

# The names of fungi

An introduction to the nomenclature of fungi

by  
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## SYSTEMA MYCOLOGICUM,

SISTENS

FUNGORUM

ORDINES, GENERA ET SPECIES;

HUC USQUE COGNITAS,

QUAS

AD NORMAM METHODI NATURALIS

DETERMINAVIT, DISPOSUIT ATQUE

DESCRIPSIT

*ELIAS FRIES,*

*Acad. Carol. Adjunctus,*

*Acad. Caesar. Leopold. Carol. Nat. Curiosorum,*

*Reg. Soc. Nat. Curios. Lips., Botan. Ratisbon.,*

*Physiogr. Lund. Membrum,*

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# The names of fungi

## An introduction to the nomenclature of fungi

The depths of the fungal nomenclature are probably among the most difficult things which amateur mycologists meet in their efforts to understand the fungal kingdom and mycology. The unpronounceable and hardly understandable scientific names usually cause a lot of frustration in the beginners and may even make them give up. In fact the basic nomenclature is not that difficult if it is explained in plain tongue and illustrated with some suitable examples. This is what I will try to do on the following pages. Do not expect from this document to solve all of your problems with the fungal nomenclature. It is a broad field with many difficult rules, perplexing cases and hidden traps. Very often there are complicated situations which require a lot of experience in order to be solved. A lot of study is needed to become a nomenclatural expert and even then constant vigilance should be practiced as a new edition of the International Code of Botanical Nomenclature is adopted every few years.

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### **Why do we need names and especially scientific names?**

The answer of this question is simple and straightforward. We need names to identify and communicate about fungi similarly to how we identify ourselves by our names. The names that people use in everyday life are different in different languages; they may even vary from one area to another in one country. The fungus *Boletus edulis* for example has many different native names in the different countries: Penny bun (English), Steinpilz (German), Porcino (Italian), Сеп (French), Боровик (Russian), Hríb smrekový (Slovakian), Hříb smrkový (Czech). In Bulgarian it has couple of different names – Манатарка, Маматарка, Самунка, Меча гъба, etc. And so, it is clear why we need a single name in one language that will be equally and undoubtedly understandable. Many scientists in the distant past proposed various ways to unify the names but the one who managed to create sound system was the great Carl Linnaeus.

### **Why are the scientific names in Latin?**

It is mostly for historical reason, similar to those that govern the prescriptions of medicines, which are even nowadays mostly in Latin. Wherever you go with your prescription the pharmacists will be able to read as it is written in Latin, which is the international language in this area. Latin was the only international language when the base of the nomenclature of the living things was developed, and this remains traditional now. Apart from that all Latin names are normally printed in italic, also by tradition.

### **What is governing the names?**

Naming and use of the names of fungi complies with a number of rules, which are established by an international scientific agreement which works like a law. It was formerly called International Code of Botanical Nomenclature (ICBN) and now International Code of Nomenclature for Algae, Fungi and Plants (ICNAPF). The Code is changing from time to time and so there are different versions of it; the newest one is the one that should be followed. Informally the codes are called by the named of the city where they were adopted – Tokyo, Sidney, Saint Louis, etc. At the time of writing of this guide the current one was adopted by the Congress in Vienna, shortly known as the Vienna Code. It will be superseded soon by the Melbourne Code, adopted by the 18<sup>th</sup> International Botanical Congress in Melbourne.

### The names themselves

Each species has a unique name, which is composed of two words (a binomial). The first name begins always with capital letter and is so called the genus name; it shows the generic affiliation of the species. The second name is the proper species name. Despite of its origin it is always written in small letters. If we turn back to one name that was mentioned above – *Boletus edulis*, we may now say that "*Boletus*" is the generic name which shows the genus that the species belongs to. The second name "*edulis*" is the specific name, meaning "edible". Remember that you may encounter many species named "*edulis*", belonging to different genera, but there is only one in the genus *Boletus*. That is why the specific names have to be composed of two separate names.

### The taxonomic categories

We already mentioned a couple of times the words "species" and "genus", but we are so far uncertain what exactly they mean. The system of the living things is a hierarchical structure composed of many nodes at different levels. The easiest way to understand it will be to trace the place in it of the already familiar *Boletus edulis*. The category "species" is the main node in that system. There are different categories above (supraspecific) and below of it (infraspecific). Lets first see the infraspecific placement of *Boletus edulis* in the system of fungi.

Kingdom *Fungi*  
Phyllum *Basidiomycota*  
Class *Basidiomycetes*  
Order *Boletales*  
Family *Boletaceae*  
Genus *Boletus*  
Species *Boletus edulis*

And so we read the above structure. The species *Boletus edulis* belongs to genus *Boletus*, which includes many other species. The genus itself belongs to the *Boletaceae* family with number of other genera, e. g. *Xerocomus*, *Tylopilus*, *Porphyrellus*, etc. The family *Boletaceae* is placed in order *Boletales*, but it is not alone there, but with other families – *Gomphidiaceae*, *Strobilomycetaceae*, *Octavianinaceae*, etc. The order *Boletales* is part of class *Basidiomycetes* together with other orders as *Agaricales*, *Russulales*, *Gomphales*, etc. The class itself is included in phylum *Basidiomycotina* and together with other phyla (*Ascomycota*, *Glomerulomycota*, etc.) it forms the kingdom *Fungi*. Intermediate categories exist, each beginning with "sub-" – subclass, suborder, subfamily, subgenus. All the taxa belonging to any node have certain common characters that are unique for this node. For example, all fungi in class *Basidiomycota* have spores born externally on structures called basidia, while the representatives of class *Ascomycota* have spores that are developed internally within structures called asci.

Now, let's turn our attention to the infraspecific categories. *Boletus edulis* is widespread species throughout the Northern Hemisphere. It is variable species and there might be some pattern in this variation that might be recognized. Should this happen, those groupings are placed in separate nodes included in the "species" category. Basically there are three main infraspecific categories – subspecies, variety and form. The subspecific category is rarely used in fungi and varieties and forms are more commonly encountered. Theoretically here we may also see intermediate categories (subvariety, subform) but these are almost never used in mycological practice.

We are going back to our *Boletus edulis* to see how this works.

Species *Boletus edulis*  
Variety *B. edulis* var. *edulis*  
Form *B. edulis* var. *edulis* f. *edulis*  
Form *B. edulis* var. *edulis* f. *citrinus*

Form *B. edulis* var. *edulis* f. *albus*  
Variety *B. edulis* var. *arcticus*  
Variety *B. edulis* var. *grandedulis*

And so, *B. edulis* has three varieties (*edulis*, *arcticus*, *grandedulis*), each one of them having its own distinguishing characters. Note that *B. edulis* var. *edulis* is divided into three forms (*edulis*, *citrinus*, *albus*). None of these categories is mandatory – a species may be subdivided only in varieties, only in forms, in both forms and varieties, or may not be subdivided at all.

Now we have to explain one more interesting thing which concerns the infraspecific categories. Lets imagine that you have come across a new species for science. You describe it and assign name to it – *Boletus neglectus* (*neglectus* means “overlooked”). Some time later you come across to something that you can refer to your *B. neglectus*, but it is somewhat different from it (e.g. has duller cap, paler stipe and smaller spores than the “normal” one). You decide that your fungus is a new variety and describe it naming it *B. neglectus* var. *microsporus*. How is this reflected in the classification.

Species *Boletus neglectus*  
Variety *B. neglectus* var. *neglectus*  
Variety *B. neglectus* var. *microsporus*

You probably noticed and first glance that apart from your new *B. edulis* var. *microsporus*, you also have *B. edulis* var. *neglectus*, but you haven’t described it. Why is that? Every time you describe a new infraspecific taxon another one is automatically created (you do not have to describe it separately) with the same name as the category within which you placed your new taxon. To illustrate this again, lets imagine that you have found an unusually coloured form of *B. edulis* var. *microsporus* and you divide it as separate form – f. *pallidus*.

Species *Boletus neglectus*  
Variety *B. neglectus* var. *neglectus*  
Variety *B. neglectus* var. *microsporus*  
Form *B. neglectus* var. *microsporus* f. *microsporus*  
Form *B. neglectus* var. *microsporus* f. *pallidus*

Again, creating f. *pallidus* you also automatically created f. *microsporus*.

### **Further complications – authors’ names**

Apart from all of the above we have to explain one more thing. The names of the authors who described every taxon must always be cited together with its name. Note however that they are not part of the name. There are many difficulties with this and we will try to explain why we need it at all. Here is one example.

*Boletus lupinus* Fr.

This means the species *Boletus lupinus* described by the mycologist Elias Magnus Fries.

The initial idea of having unique name for each species quickly became jeopardized. It was not intentional but was simply a result of the technical limitations of the time. In the times when Fries lived the possibilities for printing were more or less limited. Fries’ description of *Boletus lupinus* was very short including only the characters that he thought important for its identification later. Due to the limitations of the printing process Fries did not publish colour illustration to help the understanding of his new species. Much later, another mycologist, Giacomo Bresadola published much more detailed description of a fungus, which he identified as *Boletus lupinus*. He also supplied an illustration of his fungus. However, it is clear that Bresadola became confused and what he called *B. lupinus* is not the species described by Fries. So now we have two interpretations of this name and we must to find way to explain to

which one interpretation we refer. This is done by adding authors names and often some additional explanations coded in Latin. Here is an example below if we have to refer to Bresadola's interpretation.

*Boletus lupinus* auct. Bres. non Fr.

We decode this as "We are talking about the interpretation of *Boletus lupinus* in the sense of Bresadola, and not the original meaning of Fries".

It is accepted that for completeness of this record mycologists also have to add reference to the publication where the mentioned author did the interpretation in question. In the case with *B. lupinus* it will be the following:

*Boletus lupinus* auct. Bres., Iconogr. Mycol. 9: 928 (1931), non Fr., Epicr. Syst. Mycol., p. 418 (1838).

We decode this the following way:

"We are talking about the interpretation of *Boletus lupinus* as done by Bresadola, who published it in 1931 on page 928 of the volume 9 of his book Iconografia Mycologica; and not the original meaning of Fries, published in 1838 in his book Epicrisis Systematis Mycologici on page 418".

Apart from "auct." the word "sensu" or its abbreviation "ss" might be used; its meaning is "in the sense of". See also the last section of this document.

As it is seen both for the names of the authors and for the literature abbreviations are used to save space. The abbreviations for the names of the authors are standard and are to be found in the book "Fungal Names Authors" published by Kirk & Ansell (1992). There are standard abbreviation also for the scientific journals and traditional abbreviations for many historical and more recent books. We will have once again to turn our attention to authors names, but we will move to another topic for a while.

### **Synonyms**

One will probably question why we have synonyms, if the names are supposed to be unique. Some of the reasons were told in the previous section – sometimes the descriptions were too short and some later authors just did not realize that they have found a species that is already described, and they described it under a new name. In addition, taxonomy is not precise science and every taxonomist have the right to chose more wide or more narrow concept about what the species are. Therefore now we have synonyms. Basically synonyms are names that refer to one particular species. Here is one example.

*Boletus queletii* Schulzer, Hedwigia, **24**: 143, 1885

Syn. *Boletus lateritius* Bres. & Schulzer, in Schulzer, Hedwigia, **24**: 143, 1885

Now lets see what we get from this record.

The author who wrote this believes that

*Boletus lateritius* described by Bresadola and Schulzer in 1885, in the paper of Schulzer in the journal Hedwigia, volume 24, on page 143

is a synonym of

*Boletus queletii* described by Schulzer in 1885 in a paper that appeared in the journal Hedwigia, volume 24, page 143.

### **And more synonyms**

There might be other reason for the synonyms to appear. Very often synonyms come as a result of a procedure called "new combination". What is it? This is a basic procedure which allows the mycologists to move the names through ranks. The same procedure also allows an

entity to be moved from one species to another should the moving author believes that placing it there is more appropriate. Sounds very difficult but in fact it is very simple. Now focus on the example below:

*B. luridus* var. *discolor* Quél., Fl. Mycol. France, p. 422, 1888

Step 1. Lucien Quelét described new variety var. *discolor*, which he believed is placed in *Boletus luridus*.

*B. erythropus* ssp. *discolor* (Quél.) Kuthan & Singer, in Dermek, Kuthan & Singer, Česká Mycol., **30**: 1

Step 2. Jan Kuthan & Rolf Singer decided that this entity deserves to be a subspecies did the necessary to elevate it to this level. Apart from that they believed that this taxon fits better in *Boletus erythropus*, rather than under *B. luridus* as originally described. Therefore when elevating it they also moved the subspecies to *B. erythropus*. Note that the name of the person who originally described the taxon (Quelét in this case) in the new combination appears in brackets and is followed by the names of the authors of the combination. The name "*B. luridus* var. *discolor* Quél." is called basynonym and serves as a base for later combinations. When proposing a new combination one must first make sure that such combination does not exist yet because if it exists there is no need of such "second" combination. It often appears that one combination was proposed twice or more by different authors. In such cases the earliest valid combination is to be used and all later are considered as superfluous combinations (combinations superfluae or abbreviated as comb. superfl.; see also the last section of this file).

Now we have two names for the same thing. If you believe that Quelét was right, you accept *B. luridus* var. *discolor* and *B. erythropus* ssp. *discolor* will be its synonym. Should you accept to use *B. erythropus* ssp. *discolor*, then *B. luridus* var. *discolor* will appear its synonym. There is more scientific explanation but I do not want to introduce at this stage the term "type", which will be discussed a bit further.

### **Which name must be used?**

There are many things in taxonomy that are matter of taste, but this is not the case with the name. No matter how many competing names you have, there will always be one that has priority over the rest and this is the name that is valid and must be used to denote the particular taxon. There are very strict rules imposed by the Code which when followed determine the priority name. It is a lengthy procedure and I will spare the reader most details, but will note some of the most important points:

- the name proposal must follow the guidance of the Code – it must derive from Latin word or must be Latinized; specific name must always be associated with generic name and infraspecific names must be associated with name of species to which the infraspecific taxon belongs;
- the proposed name must have not been validly published before; should such case occur the new name will be superfluous and not valid;
- the name must be published in printed text and not in manuscript, letter, etc.; there are some other limitations imposed by the Code; this is called filter for "effective publication"; on or after 1 January 2012 the publishing of new names in electronic publications is effective with certain limitations;
- from certain date onwards the new names must be accompanied by Latin diagnosis containing the distinguishing characters of the new taxon or more extensive Latin description; on or after 1 January 2012 English description or diagnosis is also accepted for valid publication;
- from certain date onwards in the publication there must also be a special specimen chosen, that will serve as "standard" for the new taxon; such specimens are called "type specimens" or simply "types" and there will be more information about them further.

Basically, the principle of the selection is that if there are more than one names that fulfil the requirements of the Code, the earliest published one has priority and is the one to be used. Bear in mind that there might be many hidden difficulties in this procedure and the final decision is best reached by taxonomist skilled in the nomenclature.

Now, there is one more thing to be explained that concerns priority of the names. It is tricky thing but I prefer to explain it as readers will probably sooner or later come across it. When you browse through fungal books you will certainly meet some quite strange citations of authors of fungal names. I will try to explain them in the next few paragraphs.

The case "someone" **in** "someone"

This is often seen in nomenclatural citation and means that the name was published by the first mentioned author in some work authored by the person mentioned in the second place.

The case "someone" **apud** "someone"

This is actually the same case as the previous one. The Latin word "apud" means "in". This case is seen in older works and has been especially popular prior 20<sup>th</sup> century. Nowadays this citation is to be avoided.

The case "someone" **ex** "someone"

This is very often met in nomenclatural citation. It is decoded in the following way: "the name was first proposed by the author mentioned in first place, but he failed to publish it validly; it was validly published by the person placed after "ex". The Code allows to omit the name of the person who failed to publish validly the name, but it is often added as a form of acknowledgement.

The case "someone" : "someone"

The trickiest case. This procedure is called sanctioning and its use is restricted to fungi only. The first mentioned person is the one who first validly published the name. The person following the colon ":" is the so called "sanctioning author". There are only two mycologists (sanctioning authors) whose names may stay after the sign ":"; they are Persoon and Fries and nobody else. Persoon and Fries published many mycological works but this quotations means that the name in question appears in certain works of those two authors (sanctioning works). These works are: Fries' *Systema Mycologicum* (1821) and *Elenchus Fungorum* (1828), and Persoon's *Synopsis Methodica Fungorum* (1801). Persoon is sanctioning names only of rusts, smuts and gasteromycetes, while Fries is sanctioning fungal names for all other fungi. The main point of sanctioning is that is there are two names competing and one of them is sanctioned, it must be given priority even if it is earlier than the other competing name.

Two examples that will illustrate the above explanations.

There are three competing names:

1. *Boletus calopus* Pers., *Syn. Meth. Fungorum*, p. 513, 1801; *B. calopus* Pers. : Fr., *Syst. Mycol.*, **1**: 390, 1821
2. *Boletus olivaceus* Schaeff., *Fung. Bav.*, p. 77, 1774
3. *Boletus pachypus* Fr., *Syst. Mycol.*, **1**: 390, 1821.

The oldest name is *B. olivaceus*, a newer name is *B. calopus* and the most recent name is *B. pachypus*. Under normal circumstances *B. olivaceus* will have to be chosen as the oldest valid name. However, the other two names, although newer, both appear in the sanctioning work of Fries *Systema Mycologicum*. This leaves *B. olivaceus* automatically out of competition, but the question now is which one of the other two names will have to be given priority since both of them occur in the sanctioning work. The answer is simple – the oldest validly published of the two sanctioned names. The name *B. calopus* first appeared in 1801, when *Synopsis Methodica Fungorum* was published, and so it is considerably older than *B.*

*pachypus* which was first published 20 years later, in 1821. That is why *B. calopus* has priority and must be used as the valid name, while the other two names will have to be listed as its synonyms.

Another interesting situation – a number of competing names, none of them sanctioned.

*Boletus fechtneri* Velen., Česke houby, 4/5: 704, 1922.

*Boletus pallescens* (Konrad) Singer, Ann. Mycol., 34: 416, 1937

*Boletus appendiculatus* ssp. *pallescens* Konrad, Bull. Soc. Mycol. France, 45: 73, 1929

*Tubiporus appendiculatus* var. *pallescens* (Konrad) Imler, Bull. Soc. Mycol. France, 66: 201, 1950

*Boletus appendiculatus* var. *pallescens* (Konrad) Kühner & Romagn., Fl. Anal. Champ. Super., p. 38, 1953

*Boletus romellii* Kallenb., Röhrlings-Best., p. 13, 1931.

*Boletus aestivalis* sensu Kallenb., Die Röhrlinge, p. 139, 1926 non Fr., Epicr. Syst. Mycol., p. 422, 1838, nec *Tubiporus aestivalis* Paulet, Traité Champ., p. 371, 1835.

#### Step 1

We consider that the fungus is a self standing species and not a variety or subspecies. Therefore three names automatically leave the competition – *Boletus appendiculatus* ssp. *pallescens*; *Tubiporus appendiculatus* var. *pallescens* and *Boletus appendiculatus* var. *pallescens*; they will be listed as synonyms after the priority name is identified.

#### Step 2

We exclude *Boletus aestivalis* sensu Kallenb., because it is not a competing synonym strictly speaking, but just Kallenbach's misinterpretation of the name *Boletus aestivalis* Fr., which is another fungus.

#### Step 3

So far we have left just three names competing:

*Boletus fechtneri* Velen., Česke houby, 4/5: 704, 1922.

*Boletus romellii* Kallenb., Röhrlings-Best., p. 13, 1931.

*Boletus pallescens* (Konrad) Singer, Ann. Mycol., 34: 416, 1937

It is easily seen that the name *Boletus fechtneri* was published prior to the other two and so it is the valid name to be used.

### **Types. What are these and why do we need them?**

The term type was mentioned above and now the time has come to understand why it is so vital in fungal taxonomy.

Imagine that your colleague has found a very interesting fungus that was not supposed to grow in your area. You would like of course to verify its identification and the only way to do that with some degree of certainty is to see the fungus yourself. This is the reason that stays behind the recommendation to preserve some kind of specimens from every single fungal finding.

Well now we have come very close to the types. If it is important to preserve material from every fungal collection, undoubtedly much more important to have a specimen when you describe a new species, subspecies, etc. All the specimens that were used to prepare the description of new taxon have a special value in taxonomy and are called "types". These are the most precious specimens ever and mycological collections put enormous effort to preserve them. This is of course easy to explain. Think of types as of standards, exactly like the standard for kilogram, meter and so on, that are physically fixing the definition of those metric units. The types are the things that best justify the proper understanding and application of fungal names.

In publications one may encounter different kinds of types. Basically they are:

- holotype – it is a single specimen that was designated as such by the author of the name himself; in mycological works it is often abbreviated to “Holo”;
- isotype – every specimen not designated as holotype, but labeled as belonging to the same collection from which it comes (same place, date and collector); often seen as abbreviation “Iso”
- paratype – all the specimens mentioned in the original publication that are not holotype or isotype; paratypes are also the remaining specimens after selection of lectotype, in case that there is no holotype designated;
- syntype – in many cases older authors mentioned more than one specimen in their original publication (as holotype designation was not required for new species published before certain date); in such case all the mentioned specimens are called “syntypes”;
- lectotype – the lectotype is also called “selected type”; it is a single specimen that is selected in certain occasions; such occasions might be: there is no holotype designated but there are syntypes and one of them is selected as lectotype; the holotype is lost or destroyed, but there are paratypes left and one of them is selected as lectotype. The selection of lectotype must not be automatic and the selecting person must take various circumstances into account; the lectotype may have isolectotypes – every specimen that belongs to the same collection as the lectotype (the same place, date and collector); often abbreviated as “Lecto”;
- neotype – if it has been proven that all the original specimens that served for preparation of the original description of the species, there is a possibility to select a single specimen that belongs to other collections, which will further serve as type. The selection of neotype is a difficult task as it has to be selected preferably from specimens collected and determined by the author of the taxon himself; if there are no such specimens available at all, other specimen might be chosen and in this cases it is preferred this specimen to be collected in the original place from where the missing types were collected; the neotype may have isonetypes similarly to isotypes and isolectotypes; Might be abbreviated to “Neo”;
- iconotype – term that is often met in the mycological literature, but not officially approved by the Code; in certain cases the Code allows the type to be a drawing or other illustration; by the Code’s definitions such types must fall in one of the above categories; however, many mycologists use “iconotype” to turn reader’s attention to the fact that the type is not a specimen but illustration.

### **Some other things**

Beginner mycologists will certainly meet from the same beginnings many other puzzling things about the fungal names. In this section they will find a few additional quotations that are often seen in nomenclatural notes.

#### **Nomen superfluum**

is frequently seen in nomenclatural works and it is likely that the readers may also see it abbreviated as “nom. superfl.” (plural – nomina superflua). In English it is called “superfluous name”. Understanding of this term is fairly easy. As it was mentioned above only one particular name may exist within one genus. However, it often appears that a mycologist described a species, giving it exactly the same name that was earlier validly published by someone else. In such case only the earlier name might be used and the other is invalid and noted as nomen superfluum. Similar is the idea of “combinatio supreflua”, but these arise as a result of proposal of new combinations.

#### **Nomen dubium and nomen confusum**

The translation of those terms is respectively “dubious name” and “confusing name”. Those terms have much in common. Dubious names are usually old names, which were published with description that does not give enough information to assign the name to particular

fungus. They are normally lacking type, which may possibly help to justify the meaning of the name, or the condition of the type might not allow critical studies. One good example is *Boletus aestivalis* Paulet, where the original publication contains description and illustration but does not allow justification of the use of the name. Confusing names have much in common, but there is usually one additional detail. Such names were subject of many controversial interpretations which made their application extremely difficult. An example for such confusing name is *Boletus purpureus* Fr. which for the long time of its existence was applied to virtually every red-capped red-pored bolete. There are various ways to deal with dubious and confusing names. One of them is to abandon their use and publish new name (nomen novum) to replace the abandoned name. Other possibility is to fix the application of the name as to preserve its current use.

#### Sensu lato and sensu strictu

These are often used in nomenclatural citations. Different authors have different perception for the limits of the taxa; one may accept one name in broad or more narrow sense and that is what is noted with those phrases; sensu lato (abbreviated as "s. l." or "s. lat.") means the broad interpretation of the name, sensu stricto ("s. str.") means that strict sense is applied to the name. Here is one example. The group of *Boletus edulis* in Europe is represented by a couple of species, namely *B. edulis* s. str., *B. aereus*, *B. reticulatus* and *B. pinophilus*. The indication "*B. edulis* s. lat." means that the authors use the broader sense, which includes all four mentioned species. In the everyday mycological practice "s. lat." is often used for collections that are showing some mixed characters and exact identification was not achieved for some reasons.