



A. Ascomata on twig of *Abies* sp. B. Ascumatal hair, detail of tip. C. Ascus initials. D. Asci and paraphyses. E, F. Ascus and ascospores. [B–F at same magnification; all material from IMI 364906a.]

**Lachnellula calyciformis** (Batsch) Dharne, *Phytopathologische Zeitschrift* **53**(2): 124 (1965).

*Elvella calyciformis* Batsch, *Elenchus Fungorum Continuatio Prima*: 195 (1786).

*Peziza calyciformis* (Batsch) Willd., *Flora Berolinensis Prodrromus Secundum Systema Linneanum a Thunbergio Emendatum Conscriptus*: 404 (1787) [see also E.M. FRIES, *Systema Mycologicum* **2**(1): 91 (1822)].

*Otospora calyciformis* (Batsch) Hedw., *Descriptio et Adumbratio Microscopico-analytica Muscorum Frondosorum nec non Aliorum Vegetantium e Classe Cryptogamica Linnaei Novorum Dubiisque Vexatorum. Stirpium Cryptogamicarum* **2**: 64 (1789).

*Helotium calyciforme* (Batsch) Wettst., *Botanisches Zentralblatt* **31**: 285 (1887).

*Dasyscyphus calyciformis* (Batsch) Rehm, *Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz* Aufl. 2, **1**(3) Ascomyceten: Hysteriaceen und Discomyceten: 834 (1893) [as 'Dasyscypha'].

*Trichoscypha calyciformis* (Batsch) Grélet, *Revue de Mycologie Paris* **16**: 87 (1951).

*Habit* occurring singly or in clusters, breaking out from bark of dead twigs and small branches, often on detached fallen brushing trash or branches broken by wind or snow, usually not buried but rather on upper surfaces, sometimes also on cankers of living trees. *Conidiomata* often overlooked, light-coloured, compact, ± globose, later developing into teleomorph initials, producing conidia within pale yellow to orange-yellow labyrinthiform cavities. *Conidiophores* colourless, thin-walled, smooth, verticillately branched. *Conidiogenous cells* colourless, thin-walled, smooth, subulate, 10–15 × 1.5 µm, producing conidia by non-progressive replacement wall-building apex 'phialide' development. *Conidia* colourless, aseptate, thin-walled, smooth, oblong ellipsoidal, 2–5 × 1–2 µm. *Ascomata* generally bright and rather conspicuous, apothecial, with white flanks, when young curled up, becoming cup-shaped and, finally, curled up when dry but opening widely in humid conditions to expose yellow or orange-yellow concave saucer-shaped hymenial surface, circular when viewed from above, 1–4 mm diam., short-stalked when viewed from side, with white excipulum covered in conspicuous white hairs that later sometimes become greyish or slightly yellowish. In *mid-point vertical section* ectal excipulum composed of coalescing colourless, rather irregularly arranged, hyphal cells up to 11 × 3–5 µm, forming *textura epidermoidea*, medullary excipulum composed of loosely woven thin-walled hyphae forming *textura intricata*. *Hairs* colourless, with finely granulated surface, septate, cylindrical, 3–4 µm wide. *Asci* containing eight ascospores arranged in single row, with only one visible wall layer, thin-walled, cylindrical to clavate, rounded at apex, tapering gradually towards base, 50–63 × 4–5.5 µm, blueing of apex in iodine not observed, opening by small apical pore. *Ascospores* colourless, smooth, aseptate, ellipsoid or fusoid, 4–7.5 × 2.5–3.5 µm. *Paraphyses* colourless, smooth, septate, cylindrical, unbranched, slightly wider towards apex, a little longer than asci, 60–70 × 1.5 µm, containing yellow to yellowish-orange globules.

**DISEASE:** This species has been associated with damaging cankers on *Pinus contorta* in Denmark, with bark necroses formed especially around branch whorls, where they usually tapered towards both ends. With further development, larch canker-like wounds or swellings on the stems sometimes formed, but more often very long bark necroses developed. At some localities plantations were nearly totally destroyed. Attacks began when trees were around 15 years old, when branch suppression starts, and were exacerbated by frost (FERDINANDSEN & JØRGENSEN, 1938). Assessing this report, ROLL-HANSEN (1979) considered that the fungus entered through dead tissue possibly killed by frost, and worsened the damage. *Lachnellula calyciformis* was reported as pathogenic on *Pinaceae* in the former Soviet Union (RAITVIIR, 1980) and has also been reported as causing some damage to *Abies* (OGUCHI, 1981a) and *Pinus pumila* and *P. strobus* in Japan (OGUCHI, 1979, 1981b). In these Japanese outbreaks, damage caused by the settling and creeping of snow provided a focus for infection.

The fungus is, however, generally regarded as a saprobe, with most observations of it as fruitbodies erumpent from bark of dead twigs and small branches, usually from spring to autumn, but also sometimes in winter in oceanic climates and, exceptionally, in continental climates (PROKHOROV, 2000).

**HOSTS:** *Abies alba*, *A. amabilis*, *A. balsamea*, *A. cephalonica*, *A. concolor*, *A. firma*, *A. grandis*, *A. holophylla*, *A. homolepis*, *A. mariesii*, *A. nordmanniana*, *A. pectinata*, *A. sachalinensis*, *A. sibirica*, *A. veitchii*, *Abies*

sp.; *Larix decidua*, *L. gmelinii*, *L. gmelinii* × *L. leptolepis*, *L. occidentalis*; *Picea abies*, *P. excelsa*, *P. glehnii*, *P. jezoensis*, *P. sitchensis*, *Picea* sp.; *Pinus attenuata*, *P. banksiana*, *P. contorta*, *P. montana*, *P. monticola*, *P. mugo*, *P. mugo* var. *pumilio*, *P. nigra*, *P. nigra* var. *poiretiana*, *P. ponderosa*, *P. pumila*, *P. pumilio*, *P. radiata*, *P. rigida*, *P. strobus*, *P. sylvestris*, *Pinus* sp.; *Pseudotsuga menziesii*, *P. taxifolia*; *Tsuga heterophylla* (*Pinaceae*). Also reported exceptionally on *Sorbus* (*Rosaceae*). Other associated organisms observed: *Herpotrichia nigra*; *Sclerophoma pythiophila*.

**GEOGRAPHICAL DISTRIBUTION:** NORTH AMERICA: Canada (British Columbia, Ontario, Québec), USA (Arizona, California, Colorado, Idaho, Massachusetts, Michigan, New Hampshire, New York, Oregon, Pennsylvania). ASIA: China (Heilongjiang, Sechuan, Shaanxi), Georgia, Japan, Russia (Primorskyi krai, Sakhalinskaya oblast). AUSTRALASIA: New Zealand. EUROPE: Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Great Britain, ?Hungary, Ireland, Italy, Latvia, Luxembourg, Netherlands, Norway (including Svalbard), Russia (Leningradskaya oblast, Moscovskaya oblast), Slovakia, Sweden, Switzerland, Ukraine. There are further records from the former Soviet Union for which the current country cannot be identified. Highest altitude recorded: 1300 m.

**PHYSIOLOGICAL SPECIALIZATION:** None reported, but OGUCHI (1981c) provided descriptions of the appearance of isolates in pure culture.

**TRANSMISSION:** Not known, but presumably by wind-dispersed ascospores. OGUCHI (1981c) noted that conidia germinate on malt extract agar, from which it may be guessed that they too have some dispersal function.

**NOTES:** Macroscopically, all white-haired species of *Lachnellula* tend to look alike, and a confident identification can only be made by microscopic examination. The combination of white hairs and ascospores measuring 4–7.5 × 2.5–3.5 µm distinguishes this species from other members of the genus occurring on *Coniferales*. A colour photograph of ascomata of this species can be found in BREITENBACH & KRÄNZLIN (1984, photo 230, p. 197). DHARNE (1965) reported that the fungus can be isolated into pure culture and, on 2% malt extract agar, forms cottony white mycelium, producing the anamorph *in vitro* after 40–50 days. OGUCHI (1981c) noted that ascomata were produced within 4–6 months of incubation.

There is one literature-based record of this fungus from Altaiskyi krai on bark of *Sorbus* (PROKHOROV, 1999) and another on boards and driftwood from Svalbard (HUHTINEN, 1993) for which the author has not seen specimens. The identity of records on *Pseudotsuga* has been questioned (BARAL, 1984). This species was included in a study of phylogenetic relationships of *Lachnum* and some related genera using sequence analysis of partial 18S rDNA (YU & ZHUANG, 2003), and was included in a review on polyploidy in discomycetes (WEBER & BRESINSKY, 1992). Results indicated that it belonged in a group with a low bootstrap value (57%) along with various species of *Lachnum*, *Albotricha guangxiensis*, *Calycellina populina*, *Cistella grevillei*, *Hyaloscypha aureliella*, *Parachnopeziza guangxiensis* and *Trichopeziza sulphurea*, but no conclusions were made about its relation with other members of the genus *Lachnellula*.

*Lachnellula calyciformis* is known mainly from some northern hemisphere mountainous, temperate or boreal areas, almost universally on *Pinaceae*. In Europe it is clearly widespread, though no records have been found for some mountainous areas: the Apennines, Balkans, Carpathians, Iberian peninsula, Massif Central of France, Pyrenees, Tatras or Urals – all areas with some tradition of mycology. It is not included in lists of fungi from the Atlas Mountains of Africa, and there seem to be no records from mountainous regions of Afghanistan, Bhutan, India, Iran, Iraq, Kazakhstan, Kirgizstan, Korea, Mongolia, Nepal, Pakistan, Tadzhikistan, Turkey or Uzbekistan. It has also apparently not been recorded on native or introduced pines from Central America, the Caribbean, México, the southern USA or tropical Asia, although it has been recorded as an exotic introduction to New Zealand.

The conservation status of this species has never been assessed, but there is no evidence of any change in its distribution or frequency of occurrence. Its connexion with the snow mould fungus *Herpotrichia nigra* and distribution restricted to mountainous, temperate or boreal areas, from which some adaptation to cold

may be inferred, may make it vulnerable to climate change. Where it has been introduced inadvertently as an exotic, there is no evidence of it being a problem.

In addition to cited literature and internet sources, the information in this description sheet is derived from specimens in the **IMI** and **K** fungal reference collections and the author's computerized database of around 800,000 records of fungi and other organisms.

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See also the following internet sites:

[www.hfri.bibai.hokkaido.jp/kanko/kenpo/pdf/kenpo19-9.PDF](http://www.hfri.bibai.hokkaido.jp/kanko/kenpo/pdf/kenpo19-9.PDF) [description, distribution, hosts, illustration]

<http://nzfungi.landcareresearch.co.nz/html/mycology.asp?ID=37-HKN-55> [distribution]

[http://priede.bf.lu.lv/grozs/Prakse/Kolkas\\_senes.doc](http://priede.bf.lu.lv/grozs/Prakse/Kolkas_senes.doc) [distribution]

<http://moritz.botany.ut.ee/lectures/mukoloogia/seente.sustemaatika.konspekt.pdf> [distribution]

<http://pnwfungi.wsu.edu/programs/aboutDatabase.asp> [hosts, distribution]

[http://sevlauqu.club.fr/images/Lachnellula\\_calyciformis.jpg](http://sevlauqu.club.fr/images/Lachnellula_calyciformis.jpg) [illustration]

[http://sevlauqu.club.fr/images/Lachnellula\\_calyciformis2.jpg](http://sevlauqu.club.fr/images/Lachnellula_calyciformis2.jpg) [illustration]

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