

Three new species of *Hyphodontia* (Corticiaceae)

Heikki Kotiranta & Reima Saarenoksa

Kotiranta, H., Finnish Environment Institute, Nature and Land Use Division, P.O. Box 140, FIN-00251 Helsinki, Finland (heikki.kotiranta@vyh.fi)

Saarenoksa, R., Department of Ecology and Systematics, Division of Systematic Biology, P.O. Box 7 (Unioninkatu 44), FIN-00014 University of Helsinki, Finland.

Received 22 June 2000, accepted 31 July 2000

Kotiranta, H. & Saarenoksa, R. 2000: Three new species of *Hyphodontia* (Corticiaceae). — *Ann. Bot. Fennici* 37: 255–278.

Three new species of *Hyphodontia* J. Erikss., *H. borealis* Kotir. & Saarenoksa, *H. erastii* Saarenoksa & Kotir. and *H. tuberculata* Kotir. & Saarenoksa are described. The first one is characterised by small, white aculei, thin-walled hyphae, narrow, sting-like cystidia and wide apical hyphae of aculei. *Hyphodontia tuberculata* is yellowish, tuberculate, has fairly thin-walled hyphae, bears long, thin-walled hyphoid cystidia and gloeocystidia. *Hyphodontia erastii* is closely related to *H. sambuci* (Pers.) J. Erikss., but has mostly smaller capitate cystidia and subcylindrical spores. Species resembling the new species are described and illustrated, and a key to the species treated is given.

Key words: Basidiomycetes, Corticiaceae, *Hyphodontia*, taxonomy

INTRODUCTION

The basidiomycete genus *Hyphodontia* J. Erikss. (Corticiaceae) has a world wide distribution and includes about 80 taxa (Langer 1994). Many of them have capitate cystidia/cystidioles or little differentiated hyphal ends which are named differently by several authors (e.g. Lentz 1954, Eriksson 1958, Eriksson & Ryvarden 1976, Jülich & Stalpers 1980, Wu 1990, Langer 1994). In this paper, we simply use the term cystidia, which means a cell of (sub)hymenial origin and differs from other cells (basidioles and basidia) in hymenium. These cystidia are, of course, differently shaped.

When the senior author identified material from the West Siberian Plain, two conspecific col-

lections of *Hyphodontia* were unknown to him. Thus, the name *H. nudiseta* Warcup & Talbot was used (Kotiranta 1995: 92) because no better name was available when the article was written. However, in his monograph of the genus *Hyphodontia*, Langer (1994) showed a species similar to the Siberian ones. He called it in the figure text *H. aff. nudiseta* (p. 169). Material of *H. nudiseta* was requested from Gothenburg (GB), Oslo (O) and Ewald Langer and it proved to include three species. According to the description of *H. nudiseta* (Langer 1994) two of the species are in our opinion not conspecific with it, and are described here as new species (*H. borealis*, *H. tuberculata*). The third one (*Hyphodontia* sp. 1 Langer 5302) is also most probably not *H. nudiseta*, since it is found at least in Central Europe, whereas *H. nudiseta* is

described from Australian material. The common species, *H. aspera*, *H. breviseta* and *H. sambuci* were also studied, because all of them share characteristics of *H. nudiseta* complex. Only *H. aspera* seems to be, at the very least, morphologically a fairly well-delimited taxon, whereas *H. breviseta* and *H. sambuci* are rather species complexes which still require further study (see also Eriksson & Ryvarden 1976).

MATERIALS AND METHODS

The material studied is preserved in the herbaria GB, H, O, TAA and/or in the reference herbaria of Heikki Kotiranta (H.K.) and Gitta and Ewald Langer (GEL).

Thirty spores per specimen were measured, and all the measurements were made in Cotton Blue (CB). The other mounting media used were Melzer's reagent (IKI) and 5% potassium hydroxide (KOH). In the text the following abbreviations are used: *L* = mean spore length, *W* = mean spore width, *Q* = range of the variation in *L:W* ratio, *Q** = quotient of the mean spore length and mean spore width (*L:W*). The measurements for each specimen are given in Table 1, and in the text only the mean *Q**-value and the mean spore length and width of all the specimens are given. The values *L* and *W* (in Table 1) set in boldface include at least 90% of the spores. None of the measurements derive from spore print.

Biological provinces and collecting sites in Finland are indicated according to the Finnish national uniform grid system (E 27°), and applied to biological material by Heikinheimo and Raatikainen (1981).

The nomenclature of fungi follows Hjortstam (1998) and Niemelä (1999) and of vascular plants Hämet-Ahti *et al.* (1998). The authors of vascular plants and polypores are found in those publications and are not repeated here. The epithets "Picea" and "spruce" refer to *Picea abies*, "Pinus" to *Pinus sylvestris*, "birch" to *Betula* spp. and "aspen" to *Populus tremula*, respectively. The species are arranged in alphabetical order.

TAXONOMIC TREATMENT

Key to the species

1. Gloeocystidia present 2
1. Gloeocystidia absent 3
2. Hyphae thin-walled, long hyphoid cystidia present ...
..... *Hyphodontia tuberculata*
2. Hyphae thick-walled, long hyphoid cystidia absent ...
..... *Hyphodontia breviseta*
3. Hyphae in aculeal tips 4–7 µm wide
..... *Hyphodontia borealis*
3. Hyphae in aculeal tips up to 4 µm wide or hymenium
more or less smooth 4
4. Hymenium smooth between aculei or papillae 5
4. Hymenium porose reticulate between aculei 7
5. Basidiocarp aculeate *Hyphodontia aspera*
5. Basidiocarp smooth or tuberculate 6
6. All hyphae thin-walled, capitate cystidia up to 35 µm
long, spores narrowly ellipsoid or subcylindrical, thin-
walled *Hyphodontia erastii*
6. At least subicular hyphae thick-walled, capitate cystidia
up to 50 µm long, spores broadly ellipsoid, thick-walled
..... *Hyphodontia sambuci*
7. Hyphoid cystidia in groups in aculeal tips
..... *Hyphodontia* sp. 1 Langer 5302
7. Hyphoid cystidia solitary or lacking 8
8. Hyphae thin-walled, spear shaped cystidia present
..... *Hyphodontia* sp. 2 Saarenoksa 10498
8. Hyphae fairly thick-walled, spear shaped cystidia absent
..... 9
9. Subulate cystidia absent, capitate cystidia common,
spores broadly ellipsoid, northern species
..... *Hyphodontia* sp. 3 Kotiranta 12752
9. Subulate cystidia common, capitate cystidia lacking,
spores subcylindrical, tropical or subtropical species ..
..... *Hyphodontia knysnana*

Hyphodontia aspera (Fr.) J. Erikss. (Fig. 1)

Symb. Bot. Upsaliensis 16: 104. 1958. — *Grandinia aspera*
Fr., Hym. Eur.: 627. 1874.

A good macroscopical description of the species is presented in Eriksson and Ryvarden (1976) and Langer (1994).

Hyphal system monomitic; all hyphae clamped, cyanophilous. Subicular hyphae richly branched, thick-walled (up to 0.7 µm), 3–3.5 µm in diameter. Tramal hyphae in aculei subparallel, very

Table 1. Spore dimensions of the studied specimens. The values set in boldface include at least 90% of the spores.

	<i>L</i>	<i>L</i> *	<i>W</i>	<i>W</i> *	<i>Q</i>	<i>Q</i> *
<i>H. aspera</i>						
Kotiranta 5212	(4.8–)5.0–5.8(–6.0)	5.3	3.9–4.3(–4.5)	4.1	1.2–1.5	1.3
Kotiranta 5242	(4.9–)5.1–6.0	5.4	4.3–5.0(–5.8)	4.7	1.0–1.3	1.2
Kotiranta 5010	4.9–5.4(–5.5)	5.1	(3.6–)4.0–4.3(–4.5)	4.1	1.1–1.4	1.2
Kotiranta 4112	(4.9–)5.0–6.0	5.5	4.0–4.9(–5.1)	4.5	1.1–1.4	1.2
<i>H. borealis</i>						
Saarenoksa 03599	4.5–5.1	4.9	(3.1–)3.3–4.1	3.7	1.2–1.5	1.3
Saarenoksa 05497	(4.5–)4.7–5.3	5.0	(3.3–)3.5–4.0(–4.2)	3.7	1.2–1.5	1.3
Saarenoksa 06697	4.5–5.3(–5.6)	5.0	3.5–4.0(–4.2)	3.7	1.2–1.4	1.3
Saarenoksa 28090	4.7–5.2(–5.6)	5.0	2.7–3.1	2.9	1.6–1.8	1.7
Haikonen 6263a	(4.2–)4.4–5.0(–5.2)	4.8	3.0–3.4	3.2	1.4–1.7	1.5
Saarenoksa 14495	4.5–5.0(–5.2)	4.8	(3.0–)3.3–4.0	3.6	1.2–1.5	1.4
Schulmann	4.6–5.2(–5.6)	5.0	(3.2–)3.4–3.8(–4.0)	3.6	1.3–1.6	1.4
Haikonen 6247	4.6–5.1	4.8	3.0–3.3	3.1	1.4–1.7	1.5
Haikonen 6250	4.6–5.2(–5.4)	4.9	3.3–3.7(–3.9)	3.4	1.3–1.6	1.4
Larsson 5427	(4.0–)4.4–5.1	4.7	2.6–3.2(3.4)	2.9	1.3–1.9	1.6
Larsson 5435	4.9–5.6	5.2	3.4–4.0(–4.3)	3.7	1.3–1.6	1.4
Eriksson 10171	4.8–5.4(–6.1)	5.1	(3.0–)3.3–4.0	3.6	1.3–1.6	1.4
Kotiranta 7550	4.5–5.2	4.9	3.2–3.8	3.5	1.3–1.5	1.4
Larsson 4593	(4.6–)4.9–5.6	5.2	(3.2–)3.4–4.0(–4.6)	3.8	1.2–1.6	1.4
Stokland 26064	4.8–5.5(–5.8)	5.1	(3.6–)3.8–4.5(–4.6)	4.1	1.1–1.4	1.2
Kotiranta 10365	4.6–5.6(–5.9)	5.1	2.9–3.6(–3.9)	3.4	1.3–1.8	1.5
Kotiranta 10430	4.9–5.8(–6.0)	5.4	3.2–3.8(–4.0)	3.6	1.4–1.8	1.5
Larsson 7121	(4.6–)5.0–5.8	5.2	3.5–4.1(–4.3)	3.8	1.2–1.5	1.4
Larsson 6314	4.6–5.2(–5.4)	4.9	3.3–3.9(–4.2)	3.6	1.2–1.5	1.4
Larsson 5478	4.5–5.1(–5.9)	4.9	2.5–3.1	2.8	1.5–2.0	1.7
Larsson 3607	4.5–5.3(–5.7)	5.0	(3.0–)3.3–4.2(–4.4)	3.7	1.2–1.5	1.3
Larsson 2080	(4.3–)4.5–5.0	4.7	(3.2–)3.5–4.0(–4.2)	3.7	1.1–1.6	1.3
<i>H. breviseta</i>						
Saarenoksa 29294	(4.6–)4.8–5.4(5.6)	5.0	3.0–3.5(–3.9)	3.3	1.4–1.6	1.5
Hamunen	4.0–4.5(–4.6)	4.2	2.9–3.3(–3.5)	3.1	1.2–1.5	1.4
Fagerström	4.6–5.5(–6.0)	5.1	2.9–4.0(–4.8)	3.5	1.3–1.7	1.5
Kotiranta 1520	4.2–4.6(–4.8)	4.5	(2.9–)3.1–3.6	3.3	1.3–1.5	1.4
Kotiranta 2459	4.0–4.7(–4.9)	4.4	2.9–3.5(–3.7)	3.2	1.3–1.5	1.4
Karsten	4.0–4.7(–4.9)	4.4	(2.7–)3.0–3.3	3.1	1.3–1.6	1.4
<i>H. erastii</i>						
Kotiranta 7514	(5.1–)5.3–6.5	5.7	(2.9–)3.1–3.5(–3.9)	3.3	1.6–2.0	1.8
Saarenoksa 17195	(4.9–)5.0–5.7(–5.9)	5.3	2.8–3.2	3.0	1.6–2.0	1.8
Saarenoksa 06290	5.5–6.2(–6.5)	5.9	3.0–3.5	3.3	1.6–2.0	1.8
Saarenoksa 17891	4.9–5.5	5.2	2.7–3.0(–3.2)	2.9	1.7–2.0	1.8
Saarenoksa 12989	4.9–5.6(–5.8)	5.2	(2.7–)2.9–3.2	3.0	1.6–1.9	1.7
Saarenoksa 13089	4.8–5.5(–5.9)	5.2	2.7–3.0(–3.2)	2.9	1.6–2.0	1.8
Saarenoksa 52289	5.2–6.0	5.6	2.9–3.4	3.2	1.6–1.9	1.8
Saarenoksa 08090	4.9–5.4(–5.9)	5.2	2.8–3.2(–3.4)	3.0	1.6–2.0	1.8
Saarenoksa 03890	4.9–5.8(–6.1)	5.4	2.9–3.6	3.3	1.5–1.9	1.7
Fagerström 1977	5.0–6.0(–6.3)	5.6	3.1–3.5(–3.9)	3.3	1.5–2.0	1.7
Fagerström 1978	5.3–6.0(–6.4)	5.7	3.1–3.4(–3.6)	3.3	1.6–1.8	1.7
Parmasto 8836	5.0–5.7(–6.0)	5.3	(2.8–)3.0–3.6(–3.8)	3.2	1.3–1.9	1.7
Parmasto 12116	4.5–5.6(–6.0)	5.1	2.5–3.2(–3.4)	3.0	1.6–1.9	1.7

continued

Table 1. Continued.

	L	L*	W	W*	Q	Q*
<i>H. knysnana</i>						
Ryvarden 19606	(4.8–)5.0–5.8	5.2	2.2–2.6	2.4	1.9–2.3	2.1
Ryvarden 20054	5.2–5.8(–6.0)	5.5	2.9–3.3	3.1	1.6–2.0	1.8
Ryvarden 10126	4.8–5.5	5.1	(2.5–)2.8–3.4	3.0	1.5–2.0	1.7
<i>H. sambuci</i>						
Kotiranta 10013	4.9–5.9(–6.1)	5.4	3.6–4.1	3.9	1.2–1.6	1.4
Kotiranta 16710	(4.6–)4.8–5.3(–5.5)	5.1	3.5–3.9	3.7	1.2–1.5	1.4
Kotiranta 7505	4.6–5.1(–5.4)	5.0	3.5–4.0(–4.5)	3.8	1.1–1.4	1.3
Kotiranta 7512	4.5–5.1(–5.3)	4.9	3.7–4.4(–4.6)	4.1	1.1–1.3	1.2
Saarenoksa 10689	4.8–5.4(–5.6)	5.1	3.2–3.7(–3.9)	3.5	1.3–1.6	1.5
Saarenoksa 52589	4.7–5.6(–5.9)	5.2	(3.2–)3.4–3.7(–4.0)	3.6	1.2–1.6	1.4
Saarenoksa 25498	4.6–5.5(–5.7)	5.1	(3.6–)3.8–4.1(–4.3)	4.0	1.2–1.4	1.3
Saarenoksa 42988	4.4–5.1(–5.3)	4.9	3.3–3.9(–4.1)	3.6	1.2–1.5	1.4
Saarenoksa 38588	(4.4–)4.8–5.6(–5.8)	5.1	3.5–4.0(–4.2)	3.8	1.2–1.5	1.4
Saarenoksa 54591	4.9–5.8(–6.0)	5.5	(3.7–)3.9–4.3	4.1	1.2–1.6	1.3
Saarenoksa 06390	(5.0–)5.2–5.9(–6.1)	5.5	(3.5–)3.8–4.2	4.0	1.3–1.6	1.4
Kotiranta 7360	4.7–5.4(–5.6)	5.1	3.3–3.8(–4.0)	3.5	1.3–1.6	1.4
Saarenoksa 34293	5.0–6.0	5.4	(3.3–)3.5–4.2(–4.5)	3.9	1.2–1.7	1.4
Haikonen 5274	4.6–5.6(–5.8)	5.1	3.6–4.4(–4.6)	4.0	1.1–1.4	1.3
<i>H. tuberculata</i>						
Winterhoff	4.4–5.0	4.7	2.9–3.6	3.2	1.3–1.7	1.4
Stokland 4242	(4.1–)4.3–5.0(–5.2)	4.6	2.9–3.6	3.2	1.2–1.8	1.4
Stokland 4243	4.1–4.9	4.5	2.9–3.3(–3.5)	3.2	1.3–1.6	1.4
Stokland 4246	4.0–4.8(–5.0)	4.4	2.9–3.5	3.1	1.3–1.6	1.4
Larsson 6028	4.1–4.7(–4.9)	4.4	3.1–3.7(–4.1)	3.5	1.1–1.4	1.3
Martini 3034	4.1–4.9	4.5	2.8–3.7(–3.9)	3.2	1.2–1.6	1.4
<i>H. sp. 1</i>						
Langer 5302	(4.3–)4.6–5.3(–5.5)	4.9	(3.4–)3.5–3.9(–4.1)	3.7	1.2–1.5	1.3
<i>H. sp. 2</i>						
Saarenoksa 10498	(4.5–)4.8–5.6	5.1	2.9–3.5(4.1)	3.2	1.3–1.8	1.6
<i>H. sp. 3</i>						
Kotiranta 12752	(4.2–)4.5–5.1(–5.5)	4.7	3.4–3.9(–4.1)	3.7	1.1–1.5	1.3

equal in width, normally 2.5–3 µm wide, with walls up to 0.6 µm thick. Tramal hyphae in aculeal tips sparsely covered with small crystals; subhymenial hyphae fairly thin-walled, not especially short-celled, 3 µm in diam. Cystidia of two types: (a) capitate thin-walled cystidia common, not projecting over the hymenium (23–)30–40(–44) × 4.5–5.5(–6) µm, and (b) subulate cystidia close to the dissepiment edge, 25–35 × 3 µm. Basidia basally clamped, subclavate or cylindrical (23–)28–34(–39) × 4.5–5.5(–6) µm, with four, up to 3.5 µm long sterigmata. Spores broadly ellipsoid or subglobose, 5.3 × 4.4 µm, $Q^* = 1.2$, thin-walled, faintly cyanophilous, IKI–.

The small crystals (up to 2.5 µm in diam.) on apical hyphae of aculei are very similar to those seen in *H. radula*, and some rose-thorn shaped

are in light microscope remarkably similar to those of the polypore genera *Skeletocutis* and *Tyromyces* (see e.g. David 1982, Niemelä 1998, Renvall & Kaaro 1998).

Hyphodontia aspera mostly grows on coniferous wood, but is not rare on deciduous substrate either. In Finland, it is fairly common in all kinds of coniferous forests, and grows only occasionally on sites affected by human activity.

SPECIMENS EXAMINED: **Finland.** Varsinais-Suomi: Merimasku, spruce dominated *Vaccinium myrtillus* forest site type, on corticated *Betula pendula* branch together with *Stereum hirsutum*, Grid 27°E 671: 21, 16.X.1983, Kotiranta 5212 (H.K.). Etelä-Häme: Tammela, Liesjärvi Nat. Park, old spruce dominated *Vaccinium myrtillus* forest site type, on decorticated fallen *Picea*, Grid 27°E 6731: 330, 22.X.1983 Kotiranta 5242 (H.K.). Koillismaa: Posio, Riisitunturi Nat. Park, Riisiahonkangas, spruce dominated open

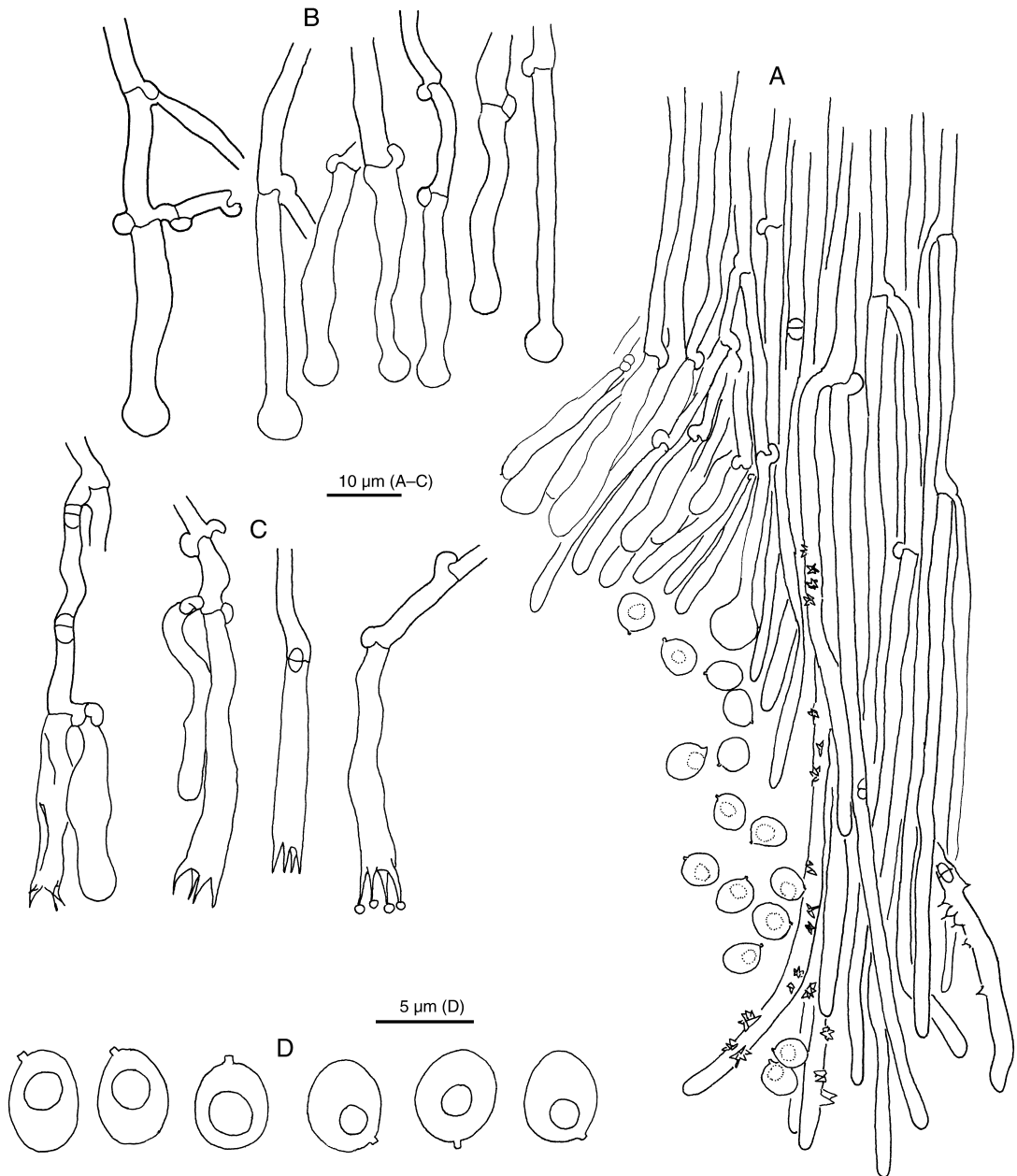


Fig. 1. *Hyphodontia aspera* (Fr.) J. Erikss. (from *Kotiranta 5010*). — A: Section through an aculeus showing a capitate cystidium, basidiolae, spores and encrusted hyphae. — B: Capitate cystidia. — C: Basidia at different stages of development. — D: Spores.

old-growth forest, on partly decorticated, partly markedly decayed *Picea*, Grid 27°E 734: 57, 7.IX.1983 *Kotiranta 5010* (H.K.). Kittilän Lappi: Kittilä, Pallas-Ounas Nat. Park, Sammaltunturi, brook-side above forest line, on corticated *Salix* sp., Grid 27°E 754:38, 5.IX.1982 *Kotiranta 4112* (H.K.).

Hyphodontia borealis Kotir. & Saarenoksa,
sp. nova (Figs. 2–6)

Fungus resupinatus, hymenophoro aculeato, in vivo albus, in statu sicco albus vel cremeoalbus;

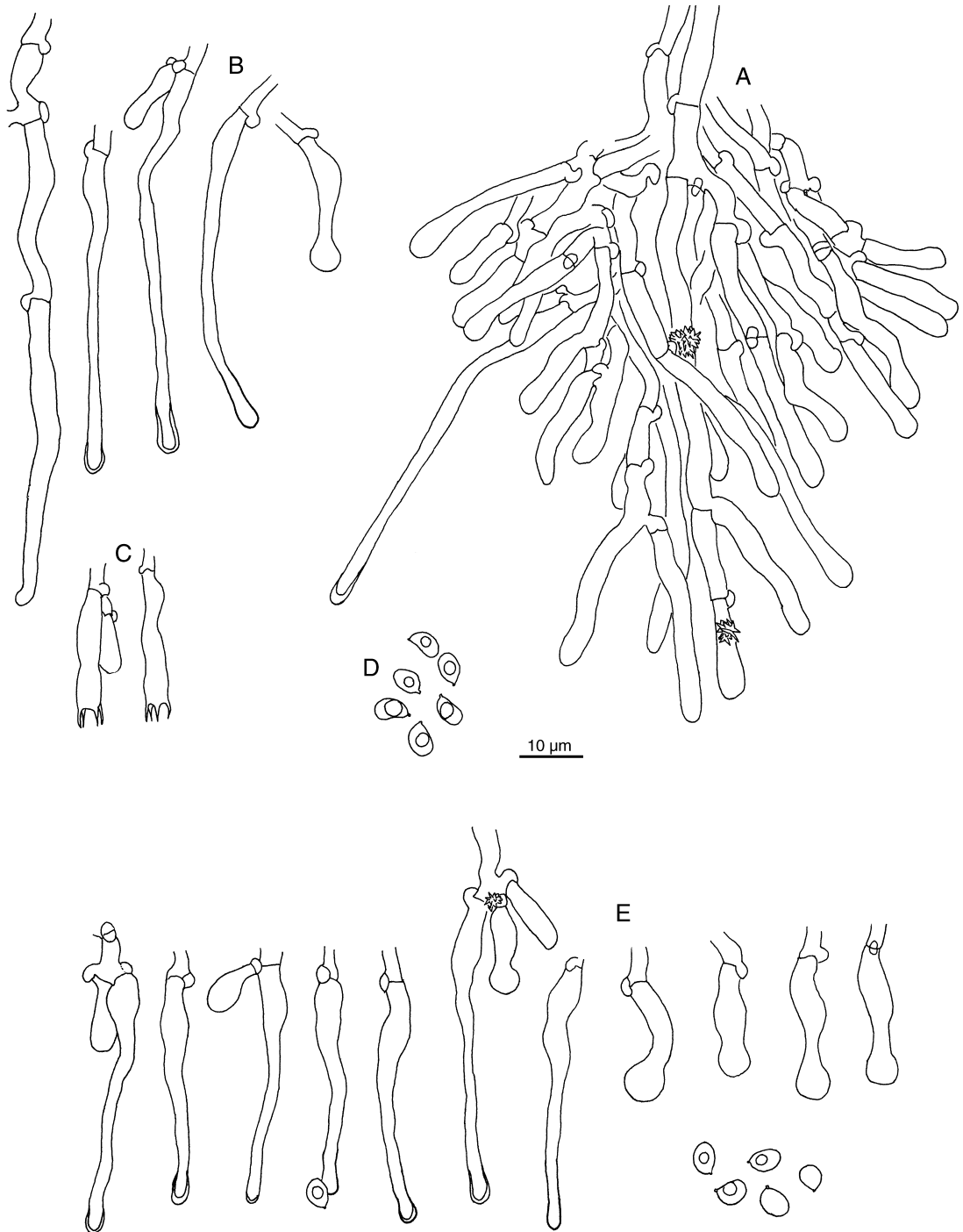


Fig. 2. *Hyphodontia borealis* Kotir. & Saarenoksa (A–D from Saarenoksa 28090, E from Saarenoksa 14495). — A: Section through an aculeus. — B: Pin-shaped hyphoid cystidia and capitata cystidia. — C: Basidia. — D: Spores. — E: Cystidia and spores.

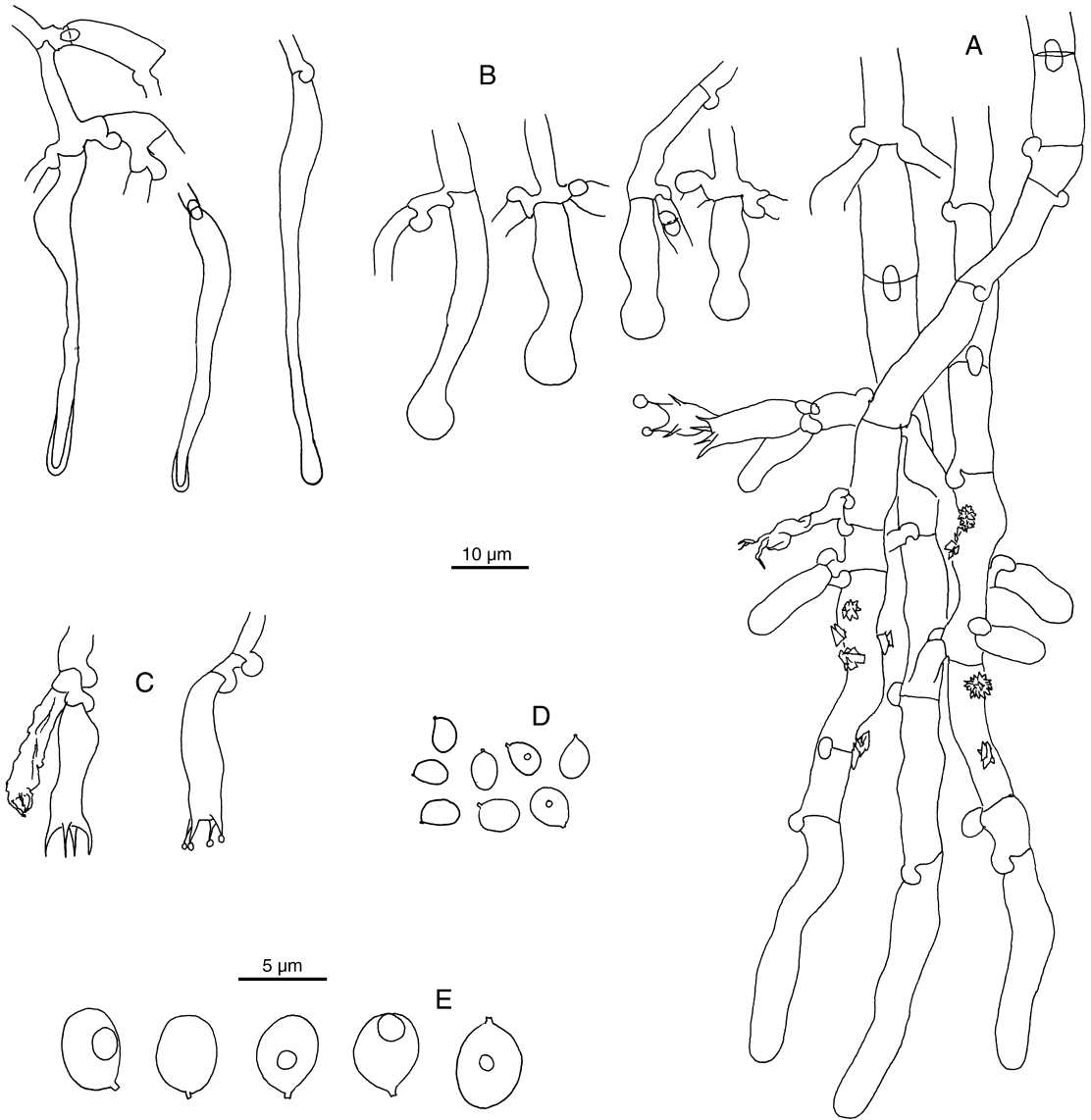


Fig. 3. *Hyphodontia borealis* Kotir. & Saarenoksa (from the holotype). — A: Wide penetrating hyphae from the aculeal tip. — B: Cystidia. — C: Basidia. — D–E: Spores.

systema hypharum monomiticum, hyphis fibulatis. Cystidia subulata numerosa, 40–60 × 4–5 µm et cystidia capitatae 20–40 × 4.5–5.5 µm. Sporae ellipsoideae, 5 × 3.5 µm.

HOLOTYPE: Finland. Uusimaa: Helsinki, Kumpula, corticated *Pinus sylvestris*, Grid 27°E 6679:387, 6.XI.1999 Saarenoksa 03599 (H).

Basidiocarp resupinate, thin or more seldom fairly thick, at first porose reticulate, later odontoid with irregularly distributed small aculei, which are apically pilose by projecting hyphae (×25), watery white, pure white or pale cream coloured. Margin not differentiated, distinct.

Hyphal system monomitic, all hyphae clamped,

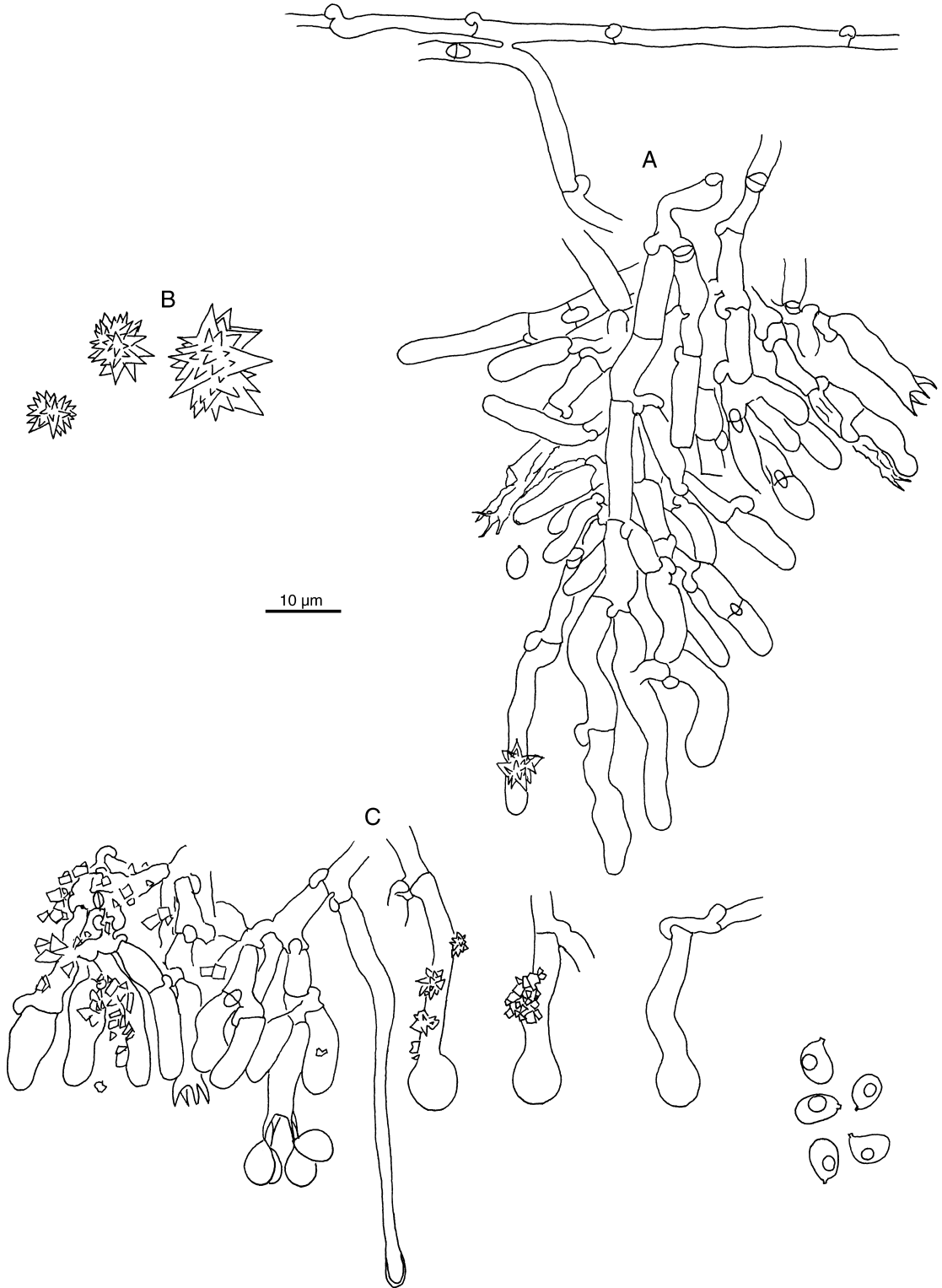


Fig. 4. *Hyphodontia borealis* Kotir. & Saarenoksa (A and B from *Haikonen 6247*, C from *Haikonen 6250*). — A: Section through an aculeus. — B: Crystals. — C: Part of hymenium, cystidia and spores.

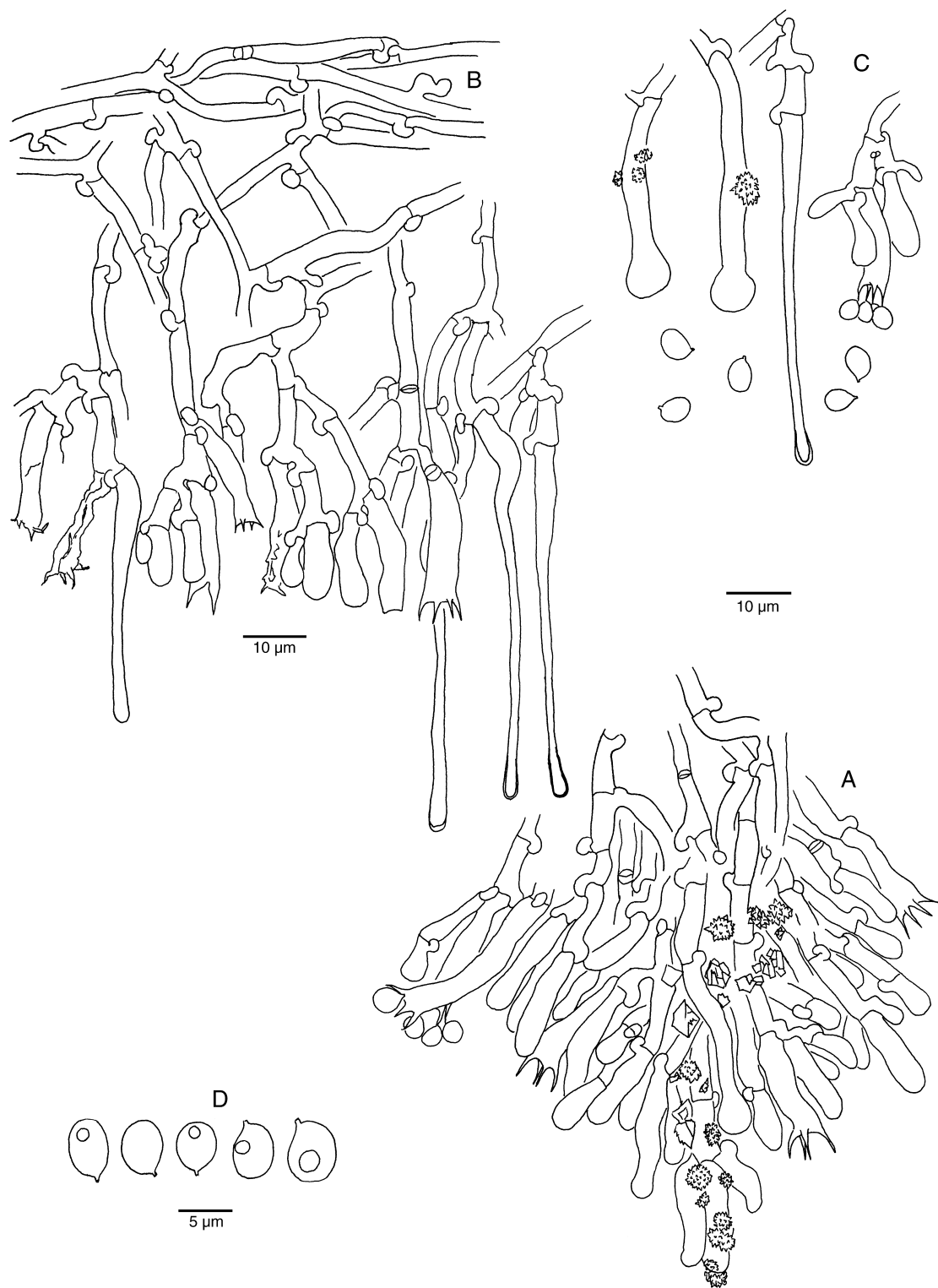


Fig. 5. *Hyphodontia borealis* Kotir. & Saarenoksa (from *Larsson 3607*). — A: Section through an aculeus. — B: Section through basidiocarp. — C: Cystidia, basidia and spores. — D: Spores.

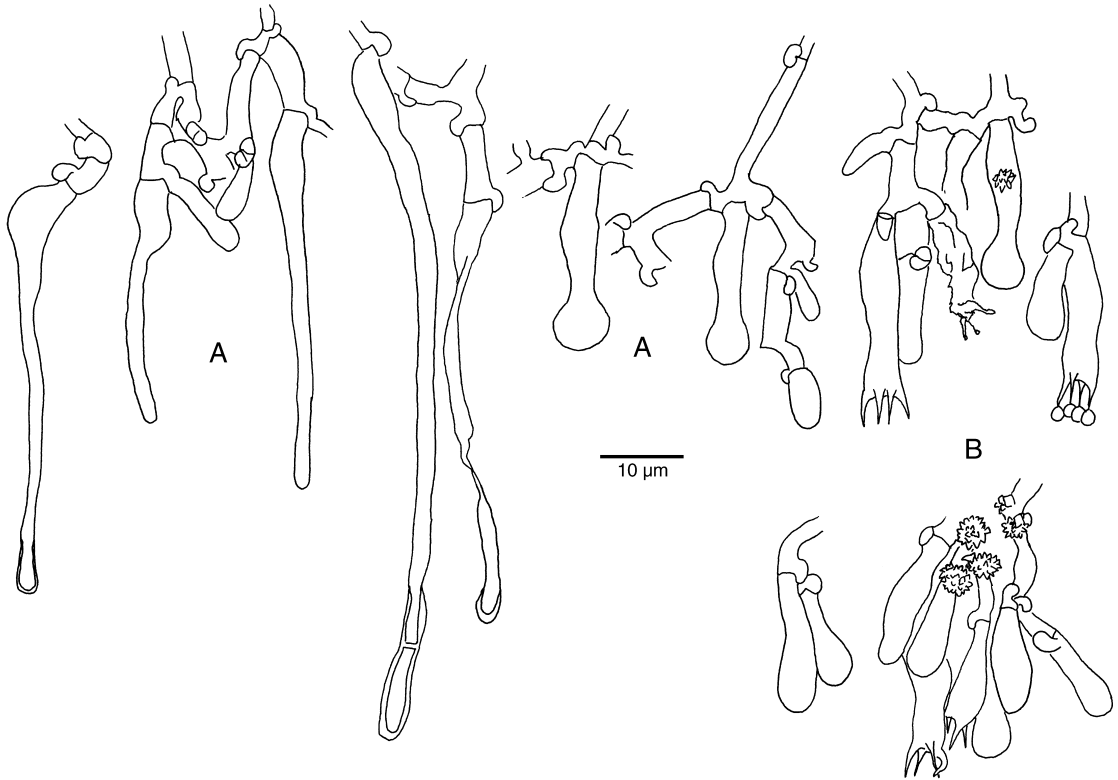


Fig. 6. *Hyphodontia borealis* Kotir. & Saarenoksa (from Larsson 3607). — A: Young and old, collapsed cystidia. — B: Basidia.

cyanophilous. Subicular hyphae few, parallel to the substrate, sparingly branched, thin- to slightly thick-walled, (2–)2.5–3 µm in diam. Tramal hyphae in aculei thin-walled, richly branched, relatively short-celled, 4–6 µm wide. Hyphae (3–5) projecting from the aculeal apices wide, (4–)5–6(–7) µm in diameter, covered with rosette-looking crystals (up to 10 µm in diam.). Subhymenial hyphae richly branched, short-celled, thin-walled, (2–)3–4 µm in diam. Cystidia of two kinds, (a) pin- or sting-like cystidia abundant, projecting 20–35 µm over the hymenium, (30–)40–60(–70) × (3–)4–5(–6) µm, thin-walled, except the slightly widened (up to 2.8 µm wide) strongly cyanophilous obtuse tip (wall up to 1.8 µm thick), and (b) capitate cystidia rare or common, thin-walled, (15–)20–40(–50) × (4–)4.5–5.5(–6.5) µm. Basidia small, basally clamped, cylindrical or sub-cylindrical, with one or two constrictions, (11–)15–20(–28) × (3.5–)4–4.5(–5.5) µm, with four straight or curved, normally 4 µm long sterigmata. Spores short cylindrical, or more commonly ellipsoid or

broadly ellipsoid, 5.0 × 3.5 µm, $Q^* = 1.4$, thin- or slightly thick-walled, faintly but clearly cyanophilous, inamyloid, indextrinoid.

Hyphodontia borealis is most easily identified by its pin-shaped cystidia, which are apically slightly widened, thick-walled and cyanophilous. Moreover, the 3–5 hyphae penetrating from the aculeal apices are wide. *Hyphodontia tuberculata* is mostly yellowish, tuberculate (not aculeate), the pin-shaped cystidia are thin-walled, not apically widened and it has gloeocystidia. The hyphae on aculeal tips of *Hyphodontia* sp. 1 are much narrower, it lacks the pin-shaped cystidia and the hyphae are much thicker-walled. *Hyphodontia sambuci* is more or less smooth, much tougher, and its narrow cystidia are different.

Langer (1994) published a drawing of *Hyphodontia borealis* under the name *H. aff. nudiseta*. However, the name *H. nudiseta* has normally been used for *H. borealis* (Kotiranta 1995, Dämon 1997, Hjortstam & Larsson 1997). Hjortstam and Larsson (1997) used the name *H. nudiseta* only

with reservations. In their opinion, a species, which in North Europe often grows on dead ferns (*H. borealis*) is hardly conspecific with a species described from Australian material and growing on grass roots on open fields (*H. nudiseta*).

The hitherto finds of *Hyphodontia borealis* give the impression that it is a taiga species with a relatively northern distribution, and in more southern areas (Central Europe) it grows, at least, on high elevations. The ecological habitat requirements of *H. borealis* are not strict, vice versa; it has been found anywhere from luxuriant grass-herb forests with ferns to old-growth forests and semi-urban forests. It grows on all kinds of wood, both deciduous and coniferous, as well as on dead ferns. To date, the collections derive from ferns (6), aspen trees (2), pine (2), *Salix* spp. (2), *Alnus fruticosa*, *Betula* sp., *Juniperus communis*, *Larix sibirica*, *Prunus padus*, *Sambucus racemosa* and unidentified coniferous and deciduous wood.

Note that the specimens *Saarenoksa* 05497 and 06697 are treated separately in Table 1, even if the specimens derive from the same tree, and from the collection *Haikonen* 6263a 60 spores are measured.

SPECIMENS EXAMINED: Finland. Uusimaa, Helsinki, Kumpula, mixed *Vaccinium myrtillus*–*Oxalis acetosella* forest site type, thin, felled, corticated *Pinus sylvestris*, Grid 27°E 6679:387, 6.XI.1999 *Saarenoksa* 03599 (H). Helsinki, Toukola, young moist deciduous forest, markedly decayed, decorticated *Salix* sp., Grid 27°E 6679:387, 1.X.1997 *Saarenoksa* 05497 (H), and 4.X.1997 *Saarenoksa* 06697 (H). Helsinki, Vanhakaupunki, Pornaistenniemi, grass-herb forest ashore, thin, decorticated *Sambucus racemosa*, Grid 27°E 6679:388, 31.VIII.1990 *Saarenoksa* 28090 (H). Lapinjärvi, Latokartano, brook-side grass-herb forest, bases of dead *Matteuccia struthiopteris* leaves with *Athelopsis lembospora*, Grid 27°E 6729:451, 6.IX.1985 *Haikonen* 6263a (H). Sipoo, Östersundom, Björnsö, *Oxalis acetosella*–*Maianthemum bifolium* forest site type, fallen, corticated *Juniperus communis*, Grid 27°E 6683:400, 28.IX.1995 *Saarenoksa* 14495 (H). Tammisaari, decorticated pine branch, Grid 27°E 665:30, v. *Schulmann* (H). EH: Asikkala, Salo, Suopelto, brook-side grass-herb forest, bases of dead *M. struthiopteris* leaves, Grid 27°E 6784:426, 31.VIII.1985 *Haikonen* 6247 (H). Hollola, Kalliola, Meruenkorpi, brook-side grass-herb forest, bases of dead *M. struthiopteris* leaves, Grid 27°E 6774:431, 3.IX.1985 *Haikonen* 6250 (H). Hämeenkoski, Pääjärvi S, Käikälä, spruce dominated *Vaccinium myrtillus* forest site type, bases of dead *Athyrium* sp. leaves, Grid 27°E 6772:394, 6.X.1984 *Larsson* 5427 & *Hjortstam* 1154 (GB) and same site, date, and substrate, *Larsson* 5435 & *Hjortstam* 1158 (GB). Pohjois-Karjala: Lieksa, Koli-Jerojärvi, decayed

Betula sp. branch, Grid 27°E 700:64, 9.IX.1960 *Eriksson* 10171 & *Kujala* (GB 05206). Kittilän Lappi: Kittilä, Homevuoto Nature Res., spruce dominated luxuriant old growth grass-herb forest, *Prunus padus* twig, Grid 27°E 7519:398-9, 27.VIII.1989 Kotiranta 7550 (H.K.). **Norway.** Hedmark: Lötén, Flötholmen, decorticated branch of deciduous tree, 2.X.1982 *Larsson* 5493 (GB). Østfold: Rømskog, Steinsvika, decorticated, fairly decayed aspen, 20.X.1997 *Stokland* 26064 (J.S.). **Russia.** Yamal Nenetes Okrug, Yamal Peninsula, Yadayakhodyakha river, bark and wood of *Larix sibirica* branch, 67°10'N, 71°25'E, 25.VII.1992 *Kotiranta* 10365 (H.K.) and same place, on *Alnus fruticosa* together with *Stereum rugosum*, 26.VII.1992 *Kotiranta* 10430 (H.K.). **Sweden.** Gästrikland: Österfärnebo, Dalälven, Torrö W, decorticated aspen branch, 29.IX.1988 *Larsson* 7121 (GB). Halland: Släp, Särö, Västerskog, coniferous twig, 26.VIII.1986 *Larsson* 6314 (GB). Skåne: Riseberga, Skåralid, dead *Dryopteris*, 14.X.1984 *Larsson* 5478 (GB). Västergötland: Västra Tunhem, Hunneberg, Munkesten, *Salix* sp. branches, 10.IX.1978 *Larsson* 2080 (GB). Västra Tunhem, Halleberg, Ovandalen, mixed forest, dead *Athyrium* sp., 17.X.1982 *Larsson* 3607 (GB).

Hyphodontia breviseta (P. Karst.) J. Erikss.
(Fig. 7)

Symb. Bot. Upsalienses 16: 104. 1958. — *Kneiffia breviseta* P. Karst., Hedwigia 25: 232. 1886

Eriksson and Ryvarden (1976) and Langer (1994) present a good macroscopical description of the species.

Hyphal system monomitic, all hyphae clamped, cyanophilous, IKI–. Subicular hyphae richly branched, thick-walled (up to 0.9 µm), 3.5–4 µm in diam. Tramal hyphae in aculei with clearly thickened walls, subparallel, in apices covered with rosette-looking crystals (up to 6 µm in diam.). Subhymenial hyphae relatively short-celled, with thickened walls, 3–3.5 µm in diam. Cystidia of two types, (a) capitate, thin-walled cystidia common, not, or only slightly projecting over the hymenium, (23–)27–35(–38) × (3.5–)4–5(–5.5) µm and, (b) cylindrical, thin-walled gloeocystidia, which may have several constrictions, rather few or fairly common, (45–)50–70 × 6–7 µm (contents strongly cyanophilous, IKI pale yellow). Basidia basally clamped, subcylindrical, with one, two or three constrictions, (13–)15–20(–25) × 4–4.5 µm, with four, normally up to 4.5 µm long sterigmata. Spores ellipsoid, 4.5 × 3.3 µm, *Q** 1.4, thin-walled, slightly cyanophilous, IKI–.

The rosette-looking crystals are very charac-

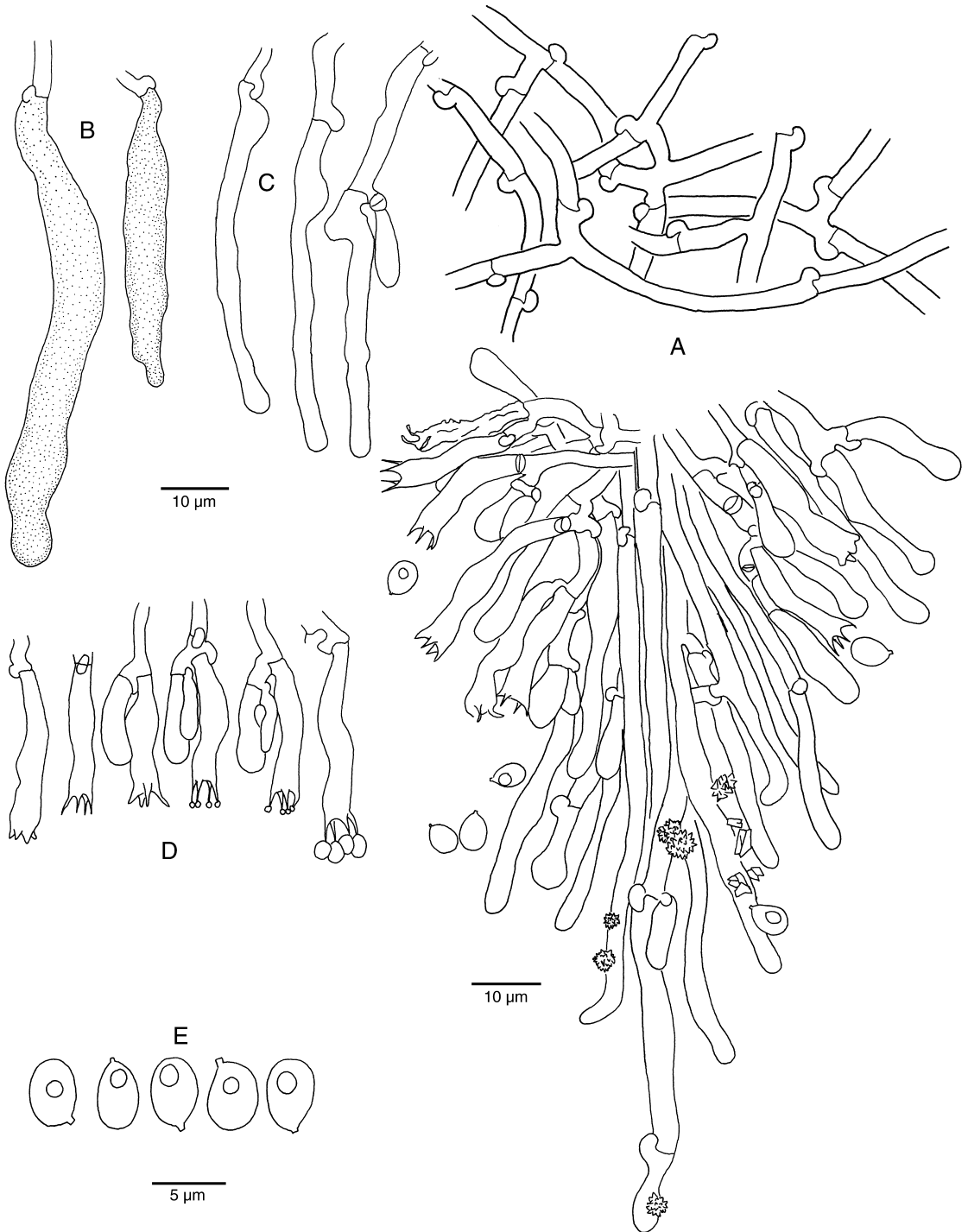


Fig. 7. *Hyphodontia breviseta* (P. Karst.) J. Erikss. (from Kotiranta 2459). — A: Section through an aculeus and thick-walled subicular hyphae. — B: Gloeocystidia. — C: Little differentiated capitate cystidia. — D: Basidia. — E: Spores.

teristic of *Hyphodontia breviseta*. They differ from the crystals of *H. aspera* in being much larger and more numerous. We have two specimens which differ from the typical *H. breviseta*. The first one, *Hyphodontia* cf. *breviseta* (*Saarenoksa* 29294, Fig. 8), is characterised by a very long sterile aculeal apex, and the tightly agglutinated hyphae are strictly parallel and amyloid. The gloecystidia are also relatively large, over 90 µm long. Spores are very similar to *H. breviseta*, ellipsoid, 5.0 × 3.3 µm, $Q^* = 1.5$, thin-walled, cyanophilous, IKI-. The second one, *Hyphodontia* sp. 3 (*Kotiranta* 12752, Fig. 16) is described below.

Hyphodontia breviseta is very common in all kinds of coniferous forests, and in one careful study it proved to be the most common *Hyphodontia* species (Penttilä & Kotiranta 1996). Its host is mostly decorticated coniferous wood.

SPECIMENS EXAMINED: **Finland.** Uusimaa: Helsinki, Viikki, Hakala, spruce dominated *Oxalis acetosella*–*Vaccinium myrtillus* forest site type, on decorticated, fairly decayed *Picea* together with *Oligoporus sericeomollis*, Grid 27°E 6679:389, 9.X.1994 *Saarenoksa* 29294 (H). Vantaa, Koivupää, Lapinkylä, corticated *Picea*, Grid 27°E 6691:382 *Hamunen* (H). Etelä-Karjala: Sippola, Enäjärvi, Kahisevan-suo, decorticated *Picea*, Grid 27°E 6748:509, 18.VIII.1977 *Fagerström* (H). Etelä-Häme: Jämsä, Edessalo, Pajulahti, spruce dominated *Vaccinium myrtillus* forest site type, on decorticated *Picea*, Grid 27°E 6848:413, 18.VIII.1979 *Kotiranta* 1520 (H). Padasjoki, Vesijako Strict nat. Reserve, spruce dominated old-growth forest, on advanced decayed *Picea*, Grid 27°E 6806:398, 9.IX.1980 *Kotiranta* 2459 (H.K.). Tammela, Mustiala, Salois (Saloinen), on decorticated *Pinus*, Grid 27°E 6759:324, 1.VIII.1886 *Karsten* (H, Lectotype of *Kneiffia breviseta* Karst.).

***Hyphodontia erastii* Saarenoksa & Kotir.,
sp. nova** (Fig. 9)

Hyphodontia sambuci (Pers.) J. Erikss. var. *angustispora* Parm., Consp. Syst. Cortic. 215. 1968.

Hyphodontia sambuci similis sed hyphis parietibus tenuioribus, cystidia capitata minores et spora elongato-ellipsoideae vel subcylindraceae, (4.5–)5–5.7 × (2.5–)3–3.5 µm.

HOLOTYPE: Finland. Uusimaa: Helsinki, Viikki, Säynä-lahti, grass-herb forest, dead twigs and small branches of *Sambucus racemosa*, Grid 27°E 6680:388, 8.X.1989

Saarenoksa 52289 (H).

ETYMOLOGY: “erastii”, in reference to Prof. Erast Parmasto, a distinguished authority on taxonomy of Corticia-ceae.

Basidiocarp resupinate, thin or fairly thick, staying porose-reticulate for a long time, later smooth, white, cracking into small polygons when dry; margin not differentiated, thinning out.

Hyphal system monomitic, hyphae thin-walled, cyanophilous. Subicular hyphae relatively sparingly branched, thin- or seldom slightly thick-walled, (2–)2.5–3(–3.5) µm in diam.; trama open, hyphae thin-walled, (2.5–)3–4 µm in diam.; sub-hymenial hyphae richly branched, thin-walled, 2–2.5 wide, sometimes covered with small crystals. Cystidia of two kinds, (a) capitate cystidia common, thin-walled, (13.5–)16–28(–37) × (3–)4–4.5 µm, and (b) subulate cystidia few, 15–25(–35) µm. Basidia cylindrical, subcylindrical, subclavate or seldom suburniform, with one or two constrictions, basally clamped, (13–)17–20(–24) × (3.5–)4–5 µm, with four, up to 4.5 µm long sterigmata. Spores ellipsoid, narrowly ellipsoid or subcylindrical, 5.4 × 3.1 µm, $Q^* = 1.7$, often glued in pairs or tetrads, thin-walled, faintly cyanophilous, inamyloid, indextrinoid.

Macroscopically *Hyphodontia erastii* is very similar to *H. sambuci*, in being fairly thick, white and smooth. However, it remains porose-reticulate much longer than *H. sambuci*, and especially those specimens, which grow on large herbs, do not reach the thickness of *H. sambuci*. Microscopically it differs from *H. sambuci* in having thin-walled hyphae, which are usually without crystals. It has also much less subulate cystidia, the capitate cystidia are in general clearly smaller and project only rarely above the hymenium, and the basidia fade quickly after the spore discharge. Moreover, the spores are thin-walled, mostly narrowly ellipsoid or subcylindrical, often narrowing to the apical end, and frequently glued in pairs or tetrads. The *L:W* ratio (Q^*) of the spores in *H. erastii* is 1.7–1.8 and in *H. sambuci* 1.2–1.5, respectively.

The habitats of *Hyphodontia erastii* are semi-urban, luxuriant grass-herb forests, more shaded and moister than those of *H. sambuci*.

It has long been known that *Hyphodontia*

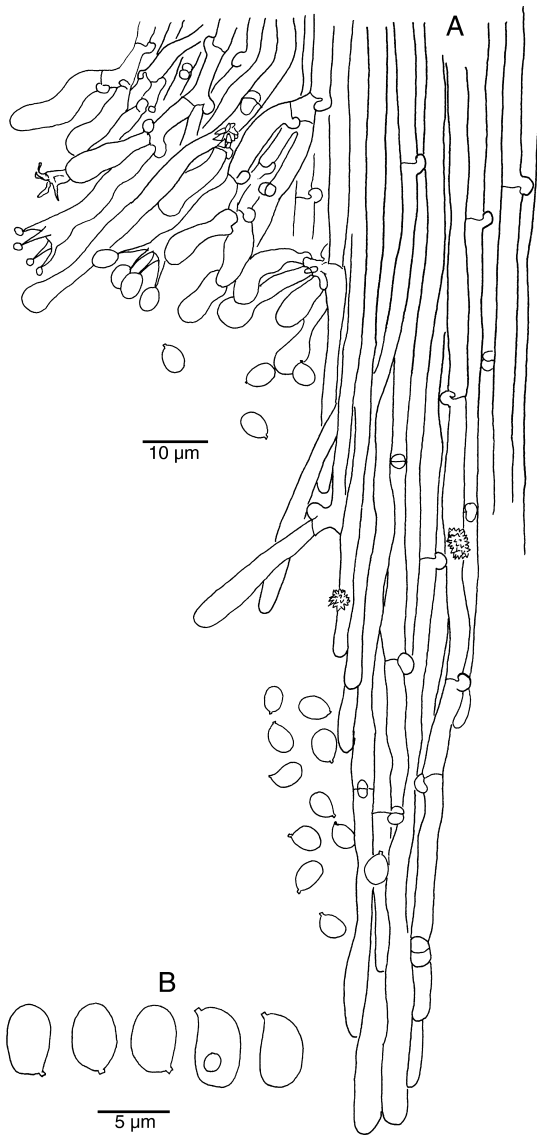


Fig. 8. *Hyphodontia* cf. *breviseta* (P. Karst.) J. Erikss. (from *Saarenoksa* 29294). — A: Section through an aculeus showing strictly parallel tramal hyphae and the long sterile apex. — B: Spores.

sambuci is a species complex (e.g. Eriksson & Ryvar den 1976: 576–577). We hope this new species can go some way to clearing up the confusions, but we are fully aware that there are still more species involved in the north, as well as in the tropics. However, to disentangle the complex, microscopic research is insufficient; both mating tests and DNA analyses are needed.

The hosts of *Hyphodontia erastii* ($n = 13$):

<i>Sambucus racemosa</i>	5
<i>S. kamtschatica</i>	1
<i>Angelica sylvestris</i>	3
<i>Filipendula ulmaria</i>	2
<i>Arctium tomentosum</i>	1
<i>Caragana</i> sp.	1

SPECIMENS EXAMINED: **Finland.** Uusimaa: Helsinki, Käpylä, luxuriant thicket, corticated twigs of *Sambucus racemosa*, Grid 27°E 66806:3870, 22.VIII.1989 Kotiranta 7514 (H). Helsinki, Mustavuori, grass-herb forest, fallen, dead *Filipendula ulmaria*, Grid 27°E 6681:397, 4.X.1995 Saarenoksa 17195 (H). Helsinki, Vanhakaupunki, moist grass-herb forest, dead *F. ulmaria*, Grid 27°E 6680:388, 14.VII.1990 Saarenoksa 06290 (H). Helsinki, Vanhakaupunki, Pornaistenniemi, forested field, grass-herb forest, partly corticated *S. racemosa* branch, Grid 27°E 6679:388, 17.VIII.1991 Saarenoksa 17891 (H). Helsinki, Viikki, Hakala, grass-herb forest, dead *Angelica sylvestris*, Grid 27°E 6680:389, 19.VIII.1989 Saarenoksa 12989 (H), and same place, date and matrix, Saarenoksa 13089 (H). Helsinki, Viikki, Säynäslahti, grass-herb forest, partly decorticated *S. racemosa*, Grid 27°E 6680:388, 8.X.1989 Saarenoksa 52289 (H, holotype), and same place, grass-herb forest ashore, fallen, dead *A. sylvestris*, 16.VII.1990 Saarenoksa 08090 (H). Vantaa, Tammisto. Grass-herb forest, dead *Arctium tomentosum*, Grid 27°E 6686:387, 7.VII.1990 Saarenoksa 03890 (H). Etelä-Karjala: Vehkalahti, Pyhäntö, Ämmänmäki, twigs of *S. racemosa*, Grid 27°E 6736:518, 14.V.1977 Fagerström (H). Vehkalahti, Summa, *Quercus-Larix* plantation, corticated *S. racemosa* branch, Grid 27°E 6716:506, 30.IX.1978 Fagerström (H). **Russia.** Altay Kray, Gorno Altay, Altay reserve, lake Telezkoje, 900–1 000 m a.s.l., corticated *Caragana* sp., 6.IX.1958 Parmasto 8836 (TAA, paratype of *H. sambuci* var. *angustispora*). Kamchatka, Milkovo, partly corticated *Sambucus kamtschatica* E. Wolf, 30.VIII.1960 Parmasto 12116 (TAA, paratype of *H. sambuci* var. *angustispora*).

Hyphodontia knysnana (van der Byl) Reid (Fig. 10)

J. S. Afr. Bot. 39: 175. 1973. — *Odontia knysnana* van der Byl, Ann. Univ. Stellenbosch 12(A1): 9. 1934.

The subtropical or tropical *Hyphodontia knysnana* shares characteristics of *H. nudiseta*. It is fairly thick, whitish or cream-coloured and the surface is densely aculeate.

Hyphal system monomitic, all hyphae clamped, cyanophilous. Subicular hyphae sparingly branched, thick-walled, 2–2.5(–3) µm in diam; tramal hyphae with thickened walls, 2.5–

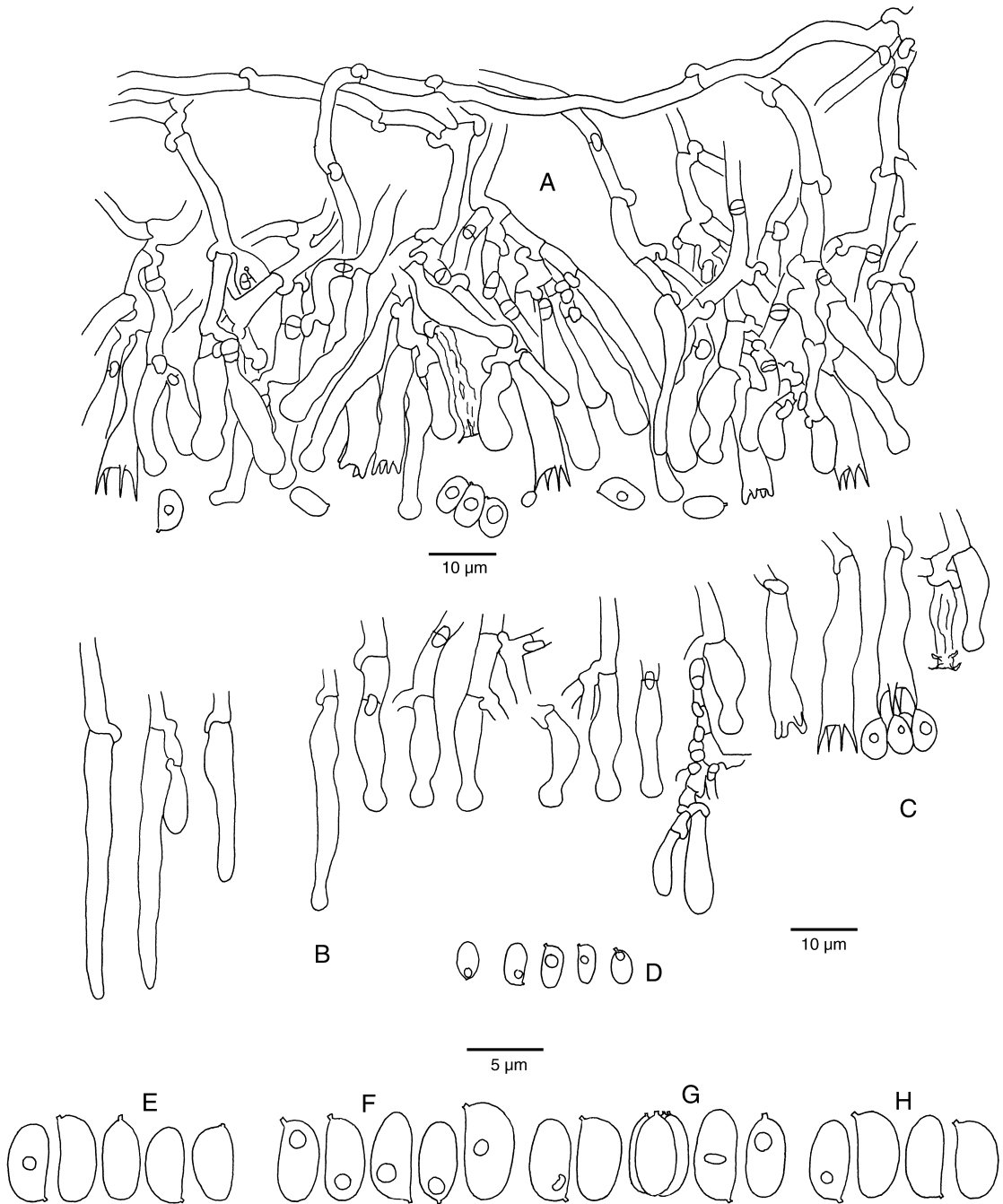


Fig. 9. *Hyphodontia erastii* Saarenoksa & Kotir. (A–D from the holotype, E from Saarenoksa 17195, F from Saarenoksa 52289, G from Fagerström 1978, H from Parmasto 12116, paratype of *H. sambuci* var. *angustispora*). — A: Section through basidiocarp. — B: Subulate and capitate cystidia. — C: Basidia. — D–H: Spores.

3.5 µm in wide, heavily encrusted with rosette-looking crystals, in aculeal apices 2.5–3 µm wide, narrowing gradually to the rounded tip; subhymenial hyphae fairly thin-walled, up to 4 µm

in diam. Cystidia subulate, sometimes difficult to find, reminiscent of those of *H. borealis*, but entirely thin-walled and gradually tapering to the apex, (20–)30–40(–47) × 3–4(–4.5) µm. Basidia

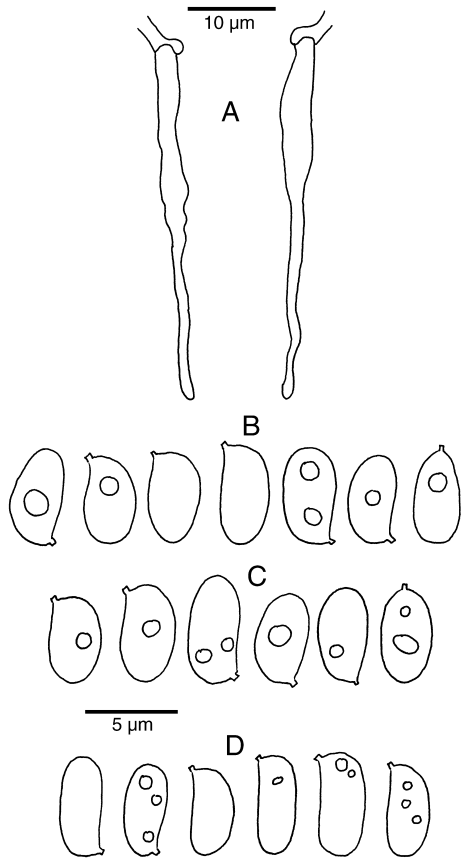


Fig. 10. *Hyphodontia knysnana* (van der Byl) Reid (A and B from *Ryvarden 10126*, C from *Ryvarden 20054*, D from *Ryvarden 19606*). — A: Subulate cystidia. — B–D: Spores.

basally clamped, subcylindrical, with one or two constrictions, $(15\text{--}18\text{--}25\text{--}30) \times (3.5\text{--}4\text{--}4.5\text{--}5) \mu\text{m}$, with four, up to $4 \mu\text{m}$ long sterigmata. Spores ellipsoid, subcylindrical or cylindrical, $5.3 \times 2.8 \mu\text{m}$, $Q^* = 1.9$, thin-walled, acyanophilous, with a small apiculus.

Hyphodontia knysnana lacks capitate cystidia and its spores are normally rather cylindrical or subcylindrical, compared with the ellipsoid or broadly ellipsoid spores of *H. nudiseta*.

SPECIMENS EXAMINED: **Argentina.** Misiones: Iguazu Nat. Park, Catatas de Iguazu, deciduous wood, 1.–5.III.1982 *Ryvarden 19606* and *20054* (O). **Tanzania.** Arusha Nat. Park, Mt. Meru E, alt. 1 800–2 300 m a.s.l., $3^{\circ}14'S$, $36^{\circ}47'E$, 8.II.1973 *Ryvarden 10126* (O).

***Hyphodontia sambuci* (Pers.) J. Erikss.**
(Fig. 11)

Symb. Bot. Upsalienses 16: 104. 1958. — *Corticium sambuci* Pers., Neues Mag. Bot. 1: 111. 1794.

Basidiocarp resupinate, fairly thick, at first smooth, later with low, unevenly spread papillae, white. Margin thinning out, or mostly thick, distinct.

Hyphal system monomitic, all hyphae clamped, cyanophilous. Subiculum open, subicular hyphae fairly thick- to thick-walled (up to $0.8 \mu\text{m}$), sparingly branched, $2\text{--}2.5\text{--}(3)$ in diam.; tramal hyphae mostly thin-walled, heavily covered with crystals, richly branched, $2.5\text{--}3 \mu\text{m}$ in diam.; subhymenial hyphae richly branched, thin-walled, $(2.5\text{--})3\text{--}(3.5) \mu\text{m}$ wide. Cystidia of two kinds, (a) capitate cystidia conical, common, projecting up to $30 \mu\text{m}$ over the hymenium, $(18\text{--})25\text{--}40 \times (3.5\text{--})5\text{--}6\text{--}(6.5) \mu\text{m}$, and (b) subulate cystidia less common, $(14\text{--})20\text{--}45\text{--}(50) \times 3.5\text{--}4 \mu\text{m}$. Basidia basally clamped, very thin-walled, cylindrical, sometimes with a low median constriction, $17\text{--}23 \times 4\text{--}4.5 \mu\text{m}$, with four, up to $3.5 \mu\text{m}$ long sterigmata. Spores ellipsoid or broadly ellipsoid, $5.0 \times 3.9 \mu\text{m}$, $Q^* = 1.3$, with one droplet in Cotton Blue, fairly thick- or thick-walled, cyanophilous, inamyloid, indextrinoid.

Normal habitats of *Hyphodontia sambuci* are urban thickets, grass-herb forests, gardens, forest edges etc., and in Finland *H. sambuci* is most often seen on *Sambucus racemosa* or cultivated garden trees, bushes or ornamental shrubs. However, it also grows on all kinds of deciduous wood and less often on coniferous timber. Even if many of the collections derive from grass-herb forests, its habitats are drier than those of *H. erastii*, and so far it has not been found on herbs.

The hosts of *H. sambuci* ($n = 34$):

<i>Sambucus racemosa</i>	9
<i>Salix</i> sp.	3
<i>S. caprea</i>	2
<i>Populus tremula</i>	3
<i>P. laurifolia</i>	1
<i>Tilia</i> sp.	1
<i>T. cordata</i>	1
<i>T. platyphyllos</i>	1
<i>Ulmus</i> sp.	2

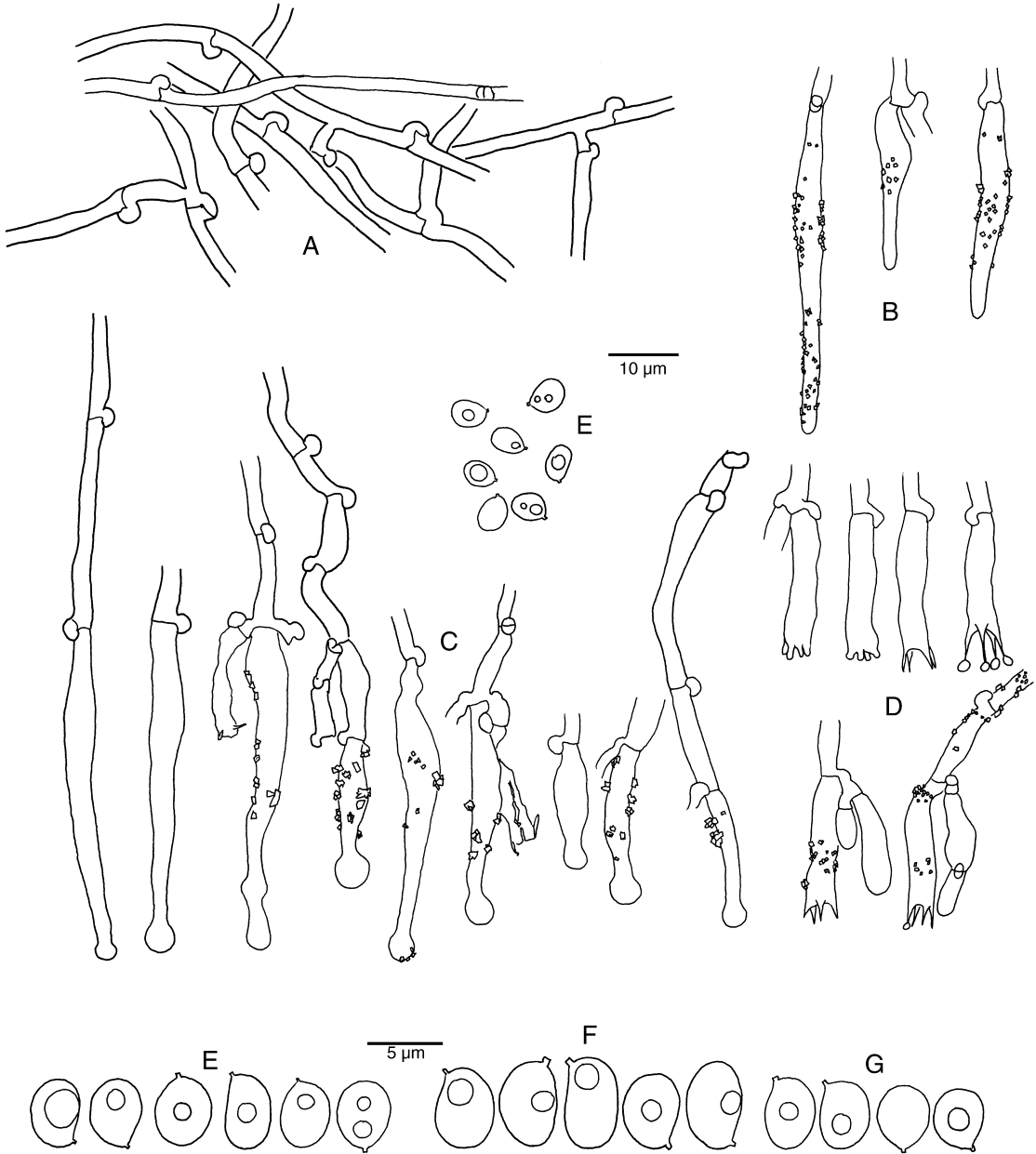


Fig. 11. *Hyphodontia sambuci* (Pers.) J. Erikss., (A–E from Kotiranta 7505, F from Saarenoksa 54591, G from Haikonen 5274). — A: Thick-walled subicular hyphae. — B: Subulate cystidia — C: Capitulate cystidia. — D: Basidia. — E–G: Spores.

<i>Alnus</i> sp.	1	<i>Prunus padus</i>	1
<i>A. incana</i>	1	<i>Ribes uva-crispa</i>	1
<i>Betula pendula</i>	1	<i>Viburnum lentago</i>	1
<i>Malus domestica</i>	1	Unidentified coniferous wood	2
<i>Phoenix dactylifera</i>	1	Unidentified deciduous wood	1

SPECIMENS EXAMINED: Finland. Varsinais-Suomi: Karjalohja, Maila, small *Ulmus glabra* forest, decorticated *Sambucus racemosa* branch, Grid 27°E 6684:324, 25.IX.1991 Kotiranta 10013 & Pykälä (H). Uusimaa: Helsinki, Annala, luxuriant mixed forest, advanced decayed, decorticated *Salix* sp., Grid 27°E 66796:3877, 1.X.1998 Kotiranta 16710 & Saarenoksa (H). Helsinki, Eira, *Ulmus* sp. stump in park, Grid 27°E 667:38, 15.VIII.1989 Kotiranta 7505 (H.K.). Helsinki, Kaisaniemi, Bot. Garden, dead leaf bases of *Phoenix dactylifera* in glasshouse, Grid 27°E 6675:386, 22.VIII.1989 Kotiranta 7512, Saarenoksa & Härkönen (H.K.). Helsinki, Mustikkamaa, Isoisänniemi, abandoned garden, fairly thick decorticated branch of *Betula pendula*, Grid 27°E 6675:388, 13.VIII.1989 Saarenoksa 10689 (H). Helsinki Mustikkamaa, grass-herb forest, decorticated deciduous wood, Grid 27°E 6676:388, 13.VIII.1989 Saarenoksa 52589 (H). Helsinki, Toukola, Arabia, open ruderate field, coniferous board, together with *Dacryobolus sudans*, Grid 27°E 6679:388, 11.VIII.1998 Saarenoksa 25498 (H). Helsinki, Toukola, Syyriankatu 10, garden, thin, corticated branch of *Malus × domestica*, Grid 27°E 6679:387, 10.VIII.1988 Saarenoksa 42988 (H), same place, painted coniferous board, 4.X.1988 Saarenoksa 38588 (H), same place, corticated branches of *Ribes uva-crispa*, 23.XI.1991 Saarenoksa 54591 (H). Helsinki Vanhakaupunki, grass-herb forest, fallen thin, decorticated *Populus*, Grid 27°E 6680:388, 14.VII.1990 Saarenoksa 06390 (H). Helsinki, Viikki, grass-herb forest, markedly decayed, decorticated *S. racemosa*, Grid 27°E 6679:390, 9.VI.1989 Kotiranta 7360 & Saarenoksa (H.K.). Kirkkonummi, Porkkala, grass-herb forest, corticated branch of *Salix caprea*, Grid 27°E 6654:355, Saarenoksa 34293 (H). Etelä-Häme: Hollola, Pyhäniemi, manor house park, corticated *S. racemosa*, Grid 27°E 6772:417, 11.XI.1984 Haikonen 5274 (H).

***Hyphodontia tuberculata* Kotir. & Saarenoksa, sp. nova** (Figs. 12 and 13)

Basidioma resupinatum, effusum, tuberculatum, porosum, reticulatum, cremeoalbum vel ochraceum, margine, differentiato distincto. Systema hypharum monomiticum; hyphis 2.5–3.5 µm latis, fibulatis. Cystidia capitata rara, 20–35 × 5–6 µm, cystidia subulata numerosa, 40–70 × 4–5 µm, gloeocystidia cylindracea, 45–70 × 6–6.5 µm. Basidia cylindracea, 17–22 × 4 µm, sterigmatibus 4. Sporae ellipsoideae, 4.5 × 3.3 µm, cyanophilae non-amyloideae, non-dextrinoideae.

HOLOTYPE: Sweden. Västergötland: Västra Tunhem, Halleberg, Hallesnipen, markedly decayed, decorticated *Populus tremula*, 8.IX.1985 Larsson 6028 (GB).

Basidiocarp resupinate, soft, fairly thin, at first smooth, later papillose or tuberculate, hypochnoid,

under the lens (×50) reticulate porose, pale cream coloured or yellow buff, margin not differentiated, distinct.

Hyphal system monomitic, all hyphae clamped, cyanophilous. Subicular hyphae richly branched, with thickened walls, 2.5–3 µm in diam; tramal hyphae richly branched, with thickened walls (up to 0.2 µm), 2.5–3 µm wide, in apices of the papillae of same width; subhymenial hyphae, richly branched, slightly thick-walled, (2–)2.5–3.5 µm in diam. Cystidia of three kinds, (a) capitate cystidia relatively few, (15–)20–35(–42) × (4–)5–6 µm, (b) hyphoid, basally slightly widened entirely thin-walled cystidia common, projecting up to 50 µm above the hymenium, 40–70(–80) × (3–)4–5(–5.5) µm, and c) gloeocystidia of various numbers, in some parts extremely common, in others almost lacking, very thin-walled, easily bursted, cylindrical, often with several constrictions in apical part, (40–)45–70(–115) × (5–)6–6.5(–8) µm, contents strongly cyanophilous, yellow in IKI, pale yellow in KOH. Basidia basally clamped, cylindrical, mostly with one constriction, 17–22(–25) × (3.5–)4(–4.5) µm, with four, up to 4.5 µm long, curved sterigmata. Spores ellipsoid or broadly ellipsoid, 4.5 × 3.3 µm, $Q^* = 1.4$, fairly thin- or thick-walled (up to 0.5 µm), cyanophilous, inamyloid, indextrinoid.

Hyphodontia tuberculata is most easily confused with *H. borealis*. The former species, however, is tuberculate, the hyphae are more thick-walled, the apical hyphae are less than 4 µm wide, the basidiocarp is often yellowish, it grows on wood, and has gloeocystidia. Moreover, the subulate cystidia are mostly gradually tapering to the apex, which is always thin-walled, and not strongly cyanophilous as in *H. borealis*.

The collections to date give the impression that *Hyphodontia tuberculata* in general has a more southern distribution than *H. borealis*. However, more material is needed to confirm this. The finds derive from hemiboreal and nemoral vegetation zones from luxuriant sites, and the substrate was decorticated deciduous wood in an advanced state of decay.

Note that the collections *Stokland 4242, 4243, 4246* are here treated separately, even if they were collected from the same tree trunk, and are perhaps only parts of a single individual (same mycelium).

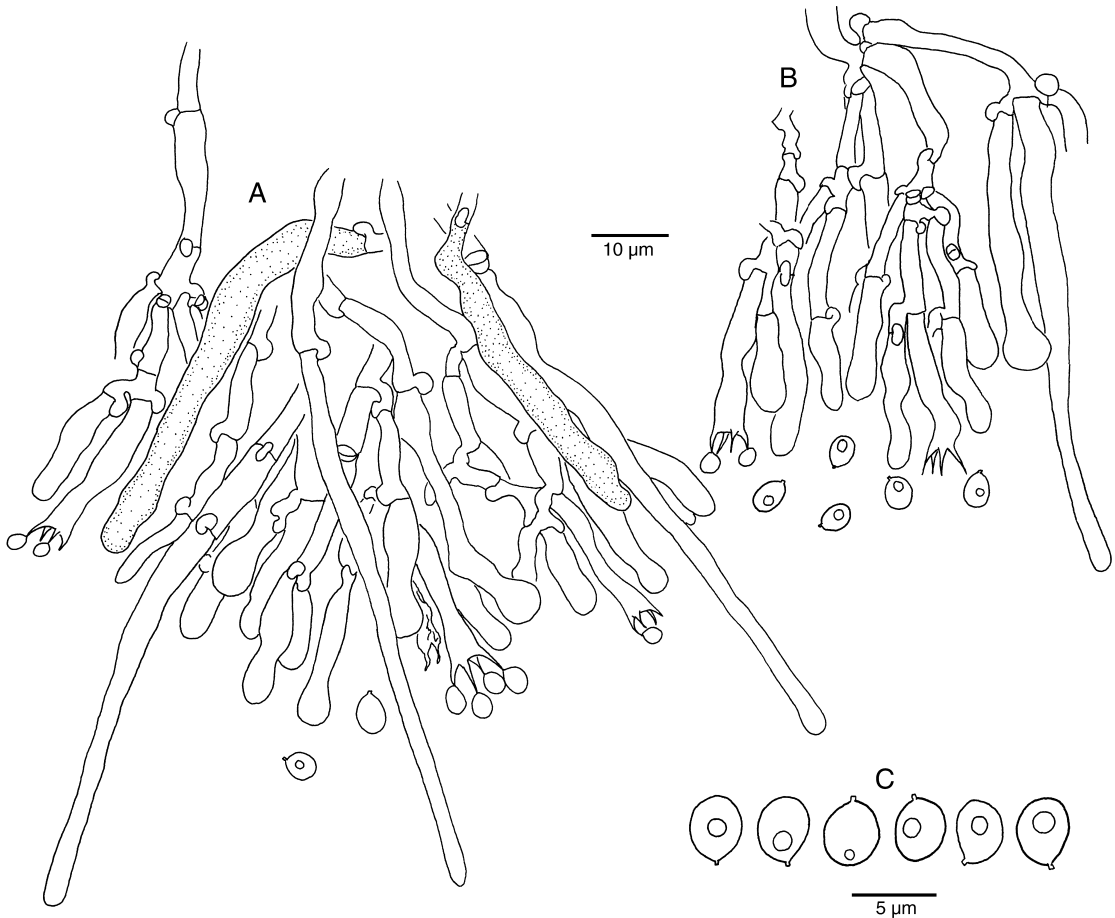


Fig. 12. *Hyphodontia tuberculata* Kotir. & Saarenoksa (from the holotype). — A: Section through basidiocarp showing gloeocystidia and hyphoid cystidia. — B: Section through basidiocarp showing cystidia, basidia and spores. — C: Spores.

SPECIMENS EXAMINED: **Germany.** Baden-Württemberg, Oberrheinebene, Graben, Ehrlich, 9.I.1988 *Winterhoff et al.* (GB, dupl. ex herb. *H. Grosse-Brauckmann 3703*). **Norway.** Vestfold (Sem): Gullkrona, luxuriant grass-herb forest, fairly strongly decayed, decorticated *Quercus robur*, VIII–IX.1996 *Stokland 4242, 4243, 4246 et al.* (O). **Sweden.** Västergötland: Västra Tunhem, Halleberg, Hallsnipen, strongly decayed, decorticated *Populus tremula*, 8.IX.1985 *Larsson 6028* (GB, holotype). **Switzerland.** Ticino: Ritorto, decorticated, moist, decayed *Tilia cordata*, 1XII.1991 *Martini 3034* (GB).

***Hyphodontia* sp. 1, Langer 5302**
(Fig. 14)

Basidiocarp resupinate, fairly thin, aculeate, the hymenium between the aculei at first porose

reticulate, later smooth, pale cream coloured. Margin not differentiated, distinct.

Hyphal system monomitic, all hyphae clamped, cyanophilous. Subicular hyphae mostly straight, sparsely clamped, thick-walled (up to $0.8\ \mu\text{m}$), $3\text{--}3.5\text{--}(4)\ \mu\text{m}$ in diam.; tramal hyphae with thickened walls, richly branched, $(2.5\text{--})3\text{--}3.5\text{--}(4)\ \mu\text{m}$ in diam., in aculeal apices long-celled, up to $3\ \mu\text{m}$ in diam.; subhymenial hyphae thin-walled, richly branched, $2.5\text{--}3.5\text{--}(4)\ \mu\text{m}$ in diam. Cystidia of two kinds, (a) thin-walled, acute, spear shaped cystidia mostly in groups in aculeal tips, $(23\text{--})28\text{--}35.5 \times 4\text{--}5\ \mu\text{m}$, and (b) capitate cystidia rare, normally in sterile apices, $21\text{--}32\text{--}(36) \times 3.5\text{--}4\ \mu\text{m}$. Basidia basally clamped somewhat thick-walled, cylindrical, with two, rarely with one constriction, $(16\text{--})20\text{--}25\text{--}(31) \times 4\text{--}5\ \mu\text{m}$, with four, up to 4

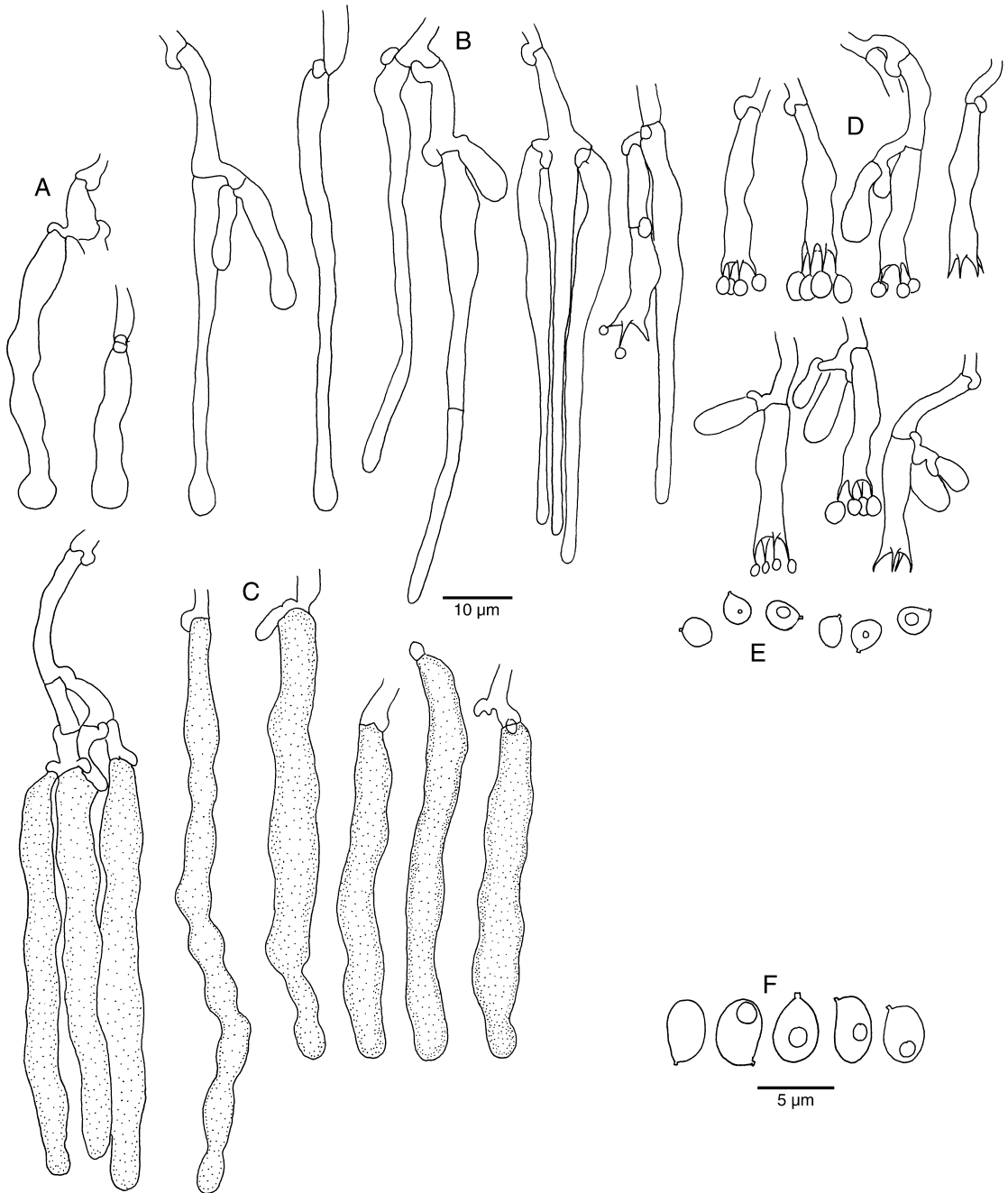


Fig. 13. *Hyphodontia tuberculata* Kotir. & Saarenoksa (A–E from the holotype, F from *Stokland 4243*). — A: Capitulate cystidia. — B: Hyphoid cystidia. — C: Gloeocystidia. — D: Basidia. — E–F: Spores.

µm long sterigmata. Spores ellipsoid or broadly ellipsoid, 4.9×3.7 µm, $Q^* = 1.3$, thin- or slightly thick-walled, faintly cyanophilous.

Macroscopically *Hyphodontia* sp. 1 resembles *H. borealis* in being white and having small aculei.

Microscopically, however, it differs from *H. borealis* in having characteristic spear- or sword-like cystidia in aculeal apices, or the hyphae are not differentiated, being only up to 3 µm wide. Moreover, the hyphae are more thick-walled than

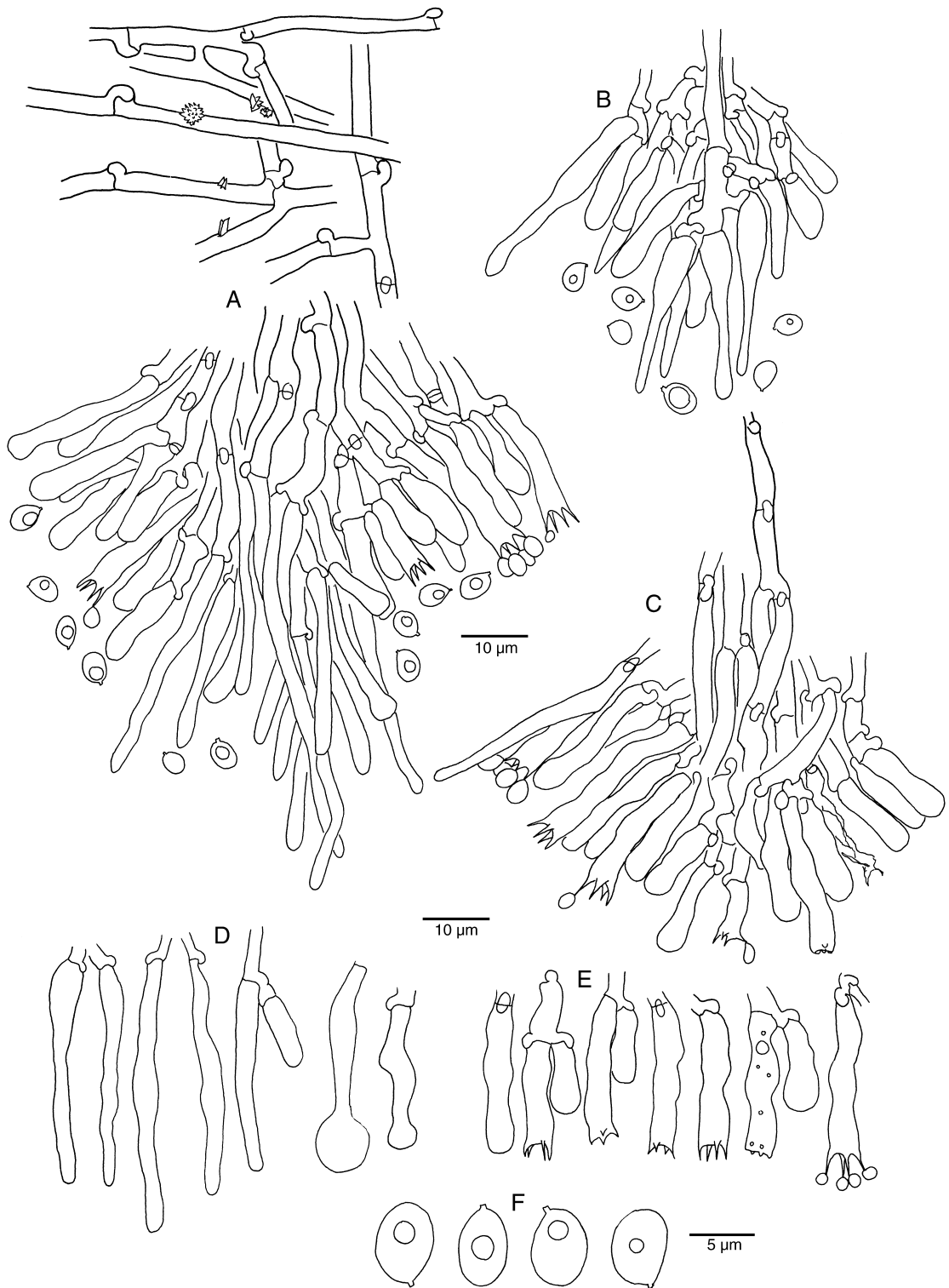


Fig. 14. *Hyphodontia* sp. 1. (from Langer 5302). — A: Section through an aculeus and thick-walled subicular hyphae. — B: An aculeus showing sword-like cystidia and spores. — C: An aculeus. — D: Subulate cystidia and capitate cystidia. — E: Basidia. — F: Spores.

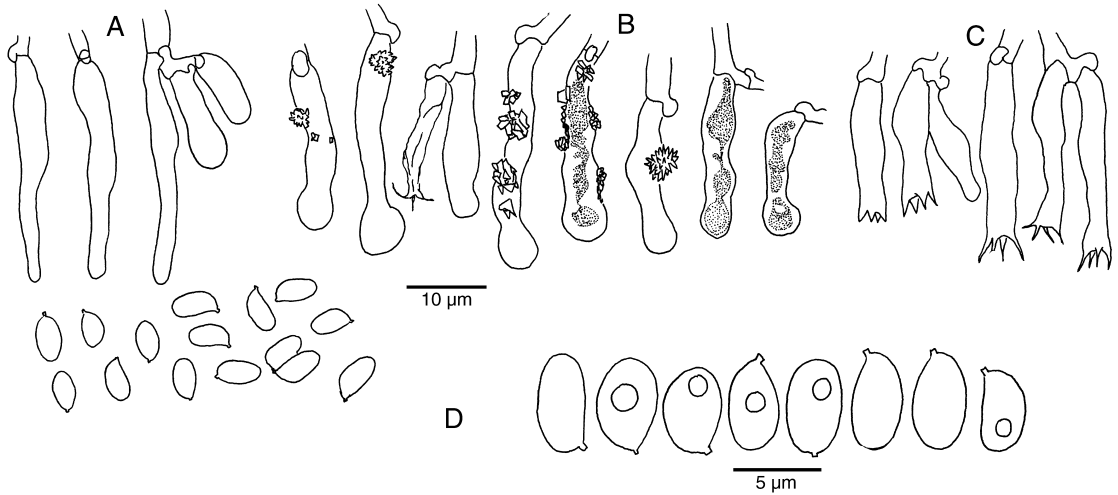


Fig. 15. *Hyphodontia* sp. 2. (from Saarenoksa 10498). — A: Subulate cystidia — B: Capitate cystidia. — C: Basidia. — D: Spores.

in *H. borealis*, the hyphoid, pin-shaped cystidia are lacking and capitate cystidia are rare; young spear-shaped cystidia might have a slightly widened tip, but it is always thin-walled.

This taxon, among some others, has been called *Hyphodontia nudiseta*. Larsson (in litt.) hesitated to use the name *H. nudiseta* for the specimens found in the Nordic countries, and wrote that the type material of *H. nudiseta* is in such a poor condition, that a re-examination of it would not clear up the identity of the European material. However, as noted, the name has been used for practical reasons (see under *H. borealis*). At present it seems rather obvious that *H. nudiseta* Warcup & Talbot does not exist in the Nordic countries. It is also questionable if the more south European material is conspecific with the Australian finds. Nevertheless, a lectotype of *H. nudiseta* should be chosen from Australian material.

SPECIMEN EXAMINED: Germany. Bavaria: Oberallgäu, Oberjoch, Kematsried-Moos, *Pinus mugo*, 1 150 m a.s.l., 11.X.1998 Langer 5302 & Hennen (GEL).

***Hyphodontia* sp. 2.** Saarenoksa 10498
(Fig. 15)

Basidiocarp resupinate, thin, soft, porose reticulate, finely aculeate or papillate; margin distinct.

Hyphal system monomitic, all hyphae

clamped, cyanophilous. Subicular hyphae thin-walled, 3 µm in diam.; tramal hyphae richly branched, thin-walled, 3 µm in diam., in aculeal apices gradually tapering, 2–3 µm wide; subhymenial hyphae covered with crystals, thin-walled, up to 4 µm wide. Cystidia of two kinds, (a) capitate cystidia common, fairly often with olive brownish contents, (13–)20–30 × 3–5 µm, and (b) subulate cystidia fairly common, evenly distributed, 30–40(–45) × 4–4.5 µm. Basidia basally clamped, cylindrical or subcylindrical with one or two constrictions, 18–25(–30) × 4–4.5 µm, with four, up to 3.5 µm long sterigmata. Spores ellipsoid, sometimes glued in pairs or tetrads, 5.1 × 3.2 µm, $Q^* = 1.6$, thin-walled, faintly cyanophilous, inamyloid, indextrinoid.

This specimen very much resembles *Hyphodontia erastii*, but is distinguished most clearly by its soft, aculeate structure of the basidiocarp and the abundant subulate cystidia. It differs from *Hyphodontia* sp. 1 in lacking sword-like cystidia in aculeal apices and in having numerous capitate cystidia, not only in aculei, but also in areas between them. Also the hyphae are thinner-walled than in *Hyphodontia* sp. 1. *Hyphodontia breviseta* has gloeocystidia and *H. aspera* is much more compact and the hymenium is smooth between the aculei. Moreover, the spores of *H. aspera* are larger and the tramal hyphae in aculei are more or less parallel and thick-walled.

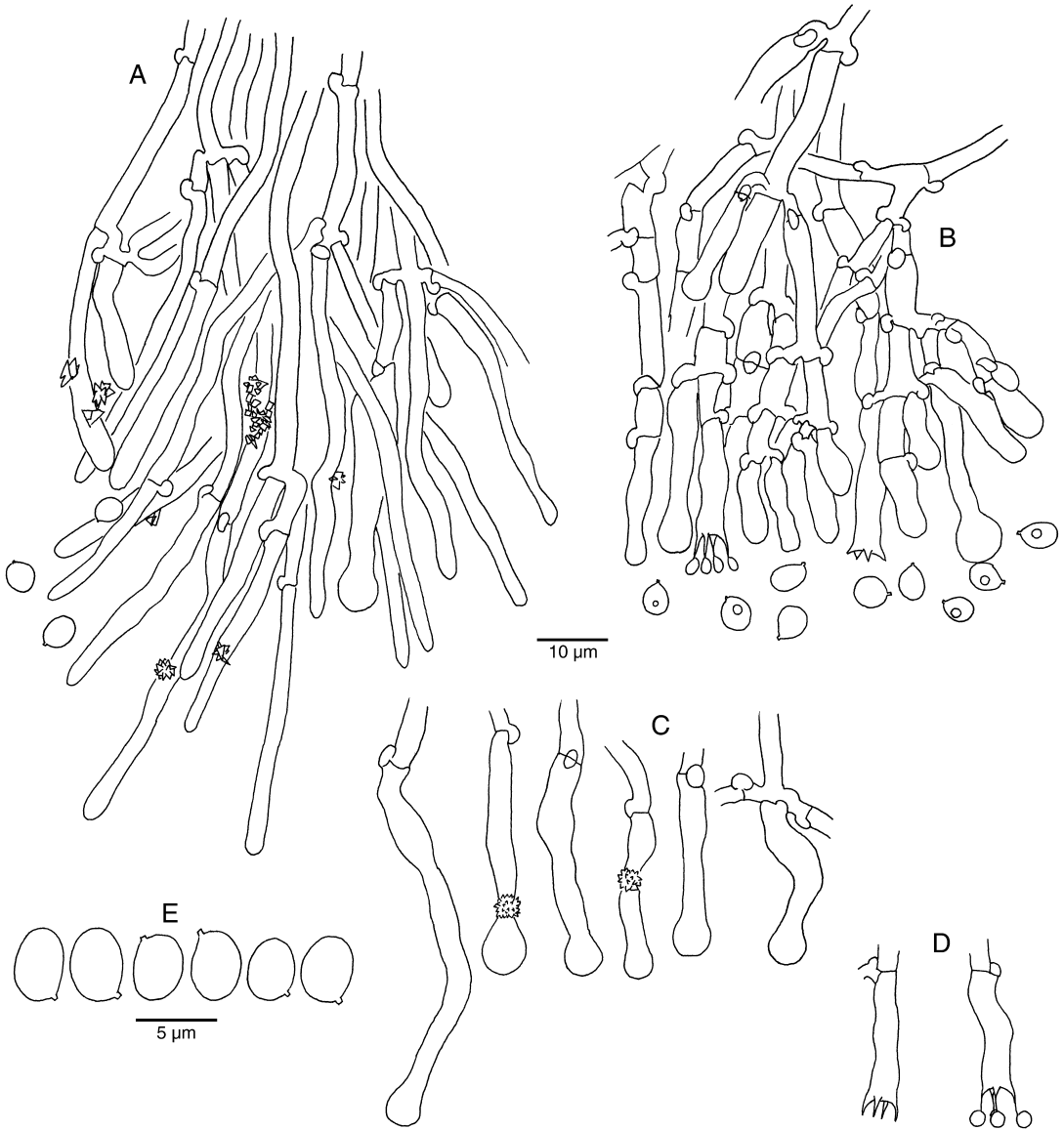


Fig. 16. *Hyphodontia* sp. 3. (from Kotiranta 12752). — A: Section through an aculeus. — B: Section through the basidiocarp showing wide subhymenial and tramal hyphae. — C: Cystidia — D: Basidia. — E: Spores.

SPECIMEN EXAMINED: **Finland.** Uusimaa: Helsinki, Kumpula valley, grass-herb forest, spruce board, Grid 27°E 6679:387, 27.VII.1998 Saarenoksa 10498 (H).

***Hyphodontia* sp. 3, Kotiranta 12752**
(Fig. 16)

Basidiocarp as in *H. breviseta*.

Hyphal system monomitic, all hyphae clamped,

cyanophilous. Subicular hyphae long celled, relatively sparingly clamped, 2.5–3 µm wide, with thickened walls. Tramal hyphae mostly short-celled, 3–4(–5.5) µm in diam., with thickened walls; subhymenial hyphae short-celled, fairly thin-walled, 3–4 µm in diam. Cystidia capitate, only seldom projecting over the hymenium, slightly thick-walled, (18–)22–30(–37) × (4–)4.5–5.5(–6.5) µm. Basidia basally clamped, cylindrical, normally with one constriction, (15–)17–

22(–25) × 4–4.5 µm, with four, up to 3 µm long, curved sterigmata. Spores broadly ellipsoid, 4.7 × 3.7 µm, $Q^* = 1.3$, thin-walled, faintly cyanophilous, inamyloid, indextrinoid.

The basidiocarp is very similar to *Hyphodontia breviseta*, and the total lack of gloeocystidia is virtually the only reliable distinguishing character, even if the hyphae are also more thin-walled, and especially the tramal hyphae, more short-celled. The hymenium between aculei is porose reticulate, contrary to the hymenium of *H. aspera*, which also has larger spores.

SPECIMEN EXAMINED: **Finland.** Uusimaa: Nurmijärvi, Klaukkala, Lepsämä, open, dry place in spruce dominated *Vaccinium myrtillus* forest site type, dead, corticated *Juniperus communis*, Grid 27°E 6699:371, 16.IX.1996 Kotiranta 12752 (H, H.K.).

ACKNOWLEDGEMENTS: Dr. Karl-Henrik Larsson (Gothenburg), Dr. Ewald Langer (Tübingen), Prof. Leif Ryvarden (Oslo), Dr. Jogeir Stokland (Oslo), Prof. Erast Parmasto (Tartu) and the Curator of the herbarium of Gothenburg are very warmly thanked for placing valuable material at our disposal. Prof. Teuvo Ahti (Helsinki) greatly helped us with the Latin diagnoses, and we owe a debt of gratitude to him, too. The English of this paper was revised by Michael Collinson, M.A.

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