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# HYMENOCHAETOID FUNGI (BASIDIOMYCOTA) OF NORTH AMERICA

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28 species of the genera *Asterodon, Dichochaete* and *Hymenochaete* found in northern America (Greenland, Canada, Temperate Mexico and USA), two dubious species and one not yet found here are described, their distribution and hosts (substrata) characterized. Morphological characters in use for identification are described and keys to species found in this region are given. The number of species inhabiting different zones diminishes from southeastern USA (23 species) to northern Subarctic America (4 species).

**Keywords:** *Asterodon, Dichochaete, Hydnochaete, Hymenochaete,* North America

## INTRODUCTION

Hymenochaetoid fungi (families Asterodontaceae, Clavariachaetaceae and Hymenochaetaceae) is a group of the order Hymenochaetales (Hymenomycetes, Basidiomycota) characterized by resupinate (effused), effused-reflexed, pileate or clavarioid non-poroid basidiomata (fruitbodies). In one species *(H. damicornis)* the pileate basidiome is stalked. Hymenophore is smooth, in some species colliculose, with flattened teeth or in some species hydnoid; basidiome is brown, sometimes yellowish or blackish; the colour darkens when moistened with KOH solution *(xanthochroic reaction)*. Hyphae are with simple septa (without clamps); hyphal system is sometimes subdimitic, i. e., differentiated into subhyaline thin-walled generative hyphae and brown thick-walled skeletoids. In hymenium thick-walled brown or dark brown subulate or fusoid cystidia-like cells *(setae)* are present. Usually the setae are very numerous, hymenium is thickening and a *setal layer* will be formed. Basidia are clavate or subutriform, bear four (rarely two) sterigmata and on these hyaline, thin-walled, non-amyloid spores.

All species inhabit angiospermic or gymnospermic wood, being on dead trunks, branches and twigs; fallen logs and other wood, as an exception on bark scales of living trees, living twigs or seemingly on ground but really on buried roots or pieces of wood. All species cause white fibrose or pocket rot of wood.

## GEOGRAPHICAL SCOPE

This paper covers Northern America as delimited by the Plant Taxonomic Database Standard No 2 (Hollis & Brummitt, 1992) including Greenland, Canada, Alaska south to central Mexico. The Western Antilles, southeastern Mexico and countries to the South are excluded because they belong to the Mesoamerican Plant Region of Southern America. One species common in Mesoamerica and Caribbean regions has been included because it may occur in southern regions of the area.

## FORMER STUDIES IN NORTHERN AMERICA

Few species of Hymenochaetoid fungi were mentioned in Northern America before Burt's survey was published in 1918. Of the new species of *Thelephora* by Schweinitz, two were later transferred to *Hymenochaete (H. episphaeria* and *H. imbricatula*, a synonym of *H. tabacina*). Peck described four new taxa of *Hymenochaete* and one of *Hydnochaete;* two of these *(Hymenochaete spreta* and *H. tenuis;* Peck, 1878, 1887) are accepted here. Banker (1914) published a paper on nomenclature and synonymy of *Asterodon* and *Hydnochaete;* however, according to his views, the last named genus belongs to pore fungi (Polyporaceae s. l.). Ecology of *Hymenochaete agglutinans (= H. corrugata),* a facultative parasite causing death of several angiospermic trees and bushes was studied by Graves (1914); these data were supplemented by Overholts' (1924) studies. Timber rot caused by *H. rubiginosa* was studied by Brown (1915). In the monograph of the genus *Hymenochaete* by Burt (1918), 10 new species were described from N. America and Cuba. He gave descriptions of 21 species found in the region; of these, 6 are now synonyms, 2 are dubious species. In a later paper (Burt, 1924), the only species of the genus *Asterodon, A. ferruginosus* was described by him as a new species *Asterostroma ochrostroma* from New Hampshire. All collections studied by Burt were indicated in detail in his papers. Altogether, 16 species were found by him in our study area.

Some *Hymenochaete* species have been mentioned in the lists of fungal biota by several authors, but only few of them (e. g., Morgan, 1887; Gilbertson & Bigelow, 1998), have mentioned more than 2-3 species. Coker (1921) in his paper on North Carolina fungi gave descriptions of three species. In their paper of West Indian species of *Hymenochaete,* Reeves & Welden (1967) indicated four species as found in USA, and one, *H. sallei (= H. rheicolor),* as found in Mexico; three of these were new for USA *(H. anomala, H. opaca* and *H. rigidula). H. agglutinans* was synonymized with *H. corrugata* by them. In his unpublished dissertation, DeFigio (1970) described and listed localities of six species, found in Canada and USA; he neotypified three species described originally in Europe, using for this North American (!) specimens *(Hymenochaete fuliginosa, H. rubiginosa, H. tabacina).* This unfortunate selection was supported by Job (1990) who published the neotypification data on *H. rubiginosa* and *H. tabacina.* Two species found in northern America were described in detail in the monograph of the genus *Hydnochaete* by Ryvarden (1982). In a paper on wood-rotting fungi of the Appalachian coniferous forests, Jung (1987) described and illustrated by figures five species; three common species were described by Chamuris (1988) from Northeast USA and adjacent Canada. Two species found in transitional area between boreal woodland and forest tundra in northern Quebec, Canada, were mentioned by Niemelä (1985). In a paper on *Hymenochaete* species of the temperate zone of the Southern Hemisphere by Job (1990), some specimens of 8 species collected in Northern America were cited, including *H. cacao* and *H. rheicolor* found in Mexico; *H. tenuis* was lectotypified by him. In his world monograph of *Hymenochaete* by Léger (1998), specimens of 13 species found in North America were used; this is also the only modern book with full descriptions (in French) of species found in the present study area.



A list of species of *Hydnochaete* and *Hymenochaete* found in the United States was published by Farr *et al.* (1989); of 19 species mentioned by them, 13 are accepted in this paper. The published data on Canadian and USA species were summarized by Ginns (1986) and Ginns & Lefebvre (1993).

Most of the data published on hymenochaetoid fungi are from USA and Canada. 17 species have been found in Mexico, but only few localities are mentioned in these papers (Burt, 1918; Reeves & Welden, 1967; Guzmán, 1972; Welden & Guzman, 1978; Escobar, 1978; Welden, Dávalos & Guzman, 1979; Marmolejo, Castillo & Guzmán, 1981; Job, 1990). Data on two species found in southern Greenland have been published by Knudsen, Hallenberg & Mukhin (1993).

Altogether 27 taxa have been noticed in literature in Northern America; of these, six *(H. agglutinans, H. arida, H. badioferruginea, H. borealis, H. spreta, H. ungulata)* are considered to be synonyms here, two *(H. episphaeria* and *H. opaca)* are doubtful species. Four new species have been described by Parmasto and Greslebin (Parmasto, 2001). 28 'good' species are accepted in the Northern American mycoflora.

## MATERIALS AND METHODS

This paper is based on a study of herbarium specimens in the herbaria ARIZ, BPI, CFMR, LA, NY, TENN. In addition, types and some other specimens were borrowed from FH, NYS, PDD, TRTC, XAL, or studied in the European herbaria visited by me (GB, H, K, LE, O, S, TUR, UPS); the author used also his own collections from Great Smoky Mountains (1988) and Louisiana (1994). Descriptions are mainly based on the specimens from Northern America. Colours are named using Rayner's Mycological Colour Chart (1970), these names are with a capital letter. Colour notations are given using the Munsell Book of Color (1942) and Methuen Book of Colour by Kornerup & Wanscher (1967); colour names used in that book are in parentheses. Microscopic study was carried on making free-hand sections of basidiomata or as squash mounts in 2% aqueous solution of KOH. Measurements have been made using eyepiece micrometer at magnifications x 700 and x 1000, since 1998 with the aid of a Sony CCD Video Camera attached to a Nikon Labophot 2 microscope and analysed by Global Lab Image (Data Translation Inc.) software. For statistics, 25 or 30 spores were measured in each specimen. Keys to species and descriptions are compiled with the aid of the program DELTA (Dallwitz, 1980; Dallwitz, Paine & Zurcher, 1993). Herbarium acronyms are after Holmgren,

Holmgren & Barnett (1990). Latin names of substrata are unified using the Kartesz (1994) checklist.

## PRESENTATION OF THE DATA

Of synonyms, only those used in North America are given. In the nomenclatural part, also the basionym of the correct name, descriptions of species by American authors or in some instances important papers (Jahn, 1971; Léger, 1998; Ryvarden, 1982, 1985) are cited. In the lists of substrata and States where a species has been found, the number of collections studied by the author of this paper is indicated in parentheses. When the author has not seen the specimens, these data are given mainly following Ginns & Lefebvre (1993) check list; no attempts were made to check once again all the literature used by them. Distribution in other regions has been indicated using Hollis & Brummitt's World Geographical Scheme for Recording Plant Distributions (1992); for these data, reliable literature sources as well as author's unpublished data have been used.

There are numerous misidentified specimens in all herbaria; to help avoiding similar mistakes, in a special paragraph the most common misnamings are indicated.

## MORPHOLOGY

The basidiomata (basidiocarps, fruit bodies) are in most species resupinate (effused), i. e., without any pilei or reflexed margins. In other species, they are pileate or resupinate with elevated upper margin (effused-reflexed; part of such basidioma is resupinate, another part pileate). The form sometimes depends on the substrate: in all species, the spore-bearing hymenophore (hymenium) is directed downwards, to enable free falling of ripened spores. However, on figures presented in several papers on *Hymenochaete,* the layers of a basidiome have been shown "upside down", i. e., basidium, setae etc. pointing upwards. In one species *(Hymenochaete damicornis),* the basidiome is a vertical, sometimes scantily branched in upper part, stipe and pilei on top of it.

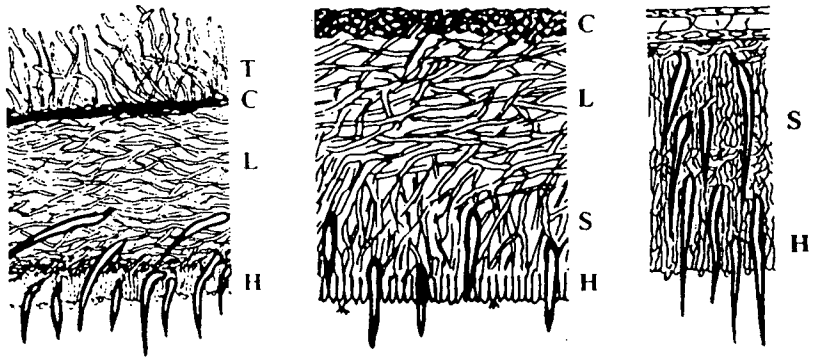


Fig. 1. Structure of basidiomata: T - tomentum, C - cortex, L - hyphal layer, S - setal layer, H - hymenium. (Adopted from Jahn, 1971 and Léger, 1998.)



Hymenium is smooth in most of the species; in some species it is colliculose or with low, almost subspherical warts. In the species of the genera *Asterodon* and *Dichochaete* the warts are developing to spines. In the species of the genus *Hydnochaete,* hymenophore is hydnoid to odontioid.

The colour of basidiomata is always of some shade of brown, and this colour darkens or turns almost black when KOH water solution or any other alcaline reagent is used (xanthochroic reaction). The colour is not caused by some specific pigment, but mainly by polymerized polyphenols of unstable composition (Parmasto & Parmasto, 1979), or (also?) by styrylpyrones (Fiasson, 1982). The colour of a basidiome is in most species quite variable and depends on the stage of development of its hymenium. When this is without basidia and spores (sterile), it is usually much darker; when basidia and spores are present, it may be much lighter. The same bleaching takes place in old basidiomata of some species, when hymenium is covered with numerous crystals, but also when hyaline hyphal ends are forming a new layer of the thickening hymenium.

In the structure of a basidiome, several strata or layers may be distinguished under a looking glass at magnification of not less than x 10; for better understanding, it must be studied under a microscope at magnification 100-400 x (Fig. 1). Depending on species, but also on age of the specimen studied, not all layers are present (except hymenium which is always present in fertile specimens).

Hymenium is the undermost layer; it consists of basidioles, basidia, setae, sometimes also of hyphidia (see below), rarely of simple cystidia. Next is the setal layer: a uniform or indistinctly stratose layer made by thickening hymenium. Setae interwoven with more or less vertically situated hyphae is the main element of this layer; sometimes old hyphidia, in many species crystals, brown(ish) resinous matter or conglomerates of both are abundant in this layer.

Next is the hyphal layer composed of loosely or densely, more or less parallel (radiately situated) or irregularly intertwined hyphae. Different types of hyphae (thick-walled and brown, thin-walled and subhyaline) may be distinguished in different species; seta-like dark hyphae (setal hyphae) are characteristic for some species. In four species, hyphal layer seems to be divided into upper and lower part by a dark line (duplex basidiome); actually, the line is cortex and upper layer of hyphae is homologous with the tomentum.

Cortex (crust) is composed of densely agglutinated thick-walled dark hyphae; it is usually 25-250 $\mu$m thick.

Tomentum is a layer of loosely interwoven or descending fascicles of hyphae; in pileate specimens it is forming the velutinous, hairy or strigose upper surface of a pileus. In resupinate specimens, presence of a tomentum is a sign that the species is able to develop pilei (or reflexed margins), or that the species has been evolved from a pileate ancestor.

Due to the different structure of basidiomata, their consistency varies from soft or coriaceous to woody hard. Thick setal layer is making a basidiome hard and woody; when cortex is present, the basidiome is coriaceous but usually breakable, not flexible. Thin basidiomata without a cortex are bendable when

with pilei. When resupinate specimens have a tomentum (sometimes degraded to a thin layer), the basidiomata are detachable from the substrate.

*Hyphae.* Two main types of hyphae, generative and skeletal have been distinguished in many aphyllophoroid fungi. When both types are present, the hyphal system is called dimitic; when only generative hyphae are present, the system is called monomitic.

Generative hyphae are with septa and branching, subhyaline and thin-walled when young. Later the walls thicken and change to yellow or brown. Skeletal hyphae are typically thick-walled, brown, straight, with only rare septa and not branching. In the order Hymenochaetales, in some species the hyphal system is distinctly monomitic; in other species, it may be called subdimitic. The skeletal hyphae are not true skeletals in this case, but with rare septa, occasional branching, and there are intermediates between these *skeletoids* and generative hyphae. In other words: the hyphae are differentiated but not enough to call their system dimitic; the term *subdimitic* is used in such case.

In some species (e. g., *Hymenochaete tabacina*) there are a few setal hyphae embedded in the hyphal layer. These are very thick-walled, with greater diameter and darker walls than generative or skeletal hyphae, lacking septa, their ends are sometimes pointed as in hymenial setae.

In *Asterodon,* most of the hyphal layer is made of asterosetae - stellate or slightly branched compound setae with several simple or repeatedly branched rays (Fig. 3, 2 *a*).

In *Dichochaete resupinata,* many hyphae are dichotomously branched; this is a type unusual in most hymenochaetoid fungi, but observed in a tropical genus *Clavariachaete* characterized by positively geotropic branched, *Pterula*- or *Ramaria*-like basidiomata.

*Hymenial setae* (Figs. 2-4) are thick-walled, usually subulate, narrowly fusoid or narrowly conical; their length is about 30-120 μm, diameter 4-15 μm; usually they emerge 10-60 μm above the hymenium. In thickening hymenium the old setae are embedded into the setal layer. In several species, setae are encrusted in upper half or at tip. This incrustation may be disolvable in KOH solution stronger than 2%, and spiral-like structure of setal walls may be seen in many species when a 10% solution is used. In most species, old setae are covered with a very thin sheath of hyaline thin-walled hyphae 0.5-1.5 μm in diam. Using scanning electron microscopy, Gilbertson & Lindsey (1978) observed another type of setal sheath in *Hymenochaete arida* (= *H. cinnamomea*), made of primary wall of young setae separated from the secondary wall during the growth of setae. No other studies on ultrastructure of setae have been published since 1978.

*Cystidia* have been observed in three species (*Asterodon ferruginosus, Hymenochaete anomala* and *H. fulva*); these are atypical, usually hardly noticeable, and may be incrusted by crystals. They are somewhat enlargened hyphal ends in the hymenium and subhymenium.

*Hyphidia* are similar to hyphal ends; they may be on the same level as basidioles and basidia, or may project somewhat from the hymenium. In several species, hyphidia have yellowish, brownish or brown thickened walls; sometimes they may be covered with small granules of resinous matter, and then



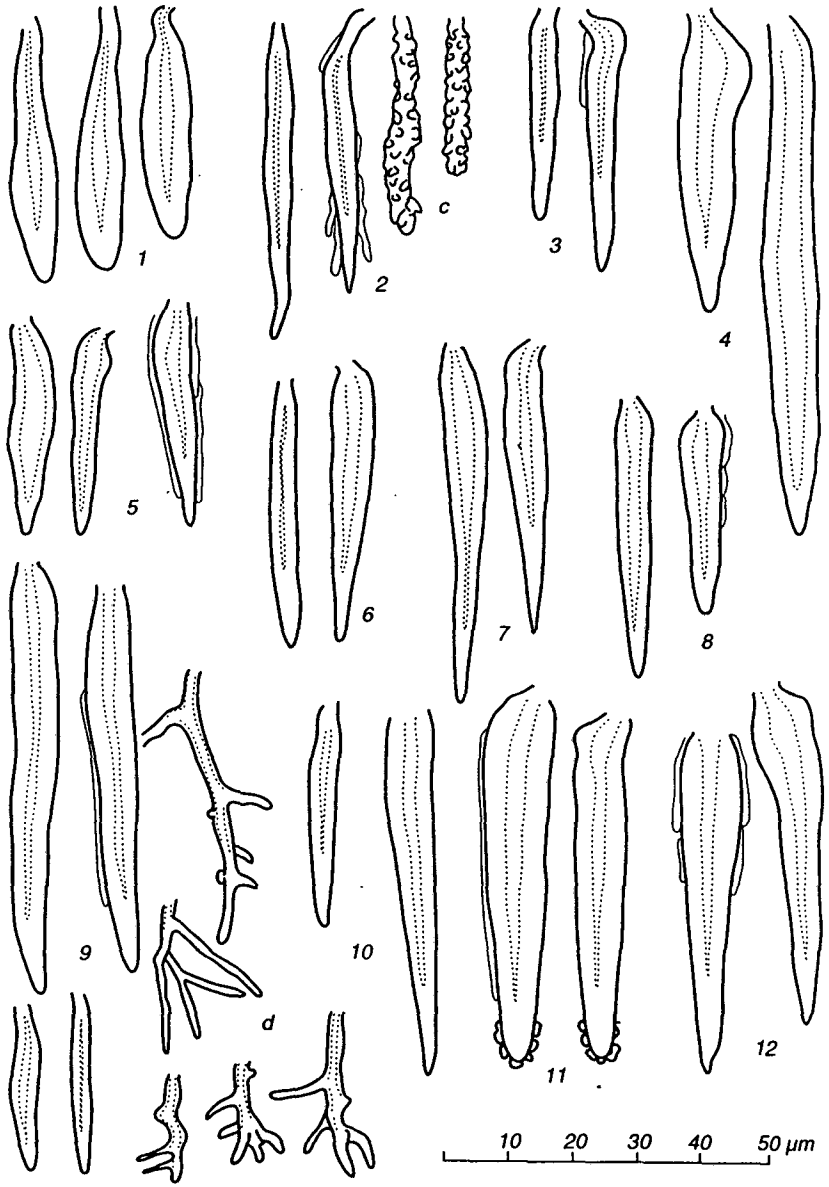


Fig. 2. Setae of hymenochaetoid fungi: *1 - Hymenochaete cacao, 2 - H. anomala* (*c* - cystidia), *3 - Hydnochaete tabacina, 4 - H. olivacea, 5 - Hymenochaete luteobadia, 6 - H. epichlora, 7 - H. tenuis, 8 - H. rigidula, 9 - H. pinnatifida* (*d* - dendrohyphidia), *10 - H. unicolor, 11 - H. corrugata, 12 - H. leonina.*

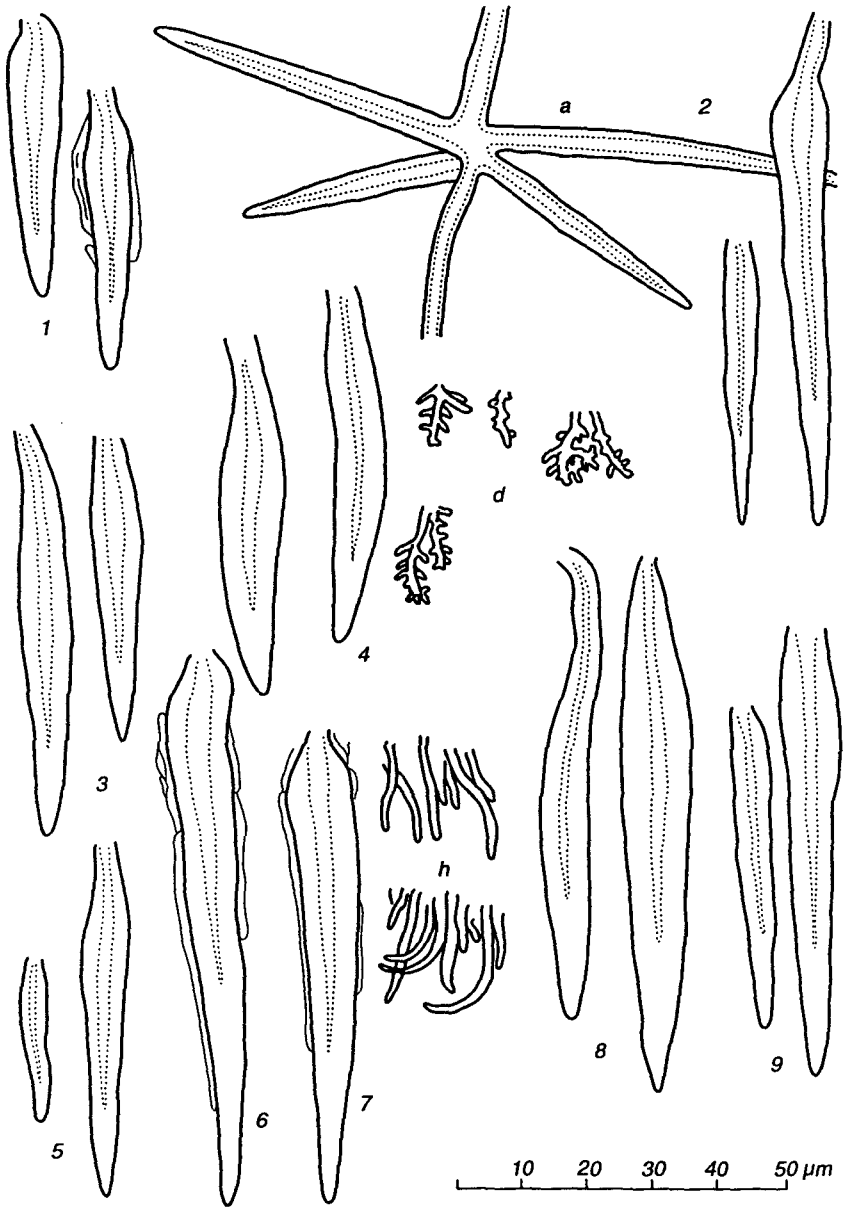


Fig. 3. Setae of hymenochaetoid fungi: *1 – Dichochaete setosa*, *2 – Asterodon ferruginosus* (*a* – asteroseta), *3 – Hymenochaete rubiginosa*, *4 – H. escobarii* (*d* – dendrohyphidia), *5 – H. carpatica*, *6 – H. burdsallii*, *7 – H. curtisii* (*h* – hyphidia), *8 – H. cervina*, *9 – H. jobii*.



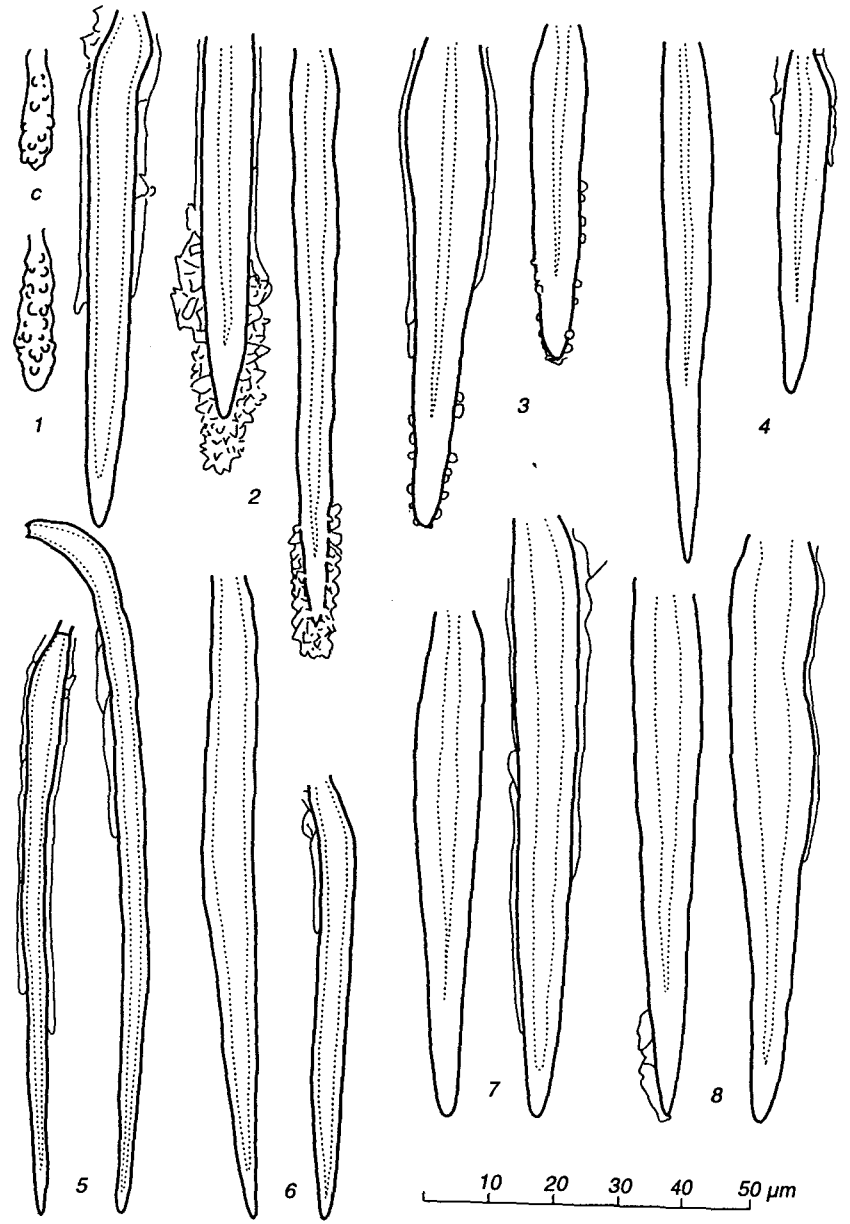


Fig. 4. Setae of hymenochaetoid fungi: *1 – Hymenochaete fulva* (*c* – cystidia), *2 – H. americana*, *3 – H. tabacina*, *4 – H. fuliginosa*, *5 – H. cinnamomea*, *6 – H. rhabarbarina*, *7 – H. rheicolor*, *8 – H. damicornis*.

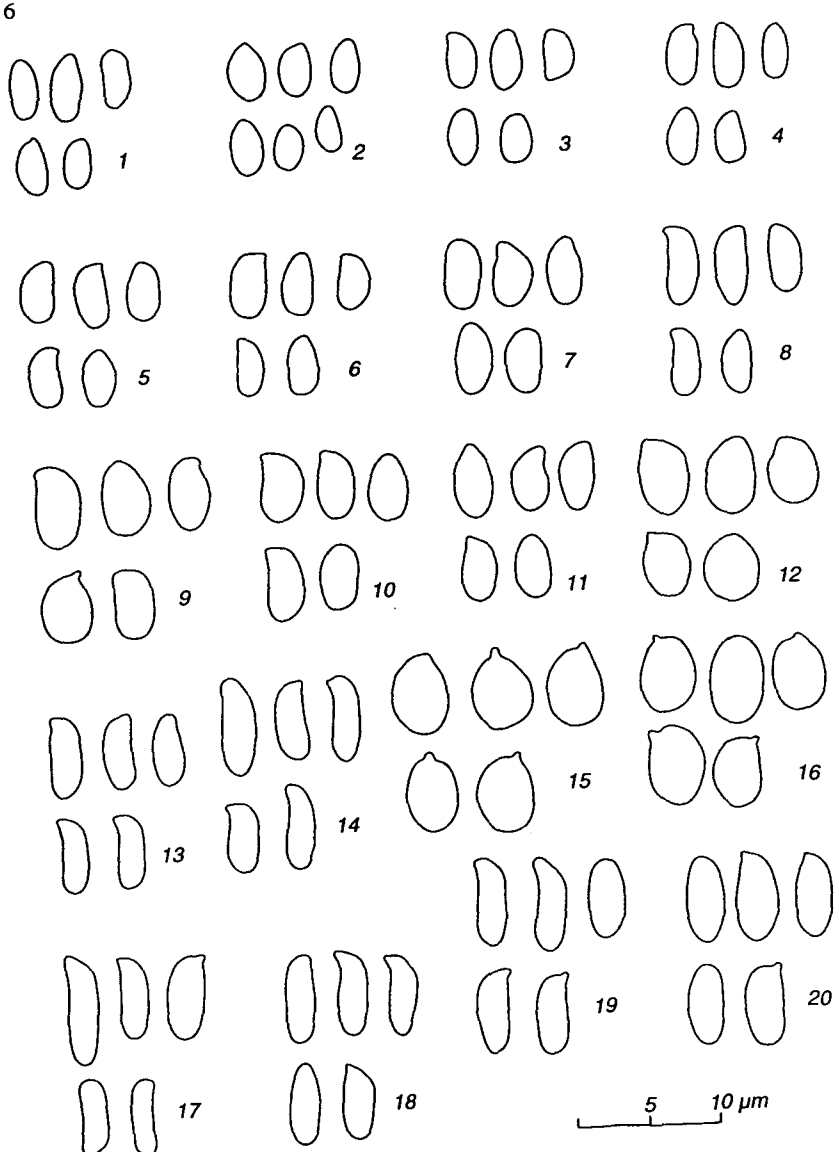


Fig. 5. Spores of hymenochaetoid fungi: *1 - Hymenochaete rheicolor, 2 - H. cacao* (Léger, 1998, f. 18), *3 - Dichochaete setosa, 4 - Hymenoch. epichlora, 5 - H. anomala, 6 - H. rigidula, 7 - H. rubiginosa, 8 - H. tenuis, 9 - H. rhabarbarina, 10 - H. jobii, 11 - H. leonina, 12 - H. fulva, 13 - H. tabacina, 14 - Hydnochaete tabacina, 15 - Hymenochaete cervina, 16 - H. burdsallii, 17 - Hydnochaete olivacea, 18 - Hymenochaete americana, 19 - H. pinnatifida, 20 - H. cinnamomea.*



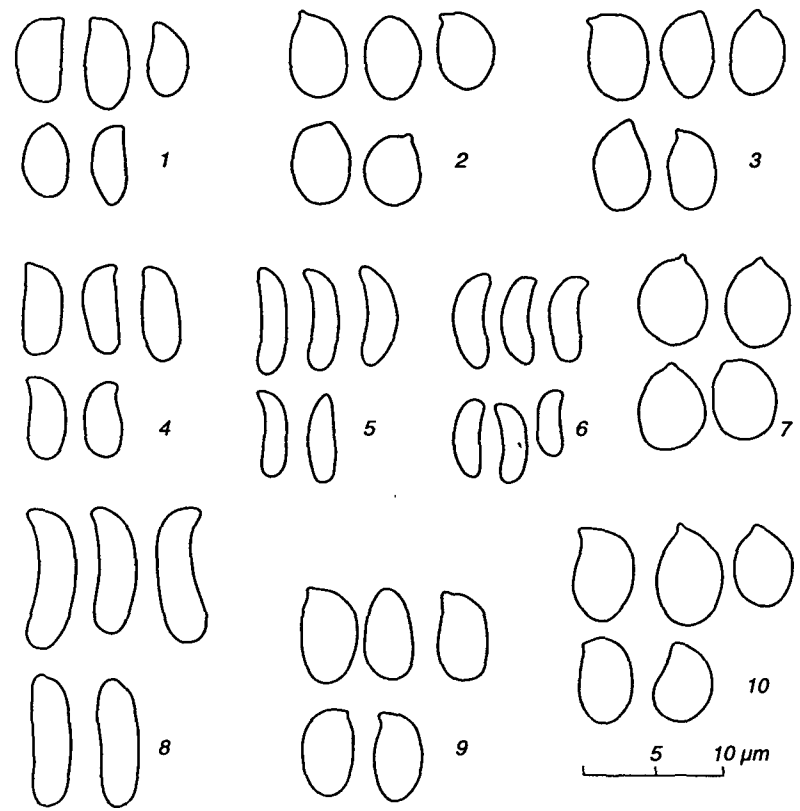


Fig. 6. Spores of hymenochaetoid fungi: *1 - Hymenochaete luteobadia, 2 - Asterodon ferruginosus, 3 - Hymenochaete unicolor, 4 - H. fuliginosa, 5 - H. allantospora, 6 - H. corrugata, 7 - H. damicornis, 8 - H. curtisii, 9 - H. carpatica, 10 - H. escobarii.*

these seem to be with unevenly thickened walls or monilioid. In some species *(Hymenochaete cinnamomea* ssp. *spreta, H. rhabarbarina)* the encrusted hyphidia look sometimes like acanthohyphidia. Hyphidia are usually numerous in sterile hymenium before (or after) formation of basidioles and basidia.
When sterile hymenium is beginning to thicken, i.e., before formation of a new layer of setae, basidioles and basidia, growing hyphae are emerging from it.Sometimes these hyphae simulate hyphidia, and have been described as such.

*Basidioles* are common in most species; partly these are unripe basidia - not all basidia are sporulating simultaneously. A portion of the basidioles will remain sterile; both types may have thickened at the base, sometimes encrusted with granules of resinous matter yellow(ish) walls. Several authors (e. g., Cunningham, 1963) have called these hyphidia, and sometimes there are intermedi-

growing trees and shrubs; parasitic way of living is possible but not proved in other species.

All species cause a white rot, i. e., are decomposers of lignin. Some species cause a pocket rot of wood, i. e., the rotten wood has numerous small holes.

Basidiomata may develop during all vegetation seasons but in countries with temperate climate mostly late summer or early spring. Most species have perennial basidiomata: their hymenium is thickening, forming a setal layer. In some species the new annual setal layer is clearly distinguishable from the old ones, sometimes strata are separated from each other by a thin layer of interwoven hyphae. If one setal layer (and hymenium) is developing during a year, the age of basidiomata may be counted; it is usually not more than 2-3 years, but in some species up to 12 *(Hymenochaete cinnamomea),* 15 *(H. escobarii)* or 20 *(H. cervina)* years.

Most collections in all herbaria are sterile, i. e., without basidia and spores. In many cases, it is so due to slow drying of specimens: the basidia will collapse during this, and thin-walled spores will be destroyed by insects and (mainly) bacteria. Sporulation period of most species is unknown and it may be quite short. In other groups of Aphyllophorales fungi, it is usually early spring and late summer to late autumn (in Boreal Zone), when it is rainy and air temperature not high. Many species of aphyllophoroids studied sporulate late evening and early morning, or during the night, i. e., when basidiomata are usually not collected by mycologists.

## DISTRIBUTION

Of the about 115 accepted species of the genera *Asterodon, Clavariachaete, Dichochaete, Hydnochaete* and *Hymenochaete,* more than a half have been only found in tropical or subtropical areas. 34 species have been found in the Boreal and Nemoral zones of the Northern Hemisphere, of these 11 only in this area. There are numerous species (22) which seem to have distribution of Gondwana type; 12 species have been found until only in Australasia, 17 only in Africa and 20 only in Southern America. These numbers reflect the fact that some areas are better studied than others; nevertheless, general features of their distribution show that the species are mainly of tropical/subtropical origin. The number of species specialized to grow only or mainly on coniferous wood is 4, on angiospermic wood (including 2 species only found on bamboos) - 39. For many species the preferred host is unknown.

In Northern America, the number of species diminishes from south and northeast to northwest. Of the 30 species (including two doubtful ones), 23 have been found in southeastern USA, 15 in northeastern, 15 in southwestern (mainly in Arizona), 11 in south-central, 9 in north-central USA, northwestern USA, western and eastern Canada, and only 4 in Subarctic America (two in Greenland and one in the Northwest Territories of Canada). 18 species (including 2 doubtful ones) have been found in Mexico, but this small number is obviously due to insufficient study of this area.



## COLLECTING

Species of Hymenochaetoid fungi are mainly growing on fallen trunks and twigs. As other aphyllophoroid fungi, most resupinate species prefer the underside of fallen logs or twigs. Pileate species can also grow on vertical substrate. Three species have special localities: the basidiomata of *Hymenochaete damicornis* are upright and growing seemingly on soil, actually on buried wood or roots; *H. carpatica* forms basidiomata on bark scales of living trees; *Asterodon ferruginosus* may grow not only on very rotten logs, but also under the roots of rotten stumps.

The collected specimens must be dried as soon as possible; to avoid change of colour and consistency, it is best to be done in moving air and with temperature not above 35 centigrade. Slowly dried or kept in moisture specimens are usually without basidia and spores; especially important is quick drying in tropics and subtropics, where basidia and spores will be damaged very soon.

To acquire spores for further study, it is recommended to make a spore print. When basidiomata are dry, soak these for 20-30 min in water and let them slightly dry after this. Place a moist basidiome on waterproof black paper and cover with a plastic bag to avoid rapid drying. A clearly visible white spore print will be formed in a few hours; lower temperature stimulates sporulation more than warm one. The spore print must be dried immediately and put into a small envelope. Using sterile microscope slides instead of paper, the spore print is suitable for introducing the fungus into pure culture; dry spores are viable for several weeks. Fresh spore prints as well as these kept in a herbarium many years are usable for spore measurement and statistical treatment of the results.

## LABORATORY STUDY OF SPECIMENS

Colour of specimens is variable not only between species, but even more in the same basidioma during its life cycle. To describe the colour, several colour charts are available. The colours have no names in the *Munsell Book of Color* (1942 or any later variety of this, including the *Soil Color Chart*), but are denoted using a combination of letters and numbers. (E. g., deep red is denoted as 2.5 R 4/12). This costly book has been used by few mycologists in North America. Available for a much smaller cost is the book by Kornerup and Wanscher (1967). On 30 tables, 1266 colours are represented, and in addition to the colour notations (e. g., 6 C 5), vernacular names are given, too. These names are used in this paper (in parentheses) to describe the basidiomata.

MICROSCOPIC STUDY. Hand-made sections made radially from basidiomata are needed to see the structure (presence or absence of its different layers, basidia and other hymenial elements); scratch preparates may be done to measure the setae and spores. Preparates are usually mounted into 2-3 percent water solution of KOH. Avoid use of more concentrated KOH because the incrustation of setae and crystals present in basidiome may dissolve. Use of Melzer's reagent is in most cases useless, as is the use of different stains.

Spore measurements are useful for sure identification in many species. Measurement of some 7-10 spores avoiding extreme sizes may give a preliminary picture of spore size for identification. For more detailed study, 25-30 randomly taken (not selected!) spores must be measured. Arithmetic mean of

the measurements is a statistics usable to characterize a specimen (but not species!) and to study variation within a species when data on several specimens are available. In most species, spores are small and moving due to the Brownian movement; use of a micoscope with image analysis equipment gives much more exact data than a usual microscope.

## ABBREVIATIONS USED

G & L - Ginns & Lefebvre, 1993
K & W - Kornerup & Wanscher, 1967
M - Munsell, 1942

**Abbreviations of state names**

**Canada**
AB - Alberta
BC - British Columbia
MB - Manitoba
NB - New Brunswick
NF - Newfoundland
NS - Nova Scotia
NT - Northwest Territories
ON - Ontario
PE - Prince Edward Island
PQ - Quebec
YT - Yukon Territory

**Mexico**
BS - Baja California Sur
DU - Durang
JA - Jalisco
M-MI - Michoacan
M-MO - Morelos
NL - Nuevo León
OA - Oaxaca
PU - Puebla
SI - Sinaloa
SL - San Luis Potosí
TA - Tamaulipas
VC - Veracruz

**United States**
AK - Alaska
AL - Alabama
AR - Arkansas
AZ - Arizona
CA - California
CO - Colorado
CT - Connecticut
DC - District of Columbia
DE - Delaware
FL - Florida
GA - Georgia
IA - Iowa
ID - Idaho
IL - Illinois
IN - Indiana
KS - Kansas
KY - Kentucky
LA - Louisiana
MA - Massachusetts
MD - Maryland
ME - Maine
MI Michigan
MN - Minnesota
MO - Missouri
MS - Mississippi
MT - Montana
NC - North Carolina
ND - North Dakota
NE - Nebraska
NH - New Hampshire
NJ - New Jersey
NM - New Mexico
NV - Nevada
NY - New York
OH - Ohio
OK - Oklahoma
OR - Oregon
PA - Pennsylvania
RI - Rhode Island
SC - South Carolina
TN - Tennessee
TX - Texas
UT - Utah
VA - Virginia



VT - Vermont
WA - Washington
WI - Wisconsin
WV - West Virginia
WY - Wyoming

## KEYS TO THE NORTH AMERICAN SPECIES

1. Synoptical key to some species with distinctive characters.
2. Key to species found in Greenland, Canada and northern USA.
3. Key to all species.

### 1. SYNOPTICAL KEY TO SOME SPECIES WITH DISTINCTIVE CHARACTERS

Pileus **stipitate**: 15. *Hymenochaete damicornis.*
Basidiomata **stratose** with **distinct** setal layers; hyphal layer(s) present: 12. *Hymenochaete cinnamomea* ssp. *spreta*, 17. *H. escobarii*, 23. *H. pinnatifida.*
Basidiomata **on bark scales of living trees**: 10. *Hymenochaete carpatica.*
In context and hymenium numerous **asterosetae**: 1. *Asterodon ferruginosus.*
In context numerous **dichohyphae**: 2. *Dichochaete setosa.*
**Setal hyphae** present: 1. *Asterodon ferruginosus,* 2. *Dichochaete setosa,* 3. *Hydnochaete olivacea,* 4. *H. tabacina,* 10. *Hymenochaete carpatica,* 26. *H. rigidula*, 28. *H. tabacina.*
Hyphidia with **hook-like curved tips**: 14. *Hymenochaete curtisii.*
Brown(ish) or yellow **hyphidia with thickened walls** present: 11. *Hymenochaete cervina,* 21. *H. leonina,* 22. *H. luteobadia,* 23. *H. pinnatifida.*
**Dendrohyphidia** present: 2. *Dichochaete setosa,* 17. *Hymenochaete escobarii,* 23. *H. pinnatifida.*

### 2. KEY TO SPECIES FOUND IN GREENLAND, CANADA AND NORTHERN USA (north of California, Arizona, New Mexico, Texas, Arkansas, Kentucky and North Carolina)

1. Hymenophore distinctly warted or with teeth up to 2.5(-4) mm long (hydnoid) ..... 2
- Hymenium smooth or with scattered low tubercles ..... 3
2 (1). Basidiomata very soft when dry, easily detachable from substrate; in context and hymenium stellate asterosetae; mycelial strands at margin usually present **1. Asterodon ferruginosum**
- Basidiomata coriaceous, woody when dry, closely adnate; asterosetae and mycelial strands absent **3. Hydnochaete olivacea**
3 (2). Basidiomata pileate, effused-reflexed or with elevated margins ..... 4
- Basidiomata effused ..... 6
4 (3). Setae few, in sterile hymenium numerous hyphidia with hook-like or coiled tips; spores 5.5-8.3 μm long **14. Hymenochaete curtisii**
- Setae numerous; hyphidia absent or without coiled tip; spores 3.8-7 μm long ..... 5

5 (4). Basidiome woody hard; pileal surface velutinous, soon glabrous; hymenium not cracked or deeply scantily creviced when old; no setal hyphae **27. Hymenochaete rubiginosa**

- Basidiome soft coriaceous, brittle when dry; pileal surface radially fibrose, hairy, glabrous when very old; hymenium radially or plumosely densely cracked; setal hyphae usually present but scattered, 120-250 µm long **28. Hymenochaete tabacina**

6 (3). Dendrohyphidia absent ..... 7

- Dendrohyphidia with thickened brownish walls, usually repeatedly branched; basidiome sometimes stratose with alternating hyphal and setal layers **23. Hymenochaete pinnatifida**

7 (6). On bark scales of living angiospermic trees; spores ellipsoid to broadly ellipsoid, 5.5-6.5 x 3-3.5 µm **10. Hymenochaete carpatica**

- Never on living trees ..... 8

8 (7). Hyphal layer present (sometimes thin) ..... 9

- Hyphal layer absent, only (thickening) setal layer present ..... 10

9 (8). Basidiomata stratose, with 2-10 distinct rows of setae and sometimes a thin hyphal layer between these, thickening (up to 1-2 mm), deeply cracked; spores 4.5-6.5 x 1.8-2.8 µm **12. Hymenochaete cinnamomea** ssp. **spreta**

- Basidiomata not stratose, thin (up to 200 µm), not cracked; spores broadly ellipsoid, 7-8 x 4.2-5.2 µm **8. Hymenochaete burdsallii**

10 (8). Most setae with almost blunt tip, 7-15 µm in diam, in upper part always encrusted with amorphous granules or rugose; no hyphidia; spores cylindrical, slightly curved, 4.5-6.8 x 1.5-2.3 µm **13. Hymenochaete corrugata**

- Setae usually with an acute tip, not encrusted or in old basidiomata sometimes encrusted in the upper part; hyphidia absent or when present, then hyaline or brownish; spores 1.8-4.3 µm broad ..... 11

11 (10). Setae small, 30-60 x (5-)6-10(-12) µm, without incrustation, some with slightly curved tips, some sinuate; spores 4.5-5.5 x 2-2.5 µm **29. Hymenochaete tenuis**

- Setae 55-110 x 7-15 µm, in old specimens sometimes encrusted; spores 5-7.5 x 1.8-4.3 µm ..... 12

12 (11). Spores cylindrical, slightly curved, 5-6.5 x 1.8-2.6 µm. On conifers **18. Hymenochaete fuliginosa**

- Spores ellipsoid or broadly ellipsoid. On angiospermic trees ..... 13

13 (12). Hymenium usually with scattered low rounded tubercles; spores ellipsoid, 4.5-6 x 2.2-3.2 µm **20. Hymenochaete jobii**

- Hymenium smooth; spores broadly ellipsoid, 5-7.5 x 3.5-4.3 µm **11. Hymenochaete cervina**

## 3. KEY TO ALL SPECIES

1. Hymenophore distinctly warted or with teeth up to 2.5(-4) mm long (hydnoid or odontioid) ..... 2

- Hymenium smooth or with scattered low tubercles ..... 5



2 (1). Basidiomata very soft when dry, easily detachable from substrate; in context and hymenium dichotomously branched hyphae or stellate asterosetae; mycelial strands at margin usually present; spores 1.8-4.5 µm in width ..... 3

- Basidiomata coriaceous or soft-coriaceous, closely adnate; dichotomously branched hyphae and asterosetae absent; mycelial strands absent; spores 5-6 x 1.2-2.2 µm ..... 4

3 (2). Basidiomata effused; in context and hymenium numerous asterosetae; spores 4.5-7 x 3.5-4.5 µm. Not found in southern USA (except AR) and Mexico **1. Asterodon ferruginosus**

- Basidiomata effused-reflexed or effuse; in context numerous dichotomously branched hyphae; spores 3-4.2 x 1.8-2.3 µm. Southern species, Mexico and to the South **2. Dichochaete setosa**

4 (2). Tomentum absent, in old specimens cortex present as a black zone near substrate; setae numerous, 60-200 x 8-15 µm **3. Hydnochaete olivacea**

- Tomentum present as a cottony upper layer of the context; cortex present as a dark line; setae rare, present in the hymenium of the upper part of the teeth and between these, 25-55 x 5-9 µm **4. Hydnochaete tabacina**

5 (1). Basidiomata pileate, effused-reflexed or umbonate ..... 6

- Basidiomata effused, margins sometimes slightly elevated ..... 14

6 (5). Basidiome pileate, with a (sometimes branched) distinct stipe, 2-10 cm high; usually growing on ground near trees. Southern species, Mexico and to the South **15. Hymenochaete damicornis**

- Basidiome always without a stipe, growing on wood ..... 7

7 (6). Pileus flexible, soft; no cortex; hyphal layer well developed, with loosely arranged hyphae; spores cylindrical, slightly curved, 1.5-2.5 µm broad . 8

- Pileus coriaceous or woody hard, not flexible; hyphal layer absent or when present, then hyphae more or less densely arranged and basidiome with a cortex; spores cylindrical or ellipsoid, 1.2-4.8 µm broad ..... 9

8 (7). Basidiomata effused-reflexed; setae few, in sterile hymenium numerous hyphidia with hook-like or coiled tips; spores 5.5-8.3 µm long **14. Hymenochaete curtisii**

- Basidiomata sessile-pileate or umbonate-sessile; setae scattered or numerous; no hyphidia with coiled or hook-like tips; spores 4.5-7 µm long **25. Hymenochaete rheicolor**

9 (7). Setae 4-8 µm in diam. Southern species, Mexico and to the South ..... 10

- Setae 7-15 µm in diam ..... 12

10 (9). Dendrohyphidia present; setal layer distinctly stratose; spores broadly ellipsoid, 5.2-6.5 x 3.5-4.5 µm **17. Hymenochaete escobarii**

- Dendrohyphidia absent; setal layer never distinctly stratose; spores subcylindrical to broadly ellipsoid, 3-5 x 1.8-2.5 µm ..... 11

11 (10). Hyphidia absent; setae 20-40 x 4-8 µm; spores 3-4(-4.5) µm long; hymenium brown, greyish or dark brown to blackish **9. Hymenochaete cacao**

- Numerous brownish encrusted hyphidia with thickened walls present; setae (25-)40-60 x 5-8 µm; spores 4-5(-5.5) µm long; hymenium greyish to

brownish orange, in old specimens rust brown
**22.Hymenochaete luteobadia**

12 (9). Basidiome woody hard; pileal surface velutinous, soon glabrous; hymenium not cracked or with few deep crevases when old; no setal hyphae; setae 40-80(-100) x 8-10(-12) μm, without incrustation; spores ellipsoid, with one side flattened, 3.8-5.5 x (1.8-)2-2.8 μm
**27. Hymenochaete rubiginosa**

- Basidiome coriaceous; pileal surface radially fibrose or coarsely hirsute, glabrous when old; setae (50-)60-150 x 7-15(-16) μm, with encrusted tip; spores cylindrical, slightly curved or allantoid, (4.3-)4.5-11(-13) x 1.2-2.7 μm ..... 13

13 (12) Pileal surface radially fibrose and hairy; hymenium radially or plumosely densely cracked; setal hyphae usually present but not numerous, 120-250 μm long; setae (50-)60-120(-150) x 7-15(-16) μm, with finely encrusted tip; spores slightly curved, 4.5-7 x 1.2-2.2 μm
**28. Hymenochaete tabacina**

- Pileal surface coarsely hirsute; hymenium not cracked; setal hyphae absent; setae 80-150 x (9-)10-15 μm, in upper part or at tip encrusted with granules of polyhedric crystals; spores curved (allantoid), 8.5-11(-13) x 2.2-2.7 μm **5. Hymenochaete allantospora**

14 (5). Dendrohyphidia absent ..... 15

- Dendrohyphidia with thickened brownish walls, usually repeatedly branched; basidiome without tomentum but with cortex and hyphal layer, sometimes stratose with alternating hyphal and setal layers
**23. Hymenochaete pinnatifida**

15 (14). Hyphal layer present (sometimes thin) ..... 16

- Hyphal layer absent or indistinct, only (usually thickening) setal layer present ..... 26

16 (15). Hyphal layer (seemingly) duplex, with a dark line in this layer.... 17

- Hyphal layer not duplex ..... 18

17 (16). In sterile hymenium hyphidia with yellowish thickened walls; in hyphal layer setal hyphae absent; basidiome with a dark line (cortex) in context dividing it into two parts **21. Hymenochaete leonina**

- Hyphidia always absent; setal hyphae infrequent, up to 150 μm long, 5-10 μm in diam; dark line in hyphal layer sometimes present
**26. Hymenochaete rigidula**

18 (16). Cortex present, sometimes thin (12-60 μm). Very rare southern species ..... 19

- Cortex indistinct or absent ..... 20

19 (18). Setae 70-100 x 8-12 μm, always encrusted with groups of crystals, or crystals forming a narrowly conical cap; basidiome 100-600 μm thick; spores cylindrical, slightly curved or sigmoid, (7-)7.5-9.2 x 2.5-3(-3.2) μm **6. Hymenochaete americana**

- Setae 70-90(-95) x 7-9(-10.5) μm, without incrustation; basidiome up to 225 μm thick; spores broadly ellipsoid, 5-6 x 3.2-4 μm
**19. Hymenochaete fulva**



20 (18). Setae 30-60 μm long ..... 21

- Setae 55-120 μm long ..... 23

21 (20). Setae rare or scattered, fusiform; spores 3.5-5 x 1.8-2.5 μm; hyphidia absent; basidiome thin (up to 230 μm), soft to coriaceous
**16. Hymenochaete epichlora**

- Setae numerous, subulate to fusiform; basidiome 200-1000 μm thick, coriaceous to woody hard ..... 22

22 (21). Setal hyphae absent; spores 4-5 x 2.4-3.2(-3.5) μm; hyphidia not numerous, hyaline or yellowish **30. Hymenochaete unicolor**

- Setal hyphae infrequent, up to 150 μm long and 4-10 μm in diam; spores 3.7-5 x 1.5-2.3(-2.5) μm; hyphidia absent **26. Hymenochaete rigidula**

23 (19). Setae rare or scattered; spores cylindrical, slightly curved, 5.5-8.3 x 1.5-2.5 μm; hyphidia numerous, with hook-like or coiled tips in sterile hymenium **14. Hymenochaete curtisii**

- Setae numerous; spores cylindrical or ellipsoid; hyphidia with coiled tips absent ..... 24

24 (23). Basidiomata stratose, with 2-10 distinct rows of setae and sometimes a thin hyphal layer between these, thickening (up to 1-2 mm), deeply cracked; spores short cylindrical, 4.5-6.5 x 1.8-2.8(-3.2) μm. Common species **12. Hymenochaete cinnamomea** ssp. **spreta**

- Basidiomata not stratose, thin (up to 300, rarely 700 or 1000 μm), not deeply cracked; spores ellipsoid, 2.3-5.2 μm broad. Very rare species . 25

25 (24). Spores broadly ellipsoid, 7-8 x 4.2-5.2 μm; basidioles thin-walled, 5-8 μm in diam **8. Hymenochaete burdsallii**

- Spores ellipsoid, 4.8-6 x 2.3-3.3 μm; basidioles with thickened walls, 3.5-5 μm in diam **24. Hymenochaete rhabarbarina**

26 (15). Setae 7-15 μm in diam, setal tip usually encrusted with crystals or amorphous granules. On angiospermic trees, rarely on conifers ..... 27

- Setae 5-11 μm in diam, without incrustation (in *H. opaca* encrusted in uppermost part) ..... 30

27 (26). Most setae with almost blunt tip, in upper part encrusted with granules; no hyphidia; spores cylindrical, slightly curved, 4-6.8 x 1.5-2.3 μm ..... 28

- Setae usually with acute tip, in older basidiomata with encrusted with crystals upper part or tip; hyphidia absent or when present, then hyaline or brownish; spores 2.2-4.3 μm broad ..... 29

28 (27). Cortex absent but thin dense cortex-like layer of hyphae may be present; basidiome brownish or reddish grey, later sometimes dark brown. Common species **13. Hymenochaete corrugata**

- Cortex 30-40 μm thick; basidiome yellowish brown to brown. Doubtful species, found only twice **31. Hymenochaete episphaeria**

29 (27). Hymenium usually with scattered low tubercles; spores ellipsoid, 4.5-6 x 2.2-3.2(-3.5) μm **20. Hymenochaete jobii**

- Hymenium smooth; spores broadly ellipsoid, 5-7.5 x 3.5-4.3 μm
**11. Hymenochaete cervina**

30 (26). On bark or between bark scales of living angiospermic trees. Spores ellipsoid, (5-)5.5-6.5(-7) x (2.8-)3-3.5 μm; most setae 50-90 x 6-10 μm, some setae 20-25 x 5.5-7 μm **10. Hymenochaete carpatica**

- Never on living trees. Spores cylindrical or ellipsoid, 1.5-2.6 μm in width; setae more or less of uniform size ..... 31

31 (30). Setae 30-60 x 5-10 μm ..... 32

- Setae 65-100 x 7-11 μm ..... 33

32 (31). Basidioles hyaline, thin-walled; spores 4.5-5.5 x 2-2.5 μm; some setae with slightly curved tips, sometimes some sinuate; no cystidia **29. Hymenochaete tenuis**

- Basidioles yellowish, encrusted with thin granules; spores 3.2-4(-4.5) x (1.5-)1.8-2.3(-2.5) μm; setae usually flexuose; cystidia sometimes present, with thickly encrusted walls, 15-23 x 6-12(-15) μm **7. Hymenochaete anomala**

33 (31). Setae without incrustation; on wood of coniferous trees. Common in boreal forests, not found in southeastern USA or Mexico **18. Hymenochaete fuliginosa**

- Setae encrusted in uppermost part with small crystals; on wood of angiospermic trees. Described from Jamaica, mentioned (possibly erroneously) from AL, FL, LA and Mexico; dubious species **32. Hymenochaete opaca**

## ASTERODONTACEAE

**1. Asterodon ferruginosus** Pat. Figs. 3, *2;* 6, *2*

Pat., Bull. Soc. Mycol. France 10: 130 (1894); Corner, Trans. Brit. Mycol. Soc. 31: 235, f. 1-5 (1948); Parmasto, Lachnocladiaceae Soviet Union 121, 151, f. 88-95, 105 (1970). - *Hydnochaete setigera* Peck, Ann. Rep. New York St. Mus. 50: 113 (1897). - *Asterostroma ochrostroma* Burt, Ann. Missouri Bot. Gard. 11: 34 (1924).

Basidiome annual, effused, easily detachable from substrate, cottony soft, light weight, to 5 mm thick, round, 3-20 cm in diam (when confluent to 5 m long); context soft, loose, cottony, up to 1 mm thick. Hymenophore warted, soon composed of densely arranged teeth, bright Fulvous or Ochreous-Fulvous to Sienna (M: 7.5 YR 6/8, sometimes 5-7/6-8; K & W: (5-)6 C 7 or 6 C-D 6, brownish orange, caramel brown or cinnamon brown); teeth cylindrical-conical, (0.2-)0.5-2(-4) mm long, 0.12-0.3(-0.4) mm diam; margin 0.5-2 mm wide, thin, radially fibrillose or almost arachnoid, whitish, then concolorous with hymenophore, later disappearing; margin and rotten substrate with numerous, sometimes branched, soft, whitish, later brownish mycelial threads up to 0.7 mm in diam.

Tomentum and cortex absent; context composed of hyphal layer 200-1000 μm thick; dark line above the hymenium absent.

Hyphal system asteritrimitic with generative and skeletal hyphae, and asterosetae; setal hyphae present in teeth, 60-170 x 5-7 μm; generative hyphae numerous, with thin hyaline or yellowish walls, septate, branched, 1.5-3 μm in diam; skeletal hyphae thick-walled, brownish, 1.5-3 μm in diam; asterosetae common, with 3-5(-7) unbranched rays, each 30-120(-150) x 5-8 μm, in subhymenium smaller than at substrate; hyphae in teeth more or less parallel; in hymenium crystalline matter absent.



Hymenial setae numerous, 40-80 x 5-10 μm, single or as sidebranches of setal hyphae, simple or with 2-4 sidebranches at base, 25-80 x 5-10 μm, projecting to 40 μm, subulate to fusiform, with acute tip, straight, naked, without incrustation.

Cystidia (cystidioles) not numerous, mainly situated on tip of a tooth, fusoid, with usually cylindric upper part, thin-walled, 20-50 x 4-6 μm; hyphidia rare, hyaline, 1-2.5(-3) μm in diam. Basidioles present, without incrustation; basidia clavate, some slightly flexuose, 17-25(-30) x 5-7(-8) μm; sterigmata 4, 4-5 μm long; spores broadly ellipsoid, with one side slightly flattened, with thin or slightly thickened walls, 5-6.5(-7) x 3.5-4.5 μm.

**SUBSTRATA IN N. AMERICA. Abies** balsamea (6), A. lasiocarpa (G & L, 1995), **Acer** rubrum (1), Acer sp. (1), **Betula** alleghaniensis (8), B. papyrifera (1), Betula sp. (4), **Fagus** grandifolia (3), Fagus sp. (2), **Picea** engelmannii (4), P. glauca (G & L, 1995), P. rubens (7), Picea sp. (3), **Pinus** monticola (1), P. strobus (2), **Populus** grandidentata (1), Populus sp. (2), **Pseudotsuga** menziesii (2), **Thuja** plicata (1), **Tsuga** canadensis (12), T. heterophylla (4), Tsuga sp. (8).

**DISTRIBUTION IN N. AMERICA. CANADA:** BC (1), NB (G & L, 1995), ON (5), PQ (1), YT (G & L, 1995). **USA:** AR (G & L, 1995), CT (G & L, 1995), DE (1), ID (11), MA (2), ME (8), MI (16), MT (8), NH (28), NY (17), VT (3), WA (1), WI (1).

**DISTRIBUTION ELSEWHERE. Europe; Asia-Temperate:** Russia (W. Siberia, S. Siberia incl. Altai and Sayani Mts.). - On rotten logs, under roots of old rotten stumps or in forest litter of mainly coniferous trees (Abies, Larix, Picea, Pinus).

**REMARKS.** Basidiomata of this species are sometimes growing over the remains of the last year ones, and seem to be stratose. One of such specimens seen by me (collected in Vermilion, Michigan; BPI 325219) has 7 layers and is more than 15 mm thick. Development of microstructure in this species has been described in detail by Corner (1948). Parmasto (1970: 125) found that the first stage in development of skeletal hyphae and asterosetae from the generative hyphae is identical: after a septum, a brownish hypha with thickening walls begins to grow. After an interval of length equal with prospective rays of an asteroseta, growth stops in one case and an asteroseta will develop. In other cases, the growth of the hypha is unlimited and a skeletal hypha will be formed. Accordingly, skeletal hyphae and asterosetae are homologous in this species. **Misidentifications.** In herbaria, sometimes *A. ferruginosus* has been filed under the name *Tomentella crinalis* (Fr.) M.J. Larsen (Thelephoraceae s. str.)

## CLAVARIACHAETACEAE

**2. Dichochaete setosa** (Sw.: Fr.) Parmasto Figs. 3, *1;* 5, *3*

Parmasto, Folia Crypt. Estonica 37: 57 (2001). - *Thelephora setosa* Sw., Fl. Indiae Occid. 3: 1929 (1806); Fr., Syst. Mycol. 3, Index 189 (1832). - *Hydnochaete setosa* (Sw.) Lloyd, Mycol. Writ. 4, Mycol. Notes 41: 559, f. 766 (1916). - *Hydnum resupinatum* Sw., Prodr. 149 (1788). - *Hydnochaete resupinata* (Sw.) Ryvarden, Myco-

taxon 15: 437, f. 5 (1982); Corner, Ad Polyporaceas 7: 164, f. 39-42 (1991). - *Hymenochaete aspera* Berk. & M.A. Curtis, J. Linn. Soc. Bot. 10: 334 (1868); Burt, Ann. Missouri Bot. Gard. 5: 311, f. 2 (1918); Reeves & Welden, Mycologia 59: 1040, f. 1 J (1967); Léger, Hymenochaete 57, f. 10 (1998).

Basidiome effused, effuso-reflexed or resupinate with elevated margins, closely adnate but sometimes separable, cottony soft or papery when dry, 100-3000(-7000) μm thick. Pilei confluent, imbricate, flabelliform to dimidiate, (0.5-)1-3(-5) cm long and to 10 cm wide, flexible when dry; surface radiately strigose, rough with coarse fibers, or densely covered with entangled forked or corniculately branched hairs up to 4 mm long, with concentric zones, at base sometimes with long branched outgrowths, dark Sienna to Umber (M: 5-7.5 YR 4/4, 6/8 or 4/6-8; K & W: 6 E 7 or 6 D 5 - 6, cognac or sunburn to cinnamon brown); margin thin, entire to lacerate, sometimes long-fimbriate (up to 7 mm broad) or eroded at the edge, plicate, concolorous with the pileal surface. Hymenium granulose, colliculose, then warted or hymenophore irregularly hydnoid; aculei pointed to rounded, scattered or in groups, up to 2 mm long, dark Sienna to light Umber (M: 5-7.5 YR 5/7-8, 5/5 or 4/6; K & W: 6 C 3 - 6 E 6-7, light brown to cocoa colour at the center; 6 B 4, greyish orange at the edges), without olive or lilac tint; margin of the resupinate part usually fibrillose, concolorous or lighter than hymenium, or with a darker zone; mycelial strands usually present at the margin and at base of the basidiome, up to 10 mm long, finger-like, sometimes brighter coloured.

Tomentum and cortex absent; context composed of hyphal layer, some darker hyphae agglutinated to form a thin darker band in some areas; sometimes in context hyphal threads 50-100 μm in diam; or of hyphal layer and a setal layer formed of overlapping rows of setae; dark line above the hymenium absent.

Hyphal layer 100-1000 μm thick, concolorous with other layers, cinnamon to rusty brown; context hyphae tightly interwoven but more loosely arranged towards the adaxial surface, often structure fibrillose with elongated cavities and hyphal threads 20-45 or up to 90 μm in diam, these longitudinally arranged or descending, curved outward toward the upper surface of the pileus.

Hyphal system dimitic with generative and dichohyphae; setal hyphae present in context and in pileal surface, up to 250 μm long, 4-10 μm in diam; generative hyphae 2-5 μm in diam, yellowish to brownish, thin- to thick-walled, septate, in the subhymenium hyaline and thin-walled; dichohyphae rare or abundant in the teeth, less common in the context but numerous at margin of the pileus, strongly dendroidly, dichotomously branched with mostly short sidebranches, yellow to hyaline; in context, setal stratum and hymenium crystalline matter absent.

Setal layer 40-100 μm thick (when present); setae uncommon to numerous, 40-80 x 5-10 μm, projecting to 30-40 μm, conical to fusiform, with acute tip, straight, naked or enmeshed in hyphal sheaths, without incrustation.

Dichotomous hyphidia abundant in the teeth, with mostly short sidebranches; dendrohyphidia present or absent (see above about dichohyphae); cystidia absent; basidioles present, without incrustation; basidia clavate or subclavate, 8-15 x 3-5 μm; sterigmata 4; spores broadly ellipsoid, 3-4.2 x 1.8-2.3 μm.



**SUBSTRATA IN N. AMERICA.** On dead wood of deciduous trees.

**DISTRIBUTION IN N. AMERICA. MEXICO:** VC (Córdoba, Matlaquihahuite, Dec 1854 Sallé, K; near Córdoba, 17 Jan 1910 W.A. & E.L. Murrill 1215, NY).

**DISTRIBUTION ELSEWHERE. Mesoamerica**: Costa Rica; **Caribbean**: Cuba, Dominica, Jamaica, Puerto Rico, Trinidad; **South America**: Argentina (Tierra del Fuego), Brazil, Chile, Colombia, Ecuador, Venezuela; **Asia-Tropical**: India (N. India and Bengal), Nepal.

**TYPES STUDIED.** *Thelephora setosa:* Jamaica, Swartz (K). *Hydnum resupinatum:* Jamaica, Swartz (K, lectotype selected by L. Ryvarden; K, S, isolectotypes). *Hymenochaete aspera:* Cuba, Wright 211 (K; isolectotypes: BPI 277592, FH, K, NY, S; paratypes: K).

**REMARKS.** Strigose pileal surface, granular to hydnoid hymenium and dichotomous hyphidia similar to those in *Clavariachaete* and *Vararia* are the most important characteristics of this species.

## HYMENOCHAETACEAE

**3. Hydnochaete olivacea** (Schwein.: Fr.) Banker Figs. 2, *4;* 5, *17*

Banker, Mycologia 6 (5): 234 (1914); Ryvarden, Mycotaxon 15: 433, f. 3 (1982); Jung, Wood-rott. Aphyll. s. Appal. 131, f. 41, pl. 16 C, 26 E; Gilb. & Ryvarden, N. Am. Polypores 1: 351, f. 168 (1986). - *Sistotrema olivaceum* Schwein.: Fr., Schr. Naturf. Ges. Leipzig 1: 101 (1822). - *Hydnum olivaceum* (Schwein.: Fr.) Fr., Elench. fung. 134 (1828). - *Sistotrema fuscescens* Schwein., Schr. Naturf. Ges. Leipzig 1: 102 (1822). - *Hydnoporia fuscescens* (Schwein.) Murrill, N. Am. fl. 9 (1): 3 (1907). - *Irpex cinnamomeus* Fr., Epicr. 524 (1838).

Basidiome annual (?), effused or effuso-reflexed, closely adnate, coriaceous, woody when dry, 500-2800 μm thick, round, 5-25 cm in diam; reflexed margin (pileus) short (up to 2 mm) and broad. Hymenophore warted or hydnoid with irregular, round to flattened teeth, obtused to incised in the top, often antlerlike with a fused base; length of teeth 0.5-2.5 mm; hymenium not cracked, in fertile specimens Cinnamon or reddish Brown (M: 7.5 YR 5/6-10; K & W: 5 C 5-8, topaz to brownish yellow), rusty brown in sterile and old specimens (K & W: 6 D 7-8, light brown), without olive or lilac tint; resupinate margin fibrillose or abrupt, lighter coloured (M: 7.5 YR 8/6-8 to 7/10 when older), then concolorous with hymenium, pale cinnamon to rusty brown or ferruginous.

Tomentum and cortex absent, or cortex present in old specimens as a black zone next to the substrate; context composed of hyphal layer, or setal layer only with setae scattered throughout; dark line above the hymenium absent.

Hyphal layer to 300 μm thick, rusty brown, homogeneous (without a dark line); hyphal system dimitic; setal hyphae present; generative hyphae 1.5-3 μm in diam, yellowish, with thickened walls, moderately branched, with scattered septa; skeletal hyphae dominating, yellow to pale rusty brown, 3-5 μm in diam, thick- or very thick-walled to solid; there are also a few hyphae of transitional type with very rare septa; in context and hymenium crystalline matter absent.

Setae numerous, 60-200 x 8-15 μm, projecting to 50 μm, fusiform-subulate, with acute tip, straight, naked, without incrustation.

Hyphidia, cystidia and basidioles absent; basidia clavate or subclavate, 6-12 x 4-5 μm; sterigmata 4; spores cylindrical to allantoid, 5-6 x 1.2-2 μm.

**SUBSTRATA IN N. AMERICA**. On dead branches, often still attached to the trees. **Acer** rubrum (G & L, 1995), A. spicatum (Jung, 1987), **Alnus** incana (includ. ssp. *incana* and ssp. *rugosa*) (G & L, 1995), A. rubra (1), A. viridis ssp. crispa (G & L, 1995), **Betula** alleghaniensis (G & L, 1995), B. lenta (G & L, 1995), B. lutea (Jung, 1987), B. pumila (G & L, 1995), **Carpinus** caroliniana (G & L, 1995), **Fagus** grandifolia (G & L, 1995), **Ligustrum** sp. (1), **Ostrya** virginiana (1), **Populus** sp. (G & L, 1995), **Prunus** serotina (G & L, 1995), **Pseudotsuga** menziesii (G & L, 1995), **Quercus** alba (1), Q. coccinea (1), Q. marilandica (1), Q. nigra (G & L, 1995), Q. rubra (syn.: Q. borealis) (3), Q. velutina (G & L, 1995), Quercus sp. (17), **Salix** nigra (G & L, 1995).

**DISTRIBUTION IN N. AMERICA. CANADA:** NB (G & L, 1995), NS (G & L, 1995), ON (5), PQ (7). **MEXICO:** VC (Jalapa, 1). **USA:** AL (G & L, 1995), AR (1), CT (4), FL (3), GA (G & L, 1995), ID (G & L, 1995), IL (G & L, 1995), IN (G & L, 1995), KY (G & L, 1995), LA (3), MD (1), ME (G & L, 1995), MI (G & L, 1995), MO (G & L, 1995), MS (1), MT (G & L, 1995), NC (7), NH (G & L, 1995), NJ (1), NY (G & L, 1995), OH (G & L, 1995), PA (Ryvarden, 1982; G & L, 1995), RI (1), SC (G & L, 1995), TN (6), TX (G & L, 1995), VA (G & L, 1995), VT (G & L, 1995), WA (1), WI (1), WV (G & L, 1995).

**DISTRIBUTION ELSEWHERE. Caribbean**: Jamaica; **South America**: Ecuador.

**TYPE STUDIED.** *Sistotrema olivaceum:* USA, Pennsylvania, Salem, 540 (UPS, isotype).

**4. Hydnochaete tabacina** (Berk. & M.A. Curtis) Ryvarden Figs. 2, *3;* 5, *14*

Ryvarden, Mycotaxon 15: 441, f. 7 (1982); Gilb. & Ryvarden, N. Am. Polypores 1: 353, f. 169 (1986); Corner, Ad Polyporaceas 7: 168, f. 43 (1991). - *Irpex tabacinus* Berk. & M.A. Curtis in Fr., Nova Acta Reg. Soc. Sci. Upsal. III 1: 106 (1851). - *Cerrenella tabacina* (Berk. & M.A. Curtis) Murrill, Bull. Torrey Bot. Club 32: 361 (1905).

Basidiome effused to effuso-reflexed, closely adnate, coriaceous when dry, up to 3000 μm thick. Pilei single or a few growing together, short and broad, when present reflexed part up to 0.6 cm long; pileal surface concentrically sulcate or not, tomentose but not radiately fibrillose or rugose, with concentric zones, dark cinnamon brown; margin entire, not plicate, concolorous with the pileal surface. Hymenophore hydnoid, azonate, cracked, dark Sienna, dark Cinnamon (M: 7.5 YR 5-8/10; K & W: 6 D 6-7, cinnamon brown to raw Sienna), in old specimens dark brown, without olive or lilac tint; teeth round and acute to flattened, often fused in basal parts, sometimes radially arranged, when immature sinuous and deeply incised, up to 2 mm long, 2-3 per mm; resupinate margin concolorous with hymenophore.

Tomentum present as the floccose or cottony upper layer of the context, up to 200 μm thick; cortex (30-)40-50(-100) μm thick; hyphal layer 200-300 μm thick, hyphae interwoven; trama in the teeth distinctly paler, hyphae more parallel intertwined.



Hyphal system subdimitic; setal hyphae present; generative hyphae 2-4(-5) μm in diam, subhyaline to pale rusty brown, thin-walled or with thickened walls, septate, very rare in the context; skeletoids numerous in tomentum and hyphal layer but lacking or few in hymenophoral trama, dark rusty brown, 3.5-6 μm in diam, thick-walled; in context and hymenium crystalline matter absent.

Setae rare or not numerous, present in the hymenium in the upper part of the teeth, 25-55 x 5-9 μm, projecting to 30 μm, fusiform, with almost blunt tip, straight, often with slightly undulating walls, without sheaths or incrustation.

Hyphidia and cystidia absent; basidioles 4-5.5 μm in diam; basidia 13-20 x 4.5-6 μm, soon collapsing; spores cylindrical or allantoid, 5-6 x 1.5-2 μm.

**SUBSTRATA IN N. AMERICA. Quercus** alba (1), Q. macrocarpa (1), Q. rubra (syn.: Q. borealis) (1), Q. virginiana (1), Quercus sp. (3).

**DISTRIBUTION IN N. AMERICA. USA:** FL (12), GA (2), LA (2), MO (1), NC (3), SC (Ryvarden, 1982), TN (1).

**DISTRIBUTION ELSEWHERE**. Not found.

**REMARKS.** Mean size of spores was 5.28 x 1.78 μm ($Q$ = 2.96) in the only specimen studied which has spores (TAA 151201, TN). The species has been lectotypified by Maas Geesteranus (1974) who selected *Curtis 2358* (K). Subsequently Ryvarden (1982) designated *Curtis 2356* (K) as lectotype.

**5. Hymenochaete allantospora** Parmasto Fig. 6, *5*

Parmasto, Folia Cryptog. Estonica 37: 58, f. 1, *1* (2001).

Basidiomata effuso-reflexed with small pilei 0.5-1 cm long, 200-500(-700) μm thick, resupinate part 1-3 cm in diam, then confluent; upper surface of pilei coarsely hirsute, indistinctly zonate, dark Umber (M: 7.5 YR 3-4/4; K & W: 6 E 6-7, later 6 F 7, dark brown). Hymenium smooth, sometimes concentrically sulcate, not cracked, fulvous Umber or dark Hazel (M: 7.5 YR 5/5, later 5 YR 6/4; K & W: 6 D 4-5, then 6 D 3, light brown to greyish brown = Café-au-lait), without olive or lilac tint; margin of the pileus slightly lobose or lacerate.

Tomentum well developed; cortex present; context composed of hyphal layer and (in old specimens) of setal layer; dark line above the hymenium absent or indistinct.

Tomentum 200-400(-600) μm thick, hyphae in ascending bundles, brownish, with thickened walls, 3.5-5 μm in diam; cortex 20-35(-45) μm thick, hyphae densely parallel, agglutinated, brown; hyphal layer up to 300 μm thick, hyphae densely longitudinally arranged but not agglutinated.

Hyphal system monomitic; hyphae with thickened walls, brownish, septate, rarely branching, 2.5-4 μm in diam; uncommon hyphae thin-walled and subhyaline; in hymenium crystals or granules of resinous brownish matter locally present.

Setae rare or uncommon, 80-150 x (9-)10-15(-16) μm, projecting up to 120 μm, subulate to fusiform, very easily breakable, with acute tip, straight, enmeshed in thin or thick hyphal sheaths, in upper part or at tip encrusted with granules of polyhedric crystals.

Cystidia absent; hyphidia numerous, cylindrical, thin-walled and hyaline, then brownish, with thickened walls usually encrusted with resinous granules or crystals, 2-3.5 μm in diam; basidioles not numerous, partly with slightly thickened and encrusted walls; basidia clavate-cylindrical, 20-25 x 5-6 μm; sterigmata 4, 3-4 μm long; spores cylindrical, curved (allantoid), 8.5-11(-13) x 2.2-2.7 μm.

**SUBSTRATA IN N. AMERICA.** Unknown.

**DISTRIBUTION IN N. AMERICA. MEXICO**: VC (Rancho Santa Inés, km 1 of the Xalapa-Coatepec road, alt. 1330 m, 29 Mar 1990 V.M. Bandala, TAA 171364, holotype; XAL, isotype; near Xalapa, alt. 1330 m, 10 Dec 1990 D.M. Murietta 359, XAL; near Xalapa, 1750 m, 7 Jul 1994 A. García-Velázquez 394, XAL and TAA 171365).

**DISTRIBUTION ELSEWHERE.** Not found.

**TYPE STUDIED.** See above.

**REMARKS.** *H. allantospora* is externally similar to *H. tabacina* which has setae up to 120(-150) μm long and spores less than 7 μm long, and setal hyphae in context.

Mean spore size and *Q* value of the specimens studied:

9.36 x 2.33 4.02 (paratype, TAA 171365)

9.96 x 2.51 3.96 (holotype, TAA 171364)

**6. Hymenochaete americana** Greslebin & Parmasto Figs. 4, *5;* 6, *11*

Parmasto, Folia Cryptog. Estonica 37: 59, f. 2 (2001).

Basidiomata resupinate, crustose, 100-600 μm thick, 1-3 cm in diam, then confluent. Hymenium smooth or with scattered rounded tubercles, slightly cracked, dark Vinaceous Buff to dark Fawn or chocolate brown (M: 5 YR 5/3 or 3-4/3-4; K & W: 6 D 4), without olive or lilac tint; margin broad (up to 2 mm wide), distinct, yellow-ochre or Sienna (M: 7.5 YR 5/8; K & W: 5 C-D 7, yellow ochre or golden brown), later not distinguishable from the hymenium.

Tomentum present but sometimes indistinct; cortex present; context composed of thin hyphal layer and later a stratose setal layer; dark line above the hymenium absent.

Tomentum 25-40 μm thick, hyphae loosely interwoven, brownish, with thickened walls, 4-5 μm in diam; tomentum in old specimens disappearing; cortex 20-60 μm thick, hyphae parallel densely agglutinated, brown; hyphal layer thin, hyphae more or less loosely, longitudinally arranged.

Hyphal system subdimitic; setal hyphae absent; generative hyphae 2-3.5 μm in diam, yellowish, with thickened walls; skeletoids brownish, 3-4.5 μm in diam; in context and hymenium crystalline matter locally present.

Setal layer 50-400 μm thick, indistinctly 1-3-stratose; setae not numerous or numerous, (60-)70-100 x 8-12 μm, projecting up to 70 μm, subulate to fusiform, with acute tip, straight, naked or rarely enmeshed in hyphal sheaths, always encrusted with small groups of polyhedric crystals, sometimes crystals forming a narrowly conical cap.

Cystidia and hyphidia absent; basidioles numerous, with slightly thickened walls; basidia clavate-cylindrical, 15-22 x 5-6 μm; sterigmata 4, 4-5 μm long;



spores cylindrical, slightly curved, sometimes some almost sigmoid, (7.0-)7.5-9.2(-9.5) x 2.5-3(-3.2) μm.

**SUBSTRATE IN N. AMERICA. Quercus** arizonica (2).

**DISTRIBUTION IN N. AMERICA. USA:** AZ (Pima Co, Coronado Nat. Forest, Sycamore Canyon, 24 Sep 1970 and 21 Jan 1971 E.R. Canfield 56 and 7122, ARIZ).

**DISTRIBUTION ELSEWHERE. Southern South America:** Argentina (Tierra del Fuego), Brazil (Rio Grande do Sul).

**TYPES STUDIED.** Argentina, Tierra del Fuego, Estancia Moat, on Drymis winteri, 12 Nov 1999 A. Greslebin 2181 (TAA 166666, holotype; BAFC, isotype).

**REMARKS.** The possibly related *H. vaginata* G. Cunn. differs in having sometimes effused-reflexed basidiomata, numerous hyaline, yellow or brownish hyphidia and encrusted with small crystals or not encrusted large setae 90-160 x 9-14 μm; it has been found once in New Zealand on Phyllocladus alpinus (Pinopsida, Podocarpales), and (a young specimen) in Hawaii. Isotype of that species (K) has only few, partly collapsed spores; these are (6-)6.8-8 x 2.4-3.2 μm (mean of 12 spores: 7.24 x 2.79 μm). If the two taxa are allopatric species or subspecies, their origin and distibution is possibly Gondwanan.

**7. Hymenochaete anomala** Burt Figs. 2, *2;* 5, *5*

Burt, Ann. Missouri Bot. Gard. 5: 358 (1918); Reeves & Welden, Mycologia 59 (6): 1040, fig. 1 D (1967); Job, Mycol. Helvet. 4 (1): 6 (1990); Léger, Hymenochaete 55, f. 9 (1998).

Basidiomata effused, closely adnate, coriaceous to hard when dry, 50-200(-250) μm thick, 0.5-2 cm long, then confluent. Hymenium smooth or finely granulose, azonate, irregularly minutely cracked when old, Isabelline (M: 10 YR 6-7/4, later 5-6/6; K & W: 5 C 4-5, brownish orange, to 5 D 5-7, golden brown), with a slight olive tint, without a lilac tint; margin thin, slightly tomentose, then determinate, concolorous with hymenium or lighter coloured (K & W: 5 A 4).

Tomentum and cortex absent; context composed of hyphal layer and concolorous setal layer, sometimes setal layer seated on substratum and hyphal layer absent; setal layer composed of overlapping rows of setae; dark line above the hymenium absent.

Hyphal layer (when present) to 150 μm thick, hyphae compactly interwoven; hyphal system monomitic or subdimitic, without setal hyphae; generative hyphae 2-4 μm diam, yellowish, branched, with slightly thickened walls; skeletoids brownish, with thickened walls, 2-4 μm in diam; some crystals in context and in hymenium, clusters of reddish brown granules to 25 μm diam present.

Setal layer 60-120 μm thick; setae numerous, small, (20-)30-45(-50) x (4-)5-7(-8) μm, embedded or projecting to 15(-25) μm above the hymenium, subulate to fusiform, usually flexuose, with tip acute, naked, without incrustation.

Hyphidia absent; cystidia sometimes present, 15-23 x 6-12(-15) μm, cylindrical, with thin or thickened usually thickly encrusted walls; basidioles 4-5 μm in diam, yellowish, usually encrusted with small granules; intermediates

between cystidia and basidioles sometimes present; basidia clavate or subclavate, 15-20(-25) x 4-5 μm, sterigmata 4, 3-4 μm long; spores ellipsoid, one side flattened, 3.2-4(-4.5) x (1.5-)1.8-2.3(-2.5) μm.

**SUBSTRATE IN N. AMERICA.** **Salix** sp. (1).

**DISTRIBUTION IN N. AMERICA. USA**: LA (St. Martin Parish, St. Martinsville, 14 Oct 1956 A.L. Welden 205, BPI 277530); MS (Harrison Co, Harrison Exper. Forest, 2 Dec 1989 H.H. Burdsall 13034, CFMR).

**DISTRIBUTION ELSEWHERE. Mesoamerica**: El Salvador; **Caribbean**: Cuba, Trinidad; **South America**: Argentina, Brazil, Venezuela.

**TYPE STUDIED.** Cuba, Managua, Earle & Murrill 36 (NY, holotype).

**REMARKS.** The 'cystidia' figured by Burt (1918, f. 26 c) and described as 16-20 x 6 μm are obviously encrusted hyphidia similar to those in *H. yasudai* Imazeki, many specimens of *H. cinnamomea* ssp. *spreta* and very conspicuously in *H. mollis* Bres. Cystidia are described as 6-12 μm in diam by Reeves & Welden (1967) and 7-11 μm in diam by Job (1990); on Fig. 1 D by Reeves & Welden (1967) they are figured as similar to basidioles. In the holotype the 'cystidia' are actually somewhat enlarged hyphal ends covered with agglomeration of crystals; they are hardly differentiated and not easily distinguishable.

**8. Hymenochaete burdsallii** Parmasto Figs. 3, *6;* 5, *16*

Parmasto, Folia Cryptog. Estonica 37: 61, f. 1, *4* (2001)

Basidiomata effused, closely adnate, coriaceous when dry, as round patches 0.5-2.5 cm in diam, 40-150 μm thick. Hymenium smooth but in some places uneven (with very low tubercles), azonate, somewhat farinose, not cracked, dark Ochreous (M: 10 YR 6/8; K & W: 5 C-D 7), without olive or lilac tint; margin farinose-fibrillose, thin, when young about 1 mm wide, Luteous (M: 10 YR 7.5/10; K & W: 5 A-B 7), later disappearing and margin distinctly delimited

Tomentum and cortex absent, hyphal layer absent or indistinct, then 20-30 μm thick, hyphae densely interwoven but not agglutinated; setal layer with numerous hyphae; dark line above the hymenium absent; in hymenium conglomerates of brownish resinous matter or crystals up to 10 μm in diam.

Hyphal system monomitic; setal hyphae absent; generative hyphae brownish, with thin or thickened walls, (1.5-)2-3.2(-4) μm in diam.

Setae numerous but not crowded, subulate, with acute tip, straight, (50-)60-90(-95) x 5-9(-10) μm, projecting 30-50 μm, usually covered with a thin hyphal sheath.

Cystidia and hyphidia absent; basidioles numerous, hyaline, thin-walled, with rounded tip, 15-25 x 5-7(-8) μm; basidia urniform, thin-walled, hyaline, 15-20(-25) x 6-7.5 μm, with 4 broad when young, then thin sterigmata about 4 μm long; spores broadly ellipsoid, thin-walled, hyaline, some with one side slightly flattened, (6.5-)7-8(-8.5) x 4.5-5.2(-5.5) μm.

**SUBSTRATE IN N. AMERICA.** **Ostrya** virginiana (2).

**DISTRIBUTION IN N. AMERICA. USA**: MI (Marquette Co, Big Bay, SE slope of Breakfast Roll, 10 Aug 1974 H.H. Burdsall 8272, CFMR, holotype; nearby, Lumbermanna cove, 9 Aug 1974 H.H. Burdsall 8252, CFMR, paratype)

**TYPE STUDIED.** See above.



**REMARKS.** Basidiomata of *H. burdsallii* are externally similar to *H. cinnamomea* which has a well developed layer of loosely interwoven hyphae and short cylindrical or almost ellipsoid narrow spores 4.5-6.5(-7).x 1.8-2.8(-3.2) μm.

**9. Hymenochaete cacao** (Berk.) Berk. Figs. 2, *1;* 5, *2*

Berk., J. Linn. Soc. Bot. 10: 333 (1868); Reeves & Welden, Mycologia 59 (6): 1041, f. 1 C (1967); Job, Mycol. Helvet. 4 (1): 10 (1990); Léger, Hymenochaete 79, f. 18 (1998). - *Stereum cacao* Berk., Hook. J. Bot. 6: 169 (1854).

Basidiome sessile-pileate, effuso-reflexed or seemingly effused but attached in midpoint and with slightly elevated margins (umbonate), closely adnate, hard or coriaceous but brittle when dry, 250-600(-2000) μm thick. Pilei single or a few growing together, sometimes confluent and imbricate, flabelliform or dimidiate, 1-3.5 cm long; pileal surface densely concentrically sulcate and zonate, velutinous or tomentose, yellowish brown, dark brown to blackish (M: 10 R 3-3.5/4; K & W: 5 B 2 - 6 E 8 or 6-7 E 6 - F 7, orange grey to hazel, almost chestnut or dark brown); margin lobate, plicate, concolorous with the pileal surface. Hymenium azonate, not or slightly cracked, brown, dark brown or blackish, usually somewhat greyish (M: 10 R 3-5/2 when with basidia; K & W: 5 E 3 or 6 E 4-6 G 8, greyish brown to purplish gray, sometimes 6 D 7), without olive or lilac tint; margin sometimes pale yellow (K & W: 4 A 3 or yellow orange).

Tomentum indistinct, 20-30 μm thick, or present as abhymenial hairs; cortex absent or sometimes only present as some agglutinated darker hyphae forming a thin dark band in some areas; context composed of hyphal layer and setal layer. Hyphal layer sometimes indistinctly duplex (upper part with very thick-walled hyphae); setal layer with overlapping rows of setae; dark line above the hymenium absent.

Cortex (when present) 20-30 μm thick, hyphae densely interwoven, agglutinated; hyphal layer 150-700 μm thick, concolorous with the setal layer; context hyphae longitudinally, not very compactly arranged, sometimes glued together.

Hyphal system monomitic; setal hyphae absent; generative hyphae 2.5-5 μm diam, yellowish to brownish, thick-walled; in hymenium of old specimens crystalline matter present.

Setal layer (40-)80-140 μm thick; setae numerous, 20-40 x 4-8 μm, projecting to 30 μm, fusiform, with stipe-like basal part (similar in form to metuloids of *Peniophora* species), straight, with tip acute, naked, without incrustation.

Cystidia and hyphidia absent; basidioles present, without incrustation; basidia clavate or subclavate, 8-12 x 3-5 μm; sterigmata 4, 2-3 μm long; spores ellipsoid to broadly ellipsoid, 3-4(-4.5) x 1.8-2.5 μm.

**SUBSTRATA IN N. AMERICA.** Unknown.

**DISTRIBUTION IN N. AMERICA. USA**: NC (M.A. Curtis, BPI 277660). **MEXICO**: ? VC (Jalapa, Escobar 1978; the specimen in NY collected by W.A. & E.L. Murrill in 1909, no. 334 is very small and of somewhat doubtful identity).

**DISTRIBUTION ELSEWHERE. Mesoamerica:** Costa Rica, Mexico; **Caribbean:** Cuba, Guadeloupe, Jamaica, Puerto Rico; **South America:** Argentina, Brazil, Colombia, Venezuela; **Asia:** India (Eastern part), Indonesia (Amboina Is.), Malaya, Malaysia (Sabah), Nepal, ? Philippines, ? Singapore; **Australasia:** Australia. - Found on wood of angiospermic trees.

**TYPES STUDIED.** *Stereum cacao:* India, Khasia (K, holotype; LA, isotype); "authentic, Hook. Herb." (isotypes in BPI: 277664, 277665, 277667 and Lloyd Herb. 29713).

**REMARKS.** Setae similar to those in *H. cacao* are also characteristic for *H. luteobadia*, but that species differs in its grayish yellow hymenium and presence of thick-walled brownish hyphidia. Most of the Southeast Asian specimens seen by me in American herbaria are of doubtful identity: their setae are sometimes longer (to 50 μm); these, mainly old specimens may belong to *H. villosa* (Lév.) Bres.

**10. Hymenochaete carpatica** Pilát Figs. 3, *5;* 6, *9*

Pilát, Hedwigia 70: 124 (1930); Baici & Léger, Mycol. Helvet. 3: 90 (1988); Rücker & Forstinger, Linzer Biol. Beitr. 23 (1): 417-424, f. 1-3 (1991); Léger, Hymenochaete 81, f. 19-20 (1998).

Basidiomata effused, closely adnate, corky (soft when young), 50-600(-800) μm thick, small, inconspicuous, at first 0.3-1 mm broad, rounded, then confluent and forming irregular patches to 10 cm long. Hymenium smooth, later irregularly deeply cracked, dark Ochreous, dark Fulvous or grayish Sienna when sporulating (M: 10 YR 6/8 to 7.5 YR 5-6/6; K & W: 5 C 6 to 6 D 5-6, Pompeian yellow to cinnamon brown), when sterile golden brown or brown (M: 5-7.5 YR 6.5/5, 5/8 or 4-5/4-6; K & W: 6 D-E 5 or 6 E 5-7, sunburn or cocoa brown), without olive or lilac tint, but sometimes dark reddish grey; margin thin, indistinct, whitish, soon abrupt, thick and concolorous with hymenium.

Tomentum indistinct or absent; cortex absent or indistinct; hyphal layer present in young specimens, later disappearing; setal layer with few or numerous rows of setae; dark line above the hymenium absent or present.

Cortex about 15 μm thick but absent in the majority of specimens, discontinuous in others; hyphae of the cortex few, very densely interwoven, dark reddish brown, thick-walled; hyphal layer to 100 μm thick. Context hyphae compactly agglutinated, erect, in subhymenium almost loosely interwoven.

Hyphal system monomitic; generative hyphae septate, 1-3 μm diam, yellowish brown, with thickened walls; crystalline masses or numerous crystals and brown resinous matter in context and hymenium present.

Setal layer 30-600(-800) μm thick, in old specimens indistinctly stratified; setae numerous, 50-90 x 6-10(-12) μm (sometimes there are also setae 20-25 x 5.5-7 μm), projecting 35-60(-70) μm, a few 2-rooted; subulate, with tip acute, straight, naked or ensheathed by thin-walled, hyaline hyphae about 1 μm diam, without incrustation.

Cystidia and hyphidia absent; basidioles with slightly thickened and yellowish at base walls, 15-25 x 3.5-4.5 μm; basidia clavate or subclavate, 15-25 x 4-5.2 μm; sterigmata 4, 4-5(-6) μm long; spores ellipsoid to broadly ellipsoid, with one side flattened or sometimes slightly concave, (5-)5.5-6.5(-7) x (2.8-)3-3.5(-3.8) μm.



**CULTURAL CHARACTERS.** Léger & Lanquetin, 1996: 106.

**SUBSTRATA IN N. AMERICA. Acer** sp. (1), **Quercus** alba (3).

**DISTRIBUTION IN N. AMERICA. USA:** MD (Takoma Park, on bark of living maple, 19 Feb 1899 C.L. Shear 1096, BPI 277679, identified by E.A. Burt as *H. corticolor*); NY (Scarsdale, 26 Jul 1914 P. Wilson; Ulster Co, Glasco, 25 Aug 1914 P. Wilson; Greene Co, Vicinity of Green Lake, 3 Sep 1914 P. Wilson; all three on bark of living Quercus alba; NY).

**DISTRIBUTION ELSEWHERE. Europe:** Austria, Czechia, England, Germany, Slovakia, Switzerland; **Asia Temperate:** Russian Far East. - In Europe on bark of Acer platanoides, A. pseudoplatanus and Ulmus procera, in Asia of Tilia manshurica.

**TYPE STUDIED.** Slovakia, Kleine Karpathen, Glashütten, on Acer platanoides, Apr 1926 A. Pilát (K, isotype).

**REMARKS.** Basidiomata of this species are hardly remarkable growing on external and lateral sides of bark scales of living trees. The species is similar to *H. jobii* which differs in its habitat (never on living trees) and spores 4.5-6 x 2.2-3.2(-3.5) μm. *H. corrugata* may be similar to *H. carpatica;* it differs in short, encrusted in upper part with amorphous granules or rugose setae 35-80 x 7-13 μm and cylindrical spores 4-7 x 1.5-2.2 μm.

Possibly the species is widely distributed in Northern America but not yet noticed due to its inconspicuous appearance and unusual for *Hymenochaete* habitat on bark of living trees. Setal hyphae are absent in North American specimens but present in the Asian Far East, few, 4-6.5 μm diam and to 100 μm long; they were also noted in culture of the species by Léger & Lanquetin (1996).

Mean spore size and *Q* value of the specimens studied

| | | |
|---|---|---|
| 5.81 x 3.12 | 1.86 | (NY, NY, Wilson 3 Sep 1944) |
| 6.25 x 3.03 | 2.06 | (Russian Far East, TAA 107605) |
| 6.30 x 3.60 | 1.75 | (England, Ainsworth) |

**11. Hymenochaete cervina** Berk. & M.A. Curtis Figs. 3, *8;* 5, *15*

Berk. & M.A. Curtis, J. Linn. Soc. Bot. 10: 334 (1868); Burt, Ann. Missouri Bot. Gard. 5: 363 (1918); Reeves & Welden, Mycologia 59 (6): 1042, f. 1A (1967); Léger, Hymenochaete 86, f. 21 (1998) *p. p.* - *H. corticolor* Berk. & Ravenel, Grevillea 1: 165 (1873); Burt, Ann. Missouri Bot. Gard. 5: 339, f. 14 (1918); Reeves & Welden, Mycologia 59 (6): 1043 (1967).

Basidiome perennial, effused, sometimes with thickened (reflexed) blackish upper margin, closely adnate, woody hard when dry, indistinctly stratose when old, 100-700(-800) μm thick. Hymenium smooth, azonate, irregularly cracked when old, dark Hazel, Isabelline, light Umber to Umber (M: 5-7.5 YR 4/6 to 5/4; K & W: 5-6 C 4-5, 6 D 4, 6 E 8 or 6 D-E 6-7, light umber or hazel), Vinaceous Buff when with basidia and spores (M: 7.5 YR 6/4-6; K & W: 6 C 4), without olive or lilac tint; margin slightly tomentose when young, then thick, abrupt, concolorous with hymenium or darker (tobacco brown).

Tomentum and hyphal layer absent; cortex absent or a thin blackish band of dark hyphae next to the substratum; setal layer composed of setae in overlapping rows or arranged in irregular strata; dark line above the hymenium absent.

Hyphae of the cortex densely interwoven, thick-walled, about 3 μm diam; context hyphae compactly arranged, erect or descending, later cemented together.

Hyphal system monomitic; setal hyphae absent; generative hyphae 2-4 μm diam, subhyaline to brown, thin- to thick-walled, branched; in context and hymenium usually numerous crystals and aggregates of brown resinous matter 12-30 μm diam; in hymenium crystals usually present.

Setal layer 100-650 μm thick; setae numerous, 55-100 x 7-15 μm, projecting to 25, rarely to 60(-70) μm above the hymenium, subulate to long-conical, with almost blunt or acute tip, straight, at base grown together with a bundle of brown branched agglutinated hypha, enmeshed in hyphal sheaths (rarely naked), in older basidiomata with encrusted upper part.

Hyphidia absent or present (in old specimens difficult to find), cylindrical-filiform, 2-3 μm diam, hyaline to brownish, with thickened rough wall, very little projecting above the basidia; cystidia absent; basidioles present, encrusted or without incrustation; basidia subclavate or subutriform, (15-)20-25 x 5-7 μm; sterigmata 4, 3-4.5 μm long; spores broadly ellipsoid to short cylindric, one side flattened, 5-7.5 x 3.5-4.3 μm.

**CULTURAL CHARACTERS**. Job, 1986: 224.

**SUBSTRATA IN N. AMERICA**. **Fagus** grandifolia (1), **Magnolia** grandiflora (1), Magnolia sp. (1), **Prosopis** glandulosa (2), **Quercus** alba (2), Q. gambelii (1), Quercus sp. (2), ? **Rhododendron** maximum (1), **Ulmus** sp. (1).

**DISTRIBUTION IN N. AMERICA. MEXICO:** VC (Jalapa, 1). **USA**: AZ (2), FL (5), GA (1), IL (1), LA (2), MD (Burt, 1918 p.p.), NJ (1), NM (1), NY (2), SC (1), TN (1), VA (2).

**DISTRIBUTION ELSEWHERE. Mesoamerica**: Costa Rica. **Caribbean**: Cuba, Grenada, Jamaica; **South America**: Argentina, Brazil, Ecuador, Paraguay, Uruguay; **Africa**: ? Uganda; **Australasia**: New Zealand. - On many unknown substrata, in New Zealand on Nothofagus fusca.

**TYPES STUDIED**. *H. cervina:* Cuba, Wright 213 (FH, holotype; BPI, Lloyd Herb. 29422, isotype). *Corticium corticolor:* USA, South Carolina (Ravenel, Fungi Carol. Exs. III 30 as *H. corticola*, lectotype selected by Léger, NY; isotypes in BPI).

**REMARKS.** Hyphidia are sometimes absent, or difficult to see in the basidiomata of *H. cervina* when covered with brown resinous matter; their tips may seem to be shortly branched but this is caused by agglomerates of the resinous matter. Léger observed hyphidia in the (iso)type specimen of *H. cervina* (K); however, the author of this paper was unable to distinguish these in the holotype (FH). Encrusted cystidia figured (f. 29, b) but not described by Burt (1918: 363) and mentioned shortly by Reeves & Welden were not seen by me nor by Job (1990: 12).

There are three very closely related species in Northern America, Mesoamerica and Caribbean which may form very thick effused, externally almost identical basidiomata. *H. unicolor* (found in Caribbean area and Mesoamerica) has much smaller setae (25-)40-60 x 5-7.5 μm, short spores (3.5-)4-5 x 2.4-3.2(-3.5) μm, and a sometimes hardly remarkable thin hyphal layer 10-100 μm thick. *H. jobii* has short narrowly ellipsoid spores 4.5-5.5 x 2.2-3.2 μm similar to these in *H. unicolor*, but setae similar to those in *H. cervina*, (50-)65-110(-120) x 7-12(-15) μm, and uneven hymenium with scattered low tubercles. Specimens of *H. cervina* and *H. jobii* are almost indistinguishable when without basidia and spores. **Misidentifications**. Some specimens of this species have been misidentified in herbaria as *H. corrugata*.



**12. Hymenochaete cinnamomea** (Pers.: Fr.) Bres. Figs: 4, *5;* 5, *20*

Bres., Atti Accad. Sci., Lett. Arti Agiati III 3 (1): 110 (1897); Burt, Ann. Missouri Bot. Gard. 5: 345, f. 17 (1918); Jahn, Westfäl. Pilzbr. 8 (4-7): 139, f. 25 (1971): Léger, Hymenochaete 91, f. 93 (1998). - *Thelephora cinnamomea* Pers.: Fr., Myc. Eur. 1: 141 (1822). - *Hymenochaete unicolor* s. auct. Amer. non Berk. & M.A. Curtis. - *H. simulans* s. Peck (1897) non Bres. - *H. spreta* Peck, Ann. Rep. N. Y. State Mus. 30: 47 (1878). - *Hymenochaetella arida* P. Karst:, Bidr. Känned. Finl. Nat. Folk 48: 428 (1889). - *Hymenochaete arida* (P. Karst.) Sacc., Syll. fung. 9: 228 (1891); Burt, Ann. Missouri Bot. Gard. 5: 340, f. 15 (1918); Gilb. & Lindsey, Great Basin Naturalist 38 (1): 42, f. 1-3 (1978).

**H. cinnamomea ssp. spreta** (Peck) Parmasto

Parmasto, Folia Cryptog. Estonica 37: 62 (2001). - *H. spreta* Peck, Ann. Rep. N. Y. State Mus. 30: 47 (1878); Burt, Ann. Missouri Bot. Gard. 5: 348, f. 19 (1918); Pilát, Hedwigia 70 (1/2): 115 (1931); Jung, Wood-rott. Aphyll. s. Appal. 137, f. 43 j-m, pl. 27 B (1987).

Basidiomata effused, loosely adnate and separable, soft but not waxy, coriaceous or brittle when dry, (50-)200-1000(-2000) μm thick, confluent and then up to 25 cm long. Hymenium smooth, azonate, not cracked when very young, then densely, later deeply irregularly cracked, Cinnamon, then dark Sienna to Cinnamon Umber or reddish brown (M: 7.5 YR 4.5-5/6-8, sometimes 2.5 YR 4-5/4-5 or 7.5 YR 6/9; K & W: 6-7 D 6-8 or 7 D-E 7-8, cinnamon to light brown or brick red), without an olive or lilac tint; margin thin, indeterminate, later distinct, concolorous with the hymenium.

Tomentum and cortex absent; context composed of a hyphal layer and a setal layer with 1-10 more or less distinct rows of setae; sometimes between the rows a thin intermediate hyphal layer to 30(-60) μm thick composed of densely, sometimes partly loosely interwoved hyphae; dark line above the hymenium absent. Basal hyphal layer 20-150(-250) μm thick, lighter coloured than setal layers or concolorous; hyphae loosely arranged, interwoven.

Hyphal system monomitic; setal hyphae absent; generative hyphae distinct, 2-4.5 μm diam, yellow to brownish, with thickened walls, branches diverging at a right angle, with numerous septa; in context, setal stratum and hymenium crystalline matter absent.

Setae numerous, (60-)70-120(-150) x 5-9(-10) μm, projecting to 90 μm, subulate, usually some slightly curved, naked or enmeshed in hyphal sheaths, without incrustation, tips acute or very sharp; hyphae between setae vertically arranged, short-celled.

Hyphidia absent but basidioles may simulate thick-walled hyphidia; cystidia absent; basidioles septate, 15-30 x 3.5-5 μm, usually yellowish, later walls often thickened at base, yellow or brownish and granulose; basidia subclavate or subutriform, 15-30 x 3.8-6 μm, sometimes with thickened basal walls; sterigmata 4, 4-5 μm long; spores short cylindrical, some slightly curved, or almost ellipsoid with one side flattened, 4.5-6.5(-7) x 1.8-2.8(-3.2) μm.

Causes a white rot of wood.

**SUBSTRATA IN N. AMERICA. Abies** balsamea (1), A. grandis (2), Abies sp. (1), **Acer** circinatum (2), A. macrophyllum (1), A. rubrum (3), A. saccharinum (syn.: A. dasycarpum ) (1), A. saccharum (3), A. spicatum (1), Acer sp. (9), **Alnus** rubra (syn.: A. oregona) (2), A. incana ssp. rugosa (4), A. incana ssp. tenuifolia (1), A. viridis ssp. crispa (Niemelä, 1985), Alnus sp. (6), **Artemisia** tridentata (1), **Betula** alleghaniensis (syn.: B. lutea) (4), B. populifolia (1), Betula sp. (1), **Carpinus** sp. (1), **Carya** illinoinensis (1), **Ceanothus** fendleri (1), C. velutinus (4), Ceanothus sp. (2), **Chilopsis** linearis (1), **Cornus** florida (1), **Corylus** americana (1), **Crataegus** brevispina (= ?) (1), **Fagus** grandifolia (11), Fagus sp. (6), **Fraxinus** nigra (2), Fraxinus sp. (1), **Juglans** cinerea (1), **Juniperus** deppeana (1), **Liquidambar** styraciflua (1), **Liriodendron** tulipifera (3), **Maclura** pomifera (1), **Magnolia** grandiflora (1), Magnolia sp. (3), **Ostrya** virginiana (2), Ostrya sp. (1), **Picea** glauca (1), P. x lutzii (1), P. rubra (1), **Pinus** aristata (including var. longaeva) (1), P. ponderosa (1), **Platanus** occidentalis (1), **Populus** tremuloides (2), Populus sp. (4), **Prosopis** glandulosa (1), **Prunus** serotina (2), Prunus sp. (1), **Pseudotsuga** menziesii (1), **Quercus** agrifolia (5), Q. arizonica (1), Q. emoryi (2), Q. gambelii (3), Q. hypoleucoides (4), Q. nigra (1), Q. rubra (1), Quercus sp. (12), **Rhododendron** sp. (3), **Ribes** floridum (= ?) (1), Ribes sp. (2), **Rosa** canina (1), **Salix** planifolia (Niemelä, 1985), Salix sp. (1), **Sequoia** sempervirens (1), **Symphoricarpos** occidentalis (G & L, 1995), **Taxodium** sp. (1), **Thuja** occidentalis (2), T. plicata (14), Thuja sp. (1), **Tsuga** heterophylla (1), Tsuga sp. (1), **Umbellularia** californica (1), **Vaccinium** arboreum (3), **Vitis** vinifera (1), Vitis sp. (1).

**DISTRIBUTION IN N. AMERICA**. Northernmost localities are in Alaska, Yukon Terr., Labrador Peninsula (Quebec, 55.3° N, 77.8° W), Newfoundland and South Greenland. Widely distributed in USA, but more rare in South-East; only one locality known from Mexico. **CANADA**: BC (11), MB (2), NF (Niemelä, 1985), NS (2), ON (17), PQ (1), YT (1). **GREENLAND**: southernmost part S of 61°15' N. (Knudsen, Hallenberg & Mukhin, 1993). **MEXICO**: OA (1). **USA**: AK (5), AL (2), (South) AZ (18), CA (15), CO (2), CT (3), DC (1), FL (5), GA (1), ID (11), IL (2), IN (1), KS (2), KY (4), LA (6), MA (3), MD (9), MI (16), MN (3), MO (1), MS (5), MT (9), NC (12), ND (1), NE (2), NH (8), NJ (5), NM (2), NY (45), OH (4), OR (14), PA (2), SC (2), TN (18), UT (2), VA (2), VT (4), WA (14), WI (1), WV (17).

**DISTRIBUTION ELSEWHERE**. Not found in other regions, but ssp. *cinnamomea* has been observed in: **Caribbean**: Cuba; **Southern America**: Argentina, Brazil, Colombia, Ecuador; **Europe**: common in all countries; **Africa:** Macaronesia, Northern Africa, West-Central and East Tropical Africa, Southern Africa; **Asia-Temperate**: Israel, Caucasus, Middle Asia, Siberia, Russian Far East, Turkmenistan, China, Japan; **Australasia**: New Zealand. Data on occurrence in Australia are doubtful. - On numerous species of angiospermic and (more rarely) gymnospermic trees.



**TYPES STUDIED**. *H. spreta:* New York, Albany Co, Helderberg Mts., on Acer, Oct 1875 C.H. Peck (NYS, holotype; NY, isotype). *H. arida:* Finland, P. Karsten 809 (H, holotype).

**REMARKS.** Subspecies *cinnamomea* of this species differs in having distinctly alternating hyphal and setal layers with hyphal layer 50-200 μm thick and composed of loosely interwoven hyphae; hymenial surface is of lighter colour, not cracked or with few cracks. Externally similar *H. epichlora* differs with its non-layered basidiomata, shorter setae (30-60 x 4.5-9 μm) and ellipsoid spores 3.5-5 x 1.8-2.5 μm. Setae of ssp. *spreta* are of variable size within one specimen, but there are always present setae 80 μm or more in length.

There are two additional species macroscopically similar to *H. cinnamomea* basidiomata. *H. rhabarbarina* has similar structure but ellipsoidal spores with mean spore width more than 2.6 μm and mean spore length/width coefficient *Q* less than 2.1. The other differences are described at this species. *H. burdsallii* is characterized by absent or indistinct hyphal layer and broad ellipsoidal spores (6.5-)7-8(-8.5) x 4.5-5.2(-5.5) μm.

Young specimens of ssp. *spreta* lack a thickened setal layer (hymenium) and are of light colour; such specimens are indistinguishable from ssp. *cinnamomea* and have been named *H. arida* in N. American herbaria. Somewhat older specimens may have a few setal layers with a very thin layer of densely intertwined hyphae between these; colour is darker and hymenium slightly cracked; these have usually been called *H. cinnamomea*. Most of the specimens have stratified setal layer as described above; in some old specimens collected mainly in Canada and the States of New York, West Virginia, Idaho, Kansas and California, two or three of the setal layers have a hyphal layer to 100 μm thick between these, and in other part of the basidiome the setal strata are without an intermediate hyphal layer. However, *spreta*-type of basidiome structure is absent in specimens collected in Europe or Asia. The dark(er) colour and deeply fissured hymenium in ssp. *spreta* is caused by the structure of basidiomata; presence of soft intermediate hyphal layers protects hymenium from cracking in ssp. *cinnamomea*.

Differing from most species of *Hymenochaete,* about a half of the specimens of *H. cinnamomea* studied have numerous spores. Obviously, sporulation period is very long in this species.

**Misidentifications**. In herbaria, some specimens of *H. cinnamomea* ssp. *spreta* have been filed under the name *H. rhabarbarina* and several under *H. corrugata.* The basidiomata of these species are sometimes externally similar (brown, densely cracked), but the structure is very different in *H. corrugata*: hyphal layer is absent, setae are broad (35-80(-100) x (6-)7-13(-15) μm) and encrusted or rugose in upper part. - For *spreta,* three names have been used erroneously since the early 1900s: *Corticium simulans* Berk. & Rav. *nom. nudum* and based on this name *Hymenochaete simulans* (Berk. et Rav.) Peck, 1897 non (Berk. & Broome) Bres., 1896, and *H. unicolor* which is a species of southern distribution characterized by short setae (25-)40-60 μm long and ellipsoid spores 4-5 x 2.4-3(-3.5) μm

**13. Hymenochaete corrugata** (Fr.: Fr.) Lév. Figs. 2, *11;* 6, *6*

Lév., Ann. Sci. Nat. III 5: 152 (1846); Burt, Ann. Missouri Bot. Gard. 5: 358 (1918); Coker, J. Elisha Mitchell Sci. Soc. 36 (3 & 4): 167, pl. 32 (1921); Reeves & Welden, Mycologia 59: 1042, f. 1 F (1967); Léger, Hymenochaete 100, f. 26 (1998). - *Thelephora corrugata* Fr.: Fr., Observ. mycol. 1: 154 (1815). - *Hymenochaete insularis* Berk., Grevillea 1: 165 (1873) *nom. nud.* - *Hymenochaete agglutinans* Ellis, Bull. Torrey Bot. Club 5: 46 (1874); Burt, Ann. Missouri Bot. Gard. 5: 344 (1918); Coker, J. Elisha Mitchell Sci. Soc. 36 (3 & 4): 168 (1921).

Basidiomata effused, closely adnate, hard when dry, 200-600 μm thick. 0.5-3 cm diam, then confluent and to 30 or more cm long. Hymenium smooth or minutely granulose, azonate, minutely irregularly cracked (rarely not cracked), brownish or reddish grey, sometimes with rosy tint, or dark brown or blackish (M: 2.5 YR 4.5, 10 R 5.5/2 to 2.5 YR 5.5/2, 10 R 2.5/4 to 2.5 YR 3/4; K & W: 7 E 5, 7-8 D 3, 7 E-F 6), without an olive tint; margin thin, indeterminate, fibrillose or tomentose, 0.2-0.7 mm wide, whitish, then concolorous with the hymenium, later as a narrow brown border.

Tomentum absent; cortex absent, but thin dense cortex-like hyphal layer may be present; context composed of setal layer composed of overlapping rows of setae; dark line above the hymenium absent. Basal hyphal layer 10-40 μm thick; context hyphae compactly agglutinated, erect or interwoven.

Hyphal system monomitic; setal hyphae absent; generative hyphae 2.2-4.2 μm diam, brownish to brown, thick-walled, septate, branched; in context and hymenium crystalline matter absent.

Setal layer 200-550 μm thick; setae numerous, 35-80(-100) x (6-)7-15(-17) μm, projecting to 50(-60) μm above the hymenium, conical to almost fusiform, at base surrounded with a node of agglutinated hyphae, with blunt or almost acute easily broken tip, straight, naked, in upper part always encrusted with scattered amorphous granules or rugose.

Hyphidia and cystidia absent; basidia clavate or subclavate, 15-22 x 3.5-4.5 μm; sterigmata 4, 4-5 μm long; spores cylindrical, slightly curved, 4.5-6.8(-7) x 1.5-2.3 μm.

**Sterile state** (*H. agglutinans* Ellis; *H. corrugata* f. *conglutinans* Bourdot & Galzin, Hymen. Fr. 393, 1928) forms effused round patches 1-3(-5) cm in diam on living branches where they bind these together in contact zone. The mycelial pad is up to 2 mm thick, concentrically sulcate, yellowish cream, grey-cinnamon in centre, later brownish. Hyphae densely interwoven, thick-walled, 2-4 μm in diam; scattered setae present, similar to the hymenial ones. Sterile state is rarely growing together with basidiomata, but in many cases separately, and can continue their growth after branches are dead already.

Causes white rot of wood.

**CULTURAL CHARACTERS**. Nobles, 1948: 339, 1965: 1134.

**SUBSTRATA IN N. AMERICA** (*agglutinans* state mentioned by an asterisk *). Found on more than 70 species of trees and bushes. Of more than 200 specimens with host data seen, only four have been found on gymnospermic substrata. - **Abies** balsamea (1), **Acer** circinatum (1), A. negundo (G & L, 1995), A. nigrum (G & L, 1995), A. pensylvanicum (G & L, 1995), A. rubrum (10+5*), A. saccharinum (1+1*), A. saccharum (1+3*), A. spicatum (4+7*), Acer sp. (20), **Aesculus** sp. (G & L, 1995),



**Alnus** incana (5+2*), A. incana ssp. rugosa (3+1*), A. incana ssp. tenuifolia (1*), A. serratula (6+2*), Alnus sp. (3+3*), **Amelanchier** alnifolia (2), A. canadensis (1+1*), Amelanchier sp. (1), **Ampelopsis** arborea (syn.: Vitis bipinnata) (2), **Andromeda** sp. (Ellis, 1874), **Betula** alleghaniensis (syn.: B. lutea) (2), B. lenta (2), B. nigra (1*), B. papyrifera (G & L, 1995), B. populifolia (1), Betula sp. (4+2*), **Carpinus** caroliniana (1+2*), Carpinus sp. (2), **Carya** glabra (1), C. ovata (1*), Carya sp. (3+3*), **Castanea** sativa (1), Castanea sp. (1+1*), **Celtis** sp. (1), **Clethra** sp. (1*), **Cornus** stolonifera (3), Cornus sp. (1*), **Corylus** cornuta (syn.: C. rostrata) (2+1*), **Crataegus** sp. (1), **Fagus** americana (6), F. atropunica (1*), F. ferruginea (2), F. grandifolia (14+5*), Fagus sp. (19), **Fraxinus** americana (1*), F. nigra (1*), **Hamamelis** virginiana (3+3*), **Ilex** verticillata (3), **Juniperus** virginiana (1), **Laurus** sp. (1), **Lindera** benzoin (2+1*), **Liquidambar** styraciflua (4), **Magnolia** fraseri (2), Magnolia sp. (1), **Malus** pumila (1), **Nerium** oleander (1), **Nyssa** sp. (1), **Ostrya** virginiana (1+1*), **Pinus** strobus (? 2*), **Platanus** sp. (1), **Populus** grandidentata (G & L, 1995), P. tremuloides (2), **Prunus** caroliniana (1), P. pensylvanica (4*), P. serotina (2), P. virginiana (1+1*), Prunus sp. (2+1*), **Quercus** alba (2+1*), Q. coccinea (1*), Q. digitata (= ?) (1*), Q. ilicifolia (1), Q. nigra (G & L, 1995), Q. rubra (G & L, 1995), Quercus sp. (13+1*), **Rhododendron** maximum (8), Rhododendron sp. (5+1*), **Salix** bebbiana (1), S. nigra (1), Salix sp. (1), **Thuja** occidentalis (G & L, 1995), T. plicata (G & L, 1995), **Tilia** americana (1), **Toxylon** pomiferum (1), **Tsuga** canadensis (1), **Vaccinium** sp. (1), **Vernicia** fordii (1), **Viburnum** dentatum (1), V. lantanoides (1), Viburnum sp. (1), **Vitis** aestivalis (2), V. vulpina (1), Vitis sp. (2).

**DISTRIBUTION IN N. AMERICA**. Found mainly in South-East and East parts of the USA; no data on occurrence in Mexico. The *agglutinans* state (mentioned by an asterisk *) is distributed mainly in the North-East of the USA. **CANADA**: MB and NB (G & L, 1995), NS (1), ON (11+2*), PE (G & L, 1995), PQ (1+1*). **USA**: AL (8+1*), AR (G & L, 1995), AZ (G & L, 1995), CT (6+18*), DC (1+2*), DE (4+3*), FL (21), GA (3), ID (1*), IL (1), IN (3), KY (6), LA (14), MA (18+7*), MD (26+2*), ME (11+8*), MI (6), MN (G & L, 1995), MO (1), MS (10), MT (G & L, 1995), NC (29+2*), NH (16+14*), NJ (16+6*), NY (51+9*), OH (6+1*), PA (16+3*), RI (1+3*), SC (6), TN (22), TX (5), VA (18+5*), VT (2+2*), WA (2), WI (1+1*), WV (6).

**DISTRIBUTION ELSEWHERE**. **Mesoamerica**: Costa Rica; **Caribbean**: Jamaica, Puerto Rico; **South America**: Argentina, Brazil, Ecuador, Uruguay; **Europe**: Austria, Belgium, France, Germany, Italy, Switzerland, Ukraine, United Kingdom; **Northern Africa**: Tunisia; **Southern Africa**; **Asia-Temperate**: China, Japan, Russia (Siberia), Taiwan; **Australasia**: New Zealand; **North-Central Pacific**: Hawaii. - On numerous angiospermic hosts. Sterile state (*"H. agglutinans"*) has been found in Europe (England, France) where it is very rare.

**TYPE STUDIED**. *H. agglutinans:* New Jersey, Newfield (NY, holotype).

**REMARKS.** *H. agglutinans* has been synonymized with *H. corrugata* by Reeves & Welden (1967: 1042-1043); presence of this sterile state is a sign that the species may be called facultative parasite (cf. Graves, 1914). Macroscopically sometimes similar *H. cinnamomea* ssp. *spreta* differs from *H. corrugata* by presence of hyphal layer(s) and with long sharp, never incrustated setae (60-)70-120(-150) x 5-9(-10) μm. **Misidentifications**. In herbaria, filed under the

name of *H. corrugata* are specimens of *H. pinnatifida* or *H. cinnamomea* ssp. *spreta*, sometimes also *H. curtisii* or *H. jobii*.

**14. Hymenochaete curtisii** (Berk.) Morgan Figs. 3, *7*; 6, *8*

Morgan, J. Cincinnati Soc. Nat. Hist. 10: 197 (1888); Burt, Ann. Missouri Bot. Gard. 5: 320, f. 7 (1918); Coker, J. Elisha Mitchell Sci. Soc. 36 (3 & 4): 167, pl. 19, 32 f. 11-12 (1921); DeFigio, Tax. anal. 25, f. 6, pl. 2 f. 6a (1970); Jung, Wood-rott. Aphyll. s. Appal. 136, f. 43 a-e, pl. 27 A (1987); Chamuris, Non-stipit. stereoid fungi 156, f. 58 C (1988); Léger, Hymenochaete 110, f. 30 (1998). - *Stereum curtisii* Berk., Grevillea 1: 164 (1873).

Basidiome effused to effuso-reflexed or with slightly elevated margins, attached with umbos, adnate but separable, soft or soft coriaceous and flexible but not waxy when dry, 100-500 μm thick, orbicular, confluent and then to 20 x 2.5 cm. Pilei short and broad, to 0.8 cm long; pileal surface concentrically (sometimes indistinctly) sulcate, sometimes radiately fibrillose, silky, glabrous when old, with zones, brown (M: 5 YR 4/4-2, when old 5 YR 5/1; K & W: 5 C 2 or 5-6 C 3 to 5 D 4, 6 D 5-6, brownish orange to light brown, later grayish); margin lighter coloured than pileal surface (yellowish brown). Hymenium smooth or velvety, azonate, not cracked, golden brown or greyish brown (M: 7.5 YR 5/2; K & W: 6 D 4-6, 6 E 3-4 or 6 E 5-8, yellowish brown or light brown), when sterile Sepia or vivid Umber (M: 7.5 YR 3/6, K & W: 7 E 7), without an olive or lilac tint; context darker than hymenium; margin cinnamon brown when young (M: 7.5 YR 4-5/6), then concolorous.

Tomentum present, cortex indistinctly present; context composed of hyphal layer; dark line above the hymenium absent.

Tomentum 50-100 μm thick; cortex thin, composed of darkened thick-walled densely compacted hyphae; hyphal layer 80-450 μm thick, hyphae compactly longitudinally arranged or interwoven, but not glued together.

Hyphal system monomitic; setal hyphae absent; generative hyphae 2-4 μm diam, subhyaline to brownish, with thickened walls, ramified, septate. In context and hymenium crystalline matter absent.

Setae rare or very rare, 55-75(-100) x (6-)7-10(-12) μm, projecting to 50 μm above the hymenium, fusiform or subulate, with tip acute, straight, naked or enmeshed in hyphal sheaths, without incrustation.

Hook-like, curved or coiled hyphal tips absent or rare in specimens having basidia, but in sterile hymenium very numerous, to 2.5 μm diam, brownish, with slightly thickened walls, acute; hyphidia absent; basidioles present, without incrustation; basidia subclavate or (sub)utriform, with walls thickened and brownish at base, 12-30 x 4.5-5.5 μm; sterigmata 4; spores cylindrical, slightly curved, 5.5-8.3 x 1.5-2.5 μm.

**SUBSTRATA IN N. AMERICA.** Found on more than 30 species of angiospermic trees and bushes, but of 143 specimens with data on the substrate, only 17 were on other hosts than oak. - **Acer** sp. (2), **Betula** nigra (1), **Carpinus** caroliniana (1), **Castanea** dentata (1), **Fagus** sp. (1), **Fraxinus** velutina (1), **Gordonia** sp. (2), **Juglans** major (1), J. nigra (1), **Ligustrum** sp. (1), **Populus** sp. (1), **Quercus** alba (26), Q. coccinea (3), Q. garryana (3), Q. macrocarpa (11), Q. marilandica (G & L, 1995), Q. michauxii (1), Q. minor (2), Q. nigra (G & L, 1995), Q. obtusiloba (2), Q. palustris (1), Q. platanoides (1), Quercus prinus (1), Q. rubra (2), Q. stellata (9), Q. toumeyi (2), Q. velutina (3), Q. virginiana (6), Quercus sp. (53), **Robinia** pseudacacia (2), **Sambucus** caerulea (syn.: S. glauca) (1), **Ulmus** sp. (1).



**DISTRIBUTION IN N. AMERICA. CANADA**: MB (G & L, 1995). **MEXICO:** BS (Santa Catalina Is., 1). **USA:** AL (8), AR (8), AZ (7), CT (3), DC (4), DE (2), FL (16), GA (9), IA (5), IL (2), IN (2), KY (G & L, 1995), LA (16), MA (7), MD (16), MN (3), MO (21), MS (12), NC (14), ND (7), NH (1), NJ (12), NV (G & L, 1995), NY (6), OH (6), OK (2), OR (2), PA (7), SC (5), TN (7), TX (9), VA (22), WA (2), WI (9), WY (1).

**DISTRIBUTION ELSEWHERE. Mesoamerica:** Mexico, Panama, Puerto Rico.

**TYPES STUDIED.** *Stereum curtisii:* USA, South Carolina, H.W. Ravenel, Fungi Carol. III, 26 (NY, lectotype selected by Léger; BPI, isotype).

**REMARKS.** Crowded vertical hyphae with hooked or bent tips in hymenium are unique in *Hymenochaete* and enable to identify the species in sterile state. These hyphae are modifications homologous with hyphidia. When a specimen is with basidia, these hyphae are not numerous or even rare, and these specimens are very similar to *H. pinnatifida*. The last named species usually has numerous setae which are surrounded by a knot of agglutinated branched hyphae at base. **Misidentifications**. This species has been several times misidentified as *H. tabacina* or *H. corrugata*.

**15. Hymenochaete damicornis** (Link) Lév. Figs. 4, *8*; 6, *7*

Lév., Ann. Sci. Nat. Bot. III 5: 151 (1846) ut *H. damaecornis;* Burt, Ann. Missouri Bot. Gard. 5: 306, pl. 16 f. 1 (1918); Léger, Hymenochaete 112, f. 31 (1998). - *Stereum damicorne* Link, Mag. Ges. Naturforsch. Freunde Berlin 3: 40 (1809); Lloyd, Mycol. Writ. 4, Stipit. Stereum 41, f. 564 (1913). - *Stipitochaete damicornis* (Link) Ryvarden, Trans. Brit. Mycol. Soc. 85 (3): 537, f. 1 (1985).

Basidiome stipitate; stem vertical or sometimes horisontal, usually with 2-5 short branches in the upper part, 2-10 cm high, 2-7(-10) mm diam, at the base (in section) round, more flattened towards the pilei, finely tomentose, covered with crowded setae, dark brown (M: 5 YR 5/6-8 to 4/6; K & W: 6 D-E 7, raw Sienna or cognac). Pilei flabelliform to spathulate, 300-700(-1200) μm thick, 1-6 cm long; surface silky to velutinous, densely zonate, slightly radially sulcate, when young dark Sienna (M: 5 YR 6/8, K & W: 6 C 7, reddish golden), later Fulvous Umber (M: 5-7.5 YR 5/8; K & W: 6 D 6, cinnamon brown); margin thin, lobate, wavy, incised or laciniate, in young specimens lighter coloured than other pileal surface (M: 7.5 YR 8/8; K & W: 5 B 5). Hymenium smooth, azonate or with few zones near the margin, not cracked, cinnamon buff or greyish brown (M: 5 YR 5-6/4; K & W: 6 D-E 5, sunburn), without olive or lilac tint, covered with projecting setae.

Tomentum absent but scattered, thick- or thin-walled, or aborted setae present on upper surface; cortex absent; context thick, composed of parallel moderately densely arranged hyphae; setal layer in old specimens present, 100-200 μm thick; dark line in the context or above the hymenium absent. Stipe composed of densely interwoven hyphae, but in well developed specimens differentiated into three layers: outer brown part up to 2 mm thick (tomentum) is composed of almost loosely interwoven hyphae, central yellowish cylinder

(core) of parallel hyphae with thin or thickened walls, and this is surrounded by a thin (100-150 μm) dark brown cortex of densely agglutinated thick-walled hyphae.

Hyphal system monomitic or subdimitic; setal hyphae absent; generative hyphae 2.5-6 μm diam, pale yellowish brown to rusty brown, with thin or thickened walls, septate, branched, in the core of the stipe pale golden yellow and 4-7 μm in diam, in the stipe tomentum with thickened walls, brownish, 3-5 μm diam.

Setae in hymenium rare, scattered or numerous, 90-160(-220) x 8-15 μm, projecting to 150 μm, aculeate to narrowly conical, naked or sheathed, straight, with acute tip, without incrustation; stipe covered with usually very numerous aculeate thick- or thin-walled setae up to 250 μm long; setae on pileal surface rare or scattered, 60-100 x 8-13 μm, sometimes abortive, thin-walled, cylindrical and with rounded tip, or short (40-50 x 8-10 μm).

Hyphidia and cystidia absent; basidioles in sterile hymenium numerous, subhyaline, with thin or thickened walls, 15-22 x 5-8 μm; basidia subutriform or subclavate, 15-25 x 5-8 μm, with 4 thin sterigmata 4-5 μm long; spores broadly ellipsoid, with thin or slightly thickened walls, 5.5-8(-8.2) x 4-5.5 μm.

**SUBSTRATA IN N. AMERICA.** Unknown.

**DISTRIBUTION IN N. AMERICA. MEXICO:** OA (Montepío and NE of Matías Romero - Welden, Dávalos & Guzmán, 1979; Marmojelo, Castillo & Guzmán, 1979), VC (11).

**DISTRIBUTION ELSEWHERE. Mesoamerica**: Belize, Costa Rica, Guatemala, Honduras, Mexico (Chiapas), Panama, El Salvador; **Caribbean**: Cuba, Dominican Rep., Guadeloupe, Jamaica, Puerto Rico, Trinidad; **South America**: Argentina, Bolivia, Brazil, Colombia, French Guiana, Guyana, Paraguay, Peru, Suriname, Venezuela. - On rotten wood and roots of living deciduous woody plants and Bambusa sp. Common in Brazilian Amazonia.

**TYPE STUDIED.** Brazil, Sao Leopoldo, ad terram, Jan 1904 Rick, Fungi Austro-Americani no. 10 as *Hymenochaete formosa* Lév. (BPI, iso-lectotype).

**REMARKS.** Collected usually on ground but obviously parasitic on roots. The stipe is sometimes not clearly distinguished from pilei, and is then a prolongated narrow base of it. Sometimes the short stipe is horizontally branched. Structure of a thick, well developed stipe is surprisingly similar to that in *Clavariachaete* species: in both cases the central cylindric "core" of parallel hyphae is surrounded by a thin hard cortex and thick tomentum which bears strong setae. Differs from *Clavariachaete* in lacking dichotomously branched hyphae in the tomentum of *H. damicornis*.

*H. damicornis* is one of the few species of *Hymenochaete* which is almost always fertile; specimens with abundant spores have been collected in Mexico from July to November. Mean size and Q value of spores is:

| | | |
|---|---|---|
| 6.18 x 4.68 | 1.32 | (XAL, Samp 909) |
| 6.37 x 4.77 | 1.33 | (XAL, Band 281) |
| 6.55 x 4.83 | 1.36 | (XAL, Anell 527) |
| 6.59 x 5.02 | 1.31 | (XAL, Guzmán 30372) |
| 6.71 x 4.92 | 1.36 | (XAL, Samp 984) |
| 7.05 x 4.78 | 1.47 | (XAL, Gomez 11) |
| 7.68 x 4.72 | 1.63 | (XAL, Chacon 2327) |



**16. Hymenochaete epichlora** (Berk. & M.A. Curtis) Cooke Figs. 2, *6;* 5, *4*

Cooke, Grevillea 8: 147 (1880); Burt, Ann. Missouri Bot. Gard. 5: 351, f. 20 (1918); Léger, Hymenochaete 130, f. 40 (1998). - *Corticium epichlorum* Berk. & M.A. Curtis, Grevillea 1 (12): 178 (1873). - *Hymenochaete asperata* Ell. & Everh., Bull. Torrey Bot. Club 27: 50 (1900).

Basidiome effused, 70-180(-230) μm thick, soft to coriaceous when dry, 5-10 x 1-3 cm, closely or loosely adnate. Hymenium smooth or somewhat granular, azonate, irregularly, soon densely cracked, greyish Cinnamon to dark Sienna (M: 5-7.5 YR 6-7/4 to 5/4, or 10 YR 5/6 (when young); K & W: 4 A 4, 6 C-D 5 or 6 E 5, light yellow, sunburn or cocoa brown), sometimes with an olive tint; margin thin, tomentose or indeterminate, sometimes slightly byssoid, Ochreous or concolorous with hymenium.

Tomentum absent; cortex absent or sometimes as a thin darker band of more tightly interwoven hyphae next to the substratum; context composed of hyphal layer; dark line above the hymenium absent; context hyphae rather densely interwoven.

Hyphal system monomitic or subdimitic (part of the hyphae hyaline, thin-walled, septate and more branching, others brownish and with thickened walls); setal hyphae absent; hyphae 2-4 μm diam, yellowish, thin-walled or with thickened walls, septate, branched; in context crystalline matter rarely present, in hymenium absent.

Setae rare or scattered, 30-60 x (4.5-)5.5-9 μm, projecting to 20(-35) μm, fusiform, with tip acute, straight or some slightly curved, some rarely T-shaped, naked, without incrustation.

Hyphidia and cystidia absent; basidioles present, with slightly thickened walls, without incrustation; basidia subclavate to (sub)utriform, 10-16 x 4-6 μm; sterigmata 4, 3-4 μm long; spores ellipsoid, one side flattened, 3.5-5 x 1.8-2.5 μm.

**SUBSTRATA IN N. AMERICA. Ostrya** virginiana (1), **Quercus** virginiana (1), **Sabal** palmetto (1), **Symplocos** sp. (1), **Vitis** sp. (G & L, 1995).

**DISTRIBUTION IN N. AMERICA. MEXICO:** VC (Jalapa, 3). **USA:** AL (type of *C. epichlorum),* FL (Highlands Co, Highlands Hammock St. Pk., 29 Jan 1970 H.H. Burdsall 4835, CFMR; De Soto Co, Arcadia, 19 May 1985 J.P. Lindsey 1331, ARIZ), LA (type of *H. asperata;* St. Martinsville, 18 Mar. 31 Aug and 23 Nov 1899 A.B. Langlois 1751, 2089 and *s. n.,* NY, S; Tammany Par., Indian Village, 1 Feb 1958 D. Stone, det. A.L. Welden, NY and BPI 278119; St. James Par., near Gramercy, Sept 1961 A.L. Welden, det. F. Reeves, NY and BPI 278116), TX (San Jacinto Co, Little Thicket Nat. Sanctuary, 25 Aug 1967 H.H. Burdsall 77, CFMR).

**DISTRIBUTION ELSEWHERE. Southern America**: Argentina, Brazil; **Malesia**: Java.

**TYPES STUDIED.** *Corticium epichlorum:* Alabama, on Symplocos sp., Peters; Ravenel, Fungi Carol. Exs. V, 24 (2 isotypes in BPI, 1 in S; lectotype not yet selected). *Hymenochaete asperata:* Louisiana, St. Martinville, 4 Jan 1898, no. 2647 (NY, holotype).

**REMARKS.** Similar to *H. cinnamomea,* but that is usually layered and with setae (60-)70-120(-150) x 5-9(-10) μm. *H. rigidula* is very similar when young and thin, but differs in presence of setal hyphae. **Misidentifications.** Some specimens collected by Langlois in 1890 and 1899 (BPI 278123, 278858-859, 278867, 278871) and identified by Burt (?) as *H. epichlora* are possibly *H. cervina*. A specimen of *H. asperata* from Burt's Herb. (on Fraxinus, Louisiana, coll. A.B. Langlois 21 Jan 1889, S) is *H. pinnatifida*.

Mean size and *Q* value of spores of *H. epichlora* are:

| | | |
|---|---|---|
| 3.68 x 2.21 | 1.67 | (FL, CFMR 4835) |
| 3.92 x 2.30 | 1.71 | (Mexico, NY, Murrill 338) |
| 4.21 x 2.37 | 1.78 | (TX, CFMR 77) |

**17. Hymenochaete escobarii** Léger Figs. 3, *4;* 6, *10*

Léger, Cryptogamie, Mycol. 11 (4): 296, f. 5 (1990); Léger, Hymenochaete 134, f. 42 (1998). - *H. dendroidea* Escobar *nom. nud.*, Contr. Hymenochaete 92, f. 27 (1978) non Berk. & Broome (= *Hypomyces chrysostomus* Berk. & Broome 1875, Hypocreales).

Basidiome with well developed pilei, sometimes seemingly resupinate but really umbonate-adnate (with free, slightly elevated marginal part), woody hard and brittle when dry, (150-)300-1500(-2500) μm thick. Pilei single or confluent, imbricate, semicircular, 0.5-2.5 cm long; pileal surface deeply concentrically sulcate, rugose or tomentose, Umber, later dark Umber or blackish (M: 5 YR 4/6 or 4/4; K & W: 7 E 5); margin thin. Hymenium smooth or with scattered rounded collicles, not cracked or with a few deep crevices, Cinnamon to Fawn, bright Fulvous or dark Sienna (M: 5 YR 5-6/4, 5-6/8 or 5/6; K & W: 7 D 4, sometimes 5 D 8, 5 C 7 or 6 D 7), without olive or without a lilac tint. Setal layer under looking glass distinctly stratose (with some or numerous dark lines).

Tomentum and cortex present, later indistinct; context composed of hyphal layer and a stratose setal layer; dark line above the hymenium absent.

Tomentum (30-)50-300 μm thick, hyphae loosely intterwoven; in old specimens disappearing; cortex 25-80 μm thick, hyphae parallel densely agglutinated, rust brown; hyphal layer 100-1300 μm thick, hyphae more or less compactly longitudinally arranged.

Hyphal system subdimitic; setal hyphae absent; generative hyphae yellowish, thin-walled, 2-4 μm in diam; skeletoids brownish or brown, thick-walled, 3-5 μm in diam; in context, setal stratum and hymenium crystalline matter locally present.

Setal layer 100-1000 μm thick, 3-15 stratose, each composed of old thick-walled, later agglutinated brownish dendrohyphidia, vertically arranged hyphae and setae; between strata thin (20-30 μm) layer of densely interwoven brown hyphae; setae rare or not numerous, (25-)35-80(-100) x (4-)5-8(-9) μm, projecting 20-40 μm, subulate, with acute tip, straight, naked or enmeshed in hyphal sheaths, without incrustation.

Dendrohyphidia in sterile hymenial layer numerous, hyaline or yellowish, in upper half repeatedly branched (tree-like), up to 45 μm long, 1.5-3.5 μm in diam; in fertile (basidia-bearing) hymenium less numerous or very rare, with



thick brown walls, agglutinated with brown resinous matter; no cystidia; basidioles present, 15-18 x 3.5-5 μm, without incrustation; basidia clavate or almost cylindrical, hyaline or at base with thickened brownish walls, 20-30 x 5.5-7 μm; sterigmata 4, 4-5 μm long; spores broadly ellipsoid, with one side slightly flattened, sometimes with a guttula, (5-)5.2-6.5(-7) x (3-)3.5-4.5(-4.8) μm.

**SUBSTRATA IN N. AMERICA. Cerocarpus** sp. (1), **Prosopis** glandulosa (2).

**DISTRIBUTION IN N. AMERICA. USA:** AZ (Pima Co, Coronado Nat. Forest, Lower Bear Canyon and Sabino Canyon, 16 Nov 1972 R.L. Gilbertson 1274, 1277, 5700; Carr Canyon, 3 Oct 1975 R.L. Gilbertson 11418, ARIZ).

**DISTRIBUTION ELSEWHERE. Mesoamerica.** Costa Rica (Las Tablas Protector Zone, 24 Jun 1999 K. Haugerud 121, O and TAA; Rio Grande, Luquillo Mts., 18 Jun 1996 K.H. Larsson 9024, G and TAA); Panama, Canal Zone, Chiriqui, 17-19 Mar 1911 W.R. Maxon 559 (BPI). **Caribbean.** Dominica (Basin Will [= ?], 19 Aug 1992 M.R. Elliote 356, K); Puerto Rico (30 Apr 1991 Setliff & L. Sevean 1860, K; P. Roberts 542, K). **Northern South America.** Venezuela (type).

**TYPE STUDIED.** Venezuela, Estado Bolívar, Torono-Tepuí, Chimantá Massif, 23 Feb 1955 J.A. Steyermark & J.J. Wurdack 1115 (NY, holotype).

**REMARKS.** Seemingly effused specimens are sometimes very similar to *H. pinnatifida;* that species differs with closely adnated truly resupinate basidiomata and cylindrical, slightly curved spores 4-6(-7) x 1.5-2.5(-2.8) μm.

The holotype of *H. escobarii* is sterile; Costa Rican specimen *Haugerud 121* has some heavily damaged spores, but three Arizona collections have numerous, partly undamaged spores. Unique combination of characters (pileate basidiomata with tomentum, cortex, hyphal and stratose setal layer; presence of well developed dendrohyphidia) and size of setae, colour of hymenium makes it possible to assert conspecificy of these collections. Mean size of spores was 5.85 x 3.84, 6.03 x 3.95 and 6.38 x 4.12 μm in the Arizona specimens; mean *Q* value was 1.52, 1.53 and 1.55. Dendrohyphidia are very distinct in sterile specimens but agglutinated with brown resinous matter and indistinct in sporulating ones.

**18. Hymenochaete fuliginosa** (Pers.) Lév. Figs. 4, *4;* 6, *4*

Lév., Ann. Sci. Nat. III 5: 152 (1846); Léger, Hymenochaete 145, f. 48 (1998) *p. p.* - *Thelephora fuliginosa* Pers. Mycol. Eur. 1: 145 (1822). - Not *H. fuliginosa* sensu Berk., 1869, Wakef., 1915 and Burt, 1918.

Basidiome effused, closely adnate, hard when dry, (50-)75-400(-600) μm thick but usually only up to 300 μm, 0.2-1 cm in diam, then confluent and up to 10 cm long. Hymenium smooth or slightly uneven, later densely irregularly cracked, dark Umber or dark chocolate (7.5 YR 4/4; K & W: 7 E 4-5, fawn to Somalis), without olive or lilac tint; margin thin, abrupt, when young rust brown and tomentose, then concolorous with hymenium or with a darker zone.

Tomentum absent, cortex absent or indistinct; context composed of setal layer of overlapping rows of setae, sometimes thin indistinct hyphal layer present; dark line above the hymenium absent.

Cortex 5-25 μm thick when present; hyphae densely interwoven, indistinct, agglutinated, brown; hyphal layer when present up to 30 μm thick, hyphae compact, longitudinally agglutinated.

Hyphal system monomitic; setal hyphae absent; generative hyphae 2-4 μm in diam, yellowish to brownish, thin-walled or with thickened walls, agglutinated, subindistinct; in context and hymenium crystalline matter absent.

Setal layer 50-575 μm thick; setae numerous, (60-)65-100 x (6-)7-11 μm, partly projecting up to 65 μm, subulate, with acute or very sharp tip, straight, naked, without incrustation.

Hyphidia not numerous to numerous, hyaline or yellowish, 2.5-3 μm in diam, thin-walled, without incrustation; cystidia absent; basidioles absent or present, 2.5-3.5 μm in diam, without incrustation; basidia clavate or subclavate, 13-18 x (3.5-)4-5 μm; sterigmata 4, about 4 μm long; spores cylindrical, slightly curved, 5-6.5(-7) x 1.8-2.6(-2.8) μm.

**CULTURAL CHARACTERS**. Léger & Lanquetin, 1996: 108.

**SUBSTRATA IN N. AMERICA**. On wood and bark of coniferous trees, except in Alaska also on birch and in Arizona on poplar. - **Abies** grandis (3), A. lasiocarpa var. arizonica (1), **Betula** sp. (1), **Chamaecyparis** thyoides (1), **Juniperus** virginiana (2), **Larix** occidentalis (3), **Libocedrus** decurrens (1), **Picea** engelmannii (1), P. glauca (5), P. x lutzii (2), P. mariana (1), Picea sp. (6), **Pinus** albicaulis (1), P. contorta (4), P. resinosa (2), Pinus sp. (2), **Populus** spp. (1), **Pseudotsuga** macrocarpa (1), P. menziesii (5), **Thuja** occidentalis (14), T. plicata (3), **Tsuga** canadensis (1), T. heterophylla (4), Tsuga sp. (3).

**DISTRIBUTION IN N. AMERICA. CANADA:** AB (2), BC (3), ON (2). **USA:** AK (10), AZ (4), CA (2), CO (8), ID (8), MD (1), MI (16), MT (12), NC (1), NY (2), PA (1), TN (2), WA (1).

**DISTRIBUTION ELSEWHERE. Europe**: Austria, Byelorussia, Czechia, Estonia, Finland, France, Germany, Norway, Poland, Russia (Komi and Murmansk Reg., Ural), Slovakia, Sweden, Ukraine (Transcarpatia); **Asia-Temperate**: Caucasus, China, Japan, Russian Far East (incl. Kamchatka and Sakhalin Is.), Siberia, Turkmenistan. - On logs and trunks of coniferous trees; found once also on Salix sp. in N. Sweden and in Norway.

**TYPE.** Possibly lost; an unpublished and ill-considered neotype (USA, Ohio, Burt 33121, BPI) designated by DeFigio (1970: 62) belongs to *H. jobii*, not to *H. fuliginosa*.

**REMARKS.** A thin layer of parallel agglutinated hyphae 15-30 μm thick may be present at base of the basidioma; this may be called cortex, or hyphal layer equally. Some American authors (Jung, 1987: 136; DeFigio, 1970: 62) have not distinguished *H. fuliginos*a and European *H. subfuliginos*a Bourdot & Galzin; Léger (1998: 145) considered these names to be synonymous. Closely related *H. jobii* differs in its spores (ellipsoid, 4.5-6 x 2.3-3 μm) and substrate (angiospermic trees, mainly oak). *H. fuliginosa* is also similar to *H. corrugata* which differs in more slender spores 4.5-6.8 x 1.5-2.3 μm and setae always encrusted in upper part with amorphous granules, or with a rugose tip.

*H. fuliginosa* has been described from N. America and Cuba as growing on wood of deciduous trees by Burt, 1918: 365 (on wood of *Betula, Rhododendron*), or as growing on *Betula* by Jung (1987: 136), but spores of the American specimens have been described as 4 x 2 μm (Burt) or 5-6.5 x 3-4 μm, broadly suballantoid to ovoid (DeFigio, 1970). The Cuban specimen (MO 55156, BPI) mentioned by Burt (1918) was studied by Reeves & Welden (1967: 1044); its spores were described by them as 5 x 3 μm, ovoid. Possibly most of the specimens mentioned by these authors belong to *H. jobii*. *H. fuliginosa* has been found on angiospermic trees as an exception in northern regions (Alaska, Norway, Sweden) where this species is common.



**Misidentifications**. Several specimens filed under the name *H. fuliginosa* in herbaria are misidentified; these belong to *H. jobii*, others to *H. cinnamomea* ssp. *spreta, H. corrugata, H. curtisii, H. pinnatifida, H. semistupposa.* On the other hand, several specimens of *H. fuliginosa* have been filed under the name *H. tenuis*.

**19. Hymenochaete fulva** Burt Figs. 4, *1;* 5, *12*

Burt, Ann. Missouri Bot. Gard. 5: 354, f. 23 (excl. 23-c) (1918); Reeves & Welden, Mycologia 59 (6): 1044 (1967); Léger, Hymenochaete 149, f. 49 (1998). - Not *H. fulva* sensu Doidge, Bothalia 5: 484 (1950): see Talbot, Bothalia 7: 155 (1958).

Basidiomata effused, closely adnate, coriaceous when dry, 1-1.5 cm in diam, then confluent and up to 8 cm long, 100-225 μm thick. Hymenium smooth, not cracked or with few deep crevices, Cinnamon (light) brown (M: 7.5 - 10 YR 5-6/5-6; K & W: 5-6 D 6, cinnamon brown or oak brown), without olive or lilac tint; margin abrupt, distinctly limited, yellowish Ochraceous (M: 7.5-10 YR 8/6-7; K & W: 5 B 5, dull apricot yellow).

Tomentum absent, cortex present; context composed of hyphal layer composed of loosely interwoven hyphae; dark line above the hymenium usually present.

Cortex 12-30 μm thick, hyphae tightly interwoven, thick-walled, 2.5-4 μm.

Hyphal layer 40-50 μm thick.; hyphal system monomitic; setal hyphae in hyphal layer absent; generative hyphae with thickened walls, brownish, branched, septate, 2.5-4 μm in diam, some encrusted with resinous matter; in hymenium crystalline matter present, sometimes forming agglomerates up to 20 μm in diam.

Setae in hymenium numerous, (60-)70-90(-95) x (6-)7-9(-10.5) μm, projecting up to 60 μm, subulate to subfusiform, straight, without or with a hyphal sheath, without incrustation, tips acute.

Hyphidia absent; heavily encrusted cystidia-like hyphal ends with a conglomerate of crystals 20-30 x 6-10 μm sometimes present; basidioles present; basidia clavate, hyaline, 18-25(-30) x 5-6 μm; sterigmata 4, 3-4 μm long; spores broadly ellipsoid, (4.8-)5-6(-6.2) x 3.2-4 μm.

**SUBSTRATA IN N. AMERICA.** Unknown.

**DISTRIBUTION IN N. AMERICA. MEXICO:** VC (Botanical Garden, near Xalapa, 1300 m, 6 Jan 1992 M. Palacios-Ríos 3453, XAL; TAA 174363). - The collection from USA, Louisiana mentioned in the original description of the species by Burt (1918: 335) is a mixture of *H. pinnatifida* and *H. episphaeria* according to DeFigio (1970: 66).

**DISTRIBUTION ELSEWHERE. Caribbean**: Jamaica (holotype). Mentioned by Doidge (1950) from Southern Africa, possibly erroneously.

**TYPE STUDIED**. Jamaica, Cinchona, W.A. & E.L. Murrill 645 (NY; the basidiome, less than 1 cm in size, was not studied microscopically).

**REMARKS.** Externally similar and possibly related to *H. cinnamomea* which differs in lack of cortex and spores 4.5-6.5(-7) x 1.8-2.8(-3) µm. Cystidia of *H. fulva* described and figured by Burt (1918) and Léger (1998) are actually encrusted tips of hyphae, only slightly differentiated and of little use in identification of this species. Spore size of the holotype was described as 4-5.5 x 3-4 µm by Léger (1998: 149), 6 x 3-3.5 µm by Reeves & Welden (1967: 1045) and 5-6.2 x 3-4 µm by D.J. Job (note with the type in NY). Mean spore size of the Mexican specimen is 5.44 x 3.63 µm; $Q = 1.50$.

**20. Hymenochaete jobii** Parmasto Figs. 3, *9;* 5, *10*

Parmasto, Folia Cryptog. Estonica 37: 62, f. 1, *5* (2001). - *H. corticolor* sensu Reeves & Welden, Mycologia 59 (6): 1043 (1967) and Job, Mycol. Helvet. 4 (1): 16 (1990). - *H. ungulata* Burt, Ann. Missouri Bot. Gard. 5: 338 (1918).

Basidiomata effused, closely adnate, hard when dry, 0.5-1.5 cm in length, then confluent and up to 15 cm, (150-)300-1000(-3000) µm thick. Hymenium usually with scattered or densely situated low rounded tubercles, azonate, not cracked or with not numerous irregular cracks, greyish brown (M: 5 YR 5/4; K & W: 6 D 3-4, camel or café-au-lait), later brown or dark chocolate brown (M: 7.5 YR 4/4-7; K & W: 6 F 7 - 6 E 3, chestnut brown to greyish brown), without olive or lilac tint; margin fibrillose when young, 0.5-1 mm broad, whitish or yellowish brown (M: 7.5 YR 5/8-10; K & W: 6 D 7), then disappearing, concolorous with hymenium or more clearly brown (without a grey tint).

Tomentum absent; cortex absent but when basidiome young, a thin (10-50 µm) basal layer of parallel densely packed hyphae present; context composed of setal layer as overlapping or distinct rows of setae; dark line above the hymenium present or absent.

Cortex (when present) hyphae interwoven, brown, agglutinated; context hyphae compactly arranged, erect.

Hyphal system monomitic with indistinct differentiation to generative and pseudoskeletal hyphae; setal hyphae absent; generative hyphae 2-4.5 µm in diam, yellowish to brownish, with thickened walls, ramified, usually distinct; in context of old specimens agglomerates of crystalline matter.

Setal layer 200-3000 µm thick; setae numerous, (50-)60-110(-120) x 7-12(-15) µm, projecting up to 60 µm, subulate, with acute tip, straight or some with slightly curved tip, naked or with a hyphal sheath, without incrustation or sometimes encrusted with small crystals at tip.

Cystidia absent; hyphidia not numerous to numerous, hyaline or yellowish, 2-3 µm in diam, thin-walled, without incrustation, but rarely with slightly thickened and granulose walls; basidia clavate or subclavate, 15-25 x 3.5-5 µm; sterigmata 4, 3-5 µm long; spores ellipsoid, with one side flattened, 4.5-6 x 2.2-3.2(-3.5) µm.

Causes a white pocket rot of wood.

**SUBSTRATA IN N. AMERICA**. **Acer** sp. (7), **Alnus** oblongifolia (1), **Betula** sp. (1), **Castanea** sp. (1), **Fagus** grandifolia (2), Fagus sp. (3), **Juglans** major (2),



**Populus** tremuloides (1), Populus sp. (1), **Quercus** arizonica (1), Q. hypoleucoides (3), Q. reticulata (1), Q. rubra ( syn.: Q. borealis) (4), Quercus sp. (15).

**DISTRIBUTION IN N. AMERICA. CANADA:** ON (5), PQ (1). **USA:** AZ (10), CT (1), KY (1), LA (1), MD (1), ME (1), MI (16), NC (9), NY (4), OH (1), PA (1), TN (2), VA (2), VT (4), WI (4).

**DISTRIBUTION ELSEWHERE. Caribbean:** Cuba, Jamaica; **South America:** Brazil, Ecuador.

**TYPES STUDIED.** *H. jobii:* USA, New York, Schuyler Co, Van Etten, Arnot Forest, on Betula sp., 19 Sep 1970 H.H. Burdsall 4932 (TAA 171182, holotype; CFMR, BPI, isotypes). *H. ungulata:* Mexico, Jalapa, 12-20 Dec 1909 W.A. & E.L. Murrill 176 (NY, holotype; BPI 348551, isotype).

**REMARKS.** The name *H. corticolor* Berk. & Ravenel has been misused for this species in many cases; unfortunately, the type of the first belongs to *H. cervina*. Both species as well as *H. unicolor* are closely related sibling species; the differences are described under *H. cervina*. Macroscopically the very similar *H. fuliginosa* differs in cylindrical slightly curved spores 5-6.5(-7) x 1.8-2.6(-2.8) µm, broader setae and growing on conifers. Resupinate basidiomata of *H. rubiginosa* also grow on oak wood and are sometimes quite similar to *H. jobii,* but differ in free margins of easily separable from substratum basidiomata, by presence of tomental and basal hyphal layers and spores (3.5-)3.8-5.5 x (1.8-)2-2.8(-3) µm.

In Europe, a possibly very closely related species *H. subfuliginosa* Bourdot & Galzin has been found growing on wood of *Quercus* spp.

The basidiomata of *H. jobii* are usually resupinate but sometimes with thickened, somewhat reflexed black upper margin (e. g., specimens from Nova Scotia, L.E. Wehmeyer 628, NY and Florida, N.L.T. Nelson, BPI 329792). *H. ungulata* Burt is possibly based on such an old and weathered specimen. The type of that species is sterile; whitish gray colour of its hymenial surface is caused by numerous crystals and agglutinated hyphae; setae are sheathed with hyphae, 60-95 x 9-12 µm, with indistinct contours; it is possible that the sterile when collected specimen has been preserved in alcohol. Lindblad & Ryvarden (1999 ) described a specimen under the name *H. ungulata* from Costa Rica, but it has small setae 30-50 x 6-8 µm and spores 4-5.2 x 2.3-2.8(-3) µm, both typical for *H. unicolor.*

Many of the speciemens mentioned in literature as *H. fuliginosa* or *H. fusca* (P. Karst.) Sacc. collected on wood of deciduous trees and having ellipsoid or ovoid spores may belong to *H. jobii*. **Misidentifications**. *H. jobii* has sometimes been filed in herbaria under the names *H. corrugata* and *H. rubiginosa*.

**21. Hymenochaete leonina** Berk. & M.A. Curtis Figs. 2, *12;* 5, *11*

Berk. & M.A. Curtis, J. Linn. Soc. Bot. 10 (46): 334 (1868); Burt, Ann. Missouri Bot. Gard. 5: 353, f. 22 (1918); Reaves & Welden, Mycologia 59 (6): 1045 (1977); DeFigio, Tax. anal. 44, f. 15, pl. 4 f. 15a (1970); Léger, Hymenochaete : 174, f. 62 (1998).

Basidiomata effused, adnate but separable when moist or as pieces when dry, soft coriaceous when dry, 100-800 µm thick, 0.5-2 cm in diam, when con-

fluent up to 10 cm in extent. Hymenium smooth, azonate, not cracked, Isabellous Cinnamon, darker in center (Sienna to Umber or cocoa brown) (M: when young 7.5 YR 6/8, then 5-7.5 YR 4-5/6-7 to 6/10; K & W: 6 D-E 4 - 6 E 7, camel to cognac), sometimes with an olivaceous tint; margin thin, up to 2 mm wide, abrupt, sometimes tomentose or indeterminate, lighter coloured than hymenium, Fulvous (M: 7.5 YR 7/8-10; K & W 5 B 6, apricot yellow) or concolorous.

Tomentum absent or present as the upper part of the hyphal layer; cortex present as a dark line up to 55 μm thick in the middle of the seemingly duplex hyphal layer dividing it into two parts of more or less the same thickness; context composed of hyphal layer and a setal layer; upper and lower part of the hyphal layer similar in texture; setal layer present as overlapping or indistinct rows of setae; dark line above the hymenium present or absent.

Hyphal layer 100-700 μm thick; hyphae loosely interwoven, in the lower part somewhat descending; hyphal system monomitic; setal hyphae absent; generative hyphae 2.5-4 μm in diam, yellowish or brownish, with thickened walls or thick-walled, septate, rarely branched; in context, setal stratum and hymenium crystalline matter absent.

Setal layer 50-250 μm thick, darker than hyphal layer; setae numerous, in 1-4 indistinct rows, 40-80(-90) x (6-)7-13(-14) μm, projecting up to 30-60 μm, conical to slightly fusiform, with almost blunt or acute tip, straight or some with slightly curved tip, enmeshed in hyphal sheaths or naked, without incrustation; in marginal part of the basidiome sometimes embedded curved setae up to 120 μm long.

Hyphidia in fertile hymenium absent, in sterile hymenium numerous (sometimes rare), yellowish, cylindrical or slightly conical, with almost blunt conical tip, 2-3 μm in diam, with thickened walls, without incrustation; basidioles present, without incrustation; basidia clavate or subclavate, 14-20(-25) x 4-6 μm; sterigmata 4, 4-5 μm long; spores short-cylindrical, slightly curved, or ellipsoidal with one side slightly flattened, 3.8-5.5 x (1.8-)2-3(-3.2) μm.

**SUBSTRATA IN N. AMERICA.** **Fraxinus** velutina (G & L, 1995), **Juglans** major (1), **Liquidambar** styraciflua (2), **Quercus** arizonica (G & L, 1995), **Rhizophora** sp. (1).

**DISTRIBUTION IN N. AMERICA. MEXICO:** OA (San Pedro Yolox) (Escobar, 1978), SI (San Blas, 12 Jun 1970 C.K. Sylber 322, BPI 277515), VC (Lanborn, C.R. Orcut 1920, NY, K). **USA:** AR (Burt, 1918: 354), AZ (Santa Cruz Co, Coronado Nat. Forest, 12 Aug 1971 H.H. Burdsall 6006, 6008, CFMR), KY (DeFigio, 1970: 46, but the cited specimen not found in BPI), LA (St. Martin Parish, N of Chacaoula, 14 Oct 1956 A.L. Welden 1028, NY; near St. Martinsville, 4 Aug 1889 A.B. Langlois 2091, BPI and NY, and Nov 1899 A.B. Langlois, K), NC (Haywood Co, Baxter Creek Trail, 6 Jul 1970 H.H. Burdsall 4207, CFMR).

**DISTRIBUTION ELSEWHERE.** **Caribbean**: Cuba, Jamaica, Guadeloupe, Trinidad; **South America**: Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Uruguay, Venezuela; **East Tropical Africa**: Kenya; **Southern Africa**; **Asia Tropical**: India, Sri Lanka. Mentioned also from Great Britain but these data are doubtful. - On angiospermic trees (Aspidosperma sp., Nectandra sp. et al.); most collections are from unknown substrata.



**TYPE STUDIED.** Cuba, C. Wright 532 (K, holotype; "Cuba Orientalis, 1856-7 C. Wright 423", FH 3027, isotype ?).

**REMARKS.** Easily distinguishable by soft loose subiculum and a dark line in the middle of context ("hyphal layer"); however, it is sometimes lacking, especially in young specimens; sometimes there are 2-4 lines. This line is homologous with cortex, and there is no duplex hyphal layer in this species: the upper part of the context is tomentum, not an "upper" part of the hyphal layer. **Misidentifications**. In some cases *H. corrugata*, *H. pinnatifida* and *H. tabacina* have been misidentified as this species.

Mean spore size and *Q* value of the specimens studied:

| | | |
|---|---|---|
| 4.08 x 2.31 | 1.77 | (NC, CFMR 4207) |
| 4.28 x 2.53 | 1.69 | (AZ, ARIZ 6008) |
| 4.38 x 2.31 | 1.89 | (CFMR 3927) |
| 4.53 x 2.34 | 1.94 | (Jamaica, K, Roberts GA627) |
| 4.57 x 2.84 | 1.61 | (AZ, CFMR 6006) |

**22. Hymenochaete luteobadia** (Fr.) Höhn. & Litsch. Figs. 2, *5;* 6, *1*

Höhn. & Litsch., Sitzungsber. K. Akad. Wiss. Wien, Math.-nat. Kl. I 116: 750 (1907); Burt, Ann. Missouri Bot. Gard. 5: 323, f. 8 (1918); Reeves & Welden, Mycologia 59 (6): 1045, f. 1 B (1967); DeFigio, Tax. anal. 48, f. 17, pl. 5 f. 17a (1970); Léger, Hymenochaete 184, f. 67 (1998). - *Thelephora luteobadia* Fr., Linnaea 5: 526 (1830). - *Stereum laetum* Berk., J. Acad. Nat. Sci. Philadelphia 2: 279 (1853). - *Stereum pulchrum* (Schwein. ex Cooke) Cooke in Sacc., Syll. fung. 6: 561 (1888). - *Hymenochaete reflexa* Burt, Ann. Missouri Bot. Gard. 5: 336, f. 12 (1918). - *Hymenochaete cubensis* Burt, Ann. Missouri Bot. Gard. 5: 327, f. 13 (1918).

Basidiome effuso-reflexed or sessile-pileate, coriaceous when dry, 185-700(-1000) μm thick. Pilei single or a few growing together to confluent, imbricate, flabelliform to dimidiate, 0.2-3 cm long, up to 6(-8) cm broad, somewhat flexible or brittle when dry; pileal surface concentrically sulcate and zonate, velutinous or tomentose to strigose with glabrous zones, becoming glabrous or radially fibrillose when old, reddish brown or brown (M: 5-5 YR 5/7 or 4.5/6 or 2.5 YR 4-5/6; K & W: 6 D 6 - 6 F 6, 5 B 2 - 5 B 3, cinnamon brown to burnt umber, rarely with orange grey to brownish grey concentric bands); margin thin, entire or lobate, ruffled, concolorous with the pileal surface or lighter coloured (yellowish brown). Hymenium smooth, azonate or faintly zonate, not cracked, greyish orange to pale reddish brown or dark fulvous; rusty brown in old specimens (M: 7.5 - 10 YR 6-6.5/4-6 or 7.5 YR 6/6 - 5/8; K & W: 5 B 3 - 5 B 6 to 5 C 4 - 5 C 6, greyish orange to brownish orange), sometimes with an olive tint; margin concolorous with hymenium or lighter coloured (when young: whitish orange).

Tomentum present or almost indistinct (as abhymenial hairs); cortex present; context composed of hyphal layer or hyphal and setal layer of overlapping rows of setae; dark line above the hymenium absent.

Tomentum 50-400 μm thick, consists of loose spongy tissue of more or less erect and somewhat entwined hyphae with brownish thickened walls,

septate, 2.2-3.3 μm in diam; cortex 20-65 μm thick, its hyphae densely parallel or interwoven; hyphal layer 200-500 μm thick, hyphae compactly longitudinally arranged.

Hyphal system monomitic; setal hyphae absent; generative hyphae 2.5-3.5 μm in diam, brownish or brown, with thickened walls or thick-walled; in context, setal stratum and hymenium crystalline matter absent.

Setal layer (when present) 80-400 μm thick; setae not numerous, (25-)40-60 x 5-8 μm, projecting to 35 μm, distinctly fusiform, with acute tip, straight or some slightly curved or falcate, enmeshed in hyphal sheaths, without incrustation.

Hyphidia usually numerous, brownish, slightly conical, 2-3 μm in diam, with (sometimes unevenly) thickened walls to thick-walled, without incrustation or in upper part with small brown granules which may dissolve in KOH solution; cystidia absent; basidioles present, without incrustation; basidia clavate or subclavate, 15-20 x 4-5 μm; sterigmata 4, 4-5 μm long; spores oblong-ellipsoid, one side flattened, 4-5(-5.5) x 1.8-2.5 μm.

**CULTURAL CHARACTERS**. Boidin & Lanquetin, 1984: 214; Job, 1986: 228.

**SUBSTRATE IN N. AMERICA.** Unknown.

**DISTRIBUTION IN N. AMERICA. MEXICO:** VC (Uxpanapa reg., Campamento Hermanos Cedillo, 14 Jul 1976 A.L. Welden 3677, XAL).

**DISTRIBUTION ELSEWHERE. Mesoamerica**: Mexico (Campeche and Yukatan), Belize, Costa Rica, Panama; **Caribbean**: Cuba, Dominica, Jamaica, Grenada, Guadeloupe, Puerto Rico, Santa Lucia, Trinidad; **South America:** common - Argentina, Bolivia, Brazil, Colombia, Galápagos, Guyana, Paraguay, Peru, Suriname, Venezuela; **Africa**: Angola, Burundi, Central African Republic, Ethiopia, Kenya, Madagascar, Rwanda, South African Republic, Tanzania, Uganda, Zaire, South Africa; **Asia-Temperate:** China; **Asia Tropical**: India, Malaysia (Sabah), Nepal, Philippines, Thailand, Vietnam; **Australasia:** Australia, Tasmania. - On rotten wood of angiospermic trees; host of most collections unknown (some few hosts mentioned, e. g., Acacia arabica).

**TYPES STUDIED**. *H. cubensis:* Cuba, Alto Cedro, March 1903 L.M. Underwood & F.S. Earle 1491 (NY); *H. reflexa:* Jamaica, 12-14 Jan 1909 W.A. Murrill & W. Harris 989 (NY).

**REMARKS.** Characteristic for *H. luteobadia* are relatively small distinctly fusiform setae, presence of numerous brownish encrusted hyphidia with thickened walls, presence of tomentum and cortex, and dull grayish-yellowish or ochraceous colour of hymenium. Most of the specimens of this species studied by me are sterile; in one collection from Mexico (Yucatan, Quintana Roo, Guzmán 20791, XAL) the mean spore size is 4.56 x 2.26 μm; $Q = 2.02$.

### 23. Hymenochaete pinnatifida Burt

Figs. 2, *9;* 5, *19*

Burt, Ann. Missouri Bot. Gard. 5: 355, f. 24 (1918); DeFigio, Tax. anal. 23, f. 5, pl. 2 f. 5a (1970); Léger, Hymenochaete 218, f. 83-84 (1998).

Basidiomata effused, adnate, sometimes with separable margins, coriaceous when dry, growing as small patches 0.5-1.5 cm in diam, then confluent and up to 10 cm in length, 100-350 μm thick. Hymenium smooth or with scattered low tubercles, azonate, when old irregularly cracked, greyish brown or



light brown (M: 7.5-5 YR 6/2 to 5/4; K & W: 6 D 2-4), then cocoa brown, chestnut brown or dark brown (M: 7.5 YR 4/6-7, 4-5/4 or 6/6; K & W: 6 E-F 5-7, teak brown to dark brown); margin finely fibrillose, 0.5-1 mm broad, whitish or light brownish orange (M: 5 YR 5/6 to 7.5 YR 6/8; K & W: 6 C-D 5-6 or 6 D 4), later concolorous with hymenium or brown without a grey tint.

Tomentum absent; cortex present; basidiome composed of hyphal and one setal layer, rarely 2-3 alternating hyphal and setal layers present; dark line above the hymenium present, about 12-32 μm thick, composed of thick-walled agglutinated hyphae 2-3 μm in diam.

Cortex 15-25 μm thick, hyphae parallel or interwoven, dark reddish brown, thick-walled, agglutinated, 2-2.5(-3) μm in diam.

Hyphal layer 40-300 μm thick, hyphae loosely longitudinally arranged or interwoven; hyphal system subdimitic; setal hyphae absent; generative hyphae 1.8-2.7 μm in diam, hyaline or subhyaline, thin-walled, septate, ramified; skeletoids numerous, yellowish brown, 2.3-3.8 μm in diam, thick-walled; setal stratum and hymenium contain crystalline masses 10 - 20 x 10 μm.

Setal layer 30-100(-250) μm thick, with a few or up to 10 overlapping rows of setae; setae of two types: numerous setae 15-40 x 3-6 μm, embedded; not numerous big setae 40-70 x 5-8(-10) μm, projecting to 40 μm, both conical-fusiform, with acute tip, straight, naked or enmeshed in hyphal sheaths, without incrustation.

Simple hyphidia absent or present, 2-3 μm in diam, walls brownish, thickened; dendrohyphidia with thickened brownish walls, stem 12-22 x 2-3(-6) μm, in upper half or uppermost part repeatedly branched, with pinnatifid tips; cystidia absent; basidioles present, without incrustation; basidia not numerous, clavate or subclavate, 14-18 x 3-4.5 μm; sterigmata 4, about 3.5-4 μm long; spores cylindrical, slightly curved, 4-6(-7) x 1.5-2.5(-2.8) μm.

**CULTURAL CHARACTERS**. Job, 1986: 223; Léger & Lanquetin, 1989: 328 and 1996: 115.

**SUBSTRATA IN N. AMERICA**. **Abies** fraseri (1), **Acer** negundo (1), A. rubrum (1), **Alnus** rugosa (G & L, 1995), Alnus sp. (1), **Betula** populifolia (1), **Carya** sp. (3), **Celtis** laevigata (1), **Elaeagnus** umbellata (G & L, 1995), **Fagus** sp. (3), **Fraxinus** velutinus (2), Fraxinus sp. (1), **Gordonia** lasianthus (1), **Ilex** vomitoria (1), **Juglans** major (1), **Juniperus** deppeana (1), **Liquidambar** styraciflua (2), **Magnolia** virginiana (1), Magnolia sp. (1), **Micropholis** guyanensis (syn.: M. chrysophylloides) (1), **Myrica** cerifera (1), **Parthenocissus** sp. (1), **Persea** sp. (1), **Prunus** sp. (2), **Quercus** falcata (1), Q. nigra (1), Q. prinus (1), Quercus sp. (12), **Sabal** palmetto (1), **Salix** sp. (2), **Taxodium** sp. (1), **Ulmus** sp. (1).

**DISTRIBUTION IN N. AMERICA. MEXICO:** NL (Escobar, 1978), VC (1). **USA:** Rather rare, mainly found in the southern part of the USA. AK (1), AL (2), AR (1), AZ (3), CA (2), FL (47), GA (5), IL (3), LA (12), MA (1), MD (1), MS (14), NC (2), NM (1), NY (3), OH (2), PA (5), SC (1), TX (2), VA (2), VT (1).

**DISTRIBUTION ELSEWHERE. Mesoamerica**: Mexico (Chiapas, Escobar, 1978), El Salvador; **Caribbean**: Cuba, Jamaica, Dominica, Grenada, Guadeloupe, Puerto Rico, Santa Lucia; **South America**: Argentina, Brazil, Ecuador, Guyana, Peru, Venezuela; **Africa**: Central African Republic, Gabon, Réunion, South Africa; **Asia Temperate**: China (Hainan); **Asia Tropical**: India (Tamil Nadu St.). Data on

collections from Philippines are doubtful. - On bark of fallen limbs, on many unidentified substrata, and on Carapa procera.

**TYPES STUDIED.** *Paratypes:* Florida, G.C. Fischer (Lloyd Herb. 8238) and W.W. Calkins 22 (both: BPI); Georgia, E. Bartholomew 5675 (BPI).

**REMARKS.** Setae of this species are of two types; embedded setae are usually only up to 35 μm long. Between the two types there are usually a few intermediates. Dendrohyphidia are abundant in mainly sterile specimens, rare or easily overlooked in fertile ones. Another species with dendrohyphidia, *H. escobarii* has sometimes seemingly resupinate but actually umbonate-adnate basidiomata and broadly ellipsoid spores (5-)5.2-6.5 x (3-)3.5-4.5(-4.8) μm. *H. pinnatifida* is sometimes very similar to specimens of *H. jobii* and *H. curtisii* which lack characteristic dendrohyphidia. **Misidentifications**. Many specimens of this fungus have been misidentified in herbaria as *H. asperata* Ell. & Everh. (= *H. epichlora*), *H. cinnamomea*, *H. corrugata*, *H. curtisii*, *H. episphaeria*, *H. insularis* (= *H. corrugata*), *H. rubiginosa*, and *H. spreta* (= *H. cinnamomea* ssp. *spreta*).

**24. Hymenochaete rhabarbarina** (Berk.) Cooke Figs. 4, *6;* 5, *9*

Cooke, Grevillea 8 (48): 148 (1880); Léger, Hymenochaete 233, f. 89 (1998). - *Corticium rhabarbarinum* Berk. in Hooker, Fl. Nov.-Zel. 2: 184 (1855).

Basidiome effused, closely adnate, soft or almost coriaceous when dry, 100-300(-700) μm thick, at first as numerous scattered patches 2-5 mm in diam, then merging to form areas up to 15 x 5 cm. Hymenium smooth or sometimes slightly tuberculate, azonate, not cracked, when old sometimes irregularly cracked, Fulvous to dark Sienna (M: 7.5 YR 6/6-6/8 or 5 YR 5/8, then 5/4; K & W: 5-6 D-E 5-6, 6 C-D 7 or 5-6 C 5, brownish orange to cocoa brown or Pompeian yellow), without lilac tint; margin indeterminate, thin, lighter coloured than hymenium when young (M: 7.5 YR 7/8-9; K & W: 5 B 6, apricot yellow), then concolorous and abrupt.

Tomentum and cortex absent; context composed of hyphal layer, or hyphal layer and thin setal layer; dark line above the hymenium usually present.

Hyphal layer 60-300(-600) μm thick; context hyphae loosely arranged, interwoven; hyphal system monomitic; setal hyphae absent; generative hyphae 2.5-4(-4.5) μm in diam, brownish, thin-walled or with thickened walls, septate, ramified at right angle; in context crystalline or amorphous matter usually present, some part of hyphae sometimes covered with brownish resinous granules.

Setae scattered (sometimes numerous), (50-)60-100(-120) x 5-8(-9.5) μm, projecting to 60-80 μm, subulate or subfusiform, with acute tip, straight or some with slightly curved tip, usually enmeshed in hyphal sheath, this usually encrusted with amorphous yellow or brownish granules in upper half.

Hyphidia absent or not numerous, hyaline or yellowish, 1-1.5 μm in diam, thin-walled, without incrustation; cystidia absent; basidioles 7-12 x 3.5-5 μm, with thickened walls, without incrustation; basidia (sub)utriform, with walls thickened at base, 15-22 x (4-)5-6(-7) μm; sterigmata 4, 3-5 μm long; spores ellipsoid to broadly ellipsoid, with one side flattened, (4.5-)4.8-6 x 2.3-3.3 μm.

**CULTURAL CHARACTERS**. Léger & Lanquetin, 1987: 29.

**SUBSTRATA IN N. AMERICA. Taxodium** sp., ? **Populus** sp.



**DISTRIBUTION IN N. AMERICA. MEXICO:** NL (Escobar, 1978), OA (on road from Oaxaca to Valle Nacional, 10 Aug 1963 K.P. Dumont, CUP-ME 165, NY). **USA:** AZ (Pima Co, Coronado Nat. Forest, on aspen (?), 22 Jul 1980 H.H. Burdsall 10883, CFMR); LA (on cyprus tree, Humphrey 2516, BPI 278128; East Feliciana Parish, Idlewild, 27 Aug 1994 E. Parmasto, TAA 153146; St. Tammany Parish, Pearl River Wildlife Area, 28 Aug 1994 E. Parmasto, TAA 153238; Baton Rouge, Burton Plantation, 24 and 30 Aug 1994 E. Parmasto, TAA 153001, 153251).

**DISTRIBUTION ELSEWHERE. South America**: Argentina, Brazil, Colombia, Venezuela; **Africa**: Burundi, Kenya, Réunion, Tanzania; **Asia-Tropical**: Sri Lanka; **Australasia**: Australia, New Zealand. - On bark of dead trunks and branches of numerous angiospermic and coniferous hosts.

**TYPE STUDIED**. *Corticium rhabarbarinum:* New Zealand, Colenso (K, holotype).

**REMARKS.** Some old specimens have setae arranged in two or three obscure layers. Incrustation of setae and hyphae with reddish brown granules, a character stressed by Léger (1998), are not always both present. Spores of this species have been described as oval to ellipsoidal, 4-5.5 x 2.2-3 μm by Job (1990), ovoid to ellipsoidal, 4.5-5(-5.5) x 2.5-3.5 μm by Léger (1998). The species is very closely related to *H. cinnamomea* (ssp. *spreta*) which differs in almost cylindrical spores 4.5-6.5(-7) x 1.8-3(-3.2) μm, more slender setae (60)70-120(-150) x 5-9(-10) μm and (usually) several or many alternating layers of setae and hyphae (*H. rhabarbarina* has sometimes two layers of setae).

The type of *H. rhabarbarina* has been synonymized with *H. cinnamomea* by P. Corfixen (note at the holotype in K). I have had great difficulties with identification of *H. rhabarbarina* and was inclined to agree with Corfixen. Nevertheless, there is a small difference in spore form and mean size which is considerably larger than "normal" variability of spores of a species in Hymenochaetales. Mean width of spores of *H. cinnamomea* is 1.93-2.63(-2.79) μm, mean *Q* value is (1.83-)2.05-2.79 (35 collections from Europe, Asia, Australasia, North and South America). The extreme values indicated in parentheses have been observed in specimens collected in Argentina and Louisiana, i.e., in regions where *H. rhabarbarina* has also been found.

Mean size of spores and mean *Q* value of the specimens of *H. rhabarbarina* studied are:

| | | |
|---|---|---|
| 5.22 x 2.62 | 1.99 | (Argentina, BAFC 30328) |
| 5.25 x 2.62 | 2.01 | (LA, TAA 153098) |
| 5.32 x 2.88 | 1.85 | (AZ, CFMR 10883) |
| 5.43 x 2.95 | 1.84 | (LA, TAA 153146) |
| 5.27 x 3.05 | 1.73 | (LA, TAA 153001) |

**25. Hymenochaete rheicolor** (Mont.) Lév. Figs. 4, *7;* 5, *1*

Lév., Ann. Sci. Nat. III 5: 151 (1846); Graff, Bull. Torrey Bot. Club 45: 458 (1918); Léger, Hymenochaete 235, f. 90 (1998). - *Stereum rheicolor* Mont., Ann. Sci. Nat. Bot. II 18: 23 (1842). - *Hymenochaete sallei* Berk. & M.A. Curtis, J. Linn. Soc. Bot. 10: 333 (1868); Burt, Ann. Missouri Bot. Gard. 5: 314 (1918); Lentz, Agric. Monogr. 24: 18 (1955); Reeves & Welden, Mycologia 59 (6): 1048 (1967).

Basidiome sessile-pileate (rarely umbonate-sessile and then sometimes seemingly effuso-reflexed), closely adnate, soft or papery-coriaceous and flexible when dry, (150-)250-800(-900) μm thick. Pilei 1-3.5(-5) cm long, flabelliform to dimidiate, confluent, imbricate or in rosettes up to 10 cm in diam; pileal surface densely concentrically sulcate and zonate, radiately fibrillose, silky or velutinous, dull or shiny, Fulvous to dark Sienna (M: 5 YR 4-5/8-10; K & W: 6 C-D 7-8, reddish golden to light brown), old specimens more greyish (M: 5 YR 6/4-6); margin thin, lobate, sometimes plicate, concolorous with the pileal surface or lighter coloured. Hymenium smooth, not cracked, Fulvous to dark Sienna, almost concolorous with pileal surface (M: 5-7.5 YR 4-5/6-8; K & W: 6 D 6-5, cinnamon brown to sunburn or 6 D-E 7-8, cognac to light brown), when sporulating sunburn (M: 5 YR 5/4-5; K & W: 6 D 5), without olive or lilac tint; margin concolorous but may be yellowish when young (M: 5 YR 7/10; K & W: 6 B 7, carrot red).

Tomentum of abhymenial hairs or almost indistinct; cortex absent; context composed of hyphal layer or (in some old specimens) of hyphal layer and a thickening setal layer; dark line above the hymenium absent.

Tomentum (when present) 20-50(-350) μm thick; hyphal layer 230-800 μm thick, hyphae rather loosely longitudinally arranged, in thin subhymenium adscending and more densely packed. Hyphal system monomitic; setal hyphae absent; generative hyphae 2.5-5 μm in diam, yellowish to brownish, with thickened walls to thick-walled, septate, branched usually at right angle; in context, setal stratum and hymenium crystalline matter absent.

Setal layer (when present) 50-100 μm thick; setae scattered, sometimes numerous, (60-)70-110(-135) x (8-)9-15 μm, projecting 35-90 μm, broadly subulate to conical, with almost blunt or acute tip, usually enmeshed in very thin hyphal sheaths (hyphae 1-2 μm in diam), without incrustation.

Hyphidia and cystidia absent; basidioles present, in sterile specimens very numerous, 10-20 x 2.5-3.5(-4) μm, with slightly thickened yellowish or brownish walls at base, in old specimens brownish and with thickened in whole length walls and sometimes finely encrusted; basidia clavate or subclavate, subhyaline, 15-20 x 3.5-5 μm; sterigmata 4, 3-5 μm long; spores cylindrical, curved, 4.5-7(-7.2) x 1.5-2.5 μm.

**CULTURAL CHARACTERS.** Boidin & Lanquetin, 1984: 193; Job, 1986: 223.

**SUBSTRATA IN N. AMERICA. Ilex** vomitoria (1), **Myrica** cerifera (2), **Quercus** virginiana (1), Quercus sp. (2).

**DISTRIBUTION IN N. AMERICA. MEXICO:** DU (1), JA (1), M-MO and NL (Mamolejo, Castillo & Guzman, 1981), OA (1), PU (1), SL (1), TA (Guzmán, 1972), VC (14). **USA:** FL (16), MS (2), NC (G & L, 1995), SC (1).

**DISTRIBUTION ELSEWHERE. Mesoamerica**: Mexico (Chiapas, Yucatan), Costa Rica, El Salvador, Guatemala, Honduras, Panama; **Caribbean**: Cuba, Dominica, Grenada, Guadeloupe, Jamaica, Leeward Is., Puerto Rico, St. Lucia, St. Vincent, Trinidad; **South America**: Argentina, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Venezuela; **Africa**: Rwanda; **Asia-Temperate**: China, Japan, Taiwan; **Asia-Tropical**: India, Indonesia (Java), Malaysia (Pahang), Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; **Australasia**: New Zealand; **Southwestern Pacific**: Fiji, Tonga. - Found on mainly angiospermic trees and bushes.



**TYPES STUDIED.** *Stereum rheicolor:* "Mont. orig., Nilghery, Perrotet" (S, isotype) and "Stereum. 31. Authentic" (BPI, Lloyd Herb. 29711, isotype). *H. sallei:* Cuba, Cordova, 1854 Sallé 278 (K, Herb. Berk. 1879; isotypes in BPI, "ex Herb. Bresadola" and Lloyd Herb. 29726, "Authentic").

**REMARKS.** Characteristic for this species are thin, flexible, silky, densely zonate basidiomata, lack of cortex, broad setae, and basidioles with thickened walls. Seemingly effused basidiomata with elevated margins are rare; I have seen only two such specimens both collected in Florida. Most specimens studied are sterile; the few specimens with spores seen by me have been collected in Mexico in March, August and October. Mean spore measurements and *Q* value are:

| | | |
|---|---|---|
| 4.10 x 1.81 | 2.26 | (MS, CFMR 13017) |
| 4.27 x 1.94 | 2.20 | (FL, BPI 278538) |
| 4.75 x 1.92 | 2.48 | (Mexico, XAL 104) |
| 4.75 x 1.96 | 2.43 | (Mexico, XAL, Guzmán 23553) |
| 4.80 x 1.95 | 2.47 | (Mexico, XAL 2612) |
| 4.85 x 1.94 | 2.50 | (Mexico, XAL 1599) |
| 4.87 x 2.13 | 2.29 | (Mexico, TENN 18369) |
| 5.09 x 2.01 | 2.54 | (Mexico, XAL, Chacon 1008) |
| 5.40 x 2.06 | 2.62 | (FL, CFMR 17364). |

Among the specimens from the tropics identified as *H. tenuissima* (Berk.) Berk. (= *H. rheicolor*) and in some herbaria in USA, there are many collections of *H. luteobadia* and *H. villosa* (Lév.) Bres. **Misidentifications**. Some specimens of this fungus have been misidentified as *H. tabacina* or *H. badioferruginea* (= *H. tabacina),* including Ravenel, Fungi Americi Exsiccati no. 718.

**26. Hymenochaete rigidula** Berk. & M.A. Curtis Figs. 2, *8;* 5, *6*

Berk. & M.A. Curtis, J. Linn. Soc. Bot. 10 (46): 334 (1868); Burt, Ann. Missouri Bot. Gard. 5: 318, f. 6 (1918); Reeves & Welden, Mycologia 59 (6): 1047, f. 1 E (1967); DeFigio, Tax. anal. 46, f. 16, pl. 4 f. 16a (1970); Léger, Hymenochaete 239 (1998).

Basidiome effused or effuso-reflexed with slightly elevated margins, coriaceous to hard and brittle when dry, 200-600(-700) μm thick, resupinate part up to 4 cm long; reflexed part short and broad, 0.5-1 cm long. Pileal surface radiately fibrillose, velutinous or strigose, shiny, with concentric zones, Umber (M: 7.5 YR 8/4; K & W: 6 E 8, hazel) with Ochreous (5 B 4, greyish orange) bands; margin thin, entire or lobate, not plicate, concolorous with the pileal surface. Hymenium smooth or slightly tuberculate when old, sometimes slightly irregularly cracked, dark Cinnamon to Umber (M: 5-7.5 YR 5.5/6-8, later darker, 4/6 to 4/4; K & W: 5-6 C 7, yellow ochre to reddish golden, or 6 D 6, cinnamon brown, then 6 E 6-7, tan to cognac), without olive tint; resupinate margin distinct (abrupt), up to 1 mm wide, lighter coloured (5 YR 7/8), then concolorous with the hymenium.

Tomentum absent, cortex or cortex-like dark line in the middle of hyphal layer sometimes present, then 20-80 μm thick and composed of interwoven hyphae; dark line above the hymenium sometimes locally present.

Hyphal layer 100-450 μm thick, with infrequent horizontal setal hyphae; hyphal system monomitic; generative hyphae loosely to compactly arranged, in upper part longitudinally arranged, in the lower part interwoven, 3-4.5 μm in diam, yellowish, with thickened walls or thick-walled, septate, infrequently branched; setal hyphae up to 150 μm long and 4-10 μm in diam, brownish; crystalline matter absent.

Setal layer 30-250 μm thick; setae numerous, (35-)40-60(-80) x 7-12(-18) μm, projecting to 40 μm, fusiform, straight, not sinuate, naked, tip acute, without incrustation or slightly encrusted with small crystals; embedded setae sometimes with bulbous base.

Hyphidia and cystidia absent; basidioles present, thin-walled, without incrustation; basidia clavate or subclavate, 16-22 x 5-7 μm; sterigmata 4; spores short-cylindrical or cylindrical and slightly curved, 3.7-5(-5.5) x 1.5-2.3(-2.5) μm.

**SUBSTRATE IN N. AMERICA. Quercus** sp.

**DISTRIBUTION IN N. AMERICA. USA:** MS (Harrison Co, Harrison Exp. Forest, 2 Dec 1989 H.H. Burdsall 13049, CFMR), TN (Knox Co, New Hopewell, 18 Mar 1945 L.R. H[esler], TENN 16741), TX (Hardin Co, Lumberton, 20 Sep 1981 R.L. Gilbertson 13242, ARIZ).

**DISTRIBUTION ELSEWHERE. Caribbean**: Cuba, Grenada, Guadeloupe, Jamaica; **South America**: Brazil, British Guyana, Colombia, Venezuela; **Africa**: Kenya. - On dead wood and bark of frondose species.

**TYPES STUDIED.** Cuba, La Perla, C. Wright 529 (FH, holotype; S, isotype).

**REMARKS.** All three specimens from USA and one from Jamaica studied by me have spores; mean size and *Q* value of these are:

| | | |
|---|---|---|
| 4.01 x 1.87 | 2.15 | (MS, CFMR 13049) |
| 4.08 x 1.98 | 2.06 | (AZ, ARIZ 13242) |
| 4.64 x 1.60 | 2.89 | (Jamaica, XAL, Welden 931) |
| 5.17 x 2.43 | 2.13 | (TN, TENN 16741). |

**27. Hymenochaete rubiginosa** (Dicks.: Fr.) Lév. Figs. 3, *3;* 5, *7*

Lév., Ann. Sci. Nat. Bot. III 5: 151 (1846); Brown, Mycologia 7 (1): 1-20, f. 1-30 (1915); Burt, Ann. Missouri Bot. Gard. 5: 332, f. 11 (1918); Davidson, Campbell & Vaughn, Tech. Bull. U.S. Dept. Agric. 785: 22, f. 3 M (1942); DeFigio, Tax. anal. 51, f. 18, tab. 5 f. 18a (1970); Chamuris, Non-stipit. stereoid fungi 157, f. 58 D (1988); Léger, Hymenochaete 242, f. 92 (1998). - *Helvella rubiginosa* Dicks.: Fr., Plant. Crypt. Brit. 1: 20 (1785).

Basidiome effuso-reflexed, usually with well developed pilei, sometimes umbonate-adnate or seemingly effused, but fixed to the substratum with an umbonate point; resupinate part up to 4 cm in diam; woody hard and brittle when dry, (300-)400-1200(-2000) μm thick. Pilei single or a few growing together to confluent, imbricate, reniform, 0.5-3.5 cm long; pileal surface concentrically sulcate and zonate, not radiately fibrillose or rugose; velutinous or tomentose, later glabrous, reddish brown or brown to blackish (M: 5 YR 4/8 when young, then 2.5 YR 4/4-6, when old 5 YR 3-4/2; K & W: 6 D 6 - 6 F 3, light brown to dark brown); margin thin to thick, entire or lobate, not plicate, lighter coloured than pileal surface, bright Fulvous or ochraceous brown, rust



brown, later concolorous; adaxial surface of the effused basidiome concentrically zonate and sulcate, tomentose or velutinous. Hymenium smooth or with scattered round semispherical tubercles, not cracked or deeply scantily irregularly creviced when old, reddish brown or brown to blackish (M: 2.5-5 YR 3-5/4; K & W: 6 E 4 - 7 D 3 to 7 E 6, chocolate or bistre with reddish tinge, greyish brown to orange brown), without olive tint, with or without a lilac tint; margin of the resupinate part abrupt, lighter coloured than hymenium or concolorous.

Tomentum 50-250 μm thick, darker than context; cortex (20-)40-55 μm thick, hyphae densely parallel or interwoven, agglutinated, rust brown; hyphal and setal layers present; dark line above the hymenium absent.

Hyphal layer 100-500 μm thick, hyphae more or less compactly longitudinally arranged; hyphal system dimitic, but difference between skeletals and generative hyphae small; setal hyphae absent; generative hyphae 2-3.5 μm in diam, subhyaline, thin-walled; skeletal hyphae numerous, brown, (2.5-)3-5 μm in diam, thick-walled; in context, setal stratum and hymenium crystalline matter absent.

Setal layer 70-500 μm thick, composed of overlapping rows of setae; setae very numerous, 40-80(-100) x (6-)8-10(-12) μm, projecting (20-)40-60 μm, conical to fusiform, with acute tip, straight or some with slightly curved tip, naked or very rarely enmeshed in hyphal sheaths, without incrustation.

Hyphidia present but usually not well differentiated, hyaline or yellowish, 1.5-3 μm in diam, thin-walled; cystidia absent; basidioles present, 8-18 x 3.5-4 μm, without incrustation; basidia clavate or subclavate, hyaline or yellowish, 15-25(-30) x 4-6(-7) μm; sterigmata 4, 4-5 μm long; spores elongated ellipsoid, with one side flattened, (3.5-)3.8-5.5 x (1.8-)2-2.8(-3) μm.

Causes a white pocket rot of wood.

**CULTURE CHARACTERS.** Davidson, Campbell & Vaughn, 1942: 22; Boidin, 1958: 213.

**SUBSTRATA IN N. AMERICA.** Found on about 30 species of trees and bushes, but mainly on *Quercus* spp. and *Castanea*. Mentioned by Lowe (1977) also on Abies lasiocarpa, but this is obviously erroneous. - **Acer** saccharum (1), **Castanea** dentata (38), Castanea sp. (14), **Fraxinus** velutina (1), **Holodiscus** discolor (G & L, 1995), **Juglans** major (G & L, 1995), **Liriodendron** tulipifera (2), **Myrica** cerifera (G & L, 1995), **Ostrya** virginiana (1), **Platanus** occidentalis (1), **Prosopis** glandulosa (G & L, 1995), **Prunus** sp. (1), **Quercus** agrifolia (G & L, 1995), Q. alba (71), Q. bicolor (2), Q. coccinea (1), Q. gambellii (4), Q. garryana (6), Q. hypoleucoides (1), Q. macrocarpa (2), Q. palustris (2), Q. prinus (1), Q. rubra (1), Q. rubra var. ambigua (syn.: Q. borealis) (1), Q. stellata (1), Quercus sp. (48). **Rhamnus** crocea ssp. insula (G & L, 1995), Rhamnus sp. (1), **Robinia** pseudacacia (4), **Sambucus** caerulea (syn.: S. glauca) (G & L, 1995), **Tilia** sp. (1), **Ulmus** americana (2).

**DISTRIBUTION IN N. AMERICA.** Common everywhere Quercus grows. **CANADA:** NF (DeFigio, 1970: 54), ON (4). **MEXICO:** BS (Santa Catalina Is, 2), M-MI (1), M-MO (Cuernavaca; Guzmán, 1972 and Escobar, 1978). **USA:** AL (1), AR (6), AZ (2), CA (2), CO (6), CT (16), DC (3), DE (1), FL (3), GA (3), IA (1), IL (1), IN (12), KS (7), KY (1), LA (2), MA (18), MD (10), MI (2), MN (1), MO (3),

MS (6), NC (27), NE (1), NJ (5), NM (4), NY (25), OH (10), OK (1), OR (2), PA (24), SC (2), TN (10), TX (2), VA (33), VT (1), WA (4), WI (6), WV (8).

**DISTRIBUTION ELSEWHERE. Mesoamerica:** Costa Rica, El Salvador; **Caribbean:** Cuba; **South America:** Argentina (incl. Patagonia), Chile, Colombia, Ecuador, Peru; **Europe:** all countries where Quercus spp. grow; **Asia-Temperate:** Caucasus, Japan, Russian Far East, Turkey; **Africa:** Kenya, Morocco, South Africa; **Asia-Tropical:** Borneo (Sarawak), India, Pakistan, Philippines, Vietnam; **Australasia:** New Zealand. - Mainly on Quercus spp., also on Castanea sativa; rarely on some other deciduous species (Calycophyllum sp., Fagus orientalis, F. sylvatica, Carpinus betulus, Nectandra sp., Rhamnus sp.).

**TYPE.** Possibly lost; neotype of *H. rubiginosa* (not *Helvella rubiginosa!*) is collected by Lloyd (no. 3910 in FH) in USA, Ohio, designated by DeFigio (1970: 52) and published by Job (1990: 39).

**REMARKS.** Resupinate basidiomata of this species are similar to *H. jobii* which is always closely adnate (also in marginal part) and lacks hyphal layer. **Misidentifications.** Several specimens filed in herbaria under the name *H. rubiginosa* are misidentified and belong to *H. tabacina*, *H. curtisii*, *H. jobii*, *H. pinnatifida* or to *H. rhabarbarina*.

**28. Hymenochaete tabacina** (Sowerby: Fr.) Lév. Figs. 4, *3;* 5, *13*

Lév., Ann. Sci. Nat. Bot. III 5: 145 (1846); Burt, Ann. Missouri Bot. Gard. 5: 325, f. 9 (1918); DeFigio, Tax. anal. 37, f. 12, pl. 3 f. 12a (1970); Jung, Wood-rott. Aphyll. s. Appal. 137, f. 43 n-q (1987); Chamuris, Non-stipit. stereoid fungi 158, f. 58 C (1988); Léger, Hymenochaete 270, f. 105 (1998). - *Auricularia tabacina* Sowerby, Col. fig. Engl. fungi 1, pl. 25 (1797). - *Thelephora imbricatula* Schwein., Trans. Am. Phil. Soc. N.S. 4: 166 (1832). - *Hymenochaete imbricatula* (Schwein.) Lév., Ann. Sci. Nat. Bot. III 5: 152 (1846). - *Stereum badioferrugineum* Mont., Ann. Sci. Nat. Bot. II 20: 367 (1843). - *Hymenochaete badioferruginea* (Mont.) Lév., Ann. Sci. Nat. Bot. III 5: 152 (1846); Burt, Ann. Missouri Bot. Gard. 5: 330, f. 10 (1918). - *H. borealis* Burt, Ann. Missouri Bot. Gard. 5: 317, f. 5 (1918); Chamuris, Non-stipit. stereoid fungi 155, f. 58 A (1988); Léger, Hymenochaete 78 (1998). - *H. obesa* G. Cunn., Trans. R. Soc. New Zeal. 85 (1): 15, f. 4, pl. 1 f. 3 (1957); DeFigio, Tax. anal. 40, f. 13, pl. 4 f. 13a (1970).

Basidiome effuso-reflexed or effused, closely adnate, soft coriaceous but brittle when dry, 100-600(-700) μm thick. Pilei confluent, imbricate, dimidiate or short and broad, 0.3-1.5 cm long; pileal surface radiately fibrillose, silky, glabrous when old, with concentric zones, rust brown, grayish or dark brown (M: 5-7.5 YR 4-5/6; K & W: 6 D 6 - 6 F 8, 7 E 4-6, cinnamon brown to deep dark brown); margin thin, entire, sometimes torn, plicate or crispate, lighter coloured (golden yellow), concolorous with the pileal surface when old. Hymenium smooth but uneven, usually concentrically zonate and sulcate, sometimes only with some broad zones, rarely tuberculose, radially or plumosely cracked (not cracked in var. *badioferruginea* (Mont.) Pilát), yellowish or golden brown, brownish with grey or slightly rosy tint, then Umber (M: 7.5 YR 4-5/4, or 6.5/5 or 7/8 when young and sporulating; K & W: 5 B 3, 6 C 3 or 6 D 4-5, greyish orange, deep bownish grey or sunburn); without a lilac tint;



margin of the resupinate part fibrillose or abrupt, lighter coloured, then concolorous with the hymenium (bright Fulvous, K & W: 5 A 3, pale orange).

Tomentum present but in old specimens sometimes almost indistinct; cortex present (in some young specimens absent); context composed of hyphal layer, or hyphal layer and one setal layer with overlapping rows of setae; thin dark line above the hymenium usually present.

Tomentum (20-)30-50(-100) μm thick, sometimes with few setal hyphae; cortex (15-)20-50 μm thick, hyphae tightly interwoven, thick-walled; hyphal layer 50-300 μm thick, lighter coloured than other layers, orange-yellow, hyphae longitudinally loosely to (towards the hymenium) compactly arranged.

Hyphal system subdimitic; setal hyphae present in hyphal layer but not numerous, 120-250 μm long, 7-13 μm in diam, dark brown, with very thick walls, sometimes in young basidiomata absent; generative hyphae (2.5-)3-5 μm in diam, yellowish, thin-walled or with thickened walls, septate, branches usually diverging at a right angle; skeletoids brown, thick-walled, with scarce septa; in context and hymenium crystalline matter absent.

Setal layer (when present) up to 150(-300) μm thick; setae in 2-5 overlapping rows, numerous, (50-)60-120(-150) x 7-15(-16) μm, projecting to 50(-70) μm, very rarely bifurcate at base, fusiform, with acute tip, straight or rarely some few slightly curved, naked or enmeshed in hyphal sheaths, finely encrusted with hyaline or yellowish amorphous granules or crystals in upper part.

Hyphidia and cystidia absent; basidioles present, 10-14 x 3.5-4 μm, without incrustation; basidia clavate or subclavate, 15-25 x 3.5-5 μm; sterigmata 4, up to 4(-5) μm long; spores cylindrical, slightly curved, (4.3-)4.5-7 x 1.2-2.2(-2.5) μm.

Causes white rot of wood. Experimental study on wood rot has been made by Job & Keller, 1988.

**CULTURAL CHARACTERS.** Nobles, 1948: 340, 1965: 1134; Boidin, 1958: 210.

**SUBSTRATA IN N. AMERICA.** Found on nearly 155 species of trees and bushes. Of 560 specimens with known substrata seen, 23% were on gymnospermic substrata; among these, more than one third on Thuja, next is Abies. Most common hosts are Acer spp., next are Alnus spp. and Betula spp. Rare on Quercus (as well as in Europe). Larix is a usual host in North and East Asia; in N. America I have seen 6 collections from British Columbia, Idaho and Montana (on elev. of about 9,000 ft). - **Abies** balsamea (8), A. canadensis (= ?) (1), A. concolor (1), A. firma (1), A. grandis (13), A. lasiocarpa (G & L, 1995), Abies sp. (2), **Acer** circinatum (7), A. glabrum (19), A. glabrum var. douglasii (2), A. glaucum (2), A. grandidentatum (1), A. macrophyllum (1), A. negundo (G & L, 1995), A. pensylvanicum (5), A. rubrum (21), A. saccharinum (1), A. saccharum (22), A. spicatum (27), Acer sp. (43), **Alnus** crispa (1), A. fruticosa (G & L, 1995), A. incana (12), A. incana ssp. rugosa (1), A. rubra (syn.: A. oregona) (6), A. sitchensis (1), A. sinuata (4), A. tenuifolia (20), Alnus sp. (12), **Amelanchier** alnifolia (4), A. canadensis (1), Amelanchier sp. (1), **Arbutus** menziesii (1), **Arctostaphylos** patula (1), **Aristolochia** californica (3), **Betula** alleghaniensis (syn.: B. lutea) (9), B. glandulosa (Niemelä, 1985), B. lenta (3), B. nana (2), B. occidentalis (syn.: B. fontinalis) (2), B. papyrifera (4), B. populifolia (2), Betula sp.

(10), **Carpinus** caroliniana (1), **Carya** alba (1), Carya sp. (5), **Castanea** dentata (1), Castanea sp. (1), **Castanopsis** chrysophylla (G & L, 1995), **Ceanothus** velutinus (4), Ceanothus sp. (1), **Cerasus** sp. (1), **Chamaecyparis** nootkatensis (1), C. thyoides (1), **Clethra** alnifolia (1), **Cornus** stolonifera (2), **Corylus** cornuta (syn.: C. californica, C. rostrata) (9), Corylus sp. (4); **Crataegus** sp. (3), **Fagus** sylvatica var. atropunicea (3), F. grandifolia (7), Fagus sp. (5), **Fraxinus** americana (1), F. nigra (2), F. sambucifolia (1), **Gaultheria** shallon (1), **Hamamelis** virginiana (1), **Heteromeles** arbutifolia (1), **Holodiscus** discolor (2), **Ilex** verticillata (5), **Juniperus** communis (1), J. virginiana (3), Juniperus sp. (1), **Larix** laricina (G & L, 1995), L. lyallii (1), L. occidentalis (5), **Lindera** benzoin (2), **Liriodendron** tulipifera (1), **Lithocarpus** densiflorus (3), **Lonicera** involucrata (1), L. periclymenum (1), Lonicera sp. (1), **Lyonothamnus** floribundus (1), **Magnolia** sp. (1), **Myrica** sp. (1), **Nemopanthus** canadensis (= N. mucronatus?) (1), **Oplopanax** horridus (2), **Opulaster** sp. (1), **Ostrya** virginiana (8), **Paxistima** myrsinites (1), **Physocarpus** malvaceus (G & L, 1995), **Picea** abies (3), P. engelmannii (G & L, 1995), P. glauca (1), P. x lutzii (4), P. mariana (Niemelä, 1985), P. rubens (2), P. sitchensis (1), Picea sp. (5), **Pinus** contorta (1), P. ponderosa (G & L, 1995), P. rigida (1), P. strobus (3), Pinus sp. (1), **Platanus** occidentalis (1), **Populus** balsamifera (2), P. balsamifera ssp. trichocarpa (2), P. grandidentata (2), P. tremuloides (4), Populus sp. (3), **Prunus** emarginata (G & L, 1995), P. pensylvanica (3), P. serotina (1), P. virginiana (2), P. virginiana var. melanocarpa (1), Prunus sp. (5), **Pseudotsuga** menziesii (syn.: P. taxifolia) (6), P. mucronata (= ?) (1), **Pyrus** malus (1), **Quercus** alba (1), Q. coccinea (1), Q. gambelii (2), Q. garryana (G & L, 1995), Q. rubra (1), Q. stellata (G & L, 1995), Quercus sp. (2), **Rhododendron** canadense (1), R. maximum (2), R. viscosum (1), **Rhus** diversiloba (1), **Rosa** nutkana (G & L, 1995), **Rubus** sp. (G & L, 1995), **Salix** alaxensis (1), S. alba (1), S. bebbiana (2), S. laevigata (1), S. scouleriana (1), Salix sp. (10), **Sambucus** sp. (1), **Sequoia** sempervirens (3), **Shepherdia** canadensis (1), **Sorbus** americana (1), S. scopulina (G & L, 1995), **Spiraea** alba (1), S. douglasii (1), S. pyramidata (1), **Symphoricarpos** albus (syn.: S. racemosus) (3), **Syringa** vulgaris (1), **Taxus** brevifolia (G & L, 1995), T. canadensis (G & L, 1995), **Thuja** gigantea (= ?) (1), T. occidentalis (7), T. plicata (33), Thuja sp. (1), **Tilia** americana (1), **Tsuga** canadensis (1), T. heterophylla (17), **Ulmus** americana (4), U. rubra (1), Ulmus sp. (1), **Umbellularia** californica (1), **Vaccinium** corymbosum (1), V. membranaceum (1), V. parvifolium (1), V. pensylvanicum (= ?) (1), Vaccinium sp. (5), **Viburnum** dentatum (3), V. lantanoides (syn.: V. alnifolium) (2), V. nudum var. cassinoides (2), Viburnum sp. (2), **Vitis** labrusca (1), Vitis sp. (1).

**DISTRIBUTION IN N. AMERICA.** Rare or very rare in the southern USA (except California) and in Mexico, common northwards. Northernmost localities are in Alaska, Yukon Terr. (61°11' N, 129°07' W), in Mackenzie Distr. of Northwest Terr., in Labrador Peninsula (Quebec, 55.3° N, 77.8° W and Newfoundland, 53.5° N, 64.5°W) and South Greenland. **CANADA:** AB (G & L, 1995), BC (24), NB (3), NF (6), NT (Distr. Mackenzie; G & L, 1995), NS (4), ON (30), Prince Edward Is. (2), PQ (18), YT (1). **GREENLAND:** sothernmost part south of 61°15' N (Knudsen, Hallenberg & Mukhin, 1993). **MEXICO:** BS (Santa Catalina Is., 1), OA (Guzmán, 1972; Escobar, 1978; Welden & Guzmán, 1978), VC (1). **USA:** AK (35), AL (1), AR (G & L, 1995), CA (31), CO (1), CT (11), DE (1), FL (2), GA (G & L, 1995), ID (72), KY (G & L, 1995), LA (4), MA (30), MD (3), ME (43), MI (50), MN (5), MT (49), NC (10),



ND (G & L, 1995), NH (47), NJ (20), NM (1), NY (99), OK (G & L, 1995), OR (21), PA (27), RI (2), SC (1), TN (5), UT (11), VA (13), VT (34), WA (64), WI (10), WV (6), WY (3).

**DISTRIBUTION ELSEWHERE. Mesoamerica**: Costa Rica, Panama; **Caribbean**: Trinidad; **South America**: Argentina, Guyana, Brazil, Venezuela; **Europe**: Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Spain, Sweden, Switzerland, Ukraine, United Kingdom; **Asia-Temperate**: China, Japan, Russia; **Africa**: Rwanda, Tunisia, Zaire; **Asia Tropical**: India, Indonesia (Jawa), Malesia, Nepal, Pakistan; **Australasia**: Australia, New Zealand. - On numerous deciduous, more rarely on coniferous trees and bushes. Common in Eurasia on Salix spp.

**TYPES STUDIED.** *Auricularia tabacina:* holotype possibly lost; neotype of *H. tabacina* (not *Auricularia tabacina!)* collected by W.B. Cooke 13 Jun 1948 (NY) in USA, Idaho, designated by DeFigio (1970: 37) and published by Job (1990: 44) as if collected by Cooke on 6 Jun 1948. *H. borealis:* Canada, Ontario, London, 15 Oct 1889, J. Dearness 1017 (NY, BPI, paratypes; setal hyphae present!), USA, New Jersey, Newfield, March-April J.B. Ellis (NY, BPI, paratypes).

**REMARKS.** Externally very variable species. Easily recognizable thanks to presence of tomentum, cortex, and presence of setal hyphae in context. Setal hyphae are sometimes quite rare. Young and small, usually effused specimens of this species with undeveloped dark line between hyphal and setal layers have been described as *H. borealis* by Burt in 1918.

*H. tabacina* is rare in southern States of USA and in Mexico; data on occurrence in South America are partly doubtful: in southern part of this continent it is replaced by its vicarious counterpart *H. australis* Greslebin & Parmasto.

Most of the specimens studied are without basidia and spores; the time or season of sporulation period is unknown.

**Misidentifications.** Several specimens filed under the name *H. tabacina* are misidentified; these are *H. cinnamomea* ssp. *spreta*, *H. curtisii*, *H. rheicolor* and (most frequently) *H. rubiginosa*. On the other hand, *H. tabacina* has been sometimes misidentified as *H. curtisii*.

### 29. **Hymenochaete tenuis** Peck

Figs. 2, *7*; 5, *8*

Peck, Ann. Rep. N. Y. St. Mus. Nat. Hist. 40: 57 (1887); Burt, Ann. Missouri Bot. Gard. 5: 364, f. 31 (1918); Léger, Hymenochaete 278, f. 107 (1998). - *Hymenochaete multisetae* Burt, Ann. Missouri Bot. Gard. 5: 357, f. 25 (1918); Reeves & Welden, Mycologia 59 (6): 1046 (1967).

Basidiomes effused, closely adnate, coriaceous when dry, velvety, thin, 50-400(-1000) μm thick, becoming confluent, 2-10 x 1-2 cm. Hymenium smooth, finely tuberculate, azonate, when old sometimes irregularly cracked, brown, very dark brown or almost black, sometimes cinnamon brown (M: 5-7.5 YR 4-5/4 or 4/6 to 5/8 (according to Léger, 1998: 5 YR 2-3/2-4); K & W: 5 F 8, 6 E-F 7 or 6 F 8, 6 D 8, raw umber, cognac or deep dark brown, or 6 C 6, caramel brown, rarely 5 C 4-5, brownish orange), without olive or lilac tint;

margin thin, indeterminate, then determinate (abrupt), concolorous with hymenium.

Tomentum and cortex absent; context composed of setal layer of overlapping rows of setae (or only one layer of setae); dark line above the hymenium absent.

Hyphal system monomitic; setal hyphae absent; generative hyphae compactly agglutinated, erect or interwoven, 2.5-4(-4.5) μm in diam, yellowish to brownish, with thickened walls to thick-walled, branched, septate; in context and hymenium crystalline matter absent.

Setae very numerous, (25-)30-60 x (5-)6-10(-12) μm, projecting to 40 μm, fusiform-conical or subulate, with acute or very sharp, some with slightly curved tip, not sinuate or sinuate (sometimes some twisted), naked, without incrustation.

Hyphidia and cystidia absent; basidioles present, without incrustation; basidia clavate or subclavate, 12-20 x 4-5.5 μm; sterigmata 4, 3-4.5 μm long; spores ellipsoid or subcylindrical, one side flattened or slightly concave, 4.5-5.5 x 2-2.5 μm.

**SUBSTRATA IN N. AMERICA. Sabal** serratula (3), **Thuja** sp. (1), **Tsuga** canadensis (4), Tsuga sp. (1). Mentioned also by G & L, 1995 on **Abies** balsamea, A. lasiocarpa, **Picea** glauca, Picea sp., **Pinus** ponderosa, **Pseudotsuga** menziesii, **Thuja** occidentalis.

**DISTRIBUTION IN N. AMERICA. USA:** AL (Reeves & Welden, 1967), FL (3), MI (2), NY (2), PA (2). Mentioned also by G & L, 1995: AR, AZ, MS, NM, VT.

**DISTRIBUTION ELSEWHERE. Mesoamerica**: Costa Rica; **Caribbean**: Cuba, Jamaica, Puerto Rico, Trinidad; **South America**: Brazil, Colombia, Venezuela. - On bark and decorticated wood of fallen limbs of coniferous and deciduous trees.

**TYPES STUDIED.** *H. tenuis:* USA, New York, Edmond ponds, on Thuja, June Peck (NYS, lectotype selected by Léger, 1998). *H. multisetae*: Cuba, Cellabos, 12/11 1914 C.J. Humphrey 2808 (BPI 348562).

**REMARKS.** Externally similar to *H. fuliginosa* and *H. jobii* but setae of these species are much longer, 60-110 x 7-11 μm. Basidiomata of *H. tenuis* have been described as only up to 120(-200) μm thick, but specimens collected on *Thuja* are sometimes very thick, up to 1 mm. Mean size and *Q* value of spores are:

5.14 x 2.29 2.24 (CFMR 3560)
5.20 x 2.29 2.27 (CFMR 3318)

**Misidentifications.** Most specimens filed under the name *H. tenuis* in herbaria have been misidentified; these belong mainly to *H. fuliginosa,* some to *H. jobii* or *H. cinnamomea.*

**30. Hymenochaete unicolor** Berk. & M.A. Curtis Figs. 2, *10;* 6, *3*

Berk. & M.A. Curtis, J. Linn. Soc. Bot. 10: 335 (1868); Burt, Ann. Missouri Bot. Gard. 5: 342, f. 16 (1918); Reeves & Welden, Mycologia 59 (6): 1048, f. 1 I (1967); Léger, Hymenochaete 283, f. 109 (1998). - *Hymenochaete fuliginosa* Berk. & M.A. Curtis, J. Linn. Soc. Bot. 10: 335 (1868) non (Pers.) Lév. (1846).

Basidiome perennial, effused, sometimes with thickened (reflexed) black densely sulcate upper margin, closely adnate, coriaceous to woody hard when dry, brittle, (100-)350-700(-1300) μm thick; at first as numerous orbicular patches 2-15 mm in diam, then merging and up to 20 x 5 cm; margin thin, later thick and abrupt. Hymenium smooth, azonate, irregularly cracked, sometimes lifting at the crevice edges and scaling off, Cinnamon Umber or yellowish brown (M: 7.5 YR 4.5-6/6 or 5 YR 4/4-6; K & W: 6 D 8, 6-7 E 4-5 or 6 F 8, Camel or Somalis brown), without olive or lilac tint; margin indeterminate, fibrillose or abrupt, concolorous or lighter coloured than hymenium (fulvous).



Tomentum and cortex absent; context composed of thin hyphal layer 10-200 (-300) μm thick and a thickening setal layer of indistinct overlapping rows of setae; dark line above the hymenium absent, or present as a narrow zone of intertwined hyphae of deep colour.

Hyphal system monomitic; context hyphae compactly arranged, at base interwoven; setal hyphae absent; generative hyphae 2-4.5 μm in diam, yellowish, with thickened walls; in context and setal stratum crystalline matter absent, or present in dark bands between setal rows, in hymenium absent or present.

Setae numerous, (25-)35-60 x 5-7.5(-8) μm, projecting to 40 μm, not bifurcate at base, subulate or fusiform, straight, some with slightly curved tip, not sinuate, naked or enmeshed in hyphal sheaths, without incrustation, tips acute.

Hyphidia present, not numerous, hyaline or yellowish, cylindrical or slightly conical, 2.3-3 μm in diam, thin-walled, without incrustation; cystidia absent; basidioles present, 6-10 x 3.5-4, without incrustation; basidia clavate or subclavate, 12-18 x 4-5 μm; sterigmata 4, 3.5-5 m long; spores ellipsoid, (3.5-)4-5 x 2.4-3.2(-3.5) μm.

**DISTRIBUTION IN N. AMERICA.** Not yet found.

**DISTRIBUTION ELSEWHERE. Mesoamerica:** Costa Rica, El Salvador; **Caribbean**: Cuba, Jamaica, Puerto Rico; **South America**: Brazil, Colombia, Ecuador, Juan Fernández Is., Venezuela; **Asia-Temperate**: Japan; **Australasia**: Australia, New Zealand. - On dead frondose wood (Nectandra sp., Nothofagus sp.), on bark of dead branches or leaf bases of palmae (Rhopalostylis sapida) and on unknown frondose substrata.

**TYPES STUDIED.** *H. unicolor:* Cuba, C. Wright 541 (K). *H. fuliginosa:* Cuba, C. Wright 188 (K).

**REMARKS.** Thick specimens of *H. unicolor* are externally very similar to *H. cervina* and *H. jobii* which differ in large setae (55-110 x 7-15 μm) and different spore size (4.5-5.5 x 2.2-3.2 μm in *H. jobii*, 5-7.5 x 3.5-4.3 mμ in *H. cervina*). **Misidentifications**. Most specimens filed under the name *H. unicolor* in herbaria belong to *H. cinnamomea* ssp. *spreta*; however, Massee (1890: 108) indicated *H. spreta* as a synonym of *H. unicolor.* This misinterpretation has been followed by several authors of "floristic" lists.

## DUBIOUS SPECIES

**31. Hymenochaete episphaeria** (Schwein.: Fr.) Massee

Massee, J. Linn. Soc. Bot. 27: 111 (1890); Burt, Ann. Missouri Bot. Gard. 5: 362, f. 28 (1918); DeFigio, Tax. anal. 55, f. 19, pl. 5 f. 19a (1970); Léger, Hymenochaete 132, f. 41 (1998). - *Thelephora episphaeria* Schwein. in Fr., Elench. fung. 1: 225 (1828).

Basidiome effused, closely adnate, coriaceous to hard when dry, 80-120 μm thick, 2-5 x 1-2 cm; margin thin. Hymenium smooth, azonate, irregularly cracked, orange, yellowish or golden brown or brown (yellowish brown, light brown to brown; Ridgway: Buckhorn-brown to Tawny olive or Verona brown), sometimes with olive tint; margin indeterminate, concolorous with hymenium or lighter coloured.

Tomentum and hyphal layer absent; context composed of cortex and a setal layer, or setal layer only; setal layer present as a layer of hyphae with scattered setae in all levels of it; dark line above the hymenium absent.

Cortex 30-40 μm thick; hyphae very compactly interwoven (cemented), with thick brown walls.

Hyphal system monomitic; setal hyphae absent; generative hyphae 2.5-4 μm in diam, red-brown, thick-walled; in context and hymenium crystalline matter absent.

Setal layer 70-110 μm thick; setae numerous, 60-90(-110) x 7-12(-14) μm, projecting to 50 μm, subulate to fusiform, with almost blunt tip, straight, naked or enmeshed in hyphal sheaths, encrusted with amorphous granules or crystals in upper part.

Hyphidia absent or not numerous to numerous, cylindrical or slightly conical, to 3 μm in diam, thin-walled, without incrustation; cystidia absent; basidia subclavate or (sub)utriform, 15-21 x 3.5-4(-6) μm; sterigmata 4; spores cylindrical or ellipsoid, 4-6.5 x 1.5-2.2 μm. (Description based on the literature data cited above.)

**SUBSTRATE IN N. AMERICA. Diatrype** sp. (Fungi, Ascomycetes).

**DISTRIBUTION IN N. AMERICA. MEXICO**: VC (Orizaba, J.G. Smith 571, BPI 278133; see remark below). **USA**: PA (type specimen, see below).

**TYPES STUDIED.** *Thelephora episphaeria:* USA, Pennsylvania, Bethelem, in Diatrype, Schweinitz (PH, holotype; BPI, isotype).

**REMARKS.** The type is up to 100 μm thick, effused, closely adnate. Hyphal system monomitic; generative hyphae 2.5-4 μm in diam, with thickened or thick walls, sparsely branched, septate. Setae broadly conical, with obtuse tip, 45-70 x 10-15 μm. No cystidia or hyphidia; basidia not developed, no spores.

The type of this species is sterile, as well as most other specimens identified as this species and studied later by Léger (1998: 132) or by me. DeFigio (1970) and Léger (1998) described a cortex present in this species; in the specimens studied by me, this layer may be called a hyphal layer. DeFigio described the species as having urniform basidia with thickened at the base walls and spores 6.0-8.5 x 2.5-3.5 μm; these characteristics have not been mentioned by other authors.



The identity of this dubious species is unknown; it is possible that its type and several specimens described under this name are a young state of *H. corrugata*. The other specimens studied by me are possibly young or/and sterile states of following species:

*H. cervina (? H. jobii):* New York, McLean, the Lloyd-Cornell Preserve, 5 Sep 1952 J.A. Stevenson & M. O'Brien (BPI 278134).

*H. cinnamomea* ssp. *spreta:* NY, Albany, *Castanea dentata,* Oct 1907 C.G. Lloyd 7120 and 44562 (BPI 278135 and 330868); Vermont, Middlebury, Oct 1907 C.G. Lloyd 7221 and 20605 (BPI 278126 and 330867); Wisconsin, LaCrosse Co, Gundersen Arboretum, 21 Sep 1979 W.B. & V.G. Cooke 57561 (BPI 299846).

*H. corrugata:* MA, Weston, A.B. Seymour (MOBG 18358 / BPI 0278130); [PA, Trexlertown ?] Dr. Herbst (Lloyd 20601, BPI 330866); OH, Cincinnati, A.P. & L.V. Morgan (BPI 278132).

*H. rhabarbarina (?):* LA, St. Martinsville, on living cypress tree, 20 Jun 1914 G.J. Humphrey 2516 (BPI 278128).

*H. tenuis:* TN, Memphis, 18 Feb 1914 C.L. Shear (BPI 278127).

A specimen named as *H. episphaeria* has well developed basidia and spores 5-6(-7) x 1.5 μm, slightly allantoid: Mexico, Orizaba, J.G. Smith 571 (BPI 278133). This specimen has brownish basidia with slightly thickened on base walls; possibly the description of basidia by DeFigio (1970: 56) is based on it. Identity of this collection is unknown.

**32. Hymenochaete opaca** Burt

Burt, Ann. Missouri Bot. Gard. 5: 364 (1918); Reeves & Welden, Mycologia 59: 1046 (1967); DeFigio, Tax. anal. 57 (1970); Léger, Hymenochaete 205, f. 76 (1998).

Basidiome effused, closely adnate, 100-300 μm thick; hymenium smooth, azonate, sometimes irregularly cracked, brown or dark brown, without olive or lilac tint; margin thin, abrupt, concolorous with hymenium or lighter coloured.

Tomentum and cortex absent; context composed of setal layer of overlapping rows of setae only; dark line above the hymenium absent.

Hyphal system monomitic; setal hyphae absent; generative hyphae 2-3 μm in diam, yellowish to brownish, septate, branched.

Setal layer 100-300 μm thick; setae numerous, (60-)70-90 x (7-)8-11 μm, projecting to 65 μm, fusiform, straight, encrusted in uppermost part with small crystals.

Hyphidia and cystidia absent; basidia 15-18 x 3.5 μm; spores cylindrical, slightly curved, 5.5-7(-7.5) x 2-2.2(-2.5) μm. (Description adopted from the book by Léger, 1998.)

**DISTRIBUTION IN N. AMERICA.** Mentioned from AL, FL, LA and Mexico by Reeves & Welden (1967: 1047), but presumably erroneously (Léger, 1998: 205-207).

**DISTRIBUTION ELSEWHERE. Caribbean:** Jamaica.

**REMARKS.** A doubtful species, possibly closely related to *H. jobii* or *H. tenuis*.

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