphal system monomitic, hyphae thin-walled, with clamp connections, weakly amyloid in tube trama, acyanophilous. Brown oily matter abun-

dant in between the hyphae. Spores thin-walled, ellipsoid, negative in both Melzer's reagent and Cotton Blue, ca. 4–5.7 × 2.5–2.9 µm in type species, with one prominent oil-guttule.

Erastia salmonicolor (Berk. & M.A. Curtis) Niemelä & Kinnunen, **comb. nova**

Basionym: *Polyporus salmonicolor* Berk. & M.A. Curtis, Hooker's J. Bot. Kew Gard. Misc. 1:104, 1849. Type: '*Pol. salmonicolor* Berk. & Curt. 1527, [U.S.A., South Carolina, Berkely Co.,] Santee River, *H.W. Ravenel*' (K, studied by Ryvarden 1977).

This species was illustrated in colour in Bernicchia (2005:665, at least the upper photograph), and it and *Hapalopilus aurantiacus* will be illustrated by Niemelä (2005). These two species, and *H. ochraceolateritius* Bondartsev, have been misunderstood in most modern papers. Pouzar (1967) analysed the protologues of *aurantiacus* and *salmonicolor* and concluded that they cannot mean the same species. Donk (1967) discussed the identities and typifications of these names, without giving any clear answer.

In our opinion *Hapalopilus aurantiacus*, *H. ochraceolateritius* and *Erastia salmonicolor* are three well-defined species. The best differentiating characters are listed in Table 1. At least in North Europe the first one is the commonest, the others extremely rare. They all grow on coniferous trees.

Ko et al. (2001) studied phylogenetic relationships among the *Hapalopilus* complex. They found that '*Hapalopilus*' *salmonicolor* is in fact alien to the genus, while *H. rutilans* and *H. croceus* are closely related. They proposed *salmonicolor* to be included in the genus *Sarcoporia*, as was already done by Teixeira (1986). Below we will show that this is unacceptable, and hence the new genus *Erastia* was described.

Hapalopilus ochraceolateritius was first described by Karsten (1887) as *Physisporus aurantiacus* var. *saloisensis* P. Karst. That name was never validly transferred to species rank, and Bondartsev (1940) eventually described it as a species. Domański (1965) was one of the few who adopted Bondartsev's idea and clearly knew the species.

Table 1. Comparison of *Erastia salmonicolor*, *Hapalopilus aurantiacus* and *H. ochraceolateritius*.

Character	<i>E. salmonicolor</i>	<i>H. aurantiacus</i>	<i>H. ochraceolateritius</i>
Pores per mm	1–2	(1–)2–3	(3–)4–6
Fresh colour	salmon or pinkish	orange-yellow or ochraceous	brick or terracotta
Dry colour	dirty pale brownish	dark ochraceous, or purple reddish	dark brick, or black with blood-red tint
Bruised parts (dry)	almost unchanged	reddish black	reddish black
KOH	almost unchanged, or light cherry red in subiculum and margin	dark blood red	dark blood red
Spore shape	ellipsoid	thick cylindric	narrow cylindric
Spore size (average)	4–4.7 × 2.5–2.9 µm L=4.3 µm, W=2.7 µm, Q=1.6	4.9–6 × 2.2–2.6 µm L=5.4 µm, W=2.4 µm, Q=2.2	4.3–5.2 × 1.8–2.1 µm L=4.7 µm, W=2.0 µm, Q=2.4
Host in N Europe	pine	pine or spruce	pine or spruce

Sarcoporia polyspora P. Karst.

Another misinterpretation was found while studying Karsten's type materials addressed to the *Hapalopilus* / *Erastia* complex. Lowe (1956) considered the type of *Sarcoporia polyspora* P. Karst. to be conspecific with *Physisporus aurantiacus* var. *saloensis* P. Karst., i.e. what is here called *Hapalopilus ochraceolateritius*. That view has been followed ever since. The holotype of *Sarcoporia polyspora* is deposited in Herb. H (Helsinki); although small and blackened, the specimen is good for microscopy. Hyphal structure is monomitic, with clamps and plenty of oily droplets in between the hyphae. The specimen is abundantly fertile (polyspora!), spores being slightly thick-walled, ellipsoid with obtuse ends, dextrinoid and very strongly cyanophilous, (4.5–)4.6–6.1(–6.5) × (2.6–)2.7–3.3(–3.4) µm, L=5.34 µm, W=2.99 µm, Q=1.79 (n=30/1). It is certainly the same species as what is nowadays known as *Parmastomyces transmutans* (Overh.) Ryvarden & Gilb. (holotype Overholts 22971, PAC, studied) or *P. mollissimus* (Maire) Pouzar,

and much older than these two names. As this is the type of both the genus and the species, the widely used epithets under *Parmastomyces* must be abandoned. The genus name *Sarcoporia* fits very well for the species, because the basidiocarp attains flesh-reddish tints in the course of its growth and if bruised. The specimens are always very rich in spores.

Oligoporus balsaminus (Niemelä & Y.C. Dai) Niemelä, **comb. nova**

Basionym: *Postia balsamina* Niemelä & Y.C. Dai, *Karstenia* 44:68, 2004. Holotype: Finland, Kittilän Lappi, Kolari, *Picea abies*, 31.VIII.1999 *Niemelä 6601* & *Dai* (H).

Phylogenetic analysis carried out by KHL and EL from Finnish materials of the *Postia* / *Oligoporus* complex and related genera revealed the heterogeneous nature of this group. Preliminary results show that thick-spored species make up a clade around *Oligoporus rennyi* (Berk. & Broome) Donk, type of *Oligoporus*. Most of the narrow-spored species are closely related to *Pos-*

tia lactea (Fr.) P. Karst., type of the genus *Postia*. For this reason this combination was made, as well as the two below.

Oligoporus balsaminus is a northerly species, growing on spruce in old-growth forests. In the microscope it resembles *O. balsameus* (Peck) Gilb. & Ryvarden, but spores of *O. balsaminus* are slightly larger, basidiocarps are predominantly effused, with larger pores and gelatinous subiculum. During drying the specimens of *O. balsaminus* shrink and become brittle, while *O. balsameus* becomes hard or chalky and keeps its shape fairly well.

***Oligoporus immitis* (Peck) Niemelä,
comb. nova**

Basionym: *Polyporus immitis* Peck, New York State Mus. Nat. Hist. 35:135, 1884.

While studying *O. stipticus* (Pers. : Fr.) Gilb. & Ryvarden and *O. guttulatus* (Peck) Gilb. & Ryvarden, still another species was detected in this group of fungi. The main differences are shown in Table 2. According to the proposal of

W. Spirin (St.Petersburg, Russia), this name was accepted for the taxon; usually it is listed as one of the many synonyms of *O. stipticus*. Another possible name would be *Tyromyces tiliophilus* Murrill (Murrill 1907, cf. Ryvarden 1985:196), and further studies are needed to solve the taxonomy and nomenclature of this taxon.

***Oligoporus persicinus* (Niemelä & Y.C. Dai)
Niemelä, comb. nova**

Basionym: *Postia persicina* Niemelä & Y.C. Dai, Karstenia 44:74, 2004. Holotype: Finland, Kitilän Lappi, Kolari, *Picea abies*, 17.VIII.1999 Niemelä 6453 & Dai (H).

***Porodaedalea laricis* (Jacz. ex Pilát) Niemelä,
comb. nova**

[*Xanthochrous pini* (Brot.) Pat. subsp. *abietis* (P. Karst.) Bourdot & Galzin var. *laricis* Jacz. ex Pilát, Bull. Trimestriel Soc. Mycol. France 48:28, 1933 ('1932'), nomen nudum.]

Table 2. Comparison of *Oligoporus stipticus*, *O. guttulatus* and *O. immitis*.

Character	<i>O. stipticus</i>	<i>O. guttulatus</i>	<i>O. immitis</i>
Pores per mm	4–5(–6)	5–6(–7)	4–5
Upper surface fresh/dry	white/citric yellow	cream + tan zones/ ochraceous yellow	white/white with tan flecks
Pore surface fresh/dry	white/citric yellow	greenish white/yellowish or greyish cream	white/dark brownish cream
Dry context & tubes	hard	soft chalky	soft chalky
Taste	bitter, peppery	sour	sour
Context hyphae	both the straight 'conductive', and interwoven narrow hyphae thick-walled	straight 'conductive' hyphae thick-walled, interwoven and narrow hyphae thin-walled	straight 'conductive' hyphae thick-walled, interwoven and narrow hyphae thin- walled
Spores (average)	4–5.1 × 1.9–2.4 µm, L=4.5 µm, W=2.1 µm, Q=2.0–2.2	3.5–4.9 × 2.2–2.6 µm, L=4.1 µm, W=2.4 µm, Q=1.7–1.8	3.9–4.5 × 1.9–2.1 µm, L=4.1 µm, W=2.0 µm, Q=2.1
Host in N Europe	coniferous trees (mostly <i>Picea</i>)	coniferous trees (mostly <i>Picea</i>)	deciduous trees (<i>Betula</i> , <i>Quercus</i> , <i>Juglans</i> etc.)

Basionym: *Xanthochrous pini* (Brot.) Pat. f. *laricis* Jacz. ex Pilát, Bull. Trimestriel Soc. Mycol. France 49:272, 1934 ('1933'). Holotype (the only specimen listed): "Ad truncos *Laricis sibiricae* in Sibiria, districtus Tara, 1.IX.1928, leg. *Murashkinsky*" (not studied).

Phellinus laricis (Jacz. ex Pilát) Pilát, Bull. Trimestriel Soc. Mycol. France 88:346, 1972.

Pilát described f. *laricis* from material forwarded to him by A.A. Jaczewski, but the latter clearly was not a coauthor ("Jaczewski pro spec. in litt."). So it is appropriate to address the taxon to Jacz. ex Pilát, or just Pilát. The description is valid, even though the name is not listed in recent indexes of fungal names. Dai (2005) seems to be the only modern author who interpreted it correctly.

While making the new combination *Phellinus laricis*, Pilát (1972) addressed the description of f. *laricis* to page 273, while the correct page is 272. This is a technical error and does not make the combination invalid; in fact the description of the new form (Pilát 1934) still continues on that page. Donk (1974:329) did not present any reservations on its validity. In the same paper Pilát (1972) indicates a more recent collection from Mongolia (PRM 712454) as 'neotypus', without explaining the reason. The wording implies that the original material was lost, but that was not checked for this paper.

Phellinus laricis is clearly a member of the '*Phellinus pini* complex'. Molecular studies (Fischer 1996, Wagner & Fischer 2001, 2002) have shown that the old genus *Phellinus* is too heterogeneous to be kept undivided, and *Porodaedalea* is the name for the more natural genus. This species was recently described as *Porodaedalea niemelaei* M. Fischer from material collected on *Larix sibirica* in Finland (Fischer 2000). Larch is not indigenous to the country, and it is clear that the strictly host-specific fungus originates from the range of *Larix sibirica*, i.e. north-eastern parts of European Russia and Siberia. In fact *P. laricis* is common from the Veps forest (eastern Leningrad Region; the westernmost natural site of *Larix sibirica*) up to China (Y.C. Dai, H. Kotiranta and others, pers. comm.).

***Rhodonía* Niemelä & K.H. Larsson, genus novum**

Carpophorus annuus, effusus, poroideus, mollis, roseicolor vel niveus. Systema hypharum monomiticum, hyphae fibulatae, primo tenuitunicatae, in statu maturo crassitunicatae. Sporae cylindricae.

Type: *Polyporus placenta* Fr.

Etymology: *Rhodonía* (fem.), from *rhodon*, Greek name of rose, referring to the pale pink colour reminiscent of that in wild roses.

Basidiocarp annual, effused, poroid, fairly thick, juicy and soft, pale rose-coloured or white. Hyphal system monomitic, hyphae with clamp connections, at first thin-walled but in mature basidiocarp thick-walled. Spores cylindrical. Causing a brown rot on coniferous trees.

***Rhodonía placenta* (Fr.) Niemelä, K.H. Larsson & Schigel, comb. nova**

Basionym: *Polyporus placenta* Fr., Öfvers. Kungl. Vetensk.-Akad. Förh.: 30, 1861.

The strongest evidence for separating *R. placenta* from *Oligoporus* and *Postia* comes from molecular analysis, where this becomes invariably nested far off from those genera, in a separate clade near *Antrodia* (our results). This will be illustrated and discussed thoroughly in a forthcoming paper. Young basidiocarps have consistently thin-walled hyphae, but when they grow older, some hyphae become thick-walled, and then the structure looks like dimitic. Most hyphae of fully grown basidiocarps are thick-walled to subsolid.

This species has been well described in many papers, e.g. Ryvarden and Gilbertson (1994) and Bernicchia (2005). The gradual thickening of hyphal walls has been mostly neglected, however. A good hint for identification is seen in Cotton Blue / lactic acid mounts: small greasy droplets are dispersed in the mountant, and in 1–2 minutes they become fragmented and 'explode' into snowflake-like groups. Such phenomenon is not seen in *Antrodia infirma* or other similar-looking species.

It is not yet known which other species are related. Both externally and in the microscope *Antrodia infirma* Renvall & Niemelä is very similar, but this relationship needs to be studied more closely. A possible candidate would also be *Oligoporus mappa* (Overh. & J. Lowe) Gilb.

& Ryvarden. – The species names *placenta* and *mappa* are nouns, and stay uninflected irrespective of the gender of the genus.

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References

- Bernicchia, A. 2005: Fungi Europaei 10. Polyporaceae s.l. – Edizioni Candusso, Alassio. 808 pp.
- Bondartsev, M.A. 1940: O novykh gribakh sem. Polyporaceae. – Bot. Mater. Otd. Spor. Rast. Bot. Inst. Akad. Nauk SSSR 5: 17–23. [In Russian]
- Dai, Y.C. 2005: Illustrations of pathogenic wood-decaying fungi in China. – Science Press, Beijing. 197 pp. [In Chinese]
- Domański, S. 1965: Grzyby (Fungi), podstawczaki bezblaszkowe, zagwiowate 1, szczecinkowate 1. Państwowe Wydawnictwo Naukowe, Warszawa. 280 pp. + 63 pls.
- Donk, M.A. 1967: Notes on European polypores 2. Notes on *Poria*. – Persoonia 5: 47–130.
- Donk, M.A. 1974: Check list of European polypores. – Verh. Koninkl. Nederlandse Akad. Wetensch. Afd. Natuurk. Tweede Reeks 62: 1–469.
- Fischer, M. 1996: Molecular and microscopical studies in the *Phellinus pini* group. – Mycologia 88: 230–238.
- Fischer, M. 2000: *Porodaedalea* (*Phellinus pini* group, Basidiomycetes) in Europe, a new species on *Larix sibirica*, *P. niemelaei*. – Karstenia 40: 43–48.
- Johannesson, H., Renvall, P. & Stenlid, J. 2000: Taxonomy of *Antrodiella* inferred from morphological and molecular data. – Mycol. Res. 104: 92–99.
- Karsten, P.A. 1887: Fungi novi vel minus bene cogniti Fenniae et Galliae descriptis. – Rev. Mycol. 9: 9–11.
- Ko, K.S., Jung, H.S. & Ryvarden, L. 2001: Phylogenetic relationships of *Hapalopilus* and related genera inferred from mitochondrial small subunit ribosomal DNA sequences. – Mycologia 93: 270–276.
- Lowe, J.L. 1956: Type studies of the polypores described by Karsten. – Mycologia 48: 99–125.
- Lowe, J.L. 1975: Polyporaceae of North America. The genus *Tyromyces*. – Mycotaxon 2: 1–82.
- Murrill, L.O. 1907: Polyporaceae. – North American Flora 9: 1–131.
- Niemelä, T. 1985: On Fennoscandian polypores 9. *Gelatoporia* n. gen. and *Tyromyces canadensis*, plus notes on *Skeletocutis* and *Antrodiella*. – Karstenia 25: 21–40.
- Niemelä, T. 2005: Käävät, puiden sienet. Polypores, lignicolous fungi. – Norrlinna 13: 1–320. [In Finnish, with English summary]
- Pilát, A. 1934: Additamenta ad floram Sibiriae Asiaeque orientalis mycologicam. Pars secunda. – Bull. Trimestriel Soc. Mycol. France 49: 256–339.
- Pilát, A. 1972: Contribution a l'étude des basidiomycètes de la Mongolie. – Bull. Trimestriel Soc. Mycol. France 88: 333–356 + plates.
- Pouzar, Z. 1967: Studies in the taxonomy of the polypores 3. – Česká Mykologie 21: 205–212.
- Ryvarden, L. 1985: Type studies in the Polyporaceae 17. Species described by W.A. Murrill. – Mycotaxon 23: 169–198.
- Ryvarden, L. & Gilbertson, R.L. 1984: Type studies in the Polyporaceae 15. Species described by L.O. Overholts, either alone or with J.L. Lowe. – Mycotaxon 19: 137–144.
- Ryvarden, L. & Gilbertson, R.L. 1994: European polypores 2. *Meripilus* to *Tyromyces*. – Synopsis Fungorum 7: 389–743.
- Teixeira, R. 1986: New names and new combinations in the Polyporaceae. – Revista Brasil. Bot. 9: 43–44.
- Wagner, T. & Fischer, M. 2001: Natural groups and a revised system for the European poroid Hymenochaetales (Basidiomycota) supported by nLSU rDNA sequence data. – Mycol. Res. 105: 773–782.
- Wagner, T. & Fischer, M. 2002: Proceedings towards a natural classification of the worldwide taxa *Phellinus* s.l. and *Inonotus* s.l., and phylogenetic relationships of allied genera. – Mycologia 94: 998–1016.