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A PRELIMINARY RED DATA LIST OF MACROFUNGI IN THE NETHERLANDS

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An enumeration is presented of species of macrofungi considered to be threatened in the Netherlands. The list comprises 944 species, including 91 (presumably) extinct species and 182 species which are directly threatened with extinction. In addition for each species information is given on preferential habitat, substrate, if possible the associated organisms, way of habitat exploitation, estimated frequency before 1950 and after 1970 and presence in Red Data Lists of other European countries. The criteria used for placing a species on the Red Data List are briefly discussed. Some statistical data are presented on the proportional contribution of various taxonomic and ecological groups to the list. The most important causes for the decrease of threatened macrofungi are concisely discussed and some measures for conservation of macrofungi are recommended.

1. INTRODUCTION

In the framework of an expected revision of the national law on nature conservation, the Nature Conservation Council in the Netherlands intended to make an inventory of problems concerning conservation of lower plants (bryophytes, lichens and algae) and fungi. Lists of threatened species will possibly be included in the new law. For the preparation of these lists and accompanying texts an ad hoc working group of experts was appointed in 1985, in which the present author participated and proposed the text on fungi. The results were published as proposals to the Minister of Agriculture in 1986 (Natuurbeschermingsraad, 1986) and included a list of 406 selected threatened fungi (see also Kuyper, 1987). The list is not available in any easily accessible publication, which is considered undesirable, in particular since the national and international interest in such lists has strongly increased.

In recent years several national and regional lists of threatened fungi have been published. The European Committee for the Protection of Fungi held its first meeting in Lodz (Poland) in 1988, on which Red Data Lists were extensively discussed (Jansen, 1989). It was planned to draw up a European list of threatened fungi. For such an attempt data from many countries are necessary.

The present list comprises 944 species, over twice as many as in the first informal edition. This difference in number of admitted species is mainly caused by the different purpose of the two lists. In the first one no attempt was made to give a complete enumeration of threatened species, but merely a good number of well-known species were listed. The categories of (possibly) extinct species and potentially threatened species (§ 5) were almost completely neglected and only part of the very rare species were included.

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In view of the purposes of a Red Data List, in particular the evaluation of the mycological importance of certain areas (§ 2), a complete enumeration of threatened species is considered to be useful. However, also this list has a preliminary character since distributional and ecological data on many species are still far from being complete, especially in taxonomic groups with more inconspicuous sporocarps, e.g. many Ascomycetes and corticioid Aphyllophorales (§ 6.1). However, it is likely that the number of threatened species is sooner considerably larger than smaller, compared with the present list.

The list is based on a variety of mycocoenological (e.g. Barkman, 1987), mycogeographical (e.g. Arnolds, 1985; Arnolds & al., 1987) and floristical data (e.g. Arnolds, 1984), as well as the field experience of a number of mycologists, in particular Dr. C. Bas (Leiden), Drs. P.J. Keizer (Wijster), Dr. Th.W. Kuyper (Wijster), Ir. M. Veerkamp (Werkhoven), Drs. E.C. Vellinga (Leiden) and B. de Vries (Wijster) who studied this list critically. Data on possibly extinct species were also based on distributional data of the Working Group for mapping of macrofungi in the Netherlands (Rijksinstituut voor Natuurbeheer en Biogeografisch Informatie Centrum, Arnhem).

2. Aims of the presentation of a Red Data List of macrofungi

The presented list is intended to serve six main goals:

(1) To provide information for professional and amateur *mycologists* on the status of macrofungal species in order to draw their special attention to threatened species and to areas where many of such species are present.
(2) To provide information for *nature conservationists* and *environmental planners* to facilitate the interpretation of mycological data for the planological protection of certain areas or the acquisition as nature reserves, as well as for the evaluation of management.
(3) To provide information for *decision makers* and *politicians* to enable them to estimate the threats to macrofungi and to develop measures and laws to prevent further decline or improve the situation.
(4) To provide basic data for the selection of species for *monitoring* programs.
(5) To provide basic data for the selection of species for possible *protection by law*.
(6) To enable comparison of the list for the Netherlands with other lists in order to estimate the *international status* of the included species.

3. Nomenclature and taxonomy

Only for the sake of consistency and comparability the nomenclature in this list is in agreement with Arnolds (1984). The names in that publication are based on various reference works for different taxonomic groups. Therefore these names are not always in agreement with present nomenclatural rules (Voss & al., 1983) and with modern revisions and monographs.

Species concepts are also in agreement with Arnolds (1984), but doubtful species and species names which have appeared to be synonyms are not considered. Infraspecific taxa are not included. Applied species concepts are sometimes deviating from modern concepts as developed in agaricology in the Netherlands (Kuyper, 1988). Taxonomic knowledge of many groups is still very insufficient. This explains for instance why the percentage of listed species in *Entoloma*, of which a modern revision is available (Noordeloos, 1988), is much higher than in *Cortinarius*, of which such a revision is lacking. In reality the proportion of threatened species is probably higher in the latter genus.

4. CRITERIA FOR SELECTION OF SPECIES ON THE LIST

4.1. Rarity.

Species that are found in only few localities are in principle threatened, since local disturbance can easily lead to local or regional extinction. This is true for species from all habitats. However, in the present list most species from strongly synanthropic habitats (gardens, ruderal sites) and very ephemeral substrates (dung, compost piles, burnt wood, twigs) are omitted since the causes of their rarity are not understood and measures for their conservation are usually impossible. However some species of ephemeral substrates were included, because they meet at the same time one of the other criteria, namely a strong decrease or dependence on a threatened habitat. Examples are *Poronia punctata* and *Anellaria semiovata*, which have decreased and are dependent on excrements in permanent, poor pastures, and *Pustularia rosea*, occurring on burnt places in peat bogs. It is quite possible that many comparable examples are hidden among the remaining rare species, which were not included in the list.

Species which are very rare in semi-natural or natural habitats and do not meet any of the other criteria, are generally included in the category of potentially threatened species (§ 5).

4.2. Change in frequency.

The most important direct criterion in order to consider a species as threatened is the decline of the number of its localities or a strong reduction of fruiting on its localities. For many species it is difficult or impossible to establish a change in frequency because of (1) lack of older data, e.g. from before 1950; (2) incompleteness of more recent data; (3) strong fluctuations in fruiting due to weather conditions; (4) short duration of carpophores of most species; (5) changes in taxonomic concepts and nomenclature in the course of time (for a more extensive discussion, see Winterhoff & Krieglsteiner, 1984; Arnolds, 1985). Nevertheless some methods for comparison of frequency in past and present have been applied successfully in the Netherlands (Arnolds, 1985, 1988) and the results are one of the important sources for the present list. In the present list the frequency of all species in the Netherlands is indicated before 1950 and since 1970. These data are in part based on exact data, in part only rough estimations, and may differ from the distributional data presented by Arnolds (1984), due to improved knowledge. A number of species was unkown before 1970, due to taxonomic confusion or neglect. Their frequency in the period before 1950 is indicated with '?'.

The decrease of a species may ultimately lead to its complete extinction in a region or country. For the reasons mentioned above it is equally difficult to determine whether a fungus has really become extinct or is only hidden due to long term fluctuations or overlooking by mycologists. In the present list a species is classified as (probably) extinct when no records are known since 1970. For many other groups of organisms an earlier year is used (in the Netherlands often 1950), but for macrofungi 1970 seems to be more relevant since many species have strongly decreased between 1950 and 1970, and floristic research has increased so much since 1970 that a species not observed since is very likely to have really disappeared or at least has become extremely rare (Jansen & al., 1989).

Neophytes, recently introduced and spreading in the Netherlands, are not considered in this list, although some of them are still rare, e.g. *Mutinus ravenelii* and *Anthurus archeri*.

4.3. Habitat.

Many species of macrofungi occur predominantly in habitats or on substrates, which are generally threatened by a variety of causes (see § 8). Rare species from such habitats are automatically regarded as threatened. Some species which are still rather common but strongly decreasing are also included in the list. Species with a very narrow ecological range are considered as more vulnerable than species with a wider range.

5. Categories of threatened macrofungi

In accordance with Winterhoff (1984) five categories of threatened species are distinguished.

Category 0: (Probably) extinct.
— Species which were not recorded from the Netherlands since 1970, and which have not likely been overlooked.

Category 1: Threatened with extinction.
— Very rare species, restricted to acutely threatened habitats or localities.
— Rare and very rare species which have very strongly decreased in this century.

Category 2: Strongly threatened.
— Rare species, exclusively or predominantly growing in strongly threatened habitats.
— Rare species which have strongly decreased in this century.

Category 3: Threatened.
— Rare to scattered species, exclusively or mainly growing in threatened habitats.
— Uncommon to scattered species which have distinctly decreased during this century.

Category 4: Potentially threatened.
— Rare and very rare species without distinct tendency to decrease and growing in habitats which seem not to be threatened at present.

6. Taxonomic and ecological aspects of threatened fungi

6.1. Number of species in different taxonomic groups.

In all 944 species are included in the preliminary Red Data List, i.e. 28% of all species of macrofungi in the Netherlands, listed by Arnolds (1984) and Arnolds & al. (1989) (Table 8). Among the threatened species 91 (10%) belong to the (presumably) extinct species, 182 (19%) to the species threatened with extinction, 173 (18%) to the strongly threatened species, 245 (25%) to the threatened species and 253 (27%) to the potentially threatened species.

A large majority of species included in the Red Data List belong to the Agaricales: 713 species or 75%. This was to be expected because the Agaricales form the majority (62%) of macrofungi in the Netherlands. However, the highest percentage of threatened species (51%) is found in the Gasteromycetes, mainly due to a large proportion of potentially threatened species (Table 1). The Heterobasidiomycetes are the group with the lowest proportion of threatened species, viz. 3%. The figures for different groups do not only reflect the degree of threat, but are influenced by the state of taxonomic, geographical and ecological knowledge and the proportion of species with prominent sporocarps. The Gasteromycetes comprise mainly well-known genera with large sporocarps. On the other hand, the knowledge of resupinate Aphyllophorales, Heterobasidiomycetes and smaller Ascomycetes is so limited, that only few species were included in the Red Data List. Therefore the numbers for these taxonomic groups have to be considered as minimum values.

The distribution of species over various categories of threat for a number of important genera or groups of related genera is given in Table 2. All larger genera (> 10 species) with a majority of threatened species are listed, and in addition a selection of other larger genera. Very high percentages of threatened species (> 85%) are only found among genera comprising predominantly ectomycorrhizal fungi or grassland saprophytes. High proportions of strongly threatened species (categories 1 and 2) are also encountered in these groups.

The group of (presumably) extinct species is only well-represented in some ectomycorrhizal genera, viz. *Hygrophorus* (38%), hydnaceous fungi (32%), *Suillus* (30%), *Boletus* (17%) and *Tricholoma* (15%). The highest alsolute number of extinct species is found in *Cortinarius*, viz. 14. Some genera of predominantly litter saprophytes in forests have a considerable share of threatened species, viz. *Lepiota* sensu lato (62%) and *Leucoagaricus* (82%). However, the majority of these species belong to the category of potentially threatened species. It is striking that there is not a single genus of predominantly wood-inhabiting fungi among the genera with many threatened species.

The figures in Table 2 are, again, influenced by the state of knowledge on different groups. For instance, the proportion of listed species in the recently revised genus *Entoloma* (Noordeloos, 1988) is considerably higher than in the insufficiently known genus *Cortinarius*. However, in view of their ecology and preferential habitat we may expect a higher share in *Cortinarius*.

6.2. Declining species.

The Red Data List comprises 346 species (37%) which have shown a distinct decrease since ± 1950, including 91 species (10%) which are considered as extinct. For the other species the available data are insufficient to establish a possible decrease or they have always been rare. The decline is estimated as very severe for 72 species (8% of listed number), i.e. at least two frequency classes, for instance from very rare to rather rare, or from common to rather rare. The 9 species with the strongest decline (3 or 4 frequency classes) are *Sarcodon imbricatus* (CC → RRR), *Bankera fuligineo-alba*, *Lactarius piperatus*, *Phellodon tomentosus*, and *Sistotrema confluens* (all R → extinct), *Coltricia perennis* (CCC → R), *Cortinarius bolaris*, *Hydnellum concrescens* (CC → RR), and *Phellodon melaleucus* (C → RRR). Six of these species belong to the hydnaceous fungi.

On the other hand, a number of species have increased or recently become established in the Netherlands. Examples were given by Arnolds (1985, 1988). These species are in general not considered as threatened and therefore not included in the Red Data List. An exception was made for some very rare, recently discovered species with striking sporocarps which are not likely to have been overlooked in the past, for instance *Agaricus geesterani, Entoloma moserianum*, and *Pisolithus tinctorius*.

6.3. Number of threatened species in different functional groups.

Almost half of the species (458 or 49%) mentioned in the Red Data List belong to the terrestrial saprophytes, taken here in a broad sense, including species on herbaceous stems, mosses, rotten fungi (7 species), dung (3 species), etc. The second largest group comprise the ectomycorrhizal fungi with 378 species (40%). Finally, lignicolous fungi are represented with 108 species (11%) (Table 3). However, ectomycorrhizal fungi contain by far the highest share of threatened species, almost half of these species (47%) being included in the Red Data List. Moreover, the groups of extinct and severely threatened species are strongly represented, whereas in the terrestrial saprophytes and lignicolous fungi the potentially threatened species are the largest group on the list. The share of terrestrial saprophytes is almost equal to its percentual contribution to the mycoflora in the Netherlands. On the contrary, lignicolous fungi are underrepresented in the list. These data conform the trends found by Arnolds (1985) for a strong decrease of ectomycorrhizal fungi, stability of terrestial saprophytes and an increase of lignicolous species.

The distribution of threatened ectomycorrhizal fungi over various host plants is presented in Table 4. The data on host preference are based on field experience in the Netherlands and taken from Arnolds (1984). The degree of preference ranges from weak (for instance *Amanita muscaria*, mostly with *Betula*, but with many other deciduous trees, *Picea* and *Pinus*; *Lactarius mitissimus*, in the Netherlands the most frequent near *Salix repens*, but also (in most other countries predominantly) associated with coniferous trees) to an exclusive relationship, for instance between *Lactarius quietus* and *Quercus*, *Russula fellea* and *Fagus*, *Suillus luteus* and *Pinus*, and so on. This should be kept in mind with the interpretation of these data.

The percentage of threatened species is higher for fungi, mainly associated with coniferous trees (58) than for fungi with preference for deciduous trees (51). The percentage of extinct species is even twice as high. This agrees with the larger decline of ectomycorrhizal fungi in coniferous forests, reported by Arnolds (1985, 1988). Among the trees with a large number of specialized ectomycorrhizal fungi, *Pinus* is the genus with the highest percentage of threatened species (76). The high number of (presumably) extinct species for *Pinus* is also striking. It is also remarkable that all six *Larix* symbionts are regarded as threatened or extinct.

The group of non-specialized species, mainly associated with deciduous trees, is much larger than of non-specialized conifer symbionts. This is caused by an approximately equal preference of many species for both *Fagus* and *Quercus*, sometimes also *Betula*. The share of threatened ectomycorrhizal species is approximately equally high for specialized symbionts of *Fagus* (71%), *Alnus* (69%), and *Quercus* (65%), but the proportion of strongly threatened species (categories 1 and 2) is much higher for *Fagus* (39%) and *Quercus* (29%) than for *Alnus* (15%). The percentage of threatened ectomycorrhizal fungi is considerably lower for symbionts of *Betula, Salix,* and *Populus*. Extinct species of deciduous trees are only known among *Quercus* (6 or 6%) and *Fagus* (5 or 6%) symbionts, but the host trees of the majority (14) of extinct species are unknown, due to incomplete data on former collections or records in literature.

6.4. Number of species in different habitat types.

The number of threatened macrofungi in various important habitat types is indicated in Table 5, together with their distribution over different categories of threat. The data on habitat preference are taken from Arnolds (1984) and Arnolds & al. (1989) with the same restrictions as mentioned for host preference of ectomycorrhizal fungi. An additional complication is that in this Red Data List some of the habitat indications were changed in view of more recent data. However, these factors do not substantially influence the overall picture.

As to be expected the large majority of threatened species occur in forest communities, viz. 649 or 69% of all listed species. The number of species with an optimum in deciduous forests is four times the number of species in coniferous forests (519 or 55% against 130 or 14%). The latter number is surpassed by the number of threatened grassland fungi: 159 species (17%). Also the group of fungi from heathlands and bogs is well-represented with 60 species (6%).

The share of threatened fungi is high (> 70%) in all types of poor, unfertilized, mesic to dry grasslands, due to the occurrence of many rare saprophytes, and in roadsides with trees on both rich and poor soils, due to ectomycorrhizal species (Table 6). This proportion is low (< 20%) in the species group of arable fields and ruderal sites, fertilized pastures and juniper scrub. The low number in the latter habitat is rather surprising because this community is uncommon and threatened in many places, for instance by continuing vegetation succession. Most fungi listed as characteristic by Arnolds (1984) are inconspicuous resupinate Aphyllophorales, well-known in this community by extensive mycocoenological studies by Barkman & De Vries. However the distribution and ecology in other habitats of most species is insufficiently known, so that only a small proportion has been included in the Red Data List.

The share of (presumably) extinct species is relatively high (10%) in the groups of fungi from roadsides with trees on rich soils and from coniferous forests on poor soils, in both cases mainly by the contribution of ectomycorrhizal species (Table 6). On the other hand, the absence of extinct species among the grassland fungi seems remarkable in view of the strong decline of all types of poor grasslands during this century on the one hand, and the large proportion of threatened species on the other hand. This phenomenon must be mainly ascribed to the neglection of these habitats by Dutch mycologists in the past. For instance, no reports are known at all from the mycoflora in limestone grasslands before 1970. A number of species has probably become extinct unnoticed before. In addition many species belong to critical taxonomic groups which have been revised only recently, for instance *Entoloma* and *Hygrocybe*.

The categories of species threatened with extinction (1) and strongly threatened species (2) are best represented in poor grasslands on clay and limestone (together 60% of all species), poor grasslands on sandy soils in the interior (47%), *Betula* forests on wet soils (47%) and roadsides with trees on poor soils (44%). These habitats deserve particular attention from nature conservation organisations.

The proportion of threatened species is also considerable in deciduous forests on rich, sandy soils (43%) and limestone (48%), scrub on dry, rich soils (32%) and *Salix repens* scrubs (27%). However, in these habitats most listed species belong to the potentially threatened species (27, 31, 27 and 19% of all species, respectively). These habitats cover relatively small areas and contain many rare fungal species with a restricted ecological range, but the conservation of these habitats (and their fungi) do not offer an urgent problem. The same applies to the fungi of open coastal dunes.

Table 6 combines data on the number of species in habitat types and functional groups for forest and scrub communities only. It had no sense to do the same for other habitat types because there all macrofungi belong, with few exceptions, to the terrestrial saprophytes in a broad sense.

In many forest habitats ectomycorrhizal fungi form the bulk (> 80%) of threatened species: Roadsides with trees on rich soils and poor soils (92 and 87%, respectively), *Betula* forests (89%), *Salix repens* scrub (86%) and coniferous forests on poor soils (80%). It is remarkable that in all habitat groups the ectomycorrhizal species are overrepresented among the threatened fungi in comparison with their share in the entire mycoflora. This is especially clear in *Alnus* forests (52 against 21%), coniferous forests on poor soils (80 against 47%) and *Salix aurita/cinerea* scrub (62 against 31%).

Terrestrial saprophytes form the majority of threatened fungi in *Juniperus* scrub (64%) and scrub on dry, rich soils (86%). These communities contain predominantly non-ectomycorrhizal woody plants. Their share is also considerable in deciduous forest on rich soils (45–49%), caused by the occurrence of many rare, potentially threatened species, for instance of *Lepiota* and related genera. The share of terrestrial saprophytes is in general in the same order of magnitude when all species and threatened species are compared. They are significantly underrepresented in coniferous forests on both rich and poor soils (14 against 32% and 9 against 21%, respectively) and overrepresented in juniper scrub (64 against 40%) and scrub on dry, rich soils (86 against 64%).

Habitats with a remarkably high proportion of threatened lignicolous fungi are *Juniperus* and *Salix* scrub (36 and 31%, respectively). Nevertheless, threatened wood inhabiting fungi are underrepresented in almost all forest types, especially in *Alnus* forests (18 against 34%) and coniferous forests on poor soils (11 against 32%).

7. A comparison with other Red Data Lists

Thirteen Red Data Lists from various parts of West-, North- and Central-Europe were compared with the list of the Netherlands. In the present list an indication is given for each species, in which of the foreign lists it was recorded (Table 8). In Table 7 the number of listed species and the number of common species are compared for different areas. The figures for other regions, ranging from 132 to 1208 species, are not directly comparable with each other. The number of species is not only a function of the degree of threat in a particular area, but depends also on the regional state of knowledge on taxonomy, distribution and ecology of macrofungi and is determined by the goals of the list. Some of them only aim at giving examples of threatened pecies. Nevertheless some conclusions are possible.

Out of 944 species mentioned for the Netherlands no less than 723 species (77%) are included in one or more of the other lists. This proportion varies in different taxonomic groups. It is, for instance, comparitively low in the genus *Entoloma* (56%), evidently because of incomplete taxonomic knowledge of this genus in most other countries.

The number of species in the Netherlands is in the same order of magnitude as in nearby areas with comparable criteria for their lists, such as Niedersachsen, Saarland and the Federal Republic of Germany. The share of common species is mostly between 30 and 50% with a weak tendency to be lower in the northern countries.

The species included in the list from the Netherlands and most frequently recorded in other European lists are: *Boletus satanas* and *Inonotus dryadeus* in 11 (out of 13) lists; *Boletus appendiculatus, B. fechtneri, B. radicans, B. rhodoxanthus, Camarophyllus russocoriaceus, Geastrum nanum, Geoglossum glutinosum, Hericium erinaceum, Pulveroboletus cramesinus, Trametes trogii, Trichoglossum hirsutum,* and *Tulostoma brumale* in 10 lists; *Entoloma euchroum, Ganoderma pfeifferi, Grifola frondosa, Gyromitra infula, Gyroporus castaneus, Hygrocybe coccinea, H. punicea, H. unguinosa, Hypholoma myosotis, Inonotus rheades, Russula pumila,* and *Volvariella bombycina* in 9 lists. It is not allowed to interpret this selection as a good representation of the strongest threatened fungi in Europe, since the number of recorded lists is also determined by the distribution area. Rare species with a restricted distribution, and therefore particularly vulnerable, will never be included in many lists. In addition, the enumeration indicates that less scientific, subjective factors influence the status of a species, such as the striking appearance of basidiocarps of boletes, large polypores and *Hygrocybes*. Nevertheless the list is a good reflection of severely threatened, mycologically important habitats in north-, western and central Europe. It comprises mycorrhizal species of old trees on calcareous soils, lignicolous species on large trunks in old deciduous forests, lignicolous and mycorrhizal species of alder swamps, saprophytic species of poor grasslands, bogs and open sand dunes. Only the group of mycorrhizal species of deciduous and coniferous trees on very poor soils, numerically very important in the Netherlands, is not represented in the European 'top twenty'.

8. Causes of decline of macrofungi

8.0. Introduction.

In this section a concise review is given of the main causes, which have led to decline of part of the macrofungi in the past and are threatening them at present. In general these factors are reasonably well known, but on the level of individual species the knowledge is still very insufficient. For example, the importance of air pollution in the process of decline of mycorrhizal fungi is evident (§ 8.7), but the influence of the different compounds on different species is practically unknown. More extensive ecological research in this field is urgent. Most species are not threatened by a single factor, but by a complex of different causes. For instance, wet alder forests are threatened by habitat destruction, eutrophication and drainage at the same time. For these reasons I have abandoned the idea to indicate threatening factors for each species.

In the following paragraphs the different factors are briefly described and further illustrated by examples. For more extensive discussions of these problems the reader is referred to e.g. Winterhoff & Krieglsteiner (1984), Arnolds (1985, 1988) and Derbsch & Schmitt (1987).

A. Natural factors

8.1. Succession.

Spontaneous succession of plant communities to climax communities leads to rarification of earlier successional stages and their associated fungi.

Examples:

(1) Spreading of scrubs and forests in the coastal dunes leads to a decrease of open sand and dune grasslands with many characteristic fungi, e.g. *Geastrum* spp., *Tulostoma* spp.

(2) Forest development in formerly open heathlands, bogs and inland sand dunes has contributed to a decrease of these habitats and their fungi.

(3) Succession in forest may lead to average ageing of trees, increase of litter and humus and acidification of the top soil. This is unfavourable for part of the fungi, e.g. early-stage mycorrhizal fungi (Termorshuizen & Schaffers, 1987; Jansen & De Vries, 1988).

8.2. Natural decline of plant species.

The decreased vitality and subsequent death of plant species, in particular trees, may lead to a decrease of associated fungi. However, the general decrease of vitality of forest trees, established in the latest decades, cannot be considered as a natural phenomenon (see § 8.7).

Example:

(4) The dutch elm disease has lead to a rarification of *Ulmus*, and a small number of associated macrofungi is regarded as threatened, e.g. the wound parasite *Lyophyllum ulmarium* and the presumably mycorrhizal *Entoloma aprile* and *E. saundersii*.

B. Anthropogenic factors

8.3. Destruction of habitats.

Many habitats for macrofungi have been and are destroyed by the increasing surface for town-building, industry sites, roads and other elements of infrastructure, rubbish dumps, and winning of sand, gravel, clay, limestone, and peat. Most of these changes in the landscape can be regarded as irreversible, in contrast with the factors mentioned in § 8.4. However, there is a gradual transition.

Examples:

(5) By the continuous expansion of towns, industrial areas and roads both agricultural and natural areas are declining, including many interesting habitats for macrofungi.

(6) Reconstruction of roads often leads to destruction of old trees originally planted along roads, and to disturbance or eutrophication of the soil. Road sides with old trees are among the most important habitats for rare mycorrhizal fungi in the Netherlands.
(7) Pine forests in the coastal dunes, planted in the first half of this century, are declining by cutting, not followed by renewed planting. This measure is often carried-out from a viewpoint of nature conservation, but means a threat to the many rare mycorrhizal symbionts, largely restricted to pine trees on calcareous sand, e.g. *Tricholoma myomyces, Russula torulosa*, and *Inocybe subporospora.*
(8) The area of peat bogs in the Netherlands has been ± 1800 km^2. At present only 2 % remains (Westhoff & al., 1973) including only a few hectares of undisturbed, living bogs. Most bogs have disappeared completely by digging of peat. Many characteristic species of bogs have become very rare, e.g. *Omphalina philonotis* and *O. sphagnicola.*

8.4. Alteration of habitats.

Even more widespread than the complete destruction of habitats is the drastic transformation of landscapes and plant communities by various forms of agriculture and other human activities.

Examples:
(9) Pumping of groundwater from coastal dunes has lead to a strong decline of wet and moist dune slacks and their characteristic fungi, for instance the saprophytic *Hygrocybe phaeococcinea* and many mycorrhizal symbionts of *Salix repens*, e.g. *Inocybe agardhii, I. caesariata, Russula persicina*, and *Cortinarius uraceus.*
(10) The area of dry and moist heathlands (*Nardo-Callunetea, Ericion tetralicis*) has been decimated by reclamation and afforestation (8000 km^2 heathland in 1900; 400 km^2 around 1980; Heil, 1984). Consequently, characteristic macrofungi, such as *Clavaria argillacea, C. vernalis, Entoloma helodes*, and *Omphalina ericetorum* have strongly decreased.
(11) Bogs and boggy forests have been drained and/or converted into agricultural land and planted forests. As a result the surface of alder forests (*Alnion glutinosae*) and willow scrub (*Salicion cinereae*) has been strongly reduced, including their characteristic fungi, for example the mycorrhizal species *Dermocybe sphagneti, Cortinarius bibulus, Entoloma bisporigerum, Gyrodon lividus*, and the wood-inhabiting *Entoloma euchroum, Pholiota conissans, Hypocreopsis lichenoides*, and *Trametes hoehnelii.* Most characteristic species in boggy forests disappear after drainage (Arnolds, n.p.).
(12) Over 95 % of the formerly widespread, not or weakly fertilized, low-productive pastures and hayfields has been converted by fertilization and drainage into high-productive grassland (dominated by *Lolium perenne*) and arable fields (at present predominantly maize). Poor grasslands were rich in macrofungi, especially of the genera *Hygrocybe, Entoloma, Camarophyllus, Hygrotrama, Dermoloma, Geoglossum, Clavaria, Clavulinopsis*, all of which have become rare at present and are virtually lacking in rich grass lands. The species diversity is among other things dependent on the duration of undis-

turbed grassland use (Arnolds, 1980; Nitare, 1988). Various types of low-productive grasslands have characteristic species of their own, for instance in limestone grasslands (*Mesobromion erecti*) *Camarophyllus lacmus, Hygrocybe reai, Entoloma mougeotii*, and *E. incanum*; in dune grasslands (*Galio-Koelerion*) e.g. *Hygrocybe acutoconica, Camarophyllus fuscescens, Geoglossum cookeianum*, and *Thuemenidium atropurpureum*; in poor grasslands on dry, acid sand (*Thero-Airion*) e.g. *Entoloma serrulatum, Clavulinopsis luteoalba, C. helveola*, and *Geoglossum glutinosum*; in not or sparsely fertilized hayfields on moist peat (*Calthion palustris, Junco-Molinion*) e.g. *Mycena bulbosa, Entoloma coelestinum*, and *Hygrocybe aurantioviscida* (Arnolds, 1981, 1982).

Not only the mycoflora of low productive, semi-natural grasslands have become rare. Also species, characteristic of moderately fertilized pastures (*Lolio-Cynosuretum*) and often very widespread until recently, have decreased enormously due to the overdosis of artificial fertilizers, liquid manure and herbicides and the frequent change of cultivated crop. Examples are *Macrolepiota excoriata, Leucoagaricus pudicus, Lepista personata*, and *Agaricus campester*.

(13) Part of the original deciduous forests, especially oak forests on poor, sandy soils (*Quercion robori-petraeae*), have been converted into monocultures of *Pinus sylvestris* or exotic coniferous trees, such as *Picea abies, Pseudotsuga menziesii, Pinus nigra*, and *Larix leptolepis*. As a consequence the available area for fungi associated with deciduous trees have decreased, e.g. many mycorrhizal species of the genera *Amanita, Cortinarius, Lactarius*, and *Russula*. More recently pine forests are being replaced by *Picea* and *Pseudotsuga*, reducing the rich mycoflora associated with *Pinus*. In the Netherlands forest plantations of *Picea, Pseudotsuga*, and other exotic trees are relatively poor in macrofungi, in particular in specialized mycorrhizal fungi (Jansen & De Vries, 1988).

8.5. Changes in management.

In a number of areas the destination of the local biocoenoses has not fundamentally changed, but nevertheless environmental conditions and plant communities altered under the influence of changing local human influence or management. The mycoflora is influenced by such developments as well.

Examples:

(14) In most heathlands (*Nardo-Callunetea, Ericion tetralicis*) the traditional exploitation by sheep grazing, burning and sod cutting disappeared completely or in part (De Smidt, 1979). This has led, together with deposition of nitrogen from air pollution (see § 8.7), to humus accumulation, regeneration of forests and a strong decrease of *Calluna, Erica* and many herbs, in favour of a few grasses, mainly *Deschampsia flexuosa* and *Molinia caerulea*. These dense grass swards lodge only few macrofungi, relics of the former heathland mycoflora (see example 10).

(15) In nearly all forests the practices of coppicing and litter collecting vanished. These measures contributed to a lowering of the nutrient status of the soil and a very rich mycorrhizal flora, for instance with *Cantharellus cibarius* (Jansen & Van Dobben, 1987), *Hydnellum, Phellodon*, and *Sarcodon* species. These fungi have strongly rarified in

recent years. On the other hand litter saprophytes and lignicolous fungi were reduced by these practices.

(16) Some decades ago roadsides were covered with low productive grassland communities and usually harvested by farmers, who maintained a low nutrient status of the soil by removal of the sward. These habitats were rich in saprophytic grassland fungi (see example 12) and in rare mycorrhizal fungi near the planted trees in such roadsides (Keizer & Sullock Enzlin, 1988). At present most roadsides are only mown without removal of the sward. This leads, together with external factors (see example 18, § 8.7) to eutrophication and ruderalization of the vegetation and as a result to the strong impoverishment of both saprophytic and mycorrhizal fungi.

8.6. Side effects of agricultural measures.

The intensification and industrialization of agriculture had an enormous direct impact on the landscape and mycoflora (see also § 8.4). Besides it has a number of unintended side-effects on near-by semi-natural and natural biocoenoses, mainly by drainage and eutrophication.

Examples:

(17) In the framework of re-allotment projects the drainage system has been drastically altered in many regions. By (re)construction of ditches and canalization of streams the average groundwater table has been considerably lowered, in many places over 0.5 metres. This process does not stop at the borders of forests and nature reserves. As a consequence most biocoenoses of wet environments have decreased and are further endangered in future, for instance alder forests (*Alnion glutinosae*), willow scrub (*Salicion cinereae*) and wet hayfields (*Calthion palustris, Junco-Molinion*) with their numerous characteristic macrofungi (see examples 11, 12).

(18) The enormous increase of the application of organic dung and artificial fertilizers leads to eutrophication and ruderalization of nature areas. This influence is especially severe in narrow landscape elements, such as natural forest edges and roadsides. Eutrophication may penetrate deeply into wetlands by admitting surface water. This is for instance a threat to mesotrophic marshes (*Parvocaricetea*) with rare macrofungi, such as *Hygrocybe helobia, Pholiota henningsii*, and *Armillariella ectypa*.

(19) The growth of the livestock in the Netherlands has caused an increased emission of ammonia, which is in part deposited in forests and nature reserves. See § 8.7.

8.7. Air pollution.

During this century the emission of chemicals, such as SO_2, NO_x, NH_x and O_3, has dramatically increased and the actual high levels cause drastic changes in many terrestrial and aquatic ecosystems. The most important sources of SO_2 emission are industry (60%), electricity plants (24%) and traffic (11%); of NO_x traffic (61%), electricity plants (15%) and industry (15%); of NH_x agriculture (cattle-breeding, 94%) (Schneider & Bresser, 1988). The average acid deposition amounts to 5300 mol H^+ equivalents per hectare per year. The average nitrogen deposition is approximately 50 kg N/ha/yr. The main effects of air pollution are (1) direct damage to plants, in particular trees, resulting in reduced vitality; (2) acidification of soils by acid deposition, in particular on sandy soils; (3) eutrophication of soils by nitrogen deposition.

Examples:

(20) Nitrogen enrichment and acidification of forest soils has lead to almost complete disappearance of the two forest types with the richest mycorrhizal flora in the Netherlands, viz. the *Cladonia-Pinus* forest (Vries & al., 1985) and the *Dicrano-Quercetum* (Jansen, 1984). As a consequence many species of hydnaceous fungi, *Tricholoma*, *Cortinarius* and many other genera have become very rare or extinct. The characteristic fungi from the *Dicrano-Quercetum* find nowadays refugia in roadsides with old trees on dry, acid sand with low nutrient status and little litter accumulation (Keizer & Sullock Enzlin, 1988). For species from the *Cladonia-Pinus* forest no such refugia are available, which explains the stronger decline of this group and the complete extinction of some species (§ 6.4). In general, eutrophication and acidification are regarded as the main factors for the established, general decrease of mycorrhizal fungi (e.g. Meyer, 1984; Arnolds, 1985, 1988; Termorshuizen & Schaffers, 1987). Nitrogen enrichment is for most species probably a more critical factor than decrease of pH.

(21) Nitrogen deposition is an important cause of the widespread replacement of *Calluna* and *Erica* by *Deschampsia* and *Molinia* as dominant species in heathlands (Heil, 1984). Characteristic fungi of heathlands have disappeared, since they are rare or lacking in grass-dominated stands (see examples 10, 14).

9. Measurements for the conservation of macrofungi

Desirable measures for the maintainance of a rich and varied mycoflora and for the conservation of rare species can be logically deduced from the causes of decrease, mentioned in the preceding paragraph. They are not fundamentally different from measures proposed for most other groups of organisms, in particular green plants, and mainly based on the principle of habitat conservation. In this section only a very concise treatment is given with emphasis on measures of special importance for macrofungi.

9.1. Protection of areas with a valuable mycoflora, either by law or by entrusting them to the care of an organization for nature conservation.

Special attention should be paid to habitats and areas with great importance for macrofungi, but only limited importance for green plants. The more important examples are: oak and pine forests on very poor, dry sand with thin litter layer (*Dicrano-Quercetum*, *Cladonia-Pinus* forest); pine forests on deviating soil types, such as calcareous sand (coastal dunes) and clay; roadsides with old trees on all soils poor in nitrogen; scrub of *Salix repens* in the coastal dunes; old scrub of *Salix aurita* and *S. cinerea* in bogs (*Salicion cinereae*); *Betula* forest on wet peat (*Betuletum pubescentis*); old, undisturbed, not to moderately fertilized meadows.

9.2. Creation of appropriate habitats for macrofungi.

New areas with considerable biological value can be developed by conscientious application of ecological principles. From a mycological view-point special attention should be paid to the use of indigineous tree species, adapted to local environmental conditions, when planting new forests, for instance for recreational purposes; planting of trees, especially the mycorrhizal species *Quercus robur* and *Fagus sylvatica,* along new roads; aiming at a low nutrient status of soils in newly planted areas (no supply of 'good', nutrient- and humus-rich soil); admitting spontaneous colonization and vegetation development in newly formed areas, e.g. on sand flats in diked areas of the estuarium in the southwestern Netherlands.

9.3. Management of nature reserves and other important areas.

The optimal management for macrofungi will in general be similar to the desirable management from a botanical point of view, as described in many publications (e.g. Rijksinstituut voor Natuurbeheer, 1979). In forests of great (potential) mycological importance special attention should be paid to the maintenance and creation of favourable microhabitats and substrates, for instance by the maintenance of old and dying trees in and outside forests; leaving of dead standing trees as well as fallen trunks, bogs and other wood remains in the forest; concentrated burning of unwanted wood to create a habitat for specialized fungi. In general, the differentiation of the mycoflora in forests is promoted by restoration of the natural processes, in other words the omittance of human influence. However, in some cases vulnerable successional stages can only be preserved by active management, for instance by removal of competing trees from old juniper and willow scrub. With the present level of air pollution it may be useful to resume the removal of litter and humus in places in pine and oak forests on dry sand for the survival of a large number of rare mycorrhizal fungi.

In grassland reserves extensive grazing or mowing with subsequent removal of the sward are favourable measures for the mycoflora. It is important that mowing takes place late in summer, so that the sward is short during the fruiting season. This recommandation applies also to areas outside nature reserves, for instance mowing and removal of the sward in roadsides, both with and without planted trees.

In addition to these examples of internal management often measures for external management are necessary in order to protect an area from unwanted influence from surrounding agricultural areas (§ 8.6). Examples are the creation of buffer zones and in wetlands the damming up of ditches to maintain a high ground water level and good water quality in the reserve.

9.4. Decrease of environmental pollution.

It is predicted that, when the present high levels of air pollution are maintained, most of the oligotrophic habitats (bogs, heathlands) and most of the forests on sandy soils will disappear in the next decades. It is clear that many species of characteristic macrofungi will disappear together with these ecosystems. In addition, it is to be feared, that almost all mycorrhizal macrofungi will become rare or extinct. Schmitt & Derbsch (1987) reported recently from the densely populated and strongly industrialized German state Saarland a strong decline in the latest years of e.g. *Amanita muscaria*, *A. rubescens*, *Laccaria laccata*, and *Lactarius hepaticus*, species which are still very common in the Netherlands. According to Schneider & Bresser (1988) the acid deposition should be reduced by 80% compared to the level in order to prevent the most serious effect of forests and semi-natural ecosystems, and even by 90% to prevent any damage.

10. Conclusions

A large number of macrofungi must at present be regarded as threatened in the Netherlands. No less than 944 species are included in this preliminary Red Data List, although this number has to be seen as a minimum value. At least 91 species have not been observed in the Netherlands since 1970 and are considered as extinct.

The decline of many species of macrofungi is not only regrettable from a view-point of mycologists, naturalists and nature-conservationists, but has also far-reaching consequences for the functioning of ecosystems. The highest proportion of threatened species is found among fungi living in ectomycorrhizal symbiosis with woody plants. Their strong decline in species diversity and sporocarp frequency is correlated with a decrease of mycorrhizal root frequency (e.g. Schlechte, 1986; Jansen & De Vries,1988) and of tree vitality (Termorshuizen & Schaffers, 1985). By various authors also a direct causal relation is supposed between the decline of ectomycorrhizal fungi and tree vitality (e.g. Meyer, 1984; Arnolds, 1988).

Changes in species composition are also observed among the litter and wood decomposing fungi in forests (Arnolds, 1985; Kuyper & De Vries, 1989). In this case no general decrease is established, but instead a shift in favour of nitrophytic and acidophytic species. These changes may very well cause important changes in decomposition processes with unknown consequences for the functioning of forest ecosystems.

Also many other habitats than forests are rich in macrofungi, including many threatened species, such as old, poor grasslands, heathlands, bogs and coastal dunes. Intensification of agricultural practice is the main cause of the strong decrease of species diversity in these habitats.

In fact, macrofungi appear to be excellent potential bioindicators, especially in forest ecosystems, in view of their large number of species, their ecological functions, being fundamentally different from those of green plants and animals, and various degree of specialization. However, the ecology and distribution of most species are still unsufficiently known. Extension of ecological research and monitoring of macrofungi is urgent.

Macrofungi are threatened by a variety of causes. These causes are not fundamentally different from factors threatening green plants, but the relative importance of various factors and habitats is different. It is essential to recognize the hierarchy among the mentioned environmental factors. Of course it is extremely important to save areas of high mycological value by creation of nature reserves, but the meaning of such an action is often limited and may be even adverse when no long-lasting, adequate management is carried-out. Similarily, acquisition and management of a nature reserve is of limited value when harmful influence of neighbouring agricultural areas cannot be prevented. Finally, the preservation of even isolated, oligotrophic habitats with low buffer capacity is impossible when the eutrophication and acidification from air pollution is not strongly diminished.

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Table 1. Percentages of species, belonging to different categories of threat for main taxonomic groups of macrofungi in the Netherlands.

NS = Number of species in the Netherlands, NTS = Number of threatened species, %NTS = Percentage of threatened species, %CT0 = Percentage of species in category 0 (extinct or presumably extinct), %CT1 = Idem in category 1 (threatened with extinction), %CT2 = Idem in category 2 (strongly threatened), %CT3 = Idem in category 3 (threatened), %CT4 = Idem in category 4 (potentially threatened), %NC = Percentage of species which are not classified.

Taxonomic group	NS	NTS	%NTS	%CT0	%CT1	%CT2	%CT3	%CT4	%NC
Gasteromycetes	85	43	51	6	9	4	11	21	47
Agaricales	2117	713	34	3	6	7	9	9	66
Aphyllophorales	500	114	23	5	4	4	6	5	77
Ascomycetes (p.p.)	625	72	12	1	2	2	3	3	88
Heterobasidiomycetes	64	2	3	2	-	-	-	2	97
Macromycetes	3391	944	28	3	5	5	7	8	72

Table 2. Percentages of species, belonging to different categories of threat for selected genera and groups of related genera of macrofungi in the Netherlands.

F. gr. = Dominant functional group: em = ectomycorrhizal, sd = saprofytes on dung, sf = saprophytes on litter in forests, sg = saprophytes on litter in grasslands, heathlands and bogs, sw = saprophytes on wood.

Taxonomic group	F. gr.	NS	NTS	%NTS	%CT0	%CT1	%CT2	%CT3	%CT4	%NC
Hygrophorus	em	16	16	100	38	44	6	13	–	–
Hydnum, Hydnellum, Phellodon, Sarcodon	em	19	19	100	32	47	16	5	–	–
Geoglossum, Trichoglossum, Thueminidium	sg	11	10	91	18	27	–	45	–	9
Hygrocybe, Camarophyllus	sg	46	42	91	–	22	37	33	–	9
Suillus	em	10	9	90	30	10	20	30	–	10
Boletus	em	18	16	89	17	33	17	22	–	11
Geastrum	sf, sg	15	13	87	–	20	7	27	33	13
Leucoagaricus	sf, sg	11	9	82	–	–	–	9	72	18
Ramaria	em, sf	16	13	81	12	31	19	19	–	19
Tricholoma	em	40	26	65	15	13	23	15	–	35
Lepiota, Cystolepiota	sf	50	31	62	4	2	–	4	52	38
Entoloma	sf, sg, em	165	96	58	1	16	17	15	9	42
Lactarius	em	63	36	57	8	14	5	29	2	43
Clavaria, Clavulinopsis	sg, sf	23	13	57	9	–	17	22	9	43
Amanita	em	22	12	55	5	18	23	9	–	45
Omphalina	sg, sf	20	11	55	10	30	10	5	–	45
Cortinarius, Dermocybe	em	194	70	36	7	12	8	7	2	64
Helvella	sf	23	8	35	–	–	–	–	35	65
Inocybe	em	131	35	27	2	2	5	8	11	73
Pluteus	sw	40	11	27	–	–	2	2	23	73
Agaricus	sf, sg	50	11	22	–	2	2	4	14	78
Mycena	sf, sg, sw	81	18	22	–	–	5	10	7	78
Galerina	sf, sg, sw	61	9	15	–	2	5	8	–	85
Clitocybe	sf	55	7	12	–	2	2	4	4	88
Coprinus	sf, sg, sd	87	3	3	–	–	1	–	2	97
Panaeolus	sg, sd	11	–	–	–	–	–	–	–	100

Table 3. Distribution of species belonging to different categories of threat over main functional groups of macrofungi in the Netherlands.

NS = Number of species in the Netherlands, NTS = Number of threatened species, %NTS = Percentage of threatened species, %CT0 = Percentage of species in category 0 (extinct or presumably extinct), %CT1 = Idem in category 1 (threatened with extinction), %CT2 = Idem in category 2 (strongly threatened), %CT3 = Idem in category 3 (threatened), %CT4 = Idem in category 4 (potentially threatened), %NC = Percentage of species which are not classified.

Functional group	NS	NTS	%NTS	%CT0	%CT1	%CT2	%CT3	%CT4	%NC
Ectomycorrhizal fungi	800	378	47	7	12	10	12	6	53
Terrestrial saprophytes	1727	458	27	2	4	5	7	9	73
Lignicolous fungi	868	108	12	1	1	1	3	5	88
All macrofungi	3391	944	28	3	5	5	7	8	72

Table 4. Distribution of threatened ectomycorrhizal fungi among different host tree genera or species.

NS = Number of species in the Netherlands, NTS = Number of threatened species, %NTS = Percentage of threatened species, NSC0 = Number of (presumably) extinct species, %SCO = Percentage of (presumably) extinct species.

	NS	NTS	%NTS	NSC0	%SCO
Deciduous trees including:	536	276	51	25	5
Quercus	93	60	65	6	6
Fagus	66	47	71	5	8
Betula	39	16	41	–	–
Alnus	26	18	69	–	–
Salix excl. *S. repens*	23	8	35	–	–
Salix repens	18	6	33	–	–
Populus	16	4	25	–	–
Carpinus	3	3	100	–	–
Tilia	2	1	50	–	–
Prunus	2	1	50	–	–
Ulmus	2	2	100	–	–
Corylus	1	–	–	–	–
Coniferous trees including:	134	78	58	15	11
Pinus	67	51	76	11	16
Picea	12	7	58	1	8
Larix	6	6	100	1	17
Juniperus	1	1	100	–	–
No preference/unknown	131	14	11	11	8
Total	801	368	45	51	6

Table 5. Numbers and percentages of threatened species of macrofungi in different habitat types.

E. gr. = Ecological group (see Table 9), NS = Number of species in the Netherlands, according to Arnolds (1984) and Arnolds & al. (1989), NTS = Number of threatened species, %NTS = Percentage of threatened species, %CT0 = Percentage of species in category 0 (extinct or presumably extinct), %CT1 = Idem in category 1 (threatened with extinction), %CT2 = Idem in category 2 (strongly threatened), %CT3 = Idem in category 3 (threatened), %CT4 = Idem in category 4 (potentially threatened), %NC = Percentage of species which are not classified.

E. gr.	Habitat type	NS	NTS	%NTS	%CT0	%CT1	%CT2	%CT3	%CT4	%NC
1.0, 2.0, 4.0	Deciduous forests and scrubs	1565	519	33	3	6	5	8	13	67
1.2	*Alnus* forests on wet soil	106	33	31	–	2	4	25	–	69
1.3	*Betula* forests on wet soil	15	9	60	–	7	40	13	–	40
1.4	Deciduous forests on moist clay	260	75	29	2	5	3	3	16	71
1.5	Deciduous forests on rich sand	320	138	43	3	6	3	5	27	57
1.6	Deciduous forests on limestone	75	36	48	5	9	–	3	31	62
1.7	Deciduous forests on dry, poor sand	195	69	35	4	10	9	9	4	65
4.6, 4.7	Roadsides with trees on rich soils	96	75	78	10	18	14	23	14	22
4.8, 4.9	Roadsides with trees on poor soils	30	23	77	–	17	27	33	–	23
2.2	Scrub of *Salix cinerea* and *S. aurita*	55	13	24	–	4	4	16	–	76
2.5	Scrub of *Salix repens*	26	7	27	–	4	4	–	19	73
2.3, 2.4, 2.6	Scrub on dry, rich soils	22	7	32	–	5	–	–	27	68
3.0	Coniferous forests and scrubs	439	130	30	6	7	6	7	3	70
3.1, 3.2	Coniferous forests on poor soils	156	64	41	10	11	9	9	3	59
3.3, 3.4	Coniferous forests on rich soils	65	29	45	6	6	9	12	11	55
3.5	Scrub of *Juniperus*	67	11	16	–	6	4	6	–	84
5.0, 6.0	Heathlands and bogs	162	60	37	2	7	8	15	2	63
5.1, 5.6, 5.8	Dry heathlands and sand dunes	15	9	60	7	13	27	13	–	40
5.2, 5.3, 5.7	Moist heathlands	17	10	59	6	12	6	35	–	41

E. gr.	Habitat type	NS	NTS	%NTS	%CT0	%CT1	%CT2	%CT3	%CT4	%NC
6.1, 6.2	Oligotrophic *Sphagnum* bogs	33	19	56	3	15	12	24	3	44
6.3–6.9	Mesotrophic and eutrophic bogs	49	14	27	2	–	12	10	4	73
7.0	Grasslands	365	159	44	0	12	13	15	3	56
7.1, 7.2	Fertilized pastures	84	13	15	–	2	2	7	4	85
7.3, 7.6	Poor grasslands on clay and limestone	42	36	86	–	36	24	24	4	14
7.7	Poor grasslands in coastal dunes	55	39	71	–	16	22	24	9	28
7.8, 7.9	Poor grasslands on other soils	61	48	79	–	21	26	30	2	21
7.4, 7.5	Poor hayfields on wet soils	30	15	50	–	17	20	16	–	50
8.1, 8.2	Open coastal dunes	42	23	55	5	5	2	17	26	45
9.0–9.9	Arable fields, ruderal sites	124	5	4	1	–	–	–	3	96

Table 6. The proportion of functional groups in various habitat types for all macrofungi and for threatened species included in the Red Data List of the Netherlands.

E. gr. = Ecological group (see Table 9), NS = Number of species in the Netherlands, %EM = Percentage of ectomycorrhizal species, %TS = Percentage of terrestrial saprophytes, %Wo = Percentage of wood inhabiting fungi, NTS = Number of threatened species, %TEM = Percentage of threatened ectomycorrhizal fungi, %TTS = Percentage of threatened terrestrial saprophytes, %TWo = percentage of threatened wood inhabiting fungi.

E. gr.	Habitat type	NS	%EM	%TS	%Wo	NTS	%TEM	%TTS	%TWo
1.0, 2.0, 4.0	Deciduous forests and scrubs	1565	33	34	32	519	54	30	16
1.2	*Alnus* forests on wet soil	106	21	34	45	33	52	30	18
1.3	*Betula* forests on wet soil	15	80	7	13	9	89	-	11
1.4	Deciduous forests on moist clay	260	30	44	25	75	39	45	16
1.5	Deciduous forests on rich sand	320	29	50	21	138	36	49	15
1.6	Deciduous forests on limestone	75	32	49	19	36	39	47	14
1.7	Deciduous forests on dry, poor sand	195	57	25	18	69	71	16	13
4.6, 4.7	Roadsides with trees on rich soils	96	79	16	5	71	92	4	4
4.8, 4.9	Roadsides with trees on poor soils	30	75	15	10	23	87	13	–
2.2	Scrub of *Salix cinerea* and *S. aurita*	55	31	13	56	13	62	8	31
2.5	Scrub of *Salix repens*	26	69	23	8	7	86	14	–
2.3, 2.4, 2.6	Scrub on dry, rich soils	22	9	64	27	7	14	86	–
3.0	Coniferous forests and scrubs	439	30	27	44	130	61	20	19
3.1, 3.2	Coniferous forests on poor soils	156	47	21	32	64	80	9	11
3.3, 3.4	Coniferous forests on rich soils	65	62	32	6	29	79	14	7
3.5	Scrub of *Juniperus*	67	3	40	57	11	–	64	36

Table 7. Comparison between the preliminary Red Data List of macrofungi in the Netherlands with Red Data Lists from other areas in north-west and Central Europe.

NTS = Number of threatened species, NCS = Number of species in common with the Netherlands, %NCS = Percentage of species in common with the Netherlands.

Area	Reference	NTS	NCS	%NCS
Netherlands	This publ.	944	..	..
FRG, Niedersachsen	Wöldecke, 1987	813	401	49
FRG, Westfalen	Runge, 1987	335	175	52
FRG, Schleswig-Holstein	Lettau, 1982	404	163	40
FRG, Saarland	Derbsch & Schmitt, 1984, 1987	1208	345	29
FRG, Baden-Württemberg	Winterhoff & Krieglsteiner, 1984	458	200	44
FRG	Winterhoff, 1984	1037	341	33
GDR	Benkert, 1982	307	138	45
Poland	Wojewoda & Lawrynowicz, 1986	800	258	32
Austria	Krisai, 1986	211	87	41
Sweden	Hallingbäck, 1988	512	174	34
Norway	Høiland, 1988	132	29	22
Finland	Rassi & Väisänen, 1987	162	58	36

Table 8. Preliminary list of threatened macrofungi in the Netherlands.

Name: according to Arnolds (1984). Species with * were also mentioned by Natuurbeschermingsraad, 1986.

C = class of threatened species:
0 = (probably) extinct
1 = threatened with extinction
2 = strongly threatened
3 = threatened
4 = potentially threatened

Hab: habitat code according to Arnolds (1984), see Table 9.
Sub: substrate code according to Arnolds (1984), see Table 9.
Org: code of associated organisms, according to Arnolds (1984), see Table 9.
E : Exploitation of habitat: M = mycorrhizal species, P = parasitic species, S = saprophytic species.
F1 : Frequency before 1970: CCC = very common, CC = common, C = rather common, R = rather rare, RR = rare, RRR = very rare, – = absent, ? = unknown.
F2 : Frequency since 1970: see F1.

Lists: records from other Red Data Lists (see also References): 1: Benkert, G. D. R. (1982) – 2: Winterhoff, F. R. G. (1984) – 3: Winterhoff & Krieglsteiner, Baden-Württemberg (F. R. G.) (1984) – 4: Wöldecke, Niedersachsen and Bremen (F. R. G) (1987) – 5: Runge, Westfalen (F. R. G.) (1987) – 6: Wojewoda & Lawrynowicz, Poland (1986) – 7: Hallingbäck, Sweden (1988) – 8: Rassi & Väisänen, Finland (1987) – 9: Derbsch & Schmitt, Saarland (F. R. G.) (1984) – 10: Derbsch & Schmitt, Saarland (F. R. G.) (1987) – 11: Lettau, Schleswig-Holstein (F. R. G.) (1982) – 12: Krisai, Austria (1986) – 13: Høiland, Norway (1988).

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Agaricus augustus	4	4.6	1.2	..	S	R	RR	
Agaricus bernardii*	4	8.3	1.5	..	S	RR	RR	2, 4, 5, 9
Agaricus campester	3	7.2	1.0	..	S	CCC	C	
Agaricus cupreobrunneus*	3	7.7	1.4	..	S	C	R	1, 2, 4, 5, 9, 11
Agaricus elvensis ss. Cooke	4	1.4	1.5	..	S	?	RRR	
Agaricus excellens	4	1.4	1.2	..	S	RR	RR	2, 3, 4, 5, 9
Agaricus geesterani	1	1.4	1.5	..	S	–	RRR	
Agaricus lanipes	4	1.4	1.5	..	S	RRR	RRR	4, 11
Agaricus niveolutescens*	4	1.6	1.2	..	S	RRR	RRR	4
Agaricus phaeolepidotus*	4	1.5	1.2	..	S	RR	RR	2, 3, 4
Agaricus porphyrocephalus*	2	7.7	1.4	..	S	RR	RRR	2, 9
Agrocybe firma	4	1.5	3.0	1.0	S	RR	RR	1, 2, 3, 4, 6, 9
Agrocybe paludosa	3	7.4	1.2	..	S	C	R	1, 3, 6, 7, 9
Agrocybe pusiola	3	7.7	1.4	..	S	RR	RR	2, 3, 4, 9
Agrocybe vervacti	4	7.7	1.2	..	S	RRR	RRR	2, 4, 5, 9, 11
Aleurodiscus amorphus	0	3.0	3.5	6.3	S	RRR	–	1
Aleurodiscus disciformis	0	1.0	3.1	4.2	S	RRR	–	1, 5, 6, 7, 13
Amanita aspera*	1	4.6	1.5	1.0	M	R	RR	2, 3, 4, 6, 7, 9
Amanita crocea*	2	1.5	1.2	1.0	M	RRR	RRR	4, 11
Amanita eliae	0	1.7	1.5	1.0	M	RRR	–	3, 4, 5
Amanita friabilis*	1	1.2	1.3	1.3	M	?	RRR	2, 13

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Amanita gemmata	3	1.7	1.2	4.2	M	CC	C	7, 11, 12
Amanita inaurata*	2	4.6	1.5	1.0	M	R	RR	4, 7, 11
Amanita lividopallescens*	3	4.6	1.5	4.2	M	RRR	RRR	
Amanita porphyria*	2	1.7	1.2	4.2	M	R	RR	4, 11
Amanita solitaria*	1	1.4	1.5	1.0	M	RR	RRR	1, 2, 3, 4, 9, 12
Amanita strobiliformis*	2	1.4	1.5	1.0	M	RR	RR	2, 3, 4, 5, 7, 9, 11
Amanita verna	1	1.5	1.2	1.0	M	RRR	RRR	2, 3, 11
Amanita virosa*	2	1.7	1.2	1.9	M	R	RR	4, 6, 9, 11
Amylostereum laevigatum	3	3.5	3.1	6.1	S	R	R	1
Anellaria semiovata*	3	7.7	7.3	9.6	S	CC	C	5
Anomoporia myceliosa	3	3.5	3.4	6.1	S	RRR	RRR	7, 8
Armillariella ectypa*	2	6.4	5.1	..	S	RRR	RRR	1, 2, 3, 12
Asterophora lycoperdoides	3	4.9	8.5	..	S	CC	R	9, 11
Asterophora parasitica	2	4.9	8.5	..	S	R	RR	1, 4, 6, 9, 11
Astraeus hygrometricus*	1	1.7	1.4	1.0	M	R	RRR	2, 4, 5, 6
Aurantioporus fissilis	4	9.3	2.7	1.0	S	RR	RR	4, 7, 8, 9, 12, 13
Auriscalpium vulgare	2	3.3	4.7	6.4	S	CC	R	
Balsamia fragiformis	1	1.5	1.2	1.0	M?	RRR	RRR	2, 9
Bankera fuligineoalba*	0	3.1	1.4	6.8	M	R	–	1, 2, 4, 6, 11
Boletinus cavipes*	1	3.1	1.2	6.2	M	R	RRR	6, 11
Boletopsis leucomelaena	1	4.9	1.2	4.4	M	RR	RRR	1, 2, 3, 4, 6
Boletus aereus*	1	4.7	1.5	4.4	M	RR	RRR	1, 2, 4, 10
Boletus appendiculatus	1	4.6	1.5	4.4	M	RRR	RRR	2, 3, 4, 5, 6, 7, 9, 11, 12
Boletus calopus*	2	4.9	1.2	1.9	M	R	RR	4, 6, 8, 10, 11
Boletus erythropus	3	4.9	1.2	4.2	M	CC	C	
Boletus fechtneri	1	4.7	1.5	1.9	M	RRR	RRR	2, 3, 4, 5, 6, 7, 8, 9, 12
Boletus fragrans	0	4.7	1.5	1.9	M	RRR	–	2, 6, 7, 9, 12
Boletus impolitus*	2	4.6	1.5	1.9	M	RR	RR	2, 3, 4, 5, 6, 7, 8, 9, 11, 12
Boletus junquilleus	1	4.9	1.2	4.4	M	RRR	RRR	2, 6, 7, 9, 11, 12
Boletus lupinus	0	4.7	1.5	4.4	M	RRR	–	
Boletus luridus	3	4.6	1.5	1.9	M	C	R	4, 11
Boletus pulverulentus	3	1.4	1.2	4.4	M	R	RR	7, 11
Boletus queletii*	1	4.6	1.5	1.0	M	RR	RRR	1, 3, 4, 5, 6, 7, 8
Boletus radicans*	3	4.7	1.5	1.9	M	RR	RRR	3, 4, 5, 6, 7, 8, 9, 11, 12
Boletus regius	0	4.7	1.5	4.4	M	RRR	–	1, 2, 3, 4, 6, 9, 12
Boletus rhodoxanthus*	2	1.5	1.2	1.9	M	RR	RR	2, 3, 4, 5, 6, 7, 9, 12, 13
Boletus satanas*	1	4.7	1.5	1.9	M	RR	RRR	2, 3, 4, 5, 6, 7, 8, 9, 11, 12
Bovista colorata	4	1.5	1.2	..	S	RRR	RRR	
Bovista limosa	1	8.2	1.4	..	S	RRR	RRR	1, 2, 3, 4, 6
Bovistella radicata*	1	5.1	1.1	..	S	RR	RRR	1, 2, 9
Callistosporium elaeodes	4	1.5	1.2	..	S	RRR	RRR	2, 3

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Calocybe constricta*	2	7.0	1.2	..	S	?	RRR	2, 3, 4, 5, 7, 9, 11
Caloporus dichrous	3	1.7	3.1	1.4	S	RR	RR	1, 2, 3, 4, 5
Caloscypha fulgens	4	9.7	1.4	..	S	?	RRR	2, 3, 4, 6, 7, 12
Camarophyllus colemannianus*	2	7.6	1.5	..	S	R	RR	1, 2, 5, 7, 9
Camarophyllus fuscescens*	3	7.7	1.2	..	S	R	RR	1, 2, 3, 4, 7, 9
Camarophyllus lacmus*	1	7.6	1.5	..	S	RR	RRR	1, 2, 3, 6, 7, 9, 12
Camarophyllus niveus*	3	7.0	1.0	..	S	CCC	C	
Camarophyllus pratensis*	3	7.7	1.0	..	S	C	R	1, 4, 5, 6
Camarophyllus russocoriaceus*	3	7.7	1.2	..	S	C	R	1, 2, 3, 4, 5, 6, 7, 9, 11
Camarophyllus subradiatus*	1	7.8	1.2	..	S	?	RRR	1, 3, 4, 11, 12
Camarophyllus subviolaceus*	2	5.6	1.2	..	S	RR	RR	7
Camarops microspora	3	1.2	2.1	1.3	S	RRR	RRR	4
Camarops polysperma	3	1.2	2.1	1.3	S	RRR	RRR	1, 2, 4, 5
Cantharellula umbonata*	3	5.2	5.3	..	S	C	R	4, 9
Cantharellus cibarius*	3	1.7	1.1	1.0	M	CCC	C	1, 5, 6, 10, 11, 12
Cantharellus cinereus	0	1.0	1.0	1.0	M	RRR	–	4
Cantharellus tubaeformis*	2	4.9	1.2	1.0	M	C	RR	10
Chamaemyces fracidus*	2	1.4	1.5	..	S	RR	RRR	4, 5, 7, 8, 13
Chroogomphus rutilus*	3	3.1	1.2	6.4	M	C	R	10, 11
Clavaria argillacea*	2	5.1	1.4	..	S	CC	R	4, 5, 11
Clavaria asterospora	3	7.0	1.0	..	S	C	R	7
Clavaria greletii	4	7.7	1.2	..	S	RRR	RRR	
Clavaria incarnata	2	7.9	1.2	..	S	RRR	RRR	1, 4, 7
Clavaria straminea	2	7.9	1.4	..	S	RR	RR	7
Clavariadelphus pistillaris	1	1.6	1.5	..	M?	RRR	RRR	4, 6, 10
Clavicorona taxophila	4	1.0	3.0	..	S	RR	RR	
Clavulinopsis corniculata	3	7.9	1.2	..	S	CC	C	1, 2, 4, 5, 6
Clavulinopsis fusiformis	2	7.7	1.2	..	S	RR	RRR	7
Clavulinopsis helveola*	3	7.9	1.2	..	S	CC	C	1, 2, 3, 4, 5, 9
Clavulinopsis holmskjoldii	0	7.0	1.5	..	S	RRR	–	
Clavulinopsis laeticolor*	3	7.9	1.2	..	S	C	R	1, 4
Clavulinopsis luteoalba*	3	7.9	1.2	..	S	C	R	1, 4
Clavulinopsis subtilis	4	1.6	1.5	..	S	RRR	RRR	4, 7
Clavulinopsis vernalis*	0	5.2	1.3	..	S	RRR	RRR	
Clitocybe alexandri	4	1.6	1.2	..	S	RRR	RRR	4, 7
Clitocybe geotropa*	2	1.4	1.5	..	S	RR	RRR	4, 10, 11
Clitocybe incomis	3	3.1	1.1	..	S	RR	RR	
Clitocybe inornata	4	1.6	1.1	..	S	RR	RR	7, 9
Clitocybe josserandii	1	5.2	1.2	..	S	R	RRR	4, 9
Clitocybe lignatilis	3	1.4	2.1	1.0	S	RR	RR	2, 4, 5, 6, 7
Clitopilus cretatus	3	7.7	1.4	..	S	R	R	2, 4, 5, 9, 12
Clitopilus prunulus*	3	4.9	1.2	1.0	M?	CCC	C	
Collybia hariolorum	1	1.0	1.1	1.9	S	RR	RRR	
Collybia tuberosa	3	4.0	8.0	..	S	CC	R	11
Coltricia cinnamomea	1	1.7	1.2	1.9	M?	RRR	RRR	1, 6, 7, 8
Coltricia perennis*	2	3.1	1.4	6.0	M	CCC	R	4
Conocybe alboradicans	4	7.2	1.2	..	S	?	RRR	

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Conocybe antipus	4	7.2	1.2	..	S	RR	RR	2, 11
Conocybe cryptocystis	3	1.2	1.3	..	S	RR	RR	4, 9
Conocybe dumetorum	3	7.6	1.5	..	S	R	RR	
Conocybe dunensis	4	8.1	1.4	..	S	RRR	RRR	
Conocybe pubescens	3	7.2	7.3	9.6	S	C	R	9
Coprinus alopecia*	4	1.5	3.1	3.1	S	RRR	RRR	
Coprinus extinctorius*	2	1.5	2.7	3.1	S	RRR	RRR	9
Coprinus picaceus*	4	1.4	1.2	..	S	RR	RR	4, 6, 8, 11
Cordyceps canadensis*	3	1.7	8.1	..	P	C	R	4, 6, 7
Cordyceps capitata*	1	1.7	8.1	..	P	RRR	RRR	2, 3, 4, 6, 7, 8, 9
Cordyceps ophioglossoides*	3	1.7	8.1	..	P	C	R	6
Coriolopsis gallica	4	1.5	3.0	1.0	S	RRR	RRR	4, 5, 7
Cortinarius alboviolaceus*	2	1.7	1.1	4.2	M	CC	R	4, 10
Cortinarius allutus	0	3.1	1.1	6.4	M	RRR	–	4, 9
Cortinarius alnetorum*	3	1.2	1.3	1.3	M	C	R	3, 9, 12
Cortinarius alneus	3	1.2	1.3	1.3	M	?	R	
Cortinarius amoenolens	0	1.6	1.5	1.0	M	RRR	–	4, 5, 9, 13
Cortinarius armillatus*	2	1.3	1.3	1.4	M	C	RR	2, 4, 5
Cortinarius azureus	1	1.0	1.0	1.0	M	RR	RRR	
Cortinarius balteatus	0	4.6	1.5	4.2	M	RRR	–	9
Cortinarius betulinus*	2	1.3	1.3	1.4	M	RRR	RRR	
Cortinarius bibulus*	3	1.2	1.3	1.3	M	R	RR	4, 9
Cortinarius bolaris*	2	1.7	1.1	4.2	M	CC	RR	4, 9, 11
Cortinarius bovinus	1	1.7	1.2	1.9	M	RR	RRR	2, 5
Cortinarius bulliardii	1	1.5	1.2	1.9	M	RRR	RRR	4, 7, 11, 12
Cortinarius callisteus	1	1.7	1.2	4.2	M	RRR	RRR	2, 6
Cortinarius calochrous*	0	4.7	1.2	1.0	M	RRR	RRR	4, 5, 7, 9, 11
Cortinarius camphoratus	0	?	?	?	M	RRR	–	9
Cortinarius caninus*	2	4.6	1.5	4.4	M	RRR	RRR	4, 11
Cortinarius causticus*	1	1.4	1.5	1.0	M	RR	RRR	2, 4, 9
Cortinarius cedretorum	0	1.5	1.2	1.0	M	RRR	–	4
Cortinarius collinitus	1	3.2	1.1	6.0	M	RRR	RRR	9
Cortinarius crassus	2	4.7	1.5	1.9	M	RRR	RRR	9
Cortinarius croceocoeruleus*	2	1.5	1.2	1.9	M	RR	RR	2, 4, 5, 7, 9
Cortinarius durissimus	1	4.6	1.5	1.0	M	RRR	RRR	
Cortinarius elatior*	3	4.9	1.2	1.0	M	CC	R	10, 11, 12
Cortinarius emollitus*	2	1.5	1.0	1.0	M	R	RR	2, 4, 6
Cortinarius fusisporus*	2	1.7	1.1	4.4	M	?	RR	9
Cortinarius glaucopus	0	1.5	1.2	1.0	M	RRR	–	4, 10, 11
Cortinarius helvelloides*	3	1.2	1.3	1.3	M	C	R	
Cortinarius heterosporus*	1	3.1	1.1	6.0	M	RRR	–	4
Cortinarius hinnuleus	3	4.9	1.2	1.0	M	CC	R	10, 11
Cortinarius infractus*	4	1.5	1.2	1.9	M	RR	RR	4
Cortinarius integerrimus	1	4.9	1.2	1.0	M	RRR	RRR	4, 12
Cortinarius mucosus*	1	3.3	1.4	6.4	M	C	RR	4, 9, 11
Cortinarius multiformis*	1	1.0	1.0	1.0	M	RR	RRR	4, 6, 9
Cortinarius nemorensis	4	4.6	1.5	1.0	M	RR	RR	4, 9
Cortinarius orellanoides*	2	1.7	1.2	4.2	M	RR	RR	

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Cortinarius orellanus	1	1.6	1.5	1.0	M	RRR	RRR	2, 3, 6, 7, 9, 13
Cortinarius pholideus*	2	1.3	1.0	1.4	M	C	RR	3, 4, 5
Cortinarius porphyropus*	2	1.5	1.2	1.0	M	RR	RR	2, 4, 5, 6, 9
Cortinarius privignus	3	4.9	1.0	1.0	M	?	RR	
Cortinarius psammocephalus	2	4.6	1.5	1.0	M	RRR	RRR	9
Cortinarius pseudosulphureus*	0	4.7	1.0	1.9	M	RRR	–	4, 10
Cortinarius purpurascens*	4	1.0	1.0	1.0	M	RRR	RRR	4, 9
Cortinarius raphanoides	4	1.5	1.2	1.0	M	RRR	RRR	4, 9
Cortinarius saturninus	3	2.2	1.0	5.1	M	R	R	2, 4, 6
Cortinarius scaurus	1	3.1	1.2	6.8	M	RRR	RRR	4
Cortinarius sebaceus	0	?	?	?	M	RRR	–	4, 9
Cortinarius sodagnitus	0	?	?	?	M	RRR	–	2, 4, 7, 9, 13
Cortinarius subbalaustinus	2	4.9	1.2	1.0	M	RR	RRR	9
Cortinarius subpurpurascens	1	3.1	1.5	6.0	M	RRR	RRR	
Cortinarius talus	0	?	?	?	M	RRR	–	2, 9
Cortinarius torvus*	2	1.5	1.0	1.0	M	RR	RR	4, 11
Cortinarius traganus	0	?	?	?	M	RRR	–	
Cortinarius triumphans	1	1.4	1.5	1.4	M	RRR	RRR	2, 3, 4, 6, 9
Cortinarius variecolor	1	4.7	1.5	1.0	M	RRR	RRR	4
Cortinarius variegatus	0	1.7	1.2	1.9	M	RRR	–	3
Cortinarius veregregius	1	1.7	1.4	1.0	M	?	RRR	2, 9
Cortinarius vibratilis	3	1.5	1.2	1.0	M	R	RR	4, 11
Cortinarius violaceocinereus	0	?	?	?	M	RR	–	
Cortinarius violaceus*	1	1.7	1.2	1.0	M	RRR	RRR	2, 4, 5, 6, 9, 11
Cotylidia carpatica	0	1.0	1.2	..	S	RRR	–	1
Cotylidia pannosa	0	1.0	1.2	..	S	RRR	–	4, 6, 7
Cotylidia undulata	1	1.0	6.2	..	S	?	RRR	
Craterellus cornucopoides*	1	1.6	1.5	1.0	M	RR	RRR	4, 10
Creolophus cirrhatus*	4	1.7	2.7	1.9	S	?	RR	4, 6, 11
Cyathus stercoreus	0	8.1	1.4	..	S	RRR	RRR	2, 3, 4, 6
Cyphellostereum laeve	4	?	5.3	..	S	RRR	RRR	12
Cystoderma terrei	4	3.1	1.1	..	S	RRR	RRR	2, 4, 5, 6, 9
Cystoderma tricholomoides	4	1.5	1.2	..	S	?	RRR	1
Cystolepiota bucknallii	4	1.6	1.5	..	S	RRR	RRR	3, 4, 7, 9
Cystolepiota cygnea	0	1.5	1.2	..	S	RRR	–	2, 9
Cystolepiota hetieri	4	1.4	1.5	..	S	RR	RR	2, 3, 4, 5, 9
Cystolepiota moelleri	4	1.5	1.5	..	S	RRR	RRR	
Dacryobolus sudans	0	3.1	3.0	6.8	S	RRR	–	
Dermocybe anthracina	1	1.6	1.5	1.0	M	RRR	RRR	1, 6, 8
Dermocybe cinnabarina*	1	1.0	1.0	1.9	M	R	RRR	4, 8, 9, 13
Dermocybe croceocona	3	1.0	1.0	1.0	M	R	R	6
Dermocybe malicoria	1	?	?	..	M	RRR	RRR	4, 9
Dermocybe palustris	1	2.2	1.3	5.3	M	?	RRR	3, 4, 5, 12
Dermocybe phoenicea	1	3.0	1.1	6.0	M	RR	RRR	4
Dermocybe sanguinea*	1	3.1	1.1	6.8	M	RRR	RRR	4, 11
Dermocybe semisanguinea*	3	3.1	1.4	6.4	M	CCC	C	10
Dermocybe sphagneti*	3	2.2	1.3	5.3	M	C	R	2, 3, 5, 12
Dermocybe uliginosa*	3	2.2	1.3	5.3	M	CC	C	2, 3, 4, 5, 9, 12

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Dermoloma atrocinereum*	2	7.7	1.2	..	S	RR	RR	2, 3, 4, 5, 7, 12
Dermoloma cuneifolium*	3	7.7	1.2	..	S	RR	RR	1, 2, 4, 5, 7, 9, 12
Dermoloma josserandii	1	1.4	1.5	..	S	?	RRR	7
Dermoloma pragensis*	1	7.3	1.5	..	S	?	RRR	
Dermoloma phaeopodium	1	7.3	1.5	..	S	?	RRR	
Dermoloma pseudocuneifolium*	2	7.7	1.2	..	S	RR	RRR	2, 3
Dichomitus campestris	4	1.6	3.4	1.6	S	RRR	RRR	6, 8, 12
Disciseda bovista*	1	8.2	1.4	..	S	RR	RRR	1, 2, 3, 4, 6, 7
Disciseda calva*	0	8.2	1.4	..	S	RRR	–	1, 2, 3, 4, 6, 7, 13
Discina perlata	4	1.7	1.2	..	S	?	RRR	5, 12
Disciotis maturescens	4	1.4	1.5	..	S	RRR	RRR	
Ditiola radicata	0	3.0	3.0	6.0	S	RRR	–	6
Elaphomyces granulatus*	2	3.1	1.2	6.0	M	C	R	10
Elaphomyces maculatus	1	1.5	1.2	1.0	M	RRR	RRR	2, 6, 7
Elaphomyces muricatus*	3	1.7	1.2	1.0	M	CC	C	10
Entoloma ameides	2	7.6	1.5	..	S	?	RRR	2, 3, 4, 5
Entoloma anatinum	2	7.9	1.2	..	S	RRR	RRR	9
Entoloma aprile	3	4.7	1.2	5.8	M?	RR	RR	9
Entoloma araneosum	1	1.4	1.2	..	S	?	RRR	2, 4, 7, 9
Entoloma bisporigerum*	3	2.2	1.3	5.1	M?	?	R	4
Entoloma caeruleofloccosum	2	7.7	1.2	..	S	?	RRR	
Entoloma caesiocinctum*	3	7.6	1.2	..	S	C	R	2, 9
Entoloma calaminare	1	7.8	1.5	..	S	?	RRR	
Entoloma calthionis*	1	7.4	1.2	..	S	?	RRR	
Entoloma chlorinosum	1	7.4	1.2	..	S	?	RRR	
Entoloma clandestinum	2	7.9	1.2	..	S	RR	RR	2, 6, 9
Entoloma cocles	1	7.8	1.5	..	S	?	RRR	2, 9
Entoloma coelestinum*	1	7.5	1.3	..	S	?	RRR	9
Entoloma corvinum*	2	7.8	1.2	..	S	RRR	RRR	7
Entoloma costatum	1	7.3	1.5	..	S	RRR	RRR	4, 11
Entoloma cuniculorum	2	5.6	1.2	..	S	?	RRR	4
Entoloma cuspidifer*	1	2.2	1.3	..	S	?	RRR	2, 3, 4, 6
Entoloma dichroum	4	1.5	1.2	..	S	RRR	RRR	3
Entoloma dysthales	3	1.2	1.3	..	S	RR	RR	2, 4
Entoloma dysthaloides	3	1.2	1.3	..	S	?	R	
Entoloma euchroum*	3	1.2	3.2	1.3	S	C	R	2, 4, 5, 6, 7, 8, 9, 12
Entoloma excentricum	1	7.7	1.2	..	S	?	RRR	2, 3, 5, 6, 7
Entoloma exile	1	7.8	1.5	..	S	?	RRR	
Entoloma farinasprellum	2	7.9	1.2	..	S	?	RRR	
Entoloma fulvum	2	5.7	1.1	..	S	?	RRR	2, 3
Entoloma fuscomarginatum	2	5.4	1.2	..	S	?	RRR	
Entoloma globuliferum	1	7.7	1.2	..	S	?	RRR	
Entoloma griseocyaneum	2	7.6	1.5	..	S	RR	RRR	2, 6, 7, 9, 11
Entoloma griseorubidum	4	1.5	1.2	..	S	?	RRR	2
Entoloma helodes*	3	6.1	1.3	..	S	R	RR	2, 3, 6
Entoloma hirtum	1	7.6	1.5	..	S	?	RRR	
Entoloma hispidulum*	3	5.6	1.1	..	S	?	R	

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Entoloma huysmanii	2	7.8	1.2	..	S	?	RRR	
Entoloma incanum*	3	7.6	1.5	..	S	RR	RR	4, 7, 9
Entoloma infula*	3	7.6	1.5	..	S	R	RR	4
Entoloma inutile*	2	5.1	1.1	..	S	RR	RR	2
Entoloma jubatum*	3	7.6	1.5	..	S	R	RR	2, 3
Entoloma juniperinum	1	7.6	1.5	..	S	?	RRR	
Entoloma kitsii	4	1.5	1.2	..	S	?	RRR	
Entoloma lazulinum	3	7.7	1.2	..	S	C	R	2, 3, 6, 9
Entoloma lepidissimum	1	7.8	1.2	..	S	?	RRR	
Entoloma leptonipes*	3	7.6	1.5	..	S	R	R	2, 5, 9
Entoloma leucocarpum	4	1.5	1.2	..	S	?	RRR	
Entoloma lividoalbum*	4	1.4	1.5	..	S	RRR	RRR	2, 4, 5, 9
Entoloma lividocyanulum	1	7.8	1.2	..	S	?	RRR	2
Entoloma lividum*	4	1.4	1.5	..	S	RRR	RRR	4, 8, 12
Entoloma lucidum	2	7.5	1.3	..	S	?	RRR	2, 9
Entoloma madidum*	2	7.6	1.5	..	S	RR	RRR	2, 3, 5, 6, 7, 9
Entoloma minutum*	3	7.4	1.3	..	S	C	R	2, 6, 9
Entoloma moserianum	4	1.4	1.5	..	S	–	RRR	
Entoloma mougeotii	2	7.8	1.2	..	S	R	RR	2, 3, 5, 6, 7
Entoloma neglectum*	3	7.2	1.2	..	S	R	RR	2, 3, 4
Entoloma niphoides*	4	2.3	1.2	3.9	M?	RR	RR	
Entoloma nitidum*	2	1.3	1.3	1.4	M?	RR	RRR	4, 9
Entoloma olorinum	2	7.9	1.2	..	S	?	RRR	
Entoloma ortonii	2	7.9	1.2	..	S	?	RRR	
Entoloma pallens	2	7.2	1.2	..	S	?	RRR	
Entoloma phaeocyathus	4	8.1	1.2	..	S	?	RRR	
Entoloma plebeioides	1	7.7	1.2	..	S	?	RRR	
Entoloma poliopus	3	7.8	1.2	..	S	RR	RR	
Entoloma porphyrofibrillum	1	5.6	1.2	..	S	?	RRR	
Entoloma porphyrophaeum*	2	7.5	1.3	..	S	R	RR	4, 11
Entoloma prunuloides	1	7.6	1.5	..	S	?	RRR	6, 7, 9, 11
Entoloma pseudoturci	2	7.7	1.2	..	S	RR	RRR	
Entoloma pulvureum	4	1.5	1.2	..	S	?	RRR	
Entoloma pygmaeopapillatum	1	7.4	1.3	..	S	?	RRR	
Entoloma pyrospilum	1	7.6	1.5	..	S	?	RRR	2, 3
Entoloma resutum	2	6.7	1.2	..	S	?	RRR	
Entoloma rhombisporum	2	6.7	1.2	..	S	?	RRR	2, 6
Entoloma roseum	1	7.7	1.2	..	S	?	RRR	4, 7
Entoloma sacchariolens	2	6.7	1.2	..	S	?	RRR	
Entoloma sarcitulum	3	7.9	1.2	..	S	R	RR	9
Entoloma sarcitum	1	7.8	1.2	..	S	?	RRR	
Entoloma saundersii*	3	4.6	1.5	5.8	M?	RR	RR	
Entoloma scabiosum	4	1.5	1.2	..	S	RR	RR	
Entoloma scabrosum	1	1.2	1.3	..	S	?	RRR	
Entoloma sericeoides	2	7.7	1.2	..	S	?	RRR	
Entoloma serrulatum*	3	7.9	1.2	..	S	C	R	2, 3, 4, 6, 9
Entoloma sinuatum	4	1.4	1.5	..	S	?	RRR	2, 5, 6, 11
Entoloma sodale	2	7.8	1.2	..	S	RR	RR	2, 3, 9

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Entoloma solstitiale	2	7.0	1.2	..	S	?	RRR	4
Entoloma speculum	4	1.4	1.5	..	S	RRR	RRR	2, 6, 11
Entoloma sphagneti*	3	6.2	5.2	..	S	RR	RR	1, 4, 5
Entoloma strigosissimum	4	1.4	1.5	..	S	RR	RR	2, 6, 9
Entoloma tenellum	3	6.3	1.3	..	S	RR	RR	
Entoloma tibiicystidiatum*	1	7.4	1.3	..	S	?	RRR	
Entoloma tjallingiorum	4	1.5	1.2	..	S	?	RRR	
Entoloma triste	1	6.2	5.2	..	S	?	RRR	
Entoloma turbidum	3	5.2	1.1	..	S	C	R	4
Entoloma turci*	3	7.9	1.2	..	S	RR	RRR	2
Entoloma velenovskyi*	2	7.5	1.3	..	S	?	RRR	
Entoloma ventricosum*	1	7.2	1.2	..	S	?	RRR	
Entoloma versatile	0	1.7	1.2	..	S	RRR	–	7
Entoloma vinaceum	3	5.0	1.1	..	S	C	R	4
Entoloma xanthochroum	1	7.8	1.5	..	S	?	RRR	
Epithele typhae	3	6.5	4.2	7.3	S	R	R	1, 4
Fayodia gracilipes	0	?	?	?	S	RRR	–	2, 9
Femsjonia pezizaeformis	4	1.7	3.4	4.4	S	RRR	RRR	6, 7, 8
Flammulaster muricatus	4	1.6	3.0	1.0	S	?	RRR	2, 3, 4, 9
Fomitopsis pinicola*	4	3.0	3.1	6.3	S	RR	RR	
Fomitopsis rosea	0	3.0	3.1	6.0	S	RRR	–	1, 2, 3, 6, 7
Galerina gibbosa*	1	6.1	5.1	..	S	?	RRR	
Galerina heimansii*	3	1.2	1.3	..	S	RR	RR	
Galerina hygrophila	3	7.4	1.3	..	S	?	RR	
Galerina inundata*	2	7.4	1.3	..	S	?	RRR	
Galerina mycenoides*	3	6.6	1.3	..	S	R	R	1, 2, 4, 6, 9
Galerina propinqua*	3	6.2	1.8	..	S	RR	RR	4
Galerina septentrionalis	2	6.1	5.1	..	S	?		RRR
Galerina sphagnorum	2	6.1	5.1	..	S	RRR	RRR	2, 5, 6, 9, 11, 12
Galerina tibiicystis	3	6.1	5.1	..	S	CC	C	9
Ganoderma pfeifferi	4	4.7	2.1	1.9	P	RR	RR	1, 2, 4, 5, 7, 9, 11, 12
Gautieria graveolens	2	1.5	1.1	1.9	M?	RRR	RRR	13
Gautieria morchellaeformis	0	1.4	1.2	1.0	M?	RRR	–	1, 3
Geastrum badium*	3	8.2	1.4	..	S	RR	RR	1, 3, 4, 8, 12
Geastrum campestre*	2	8.2	1.4	..	S	RRR	RRR	1, 2, 3, 4, 5, 7
Geastrum coronatum*	4	2.6	1.2	..	S	RR	RR	2, 3, 4, 6, 12
Geastrum floriforme*	1	3.5	1.1	..	S	–	RRR	1, 2, 3, 4, 5, 6, 7
Geastrum fornicatum	4	1.6	1.2	..	S	–	RRR	2, 4, 7, 11, 12,.13
Geastrum minimum	3	8.2	1.4	..	S	R	R	2, 3, 4, 6, 7, 8, 11
Geastrum nanum*	3	8.2	1.4	..	S	RR	RR	1, 2, 3, 4, 6, 7, 8, 12, 13
Geastrum pectinatum	4	3.1	1.1	..	S	RR	RR	5, 6, 9, 11
Geastrum quadrifidum*	1	3.1	1.1	..	S	R	RRR	6, 9, 11
Geastrum recolligens*	4	1.5	1.2	..	S	RR	RR	1, 2, 3, 6, 12
Geastrum saccatum*	1	2.6	1.2	..	S	RR	RRR	2, 7
Geastrum striatum	4	2.6	1.2	..	S	RR	RR	3,4,6,9,11,12,13
Geastrum vulgatum*	3	1.5	1.2	..	S	RR	RR	6, 9, 11, 13

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Genea hispidula	1	1.7	1.2	4.4	M?	RRR	RRR	2, 3
Geoglossum barlae	1	7.7	1.2	..	S	RRR	RRR	
Geoglossum cookeianum	3	7.7	1.2	..	S	R	RR	1, 2, 3, 4, 5, 7
Geoglossum fallax	3	7.7	1.2	..	S	C	R	1, 2, 4, 5, 7, 8
Geoglossum glutinosum	3	7.9	1.2	..	S	C	R	1, 2, 4, 5, 6, 8, 9, 11, 12
Geoglossum nigritum	3	7.9	1.2	..	S	C	R	1, 2, 3, 4, 5, 7, 8, 12
Geoglossum peckianum	0	?	?	?	S	RRR	–	4
Gloiocephala menieri*	4	6.3	4.4	7.9	S	RR	RR	
Gomphidius glutinosus*	2	3.1	1.1	6.4	M	C	RR	4, 6, 10
Gomphidius maculatus	0	3.1	1.1	6.2	M	RRR	–	4, 6, 9, 11
Gomphidius roseus*	3	3.1	1.2	6.4	M	C	R	1, 6, 9, 11
Grifola frondosa*	4	4.0	2.1	4.4	P	RR	RR	2, 3, 4, 5, 6, 8, 11, 12
Gymnopilus flavus	4	7.3	4.5	7.9	S	RR	RR	1, 2, 4, 5, 6, 9
Gymnopilus fulgens*	3	6.2	1.3	..	S	C	R	4
Gymnopilus stabilis	4	6.1	3.0	6.0	S	RR	RR	2, 3, 6, 9
Gyrodon lividus*	3	1.4	1.2	1.3	M	RR	RR	2, 3, 4, 5, 6, 9, 12
Gyromitra esculenta*	3	3.1	1.4	6.4	M?	C	R	12
Gyromitra infula	4	3.0	3.0	6.0	S	RR	RR	2, 3, 4, 5, 6, 9, 11, 12
Gyroporus castaneus*	3	4.7	1.2	4.4	M	R	RR	2, 3, 4, 5, 6, 9, 11, 12
Gyroporus cyanescens*	2	1.7	1.4	4.4	M	C	RR	4, 5, 10, 11, 12
Hebeloma cylindrosporum	3	3.1	1.4	6.8	M	?	R	
Hebeloma edurum	4	1.4	1.5	1.0	M	?	RRR	4
Hebeloma fusisporum	3	1.2	1.3	1.3	M	?	RR	
Hebeloma ingratum	2	2.2	1.3	5.3	M	?	RRR	
Hebeloma radicosum*	4	1.4	1.5	1.9	M?	R	R	4, 11
Hebeloma sinapizans*	3	4.7	1.5	1.9	M	C	R	10, 12
Hebeloma spoliatum	4	1.7	1.2	1.0	M	RRR	RRR	2, 6, 9, 11
Hebeloma tomentosum	3	1.4	1.5	3.1	M	?	RR	1
Hebeloma truncatum	4	1.5	1.2	1.0	M	RRR	RRR	
Hebelomina neerlandica	1	3.1	3.4	6.8	S	RRR	RRR	
Helvella costifera	4	1.5	1.2	..	S?	RRR	RRR	4, 7
Helvella cupuliformis	4	1.6	1.5	..	S?	RRR	RRR	7
Helvella ephippium	4	1.5	1.2	..	S?	RR	RR	4, 6, 7
Helvella fusca	4	1.5	1.2	..	S?	RRR	RRR	
Helvella latispora	4	1.5	1.2	..	S?	RRR	RRR	2
Helvella leucomelaena	4	3.4	1.1	..	S?	RR	RR	2, 4, 5, 8
Helvella leucopus	4	1.5	1.2	..	S?	RR	RR	1, 2
Helvella stevensii	4	1.4	1.5	..	S?	RRR	RRR	4
Hericium clathroides*	1	1.0	3.1	1.9	S	RRR	RRR	2, 3, 4, 5, 6, 9
Hericium erinaceum*	2	1.0	2.1	1.9	S	RR	RR	2, 3, 4, 5, 6, 7, 9, 11, 12
Hohenbuehelia culmicola*	4	8.1	4.4	7.2	S	–	RRR	
Hohenbuehelia mastrucata*	4	1.0	3.0	1.0	S	RR	RR	2, 5, 9

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Hohenbuehelia myxotricha*	3	2.2	3.4	5.3	S	?	R	2, 3, 4, 5, 6, 9
Hydnangium carneum	0	?	?	?	M?	RRR	–	6
Hydnellum aurantiacum*	0	3.1	1.1	6.8	M	RR	–	4, 6, 9, 11
Hydnellum caeruleum*	0	3.1	1.1	6.8	M	RR	–	2, 3, 4, 6, 11
Hydnellum compactum*	1	3.1	1.1	6.8	M	RR	RRR	
Hydnellum concrescens*	2	4.9	1.2	1.0	M	CC	RR	2, 3, 4, 6, 11
Hydnellum cumulatum*	0	3.1	1.1	6.4	M	RRR	–	
Hydnellum ferrugineum	0	3.1	1.1	6.4	M	RR	–	1, 2, 3, 4, 6, 11
Hydnellum peckii*	0	3.1	1.1	6.0	M	RRR	–	1, 2, 3
Hydnellum spongiosipes*	2	4.9	1.2	1.0	M	C	RR	1, 2, 4
Hydnobolites cerebriformis	2	1.7	1.2	1.0	M?	RRR	RRR	1, 6, 7, 9
Hydnotria tulasnei	3	1.0	1.1	1.0	M	R	RR	
Hydnum repandum*	3	1.5	1.2	1.0	M	R	RR	10
Hydnum rufescens*	1	1.5	1.2	1.0	M	RR	RRR	
Hydropus moserianus	4	1.5	1.5	..	S	?	RRR	
Hydropus scabripes	4	1.5	3.8	1.0	S	RRR	RRR	3, 4
Hydropus subalpinus	4	9.2	3.7	1.0	S	?	RRR	7
Hygrocybe acutoconica*	3	7.7	1.4	..	S	C	R	4, 5, 7, 9
Hygrocybe aurantiosplendens	1	7.6	1.5	..	S	?	RRR	2, 6, 7, 9
Hygrocybe aurantioviscida*	2	7.4	1.2	..	S	?	RRR	
Hygrocybe calciphila	2	7.6	1.5	..	S	?	RR	4
Hygrocybe cantharellus*	3	5.0	1.1	..	S	R	RR	1, 2, 3, 6, 7, 9, 12
Hygrocybe ceracea*	3	7.9	1.2	..	S	CC	R	2, 3, 4, 6, 9, 11
Hygrocybe chlorophana*	2	7.6	1.5	..	S	R	RR	2, 3, 6, 9
Hygrocybe coccinea*	2	7.7	1.2	..	S	C	RR	1, 2, 3, 4, 5, 6, 9, 11
Hygrocybe coccineocrenata*	3	6.1	5.1	..	S	R	RR	1, 2, 3, 4, 5, 6, 12
Hygrocybe conicoides*	3	8.2	1.4	..	S	?	RR	1, 2, 3, 4
Hygrocybe conicopalustris*	3	6.0	1.2	..	S	?	RRR	2, 3
Hygrocybe flavescens*	2	7.6	1.5	..	S	C	RR	2, 3, 7, 9
Hygrocybe fornicata*	2	7.2	1.2	..	S	R	RR	1, 3, 4, 7, 8, 9
Hygrocybe glutinipes*	2	7.5	1.2	..	S	R	RR	2
Hygrocybe helobia*	3	6.4	5.1	..	S	?	RR	2, 5, 7
Hygrocybe insipida*	3	7.8	1.2	..	S	C	R	1, 2, 4, 6, 7, 9
Hygrocybe intermedia*	1	7.6	1.5	..	S	?	RRR	1, 2, 4, 6, 7, 9
Hygrocybe konradii*	3	7.8	1.5	..	S	?	RR	1, 2, 3, 7, 9
Hygrocybe laeta*	3	5.7	1.2	..	S	C	R	1, 2, 3, 4, 5, 6
Hygrocybe marchii*	2	7.8	1.2	..	S	?	RR	2, 6, 7
Hygrocybe murinacea*	1	7.8	1.2	..	S	RR	RRR	1, 2, 3, 4, 6, 7, 9
Hygrocybe perplexa*	1	7.6	1.5	..	S	?	RRR	2, 3, 6, 9
Hygrocybe phaeococcinea*	2	6.7	1.2	..	S	RR	RR	7
Hygrocybe psittacina*	3	7.8	1.2	..	S	CC	C	1, 4, 5, 6, 11
Hygrocybe punicea*	1	7.6	1.5	..	S	R	RRR	1, 2, 3, 4, 5, 6, 7, 11
Hygrocybe quieta	1	7.3	1.5	..	S	R	RRR	2, 3, 6, 7, 9
Hygrocybe reai*	2	7.6	1.5	..	S	?	RR	1, 2, 3, 4, 6, 7, 9
Hygrocybe reidii	2	7.8	1.2	..	S	?	RRR	7
Hygrocybe strangulata*	2	7.8	1.2	..	S	?	RR	2, 7, 9

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Hygrocybe subglobispora*	2	7.3	1.5	..	S	?	RR	1, 2, 4, 5
Hygrocybe turunda*	1	3.5	1.2	..	S	RRR	RRR	
Hygrocybe unguinosa*	2	7.7	1.2	..	S	R	RR	1, 2, 4, 5, 6, 7, 9, 11
Hygrocybe viola	1	1.6	1.5	..	S	?	RRR	
Hygrocybe vitellina*	2	7.7	1.2	..	S	RR	RRR	1, 6
Hygrophoropsis pallida	3	7.0	1.2	..	S	R	RR	1, 6
Hygrophorus agathosmus	0	3.4	1.0	6.3	M	RRR	–	4
Hygrophorus aureus*	1	3.1	1.1	6.4	M	RR	RRR	2, 5, 6, 7, 8
Hygrophorus cossus*	1	4.7	1.5	1.9	M	RR	RRR	4
Hygrophorus dichrous*	3	1.5	1.2	4.4	M	RR	RR	2, 3, 5, 8, 9, 13
Hygrophorus discoideus	0	?	?	?	M	RRR	–	9
Hygrophorus eburneus*	1	4.7	1.2	1.9	M	RR	RRR	4
Hygrophorus hypothejus*	3	3.1	1.1	6.4	M	C	R	10
Hygrophorus leucophaeus*	2	1.4	1.5	1.9	M	RRR	RRR	4
Hygrophorus lucorum*	1	3.3	1.2	6.2	M	RR	RRR	
Hygrophorus mesotephrus*	0	1.4	1.5	1.9	M	RRR	–	1, 2, 4, 5, 9
Hygrophorus nemoreus*	1	1.5	1.2	4.4	M	RR	RRR	4, 7, 11
Hygrophorus olivaceoalbus*	1	3.1	1.1	6.3	M	–	RRR	
Hygrophorus pudorinus s. lat.	0	?	?	?	M	RRR	–	1, 2, 3, 4, 5, 6, 8
Hygrophorus purpurascens	0	?	?	?	M	RRR	–	1, 7, 13
Hygrophorus pustulatus*	1	3.4	1.5	6.3	M	RRR	RRR	
Hygrophorus russula	0	1.6	1.5	4.4	M	RR	–	2, 4, 6, 7, 9
Hygrotrama atropuncta*	1	1.4	1.5	..	S	RRR	RRR	2, 3, 4, 7, 9
Hygrotrama foetens	3	7.6	1.5	..	S	RR	RR	2, 3, 7, 9, 13
Hygrotrama phaeoxantha*	2	7.8	1.5	..	S	?	RRR	7
Hygrotrama rugulosum*	3	7.6	1.5	..	S	?	RR	4, 7
Hygrotrama schulzeri*	1	7.6	1.5	..	S	?	RRR	3, 7, 8
Hymenogaster arenarius	4	1.5	1.2	..	M	RRR	RRR	9
Hymenogaster luteus	4	1.5	1.2	..	M	RRR	RRR	7
Hymenogaster olivaceus	4	1.5	1.2	..	M	RR	RR	6, 10
Hymenogaster tener	4	1.5	1.2	..	M	RR	RR	
Hymenogaster vulgaris	4	1.5	1.2	..	M	RRR	RRR	
Hypholoma epixanthum	2	3.0	3.3	6.0	S	R	RR	9, 11
Hypholoma ericaeoides	3	5.2	1.1	..	S	?	R	2, 4, 5, 6, 9
Hypholoma ericaeum	3	5.7	1.1	..	S	C	R	2, 3, 4, 5, 6, 9
Hypholoma myosotis	3	6.0	1.3	..	S	C	R	1, 2, 3, 4, 5, 6, 9, 12
Hypocreopsis lichenoides	2	2.2	3.4	5.3	S	RRR	RRR	2, 3, 4, 8, 9, 11
Hysterangium crassum	1	1.5	1.2	1.0	M	RRR	RRR	
Inocybe acuta	3	3.2	1.0	6.0	M	R	RR	1, 2, 5, 6, 9, 11
Inocybe acutella*	3	2.2	1.3	5.1	M	?	RR	4
Inocybe aeruginascens*	4	1.5	1.2	1.0	M	?	RRR	
Inocybe agardhii*	4	2.5	1.2	5.5	M	RR	RR	2
Inocybe albovelutipes	0	1.7	1.2	1.0	M	RRR	–	2, 3, 4
Inocybe appendiculata	4	3.0	1.2	6.0	M	RR	RR	4
Inocybe atripes*	4	4.6	1.5	1.0	M	RR	RR	
Inocybe aurea*	2	3.1	1.1	6.0	M	RR	RRR	

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Inocybe bongardii*	4	4.6	1.5	1.0	M	RR	RR	7, 8, 10, 11
Inocybe brunneotomentosa	1	1.5	1.2	1.0	M	RRR	RRR	
Inocybe calamistrata*	2	1.2	1.3	1.3	M	R	RR	1, 2, 3, 4, 5, 6, 9
Inocybe calospora*	2	1.2	1.3	1.3	M	RR	RR	2, 4, 5, 6, 9
Inocybe corydalina	3	4.6	1.5	4.2	M	R	RR	7
Inocybe devoniensis*	4	2.5	1.4	5.5	M	RR	RR	4, 13
Inocybe dunensis*	4	2.5	1.2	5.5	M	RR	RR	4, 13
Inocybe furfurea	4	1.4	1.5	1.0	M	?	RRR	2
Inocybe godeyi	4	1.4	1.5	1.0	M	RR	RR	2, 4, 5, 6, 7, 8, 9
Inocybe haemacta*	4	1.4	1.5	1.0	M	RR	RR	2, 4, 9
Inocybe hystrix*	3	1.5	1.2	1.0	M	RR	RRR	2, 3, 4, 5, 6, 8, 9
Inocybe jurana	3	4.6	1.5	4.2	M	R	RR	7
Inocybe langei	4	1.4	1.5	1.0	M	RRR	RRR	9
Inocybe maritima	1	2.5	1.4	5.5	M	RRR	RRR	13
Inocybe paludinella	3	1.2	1.0	1.3	M	R	R	2, 4, 9
Inocybe phaeodisca	3	1.5	1.2	1.0	M	RRR	RRR	2, 4, 5, 6, 9
Inocybe pruinosa	3	3.3	1.2	6.0	M	?	RRR	
Inocybe pseudodestricta	4	1.4	1.5	1.0	M	?	RRR	
Inocybe pyriodora*	3	4.6	1.5	4.2	M	R	RR	10
Inocybe queletii	4	3.1	1.2	6.4	M	?	RRR	2, 3
Inocybe quietiodor	4	4.6	1.5	1.0	M	RRR	RRR	4
Inocybe reisneri	0	1.0	1.0	1.0	M	RRR	–	
Icocybe sambucina*	2	1.7	1.4	1.0	M	C	RR	2, 4, 6, 9
Inocybe similis	2	2.5	1.5	5.5	M	?	RR	4
Inocybe squarrosa*	3	1.2	1.3	5.1	M	RR	RR	4
Inocybe submaculipes	2	3.3	1.2	6.4	M	RRR	RRR	2, 3, 9
Inocybe subporospora	3	3.3	1.4	6.4	M	RR	RR	
Inocybe vaccina	4	1.5	1.2	4.2	M	?	RRR	2, 9
Inonotus dryadeus	3	1.6	2.1	4.4	P	RR	RR	1, 2, 3, 4, 5, 6, 7, 9, 11, 12
Inonotus hispidus	3	4.0	2.1	1.0	P	R	R	4, 6, 7, 8, 11, 13
Inonotus rheades	2	1.7	3.1	3.4	P	RR	RRR	1, 2, 3, 4, 5, 6, 9, 11
Kavinia alboviridis*	3	3.5	3.1	6.1	S	R	R	7
Laccaria maritima*	4	8.1	1.4	..	S	RRR	RRR	4
Lactarius acerrimus*	3	4.6	1.5	4.4	M	RRR	RRR	2, 4, 5, 6, 9
Lactarius acris	0	1.6	1.5	1.0	M	RRR	–	2, 4, 5, 6, 7, 9, 11
Lactarius aspideus*	3	2.2	1.3	5.3	M	RR	RR	1, 2, 3, 4, 6, 9, 12
Lactarius azonites*	1	4.7	1.5	4.4	M	RRR	RRR	
Lactarius camphoratus*	3	1.7	1.2	4.2	M	CC	C	10
Lactarius chrysorrheus*	3	1.7	1.2	4.2	M	CCC	C	6, 11
Lactarius circellatus*	3	1.6	1.5	1.5	M	R	RR	4, 10
Lactarius decipiens*	3	4.6	1.5	4.2	M	RR	RR	2, 4, 5

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Lactarius deliciosus	2	3.3	1.4	6.4	M	C	R	4, 6
Lactarius flexuosus	1	1.4	1.5	1.0	M	RRR	RRR	9, 11
Lactarius fluens*	3	4.6	1.5	1.9	M	R	R	4
Lactarius fuliginosus*	1	1.4	1.2	1.0	M	RRR	RRR	4
Lactarius fuscus	2	3.1	1.2	6.3	M	RRR	RRR	2, 5, 9
Lactarius glaucescens	0	1.5	1.2	1.0	M	RRR	–	4
Lactarius hemicyaneus*	3	3.4	1.1	6.8	M	RRR	RRR	
Lactarius hysginus*	1	3.1	1.1	6.8	M	RRR	RRR	2, 4, 5, 6, 9, 11
Lactarius ichoratus*	3	4.7	1.5	1.9	M	R	R	4
Lactarius insulsus	3	4.7	1.5	4.4	M	RR	RR	2, 5, 6
Lactarius lacunarum*	3	1.3	1.3	1.4	M	?	R	2, 4, 5, 6, 9
Lactarius lilacinus*	3	1.2	1.3	1.3	M	R	R	2, 3, 4, 5, 6, 12
Lactarius mairei	1	4.6	1.5	4.4	M	RRR	RRR	1, 2, 7, 9
Lactarius mitissimus*	4	2.5	1.2	5.5	M	R	R	4
Lactarius omphaliformis*	3	1.2	1.3	1.3	M	CC	C	2, 3, 4, 5
Lactarius pallidus*	3	4.6	1.5	1.9	M	RR	RR	4
Lactarius piperatus*	0	1.7	1.1	4.4	M	R	–	4, 10
Lactarius pterosporus	1	1.6	1.5	1.5	M	RRR	RRR	4
Lactarius resimus*	1	1.7	1.2	1.4	M	RRR	RRR	2, 6
Lactarius ruginosus	1	1.6	1.5	1.9	M	RRR	RRR	
Lactarius semisanguifluus*	3	3.3	1.2	6.4	M	RR	RRR	2, 4, 5, 6, 9, 11
Lactarius serifluus*	3	4.9	1.2	4.2	M	C	R	4, 8, 11
Lactarius trivialis*	1	1.7	1.1	1.4	M	RR	RRR	1, 4, 5, 6, 9, 11
Lactarius uvidus	2	1.4	1.5	1.0	M	R	RR	4
Lactarius vellereus	3	4.9	1.2	1.9	M	CC	C	4, 10
Lactarius vietus*	3	1.7	1.2	1.4	M	CC	C	
Lactarius violascens	0	1.4	1.5	1.0	M	RRR	–	2, 4, 6, 8, 9, 11
Lactarius volemus	0	4.7	1.2	1.0	M	RRR	–	4, 10, 11, 12
Leccinum aurantiacum	3	1.7	1.2	1.4	M	R	RR	4, 9, 10, 12
Leccinum duriusculum*	4	4.6	1.5	3.2	M	RR	RR	2, 3, 4, 9, 12
Leccinum griseum*	4	1.6	1.5	1.5	M	RR	RR	10
Leccinum holopus*	2	1.3	1.3	1.4	M	RR	RR	1, 2, 3, 5, 6, 9, 12
Leccinum roseofractum	2	1.7	1.2	1.4	M	RRR	RRR	2, 3, 4, 11, 12
Leccinum testaceoscabrum*	2	1.7	1.2	1.4	M	C	RR	9, 10
Lentinellus pilatii	0	1.5	3.3	1.0	S	RRR	–	1
Lentinus adhaerens*	2	3.0	3.3	6.0	S	RRR	RRR	1, 6, 9, 11
Lentinus cyathiformis	4	1.5	3.3	1.0	S	RRR	RRR	1, 2, 3, 6, 9
Lenzites betulina	3	1.7	3.6	1.0	S	CCC	C	
Leotia lubrica*	3	1.7	1.2	..	S	CC	C	4, 10
Lepiota brunneoincarnata*	4	1.5	1.2	..	S	RR	RR	2, 3, 5, 6, 9
Lepiota calcicola	4	1.5	1.2	..	S	RRR	RRR	2, 3, 5, 7, 9
Lepiota clypeolarioides	1	1.5	1.2	..	S	RRR	RRR	
Lepiota cortinarius*	4	1.5	1.2	..	S	RRR	RR	2, 5
Lepiota echinacea*	4	1.5	1.2	..	S	RR	RR	2, 3, 5, 6, 7, 9
Lepiota echinella	4	8.9	1.0	..	S	RRR	RRR	
Lepiota erminea	4	1.5	1.2	..	S	RRR	RRR	2, 6, 11, 12
Lepiota felina	4	1.5	1.2	..	S	RRR	RRR	4, 9, 11, 12

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Lepiota forquignonii	4	1.6	1.2	..	S	?	RRR	3
Lepiota fuscovinacea*	4	1.4	1.5	..	S	RRR	RRR	2, 4, 5, 7, 9
Lepiota grangei*	3	1.5	1.2	..	S	RRR	RRR	2, 4, 5, 6, 7, 8, 9
Lepiota griseovirens*	4	1.5	1.2	..	S	RRR	RRR	2, 3, 6
Lepiota hymenoderma	4	1.6	1.2	..	S	?	RRR	
Lepiota ignicolor	4	1.5	1.2	..	S	RRR	RRR	
Lepiota josserandii	4	3.3	1.2	..	S	?	RRR	2, 9
Lepiota kuehneri	0	9.2	1.2	..	S	RRR	–	2, 9
Lepiota langei	4	1.5	1.2	..	S	RR	RR	2, 4, 5, 6
Lepiota lilacea	4	?	?	..	S	RRR	RRR	2, 3, 6
Lepiota oreadiformis	3	7.7	1.2	..	S	RR	RR	1, 3, 4
Lepiota pseudofelina	4	1.5	1.2	..	S	RRR	RRR	2, 3, 6
Lepiota pseudohelveola*	4	7.7	1.2	..	S	RR	RR	2, 3, 4, 7
Lepiota pseudolilacea	4	?	?	..	S	RRR	RRR	
Lepiota rhodorrhiza	4	1.5	1.2	..	S	RRR	RRR	
Lepiota setulosa	4	1.5	1.2	..	S	RR	RR	2, 6
Lepiota subalba	4	1.5	1.2	..	S	R	R	2, 3, 4, 5, 7, 11
Lepiota tomentella	4	8.9	1.0	..	S	?	RRR	2, 3, 4, 5, 6
Lepiota xanthophylla	4	1.6	1.2	..	S	?	RRR	3
Lepista caespitosa	1	7.8	1.2	..	S	?	RRR	12
Lepista luscina	3	7.2	1.2	..	S	C	R	1, 4, 10
Lepista personata*	3	7.2	1.2	..	S	CC	C	11
Lepista rickenii*	3	?	?	..	S	RR	RR	9, 11
Leptoglossum acerosum*	3	7.4	1.3	..	S	C	R	2, 3, 4, 6, 9
Leptoglossum lobatum	1	6.0	5.3	..	P?	RRR	RRR	1, 2, 3, 4, 6
Leptoglossum muscigenum	4	8.2	5.3	..	P?	R	R	2, 5, 6, 9, 11
Leptoglossum retirugum	4	1.5	5.3	..	P?	R	R	2, 6
Leucoagaricus cinerascens	4	8.2	1.4	..	S	RRR	RRR	4
Leucoagaricus macrorhizus	4	7.7	1.4	..	S	RRR	RRR	
Leucoagaricus melanotrichus	4	1.5	1.2	..	S	RRR	RRR	
Leucoagaricus pinguipes	4	8.2	1.4	..	S	?	RRR	
Leucoagaricus pudicus*	3	7.2	1.5	..	S	C	R	11
Leucoagaricus pulverulentus*	4	1.4	1.5	..	S	RRR	RRR	2, 3, 5
Leucoagaricus purpureolilacinus	4	1.5	1.2	..	S	RRR	RRR	
Leucoagaricus tener	4	3.4	1.1	..	S	?	RRR	
Leucoagaricus wychanskii*	4	1.5	1.2	..	S	RR	RR	2, 3, 5
Leucocoprinus badhamii	4	1.5	1.2	..	S	RR	RR	2, 3
Leucocoprinus bresadolae	4	1.5	1.2	..	S	RRR	RRR	2, 3
Leucocoprinus croceovelutinus	4	1.5	1.2	..	S	RR	RR	
Leucocoprinus georginae	4	1.5	1.2	..	S	RR	RR	
Leucocoprinus roseolanatus	0	1.0	1.2	..	S	RRR	–	
Leucopaxillus giganteus*	1	7.2	1.2	..	S	RRR	RRR	4, 9, 11
Leucopaxillus lentus*	2	3.5	1.1	..	S	RRR	RRR	7
Leucopaxillus paradoxus*	4	1.5	1.2	..	S	RR	RR	2, 4, 6, 7, 9
Leucopaxillus tricolor	0	?	?	..	S	RRR	–	1, 2, 3, 4, 5, 7, 12
Limacella glioderma*	4	1.5	1.2	..	S	RR	RR	4, 7

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Limacella guttata*	4	1.5	1.2	..	S	RR	RR	4, 7, 8, 11
Limacella ochraceolutea	4	1.6	1.5	..	S	?	RRR	2, 3, 4
Limacella roseofloccosa*	4	1.5	1.2	..	S	RRR	RRR	
Limacella vinosorubescens	4	1.6	1.2	..	S	?	RRR	3
Lopharia cinerascens	4	2.1	3.0	5.1	S	?	RRR	
Lopharia spadicea	4	1.0	3.4	1.0	S	RRR	RRR	1, 4, 6
Lycoperdon mammiforme	1	4.6	1.5	..	S	RRR	RRR	4, 5, 6, 7, 9
Lycoperdon marginatum	0	?	?	..	S	RRR	–	1, 2, 5, 6
Lycoperdon umbrinum*	4	1.7	1.1	..	S	RR	RR	
Lyophyllum capniocephalum	4	1.6	1.5	..	S?	RRR	RRR	2, 3
Lyophyllum immundum	4	?	?	..	S?	RRR	RRR	
Lyophyllum infumatum	4	1.5	1.2	..	S?	RRR	RRR	2, 4, 6, 9
Lyophyllum semitale*	1	4.9	1.2	..	S?	R	RRR	
Lyophyllum ulmarium	3	4.6	2.1	5.8	P	R	RR	2, 3, 4, 5, 6, 11
Macrolepiota excoriata*	3	7.2	1.2	..	S	C	R	4, 11
Macrolepiota gracilenta	4	7.7	1.2	..	S	RR	RR	11
Macrolepiota konradii	4	8.2	1.4	..	S	RRR	RRR	
Marasmiellus caespitosus*	3	8.3	4.4	7.6	S	RRR	RRR	
Marasmiellus ornatissimus	1	1.3	3.5	8.2	S	?	RRR	
Marasmiellus tricolor	4	7.2	4.4	7.0	S	RRR	RRR	2, 9
Marasmius anomalus	4	8.2	4.4	7.0	S	R	R	1, 3, 4, 9
Marasmius capillipes	4	4.6	4.2	3.1	S	?	RRR	1, 4, 9
Marasmius hudsonii	0	?	4.2	2.5	S	RRR	–	4
Marasmius prasiosmus*	3	1.5	4.2	1.9	S	RR	RR	4
Marasmius scorodonius	3	7.8	4.4	7.0	S	C	R	11
Marasmius wynnei	4	1.6	4.2	1.9	S	RR	RR	4, 7, 11
Marcelleina persoonii	4	1.4	1.5	..	S	RRR	RRR	
Melanogaster ambiguus	3	1.7	1.1	1.0	M	R	RR	9
Melanogaster broomeianus	3	1.7	1.1	1.0	M	RR	RR	
Melanogaster tuberiformis	2	1.7	1.1	1.0	M	RRR	RRR	2, 3, 7, 9
Melanoleuca verrucipes	1	1.4	1.5	..	S	?	RRR	7
Melanophyllum eyrei	4	1.6	1.2	..	S	?	RRR	1, 6, 7, 8
Microglossum nudipes	1	7.6	1.5	..	S	?	RRR	
Microglossum olivaceum	1	?	?	..	S	RRR	RRR	1, 2, 4, 6, 7, 8
Microglossum viride*	2	1.5	1.2	..	S	RR	RR	2, 3, 4, 5, 6, 9, 11
Micromphale foetidum*	4	1.6	3.5	1.6	S	RR	RR	4, 7
Micromphale inodorum	4	1.4	3.5	1.0	S	RR	RR	
Mitrula paludosa*	2	..	4.2	1.0	S	R	RR	3, 4, 5, 6, 9, 11, 12
Mniopetalum bryophilum	4	7.9	5.3	..	S?	RR	RR	
Mniopetalum globisporum	3	1.2	5.3	..	S?	RR	RR	1, 4
Mycena adonis*	3	5.3	1.1	..	S	C	R	1, 2, 4, 5, 6, 9, 11
Mycena belliae*	4	6.3	4.4	7.8	S	RR	RR	1, 2, 3, 4, 5, 6
Mycena bulbosa*	3	7.4	4.4	7.3	S	C	R	3
Mycena concolor*	3	6.1	5.1	..	S	RR	RR	4
Mycena hiemalis	3	1.0	3.1	1.0	S	C	R	9, 11

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Mycena latifolia*	4	?	?	..	S	RRR	RRR	
Mycena meliigena*	2	1.0	2.1	1.0	S	R	RRR	2, 4, 5, 9
Mycena olida	2	1.0	3.4	1.0	S	R	RR	2, 4, 6, 9
Mycena pachyderma	4	1.0	2.1	1.0	S	RRR	RRR	2
Mycena pelianthina*	4	1.6	4.2	1.9	S	RR	RR	4, 5, 11
Mycena pelliculosa*	3	5.6	1.1	..	S	C	R	
Mycena picta*	3	2.2	3.4	5.3	S	RRR	RRR	2, 4
Mycena pseudocorticola	2	4.0	2.1	1.0	S	R	RR	4, 5
Mycena pseudopicta*	3	7.0	1.2	..	S	RR	RR	2, 3
Mycena pterigena	4	1.5	4.3	8.4	S	RRR	RRR	4
Mycena renati	2	1.4	3.3	..	S	RRR	RRR	1, 4, 6, 7
Mycena tintinnalulum	4	1.7	3.1	1.9	S	?	RR	8
Mycena typhae*	3	6.3	4.4	7.9	S	RRR	RRR	
Mycenastrum corium	4	9.4	1.2	..	S	?	RRR	3, 6, 7
Mycenella bryophila*	4	1.0	3.0	1.0	S	RR	RR	4, 9
Mycenella margaritispora*	4	1.5	3.0	1.0	S	RRR	RRR	2, 4, 6
Mycenella rubropunctata	4	1.0	1.0	..	S	?	RR	
Mycenella trachyospora	0	1.5	2.1	5.8	S	RRR	–	
Myriostoma coliforme	4	2.6	1.2	..	S	RR	RR	1, 2, 6, 7, 12
Naucoria luteolofibrillosa*	3	1.2	1.5	1.3	M	RR	RR	
Naucoria sphagneti	2	1.2	1.3	1.3	M	?	RRR	
Naucoria suavis*	3	1.2	1.3	1.3	M	RRR	RRR	9
Naucoria subconspersa*	3	1.2	1.3	1.3	M	R	R	
Neogyromitra gigas	0	1.5	1.2	..	S	RRR	–	2, 3, 6, 12
Ombrophila violacea*	3	1.2	4.2	1.3	S	RR	RR	
Omphaliaster asterosporus	3	3.5	1.1	..	S	R	RR	2, 4, 5, 6, 9
Omphalina chlorocyanea*	1	7.9	1.4	..	S	?	RRR	
Omphalina cyathella	0	6.5	4.2	7.3	S	RRR	–	
Omphalina demissa	0	4.6	1.5	..	S	RRR	–	2, 9, 11
Omphalina ericetorum*	3	6.2	1.3	..	S	C	R	2, 3, 5, 6, 9
Omphalina grossula*	2	3.1	1.1	6.0	S	RR	RR	
Omphalina luteolilacina	1	1.7	2.1	..	S	RR	RRR	
Omphalina oniscus	1	6.1	5.1	..	S	RRR	RRR	2,3,4,6,9,12
Omphalina philonotis*	1	6.0	5.1	..	S	RR	RRR	1, 2, 3, 6
Omphalina pseudoandrosacea	2	?	?	..	S	RRR	RRR	
Omphalina rosella	1	7.9	1.2	..	S	?	RRR	
Omphalina sphagnicola*	1	6.1	5.1	..	S	RR	RRR	1, 2, 3, 4, 5, 6, 12
Omphalotus olearius*	4	4.6	3.3	1.0	S	RRR	RRR	1, 2, 3, 9
Otidea alutacea*	3	1.5	1.2	..	S	R	RR	
Otidea bufonia*	3	1.5	1.2	..	S	CC	C	
Otidea cochleata*	2	1.4	1.5	..	S	RR	RRR	
Otidea concinna	0	1.4	1.5	..	S	RRR	–	8, 9
Otidea leporina*	3	1.5	1.2	..	S	R	RR	
Otidea onotica*	2	1.7	1.2	..	S	C	RR	10, 12
Oudemansiella badia*	4	1.4	3.3	1.0	S	RR	RR	4, 6, 7, 8, 9
Oudemansiella kuehneri	4	1.5	1.2	..	S	?	RRR	3
Oxyporus latemarginatus	4	1.5	3.1	1.0	S	RRR	RRR	2, 5

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Oxyporus ravidus	4	1.5	3.1	1.0	S	RRR	RRR	2, 3, 6
Pachyphloeus citrinus	2	1.5	1.2	1.0	M?	RRR	RRR	2, 6, 7
Pachyphloeus conglomeratus	1	1.5	1.2	1.0	M?	RRR	RRR	2, 7
Panus conchatus*	3	1.4	3.1	1.9	S	RR	RR	
Paxillus atrotomentosus*	3	3.1	3.3	6.4	S	C	R	
Paxillus rubicundulus*	3	1.2	1.3	1.3	M	RR	RR	2, 4, 9
Peniophora pini	2	3.1	3.4	6.4	S	C	RR	
Perenniporia fraxinea*	4	1.4	2.1	2.2	S	RR	RR	4, 7, 12
Perenniporia medulla-panis	3	1.0	3.3	4.2	S	RRR	RRR	6, 7, 8, 9, 11
Peziza badiofusca	4	1.4	1.5	..	S	RRR	RRR	
Peziza celtica	4	1.4	1.5	..	S	RRR	RRR	
Peziza domiciliana	0	1.5	1.2	..	S	RRR	–	
Peziza emileia	4	1.4	1.5	..	S	RR	RR	
Peziza limosa	3	1.2	1.7	..	S	C	R	4
Peziza succosella	4	1.4	1.5	..	S	?	RR	4
Phaeogalera stagnina	2	6.1	5.1	..	S?	RRR	RRR	1
Phaeolepiota aurea	4	1.4	1.5	..	S	RR	RR	4, 6, 9, 11
Phaeomarasmius erinaceus	3	1.2	3.4	1.0	S	RR	RR	2, 4, 6, 9
Phallus hadriani*	4	8.1	1.4	..	S	R	R	2, 3, 11, 12
Phellinus igniarius	3	1.5	2.1	5.1	P	C	R	
Phellinus pini	1	3.0	2.1	6.4	P	RRR	RRR	1, 2, 4, 11
Phellinus populicola	0	?	?	3.1	P	RRR	–	6
Phellinus robustus	3	4.0	2.1	4.2	P	R	RR	8, 11
Phellodon confluens*	1	4.9	1.2	4.2	M	R	RRR	2, 5, 7, 11
Phellodon melaleucus*	1	1.7	1.2	1.0	M	C	RRR	1, 2, 4, 5, 11
Phellodon niger*	1	1.7	1.2	4.2	M	RR	RRR	1, 2, 3, 4, 6, 11
Phellodon tomentosus*	0	3.1	1.2	6.4	M	R	–	1, 2, 3, 4, 6, 9, 11
Phlebiopsis gigantea	3	3.1	3.3	6.0	S	CC	C	9
Pholiota conissans	3	2.2	3.4	5.1	S	RR	RR	
Pholiota flavida	4	3.3	3.1	6.3	S	?	RRR	9
Pholiota fusus	0	1.7	3.2	1.4	S	RRR	–	
Pholiota henningsii*	2	6.4	5.1	..	S	RR	RR	2, 3, 6
Pholiota heteroclita	4	1.7	3.1	1.4	S	?	RRR	2, 3, 5, 6
Pholiota scamba	4	3.1	3.7	6.8	S	RRR	RRR	4
Phylloporus rhodoxanthus*	1	1.7	1.2	4.4	M	RR	RRR	4, 6, 7, 9, 13
Piloderma bicolor	1	3.0	3.0	6.0	M	?	RRR	
Pisolithus arhizus	4	8.9	1.9	1.0	M	–	RRR	2, 3, 4, 5, 6, 9, 11
Pleurotus eryngii*	3	7.3	4.5	8.0	S	RR	RR	2
Pluteus atromarginatus*	3	3.1	3.3	6.4	S	RR	RR	9
Pluteus aurantiorugosus*	4	1.4	3.3	5.8	S	RRR	RRR	2, 3, 5, 6, 7, 12
Pluteus chrysophaeus	4	1.5	3.0	1.0	S	RRR	RRR	11
Pluteus exiguus	4	1.5	3.0	1.0	S	RRR	RRR	2, 4, 9
Pluteus hispidulus	4	1.4	3.0	1.0	S	RRR	RRR	2, 4, 6, 9
Pluteus insidiosus	2	1.2	3.2	1.3	S	?	RRR	
Pluteus leoninus*	4	1.4	3.0	1.0	S	RR	RR	
Pluteus luctuosus	4	1.5	3.0	1.0	S	RR	RR	4, 9

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Pluteus pallescens	4	1.4	3.3	1.0	S	RRR	RRR	2, 9
Pluteus pellitus	4	1.0	3.3	1.0	S	RR	RR	11
Pluteus umbrosus*	4	1.6	3.3	1.0	S	RR	RR	4, 7, 8, 9
Polyporus umbellatus	4	1.5	2.6	1.0	S	?	RRR	4,6,7,8,11, 12
Poronia punctata*	1	7.7	7.3	9.6	S	R	RRR	4, 6, 7, 8, 13
Porpoloma spinulosum*	0	1.4	1.5	..	S	RRR	–	1
Psathyrella bipellis	4	1.5	1.2	..	S	RR	RR	2, 9, 11
Psathyrella caput-medusae*	3	3.0	3.3	6.0	S	RR	RRR	2, 5, 6
Psathyrella clivensis	2	7.8	1.2	..	S	?	RRR	9
Psathyrella leucotephra	4	1.4	1.5	..	S	RR	RR	2, 9
Psathyrella maculata	4	1.5	3.3	1.0	S	RR	RR	2, 9
Psathyrella narcotica	2	7.7	1.2	..	S	RRR	RRR	
Psathyrella pygmaea	4	1.4	3.3	1.0	S	RR	RR	3, 9
Pseudobaeospora pillodii	4	1.5	1.2	..	S	–	RRR	
Pseudobaeospora syringea	4	2.5	1.2	..	S	RRR	RRR	
Pseudoclitocybe cyathiformis*	2	3.0	1.1	6.0	S	RR	RRR	10
Pseudoclitocybe obbata	4	8.2	1.4	..	S	RR	RR	
Pseudocraterellus sinuosus*	2	1.4	1.5	1.0	M	R	RR	4
Psilocybe atrobrunnea*	2	6.1	5.1	..	S	RR	RR	1, 6
Psilocybe callosa	2	7.7	1.2	..	S	RRR	RRR	
Psilocybe glutinosa	1	5.7	1.3	..	S	?	RRR	
Psilocybe liniformans	1	7.7	7.3	9.0	S	?	RRR	
Pterula multifida*	4	3.3	4.2	6.3	S	RR	RR	2, 4, 5, 6, 9
Pulcherricium caeruleum	4	1.4	3.4	1.0	S	RRR	RRR	2, 3, 4, 5, 9
Pulveroboletus cramesinus*	1	1.4	1.5	1.0	M	RRR	RRR	2, 3, 4, 5, 6, 7, 9, 12, 13
Pustularia rosea	2	5.0	6.0	1.0	S	RR	RRR	4
Ramaria aurea*	1	1.5	1.2	1.9	M?	RRR	RRR	2, 4, 5, 6, 9, 10
Ramaria botrytis*	1	1.4	1.5	1.9	M?	RR	RRR	1, 2, 3, 4, 6, 9
Ramaria corrugata*	2	3.0	1.1	6.0	S?	R	RR	
Ramaria crispula	3	1.0	1.2	..	S?	RRR	RRR	
Ramaria fagetorum	1	1.5	1.2	1.9	M?	RRR	RRR	
Ramaria fennica*	2	4.7	1.2	1.9	M?	RR	RRR	4, 9
Ramaria flaccida	3	3.0	1.1	6.0	S?	R	RR	4
Ramaria formosa*	1	4.7	1.2	1.9	M?	R	RRR	1, 4, 5, 6, 7
Ramaria gracilis	0	3.0	1.1	6.0	S?	RRR	–	4
Ramaria mairei	0	4.7	1.2	1.9	M?	RRR	–	5, 9
Ramaria myceliosa	2	3.0	1.1	6.0	S?	RRR	RRR	
Ramaria pusilla	3	3.0	1.1	6.0	S?	RRR	RRR	
Ramaria suecica*	1	3.5	1.1	6.1	S	RRR	RRR	
Ramariopsis crocea*	1	3.5	1.1	6.1	S	RRR	RRR	1, 4, 7
Ramariopsis kunzei	3	7.9	1.2	..	S	R	RR	1, 4, 6
Ramariopsis pulchella	2	7.6	1.5	..	S	?	RRR	1, 4, 7
Ramariopsis tenuiramosa	3	7.9	1.2	..	S	C	R	
Rhizopogon luteolus*	3	3.1	1.4	6.8	M	CC	R	4, 9
Rhizopogon luteorubescens	1	3.0	1.1	6.0	M	RRR	RRR	
Rhizopogon vulgaris	1	3.1	1.1	6.3	M	RRR	RRR	9

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Rhodocybe caelata*	2	3.5	1.2	..	S	RR	RR	2, 3, 4, 6
Rhodocybe fallax	4	1.5	1.2	..	S	RR	RR	2, 3, 5, 6
Rhodocybe melleopallens*	4	1.5	1.2	..	S	?	RRR	2, 3
Rhodocybe nitellina*	4	1.5	1.2	..	S	?	RR	6, 9
Rhodocybe parilis	1	7.9	1.2	..	S	RRR	RRR	1, 2, 5, 9
Rhodocybe popinalis	3	8.2	1.4	..	S	R	R	2, 3, 4, 5, 9, 11
Rhodocybe truncata	4	1.5	1.2	..	S	RR	RR	2, 3, 4, 5, 9
Rhodotus palmatus	4	1.5	3.1	1.0	S	RR	RR	2, 3, 5, 7
Ripartites helomorphus	4	1.5	1.2	..	S	RRR	RRR	
Ripartites metrodii	4	3.0	1.1	..	S	RR	RR	
Ripartites strigiceps	4	1.5	1.2	..	S	RRR	RRR	9
Rozites caperata*	1	3.1	1.1	6.8	M	RR	RRR	4, 9
Russula albonigra	3	1.5	1.2	1.0	M	R	RR	4
Russula amoena	2	?	?	?	M	RRR	RRR	2, 6, 9,
Russula amoenicolor	4	1.6	1.5	1.0	M	RRR	RRR	
Russula anthracina	4	1.7	1.2	4.2	M	RR	RR	4, 12
Russula aquosa	1	?	?	?	M	RRR	RRR	4, 5, 9, 11
Russula aurantiaca	2	4.6	1.5	1.4	M	RRR	RRR	2, 3, 5, 9
Russula borealis	1	1.4	1.5	1.9	M	RRR	RRR	2, 4, 5, 9
Russula clariana	4	4.6	1.5	3.1	M	RR	RR	2, 3
Russula cuprea	3	4.6	1.5	1.0	M	RR	RRR	4
Russula decolorans*	1	3.1	1.1	6.8	M	RR	RRR	11
Russula farinipes*	2	4.6	1.5	1.0	M	R	RR	4, 11
Russula foetens	2	4.7	1.2	4.2	M	CC	R	4, 10
Russula font-queri	4	1.5	1.2	1.0	M	RRR	RRR	2, 3, 9
Russula heterophylla	3	4.7	1.5	1.9	M	R	RR	4, 9, 11
Russula illota	3	1.5	1.2	4.4	M	RRR	RRR	4, 9
Russula lilacea	1	1.7	1.2	1.9	M	RRR	RRR	4
Russula luteotacta*	2	4.6	1.5	1.9	M	R	RR	4
Russula maculata*	4	4.6	1.5	5.7	M	RR	RR	4, 5
Russula medullata	1	1.4	1.5	1.0	M	RRR	RRR	2, 4, 9, 11
Russula minutula	4	1.5	1.2	4.2	M	RRR	RRR	1, 2, 9, 11
Russula odorata	3	4.9	1.2	4.2	M	R	R	9
Russula olivacea*	1	4.6	1.5	1.9	M	RR	RRR	4, 8, 10
Russula paludosa*	2	3.2	1.3	6.8	M	CC	R	10
Russula pelargonia	4	1.5	1.2	3.1	M	RR	RR	2, 6, 9
Russula pseudointegra	3	4.6	1.5	4.4	M	R	R	4
Russula puellaris	2	3.1	1.1	6.3	M	RR	RRR	
Russula pumila*	3	1.2	1.3	1.3	M	?	R	1, 2, 3, 4, 5, 6, 9, 11
Russula queletii*	3	3.4	1.5	6.3	M	RRR	RRR	
Russula rosacea*	1	4.7	1.2	1.0	M	R	RRR	10
Russula sanguinea	3	3.3	1.2	6.4	M	RR	RR	4, 5, 11
Russula sardonia*	3	3.1	1.1	6.4	M	CCC	C	10
Russula solaris	3	1.7	1.1	1.9	M	C	R	4, 7, 9, 12
Russula sphagnophila	2	1.3	1.3	1.4	M	RRR	RRR	9
Russula torulosa*	2	3.4	1.5	6.4	M	RR	RR	2, 9
Russula turci	2	3.3	1.2	6.4	M	R	RR	10

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Russula veternosa*	2	4.7	1.2	1.9	M	R	RR	4, 12
Russula vinosopurpurea	2	4.6	1.5	1.0	M	RRR	RRR	1, 9
Russula violacea	4	1.5	1.2	1.0	M	RRR	RRR	9
Russula violeipes*	4	4.6	1.5	4.2	M	RR	RR	4, 7, 9
Russula virescens	3	4.7	1.2	1.9	M	R	RR	4, 7, 8, 10
Russula viscida*	4	4.6	1.5	4.2	M	RR	RR	
Russula xerampelina s.str.	2	3.3	1.2	6.4	M	R	RR	
Sarcodon imbricatus*	1	3.1	1.2	6.4	M	CC	RRR	1, 4, 6, 9, 11
Sarcodon joeides*	1	1.7	1.2	4.2	M	R	RRR	9
Sarcodon lepidus*	1	1.7	1.2	4.2	M	RRR	RRR	
Sarcodon scabrosus*	2	1.7	1.2	1.0	M	R	RR	4, 7
Sarcodon underwoodii*	1	1.7	1.2	4.2	M	RR	RRR	
Sarcodontia setosa	4	1.0	2.1	1.0	S	RRR	RRR	4, 6
Sarcoleotia platypus	0	6.2	1.3	..	S	RRR	–	
Sarcoleotia turficola	1	6.1	5.1	..	S	?	RRR	2, 7, 8
Sarcoscypha coccinea*	4	1.5	3.4	1.3	S	RR	RR	2, 3, 4, 5, 6
Scleroderma cepa	4	1.5	1.2	1.0	M	RRR	RRR	2, 4, 9
Sericeomyces serenus	4	1.4	1.5	..	S	RR	RR	2, 3, 4, 12
Sericeomyces sericatus	3	1.5	1.2	..	S	RRR	RRR	2, 3
Sistotrema confluens	0	3.1	1.1	6.0	S?	R	–	2, 3, 4, 6, 11
Sowerbyella radiculata	4	2.6	1.2	..	S	RRR	RRR	2, 4
Sowerbyella unicolor	4	2.6	1.4	..	S	?	RRR	2
Spathularia flavida*	0	3.0	1.1	6.2	S?	RR	–	1, 4, 6
Spongipellis pachyodon	4	?	?	?	S	RRR	RRR	2, 3, 5, 7
Spongipellis spumeus	4	1.5	3.1	3.2	S	RRR	RRR	2, 6, 7, 8, 12
Squamanita odorata	4	9.0	1.0	..	S	RR	RR	2, 5
Stephensia bombycina	4	1.0	1.5	1.0	M?	RRR	RRR	1, 2, 7, 9
Stereopsis vitellina*	0	1.7	1.0	..	S?	RR	–	
Strobilomyces floccopus*	1	1.7	1.2	4.2	M	RRR	RRR	4, 6, 7, 10, 11
Suillus aeruginascens*	1	3.3	1.2	6.2	M	RR	RRR	11
Suillus bovinus*	3	3.1	1.1	6.4	M	CCC	C	
Suillus collinitus*	3	3.3	1.4	6.4	M	RR	RR	4, 9
Suillus flavidus*	0	3.2	1.3	6.4	M	RRR	–	1, 2, 3, 4, 5, 6, 12
Suillus granulatus*	3	3.3	1.4	6.4	M	C	R	11
Suillus grevillei*	2	3.1	1.2	6.2	M	CC	R	10
Suillus hololeucus	0	3.3	1.2	6.2	M	RRR	–	
Suillus placidus*	0	3.1	1.2	6.7	M	RR	–	2, 4, 6, 9
Suillus variegatus*	2	3.1	1.1	6.4	M	CC	R	10
Tephrocybe boudieri	4	1.5	1.2	..	S	RR	RR	4, 9
Tephrocybe confusa	4	3.1	1.1	..	S	RRR	RRR	
Tephrocybe mephitica	4	1.5	1.2	..	S	RRR	RRR	2, 6, 9
Tephrocybe rancida*	4	1.4	1.5	..	S	RRR	RRR	4, 6, 11
Thelephora anthocephala*	3	1.4	1.5	1.0	M	R	R	6, 7, 9
Thelephora atrocitrina	0	1.4	1.5	1.0	M	RRR	–	
Thelephora mollissima	3	1.4	1.5	1.0	M	RRR	RRR	4
Thelephora palmata*	4	3.3	1.2	6.0	M	RR	RR	
Thueminidium arenarium*	0	5.8	1.4	..	S	RRR	–	1
Thueminidium atropurpureum*	1	7.7	1.4	..	S	RR	RRR	6, 7, 8

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Trametes hoehnelii	3	1.2	3.1	1.3	S	RR	RR	6, 11
Trametes trogii	3	1.5	3.0	1.0	S	RR	RR	1, 2, 3, 5, 6, 7, 11, 12, 13
Trichaptum fuscoviolaceum	0	3.0	3.0	6.4	S	RRR	–	2
Trichoglossum hirsutum*	3	7.9	1.2	..	S	C	R	1, 2, 3, 4, 5, 6, 8, 9, 12
Trichoglossum variabile	1	7.7	1.2	..	S	RRR	RRR	7
Tricholoma acerbum*	1	1.5	1.2	1.0	M	RR	RRR	2, 4, 6, 9, 11
Tricholoma albobrunneum*	2	3.1	1.4	6.4	M	C	RR	1, 9
Tricholoma argyraceum*	3	4.7	1.2	1.0	M	R	RR	12
Tricholoma atrosquamosum*	2	4.6	1.5	1.9	M	RR	RRR	4, 7
Tricholoma aurantium	0	3.1	1.4	6.8	M	RR	–	4, 6, 7, 8, 9, 10
Tricholoma auratum*	2	3.1	1.4	6.4	M	CC	R	1, 2, 3, 4, 5, 6, 10
Tricholoma colossum	0	?	?	?	M	RRR	–	1, 2, 3, 6, 7, 11
Tricholoma columbetta*	2	1.7	1.2	4.2	M	CC	R	4, 6
Tricholoma flavobrunneum	3	1.3	1.3	1.4	M	C	R	11
Tricholoma focale	1	3.1	1.4	6.4	M	RR	RRR	1, 2, 5, 6, 11
Tricholoma imbricatum*	2	3.0	1.0	6.4	M	R	RR	4
Tricholoma lascivum	3	1.6	1.5	1.0	M	RR	RR	11
Tricholoma myomyces*	3	3.3	1.2	6.4	M	R	R	12
Tricholoma pessundatum	1	1.5	1.2	1.0	M	RRR	RRR	2, 4, 5, 6, 9, 11
Tricholoma portentosum*	2	3.1	1.2	6.4	M	C	RR	10
Tricholoma psammopus*	0	3.3	1.4	6.4	M	RRR	RRR	4, 11
Tricholoma saponaceum*	2	4.9	1.2	4.2	M	CC	R	4, 10
Tricholoma scalpturatum*	2	1.0	1.2	1.0	M	CC	R	11
Tricholoma sciodes*	2	4.9	1.2	1.9	M	RR	RRR	
Tricholoma sejunctum*	1	4.7	1.5	4.4	M	RRR	RRR	1, 4, 6, 9
Tricholoma squarrulosum	0	4.7	1.5	4.4	M	RRR	–	2, 6, 7, 9
Tricholoma sudum	0	3.1	1.2	6.4	M	RRR	–	
Tricholoma sulphureum*	3	1.0	1.0	4.2	M	CC	C	10
Tricholoma ustale*	3	4.9	1.2	1.9	M	CC	R	4, 10, 11
Tricholoma vaccinum	0	3.4	1.5	6.0	M	RRR	–	11
Tricholoma virgatum*	1	1.0	1.0	1.0	M	R	RR	11
Tricholomopsis decora	4	3.0	3.3	6.0	S	RRR	RRR	4, 6, 9
Trichophaea paludosa	3	1.2	1.7	..	S	RRR	RRR	
Tuber borchii	1	1.5	1.2	1.0	M	RRR	RRR	6, 9
Tuber excavatum	0	1.6	1.5	1.0	M	RRR	–	9
Tuber foetidum	1	1.5	1.2	1.0	M	RRR	RRR	2, 3
Tuber michailowskianum	1	1.5	1.2	1.0	M	RRR	RRR	
Tuber rufum	2	1.5	1.2	1.0	M	RR	RR	
Tulostoma brumale*	3	8.2	1.4	..	S	RR	RR	2, 4, 5, 6, 7, 8, 11, 12, 13
Tulostoma fimbriatum*	3	8.2	1.4	..	S	RR	RR	2, 3, 6, 7, 12
Tylopilus felleus*	2	1.7	1.2	4.2	M	C	R	
Tyromyces balsameus	2	3.5	3.1	6.1	S	RRR	RRR	6, 11
Tyromyces wynnei	4	3.0	1.1	6.0	S	RRR	RRR	2, 3, 4, 5, 7, 9
Volvariella bombycina	3	1.0	2.7	1.0	S	RR	RR	3, 4, 6, 7, 8, 9, 11, 13

Name	C	Hab	Sub	Org	E	F1	F2	Lists
Volvariella caesiotincta	3	1.5	3.2	1.0	S	RRR	RRR	2, 9, 13
Volvariella murinella	3	7.0	1.2	..	S	RR	RR	2, 4, 5, 6, 9
Volvariella pusilla	4	1.4	1.5	..	S	RR	RR	2, 5, 6, 9
Volvariella surrecta	4	1.0	8.4	..	P	RR	RR	1, 2, 4, 7, 11
Xerocomus spadiceus	3	1.0	1.0	4.2	M	RRR	RRR	
Xerocomus subtomentosus*	3	1.7	1.2	4.2	M	CC	C	
Xylobolus frustulatus	4	1.0	3.1	4.2	S	RRR	RRR	1, 2, 3, 4, 5, 6, 12

Table 9. Codes for habitats, substrates and organisms used in the Red Data List (Table 8) and other tables, after Arnolds (1984); names of plant communities after Westhoff & Den Held (1969).

A: Habitats:

1.0. Deciduous forests
1.2. Alder forests on wet or moist soils (*Alnion glutinosae*)
1.3. Birch forests on wet or moist soils (*Betulion pubescentis*)
1.4. Deciduous forests on moist to mesic, rich, clayey soils (*Alno-Padion* p.p.)
1.5. Deciduous forests on moist to dry, rich, sandy soils (*Alno-Padion* p.p.)
1.6. Deciduous forests on mesic to dry, calcareous loam or clay (*Carpinion betuli*)
1.7. Deciduous forests on mesic to dry, poor, sandy or loamy soils poor in lime (*Quercion robori-petraeae*)
2.2. Willow scrub (*Salix cinerea, S. aurita*) on moist or wet peat or sand (*Salicion cinereae*)
2.3. Scrub of *Crataegus* and *Prunus spinosa* outside the sea-dunes (*Rubion subatlanticum*)
2.5. Scrub of *Salix repens* (*Salicion arenariae*)
2.6. Scrub of *Crataegus, Rosa*, etc. in the dunes (*Sambuco-Berberidion* p.p.)
3.0. Coniferous forests and scrub
3.1. Coniferous forests on mesic to dry, poor, sandy or loamy soils, poor in lime
3.2. Coniferous forests on wet to moist, poor soils, poor in lime
3.3. Coniferous forests on mesic to dry, calcareous or rich sandy soils
3.4. Coniferous forests on moist to dry, calcareous or rich clayey or loamy soils
3.5. Juniper scrub (*Juniperus communis*)
4.0. Roadsides with trees and forest edges
4.6. Roadsides with trees on wet to moist, calcareous or rich soils
4.7. Roadsides with trees on mesic to dry, calcareous or rich soils
4.8. Roadsides with trees on wet to moist, poor soils, poor in lime
4.9. Roadsides with trees on mesic to dry, poor sand or loam, poor in lime
5.0. Heathlands, grass-heaths, inland sand-dunes
5.1. Mesic to dry heathlands (*Genisto-Callunetum*)
5.2. Wet to moist heathlands (*Ericetum tetralicis*)
5.6. Mesic to dry grass-heaths (*Violion caninae* p.p.)
5.7. Moist grass-heaths (*Violion caninae* p.p.)
5.8. Inland sand-dunes (*Spergulo-Corynephorion*)
6.0. Bogs, marshes and shores
6.1. Living *Sphagnum* peat bogs (*Rhynchosporion albae, Erico-Sphagnion*)
6.2. Degenerated or desiccated *Sphagnum* peat bogs
6.3. Rich reed-marshes and other bank-communities (*Phragmitetea, Filipendulion*)
6.4. Poor *Sphagnum*-reed-marshes (*Pallavicinio-Sphagnetum, Sphagnetum palustri-papillosi*)
6.5. Sedge marshes (*Magnocaricion*)
6.6. Quaking bogs and mires (*Caricion curto-nigrae* p.p., *Caricion davallianae* p.p.)

(A: Habitats:)

6.7. Wet to moist dune-slacks (*Caricion davallianae* p.p.)
7.0. Grasslands
7.1 Grasslands on strongly fertilized, wet to dry soils, frequently pastured and/or mown (*Agropyro-Rumicion crispi* p.p.)
7.2. Permanent pastures on moist to dry, moderately fertilized soils (*Lolio-Cynosuretum*)
7.3. Permanent hay-fields on mesic to dry, moderately fertilized clay or clayey sand (*Arrhenatheretum elatioris*)
7.4. Hay-fields on wet to moist, weakly fertilized soils (*Calthion palustris*)
7.5. Hay-fields on wet to moist, not fertilized peat or sand (*Junco-Molinion*)
7.6. Grasslands on not or weakly fertilized cretaceous slopes (*Koelerio-Gentianetum*)
7.7. Grasslands on not or weakly fertilized, mesic to dry sand in the coastal dunes (*Galio-Koelerion*)
7.8. Grasslands on not or weakly fertilized, mesic to dry, calcareous sand or loamy sand in the interior (*Medicagini-Avenetum, Sedo-Cerastion*)
7.9. Grasslands on not or weakly fertilized, mesic to dry sand, poor in lime (*Thero-Airion*)
8.1. Outer sea-dunes (*Ammophiletea*)
8.2. Dry, sandy or moss covered places in the coastal dunes (*Violo-Corynephoretum, Tortulo-Phleetum*)
8.3. Salt-marshes and saline grasslands (*Asteretea tripolii*)
8.9. Waste of mines
9.2. Gardens
9.3. Town parks, orchards, churchyards
9.7. Open roadsides on wet to moist, poor soils

(B: Substrates:)

1.0. Terrestrial
1.1 Litter, e.g. heath-litter, decaying leaves and needles
1.2. Humus, humose or humus-rich soils
1.3. Peaty soils or peat
1.4. Sand poor in humus
1.5. Clay or loam poor in humus
1.8. Not decayed turf
1.9. Stone heaps
2.0. Living woody plants (trees and shrubs)
2.1. Living trunks
2.7. Dead parts (e.g. wounds) of living trees
3.0. Dead wood
3.1. Dead trunks
3.2. Stumps of coppice woods
3.3. Dead stumps of trees
3.4. Dead branches
3.5. Dead twigs
3.6. Fence poles
3.7. Roots and subterranean wood
3.8. Wood chips
4.2. Fallen leaves of woody and non-woody plants
4.3. Petioles
4.4. Dead herbaceous stems
4.5. Roots or rhizoms of herbaceous plants
4.7. Cones of conifers

(B: Substrates:)

5.1. Living *Sphagnum*
5.2. Dead *Sphagnum*
5.3. Other living mosses
6.2. Old, overgrown burnt places
7.3. Excrements of animals
8.0. Sporocarps of fungi
8.1. Sporocarps of hypogeous fungi
8.4. Sporocarps of *Lepista nebularis*

(C: Organisms:)

1.0. Deciduous trees, shrubs and climbers
1.3. *Alnus*
1.4. *Betula*
1.5. *Carpinus*
1.6. *Corylus*
1.9. *Fagus*
2.5. *Ilex*
3.1. *Populus* spec.
3.2. *Populus alba*
3.3. *Populus canadensis/nigra*
3.4. *Populus tremula*
3.9. *Prunus spinosa*
4.2. *Quercus* spec.
4.4. *Quercus robur*
5.1. *Salix* spec.
5.3. *Salix aurita/cinerea*
5.5. *Salix repens*
5.7. *Tilia*
5.8. *Ulmus*
6.0. Coniferous trees and shrubs
6.1. *Juniperus*
6.2. *Larix*
6.3. *Picea*
6.4. *Pinus* spec.
6.7. *Pinus strobus*
6.8. *Pinus sylvestris*
7.0. Grasses and graminoid plants (Sedges, rushes, etc.)
7.2. *Ammophila*
7.3. *Carex*
7.6. *Juncus*
7.8. *Phragmites*
7.9. Remaining graminoid plants
8.0. Herbaceous, non graminoid plants
8.4. *Dryopteris*
9.6. Horse