Join our sampling campaign of ectomycorrhizal fungi in pine forests!

Project FunDive

In FunDive we work towards putting fungal diversity on the map to enhance European conservation efforts. Fungi are essential for our ecosystems but have often been neglected in monitoring efforts and conservation practices, leaving them vulnerable to threats and habitat loss. We would like to engage you to change this.

For more information, please visit https://fun-dive.eu/

FunDive is a pan-European initiative funded by Biodiversa+ that brings together 33 partners in 22 countries to improve fungal monitoring across the continent. The goal of FunDive is to close the knowledge gap dealing with fungal distributions to improve fungal conservation using the help from you and other citizen scientists.

Why is fungal monitoring important?

Fungi are generally under-studied. Their global distribution patterns are poorly resolved. Also in Europe, despite centuries of fungal research, there is a lack of the distribution patterns of many fungal species. However, this knowledge is very important for effective conservation practices. For example, assessments of species for the IUCN Red List require an understanding of the distribution of said species.

What can you do?

FunDive is structured in different projects, each focusing on a specific target group of fungi. You can engage in each project by documenting and collecting fungal specimens. The process is simple:

- **Select** the project you would like to join
- **Join** the 'Citizens for FunDive' project in PlutofGO app, following FunDive step-by-step joining guide:

  https://fun-dive.eu/wp-content/uploads/2024/08/FunDive_Joining-guide.pdf

  In some countries you can use dedicated country-level recording apps instead of PlutofGo. Check it with your country-level coordinator.
- **Find** target species
- Make an informative **photo** of your finding, following FunDive step-by-step Photo guide:

  https://fun-dive.eu/wp-content/uploads/2024/08/How-to-photograph.pdf
- **Register** your specimen in PlutofGO app, completing as mach metadata as possible and following the FunDive step-by-step Specimen registration guide:

  https://fun-dive.eu/wp-content/uploads/2024/08/How-to-register-specimen.pdf

  Remember, that the better metadata provided for collected specimens, the bigger is the chance they will be included in the DNA barcoding.
- **Collect** a specimen and prepare it for transfer, following theFunDive step-by-step Collection guide:

  https://fun-dive.eu/wp-content/uploads/2024/08/prepare-for-transfer.pdf
- **Send** your specimen for barcoding.

  If your collected specimen is prepared for transfer, registered in PlutoF, and visible in the FunDive records (https://fun-dive.eu/en/dataportal/) it is ready for barcoding! In order to get your specimen sequenced, get in touch with your country-level point of contact (https://fun-dive.eu/get-involved/fundive-national-points-of-contact/) to receive shipment instructions.
- When received your specimen will be processed and identified based on molecular information. You can follow your fungus on FunDive records: https://fun-dive.eu/dataportal/.
- In case of any questions feel free to contact your country representatives.

Remember, to have all permits needed before sampling!

For more information on how to document your records, please visit https://fun-dive.eu/get-involved/how-to-engage/	

By reporting your findings, you will add to the knowledge of this species group and your records will be important contributions to nature conservation.

Ectomycorrhizal fungi in pine forests

is one of the targets for the 2025 FunDive projects which aim to investigate fungal biodiversity and distribution patterns in Europe

Pine forests are rich habitat for a wide variety of ectomycorrhizal fungi, of which many are host specific or selective for Pines (*Pinus* spp.). Some even have specific associations with certain groups of pines, e.g. *Suillus placidus*, that only associate with *Pinus cembra* and closely related species. Here we focus on three important groups of ectomycorrhizal fungi differing in species diversity and knowledge-level, but all including species of relevance to conservation of pine forest ecosystems in Europa, i.e.

- Webcaps (*Cortinarius* s.lato)
- Stipitate thelephoroid hydnoid and poroid fungi
- Knights (*Tricholoma*)
- Fibrecaps (*Inocybe* s.lato)

In FunDive our main sampling focus is fungi associating with scotch pine (*Pinus sylvestris* and black pines (*Pinus nigra* complex), but we are also interested in samples associated with other pine species (e.g. *P. halepensis* and other thermophilous Mediterranean species). Based on current knowledge, fungal species of conservation concern are mainly associated with older pine forest on strongly calcareous or extremely poor, sandy soils, and hence such communities are an important target for sampling within the project. For species groups emphasised as targets for collection among the stipitate thelephoroid hydnoid and poroid fungi, *Tricholoma* and Inocybe s.lato; when they are found with other hosts, they should be collected since this contributes at solving taxonomic issues.

Fig. 1. Representatives of our four target groups (from up left): *Cortinarius fusisporus*, *Phellodon connatus*, *Tricholoma sudum* (photos Thomas Kehlet & Jens H. Petersen), and *Inocybe pinophila* (photo Linos Kottis).

Webcaps (*Cortinarius* end closely related genera)

Diversity and morphological characters

Webcaps comprise the largest and most diverse group of agarics worldwide, and also in Europe, where the estimated diversity exceeds 1000 species. Of these, several hundred species are associated with Pines. Despite the high diversity European species of *Cortinarius* s.lato are comparatively well resolved taxonomically, with a rich reference dataset of ITS sequences obtained from type material available in public databases (e.g. Liimatainen m.fl. 2014 & 2020).

Webcaps are characterised by a rusty brown spore print, ornamented spores and an ectomycorrhizal lifestyle, but otherwise vary widely in shape, colours, dimensions and cap and stem surface structure. Most species have a distinct cobwebby partial veil when young (hence the name web-caps), and many also possess an universal veil leaving more or less distinct fibrils, floccules, belts or patches on the cap margin and lower stipe in expanding sporocarps (on the margin of the bulb in species in which the cap expands before the stipe elongates and along the stipe in species in which the stipe elongates before the cap expands).

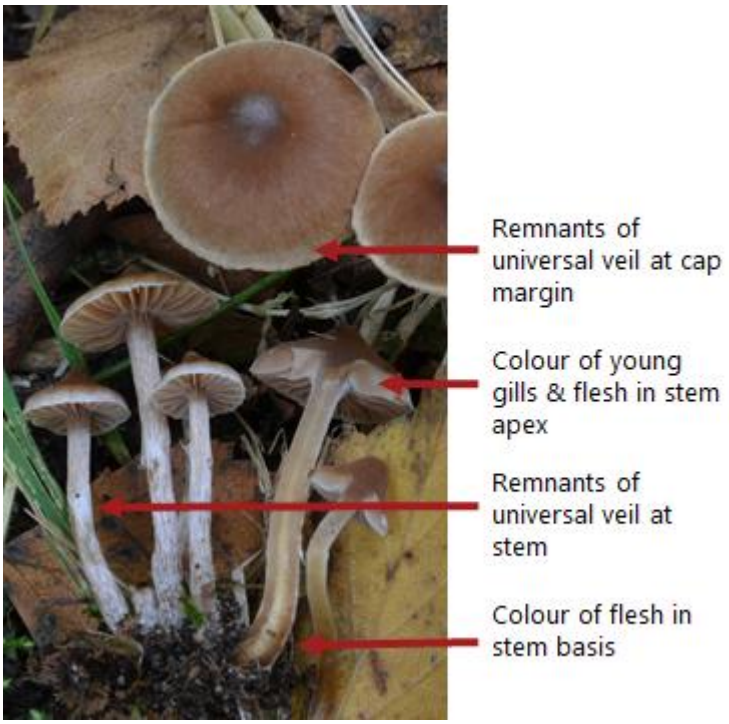

Fig. 2. Important, but often overlooked field characters in web-caps (*Cortinarius minusculus*, photo Jacob Heilmann-Clausen).

Taxonomy

Traditionally, webcaps were all assigned to one genus *Cortinarius*, but a recent study has suggested to split the genus in ten genera, which to some extent can be distinguished also based on morphological characters (Liimatainen m.fl. 2022). The split is still somewhat controversial, but is followed here. Based on the most recent phylogenetic analysis all genera are monophyletic, but not all of them receive full support (Gallone m.fl. 2024). Eight of the ten genera occur in Europe: Four of them are species-rich, *Cortinarius, Phlegmacium, Calonarius,* and *Thaxterogaster,* whereas the remaining four *Aureonarius, Cystinarius, Hygronarius,* and *Mystinarius* only include one to few species in Europe. Of the species-rich genera the genus *Cortinarius* includes almost all telamonioid and most cortinarioid and myxaciod species and some phlegmacioid species (*C. subtortus* and Infracti). The genus *Phlegmacium* includes most of the species traditionally included in the *Cortinarius* subgenus *Phlegmacium*, the genus *Calonarius* includes the species earlier recognized as *Calochroi* s. lato, and *Thaxterogaster* the phlegmacioid *Multiformes*, *Scauri*, *Riederi*, *Turmales*, and *Variegati* and myxacioid *Vibratiles* as well as *T. pinophilus, T. leucophanes* and *T. lustratus*..

Purpose of mission and how to contribute

The main purpose of the sub-project is to get an improved understanding of the ecological requirements and distribution patterns of the often poorly known species across all genera, including host association, soil-preference and sensibility to forest management. In addition we are interested in mapping the diversity of yet undescribed species. For this reason, we are interested in collections of all groups of webcaps. However, collections of high quality, and with good documentation will be preferred for sequencing, i.e.

- Collections including young as well as ripe sporocarps.
- With good documentation by photos showing
    - young and ripe sporocarps in moist condition
    - the colour of young gills
    - the colour and distribution of the universal veil (if present)
    - the colour of flesh of cut specimens.
- Notes on the smell of fresh specimens
- Notes or photos of soil- and forest type

Additional info that is most welcome include:

- Spore photos and measurements, including assessment of dextrinoid reactions in Melzer's reagent (none or somewhat dextrinoid/moderately dextrinoid/strongly dextrinoid)
- Details on other microscopical characters, including pigmentation or colour reactions of hyphae of lamellae or pileipellis in 3-10% KOH and encrustation of lamellar trama or pileipellis hyphae (often best observed in Melzer's reagent). Only a few groups of *Cortinarius* s. lato have distinct cystidia (*Cortinarius violaceus* and allies, *C. subtortus*, *C*. sect. *camphorati*, *C.* subgenus *Iodolentes*, *C.* sect. *bicolores* and *Cystinarius crassus/rubicundulus*)
- Colours under UV-light

Fibrecaps (genus *Inocybe* and closely related genera)

Diversity and morphological characters

Fibrecaps comprise the second largest group of agarics (after webcaps, i.e. *Cortinarius* s.lato) with more than 1000 species worldwide. Several hundreds of them exist in Europe; notably *Inocybe* s.lato in central Europe includes more than 450 species (Matheny et al. 2019, Bandini et al. 2019). Although the taxonomy of European species of *Inocybe* s.lato has been thoroughly studied in the pre-molecular era (e.g. Kuyper 1986, Stangl 1989), recent molecular studies have shown the taxonomy to be more complex than anticipated, and several species groups still remain poorly resolved. During the last few years, a considerable number of species new to science were described, many type specimens were sequenced, and the taxonomic knowledge for this group of agarics is undergoing a considerable revision (e.g. Bandini et al. 2021, 2022, 2024). Similarly, a considerable species richness for this group was detected in the Mediterranean region, from where – not surprisingly – many species new to science were also described (e.g. Mešić et al. 2021, Muñoz et al.2022, Fachada et al. 2024).

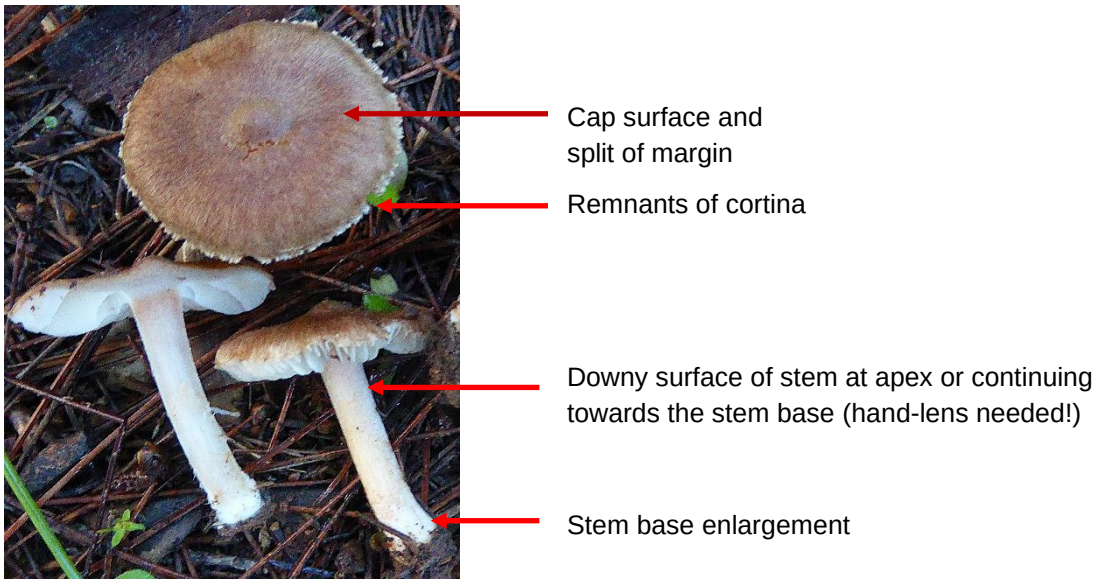

Fig. 3. Important, but often overlooked, field characters in fibrecaps (*Inocybe pinophila*; photo: Linos Kottis).

Fibrecaps are characterised by fibrillose to scaly caps (hence the name ‘fibrecaps’), with small to medium size, a rather pale grey-brown spore print, variably-shaped spores, conspicuous cheilocystidia, and an ectomycorrhizal lifestyle (Fig. 3). In *Inocybe* s.stricto, also pleurocystidia are present, often showing a characteristic, crystalline incrustation. Some species may have a transient, often inconspicuous, thread-like universal (and similarly-looking partial veil), visible only when young at the pileus margin, occasionally also on the pileus surface, and in most cases disappearing fast when the cap expands (in some species of the genus *Mallocybe*, it might be visible after the cap’s expansion as a cob-webby zone on the stipe surface). In some species the universal veil leaves a whitish to greyish layer in the central part of the cap, known as a velipellis. The stipe usually possesses numerous cystidia on its surface (thick-walled caulocystidia), in parts or along its entire length, which are

responsible for the downy outlook (hand-lens needed!). Many species are known to be poisonous, containing a toxin called muscarin.

Taxonomy

Until recently fibrecaps were assigned to the genus *Inocybe*; however, the outcome of multigene phylogenetic analysis (e.g. Matheny et al. 2019) established the presence of seven monophyletic genera in the family Inocybaceae, five of which correspond to *Inocybe* s.lato. Four genera could be found in Europe, namely *Inocybe* s.stricto, *Inosperma*, *Mallocybe* and *Pseudosperma*, while the monotypic genus *Nothocybe* is only known from India. The genus *Inocybe* is the most species-rich and includes taxa with thick-walled pleurocystidia, and both smooth and variably-shaped spores. *Inosperma* (formerly subgenus *Inosperma*) is characterized by basidiomes with often reddening flesh, absence of pleurocystidia, and smooth, often phaseoliform spores. *Pseudosperma* (formerly subgenus *Pseudosperma*) forms radially splitting (rimose) pilei, no pleurocystidia, and smooth, predominantly ellipsoid spores. Last, the genus *Mallocybe* (formerly subgenus *Mallocybe*) possesses tomentose stems throughout, necropigmented basidia, small cheilocystidia, and no pleurocystidia.

Purpose of mission and how to contribute

The main purpose of the sub-project is to get an improved understanding of the ecological requirements and distribution patterns of the often poorly known species across all genera of fibrecaps (*Inocybe* s.lato) growing in association with pines (in pure or mixed stands), including soil-preference and sensibility to forest management. In addition, we are interested in mapping the diversity of yet undescribed species especially in the Mediterranean region. For this reason, we are interested in collections of all groups of fibrecaps. However, collections of high quality, and with good documentation will be preferred for sequencing, i.e.

- Collections including young as well as ripe sporocarps.
- With good documentation by photos showing
    - young and ripe sporocarps
    - details of the surface of pileus
    - the distribution of the universal veil (if present)
    - the colour changes of flesh of cut specimens.
    - texture and silhouette throughout the entire stipe.
- Notes on the smell of fresh specimens
- Notes or photos of soil- and forest type

Additional info that is most welcome include:

- Spore photos and measurements
- Details on cheilocystidia and (if present) pleurocystidia characters, such as size and shape, presence of crystals, thickness of walls and their colour change in 3-10% KOH or ammonia
- Pigments (if present) within basidia and cystidia
- Presence along the stipe length, size and shape of caulocystidia. Please avoid overhandling or damaging the stem when collecting specimens since it is of great importance to preserve the integrity of caulocystidia and caulocystidioid hairs.

- Last but not least! Careful collecting is also necessary for an assessment of the presence (or not) of a marginate bulb at the base of the stipe.

Stipitate, thelephoroid hydnoid and poroid fungi (*Boletopsis, Hydnellum, Phellodon* and *Sarcodon*)

This group of fungi encompass members of the hydnoid genera *Hydnellum, Phellodon* and *Sarcodon,* and the poroid genus *Boletopsis*. All are characterised by ornamented brownish spores and belong to the same family, the *Bankeraceae* within the *Thelephorales*. In total the mentioned genera encompass around 50-60 species in Europe, of which at least half associate with pines. Despite the rather low diversity, several species groups are poorly resolved taxonomically, and a number of undescribed species are known to exist. Members of the species group are considered indicators of high habitat quality in pine forest, related to their preference for older pine forests with high continuity and growing on nutrient poor or calcareous soils.Several species are considered threatened globally according to the IUCN red-list (https://www.iucnredlist.org).

Stipitate thelephoroids all have an ectomycorhizal lifestyle, and produce annual, but slow-growing and long-lasting sporocarps. Most species are short-stemmed and some have caps that may fuse into larger multi-stemmed conglomerates as they grow. Identification by morphological characters usually require fresh and young sporocarps where important characters, including colours of stem base and cap margin and cap surface structure are still not weathered.

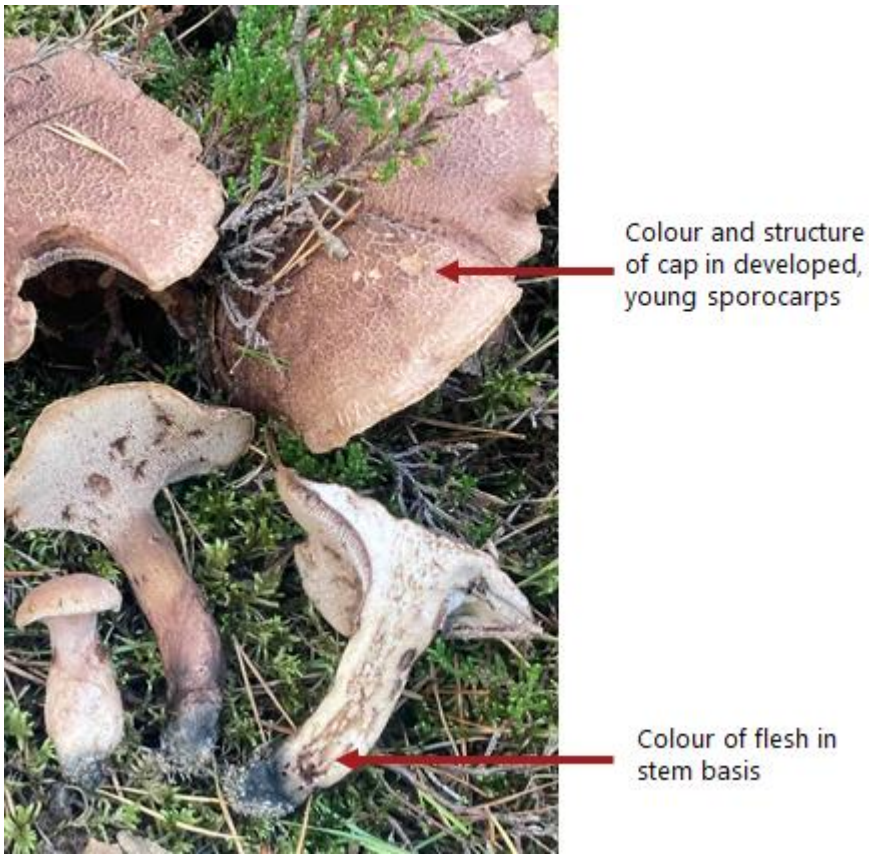

Fig. 3. Important field characters in stipitate thelephoroids (*Hydnellum scabrosum*, photo Michael Sonniks).

Taxonomy

The stipitate thelephoroids have been separated in several genera for decades, but recent phylogenetic studies have shown the traditional segregation of genera to be partly wrong. Thus several species earlier assigned to *Sarcodon* in fact belong in *Hydnellum* (Larson et al. 2019), while *Bankera* belong in *Phellodon* (e.g. Song et al. 2022). Molecular studies have indicated the presence of several species complexes, still remaining to be resolved, and overall species richness appear to be higher than traditionally accepted (Parfitt et al. 2007; Ainsworth et al. 2010)

Purpose of mission and how to contribute

The main purpose of the sub-project is to get an improved understanding of the ecological requirements, conservation needs and distribution patterns of species in the group, including host association, soil-preference and sensibility to forest management. In addition we are interested in exploring and resolving the taxonomy of several species complexes. Hence, we are interested in records of all included species, and of collections within the following species groups (even with other hosts):

Boletopsis leucomeleana s.lato
Hydnellum concrescens s.lato (incl. *H. cumulatum, scrobiculatum*)
Hydnellum ferrugineum s.lato
Hydnellum scabrosum s.lato
Phellodon connatus s.lato
Phellodon niger s.lato

Collections of high quality, and with good documentation will be preferred for sequencing, i.e.

- Collections including young as well as ripe sporocarps.
- With good documentation by photos showing
    - the structure, zonation patterns and colours of the cap
    - The colour, shape and dimensions of the stem
    - the colour of the flesh in cut specimens, including the stem base
- Notes on the smell and taste of fresh specimens
- Notes or photos of soil- and forest type

Knights (*Tricholoma*)

Diversity and morphological characters

The genus Tricholoma includes around 70-90 species in Europe, of which many associate with pine forests. Members of the genus are characterised by a white spore print, emarginate gills, smooth hyaline spores, lack of true, well differentiated cystidia and the ectomycorrhizal lifestyle. A distinct partial veil is present in some species. Species identification is in most cases possible based on macroscopical characters alone, but see below. Most species are associated with older forests, and among the pine-associated species several species have preference for stands on nutrient poor sandy or calcareous soil. Several species are considered good indicators of high natural value in such environments, and two species, viz *Tricholoma apium* and *T. matsutake* are considered globally vulnerable according to IUCN (https://www.iucnredlist.org/).

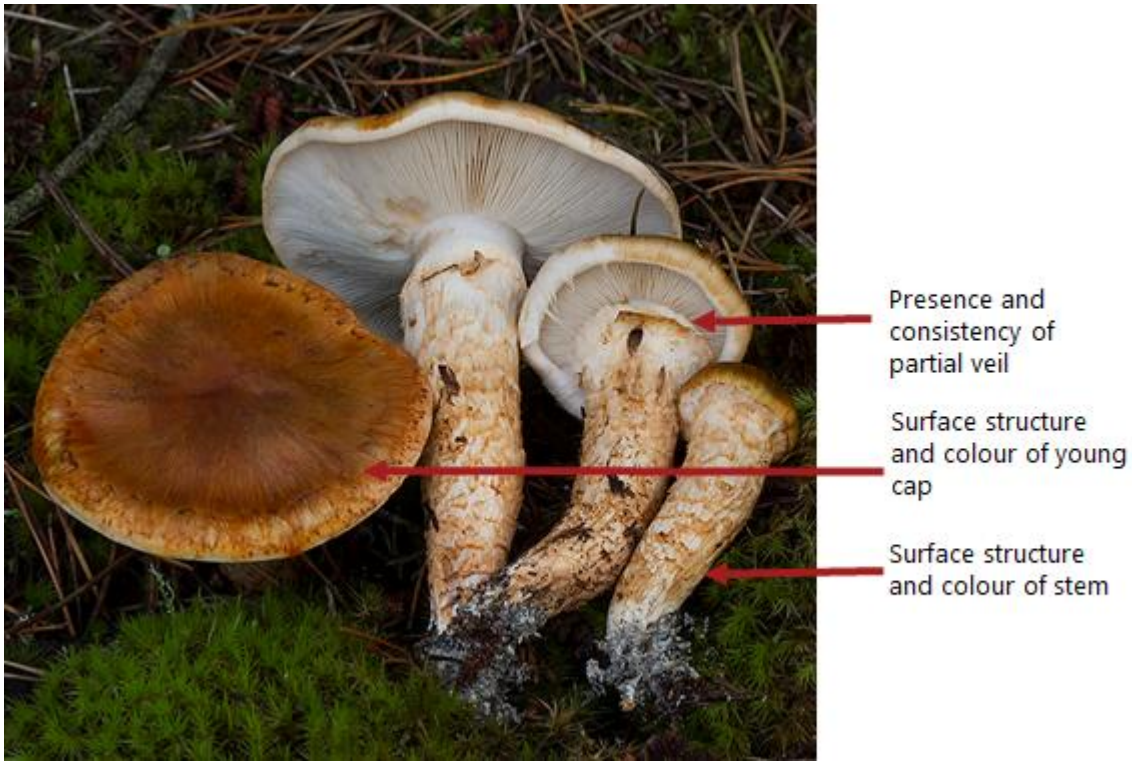

Fig. 4. Important field characters in Tricholoma (*Tricholoma focale*, photo Thomas Kehlet).

Taxonomy

The taxonomy of the genus is relatively well resolved and for many species the European distribution and ecology is well understood - at least in Northern Europe (Christensen & Heilmann-Clausen 2013). However, taxonomic traditions in southern and northern Europe have been quite different, and several species complexes are known in the genus (Heilmann-Clausen et al. 2017). Thus, additional studies incorporating collections from all over Europe are crucial to get the taxonomy of the genus resolved.

Purpose of mission and how to contribute

The main purpose of the mission is to get an improved understanding of the ecological requirements and distribution patterns of species in the group, expanding to all parts of Europe. In addition some species complexes are still poorly understood and are a main target for DNA sequencing within this subproject. Target taxa for sampling include:

- *Tricholoma caligatum and T. illkai*
- *Tricholoma focale (*incl. *T. robustum)*
- *Tricholoma batschii (*incl. *T. striatum & T. fracticum ss.auct)*
- *Tricholoma albobrunneum*
- *Tricholoma stans + T. cedretorum and T. tridentinum*
- *Tricholoma pessundatum*
- *Tricholoma vaccinum + T. inodermeum*
- *Tricholoma roseoacerbum*
- *Tricholoma arvernense*
- *Tricholoma joachimii*
- *Tricholoma equestre,* inkl. *T. ulvinenii*
- *Tricholoma atrosquamosum*
- *Tricholoma bonii and T. triste (+ more)*
- *Tricholoma sudum*
- *Tricholoma saponaceum s.lato*

High quality collections with good documentation will be preferred for sequencing, i.e.

- Collections including young as well as ripe sporocarps.
- With good documentation by photos showing
    - The structure and colours of the cap
    - The colours, surface and shape of the stem
    - The colour of the young gills
- Notes on the smell and taste of fresh specimens, both before and after cutting
- Notes of colour reactions in the gills, stem and cap surface and stem base
- Notes or photos of soil- and forest type

Additional information, identification keys and more:

Web-caps (*Cortinarius* s.lato):

Recent taxonomic advances have made old keys obsolete, while new keys still need a lot of testing and development to be truly trustworthy. Hence identification to species level is often difficult, with final ID requiring molecular data.

- Gallone, B., Kuyper, T.W. & Nuytinck, J. 2024. The genus Cortinarius should not (yet) be split. – bioRxiv, 2024-05.
- Kibby, G. & Tortelli, M. 2022. *The Genus Cortinarius in Britain*
- Liimatainen, K., Niskanen, T., Dima, B., Kytövuori, I., Ammirati, J.F. & Frøslev, T.G. 2014. The largest type study of Agaricales species to date: bringing identification and nomenclature of Phlegmacium (Cortinarius) into the DNA era. – Persoonia 33(1): 98-140.
- Liimatainen, K., Niskanen, T., Dima, B., Ammirati, J.F., Kirk, P.M. & Kytövuori, I. 2020. Mission impossible completed: unlocking the nomenclature of the largest and most complicated subgenus of Cortinarius, Telamonia. – Fungal diversity 104: 291-331.
- Liimatainen, K., Kim, J.T., Pokorny, L., Kirk, P.M., Dentinger, B. & Niskanen, T. 2022. Taming the beast: a revised classification of Cortinariaceae based on genomic data. – Fungal Diversity 112: 89-170.
- Petersen, J.H., Frøslev, T.G. & Heilmann-Clausen, J. 2024. Slørhatte i Danmarks basidiesvampe (In Danish): https://drive.google.com/file/d/1duF5nhS3vHrE7UFQzgwTPK1uFKyT0nZy/view

Stipitate thelephoroids (*Boletopsis, Hydnellum, Phellodon* and *Sarcodon*):

Overall species identification in stipitate thelephoroids is rather easy based on morphological and ecological characters, if good material is available. However some species complexes remain to be resolved, and in these species separation is still unclear.

- Ainsworth, A. M., Parfitt, D., Rogers, H. J., & Boddy, L. (2010). Cryptic taxa within European species of Hydnellum and Phellodon revealed by combined molecular and morphological analysis. *Fungal Ecology*, *3*, 65-80.
- Holec, J., & Kučera, T. (2018). Hydnoid fungi of the family Bankeraceae–their assemblages and vegetation ecology in Central Europe, Czech Republic. *Fungal ecology*, *32*, 40-48.
- Larsson, K. H., Svantesson, S., Miscevic, D., Kõljalg, U., & Larsson, E. (2019). Reassessment of the generic limits for Hydnellum and Sarcodon (Thelephorales, Basidiomycota). *MycoKeys*, *54*, 31.
- Loizides, M., Ševčíková, H., Rossi, C., & Moreau, P. A. (2020). Taxonomic challenges posed by the genera Hydnellum and Phellodon highlighted by two interesting collections on the Atlantic coast of Spain. Myco-Liébana: 81–96.
- Nitare, J., Ainsworth, A. M., Larsson, E., Parfitt, D., Suz, L. M., Svantesson, S., & Larsson, K. H. (2021). Four new species of Hydnellum (Thelephorales, Basidiomycota) with a note on Sarcodon illudens. *Fungal Systematics and Evolution*, *7*(1), 233-254.
- Parfitt, D., Ainsworth, A. M., Simpson, D., Rogers, H. J., & Boddy, L. (2007). Molecular and morphological discrimination of stipitate hydnoids in the genera Hydnellum and Phellodon. *Mycological research*, *111*, 761-777.

- Petersen, J.H. & Læssøe, T. 2024. Key to thelephoralean, stipitate hydnoid fungi (http://www.mycokey.com/keys/FunDiveStipitateThelephoraceae.pdf)
- Song, C. G., Chen, Y. Y., Liu, S., Xu, T. M., He, X. L., Wang, D., & Cui, B. K. (2022). A phylogenetic and taxonomic study on Phellodon (Bankeraceae, Thelephorales) from China. *Journal of Fungi*, *8*, 429.

Tricholoma:

Overall species identification in *Tricholoma* is rather easy based on morphological and ecological characters, if good material is available. However some species complexes remain to be resolved, and in these species separation is still unclear.

Christensen, M., & Heilmann-Clausen, J. (2013). The genus Tricholoma. Fungi of Northern Europe vol 4, Svampetryk (http://www.mycokey.com/Downloads/TheGenusTricholoma.pdf)

Heilmann-Clausen, J., Christensen, M., Frøslev, T. G., & Kjøller, R. (2017). Taxonomy of Tricholoma in northern Europe based on ITS sequence data and morphological characters. *Persoonia 38*, 38-57.

***Inocybe* s. lato:**

Bandini, D., Oertel, B., Ploch, S. *et al.* Revision of some central European species of *Inocybe* (Fr.: Fr.) Fr. subgenus *Inocybe*, with the description of five new species. Mycol Progress **18**, 247–294 (2019). https://doi.org/10.1007/s11557-018-1439-9

Bandini D, Oertel B, Eberhardt U. 2021. A fresh outlook on the smooth-spored species of *Inocybe*: type studies and 18 new species. Mycol Prog. 20(9):1019–1114. doi:10.1007/s11557-021-01712-w.

Bandini D, Oertel B, Eberhardt U. 2022. More smooth-spored species of *Inocybe* (Agaricales, Basidiomycota): type studies and 12 new species from Europe. Persoonia-Molecular Phylog Evol Fungi 48(1):91–149. doi:10.3767/persoonia.2022.48.03.

Bandini D, Oertel B, Eberhardt U 2024. Even more fibre-caps (5): Eleven new species of the family Inocybaceae and epitypification of *Pseudosperma rimosum*. Mycologia Bavarica **24**: 1-52.

Fachada, V., Bandini, D., & Beja-Pereira, A. (2023). Two new species of *Inocybe* from Mediterranean Cistaceae heathlands. Mycologia 116(1), 1–16. https://doi.org/10.1080/00275514.2023.2284557

Kuyper TW. 1986. A revision of the genus *Inocybe* in Europe. I. subgenus *Inosperma* and the smooth-spored species of subgenus *Inocybe*. Persoonia-Supplement 3(1):1–247.

Matheny, P. B., Hobbs, A. M., & Esteve-Raventós, F. (2019). Genera of Inocybaceae: New skin for the old ceremony. Mycologia 112(1), 83–120. https://doi.org/10.1080/00275514.2019.1668906

Mešić A, Haelewaters D, Tkalčec Z, Liu J, Kušan I, Aime MC, Pošta A. 2021. *Inocybe brijunica* sp. nov., a new ectomycorrhizal fungus from Mediterranean Croatia revealed by morphology and multilocus phylogenetic analysis. J. Fungi 7(3):199. doi:10.3390/jof7030199.

Muñoz G, Pancorbo F, Turégano Y, Esteve-Raventós F. 2022. New species and combinations of *Inocybe* with lilac or violet colours in Europe. Fungi Iberici 2:7–26.

Stangl J. 1989. Die gattung *Inocybe* in Bayern. Hoppea 46:5–388.

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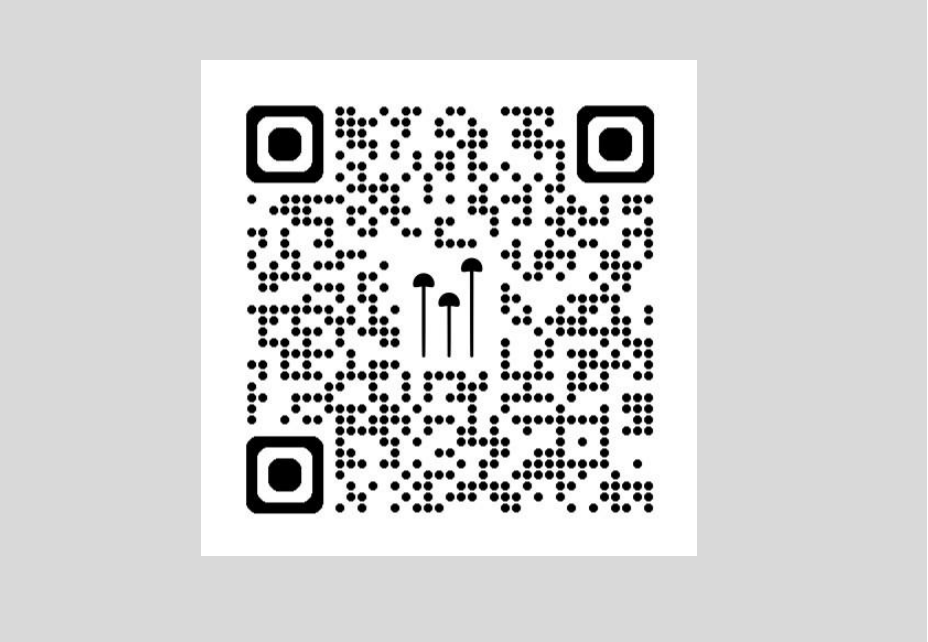
For more information on FunDive, please visit https://fun-dive.eu/get-involved/



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Phellodon connatus **(photo Jens H. Petersen).**