THE GENUS BASIDIODENDRON[1]

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Abstract

Sebacina, *Exidiopsis*, and *Basidiodendron*, three genera of the resupinate tremellaceae, are recognized. *Sebacina*, based on *Thelephora incrustans* Pers. ex Fries, is retained (in sensu stricto). *Exidiopsis*, established for *Exidia effusa* Bref., is accepted as a genus. The taxon *Bourdotia*, originally created by Bresadola in 1908 as a subgenus with *Sebacina* (*Bourdotia*) *galzinii* as the type and in 1913 elevated by Bresadola and Torrend to generic rank, is proposed as a subgenus of *Exidiopsis*. Since *Bourdotia galzinii* is the type of *Bourdotia*, the generic name *Basidiodendron* created by Rick in 1938 in order to accomodate *B. luteo-griseum* is reinstated for the arid-reticulate gloeocystidiate species formerly included in *Bourdotia*. Two subgenera of *Basidiodendron* are recognized, namely the type subgenus *Basidiodendron* established for *B. luteo-griseum* Rick and *Asarcogloea* subg. nov. based on *Sebacina pini* Jacks. & Martin. The type subgenus *Basidiodendron* includes six species. In *Asarcogloea*, there are four species involved. Two of these, *B. subreniformis* sp. nov. and *B. nodosa* sp. nov., found in Ontario inhabiting decaying wood, are described for the first time. Taxonomic keys and illustrations are included for these species.

Introduction

For the past few years, the writer has devoted her attention to a study of the Tremellaceae with especial attention being given to the genus *Sebacina*. The species are rather widely distributed over temperate and tropical regions, inhabiting soil and decaying wood of various kinds, either on the lower surfaces or exposed, and occasionally encrusting the bases of herbaceous plants or shrubs.

In temperate North America, McGuire (1941) recorded 25 species. Since then, one new species has been reported from North Carolina by Olive (1944). Christiansen (1959) reported still another new member from Denmark. Martin (1944*a*) has reported, in new or noteworthy tropical fungi, an account of an interesting new species. Olive (1958) described seven new species of *Sebacina* from Tahiti in addition to reporting the occurrence of one tropical member previously described by Rogers (1947) from the Marshall Islands. More recently Wells (1959), in a more restricted sense, included 11 species within the genus *Bourdotia*, 4 of which were tropical. Wells (1961) in his treatment of the genus *Exidiopsis*, records 15 species representing transfers from three genera, *Sebacina*, *Heterochaete*, and *Eichleriella*.

In Canada, species of *Sebacina* are best represented by numerous collections made throughout the Province of Ontario and deposited in the Cryptogamic Herbarium of the University of Toronto. The provinces of British Columbia and Quebec are also represented. In addition to these localities numerous collections from other parts of the world, notably Europe and America, are deposited in this herbarium. In an unrestricted sense, there are represented in Canada 21 of the 25 species included by McGuire (1941), and 19 of the 22 species recorded by Martin (1952).

[1]Portion of a thesis presented at the University of Toronto in partial fulfillment of the requirements of the degree of Doctor of Philosophy.

An attempt has been made to bring some order into the existing chaos surrounding doubtful or little known species within the genus after careful examination of either the type or of authentic collections of the species under consideration. A number of the type collections are deposited in the University of Toronto herbarium. Examinations of these along with those from other herbaria and from exsiccati have alleviated some of the difficulties involved in the identification of species. Two species are being described as new to science in this manuscript and new combinations are presented. Taxonomic keys are included.

Detailed microstructural studies were performed using the rapid KOH–phloxine method described by Martin (1944*b*). All critical examinations and measurements were made with the use of an oil immersion lens and 15× ocular. Dried specimens and a number of fresh collections were examined. The terminology used in this paper is largely that of Talbot (1954) for lower hymenomycetes. The nomenclature of color is that of Ridgway (R); otherwise general descriptive terms are employed. Extreme ranges of dimensions are occasionally given in parentheses.

Sebacina and Related Genera

As a genus within the family Tremellaceae *Sebacina* can be delimited from other genera by such characters as habit of growth, texture, hymenial organization, and shape of basidia. These qualities are used in conjunction with other attributes of lesser value in making the necessary separations. In the broad sense, *Sebacina* can be separated from other members within its family by the thin, resupinate and broadly effused habit, indefinite adnate margin, and relatively smooth hymenial surface. The fructification is generally continuous, anastomosing, arid or porose, tough, waxy, or gelatinous. There is typically present a cruciate-septate type of basidium which is usually 4-celled but may be on occasions 2- or 3-celled. In its resupinate habit it corresponds to species of *Corticium* of the Corticiaceae.

Superficially *Sebacina* bears striking resemblances to species of *Stypella*, *Heterochaete*, and *Eichleriella* but a more thorough microscope examination of the representative species will serve to point out the differences. *Stypella* appears to be very closely allied to the arid species of *Sebacina* and more often is readily differentiated by gross morphological characters. The fructification in *Stypella* is interrupted, composed of gregarious gelatinous tubercles or elevations which seem to stand out individually or otherwise anastomose on a thin, arachnoid, basal layer. This is in sharp contrast with the scattered indeterminate ofttimes confluent and continuous patches seen in the arid species of *Bourdotia* which are not connected by such a superficial network. More critical examinations of the hymenial configurations of the two genera reveal apparent distinctions which serve to justify the delineation. An even closer affinity between *Sebacina* and *Stypella* can be seen through critical studies of the two species, *Stypella minor* Möll. and *Exidiopsis sublilacina* (Martin) Ervin. Interestingly enough, the latter is waxy with a more or less continuous hymenium while the former is interrupted with tubercles superimposed on a thin, floccose basal layer. Microstructural examinations show little differences in the hymenial configurations of the two species concerned, the two being amazingly similar except for the presence of prominent cystidioles in *E. sublilacina* and their absence in *Stypella minor*. According to Olive (1958), one collection of *Stypella minor* from Tahiti "was found to be composed of many minute hyaline pustules which remain separate or are crowded together in an almost continuous layer that retain the tuberculate appearance". Except for the fine strands of hyphae connecting the pustules, the subiculum is scarcely visible. It is rather apparent that there is need of establishing more definite generic distinctions within the family. Wells (1961) excluded *E. sublilacina* from *Exidiopsis* and suggested that its affinity was with *Exidia nucleata*.

In *Sebacina grandinioides* (Bourd. & Galz.) Rogers, and in the tropical *Sebacina mucedinea* Pat., there is some suggestion of a "*Heterochaete*-like" tendency which is evident in the raised emergencies which project from the hymenium. In species of *Heterochaete* (Bodman 1952) these elevations are peg-like, sterile, and composed of parallel hyphae. In *Sebacina grandinioides*, the elevations are more tuberculate and consist of a central axis of parallel hyphae from which radiate outwardly gloeocystidia and fertile hyphae. The emergencies in *Sebacina mucedinea* are, according to Wells (1957), more mineral in character. The microstructure of these two species of *Sebacina* is very different from that of *Heterochaete*; the justification for the exclusion is well founded.

The genus *Eichleriella* created by Bresadola (1903), in order to accommodate *E. incarnata* includes within its concept waxy-membranous, subgelatinous, cupulate fruit bodies with free margins. In *Sebacina calcea*, the structure of the hymenium with its large obovate to elongate basidia, two types of branching paraphysoidal elements, and curved spores, there is the possibility of an alliance more in keeping with species of *Eichleriella* (through *E. macrospora*) than with species of *Sebacina*. Although species of *Eichleriella* are more coriaceous and stereum-like which suggest a more complex fruit body, it might be possible to postulate that *S. calcea* with its resupinate, arid, chalky nature represents a primitive link in the chain of *Eichleriella* species.

Both *Exidia* and *Tremella* include members which seem to approach species of *Sebacina* in consistency and in spore character. In *Exidia* the spores are allantoid, while in *Tremella* they are subglobose or ovate. In *Sebacina* (in sensu lato) one encounters both types. The thick erumpent, cerebriform, and pulvinate fructifications of *Tremella* species are very distinctive and more easily separated from *Sebacina* than are those of the *Exidia* members. In a species such as *Exidia nucleata*, the pustulate character of the fructification when fresh is somewhat similar to *Sebacina epigaea*. The one criterion which, at present, is used to delimit *Exidia* and *Tremella* from *Sebacina* is the character of the margins involved. The practice of regarding such characters as pileate or effused as a basis of taxonomy in heterobasidiomycetes should be discouraged in favor of more fixed and natural tendencies.

Prior to the Tulasnes, very little attention had been given to microstructural characters in delimitations; consequently many resupinate species of basidiomycetes, especially tremellaceous members, were included either within the genus *Thelephora* or the genus *Corticium*, primarily on the basis of gross superficial examinations. Since then more emphasis has been placed on the use of microstructural characters as indices of taxonomic entities, thereby necessitating transfers and additions to or from the genus *Sebacina*. Until recently (Ervin 1957; Wells 1959, 1961), the genus was composed of a heterogenous group of organisms which included the tough-coriaceous, widely effused *Sebacina helvelloides* with large 4-celled obovate basidia and the thin waxy-gelatinous evanescent members with smaller basidia than the previous, conspicuous clamp connections, and with hyphal walls highly gelatinized. These latter features are peculiar to such species as *Exidiopsis fugacissima* (Bourd. & Galz.) Sacc. & Trott. and *Sebacina sphaerospora*. Closely allied with these thin, waxy species are members such as *Exidiopsis sublilacina* (Martin) Ervin and *E. podlachica* (Bres.) Ervin, both of which possess sterile projecting elements which I prefer to call cystidioles. From these one passes on to a consideration of the arid *Sebacina calcea*, which seems entirely remote in its kinship to the other members within the same taxon but linked with them apparently because of the resupinate nature of its fruit body and the indeterminate character of its margin, features which have been somewhat exaggerated or overemphasized.

With the gloeocystidiate species of *Bourdotia*, one meets still another complex embracing the thick, waxy-gelatinous, stratified *Sebacina* (*Bourdotia*) *galzinii*, which possesses nonsheathing obovate basidia embedded in a layer of prominently branching dendrophyses, a form which seems more closely akin to the waxy-gelatinous, nongloeocystidiate species, *Exidiopsis laccata* than to the thin, arid-waxy, pruinose, porous-reticulate members represented by *Sebacina* (*Bourdotia*) *eyrei* or *Sebacina* (*Bourdotia*) *caesio-cinerea*.

Finally there are those very remote species of *Heterochaetella* such as *dubia* and *bispora* with fructifications which vary from minute bristles to very hispid tufts of cystidia which project upward as much as 100 μ beyond the basidia and whose relationship and taxonomic status have been rather consistently argued by varied students of the group. The cruciate-septate character of the basidium is convincing evidence of its being a tremellaceous member, but in its more narrow delimitations the question of position becomes more and more debatable. This genus has already been discussed in a previous paper by the author (1960).

The writer proposes to retain *Sebacina* in a more restricted sense for the genus which will be discussed at length in a future paper. This paper deals with a group of temperate species segregated from *Bourdotia*.

A Discussion of *Bourdotia* and its Relationships

Since the history of *Bourdotia* has been so thoroughly reviewed recently by Wells (1959), the writer finds it quite unnecessary to elaborate further on this aspect of the problem. However, it is significant to reiterate that Ervin (1957) reverted to the Bourdot and Galzin concept of treating *Bourdotia* as a genus, a practice which had already been rigidly adhered to by some of the current European workers, Donk (1931), Neuhoff (1936), Pílat (1957). The genus is based upon *Sebacina* (*Bourdotia*) *galzinii* Bres. Malençon (1954) also regarded *Bourdotia* as a genus. However, Boidin (1957), and Christiansen (1959) found it convenient to adhere to the McGuire and Martin interpretation and considered *Bourdotia* as a section of *Sebacina*.

In segregating *Bourdotia*, Ervin (1957) considered of prime importance the presence of gloeocystidia and included only five of the nine species which McGuire (1941) had considered in his section *Bourdotia*.

Wells (1959), in his interpretation of *Bourdotia* as a genus, utilized the three features which Rogers (1933) had previously found workable in substantiating the position of *Bourdotia* on the subgeneric level. Wells included 11 species in the genus; four of these were tropical and three others were placed in his species excludendae. He considered *Sebacina obscura* as the simplest member included in *Bourdotia* and *Sebacina* (*Bourdotia*) *galzinii* as the most complex. He maintains that "it is possible to observe consistent modifications of several characters" proceeding from the simplest to the most complex forms and finds it undesirable to postulate a dual origin for the *Bourdotia* group.

In the broad sense *Bourdotia* might well be described as a heterogenous complex made up of both arid-waxy and waxy-gelatinous gloeocystidiate members bearing basidia in clusters terminally and proliferating, with older fertile stalks often sheathed by collapsed basidial walls or with basidia produced singly and in series at intervals on the fertile stalk. The species vary from a waxy-gelatinous, continuous, undulate condition as seen in *Sebacina* (*Bourdotia*) *galzinii* and *Sebacina umbrina* to the arid-dry, reticulate, porous nature of *Sebacina* (*Bourdotia*) *eyrei* and *Sebacina* (*Bourdotia*) *cinerea* to a rimose, farinaceous state as seen in *Sebacina* (*Bourdotia*) *pini* and *Sebacina rimosa*, finally verging toward the interrupted habit exemplified by *Basidiodendron subreniformis* sp. nov. and *Sebacina* (*Bourdotia*) *grandinioides*.

McGuire (1941) has pointed out that the arid-waxy species of *Bourdotia* are perhaps part of a transitional series from such an arid form of *Eusebacina* as *Sebacina calcea* or that possibly some relationship can be established between the gelatinous species of *Bourdotia* and some gelatinous-waxy member of *Eusebacina*. The writer is in agreement with the latter premise.

Olive (1958) suggested a possible relationship between *Bourdotia* and *Heterochaetella*. He maintained that the thin-walled cystidia of *Sebacina psilochaeta* and *S. minima* are in all probability intermediate between the gloeocystidia of species included in McGuire's section *Bourdotia* and the cystidia of *Heterochaetella dubia* and that these two species with thin-walled cystidia cannot be aptly accommodated in *Heterochaetella* if one is to adhere to Ervin's concept of the taxon. He would rather interpret these as "transitional forms linking the sections *Heterochaetella* and *Bourdotia* too closely to permit their being treated as separate genera". If one were to look for linkage of the arid-waxy *Bourdotia* species in *Heterochaetella* through *H. dubia*, then the only notable feature would be the subulate sterigma, which does not appear to be significant enough to base a premise of relationship on since subulate sterigmata may be demonstrated along other lines. Luck-Allen (1960) in her treatment of *Heterochaetella* excluded these thin-walled species from the genus.

It is the writer's opinion that *Bourdotia* should be segregated from *Sebacina* in part; therefore she partially agrees with Ervin (1957) and Wells (1959). Because gloeocystidia have been such poorly defined elements and occur in so many widely scattered groups, the writer concurs with Olive in regarding them as little more than specific characters. With the correlation of such characters as texture, spores, paraphysoidal elements, arrangement, and character of basidia together with that of the presence of gloeocystidia, an attempt has been made to offer further justifications for the separations into more natural groupings which will be made in this paper.

As a rule, temperate species of *Bourdotia* are all rather thin, with negligible stratification. Especially is this true of the arid-waxy species *S. eyrei*, *S. caesio-cinerea*, and *S. deminuta*. The basidia are generally produced as a single layer in a narrow zone at the surface and the sterigmata are very short. This is in contrast to the condition seen in *S. strigosa*, *S. helvelloides*, and *S. incrustans* where there is a very thick basal layer often growing aerially, creeping over debris, stems, and mosses. The arrangement of basidia in these thick members points to a different mode for thickness as contrasted with the *Bourdotia* species. In such coriaceous species the fertile stalks are long, erect, and ascending. They proliferate by a lateral branch formed at the base of each basidium, which may again proliferate by another lateral branch so that chains or series of large obovate or elongate-obovate basidia are formed and ascend perpendicularly. The hymenium is thick, gelatinous, or mucid with long, tubular protosterigmata that bring the basidia and spores to the surface. Such thick fructifications may arise where one layer of basidia is produced on top of another layer, brought on by continued growth over a period of time.

In the arid species of *Bourdotia* such as *S. eyrei*, *S. deminuta*, and *S. cinerea*, there is a tendency for the fructification to spread out with some thickness, but this is by no means comparable to that which is seen in *S. incrustans* and others mentioned in the same complex. Basidia are produced terminally and are formed on short lateral proliferations which eventually collapse forming an involucre along the fertile stalks. There is a general collapse of basidia so that thickness is somewhat retarded. The uncollapsed basidia assume an oblique position and hence do not grow up perpendicularly. Rogers (1935) gave a very vivid account of basidial formation in *S. deminuta* which is equally applicable to the other species in this complex. In such cases, as Rogers has described, the uncollapsed basidia, which are typically elongate-urniform, arrange themselves in clusters of three to four at the apices of fertile hyphae. These basidia are usually of varied sizes with the oldest basidium projecting beyond the others. This mature basidium releases its spores, collapses, and is pushed to one side in order to permit differentiation of the next which has developed as a lateral extension of the axis. Before maturation of this particular one, still a third begins to develop upon a short subdistal prolongation of the fertile axis. New basidia continue to develop, always at the surface of the hymenium. The older, collapsed basidia, packed one upon the other, consequently form an involucre which surrounds the fertile branch. This method of basidial formation is seemingly absent in all of the members of the section *Eusebacina* of McGuire. It has been clearly detected in *Sebacina cinerea*, *S. grandinioides*, *S. eyrei*, *S. caesio-cinerea*, and *Bourdotia rimulenta* Bourd. & Galz. It was not apparent in *Sebacina galzinii*, the type of *Bourdotia*, and *Sebacina umbrina*. Basidial formation in these latter two species more clearly approaches the sort of proliferation which can be seen in species of *Exidiopsis* simulating *plumbescens* and *laccata*.

The writer believes that the relationship of the arid-waxy species of *Bourdotia* is remote from or is not with *Sebacina* (in sensu stricto) at all, and therefore should be segregated. To be sure, their affinities are not with the softer and more waxy-gelatinous species of *Sebacina*, by virtue of the differences in texture and consistency and because of the variation in hymenial structure. For example, the non-gloeocystidiate species, *Exidiopsis glaira*, *E. fugacissima E. sublilacina*, and *Sebacina sphaerospora*, all tend to possess a subhymenium in which the hyphae composing it become agglutinated and indistinct. At times, such structures as septa, clamp connections, and paraphysoidal elements are scarcely visible. The basidia generally occur singly at the apices with branches arising laterally. At no time is there evidence of the sheathed condition of fertile hyphae which is so prominent in the arid *Bourdotia* species. The position of the clamp, far removed from the bases of basidia as it exists in *Exidiopsis podlachica* and *Sebacina sphaerospora*, is in sharp contrast to the location of this structure immediately at the bases of basidia in the arid species of *Bourdotia* previously mentioned.

The situation is rendered even more complex when one attempts to link the thicker, waxy-gelatinous, laccate species with their large obovate basidia, conspicuous loops, and prominent dendrophyses (as in *Sebacina uvida*, *E. laccata*, and *E. plumbescens*) with these arid-waxy *Bourdotia* members. It is my belief that the relationship of the arid species is not with the *Eusebacina* complex at all; therefore they should be justifiably separated. It is difficult to postulate a link between the arid *Bourdotia* members and *Sebacina calcea*, a possibility suggested by McGuire (1941). In my opinion, the only common bond significant in this case is the arid condition of the fructification. *Sebacina calcea* is thick, very pulverulent, and farinaceous, exhibiting none of the intrinsic character of the thinner, waxy, pruinose-reticulate members of *Bourdotia*. Even more important are the differences in size, shape, and formation of basidia, which, in *S. calcea*, are large and obovate, produced singly at the apices of fertile hyphae, and confined to the lower layer. The protosterigmata are long, tubular, tortuous, and reach to the surface. The paraphysoidal elements extend up to 40 μ beyond basidia, forming a definite layer above. These features suggest little evidence to support a possible linkage.

It is my opinion (Luck-Allen 1959) that the ceraceous-gelatinous members of *Bourdotia* such as *Sebacina galzinii* and *Sebacina umbrina* best find their relationship with the waxy-gelatinous species of *Exidiopsis* through the character of their basidia and the nature of the tortuous branching dendrophyses, which extend upwards projecting at times 60 μ or more beyond basidia and forming a layer above. More specifically, *Sebacina galzinii* shows a distinct affinity with the temperate species *Exidiopsis laccata* (Bourd. & Galz.) Luck-Allen, the two possessing in common gelatinous vernicose hymenia, gelatinized basal layers of horizontal hyphae, cylindric-curved spores, and similarly produced large obovate 4-celled basidia, each cell of which terminates in a long tubular protosterigma. *S. umbrina* very closely resembles *Exidiopsis plumbescens* and *Sebacina uvida*, not only in texture and consistency but in microstructure as well. Particularly significant are the large, often ventricose sterile elements (pseudophyses and simple paraphysoids) which are common in both species. Therefore *Sebacina galzinii* and *S. umbrina* are being placed in a separate subgenus (*Bourdotia*) of *Exidiopsis*. Wells (1961) considers *S. umbrina* Rogers, a synonym of *Exidiopsis grisea* (Pers.) Bourd. & Maire.

Since *Sebacina* (*Bourdotia*) *galzinii* Bres. is the type of *Bourdotia*, the monotypic genus *Basidiodendron* created by Rick (1938) to accomodate *Basidiodendron luteo-griseum* has been resurrected for the arid-reticulate, gloeocystidiate species formerly included in the taxon *Bourdotia*. A total of 10 temperate species, 8 of which occur in Ontario, have been assigned to *Basidiodendron*.

An examination of the holotype of *B. luteo-griseum* located at the Farlow Herbarium was made. Spores were very sparse but the structure of those seen and the character of the basidia strongly suggested that its identity was with *Sebacina* (*Bourdotia*) *eyrei*. Martin (1952) has included the species as a synonym of *Sebacina* (*Bourdotia*) *caesio-cinerea*.

Two new subgenera, *Basidiodendron* and *Asarcogloea*, are recognized. Included in these taxa are species with hymenia which vary from smooth to interrupted, granular to rimose. The six species placed in *Basidiodendron* have short stubby extensions at the bases of basidia (*S. eyrei S. deminuta*) while, in comparison, those of the four species included in *Asarcogloea* possess rather elongated proliferations (*S. pini* and *S. rimosa*). In addition, two newly described species are accomodated in *Asarcogloea*. One of these *Basidiodendron subreniformis* sp. nov. appears to be the simplest species in the subgenus *Asarcogloea* and shows a slight affinity with *Sebacina rimosa*.

It is my belief that the main characters of separation such as texture, shape of basidia, arrangement of these fertile elements, and character of the spores are significantly unchangeable enough in themselves to justify the delineation into the two new subgenera, *Basidiodendron* and *Asarcogloea*.

Key to Genera

1. Fructification resupinate, arid-waxy, porous-reticulate or tuberculate .... *Basidiodendron*
1. Fructification resupinate, tough-coriaceous, mucid or gelatinous waxy 2
   2. Spongy or tough-coriaceous; basal layer of thick-walled, non-clamp-bearing hyphae; spores broadly ovate .... *Sebacina*
   2. Mucid or gelatinous waxy; hyphae with clamp connections; spores other than as above .... *Exidiopsis*

Description of Genus

Basidiodendron Rick, Brotéria 7: 74. 1938.

Fructification resupinate, effused, with indeterminate margin; hymenium arid-waxy, porous-reticulate, granular or tuberculate, varying from an almost continuous layer to an interrupted, rimose, farinaceous areolate condition and covered by a whitish to grayish bloom; gloeocystidia, at maturity, with contents yellow to golden brown; paraphysoids or dendrophyses rarely present; basidia urniform or suburniform, produced either terminally in clusters on short, stubby, lateral proliferations which grow out from clamp connections and at maturity collapse forming involucres along fertile stalks or basidia produced singly, rarely in two's on fertile stalks with rather lengthy lateral proliferations which differentiate at clamp connections, at first two-, finally 4-celled, with cells of basidium at maturity splitting from apex downward and each cell terminating either in a tubular protosterigma or a short sterigma; spores germinating by repetition.

Basidiodendron subgen. nov.

Basidia minuta minor quam 20 μ, urniformia, racemis terminalibus formata, ad lateralia prominenta quae ex noduloso-septatis emanant; involucrum circum fertiles hyphas facientia concidunt; sterigmata subulata, brevia.

Basidia less than 20 μ long, urniform, produced terminally in compact clusters of three to four on short lateral stub-like outgrowths which originate at clamp connections and which at maturity collapse forming conspicuous involucres along fertile stalks; sterigmata short, subulate.

Type: *Basidiodendron luteo-griseum* Rick (*B. eyrei*).

Species included: *B. eyrei*, *B. caesio-cinerea*, *B. rimulenta*, *B. grandinioides*, *B. deminuta*, and *B. cinerea* (new combinations).

Asarcogloea subgen. nov.

Basidia magna, major quam 20 μ, suburniformia vel globosa, ad apices hypharum fertilium singillatim formatia; cellulis basidii secendentibus axibus fertilibus non involucris circumdatis; protosterigmatibus tubulatis.

Basidia generally more than 20 μ (except in *B. nodosa* sp. nov.) with cells separating out from the apex downward, produced singly rarely in two's at the apices of fertile stalks; lateral proliferations somewhat lengthy extending from clamp connections located at the bases of basidia; involucres of collapsed basidia sheathing fertile stalks absent; tubular protosterigmata rather common.

Type: *Sebacina pini* Jackson & Martin.

Etymology: Gr. *asarkos*, lean, not fleshy and *gloia*, sticky substance.

Species included: *B. nodosa* sp. nov., *B. subreniformis* sp. nov., *B. pini* and *B. rimosa* (new combinations).

KEY TO SPECIES

1. Basidia generally more than 20 μ in length (except in *B. nodosa*) and splitting longitudinally from apex downward; fertile stalks unsheathed by involucres of collapsed basidia . . 7
1. Basidia generally less than 20 μ in length; fertile stalks conspicuously sheathed by involucres of collapsed basidia 2
    2. Hymenium porous-reticulate, almost continuous; spores globose to subglobose 3
    2. Hymenium interrupted; spores not as above 4
3. Spores smooth, apiculus obscure . . . . 1. *B. eyrei*
3. Spores inconspicuously roughened, apiculus prominent . . . . 2. *B. caesio-cinerea*
    4. Hymenium rimose-areolate, pale vinaceous when dry; spores cordate to napiform . . . . 3. *B. rimulenta*
    4. Hymenium and spores not as above 5
5. Hymenium granulate, tuberculate; spores subglobose to oval, 3 × 2.5–3 μ . . . . 4. *B. grandinioides*
5. Hymenium finely reticulate, almost continuous; spores larger than above 6
    6. Spores obovate to oblong 4–6 × 3–4.5 μ . . . . 5. *B. deminuta*
    6. Spores broadly ovate to oblong slightly curved, 8–11 × 6–8 μ . . . . 6. *B. cinerea*
7. Fructification almost continuous; spores less than 10 μ long . . . . 7. *B. nodosa* sp. nov.
7. Fructification interrupted, granulate to pronouncedly rimose; spores larger than above . . 8
    8. Fructification very thin, granulate, in section less than 20 μ in thickness; spores subreniform . . . . 8. *B. subreniformis* sp. nov.
    8. Fructification more than 20 μ in thickness; spores other than as above 9
9. Spores ovate to oblong, 15–22 × 8–10.5 μ . . . . 9. *B. pini*
9. Spores subglobose to oval, 9–13 × 6–11 μ . . . . 10. *B. rimosa*

Species Descriptions and Discussions

SUBGENUS BASIDIODENDRON

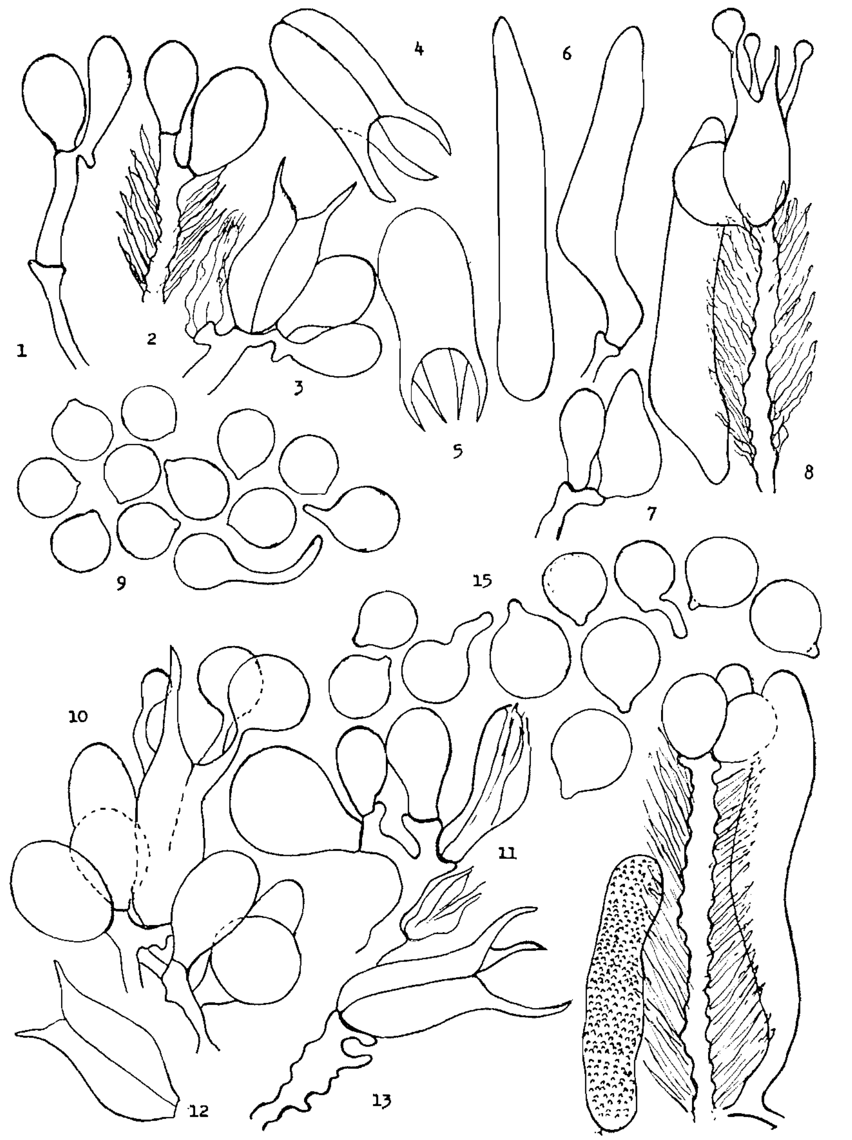
1. ***Basidiodendron eyrei*** (Wakef.) comb. nov. (Figs. 1–9)
   Sebacina eyrei Wakef. Trans. British Mycol. Soc. 5: 126. 1915.
   Gloeocystidium croceo-tingens Bres. (attributed to Wakef.) Ann. Myc. 18: 48. 1920.
   Gloeocystidium eyrei (Wakef.) Sacc. Trev. & Trott. Syll. Fung. 23: 518. 1925.
   Bourdotia eyrei (Wakef.) Bourd. & Galz. Hymén. Fr. 50. 1928.
   Basidiodendron luteo-griseum Rick, Brotéria 7: 74. 1938.

The species appears to be frequently confused in our collections with *B. caesio-cinerea* because of the nature of the spores involved. *B. eyrei* has smaller basidia with smooth spores varying from globose to subglobose and provided with an inconspicuous mucronate apiculus which shows up as a slight hump on the spore surface when examined with a 15× ocular and oil immersion lens. The basidia of *B. caesio-cinerea* are larger and more elongate-urniform than in *eyrei*. In addition, the spore wall is minutely roughened; spores are globose and provided with definite, blunt, peg-like apiculi. The gloeocystidia in *B. eyrei* are more narrow than in *B. caesio-cinerea* measuring 10–45 × 3–6 μ (Fig. 6); probasidia pyriform to obovate 6–7.5 × 7.5–10.5 μ (Figs. 1–3, 8); mature basidia are urniform, elongate, indistinctly longitudinally septate, 6–8 × 8–14 (–15) μ at first 2- to 3-celled (Figs. 3, 4), finally 4-celled (Figs. 5, 8); basidiospores globose to subglobose, when globose measuring 5–7 μ, subglobose 4–5 × 5–7 μ with obscure mucronate apiculus (Fig. 9), germinating by repetition or by the formation of germ tube, apparently through the apiculate end.

Type: England.

Habitat: on rotten deciduous and conifer wood: *Picea mariana*, *Abies* spp.; *Thuja occidentalis*, *Tilia* spp.; *Fraxinus* spp.; *Populus* spp.; *Betula lutea*, *Acer* spp.; *Populus trichocarpa*, *Fagus silvatica*, *Arbutus menziesii*.

Specimens examined: Canada: Ontario (11 collections), R. F. Cain, H. S. Jackson, R. Biggs, L. O. Overholts (TRTC 9024, 13545, 16008, 16012, 16849, 16875, 16888, 31354, 31412, 31692, 32873). Quebec: Duchesnay, Aug. 24, 1938, *Betula lutea* much decayed wood, H. S. Jackson (TRTC 33689); Cascades, Oct. 1, 1935, rotted log *Acer* sp., I. Mounce DAOM F 6110 (in TRTC). British Columbia: Victoria: Mt. Douglas Pk., May 30, 1947, *Arbutus menziesii*, P. J. Salisbury DAVFP V 2638 (in TRTC); Quesnal, Sept. 13, 1948, *Populus trichocarpa*, W. G. Ziller DAVFP V 3715 (in TRTC). United States: New York: Slattersville, Sept. 6, 1952, *Populus*, R. F. Cain (TRTC 24253); Newcomb, Sept. 27, 1932, *Thuja occidentalis*, rotten log, P. Spaulding, BPI FP 81154 (in TRTC); Iowa: Iowa City, May 2, 1937, on *Quercus*, G. W. Martin 3882 (in TRTC); Indiana: W. of Bloomington; McCormick Pk., Aug. 22, 1958 decaying wood, R. Luck-Allen & R. F. Cain (TRTC 33967). Europe: Austria: Tirol, July 22, 1933, decaying wood of *Fagus silvatica*, V. Litschauer, Fungi Austriaci exsiccati (as *B. cinerella* in TRTC), Oct. 3, 1924, on decaying branch of *Tilia*, V. Litschauer (as *B. cinerella* in TRTC).



FIGS. 1–9. *Basidiodendron eyrei.* Figs. 1, 2. Probasidia, TRTC 16875. Fig. 3. Two-celled basidium, collapsed basidium, and two probasidia, TRTC 16875. Fig. 4. Three-celled basidium, TRTC 16875. Fig. 5. Four-celled basidium, TRTC 16012. Figs. 6, 7. Gloeocystidia, two arising from clamp connections, TRTC 33689, 16875. Fig. 8. Fertile stalk enveloped by sheath of collapsed basidia, with probasidium and 4-celled basidium at apex; gloeocystidium at left, TRTC 13545. Fig. 9. Basidiospores, two germinating, TRTC 16008, 16012, 16849.

FIGS. 10–15. *Basidiodendron caesio-cinerea.* Fig. 10. A 4-celled basidium surrounded by probasidia and with gloeocystidium emanating from the fertile stalk, TRTC 8498. Fig. 11. Fertile stalk with three probasidia and two collapsed basidia, TRTC 11750. Figs. 12, 13. Two- and three-celled basidia, TRTC 33769, 16877. Fig. 14. Fertile stalk enveloped by collapsed basidia and with three probasidia at the apex; gloeocystidia to the right and left, TRTC 31663. Fig. 15. Basidiospores, two germinating, TRTC 31663, 20530; S. Lundell, Fungi Suecici 968; A. M. & D. P. Rogers, Oregon.

2. ***Basidiodendron caesio-cinerea*** (Höhn. & Litsch.) comb. nov. (Figs. 10–15).

Corticium caesio-cinereum Höhn. & Litsch. K. Akad. Wiss. in Wien. Sitzungsber., Math.–Nat. Kl. I. 117: 1116. 1908.

Gloeocystidium caesio-cinereum (Höhn. & Litsch.) Bourd. & Galz. Bull. Soc. Myc. Fr. 28: 369. 1912.

Bourdotia cinerella Bourd. & Galz. Bull. Soc. Myc. Fr. 36: 71. 1920.

Sebacina cinerella (Bourd. & Galz.) Killerm., in Engl. & Pr. Nat. Pflanzenf. ed. 2. 6: 115. 1928.

Sebacina (*Bourdotia*) *caesio-cinerea* (Höhn. & Litsch.) Rogers, Univ. Iowa Stud. Nat. Hist. 17: 37. 1935.

Bourdotia caesio-cinerea (Höhn. & Litsch.) Bourd. & Galz. ex Pílat & Lindtner Soc. Sci. Skoplje Bul. Sci. Nat. 18: 175. 1938.

Fructification very thin, ceraceous, whitish to pearl gray (R)*, pruinose, on drying pruinose-reticulate to continuous and occasionally becoming crust-like, thinning toward the margin and porous-reticulate, often granulose, indeterminate; color varying from pale drab gray to pale smoke gray (R) or from pale ochraceous salmon to light ochraceous buff (R) in thicker areas; in thickness 26–75 (–90) μ, composed of a thin, scanty, horizontal layer of hyphae, at times agglutinated, running parallel with substratum and connecting up with erect, ascending, fertile and sterile hyphae; gloeocystidia cylindric, sometimes tapering toward the apex, cylindric-clavulate or irregular with contents hyaline, then yellowish, finally resinous, fragmented, infrequently septate, flexible, non-projecting, 15–50 $\times$ (3–) 4.5–8 (–18) μ (Fig. 14); fertile hyphae nodulose, tortuous, ascending 2–3 (–4.5) μ in diameter up to 45 μ in length, with a sheath of collapsed basidia extending down the sides of the fertile columns almost to the base (Fig. 14); probasidia obovate 9–13 $\times$ 5–8 μ with clamp connections at the bases (Fig. 11); basidia at first 2-celled (Fig. 12), eventually 4-celled with septum at times indistinct, urniform, elongated, measuring 11–17 (–19) $\times$ 8–10 μ produced in groups of 2–3 (–4) terminally on fertile axis (Fig. 10), sterigmata subulate, divergent, or incurved 5–12 μ in length (Figs. 12, 13); basidiospores globose very minutely roughened, at times roughening indistinct, 5–9 μ, with prominent apiculus measuring up to 2 μ, germinating by repetition or by germ tubes produced at the non-apiculate end (Fig. 15).

Type: Austria.

Habitat: On bark and decayed wood, especially of *Abies*, *Pinus*, *Fagus*, and *Betula* species.

Specimens examined: Canada: Ontario (16 collections). R. F. Cain & H. S. Jackson (TRTC, 8498, 11750, 16877, 16909, 18217, 19194, 20530, 20807, 21052, 31357, 31365, 31377, 31494, 31499, 31655, 31663). Quebec: Lac St. Joseph, Pine R., Aug. 26, 1938, decayed wood, R. F. Cain 11320 (TRTC 33690); N. of Stoneham: Camp Donnacona, Aug. 27, 1938, on conifer, R. F. Cain 11131 (in TRTC); near Montreal: Morgan's Woods, Macdonald College, Aug. 27, 1941, on *Pinus strobus*, H. S. Jackson (TRTC 33769); Duchesnay, Aug. 24, 1938, on decayed deciduous wood, H. S. Jackson (TRTC 33770).

*(R) indicates use of a color name in the sense of Ridgway.

United States: New York: Ithaca, Michigan Hollow, Sept. 4, 1952, on conifer, R. F. Cain (TRTC 24283); Lewiston: Long Pond, Oct. 6, 1956, on decaying wood, R. F. Cain (TRTC 32229); Oregon: Santrain below Detroit, Nov. 5, 1938, host? A. M. & D. P. Rogers (in TRTC); Iowa: Dubuque Co., Pine Hollow, Oct. 8, 1932, on *Pinus strobus* D. P. Rogers 26 (in TRTC); Maine: Baxter State Pk., Aug. 21, 1940, wood, G. W. Martin 4986 (in TRTC). Europe: Sweden: near Upsala, Nov. 8, 1930, on decaying frondose wood, S. Lundell, Fungi Suecici 895 (in TRTC); Upland: near Storvreta, Oct. 28, 1929, underside of decaying trunk of *Betula alba*, S. Lundell, Fungi Suecici 968 (in TRTC).

The interesting thing about this species is the very minute roughening characteristic of the spores. These minute spines are quite inconspicuous and are not seen in KOH–phloxine mounts as readily as they are seen in water mounts. Only after a series of examinations of collections had been made was this evident to me. This is the only temperate species with rough-walled spores so far reported. Olive (1958) has reported two rough-spored species from Tahiti.

3. ***Basidiodendron rimulenta*** (Bourd. & Galz.) comb. nov. (Figs. 16–24).
Bourdotia rimulenta Bourd. & Galz. Hymén Fr. 51. 1928.

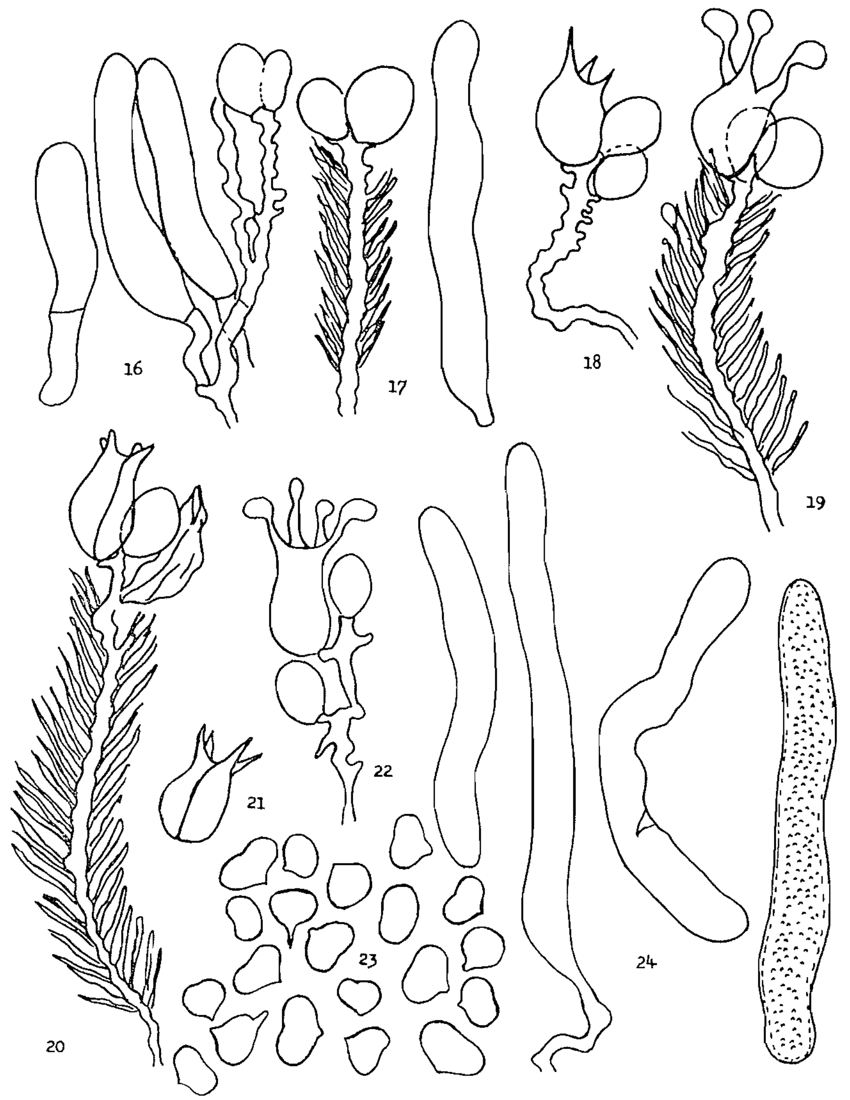
Effused, arid-waxy, adnate, reticulate, strongly tuberculate, rimose-areolate, drying vinaceous lilac (R), becoming pale vinaceous drab to brownish drab, covered by a whitish bloom, thinning toward the margin and then more reticulate; in section up to 100 μ thick; gloeocystidia slender, cylindric, at first hyaline staining red in KOH–phloxine, later filled with resinous contents, flexuous sometimes septate, measuring 25–90 $\times$ 3–6 μ, arising from a thin basal layer of indistinct horizontal hyphae which measures 1.5–2.4 μ or occasionally emanating at clamps on fertile axis (Figs. 16, 24); fertile hyphae originating from a thin basal layer, ascending, slender, tortuous with short lateral nodes, 1.5–2 μ in diameter up to 50 μ in length and enveloped by a dense sheath of collapsed basidia (Figs. 17, 19, 20), probasidia obovate 6–9 $\times$ 5–7.5 μ (Figs. 17–19); basidia at first 2- to 3-celled (Figs. 18, 19) finally 4-celled, urniform-elongate, produced in clusters of 2–3 apically, measuring 8–11 $\times$ 6–7.5 μ (Figs. 20–22); sterigmata short, subulate 3–5 μ; basidiospores ovoid to cordate or napiform 4.5–6 $\times$ 3–5 μ with distinct apiculus, germinating by repetition (Fig. 23).

Type: (Lectotype) France.

Habitat: On decaying hard and soft wood.

Specimens examined: France: l'Aveyron, sent Nov. 3, 1917, on *Pinus*, M. Galzin 10159 (ex Herb. H. Bourdot 20192, in PC Lectotype); l'Aveyron, May 13, 1913, on *Acer*, M. Galzin 13279 (ex Herb. H. Bourdot 20190, in PC).

This species is listed by Bourdot & Galzin (1928) as one of three "formes insuffisamment connues". *Bourdotia grandinioides*, one of the species included, has since been worked over by Rogers (1935). The species, *Bourdotia rimulenta* is being transferred to the genus *Basidiodendron* along with the other species which share, in common with it, elongate-urniform basidia borne in clusters at the apices of fertile stalks which are sheathed by collapsed basidia.



FIGS. 16–24. *Basidiodendron rimulenta*. Fig. 16. Tortuous fertile hyphae bearing two probasidia and one gloeocystidium emanating from a clamp connection; two other gloeocystidia are shown. Fig. 17. Fertile hyphae sheathed by collapsed basidia and bearing apically two probasidia; a gloeocystidium to the right. Figs. 18–20. Further stages in the development of basidia showing 3- and 4-celled elements; fertile stalks with involucres of collapsed basidia. Fig. 21. Four-celled urniform basidium. Fig. 22. Clamp-bearing fertile hyphae with a single 4-celled basidium and young probasidia. Fig. 23. Basidiospores, three germinating. Fig. 24. Four gloeocystidia. All drawings made from Coll. ex Herb. H. Bourdot 20190 except for Figs. 23 and 24, which were made from lectotype, ex Herb. H. Bourdot 20192.

It is possibly closely related to *B. eyrei* from which it can be easily separated by its distinctive purplish vinaceous color and peculiarly shaped ovoid or subglobose apiculate spores, which are flattened at the top giving them a rather interesting napiform or cordate shape.

4. ***Basidiodendron grandinioides*** (Bourd. & Galz.) comb. nov. (Figs. 25–29).
Bourdotia grandinioides Bourd. & Galz. Hymén. Fr. 51. 1928.
Sebacina (*Bourdotia*) *grandinioides* (Bourd. & Galz.) Rogers, Univ. Iowa Stud. Nat. Hist. 17: 40. 1935.

Broadly effused, thin, adnate, fleshy, isabella color (R) when fresh, drying continuous or interrupted, reticulate, tuberculate, granular, often pulling away in areas leaving knots of tissue connected by radiating strands of hyphae, becoming occasionally finely reticulate; in section 35 μ thick; with central axis composed of fungal tissue growing up through hydnoid projections and radiating outward; new hymenium growing outwardly brought about by extensive proliferation with increasing thickness; gloeocystidia at first homogenous, hyaline, later becoming brownish, with globular or fragmented contents, cylindrical or more commonly enlarged at base, narrowing and tortuous toward the apex, originating from a basal layer but often arising from fertile branches and projecting into the hymenium, measuring 3–7.5 $\times$ 25–50 μ (Figs. 26, 28); probasidia subglobose or pyriform 5–9 $\times$ 4.5–7.5 μ, in clusters of two to three rarely four, borne at apices of fertile branches (Fig. 25); basidia urniform 2- to 4-celled, typically 4-celled, measuring 5–7(–8) $\times$ 6–9 (–10) μ (Figs. 26–27); fertile axis tortuous 1.5–2 $\times$ 18–40 μ, with dense involucres of collapsed basidia (Fig. 26); sterigmata at first divergent becoming arcuate, subulate, 3–7 μ in length; spores subglobose to oval, 3 $\times$ 2.5–3 μ apiculate, germinating by repetition (Fig. 29).

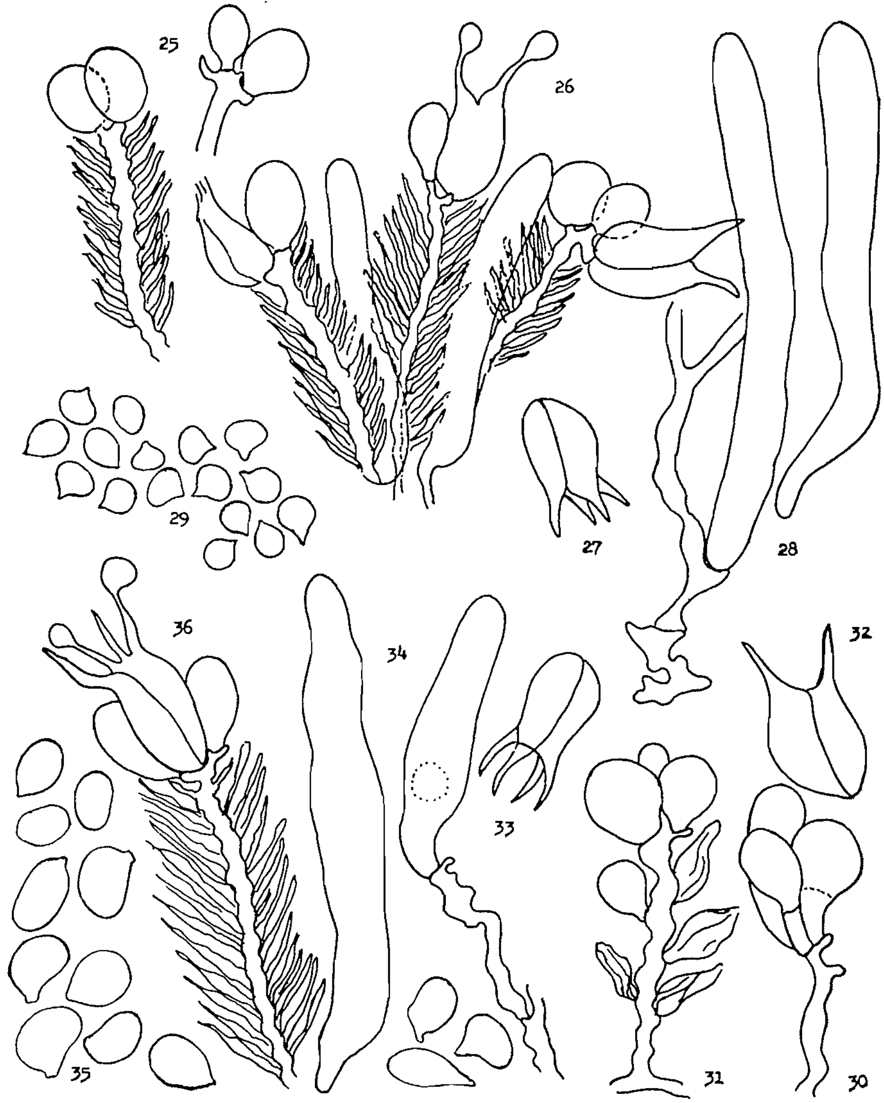
Type: France.

Habitat: On decaying hard wood.

Specimens examined: United States: New Jersey, Aug. 1896, on rotten magnolia, Ellis & Everhart Fung. Col. 1017, as *Hydnum farinaceum* var. *luxurians*. N.A.F. 711. (in TRTC). France: l'Aveyron, April 9, 1910, on *Populus*, M. Galzin 5522 (in Herb. H. Bourdot 20193, PC TYPE).

This is a rarely collected species. An authentic collection, from the herbarium of H. Bourdot, showed a fruit body which was thinner and more continuous than that of the Ellis and Everhart collection. The Galzin collection exhibited occasional tuberculate areas while the exsiccati was strongly hydnoid.

It is possible that as the fruit body gets older, it thickens. The fertile stalks are shorter in the thinner collections, and hence the elevations in the hymenium are not as pronounced as in cases where the fertile stalks are longer. The increasing thickness may be correlated with the mode of proliferation, followed by the "outwardly growing" manner of the new hymenium. The gloeocystidia are interestingly tortuous toward the apex, suggesting that they grow up and around the basidia as they develop. The spore character is correlated with the type of basidium produced here. The species is suggestive of *B. deminuta*, both in spore character and in the development of collapsed basidia but can be easily distinguished from the latter by its hymenial configuration, by the sizes of hymenial elements and by the shape of the spores.



FIGS. 25–29. *Basidiodendron grandinioides*. Figs. 25. Fertile stalks bearing probasidia in varied stages of development. Fig. 26. Reconstructed hymenium showing sheaths of collapsed basidia, surrounding fertile stalks, gloeocystidia, and basidia in varied stages of development. Fig. 27. Four-celled basidium. Fig. 28. Two gloeocystidia, one to left produced at a clamp connection on the fertile stalk. Fig. 29. Basidiospores, four germinating. All drawings made from Bourdot collection 20193 except three lower spores to left of the germinating spore, which were made from Ellis & Everhart Fun. Col. 1017, N.A.F. 711.

FIGS. 30–36. *Basidiodendron deminuta*. Fig. 30. Two probasidia and a gloeocystidium produced on fertile stalk, TRTC 18200. Fig. 31. Fertile hyphae with probasidia and four collapsed basidia, TRTC 18200. Figs. 32, 33. Two- and four-celled basidia TRTC 33687, 31545. Fig. 34. Two gloeocystidia, one at right emanating at a clamp on fertile hyphae, TRTC 33687. Fig. 35. Basidiospores three germinating. TRTC 31373, 31685, 33687. Fig. 36. Fertile stalk with involucre of collapsed basidia and bearing apically two probasidia and a 4-celled basidium, TRTC 33687.

5. ***Basidiodendron deminuta*** (Bourd.) comb. nov. (Figs. 30–36).
Sebacina deminuta Bourd. Ass. Fr. Av. Sc. 45: 575. 1922.
Corticium involucrum Burt, Ann. Missouri Bot. Gard. 13: 271. 1926.
Bourdotia deminuta (Bourd.) Bourd. & Galz. Hymén. Fr. 50. 1928.
Bourdotia mucosa Bourd. & Galz., Hymén. Fr. 51. 1928.

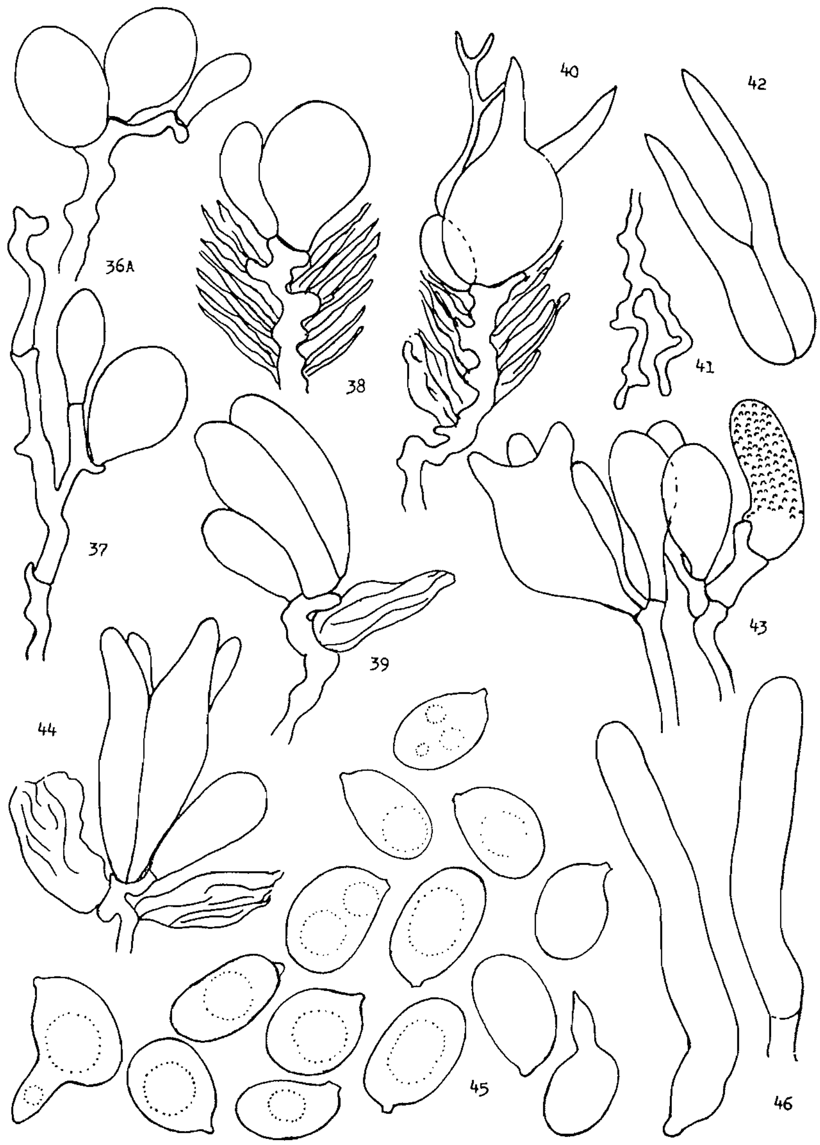
Fructification thin, waxy, somewhat tuberculate, becoming confluent, grayish, drying finely reticulate to continuous, thinner at margins and more intricate, indeterminate, adnate, occasionally forming a waxy crust, covered by a grayish-white bloom or vernicose, varying from pale smoke-gray to tawny-olive (R) or pale ochraceous buff to clay color (R); basal layer thin; fertile hyphae and gloeocystidia erect, perpendicular; fertile hyphae long, tortuous, 1.5–3 μ in diameter up to 30 μ in length, with short lateral proliferations which persist as short stumps along the stalks, with younger basidia terminal and older collapsed ones forming involucres about fertile axis (Fig. 36); gloeocystidia originating either from hyphae of thin basal layer coming to the surface and on the same level as basidia or emanating at clamps on fertile branches and slightly projecting, at times up to 10 μ beyond basidia, irregular, cylindric, flexible, with blunt apices, contents originally hyaline, staining red in KOH–phloxine becoming yellowish–brown, with fragments, flexible 15–50 × 4–6 μ (Fig. 34); probasidia obovate to ovate (6–)7–11 × (5–)6–9 μ (Figs. 30, 31); basidia urniform, elongate 2- to 4-celled, mostly 4-celled, produced at apices of fertile stalks and measuring 6–9 × 8–12 (–14) μ (Figs. 32, 33, 36); sterigmata subulate, arcuate, 4–6 μ in length; basidiospores oblong to oval, laterally flattened and abruptly attenuated at base 4.5–6(–7.5) × 3.5–4.5(–6) μ, germinating by repetition or by a slender germ tube (Fig. 35).

Type: France.

Habitat: Widely distributed on hard and soft woods.

Specimens examined: Canada: Ontario: Algonquin Park: 2 miles W. of Lake of Two Rivers, Sept. 16, 1938, on *Abies*, R. F. Cain (TRTC 31373); Frontenac Co.: Silver Lake, Sept. 1, 1941, on *Fraxinus*, R. F. Cain (TRTC 18200); Renfrew Co.: Pt. Alexander, Sept. 3, 1941, on *Populus*, H. S. Jackson (TRTC 31545); York Co.: Woods west of Maple, Oct. 31, 1950, on hardwood, H. S. Jackson (TRTC 31687); woods west of Maple, Oct. 31, 1950, on deciduous wood, H. S. Jackson (TRTC 31685); woods west of Richmond Hill, Sept. 29, 1937, on *Populus*, H. S. Jackson (TRTC 31394); Lake Timagami: Long Portage to Gull Lake, Aug. 14, 1946, on rotten balsam log, R. F. Cain (TRTC 20975). United States: Iowa: Milford: Little Sioux R., Aug. 4, 1933, on *Prunus Americana* A. M. & D. P. Rogers 295 (in TRTC); Oregon: Heceta Beach, Nov. 26, 1937, on *Pinus contorta*, D. P. Rogers 438 (in TRTC); Mississippi: Soucier, Aug. 7, 1951, on *Pinus*, J. L. Lowe 4801 (TRTC 33687). Europe: Bordeaux: l'Aveyron, April 9, 1910, standing cherry tree, Galzin 5428 (ex Herb. H. Bourdot 7129, as *Bourdotia mucosa* in PC).

According to Olive (1958), *S. eyrei* Wakef. and *S. deminuta* Bourd. are the same species. McGuire (1941) had previously pointed out the probability, stating that the two were possibly variations of the same species in response to different environmental conditions. Wells (1959) had the same concept regarding these species and therefore treated *B. deminuta* as a synonym of *B. eyrei*.



FIGS. 36A–46. *Basidiodendron cinerea*. Figs. 36A–38. Probasidia in varied stages of development, with dendrophysis in Fig. 37, TRTC 20798, 31478. Fig. 39. Young 2-celled basidium, probasidium, and a collapsed basidium, TRTC 31484. Fig. 40. Fertile stalk with involucre of collapsed basidia, probasidium, and 2-celled basidium, a dendrophysis projects slightly beyond, TRTC 31393. Fig. 41. Tortuous dendrophysis. Fig. 42. Two-celled basidium with tubular protosterigmata, TRTC 31462. Fig. 43. Clusters of probasidia, and a 3-celled basidium; at the far right, a gloeocystidium arising at a clamp connection on the fertile stalk, TRTC 16876. Fig. 44. Fertile stalk with two collapsed basidia, probasidium, and a 4-celled basidium, TRTC 31484. Fig. 45. Basidiospores, two germinating. Fig. 46. Two gloeocystidia, TRTC 17503.

In the Ontario collections examined, the writer finds that the spores do not show this type of variation but are consistently oblong, often verging toward oval but never approaching the subglobose to globose condition evident in *B. eyrei*. In our collections, the similarity is greater between *B. eyrei* and *B. caesio-cinerea*.

It is perhaps possible that our concept of the species is not clear. Again, it is possible that the confusion growing out of the distinctions may be due to the position which the apiculus and germ tube may assume on the spore when one looks at it. A clear line of vision is seen best only with a 15× ocular and oil immersion lens; otherwise differentiation is more difficult.

Erroneous determinations have served to confuse matters immeasurably where these two species are concerned. The writer regards *B. deminuta* as distinct from *B. eyrei*.

6. ***Basidiodendron cinerea*** (Bres.) comb. nov. (Figs. 36A–46).

Sebacina cinerea Bres. Fungi Trid. 2: 99. 1892.

Thelephora cinerea (Bres.) Sacc. Syll. Fung. 16: 183. 1902. Not *T. cinerea* Fries 1821.

Exidiopsis cystidiophora Höhn. Ann. Myc. 3: 323. 1905.

Sebacina murina Burt, Ann. Missouri Bot. Gard. 13: 337. 1926.

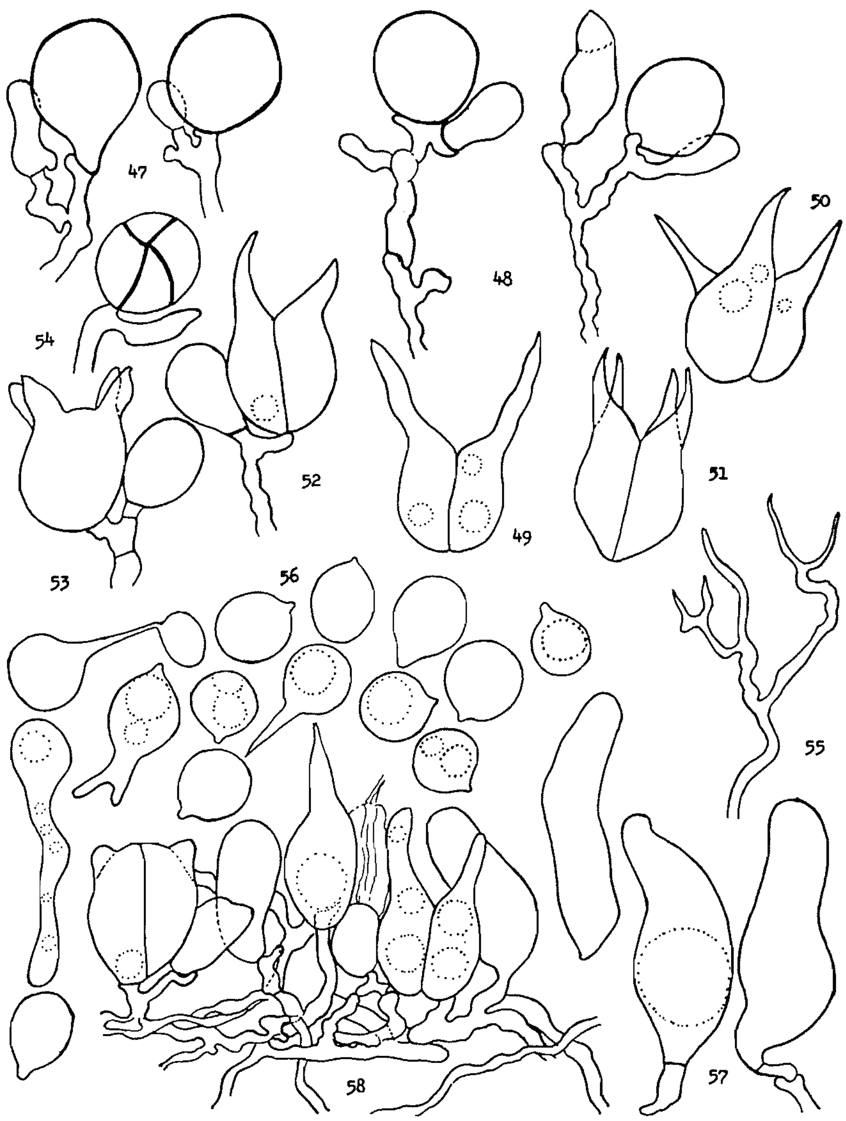
Sebacina gloeocystidiata Kühner, Le Botaniste 17: 26. 1926.

Bourdotia cinerea (Bres.) Bourd. & Galz. Hymén. Fr. 49. 1928.

Thin, broadly effused, waxy-gelatinous or arid-waxy, drying smooth or pruinose-reticulate, occasionally vernicose, varying from grayish white to pale drab gray (R) or pale ochraceous buff (R), becoming clay color when older; a basal layer next to substratum composed of indistinct agglutinated horizontal hyphae measuring 1.5–2 μ; gloeocystidia flexuous, cylindric to clavate-cylindric, rarely incrusted, with hyaline then yellowish contents which finally become resinous, fragmented, 16–35(–60) × 4–7.5 μ, originating from a basal layer of indistinct hyphae or from clamps on fertile branches (Figs. 43, 46); dendrophyses or simple paraphysoids present 1–2 μ, straight or tortuous, emanating from clamps on system of fertile hyphae, generally nonemergent (Figs. 37, 40, 41); probasidia pyriform to obovate 10.5–15 × 8–13 μ (Figs. 36A–38, 43) basidia at surface, obovate often elongating, becoming 2- to 4-celled by a longidutinal septum, with clamp connections at base and short lateral proliferations which grow out from indistinct clamps (Figs. 39–40, 42–44); fertile branches ascending 1.5–2.5 μ in diameter, with prominent nodes occurring along the sides of stalks subtending old and collapsed basidia forming an involucre and bearing at the apices, in clusters, younger basidia (Fig. 40); sterigmata cylindric with apex blunt, or subulate 8–15(–25) × 2–3 μ; spores ovate to oblong, flattened on one side and slightly curved, guttulate, apiculate 8–11(–13) × 6–8 μ, germinating by repetition or by germ-tube formation (Fig. 45).

Type: Trento, Italy.

Habitat: On bark and decayed wood of *Thuja occidentalis*, *Pinus strobus*, *Abies balsamea*, *Populus* spp., *Acer* spp., *Salix* spp., *Fraxinus* spp., *Fagus grandifolia*.



FIGS. 47–58. *Basidiodendron nodosa.* Fig. 47. Fertile hyphae with probasidia, one to far left with lateral proliferation, TRTC 16835, 33408. Fig. 48. Nodulose fertile hyphae bearing probasidia and lateral proliferations; illustration to the right showing a gloeocystidium. Figs. 49–51. Two-, three-, and four-celled basidia, TRTC 33408, 16835, 31476. Figs. 52–54. Fertile hyphae subtending probasidia, 2- and 4-celled basidia; top, Fig. 54 optical view of 4-celled basidium, TRTC 33408, 16835, 31917. Fig. 55. Dendrophysis, TRTC 33408. Fig. 56. Basidiospores, four germinating, TRTC 33408. Fig. 57. Three gloeocystidia, TRTC 16835, 31917. Fig. 58. Reconstructed hymenium showing thin horizontal basal layer, short nodulose fertile hyphae, basidia at varied levels of development and gloeocystidia, TRTC 33408, 16835.

Specimens examined: Canada: Ontario (15 collections), H. S. Jackson, R. F. Cain, R. Biggs (TRTC, 11112, 16876, 16912, 17503, 18211, 20798, 31136, 31351, 31393, 31462, 31480, 31484, 31504, 31536, 31669). Quebec: Ste. Dorothée, Ile Jesus, near Montreal, Aug. 26, 1941, on *Abies balsamea*, R. F. Cain 12960 (TRTC 33684); Aug. 26, 1941, on *Thuja occidentalis*, R. Macrae (TRTC 33685). British Columbia: Vancouver Is.: King's Road, Sept. 25, 1943, on *Salix* ?, I. Mounce DAOM 11505 (in TRTC). United States: Iowa: Iowa City, April 10, 1935, on prostrate log of *Salix*, D. P. Rogers 54 (in TRTC); Ohio: Lorain Co., Sept. 1933, on *Fagus grandifolia*, D. P. Rogers 322 (in TRTC); Indiana: W. of Bloomington: McCormick Creek Pk., Aug. 22, 1958, on decaying prostrate log, R. F. Cain & R. Luck-Allen, (TRTC 33912). Mexico: Cordoba, Jan. 1910, Virgin Forest on mountain side 800–1500 ft., W. A. & B. L. Murrill (in BPI 54603 as *Sebacina murina*, *TYPE*).

SUBGENUS ASARCOGLOEA

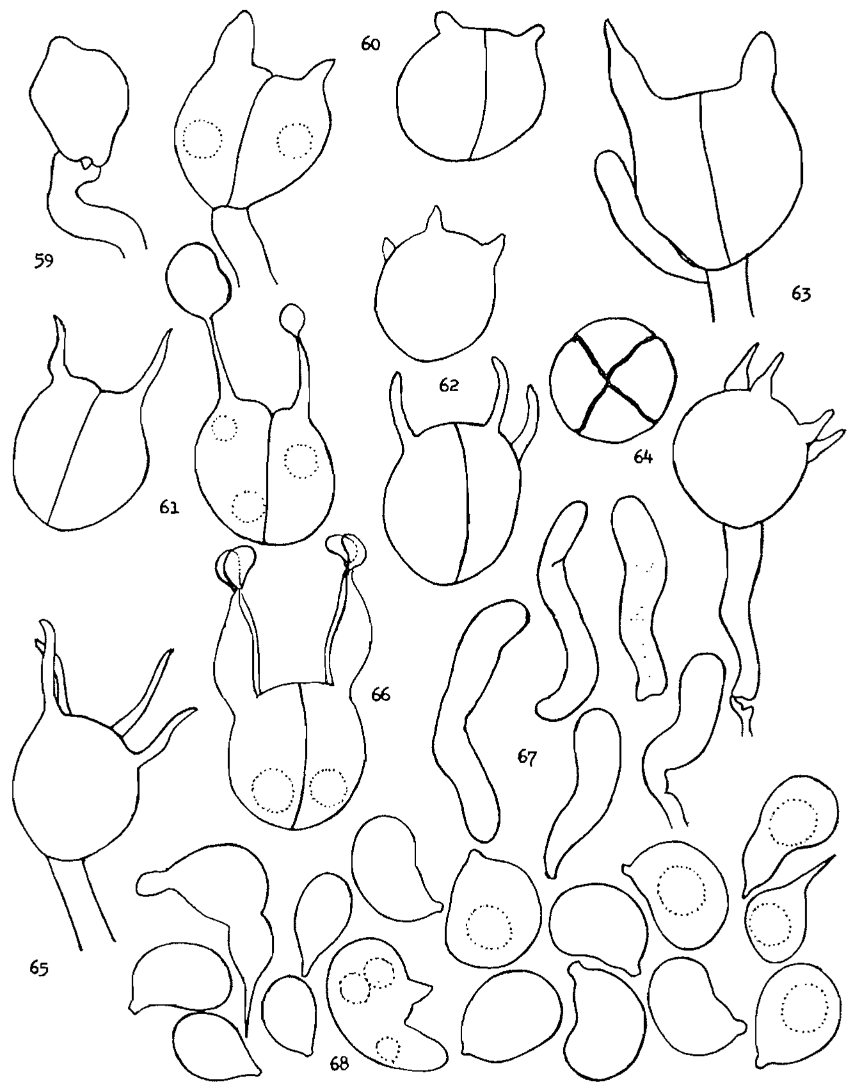
7. ***Basidiodendron nodosa*** sp. nov. (Figs. 47–58).

Fructificatione tenui, effusa, arida, tenuiter reticulata, adnata, interdum paene continua, sicca grisea aut lutea interdum badia, pruinosa; sectione, 50–70 μ cr. fertilibus hyphis noduloso-septatis usque ad 2 μ (Figs. 48, 52); dendrophysibus tenuibus, nonemergentibus, 1–1.5 μ diam. (Fig. 55); gloeocystidiis cylindraceis 18–40 × 7–11 μ (Fig. 57); basidiis primo globosis deinde obovatis interdum paene urniformibus 9–12 × 9–14 (–15) μ (Figs. 49–52); protosterigmatibus subulatis, arcuatis usque ad 20 μ longitudine; basidiosporis globosis vel subglobosis, 7–9 × 6–7 μ, per repetitionem germinantibus (Fig. 56).

Thin, effused, arid, finely reticulate, at times almost continuous, adnate, drying grayish, light buff (R) or darkening to cinnamon-brown (R), pruinose; in section 50–70 μ; basal layer thin, composed of horizontal clamp-bearing hyphae 1.5–2 μ in diameter; fertile hyphae nodulose, clamp-bearing up to 2 μ in diameter, frequently very short, (5–6 μ in length) (Fig. 58); dendrophyses slender, tortuous 1–1.5 μ in diameter (Fig. 55), nonemergent; gloeocystidia irregular, cylindrical, broad, 18–40 × 7–11 μ, golden brown in KOH–phloxine, immature ones staining red, originating from a thin, basal layer of horizontal clamp-bearing hyphae or at clamps on the system of fertile hyphae (Figs. 57–58); probasidia globose, up to 12 μ with clamps at base and proliferating (Figs. 47, 48); basidia globose to obovate verging toward urniform, at first 2-celled, finally 4-celled, guttulate, with short connections between young and old basidia, when globose measuring 9.5–12 μ when suburniform 9–12 × 9–14 (–15) μ, cells frequently separating out from apex downward (Figs. 49–53); protosterigmata at first straight then arcuate, subulate, up to 20 μ in length; basidiospores varying from globose to subglobose, when subglobose elongated through axis of apiculus and measuring 7–9 × 6–7 μ, globose spores mostly 6–7.5 μ often with one large central refractive globule, apiculus peg-like projecting 0.5 μ, germinating by repetition often through apiculate end or by germ tube from the side of the spore (Fig. 56).

Type: Little White River, Algoma Dist., Ont. Sept. 14, 1956, R. F. Cain, TRTC 33408.

Habitat: Found only on very much decayed coniferous wood.



FIGS. 59–68. *Basidiodendron subreniformis.* Fig. 59. Probasidium with clamp connection. Fig. 60. Two two-celled basidia, one at left showing two guttulae. Figs. 61, 62. Two- and three-celled basidia showing character of sterigmata. Fig. 63. Two-celled basidium with lateral proliferation at base and with sterigmata at irregular stages of formation. Fig. 64. Optical view of 4-celled basidium—to the right, clamp-bearing fertile stalk subtending 4-celled basidium, septum not visible. Figs. 65, 66. Four-celled basidia showing character of protosterigmata, one to right with spores attached to the sterigmata. Fig. 67. Gloeocystidia. Fig. 68. Basidiospores, five germinating, TRTC 32171, type.

Specimens examined: Canada: Ontario: Algonquin Park: Cache Lake, Sept. 1, 1939, on *Thuja occidentalis*, R. F. Cain (TRTC 16835); Macaulay R., Aug. 24, 1939, on *Abies*, R. F. Cain (TRTC 31917); Algoma Dist., Little White R., twp. 1B, Sept. 14, 1956, on decayed *Pinus*, R. F. Cain (TRTC 33408, TYPE); Brant County E. of New Durham, Oct. 9, 1937, on conifer, R. F. Cain (TRTC 33698); Lake Timagami: Timagami Is., Aug. 10, 1939, on conifer, R. F. Cain (TRTC 31476). Quebec: N. of Stoneham: Camp Donnacona, Aug. 27, 1938, on *Abies balsamea*, R. F. Cain 11210 (TRTC 33962); Ste. Dorothée, Ile Jesus, near Montreal, Aug. 26, 1941, on conifer, R. F. Cain (TRTC 33691).

The closest relative to this species appears to be *B. rimosa*. *B. nodosa* sp. nov. seems to be less rimose with distinct nodules marking the fertile hyphae. It differs from *B. rimosa* primarily in the smaller size of basidia and basidiospores.

On the other hand, *B. nodosa* also shows some relationship to *B. cinerea* from which it can be easily separated by its globose or subglobose spores and by the naked fertile stalk which lacks the involucre so typical of *B. cinerea*.

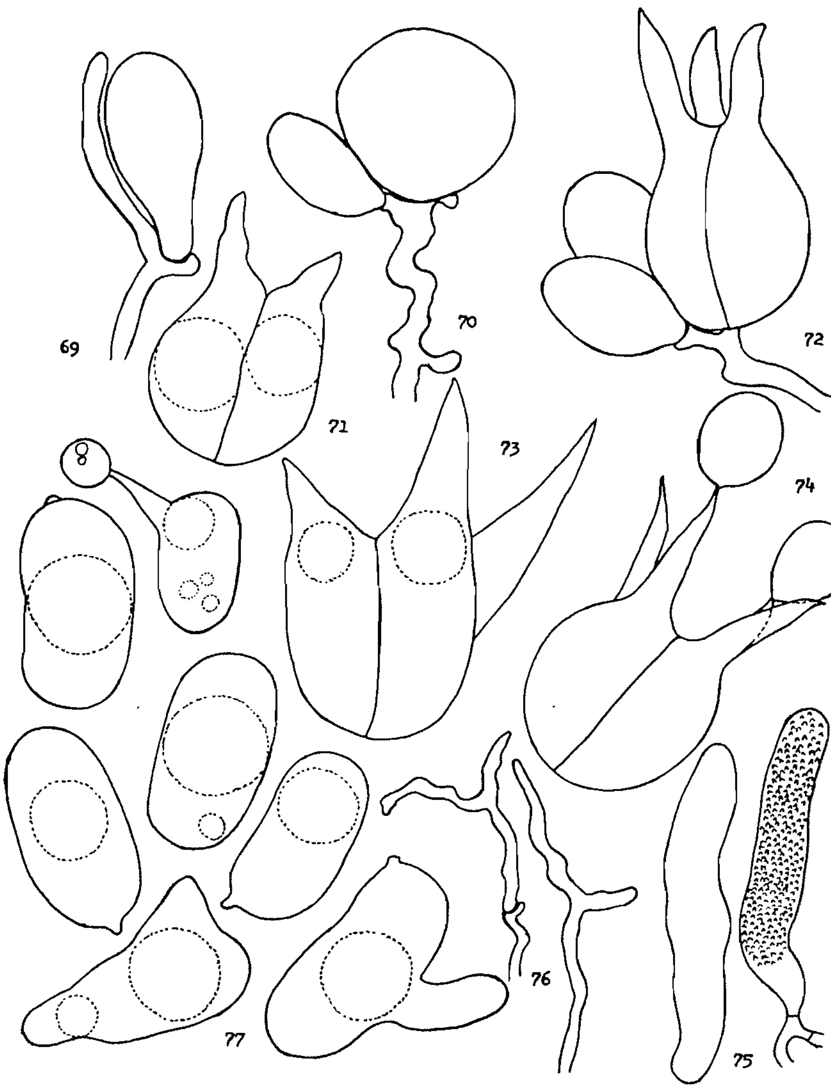
8. ***Basidiodendron subreniformis*** sp. nov. (Figs. 59–68).

Fructificatione pruinosa, tenuissima, adnata, albida vel grisea, granulosa, gloeocystidiis tenuibus, filiformibus interdum septatis, 16–60 × 3–7 μ primo hyalinis deinde flavidis (Fig. 67); probasidiis subglobosis vel globosis, 12–14 μ nodosis ad basem; maturis basidiis globosis, 11.5–21 μ, generaliter 4-cellularibus (Figs. 64–66); protosterigmatibus brevibus, tenuibus, 1–1.5 × 7–13 μ (Fig. 65); vel ad basim amplificatis 2–2.5 μ, ad spiculum attenuatis (Figs. 64, 66); sporis subreniformibus, 9–14 × 6–9.5 μ, per reptitionem germinantibus (Fig. 68).

Fructification pruinose, whitish to gull-gray (R) very thin, adnate, drying down to interrupted patches and standing out as individual particles, granular; margin indeterminate; distinct hyphal layer lacking at bases of fertile system, branches arising directly from substrate to produce hymenial elements; gloeocystidia slender, filiform often septate, at first hyaline, later with resinous contents, originating directly from the substrate or from hyphae which originate in the substrate and measuring 16–60 × 3–7 μ (Fig. 67); probasidia subglobose 14 × 12 μ to globose 12–14 μ at times obovate (Fig. 59); basidia at first 2- to 3-celled with proliferations at base (Figs. 60–63), but finally 4-celled (Figs. 65–66) often with cells separating out at maturity; protosterigmata short 7–13 × 1–1.5 μ (Fig. 65), often enlarged at base from 2–2.5 μ in diameter, narrowing to less than 1 μ toward spiculum (Fig. 66); spores concave on ventral surface, subreniform, measuring 9–14 × 6–9.5 μ apiculate, germinating by repetition in a variable manner at any point on the spore, often at two corners with sterigmata drawn out into long points at each end or with sterigma inflated at base and then drawn out to a point; immature spores characteristically lacrimoid (Fig. 68).

Type: Gull Lake Portage, Lake Timagami, Ontario. Aug. 20, 1936, R. Biggs, TRTC 32171.

Habitat: On coniferous host.



FIGS. 69–77. *Basidiodendron pini*. Figs. 69, 70. Probasidia in varied stages of development; Fig. 69 showing lateral proliferation, TRTC 13090, 31488. Fig. 71. Two-celled guttulate basidium, TRTC 31690. Fig. 72. Three-celled basidium with two probasidia, TRTC 31488. Figs. 73, 74. Three- and four-celled basidia, TRTC 21814, 31488. Fig. 75. Two gloeocystidia one to the right encrusted, TRTC 31488. Fig. 76. Dendrophyses, TRTC 13090. Fig. 77. Basidiospores, three germinating, TRTC 13090, type.

Specimens examined: A single collection, on *Abies*, Canada: Ontario: Lake Timagami; Gull L. Portage, Aug. 20, 1936, on *Abies*, R. Biggs. (TRTC 32171, TYPE).

This is a rather unusual species characterized by an exceedingly thin, inconspicuous fructification which simulates a *Stypella* in habit but here the resemblance ends. In microstructure, *B. subreniformis* seems to be more closely related to *B. rimosa*. It is characterized by large, globose basidia produced singly at the apex of fertile stalks and easily separated from them. It can be very easily distinguished from *B. rimosa* not only by the character of its growth habit but also on the basis of its distinctive spores.

9. ***Basidiodendron pini*** (Jackson & Martin) comb. nov. (Figs. 69–77).
Sebacina pini Jackson & Martin, Mycologia 32: 684. 1940.
Bourdotia pini (Jackson & Martin) Wells, Mycologia 51: 551. 1959.

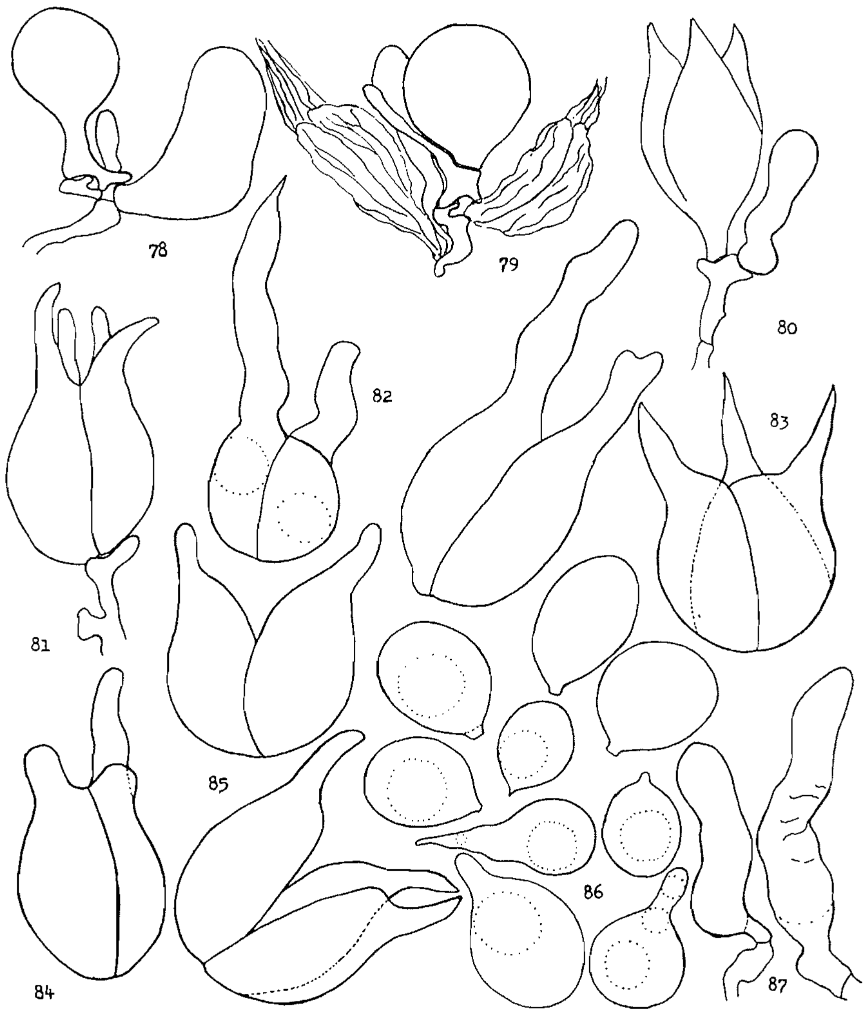
Fructification thin, effused, arid-waxy, smoke gray, on drying adnate, grayish-white to olive buff (R) or rarely inconspicuous, porous-reticulate verging toward rimose, finely pruinose; margin very thin, indeterminate, granular or farinaceous; in section 50–120 μ thick, composed of a thin often agglutinated basal layer of hyphae parallel with the substratum, measuring 1–2 μ in diameter and with prominent clamp connections; dendrophyses slender, very tortuous 1.5–2 μ in diameter, narrowing to less than 1 μ at apex, emanating from either clamps on fertile branches or from hyphae in the basal region, apparently forming a zone in which the basidia are situated, generally nonemergent (Fig. 76); gloeocystidia arising from basal layer or from fertile hyphae, occasionally projecting as much as 14–17 μ beyond basidia – when originating from fertile system, cylindric, flexible at first staining red in KOH–phloxine, then becoming yellowish brown when older (often with peculiar pits inside cells) measuring 15–50 × 5–7.5 μ (Fig. 75); probasidia pyriform to obovate then subglobose, proliferating from clamps at the base and with long lateral proliferations, 12–16 × 16–20(–25) μ (Figs. 69, 70); basidia large, cruciate-septate splitting longitudinally from apex downward, 2- to 4-celled, suburniform (10–)18–22 × (13–)19–24 μ, borne terminally and on rather long lateral proliferations from distinct clamp connections at the base of each basidium (Figs. 71–74); protosterigmata 10–25 × 2–3 μ, straight, frequently divergent, subulate; basidiospores cylindrical laterally flattened, slightly curved or ovate, guttulate (12–)15–22 × 8–10 μ, germinating by repetition or by broad germ tube (Fig. 77).

Type: Maple, Ontario.

Habitat: Found on coniferous hosts.

Specimens examined: Canada: Ontario: York Co., Nov. 6, 1938, on *Pinus strobus*, H. S. Jackson (TRTC 13090, TYPE); N. of Richmond Hill, Sept. 29, 1945, on *Pinus strobus*, H. S. Jackson (TRTC 21814); Woods W. of Maple, Oct. 6, 1937, on *Pinus strobus*, H. S. Jackson (TRTC 31487), Oct. 30, 1948, on *Tsuga canadensis* H. S. Jackson (TRTC 31690), Oct. 21, 1939, *Pinus strobus*, H. S. Jackson (TRTC 31488); N. Toronto, Strathgowan Pk., Sept. 17, 1943, on *Tsuga*, H. S. Jackson (TRTC 31467).

This species is strikingly characteristic because of the extremely large fertile elements and easily discernible from other members within the same complex because of them.



FIGS. 78–87. *Basidiodendron rimosa*. Fig. 78. Probasidium with gloeocystidium, TRTC 31359. Fig. 79. Probasidium with two collapsed basidia, gloeocystidium, and proliferation, TRTC 13086, type. Fig. 80. Three-celled basidium with gloeocystidium, TRTC 31359. Fig. 81. Four-celled basidium with clamp connection at base, TRTC 13086. Fig. 82. Two-celled basidia showing irregularities in time of formation of protosterigmata, TRTC31 359, 13086. Fig. 83. Three-celled basidium with the more typical type of sterigmata, TRTC 13086. Fig. 84. Three-celled basidium showing irregularities in time of formation of protosterigmata, TRTC 13086. Fig. 85. Basidia splitting longitudinally from the apex downward, TRTC 13086. Fig. 86. Basidiospores, three germinating, TRTC 13086, 31359. Fig. 87. Two gloeocystidia, TRTC 13086.

NOTE: All figures (1–87) were drawn with the aid of a camera lucida at approximately ×2400 and reproduced to approximately ×1600.

10. ***Basidiodendron rimosa*** (Jackson & Martin) comb. nov. (Figs. 78–87).
Sebacina rimosa Jackson & Martin, Mycologia 32: 684. 1940.

Fructification thin, effused, drying arid-waxy, finely pruinose almost continuous to interrupted, porous-reticulate, white, thinner at margins, almost granular, indeterminate, varying from grayish-white to light brownish-olive (R), rimulose, 35–75 μ in thickness, with a thin basal layer of clamp-bearing hyphae parallel with substratum, measuring 1–2 μ in diameter; gloeocystidia cylindric or subcylindric frequently septate, thin-walled, with contents hyaline later becoming golden-brown, resinous, 5–7.5 × 15–40 μ, originating either from horizontal hyphae of the basal layer or from fertile hyphae, flexible, nonemergent (Figs. 80, 87); dendrophyses absent or obscure; probasidia subpyriform to nearly globose measuring 13–16 × 10–12 μ (Figs. 78, 79); basidia globose, guttulate, verging toward urniform, borne singly at apex of fertile axis, easily separable and detached from fertile stalks, at first 2-celled becoming 4-celled (Figs. 80–84); cells of basidium separating out from apex downward (Fig. 85), when globose measuring 15–17 μ, suburniform 14–18(–20) × 12–17.5 μ with lateral proliferations (Fig. 79); protosterigmata occasionally showing irregularities in time of formation (Figs. 82, 84), at times cylindric; more generally sterigmata subulate, divergent, 3–4 μ in diameter at base and up to 20 μ in length; spores subglobose to oval, with blunt apiculus, often with one large central refractive globule 9–13(–14) × 8–11 μ, germinating by repetition or by germ tube formation (Fig. 86).

Type: Maple, Ontario.

Habitat: On coniferous hosts.

Specimens examined: Canada: Ontario: Algonquin Park: Lake Opeongo, Aug. 23, 1939, on *Thuja occidentalis*, R. F. Cain (TRTC 31359); York Co., Woods E. of Maple, Nov. 13, 1938, on *Thuja occidentalis*, H. S. Jackson, (TRTC 13086, TYPE).

One of the more conspicuous arid members easily differentiated from other species in the *Basidiodendron* complex by its large basidia which conspicuously separate out into cells from the apex downward, and by its subglobose to oval spores. It seems closely related to *B. nodosa*.

Species not Included

1. **Sebacina (Bourdotia) galzinii** Bres. Ann. Myc. 6: 46. 1908.

This species is being included within the concept of *Exidiopsis*. See discussion page 1031 (this paper).

2. **Sebacina (Bourdotia) umbrina** Rogers, Univ. Iowa Stud. Nat. Hist. 17. 39. 1935.

Sebacina umbrina is a gelatinous-waxy species with cylindrical to broad, clavate, sterile elements previously interpreted as gloeocystidia but which are apparently only simple, broad paraphysoidal elements. Its affinity seems to be rather with members of the *Exidiopsis plumbescens* complex than with species of *Basidiodendron*.

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