

Zeitschrift: Mycologia Helvetica
Herausgeber: Swiss Mycological Society
Band: 4 (1990-1991)
Heft: 1

Artikel: Mycoecological analysis of Alnus associated macrofungi in the region of the Swiss National Park as recorded by J. Favre (1960)
Autor: Brunner, Ivano / Horak, Egon
DOI: <https://doi.org/10.5169/seals-1036489>

Nutzungsbedingungen

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. [Siehe Rechtliche Hinweise.](#)

Conditions d'utilisation

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. [Voir Informations légales.](#)

Terms of use

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. [See Legal notice.](#)

Download PDF: 05.05.2025

ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>

Mycoecological analysis of *Alnus* associated macrofungi in the region of the Swiss National Park as recorded by J. Favre (1960)

Ivano Brunner

Swiss Federal Institute for Forest, Snow and Landscape Research (WSL)
CH-8903 Birmensdorf, Switzerland

and

Egon Horak

Herbarium, Geobotanical Institute, ETH, Zollikerstrasse 107
CH-8008 Zürich, Switzerland

Manuscript received May 8, 1990

Summary: Macrofungi associated both with *Alnus viridis* and *A. incana* were investigated by Favre (1960) and reported in his study on the subalpine and montane fungus flora of the Swiss National Park (SNP) and its adjacent regions. In the above publication most mycoecological data presented by Favre, such as collecting dates for all records, are unfortunately not readily accessible to the reader or are absent. Therefore, in this present mycoecological analysis both published and unpublished data (kept in G) have been taken into account and, if feasible, added.

During a period of 17 years, Favre made 76 excursions (mostly during August and September) to seven stands of *A. incana* and 15 stands of *A. viridis*. The sites he explored are located in six regions (Zernez, S-chanf, Susch, Scuol, S-charl, Pass dal Fuorn) either within the SNP or close to its borders. The areas investigated best are those of S-charl (including 19 excursions to a small topographically defined stand of *A. viridis* in the subalpine zone of Val Sesvenna) and S-chanf. By comparison Favre has been visiting locations with *A. viridis* about four times more often than those with *A. incana*, and hence a clear correlation can be demonstrated between the number of visits and the number of agarics gathered on either habitats. In locations with *A. incana* about 67 species of macrofungi have been recorded whereas stands dominated by *A. viridis* yielded about 138 different taxa.

The total number of macrofungi either associated as symbionts or saprobes on detritus of the two species of *Alnus* found in the study area was about 157. Beside *Alpova diplophloeus*, the most common group of fungi are the Agaricales with 17 ectomycorrhizal representatives exclusively found in association with alders. Accordingly the most dominant and constant ectomycorrhizal macrofungi of *A. viridis* are *Lactarius obscuratus*, *Naucoria luteolofibrillosa*, and *N. scolecina*. The most frequently gathered saprobic macrofungi of *A. viridis* are *Rutstroemia firma*, *Mycena citrinomarginata*, *M. galopoda*, *Clitocybe alnetorum*, and *Pseudobaeospora pillodii*. Relying upon Favre's data, however, *Naucoria escharoides* is the only dominant and most consistently ectomycorrhizal agaric associated with *A. incana*.

A comparison of species lists reported from additional alder forests in Central Europe revealed that in the SNP region about nine ectomycorrhizal fungi (including *Russula alnetorum*, *Lactarius obscuratus*, and *Cortinarius atropusillus*) must be considered

as being exclusively associated with *A. viridis*. In contrast, *Paxillus filamentosus* is the only agaric entering ectomycorrhizal symbiosis with the more common and much wider distributed *A. incana*, which in the SNP region is restricted to the montane zone.

Zusammenfassung: Die Basis für die vorliegende Analyse der in der montan-subalpinen Zone der Schweizer Zentralalpen mit *Alnus* (*A. viridis*, Grünerle; *A. incana*, Grauerle) vergesellschafteten Makromyceten bildeten sowohl die von Favre (1960) publizierte Studie über die subalpine Pilzflora des Schweizer Nationalparks (SNP) als auch die von Favre weiter nicht ausgewerteten und heute in seinem Herbarium (G) hinterlegten Originalaufzeichnungen. In Favre's Publikation fehlen z.B. alle Angaben über Funddaten, so dass bisher keine Anhaltspunkte über die Phänologie der von ihm erwähnten Pilzarten vorlagen. Bei der Durchsicht der Feldbücher konnte diese Information ermittelt werden, und diese Daten werden bei jedem erwähnten Taxon somit auch im ökologischen Zusammenhang ergänzt.

Die Analyse der hier berücksichtigten Daten zeigte, dass Favre während 17 Jahren nicht weniger als 76 (jahreszeitlich meist in den Monaten August und September liegenden) Exkursionen zu Standorten mit Erlen durchführte, d.h. zu sieben montanen Standorten (im Raum Zernez, Susch und Scuol) mit *A. incana* und zu 15 subalpinen Standorten (in der Umgebung von S-charl, S-chanf und Pass dal Fuorn) mit vorwiegend *A. viridis*. Die von Favre vergleichsweise am häufigsten besuchten Regionen liegen bei S-chanf und S-charl. Der relativ kleine Standort mit *A. viridis* im oberen Val Sesvenna (im N von S-charl) war das Ziel von 19 Exkursionen. Beim Vergleich der Anzahl von Exkursionen und der Zahl der beobachteten Pilzarten zeigt sich bezüglich der beiden Erlen-Habitate eine deutliche Korrelation.

Die Gesamtzahl der mit Erlen entweder als Mykorrhizasymbionten oder als Streuabbauer verzeichneten Pilzarten beläuft sich auf 157. Favre registrierte in den Standorten mit *A. incana* 67, dagegen in den Standorten mit *A. viridis* aber 138 verschiedene Grosspilze. In seiner Liste stellen die Agaricales die zahlenmässig häufigste Pilzgruppe, wobei neben *Alpova diplophloeus* 17 weitere Taxa ökologisch als spezifische Ektomykorrhiza-Partner von *Alnus* eingestuft werden müssen. Die in der Region des SNP dominierenden Ektomykorrhizapilze von *A. viridis* sind *Lactarius obscuratus*, *Naucoria luteolofibrillosa* und *N. scolecina*. Bei den saproben Pilzen sind im gleichen Habitat *Rutstroemia firma*, *Mycena citrinomarginata*, *M. galopoda*, *Clitocybe alnetorum* und *Pseudobaespora pillodii* am häufigsten anzutreffen. Im Vergleich dazu ist in Standorten mit *A. incana* nur *Naucoria escharoides* als einzige dominierende und stete Ektomykorrhiza-bildende Pilzart vertreten.

Der Vergleich der von Favre beobachteten Pilzarten mit den aus anderen mykosoziologisch untersuchten Erlenwäldern Mitteleuropas bekannten Taxa zeigt, dass neun Ektomykorrhizapilze (inkl. *Russula alnetorum*, *Lactarius obscuratus* und *Cortinarius atropusillus*) ausschliesslich mit *A. viridis* vergesellschaftet sind. Im Gegensatz dazu kommt *Paxillus filamentosus* nur unter *A. incana* vor. Die meisten saproben Pilze sind nicht substrat-spezifisch und können deshalb auf Detritus sowohl von Grünerle als auch von Grauerle angetroffen werden.

Résumé: Le présent travail concerne les Macromycètes associés aux *Alnus* (*A. viridis* et *A. incana*) des zones alpine et subalpine du Parc National Suisse (PNS) et des régions adjacentes; il se base d'une part sur les publications de J. Favre (1960), mais aussi sur des documents originaux inédits de cet auteur déposés au Conservatoire Botanique de Genève (G). Dans ses publications, Favre ne fournit malheureusement pas toutes les données concernant les dates de récolte: il y manquait donc des points de repère pour une étude phénologique. L'étude des documents inédits a permis, pour chaque taxon mentionné, une analyse mycoécologique tenant compte de ces dates.

Durant 17 années, Favre a effectué pas moins de 76 excursions, la plupart en août et septembre, dans des stations à *Alnus*, précisément dans 7 stations alpines à *A. incana*

(régions de Zernez, Susch et Scuol) et dans 15 stations subalpines à *A. viridis* dominant (dans les régions de S-charl, S-chanf et Col du Fuorn). Les stations les plus visitées par Favre sont celles de S-charl (y compris 19 excursions dans la petite station à *A. viridis* du Val Sesvenna en zone subalpine) et S-chanf. A titre comparatif, Favre a visité des stations à *A. viridis* environ quatre fois plus souvent que celles à *A. incana*, et on peut en déduire une corrélation évidente entre le nombre d'excursions et le nombre d'espèces d'Agaricales récoltées dans chacun des habitats.

Le nombre total d'espèces trouvées par Favre sous des aunes, qu'elles soient symbiotiques ou saprophytes, est de 157, parmi lesquelles 67 sous *A. incana*, et 138, par contre, sous *A. viridis*. Les Agaricales représentent la majorité de ces espèces et, mis à part *Alpova diplophloeus*, 17 autres taxons doivent être classés comme partenaires spécifiques ectomycorhiziques des *Alnus*. Dans le PNS, les espèces ectomycorhiziques dominantes d'*A. viridis* sont *Lactarius obscuratus*, *Naucoria luteolofibrillosa* et *N. solecina* et, dans le même habitat, les espèces les plus fréquentes saprophytes sont *Rutstroemia firma*, *Mycena citrinomarginata*, *M. galopoda*, *Clitocybe alnetorum* et *Pseudobaeospora pillodii*. En comparaison, dans les stations à *A. incana*, la seule espèce dominante et constamment ectomycorhizique est *Naucoria escharoides*.

La comparaison de la liste des espèces observées par Favre avec celle des espèces rencontrées dans les aunaies d'Europe centrale révèle que dans la région du PNS on trouve 9 espèces (*Russula alnetorum*, *Lactarius obscuratus* et *Cortinarius atropusillus* inclusivement) associées par ectomycorhizes à *A. viridis*. *Paxillus filamentosus*, par contre, est la seule espèce d'Agaricale totalement en symbiose mycorhizique avec *A. incana*, dont l'aire d'extension est bien plus vaste et qui, dans le PNS, n'est présent qu'en zone alpine. La plupart des espèces saprophytes n'ont pas de substrat spécifique et peuvent donc se développer aussi bien sur humus d'aune vert que sur humus d'aune blanc.

Introduction

The mycofloristic publications by Jules Favre dealing with the macrofungi both in Jurassian bogs (1948) and in the alpine and subalpine zone in the Swiss National Park (SNP) and its neighbourhood (Favre 1955, 1960) are fundamental works for the past 30 years which no mycologist interested in such habitats can neglect. In particular, the monograph dealing with alpine fungi in the SNP (Favre 1955) is considered the basic source of information about arcto-alpine macrofungi (Horak 1987a, 1987b). Due to Favre's unusually accurate field observations and his excellent knowledge of cryptogams and phanerogams, his data yield immense ecological information about the mycoflora in rather little explored plant associations. In his approach to mycoecology Favre always recognized fungi as heterotrophic organisms as integral parts in well defined phytocoenoses. As a rule Favre's fungus records are complemented by information about plant association, elevation and edaphic data. For that reason Favre is rightly considered as one of the foremost pioneers in mycoecology (Monthoux 1973).

It must be emphasized, however, that the wealth of taxonomic and mycoecological information in Favre's publications is not always readily accessible to the reader. Lack of keys for identification of fungus taxa involved

and occasionally the incomplete description of collecting sites do actually restrict the direct evaluation and analysis of several data. Since 1985 (Monthoux 1986) Favre's complete set of field books and additional notes about microscopic observations as well as the original specimens have been kept at the "Conservatoire Botanique" in Geneva (G). This offers the chance to discover and evaluate additional data such as collecting date, phenology, or fruiting behavior, which have been suppressed or are not referred to at all in the previously mentioned publications of Favre.

Our own mycofloristic and mycoecological investigations in various stands of *Alnus*, both in the subalpine and montane zones in the Alps of eastern Switzerland (Horak 1963, 1985; Horak & Griesser 1987; in prep.) and in North America (Alaska: Brunner & Miller 1988; Brunner 1989; Brunner & al. 1990. - Appalachians: Brunner, unpubl.) made it necessary to re-examine the data on macrofungi associated with alders presented by Favre (1960). The reassessment of the entries in Favre's field books revealed extensive unpublished information on *Alnus*-related macrofungi. In our opinion these new data must be considered ecologically important additions to our (in general fragmentary) knowledge about the mycoflora found in association both with *Alnus viridis* (Chaix.) D. C. and *A. incana* (L.) Moench in subalpine and montane locations in and near the SNP. Another reason to disclose these previously unreported records is that further ecological data can be presented for several new taxa originally described by Favre from these particular habitats, viz. *Clitocybe alnetorum*, *Cortinarius atropusillus*, *Marasmius alniphilus*, *Mycena alnetorum*, and *Rhodocybe cuprea* (Favre) Horak (Horak 1978).

Taking the above-mentioned circumstances (Favre 1960) into account the goals of this paper are:

- 1) to provide additional mycoecological and taxonomic information on macrofungi associated with *Alnus*,
- 2) to localize all alder forests within and in the vicinity of the SNP visited by Favre over a period of 17 years,
- 3) to verify *A. incana* and/or *A. viridis* as potential host-trees at these locations,
- 4) to present lists of macrofungi which must be considered either ectomycorrhizal or saprobic on one or both alders found in the study area, and finally
- 5) to compare the subalpine to montane mycoflora reported by Favre (1960) from *Alnus* with data published from alder forests elsewhere in Central Europe.

Material and methods

All records of fungi listed by Favre (1960) from alder forests in the region of the SNP have been checked and compared with Favre's original notes now kept in Geneva (G). In addition, each collecting site has been critically revised regarding location, altitude, date of collection and presence/absence of reported host-trees as being either *Alnus incana* or *A. viridis*.

Using these methods complete ecological information for most of the fungi treated by Favre were obtained. This included in particular the collection dates omitted by Favre in his 1960 publication. The fungi recorded from alder forests have been separated into those which are closely related to either species of *Alnus* (by virtue of forming ectomycorrhiza or being more or less restricted to wood, bark or leaves of these host-trees) and those which have been gathered in alder habitats but obviously are not strictly associated with *Alnus*. The former group of fungi was listed alphabetically and whenever possible unpublished information about site, collecting date, and substrate have been supplied (and in some cases corrected). Further references regarding substrate relationships have been taken from Horak (1963, 1985), Stangl (1970), Schmid-Heckel (1985), and Brunner (1987).

Results

During the period from 1941 to 1957 Favre reportedly visited and collected alder-associated fungi in 22 locations within and near the boundaries of the Swiss National Park. These sites are associated with six regions close to the villages of S-chanf, Zernez, Susch, Scuol, S-charl and Pass dal Fuorn (Table 1). Based upon own field observations made on the actual sites at the previously mentioned localities, the two local species of alder have been correctly identified by Favre. Notable exceptions are Cinuos-chel (i 1.1) where, contrary to Favre's observation, only *Alnus incana* (but not *A. viridis*) can be found. Furthermore both at God d'Arduond (i 2.1) and Zernez (i 2.2) only the presence of *A. incana* can be confirmed. Accordingly, seven out of the 22 locations investigated by Favre (1960) are characterized by woods of *A. incana*, and of the remaining 15 habitats, *A. viridis* must be considered the (dominant) host tree.

It is remarkable that Pass dal Fuorn (Val Cluozza, God dal Fuorn) is the only location situated within the SNP, whereas the 20 other sites are outside the SNP proper (Figure 1).

As pointed out above, Favre (accompanied by his wife Jeanne) visited the SNP for 17 consecutive years. No less than 76 excursions were directed to alder stands (Table 2). The majority of collecting trips were carried out in August (44) and in September (21). Less frequently, alder-associated macrofungi were gathered in springtime (six during April-May), and during the

summer period Favre visited stands of *Alnus* on five occasions only. According to Favre's diaries 29 excursions were carried out in the region of S-charl, versus 21 in the surroundings of S-chanf. The other four locations together have been searched 26 times, i.e. eight excursions were recorded for Pass dal Fuorn, and six collecting trips each were directed to alder forests near Zernez, Susch and Scuol. The analysis of Favre's field books also demonstrates that on 59 occasions fungi gathering took place under the rather rare *A. viridis* and only 17 times under the much more common *A. incana*. These data indicate that the mycoflora of *A. viridis* obviously attracted the attention of Favre who, for example, searched the very small and delimited stand of *A. viridis* in Val Sesvenna on 19 occasions. However, over the years all other localities have been visited less than 10 times. Although no entries can be found in the field books, Favre (1960) mentioned a few records of alder-related

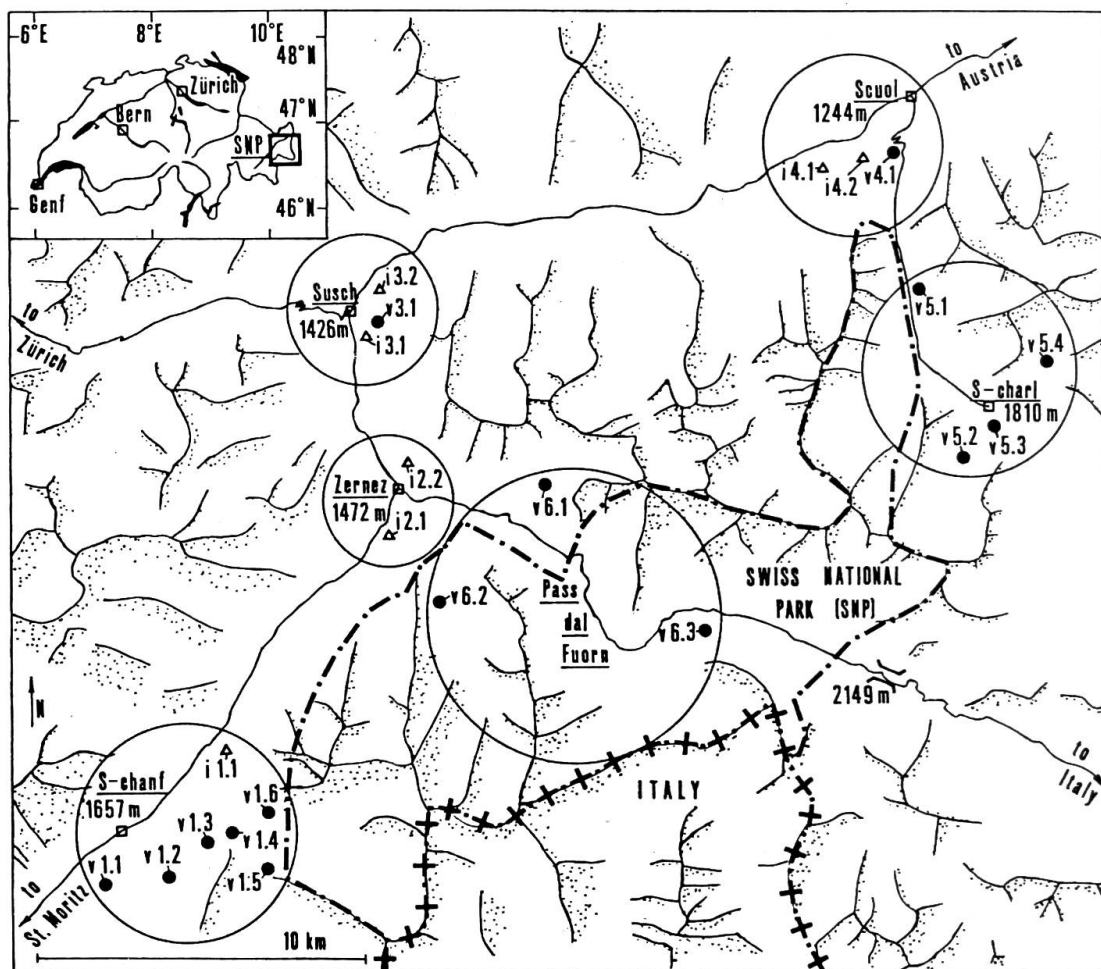


Figure 1: Locations of *Alnus incana* (i) and *A. viridis* (v) in the six regions of the Swiss National Park visited by Favre (see Table 1 for locations).

fungi both from God Averts (v 1.1), above the power station S of Scuol (v 4.1), and from Val Cluozza (v 6.2) in the southern section of the SNP.

The large majority of alder stands investigated by Favre (1960) are located on basic bedrocks (limestone, dolomite) whereas the few other collecting areas (S-charl and Susch) are restricted to sites with silicate rocks (granite, gneiss, serpentine).

The list of recorded macrofungi in Table 3 shows that in alder habitats Favre gave obvious priority to the Agaricales (Basidiomycetes). Among the less interesting and thus neglected Ascomycetes, he gathered only specimens characterized as macromycetes (Pezizales, Helotiales) whose ascoms exceed 1 mm in diameter (Arnolds 1981). According to the records, Gastromycetes (except one species in the Melanogastrales), Boletales, Gomphidiaceae, and Hygrophoraceae are completely lacking in the alder forests analysed by Favre. In addition, only five of the 20 families in the Aphyllophorales and just two of the six orders of Heterobasidiomycetes (Jülich 1984) are listed in the catalogue of macrofungi associated with *Alnus*.

In total Favre (1960) recorded 157 ectotrophic, saprobic and parasitic macrofungi from subalpine and/or montane alder forests of the SNP (Table 4).

Despite the fact that Favre spent 17 seasons in the study area, 67 taxa have been observed only in one and 31 only in two locations. Fifty-nine taxa (38%) were noticed to be present in between three to 13 different locations. The origin of one species is unknown.

In addition, the evaluation of the species list demonstrates that 47 macrofungi have been recorded in association with *A. incana*. However, not more than 18 taxa are exclusively restricted to this host-tree (or the sites of its occurrence). By comparison, in stands of *A. viridis*, which is usually found at higher elevations under much more inhospitable ecological conditions, as many as 138 macrofungi have been observed. To our knowledge, no less than 107 species appear to enter specific relationships with *A. viridis* as host-tree.

Based upon the available data, the *A. viridis* stand in Val Sesvenna (v 5.4) yielded 94 different taxa, followed by Val Tavrü (v 5.2) with 57 and Val Trupchun (v 1.6) with 55 species. This compares with only 19 taxa recorded under *A. incana* in Vallatscha (i 4.1), SW of Scuol. These facts point towards a positive relation (Figure 2) between the number of excursions and the number of macrofungi observed in the alder forests examined by Favre.

In Table 5 some 53 macrofungi are listed from alder forests. The ecological analysis, however, reveals that these taxa are obviously aliens in both *Alnus* associations reported from the SNP and its neighbourhood. Seven additional but rather doubtful species [*Calvatia saccata* (Vahl), *Inocybe fastigiata* (Schff.: Fr.), *I. perbrevis* (Weinm.: Fr.), *Oxyporus populinus* (Fr.), *Naucoria abstrusa* (Fr.), *Rhodophyllus proletarius* (Fr.), and *Russula lepida* (Fr.)] have been reported by

Nüesch from several alder stands within and near the SNP (according to an unpublished list kept in G) which are nevertheless included in Favre (1960) but not in the present enumeration.

By comparing the published data with the original entries in Favre's field books, some inaccuracies and omissions regarding citations of localities, species records or ecological data about habitat can be seen. In some cases, it was possible to find the exact locations of, for example, *Collybia cirrhata*, *C. tuberosa*, *Mycena flavoalba* or *Entoloma serrulatum*, when simply described to be "common in alder forests". Despite detailed search in Favre's notes the actual collecting sites of several species (e.g. *Marasmius androsaceus*) in alder forests remain unknown. In addition, no collecting dates could be established

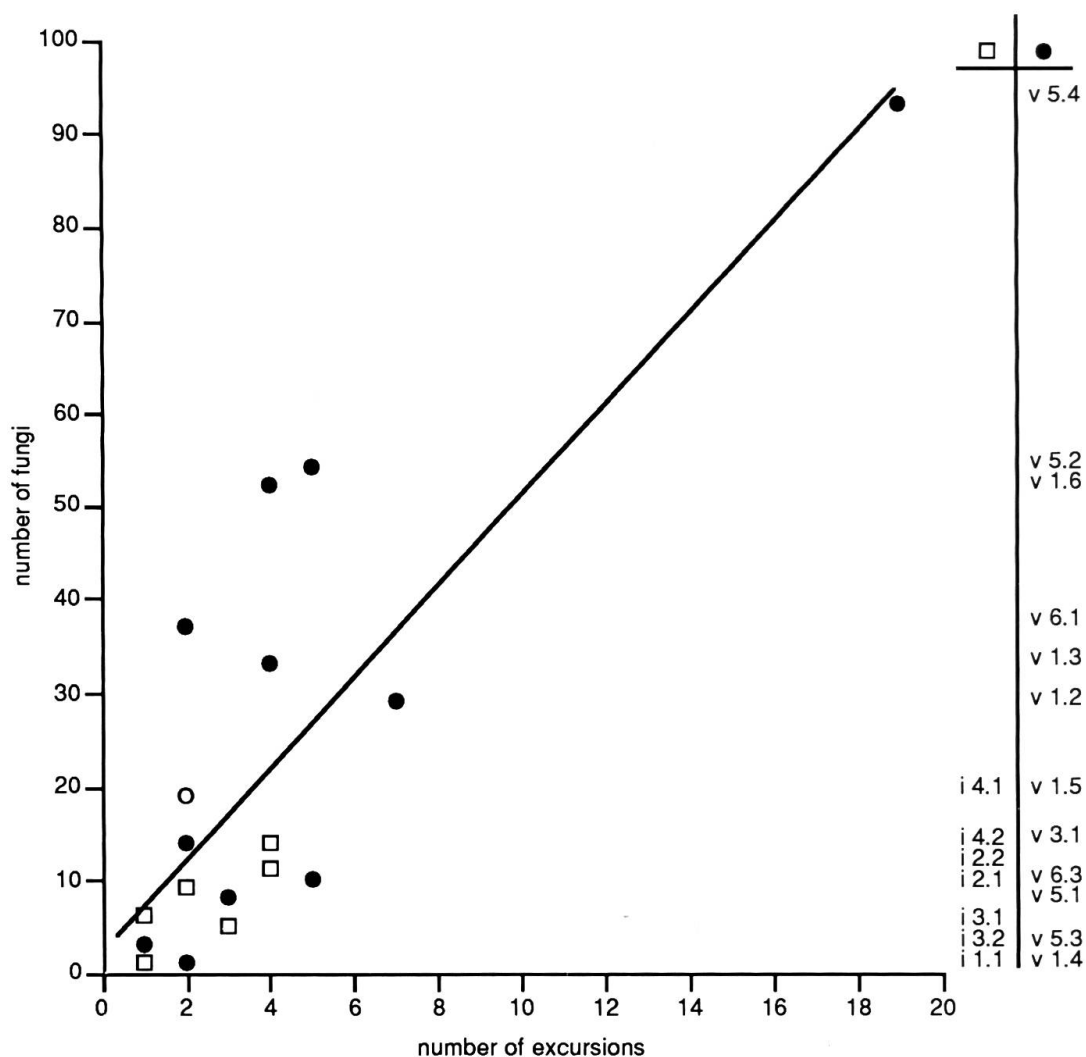


Figure 2: Relation between Favre's number of excursions and number of species of fungi (see Table 1 for locations). No excursion were noted in the field books to the locations v 1.1, v 4.1, and v 6.2.

from the note books for several taxa such as *Helvella lacunosa*, *Inocybe friesii*, *Kuehneromyces mutabilis*, *Mitrula gracilis*, *Pluteus murinus* and *Tremella moriformis*. On the other hand, some fungi are listed only in Favre's notes, but are not mentioned in his 1960 publication. This applies to *Entoloma strigosissimum* (Rea) Noordel., *Psathyrella spintrigera* (Fr.) Konrad & Maublanc, *Rhodophyllus dichrous* (Pers.: Fr.), and *Tephrocybe murina* (Batsch: Fr.) Moser which accordingly are not listed in the present catalogue. Also omitted are those taxa or names which are shown in Favre's notes as "nom. prov.", e.g. "*Exidia angustispora*" (no material in G) or "*Mycena albella*" (one single basidiome in G).

In Favre (1960), *Helvella capucina* (i 2.1) and *Mycena alnetorum* (i 2.2) are listed in association with *A. viridis*. However, careful inspection of the specified habitat did not verify the actual presence of this tree. Also in the field books no notes are found regarding *Tremella moriformis* (v 1.1), *Clitocybe alnetorum* (v 4.1), *Naucoria luteolofibrillosa* (v 4.1), *N. scolecina* (v 4.1), and *Mycena speirea* (v 6.2), but these taxa are referred to in the final publication.

In the alder forests studied by Favre, the most dominant genera of macrofungi are *Mycena* with 24 species, followed by *Entoloma* with 14, *Collybia* with seven, *Galerina* with six, and *Cortinarius* with five taxa. Only 21 macrofungi are considered to be ectomycorrhizal associates of the two alders. The parasitic fungi are represented by only one species, *Armillariella mellea*.

The species constantly associated with *Alnus viridis* can be divided into four groups (A-D; Table 6). In group A are those species which occur in at least 50% of the ten areas of *A. viridis* whose number of taxa exceed 5% of the totally known species in this plant association. Among the putatively ectomycorrhizal species *Lactarius obscuratus*, *Naucoria luteolofibrillosa* and *N. scolecina* are the most dominant. Likewise, *Rutstroemia firma*, *Mycena citrinomarginata*, *M. galopoda*, *Clitocybe alnetorum*, and *Pseudobaeospora pillodii* are the most common saprobic macrofungi. In group B those species are assembled which occur in at least 50% of eight *A. viridis* stands in which more than 10% of the total number of taxa have been gathered. Here *Cortinarius bibulus* and *Lactarius lepidotus* represent the most dominant ectomycorrhizal fungi whereas *Mycena pura*, *M. speirea*, *M. metata*, and *Galerina vittaeformis* have to be mentioned as the dominant saprobic representatives. Group C contains macrofungi which occur in at least 50% of the six locations of *A. viridis* where more than 20% of the complete set of taxa has been filed. No ectomycorrhizal macrofungi are dominant, but among the saprobic species *Trametes hirsuta*, *Mycena epipterygia* and *Collybia dryophila* are found most often. Finally, in group D all those taxa are placed which have been gathered at least three times in different sites of *A. viridis*. Of peculiar interest are the records of *Amanita friabilis*, *Cortinarius atropusillus*, *Encoelia furfuracea*, and *Dasyscyphus bicolor* which exclusively occur on locations rich in calcium (dolomite, limestone).

The only constant macrofungus associated with *A. incana* is *Naucoria escharoides* which has been recorded in 86% of the investigated plots. Other constant species with a frequency above 50% are the ectomycorrhizal *Naucoria luteolofibrillosa* and the saprobic *Trametes hirsuta*.

From 157 montane and subalpine macrofungi observed by Favre (1960) in stands of *A. viridis* and *A. incana*, only 73 taxa are reported from alder forests situated elsewhere in Central Europe (Table 7). It is noteworthy that among the 15 ectomycorrhiza-forming species only *Paxillus filamentosus* Fr. is exclusively associated with *A. incana*. Since no basidiomes of this significant fungus have ever been seen under *A. viridis*, one can safely conclude that this species does not enter an ectotrophic symbiosis with *A. viridis*, which in the Alps is most commonly encountered in the subalpine zone, but rarely occurs below 1200 m. Mycoecological, data both from other parts of the Alps and from dealpine locations in Central Europe indicate that at least nine other macrofungi (e.g. *Russula alnetorum*, *Lactarius obscuratus*, and *Cortinarius atropusillus*) must be considered to have a similar pattern of host relationship to *A. viridis*. In fact, among the ectomycorrhizal fungi only five taxa (*Naucoria escharoides* and *N. luteolofibrillosa* being the most significant ones) have been found to share both *A. incana* and *A. viridis* as host-trees.

Among the saprobic fungi there are a few taxa (e.g. *Melanophyllum echinatum* or *Bjerkandera fumosa*) exclusively specialized to litter and woody debris of *A. incana*, whereas *Ascocoryne sarcoides*, *Encoelia furfuracea*, *Entoloma favrei* and *Pseudobaeospora pillodii* are strictly associated with *A. viridis* (Table 7). The majority of macrofungi in alder forests studied by Favre (and others), however, are not selective towards *Alnus* present in the region of the SNP or in Central Europe. Surprisingly, only 26-64% of the taxa in the species list of Table 7 have been reported in previous publications dealing with the mycoflora in stands of *Alnus* elsewhere in Central Europe. Unusually high species variation between alder communities in ecologically different regions may explain this lack of habitat sharing by macrofungi. However, the most likely explanation is that the majority of the compared sites have not been studied long enough to ascertain the full quantitative and qualitative range of the macrofungi which potentially may occur there.

Table 1: Locations, codes, and elevation of alder stands investigated by Favre (1960) in or around the Swiss National Park.

Region	Location	with <i>Alnus incana</i>	with <i>Alnus viridis</i>	Elevation (m a.s.l.)
1. S-chanf	Cinuos-chel God Averts Val Bugliauna Laviner dal Cuogn God Drosa God Trid Laviner Martin	i 1.1	v 1.1 v 1.2 v 1.3 v 1.4 v 1.5	1600 1750 1700-1800 1800-1850 1850-1900 1830-1900
2. Zernez	God d'Arduond, Las Vallainas Zernez, Clüs, Gondas	i 2.1 i 2.2		1550-1600 1450-1650
3. Susch	Sandöгна Fuora Baldirun God d'Arpiglias, Sfrattamada	i 3.1 i 3.2	v 3.1	1450-1500 1500-1600 1500-1550
4. Scuol	Vallatscha, Gondas Tarasp, Fontana, Chants, Sgné plateau of Lai Nair, Avrona above power station	i 4.1 i 4.2	v 4.1	1350-1500 1400-1550 1250-1300
5. S-charl	gorge of Clemgia Val Tavrü La Jürada Val Sesvenna		v 5.1 v 5.2 v 5.3 v 5.4	1650-1700 1800-2000 1800-2000 1800-2000
6. Pass dal Fuorn	Val Laschadura Val Cluozza God dal Fuorn, Val Chavagl		v 6.1 v 6.2 v 6.3	1750-2000 1900 1850-1950

Table 2: Descriptive data of Favre's original notes: collecting year, field book page number, location, and collecting dates between 1941 and 1957.

Year	Number	Location	Day, Month	Year	Number	Location	Day, Month
1941	37	v 6.3	22. Aug.	1951	485	v 5.1	13. Aug.
					492	v 5.4	19. Aug.
1942	44	v 6.3	24. Aug.		497, 498	v 5.4	21. Aug.
					499	v 5.2	23. Aug.
1943	81	v 5.3	19. July		501	v 5.4	25. Aug.
	88	v 5.4	20. July		512	v 5.4	30. Aug.
	97	v 5.2	25. July				
	100	v 5.2	20. July	1952	528	v 5.1	17. Aug.
	101	v 5.1	28. July		528, 529	v 5.4	17. Aug.
	103, 104, 105	v 5.4	4. Aug., 6. Sept		561, 564	v 5.4	2. Sept.
1944	159	v 5.4	16. Aug., 5. Sept.	1953	573	i 2.2	8. Aug.
	189, 190, 191	v 5.2	2. Sept.		597	v 6.3	22. Aug.
	201, 202	v 5.4	9. Sept.				
1945	218, 219	i 4.2	27. Aug.	1954	626	v 1.2	9. Aug.
	227	i 4.2	1. Sept.		629	v 1.3	11. Aug.
	231	i 4.1	30. Aug.		647, 648	v 1.3	25. Aug.
	233, 234	i 4.1	2. Sept.		650	v 1.6	27. Aug.
	243	i 4.2	12. Sept.		651, 652	v 1.6	28. Aug.
					663	i 1.1	1. Sept.
1946	267	v 5.4	16. Aug.	1955	671	v 1.4	16. Aug.
	279	i 4.2	24. Aug.		678	v 1.6	19. Aug.
	295	v 3.1	2. Sept.		693	i 2.1	28. Aug.
	308	v 3.1	7. Sept.		697	v 1.6	30. Aug.
					711	v 1.4	9. Sept.
1947	311	v 5.4	19. Aug.				
	315	v 5.4	21. Aug.	1956	718	i 2.2	24. April
	316	v 5.4	7. Sept.		728	i 3.2	14. Aug.
					733	v 1.5	17. Aug.
1948	342	v 5.4	11. Aug		758	i 3.2	31. Aug.
	348, 349	v 5.4	14. Aug.		772	v 1.6	7. Sept.
	367	v 5.2	24. Aug.		773	i 2.2	9. Sept.
	369	v 5.4	25. Aug.		776	i 3.1	9. Sept.
	375, 376	v 5.2	27. Aug.				
1949	399	v 6.1	10. Aug.	1957	785	v 1.2	17. May
	403	v 6.3	15. Aug.		787	v 1.2	18. May
					795	v 1.2	20., 31. Aug.
1950	468	v 6.3	30. Aug.		814	i 2.2	29. Aug.
	472, 473	v 6.1	31. Aug.		819	v 1.5	1. Sept.
	479	v 6.3	7. Sept.		823, 824	i 2.1	4. Sept.
					835	i 3.2	11. Sept.
					837	v 1.2	14. Sept.
					841	v 1.3	16. May
					842	v 1.2	17. May
					843	v 1.3	18. May

Table 3: Systematic arrangement of Asco- and Basidiomycetes recorded in alder forests; fungi related to alders or to organic material typical for alder forests. (Systematics according to Moser 1983, Jülich 1984, and Dennis 1978).

Class	Order	Family	Genera
Ascomycetes	Pezizales	Helvellaceae	<i>Helvella</i> , <i>Leptopodia</i> , <i>Cyathipodia</i>
		Pezizaceae	<i>Tarsetia</i>
	Helotiales	Geoglossaceae	<i>Mitrula</i>
		Sclerotiniaceae	<i>Rutstroemia</i>
		Helotiaceae	<i>Ascocoryne</i> , <i>Bisporella</i> , <i>Encoelia</i>
		Hyaloscyphaceae	<i>Dasyscyphus</i>
Basidiomycetes	Aphylliphorales	Clavariaceae	<i>Macrotyphula</i>
		Clavulinaceae	<i>Clavulina</i>
		Corticaceae s. lat.	<i>Plicatura</i> , <i>Stereum</i>
		Hymenochaetaceae	<i>Inonotus</i>
		Polyporaceae s. lat.	<i>Polyporus</i> , <i>Hapalopilus</i> , <i>Bjerkandera</i> ,
			<i>Datronia</i> , <i>Pycnoporus</i> , <i>Trametes</i> ,
	Tremellales	Tremellaceae	<i>Schizophyllum</i> , <i>Lentinellus</i>
			<i>Tremella</i> , <i>Exidia</i>
	Dacrymycetales	Dacrymycetaceae	<i>Dacrymyces</i>
	Melanogastrales	Melanogastraceae	<i>Alpova</i>
	Boletales	Paxillaceae	<i>Paxillus</i>
	Agaricales	Tricholomataceae	<i>Gerronema</i> , <i>Laccaria</i> , <i>Clitocybe</i> , <i>Lepista</i> ,
			<i>Ripartites</i> , <i>Armillariella</i> ,
			<i>Leptoglossum</i> , <i>Lyophyllum</i> ,
			<i>Melanoleuca</i> , <i>Collybia</i> , <i>Hohenbuehelia</i> ,
			<i>Mycenella</i> , <i>Marasmius</i> , <i>Hemimycena</i> ,
			<i>Mycena</i>
			<i>Rhodocybe</i> , <i>Entoloma</i>
			<i>Pluteus</i>
			<i>Amanita</i>
			<i>Agaricus</i> , <i>Melanophyllum</i> ,
			<i>Cystolepiota</i> , <i>Lepiota</i> ,
			<i>Pseudobaeospora</i>
			<i>Coprinus</i> , <i>Panaeolus</i> , <i>Psathyrella</i>
			<i>Conocybe</i> , <i>Pholiotina</i> , <i>Bolbitius</i>
			<i>Stropharia</i> , <i>Psilocybe</i> , <i>Pholiota</i> ,
			<i>Kuehneromyces</i> , <i>Phaeomarasmium</i>
			<i>Crepidotus</i>
			<i>Inocybe</i> , <i>Naucoria</i> , <i>Cortinarius</i> ,
			<i>Galerina</i>
	Russulales	Russulaceae	<i>Russula</i> , <i>Lactarius</i>

Table 4: Alphabetic list of fungi found by Favre (1960) in alder forests; fungi are related to alders (ectomycorrhizal, lignicolous, terricolous, follicolous) or to organic material typical for alder forests (graminicolous, muscicolous).

Legend: Systematics according to Moser (1983), Jülich (1984), and Dennis (1978). In parantheses: systematics (if different) and page number according to Favre (1960); locations of the fungus (according Table 1); monthes of collection and field book page numbers (according Table 2); substrate-nutrition; observations in other habitats than alder forests as recorded by Favre (1960). (*found under *Alnus viridis*).

1. *Agaricus silvicola* (VITT.) SACC. (*Psalliota*, p. 559); v 6.1; Aug. (472); terricolous-saprobic; also in mixed conifer forests, pine forests, spruce forests
2. *Alpova diplophloeus* (ZELLER & DODGE) TRAPPE & SMITH (*Melanogaster microsporus* VEL., p. 585); i 2.1, v 5.4; Aug., Sept. (497, 824); terricolous-ectomycorrhizal
3. *Amanita friabilis* KARST. (*Amanitopsis vaginata* (BULL. ex FR.) var. *Sternbergii* (VEL.), p. 566); v 1.2, v 1.5, v 1.6; Aug., Sept. (795, 819); terricolous-ectomycorrhizal
4. *Armillariella mellea* (VAHL. in Fl. Dan.: FR.) KARST. (p. 436); i 4.2, v 1.2, v 5.2, v 5.4, v 6.1; Aug., Sept. (243, 315, 375, 472, 564, 837); lignicolous, terricolous-parasitic; also in spruce forests and with *Pinus montana*
5. *Ascocoryne sarcoides* (JACQ. ex S.F. GRAY) GROVES & WILSON (*Coryne*, p. 359); v 5.4; Sept. (316); lignicolous
6. *Bisporella citrina* (BATSCH: FR.) KORF & CARPENTER (*Helotium*, p. 357); v 5.4; Aug. (497); lignicolous
7. *Bjerkandera fumosa* (PERS.: FR.) KARST. (*Gloeoporus*, p. 372); i 4.2; collection date unknown; lignicolous
8. *Bolbitius vitellinus* (PERS.) FR. (p. 549); v 1.2, v 5.2; Aug. (279, 795); terricolous-saprobic; also under *Populus tremula* and *Betula*, and in meadows
9. *Clavulina rugosa* (FR.) SCHROET. (p. 364); v 5.4; Sept. (316); terricolous-saprobic; also in mixed conifer forests and pine forests
10. *Clitocybe alnetorum* FAVRE (p. 420); i 2.1, v 1.3, v 1.4, v 1.6, v 3.1, v 4.1, v 5.1, v 5.2, v 5.4, v 6.1; Aug., Sept. (201, 311, 316, 376, 497, 528, 564, 647, 651, 711, 772, 824); terricolous-saprobic
11. *Clitocybe odora* (BULL.: FR.) KUMMER (p. 432); i 4.1; Sept. (234); terricolous-saprobic; usually under conifers
12. *Clitocybe suaveolens* (SCHUM.: FR.) KUMMER (p. 434); v 1.6, v 5.2, v 5.4, v 6.1; July, Aug., Sept. (100, 105, 186, 472, 499, 561, 711); terricolous-saprobic; also in conifer forests
13. *Collybia alkalivirens* SING. (*Marasmius obscurus* FAVRE, p. 399); v 1.6, v 5.4; Aug. (652); terricolous-saprobic; also on *Dryas*-mats
14. *Collybia butyracea* (BULL.: FR.) QUEL. (p. 401); v 6.1; Aug. (472); terricolous-saprobic; also in *Pinus cembra*, spruce, pine, and larch forests
15. *Collybia cirrhata* (SCHUM.: FR.) KUMMER (*C. tuberosa* ssp. *cirrhata* (SCHUM. ex FR.), p. 405); v 1.2, v 1.6, v 5.2, v 5.4; Aug., Sept. (190, 201, 564, 650, 795); terricolous-saprobic; also in conifer forests
16. *Collybia cookei* (BRES.) J. D. ARNOLD (*C. tuberosa* ssp. *Cookei* (BRES.), p. 405); v 1.6, v 5.2; Aug. (651); terricolous-saprobic; also in conifer forests
17. *Collybia dryophila* (BULL.: FR.) KUMMER (*Marasmius*, p. 398); v 1.3, v 1.6, v 5.2, v 5.4, v 6.1; July, Aug., Sept. (88, 202, 472, 501, 529, 629, 772); terricolous-saprobic; in all types of conifer forests, in bogs, on *Dryas*-mats
18. *Collybia racemosa* (PERS.: FR.) QUEL. (p. 405); i 2.1; Aug. (693); terricolous-saprobic
19. *Collybia tuberosa* (BULL.: FR.) KUMMER (p. 405); i 4.1, v 1.2, v 1.3, v 5.4; Aug., Sept. (105, 233, 648, 795); terricolous-saprobic; also in conifer forests

20. *Conocybe siennophylla* (BK. & BR.) SING. (*C. siliginea* var. *ochracea* KÜHN., p. 548); v 5.4; Aug. (315); terricolous-saprobic; also in meadows
21. *Conocybe siliginea* (FR.: FR.) KÜHN. (p. 548); v 5.4; Aug. (104); terricolous-saprobic
22. *Coprinus plicatilis* (CURT.: FR.) FR. (p. 554); v 1.2; Sept. (837); terricolous-saprobic, coprophilous; also in meadows, on dung-hills
23. *Coprinus xanthothrix* (ROMAGN.) (*C. domesticus* (PERS.) ss. LGE., METROD, p. 553); i 4.2, v 1.2, v 5.4; Aug. (219, 498, 795); lignicolous; also in mixed conifer forests, in *Salix*-shrubs, and in formations with *Filipendula*
24. *Cortinarius* (Tel.) *atropusillus* FAVRE (p. 518); v 1.2, v 1.5, v 1.6; Aug., Sept. (772, 795, 819); terricolous-ectomycorrhizal
25. *Cortinarius* (Tel.) *bibulus* QUEL. (= *C. pulchellus* J.E.LGE., p. 520); v 1.2, v 1.3, v 1.5, v 1.6, v 5.2, v 5.4, v 6.1; Aug., Sept. (202, 311, 315, 316, 376, 472, 497, 498, 561, 648, 772, 795, 819); terricolous-ectomycorrhizal
26. *Cortinarius* (Tel.) *helvelloides* (FR.) FR. (p. 529); v 1.6, v 3.1, v 5.2, v 5.4; July, Aug., Sept. (88, 100, 103, 210, 295, 497, 678); terricolous-ectomycorrhizal
27. *Cortinarius* (Tel.) *pulchripes* FAVRE (p. 534); i 4.2; collection date unknown; terricolous-ectomycorrhizal (*Alnus*, *Betula*, *Salix*)
28. *Cortinarius* (Tel.) *sinapizans* MOS. (*C. hebelomoides* FAVRE, p. 528); v 5.2, v 5.4; collection dates unknown; terricolous-ectomycorrhizal
29. *Crepidotus sphaerosporus* (PAT.) LGE. (*C. Cesatii* RAB. = *Dochmiopus sphaerosporus* PAT., p. 396); i 4.1; Sept. (233); lignicolous; also on *Picea*
30. *Crepidotus subverrucisporus* PILAT (p. 396); v 1.6, v 5.2, v 5.4; Aug., Sept. (104, 105, 375, 497, 652); lignicolous; also on *Betula*
31. *Crepidotus variabilis* (PERS.: FR.) KUMMER (p. 396); v 5.1; July (101); lignicolous; also on *Picea*
32. *Cyathipodia corium* (WEBERB.) BOUD. (*Helvella arctica* NANNF., p. 356); v 5.4; Aug. (104); terricolous-saprobic
33. *Cystolepiota sistrata* (FR.) SING. (*Lepiota seminuda* (LASCH), p. 557); i 4.2, v 3.1; Aug. Sept. (219, 243, 295); terricolous-saprobic; also under conifers, and in formations with *Filipendula ulmaria*
34. *Dacrymyces stillatus* NEES: FR. (*D. deliquescens* (BULL.), p. 363); v 1.2, v 1.3; Aug. (626, 629); lignicolous; also on *Pinus montana*
35. *Dasyscyphus bicolor* (BULL. ex MERAT) FUCK. (p. 357); v 1.2, v 1.5, v 1.6; Aug. (733); lignicolous
36. *Datronia stereoides* (FR.) RYV. (*Trametes*, p. 373); v 1.3, v 5.4; Aug. (498, 629); lignicolous
37. *Encoelia furfuracea* (ROTH. ex PERS.) KARST. (p. 358); v 1.2, v 1.3, v 1.6; May (785, 787, 841, 842, 843); lignicolous
38. *Entoloma cetratum* (FR.) MOS. (*Rhodophyllus*, p. 454); v 1.6, v 5.4; Aug., Sept. (202, 652); terricolous-saprobic; also in conifer forests and bogs
39. *Entoloma chalybaeum* (FR.: FR.) NOORDEL. (*Rhodophyllus*, p. 459); i 4.2; Aug. (279); terricolous-saprobic; also in meadows, pine and mixed conifer forests, bogs
40. *Entoloma conferendum* (BRITZ.) NOORDEL. (*Rhodophyllus stauroporus* BRES. and var. *Rickenii* (ROMAGN.), p. 456); v 5.2, v 6.1; Aug. (375, 472); terricolous-saprobic; also in various conifer forests, bogs, meadows
41. *Entoloma dysthales* (PECK) SACC. (*Rhodophyllus*, p. 455); i 4.1, v 5.1, v 5.4; Aug., Sept. (316, 485); terricolous-saprobic; also in formations with *Petasites paradoxus*
42. *Entoloma euchroum* (PERS.: FR.) DONK (*Rhodophyllus*, p. 459); v 1.6; Sept. (711); lignicolous
43. *Entoloma favrei* NOORDEL. (*Rhodophyllus tenellus* FAVRE, p. 456); v 5.2, v 5.4; Aug., Sept. (103, 105, 189, 201); terricolous-saprobic
44. *Entoloma jubatum* (FR.) KARST. (*Rhodophyllus*, p. 457); v 5.4; Aug. (315); terricolous-saprobic; also in clearings of conifer forests

45. *Entoloma juncinum* (KÜHN. & ROMAGN.) NOORDEL. (*Rhodophyllus juncinus* KÜHN.-ROMAGN. = *R. junceus* J.E. LGE., non FR., p. 455); v 1.5, v 1.6, v 5.4, v 6.1; Aug., Sept. (159, 201, 473, 498, 501, 678, 711, 819); terricolous-saprobic; also in conifer forests and their clearings
46. *Entoloma minutum* (KARST.) NOORDEL. (*Rhodophyllus*, p. 455); i 4.2; Aug. (219); terricolous-saprobic
47. *Entoloma nidorosum* (FR.) QUEL. (*Rhodophyllus*, p. 457); i 3.1; Sept. (308); terricolous-saprobic; mostly under *Pinus* and *Salix*
48. *Entoloma sarcitulum* (KÜHN. & ROMAGN. ex ORTON) ARNOLDS (*Rhodophyllus*, p. 460); v 5.4; Aug. (103); terricolous-saprobic (under *Alnus* and *Salix*); also in meadows, clearings, bogs, formations with *Filipendula ulmaria*
49. *Entoloma sericellum* (BULL.: FR.) KUMMER (*Rhodophyllus*, p. 454), i 4.1, v 5.4; Aug., Sept. (104, 233); terricolous-saprobic; also in clearings and in formations with *Lonicera alpigena*
50. *Entoloma serrulatum* (PERS.: FR.) HESLER (*Rhodophyllus*, p. 460); i 4.2; Aug. (279); terricolous-saprobic (under *Alnus*, *Populus* and *Betula*); also in meadows, clearings, bogs
51. *Entoloma xanthochroum* (ORTON) NOORDEL. (*Rhodophyllus Whiteae* (MURR.) ss. HEIM & ROMAGN., p. 461); i 4.1; Sept. (233); terricolous-saprobic; also in conifer forests and meadows
52. *Exidia thurettiana* (LEV.) FR. (= *E. albida* (HUDS. ex LOUD.), p. 363); v 5.2; Sept. (189); lignicolous
53. *Galerina heterocystis* (ATK.) SMITH & SING. (= *Galera clavata* (VEL.) ss. KÜHN.), p. 537); v 5.4; Aug., Sept. (104, 316); muscicolous; also in bogs
54. *Galerina hypnorum* (SCHRANK: FR.) KÜHN. (*Galera*, p. 537); v 1.3, v 5.4; Aug., Sept. (202, 648); muscicolous; also in *Larix* forests and bogs
55. *Galerina laevis* (PERS.) SING. (*Galera graminea* VEL., p. 537); v 5.4; Aug. (315); terricolous-saprobic, muscicolous; also in meadows
56. *Galerina marginata* (FR.) KÜHN. (*Galera*, p. 537); v 1.2, v 5.2, v 5.4, v 6.1; Aug., Sept. (315, 472, 528, 564, 795); lignicolous; also in all types of conifer forests
57. *Galerina triscopa* (FR.) KÜHN. (*Galera*, p. 538); v 5.4, v 6.1; Aug. (472); lignicolous; also on conifer wood
58. *Galerina vittaeformis* (FR.) SING. (= *Galera rubiginosa* (PERS. ex FR.) ss. KÜHN., p. 538); i 2.2, v 1.3, v 1.5, v 1.6, v 5.2, v 5.4, v 6.1; Aug. Sept. (104, 105, 201, 315, 316, 472, 528, 671, 773, 819); muscicolous, terricolous-saprobic; also in mixed conifer forests, pine and spruce forest clearings, bogs
59. *Gerronema albidum* (FR.) SING. (*Hygrophoropsis albida* (FR.), p. 418); v 1.6; Aug., Sept. (697, 711); terricolous-saprobic, muscicolous; also in meadows
60. *Hapalopilus rutilans* (PERS.: FR.) KARST. (*Phaeolus*, p. 372); v 1.3; Aug. (648); lignicolous
61. *Helvella lacunosa* AFZ.: FR. (*H. sulcata* AFZ. ex FR., p. 356); v 6.3; collection date unknown; terricolous-saprobic
62. *Hemimycena angustispora* (JOSS. ex ORTON) SING. (*Delicatula*, p. 415); v 1.6; Aug. (678); foliicolous
63. *Hemimycena delectabilis* (PECK) SING. (*Delicatula*, p. 415); v 1.6, v 5.2; Aug., Sept. (189, 652); terricolous-saprobic, lignicolous; also in mixed conifer forests
64. *Hemimycena epichloe* (KÜHN.) SING. (*Delicatula*, p. 415); v 5.4; Aug. (497); graminicolous
65. *Hemimycena pseudocrispula* (KÜHN.) SING. (*Delicatula*, p. 415); v 5.2, v 5.4; July, Aug. (100, 498); lignicolous
66. *Hohenbuehelia reniformis* (FR.) SING. (p. 395); v 1.6, v 5.2; July, Sept. (100, 189, 772); lignicolous
67. *Inocybe friesii* HEIM (p. 466); v 5.4; collection date unknown; terricolous-ectomycorrhizal; in all habitats of the National Park
68. *Inocybe geophylla* (SOW.: FR.) KUMMER (p. 467); v 1.6, v 5.2, v 5.3, v 5.4; Aug. (81, 348); terricolous-ectomycorrhizal; in all habitats of the National Park

69. *Inocybe petiginosa* (FR.: FR.) GILL. (p. 482); i 2.1, i 3.2; Aug. Sept. (728, 758, 823); terricolous-ectomycorrhizal
70. *Inocybe pseudoasterospora* KÜHN. & BOURS. (p. 483); v 5.4; Aug. (512); terricolous-ectomycorrhizal
71. *Inonotus radiatus* (SOW.: FR.) KARST. (p. 375); v 5.4; Aug., Sept. (528, 564); lignicolous
72. *Kuehneromyces mutabilis* (SCHFF.: FR.) SING. & SMITH (= *Pholiota*, p. 544); v 5.4; collection date unknown; lignicolous; also on conifer wood
73. *Laccaria laccata* (SCOP.: FR.) BK. & BR. (p. 419); v 6.1; Aug. (472); terricolous-ectomycorrhizal; also in conifer forests, bogs, meadows
74. *Lactarius alpinus* PECK (*L. pusillus* BRES., p. 579); v 1.3, v 1.6, v 5.4, v 6.1, v 6.3; July, Aug., Sept. (44, 88, 103, 104, 105, 201, 311, 472, 497, 564, 647, 651); terricolous-ectomycorrhizal
75. *Lactarius lepidotus* SMITH & HESLER (*L. griseus* PECK, p. 578); v 1.2, v 1.3, v 1.5, v 1.6, v 5.2, v 5.4, v 6.1; July, Aug. Sept. (97, 103, 159, 316, 376, 472, 497, 512, 561, 647, 651, 678, 733, 772, 795, 819); terricolous-ectomycorrhizal
76. *Lactarius lilacinus* (LASCH) FR. (p. 578); i 3.1, v 3.1; Sept. (295, 776); terricolous-ectomycorrhizal
77. *Lactarius obscuratus* (LASCH) FR. (= *L. cyathulus* ss. RICK., p. 578); v 1.2, v 1.3, v 1.5, v 1.6, v 3.1, v 5.2, v 5.4, v 6.1, v 6.3; Aug., Sept. (159, 189, 267, 295, 315, 376, 403, 472, 497, 561, 629, 648, 671, 678, 772, 795, 819, 837); terricolous-ectomycorrhizal
78. *Lentinellus omphalodes* (FR.) KARST. (*L. bisus* (QUEL.) ss. KÜHN.-MAIRE = *L. flabellinus* ss. KR., p. 395); v 1.3, v 1.6, v 5.2, v 5.4; Aug., Sept. (629, 647, 651, 772); lignicolous; also on *Vaccinium*, *Pinus* und *Larix*
79. *Lepiota clypeolaria* (BULL.: FR.) KUMMER (p. 555); v 5.2; Aug. (376); terricolous-saprobic; also in mixed conifer forests
80. *Lepista luscina* (FR.) SING. (*Rhodopaxillus panaeolus* (FR.), p. 450); i 3.1; Sept. (776); terricolous-saprobic; also in meadows and clearings
81. *Lepista nuda* (BULL.: FR.) CKE. (*Rhodopaxillus*, p. 449); i 4.1; Sept. (233); terricolous-saprobic; also in mixed conifer forests, clearings, pine forests
82. *Leptoglossum acerosum* (FR.) MOS. (*Pleurotellus*; p. 395); v 1.6; Sept. (772); lignicolous, terricolous-saprobic; also in bogs
83. *Leptoglossum lobatum* (PERS.: FR.) RICK. (p. 394); v 5.4; Aug. (104); muscicolous (on *Drepanocladus*)
84. *Leptopodia capucina* (QUEL.) BOUD. (*Helvella*, p. 356); i 2.1*, v 5.4; Aug., Sept. (104, 316, 824); terricolous-saprobic; also in mixed conifer forests
85. *Lyophyllum decastes* (FR.) SING. (*L. aggregatum* (SCHAEFF. ex FR.) ss. KÜHN. ss. lat., p. 446); v 5.4; Sept. (561); terricolous-saprobic; mostly in clearings of conifer forests
86. *Macrotyphula fistulosa* (FR.) PETERSEN (*Clavariadelphus*, p. 367); v 5.2; July (97); lignicolous
87. *Marasmius alniphilus* FAVRE (p. 397); v 5.4; Aug. (315); foliicolous
88. *Marasmius androsaceus* (L.: FR.) FR. (p. 397); localities unknown; collection dates unknown; lignicolous; common in alder forests, various conifer forests, bogs
89. *Marasmius graminum* (LIBERT) BERK. (p. 399); v 1.6; Sept. (711); graminicolous
90. *Melanoleuca graminicola* (VEL.) KÜHN. & MRE. (= *M. stridula* ss. METROD, p. 440); v 5.2, v 5.4, v 6.1; July, Aug., Sept. (88, 104, 201, 375, 472, 497); terricolous-saprobic; also in mixed conifer, pine and spruce forests, bogs
91. *Melanoleuca grammopodia* (BULL.: FR.) PAT. (p. 440); v 5.2; Sept. (191); terricolous-saprobic; also in meadows
92. *Melanophyllum echinatum* (ROTH.: FR.) SING. (*Lepiota*, p. 555); i 4.2; Aug. (219); terricolous-saprobic
93. *Mitrula gracilis* KARST. (= *Gymnomitrula Rehmii* (BRES.), p. 101); v 5.2; collection date unknown muscicolous; also in bogs, meadows, conifer forests

94. *Mycena abramsii* MURR. (*M. praecox* VEL., p. 412); i 2.2, v 5.2, v 5.4; July, Aug., Sept. (88, 103, 191, 202, 561, 573); lignicolous
95. *Mycena acicula* (SCHFF.: FR.) KUMMER (p. 405); i 4.1; Sept. (233); lignicolous
96. *Mycena adonis* (BULL.: FR.) S. F. GRAY (p. 405); v 6.1; Aug. (472); terricolous-saprobic
97. *Mycena aetites* (FR.) QUEL. (p. 405); v 5.4; Sept. (561); terricolous-saprobic
98. *Mycena alcalina* (FR.) KUMMER (p. 405); v 5.2, v 5.4; July, Aug., Sept. (88, 103, 105, 201, 375, 497, 561); lignicolous, foliicolous; also in conifer forests
99. *Mycena alnetorum* FAVRE (p. 405); i 2.2*, v 1.6, v 5.2, v 5.4; Aug., Sept. (375, 678, 772); lignicolous
100. *Mycena amicta* (FR.) QUEL. (p. 406); v 1.3, v 1.6, v 5.2, v 5.4; July, Aug., Sept. (100, 189, 202, 315, 375, 497, 564, 647, 651, 678); lignicolous; also in conifer and mixed conifer forests
101. *Mycena chlorantha* (FR.: FR.) KUMMER (p. 406); v 5.4, v 6.1; Aug. (369, 472); terricolous-saprobic
102. *Mycena citrinomarginata* GILL. (p. 406); i 2.1, i 2.2, i 4.1, v 1.2, v 1.3, v 1.5, v 1.6, v 5.1, v 5.2, v 5.4, v 6.1; July, Aug., Sept. (97, 101, 104, 189, 233, 472, 497, 528, 561, 647, 652, 671, 697, 711, 733, 795, 814, 819, 824); terricolous-saprobic; also in conifer forests
103. *Mycena epipterygia* (SCOP.) S.F. GRAY (p. 407); i 3.2, v 1.3, v 1.6, v 5.2, v 5.3, v 5.4, v 6.1; July, Aug., Sept. (81, 100, 104, 105, 189, 202, 375, 399, 497, 564, 647, 772, 835); lignicolous, muscicolous; also in conifer forests, bogs
104. *Mycena filopes* (BULL.) KUMMER (*M. iodolens* LUND = *M. vitilis* (FR.) ss. RICK., KÜHN. (p. 410); v 1.6, v 5.2, v 5.4; Aug., Sept. (104, 105, 159, 190, 201, 202, 316, 349, 497, 564, 678); terricolous-saprobic, lignicolous; also in mixed conifer forests
105. *Mycena flavoalba* (FR.) QUEL. (p. 408); i 3.1, i 4.1, v 5.2, v 5.3, v 5.4, v 6.1, v 6.3; Aug., Sept. (44, 81, 105, 231, 472, 497, 499, 564, 776); terricolous-saprobic, lignicolous; also in conifer forests
106. *Mycena floridula* (FR.) KARST. (p. 408); v 5.4; collection date unknown; terricolous-saprobic
107. *Mycena galericulata* (SCOP.: FR.) S. F. GRAY (p. 409); v 3.1, v 5.1, v 5.4; July, Aug., Sept. (88, 101, 103, 295); lignicolous
108. *Mycena galopoda* (PERS.: FR.) KUMMER (*M. galopus* (PERS. ex FR.), p. 409); i 2.2, v 1.2, v 1.3, v 1.5, v 1.6, v 5.4, v 6.1, v 6.3; July, Aug., Sept. (44, 88, 472, 564, 573, 647, 651, 711, 772, 795, 819); lignicolous, muscicolous; also in conifer forests, bogs
109. *Mycena grisellina* FAVRE (p. 409); v 1.3, v 1.6; Aug., Sept. (648, 652, 772); terricolous-saprobic
110. *Mycena metata* (FR.) KUMMER (p. 411); v 1.5, v 1.6, v 3.1, v 5.2, v 5.4; Aug., Sept. (189, 295, 315, 316, 376, 564, 772, 819); lignicolous, muscicolous; also in various conifer forests, bogs
111. *Mycena mirata* (PECK.) SACC. (p. 411); v 1.6; Aug. (652); lignicolous, muscicolous
112. *Mycena niveipes* MURR. (= *M. Jacobi* R.MRE., p. 411); v 5.1; July (101); lignicolous
113. *Mycena pura* (PERS.) KUMMER (p. 412); i 2.1, i 4.1, v 1.2, v 1.3, v 1.5, v 1.6, v 5.2, v 5.4, v 6.1; July, Aug., Sept. (100, 103, 189, 243, 315, 316, 375, 472, 497, 528, 564, 647, 678, 711, 733, 772, 795, 819, 824); terricolous-saprobic; also in all types of conifer forests, under *Populus* and *Betula*
114. *Mycena rorida* (SCOP.: FR.) QUEL. (p. 412); v 1.3, v 5.2, v 5.4; July, Aug., Sept. (88, 564, 629); lignicolous; also in *Pinus cembra* and *Larix* forests
115. *Mycena speirea* (FR.: FR.) GILL. (p. 412); i 4.1, i 4.2, v 1.2, v 1.5, v 1.6, v 3.1, v 5.2, v 5.4, v 6.1, v 6.2; July, Aug., Sept. (97, 103, 105, 190, 219, 233, 295, 472, 485, 497, 652, 733, 772, 795, 819); lignicolous; also in formations with *Filipendula ulmaria*
116. *Mycena stylobates* (PERS.: FR.) KUMMER (p. 413); v 5.2, v 6.1; Aug., Sept. (189, 472); lignicolous
117. *Mycena vitrea* (FR.) QUEL. (p. 415); v 1.6, v 3.1, v 5.2, v 5.4; Aug., Sept. (201, 295, 376, 564, 652, 772); terricolous-saprobic, lignicolous; also in various conifer forests

118. *Mycenella bryophila* (VOGL.) SING. (*Mycena*, p. 406); v 1.6; Sept. (772); terricolous-saprobic; also with *Pinus* and with *Dryas*
119. *Mycenella lasiosperma* (BRES.) SING. (*Mycena*, p. 410); i 4.1, v 1.2, v 1.5, v 5.4; Aug., Sept. (234, 316, 498, 819, 837); terricolous-saprobic; also under *Betula*
120. *Naucoria escharoides* (FR.: FR.) KUMMER (*Alnicola*, p. 484); i 2.1, i 2.2, i 3.1, i 3.2, i 4.1, i 4.2, v 3.1, v 5.2, v 5.4, v 6.1; July, Aug., Sept. (100, 218, 234, 308, 311, 315, 376, 472, 693, 776, 814, 835); terricolous-ectomycorrhizal
121. *Naucoria luteolofibrillosa* (KÜHN.) KÜHN. & ROMAGN. (*Alnicola*, p. 484); i 2.1, i 2.2, i 4.1, i 4.2, v 1.2, v 1.3, v 1.5, v 1.6, v 5.1, v 5.2, v 5.4, v 6.1, v 6.3; July, Aug., Sept. (88, 101, 103, 104, 105, 189, 201, 219, 234, 243, 311, 315, 316, 367, 376, 468, 472, 492, 497, 499, 529, 564, 647, 651, 678, 711, 733, 772, 773, 795, 819, 824, 837); terricolous-ectomycorrhizal
122. *Naucoria scolecina* (FR.) QUEL. (*Alnicola phaea* KÜHN.-MAIRE = *A. badia* KÜHN. non MURR., p. 484); v 1.2, v 1.3, v 1.5, v 1.6, v 5.1, v 5.2, v 5.4, v 6.1, v 6.3; July, Aug., Sept. (44, 103, 105, 201, 316, 472, 479, 485, 497, 564, 647, 651, 671, 678, 711, 733, 772, 795, 819); terricolous-ectomycorrhizal
123. *Panaeolus rickenii* HORA (= *P. acuminatus* RICK. non FR., p. 550); v 1.6, v 5.2, v 5.4; July, Aug., Sept. (100, 104, 711); terricolous-saprobic; also in clearings, edge of bogs
124. *Paxillus involutus* (BATSCH) FR. (p. 382); i 4.1, i 4.2, v 1.6, v 3.1, v 5.4, v 6.1; Aug., Sept. (219, 227, 233, 243, 295, 472, 564); terricolous-ectomycorrhizal; also in mixed conifer forests, and with *Betula*
125. *Phaeomarasmus erinaceus* (FR.) KÜHN. (p. 484); v 1.3, v 1.6, v 5.2, v 5.4, v 6.3; July, Aug. (100, 342, 629); lignicolous
126. *Pholiota alnicola* (FR.) SING. (*Dryophila*, p. 541); v 5.2, v 5.4; Sept. (190, 201); lignicolous; also on *Betula*
127. *Pholiota lenta* (PERS.: FR.) SING. (*Dryophila*, p. 543); v 3.1, v 5.4, v 6.1; Aug., Sept. (295, 472, 564); lignicolous; also in mixed conifer and spruce forests
128. *Pholiotina arrhenii* (FR.) SING. (*Conocybe blattaria* ss. RICK., KÜHN., p. 548); v 5.4; July (103); terricolous-saprobic; also in mixed conifer and pine forests
129. *Pholiotina blattaria* (FR.) FAY. ss. KITS van WAV. (*Conocybe togularis* (BULL. ex FR.) ss. KÜHN., p. 549); i 3.1, v 1.6, v 5.2, v 5.4, v 6.1; Aug., Sept. (103, 189, 315, 375, 472, 497, 501, 564, 772, 776); terricolous-saprobic; also in mixed conifer forests, bogs
130. *Plicatura nivea* (FR.) KARST. (p. 368); v 1.2, v 1.5, v 1.6, v 5.4; Aug., Sept. (795, 819); lignicolous
131. *Pluteus atricapillus* (SECR.) SING. (*P. cervinus* (SCHAEFF. ex FR.), p. 559); i 4.1, v 1.3, v 5.2; Aug., Sept. (234, 276, 648); lignicolous; also on *Picea* and *Pinus montana*
132. *Pluteus murinus* BRES. ss. ROMAGN. (p. 563); v 5.4; collection date unknown; terricolous-saprobic
133. *Polyporus arcularius* (BATSCH) ex FR. (*Polyporellus*, p. 372); i 2.2, v 1.3, v 5.4; April, Aug., Sept. (316, 629, 718); lignicolous
134. *Polyporus brumalis* (PERS.) ex FR. (*Polyporellus*, p. 372); v 3.1, v 5.2, v 5.4; July, Sept. (88, 100, 103, 295); lignicolous
135. *Polyporus varius* (PERS.) ex FR. (*Polyporellus*, p. 372); i 1.1, v 1.6, v 5.4; Aug., Sept. (103, 104, 105, 315, 316, 651, 663); lignicolous; also on *Salix*, *Sorbus aucuparia*, and *Betula*
136. *Psathyrella gracilis* (FR.) QUEL. (*Drosophila*, p. 550); v 5.2, v 5.4; Aug., Sept. (190, 349); terricolous-saprobic
137. *Psathyrella prona* (FR.) GILL. (*Drosophila*, p. 550); i 4.2; collection date unknown; lignicolous, terricolous-saprobic
138. *Psathyrella pseudocasca* (ROMAGN.) KITS van WAV. (*Drosophila*, p. 553); v 5.4; Sept. (561); lignicolous
139. *Psathyrella trepida* (FR.) GILL. (*Drosophila*, p. 552); v 5.4; Aug., Sept. (104, 105, 201, 311, 315); terricolous-saprobic, muscicolous; also in mixed conifer and pine forests

140. *Pseudobaeospora pillodii* (QUEL.) HORAK (*Collybia*, p. 404); v 1.2, v 1.3, v 1.6, v 3.1, v 5.1, v 5.2, v 6.1; July, Aug., Sept. (100, 101, 295, 472, 648, 652, 671, 678, 711, 772, 795); terricolous-saprobic
141. *Psilocybe crobula* (FR.) M. LGE. ex SING. (*Geophila*, p. 547); v 1.6, v 5.4; Sept. (561, 772); terricolous-saprobic, lignicolous
142. *Psilocybe inquilina* (FR.: FR.) BRES. (*Geophila*, p. 547); v 5.2, v 6.1; July, Aug., Sept. (100, 189, 472); terricolous-saprobic, muscicolous, graminicolous; also in conifer forests, meadows
143. *Pycnoporus cinnabarinus* (JACQ.: FR.) KARST. (*Trametes*, p. 373); i 2.2; April (718); lignicolous; also on *Betula*
144. *Rhodocybe caelata* (FR.) MRE. (=R. *dubia* FAVRE, p. 451); v 5.2, v 5.4; Aug. (497); terricolous-saprobic, muscicolous; also in mixed conifer forests, meadows
145. *Rhodocybe cuprea* (FAVRE) HORAK (*Collybia*, p. 401); v 5.4; Sept. (201); terricolous-saprobic
146. *Rhodocybe nitellina* (FR.) MOS. (*Rhodopaxillus*, p. 450); v 5.4; Aug. (529); terricolous-saprobic; also in mixed conifer forests
147. *Ripartites tricholoma* (A. & S.: FR.) KARST. (p. 452); v 1.3, v 6.1; Aug. (472, 647); terricolous-saprobic; also in conifer forests
148. *Russula alnetorum* ROMAGN. (p. 568); i 3.2, v 1.2, v 1.5, v 5.4; Aug., Sept. (497, 795, 819, 835); terricolous-ectomycorrhizal
149. *Rutstroemia firma* (PERS.) KARST. (p. 357); i 4.1, v 1.2, v 1.3, v 1.5, v 1.6, v 5.2, v 5.4, v 6.1, v 6.3; July, Aug., Sept. (100, 234, 473, 497, 564, 629, 678, 711, 733, 772, 795, 819, 837); lignicolous
150. *Schizophyllum commune* FR.: FR. (p. 394); v 1.2; May (785); lignicolous
151. *Stereum hirsutum* (WILLD.: FR.) S. F. GRAY (p. 368); i 2.2, v 1.3, v 1.6, v 3.1; Aug., Sept. (295, 573, 648, 772); lignicolous; also on *Betula*, *Pinus montana*, and *P. cembra*
152. *Stropharia aeruginosa* (CURT.: FR.) QUEL. (*Geophila*, p. 546); i 4.1; Sept. (233); terricolous-saprobic; often in conifer forests
153. *Tarzetta catinus* (HOLMSK.: FR.) KORF & ROGERS (*Pustularia*, p. 354); v 1.6; Aug. (652); terricolous-saprobic; also in conifer forest
154. *Trametes hirsuta* (WULF.: FR.) PILAT (p. 373); i 2.1, i 2.2, i 3.2, i 4.1, v 1.2, v 1.3, v 1.6, v 5.2, v 5.4, v 6.1; April, May, Aug., Sept. (233, 472, 497, 718, 758, 772, 785, 843); lignicolous; also on *Betula* and *Sorbus aucuparia*
155. *Trametes pubescens* (SCHUM.: FR.) PILAT (p. 373); v 1.3; Aug. (629); lignicolous; also on *Betula*
156. *Trametes versicolor* (L.: FR.) PILAT (p. 374); v 1.2, v 5.4; Sept. (105); lignicolous; also on *Betula*
157. *Tremella moriformis* SM. ex PURT. (p. 362); v 1.1, v 1.3, v 6.3; collection dates unknown; lignicolous

Table 5: Alphabetic list of fungi found by Favre (1960) in alder forests that are associated with *Picea*, *Pinus*, *Larix*, and *Betula* (ectomycorrhizal, lignicolous, terricolous, foliicolous) or to organic material typical for alder forests (graminicolous, muscicolous).

Legend: Systematics according to Moser (1983), Jülich (1984), and Dennis (1978). In parantheses: systematics (if different) and page number according to Favre (1960).

- Bovista nigrescens* PERS. ex PERS. (p. 583)
Clitocybe diatreta (FR.: FR.) KUMMER (p. 423)
Clitocybe gibba (PERS.: FR.) KUMMER (*C. infundibuliformis* (SCHAEFF. ex FR.) (p. 428)
Clitocybe inornata (SOW.: FR.) GILL. (p. 430)
Clitocybe pseudoobbata (LGE.) MOS. (p. 432)
Cortinarius (Ser.) *anomalous* (FR.: FR.) FR. (p. 510)
Cortinarius (Tel.) *casimiri* (VEL.) HUIJSM. (p. 522)
Cortinarius (Myx.) *cristallinus* FR. (p. 498)
Cortinarius (Tel.) *erythrinus* (FR.) FR. (p. 525)
Cortinarius (Tel.) *glandicolor* FR. (p. 527)
Cortinarius (Ser.) *spilomeus* (FR.: FR.) FR. (p. 514)
Cystoderma carcharias (PERS.) KONR. & MAUBL. (p. 554)
Dermocybe crocea (SCHFF.) MOS. (*Cortinarius*, p. 517)
Fayodia gracilipes (BRITZ.) BRESINSKY & STANGL (*F. bisphaerigera* (J.E. LGE.) KÜHN., p. 415)
Fayodia leucophylla (GILL.) LGE. & SIVERTSEN (*Omphalia striatula* (KÜHN.), p. 418)
Galerina badipes (FR.) KÜHN. (*Galera*, p. 536)
Galerina pruinatipes SMITH (*Gymnopilus laricicola* FAVRE, p. 539)
Galerina stylifera (ATK.) SMITH & SING. (*Galera sideroides* (BULL. ex FR.) ss. KÜHN., p. 538)
Geastrum quadrididum PERS. ex PERS. (*G. coronatum* (SCHAEFF.), p. 584)
Gymnopilus bellulus (PECK) MURR. (p. 539)
Hebeloma mesophaeum (PERS.: FR.) QUEL. (p. 491)
Hemimycena delicatella (PECK) SING. (*Mycena lactea* (PERS. ex FR.) ss. LGE., p. 410)
Hemimycena gracilis (QUEL.) SING. (*Delicatula*, p. 415)
Heyderia abietis (FR.) LINK (*Gymnomitrula cucullata* (FR.), p. 359)
Hypholoma capnoides (FR.) ex FR. KUMMER (*Geophila*, p. 545)
Inocybe acuta BOUD. (p. 478)
Inocybe cervicolor (PERS. ex PERS.) QUEL. (p. 461)
Inocybe geranioidora FAVRE (p. 462)
Inocybe pudica KÜHN. (p. 473)
Kuehneromyces myriadophylla (ORTON) PEGLER & YOUNG (*K. vernalis* (PECK), p. 544)
Lactarius glyciosmus FR. (= *L. impolitus* KÜHN.-ROMAGN., p. 578)
Lepiota felina (QUEL.) (p. 555)
Macrolepiota puellaris (FR.) MOS. (= *Lepiota rhacodes* (VITT.) var. *puellaris*, p. 556)
Mycena aurantiomarginata (FR.) QUEL. (*M. elegans* (PERS. ex FR.) ss. SCHRÖT., p. 406)
Mycena capillaripes PECK (p. 406)
Mycena cinerella KARST. (p. 406)
Mycena cyanorhiza QUEL. (p. 406)
Mycena flos-nivium KÜHN. (= *M. occidentalis* KÜHN., non MURR., p. 408)
Mycena laevigata (LASCH) QUEL. (p. 410)
Mycena phaeophylla KÜHN. (p. 411)
Mycena rubromarginata (FR.: FR.) KUMMER (p. 412)
Mycena viridimarginata KARST. (p. 414)
Mycena vulgaris (PERS.: FR.) QUEL. (p. 415)

- Omphalina cyanophylla* (FR.) (*Omphalia*, p. 416)
Omphalina ericetorum (PERS.: FR.) M. LGE. (= *Omphalia umbellifera* (L. ex FR.), p. 418)
Pholiotina aberrans (KÜHN.) SING. (*Conocybe*, p. 548)
Pholiota scamba (FR.) MOS. (*Dryophila*, p. 544)
Pholiota spumosa (FR.) SING. (*Dryophila*, p. 544)
Postia caesia (SCHRAD.: FR.) KARST. (*Leptoporus*, p. 373)
Russula fragilis (PERS.: FR.) FR. (p. 571)
Trichaptum abietinum (PERS.: FR.) RYV. (*Trametes*, p. 373)
Tricholoma argyraceum (BULL.: FR.) SACC. (p. 442)
Tricholoma scalpturatum (FR.) QUEL. (*T. argyraceum* var. *scalpturatum* (FR.), p. 442)
Trichomolopsis decora (FR.) SING. (p. 445)

Discussion

Analysing the mycosociological and taxonomic data presented by Favre (1960) several unexpected results yielded in relation to alder-associated macrofungi have been encountered. It turned out that Favre's most preferred hunting grounds have been the subalpine regions around S-charl and S-chanf, both located outside the actual SNP boundaries. In the subalpine zone, the small stand of *Alnus viridis* in Val Sesvenna is mycologically by far the best studied, because Favre visited this location most often and accordingly the number of macrofungi extracted there is matched by no other collecting site.

Another new fact is that Favre was undoubtedly much more attracted by the mycoflora associated with the "*Alnetum viride*". Over the years he visited only about half as many localities with *A. incana*. At the same time he spent only a quarter as much time in the marginal region of the SNP. For that simple reason, the list of taxa reported from *A. viridis* habitats is about three times longer than that from *A. incana*.

During the 17 years of Favre's exploration, most excursions to the alder stands were carried out in August and September. Comparatively little time was spent gathering fungi in spring and early summer (April, May, July) and even less is known about the autumnal mycoflora (October, November). These seasonal gaps in collecting have to be taken into account because our own observations clearly indicate that, especially in montane alder forests, a remarkable number of macrofungi can be found in off-seasons. As a matter of fact, during mild winters many Basidiomycetes and Ascomycetes can be observed in alder woods free of snow.

The lack of the specific knowledge of Favre's collecting techniques creates a problem in comparing the results from the different localities investigated by him. There are a number of open questions, for example did he visit permanent plots of certain size which were collected regularly or did he adhere to other patterns to search for macrofungi? Were the species encountered identified mostly in the field only? Did he gather the basidiomes of all unknown and critical species or were samples taken occasionally at

Table 6: Constancy (between 50 and 100%) of species of fungi found in stands of *Alnus viridis* in three or more locations in which at least 5% (A), 10% (B) or 20% (C), respectively, from totally 138 fungi have been observed. Remaining species (D). Ectomycorrhizal fungi are underlined (* see Table 1 for location).

location *	v5.4	v5.2	v1.6	v6.1	v1.3	v1.2	%	v1.5	v3.1	%	v6.3	v5.1	%
number of species	94	57	55	37	33	29	con.	19	15	con.	10	9	con.
% from 138 species	68	41	40	29	24	21		14	11		7	7	
A:													
<u>Lactarius obscuratus</u>	x	x	x	x	x	x		x	x		x		90
<u>Naucoria luteolofib.</u>	x	x	x	x	x	x		x			x	x	90
<u>Naucoria scolecina</u>	x	x	x	x	x	x		x			x	x	90
<u>Rutstroemia firma</u>	x	x	x	x	x	x		x			x		80
<u>Mycena citrinomarg.</u>	x	x	x	x	x	x		x				x	80
<u>Clitocybe alnetorum</u>	x	x	x	x	x				x			x	70
<u>Mycena galopoda</u>	x		x	x	x	x		x			x		70
<u>Pseudobaeospora p.</u>		x	x	x	x	x			x			x	70
<u>Phaeomarasmius er.</u>	x	x	x		x						x		50
<u>Lactarius alpinus</u>	x		x	x	x						x		50
B:													
<u>Cortinarius bibulus</u>	x	x	x	x	x	x		x		88			
<u>Lactarius lepidotus</u>	x	x	x	x	x	x		x		88			
<u>Mycena pura</u>	x	x	x	x	x	x		x		88			
<u>Mycena speirea</u>	x	x	x	x		x		x	x	88			
<u>Galerina vittaeform.</u>	x	x	x	x	x			x		75			
<u>Mycena metata</u>	x	x	x					x	x	63			
<u>Cortinarius helvell.</u>	x	x	x						x	50			
<u>Mycena vitrea</u>	x	x	x						x	50			
<u>Naucoria escharoid.</u>	x	x		x					x	50			
<u>Entoloma juncinum</u>	x		x	x				x		50			
<u>Paxillus involutus</u>	x		x	x					x	50			
<u>Plicatura nivea</u>	x		x			x		x		50			
C:													
<u>Trametes hirsuta</u>	x	x	x	x	x	x	100						
<u>Mycena epipterygia</u>	x	x	x	x	x		83						
<u>Collybia dryophila</u>	x	x	x	x	x		83						
<u>Clitocybe suaveole.</u>	x	x	x	x			67						
<u>Pholiotina blattaria</u>	x	x	x	x			67						
<u>Lentinellus omphal.</u>	x	x	x		x		67						
<u>Mycena amicta</u>	x	x	x		x		67						
<u>Collybia cirrhata</u>	x	x	x			x	67						
<u>Armillariella mellea</u>	x	x		x		x	67						
<u>Galerina marginata</u>	x	x		x		x	67						
<u>Inocybe geophylla</u>	x	x	x				50						
<u>Mycena alnetorum</u>	x	x	x				50						
<u>Crepidotus subverr.</u>	x	x	x				50						
<u>Panaeolus rickenii</u>	x	x	x				50						
<u>Mycena filopes</u>	x	x	x				50						
<u>Malanoleuca grami.</u>	x	x		x			50						
<u>Mycena flavoalba</u>	x	x		x			50				x		
<u>Mycena rorida</u>	x	x			x		50						
<u>Collybia tuberosa</u>	x				x	x	50						
D: <u>Amanita friabilis</u> (v 1.6, v 1.2, v 1.5), <u>Cortinarius atropusillus</u> (v 1.6, v 1.2, v 1.5), <u>Dasyscyphus bicolor</u> (v 1.6, v 1.2, v 1.5), <u>Encoelia furfuracea</u> (v 1.6, v 1.2, v 1.5), <u>Mycena galericulata</u> (v 5.4, v 3.1, v 5.1), <u>Mycenella lasiosperma</u> (v 5.4, v 1.2, v 1.5), <u>Pholiota lenta</u> (v 5.4, v 6.1, v 3.1), <u>Polyporus brumalis</u> (v 5.4, v 5.2, v 3.1), <u>Russula alnetorum</u> (v 5.4, v 1.2, v 1.5), <u>Stereum hirsutum</u> (v 1.6, v 1.3, v 3.1), <u>Tremella moriformis</u> (v 1.3, v 6.3 v 1.1)													

random? How much time was given to examine each locality and was the site composed of pure or mixed alder forests? We have no conclusive information about the techniques Favre employed. The entries in the original note books indicate, however, that all collections had been taken at random. After completion of the excursions the specimens of the unknown agarics were annotated and preserved for further microscopic examination.

Evaluation of Favre's data reveal some taxonomic and ecological difficulties with several species, for instance with *Paxillus filamentosus*. According to the literature (Schmid-Heckel 1985, Stangl 1970, Szczepka 1987) and own observations (Horak 1985) *P. filamentosus* is an associate of *A. incana*. Favre, however, recorded only *P. involutus* but in association with *A. incana* and *A. viridis*. Therefore, it appears that Favre did not recognize *P. filamentosus*. Nevertheless, *P. involutus* forms *in vitro*-mycorrhizae with several species of alders (Godbout & Fortin 1983, Molina 1981) and with various trees (Laiho 1970).

A second example of difficult data is with *Alpova diplophloeus* which is known in Europe to be restricted to *A. viridis* (Cléménçon 1977, Gross 1980, Schmid-Heckel 1985). Favre recorded this hypogeous fungus at God d'Arduond (i 2.1) under *A. viridis*. However, this host was not registered during own observations. The relationship between *A. viridis* and *A. diplophloeus* is further supported by personal records in at least three other locations in the Swiss Alps. In North America this fungus is widely distributed under various species of alders, mainly along the Pacific West Coast from Alaska to California (Trappe 1975).

Another taxonomic and mycoecological problem concerns *Russula alnetorum* (Romagnesi 1956). This rare species was found by Romagnesi and by Bresinsky & al. (1980), again exclusively with *A. viridis* which is in contradiction to Favre's record from *A. incana* stands (Fuora Baldirun, i 3.2). The present authors do not exclude the possibility that Favre's *R. alnetorum* actually is *R. pumila* Rouzeau & Massart, which is an associate of *A. incana* and *A. glutinosa* (L.) Gaertn. (Jahn 1976, Bresinsky & al. 1980; Brunner 1989). In many features these two species of *Russula* are similar (Einhellinger 1987) and thus can be readily confused.

In addition a few critical remarks can be made concerning the species complex of *Entoloma tenellum* - *E. minutum* - *E. favrei*. Originally, Favre (1960) filed his SNP collection as *E. tenellum* (Favre 1948; type collection from Jurassic bogs in western Switzerland) despite the lack of cheilocystidia. Assuming that the type material of Favre's taxon was lost, Noordeloos (1982) renamed the SNP record as "*Entoloma favrei*". As description he took his description of *E. tenellum* from Noordeloos (1980), but including the wrong collecting date: 14. Aug. 1943 instead of 4. Aug. 1943. In a third paper

Table 7: Fungi associated with *Alnus incana* and *A. viridis* in Central Europe; only species which occur in at least two of the five regions are considered (region 1: Favre 1960, 2: Horak 1985, 3: Stangl 1970, 4: Schmid-Heckel 1985, 5: Horak 1963).

	<i>A. incana</i>			<i>A. viridis</i>				<i>A. incana</i>			<i>A. viridis</i>		
	1	2	3	1	4	5		1	2	3	1	4	5
Ectomycorrhizal fungi													
<i>Paxillus filamentosus</i>		x	x										
<i>Cortinarius atropusil.</i>				x	x	x							
<i>Russula alnetorum</i>		x ^a		x	x	x							
<i>Lactarius obscuratus</i>				x	x	x							
<i>Naucoria scolecina</i>				x	x								
<i>Cortinarius bibulus</i>				x	x								
<i>Lactarius alpinus</i>				x	x								
<i>Lactarius lepidotus</i>				x	x								
<i>Alpova diplophloeus</i>		x ^b		x	x								
<i>Paxillus involutus</i>		x ^c		x		x							
<i>Naucoria escharoides</i>		x	x	x	x	x							
<i>Naucoria luteolofibr.</i>		x	x	x	x								
<i>Lactarius lilacinus</i>		x	x										
<i>Laccaria laccata</i>			x		x	x							
<i>Naucoria subconspers.</i>			x		x								
Saprobic fungi													
<i>Melanophyllum echi.</i>		x	x										
<i>Bjerkandera fumosa</i>		x		x									
<i>Conocybe tenera</i>			x	x									
<i>Coprinus comatus</i>			x	x									
<i>Coprinus domesticus</i>			x	x									
<i>Coprinus lagopus</i>			x	x									
<i>Lepiota cristata</i>			x	x									
<i>Mycena alba</i>			x	x									
<i>Tubaria conspersa</i>			x	x									
<i>Ascocoryne sarcoides</i>					x	x							
<i>Bisporella citrina</i>					x	x							
<i>Collybia dryophila</i>					x	x							
<i>Dasyscyphus bicolor</i>					x	x							
<i>Encoelia furfuracea</i>					x	x							
<i>Entoloma favrei</i>					x	x							
<i>Entoloma juncinum</i>					x	x							
<i>Mycena filipes</i>					x	x							
<i>Mycena rorida</i>					x	x							
<i>Pseudobaeospora pil.</i>					x	x							
<i>Rhodocybe nitellina</i>					x	x							
<i>Entoloma conferend.</i>					x		x						
<i>Pholiotina blattaria</i>		x	x	x	x	x	x						
<i>Armillariella mellea</i>		x	x	x	x		x						
<i>Cystolepiota sistrata</i>		x	x	x	x								
<i>Crepidotus sphaeros.</i>		x	x	x		x							
<i>Mycena pura</i>		x	x		x	x							
Saprobic fungi (continued)													
<i>Mycena speirea</i>		x	x					x	x		x	x	
<i>Clitocybe alnetorum</i>		x	x					x	x			x	
<i>Lepista nuda</i>		x	x					x	x				
<i>Mycena acicula</i>		x	x								x		
<i>Mycena citrinomargi.</i>		x						x		x	x	x	
<i>Polyporus varius</i>		x						x		x	x	x	
<i>Trametes hirsuta</i>		x						x		x	x	x	
<i>Mycena niveipes</i>			x	x					x	x	x		
<i>Polyporus brumalis</i>			x	x				x	x	x		x	
<i>Psathyrella gracilis</i>			x	x				x	x	x			
<i>Pluteus atricapillus</i>		x									x	x	x
<i>Entoloma dysthales</i>		x									x	x	
<i>Galerina vittaeformis</i>		x									x	x	
<i>Marasmius androsac.</i>		x ^d						x ^d			x		
<i>Mycena galopoda</i>		x									x	x	
<i>Rutstroemia firma</i>		x									x		x
<i>Stereum hirsutum</i>		x									x	x	
<i>Kuehneromyces mut.</i>			x						x			x	
<i>Macrotyphula fistulo.</i>			x						x		x	x	
<i>Mycena galericulata</i>			x						x		x	x	
<i>Ripartites tricholoma</i>			x								x		x
<i>Schizophyllum com.</i>									x		x		x
<i>Entoloma minutum</i>		x										x	
<i>Stropharia aeruginosa</i>		x										x	
<i>Crepidotus subverru.</i>			x								x		
<i>Collybia cookei</i>			x								x		
<i>Coprinus plicatilis</i>			x								x		
<i>Helvella lacunosa</i>			x								x		
<i>Lentinellus omphalo.</i>			x								x		
<i>Leptoglossum acero.</i>			x								x		
<i>Marasmius alniphilus</i>			x								x		
<i>Melanoleuca gramin.</i>			x								x		
<i>Melanoleuca gramm.</i>			x								x		
<i>Pholiota anicola</i>			x								x		
<i>Pholiotina arrhenii</i>			x								x		
<i>Bolbitius vitellinus</i>									x		x		
<i>Crepidotus variabilis</i>										x	x		
<i>Inonotus radiatus</i>										x	x		
<i>Trametes versicolor</i>										x	x		
number of species		29	40	27				29	40	27	65	40	16
total number of species		47	153	73				47	153	73	138	102	37
percentage		62	26	37				62	26	37	47	64	43

^a probably *Russula pumila*

^b probably in association with *Alnus viridis*

^c probably *Paxillus filamentosus*

^d collection localities (in association with *Alnus incana* or *A. viridis*) unknown

(Noordeloos 1987) the collecting date changed to 14. Aug. 1945, which confused the status of *E. favrei* again. According to Favre's notes he never collected at this date at the type locality of *E. favrei*.

One of the most interesting results of the present study centers on the lists of agarics (Tab. 4 and 7), especially those with putative ectomycorrhizal relationships to the two species of *Alnus* occurring in the region of the SNP. Evaluation of available data indicates that *A. incana* is strongly associated only with *Paxillus filamentosus*, whereas *A. viridis* hosts at least eight agarics as intimate symbionts viz. *Cortinarius atropusillus*, *Lactarius obscuratus*, *L. alpinus*, *L. lepidotus*, *Russula alnetorum*, *Alpova diplophloeus*, and *Naucoria scolecina*. At first sight this is a rather surprising and obvious example of strict host specificity. It is better understood, however, if the following two factors are taken into account. Firstly, *A. incana* is taxonomically not closely related to *A. viridis* (Murai 1968), and secondly, the ecology of these two trees is distinctly different. In the montane zone of the study area, *A. incana* is typically found on sandy soils along frequently inundated river banks. *A. viridis*, however, usually does not occur at the bottom of the Inn valley, but prefers unstable locations (landslides or gullies annually covered by avalanche snow until early summer) at higher elevations on the slopes of the subalpine belt.

Based upon Favre's data only *Lactarius lilacinus*, *Naucoria escharoides* and *N. luteolofibrillosa* are actually recorded as being in ectotrophic association with both taxa of *Alnus*.

Reassessing the original enumeration of the macrofungi in montane and subalpine stands of *Alnus*, it is remarkable that *Gyrodon lividus* (Bull.: Fr.) Sacc., reportedly a close but rarely encountered associate of *A. incana* (Schmid-Heckel 1985), has not been listed by Favre for the region of the SNP. According to the observations of Horak (1985) and Griesser (in prep.), this conspicuous species is missing from the pure stands of its supposed host-tree both in the Lower Engadine and in the upper Rhine valley in central Grisons. It appears (Horak, unpubl.) that *G. lividus* has only a loose relationship to *A. incana*, a fact which is further supported by its inability to form ectomycorrhiza in artificial systems (Brunner & al. 1990).

In general, the saprobic agarics recorded by Favre (1960) under *Alnus* in the montane and subalpine zone of the SNP do not exhibit host-specific relationships to either of the two alders. Remarkable exceptions are some of the new taxa described by Favre from this area viz., *Clitocybe alnetorum*, *Marasmius alniphilus*, *Mycena alnetorum*, and *Rhodocybe cuprea*. Several other agarics, e.g. *Macrotyphula fistulosa*, *Hohenbuehelia reniformis*, and *Pseudobaeospora pillodii*, are rarely encountered; hence, there are not enough reliable ecological data available to assess their actual rôle in the alder dominated habitats. Of course, however, the great majority of agarics mentioned by Favre

(1960) are non-specific saprobes with a wide host-range. This is particularly true for the common *Collybia dryophila*, *Dasyscyphus bicolor*, *Mycena acicula*, *M. epipterygia*, *M. galericulata*, *M. pura*, *M. speirea*, and *Polyporus brumalis* which are also common representatives in beech, spruce and pine forests or in grasslands in Switzerland (Horak 1985; Brunner 1987; Brunner & Horak 1988) and elsewhere.

Acknowledgements

The senior author appreciates the financial support received from the Swiss National Foundation. In particular, we are indebted to Dr. O. Monthoux, curator of the cryptogamic herbarium at the Conservatoire Botanique in Geneva (G) for permission to have unlimited access to published and unpublished data kept in the J. Favre fungarium. We are also grateful to Dr. O. K. Miller (VPI, Blacksburg, USA) for his critical suggestions which led to improvements of the original manuscript. Drs. J. Klemmedson (University of Arizona, Tucson, USA) and D. Jones (ETH, Zürich) are thanked for reading and improving the English text.

Literature

- Arnolds, E. (1981). Ecology and coenology of macrofungi in grasslands and moist heathlands in Drenthe, the Netherlands. 1. Introduction and synecology. - *Biblioth. Mycol.* **83**: 1-407.
- Bresinsky, A., J. Stangl & A. Einhellinger (1980). Beiträge zur Revision M. Britzelmayrs "Hymenomyceten aus Südbayern". 14. Die Gattung *Russula* unter besonderer Berücksichtigung ihrer Arten in der Umgebung von Augsburg. - *Z. Mykol.* **46**: 131-156.
- Brunner, I. (1987). Pilzökologische Untersuchungen in Wiesen und Brachland in der Nordschweiz (Schaffhauser Jura). - *Veröff. Geobot. Inst. ETH, Stiftung Rübel, Zürich* **92**: 1-241.
- Brunner, I. (1989). Two new species of *Russula* (stirps *Atropurpurea*) associated with *Alnus crispa* from Alaska. - *Mycologia* **81**: 667-676.
- Brunner, I. & E. Horak (1988). Zur Ökologie und Dynamik praticoler Agaricales in Mesobrometen der Nordschweiz. - *Mycol. Helv.* **3**: 1-26.
- Brunner, I. & O.K. Miller, JR. (1988). *Calocybe fallax*: its ecology and cultural behavior. - *Mycotaxon* **33**: 41-50.
- Brunner, I., F. Brunner & O.K. Miller JR. (1990). Ectomycorrhizal synthesis with Alaskan *Alnus tenuifolia*. - *Canad. J. Bot.* **68**: 761-767.
- Cléménçon, H. (1977). Über *Melanogaster microsporus* and *Alpova diplophloeus*. - *Schweiz. Z. Pilzkde.* **55**: 155-156.
- Dennis, R.W. G. (1978). *British Ascomycetes*. 3rd ed. - Cramer, Vaduz. 585 pp.

- Einhellinger, A. (1987). Die Gattung *Russula* in Bayern. - Biblioth. Mycol. **112**: 1-311.
- Favre, J. (1948). Les associations fongiques des hauts-marais jurassiens et de quelques régions voisines. - Beitr. Kryptog. Flora Schweiz **10** (3): 1-228.
- Favre, J. (1955). Les champignons supérieurs de la zone alpine du parc national suisse. - Ergebn. Wiss. Untersuch. Schweiz. Nationalparks **5**: 1-212.
- Favre, J. (1960). Catalogue descriptif des champignons supérieurs de la zone subalpine du parc national suisse. - Ergebn. Wiss. Untersuch. Schweiz. Nationalparks **6**: 323-610.
- Godbout, C. & J. A. Fortin (1983). Morphological features of synthesized ectomycorrhizae of *Alnus crispa* and *A. rugosa*. - New Phytol. **94**: 249-262.
- Gross, G. (1980). Über einige *Alpova*-Funde in den Bayerischen Alpen. - Z. Mykol. **46**: 21-26.
- Horak, E. (1963). Pilzökologische Untersuchungen in der subalpinen Stufe (*Piceetum subalpinum* und *Rhodoreto-Vaccinietum*) der rhätischen Alpen. - Mitt. Schweiz. Anst. Forstl. Versuchswes. **31**: 1-112.
- Horak, E. (1978). Notes on *Rhodocybe* Maire. - Sydowia **31**: 58-80.
- Horak, E. (1985). Die Pilzflora (Macromyceten) und ihre Ökologie in fünf Pflanzengesellschaften der montan-subalpinen Stufe des Unterengadins (Schweiz). - Ergebn. Wiss. Untersuch. Schweiz. Nationalparks **12**: 337-476.
- Horak, E. (1987a). Revision der von J. Favre (1955) aus der Region des Schweizer Nationalparks beschriebenen alpinen Arten von *Cortinarius* subgen. *Telamonia* (Agaricales). - Candollea **42**: 771-803.
- Horak, E. (1987b). *Astrosporina* in the alpine zone of the Swiss National Park (SNP) and adjacent regions. In: Laursen & al. (eds.). Arctic and alpine mycology II. - Environmental science research **34**: 205-234. Plenum Press, New York.
- Horak, E. & B. Griesser (1987). Über zwei neue Arten von *Psathyrella* und *Rhodocybe* aus Grauerlen-Wäldern Graubündens (Schweiz). - Beitr. Kenntn. Pilze Mitteleuropas **3**: 265-274.
- Jahn, H. (1976). *Russula pumila* Rouzeau & Massart, ein Täubling unter *Alnus glutinosa*, in Norddeutschland und Westfalen gefunden. - Westf. Pilzbr. **11**: 15-21.
- Jülich, W. (1984). Die Nichtblätterpilze, Gallertpilze und Bauchpilze. Kleine Kryptogamenflora IIb/1. - Fischer, Stuttgart, 626 pp.
- Laiho, O. (1970). *Paxillus involutus* as a mycorrhizal symbiont of forest trees. - Acta For. Fenn. **106**: 1-73.
- Molina, R. (1981). Ectomycorrhizal specificity in the genus *Alnus*. - Canad. J. Bot. **59**: 325-334.

- Monthoux, O. (1973). Les notes manuscrites du mycologue Jules Favre. - *Revue Mensuelle des Musées et collections de la ville Genève* **135**: 17-22.
- Monthoux, O. (1986). Vorstellung einer Serie von Aquarellen von Jeanne Favre. - *Schweiz. Z. Pilzkde.* **64**: 148.
- Moser, M. (1983). Die Röhrlinge und Blätterpilze. *Kleine Kryptogamenflora* IIb/2. - Fischer, Stuttgart, 533 pp.
- Murai, S. (1968). Relationships of allied species between Northwestern U.S.A. and Japan on the genus *Alnus*. In: Trappe et al. (eds.). *Biology of alder*. - Northwest Sci. Assoc. 40th Annu. Meet., Symp. Proc. 1967: 26-36.
- Noordeloos, M. E. (1980). *Entoloma* subgen. *Nolanea* in the Netherlands and adjacent regions with a reconnaissance of its remaining taxa in Europe. - *Persoonia* **10**: 427-534.
- Noordeloos, M. E. (1982). Studies in *Entoloma* 1-5. - *Int. J. Myc. Lich.* **1**: 49-60.
- Noordeloos, M. E. (1987). *Entoloma* (Agaricales) in Europe. - *Nova Hedw., Beih.* **91**: 1-419.
- Romagnesi, H. (1956). Une russule nouvelle de l'aunaie subalpine. - *Bull. Soc. Linn. Lyon* **25**: 181-183..
- Schmid-Heckel, H. (1985). Zur Kenntnis der Pilze der Nördlichen Kalkalpen. - *Nationalpark Berchtesgaden, Forschungsbericht* **8**: 1-201.
- Stangl, J. (1970). Das Pilzwachstum in alluvialen Schotterebenen und seine Abhängigkeit von Vegetationsgesellschaften. - *Z. Pilzkde.* **31**: 209-255.
- Szczepka, M. (1987). Bestimmungsschlüssel für europäische Arten der Gattung *Paxillus* Fr. - *Beitr. Kenntn. Pilze Mitteleuropas* **3**: 79-94.
- Trappe, J. M. (1975). A revision of the genus *Alpova* with notes on *Rhizopogon* and the Melanogastraceae. - *Beih. Nova Hedw.* **51**: 279-309.

