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Dedicated to Professor Alina Skirgiełło on the occasion of her ninety fifth birthday

Armillaria ectypa, a vulnerable indicator of mires

ESTERI OHENOJA

Botanical Museum, University of Oulu
P.O. Box 3000, FI 90014, esteri.ohenoja@oulu.fi

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A boreal montane basidiomycete, *Armillaria ectypa,* occurs as occasional in northern Finland, mainly in the aapa mire area. According to the IUCN criteria it has been classified as a vulnerable fungus in Finland. Its ecology is in some way connected e.g. to the carices of wet mesotrophic mires.

Key words: *Armillaria ectypa*, Agaricales, *Marasmiaceae*, *Tricholomataceae*, ecology, threat

INTRODUCTION

The genus *Armillaria* belongs to the basidiomycete family *Marasmiaceae* (*Tricholomataceae*), Agaricales. There occur all four species of the genus *Armillaria* in Finland (*A. borealis, A. cepistipes, A. ectypa, A. ostoyae*). *A. borealis* is common in Finland, rarer in the northernmost Lapland, *A. cepistipes* is occasional, and *A. ostoyae* is rare occurring in southern and central Finland. *A. ectypa* has, on the contrary, a northern distribution (Ohenoja 1996).

DESCRIPTION OF THE SPECIES

Armillaria ectypa has (Fig. 1) 5-10 cm high fruit bodies, cap 2-5 cm in diameter, hygrophan, somewhat glossy or fatty, pale ochraceous, brownish when dry, centre covered by faint dark scales or striae, margin later translucently striated. Gills decurrent, rather narrow, whitish first, later ochraceous. Stem slender, 5-10 x 0,5-1,5 cm, lower part often thicker (depending on the consistence of substrate), fibrillose, of the same colour as the cap, base felty. Flesh watery, whitish, taste mild, smell fungous or slightly anisate.

Basidia 4-spored, 32-40 x 6-9 μm in size, sterigmata 2-4 μm long. Spore print white or creamish, spores subglobose or ovoid, 7.0-9.0 x 5.5-6.5 μm. Clamps not seen.

ECOLOGY AND DISTRIBUTION

Armillaria ectypa has been found in Finland mainly in the northern parts of the country (Fig. 2), its occurrence concentrating to the aapa mire zone. Typical habitats are mesotrophic, thin-turfy, often rocky or stony pine bogs or fens and alluviated shores of ponds (Fig. 3). It often grows on wet substrate, on tufts of decaying carices, as *Carex rostrata, C. lasiocarpa* and *C. aquatilis.* The vascular plants, mosses and fungi found in the closest neighbourhood of *A. ectypa* are listed in Tab. 1.

The southernmost known localities of *Armillaria ectypa* are in the southern coast of Finland, but those two habitats at Vantaa (Tab. 2) have not been checked since the species was found in 1959 and 1966. From Janakkala it has been collected last time in the year 1982. This mire is still in good condition and protected, but the occurrence of *A. ectypa* has not been annually monitored. Some habitats in the northern mires are spoiled in some amount because of draining bogs or constructing reservoirs, but very few of them have been studied later. At least one of them is totally flooded into a reservoir. About one half of the localities in Finland are situated in nature reserves.

357,7535 S Muonio Rahtusenjärvi
360,7457 A Kolari Sieppijänkkä
377,7171 A Raahe Rytilampi
381,6685 S Vantaa Kaivoksela
381,6766 A Janakkala Suurisuo
383,6686 S Vantaa Sillböle
388,7447 S Kolari Pasmajärvi
389,7440 S Kolari Kaakkuririipilampi
390,7350 A Tornio Sorvasvaara
409,7348 S Tervola Ruuttulampi
410,7450 S Rovaniemi Lohiniva
412,7418 S Rovaniemi Marrasjärvi
414,7281 S Kuivaniemi Ihanalampi
416,7071 S Haapajärvi Kurikkalampi
425,7240 A Haukipudas Syvä Susijärvi
435,7262 A Ii Rytisuo
452,7235 S Haukipudas Kallioselkä
453,7222 A Kiiminki Kourilampi
493,7353 A Ranua Tyyräsenjärvi
499,7228 S Pudasjärvi Koirapuro
500,7388 A Kemijärvi Sammalvaara
503,7734 S Utsjoki Kenesjärvi
508,7451 A Pelkosenniemi Ahma aapa
510,7451 G Pelkosenniemi Korpela
524,7544 A Sodankylä Posoaapa
538,7200 A Puolanka Vantaslahti
539,7265 S Taivalkoski Tutulampi
539,7446 A Savukoski Kätkäaapa
543,7231 S Pudasjärvi Huosiosoja
569,7349 A Posio Riisitunturi
576,7461 A Savukoski Sattoaapa
583,7418 A Salla Aatsinginhauta
603,7367 A Kuusamo Rytilampi
604,7364 A Kuusamo Hiidenlammet
607,7239 A Suomussalmi Takkosenlampi
609,7340 A Kuusamo Vaimojärvi
715,6949 A Ilomantsi Kuikkalampi

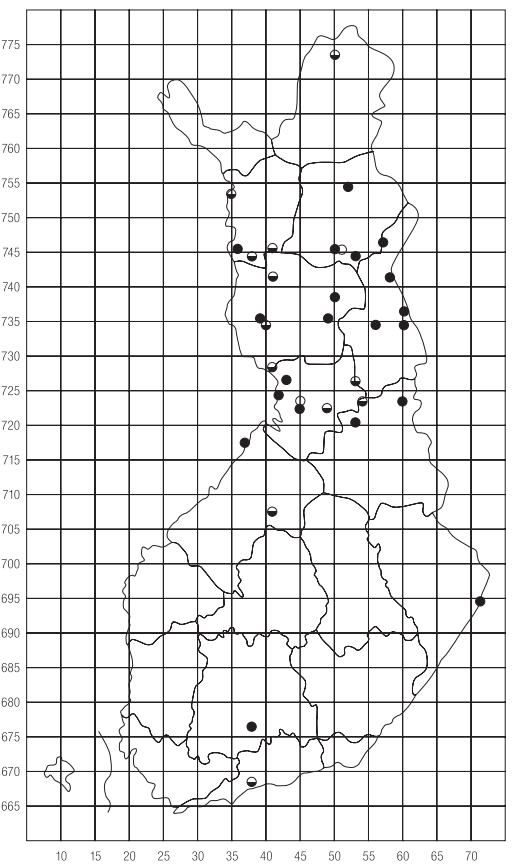

Fig. 2. Distribution of *Armillaria ectypa* in Finland. (Grid 27°E)
● Found after the year 1980 (A) ◒ Found before the year 1980 (S) ○ Extinct (G)

Table 1
Vascular plants, mosses and fungi found in the closest neighbourhood of *Armillaria ectypa* in Finland

Vascular plants	*Equisetum fluviatile*
Carex aquatilis	*Selaginella selaginoides*
Carex chordorrhiza	
Carex echinata	**Mosses**
Carex lasiocarpa	*Sphagnum angustifolium*
Carex limosa	*Sphagnum lindbergii*
Carex magellanica	*Sphagnum majus*
Carex panicea	*Sphagnum platyphyllum*
Carex rostrata	*Sphagnum recurvatum*
Carex rotundata	*Sphagnum subsecundum*
Phragmites australis	*Aulacomnium palustre*
Molinia caerulea	*Cinclidium subrotundum*
Eriophorum gracile	*Loeskypnum badium*
Eriophorum latifolium	*Paludella squarrosa*
Trichophrum alpinum	*Pseudocalliergon trifarium*
Trichophorum cespitosum	*Scorpidium revolvens*
Dactylorhiza incarnata	*Scorpidium scorpioides*
Salix lapponum	*Straminergon stramineum*
Betula nana	*Warnstorfia exannulata*
Betula pubescens	*Warnstorfia procera*
Ranunculus hyperboreus	*Warnstorfia sarmentosa*
Menyanthes trifoliata	
Drosera anglica	**Fungi**
Andromeda polifolia	*Laccaria proxima*
Vaccinium oxycoccus	*Lactarius pubescens*
Pedicularis palustris	*Lyophyllum palustre*

Table 2
The localities of *Armillaria ectypa* in Finland

Abrreviations: U InL biological provinces; H Herbarium of the University of Helsinki, JOE Herbarium of the University of Joensuu, OULU Herbarium of the University of Oulu, TUR A Herbarium of the Åbo Akademi .

Uusimaa (U). Vantaa 30.8.1959 (H), 18.9.1966 (H)
Etelä-Häme (EH). Janakkala 16.9.1957 (H), 4.9.1971 (H), 2.9.1982 (H), 7.9.1982 (H)
Pohjois-Karjala (PK). Ilomantsi 27.8.1996 (H, JOE)
Keski-Pohjanmaa (KP). Haapajärvi 22.7.1970 (OULU), Raahe 15.9.1983 (OULU).
Kainuu (Kn). Puolanka 2.8.1989 (OULU), 25.7.1990 (OULU)
Oulun Pohjanmaa (OP). Haukipudas 3.8.1968 (OULU), 17.8.1988 (OULU), Kuivaniemi 29.7.1970 (OULU), Pudasjärvi 24.7.1975 two finds (OULU), 9.8.1977 (OULU), Ii 6.8.1985 (OULU), Kiiminki 1.9.1999 (OULU).
Perä-Pohjanmaa (PeP). Rovaniemi rural commune 23.7.1976 (OULU), 24.7.1976 (OULU), Tervola 29.7.1978 (OULU), Ranua 30.7.1992 (OULU), Kemijärvi 26.7.1993 two finds (OULU), Tornio 20.9.1998 (OULU).
Koillismaa (Ks). Taivalkoski 6.8.1979 (OULU), Kuusamo 25.7.1986 (OULU), 20.8.2005 (OULU), 21.8.2005 (OULU), 24.8.2005 (TUR-A), 1.9.2005 (OULU), Posio 23.8.2005 (OULU), Salla 20.7.1994 (OULU).
Kittilän Lappi (KiL). Muonio 7.8.1970 (Arch. OULU), Kolari 31.7.1970 two finds (OULU), 29.8.1997 (Arch. OULU)
Sompion Lappi (SoL). Pelkosenniemi 3.8.1984 two finds (OULU), 23.7.1995 (OULU), Savukoski 23.7.1995 two finds (OULU), 10.8.2001 (OULU).
Inarin Lappi (InL). Utsjoki 14.9.1972 (OULU).

The 44 samples from Finland are from 30 years between 1959 and 2005, mostly one find per season, but there are 3-5 finds from the years 1970, 1995 and 2005. A special study has not been done and the fungus has been found usually in connection of the flora and vegetation inventories. As for the phenology of the species its finds have been made in Finland in July – September (20th July – 18th September), the main fruiting time being in the southern half of the country somewhat later than in the North.

Armillaria ectypa is, according to the criteria of IUCN, a vulnerable fungus in Finland (Rassi et al. 2001) and a good indicator of the mesotrophic mire habitats.

Armillaria ectypa was found in 12 European countries (Dahlberg, Croneborg 2003), but it is rare everywhere, also in Finland where it has, however, more localities than elsewhere in Europe. In Sweden the threat class is NT, near threatened, in Denmark EN, endangered. It has never been seen in Norway neither in Estonia nor Iceland. It is considered extinct in Switzerland and Poland, and in Mecklenburg-Vorpommern it had been seen last time in the year 1959 (Kreisel 1992). It is one of the 33 fungus species proposed to the Bern Convention (Dahlberg, Croneborg 2003).

DISCUSSION

Distribution of *Armillaria ectypa* seems to be boreal-montane and maybe also continental. The ecology of it is different from the other species of the genus, and very poorly known, thus far. It´s mycelium grows in very wet substrate and can survive in low oxygen conditions. Some species of *Armillaria* can oxygenate its rhizomorphs in very wet conditions (Ainsworth 2003), but no rhizomorphs have been detected in *A. ectypa*. There grows in Canada *A. sinapina* except on wood also in wet fens (Thormann et al. 2001), where its mycelium has been isolated from the rhizomes and decomposing leaves of *Carex aquatilis*, and also from decomposing *Salix planifolia* leaves. Some species of *Armillaria* can form a mutualistic relationship with the rhizomes of e.g. orchids. Thormann et al. (2001) think that a possible relationship can also exist between *A. ectypa* and *Carex aquatilis*. If this kind of mycorrhizal connection really exists, it is very likely that also *C. rostrata* and some other carices could be suitable symbionts. There are in the bases of stems in our samples often roots, stems and leaves of carices and salices, but no proper study has been done in the field. Such study is needed, for which the habitats in northern Finland should suit well.

Except for the ecology, the homothallism of the species also is its special characteristic deviating from the other species of the genus. Chillali et al. (1998) suppose that *Armillaria ectypa* separated, as *A. tabescens,* too, earlier in the evolution than the other species of the genus.

A question arises if this homothallic mode of reproduction is limiting its ecological capacity so that its impact to changing environment were weaker than that of the heterothallic species? On the contrary the genesis of new mycelia could in theory be easier for these kinds of fungi.

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Armillaria ectypa, zagrożony gatunek wskaźnikowy torfowisk

Streszczenie

Armillaria ectypa, gatunek borealno górski, znany jest z licznych stanowisk w północnej Finlandii. Zajmuje wilgotne siedliska, często spotykany jest w darniach, na obumarłych pę dach turzyc, głównie *Carex rostrata* i *C. aquatilis*. W pracy zestawione są rośliny naczyniowe, mszaki i grzyby towarzyszące *A. ectypa*, jak również rozmieszczenie stanowisk tego gatunku na terenie Finlandii.