Neotropical polypores Part 1

Introduction, Ganodermataceae & Hymenochaetaceae

Synopsis Fungorum 19

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Papers are accepted by invitation only.

Nomenclaturial novelties proposed in this volume:

New species:

New combinations:

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Abstract

21 neotropical species of *Amauroderma*, 20 of *Ganoderma*, 1 of *Haddowia*, 1 of *Aurificaria*, 9 of *Coltricia*, 3 of *Coltriciella*, 3 of *Cyclomyces*, 25 of *Inonotus*, 60 of *Phellinus* and 6 of *Phylloporia* are described and in parts illustrated.
Keys to genera and species are provided.
Amauroderma elegantissimum Ryvarden & Iturriaga, *Amauroderma deviatum* Ryvarden *Ganoderma citriporum* Ryvarden & Iturriaga, *Ganoderma elegantum* Ryvarden, *Ganoderma guianensis* Decock & Ryvarden, *Phellinus luteus* Ryvarden, *Phellinus neonoxius*, Ryvarden, *Phellinus semihispidus* Ryvarden and *Phellinus turbinatus* Ryvarden are described as new.
The following new combinations are proposed: *Amauroderma brasilensis* (Singer) Ryvarden, *A. dubiopansum* (Lloyd) Ryvarden and *Phellinus detonsus* (Fr.) Ryvarden

Contents:

1. INTRODUCTION

This mycota is a follow-up to "Polypores of North America" (Gilbertson & Ryvarden 1986-87), "European Polypores" (Ryvarden & Gilbertson 1993-94) and manual East Asian Polypores (Nunez & Ryvarden 2000 & 2001). It seems useful and natural to produce a similar work for tropical America.

The reason is partly that this area has a very rich mycota of polypores and wood-inhabiting fungi in general and further exploration has been hampered by lack of suitable manuals shortcomings as a first edition always will have.
Furthermore, communication between mycologists around the world has improved, settling many taxonomic questions and leading to a more uniform use of names.
I hope that this mycota may contribute to this process and help promote a better exchange of information within this group of fungi.

The format is basically the same as in the previous mycotas and as before the species are described in a standardized style so it should be easy to compare diffierent species and find pertinent information. Due to the large number of species found in tropical America, I have placed Ganodermataceae and Hymenochaetaceae in the first volume, while the rest of the polypores will be found in part 2 and 3.
The genera and species have been placed alphabetically without regard to relationship, as this will make the mycota easier to use.

It is inevitable that mistakes will have crept in and omissions will have occurred. I will of course be grateful for information about such cases and for suggested improvements. My address is given on page 4.

In these volumes I have tried to include all fungi that would naturally be sought in a mycota of polypores, although I acknowledge that these are a mixed group of families with different phylogenetic histories. I have included *Lentinus* as it is clear that the genus belongs in Polyporaceae even if it has gills, which by the way is also the case with some genera of polypores.

In the Corticiaceae (*s. lato*) there are a few species with a distinctly poroid hymenophore, and they have been included here. However, in this family transitions exist in some genera (like *Trechispora* and *Sistotrema*) from smooth to poroid hymenophores. In doubtful cases notes regarding the development of pores have been added under each species where appropriate.

Scope

North American polypores (Gilbertson & Ryvarden 1986-87) include all polypores known from United States and Canada at the time it was published. Many of these species are restricted to different conifers and it is obvious that many of them follow the pine further to the south, i.e. to Guatemala and Cuba. Since this manual basically is aimed at species in lowland tropical forests, i.e. on hardwoods, species known exclusively on conifers in America are excluded from this manual. For specimens collected on *Pinus* spp, the reader is referred to the manual mentioned above.
It is also obvious that along the Andes and also some mountains in Central America some boreal species are known and more will certainly be found. They have to my best ability been included here although they are not tropical in the usual sense as they have their main distribution in temperate and boreal areas, although they are found in what is usually called a tropical country.
The geographical scope of this manual is by necessity somewhat vague as I have included species known from southern Mexico to Northern Argentina. Temperate to boreal species found only in the highland of Mexico are excluded, the same goes for species known from the southern part of the continent, for example the *Nothofagus* zone. The set of polypores found here is boreal to temperate with links to the similar areas in the Northern Hemisphere and to the *Nothofagus* areas in New Zealand and Australia.

Macromorphology

In contrast to most agarics, where the basidiocarps typically develop in the soil and the last stage is more or less a matter of tremendous expansion, basidiocarp development among polypores is preceded by a vegetative stage. Inside the host this vegetative stage can be a vast network of hyphae while on the surface a mycelial mat may emerge from which the mature basidiocarp develops, often after a considerable span of time. Such sterile mats are frequently collected, especially among the resupinate polypores, and normally they should be discarded. In other cases a sterile knob-like stage may be found which can sometimes be identified because of its structure, colour, scent, etc. However, such collections will normally be of restricted value.

Macroscopic Characters of the reproductive stage

Types of basidiocarps

Some polypores are rather versatile with regard to basidiocarps, but for most species the shape, attachment, colours, etc. are distinct and are important characters. The most common types of basidiocarps are shown in fig. 1. However, it is important to note that in some species there may be a development from resupinate to effused-reflexed basidiocarps and that both resupinate and distinctly pileate basidiocarps may occur on the same log or stump. Thus it is necessary to use the terms with discretion and understanding.

Attachment of basidiocarps
In addition to the type of basidiocarp, the attachment may also be distinctive. A pileate basidiocarp may, for example, be broadly sessile or may taper at the base almost to a stipe. Again there may be transitions in some species while others are consistent. Fig. 2 shows different types of attachment.

Consistency
With some experience it is often possible to determine hyphal structure in the field, based on the consistency of fresh basidiocarps. Perennial basidiocarps with a dominance of skeletal hyphae will normally be woody, while the trimitic ones will be tough and difficult to tear apart. Monomitic ones may be soft or very sappy and may shrink considerably during drying, often accompanied by a colour change.

Scent and taste
Most polypores have no distinct taste or scent, but some species (e.g. *Haploporus odorus, Trametes suaveolens* and *Gloeophyllum odoratum*) have very distinct scents. Such a character should be recorded as it has a tendency to disappear on drying or storing. Except for *Hapalopilus nidulans*, no polypores are poisonous as far as we know, but many have a bitter taste.

There are not many edible polypores, those most popular being species of *Albatrellus. Boletopsis* species, *Meripilus giganteus, Grifola frondosa*, and *Fistulina hepatica* are also eaten from time to time.

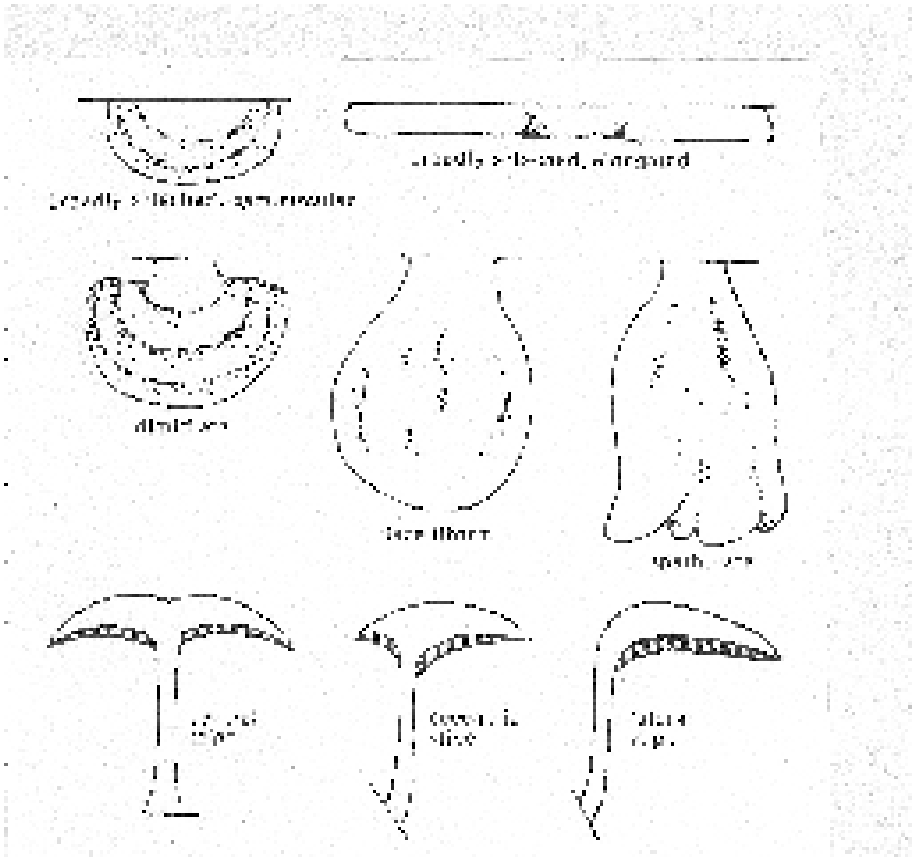


Fig. 1. Types of basidiocarps

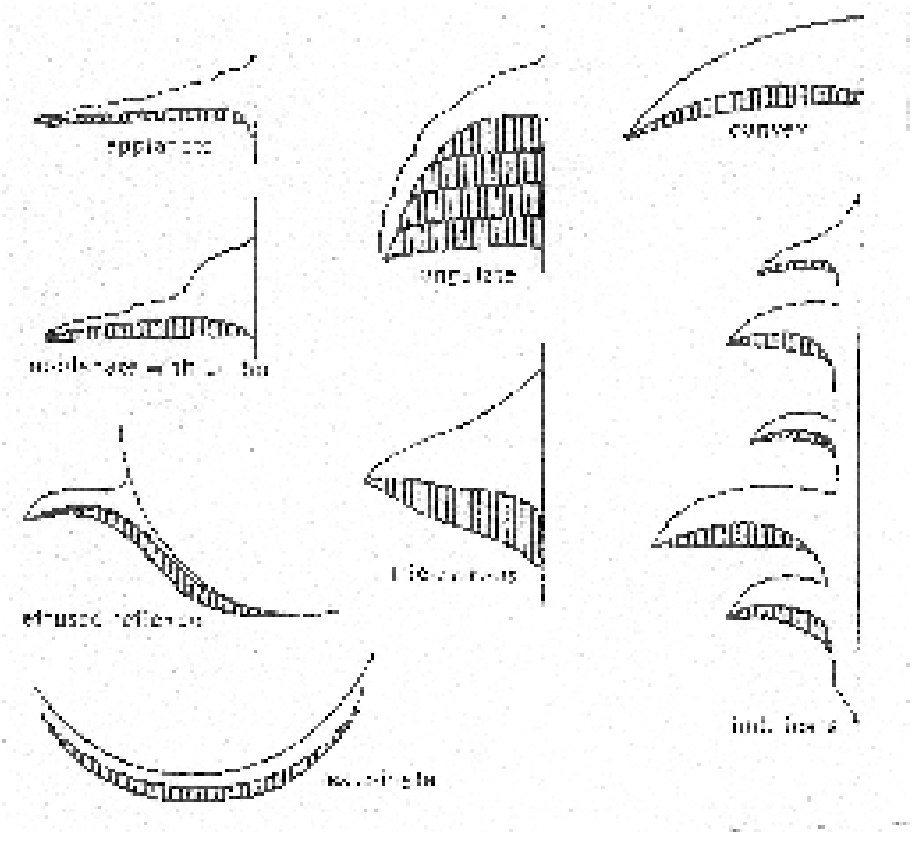


Fig. 2. Basidiocarps and their type of attachment to the substratum.

greenish tint. Furthermore, in other species the hairs may wear away with age or become agglutinated and attached to the surface as warts, or lines of scrupose tufts of hyphae. This is often seen for example in *Gloeophyllum sepiarium*.

In some species there is a distinct dark cuticle below a tomentum and with age the hairs may fall off, often zone wise, exposing the cuticle which will then contrast strongly with the more light-coloured tomentum. A good example is *Trametes versicolor* where the number of zones and their colour may vary tremendously.

In Japan there is a large industry based on the cultivation of *Polyporus umbellatus* and *Grifola frondosa*, and dried specimens of these species can be bought in supermarkets.

CONSTRUCTION OF THE BASIDIOCARPS

Pileus surface

In many species the pileus has a distinct colour which remains reasonably unchanged throughout the life span of the basidiocarp. This is true for many species with brown tissue.

The colour is apparently due to complex polyphenols, which are very resistant to degradation by natural causes. In other species the colour may fade because weathering has destroyed the pigments in the pilear surface. *Pycnoporus sanguineus*, a species with brilliant reddish basidiocarps, is an excellent example of this. White and light-coloured species frequently become darker with age as the upper layer of hyphae collapses and becomes darker in ochraceous to brownish shades, resulting in a distinct zonation from the base to the margin where new hyphae are actively developing. This is typical in perennial basidiocarps. In *Phellinus* it is common to see blackish basidiocarps with a whitish to pale yellowish margin in which the hyphae are still thin-walled and almost hyaline. In the basal part the hyphae will be solid, dark-coloured and agglutinated to a nearly indestructible mass. In some species which normally have light-coloured basidiocarps, a thin, black or deep reddish cuticle may develop from the base, making the pileus strikingly bi-coloured. A section will reveal that the coloured layer is very thin. Such a cuticle is of little taxonomic significance as one may often find specimens with and without such a layer in a large collection.

The pilear surface may be glabrous or covered with hairs of different types. When glabrous the surface may be dull or shiny, in some cases with a distinct cuticle. In most cases such a cuticle will have no special structure, while in other species it may be very distinct, as in *Ganoderma* spp. where it consists of many dense palisade of club-like hyphal cells.

A glabrous pileus may be smooth without any zonation, radial lines or raised ridges. However, it is often common to see a distinct sulcate zonation reflecting different stages of growth commonly combined with some radial lines or raised edges. The latter may become more prominent on drying as basidiocarps of many polypores have a tendency to shrink slightly when dried.

For some species the pileus cover may have a distinct character, although it may be difficult to describe it properly. The reason is that pilear hairs, which are normally composed of hyphae, have a variable development according to weather conditions. In wet weather the hyphae are seemingly shorter and more agglutinated than in dry weather. Basidiocarps of some species with hairs on the pileus are long-lived or perennial and often algae are established between the hairs, giving the pileus a

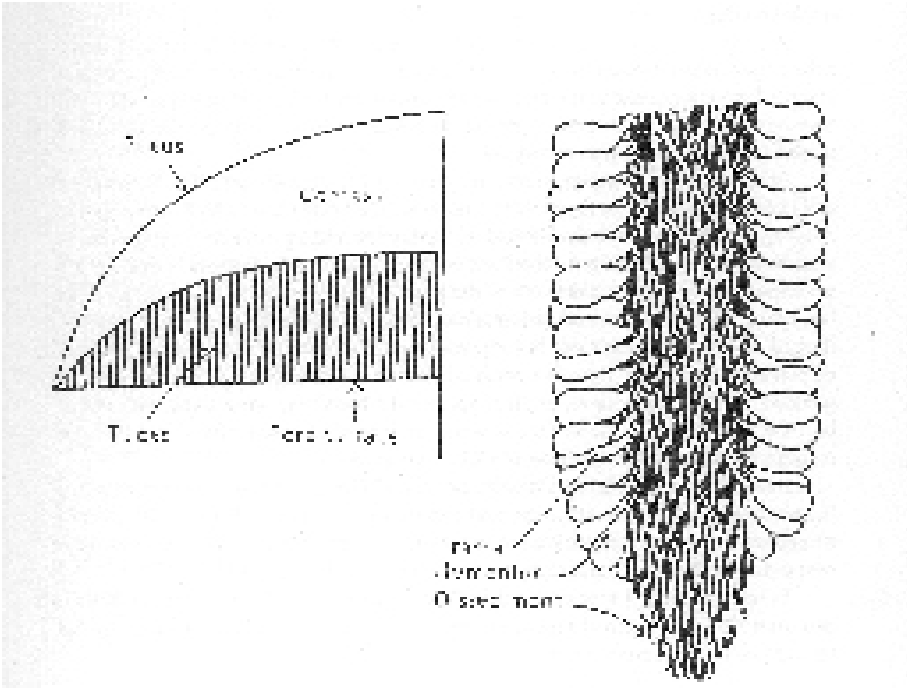


Fig. 3. Section of a pileate basidiocarp and outer part of a pore.

Pore surface

The colour of the pore surface is characteristic and diagnostic for many species. With age, or in some cases through bruising, it has a tendency to become darker and this has to be remembered when using keys. More important than the colour is the shape of the pores and their size. For most species the number of pores per mm or cm is a fairly consistent character although the pores often have a tendency to become larger with age and in large specimens. There are also exceptions to round or angular pores and sometimes the pores become irregular, sinuous to labyrinthine.

While some species have consistently poroid basidiocarps, there are a few confusing ones where the hymenophore may change with age and development. Examples are *Gloeophyllum* spp. and *Trametes elegans*. In all these species poroid specimens have been found side by side with lamellate ones and single basidiocarps may even be variable in different parts of the hymenophore, indicating that configuration of the hymenophore may not be so strongly genetically fixed as often assumed.

With age the dissepiments in some species may become incised or dentate as they develop at different rates. In such cases it is normally easy to observe that the

In many perennial species the pileus may crack with age, either in radial lines or in an irregular pattern of angular pieces, often so strongly and characteristically that the surface is called “rimose”.

Margin

Especially for species with resupinate basidiocarps, the margin and its development may be an important character. Most species have a more or less continuous margin several mm wide, often white or light-coloured. The hyphae grow at an equal rate and the margin becomes soft and finely tomentose, especially when viewed by a lens. However, there are species where strands of hyphae or rhizomorphs are developed, often in a particular way. Such a character will normally be important. For other species the margin can end abruptly with an almost vertical slope. Such basidiocarps often have a tendency to curl up and loosen along the margin on drying.

Stipe

The attachment of the stipe to the pileus is shown in fig.1. The consistency and colour of the stipe will normally be that of the pileus. However, in a few species the stipe may be differently coloured, for example *Polyporus varius* and *P. melanopus* where the stipes are darker than the pilei. The tubes can be more or less decurrent on the stipe, especially when the stipe is expanding upwards and the whole basidiocarp has a conical shape. In other cases, such as in many *Polyporus* species, the stipe has the same width from base to pileus.

There are species where an applanate basidiocarp is so strongly fan-shaped or tapering towards the base that it may be difficult to decide whether a true lateral stipe is present or not. In such cases only experience will help, but if there is a distinct non-poroid area on the lower side of the base close to the attachment, it is a good indication that a lateral stipe is present.

In a few species more than one pileus may develop from a common stipe or elongated base. In such cases the pilei will be fan-shaped and overlapping at the circumference of the basidiocarp. Very rarely circular pilei are found in specimens with many pilei from a common stipe *(Polyporus umbellatus*). In section a stipe may have a cuticle such as in the *Polyporus melanopus*-group. In addition, it may be hollow or duplex with a loose outer layer over an inner denser core. Thus it will normally be useful to section the stipe longitudinally to check its structure.

Sclerotia

A few polypores develop an underground sclerotium consisting of a dense mass of hyphae. Very often the collector is not aware of the sclerotium as it is deeply buried in the substratum, as in *Polyporus tuberaster*. It has been demonstrated that some species may develop basidiocarps on dead wood, although they are connected to sclerotia in the ground below. Thus, presence or absence of a sclerotium has not been used as a character in the keys to genera and species.

basal parts of the tubes are coherent and that one is confronted with a polypore and not a true hydnoid species. However, there are cases where this may be difficult to see as the tubes are split to the very base. In such cases the resulting spines are often somewhat irregular and flattened and with teeth of unequal length from the margin towards the central part of the basidiocarp. A small number of such species are included in this manual because we are convinced, with evidence from their hyphal structure, that they belong among the polypores more than with hydnoid fungi as seen in the Thelephoraceae and Corticiaceae *s. lato*.

The pores or lamellae are indicated as a certain number per mm or cm. This measurement has to be taken tangentially to the margin as many pores have a tendency to become radially elongated with age. It is important to take measurements in several places to avoid atypical development. It may be convenient to cut a mm paper in small bits and place a piece on the pore surface and count through the lens.

It is important to note that the number of pores per mm does not automatically indicate how easy the pores are to see. In some perennial species the dissepiments are so thick that even if the pores are only 4-5 per mm, they are almost invisible to the naked eye. In a species with thin dissepiments there may be 7-10 pores per mm with the same pore size.

Tubes and context

In most species the tubes are more or less concolorous with the pore surface but with age may become paler than the pore surface. In many species there is no apparent difference either in colour or consistency between the tubes and the context or subiculum. However, in other species the tubes may have a different colour, consistency and even hyphal system than the context. These differences may be important taxonomic characters, and a specimen should therefore always be sectioned to observe the tubes and context. In some genera such as *Gloeoporus*, there may also be a distinct zone or dense layer between the tubes and the context.

The context is the sterile part of a basidiocarp between the tubes and the pilear surface. In the Corticiaceae *s. lato* the sterile part between the tubes and the substratum is often called the subiculum although there is no difference in principle between these two types of tissue. In most species the context is homogeneous with regard to both colour and consistency and will normally have a radial structure as the hyphae grow from the base towards the margin. However, in some species the context is distinctly duplex, the lower part being dense and without apparent structural direction while the upper part is more soft and fibrous and often intergrading with a pileus tomentum. In species like *Cerrena unicolor, Trametes versicolor* and *Datronia mollis*, there is a black zone between a lower dense context and an upper loose context or pileus tomentum. Such a zone is always best developed at the base and for some species it is an important and reliable character.

In some species with duplex consistency the tomentum and the lower context may have different hyphal construction, and binding hyphae will normally never be

present in the tomentum.

A mycelial core is present in the context of a few species such as *Fomes fasciatus*, *Inonotus rheades* and some others. The core is usually a spherical body close to the substratum and will normally be mottled with light-coloured spots or streaks of a different, looser, cheesy or granular structure than the context. In young specimens a mycelial core may be difficult to observe because it is tiny, and a good section has to be made to find the original point of attachment where the basidiocarp started to develop.

Micromorphology

In the following sections the different microscopic characters in polypores are described and discussed. For a more comprehensive overview of these characteristics and their presumed relationship see Ryvarden (1991).

1. Hyphae

The basidiocarp consists of hyphae and for a long time no particular attention was paid to them, although there were scattered remarks as to their thickness and colour, etc. Very rarely the septation was mentioned. Ames (1913) was the first to realize that the hyphae were important for an understanding of the polypores, but it was Corner's (1933) descriptions of the hyphal system which gave mycologists a new taxonomic tool, and his discovery was a major step towards a more consistent and reliable classification of this group of fungi. Corner's hyphal classification has been somewhat modified in recent years as experience has shown that hyphal analysis is considerably more complicated than originally assumed.

Generative hyphae

Fig.4

Generative hyphae are the basic units of structure since they are always present in a basidiocarp and give rise to all other types. The initial stage of the basidiocarp will be composed of such hyphae and in some cases will continue to be composed of such hyphae right up to the development of basidia and basidiospores. In other cases vegetative or secondary hyphae may arise from the generative hyphae (see below).

The type of septation in the generative hyphae is a very important character in the classification of polypores and in difficult cases, such as species with resupinate basidiocarps, this character has to be observed and recorded before a reliable determination can be reached. The septum between two hyphal cells can either be simple or result from the formation of a clamp, in rare cases from several clamps. The septation of the generative hyphae is a fundamental characteristic as it is consistent for a species. Only in few species are there both multiple clamps and simple septa on the generative hyphae. Some genera include species with both single clamps and simple septa, e.g. *Albatrellus*. In the Corticiaceae this phenomenon is more frequent.

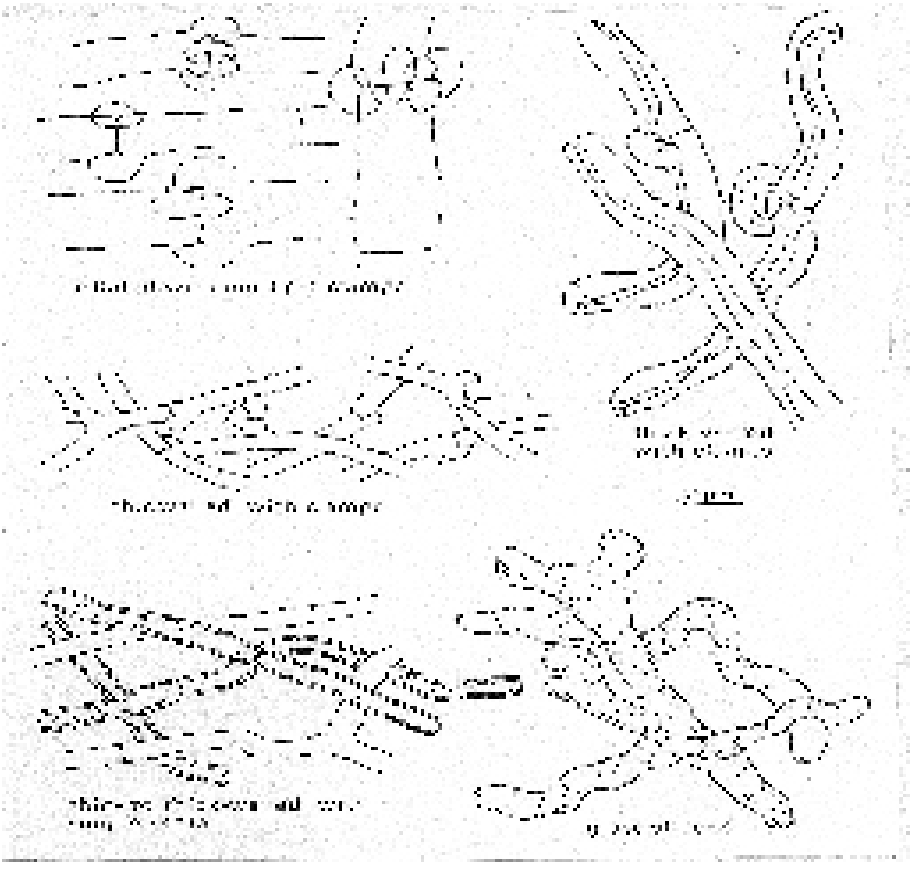


Fig. 4. Types of generative and gloeoplerous hyphae.

It may often be difficult to interpret septation properly if the clamp is just below or above the septum and seen in face view rather than in side view. Several septa must therefore be observed to reach a reliable conclusion. In simple-septate species, the septation at the branching of hyphae may sometimes look very similar to a clamp because the branch may bend back and pass behind the parent hypha. To be sure, it is best to look for septa in unbranched hyphae.

The inexperienced student may also be misled by adventitious septa. They arise when the protoplasm dries up inside thick-walled hyphae, which do not collapse during drying. Such dried protoplasm may then appear as a dark line across the hypha, but will normally be much thinner than the hyphal wall, while the true septum will have the same thickness as the rest of the hyphal wall. If generative hyphae are difficult to find, the dissepiments or the margin are good places to search. In some

species the hyphal width may vary quite considerably while in others the generative hyphae are remarkably uniform. Thus it is important during a microscopic examination to note this down together with the hyphal diameter.

The wall thickness of generative hyphae may vary considerably although they are mostly thin-walled. In some species, however, a considerable thickening may be observed and in such cases non-septate segments may easily be taken as skeletal hyphae. Such hyphae are most common in the context of certain monomitic species, such as *Ischnoderma resinosum*, and are often called sclerified generative hyphae. Thus it is important to examine some hyphae over a considerable distance to exclude the occurrence of clamps or simple septa before a hypha is defined as "skeletal" instead of "sclerified generative". Also, since generative hyphae give rise to all other types, it is not unusual to see segments of the same hypha with an abrupt transition between generative and skeletal separated by a clamp.

Gloeoplerous hyphae

Fig. 4

In some polypores there may be wide, thin-walled hyphae with refractive contents that are distinctly different from the normally hyaline generative hyphae. Such hyphae are called gloeoplerous hyphae. They are often yellowish and the contents may be homogeneous or grainy. In some cases the contents darken when observed in Melzer's solution or stain brightly with phloxine.

The occurrence of gloeoplerous hyphae is rather scattered in the Polyporaceae *s. lato*, and they have taxonomic significance only at species level.

Vegetative hyphae

Vegetative hyphae have by definition, no septa. They arise from a septum or clamp and can have a restricted growth, which is especially the case with binding hyphae, or almost unlimited growth, which is often the case with skeletal hyphae. In rare cases they may be intercalate, i.e. a skeletal hypha may arise from a septum and may then again end abruptly via a septum and develop further as a generative thin-walled hypha.

In trimitic species, it is normally easy to distinguish skeletal hyphae from binding hyphae. However, in many species this is not the case as there are transitions from unbranched skeletal hyphae to more branched types, as is the case with the skeleto-binding hyphae of *Polyporus s. str*., or the arboriform hyphae of the Ganodermataceae. In such cases the aspects of the vegetative hyphae are described in detail.

Skeletal hyphae

Fig.5

A skeletal hypha is normally unbranched and thick-walled to solid. In some species however, it is possible to find sparingly branched solid hyphae without septa, which in this manual will be called skeletal hyphae. Normally a skeletal hypha will have an even diameter throughout most of its length while a binding hypha proper normally has tapering side branches from a main stem.

In the Ganodermataceae and several *Perenniporia* spp., there are arboriform hyphae. They are unbranched up to 200 µm and then form tree-like branches. If loose segments of such hyphae are observed separately, they may easily be taken for binding hyphae. In some species it is necessary to examine long segments of suspected skeletal hyphae to be sure that no clamps or simple septa occur and that sclerified generative hyphae are not misinterpreted. Only experience will help here, because such hyphae can be very similar to skeletal hyphae proper. Pegler (1996) has called this type of hyphal system as "amphimitic".

Under a phase contrast microscope skeletal hyphae are light refractive because of the thick walls. In the apex they will be thin-walled, often rather abruptly so. Some adventitious septa may occur at the apices since they are more densely filled with protoplasm than the older parts.

Skeletal hyphae should be mounted in Melzer's solution, because in some species they react and change colour to strongly reddish brown (dextrinoid reaction) or greyish-bluish (amyloid reaction). As Melzer's solution itself is pale yellowish, it is inevitable that hyphae mounted in it will also appear slightly coloured. Such a weak colouration should not be confused with a dextrinoid reaction.

When mounted in 3-5% KOH the skeletal hyphae of some species become gelatinized or strongly swollen with blurred outlines. A change of mounting medium is then necessary to ascertain the true nature of the vegetative hyphae. The use of KOH has its advantages for those working with a phase-contrast microscope, but both basidiospores and hyphae have a tendency to swell slightly and give measurements somewhat larger than those reported from measurements in Melzer's reagent, cotton blue, and other media.

Binding hyphae

Fig. 6.

Binding hyphae are branched, solid to very thick-walled, non-septate hyphae which often have a more randomly oriented growth than skeletal hyphae. In trimitic genera like *Trametes* and *Coriolopsis*, they are intricately intertwined between the more radially (in the context) or vertically (in the trama) oriented skeletal hyphae. Such binding hyphae are short-branched with tortuous side branches, and normally thinner and far more sinuous than skeletal hyphae.

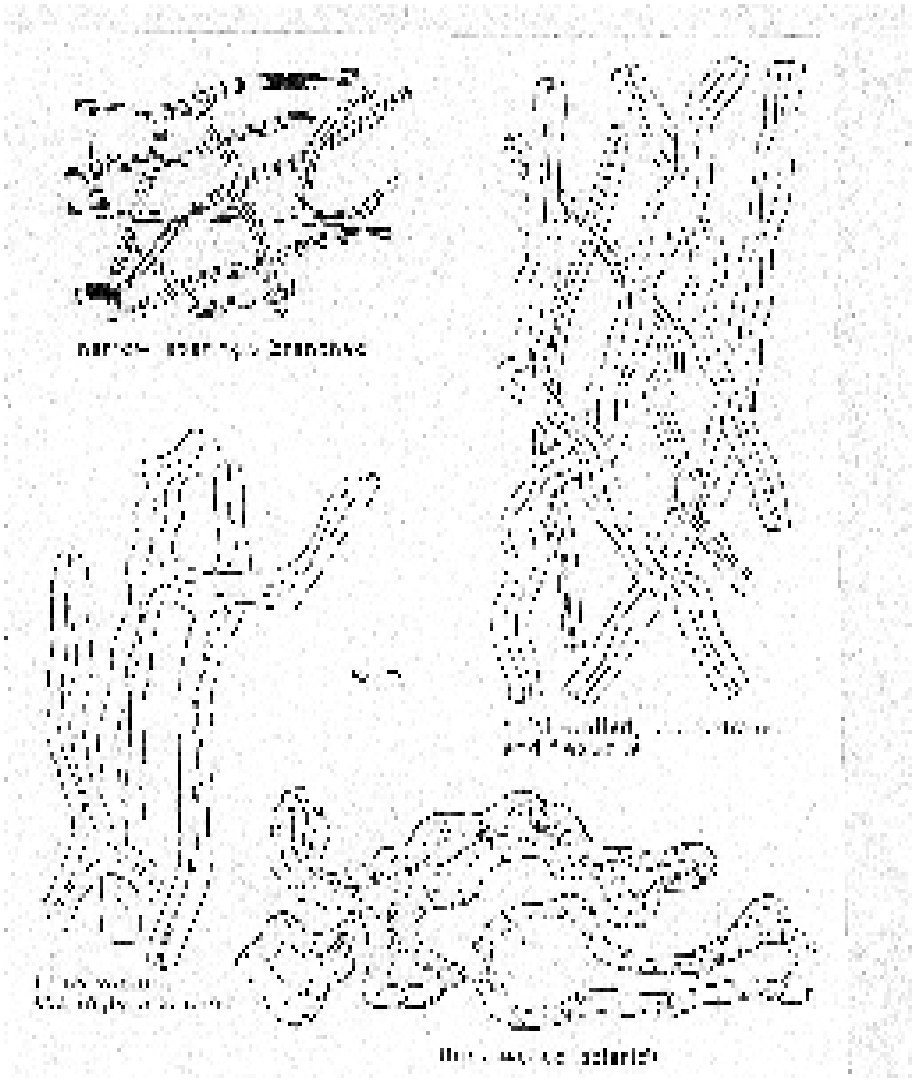


Fig. 5. Skeletal hyphae and sclerids.

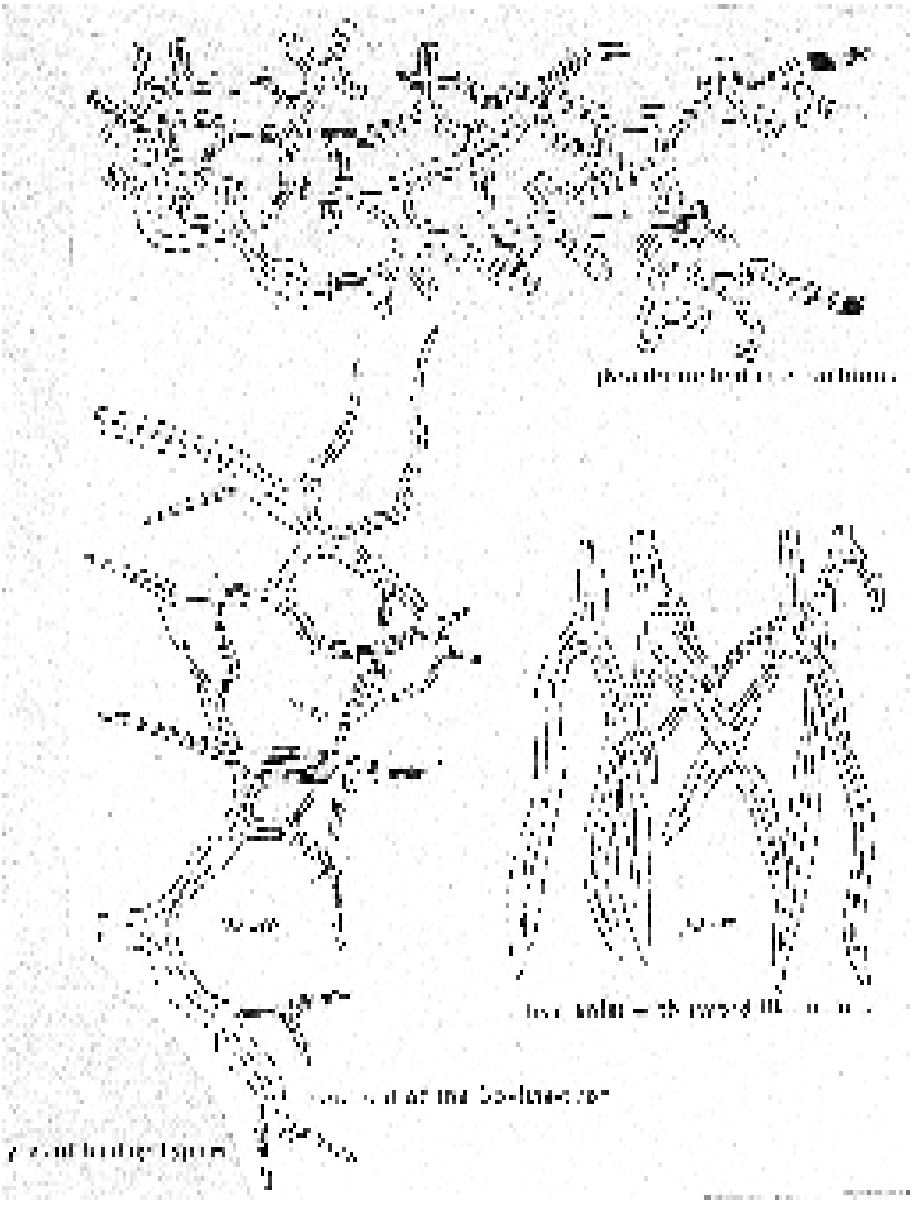


Fig. 6. Types of binding hyphae

They arise from generative hyphae. Among the polypores, skeletal hyphae are much more widespread than binding hyphae.

The vegetative hyphae in *Echinochaet and Polyporus,* and *Pseudofavolus* are called skeleto-binding hyphae. They arise either terminally or intercalary from generative hyphae. Single to branched binding processes with tapering ends arise from the main axis, which in many cases is a transformed generative hypha.

Hyphal construction of the pilear cover

In species with a distinct pilear cover, it may often be useful to check the hyphal system in the tomentum. In most trimitic species the tomentum will consist of skeletal hyphae mixed with some scattered generative hyphae.

In monomitic species, the tomentum will of course be composed of generative hyphae, often with a considerable thickening of the walls and wider than those of the trama. In the Polyporaceae and Hymenochaetaceae a cuticle or crust will normally be composed of densely agglutinated hyphae without diagnostic value. In the Ganodermataceae on the other hand, there are numerous species with a palisade of hyphal ends, the shape and size of which can be important. The hyphae arise from generative hyphae, but the clamps generally disappear as the walls increase in thickness to 3 or 4 µm. A few species like *Inonotus munzii* have distinctively branched, antler-like elements on the pilear surface.

Hyphal construction and development of the context

The hyphal construction of the context is important as in many species it is different from that of the trama, and thus of diagnostic value. It may change considerably during different stages of development. For example, immature basidiocarps of *Polyporus squamosus* consist mainly of generative hyphae with conspicuous clamps. Mature specimens have a context composed mainly of binding hyphae and generative hyphae which are difficult to discern. In species with vegetative hyphae the context will eventually be composed invariably of skeletal hyphae, and will remain so in the dimitic species. However, in trimitic species binding hyphae will develop, presumably because strain on the pileus increases with age. Thus, a fragment from the basal parts of the context will normally include all types of hyphae present in the context.

Hyphal construction of the trama

The trama is in many species of a different construction than the context and this will often be apparent to the naked eye as it has a different colour from the context. As the trama is developed vertically the hyphae are normally more or less parallel, but in some species the vegetative hyphae may be intricately intertwined and difficult to separate. Thus, it is important to take a section along the trama to ascertain the general structure. Especially in *Phellinus*, there are striking differences from one species to another in tramal construction. Vegetative hyphae are normally

confined to the central trama and are surrounded by generative hyphae forming a subhymenium from which the basidia are developed. Besides generative hyphae and vegetative hyphae (mostly skeletal hyphae), gloeoplerous hyphae may occur. As stated under the section on cystidia (below), skeletal hyphae may project or bend into the hymenium and will then be called cystidia. Setal hyphae in some species of *Phellinus* and *Inonotus* may occur in the same way and will then be rather conspicuous.

Structure of the dissepiments

For most species the dissepiments are composed of sterile hyphal ends, either generative alone or mixed with skeletal hyphae. These hyphal ends may be encrusted and could then be easily interpreted as some sort of cystidia. However, such an encrustation is normally irregular with scattered crystals, as in *Schizopora*, or regular and dense on most hyphae. They will then be called encrusted hyphae rather than cystidia. In a few species (e.g. *Datronia* spp.) there are finely branched dendrohyphidia (Fig. 8) in the dissepiments, often covered with fine crystals that obscure their true nature. A very careful observation will be necessary to reveal their presence.

2. Basidia

Like other hymenomycetes, polypores have a continuous development of basidia over periods that vary from several days to many years. Consequently basidia in all stages of development may be found in any actively sporulating basidiocarp.

Most polypores have four-spored basidia which are more or less clavate and hyaline. Their size varies considerably from species to species and may be an important taxonomic character. If clamped generative hyphae are present in the context and trama, the basidia will have a basal clamp.

Elmerina and *Protomerulius* have septate basidia, since these genera belong in the Heterobasidiomycetes. In order to determine the true length of basidia from the basal septum to the apex it is necessary to crush out some very thin sections to separate individual basidia. This is somewhat difficult to do and provides a good test for the skill of the polyporologist.

3. Basidiospores

Basidiospores are accepted as important for classification of the Basidiomycetes, and this is also the case for the polypores. Specimens collected during periods when active sporulation is not in progress may have few basidiospores or apparently no basidiospores at all. This is probably one of the most difficult problems in the identification of polypores. The ability to cut good thin sections and to find basidiospores is a skill that anyone interested in polypores must have. Many species can be reliably determined without basidiospores, but for other species examination of the basidiospores is necessary for a determination. This is the case for species with resupinate basidiocarps.

Spore size

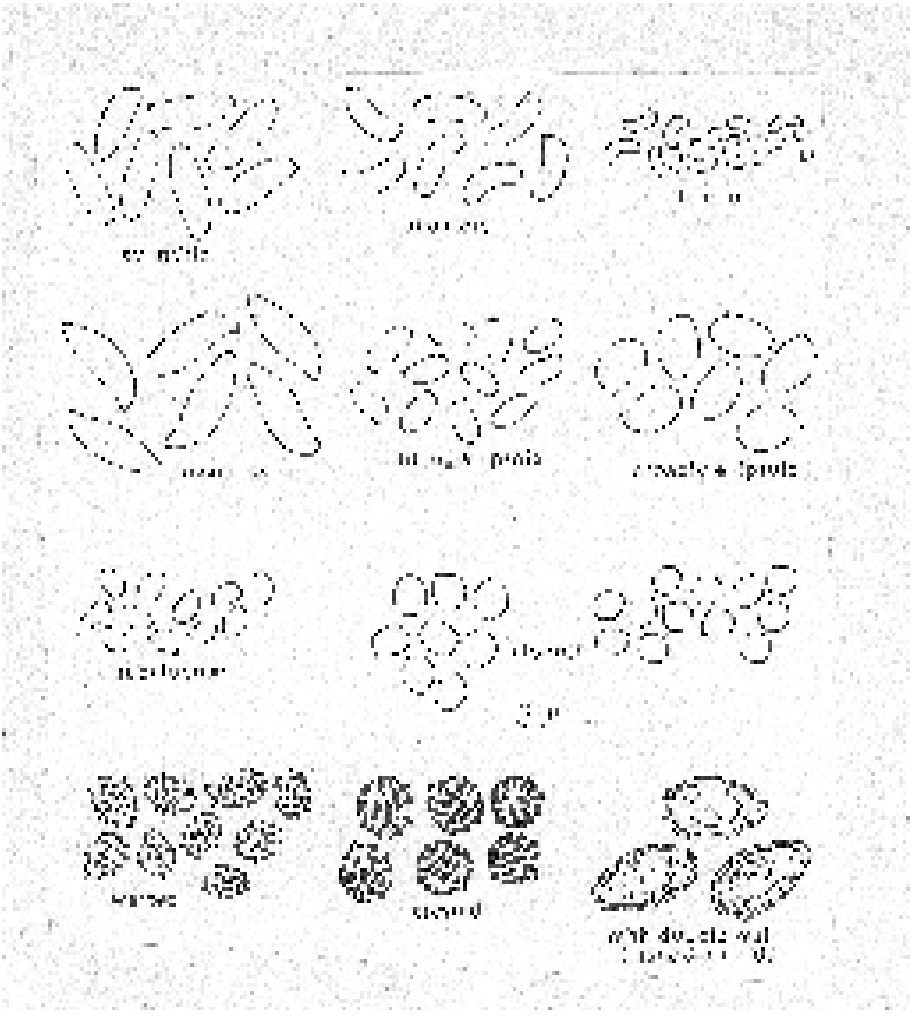


Fig. 7. Basidiospore shape and ornamentation

The measurements in this mycota are given as a range of variation based on 10 spore measurements or more for each species. It is important to note that a few basidiospores may be larger or smaller than the range given for a particular species. In the case of larger basidiospores they can be a result of development of basidia with less than 4 basidiospores. Smaller basidiospores are often simply immature. A spore print is of course very desirable, as basidiospores are never released in nature before they are mature. Basidiospores measured in KOH will often be slightly larger than in Melzer's solution.

For ornamented basidiospores, the measurements include the spines or aculei.

Spore shape

The shape of the basidiospores is important and Fig. 7 shows some of the more common types of basidiospores and their designation. Basidiospores tend to become longer and narrower as they mature and this may account for a degree of variation.

Spore ornamentation and wall-thickness

Basidiospores of most polypores are smooth and thin-walled, but in a few genera they are ornamented with small warts, spines or longitudinal striae. In the Ganodermataceae all basidiospores have a thick yellowish to pale brown endospore, on which there is a regular pattern of warts or protuberances making the basidiospores of this family very distinctive. Covering the endosporic protuberances is a hyaline exospore, which is invisible in microscopic preparations.

The ornamentation on some basidiospores may be difficult to observe in KOH, and sections should be mounted in either Melzer's or another medium before a basidiospore is stated to be smooth. Especially for species with amyloid basidiospores, it is necessary to observe them very accurately as many basidiospores with an amyloid reaction have very minute ornamentation. Observation with oil immersion or a scanning electron microscope may be essential to discern the ornamentation. Basidiospores with thickened walls are easiest to observe in cotton blue, Melzer's or phloxine. Under a phase contrast microscope basidiospores mounted in Cotton Blue will appear almost red if they are thick-walled. In KOH it may be difficult to observe the thickness of the wall properly.

4. Cystidia and other sterile hymenial organs

In many polypores, as well as in other Basidiomycetes, sterile organs occur among the basidia and are of importance in delimiting genera and identifying specimens. They have different designations according to where they arise and their morphology.

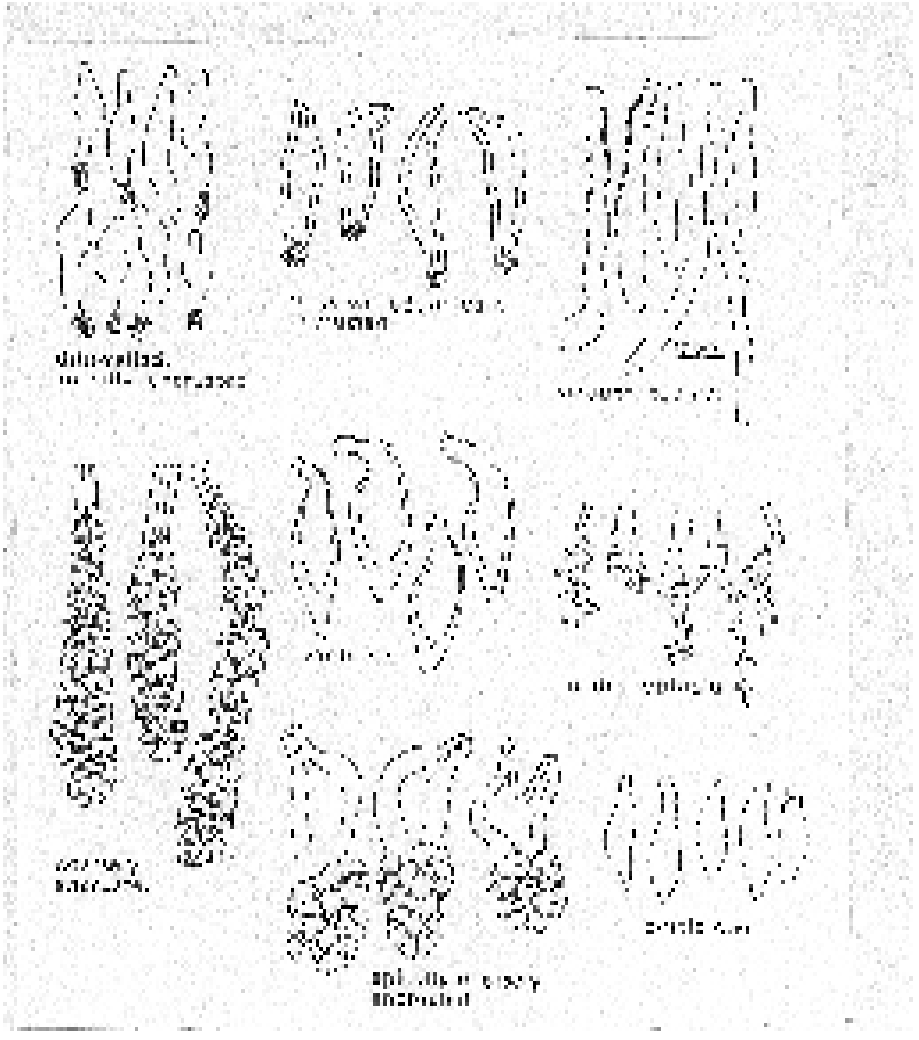


Fig. 8. Types of cystidia and other sterile hymenial organs

Cystidia Fig. 8

Cystidia may be divided into two groups according to where they arise. Hymenial cystidia arise in the subhymenium and are usually of the same size or slightly larger than basidia. They can be thick- to thin-walled, and some are smooth while others have a crown of crystals or may even be encrusted for a considerable length. Their shape may, as the figures show, vary from clavate to ventricose. They will mostly be prominent and easy to observe, but may also be rare. In such cases the species is keyed out at least twice.

Tramal cystidia arise as the name indicates, in the trama, and may or may not bend into the hymenium, often far beyond it. Usually they are the outer ends of skeletal hyphae with a widened often strongly encrusted apex. Sometimes such cystidia also occur in the dissepiments or deeply embedded in the trama. They are often called skeletocystidia.

Gloeocystidia are smooth and thin-walled cystidia, often tubular and slightly sinuous or constricted with grainy to oily, refractive contents. They are generally conspicuous in Melzer's reagent and mostly stain brightly in phloxine. In some species of Hymenomycetes they turn blackish in sulphuric benzaldehyde. Gloeocystidia are analogous to gloeoplerous hyphae and in some cases there are transitions between them. However, if such structures are more or less confined to the hymenium, they are called gloeocystidia. They will be far more refractive and normally larger than sterile hyphal ends that may occur in the hymenium. Gloeocystidia are relatively uncommon in polypores.

Cystidioles Fig. 8

Cystidioles are smooth, bottle-shaped or clavate, often pointed organs of the same size as the basidia. They occur in the hymenium among basidia, in some species in large numbers. They can be distinguished from immature basidia by being pointed and tapering. Immature basidia are slightly widened towards the apex.

Dendrohyphidia Fig. 8

Dendrohyphidia are branched hyphae that may occur in the hymenium and dissepiments of some polypores. They arise from a septum, and their degree of branching may vary quite considerably. The outer apices are mostly very thin-walled and collapse rapidly on drying. In many cases they are strongly encrusted with tiny crystals. Thus, they can be easily overlooked unless specifically looked for. Their function is doubtful though they may play a role in excretion of metabolites (like cystidia).

Setae and setal hyphae

Setae and setal hyphae are confined to the Hymenochaetaceae and are diagnostic for the family, and play an important taxonomic role at the specific level. They are dark brown, thick-walled, and quite prominent elements when they occur.

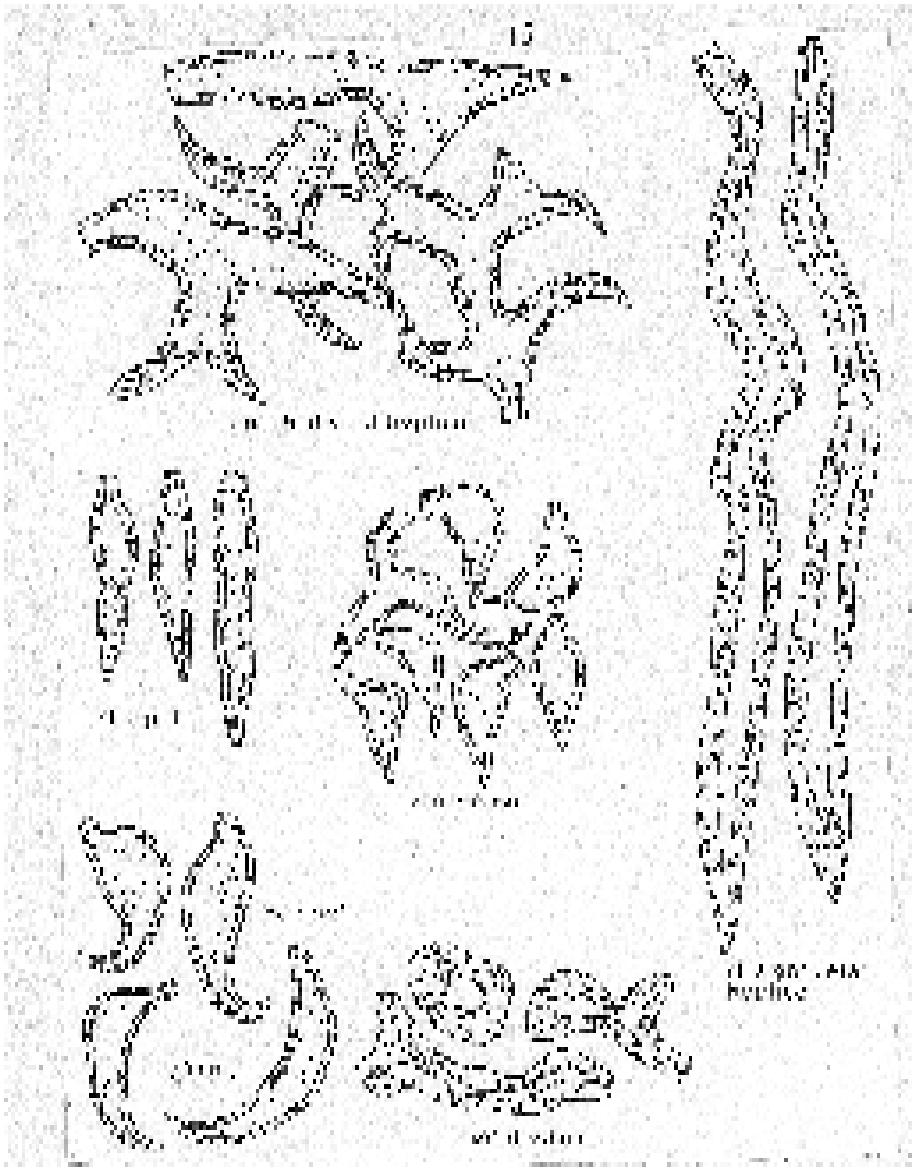


Fig. 9. Types of setae and setal hyphae.

Setae

These are of two types: hymenial and tramal. The former occur in the hymenium, arise at the same level as the basidia, and usually project beyond them, in some species very conspicuously so. They may then be observed with a good hand-lens. In most cases they are simple with a sharp and tapering apex. The top may be straight or distinctly bent or hooked. Hymenial setae arise terminally from hyphae, but may also be lateral. In the latter case they will be extended laterally from the base on both sides and may often be somewhat swollen at the base.

The setae are either subulate, i.e. they are thickest at the base and taper evenly towards the top, or ventricose, i.e. with a swollen part above the base and then more abruptly constricted at the top. In most species the shape of the setae is fairly constant, in others there may be a mixture of subulate and ventricose ones and a clear distinction may then be difficult to draw.

Tramal setae are embedded in the trama and run parallel to the tube walls or may project obliquely into the hymenium. They may be of considerable length and could be called giant setae. It is easy to confuse them with setal hyphae (see below), but true tramal setae are distinctly conical and are widest in the middle part and taper slightly towards the apex. It must be admitted, that in some cases it is difficult to separate them from short setal hyphae.

Setal hyphae

When present these organs are usually conspicuous and may be up to 400 µm long and 25 µm wide. They are often straight and run parallel to the tubes, but in some species the apex is bent into and beyond the hymenium and may then be seen with a good hand lens. Setal hyphae are of equal width tapering only at the apex and are thus different from the tramal setae. Setal hyphae may also be present in the context, especially in marginal tissue, and in mycelial felts in decayed wood. Branched setal hyphae occur on the pilear surface of a few species of *Inonotus*.

6. Asexual spores

Conidia

Conidia are rare in the polypores and only in a few cases are they diagnostic. They develop from conidiophores or undifferentiated conidiogenous hyphae, often in the margin or in the context, but their occurrence is normally so irregular that their presence or absence is not used in the keys, except for the genus *Echinoporia*.

Chlamydospores

Chlamydospores occur in the basidiocarps of a few polypores and are an important character for identification of those species. Chlamydospores differ from conidia in being thick-walled and are often intercalate and rarely terminal.

7. Hyphal pegs
Hyphal pegs occur in quite a number of polypores and can best be seen in sections cut across the tubes. These structures appear as either papillate or columnar projections from the hymenium or may represent ridges that run longitudinally and appear as pegs in cross sections. They are composed of intertwined vegetative hyphae and are readily recognized by the absence of a hymenium on their surface.

Decay characteristics

Polypores are mostly wood-inhabiting fungi able to utilize components of wood cell walls as their main source of energy for growth and reproduction. Wood consists mainly of lignin, cellulose and hemicellulose. Cellulose is a long chain polymer of glucose anhydride units joined by ß 1-4 linkages. Hemicellulose consists of similar polymers of glucose joined by other linkages or polymers of monosaccharides other than glucose. Lignin is a complex polymer of phenolic units. Conifer wood in general has a higher lignin content (27-35 per cent) than wood of dicotyledonous angiosperms or "hardwoods" (19-24 per cent). Wood-rotting fungi can be grouped into two categories according to which enzyme systems they produce to decay the wood. These two groups are referred to as "white-rot" and "brown-rot" fungi. White-rot fungi have cellulase and lignase enzyme systems that enable them to degrade all components of wood cell walls.

Only a fraction of the known species of wood-rotting Basidiomycetes are brown-rot fungi. The number of wood-rotting Basidiomycetes in Asia constitute less than 10% of the total number. The majority of brown-rot fungi are polypores. The other species are distributed in a number of families that are not considered to have close phylogenetic relationships to the polypores (Gilbertson 1980, Ryvarden 1991). For lists of brown-rot genera in North America and Europe respectively, see North American Polypores and European Polypores.

Apparently the development of the brown-rot type of enzyme system occurred independently in a number of evolutionary lines. However, within each family the genera containing brown-rot fungi have close relationships on the basis of both morphological characters and recent DNA investigations (Hibbet & Donoghue 1995). Thus, the brown-rot type of wood degrading system is correlated with morphology at the genus level and is a character of taxonomic significance. A complete survey of brown-rot polypores and their distribution can be found in Ryvarden (1991).

Practical advice for collection and determination

A set of field equipment for collecting polypores includes the following:
Collecting basket
Field labels
Small hand axe with sheath
Pencils with erasers
Sturdy knife with sheath
Paper bags
Hand lens
Waxed paper

Equipment needed for collection of polypores is simple and inexpensive. As most are wood-rotting fungi, a small hand axe or knife is needed. This enables the collector to remove basidiocarps with a minimum of damage and makes it easy to obtain samples of the substratum and the associated rot. A strong knife is necessary and indispensable for removing specimens from beneath logs or other locations where an axe cannot be used. A hook with a handle is extremely useful for rolling logs. Such hooks are readily available from suppliers of logging equipment and provide enough leverage to move surprisingly large logs.

The collecting basket may be of the large, open-arm type or the pack type carried on the back. Axes and knives should be kept clean and sharp and provided with leather sheaths when not in use. These tools are easily lost in the woods and great care must be taken to place them in the collecting basket after a collection is made and before moving to a new location. Many mycologists paint them in strong yellow or red colours. Some even fasten them with a string to the basket, so they start rattling if you leave them behind.

A handlens is indispensable and should be kept on a string around your neck, otherwise it will soon be lost. In the field it is wise to carry a cheap one, because whatever you do, sooner or later you will leave it on a log or stump. The type used by stamp collectors is often sufficient for field use.

Where to search for polypores

Since most polypores are wood-rotting fungi, it follows that the best collecting areas are forests in which dead wood is abundant. Some polypores decay the heartwood of living trees and their basidiocarps develop on standing living trees. Others are known only on dead wood and produce basidiocarps on dead standing or fallen trees, stumps, fallen branches or logging slash. The identity of the woody substrata on which polypores are collected is important and should be carefully recorded on the field label. If you are collecting in an area with relatively few hosts, a leaf or twig from the host can also be placed in the bag with the specimen. This is convenient

especially when collecting in heavy rain. The collector should become familiar with the trees and shrubs in the area and should be able to identify substrata from bark and wood characteristics. If necessary the field identification of woody substrata can be checked later by a study of their microscopic structure. This is another reason why a piece of the wood should always be collected along with the basidiocarps.

Basidiocarps of the pileate polypores usually develop on standing trees or stumps or on the exposed surfaces of fallen trees and branches and are generally conspicuous and easy to find. A large number of polypores have basidiocarps that are resupinate. These effused basidiocarps commonly develop on the underside of fallen trees and are inconspicuous and easily overlooked unless logs are turned over.

Labels may be pre-printed with the general locality, name of collector and can be numbered by hand or with a stamping machine before going into the field. This avoids the hazard of losing track of the numbering sequence and ending up with duplicate numbers. At the time of collection the following information should be recorded on the field label:

· Field identification of the fungus. This may be only to genus or family.
· Identification of substratum to species if possible.
· Locality. This ordinarily should provide a specific location with an accepted name as found on available maps and names of forest reserves, national parks, mountain ranges and county.
· Name of collector and number of collection.
· Date of collection.
· Additional information may be recorded on the back of the field label.

This includes notes on colour and colour changes, consistency, and other characters that are not discernible from dried specimens.

Collecting

Care should be taken in the field to collect specimens with as little damage to them as possible. Basidiocarps should not be broken or cut off the substratum. Pieces of wood with basidiocarps attached should be chopped out carefully. The associated rot should be noted on the back of the field label and an attempt made to include a sample of the rot with the basidiocarp. Each collection should be placed with the field label in a strong paper bag of appropriate size. The bag should be large enough so that the top may be folded or rolled to prevent the contents from falling out. Never put specimens of more than one species in the same bag. Keep each collection carefully separated with its label from all others. Most polypores have basidiocarps that are tough enough to be stored in ordinary paper bags without damage. Very small or soft and fleshy basidiocarps should be wrapped in waxed paper or newspaper. Plastic bags should never be used for field collecting as they do not permit exchange of air and provide ideal conditions for growth of moulds and bacteria or promote outgrowth of hyphae of the basidiocarp, which would obscure the normal hymenial and other characters.

After a little experience, one becomes selective in what to collect. Look for uncommon species. However, if you are in doubt about whether something is worth collecting, take it. You can always throw it away after you have checked it out in the lab, but if you leave it in the woods it's gone, maybe forever. Put a couple of empty cardboard cartons in your car on collecting trips. These will provide a convenient place to transfer specimens from your collecting basket frequently. This will give you continued access to empty collecting bags and other equipment in your collecting basket and also prevent specimens from being crushed and damaged by the weight of others above them.

Specimens should be stored in as cool a location as possible in field vehicles and should not be piled up so that those at the bottom are damaged by the weight of others above them.

Specimens that are dried promptly with good drying equipment will retain hymenial and other characters indefinitely. Annual basidiocarps of many species have a high percentage of water when fresh and consequently will shrink considerably on drying. In addition, changes in colour and consistency commonly occur. Notes on fresh specimens and photographs should be routinely made before specimens are dried. Most of the perennial basidiocarps change little on drying but it is wise to make notes on these in the fresh condition also.

Spore print

Spore prints should be made on a rough black paper since the basidiospores of most polypores are white in masses. There are more sophisticated papers on the market being half-black and half-white. Spore prints on such paper can be stored with the specimens in the herbarium for many years without yellowing or other deterioration. Select a good specimen with well-developed tubes and carefully cut off a portion that will fit on a piece of paper. Smaller specimens are used intact. Write the collection number of the specimen on the spore print paper. Invert the specimen with tubes down on the paper and wrap the specimen and spore print paper in waxed paper or put it under a glass jar or similar device. Many perennial species can be induced to sporulate if the specimens are wrapped in wet newspaper for 8 to 12 hours and then placed under a closed container. Carefully place it so that the tubes are as perfectly vertical as possible. Polypore basidiocarps, particularly those with tubes of small diameter, must be oriented properly or no basidiospores will reach the paper to leave a print.

Preservation of specimens

Drying is the simplest method of preserving polypore specimens. Polypores should be dried over a heater, preferably one with a fan to circulate warm air and remove moisture as quickly as possible. Specimens that are dried or placed in sunlight to dry may undergo enough abnormal hyphal growth during the long drying period to obscure hymenial characters. An electric forced-air dryer with fan and heating coil

is very efficient in situations where electricity is available. In other situations a gas heater will provide an excellent heat source. A dryer equipped with screen shelves to promote easy circulation of air should be used. For fieldwork a collapsible dryer can be constructed for use with an electric or a gas powered heat source.

Specimens should be placed in the dryer with the field label placed in such a position that it will not be lost or become associated with the wrong collection. One efficient method is to place specimen and label in an open mesh bag at the time of collection. The specimens can then be dried in the mesh bags. Small specimens can be left in paper bags for drying. After specimens are dried, they should be placed in paper bags with the field label for temporary storage.

The dryer should be a substantial cabinet with sturdy shelves of hardware cloth. A converted herbarium case with screen shelves, ventilation and a space in the bottom for the heating unit makes an excellent dryer. Some companies market a modified herbarium case for this purpose. Folding dryers or prefabricated units that can be dismantled and assembled easily are essential for fieldwork.

Disinfection

Many polypores, especially those of genera like *Trametes, Pycnoporus* and *Ganoderma* are susceptible to infection from insects. These insects often survive drying at fairly high temperature for days, and can destroy a collection if not checked. There are many methods of disinfection, the simplest is to place one or two mothballs in each envelope. This will, in most cases, be satisfactory, especially if plastic bags are used (care must be taken that the specimens are completely dry, otherwise mouldy specimens invariably result).

In museums and other collections the specimens are either treated in a fumigating chamber with a volatile toxic chemical compound or a deep freezer. The specimens are placed in the freezer for about a week at a temperature of about -15 to -25° C. Most freezers may achieve this when set at lowest temperature. Much of the effect comes from the very quick drop in temperature, i.e. from 20°C to -20°C or lower. This gives the insects no time to prepare for hibernation, which seems to be important for their successful survival through a normal winter.

Storage and arrangement of herbaria

Polypores can usually be stored without difficulty as they are rather tough and hard when dry. Any bag or box will do, and the label should be glued on the outside or left inside of the bag or box. Specimens of *Trametes* and other genera susceptible to insect attack should preferably be stored in plastic bags.

Some herbaria prefer to store their collections standing inside larger boxes and each species separated by a small piece of cardboard or similar material. The boxes are more expensive, but admit more collection per unit than loose sheets on which the bags or envelopes either are glued or placed loose.

It is always a problem how to place the species in a herbarium so specimens can be retrieved easily for examination. If taxonomy had been stabilized one could put the specimens according to genera and then either place the genera alphabetically or in groups according to relationship, i.e. families like Ganodermataceae etc. If a data-file is kept up to date, this will be a satisfactory system. The problem arises in larger herbaria where people without knowledge of the group may file specimens. Specimens may then easily be misplaced, as the generic name used on the label may well not be the same as used in the herbarium.

The alternative is to place all polypores alphabetically according to specific epithet. The latter is fairly stabilized in America as in other temperate areas as only very minor changes can be expected. Such a system makes it very easy to find and file specimens even for non-mycologists. However, the system has the disadvantage that closely related species might be placed in different parts of the herbarium. Based on how these advantages and disadvantages are considered one or another system should be adopted.

Determination

With some experience many polypores can be named on sight, but often a microscopical examination is necessary to reach a reliable determination, this being especially the case with resupinate specimens. For a microscopical examination the specimens should be sectioned along the tubes. The pore mouths are mostly sterile and a fertile hymenium is found a certain distance beyond the pore mouths where basidiospores and possibly cystidia may be observed. A small slice of the context or pilear cover may be mounted in the same preparation. The sectioning may be done with any sharp thin tool, personally we prefer a razor blade. The best results are achieved if the sectioning is done under a stereomicroscope.

If a phase-contrast microscope is available, the sections can be mounted in 3-5% KOH. This medium makes it easy to squash the preparation with a gentle tap on the cover glass. Hyphae, cystidia and basidiospores can then normally be examined without difficulty.

If a phase-contrast microscope is not available, sections of light-coloured polypores should be stained with Cotton blue, Congo red, etc. (for instructions, see below). Cotton blue in lactic acid is often used, and basidiospores and hyphae are said to be cyanophilous if their walls take colour. However, a certain precaution is necessary as protoplasm very often takes up colour. To the untrained eye, it can be difficult to distinguish a real cyanophilous reaction and just a colouration of the protoplasm. Thus, a cyanophilous reaction is not used as a diagnostic character in this manual but is mentioned in a few cases where it is a prominent factor.

An iodine reaction is most commonly noticed with Melzer's reagent. Basidiospores and hyphae are said to be amyloid if they become grey or blue and dextrinoid if they turn reddish brown. A negative reaction with this reagent is noted IKI-.

In dense polypores, sections often contain entrapped air that can be difficult to

remove, but a drop of ethyl alcohol will solve the problem. A drop of mounting medium is then placed on the sections just before the alcohol evaporates.

Reagents for staining
Cotton blue: Cotton blue in 60% lactic acid.
Congo red: 1% Congo red in conc. ammonia.
Melzer's reagent: 0.5 g Iodine, 1.5 g KI, 22 g Chloral hydrate and 20 g water.
Eosin and Phloxine: 1 g Eosine or Phloxine in 100 g water.
Lactophenol: (to clarify preparations)
5 g lactic acid, 5 g phenol, 10 g glycerine and 5 g water.
KOH: 2-5% KOH in water.

2. KEY TO FAMILIES OR GROUPS

1. Basidiospore-wall double, endospore ornamented and yellow to brown, exospore smooth and hyaline ..... **Ganodermataceae**
1. Basidiospore-wall simple 2

2. Basidiocarp brown, becoming black with KOH, generative hyphae with simple septa, acute setae absent or present, cystidia never present .....**Hymenochaetaceae**
2. Basidiocarp variably coloured, generative hyphae with clamps or simple septa, dark brown setae never present, cystidia absent or present .....
.....**Poroid genera from other families**

3. GANODERMATACEAE Donk

Basidiocarps perennial to annual, stipitate to pileate, pileus velutinate to glabrous, yellow, brown, bay or black, dull or shiny, often sulcate, with or without a cuticle or cuticle, stipe if present, round to flattened, dull to shiny and usually with a cuticle, pore surface whitish when actively growing, by age ochraceous to dark brown, pores in general small, more rarely of medium size, tubes stratified, context dark brown to wood-coloured, duplex or with several bands or zones. Hyphal system di- to trimitic, generative hyphae with clamps, often difficult to find, the cuticle in many species constitutes of short-celled and thick-walled coloured generative hyphae where, however, the clamps are usually difficult to observe, skeletal hyphae present in all species, either unbranched or arboriform with a long unbranched lower segment and a branched upper part, binding hyphae proper apparently not present, but similar, branched, thin hyphae often fill old pores, cystidia absent, basidia with 4 sterigmata, usually barrel-shaped, basidiospores almost invariably (one single exception) double-walled, the inner one verruculose to ornamented, thickened and usually coloured, on which there is a thin hyaline outer wall. On the ground or on dead wood with a strong white rot. Cosmopolitan family with a small number of genera.
Type genus: *Ganoderma* P. Karsten.
Remarks. The family is well circumscribed because of the unique spores, although there is now known one species with smooth spore wall.

Key to genera

1. Basidiocarps sessile 2
1. Basidiocarps stipitate 3

2. Basidiospores truncate ..... **Ganoderma**
2. Basidiospores ellipsoid ..... **Amauroderma andinum**

3. Basidiospores with separate warts or smooth 4
3. Basidiospores with crests or an irregular ornamentation 5

4. Basidiospores truncate, finely warted, stipe usually lateral to eccentric, cosmopolitan genus ..... **Ganoderma**
4. Basidiospores globose, ellipsoid to cylindrical, finely warted, very rarely smooth, tropical genus ..... **Amauroderma**

5. Basidiospores with longitudinal crests ..... **Haddowia**
5. Basidiospores with an irregular ornamentation ..... **Ganoderma**

AMAURODERMA Murrill

Bull. Torr. Bot. Cl. 32:366, 1905.
Basidiocarps annual or reviving for a second season, centrally-laterally stipitate, solitary or in small groups with several fused pilei, consistency coriaceous, corky to woody hard, seldom brittle. Pileus round, reniform to fan-shaped, concave, umbilicate to strongly infundibuliform, upper surface in varying colours from white, ochraceous, brown to almost black, finely tomentose to glabrous, dull to glossy with a distinct cortex or cuticle, often concentrically zoned and radially wrinkled, stipe rather thin and long, finely tomentose to glabrous, pore surface whitish to ochraceous when fresh, darkens when dry to brownish colours, pores round to angular and entire, large to small, tubes seldom stratified, context white, ochraceous to dark brown, cystidia absent, hyphal system dimitic, generative hyphae with clamps hyaline and thin-walled, skeletal hyphae arboriform to more rarely unbranched, hyaline to brown, those being hyaline often dextrinoid or without reaction in Meltzer's reagent, basidia bladder-like with 4 large curved sterigmata, basidiospores hyaline to pale yellow, sub-globose to cylindrical, dextrinoid to IKI-, bitunicate with the inner wall finely asperulate or very rarely smooth. Usually parasitic on roots of living trees where basidiocarps are produced when the host is dead. A tropical genus with a white rot.
Type species: *Fomes regulicolor* Cooke, (=*Polyporus schomburgkii* Mont. & Berk.).
Remarks. The basidiocarp is stipitate in all neotropical species except in *A. andinum* and may attain various shapes although centrally stipitate basidiocarps are most common. Frequently, several stipes arise from the same base and then more compound basidiocarps are developed and the pilei will then often fuse. In section some basidiocarps are distinct with one or two distinct inner black bands or zones. The stipe is often duplex with an outer dense layer surrounding an inner softer or hollow core sometimes separated by a black band. In species with a distinct tomentum on the stipe, there is often a dark zone just below the tomentum of the pileus. These zones are absent from some species with a pale stipe without a tomentum proper. However, when present they continue into the context and frequently there is also another zone stretching more or less horizontally across the context. The basidiospores are with one exception, all of the same type with an inner ornamented wall on which there is a hyaline epicutis, which is very thin and difficult to see in ordinary microscopic preparations. Mature basidiospores are pale-yellowish. An apiculus is often difficult to observe.
A dextrinoid reaction is as observed with Meltzer's reagent and a positive reaction is indicated as IKI+ and a negative one with IKI-.

Key to species

1. Pores 1-4 per mm **.....2**
1. Pores 5-8 per mm..... **8**

2. Pores 3-4 per mm..... **6**
2. Pores 1-3 mm wide **.....3**

3. Basidiospores 7-10 µm in diam, basidiocarp whitish when fresh **.....A. brasilensis**
3. Basidiospores larger, basidiocarps more or less brownish **.....4**

4. Basidiospores oblong ellipsoid, 12-15 x 8-10 µm **..... A. partitum**
4. Basidiospores broadly ellipsoid to globose, wider than 10 µm **.....5**

5. Basidiospores broadly ellipsoid 12-15 x 10-13 µm **..... A. calcigenum**
5. Basidiospores almost globose 13-16 x 13-15 µm .....**A. macrosporum**

6. Upper surface with adpressed brown velutinate to tomentose zones alternating with black glabrous zones **..... A. trichodermatum**
6. Upper surface dull and finely adpressed velutinate **.....7**

7. Basidiospores globose, 7-10 µm, upper surface umber brown with ventricose cells,
.....**A. boleticeum**
7. Basidiospores subglobose 9-11 x 7.5-9 µm, upper surface deep brown to almost black, cuticle with wide thick-walled apical cells **..... A. intermedium**

8. Upper surface laccate and shiny **.....A. renidens**
8. Upper surface dull, glabrous to velutinate or zone wise tomentose **9**

9. Basidiospores longer than 10 µm **.....10**
9. Basidiospores 7-10 µm in longest dimension **.....16**

10. Basidiospores ellipsoid **11**
10. Basidiospores subglobose to globose **.....13**

11. Basidiospores 8-10 µm wide **..... A. elegantissimum**
11. Basidiospores wide than 10 µm **.....12**

12. Upper surface yellowish brown to pale greyish brown, context first white then cream coloured .....**A. camerarium**
12. Upper surface deep reddish brown, context yellowish brown ..... **A. omphalodes**

13 Context with two black bands extending from the stipe..... **14**
13. Context without black bands **15**

14. Context fibrous, yellowish brown, spores finely ornamented **.....A. praetervisum**
14. Context wood, white, spores very coarsely ornamented **.....A. deviatum**

15. Basidiospores 15-17 µm long, dextrinoid **.....A. unilaterum**
15. Basidiospores 10-13 µm long, IKI- ..... **A. pseudoboletum**

16. Basidiocarp sessile on dead wood **..... A. andinum**
16. Basidiocarp stipitate, usually on the ground **17**

17. Context dark rusty brown, basidiospores smooth**..... A. coltricioides**
17. Context differently coloured, basidiospores ornamented **.....18**

18. Pore surface orange **..... A. dubiopansum**
18. Pore surface white becoming pale yellowish brown **.....19**

19. Upper surface glittery **.....A. exile**
19. Upper surface dull **20**

20. Context white becoming ochraceous to pale cinnamon **..... A. sprucei**
20. Context golden brown to deep brown **..... A. schomburgkii**

Amauroderma andinum Ryvarden, Fig. 10
Synopsis Fung. 18:59, 2004.
Basidiocarps perennial, pileate, sessile and broadly attached, corky to woody, 11 x 13 x and 2 cm thick at the base, upper surface dark brown, flat, slightly sulcate with some faint black bands, dull and very finely velutinate becoming glabrous by age, with a distinct crust in section, pore surface creamy white at first, later pale ochraceous, pores circular, about 5-6 per mm with thick pore walls; tube layers concolorous with pore surface, up to 10 mm deep without stratification, separated from the context by a thin darker line, context white, distinctly paler than the tubes and up to 6 mm thick at the base, cuticle present, dark brown to black and dense.
Hyphal system dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-5 µm in diam, difficult to observe in dried specimens; arboriform skeletal hyphae abundant, thick-walled, hyaline IKI-, lower part unbranched in lengths up to 110 µm and then with a few distal branches, up to 10 µm wide in main stem (3% KOH) to 3 µm in the thin apices.
Cuticle: 150-200 µm thick consisting of agglutinated, dark brown, thick-walled,

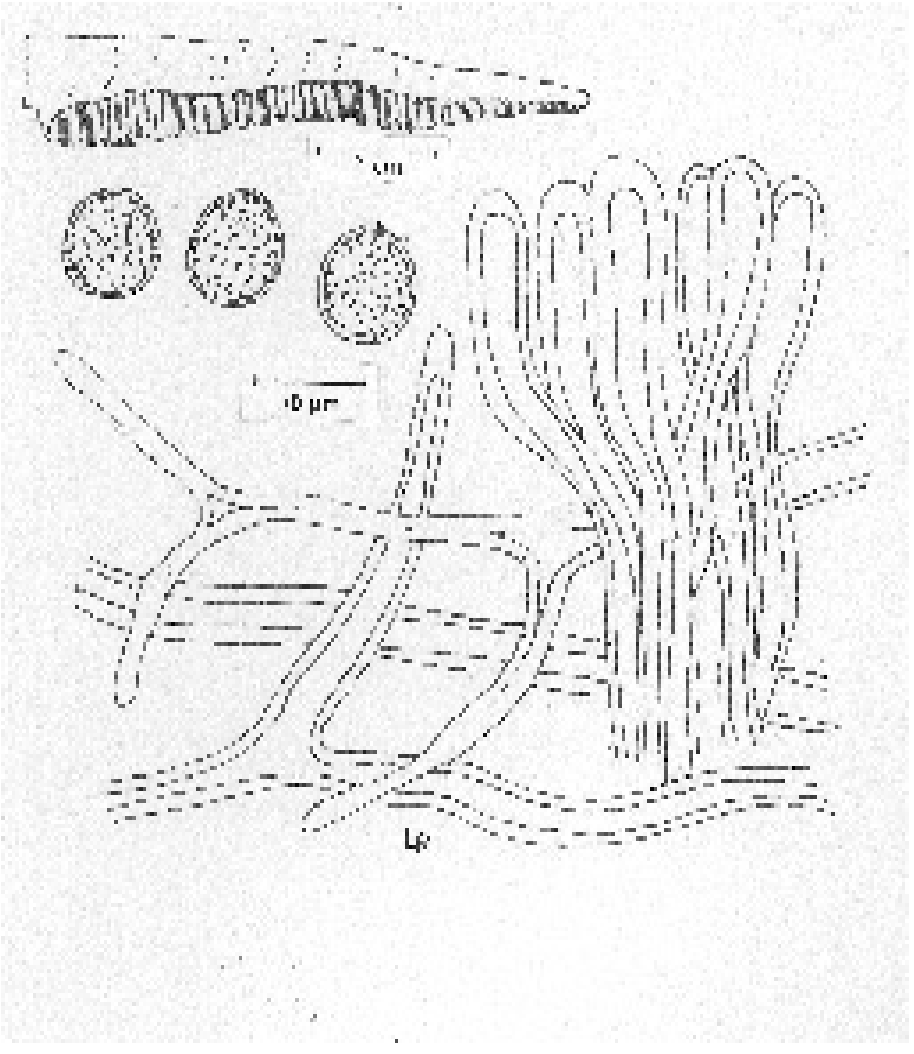


Fig. 10. *Amauroderma andinum*, A) Section through basidiocarp, B) Skeletal hyphae, C) Hyphal ends from the cuticle, D) Basidiospores. From the holotype.

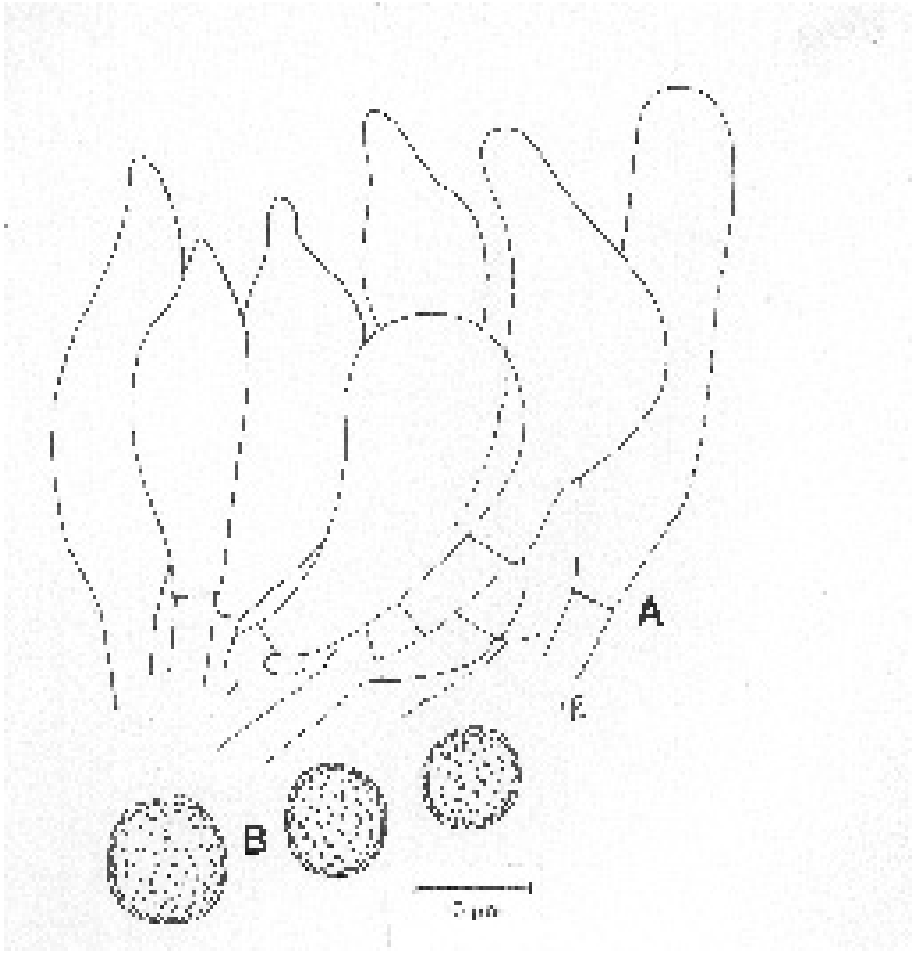


Fig. 11. *Amauroderma boleticeum,* a) Apical cells from the pileus, b) Basidiospores. Samuels et al. Fr. Guyana (NY)

hyphal ends in a vertical palisade making them difficult to separate.
Basidia not seen.
Basidiospores globose, finely ornamented, pale yellow, 8-10 µm in diameter.
Substrata. Unknown dead hardwood tree.
Distribution. Known only from the type locality at Merida in Venezuela.
Remarks. This is a remarkable species, being the first neotropical *Amauroderma* species to have a sessile basidiocarp and growing on dead wood. Such a habitat and type of basidiocarp are common in *Ganoderma*, and it may be that *A. andinum* really is the first *Ganoderma* species without truncate spores.

Amauroderma boleticeum (Pat. & Gaillard) Torrend,
Fig. 11
Broteria Bot., 18:132, 1920. - *Polyporus boleticeus* Pat. & Gaillard, Bull. Soc. Mycol. Fr. 4:29, 1888.
Basidiocarps annual, stipitate; pileus single, convex, slightly undulate, 3-6 cm in diam, 6-7 mm thick, soft, glabrous, dull, umber brown and velutinate to touch, margin sharp and deflexed when dry, pore surface cream to ochraceous, becoming black when touched, pores angular with entire dissepiments, 3-4 per mm; tubes concolorous, up to 3 mm deep, darker than context due to masses of yellow basidiospores, context soft, white when fresh, drying cream and darkens with KOH, up to 2 mm thick.
Stipe central, 4-9 cm long, 5-8 mm thick, tubular, brown, dull, almost glabrous, apparently hollow when fresh, longitudinally wrinkled when dry, the cortex on the upper surface consists of agglutinated hyphae without any distinct structure.
Hyphal system dimitic; generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae thick-walled, hyaline, arboriform 2-6 µm wide, the cortex on the upper surface consists of agglutinated hyphae with swollen ventricose apical cells.
Basidia not seen.
Basidiospores subglobose to globose, thick-walled with endosporic projections, yellow, IKI-, 7-10 µm in diam.
Substrata. Known from dead hardwood.
Distribution. From southern Brazil to Venezuela and Colombia.
Remarks. The white to cream context, the dark brown pileus with apical ventricose cells besides the soft consistency are good field characteristics.

Amauroderma brasilensis (Singer) Ryvarden comb. nov.
Fig. 12
Basionym: *Scutiger brasilensis* Singer, Nova Hedwigia, Beih. 17: 22, 1983. - *Amauroderma corneri* Gulaid & Ryvarden, Mycol. Helv. 10:28, 1998.
Basidiocarp funnel shaped to flabellate or spatulate with an elongated tapering stipe, up to 12 cm wide and 15 cm from base of stipe to edge of pileus, soft when fresh, fragile when dry, upper surface glabrous, azonate, papery smooth when fresh, wrinkled and with a few radial lines when dry and then curled, almost whitish when fresh drying ochraceous brown to brown, pore surface pale wood coloured when fresh, discoloured to resinous brown when dry, pores angular thin-walled, radially elongated, 1-2 per mm to 2.3 mm long in radially direction, tubes up to 3 mm deep, context pale cream, up to 3 mm deep at the base.
Stipe rudimentary about 2 cm long and 1 cm long expanded to a broad disk attaching the basidiocarp to the wood.
Hyphal system dimitic, generative hyphae with clamps hyaline, thin- to slightly thick-walled, in the context 4-12 µm wide and with large conspicuous clamps, often branched in almost right angles, in the subhymenium, 3-5 µm wide, skeletal hyp-

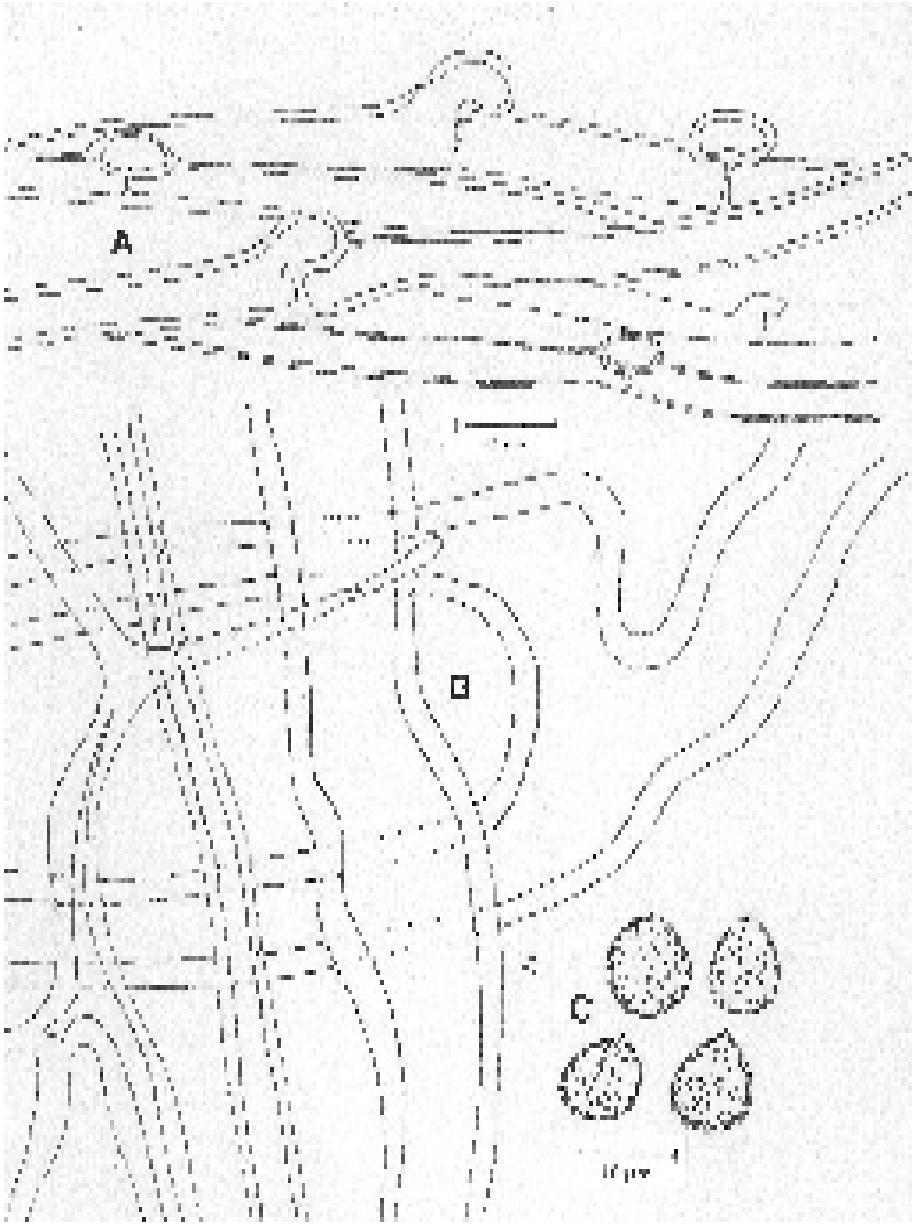


Fig. 12. *Amauroderma brasilensis* a) generative hyphae, b) arboriform skeletal hyphae, c) basidiospores. From the holotype of *A. corneri*.

hae scattered in the basidiocarp, hyaline, conspicuously wide, 6-30 µm in diameter, thick-walled, a few ending in large, smooth to tuberculate swellings, 30-50 x 100-300 µm (chlamydospores?) a few becoming yellow, otherwise IKI-.
Basidia barrel-shaped with 4 sterigmata, 12-15 x 8-12 µm
Basidiospores globose, finely ornamented, 7-9 µm in diameter, hyaline to pale yellow in KOH, dextrinoid.
Substrata. On dead hardwood of unknown identity.
Distribution. Known from Brazil and Venezuela.
Remarks. The species is remarkable by its fan-shaped, fleshy and almost whitish colour when fresh as almost all other *Amauroderma* species are coloured in shades of brown. Further, the hyphal texture with a dominance of the wide generative hyphae and very wide scattered skeletal hyphae is also unusual in the genus. This hyphal construction makes the basidiocarps fleshy when fresh and fragile when dry. When the type of *A. corneri* was collected it was not at all suspected to be an *Amauroderma* species, which usually are recognized in the field by its dark colours and stipitate basidiocarps.
Some skeletal hyphae have a strong swollen apex which may act as a chlamydospore. Most of these large swellings are smooth, but two were distinctly tuberculate and thus, simulating chlamydospores.

Amauroderma calcigenum (Berk.) Torrend,
Fig. 13
Broteria Bot. 18:129, 1920. - *Polyporus calcigenus* Berk. Lond. J. Bot. 2:636, 1843.
Basidiocarps annual, centrally to more rarely laterally stipitate; often distinctly funnel shaped, more rarely semicircular and flabellate, 10 cm in diam, 1-10 mm thick, glabrous, beautifully reddish brown and subshiny when fresh, fading with age to bay or greyish brown, in section with a thin dark cuticle; margin sharp and deflexed when dry, pore surface white when fresh, later cream to ochraceous, sharply delimited towards the stipe, pores angular with entire dissepiments, 1-2 per mm, those close to the stipe often larger, 1-3 mm long radially, tubes concolorous, up to 3 mm deep, context white to cream when fresh, thin, homogenous, up to 2 mm thick.
Stipe central, 4-10 cm long, 3-6 mm in diameter, dull, brown, glabrous, but at the base often with an adpressed brown irregular tomentum, in section with a cuticle, context white to pale cream.
Hyphal system dimitic; generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae thick-walled, hyaline, arboriform, 3-6 µm wide, strongly to slightly dextrinoid, the cuticle on stipe and pileus dominated by agglutinated skeletal hyphae without distinct structure.
Basidia not seen.
Basidiospores ellipsoid, thick-walled, finely ornamented, yellow, IKI-, 12-15 x 9-12 µm
Substrata. Parasitic, basidiocarps develop on the ground from buried roots when the

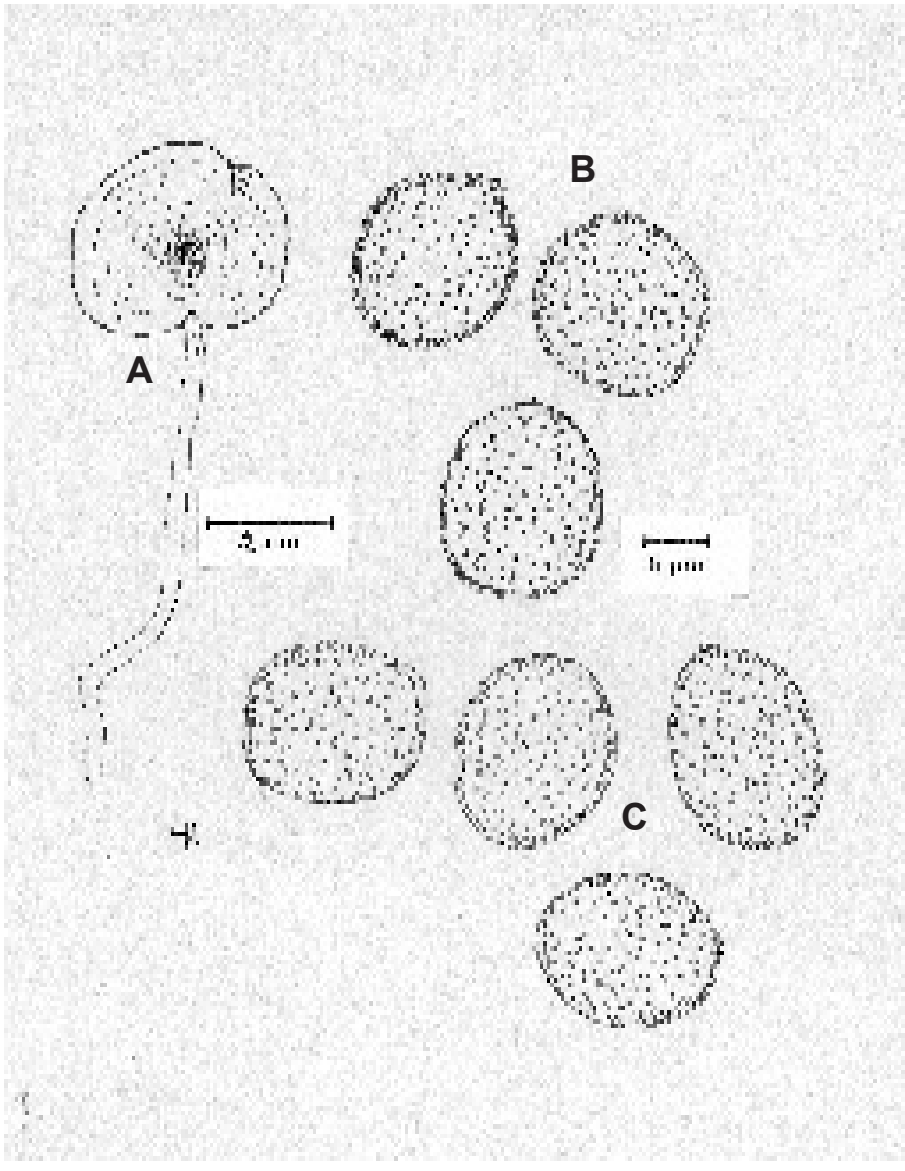


Fig. 13. *Amauroderma calcigenum*, a) Basidiocarp, b) Basidiospores. *Amauroderma camerarium* c) Basidiospores. From the lectotypes.

host is dead.
Distribution. Southern Brazil to Venezuela and Guyana, and probably widespread in the Amazonian basin.
Remarks. This is a distinct species when fully developed with often large funnel shaped sub-shiny warm reddish brown basidiocarps, white pore surface with large angular pores. The dextrinoid reaction of the skeletal hyphae and the ellipsoid finely ornamented basidiospores are also distinctive.

A. partitum is related, having slightly smaller pores and basidiospores, but with much more slender and elegant laterally stipitate basidiocarps. *A. macrosporum* is also related, but has globose to subglobose basidiospores, 13-16 µm in diam.

Amauroderma camerarium (Berk.) Furtado,
Fig. 13
Rev. gen *Amauroderma*. p. 140, 1968. - *Polyporus camerarius* Berk., London J. Bot. 8:143, 1856. - *Polyporus variabilis* Berk. Ibid. p. 193, 1856.
Basidiocarps annual, centrally to more commonly laterally stipitate; pileus single, circular to reniform, convex, smooth, slightly undulate, 2-10 cm in diam, 6-15 mm thick, dense and hard when dry, glabrous, dull, clay coloured, yellowish brown or pale greyish brown (cafe au lait), densely concentrically zoned and radially veined or furrowed, in section with a thin black cuticle; margin sharp and deflexed when dry, pore surface whitish when fresh becoming cream to honey coloured when old, pores round with thick walls, 5-7 per mm, hardly visible to the naked eye, tubes concolorous, up to 7 mm deep, context almost white when fresh, fading to ochraceous, dense and hard, homogenous, up to 4 mm thick .
Stipe up to 10 cm long and 5-8 mm in diam, glabrous, dull, dark brown, in section with a thick black cuticle or crust and a white to pale wood coloured context.
Hyphal system dimitic, generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae thick-walled, hyaline, arboriform 4-9 µm wide in the main stem, strongly dextrinoid, the cuticle on stipe and pileus consists of agglutinated hyphae without any distinct structure.
Basidia not seen.
Basidiospores yellow, subglobose to broadly ellipsoid, 12-15 (16) x 10-13 µm, thick-walled, ornamented, yellow, and IKI-.
Substrata. Parasitic, basidiocarps develop from buried roots when the host is dead.
Distribution. Southern Brazil to Belize, but evidently rare.
Remarks. The clay coloured pileus, the whitish pore surface, tubes and context becoming very dense, the small pores and the brown glabrous stipe are good field characteristics. Microscopically the dextrinoid skeletal hyphae and the large basidiospores are distinctive.

Amauroderma coltricioides Aime, Henkel & Ryvarden,
Fig. 14

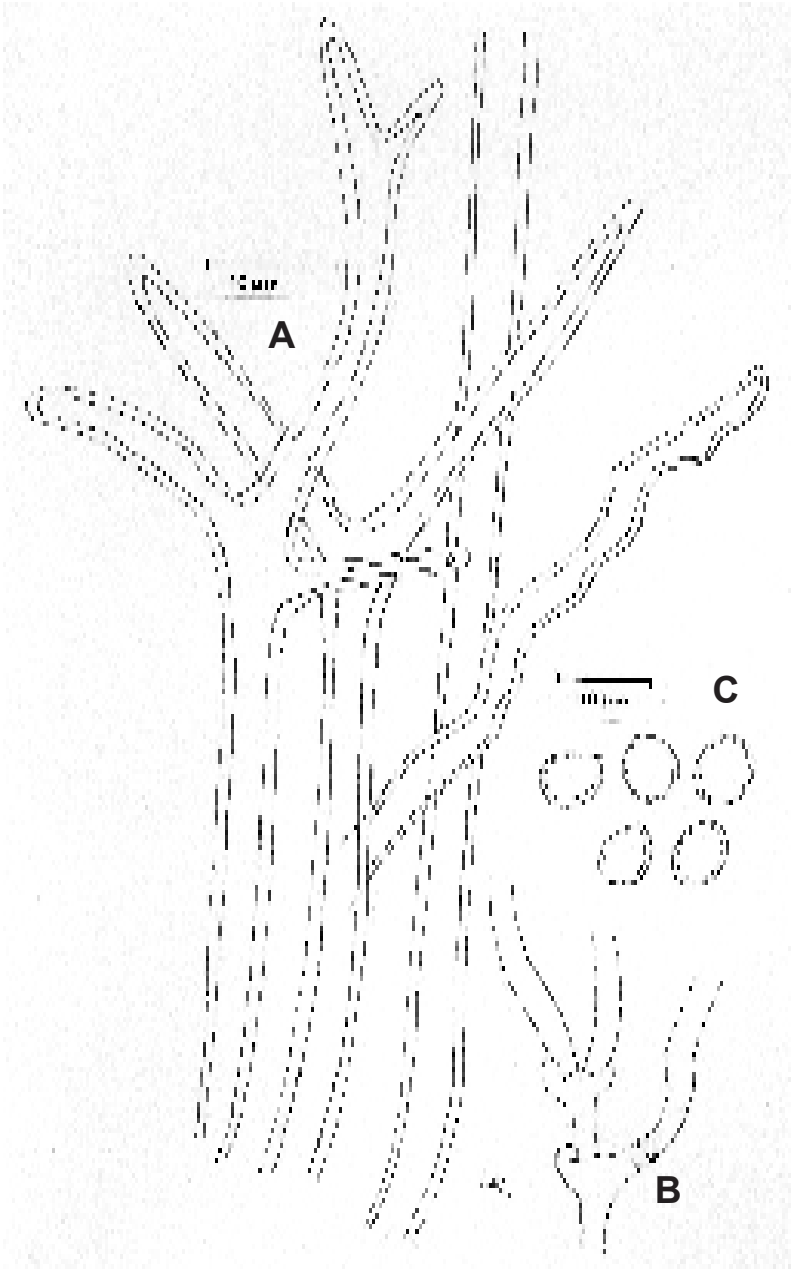


Fig. 14. *Amauroderma coltricioides* a) arboriform skeletal hyphae, b) generative hyphae, c) basidiospores. From the holotype.

Mycologia 95:615, 2003.
Basidiocarps annual, laterally to centrally stipitate, pileus circular to semicircular or even flabellate in young specimens, flat to infundibuliform, up to 10 cm in diam, up to 3 mm thick in centre, margin lobed, incised to entire, sharp and mostly deflexed when dry; pileus surface finely adpressed velutinate, shiny with numerous distinct to indistinct concentric zones, brown to deep reddish brown, the latter especially in mature specimens;, pore surface reddish brown, pores round to angular, 7-8 per mm, hardly visible to the naked eye; tube layer up to 2 mm thick, concolorous with the pore surface, context up to 1 mm thick, fibrous and rusty to reddish brown.
Stipe cylindrical, finely velutinate, rusty to deep reddish brown, up to 5 cm long. 4-8 mm in diam, expanded towards the pore layer and then up to 1.5 cm in diameter in the sterile part, dense and homogenous in section
Hyphal system dimitic; generative hyphae with clamps, 3-5 µm in diameter, difficult to observe in dried specimens, hyaline and richly branched, arboriform skeletal hyphae present and dominating in the basidiocarp, yellow to brown, thick-walled to almost solid, apically moderately branched, up to 10 µm wide in the basal stems, and these up to 300 µm without branching, thus fragments may be mistaken for true skeletal hyphae**.**
Basidia not seen .
Cystidia or other sterile hymenial elements absent.
Basidiospores globose, smooth, thick-walled, pale rusty brown, IKI-, 6.5-7 µm in diameter.
Substrata. On the ground.
Distribution. Known only from the type locality.

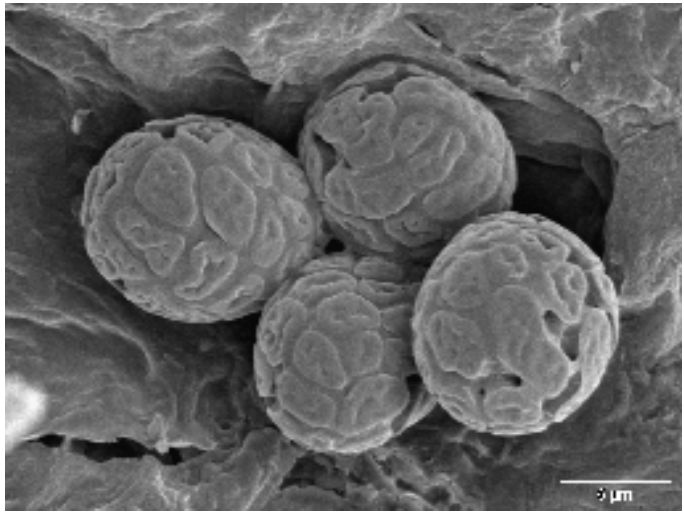
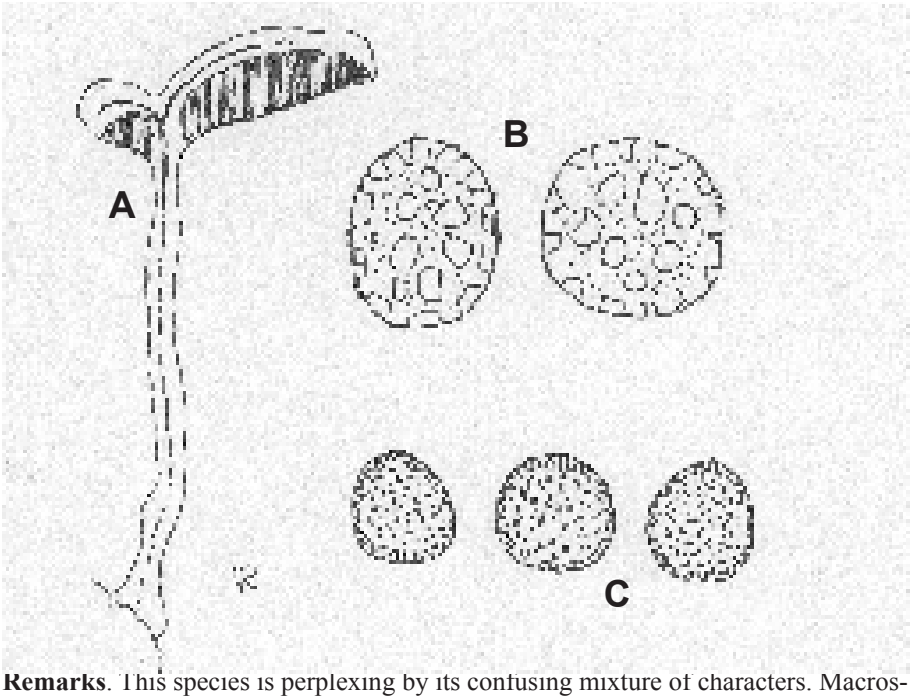


Fig. 15 *Amauroderma deviatum* Basidiospores showing the irregular, in parts angular ornamentation.



Remarks. This species is perplexing by its confusing mixture of characters. Macroscopically it looks exactly like a *Coltricia* species, but easily distinguished by its clamped generative hyphae and arboriform skeletal hyphae. Apparently this is the first species reported with smooth spores in Ganodermataceae and thus very deviating in a basic character. However, DNA sequencing indicated clearly that it belongs in the genus with a middle position among the tested species (J-M. Moncalvo pers. comm.)

Fig. 16. *Amauroderma deviatum* A) section through basidiocarp, B) basidiospores. *Amauroderma dubiopansum* C) basidiospores. From the holo- and lectotypes, repectively.

Amauroderma deviatum Ryvarden nova sp.
Fig.15-16
Ad *Amauroderma praetervisum* sed sporae grosse ornamentae.
Holotype: Ecuador, Orellana prov. Yasuni National Park, Yasuni Scientific Res. Sta. 9 March 2002, Ryvarden 44500 (O), isotype in QCA.
Basidiocarp annual, single pileate with a lateral to central stipe, flat or convex with deflexed margin, up to 6 cm wide and about 1.0 cm thick, woody hard when dry. pileus dull, dark brown, concentrically zoned and slightly sulcate, in section with a distinct black cortex, about 100-250 µm thick, pore surface white to pale wood coloured, pores small and isodiametric, 4-5 per mm with very thick pore walls, tubes

white, up to 10 mm deep, context white, up to 3 mm thick with two thin black resinous bands emerging from the stipe.
Stipe up to 10 cm high, 3-6 mm thick, deep sepia-brown to black, in section with a distinct outer cortex and inner one, between which there is a whitish to pale wood-coloured context, the inner core whitish and in part hollow.
Hyphal system dimitic, generative hyphae thin-walled, short-celled and with clamps, 2-6 µm wide, skeletal hyphae arboriform, thick-walled to solid, 3-7 µm wide, hyaline to pale yellowish, sparingly branched, slightly dextrinoid in masses, in the trama rather intertwined, cortex of thick-walled, more or less vertical generative hyphae, yellowish to deep brown and with numerous short cells, densely agglutinated.
Basidia subglobose, 20-30 x 14-18 µm with 4 large sterigmata..
Basidiospores globose, 13 to 16 µm in diameter, pale brown in KOH, coarsely ornamented with large projections, about 2 µm high, 3 x 6 µm wide.
Substrata. On the ground.
Distribution. Known only from the type locality.
Remarks. The species is related to *A. praetervisum*, but easily separated by the very coarsely ornamented spores which remind one of those seen in *G. neurosporum* .

Amauroderma dubiopansum (Lloyd) Ryvarden, comb. nov. Fig. 16 C
Basionym: *Polyporus dubiopansus* Lloyd, Lloyd Mycol. Writ. 3:116, 1912 (BPI!) (previous combination of Dennis in Fungus flora of Venezuela, p. 117, 1970 is illegitimate because place of publication was omitted).
Basidiocarps annual, centrally to laterally stipitate; pileus single, convex to applanate, spatulate or flabelliform to infundibuliform, slightly undulate, 3-8 cm in diam, 6-20 mm thick, woody, more or less glabrous, dull, greyish to black or dark brown, often with concentric zones, in section with a thin darker cuticle; margin sharp and deflexed when dry, pore surface brilliant orange to reddish orange when fresh and actively growing, becoming pale cinnamon brown with age and drying, pores angular with entire dissepiments, 5-7 per mm; almost invisible to the naked eye, tubes concolorous, often darker than the context, up to 5 mm deep, context white to cream paling to cinnamon in old specimens, up to 8 mm thick.
Stipe 5 cm long, 6-8 mm thick, tubular, glabrous and concolorous with the pileus.
Hyphal system dimitic, generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae thick-walled, hyaline, arboriform, 3-8 µm wide, strongly dextrinoid, some skeletal hyphae project into the hymenium with binding processes, the cortex on the upper surface consists of partly inclined thick-walled hyphae becoming agglutinated and projecting irregularly, up to 150 µm thick, cuticle on stipe similar, but thicker.
Basidia 25 x 13-14 µm with 4 sterigmata.
Basidiospores globose, thick-walled and conspicuously ornamented, pale yellow,

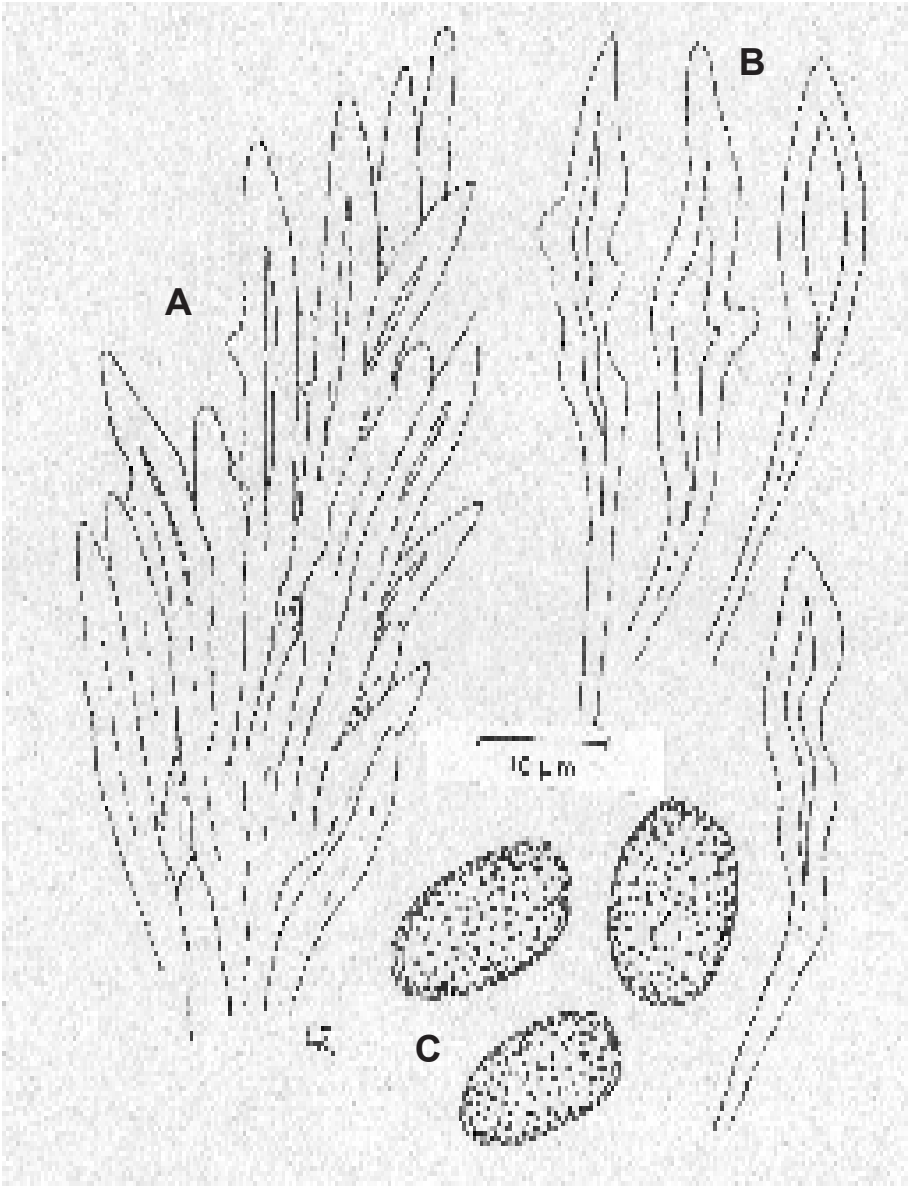


Fig. 17. *Amauroderma elegantissimum* A) skeletal hyphae from the dissepiments, B) basidiospores. From the holotype.

IKI-, 8-10 µm in diam.
Substrata. Known from dead deciduous wood.
Distribution. Brazil, Cuba, Belize and Venezuela.
Remarks. The brilliant orange pore surface separate this species from *A. sprucei* to which it obviously is closely related. Microscopically, the strongly dextrinoid skeletal hyphae are distinctive.

Amauroderma elegantissimum Ryvarden & Iturriaga nova species, Fig. 17
Ad *Amauroderma exile* (Berk.) Torrend, sed sporae ellipsoideae.
Holotype: Venezuela, Eastado Bolivar, Gran Sabana, Forest by Eastacion Aponwao, 1200 µm altitude, 24. Feb. 2000, Ryvarden 42351, VENN, isotype in O.
Basidiocarps annual, centrally to laterally stipitate, pileus single, semicircular to circular and usually slightly infundibuliform, 1-5 cm in diam, 1-2 mm thick, tough, but flexible, first finely adpressed velutinate, but rapidly glabrous, slightly shiny, black to dark brown, slightly concentrically zonate reflecting stages of growth, margin sharp and deflexed when dry, pore surface pale grey in actively growing specimens becoming dark brown with age, pores angular 5-7 per mm; tubes concolorous, up to 1 mm deep, context thin, dark brown, up to 1 mm thick.
Stipe 3-10 cm long, 2-3 mm in diameter, straight to somewhat bent or twisted, first covered with a fine brown tomentum which wears away with age and then with a thin cuticle and darker brown, context duplex, peripheral part cinnamon brown and dense surrounding a paler inner core of looser consistency, but normally there is no distinct black zone between the two parts.
Hyphal system dimitic, generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae in the context thick-walled, pale brown, unbranched to rarely dichotomously branched, thick-walled, 4-7 µm wide, in the trama, and especially towards the dissepiments straight and setae-like, dark brown, rounded to pointed, some with a few lateral protuberances or outgrowths, 3-12 µm wide, up to 180 µm long with a distinctly tapering base towards the clamps from which they originate.
Basidia barrel shaped with 4 sterigmata, 20-25 x 12-15 µm.
Basidiospores ellipsoid, pale yellow, thin-walled with a very fine ornamentation, almost invisible even at 1000 x magnification, often with a large oil-drop, 12-15 (16) x 8-10 µm, IKI-.
Substrata. Known from dead deciduous wood.
Distribution. Known from Gran Sabana Venezuela, Roriama in Brazil and Mt. Wokomung in Guyana, which indicates that it may be widespread in the Guyana highland.
Remarks. This is a very distinct species, firstly by its elegant thin and small basidiocarps with conspicuously thin stipes, the oblong pale yellow spores, but above all

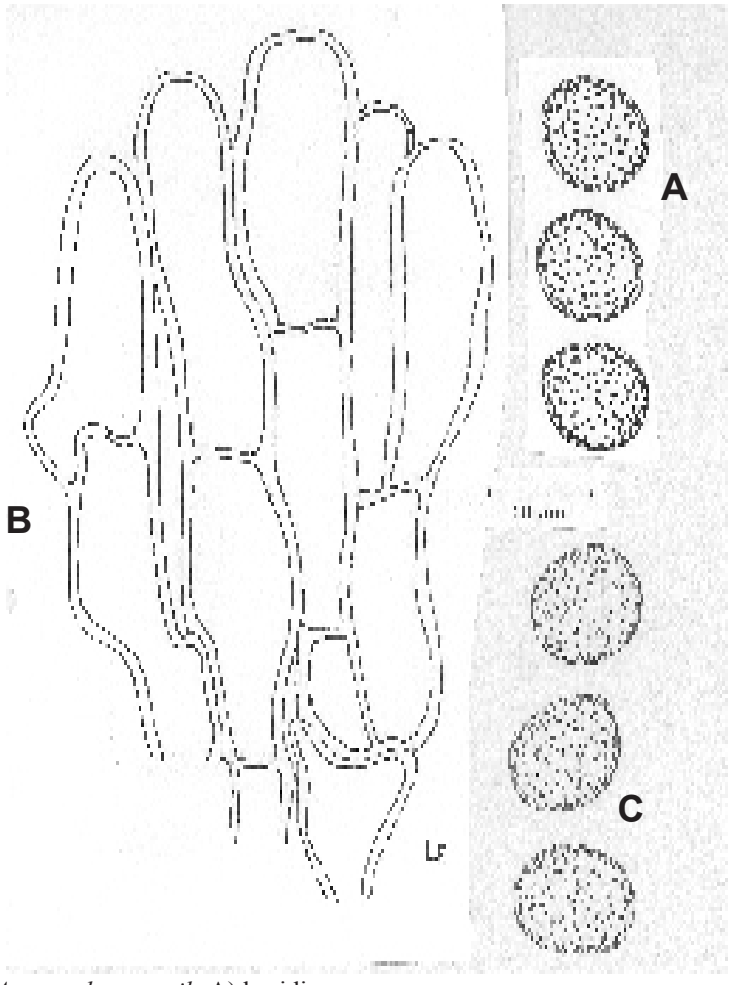


Fig. 18. *Amauroderma exile* A) basidiospores.
Amauroderma intermedium B) apical cells from the pileus, C) basidiospores.
From the lectotypes.

by its hyphal construction. The short setae-like skeletal hyphae of the trama are also seen in *A. schomburgkii*, which however have smaller globose basidiospores and where the basidiocarps are much larger and sturdier than in this new species.
Specimens examined: Brazil, Roraima, Auares, 800 µm, Prance et al. 21535 (NY, O), Guyana. Mt. Wokomung, Basecamp by Kopinang Village, 1540 µm, 12 July 1989, Samuels 6529 (NY, O).

Amauroderma exile (Berk.) Torrend,
Fig. 18 A
Broteria Bot. 18:142, 1920. - *Polyporus exilis* Berk., Lond. J. Botany. 8:173, 1856. - *Polyporus renatus* Berk., Ibid. p. 170, 1856. - *Polyporus procerus* Berk. Ibid. p. 171, 1856. - *Polyporus marasmioides* Berk., Ibid. p. 173, 1856. - *Polyporus parmula* Berk., Ibid. p. 175, 1856. - *Polyporus passerinus* Berk., Ibid. p. 175, 1856. - *Polyporus macer* Berk., Ibid. p. 176, 1856.
Basidiocarps annual, centrally to laterally stipitate, pileus single, round to infundibuliform or flabelliform, slightly undulate, 1-5 cm in diam, 2-5 mm thick, tough, but flexible, glabrous to finely velutinate, glittery, but not laccate, concentrically zonate, radially wrinkled when dry, reddish brown to vinaceous brown, in section with a thin darker cuticle; margin sharp and deflexed when dry, pore surface pale yellowish brown, pores angular 5-7 per mm; tubes concolorous, up to 3 mm deep, context thin, pale yellowish brown, becoming darker with age, up to 2 mm thick.
Stipe 3-18 cm long, 2-8 mm thick, solid, becoming tubular, concolorous with the upper surface, dull and glabrous.
Hyphal system dimitic; generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae thick-walled, hyaline, arboriform in the tip or aciculiform, 2-6 µm wide, strongly dextrinoid, the cortex on the upper surface consists of agglutinated hyphae without any distinct structure.
Basidia not seen.
Basidiospores globose, slightly thick-walled and distinctly ornamented, hyaline to pale yellow, IKI-, 7-10 µm in diam.
Substrata. Dead hardwood or on the ground.
Distribution. Southern Brazil to Venezuela and Colombia, and probably widespread in the Amazonian basin.
Remarks. The dark reddish to vinaceous brown shiny surface and the flexible pileus besides the fairly small basidiospores characterize this species.

Amauroderma intermedium (Bres. & Pat.) Torrend, Fig. 18 B/C
Broteria ser. Bot. 18:128, 1920. - *Ganoderma intermedium* Bres. & Pat. Bull. Soc. Mycol. Fr. 5:76, 1889. - *Ganoderma guadalupense* Pat., Bull. Soc. Mycol. Fr. 15:198, 1899. - *Polyporus puiggarianus* Henn. Hedwigia 43:200, 1904. - *Polyporus rude* Berk. of many American authors, a species originally described from Australia.
Basidiocarp annual, single, laterally or centrally stipitate, pileus flat or convex, circular and then often umbilicate to infundibuliform to flabelliform with deflexed margin, up to 20 cm wide and about 1-3 cm thick, woody hard when dry, pileus dull, glabrous, deep brown to black, concentrically zoned and slightly sulcate, in dry specimens also somewhat radially wrinkled, in section with a distinct black cortex,

about 100-300 µm thick, pore surface whitish when actively growing and then darkening when touched, cinnamon to olivaceous brown with age and on drying, pores intermediate, isodiametric, 2-4 per mm, tubes pale brown, up to 10 mm deep, only slighter darker than the context, context cottony to fibrous, with or without dark lines or zones, cinnamon to dark brown in old specimens, up to 20 mm thick.
Stipe up to 12 cm high, 3-8 mm thick, deep sepia-brown to black, in section with a distinct outer cortex and inner one, between which there is a whitish to pale wood-coloured context, the inner core whitish and in part hollow.
Hyphal system dimitic, generative hyphae in the hymenium mostly thin-walled, short-celled and with clamps, 2-6 µm wide, skeletal hyphae almost exclusively of the aciculiform type, thus the more fibrous consistency of the context, slightly tortuous, thick-walled to solid, 3-7 µm wide, very pale yellowish, a few are sparingly branched at the end, cortex consisting of thick-walled, more or less vertical generative hyphae, but not formed as a palisade, yellowish to deep brown and with numerous densely agglutinated short cells,.
Basidia bladder like, 20-30 x 12-14 µm with 4 sterigmata.
Basidiospores sub-globose, 9-11 x 7.5-9 µm, finely asperulate, pale yellowish by maturity.
Substrata. On the ground.
Distribution. Paraguay to Puerto Rico.
Remarks. *A. intermedium* is recognized by its dark coloured pileus partly brown partly black and microscopically by its large apical thick walled pileus cells. *Polyporus rude* was described on the basis of a specimen from Tasmania and the interpretation of this taxon is variable. A careful comparison of the neotropical specimens with those from Australia should be undertaken to check whether this is really a pantropical taxon or not. The very dark pileus characterizes this species compared with those having the same type of basidiospores.

Amauroderma macrosporum Furtado,
Fig. 19A
Rev. gen. *Amauroderma* p. 203, 1968.
Basidiocarps annual, stipitate; pileus single, convex, slightly undulate, 3-6 cm in diam, 6-7 mm thick, soft when fresh, woody when dry, soft and often slightly glittery, but without a laccate appearance, glabrous, reddish brown with some light coloured zones, in section with a thin cuticle; margin sharp and deflexed when dry, pore surface ochraceous to pale cinnamon brown, pores angular with entire dissepiments, 1-2 mm in diam; tubes concolorous, up to 10 mm deep, context homogenous, pale yellowish brown to cinnamon, up to 2 mm thick.
Stipe central, 4-9 cm long, 5-8 mm thick, tubular, dark brown, dull and glabrous.
Hyphal system dimitic, generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae thick-walled, pale yellow, arboriform, 3-6 µm wide, the

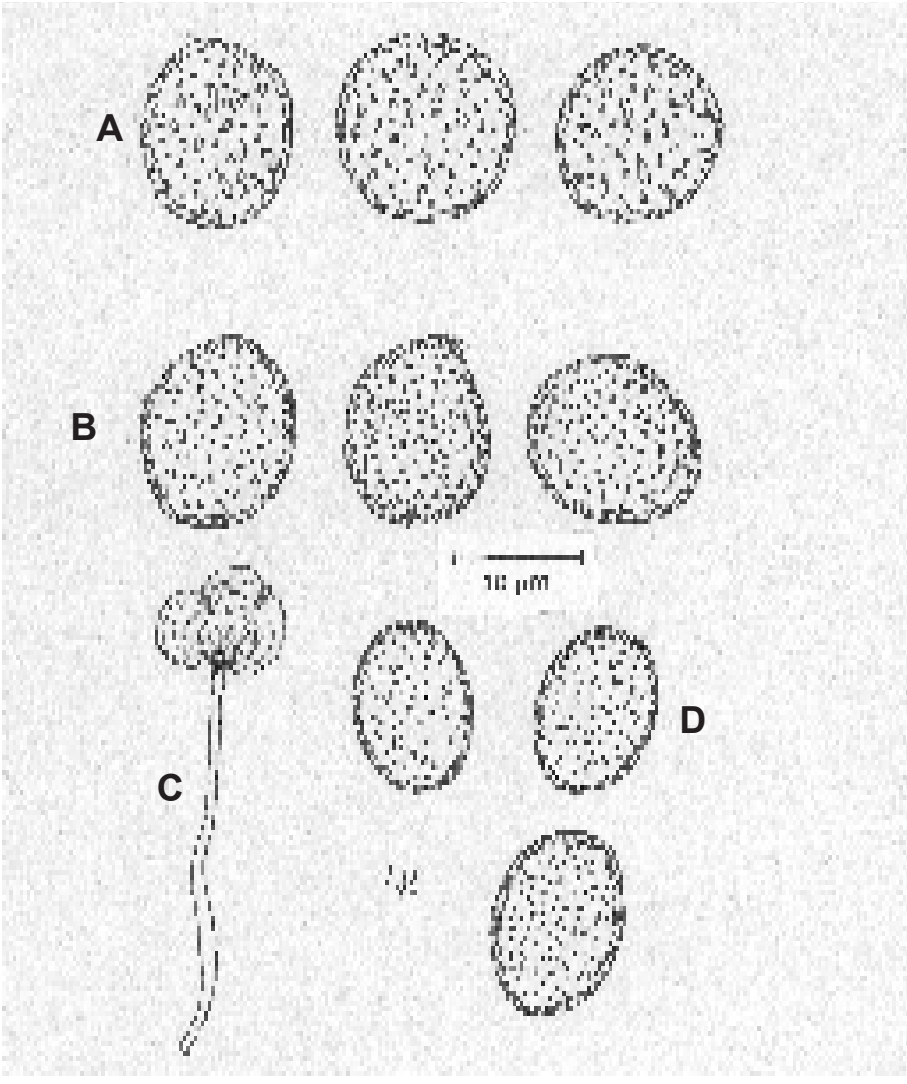


Fig. 19. *Amauroderma macrosporum*, A) basidiospores.
A. omphalodes B) basidiospores. *A. partitum* C) basidiocarp, D) basidiospores.
From the lectotype..

cortex on the upper surface of agglutinated hyphae without any distinct structure.
Basidia subclavate, 30-50 x 10-20 µm with four sterigmata.
Basidiospores subglobose to globose, thick-walled with a partly irregular ornamentation of small, straight to sinuous ridges, yellow, IKI-, 13-16 x 13-15 µm.
Substrata. Known from dead deciduous wood.
Distribution. Known from the type locality in Sao Paulo State, Brazil and Yutaje, Amazonas in Venezuela.
Remarks. The large pores and basidiospores characterize this species. From *A. calcigenum* which macroscopically is almost identical, it is separated by larger, ellipsoid basidiospores.

Amauroderma omphalodes (Berk.) Torrend,
Fig. 19 B
Broteria Bot. 18:131, 1920. - *Polyporus omphalodes* Berk., London J. Bot. 8:172, 1856.
Basidiocarps annual, stipitate, centrally or laterally; pileus single, convex to infundibuliform, slightly undulate, round to fan shaped 1-10 cm in diam, 2-10 mm thick, woody, glabrous, dull, concentrically zoned, wrinkled radially when dry, first ochraceous, then brown and finally deep reddish brown to almost black, in section with a thin darker cuticle; margin sharp and deflexed when dry, pore surface cinnamon to dark yellowish brown, pores angular with entire dissepiments, 4-6 per mm; tubes concolorous, up to 8 mm deep, context with one or two black lines originating at the centre, cottony to touch, yellowish to cinnamon, up to 3 mm thick.
Stipe, 4-7 cm long, 5-15 mm thick, tubular, dark brown, dull and glabrous context duplex, the peripheral part dark brown and separated toward the inner looser and paler core by a black line.
Hyphal system dimitic, generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae thick-walled, hyaline, arboriform or aciculiform, 3-6 µm wide, the cortex on the upper surface consists of agglutinated hyphae without any distinct structure.
Basidia not seen.
Basidiospores subglobose to globose, thick-walled, distinctly ornamented, yellow, IKI-, 11-14 x 10-13 µm.
Substrata. Known from dead deciduous wood.
Distribution. Southern Brazil to Venezuela and Colombia, and probably widespread in the Amazonian basin.
Remarks. The pale yellowish context and the dull, deep brown upper surface besides the smaller pores are good field characteristics.

Amauroderma partitum (Berk.) Wakef., Fig. 19 C-D
Kew Bull. 1934:242, 1934. - *Polyporus partitus* Berk., London J. Bot. 8:170, 1856. -

Hexagonia gracilis Berk., Ibid. p 237, 1856.
Basidiocarps annual, stipitate; pileus, lateral, thin and semicircular, flat when fresh, often curled when dry, up to 3 cm wide and long, often smaller, 1-2 mm thick, single, occasionally split in two tongue like pilei, upper surface glabrous, usually slightly shiny, deep reddish brown, finely concentrically zonate, in section with a darker dense cuticle; margin sharp and deflexed when dry, pore surface white when fresh, later cream to ochraceous, pores angular 2-3 per mm, a few occasionally larger and slightly radially elongated, tubes concolorous, up to 1 mm deep, slightly darker than context due to masses of yellow basidiospores, context white to cream, 0.2-0.4 mm thick and with a thin dark cuticle,
Stipe thin, tall and elegant, up to 3 mm in diameter and 12 cm long, glabrous, dull and dark brown, finely wrinkled, towards the base occasionally with a very fine brown tomentum, context ochraceous, often with a thin loose core surrounded by a dark cuticle.
Hyphal system dimitic; generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, more rarely modified and yellow with thick walls, skeletal hyphae thick-walled, hyaline, aciculiform or unbranched, 3-6 µm wide, strongly to slightly dextrinoid, the cortex on the upper surface consists of agglutinated skeletal hyphae mixed with generative hyphae without any distinct structure.
Basidia not seen.
Basidiospores ellipsoid, thick-walled, pale yellow, and finely ornamented, often with a large oil drop when fresh, IKI-, (10) 12-15 x 8-10 µm.
Substrata. Known from dead deciduous wood.
Distribution. From southern Brazil to Venezuela and Guyana, and probably widespread in the Amazonas basin.
Remarks. The elegant tall, stalked basidiocarps with a subshiny glabrous pileus, a whitish pore surface, large angular pores and a very thin pale context are distinct morphological characters for this species.
Microscopically the large oblong basidiospores are of the same type as seen in *A. calcigenum*, but this is a more robust larger species, often with conspicuous, funnel shaped basidiocarps. *A. elegantissimum* has similar spores, but much smaller pores, i.e. 5-7 per mm.
A. macrosporum, is separated by being much thicker and more robust and with globose to subglobose basidiospores, 13-16 µm in diam.

Amauroderma praetervisum (Pat..) Torrend,
Fig. 20
Broteria ser. Bot. 18:131, 1920. - *Ganoderma praetervisum* Pat., Bull. Soc. Mycol. Fr. 5:78, 1889. - *Ganoderma chaperi* Pat., J. Bot. 4:179, 1890. - *Fomes auriscalpioides* P. Henn., Hedwigia 43:82, 1904.
Basidiocarp annual, single pileate with a lateral to central stipe, flat or convex with deflexed margin, up to 10 cm wide and about 1.5 cm thick, woody hard when dry. pileus dull, deep reddish brown to blackish brown, concentrically zoned and

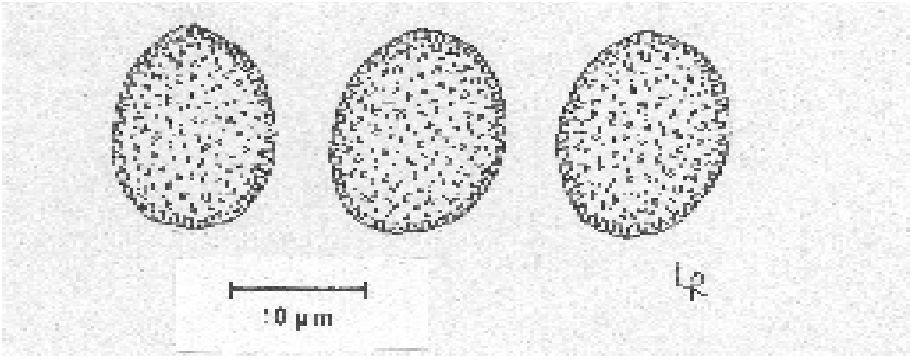


Fig. 20. *Amauroderma praetervisum*. Basidiospores. From the lectotype.

slightly sulcate, in dry specimens also somewhat radially wrinkled, in section with a distinct black cortex, about 100-200 µm thick, pore surface pale to dark brown in old specimens, pores small and isodiametric, 4-6 per mm, tubes concolorous, up to 5 mm deep, only slighter darker than the context, the latter up to 4 mm thick, white becoming yellowish brown, fibrous and with two black resinous bands, between those a looser consistency than above and below them,
Stipe up to 12 cm high, 3-8 mm thick, deep sepia-brown to black, in section with a distinct outer cortex and inner one, between which there is a whitish to pale wood-coloured context, the inner core whitish and in part hollow.
Hyphal system dimitic, generative hyphae thin-walled, short-celled and with clamps, 2-6 µm wide, skeletal hyphae arboriform, thick-walled to solid, 3-7 µm wide, yellowish, a few are sparingly branched at the end, in the trama rather intertwined and not regular and parallel as in other *Amauroderma* species, cortex of thick-walled, more or less vertical generative hyphae, yellowish to deep brown and with numerous short cells, densely agglutinated.
Basidia not seen.
Basidiospores sub-globose to globose, 10-13 x 10-12 µm, the inner wall finely asperulate, pale yellowish in maturity.
Substrata. On the ground.
Distribution. Rare species, specimens have been seen from Southern Brazil, Belize, Costa Rica and Mexico.
Remarks. The species is easily confused with *A. omphalodes* and *A. pseudoboletum* which have more ellipsoid basidiospores.

Amauroderma pseudoboletum (Spegazzini) Furtado,
Rev. gen. *Amauroderma* p. 230, 1968. - *Polyporus pseudoboletum* Spegazzini, Ann. Soc. Cient. Argent. 16:279, 1883.

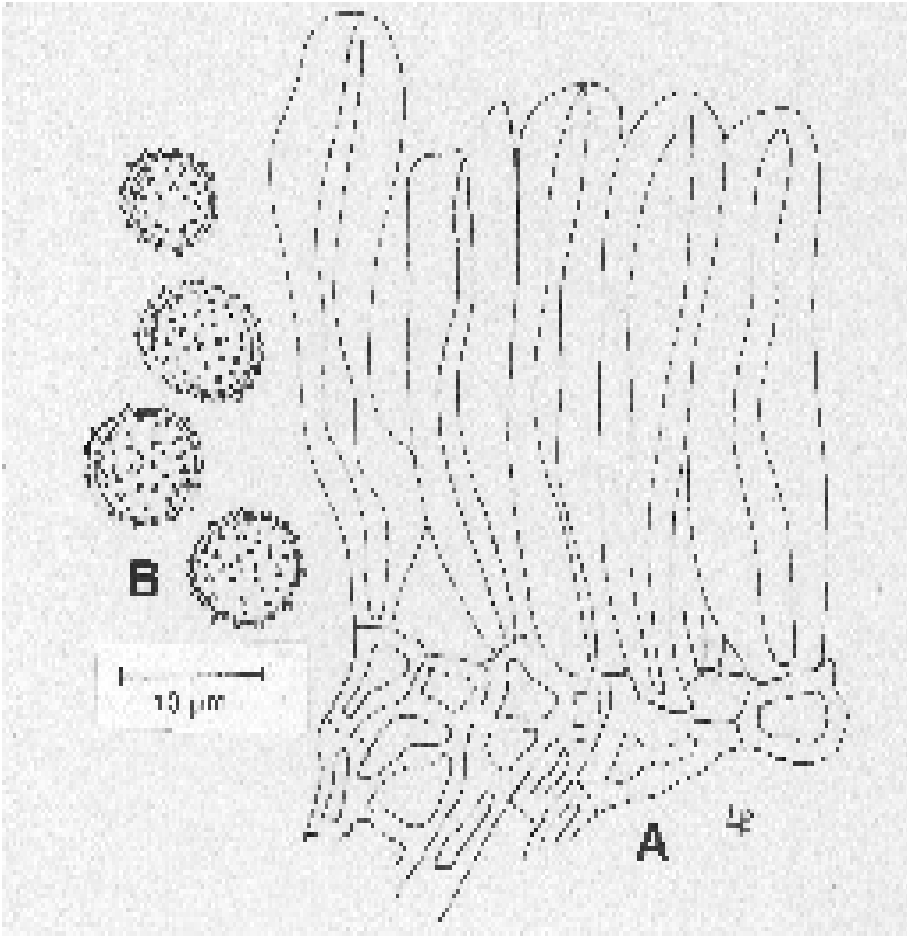


Fig. 21. *Amauroderma renidens* A) section through cuticle, B) basidiospores. From the lectotype.

Basidiocarps annual, stipitate, either centrally or laterally; pileus single, flat to convex, slightly undulate, up to 12 cm in diam, and to 20 mm thick, soft or corky when fresh, becoming more woody by age, glabrous, concentrically zoned and when dry also radially wrinkled, dark reddish brown becoming almost blackish by age and drying, usually soft and glittery, but not laccate, in section with a thin darker cuticle; margin sharp and deflexed when dry, pore surface yellowish brown to dark cinnamon, pores round, 3-5 per mm; tubes concolorous, up to 10 mm deep, context punky and soft, ochraceous and darkens to golden brown and darkens with KOH, up to 10 mm thick.
Stipe up to 5 cm long and 15 mm thick, tubular in old specimens, reddish brown, dull and glabrous.
Hyphal system dimitic; generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae thick-walled, hyaline, arboriform, 2-6 µm wide, distinctly dextrinoid, the cortex on the upper surface consists of agglutinated vertical hyphae in a dense palisade and embedded in a resinous substance.
Basidia not seen.
Basidiospores subglobose to globose, thick-walled, distinctly ornamented, yellow, slightly dextrinoid, 12-13 x 9-11 µm in diam.
Substrata. Known from dead deciduous wood.
Distribution. From southern Brazil to Venezuela and Colombia, and probably widespread in the Amazonas basin.
Remarks. The glittery and fairly thick, in parts soft pileus, which inspired the specific name, are the best macroscopic characters for identification.

Amauroderma renidens (Bres.) Torrend,
Fig. 21
Broteria Bot. 18:136, 1920. - *Ganoderma renidens* Bres., Hedwigia 35:280, 1896.
Basidiocarps annual, laterally stipitate; pileus single, flabelliform to spatulate, sulcate and zonate, 3-8 cm in diam, 6-7 mm thick, woody, laccate and glabrous, reddish brown, in section with a thin darker cuticle; margin sharp and deflexed when dry, pore surface white when fresh, darkening when touched, later pale cinnamon brown, pores angular with entire dissepiments, 3-4 per mm; tubes concolorous, up to 3 mm deep, context cinnamon brown, up to 2 mm thick.
Stipe up to 10 cm long and 5-8 mm thick, tubular, laccate, dark reddish brown.
Hyphal system dimitic; generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae thick-walled, hyaline, arboriform, 2-6 µm wide, the cuticle consists of a palisade of vertical yellow hyphal cells, rounded to slightly irregular, agglutinated and difficult to separate in microscopical sections.
Basidia not seen.
Basidiospores subglobose to globose, thick-walled, distinctly ornamented, yellow, IKI-, 7-10 µm in diam.
Substrata. Known from dead deciduous wood.

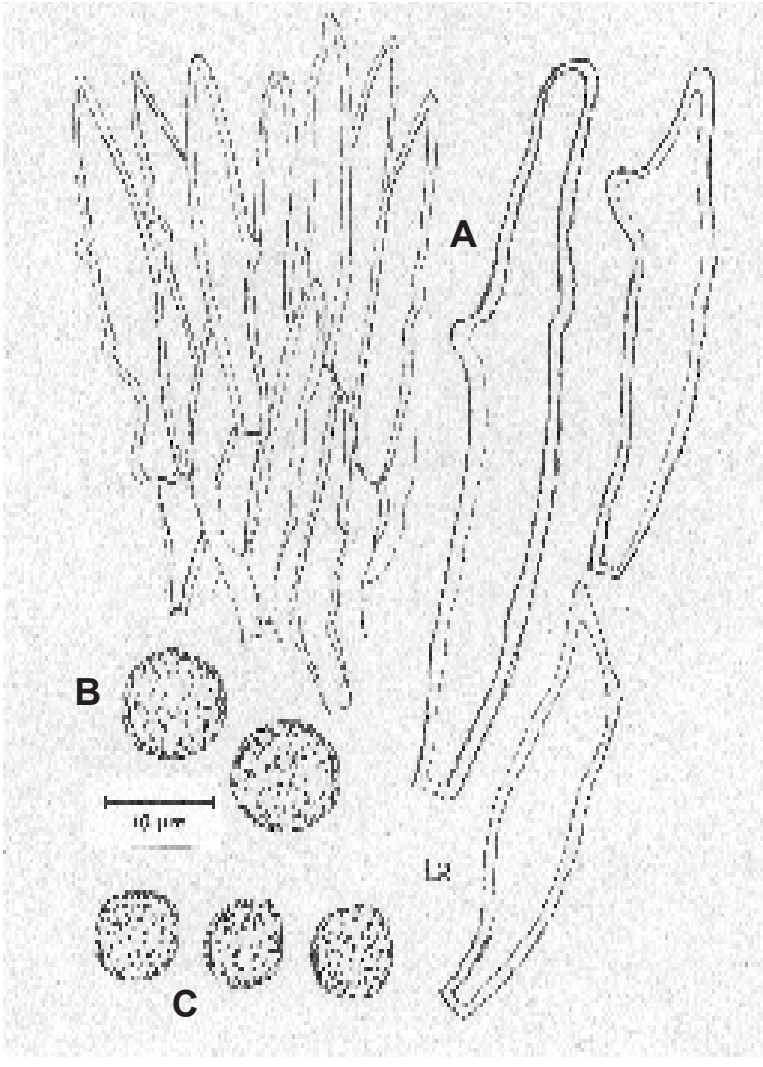


Fig. 22. *Amauroderma schomburgkii* A) skeletal hyphae from the dissepiments, B) basidiospores. *A. sprucei* C) basidiospores. From the lectotypes.

Distribution. Known only from the type locality in Santa Catarina in southern Brazil.
Remarks. The laccate reddish brown pileus surface makes this a unique species in the genus. It is easily taken as a *Ganoderma* species until the basidiospores are observed.

Amauroderma schomburgkii (Mont. & Berk.) Torrend, Fig. 22 A-B
Broteria Bot. 18:140, 1920. - *Polyporus schomburgkii* Mont. & Berk., Lond. J. Bot. 3:331, 1844. - *Polyporus brunneo-pictus* Berk., London J. Bot. 8:176, 1856. - *Polyporus cassiaecolor* Berk., Ibid. 8:181, 1856. - *Polyporus ocellatus* Berk., Ibid. p.172, 1856. - *Polyuporus semiclausus* Berk., ibid. p. 193, 1856. - *Polyporus xylodes* Berk., ibid. p. 171, 1856. - *Polyporus glaziovii* Berk., Vidensk. Medd. Dansk Naturforh. Copenhagen 31/32: 31, 1880. - *Fomes regulicor* Cooke, Grevillea 15:123, 1886. - *Polyporus papillatus* Lloyd, Lloyd Mycol. Writ. 4:567, 1916. – *Microporellus setigerus* Corner, Beih. Nova Hedwigia 86:119, 1987.
Basidiocarps annual, centrally to laterally stipitate; pileus single, convex to applanate, spatulate or flabelliform to infundibuliform, slightly undulate, 3-10 cm in diam, 6-10 mm thick, woody, glabrous, dull, dark reddish brown, often with concentric zones, in section with a thin darker cuticle; margin sharp and deflexed when dry, pore surface whitish grey when fresh and actively growing, becoming dark brown with age and drying, pores angular with entire dissepiments, 5-7 per mm; tubes concolorous, often darker than the context, up to 5 mm deep, context golden to dark brown, darker when old and dry, up to 4 mm thick.
Stipe, 4-9 cm long, 5-8 mm thick, tubular, dull, concolorous with the pileus.
Hyphal system dimitic, generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae thick-walled, hyaline, arboriform , those of the dissepiments with apical protuberances, 2-6 µm wide, the cortex on the upper surface consists of agglutinated hyphae without any distinct
structure.
Basidia not seen.
Basidiospores globose, thick-walled with a distinct endosporic projections, yellow, IKI-, 7-10 µm in diam.
Substrata. Known from dead deciduous wood.
Distribution. Known from southern Brazil to Cuba, Puerto Rico and Jamaica and seemingly the most common *Amauroderma* seen in the neotropics and locally rather abundant.
Remarks. The reddish brown pileus, the brown context, the small pores and the globose basidiospores characterize this species. *A. sprucei* is separated by its white to pale cream context.

Amauroderma sprucei (Pat.) Torrend,
Fig.22 C

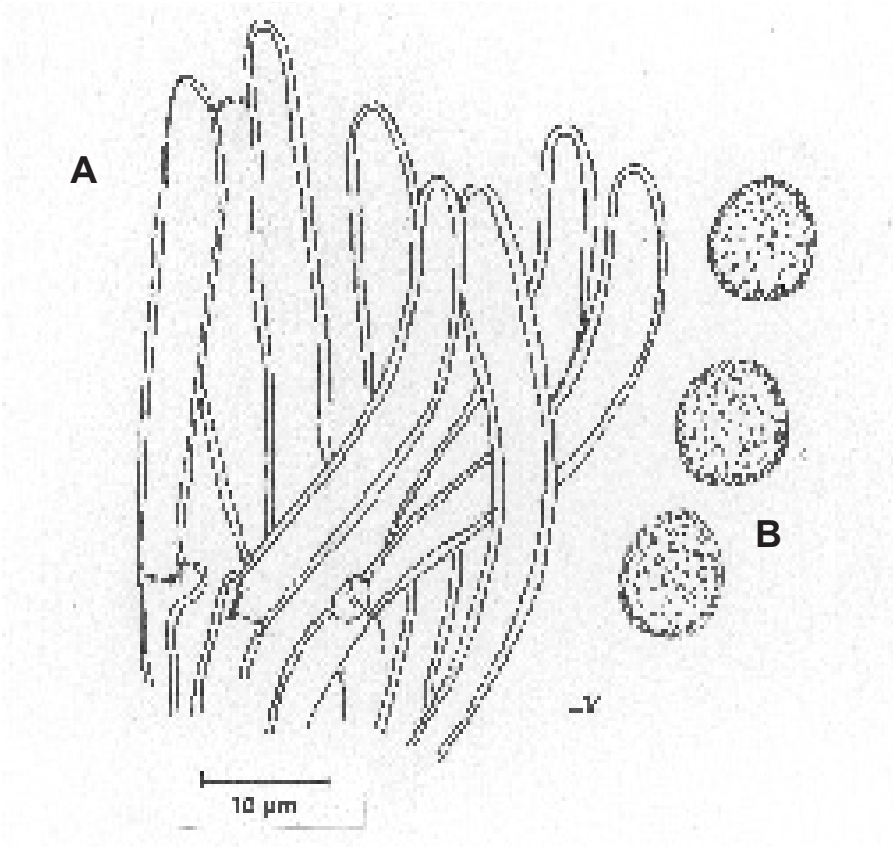


Fig. 23. *Amauroderma trichodermatum* A) apical cells from the pileus, B) basidiospores. Ryvarden 42325 Venezuela (O).

context.

Hyphal system dimitic, generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae dextrinoid, thick-walled, hyaline to pale yellow, arboriform, 2-6 µm wide, pileus tomentum of agglutinated pale brown thin- to thick-walled generative hyphae, 2-6 µm wide with distinct clamps.

Basidia not seen.

Basidiospores subglobose, thick-walled, distinctly ornamented, hyaline to very pale yellow, IKI-, 7-8 x 6.5-7.5 µm

Substrata. Known from dead hard wood.

Distribution. Known from the type locality in Parana State, Brazil and the Gran

Broteria Bot. 18:121, 1920. - *Porothelium rugosum* Berk. London J. Bot. 8:237, 1856. - non *Amauroderma rugosum* (Blume & Nees:Fr.) Torrend, Broteria Bot. 18:1279, 1920. - *Ganoderma sprucei* Pat., Bull. Soc. Mycol. Fr. 10:75, 1894.
Basidiocarps annual, centrally to laterally stipitate; pileus single, convex to applanate, spatulate or flabelliform to infundibuliform, slightly undulate, 3-10 cm in diam, 6-20 mm thick, woody, first hirsute later becoming more or less glabrous, dull, dark reddish brown, often with concentric zones, in section with a thin darker cuticle; margin sharp and deflexed when dry, pore surface whitish to ochraceous when fresh and actively growing, becoming pale cinnamon with age and drying, pores round, 5-7 per mm; tubes concolorous, up to 5 mm deep, context white to cream paling to cinnamon in old specimens, sometimes with faint black lines when mature, up to 10 mm thick and with a thin cuticle in section.
Stipe, 4-9 cm long, 5-8 mm thick, tubular, concolorous with the pileus, glabrous, context duplex, peripheral part denser and darker than the central core from which it is separated by a thin black line.
Hyphal system dimitic, generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae thick-walled, hyaline, arboriform, 3-8 µm wide, dextrinoid, the cortex on the upper surface consists of partly inclined hyphae becoming agglutinated and without any distinct structure.
Basidia not seen.
Basidiospores globose, thick-walled, distinctly ornamented, yellow, IKI-, 8-10 µm in diam.
Substrata. Known from dead deciduous wood.
Distribution. From southern Brazil to Cuba, Colombia, Puerto Rico and Jamaica.
Remarks. The white to cream context above all, but also reddish brown pileus, the small pores and the globose basidiospores characterize this species. It is separated from *A. schomburgkii* only by the much lighter context being white to pale cream in fresh condition.

Amauroderma trichodermatum Furtado,
Fig. 23
Rev. gen. *Amauroderma* p. 311, 1968.
Basidiocarps annual, laterally stipitate; pileus single, applanate, concentrically zonate, slightly undulate, 11 cm in diam, 6-7 mm thick, soft, zonate with dark brown tomentose zones alternating with glabrous black zones, tomentum variable from slightly hirsute to tomentose-velutinate, in section with a thin dark cuticle; margin sharp and deflexed when dry, pore surface white when fresh, becoming ochraceous by age, pores angular with entire dissepiments, 3-4 per mm; tubes concolorous, up to 3 mm deep, context white, dense and homogenous drying ochraceous, up to 3 mm thick.
Stipe lateral up to 8 cm long and 5-8 mm in diameter, velutinate and dark brown becoming glabrous with age, in section with distinct cuticle and a white homogenous

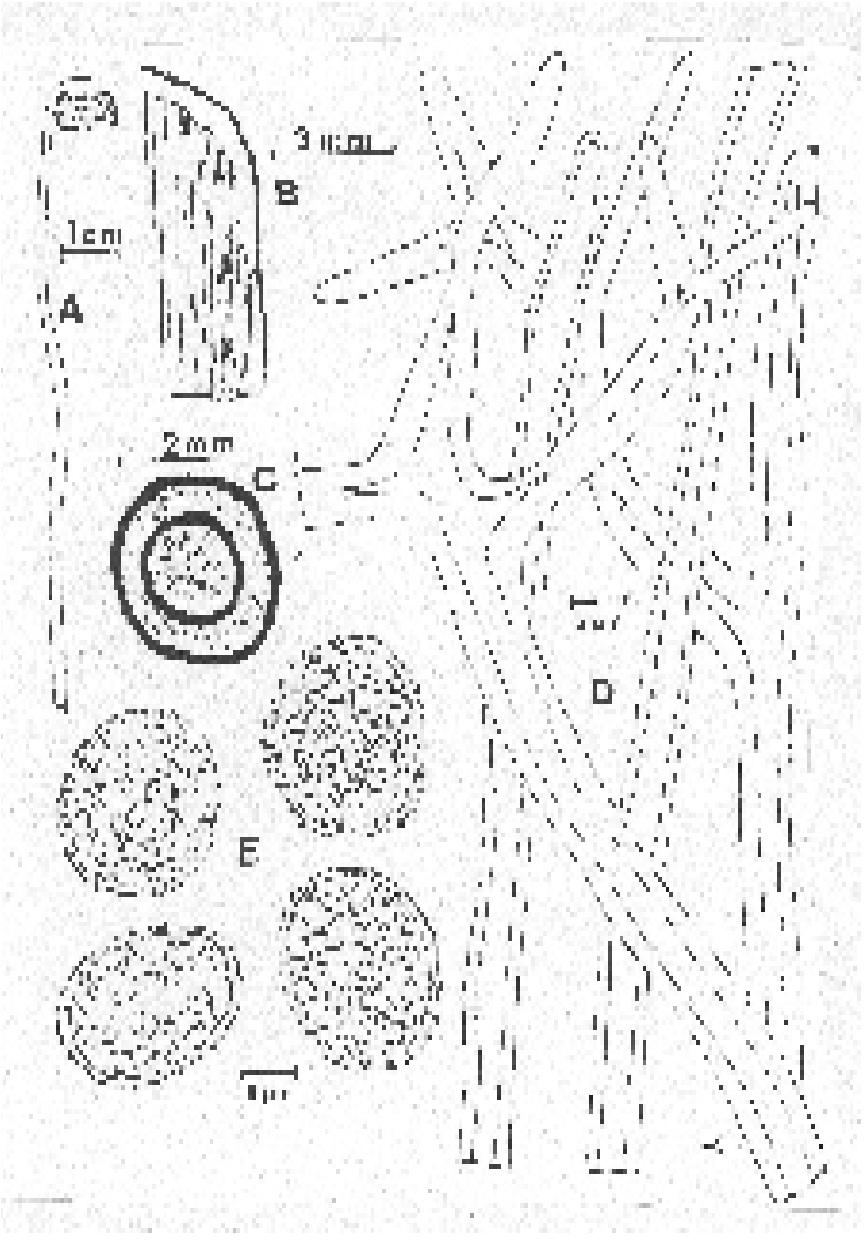


Fig. 24. *Amauroderma unilaterum* A) basidiocarp, B) section through pileus, C) section through stipe with distinct loose core surrounded by a black zone, D) arboriform skeletal hyphae, E) basidiospores. From the lectotype.

Sabana in Venezuela.
Remarks. The zonate pileus where dark brown velutinate zones alternating with black glabrous zones, a white pore surface, tubes and context beside are good field characteristics. The species seems isolated compared with the other species described here. Anyone who has seen the boreal *Ischnoderma resinosum* will immediately think about to this species when observing the pileus of *A. trichodermatum*. Their pileus surface both in colour and the variable tomentum is virtually identical.

Amauroderma unilaterum (Lloyd) Ryvarden,
Fig. 24
Mycotaxon 38:101, 1990. - *Polyporus unilaterus* Lloyd, Lloyd Mycol. Writ. 3:117, 1912.
Basidiocarps annual, stipitate; pileus single and laterally attached, being almost pendant in the type, semicircular, 1 cm in diam, 3-6 mm thick, upper surface glabrous, smooth, dull, reddish brown and concentrically zonate, in section with a thin darker cuticle; margin sharp pore surface pale brown, pores tiny and almost invisible to the naked eye, 7-8 per mm, tubes concolorous, up to 3 mm deep, context probably white when fresh, in the type pale cream, up to 3 mm thick.
Stipe lateral, up to 15 cm long and 2-3 mm thick, tubular and hollow in the type, concolorous with the pileus surface, the core is filled with a cottony white mycelium.
Hyphal system dimitic, generative hyphae with clamps, hyaline, thin-walled, 2-4 µm wide, skeletal hyphae thick-walled, hyaline, arboriform, 2-6 µm wide in the main stem, the cortex on the upper surface of agglutinated hyphae without any distinct structure.
Basidia not seen.
Basidiospores subglobose to globose, thick-walled, distinctly ornamented, yellow, distinctly dextrinoid, 15-17 x 13-15 µm.
Substrata. Known from dead deciduous wood.
Distribution. Known only from the type locality in Brazil.
Remarks. The white to cream context, the tiny pores and the large, dextrinoid basidiospores characterize this species.

GANODERMA P. Karst.
Rev. Mycol.3:17, 1881.
Basidiocarps annual or perennial, stipitate to sessile; pileus surface with a thick, dull cuticle or shiny and laccate with a thin cuticle or cuticle of clavate end cells; context

cream coloured to dark purplish brown, soft and spongy to firm-fibrous; pore surface cream coloured, bruising brown, the pores regular, 4-7 per mm; tube layers single or stratified, pale to purplish brown; stipe when present central or lateral; hyphal system dimitic; generative hyphae with clamps; skeletal hyphae hyaline to brown, non-septate, often with long, tapering branches; basidia broadly ellipsoid, tapering abruptly at the base; cystidia absent; basidiospores broadly to narrowly ellipsoid with a truncate apex and apical germ pore, wall two layered, the endosporium brown and separated from the hyaline exosporium by inter-wall pillars or sinuous ridges, negative in Melzer's reagent, 7-30 µm long. Causing uniform or mottled white rots of dead and living hardwoods and conifers. Large, cosmopolitan genus with most species in the tropical zone.

Type species: *Ganoderma lucidum* (W. Curt.: Fr.) P. Karst.

Remarks. The genus is separated from *Amauroderma* mainly by its distinctly truncate spores. Most species of *Ganoderma* grow on dead wood, while most *Amauroderma* species grow on the ground from buried roots, being apparently parasitic. Species with a laccate shiny surface are present in both genera and this is also the case with both centrally and laterally stipitate species. The borderline between the two genera is not very distinct, and some species are similar with regard to macroscopical characteristics.

Key to species

1. Pileus dull, grey to dark brown and with a thick, hard cuticle..... **2**
1. Pileus laccate and shiny, cream, reddish orange, red, bay or black **.....7**

2. Context whitish **3**
2. Context brown..... **6**

3. Basidiospores 7-11 µm long **4**
3. Basidiospores 15-20 µm long **5**

4. Basidiospores with regular ornamentation, 7-8 µm long **.....G. amazonense**
4. Basidiospores with irregular ornamentation 10-11 µm long **..... G. coffeatum**

5. Basidiospores with regular ornamentation **.....G. guianensis**
5. Basidiospores with irregular sinuous ornamentation **..... G. neurosporum**

6. Basidiocarp sessile, pore surface white when fresh becoming brown, basidiospores 5-8 µm wide, very common species**.....G. australe**
6. Basidiocarp stipitate, pore surface citric yellow, basidiospores 4.5-5 µm wide, very rare Amazonian species **.....G. citriporum**

7. Context whitish and spongy, often up to 5 cm thick, spores longer than 15 µm .....**G. colossum**

7. Context wood-coloured to brown, tough to woody, spores shorter than 15 µm..... **8**

8. Cuticle elements strongly amyloid with protuberances and outgrowths **9**
8. Cuticle elements non amyloid or weakly amyloid, smooth and club-like..... **14**

9. Basidiocarp with up to 20 cm long slender stipe **10**
9. Basidiocarp sessile or with a lateral stipe **.....11**

10. Basidiospores 15-16 µm long, ... **G. longistipitatum**
10. Basidiospores 12-14 µm long, **.....G. concinnum**

11. Spores 7-8 x 5-6 µm **..... G. multiplicatum**
11. Spores 10-11 x 6-7 µm **.....12**

12. Cuticle cells antler like with numerous outgrowths or protuberances, upper surface shiny black and densely zonate **.....G. multicornis**
12. Cuticle cells sinuous and lobed with wide rounded outgrowths **.....13**

13. Spores 10-11 µm **..... G. orbiformum**
13. Spores 12-15 µm **.....G. zonatum**
14. Basidiospores shorter than 10 µm **.....15**
14. Basidiospores longer than 10 µm (*G. resinaceum* group) **16**

15. Context of stipe and pileus with 1 or 2 black zones ..... **G. stipitatum**
15. Context without dark resinous bands..... **G. perzonatum**

16. Context with one or two black bands from base **.....17**
16. Context without black bands **.....18**

17. Basidiocarp sessile to dimidiate, pores 3-4 per mm **..... G. chalceum**
17. Basidiocarp with a thin long stipe, pores 6-7 per mm **.....G. elegantum**

18. Spores 12-15 x 8-10 µm..... **G. oerstedtii**
18. Spores shorter **.....19**

19. Cuticle cells sinuous with occasional outgrowths and dichotomously lobed .....**G. nitidum**
19. Cuticle cells regularly clavate**.....G. resinaceum**

Ganoderma amazonense Weir, ...
.....
Fig. 25 A

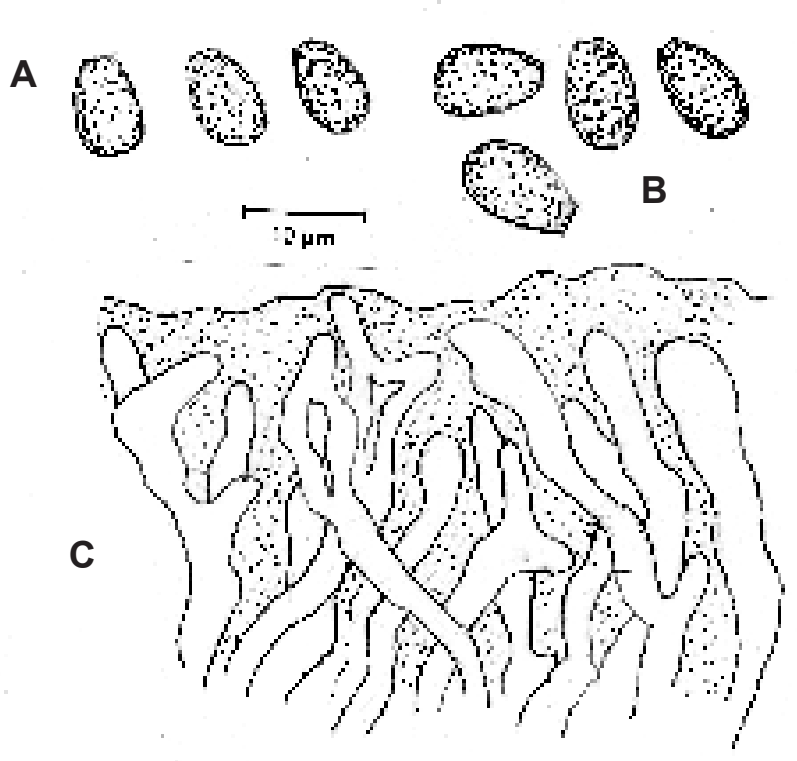


Fig. 25. *Ganoderma amazonense*, A) Basidiospores, *G. australe* B) Basidiospores, C) section through the upper cuticle, A-B from the lectotypes, C from R. 36712 (Zimbabwe).

Bull. US Dep. Agric. 1380:93, 1926.

Basidiocarps perennial, pileate, laterally stipitate to sessile and broadly attached, corky to woody, 10 x 10 x 3 cm; upper surface flat, or slightly depressed when stipitate, usually sulcate, glabrous, with a distinct cuticle in section, pale to dark brown to deep reddish brown, stipe up to 5 cm long, concolorous with the pileus cover, pore surface creamy white at first, later ochraceous, pores angular to circular, about 4-6 per mm; tube layers concolorous with pore surface, up to 20 mm thick, usually without distinct stratification, context yellowish cream, slightly darker toward the dark brown and dense cuticle, up to 6 mm thick at the base or close to the stipe. **Hyphal system** dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-5 µm in diam, difficult to observe in dried specimens; skeletal hyphae abundant, thick-walled, pale yellowish brown, unbranched or with a few distal branches, hyaline to pale yellow, thick-walled, non-septate, 3-5 µm in diam at the base, side branches

long and whip-like, cuticle 100-200 µm thick with agglutinated hyphae in a dense structure without any distinct organization.
Basidia not seen.
Basidiospores ellipsoid, hyaline to pale yellow, 7-8 x 5-6(7) µm
Substrata. Numerous hardwoods.
Distribution. Neotropical species, recorded from Brazil and north to several countries in the Caribbean including Jamaica and Puerto Rico.

Remarks. *G. amazonense* may be recognized by the light coloured context, the dull and indeterminate cuticle and the small spores.

Ganoderma australe (Fr.) Pat., ...
.....
Fig. 25, B-C.
Bull. Soc. Mycol. Fr. 5:67, 1889. - *Polyporus australis* Fr., Elench. Fung. 1:108, 1828. – *Ganoderma tornatum* (Pers.) Bres., Hedwigia 53:55, 1912.
Basidiocarps perennial, applanate, ungulate, often irregular when growing from cracks etc., normally dimidiate and semicircular in outline, variable in size, 4-40 cm long, 4-20 cm wide and up to 10 cm thick in single basidiocarps, woody hard when dry, pileus dull, cocoa-brown to deep umber to black in old specimens, dying or weathered specimens more greyish, surface often covered with a cinnamon to pale cocoa powder of deposited spores, otherwise surface glabrous, smooth, mostly distinctly sulcate in variable zones, somewhat cracking with age and drying, black cuticle present, 0.2-3 mm thick, increasing in thickness towards the base, margin light- coloured in actively growing specimens, whitish to yellowish, pore surface white to cream in actively growing specimens, then dark when bruised, in older and resting species, pale to umber-brown, pores round, entire, quite thick-walled, 3-5 per mm, tubes dark brown in section with light-coloured tube-walls, in older parts often stuffed with white mycelium, weakly stratified, up 6 cm thick, context evenly dark bay brown, rarely with some white spots, in most specimens with one or several horizontal black resinous or melanoid bands above the tubes, but these bands are apparently absent in some specimens.
Hyphal system dimitic, generative hyphae with clamps, thin-walled and hyaline, 1.5-3 µm wide, skeletal hyphae dominating in the basidiocarp, variable brown to yellow, thick-walled to solid, up to 6 µm wide, branching variable, in lower part unbranched and then arboriform in the top, often irregular, binding hyphae delicate, mostly very thin, 1-2 µm wide and richly branched, easiest to find in the white mycelium filling the old tubes.
Basidia barrel shaped, 15-20 x 6-10 µm and with 4 large sterigmata.
Basidiospores truncate, golden-brown, echinulate, 7-12 x 5-8 µm.
Substrata. On deciduous wood.

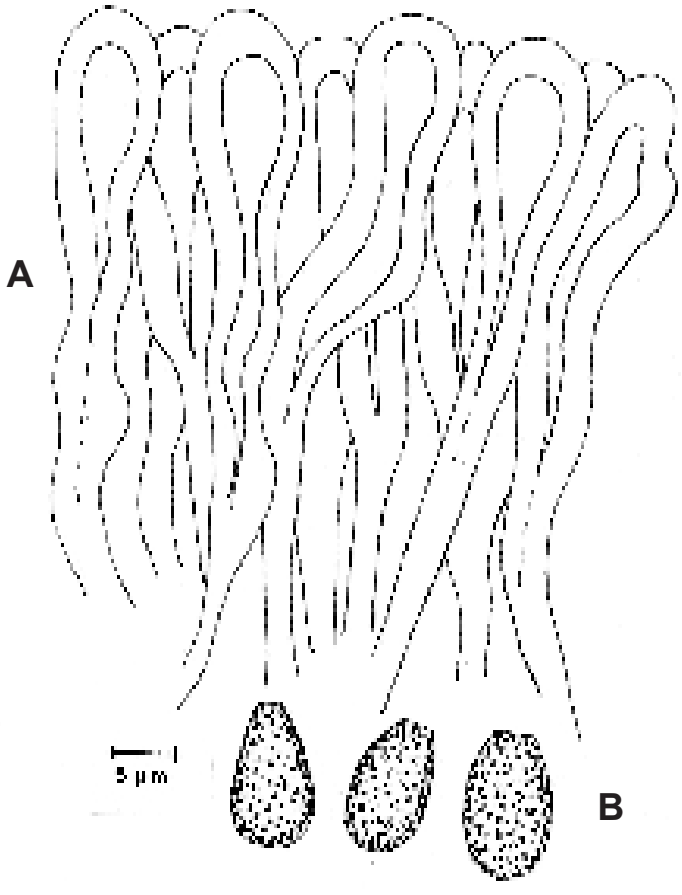


Fig. 26. *Ganoderma chalceum* A) Apical cells from the cuticle, B) basidiospores, from the holotype of *Ganoderma hollidayii* (Colombia).

Distribution. Pantropical and common in tropical America and because of the long-lived and large basidiocarps it is conspicuous and thus frequently collected.
Remarks. The species is usually recognized in the field due to its distinct black cuticle, the greyish to brown pileus and dark brown tubes and context. Macroscopically it is strikingly reminiscent of *Fomes fasciatus*, but this species has a rustier brown context with a granular mottled mycelial core at the base. Microscopically it is easily separated by its large cylindrical and hyaline basidiospores.

The closely related species *G. applanatum* of the temperate zone has similar basidiocarps, but a thinner cuticle, context without black bands and shorter spores.

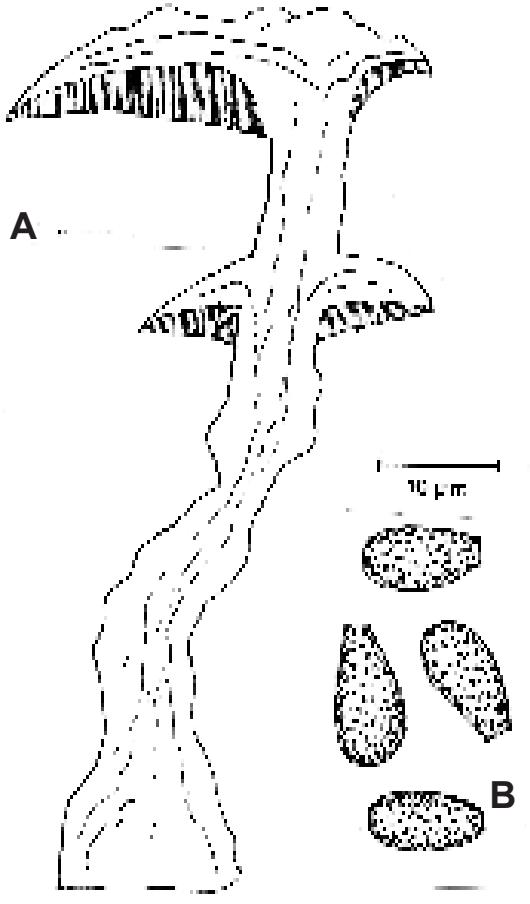


Fig. 27. *Ganoderma citriporum,* A) section of basidiocarp, B) basidiospores, from the holotype.

Ganoderma chalceum (Cooke) Steyaert, ...

.....

Fig. 26

Bull. Jard. Nat. Belg. 37:481, 1967. - *Polyporus chalceus* Cooke, Trans. Proc. Bot. Soc. Edinb. 13:135, 1878. - *Ganoderma hollidayii* Steyaert, Bull. Jard. Bot. Belg. 32:99, 1962.

Basidiocarps perennial, pileate, more or less dimidiate to broadly attached, corky to woody, up to 15 cm in diam and 3 cm thick at the base, upper surface flat, sulcate, glabrous, with a distinct cuticle in section, at first reddish to bay and then black from the base, pore surface pale brown, pores angular to circular, about 3-4 per mm with thick dissepiments, tube layers concolorous with pore surface, up to 2 cm deep, con-

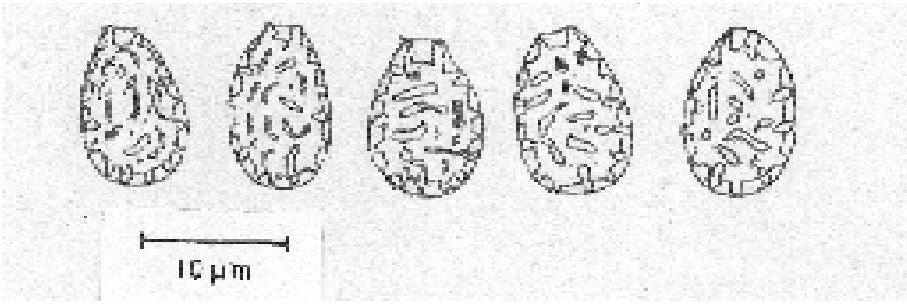


Fig. 28. *Ganoderma coffeatum*, basidiospores, from the lectotype.

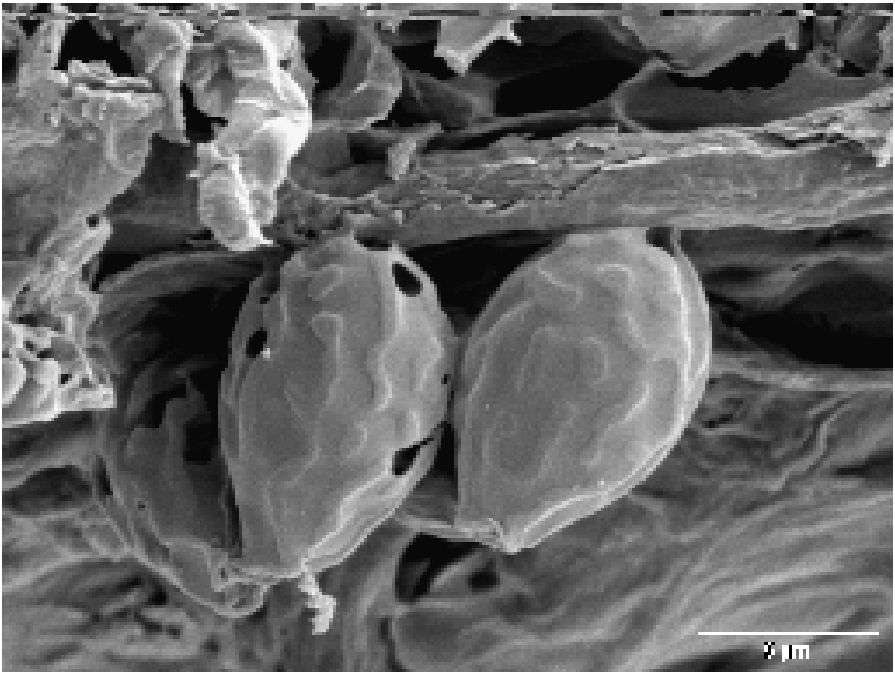


Fig. 29. *Ganoderma coffeatum*, basidiospores showing the irregular ornamentation.

text up to 3 cm thick at the base, pale brown with a darker zone just above the tubes and a black resinous band starting at the base and extending about half way to the periphery, cuticle a palisade of clavate to club shaped generative hyphae, smooth, apically slightly amyloid, up to 70 µm long.
Hyphal system dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-5 µm in diam, skeletal hyphae abundant, thick-walled, yellowish brown, 2-6 µm in diam.
Basidia not seen.
Basidiospores ellipsoid, yellowish brown, 10-12 x 5-7 µm.
Substrata. On dead hardwood.
Distribution. Widespread in the paleotropic zone. In the neotropical zone only known from Colombia.
Remarks. The species belongs in the widespread *G. resinaceum* complex, separated mainly by a black band in the context, a characteristic not seen in *G. resinaceum.* Microscopically the two species are identical.

Ganoderma citriporum Ryvarden & Iturriaga nov. sp. ..... Fig. 27
Ad *Ganoderma australe* (Fr.) Pat, sed basidioma stiptatum, pori citrini et sporae oblongae.
Holotype: Venezuela, Estado Amazonas, Yutaje, 12. June 1997, Ryvarden 40466, VENN, Isotype in O.
Basidiocarps perennial, laterally stipitate with one or two pilei from the same stipe, individual pilei up 15 cm wide and long and 3 cm thick, woody hard when dry, pileus dull, glabrous, slightly sulcate zoned, grey to almost white with some darker bands, thin black cuticle present, 100-300 µm thick, margin sharp and light- coloured in actively growing specimens, pore surface bright citric yellow in actively growing specimens, only slightly paling when dry, pores round, entire, quite thick-walled, 6-7 per mm, invisible to the naked eye, tubes dark brown, up to 1cm deep without zonation, context evenly dark bay brown with one or several horizontal to irregular black resinous or melanoid bands.
Stipe 25 cm high in the type, twisted and 2 to 5 cm in diameter, irregular of outline with knobbly outgrowths and a smaller pileus beneath the upper one, glabrous and evenly dark brown, context dark brown and slightly duplex, the other part homogenous, the inner part vaguely delimited and with numerous short black melanoid bands which may be continuous although this is difficult to ascertain in the sectioned type.
Hyphal system dimitic, generative hyphae with clamps, thin-walled and hyaline, 1.5-3 µm wide, skeletal hyphae dominating in the basidiocarp, variable brown to yellow, thick-walled to solid, up to 6 µm wide, branching variable, unbranched in lower part, arboriform in the top, often irregular
Basidia barrel shaped, 18-20 x 7-10 µm and with 4 large sterigmata.

Basidiospores truncate, golden-brown and oblong, finely ornamented, 9-10 x 4.5-5 µm, thus narrower than the spores in *G. australe* (7-12 x 5-8 m).
Substrata. On unknown hardwood log.
Distribution. Known only from the type locality.
Remarks. This is a striking species because of its irregular large stipe, the citric yellow pore surface and the oblong relatively narrow spores, all characters distinct from *G. australe* to which it apparently is related. The dark brown context with black melanoid bands and the dull cuticle are common characters for the two species.

Ganoderma coffeatum (Berk.) Furtado, ...
.....
Fig. 28-29
Persoonia 4:383, 1967. - *Polyporus coffeatum* Berk., Ann. Mag. Nat. Hist. 3:385, 1839.
Basidiocarps annual, more or less centrally stipitate, often pleuropodial, pileus up to 15 cm in diam, flat to convex, first velutinate with alternating velutinate to pubescent and glabrous zones, becoming glabrous with age, dull, undulating, usually with concentric zones, central part dark brown, paler towards the margin and cinnamon brown, margin thick and with furrows or groves, pore surface citric yellow to pale whitish yellow when fresh, drying wood-coloured, bright yellow or straw-coloured, pores round, 4-6 per mm; tubes concolorous, up to 10 mm deep, context white becoming cream coloured, 4-10 mm thick in the centre of the pileus and with a cuticle, up to 100 µm thick.
Stipe usually lateral, up to 10 cm high and 8-15 mm in diam, base often slightly swollen, dark brown, dull and glabrous with a distinct dark cuticle, 100-300 µm thick, context of stipe as in pileus.
Hyphal system dimitic; generative hyphae with clamps, hyaline, thin-walled, branched, 2-7 µm wide, skeletal hyphae terminal arboriform, hyaline, 4-6 µm wide, in the cuticle on the pileus and stipe embedded in a dark substance that dissolves in KOH, surface of pileus with irregularly aggregated hyaline hyphal ends, both of skeletal and generative origin**.**
Basidia barrel-shaped, 4-sterigmate, 12-16 x 8-10 µm, with a basal clamp.
Basidiospores ellipsoid, pale brown, truncate, covered with short traverse ridges in a reticulate pattern, negative in Melzer's reagent, 10-11 x 6-8 µm.
Substrata. Known from dead wood of hardwood trees.
Distribution. Neotropical species, known from Brazil and Bolivia and north to Cuba and Puerto Rico.
Remarks. The species is easy to recognize by its white to yellow pore surface, white context and the irregularly, reticulated basidiospores. In the field it may easily be mistaken to be an *Amauroderma* species, but the truncate, irregularly ornamented spores will be diagnostic.

Ganoderma colossum (Fr.) C.F. Baker,.....

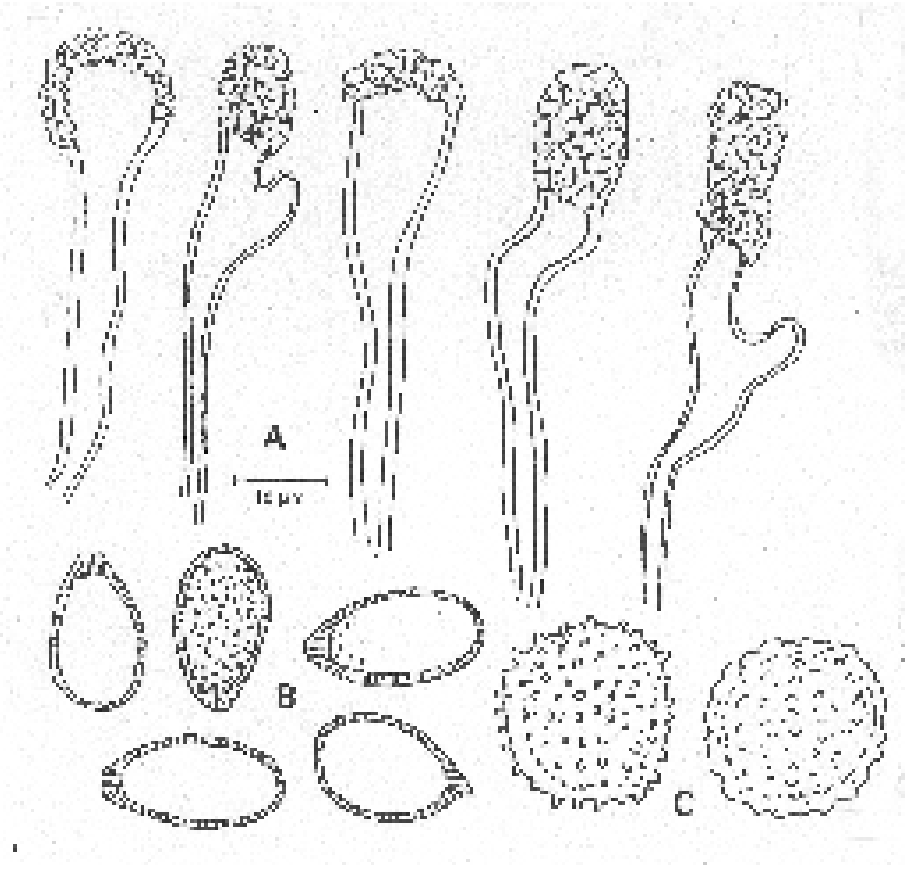


Fig. 30. Ganoderma colossum, A) apical cells from the cuticle, B) basidiospores C) chlamydospores from the context. From the holotype.

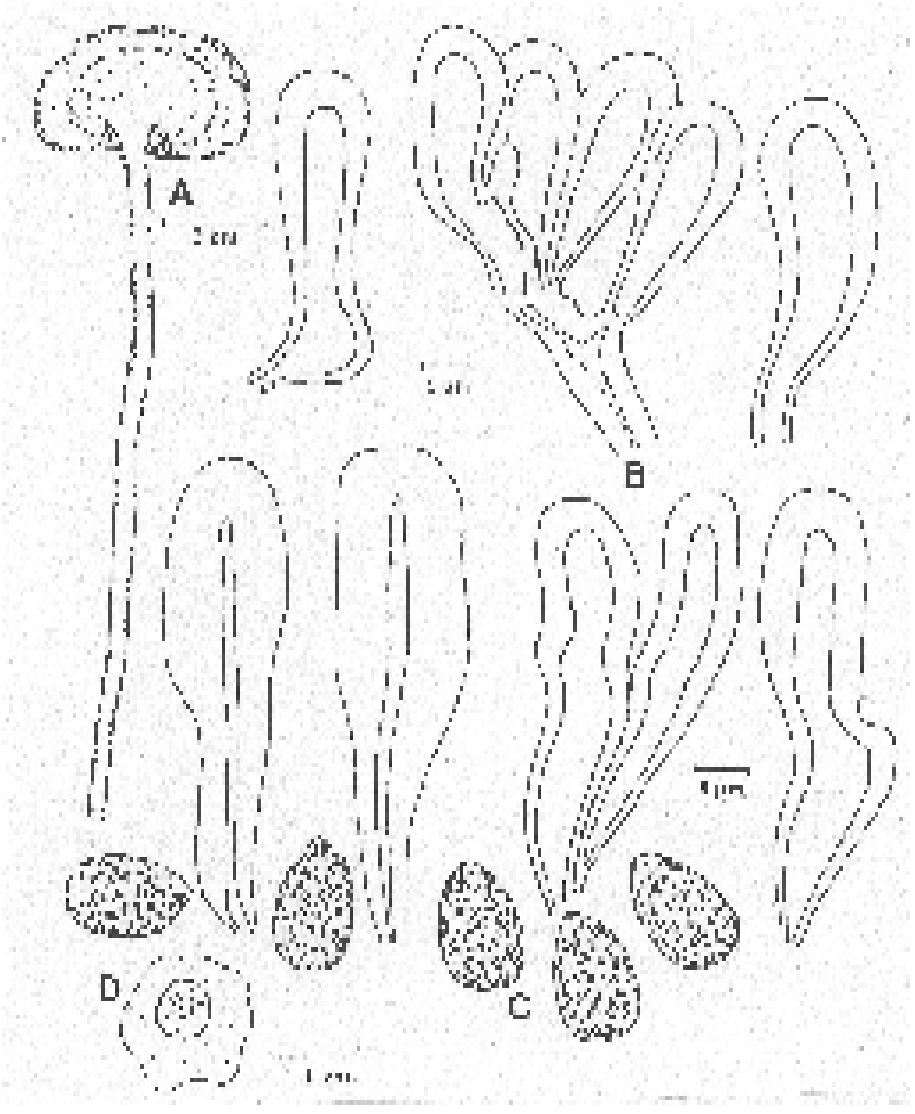


Fig. 31: *Ganoderma concinnum* A) Basidiocarp, B) apical cells from the cuticle, C) basidiospores D) section of the stipe. From the holotype.

..... Fig. 30

V. Cent. Fungi Malay. No. 425, 1918. - *Polyporus colossus* Fr., Nov. Symb. p. 56. 1851.

Basidiocarps annual, sessile, up to 50 x 25 x 12 cm, very light in weight when dried; pileus first finely tomentose, quickly developing a thin, laccate cuticle that is easily dented with a fingernail, yellow, becoming yellowish brown or eventually blackening with age; pore surface cream coloured when fresh, darkening to a dull pale brown on age or drying, the pores angular to rounded, 2-4 per mm, with thick, entire dissepiments; tube layer pale vinaceous brown, also soft, up to 2 cm thick, context cream coloured to pale buff, soft, fibrous-spongy, azonate, homogeneous, up to 10 cm thick.

Hyphal system dimitic, generative hyphae obscure, thin-walled, with clamps 2.5-4 µm in diam; skeletal hyphae thick-walled, hyaline, weakly dextrinoid with occasional branching, 2-6 µm in diam, generative hyphae readily discernible; pileus surface with a dense palisade of clavate thin-walled cells, negative in Melzer's reagent, 32-75 x 7.5-12 µm.

Chlamydospores scattered through context and rare in the trama, reddish brown in KOH, negative in Melzer's reagent, spherical, thick-walled, with a coarse reticulate surface ornamentation and blunt, cylindrical projections up to 4 µm long and 2 mm wide, main body of spore 18-23 µm in diam.

Basidia almost spherical with a short narrowed base, apparently 4-sterigmate, 20-30 x 13-17 µm.

Basidiospores ellipsoid, pale brown in KOH, negative in Melzer's reagent, strongly ornamented, 15-19 x 10.5-12.5 µm.

Substrata. Hardwoods and of specific hosts recorded on *Celtis laevigata*.

Distribution. A rare tropical species, known from Florida in USA, Central and South America, and tropics of the old world.

Remarks. This is a very distinctive species of *Ganoderma* with the yellow, laccate pileus surface, pale context with slightly dextrinoid skeletal hyphae, large basidiospores, and striking chlamydospores, providing a unique combination of characters. The species is the type of *Tomophagus* Murrill.

Ganoderma concinnum Ryvarden,..... Fig. 31

Mycologia 92:183, 2000.

Basidiocarps annual, laterally stipitate, pileus semicircular, up to 5 cm in diameter and about 4 cm thick at the stipe attachment, upper surface flat to slightly bent when dry, faintly sulcate, glabrous, shiny when fresh, dull when dry, laccate, first deep copper red then deep bay, pore surface creamy white at first, probably becoming brown when weathered naturally in the forest, pores small, not visible to the naked eye, round, in the type 6 per mm, pore walls of same thickness as the pore diameter,

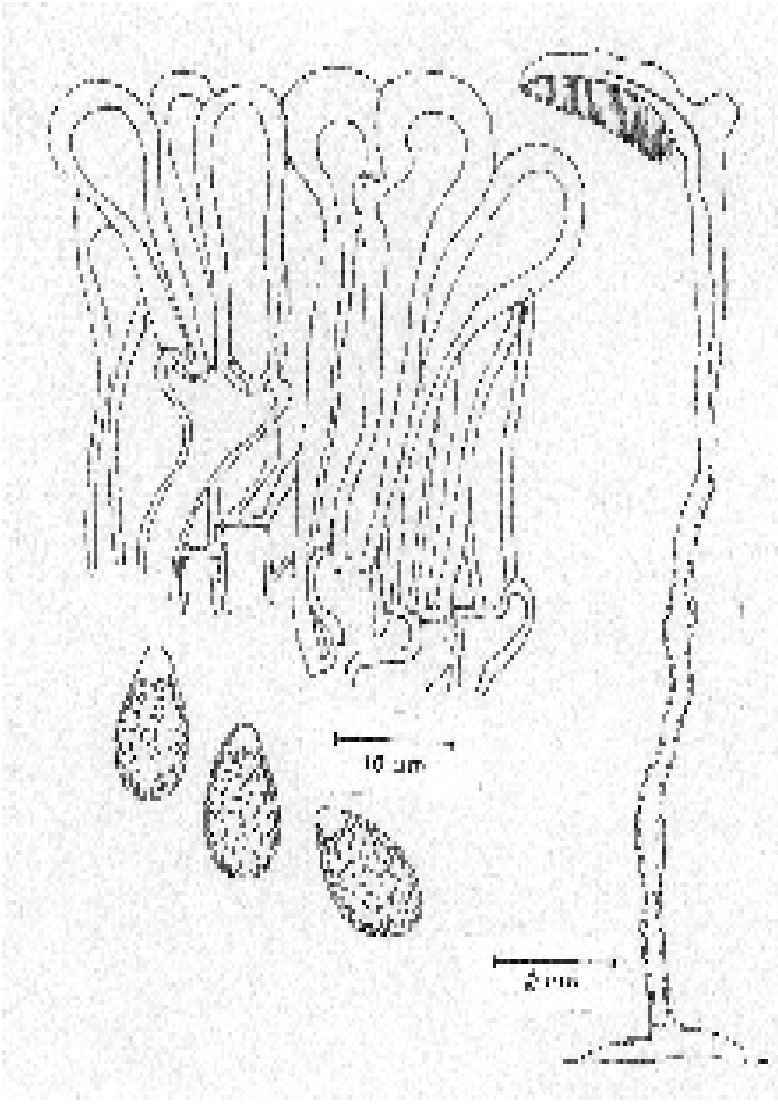


Fig. 32 *Ganoderma elegantum* A) apical cells from cuticle B) section of the basidiocarp C) basidiospores. From the holotype.

tubes pale brown, finally stratified, up to 3 cm deep, context duplex in colour, lower part dark brown, the upper part pale brown, up to 10 mm thick at the base from which several black resinous bands penetrate the context horizontally up to 2.5 cm. These bands or zones are an elongation of the black cylinder in the stipe.
Stipe up to 20 cm long, round to slightly flattened, 4 to 15 mm in diameter, deep bay to black and shiny, in section duplex with an inner dark brown core and with a partly open vertical channel, surrounded a black zone from the outer dense pale brown context, the core diameter about the width as the pale context
Hyphal system dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-4 µm in diam, difficult to observe in dried specimens; skeletal hyphae pale yellowish brown to pale rusty brown, abundant, thick-walled, yellowish brown, arboriform with a long unbranched basal part and with a moderately, mostly dichotomously branching in the upper part, 5-10 µm in diam in the unbranched part, ending in whip like apices.
Cuticle a palisade of club shaped cells, smooth, yellowish brown in KOH, thick-walled and more so in the apical part, 20-50 x 8-15 µm distinctly amyloid in the apical part, those of the stipe cuticle up to 80 µm long.
Basidia not seen.
Basidiospores broadly ellipsoid, truncate at the apex, coarsely echinulate, pale brown, 12-14 x 7-8 µm.
Substrata. From buried roots.
Distribution. Only the type is known, Colombia, Department Choco, Riosucio nat. park.
Remarks. This is a beautiful and conspicuous species by its long, slender and black shiny stipe with a circular copper red pileus and tiny pores. The duplex core is also rare among the stipitate *Ganoderma* species. Microscopically the coarsely ornamented, large basidiospores and relatively short broadly clavate apical cells in the cuticle are diagnostic.

Ganoderma elegantum Ryvarden nova species,.....
.....
Fig. 32
Ad *G. stipitato* Murrill sed sporae oblongae, 10-13 x 5-7 µm (7-9.5 x 5-6.5 µm in *G. stipitatum*).
Holotype: Ecuador, Yasuni National Park, Yasuni Scientific Res. Sta. 12. March 2002, on dead hardwood log, Ryvarden 44573 (O), isotype in QCA.
Basidiocarps perennial, laterally stipitate, pileus semicircular, 3 x 2 x 1 cm; upper surface deep bay, sulcate, shiny and laccate with a distinct cuticle in section, pore surface pale brown, pores round 6-7 per mm; tubes concolorous with pore surface, up to 6 mm deep, context with one or two black dense bands originating at the bottom of the stipe and extending to about 1 cm from the margin, the lower part of context dark brown, up to 4 mm thick at the base.
Stipe long, slender and elegant, 15 cm long and up to 5 mm in diameter, deep bay,

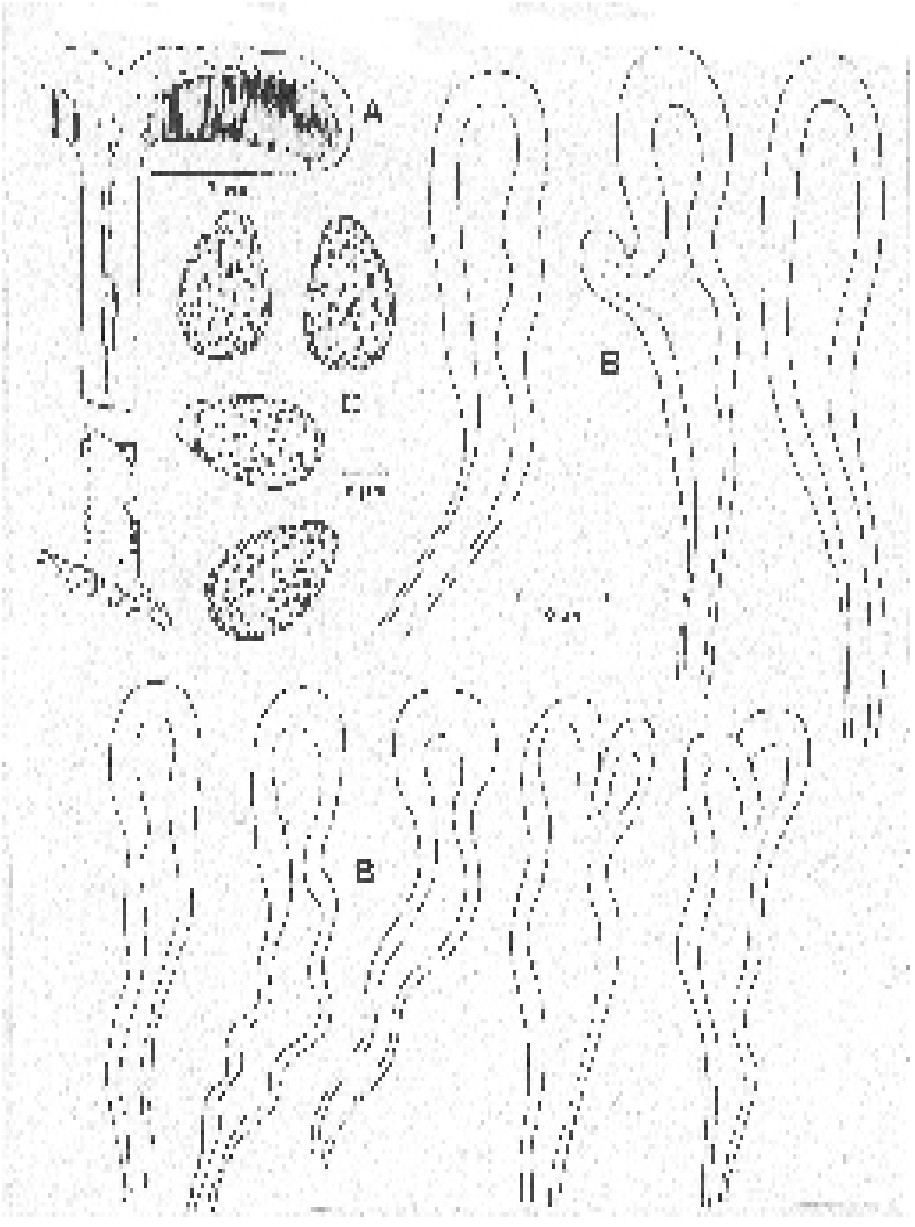
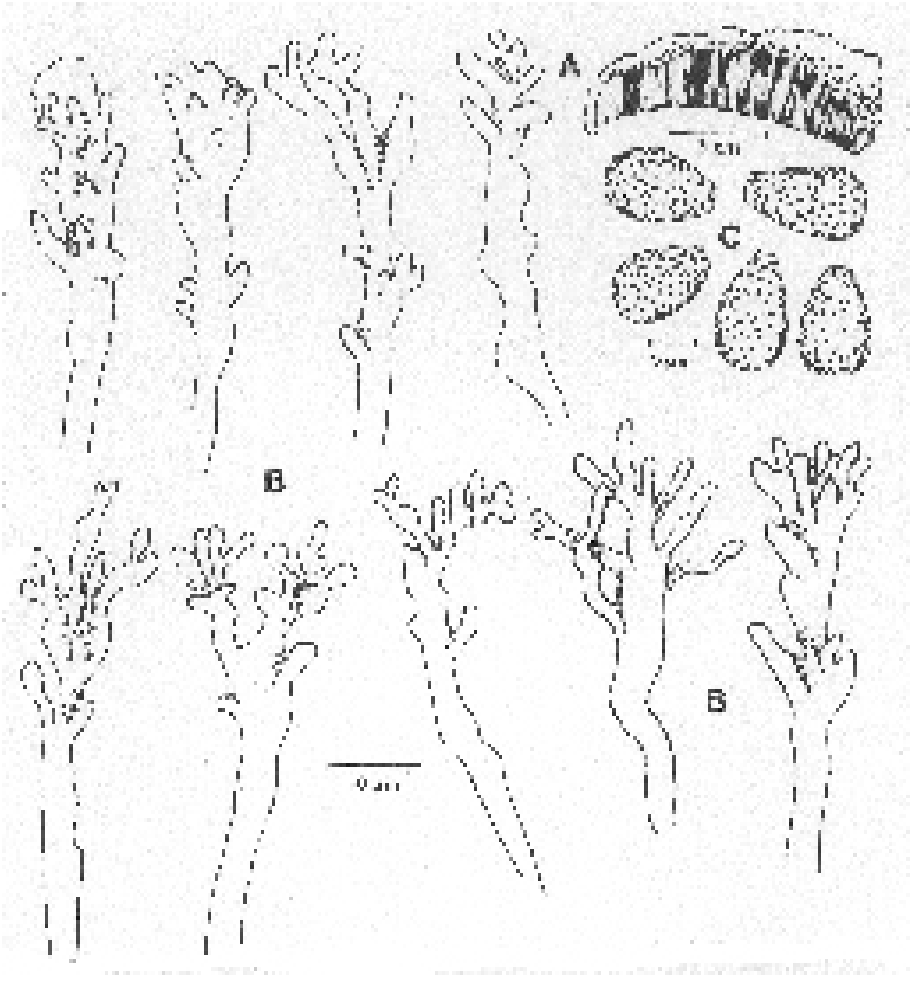


Fig. 33 *Ganoderma longistipitatum* A) Part of basidiocarp, B) apical cells from the cuticle, C) Basidiospores. From the holotype.

laccate, context dark brown with two black bands defining an inner core slightly paler than the peripheral part,
Hyphal system dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-3 µm in diam, difficult to observe in dried specimens; skeletal hyphae abundant, thick-walled, yellowish brown and arboriform, 3-6 µm in diam.
Cuticle a palisade of hyphal ends, yellowish brown, thick-walled to solid, apically widened with a narrow lower part, smooth, distinctly amyloid in the apical part, 20-45 x 6-10 µm
Basidia not seen.
Basidiospores oblong ellipsoid, brown, 10-13 x 5-7 µm.
Substrata. On dead hardwood log.
Distribution. Known only from the type locality in the lowland, Amazonas jungle in Ecuador.
Remarks. The species is above all recognized by the long slender stipe, the black melanoid bands in the pale brown context and the oblong spores. The cells in the cuticle are generally also distinctly widened apically, while they in *G. stipitatum* are more club like with an evenly widening towards the apex.

Ganoderma guianensis Decock & Ryvarden nov. sp.
Ad *Ganoderma amazonense*,Weir, sed sporae grande 15-18 x 12-13 µm (7-8 x 5-6 µm in *G. amazonense*).
HOLOTYPE. French Guyana, Cayenne area, Matouri, Sentier d'interpretation de la nature "Lamirande", on a dead stump of an unidentified angiosperm, 28 Jun. 2002, Cony Decock and Gabriel Castillo # FG-02/02, MUCL 43922, Isotype in O. Culture ex-holotype MUCL 43922.
Basidiocarp pileate, sessile, dimidiate to semicircular, applanate in section, up to 100 mm long, 120 mm wide, 15 mm thick at the base down to 4 mm thick at the margin; pileus smooth to irregularly rugose, covered by a thick, dark brown to almost black hard, horny crust, up to 750 µm (1000) µm thick, in the type covered by a dense light to cinnamon brown layer of basidiospores; pore surface plane, the colour when fresh unknown but probably light-coloured, whitish (?); pores round, even, 4-5/mm, tubes in a single layer pale greyish cream when fresh, drying pale corky to greyish orange, darker than the context, up to 7 mm thick, context hard and corky when fresh, drying hard, woody, densely fibrous, greyish orange when fresh, drying up to light brown when dry, 5 mm thick.
Hyphal system dimitic, generative hyphae hyaline, thin-walled, arboriform skeletal hyphae present, with a long basal stalk, 4-7 µm wide.
Basidia not seen;
Basidiospores ellipsoid with a dense ornamentation, pale yellow, IKI-, k, (15.5)16.-17.5(18.5) x (11.5)12.0- 13.0(13.5) µm (in average = 16.6 x 12.5 µm),
Chlamydospores absent.
Substrate. On dead hard wood.



Distribution: So far known from the type locality in French Guyana.
Remarks. Macroscopically this new species is practically identical with *G. amazonense*, but easily separated by the much larger spores.

Ganoderma longistipitatum Ryvarden,.....
.....
Fig. 33
Mycologia 92:183, 2000.
Basidiocarps annual, laterally stipitate, but in the type the pileus is almost closed around the stipe attachment, thus, superficially, the pileus looks circular and the stipe centrally attached, pileus circular, 9 cm in diameter and about 1.5 cm thick at the stipe attachment, upper surface flat to slightly bent when dry, distinctly sulcate, and radially furrowed, glabrous, shiny both when fresh and dry, laccate, deep bay and smooth when fresh, slightly reticulate when dry, pore surface bright chrome yellow, pores small, not visible to the naked eye, round, 4 per mm with thick pore walls, slightly thicker than the diameter of the pores, tubes pale brown, up to 12 mm deep, context thin, 1-3 mm thick, slightly duplex in colour, lower part dark brown with an even transition to the upper, pale brown part.
Stipe up to 22 cm long, round to slightly flattened, 12-18 mm in diam, black, shiny and with a cuticle, in section slightly duplex with an inner brown core with a vertical channel, 7-8 mm in diam, surrounded by a very dense pale brown context.
Hyphal system dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-4 µm in diam, difficult to observe; skeletal hyphae pale yellowish brown to pale rusty brown, abundant, thick-walled, arboriform with a long unbranched basal part, 3-10 µm wide, and with a moderately, mostly dichotomously branching in the upper part, ending in whip like apices, the skeletal hyphae in upper part of context below the cuticle apparently stronger apically branched.
Cuticle a palisade of club shaped cells, occasionally apically divided into to rounded lobes, smooth, yellowish brown in KOH, thick-walled and more so in the apical part, 40-75 x 10-20 µm, strongly amyloid in their whole length, those of the stipe cuticle similar, but more thick-walled and longer, up to 100 µm long.
Basidia not seen.
Basidiospores broadly ellipsoid, coarsely echinulate, pale brown, 15-16 x 10-11 µm
Substrata. On dead wood.
Distribution. Only known from the type locality in Venezuela.
Remarks. This is a beautiful and conspicuous species by its long, slender and black shiny stipe, a deep bay, shiny, round pileus, bright chrome yellow pore surface, strongly amyloid club-shaped cuticle cells and large basidiospores. There is no apparent related species which can be confused with this species.
Fig. 34*: Ganoderma multicornis* A) part of basidiocarp, B) apical cells from the cuticle, C) Basidiospores. From the holotype.

Ganoderma multicornis Ryvarden, ...
.....
..... Fig. 34

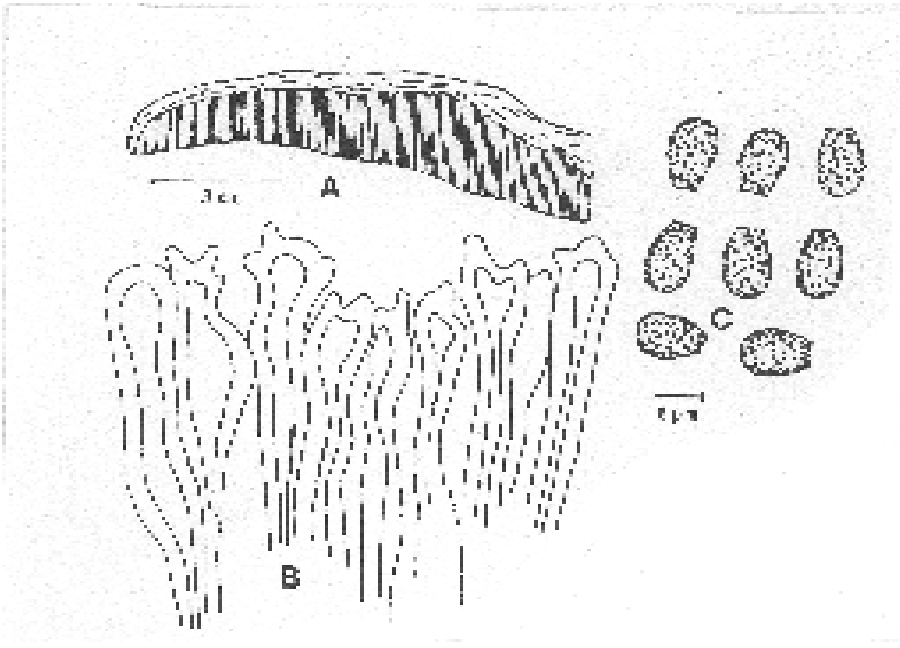


Fig. 35. *Ganoderma multiplicatum*, A) Part of basidiocarp, B) part of cuticle, C) Basidiospores, From the holotype.

Mycologia 92:184, 2000.

Basidiocarps perennial, sessile with a slightly contracted base, pileus semicircular, up to 7 cm in diameter and about 2 cm thick at the attachment, upper surface convex, strongly sulcate in numerous narrow zones, glabrous, probably shiny when fresh, subshiny when dry, laccate, deep bay to almost black, pore surface pale straw when dry, probably paler when fresh, pores small, not visible to the naked eye, round, in the type 5- 6 per mm, pore walls of same thickness as the pore diameter, tubes pale brown, up to 12 mm deep at the base, not stratified, context duplex in colour, lower part dark brown, the upper part ochraceous, up to 10 mm thick at the base and there with black dense resinous bands, in parts broken, penetrating up to 3 cm horizontally into the context.

Hyphal system dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-3 µm in diam, difficult to observe in dried specimens; skeletal hyphae hyaline to pale yellowish brown, thick-walled, unbranched to sparingly arboriform and then with a long unbranched basal part and with a moderately, mostly dichotomously bran-

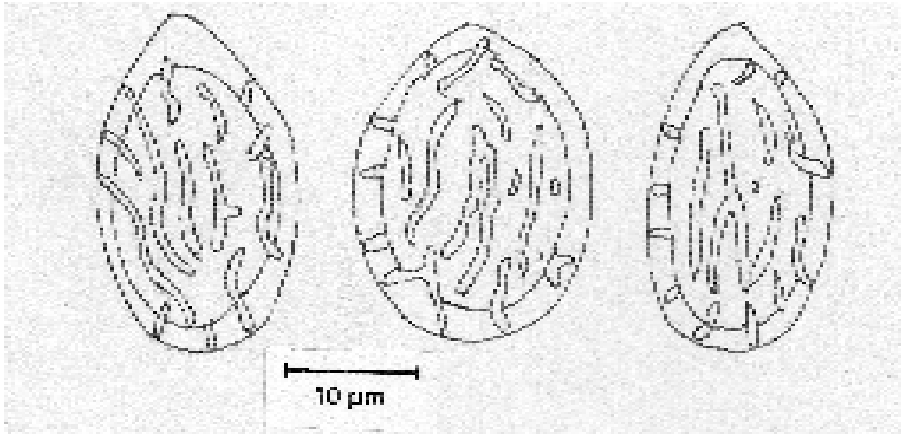


Fig. 36. *Ganoderma neurosporum* Basidiospores, from the lectotype**.**

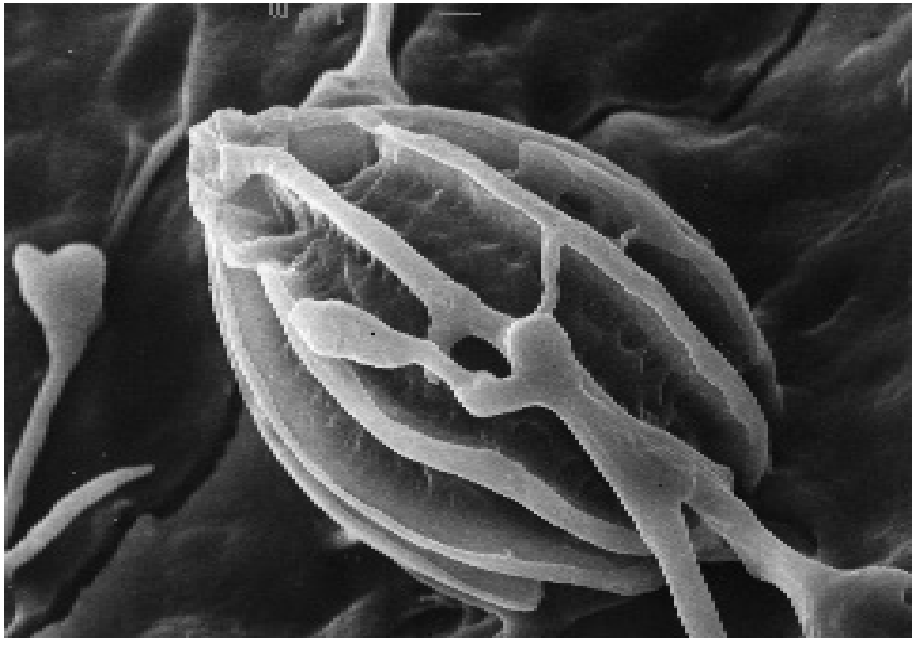


Fig.37. Basidiospore of *G. neurosporum* showing irregular ornamentation.

ching in the upper part, 5-10 µm in diam in the unbranched part, ending in whip like apices.
Cuticle a palisade of club shaped cells, with scattered small protuberances in the lower part, apically antler-like branched, yellowish brown in KOH, thick-walled to solid and strongly amyloid, 20-50 x 6-18 µm, but presumably longer as they look like skeletal hyphae where the apical branching have been strongly contracted.
Basidia barrel-shaped, only few seen, 16-24 x 12-15 µm with 4 sterigmata.
Basidiospores ellipsoid, finely echinulate, pale brown, 10-12 (13) x 7-8 (8.5) µm.
Substrata. From dead hardwood.
Distribution. Only known from the type locality in Venezuela, Amazonas, Dpto Rio Negro, Rio Mawarinuma.
Remarks. This is a beautiful species by its deep bay shiny strongly zonate pileus and straw coloured pore surface. The apical antler-like and strongly amyloid cuticle cells make this a very distinct species microscopically.

Ganoderma multiplicatum (Mont.) Pat., ...
.....
Fig. 35
Bull. Soc. Mycol. Fr. 5:74, 1889. - *Polyporus multiplicatus* Mont., Ann. Sci. Nat. Bot. Ser. 4, 1:128, 1854.
Basidiocarps perennial, pileate, dimidiate to sessile and broadly attached, corky to woody, 14 x 10 x 3 cm; upper surface flat, usually strongly sulcate, glabrous and shiny laccate, pale to light brown to deep reddish to chestnut brown becoming darker by age, margin in actively growing specimens usually light coloured, pore surface creamy white at first, later ochraceous to pale brown, pores round, in the type 6-8 per mm; tubes concolorous with pore surface, up to 15 mm thick, usually without stratification, context pale brown, up to 6 mm thick at the base or close to the stipe.

Hyphal system dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-5 µm in diam, difficult to observe in dried specimens; skeletal hyphae abundant, thick-walled, yellowish brown, unbranched or with a few distal branches, 3-6 µm in diam.
Cuticle a palisade or swollen hyphal ends, some smooth, but mostly with small protuberances, brown, thick-walled to solid and strongly amyloid, 50-70 x 6-12 µm.
Basidia not seen.
Basidiospores almost subglobose or broadly ellipsoid, truncate at the apex, brown, 7-8 x 5-6 µm
Substrata. Dead hardwoods.
Distribution. Tropical species, originally described from Venezuela and probably widespread in the neotropics.
Remarks. *G. multiplicatum* may be recognized by the amyloid slightly tuberculate hyphal ends in the cuticle and the small basidiospores. *G. orbiformum* has similar

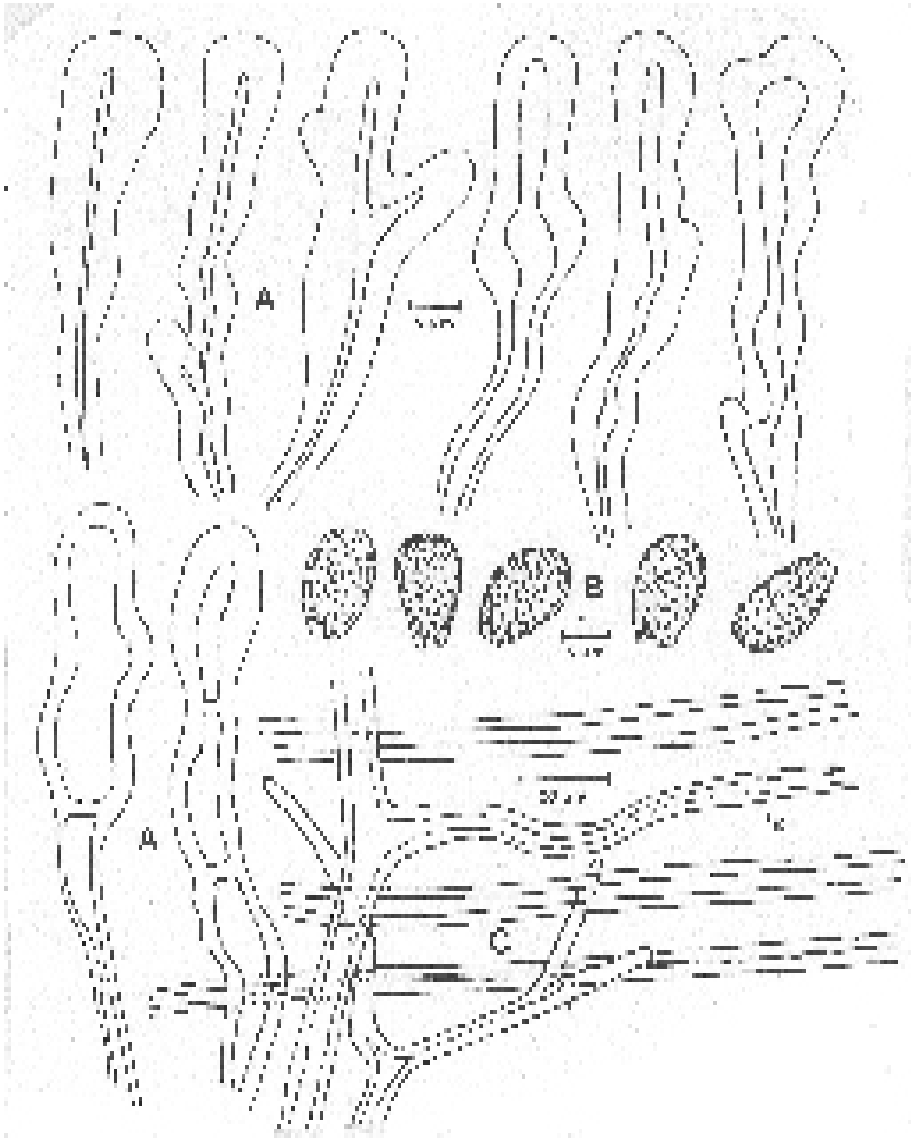


Fig. 38. Ganoderma nitidum A) Apical cells from the cuticle, B) Basidiospores, C) Skeletal hyphae. From the holotype.

tuberculate hyphal ends, but has larger basidiospores.

Ganoderma neurosporum Furtado, ...
.....
Fig. 36-37
Persoonia 4:386, 1967.
Basidiocarps annual, laterally stipitate or sessile and then dimidiate, pileus up to 15 cm in diam or wide, 1-3 cm thick, flat to convex, glabrous, dull, undulating, usually with concentric zones, dark to reddish brown, margin thick and obtuse, pore surface cream to pale cinnamon brown when dry, pores round, 4-5 per mm; tubes pale greyish brown, up to 15 mm deep, context 1-2.5 cm thick at the centre of the pileus, pallid white or cream coloured becoming pale brown in old specimens, fibrous and soft in fresh specimens, being compacted by drying and then with darker colours with some whitish radiating streaks, cuticle present, up to 500 µm thick.
Stipe up to 10 cm high and 8-15 mm in diam, often with a slightly swollen base, dark brown, dull and glabrous with a distinct dark cuticle, 100-300 µm thick, context white to cork-coloured.
Hyphal system dimitic; generative hyphae with clamps, hyaline, thin-walled, branched, 2-5 µm wide, skeletal hyphae terminal arboriform or unbranched , hyaline to pale yellow, 3-7 µm wide, in the cuticle on the pileus and stipe embedded in a dark substance that dissolves in KOH,
Cuticle of irregularly to slight anticlinal skeletal hyphae apparently glued together by the softer and thinner generative hyphae.
Basidia not seen.
Basidiospores ellipsoid, pale yellow, slightly truncate, covered with short traverse ridges in a reticulate pattern, in parts as longitudinal ridges, negative or pale brown in Melzer's reagent, 16-20 x 11-15 µm.
Substrata. Known from dead wood of deciduous trees.
Distribution. Known from Brazil, Venezuela, Colombia, Ecuador, Panama and Costa Rica.
Remarks. The species is easy to recognize by its large spores with a reticulate pattern with partly sinuous and partly longitudinal ridges.

Ganoderma nitidum Murrill, ...
.....
.....
Fig. 38
North Am. Fl. 9:123, 1908.
Basidiocarps perennial, pileate, stipitate with a short, round expanding stipe or dimidiate to broadly attached, corky to woody, often large, 10 x 20 x 5 cm; upper

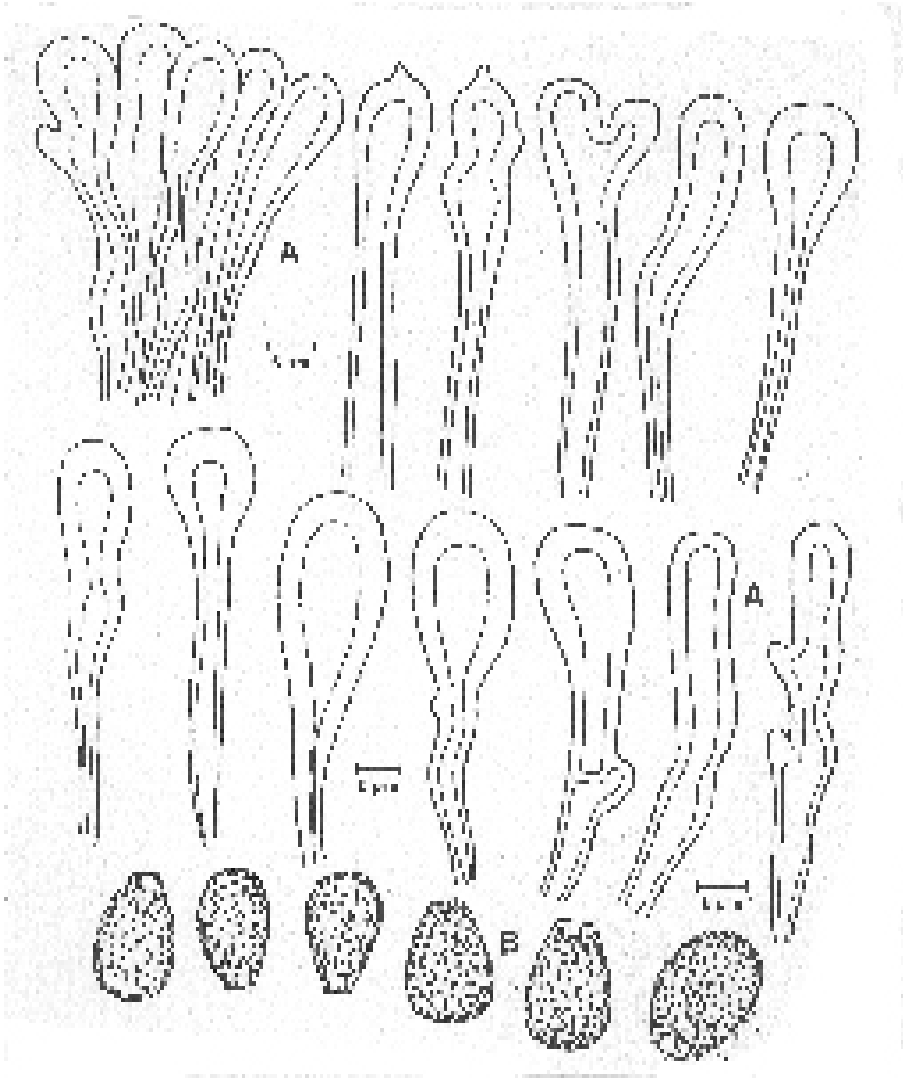


Fig. 39:Ganoderma oerstedtii A) Apical cells from the cuticle, B) Basidiospores. From the holotype.

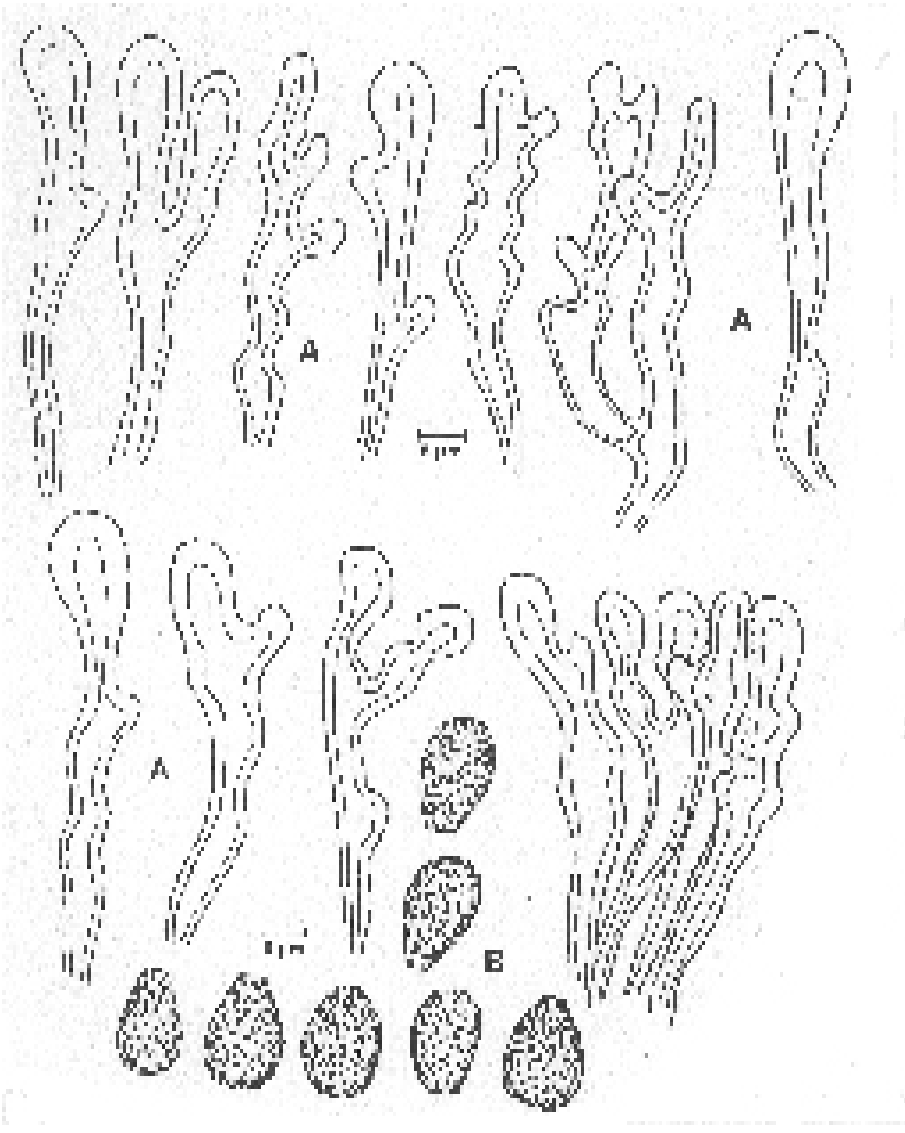


Fig. 40 *Ganoderma orbiformum* A) Apical cells from the cuticle, B) Basidiospores. From the holotype.

surface flat, sulcate, glabrous, with a distinct cuticle in section, at first reddish and glossy, with age more reddish brown to bay and dull due to a excreted resinous layer which becomes yellowish when crushed and melts in a match flame; pore surface creamy white at first, later ochraceous to pale greyish with brown tints, pores angular to circular, about 3-4 per mm; context pale greyish brown with a darker zone just above the tubes, up to 6 cm thick at the base; tube layers concolorous with pore surface, up to 3 cm thick, usually without distinct stratification.
Hyphal system dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-5 µm in diam, difficult to observe in dried specimens; skeletal hyphae abundant, thick-walled, yellowish brown, unbranched or with a few distal branches, 3-10 µm in diam.
Cuticle of vertical club-like to clavate cells, slightly sinuous and occasionally with short outgrowths, now and then with simple thick-walled septa, faintly amyloid in the apical part, up to 80 µm long in broken fragments.
Basidia not seen.
Basidiospores ellipsoid, ornamented, yellowish 10-13 x 7-8 µm.
Substrata. On dead hardwoods.
Distribution. Described from Honduras, but specimens have also been examined from Virgin Islands, which indicates a wide distribution in the Caribbean area at least.
Remarks. Basidiocarps of *G. nitidum* may be confused with those of *G. resinaceum* which however has regular cuticle cells without outgrowths and simple septa. It may be that these characters will fall within the normal variation of *G. resinaceum* in tropical America, but for the time being, *G. nitidum* is kept as a species of its own.

Ganoderma oerstedtii (Fr.) Murrill,.....
.....
..... Fig. 39
Bull. Torrey Bot. Cl. 29:606, 1902. - *Polyporus oerstedtii* Fr., Nova Acta Soc. Sci. Upsal. Ser. 3,1:63, 1851. - *Ganoderma tuberculosum* Murrill, North Am. Fl. 9:123, 1908.
Basidiocarps perennial, pileate, dimidiate to broadly attached, corky to woody, 15 x 20 x 10 cm; upper surface flat, sulcate, glabrous, with a distinct cuticle in section, at first reddish orange and glossy, with age more reddish brown to bay or chestnut brown, pore surface creamy white at first, later ochraceous to pale brown, pores angular to circular, about 3-4 per mm; tubes concolorous with pore surface, up to 3 cm thick, usually without distinct stratification, context dark brown above the tubes changing to ochraceous below the dark cuticle, up to 3 cm thick at the base;
Hyphal system dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-3 µm in diam, difficult to observe in dried specimens; skeletal hyphae abundant, thick-walled, yellowish brown and arboriform, 3-6 µm in diam.
Cuticle a palisade of vertical, pale brown cells, thick-walled to solid, clavate or

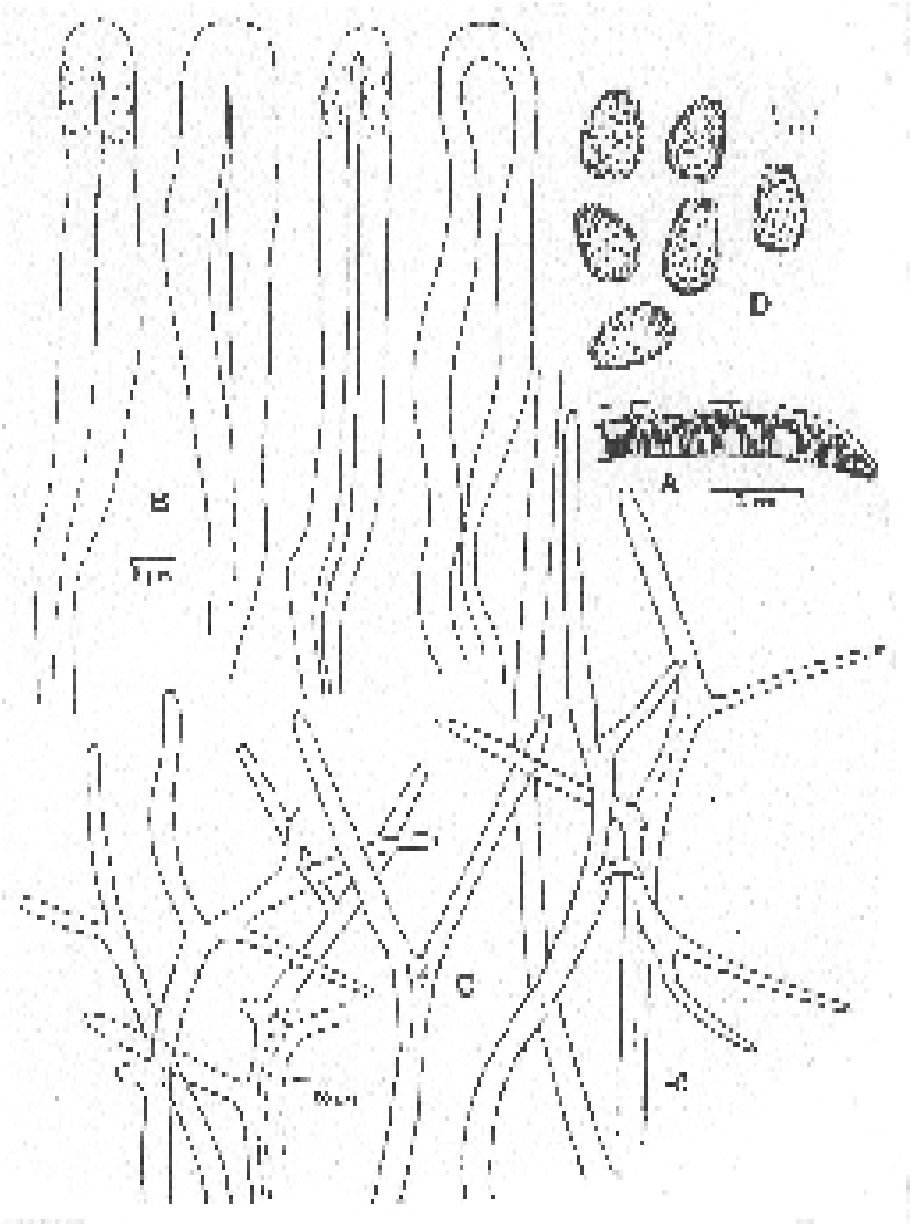


Fig. 41. *Ganoderma perzonatum* A) part of basidiocarp, B) apical cells from the cuticle, C) upper part of arboriform skeletal hyphae, D) basidiospores. From the holotype.

slightly apically widened, rounded or occasionally with a projecting apex, very rarely with a lateral lobe, apically faintly amyloid, up to 130 µm deep.
Basidia not seen.
Basidiospores ellipsoid, truncate at the apex, brown, 12-15 x 8-10 µm.
Substrata. Numerous hardwoods.
Distribution. Originally described from Costa Rica but probably widespread in the neotropics.
Remarks. This species is closely related to *G. resinaceum*, and is mainly separated by larger basidiospores. More collections are desirable to verify if other characters may be used to separate the two species.

Ganoderma orbiformum (Fr.) Ryvarden, ...
.....
Fig. 40
Mycologia 92:187, 2000. - *Polyporus orbicularis* Fr., Epicrisis Mycol. p. 463, 1838. - *Ganoderma boninense* Pat., Bull. Mycol. Soc. Fr. 5:72, 1889.
Basidiocarps biannual or perennial, pileate, dimidiate to sessile and broadly attached, corky to woody, 15 x 10 x 3 cm; upper surface flat, sulcate, glabrous and shiny laccate, pale to light brown to deep reddish to chestnut brown becoming darker by age, margin in actively growing specimens usually light coloured, pore surface black drying dark brown, pores round, 4-5 per mm; tubes dark brown up to 10 mm thick, usually without stratification, context dark brown, up to 10 mm thick at the base, often with black melanoid bands.
Hyphal system dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-4 µm in diam, difficult to observe in dried specimens; skeletal hyphae pale yellowish brown to pale rusty brown, abundant, thick-walled, yellowish brown, arboriform with a long unbranched basal part and with a moderate, mostly dichotomous branching in the upper part, 3-6 µm in diam.
Cuticle a palisade of strongly irregular hyphal end, either club shaped with irregular protuberances or more sinuous with short blunt outgrowths, many with an apical swelling, brown, thick-walled to solid and variably amyloid, in fresh specimens strongly amyloid, mostly so in the apical end, 50-100 x 6-12 µm.
Basidia not seen.
Basidiospores broadly ellipsoid, echinulate, pale brown, 10-11 x 6-7 µm.
Substrata. Dead hardwoods.
Distribution. Tropical species, originally described from Guinea in Africa, but also known from Bonin Island in the Pacific, in the neotropics recorded from Venezuela and Puerto Rico.
Remarks. *G. orbiformum* may be recognized by the amyloid, irregular, tuberculate to blunted hyphal ends of the cuticle and moderately large spores. *G. stipitatum* has similar black bands in the context, but has shorter spores.

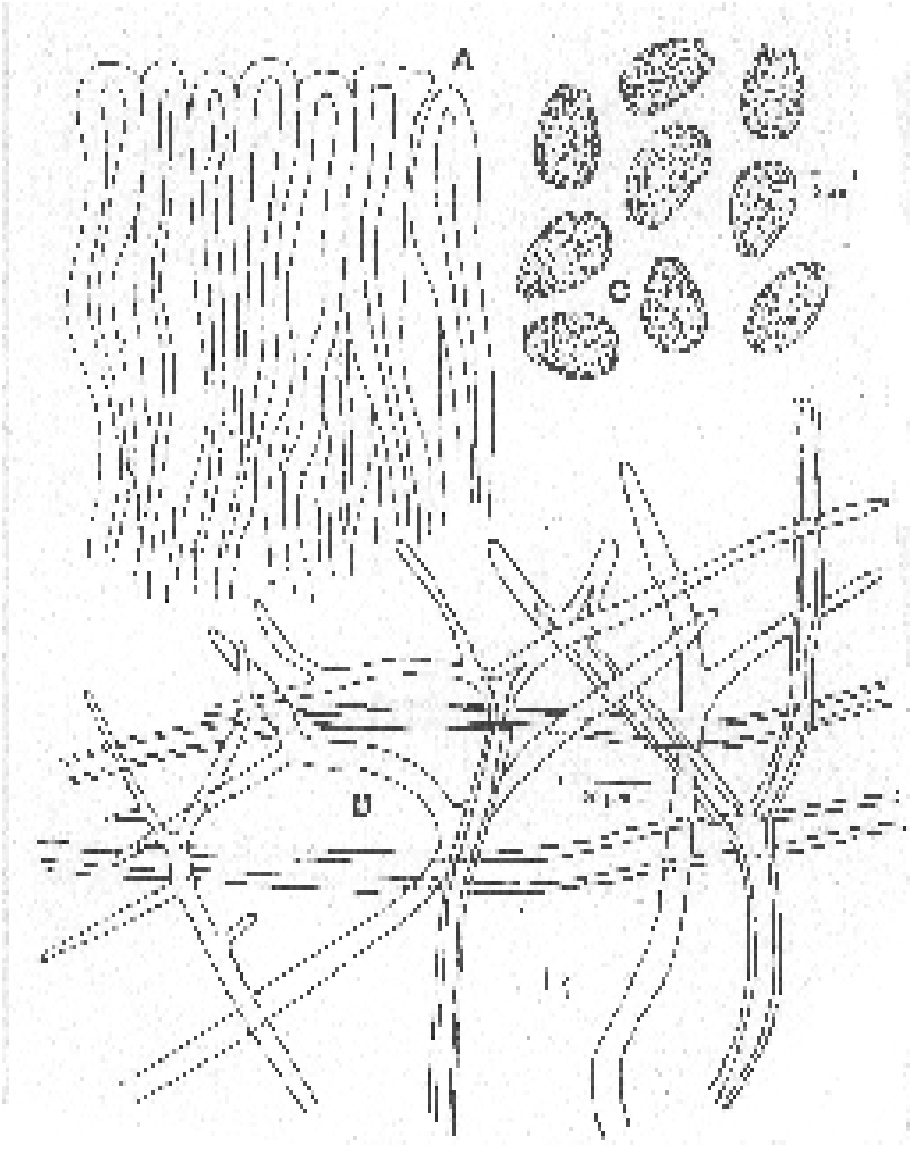


Fig. 43 *Ganoderma resinaceum* A) Apical cells from the cuticle, B) Parts for skeletal hyphae, C) Basidiospores. England, Middlesex, Ruislip Forest, Coll. D. Reid (K).

Ganoderma perzonatum Murrill, ...
.....
..... Fig. 41

North Am. Flora 9:121, 1908.

Basidiocarps annual to perennial(?), pileate, dimidiate, broadly attached or shortly stipitate, applanate to slightly bent, woody and rather dense, in the type spatulate to semicircular, about 12 cm in radius, upper surface sulcate, glabrous, with a distinct laccate, glossy, first deep red, later becoming bay to wine-coloured, upper surface often covered with cinnamon powder of deposited basidiospores, pore surface probably creamy white at first, in the type greyish brown, pores circular, about 5 per mm; almost invisible to the naked eye due to thick pore walls, tube layer evenly brown and without zonation, up to 1 cm long, context ochraceous brown with a slightly indistinct darker zone just above the tubes, up to 5 mm thick at the base;

Hyphal system dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-4 µm in diam, difficult to observe in dried specimens; skeletal hyphae abundant, yellow to pale brown, thick-walled, and with a long basal unbranched part, up to 300 µm long and in the apical part with a few long arboriform tapering branches, 3-10 µm in diam, when broken the distal part with long whip-like branches may simulate binding hyphae, In Melzers reagent the skeletal hyphae becomes a little reddish, thus they can be interpreted as slightly dextrinoid.

Cuticle on pileus surface consists of a vertical palisade of long regular club-like apical thick-walled cells, up to 150 µm long and 5-18 µm in diameter, close to the apex as if with a fine grainy content, faintly amyloid in parts and also slightly dextrinoid in masses.

Basidia not seen.

Basidiospores oblong ellipsoid, thick-walled, finely ornamented and pale yellowish, negative in the Melzers reagent, 8-10 x 6-7 µm.

Substrata. The type was found on a mango tree.

Distribution. Known only from Cuba.

Remarks. There is no doubt that this species comes close to *G. resinaceum*, but is separated by smaller basidiospores and the long regular apical cells in the cuticle with a slight encrustation. However, it might be that this lies within the variation of *G, resinaceum*, but this has to be decided when more collections have been made.

Ganoderma resinaceum Boud., ...
.....
..... Fig. 43

Bull. Soc. Mycol. Fr. 5:72, 1889. - *Ganoderma chaffangeonii* Pat., Bull. Soc. Mycol. Fr. 5:74, 1889. - *Ganoderma sessile* Murrill, Bull. Torr. Bot. Cl. 29:604, 1902. - *Polyporus polychromus* Copel., Ann. Mycol. 2:507, 1904. - *Ganoderma praelongum* Murrill, N. Am. Fl. 9:121, 1908. - *Ganoderma argillaceum* Murrill, N. Am. Fl.

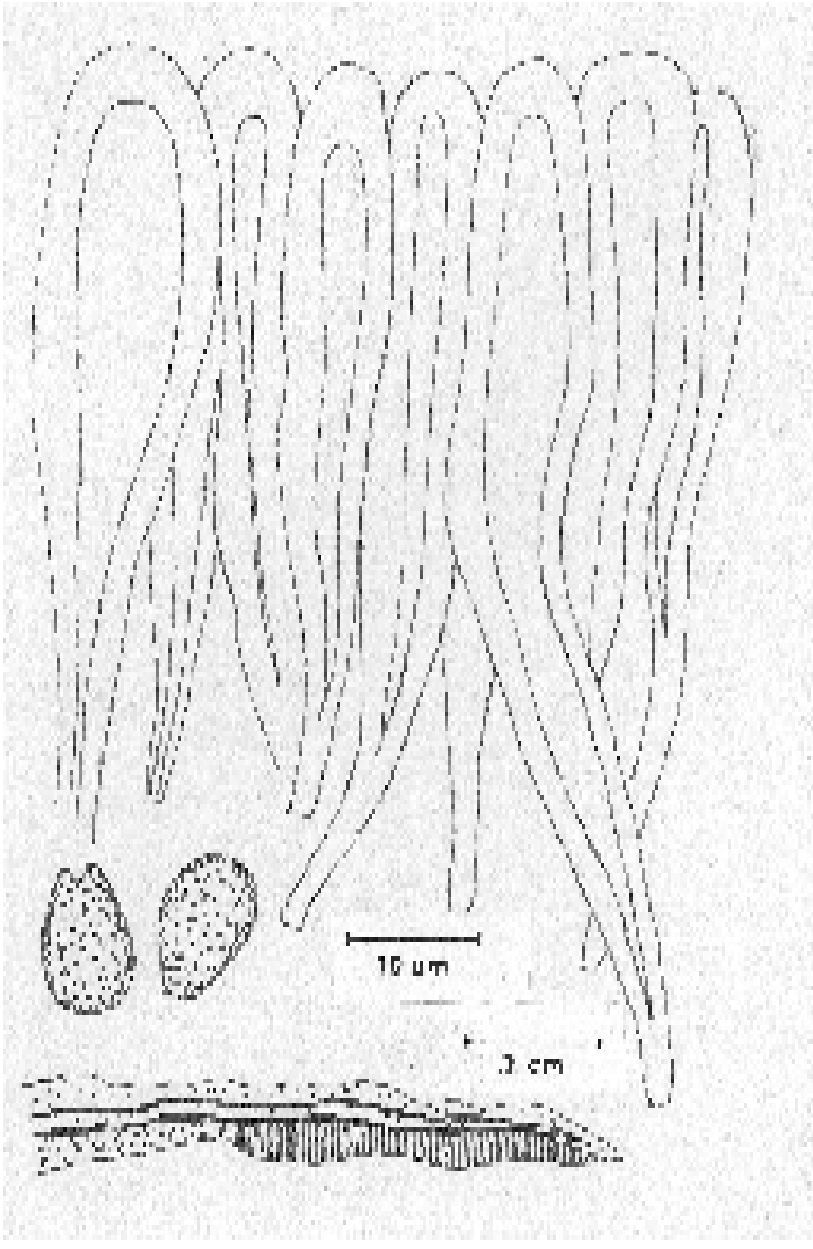


Fig. 44 *Ganoderma stipitatum* A) Part of basidiocarp with resinous bands, B) Apical cells from the cuticle, C) Basidiospores. From the holotype.

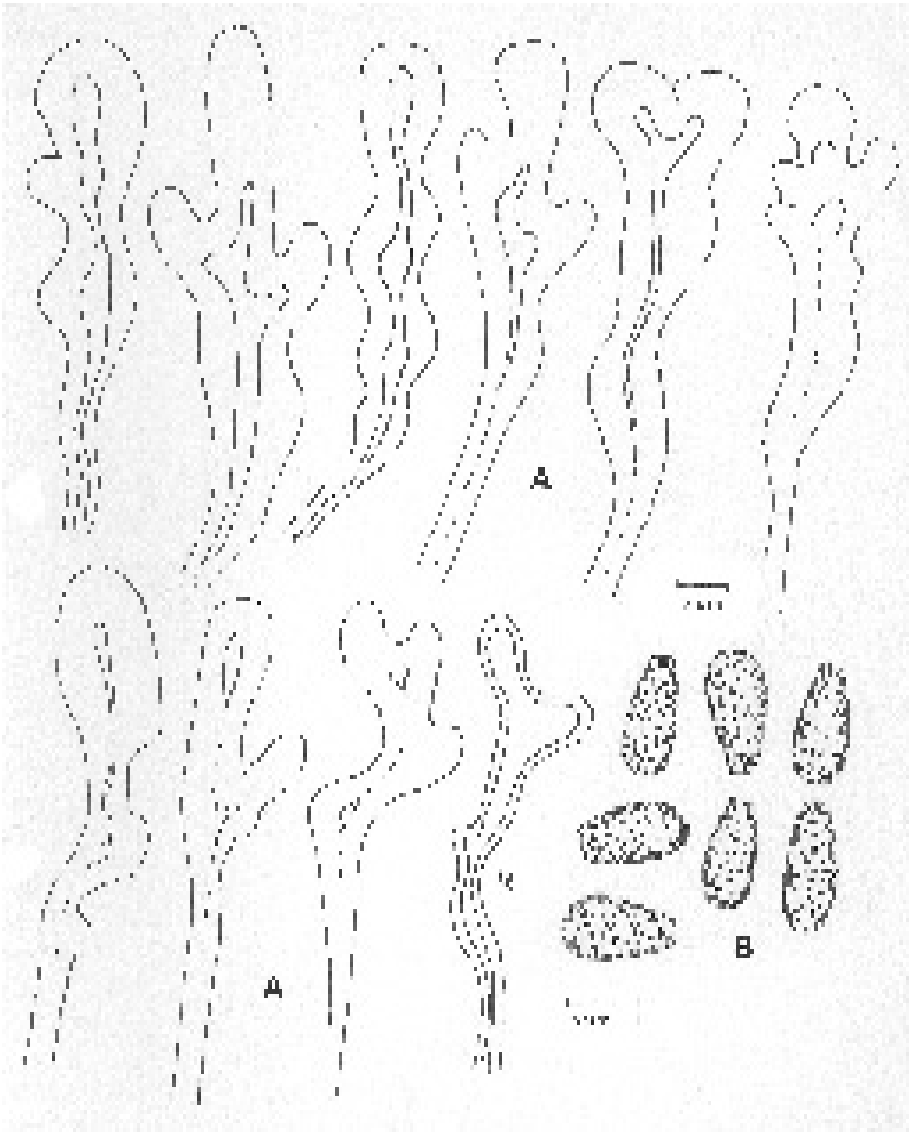


Fig. 45 *Ganoderma zonatum* A) Apical cells from the cuticle, B) Basidiospores. From the holotype.

9:122, 1908. - *Ganoderma subperforatum* Atk., Bot. Gaz. 46:337, 1908. - *G. areolatum* Murrill, Bull. N. Y. Bot. Gard. 8:149, 1912. - *Ganoderma subtuberculosum* Murrill, Lloydia 7:326, 1944. - *Ganoderma pulverulentum* Murrill, North Am. Fl. 9:121, 1908.

Basidiocarps perennial, pileate, stipitate with a short, round expanding stipe or dimidiate to broadly attached, corky to woody, often large, 15 x 40 x 10 cm; upper surface flat, sulcate, glabrous, with a distinct cuticle in section, at first reddish and glossy, with age more reddish brown to bay and dull due to a excreted resinous layer which becomes yellowish when crushed and melts in a match flame; pore surface creamy white at first, later ochraceous to pale greyish with brown tints, pores angular to circular, about 3 per mm;; tube layers concolorous with pore surface, up to 3 cm thick, usually without distinct stratification, context pale greyish brown with a darker zone just above the tubes, up to 6 cm thick at the base.

Hyphal system dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-5 µm in diam, difficult to observe in dried specimens; skeletal hyphae abundant, thick-walled, yellowish brown, unbranched or with a few distal branches, 3-6 µm in diam, sometimes with lateral blunt outgrowths, these usually separated from the main stem by a simple septum.

Cuticle of a vertical palisade of amyloid, club-like cells, usually longer than 50 µm

Basidia not seen.

Basidiospores ellipsoid, brown, 9-11.5 x 5-7 µm.

Substrata. Numerous hardwoods.

Distribution. More or less cosmopolitan from the tropics to the southern part of the temperate zone.

Remarks. Basidiocarps of *G. resinaceum* may be confused with *G. chalceum*, which however has a black band in the context.

Ganoderma stipitatum Murrill, ... Fig. 44

Bull. Torrey Bot. Cl. 30:229, 1903. - *Ganoderma parvulum* Murrill, North. Am. Fl. 9:123, 1908. - *Ganoderma bibadiostriatum* Steyaert, Bull. Jard. Bot. Belg. 31:99, 1962.

Basidiocarps perennial, pileate, circular, dimidiate with a contracted base to laterally stipitate, 5 x 10 x 1 cm; upper surface flat, sulcate, glabrous, laccate with a distinct cuticle in section, at first reddish then reddish brown to bay or chestnut brown to almost black, dull, covered with a relatively hard black cuticle, pore surface creamy white at first, later ochraceous to pale brown or black, stipe when present, lateral, short and rarely above 3 cm long and black or at least darker than the upper surface of the pileus, pores angular to circular, about 4-5 per mm; tubes concolorous with pore surface, up to 5 mm thick, context with one or two black dense bands originating at the bottom of the stipe or base of the basidiocarp and extending to about 1 cm

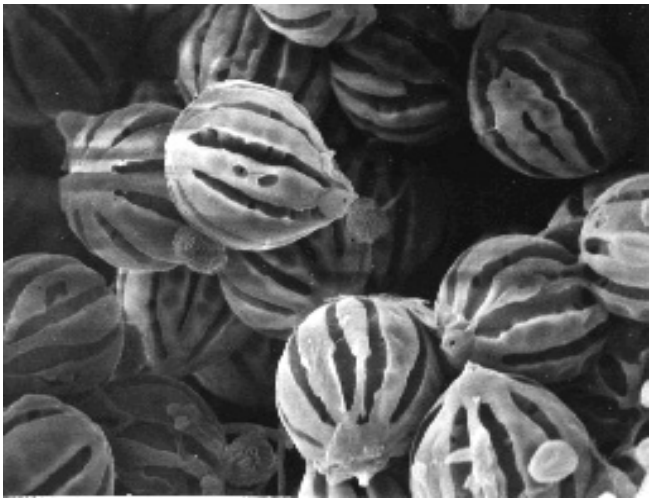


Fig. 46
Haddowia longipes, basidospores.

from the margin, the lower part of context dark brown, darker than the intermediate and upper paler brown part, context up to 6 mm thick at the base;
Hyphal system dimitic; generative hyphae hyaline, thin-walled, with clamps, 2-3 µm in diam, difficult to observe in dried specimens; skeletal hyphae abundant, thick-walled, yellowish brown and arboriform, 3-6 µm in diam.
Cuticle a palisade of hyphal ends, yellowish brown, thick-walled to solid, clavate, occasionally with some scattered outgrowths, smooth, distinctly amyloid in the apical part, 20- 40 x 6-10 µm.
Basidia not seen.
Basidiospores ellipsoid, brown, 7-9.5 x 5-6.5 µm.
Substrata. Numerous hardwoods.
Distribution. Widespread in the neotropics from Nicaragua, Costa Rica, Surinam, Bolivia, Brazil, Peru and Venezuela.
Remarks. The species is above all recognized by the dark resinous bands in the pale brown context, reminiscent of similar bands or zones seen in the context and stipe in many *Amauroderma* species. As usual in many *Ganoderma* species, its basidiocarps can vary considerably from sessile to laterally stipitate. The cuticle is difficult to crush and is rather thick especially on the stipe.

Ganoderma zonatum Murrill,.....
.....
..... Fig. 45
Bull. Torrey Bot. Cl. 29.606, 1902. - *Ganoderma sulcatum* Murrill, Bull. Torr. Bot. Cl. 29:607, 1902.
Basidiocarps annual to perennial, pileate, dimidiate to broadly attached, corky and rather light of weight, in the type semicircular, about 8 cm in radius, upper surface flat, sulcate, glabrous, with a distinct cuticle in section, first reddish brown then deep bay, pore surface probably creamy white at first, in the type pale brown, pores circular, about 4-5 per mm; almost invisible to the naked eye due to thick pore walls,

4. HYMENOCHAETACEAE

Wood-inhabiting fungi, very rarely facultative ectomycorrhizal, basidiocarps stipitate to resupinate, general brown, rarely other colours, annual to perennial, hymenophore smooth, hydnoid to poroid, hyphal system mono- to dimitic, generative hyphae usually thin-walled, simple septate, skeletal hyphae present in some genera, thick-walled and yellow to rusty brown, thick-walled dark brown setal hyphae present in some species, embedded or projecting into the hymenium, cystidia never present, dark brown, pointed setae present in most species, usually simple, more rarely star like, either straight and of tramal origin, more commonly present as hymenial setae projecting beyond the basidia, basidia clavate to barrel-shaped with 4 sterigmata, more rarely with two, basidiospores smooth, rarely ornamented, thin to thick-walled, negative in Melzer's reagent or dextrinoid in a few species. All species produce a white rot. Cosmopolitan family with numerous species.
Types genus: *Hymenochaete* Lév.
Remarks. The family is usually easy to recognize due to the brown colours, but doubtful specimens must be examined microscopically. The genus *Hymenochaete* seems to be the most primitive and where all species have hymenial setae. These organs seem then to be successively lost when more complex taxa were evolved. *Coltricia* which is stipitate and poroid, has only one tropical species with setal hyphae, all other species are without setal organs. It is also in this genus that facultative ectomycorrhiza has been proven.
The type of rot and septation of the generative hyphae are consistent and without a single exception in the whole of the family.

KEY TO GENERA

1. Basidiospores finely ornamented, basidiocarps small, pendant or stipitate .... **Coltriciella**
1. Basidiospores smooth, basidiocarps small to very large, resupinate, pileate to stipitate **2**

2. Basidiocarps laterally or centrally stipitate, usually on the ground **3**
2. Basidiocarps resupinate, pileate, sometimes with a lateral, tapering base..... **4**

3. Basidiospores longer than 6 ìm, basidiocarps growing on the ground, more or less centrally stipitate, pores 1-4 per mm, often angular, context homogeneous **Coltricia**
3. Basidiospores up to 6 ìm long, basidiocarps on dead wood, living trees, or from buried roots, pores 6-8 per mm, round, context duplex with a black line **Phylloporia**

4. Hyphal system dimitic with skeletal hyphae, basidiocarps mostly woody hard .....

.....**Phellinus**
4. Hyphal system monomitic, basidiocarps mostly fragile when dry, species on living hosts belong here..... **5**

5. Basidiocarps usually small, rarely more than 3 cm wide to the margin, context distinctly duplex, upper loose part often separated from the lower dense part by a black zone **6**
5. Basidiocarps often large, context homogeneous, pileus strigose, tomentose to velutinate, or with a thin black cuticle ..... **Inonotus**

6. Setae absent, spores usually abundantly present, ellipsoid, pale yellowish, basidiocarps 5-20 mm thick, on living trees or plants .....**Phylloporia**
6. Setae present, spores usually few, cylindrical, hyaline, basidiocarps 1-3 mm thick, on dead wood ..... **Cyclomyces**

AURIFICARIA Reid,
Kew Bull. 17:278-79, 1963.
Basidiocarp terrestrial or lignicolous, sessile to laterally semistipitate, often lobed and sessile, dimidiate, imbricate and entire, pileus fulvous to dark brown but often covered with a rusty pruina, first finely tomentose, with age becoming glabrous, and black usually zone wise, cuticle present below a very thin tomentum in actively growing specimens, context brilliant golden-brown, often with concentric zones in section, consistency hard, almost woody and becoming reddish with KOH, hyphal system monomitic, generative hyphae with simple septa, thin to thick-walled, hyaline to brown, setae and setal hyphae lacking, basidiospores sub-globose to broadly elliptical and with almost hyaline to dull-brown walls, becoming pale olivaceous in KOH, non-amyloid. Tropical genus with one species in America.
Type species: *Polyporus indicus* Mass.
Remarks. The genus is related to *Inonotus*, separated mainly by the distinct crust on the pileus, lack of setae and small spores becoming pale olivaceous in KOH. Its consistency is also generally harder than seen in the basidiocarps of *Inonotus* species.

Aurificaria luteo-umbrinum (Romell) D. Reid,
Kew Bull. 17:279, 1963. - *Phaeoporus luteo-umbrinus* Romell, Kung. Sv. Vetensk. Akad. Hand. 26, no. 16:27, 1901. - *Pyropolyporus sublinteus* Murrill, North Am. Fl. 9:110, 1908.
Basidiocarps annual, pileate, sessile or conchate with a contracted base, applanate, up to 10 cm wide and long, 0,3-3 cm thick, soft when fresh, brittle and hard when

dried, but of light consistency, upper surface first cinnamon brown, later darker and finally becoming blackish from the base as the cuticle below the tomentum becomes exposed, often zone wise, first adpressed tomentose, glabrous by age and with a thin black cuticle below the tomentum, best developed close to the base, sulcate and concentrically zoned, when dried with some slight radial undulations, margin thin, bent down in dry specimens, pore surface cinnamon to pale yellowish brown, pores tiny, almost invisible to the naked eye, 7-8 per mm, tubes concolorous, up to 1 cm deep, context up to 1 cm thick brilliant yellowish brown, often slightly zonate, hard, becoming red with KOH, homogeneous with a upper black cuticle.
Hyphal system monomitic, generative hyphae hyaline to pale rusty brown, thin-walled to thick-walled, sparingly branched in the context, 3-6 m wide.
Setae none.
Basidia clavate 12-18 x 6-7 µm.
Basidiospores globose to subglobose, yellowish brown in water, olivaceous brown in KOH, 4-5 x 3,5-4,5 µm.
Substrata. Hard wood trees of different kinds.
Distribution. American species known from Brazil to Louisiana and Texas in United States, but apparently rare.
Remarks. In the field this species can be taken for an *Inonotus* species, but the olivaceous spores in KOH and the thin cuticle below a thin tomentum, should be sufficient for a generic determination.

COLTRICIA S.F. Gray.

Nat. Arr. Brit. Plants 1:644, 1821.

Basidiocarps annual, stipitate, soft and tough when fresh, hard and brittle when dry; pileus surface yellowish to deep rusty brown, in some species greyish with age, tomentose to silky with appressed hairs; pore surface cinnamon to rusty brown, pores angular, medium to large; stipe usually central, concolorous with the pileus; context cinnamon to deep rusty brown; all parts of basidiocarp black with KOH; hyphal system monomitic; generative hyphae with simple septa, hyaline to pale rusty brown, narrow to wide, thin- to thick-walled; setae absent in all temperate species or present in some tropical representatives; spores cylindrical to ellipsoid, at maturity golden yellow to rusty brown, thin- to slightly thick-walled, slightly dextrinoid in Melzer's reagent. On the ground or well decayed wood with a white rot.

Type species: *Polyporus perennis* L.:Fr.

Remarks. The genus as circumscribed here seems to be a rather natural one. In the South America one species has setal hyphae which some may judge to be deviating elements in the genus. *Coltricia* species are generally terrestrial and *Coltricia perennis* has been demonstrated to be able to produce basidiocarps both as a wood-destroying agent and as a facultative mycorrhizal partner (Davidson 1984). As far as we know it is the only true polypore, which has been, shown experimentally to have this ability. The other *Coltricia* species may have the same ability.

NB. As all hyphae are simple septate, all basidiospores are smooth and hymenial setae are absent in all species, this are not repeated in the descriptions.

Key to species

1. Setal hyphae present ..... **C. hamata**
1. Setal hyphae absent 2

2. Basidiospores longer than 6 µm long 3
2. Basidiospores shorter than 6 µm 7

3. Basidiospores cylindrical, basidiocarps on burnt wood or fire places .... **C. focicola**
3. Basidiospores ellipsoid, on the ground 4

4. Basidiospores 9-14 µm long, pores 1-3 mm wide ..... **C. montagnei**
4. Basidiospores 6-10 µm long, pores 2-5 per mm 5

5. Basidiocarp less than 2 cm wide, pileus striate, hyphae strongly pruinate ..... **C. verrucata**
5. Basidiocarp wider than 2 cm, pileus shiny, adpressed or shiny, hyphae smooth .. 6

6. Basidiocarp usually 3-10 cm in diameter and centrally stipitate, upper surface shiny
and multizonate ..... **C. cinnamomea**
6. Basidiocarp up to 4 cm wide, laterally stipitate, pileus dull, soft and azonate .....
..... **C. duportii**

7. Basidiospores globose, margin ciliate ..... **C. barbata**
7. Basidiospores ellipsoid, no cilia along the margin 8

8. Basidiospores 2.5-3 µm wide, pores 6-8 µm, context duplex ..... **C. fonsecoensis**
8. Basidiospores 3-3.5 µm wide, pores 2-6 per mm, context homogenous 9

9. Pores 4-6 per mm, on the ground in Argentine and Paraguay ..... **C. stuckertiana**
9. Pores 2-4 per mm, on burnt ground in Venezuela ..... **C. fragilissima**

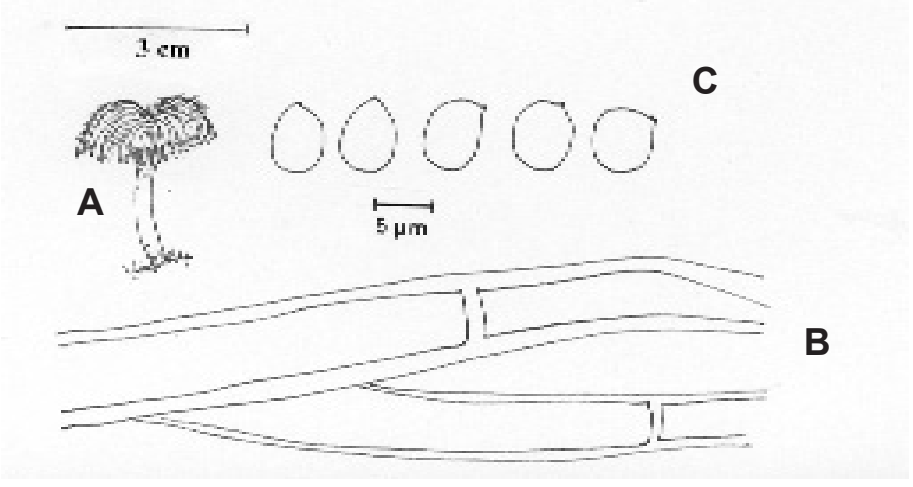


Fig. 47. *Coltricia barbata* A) basidiocarp, B) generative hyphae, C) basidiospores. From the holotype.

Coltricia barbata Ryvarden & Meijer, Fig. 47
Synopsis Fung. 15:46, 2002.
Basidiocarps annual, centrally stipitate, pileus circular, infundibuliform, 10-18 mm in diameter, concentrically zonate, glabrous, shining, deep reddish brown, margin with 1-2 mm long tufts, pore surface reddish brown sharply delimited toward the stipe, pores thin-walled, round to angular, 4-9 per mm; context reddish brown, fibrous, up to 400 µm thick, stipe 10-30 x 1-2 mm, deep reddish brown and velutinous.
Hyphal system monomitic; generative hyphae, thin-walled to thick-walled, golden to light rusty brown, septation frequent in hymenium and subhymenium, more scattered in the context, in the trama and hymenium 2-5 µm in diam, in the context of pileus and stipe up to 8 µm in diam.
Basidia not seen.
Basidiospores subglobose, thick-walled, golden yellow to rusty brown, and without reaction in Melzer's reagent, 5-6 µm in diameter.
Substrata. On the ground in ombrophilous forest.
Distribution. Known only from the type locality, but probably overlooked in many places because of its tiny size.
Remarks. The species is conspicuous by its barbate margin with hanging tufts of entangled hyphae besides the small globose basidiospores.

Coltricia cinnamomea (Jacq.) Murrill, Fig. 48 A
Bull. Torrey Bot. Club 31:343, 1904. - *Boletus cinnamomeus* Jacq. Collect. Bot. 1:116, 1787. - *Polyporus cinnamomeus* (Jacq.) Pers., Mycol. Europ. 2:41, 1825.
Basidiocarps annual, more or less stipitate, pileus circular, flat to infundibuliform, up to 12 cm in diam, up to 5 mm thick in centre, margin lobed, incised to entire, often fused with adjacent basidiocarps, sharp and mostly deflexed when dry; pileus surface finely velutinate, shiny to glossy, with numerous distinct to indistinct concentric zones, brown to deep reddish brown; stipe cylindrical to flattened, mostly expanded towards the base, finely velutinate, ochraceous rusty to deep reddish brown, up to 3-4 cm long. 2-6 mm in diam; pore surface reddish brown, pores thin-walled and angular, 2-4 per mm; context thin, up to 1 mm thick, fibrous and rusty to reddish brown; tube layer up to 2 mm thick, more or less concolorous with the pore surface.
Hyphal system monomitic; generative hyphae at first thin-walled and hyaline (best seen in the subhymenium), later more thick-walled and golden to light rusty brown, septation frequent in hymenium and subhymenium, more scattered in the context where the hyphae are longer and straighter, not branched to the same degree as in the hymenium, branching at right or wide angles, in the hymenium 2-5 µm in diam, in the context of pileus and stipe up to 10 µm in diam and sometimes very thick-walled.
Basidia clavate, 2- to 4-sterigmate, 18-30 x 5-7 µm.
Basidiospores oblong to broadly ellipsoid, thin to distinctly thick-walled, golden

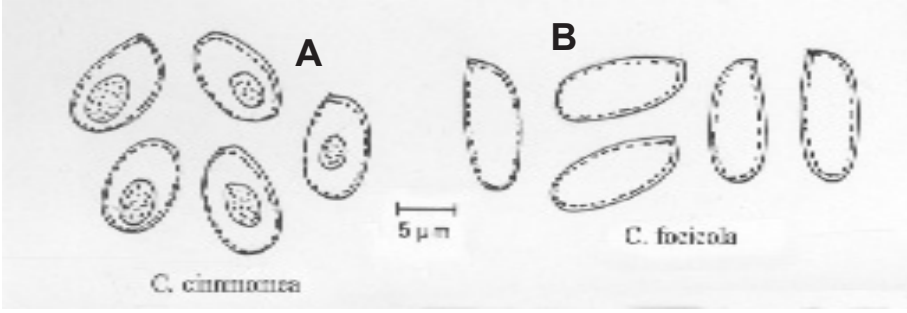


Fig. 48 *Coltricia cinnamomea* A) basidiospores, *C. focicola* B) basidiospores. From the lectotypes.

yellow, weakly dextrinoid in Melzer's reagent, 6.5-8 x 5-6 µm.
Substrata. On the ground in hardwood or mixed forests, rarely in coniferous ones.
Distribution. Cosmopolitan species.
Remarks. The species is rather easy to recognise by its shiny deep warm colours, its terrestrial habitat and the large pores.

Coltricia duportii (Pat.) Ryvarden,
Occ. Papers Farlow herb 18:15, 1983. - *Xanthochrous duportii* Pat., Bull. Soc. Mycol. Fr. 28:34, 1912 (FH!).
Basidiocarps annual, pileate, laterally to almost centrally stipitate, applanate, up to 2.5 cm wide and long, 1 cm thick, soft when fresh, brittle and hard when dried, but of light consistency, upper surface dull azonate, adpressed velutinate, rusty to deep cinnamon brown, pore surface rusty brown, pores angular, 2-3 per mm, tubes concolorous, up to 5 mm deep, context up to 5 mm thick rusty brown.
Hyphal system monomitic, generative hyphae hyaline to pale rusty brown, thick-walled, 3-7 µm wide.
Setal hyphae and **hymenial setae** absent.
Basidia not seen.
Basidiospores ellipsoid, rusty brown, thick-walled, 8-10 x 6-7 µm.
Substrata. Deciduous trees.
Distribution. So far known only from French Guyana and Brazil.
Remarks. The ellipsoid, dark brown and large basidiospores, the lack of setae and the semistipitate basidiocarp should make this species rather easy to recognize.

Coltricia focicola (Berk. & Curt.) Murrill,
Fig. 48B
N. Am. Fl. 9:92, 1908. - *Polyporus focicola* Berk. & Curt., J. Linn. Soc. Bot. 10:305, 1868.
Basidiocarps annual, stipitate, pileus circular, centrally depressed, 1-4 cm in dia-

meter, margin often incised or lobed, tough and coriaceous when fresh, more brittle when dry, upper surface first rusty brown to cinnamon, becoming more greyish from the centre and with age brownish grey, tomentose, multizonate, in dry condition usually with radial wrinkled ridges, stipe cinnamon to rusty brown, finely tomentose to velvety, 1.5-5 cm long and 2-5 mm in diameter, pore surface cinnamon to rusty brown, pores angular, thin-walled, in age pore-mouths becoming lacerated and more irregular, usually 1-2 per mm and not decurrent on the stipe, but often larger pores do occur near the stipe and then somewhat radially elongated, up to 2 mm in longest dimension, tubes rusty brown, up to 5 mm deep, context cinnamon, dense 1-2 mm thick.
Hyphal system monomitic with two types of generative hyphae, a) straight to sparingly branched, 4-8 µm wide, and with a wide lumen, yellow to pale rusty brown and with numerous simple septa, this type predominant in the trama and the context, b) strongly branched and twisted, narrow, 2-4.5 µm wide, and with few simple septa, hyaline to pale golden yellow, most common in the stipe-context, only scattered in the pileus context, the latter hyphae simulate binding hyphae and make the stipe harder than the context in the pileus.
Basidia clavate, 18-23 x 7-8 µm, 2 to 4-sterigmate.
Basidiospores cylindrical to cylindrical-ellipsoid, hyaline to golden yellow, weakly dextrinoid, 8-11 x 4-5 µm.
Substrata. On the ground, usually on burnt over soil, or around old campfire sites.
Distribution. Apparently a rare fungus, in Central America known from Costa Rica. widespread in eastern North America.
Remarks. Microscopically the cylindrical spores will separate *C. focicola* from the other species described here. Like *C. fragilissima* it almost always grows on burnt wood or in fireplaces, but this species has much shorter basidiospores and is a strictly lowland rain forest species.

Coltricia fonsecoensis Cooke & Bonar,
Fig. 49
Occas. papers Calif. Acad. Sci. 29:3, 1961.
Basidiocarps annual, more or less stipitate, pileus circular, flat to infundibuliform, rarely above 3-4 cm in diam, and margin curled when dry, up to 5 mm thick in centre, pileus surface finely velutinate, dull and with indistinct concentric zones, brown to deep reddish brown; stipe cylindrical to flattened, finely velutinate, ochraceous rusty to deep reddish brown, up to 3-4 cm long, 4-6 mm in diam; pore surface reddish brown, pores thin-walled and round, tiny, 6-8 per mm; context duplex, lower part dense bright yellowish brown, upper softer part more cinnamon, no black line separating the two parts, up to 2 mm thick, fibrous and rusty to reddish brown; tube layer up to 2 mm thick, more or less concolorous with the pore surface.
Hyphal system monomitic; generative hyphae at first thin-walled and hyaline, later more thick-walled and golden brown, 2-5 µm in diam.

Basidia clavate, 4-sterigmate, 15-22 x 4-6 µm.
Basidiospores oblong to broadly ellipsoid, thin to distinctly thick-walled, golden yellow, 4-5 x 2.5-3 µm.
Substrata. On the ground in hardwood forests.
Distribution. Described from Nicaragua, but also found in Costa Rica

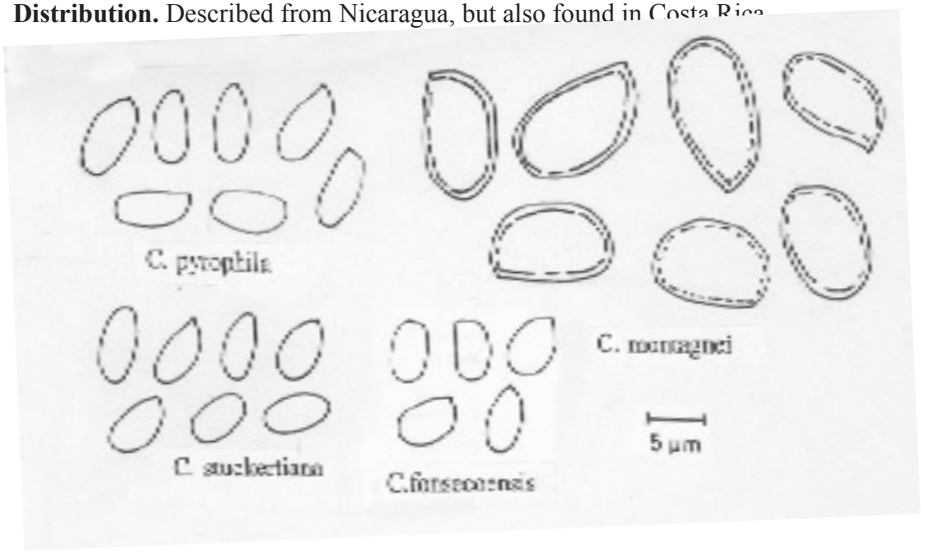


Fig. 49 *Coltricia spp.* Basidiospores. From the lectotypes expect *C. fonsecoensis* Crocken 6.7.32 (Costa Rica),

azonate, yellowish-brown to dark cinnamon, velvety adpressed tomentose to almost glabrous with age, smooth to slightly folded radially, also with scattered protuberances and small pits, margin entire to wavy, thin and deflexed, at least in dry specimens, stipe short and expanded both towards the base and the pileus, 5-30 mm in diameter, 2-6.5 cm long, fulvous to cinnamon, finely adpressed velvety, probably almost smooth with age as the upper hyphae agglutinate, smooth to slight uneven, solid and non-stratified, pore surface cinnamon to brown with a narrow lighter sterile margin, pores angular and thin-walled, often decurrent on the stipe, 2-4 per mm, tubes concolorous, up to 3 mm deep, context homogeneous, cinnamon to golden-brown, quite dense, up to 20 mm thick towards the stipe, 2 mm or so at the margin.
Hyphal system monomitic, generative hyphae hyaline, golden-brown or rusty-brown, moderately branched, brittle and break easily in microscopic preparations, 3.5-5 µm wide in the hymenium, up to 10 µm wide in context and stipe.
Basidiospores oblong ellipsoid, hyaline, slightly dextrinoid and thin-walled, 4-5-5(6) x 3-3.5 um.
Basidia clavate, 15-18 x 4-6 µm with 4 sterigmata.
Substrata. On burnt wood or in fireplaces.
Distribution. In America known only from Venezuela. Described from West Africa

Remarks. The species is from above like C. cinnamomea, but has much smaller pores and spores. It must be a rare species and more collections are necessary to record the whole macroscopic variation.

Coltricia fragilissima (Mont.) Ryvarden
Fig . 49
Nord. J. Bot 2:78, 1982. - *Polyporus fragilissimus* Mont., Ann. Sci. Nat. Ser. 4 vol 1:130, 1854 (PC!). - *Polyporus pyrophilus* Wakefield, Kew Bull. 1916:71, 1916. - *Polyporus capucinus* Mont. Am. Sci. Nat Ser 4, Vol 5: 369, 1857.
Basidiocarp annual, centrally stipitate, flat to infundibuliform, up to 8.5 cm in diameter, and 3 cm thick at the base, coriaceous when fresh, brittle when dry, pileus

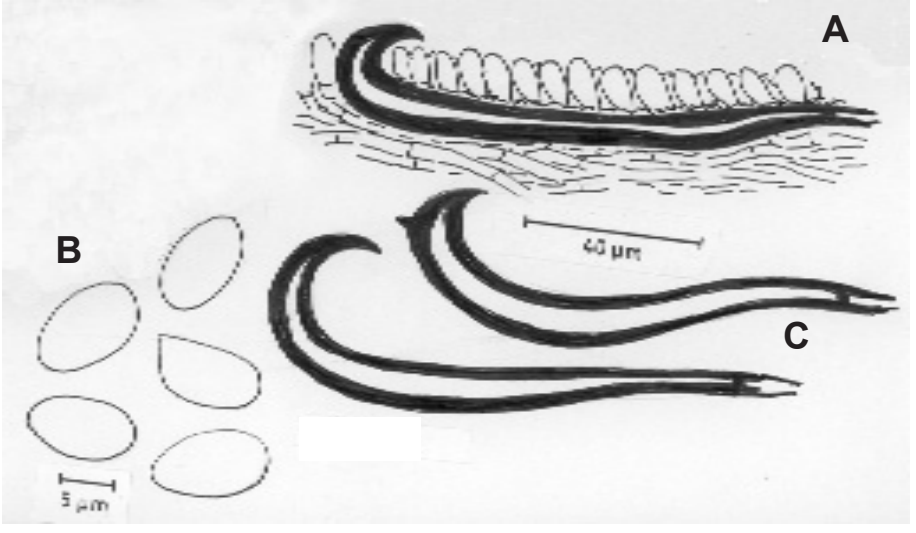


Fig. 50. *Coltricia hammata.* A) section of hymenium, B) basidiospores. C) setal hyphae. From the lectotype.

Remarks. This is a distinct robust species with a thick and mostly short stipe. The azonate cinnamon, dull surface with homogeneous stipe and context and the habitat should be good field characteristics.

Coltricia hamata (Rom.) Ryvarden,
Fig. 50
Sv. Bot. Tidskr. 68:276, 1974. - *Pelloporus hamatus* Romell, K. Sv. Vetensk. Akad. Handl. 26:26, 1901.
Basidiocarps centrally stipitate with a circular and infundibuliform pileus, 3-8 cm in diameter, up to 2 mm thick in centre, rigid and brittle, pileus rusty to snuff-brown, finely tomentose to adpressed velutinate in concentric zones, with age wearing away

zonewise and becoming glabrous and darker, margin thin and deflexed when dry, stipe more or less circular in section, often somewhat swollen towards the base, 5-13 cm high, 3-15 mm in diameter, dark fulvous to snuff-brown, finely velutinate, in section weakly duplex with a outer softer and slightly spongy layer covering a more dense core, but no zones or lines separate the two layers, of which the inner is darker than the outer, pore surface snuff-brown, pores entire, round to slightly angular, 2-3 mm, context very thin, cinnamon to snuff-brown, up to 1 mm thick, in old specimens the upper part of the context becomes darker as the hyphae agglutinates and then the context appear sub-duplex in structure (strong lens), but this agglutination appears zonewise and not as a distinct dark line below an upper tomentum.
Hyphal system monomitic, generative hyphae subhyaline to rusty brown, on the pileus wide and with wide lumen, sparingly branched, 6-10 µm in diameter, in the trama and more thick-walled and more branched, the hyphae on the stipe are as on the pileus, those of the core as in the lower context and trama.
Setal hyphae present in lower context and trama, partly embedded, partly projecting into the hymenium with a hooked tip, thick-walled and dark brown, 6-14 µm wide, up to 400 µm long.
Basidiospores broadly ellipsoid, slightly thick-walled, light yellowish golden-brownish, 8-10 x 5.5- 6.5 µm.
Basidia not seen.
Substrata. On the ground in rain forests.
Distribution. South-American species and known from Brazil, British Guyana and Venezuela, but it will certainly be found scattered throughout the rain forests in the Amazonian-area.
Remarks. The shiny zonate pileus and above all, the dark setal hyphae make this a distinctive species.

Coltricia montagnei (Fr. in Mont.) Murrill,
Fig. 49
Mycologia 12:13, 1920. - *Polyporus montagnei* Fr. in Mont., Ann. Sci. Nat. Bot. ser. 2, 1:341, 1836.
Basidiocarps annual, stipitate, soft when fresh, more brittle when dry, pilei circular to more irregular and partly flabelliform, mostly depressed in the centre or towards the lateral attachment of the stipe, up to 12 cm wide and 1-2 cm thick; upper surface cinnamon to deep reddish rusty brown, usually azonate, more rarely slightly banded in somewhat sulcate zones, at first velvety to tomentose, later more irregularly hispid to warted or fibrous- scaly, especially towards the centre; margin paler in actively growing specimens, wavy and sometimes incised; stipe slender to thick, mostly expanding towards the pore surface, 1-4 cm long, 0.5-1 cm in diam, cinnamon to deep rusty brown, tomentose to warted and in parts glabrous with age, tissue homogeneous; pore surface cinnamon to rusty brown, poroid to concentrically lamellate, when poroid, pores angular, thin-walled, often slightly expanded and radially elongated

towards the stipe, 1-3 mm wide, with age some pores split and the hymenophore becomes partly concentrically lamellate to poroid while others are completely lamellate, 1-3 mm between the lamellae; context concolorous with pore surface, upper part soft to corky, lower part distinctly denser, but with no distinct duplex character, up to 2 cm thick at the centre; tube layer up to 1-4 mm thick, rarely up to 8 mm in places near the stipe.
Hyphal system monomitic; hyphae thin to thick-walled, hyaline to golden or slightly rusty brown, richly branched, often at almost right angles, up to 14 µm in diam; tramal hyphae 5-8 µm in diam.
Basidia clavate, 2- to 4-sterigmate, 20-35 x 6-8 µm.
Basidiospores ellipsoid, pale golden yellow, becoming slightly thick-walled with age, smooth, slightly dextrinoid, 9-14 x 5.5-7.5 µm.
Substrata. On the ground in hardwood forests, rarely in coniferous forests, often on exposed soil, footpaths, clay banks, etc.
Distribution. A very rare cosmopolitan species and in tropical America only reported from Costa Rica.
Remarks. Basidiocarps of *C. montagnei* are usually easy to recognise in the field because of they are relatively large and thick, much thicker than those of the other *Coltricia* species described in this manual. However, small specimens may be confused with *C. cinnamomea* and in such cases the larger spores of *C. montagnei* will be diagnostic. *Phaeolus schweintizii* also has dark brown, large-pored basidiocarps with simple septa, but has thin-walled tubular cystidia and much smaller, thin-walled spores (5-7 x 3.5-4.5 µm).

Coltricia stuckertiana (Speg.) Rajchenb. & Wright, Fig. 49
Folia Crypt. Estonica 33:119, 1998. - *Polyporus stuckertianus* Speg., Ann. Mus. Nat. Buenos Aires 6:163, 1898.
Basidiocarps annual, stipitate, pileus circular or when several specimens are fused, more spatulate to dimidiate, thin, often incised with lobes, up 3-4 cm in diam, and margin curled when dry, up to 3 mm thick in centre, pileus surface finely velutinate, dull and with indistinct concentric zones, yellow brown to tobacco brown, often wrinkled when dry; stipe single or several fused and then irregular, otherwise cylindrical to flattened, up to 2 cm long and 2-4 mm in diam, finely velutinate, yellowish brown to deep brown, pore surface golden brown, pores thin-walled and angular, 4-6 per mm; context yellowish brown, up to 5 mm thick, fibrous and rusty to reddish brown; tube layer up to 2 mm thick, more or less concolorous with the pore surface.
Hyphal system monomitic; generative hyphae at first thin-walled and hyaline, later more thick-walled and golden brown, 2-5 µm in diam.
Basidia clavate, 4-sterigmate, 11-15 x 4-6 µm, simple-septate at the base.
Basidiospores oblong to broadly ellipsoid, thin to distinctly thick-walled, golden

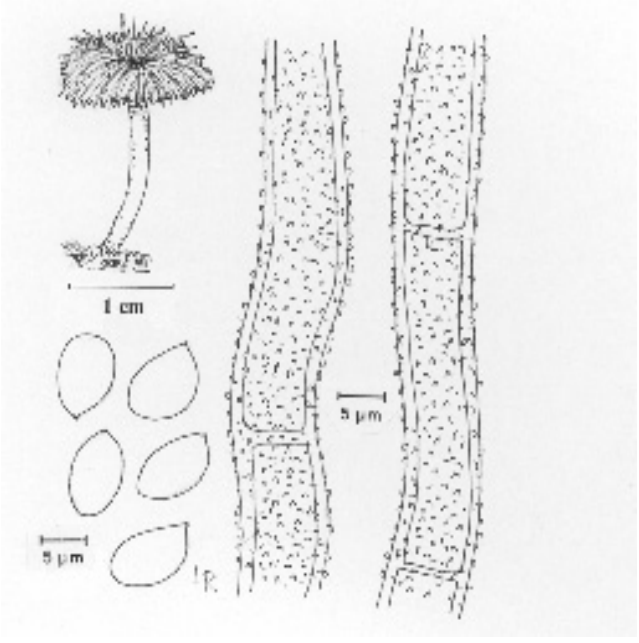


Fig. 51 *Coltricia verrucata* A) basidiocarp, B) hyphae, C) basidiospores. From the holotype.

yellow, 4-4.5 x 3-3.5 µm.
Substrata. On the ground in hardwood forests.
Distribution. Known from Northern Argentina and Paraguay.
Remarks. The species may remind about *C. cinnamomea*, but has smaller pores and spores. From *C. fonsecoensis* it is separated by more broadly ellipsoid basidiospores. However, undoubtedly the two species are closely related.

Coltricia verrucata Aime, Henkel & Ryvarden,
Fig. 51
Mycologia 95:671, 2003.
Basidiocarps annual, centrally stipitate, pileus circular, infundibuliform, 10-15 mm in diameter, deep reddish brown, striate with bundles of hyphae, erect in the centre, more flattened towards the margin, each bundle up to 600 µm long, margin thin, partly incised, deflexed when dry, pore surface reddish brown, pores thin-walled, angular, 4-5 per mm; context reddish brown, fibrous, up to 400 µm thick, stipe 10-30 x 1-2 mm, reddish brown and velutinous.
Hyphal system monomitic; generative hyphae, thin-walled to thick-walled, golden to rusty brown, strongly pruinate by numerous small tubercles throughout the basidiocarp, (5) 8-13 (16) µm in diam.
Basidia barrel-shaped 18-20 x 7-10 µm with 4 sterigmata.
Basidiospores ellipsoid, thick-walled, golden yellow and without reaction in Melzer's reagent, 5-6 µm in diameter.
Substrata. On the ground.

COLTRICIELLA Murrill,

Bull. Torrey Bot. Cl. 31:348, 1904.

Basidiocarps stipitate or pendant with a thin stipe or elongated tapering base, usually small 4-20 mm wide, soft and fragile, pileus rusty-brown, adpressed velutinate, pore surface brown, pores 2-3 per mm, context rusty-brown, hyphal system monomitic, generative hyphae with simple septa, setae none, spores elliptical to slightly pip shaped, pale yellowish and finely verruculose. On deciduous wood. Tropical genus.
Type species: *Polyporus dependens* Berk. & Curt.
Remarks. The genus is close to *Coltrica*, but separated by the finely verruculose spores. All species of *Coltricia* have smooth spores.

Key to species

1. Basidiocarps pendant ..... **C. dependens**
1. Basidiocarps stipitate 2

2. Basidiospores ellipsoid, 7-10 µm long ..... **C. oblectabilis**
2. Basidiospores navicular 10-14 µm long **.....C. navispora**

Coltriciella dependens (Berk. & W. A. Curt.) Murrill,
Fig. 52 A
op cit. - *Polyporus dependens* Berk. & W. A. Curt., Ann. Mag. Nat. Hist. Ser. 2, Vol. 12:431, 1853.
Basidiocarp pendant from a distinct stipe or more contracted vertex, stipe up to 1 cm long and some mm wide, pileus usually circular, 3-20 mm wide, 2-8 mm thick, soft and brittle or fragile when dry, light in weight, pileus rusty-brown in variable shades, first finely velutinate, with age the adpressed tomentum becomes agglutinated and pileus glabrous with some faint radial striae, margin vertical, pore surface rusty-brown, applanate, pores angular, 2-3 per mm, tubes up to 6 mm deep, context rusty-brown, soft and 2-5 mm deep.
Hyphal system monomitic, generative hyphae 2-8 µm wide, in context and trama thick-walled and yellowish, in the subhymenium hyaline and narrower, moderately branched, often at right angles.
Basidiospores ellipsoid to slightly pip shaped, yellowish, finely verruculose, 7-10 x 4-6 µm.
Substrate. On hard wood, often on burnt wood.
Distribution. Specimens have been seen Central America and USA, widely distributed in tropical and subtropical zones, but rare and easily overlooked.
Remarks. The species is usually easy to recognize because of the small, rusty-brown, pendant basidiocarps and microscopically by the finely verruculose spores.

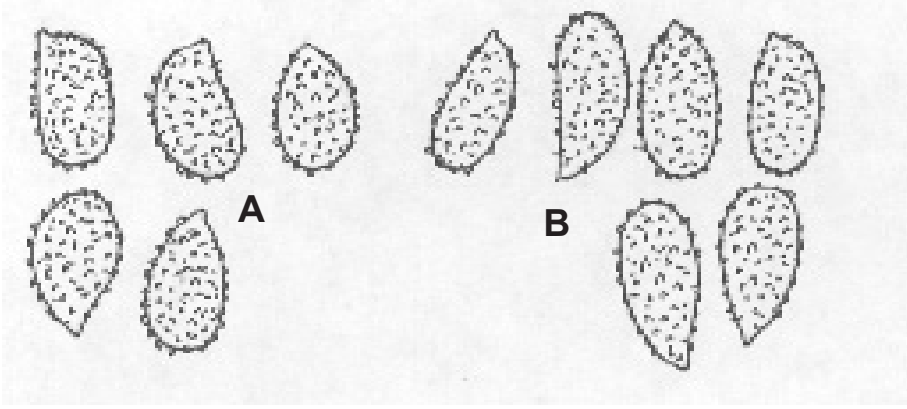


Fig. 52 . *Coltriciella dependens* A) basidiospores. C. *oblectabils* B) basidiospores. From the lectotypes.

Coltriciella oblectabilis (Lloyd) Kotlaba, Pouzar & Ryvarden, Fig. 52 B

Ceska Mykol. 38:140, 1984. - *Polyporus oblectabilis* Lloyd, Lloyd Mycol. Writ. 3:164, 1912. - *Coltricia pseudocinnamomea* Burds., Mycologia 61:647, 1969.

Basidiocarp annual, centrally stipitate, pileus infundibuliform, 1-3 cm in diameter, up to 2 mm thick in centre, margin thin, slightly lobed to incised, deflexed when dry, pileus slightly shiny, adpressed tomentose, dark cinnamon to rusty-brown, weakly concentrically zonate, no cuticle below the tomentum, stipe up to 3 cm long, 1-3 mm in diameter, finely velutinate, cinnamon to rusty-brown, pore surface greyish brown to rusty-brown with age, pores angular, shallow, 1-2(3) per mm, tubes concolorous, up to 1 mm deep, context rusty-brown, homogeneous, about 1 mm thick.

Hyphal system monomitic, generative hyphae golden-yellow to light rusty-brown, on the pileus 5-8 µm wide with distinct wide lumen, in the trama 3.5-6.5 µm with slightly thicker walls, moderately branched.

Basidiospores oblong ellipsoid with rounded base and somewhat tapering at the other end, some spores apparently also slightly oblique at the tapering end, golden-yellowish to light rusty-brown, finely verrucose and somewhat thick-walled, 7-10 x 4-5 µm.

Substrate On the ground in deciduous forest

Distribution. Known from Brazil and South-Eastern United States.

Remarks. The species is morphologically similar to *Coltricia cinnamomea*, but separated by the conical ornamented spores.

Coltriciella navispora Aime, Henkel & Ryvarden,

Fig. 53
Mycologia 95:617, 2003.
Basidiocarp annual, laterally stipitate, pileus slightly infundibuliform, 1-2 cm in diameter, up to 2 mm thick in centre, margin thin, deflexed when dry, pileus dull, finely adpressed velutinate, rusty-brown, weakly concentrically zonate, no cuticle present, stipe up to 1 cm long, 1-2 mm in diameter, velutinate, more distinctly so than on the pileus, rusty-brown, pore surface concolorous with stipe, pores angular, shallow, 1-2 per mm, tubes concolorous, up to 1 mm deep, context rusty-brown, homogeneous, about 1 mm thick.
Hyphal system monomitic, generative hyphae golden-yellow to light rusty-brown, on the pileus 5-8 µm wide with distinct wide lumen, in the trama 3-6 µm with slightly thicker walls, moderately branched.
Basidiospores navicular, golden-yellowish to light rusty-brown, finely verrucose and somewhat thick-walled, 10-12 x 4-5 µm.
Substrate. On the ground in deciduous forest.
Distribution. Known only from the type locality, but easily overlooked due to its minute size.
Remarks. The species looks macroscopically like *C. oblectabilis*. However, the basidiospores of the latter are oblong ellipsoid and shorter i.e 7-10 x 4-5 µm.

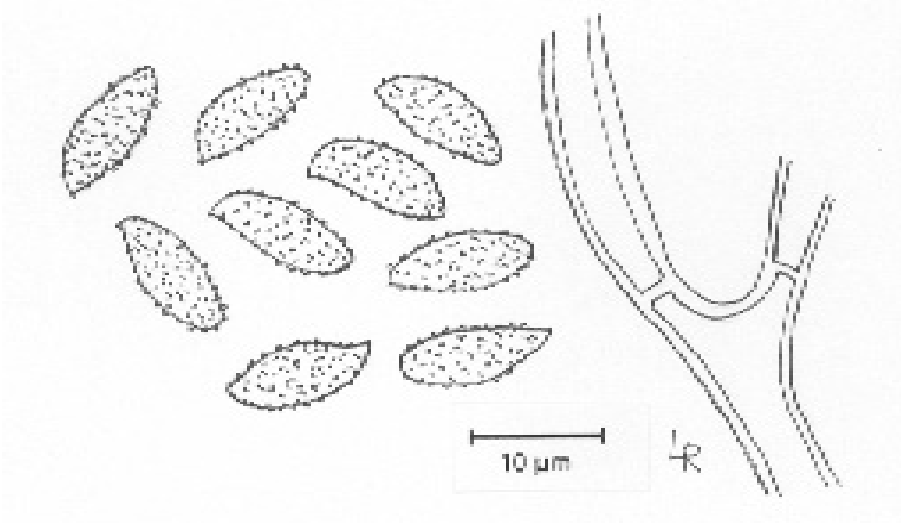


Fig. 53 *Coltriciella navispora* A) basidiospores, B) hyphae. From the holotype.

colours, pores variable or hymenophore concentrically lamellate, context distinctly duplex, lower part dense, separated from the pileus tomentum by a thin black zone, hyphal system monomitic, generative hyphae hyaline to brown, hymenial setae present, dark brown, acute and thick-walled, basidiospores hyaline to very pale yellowish, cylindrical to ellipsoid, negative in Melzer´s reagent, basidiocarps black in KOH. On hardwood with a white rot. Pantropical genus with four species.
Type species: *Cyclomyces fuscus* Fr.
Remarks. The genus may be related to *Inonotus*, but is easily separated by its thin and flexible basidiocarps with a distinct duplex context where the context is separated from the pileus tomentum by a thin black line, at least close to the base.

Key to species

1. Hymenophore concentrically lamellate, at least in parts ..... **C. fuscus**
1. Hymenophore poroid 2

2. Pores 7-9 per mm ..... **C. tabacinus**
2. Pores 4-6 per mm ..... **C. iodinus.**

Cyclomyces fuscus Fr.,
Linnaea 5:512, 1830.
Basidiocarps annual to perennial, solitary or imbricate, in clusters, flabelliform with an almost stipitate attachment to more broadly attached to sessile, consistency coriaceous when dry, pileus up to 5 cm wide and long and 1-3 mm thick, ferruginous, fuscous to sepia, concentrically zoned in different shades of brown, tomentose to velvety in touch and slightly furrowed, margin acute, entire or lobed, pore surface bay, ferruginous or dark brown, plane, margin sterile, hymenophore concentrically lamellate, 4-5 per mm radially, when older 2-3 per mm, edges acute, toothed, finely velutinate, up to 1 mm deep. Near the periphery they may anastomose to form angular, shallow pores, context up to 2 mm thick, duplex, lower part dense, chestnut to dark fuscous, separated with a black zone from the looser tomentum.
Hyphal system monomitic, generative hyphae yellowish to pale ferruginous, thick-walled, 4-8 µm wide.
Hymenial setae dark brown, thick-walled and acute, 25-40 x 5-10 µm, projecting, often bent at the base.
Basidiospores narrowly elliptical, walls hyaline, 3.5-4 x 1.5-2 µm.
Substrata. On dead wood.
Distribution. Pantropical, but rare.
Remarks. *C fuscus* differs from the other species in the genus in having concentric lamellae at least in parts, which near the margin may anastomose to form angular, shallow pores.

CYCLOMYCES Fr.,

Linnaea 5:512, 1830.

Basidiocarps annual, pileate, solitary or imbricate, semi-circular to flabelliform or sometimes dimidiate with a contracted base, finely pubescent in warm brown

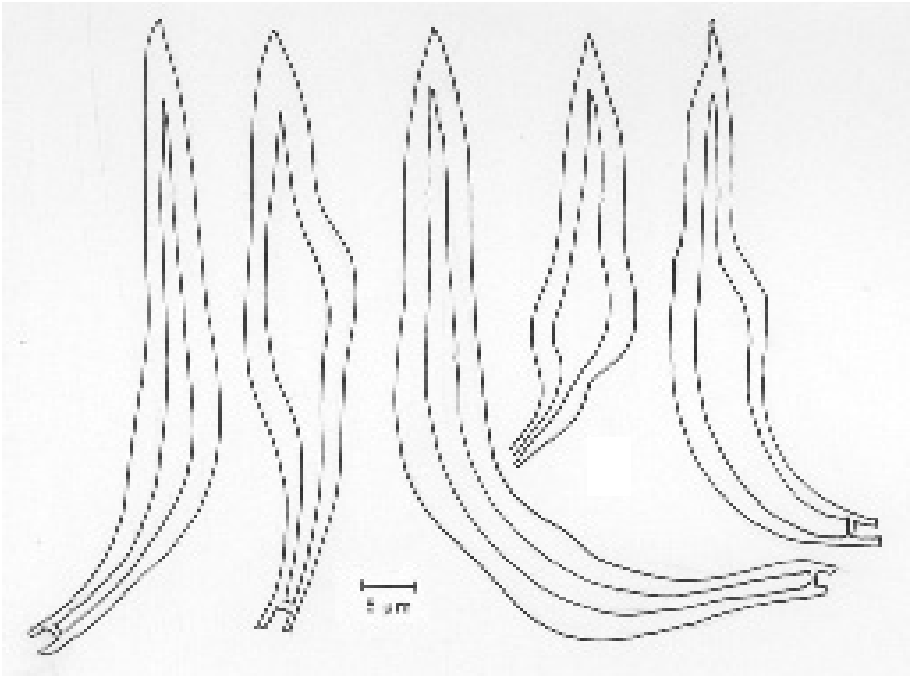


Fig. 54 *Cyclomyces iodinus* Hymenial setae, from the lectotype.

Cyclomyces iodinus (Mont.) Pat.,
Fig. 54
Essai tax. p. 98, 1900. - *Polyporus iodinus* Mont., Ann. Sci. Nat. Bot. Ser II. 16:108, 1841.

Basidiocarps annual, pileate, single or in clusters, dimidiate, flabelliform to fan shaped, more rarely broadly sessile, semicircular, applanate, flexible when dry and then with a curved margin, up to 5 cm wide and long, often smaller, 1-2 mm thick, upper surface light to dark rusty brown, finely velutinate in numerous narrow concentric zones, margin thin, deflexed and often incised or lobed, pore surface dark cinnamon to rusty brown, pores angular and thin-walled, with age dentate or slightly incised along the pore edges, 3-6 per mm, often some pores are elongated or fused concentrically and sinuous, tubes up to 1 mm deep, context rusty brown, distinctly duplex, lower part dense and separated by a black zone from the pileus tomentum,

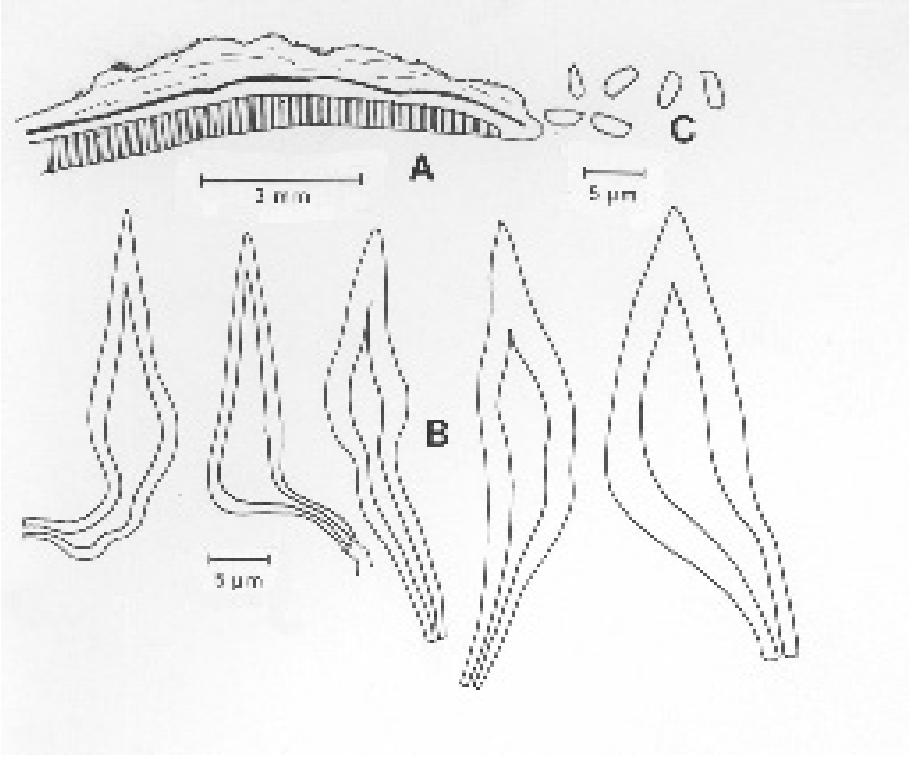


Fig. 55. *Cyclomyces tabacinus*, A) section of basidiospores, B) hymenial setae C) basidiospores, from the lectotype.

Hyphal system monomitic, generative hyphae in the tomentum yellow to rusty brown, thick-walled and strongly simulating skeletal hyphae, but thick-walled septa do occur along almost all segments examined and the hyphae should best be classified as sclerified generative hyphae, 4-7 µm wide and sparingly branched, in the trama similar, but lighter and with a wider lumen, in the subhymenium hyaline to pale yellow, more richly branched, 3-5 µm wide.
Hymenial setae abundant, dark brown, acute with a bent base or obliquely projecting into and above the hymenium, 25-60 x 4-7 µm.
Basidia cylindrical 12-18 x 3-4 µm, in dried specimens hyaline and with some fine excretions in the apex, pale yellowish and slightly thick-walled at the base.
Basidiospores cylindrical to oblong ellipsoid hyaline, 3.5-4 x 2-2.5 µm.
Substrata. On deciduous wood,
Distribution. Neotropical species, known from Florida and Louisiana to Brazil.

Remarks. The species is easy to recognize because of the multizonate, thin, flabelli-

form or semicircular basidiocarps with a black zone in the context and the numerous setae. The basidiospores are often difficult to find. It is closely related to *C. tabacinus* (pores 7-9 per mm, invisible to the naked eye) and separated by larger pores, slightly wider basidiospores and longer setae.

Cyclomyces tabacinus (Mont.) Pat.,
Fig. 55
Essai tax. p. .98, 1900. - *Polyporus tabacinus* Mont. Ann. Sci. Nat. Ser. 3, vol 3:349, 1835.
Basidiocarps annual to perennial, up to 8 cm wide and long, 1-3 mm thick, solitary to densely imbricate or in rows, sessile or more usually fan shaped to flabelliform with lateral tapering base, more seldom orbiculate with central stipe like base, consistency tough to brittle when dry, pileus dark brown to bay or reddish-brown, narrowly concentrically zoned in different shades, almost black when old, upper surface velvety, tomentose to hirsute, with age glabrous in concentric zones, finely radiately striate, silky and shining, pore surface fulvous to dark brown sometimes with a greyish tint, pores round and entire, when old often lacerate, (7)8-9 per mm, tubes 0.5-1 mm deep, context duplex, 0.5-1 mm thick, ferruginous to cinnamon, towards the tomentum separated by one or two (seldom three) dark lines or zones of dark agglutinated hyphae.
Hyphal system monomitic, generative hyphae in the tubes yellowish to brown, thin to thick-walled, 3.5-5 µm in diameter, in the pileus tomentum thick-walled and 5-6 µm wide.
Hymenial setae dark brown, thick- walled and pointed, 25-45 x 5-6.5 (8) µm, often bent towards the base.
Basidia cylindrical 12-18 x 3-4 µm, hyaline to pale yellowish and slightly thick-walled at the base.
Basidiospores elliptical 2.5-3.5 x 1.5-2 µm, hyaline to pale brown and smooth.
Substrata. On dead wood.
Distribution. Pantropical and rather common.
Remarks. The tiny, almost invisible pores characterize this species. It is the most common species in the genus.

5. Basidiospores 4.5-5 µm in diam, margin sharp and distinct..... **I. marginatus**
6. Setal hyphae present in the dissepiments 7
6. Setal hyphae absent in the dissepiments 10

7. Hymenial setae absent, pore surface olivaceous brown .....**I. dentiporus**
7. Hymenial setae present, pore surface rusty to dark brown 8

8. Basidiospores 5-6 x 4-4.5 µm, upper surface glabrous with black cuticle from the base .....**I. pseudoglomeratus**
8. Basidiospores 6-8 x 4-5.5 µm, upper surface finely tomentose, becoming zoned .9

9. Upper surface with alternating black and rusty brown zones, chlamydospores absent .....**I. patouillardii**
9. Upper surface azonate, rusty brown, chlamydospores present in context or on pileus..... **I. rickii**

10. Hymenial setae absent 11
10. Hymenial setae present 18

11. Pores 4-6 per mm 12
11. Pores 1-4 per mm or wider 14

12. Basidiospores 7-8 x 6-7 µm..... **I. neotropicus**
12. Basidiospores smaller 13

13. Basidiocarps tiny, approximately 2 x 2 x 1 mm, contorted hyphae absent on pileus .....
.....**I. pusillus**
13. Basidiocarps larger, contorted hyphae present on pileus .....**I. porrectus**

14. Basidiospores 4-5.5 µm long 15
14. Basidiospores longer than 5.5 µm 16

15. Basidiocarps golden yellow, pores irregular 1-3 per mm ..... **I. dentatus**
15. Basidiocarps in shades of rusty brown, pores regular round to angular, 2-6 per mm .....
..... **I. splitbergeri**

16. Context up to 2 mm thick, pores 3-4 per mm, pileus becoming black and with cuticle .....**I. jamaicensis**
16. Context 2-20 mm thick, pileus persistently brown and without cuticle 17

INONOTUS P. Karsten**,**

Medd. Soc. Fauna Fl. Fenn. 5:39, 1880.
Basidiocarps annual, resupinate, effused-reflexed, sessile, or rarely laterally stipitate, tissue yellowish to reddish-brown, darkening in KOH; pileus surface hirsute, hispid, tomentose, or glabrous, yellowish to reddish-brown, often darkened and rimose in age; context brown, soft-fibrous to tough-corky; hyphal system monomitic; hyphae simple-septate, in most species ranging from thin-walled and almost hyaline to thick-walled and brownish in KOH, much branched, setal hyphae present in context or trama of some species; hymenial setae present in most species, usually hymenial or subhymenial in origin, subulate to ventricose, pointed, pale to dark brown in KOH; basidia clavate to broadly ellipsoid, 4-sterigmate, simple-septate at the base; basidiospores narrowly ellipsoid to ovoid or subglobose, hyaline or golden to reddish brown, smooth, negative or dextrinoid in Melzer's reagent; causing a white rot of living and dead conifers and hardwoods.
Type species: *Polyporus hispidus* Bull.:Fr.
Remarks. The genus is usually easy to recognize by its brown, annual basidiocarps with a fibrous to soft or fragile consistency. The generative hyphae are generally wider than those of the related genus *Phellinus* that is characterized by its woody, perennial basidiocarps and dimitic hyphal system.
There is no doubt that *Inonotus* as defined here is an artificial genus, with several evolutionary lines to *Phellinus*. Of practical reasons, the genera are here kept separate to make determinations easier. Those interested in what is called a natural classification of the two genera and their phylogenetic relationships, are referred to Wagner & Fischer 2002.

Key to species

1. Basidiocarp resupinate to nodulose 2
1. Basidiocarp pileate or effused reflexed..... 6

2. Hymenial setae and setal hyphae absent **.....**3
2. Hymenial setae and setal hyphae present **.....**4

3. Pores 3-4/mm, basidiospores ellipsoid 5-6 x 4.5-5 µm ..... **I. venezuelicus**
3. Pores 7-8 per mm, basidiospores globose, 5.5-6.5 µm in diam..... **I. costaricensis**

4. Basidiospores 10-13 x 8-12 µm..... **I. micantissimus**
4. Basidiospores globose and smaller 5

5. Basidiospores 7-8 µm in diam, margin thin to absent **..... I. adnatus**

17. Setigerous elements present on the pileus, basidiospores 6-8 µm long, USA and Mexico ..... **I. munzii**
17. Setigerous elements absent on the pileus, basidiospores 5-6.5 µm long, Southern USA ..... **I. ludovicianus**

18. Setae hooked **19**
18. Setae straight **21**

19. Basidiospores subcylindrical, 6-7.5 µm long, ... **I. fulvomelleus**
19. Basidiospores ellipsoid and shorter, ... **20**

20. Basidiospores rusty brown, 5-6 x 4-4.5 µm, pileus villose to hispid,..... **I. fimbriatus**
20. Basidiospores hyaline to golden yellow, 4-4-5 x 3-3.5 µm, pileus glabrous to finely tomentose ..... **I. crocitinctus**

21. Basidiospores rusty to umber brown..... **I. pertenuis**
21. Basidiospores hyaline **22**

22. Hymenial setae slender, 4-7 µm wide..... **I. xanthoporus**
22. Hymenial setae ventricose, 10-14 µm wide ..... **I. pseudoradiatus**

Inonotus adnatus Ryvarden**,**
Fig. 56
Synopsis Fung. 15:70, 2002.
Basidiocarps annual, resupinate, up to 4 cm in diameter, strongly adnate, probably tough when fresh, hard and dense when dry, pore surface ochraceous, dull, margin thin to absent, pores round to angular, 7-9 per mm, not visible to the naked eye, tubes brown, up to 3 mm deep, context cinnamon, very thin, virtually absent in parts.
Hyphal system monomitic, generative hyphae thin to thick-walled, golden to rusty brown, 3-5 µm wide.
Setal hyphae abundantly present, dark brown, acute, thick-walled, up to 150 µm long, 10-25 m wide, embedded in trama and not projecting.
Hymenial setae present, ventricose to more rarely clavate, thick-walled, dark brown, 20-45 x 7-16 µm.
Basidia not seen.
Basidiospores globose, slightly thick-walled, pale yellow, 7-8 µm in diameter.
Substrate. On unknown dead hardwood.
Distribution. Known only from the type locality in Costa Rica.
Remarks. This species is easily separated from other resupinate species in the area

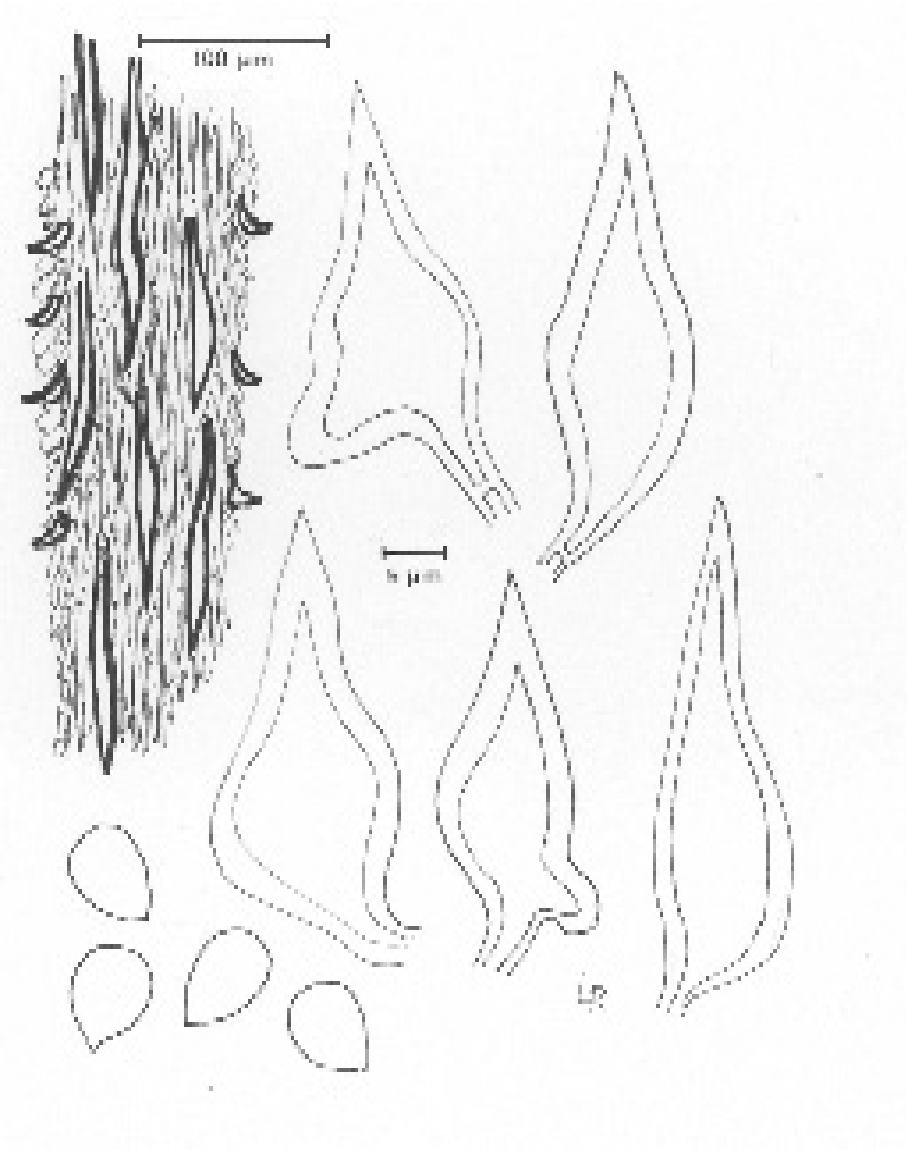


Fig. 56. Inonotus adnatus. A) section of trama, B) hymenial setae, C) basidiospores. From the holotype.

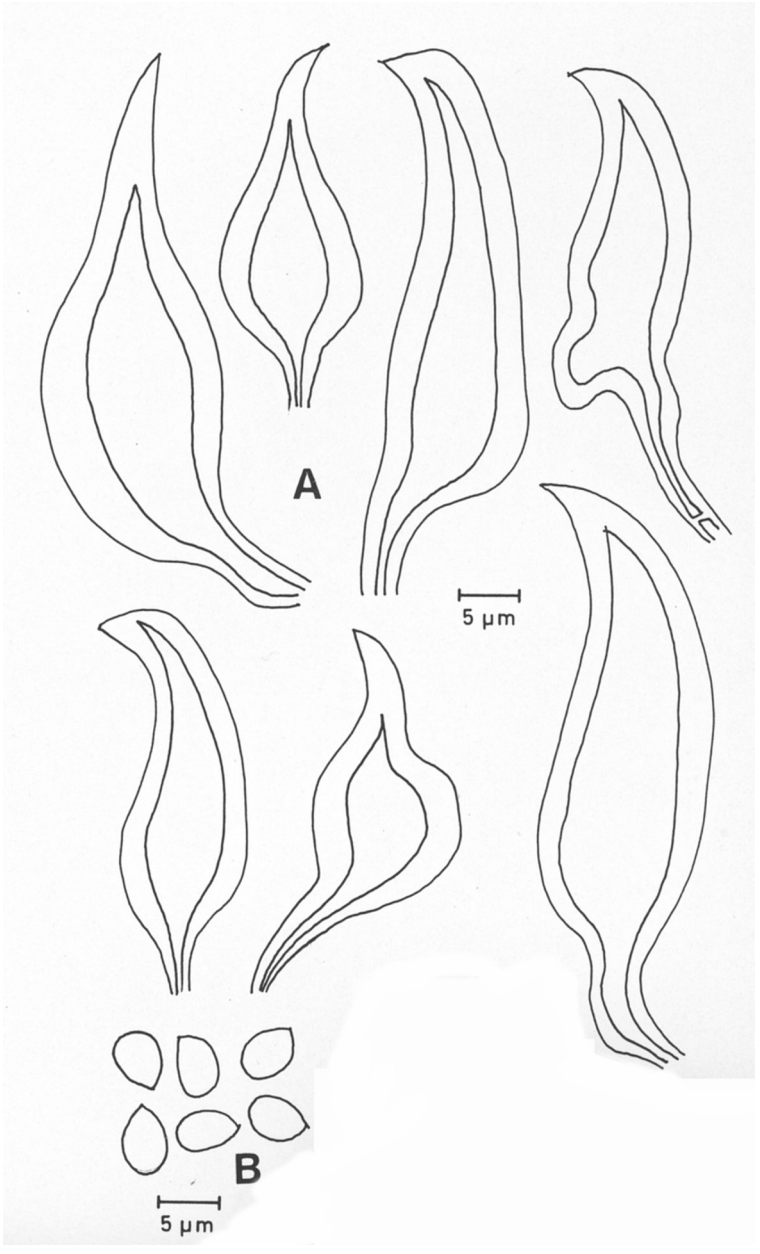


Fig. 57. *Inonotus crocitinctus*. A) hymenial setae, B) basidiospores. From the holotype.

by the combination of large globose basidiospores and presence of both hymenial setae and setal hyphae. The collection was dry when collected, thus the pore surface will probably be darker than described here in fresh specimens.

Inonotus costaricensis Ryvarden,
Synopsis Fung. 15:72, 2002.

Basidiocarps annual, resupinate, individual basidiocarps more or less circular, up to 6 cm in diameter, soft when fresh, hard and brittle when dry, pore surface greyish brown, shiny when turned in incident light in fresh condition, slightly also so when dry, margin thin and narrow and pale cinnamon, pores round to angular, 7-8 per mm, not visible to the naked eye, tubes deep brown, up to 3 mm deep, context very thin, cinnamon.
Hyphal system monomitic, generative hyphae thin to thick-walled, golden to rusty brown, 3-5 µm wide.
Setal hyphae absent.
Hymenial setae absent.
Basidia 10-12 x 7-8 µm with 4 sterigmata.
Basidiospores globose, slightly thick-walled, pale yellow, 5.5-6.5 (7) µm in diameter.
Substrate. On unknown dead hardwood.
Distribution. Known only from the type locality in Costa Rica.
Remarks. This species is easily separated from other resupinate species in the area by the combination of globose basidiospores and a total lack of setal organs. *I. venezuelicus* is another resupinate species lacking setal organs, but this species has larger pores (3-4 per mm), a black line next to the substrate and ellipsoid basidiospores.

Inonotus crocitinctus (Berk. & Curt.) Ryvarden,
Fig. 57
Norw. J. Bot. 19:232, 1972. - *Polyporus crocitinctus* Berk. & Curt. J. Linn. Soc. Bot. 10:311, 1868.

Basidiocarps annual, sessile, dimidiate, probably fleshy when fresh, hard and brittle when dry, up to 2 cm wide and long, up to 4 mm thick at the base, upper surface dark cinnamon, glabrous, smooth to slightly wrinkled in dry condition, basal portion becoming reddish-brown, laccate, with a fine crust in section, pore surface cinnamon, pores round, almost invisible to the naked eye, 7-9 per mm, tubes concolorous with pore surface, up to 2 mm deep, context dense, golden brown, l-2 mm thick, homogeneous.
Hyphal system monomitic, generative hyphae 3-5 µm wide with slightly thickened walls, pale yellow, simple septate, those of the trama similar, but in the subhymenium more thin-walled and hyaline.
Hymenial setae subulate to ventricose and hooked with slightly to moderately thickened walls, 20-50 x 7-15 µm.
Basidia not seen.
Basidiospores ellipsoid, hyaline to pale yellowish, 4-4.5 x 3-3,5 µm, smooth, IKI-.
Substrate. On dead hardwoods.

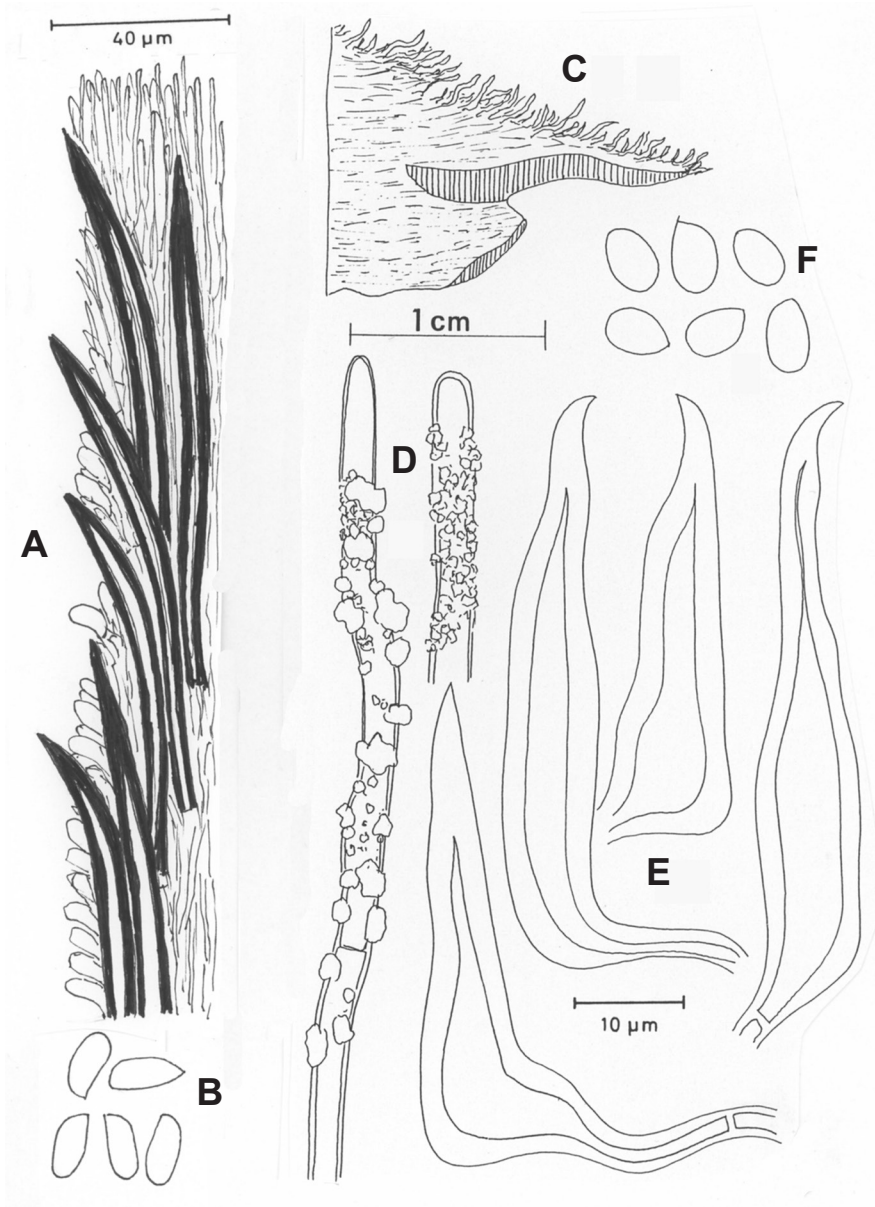


Fig. 58 A-B *Inonotus dentiporus.* A) section of trama, B) basidiospores. From the holotype.
Fig. 58 C-F. *Inonotus fimbriatus.* C) section of basidiocarp, D) generative hyphae, E) hymenial setae, F) basidiospores. From the holotype.

Distribution. Known from Cuba, Costa Rica and Venezuela..
Remarks. The species is microscopically similar to *I. fimbriatus* which however has a fibrous to hispid pileus.

Inonotus dentatus Decock & Ryvarden,

Synopsis Fung. 15:73, 2002.
Basidiocarps annual, pileate and dimidiate with strongly contracted base, semicircular of outline, up 1.5 cm wide and long, 1.5 mm thick at base, fragile and brittle when dry, upper surface shiny golden brown, at the base with raised tufts of loose fibres, becoming adpressed velutinate to fibrous towards the margin, azonate or faintly zonate, no cuticle in section, margin sharp, pore surface golden yellow, pores irregular, 1-3 per mm, angular, in parts radially elongated, up to 1 mm deep, context golden yellow brown, homogenous, up to 0.5 mm thick at base, the whole basidiocarp sharply cherry red with 3% KOH..
Hyphal system monomitic, generative hyphae thin to thick-walled, golden to rusty brown, 3-6 µm wide.
Setal hyphae and **hymenial setae** absent.
Basidia clavate, 12-15 x 3-4.5 µm with 4 sterigmata. .
Basidiospores ellipsoid, slightly thick-walled, golden yellow, a few with a distinct oil drop, 4.5-5 x 3-3.5 µm.
Substrate. On unknown dead hardwood.
Distribution. Known only from the type locality in French Guyana
Remarks. This species is remarkable with its small, thin and fragile basidiocarps, the irregular pores and the fibrous hairs on the pileus varying from a vertical clustered position at the base becoming radially flattened and adpressed toward the margin.
The red colour in KOH is distinct, like seen in *Inonotus splitbergeri* which also lacks all hymenial organs. DNA sequencing has shown that it is true member of the genus and not an example of convergent evolution in some other groups of polypores.

Inonotus dentiporus Ryvarden,
Fig. 58 A-B
Synopsis Fung. 15:73, 2002.
Basidiocarps annual, solitary or clustered with several partly fused basidiocarps, usually pendant to rarely dimidiate with distinctly tapering base, semicircular, up to 4 cm in diameter or wide and 1 cm thick at the base, applanate and soft when fresh, curled, hard and fragile when dry, upper surface glabrous, slightly zoned, yellowish to reddish brown, becoming blackish from base, but no distinct cuticle in section, margin sharp, strongly curled when dry, pore surface deep yellowish olivaceous brown and shiny even when dry, pores angular, 3-4 per mm, and with dentate dissepiments, tubes up to 7 mm deep concolorous with the pores surface, inside of pores

Basidia not seen.
Basidiospores ellipsoid, abundant, yellowish brown, thick-walled, 5.5-6 x 4-5 µm
Substrate. Dead hardwood stump.
Distribution. Known only from Costa Rica.
Remarks. The species is characterized by yellowish basidiocarps, often dorsally attached, later becoming more brown, the prominent setal hyphae, the angular pores and the ellipsoid spores. The closest relative is undoubtedly *I. patouillardii*, which however, usually has large soft basidiocarp, rusty brown colours and larger basidiospores, i.e. 6-8 x 4-5.5 µm.

Inonotus fimbriatus Gomez & Ryvarden,
Fig. 58 C-F
Mycotaxon 23: 291, 1985.
Basidiocarps annual, pileate, sessile, up to 2 cm wide and long, 1 cm thick at the base; upper surface strongly hispid to fimbriate, deep golden brown, azonate; pore surface deep golden brown, pores round to angular, 3-4 per mm; tubes up to 2 mm deep; context homogeneous, golden brown.
Hyphal system monomitic, generative hyphae in the context and trama thick-walled with scattered septa, golden brown, 3-8 µm wide, in the dissepiments many encrusted hyphae, partly projecting.
Hymenial setae present, straight to hooked, thick-walled and dark brown, 40-50 x 6-11 µm.
Basidia not seen.
Basidiospores pale rusty brown, ellipsoid, smooth, 5-6 x 4-4.5 µm.
Substrate. On dead *Quercus* spp.
Distribution. Locally common in the high mountains of south Costa Rica and found once in the Andes in Venezuela.
Remarks. The species is recognized by its strongly villose to fimbriate pileus and its large hymenial setae.

Inonotus fulvomelleus Murrill,
Fig. 59
North. Am. Fl., 9:87-88, 1908.
Basidiocarps annual, pileate sessile, semicircular, applanate to semi ungulate, 3-5 x 5-10 x 1-3 cm, upper surface rusty to dark brown, densely strigose to hispid and zone wise covered with dark brown forked hairs, margin with shorter hairs, softer and rounded, pore surface yellowish to cinnamon brown, pores hardly visible to the naked eye, 4-5 per mm, tubes concolorous, up 1 cm deep, context duplex, the lower part shiny, dense, yellowish brown, up to 4 mm thick at the base, the upper part loose as if composed of compressed fibers, up to 2 cm thick.
Hyphal system monomitic, generative hyphae yellow to rusty brown, 2-6 µm wide.
Setal hyphae absent.

with numerous small white hyphal pegs, context rusty brown and conspicuously different from the tubes, 3 mm deep, dense and homogenous.
Hyphal system monomitic, generative hyphae pale yellow to rusty brown, 4-6 µm wide in the context, generally narrower in the trama, 3-4 µm wide.
Setal hyphae abundantly present in the trama, dark brown, embedded and running more or less parallel to the tube walls, up to 180 µm long and 10-20 µm wide and strongly pointed.
Hymenial setae absent.

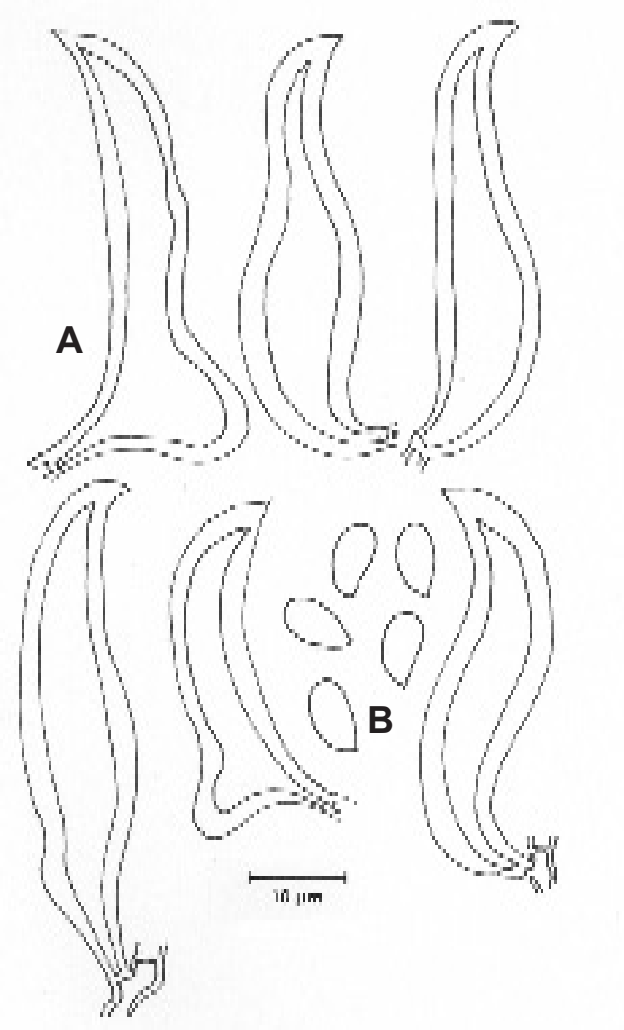


Fig. 59. Inonotus fulvomellus. A) hymenial setae, B) basidiospores. From the holotype.

Hymenial setae dark brown, acute, usually hooked, 30-55 x 8-14 µm.
Basidia not seen.
Basidiospores ellipsoid to short cylindrical, golden yellow to rusty brown, 6-7.5 x 4-5 µm.
Substrata. Hardwoods, noted on *Quercus*.
Distribution. Known from Jamaica and Mexico.
Remarks. The hispid and villose pileus, the small pores and the large, hooked setae characterize this species.

Inonotus jamaicensis Murrill,
Bull. Torr. Bot. Cl. 31:597, 1904.
Basidiocarps annual, pileate to effused reflexed, sessile to dimidiate to triquetrous, single or imbricate, 2-4 x 3-7 x 0,5-1.5 cm, upper surface first dark brown and rugose, then becoming blackish with a thin crust, pore surface dark brown, pores 3-4 (5) per mm, tubes concolorous, up to 1 cm deep, context very thin, up to 2 mm thick, cinnamon and rusty brown.
Hyphal system monomitic, generative hyphae yellow to rusty brown, 3-7 µm wide.
Setal hyphae and **hymenial setae** absent.
Basidia not seen.
Basidiospores ellipsoid, rusty to umber brown, 5-7 x 4-5 µm.
Substrate. Dead hardwoods.
Distribution. Known from Jamaica, Chile, Argentine and Tristan da Cunha.
Remarks. The encrusted almost blackish pileus and the lack of setae are characteristic for this species.

Inonotus ludovicianus (Pat.) Murrill,
Southern Polyp. p 41, 1915. - *Xanthocrous ludovicianus* Pat., Bull. Soc. Mycol. Fr. 24:6, 1908.
Basidiocarps annual, sessile to substipitate, usually forming large clusters or rosettes of imbricate pilei, the compound basidiocarp up to 50 cm in diam, individual pilei flabelliform 10-30 cm wide and long, 1-2.5 cm thick, sappy and tough when fresh, brittle when dry, upper surface rusty red to rusty brown, rugose to warted, often zonate and radially lined, at the margin more matted tomentose, pore surface often decurrent on the base, cinnamon to chestnut brown, pores thin-walled, angular to slightly irregular on drying, 2-3 per mm, tubes concolorous , up to 1 cm deep, context rusty brown, fibrous and friable, up to 2 cm thick at the base.
Hyphal system monomitic, generative hyphae in the context 4-8 µm wide, thick-walled and pale rusty to golden brown, some hyphae with irregular thickened walls making them look punctuated in the light microscope, in the subhymenium golden to hyaline and narrower.
Setal hyphae and **hymenial setae** absent.
Basidia clavate, 15-20 x 4-6 µm.

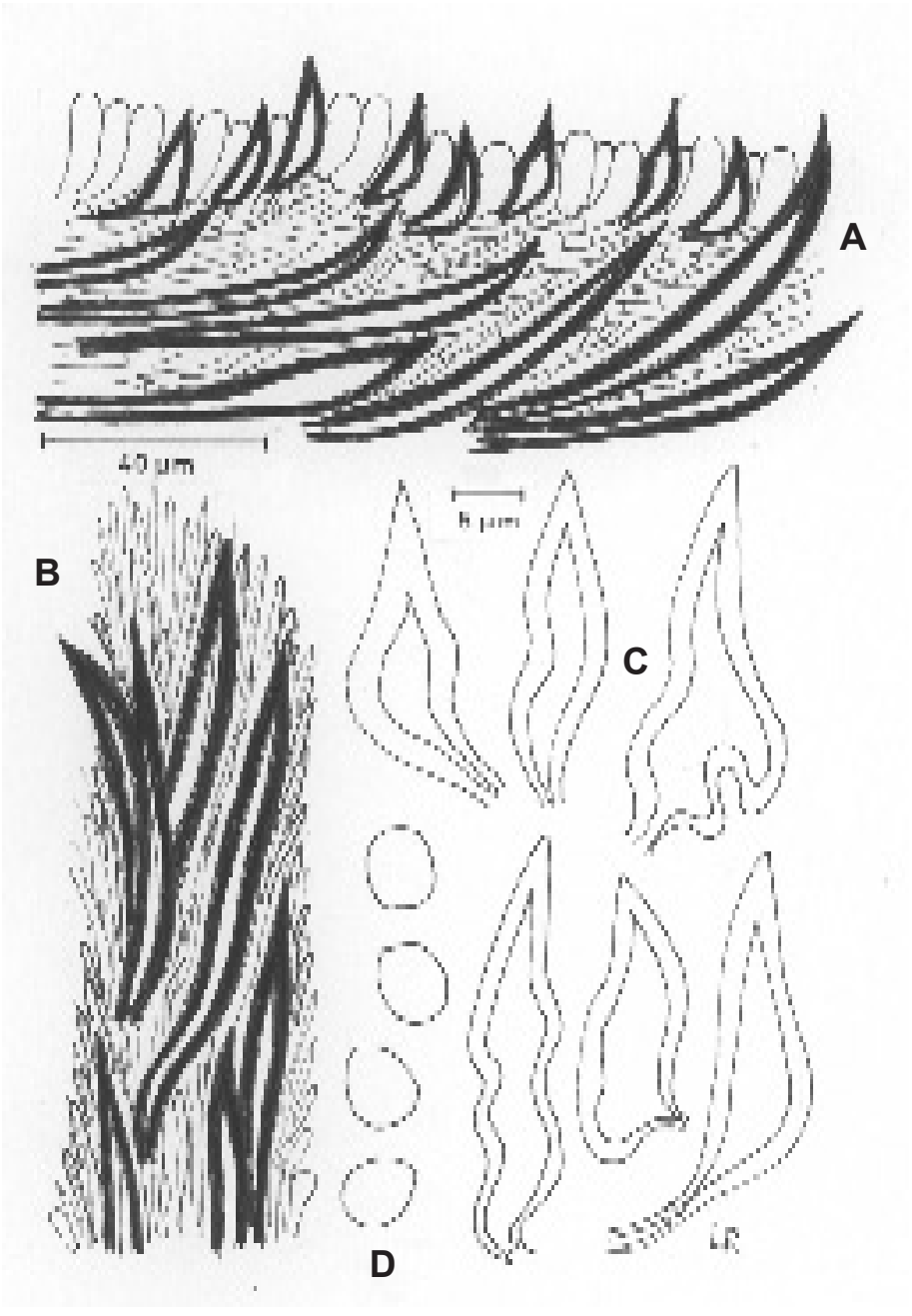


Fig. 60. *Inonotus marginatus*. A) section of trama, B) section of dissepiments, C) hymenial setae, D) basidiospores. From the holotype.

Basidiospores ellipsoid, rusty brown, 5-6.5 x 3.5-4.5 µm.
Substrate. Known from *Quercus, Nyssa* and *Liquidambar.*
Distribution. Southeastern United States from North Carolina to Texas.
Remarks. The large, partly imbricate cluster- like basidiocarps make this a distinct species in the field. The complete lack of setae and setal hyphae and relatively large pores separate it from related species.

Inonotus marginatus Ryvarden,
Fig. 60
Synopsis Fung. 15:75, 2002.
Basidiocarps annual, resupinate, in parts with new basidiocarps developing on top of old ones, as if biannual, individual basidiocarps more or less circular to elongated, up to 7 cm in longest dimension, soft and flat when fresh, hard, brittle and bent in thickest parts due to shrinking when dry, pore surface deep yellowish brown, margin 1-2 mm wide, deep brown to black and glabrous, distinct and sharp with a sloping surface as the pores has a tendency to be well developed all the way to the sterile margin, pores round to angular, 7-8 per mm, invisible to the naked eye, tubes deep brown, up to 3 mm deep, subiculum cinnamon to rusty brown with intermittent black lines, in parts up to 1.5 mm thick, in some parts missing and in others extending to the margin. In old and dead basidiocarps below living ones, the subiculum is almost entirely transformed to a thick, black zone extending to the margin.
Hyphal system monomitic, generative hyphae thin to thick-walled, golden to rusty brown, 3-5 µm wide.
Setal hyphae very abundant in the trama, embedded or projecting, especially in the dissepiments, 30-180 x 5-12 µm, dark brown and thick-walled.
Hymenial setae present, slightly ventricose to evenly tapering from the base, 18-30 x 6-10 µm.
Basidia 10-15 x 6-7 µm with 4 sterigmata.
Basidiospores globose, thin-walled, hyaline, 4.5-5 µm in diameter.
Substrate. On unknown dead hardwood.
Distribution. Known from the type locality in Costa Rica and one locality in Venezuela.
Remarks. This species is easily separated from other resupinate *Inonotus* species in the area by the distinct, partly black margin originating from a black zone in the subiculum, the small globose basidiospores and presences of setal hyphae and hymenial setae.

Inonotus micantissimus (Rick) Rajchenberg,
Fig. 61
Nord. J. Bot. 7: 565, 1987. - *Poria micantissima*, Rick, Iheringia Bot. 7: 287, 1960.

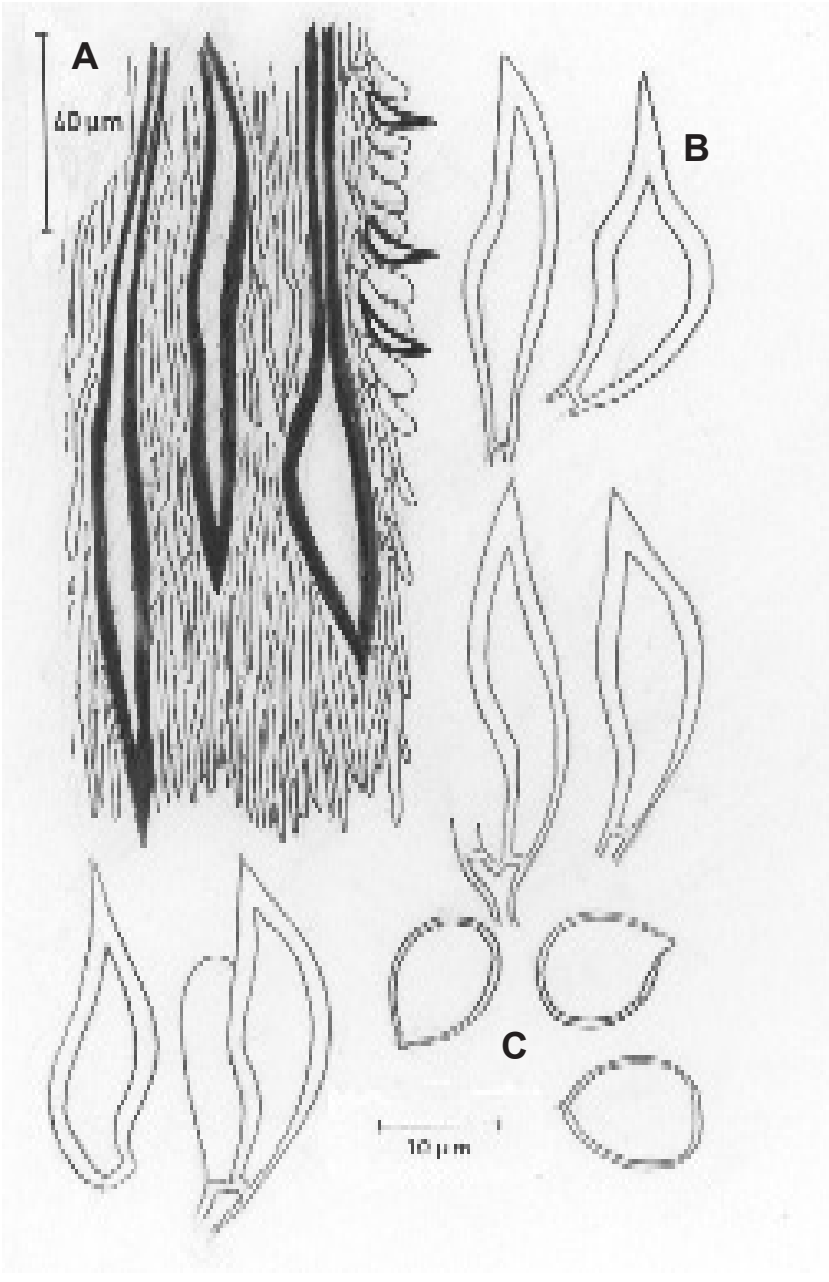


Fig. 61. *Inonotus micantissimus*. A) section of trama, B) hymenial setae, C) basidiospores. From the holotype.

Remarks. *Inonotus munzii* is the only species in the area with setigerous elements on the pileus. It is a member of a complex that in America also includes *I. farlowii* and *I. cuticularis* which, however, are known only from northern United States. It differs from these two species in the complete absence of hymenial setae and in its large basidiocarps with a thick and duplex context.

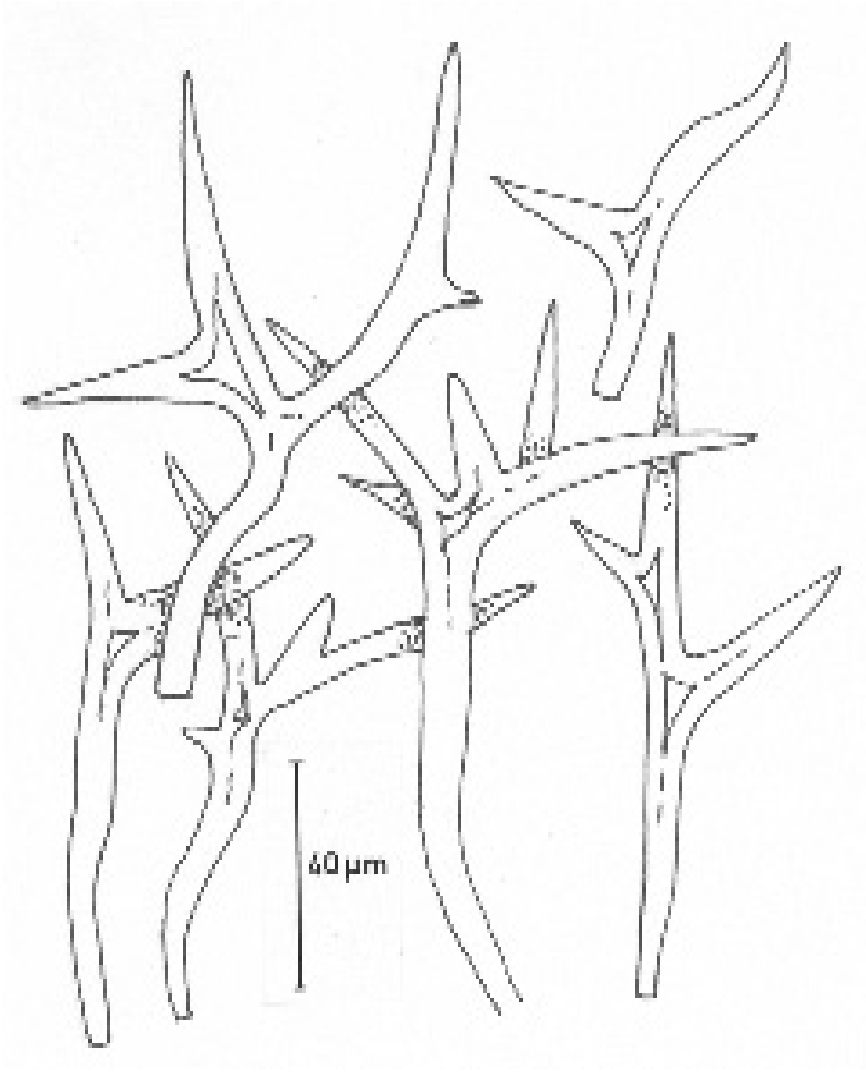


Fig. 62 *Inonotus munzii*, setigerous elements from the pileus, from the lectotype.

Basidiocarps annual, resupinate, 10 x 4 cm, up to 1.4 cm thick, woody, margin regular, light fulvous; pore surface dark sienna to grey chestnut, pores round, 5-7 per mm; tube layer dark fulvous, oblique, up to 1.4 cm thick, context dark brown almost absent.
Hyphal system monomitic, generative hyphae 3-5 µm in diam., with yellowish to chestnut, slightly thickened walls.
Setal hyphae abundant in the dissepiments, 160-300-(400) µm long, 10-15 µm wide but swelling up to 25 µm in KOH, dark chestnut, walls up to 4 µm thick, tapering towards the ends, not protruding into the pores or rarely so.
Hymenial setae lanceolate with a ventricose base, 20-32 x 5-9 µm, scattered and in parts totally absent, apparently found only in the young pore mouths.
Basidia and basidioles present but partially collapsed, 12-15 µm..
Basidiospores globose to subglobose, 10-13 x 8-12 µm, apiculate, with thickened walls, slightly yellow to pale brown, with abundant oily contents..
Substrate. *Nectandra* in Brazil and an unknown hardwood tree.
Distribution. Known from Argentine, Brazil and the Dominican Republic.
Remarks. The resupinate basidiocarp and the large spores are diagnostic.
Inonotus munzii (Lloyd) Gilbn.,
Fig. 62
South-western Nat. 1:125, 1969. - *Polyporus munzii* Lloyd, Mycol. Notes 67:1163, 1922.
Basidiocarps sessile, often in large imbricate clusters, applanate to ungulate, 20 x 30 x 6 cm, upper surface bright yellowish brown at first, becoming reddish brown, short-hispid to tomentose, becoming rough-fibrillose to glabrous, finally rimose and blackened with age, pore surface yellowish brown, the pores angular, 2-4 per mm, with thin, lacerate dissepiments, context duplex at first, with a soft, spongy upper layer which rapidly deteriorates and disappears, leaving the lower context exposed, this becomes blackened and rimose, context lustrous golden brown, faintly to distinctly zonate, firm, fissile, up to 4.5 cm thick, tube layer clearly distinct from context, yellowish brown, up to l.5 cm thick, spore print bright yellowish brown.
Hyphal system monomitic, hyphae pale yellowish in KOH, thin- to firm-walled, simple-septate, with occasional branching, 3-9 µm in diam, tramal hyphae similar, 3-7 µm in diam.
Setal hyphae branched, abundant on upper surface of pileus, becoming thick-walled, with few to numerous branches, each tapering to a point, main axis of setal hyphae 5-10 µm in diam.
Hymenial setae absent.
Basidia broadly clavate, 4-sterigmate, 15-20 x 7-9 µm, simple-septate at the base.
Basidiospores broadly ellipsoid, golden brown, smooth, negative in Melzer's reagent, becoming thick-walled, 6-8 x 4.5-6 µm.
Substrata. On numerous dead hardwoods like *Salix, Populus, Schinus molle*, *Morus alba*), *Acer, Carya, Ficus, Quercus, Platanus, Sambucus ,* and *Ulmus.*
Distribution. South-western U.S. and Mexico.

Inonotus neotropicus Ryvarden,
Synopsis Fung. 15:77, 2002.
Basidiocarp annual, dimidiate, semicircular, up to 4 cm wide and 5 mm thick at the base, fragile when dry, upper surface dull, soft to touch and covered with a very fine adpressed tomentum, faintly concentrically zoned, deep rusty brown, margin sharp and slightly undulating, not deflexed when dry, pore surface rusty brown, pores angular, 4-5 per mm, and with entire dissepiments, tubes up to 3 mm deep concolorous with the pore surface, context rusty brown, dense, up to 2 mm thick at the base.
Hyphal system monomitic, generative hyphae hyaline, pale yellow to rusty brown,

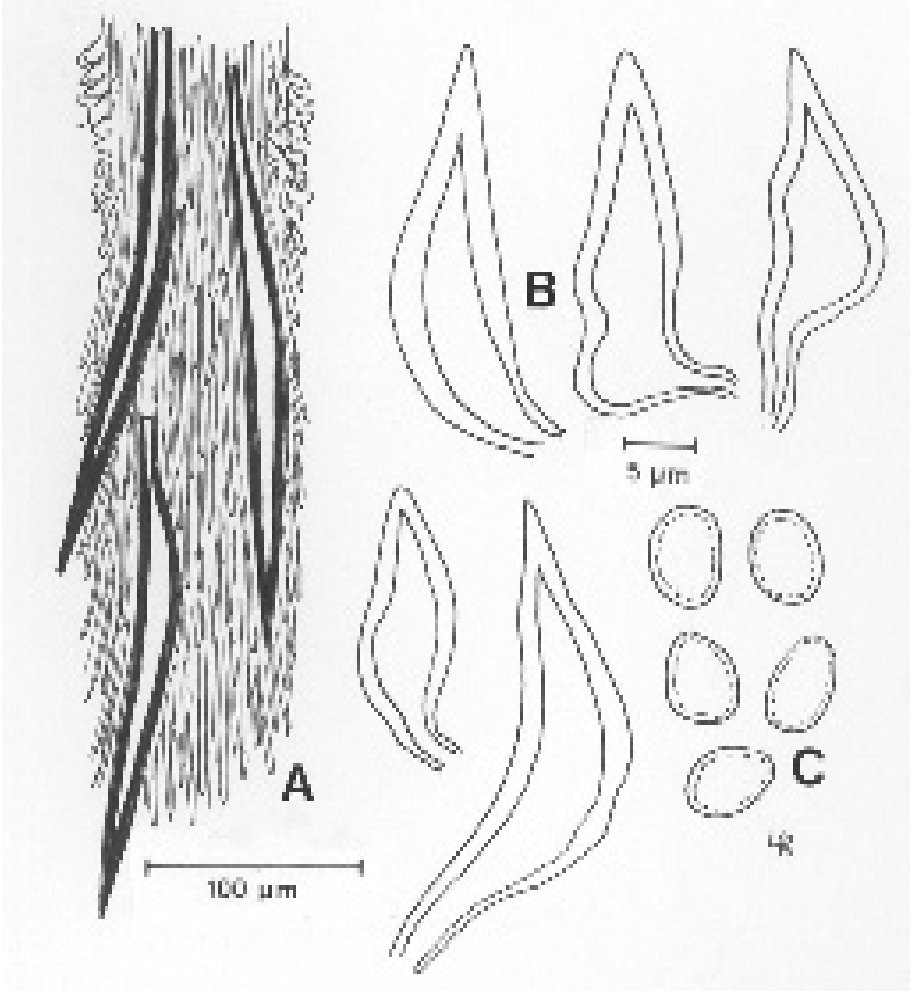


Fig. 63. *Inonotus patouillardii.* A) section of trama, B) hymenial setae, C) basidiospores. From the holotype.

Basidia not seen.
Basidiospores subglobose, abundantly present, yellowish brown to rusty brown, 7-8 x 6-7 µm, negative in Melzer's reagent.
Substrate. Dead hardwood of unknown identity.
Distribution. Known only from the type locality in Costa Rica.
Remarks. The species is characterized by the lack of setae and setal hyphae and the fairly large, subglobose basidiospores.

Inonotus patouillardii (Rick) Imazeki,
Fig. 63
Bull. Tokyo Sci. Mus. 6:105, 1943. - *Polystictus patouillardii* Rick, Broteria 6:89, 1907.
Basidiocarps annual, sessile, dimidiate, up to 8 cm wide, 5 cm long and 4 cm thick, finely tomentose in rusty brown colours in concentric zones, soon becoming zonewise black with a tar like, often slightly wrinkled glabrous surface, later cracking both transversely and radially into angular areas, and finally becoming dark blackish-brown, margin rounded, concolorous with upper surface in older specimens, pore surface becoming dark reddish-brown on older specimens, the pores circular, 3-4 per mm, with thick dissepiments, tubes dark reddish-brown, streaked pale yellow from stuffed tubes in older specimens, up to l.5 cm thick, context dark brown with lighter streaks , concentrically zonate in thicker portions, very hard and flinty when dry, highly lustrous on broken surfaces, up to 4 cm thick,.
Hyphal system monomitic, hyphae of two types, some thin- to moderately thick-walled, pale yellow, 3-5 µm in diam, arranged in parallel fashion, others thick-walled, dark-brown, occasionally simple-septate, 5-8 µm in diam tramal hyphae similar, 2.5-5 µm in diam.
Setal hyphae abundant in tramal tissue, mostly parallel to hymenial layer but occasionally projecting downward up to 100 µm past hymenium, 8-11 µm diam.
Basidia broadly clavate, 4-sterigmate, 17-20 x 7.5-9 µm.
Hymenial setae absent
Basidiospores pale yellow, becoming thick-walled, ovoid to ellipsoid, 6-8 x 4-5.5 µm.
Substrata. Known from different hardwoods.
Distribution. From Ururugay to Costa Rica. Known also from Africa and Asia.
Remarks. The zonate pileus with alternating brown tomenbtose or velevety and black glabrous zones the large, conspicuous setal hyphae are diagnostic characters for *I. patouillardii.*

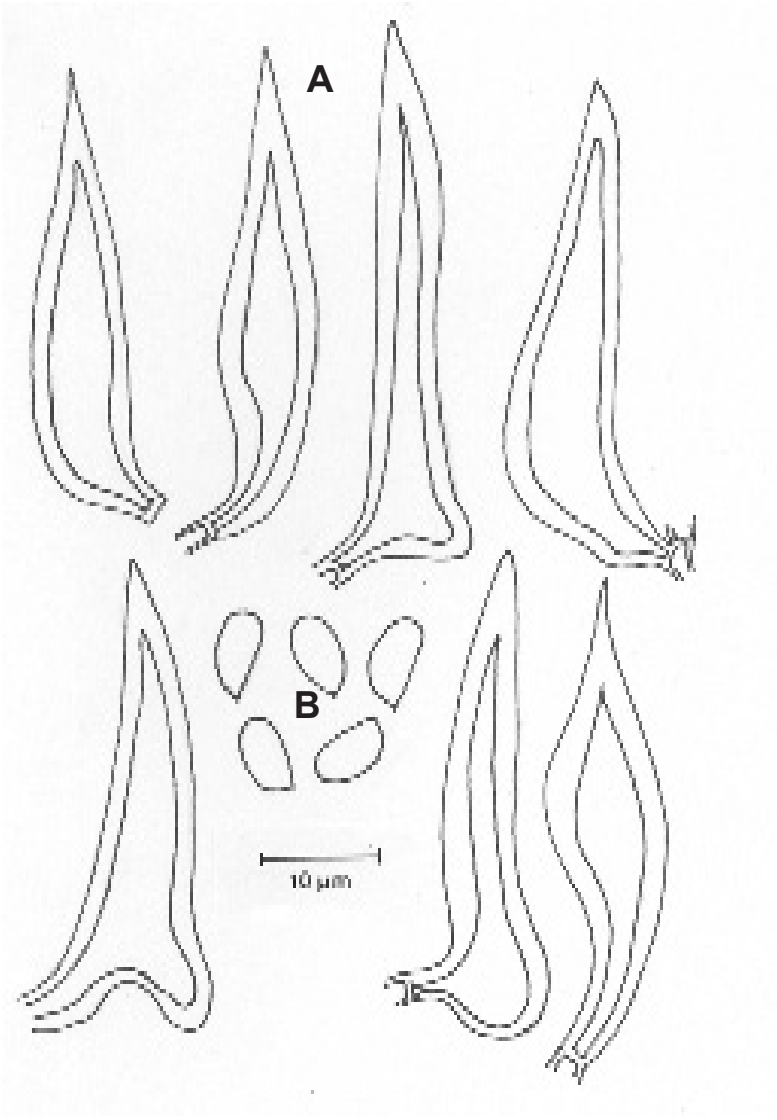


Fig. 64. *Inonotus pertenuis*. A) hymenial setae, B) basidiospores. From the holotype.

Inonotus pertenuis Murrill,
Fig. 64
North Am. Fl. 9:87,1908.
Basidiocarps annual,, single or imbricate, applanate, dimidiate to sessile, thin, fragile, 2-3 x 4-6 cm x 2-4 mm, upper surface dull, radially striate to finely scrupose, concentrically zoned, fulvous to rusty brown. pore surface dark brown, pores small,

round to angular, 5-8 per mm, tubes up to 2 mm, concolorous, context thin, cinnamon and dense, 1-2 mm.
Hyphal system monomitic, generative hyphae golden yellow to rusty brown, 3-6 µm wide.
Setal hyphae absent.
Hymenial setae dark brown, thick-walled, acute with a bent base, 25-45 x 8-15 µm.
Basidia not seen.
Basidiospores dark brown, ellipsoid, 5-6-5 x 3-5-4,5 µm.
Substrata. Dead hardwoods.
Distribution. Known from Cuba and Panama but is probably widespread in Central America.
Remarks. The small size of the basidiocarp, the large setae and small pores characterize this species.

Inonotus porrectus Murrill,
Tropical polypores, p. 68, 1915.
Basidiocarps annual, flabelliform or substipitate with a narrowed base, pilei circular to dimidiate, single or imbricate, up to 4.5 cm wide and 3.5 cm thick, upper surface bright yellowish brown, zonate, finely tomentose, smooth, margin acute to rounded, concolorous but sometimes staining dark brown on handling and drying, pore surface dull purplish brown, the pores circular to angular, 5-6 per mm, with thick, entire, minutely tomentose dissepiments, context bright golden brown, lustrous, concentrically zonate, firm-fibrous, slightly darker in the narrowed basal portion, up to 3 cm thick, tube layer purplish brown, decurrent on the narrowed base, up to 3 mm thick.
Hyphal system monomitic, generative hyphae pale yellowish, 4.5-8.5 µm in diam, tramal hyphae tightly interwoven and agglutinated in dried specimens, difficult to separate, firm- to thick-walled, 3-6 µm in diam, hyphae on pileus surface erect, variously contorted, branched, or lobed, thin- to firm-walled, 3.5-7 µm in diam.
Hymenial setae absent.
Basidia broadly clavate, 4-sterigmate, 12-16 x 6-7 µm, simple-septate at the base.
Basidiospores broadly ellipsoid to ovoid, reddish-brown, smooth, 4.5-6 x 3.5-4.5 µm.
Substrata. On dead or live hardwoods.
Distribution. Originally described from the Bahamas, *I. porrectus* is known elsewhere only from Louisiana.
Remarks. The substipitate nature of the basidiocarps, lack of setae, and presence of contorted and branching hyphae on the pileus surface suggest affinities with the genus *Coltricia*. The bright golden yellow, lustrous context and the darker, purplish brown tube layer are distinctive characters.

Inonotus pseudoglomeratus Ryvarden,
Fig. 65

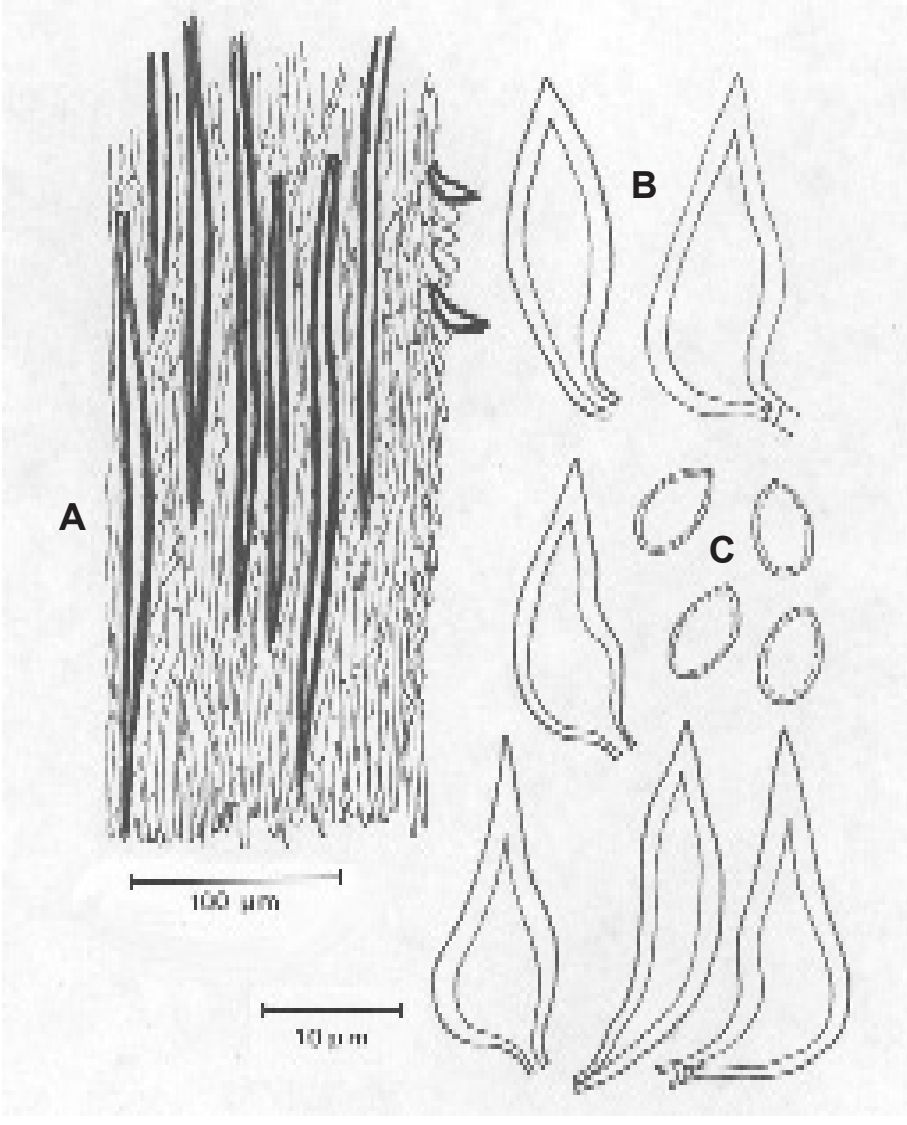


Fig. 65. *Inonotus pseudoglomeratus.* A) section of trama, B) hymenial setae, C) basidiospores. From the holotype.

Substrate. On unknown dead hardwood.
Distribution. Known only from the type locality in Venezuela and Belize.
Remarks. This species is microscopically reminiscent of *I glomeratus* from North America which however has much more abundant hymenial setae, mostly resupinate basidiocarps, only occasionally with imbricate pilei.

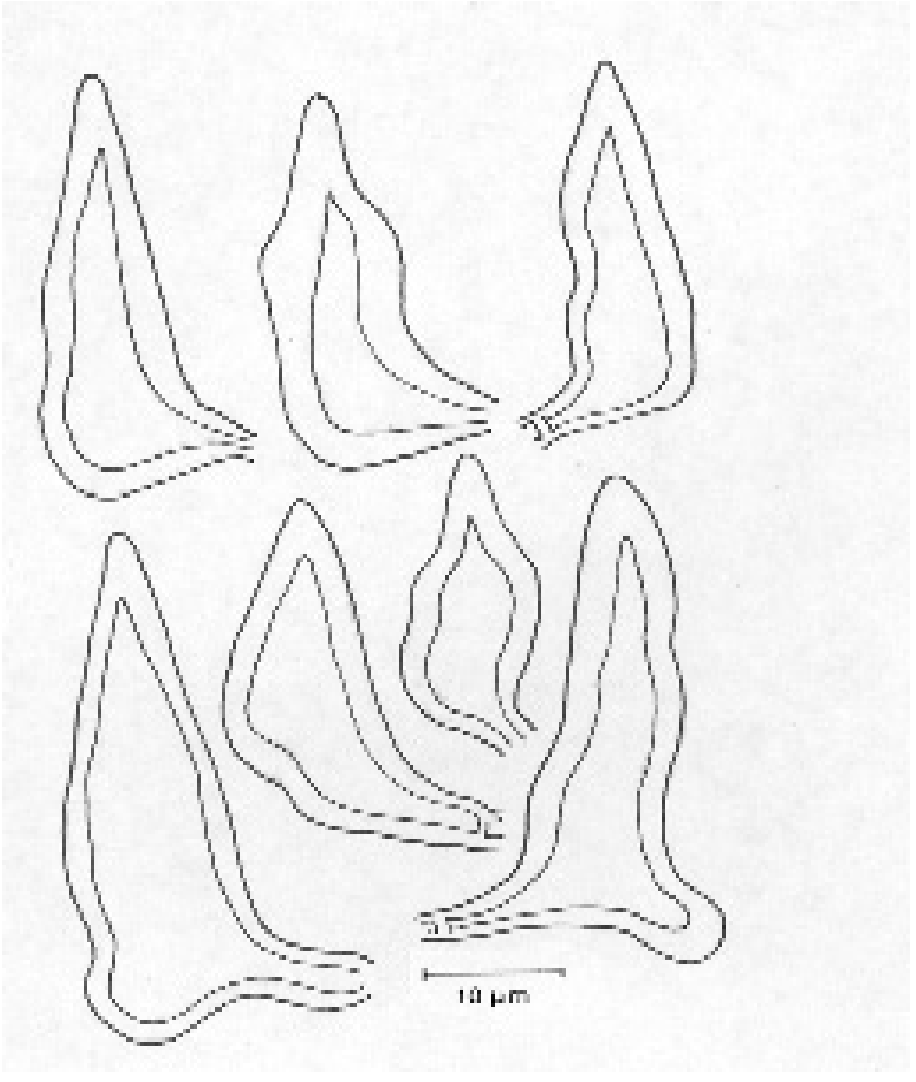


Fig. 66. *Inonotus pseudoradiatus.* Hymenial setae. From the holotype.

Inonotus pseudoradiatus (Pat.) Ryvarden,
Fig. 66
Occ. Pap. Farlow Herb., 18:30, 1983. - *Polyporus pseudoradiatus* Pat., Bull. Soc. Mycol. Fr. 11:207, 1895.
Basidiocarp annual, sessile, flabellate to fan shaped, 7 cm wide, 6 cm long, dimidiate, tapering towards the base which is up to 1 cm, fragile when dry, upper surface rusty brown, dull, azonate, radially folded, finely adpressed velutinate, probably becoming glabrous with age, pore surface dark rusty brown, pores 3-5 (6) per mm, 5 mm deep, context rusty brown, dense and shiny, up to 5 mm thick at the base.
Hyphal system monomitic, generative hyphae thick-walled, yellow to rusty brown, freely branched, 3-8 µm wide.
Hymenial setae abundant, straight, dark brown, 20-50 x 10-14 µm.
Setal hyphae absent.
Basidia not seen.
Basidiospores not seen in the type.
Substrata. Dead hardwood tree.
Distribution. Known only from the type locality in Ecuador.
Remarks. The species is recognized by the large wide setae, much wider than those of *I. xanthoporus* which macroscopically is similar.

Inonotus pusillus Murrill,
Bull. Torr. Bot. Cl. 31:599, 1904.
Basidiocarps minute, flabelliform. growing from openings in the bark, up to 2 mm wide and broad and to 1 mm thick at the base, upper surface rusty to dark brown, finely striate, shining and faintly zonate, pore surface rusty to umber, pores angular, 4-6 per mm, tubes concolorous, context rusty brown, very thin.
Hyphal system monomitic, generative hyphae golden to rusty brown, 3-7µm wide.
Setal hyphae and **hymenial setae** absent.
Basidia not seen.
Basidiospores ellipsoid, hyaline to pale yellow, abundantly present, 4.5-6 x 3.5-4.5 µm.
Substrata. On dead hardwoods.
Distribution. Known only from Mexico and Belize.
Remarks. The tiny basidiocarps and the lack of setal characters should be sufficient to recognize this species. *I. splitbergeri* has normally larger basidiocarps besides that the spores are more oblong ellipsoid. However, the two species are probably related as they both lack setal characters and have pale golden spores of almost the same

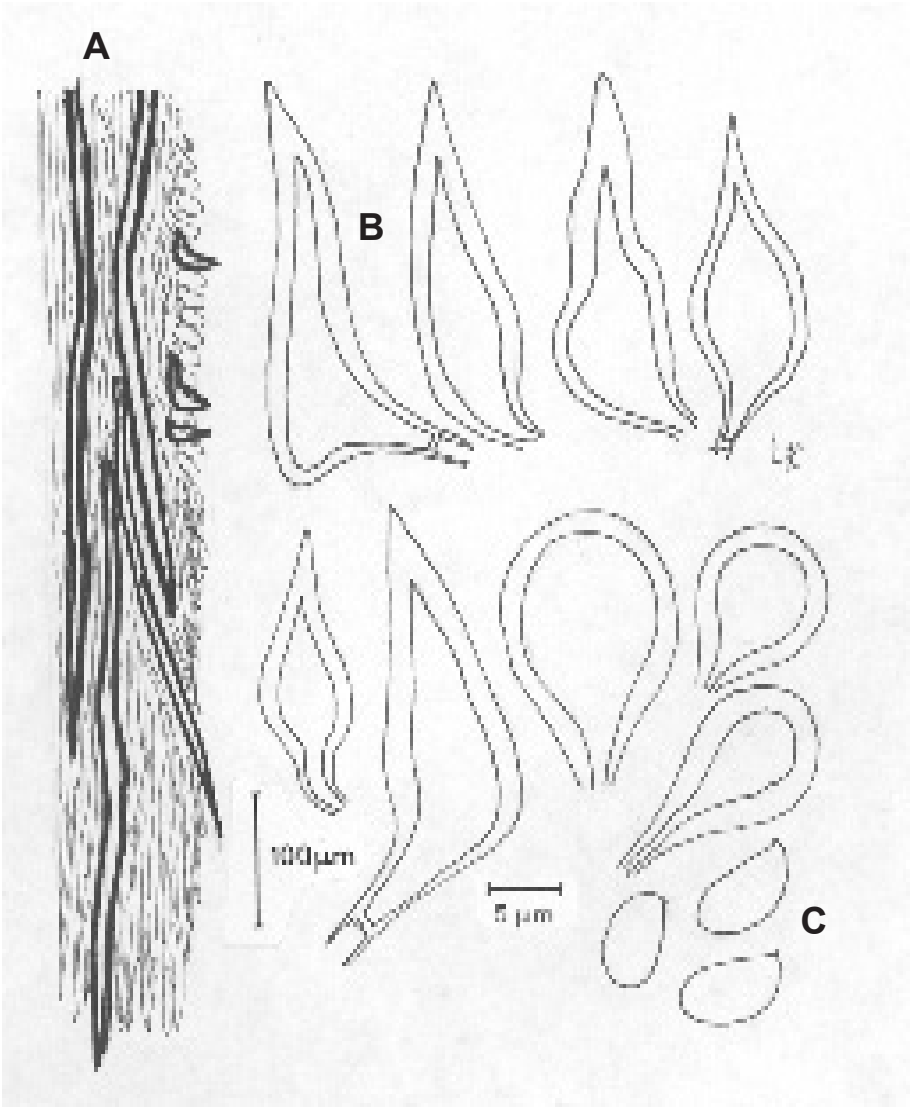


Fig. 67. *Inonotus rickii*. A) section of trama, B) hymenial setae, C) basidiospores. From the holotype.

Synopsis Fung. 15:78, 2002.
Basidiocarps annual, pileate and dimidiate with strongly contracted base, semicircular of outline, up 6 cm wide and long, 1.8 cm thick at base, probably soft when fresh, hard and brittle when dry, upper surface dark blackish brown, dull, glabrous, concentrically sulcate and with a black cuticle in section, margin sharp, pore surface deep rusty brown, tubes rusty brown, up to 8 mm deep, context cinnamon, distinctly paler than the tubes, dense and homogenous.
Hyphal system monomitic, generative hyphae thin to thick-walled, golden to rusty brown, 3-6 µm wide.
Setal hyphae present, embedded and straight, dark brown, pointed 5-14 µm wide, up to 150 µm long.
Hymenial setae present, few and scattered, thick-walled and evenly tapering, 15-25 x 6-10 µm.
Basidia not seen..
Basidiospores ellipsoid, slightly thick-walled, yellow 5-6 x 4-4.3 µm. diameter.
Inonotus rickii (Pat.) D. Reid,
Fig. 67
Kew Bull. 12:141, 1957. - *Xanthochrous rickii* Pat., Bull. Soc. Mycol. Fr. 24:6, 1908. - *Ptychogaster cubensis* Pat., Bull. Soc. Mycol. Fr. 12:133, 1896. (anamorph).
Basidiocarps annual, sessile, applanate to ungulate, single to imbricate, apparently up to several cm wide and at least 5 cm thick, at first soft and fleshy and then becoming firm and finally crumbly and dusty as chlamydospore formation progresses, upper surface at first tomentose, golden brown, becoming rough and dark rusty brown on older specimens, pore surface pale brown, pores angular, 2-3 per mm, context becoming dark rusty brown, conspicuously concentrically zonate, firm or eventually crumbling into a mass of chlamydospores, up to 6 cm thick, tube layer pale brown, up to 8 mm thick, firm but easily sectioned.
Ptychogastric stage developing as a cushion shaped mass of brown tissue, soft and fleshy at first, exuding clear droplets of exudate from the entire surface, moist and velvety to the touch, up to 20 cm wide, 25 cm deep, and 15 cm thick, the entire structure resembling a sessile *Inonotus* basidiocarp but no tube layer ever develops, within a few weeks the fruiting body becomes drier and firmer and broken pieces show the crumbly and dusty texture resulting from chlamydospore formation.
Hyphal system monomitic, generative hyphae thin to moderately thick-walled, almost hyaline to yellowish brown, occasionally branched, pale brownish, 3.5-5 µm in diam.
Setal hyphae conspicuous in tramal tissue, running parallel to the long axis and occasionally diverging out into the tubes, thick-walled with a narrow, sinuous lumen extending nearly to the tip, tapering to a point, narrow basal portion 3-5 µm in diam, widest portion below the apex up to 15 µm in diam, up to 250 µm long.

Hymenial setae frequent, subulate to ventricose, thick-walled, dark brown in KOH, rarely forked at the tip, 15-20 x 4-6 µm, straight.
Basidia not seen.
Basidiospores abundant in context tissue, thick-walled, dark reddish brown in KOH, negative in Melzer's reagent, 6-8.5 x 4.5-5.5 µm.
Chlamydospores abundant in context tissue, thick-walled, dark reddish brown in KOH, negative in Melzer's reagent, irregular in shape, smooth, globose to ellipsoid or often with an elongated cylindric appendage, 10-30 µm in widest diameter, wall up to 6 µm thick.
Substrata. Dead hardwoods of many kinds.
Distribution. United States (Florida, Louisiana, and Arizona) and only in the ptychogastric stage. Its true distribution in the neotropics is unknown. Widespread in the paleotropics.
Remarks. The species produces the ptychogastric stages near the base of living trees and is apparently pathogenic, as the infected trees invariably decline and die in a few years after the basidiocarps first appear.

Inonotus splitbergeri (Mont.) Ryvarden,
Svensk Bot. Tidskr. 68:274, 1974. - *Polyporus splitbergeri* Mont. Ann Sci. Nat. ser 2, 15:109,1841.
Basidiocarps annual small often in imbricate clusters, applanate, often incised or lobed, fanshaped to spatulate with tapering base, sappy and fleshy when fresh, fragile and light of weight when dry, up to 10 x 13 x 1.5 cm, upper surface yellowish brown with red shades when young, rusty to dark brown when dry, finely radially striate to adpressed velvety in parts, zonate, pore surface yellow in fresh condition becoming deep rusty brown, pores angular, somewhat elongated radially in parts, (2) 4-6 per mm, tubes concolorous, 6 mm deep, context thin, cinnamon to rusty brown and dense, homogeneous and no cuticle visible in section, becoming distinctly red with KOH.
Hyphal system monomitic, generative hyphae golden to rusty brown, 2-5 µm wide.
Setal hyphae and **hymenial setae** absent.
Basidia 8-12 x 4-5 µm with 4 sterigmata.
Basidiospores oblong ellipsoid, hyaline to pale golden yellow often collapsed in microscopical preparations, 4-5(6) x 3-4.5 µm.
Substrata. Dead hardwoods, and in Venezuela among other hosts found on *Chlorophora tinctoria* (Moraceae).
Distribution. Tropical America from Brazil to Mexico.
Remarks. The species is characterized by cinnamon, soft basidiocarps with red tinges when fresh and reacting red with KOH, besides the small almost hyaline spores and lack of all setal characters.

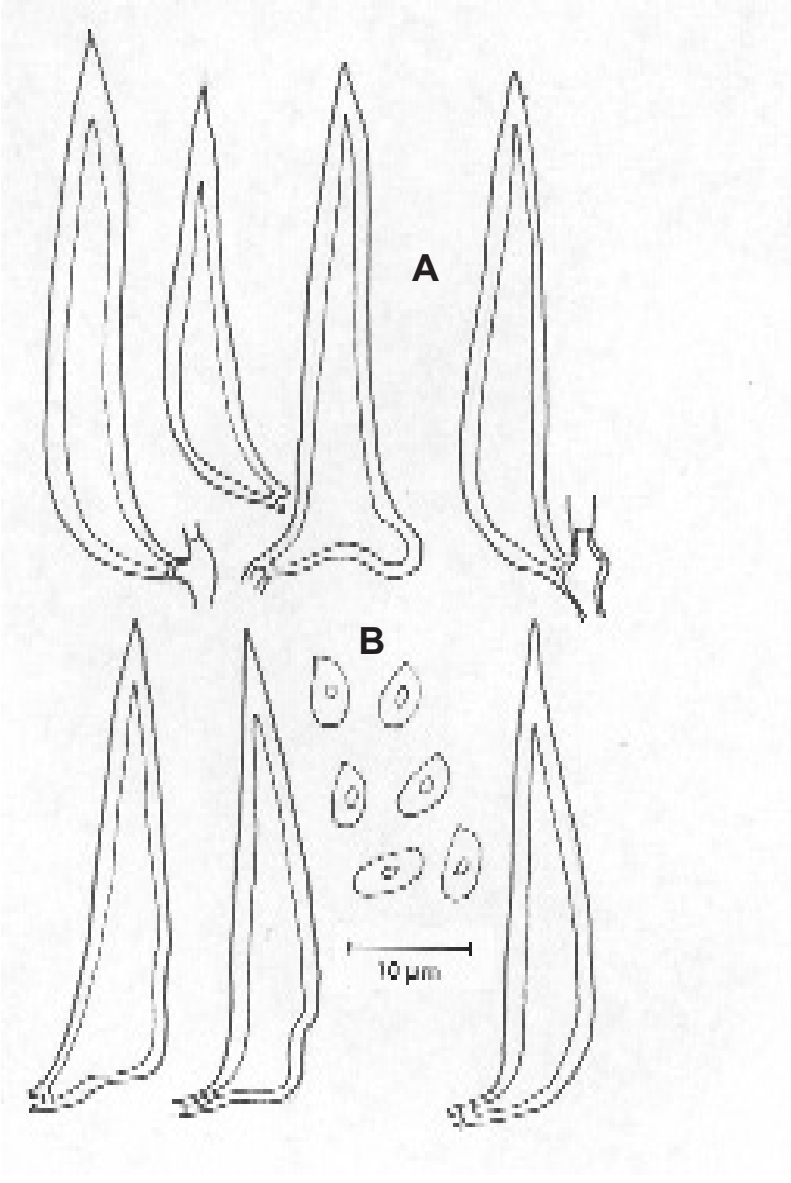


Fig. 68 *Inonotus xanthoporus* A) setae, B) basidiospores. From the holotype.

Inonotus venezuelicus Ryvarden,
Mycotaxon 28:529, 1987.
Basidiocarps resupinate, annual, effused, oblique, adnate, hard and brittle, margin distinct, smooth, dark brown, 1-3 mm wide, a sloping wide margin simulating a pileus may be present along the upper edge in specimens growing on standing trunks, pore surface dark brown, glancing in incident light, pores round to angular, 3-4 per mm; tube layer up to 10 mm thick, dark rusty brown; context dense, rusty brown and very thin.
Hyphal system monomitic, generative hyphae hyaline to rusty brown, thin-walled to thick-walled, 2-6 µm in diameter, simple septate, moderately branched.
Basidia broadly clavate, 12-15 x 6-7.5 µm,.
Setal hyphae and **hymenial setae** absent.
Basidiospores ellipsoid to ovoid, 5-6 x 4.5-5 µm, IKI-, rusty brown.
Substrata. Dead hardwood.
Distribution. Known from Venezuela and Panama.
Remarks. The lack of setae and the rusty brown spores characterize this species.

Inonotus xanthoporus Ryvarden,
Fig. 68
Mycotaxon 71:345, 1999.
Basidiocarps annual effused reflexed, pileus semi-circular, up to 4 cm wide and 6 cm wide at base, applanate, slightly undulate, tough and hard. Upper surface rusty to

PHELLINUS Quél.

Ench. Fung. p. 172, 1886.

Basidiocarps perennial, resupinate to pileate, single or imbricate with decurrent pore layer, pileus if present, yellowish, rusty brown, grey to black, tomentose, hispid, glabrous or deeply cracked, pore surface brownish, pores isodiametric, more rarely irregular and angular and slightly split, context dark reddish brown, umber or yellowish brown, mostly woody, more rarely cottony; hyphal system dimitic, generative hyphae hyaline, narrow, thin-walled and with simple septa, skeletal hyphae yellowish to rusty brown, mostly thick-walled and wider than the generative hyphae, hymenial setae and tramal setae absent or present, setal hyphae absent or present in the margin, context or hymenium, spores globose to cylindrical, smooth, hyaline to rusty brown, thin- to thick-walled, dextrinoid to non-dextrinoid; on dead or living trees with a white rot, both in gymnosperms and angiosperms. Large, cosmopolitan genus.

Type species: *Polyporus torulosus* Pers.

Remarks. Murrill (1907) split *Phellinus* as circumscribed here into several smaller genera, which, however for a long time were neglected by later mycologists. Fiasson & Niemelä (1984) reintroduced Murrill's genera and split the genus even further down by describing two new genera. Later on several authors (Wagner & Fischer 2002 with references) have re-examined the generic concepts based on DNA sequencing, and their results indicate that both *Phellinus* and *Inonotus* are artificial genera. Never the less, the original concepts are kept here, since we probably have not yet seen the whole truth and since *Phellinus* and *Inonotus*, can usually be separated in the field, based on their consistency and longevity.

Using the key and the descriptions

All colours designations for microscopical details are as observed in 3% KOH. All basidia are with 4 sterigmata, so this information is not repeated for each species. The same goes for the simple septa of the generative hyphae and that all basidiospores being smooth. As to reactions in Melzer's reagent, only those spores being dextrinoid are reported, thus, if this reaction is not given, the spores have no reaction in this reagent.

Condensed key

1. Setal hyphae or tramal setae present ..... **Key A**
1. Setal hyphae or tramal setae absent 2

2. Basidiospores subglobose to globose, hyaline and dextrinoid ..... **Key B**
2. Basidiospores cylindrical to globose, hyaline to rusty brown, not dextrinoid 3
3. Hymenial setae absent 4
3. Hymenial setae present 5

4. Basidiocarps resupinate ..... **Key C**
4. Basidiocarps pileate ..... **Key D**

5. Basidiocarps resupinate ..... **Key E**
5. Basidiocarps pileate 6

6. Basidiospores cylindrical to allantoid ..... **Key F**
6. Basidiospores ellipsoid to globose 7

7. Basidiospores 3-4 µm in longest dimension ..... **Key G**
7. Basidiospores longer than 4 µm in longest dimension ..... **Key H**

KEY A

Setal hyphae or long tramal setae present

1. Basidiocarp resupinate 2
1. Basidiocarp pileate 7

2. Hymenial setae absent ..... **P. longisetulosus**
2. Hymenial setae present 3

3. Pores 2-3 per mm ..... **P. contiguus**
3. Pores 7-9 per mm 4

4. Basidiospores 5-7 µm long 5
4. Basidiospores shorter 6

5. Spores globose, 6.3-7.2 um in diameter ..... **P. macrosporus**
5. Spores cylindrical, 5-7 x 3-3.5 um ..... **P. ferruginosus**

6. Hymenial setae straight, basidiospores ellipsoid, 2-3 µm wide ..... **P. rufitinctus**
6. Hymenial setae slightly to strongly hooked, basidiospores subglobose 3-3.8 µm wide ..... **P. anchietanus**

7. Hymenial setae absent ..... **P. noxius**
7. Hymenial setae present 7

8. Basidiospores 3-4 µm in diam, setal hyphae obtuse, 5-8 µm wide ..... **P. lamaensis**
8. Basidiospores 3.5-6 µm in diam, setal hyphae acute, 7-20 µm wide ..... **P. portoricensis**

KEY B

Setal hyphae or tramal setae absent, basidiospores dextrinoid, hyaline in KOH.

1. Basidiocarp pileate 2
1. Basidiocarp resupinate 3

2. Basidiospores 5-6 µm in diam .....**P. apiahynus**
2. Basidiospores 6-8.5 µm in diam .....**P. robustus**

3. Hymenial setae absent, on hardwoods..... 4
3. Hymenial setae present, on *Bambusa* spp. 5

4. Margin sulphurous yellow, basidiospores 5-6 µm in diam .....**P. maxonii**
4. Margin deep brown, basidiospores 6.5-8 x 5.5-7 µm .....**P. punctatus**

5. Hymenial setae with apical protuberances .....**P. spinescens**
5. Hymenial setae smooth 6

6. Hymenial setae hooked .....**P. uncinatus**
6. Hymenial setae straight .....**P. bambusarum**

KEY C

Basidiocarps resupinate, setal hyphae absent, basidiospores non-dextrinoid, hymenial setae absent.

1. Basidiospores rusty brown, 4-5 x 3.5-4 µm..... **P. umbrinellus**
1. Basidiospores hyaline to golden yellow 2

2. Basidiospores subglobose, shorter than 4 µm, black line present in context .....
.....**Phylloporia pectinata**
2. Basidiospores longer than 4 um, no black line present under persistent tomentum 3

3. Basidiospores globose, 3-5 µm in diam, on *Bambusa*..... **P. garuhapensis**
3. Basidiospores ellipsoid, on hardwoods 4

4. Basidiospores 3-4 x 2.5-3 µm .....**P. membranceus**
4. Basidiospores 4-5 x 3-3.5 µm..... **P. melleoporus**

KEY D

Basidiocarps pileate, setal hyphae and hymenial setae absent, basidiospores non-dextrinoid. NB. *Aurificaria* with a monomitic hyphal system will key out here if not properly examined. Its basidiospores become olivaceous brown in KOH and it has a black cuticle on the pileus.

1. Basidiospores hyaline to pale golden yellow 2
1. Basidiospores rusty brown 4

2. Basidiospores globose 4-6 µm in diam 3
2. Basidiospores oblong ellipsoid to subcylindrical 3.5-4 x 2-2.5 µm **.....** ..... **P. neocallimorphus**

3. Upper surface adpressed tomentose to velutinate with a black zone...**P. bacchari-dis**
3. Upper surface velutinate, soon glabrous, no black zone or cuticle **...P. griseoporus**

4. Upper surface velvety tomentose with a black line 5
4. Upper surface glabrous or becoming rimose, grey to black when old 8

5. Tubes and context fragile and fibrous **.....P. sanctigeorgii**
5. Tubes and context woody 6

6. Basidiospores globose 4-5 µm in diam, context bright yellowish brown ..... **P. rhytiphloeus**
6. Basidiospores ellipsoid to subglobose, context rusty brown 7

7. Basidiospores ellipsoid, 4-6 x 3-4 µm **..... P. grenadensis**
7. Basidiospores subglobose 4.5-6 x 4-5.5 µm..... **P. fastuosus**

8. Pileus smooth and grey **.....P. piptadeniae**
8. Pores first smooth and dark brown, then cracking, rimose and black 9

9. Pores 7-10 per mm **..... P. merrillii**
9. Pores 4-5 per mm **.....P. rimosus**

KEY E

Setal hyphae absent, basidiospores non-dextrinoid, hymenial setae present, basidio-carps resupinate.

1. Hymenial setae hooked **..... P. undulatus**
1. Hymenial setae straight 2

2. Basidiospores cylindrical to subcylindrical 3
2. Basidiospores globose to ellipsoid 5

3. Hymenial setae 50-70 µm long, on palms **.....P. palmicola**
3. Hymenial setae shorter than 50 µm 4

4. Basidiospores 5-7 x 2-2.5 µm ..... **P. ferreus**
4. Basidiospores 4-6 x 1.5-2 µm ..... **P. punctatiformis**

5. Basidiospores hyaline 6
5. Basidiospores pale yellow brown to rusty brown 8

6. Hymenial setae 12-25, basidiospores 2.5-3.5 x 2-2.5 µm..... **P. detonsus**
6. Hymenial setae longer than 25 µm, basidiospores longer than 3.5 µm 7

7. Hymenial setae 25-55 µm, basidiospores 4.5-6 x 4-5.5 µm .....**P. orientalis**
7. Hymenial setae 25-40 µm, basidiospores 3.5-4 x 2-2.5 µm .....**P. chryseus**

8. Hymenial setae 12-20 µm long .....**P. shaferi**
8. Hymenial setae 25-60 µm long..... 9

9. Pores 7-8 per mm, hymenial setae 7-10 µm wide ..... **P. altocedronensis**
9. Pores 1-5 per mm, some often irregular, hymenial setae 3-7 um wide 10

10. Basidiospores ellipsoid, 3.5-5.2 x 2.5-3.5 µm, pores irregular sinuous to daedaleoid .....
.....**P. daedaliformis**
10. Basidiospores larger, pores round to angular, a few may be split tramal setae present in trama and sterile margin ..... **P. contiguus**

KEY F
Setal hyphae absent, basidiospores non-dextrinoid, hymenial setae present, basidiocarps pileate, basidiospores cylindrical to allantoid

1. Basidiospores shorter than 6 µm, annual, very common .....**P. gilvus**
1. Basidiospores 6-9 µm long, perennial **2**

2. Hymenial setae 25-75 µm long, basidiospores 1.5-2 µm wide ..... **P. viticola**
2. Hymenial setae 20-30 µm long, basidiospores 2.5-3.5 µm wide **3**

3. Basidiospores 2.5- 3.5 µm wide..... **P. chinchonensis**
3. Basidiospores 2-2.5 µm wide ..... **P. cylindrosporus**

KEY G
Basidiocarps pileate, setal hyphae absent, basidiospores non-dextrinoid, hymenial setae present, basidiospores globose to subglobose, 3-4.5 µm in longest dimension.

1. Hymenial setae 10-20 µm long **.....2**
1. Hymenial setae longer than 20 µm **.....3**
2. Basidiocarp ungulate to pendent, up to 7 cm thick at the base, upper surface first tomentose and dark rusty brown, soon black and becoming rimose from the base **.....** **P. dependens**
2. Basidiocarp dimidiate to sessile, applanate, rarely above 1 cm thick at the base, first tomentose and reddish brown with a black cuticle, which becomes exposed from the base **..... P. extensus**

3. Upper surface reddish brown to deep chestnut, hirsute to tomentose in radial striae, with age scrupose to warted and some intermittent black bands, **.....P. sarcites**
3. Upper surface glabrous, brown to greyish, finally with a black cuticle from the base **.....** **P. rhabarbarinus**

KEY H

Setal hyphae absent, basidiospores non-dextrinoid, hymenial setae present, basidiocarps pileate, basidiospores globose to subglobose, 4.5-7 µm in longest dimension.

1. Hymenial setae hooked 2
1. Hymenial setae straight 3

2. Basidiospores 4-5 x 3.5-4.5 µm, hyaline to pale yellow **..... P. wahlbergii**
2. Basidiospores. 5-7 x 4-6 µm, yellow to rusty brown **..... P. setulosus**

3. Basidiocarp usually annual, glabrous to scrupose or hispid in reddish brown colours..... **P. gilvus**
3. Basidiocarp perennial, tomentose, ultimately glabrous in zones **.....4**

4. Pileus tomentose with a black line below the tomentum..... **5**
4. Pileus first tomentose without a dark line below the tomentum, later glabrous **.....6**

5. Hymenial setae 5-8 µm wide at the base, basidiospores 5-6 x 4.5-5 µm **.....P. calcitratus**
5. Hymenial setae 7-13 µm wide at the base, basidiospores 4-5.5 x 3-4.5 µm **.....** **P. caryophylleus**

6. Basidiocarp rarely above 2 cm thick at the base, applanate, pores 7-11 per mm, invisible to the naked eye, context 1-3 mm thick **..... P. senex**
6. Basidiocarp up to 6 cm thick at the base, applanate to ungulate, pores 5-7 per mm, context up to 2.5 cm thick **..... P. linteus**

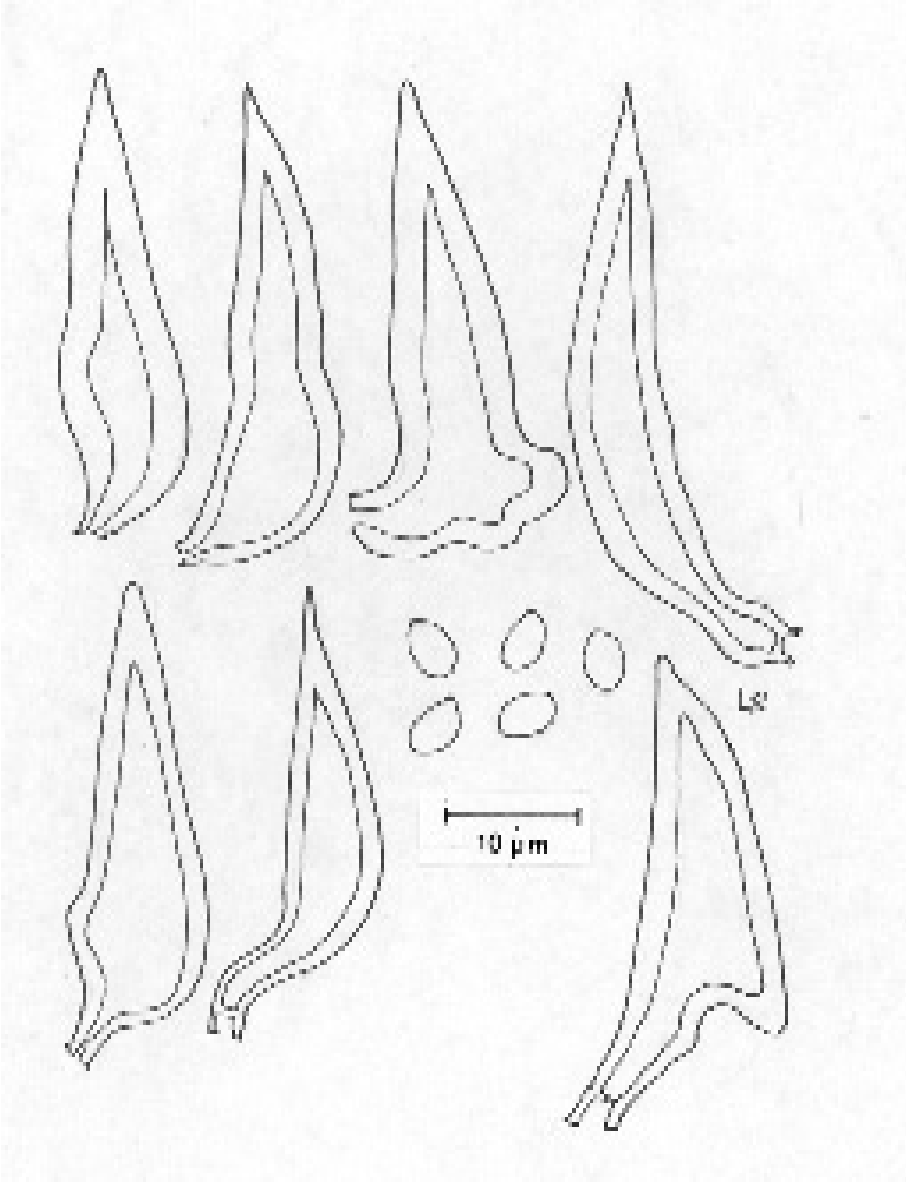


Fig. 69. *Phellinus altocedronensis,* hymenial setae and basidiospores. From the lectotype.

DESCRIPTION OF SPECIES

Phellinus altocedronensis (Murrill) Ryvarden,
Fig. 69
Mycotaxon 23:176, 1985. - *Fomitiporella altocedronensis* Murrill, North Am. Fl. 9:12, 1907.
Basidiocarp resupinate, effused, hard, adnate, 1-2 cm thick, margin finely velutinate and rusty brown, pore surface rusty brown, slightly shiny in incident light when fresh, pores more or less round, about 7-8 per mm, tubes up to 1.5 mm deep in each layer, tubes rusty brown, subiculum less than 1 mm, rusty brown.
Hyphal system dimitic, generative hyphae delicately thin-walled, simple septate and 2-3(4) µm wide, skeletal hyphae dominating in the trama, rusty brown, up to 3-6 µm wide, in the subiculum distinctly wider, up to 8 µm in parts and almost solid and dark rusty brown.
Hymenial setae few, acuminate, thick-walled, straight, often with a swollen base, 30-50 x 7-10 µm.
Basidiospores subglobose, hyaline, thin-walled, 4-4.5 x 3-4 µm.
Substrata. On dead hardwood**.**
Distribution. Described from Cuba, but now known from Venezuela and Costa Rica as well.
Remarks. The long setae and the small, hyaline basidiospores are diagnostic for this species.

Phellinus anchietanus Decock & Ryvarden,
Fig. 70
Cryptogam. Mycol. 18:222, 1997.
Basidiocarp resupinate, effused, hard, adnate 1-2 cm thick, margin finely velutinate and yellowish brown, when old almost black and partly lifted from the substrate, pore surface light brown, from cinnamon to cocoa, pores more or less round, about 6-8 per mm, almost invisible to the naked eye, tubes up to 6 mm deep and dark brown, subiculum up to 2 mm thick, dark brown, in parts with a black line.
Hyphal system dimitic, generative hyphae delicately thin-walled, 2-3 µm wide, skeletal hyphae dominating in the trama, rusty brown, up to 3-5 µm wide.
Hymenial setae numerous, conical to ventricose, acute, straight or with a slight to strongly curved apex, 12-24 x 5.5-9 µm.
Setal hyphae or **tramal setae** present in the trama, especially in the dissepiments and in the sterile margin, dark brown, acute, thick-walled, parallel to the skeletal hyphae in the trama, up to 70 µm long and 4-8 µm wide.
Basidia not seen.
Basidiospores broadly ellipsoid to subglobose, hyaline to slight yellowish brown in

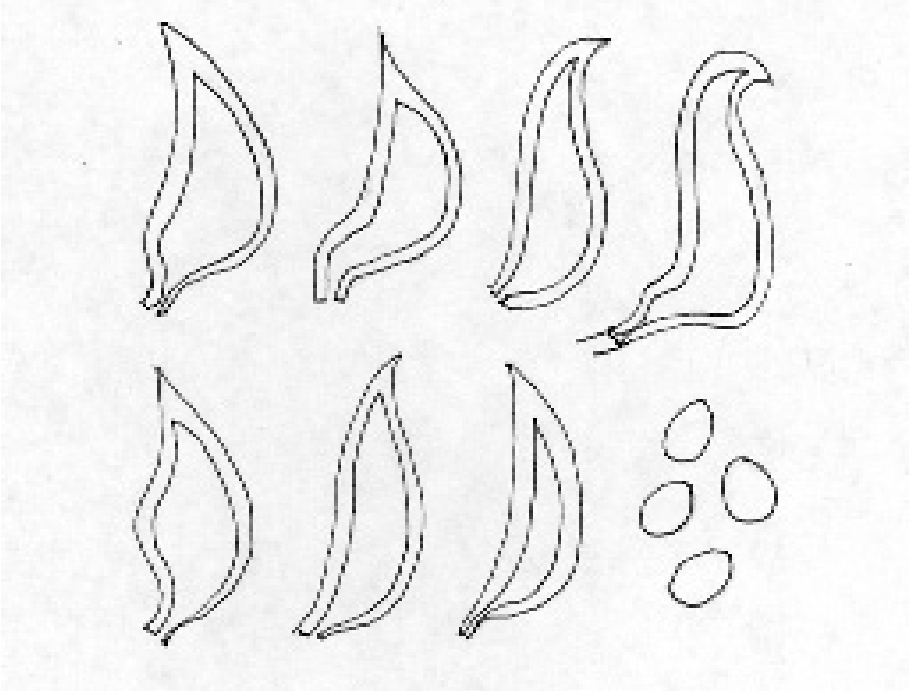


Fig. 70. *Phellinus anchietanus,* hymenial setae and basidiospores. From the lectotype.

Basidiospores globose, thin to slightly thick-walled, hyaline to pale golden yellow, 5-6 (6.5) µm in diameter.
Substrata. On deciduous wood.
Distribution. Venezuela, Brazil and Ecuador.
Remarks. A distinct black line below a tomentum, its lack of setae, medium-sized globose, hyaline to yellow basidiospores and rather friable consistency of the tubes, characterise the species. It may remind of *Phylloporia pectinata*, but is lighter in weight and has larger basidiospores.

Phellinus bambusarum (Rick) Larsen,
Synopsis Fung. 3:40, 1995. - *Poria bambusarum* Rick, Broteria Ser. Cien. Nat. 6:146, 1927. - *Phellinus rickianus* Wright & Deschamp, Mycotaxon 21:414, 1984.
Basidiocarps perennial, resupinate, becoming widely effused, pore surface yellowish- to greyish-brown, dull, smooth, the pores circular, 6-8 per mm, the dissepiments thick, entire, minutely tomentose; tube layers concolorous, context golden brown, up to 1 mm thick

masses, thin- to slightly thick-walled, 3.7-4.3 x 3-3.8 µm.
Substrata and **Distribution**. Known only on hardwood from the type locality in San Salvador in Brazil.
Remarks. The hooked setae in combination with the tramal setae make this a characteristic species.
Phellinus apiahynus (Speg.) Rajch. & Wright
Mycologia 79:251, 1987. - *Fomes apiahynus* Speg., Bol. Acad. Nac. Cien. 11:438, 1889. - *Phellinus elegans* Wright & Blumenf., Mycotaxon 21:418, 1984.
Basidiocarps perennial, sessile, triquetrous, ungulate to applanate, 5 x 3 x 1 cm; upper surface brown glabrous, densely sulcate, concentrically zonate, dark brown to black, in basal parts with a dense black zone, margin acute, pore surface greyish-brown, the pores circular, 7-9 per mm, with thick, entire dissepiments; tubes 2 mm long each year, context shining yellowish brown, woody hard, up to 0.2 cm thick.
Hyphal system dimitic; contextual skeletal hyphae brown in KOH, thick-walled, rarely branched, 2.5-5 µm in diam; generative hyphae hyaline, thin-walled, 1.5-3 µm in diam, inconspicuous.
Basidia broadly ellipsoid, 7-10 x 4.5-6 µm, simple-septate at the base.
Basidiospores subglobose, hyaline, thick-walled at maturity, dextrinoid in Melzer's reagent, and 5-6 x 4.5-5 µm.
Hymenial setae absent.
Substrata. Known only from different hardwoods.
Distribution. Known from Northern Argentine to Costa Rica, but not common.
Remarks. The fairly small dextrinoid basidiospores differentiate this species from the related *Phellinus robustus*, which is known only from the Temperate Zone.

Phellinus baccharidis (Pat.) Pat.,
Ess. tax. p. 97, 1900. - *Polyporus baccharidis* Pat., Bull. Soc. Mycol. Fr. 9:129, 1893.
Basidiocarp perennial, pileate, broadly attached, applanate to triquetrous, 5 cm wide, 7 cm long and 1 cm thick at the base, woody hard, pileus first finely adpressed tomentose to velutinate in narrow sulcate zones, pale fulvous to cinnamon, in section with a distinct black line below the tomentum, with age the tomentum wears away zone wise, in part becomes agglutinated to the crust and the pileus then paler, partly dark brown where the tomentum is more worn, margin rounded, pore surface dark fulvous to sienna, pores 8-10 per mm, tubes distinctly stratified, fragile, dark cinnamon, up to 3 mm thick in individual layers, totally up to 1,8 cm in the type, some layers with a very thin intermittent context, context cinnamon, very thin, adpressed, separated towards the tomentum by a distinct thin black line.
Hyphal system dimitic, generative hyphae hyaline, thin-walled to slightly thick-walled, 2-3.5 µm wide, skeletal hyphae thick-walled, but with a distinct lumen of almost even width, hyphae running parallel in the trama and this gives the pore-walls a rather easily-sectioned or crumbly consistency.
Hymenial setae absent.

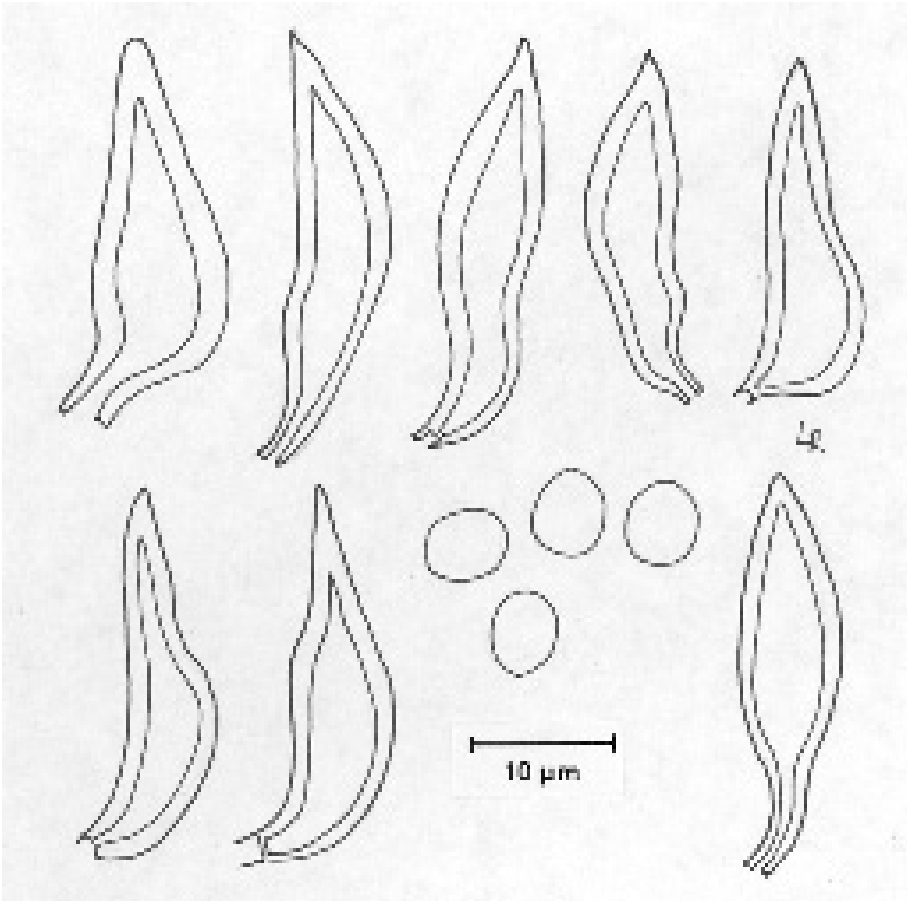


Fig. 71. *Phellinus calcitratus,* hymenial setae and basidiospores. From the lectotype.

Hyphal system dimitic, generative hyphae hyaline, 1.5-3.5 µm wide, skeletal hyphae dark brown in KOH, thin- to thick-walled, rarely branched, 2.5-5 µm in diam.
Hymenial setae rare, 13-25 x 6-8 µm, straight, slightly ventricose.
Basidia not seen.
Basidiospores globose to subglobose, hyaline, dextrinoid in Melzer's reagent, 5-6 x 5 µm.
Substrata. *Bambusa vulgaris.*
Distribution. Known only from southern Brazil., but will probably found in others areas with *Bambusa* as well.
Remarks. The resupinate basidiocarps, the host and globose dextrinoid basidiospores are sufficient to recognise this species.

Phellinus calcitratus (Berk. & Curt.) Ryvarden,
Fig. 71
Norw. J. Bot. 19:234, 1972. - *Polyporus calcitratus* Berk. & Curt., J. Linn. Soc. Bot. 10:314, 1868.
Basidiocarp perennial, applanate, broadly attached, up to 10 cm wide and long, semicircular to elongated and shelf- like, up to 4 cm thick at the base, margin sharp and thin, woody hard when dry, pileus velvety and mostly persistently so, yellowish-brown to fulvous, concentrically zonate in narrow bands or ridges, with age becoming glabrous from the base usually zone wise, tomentum more persistent in the grooves between the zones, tomentum up to 1 mm thick, below it is a distinct black line, up to 0.5 mm thick, glabrous part therefore greyish to dark brown or even black in very old specimens, pore surface greyish brown to umber brown, pores small 8-10 per mm, invisible to the naked eye, tubes distinctly stratified with intermittent context layers, individual tube-layers up to 10 mm thick, tubes totally up to 3 cm deep, concolorous with the pore surface, tubes dense and somewhat cartilaginous and translucent, context cinnamon to pale reddish-brown, fibrous and woody hard, up to 10 mm separated from the tomentum by a distinct black line.
Hyphal system dimitic, generative hyphae hyaline and 1.5-3 µm wide, skeletal hyphae dominating, golden to pale rusty brown, 2.5-4.5 µm wide.
Hymenial setae acuminate and more or less evenly tapering, more rarely slightly ventricose, acute, dark brown and thick-walled, 15-28 x 5-8 µm.
Basidiospores globose to sub-globose, 5-6 x 4.5-5 µm, when mature pale yellowish-brown, a few pale rusty brown.
Substrata. On hardwoods.
Distribution. American species known from the West Indies and South America.
Remarks. The sharply zoned pileus, the slightly translucent and cartilaginous tubes and the black line below the tomentum are quite distinctive characters for this species. With the distinctive black line between the tomentum and the context, it comes close to *P. extensu*s, which however, has smaller and much more ventricose setae and smaller basidiospores. It is also somewhat reminiscent of *P. bacchardis*, which however, does not have hymenial setae.

Phellinus caryophylleus (Cooke) Ryvarden,
Fig. 72
Norw. J. Bot. 19:234, 1972. - *Polyporus caryophylleus* Cooke, Grevillea 15:21, 1886.
Basidiocarp perennial, pileate, broadly attached, applanate and conchate, up to 10 cm long, 6 cm wide and 1 cm thick at the base, margin acute and deflexed, woody hard, pileus velutinate to tomentose and rather persistently so, rusty to reddish-brown, sulcate in concentric zones, the tomentum is adpressed, 0.5-2 mm thick, and

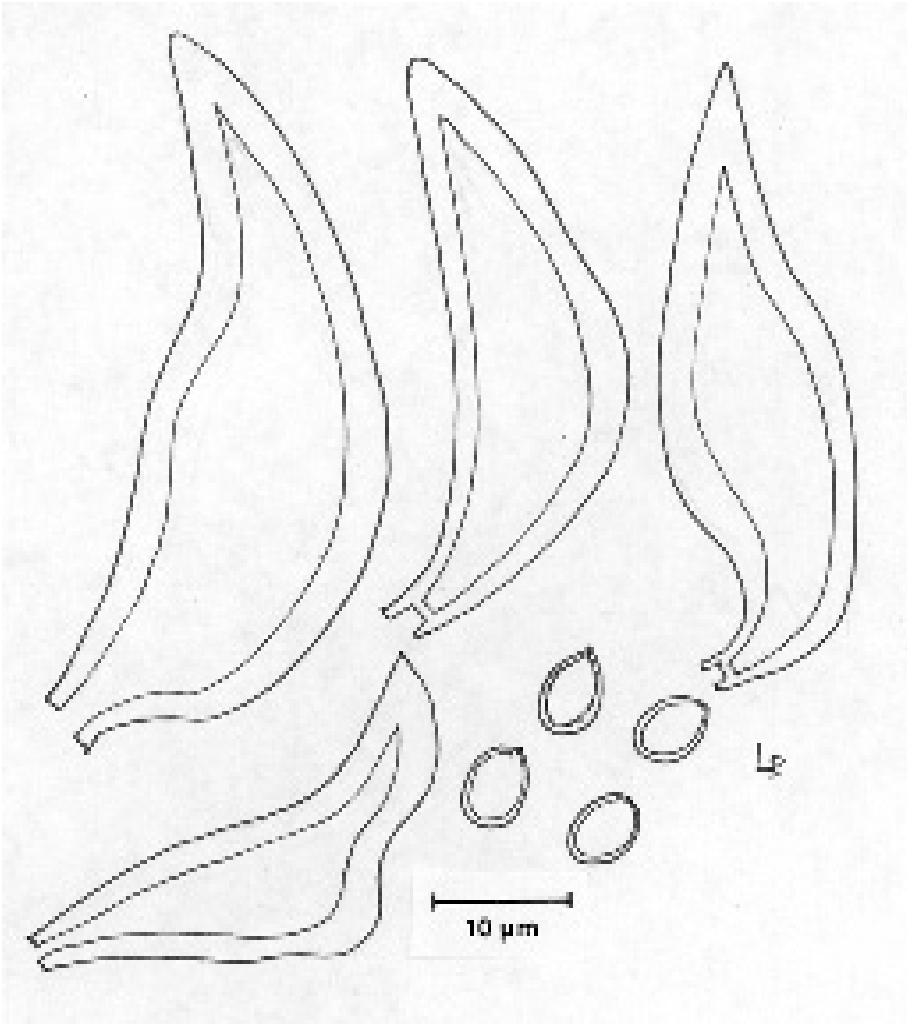


Fig. 72. *Phellinus caryophyllaceus,* hymenial setae and basidiospores. From the lectotype.

Distribution. Known apparently only from the type locality at Rio de Janeiro, Brazil.

Remarks. *P. linteus* is fairly similar, but it lacks the black line below a persistent tomentum, besides the setae are slender and not as distinctly ventricose as in *P. caryophylleus*. *P. extensus* has much smaller setae and basidiospores, and *P. calcitratus* has slender acuminate setae.

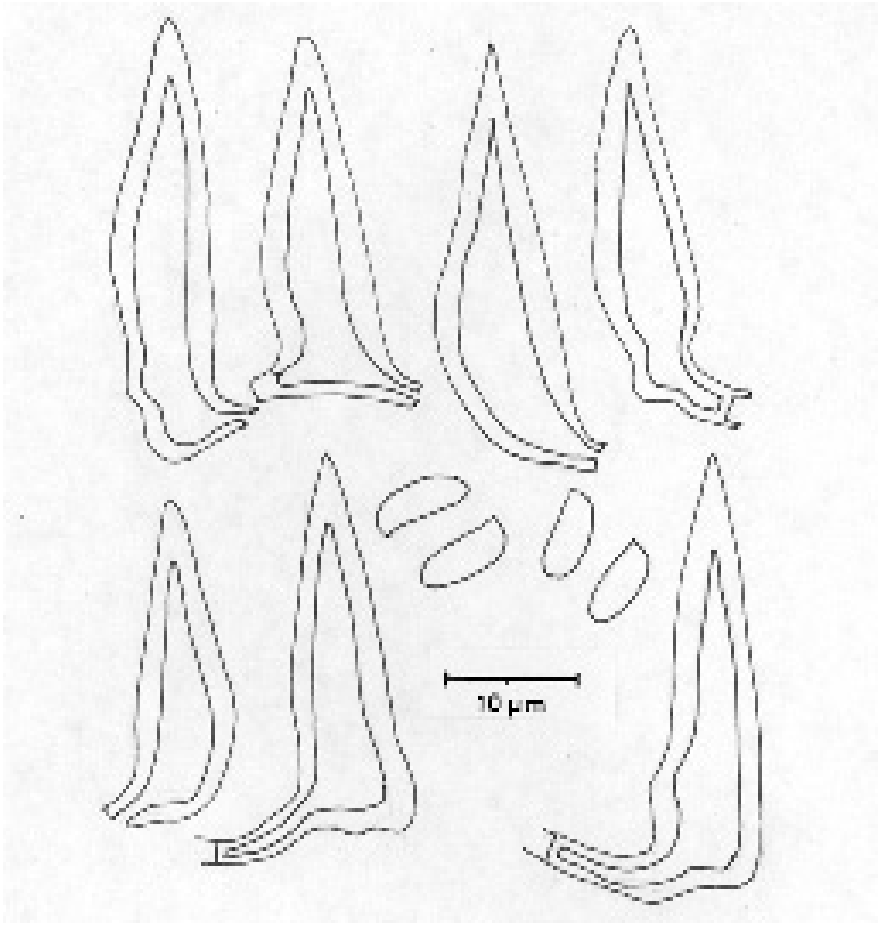


Fig. 73. *Phellinus chinchonensis,* hymenial setae and basidiospores. From the lectotype.

below it there is a distinct black line, closer to the base some zones are weathered and glabrous and black as the thin black zone is exposed, pore surface dark reddish-brown, pores small, 6-8 per mm, almost invisible to the naked eye, tubes concolorous, up to 4 mm deep, context ferruginous brown, darker towards the base, 1-4 mm thick.

Hyphal system dimitic, generative hyphae hyaline, 2-3 µm wide, skeletal hyphae dominating, yellow to rusty brown, 2.5-5 µm wide.

Hymenial setae scattered to rare, mostly ventricose, a few also acuminate, thick-walled, dark brown, straight or some with a hooked tip, 20-35 x 7-13 µm.

Basidiospores sub-globose, yellow to rusty brown, 4-5.5 x 3-4.5 µm.

Substrata. On dead hardwoods**.**

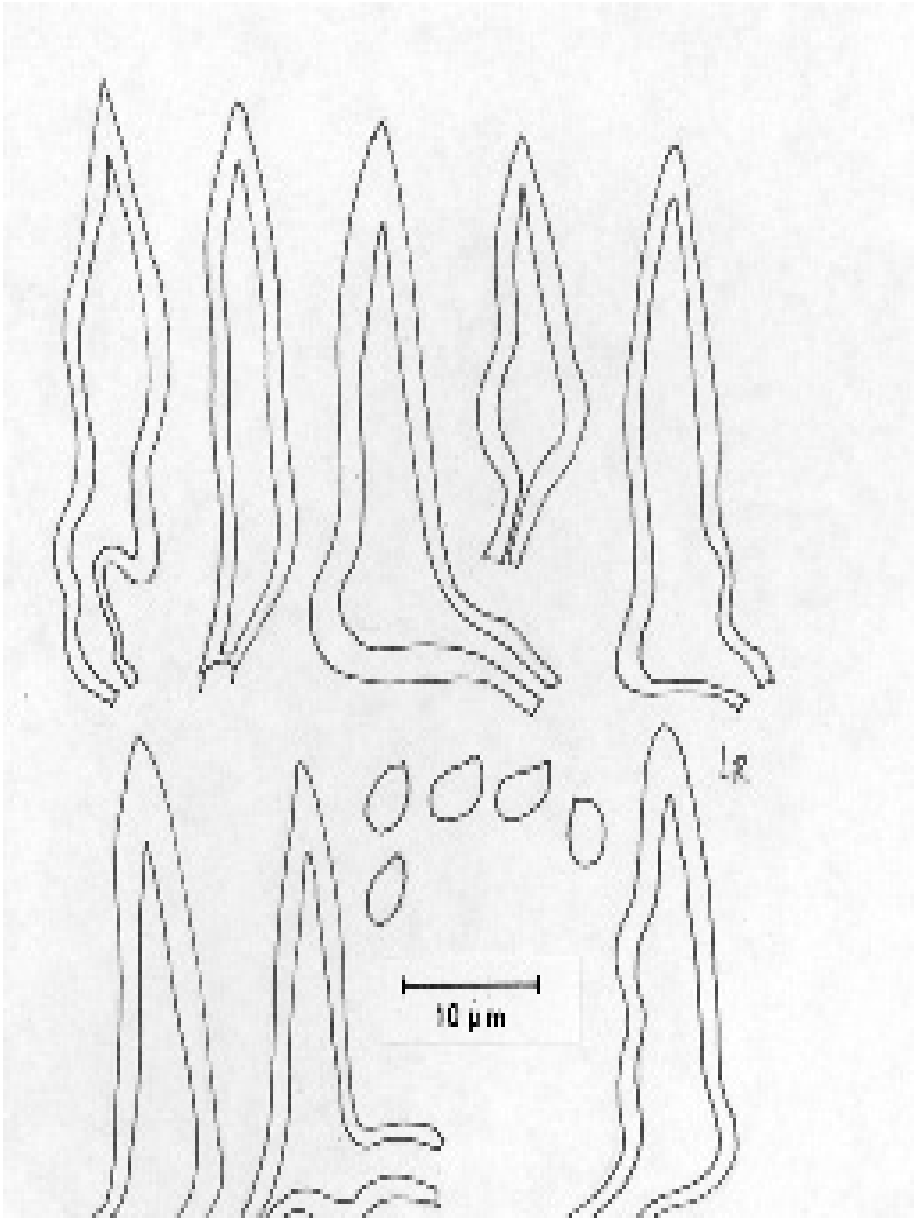


Fig. 74. *Phellinus chryseus,* hymenial setae and basidiospores. From the lectotype.

Phellinus chinchonensis (Murrill) Ryvarden,
Fig. 73
Norw. J. Bot. 19:234, 1972. - *Pyropolyporus chinchonensis* Murrill, Mycologia 2:195, 1910.
Basidiocarp pileate, sessile and mostly broadly attached, semi-applanate to ungulate, up to 15 cm long, 7 cm wide and thick, margin rounded, woody hard, but fairly light in weight, pileus reddish-brown, first finely velvety, but soon glabrous and dull, smooth or concentrically sulcate, the upper hyphae do not become indurated to a blackish layer and no crust or black zone are present in sections, pore surface golden-brown to reddish-brown, pores round, 6-8 per mm, tubes concolorous, rather fragile, up to 8 mm in each layer, totally up to 6 cm deep, context shiny, reddish-brown and radially fibrous, up to 2 cm thick at the base.
Hyphal system dimitic, generative hyphae thin-walled and 2-4.5 µm wide, skeletal hyphae golden to pale rusty brown, 3-6 µm wide.
Hymenial setae abundant, subulate, acuminate, thick-walled and dark brown, 20-32 x 4-8 µm.
Basidiospores cylindrical to sub-cylindrical, hyaline and thin-walled, 6-8 x 2.5-3.5 µm.
Substrata. On hardwoods.
Distribution. The West Indies and seen from Jamaica, Panama and Mexico.
Remarks. Externally the species is rather similar to *P. robustus* with its smooth pileus and ungulate basidiocarp. However, the setae and above all the cylindrical basidiospores will reveal its identity.

Phellinus chryseus (Lév.) Ryvarden,
Fig. 74
Prelim. polypore flora East Africa p. 151, 1980. - *Polyporus chryseus* Lév., Ann. Sci. Nat. Ser. 3, vol 5:133, 1846.
Basidiocarp resupinate and then with a distinct margin, effused reflexed, upper margin slightly reflexed and it may be that the normal condition is an effused portion with a narrow reflexed pileus, in the type it is about 3 mm wide and 1,5 cm long, dark brown and with some radial striae, finely fibrillose (lens) (could it represent a loosened margin?), up to 4 mm thick, woody hard, pore surface yellowish-brown to dark brown, pores more or less round, about 6 per mm, tubes up to 1.5 mm deep, tubes ochraceous, trama cinnamon brown, subiculum less than 1 mm, dark cinnamon brown.
Hyphal system dimitic, generative hyphae delicately thin-walled, simple septate and 2-3(4) µm wide, skeletal hyphae dominating in the trama, rusty brown, up to 4.5 µm wide, projecting hyphae in the dissepiments smooth, in the subiculum distinctly wider, up to 8 µm in parts and almost solid and dark rusty brown.
Hymenial setae common, sharply pointed, thick-walled, straight, often with a widened base, (20)25-50 x 5-8 µm.

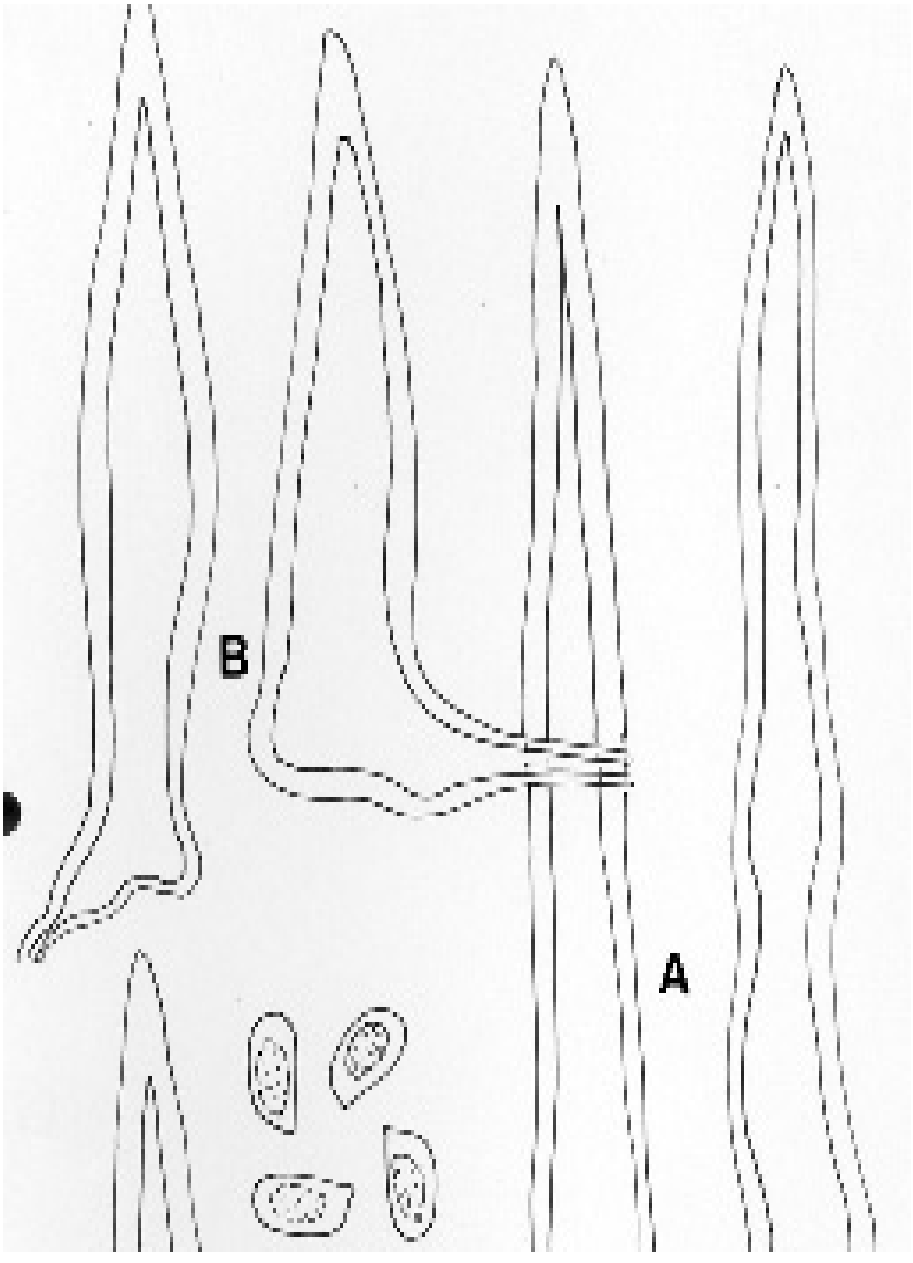


Fig. 75. *Phellinus contiguus* A) tramal setae, B) hymenial setae and C) basidiospores. From the lectotype.

Basidiospores broadly ellipsoid, hyaline to pale yellow, 3.5-4.5 x 2.5-3 µm.
Substrata. Dead hardwoods**.**
Distribution. Specimens have been seen from Colombia, Costa Rica, Belize, Venezuela and Jamaica, which indicate a wide neotropical distribution.
Remarks. As we have only seen few specimens it is difficult to decide whether the macroscopical description given above covers the whole range of variation, it may with age develop a distinct narrow pileus. The hyaline basidiospores and the bright golden-yellow pore surface reminds one of *P. sarcites*, which however, is pileate and has smaller setae and narrower skeletal hyphae in the context.

Phellinus contiguus (Fr.) Pat.,
Fig. 75
Ess. tax. p. 97, 1900. - *Polyporus contiguus* Fr., Syst. Mycol. 1:378, 1821.
Basidiocarp perennial, resupinate, adnate, mostly elongated and effused, up to 20 cm long, 5 cm wide and up to 1 cm thick, smooth and even or nodulose and undulated on oblique substrata with smooth sterile areas in between fertile poroid areas, spongy when fresh, hard when dry; pore surface reddish to umber brown, often with a greyish pruina, margin mostly narrow, rusty brown and finely floccose, disappearing with age, pores angular, on average 2-3 per mm, often somewhat sinuous and irregular, especially on oblique substrata and then often split in front, up to 1 mm wide, along the margin often deeply split into a labyrinthine to irpicoid configuration, tubes indistinctly stratified, up to 10 mm deep, mostly with a greyish brown pruina; context very thin, rusty brown, up to 1 mm thick.
Hyphal system dimitic; generative hyphae thin-walled and hyaline, 2-3.5 µm, slightly thick-walled and pale yellowish in the subiculum and the floccose margin, skeletal hyphae yellowish to rusty brown, straight, thick-walled and 3-5 µm wide with a distinct lumen.
Setae of two kinds:
a) **tramal setae** acute, tapering from the base, thick-walled and straight, dark brown to light yellowish in the top, scattered and not always easy to find, occurring in the floccose margin and in the trama, 40-120 x 5-12 µm,
b) **hymenial setae** very abundant, subulate, thick-walled, dark brown and with a bent base, either terminal or more rarely lateral from generative hyphae, often with a bulbous base, (35-)40-60(-65) x 6-10 µm, projecting 15-25 µm above the hymenium,.
Cystidioles abundant, hyaline and thin-walled, mostly as hyphal ends, partly embedded in the hymenium, but also as ventricose organs with a tube like upper part projecting above the hymenium.
Basidia clavate, 10-14 x 5-7 µm.

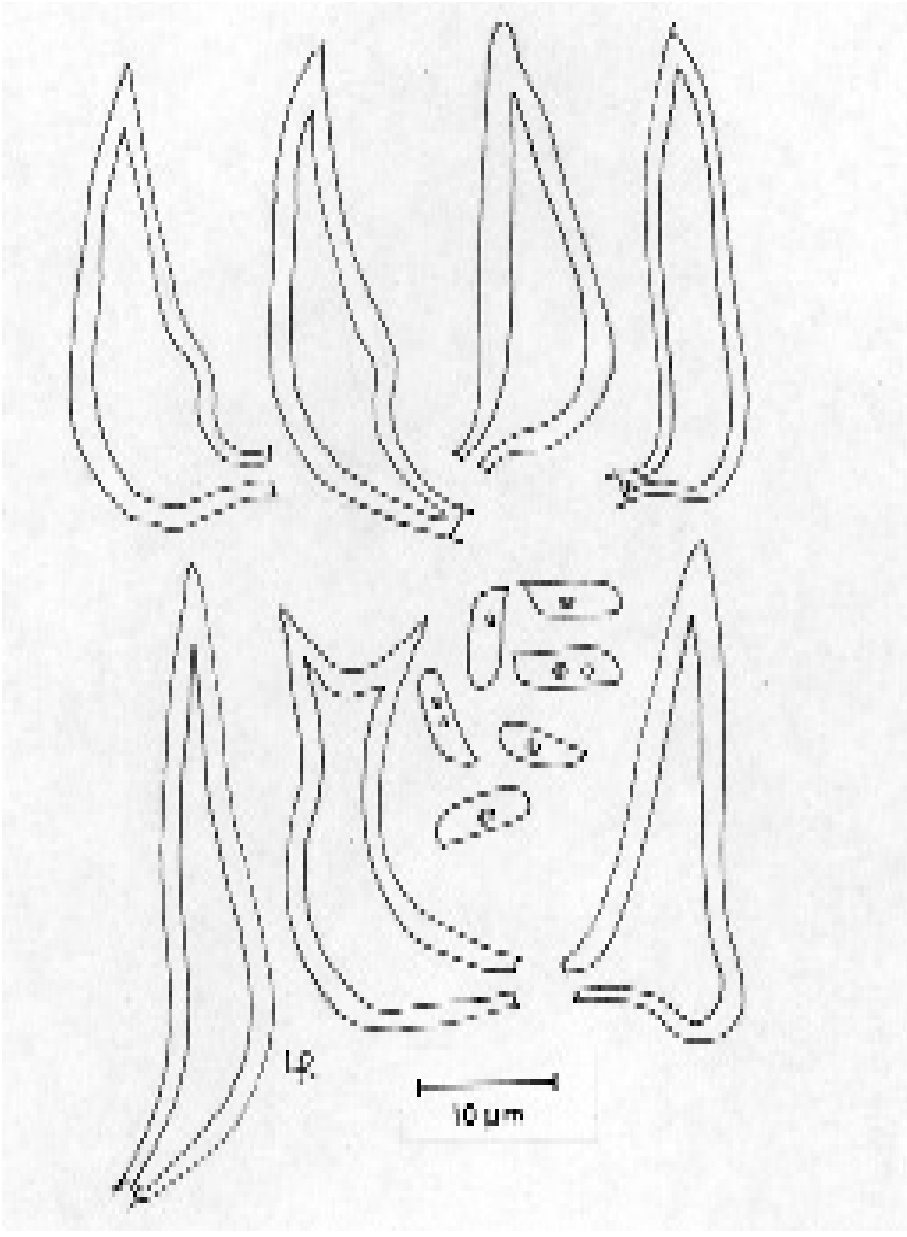


Fig. 76. *Phellinus cylindrosporus,* hymenial setae and basidiospores. From the lectotype.

Basidiospores oblong ellipsoid, hyaline, thin-walled, with a large oil drop, 5-7 x 3-3.5 µm.
Substrata. On dead wood of numerous genera.
Distribution. *P. contiguus* is widespread throughout the tropical zone and into the warmer parts of the temperate zones as well.
Remarks. This species is easy to recognise because of the two types of setae, the fairly large pores and the ellipsoid, hyaline basidiospores.

Phellinus cylindrosporus Ryvarden,
Fig. 76
Mycotaxon 38:536, 1987.
Basidiocarp perennial, pileate, applanate, flabelliform to semicircular to almost dimidiate, in the type about 3 cm wide and long, up to 3 mm thick at the base, woody hard, pileus rusty brown in narrow concentric zones, glabrous, becoming slightly wrinkled when dry, margin sharp and bent when dry, pore surface snuff brown, pores 6-8 per mm, tubes concolorous, up to 1.5 mm deep in the type, context rusty brown, 1.5 mm thick at the base.
Hyphal system dimitic, generative hyphae 2-3 µm wide, hyaline and thin-walled, skeletal hyphae dominating, thick-walled golden to pale rusty brown, 3-7 µm wide.
Hymenial setae abundant, subulate, dark brown, 25-35 x 5-12 µm.
Basidia clavate, 12-15 x 6-7 µm.
Basidiospores hyaline, cylindrical to subnavicular, 6.5-7 x 2-2.5 µm.
Substrata. On deciduous wood.
Distribution. We have only examined the type from Panama, but it is probably rather widespread in the West Indies.
Remarks. The species is closely related to *P. chinchonensis* but separated by narrower basidiospores.

Phellinus daedaliformis Wright & Blumenf.,
Mycotaxon 21:418, 1984**.**
Basidiocarp annual, resupinate to effused reflexed, corky when dry, 1-1.5 cm long, up to 1 cm wide and 0.5 cm thick at the base, upper surface velvety and dark brown, pore surface brown, pores irregular, 4-5 per mm, frequently daedaleoid, less frequent angular to oblong radially, tubes concolorous, up to 4 mm deep in the type, context dark brown, 3 mm thick at the base.
Hyphal system dimitic, generative hyphae 1.5-3 µm wide, hyaline and thin-walled, skeletal hyphae dominating, thick-walled, golden to pale rusty brown, 2-4 µm wide.
Hymenial setae abundant, subulate to ventricose, dark brown, 30-50 x 3-6 µm.
Basidia subclavate, 7-14 x 3-5 µm with four sterigmata.
Basidiospores ellipsoid, hyaline, thin-walled, 3.5-5.2 x 2.5-3.5 µm.
Substrata. The type was collected on *Tabebuia*.
Distribution. The species is only known from the type locality in Northern Argen-

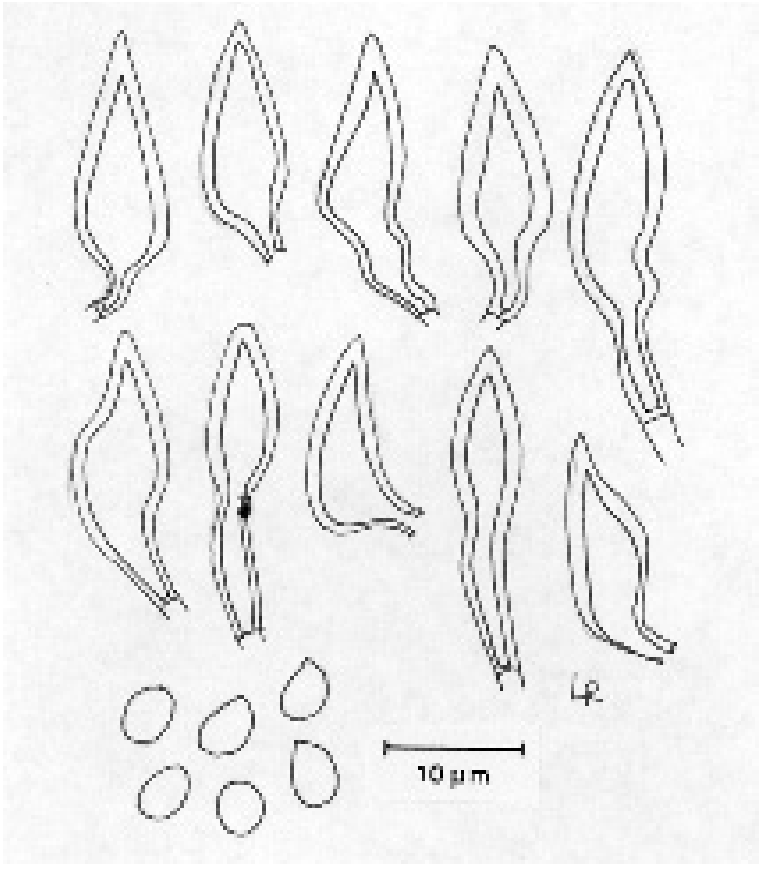


Fig. 77. *Phellinus dependens,* hymenial setae and basidiospores. From the lectotype.

tine.
Remarks. The irregular pores distinguish this species from the other species with hyaline basidiospores described in this manual.

Phellinus dependens (Murrill) Imazeki,
Fig. 77
Bull. Gov. Forest. Exp. Sta. (Tokyo) 57:117, 1952. - *Pyropolyporus dependens* Murrill, N. Am. Flora 9:106, 1908.
Basidiocarps perennial, more or less pendant with distinct tapering base or vertex from the pileus, ungulate, up to 10 cm wide and long, 7 cm thick at the basal part, woody hard; upper surface first finely tomentose and dark rusty brown, but soon the upper hyphae become indurated and a black irregular crust develops, thickest in the basal parts, sulcate and in older specimens cracked and rimose, margin rounded and

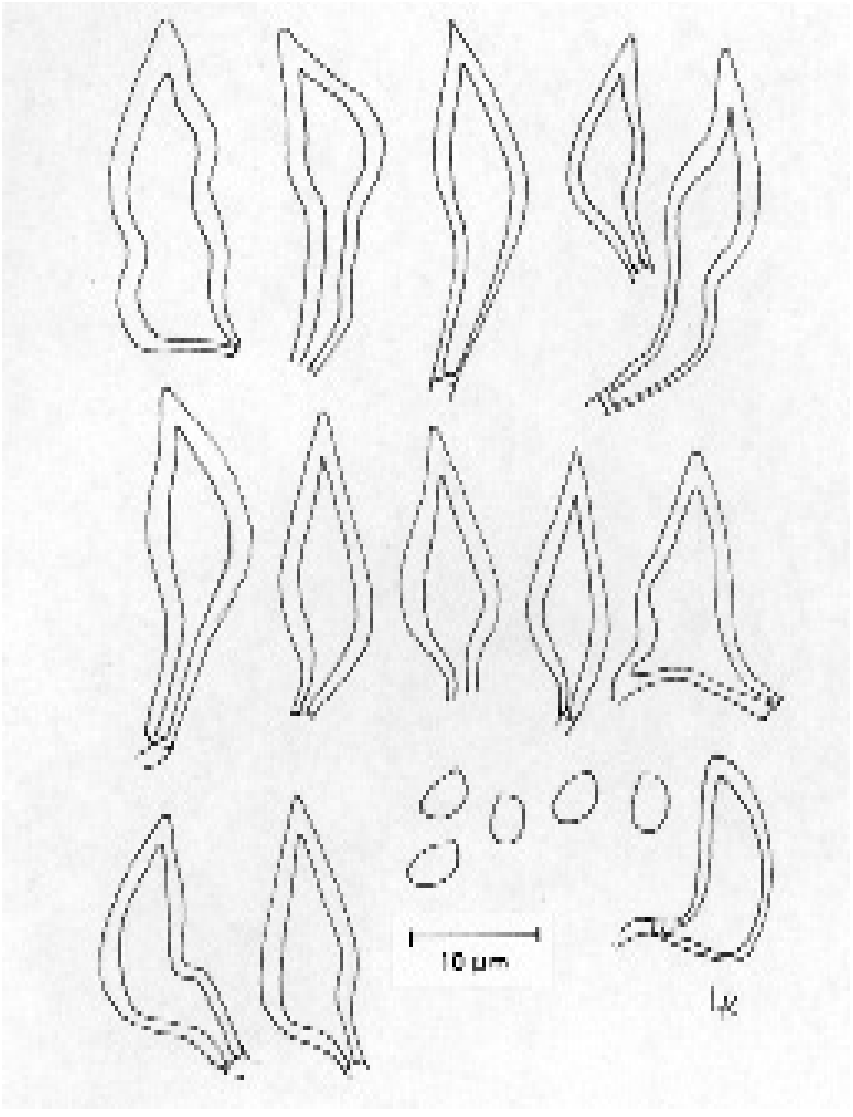


Fig. 78. *Phellinus detonsus,* hymenial setae and basidiospores. From the lectotype.

obtuse, umber brown to greyish; pore surface reddish brown to umber, pores round and small, 7-9 per mm, tubes concolorous, indistinctly stratified, up to 7 cm deep; context fulvous to reddish-brown, up to 5 mm near the base.
Hyphal system dimitic; generative hyphae thin-walled and simple-septate, 2-3.5 µm wide, skeletal hyphae thick-walled, yellow to pale rusty brown, 3-5 µm wide.
Hymenial setae slightly to strongly ventricose, straight, thick-walled and acute, 12-

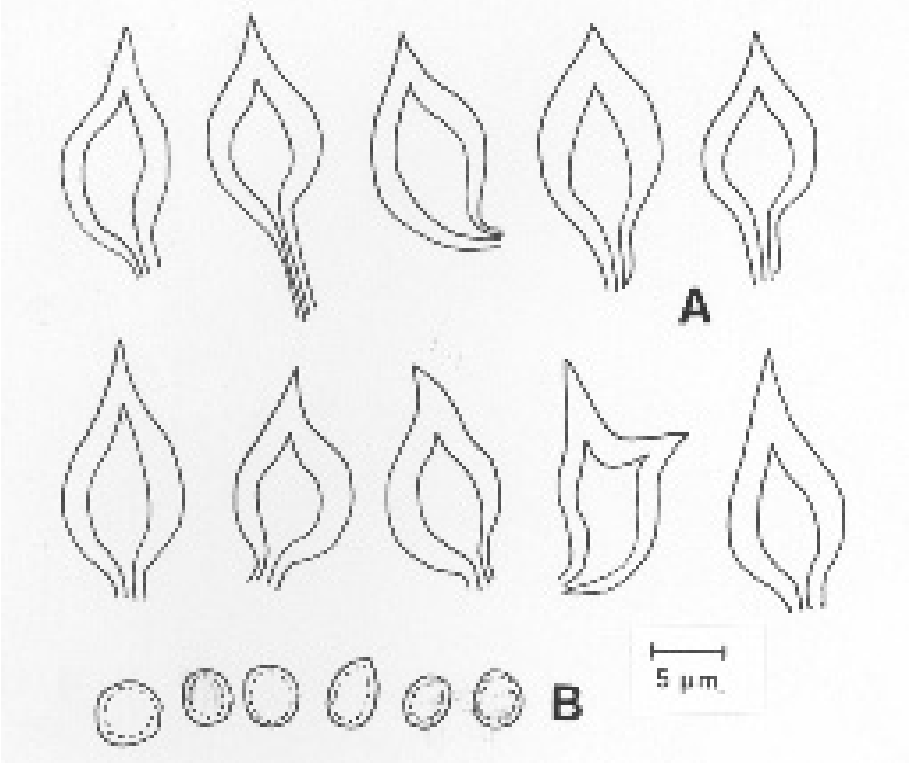


Fig. 79. *Phellinus extensus,* hymenial setae and basidiospores. From the lectotype.

18 x 5-8 µm.
Basidia not seen.
Basidiospores subglobose, pale yellowish and then pale reddish brown with age, thick-walled, about 3-4 µm in diameter.
Substrata. Dead deciduous trees .
Distribution. Florida in United States, West Indies and south to Brazil.
Remarks. The pendant basidiocarp with the sulcate and rimose surface and the small basidiospores are important characteristics. *P. rimosus* as defined here, has larger pores and basidiospores. *P. linteu*s is similar as it often has a constricted attachment to the substrate and pores and surface are similar in the two species. The latter has, however, larger basidiospores, i.e. 4-5 µm long, only 3-4 µm long in *P. dependens.*

Phellinus detonsus (Fr.) Ryvarden, comb. nov.,
Fig. 78
Basionym: *Polyporus detonsus* Fr. Linnea 5, 519, 1830 (PC!). - *Poria ferrugineo-*

velutina Henn., Hedwigia 44: 59, 1905. - *Fomitoporia flavomarginata* Murrill, North. Am. Fl. 9:1, 1907. - *Poria rickii* Bres., Ann. Mycol. 18:37, 1920. - *Phellinus rickii* (Bres.) David & Rajchenb., Mycotaxon 22:288, 1985. - *Phellinus tropicalis* Larsen & Lombard, Mycologia 80:73, 1988.

Basidiocarps resupinate, perennial, effused, adnate, up to 6 mm thick, margin narrow to wide, first golden-yellow, with age more reddish-brown; pore surface reddish-brown to umber brown, pores small, round, 7-9 per mm, tubes in older specimens stratified, up to 1 mm in each layer, concolorous with pore surface, totally up to 4 mm deep; context very thin, less than 1 mm, reddish-brown, dense and somewhat shiny.

Hyphal system dimitic; generative hyphae hyaline, simple-septate, 2-4.5 µm wide, skeletal hyphae thick-walled to almost solid in the subiculum, 2-5 µm wide, golden-yellow to rusty brown.

Hymenial setae usually ventricose, scattered, acuminate, straight, dark brown, 12-25 x 4-8 µm.

Basidia broadly ellipsoid, 8-10 x 5-6 µm.

Basidiospores subglobose to ellipsoid, hyaline to pale yellow, 3 x 3-4 µm.

Substrata. Dead wood of deciduous trees.

Distribution. Florida and Georgia. West Indies, Colombia and Brazil.

Remarks. The species is recognised by its small hyaline to pale yellowish brown basidiospores.

Phellinus extensus (Lév.) Pat.,
Fig. 79
Essai tax. p. 97, 1900. - *Polyporus extensus* Lév., Ann. Sci. Nat. Bot. III, 5:129, 1846.

Basidiocarps perennial, solitary, pileate to dimidiate, broadly attached, conchate to applanate, woody hard when dry, up to 5 cm wide, 7 cm broad and 0.7 cm thick, upper surface reddish-brown to blackish, first covered with a fine tomentum under which there is a distinct dark cuticle, with age more or less glabrous in concentric zones and dark brown to almost black; margin obtuse; pore surface dark brown, pores round and small, 7-10 (11) per mm, dissepiments entire and rather thick, tubes usually single-layered or indistinctly stratified up to 2 mm in each layer, totally up to 6 mm deep; context fulvous to reddish-brown with a dark cuticle above, fibrous and shiny, up to 5 mm thick.

Hyphal system dimitic; generative hyphae in the tubes hyaline to pale yellow, thin- to thick-walled and simple-septate, 2-3.5(-4) µm wide, sparingly branched, darker yellow and slightly wider in the context; skeletal hyphae dominating, yellow to rusty brown, 3-5 µm thick in the dissepiments, 4-7(-9) µm in the context; tomentum completely dominated by skeletal hyphae, about 5 µm wide.

Hymenial setae strongly ventricose, thick-walled, acute, 10-20 x 5-9 µm.

Basidia broadly clavate, 8-12 x 5-7 µm.

Basidiospores globose, pale yellow, slightly thick-walled with age, 3-4 µm in diameter.

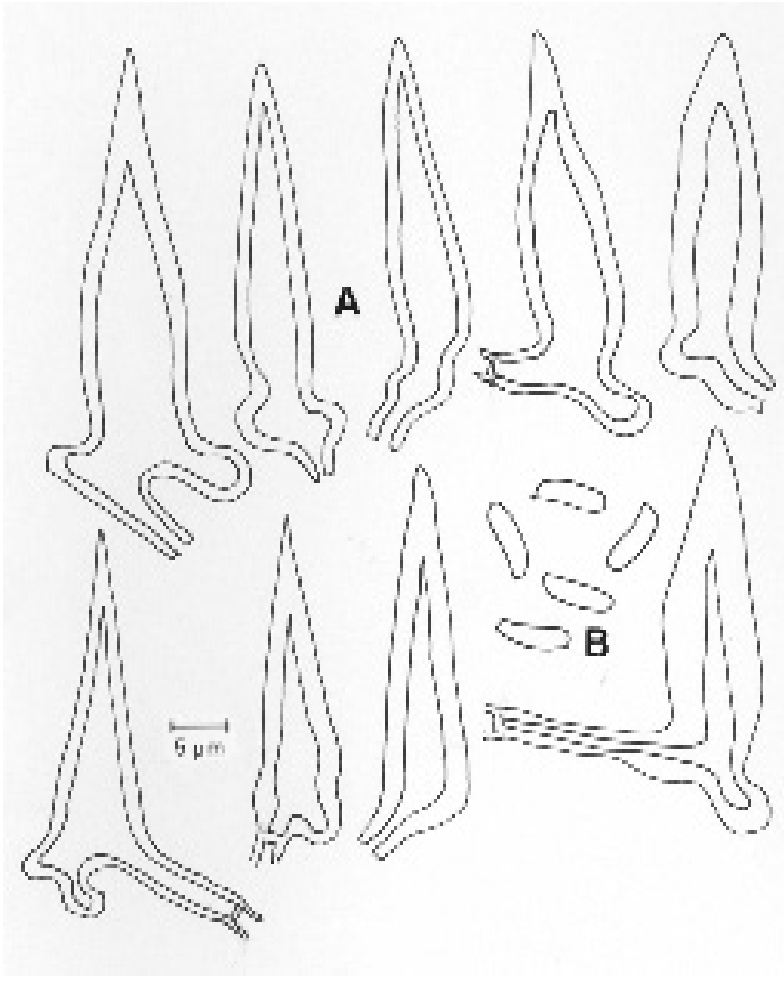


Fig. 80. *Phellinus ferreus,* hymenial setae and basidiospores. From the lectotype.

Substrata. Dead hardwood.
Distribution. Pantropical species.
Remarks. The species is characterised by an applanate basidiocarp with a black zone below an adpressed tomentum and microscopically by very short and strongly ventricose setae and small hyaline to pale yellow basidiospores.

Phellinus fastuosus (Lév.) Ryvarden,
Norw. J. Bot. 19:234, 1972. - *Polyporus fastuosus* Lév., Ann. Sci. Nat. Ser. 3, Vol. 2:190, 1844.
Basidiocarps perennial, solitary or imbricate, pileate, broadly attached, dimidiate, flat to convex, up to 60 cm broad, 30 cm wide and 7 cm thick, woody when dry, upper surface rusty brown, first velvety tomentose in narrow to broad concentric

sulcate zones with a black zone, later almost black and with a distinct black crust up to 1 mm thick and more or less glabrous; margin usually rather thick and obtuse, velutinate and golden-yellow to ferruginous; pore surface golden-yellow to cinnamon or rusty-brown, more fuscous in older specimens, pores round and regular, (6-)7-10 per mm, dissepiments entire and fairly thick, tubes concolorous or more fulvous than the pore surface, strongly stratified, each strata usually 1-3 mm thick; context golden-brown to more cinnamon or ferruginous in older specimens, up to 15 mm thick, sometimes with several thin, dark zones.
Hyphal system dimitic; generative hyphae simple-septate, hyaline to pale yellow, thin- to slightly thick-walled, 1.5-3 µm in diameter, skeletal hyphae yellow to bay, thick-walled with a distinct lumen, 3-7(-8) µm wide, on average wider in the context than in the tubes.
Hymenial setae absent.
Basidia broadly clavate to barrel shaped, 10-12 x 6-8 µm, 4-sterigmate.
Basidiospores ellipsoid to subglobose, rusty brown, thick-walled, 4.5-6(-6.5) x 4-5.5 µm.
Substrata. Deciduous trees of many genera.
Distribution. Widespread and common in the tropical zone.
Remarks. The species is recognised by its often large applanate basidiocarps and the lack of setae. Species in the so-called *Phellinus rimosus* complex have similar rusty brown basidiospores and absence of setae, but their basidiocarps are ungulate and rapidly becoming black and rimose.

Phellinus ferreus (Pers.) Bourd. et Galzin,
Fig. 80
Soc. Mycol. France Bull. 41:247, 1925. - *Polyporus ferreus* Pers., Mycol. Europe 2:89, 1825.
Basidiocarps perennial, resupinate, effused up to 23 cm, woody, not readily separable; margin fertile or narrowly sterile, then yellowish-brown, tomentose, up to 2 mm wide; pore surface yellowish-brown, often cracking extensively, the pores circular, 6-7 per mm, with thick, entire dissepiments; tube layers indistinctly stratified, concolorous and continuous with the context, each layer up to 1 cm thick, context yellowish-brown, corky, azonate, up to 1 mm thick.
Hyphal system dimitic, skeletal hyphae dark brown to almost hyaline, 3-5 µm wide, generative hyphae simple-septate, 2-4 µm in diam.
Hymenial setae abundant, subulate to slightly ventricose, thick-walled, 22-29 x 6-7 µm.
Basidia clavate, 12-14 x 5-6 µm.
Basidiospores cylindrical, hyaline,5-7.5 x 2-2.5 µm.
Substrata. Dead wood of many hardwood and conifer genera
Distribution. Cosmopolitan species.
Remarks. This species is similar to *P. ferruginosus*, another common hardwood-in-

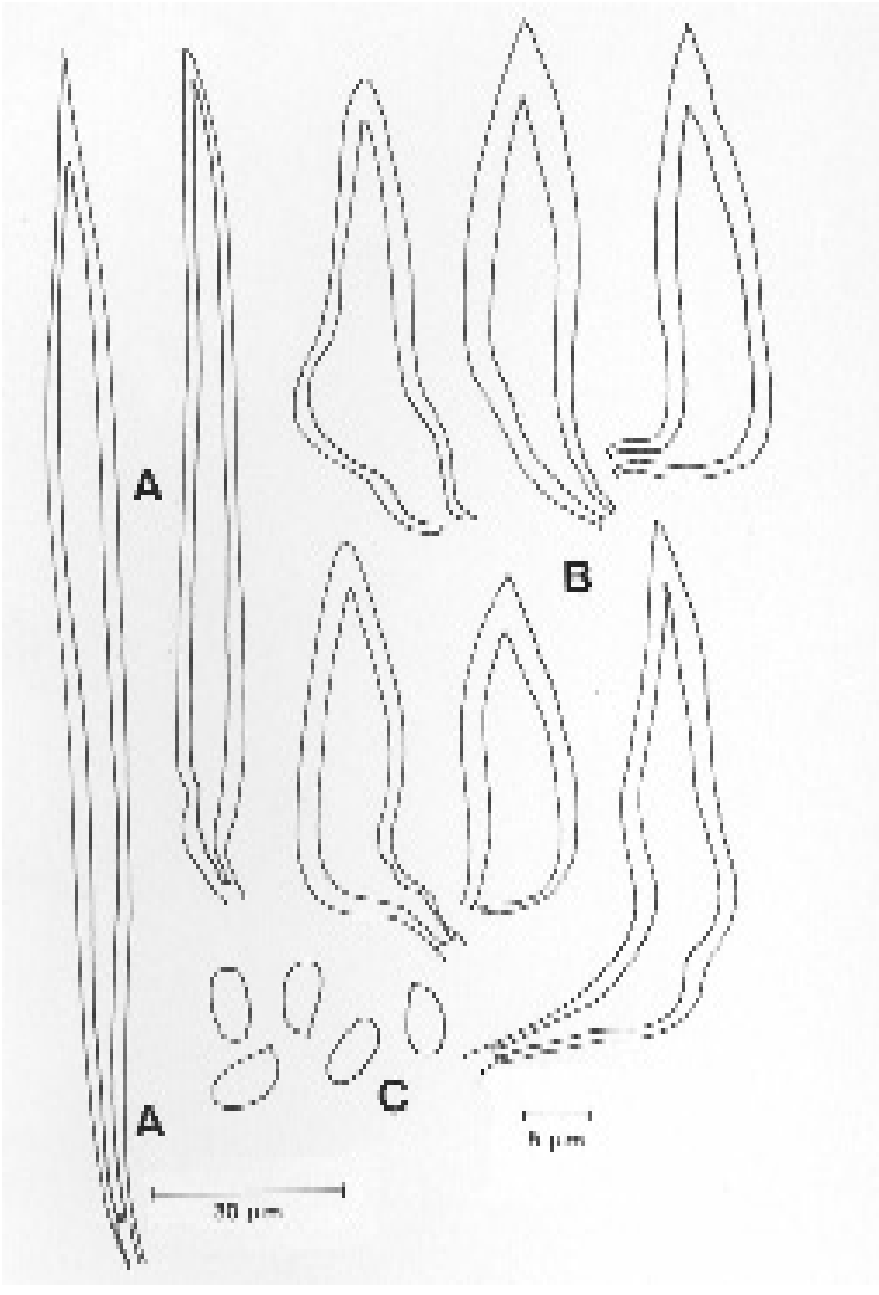


Fig. 81. *Phellinus ferruginosus,* setal hyphae, hymenial setae and basidiospores. From R 19306 (Kenya).

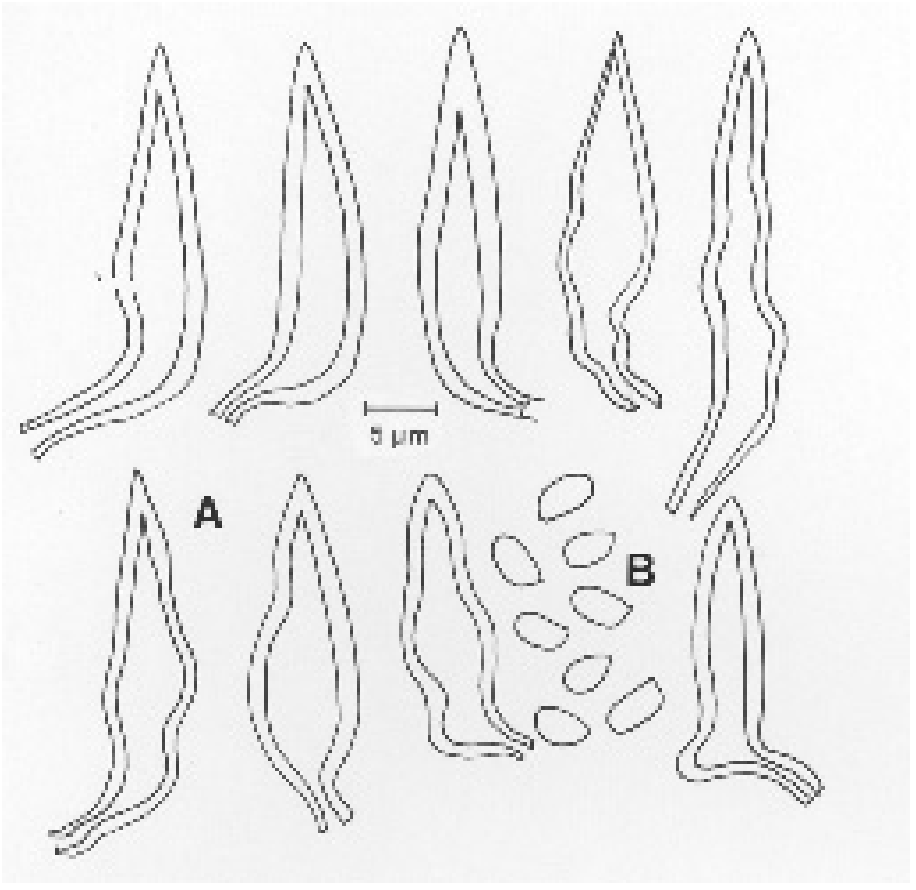


Fig. 82. *Phellinus gilvus,* hymenial setae and basidiospores. From the lectotype.

habiting fungus. This species has shorter basidiospores and usually has setal hyphae in the marginal and context tissue, features that distinguish it from *P. ferreus.*

Phellinus ferruginosus (Schrad.:Fr.) Bourd. & Galzin,
Fig. 81
Hym. France p. 625, 1928. - *Polyporus ferruginosus* Schrad.: Fr., Syst. Mycol. 1:378, 1821.
Basidiocarps annual, becoming widely effused, tough to soft-spongy, not easily separable; margin tawny, soft-spongy, often appearing setulose under a lens, up to 2 cm wide; pore surface rusty brown, the pores circular, usually 7-9 per mm, but in some unusual specimens 2-3 per mm, with thick, tomentose dissepiments; tube layer slightly darker than the context or concolorous, continuous with the context, up to 2

cm thick, context yellowish-brown, azonate, soft-fibrous, up to 1.5 mm thick.
Hyphal system dimitic, generative hyphae 2-4 µm in diam, skeletal hyphae yellow brown, 2-5 um wide.
Setal hyphae present, easiest to observe in the sterile margin, dark reddish-brown, very thick-walled, tapering, 5-8 µm in diam, up to 150 um long.
Hymenial setae abundant, mostly subulate, thick-walled, 25-65 x 6-8 µm.
Basidia clavate, 11-14 x 4.5-6.5 µm.
Basidiospores hyaline, cylindrical or short-oblong, 5-7 x 3-3.5 µm.
Substrata. On dead wood of numerous hardwood genera.
Distribution. Cosmopolitan species.
Remarks. Considerable variation occurs in basidiocarps of *P. ferruginosus*, especially in pore size. *Phellinus ferreus* is similar but has narrower basidiospores and lacks setal hyphae.

Phellinus garuhapensis Wright & Blumenf.,
Mycotaxon 21:420 , 1984.
Basidiocarps resupinate, adnate, up to 3 mm thick, margin narrow to wide, first golden-yellow, with age more reddish-brown; pore surface golden brown, pores small, round, 6-8 per mm, tubes concolorous with pore surface, totally up to 2 mm deep; context very thin, less than 2 mm, golden brown.
Hyphal system dimitic; generative hyphae hyaline, simple-septate, 2-3.5 µm wide, skeletal hyphae thick-walled to almost solid in the subiculum, 1.5-3 µm wide, golden-yellow to rusty brown.
Hymenial setae absent.
Basidia broadly ellipsoid, 8-10 x 5-6 µm.
Basidiospores globose, hyaline, slightly thick-walled 3-5 µm in diam..
Substrata. Dead wood of *Bambusa vulgaris*.
Distribution. Northern Argentine.
Remarks. The species is recognised by its host and the small hyaline basidiospores. It reminds one about *P. umbrinellus*, which however has a much darker pore surface and coloured basidiospores.

Phellinus gilvus (Schw.:Fr.) Pat.,
Fig. 82
Ess. Tax. Hym., p. 97, 1900. - *Boletus gilvus* Schw., Schr. Nat. Ges. Leipzig 1:96, 1822. - *Polyporus gilvus* Schw: Fr., Elench. Fung., p. 104, 1828.
Basidiocarps annual, rarely perennial, sessile to slightly effused-reflexed; pilei solitary or imbricate, dimidiate, up to 7 x 12 x 3 cm; upper surface reddish to yellowish brown, scrupose, warted or even hispid in parts, tomentose to glabrous, often rugose, zonate or azonate; margin concolorous; pore surface dark purplish brown, the pores circular, 6-8 per mm, with thick, entire dissepiments, tube layer up to 1 cm thick; context bright yellowish brown, zonate, fibrous, up to 2 cm thick.

Hyphal system dimitic, generative hyphae simple-septate, 3-5 µm in diam, skeletal hyphae yellowish brown, thick-walled, 3-5 µm in diam; tramal hyphae similar.
Hymenial setae abundant, subulate, sharp, thick-walled, 20-30 x 5-6 µm.
Basidia broadly clavate, 5-11 x 5-7 µm.
Basidiospores ellipsoid to ovoid, hyaline, 4-5 x 3-3.5 µm.
Substrata. Living and dead hardwoods of numerous genera.
Distribution. Throughout the tropical zones.
Remarks. *Phellinus gilvus* is among the most variable and frequently collected species in the tropics as it often occurs in exposed localities, and thus conspicuous. Superficially it reminds about an *Inonotus* species by its annual and small basidiocarps.

Phellinus grenadensis (Murrill) Ryvarden,
Norw. J. Bot. 18:234, 1972. - *Pyropolyporus grenadensis* Murrill, North. Am. Fl. 9:107, 1908.
Basidiocarps perennial, solitary, pileate, dimidiate to semicircular, convex or more or less ungulate, up to 12 cm broad, 10 cm wide and 4 cm thick near the base, light to medium in weight and easy to detach, woody when dry, upper surface first finely rusty velvety tomentose which wears off and exposes a dark bay to black crust 0.5-1 mm thick, broadly to narrowly concentrically sulcate and weakly zoned, smooth to cracked, margin acute to obtuse, entire or weakly lobed, pore surface fulvous to dark reddish-brown, pores round and regular, 4-7 per mm, dissepiments entire, thin- to fairly thick-walled, tubes distinctly stratified with a thin context-layer in between the separate layers, each strata up to 5 mm deep, context fulvous to dark cinnamon or rusty brown, 1.5-10 mm thick, fibrous, homogeneous or with indistinct zones and with a thin black zone toward the tomentum.
Hyphal system dimitic, generative hyphae simple-septate, hyaline to pale yellow, thin- to slightly thick-walled, 1.5-3 µm in diameter, skeletal hyphae yellow to bay, thick-walled with a distinct lumen, 3-5 µm wide in the tubes, up to 8 µm wide in the context.
Hymenial setae absent.
Basidia broadly clavate, 12-15 x 5-7 µm.
Basidiospores broadly elliptical to subglobose, golden yellow to rusty brown, 4-6 x 3-4 µm.
Substrata. Dead hardwoods of numerous genera.
Distribution. Widespread in the tropics.
Remarks. Characteristic is the dark velvety pileus with a distinct crust, distinctly stratified tubes separated by context-layers, and the wide context hyphae.

Phellinus griseoporus D. Reid,
Mem. N. Y. Bot. Gard. 28:192, 1976.
Basidiocarps perennial, solitary, pileate, dimidiate to semicircular or almost pen-

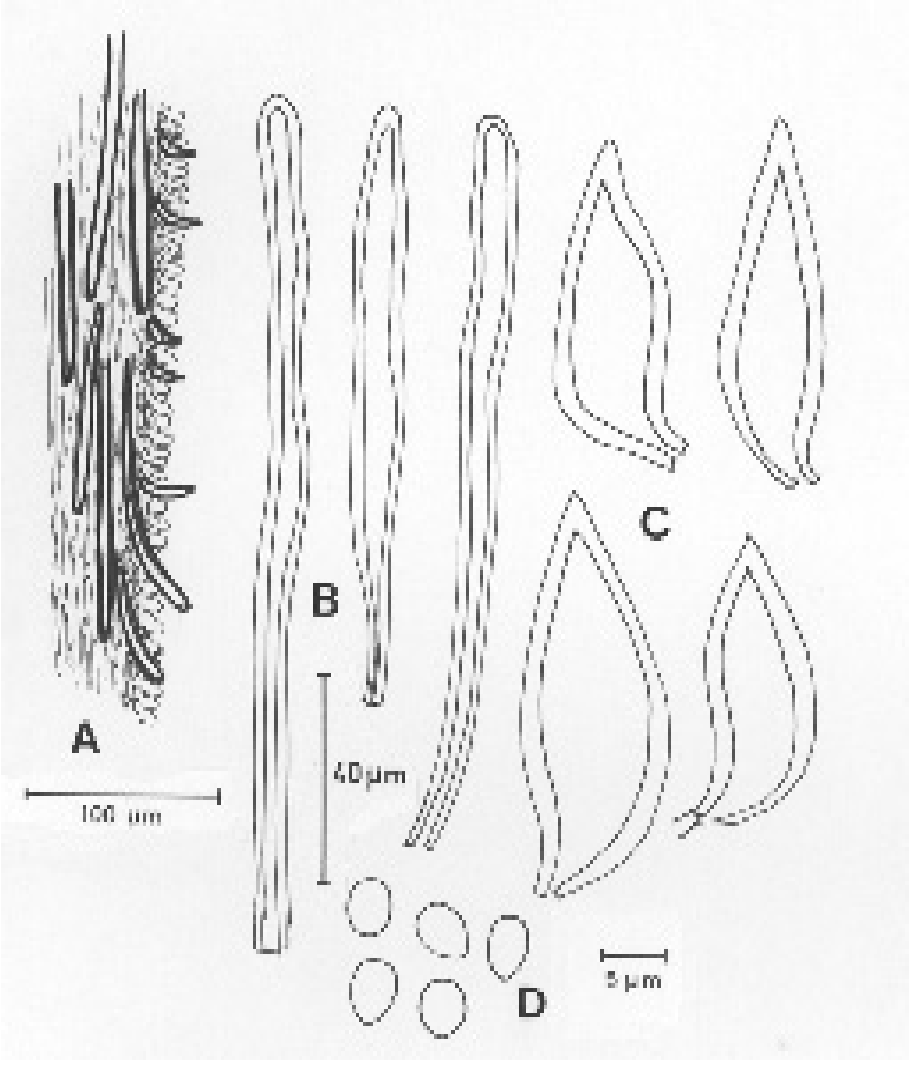


Fig. 83. *Phellinus lamaensis* A) setal hyphae, B) hymenial setae and C) basidiospores. From the lectotype.

dant, convex up to 6 cm broad and wide and 4 cm thick near the base, light to medium in weight, woody when dry, upper surface first finely minutely pruinose, later glabrous, first yellowish brown, later dark brown and zonate and then with a distinct indurated dark crust, margin acute to obtuse, pore surface first ashy grey, later brownish with a glaucous tint, pores round and regular, 6-7 per mm, dissepiments entire, thin- to fairly thick-walled, tubes up to 5 cm deep, context fulvous to yellowish

brown, 1.5-10 mm thick, homogeneous.
Hyphal system dimitic, generative hyphae, hyaline to pale yellow, thin- to slightly thick-walled, 2.5-3 µm in diameter, skeletal hyphae yellow to bay, thick-walled with a distinct lumen, 3-5 µm wide in the tubes, up to 8 µm wide in the context.
Hymenial setae absent.
Basidia subglobose, 12-15 x 7-8 µm with 4 sterigmata.
Basidiospores globose, hyaline, 4.0-5.5 µm in diam.
Substrata. Dead hardwoods.
Distribution. Known only from the type locality in Costa Rica.
Remarks. The ashy grey colour of the pore surface characterises this species besides the lack of setae and the small hyaline basidiospores.

Phellinus lamaensis (Murrill) Heim,
Fig. 83
Ann. Crypt. Exot. 7:21-22, 1934. - *Pyropolyporus lamaensis* Murrill, Bull. Torrey Bot. Club 34:479, 1907.
Basidiocarp dimidiate, subspathulate to lobate, 2-15 cm long and 4-25 cm wide, 0.2-3 cm thick, more or less of even thickness, applanate, upper surface strongly concentrically sulcate in narrow to wide zones, first covered with a depressed tomentum in shades of fulvous, bay to ferruginous, soon more glabrous and then dark brown to blackish, often partly shiny and glossy, near the margin more persistent velutinate and of paler colour, a thick cuticle present, margin entire or lobed, blunt to acute, pore layer umber to dark fuscous or bay, pores round, 8-10 per mm, almost invisible to the naked eye, dissepiments entire and quite thick, tubes often stratified in layers 1-10 mm thick, separated by white lines of context tissue, 0.3-1 mm thick, context woody hard, 2.5-10 mm thick, bright yellow-brown to dark cinnamon, but paler and strongly contrasting with the tubes, blackening in KOH, in older specimens with white mycelial strands from the base, below the tomentum or on glabrous specimens there is a very hard dark cuticle 0.3-1.2 cm thick.
Hyphal system dimitic, generative hyphae hyaline to pale yellow, thin-walled and 3-7 µm wide, often collapsed and agglutinated in dry specimens, the white strands in the context of older specimens consists of such hyphae, skeletal hyphae abundant, agglutinated, yellow to rusty brown, thick-walled 3-5 µm wide.
Setal hyphae present in the trama, yellow to dark rusty brown, 5-8 µm wide, partly running parallel to the tube walls, partly projecting into the hymenium and above it, obtuse to rounded, in the younger parts of the dissepiments and in the context often somewhat difficult to separate from ordinary skeletal hyphae, which, however, in this species usually are of a small diameter, length of setal hyphae variable, 50 to 150 µm.
Hymenial setae abundant, slender to ventricose, acute, usually easy to distinguish from projecting setal hyphae, rusty brown, 20-45 x 5-8 µm, often with a bent base.
Basidiospores sub-globose to almost round, smooth, thin-walled, hyaline to pale

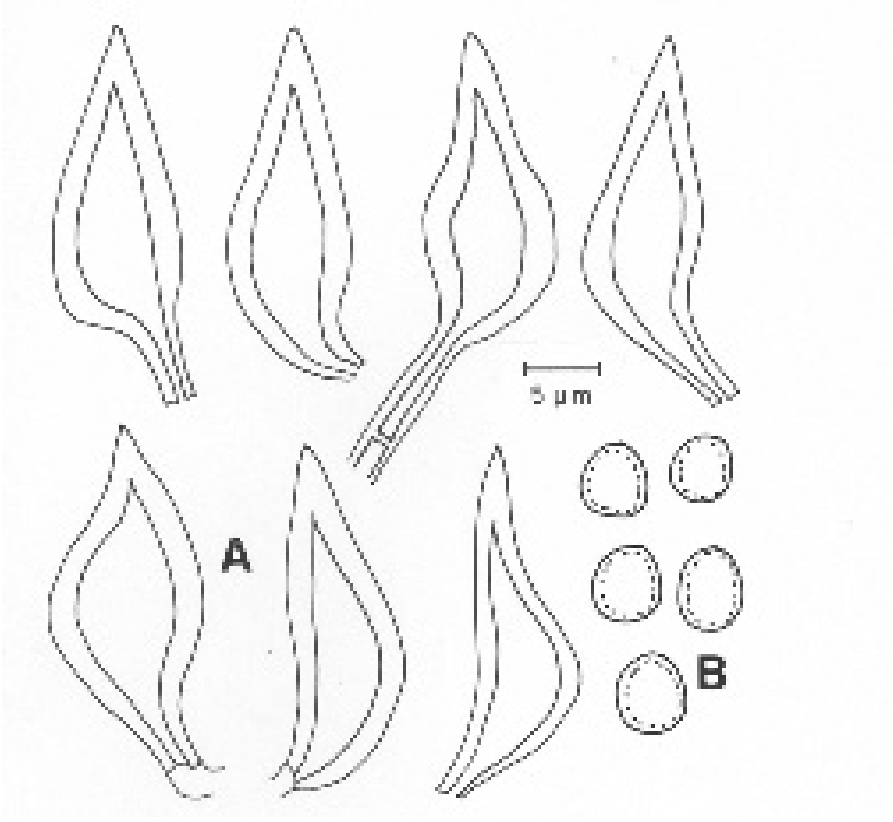


Fig. 84. *Phellinus linteus,* hymenial setae and basidiospores. From the lectotype.

yellow with age, 3-4 µm in diameter.
Substrata. Both on living and dead angiosperms.
Distribution. Pantropical, and in the neotropics known from Puerto Rico, Guatemala and Brazil (Fidalgo 1968).
Remarks. The species is recognised by its obtuse setal hyphae, which, however, in the dissepiments and sometimes also in the context are difficult to recognise as they are much narrower than usual for setal hyphae, mostly 5-7 µm wide. It is separated from *P. noxius*, which also have obtuse setal hyphae, but has no hymenial setae. Further, the basidiocarps of *P. lamaensis* are frequently applanate, of an even thickness, and with numerous sulcate zones, while those of *P. noxius* are far more irregular, often effused reflexed, semiungulate etc. and with few wider zones.

Phellinus linteus (Berk. & Curt.) Teng,
Fig. 84

Fungi of China, p. 467, 1964. - *Polyporus linteus* Berk. & Curt., Proc. Amer. Acad. (Boston) 4: 122, 1860.
Basidiocarps perennial, sessile, dimidiate to elongate, up to 9 x 11 x 6 cm, hard and woody; upper surface dark chestnut brown, matted-woolly to scrupose, concentrically zonate and shallowly sulcate, in age becoming blackened and deeply rimose with radial and concentric cracking into rectangular blocks; margin acute to rounded, pale brown to greyish, narrowly sterile below; pore surface dark reddish brown to fulvous, pores round to angular, 5-7 per mm, with thin, entire dissepiments; tube layers indistinct, slightly paler than context, single layers up to 6 mm thick, context golden brown and lustrous to darker dull brown, faintly concentrically zonate, woody, up to 2.5 cm thick.
Hyphal system dimitic; generative hyphae hyaline, 2-4 µm wide; skeletal hyphae dark brown and thick-walled to golden brown and moderately thick-walled in KOH, rarely branched, 3.5-8 µm in diam.
Hymenial setae abundant to infrequent in the hymenium, thick-walled, mostly subulate, 17-35 x 6-8 µm.
Basidia broadly clavate, 11-13 x 6-7 µm.
Basidiospores ovoid to subglobose, pale golden brown, slightly thick-walled, 4.5-6 x 4-5 µm.
Substrata. Dead hardwoods in many genera.
Distribution. Apparently circumglobal in tropical and subtropical regions.
Remarks. The pale golden brown, ovoid to subglobose basidiospores and the variably abundant setae are distinctive characters of *P. linteus.*

Phellinus longisetulosus Bond. & Herrera,
Mikol. Fitopatol. 14:476, 1980.
Basidiocarps perennial, resupinate, soft to tough and fibrous, 2-5 mm thick, pore surface fulvous to yellowish brown, pores round and regular, 4-7 per mm, dissepiments entire, thin- to fairly thick-walled, tubes 1-4 mm long, context fulvous to rusty brown, 1.5 mm thick,
Hyphal system dimitic, generative hyphae hyaline to pale yellow, thin- to slightly thick-walled, 1.5-3 µm in diameter, skeletal hyphae yellow to bay, thick-walled with a distinct lumen, 2-3 µm wide.
Setal hyphae present, 70-130 x 6-9 µm.
Hymenial setae absent.
Basidia not seen.
Basidiospores elliptical, hyaline, 4-5.5 x 2.8- 3.3 µm.
Substrata. Unknown hardwood.
Distribution. Known from the type locality in Cuba and Costa Rica.
Remarks. The species is recognised by its resupinate basidiocarps and the long setal hyphae.

Phellinus luteus Ryvarden nov. sp**.** Fig. 85

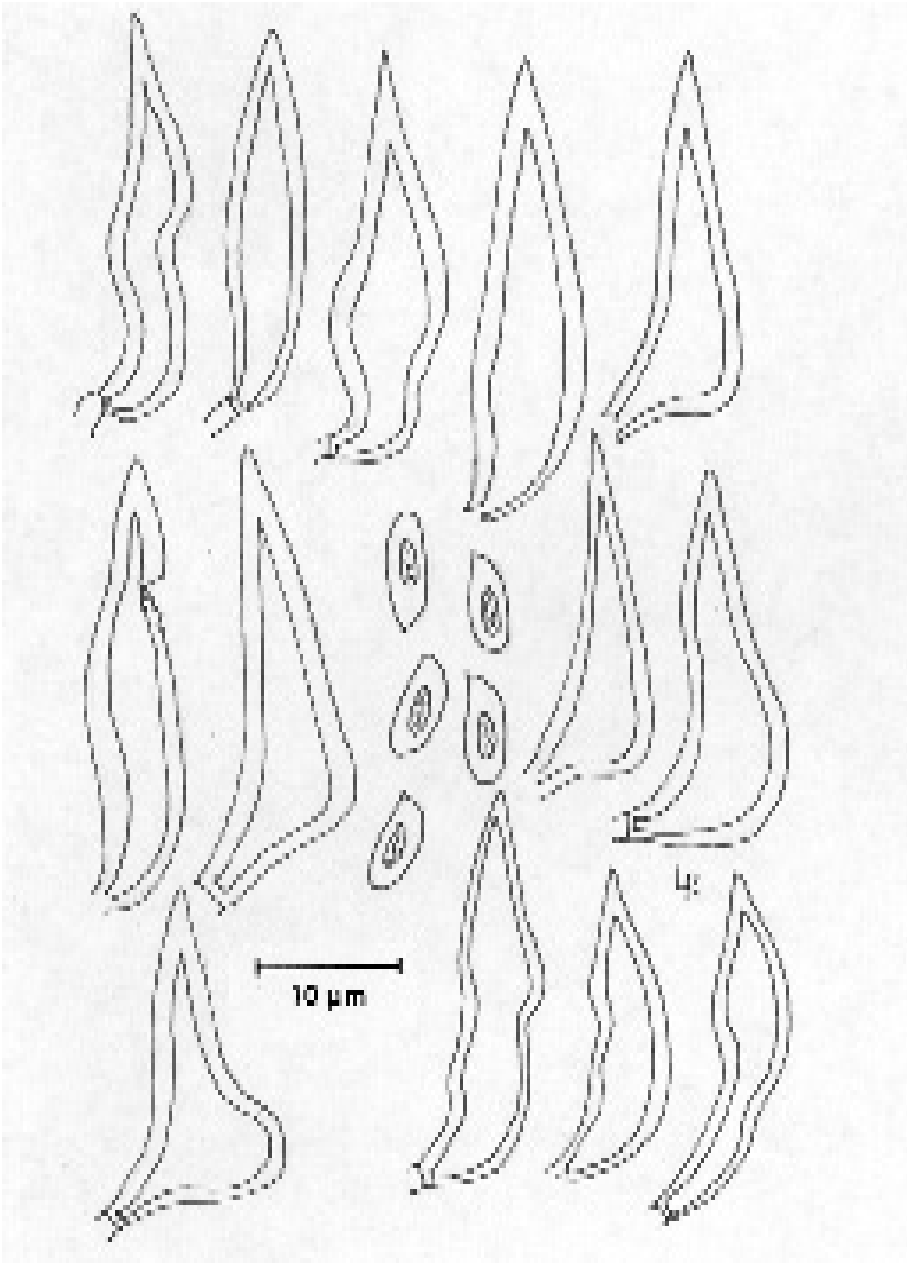


Fig. 85. *Phellinus luteus,* hymenial setae and basidiospores. From the holotype.

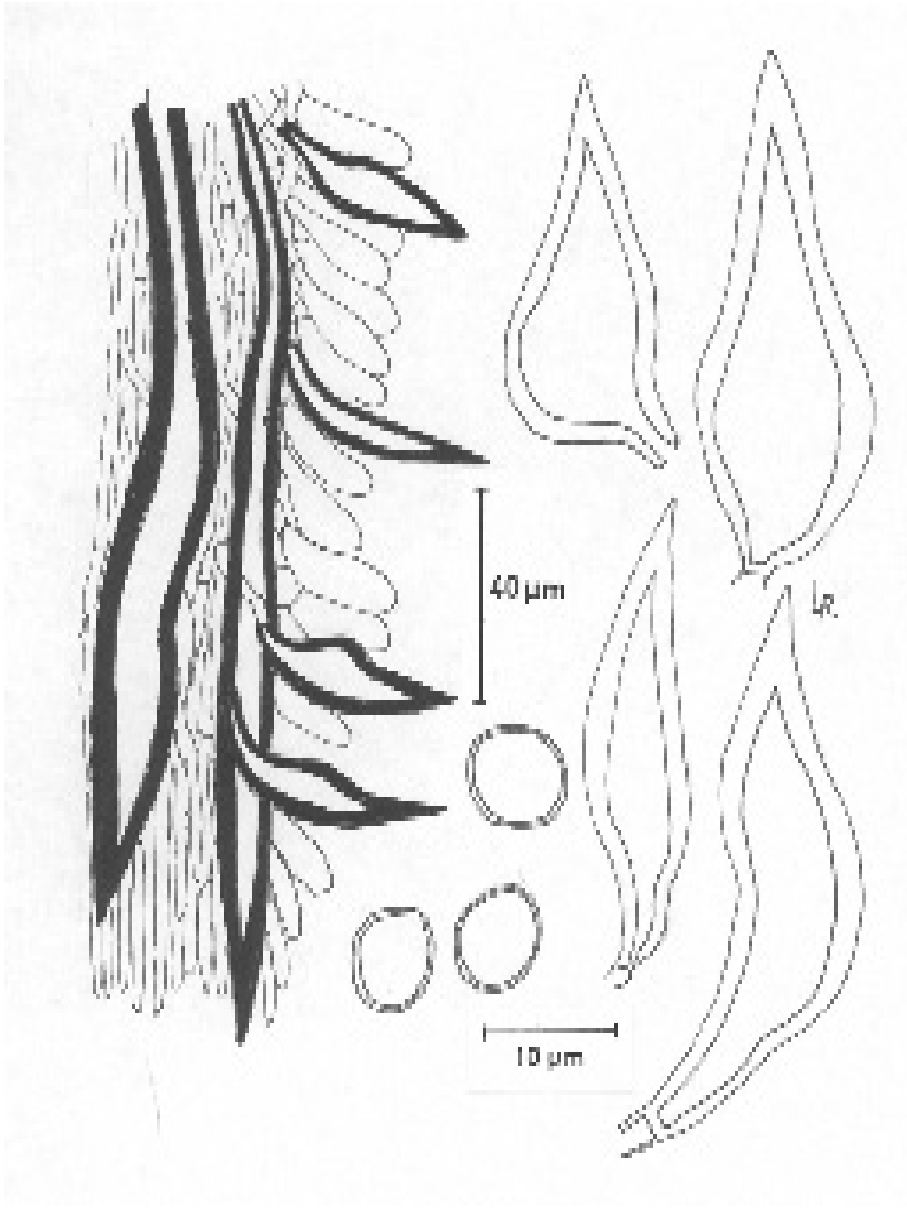


Fig. 86 *Phellinus macrosporus* Section through tube wall, hymenial setae and basidiospores. From the holotype.

Phellinus macrosporus Gibertoni & Ryvarden,
Fig. 86
Synopsis Fung. 18:51, 2004.
Basidiocarps perennial, resupinate, hard when dry, margin very narrow, pore surface dark rust brown, pores round, 7-8/mm, dissepiments thin, tubes concolorous with pore surface, up to 1.0 cm thick, context deep brown, reduced to absent.
Hyphal system dimitic, generative hyphae hyaline, thin-walled, 2.7-4.5 µm; skeletal hyphae yellowish to brown, thick-walled, 2.7-4.5 µm.
Tramal setae lanceolate, thick-walled, dark brown, acute, 50-80 x 9-12 µm.
Hymenial setae subulate to ventricose and usually hooked, 25-35 x 8.0-10.0 µm.
Basidia clavate, 10- 13 x 5.4-6.3 µm with four sterigmata.
Basidiospores globose, hyaline, smooth, 6.3-7.2 µm.
Substrata. Unknown hardwood.
Distribution: Known only from the type locality in Brazil.
Remarks: The species is remarkably similar to *Phellinus rufitinctus* (Cooke) Pat., as the basidiocarp, the setal hyphae and the hymenial setae are identical to those of that species. The basidiospores are however, much larger (2.5-4.5 x 2-3 µm in *P. rufitinctus)*.

Phellinus mangrovicus (Imazeki) Imazeki
Bull. Forest. Exp. Sta. Meguro 57:114, 1952. – *Fomes mangrovicus* Imazeki, J. Japan Bot. 17:176, 1941.
Basidiocarp perennial, pileate, broadly attached, applanate and conchate, up to 10 cm long, 6 cm wide and 2 cm thick at the base, margin round, woody hard, pileus glabrous, black and sulcate in concentric zones, pore surface dark brown, pores small, 6-7 per mm, almost invisible to the naked eye, tubes concolorous, up to 4 mm deep, context ferruginous brown, 1-4 mm thick, in parts with a thin black line,
Hyphal system dimitic, generative hyphae hyaline, 2-3 µm wide, skeletal hyphae dominating, yellow to rusty brown, 2.5-5 µm wide.
Hymenial setae absent.
Basidiospores globose, yellow to rusty brown 5 -6 x 5 µm.
Substrata. On dead *Rhizophorae mangle* in Brazil, in Japan on unknown host.
Distribution. A rare species, in America only reported from Brazil (Acta Bot. Brazil. 14:263-265, 2000). Otherwise known from Kusai in Japan.
Remarks. The species may be recognised by the black glabrous pileus, the lack of setae and globose rusty brown spores. The habitat should also be a good characteristic. The species is certainly overlooked as few mycologists have done serious and long lasting collecting of wood-inhabiting fungi in the mangrove forests.

Phellinus maxonii (Murrill) D Reid,
Kew Bull. 35:867, 1981. - *Fomitopora maxonii* Murrill, North. Am. Fl. 9:11, 1907.
Basidiocarps perennial, resupinate, pulvinate with receding pore surface, woody,

not readily separable; margin at first sulphurous yellow becoming more brilliant yellowish-brown, up to 2 cm wide, receding, becoming black and rimose in older specimens; pore surface yellowish- to greyish-brown, dull, smooth, the pores circular, 4-6 (7) per mm, the dissepiments thin-walled entire, context bright golden to yellowish brown, up to 2 mm thick; tube layers concolorous, single layers up to 6 mm thick.
Hyphal system dimitic, skeletal hyphae thick-walled, but with a distinct lumen, 1.5-3.5 µm wide, generative hyphae hyaline, thin-walled; 1.5-3 µm wide.
Hymenial setae absent.
Basidia broadly clavate, 13-20 x 7-9 µm.
Basidiospores broadly ovoid to subglobose, hyaline, strongly dextrinoid, 5-6 µm in diam.
Substrata. Dead hardwoods.
Distribution. Costa Rica, Belize and Galapagos.
Remarks. This species comes very close to *P. punctatus*, separated only by slightly smaller basidiospores, the brilliant yellowish margin and slight larger and somewhat more angular pores. The pulvinate basidiocarps, the globose dextrinoid basidiospores and the lack of setae are characters shared by the two species.

Phellinus membranceus Wright & Blumenf.,
Mycotaxon 21:422, 1984.
Basidiocarps annual, resupinate, becoming widely effused, woody, not readily separable; margin at first yellowish-brown, pore surface pale brown to greyish-brown, dull, smooth, the pores circular, 5-9 per mm, tubes concolorous, up to 5 mm thick, context brown up to 1 mm thick.
Hyphal system dimitic; skeletal hyphae thick-walled, yellowish brown in KOH, 3-5.5 µm in diam; generative hyphae thin-walled, hyaline to pale golden yellow, 3-6 µm in diam.
Hymenial setae absent.
Basidia broadly clavate to subglobose, 7-11-3-4 µm.
Basidiospores ellipsoid, hyaline to pale yellow, 3-4 x 2.5-3 µm.
Substrata. Dead hardwoods.
Distribution. Known from Northern Argentine, Brazil, Costa Rica and Panama.
Remarks. The resupinate, very hard basidiocarps, the lack of setae and the small, hyaline basidiospores should be sufficient to recognise this species.

Phellinus melleoporus (Murrill) Ryvarden,
Mycotaxon 23:169-198, 1985. - *Fomitoporella melleopora* Murrill, North Am. Flora 9:13, 1907.
Basidiocarps perennial, resupinate, becoming widely effused; pore surface golden brown to dark purplish brown in older specimens, pores angular, 4-6 per mm with thin, entire dissepiments; subiculum reddish brown, tough fibrous, azonate, up to 2

mm thick, sometimes with a black crustose layer next to the substratum; tube layers indistinctly stratified, concolorous with subiculum, up to 6 mm thick.
Hyphal system dimitic; skeletal hyphae thick-walled, 3.5-7 µm in diam, some with uneven wall thickening; generative hyphae hyaline to pale yellowish, thin- to firm-walled, 2.5-3.5 µm in diam; trama composed mainly of generative hyphae.
Hymenial setae absent.
Basidia broadly clavate, 10-12 x 6-7.5 µm.
Basidiospores ovoid to ellipsoid, pale golden yellow, 4-5 x 3-3.5 µm.
Substrata. Dead hardwoods of many kinds.
Distribution. Gulf Coast Region in United States to South America.
Remarks. The lack of setae, small pale golden yellow basidiospores, and resupinate basidiocarps distinguish *P. melleoporus*. P. *umbrinellus* is similar, but has brown basidiospores.

Phellinus merrillii (Murrill) Ryvarden,
Norw. J. Bot. 19:234, 1972. - *Pyropolyporus merrillii* Murrill, Bull. Torrey Bot. Club 34:479, 1907. - *Phellinus minutiporus* Bond. & Herrera, Mikol. Fitopatol. 14:479, 1980.
Basidiocarps perennial, sessile, dimidiate to ungulate, up to 5 cm wide, 5 cm thick, and 10 cm long; upper surface reddish brown, matted tomentose to coarsely scrupose, rugose and shallowly concentrically sulcate, in age becoming blackened and rimose; margin yellowish brown, tomentose, rounded, narrowly sterile below; pore surface dull purplish brown, glancing with a golden lustre when viewed obliquely, pores circular, 7-10 per mm, with thick, entire dissepiments; tube layers indistinctly stratified, yellowish brown, woody, trama of oldest layer merging into context, aggregate tube layers up to 4 cm thick, context with a shiny golden lustre on broken surfaces, hard and woody, up to 2 cm thick, concentrically zonate with darker zones, sometimes becoming dense and resinous, in some specimens the context is a very thin layer of dense, crust like tissue and the basidiocarp is made up almost entirely of old tube layers;.
Hyphal system dimitic; skeletal hyphae thick-walled, yellowish brown in KOH, 3-5.5 µm in diam; generative hyphae thin-walled, hyaline to pale golden yellow, 2.5-4.5 µm in diam.
Hymenial setae or other sterile hymenial elements absent.
Basidia broadly clavate, 12-14.5 x 6.5-7.5 µm.
Basidiospores subglobose to globose, pale golden brown, 5-6 x 4-5 µm.
Substrata. On dead hardwoods.
Distribution. Specimens have been examined from Brazil and Costa Rica.
Remarks. The globose, pigmented basidiospores, lustrous context, and lack of setae characterise *P. merrillii.* Only the smaller pores separate this species from *P. rimosus* (4-5 per mm), a doubtful distinction and ultimately it may be treated as a synonym of this species.

Phellinus neocallimorphus Gibertoni & Ryvarden,
Synopsis Fungorum 18:53, 2004.
Basidiocarps perennial, pileate applanate, dimidiate to conchate or more broadly attached, semicircular to elongated in shape, up to 3 cm wide and 5 cm long, up to 2 cm thick, margin rounded, consistency woody hard in thickened specimens, pileus dark reddish-brown to black, first finely velutinate, soon glabrous and black with a distinct thin cuticle, smooth to distinctly sulcate in narrow bands, pore surface cinnamon in actively growing specimens, deep umber brown in old ones and then slightly shiny when turned in incident light, pores very small, angular, thin-walled, 7-9 per mm invisible to the naked eye, up to 1.2 cm deep, non-stratified, concolorous with the pore surface context dark reddish-brown with faint black lines reflecting earlier stages of growth, up to 4 mm thick at the base.
Hyphal system dimitic, generative hyphae thin-walled, hyaline and 1.5-3 µm wide, skeletal hyphae golden to pale rusty brown, thick-walled, 3-5 µm wide.
Hymenial setae absent.
Basidia not seen.
Basidiospores oblong ellipsoid to sub-cylindrical, slightly thick-walled, hyaline to slightly pale yellow, 3.5-4.5 x 2-2.5 µm.
Substrata. On dead unknown hardwood.
Distribution. Known only from the type locality in Brazil.
Remarks. The species is undoubtedly close to the paleotropic species *P. callimorphus* (Lev.) Ryvarden, which however numerous hymenial setae. The oblong ellipsoid to almost sub-cylindrical basidiospores are diagnostic for this species. It is easily separated from species like *P. senex* by its narrow basidiospores.

Phellinus neonoxius Ryvarden nov. sp.
Fig. 87
Ad *Phellinus noxius* Corner, sed hyphae setales acutae et sporae 4-5 x 3.5-4 µm. (3.5-4.5 x 3-3.5 µm in *P. noxius*).
Holotype: Panama: Hills between Capria and Potrero, 30. December 1938, leg. C. W. Doge & A. A. Hunter. BPI, isotype in O.
Basidiocarp perennial, solitary, pileate, sessile, consistency woody hard and light in weight when dry, pileus flat, up to 4 cm long, 2.5 cm broad and 8 mm thick, upper surface first finely velvety and pale ferruginous to umber in concentric zones, margin round, pore surface fulvous to dark bay or fuscous, pores small and round, 7-9 per mm, usually invisible to the naked eye, dissepiments entire and fairly thick, tubes dark brown, up to 4 mm deep at the base, context to 4 mm thick with a black zone below the thin pileus tomentum, yellow cinnamon to ferruginous.
Hyphal system dimitic, generative hyphae hyaline to pale yellowish, 2- 4(5) µm in diameter, skeletal hyphae yellow to bay, agglutinated in the tubes, more easily

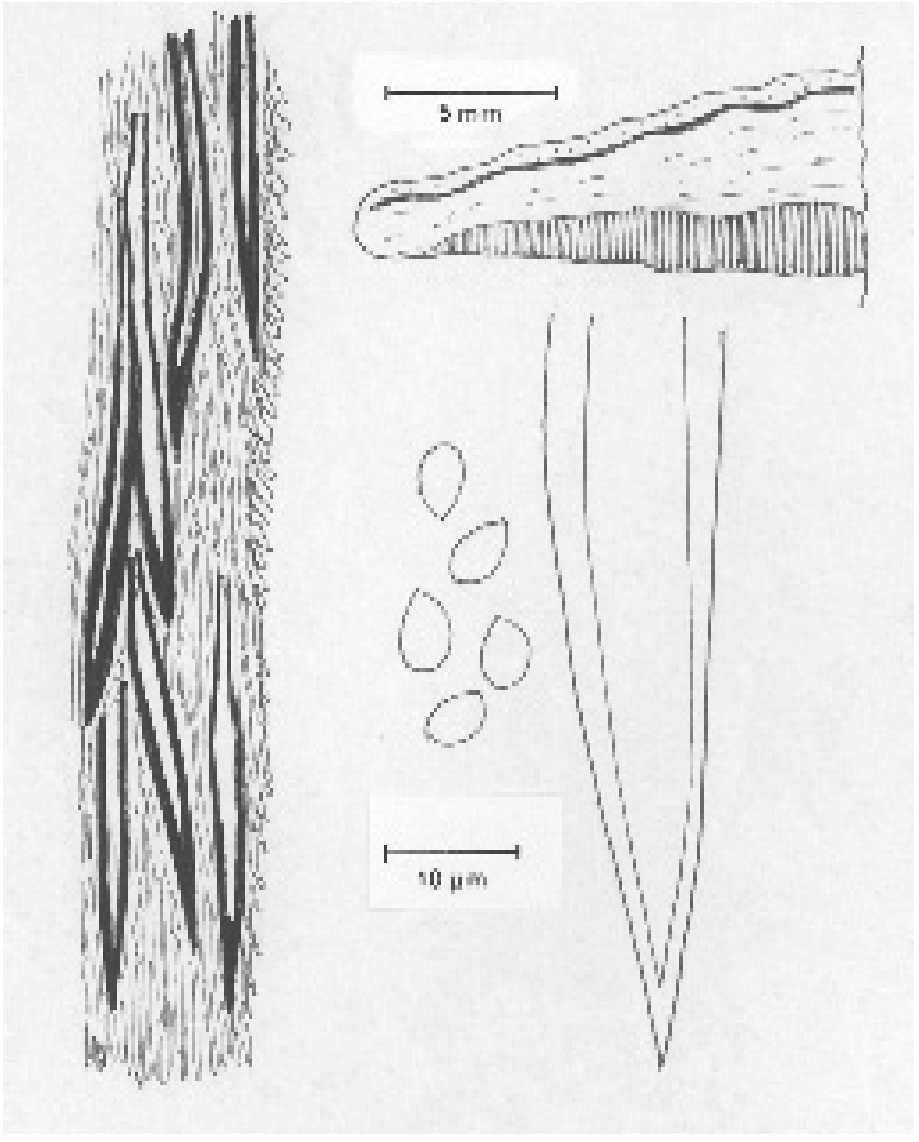


Fig. 87. *Phellinus neonoxius,* Section through the basidiocarp, section through a tube, apical part of a setal hyphae and basidiospores. From the holotype.

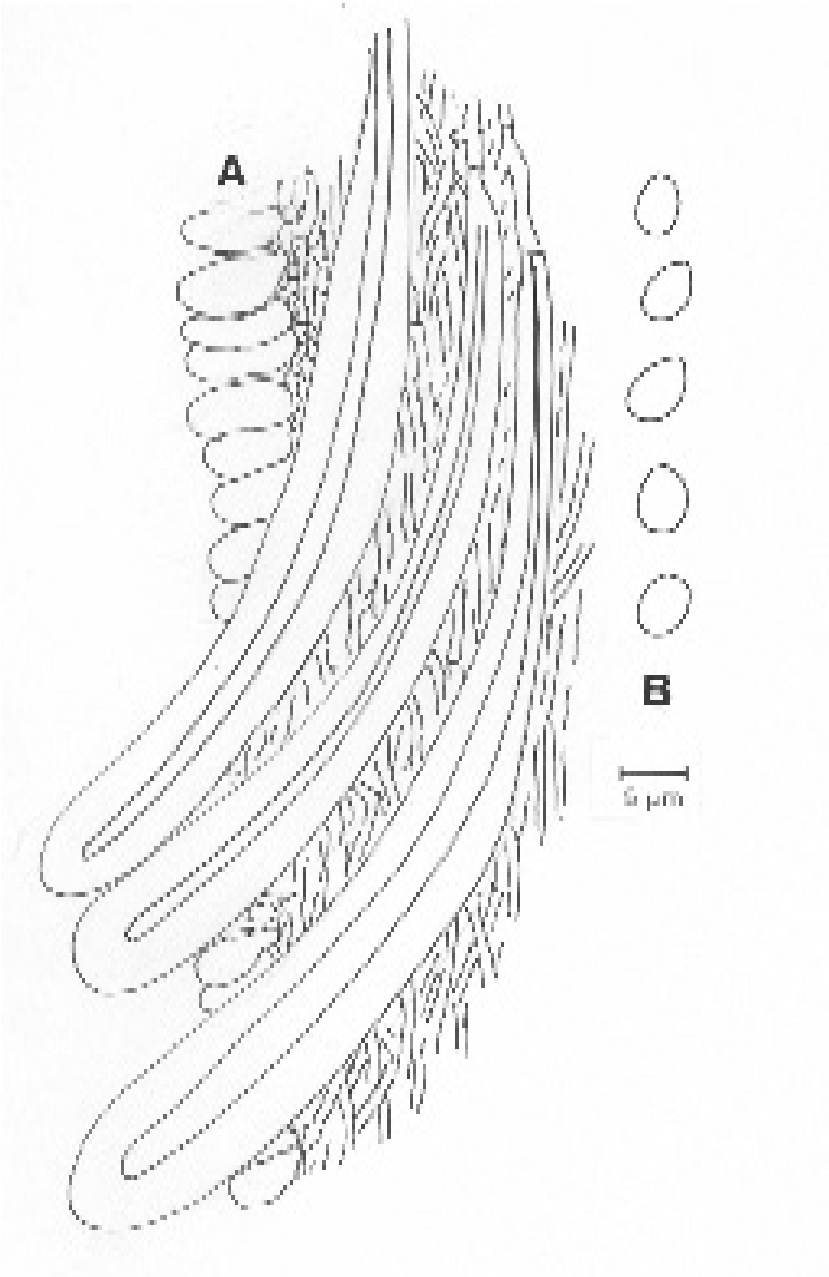


Fig. 88. *Phellinus noxius,* A) section through tube wall, and B) basidiospores. From the lectotype.

demonstrated and abundant in the context, 3-6 µm wide.
Setal hyphae abundant in the trama, thick-walled, pointed 10-25 µm wide and up to 100 µm long, embedded and not projecting.
Hymenial setae absent.
Basidiospores subglobose, hyaline and thin-walled, 4-5 x 3.5-4 µm.
Substrata. On dead hardwood.
Distribution. Known only from the type locality.
Remarks. This new species is undoubtedly related to *P. noxius* but easily separated by its huge acute setal hyphae (rounded – obtuse in *P. noxius*). The spores are also larger than in *P. noxius*. The type collection consists of relatively small basidiocarps, and it remains to see whether this reflect the true range of sizes.

Phellinus noxius (Corner) G. Cunningh.,
Fig. 88
N. Zeal. Dep. Sci. Ind. Res. Bull. 164:221, 1965. - *Fomes noxius* Corner, Gard. Bull. Straits Settlem. 5:342-45, 1932.
Basidiocarp perennial, solitary to imbricate, pileate broadly attached, effused-reflexed to resupinate, consistency woody hard and light in weight when dry, pileus dimidiate, flat or semi-ungulate, up to 13.5 cm wide, 25 cm broad and 1-5.5 cm thick, upper surface first finely velvety and pale ferruginous to umber in concentric zones, soon glabrous in irregular sulcate pattern or zones and dark brown to black, covered with a 0.2-1 mm thick resinous hard crust, thinner towards the margin. Margin round, entire and often undulating, paler than the rest of the pileus, pore surface fulvous to dark bay or fuscous, pores small and round, 8-10 per mm, usually invisible to the naked eye, dissepiments entire and fairly thick, tubes distinctly stratified, each layer separated by a 1-3 mm thick dark brown context layer, totally up to 11 mm thick, context usually 0.3-2 cm thick, homogeneous but with concentric zones reflecting different growth stages, yellow cinnamon to ferruginous, paler than the tubes, blackening in KOH, often with radially oriented white mycelial strands.
Hyphal system dimitic, generative hyphae in the tubes and the context thin-walled, hyaline to pale yellowish, 2- 4(5) µm in diameter, often collapsed, skeletal hyphae yellow to bay, highly agglutinated in the tubes, more easily demonstrated and abundant in the context, 3-6 µm wide.
Setal hyphae abundant in the trama, thick-walled, obtuse, 7.5-13 µm wide and up to 100 µm long, usually projecting into the hymenium, in the context yellow to ferruginous, obtuse to acute, 5-10 µm wide and up to 700 µm long.
Hymenial setae absent.
Basidiospores broadly elliptical to oval, hyaline and thin-walled, 3.5-4.5 x 3-3.5 µm.
Substrata. On dead hardwoods.
Distribution. Pantropical, but rare in tropical America, known from Dominican Republic, Venezuela and Brazil.

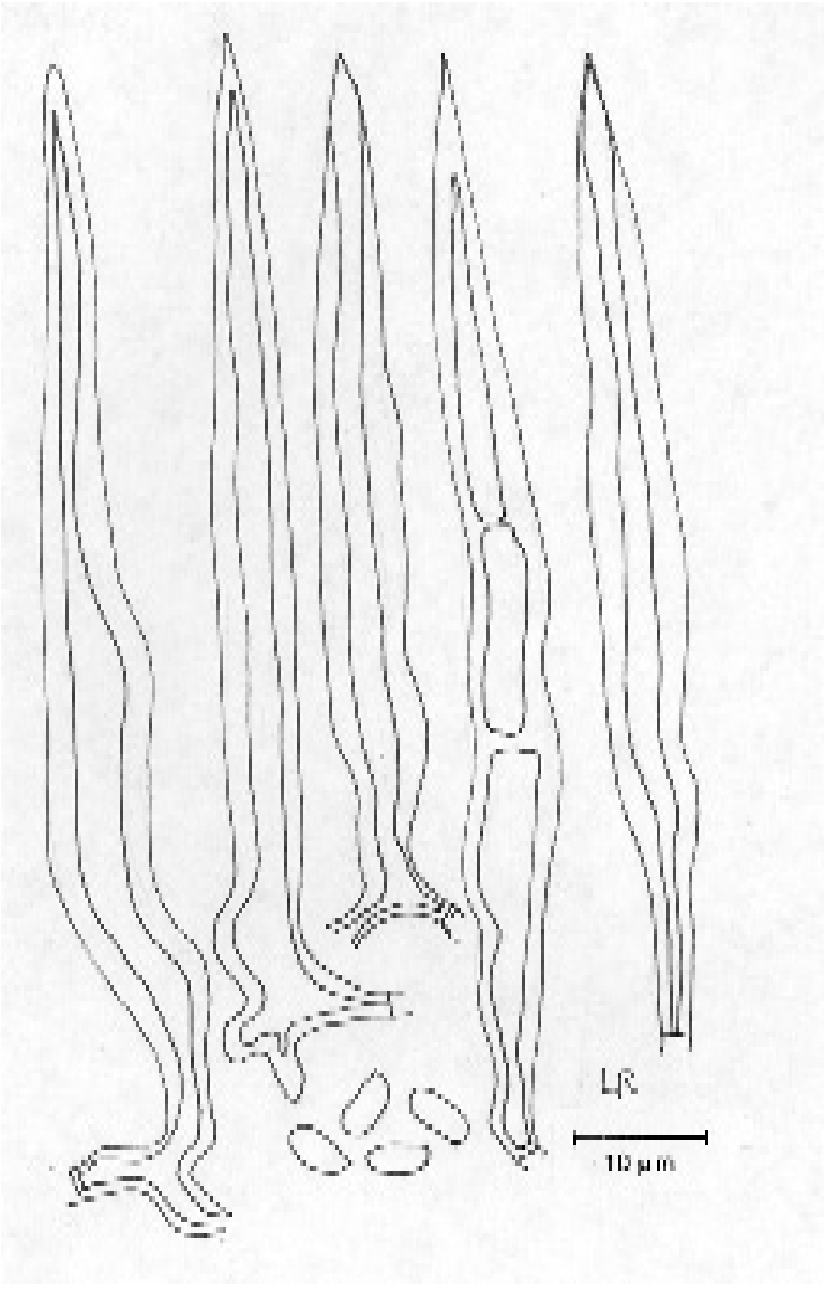


Fig. 89. *Phellinus palmicola,* hymenial setae and basidiospores. From the lectotype.

Remarks. *P. noxius* is recognised by its obtuse setal hyphae partly projecting into the hymenium and the absence of hymenial setae.

Phellinus orientalis Bond. & Herrera,
Mikol. Fitopatol. 14:478, 1980.
Basidiocarps resupinate, annual to biennial, effused, pore surface dark brown when mature or dry, more golden yellow when young and actively growing, pores round to angular, fairly wide, 3-5 per mm, tubes concolorous, up to 2 mm deep; context very thin, deep cinnamon to reddish-brown.
Hyphal system dimitic; generative hyphae 1.5-3 µm wide; skeletal hyphae yellow to reddish-brown, 2-4 µm wide.
Hymenial setae subulate, straight, thick-walled, 25-55 x 4.5-7 µm.
Basidia not seen.
Basidiospores subglobose, hyaline, thin-walled, 4.5-6 x 3.5-5.5 µm.
Substrata. Dead hardwood.
Distribution. Known only from Cuba.
Remarks. The species is characteristic by its hyaline basidiospores and long subulate setae.

Phellinus palmicola (Berk. & Curt.) Ryvarden,
Fig. 89
Norw. J. Bot. 19: 235, 1972. - *Polyporus palmicola* Berk. & Curt., J. Linn. Soc. Bot. 10:317, 1868.
Basidiocarps resupinate, annual to biennial, effused, rather soft and brittle, adnate or separable, up to 2 mm thick, margin narrow, bright reddish brown; pore surface reddish brown when mature or dry, more golden yellow when young and actively growing, pores round to angular, fairly wide, 1-2 per mm, tubes concolorous, up to 2 mm deep; context very thin, deep cinnamon to reddish-brown.
Hyphal system dimitic; generative hyphae 1.5-3 µm wide; skeletal hyphae yellow to reddish-brown, 2-5 µm wide.
Hymenial setae subulate, straight, often slightly constricted at the base, thick-walled, 50-70 x 5-7 µm.
Basidia not seen.
Basidiospores cylindrical, hyaline, thin-walled, IKI-, 4-5 x 2-2.5 µm.
Substrata. Known with certainty only from palms.
Distribution. Known from Cuba and Mexico.
Remarks. The species is highly characteristic with its soft consistency, large pores and very long subulate setae. It is undoubtedly related to *P. contiguus* which however is firmer, has smaller pores, slightly longer and wider basidiospores and shorter setae.

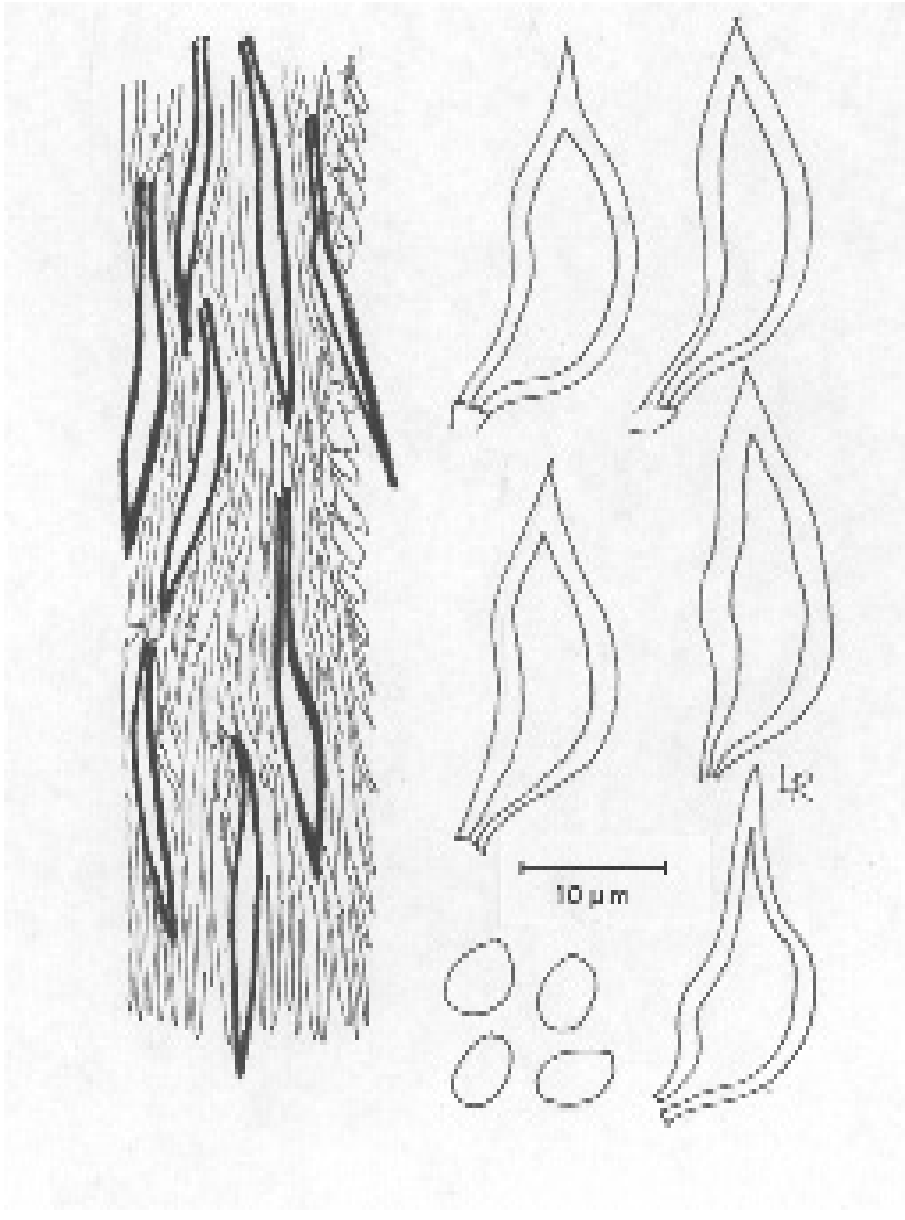


Fig. 90. *Phellinus portoricensis,* A) section though tube walls, B) hymenial setae and C) basidiospores. From the lectotype.

Phellinus piptadeniae Teixeira,
Bragantia 10:118, 1950.
Basidiocarp pileate, applanate to ungulate, solitary, up to 30 cm long, 15 cm wide and 15 cm thick at the base in ungulate specimens, woody hard, pileus first pubescent and dark brown, soon glabrous chestnut grey, sulcate in narrow bands, pore surface dark brown, pores 4-5 per mm, tubes stratified, dark yellowish to deep rusty brown, up to 4 mm thick in individual layers, context deep reddish brown, up to 5 cm thick,
Hyphal system dimitic, generative hyphae 2-3 µm wide, skeletal hyphae thick-walled, golden-brown to rusty, 3-7 µm wide.
Hymenial setae absent.
Basidiospores subglobose, thick-walled, golden brown, 4-5 x 3.5-4 µm.
Substrata. The type was collected on *Piptadenia communis.*
Distribution. Known only from Brazil.
Remarks. The species is closely related to *P. rimosus* , which has slightly larger spores and usually becomes cracked and rimose with age. DNA sequencing is necessary to decide whether *P. piptadeniae* is only a young specimens of *P. rimosus.*

Phellinus portoricensis (Overh.) O. Fidalgo,
Fig. 90
Mem. New York Bot. Gard. 17, no 2:111, 1968. - *Fomes portoricensis* Overh. in Seaver and Chardon, Sci. Surv. Puerto Rico & Virgin Isl. 8:158, 1926.
Basidiocarp perennial, pileate sessile, applanate to effused reflexed, 4-12 cm long and up to 6 cm wide and 1.5 cm thick, woody hard when dry, pileus persistently velutinate in narrow sulcate zones, reddish-brown, some of the older zones becoming black with age and then exposing a black cortex which otherwise is seen in section below the reddish-brown tomentum, margin entire, obtuse and pale brown, pore surface chocolate brown to dark umber, pores tiny, round to slightly angular, almost invisible to the naked eye, 8-10 per mm, tubes mostly distinctly stratified with intermittent layers of brown mycelium, tubes more or less as the pore surface or somewhat paler, context duplex, the lower part dense yellowish to reddish-brown, up to 5 mm thick with some narrow dark dots or lines, superimposed by a dark black line which becomes the crust in old and weathered parts of the basidiocarp, in the younger parts this black line is covered with a looser reddish-brown tomentum.
Hyphal system dimitic, generative hyphae thin-walled, 1.5-4 µm wide, skeletal hyphae dominating in the basidiocarp, thick-walled, yellow to pale rusty brown, 3-6 µm wide.
Setal hyphae present, 7-15 µm wide, up to 250 µm long, acute, thick-walled to solid, in the tubes partly running parallel to the tube walls, partly projecting obliquely into the hymenium and somewhat above it.
Hymenial setae abundant, ventricose, acute, thick-walled, 5-8 x 20-40 µm.
Basidiospores sub-globose, slightly thick-walled, first yellowish, with age pale rusty

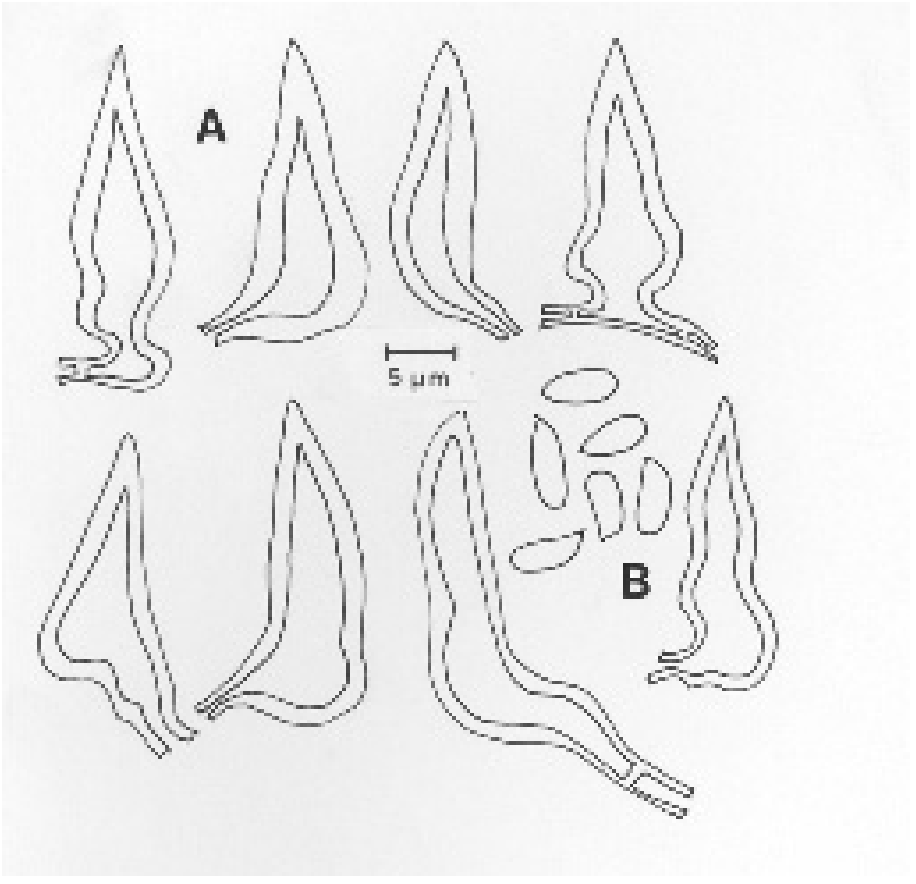


Fig. 91. *Phellinus punctatiformis,* A) hymenial setae and B) basidiospores. From the lectotype.

brown, 3.5-5 x 3-4 µm.
Substrata. On angiosperms.
Distribution. Tropical and sub-tropical America.
Remarks. The species is recognised by its more or less persistent velvety brown tomentum separated from the context proper by a distinct dark line. Further, it is the only species in group of species with setal hyphae that has distinctly coloured basidiospores.

Phellinus punctatiformis (Murrill) Ryvarden,
Fig. 91
Norw. J. Bot. 19:235, 1972. - *Fomitiporia punctatiformis* Murrill, Torrey Bot. Cl.

Bull. 65:661, 1938.
Basidiocarps perennial, resupinate, effused, adnate and up to 7 mm thick; pore surface reddish-brown to cinnamon yellowish; margin reddish-brown, rather narrow, pores small, round 6-7 per mm, tubes concolorous with pore surface, often distinctly stratified, up to 3 mm in each zone; context reddish-brown, fibrous and less than 1 mm thick.
Hyphal system dimitic; generative hyphae thin-walled, 2-5 µm wide, skeletal hyphae of same width, thick-walled, golden brown to rusty.
Hymenial setae acuminate, straight, 18-25(-30) x 4-8 µm.
Basidia not observed.
Basidiospores hyaline, subcylindrical with a tapering base, 4-6 x 1.5-2 µm.
Substrata. On dead, deciduous trees.
Distribution. Specimens have been seen from Puerto Rico, Venezuela and Brazil.
Remarks. The species is easy to recognise by its resupinate basidiocarp, setae and hyaline, subcylindrical basidiospores. *P. ferreus* is similar, but has longer setae and basidiospores.

Phellinus punctatus (Fr.) Pilat
Atlas de Champ. Europe 3:530, 1942. - *Polyporus punctatus* Fr., Hymen. Eur. p. 572, 1874.
Basidiocarps perennial, resupinate, becoming widely effused, woody, not readily separable; margin at first yellowish-brown, tomentose, up to 2 cm wide, receding, becoming black and rimose in older specimens; pore surface yellowish- to greyish-brown, dull, smooth, the pores circular, 6-8 per mm, the dissepiments thick, entire, minutely tomentose; context golden brown to dark reddish brown in older specimens, up to 2 mm thick; tube layers concolorous, single layers up to 6 mm thick.
Hyphal system dimitic, generative hyphae thin walled, 2-4 µm wide, skeletal hyphae dark brown in KOH, thin- to thick-walled, rarely branched, occasionally septate, 2.5-5 µm in diam, some almost hyaline, thinner walled.
Hymenial setae absent; thin-walled, ventricose cystidioid elements usually present.
Basidia broadly clavate, 11-12.5 x 7-8.5 µm.
Basidiospores broadly ovoid to subglobose, hyaline, strongly dextrinoid in Melzer's reagent, 6.5-8.5 x 5.5-7 µm.
Substrata. Dead hardwoods.
Distribution. Circumglobal, but rare in the neotropics, specimens have been seen from Guyana.
Remarks. The thick resupinate basidiocarps, often distinctly stratified, the large globose dextrinoid basidiospores and the lack of setae are sufficient to recognise this species.

Phellinus rhabarbarinus (Berk.) Cunningh.
Fig. 92
New Zeal. Dep. Sci. Indust. Res. Bull. 164:229, 1965. – *Polyporus rabarbarinus*

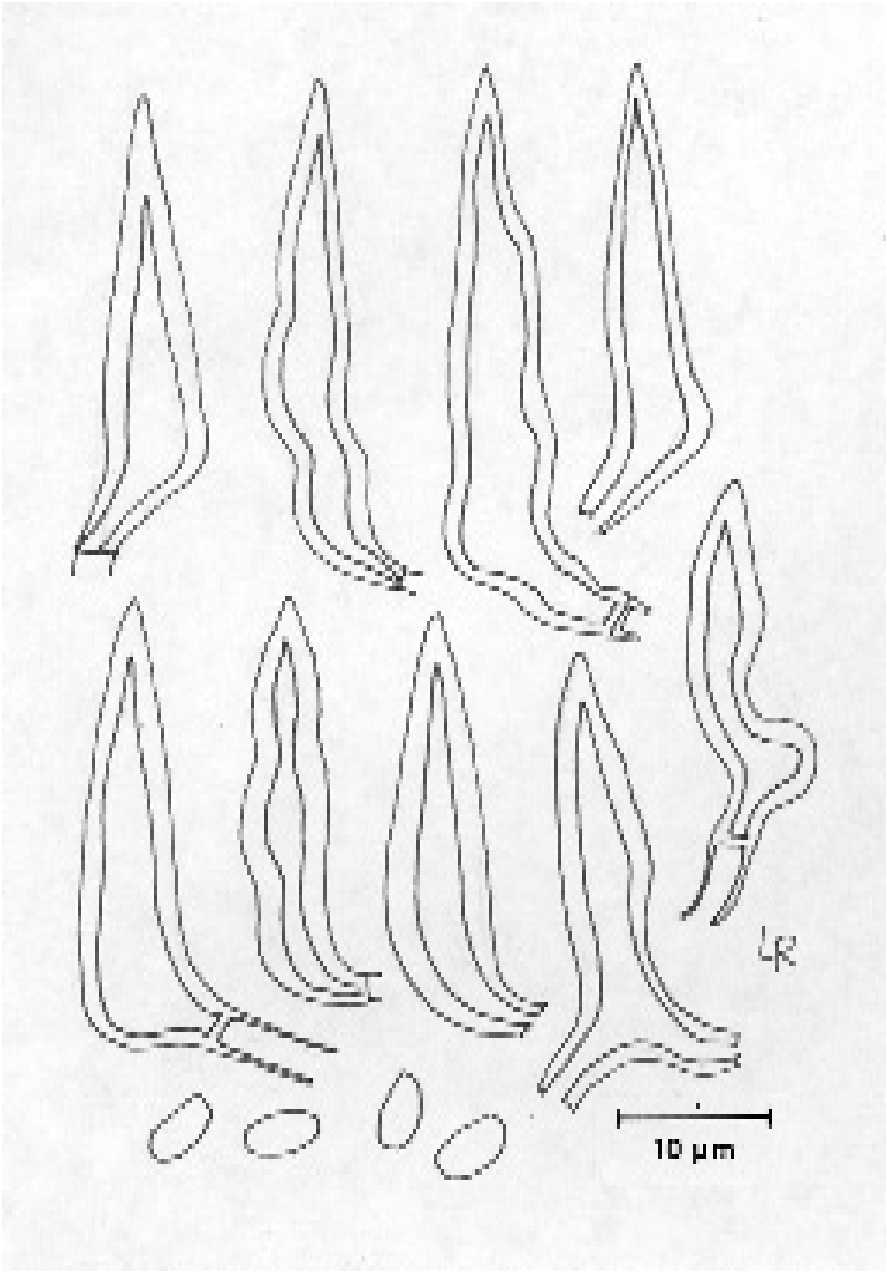


Fig. 92. *Phellinus rhabarbarinus,* hymenial setae and basidiospores. From the lectotype.

Berk. Ann. Nat. Hist. 3:338, 1839. - *Phellinus roseocinereus* (Murrill) D. Reid, Mem. N.Y. Bot. Garden 28:194, 1976. - *Pyropolyporus roseocinereus* Murrill, North Am Fl. 9:104, 1908. – *Phellinus rickii* Teixeira, Bragantia 10:120, 1950. – *Fomes rheicolor* Lloyd, Lloyd Mycol. Writ. 4:245, 1915 ? (sterile).
Basidiocarp pileate, applanate, solitary, dimidiate and semicircular, up to 5 x 8 x 2 cm, woody hard, pileus glabrous, sulcate in narrow bands, dark reddish brown becoming black, pore surface yellowish to reddish brown, pores tiny, 6-9 per mm, tubes stratified, reddish brown, up to 4 mm thick in individual layers, context reddish brown, up to 2 mm thick sometimes with an upper black line developing into a cuticle from the base.
Hyphal system dimitic, generative hyphae 3-5 µm wide, skeletal hyphae thick-walled, golden-brown to rusty, 3-5 µm wide.
Hymenial setae subulate, 20-30 x 4-5 µm.
Basidia subglobose, 8-10 x 6-8 µm.
Basidiospores ellipsoid, hyaline, 3.5-4 x 2-3 µm.
Substrata. On deciduous wood.
Distribution. Cuba, Mexico and Costa Rica.
Remarks. The species is characterised by the glabrous black surface and the fairly small hyaline spores. It may be related to *P. neocallimorphus*, which is separated by lacking setae and having smaller, sub-cylindrical basidiospores.

Phellinus rhytiphloeus (Mont.) Ryvarden,,
Prelim. polypore flora East Afr. p. 206, 1980. - *Polyporus rhytiphloeus* Mont., Ann. Sci. Nat. Ser. 4 Vol. 5:369, 1857.
Basidiocarp pileate, applanate, solitary, dimidiate and semicircular, up to 10 cm wide and long, 3 cm thick at the base, woody hard, pileus glabrous and sulcate in narrow bands, first dark brown but probably soon becoming cinnamon to ochraceous pale brown and in section with a distinct black line below a thin pale upper layer of compact hyphae, black zone 100-250 µm thick, margin round and pale brown, pore surface dark brown, pores tiny, 7-9 per mm, tubes stratified, dark cinnamon, up to 4 mm thick in individual layers, the inner part paler than the younger part, up to 15 mm deep, context bright with a silky lustre, up to 10 mm thick, distinctly lighter than the tubes and becoming red with KOH.
Hyphal system dimitic, generative hyphae 2-3 µm wide, skeletal hyphae thick-walled, golden-brown to rusty, 3-7 µm wide.
Hymenial setae absent.
Basidia not seen.
Basidiospores globose, thick-walled, golden to rusty brown, 4-5 (5.5) µm in diameter.
Substrata. On deciduous wood.
Distribution. Known from Brazil and Venezuela
Remarks. Macroscopically, *P. rhytiphloeus* is similar to *P. grenadensis* , but this

species has setae.

Phellinus rimosus (Berk.) Pilat,
Ann. Mycol. 38:80, 1940. - *Polyporus rimosus* Berk., Lond. J. Bot. 4:54, 1845.
Basidiocarp pileate, perennial, solitary, mostly ungulate to triquetrous with a sloping pileus, semicircular and dimidiate with a contracted base, up to 12 cm wide and long 3-8 cm thick at the base, some specimens may even be larger, margin sharp to rounded, woody hard, pileus first more or less glabrous, except for a narrow marginal zone, fulvous to dark brown, smooth or with a few quite wide sulcate zones, somewhat warted or with irregular protuberances around the basal part, then the upper hyphae become indurated and black and the surface cracks up, both radially and along the sulcate zones and often in a tile-like way so very coarse black polygons of the surface become partly deflexed or bent upwards, finally the whole surface becomes cracked or creviced in black irregular polygons often with a greyish bloom on the top, along the margin there will often in such old specimens be a narrow more smooth and light-coloured zone reflecting new growth, pore surface yellow-brown in actively growing specimens and then pores thin-walled, in older specimens the pores become more occluded and more round and with thicker walls, (3)4-5 per mm, tubes fulvous brown, mostly distinctly stratified, up to 7 cm deep, rather easily sectioned, context rusty to snuff brown, radially fibrillose, but fairly dense and with a fine lustre shine when broken, 0.5-3 cm thick.
Hyphal system dimitic, generative hyphae variable, in the tubes 2.5-4.0 µm wide, yellow to pale rusty brown, simple septate and moderately-branched, in the context there are also some hyphae with distinctly thickened septa and with moderate branching, rusty brown and up to 7 µm wide and with a wide lumen, they must be classified as generative hyphae and are very similar to many hyphae in the context without any trace of septation. Skeletal hyphae 3-5 µm wide and almost solid in the trama, in the context somewhat wider but mixed with septate hyphae of the same kind, and it is difficult to be sure whether only one type of hyphae is present in the context i.e. variably sclerified generative hyphae with very scattered septa. In the material examined by us, it has been easier to differentiate the two types of hyphae in the trama than in the context.
Hymenial setae none.
Basidiospores abundantly present, thick-walled, rusty brown, broadly ellipsoid to sub-globose, 5.5-7 x 4.5-6 µm.
Substrata. On deciduous wood, many collections have been made on trees from Fabaceae (in a wide sense), but also recorded from many other hosts, usually in rather arid areas or with seasonal drought.
Distribution. Widespread in the tropics, but fairly rare in tropical America, specimens seen from San Salvador, Costa Rica and Mexico .
Remarks. The species is usually easy to recognise by the ungulate, black and rimose basidiocarps, the lack of hymenial setae and the round, dark rusty brown spores.

Phellinus robustus (P. Karst.) Bourdot & Galzin,
Hym. France, p. 616, 1928. - *Fomes robustus* P. Karst., Finl. Basidsv., p. 467, 1889.
Basidiocarps perennial, sessile or effused-reflexed, pilei ungulate to applanate, up to 12 x 20 x 11 cm; upper surface brown to blackish, becoming encrusted and rimose, usually sulcate, glabrous; margin concolorous or yellowish brown at first, then faintly tomentose, rounded, fertile below; pore surface yellowish- or greyish-brown, the pores circular, 7-9 per mm, with thick, entire dissepiments; context shining yellowish brown, zonate, hard, woody, up to 3 cm thick, core with white radial streaks present near point of attachment; tube layers distinct, light brownish, becoming whitish within, woody, each layer up to 3 mm thick.
Hyphal system dimitic; skeletal hyphae brown in KOH, thick-walled, 2.5-5 µm in diam; generative hyphae hyaline, thin-walled, 2.5-5 µm in diam.
Hymenial setae absent or occasionally present in some specimens, thick-walled, subulate to ventricose, thin- to thick-walled, 18-50 x 5-8 µm.
Cystidioles usually abundant in hymenium, hyaline, thin-walled, ventricose with narrow, tapering apex, 25-50 µm long and 5-8 µm in diam at the base, narrow apical part 1.5-2 µm in diam.
Basidia broadly ellipsoid, 12-15 x 8-9.5 µm.
Basidiospores subglobose, hyaline, thick-walled at maturity, dextrinoid and 6-8.5 x 5.5-7 µm.
Substrata. Preferably on *Quercus*, but also recorded from many other hosts.
Distribution. Cosmopolitan species and found in Guyana, Costa Rica, and further to the north where oak occur.
Remarks. The distinctive ventricose cystidiols with elongated slender apices are apparently characteristic of all the species in the *Phellinus robustus* complex. These rarely differentiate into setae and in most specimens setae are apparently absent.

Phellinus rufitinctus (Cooke) Pat.,
Fig. 93
Essai tax. p. 97, 1900. - *Polyporus rufitinctus* Cooke, Grevillea 15:25, 1886.
Basidiocarps annual to biennial, resupinate, effused, up to 5 mm thick, woody, hard and adnate; pore surface cinnamon to deep reddish-brown, margin narrow to wide, finely felted and paler than the pore surface, pores small, invisible to the naked eye, 7-9 per mm, round and entire, tubes concolorous, up to 3 mm deep; context or subiculum rusty brown to golden brown, cottony near the substrate, up to 1.5 mm thick.
Hyphal system dimitic; generative hyphae thin-walled 2-4 µm wide, skeletal hyphae dominating, thick-walled and golden brown, 2.5-4 µm wide.
Setae of two kinds:
a) **tramal setae** acute, thick-walled and dark brown, 6-12 µm wide in the thickest part, 50-130 µm long, present both in the sterile margin, the subiculum and the tube walls, but rather rare in the latter, they do not project into the hymenium;
b) **hymenial setae** abundant, acute, thick-walled, dark brown and subulate with

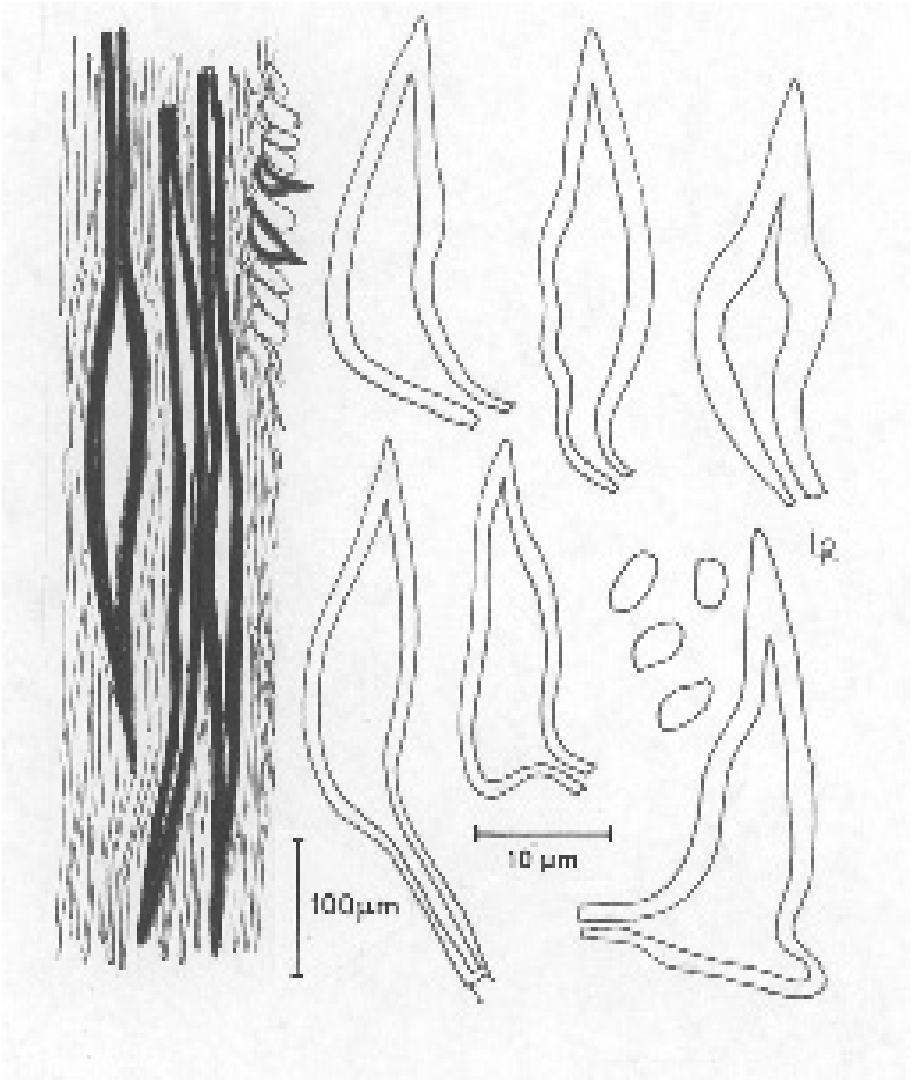


Fig. 93. *Phellinus rufitinctus* A) section through tube walls, B) hymenial setae and C) basidiospores. From the lectotype.

more or less evenly tapering walls, 20-35 x 6-9 µm.
Basidia broadly clavate, 4-sterigmate, 10-13 x 5-6 µm.
Basidiospores ellipsoid, hyaline, 2.5-4.5 x 2-3 µm.
Substrata. Dead deciduous trees.
Distribution. USA in Florida, Costa Rica, Colombia and Panama and has probably a wide distribution in the area.
Remarks. The two types of setae are distinctive together with the small hyaline basidiospores. Other species with similar types of setae have all larger or cylindrical basidiospores.

Phellinus sanctigeorgii (Pat.) Ryvarden,
Norw. J. Bot. 19:235, 1972. - *Polyporus sanctigeorgii* Pat., Bull. Soc. Mycol. Fr. 11:207, 1895.
Basidiocarp pileate, perennial, semicircular in outline, ungulate and slightly dimidiate, up to 3 cm wide, 6 cm long and 4 cm thick at the base, woody hard, pileus rusty brown in narrow sulcate zones, tomentose and in sections with a distinct black line below the tomentum which wears away zone wise from the base, the pileus then dark brown or even blackish and more sulcate, pore surface rusty brown, pores round, 6-8 per mm, tubes indistinctly stratified, fragile and almost papery, up to 8 mm in each layer, up to 3 cm total depth at the base, context fulvous to reddish-brown, fibrous and up to 1 cm thick with a separating black line towards the tomentum.
Hyphal system dimitic, generative hyphae 2-3 µm wide, skeletal hyphae golden-yellow 2.5-5 µm wide.
Hymenial setae absent.
Basidiospores globose to broadly ellipsoid, reddish-brown, 4-5 (6) x 3.5-4 µm.
Substrata. On deciduous wood.
Distribution. We have only seen the type from Venezuela.
Remarks. The fragile tubes seems to be a distinct characteristic, otherwise it is similar to *P. baccharidis* but separated by having hyaline to pale yellow and slightly larger basidiospores.

Phellinus sarcites (Fr.) Ryvarden,
Fig. 94
Norw. J. Bot. 19:235, 1972. - *Polyporus sarcites* Fr., Nova Acta Reg. Soc. Sci. Upsal, Ser. 3, Vol. 1:66, 1851.
Basidiocarp perennial, solitary, pileate, applanate and broadly sessile to dimidiate, or even sub-pendant with a tendency to a vertex at the basal part of the pileus, up to 10 cm wide and long, 2 cm thick at the base, woody hard when dry, pileus first dark reddish-brown and hispid in narrow to wide, weakly sulcate zones, with age the upper hyphae become agglutinated, and blackish, partly flattened, but also partly scrupose, often zone wise and with some radial striae, in section a thin black line is

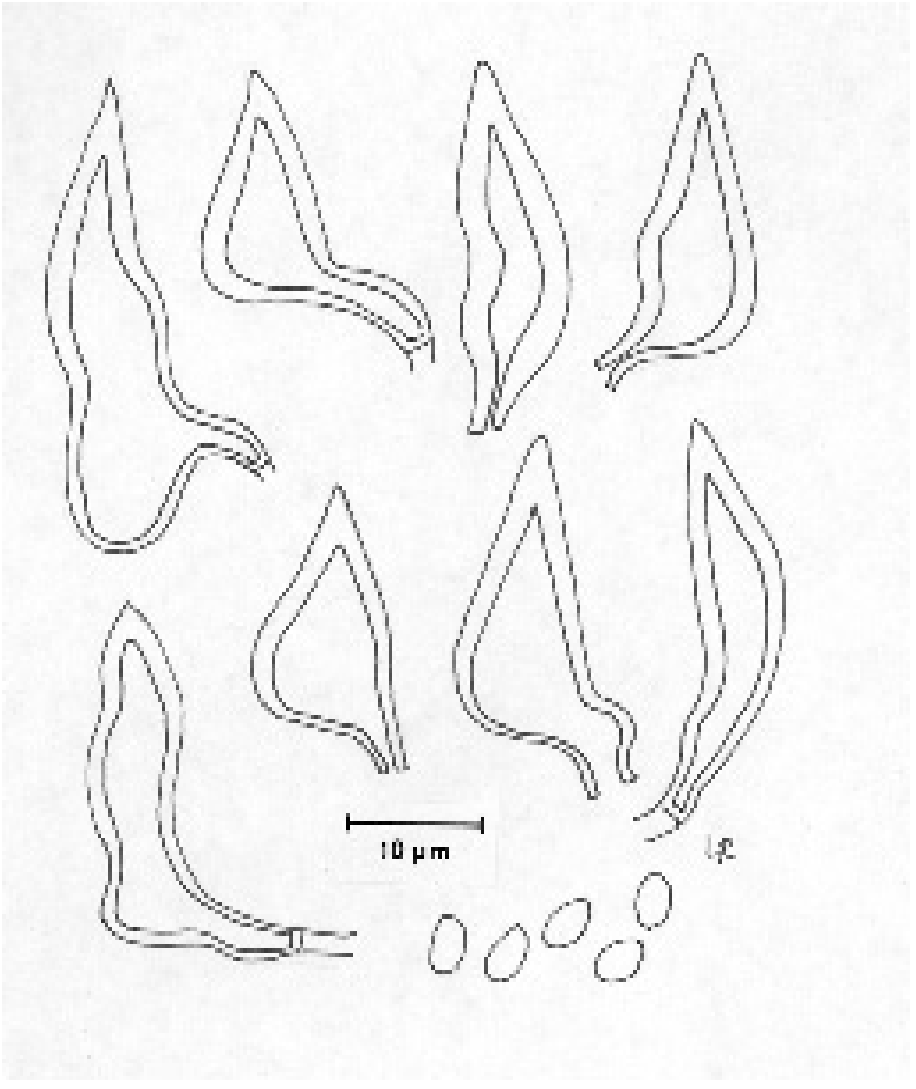


Fig. 94. *Phellinus sarcites,* hymenial setae and basidiospores. From the lectotype.

easily visible over a much lighter context, margin acute, pore surface yellow-brown contrasting the pileus, pores small, 7-8 per mm, tubes concolorous with the pore surface and bright yellow-brown in actively growing specimens, darker brown in old specimens, up to 8 mm deep, indistinctly stratified, context first bright golden-yellow, darkening with age, somewhat radially fibrous and often with small white mycelial strands.
Hyphal system dimitic, generative hyphae hyaline and 1-3 µm wide, skeletal hyphae golden-brown, 3-5 µm wide.
Hymenial setae abundant, acuminate to slightly ventricose, straight, thick-walled and dark brown, 15-25 x 5-10 µm.
Basidiospores broadly ellipsoid, thin-walled and hyaline, 3-4 x 2- 3.5 µm.
Substrata. On dead angiosperms.
Distribution. Costa Rica and Colombia.
Remarks. The species is recognised by its hispid to scrupose pileus in reddish-brown to black colours. There is often a difficulty to see the black line below a persistent tomentum as the hyphae first becomes indurated and slowly become black. Even if this process flattens some hyphae, many tufts remain on the black surface giving it a characteristic scrupose and partly radially fibrillose appearance. When young the pore surface and context are brighter yellowish-brown than in many other *Phellinus* sp.

Phellinus semihispidus Ryvarden nova sp. Fig. 95
Ad *Phellinus sarcites* (Fr.) Ryvarden sed setae unciformis et sporae subcylindricae.
Holotype: Dominicana, Bao valley, A. Liogier 12974, 7- Oct. 1968 O.
Basidiocarp perennial, solitary, pileate, applanate and broadly sessile to dimidiate, or even sub-pendant with a tendency to a vertex at the basal part of the pileus, up to 8 cm long, 4 cm wide and, 1.5 cm thick at the base, woody hard when dry, pileus first yellowish-brown and hispid to strongly scrupose with radially flattened bundles of hyphae being partly forked, azonate to weakly zonate, darker at the basal part than at the periphery, margin acute, pore surface cinnamon to yellow-brown contrasting the pileus, pores 5-6 per mm, tubes concolorous with the pore surface and up to 4 mm deep, indistinctly stratified, context golden-yellow, at the top with even transitions to the dense hyphal protuberances and no black zone present
Hyphal system dimitic, generative hyphae hyaline, 2-4 µm wide, skeletal hyphae golden-brown, 3-5 µm wide.
Hymenial setae abundant, hooked, straight or bent, frequently with lateral extensions or foot, thick-walled and dark brown, 30-55 x 7-12 µm.
Basidiospores subcylindrical, thin-walled and hyaline, 4.5-5 x 2-2.5 µm.
Substrata. On dead hardwood.
Distribution. Known only from the type locality.
Remarks. The species is recognised by its reddish-brown, densely hispid to scrupose pileus, the fairly large hooked setae and the hyaline, subcylindrical spores.

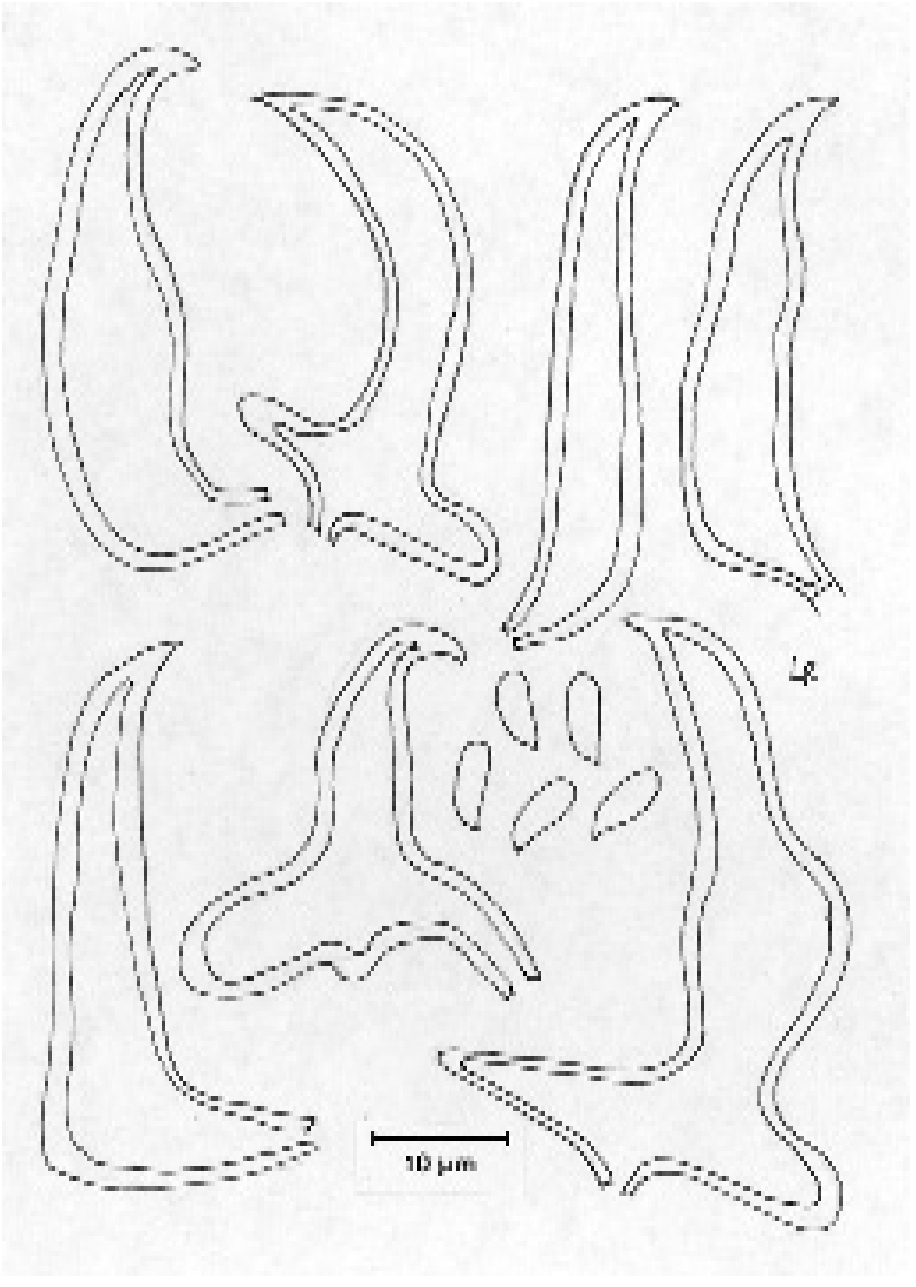


Fig. 95. *Phellinus semihispidus,* hymenial setae and basidiospores. From the holotype.

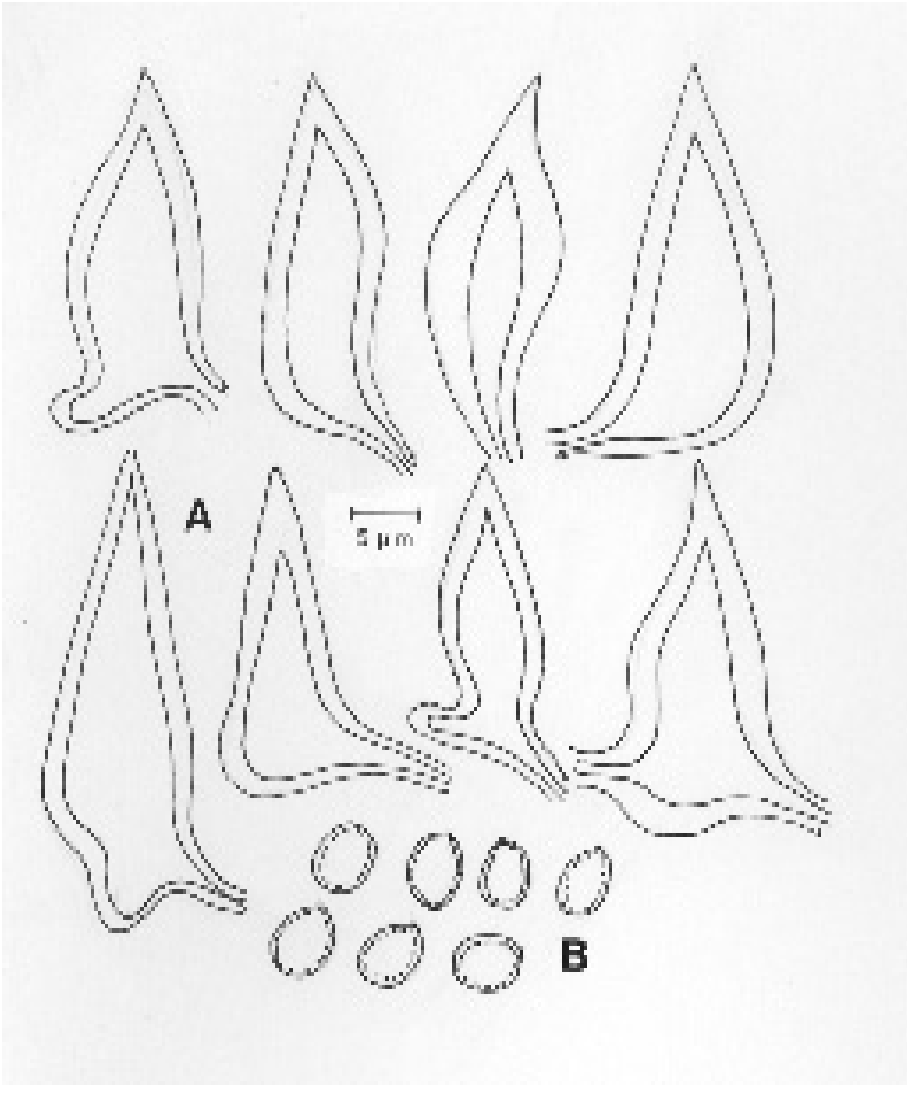


Fig. 96. *Phellinus senex,* hymenial setae and basidiospores. From the lectotype.

Phellinus senex (Nees & Mont.) Imazeki,
Fig. 96
Bull. Govern. Forest Exp. Sta. 57:115, 1952. - *Polyporus senex* Nees & Mont., Ann. Sci. Nat. Ser. 2 vol 5:70, 1836.
Basidiocarp perennial, solitary to imbricate, pileate, broadly to more narrowly attached, 3-15 cm wide and long, 0.3-2 cm thick, consistency coriaceous in thin specimens, more woody hard in thicker ones, pileus dimidiate to semicircular, flat or weakly convex, finely velvety tomentose in narrow concentric sulcate zones, first fulvous, ferruginous, then bay to chestnut, usually paler towards the margin, the tomentum is quite persistent, especially towards the margin. Old specimens are brown and partly glabrous, often covered with green algae or mosses from the base. Cuticle not present, but sometimes a darker line in the context can be seen below the tomentum representing a layer with more densely interwoven hyphae. Margin thin to rather thick, acute to obtuse, entire or weakly lobed and incised, pore layer fulvous, ferruginous to almost bay, pores round and small, 7-11 per mm, usually invisible to the naked eye, dissepiments thin and entire, tubes concolorous with the pore surface or more fulvous, in larger specimens stratified, layers up to 4 mm thick, often separated by a thin context layer making the stratification quite distinct, margin sterile, usually paler than the rest of the pore surface, context fibrous, shiny fulvous, ferruginous to bay, usually thin 1-3(5) mm, of same or deeper colour than the tubes in section.
Hyphal system dimitic, generative hyphae hyaline and thin-walled, 2-3 µm wide, sparingly branched, easy to demonstrate both in tubes and context, skeletal hyphae abundant, yellow to bay, thick-walled to almost solid, 2.5-3.5(4) µm wide.
Hymenial setae straight, thick-walled, acuminate, 15-30 (40) x 5-9 µm, often swollen near the base.
Basidiospores broadly ellipsoid, 4.5-6 x 3.5-5 µm, thin-walled and often with a large oil-drop, hyaline to pale yellow with age and then somewhat thick-walled.
Substrata. On dead wood.
Distribution. Pantropical.
Remarks. The species is characteristic with the thin, tomentose and narrowly concentrically sulcate pileus lacking a cuticle. Macroscopically similar to *P. fastuosus*, which however has no setae.

Phellinus setulosus (Lloyd) Imazeki,
Fig. 97
Bull. Tokyo Sci. Mus. 6:104, 1943. - *Fomes setulosus* Lloyd, Mycol. Writ. 4:243, 1915.
Basidiocarp perennial, solitary or imbricate, semi-resupinate to pileate broadly attached, woody hard when dry, pileus dimidiate, convex to ungulate, up to 12 cm broad, 8 cm wide and 10 cm thick near the base, upper surface very finely tomentose

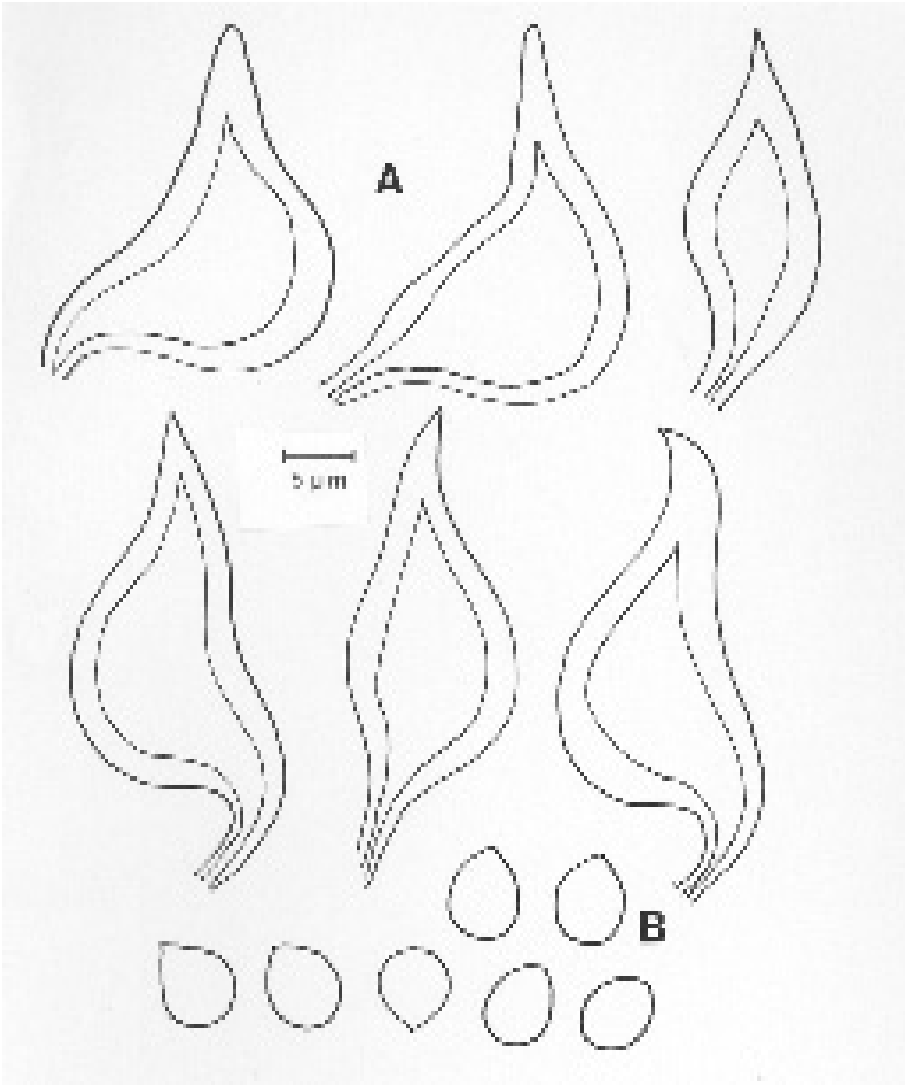


Fig. 97. *Phellinus setulosus,* hymenial setae and basidiospores. From the lectotype.

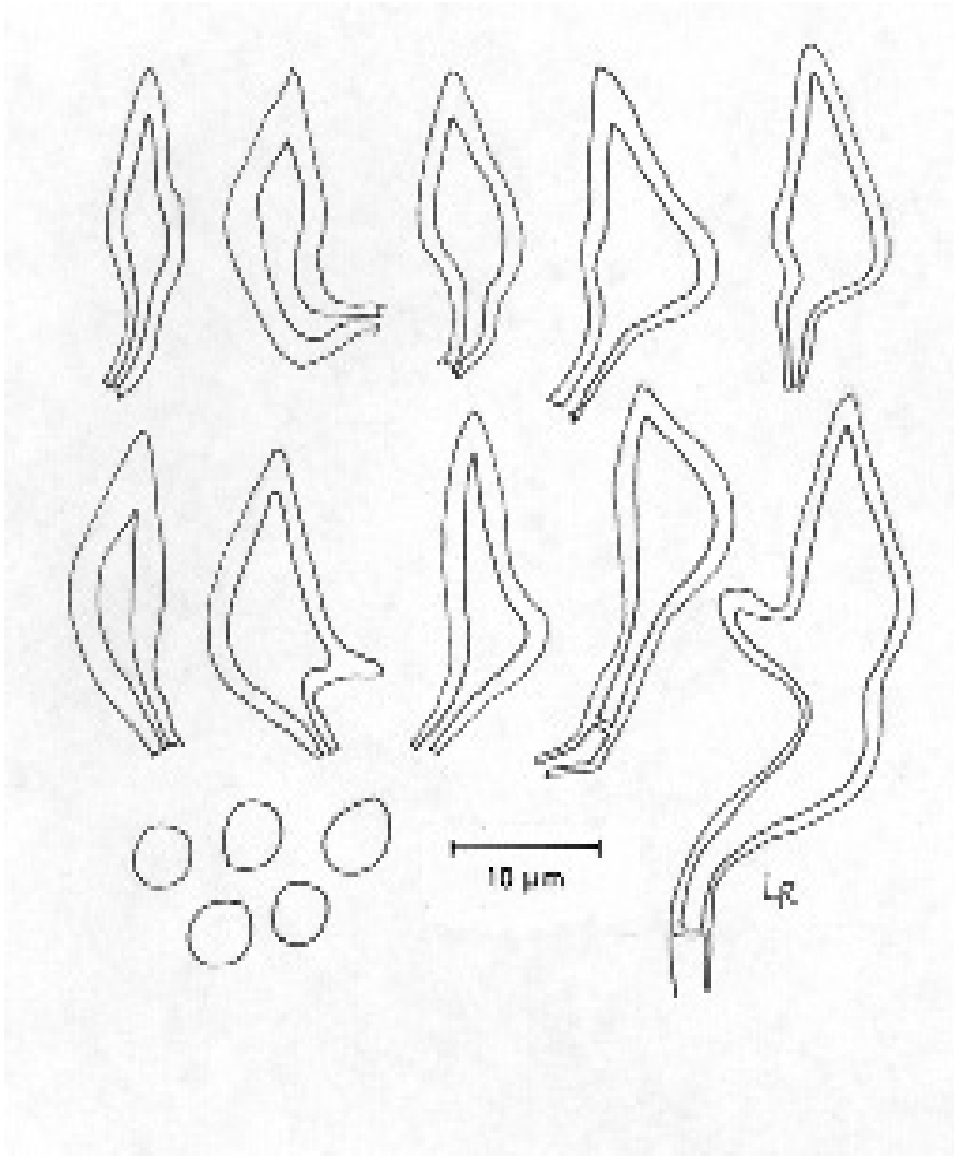


Fig. 98. *Phellinus shaferi,* hymenial setae and basidiospores. From the lectotype.

to glabrous, dull, fulvous to reddish-brown becoming blackish, sometimes basally covered with mosses, broadly concentrically zoned and sulcate, when old rimose, without distinct cortex, but upper surface denser than the context. Margin fulvous, obtuse and even, often velutinate, pore layer fulvous to ferruginous, pores round and regular, 5-8 per mm, dissepiments entire and fairly thick, tubes single-layered to stratose, each layer 2-5 mm deep and often with a greyish tint, sterile margin narrow or up to 5 mm broad, context golden yellow to ferruginous brown, lacking a distinct cuticle above, fibrous, faintly zoned, up to 3 cm thick.
Hyphal system dimitic, generative hyphae hyaline to pale yellow, thin to weakly thick-walled, 3-3.5 µm wide, on average more yellow in the context than in the tubes. Skeletal hyphae dominating in the whole basidiocarp, yellow to ferruginous, thick-walled but with a distinct lumen, 3-5 µm in diameter.
Hymenial setae abundant to infrequent, subulate to ventricose, often strongly widened at the base, apex straight or weakly curved, ferruginous and thick-walled, 15-40 x 5-16 (20) µm.

Basidiospores sub-globose to broadly elliptical, pale yellow to fulvous, smooth and thin to very thick-walled, 5-7 x 4-6 µm.
Substrata. On dead wood.
Distribution. Pantropical.
Remarks. The main characteristics are the ungulate fulvous to dark brown pileus without a distinct cuticle, the obtuse often velutinate margin, the widened setae and the rather large, sub-globose basidiospores.

Phellinus shaferi (Murrill) Ryvarden,
Fig. 98
Norw. J. Bot. 19:235, 1972. - *Fuscoporella shaferi* Murrill, North Am. Fl. 9:7, 1907.
Basidiocarp resupinate, perennial, effused and adnate, up to 2 mm thick, pore surface reddish-brown, often with an ashy blue shine, pores fairly irregular in the type, angular to incised, 5-6 per mm, tubes concolorous with the pore surface, up to 2 mm deep, context almost lacking, reddish-brown and fibrous.
Hyphal system dimitic, generative hyphae 2-4 µm wide, skeletal hyphae golden brown, 2-5 µm wide.
Hymenial setae frequent, sub-ventricose to acuminate, straight, 12-20 x 4-8 µm.
Basidiospores globose, pale yellow to rusty brown, 3.5-4.5 µm in diameter.
Substrata. On hardwoods.
Distribution. Montserrat in the West-Indies, Panama and Venezuela.
Remarks. The medium-sized pores are the diagnostic characteristics of this species.

Phellinus spinescens J. E. Wright,
Fig. 99

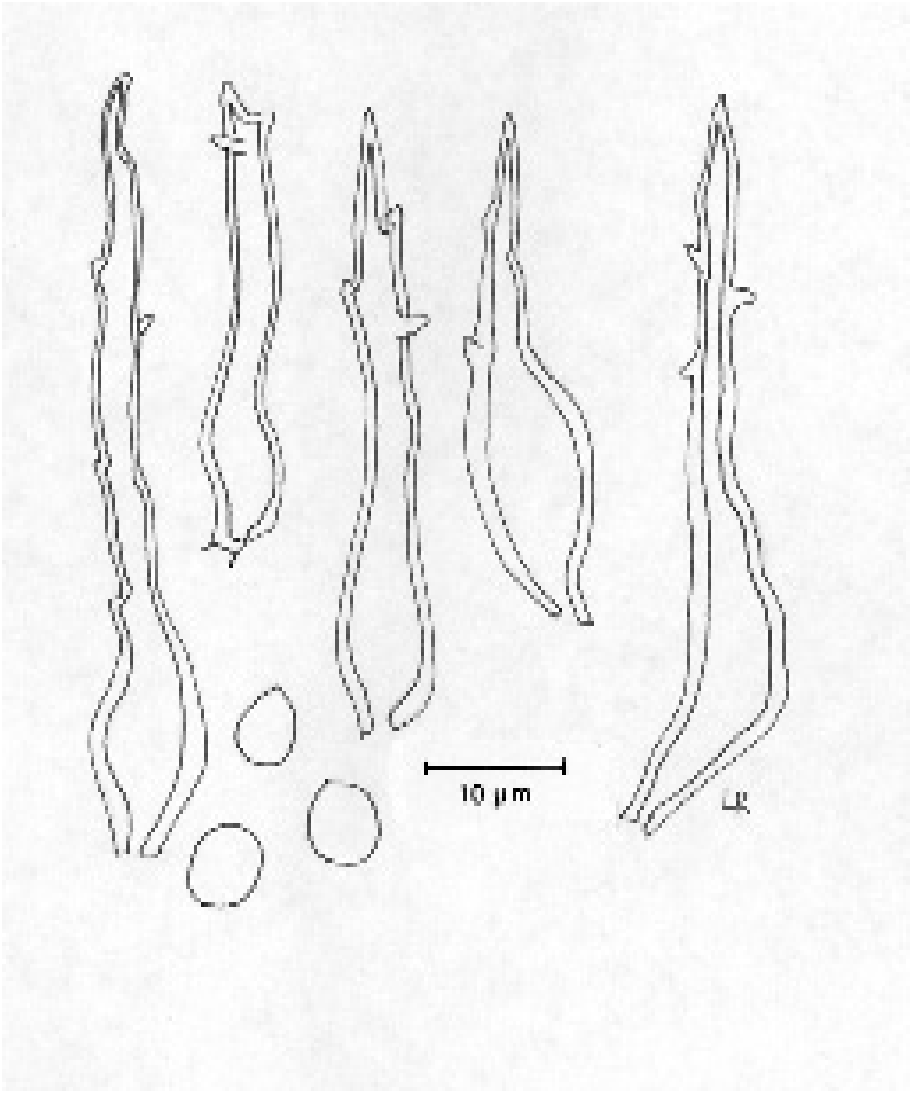


Fig. 99. *Phellinus spinescens,* hymenial setae and basidiospores. From the lectotype.

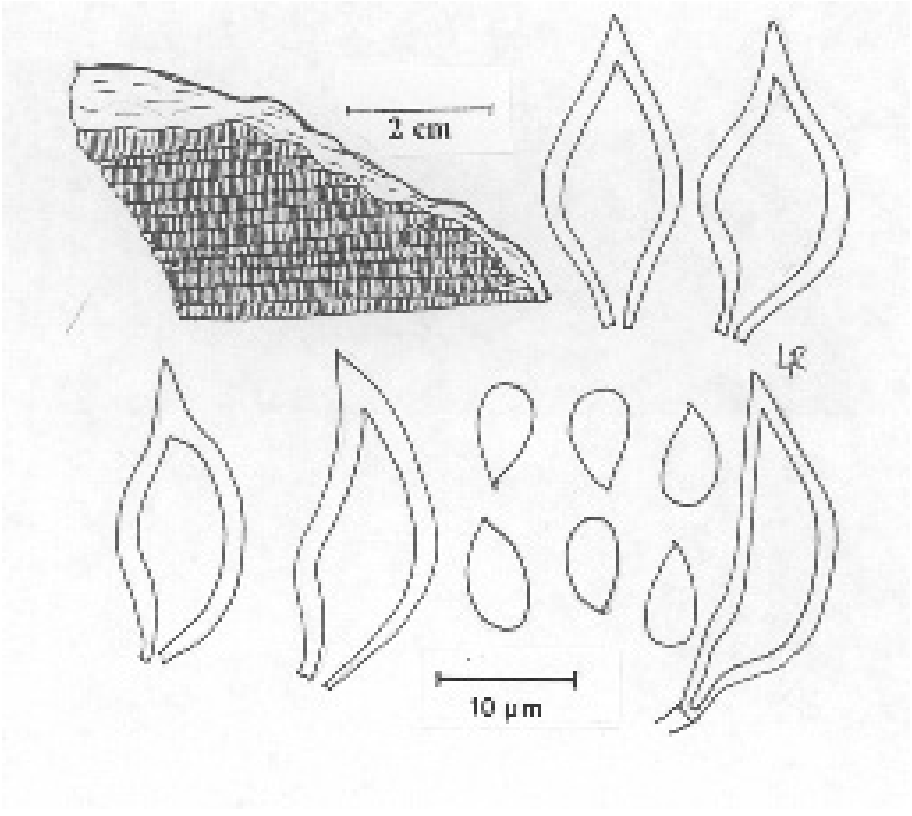


Fig. 100. *Phellinus turbinatus,* section of basidiocarp, hymenial setae and basidiospores. From the holotype.

Mycotaxon 59:384, 1996.
Basidiocarps annual, resupinate, effused, up to 2 mm thick and 10 cm wide, adnate; pore surface dark isabelline to pale brown, margin wide, finely felted and paler than the pore surface, pores circular to slightly elongated, 4-5 per mm, tubes concolorous, up to 1 mm deep; context or subiculum pale brown, up to 1.5 mm thick.
Hyphal system dimitic; generative hyphae thin-walled 1.5-2.5 µm wide, skeletal hyphae dominating, thick-walled and golden brown, 2-3 µm wide.
Hymenial setae acute, thick-walled and dark brown, 40-50 x 4-5 µm, scattered, smooth in the basal part, a few protuberances in the upper part
Basidia barrel shaped, 4-sterigmate, 10-13 x 7-8 µm.
Basidiospores globose, hyaline, dextrinoid, 4.5-6 µm in diam.
Substrata. On *Bambusa* sp.
Distribution. Known only from Iguazu National park in Northern Argentine on the

border to Brazil, but probably widespread in areas with *Bambusa*.
Remarks. The setae with protuberances are distinctive together with the hyaline dextrinoid basidiospores. No other species of *Phellinus* in the area have this combination of characters.

Phellinus turbinatus Ryvarden nov. sp.
Fig. 100
Ad *Phellinus linteus* (Berk. & Curt.) Teng, sed sporae turbinatus.
Holotype: Costa Rica, Alajuela, Area conservation de Arenal, Reserva Santa Elena, 13. July 2001, on dead unknown hardwood, L. Ryvarden 43754 (O, isotype in INBIO).
Basidiocarps perennial, sessile to dimidiate to almost dorsally attached, up to 5 x 1o x 4 cm, hard and woody; upper surface dark black and glabrous from the base towards the margin, then dark yellowish brown and minutely adpressed velutinate, concentrically zonate and shallowly sulcate, margin acute to rounded, pale yellowish brown narrowly sterile below; pore surface dark reddish brown to fulvous, the pore round, 7-9 per mm invisible to the naked eye, with thick, entire dissepiments; tube layer concolorous with pore surface, up to 3 cm deep at the base, slightly zoned with single layers to 3-4 mm, context rusty brown faintly concentrically zonate, woody, up to 3 mm thick and with a black cuticle developing from the base.
Hyphal system dimitic; generative hyphae hyaline, 2-3 µm wide; skeletal hyphae dark brown and thick-walled to golden brown and moderately thick-walled in KOH, rarely branched, 3.5-6 µm in diam.
Hymenial setae abundant in the hymenium, thick-walled, subulate, slightly ventricose with distinct swollen base or middle part, 15-25 x 6-10 µm.
Basidia broadly clavate, 12-15 x 5-7 µm.
Basidiospores hyaline, thin-walled, drop shaped to turbinate, 6-8 x 5-6 µm.
Substrata. Unknown dead hardwood.
Distribution. Known only from the type locality.
Remarks. This is a distinct species by the hyaline turbinate to drop-shaped spores and the glabrous black pileus with a distinct cuticle.

Phellinus umbrinellus (Bres.) Ryvarden,
Prelim. polypore fl. East Africa p. 224, 1980. - *Poria umbrinella* Bres., Hedwigia 35:282, 1896.
Basidiocarps perennial, resupinate, adnate and effused, in the type about 5 mm thick, woody; pore surface fulvous to dark cinnamon or greyish-brown, pores round and entire, 6-8 per mm, tubes concolorous, the inner ones stuffed with white mycelium; context more or less absent in the type, in other specimens less than 1 mm and dense and now and then with a thin black line next to the substrate.
Hyphal system dimitic; generative hyphae hyaline 1.5-2.5 µm wide, skeletal hyphae totally dominating, thick-walled, golden to pale rusty brown, 2.5-3.5(-4) µm wide.

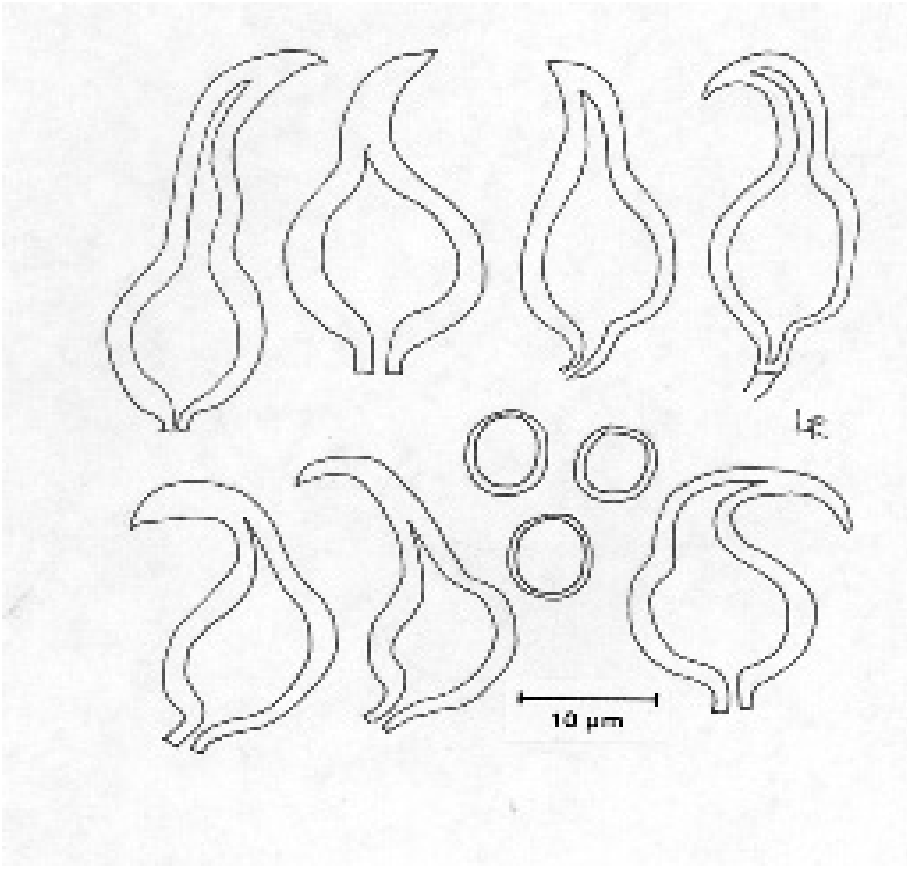


Fig. 101. *Phellinus uncinatus,* hymenial setae and basidiospores. From the lectotype.

Hymenial setae absent.
Basidia broadly clavate, 8-12 x 5-6 µm.
Basidiospores subglobose to round, thick-walled, pale rusty brown, 4-5 x 3.5-4 µm.
Substrata. Deciduous trees of many genera.
Distribution. From the Gulf States in United States and south to Brazil.
Remarks. The resupinate basidiocarp, the small pores, the lack of setae and the rusty brown basidiospores are diagnostic for this species.

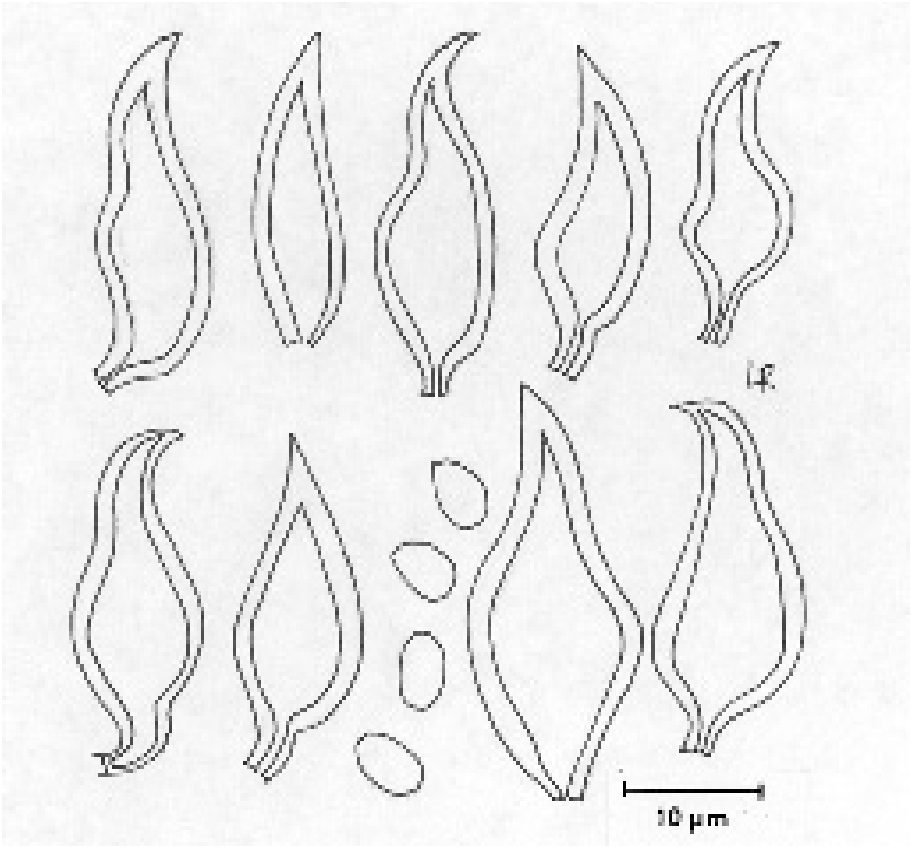


Fig. 102. *Phellinus undulatus,* hymenial setae and basidiospores. From the lectotype.

Phellinus uncinatus Rajchenb.,
Fig. 101
Mycotaxon 28:114, 1987.
Basidiocarps annual to biennial, resupinate, effused, pulvinate, up to 8 x 3 x 0.2 cm thick, woody, hard and adnate; pore surface pale umber to isabelline or greyish brown, margin narrow to wide, finely felted and paler than the pore surface, pores 5-6 per mm, round and entire, tubes concolorous, up to 1 mm deep; subiculum almost absent.
Hyphal system dimitic; generative hyphae thin-walled, 2-4 µm wide, skeletal hyphae dominating, thick-walled and golden brown, 2.5-4 µm wide.
Hymenial setae abundant, thick-walled, hooked, 25-35 x 6-12 (16) µm, distinctly

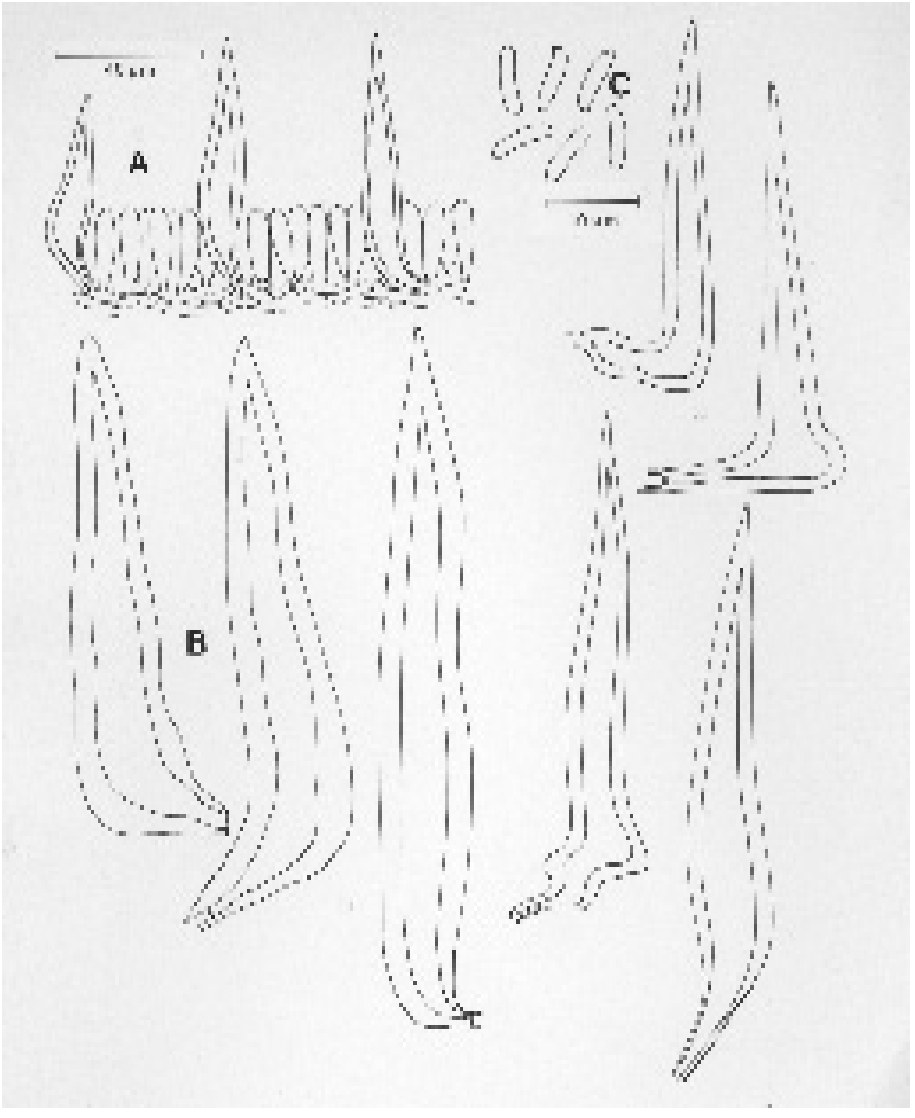


Fig. 103. *Phellinus viticola,* hymenial setae and basidiospores. LR. 13382 (Norway).

ventricose.
Basidia barrel-shaped, 10-13 x 8-9 µm.
Basidiospores globose, hyaline, thick-walled, dextrinoid, 5.5-7 x 5-6.5 µm.
Substrata. On *Bambusa* sp.
Distribution. Known only from South Brazil.
Remarks. The large globose dextrinoid basidiospores, the hooked setae and the host are diagnostic characteristic for this peculiar species. The basidiospores and shape of the basidiocarp are as for *P. punctatus*, but this species has no setae and grows on hardwoods of many kinds.
Phellinus undulatus (Murrill) Ryvarden,
Fig. 102
Norw. J. Bot. 19:235, 1972. - *Fomitiporia undulata* Murrill, North Am. Fl. 9:10, 1907.
Basidiocarp resupinate, annual to biennial, adnate, effused, very hard and up to 2 cm thick, margin golden-brown, pore surface greyish brown, dull, pores angular, somewhat thin-walled and slightly translucent, 4-6 per mm, tubes concolorous, up to 4 mm deep, often filled with white mycelium, context very thin, dark brown.
Hyphal system dimitic, generative hyphae 2-4 µm wide, skeletal hyphae golden yellow to pale rusty brown when the walls thicken, 3-5 µm wide.
Hymenial setae sub-ventricose to acuminate, rather scattered, straight or with a weakly hooked apex, 18-25 x 6-8.5 µm.
Basidiospores broadly ellipsoid, hyaline, 3.5-4.5 x 2.5-3.5 µm.
Substrata. On dead hardwoods.
Distribution. Known from Belize, Venezuela, Cuba and Costa Rica.
Remarks. The medium-sized pores and the hooked setae are the diagnostic characteristics, even if some straight setae also occur.

Phellinus viticola (Schwein. in Fr.) Donk.
Fig.103
Persoonia 4:342, 1966. - *Polyporus viticola* Schwein. in Fr., Elenchus Fung. 1:115, 1828.
Basidiocarps perennial, usually effused-reflexed, often sessile or entirely resupinate, often developing by fusion of two or more; pilei generally dimidiate or narrow and shelf like, up to 1.5 x 6 x 1 cm; resupinate specimens often effused up to 30 cm: upper surface of pileus reddish brown to blackish, hirsute to almost glabrous, sulcate; margin usually lighter reddish brown, tomentose to hirsute, acute or rounded; pore surface yellowish brown with a slight reddish tint; the pores circular to angular, 4-7 per mm, with thick, entire dissepiments; context yellowish brown, faintly zonate, corky-fibrous, up to 3 mm thick; tube layers concolorous and continuous with the context, up to 5 mm thick, the tubes usually whitish within.
Hyphal system dimitic; skeletal hyphae brown in KOH, thick-walled, 2-4 µm in diam; generative hyphae pale yellowish brown to hyaline, thin-walled, 2-3 µm in

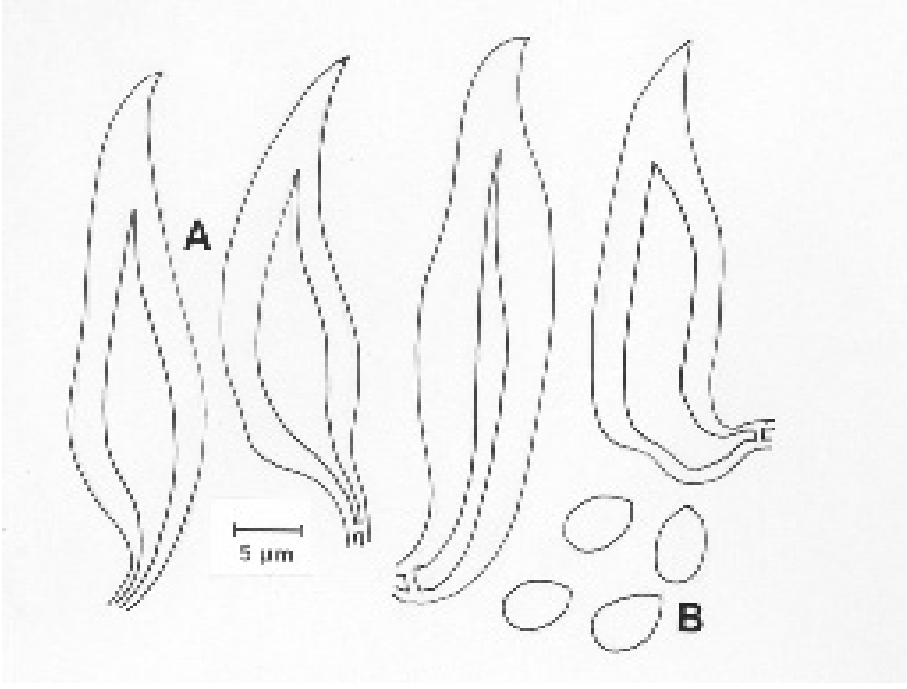


Fig. 104. *Phellinus whalbergii,* hymenial setae and basidiospores. From the lectotype.

diam; tramal hyphae similar.
Hymenial setae abundant, narrowly subulate, thick-walled, 25-75 x 5-8 µm.
Basidia clavate, 9-10 x 5-6 µm.
Basidiospores cylindrical, straight or curved, hyaline, frequently biguttulate, 7-9 x 1.5-2 µm.
Substrata. On a long series of other conifers as well as many hardwood genera.
Distribution. Widely distributed in United States, both on conifers and hardwoods, exact distribution not known in the neotropics.
Remarks. When entirely resupinate, *P. viticola* may be distinguished from similar

Phylloporia Murrill
Torreya 4:141, 1904.

Basidiocarps annual, resupinate to pileate, pileus when present cinnamon to dark brown, tomentum soft and thick over a distinct thin black zone, pileus mostly with narrow to wide concentric zones; pore surface brown, pores entire, angular to round; tubes concolorous with pore surface; context light to dark brown, thin; hyphal system mono- to dimitic; generative hyphae hyaline to light rusty brown and with simple septa; setae none; spores ellipsoid, less than 5 µm in greatest dimension, slightly thick-walled and light yellowish in maturity. On deciduous wood, with a white rot, on leaves or remarkably thin dead branches on living trees. Mainly a tropical genus. For a monograph of the genus, see Wagner & Ryvarden 2002.
Type species: *Phylloporia parasitica* Murr.
Remarks. The genus is related to *Inonotus* and *Cyclomyces*. From the former it is separated by having a thick persistent tomentum separated from the context by a thin dark zone, besides having small yellowish spores. In *Cyclomyces*, there is a similar dark zone below a tomentum, which however is much thinner, besides that the genus is characterised by having long and subulate setae and hyaline spores.
Most remarkable in *Phylloporia* is its ability to grow on living bushes and trees, often on thin branches. It seems to be adapted to invade such substrata and resist the drought often experienced in such a habitat. It may be that the soft tomentum is some sort of protection or is able to absorb and retain moisture.

Key to species

1. Basidiocarp stipitate 2
1. Basidiocarp resupinate to sessile 3

2. Basidiospores 3-4 x 2-3 µm ..... **P. spathulata**
2. Basidiospores 4-4.5 x 3-3.5 µm **.....P. veracrucis**

3. Basidiocarp on living leaves **.....P. parasitica**
3. Basidiocarp on dead or living trees or bushes 4

4. Basidiocarp dense and perennial with distinct skeletal hyphae **.....P. pectinata**
4. Basidiocarp soft and fragile, annual and with generative hyphae only 5

5. Pores angular, 2-4 per mm **.....P. frutica**
5. Pores round, 6-8 per mm **.....P. chrysita**

Using the key and descriptions.
Since the generative hyphae persistently have simple septa and all spores are smooth, this information is not repeated for each species.

Phylloporia chrysita (Berk.) Ryvarden,
Norw. J. Bot. 19:235, 1972. - *Polyporus chrysites* Berk., Hooker's J. Bot. 8:233, 1856. *Polyporus capucinus* Mont. Ann. Sci. Nat. Ser. 4, Vol. 5:369, 1857. - In*onotus corrosus* Murr., Bull. Torrey Bot. Club 31:598, 1904.
Basidiocarps annual, pileate and sessile, single or imbricate, dimidiate to semicircular, 1-5 x 2-7 cm, up to 15 mm thick at the base, pileus surface yellowish-brown to rusty-brown, mostly azonate, or zonate with age with a few sulcate zones, covered with a thick, velvety, spongy, easily compressed tomentum, up to 10 mm thick, below which there is a thin black layer; margin sharp to rounded; pore surface yellowish to dark cinnamon brown, with a thin light-coloured sterile margin, pores round, small, almost invisible to the naked eye, 6-8 per mm; tubes 1-4 mm long, concolorous with the pore surface; context 1-2 mm thick, dense and distinctly more cinnamon than the overlying tomentum from which it is separated by a dark line, easily seen in longitudinal sections.
Hyphal system monomitic; generative hyphae, yellowish to rusty brown, in the tomentum in a loose texture, 4-8(10) µm wide with 0.5-1 µm wide and walls 0.5-1.5 µm thick, in the subhymenium hyaline to light yellowish and branched, 3-5 µm wide.
Basidia clavate, 7-10 x 3-4 µm.
Basidiospores subglobose, pale yellowish brown, IKI- 2.5-3.5 µm in diameter.
Substrata. On living deciduous bushes, often on remarkably thin branches.
Distribution. From Florida and south to Brazil.
Remarks. The species is easy to recognise because of the tiny pores and a fairly soft basidiocarp.

Phylloporia frutica (Berk. & W. A. Curtis) Ryvarden,
Norw. J. Bot. 19:235, 1972. - *Polyporus fruticus* Berk. & W. A. Curtis, J. Linn. Soc. Bot. 10:310, 1868 .
Basidiocarps annual, solitary, broadly attached, usually around small twigs and often on living trees, semicircular to round in outline, 1-5 cm in diameter, up to 2 cm thick, soft and spongy, pileus velvety to strigose and covered with a spongy-cottony tomentum, up to 1 cm thick, azonate to zonate, golden yellow to rusty brown, in old and weathered specimens even umber brown, pore surface cinnamon to rusty brown, pores angular, thin-walled, 2-4 per mm, tubes up to 2 mm deep, context duplex, the lower part dense and almost like a dark zone just above the tubes, but not distinctly black as in the other species of the genus, the upper part loose and punky, dark cinnamon to rusty brown.
Hyphal system monomitic, generative hyphae with simple septa, in the tomentum thin to thick-walled, rusty brown and up to 8 µm wide, in the tubes hyaline to pale rusty, thin-walled to almost solid, 2-5 µm wide.
Basidiospores broadly ellipsoid to sub-globose, smooth, pale yellow, 3-4.5 x 2.5-3 µm, some spores partly collapsed with a flattened side, in some cases looking almost lunate.

Basidia clavate with 4 sterigmata, 8-10 x 3-4 µm.
Substrata. On living trees and bushes.
Distribution. Southern United States and widespread in the tropical zone.
Remarks. The relatively large pores and the very distinct duplex context characterise this species.

Phylloporia parasitica Murrill,
Torreya 4:141, 1904.
Basidiocarp annual, resupinate or pendant from a vertex with loosened margin, up to 8 mm in diameter, light brown above, up to 1 mm thick, pore surface greyish to rusty brown, margin narrow and concolorous, pores entire, round to angular, shallow, 5-6(8) per mm, context very thin and rusty brown.
Hyphal system monomitic, generative hyphae thin to slightly thick-walled, hyaline to light rusty brown, simple septate, moderately branched, 2-4.5 µm in diameter.
Basidiospores broadly ellipsoid, hyaline to slightly yellowish with thickened walls, 3.7-4.5 x 2.2-3 µm.
Substrata. On the under side of living leaves.
Distribution. Known from Colombia, Iguazu in Argentina besides Tanzania in Africa.
Remarks. This is probably a rare species, but is of course very easily overlooked because of its extraordinary habitat. The species is close to *P. chrysita,* but this species has smaller spores.

Phylloporia pectinata (Kl.) Ryvarden,
Synop. Fung. 5:196, 1991. - *Polyporus pectinatus* Kl. Linnaea 8:486, 1833.
Basidiocarp pileate, perennial, applanate to semi-ungulate, frequently imbricate with several partly lobed pilei from a common effused base, mostly rather small, up to 4-5 cm wide, 2-6 cm long and up to 1 cm thick in single pilei, compound basidiocarps may be larger, margin entire or distinctly lobed or incised, woody hard and quite heavy when dry, pileus with a few to numerous sulcate, rounded to sharp ridges, in young specimens covered with a quite persistent compressible tomentum in cinnamon to rusty colours, with age this tomentum partly wears away or becomes compacted and in old specimens a more blackish surface may become exposed in zones, in sections there is a distinct black, thin and dense zone below the persistent tomentum, and this zone ultimately becomes the surface of the pileus, in old basidiocarps such a black line may be found between successive pilei or as sinuous lines in bands of context between the tube layers, in young specimens the tomentum may become up to 6 mm thick at the base, the margin has usually a paler colour than the basal part of the pileus, pore surface yellow-brown and glancing when turned in incident light, the pore surface recedes typically in old and thicker basidiocarps, pores tiny, 8-10 per mm, invisible to the naked eye, tubes distinctly stratified, 1-2 mm in each zone, in some specimens with a very thin line of context between consecutive

tube-layers, the tubes may become up to a total of 8 mm deep in individual pilei, context distinctly duplex, at least in younger specimens, the lower part very dense and cinnamon to fulvous, up to 1 mm thick, with a thin black line, the pileus tomentum, usually much darker and of a more loose consistency than the lower part of the context.
Hyphal system dimitic, generative hyphae thin-walled and simple septate, 1.5-3 µm wide, skeletal hyphae dominating, thick-walled to almost solid, golden to pale rusty brown 2.5-5 µm wide.
Hymenial setae none.
Basidiospores normally abundantly present, sub-globose, hyaline to very pale yellowish, often partly collapsed, thin to slightly thick-walled, 3-3.5(4) x 3 µm.
Substrata. On deciduous wood.
Distribution. Pantropical and widespread.
Remarks. The species is usually recognised in the field by its numerous sulcate zones and its duplex consistency with a thin black line below the tomentum. Typically the pore surface is glancing and often receding with an irregular development, especially in more compound basidiocarps.

Phylloporia spathulata (Hook.) Ryvarden,
Synop. Fung. 5:196, 1991. - *Polyporus spathulatus* Hook. in Kunth, C.S. Synopsis Plant. 1:9, 1822.
Basidiocarp annual, solitary, centrally to laterally stipitate, pileus circular, dimidiate to spatulate or reniform, 1-6 cm broad and wide, up to 4 mm thick in centre, margin entire or lobed, papery-thin, consistency coriaceous and tough, pileus golden-yellow to cinnamon, adpressed velutinate, azonate or in variable concentric zones with the brightest close to the margin, duller and more cinnamon towards the centre, in dry specimens often slightly radiate and folded, in mature specimens the tomentum becomes agglutinated and pileus then more glabrous, tomentum up to 1 mm thick and separated towards the context by a very thin black line, most distinctive in the inner parts of the pileus, absent in the peripheral parts, in old weathered specimens the tomentum wears away and exposes a dark brown cuticle, but the tomentum is usually quite persistent, stipe 1-4 (8) cm high, 1-10 mm in diameter, often somewhat swollen towards the base, adpressed velutinate in golden-yellowish-brown to cinnamon, dry specimens often longitudinally wrinkled with age, tomentum up to 1 mm thick under which there is a distinct thin black line, the core is dense, hard and deep brown, pore surface often slightly decurrent on the upper expanded part of the stipe, golden-brown to fulvous, margin brighter and sterile, 1-2 mm wide, pores entire and round, very small, almost invisible to the naked eye, 7-9 per mm, tubes concolorous, up to 1 mm deep, context golden-yellow to cinnamon, up to 2 mm deep.
Hyphal system monomitic, generative hyphae hyaline to golden-brown or even rusty-brown on the pileus where they can be up to 8 µm in diameter, in the trama 2-6 µm wide, moderately branched and densely agglutinated both in context and in stipe.

Basidiospores broadly ellipsoid, smooth, golden-yellow and with slightly thickened walls, non-amyloid, 3-4 x 2-3 µm.
Substrata. On the ground from buried wood.
Distribution. Pantropical, but apparently not common, from Mexico to Brazil in America,
Remarks. This is a variable species with regard to shape and size of the basidiocarp. However, the thin dark zone below the adpressed tomentum both on the pileus and the stipe, the minute pores, the small spores and the hard consistency should be good characteristics for a separation from the other species.

Phylloporia veracrucis (Sacc.) Ryvarden,
Synop. Fung. 5:195, 1991. - *Polyporus veracrucis* Sacc. Syll. Fung. 6:89, 1888.
Basidiocarp annual, solitary, dimidiate to short laterally stipitate, semi-circular, 10 cm in radius, up to 6 mm thick in centre, pileus dark brown to dark cinnamon, glabrous to finely tomentose, azonate or with variable concentric zones stipe short, 1-4 golden-yellowish-brown to cinnamon, dry specimens often longitudinally wrinkled with age and in tomentum up to 1 mm thick under which there is a distinct thin black line, the core solid, deeper brown and very hard, pore surface often slightly decurrent on the upper expanded part of the stipe, golden-brown to fulvous, margin brighter and sterile, 1-2 mm wide, pores entire and round, very small, almost invisible to the naked eye, 7-9 per mm, tubes concolorous, up to 1 mm deep, context golden-yellow to cinnamon, up to 2 mm deep and duplex and upper looser part separated from the lower denser part by a thin black line.
Hyphal system monomitic, generative hyphae hyaline to golden-brown or even rusty-brown on the pileus where they can be up to 8 µm in diameter, in the trama 3-6 µm wide, moderately branched and densely agglutinated both in context and in stipe.
Basidiospores broadly ellipsoid, smooth, golden-yellow and with slightly thickened walls, non-amyloid, 4-4.5 x 3-3.5 µm.
Substrata. On the ground from buried wood.
Distribution. Known from Mexico and Costa Rica.
Remarks. This species is related to *P. spathulata* and is mainly separated by larger basidiospores.

Abstract

21 neotropical species of *Amauroderma*, 20 of *Ganoderma*, 1 of *Haddowia*, 1 of *Aurificaria*, 9 of *Coltricia*, 3 of *Coltriciella*, 3 of *Cyclomyces*, 25 of *Inonotus*, 60 of *Phellinus* and 6 of *Phylloporia* are described and in parts illustrated.
Keys to genera and species are provided.
Amauroderma elegantissimum Ryvarden & Iturriaga, *Amauroderma deviatum* Ryvarden *Ganoderma citriporum* Ryvarden & Iturriaga, *Ganoderma elegantum* Ryvarden, *Ganoderma guianensis* Decock & Ryvarden, *Phellinus luteus* Ryvarden, *Phellinus neonoxius*, Ryvarden, *Phellinus semihispidus* Ryvarden and *Phellinus turbinatus* Ryvarden are described as new.
The following new combinations are proposed: *Amauroderma brasilensis* (Singer) Ryvarden, *A. dubiopansum* (Lloyd) Ryvarden and *Phellinus detonsus* (Fr.) Ryvarden

Neotropical Polypores Part 1