

# Albatrellus syringae and A. peckianus (Albatrellaceae): taxonomic remarks and world distribution

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A detailed study of the closely related *Albatrellus syringae* (Parmasto) Pouzar and *A. peckianus* (Cke.) Niemelä revealed differences in anatomy, which, in addition to those already known, may be of help in species determination. Thus the cutis of the cap, and the tissue structures of the stipe, can help in a more secure discrimination. Both species are saprobic, and *A. syringae* probably also can act as a root necrotroph. *Albatrellus syringae*, an expanding taxon in North Europe since the 1960s, has also emerged in southern Europe, in the Russian Far East, and in northern and western North America. *Albatrellus peckianus* seems to be an American endemism, distributed within the North American hardwood forests including the Great Lake Region. Both species are mapped on a world scale. Some vouchers from other parts of the world, claimed to be of *A. peckianus*, did not possess the anatomical features specific to it. Although resembling *A. peckianus*, or *A. syringae*, they represent taxa unknown to us.

Key words: *Albatrellus*, distribution, ecology, Europe, North America, taxonomy

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## Introduction

Since *Albatrellus syringae* (Parmasto) Pouzar was recognized as a separate taxon by Parmasto (1962), it has gradually become familiar to at least Fennoscandian mycologists, thanks to an increasing number of new observations in these countries (Mathiassen et al. 2000, Granmo & Mathiassen 2001). Though other European records are few, it has also been reported from Austria, Estonia, France and Italy, and, in addition, the Russian Far East. The North American counterpart to *A. syringae* has been recognized as *A. peckianus* (Cooke) Niemelä, described from the northeastern US some 130 years ago (Peck 1874: 68, as *Polyporus flavidus*). This polypore is usually slightly paler than the former, but otherwise resembles *A. syringae* very much.

A comprehensive study of *Albatrellus syringae* in Fennoscandia and the Baltic region (Granmo & Mathiassen 2001), made it necessary to reconsider also *A. peckianus*. The very similar outer morphology of these species, and few discriminating microscopical details (cf. Niemelä 1970), stimulated to a search for additional features, presented here.

## Material and methods

The following herbaria have been requested for vouchers: Armenia: ERE. Austria: GZU, IB, W. Azerbaijan: BAK. Bulgaria: SOMF. Canada: DAOM. China: HKAS, HMAS, NM. Czech Republic: BRNU, OLP, PRM. Georgia: TBI. Germany: B, LZ, M, REG, STU. Hungary: BP. Italy: AQUI, FIPF, HUBO, MIPV, PAD, PI, RO. Japan:

SAPA, TFM, TMI. Kazakhstan: AA. Moldavia: CHIS. Netherlands: L. Romania: BUCH, IAGB. Russia: LECB, MAG, MW, NSK, PERM, PTZ, SYKO, TK, VLA, VU. Slovakia: SAV. South Korea: SNU. Switzerland: ZT. Turkmenistan: ASH. Ukraine: KHER, KW. U.S.A.: NYS. Yugoslavia: BEO.

A locality list of the Fennoscandian and Estonian specimens of *Albatrellus syringae* has previously been provided by Granmo & Mathiassen (2001). All extra-European collections have been studied unless otherwise stated (n.v. = not seen). We have not seen fresh basidiocarps of *A. peckianus*, and the comparison between it and *A. syringae* is made on dry specimens. Microscopic details were measured and observed in water. The terminology of the tissue types (textura) are in accordance with Hawksworth et al. (1995).

## Results and discussion

### Taxonomy

Several specimens of *Albatrellus peckianus* are clearly distinguished from *Albatrellus syringae* by being much paler: pale ochre pileus and stipe, the pileus lacking the pure pale brown tint, as well as zones and adpressed fibrils or scales, typical of *A. syringae*. However, colour is a strongly variable character, and in desiccated material may also differ according to drying conditions, and the time elapsed before being put to drying. The stipe of *A. syringae* is usually shorter (shorter than the diameter of the cap) than in *A. peckianus* (stipe equalling or longer than the diameter of the cap; cf. Ginns 1994: 87). The stipe of *A. peckianus* is minutely tomentose according to Gilbertson & Ryvarden (1986: 104), while it is stated to be glabrous in *A. syringae* (Ryvarden & Gilbertson 1993: 97). Our observations revealed a short tomentum in both species, at least in some parts of the stipe, making this character useless in discriminating the species. We examined in detail the cutis of the cap, and also the hyphal structures in the stipe of both species. Thin slices ('scalps') of the cutis were further studied in surface view.

### Cutis

(1) The cutis of *Albatrellus syringae* is 30–50  $\mu\text{m}$  thick. In surface view the tissue is golden yellow or brownish yellow, with radially oriented hyphae intermixed with crisscross running individual hyphae, often with swellings (up to 20  $\mu\text{m}$  wide) and glued together. This dense network approaches a textura intricata, where individual

hyphae are not easily discernible. Individual cells are almost impossible to trace from one septum to another, but a few were measured to be 20–40  $\mu\text{m}$  long, with clamps. Some hyphal ends were even seen to be oriented perpendicularly in the cutis. Scalp sections of the cutis will easily crumble and fracture.

(2) The cutis of *Albatrellus peckianus* is about 20  $\mu\text{m}$  thick (3–5 cell layers). In surface view the tissue is a pale yellow, lax textura porrecta, with individual hyphae equally thick, easily discernible, and usually several hyphae are running nearly parallel. Individual cells are 30–90  $\mu\text{m}$  long, 4.5–7  $\mu\text{m}$  wide, and have conspicuous clamps. Scalp sections of the cutis are always easy to slice, and will not easily crumble or fracture. – The structural difference in the cutis may be partly explained by the more frequent occurrence of gloeoplerous hyphae in the cutis of *A. syringae* than in *A. peckianus*.

### Stipe

(1) The stipe of *Albatrellus syringae* has two different layers of tissue, while *A. peckianus* usually has three layers:

(2) Both species have an outermost layer of textura intricata. In *A. syringae* it is (20–)30–60(–100)  $\mu\text{m}$  thick, and in *A. peckianus* 120–210  $\mu\text{m}$  thick. In *A. syringae* the outermost hyphae of this layer are yellowish brown, very often glued together to a mass, and lacking a distinct structure.

(3) The innermost layer in *A. syringae* must be considered a textura prismatica, while in *A. peckianus* it consists of a loosely packed and undulating textura porrecta. In *A. syringae* the individual hyphae of this layer are more inflated, with a larger diameter and thinner walls (0.8–1.2  $\mu\text{m}$  thick) compared to *A. peckianus* (1.5–2  $\mu\text{m}$  thick).

(4) An easily discernible transition zone with  $\pm$  parallel hyphae between the outer textura intricata layer and the innermost layer was observed only in *A. peckianus*, not in *A. syringae*.

We have found the anatomical differences listed above to be useful supplementary characters in discriminating herbarium specimens of *Albatrellus syringae* and *A. peckianus*. In addition we have used spore characters when basidiospores were accessible, as previously referred to by Niemelä (1970). There is obviously a possibility to confuse these species in geographical regions

where both occur, as in North America. Relying on morphological characteristics we consider these taxa as well defined species. However, as for molecular investigation, we lack data to support this opinion. Thus Bruns et al. (1998) investigated the ML5–ML6 region of the mitochondrial large subunit rRNA gene of a large number of basidiomycetes, among which were also species of *Albatrellus*. In their phylogram the clade *Albatrellus ellisii*, *A. flettii* and *A. skamianus* were supported by 71 % of the bootstrap replicates, while *Polyporoletus sublividus*, *Albatrellus syringae* and *A. peckianus* were supported by 100 %. However, the substitutions between the two latter species of *Albatrellus* were the same in this study, indicating no species difference but their close relationship. Investigation of another sequence region might, however, have elucidated a difference worth discrimination at some level. The close phylogenetic relationship between *Albatrellus* and *Polyporoletus* was anticipated by Gilbertson & Ryvarden (1987).

#### *Excluded specimens*

A Chinese specimen (HMAS 23806S) claimed to be *Albatrellus peckianus* from the Quinghai (= Tsinghai) province, Qui-Lian Mts. ('on ground in woods', leg. Qi-ming Ma 561 30 July 1958), though very fragmented, is not this species, nor *A. syringae* or *A. henanensis*. It is fragile, and has a very thick (120–150 µm), dull, waxy cutis. Contextual hyphae with clamps were noted, as well as gloeoplerous hyphae (6–8 µm thick). Unfortunately no well-developed basidiospores could be found. Teng's report of *A. peckianus* from the Tsinghai province: 'On ground under spruce in moist ravines' (Teng 1996: 369), may refer to this material.

Two collections from Japan in herb. O of suggested *Albatrellus peckianus* do not belong to this taxon. The specimens have more affinity to *A. syringae*, with basidiospores of the same type and magnitude as in that species (4–5 × 3–4 µm in *A. syringae*, versus 3–4 × 2.5–3 µm in *A. peckianus*). However, the very thin cutis of the cap, consisting of a textura intricata lacking any sign of a radial arrangement, with hyphae with distinct walls, not being substantially glued together, and with several openings (c. 30 µm in diam.) in the tissue, are not reconcilable with the Nordic specimens of *A. syringae*. A comparison of fresh specimens would be desirable.

Zhao and Zhang (1991) described *Albatrellus henanensis* J.D. Zhao & X.Q. Zhang from China, and pointed to its similarity with *A. syringae*. To judge from their drawing, however, *A. henanensis* lacks gloeoplerous hyphae, and also clamps on the generative hyphae. Additionally it has larger pores (2–3 per mm), and basidiospores as well, viz. 5.5–7.5 × 4.5–6 µm. In all these characters *Albatrellus henanensis* differs from both *A. syringae* and *A. peckianus*.

#### **Ecology**

In Fennoscandia *Albatrellus syringae* is a ruderal species, and is most frequently found on lawns in gardens, cemeteries and parks, while records from natural vegetation are scarce (Granmo & Mathiasen 2001). In Finland it has been recorded from blueberry spruce forest on limestone, and in Norway in *Alnus incana* woods or *Betula-Salix* thickets, and spruce forest. In the Northern boreal subzone in Fennoscandia it has been recorded at altitudes of c. 400 m at Abisko (Sweden) in the north, and c. 700 m at Geilo (Norway) in the south; neither of the places is far from the timberline. In subarctic Siberia it has been observed in *Salix* thickets, and also under *Alnus fruticosa*, and once in a ruderal site in Kamchatka (Knudsen pers. info.). In Canada the occurrence on humus under *Alnus* was reported by Ginns (1997), and also in 'mixed conifers', besides other, disturbed sites (edge of logging road, gravel roadside). Thus, the type of natural vegetation common in these far distant areas are the *Alnus-Salix* woods, and occasionally coniferous forest, both characteristic for the Boreal region.

The nutritional strategy of *Albatrellus syringae*, judged from North European records, is that of a saprobe, producing white rot, and it probably also acts as a root necrotroph (Granmo & Mathiasen 2001). This is in accordance with observations from America, too (Ginns 1997), and support the cultural observations of Niemelä (1970) and Stalpers (1992).

Judged from the vouchers studied in herb. DAOM of *Albatrellus peckianus*, and documentation from herbarium labels, the species is frequently connected with decaying stumps of hardwoods, and woody debris like small sticks and root fragments. The species is certainly a decomposer of partly buried wood in the soil (cf. also Overholts 1953, Stalpers 1992, and Ginns 1994, 1997).

## Biogeography

### *Albatrellus syringae*

When *Albatrellus syringae* eventually was reported for the first time from northwestern North America (Ginns 1997), it turned out that it had been collected in British Columbia, Canada as early as in 1961. That was about the time the species started to expand in Fennoscandia. The first find from Alaska dates back to 1970 (cf. Stalpers 1992). There are no published reports from Russia so far (Vasilyeva, pers. info.). However, it has been recorded from a locality in Siberia, and one in Kamchatka (Knudsen, Læssøe, pers. info.). The occurrences in western Canada may be linked with the Russian Far East localities through Alaska. This faces us with a North Temperate species with two apparently separated main distribution areas, one in northwestern Europe, the other comprising Russian Far East,

Alaska and western Canada (Fig. 1). Though one cannot exclude a possible man-made introduction to North America, the huge disjunction in Eurasia may be questioned. Nevertheless, no Russian occurrences of this species were known to any of several Russian mycologists applied to. It may well be, however, that the species exists, but is rarely fruiting, or plays a minor role in the ecosystem of the Taiga zone forests. There is also the possibility that the species may inhabit areas which are seldom visited by mycologists, for instance northern floodplains at the big Siberian rivers (Kotiranta & Niemelä 1996).

Because the climate of the boreal zone is fairly similar to the climate of montane regions in Middle Europe, the scattered occurrences at high altitudes south of the boreal zone, as in Europe, are expected, and it is justified to characterize it as a boreal-montane species (Granmo & Mathiassen 2001).



Fig. 1. World distribution of *Albatrellus syringae* and *A. peckianus*.

Explanation: *Albatrellus syringae*: Obliquely hatched area and dots. *Albatrellus peckianus*: Cross-hatched area and square.

*Albatrellus peckianus*

Overholts (1953: 219) reported *Albatrellus peckianus* from the following states in the U.S.A.: Minnesota, New York, Vermont, Wisconsin, and, as second-hand information, from Tennessee. Ginns (1994) reported it from northern Michigan. In Canada it is known from Quebec and Manitoba (Overholts 1953), and Ontario (v.i.). Thus *A. peckianus* has a distribution closely coinciding with the northern hardwood forest region in North America (cf. map in Gilbertson & Ryvarden 1986, from Duffield 1982). This is a much more restricted distribution than of *A. syringae*, and so far known the species is endemic for this region. Its distribution complies well with the 'eastern deciduous forest endemics' of North American fungi, as defined by Redhead (1989).

*Albatrellus syringae* and *A. peckianus* in North America are still geographically separated (Fig. 1). The localities of *A. syringae* are in the western part so far, mostly at high altitudes. However, having in mind the rapid spread of *A. syringae* in Fennoscandia one might well imagine a future extension towards the east, eventually resulting in partly overlapping areas of distribution of both species.

*Specimens examined**Albatrellus syringae* (Parmasto) Pouzar

**EUROPE. Austria.** Tyrol, vorderes Geschnitztal Jun 1988 Moser (IB). **France.** Haut-Savoie: Chamonix, Boid du Boucher 1000 m alt. Jul 1998 Lequin, Jul 2000 Gannaz (Herb. Max Pieri). **Italy.** South Tyrol, Anterselva (Bolzano) Aug 1986 Giaccone (herb. AMB Bolzano). Val di Casies (Bolzano) 1100–1200 m alt. Aug 1987 Lanzoni 4703 (HUBO), Aug 1992 Bernicchia 5786 (HUBO). Near San Candido (Innichen) Aug 2000 Rossi (herb. AMB Bolzano).

**NORTH AMERICA. U.S.A. Alaska:** Camp Denali near Kantishna (63° 30' N, 151° W; N of Mt. McKinley Nat. Park) Jul 1970 van der Laan (L 0065849, sub *Albatrellus peckianus*; cf. Stalpers 1992: 538). Bird Flats Sep 1971 Wells-Kempton 5625 (MICH, n.v.; cf. Ginns 1997: 272). **Canada. Yukon:** South Canol Road km 104, near Rose River crossing no. 1 (61° 10' N, 132° 59' W) Aug 1980 Ginns 5307 & Cody (DAOM 179299). Thistle Creek at Yukon River (63° 06' N, 139° 29' W) Jul 1984 Ginns 8558 & Cody (DAOM 214972). **British Columbia:** Glacier Park Beaver River (51° 16' N, 117° 31' W) Aug 1961 Harrison 6224 (MICH, n.v.; cf. Ginns 1997: 272). **Alberta:** Kananaskis Co.: Smith-Dorrien area: Watridge Lake trail Aug 1992 Danielson 3899 (DAOM 216918; by Ginns, 1997: 272, erroneously

ly cited as Danielson 3879 (= DAOM 216915), which should apply to *A. subrubescens* from 'Three Point Creek').

*Albatrellus peckianus* (Cke.) Niemelä

**NORTH AMERICA. U.S.A. New York State:** 'Eastern U.S.' Sep 1910 ex Lloyd 10250 (NYS). 'Collected in New York State' Aug–Sep 1956 Phelps (NYS). – Otsego Co.: Worcester s.a. Peck, sub *Polyporus flavidus* Peck, & *Griphola peckiana* (Cooke) Murr. 'TYPE' (NYS). E. Worcester Jul s.a. Peck 'TYPE' (NYS). – Schoharie Co.: Summit Sep s.a. Peck (NYS). **Canada. Quebec:** Gatineau Co.: Gatineau, Farmer's Rapids Jul 1932 Mounce F. 2344 (DAOM). G. Park, Etienne Brule Lookout Aug 1971 Malloch, Champlain Lookout Sept 1971 Ginns 1762, Meach Lake Sep 1978 Ginns 4128, Pink's Lake Sep 1988 Oliver (DAOM 138790, 137997, 170517, 198787). Cantley Sep 1970 Lowe 15034 (L 0065845), Aug 1973 Ginns 2322 (L 0065850), Aug 1989 Ginns 9405 (DAOM 210656), Ginns' Farm Sept 1970 Ginns 1597 (DAOM 133215, L 0065847); additional 9 coll. by Ginns from this location in the period 1970–1993 in DAOM. Cantley, Range 12 Lot 4c Aug 1969 Ginns 1336 (L 0065846, DAOM 137775); additional 5 coll. by Ginns from this location in the period 1969–1971 in DAOM. – L'Islet Co.: Hydnum Woods, St. Aubert Sep 1943 Jackson (DAOM 11768), Sep 1946 Groves, Groves & Jackson (DAOM 17037, 52170), Elgin Road Sep 1948 Jackson (DAOM 73377). Mont. Ste. Bruneau Prov. Park Sep 1978 Neumann (DAOM 169143). **Ontario:** Ottawa Sep 1891 Macoun (NYS, sub *Polyporus peckianus* Cooke, *Griphola fractipes* (Bre.) Murr.). Pakenham Sep 1951 Groves (DAOM 100726). Fallowfield Aug 1961 Groves MKN 61-59 (DAOM 125389). – Peel Co.: Bolton Aug 1976 Campbell TRTC 47612 (DAOM 159614). Petawawa F.E.S. Sep 1939 Skolko 39-1079 (DAOM 125288). Kanata Goulbourne Side Rd. Sep 1981 Ginns 6362 (DAOM 180894). Dunrobin Jul 1956 Groves MKN 56-5 (DAOM 52321; possible culture in CBS, cf. Stalpers 1992: 538), Jul 1959 Groves (DAOM 72041). 1.6 km E of Belfountain Sep 1976 Malloch (DAOM 160090). Belfountain Sep 1976 Oort (L 0065848). – Renfrew Co.: Shaw Woods (nr. Eganville) Sep 1987 Ginns 8942 (DAOM 197346). Portland Murphy Bay, Big Rideau Lake Aug 1961 Groves (DAOM 72389).

**Excluded specimens: China.** Qinghai: Qi-Lian Mts. on ground in *Picea* wood 30 July 1958 Ma (HMAS 23806(S), sub *Albatrellus peckianus*). **Japan.** Hokkaido prefecture: Lake Akan Sep 1994 Núñez 638 (O, sub *A. peckianus*). Daisetsu National Park Aug 1995 Núñez 936 (O, sub *A. peckianus*).

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