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CONVENTION ON THE CONSERVATION OF EUROPEAN WILDLIFE
AND NATURAL HABITATS

Standing Committee

Datasheets of threatened mushrooms of Europe, candidates for listing in Appendix I of the Convention

Document established by
The European Council for Conservation of Fungi (ECCF)

Contents

1. Foreword

On the 9th September 1997, the French Ministry of Foreign Office gave me an agreement to represent the J.E.C in the standing committee.

Member of the standing committee O.N.G., I proposed the inclusion of fungi in annexe 1 of Bern Convention, and in December 1998, I was commissioned to carry out a study on the threatened mushrooms of Europe, document T-PVS (99) 39, presented in the 19th meeting. The following was the proposal at the 20th meeting in November 2000, to put forward an amendment for inclusion of mushrooms in annexe I in the 21st session 2001.

The French delegate, Mrs Herrenschmidt, and the Sweden delegate, Mr Larsson, were proposed to present the amendment, and after consultation it was agreed that Mrs Herrenschmidt (with the help of the expert committee of J.E.C -E.C.C.F) will present this document to the Bern Convention for the 21st session.

I would like to thank on behalf of fungi all the people who helped me in coordinating this proposal and especially Mr Eladio Fernández-Galliano, Head of the Natural Heritage Division, and all the mycologists mentioned in this document .

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He is present in the 21st cession 2001 in Strasbourg and can present to the delegation colour documents.

2. Introduction

Fungi are quite often neglected in nature conservation and in the evaluation of habitats. Various reasons may explain this situation:
1. Fungi are extremely numerous in species, the ratio between fungi and plants in natural habitats ranging around 6:1.
2. Many species are difficult to determine, especially in the field.
3. Most fungal fruitbodies are ephemeral and species may remain unrecorded for years as a result of unfavourable fruiting conditions, although they are present and biologically active.
4. Mycological inventories therefore need years of intensive fieldwork so that nature-managers often discard fungi from their action plans because of technical difficulties.

However, fungi are now recognised to have crucial roles in natural ecosystem functioning:
1. They are involved in a wide range of symbioses : about 85 % of the Earth's vascular plants form mycorrhizae with fungi; this is the most vital of their ecological roles – without fungi, there would be no forests nor any structured natural habitats.
2 .Fungi are primary agents of organic matter decomposition, allowing nutrient recycling and release of essential elements back into the ecosystem.
3. Fungi are involved in primary soil formation; they modify soil permeability, aggregation, ionic exchange and water-retention.
4. They are a source of food for a very wide range of animals, both vertebrate and invertebrate (not to mention the consumption of wild mushrooms by man).
5. They enhance seed germination through erosion of the seed skin.

Fungi also have crucial roles in human ecosystem functioning, such as
6. Providing key metabolites for industrial applications, especially for pharmaceutical companies (the discovery of antibiotics caused the major historical revolution in medicine).
7. Being integral to bioremediation through metabolism and accumulation of toxic materials.
8. Taking part in the global economy through the pharmaceutical industry, biotechnological processes, agriculture, forestry and the food industry.

Because of these important attributes fungi clearly deserve special attention in the conservation process, the more so since many species are very rare and restricted to special, often threatened habitats. Moreover many species are decreasing in large parts of their geographical range as a result of habitat destruction, changing land use and environmental pollution.

In Europe the number of macrofungi, producing large and visible fruitbodies, is about 8,000. Only these fungi are considered for this proposal. In addition several thousands of microfungi are found in Europe. Specific mycological activities in Europe have now yielded a good level of knowledge about threats, decline or regional extinction affecting macrofungi. For 25 years, mycologists from across Europe have formed an informal but effective network, the European Council for Conservation of Fungi (ECCF), to compare their results in this field and to elaborate common strategies. For about 10 years, a careful selection of priority species has been conducted.

The present document is the result of this long-term collaboration between specialists in mycology and nature conservation. The selection of the proposed species is mainly based on information in the many available national and regional Red Data Lists of threatened species. A survey of these lists is added as an appendix to this proposal. Furthermore, only well-defined species with conspicuous, often large fruitbodies are included, so that monitoring of these species is a realistic option.

The proposed list of 33 species comprises European priority species, for which threat is identified, management can be efficiently adapted and conservation effort would yield a clear benefit to the concerned ecosystems. Priority habitats for the proposed species include old-growth forests, forests on very poor soils, bogs and swampy forests, unfertilised meadows, calcareous grasslands and sand dunes.

The introduction of these species into the Bern Convention Appendix would be a major contribution to nature conservation and would recognise the crucial value of fungi in the planet’s ecosystem. However, it should be stressed that in fact many more species are threatened and in need of protection on a European scale. Over three thousand species are listed as threatened or susceptible on at least one national Red List in Europe. A preliminary selection of candidates for a European Red List comprised 284 species. Therefore this proposal should be regarded as only the first step on a long way to go in order to achieve effective conservation of biodiversity of fungi and their natural habitats.

Prof. Dr. Régis Courtecuisse, Chairman ECCF

3. Scientific coordination committee and draft proposal list

3.1. Finland — **Dr Heikki Kotiranta**
Finnish Environment Institute, Helsinki – Delegate ECCF

3.2. France — **Prof. Dr. Régis Courtecuisse**
Department of Botany, Faculty of Pharmaceutical and Biological Sciences, Lille – Chairman ECCF
Jean-Paul Koune
Strasbourg – Delegate ECCF – ONG Bern Convention – Vice-Chairman JOC

3.3. Germany — **Dr Peter Otto**
University of Leipzig, Botanical Institute, Leipzig – Delegate ECCF

3.4. Italy — **Dr Claudia Perini**
Department of Environmental Science, University, Siena – Secretary ECCF

3.5. The Netherlands — **Dr Eef Arnolds**
Biological Station, Center for Soil Ecology, University, Wageningen – Delegate ECCF

3.6. Russian Federation — **Dr Alexander Kovalenko**
Laboratory of Systematics and Geography of Funghy, Komarov Botanical Institute of the Russian Academy of Sciences, St Petersburg – Delegate ECCF

3.7. Sweden — **Anders Bohlin**
Trollhättan, Member of the Mycological Expert Committee of the Swedish threatened Species Unit – Delegate ECCF

3.8. Switzerland — **Dr Béatrice Senn-Irlet**
Swiss Federal Research Institute WSL, Birmensdorf – Delegate ECCF

3.9. United Kingdom — **Shelley Evans**
Myco Services, BMS Conservation Officer, Salisbury – Delegate ECCF

3.10. Consulate partners

3.10.1. Finland — Esteri Ohenoja
Botanical Museum, University of Oulu, Oulu – Delegate ECCF

3.10.2. Germany — Walter Pätzold
Mycology school, Hamburg

3.10.3. Great Britain — Maurice Rotheroe
Cambrian Institute of Mycology, BMS Deputy Conservation Officer, Lampeter, Wales, United Kingdom – Delegate ECCF

3.10.4. Hungary — Imre Rimòczi
University of Horticulture and Food Industry, Dept of Botany, Budapest

3.10.5. Italy — Dr Francesco Bellù
Bolzano

3.10.6. Czech Republic — Miroslav Beran
Mycology, Museum South Bohemia, Cèskè Budèjovice

Information covering endangered fungi in 30 European countries can be consulted in the Council of Europe document T-PVS (99) 39.

Relevant literature on individual species follows each species description, in chronological order.

4. List of fungi

4.1. *Amanita friabilis* (P. Karst.) Bas

Fr. Amanite friable
Eng. Fragile Amanita
Ger. Erlen-Scheidenstreifling

Agaricales

Short characteristic
A small fly-agaric with grey cap with ash-grey spots. Stipe with a basal swelling, and sometimes lacking volva.

Description
Pileus 2-6 cm broad, grey to grey-ochraceous or sepia, striate at margin, with minute fugacious, ash-grey flocks all over or mainly at disk. Lamellae free, crowded, white. Stipe 4-12 x 0.6-1.5 cm, slender, bulbous, with a basal volva, very fragile and often reduced or even lacking, grey to ash-grey. Spore print white.

Distribution and status
Widespread in Europe, from northern Scandinavia southwards to Spain and Italy, eastwards to western Russia, Estonia, Latvia and Slovakia, but rare everywhere. Not known outside Europe.

Habitat
Mycorrhizal with alder (*Alnus glutinosa*, *A. incana*, *A. crispa*) in alder-swamps (*Alnion*, *Alno-Padion*), also with *A. viridis* in the subalpine zone of Central Europe.

Utilisation
None

Fruiting period
Mainly August-October

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Austria, Estonia, Germany, Great Britain, Norway, Sweden, Switzerland, The Netherlands.

In regional lists of endangered fungi in
BELGIUM: Flanders; FINLAND: Ahvenanmaa, Järvi-Suomi, Pohjanmaa; FRANCE: Pays-de-la-Loire; GERMANY: Brandenburg, Mecklenburg-Vorpommern, Rheinland-Pfalz, Schleswig-Holstein, Thüringen.

Threat
Drainage of wetlands, eutrophication of surface-water, deforestation, planting of other tree species (mainly *Populus* and *Picea*).

Care
Maintenance or restoration of high groundwater levels; protection of sites against clear-cut and plantation forestry.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Reid, D.A. –1987- New or interesting Records of British Hymenomycetes. VII. *Not. Roy. Bot. Garden Edinburgh* 44(3): 505;
Fraiture, A. –1993- Les *Amanitopsis* d'Europe. *Op. Bot. Belg.* 5: 101-103;
Larsson, K.H. (ed.) –1997- *Rödlistade svampar i Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 21;
Corriol, G. –1999- Deux espèces rares des milieux humides dans une réserve biologique domaniale de la forêt de Rambouillet. *Bull. Soc. Mycol. Fr.* 115(2): 205-208.

4.2. *Amylocystis lapponica* (Romell) Bondartsev & Singer

Fr. Polypore lapon
Eng. –
Lappländischer Saftporling

Poriales

Short characteristic
A medium sized polypore with annual, soft fruitbodies with a striking odour.

Description
Basidiocarps annual, pileate, margin sometimes lobed, medium sized, normally no longer than 15 cm along the wood and 8 cm across, sappy when fresh with a pleasant odour of *Ledum palustre*, hard when dry. Upper surface at the beginning cream coloured later more or less spotted with rusty brown areas, hairy. Pore surface at first dirty white, later brownish especially when bruised, pores very small, 2-3 pro mm.

Distribution and status
Widespread in the taiga-region from Scandinavia and East-Europe to Siberia, Russian Far East (Kamchatka) and the United States, but rare and localised.

Habitat
Saprotrophic on old dead logs and trunks of spruce (*Picea*) in virgin coniferous forests.

Utilisation
None

Fruiting period
Autumn

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Czech Republic (also protected by law)/Slovakia, Estonia, Finland, Norway, Poland, Sweden.

Threat
The loss of virgin forests caused by forestry.

Care
Protection of old-growth forests against exploitation by forestry.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Kotiranta, H. & Niemelä, T. –1996- *Uhanalaiset käävät Suomessa* (Threatened polypores in Finland): 29-30. Oy Edita Ab, Helsinki;
Larsson, K.H. (ed.) –1997- *Rödlistade svampar i Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 27. ArtDatabanken, SLU, Uppsala.

4.3. *Antrodia albobrunnea* (Romell) Ryvarden

Fr. Tramète blanc et brun
Eng. –
Ger. Weissbraune Tramete

Poriales

Short characteristic
A perennial, crust-like polypore, about hand-sized, corky, with a pleasant smell of dried apples.

Description
Basidiocarp up to 10 cm broad, resupinate, 1-4 mm thick. Margin at first greyish white, woolly, later resin coloured or almost black. Pore surface pale greyish brown, old parts rusty brown. Subiculum cottony, dark brown towards the wood, pale greyish brown towards the pores. Pores small, about 5 – 10 pro mm.

Distribution and status
Mainly in northern Europe through Siberia to the western United States. Rare, for instance in European Russia (only in Karelia – 4 records); also recorded from Belarus.

Habitat
On very old *Pinus* logs and trunks in old-growth forests on oligotrophic soils.

Utilisation
None

Fruiting period
Perennial

In national lists of endangered fungi in
Finland, Norway, Poland, Sweden.

Threat
Loss of pine dominated old-growth forests and old trees due to forestry.

Care
Protection of old-growth forests against exploitation by forestry; prevention of air pollution and application of fertilisers.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Kotiranta, H. & Niemelä, T. –1996- *Uhanalaiset käävät Suomessa* (Threatened polypores in Finland): 59-60. Oy Edita Ab, Helsinki;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar i Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 31. ArtDatabanken, SLU, Uppsala.

4.4. *Armillaria ectypa* (Fr.) Emel

Fr. Armillaire des marais
Eng. Marsh Honey Fungus
Ger. Moor-Hallimash

Agaricales

Short characteristic
A rather large agaric with brown, squamulose pileus, easily distinguished from related species by lack of ring, growth solitary or in loose groups and occurrence in bogs, usually among *Sphagnum.*

Description
Pileus 3.5-10 cm, convex then applanate, ochraceous brown to brown, slightly paler towards the striate margin, centre dark brown, fibrillose-squamulose. Lamellae moderately crowded to distant, adnate or emarginate, pale cream or pinkish. Stipe 7-10 x 0.7-1.3 cm, subclavate, fistulose, pale brown, minutely pruinose to fibrillose, without veil remnants. Context white. Spore print whitish.

Distribution and status
Rare in northern, western and central Europe. Also recorded from Japan.

Habitat
Probably saprotrophic in mesotrophic peat bogs and fens, usually among living *Sphagnum.*

Utilisation
None

Fruiting period
July-October

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Austria, Czech Republic (also protected by law)/Slovakia, Denmark, Finland, Germany, Great Britain, Sweden, Switzerland (extinct), The Netherlands

In regional lists of endangered fungi in
GERMANY: Baden-Württemberg, Bayern, Brandenburg, Mecklenburg-Vorpommern, Rheinland-Pfalz

Threat
Changes in groundwater regimes in and around bogs, eutrophication of groundwater, peat digging.

Care
Protection of bogs against peat digging and drainage of surrounding areas.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Termorshuizen, A.J. [*in* Bas, C. et al. (eds.)] –1995- *Flora Agaricina Neerlandica* 3: 38-39. Rotterdam, Brookfield;
Larsson, K.H. (ed.) –1997- *Rödlistade svampar i Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 39. ArtDatabanken, SLU, Uppsala.

4.5. *Boletopsis grisea* (Peck) Bondartsev & Singer

Fr. –
Eng. –
Ger. Grauer Russporling

Thelephorales

Short characteristic
Medium-sized to rather large, terrestrial polypore with stipitate, annual, fleshy fruitbodies with grey colours.

Description
Basidiocarps annual, fleshy, with a short, mostly central stipe. Pileus 5-15 cm broad, pale greyish, often brownish grey at centre , only slightly paler than hymenium, often cracked into indistinct scales. Pore surface when young pale greyish white, when bruised or old pale greyish brown with pink hue, pores 3 – 4 pro mm. Stipe 3-7 x 1-3 cm, central to excentric, solid, grey to grey-brown, smooth or squamulose. Context white, rather soft at first.

Distribution and status
Widespread in boreal pine forests, but in most regions rare, for instance in European Russia only known from Karelia (2 records). Also rare in mountains of Central Europe and the Canary Islands. It extends its range into boreal Asia and North America.

Habitat
Mycorrhizal with *Pinus sylvestris* in pine dominated forests with lichens or *Ericaceae* on very poor, acidic soils.

Utilisation
None

Fruiting period
August until November

In national lists of endangered fungi in
Germany, Norway, Sweden

In regional lists of endangered fungi in
GERMANY: Brandenburg, Mecklenburg-Vorpommern.

Threat
Deforestation of oligotrophic pine forests; air pollution, in particular nitrogen deposition; use of fertilisers and liming to enlarge timber production.

Care
Reduction of air pollution; durable forest management.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Niemelä, T. & Saarenoksa, R. –1989- On Fennoscandian polypores 10. *Boletopsis leucomelaena* and *B. grisea* described and illustrated. *Karstenia* 29: 12-28;

Larsson, K.H. (ed.). –1997- *Rödlistade svampar i Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 48. ArtDatabanken, SLU, Uppsala.

Taxonomic note
Boletopsis grisea has been confused in the past with the related species *B. leucomelaena* (Pers.) Fayod. However the two species are readily distinguished. *B. leucomelaena* differs in less compact habit; much darker, initially blackish pileus, strongly contrasting with paler hymenium; soft, easily breaking context and several microscopic characters. *B. leucomelaena* grows mostly associated with *Picea* and has a more southern distribution. See further the references.

4.6. *Boletus dupainii* Boudier

Fr. Bolet de Dupain
Eng. Dupain's Bolete
Ger. Blutroter Hexenröhrling

Boletales

Short characteristic
A very striking bolete with smooth, lively blood-red, as lacquered looking cap and strongly colour-changing flesh from pale to blue.

Description
Pileus up to 12 cm, viscid and shiny, blood-red to scarlet then fading to ochraceous red. Tubes yellow then olive greenish, bluing. Pores orange then red to orange-yellow, bluing. Stipe up to 10 x 5 cm, yellowish and reticulate upwards, reddish or bright red and red dotted elsewhere. Context pale yellow, more or less bluing.

Distribution and status
Rare in central and southern Europe, thermophilic, mostly in southern France and the Mediterranean area, northwards to southern Germany, also in Russia in northern Caucasus. Not known outside Europe.

Habitat
Mycorrhizal with frondose trees in warm, calcareous woods (*Castanea, Fagus, Quercus*).

Utilisation
Indicated by some authors as edible, by others as suspect or slightly poisonous. In any case not harvested on a large scale and without commercial value.

Fruiting period
July-November

In national lists of endangered fungi in
Austria, Germany, Hungary

In regional lists of endangered fungi in
GERMANY: Bayern, Saarland

Threat
Deforestation, coniferous plantations, forest fires.

Care
Adequate protection of thermophilic deciduous forests; management restrictions on sites with this species.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Engel, H., Krieglsteiner, G.J., Dermek, A. & Watling, R. –1983- *Dickröhrlinge, Die Gattung* Boletus *in Europa*: 87-90. H. Engel, Weidhausen;
Breitenbach, J. & Kränzlin, F. –1991- *Pilze der Schweiz* 3 : 54, pl. 7. Mykologia, Luzern.

4.7. *Bovista paludosa* Lév.

Fr. Boviste des marais
Eng. Fen Bovist
Ger. Moor-Bovist

Lycoperdales

Short characteristic
A small, pale, subglobose to pyriform puffball, often more or less stipitate, characterised by occurrence in bogs.

Description
Basidiocarps subglobose to pyriform or capitate, 1-3 cm broad, 1.5-6 cm high, snow-white when young with a more or less smooth surface. At maturity the outer surface of the basidiocarp (exoperidium) turns into thin whitish patches or appressed warts on a yellowish brown to bronzy blackish brown inner surface (endoperidium). Capillitium inside of endoperidium olive-brown to brown.

Distribution and status
Widely distributed in northern, western and central Europe but rare, mostly in montane, boreal and subalpine regions, southwards to northern Italy and Montenegro, eastwards to Carpathians. Absent from the West-European lowland. Also known from Asia in the Himalaya range and from northern North America.

Habitat
Saprotrophic amongst mosses in calcareous marshes (fens).

Utilisation
None

Fruiting period
Late summer and autumn

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Austria, Czech Republic (also protected by law)/Slovakia, Estonia, Finland, Germany, Great Britain (extinct), Norway, Poland, Sweden, Switzerland.

In regional lists of endangered fungi in
GERMANY: Baden-Württemberg, Bayern, Brandenburg, Mecklenburg-Vorpommern.

Threat
Draining of wetlands, peat digging, decreased mowing of fens.

Care
Prevention of drainage and peat digging in fens, maintenance of mineral-rich seepage water and durable management to prevent invasion of trees.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Kreisel, H. –1967- Taxonomisch-pflanzengeographische Monographie der Gattung Bovista. *Beih. Nova Hedwigia* 25: 1-244;
Pegler, D. N., Laessoe, T. & Spooner, B. –1995- *British Puffballs, Earthstars and Stinkhorns*: 134-135, figs 101, 102. Royal Botanic Gardens, Kew;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar I Sverige – Artfakta.* (Swedish Red Data Book of Fungi 1997): 62. ArtDatabanken, SLU, Uppsala;
Gminder, A., Krieglsteiner, G.J. & Winterhoff, W. –2000- *Die Großpilze Baden-Württembergs.* Band 2: 128, photograph. Stuttgart.

4.8. *Cantharellus melanoxeros*

Fr. Chanterelle noircissante
Eng. Blackening chanterelle
Ger. Schwärzender Pfifferling

Cantharellales

Short characteristic
A rather small to medium sized chanterelle with a yellowish cap and stipe, contrasting with the pinkish to violaceous underside; entire fruitbody blackening when bruised.

Description
Pileus 2-6(-10) cm broad, turbinate at first then flattened to depressed with lobed, undulate margin, vividly yellow, ochre-yellow to yellow-brown, dry. Hymenium subdecurrent with numerous narrow, blunt ridges, furcate to the margin, lilac-pink to grey-violet. Stipe 3-5 x 0.5-1.8 cm, subcylindrical or tapering downwards, often compressed, solid, usually somewhat deeper yellow than the pileus, often with pink or lilac tones, glabrous. Context pale cream to pale pink, blackening in age and when exposed to the air, especially under cortex. All parts of basidiocarp blackening in places when bruised.

Distribution and status
Rare, mainly in central and northern Europe, also in Great Britain and Italy. Not known outside Europe.

Habitat
Mycorrhizal with *Fagus* and *Quercus* in deciduous forests on rich, calcareous soils.

Utilisation
Edible and picked by mushroom hunters as accidental side-harvest. Due to rare occurrence of no commercial value. The influence of harvesting on the populations is unknown.

Fruiting period
July-November

In national lists of endangered fungi in
Austria, Denmark, Finland, Germany, Norway, Sweden.

In regional lists of endangered fungi in
FRANCE: Haute-Normandie, Nord – Pas-de-Calais, Pays-de-la-Loire; GERMANY: Baden-Württemberg, Bayern.

Threat
Acidification due to air pollution, coniferous plantations.

Care
Management restrictions on sites of this species; reduction of air pollution.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Monthoux, P.O. & Röllin, O. –1978- *Cantharellus ianthinoxanthus* et *melanoxeros*, deux espèces distinctes. *Schw. Zeitschr. Pilzk.* 56: 145-149;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar I Sverige – Artfakta.* (Swedish Red Data Book of Fungi 1997): 76. ArtDatabanken, SLU, Uppsala;
Pegler, D.N., Roberts, P.J. & Spooner, B.M. –1997- *British chanterelles and tooth fungi*: 30-31, figs 17-18. Royal Botanic Gardens, Kew;
Neville, P. & Alpago-Novello, L. –1998- Deux taxons souvent confondus à tort, *Cantharellus melanoxeros* Desm. et *C. ianthinoxanthus* (Maire) Kühner. *Bull. Soc. Mycol. Fr.* 114: 1-28.

Taxonomic note
This species has been confused in the past with the related *C. ianthinoxanthus* (R. Maire) Kühner. The latter species is readily distinguished by the non blackening basidiocarps, the colour of the stipe, which is whitish at first and then pinkish-lilac, and slightly larger spores. See further the references.

4.9. *Cortinarius ionochlorus* Maire

Fr. Cortinaire vert et violet
Eng. –
Ger. Violettblättriger Klumpfuss

Cortinariales

Short characteristic
A striking, medium sized agaric with olive green cap and yellow-green stipe with remains of veil, contrasting with lilac lamellae, with characteristic odour.

Description
Pileus 5-8 cm, convex then plano-convex, olive green with greenish yellow margin, shining, darkening from the centre with age. Lamellae adnexed, crowded, lilac. Stipe 3-5 x 1-1.5 cm, cylindrical with marginate bulb, up to 2.5 cm, yellow-green with remains of deeply yellow-green veil. Context greenish yellow. Smell particular, recalling rubbed leaves of *Asarum europaeum.* Spore print rusty brown.

Distribution and status
Mainly in south Europe, but northwards to southern Germany, rare.

Habitat
Mycorrhizal with broad-leaved trees, mainly in thermophilous, undisturbed, evergreen deciduous forests, e.g. with *Quercus ilex* on calcareous soil; in Germany with *Fagus.*

Utilisation
None

Fruiting period
Autumn

In national lists of endangered fungi in
Germany

In regional lists of endangered fungi in
GERMANY: Bayern, Sachsen-Anhalt, Schleswig-Holstein.

Threat
Nitrogen deposition, acidification, changed land-use, possibly forest fires.

Care
Adequate protection of old, evergreen mediterranean forests; reduction of air pollution.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Courtecuisse, R. & Duhem, B. –1994- *Guide des champignons de France et d'Europe* : 338, fig. 1177. Delachaux et Niestlé, Lausanne, Paris;
Brandrud, T.E., Lindström, H., Marklund, H., Melot, J. & Muskos, S. –1998- Cortinarius *Flora Photographica*. Part 4: D06. Cortinarius HB, Matfors.

4.10. *Entoloma bloxamii* (Berk. & Broome) Sacc.

Important synonym:
Entoloma madidum
sensu auct.

Fr. Entolome de Bloxam
Eng. Bloxam's Entoloma
Ger. Blauer Rötling

Agaricales

Short characteristic
A medium sized to rather large agaric, well-characterised by the blue pileus and stipe in combination with pink lamellae.

Description
Pileus 3.5-8 cm, conico-convex to flattened, often with broad umbo, not hygrophanous, deep blue or greyish blue when young, then violaceous blue, becoming more brownish with age, not translucently striate, dry and smooth to radially fibrillose. Lamellae crowded, almost free, whitish at first, then salmon pink to flesh colour. Stipe 4-7 x 1-2.5 cm, tapering downwards, solid, steel blue to violaceous blue, gradually discolouring more brownish, base whitish or yellow. Context firm, white inside. Smell and taste farinaceous. Spore print brownish pink.

Distribution and status
Widely distributed in Europe but rare, from the lowlands up to montane zone. Also recorded from North-America and Asia.

Habitat
Saprotrophic, mainly in poor, old, unfertilised meadows and hayfields on calcareous, loamy soils; in southern Europe also in broad-leaved forests.

Utilisation
None

Fruiting period
August-November

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Austria, Denmark, Germany, Great-Britain, Italy, Lithuania, Norway, Sweden, Switzerland, The Netherlands.

In regional lists of endangered fungi in
FRANCE: Haute-Normandie, Nord – Pas-de-Calais, Pays-de-la-Loire; GERMANY: Baden-Württemberg, Bayern, Hessen, Niedersachsen, Saarland, Sachsen, Thüringen.

Threat
Discontinuing maintaining, agricultural improvement, afforestation.

Care
Continued traditional cultivation with grazing or hay-making and no addition of fertilisers or soil disturbance.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Noordeloos, M.E. [*in* Bas, C. et al. (eds.)] –1988- *Flora Agaricina Neerlandica* 1: 96-97. A.A. Balkema, Rotterdam, Brookfield;
Breitenbach, J. & Kränzlin, F. –1995- *Pilze der Schweiz* 4: 56, pl. 12. Mykologia, Luzern;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar I Sverige – Artfakta.* (Swedish Red Data Book of Fungi 1997): 204. ArtDatabanken, SLU, Uppsala.

4.11. *Geoglossum atropurpureum* Batsch: Fr.

Important synonym:
Thuemenidium atropurpureum
(Batsch: Fr.) O. Kuntze

Fr. Géoglosse pourpre-noir
Eng. Dark Purple Earth Tongue
Ger. Schwarzrote Erdzunge

Leotiales

Short characteristic
A slender, clavate earth-tongue with purplish black colours.

Description
Ascocarps slenderly clavate to fusiform or subcylindrical, 3-9.5 cm high, 0.7-1.5 (2) cm broad. Upper part fertile, up to 7 cm long, compressed and usually wrinkled lengthwise, smooth, dry, reddish brown, purplish brown, purplish black to blackish brown. Stipe up to 3 cm long, 0.2-1 cm broad, not sharply separated from fertile part, not compressed, smooth to squamulose, concolorous with fertile part.

Distribution and status
Rare, mainly in central, northern and western Europe. Also recorded from Macaronesia and North America.

Habitat
Saprotrophic in old, unfertilised grasslands and grass-heath communities on acidic to subneutral, sandy and loamy soils, in pastured as well as mown grasslands; sometimes reported from forests and forest clearings.

Utilisation
None

Fruiting period
August-December

In national lists of endangered fungi in
Finland, Germany, Great-Britain, Hungary, Sweden, Switzerland, The Netherlands.

In regional lists of endangered fungi in
BELGIUM: Flanders; GERMANY: Brandenburg, Nordrhein-Westfalen, Sachsen, Sachsen-Anhalt, Thüringen.

Threat
Discontinuing maintaining, agricultural improvement, afforestation of abandoned grasslands.

Care
Continued management by grazing or mowing with removal of the sward; avoiding of fertiliser application and soil disturbance.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Breitenbach, J. & Kränzlin, F. –1984- *Pilze der Schweiz* 1: 132, pl. 134. Mykologia, Luzern;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar I Sverige – Artfakta.* (Swedish Red Data Book of Fungi 1997): 236. ArtDatabanken, SLU, Uppsala.

4.12. *Gomphus clavatus* (Pers.: Fr.) Gray

Fr. Chanterelle violette
Eng. Pig's Ear
Ger. Schweinsohr

Gomphales

Short characteristic
A highly characteristic fungus with fairly large, lilac, club-shaped fruitbodies with flattened apex.

Description
Basidiocarps 40-100 x 20-70 mm, flattened obconical or clavate to slightly infundibuliform, usually solid, occasionally split lengthwise, ear-shaped. Upper side first tomentose, violet then discolouring yellow-brown with lilac tinge. Hymenium with low, furcate ridges or wrinkled, lilac-violet to flesh-colour. Context soft, white. Smell and taste weak. A good edible species, harvested in many regions.

Distribution and status
In large parts of Europe, but lacking in the western European lowland; in Russia very rare. Mainly growing in montane to subalpine areas; in some regions, e.g. the Swiss Alps, not uncommon and fruiting in large quantities in some years. Strongly decreasing in large parts of Central Europe. Also recorded from Asia and North America.

Habitat
Mycorrhizal with coniferous trees (*Abies*, *Picea*) and with beech (*Fagus*) in mature coniferous and deciduous forests on calcareous and subneutral, loamy soils and clay, mainly in the montane and subalpine zones.

Utilisation
The fruitbodies are edible and tasty and often collected by mushroom hunters for private consumption. Without commercial value.

Fruiting period
August until November

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Austria, Bulgaria, Denmark, Estonia, Finland, Germany, Great Britain, Hungary, Latvia, Norway, Poland, Sweden.

In regional lists of endangered fungi in
FRANCE: Nord – Pas-de-Calais (extinct); GERMANY: Baden-Württemberg, Bayern, Brandenburg, Hessen, Mecklenburg-Vorpommern, Niedersachsen, Nordrhein-Westfalen, Rheinland-Pfalz, Sachsen, Sachsen-Anhalt, Schleswig-Holstein, Thüringen.

Threat
Acidification and eutrophication of forest soils, probably also harvesting.

Care
Reduction of air pollution, limitation or prohibition of harvesting.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Lange, L. –1974- The Distribution of Macromycetes in Europe. *Dansk Botanisk Arkiv* 30 (1): 1-105;
Breitenbach, J. & Kränzlin F. –1986- *Pilze der Schweiz* 2: 368, pl. 480. Mykologia, Luzern;
Dähncke, R.M. –1993- *1200 Pilze*: 1025. AT Verlag, Aarau;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar I Sverige – Artfakta.* (Swedish Red Data Book of Fungi 1997): 245. ArtDatabanken, SLU, Uppsala;
Otto, P. *et al.* –1998- Karten zur Pilzverbreitung in Ostdeutschland. 15. Serie: Ausgewählte Arten der *Cantharellales* s.l. *Gleditschia* 26: 105-143.

4.13. *Hapalopilus croceus* (Pers.: Fr.) Donk

Important synonym:
Auratioporus croceus (Pers.: Fr.) Murrill

Fr. Polypore safran
Eng. Orange Polypore
Ger. Safrangelber Weichporling

Poriales

Short characteristic
A large, annual polypore, with striking orange colours and soft flesh.

Description
Basidiocarp broadly attached, up to 20 cm wide, 15 cm long and 6 cm thick at the base, soft when fresh, brittle when dry. Upper surface pale orange at first, hairy, then orange-brown and smooth. Tubes 0.5-1.5 cm long, with rather small pores, 2-3 pro mm, reddish orange, drying orange-brown. Whole basidiocarp becoming cherry-red in contact with KOH.

Distribution and status
Widespread from Great Britain through central and eastern Europe, northwards up to the oak-limit, southwards to Italy. Known from seven regions of European Russia, also from Belarus and northern Caucasus. Everywhere very rare. Also known from North America.

Habitat
A weak parasite on very old deciduous trees, surviving saprotrophic on dead trunks for many years, in Fennoscandia and most other regions only growing on *Quercus* but also known from *Castanea* and *Robinia.*

Utilisation
None

Fruiting period
Early summer until autumn

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Armenia, Austria, Czech Republic/Slovakia, Denmark (extinct), Estonia (also protected by law), Germany, Great Britain, Latvia, Lithuania, Norway, Poland (extinct),Sweden (also protected by law), Switzerland, Yugoslavia.

In regional lists of endangered fungi in
GERMANY: Baden-Württemberg, Brandenburg, Hessen, Niedersachsen, Rheinland-Pfalz, Sachsen-Anhalt, Schleswig-Holstein.

Threat
Felling of old oak trees, cutting of old stands of natural, deciduous forests.

Care
Forest reserves including old *Quercus* stands can secure the survival of this beautiful species.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Jahn, H. –1979- *Pilze die an Holz wachsen*: 122-123. Baranek & Frost, Herford;
Ryvarden, L. & Gilbertson, R.L. –1993- *European Polypores* 1: 300-302. Fungiflora, Oslo;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar i Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 45. ArtDatabanken, SLU, Uppsala.

4.14. *Haploporus odorus* (Sommerf.: Fr.) Bondartsev & Singer

Important synonym:
Haploporus suaveolens (L.: Fr.) Donk
[non *Trametes suaveolens* (Fr.) Fr.]

Fr. Polypore odorant
Eng. Aniseed Polypore
Ger. Wohlriechender-Weidenporling

Poriales

Short characteristic
A medium sized, thick, perennial, whitish polypore with very strong, characteristic smell of anise.

Description
Basidiocarp pileate, hoof-shaped, up to 15 cm broad and 7 cm radius, perennial, corky hard or when old almost woody-hard, sharp-edged. Upper surface when young matted, pure white or ivory white, later becoming dark grey or black in oldest parts. Pore surface white or creamy white, pores 4 – 5 pro mm. Context up to 2 cm thick, whitish, zoned. Taste bitter; smell very pleasant and strong, anise-like.

Distribution and status
Rare in taiga-region in North-Europe through Siberia; for instance known from 4 regions of European Russia; also rare in North America.

Habitat
On old, large willows (*Salix caprea*) in mixed old forests, often close to moist depressions or along small brooks.

Utilisation
None

Fruiting period
Perennial

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Armenia, Finland, Norway, Sweden (also protected by law).

In regional lists of endangered fungi in
RUSSIA : Leningrad Region.

Threat
Cutting of old *Salix caprea* trees.

Care
Salix caprea is almost the only host tree and old trees should be protected also in commercially managed forests.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Kotiranta, H. & Niemelä, T. –1996- *Uhanalaiset käävät Suomessa* (Threatened polypores in Finland): 48-49, pl. 13. Oy Edita Ab, Helsinki;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar i Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 251. ArtDatabanken, SLU, Uppsala.

4.15. *Hericium erinaceum* (Bull.: Fr.) Pers.

Fr. Hydne hérisson
Eng. Monkey Head
Ger. Igel-Stachelbart

Hericiales

Short characteristic
A large to very large tooth fungus, made up of several layers of long, white spines, growing on old trees.

Description
Basidiocarp sessile or with short stipe, annual, up to 25 cm across, comprising one or more large, apileate clusters of long, pendent spines originating from a large, white bulbous tissue. Hymenium of teeth or spines, 1-4 cm long, white becoming yellowish brown in age. Context soft, fleshy, white, becoming yellowish brown with age.

Distribution and status
Widespread in Europe, from the lowland up to the montane zone, north to southern Scandinavia; generally rare, for instance in Switzerland (5 records between 220 and 930 m) and Austria (4 records from the Vienna region, altitude 150m). Locally more common, e.g. in southern England and the central part of the Netherlands. Also recorded from Asia and North America.

Habitat
Growing as a weak parasite on trunks and thick branches of old, standing deciduous trees, mainly *Quercus* and *Fagus*, often in old wounds, often high above the ground and fruiting many years on the same tree. It occurs in old, deciduous forests but also on planted trees in parks and along roadsides.

Utilisation
Young fruitbodies are edible and occasionally harvested by mushroom hunters. The species is also cultivated on a small scale and sold on European markets. Also inoculum is occasionally offered for cultivation at home. The commercial value is limited.

Fruiting period
Summer until autumn, sometimes persisting through winter.

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Armenia, Austria, Bulgaria, Denmark, Germany, Great Britain, Greece, Macedonia, Poland, Sweden (also protected by law), Switzerland, The Netherlands.

In regional lists of endangered fungi in
BELGIUM: Flanders; FRANCE: Haute-Normandie (extinct), Nord – Pas-de-Calais, Pays-de-la-Loire; GERMANY: Baden-Württemberg, Bayern, Brandenburg, Hessen, Mecklenburg-Vorpommern, Niedersachsen, Nordrhein-Westfalen, Rheinland-Pfalz, Saarland, Sachsen, Sachsen-Anhalt, Schleswig-Holstein, Thüringen.

Threat
Intensive forest use (silviculture), cutting of old *Fagus* and *Quercus* trees, also along roads and in parks for safety reasons. The rarity of this species is caused by scarcity of old growth forests in the belt of deciduous trees.

Care
Conservation of old, deciduous woodlands and solitary trees.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Marchand, A. –1976- *Champignons du nord et du midi* 4: pl. 336. Hachette, Perpignan;
Jahn, H. –1979- *Pilze die an Holz wachsen*: 78, pl. 42. Baranek & Frost, Herford;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar i Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 257. ArtDatabanken, SLU, Uppsala;
Pegler, D.N., Roberts, P.J. & Spooner, B.M. –1997- British chanterelles and tooth fungi: 56-57, figs 39-41. Royal Botanic Gardens, Kew.

4.16. *Hohenbuehelia culmicola* M. Bon

Fr. Pleurote des chaumes
Eng. Marram Oyster
Ger. Halm-Muscheling

Agaricales

Short characteristic
A small agaric with dark cap and eccentric to lateral stipe, growing on *Ammophila* culms in coastal sand dunes.

Description
Pileus 0.5-2.5(-4) cm, kidney-shaped to flabelliform or circular, ochre to blackish brown, velvety. Stipe 0.2-2 x 0.2-1 cm, eccentric to lateral, short, black brown, villose. Lamellae decurrent, rather distant, whitish with white to brown edge. Context white, but in pileus with dark, gelatinous layer under upper surface. Smell farinaceous when cut; taste farinaceous. Spore print white.

Distribution and status
Rare in coastal areas of Northwest-Europe. Not known outside Europe.

Habitat
Saprotrophic on the base of culms of *Ammophila* in coastal dunes.

Utilisation
None

Fruiting period
October-January

In national lists of endangered fungi in
Denmark, Great Britain, The Netherlands.

In regional lists of endangered fungi in
FRANCE: Nord – Pas-de-Calais; GERMANY: Schleswig-Holstein.

Threat
Disturbance of sandy coasts by recreation facilities, coastal management (fixing of natural dynamics).

Care
Protection of natural coastline.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Watling, R. & Gregory, N. –1987- *Brit. Fung. Fl.* 6 : 42. Royal Botanic Gardens, Kew;
Elborne, S. [*in* Bas, C. et al. (eds.)] –1995- *Flora Agaricina Neerlandica* 3: 162. Rotterdam, Brookfield.

4.17. *Hygrocybe calyptriformis* (Berk. & Broome) Fayod

Fr. Hygrophore en capuchon
Eng. Pink Waxcap
Ger. Rosenroter Saftling

Agaricales

Short characteristic
This agaric is unmistakable by the medium large, entirely pinkish red fruitbodies with conical pileus and thickish lamellae.

Description
Pileus 2.5-6(-7) cm, acutely conical at first, then conico-convex to campanulate with acute umbo, margin first involute, then horizontal to revolute and often lacerate, entirely pink to reddish pink with lilac tone, innate-fibrillose, viscid when moist. Lamellae subdistant, thickish, free or adnexed, ventricose, concolorous with pileus, then discolouring whitish. Stipe 5-10(-12) x 0.5-1 cm, cylindrical, fistulose, pale pink or whitish, fibrillose striate lengthwise, dry. Context in pileus pink, in stipe whitish, fragile, fibrillose. Smell and taste weak, not distinctive. Spore print white.

Distribution and status
Widespread in Europe, lacking in the northwestern European lowland, rare everywhere, for instance only one locality known in Russia (Urals), also recorded from Ukraine, Latvia and Lithuania. Also known from Asia and North-America.

Habitat
Old, undisturbed, unfertilised meadows and hayfields from the coast up to the alpine zone.

Utilisation
The species is regarded as edible but not tasty. It is rarely harvested by mushroom hunters and without commercial value.

Fruiting period
August-November

In national lists of endangered fungi in
Austria, Denmark, Germany, Great-Britain, Italy, Poland, Switzerland, Yugoslavia.

In regional lists of endangered fungi in
BELGIUM: Flanders; FRANCE: Haute-Normandie (extinct), Nord – Pas-de-Calais, Pays-de-la-Loire; GERMANY: Baden-Württemberg, Bayern, Saarland**.**

Threat
Discontinuing maintaining of grasslands, agricultural improvement, afforestation of abandoned grasslands.

Care
Continued management by grazing or mowing with removal of the sward.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Breitenbach, J. & Kränzlin, F. –1991- *Pilze der Schweiz* 3: 102, pl. 80. Mykologia, Luzern;
Boertmann, D. –1995- The Genus *Hygrocybe*: 136-137. Svampetryk, Greve, Denmark.

4.18. *Hygrophorus purpurascens* (Alb. & Schw.: Fr.) Fr.

Fr. Hygrophore pourpré
Eng. Purple-red Hygrophorus
Ger. Beschleierter Schneckling

Agaricales

Short characteristic
A rather large agaric with whitish to pinkish fruitbodies with characteristic purple spots all-over, the stipe with a fugacious, curtain-like ring.

Description
Pileus 3-10 cm broad, hemispherical to conico-convex with involute margin, then plano-convex with umbo, on white to pale pink background with numerous small purplish or vinaceous spots to somewhat squamulose, slightly viscid. Lamellae distant, broadly adnate to subdecurrent, cream at first, then purple or reddish spotted, especially along the margin. Stipe 4.5-10 x 1-2.5 cm, cylindrical, solid, white to pale pink, then with purplish spots, initially connected with margin of pileus with white cortina, leaving a fugacious, fibrillose annulus under the apex. Context firm, white. Smell and taste weak, not distinctive. Spore print white.

Distribution and status
Very rare in Europe, at present restricted to North Europe and the Central-European mountains. Formerly in a few places in the West-European lowlands (e.g. The Netherlands). Swiss records are from 1000 to 1600 m in the alpine cantons and the northern prealps; in northern Italy also at lower altitudes. No recent Austrian records. In European Russia only known from Kursk region and Urals. Also recorded from Ukraine. A different ecotype (var. *cedretorum* Maire) occurs with *Cedrus* in the Atlas mountains, North-Africa. The species is also reported from Southeastern Asia and North America.

Habitat
Mycorrhizal with *Picea alba* in coniferous forests on limestone, mainly in pastures with scattered trees.

Utilisation
None

Fruiting period
June until October

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Austria, Finland, Germany, Norway, Sweden, Switzerland, The Netherlands (extinct).

In regional lists of endangered fungi in
GERMANY: Baden-Württemberg, Bayern, Rheinland-Pfalz, Saarland.

Threat
Changing land management, especially intensive agriculture on formerly extensive pasture grounds with scattered trees.

Care
Continued traditional management (extensive grazing, hay-making) on the sites; avoiding disturbance of soil and application of fertilisers.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Galli, R. –1985- *Gli igrofori delle nostre regioni*: 100. La Tipotecnica, S. Vittore Olona, Italia;
Cetto, B. –1994- *I Funghi dal vero* 6: 453, pl. 2435. Arti Grafiche Saturnia, Trento;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar I Sverige – Artfakta.* (Swedish Red Data Book of Fungi 1997): 294. ArtDatabanken, SLU, Uppsala.

4.19. *Laricifomes officinalis* (Vill.: Fr.) Kotl. & Pouzar

Important synonym:
Fomitopsis officinalis (Vill.: Fr.) Bond & Sing.

Fr. Polypore officinal
Eng. –
Ger. Lärchen-Porling

Poriales

Short characteristic
A very large polypore with perennial, hoof-shaped fruitbodies, at first whitish, gradually darker to almost black, with a bitter taste.

Description
Basidiocarp perennial, pileate, hoof-shaped, 5-40(-65) cm high and up to 20 cm broad, 3-15 cm radius. Upper surface at first creamy white, smooth, later almost black in oldest parts, deeply cracking. Very old fruitbodies turn chalky. Pore surface creamy white, smooth, when vigorously growing with acid guttation droplets, pores 4 – 5 pro mm, but especially when old difficult to discern. Tubes 0.5-1 cm long, forming a new layer each year; old tubes in up to 70 layers. Taste very bitter, smell slightly acid.

Distribution and status
Rare in the native distribution area of *Larix*, in the Central-European mountains from 950 to 2050 m altitude, for instance in the subalpine areas of Switzerland and Austria (only three records) and spreading through northern European Russia (Arkhangelsk Region) into Siberia and Russian Far East (Kamchatka). Also a few records on introduced larch trees outside the mountains, for instance in The Netherlands. Also recorded from North America.

Habitat
In Europe a weak parasite on very old trees of *Larix decidua*, almost exclusively in natural, subalpine forests, exceptionally in plantations. In Siberia and Russian Far East also on other larch (*Larix* spp.) species.

Utilisation
Occasionally collected as decorative curiosity and for preparation of traditional medicine. No commercial value.

Fruiting period
Perennial

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Austria, Germany, Poland, Switzerland (also protected by law), The Netherlands.

In regional lists of endangered fungi in
GERMANY: Bayern. RUSSIA : Komi Republic.

Threat
Logging of subalpine forests, loss of habitat by constructing ski-runs and other infrastructure for winter sport, collecting of fruitbodies.

Care
L. officinalis fruits only on very old trunks of larches and areas with such trees should be protected. Prohibition of collecting of fruitbodies.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Jahn, H. –1979- P*ilze die an Holz wachsen*: 150, pl. 123. Baranek & Frost, Herford;
Breitenbach, J. & Kränzlin, F. –1986- *Pilze der Schweiz* 2: 316, pl. 401. Mykologia, Luzern.

4.20. *Leucopaxillus compactus* (Fr.) Neuhoff

Important synonym:
Leucopaxillus tricolor (Peck) Kühner

Fr. Leucopaxille tricolore
Eng. –
Ger. Dreifarbiger Krempentrichterling

Agaricales

Short characteristic
A very large agaric with a convex, ochre-yellow pileus with involute margin and a very thick stipe.

Description
Pileus 8-15(-20) cm, hemispherical with strongly involute margin at first, then convex to plano-convex, margin involute, often sulcate, ochre-yellow, often with greenish tone, tomentose, later with brown spots, cracking in places showing context underneath. Lamellae rather crowded, adnate to slightly decurrent, often interconnected, green-yellow then ochre-yellow, often with lacerate edge. Stipe 4-10 x (1-)2-6 cm, clavate to bulbose, solid, whitish with ochre-yellow spots, tomentose. Context compact, whitish. Smell unpleasant, acidulous-herbaceous. Spore print white.

Distribution and status
Rare in central and northern Europe, including Estonia, Latvia and Lithuania. Also known from North America.

Habitat
Saprotrophic, terrestrial in deciduous woods on calcareous ground.

Utilisation
None

Fruiting period
Summer until autumn

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Austria, Bulgaria, Denmark (extinct), Finland, Germany, Latvia, Lithuania, Norway, Sweden, Switzerland.

In regional lists of endangered fungi in
FRANCE: Haute-Normandie; GERMANY: Baden-Württemberg, Bayern, Brandenburg, Mecklenburg-Vorpommern, Niedersachsen, Rheinland-Pfalz, Sachsen-Anhalt, Schleswig-Holstein, Thüringen.

Threat
Changed land-use, possibly also acidification.

Care
Conservation of known sites, limitation of forestry impact.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Ryman, S. & Holmåsen, I**.** –1984- *Svampar. En fälthandbok*: 309. Interpublishing, Stockholm;
Breitenbach, J. & Kränzlin, F. –1991- *Pilze der Schweiz* 3: 216, pl. 252. Mykologia, Luzern;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar I Sverige – Artfakta.* (Swedish Red Data Book of Fungi 1997): 362. ArtDatabanken, SLU, Uppsala.

4.21. *Lyophyllum favrei* R. Haller Aar.& R. Haller Suhr

Fr. Lyophylle de Favre
Eng. Favre's Lyophyllum
Ger. Gelbblättriger Rasling

Agaricales

Short characteristic
A rather large agaric with a remarkable contrast between the violet-grey pileus and yellow lamellae.

Description
Pileus 5-10 cm broad, convex with involute margin then flattened, often with weak umbo, dark violet-grey, discolouring paler greyish ochre with age, surface tomentose. Lamellae crowded, emarginate-adnate, greenish to golden yellow, turning reddish then blackish when bruised. Stipe 5-7 x 1-1.5 cm, cylindrical, solid, apex cream colour, flocculose, downwards brown fibrillose on pale violet-grey background. Context firm, whitish, turning pinkish red, then brown to black when exposed to the air. Smell not distinctive, taste rancid-farinaceous. Spore print pale cream colour.

Distribution and status
Very rare in Europe, mainly found in Switzerland (20 localities), also in France, Germany and Great Britain. Outside Europe only known from Caucasus mountains.

Habitat
Saprotrophic in deciduous forests, mainly under *Fagus sylvatica* in alluvial forests in river valleys north of the Alps at rather low altitudes (350 to 600 m).

Utilisation
None

Fruiting period
September-October

In national lists of endangered fungi in
Great Britain, Switzerland (also protected by law).

Threat
Loss and change of habitat, also by negative impact of recreational activities. Alluvial forests are threatened by silviculture and groundwater-drainage.

Care
Conservation of alluvial forests.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Breitenbach, J. & Kränzlin, F. –1991- *Pilze der Schweiz* 3: 222, pl. 259. Mykoflora, Luzern;
Hahn, C. 1995. *Lyophyllum favrei* Haller & Haller - Erstnachweis für Deutschland. *Z. Mykologie* 61: 39-44.

4.22. *Myriostoma coliforme* (With.: Pers.) Corda

Fr. Myriostome
Eng. Pepper pot
Ger. Sieb-Erdstern

Lycoperdales

Short characteristic
Myriostoma coliforme belongs to the earthstars, a group of fungi closely related to the puffballs. It is easily recognised on the central spore-sac (endoperidium) with several stalks and numerous small pores.

Description
Basidiocarp initially rounded, developing epigeously. At maturity the outer layer (exoperidium) of the fruitbody splits stellately into 10-18 rays (expanded fruitbody 7-15 cm across), exposing a spherical, usually somewhat depressed spore-sac (endoperidium; 2-6 cm broad), raised on the inner surface of the exoperidium on several thin and short stalks. The endoperidium is minutely warted, grey-brown, often with a metallic lustre. It is provided with numerous small pores through which the mature spores can be dispersed.

Distribution and status
Myriostoma coliforme has a world wide distribution. In Europe it is a rare species showing southern and south-eastern tendencies in its distribution, including the southern part of European Russia and Ukraine. It reaches its northernmost outposts in South Sweden. However, it is also present in coastal dunes of western Europe, for instance in The Netherlands. In northern Europe there are only scattered occurrences.

Habitat
A thermophilous, saprotrophic species preferring nitrogen-rich sites on well-drained, basic soils in deciduous and mixed forests, gardens, along hedges and grassy road banks as well as in grazed grasslands.

Utilisation
None

Fruiting period
Autumn, but since its fruitbodies are very persistent it can be found throughout the year.

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Austria, Armenia, Germany, Great Britain (extinct), Greece, Hungary, Macedonia, Poland, Sweden, Switzerland (extinct), The Netherlands.

In regional lists of endangered fungi in
FRANCE: Pays-de-la-Loire; GERMANY: Baden-Württemberg, Brandenburg, Mecklenburg-Vorpommern, Sachsen-Anhalt; RUSSIA: Rostov Region.

Threat
Changes in land-use is the main threat to this peculiar earthstar, for instance clear felling of thermophilous forests, decreased grazing.

Care
Sites with *Myriostoma coliforme* should be subject to a traditional land-use. Clear felling must be avoided. In grassland localities grazing must be maintained.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Sunhede, S. –1990- Geastraceae *(*Basidiomycotina*), morphology, ecology and systematics with special emphasis on the North European species*: 468-486. Fungiflora, Oslo;

Jalink, L.M. –1995- De Aardsterren van Nederland en België. *Coolia* 38 suppl.: 60-61, pl. 14;

Pegler, D. N., Laessoe, T. & Spooner, B. –1995- *British Puffballs, Earthstars and Stinkhorns*: 112-113, fig. 84. Royal Botanic Gardens, Kew;

Larsson, K.H. (ed.). –1997- *Rödlistade svampar I Sverige – Artfakta*. [Swedish Red Data Book of Fungi 1997]: 387. ArtDatabanken, SLU, Uppsala.

4.23. *Phylloporus pelletieri* (Lév.) Quél.

Important synonym:
Phylloporus rhodoxanthus sensu auct. eur.

Fr. Phyllopore
Eng. Golden Gilled Bolete
Ger. Goldblatt

Boletales

Short characteristic
This medium sized species is a link between boletes and gilled fungi. It is characterised by its thick, strongly anastomosing, golden-yellow lamellae.

Description
Pileus 3-8 cm, hemispherical at first, then flattened, surface dull, finely tomentose, red-brown to dark brown. Stipe 2-6 x 0.8-2 cm, central to eccentric, cylindrical to obconical with wider apex and narrower base, yellow-brown, downwards ochraceous, slightly pruinose. Lamellae deep lemon- to golden-yellow, strongly anastomosing to rudimentary poroid. Flesh soft, thick, whitish, reddish under the cuticle. Smell and taste weak, not distinctive. Spore print ochre-yellow.

Distribution and status
Widespread in Europe (very rare in European Russia, also in Ukraine and Moldova), from the lowland up to the montane zone, sometimes subalpine. In most regions rare, very local and in low numbers, but more widespread in the Alps, e.g. in Switzerland. Spreading into Asia; in North America a closely related species.

Habitat
Mycorrhizal, mainly with broad-leaved trees (*Quercus, Fagus, Carpinus, Castanea*) in old deciduous forests and mixed forests, in Central Europe also with coniferous trees (*Picea, Abies, Pinus*), on well-drained, acidic, sandy and loamy soils.

Utilisation
Fruitbodies are edible and occasionally collected by mushroom hunters as side-harvest together with boletes. No commercial value.

Fruiting period
Summer and Autumn

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Austria, Denmark, Germany, Hungary, Moldova, Norway, Poland, Sweden, The Netherlands.

In regional lists of endangered fungi in
BELGIUM: Flanders; FRANCE: Nord – Pas-de-Calais, Pays-de-la-Loire; GERMANY: Bayern, Brandenburg, Hessen, Niedersachsen, Nordrhein-Westfalen, Rheinland-Pfalz, Saarland, Sachsen-Anhalt, Schleswig-Holstein, Thüringen.

Threat
Air pollution, in particular nitrogen deposition; intensive forestry.

Care
Reduction of air pollution; management restrictions on localities with this species.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Marchand, A. –1973- *Champignons du nord et du midi* 2 : pl. 166. Hachette, Perpignan;
Lange, L. –1974- The Distribution of Macromycetes in Europe. *Dansk Botanisk Arkiv* 30 (1): 1-105;
Breitenbach, J. & Kränzlin, F. –1991- *Pilze der Schweiz* 3: 74, pl.39. Mykologia, Luzern;
Engel, H. –1996- *Schmier- und Filzröhrlinge s.l. in Europa*: 152-154, pl. 44. H. Engel, Weidhausen;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar I Sverige – Artfakta.* (Swedish Red Data Book of Fungi 1997): 426. ArtDatabanken, SLU, Uppsala;
Galli, R. –1998- *I Boleti*. Edinatura, Milano.

4.24. *Podoscypha multizonata* (Berk. & Broome) Pat.

Fr. Théléphore zone
Eng. Zoned Podoscypha
Ger. Gezonter Büschelwärzling

Stereales

Short characteristic
The fruitbodies of this fungus are remarkable, large rosettes of numerous, concentrically arranged, erect, brownish, zoned lobes with smooth surface and underside.

Description
Basidiocarp 5-20 cm broad, in outline more or less globose, made up of a rosette of spatulate to fan-shaped, erect lobes originating from a central, bulbous, tough root-like structure. Upper surface ochraceous or pinkish with concentric red-brown zones and whitish, undulating margin, smooth. Hymenium pinkish to ochre-brown or pale grey, smooth. Context thin, tough, leathery.

Distribution and status
Very rare and local in central, southern and western Europe; recorded from Great Britain, France, Italy (Sicilia, Sardegna, Emilia-Romagna), Czech Republic, Hungary and Germany (only 3 records). Not found in European Russia. Also in Asia, in Russian Far East and Azerbaijan.

Habitat
Saprotrophic or possibly a weak parasite on roots, growing at the basis of very old oak trees (*Quercus*) in old deciduous forests and parks on rich soils.

Utilisation
None

Fruiting period
Summer and autumn

In national lists of endangered fungi in
Hungary

In regional lists of endangered fungi in
FRANCE: Pays-de-la-Loire; GERMANY: Niedersachsen, Schleswig-Holstein.

Threat
Exploitation of relics of deciduous old-growth forests; cutting of old oaks, also for safety reasons in parcs.

Care
Protection of remaining old oak forests and individual trees; enlargement of surface of undisturbed woodland in the zone of deciduous forests.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Reid, D.A. –1965- A monograph of the stipitate stereoid fungi. *Beih. Nova Hedwigia* 18: 150-290;
Jahn, H. & Müller, K.-H. –1976- *Podoscypha multizonata* (Berk. & Br.) Pat. bei Dessau (Bezirk Halle, DDR) gefunden. *Westf. Pilzbr.* 11: 22-26;
Phillips, R. –1981- *Mushrooms and other fungi of Great Britain and Europe*: 222 (photograph). Pan Books, London;
Jülich, W. –1984- *Die Nichtblätterpilze, Gallertpilze und Bauchpilze*: 209-210. Gustav Fischer, Stuttgart, New York.

4.25. *Pycnoporellus alboluteus* (Ellis & Everhart) Kotl. & Pouzar

Fr. Polypore blanc et jaune
Eng. –
Ger. Weissgelber Weichporling

Poriales

Short characteristic
A medium sized to large, annual, soft polypore, forming long, crust-like strips on dead logs with remarkably large, orange pores.

Description
Basidiocarp annual, resupinate, waxy, medium sized to large, usually 10-30 cm long, but up to even 2 m along the wood. Tubes 0.5-3 cm long, whitish to pale orange. Pores very large, 1-3 mm wide, at first pale orange creamy, later bright orange, turning lilac when treated with a droplet of KOH.

Distribution and status
Extremely rare in northern Europe and eastern Central-Europe, in Russia only known from one northern locality (Komi republic). In Asia rare, recorded from the Caucasus, Siberia and Russian Far East (Kamchatka). More common in North America.

Habitat
Saprotrophic on very old logs and trunks which are already decayed by *Fomitopsis pinicola*, in luxuriant virgin coniferous forests, mostly on spruces (*Picea* spp.), but also on aspen trees (*Populus tremula*).

Utilisation
None

Fruiting period
Autumn

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Finland, Norway (extinct), Poland, Sweden (also protected by law).

In regional lists of endangered fungi in
RUSSIA: Komi Republic.

Threat
Exploitation of old-growth forests by forestry.

Care
The remains of luxuriant, spruce dominated old-growth forests should be protected.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Kotiranta, H. & Niemelä, T. –1996- *Uhanalaiset käävät Suomessa* (Threatened polypores in Finland). Oy Edita Ab,Helsinki;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar I Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 451. ArtDatabanken, SLU, Uppsala.

4.26. *Sarcodon fuligineoviolaceus* (Kalchbr.: Fr.) Pat.

Fr. Hydne gris violacé
Eng. Burnt Spine-cap
Ger. Brennender Braunsporstacheling

Thelephorales

Short characteristic
A medium sized to large tooth fungus with a violaceous brown pileus, purple-brown spines, characterised by dark blue-grey to violaceous context in pileus and acrid taste.

Description
Pileus 3-13 cm broad, convex to flattened with undulating margin, yellow-brown to olive-brown or reddish brown, with dark blue or violaceous tones with age, tomentose at first, then fibrillose to scaly. Spines decurrent, up to 4 mm long, subulate, pinkish brown to purple-brown with paler tips. Stipe 3-6 x 1-3 cm, cylindric or slightly tapering downwards, concolorous with pileus or purple-brown, sometimes greenish at base, tomentose to fibrillose. Context pinkish at first, then dark blue-grey to violaceous in pileus, reddish to vinaceous in stipe. Smell not distinctive or slightly unpleasant, taste acrid.

Distribution and status
Very rare in northern and central Europe, doubtful in Western France and Great-Britain. Not found in Switzerland during the last 20 years, also no recent record in Austria and perhaps almost extinct in Central Europe (one locality in the French Alps). In Russia recorded only from Asian part, Sakhalin Island. Also rare in North America.

Habitat
Mycorrhizal with coniferous trees (*Abies*, *Picea*, *Pinus*) in coniferous forests on calcareous ground, otherwise poor in nutrients.

Utilisation
None.

Fruiting period
Late summer and autumn

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Finland, Germany, Great Britain, Hungary, Norway, Sweden.

In regional lists of endangered fungi in
BELGIUM: Flanders; GERMANY: Baden-Württemberg, Niedersachsen, Saarland, Sachsen, Thüringen.

Threat
Acidification and nitrogen enrichment of forest soils due to air pollution; clear felling of remaining sites.

Care
Reduction of air pollution, protection of sites against forestry.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Maas Geesteranus, R.A. –1975- *Die terrestrischen Stachelpilze Europas*: 77-78, fig. 56, pl. 38, 39a. North-Holland publ. comp., Amsterdam, London;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar I Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 473. ArtDatabanken, SLU, Uppsala;
Pegler, D.N., Roberts, P.J. & Spooner, B.M. –1997- *British chanterelles and tooth fungi*: 94-95, figs. 72-73. Royal Botanic Gardens, Kew.

4.27. *Sarcosoma globosum* (Schmidel: Fr.) Casp.

Fr. Pézize globuleuse
Eng. –
Ger. Dunkle Gallertkugel

Pezizales

Short characteristic
A remarkable, rather large cup fungus with a thick-set stipe, filled with a watery, gelatinous substance.

Description
Ascocarps up to 10 cm high, 3-6 cm broad, egg-shaped to barrel-shaped with dish-shaped apex. Hymenium wrinkled, with thick margin, dark brown to blackish, shiny. 'Stipe' with thick cortex, wrinkled, pale brown, tomentose, also with some black hairs. Context jelly-like, very watery, pale grey, translucent.

Distribution and status
Very rare in North Europe, including European Russia, and in Central-European mountains. Also known from North America.

Habitat
Probably saprotrophic, terrestrial in old spruce forests, by preference in undisturbed pristine forests.

Utilisation
None

Fruiting period
Early spring to early summer

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Armenia, Austria**,** Czech Republic /Slovakia, Estonia, Finland, Germany (extinct), Latvia (extinct), Lithuania, Norway (extinct), Poland, Russia, Sweden (also protected by law).

In regional lists of endangered fungi in
GERMANY: Bayern, Mecklenburg-Vorpommern, Sachsen, Thüringen; RUSSIA: Leningrad Region, Komi Republic; East Fennoscandia (Finland, parts of Russia).

Threat
Rational forestry, in particular clear-cut, removing soil, possibly unknown factors as well.

Care
Conservation of undisturbed spruce forests; restriction of forestry activities on sites.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Lange, L. –1974- The Distribution of Macromycetes in Europe. *Dansk Botanisk Arkiv* 30 (1): 1-105;
Martinsson, K. & Nitare, J. –1986- Bombmurklan, *Sarcosoma globosum*, en hotad svamp. *Svensk Bot. Tidskr.* 80: 169-184;
Larsson,K.H. (ed.) –1997- *Rödlistade svampar i Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 480. ArtDatabanken, SLU, Uppsala.

4.28. *Sarcosphaera coronaria* (Jacq.) Boud

Important synonym:
Sarcosphaera crassa (Steudel) Pouzar

Fr. Pézize couronnée
Eng. Violet Crown-cup
Ger. Kronenbecherling

Pezizales

Short characteristic
A fairly large, vernal cup-fungus with violaceous to lilac tones, closed and hypogeous at first, later star-formed opened in 5-10 flaps.

Description
Ascocarps often gregarious, 3-15(-20) cm wide, sessile, first closed, subglobose, immersed in the soil, then opening at the top with lacerate margin, finally expanding and more or less star-shaped. Inner surface (hymenium) pale violet then brown-violet. Outer surface (receptaculum) pale with lilac tone. Context white, fragile.

Distribution and status
North Europe and mountains of Central and South Europe up to 1700 m altitude. In most regions rare but in some regions more widespread and even numerous in places, for instance in the Swiss Alps and Central Italy. Also recorded from North America and North Africa.

Habitat
Saprotrophic or possibly mycorrhizal with coniferous trees, by preference on calcareous ground but also on acidic bedrock, sometimes along roads and in parks.

Utilisation
Cooked fruitbodies are edible (in raw condition poisonous), but the species is rarely collected by mushroom hunters and of no commercial value.

Fruiting period
April-June

In national lists of endangered fungi in
Austria, Bulgaria, Denmark, Estonia (also protected by law), Finland, Germany, Great Britain, Hungary, Norway, Poland, Sweden.

In regional lists of endangered fungi in
FRANCE: Pays-de-la-Loire; GERMANY: Bayern, Brandenburg, Hessen, Mecklenburg-Vorpommern, Niedersachsen, Nordrhein-Westfalen, Rheinland-Pfalz, Saarland, Schleswig-Holstein, Thüringen.

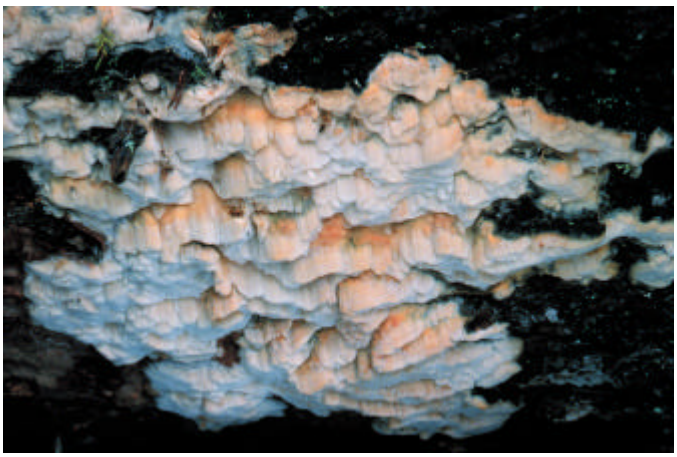
Threat
Clear-cutting and ground damage in forests, acidification of forest soils.

Care
Protecting of habitats and excluding forestry in coniferous woods on calcareous ground; restriction of air pollution.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Breitenbach, J. & Kränzlin, F. –1984- *Pilze der Schweiz* 1: 66, pl. 34. Mykologia, Luzern;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar i Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 481. ArtDatabanken, SLU, Uppsala.

4.29. *Skeletocutis odora* (Sacc.) Ginns



Important synonym:
Skeletocutis tschulymica (Pilát) Keller

Fr. –
Eng. –
Ger. Sibirischer Knorpelporling

Poriales

Short characteristic
A rather large, annual, resupinate polypore with thick, white, gelatinous fruitbodies with a characteristic sweetish smell.

Description
Basidiocarp annual, medium sized, up to 30 (-50) cm broad, resupinate, fairly thick, sappy when fresh, hard when dry. Pore surface at first white, later cream coloured, when dry dirty greyish cream, pores 3 – 5 pro mm. Odour sweetish sour when fresh.

Distribution and status
Very rare in western Europe, rare from Scandinavia to Siberia and North-America.

Habitat
Saprotrophic on large, fallen trunks of mainly coniferous trees, in particular spruce (*Picea* spp.), also on aspen (*Populus tremula*) in virgin coniferous forests.

Utilisation
None

Fruiting period
Autumn

In national lists of endangered fungi in
Finland, Norway, Poland, Sweden.

In regional lists of endangered fungi in
Habitat destruction by logging (forestry).

Threat
Habitat destruction by logging (forestry).

Care
This species grows almost exclusively in old-growth spruce dominated forests and protection of such forests is the only way to protect *S. odora.*

Proposed measures
Bern Convention and program for inventory and mapping.

References
Kotiranta, H. & Niemelä, T. –1996- *Uhanalaiset käävät Suomessa* (Threatened polypores in Finland): 33. Oy Edita Ab, Helsinki;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar i Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 490. ArtDatabanken, SLU, Uppsala.

4.30. *Suillus sibiricus* Singer **ssp. *Helveticus*** Singer

Fr. Bolet Suisse
Eng. –
Ger. Beringter Zirbenröhrling
Schweizerischer Körnchenröhrling

Boletales

Short characteristic
A medium sized bolete with pale yellow pileus with darker spots and the margin fringed with veil and with a stipe with woolly, white ring; restricted to five-needled pines.

Description
Pileus 4-10 cm broad, hemispherical then plano-convex to flattened, pale yellow, vividly yellow to yellow-brown with large, darker brown spots, slimy to viscid, margin fringed with whitish remains of veil at first. Hymenium adnate to decurrent with tubes up to 1 cm long, pale yellow then olive-brown with concolorous, angular pores up to 2 mm wide. Stipe 3-8 x (0.6-)1-2.5 cm, cylindrical or tapering downwards, solid, cream-colour to ochre-yellow with many small dots, first whitish, soon brown-red to dark brown, with fugacious, woolly, white annulus, base with orange mycelium tomentum. Context firm at first, then weak, yellowish, not discolouring when exposed to the air or turning brown. Smell and taste weak, pleasant. Spore print olive-brown.

Distribution and status
Endemic to Central-European mountains, rare in the subalpine zone, for instance in Switzerland from (580-) 1250 to 2300 m, in Austria one record from Tyrol, in Italy recorded from Lombardino and Piemonte; also known from Macedonia. In Russia and North America ssp. *sibiricus* occurs with *Pinus sibirica* and *Pinus monticola.* The status of that taxon is not considered.

Habitat
Mycorrhizal with *Pinus cembra* in subalpine forests in the Alps and with *Pinus peuce* in Macedonia; in Switzerland scattered in autochthonous stands of *Pinus cembra,* often with scattered trees in extensively pastured areas.

Utilisation
The fruitbodies are edible but not much appreciated by mushroom hunters. No commercial value.

Fruiting period
July-October

In national lists of endangered fungi in
Austria, Germany, Macedonia, Poland, Switzerland.

In regional lists of endangered fungi in
GERMANY: Bayern.

Threat
Loss of habitat by constructing ski-runs and other infrastructure for winter sport; intensification of agriculture and forestry in subalpine regions.

Care
Protection of native stands of *Pinus cembra,* maintenance of traditional land use.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Breitenbach, J. & Kränzlin, F. –1991- *Pilze der Schweiz* 3: 82, pl. 50. Mykologia, Luzern;
Engel, H. –1996- *Schmier- und Filzröhrlinge s.l. in Europa*: 88-90, pl. 24, 25. H. Engel, Weidhausen.

4.31. *Torrendia pulchella* Bres.

Fr. Torrendie délicate
Eng. –
Ger. Weisser Scheidenstäubling

Agaricales

Short characteristic
A peculiar, small, stipitate, whitish fungus with a basal sack (volva), similar to a little *Amanita* but pileus not expanding and underside without lamellae.

Description
Pileus 0.8-3 cm broad, hemispherical with thick, involute margin, white. Inside pileus a gleba, made up of many roundish cavities with white hymenium. Stipe 2-5 x 0.2-0.8 m, cylindrical, sometimes curved, white, with a basal thick volva.

Distribution and status
Rare in the western Mediterranean region, recorded from Portugal, Spain, France and Italy (Sardegna). Also in North Africa (Morocco, Algeria).

Habitat
Mycorrhizal with *Quercus suber*, among grass, maccia, garigue.

Utilisation
None

Fruiting period
Summer and autumn

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Italy

Threat
Destruction of sites by overgrazing, fires.

Care
Protection of sites of this very rare and peculiar species.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Bas, C. –1975- A comparison of *Torrendia* (Gasteromycetes) with *Amanita* (Agaricales). *Beih. Nova Hedwigia* 51: 53-61, pl. 11;
Cetto, B. –1989- *I funghi dal vero* 6: 618-621, pl. 2540, 2540 bis. Arti Grafiche Saturnia, Trento;
Venturella, G., Perini, C., Barluzzi, C., Pacioni, G., Bernicchia, A., Padovan, F., Quadraccia, L. & Onofri, S. –1997- Towards a Red Data List of fungi for Italy. *Bocconea* 5: 867-872.

4.32. *Tricholoma colossus* (Fr.) Quél.

Fr. Tricholome colosse
Eng. Giant Tricholoma
Ger. Riesen-Ritterling

Agaricales

Short characteristic
A very large, robust agaric with red brown pileus, white lamellae and a stipe with fugacious, fibrillose annulus.

Description
Pileus 10-20(-25) cm broad, hemispherical to convex with strongly involute margin, only slightly expanding with age, beige-brown at first then reddish brown to brick-red with yellow-brown patches, slightly viscid when moist. Lamellae emarginate, rather crowded, white at first then yellowish pink to vinaceous, with irregular edge. Stipe 5-22 x 3-8(-10) cm, subcylindrical to subbulbous, solid, when young with woolly-fibrillose annuliform zone which disappears at age, white above annulus, pale brown with reddish brown fibrils below. Context thick, rather firm, white, turning reddish when cut. Smell indistinct, taste mild to slightly bitter. Spore print white.

Distribution and status
Scattered over large parts of Europe, but rare, for instance in European Russia only recorded from two northern regions. Decreasing everywhere.

Habitat
Mycorrhizal symbiont of *Pinus* in wood on very oligotrophic, acidic soils, in particular in *Cladonio-Pinetum.*

Utilisation
The fruitbodies are edible but not much appreciated. Occasionally collected by mushroom hunters but without commercial value.

Fruiting period
Autumn to late autumn

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Austria, Denmark, Estonia, Finland, Germany, Great Britain, Latvia (extinct), Poland, Russia, Sweden, Switzerland (also protected by law), The Netherlands (extinct).

In regional lists of endangered fungi in
FRANCE: Pays-de-la-Loire (extinct); GERMANY: Baden-Württemberg, Bayern, Brandenburg, Niedersachsen, Rheinland-Pfalz, Sachsen, Sachsen-Anhalt, Schleswig-Holstein; RUSSIA: Leningrad Region.

Threat
Air pollution, in particular nitrogen deposition, use of fertilisers and application of lime in forestry.

Care
Reduction of air pollution; restrictions to forest exploitation on sites of this species; prohibition of harvesting.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Riva, A. –1988- *Tricholoma, Fungi Europaei* 3: 396-399, pl. 67. Giovanna Biella, Saronno;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar i Sverige – Artfakta.* [Swedish Red Data Book of Fungi 1997]: 515. ArtDatabanken, SLU, Uppsala;
Noordeloos, M.E. [*in* Bas, C. et al. (ed.)] –1999- *Flora Agaricina Neerlandica* 4: 131-132, fig. 102. A.A. Balkema, Rotterdam, Brookfield.

4.33. *Tulostoma niveum* Kers

Fr. Tulostome blanc de neige
Eng. White Stalk-puffball
Ger. Weisser Stielbovist

Tulostomatales

Short characteristic
A rather small, stipitate, entirely white puffball with a peculiar habitat on boulders and cliffs.

Description
Basidiocarp up to 2.5 cm high, consisting of a globose head (endoperidium) and a stipe. Endoperidium 0.3-0.9 cm broad, white, subglobose to onion-shaped, at maturity with a small, protruding, apical pore for spore dispersal. Content (gleba) pale brown at maturity. Stipe 1-2 x 0.1-0.2 cm, slender, white or yellowish, deeply immersed in moss.

Distribution and status
Extremely rare. The world wide distribution of *T. niveum* is confined to three areas in North Europe: South Finland (2 sites), Southeast Sweden (ca 10 sites) and the Scottish Highlands (1 site).

Habitat
Tulostoma niveum grows solitary or gregariously in dense moss tussocks on limestone cliffs and boulders.

Utilisation
None

Fruiting period
Fresh specimens are found in the autumn but since the dry and mature basidiocarps are long-lived, they can be found throughout the year.

In the list of endangered fungi of
Europe

In national lists of endangered fungi in
Finland, Great-Britain, Sweden.

Threat
Exploitation (buildings, road constructions etc.) of localities from which *Tulostoma niveum* is on record. In localities where it grows on cliffs, trampling by man is a possible threat.

Care
Legal protection of sites as nature reserves.

Proposed measures
Bern Convention and program for inventory and mapping.

References
Kers, L.E. –1978- *Tulostoma niveum* sp. nov. (Gasteromycetes), described from Sweden. *Botaniska Notiser* 131: 411-417;
Pegler, D.N., Laessoe, T. & Spooner, B. –1995- *British Puffballs, Earthstars and Stinkhorns*: 44-45, figs 22-23. Royal Botanic Gardens, Kew;
Larsson, K.H. (ed.). –1997- *Rödlistade svampar i Sverige – Artfakta*. (Swedish Red Data Book of Fungi 1997): 527. ArtDatabanken, SLU, Uppsala;
Fleming, L.V., Ing, B. & Scouller, S.E.K. –1998- Current Status and Phenology of Fruiting in Scotland of the Endangered Fungus *Tulostoma niveum*. *Mycologist* 12(3):126-131.

Appendix

Picture credit

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1 – *Amanita friabilis* (P. Karst.) Bas: © F. Müller (Switzerland – Langnau). [from Breitenbach J. & Kränzlin F. – 1995- *Champignons de Suisse ; Tome 4 ; Champignons à lames, 2ème partie.* 371 pp. (Ed. Mykologia, Luzern, Switzerland)]

2 – *Amylocystis lapponica* (Romell) Bondartsev & Singer: © H. Kotiranta (Helsinki - Finland)

3 – *Antrodia albobrunnea* (Romell) Ryvarden: © H. Kotiranta (Helsinki - Finland)

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18 – *Hygrophorus purpurascens* (Alb.& Schw.: Fr.) Fr.: © R. Galli (Milano -Italy) [from Galli, R. - 1985 - *Gli igrofori delle nostre regioni: 100.* (Ed. La Tipotecnica, S. Vittore Olona, Italy)]

19 – *Laricifomes officinalis* (Vill.: Fr.) Kotl. & Pouzar: © G. Frossard (Switzerland).

20 – *Leucopaxillus compactus* (Fr.) Neuhoff : © J. Bächler (Switzerland). [from Breitenbach J. & Kränzlin F. –1991- *Champignons de Suisse ; Tome 3 ; Bolets et champignons à lames, 1ème partie*. 364 pp. (Ed. Mykologia, Luzern, Switzerland)]

21 – *Lyophyllum favrei* Haller & Haller : © J. Bächler (Switzerland). [from Breitenbach J. & Kränzlin F. –1991- *Champignons de Suisse ; Tome 3 ; Bolets et champignons à lames, 1ème partie*. 364 pp. (Ed. Mykologia, Luzern, Switzerland)]

22 – *Myriostoma coliforme* (With.: Pers.) Corda: © J. M. Vidal (Spain). [from Societat Catalana de Micologia – *Bolets de Catalunya*. VII collecció].

23 – *Phylloporus pelletieri* (Lév.) Quélet: © G. Müller (Germany) [http://www.pilzepilze.de/]

24 – *Podoscypha multizonata* (Berk. & Broome) Pat.: © E. Arnolds (Wijster - The Netherlands).

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32 – *Tricholoma colossus* (Fr.) Quél.: © E. Gerhardt (Berlin - Germany). [from Gerhardt, E. – 1984 - *Pilze; Band 1* (Ed. BLV, München, Germany)]

33 – *Tulostoma niveum* Kers: © J. Jeppson (Sweden)

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