

On the genera *Sarcodontia*, *Radulodon* and *Pseudolagarobasidium*

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Abstracts: The genera *Sarcodontia* and *Radulodon* are considered as closely related, while *Pseudolagarobasidium* is a synonym of the latter. The genera share a resupinate hydroid basidiome, globose to broadly ellipsoid spores, an astatocoenocytic behaviour and a bipolar mating system. *Acia licentii* is considered a synonym of *Radulodon copelandii*.

When Ryvar den (1972) proposed the genus *Radulodon*, he compared it with *Mycoacia*, *Hyphoderma*, *Hypochnicium*, *Basidioradulum* and *Radulomyces*, and considered the combination of hydroid hymenophore and globose spores as distinctive. As both characters also occur in *Sarcodontia* (not mentioned in the discussion), Ryvar den might have considered this the correct generic name. The fact that the spines are somewhat more con crescent in *Radulodon* than in *Sarcodontia* has never been considered important at the generic level. Maekawa (1993) proposed to classify *Mycoacia copelandii* (Pat.) Aoshima & Furukawa in *Radulodon*, reasoning along similar lines as Ryvar den and also not considering *Sarcodontia*. Wu (1990) could not accept *Radulodon* for *Pseudolagarobasidium* because the spores of *Radulodon* are globose to subglobose and have thicker walls (despite the fact that the description of the spores of both accepted species contained the word 'subglobose').

MATERIAL EXAMINED

Herbarium specimens:

Radulodon americanus: USA, Ithasca Lake, 16-IX-1977, L. Ryvar den no 14273 (K, O); Canada, Petawawa Experimental Forest, on *Populus grandifolia*, 8-X-1967, Berit & John Eriksson (K); Norway, Ladalen, on *Populus tremula*, 25-V-1993 (O). *Radulodon erikssonii*: Norway, Jordetägg, on dead *Populus tremula*, 14-5-1995, H. Andersen (O). *Hydnum calcareum*: Australia, Kurrumburra, Martin 1027, type (K); Australia, Kangaroo Ground, on fallen, rotten trunk, 12-VII-1953, E.M. Davies nr 3643 (K). *Sarcodontia setosa*: Germany, Württemberg, on fallen trunk of *Malus*, 21-X-1969, R. Kautt; *Radulodon copelandii* (as *Sarcodontia*): China, Jilin, Chang

Bai Shan Forest Reserve, on *Larix olgensis*, IX-1983, Ryvar den no 21596 (O); China, Jilin, Chang Bai Shan Forest Reserve, on *Acer* sp., IX-1983, Ryvar den no 21760 (O). *Pseudolagarobasidium subvinosum*: Sri Lanka (Ceylon), XI-1867, no 180, type (K); India, Kerala, 9-XI-1984, J. K. Sharma no 052 (K). *Hydnum pseudomucidum*: Sri Lanka (Ceylon), Hakgala, IV-1919, Petch no 5962

Cultures:

Radulodon americanus: CBS 463.48 (DAOM 166599), Canada, British Columbia, M.K. Nobles, ex *Populus tremelloides*; CBS 100846 (FCUG 578) Canada, Quebec, ex *Populus*; CBS 100848 (FCUG 735), Canada, Ontario, ex *Populus*. *Radulodon erikssonii*: CBS 100849 (FCUG 1988), Switzerland, Ticino. *Sarcodontia setosa*: CBS 155.63, France, J. Boidin; CBS 150.80, The Netherlands, W. Loerakker, ex *Malus silvestris*.

ANALYSIS OF SOME CHARACTERS

1. Spines.

At first sight the texture of the spines seems to be quite different. In *Sarcodontia setosa* (Pers.) Donk they are ceraceous, acute and single or sometimes con crescent in pairs. Branching is rare, and branches are always much narrower and smaller than the parent spine. Occasionally warts are present at the base of a spine. *Radulodon copelandii* (Pat.) N. Maekawa, *Radulodon erikssonii* Ryvar den and *Hydnum pseudomucidum* Petch also have ceraceous, acute, single and unbranched spines. *Pseudolagarobasidium subvinosum* (Berk. & Br.) S. H. Wu has more membranaceous spines, which are often con crescent to raduloid structures, but there are also slender, simple spines, which may be slightly fimbriate at the apex.

Table 1. Distribution of characters in the species concerned. Spine structure: s=single, c=concretescent and flattened, b=bundles; apex of spines: a=acute and agglutinated, f=fimbriate; texture of spines: c=ceraceous, m=membranaceous; gloeocystidia: a=absent, u=uncertain or indistinct, i=immersed, p=projecting; quasibinding hyphae: a=absent, b=present; basidia: c=clavate; cyanophilic spores: + =present, - =absent, ± =variable.

Species	spine structure	spine apex	spine texture	gloeocystidia	quasibinding hyphae	basidia	spore-wall
<i>S. setosa</i>	s,c	a	c	a	a	c	c
<i>R. copelandii</i>	s	a	c	u,i	a	c	c
<i>R. pseudomucidus</i>	s	a	c	i	a	c	c
<i>R. erikssonii</i>	s	a	c	i/p	a	c	a/c
<i>R. americanus</i>	b	f	c-m	u,i	p	c	a/c
<i>R. calcareus</i>	b	f	m	p	p	c	a
<i>R. subvinosus</i>	s,c	a-f	m	p	a	c	a
<i>Acia licentii</i>	s	a	c	u	a	c	±

However, the difference between ceraceous and membranaceous is rather vague in this group, as is illustrated by Hjortstam & Ryvar den (1986), who called *Amethicium luteoincrustedum* membranaceous, while Hjortstam (1995, sub *Cericium*) considered it ceraceous. Both *Radulodon americanus* and *Pseudolagarobasidium calcareus* (Cooke & Masee) S. H. Wu have more or less membranaceous, simple, fimbriate spines, which at first sight seem to originate from a common, raised base. However, section of such a structure reveals, that the spines are recognizable as distinct entities to the very base, but are fasciculate, sometimes connected by relatively loose, white mycelium. The effused part of the basidiome is in all cases membranaceous, with a non-gelatinized subiculum.

2. Hyphae

The hyphal system is in all cases monomitic, consisting of thin- to thick-walled hyphae with clamps (except *Radulodon casearium* (Morgan) Ryvar den, which could not be studied). In all cases there is a central cylinder in the spines, which contains more or less parallel hyphae, and often also crystals. The central hyphae may be relatively wide and scarcely septate in the more ceraceous species, but such hyphae can

also be found in the more membranaceous species, although they are less abundant. However, there are two complicating factors:

a. *Sarcodontia setosa* often grows on a vertical substrate and is then capable to form nodulose structures, from which the spines arise. These structures mainly consist of thick-walled hyphae, which may produce swellings up to 35 µm diam. (sometimes called 'sclerocysts'), while the thickness of the wall may exceed 7 µm. I have not found similar structures in any of the other species.

b. Wu (1990) described a structure that he called 'quasi-binding hyphae'. Such hyphae are hyaline, thin- to thick-walled, terminally much-branched, 1-2 µm wide. They are the same hyphae which Hjortstam & Ryvar den (1986) described as 'thin-walled skeletal hyphae' for *Amethicium luteoincrustedum*, and somewhat later by Hjortstam (1995), when he transferred the species to *Cericium*, as 'arboriform (binding-type) hyphae'. These hyphae are known from *Pseudolagarobasidium calcareum*, and they are also present in *Radulodon americanus*. Although these hyphae are quite characteristic, it is often hard to demonstrate them in dried material. I found them only in sections near the substrate, especially in gaps.

Similar hyphae have been described for species of the genera *Licrostroma*, *Amethicium*, *Cystostereum*, *Crustoderma*, *Phlebia* s.l., and *Laeticorticium ussuricum*, but I am not convinced that these hyphae are homologous in all cases.

3. Gloeocystidia

For a number of species (gloeocystidia have been described: *Pseudolagarobasidium calcareum*, *P. subvinosum* and *Radulodon erikssonii*. In all cases the cystidia are immersed or slightly projecting, thin-walled, with homogeneous and hyaline contents and they are sulpho-negative, which makes it difficult to decide whether they should be called gloeocystidia or cystidia. Generally they stain more strongly with cotton blue than hyphae and basidia. It is even more difficult when the morphological differences from young basidia become slight, as is the case in *Radulodon americanus*. The collection from Norway is here considered to be *R. americanus* rather than *R. erikssonii*, but it differs from american specimens by having many and slightly larger gloeocystidia. *Hydnum pseudomucidum* also has gloeocystidia, subclavate to cylindrical; they may resemble pseudocystidia (gloeoplerous hyphae), as also in *P. subvinosum*, where some gloeocystidia are more than 100 µm long. In *Radulodon copelandii* a single structure was observed that could have been a gloeocystidium. It would, however, be misleading to consider the species as having gloeocystidia.

4. Hyphidia

Hyphidia could be demonstrated in all specimens examined. They were all unbranched and not or slightly projecting, 2.5-3.5 µm wide. The occurrence is irregular, sometimes quite abundant, but sometimes also hard to find. They are of the same type as found in *Radulomyces*.

5. Basidia

The basidia are clavate to flexuous-clavate, 20-35(-40) x 6-8 µm (in *P. calcareum* 14-20 x 4.5-5.5 µm, in *S. crocea* 18-30 x 4.5-6 µm).

6. Spores

The spores are globose to broadly ellipsoid, with 1-2 big oil drops and thin or slightly thickened walls. In the latter case the walls are always cyanophilous, in the former case the reaction is variable. One should be aware, that strong contrasts may suggest broader dimensions, and that a cyanophilous wall will more easily be in-

terpreted as thick-walled than a non-staining wall. The reaction in *P. subvinosum* has been reported as cyanophilous by Jang & Chen (1985), and as not cyanophilous by Wu (1990); I agree with the latter observation. There is, however, a problem with this stain, as none of my permanent slides (in lactic acid/cotton blue in PVA) after one week of preservation showed any cyanophilous spore-wall for all species examined, while the cell contents were still perfectly stained.

7. Type of rot

All specimens examined provoked a distinct white rot, except *H. pseudomucidum*, which was growing on brown bark. The reaction of the species with alpha-naphthol is variable: there is never a reaction after 3 hours or one day, but later there may be an open ring or even a spot. This is a typical reaction for many species of the Meruliaceae, where lignin-degrading enzymes are only produced in response to an external stimulus (a phenolic compound) rather than under general cultural conditions. A similar reaction is also known for example for *Merulius*, *Phlebia*, *Mycoacia*, *Cystidiophorus*, but also from the poroid genera *Hapalopilus*, *Spongipellis*, *Fibuloporia*, *Ischnoderma* and *Aurantioporus*. All species of these genera (as far as known) are also bipolar (unifactorial) and have an astatocoenocytic nuclear behaviour.

8. Cultural characters

Cultures of *Sarcodontia setosa*, *Radulodon americanus*, *R. erikssonii* are so similar, that they can be accommodated in a single description:

Growth rate 40-80 cm radius in 14 days on Oxoid malt agar, 30-50 cm on Cherry decoction agar. Advancing zone appressed, hyphae distant. Aerial mycelium appressed or locally downy or farinaceous, flamed. Marginal hyphae hyaline, thin-walled, with no or rare simple septa, 4-8 µm wide, branching with narrower, septate and clamped hyphae, 2-4 µm wide. Aerial hyphae hyaline, with thin- to somewhat thickened walls, (1.5-)2-4.5(-5) µm wide. Chlamydospores abundant in aerial mycelium, thick-walled (up to 2 µm), ellipsoid to subglobose, 8-16 x 6.5-11 µm.

Cultures of *S. setosa* have a remarkable sweet odour, which may disappear after many years in culture.

TAXONOMY

The broad-spored members of *Sarcodontia*, *Radulodon* and *Pseudolagarobasidium* are closely related. Not only are they all resupinate, membranaceous-ceraceous and hydroid, but they have also clavate to flexuous-clavate basidia and globose to broadly ellipsoid spores; moreover, all species have a unifactorial (bipolar) mating system and show an astatocoenocytic nuclear behaviour. The type species of *Radulodon* and *Pseudolagarobasidium* are hardly different and have to be regarded as conspecific, and *Pseudolagarobasidium* in the original sense is a synonym of *Radulodon*. A third species, *P. concentricum* (Cooke & Ellis) Hjortstam, with narrowly ellipsoid to subcylindrical spores, narrow basidia and brown, thick-walled subicular hyphae can either be placed in *Phlebia* s.l. as proposed by Kropp & Nakasone (1985), which I prefer at the moment, or accepted in *Ptrex* Hjortstam & Ryvarden, of which it is the type (Hallenberg & al. 1985).

The specimens of *Radulodon copelandii*, which were both collected in China, agreed with the emended description of *Acia licentii* Pilát by Ryvarden (1976). The description of Maekawa (1993) of Japanese material mainly differs in the mentioning of 'paraphysoid hyphae' (which are present in the material examined), and slightly thick-walled spores. I see no reason to distinguish these taxa and consider *A. licentii* as a synonym of *R. copelandii*. The species shares several characters with *Sarcodontia setosa*: ceraceous spines, globose, slightly thick-walled spores, practical absence of gloeocystidia, but it does not have the thick-walled, swollen subicular hyphae. On the other hand it closely resembles *R. eriksonii*, which only differs in having abundant gloeocystidia.

For the moment I am inclined to keep *Sarcodontia* separate from *Radulodon* on behalf of the subicular hyphae and sclerocysts. However, molecular data may prove otherwise. The basidiospores of *Hydnum pseudomucidum*, which are sometimes broader than long, strongly resemble those of *Gloeocorticium cinerascens* Hjortstam & Ryvarden. This species has a smooth hymenophore and conspicuous monilioid gloeocystidia, which are amyloid and SA-. Hjortstam & Ryvarden (1986) compared it with *Radulomyces*, but *Radulodon* may even be closer.

Cericium luteoincrustatum (Hjortstam & Ryvarden) Hjortstam is probably quite close to *Radulodon*. The species is not hydroid, but even to tuberculate, and the spores are ellipsoid, but the presence of 'quasi-binding hyphae' and immersed to slightly projecting gloeocystidia suggest a relationship. Anyway, it is stated that the species here accepted in *Radulodon* and *Sarcodontia* are closely related, not that other phlebioid genera may not contain other close relatives.

The genus *Radulomyces* has often been mentioned as a close relative. Indeed it resembles *Radulodon* in several respects: there are globose to broadly ellipsoid, thin- to somewhat thick-walled spores, sinuous-clavate basidia and a ceraceous basidiome. However, typical species have a loose consistency (nearly hygrophanous), there are no thick-walled hyphae and the species are even to tuberculate, except *R. molaris*, which is raduloid with irregular to flattened teeth with a sterile apex. Cultures of *Radulomyces* lack an astatocoenocytic behaviour, possess tyrosinase, have a different reaction with alpha-naphthol and often have crustose areas; they are thus quite distinct from *Sarcodontia/Radulodon*.

KEY TO THE RESUPINATE HYDROID SPECIES WITH GLOBOSE TO BROADLY ELLIPSOID SPORES

- 1a. Spores 8-13 x 6.5-8 µm. Cf. *Radulomyces molaris*
 1b. Spores up to 8 µm long. 2
 2a. Basal hyphae thick-walled, often with irregular swellings (sclerocysts). Hymenial surface yellow to orange yellow, often with reddish tinges. Odour distinctly sweet.
 Basidiome effused, ceraceous to membranaceous. Hymenial surface hydroid, becoming brownish when old, yellowish parts becoming reddish or purplish in KOH. Spines cylindrical, sometimes conrescent, ceraceous, 5-10(-15) x 0.2-0.6 mm. Margin velutinous or forming a mat of

- yellowish mycelium. Generative hyphae in mat and substrate thick-walled, 3-5 μm wide, with clamps, often producing thick-walled swellings up to 35 μm wide. Tramal hyphae thin- to slightly thick-walled, 2-4 μm wide, with clamps. Basidia clavate, 18-35(-45) x 4-6 μm . Spores hyaline, subglobose to broadly ellipsoid, somewhat thick-walled, 4.5-6 x (3-)3.5-4.5 μm . On angiosperms, preferably on Rosaceae. **S. crocea** (Schw.) Kotlaba
 Syn.: *Hydnum setosum* Pers.; *H. luteocarneum* Secr.; *Sarcodontia mali* S. Schulzer; *H. schiedermayri* Heufler; *H. amplissimum* Berk. & M. A. Curtis; *H. subvelutinum* Berk. & M. A. Curtis; *H. earleanum* Sumstine; *H. foetidum* Velen.
 Ref.: Kotlaba 1954; Eriksson et al., 1981; Breitenbach & Kränzlin, 1986.
- 2b. Basal hyphae without irregular swellings. Hymenial surface not orange yellow. Odour not sweet 3
- 3a. Spores globose to subglobose, (5.5-)6.5-7.5 x (4.8-)5.5-7.2 μm .
 Basidiome effused, ceraceous to membranaceous, cartilagineous when dry. Hymenial surface hydroid, cream-coloured to pale brown, becoming purplish when old, hydroid. Spines slender, simple or sometimes conrescent and flattened, ceraceous, up to 12 x 0.8 mm. Margin tomentose, white. Hyphae hyaline, thin- to slightly thick-walled, ???, with clamps. Hyphidia present, rare. Gloeocystidia narrowly clavate or capitate to cylindrical, 30-60 x 6-11 μm , not projecting. Basidia clavate, 16-25 x 5.5-7 μm
 **R. pseudomucidus** (Petch) Stalpers comb. nov.
 Bas.: *Hydnum pseudomucidum* Petch 1916, Ann. R. bot. Gdns Peradeniya 6: 156.
- 3b. Spores smaller 4
- 4a. Clamps absent.
 Basidiome effused, membranaceous. Hymenial surface cinereous to buff when dry, hydroid. Spines up to 8 x 0.5 mm, often conrescent. Quasi-binding hyphae present, thick-walled, 1.5-2 μm wide. Generative hyphae hyaline, thin-walled, 2-3.5 μm wide, often encrusted. Basidia clavate, 5-5.5 μm wide. Spores subglobose, 5-6 x 4-5.5 μm
 **R. casearius** (Morgan) Ryvarden. Ref.: Gilbertson, 1964.
- 4b. Clamps present 5
- 5a. Apex of spines fimbriate.
 Basidiome effused, membranaceous. Hymenial surface raduloid to hydroid. Spines cylindrical or fused, 3-6 per mm. Subicular hyphae thin- to somewhat thick-walled, with clamps. Subhymenial hyphae, thin-walled, somewhat agglutinated. Hyphidia present. Cystidia cylindrical to irregular-flexuous, thin-walled, immersed or hardly projecting. On angiosperms. 6
- 5b. Spines with agglutinated axis, apex not fimbriate 8
- 6a. Hymenial surface raduloid to hydroid, cinnamon buff to olive brown. Narrow, much-branched hyphae absent.
 Spines up to 0.6 mm long. Margin fimbriate. Subicular hyphae yellowish to brownish, 2.5-5(-5.5) μm . Brownish excreted material abundant. Cystidia 35-110 x 7-10.5 μm . Basidia (sub)clavate, 20-30 x 6-6.7 μm . Spores (5-)5.5-6.5 x 4-5 μm
 **R. subvinosus** (Berk. & Br.) Stalpers comb. nov.
 Bas.: *Hydnum subvinosum* Berk. & Br. 1875, J. Linn. Soc. Bot. 14: 60
 Syn.: *Pseudolagarobasidium leguminicola* J.C. Jang & T. Chen
 Ref.: Wu 1990
- 6b. Hymenial surface hydroid, spines often conrescent in fascicles, pale ochraceous to ochraceous salmon to buff. Quasi-binding hyphae may be present, thin- to thick-walled, 1-2 μm wide. .
 7
- 7a. Gloeocystidia fusiform, subclavate or cylindrical, 40-110 x 6-11 μm . Spores subglobose to broadly ellipsoid, 4.8-6 x 3.2-4 μm .
 Hymenial surface hydroid, pale ochraceous salmon to buff. Spines up to 1.2 mm long. Margin white. Subicular hyphae hyaline, with slightly thickened walls, 1.5-3 μm wide. Crystals present in subiculum. Basidia subclavate, 14-20 x 4.5-5.5 μm
 **R. calcareus** (Cooke & Masee) Jülich. Ref.: Jülich, 1978; Wu, 1990.
- 7b. Gloeocystidia absent or small, clavate to cylindrical, 25-40 x 8-10 μm . Spores globose to

subglobose, (4-)4.5-6.5 x 4-5.5 μm .

Hymenial surface ochraceous to salmon or buff, pale tan when dry, hydroid. Spines cylindrical, often concolorous at the base, 1-6 mm long. Margin white. Subcicular hyphae typically somewhat thick-walled, 2-5 μm wide. Subhymenial hyphae 1.5-4.5 μm wide. Hyphae thin- to lightly thick-walled. Basidia sinuous-clavate to urniform, 20-40 x 5-8(-10) μm . On angiosperms. **R. americanus** Ryvarden. Ref.: Ryvarden, 1972.

- 8a. Gloeocystidia present, clavate to fusiform, often with narrowed, hyphoid apex, 35-70 x 6-10(-13) μm .

Basidiome effused, ceraceous to membranaceous, cartilagineous when dry, up to 0.3 mm thick. Hymenial surface hydroid, whitish when young, becoming yellow and finally pale tan. Spines cylindrical, sometimes fused, up to 3 x 0.7 mm. Margin white. Subcicular hyphae thin- to usually somewhat thick-walled, 2-5 μm wide. Subhymenial hyphae thin-walled, (1.5-)2-3 μm wide. Hyphidia present. Basidia sinuous-clavate, 20-40 x (5-)6-8(-10) μm . Spores subglobose, slightly thick-walled, 5-6.5(-7) x 4.5-6 μm . On *Populus*. **R. erikssonii** Ryvarden. Ref.: Ryvarden, 1972; Eriksson & al. 1980.

- 8b. Gloeocystidia absent.

Basidiome effused, ceraceous. Hymenial surface hydroid, greyish-cream to ochraceous when young, brownish when old. Spines cylindrical, 5-10 x 0.2-1 mm. Margin thinning out, fimbriate, white. Hyphae thin- to thick-walled, 2-6 μm wide, with clamps. Simple hyphidia may be present. Basidia clavate to subcylindrical, 20-35 x 6-7.5 μm . Spores globose to subglobose, slightly thick-walled, 5-6.5(-7) x 4.5-6(-6.5) μm diam. On angiosperms, rarely on gymnosperms. **R. copelandii** (Pat.) N. Maekawa Syn.: *Actia licentii* Pilát. Ref.: Pilát, 1940; Ryvarden, 1976; Imazeki et al., 1988; Maekawa, 1993.

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REFERENCES

- Aoshima, K. & Furukawa, H. 1966. Some Japanese species of hydriaceous fungi growing on wood (in Japanese). *Trans. mycol. Soc. Japan* 7: 133-143
- Breitenbach, J. & Kränzlin, F. 1986. Pilze der Schweiz 2: Nichtblätterpilze. *Mykologia*, 416 pp.
- Eriksson, J., Hjortstam, K. & Ryvarden, L. 1981. *The Corticiaceae of North Europe* 6: 1051-1276.
- Gilbertson, R.L. 1964. *Pap. Mich. Acad. Sci., Arts, Lett.* 49: 15-25.
- Hallenberg, N., Hjortstam, K. & Ryvarden, L. 1985. *Pitrex* genus nova (Basidiomycetes, Corticiaceae). *Mycotaxon* 24: 287-291.
- Hjortstam, K. 1995. Two new genera and some new combinations of corticioid fungi (Basidiomycotina, Aphyllphorales) from tropical and subtropical areas. *Mycotaxon* 54: 183-193.
- Hjortstam, K. & Ryvarden, L. 1986. Some new and noteworthy fungi (Aphyllphorales, Basidiomycetes) from Iguazu, Argentina. *Mycotaxon* 25: 539-567.
- Imazeki, R., Otani, Y. & Hongo, T. 1988. *Fungi of Japan (in Japanese)*. Yama-Kei, Tokyo, 623 pp.
- Jang, J. C. & Chen, T. 1985. *Pseudolagarobasidium leguminicola* gen. et sp. nov. on *Leucaena* in Taiwan. *Trans. Brit. mycol. Soc.* 85:
- Jülich, W. 1978. On some Aphyllphorales from Australia. *Persoonia* 9: 453-472
- Kotlaba, F. 1954. Nebezpečný parazit jabloni *Sarcodontia crocea* (Schweinitz) c.n. *Ceska Mykol.* 7: 117-123.
- Kropp, B. R. & Nakasone, K. K. 1985 - Redisposition of *Radulum concentricum* (Aphyllphorales, Corticiaceae). *Mycotaxon* 24: 423-429.
- Maekawa, N. 1993. *Taxonomic study of Japanese Corticiaceae (Aphyllphorales)* I. Rep. Tottori mycol. Inst. 31: 1-149.
- Pilát, A. 1940. Basidiomycetes chinenses. *Annals mycol.* 38: 61-82.
- Ryvarden, L. 1972. *Radulodon*, a new genus in the Corticiaceae (Aphyllphorales). *Can. J. Bot.* 50: 2073-2076
- Ryvarden, L. 1976. On the identity of *Actia sibirica* Pil. and *A. licentii* Pil. *Ceska Mykol.* 30:
- Wu, S. H. 1990. The Corticiaceae (Basidiomycetes) subfamilies Phlebioideae, Phanerochaetoideae and Hyphodermataceae in Taiwan. *Acta bot. fenn.* 142: 1-123.