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Laboulbeniales (Ascomycetes) of Finland and adjacent parts of the U.S.S.R.

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About 160 000 specimens of insects, belonging to 1 100 species, and a few millipedes, mostly from museum collections, were investigated with respect to the occurrence of ectoparasitic, laboulbeniaceous fungi in Finland and adjacent parts of the U.S.S.R. In all 166 species of insects (Coleoptera and Diptera) were found to be infested by 88 taxa of Laboulbeniales (81 species from Finland and 42 species from the U.S.S.R.), all are reported from the area for the first time. All the fungus taxa are illustrated and their distribution mapped. Twenty-four taxa are described as new for science: *Cantharomyces aploderi* n. sp., *Dichomyces furcifer* subsp. *subarcticus* n. subsp., *Eucantharomyces fennoscandicus* n. sp., *Fanniomyces copromyzae* n. sp., *Hydrophilomyces arcuatus* n. sp., *Laboulbenia carelica* n. sp., *L. fennica* n. sp., *L. hastiana* n. sp., *L. kajanensis* n. sp., *L. murmanica* n. sp., *L. oodiphila* n. sp., *Monoicomyces oxyteli* n. sp., *Siemaszkoa fennica* n. sp., *Stigmatomyces axystae* n. sp., *S. bottnica* n. sp., *S. chthonicus* n. sp., *S. dichaetae* n. sp., *S. hackmanii* n. sp., *S. manicatae* n. sp., *S. mantis* n. sp., *S. setacerae* n. sp., *S. subterraneus* n. sp., *Symplectromyces lapponicus* n. sp. and *S. rarus* n. sp. Five other species are recorded for the first time from Europe: *Laboulbenia compressa* Thaxter, *L. curtipes* Thaxter, *L. manubriolata* Thaxter, *Monoicomyces furcata* Thaxter and *Teratomyces brevicaulis* Thaxter.

A short review is given of the morphology, host-parasite relationships, distribution, origin and taxonomy of the parasites of the Laboulbeniales. The general conditions for the occurrence of laboulbeniaceous parasites are discussed. The frequency of these parasites on insects in Northern Europe proved to be about 1 %, which is very low compared with the values for Central Europe, where the frequency is generally 10—35 %. The explanation appears to be that in the north the host populations are smaller, more scattered and living under more unpredictable climatological conditions, which lowers the probability of establishment, dispersal and survival of the parasites. This is probably also the reason why many parasites do not extend as far north as their hosts, though another explanation may be an alteration in the life cycle pattern of the host towards the north. In one case, at least, viz. *Misgomyces dyschirii* Thaxter on *Dyschirius globosus* (Herbst), the distribution of the parasite is apparently directly limited by certain climatological factors.

Preliminary results of investigations of *Laboulbenia fennica* occurring on whirligig beetles (Coleoptera, Gyrinidae) in several host populations in southern Finland have shown a very constant frequency of the parasite, with no seasonal variation. In contrast, investigations of the Laboulbeniales in Central Europe have revealed two different patterns of population dynamics with distinct seasonal fluctuations.

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1. Introduction

The Laboulbeniales are a relatively large order of fungi within the Ascomycetes, with a world-wide distribution and more than 1800 species. All the species are nowadays classified as obligate ectoparasites of Arthropoda, mainly insects, but also mites and millipedes. They are in most cases microscopical, the size varying from 0.04 mm to about 1 mm. Despite their parasitic habit, they cause little or no harm to the host.

The earliest observations on Laboulbeniales were made by two French entomologists, A. Laboulbéne and A. Rouget, in the 1840s. Rouget published the first illustrated report on these parasites in 1850 and three years later the first two species were described from France by J. Montagne and C. Robin (Robin 1853). Except for a few papers in the subsequent years, little attention was paid to the Laboulbeniales until 1890, when the famous American mycologist Roland Thaxter published the first of a long series of papers on this fungus group. His most important work was the monograph of the Laboulbeniales, of which five volumes were published in 1896, 1908, 1924, 1926 and 1931. Unfortunately he died before he could prepare the sixth volume, which was intended to be a synthesis of his knowledge of the Laboulbeniales. About two thirds of all the known species have been described by Thaxter. A long series of papers on the Laboulbeniales, mainly from South America and Italy, was published in Argentina by one of Thaxter's contemporaries, the Italian mycologist Carlos Spegazzini (1902—1924). He described nearly 270 new taxa and he is thus one of the most outstanding researchers in this group. Other important names are F. Picard, É. Chatton and C. Cépède (France) and R. Maire (Algeria).

In Europe numerous regional floristic works have been published on the Laboulbeniales during the twentieth century. In addition to the above-mentioned names at least the following ought to be mentioned: R. Baumgartner (Switzerland), J. and W. Siemaszko (Poland), S. Colla (Italy), P. Lepesme (France), Middelhoek (Netherlands), A. Collart (Belgium) and J. Banhegyi (Hungary).

In the 1970s and early 1980s important work has been done on the Laboulbeniales by R.K. Benjamin and I.I. Tavares (U.S.A.), J. Balazuc, J. and H. Dainat (France), K. Sugiyama and K. Terada (Japan), W. Rossi and G. Cesari Rossi (Italy), T. Majewski (Poland) and H.-W. Scheloske (Federal Republic of Germany). A few other authors have contributed floristic notes or descriptions of new taxa.

Although about 265 species have been reported from Europe, there are few literature records for Northern Europe. Only 18 species have been reported for Fennoscandia and Denmark, by: (1) Thaxter (1908), (2) Rostrup (1916), (3) Siemaszko & Siemaszko (1928), (4) Arwidsson (1946), (5) Ryberg (1947), (6) Huggert (1973), (7) Balazuc (1973—74) and (8) Balazuc (1980). These are as follows (the number in brackets refers to the author):

Amphimyces liodivorus Huggert, Sweden (6)
Arthrorhynchus nycteribiae (Peyritsch) Thaxter, Sweden, Denmark (5)
Asaphomyces gillerforsii Huggert, Sweden (6)
A. tubanticus (Middelhoek & Boelens) Scheloske, Sweden (6)
Colonomyces appendiculatus Benjamin, Sweden (6)
Corethromyces niger Majewski (*Laboulbenia ptomaphagi* Huggert), Sweden, Denmark (6)
Ecteinomyces agathidii Maire, Sweden (6)
Eumonoicomyces papuanus Thaxter, Denmark (2)
Hydrophilomyces digitatus Picard, Sweden (7)
Laboulbenia colasi Lepesme, Sweden (7)
L. flagellata Peyritsch, Denmark (2)
L. cf. *ophoni* Thaxter, Sweden (4)
L. cf. *polyphaga* Thaxter/*vulgaris* Peyritsch, Sweden (4)
L. pterostichi Thaxter, Denmark (2), Finland (3)

Rhachomyces philonthinus Thaxter, Sweden (1)
Rickia huggerti Balazuc, Sweden (8)
R. hyperborea Balazuc, Norway (8)
Stigmatomyces euconni Picard, Denmark (7)

Briedis (1932) reported 15 species of Laboulbeniales from Latvia. It may be noted that there are only scattered records of Laboulbeniales from Siberia and Canada (Thaxter 1908, Siemaszko & Siemaszko 1928). From Alaska only one species is known from the Aleutian Islands (Thaxter 1896).

The present study on the Laboulbeniales is the first on this fungus group from Eastern Fennoscandia (Siemaszko's note excluded). The taxa reported from the area number 88. Of these 23 species and one subspecies are described as new to science and five other species are reported for the first time from Europe. Owing to the scarcity of literature records from northern regions, these observations provide new information on the distribution of the parasites in relation to their hosts and also serve to elucidate the biology of the hosts.

2. Morphology and development

This section is mainly based on Benjamin (1971, 1973), where the student of the group can obtain more details. The different developmental stages of the Laboulbeniales are illustrated in Thaxter (1896).

2.1. Development of the receptacle

The basal part of the germinating spore darkens and forms a suckerlike organ called the foot. The foot finally becomes black and adheres to the surface of the host, and a short haustorium penetrates the integument and comes into contact with living cells in the host. In a few genera this haustorium may be large and branched with the foot only slightly darkened. After development of the haustorium the spore cells rapidly begin to divide and form the receptacle, i.e. that part of the thallus from which appendages and perithecia develop. The cell divisions take place in a very exact sequence and in a manner typical of the genus. The receptacle normally has a definite number of cells. The complexity of the receptacle varies greatly. It may consist of only three cells, a basal cell, a subbasal cell, which may bear a perithecium or other outgrowths, and an upper cell terminating in an appendage. In other cases it may be composed of one or a few rows of superposed cells and sometimes secondary axes grow from the subbasal cell. The organization of the receptacle is an important character for separating different genera within the order.

2.2. Appendages

The primary appendage is a branch originating directly from the upper segment of the spore. It may persist or disappear. Secondary appendages often grow from the receptacle or sometimes from the perithecium. In genera such as *Stigmatomyces* and *Haplomyces* the apex of the original upper segment of the spore is readily seen as a distinct spine at the top of the appendage. The structure of the appendages may vary from only one cell to long simple or branched rows of superposed cells, which may bear antheridia. The perithecial appendages are always sterile.

2.3. Male sexual organs

In sexual reproduction the carrier of the male genes, the spermatium, originates in three different ways, by exogenous formation, in simple antheridia or in compound antheridia. The exogenous spermatia arise directly, as small rodlike branchlets, on the lateral side of the appendage cells. The simple antheridium in which spermatia are formed endogenously is composed of a flaskshaped cell with attenuated neck, through which the spermatia pass to the outside. This type of spermatia formation is the most common in the Laboulbeniales. Simple antheridia may occur on the appendage singly or in groups of varying size. In many dioecious species the male thallus terminates in a single antheridium with an obliquely placed neck. The antheridia may be free or connected to a varying degree with neighbouring cells or antheridia, sometimes only the discharge tube being free. In the compound antheridium many antheridial cells discharge spermatia into a common chamber with one common discharge opening. Compound antheridia often occur singly, but sometimes there are several of them on the thallus. The antheridia are still unknown in many genera.

2.4. The perithecium and female sexual organ

The perithecial cells originate from the lower spore segment. They develope from a single cell somewhere on the receptacle. In most cases this divides into an upper and a lower cell. The upper one forms the female organ while the lower one gives rise to the stalk, base and walls of the perithecium. The female organ consists of a lower carpogenic cell, a median trichophoric cell and a terminal trichogyne. The cells of the perithecial walls grow up around the carpogenic cell and trichophoric cell, the trichogyne being an external structure consisting of one or a few cells, simple or branched. A spermatium from the male organ adheres on some occasion to the trichogyne and the male nucleus moves into the perithecium, where fertilization finally takes place. At maturation of the perithecium, the trichophoric cell and the trichogyne disappear and the carpogenic cell gives rise to one, two, four, eight or more ascogenous cells. In many species the number of ascogenous cells seems to be relatively limited. The ascogenous cells develop in succession, giving rise to four, rarely eight, ascospores each and eventually filling the perithecial cavity. There are some important deviations from the abovementioned process, which have taxonomic implications; for instance *Euzodiomyces* has additional secondary perithecial stalk cells; for details see Tavares (1965, 1966, 1980) and Benjamin (1971).

Plasmogamy and meiosis have not been observed in the Laboulbeniales (Alexopoulos & Mims 1979), but according to Tavares (1965) the nuclei fuse in the asci of at least one studied species.

2.5. Asci and ascospores

The ascospore is more or less elongate, spindle-shaped and two-called, with the septum dividing the spore into two segments, usually unequal in length. Four (rarely eight) spores develop in each ascus, the walls of which deliquesce prior to spore discharge. The longer, basal cell of the spore is directed upwards and emerges first when the spore is discharged from the perithecium. The spores sometimes start to germinate within the perithecium but this process normally begins after they have been discharged from the perithecium. The spores are very often discharged in pairs. They are surrounded by a hyaline envelope, which is thicker in the basal part and which improves the adhesion of the spore to the surface of the host. In dioecious species the female individuals originate from spores which are distinctly larger than the male ones. Asexual spores have never been observed in the Laboulbeniales.

2.6. Life cycle

The Laboulbeniales lack extensive mycelium and conidial stages, and reproduction takes place only by means of ascospores. Some old reports of anamorphs (imperfect stages) in the Laboulbeniales are apparently erroneous (cf. Alexopoulos & Mims 1979). The time required for development from ascospore to the fully grown thallus and the maturation of the perithecium varies in most of the species studied from 10 to 21 days (e.g. Peyritsch 1875, Baumgartner 1934, Lindroth 1948). On the other hand Boyer-Lefévre (1966) found that *Rhachomyces aphaenopsis* Thaxter, which occurs on a cavernicolous beetle in constantly low temperatures, required nearly six months for maturation. Lindroth (1948) found that the spores not reaching the host were short-lived, persisting for at most two weeks.

3. Parasite-host relationships

3.1. Nutrition and pathogenicity

The members of the Laboulbeniales obtain all the nutrition and water they need from their host (Benjamin 1971). In culture experiments on artificial media (Richards & Smith 1954, Whisler 1968), the fungus never completed its development, antheridia were formed at most, but no female organs. These fungi can consequently be regarded as obligate ectoparasites, able to grow only on living hosts. With few exceptions, they have been found only on the imaginal stage of the host. The only part of the fungus that penetrates the surface of the host is the haustorium. If the fungus grows on a larval stage of the host (studied in cockroaches) the infection is lost at ecdysis (Richards & Smith 1956). The remains of the haustorium cannot regenerate the infection.

The pathogenicity of the Laboulbeniales is very low. However, in cases like the fly in Fig. 112, heavy infestation may influence the behaviour of the host. Kamburov et al. (1967) reported an increased rate of premature mortality in a beetle, *Chilocorus bipustulatus* (Linnaeus) (Coleoptera, Coccinellidae), presumably caused by heavy infestation by a laboulbeniaceous fungus. Bro Larsen (1952) found high mortality among *Bledius* species (Coleoptera, Staphylinidae) infected by a species of the Laboulbeniales in Denmark. Benjamin (1971), however, expressed some doubt about the exact cause of mortality in these cases. Generally, the Laboulbeniales can be regarded as harmless to their hosts.

3.2. Transmission and occurrence in host populations

The spores are spread by the activities of the host. As they are adhesive and short-lived they probably cannot spread through the air or over long distances without the presence of a suitable host. The general transmission patterns are illustrated in Fig. 1.

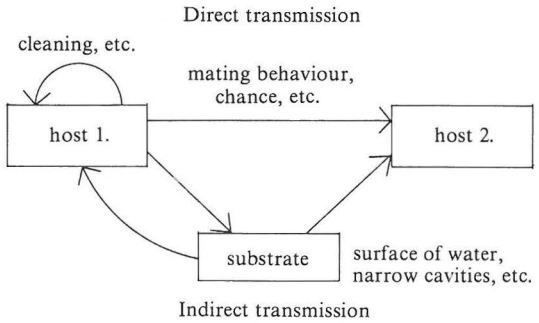

Fig. 1. Transmission patterns of the Laboulbeniales

Direct transmission enables the fungus to persist in a small host population even when the number of spores is limited. Scheloske (1976a, 1976b) described two cases of highly specialized tranmission patterns in which different morphs of the parasite occurred on different sexes of the host. Indirect transmission is presumably more dependent on large host populations and a greater number of spores. Some of the general conditions essential or favourable to the existence of laboulbeniaceous parasites are:

1. A host overwintering at least partially in the imaginal stage;
2. Overlapping between the imaginal stages of the overwintered and the new generations;
3. Mating between members belonging to successive generations of the host, in cases where transmission takes place only during mating (Scheloske 1976a);
4. Large or dense host populations;
5. Low isolation between host populations;
6. Stable host populations;
7. Warmth (the fungus group tends to be more common in warmer regions).

The first three conditions are essential, while the importance of the others can vary. In a highly isolated host population, for instance, the stability of the population is particularly important.

3.3. Host range

The species of the Laboulbeniales have been found

mostly on insects (Insecta) but also on a few millipedes (Diplopoda) and mites (Acari). Among insects, ten orders are involved: Blattodea, Coleoptera, Dermaptera, Diptera, Heteroptera, Hymenoptera, Isoptera, Mallophaga, Orthoptera and Thysanoptera (Benjamin 1971). More than 90 % of the total species and 120 of the 130 genera have been found on Coleoptera and Diptera. Coleoptera is by far the most important order, with at least 43 known host families. However, Diptera may be more important than present knowledge suggests, Coleoptera have been studied and collected to a far greater extent than Diptera. Ants (Formicidae) are the only known hymenopteran hosts and only one host species is known in Thysanoptera; in the other groups the hosts are scattered among many fimilies or genera. Within Acari only the suborder Gamasida (Mesostigmata; see classification in Krantz 1978) contain hosts of Laboulbeniales, most of which are associated with insects. At least two orders with several genera are known as hosts among the millipedes (Rossi & Balazuc 1977).

The known hosts represent a broad spectrum of ecological adaptations, including aquatic, semiaquatic, terrestrial, subterranean, cavernicolous, phytophagous, predacious, saprophagous, parasitic, marine, limnic, etc. arthropods. Yet, predacious insects are in the clear majority (e.t. Carabidae and Staphylinidae in Coleoptera) and moist conditions are more favourable than dry environments.

3.4. Host specificity

Like most parasites, the Laboulbeniales show a high degree of host specificity. A large number of the species occur on only one or a few host species, and very few of them occur on a large number of hosts. This is illustrated in Fig. 2. The specificity is somewhat obs-

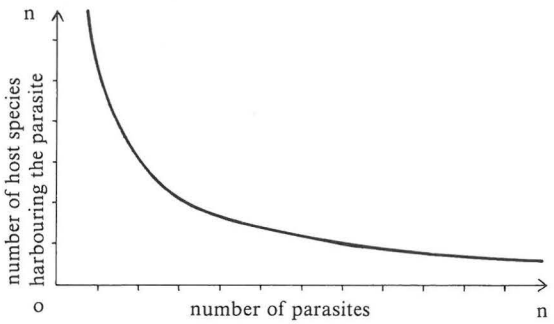

Fig. 2. Schematic presentation of the number of host species

cured by the fact that fungi have both main hosts and accidental hosts. The accidental hosts normally belong to the same genus as the main host but sometimes they may represent different genera, families or even orders and classes (see Benjamin 1971 for examples). The reason for the occurrence on accidental hosts is that the niches of these hosts largely overlap with that of the main host. The persistence of the parasite on an accidental host is usually limited by several factors, unsuitable physiological properties of the host, lack of overlapping between successive generations of the host, etc. However, accidental transmission to unrelated hosts probably played an important role in the evolution of new taxa (Benjamin 1967, 1968b). A case in which entirely unrelated hosts harboured the same parasite was described by Blum (1924): the same species of *Laboulbenia* occurred on an ant, two genera of parasitic mites and a beetle living in the ant's nest. Similar observations were made by Thaxter (1924). Benjamin (1965) attributed the phenomenon to similarity in properties resulting from long and intimate association.

3.5. Position specificity

It has long been known that species of the Laboulbeniales may occupy a very definite position on their hosts (see Figs. 101, 102, 103 and 108). In most cases this must be caused by the host's own behaviour. Scheloske (1976a, 1976b) described two cases of position specificity in which the fungus occurred in different positions on the different sexes of the host, due to their mating behaviour. In both cases different morphs of the fungi inhabited different sexes of the host. This suggests that the sex-of-host specificity originally described by Benjamin and Shanor (1952) and discussed by Benjamin (1971) may not actually exist, the authors merely having observed different morphs of the same parasite. In cases where the fungus occurs in the same position, often asymmetrically, on both sexes of the host (Figs. 101 and 103) the explanation is probably not the mating behaviour but some other kind of behaviour, e.g. cleaning.

3.6. Distribution of the Laboulbeniales

The distribution of laboulbeniaceous parasites is determined by the distribution of their main hosts. On the whole the environmental factors may be assumed to be suitable for the parasite if they are suitable for the host, because the parasite seems to thrive only when the host thrives. Many species are known to have very wide distribution and evidently occur wherever a suitable host is present. Species like *Laboulbenia vulgaris* and *Monoicomyces sanctae-helenae* are probably cosmopolitan, because their host range is broad, including several genera. *Dichomyces furcifer* on *Philonthus* spp. and *Stigmatomyces baeri* on *Musca domestica* are also cosmopolitan, having cosmopolitan hosts. *Dichomyces nigrescens,* occurring only on *Philonthus debilis,* is holarctic in distribution, like its host. Another distribution pattern is represented by the species pair *Asaphomyces cholevae* and *A. tubanticus*; the former is nearctic and the latter European (or palaearctic?). *A. cholevae* occurs on the holarctic *Sciodrepoides fumatus* while *A. tubanticus* mainly occurs on *S. watsoni* and the genus *Catops,* which also occurs in North America. Thus the two parasites seem to replace each other despite the of common hosts in the two regions, though their records are too scattered to allow definite conclusions.

Yet it is probable that external factors have an direct or indirect influence on the occurrence of the parasite. In colder regions a switch in the life-cycle of the host may make conditions impossible for the par-

asite. Siemaszko & Siemaszko (1928) reported that *Laboulbenia vulgaris* reached only 1 000 m in the mountains and that *L.alpestris* known to occur high in the Alps in Switzerland and France, occurred only in the lowlands in Poland. Similarly the lack of many species in northern Finland must be caused at least indirectly by external factors, as their hosts may occur throughout the country (for discussion see section 7.4.).

4. Systematic position

Despite the great diversity in the habit of the thallus, the Laboulbeniales are a well-defined group of fungi, whose members are fairly easy to recognize. The exceptional morphology of the ascospore is considered to be important evidence that the Laboulbeniales are monophyletic (Benjamin 1973). Other features common to all members are the lack of vegetative mycelia, blackened foot, more or less determinate growth pattern of the thallus and obligate parasitism on arthropods.

The first members of the Laboulbeniales described in the 19th century were placed with some hesitation among the Ascomycetes. Thaxter (1896) was the first to describe the ascogenous system and to demonstrate the affinities to the Ascomycetes. However, the Laboulbeniales long remained a 'wild' group within Ascomycetes. The nonmycelial thallus with its determinate growth pattern keeps the Laboulbeniales apart from the class and suggest the status of subclass.

Cavaliere & Johnson (1965) described a new parasitic fungus of unknown systematic position, *Spathulospora phycophila,* occurring on a red alga, *Ballia callitricha* Ag., in the southern hemisphere. Four additional species of *Spathulospora* were described by Kohlmeyer (1973), who placed the fungi in a separate order, the Spathulosporales. He considered the new order to be a missing link between the Laboulbeniales and the pyromycetial Ascomycetes. There are many similarities between the Laboulbeniales and the Spathulosporales, the main difference being that the spores in the former group are two-celled whereas in the latter group they are one-celled.

Kohlmeyer (1975) reviewed the evidence for the old hypothesis that the Ascomycetes originate from red algae (Rhodophyta). Savile (1968) had suggest that 'the first typical fungi were probably parasites; and it was as parasites that the fungi left the water...' Agreeing with this view, Kohlmeyer considered the Spathulosporales to be an archaic group of fungi with many primitive characteristics, such as thin-walled, early deliquescent asci, presence of antheridia and a trichogyne and lack of asexual spores. Obligate parasitism is also considered to be a more primitive feature than the saprophytic habit. Corresponding characteristics are found in the Laboulbeniales. It is assumed that the Ascomycetes evolved from ancestors related to fungus-like parasitic red algae. The Spathulosporales and the Laboulbeniales probably separated very early from the main line of Ascomycetes and preserved their obligate parasitic habit. The Laboulbeniales must be considered a highly specialized line, while the Spathulosporales probably represent a more primitive form.

In a very recent classification (Eriksson 1982) the Ascomycetes are divided into two subclasses, Euascomycetidae and Laboulbeniomycetidae, the former comprising 37 orders and the latter the two orders Laboulbeniales and Spathulosporales.

In this connection it is worth mentioning that no fossil representatives of the Laboulbeniales have yet been found, despite the large number of insects in good condition known from amber in different parts of the world. Hitherto only one record of Entomophthorales (a group of endoparasitic fungi) and a few saprophytic fungi have been obtained from insects in amber (Larsson 1978, Poinar & Thomas 1982). The lack of fossil records is probably due to the fact that entomologists are not generally acquainted with fungi ectoparasitic on insects.

5. Classification of the Laboulbeniales

In his monographs R. Thaxter recognized three major groups in the Laboulbeniales, nowadays treated as families, viz. the Laboulbeniaceae, Peyritschiellaceae and Ceratomycetaceae. This classification was primarily based on the structure of the male sexual organs, in which three types were distinguished: simple antheridia, compound antheridia and exogenous spermatia. The main shortcoming of this system is that in many genera the male sexual organs are still unknown. Tavares (1980, 1981b) recently described or validated two new families, the Herpomycetaceae and the Euceratomycetaceae, using the development of the perithecium and origin of the female sexual organ as the basic characters. She had previously (Tavares 1967) suggested the ontogeny of the perithecium as a new basis four classification. However, no classification has yet been elaborated that comprises all the described genera and takes into consideration all the recent advances in this group. Tavares (1981b) and Eriksson (1982) outline the division of the Laboulbeniales as follows:

Order Laboulbeniales
1. Suborder Herpomycetinae
   1. Family Herpomycetaceae
2. Suborder Laboulbeniinae
   1. Family Laboulbeniaceae
   2. Family Peyritschiellaceae
   3. Family Ceratomycetaceae
   4. Family Euceratomycetaceae

The order contains 130 genera (Rossi & Balazuc 1977, Tavares 1979, Majewski 1980, Terada 1981, Rossi 1982). This number includes the unnamed segregates of described genera noted by Tavares (1979).

6. Laboulbeniales-like parasites and hyperparasites

Most of the known ectoparasitic fungi on arthropods belong to the Laboulbeniales. There is, however, a small heterogenous group of ectoparasites for which only an anamorph is known and which have been

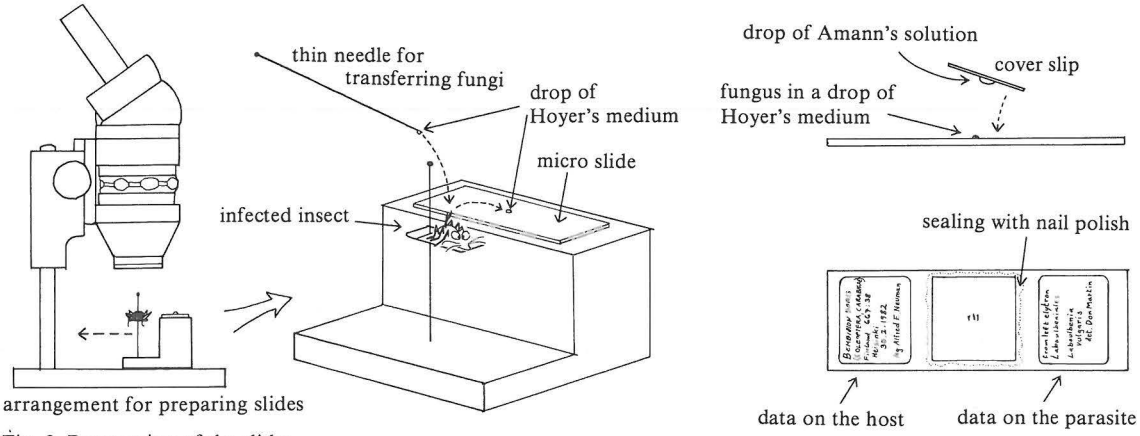

Fig. 3. Preparation of the slides

placed in the Deuteromycetes. A large number of these nonperithecial ectoparasites were described early in this century (Thaxter 1914, 1920, Spegazzini 1918, Siemaszko & Siemaszko 1928). In recent years the taxonomy of this group of fungi has received more attention (Buchli 1966, Khan & Kimbrough 1974, Balazy & Wisniewski 1974, Majewski & Wisniewski 1978, Blackwell & Kimbrough 1978, Kimbrough & Lenz 1982). Some of them are amazingly similar to the Laboulbeniales. They may have a blackened foot and consist of one, two, three or more cells with a more or less characteristic growth pattern. As long as affinities to the Laboulbeniales have not been confirmed, Madelin (1968) prefers to consider them remarkable instances of parallel evolution. Within the group some genera have specialized on certain groups of arthropods, e.g. *Antennopsis* on termites, *Aegeritella* on ants and *Thaxteriola* and *Acariniola* on mites.

The nonperithecial genus *Amphoromorpha,* which normally occurs as an ectoparasite on insects, has sometimes been found as a hyperparasite on members of the Laboulbeniales (Siemaszko & Siemaszko 1928, Rossi & Cesari Rossi 1979b, see also section 8.4. and Figs. 99 and 100). Cepede (1913) described a hyperparasite, *Fusarium laboulbeniae,* on *Laboulbenia casnoniae* Thaxter (*L. blanchardi* Cepede), and Rossi (1978) reported a hyperparasite, possibly related to *Monilia,* on a species of *Rickia* (Laboulbeniales). The Laboulbeniales are so rare as a resource that their hyperparasites may be assumed to be quite unspecialized fungi.

7. Laboulbeniales in Finland and adjacent parts of the U.S.S.R.

7.1. Material and methods

Most of the fungus material was obtained from the collections of the Division of Entomology, Zoological Museum, University of Helsinki (MZH). Some additional material was found in the collections of the Department of Agricultural and Forest Zoology of the University of Helsinki, Tvärminne Zoological Station, the University Oulu and some private collections. Lastly, some species have been recorded during field work by the author in the years 1979—1982. Most of the insect families known as potential host and a smaller number of millipedes were studied (see Appendix 1). More than 160 000 specimens of insects, representing about 1 100 species, were examined with a dissecting microscope (up to ×100 magnification). The determinations of most of the infested specimens of Coleoptera were checked by the author, within Diptera he had to rely on previous determinations, but many of these were made by specialists. The fungus slides were mainly mounted by the method described by Benjamin (1971). The following two media were used:

1. Amann's solution

Phenol	20 g
Lactic acid	16 g
Glycerol	32 g
Distilled water	20 ml
Acid fuchsin	0.1 g

2. Hoyer's medium

Gum arabic	30 g
Chloral hydrate	200 g
Glycerol	16 g
Distilled water	50 ml

(Note: The components of Hoyer's medium dissolve very slowly, requiring 2—3 days). The fungi were removed from the insects with a very thin needle with a drop of Hoyer's medium, placed in a small drop of the same medium on a micro slide and covered with a square cover slip with a drop of Amann's solution. The cover slip was sealed with nail polish. After a week in medium the dry fungi had regained their normal size and shape. Data on the host were written on the slides. The illustrations of the fungi were made by means of a drawing tube connected to a research microscope. The infested insects were drawn by free hand. The whole preparation of the slides can most easily be performed under the dissecting microscope, the infested insect and the micro slide being placed close together and on the same level, Fig. 3.

All the fungus material (including types) and the infested host insects are deposited in a separate collection in MZH.

7.2. The study area

The study area was chosen in accordance with the East Fennoscandian collection in the Zoological Museum of the University of Helsinki. The area comprises Finland, the northern part of the Leningrad Region, the Karelian A.S.S.R. and the Murmansk Region. Records from the Solovetsk Islands, belonging to the Archangel Region, have also been included (see Fig. 4).

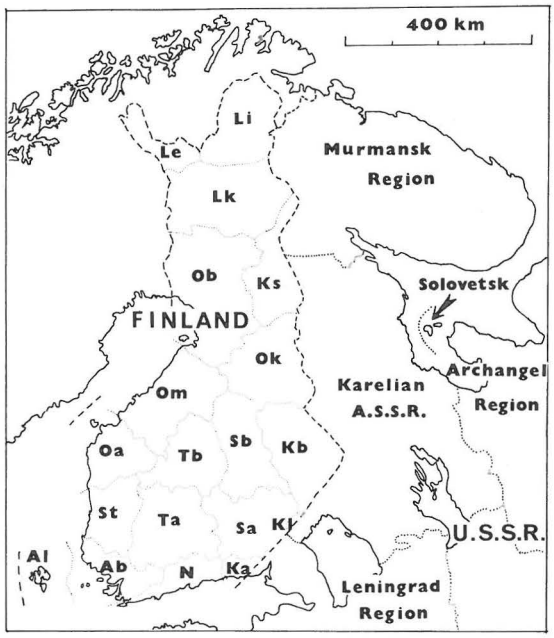

Fig. 4. Study area. Finland divided in biogeographic provinces.

7.3. Species composition and host range

The taxa of Laboulbeniales number 88 and represent 27 genera. Twenty-three species and one subspecies are described as new and four American and one East Asian species are recorded for the first time from Europe. By far the most important genera are *Laboulbenia* and *Stigmatomyces,* with 27 and 14 species, respectively. Nineteen genera are represented by only one species (Appendix 3).

Only Coleoptera and Diptera were found to be infected by Laboulbeniales in Eastern Fennoscandia. The Coleoptera specimens represent 15 families, 52 genera and 149 species. The most important families are the Carabidae (64 species), Staphylinidae (50 species), Gyrinidae (8 species) and Catopidae (8 species). The Diptera specimens represent 4 families, 11 genera and 18 species, the most important family being the Ephydridae, with 12 species. Diptera seems to be a poorly studied order, as 10 of the 14 parasite species found in this group have to be described as new. The museum material of Diptera is very poor in comparison with that of Coleoptera.

In Appendix 2 all the recorded parasites are listed under their host species. The host species are arranged in systematic order according to Silfverberg (1979) and Hackman (1980).

7.4. Frequency on the host and distributional patterns

As the insects in the museum (and most other collections) in general are collected at random with respect to the occurrence of the Laboulbeniales (because of the parasites' minute size and harmlessnes to their host), the number of infected specimens (regardless of the number of parasite species) in relation to the total number of specimens can be taken as a measure of the frequency of Laboulbeniales on their hosts in a given area, here Eastern Fennoscandia. The insect collections in MZH are representative with respect to the distributions of the insects in Eastern Fennoscandia and thus the frequency values must be interpreted in a general sence and not at the level of single host population. The values are largely comparable with those given by Scheloske (1969) from Central Europe (Federal Republic of Germany: Bavaria), although derived from an area of different size. Scheloske's values are given in Appendix 2 in all cases where the host taxa appear in both lists.

It is remarkable that the frequency of Laboulbeniales in Central Europe is generally 10 to 30 times as high as in Northern Europe. In only four host species in Northern Europe did the frequency exceed 10 % (only cases with $\geqq$50 host specimens considered), while the corresponding number of host species in Central Europe was 35. At the host family level, the frequencies in Northern Europe are generally about 1 %, but in Central Europe 10—33 %. The trend is evident regardless of the taxonomic level. This is probably chiefly due to the changing conditions in the host populations in the north, smaller and/or more isolated populations, high winter mortality, narrow or variable overlapping of successive generations (caused by less predictable climatological conditions), partially changed life-cycle patterns, etc. For a few host species the frequency of parasites in the north exceeded that in Central Europe, e.g. *Philonthus debilis* and *Quedius fuliginosus.* The material in such cases is possibly too small for any definite conclusions.

When the separate parasite species are considered, it must be kept in mind that the individual host species are not equally common all over their distributional area. An oligophagous parasite probably prefers the most common (or suitable) of its potential host species in a particular area. In interpreting the frequencies of the separate parasites, attention must be paid to the circumstances of the individual cases.

The distribution of the species of Laboulbeniales occurring in Eastern Fennoscandia are given in Figs. 114—201 according to the 50-km UTM grid (cf. Atlas Florae Europaeae). Fig. 204 shows the numbers of species in six latitudinal zones (200 km in width, except zone I, which comprises the archipelago of Åland, and zone VI, which is 400 km wide). The decrease in the number of parasite species towards the north is only partly due to the decrease in the number of known host species, see Table 1.

Table 1. The number of parasite and host species in the different zones of East Fennoscandia.

	Number of parasite species	Number of host species
Zone I	34	110
Zone II	66	141
Zone III	40	127
Zone IV	19	109
Zone V	17	97
Zone VI	19	74

The number of parasite species decreases to one quarter in the north, while the number of host species decreases to only about one half of that in the south of Finland. The difference is somewhat exaggerated because the number of host species includes accidental hosts. However, it is evident that many parasite species do not reach the northernmost areas of their hosts, although in some cases lack of parasites may depend on incomplete collecting of the hosts. The parasites are also underrepresented in the archipelago of Åland in comparison with the number of existing host species. Probably some degree of isolation of the host populations on these islands explains the paucity of parasite species.

Very few if any of the parasites are exclusively northern in distribution. Some of the taxa described as new here cannot be considered in this respect (i.e. *Dichomyces furcifer* ssp. *subarcticus, Laboulbenia murmanica* or *L. hastiana*), because their records are too limited. *Rickia hyperborea* which inhabits *Micralymma* species on the shores of the Arctic Ocean has also been recorded from France, on the Atlantic coast (Balazuc 1980). If there are any arctic or northern species of Laboulbeniales they are certainly specialists (probably monophagous), because generalists always seem to have potential hosts in many regions.

Finally, two examples of curious distribution patterns ought to be mentioned:

a) Both *Laboulbenia vulgaris* and *Haplomyces texanus* have disjunct distributions, with many records in the south and the north but none in the central part of the study area. In both cases the parasite occurs on different hosts in the separate ranges, which may possibly explain these distributions.

b) *Laboulbenia pedicellata* and *Misgomyces dyschirii.* The main host of these species in Northern Europe seems to be *Dyschirius globosus* (distribution of checked specimens given in Fig. 169), which is common all over Eastern Fennoscandia. *L. pedicellata* reaches the southern border of zone VI, which presumably indicates the limit of suitable conditions for the Laboulbeniales on *D. globosus,* but *M. dyschirii* is restricted to the south. It is possible that some climatological factors directly limit the distribution of the latter species.

7.5. Population dynamics of Laboulbenia fennica in Finland

Laboulbenia fennica is a southern species in Finland (Fig. 150) although at least three of its known hosts (*Gyrinus aeratus, G. minutus* and *G. marinus*) are distributed throughout the country (Huldén 1983). The main host seems to be *Gyrinus aeratus,* which normally forms large and dense populations on the surface of medium-sized to large streams. *L. fennica* is known from both lentic and lotic habitats but records in lentic habitats and on hosts other than *G. aeratus* (and possibly *G. minutus* and *G. marinus*) seem to be only accidental. Investigations in several permanent localities of *L. fennica* have yielded some interesting preliminary results. The frequency of the parasite in a host population (% of infected specimens) seems to be fairly constant from year to year but may differ from one host population to another. In the more thoroughly studied cases the frequencies were found to be 95—100 % in two localities (four generations), about 50 % in a third locality (three generations) and 30—50 % in a fourth (two generations). The host overwinters in the imaginal stage and mates in May, the new generation reaching the imaginal stage in late June and July. Samples of the host have shown no seasonal variation in the frequencies of the parasite, indicating that the new generation is immediately infected by the overwintered generation. The variation in the extent to which the different host populations are parasitized is interesting. If there are no significant differences in the properties of the spores, it must be due either to the host and/or to external factors. Clusters of Gyrinids are usually composed of several species, one dominant species and a few other species in variable portions. Some species, such as *G. natator* and *G. substriatus,* are rarely infected. When *G. minutus* or *G. marinus* are present in clusters of *G. aeratus,* all the species are infected to the same degree by *Laboulbenia fennica.* This suggests that the variation in parasitization cannot be due to differences in resistance in the hosts, because it is unlikely that resistance would differ between localities in the same way in different species of *Gyrinus.* The reason for the variation probably lies in external factors. Differences in the vegetation density, speed of current, food resources, etc. may cause variation in the distance between host individuals, thus affecting the probability of the spores reaching new hosts. The spores are presumably spread along the surface of the water.

Scheloske (1969, Figs. 5 and 6) described two different patterns of population dynamics in the Laboulbeniales, which depended on the hosts' life cycles. In the first case the host is a spring-breeding species (*Oxytelus rugosus* infected by *Peyritschiella protea*), in which the old generation dies during the summer after the new generation has reached the imaginal stage. The imaginal stages of the two generations overlap in the latter part of the summer and the new generation has not time to become heavily parasitized before overwintering, but in the following spring and summer the frequency of the parasite rapidly increases. In the second case the host is an autumn-breeding species (*Patrobus atrorufus* infected by *Laboulbenia fasciculata*), which overwinters in the larval and imaginal stages. The old generation partially survives a second winter and dies after the new generation has reached the imaginal stage in early summer. In this host the frequency of the fungus is lowest in mid summer after the appearance of the new host generation but, gra-

dually rises to its maximum before the winter, then remaining stable till the next summer.

Laboulbenia fennica, which occurs on a spring-breeding host, presents a third pattern of population dynamics. The infection frequency of the host is constant, because the new generation is immediately infected to a certain (± high) definite level. Immediate transmission of the spores to new host individuals is necessitated by the continuous movement of the water (also in backwaters), otherwise the spores will be lost. The two patterns described by Scheloske were found in predacious insects living on land, where the time needed for the infection of the new generation is prolonged by the relatively low activity and density of the host (compared with *Gyrinus* species). The three patterns are illustrated in Figs. 5 a-c.

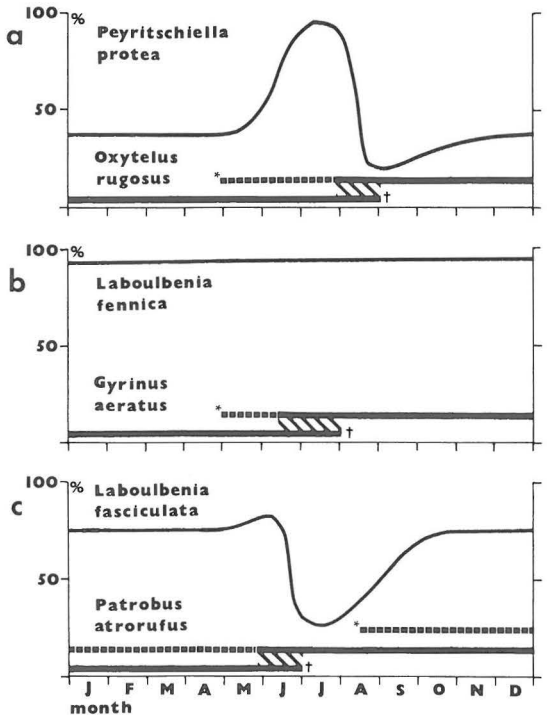

Fig. 5. Life-cycle patterns of three laboulbeniaceous parasite species. a) *Peyritschiella protea* on *Oxytelus rugosus,* b) *Laboulbenia fennica* on *Gyrinus aeratus,* c) *Laboulbenia fasciculata* on *Patrobus atrorufus.* a) and c) modified from Scheloske (1969).

The following general conclusions can be made: (1) The level of infection during overwintering of the host is determined by the time at which the host generations overlap. The earlier the overlapping period, the higher the level of infection during overwintering. It is possible that the general shape of the infection curve in a spring-breeding species (Fig. 5a) may resemble that in an autumn-breeding species (Fig. 5c) if the pre-imaginal development is rapid. (2) The speed with which the parasite spreads within the new host generation depends on the activity of the host and may possibly be altered by climatological factors. In the case of highly specialized transmission patterns there is little seasonal variation in the frequency of the parasites. (3) The upper level of frequency is mainly determined by the suitability of the habitat of the host and partially by climatological factors.

These conclusions are probably generally valid for univoltine host species in temperate regions. The paucity of parasite species in the north indicates changes in the life-cycle patterns and population dynamics of the hosts, chiefly due to the decreasing temperature.

7.6. Potential new parasite species in Finland

Despite the large insect material that has been checked, it is obvious that many new laboulbeniaceous parasite species are still to be found in the study area. The interested student should consult the parasite-host list given by Stadelmann & Poelt (1962), which comprises Central European species. The coleopteran families Carabidae and Staphylinidae are well studied groups, but many families of aquatic and semi-aquatic beetles are still imperfectly studied. More attention should also be paid to Diptera (e.g. Drosophilidae, Empididae, Sphaeroceridae and Ephydridae), aquatic Heteroptera (Hebridae and Corixidae), Mallophaga, Blattodea (mainly introduced species), Dermaptera and Hymenoptera (Formicidae). Examples of parasite species which should be searched for in Finland are:

— *Rickia wassmannii* Cavara, on *Myrmica* spp. (Hymenoptera, Formicidae),
— *Coreomyces* spp., on genera of *Cymatia, Callicorixa, Hesperocorixa* and *Sigara* (Heteroptera, Corixidae),
— *Tavaresiella hebri* Majewski and *Triceromyces balazucii* Majewski, on *Hebrus ruficeps* Thomson and *H. pusillus* (Fallén) (Heteroptera, Hebridae),
— *Hesperomyces forficulae* Majewski, on *Forficula auricularia* Linnaeus (Dermaptera, Forficulidae),
— *Laboulbenia cristata* Thaxter, on *Paederus* spp. (Coleoptera, Staphylinidae),
— *L. harpali* Thaxter, on *Harpalus* spp. (Coleoptera, Carabidae),
— *Stigmatomyces entomophilus* Thaxter, on *Drosophila funebris* (Fabricius) (Diptera, Drosophilidae).

In addition to the insects also mites and millipedes ought to be more extensively studied.

8. Taxonomic section

8.1. Terminology

The terminology used is chiefly that of R.Thaxter in his monographs. *Laboulbenia vulgaris* is often used as a basis in naming the essential structures and numbering cells. In *Laboulbenia* the receptacle is typically five-celled and these cells are numbered I—V. Cell I is

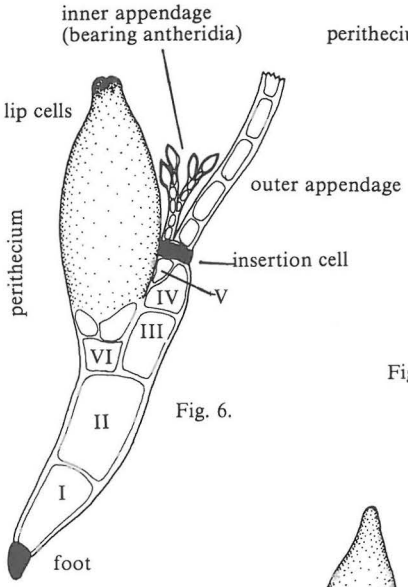

Fig. 6.

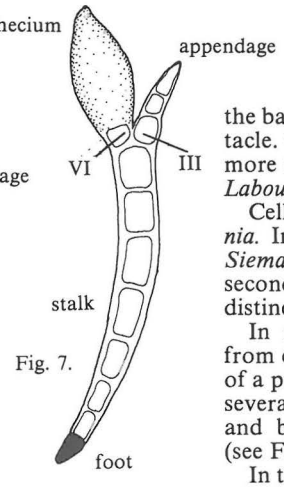

Fig. 7.

Figs. 6—10. Schematic illustrations of — 6: *Laboulbenia* sp. — 7: *Siemaszkoa* sp. — 8: *Monoicomyces* sp. — 9: *Stigmatomyces* sp. and — 10: *Dichomyces* sp.

the basal cell and cell II the subbasal cell of the receptacle. Cell VI is the stalk cell of the perithecium. The more or less black insertion cell is mainly limited to *Laboulbenia* (see Fig. 6).

Cell IV and V are differentiated only in *Laboulbenia.* In some other genera, such as *Misgomyces* and *Siemaszkoa,* cells I and II may form a long stalk by secondary divisions and then only cells III and IV are distinctly defined (see Fig. 7).

In most genera the (primary) appendage grows from cell II. In *Monoicomyces* the receptacle consists of a primary axis (cells I-II + appendage) and one or several secondary axes arising laterally from cell II and bearing appendage, antheridia and perithecia (see Fig. 8).

In the perithecium of *Stigmatomyces* three sections are recognized: the basal venter, the neck and the distal tip (Fig. 9). The lip cells constituting the tip may possess processes important for the identification of the species.

In *Dichomyces* (Fig. 10) the receptacle is bilaterally symmetric and consists of one single basal cell and three superposed transverse rows of cells. The lowest row forms lateral, more or less blackish projections, the second row bears compound antheridia and sterile appendages and the distal third row bears perithecia and sterile appendages.

In most genera the margin on the appendage side of the perithecium is interpreted as the inner (anterior) margin, and that on the opposite side as the outer (posterior) margin. The orientation may sometimes be obscured by spiral rotation of the rows of wall cells.

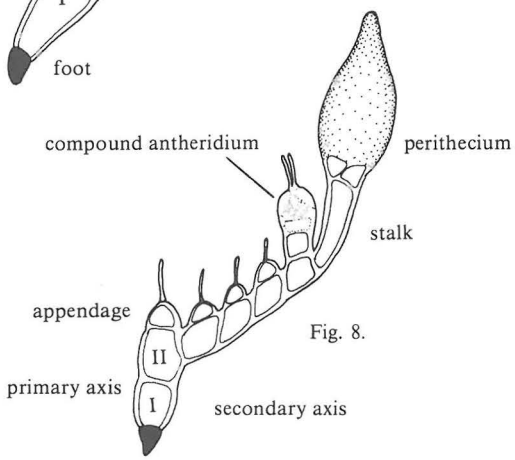

Fig. 8.

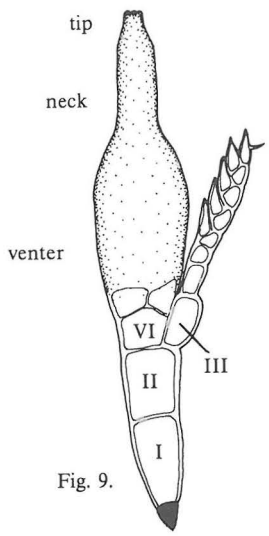

Fig. 9.

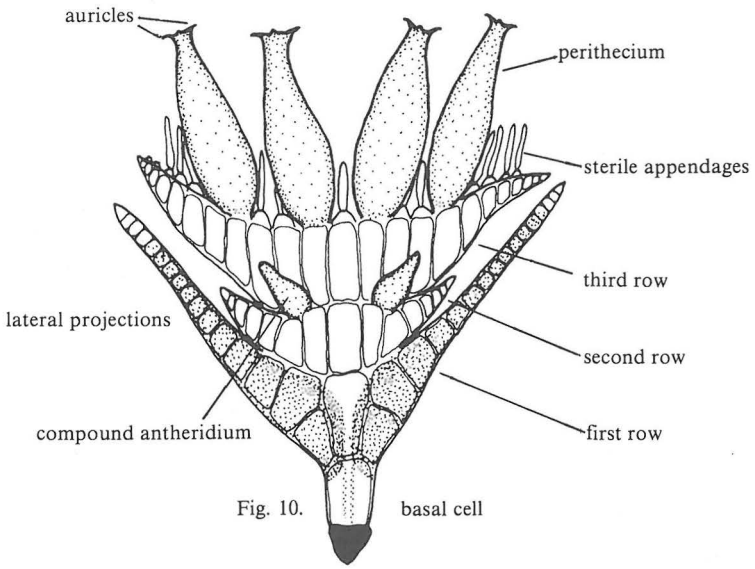

Fig. 10.

8.2. Identification of the species of Laboulbeniales

Although the species of Laboulbeniales are morphologically separable it is almost impossible to construct a traditional key on this basis. Benjamin (1971) published a key to the genera, but even at this level a key is very difficult to use for beginners. The easiest way to identify the parasites is first to determine the host and then to find out which parasites are known from that host. Usually only a few parasite species need be considered. The parasites of related hosts should also be checked. In many cases the parasites in question belong to different genera and are consequently immediately recognized. In other cases serious problems may arise, especially with genera like *Laboulbenia.* Descriptions and illustrations of material from different areas must be carefully examined, but even then the identification may be no more than tentative. The reason may be that the genus is in a state of strong speciation and that the separate taxa are still not properly established. Separate species may occur in many distinct host strains.

8.2.1. Key to the genera of the East Fennoscandian Laboulbeniales

The following key to the genera found in the study area is modified from Benjamin (1971) and includes some additions from Tavares (1979). Unfortunately it is rather theoretical, but at least it indicates the characters that deserve closest study. It can most conveniently be compared with the illustrations, because the genera are often immediately recognized by their general habitus. However, it must be kept in mind that members of additional or even undescribed genera can still be expected to be found. Students of the group are also referred to the generic key in Benjamin (1971).

1 Perithecium, together with its true stalk and basal cells borne on a stalk of two small cells. Receptacle consisting of an indeterminate number of superposed cells generating an elongate, massive multicellular axis continous with a terminal branched appendage and laterally bearing numerous perithecia and appendages. On *Lathrobium* (Col., Staphylinidae) ..... *Euzodiomyces*
— Perithecium, together with its true stalk and basal cells, sessile or, if appearing stalked, the stalk consisting of the true stalk cell and one or more of the modified basal cells of the perithecium 2
2 Outer wall of perithecium (opposite to the appendage), excluding its basal cells, composed of at least seven or more tiers of wall cells 3
— Outer wall of perithecium, excluding its basal cells, composed of only four or five tiers of wall cells 4
3 Receptacle consisting of a large number of superposed cells. On *Dryops* (Col., Dryopidae) ..... *Helodiomyces*
— Receptacle consisting of three or four superposed cells. On *Haliplus* (Col., Haliplidae) ..... *Hydraeomyces*
4 Dioecious. Male individual consisting of only four superposed cells, the fourth being one simple antheridium, much smaller than the female individual (Figs. 33 a—i). On *Anthicus* (Col., Anthicidae) ..... *Dioicomyces*
— Monoecious. Antheridia normally occurring on the appendage, but in some genera unknown 5
5 Antheridia simple, borne singly or in groups 6
— Antheridia compound, well-defined, consisting of few to many antheridial cells 21
6 Receptacle with only two cells subtending the stalk cell of a single primary perithecium and the stalk cell of the appendage, the subbasal cell of the receptacle not giving rise to secondary fertile or sterile axes or branches ... 7
— Receptacle with more than two cells subtending the stalk cell of the primary perithecium and/or the appendage; if the receptacle apparently two-called and bearing a primary perithecium and primary appendage, then subbasal cell forming secondary fertile axes or secondary fertile or sterile appendages 11
7 Subbasal cell of the receptacle and stalk cell of the perithecium laterally adnate. On *Ptomaphagus* (Col., Catopidae), unpublished segregate of *Corethromyces* (Tavares pers.comm.), ... *C. niger*
— Subbasal cell of the receptacle and the stalk cell of the perithecium superposed 8
8 Basal cell + subbasal cell of the receptacle constituting a quarter or less of the length of the whole thallus 9
— Basal cell + subbasal cell of the receptacle usually much more developed, constituting a third to a half of the length of the whole thallus 10
9 The appendage well developed and strongly branched. On *Choleva* (Col., Catopidae) ..... *Corethromyces*
— The appendage well developed (but fragile), unbranched. On *Brachygluta* (Col., Pselaphidae) ..... *Peyerimhoffiella*
— The appendage poorly developed with only two or three slender branchlets. On *Cryptophagus* (Col., Cryptophagidae) ..... *Autophagomyces*
10 The appendage consisting of a main axis with lateral antheridia in one or two rows. On Diptera ..... *Stigmatomyces*
— The appendage sympodially branched. On *Copromyza* (Dipt., Sphaeroceridae) ..... *Fanniomyces*
11 Receptacle composed of a more or less indeterminate number of cells, these disposed in a single vertical series, or by secondary divisions, forming superposed tiers of cells, each tier containing a definite or indefinite number of cells 12
— Receptacle composed of two to four or rarely more superposed cells, these not forming superposed tiers of cells 16
12 Receptacle consisting of an indeterminate number of superposed cells, which, by transverse divisions in the upper part of the receptacle, form irregular tiers containing an indefinite number of cells. On *Cyrtusa* (Col., Leiodidae) ..... see *Ecteinomyces agathidii* for comments.
— Receptacle consisting of an indeterminate number of cells superposed in a single series; these cells remaining undivided or giving rise to single appendiculate cells on one side 13
13 Axis of the receptacle with appendages forming below as well as above the point of insertion of the perithecium. On Staphylinidae (Col.) ..... *Rhachomyces*
— Axis of the receptacle not giving rise to appendages below the point of insertion of the perithecium 14
14 Outer, basal wall cells of the perithecium with an interposed, elongate, externally prominent accessory cell extending from the basal cell region to the subbasal tier of wall cells. On *Ochthebius* (Col., Hydraenidae) ..... *Hydrophilomyces*
— Basal tier of wall cells of the perithecium without an interposed accessory cell 15
15 Walls of basal cells of perithecium distinct, equal number of cells in each vertical row of perithecial wall cells. On *Acrotrichis* (Col., Ptiliidae) ..... *Ecteinomyces*
— Wall of basal cells of perithecium indistinct, unequal number of cells in different vertical rows of perithecial wall cells. On *Ptenidium* (Col., Ptiliidae) ..... *Siemaszkoa*
16 Subbasal cell of the receptacle followed immediately above by two cells placed side by side 17

— Subbasal cell of the receptacle forming secondary cellular axes or fertile branches or simply followed by a continuation of the primary axis 18
17 Appendages terminating the upper one or two cells of the receptacle simple, unbranched, unicellular, evanescent, distinguished at the base by small constricted, darkened septa; antheridia unknown. On Dytiscidae (Col.) ..... *Chitonomyces*
— Appendages more or less well developed, simple or branched, usually bearing simple antheridia. On Carabidae and Staphylinidae (Col.) ..... *Laboulbenia*
18 Receptacle consisting of a small, but indeterminate number of superposed cells directly continuous above with a more or less elongate sterile or fertile appendage. One to three perithecia arising laterally from successive proximal cells of receptacle. On *Catops* and *Sciodrepoides* (Col., Catopidae) ..... *Asaphomyces*
— Receptacle consisting of three or four superposed cells readily distinguishable from terminal part 19
19 Receptacle terminated by three cells; the single posterior cell bearing a terminal primary appendage; the two anterior cells each bearing a single primary perithecium, a simple antheridial appendage, and an elongate cellular axis, each cell of which bears a branched antheridial appendage; cells of the fertile branches converted directly into simple antheridial cells. On *Erichsonius* (Col., Staphylinidae) ..... *Diplomyces*
— Receptacle terminated by numerous small cells bearing appendages, which more or less surround the base of the perithecia 20
20 Cells of the fertile appendages subtending free, flask-shaped antheridia, which may be associated with sterile, beak-life branchlets. On *Erichsonius* and *Gabrius* (Col., Staphylinidae) ..... *Teratomyces*
— Cells of the fertile appendages converted directly into simple antheridial cells having short, divergent discharge tubes; beak-like cells present or absent. On Quedius (Col., Staphylinidae) ..... *Symplectromyces*
21 Receptacle composed of a long uniseriate row of superposed cells; base of appendage forming a compound antheridium. On *Dyschirius* (Col., Carabidae) ..... *Misgomyces*
— Receptacle composed of two superposed cells or the receptacle leaf-like, due to secondary transverse divisions 22
22 Receptacle with more than two cells subtending the stalk cell of the primary perithecium and/or the appendage; if the receptacle apparently two-celled and bearing a primary appendage, then the subbasal cell also forming secondary fertile axes 23
— Receptacle with only two cells subtending the stalk cell of a single primary perithecium and the stalk cell of the appendage; the subbasal cell of the receptacle not giving rise to secondary fertile or sterile cellular axes or branches 26
23 Receptacle composed of two superposed cells subtending a sterile cellular appendage; the subbasal cell giving rise to one or more secondary fertile axes on one or both sides. On Staphylinidae (Col.) ..... *Monoicomyces*
— Receptacle composed of four or more superposed cells, above the single basal cell by secondary transverse divisions forming tiers containing a definite or indefinite number of cells 24
24 Receptacle, above the single basal cell, composed of an indefinite number of cells which, by secondary transverse divisions, form three vertical rows of cells. On *Micralymma* (Col., Staphylinidae) and *Scaphisoma* (Col., Scaphidiidae) ..... *Rickia*
— Receptacle, above the single basal cell, composed of three superposed cells which, by secondary transverse divisions, form tiers containing an indefinite number of cells 25
25 Receptacle bilaterally symmetrical; the subterminal tier of cells forming a single compound antheridium on or near the outer margin on each side. On *Philonthus* (Col., Staphylinidae) ..... *Dichomyces*
— Receptacle bilaterally asymmetrical; the subterminal tier of cells forming a single compound antheridium near the outer margin on one side only. On *Anotylus* (Col., Staphylinidae) ..... *Peyritschiella*
26 Appendage forming a sterile branch or branchlets in addition to the compound antheridium. On Staphylinidae and Dryopidae (Col.) ..... *Cantharomyces*
— Appendage without sterile branch or branchlets 27
27 Basal and subbasal cells of receptacle broadly and obliquely superposed, becoming nearly vertically parallel to one another. On *Agonum* (Col., Carabidae) ..... *Eucantharomyces*
— Basal and subbasal cells of receptacle transversely superposed. On *Bledius* (Col., Staphylinidae) ..... *Haplomyces*

8.2.2. Keys to the species of the East Fennoscandian Laboulbeniales

Species can be identified on the basis of the host-parasite list given in Appendix 2. In those cases in which many parasite species belonging to the same genus occur on the same host genus, additional instructions are given below. The reader is also referred to the parasite-host lists in Stadelmann and Poelt (1962), Scheloske (1969), Tavares (1979) and Frank (1982).

A. Coleopteran genera

Atheta
1 Stalk of perithecium with brownish constriction ..... *Monoicomyces homalotae*
— Stalk of perithecium more evenly broad, pale ..... *M. britannicus*

Bembidion
1 Septum IV—V more or less vertical, connected with septum III—IV ..... *Laboulbenia pedicellata*
— Septum IV—V oblique, not connected with septum III—IV 2
2 Outer appendage robust, strongly branched from second or third cell ..... *L. hastiana*
— Outer appendage not specially robust, simple or moderately branched 3
3 Two swellings at upper, outer margin of perithecium ... . *L. carelica*
— Without such swellings on perithecium 4
4 Insertion cell at level of base of perithecium, appendages poorly developed with slender branches ..... *L. curtipes*
— Insertion cell at least slightly above base of perithecium, appendages normally developed, with broad cells 5
5 Insertion cell near the base of perithecium ..... *L. murmanica*
— Insertion cell in the middle of perithecium ..... *L. vulgaris*

Harpalus
1 Perithecium yellow, poorly pigmented, lip cells brown-black ..... *Laboulbenia ophoni*
— Perithecium more or less brownish-blackish 2
2 Perithecium small, rather narrow, appendages long, branching once ..... *L. filifera*
— Perithecium, broad, appendages shorter, branching several times ..... *L. compressa*

Laccophilus
1 Perithecium blunt ..... *Chitonomyces melanurus*
— Perithecium pointed ..... *C. paradoxus*

Oxytelus
1 One, three or five secondary axes, appendages more or less blackish brown ..... *Monoicomyces sanctae-helenae*
— One or two secondary axes, appendages pale, only basal septum black 2
2 Two secondary axes, furcate appearance ... *M. furcatus*
— One secondary axis 3
3 Secondary axis with 4—7 cells ..... *M. oxyteli*
— Secondary axis with 2—3 cells, in Fennoscandia known only on *Platystethus* (Staphylinidae) ..... *M. invisibilis*

Patrobus
1 Cell V with secondary divisions, no distinct insertion cell ..... *Laboulbenia fasciculata*
— Cell V not secondarly divided, insertion cell distinct, accidental parasites 2
2 Appendages strongly branched ..... *L. pseudomasei*
— Appendages poorly branched ..... *L. flagellata*

Philonthus
1 Normally one perithecium, asymmetric, on *P. debilis* ... . *Dichomyces nigrescens*
— Normally two perithecia, symmetric, on other hosts 2
2 Elongated, pale yellow, without black spots near the base (except for the black foot) ..... *D. princeps*
— At least with black spots near the base, usually with brown-black lateral projections, broader appearance 3
3 Perithecium with long auricles on tip ..... *D. biformis*
— Perithecium with short auricles or lacking auricles ... 4
4 Long, black, lateral projections, first tier of cells above the foot much narrower than second tier, two perithecia ..... *D. hybridus*
— Lateral projections shorter, paler or lacking, width of first tier of cells above the foot equal to or at least two-thirds of width of second, or more than two perithecia 5
5 Broader habitus, two — four perithecia .... *D. vulgatus*
— Narrower habitus, usually with two perithecia 6
6 Straight perithecia ..... *D. furcifer*
— Perithecia bent outwards .... *D. furcifer* subsp. *subarcticus*

Pterostichus
1 Appendages strongly branched .... *Laboulbenia pseudomasei*
— Outer appendage long, simple, inner appendage short, rarely long, simple ..... *L. argutoris*

Quedius
1 Antheridial branches short, hidden among sterile branches, small species, 200—250 μm in length .... *Symplectromyces rarus*
— Antheridial branches long, clearly visible, larger species, more than 300 μm in length 2
2 Asymmetric, usually one larger and one smaller perithecium, stalk of perithecium relatively short, uniformly darkening upwards ..... *S. vulgaris*
— Symmetric, perithecia equal in size, stalk of perithecium longer, distinctly paler than perithecium .... *S. lapponicus*

Trechus
1 Insertion cell distinctly below middle of perithecium ... . *Laboulbenia polyphaga*
— Insertion cell in the middle of perithecium, accidental parasite ..... *L. vulgaris*

B Dipteran genera

Ephydra and *Setacera*
1 Lip cells of perithecium about equal in size .... *Stigmatomyces ephydrae*
— Lip cells of perithecium distinctly different in size ... 2
2 Cells below shorter lip cells slightly inflated .... *S. bottnica*
— Cells below shorter lip cells strongly inflated .... *S. setacerae*

Limosina
1 No swellings in upper region of venter of perithecium, the black foot unusually large .... *Stigmatomyces hackmanii*
— Four swellings in upper region of venter of perithecium, the black foot small 2
2 Very slender, neck of perithecium straight .... *S. subterraneus*
— More robust, neck of perithecium curved .... *S. chthonicus*

Ochthera
1 Perithecium: Neck longer than venter, about one-third of width of venter ..... *Stigmatomyces manicatae*
— Perithecium: Neck shorter than venter, about half width of venter ..... *S. mantis*

8.3. Review of the species

The genera and species of the Laboulbeniales found in Eastern Fennoscandia are given in alphabetical order.

Asaphomyces tubanticus
Barbariella tubantica Middelhoek & Boelens in Middelhoek 1949:260. — *Asaphomyces tubanticus* (Middelhoek & Boelens) Scheloske 1969:92.
— Figs. 26 a-j, 114 (map).

There has been some confusion conserning the identity of this species in Europe. Majewski (1973a) and Rossi (1975) reported *S. cholevae* Thaxter from Europe and Balazuc (1971) considered *A. cholevae* and *A. tubanticus* to be conspecific. According to Dr. I. Tavares (pers. comm.), *A. cholevae* is an American species with a more blunt perithecium than in the European *A. tubanticus.* The Fennoscandian material seems to fit *A. tubanticus* in this respect but otherwise there is broad intraspecific variation. Specimens from *Sciodrepoides watsoni* (Spence) (Figs. 26 h-i) seem to be simpler and slightly smaller than those on *Catops* spp. *A. cholevae* was originally described from *Sciodrepoides fumatus* (Spence) ('*Choleva terminans*'), which is closely related to *S. watsoni* (both occurring in Europe) and it is not impossible that both *Asaphomyces* species occur in Europe. More studies are required on possible differences in host specificity between the species.

Material examined
Finland. Al: Lemland (*Catops nigrita*). — Ab: Turku, Ruissalo (*C. nigrita*). Lohja (*C. nigrita, C. fuscus, Sciodrepoides watsoni*). — N: Ekenäs (*S. watsoni*). Espoo (*C. nigrita, S. watsoni*). Vantaa (*C. nigrita*). — Ta: Hattula (*C. nigrita*). Nokia (*S. watsoni*). — Kb: Juuka (*C. fuscus*). — Om: Raahe (*C. nigricans*). — Li: Inari (*C. alpinus*).
U.S.S.R. Karelian A.S.S.R.: Vojatsu (*C. alpinus*). — Leningrad Region: Gumbaritsa (*C. fuliginosus*).

General distribution
Czechoslovakia (Banhegyi 1950), Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—

74), Italy (Rossi 1975), Netherlands (Middelhoek 1947), Poland (Majewski 1973a), Sweden (Huggert 1973), U.S.S.R. (Karelian A.S.S.R.; Leningrad Region).

Host
Genera of *Catops, Catopoides* and *Sciodrepoides* (Coleoptera, Catopidae). The parasite occurs on the pronotum and elytra of the host.

Autophagomyces falcatus
Autophagomyces falcatus Majewski 1973b:229.
— Figs. 15 a-g, 115 (map).

The species was described from Polish specimens of *Cryptophagus pilosus* Gyllenhal. According to Majewski (1973b), *A. falcatus* is recognized by the very short and broad stalk cell of the perithecium, which lacks a constriction near the base. In the Finnish material, however, this constriction is more or less clearly visible. The Finnish specimens have also a more elongated perithecium and the thallus is somewhat larger than the Polish specimens (120—140 μm and 97—110 μm in length respectively). Specimens from the apex of the elytron are very long and strange-looking, because the stalk cell of the perithecium is strongly arcuate distally to the constriction and the basal cells of the perithecium are greatly prolonged.

According to Dr. I. Tavares (pers. comm.), the Finnish material may represent a new species, but for the present I am placing the material under *Autophagomyces falcatus.*

Material examined
Finland. Al: Sund (*Cryptophagus pilosus*). — Ab: Lohja (*C. pilosus*). Karjalohja (*C. setulosus*). — N: Hangö, Tvärminne (*C. setulosus*). — Om: Raahe (*C. bimaculatus*).

General distribution
Finland, Poland (Majewski 1973b).

Host
Cryptophagus spp. (Coleoptera, Cryptophagidae). The parasite occurs on the elytra of the host.

Cantharomyces aploderi Huldén n.sp.
— Figs. 32 a-b, 116 (map).

Flavo-brunneus. Pedunculus cellula basali et subbasali receptaculi confectus valde geninculatus, 60 μm longus. Cellula subbasalis macula magna nigra praedita. Antheridium compositum in cellula II appendiculata, cellula III appendiculata applanata. Pedunculus perithecii 60–75 μm longus. Perithecium aequale, 35–45 μm latum, 100–120 μm longum. Sporae 3 × 35 μm. Tota longitudo 250–365 μm. Matrix: Aploderus caesus (Erichson) (Coleoptera, Staplylinidae).

Receptacle. Yellowish brown, a large black spot on the second cell opposite to the perithecium. The two cells forming a strongly geniculate stalk, about 60 μm in length. First cell small, about 20 μm long and 12 μm wide. Second cell with a constriction in basal part, upwards broadening to a width of 25—30 μm.

Appendage. Yellowish, with brown shade, sometimes dark brown in the upper region of first cell. Second cell somewhat longer, compound antheridium visible in outer part. Third and fourth cells about 20 μm wide and very flat, 5—10 μm long. From inner, upper part of fourth cell (or sometimes from third cell) arise two branches, 50—60 μm long and 5 μm wide. In outer part of fourth cell a broad cell is visible, the distal part of the branch (or other structures) always broken.

Perithecium. Yellowish brown, with brown shade in the septa between cells. Stalk cell arising laterally from upper part of second cell of receptacle, 60—75 μm long, 15—28 μm wide gradually tapering towards base. Perithecium straight, 100—120 μm long, 35—45 μm wide, broadest in middle or just below middle. Apically regularly tapered. Spores 3 × 35 μm. Spores seem to germinate within the perithecium, producing the typical black foot before leaving the perithecium, basal part forward.

Total length from base of foot to tip of perithecium 180—235 μm.

Host. Aploderus caesus (Erichson) (Coleoptera, Staphylinidae). The parasite occurs all over the host: Head, antennae, legs, prothorax, dorsal and ventral part of abdomen.

Holotype. Slide L. Huldén 24, in MZH. Collecting data of the host: **U.S.S.R.** Karelian A.S.S.R.: Zaoneskje, Sungu, leg. Poppius.

The new species closely resembles *C. bledii* Thaxter, described on *Bledius* sp. (Coleoptera, Staphylinidae) from North America. It differs from *C. bledii* in the larger and more prolonged second cell of the receptacle and in the very broad cells above the compound antheridium, these being small and narrow in *C. bledii* (illustrated in Thaxter 1896). The margins in the apical part of the perithecium are concave in *C. bledii* but convex in *C. aploderi.* Two perithecia seem to be typical of *C. bledii* (also in European specimens as illustrated by Siemaszko & Siemaszko 1932), while all the examined specimens of *C. aploderi* had only one perithecium.

Another related species, *C. numidicus,* described by Maire (1920) on *Carpelimus mannerheimi* (Kolenati) from Algeria, differs from *C. aploderi* by the shape of the perithecium and the appendage (cf. Rossi & Cesari Rossi 1978).

Material examined
See the type.

Cantharomyces italicus
Cantharomyces italicus Spegazzini 1915c:42.
— Figs. 28 a-c, 117 (map).

Some specimens may have the base of the subbasal cell of the receptacle pigmented with black (Fig. 28c), thus resembling the closely related *C. denigratus* Thaxter. The latter species, however, should have a much more strongly pigmented subbasal cell and darker perithecium.

Material examined
Finland. Ob: Rovaniemi, Pisavaara (*Dryops griseus*).
U.S.S.R. Murmansk Region: Pečenga (Petsamo) (*D. griseus*).

General distribution
Federal Republic of Germany (Scheloske 1969), Finland, Italy (Spegazzini 1915c), Poland (Siemaszko & Siemaszko 1933), United Kingdom (Thaxter 1931), U.S.S.R. (Murmansk Region).

Host
Dryops spp. (Coleoptera, Dryopidae). The parasite occurs on the elytra and tip of abdomen of the host.

Cantharomyces orientalis
Cantharomyces orientalis Spegazzini 1915c:43 — *Cantharomyces abbreviatus* Maire 1920:131. Synonymy according to Scheloske 1969:94.
— Figs. 31 a-c, 118 (map).

The closely related *Cantharomyces thaxteri* Maire is said to be restricted to *Carpelimus dilatatus* (Erichson) and *Carpelimus bilineatus* Stephens, and *Cantharomyces venetus* Spegazzini has been described on *Carpelimus rivularis* (Motschulsky). *Cantharomyces abbreviatus* was described on *Carpelimus corticinus* (Gravenhorst). In view of the broad variation in *Cantharomyces orientalis* reported by Scheloske (1969), *Cantharomyces abbreviatus* can certainly be considered to be a synonym of that species. The Fennoscandian material of *Cantharomyces orientalis* on *Carpelimus corticinus* is similar to that on *Carpelimus elongatulus* (Erichson), except for the somewhat longer basal cells of the perithecium.

Material examined
Finland. N: Espoo (*Carpelimus elongatulus*).
U.S.S.R. Karelian A.S.S.R.: Oz. Olanga (Paanajärvi) (*C. corticinus*).

General distribution
Algeria (Maire 1920), Federal Republic of Germany (Scheloske 1969), Finland, Italy (Spegazzini 1915c), Netherlands (Middelhoek 1949, wrongly as *C. thaxteri* according to Scheloske 1969), Poland (Siemaszko & Siemaszko 1932), U.S.S.R. (Karelian A.S.S.R.).

Host
Carpelimus (*Trogophloeus*) *corticinus, C. subtilicornis* (Roubal) and *C. elongatulus* (Coleoptera, Staphylinidae). The parasite can occur anywhere on the host.

Chitonomyces bidessarius
Heimatomyces bidessarius Thaxter 1893:185. — *Chitonomyces bidessarius* (Thaxter) Thaxter 1896:292.
— Figs. 47, 119 (map).

Material examined
Finland. Ab: Lohja (*Hygrotus inaequalis*). — N: Hyvinkää (*H. inaequalis*).

General distribution
Federal Republic of Germany (Scheloske 1969), Fiji (Thaxter 1924), Finland, France (Picard 1913), Japan (Sugiyama 1973), Poland (Siemaszko & Siemaszko 1928), Taiwan (Sugiyama & Hayama 1981), U.S.A. (Thaxter 1924).

Host
Genera of *Bidessus, Guignotus, Hygrotus* and *Hyphydrus* (Coleoptera, Dytiscidae). The parasite occurs laterally on elytra of the host.

Chitonomyces melanurus
Chitonomyces melanurus Peyritsch 1873:250.
— Figs. 46, 120 (map).

Material examined
Finland. N: Espoo (*Laccophilus minutus*).

General distribution
Algeria (Maire 1920), Austria (Peyritsch 1873), Cameroon (Siemaszko & Siemaszko 1933), China (Thaxter 1924), Federal Republic of Germany (Scheloske 1969), Finland, Italy (Colla 1934), Japan (Thaxter 1924), Poland (Siemaszko & Siemaszko 1933), Taiwan (Sugiyama & Hayama 1981), United Kingdom (Bisby & Haker 1940), U.S.S.R. (Ukraina: Koval 1974), Yugoslavia (Banhegyi 1960).

Host
Laccophilus spp. (Coleoptera, Dytiscidae). The parasite occurs mainly on the lateral margin of the left elytron.

Chitonomyces paradoxus
Heimatomyces paradoxus Peyritsch 1873:251.—*Chitonomyces paradoxus* (Peyritsch) Thaxter 1895:287.—*Chitonomyces truncatus* Spegazzini 1915c:47.
— Figs. 48 a-b, 121 (map).

Material examined
Finland. N: Espoo (*Laccophilus minutus*).

General distribution
Austria (Peyritsch 1873), Federal Republic of Germany (Scheloske 1969), Finland, Indonesia (Java, Sumatra: Thaxter 1924), Italy (Spegazzini 1915c), Jamaica (Thaxter 1924), Japan (Sugiyama 1977), Poland (Siemaszko & Siemaszko 1933), Taiwan (Sugiyama & Shazawa 1977), United Kingdom (Bisby & Haker 1940), U.S.S.R. (Baltic Republics: Koval 1974), U.S.A. (Thaxter 1924), Yugoslavia (Banhegyi 1960).

Host
Laccophilus spp. (Coleoptera, Dytiscidae). The parasite occurs mainly on the lateral margin of the left elytron. Koval's (1974) report of finds on *Gyrinus* spp. (Coleoptera, Gyrinidae) and *Haliplus* spp. (Coleoptera, Haliplidae) is probably erroneous.

Corethromyces henrotii
Corethromyces henrotii Balazuc 1973, in Balazuc 1973—74, vol.42:283.
— Figs. 27 a-c, 109, 122 (map).

The Finnish material resembles the specimen illustrated by Rossi (1975). Both differ somewhat from the illustration of the type (Balazuc 1971a), in which the stalk cell of the perithecium is longer and the perithecium shorter; it is possible an immature specimen.

Material examined
Finland. Ok: Suomussalmi (*Choleva septentrionis*).

General distribution
Finland, France (Balazuc 1971a), Italy (Rossi 1975).

Host
Choleva oblonga Latreille, *C. septentrionis* Jeannel and *C. sturmi* Brisout de Barneville (Coleoptera, Catopidae). The parasite occurs on the elytra of the host.

Corethromyces niger
Corethromyces niger Majewski 1973a:114. — *Laboulbenia ptomaphagi* Huggert 1973:249, according to Balazuc 1974 in Balazuc 1973—74, vol. 43:367.
— Figs. 13 a-e, 123 (map).

The species seems to occur in two variants, one with a smaller and more pointed perithecium and one with a

larger and more prolonged perithecium with distinct lip cells at the apex. It is possible that the former is immature. The minute size of the parasite (50—80 μm) makes it difficult to observe on its host.

Dr. I. Tavares has informed me that this species will be transferred to a new genus.

Material examined
Finland. Ab: Pargas (*Ptomaphagus subvillosus*).
U.S.S.R. Leningrad Region: Uslanka (*P. subvillosus*).

General distribution
Czechoslovakia (Huggert 1973), Denmark (Huggert 1973), Finland, France (Balazuc 1973—74), Italy (Balazuc 1973—74), Poland (Majewski 1973a), Sweden (Huggert 1973), U.S.S.R. (Leningrad Region).

Host
Ptomaphagus spp. (Coleoptera, Catopidae). The parasite occurs on the elytra, mainly near the suture.

Dichomyces biformis
Dichomyces biformis Thaxter 1900:422.
— Figs. 41 a-b, 124 (map).

The material from the Murmansk Region consists of a morph with well-developed processes arising from the tip of the perithecium. According to Thaxter (1908), both this and a morph without such processes occur in the U.S.A.

Material examined
U.S.S.R. Murmansk Region: Pečenga (Petsamo) (*Philonthus umbratilis*). Kuzomen (*P. umbratilis*).

General distribution
Belgium (Collart 1945), Japan (Sugiyma 1973), Poland (Siemaszko & Siemaszko 1932), Portugal (Madeira: Thaxter 1908), United Kingdom (Thaxter 1908), U.S.A. (Thaxter 1908), U.S.S.R. (Murmansk Region).

Host
Philonthus umbratilis (Gravenhorst), *P. rigidicornis* (Gravenhorst), *P. rigidicornis* (Gravenhorst) and *P. micanticollis* Sharp (Coleoptera, Staphylinidae). The first-mentioned species is apparently the main host. The parasite occurs on the abdomen of the host.

Dichomyces furcifer
Dichomyces furciferus Thaxter 1893:184, em. Saccardo 1895:447.
— Figs. 39 a-c, 125 (map).

The species has two morphs: one with long black lateral projections and an auriculate perithecium and the other with short lateral projections and a slightly larger non-auriculate perithecium. Both often occur together on the same host.

Material examined
Finland. Ab: Uusikaupunki (*Philonthus discoideus*). Karjalohja (*P. albipes*). Karis (*P. albipes*). Lohja (*P. albipes*). — N: Vantaa (*P. discoideus*). — Ta: Kangasala (*P. discoideus*). — Ob: Rovaniemi, Pisavaara (*P. puella*).

General distribution
Apparently cosmopolitan (Scheloske 1969). In Europe known at least from the Federal Republic of Germany (Scheloske 1969), Finland, the Netherlands (Middelhoek 1943a) and the United Kingdom (Bisby & Mason 1940).

Host
Philonthus spp., *Eulissus chloropterus* Erichson (Coleoptera, Staphylinidae). The parasite occurs all over the host, mainly on the abdomen.

Dichomyces furcifer subsp. **subarcticus** Huldén n.subsp.
— Figs. 38, 126 (map).

Dichomyceti furcifero similis habitu perithecii excepto. Perithecia in margine interiore turgida, extrorsum flexa. Margo exterior concavus, leviter brunneo-umbratus. Apex perithecii auriculatus. Perithecium 70–74 μm longum. Matrix: Philonthus albipes (Gravenhorst) (Coleoptera, Staphylinidae).

Resembles *Dichomyces furcifer*, except for the different habitus of the perithecia. The two mature perithecia are outwards curving with the inner margins inflated and the outer margins concave and with a faint brown shade. Uniformly tapered from the middle towards the tip. Tip of perithecia with typical auricles. Size of perithecium 21—23 × 70—74 μm.

Host: Philonthus albipes (Gravenhorst) (Coleoptera, Staphylinidae). The parasite was found on the three apical segments of the abdomen.

Holotype. Slide L. Huldén 10, in MZH. Collecting data of the host: **U.S.S.R.** Murmansk Region: Pečenga (Petsamo), leg. W. Hellén.

Material examined
See the type.

Dichomyces hybridus
Dichomyces hybridus Thaxter 1900:423.
— Figs. 44, 127 (map).

Only the non-auriculate morph occurs in Finland. The auriculate morph seems to be restricted to Asia: China, Japan and India (Thaxter 1908).

Material examined
Finland. Ab: Uusikaupunki (*Philonthus debilis, P. ventralis*). Karjalohja (*P. ventralis*). Lohja (*P. ventralis*). — Ta: Pälkäne (*P. ventralis*).

General distribution
Widely distributed in the Nearctic, Palaearctic and Oriental Regions (Thaxter 1908). In Europe known from Finland and the United Kingdom (Bisby & Mason 1940).

Host
Philonthus spp. (Coleoptera, Staphylinidae). The parasite occurs mainly on the abdomen but also on the elytra, tibiae and tarsi of the host.

Dichomyces nigrescens
Peyritschiella nigrescens Thaxter 1893:184. — *Dichomyces inaequalis* 1894:103. — *Dichomyces nigrescens* (Thaxter) Scheloske 1969:106.
— Figs. 37 a-c, 128 (map).

This is the smallest of the North European *Dichomyces* species. It is recognized by the asymmetric habit and seems to be restricted to one host: *Philonthus debilis* (Gravenhorst).

Material examined
Finland. Ab: Uusikaupunki. Lohja. — N: Hangö, Tvärminne. Vantaa. Helsinki. — St: Rauma. — Sa: Ristiina. — Oa: Lappfjärd. — Tb: Viitasaari. — Sb: Joroinen. — Kb: Kontiolahti. All records on *Philonthus debilis.*
U.S.S.R. Leningrad Region: Poljany (Uusikirkko). Vesnino (Pyhäjärvi). Mičurinskoe (Valkjärvi). — Karelian A.S.S.R.: Sortavala. Ahvenjärvi. — Murmansk Region: Cavanga. On *P. debilis.*

General distribution
Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—74), Italy (Colla 1934), Taiwan (Sugiyama 1978), United Kingdom (Bisby & Mason 1940), U.S.A. (Thaxter 1893), U.S.S.R. (Karelian A.S.S.R.; Leningrad Region; Murmansk Region).

Host
Philonthus debilis (Coleoptera, Staphylinidae). The parasite occurs mainly on the abdomen of the host.

Dichomyces princeps
Dichomyces princeps Thaxter 1895:479.
— Figs. 42 a-b, 129 (map).

This species may be confused with pale variants of *D. vulgatus. D. princeps* is more elongated, however, and usually lacks black spots above the foot. The earlier illustration of *D. princeps* given by Middelhoek (1941, 1943a and 1943b) probably represents *D. vulgatus* while the later illustration (Middelhoek 1947) seems to be more typical *D. princeps.* The Finnish material fits very well with the illustration given by Thaxter (1896).

Material examined
Finland. Ab: Lohja (*Philonthus cephalotes*).

General distribution
Apparently cosmopolitan (cf. Thaxter 1895, 1908 and 1931). In Europe known at least from Belgium (Collart 1945), Finland, France (Balazuc 1973—74), Italy (Colla 1934), the Netherlands (Middelhoek 1947), Poland (Majewski 1973b).

Host
Philonthus spp., *Quediomacrus puniceipennis* Solsky (Coleoptera, Staphylinidae). The parasite occurs all over the host.

Dichomyces vulgatus
Dichomyces vulgatus Thaxter 1900:424.
— Figs. 40 a-d, 130 (map).

The species occurs in two morphs, as illustrated by Thaxter (1908). Both occur in Fennoscandia (Figs. 30 a-b and c-d). The status of these morphs may be questioned. They are known to occur together on the same host individual. If they are separated it must be at specific level because of their highly sympatric distribution. As there are many species in this group that seem to occur in two morphs, I think it is better to treat D. vulgatus as another of these dimorphic species.

The non-auriculate morph with less black pigment laterally may closely resemble *D. princeps,* but is broader (Figs. 40c and 42a). The specimen in Fig. 40d has produced an extremely large perithecium after being broken.

Material examined
Finland. Al: Föglö (*Philonthus cephalotes*). — Ab: Uusikaupunki (*P. longicornis*). Lohja (*P. longicornis, P. umbratilis*). — Ta: Loppi (*P. cephalotes*). — Oa: Lappfjärd (*P. cephalotes*).
U.S.S.R. Leningrad Region: Mičurinskoe (Valkjärvi) (*P. fuscus*). Zaporozskoe (Metsäpirtti) (*P. cephalotes*). Uslanka (*P. longicornis*).

General distribution
Cosmopolitan (cf. Thaxter 1908). In Europe known from Austria (Thaxter 1908), Finland, France (Balazuc 1973—74), Italy (Colla 1925), the Netherlands (Middelhoek 1943a), the United Kingdom (Thaxter 1908), U.S.S.R. (Leningrad Region).

Host
Philonthus spp. (Coleoptera, Staphylinidae). Tha parasite occurs mainly on the abdomen but is often also found on other parts of the host.

Dioicomyces anthici
Dioicomyces anthici Thaxter 1901b:33. — *Dioicomyces formicillae* f. *anthicicola* Spegazzini 1917:523, according to Thaxter 1931:62. *Dioicomyces anthici* var. *fuscescens* Maire 1920:134.
— Figs. 34 a-i, 131 (map).

This is the only dioecious species of the Laboulbeniales in Eastern Fennoscandia. From the beginning the spores are differentiated into male and female spores (Figs. 34 d-e). The male thallus consists of only four superposed cells laterally terminating in the discharge tube of the single antheridium (Figs. 34 f-i). Because of its very small size (40—50 μm), it is difficult to detect on its host. The female thallus (Figs. 34 a-b) is of 'normal' size.

Material examined
Finland. Ab: Lohja (*Anthicus formicarius*). — Ta: Juupajoki (*A. floralis*).

General distribution
Algeria (Maire 1916a), Argentina (Spegazzini 1917, as *Dioicomyces formicillae* f. *anthicicola*), Cameroon (Thaxter 1931), Finland, Guatemala (Thaxter 1931), Hungary (Banhegyi 1944), Jamaica (Thaxter 1931), Senegal (Spegazzini 1915a), U.S.A. (Thaxter 1931). Being easily overlooked, the species is probably more widely distributed.

Host
Anthicus spp. (Coleoptera, Anthicidae). The parasite occurs on the elytra of the host.

Diplomyces clavifer
Diplomyces clavifer Rossi & Cesari Rossi 1978:65.
— Figs. 55 a-d, 132 (map).

This species is rather difficult to observe on its host because of its minute size and dark appearance. The dark appearance is caused by the nearly black up-

growth starting from the base of receptacle and covering a part of the thallus. In some cases the upgrowth may be almost lacking (Fig. 55b). It is interesting to note that in both the Finnish localities (Geta and Eckerö) it occurs together with *Teratomyces brevicaulis* in populations of *Erichsonius cinerascens* (Gravenhorst), though the two parasites have not yet been found on the same host individuals.

Material examined
Finland. Al: Geta (*Erichsonius cinerascens*). Eckerö (*E. cinerascens*).
Sweden. Jämtland: Häggenäs (*E. cinerascens*).

General distribution
Finland, Italy (Rossi & Cesari Rossi 1978), Sweden.

Host
Erichsonius cinerascens and *E. signaticornis* Mulsant & Rey (Coleoptera, Staphylinidae). The parasite was found on the abdomen of the host.

Ecteinomyces agathidii
Ecteinomyces agathidii Maire 1920:31. — *Asaphomyces agathidii* (Maire) Scheloske 1969:92.
— Figs. 12 a-c, 133 (map).

Scheloske transferred this species to *Asaphomyces*. However, according to Dr. I. Tavares (pers. comm.) the taxon will be placed in a third genus and for convenience I am now using the original combination.

Cyrtusa subtestacea (Gyllenhal) is a new and possibly only accidental host for *E. agathidii*, as it belongs to the tribus Leiodini, not to the Agathidiini like the previously known host species. Huggert (1973, Fig. 1) described *Amphimyces liodivorus* from *Leiodes*, a genus more closely related to *Cyrtusa*, but his illustrations show that *A. liodivorus* is quite different from my material on *Cyrtusa*. The species of Leiodidae are said to have subterranean habits and to live mainly on fungal mycelium.

Material examined
U.S.S.R. Karelian A.S.S.R.: Oz. Olanga (Paanajärvi) (*Cyrtusa subtestacea*).

General distribution
Federal Republic of Germany (Scheloske 1969), Morocco (Maire 1920), Poland (Majewski 1980), Sweden (Huggert 1973), U.S.S.R. (Karelian A.S.S.R.).

Host
Amphicyllis globus (Fabricius), *Agathidium laevigatum* Erichson, *A. seminulum* (Linnaeus), *A. badium* Erichson, *A. rotundatum* (Gyllenhal), *Cyrtusa subtestacea* (Coleoptera, Leiodidae). The parasite occurs on the pronotum and elytra of the host.

Ecteinomyces trichopterophilus
Ecteinomyces trichopterophilus Thaxter 1902:26. — *Misgomyces trichopterophilus* (Thaxter) Thaxter 1931:304.
— Figs. 14 a-c, 134 (map).

Thaxter transferred this species to *Misgomyces* but according to Dr. I. Tavares (pers. comm.) it belongs to *Ecteinomyces*. The hosts of this parasite are among the smallest beetles, their size ranging from 0.5 to 1.1 mm. The parasite is very difficult to observe on the elytra of the host. I found the fungus on a specimen of *Acrotrichis* in a collection of undetermined Ptiliidae and unfortunately I was not able to determine the insect to specific level.

Material examined
Finland. Om: Raahe (*Acrotrichis* sp.).

General distribution
Argentina (Thaxter 1931), Chile (Thaxter 1931), Federal Republic of Germany (Scheloske 1969), Finland, Italy (Thaxter 1931), Poland (Majewski 1971), U.S.A. (Thaxter 1931).

Host
Acrotrichis spp. (Coleoptera, Ptiliidae). The parasite occurs on the elytra of the host.

Eucantharomyces fennoscandicus Huldén n.sp.
— Figs. 18 a-f, 135 (map).

Pallidae brunneus, hyalinus. Cellula basalis et subbasalis lateraliter adnatae, magnitudine fere aequales, circiter 60 µm longae. Antheridium compositum antheridiis in tribus ordinibus positis, numerus cellularum antheridiferarum aliquantum variabilis. Antheridium compositum 18 × 60 µm. Pedunculus perithecii 40–70 µm longus. Prope apicem perithecii quattuor tumores adsunt. Perithecium 60–70 × 155–215 µm. Sporae 3–4 × 42 µm. Tota longitudo 250–365 µm. Matrix: Agonum quadripunctatum (Degeer) (Coleoptera, Carabidae).

Receptacle. Pale brown, hyaline. Basal cell slightly longer than subbasal cell, nearly identical in shape. Basal cell about 60 µm in length.

Appendage. Pale brown, hyaline. Basal cell about twice the length of subbasal cell. Antheridia in three rows, number of antheridial cells in each row variable; the following combinations found: 7:4:3, 6:4:3 and 4:3:3. Marginal cell extending below middle of subbasal cell, upper part slightly inflated, terminating in a short blunt process. Discharge tube somewhat irregularly curved, 15—18 µm in length. Size of compound antheridia about 18 × 60 µm.

Perithecium. Pale brown, hyaline. Stalk cell connected to equal degree with basal and subbasal cell of receptacle and basal cell of appendage. Stalk cell variable in length, 40—70 µm, gradually broadening upwards from 25 µm to 33 µm in width. Size of perithecium 60—70 × 155—215 µm. Four swellings below the blunt tip. Spores about 3—4 × 42 µm.

Total length from base of foot to tip of perithecium 250—365 µm.

Host. Agonum quadripunctatum (Degeer) (Coleoptera, Carabidae). The parasite occurs on all parts of the host.

Holotype. Slide L. Huldén 11, in MZH. Collecting data of the host: **Finland.** Ob: Muhos, leg. Stockmann.

The new species is closely related to *E. atrani* Thaxter (1895), which occurs on *Atranus pubescens* Dejean (Coleoptera, Carabidae) in North America. It is distinguished from *E. atrani* by the broader perithecium, the swellings in the upper part of the perithecium and the small process in the apical part of the marginal

cell of the compound antheridium. Otherwise the structure of the compound antheridium is very similar to that of *E. atrani* (Thaxter 1896 and 1908).

Material examined
Finland, Ob: Muhos (*Agonum quadripunctatum*).
U.S.S.R. Karelian A.S.S.R.: Kumsjärvi (*A. quadripunctatum*).

Euzodiomyces lathrobii
Euzodiomyces lathrobii Thaxter 1900:449.
— Figs. 35 a-d, 136 (map).

Material examined
Finland. N: Vantaa (*Lathrobium longulum*).

General distribution
Algeria (Maire 1916a), Belgium (Collart 1945), Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—74), Italy (Rossi 1975), Japan (Sugiyama 1973), Netherlands (Middelhoek 1943c), Poland (Majewski 1973b), Switzerland (Baumgartner 1923), United Kingdom (Thaxter 1908), U.S.A. (Benjamin & Shanor 1951), Yugoslavia (Banhegyi 1960).

Host
Lathrobium (s.lat.) spp., *Homeotarsus bicolor* (Gravenhorst), *Hemiquedius ferox* (LeConte), *Xantholinus* sp. (Coleoptera, Staphylinidae), also accidentally on *Patrobus atrorufus* (Ström) (Coleoptera, Carabidae). *E. lathrobii* seems to be mainly restricted to *Lathrobium* species. The parasite occurs all over the host.

Fanniomyces copromyzae Huldén n.sp.
— Figs. 58 a-b, 137 (map).

Flavidus, hyalinus. Pedunculus cellula basali et subbasali receptaculi confectus 150–160 μm longus. Appendices duae sympodice paniculatae, omnibus ramis in antheridia ampullacea terminantibus. Cellula pedunculi perithecii 20–25 μm longa. Perithecium circiter 180 μm longum. Sporae 5 × 32 μm. Tota longitudo 330 μm. Matrix: Copromyza borealis Zetterstedt (Diptera, Sphaeroceridae).

Receptacle. Hyaline. The two cells forming a stalk 150—160 μm in length, uniformly 20—24 μm in width. The black foot very small. The first cell slightly shorter than the second.

Appendage. Hyaline, with very faint brown shade, which is slightly stronger on stalk cell but absent from basal cell. Basal cell 30—35 μm long, about 12 μm wide at the broadest part in upper-most third. Slightly constricted at the septum between basal cell and stalk cell. Stalk cell 8—10 μm wide, about 18 μm long. From the stalk cell arise two appendages, an inner and an outer one. Outer appendage sympodially branched, each branch having short sterile branchlets or flask-shaped antheridia. Basal cell of outer appendage about 25 μm long and 10 μm wide, the other cells of the same shape but gradually becoming smaller. Inner appendage similar to the outer one but slightly smaller and less branched. The appendages about 80—90 μm in length.

Perithecium. Hyaline with very faint brown shade. Spore bearing venter about 80 μm long and about 45 μm wide in the central region, broadly spool-formed. Neck slightly outwards bent, 20—25 μm in width, slightly tapering towards the base. Apical third of neck forming a regular cone 25 μm wide at base and equally high. No processes visible at the tip. Spores 5—32 μm.

Total length from base of foot to tip of perithecium about 330 μm.

Host. Copromyza borealis Zetterstedt (Diptera, Sphaeroceridae). The parasite was found on the thorax and left hind femur of the host.

Holotype. Slide L. Huldén 20, in MZH. Collecting data of the host **Finland.** N: Espoo, Småholmen, 7.VII.1960, leg. W. Hackman.

Fanniomyces copromyzae is closely related to *F. burdigalensis,* described by Balazuc (1979) from France on *Sphaerocera pedestris* (Meigen) (Diptera, Sphaeroceridae). In *F. copromyzae,* however, the perithecium is more robust, with the neck distally broader, and as far as can be judged, the antheridia are more elongated than in *F. burdigalensis.*

Material examined
See the type.

Haplomyces texanus
Haplomyces texanus Thaxter 1893:160.
— Figs. 33 a-c, 105, 138 (map).

The basal cells of the perithecium are much shorter in the Fennoscandian material than in the illustrations of typical *H. texanus* by Thaxter (1896) and Rossi & Cesari Rossi (1980).

Material examined
Finland. Al: Jomala (*Bledius diota*). — Ab: Lohja (*B. gallicus*). — N: Tuusula (*B. gallicus*). — Li: Inari, Ivalo (*B. poppiusi*).
U.S.S.R. Leningrad Region: Poljany (Uusikirkko) (*B. opacus*) Zaporožskoe (Metsäpirtti) (*B. longulus, B. pallipes*). Uslanka (*B. filipes*). — Murmansk Region: Kuolayarvi (Salla) (*B. kutsae*). Kandalakša (*B. arcticus*). Pečenga (Petsamo) (*B. vilis*).

General distribution
Finland, France (Balazuc 1973—74), Italy (Rossi & Cesari Rossi 1980), Netherlands (Middelhoek 1943a), U.S.A. (Thaxter 1896), U.S.S.R. (Leningrad Region; Murmansk Region).

Host
Bledius spp. (Coleoptera, Staphylinidae). The parasite occurs on various parts of the host.

Helodiomyces elegans
Helodiomyces elegans Picard 1913:557.
— Figs. 17 a-b, 139 (map).

The material studied was overmature and in bad condition with the appendage and tip of perithecium broken.

Material examined
Finland. Al: Finström (*Dryops auriculatus*).

General distribution
Algeria (Maire 1916a), Federal Republic of Germany (Scheloske 1969), Finland, France (Picard 1913), Poland (Siemaszko & Siemaszko 1928), United Kingdom (Hincks 1960).

Host
Dryops luridus (Erichson), *D. auriculatus* (Fourcroy) and *D. algiricus* Lucas (Coleoptera, Dryopidae). The parasite occurs on various parts of the host.

Hydraeomyces halipli
Heimatomyces halipli Thaxter 1892:32. — *Hydraeomyces halipli* (Thaxter) 1896:294. — *Hydraeomyces venetus* Spegazzini 1915c:52. — *Parahydraeomyces italicus* Spegazzini 1915c:70. — *Parahydraeomyces italicus* var. *neopolitanicus* Spegazzini 1915c:70. Synonymy according to Siemaszko & Siemaszko 1933: 125.
— Figs. 30 a-c, 140 (map).

This species is rather heterogeneous. In American specimens (Thaxter 1896), the second and third receptacle cells are narrow, but in Japanese, Taiwanese and European specimens they are broader and more flattened (e.g. Sugiyama 1973, Sugiyama & Hayama 1981 and Siemaszko & Siemaszko 1933). European material fairly often contains specimens with four stalk cells in the receptacle. This character is usually coupled with stronger pigmentation, a large basal cell, very flattened second to fourth receptacle cells and more robust appearance of the thallus. This variant was described from Italy (Spegazzini 1915c) as *Parahydraeomyces italicus* on '*Haliplus striaticollis*', a name not occurring in entomological literature, but according to Mainardi (1915) possibly *H. lineatocollis* (Marsham). In Finland this variant is very distinctly separable from the typical variant and occurs on *Haliplus fulvus lapponum* Thomson. A similar variant was found by Scheloske (1969) in Germany on *H. fulvus* (Fabricius) (?ssp. *fulvus*) and by Banhegyi (1950) in Hungary on *H. variegatus* Sturm. The status of this variant remains unclear as intermediate variants seem to occur (Siemaszko & Siemaszko 1933 and Scheloske 1969). It is possible that its choice of host is more restricted than in the typical variant. In Fennoscandia *Haliplus fulvus lapponum* prefers lotic habitats, while the other host species prefer lentic ones (e.g. Palm 1932, Stenius 1932, Lindberg 1937 and Eriksson 1972).

Material examined
Finland. Al: Geta (*Haliplus fulvus fulvus*). — Sa: Punkaharju (*H. fulvicollis*). — Ks: Kuusamo (*H. fulvus lapponum*). — Lk: Kittilä, Pallastunturi (*H. fulvus lapponum*).
U.S.S.R. Leningrad Region: Jašino (Vahviala) (*H. lineolatus*).

General distribution
Argentina (Spegazzini 1917), China (Thaxter 1924), Federal Republic of Germany (Scheloske 1969), Finland, France (Picard 1913), Hungary (Banhegyi 1950), Japan (Sugiyama 1973), Morocco (Maire 1916a), Poland (Siemaszko & Siemaszko 1933), Spain (Siemaszko & Siemaszko 1933), Taiwan (Sugiyama & Hayama 1981), Tunisia (Maire 1916a), U.S.A. (Thaxter 1892), U.S.S.R. (Leningrad Region).

Host
Haliplus spp., *Peltodytes* (*Cnemidotus*) spp. (Coleoptera, Haliplidae). The parasite occurs on the lateral margins of the elytra.

Hydrophilomyces arcuatus Huldén n.sp.
— Figs. 19 a-d, 141 (map).

Hyalinus, leviter brunneo-umbratus. Receptaculum ex cellulis 7–15 constans, cellula II cellulam sustinentem curvatam 60–85 µm longam ferens. Appendix ex axe principali cum ramulis lateralibus angustis constat. Perithecium extrorsum flexum. Sporae 3-4 × 30 µm. Matrix: Ochthebius minimus (Fabricius) (Coleoptera, Hydraenidae).

Receptacle. Hyaline, with faint brown shade. Straight or slightly curved, consisting of 7—15 cells below perithecium. The first cell isodiametric, the second slightly flattened, having a long curved buffer cell, 60—85 µm in length. The following cells gradually lengthening, roughly isodiametric just below perithecium. Length of receptacle (35—) 85—120 µ.

Appendage. Hyaline. Like a somewhat laterally placed continuation of the receptacle, but slightly narrower. First to third basal cells simple, but the following cells each with one or two narrow branches. The branches arising from a small triangular cell in the upper corner (or corners) of the main axis cell. Antheridia not distinguished with certainty, possibly occurring on or beside the narrow branchlets, or the branchlet itself constitutes an antheridium. Length of appendage (the main axis) 60—70 µ.

Perithecium. Hyaline with faint brown shade. Strongly outwards curved, somewhat inflated along inner margin, broadest in the basal part, without specialized neck. Directed outwards from main axis at an angle of 45—90°. Size 30—35 × 70—85 µm. Spores 3—4 × 30 µm. Septum of spore near the middle.

Host. Ochthebius minimus (Fabricius) (*O. impressus* Marsham) (Coleoptera, Hydraenidae). The parasite occurs near the apex of the elytra.

Holotype. Slide L. Huldén 8, in MZH. Collecting data of the host: **Finland.** Ab: Lohja, 29.VI.1942, leg. Harald Lindberg.

Hydrophilomyces arcuatus is easily recognized by the habitus of the perithecium with the short unspecialized neck curving evenly outwards. All the other species of the genus seem to have a long differentiated neck on the perithecium, like that in the closely related *H. digitatus,* which was described on *O. marinus* (Paykull) from France (Picard 1910).

Material examined
See the type.

Laboulbenia argutoris
Laboulbenia argutoris Cépède & Picard 1909:260.
— Figs. 92 a-c, 142 (map).

In the typical appearance of *L. argutoris* the inner appendage is short, sometimes branched, terminating in two or four (sometimes more) antheridia. Occasionally, the Finnish material contains a variant with a long unbranched inner appendage, with one antheridium arising at the normal level, from the third cell (Fig. 92a).

This ectoparasite is the host of a hyperparasite, discussed in section 8.4.

Material examined
Finland. Al: Finström. Eckerö. Sund. Geta. — Ab: Korpo.

Lohja. Turku. — N: Hangö, Tvärminne. Espoo. Tuusula. Ekenäs. Sibbo. — St: Pori, Reposaari. — Ks: Kuusamo. All records on *Pterostichus diligens.*
U.S.S.R. Leningrad Region: Vyborg (Viipuri). — Karelian A.S.S.R.: Suistama (Suistamo). *On P. diligens.*

General distribution
Federal Republic of Germany (Scheloske 1969), Finland, France (Cépède & Picard 1909), Hungary (Banhegyi 1949), Italy (Spegazzini 1914), Poland (Siemaszko & Siemaszko 1928), Romania (Balazuc 1973), Switzerland (Baumgartner 1923), U.S.S.R. (Leningrad Region; Karelian A.S.S.R.).

Host
Pterostichus spp., accidentally also on *Patrobus atrorufus* (Ström) (Coleoptera, Carabidae). The parasite occurs on various parts of the host.

Laboulbenia bradycelli
Laboulbenia bradycelli Balazuc 1974, in Balazuc 1973—74, vol.43:15.
— Figs. 76, 143 (map).

The main host of *L. bradycelli* is probably *Trichocellus placidus* (Gyllenhal). On *Bradycellus* species in Finland I have found only *Laboulbenia polyphaga* Thaxter.

Material examined
Finland. Al: Finström. — Ab: Turku, Ruissalo. Lohja. — N: Helsinki. Espoo. Vantaa. Hangö, Tvärminne. — Ta: Hattula. Lammi. — Sa: Joutseno. — Oa: Lappfjärd. — Sb: Vehmersalmi. All records on *Trichocellus placidus.*
U.S.S.R. Karelian A.S.S.R.: Sortavala. — Murmansk Region: Kandalakša. On *T. placidus.*

General distribution
Finland, France (Balazuc 1973—74), Poland (Majewski 1980), U.S.S.R. (Karelian A.S.S.R.; Murmansk Region).

Host
Trichocellus placidus, Bradycellus spp. (Coleoptera, Carabidae). The parasite occurs on various parts of the host.

Laboulbenia carelica Huldén n.sp.
— Figs. 88 a-c, 144 (map).

Brunneus - fuscus. Pedunculus cellulis I–II confectus 90–95 μm longus, 12–18 μm latus. Cellula insertionis in medio perithecii. Appendix apicem perithecii superans. In parte superiore perithecii tumores duo adsunt. Tota longitudo 115 μm. Matrix: Bembidion doris (Panzer) (Coleoptera, Carabidae).

Receptacle. Brown, dark brown in the region of septum of cells I—II and outer part of cell III. Cells I—II forming a stalk of uniform width, 12—18 μm, and 90—95 μm long. Cell II about 1.5 times the length of cell I. Cell III about as long as or somewhat longer than the width of cell IV. Cell V rather small, narrow or nearly triangular.

Appendages. Insertion cell about 12 μm in width, in middle of perithecium. Basal cell of outer appendage brown, inflated and only slightly smaller than cell IV. The basal cells of the two inner appendages brown, somewhat narrower that of the outer appendage. The upper part of the appendages are damaged, but they are at least somewhat longer than the perithecium. Antheridia not observed.

Perithecium. Dark brown, paler in the upper region, with black spots on the lip cells. Broadest in the upper part because of two symmetrically placed nearly pointed swellings. Width at the base about 21 μm and at the swellings about 30 μm, above the swellings the perithecium tapering abruptly to the tip. About 55 μm long. Spores not observed.

Total length from base of foot to tip of perithecium 155 μm.

Host. Bembidion doris (Panzer) (Coleoptera, Carabidae). On elytra of the host.

Holotype. Slide L. Huldén 2, in MZH. Collecting data of the host: **U.S.S.R.** Karelian A.S.S.R.: Suistama (Suistamo), leg. O. Renkonen. Holotype from the right elytron of the host.

The material of this species was overaged with damaged appendages. The species is, however, very characteristic with the two swellings on the perithecium and strong dark brown pigmentation on the thallus. The host, *Bembidion doris,* is widely distributed and due to this fact *L. carelica* is also likely to be widespread.

Material examined
U.S.S.R. Leningrad Region: O. Lesnoj (Seiskari). — Karelian A.S.S.R.: Suistama (Suistamo).

Laboulbenia clivinalis
Laboulbenia clivinalis Thaxter 1899:165. — *Laboulbenia henricii* Colla 1927:185. — Figs. 83, 145 (map).

Material examined
Finland. Al: Mariehamn. — N: Helsinki. Espoo. — St: Pori, mainland and Reposaari. — Ta: Hattula. Aitolahti. Orivesi. Jokioinen. — Sa: Rantasalmi. Joutseno. — Oa: Kurikka. Vaasa. — Kb: Pyhäselkä, Hammaslahti. — Om: Nivala. Kokkola. — Ok: Vaala, Säräisniemi. — Ob: Oulu. All records on *Clivina fossor.*
U.S.S.R. Leningrad Region: Rjabino (Kuolemajärvi). Vesnino (Pyhäjärvi). Pervomajskoe (Kivinebb). — Murmansk Region: Pečenga (Petsamo). All records on *C. fossor.*

General distribution
Algeria (Maire 1916a), Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—74), Hungary (Banhegyi 1940), Italy (Thaxter 1908), Philippines (Thaxter 1908), Poland (Siemaszko & Siemaszko 1928), Spain (Balazuc et al. 1982), Switzerland (Baumgartner 1923), United Kingdom (Thaxter 1908), U.S.S.R. (Leningrad Region; Murmansk Region; Latvian S.S.R.: Briedis 1932).

Host
Clivina spp., accidentally also on *Patrobus atrorufus* (Ström) (Coleoptera, Carabidae). The parasite occurs all over the host.

Laboulbenia compressa
Laboulbenia compressa Thaxter 1893:165.
— Figs. 94 a-b, 146 (map).

This material of *Laboulbenia,* found on several species of *Harpalus,* is only tentatively placed under *L. compressa,* in some cases it is difficult to separate from *L. filifera.* It is pale to bright yellow with a dark brown perithecium. The appearance is more robust and the

outer appendage is shorter and normally more branched than in *L. filifera.* The tip of the perithecium is slightly broader than in the illustration of *L. compressa* given by Thaxter (1896), but otherwise it fits the description of the species. It also shows some resemblance to *L. ophoni* subsp. *fuscula* described by Spegazzini (1914). These observations indicate that many of the described species, such as *L. ophoni, L. filifera* and some other related species, are not yet sufficiently studied and delimited. All the European material should evidently be compared with American material before the exact identity of the taxa is resolved.

L. compressa has not previously been reported from Europe.

Material examined
Finland. Al: Jomala (*Harpalus xanthopus winkleri*). — Ab: Lohja (*H. affinis*). — N: Hangö, Tvärminne (*H. affinis*). Helsinki (*H. tardus*). — St: Pori (*H. affinis*). Tyrvää (*H. affinis*). — Sa: Mikkeli (*H. affinis*). Ruokolahti (*H. affinis*). Joutseno (*H. affinis*). — Tb: Viitasaari (*H. affinis, H. latus*). — Om: Tervajärvi (*H. affinis*).
U.S.S.R. Leningrad Region: Iskra (Muolaa) (*H. tardus*). Uslanka (*H. affinis*). Vaašeni (*H. affinis*). — Karelian A.S.S.R.: Salmi (*H. affinis*). Petroskoi (*H. affinis*).

General distribution
Finland, U.S.A. (Thaxter 1893), U.S.S.R. (Leningrad Region; Karelian A.S.S.R.)

Host
Harpalus spp., *Anisodactylus baltimoriensis* Say (Coleoptera, Carabidae). The parasite was found mostly on the elytra of the host.

Laboulbenia curtipes
Laboulbenia curtipes Thaxter 1892:40.
— Figs. 78, 102, 147 (map).

This species was described from the U.S.A. on *Bembidion bimaculatum* Kirby (belonging to subg. *Peryphus*). However this host species, like all its allies, is a larval hibernator (Lindroth 1945 and 1963) and can only be an accidental host for *L. curtipes.* The European hosts belong to subg. *Notaphus* (imaginal hibernators) and the American hosts most probably also belong to this subgenus. There are at least 17 such species in North America, and one of them, namely *B. semipunctatum* (Donovan), is one of the hosts in Fennoscandia. The parasite grows typically on the tarsi and distally on the tibiae of the host (Fig. 102).

The European material of *L. curtipes* fits the description of the species (Thaxter 1892, illustrated in Thaxter 1896), but seems to be slightly paler. *L. curtipes* has not previously been reported form Europe.

Material examined
Finland. Ab: Lohja (*Bembidion obliquum*). — N: Vantaa (*B. dentellum*). Espoo (*B. obliquum*). Espoo (*B. obliquum*). — St: Karkku (*B. obliquum*). — Ta: Hattula (*B. varium*). Hauho (*B. varium*). Tampere, Messukylä (*B. obliquum*). Sääksmäki (*B. obliquum*). — Sa: Kangasniemi (*B. obliquum*). — Tb: Jyväskylä (*B. obliquum*).
U.S.S.R. Leningrad Region: Zaporožskoe (Metsäpirtti) (*B. obliquum, B. semipunctatum*). Molodežnoe (Vammeljoki) (*B. obliquum, B. semipunctatum*). Rjabino (Kuolemajärvi) (*B. obliquum*). Sestroretsk (Rajajoki) (*B. obliquum*). Gumbaritsa (*B. obliquum*). Uslanka (*B. obliquum*).

General distribution
Finland, U.S.A. (Thaxter 1892), U.S.S.R. (Leningrad Region).

Host
Bembidion: subg. *Notaphus* (incl. *B. dentellum* (Thunberg), accidentally on *B. bimaculatum* (subg. *Peryphus*). The parasite occurs distally on the legs of the host.

Laboulbenia elaphri
Laboulbenia elaphri Spegazzini 1915b:464. — *Laboulbenia baenningeri* Baumgartner 1951:XXXII. — *Laboulbenia buehlmannii* Poelt 1952b:116. Synonymy according to Banhegyi 1964.
— Figs. 72, 103, 148 (map).

Siemaszko & Siemaszko (1928) described *Laboulbenia elaphricola* from Poland on *Elaphrus riparius* Linnaeus, but according to Banhegyi (1964), their species is either *L. vulgaris* or *L. polyphaga.*

The fungus found by Rostrup (1916) on *Elaphrus cupreus* Duftschmid in Denmark, although not determined to specific level, is presumably *L. elaphri.*

Material examined
Finland. Al: Sund. — Ab: Turku. Sammatti. Lohja. — Ta: Hattula. Pälkäne. — Le: Enontekiö, Hetta. All records on *Elaphrus cupreus.*

General distribution
Belgium (Spegazzini 1915b), Denmark (cf. Rostrup 1916), Federal Republic of Germany (Baumgartner 1951), Finland, France (Balazuc 1973—74), Hungary (Banhegyi 1964), Poland (Majewski 1971).

Host
Elaphrus cupreus and *E. riparius* (Coleoptera, Carabidae). The parasite occurs on various parts of the host, but most typically on the right side of the pronotum (Fig. 103).

Laboulbenia fasciculata
Laboulbenia fasciculata Peyritsch 1873:248. — *Laboulbenia brachiata* Thaxter 1890:11.
— Figs. 90 a-b, 149 a-d (maps).

The main host in Finland is *Patrobus atrorufus* (Ström). The distribution of *Laboulbenia fasciculata* coincides with that of the host in southern Finland, where *P. atrorufus* is common. The parasite is missing farther north, where there are only scattered records of *P. atrorufus* (Fig. 149a). *P. assimilis* Chaudoir and *P. septentrionis* Dejean, which are common in northern Finland, are infested by *L. fasciculata* only in southern Finland (Figs. 149 b-c). Lindroth (1945) writes that *P. atrorufus* is mainly a larval hibernator, but this apparently not quite adequate. It most probably overwinters first as a larva and then as an imago, the life cycle taking two years. There must be some essential differences in the life cycles of the other *Patrobus* species, as the parasite occurs on them only within the range of *P. atrorufus* (Figs. 149 a-d).

Material examined
Finland. Al: Geta. Lemland. Mariehamn. Jomala. Finström.

— Ab: Lohja. Karjalohja (*Patrobus atrorufus, P. assimilis*). Turku, Ruissalo. — N: Sjundeå. Espoo. Vantaa (*P. atrorufus, P. assimilis*). Helsinki (*P. atrorufus, P. assimilis, P. australis*). — Ka: Anjalankoski. — St: Pori, mainland and Reposaari. — Ta: Sahalahti. Hattula. Tampere. Pirkkala (*P. australis*). Ruovesi. Kalvola. Janakkala (*P. septentrionis*). — Sa: Lappeenranta. — Oa: Ilmajoki. When not otherwise indicated, the only host is *P. atrorufus.*
U.S.S.R. Leningrad Region: Molodežnoe (Vammeljoki) (*P. atrorufus*). Priozersk (Käkisalmi) (*P. atrorufus*). — Karelian A.S.S.R.: Sortavala (*P. atrorufus, P. australis*).

General distribution
Holarctic (Thaxter 1908, Sugiyama 1973, Balazuc 1973). In Europe known from Austria (Peyritsch 1873), the Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—74), Greece (Scheloske 1969), Hungary (Banhegyi 1969), Italy (Colla 1934), Poland (Siemaszko & Siemaszko 1928), Romania (Balazuc 1973), Switzerland (Baumgartner 1923), the United Kingdom (Bisby & Mason 1940), the U.S.S.R. (Leningrad Region; Karelian A.S.S.R.; Estonian S.S.R.: Siemaszko & Siemaszko 1928; Latvian S.S.R.: Briedis 1932).

Host
Genera of *Patrobus, Omophron, Pterostichus, Agonum, Chlaenius, Brachinus* and *Bembidion* (Coleoptera, Carabidae). The parasite may occur anywhere on the host.

Laboulbenia fennica Huldén n.sp.
— Figs. 97 a-c, h-i, 108, 150 (map).

Olivaceo-brunneus. Pedunculus cellulis I–II confectus geniculatus, 140–165 μm longus. Appendix penicillum compactum, circiter 60 μm longum formans. Perithecium 60 × 140–165 μm, in apice processus exiguos ferens. Sporae 5 × 60–70 μm. Tota longitudo 320–420 μm. Matrix principalis: Gyrinus aeratus Stephens (Coleoptera, Gyrinidae).

Receptacle. Olivaceous brown, cells I—II paler, upwards becoming nearly opaque. Cells I—II forming a geniculate stalk 140—165 μm in length, broadening uniformly upwards from 18 μm to 42 μm in width. Cells I and II about equal in length. Cell III twice as long as cell IV. Cell VI about equal in length to cell III. Septa between cells III—IV and VI—VII directed obliquely downwards from the middle of receptacle.

Appendage. Branches of appendage forming a rather dense and compact brush, about 60 μm in length. The cells of the branches nearly hyaline, but the septa opaque. Insertion cell completely dark and opaque.

Perithecium. Dark olivaceous brown, nearly opaque, tip pale with black spots on lip cells, the outgrowths as in Fig. 97 b-c. Size 60 × 140—165 μm. Spores 5 × 60—70 μm.

Total length from base of foot to tip of perithecium 320—420 μm.

Host. Gyrinus aeratus Stephens, *G. distinctus* Aubé, *G. marinus* Gyllenhal, *G. minutus* Fabricius, *G. natator* (Linnaeus), *G. paykulli* Ochs, *G. pullatus* Zaitzev and *G. substriatus* Stephens (Coleoptera, Gyrinidae). The parasite occurs on the outer margins of the elytra and the pronotum, accidentally on abdomen of the host.

Holotype. Slide L. Huldén 7, in MZH. Collecting data of the host: (*Gyrinus aeratus*) **Finland.** N: Hyvinkää (the Kerava river), 11.VII.1982, leg. P. Hiilivirta.

Balazuc (1971) reviewed all the European and North American species of *Laboulbenia* on the Gyrinidae and placed all European taxa and records under *L. gyrinicola* Spegazzini (as synonymes or forms). The specimen illustrated by Siemaszko & Siemaszko (1933, Figs. 9 a-b), however, very probably represents *L. fennica.* It was recorded from Spain (Baleares) on *Gyrinus urinator* Degeer and was suspected by Siemaszkoś to be a new undescribed species. *L. fennica* differs very distinctly from the European *L. gyrinicola* in the general appearance (strongly geniculate and sigmoid-shaped in *L. fennica*), the shape of the outgrowths of the perithecium (Figs. 97 b-c and d) and the more compact brush formed by the appendage branchlets. The new species is most closely related to the American *L. funeralis* Thaxter, but differs in the shape of the outgrowths of the perithecium (cf. Balazuc 1971, Fig. 3). Immature specimens of *L. fennica* can be separated from *L. gyrinicola* on cell III, which is about twice as big as cell IV (in *L. gyrinicola* about the same size), and on the rather narrow brush of appendage branchlets (more spreading in *L. gyrinicola*). The main host in Finland is *Gyrinus aeratus* (and possibly *G. minutus*), the other species being only accidental hosts, often within populations of *G. aeratus.* The host prefers lotic habitats. *L. fennica* seems to be restricted to South Finland, although the host is common northwards to the timber line (Huldén 1983). The explanation for this could be some difference in the life cycle pattern of the host in northern Finland, possibly hibernation in the larval stage.

Material examined
Finland. Ab: Perniö (*G. aeratus, G. minutus*). — N: Helsinki (*G. minutus*). Sjundeå (*G. marinus*). Sibbo (*G. natator*). Hyvinkää (*G. aeratus, G. minutus, G. marinus, G. substriatus, G. nator*). Ruotsinpyhtää (*G. aeratus, G. marinus, G. substriatus, G. distinctus*). Pyhtää (*G. aeratus, G. marinus, G. distinctus*). — Ka: Vehkalahti (*G. aeratus, G. marinus, G. distinctus, G. paykulli, G.natator*). — Ta: Tampere (*G. pullatus*). Kangasala (*G. minutus*). Pirkkala (*G. minutus, G. paykulli*). — Sb: Kuopio (*G. aeratus*).

Laboulbenia filifera
Laboulbenia filifera Thaxter 1893:165.
— Figs. 95, 151 (map).

The Fennoscandian material of *L. filifera* is similar to the illustrations given by Spegazzini (1914, Figs. 37 a-c). Both differ from the American specimens (Thaxter 1896, Figs. XIV: 19—20), however, which have a straight perithecium. Dr. I. Tavares kindly called my attention to this difference, which may indicate the existence of different taxa. I think it is best to place the material under *L. filifera* until more investigations have been made.

A collection from Argentina (Spegazzini 1912) was later described as a separate species, *L. stolonicola* (Spegazzini 1917).

Material examined
Finland. Ab: Turku. — N: Helsinki. Pernå. — St: Tyrvää. Huittinen. — Sa: Mikkeli. Ruokolahti. Joutseno. — Tb: Viitasaari. On *Harpalus affinis.*
U.S.S.R. Leningrad Region: Uslanka. On *H. affinis.*

General distribution
Federal Republic of Germany (Scheloske 1969), Finland, Hungary (Banhegyi 1949), Italy (Colla 1934), Japan (Sugiyama 1973), Netherlands (Middelhoek 1949), Poland (Siemaszko & Siemaszko 1928), Romania (Balazuc 1973), Switzerland (Baumgartner 1923), U.S.A. (Thaxter 1896), U.S.S.R. (Leningrad Region; Latvian S.S.R.: Briedis 1932; Buryat A.S.S.R., Selenga: Thaxter 1908).

Host
Genera of *Harpalus, Anisodactylus, Stolonis, Trichotichnus, Badister, Pterostichus* (Coleoptera, Carabidae). Most common on *Harpalus affinis* (Schrank) (*H. aeneus* Fabricius). The parasite may be found on various parts of the host.

Laboulbenia flagellata
Laboulbenia flagellata Peyritsch 1873:247. — *Laboulbenia anceps* Peyritsch 1873:247. — *Laboulbenia elongata* Thaxter 1890:10. — *Laboulbenia gigantea* Istvanffi 1895:82.
— Figs. 89 a-c, 101 a-b, 152 (map).

This species can be found on various parts of the host. *On Agonum viduum* (Panzer), however, it seems to be restricted to the ventral side of the right posterior corner of the pronotum and the area between the fore coxae, occurring only accidentally on other parts of the body (Fig. 101a). Interestingly, a parasitic mite often occurs in the same position as the fungus, but on the left side as well (Figs. 101 b-d).

Material examined
Finland. Al: Eckerö (*Agonum viduum, A. gracile, A. dorsale*). Finström (*A. fuliginosum*). Mariehamn (*A. dorsale*). Lemland (*A. dorsale*). Sottunga (*A. dorsale*). — Ab: Lohja (*A. thoreyi, A. dolens*). Karjalohja (*A. versutum*). — N: Tuusula (*A. viduum*). — Ta: Asikkala (*A. viduum*). — Sa: Sääminki (*A. viduum*). — Sb: Siilinjärvi (*A. thoreyi*). Kuopio (*A. fuliginosum*). Joroinen (*A. viduum*). Leppävirta (*A. viduum*). — Ok: Kajaani (*Patrobus septentrionis*).
U.S.S.R. Leningrad Region: Zelenogorsk (Terijoki) (*A. marginatum*).

General distribution
Nearly cosmopolitan (Scheloske 1969). In Europe known from Belgium (Collart 1945), the Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—74), Hungary (Istvanffi 1895), Italy (Colla 1934), the Netherlands (Middelhoek 1949), Poland (Siemaszko & Siemaszko 1928), Romania (Balazuc 1973), Spain (Balazuc et al. 1982), Switzerland (Baumgartner 1923), the U.S.S.R. (Leningrad Region; Latvian S.S.R.: Briedis 1932), the United Kingdom (Bisby & Mason 1940), Yugoslavia (Siemaszko & Siemaszko 1928).

Host
Genera of *Agonum* and *Colpodes* (Coleoptera, Carabidae). Some other genera are probably accidental hosts: *Amara, Patrobus, Pterostichus,* etc. Scheloske (1969) suspects that many records on alien hosts belong to other species than *Laboulbenia flagellata.*

Laboulbenia giardii
Laboulbenia giardii Cépède & Picard 1909:258.
— Figs. 82 a-b, 153 (map).

My material from Eastern Fennoscandia is similar to the illustration in the original description, but rather different from the illustrations given by Balazuc (1973—74) and Colla (1934), which have shorter and broader perithecia. The species possibly occurs in different forms.

Material examined
Finland. N: Espoo. Vantaa. Helsinki. — Ta: Tampere. — Sa: Joutseno. On *Dicheirotrichus rufithorax.*
U.S.S.R. Karelian A.S.S.R.: Sortavala (*D. rufithorax*).

General distribution
Finland, France (Cépède & Picard 1909), 'Germania' (Spegazzini 1915a), Hungary (Banhegyi 1940), Italy (Spegazzini 1914), United Kingdom (Hinks 1960), U.S.S.R. (Karelian A.S.S.R.; Tomsk Region: Siemaszko & Siemaszko 1932).

Host
Dicheirotrichus spp. (Coleoptera, Carabidae). The parasite occurs all over the host, most often on the elytra.

Laboulbenia gyrinicola
Laboulbenia gyrinicola Spegazzini 1914:34.
— Figs. 97 d-g.

This species has not been found in Eastern Fennoscandia, but is illustrated to indicate the differences from *L. fennica.* For comments, see *Laboulbenia fennica.*

Material examined
Sweden. Gotland: Visby (*Gyrinus substriatus*).
Czechoslovakia. Průhonice (*G. substriatus*).

General distribution
Compiled from Balazuc (1971): Algeria, Belgium, Czechoslovakia, France, Hungary, Italia, Poland, Romania, Sweden, Switzerland and Yugoslavia (my own material included). A record from Spain (Siemaszko & Siemaszko 1933) very probably belongs to *L. fennica.* The record from United Kingdom (Thaxter 1908) resembles *L. fennica,* according to Dr. I. Tavares (pers. comm.).

Host
The genera of *Gyrinus* and *Aulonogyrus* (Coleoptera, Gyrinidae). The main host is probably *G. substriatus* Stephens. The parasite occurs on the lateral sides of the host.

Laboulbenia hastiana Huldén n.sp.
— Figs. 96 a-c, 154 (map).

Fuscus. Pedunculus cellulis I–II confectus brevis, sursum valde dilatatus, 72–77 μm longus. Cellula VI perplanata. Appendix exterior robusta, ex cellula II vel III valde paniculata. Appendix interior exigua. Cellula insertionis et perithecium latitudine aequalia. Perithecium 35 × 85 μm. Sporae 5 × 40 μm. Tota longitudo circiter 165 μm. Matrix: Bembidion hasti Sahlberg (Coleoptera, Carabidae).

Receptacle. Dark brown, basally paler. Cells I—II forming a short stalk broadening strongly upwards, 72—77 μm in length. Cell I narrow, 12—18 μm wide, cell II about as broad as long, about 35 μm wide. Cells III and IV about equal in size, cell V large and rounded but not connected with cell III. Cell VI much shorter than broad, about (30—) 24 × 9 μm.

Appendages. Insertion cell very broad, lower part externally blackish brown. Outer appendage with two or three basal cells very large and stout, sometimes as big as cells III and IV; from second or third cell with dense branches forming a nearly isodiametric brush. Inner appendage with basal cell very small and immediately giving rise to a brush of 8—10 branchlets, presumably terminating in one antheridium each. The inner appendage just reaching the tip of perithecium. The second cell of outer appendage often reaching beyond the tip of perithecium. Inner appendage 47—60 μm; outer appendage 95—155 μm.

Perithecium. Dark brown, with black spots on lip cells, hyaline at the tip. Stout and straight or slightly inwards curved. Size about 35 × 85 μm. Tip very broad and blunt. Spores 5 × 40 μm.

Total length from base of foot to tip of perithecium about 165 μm.

Host. Bembidion hasti Sahlberg (Coleoptera, Carabidae). On elytra of the host.

Holotype. Slide L. Huldén 6, in MZH. Collecting data of the host: **Finland.** Om: Raahe, leg. Wuorentaus.

L. hastiana greatly resembles *L. geodromici* Baumgartner (1923), which, however, occurs on *Psephidonus* (*Geodromicus*) spp. (Coleoptera, Staphylinidae). In *L. hastiana* cell IV is about as broad as the perithecium, while in *L. geodromici* the perithecium is distinctly broader. *L. hastiana* is also somewhat more strongly pigmented than *L. geodromici.* In *L. hastiana* the branches of the inner appendage reach the tip of the perithecium, while in *L. geodromici* they are shorter. I have immature specimens of *L. geodromici* from *Psephidonus nigrita* (Müller) (collected in the Alps) and they seem to have thinner walls than *L. hastiana.*

Material examined
See the type.

Laboulbenia kajanensis Huldén n.sp.
— Figs. 98 a-b, 155 (map).

Receptaculum subflavidum, perithecium griseolo-brunneum. Pedunculus cellulis I–II confectus 155 μm longus. Cellula V perexigua, angusta. Cellula insertionis prope basin perithecii. Appendices non-paniculatae. Appendices et perithecium dextro-rotata. Perithecium introrsum flexum, magnitudine 42 × 105 μm. Sporae 5 × 50 μm. Tota longitudo 275 μm. Matrix: Pterostichus diligens (Sturm) (Coleoptera, Carabidae).

Receptacle. Pale yellowish, cell I faintly darkened at the base, cells III and IV with brownish shade. Cells I—II forming a rather robust stalk, about 155 μm long and about 35 μm wide in the upper part; cell I 70 μm long. Cells III—IV about 40 μm long, cell III smaller than cell IV. Cell V very small and narrow, not connected with cell III. Cell III slightly larger than cell VI.

Appendages. Insertion cell slightly narrower than cell IV, externally dark brown. Outer appendage consisting of row of seven unbranched cells, of nearly uniform width, tapering slightly towards tip, yellowish brown. Basal cells somewhat shorter than distal ones. Inner appendage consisting of row of five unbranched cells, the basal cell small, the four following longer and equal in length. One antheridium visible on fourth cell. Length of outer appendage 110—120 μm, inner appendage about 55 μm. The appendages and the perithecium dextro-rotated.

Perithecium. Greyish brown, dark below the tip, tip nearly hyaline. The perithecium slightly bent inwards, dextro-rotated with the appendages, about 4/5 free. Width 42 × 105 μm. Spores about 5 × 50 μm.

Total length from base of foot to tip of perithecium 275 μm.

Host. Pterostichus diligens (Sturm) (Coleoptera, Carabidae). The parasite was found on the left side of the prothorax.

Holotype. Slide L. Huldén 3, in MZH. Collecting data of the host: **Finland.** Ok: Paltamo, 23.V.1949, leg. Hellman.

The new species resembles somewhat *L. contorta* Thaxter (illustrated in Thaxter 1896), which was described from *Agonum harrisi* Leconte (*affine* auct.) and *A. extensicolle* Say in the U.S.A. *L. kajanensis* differs from *L. contorta* in the shape of the apex of the perithecium and in having cell V free from cell III. The inner appendage is shorter than the perithecium in *L. kajanensis* but longer in *L. contorta.* In the specimen in Fig. 88b cell IV has an additional division. Note also that the spiral turns in the opposite direction in the two species.

Material examined
See the type.

Laboulbenia leisti
Laboulbenia leisti Siemaszko & Siemaszko 1928:203.
— Figs. 84, 156 (map).

According to Scheloske (1969), intermediate forms between *L. leisti* and *L. flagellata* occur on *Agonum* spp. In Finnish specimens of *L. flagellata* the receptacle is more strongly pigmented, the perithecium more bluntly pointed and the appendages are more strongly branched than in *L. leisti.*

Material examined
Finland. Al: Jomala. Sottunga. On *Leistus ferrugineus.*

General distribution
Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—74), Hungary (Banhegyi 1949), Poland (Siemaszko & Siemaszko 1928).

Host
Leistus spp. (Coleoptera, Carabidae). The parasite occurs mainly on the elytra of the host.

Laboulbenia manubriolata
Laboulbenia manubriolata Thaxter 1915:44.
— Figs. 87 a-c, 157 (map).

This species was described by Thaxter from Java and Ceylon, growing on a carabid allied to *Tachys.* However, it was never illustrated by him in his monographs. Rossi (1982b) published the first picture of *L. manubriolata,* found on *Perigona nigriceps* (Dejean) (Coleoptera, Carabidae) from China. According to Rossi, the host of Thaxter's *L. manubriolata* very probably also belongs to *Perigona nigriceps. P. nigriceps*

has only recently reached Finland as a result of human activity (O. Biström pers. comm.) and possibly there are now a few permanent populations in southern Finland.

The material of *Laboulbenia manubriolata* from Finland is very uniform except for some specimens from the legs which are very short, about 125 μm in length (Fig. 87c), with a more robust appearance and more strongly pigmented thallus. The stalk cells of the receptacle are very short and cells I—II of equal length.

Material examined
Finland. N: Helsinki (*Perigona nigriceps*).

General distribution
China (Rossi 1982b), Finland, Indonesia (Java: Thaxter 1915), Sri Lanka (Thaxter 1915).

Host
Perigona nigriceps (Coleoptera, Carabidae). The parasite may grow anywhere on the host.

Laboulbenia metableti
Laboulbenia metableti Scheloske 1969:124.
— Figs. 74 a-b, 158 (map).

This species is relatively easy to recognize by the shape of the perithecium and the structure of the appendages. The outer appendage may grow to a length of at least 400 μm (according to Scheloske 300 μ).

Material examined
Finland. Al: Föglö. Eckerö. Lemland. — Ab: Korpo. — N: Helsinki. — Ka: Miehikkälä. — Sa: Rantasalmi. Lappeenranta. — Oa: Ilmajoki. — Kb: Eno. All records on *Syntomus truncatellus.*
U.S.S.R. Leningrad Region: Rjabino (Kuolemajärvi). Zelenogorsk (Terijoki). Gumbaritsa. Vaašeni. — Karelian A.S.S.R.: Sortavala. On *S. truncatellus.*

General distribution
Federal Republic of Germany (Scheloske 1969), Finland, Italy (Rossi & Cesari 1976), Poland (Majewski 1971), U.S.S.R. (Leningrad Region; Karelian A.S.S.R.).

Host
Syntomus (*Metabletus*) *foveatus* Geoffroy, *S. obscuroguttatus* (Duftschmid) and *S. truncatellus* (Linnaeus) (Coleoptera, Carabidae). The parasite may occur anywhere on the host.

Laboulbenia murmanica Huldén n.sp.
— Figs. 80, 159 (map).

Receptaculum brunneum, perithecium fuscum. Pedunculus cellulis I–II confectus curvatus, 120–165 μm longus. Cellula insertionis latiuscula, juxta basin perithecii sita. Appendix perithecio brevior. Margo interior perithecii valde turgidus, margo exterior directus. Perithecium 55–65 × 120 μm. Sporae 4–5 × 35–42 μm. Tota longitudo 275 μm. Matrix: Bembidion transparens (Gebler) (Coleoptera, Carabidae).

Receptacle. Brown, paler near the base, cells I—VI with rather densely but irregularly distributed dark spots, which grow stronger upwards. Cells I—II forming a strongly curved stalk, 120—165 μm long, whose width increases uniformly upwards, from 12 μm to 35 μm. Cell I and II about equal in length, cell III slightly larger than cell IV. Cell V rather large and isodiametric.

Appendages. Insertion cell rather broad, the lower part externally dark brown, situated close to the base of perithecium. Basal cell of outer appendage rather large, the second cell slightly smaller and tapering strongly at the upper end. From the second cell arise one or two rows of cells, forming narrow branches, which apparently are very short, not reaching the tip of the perithecium, but are so fragile that their exact structure cannot be discerned. The basal cells of the two inner appendages are equal in width to the outer one, but only half as long. The second cell is equal in size to the basal cell but tapers slightly. From the second cell arise two short narrow branchlets, each ending in an antheridium. The two inner appendages are situated symmetrically on both sides of the outer appendage. Length of inner appendage, 42—48 μm.

Perithecium. Uniformly dark brown, pale near the tip. Inner margin strongly inflated, outer margin nearly straight. Nearly whole perithecium free. Size, 55—65 × 120 μm. Spores 4—5 × 35—42 μm.

Total length from base of foot to tip of perithecium about 275 μm.

Host. Bembidion transparens (Gebler) (Coleoptera, Carabidae). The parasite was found on the right elytron of the host.

Hototype. Slide L. Huldén 4, in MZH. Collecting data of the host: **U.S.S.R.** Murmansk Region: Konozero, leg. Edgren.

Material examined
See the type.

Laboulbenia notiophili
Laboulbenia notiophili Cépède & Picard 1909:259.
— Figs. 85 a-b, 160 (map).

Material examined
Finland. Al: Lemland (*Notiophilus germinyi*). Ab: Lohja (*N. biguttatus*). — N: Espoo (*N. biguttatus*). Vantaa (*N. biguttatus*). Helsinki (*N. biguttatus*). Sibbo (*N. biguttatus*). — Ta: Lammi (*N. biguttatus*). — Ok: Kajaani (*N. germinyi*).

General distribution
Federal Republic of Germany (Scheloske 1969), Finland, France (Cépède & Picard 1909), Hungary (Banhegyi 1940), Poland (Siemaszko & Siemaszko 1928), Spain (Balazuc et al.1982), Switzerland (Baumgartner 1923).

Host
Notiophilus spp. (Coleoptera, Carabidae). The parasite occurs on various parts of the host.

Laboulbenia oodiphila Huldén n.sp.
— Figs. 93 a-b, 161 (map).

Receptaculum brunnescenti-flavum, perithecium fuscum. Pedunculus cellulis I–II confectus satis robustus, 300–380 μm longus. Cellula insertionis juxta basin perithecii. Appendices dichotome paniculatae, hyalinae, fragiles. Perithecium 65 ×190 μm. Sporae 5 × 55 μm. Tota longitudo 600–770 μm. Matrix: Oodes helopioides (Fabricius) (Coleoptera, Carabidae).

Receptacle. Brownish yellow, with faint dots, darkening with age. Cells I—II forming a rather robust stalk, about 40 μm wide and 300—380 μm long. Cell I tapering towards foot. Cells III—IV about 120 μm

long, cell IV about half the size of cell III. Cell VI slightly shorter than cell III. Cell V narrow, triangular.

Appendages. Insertion cell externally dark brown, situated near base of perithecium. Basal cell of outer appendage longer than that of inner appendage. Outer appendage 0—2 times dichotomously branched. Inner appendage 3—4 times dichotomously branched, antheridia 1—2 at base of lower branches, or at apex of shorter branches. Both appendages very hyaline and fragile and soon disintegrating.

Perithecium. Uniformly dark brown, slightly paler near the tip, with blackish brown spots on lip cells; darkening with age. Nearly whole perithecium free. Regular or slightly outwards bent. Size of perithecium 65—190 μm. Spores 5 × 55 μm.

Total length from base of foot to tip of perithecium 600—700 μm.

Host. Oodes helopioides (Fabricius) (Coleoptera, Carabidae). The parasite occurs on the anterior margin of the left elytron and the left mesofemur, accidentally on the coxae or other parts of the elytra.

Holotype. Slide L. Huldén 5, in MZH. Collecting data of the host: **Finland.** Al: Finström, 30.VI.1943, leg. Håkan Lindberg.

Closely related to *L. dailodonti* Spegazzini (1912), described from Argentina on *Polystichus* (*Dailodontus*) *clandestinus* (Klug) (Coleoptera, Carabidae). *L. oodiphila* is separated from that species mainly on cell III, which is about as long as cell VI (in *L. dailodonti* cell III nearly twice as long as cell VI). *L. oodiphila* is also more strongly pigmented than *L. dailodonti.* Baumgartner (1923) reported *L. dailodonti* from Switzerland on *Oodes helopioides.* This record apparently concerns *L. oodiphila.* Another species, *L. paludosa* Picard, also occurs on *Oodes helopioides* (Balazuc 1973—74), but it is much smaller (260—270 μm) than *L. oodiphila* and the lip cells of the perithecium are quite different.

Material examined
Finland. Al: Finström. — Ab: Lohja. On *Oodes helopioides.*

Laboulbenia ophoni
Laboulbenia ophoni Thaxter 1899:190.
— Figs. 75, 162 (map).

Material examined
Finland. Al: Jomala (*Harpalus xanthopus winkleri*). — N: Ekenäs (*H. tardus*). — Ta: Hattula (*H. luteicornis*).
U.S.S.R. Leningrad Region: Vesnino (Pyhäjärvi) (*H. latus*). Hiitola (*H. luteicornis*). Uslanka (*H. tardus*).

General distribution
Algeria (Thaxter 1899), Federal Republic of Germany (Scheloske 1969), Finland, France (Picard 1914), Hungary (Banhegyi 1949), Italy (Spegazzini 1914), Poland (Siemaszko & Siemaszko 1928), Spain (Balazuc et al.1982), Switzerland (Baumgartner 1923), U.S.S.R. (Leningrad Region; Vologda Region: Siemaszko & Siemaszko 1928; 'Caucasus': Siemaszko & Siemaszko 1928).

Host
Harpalus spp., *Carterus fulvipes* (Latreille) (Coleoptera, Carabidae). The parasite occurs on various parts of the host.

Laboulbenia pedicellata
Laboulbenia pedicellata Thaxter 1892:44. — *Laboulbenia gracilipes* Cépède & Picard 1908:780. Synonymy according to Scheloske 1969.
— Figs. 77 a-e, 163 (map).

Under this species I am placing varying forms, as indicated by Figs. 77 a-e. The specimens in Figs. 77 a-b closely resemble *L. bembidiopalpi,* described from America (Benjamin & Shanor 1952). The Fennoscandian material also contains a series of forms intermediate between this and the long form in Fig. 77d (even within a brush of specimens from the same position on the leg of a host). The last-mentioned form could be called the typical *L. pedicellata.* Many specimens on *Dyschirius* spp. (Fig. 77e) resemble *L. gracilipes* Cépède & Picard, which was synonymized with *L. pedicellata* by Scheloske (1969). In my opinion, *L. pedicellata* is a polymorphic species, which, in addition to *L. gracilipes,* may include *L. bembidiopalpi* and *tapirina,* described from North America (Benjamin & Shanor 1952).

In the typical long forms, cell II is constricted in its upper part and distinctly paler, in the shorter forms this constriction is absent and the pigmentation is more evenly distributed. The septum between cells IV and V is either vertical or slightly oblique.

The main host in Eastern Fennoscandia is *Dyschirius globosus.*

Material examined
Finland. Al: Föglö. Jomala. Hammarland. — Ab: Lohja (*Dyschirius globosus, Bembidion articulatum*). Pargas (*B. gilvipes*). Korpo, Jurmo. Turku. — N: Hangö, Tvärminne. Sibbo. Espoo. Helsinki (*D. globosus, B. quadrimaculatum*). Pornainen. — St: Rauma. — Ta: Tampere. Pälkäne. — Sa: Mikkeli. — Tb: Nilsiä (*B. doris*). Suonenjoki. Vehmersalmi. Iisalmi. — Kb: Kontiolahti. — Om: Revonlahti. Haapavesi. — Ks: Salla (*D. septentrionum*). — Om: Rovaniemi. When not otherwise indicated, the only host species is *Dyschirius globosus.*
U.S.S.R. Leningrad Region: Iskra (Muolaa) (*D. globosus*). Rjabino (Kuolemajärvi) (*D. globosus, D. septentrionum*). Molodežnoe (Vammeljoki) (*D. arenosus, B. semipunctatum*). Poljany (Uusikirkko) (*D. arenosus, B. ruficolle*). — Karelian A.S.S.R.: Oz. Olanga (Paanajärvi) (*D. globosus*). — Archangel Region: Solovetsk Islands (*D. globosus*).

General distribution
Apparently cosmopolitan. In Europe known from Belgium (Collart 1945), the Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—74), Greece (Siemaszko & Siemaszko 1928), Hungary (Banhegyi 1944), Italy (Siemaszko & Siemaszko 1928), the Netherlands (Middelhoek 1943a), Poland (Siemaszko & Siemaszko 1928), Romania (Balazuc 1973), Spain (Balazuc et al.1982), the United Kingdom (Green 1954), the U.S.S.R. (Leningrad Region; Karelian A.S.S.R.; Archangel Region; Latvian S.S.R.: Briedis 1932).

Host
Dyschirius spp., *Bembidion* spp., *Tachys* spp. and some related genera (Coleoptera, Carabidae). The parasite occurs on various parts of the host.

Laboulbenia polyphaga
Laboulbenia polyphaga Thaxter 1893:165.
— Figs. 73 a-b, 164 (map).

This species resembles *L. vulgaris,* but differs in having the insertion cell closer to the base of the perithecium. The appendages are also more robust in *L. vulgaris.*

The main host of this species in Fennoscandia seem to be *Bradycellus caucasicus* Chaudoir (*B. collaris* Paykull) and *Calathus melanocephalus* (Linnaeus). The record on *Trechus secalis* is certainly an accidental one because this species is a larval hibernator in Fennoscandia (Lindroth 1945). It is interesting to note that *Laboulbenia bradycelli* has not been found on *Bradycellus* spp. in Eastern Fennoscandia, although this parasite-host combination is common in France (Balazuc 1973—74).

Material examined
Finland. Al: Lemland, Flaka (*Calathus melanocephalus*). Mariehamn (*C. melanocephalus*). Geta (*C. melanocephalus*). Finström (*C. melanocephalus*). — Ab: Uusikaupunki (*Bradycellus ruficollis, B. caucasicus*). Lohja (*C. melanocephalus, B. caucasicus*). Vihti (*B. caucasicus*). Turku (*B. caucasicus*). — N: Ekenäs (*C. micropeterus*). Hangö, Tvärminne (*C. melanocephalus, B. ruficollis, B. caucasicus*). Helsinki (*C. erratus, C. micropterus, C. melanocephalus, B. caucasicus*). Espoo (*B. caucasicus*). Tuusula (*B. caucasicus*). Sjundeå (*B. caucasicus*). — Ta: Hartola (*B. caucasicus*). Ylöjärvi (*B. caucasicus*). Pälkäne (*B. caucasicus*). Hattula (*B. caucasicus*). —Sa: Joutseno (*B. caucasicus*). Ristiina (*Acupalpus flavicollis*). — Sb: Vehmersalmi (*B. caucasicus*). — Kb: Kitee (*B. caucasicus*). — Ok: Ristijärvi (*B. caucasicus*). — Ks: Kuusamo (*B. caucasicus*).
U.S.S.R. Leningrad Region: Kamennogorsk (Antrea). Segeža. Uslanka. — Karelian A.S.S.R.: Sortavala. Pirknitsa. Ahvenjärvi. Kendjärvi. Semsjärvi. All records of *B. caucasicus.*

General distribution
Cosmopolitan (Scheloske 1969). In Europe known at least from Belgium (Collart 1945), the Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—74), Hungary (Banhegyi 1940), Italy (Colla 1934), the Netherlands (Middelhoek 1949), Poland (Siemaszko & Siemaszko 1928), Portugal (Balazuc et al. 1982), Switzerland (Baumgartner 1923), U.S.S.R. (Leningrad Region; Latvian S.S.R.: Briedis 1932).

Host
A large number of genera, including *Badister, Calathus, Acupalpus, Bradycellus, Pterostichus* and *Amara* (Coleoptera, Carabidae). The parasite occurs on various parts of the host.

Laboulbenia pseudomasei Thaxter 1899:196. — *Laboulbenia matheyi* Baumgartner 1923:263, according to Scheloske 1969.
— Figs. 91 a-b, 165 (map).

According to Balazuc (1973—74) *L. pseudomasei* is a synonym of *L. pterostichi* Thaxter (1893). The Fennoscandian material resembles the illustrations of *L. pseudomasei* in Thaxter (1896) and Scheloske (1969), but not *L. pterostichi* as illustrated in Thaxter (1908). In the Federal Republic of Germany Scheloske (1969) found only *L. pseudomasei* and no forms resembling *L. pterostichi,* which he considered to be a separate species. As I am not acquainted with the total range of variation of *L. pterostichi* and *L. pseudomasei,* I have not accepted Balazuc's opinion. Fig. 81b represents in my opinion a fairly typical *L. pseudomasei,* while Fig. 81a shows a long striated form (found only once in the north on *Pterostichus nigrita*). However, the identity of the latter form remains uncertain.

Material examined
Finland. Al: Eckerö (*Pterostichus nigrita*). — Ab: Lohja (*P. nigrita, P. minor*). — N: Hangö, Tvärminne (*P. minor, P. strenuus*). Espoo (*P. strenuus*). — Sb: 'Sav.bor., Woldstedt', exact locality not known (*P. nigrita*). — Ok: Kajaani (*P. nigrita*). — Ob: Kempele (*P. nigrita*). Liminka (*P. nigrita*). —Ks: Kuusamo (*P. nigrita, Patrobus septentrionis*).
U.S.S.R. Karelian A.S.S.R.: Oz. Olanga (Paanajärvi). *On Patrobus assimilis.*

General distribution
Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—74), Hungary (Banhegyi 1949), Italy (Spegazzini 1914), Mongolia (Thaxter 1908), Poland (Siemaszko & Siemaszko 1928), Switzerland (Baumgartner 1923), U.S.S.R. (Karelian A.S.S.R.).

Host
Pterostichus spp., *Anisodactylus* spp. and occasionally on some other related genera (Coleoptera, Carabidae). The parasite may occur anywhere on the host.

Laboulbenia pterostichi
Laboulbenia pterostichi Thaxter 1893:166. Illustrated in Thaxter 1896.

This species was not found during the present study. It was reported from Finland on *Harpalus nigritarsis* Sahlberg by Siemaszko & Siemaszko (1928). According to Lindroth (cf. Arwidsson 1946) the host in question is probably *H. solitaris* Dejean (*H. fuliginosus* Duftschmid). This record remains obscure since the collection of the Siemaszko's was destroyed during World War II (Majewski 1971).

General distribution
Federal Republic of Germany (Stadelmann & Poelt 1962), Finland (Siemaszko & Siemaszko 1928), Hungary (Banhegyi 1949), Japan (Sugiyama 1973), Poland (Siemaszko & Siemaszko 1928), Switzerland (Baumgartner 1923), Uruguay (Spegazzini 1917), U.S.A. (Thaxter 1893).

Host
Many genera, including *Harpalus* and *Pterostichus* (Coleoptera, Carabidae). The parasite occurs on various parts of the host (Thaxter 1896).

Laboulbenia pulchella
Laboulbenia pulchella Spegazzini 1914:39.
— Figs. 79, 166 (map).

Colla (1934) thought that this species is a form of *L. polyphaga,* but the cells of *L. pulchella* are more inflated than in *L. polyphaga. L. pulchella* subsp. *major,* described from Austria on *Syntomus* (*Metabletus*) *foveolatus* Dejean by Spegazzini (1914), is possibly only a larger specimen of *L. pulchella.* The dark pigmentation on the outer part of cells III and IV (and upper region of II) seems to be very typical of *L. pulchella.*

Material examined
Finland. N: Espoo (*Dromius linearis*).

General distribution
Austria (Spegazzini 1914), Finland, Italy (Spegazzini 1914).

Host
Dromius linearis (Olivier) and *Syntomus* (*Metabletus*) *foveolatus* (Coleoptera, Carabidae). The parasite occurs on various parts of the host.

Laboulbenia stilicicola
Laboulbenia stilicicola Spegazzini 1914:41.
— Figs. 86, 167 (map).

The identity of the Finnish *Laboulbenia* material found on *Rugilus* (*Stilicus*) *similis* (Erichson) is somewhat unclear. It greatly resembles *L. notiophili,* which occurs on *Notiophilus* spp. (Coleoptera, Carabidae). The illustration (Fig. 86) represents an elongated form; shorter forms look like *L. notiophili* in Fig. 85b. *L. stilicicola* should have a much smaller and simple appendage and the perithecium should be narrower than in the Finnish material. The spores of the Finnish specimens are about 25 μm long while those of *L. notiophili* are about 35 μm (Finnish specimens measured). For the time being, I am placing this material under *L. stilicicola.*

Material examined
Finland. Sa: Ristiina. On *Rugilus similis.*

General distribution
Finland, France (Balazuc 1973—74), Italy (Spegazzini 1914), Netherlands (Middelhoek 1943a), Poland (Siemaszko & Siemaszko 1932), Switzerland (Baumgartner 1923), United Kingdom (Thaxter 1908, as '*L. subterranea*'), U.S.A. (Balazuc 1973—74)

Host
Rugilus (*Stilicus*) spp. (Coleoptera, Staphylinidae). The parasite occurs on various parts of the host.

Laboulbenia vulgaris
Laboulbenia vulgaris Peyritsch 1873:248.
— Figs. 81 a-d, 168 (map).

Laboulbenia vulgaris is a very polymorphic species and presumably the most widely distributed species of the Laboulbeniales in the world. It has a broad ecological amplitude and reaches an altitude of at least 4200 m (in Mexico: Rossi & Cesari Rossi 1977). Although the specimens from different hosts may differ from each other, these strains do not seem to be very host-specific. Different morphs may also be due to the position on the host (cf. Scheloske 1969). I am treating *L. vulgaris* in a broad sence and have not tried to separate the varieties described from different hosts.

The lack of records from central parts of Eastern Fennoscandia (see map in Fig. 168) is hard to explain, because many of the host species are common all over the area. There is a shift to other host species in the north: *Bembidion hasti* Sahlberg and *B. difficile* (Motschulsky). *Trechus rubens* (Fabricius) is common to both areas, wich may indicate that this is only an accidental host. The southern hosts possibly have a different life cycle from those in the north.

Material examined
Finland. Al: Jomala (*Bembidion assimile*). — Ab: Turku, Ruissalo (*B. unicolor*). Salo (*B. bruxellense*). Lohja (*B. dentellum, B. biguttatum*). Karjalohja (*B. saxatile*). Ispoinen (*B. guttula*). Kaarina (*B. guttula*). Uusikaupunki (*Trechus rubens*). — N: Ekenäs (*B. tetracolum, B. unicolor*). Espoo (*B. bruxellense, B. unicolor*). Vantaa (*B. tetracolum, B. bruxellense, B. guttula*). Helsinki (*B. tetracolum*). Borgå (*B. bruxellense*). Nurmijärvi (*B. bruxellense*). — St: Pori, mainland and Reposaari (*B. tetracolum*). — Ta: Pälkäne (*B. guttula, B. unicolor*). Hattula (*B. bruxellense*). Orivesi (*B. bruxellense*). Tampere (*B. dentellum*). Janakkala (*B. dentellum*). — Sa: Ristiina (*B. bruxellense*). Luumäki (*B. saxatile*). — Tb: Viitasaari (*B. bruxellense*). Virrat (*B. bruxellense*). — Sb: Kuopio (*B. bruxellense, B. guttula*).
U.S.S.R. Leningrad Region: Poljany (Uusikirkko) (*B. bruxellense*). Molodežnoe (Vammeljoki) (*B. bruxellense*). Gumbaritsa (*B. unicolor*). — Karelian A.S.S.R.: Salmi (*B. bruxellense*). — Murmansk Region: Pummanki (*B. hasti*). Kola (*B. hasti*). 'Kola, fl. Tuloma' (*B. hasti*). Ponoj (*B. hasti*). Pjalitsa (*Trechus rubens*). Zapoljarnyj (Yläluostari) (*B. difficile*).

General distribution
Cosmopolitan (Balazuc 1982). Evidently all over Europe.

Host
A large number of genera, including *Bembidion, Trechus, Bradycellus, Dyschirius, Brachinus, Duvalius* (Coleoptera, Carabidae). The parasite occurs on various parts of the host.

Misgomyces dyschirii
Misgomyces dyschirii Thaxter 1900:443.
— Figs. 16, 169 (map).

Material examined
Finland. Al: Jomala (*Dyschirius politus*). Kökar (*D. globosus*). Föglö (*D. globosus*). — Ab: Korpo, Jurmo (*D. globosus*). Kimito (*D. globosus*). Lohja (*D. globosus*). — N: Hangö, Tvärminne (*D. globosus*). Ekenäs (*D. globosus*). Helsinki (*D. globosus*). — St: Rauma (*D. globosus*). — Ta: Pälkäne (*D. globosus*).
U.S.S.R. Leningrad Region: Zaporožskoe (Metsäpirtti). Molodežnoe (Vammeljoki). Poljany (Uusikirkko). All records on *D. septentrionum.*

General distribution
Algeria (Maire 1916a), Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—74), Hungary (Banhegyi 1944), Italy (Rossi 1975), Japan (Sugiyama 1973), Netherlands (Middelhoek 1943a), Poland (Siemaszko & Siemaszko 1928), Switzerland (Baumgartner 1923), United Kingdom (Bisby & Mason 1940), U.S.A. (Thaxter 1900), U.S.S.R. (Leningrad Region).

Host
Dyschirius spp. (Coleoptera, Carabidae). The parasite may be found anywhere on the host but mainly on the pronotum and base of elytra.

Monoicomyces britannicus
Monoicomyces britannicus Thaxter 1900:413
— Figs. 23 a-b, 170 (map).

Material examined
Finland. Al: Finström. Eckerö. — Ab: Lohja. — N: Kyrkslätt. Helsinki. — Sa: Ristiina. — Ob: Rovaniemi, Pisavaara. All records on *Atheta longicornis.*
U.S.S.R. Leningrad Region: Vesnino (Pyhäjärvi). — Karelian A.S.S.R.: Sortavala. On *A. longicornis.*

General distribution
Federal Republic of Germany (Scheloske 1969), Finland, France (Picard 1917), Italy (Spegazzini 1915c), Poland (Siemaszko & Siemaszko 1932), United Kingdom (Thaxter 1908), U.S.S.R. (Leningrad Region; Karelian A.S.S.R.).

Host
Atheta insecta (Thomson), *A. longicornis* (Gravenhorst), other host records are uncertain (Coleoptera, Staphylinidae). The parasite occurs mainly on the abdomen of the host.

Monoicomyces furcatus
Monoicomyces furcatus Thaxter 1931:41.
— Figs. 20 a-c, 104, 171 (map).

Not previously reported from Europe. The species is recognized by the furcate habit of the receptacle, shown in Fig. 20b. In Eastern Fennoscandia it seems to be confined to *Oxytelus laqueatus* (Marsham). Siemaszko & Siemaszko (1932) reported *Monoicomyces invisibilis* as occurring on *O. laqueatus* in Poland, but their illustrations (6a and 6b) most probably represent *M. furcatus*. Their species is larger than *M. invisibilis* (250—500 μm vs. 110—140 μm) and furcate, and the host species is that of *M. furcatus* in Fennoscandia.

Material examined
Finland. Ab: Lohja. — St: Pori. — Ta: Loppi. Janakkala. —Sa: Ristiina. — Kl: Parikkala. — Sb: Joroinen. Kuopio. Iisalmi. — Kb: Kontiolahti, Liperi. Juuka. — Ob: Oulu. Rovaniemi, Pisavaara. — Le: Kilpisjärvi. All records on *Oxytelus laqueatus.*
U.S.S.R. Leningrad Region: Vesnino (Pyhäjärvi). — Karelian A.S.S.R.: Jänisjärvi. Jaakkima. Kiži. — Murmansk Region: Zapoljarnyj (Yläluostari). *On O. laqueatus.*

General distribution
Finland, Guatemala (Thaxter 1931), Haiti (Thaxter 1931), Jamaica (Thaxter 1931), Poland (Siemaszko & Siemaszko 1932, as *Monoicomyces invisibilis*), U.S.S.R. (Leningrad Region, Karelian A.S.S.R.; Murmansk Region).

Host
Anotylus insignitus (Gravenhorst) in America, *Oxytelus laqueatus* in Europe (Coleoptera, Staphylinidae). The parasite occurs on various parts of the host, but most abundantly on the abdomen.

Monoicomyces homalotae
Monoicomyces homalotae Thaxter 1900:412.
— Figs. 24 a-c, 172 (map).

The Finnish specimens have a brownish constriction on the perithecial stalk cell, as illustrated by Thaxter (1908, Fig. XXXV:9). The normal form lacks this character (Fig. XXXV:8, in Thaxter 1908).

Material examined
Finland. Al: Lemland. — N: Helsinki. Vantaa. — Ka: Virolahti. — Sb: Kuopio. On *Atheta paracrassicornis* Brundin.

General distribution
Algeria (Maire 1916a), Argentina (Spegazzini 1912), Azores (Thaxter 1908), Federal Republic of Germany (Poelt 1952a), Finland, Italy (Spegazzini 1915c), Japan (Sugiyama 1978c), Netherlands (Middelhoek 1943a), U.S.A. (Thaxter 1908).

Host
Atheta spp., *Geostiba circellaris* (Gravenhorst) (Coleoptera, Staphylinidae). The parasite was found on the last abdominal segment of the host (on *Atheta paracrassicornis* in Finland)

Monoicomyces invisibilis
Monoicomyces invisibilis Thaxter 1900:414. — *Monoicomyces affinis* Spegazzini 1915c:65.
— Figs. 21 a-c, 173 (map).

Platystethys arenarius (Fourcroy) from which the Finnish record was made, may be an accidental host. The records from Poland (Siemaszko & Siemaszko 1932) most probably concerns *M. furcatus* (see comments under that species).

Material examined
Finland. Al: Jomala. On *Platystethus arenarius.*

General distribution
Azores (Thaxter 1900), Finland, Indonesia (Sumatra: Thaxter 1931), Italy (Spegazzini 1915c), Venezuela (Thaxter 1931).

Host
Oxytelus spp., *Platystethus arenarius* (Coleoptera, Staphylinidae). The parasite occurs on the legs and abdomen of the host.

Monoicomyces oxytelis Huldén n.sp.
— Figs. 22 a-c, 174 (map).

Flavidus, hyalinus. Ex axe principali unus axis secundarius lateralis oritur. Axis secundarius ex cellulis (3–) 4–7 oblique connexis, angustis constat. Longitudo axis principalis × secundarii 85–110 μm. Axis secundarius singulum antheridium compositum fert. Pedunculus perithecii 40–65 μm longus. Perithecium regulare, infra medium latissimum, 85–120 μm longum. Sporae 3–4 × 33 μm. Tota longitudo 190–275 μm. Matrix: Oxytelus fulvipes Erichson (Coleoptera, Staphylinidae).

Primary and secondary axis. Yellowish hyaline. Primary axis consisting of two superposed cells about equal in size, the basal cell somewhat inflated and the subbasal cell more elongated. Secondary axis consisting of (3—)4—7 obliquely connected cells. The cells are rather narrow, about 2—3 times as long as wide. Length of primary and secondary axis 85—110 μm.

Appendages and antheridia. Primary axis terminating in one sterile appendage consisting of a basal cell tapering strongly apically and a long narrow branch about 120 μm in length. Septum between the basal cell and its branch black. Cells of secondary axis with paired sterile appendages resembling that of primary axis, except for the last one which bears the compound antheridium. The compound antheridium terminating in four short appendages of varying length, at most 10 μm long. Being fragile, the appendages are usually soon broken, the upper ones persiting longest.

Perithecium. Yellowish hyaline. The stalk consisting of one elongated cell, 40—65 μm in length, arising from the last cell of the secondary axis. Perithecium very regular, broadest below the middle, tapering

upwards to a neck. Size of perithecium 35—48 × 85—120 μm. Spores about 3—4 × 33 μm.

Total length from base of foot to tip of perithecium 190—275 μm.

Host. *Oxytelus fulvipes* Erichson (Coleoptera, Staphylinidae). The parasite occurs all over the host.

Holotype. Slide L. Huldén 9, in MZH. Collecting data of the host. **Finland.** Ab: Karjalohja, 25.VI.1938, leg. O. Renkonen.

Monoicomyces oxytelis resembles *M. invisibilis,* but is separated on the cells of the secondary axis, which are more numerous and rather narrow. The new species seems to have a constant habit on *Oxytelus fulvipes,* known from three different localities in Finland.

Material examined
Finland. Al: Finström. — Ab: Lohja. Karjalohja.

Monoicomyces sanctae-helenae
Monoicomyces sanctae-helenae Thaxter 1900:413. — *Monoicomyces roccae* Colla 1925:254, according to Colla 1934.
— Figs. 25 a-c, 175 (map).

The typical morph (Fig. 25c) of this species has five or three secondary axes, arising from the second cell of the primary axis, and each formed by four long cells. The other morph (figs. 25 a-b), described as *M. roccae* but synonymized with *M. sanctae-helenae,* has normally only one secondary axis (rarely two or three) consisting of six or seven rather short cells. In the material from the Leningrad Region both morphs occur together, in Finland only the latter morph and in the Novosibirsk Region the typical morph. No intermediate forms seem to occur, so that these may represent different species, but more material of the latter morph is required before they can be separated. Specimens from Taiwan (Sugiyama 1981) look rather strange, with blunt perithecia and many antheridia along the secondary axis; they possibly also represent a separate taxon.

Material examined
Finland. Sa: Ristiina. On *Oxytelus piceus.*
U.S.S.R. Leningrad Region: Zaporožskoe (Metsäpirtti). — Novosibirsk Region: Karasuk. On *O. piceus.*

General distribution
Algeria (Thaxter 1931), Cameroon (Thaxter 1931), Finland, 'Germany' (Thaxter 1931), Italy (Colla 1925), Malaysia (Sarawak: Thaxter 1931), Poland (Siemaszko & Siemaszko 1932), St. Helena (Thaxter 1931), Taiwan (Sugiyama 1981), U.S.S.R. (Leningrad Region; Novosibirsk Region).

Host
Oxytelus piceus (Linnaeus), *O. laqueatus* (Marsham), *O. ferrugineus* Kraatz, *O. alutaceifrons* Wollaston and *O. lucens Bernhauer* (Coleoptera, Stahylinidae). The parasite occurs on various parts of the host.

Peyerimhoffiella elengans
Peyerimhoffiella elegans Maire 1916b:19. — *Cryptandromyces brachyglutae* Siemaszko & Siemaszko 1928:205, synonymy according Siemaszko & Siemaszko 1932. — *Corethromyces elegans* (Maire) Siemaszko & Siemaszko 1932:176.
— Figs. 29 a-d, 176 (map).

This species was transferred to *Corethromyces* by Siemaszko & Siemaszko, and this treatment was accepted by Scheloske (1969) and Balazuc (1973—74). However, the status of *Cryptandromyces brachyglutae* is not quite clear. Antheridia was not observed in the Finnish material (because of the fragility of the appendage) and I am not sure about the exact identity of the species. It resembles the illustration in the original description of *P. elegans* and I am provisionally placing it under that name.

The Pselaphidae are very minute beetles (c. 1 mm), specimens of which are rather scarce in Finnish museums. The impression that they are rare is contradicted by the fact that at least one species in Finland harbours Laboulbeniales. The beetles occur in moist or wet places in moss and litter.

Material examined
Finland. Ab: Lohja. — N: Hangö, Tvärminne. Espoo. —Ob: Kempele. On *Brachygluta fossulata.*

General distribution
Algeria (Maire 1916a), Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—74), Poland (Siemaszko & Siemaszko 1928).

Host
Genera of *Brachygluta, Batrisodes, Bryaxis, Arcopagus* and *Tychus* (Coleoptera, Pselaphidae). The parasite occurs chiefly on the abdomen of the host.

Peyritschiella protea
*Peyritschiella protea*Thaxter 1900:427.
— Figs. 36 a-c, 106, 177 (map).

This species is restricted to *Anotylus* spp. in Eastern Fennoscandia.

Material examined
Finland. Ab: Lohja (*Anotylus rugosus. A. insecatus*). — N: Espoo (*A. rugosus*). Helsinki (*A. rugosus*). — Ta: Vanaja (*A. rugosus*). Pälkäne (*A. rugosus, A. nitidulus*).
U.S.S.R. Leningrad: Poljany (Uusikirkko) (*A. rugosus*). — Karelian A.S.S.R.: Jaakkima (*A. rugosus*). Petroskoi (*A. rugosus*).

General distribution
Algeria (Maire 1920), Belgium (Collart 1945), Finland, Fance (Balazuc 1973—74), German Democratic Republic (Thuringia: Thaxter 1890), Hungary (Banhegyi 1944), Netherlands (Middelhoek 1943a), Poland (Siemaszko & Siemaszko 1932), United Kingdom (Thaxter 1890), U.S.A. (Thaxter 1908), U.S.S.R. (Leningrad Region; Karelian A.S.S.R.).

Host
Genera of *Acrognathus, Anotylus, Oxytelus, Bledius, Styloxis* and *Planeustomus* (Coleoptera, Staphylinidae). The parasite occurs on various parts of the host.

Rhachomyces furcatus
Acanthomyces furcatus Thaxter 1893:177. — *Rhachomyces furcatus* (Thaxter) Thaxter 1895:468.
— Figs. 53, 107, 178 (map).

Material examined
Finland. Al: Sund (*Othius lapidicola*). — N: Tuusula (*O. punctulatus*).
U.S.S.R. Karelian A.S.S.R.: Ahvenjärvi (*O. punctulatus*).

General distribution
Algeria (Maire 1916a), Austria (Siemaszko & Siemaszko 1932), 'Equatorial Africa' (Spegazzini 1915b), Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—74), Poland (Siemaszko & Siemaszko 1932), United Kingdom (Bisby & Mason 1940), U.S.S.R. (Karelian A.S.S.R.).

Host
Othius spp. (Coleoptera, Staphylinidae). The parasite occurs on various parts of the host.

Rhachomyces philonthinus
Rhachomyces philonthinus Thaxter 1900:435.
— Figs. 56 a-b, 179 (map).

Material examined
Finland. Al: Finström (*Philonthus micans*). — Ab: Lohja (*P. micans P. fulvipes, P. albipes, P. cruentatus*). Sammatti (*P. micans*). Karjalohja (*P. albipes*). — N: Tuusula (*P. fulvipes*).
U.S.S.R. Leningrad Region: Uslanka (*P. longicornis*). —Karelian A.S.S.R.: Kirjavalahti (*P. fulvipes, P. micans*). Sortavala (*P. fimetarius*).

General distribution
Algeria (Maire 1920), Belgium (Collart 1945), China (Thaxter 1908), Federal Republic of Germany (Scheloske 1969), Hungary (Banhegyi 1949), Japan (Thaxter 1908), Madagascar (Balazuc 1982), Netherlands (Middelhoek 1943c), Poland (Siemaszko & Siemaszko 1932), Sweden (Thaxter 1908), St. Helena (Thaxter 1908), United Kingdom (Thaxter 1908), U.S.S.R. (Leningrad Region; Karelian A.S.S.R.).

Host
Philonthus spp., including related genera, such as *Gabrius* (Coleoptera, Staphylinidae). The parasite occurs on various parts of the host.

Rickia hyperborea
Rickia hyperborea Balazuc 1980:216.
— Figs. 45 a-b, 180 (map).

As the host of this species occur along the shores of the Atlantic and Arctic Oceans in Europe and Siberia, *R. hyperborea* cannot be excepted to be found in Finland.

Material examined
U.S.S.R. Murmansk Region: Kervanto (*Micralymma marinum*).

General distribution
France (Balazuc 1980), Norway (Balazuc 1980), U.S.S.R. (Murmansk Region; Magadan Region: Balazuc 1980).

Host
Micralymma marinum (Ström), *M. brevilingue* ssp. *dicksoni* Mäklin (Coleoptera, Staphylinidae). The parasite may be found anywhere on the host.

Rickia peyerimhoffii
Rickia peyerimhoffii Maire 1916:19.
— Figs. 43, 113, 181 (map).

Material examined
Finland. Ab: Lohja (*Scaphisoma agaricinum*). — Ta: Korpilahti (*S. inopinatum*).
U.S.S.R. Leningrad Region: Poljany (Uusikirkko). Zelenogorsk (Terijoki). On *S. agaricinum*.

General distribution
Algeria (Maire 1916c), Federal Republic of Germany (Stadelmann & Poelt 1962), Finland, Poland (Siemaszko & Siemaszko 1928), U.S.S.R. (Leningrad Region).

Host
Scaphisoma agaricinum (Linnaeus), *S. inopinatum* Löbl, *S. flavonotatum* (Pic) and *S. assimile* Erichson (Coleoptera, Scaphidiidae). The parasite occurs on the pronotum and elytra of the host.

Siemaszkoa fennica Huldén n.sp.
— Figs. 11 a-c, 182 (map).

Flavidus. Receptaculum ex octo cellulis pedunculum curvatum, 80–100 µm longum conficientibus constat. Appendix 30 µm longa. Perithecium rectum vel leviter extrorsum flexum, magnitudine 15 × 40 µm. Cellula pedunculi perithecii applanata, 7–8 × 5 µm. Perithecium ab appendice omnino disiunctum. Sporae circiter 18 µm longae. Tota longitudo 110–140 µm. Matrix: Ptenidium laevigatum Erichson (Coleoptera, Ptiliidae).

Receptacle. Yellowish, nearly hyaline. Eight cells below the perithecium forming a slightly curved stalk, 80—100 µm long, 10 µm wide, gradually tapering towards foot, second cell smallest, nearly isodiametric, 5 µm wide, the other cells elongated.

Appendage. Yellowish. Growing as a continuation of receptacle but smaller and tapering distally, about 30 µm long. No branch or antheridia seen.

Perithecium. Yellowish. Upright or slightly outwards bent, about 40 µm long and 15 µm wide, broadest in middle or just below. Stalk cell slightly flattened, 5 µm long and 7—8 µm wide. Perithecium slightly inflated basally in outer part. Apex of perithecium slightly oblique, outer margin concave near apex. Row of four cells along inner margin of perithecium and three cells along lateral and outer margins. Perithecium completely free from the appendage. Spores about 18 µm long.

Total length from base of foot to tip of perithecium 110—140 µm.

Host. Ptenidium leavigatum Erichson (Coleoptera, Ptiliidae). The parasite was found on the pronotum and elytra of the host.

Holotype. Slide L. Huldén 25, in MZH. Collecting data of the host: **Finland.** Ab: Uusikaupunki, leg. Söderman.

The genus *Siemaszkoa* was described by Tavares & Majewski (1976) on the basis of three species previously referred to *Misgomyces, S. ptenidii* (Scheloske) Tavares & Majewski, *S. annae* (Majewski) Tavares & Majewski and *S. flexa* (Majewski) Tavares & Majewski. A fourth species *S. pusillima* (Spegazzini) Tavares was transferred from *Ecteinomyces* by Tavares (1981a). *S. fennica* differs from *S. pusillima* and *S. annae* in its larger size and higher number of receptacle cells and from *S. ptenidii* in its more flattened perithecial stalk cell and different arrangement of the perithecial wall cells (*S. ptenidii* has four outer wall

cells in a row, while *S. fennica* has four cells on the inner margin). The new species is presumably closely related to *S. flexa,* having the same arrangement of the perithecial wall cells, flattened perithecial stalk cell and the same shape of the receptacle cells (elongated, the second cell being the smallest in both species). *S. fennica* differs, however, from *S. flexa* in the straight thallus, which is upwards more evenly broadening and slightly different shape of the perithecium.

Material examined
See the type.

Stigmatomyces axystae Huldén n.sp.
— Figs. 65, 183 (map).

Hyalinus, brunneo-umbratus. Pedunculus duabus cellulis receptaculi confectus 75 µm longus. Cellula basalis circiter duplo longior quam subbasalis. Appendix sex paria antheridiorum et singulum antheridium terminale spinosum fert. Appendix 52 µm longa. Perithecii venter costis spiralibus praeditus. Perithecium 100 µm longum (cellulis basalibus exceptis). Sporae 3 × 30 µm. Tota longitudo 200 µm. Matrix: Axysta cesta (Haliday) (Diptera, Ephydridae).

Receptacle. Hyaline. The two cells forming a stalk about 75 µ in length and 10—15 µm width, tapering slightly towards the base. First cell about twice as long as second.

Appendage. Hyaline, with rather distinct brown shade. Basal cell about 15 µm long, 5—10 µm wide, tapering distinctly towards base. Stalk cell about 12 µm long, rather uniformly 7 µm wide. On main axis six oblique pairs of antheridia and one spiny terminal antheridium. Spine long and distinct. Cells of main axis rather flat. The row of antheridia nearly tangentially directed. Length of appendage from base of stalk cell to tip of terminal antheridium 52 µm.

Perithecium. Hyaline with distinct brown shade. Spore-bearing part of venter about 35 × 50 µm in size. Distinct, strongly spiralling ridges terminating in four small swelling in the upper part of venter. Width of venter at the swellings about 20 µm. Neck straight, 50 µm in length, tapering gradually upwards from 16 µm to 8 µm at constriction below tip. Trace of trichogyne visible just below the constriction. The blunt tip is surrounded by four small processes, slightly diverging from the tip. The apex of each process slightly inflated, resembling a small club. Spores about 3 × 30 µm.

Total length from base of foot to tip of perithecium 200 µm.

Host. Axysta cesta (Haliday) (Diptera, Ephydridae). The parasite was found on the dorsal part of the abdomen.

Holotype. Slide L. Huldén 17, in MZH. Collecting data of the host: **Finland.** N: Vantaa, 21.V.1922, leg. R. Frey.

S. axystae is most closely related to *S. spiralis* Thaxter (illustrated by Thaxter 1908 and Dainat & Dainat 1973). The latter species is much taller and slenderer (about 500 µm in length), and has the neck of the perithecium much narrower, with rather distinct and slightly pointed processes at the tip, and the venter of the perithecium with very pronounced ridges. The host of *S. spiralis* belongs to *Hyadina* (Diptera, Ephydridae).

Material examined
See the type.

Stigmatomyces baeri
Laboulbenia baeri Knoch 1868:185. — *Stigmatomyces muscae* Karsten 1869:78. — *Stigmatomyces pitraeana* Sorokin 1871:39. — *Stigmatomyces baeri* (Knoch) Peyritsch 1873:250.
— Figs. 66, 112, 184 (map).

Boedijn (1923) reported this species on *Fannia canicularis* (Linnaeus) from the Netherlands. In some experiments made by him with *Fannia canicularis* and *Musca domestica* Linnaeus, the parasite infected only the former host. It is very uncertain whether his parasite really represent *S. beari.* It is possible that it was *Fanniomyces ceratophorus* (Whisler) Majewski, although Boedijn's illustration does not really agree with that species.

Material examined
Finland. Ta: Kangasala. — Sb: Kuopio. On *Musca domestica.*

General distribution
Austria (Peyritsch 1871), Czechoslovakia (Beck 1903), Federal Republic of Germany (Karsten 1869), Finland, Poland (Majewski 1972), Switzerland (Ruffieux 1904), Union of South Africa (Peyritsch 1873), U.S.S.R. (Leningrad Region: Knoch 1868; Charkov Region: Sorokin 1871).

Host
Musca domestica (Diptera, Muscidae). The parasite may occur anywhere on the host (see Fig. 112). As the host is cosmopolitan, *S. baeri* is probably much more distributed than is indicated by the records.

Stigmatomyces bottnica Huldén n.sp.
— Figs. 63 a-c, 185 (map).

Hyalinus, brunneo-umbratus. Pedunculus cellulis receptaculi confectus 75 µm longus. Cellula basalis longior quam subbasalis. Appendix quattuor paria antheridiorum et singulum antheridium terminale spinosum fert. Appendix 50 µm longa. Perithecii venter tenuiter constatus. Perithecium 110–120 µm longum (cellulis basalibus exceptis). Collum rectum. Sporae 3 × 25 µm. Tota longitudo 200–220 µm. Matrix: Ephydra scholtzi Becker (Diptera, Ephydridae).

Receptacle. Hyaline. The two cells forming a stalk, about 75 µm in length, tapering uniformly towards the foot, in the upper part about 22 µm wide. First cell longer than second.

Appendage. Hyaline, faint brown shade in basal part. Basal cell about 25 µm long and 8—10 µm wide, distinctly inflated in upper part. Stalk cell 10 µm long and uniformly 6 µm wide. On the main axis four oblique pairs of antheridia and terminally a single spiny antheridium. The spine small and sometimes

indistinct. Length of appendage from base of stalk cell to tip of terminal antheridium about 50 μm. The row of antheridia obliquely inwards directed.

Perithecium. Hyaline with faint brown shade except at base and tip of neck. Spore-bearing part of venter 35—40 μm wide and 60—70 μm long. Upper part of venter with four very faint and very slightly spiral ridges growing upwards to four small swellings. Width at the swellings about 25 μm. Neck about 50 μm long, 12 μm wide at base and 15 μm wide at broadest section below tip. A distinct constriction, about 10 μm in width, separating the nearly spherical apical part of neck. Tip with one pair of small inflated processes turning the discharge opening slightly inwards. Spores 3 × 25 μm.

Total length from base of foot to tip of perithecium 200—220 μm.

Host. Ephydra scholtzi Becker (Diptera, Ephydridae). The parasite grew densely on the dorsal side of the abdomen.

Holotype. Slide L. Huldén 16, in MZH. Collecting data of the host: **Finland.** Om: Lohtaja, 20.VII.1926, leg. Krogerus.

Stigmatomyces bottnica, together with *S. ephydrae* and *S. setacerae* forms a group of species mainly separable on the different cell arrangements at the apex of the perithecium and presumably on the different host species (Figs. 61, 63 and 64). According to Dahl (1959), *Ephydra scholtzi* and *E. riparia* are halophilous, while *Setacera micans* (which previously belonged to *Ephydra*) prefers freshwater habitats. Differences in ecology of the two *Ephydra* species are not known, but *E. scholtzi* is much rarer than *E. riparia.* They have been placed in different species groups by Wirth (1975).

Material examined
See the type.

Stigmatomyces chthonicus Huldén n.sp.
— Figs. 69 a-b, 186 (map).

Hyalinus, leviter brunneo-umbratus. Pedunculus duabus cellulis receptaculi confectus 70–85 μm longus. Appendix 40–70 μm longa. Perithecii venter in parte superiore quattuor tumoribus distinctis praeditus. Collum perithecii introrsum curvatum. Perithecium 145–150 μm longum (cellulis basalibus exceptis). Sporae 3 × 18 μm. Tota longitudo 225–260 μm. Matrix: Limosina claviventris Strobl (Diptera, Sphaeroceridae).

Receptacle. Hyaline with faint brown shade. The two cells forming a stalk 70—85 μm long and about 15 μm wide, the first cell tapering slightly towards base, longer than second.

Appendage. Hyaline with faint brown shade. Basal cell about 20 μm long and 10 μm wide, somewhat inflated on outer margin, constricted in septum between basal cell and stalk cell. Stalk cell nearly isodiametric about 7 μm wide. Main axis consisting of 5—6 rounded cells equal in size to stalk cell. Each cell, including stalk cell, producing an inwards growing branchlet about 20 μm in length constituting an antheridium. Length of appendage from base of stalk cell to tip of last branchlet 40—70 μm.

Perithecium. Hyaline with faint brown shade. Straight or slightly outwards bent. Spore-bearing part of venter 65—70 μm long, 44—48 μm wide in middle. Four distinct swellings on upper part of venter at slightly different levels. Neck slightly inwards curved, about 80 μm in length, tapering uniformly from 20 μm at base to about 7 μm at tip. Apical third of neck indistinctly separated from basal part. Tip with three small processes, the outer one longest and broadest, the two inner ones smaller. Spores 3 × 18 μm.

Total length from base of foot to tip of perithecium 225—260 μm.

Host. Limosina claviventris Strobl (Diptera, Sphaeroceridae). The parasite was found on the abdomen, wings, legs and mesonotum of the host.

Holotype. Slide L. Huldén 22, in MZH. Collecting data of the host: **Finland.** N: Espoo, Westend, 13. VIII.1959, leg. W. Hackman.

S. chthonicus is possibly most closely connected (together with *S. hackmanii*) with *S. tortimasculus,* described by Thaxter (1918) on *Leptocera* sp. (Diptera, Sphaeroceridae) from Indonesia: Sarawak (illustrated in Thaxter 1931). *S. tortimasculus,* however, lacks the perithecial swellings in the upper part of the venter, the venter is more strongly inflated and the antheridia grow very irregularly on the appendage. The host of *S. chthonicus, Limosina claviventris,* is common in terrestrial habitats (Hackman 1963) and often found in burrows of voles (*Microtus* sp.), where it can complete its life cycle.

Material examined
Finland. N: Espoo, two different localities. On *Limosina claviventris.*

Stigmatomyces dichaetae Huldén n.sp.
— Figs. 59, 187 (map).

Hyalinus, brunneo-umbratus. Pedunculus duabus cellulis receptaculi confectus 100–110 μm longus, cellula basalis et subbasalis aequilongae. Appendix circiter septem antheridia in uno ordine posita fert, in antheridio terminali spina non observata. Appendix 60 μm longa. Perithecium robustum, 200 μm longum (cellulis basalibus exceptis). Sporae 4 × 40 μm. Tota longitudo 320 μm. Matrix: Dichaeta caudata (Fallén) (Diptera, Ephydridae).

Receptacle. Hyaline with very faint brown shade. The two cells equal in length, forming a stalk 100—110 μm long, which tapers gradually from 40 μm in the upper part to about 20 μm at the base.

Appendage. Hyaline, basal cell and stalk cell with faint brown shade. Basal cell about 50 μm long, 10 μm wide at base and broadening upwards to about 15 μm. Strongly constricted at septum between basal cell and stalk cell. Stalk cell small, 8 μm wide and 10 μm long. On the main axis apparently 7 antheridia in one row. Spine not observed on the terminal antheridium. Length of appendage from base of stalk cell to tip of terminal antheridium 60 μm. The row of antheridia obliquely directed outwards.

Perithecium. Hyaline with brown shade, which is strongest along inner margin and near base. Spore-bearing part of venter about 80 μm long, 58 μm wide

in upper part. Neck indistinctly separated from venter, slightly outwards curved. The apical third narrower and distinctly separated from the basal two-thirds. Tip blunt, about 12 μm in width, without processes. Spores 4 × 40 μm.

Total length from base of foot to tip of perithecium 320 μm.

Host. Dichaeta caudata (Fallén) (Diptera, Ephydridae). The parasite was found on the last dorsally visible segment of the abdomen of the host.

Holotype. Slide L. Huldén 18, in MZH. Collecting data of the host: **Finland.** N: Hangö, Täcktom träsk, leg. W. Hackman.

S. dichaetae somewhat resembles *S. excavatus,* described by Thaxter (1918) on *Notiphila* (Diptera, Ephydridae) from Cameroon (illustrated in Thaxter 1931). *S. dichaetae* has a more robust perithecium and shorter appendage with more elongated stalk cell. The host, *Dichaeta caudata* (*D. brevicauda* Loew), is closely related to *Notiphila* and is known from freshwater habitats (Dahl 1959). It has two generations in southern Scandinavia.

Material examined
See the type.

Stigmatomyces ephydrae
Stigmatomyces ephydrae Mercier & Poisson 1927:226.
— Figs. 61, 188 (map).

Material examined
Finland. Om: Jakobstad. On *Ephydra riparia.*
U.S.S.R. Karelian A.S.S.R.: Keliak. On *E. riparia.*

General distribution
Finland, France (Mercier & Poisson 1927), U.S.S.R. (Karelian A.S.S.R.).

Host
Ephydra riparia Fallén (Diptera, Ephydridae). The parasite occurs on the abdomen of the host.

Stigmatomyces hackmanii Huldén n.sp.
— Figs. 71 a-e, 111, 189 (map).

Flavidus vel brunneo-umbratus. Pedunculus duabus cellulis receptaculi confectus robustus, 50–60 (–85) μm longus. Pes niger magnus. Appendix ex octo cellulis applanatis constat, quarum quaeque antheridium longum fert. Appendix circiter 40 μm longa. Perthecium 105–140 μm (– 180) μm longum (cellulis basalibus exceptis). Sporae 3.5 × 20 μm. Tota longitudo 200 (–400) μm. Matrix: Limosina schmitzi Duda (Diptera, Sphaeroceridae).

Receptacle. Hyaline, yellowish. The two cells forming a robust stalk 50—60 (—85) μm long and 25—35 μm wide in the upper part, tapering somewhat towards the base. The black foot remarkable large.

Appendage. Hyaline, stalk cell basally with brown shade. Basal cell robust 16 (—50) μm long and 20 (—25) μm wide, constricted in septum between basal cell and stalk cell. Stalk cell flat, 10—12 μm wide and 5 μm long. Main axis consisting of eight flat cells basally equal in size to stalk cell, becoming smaller towards apex, the apical one bearing a small spine. Each cell, including stalk cell, producing a short branchlet constituting an antheridium about 10 μm in length, growing obliquely inwards; the branchlets arising from the apical cells seems to be irregularly branched. Length of appendage from base of stalk cell to tip of apical branchlet about 40 μm.

Perithecium. Hyaline. The spore-bearing part of venter 45—60 μm long, 40—60 μm wide, nearly spherical when mature. Neck of varying length, 60—80 (—120) μm, tapering fairly uniformly towards tip, the apical third very indistinctly separated from the basal part. The tip with two small processes on inner margin and one longer on outer margin. Spores 3—4 × 20 μm.

Total length from base of foot to tip of perithecium normally about 200 μm, in extreme morphs from the legs of the host, up to 400 μm.

Host. Limosina schmitzi Duda (Diptera, Sphaeroceridae). The parasite was most abundantly on the wings, but was sometimes also found on the legs of the host.

Holotype. Slide L. Huldén 23, in MZH. Collecting data of the host: **Finland.** Ok: Kajaani, leg. W. Hellén.

Stigmatomyces hackmanii is possibly related to *S. tortimasculus* (see comments under *S. chthonicus*), but much more robust, the black foot is unusually large and the cells on the main axis of the appendage are very flat. The robust appearance also suggests a connection with *S. papuanus* var. *leiostoma* (Maire 1920), but this has a very long neck on the perithecium. The host of *S. hackmanii, Limosina schmitzi,* occurs in the burrows of voles (Hackman 1963).

I have named this species in honour of my teacher in entomology, Prof. Walter Hackman.

Material examined
Finland. Ab: Karjalohja. — N: Vantaa. — Om: Nykarleby. — Ok: Kajaani. All records on *Limosina schmitzi.*

Stigmatomyces hydrelliae
Stigmatomyces hydrelliae Thaxter 1901a:404.
— Figs. 57 a-c, 110, 190 (map).

Material examined
Finland. Al: Jomala (*Hydrellia griseola*). — Ab: Pargas (*H. incana*). Turku, Ruissalo (*H. griseola*). — N: Helsinki (*H. griseola*). Vantaa (*H. flaviceps*). Hangö, Tvärminne (*H. incana*). — Tb: Laukaa (*H. griseola*). — Kb: Ilomantsi (*H. griseola*). — Om: Nykarleby (*H. flaviceps*). — Ks: Kuusamo (*H. griseola*). — Lk: Muonio (*H. griseola*).
U.S.S.R. Karelian A.S.S.R.: 'Car.ross. Tengström' = probably Petroskoi (*H. griseola*).

General distribution
Finland, France (Dainat 1971), Italy (Rossi & Cesari Rossi 1979), Poland (Majewski 1972), U.S.A. (Thaxter 1901a), U.S.S.R. (Karelian A.S.S.R.).

Host
Hydrellia flaviceps (Meigen), *H. griseola* (Fallén) and *H. incana* Stenhammar (Diptera, Ephydridae). The parasite occurs very constantly dorsally on the abdomen of the host.

Stigmatomyces manicatae Huldén n.sp.
— Figs. 62, 191 (map).

Flavidus, hyalinus, brunneo-umbratus. Pedunculus cel-

lulis duabus receptaculi confectus 140 μm longus. Appendix quinque paria antheridiorum et singulum antheridium terminale spinosum fert. Perithecium circiter 280 μm longum (cellulis basalibus exceptis). Collum longum, exile, leviter curvatum. Sporae 4 × 40–45 μm. Tota longitudo circiter 450 μm. Matrix: Ochthera manicata (Fabricius) (Diptera, Ephydridae).

Receptacle. Yellowish hyaline. The two cells forming a stalk 140 μm in length and 35 μm in width, tapering abruptly towards the small black foot. The first cell somewhat smaller than the second.

Appendage. Pale brown, stalk cell darker. Basal cell about 25 μm long and 15 μm wide, tapering slightly upwards. Stalk cell 15 μm long and 10 μm wide. Along the main axis arise five obliquely paired antheridia and one spiny terminal antheridium. The row of antheridia directed outwards or slightly obliquely. Length of appendage from base of stalk cell to tip of terminal antheridium about 85 μm.

Perithecium. Venter hyaline with distinct brown shade, neck and tip pale and hyaline. Spore-bearing part of venter 60 × 120 μm, broadest in middle. Neck slightly curved, about 160 μm in length, very uniform in width, about 20 μm except for the distal 30 μm, which is slightly tapering. Two pairs of processes on the tip, outer pair about 5 μm long, inner pair very short. Spores 4 × 40—45 μm.

Total length from base of foot to tip of perithecium about 450 μm.

Host. Ochthera manicata (Fabricius) (Diptera, Ephydridae). The parasite was found below the tip of the scutellum of the host.

Holotype. Slide L. Huldén 14, in MZH. Collecting data of the host: **Finland.** Al: Lemland, Flaka, 12—24.VIII.1954, leg. Håkan Lindberg.

This species is obviously very close to *S. gracilis* (Thaxter 1901a, illustrated in Thaxter 1908), but that species has a more distinctly separated neck on the perithecium, pronounced swellings on the neck in the distal third and a much slenderer receptacle. It was said to occur on an *Ochthera*-like fly (probably *O. circularis,* see Clausen 1977) in Indonesia. Thaxter (1917, 1931) also found an American form of *S. gracilis* on a host called *Ochthera mantis* (the right species is probably *O. anatolikos,* see Clausen 1977). Thaxter did not describe it as a different taxon, but it is possible that it resembles *S. manicatae.* The exact identity of the host species appears to be important for an understanding of the *Stigmatomyces* species occurring on *Ochthera* spp. The host of *S. manicatae, O. manicata,* is a European species.

Material examined
See the type.

Stigmatomyces mantis Huldén n.sp.
— Figs. 60 a-c, 192 (map).

Hyalinus, brunnescenti-umbratus. Pedunculus duabus cellulis receptaculi confectus 50–70 μm longus. Appendix generaliter quinque paria antheridiorum et singulum antheridium terminale spinosum fert. Appendix 60 μm longa. Perithecium 125–160 μm longum (cellulis basalibus exceptis). Apex perithecii vulgo duabus auriculis longioribus duabusque brevioribus praeditus. Sporae 4 × 30 μm. Tota longitudo 190–230 μm. Matrix: Ochthera mantis (Degeer) (Diptera, Ephydridae).

Receptacle. Hyaline. The two cells forming a stalk 50—70 μm in length. The stalk broadening abruptly at the base, otherwise fairly uniform in width, about 20 μm. The first cell about twice as long as the second.

Appendage. Hyaline, basal cell and stalk cell with brownish shade. Basal cell about 20 μm long and 15 μm wide. Stalk cell isodiametric, about 10 μm in width. Main axis usually with five pairs of antheridia and one spiny terminal antheridium. In some cases there may be only four pairs, in one case an additional antheridium was found on the stalk cell. Length of appendage from base of stalk cell to tip of terminal antheridium about 60 μm. The row of antheridia is rotated to a varying degree and may be inwards or nearly outwards directed.

Perithecium. Hyaline with faint brown shade. Spore-bearing part of venter about 40 μm wide and 80 μm long. Neck 45—80 μm long, highly variable in shape, always curved or bent inwards to varying degree. Neck divided into basal part, which is longer and broader, usually tapering towards the base, and distal part, which is shorter and tapers slightly towards the tip. When fully developed the tip has one pair of large ear-like processes on outer margin, about 10 μm in length, and one pair of small rounded processes on inner margin. The outer pair of processes may be much smaller, and in extreme cases the tip may be quite symmetrical, with four small processes of equal size. Spores 4 × 30 μm.

Total length from base of foot to tip of perithecium 190—230 μm.

Host. Ochthera mantis (Degeer) (Diptera, Ephydridae). The parasite occurs on the dorsal part of the abdomen, mainly on the right side near the base.

Holotype. Slide L. Huldén 15, in MZH. Collecting data of the host: **Finland.** Ta: Ylörjärvi, 25.VI.1921, leg. R. Frey.

This species is rather variable with respect to the shape of the apex of the perithecium, depending on how well developed it is. The variation is not correlated with the maturity of the perithecium; the different morphs are possibly some kinds of modifications (called 'Wuchsformen' by Scheloske 1969). It is related to *S. gracilis* (see also comments under *S. manicatae*) but differs in the general shape of the neck of the perithecium and is smaller (190—230 μm vs. about 330 μm). The host of *S. mantis, Ochthera mantis,* is a holarctic species. It is interesting to note that *Ochthera* is the only genus of Ephydridae with predacious species.

Material studied
Finland. Ab: Muurla. — Ta: Ylöjärvi. Heinola. — Kb: Ilomantsi. — Ob: Hailuoto. On *Ochthera mantis.*

Stigmatomyces purpureus
Stigmatomyes purpureus Thaxter 1901a:404. — *Stigmatomyces scatellae* Batra 1963:989. — *Stigmatomyces purpureus* f. *scatellae* (Batra) Balazuc 1974, in Balazuc 1973—74, vol 43:353.
— Figs. 67 a-b, 193 (map).

The typical *S. purpureus* was found in Finland on *Scatella callosicosta* Bezzi (Fig. 67b). The specimens on *Scatella stagnalis* (Fallén) resemble the shorter form of *S. purpureus,* which was described by Batra as a separate species, *S. scatellae.* Balazuc placed it as a form under *S. purpureus,* but the two forms may represent different species.

Material examined
Finland. Ab: Lohja (*Scatella callosicosta*). Karjalohja (*S. stagnalis*). — N: Vantaa (*S. callosicosta*).

General distribution
Finland, France (Dainat & Dainat 1973), India (Batra 1963, as *S. scatellae*), Italy (Rossi & Cesari Rossi 1979), Poland (Majewski 1981), United Kingdom (Biffen 1909), U.S.A. (Thaxter 1901a).

Host
Scatella stagnalis, S. callosicosta and *S. paludum* (Meigen) (Diptera, Ephydridae). The parasite occurs on the abdomen of the host.

Stigmatomyces scaptomyzae
Stigmatomyces scaptomyzae Thaxter 1901a:400.
— Figs. 70 a-b, 194 (map).

Material examined
Finland. N: Hangö, Tvärminne. Sibbo. — St: Pori, Reposaari. On *Scaptomyza pallida.*

General distribution
Finland, France (Dainat & Dainat 1973), Italy (Rossi & Cesari Rossi 1979), Poland (Majewski 1972), U.S.A. (Thaxter 1908), Venezuela (Thaxter 1908).

Host
Scaptomyza pallida (Zetterstedt) and *S. graminum* (Fallén) (Diptera, Drosophilidae). The parasite occurs on the abdomen of the host.

Stigmatomyces setacerae Huldén n.sp.
— Figs. 64 a-c, 195 (map).

Hyalinus, brunneo-umbratus. Pedunculus cellulis duabus receptaculi confectus 80–90 μm longus. Appendix quattuor antheridia in uno ordine posita et singulum antheridium terminale spinosum fert. Perithecii venter quattuor costis praeditus, in parte superiore in tumores quattuor humiles terminans. Perithecium 110–125 μm longum (cellulis basalibus exceptis). Collum leviter curvatum. Apex duobus paribus processuum in uno latere sitis praeditus. Sporae 3 × 20 μm. Tota longitudo 200–220 μm. Matrix: Setacera micans (Haliday) (Diptera, Ephydridae).

Receptacle. Hyaline. The two cells forming a stalk 80—90 μm long and 12—25 μm wide, gradually broadening upwards. First cell slightly longer than second.

Appendage. Hyaline with faint brown shade. Basal cell about 20 μm long and 10 μm wide, slightly inflated above. Constricted at the septum between basal cell and stalk cell. Stalk cell 12—15 μm long and 6—7 μm wide. Main axis with four antheridia in one row and one spiny terminal antheridium. Spine long and distinct. The appendage curved inwards. Length of appendage from base of stalk cell to tip of terminal antheridium about 60 μm.

Perithecium. Hyaline with brown shade, paler on basal part of neck. Spore-bearing part of venter 65—75 μm long and 25—40 μm wide, broadest just above middle. Four low symmetrially located ridges in upper third of venter terminating above in four low swellings just below neck. Width at swellings 20—25 μm. Neck curved inwards, 45—50 μm long from base to tip of processes, 15—18 μm wide, slightly constricted in apical third. Tip as in Figs. 64 b-c. The prosesses of tip about 8 μm in length. Spores 3 × 20 μm.

Total length from base of foot to tip of perithecium 200—220 μm.

Host. Setacera micans (Haliday) (Diptera, Ephydridae). The parasite occurs on the left anterior cormer of the first abdominal segment.

Holotype. Slide L. Huldén 19, in MZH. Collecting data of the host: **Finland.** Ob: Hailuoto, leg. R. Frey.

Closely related to *S. ephydrae* and *S. bottnica,* but differs in the shape of the apex of the perithecium (Figs. 61, 63 and 64). The neck of the perithecium is also slightly shorter than in the two other species.

The host of *S. setacerae, Setacera micans,* occurs in the vicinity of freshwater habitats, while those of the others are halophilous (Dahl 1959).

Material examined
See the type.

Stigmatomyces subterraneus Huldén n.sp.
— Figs. 68, 196 (map).

Hyalinus, tenuiter brunnescenti-umbratus. Pedunculus cellulis receptaculi confectus exilis, 80–130 μm longus. Appendix ex 6–7 cellulis turgidis constat, quarum quaeque singulum antheridium fert. Appendix circa 65 μm longa. Perithecium exile, extrorsum curvatum, tumoribus quattuor distinctis praeditum, 105–140 μm longum (cellulis basalibus exceptis). Collum rectum. Sporae 2–3 × 18 μm. Tota longitudo 260–320 μm. Matrix: Limosina talparum Richards (Diptera, Sphaeroceridae).

Receptacle. Hyaline. The two cells forming a stalk of varying length, 80—130 μm, and uniform width, 15—20 μm. First cell a half to two-thirds as long as the second.

Appendage. Hyaline, only stalk cell with faint brown shade. Basal cell elongate, up to 35 μm long and 10 μm wide in the middle, tapering slightly towards the ends. Stalk cell small and flat, 10 μm wide and 5 μm long. The main axis above the stalk cell consisting of about 6—7 cells inflated at outer margin, nearly equal in size to the stalk cell, inner margin of each cell, including stalk cell, with an antheridium about 25 μm in lenght, the upper ones being shorter. The last two or three axis cells possibly irregularly branched and apparently terminating in antheridia. Lenght of appendage from base of stalk cell to tip of last branchlet about 65 μm.

Perithecium. Hyaline with very faint brown shade, bent outwards, rarely straight. Spore-bearing part of venter 45—70 μm long and 30—42 μm wide, with four very pronounced swellings in the upper region, at somewhat different levels. Neck fairly straight,

60—70 μm long, about 20 μm wide at base, tapering uniformly for three quarters of its length, the apical quarter tapering slightly more strongly. Tip rather narrow, about 5 μm in width. Tip with one very small swelling on inner side 2—3 in width. Spores 2—3 × 18 μm.

Total length from base of foot to tip of perithecium 260—320 μm.

Host. Limosina talparum Richards (Diptera, Sphaeroceridae). The parasite occurs mainly on the abdomen, but sometimes also on the legs of the host.

Holotype. Slide L. Huldén 21, in MZH. Collecting data of the host: **Finland.** N: Espoo, Westend, 27.VI.1959, leg. W. Hackman.

Stigmatomyces subterraneus is very closely related to *S. divergatus,* described by Thaxter (1931) from Sumatra on *Leptocera* sp. (Diptera, Sphaeroceridae). The latter differs in its smaller size (160—200 μm against 260—320 μm) and slightly zigzag-shaped thallus, which is not as slender as in *S. subterraneus.* It is possible that *S. subterraneus* will prove to be merely a subspecies of *S. divergatus,* but more records are required from intervening areas.

The host of *S. subterraneus, Limosina talparum,* occurs very typically in burrows of *Microtus* (voles) and *Talpa* (moles) but unlike its relative *Limosina claviventris,* it has a much narrower ecological amplitude, being restricted to inhabited burrows (Hackman 1963).

Material examined
See the type.

Symplectromyces lapponicus Huldén n.sp.
— Figs. 49 a-d, 197 (map).

Pedunculus tribus cellulis basalibus receptaculi confectus 60 μm longus, sursum gradatim infuscatus. Cellula IV fusca, fere opaca. Appendices fuscae, ramulis superne hyalinis. In ramulis cellulae rostratae. Rami antheridiferi breves, antheridia 3–4 ferentes. Perithecia bina, fusca, 100 μm longa. Sporae 25 μm longae. Tota longitudo 225 μm. Matrix: Quedius boops (Gravenhorst) (Coleoptera, Staphylinidae).

Receptacle. The three first cell forming a stalk about 60 μm in length. First cell yellow brown, the three following following cells gradually darkening, the fourth cell dark brown and nearly opaque. First cell rather narrow, slightly longer than broad, second cell very flattened and about three times as broad as long, third cell about twice as broad as long.

Appendage. Dark brown, the branchlets hyaline towards the tips. A ring of secondary branches arises from the fourth cell above the foot. Beak-like apical cells are present on the outwards directed branchlets in young specimens, but are soon broken; these cells 3—5 times as long as their base. Antheridial branches hidden among sterile branches, short, 25—30 μm in length, only three or four antheridia in row.

Perithecium. Dark brown, paler towards base and tip. Narrowly ova, 45 × 100 μm in size. Four small sphaerical processes below the tip. Stalk of perithecium short, hidden among branches of appendage. Spores about 25 μm in length.

Total length from base of foot to tip of perithecium 225 μm.

Host. Quedius boops (Gravenhorst) (Coleoptera, Staphylinidae). The parasite was found on the legs and abdomen of the host.

Holotype. Slide L. Huldén 12, in MZH. Collecting data of the host: **Finland.** Lk: Kittilä, leg. O. Renkonen.

S. lapponicus differs from *S. vulgaris* in the smaller size, smaller spores, beak-like sterile branchlets and very short antheridial branches with only 3—4 antheridia (in *S. vulgaris* 7—10 antheridia in row).

Material examined
See the type.

Symplectromyces rarus Huldén n.sp.
— Figs. 51 a-b, 198 (map).

Receptaculum fuscum, ad basin pallidius. Pedunculus tribus cellulis basalibus confectus 60 μm longus. Rami appendiculati subbrunnei, ad basin fuscelli, 100 μm longi. Rami antheridiferi longi, antheridia numerosa ferentes. Perithecia regulariter bina, fusiformia, fusca, cellula pedunculi pallida. Perithecium 180–200 μm longum. Sporae 4 × 35 μm. Tota longitudo circiter 370 μm. Matrix: Quedius fuliginosus (Gravenhorst) (Coleoptera, Staphylinidae).

Receptacle. Dark brown, paler near the base. The stalk consisting of three superposed cells, broadening uniformly from about 15 μm to 35 μm, about 60 μm in length. The first cell slightly longer than broad, the second and third cells slightly broader than long.

Appendage. Branches pale brown, basally dark brown. The ring of branches arising from the fourth cell above the foot. The outer branches have short blunt branchlets directed outwards, the inner branches (= overlying branches) bear 5—7 simple antheridia along the inner margin. Branches up to 100 μm in length.

Perithecium. Dark brown, basally and apically slightly paler, stalk cell very pale, nearly hyaline. Stalk cell about 60 μm long and 20 μm wide, very distinctly separable from perithecium. Perithecium very regularly spool-shaped, 180—200 μm long and 50—55 μm wide. Apex relatively bluntly rounded. Spores about 4 × 35 μm. The perithecia occur very regularly in pairs of equal size.

Total length from base of foot to tip of perithecium about 370 μm.

Host. Quedius fuliginosus (Gravenhorst) (Coleoptera, Staphylinidae). The parasite occurs only on the dorsal side of the last abdominal segment of the host.

Holotype. Slide L. Huldén 13, in MZH. Collecting data of the host: **Finland.** N: Vantaa, 28.X.1934, leg. P. H. Lindberg.

Symplectromyces rarus is closely related to *S. vulgaris.* It differs from the latter in its more elegant and symmetrical appearance, more distinctly separated stalk of perithecium, dark brown perithecium, contrasting with the very pale stalk, and smaller spores. It occurs exclusively on the dorsal side of the last abdominal segment of *Quedius fuliginosus.*

Material examined.
Finland. N: Espoo. Vantaa. Helsinki. Kirkkonummi. — St: Yläne. All records on *Quedius fuliginosus.*

Symplectromyces vulgaris
Teratomyces vulgaris Thaxter 1900:431. — *Symplectromyces vulgaris* (Thaxter) Thaxter 1908:315.
— Figs. 50 a-b, 199 (map).

Symplectromyces vulgaris was earlier the only species in the genus. The main characters differentiating it from the newly described *S. lapponicus* and *S. rarus* are the large, somewhat clumsy appearance and large spores (about 60 μm in length). It is often less pigmented than the other species. The main host in Eastern Fennoscandia is *Quedius mesomelinus* (Marsham).

Thaxter (1908) reports occurrence on *Philonthus* sp. (Coleoptera, Staphylinidae), but this is either a wrongly determined or an accidental host (cf. Benjamin 1968).

The here illustrated specimen (Fig. 50a) is exceptional in having an additional horizontal septum in the perithecial stalk cell.

Material examined
Finland. Al: Saltvik (*Quedius mesomelinus*). Geta (*Q. mesomelinus*). Sund (*Q. cinctus*). — Ab: Turku, Ruissalo (*Q. cinctus*). Lohja (*Q. mesomelinus, Q. limbatus*). — N: Helsinki (*Q. cinctus*). Vantaa (*Q. mesomelinus*). — Ta: Lammi (*Q. limbatus*). — Sb: Viitasaari (*Q. mesomelinus*). — Kb: Juuka (*Q. mesomelinus*).
U.S.S.R. Leningrad Region: Mičurinskoe (Valkjärvi) (*Q. mesomelinus*). Murmansk Region: Pečenga (Petsamo) (*Q. fulvicollis*). Varsuga (*Q. mesomelinus*).

General distribution
Belgium (Collart 1945), 'Bengal' (Thaxter 1900), Canada (Thaxter 1900), Federal Republic of Germany (Scheloske 1969), Finland, Hungary (Thaxter 1900), Italy (Rossi & Cesaro Rossi 1978), Netherlands (Middelhoek 1943b), Portugal (Thaxter 1908), Spain (Thaxter 1908), United Kingdom (Thaxter 1900), U.S.A. (Benjamin 1968), U.S.S.R. (Leningrad Region; Murmansk Region), Yugoslavia (Siemaszko & Siemaszko 1932).

Host
Quedius spp. (Coleoptera, Staphylinidae). The parasite occurs on various parts of the host.

Teratomyces brevicaulis
Teratomyces brevicaulis Thaxter 1894:99.
— Figs. 52 a-d, 200 (map).

First records from Europe.

In the southwestern part of Finland this species occurs together with *Diplomyces clavifer* (see comments under that species).

Material examined
Finland. Al: Eckerö. Geta. — Ab: Lohja. — Sa: Ristiina. On *Erichsonius cinerascens.*
U.S.S.R. Karelian A.S.S.R.: Saravaara. On *E. cinerascens.*

General distribution
Finland, U.S.A. (Thaxter 1894), U.S.S.R. (Karelian A.S.S.R.).

Host
Erichsonius (*Actobius*) nanus (Horn) and *E. cinerascens* (Gravenhorst) (Coleoptera, Staphylinidae). The parasite occurs chiefly on the abdomen of the host.

Teratomyces philonthi
Teratomyces philonthi Thaxter 1900:432.
— Figs. 54, 201 (map).

The host genus of this parasite, *Gabrius,* was long treated as a sugenus of *Philonthus,* but is now generally considered a separate genus. *Teratomyces philonthi* does not occur on *Philonthus.*

Material examined
Finland. Ab: Lohja (*Gabrius trossulus*).

General distribution
Federal Republic of Germany (Scheloske 1969), Finland, France (Balazuc 1973—74), Hungary (Thaxter 1900), Italy (Rossi & Cesari Rossi 1978), Netherlands (Middelhoek 1943a).

Host
Gabrius trossulus (Nordmann) and *G. pennatus* Sharp (Coleoptera, Staphylinidae). The parasite occurs distally on the abdomen of the host.

8.4. Notes on non-laboulbeniaceous parasites in Finland

8.4.1. Amphoromorpha sp.

A few specimens of an ectoparasitic fungus, apparently belonging to the genus *Amphoromorpha* (Deuteromycetes: Gloeohaustoriales), were found on the abdomen of a specimen of *Atheta longicornis* (Gravenhorst) (Coleoptera, Staphylinidae) from Ob: Rovaniemi, Pisavaara. In Figs. 99 a-d (map in Fig. 203) four specimens of the fungus are illustrated. They are very hyaline and the size varies from 60—75 μm in length and 10—15 μm in width. No distinct structures were seen except for one or two spine-like processes at the apex of the (?)unicellular thallus. The structure of the foot is also indistinct. They resemble *A. mirabilis* diescribed on a staphylinid beetle from Poland by J. & W. Siemaszko (1928), but differ in the smaller size. For the present I think it is best not to describe this fungus as a new species.

8.4.2. A hyperparasite on Laboulbenia argutoris

A hyperparasitic fungus of unknown systematic position was found on *Laboulbenia argutoris* from two localities in South Finland (Figs. 100 a-b, map in Figs. 202). In both cases the host of *L. argutoris* was *Pterostichus diligens* (Coleoptera, Carabidae). The larger specimen (Fig. 100a) grew on the outer appendage and the smaller (Fig. 100b) on the perithecium of the parasite. The thallus consists of 4—10 cells,

with a black foot as in Laboulbeniales. No other distinct structures were seen. The beetles were collected in Al: Finström and Ab: Lohja.

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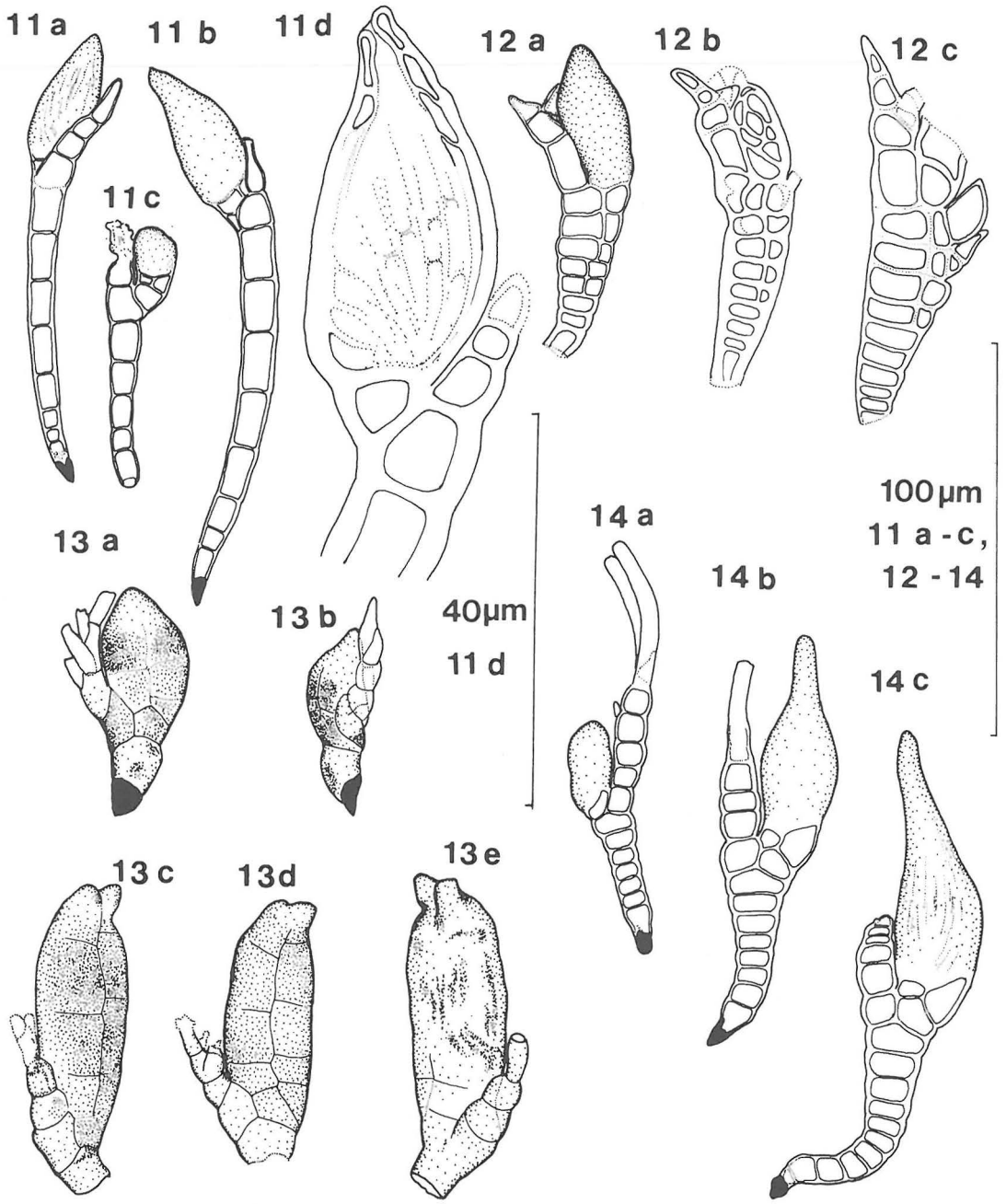


Figs. 11—14. — 11: *Siemaszkoa fennica* n.sp. from *Ptenidium laevigatum,* a)-b) mature specimens, c) young specimen, d) perithecium in detail. b) holotype. — 12: *Ecteinomyces agathidii* from *Cyrtusa subtestacea,* a) mature, b) immature and c) mature (perithecium broken) specimens. — 13: *Corethromyces niger* from *Ptomaphagus subvillosus,* a)-e) variation of thallus, a)-b) possibly immature. — 14: *Ecteinomyces trichopterophilus* from *Acrotrichis* sp., a) immature, b) nearly mature and c) mature specimen.

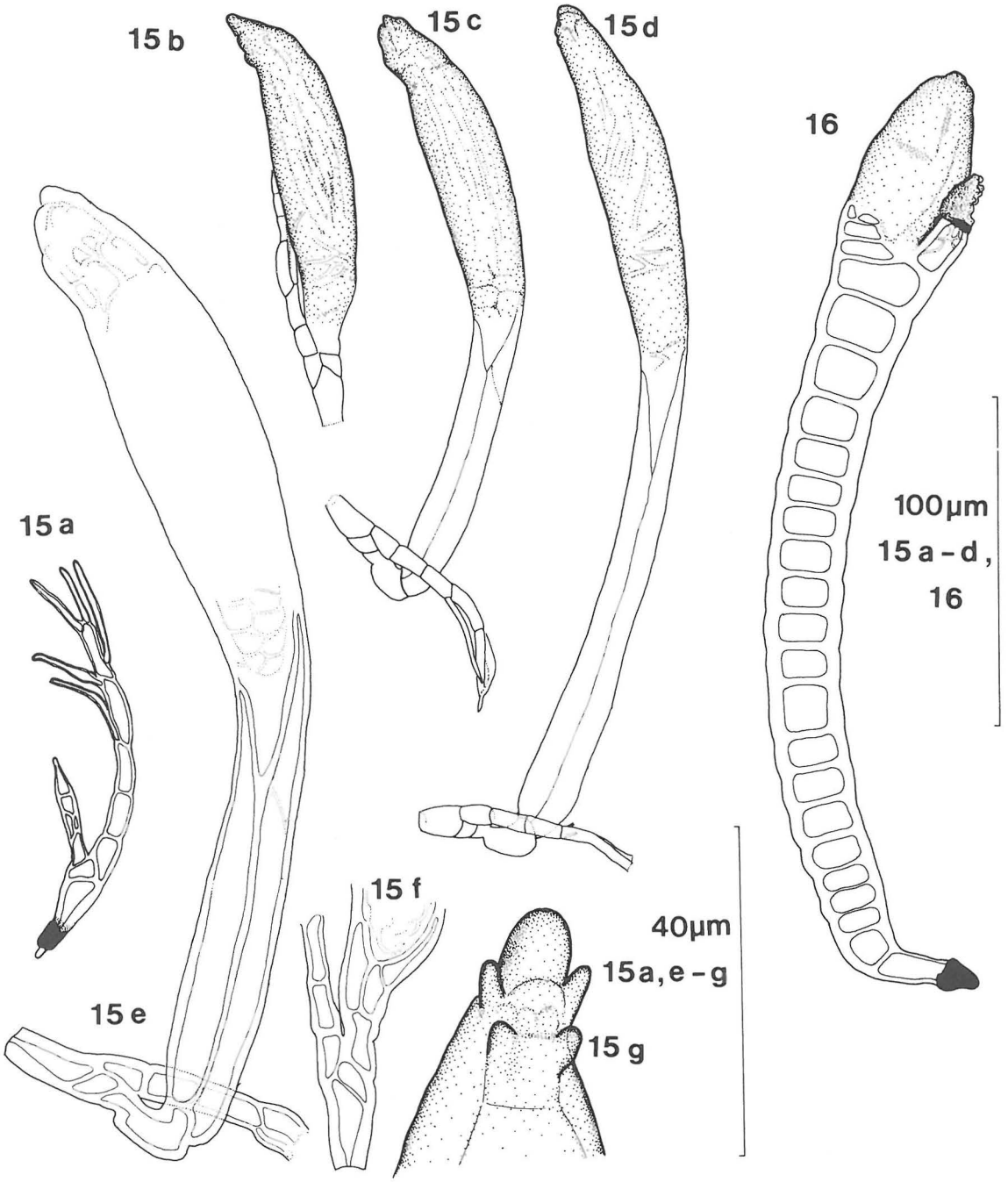
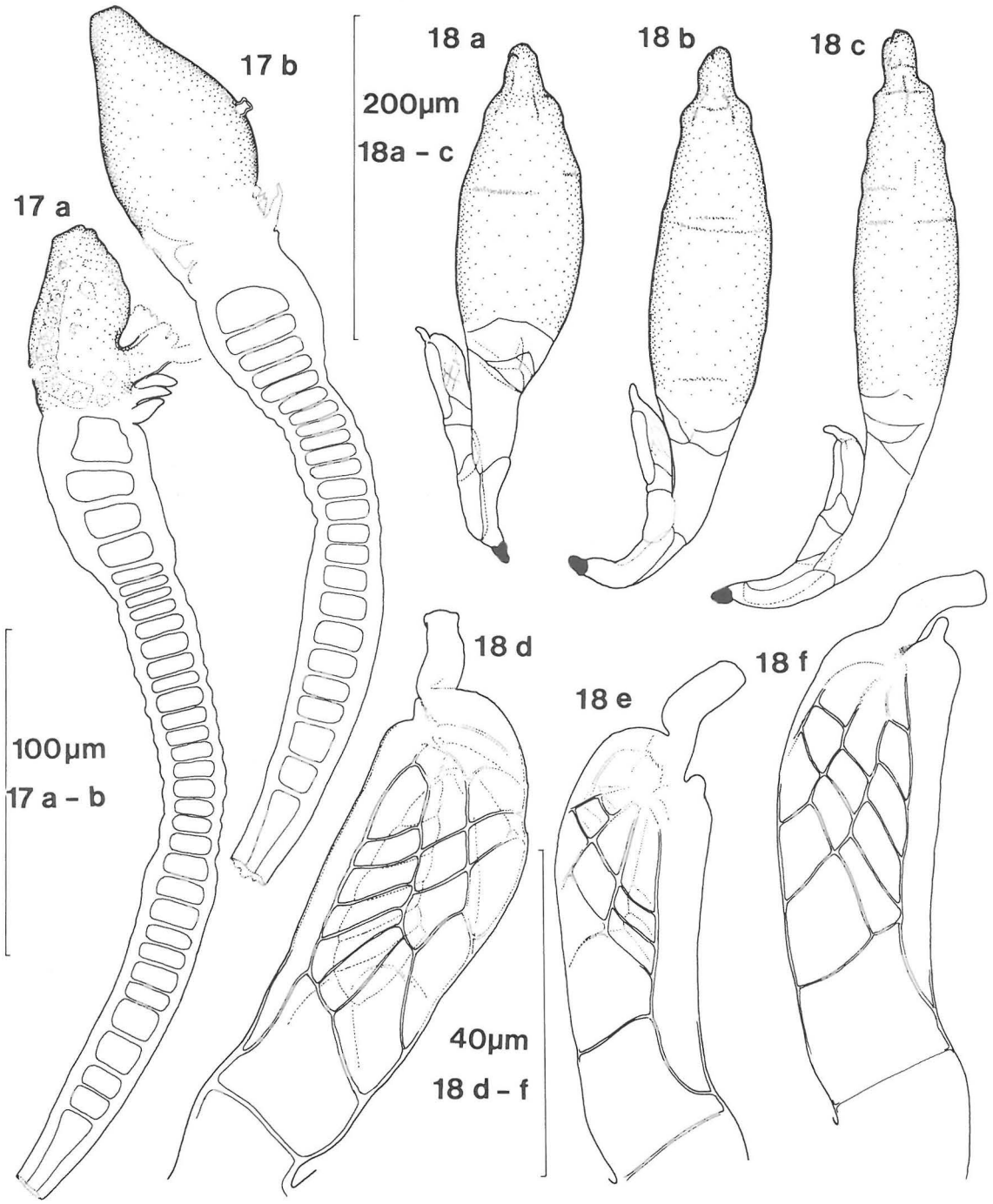


Fig. 15—16. — 15: *Autophagomyces falcatus* from *Cryptophagus pilosus,* a) young thallus with intact appendage, b) typical specimen, c)-d) long morphs, e)-f) cell arrangements of long and typical morphs in detail, g) apex of perithecium. — 16: *Misgomyces dyschirii* from *Dyschirius globosus,* compound antheridium visible in cell III.



Figs. 17—18. — 17: *Helodiomyces elegans* from *Dryops auriculatus,* a)-b) two overmature specimens. — 18: *Eucantharomyces fennoscandicus* n.sp. from *Agonum quadripunctatum,* a)-c) variation of mature thallus, d)-f) compound antheridia in detail. c) holotype.

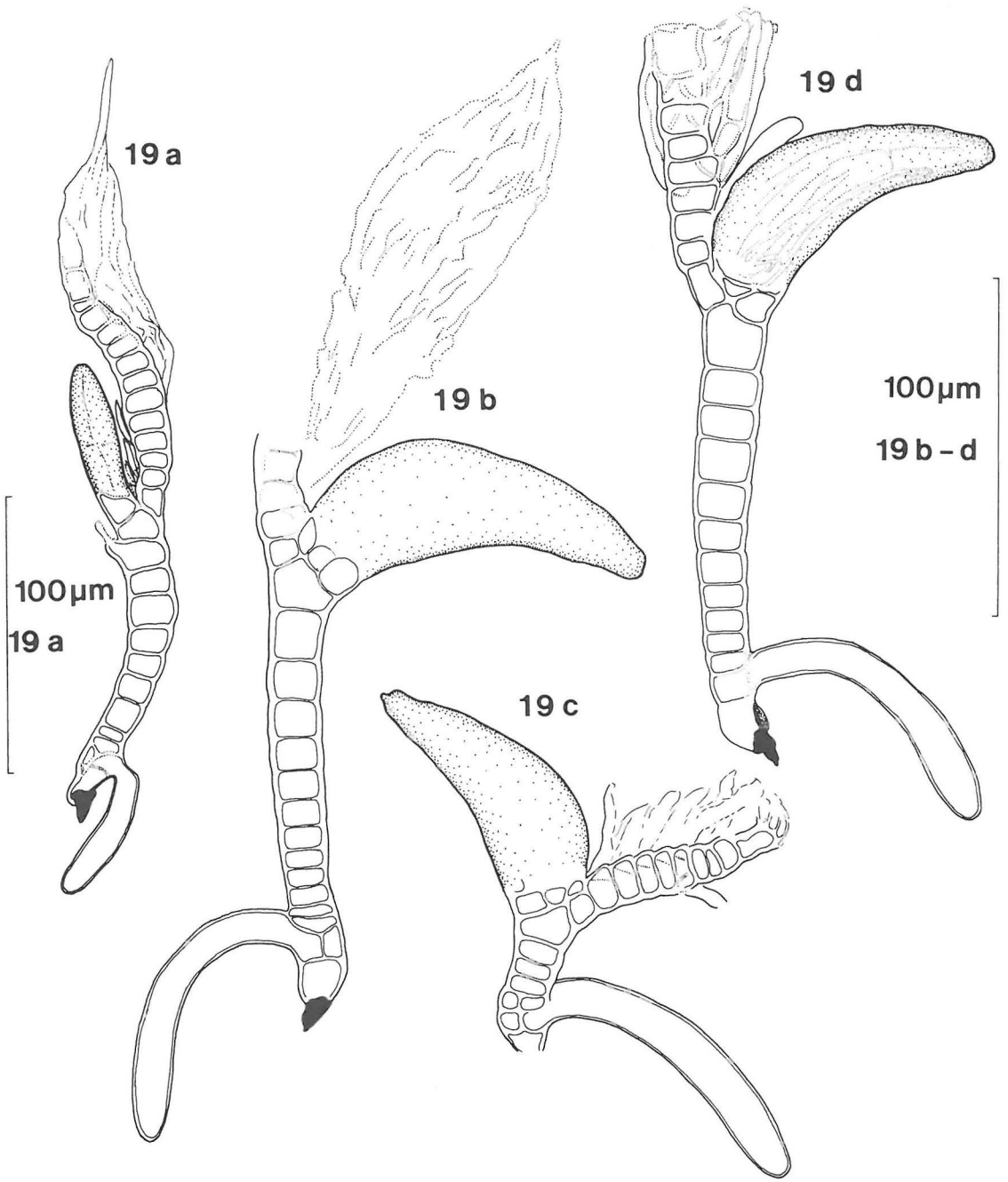
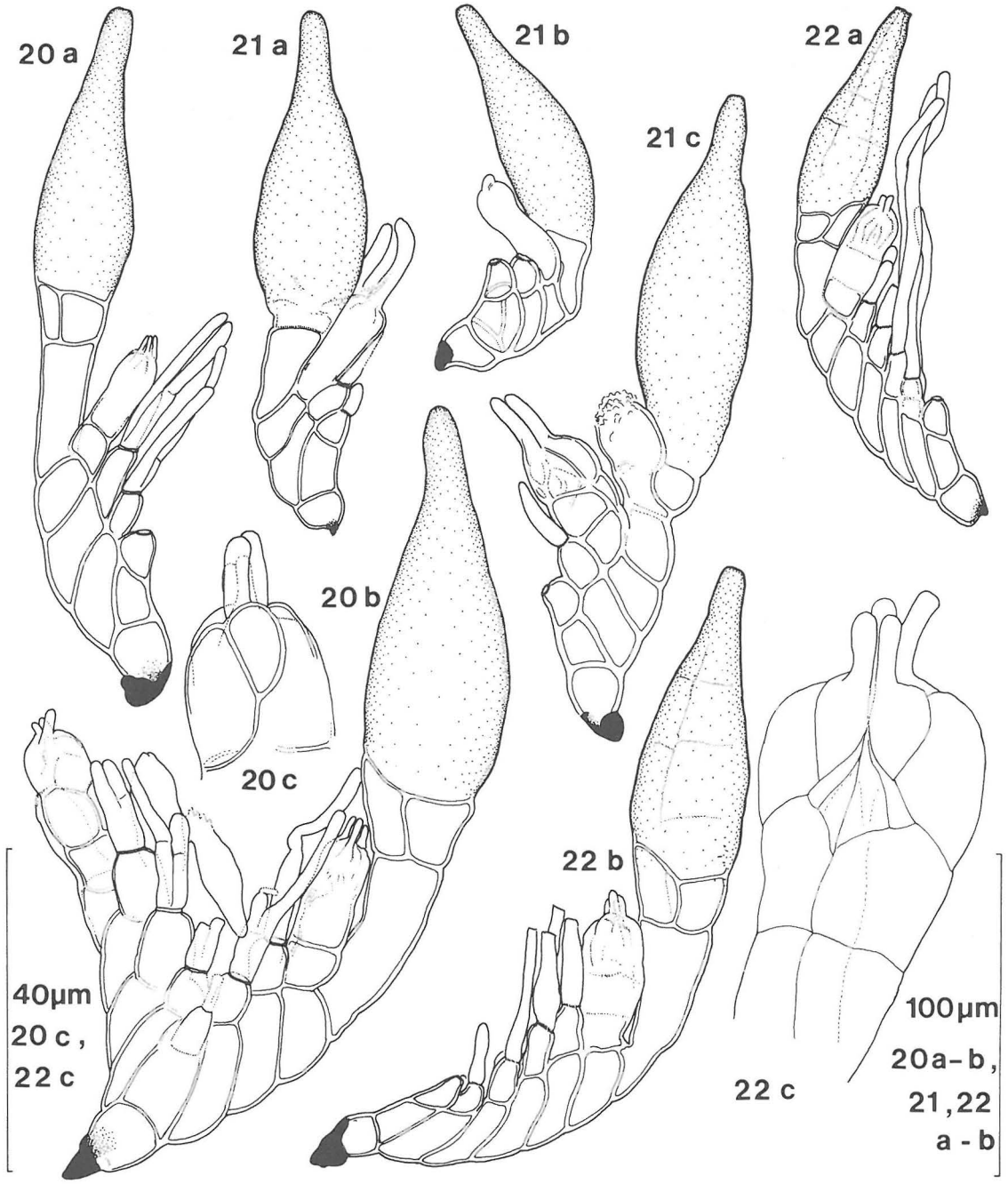
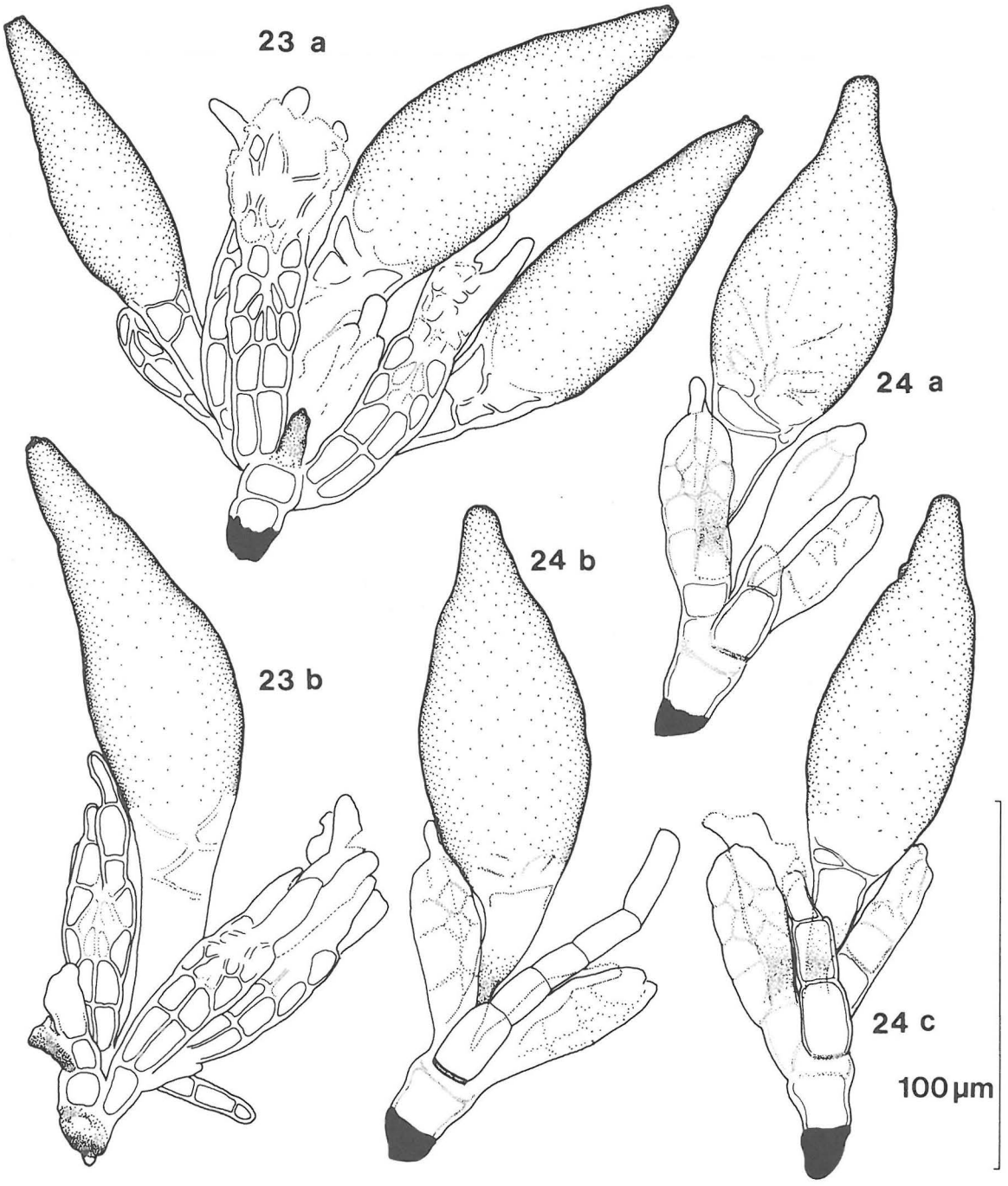


Fig. 19. *Hydrophilomyces arcuatus* n.sp. from *Ochthebius minimus,* a) immature specimen, b)-d) mature specimens. d) holotype.



Figs. 20—22. — 20: *Monoicomyces furcatus* from *Oxytelus laqueatus,* a) simple morph, b) typical furcate morph, c) compound antheridium. — 21: *Monoicomyces invisibilis* from *Platystethus arenarius,* a)-c) variation of thallus. — 22: *Monoicomyces oxytelis* n.sp. from *Oxytelus fulvipes,* a)-b) mature specimens, c) compound antheridium, b) holotype.



Figs. 23—24. — 23: *Monoicomyces britannicus* from *Atheta longicornis,* a)-b) variation of thallus. — 24: *Monoicomyces homalotae* from *Atheta paracrassicornis,* a)-c) variation of thallus.

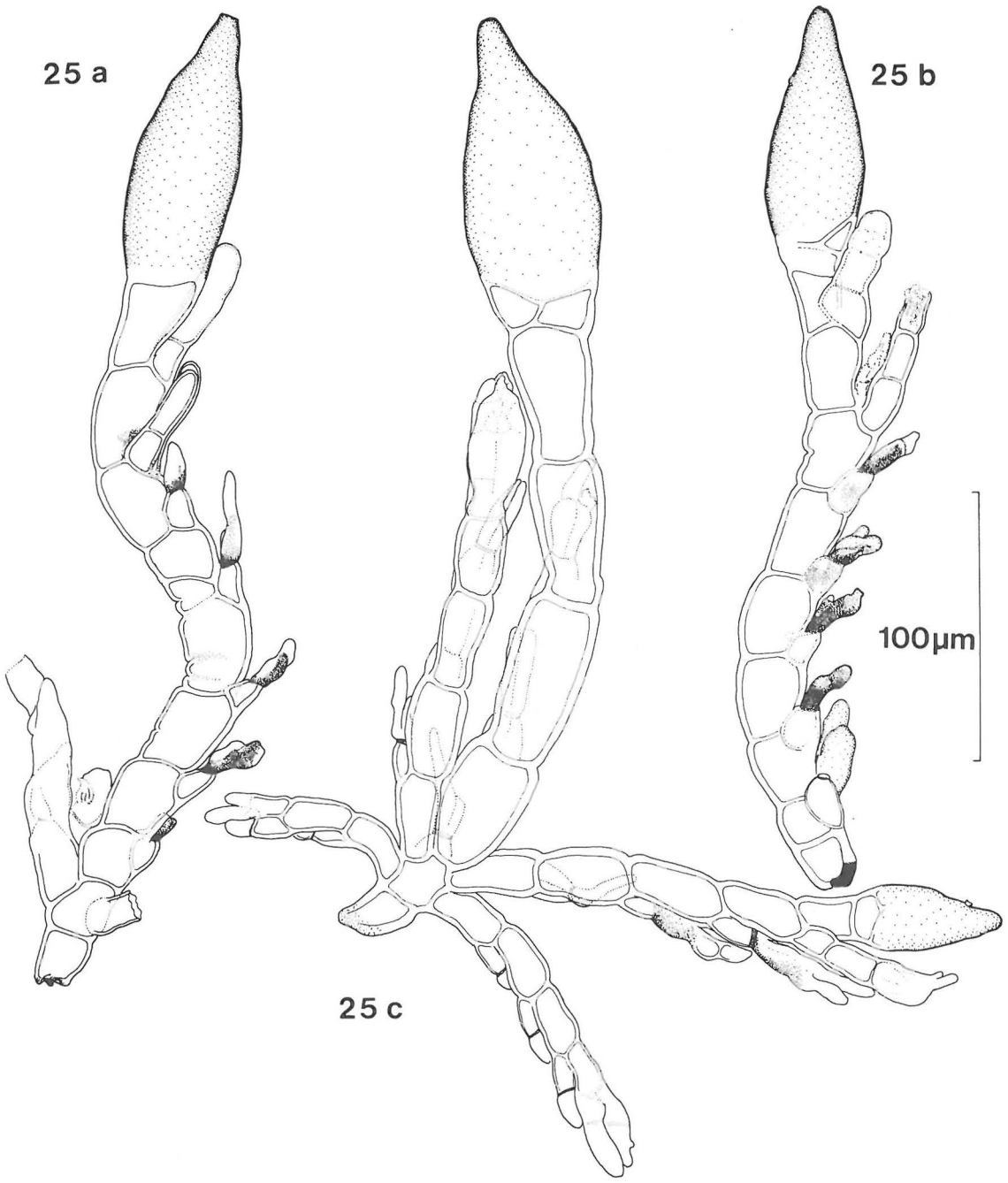


Fig. 25. *Monoicomyces sanctae-helenae* from *Oxytelus piceus,* a)-b) '*roccae*'-like morphs, c) typical morph.

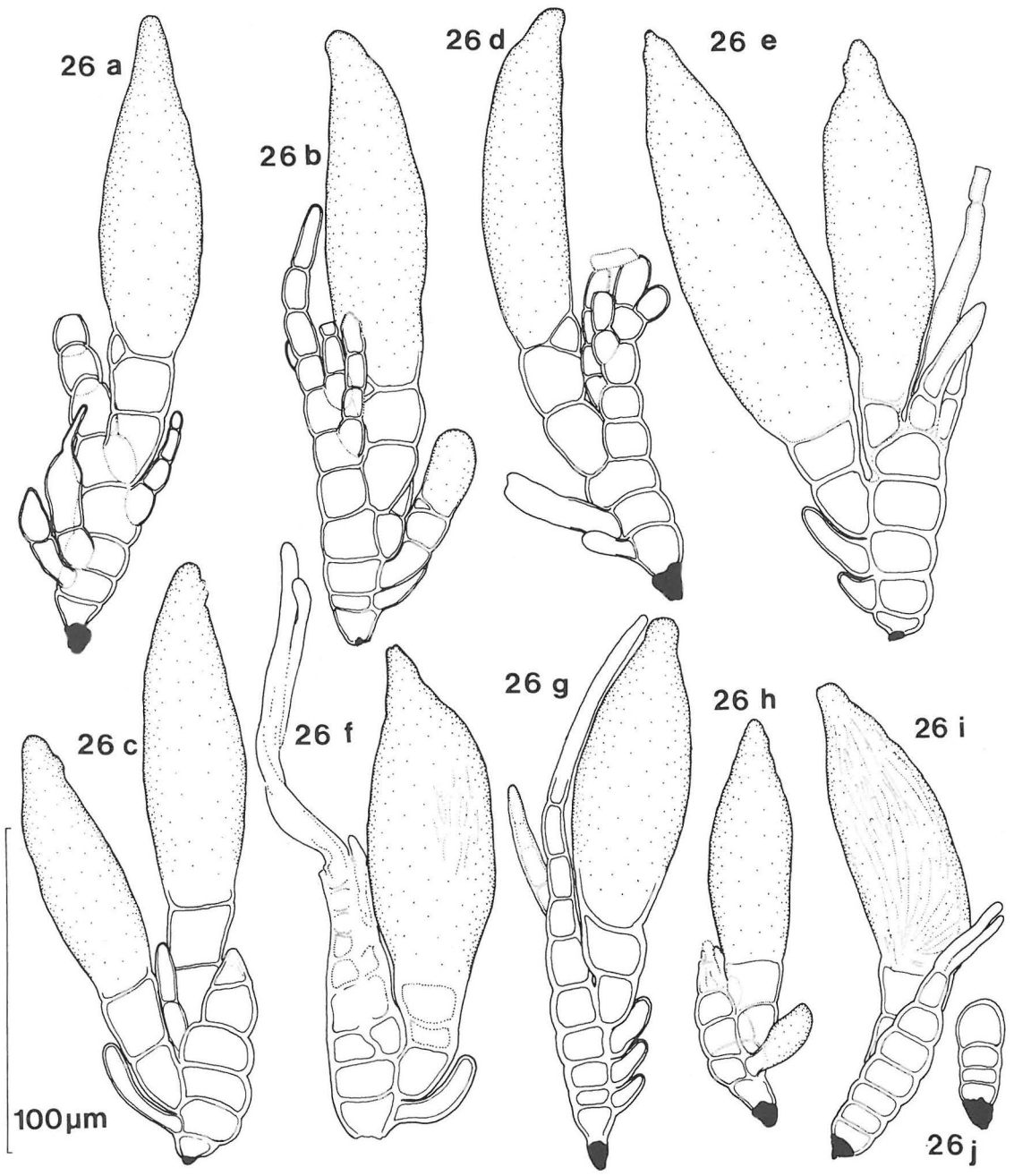
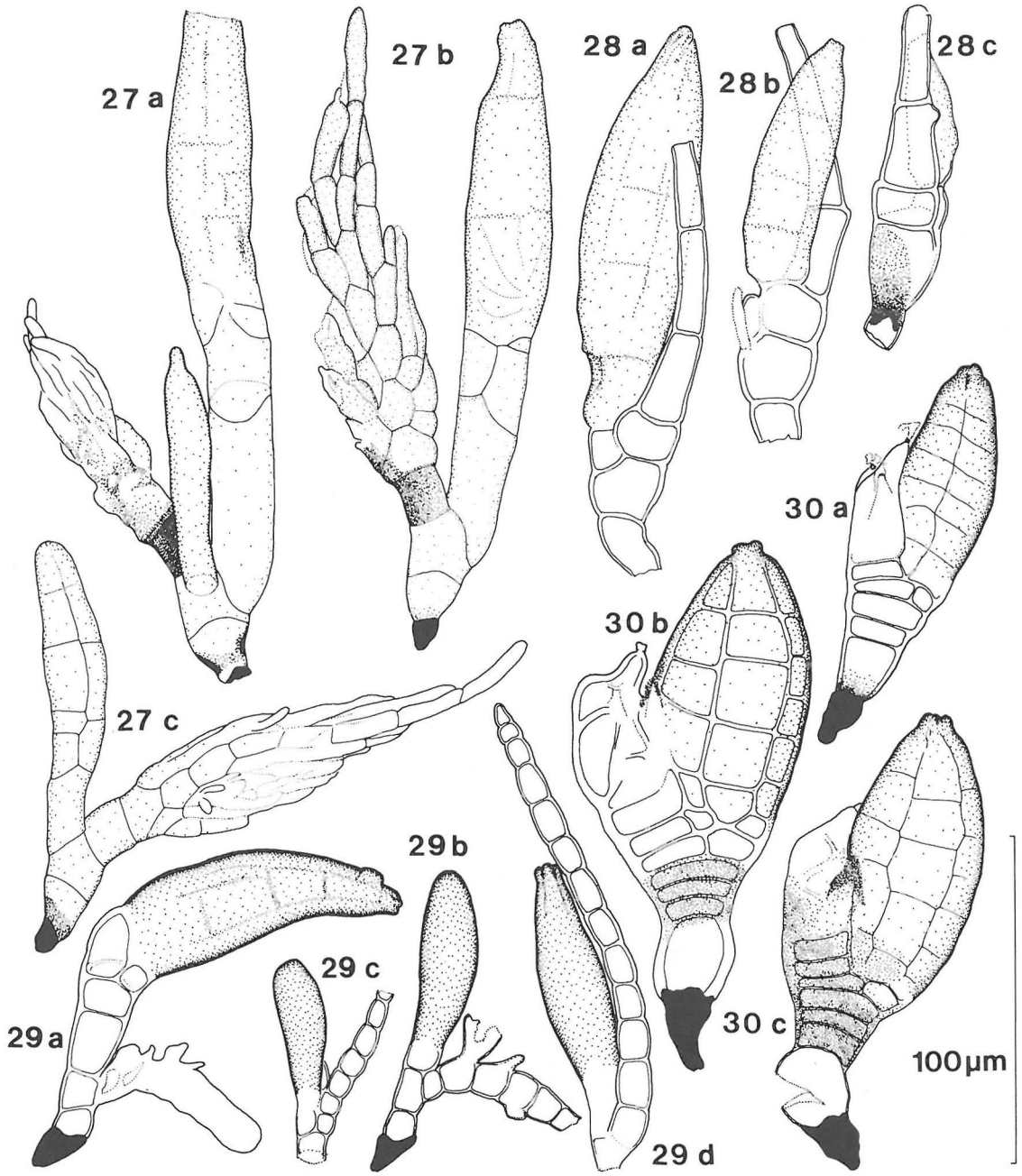
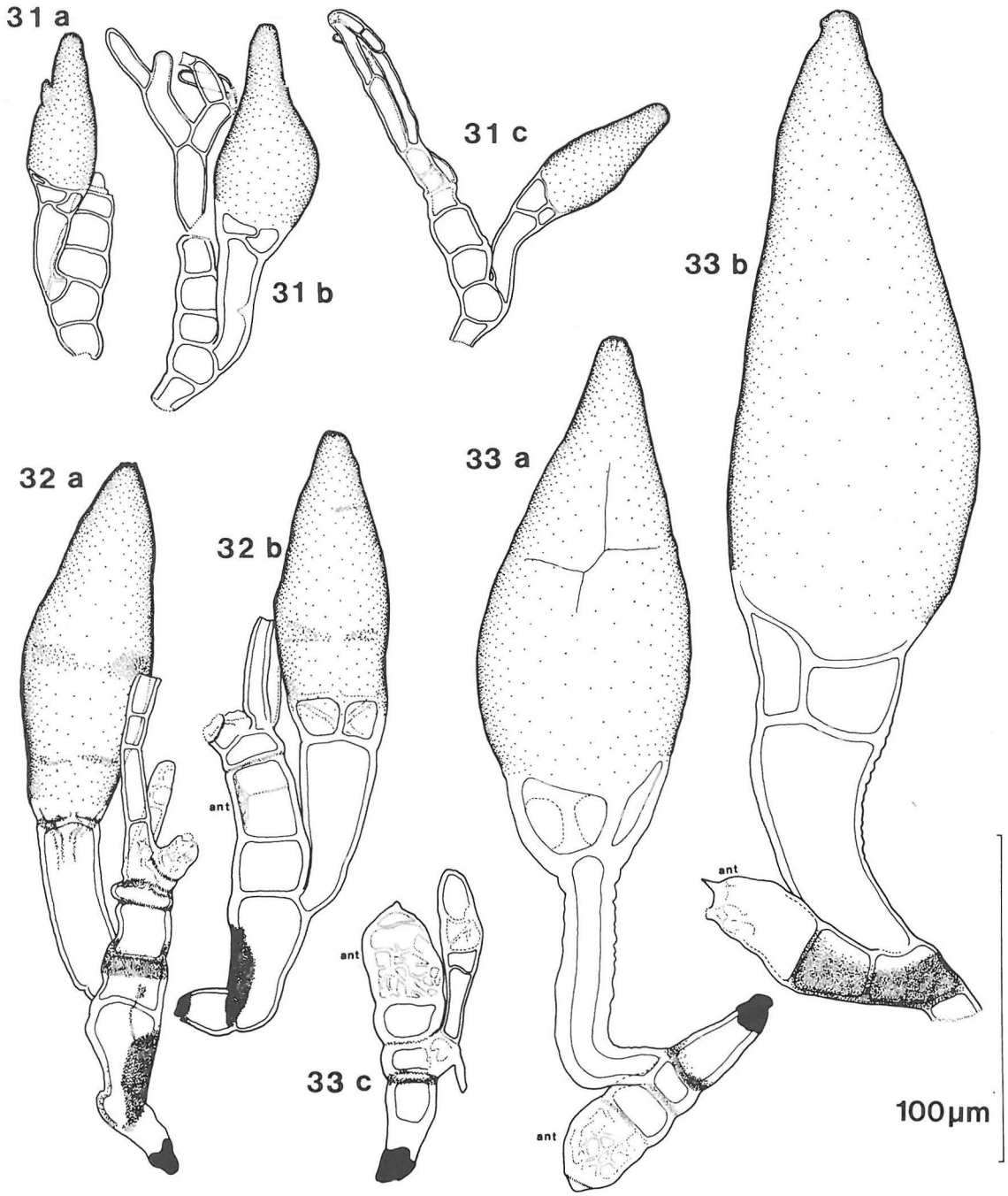


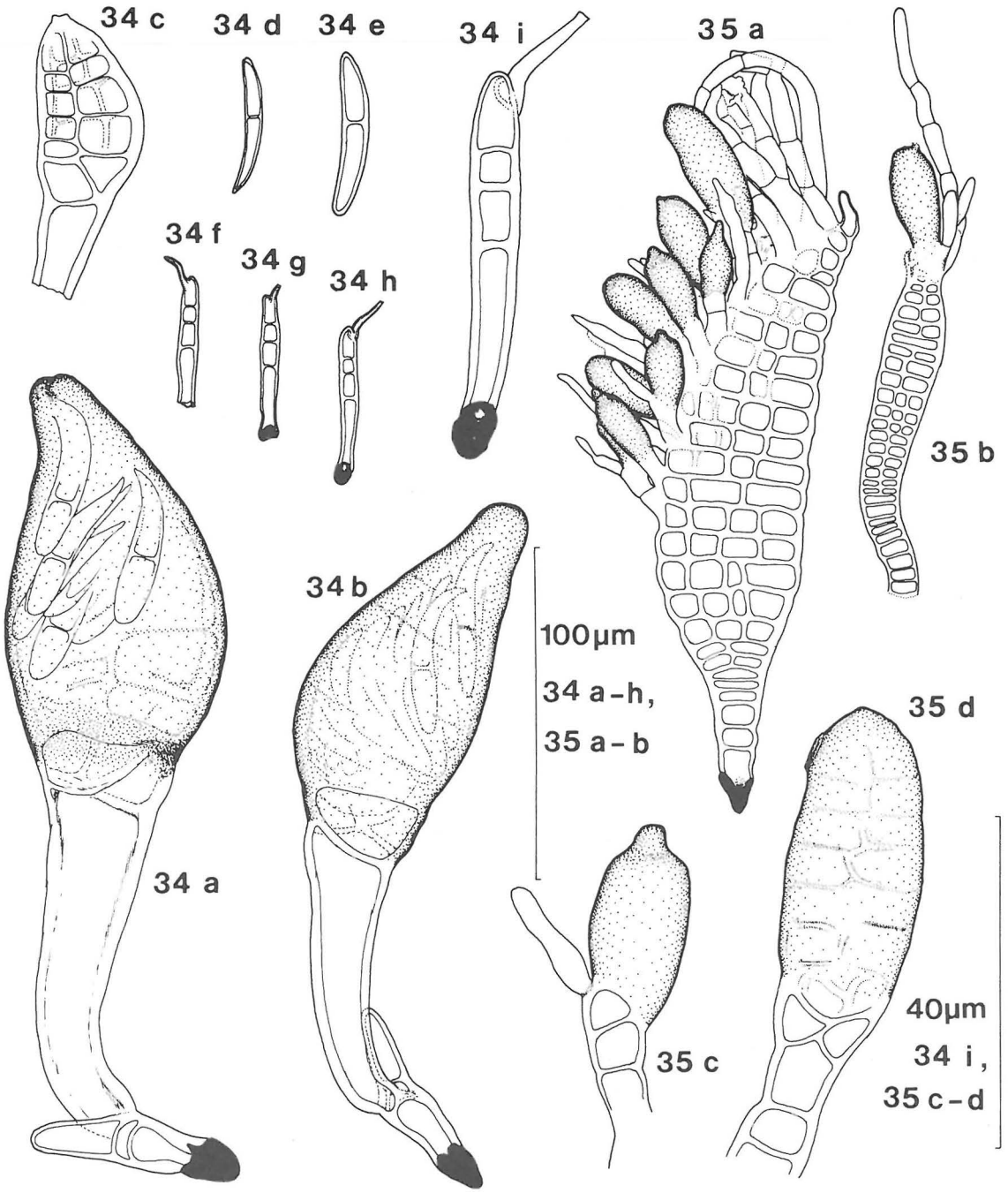
Fig. 26. *Asaphomyces tubanticus* from a)-c) *Catops fuscus,* d) *C. nigricans,* e) *C. alpinus,* f) *C. fuliginosus,* g) *C. nigrita,* h)-j) *Sciodrepoides watsoni.* j) young specimen in four cell stage.



Figs. 27—30. — 27: *Corethromyces henrotii* from *Choleva septentrionis,* a)-b) mature specimens, c) immature specimen. — 28: *Cantharomyces italicus* from *Dryops griseus,* a) mature specimen, b)-c) immature specimens. — 29: *Peyerimhoffiella elegans* from *Brachygluta fossulata,* a) mature specimen, b)-d) immature specimens in different stages. — 30: *Hydraeomyces italicus,* a) typical morph from *Haliplus fulvicollis,* b)-c) '*italicus*'-like morph from *Haliplus fulvus lapponum.*



Figs. 31—33. — 31: *Cantharomyces orientalis* from a)-b) *Carpelimus elongatulus,* c) *Carpelimus corticarius.* — 32: *Cantharomyces aploderi* n.sp. from *Aploderus caesus,* a)-b) variation of thallus, b) holotype. — 33: *Haplomyces texanus* from a) and c) *Bledius filipes,* b) *Bledius diota.* c) young specimen. — Abbreviation: ant. = compound antheridium.



Figs. 34—35. — 34: *Dioicomyces anthici,* a)-b) female specimens, c) immature perithecium, d) male spore, e) female spore, f)-i) male specimens. a), c)-g) from *Anthicus floralis,* b), h)-i) from *Anthicus formicarius.* — 35: *Euzodiomyces lathrobii* from *Lathrobium longulum,* a)-b) mature specimens, c)-d) perithecia, secondary stalk cells visible in d).

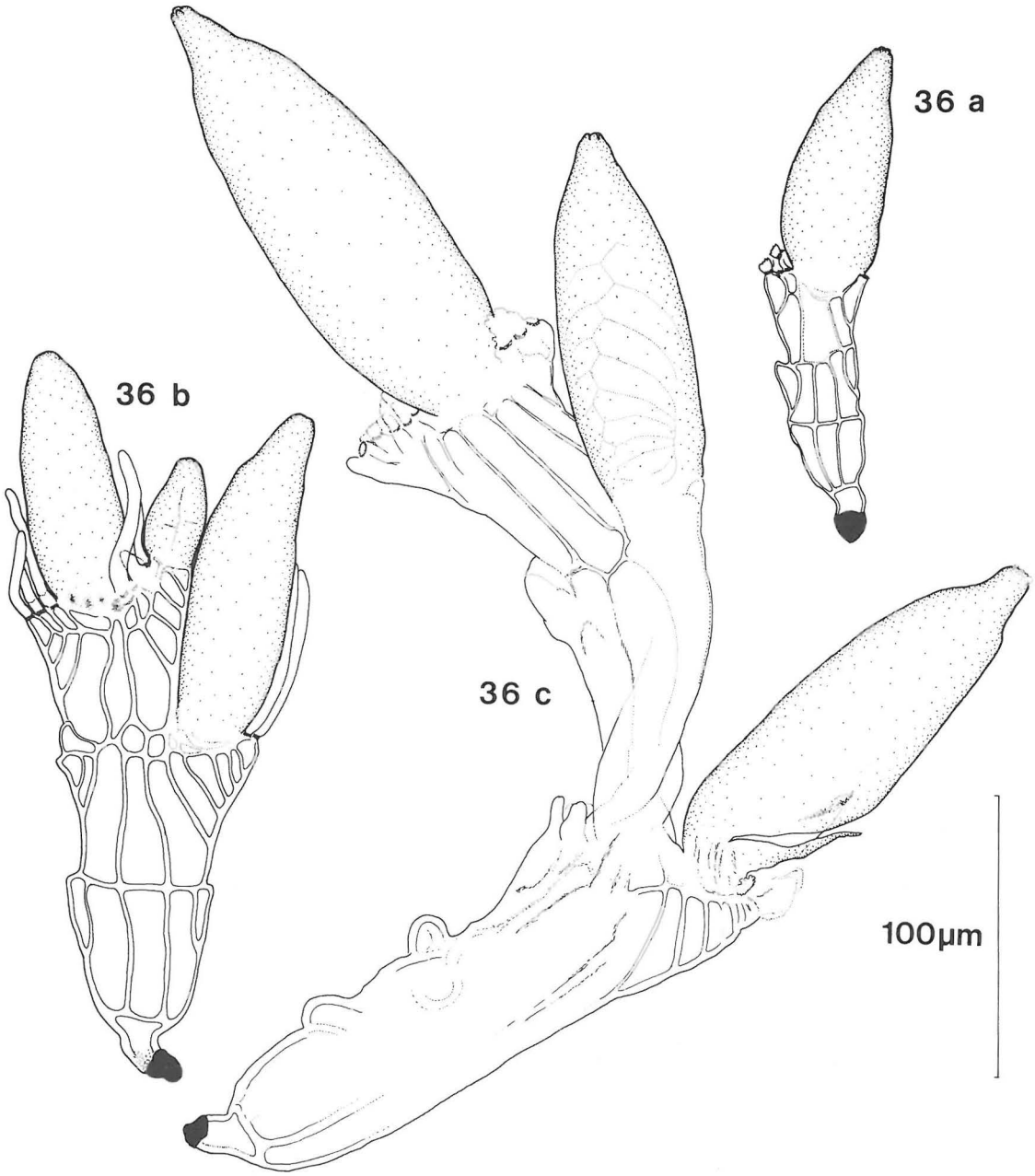
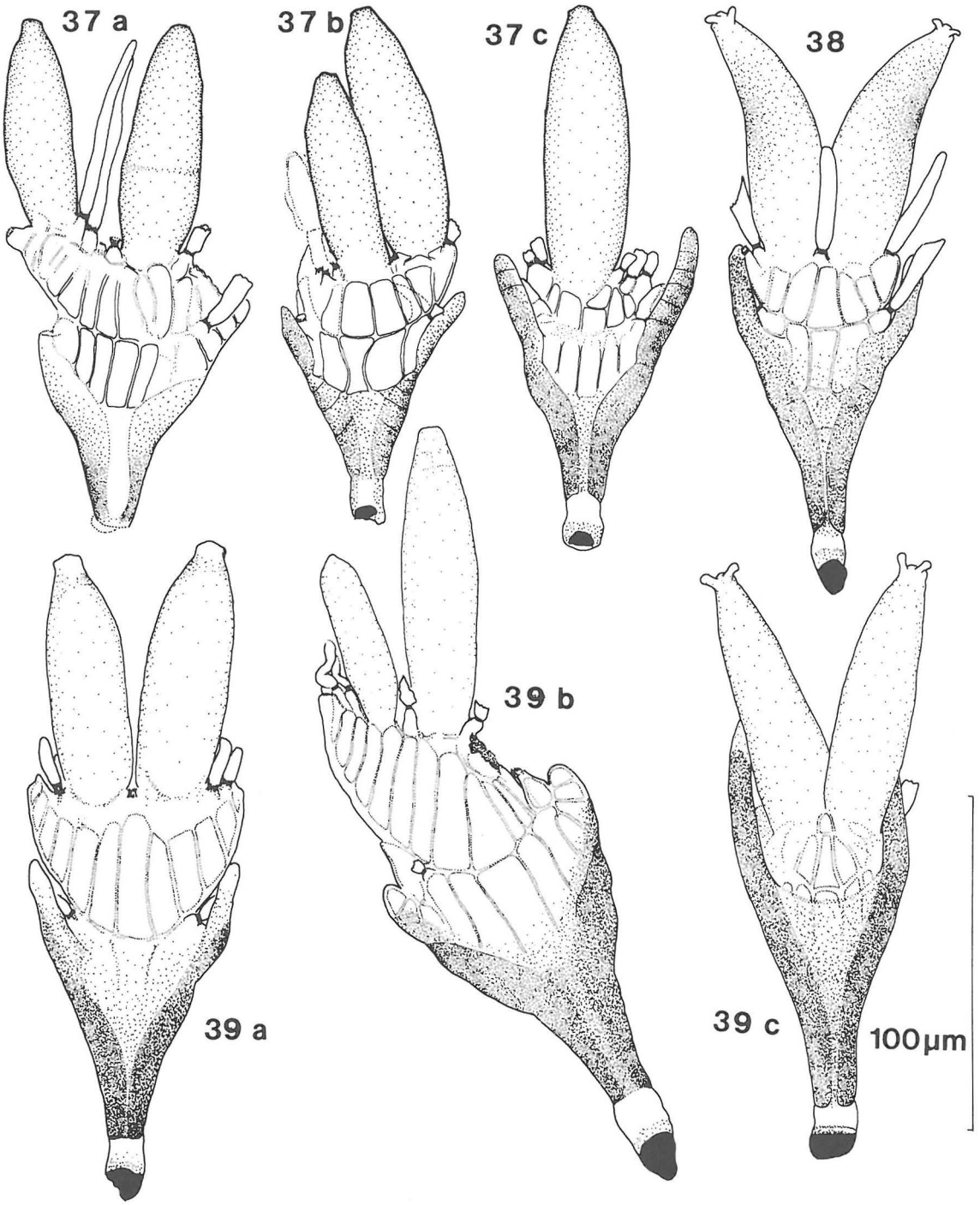


Fig. 36. *Peyritschiella protea,* a)-b) from *Anotylus insecatus,* c) from *Anotylus rugosus.*



Figs. 37—39. — 37: *Dichomyces nigrescens* from *Philonthus debilis,* a)-c) variation of thallus. — 38: *Dichomyces furcifer* subsp. *subarcticus* n.subsp. from *Philonthus albipes,* holotype. — 39: *Dichomyces furcifer,* a) from *Philonthus discoideus,* b) from *Philonthus umbratilis,* c) auriculate morph from *Philonthus puella.*

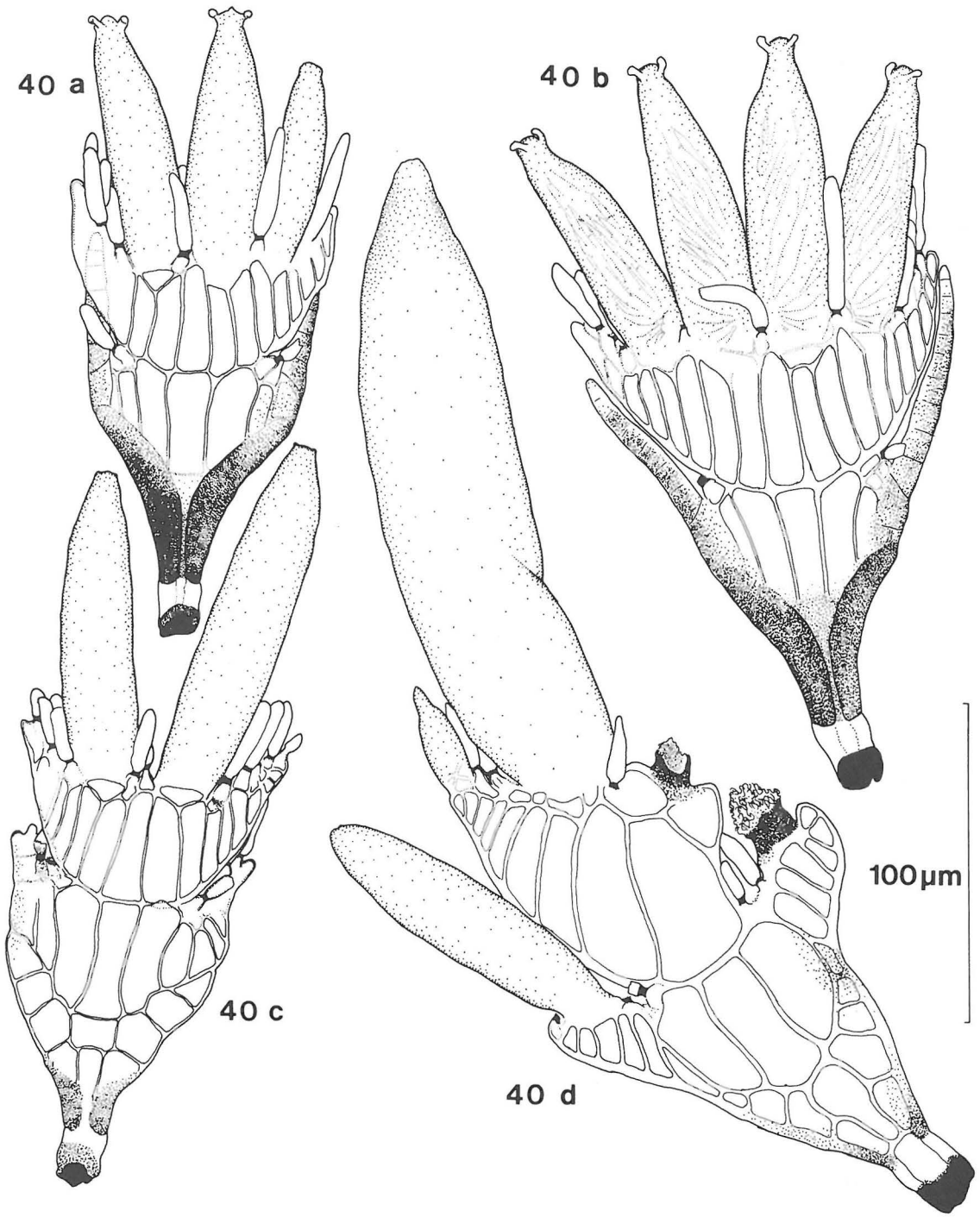
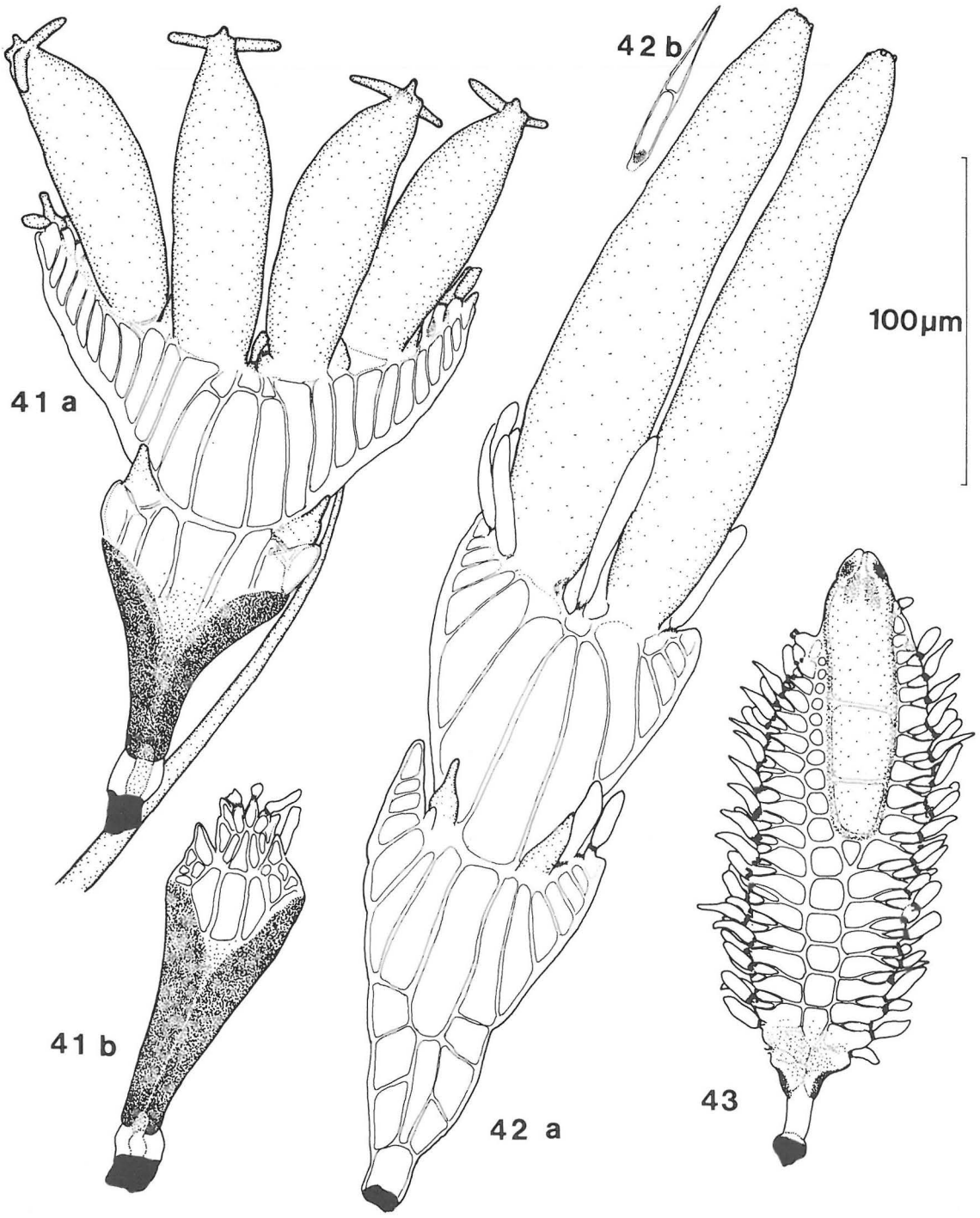
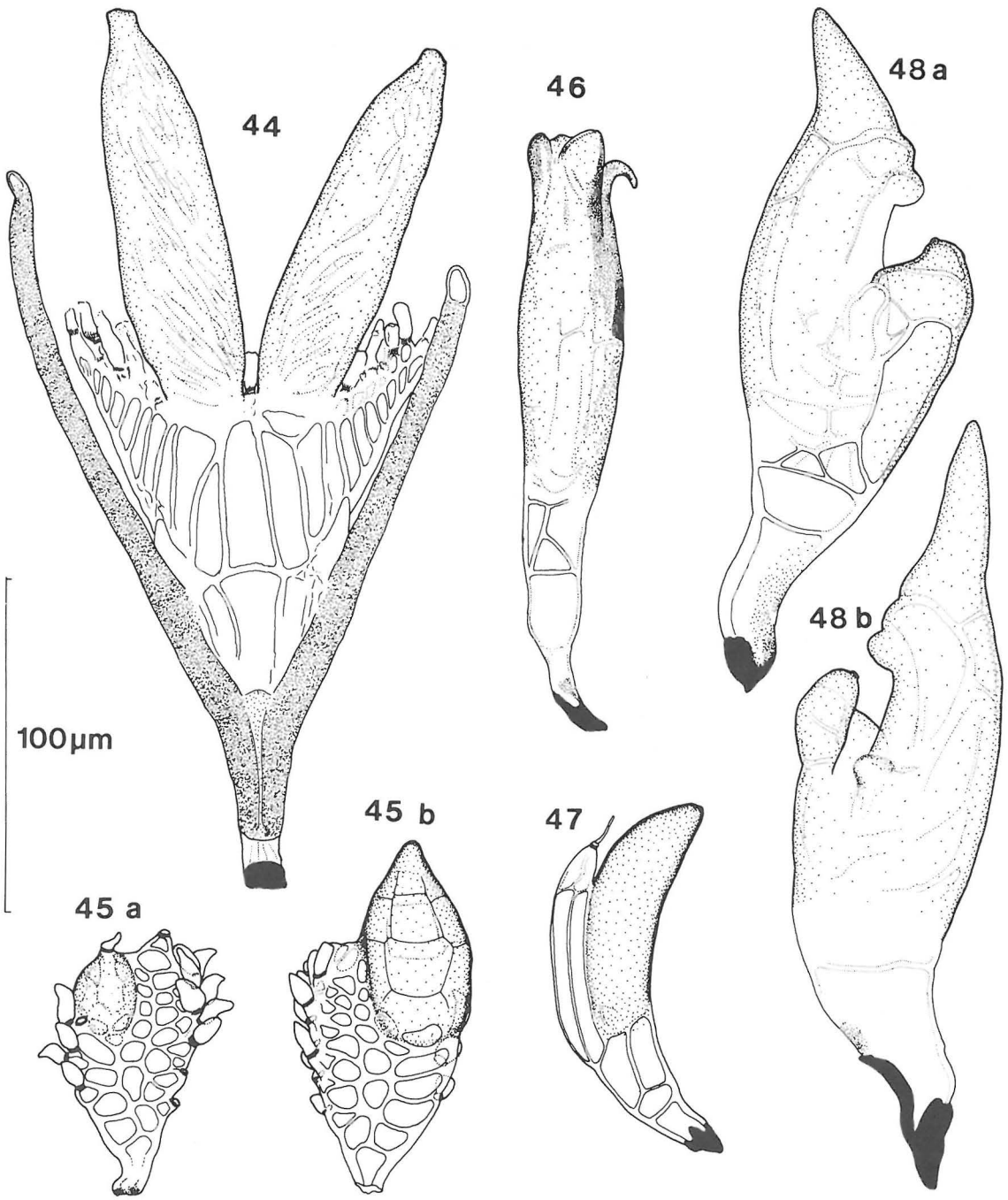


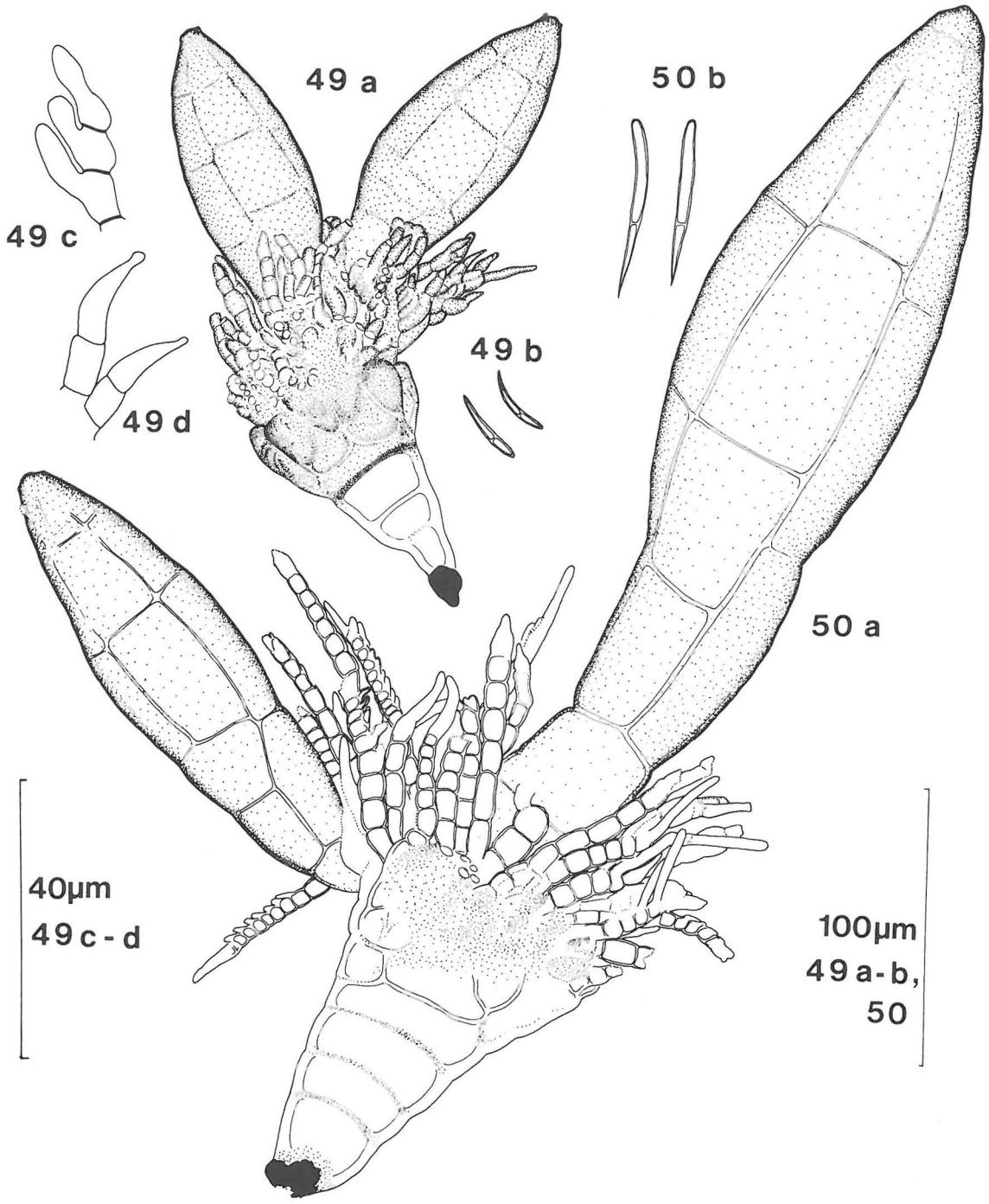
Fig. 40. *Dichomyces vulgatus,* a)-b) auriculate morphs from *Philonthus longicornis,* c) non-auriculate morph from *Philonthus longicornis,* d) non-auriculate morph from *Philonthus cephalotes.*



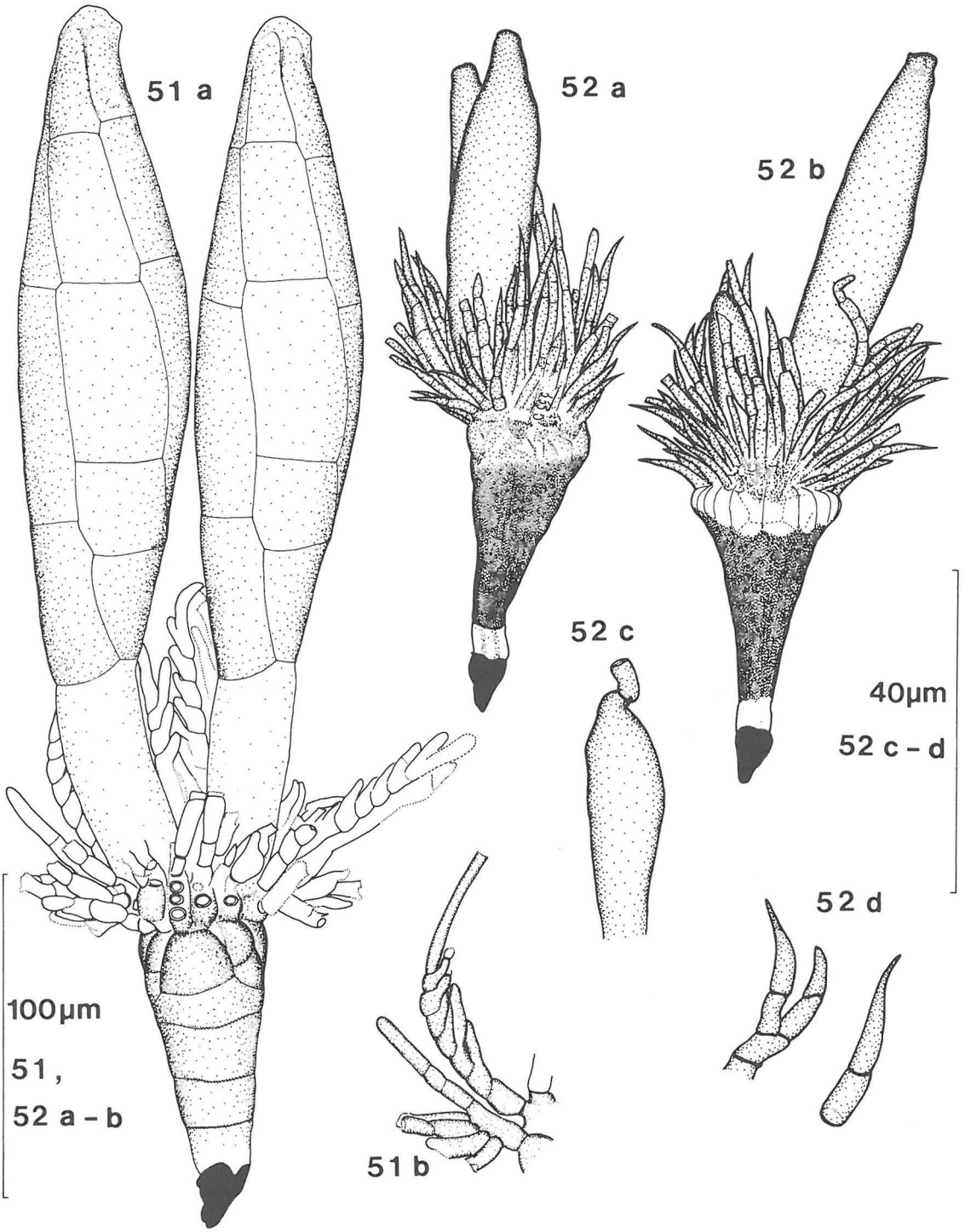
Figs. 41—43. — 41: *Dichomyces biformis* from *Philonthus umbratilis,* a) mature specimen on a seta of the host, b) immature specimen. — 42: *Dichomyces princeps* from *Philonthus cephalotes,* a) mature specimen, b) germinating spore. — 43: *Rickia peyerimhoffii* from *Scaphisoma agaricinum.*



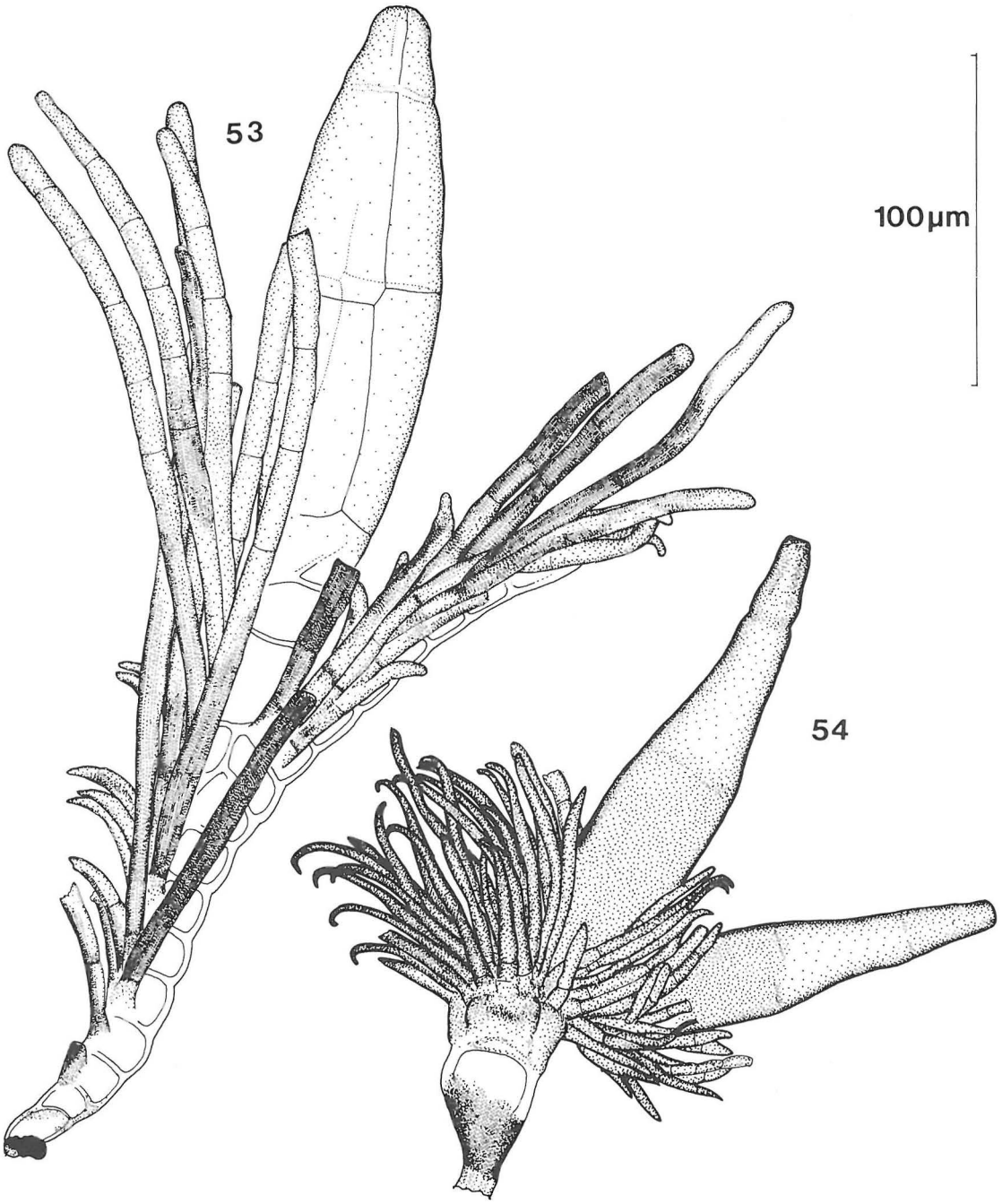
Figs. 44—48. — 44: *Dichomyces hybridus* from *Philonthus ventralis.* — 45: *Rickia hyperborea* from *Micralymma marinum,* a) immature specimen, b) mature specimen. — 46: *Chitonomyces melanurus* from *Laccophilus minutus.* 47: *Chitonomyces bidessarius* from *Hygrotus inaequalis.* — 48: *Chitonomyces paradoxus* from *Laccophilus minutus,* a)-b) variation of thallus.



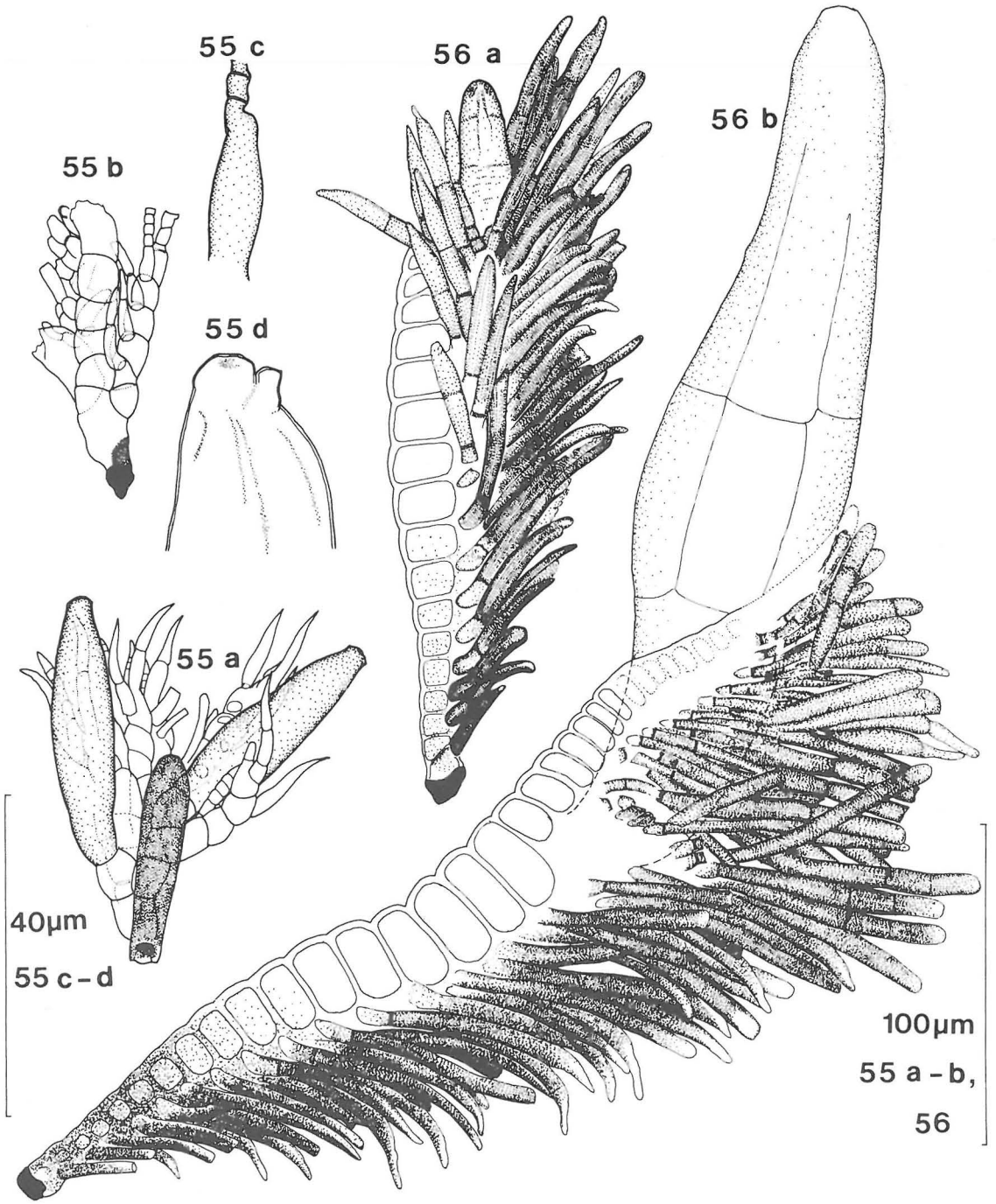
Figs. 49—50. — 49: *Symplectromyces lapponicus* n.sp. from *Quedius boops,* a) holotype, b) spores, c) branch with three antheridia, d) beak-like cells from appendage branch. — 50: *Symplectromyces vulgaris* from *Quedius mesomelinus,* a) mature specimen (perithecial stalk cell with an additional septum), b) spores.



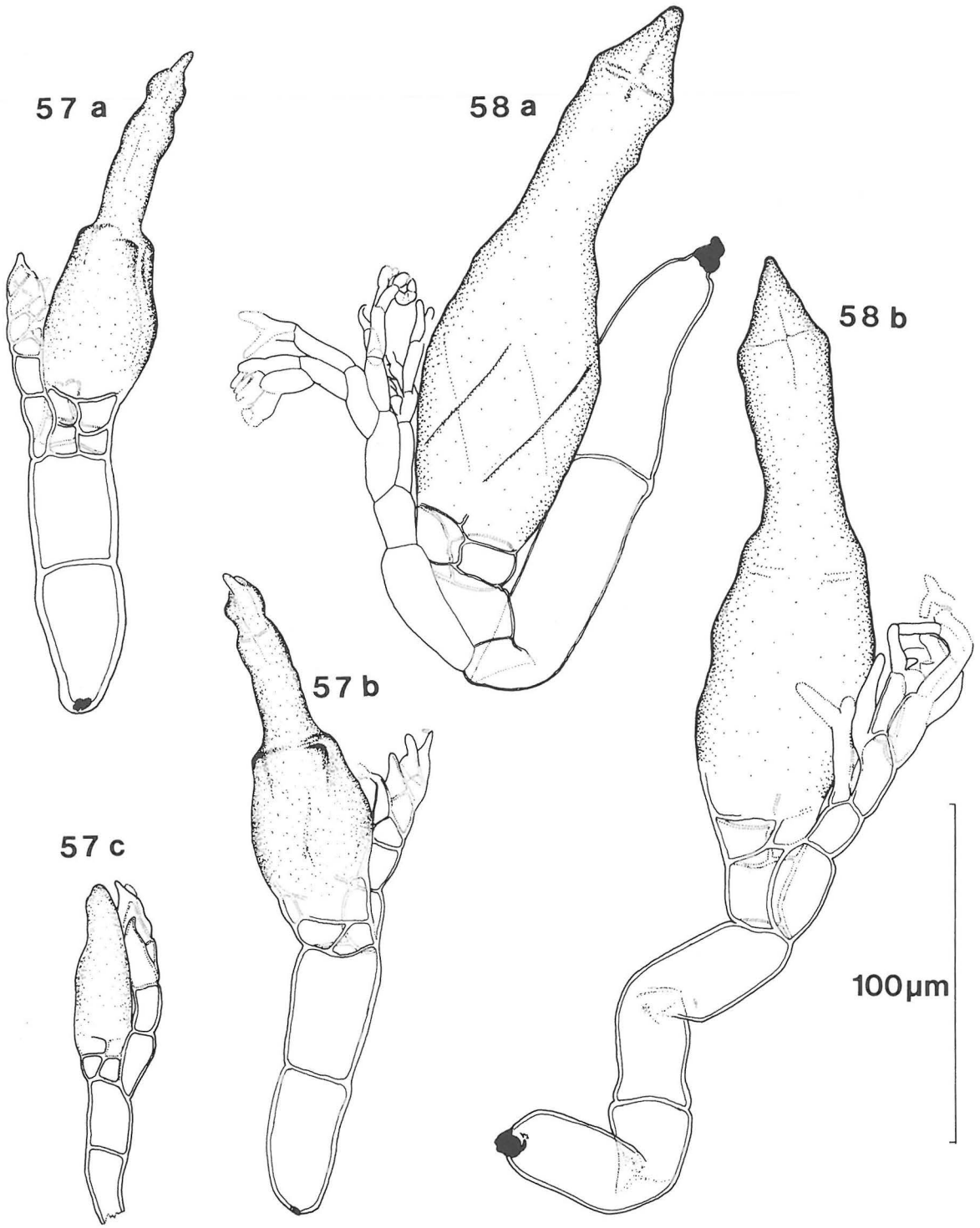
Figs. 51—52. — 51: *Symplectromyces rarus* n.sp. from *Quedius fuliginosus,* a) holotype, b) appendage branches, upper one with antheridia. — 52: *Teratomyces brevicaulis* from *Erichsonius cinerascens,* a)-b) mature specimens, c) young perithecium with base of trichogyne, d) beak-like cells from appendage branches.



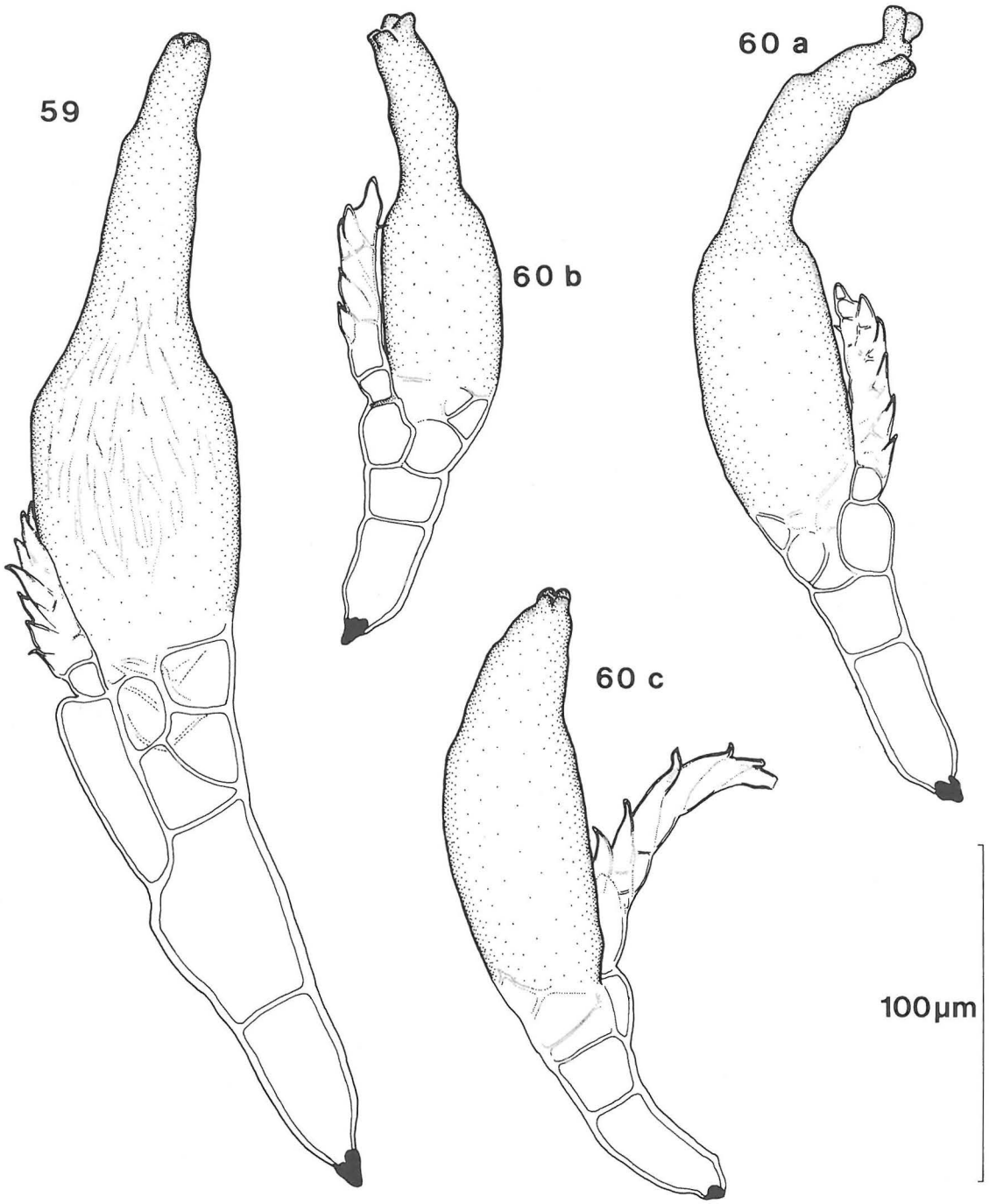
Figs. 53—54. — 53: *Rhachomyces furcatus* from *Othius punctulatus*. — 54: *Teratomyces philonthi* from *Gabrius trossulus*.



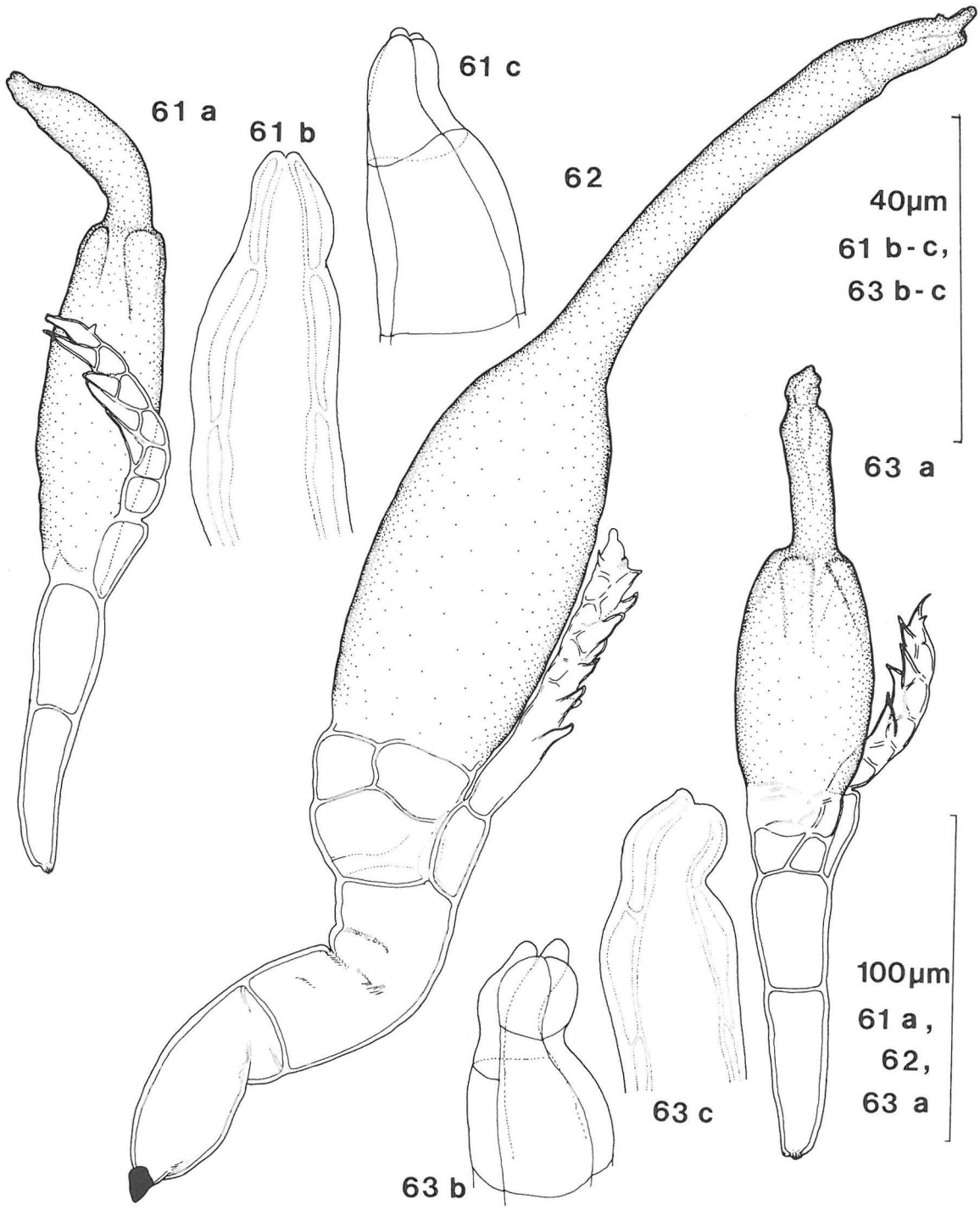
Figs. 55—56. — 55: *Diplomyces clavifer* from *Erichsonius cinerascens,* a) typical specimen, b) specimen with poorly developed outgrowth from base of receptacle (appendages and perithecium broken), c) young perithecium with base of trichogyne, d) apex of mature perithecium. 56: *Rhachomyces philonthinus* from *Philonthus fulvipes,* a) mature specimen (base of perithecium only weakly indicated in front of appendages), b) immature specimen.



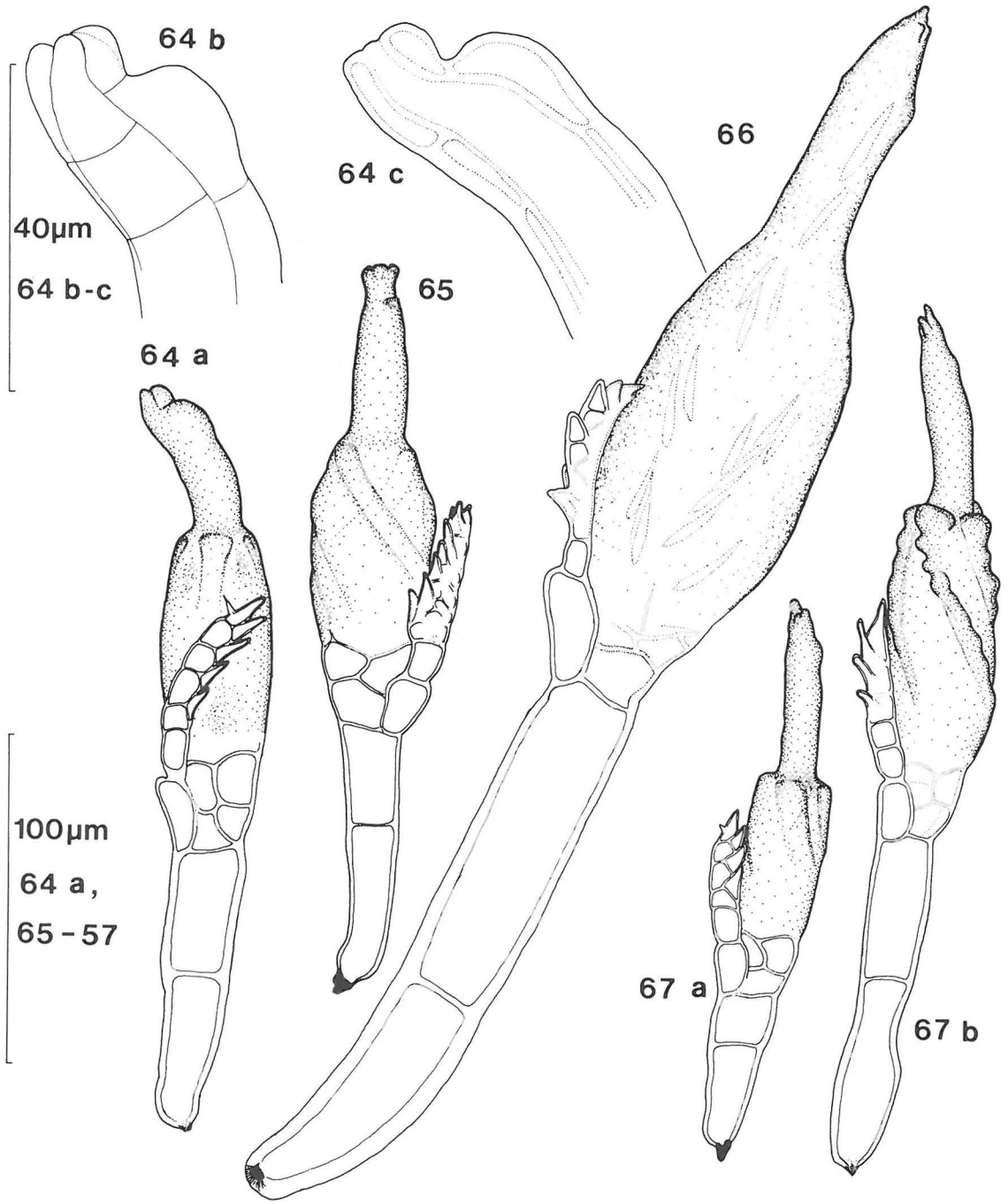
Figs. 57—58. — 57: *Stigmatomyces hydrelliae,* a) from *Hydrellia flaviceps,* b) from *H. griseola,* c) immature specimen from *Hydrellia incana.* — 58: *Fanniomyces copromyzae* n.sp. from *Copromyza borealis,* a)-b) mature specimens. a) holotype.



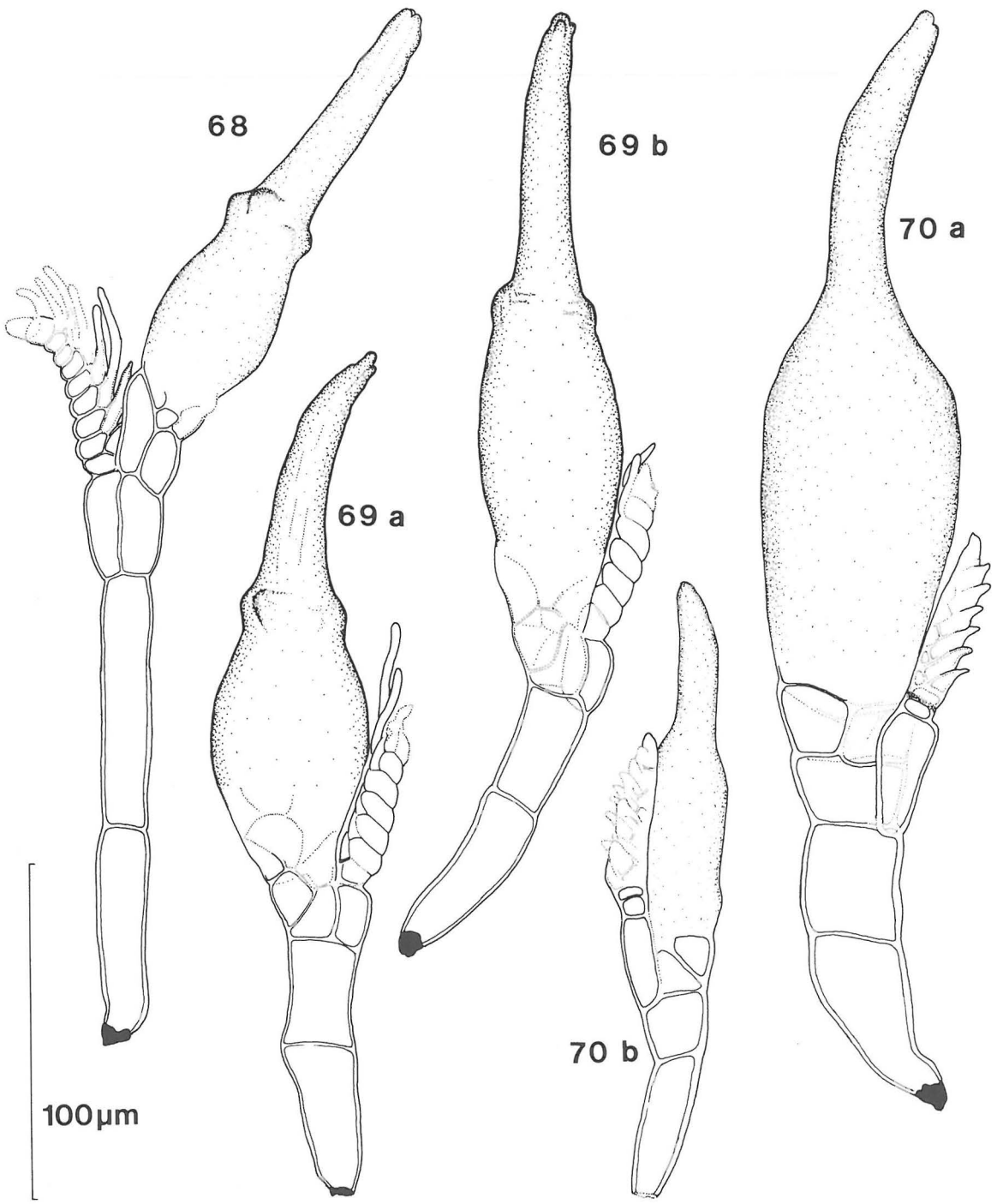
Figs. 59—60. —59: *Stigmatomyces dichaetae* n.sp. from *Dichaeta caudata,* holotype. —60: *Stigmatomyces mantis* n.sp. from *Ochthera mantis,* a)-c) variation of thallus. a) holotype.



Figs. 61—63. — 63: *Stigmatomyces ephydrae* from *Ephydra riparia,* a) mature specimen, b) section through tip of perithecium, c) cell arrangements of tip of perithecium. — 62: *Stigmatomyces manicatae* n.sp. from *Ochthera manicata,* holotype. —63: *Stigmatomyces bottnica* n.sp. from *Ephydra scholtzi,* a) holotype, b) cell arrangement of tip perithecium, c) section through tip of perithecium.



Figs. 64—67. — 64: *Stigmatomyces setacerae* n.sp. from *Setacera micans,* a) holotype, b) cell arrangement of tip of perithecium, c) section through tip of perithecium. — 65: *Stigmatomyces axystae* n.sp. from *Axysta cesta,* holotype. — 66: *Stigmatomyces baeri* from *Musca domestica.* — 67: *Stigmatomyces purpureus* from a) *Scatella stagnalis,* b) *Scatella callosicosta.*



Figs. 68—70. — 68: *Stigmatomyces subterraneus* n.sp. from *Limosina talparum,* holotype. — 69: *Stigmatomyces chthonicus* n.sp. from *Limosina claviventris,* a)-b) variation of thallus. a) holotype. — 70: *Stigmatomyces scaptomyzae* from *Scaptomyza pallida,* a) mature specimen, b) immature specimen.

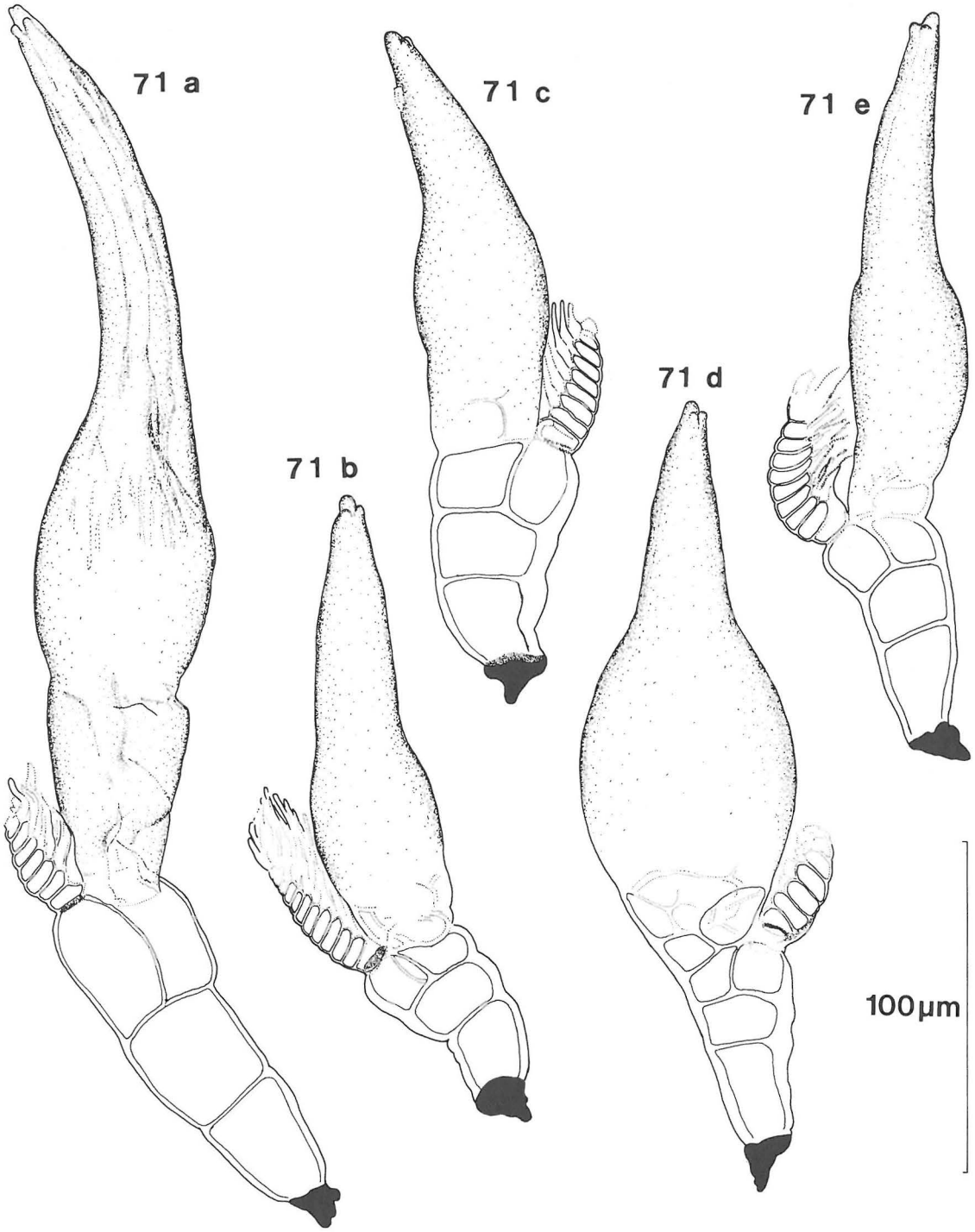
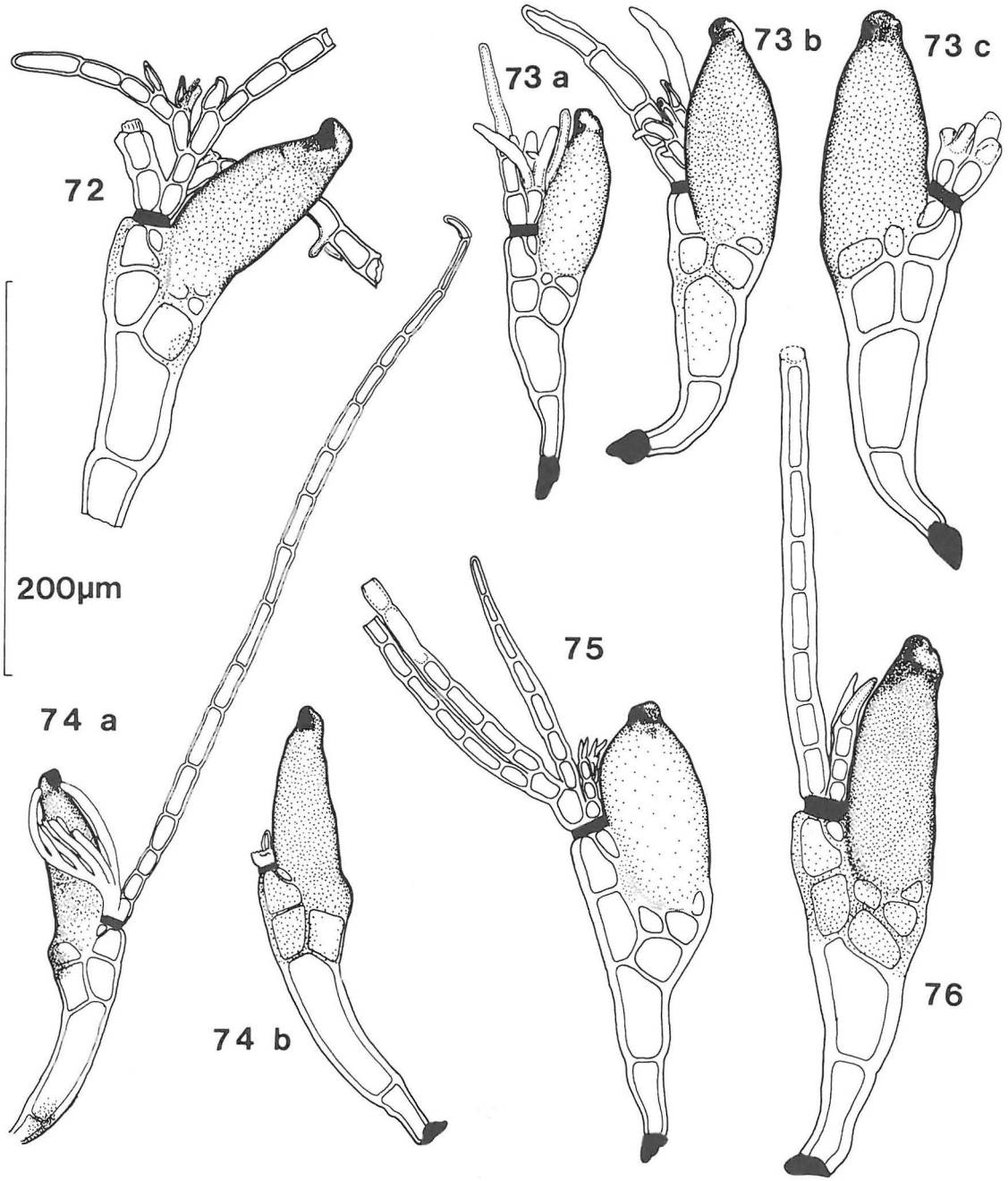
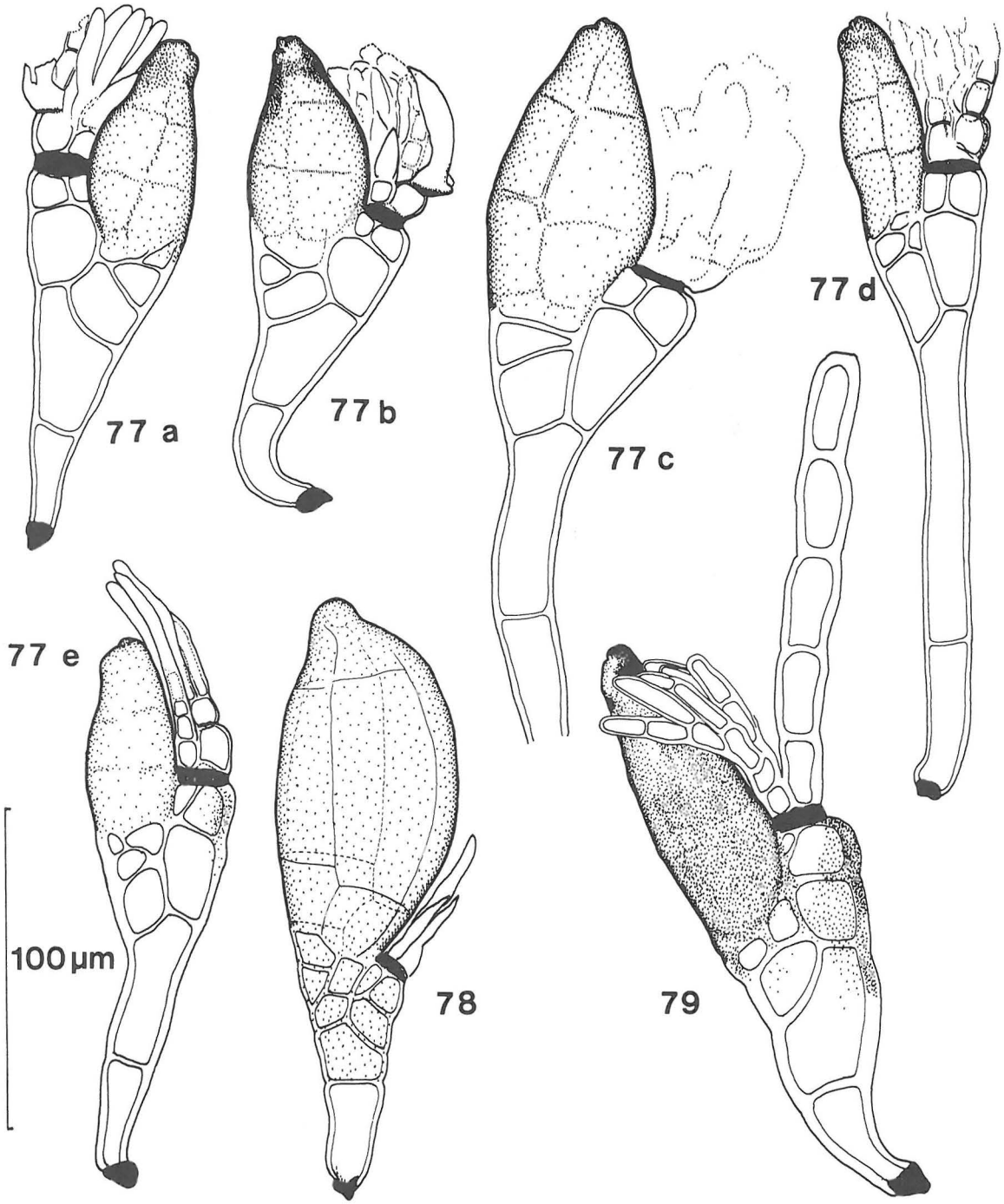


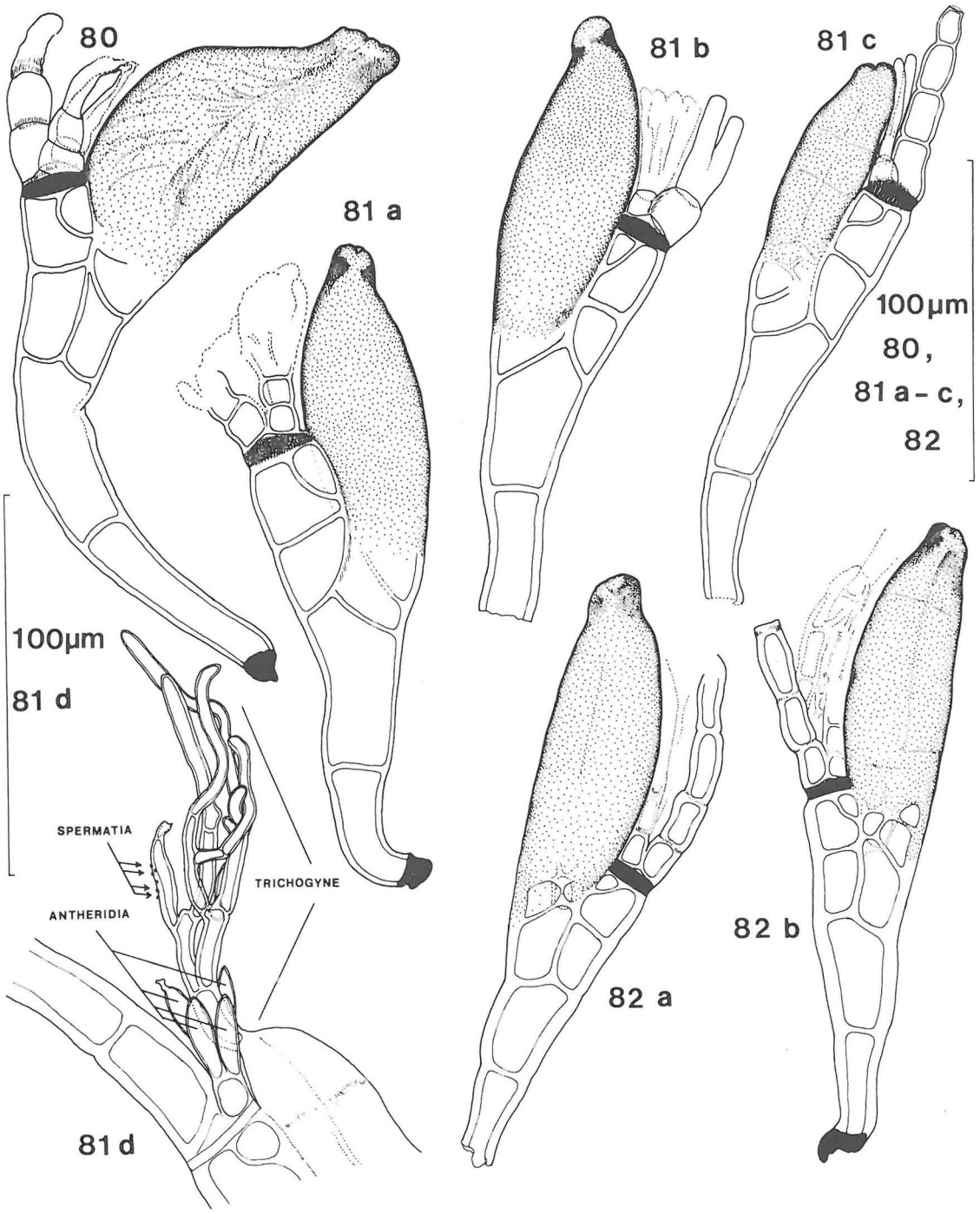
Fig. 71. *Stigmatomyces hackmanii* n.sp. from *Limosina schmitzi,* a) from the leg of the host, b)-e) from the wing of the host. d) holotype.



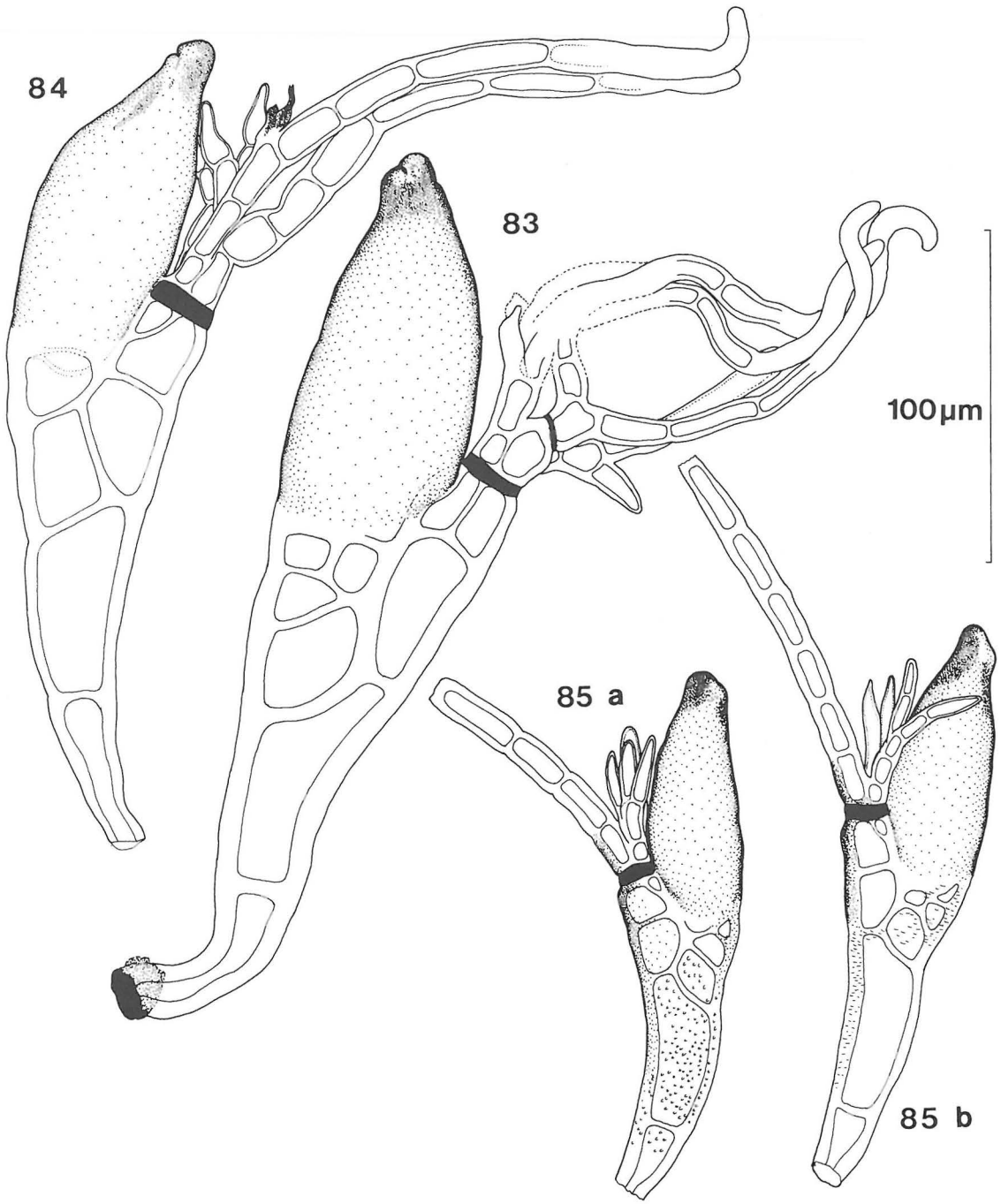
Figs. 72—76. — 72: *Laboulbenia elaphri* from *Elaphrus cupreus.* — 73: *Laboulbenia polyphaga,* a)-b) from *Calathus micropterus,* c) from *Calathus erratus.* — 74: *Laboulbenia metableti* from *Syntomus truncatellus,* a)-b) mature specimens, b) with broken appendages. — 75: *Laboulbenia ophoni* from *Harpalus xanthopus winkleri.* — 76: *Laboulbenia bradycelli* from *Trichocellus placidus.*



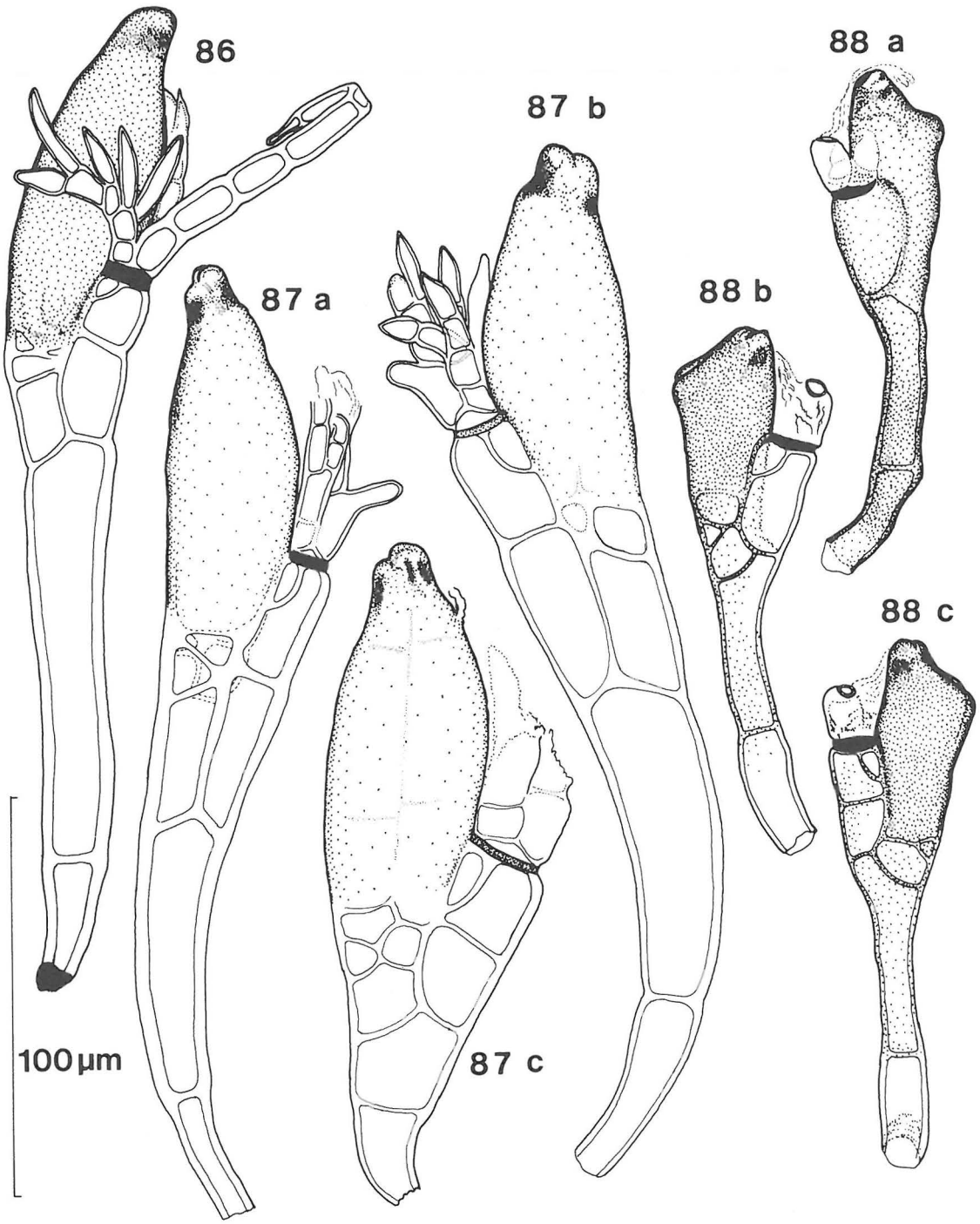
Figs. 77—79. — 77: *Laboulbenia pedicellata* from a)-b) *Bembidion quadrimaculatum,* c) *Bembidion articulatum,* d) *Bembidion doris;* e) immature specimen from *Dyschirius septentrionum.* — 78: *Laboulbenia curtipes* from *Bembidion varium.* — 79: *Laboulbenia pulchella* from *Dromius linearis.*



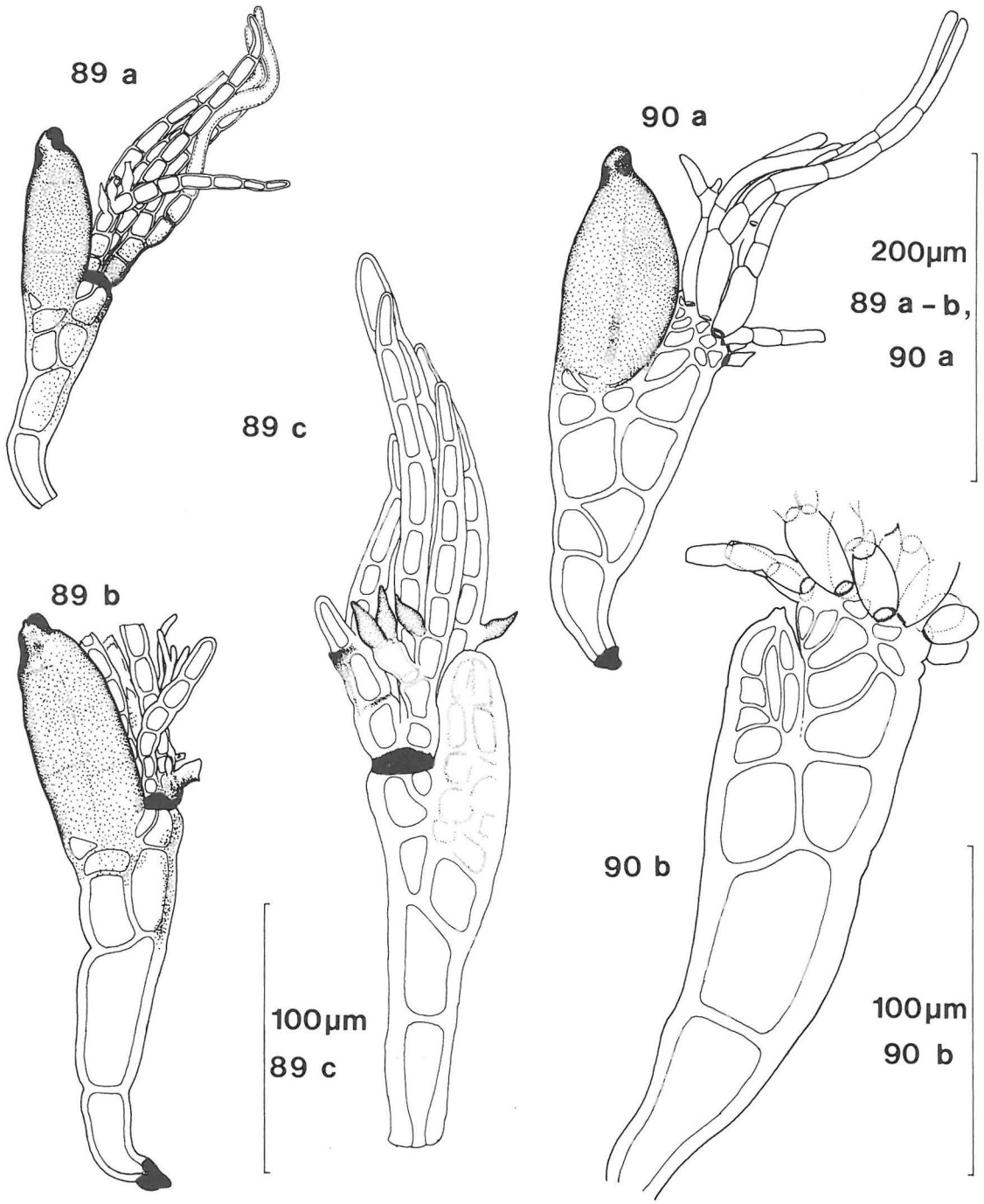
Figs. 80—82. — 80: *Laboulbenia murmanica* n.sp. from *Bembidion transparens, holotype.* - *81: Laboulbenia vulgaris,* a)-b) from *Bembidion bruxellense,* c) from *Bembidion tetracolum,* d) from *Trechus rubens,* upper part of young thallus. — 82: *Laboulbenia giardii* from *Dicheirotrichus rufithorax.*



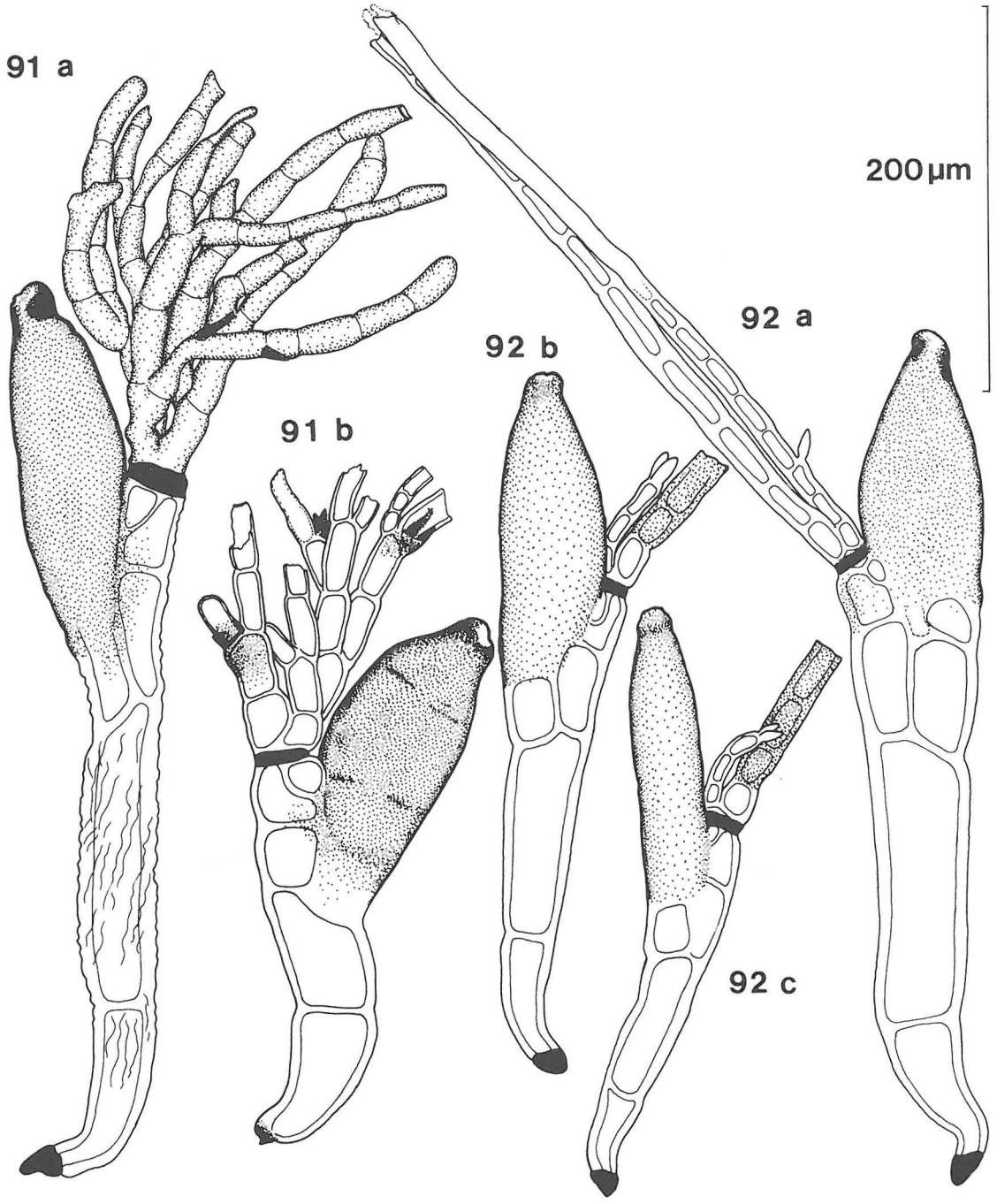
Figs. 83—85. — 83: *Laboulbenia clivinalis* from *Clivina fossor.* — 84: *Laboulbenia leisti* from *Leistus ferrugineus.* — 85: *Laboulbenia notiophili* from a) *Notiophilus germinyi,* b) *Notiophilus biguttatus.*



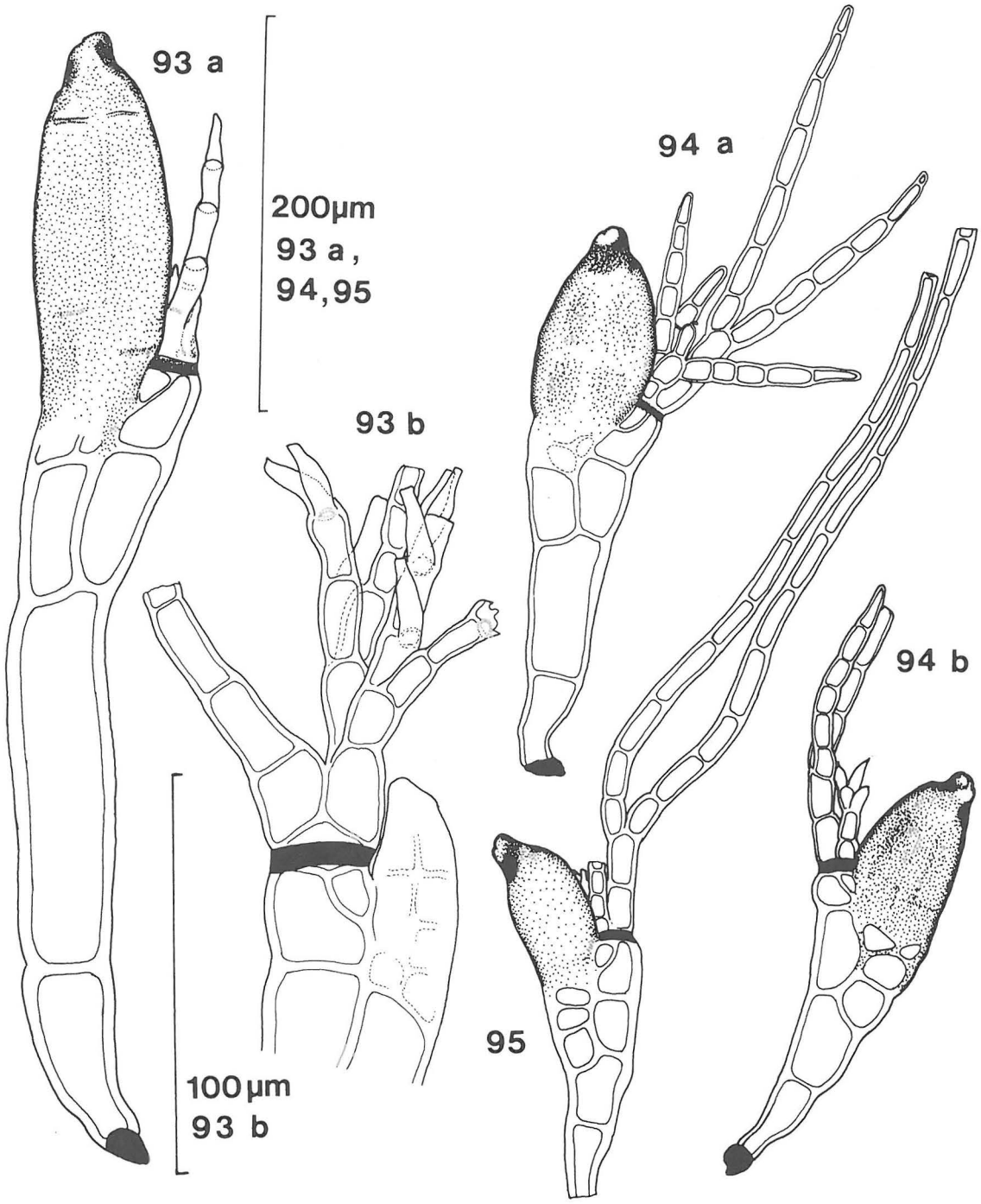
Figs. 86—88. — 86: *Laboulbenia stilicicola* from *Stilicus similis.* — 87: *Laboulbenia manubriolata,* a) mature specimen, b) nearly mature specimen with unbroken appendage and antheridia, c) short specimen from the leg of the host. From *Perigona nigriceps.* — 88: *Laboulbenia carelica* n.sp. from *Bembidion doris,* a)-c) three overmature specimens. a) holotype.



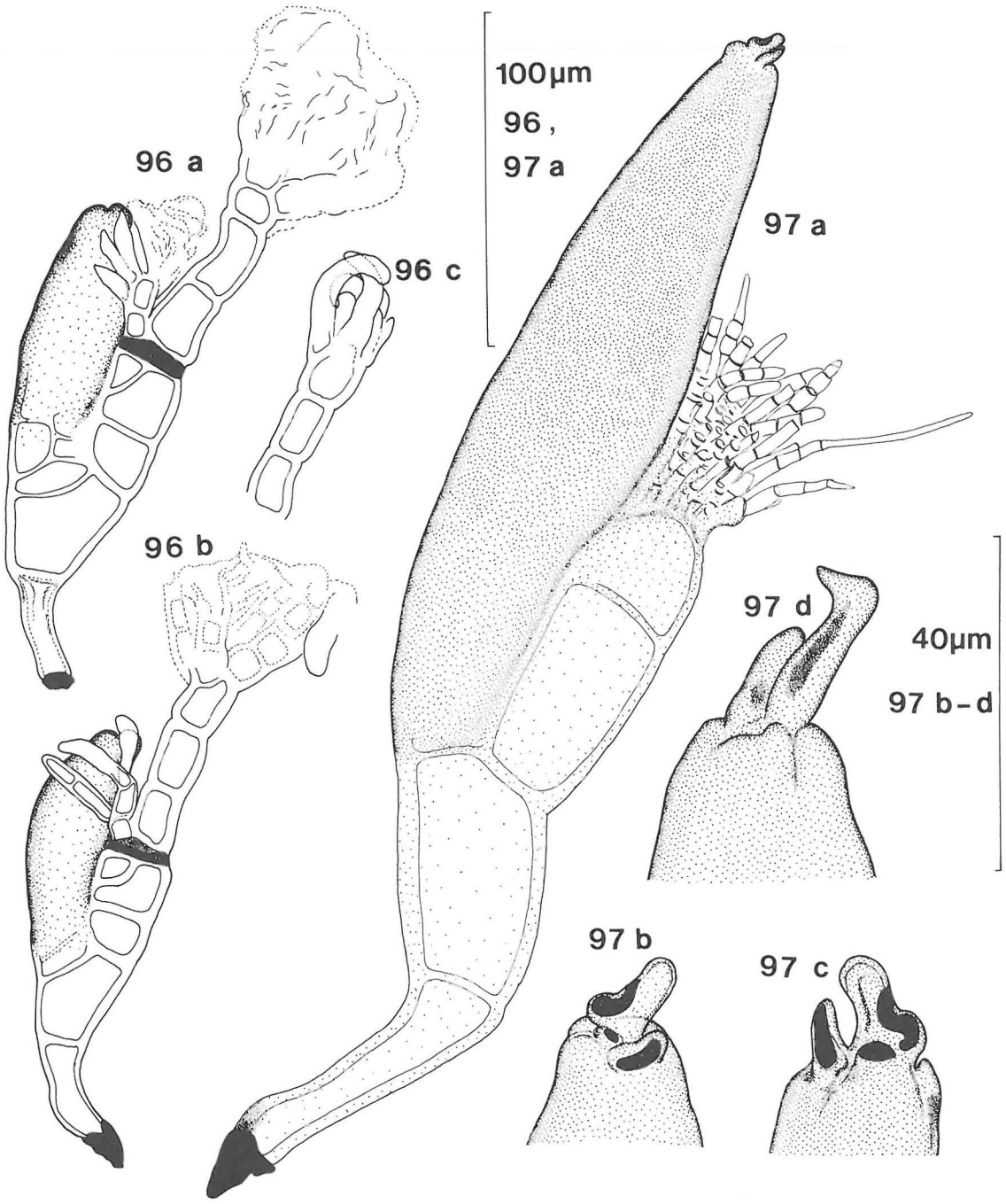
Figs. 89—90. — 89: *Laboulbenia flagellata,* a)-b) from *Agonum marginatum,* c) from *Agonum dorsale.* b) immature specimen. — 90: *Laboulbenia fasciculata* from *Patrobus assimile,* a) mature specimen, b) immature specimen.



Figs. 91—92. — 91: *Laboulbenia pseudomasei* from *Pterostichus nigrita,* a) long striated variant, b) typical specimen. — 92: *Laboulbenia argutoris* from *Pterostichus diligens,* a) specimen with long inner appendage, b)-c) typical specimens.



Figs. 93—95. — 93: *Laboulbenia oodiphila* n.sp. from *Oodes helopioides,* a) holotype (with damaged appendage), b) immature specimen with slightly damaged appendage, antheridia visible. — 94: *Laboulbenia compressa* from a) *Harpalus affinis,* b) *Harpalus xanthopus winkleri.* — 95: *Laboulbenia filifera* from *Harpalus affinis.*



Figs. 96—97. — 96: *Laboulbenia hastiana* n.sp. from *Bembidion hasti,* a)-b) mature specimens, c) outer appendage. a) holotype. — 97: *Laboulbenia fennica,* n.sp. and *Laboulbenia gyrinicola,* a) holotype of *Laboulbenia fennica,* b)-c) tip of perithecium (*L. fennica*), d) tip of perithecium (*L. gyrinicola*). *L. fennica* from *Gyrinus aeratus* (Finland) and *L. gyrinicola* from *Gyrinus substriatus* (Czechoslovakia). — Continued on next page.

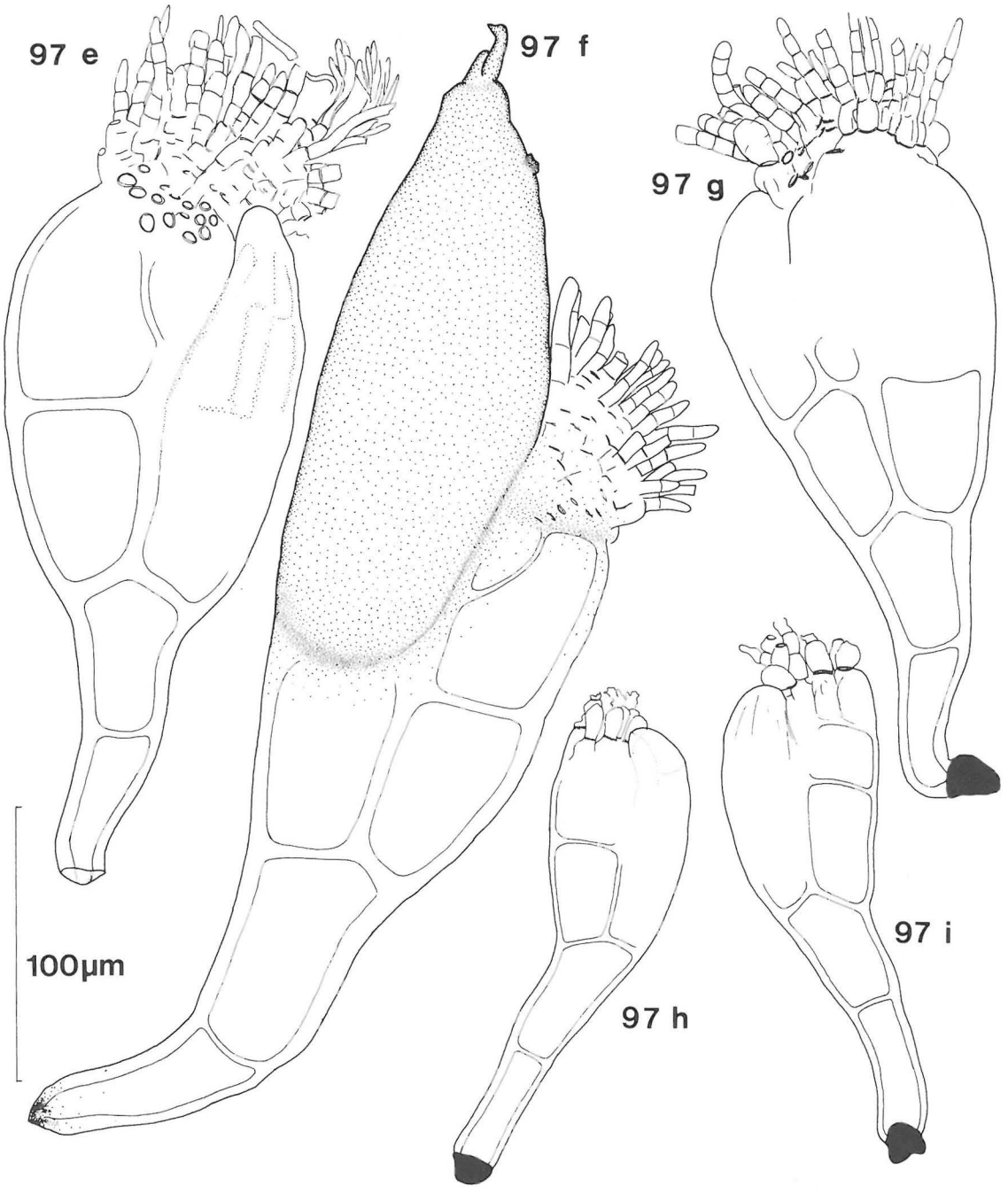
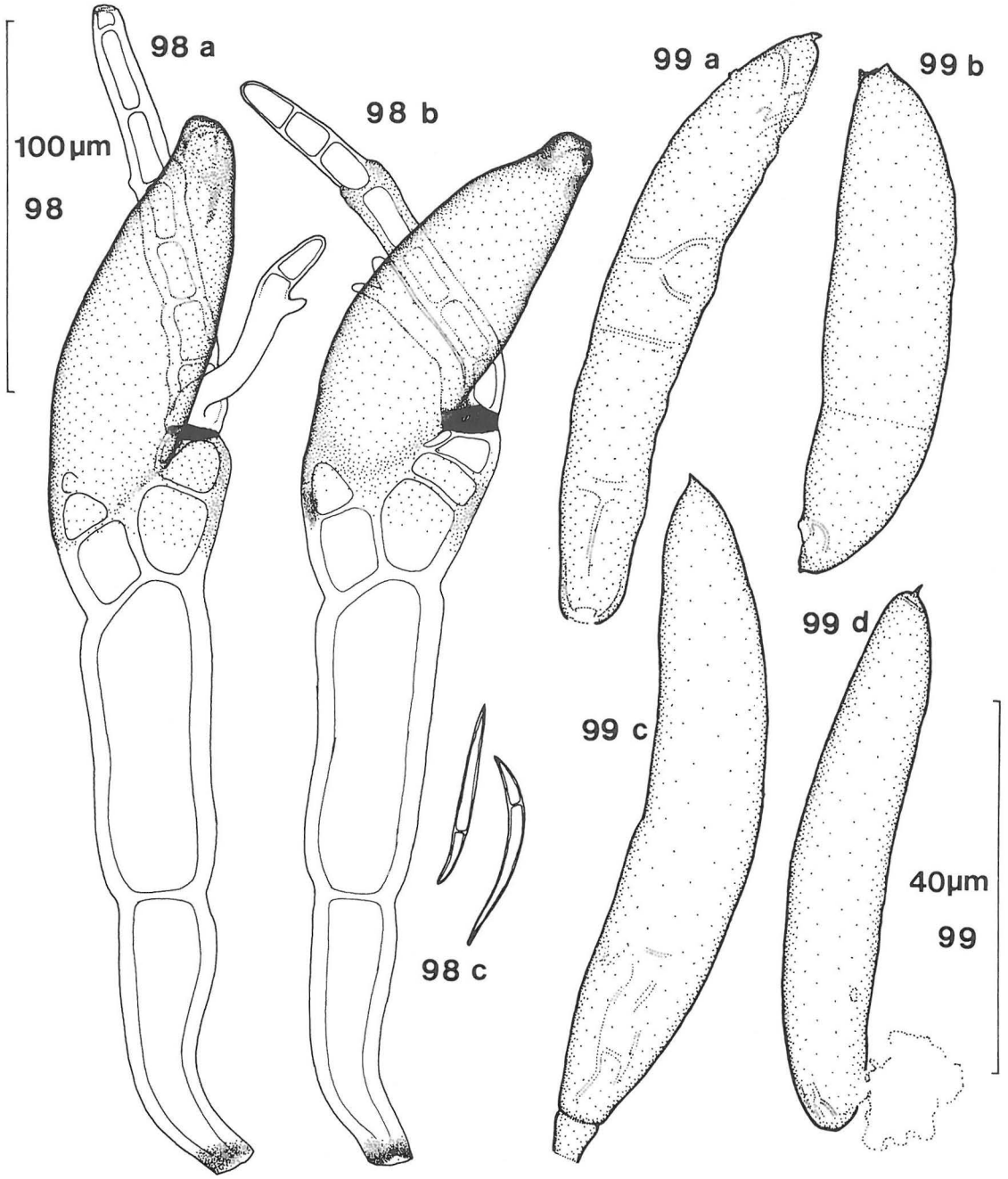
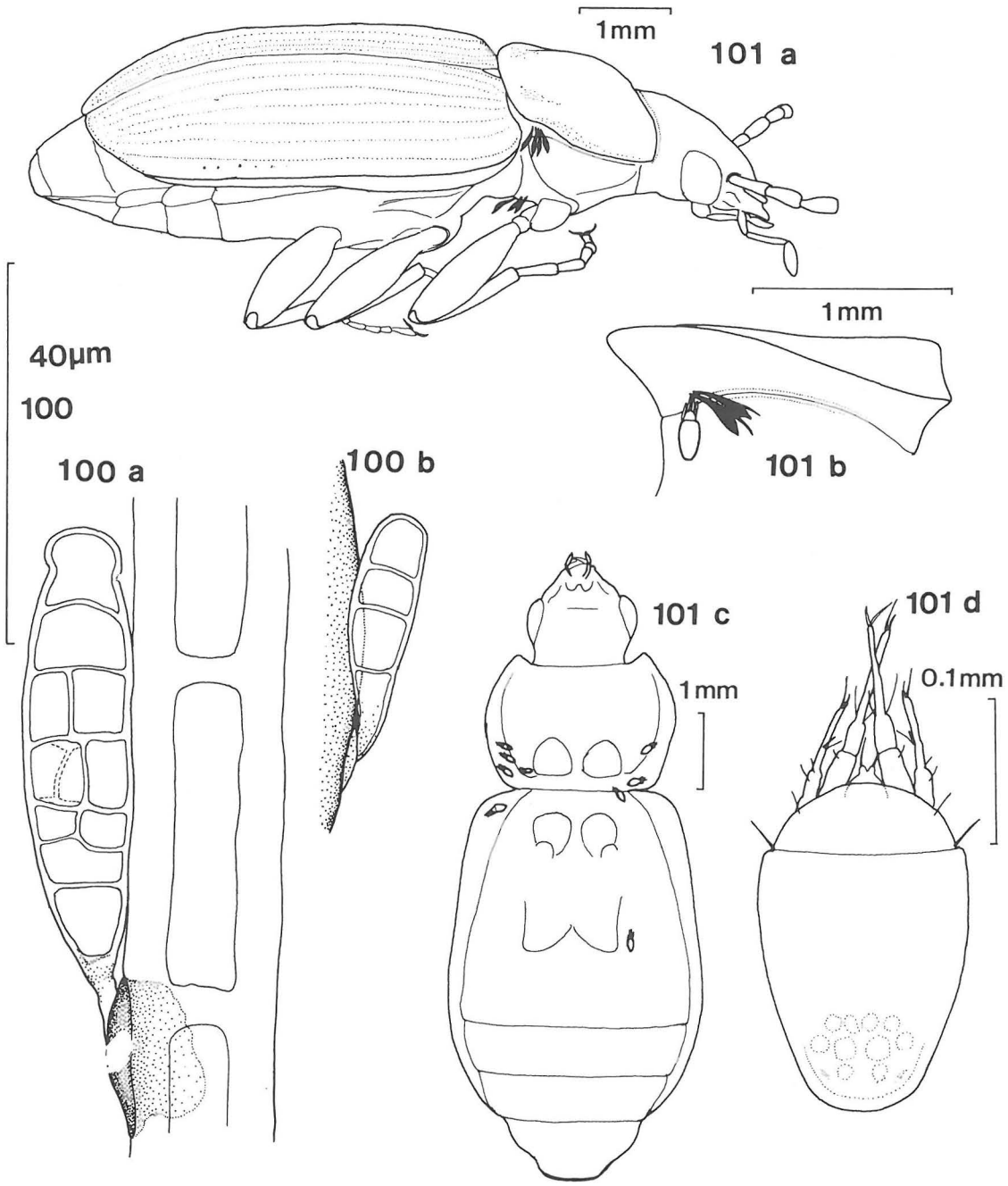


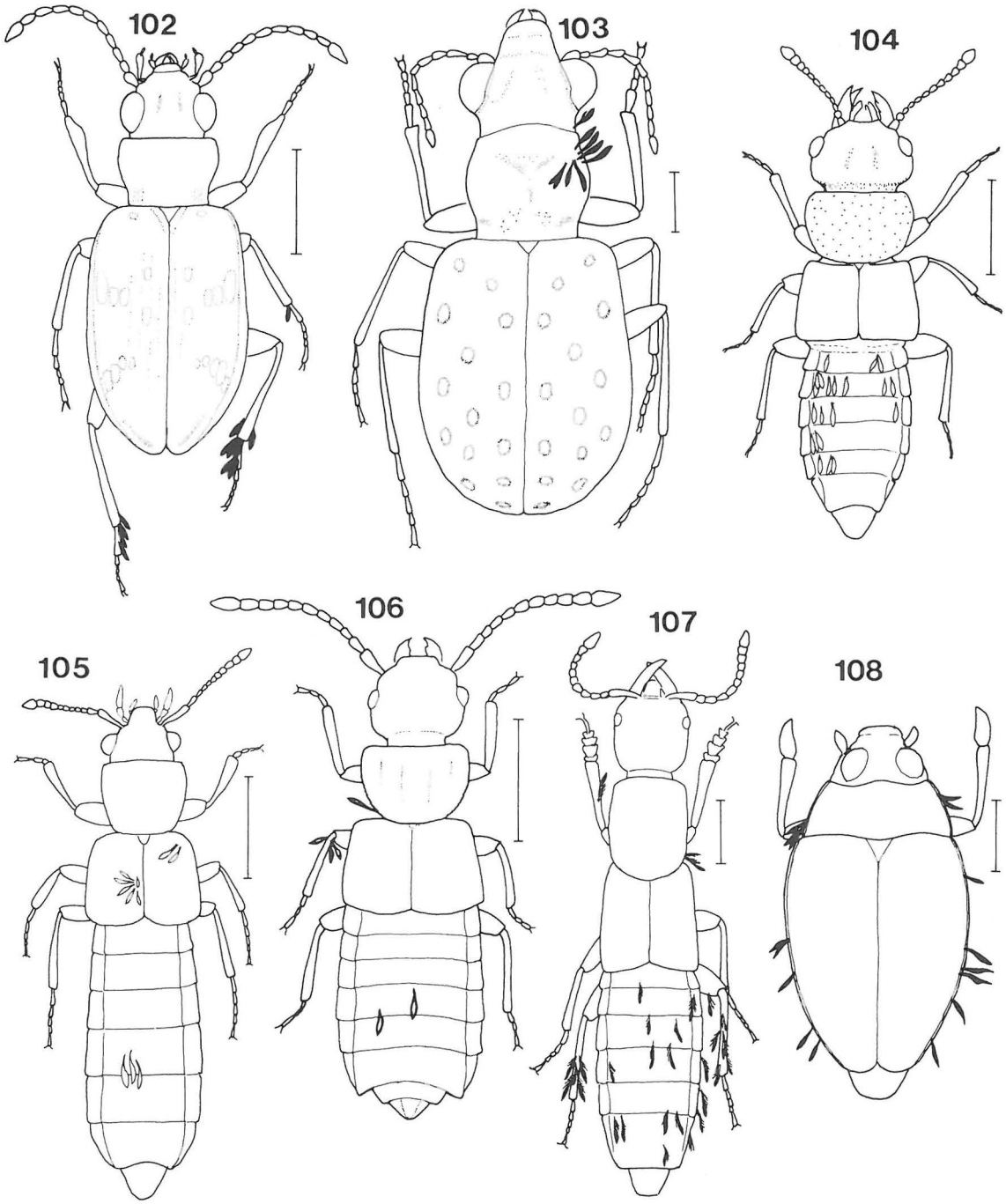
Fig. 97 (continued): e) and g) immature specimens of *L. gyrinicola* (Sweden), f) mature specimen of *L. gyrinicola* (Czechoslovakia), h)-i) immature specimens of *L. fennica* (Finland). *L. fennica* from *Gyrinus aeratus* and *L. gyrinicola* from *Gyrinus substriatus*.



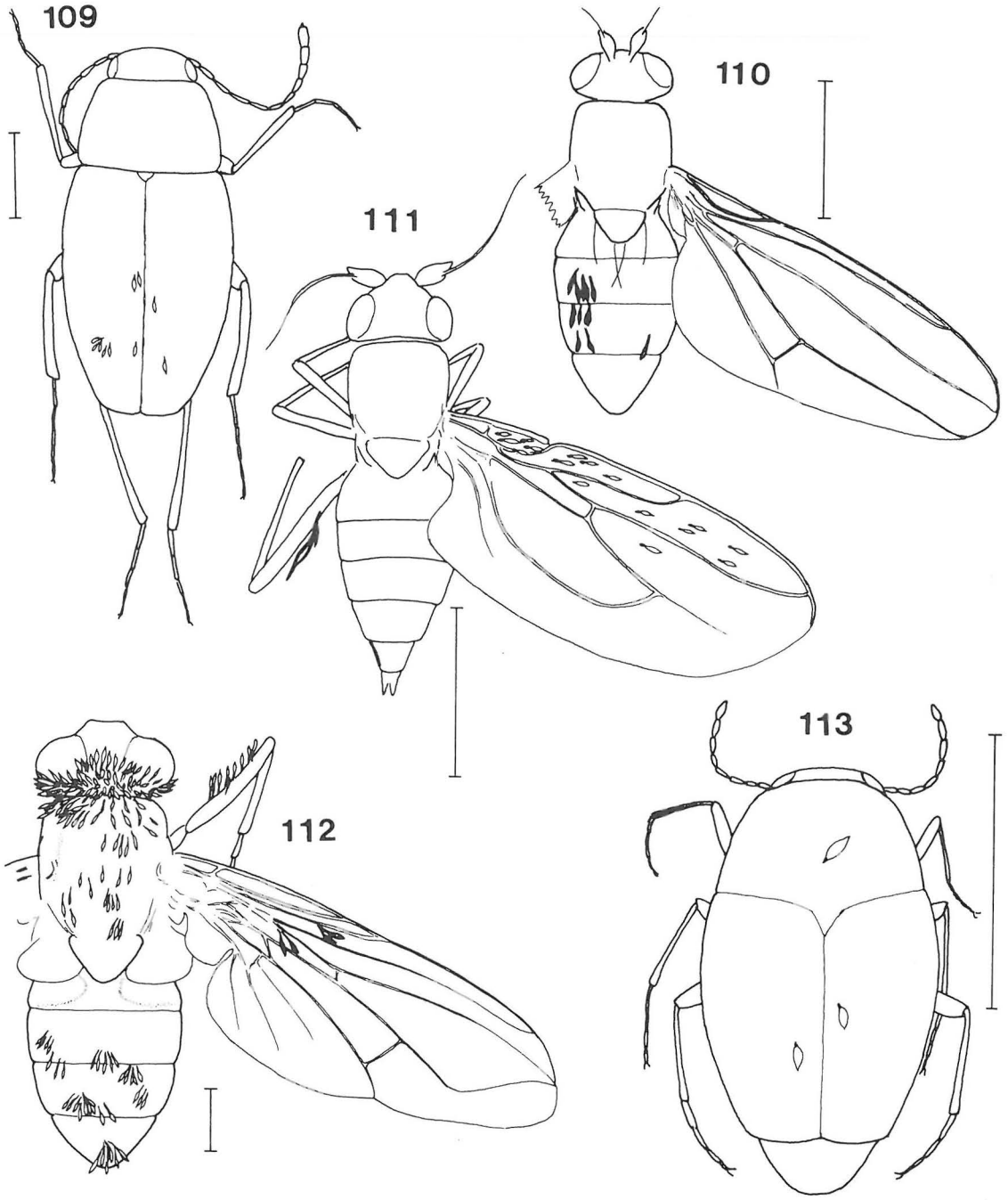
Figs. 98—99. — 98: *Laboulbenia kajanensis* n.sp. from *Pterostichus diligens,* a) holotype, b) specimen with divided cell IV, c) spores. — 99: *Amphoromorpha* sp. from *Atheta longicornis,* a)-d) variation of the thallus.



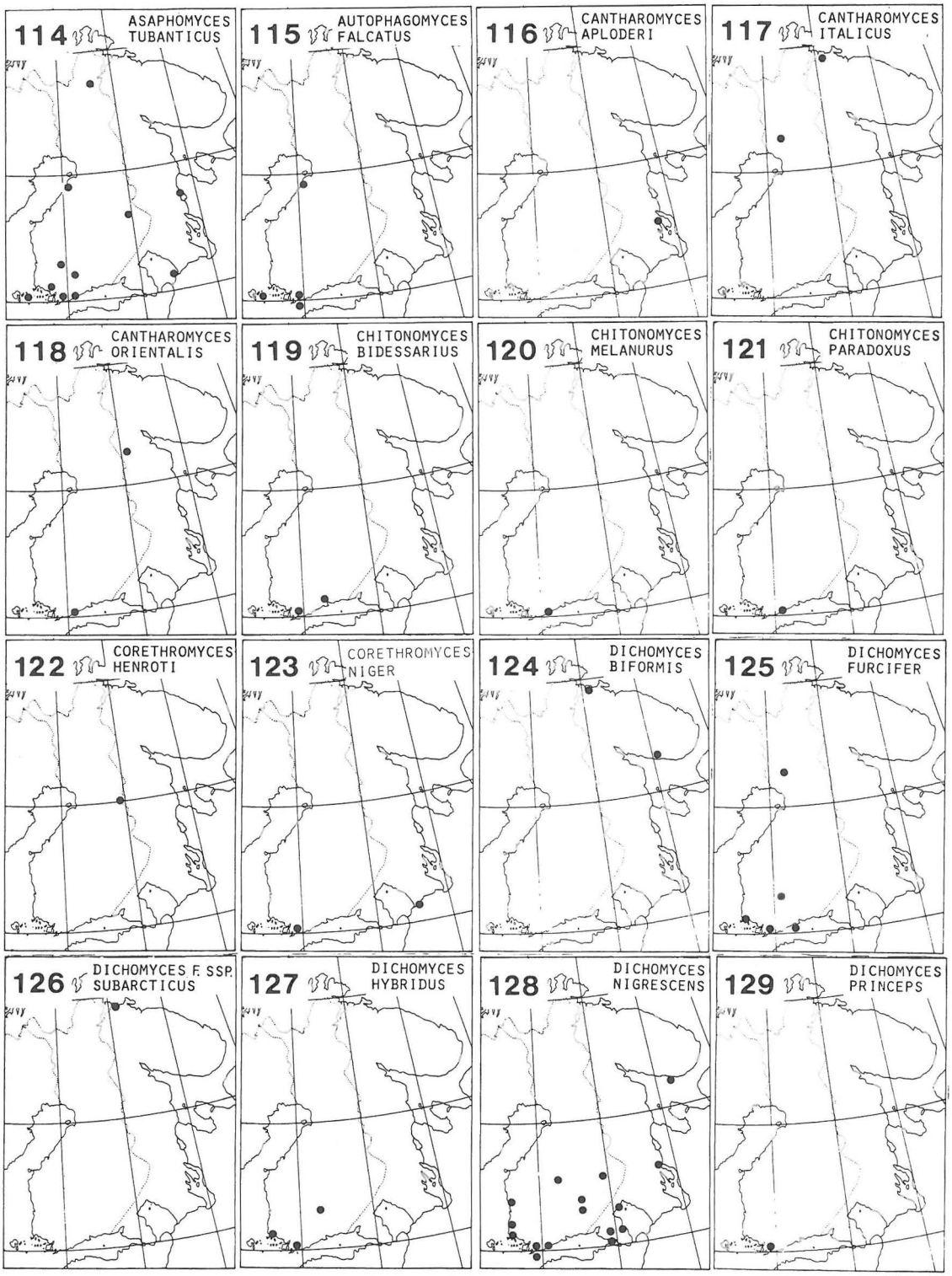
Figs. 100—101. — 100: Hyperparasitic fungus on *Laboulbenia argutoris* from *Pterostichus diligens,* a) specimen on outer appendage, b) specimen on perithecium. — 101: *Laboulbenia flagellata* and a parasitic mite on *Agonum viduum,* a) right lateral view of (fungus) infested beetle, b) right margin view of pronotum with fungi and a mite in the same position, c) ventral view of the beetle (legs removed), showing the principal positions of the parasitic mite, d) the parasitic mite enlargened.



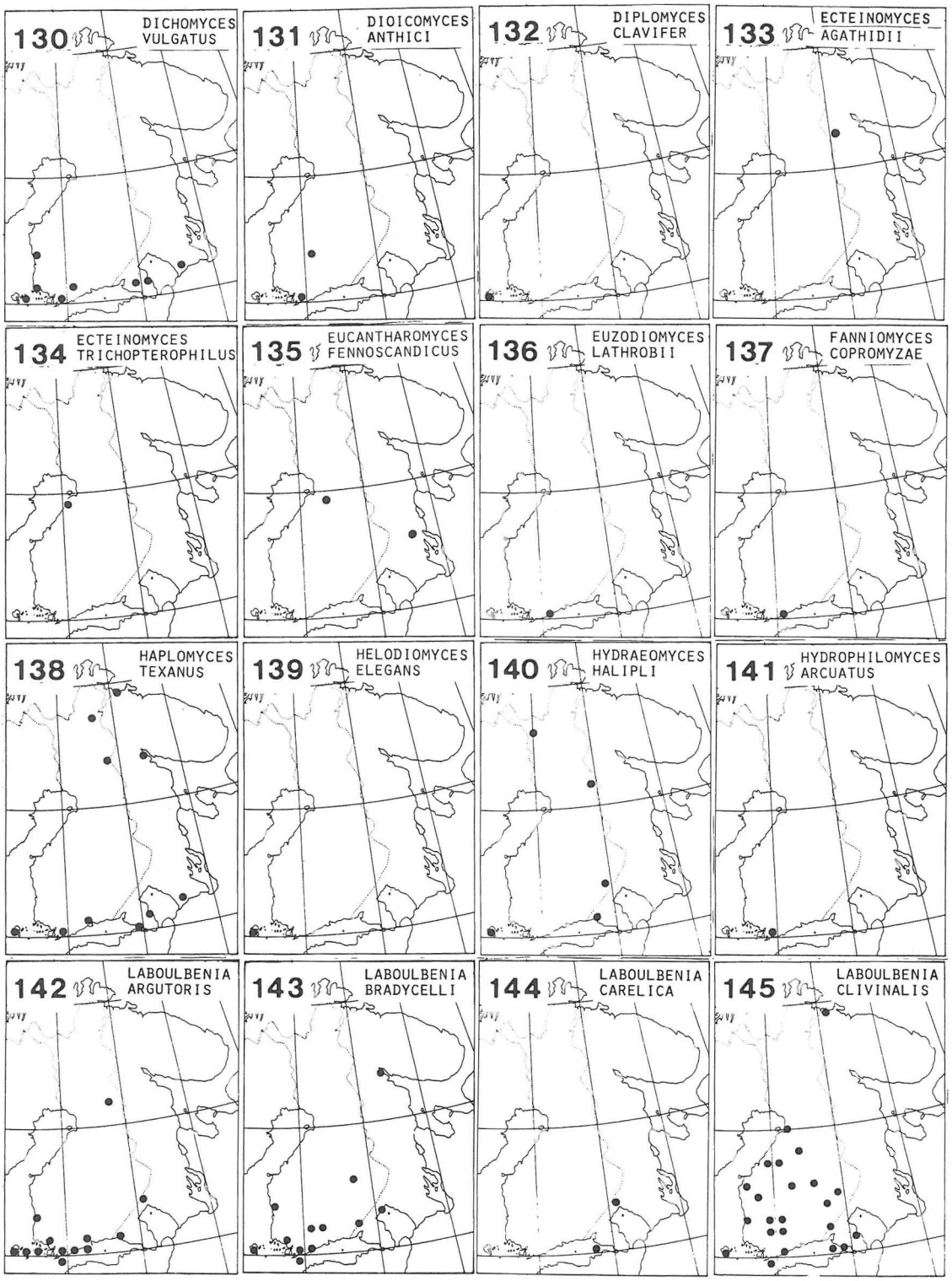
Figs. 102—108. — 102: *Laboulbenia curtipes* on *Bembidion obliquum.* — 103: *Laboulbenia elaphri* on *Elaphrus cupreus.* — 104: *Monoicomyces furcatus* on *Oxytelus laqueatus.* — 105: *Haplomyces texanus* on *Bledius pallipes.* — 106: *Peyritschiella protea* on *Anotylus rugosus.* — 107: *Rhachomyces furcatus* on *Othius punctulatus.* — 108: *Laboulbenia fennica* on *Gyrinus aeratus.* —Scale 1 mm.

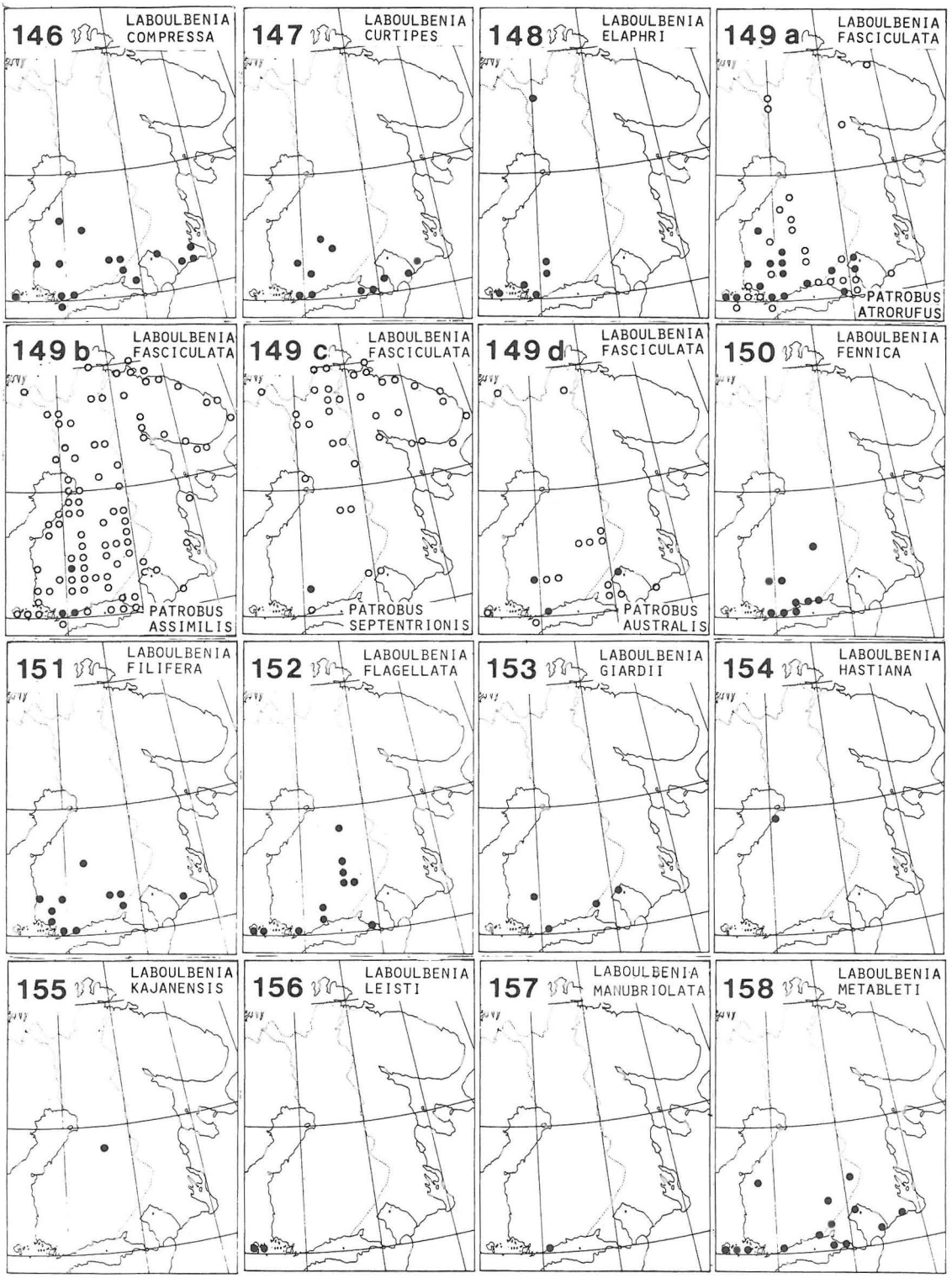


Figs. 109—113. — 109: *Corethromyces henrotii* on *Choleva septentrionum.* — 110: *Stigmatomyces hydrelliae* on *Hydrellia griseola.* — 111: *Stigmatomyces hackmanii* on *Limosina schmitzi.* — 112: *Stigmatomyces baeri* on *Musca domestica.* — 113: *Rickia peyerimhoffii* on *Scaphisoma agaricinum.* — Scale 1 mm.



Figs. 114—204. Distribution maps. ● = parasite, ○ = uninfested host specimens (the host species at lower margin).


130 DICHOMYCES VULGATUS
131 DIOICOMYCES ANTHICI
132 DIPLOMYCES CLAVIFER
133 ECTEINOMYCES AGATHIDII
134 ECTEINOMYCES TRICHOPTEROPHILUS
135 EUCANTHAROMYCES FENNOSCANDICUS
136 EUZODIOMYCES LATHROBII
137 FANNIOMYCES COPROMYZAE
138 HAPLOMYCES TEXANUS
139 HELODIOMYCES ELEGANS
140 HYDRAEOMYCES HALIPLI
141 HYDROPHILOMYCES ARCUATUS
142 LABOULBENIA ARGUTORIS
143 LABOULBENIA BRADYCELLI
144 LABOULBENIA CARELICA
145 LABOULBENIA CLIVINALIS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PATROBUS ATRORUFUS
149 b LABOULBENIA FASCICULATA
PATROBUS ASSIMILIS
149 c LABOULBENIA FASCICULATA
PATROBUS SEPTENTRIONIS
149 d LABOULBENIA FASCICULATA
PATROBUS AUSTRALIS
150 LABOULBENIA FENNICA
151 LABOULBENIA FILIFERA
152 LABOULBENIA FLAGELLATA
153 LABOULBENIA GIARDII
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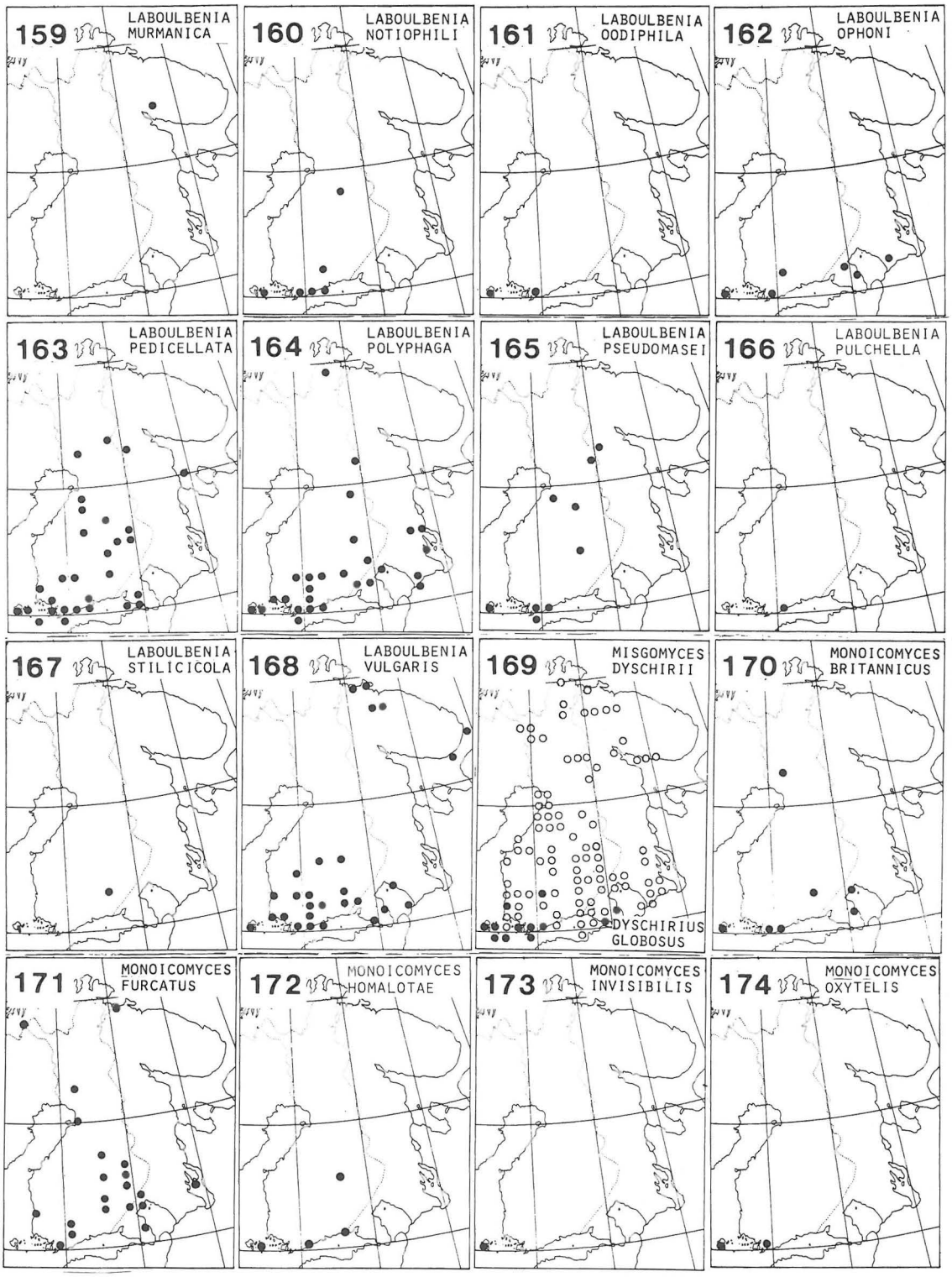
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162 LABOULBENIA OPHONI
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164 LABOULBENIA POLYPHAGA
165 LABOULBENIA PSEUDOMASEI
166 LABOULBENIA PULCHELLA
167 LABOULBENIA STILICICOLA
168 LABOULBENIA VULGARIS
169 MISGOMYCES DYSCHIRII
DYSCHIRIUS GLOBOSUS
170 MONOICOMYCES BRITANNICUS
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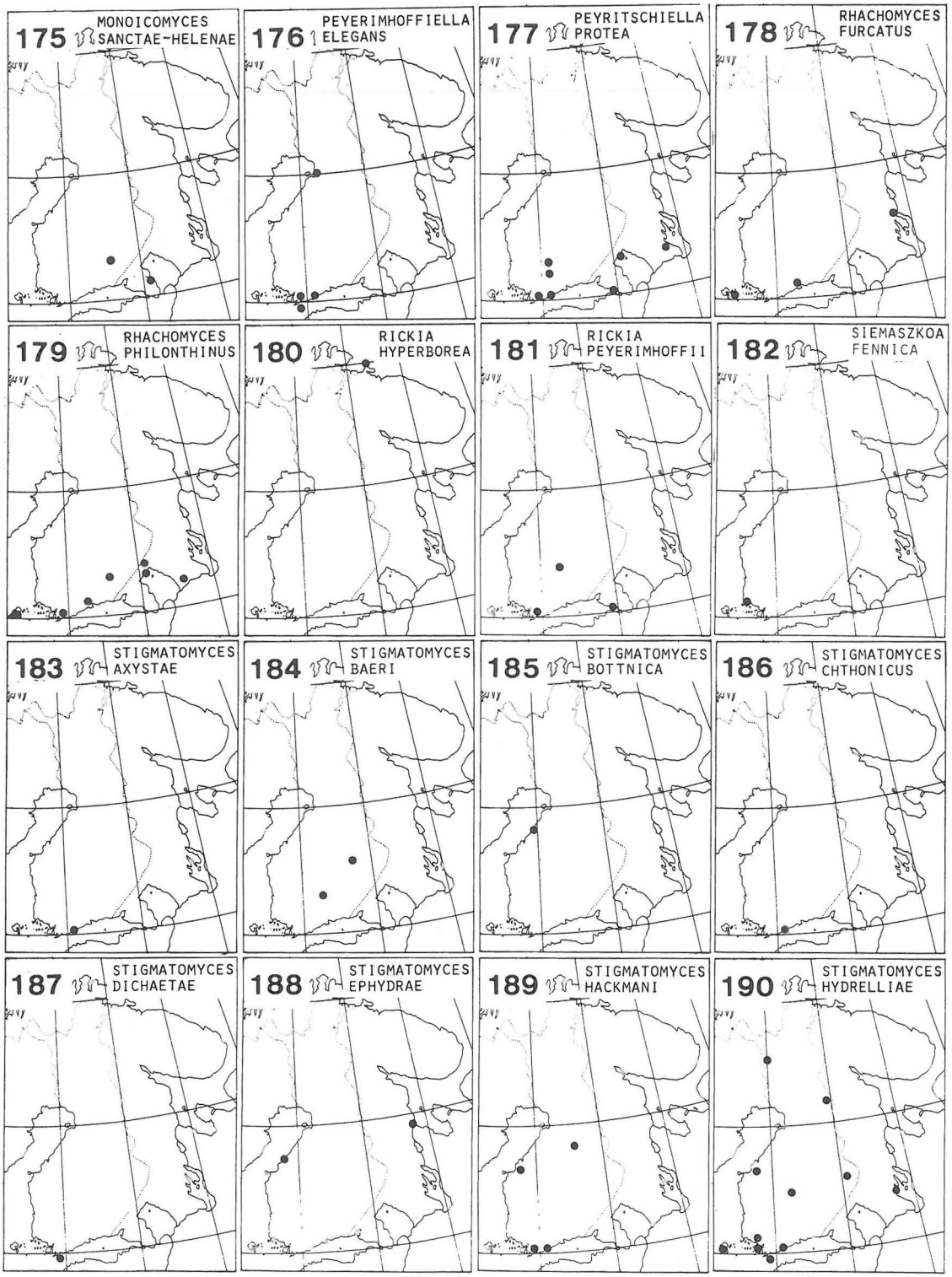
172 MONOICOMYCES HOMALOTAE
173 MONOICOMYCES INVISIBILIS
174 MONOICOMYCES OXYTELIS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178 RHACHOMYCES FURCATUS
179 RHACHOMYCES PHILONTHINUS
180 RICKIA HYPERBOREA
181 RICKIA PEYERIMHOFFII
182 SIEMASZKOA FENNICA
183 STIGMATOMYCES AXYSTAE
184 STIGMATOMYCES BAERI
185 STIGMATOMYCES BOTTNICA
186 STIGMATOMYCES CHTHONICUS
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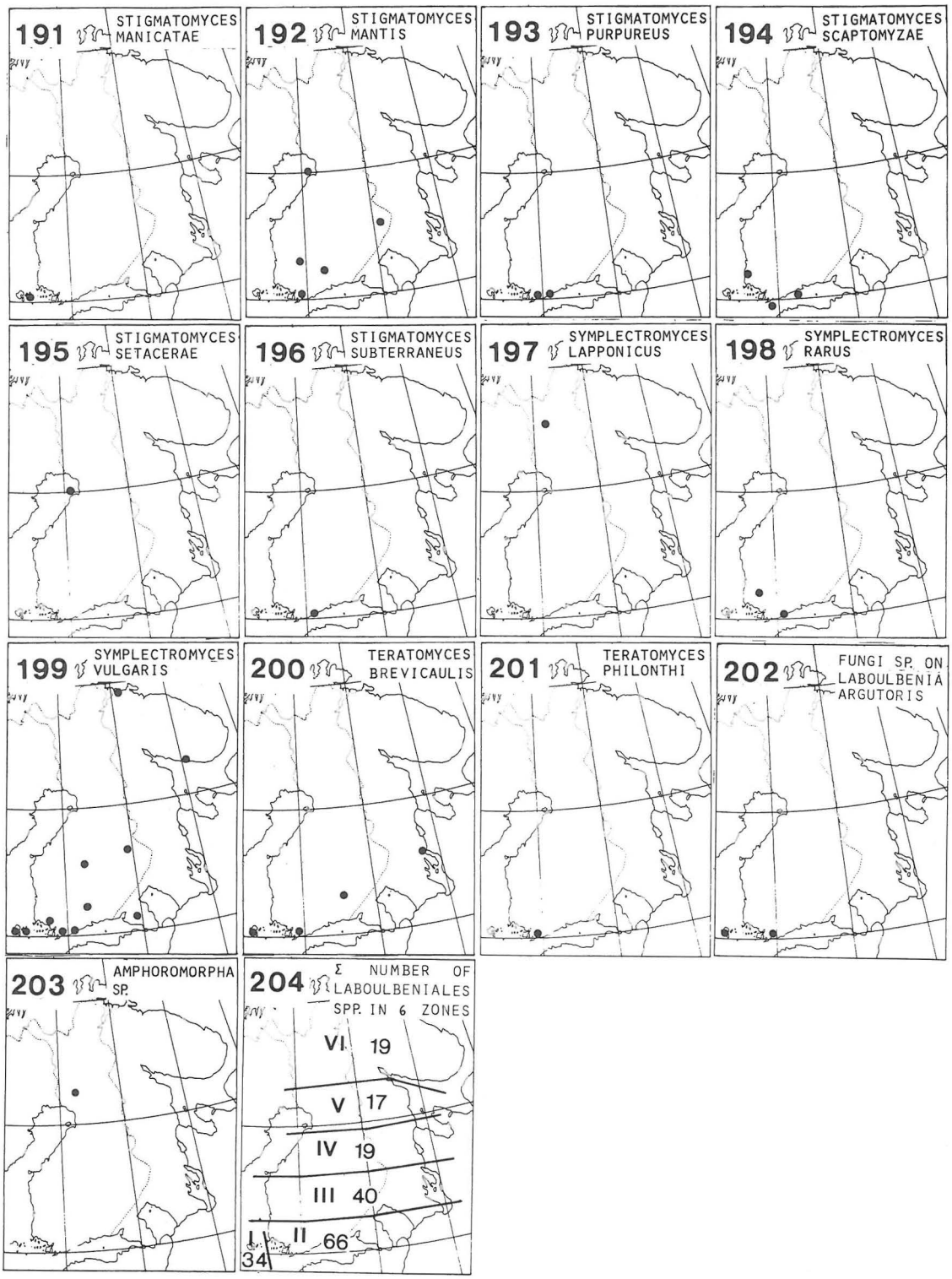
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194 STIGMATOMYCES SCAPTOMYZAE
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196 STIGMATOMYCES SUBTERRANEUS
197 SYMPLECTROMYCES LAPPONICUS
198 SYMPLECTROMYCES RARUS
199 SYMPLECTROMYCES VULGARIS
200 TERATOMYCES BREVICAULIS
201 TERATOMYCES PHILONTHI
202 FUNGI SP. ON LABOULBENIA ARGUTORIS
203 AMPHOROMORPHA SP.
204 Σ NUMBER OF LABOULBENIALES SPP. IN 6 ZONES
VI 19
V 17
IV 19
III 40
II 66
I
34

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Appendix 1

Total number of investigated arthropod specimens. An asterisk (*) indicates occurrence of ectoparasitic fungi. Nomenclature principally according to Albrecht (1979), Collingwood (1979), Hackman (1980), Kloet & Hincks (1964), Schubart (1964) and Silfverberg (1979).

INSECTA

COLEOPTERA

CARABIDAE
Leistus
terminatus 100
* ferrugineus 268
Nebria
livida 197
rufescens 615
nivalis 27
brevicollis 49
Pelophila
borealis 341
Notiophilus
aesthuans 19
aquaticus 576
palustris 459
* germinyi 426
reitteri 25
* biguttatus 379
Blethisa
multipunctata 238
Diacheila
arctica 24
polita 3
Elaphrus
lapponicus 87
uliginosus 171
* cupreus 650
riparius 907
angusticollis 94
Loricera
pilicornis 527
Clivina
* fossor 595
Dyschirius
* thoracicus 1082
obscurus 242
angustatus 59
nitidus 56
* politus 94
impunctipennis 85
salinus 137
aeneus 5
luedersi 444
* septentrionum 383
nigricornis 11
* globosus 1521
Broscus
cephalotes 309
Miscodera
arctica 190
Patrobus
* septentrionis 655
* australis 44
* assimilis 692
* atrorufus 381
Perileptus
areolatus 2
Trechus
* secalis 648
rivularis 107
* rubens 311
quadristriatus 422
micros 15
discus 114
Asaphidion
pallipes 264
Bembidion
velox 555
lapponicum 172
argenteolum 167
litorale 308
striatum 2
nigricorne 95
pygmaeum 13
lampros 608
properans 178
* biguttatum 169
aeneum 1
* mannerheimi 439
* guttula 720
punctulatum 152
bipunctatum 781
fellmanni 182
* difficile 288
crenulatum 4
prasinum 207
hyperboraeorum 97
hirmocaelum 72
virens 155
* hasti 334
monticola 5
deletum 129
stephensi 9
grapii 97
yukonum 50
* bruxellense 1752
obscurellum 29
* tetracolum 309
petrosum 24
femoratum 99
* andreae ssp. polonicum 219
* saxatile 453
genei ssp. illigeri 83
* ruficolle 134
* dentellum 352
tinctum 91
* varium 46
* obliquum 1186
* semipunctatum 238
minimum 281
azurescens 12
humerale 72
* quadrimaculatum 1000
chaudoiri 1
schueppeli 150
* gilvipes 466
* assimile 38
* transparens 216
* doris 1004
* articulatum 291
octomaculatum 2
Tachys
bistriatus 86
bisulcatus 31
nanus 250
Stomis
pumicatus 7
Pterostichus
lepidus 327
cupreus 435
versicolor 662
vernalis 361
aterrimus 78
adstrictus 316
oblongopunctatus 937
quadrifoveolatus 47
niger 1688
melanarius 513
* nigrita 792
anthracinus 2
gracilis 57
* minor 521
* strenuus 838
* diligens 1228
middendorffi 19
brevicornis 26
aethiops 70
madidus 1
Calathus
fuscipes 231
* erratus 653
ambiguus 63
* melanocephalus 1166
* micropterus 1159
Sphodrus
leucophthalmus 15
Laemostenus
terricola 7
Synuchus
vivalis 58
Olistophus
rotundatus 91
Agonum
bogemanni 2
* quadripunctatum 302
micans 6
* fuliginosum 847
piceum 518
* gracile 749
exaratum 1
munsteri 181
consimile 35
* thorey 451
impressum 13
sexpunctatum 587
ericeti 294
gracilipes 1

* marginatum 216
muelleri 303
sahlbergi 13
* dolens 291
* versutum 338
* viduum 740
moestum 35
livens 186
albipes 112
* dorsale 97
obscurum 555
mannerheimi 40
assimile 256
Amara
plebeja 747
Harpalus
nitidulus 43
puncticollis 31
rufibarbis 389
griseus 4
rufipes 603
calceatus 3
* affinis 1159
distinguendus 5
smaragdinus 74
solitaris 43
* latus 780
nigritarsis 5
* luteicornis 171
* xanthopus ssp. winkleri 37
quadripunctatus 243
rubripes 16
* tardus 464
Anisodactylus
binotatus 395
nemorivagus 8
Dicheirotrichus
* rufithorax 189
gustavi 222
Trichocellus
mannerheimi 3
cognatus 201
* placidus 741
Bradycellus
* ruficollis 101
ponderosus 1
* caucasicus 461
Stenolophus
mixtus 64
Acupalpus
* flavicollis 146
meridianus 142
parvulus 560
exiguus 133
consputus 5
Perigona
* nigriceps 11
Badister
unipustulatus 1
bullatus 22
lacertosus 188
sodalis 2
peltatus 75
dilatatus 50
Licinus
depressus 11
Chlaenius
tristis 80
nigricornis 175
sulcicollis 3
quadrisulcatus 5
costulatus 3
Oodes
* helopioides 299
Panagaeus
cruxmajor 101
bipustulatus 4
Odacantha
melanura 51
Lebia
cyanocephala 23
chlorocephala 326
cruxminor 214
Demetrias
monostigma 2
Dromius
longiceps 15
* linearis 181
agilis 326
quadraticollis 1
schneideri 280
fenestratus 268
quadrimaculatus 109
spilotus 32
sigma 541
notatus 189
Syntomus
* truncatellus 684
foveatus 130
Microlestes
minutulus 145
maurus 1
Cymindis
angularis 111
macularis 226
vaporariorum 156
Brachinus
crepitans 1

HALIPLIDAE
Brychius
elevatus ssp. cristatus 238
Haliplus
varius 5
obliquus 29
confinis 550
ruficollis 1272
heydeni 361
fluviatilis 87
wehnkei 141
interjectus 24
sahlbergi 5
* lineolatus 506
immaculatus 799
* fulvicollis 19
flavicollis 261
fulvus
* ssp. fulvus 260
* ssp. lapponum 333
variegatus 82

DYTISCIDAE
Laccophilus
hyaline 177
* minutus 100
stroehmi 16
Hyphydrus
ovatus 419
Bidessus
unistriatus 97
grossepunctatus 80
Guignotus
pusillus 276
hamulatus 229
Hygrotus
decoratus 107
* inaequalis 720
versicolor 390
quinquelineatus 390
Coelambus
impressopunctatus 711
novemlineatus 216
marklini 242
Hydroporus
dorsalis 354
lapponum 793
erythrocephalus 1448

GYRINIDAE
Gyrinus
* marinus 550
* aeratus 3522
* pullatus 977
opacus 412
* distinctus 443
* natator 256
* substriatus 364
suffriani 4
* paykulli 207
* minutus 803
Orectochilus
villosus 331

HYDRAENIDAE
Ochthebius
bicolon 5
stockmanni 3
* minimus 266
marinus 257
Hydraena
palustris 9
britteni 105
riparia 66
pulchella 23
gracilis 31
Limnebius
truncatellus 171
truncatulus 74
crinifer 12
nitidus 1
aluta 120

HYDROPHILIDAE
Hydrochus
ignicollis 118
brevis 153
Spercheus
emarginatus 1
Helophorus
nubilus 21
tuberculatus 30
Cercyon
littoralis 280
depressus 41
ustulatus 60
lugubris 5
impressus 203
haemorrhoidalis 171
melanocephalus 372
Anacaena
limbata 463

Laccobius
decorus 299
minutus 607
biguttatus 55
striatulus 7
bipunctatus 45
Helochares
obscurus 143
Enochrus
melanocephalus 103
ochropterus 256
quadripunctatus 898
bicolor 176
testaceus 248
affinis 423
coarctatus 157
sp. 32
Cymbiodyta
marginella 90
Chaetarthria
seminulum 172
Hydrochara
caraboides 39
Hydrophilus
piceus 4
aterrimus 2
Berosus
spinosus 149
luridus 257

PTILIIDAE
Ptenidium
* laevigatum 36
fuscicorne 92
punctatum 17
formicetorum 143
pusillum 141
nitidum 147
Nephanes
titan 51
Acrotrichis
grandicollis 351
montandoni 191
chevrolati 46
thoracica 138
sericans 361
dispar 56
brevipennis 86
pumila 30
silvatica 74
parva 29
cognata 13
norvegica 8
intermedia 280
atomaria 141
lucidula 1
sitkaensis 139
fascicularis 221
rugulosa 107
strandi 2
* sp. (♀) 1

LEIODIDAE
Leiodes
punctulata 32
inordinata 1
ciliaris 36
rubiginosa 2
triepkii 150
rugosa 1
puncticollis 4
hybrida 10
rhaetica 12
oblonga 4
silesiaca 33
lucens 6
curta 5
calcarata 46
picea 71
dubia 77
obesa 184
nigrita 31
litura 2
ovalis 123
badia 24
parvula 121
Colenis
immunda 53
Cyrtusa
* subtestacea 38
pauxilla 11
minuta 15
Amphicyllis
globosus 108
globiformis 10
Agathidium
nigripenne 64
seminulum 169

SILPHIDAE
Thanatophilus
rugosus 30
sinuatus 60
dispar 15
Oiceoptoma
thoracica 30
Phosphuga
atrata 50
Pteroloma
forsstroemi 28

CATOPIDAE
Ptomaphagus
* subvillosus 28
Nemadus
colonoides 46
Nargus
velox 1
badius 1
Choleva
* septentrionis 61
oblonga 2
glauca 16
angustata 5
sturmi 8
spinipennis 6
elongata 2
Dreposcia
brevipalpis 3
Sciodrepoides
* watsoni 617
fumatus 124
Catops
subfuscus 27
* alpinus 120
luteipes 2
coracinus 47
tristis 43
morio 142
* nigrita 392
nigriclavis 14
westi 8
* fungus 190
* fuliginosus 14
borealis 12
* nigricans 56

COLONIDAE
Colon
latum 24
pseudolatum 4
arcticum 2
angulare 15
dentipes 6
barnevillei 15
brunneum 136
appendiculatum 17
bidentatum 21

SCYDMAENIDAE
Eutheia
scydmaenoides 42
Nevraphes
angulatus 57
Stenichnus
scutellaris 9
collaris 226

SCAPHIDIIDAE
Scaphisoma
* agaricinum 240
* inopinatum 67
boleti 22
subalpinum 47
balcanicum 6
boreale 18
assimile 19

STAPHYLINIDAE
Staphylininae
Erichsonius
* cinerascens 355
Philonthus
rectangulus 134
* discoideus 41
quisquiliarius 247
corvinus 170
sanguinolentus 155
scoticus 61
diversipennis 6
* ventralis 109
* rigidicornis 167
* puella 158
laminatus 152
politus 334
succicola 210
addendus 64
nitidus 127
rotundicollis 117
tenuicornis 114
decorus 100
cognatus 159
* subuliformis 7
nigriventris 87
pachycephalus 273
parcus 1
* cephalotes 447
* cruentatus 138

confinis 25
marginatus 161
varians 375
atratus 114
subvirescens 126
carbonarius 193
* albipes 291
caucasicus 6
ebeninus 25
ochropus 291
* debilis 312
splendens 92
punctus 4
fumarius 1
* umbratilis 241
nigrita 284
nitidulus 15
lepidus 43
* longicornis 56
agilis 126
furcifer 151
* micans 292
* rubripennis 151
tenuis 46
Gabronthus
thermarum 7
Gabrius
vernalis 133
lividipes 3
expectatus 243
splendidulus 3
bescidicus 1
* trossulus 708
sphagnicola 3
nigritulus 3
velox 195
pennatus 111
subnigritulus 126
toxotes 11
Heterothops
praevius 29
quadripunctulus 54
Quedius
brevis 79
microps 3
longicornis 4
puncticollis 1
nigrocaeruleus 5
assimilis 6
cruentus 42
brevicornis 18
* mesomelinus 280
maurus 18
xanthopus 143
scitus 45
tenellus 41
* cinctus 91
plagiatus 225
* fuliginosus 141
curtipennis 19
subunicolor 4
molochinus 203
picipes 2
umbrinus/pseudoumbrinus 245
nigripes 3
sublimbatus 25
* limbatus 173
maurorufus 1
scintillans 1
lucidulus 12
nitipennis 114
* fulvicollis 192
fellmanni 6
boopoides 36
* boops 244
Acylophorus
wagenschieberi 175

Xantholininae
Othius
* punctulatus 85
angustus 19
volans 6
* lapidicola 191
myrmecophilus 157
Paederinae
Paederus
fuscipes 196
riparius 378
Astenus
procerus 46
pulchellus 100
gracilis 139
Rugilus
scutellatus 39
rufipes 136
* similis 40
orbiculatus 215
erichsoni 14
Lithocharis
obscurella 12
ochracea 90
nigriceps 114
Scopaeus
laevigatus 55
minutus 4
pusillus 1
Lathrobium
punctatum 169
sphagnetorum 85
terminatum 575
fennicum 73
quadratum 149
rufipenne 172
elongatum 151
geminum 83
fulvipenne 158
brunnipes 242
fovulum 65
filiforme 217
* longulum 216
Ochthephilum
fracticorne 236

Omaliinae
Xylodromus
depressus 18
concinnus 173
Micralymma
* marinum 14
Cylletron
nivale 16
Lesteva
longoelytra 87
monticola 4
Psephidonus
plagiatus 310
longipes 51

Oxyporinae
Oxyporus
rufus 142
mannerheimi 16
maxillosus 113

Oxytelinae
Carpelimus
arcuatus 30
bilineatus 131
rivularis 254
obesus 3
fuliginosus 5
impressus 2
* corticinus 289
foveolatus 136
despectus 19
pusillus 118
gracilis 23
* elongatulus 105
Aploderus
caelatus 170
* caesus 2
Oxytelus
sculptus 242
* fulvipes 160
* piceus 18
* laqueatus 591
Anotylus
* insecatus 14
* rugosus 724
sculpturatus 4
* nitidulus 479
pumilus 2
hamatus 39
fairmairei 123
clavatus 6
tetracarinatus 14
tetratoma 3
Platystethus
* arenarius 427
cornutus 2
alutaceus 14
capito 25
nodifrons 157
nitens 1
Bledius
dama 2
* diota 41
germanicus 1
tricornis 4
litoralis 37
defensus 41
fuscipes 19
* kutsae 4
* arcticus 60
terebrans 57
* filipes 15
* poppiusi 59
fennicus 2
* vilis 88
* longulus 65
denticollis 15
* opacus 38
* gallicus 129
dissimilis 11
crassicollis 1
erraticus 154
fergussoni 147
talpa 372
subteraneus 165
* pallipes 35

Aleocharinae
Dochmonota
clancula 34
rudiventris 18
Dacrila

fallax 6
Hydrosmecta
thinobioides 77
Dilacra
luteipes 20
vilis 79
Schistoglossa
gemina 38
Aloconota
currax 1
sulcifrons 43
insecta 72
gregaria 255
languida 2
Liogluta
pagana 1
granigera 46
longiuscula 5
microptera 360
oblongiuscula 74
alpestris 101
Geostiba
circellaris 715
Paranopleta
inhabilis 4
Dimetrota
cadaverina 9
Atheta
arctica 552
polaris 64
elongatula 200
hygrobia 127
hygrotopora 2
luridipennis 29
terminalis 11
gyllenhali 78
melanocera 765
malleus 153
volans 30
palustris 155
debilis 82
britteni 135
ripicola 1
fallaciosa 41
talpa 131
amicula 301
spatuloides 2
inquinula 21
excelsa 15
subtilis 267
nesslingi 9
liliputana 1
boreella 6
zosterae 74
nigra 124
dadopora 61
canescens 52
sordidula 243
celata 110
myrmecobia 335
laticollis 145
clientula 25
orphana 19
orbata 110
fungi 1674
lateralis 135
sodalis 532
gagatina 163
pallidicornis 17
trinotata 220
sparreschneideri 1
subglabra 1
macrocera 188
puncticollis 1
* longicornis 477
cribripennis 15
subsinuata 140
dwinensis 8
munsteri 4
islandica 68
eremita 20
fusca 20
latifemorata 1
nigripes 92
livida 125
cinnamoptera 115
picipennis 340
picipennoides 21
lapponica 6
altaica 3
intermedia 46
cauta 49
inchnocera 66
setigera 234
laevana 104
atramentaria 568
hypnorum 56
laevicauda 25
brunneipennis 17
xanthopus 4
graminicola 587
ebenina 3
incognita 19
procera 6
basicornis 13
nidicola 27
allocera 4
oblita 1
autumnalis 7
boletophila 70
diversa 15
strandiella 2
pilicornis 28
boleticola 14
* crassicornis/paracrassicornis 459
euryptera 451
divisa 55
frigida 8
liturata 1
nigricornis 151
harwoodi 90
coriaria 47
dubiosa 45
brunnea 26
nigritula 53
picipes 22
corvina 41
depressicollis 40
occulta 10
monticola 66
excellens 52
vestita 103
Alianta
nigella 4
Dinaraea
angustula 80
aequata 215
linearis 93
arcana 53
Acrotona
sordida 192
exigua 5
sylvicola 69
pygmaea 344
obfuscata 5
muscorum 5
aterrima 411
parvula 237
Coprothassa
melanaria 99
Pachyatheta
mortuorum 2
cribrata 47
Silusa
rubiginosa 2
Anomognathus
cuspidatus 76
Homalota
plana 83

Euaesthetinae
Euaesthetus
bipunctatus 232
ruficapillus 217
laeviusculus 165

PSELAPHIDAE
Bibloporus
bicolor 12
minutus 2
Bibloplectus
tenebrosus 1
spinosus 5
ambiguus 79
Euplectus
nanus 43
piceus 8
decipiens 14
bescidicus 6
sanguineus 36
signatus 210
punctatus 79
karsteni 83
brunneus 1
Trimium
brevicorne 112
Batrisodes
hubenthali 13
adnexus 13
Bythinus
macropalpus 1
Bryaxis
puncticollis 94
bulbifer 198
Tychus
niger 87
Rybaxis
longicornis 172
Brachygluta
* fossulata 259
haematica 18
helferi 22
Trissemus
impressus 11
Pselaphaulax
dresdensis 54
Pselaphus
heisei 129
Tyrus
mucronatus 24
Claviger
testaceus 79

HISTERIDAE
Hister

unicolor 138
striola 157

DRYOPIDAE
Dryops
* auriculatus 133
anglicanus 9
* griseus 138
similaris 121
ernesti 154

HETEROCERIDAE
Heterocerus
flexuosus 108
obsoletus 6
marginatus 78
fenestratus 86
fusculus 234
hispidulus 101
intermedius 51

CUCUJIDAE
Silvanus
bidentatus 45
unidentatus 85
Cucujus
cinnaberinus 10
haematodes 4

CRYPTOPHAGIDAE
Telmatophilus
caricis 123
typhae 167
schoenherri 45
Paramecosoma
melanocephalum 13
Henoticus
serratus 94
californicus 1
Pteryngium
crenatum 56
Cryptophagus
* bimaculatus 174
lindbergorum 37
abietis 277
longitarsis 5
acutangulus 278
angustus 26
fallax 196
badius 386
populi 1
lysholmi 2
plagiatus 1
confertus 24
lapponicus 68
subdepressus 4
instabilis 130
subfumatus 23
pubescens 2
saginatus 466
fuscicornis 5
labilis 1
confusus 4
pseudodentatus 140
distinguendus 235
corticinus 47
scanicus 541
pallidus 14
* pilosus 238
cellaris 21
laticollis 34
* setulosus 75
Emphylus
glaber 50
Antherophagus
nigricornis 65

ENDOMYCHIDAE
Sphaerosoma
pilosum 35
Mycetaea
subterranea 68

COCCINELLIDAE
Chilocorus
bipustulatus 146
renipustulatus 298

CORYLOPHIDAE
Orthoperus
punctulatus 23
atomus 105
brunnipes 49

CISIDAE
Octotemnus
glabriculus 94
mandibularis 13

COLYDIIDAE
Myrmechixenus
subterraneus 120
vaporariorum 5
Orthocerus
clavicornis 102

ANTHICIDAE
Notoxus
monoceros 205
Anthicus
axillaris
ater 299
umbrinus 18
flavipes 229
antherinus 251
* floralis 102
* formicarius 65
gracilis 1
sellatus 83
bimaculatus 66

TENEBRIONIDAE
Scaphidema
metallicum 110

DIPTERA

DROSOPHILIDAE
Drosophila
funebris 1
fenestrarum 77
Scaptomyza
graminum 1
unipunctum 22
* pallida 276

CAMILLIDAE
Camilla
atripes 2
glabra 30
glabrata 7

DIASTATIDAE
Campichoeta
griseola 11
Diastata
fuscula 59
nebulosa 87
unipuncta 12
vagans 13

EPHYDRIDAE
Mosillus
subsultans 19
Allotrichoma
laterale 23
Athyroglossa
glabra 15
Atissa
lisomina 10
Glenanthe
fuscinervis 6
ripicola 1
Discocerina
obscurella 87
Polytrichophora
duplosetosa 1
Ditrichophora
aurifacies 1
aurivillii 9
cinerella 10
plumosa 11
psilopina 9
Discomyza
incurva 5
Psilopa
compta 36
leucostoma 4
marginella 6
nitidula 108
polita 11
pulicaria 92
Trimerina
madizans 26
Notiphila
annulipes 150
aquatica 15
brunnipes 12
cinerea 25
dorsata 23
maculata 1
riparia 34
stagnicola 1
uliginosa 197
sp. 23
Dichaeta
* caudata 160
Hydrellia
albiceps 30
albilabris 22

argyrogenis 5
baltica 21
concolor 9
diadema 10
* flaviceps 56
flavicornis 23
fusca 4
* griseola 205
* incana 21
lapponica 9
nymphaeae 4
obscura 70
pilitarsis 12
Ilythea
spilota 39
Philygria
flavipes 20
nigricauna 31
obtecta 1
posticata 2
sexmaculata 3
Nostima
picta 6
Parydra
aquila 130
coarctata 59
fossarum 46
nubecula 4
pusilla 47
quadripunctata 41
Axysta
* cesta 11
Hyadina
guttata 6
humeralis 2
nitida 45
Pelina
aenea 25
aenescens 18
Eutaenionotum
guttipennis 2
Ochthera
* manicata 2
* mantis 172
Ephydra
macellaria 32
* riparia 72
* scholtzi 39
Setacera
aurata 7
* micans 26
Limnellia
fallax 1
quadrata 34
stenhammari 79
Philotelma
nigripennis 4
Lamproscatella
dichaeta 6
sibilans 122
Scatella
* callosicosta 32
crassicosta 1
lutosa 8
paludum 81
silacea 8
* stagnalis 495
subguttata 32
tenuicosta 68
Scatophila
caviceps 14
contaminata 3
cribrata 17
despecta 2
flavitarsis 2
variegata 20
Coenia
palustris 58
Paracoenia
fumosa 40

HETEROMYZIDAE
Heteromyza
oculata 27
Tephrochlamys
flavipes 35
rufiventris 25
tarsalis 49

FANNIIDAE
Fannia
canicularis 47
difficilis 108
fuscula 11
genualis 2
glaucescens 16
hamata 30
hirticeps 8
hirundinis 2
incisurata 45
limbata 1
lugubrina 5
manicata 66
minutipalpis 6
monilis 5
mutica 9
nodulosa 20
pallitibia 2
parva 5
polychaeta 9
postica 37
pretiosa 1
ringdahlana 6
scalaris 38
serena 54
similis 21
sociella 38
speciosa 2
tuberculata 11

MUSCIDAE
Morellia
hortorum 101
Musca
autumnalis 109
* domestica 48
tempestiva 27

SARCOPHAGIDAE
Sarcophaga
carnaria 245

CALLIPHORIDAE
Pollenia
rudis 374
Phormia
terraenovae 301

HIPPOBOSCIDAE
Melophagus
ovinus 24

HYCTERIBIIDAE
Nycteribia
latreillei 9
Penicillidia
monoceros 6

HELEOMYZIDAE
Oecothea
fenestralis 74
Eccoptomera
infuscata 9
longiseta 3
ornata 27
pallescens 3
Chaetomus
flavotestaceus 19

SPHAEROCERIDAE
Copromyza
notabilis 90
nitida 74
* borealis 101
stercoraria 52
Thoracochaeta
zosterae 28
Limosina
* claviventris 184
clunipes 240
* schmitzi 45
* talparum 177
parvula 48
Leptocera
fontinalis 592

HYMENOPTERA

FORMICIDAE
Ponera
punctatissima 86
Myrmica
rubra 770
ruginodis 535
sulcinodis 86
gallieni 7
rugulosa 34
scabrinodis 140
schencki 98
lobicornis 174
sabuleti 233
Leptothorax
acervorum 753
muscorum 288
tuberum 100
Lasius
fuliginosus 90
niger 1124
alienus 221
flavus 120

HETEROPTERA

CORIXIDAE
Hesperocorixa
linnei 100
sahlbergi 100
Corixa
dentipes 25
Paracorixa

concinna 25
Arctocorisa
carinata 50
Callicorixa
producta 50

HEBRIDAE
Hebrus
pusillus 96
ruficeps 202

DERMAPTERA

LABIIDAE
Labia
minor 155

FORFICULIDAE
Forficula
auricularia 335

BLATTODEA

PSEUDOMOPIDAE
Ectobius
lapponicus 380
silvestris 249
Blattella
germanica 98

BLATTIDAE
Periplaneta
americana 55

DIPLOPODA

BLANIULIDAE
Isobates
varicornis 10

JULIDAE
Julus
terrestris 60
Leptoiulus
minutus 55
Schizophyllum
sabulosum 100
sp. 22

Appendix 2

Host-parasite list of the East Fennoscandian Laboulbeniales. Abbreviations: Σ = total number of investigated host specimens; Σ inf. = total number of infested host specimens; %inf. = frequency of infested host specimens. The figures for Central Europe (in cases when the host taxon is the same in East Fennoscandia) are according to Scheloske (1969). In cases when more than one parasite species occur on a host, the number of infested host specimens are given in brackets for each parasite species. The %inf. for Gyrinidae (Coleoptera) concerns only randomly collected specimens. The figures for *Patrobus atrorufus, Agonum viduum* and *Gyrinus* spp. are not up to date in comparison with the data given under *Laboulbenia fasciculata, L. flagellata* and *L. fennica* respectively in section 8.3.

Host species	Σ	Σinf.	%inf.	%inf. in Central Europe	Parasite species
COLEOPTERA					
CARABIDAE	62713	687	1.1%	33.2%	
Nebriini	1597	3	0.2%	21.0%	
Leistus					
ferrugineus (Linnaeus)	268	3	1.1%	28.6%	Laboulbenia leisti
Notiophilini	1884	15	0.8%	1.4%	
Notiophilus					
germinyi Fauvel	426	2	0.5%		Laboulbenia notiophili
biguttatus (Fabricius)	379	13	3.4%	0	Laboulbenia notiophili
Elaphrini	2174	19	0.9%	0	
Elaphrus					
cupreus Duftschmid	665	19	2.9%	0	
Scaritini	4714	122	2.6%	59.4%	
Clivina					
fossor (Linnaeus)	595	38	6.4%	67.9%	Laboulbenia clivinalis
Dyschirius					
thoracicus (Rossi)	1082	5	0.5%		Laboulbenia pedicellata
politus (Dejean)	94	1	1.1%		Misgomyces dyschirii
septentrionum Munster	383	11	2.9%		Misgomyces dyschirii
					(8) Misgomyces dyschirii
					(3) Laboulbenia pedicellata
globosus (Herbst)	1521	67	4.4%	58.2%	(60) Laboulbenia pedicellata
					(13) Misgomyces dyschirii
Patrobini	1772	106	5.9%	66.5%	
Patrobus					
septentrionis Dejean	655	3	0.5%		(1) Laboulbenia fasciculata
					(1) Laboulbenia pseudomasei
					(1) Laboulbenia flagellata
australis J. Sahlberg	44	7	15.9%		Laboulbenia fasciculata
assimilis Chaudoir	692	9	1.3%		(7) Laboulbenia fasciculata
					(2) Laboulbenia pseudomasei
atrorufus (Ström)	381	87	22.8%	66.5%	Laboulbenia fasciculata
Trechini	1619	3	0.2%	1.7%	
Trechus					
secalis (Paykull)	648	1	0.2%	2.1%	Laboulbenia polyphaga
rubens (Fabricius)	311	2	0.6%		Laboulbenia vulgaris
Bembidiini	15155	135	0.9%	19.3%	
Bembidion					
biguttatum (Fabricius)	169	1	0.6%	28.6%	Laboulbenia vulgaris
mannerheimi Sahlberg	439	7	1.6%		Laboulbenia vulgaris
guttula (Fabricius)	720	8	1.0%	31.3%	Laboulbenia vulgaris
difficile (Motschulsky)	288	4	1.4%		Laboulbenia vulgaris
hasti Sahlberg	334	12	3.6%		(7) Laboulbenia hastiana n.sp.
					(5) Laboulbenia vulgaris
bruxellense Wesmaël	1748	30	1.7%	43.8%	Laboulbenia vulgaris
tetracolum Say	309	13	4.2%		Laboulbenia vulgaris
andreae (Fabricius)					
ssp. polonicum Müller	219	3	1.4%		Laboulbenia vulgaris
saxatile Gyllenhal	453	12	2.7%		Laboulbenia vulgaris
ruficolle (Panzer)	134	1	0.8%		Laboulbenia pedicellata
dentellum (Thunberg)	345	6	1.7%		(5) Laboulbenia vulgaris
					(1) Laboulbenia curtipes
varium (Olivier)	46	3	6.5%	5.6%	Laboulbenia curtipes
obliquum Sturm	1186	19	1.6%	1.8%	Laboulbenia curtipes
semipunctatum Donovan	238	6	2.5%		(3) Laboulbenia curtipes
					(3) Laboulbenia pedicellata

Host species	Σ	Σinf.	%inf.	%inf. in Central Europe		Parasite species
quadrimaculatum (Linnaeus)	1000	2	0.2%	0		Laboulbenia pedicellata
gilvipes Sturm	466	2	0.4%			Laboulbenia pedicellata
assimile Gyllenhal	38	2	5.3%	80.0%		Laboulbenia vulgaris
transparens (Gebler)	216	1	0.5%			Laboulbenia murmanica n.sp.
doris (Panzer)	1004	3	0.3%		(2)	Laboulbenia carelica n.sp.
					(1)	Laboulbenia pedicellata
articulatum (Panzer)	291	1	0.3%	8.8%		Laboulbenia pedicellata
Pterostichini	19537	84	0.4%	36.8%		
Pterostichus						
nigrita (Paykull)	792	14	1.8%	26.2%		Laboulbenia argutoris
minor (Gyllenhal)	521	4	0.8%	53.4%		Laboulbenia argutoris
strenuus (Panzer)	838	3	0.4%	41.2%		Laboulbenia argutoris
diligens (Sturm)	1228	27	2.2%	17.9%	(26)	Laboulbenia argutoris
					(1)	Laboulbenia kajanensis n.sp.
Calathus						
erratus (Sahlberg)	653	1	0.2%	7.7%		Laboulbenia polyphaga
melanocephalus (Linnaeus)	1166	9	0.8%	25.4%		Laboulbenia polyphaga
micropterus (Duftschmid)	1159	2	0.2%	0		Laboulbenia polyphaga
Agonum						
quadripunctatum (Degeer)	302	2	0.7%			Eucantharomyces fennoscandicus n.sp.
fuliginosum (Panzer)	847	3	0.1%	46.2%		Laboulbenia flagellata
gracile (Gyllenhal)	749	2	0.3%	44.4%		Laboulbenia flagellata
thorey Dejean	449	4	0.9%	0		Laboulbenia flagellata
marginatum (Linnaeus)	216	1	0.5%	31.3%		Laboulbenia flagellata
dolens (Sahlberg)	291	1	0.3%			Laboulbenia flagellata
versutum Sturm	338	1	0.3%			Laboulbenia flagellata
viduum (Panzer)	740	5	0.7%	5.1%		Laboulbenia flagellata
dorsale (Pontoppidan)	97	5	5.2%	63.6%		Laboulbenia flagellata
Harpalini	7442	171	2.3%	15.7%		
Harpalus						
affinis (Schrank)	1159	23	2.0%	16.8%	(15)	Laboulbenia compressa
					(14)	Laboulbenia filifera
latus (Linnaeus)	780	2	0.3%		(1)	Laboulbenia compressa
					(1)	Laboulbenia ophoni
luteicornis (Duftschmid)	171	2	1.2%			Laboulbenia ophoni
xanthopus Gemminger & Harold ssp. winkleri Schauberger	37	1	2.7%		(1)	Laboulbenia compressa
					(1)	Laboulbenia ophoni
tardus (Panzer)	464	4	0.9%		(2)	Laboulbenia compressa
					(2)	Laboulbenia ophoni
Dicheirotrichus						
rufithorax (Sahlberg)	189	27	14.3%			Laboulbenia giardii
Trichocellus						
placidus (Gyllenhal)	741	53	7.2%			Laboulbenia bradycelli
Bradycellus						
ruficollis (Stephens)	101	4	4.0%			Laboulbenia polyphaga
caucasicus Chaudoir	461	54	11.7%			Laboulbenia polyphaga
Acapalpus						
flavicollis (Sturm)	146	1	0.7%	36.0%		Laboulbenia polyphaga
Perigonini	11	1	9.1%			
Perigona						
nigriceps (Dejean)	11	1	9.1%			Laboulbenia manubriolata
Oodini	299	9	3.0%			
Oodes						
helopioides (Fabricius)	299	9	3.0%			Laboulbenia oodiphila
Lebiini	3960	20	0.5%	7.7%		
Dromius						
linearis (Olivier)	181	1	0.6%	0		Laboulbenia pulchella
Syntomus						
truncatellus (Linnaeus)	684	19	2.8%	26.3%		Laboulbenia metableti
HALIPLIDAE	4972	9	0.2%	31.1%		
Haliplus						
lineolatus Mannerheim	506	5	1.0%			Hydraeomyces halipli
fulvicollis Erichson	19	1	5.3%			Hydraeomyces halipli
ssp. fulvus (Fabricius)	260	1	0.4%	40.5%		Hydraeomyces halipli
ssp. lapponum Thomson	333	2	0.3%			Hydraeomyces halipli
DYTISCIDAE	6765	5	0.1%	10.2%		

Host species	Σ	Σinf.	%inf.	%inf. in Central Europe	Parasite species
Laccophilus					
minutus (Linnaeus)	100	3	3.0%	16.9%	(2) Chitonomyces melanurus
					(1) Chitonomyces paradoxus
Hygrotus					
inaequalis (Fabricius)	720	2	0.3%	26.6%	Chitonomyces bidessarius
GYRINIDAE	7869	766	(0.9%)	0	
Gyrinus					
marinus Gyllenhal	550	21		0	Laboulbenia fennica n.sp.
aeratus Stephens	3522	657			Laboulbenia fennica n.sp.
pullatus Zaitzev	977	3			Laboulbenia fennica n.sp.
distinctus Aubé	443	19			Laboulbenia fennica n.sp.
natator (Linnaeus)	256	2			Laboulbenia fennica n.sp.
paykulli Ochs	207	1			Laboulbenia fennica n.sp.
substriatus Stephens	364	2			Laboulbenia fennica n.sp.
minutus Fabricius	803	61		0	Laboulbenia fennica n.sp.
HYDRAENIDAE	1143	3	0.3%	0	
Ochthebius					
minimus (Fabricius)	266	3	1.1%		Hydrophilomyces arcuatus n.sp.
PTILIIDAE	2902	2	0.1%	6.2%	
Ptenidium					
laevigatum Erichson	36	1	2.8%		Siemaszkoa fennica n.sp.
Acrotrichis					
sp. (♀)		1		(6.5%)	Ecteinomyces trichopterophilus
LEIODIDAE	1443	1	0.1%		
Cyrtusa					
subtestacea (Gyllenhal)	38	1	2.6%		Ecteinomyces agathidii
CATOPIDAE	1987	39	2.0%	15.7%	
Ptomaphagus					
subvillosus (Goeze)	28	2	7.1%		Corethromyes niger
Choleva					
septentrionis Jeannel	61	1	1.6%		Corethromyces henrotii
Sciodrepoides					
watsoni (Spence)	617	9	1.5%	19.6%	Asaphomyces tubanticus
Catops					
alpinus Gyllenhal	120	2	1.7%		Asaphomyces tubanticus
nigrita Erichson	392	17	4.3%		Asaphomyces tubanticus
fuscus (Panzer)	190	6	3.2%		Asaphomyces tubanticus
fuliginosus Erichson	14	1	7.1%		Asaphomyces tubanticus
nigricans (Spence)	56	1	1.8%		Asaphomyces tubanticus
SCAPHIDIIDAE					
Scaphisoma					
agaricinum (Linnaeus)	240	3	1.3%		Rickia peyerimhoffii
inopinatum Löbl	67	1	1.5%		Rickia peyerimhoffii
STAPHYLINIDAE	40193	297	0.7%	12.3%	
Staphylininae	11580	169	1.5%	3.8%	
Erichsonius					
cinerascens (Gravenhorst)	355	10	2.8%	60.0%	(5) Teratomyces brevicaulis
					(5) Diplomyces clavifer
Philonthus					
discoideus (Gravenhorst)	41	4	9.8%		Dichomyces furcifer
ventralis (Gravenhorst)	109	7	6.4%		Dichomyces hybridus
rigidicornis (Gravenhorst)	167	3	1.8%		Rhachomyces philonthinus
puella Nordmann	158	1	0.6%		Dichomyces furcifer
subuliformis (Gravenhorst)	7	1	14.3%		Dichomyces vulgatus
cephalotes (Gravenhorst)	447	5	1.1%		(4) Dichomyces vulgatus
					(1) Dichomyces princeps
cruentatus (Gmelin)	138	1	0.7%		Rhachomyces philonthinus
albipes (Gravenhorst)	291	9	3.1%		(4) Rhachomyces philonthinus
					(6) Dichomyces furcifer
					(1) Dichomyces furcifer subsp. subarcticus n.subsp.
debilis (Gravenhorst)	312	68	21.5%	7.7%	Dichomyces nigrescens
umbratilis (Gravenhorst)	241	4	1.7%		(3) Dichomyces biformis
					(1) Dichomyces vulgatus
longicornis Stephens	56	5	8.9%		(5) Dichomyces vulgatus
					(1) Rhachomyces philonthinus
micans (Gravenhorst)	292	10	2.9%		Rhachomyces philonthinus
rubripennis Stephens	151	5	3.3%	15.8%	Rhachomyces philonthinus

Host species	Σ	Σinf.	%inf.	%inf. in Central Europe	Parasite species
Gabrius					
trossulus (Nordmann)	708	1	0.1%	(1.8%)	Teratomyces philonthi
Quedius					
mesomelinus (Marsham)	280	23	8.3%	10.7%	Symplectromyces vulgaris
cinctus (Paykull)	91	2	2.2%		Symplectromyces vulgaris
fuliginosus (Gravenhorst)	41	6	4.3%	1.0%	Symplectromyces rarus n.sp.
limbatus (Heer)	173	2	1.2%		Symplectromyces vulgaris
fulvicollis (Stephens)	192	1	0.5%		Symplectromyces vulgaris
boops (Gravenhorst)	244	1	0.4%		Symplectromyces lapponicus n.sp.
Xantholininae	458	3	0.7%	4.8%	
Othius					
punctulatus (Goeze)	85	2	2.4%	(100%)	Rhachomyces furcatus
lapidicola Kiesenwetter	191	1	0.5%		Rhachomyces furcatus
Paederinae	4170	4	0.1%	38.5%	
Rugilus					
similis (Erichson)	40	1	2.5%		Laboulbenia stilicicola
Lathrobium					
longulum Gravenhorst	216	3	1.4%	13.8%	Euzodiomyces lathrobii
Omaliinae	673	2	0.3%	0	
Micralymma					
marinum (Ström)	14	2	14.3%		Rickia hyperborea
Oxytelinae	5894	96	1.6%	35.6%	
Carpelimus					
corticinus (Gravenhorst)	289	2	0.7%	(7.9%)	Cantharomyces orientalis
elonngatus (Erichson)	105	2	1.9%		Cantharomyces orientalis
Aploderus					
caesus (Erichson)	2	1	50.%		Cantharomyces aploderi n.sp.
Oxytelus					
fulvipes Erichson	160	7	4.4%		Monoicomyces oxytelis n.sp.
piceus (Linnaeus)	18	2	11.1%		Monoicomyces sanctae-helenae
laqueatus (Marsham)	591	55	9.3%		Monoicomyces furcatus
Anotylus					
insecatus (Gravenhorst)	14	1	7.1%		Peyritschiella protea
rugosus (Fabricius)	724	11	1.5%	65.5%	Peyritschiella protea
nitidulus (Gravenhorst)	479	1	0.2%		Peyritschiella protea
Platystethus					
arenarius (Fourcroy)	427	1	0.2%	0	Monoicomyces invisibilis
Bledius					
diota Schiödte	37	3	8.1%		Haplomyces texanus
kutsae Kangas	4	1	25.0%		Haplomyces texanus
arcticus J. Sahlberg	60	1	1.7%		Haplomyces texanus
filipes Sharp	15	1	6.7%		Haplomyces texanus
poppiusi Bernhauer	59	1	1.7%		Haplomyces texanus
vilis Mäklin	88	1	1.1%		Haplomyces texanus
longulus Erichson	65	1	1.5%		Haplomyces texanus
opacus (Block)	38	1	2.6%		Haplomyces texanus
gallicus (Gravenhorst)	129	2	1.6%		Haplomyces texanus
pallipes (Gravenhorst)	35	1	2.9%		Haplomyces texanus
Aleocharinae	16532	24(25)	0.1%		
Atheta					
longicornis (Gravenhorst)	477	18(19)	3.8%		(18) Monoicomyces britannicus (1) Amphoromorpha sp. x)
paracrassicornis Brundin	(459) xx)	6	(1.7%) xx)		Monoicomyces homalotae
PSELAPHIDAE	1765	12	0.7%	9.5%	
Brachygluta					
fossulata (Reichenbach)	259	12	4.6%	26.7%	Peyerimhoffiella elegans
DRYOPIDAE	535	7	1.3%	7.0%	
Dryops					
auriculatus (Fourcroy)	113	1	0.9%		Helodiomyces elegans
griseus (Erichson	138	6	4.4%		Cantharomyces italicus
CRYPTOPHAGIDAE	4069	7	0.2%	0	
Cryptophagus					
bimaculatus (Panzer)	174	1	0.6%		Autophagomyces falcatus
pilosus Gyllenhal	238	4	1.7%		Autophagomyces falcatus
setulosus Sturm	75	2	2.7%		Autophagomyces falcatus

x) Belongs to Gloeohaustoriales (Deuteromycetes), see section 8.4.1.
xx) The figures for Σ and %inf. concerns A. crassicornis/paracrassicornis.

Host species	Σ	Σinf.	%inf.	%inf. in Central Europe	Parasite species
ANTHICIDAE	1317	3	0.2%		
Anthicus					
floralis (Linnaeus)	102	2	2.0%		Dioicomyces anthici
formicarius (Goeze)	65	1	1.5%		Dioicomyces anthici
DIPTERA					
DROSOPHILIDAE	377	6	1.6%		
Scaptomyza					
pallida (Zetterstedt)	276	6	2.2%		Stigmatomyces scaptomyzae
EPHYDRIDAE	3646	35	1.0%		
Notiophilinae					
Dichaeta					
caudata (Fallén)	188	1	0.5%		Stigmatomyces dichaetae n.sp.
Hydrellia					
flaviceps (Meigen)	56	2	3.6%		Stigmatomyces hydrelliae
griseola (Fallén)	205	14	6.8%		Stigmatomyces hydrelliae
incana Stenhammar	21	2	9.5%		Stigmatomyces hydrelliae
Parydrinae					
Axysta					
cesta (Haliday)	11	1	9.1%		Stigmatomyces axystae n.sp.
Ochthera					
manicata (Fabricius)	2	1	50.0%		Stigmatomyces manicatae n.sp.
mantis (Degeer)	172	8	4.7%		Stigmatomyces mantis n.sp.
Ephydrinae					
Ephydra					
riparia Fallén	72	2	2.9%		Stigmatomyces ephydrae
scholtzi Becker	39	1	2.6%		Stigmatomyces bottnica n.sp.
Setacera					
micans (Haliday)	26	1	3.9%		Stigmatomyces setacerae n.sp.
Scatella					
callosicosta Bezzi	32	1	3.1%		Stigmatomyces purpureus
stagnalis (Fallén)	495	1	0.2%		Stigmatomyces purpureus
MUSCIDAE	285	2	0.7%		
Musca					
domestica Linnaeus	48	2	4.2%		Stigmatomyces baeri
SPHAEROCERIDAE	1631	20	1.2%		
Copromyzinae					
Copromyza					
borealis Zetterstedt	101	1	1.0%		Fanniomyces copromyzae n.sp.
Leptocerinae					
Limosina					
claviventris Strobl	184	3	1.6%		Stigmatomyces chthonicus n.sp.
schmitzi Duda	45	5	11.1%		Stigmatomyces hackmanii n.sp.
talparum Richards	177	11	6.2%		Stigmatomyces subterraneus n.sp.

Appendix 3

Parasite-host list of the East Fennoscandian Laboulbeniales (including Gloeohaustoriales). Parasite species as well as host species in alphabetical order. Occurrence of the parasite in the separate regions indicated for each host species. Abbreviations: F = Finland, L = Leningrad Region, K = Karelian A.S.S.R., M = Murmansk Region, A = Archangel Region (Solovetsk Islands). A few other records given in brackets.

Amphoromorpha sp.
(Gloeohaustroriales)
Atheta longicornis F
Asaphomyces tubanticus
Catops alpinus F K
Catops fuliginosus L
Catops fuscus F
Catops nigricans F
Catops nigrita F
Sciodrepoides watsoni F
Autophagomyces falcatus
Cryptophagus bimaculatus F
Cryptophagus pilosus F
Cryptophagus setulosus F
Cantharomyces aploderi n.sp.
Aploderus caesus K
Cantharomyces italicus
Dryops griseus F M
Cantharomyces orientalis
Carpelimus corticinus K
Carpelimus elongatulus F
Chitonomyces bidessarius
Hygrotus inaequalis F
Chitonomyces melanurus
Laccophilus minutus F
Chitonomyces paradoxus
Laccophilus minutus F
Corethromyces henrotii
Choleva septentrionis F
Corethromyces niger
Ptomaphagus subvillosus F L
Dichomyces biformis
Philonthus umbratilis M
Dichomyces furcifer
Philonthus albipes F
Philonthus discoideus F
Philonthus puella F
D. furcifer subsp. **subarcticus** n. subsp.
Philonthus albipes M
Dichomyces hybridus
Philonthus debilis F
Philonthus ventralis F
Dichomyces nigrescens
Philonthus debilis F L K M
Dichomyces princeps
Philonthus cephalotes F
Dichomyces vulgatus
Philonthus cephalotes F L
Philonthus fuscus L
Philonthus longicornis F L
Philonthus umbratilis F
Dioicomyces anthici
Anthicus floralis F
Anthicus formicarius F
Diplomyces clavifer
Erichsonius cinerascens F
(+ Sweden)
Ecteinomyces agathidii
Cyrtusa subtestacea K
Ecteinomyces trichopterophilus
Acrotrichis sp. F
Eucantharomyces fennoscandicus n.sp.
Agonum quadripunctatum F K
Euzodiomyces lathrobii
Lathrobium longulum F
Fanniomyces copromyzae n.sp.
Copromyza borealis F
Haplomyces texanus
Bledius arcticus M
Bledius diota F
Bledius filipes M
Bledius gallicus F
Bledius kutsae M
Bledius longulus L
Bledius opacus L
Bledius pallipes L
Bledius poppiusi F
Bledius vilis M
Helodiomyces elegans
Dryops auriculatus F
Hydraeomyes halipli
Haliplus fulvicollis F
Haliplus fulvus fulvus F
Haliplus fulvus lapponum F
Haliplus lineolatus L
Hydrophilomyces arcuatus n.sp.
Ochthebius minimus F
Laboulbenia argutoris
Pterostichus diligens F L K
Laboulbenia bradycelli
Trichocellus placidus F K M
Laboulbenia carelica n.sp.
Bembidion doris L K
Laboulbenia clivinalis
Clivina fossor F L M
Laboulbenia compressa
Harpalus affinis F L K
Harpalus latus F
Harpalus tardus F L
Harplaus xanthopus F
Laboulbenia curtipes
Bembidion dentellum F
Bembidion obliquum F L
Bembidion semipunctatum L
Bembidion varium F
Laboulbenia elaphri
Elaphrus cupreus F
Laboulbenia fasciculata
Patrobus assimilis F
Patrobus atrorufus F L K
Patrobus australis F K
Patrobus septentrionis F
Laboulbenia fennica n.sp.
Gyrinus aeratus F
Gyrinus distinctus F
Gyrinus marinus F
Gyrinus minutus F
Gyrinus natator F
Gyrinus paykulli F
Gyrinus pullatus F
Gyrinus substriatus F
Laboulbenia filifera
Harpalus affinis F L
Laboulbenia flagellata
Agonum dolens F
Agonum dorsale F
Agonum fuliginosum F
Agonum gracile F
Agonum marginatum L
Agonum quadripunctatum F
Agonum thorey F
Agonum versutum F
Agonum viduum F
Agonum septentrionis F
Laboulbenia giardii
Dicheirotrichus rufithorax F K
(Laboulbenia gyrinicola)
Gyrinus substriatus (Sweden, CSR)
Laboulbenia hastiana n.sp.
Bembidion hasti F
Laboulbenia kajanensis n.sp.
Pterostichus diligens F
Laboulbenia leisti
Leistus ferrugineus F
Laboulbenia manubriolata
Perigona nigriceps F
Laboulbenia metableti
Syntomus truncatellus F L K
Laboulbenia murmanica n.sp.
Bembidion transparens M
Laboulbenia notiophili
Notiophilus biguttatum F
Notiophilus germinyi F
Laboulbenia oodiphila n.sp.
Oodes helopioides F
Laboulbenia ophoni
Harpalus latus L
Harpalus luteicornis F L
Harpalus tardus F L
Harpalus xanthopus winkleri F
Laboulbenia pedicellata
Bembidion articulatum F
Bembidion doris F
Bembidion gilvipes F
Bembidion quadrimaculatum F
Bembidion ruficolle L
Bembidion semipunctatum L
Dyschirius arenosus L
Dyschirius globosus F L K A
Dyschirius septentrionum F L

Laboulbenia polyphaga
Acupalpus flavicollis F
Bradycellus caucasicus F L K
Bradycellus ruficollis F
Calathus erratus F
Calathus melanocephalus F
Calathus micropterus F
Laboulbenia pseudomasei
Patrobus assimilis K
Patrobus septentrionis F
Pterostichus minor F
Pterostichus nigrita F
Pterostichus strenuus F
Laboulbenia pterostichi
Harpalus nigritarsis F
(according to Siemaszko & Siemaszko 1928)
Laboulbenia pulchella
Dromius linearis F
Laboulbenia stilicicola
Rugilus similis F
Laboulbenia vulgaris
Bembidion assimile F
Bembidion biguttatum F
Bembidion bruxellense F L K
Bembidion dentellum F
Bembidion difficile M
Bembidion guttula F
Bembidion hasti M
Bembidion saxatile F
Bembidion tetracolum F
Bembidion unicolor F L
Trechus rubens F M
Misgomyces dyschirii
Dyschirius globosus F
Dyschirius politus F
Dyschirius septentrionum L
Monoicomyces britannicus
Atheta longicornis F L K
Monoicomyces furcatus
Oxytelus laqueatus F L K M
Monoicomyces homolotae
Atheta paracrassicornis F
Monoicomyces invisibilis
Platystethus arenarius F
Monoicomyces oxytelis n.sp.
Oxytelus fulvipes F
Monoicomyces sanctae-helenae
Oxytelus piceus
(+ Novosibirsk) F L
Peyerimhoffiella elegans
Brachygluta fossulata F
Peyritschiella protea
Anotylus insecatus F
Anotylus nitidulus F
Anotylus rugosus F L K
Rhachomyces furcatus
Othius lapidicola F
Othius punctulatus F K
Rhachomyces philonthinus
Philonthus albipes F
Philonthus cruentatus F
Philonthus fimetarius K
Philonthus fulvipes F K
Philonthus longicornis L
Philonthus micans F K
Rickia hyperborea
Micralymma marinum M
Rickia peyerimhoffii
Scaphisoma agaricinum F L
Scaphisoma inopinatum F
Siemaszkoa fennica n.sp.
Ptenidium laevigatum F
Stigmatomyces axystae n.sp.
Axysta cesta F
Stigmatomyces baeri
Musca domestica F
Stigmatomyces bottnica n.sp.
Ephydra scholtzi F
Stigmatomyces chthonicus n.sp.
Limosina claviventris F
Stigmatomyces dichaetae n.sp.
Dichaeta caudata F
Stigmatomyces ephydrae
Ephydra riparia F K
Stigmatomyces hackmanii n.sp.
Limosina schmitzi F
Stigmatomyces hydrelliae
Hydrellia flaviceps F
Hydrellia griseola F K
Hydrellia incana F
Stigmatomyces manicatae n.sp.
Ochthera manicata F
Stigmatomyces mantis n.sp.
Ochthera mantis F
Stigmatomyces purpureus
Scatella callosicosta F
Scatella stagnalis F
Stigmatomyces scaptomyzae
Scaptomyza pallida F
Stigmatomyces setacerae n.sp.
Setacera micans F
Stigmatomyces subterraneus n.sp.
Limosina talparum F
Symplectromyces lapponicus n.sp.
Quedius boops F
Symplectromyces rarus n.sp.
Quedius fuliginosus F
Symplectromyces vulgaris
Quedius cinctus F
Quedius fulvicollis M
Quedius limbatus F
Quedius mesomelinus F L M
Teratomyces brevicaulis
Erichsonius cinerascens F K
Teratomyces philonthi
Gabrius trossulus F