

DIFFERENCES BETWEEN EUROPEAN REGULATIONS ON WILD MUSHROOM COMMERCE AND ACTUAL TRENDS IN WILD MUSHROOM PICKING

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Currently more and more European countries are introducing lists of mushroom species allowed for commercial use. However these lists are far from the actual composition of mushroom species collected by local communities. Field research conducted in five villages located in central Mazovia, Poland presents a record of thirty five different taxa collected among local communities of which 12 weren't registered as allowed for commerce in Poland. This article aims to discuss the reasons that stand behind these differences in relation to the actual useful potential of European mycobiota.

Key words: ethnomycology, Mazovia, Europe, mushroom commerce, traditional mushroom use, mushroom trade

1. INTRODUCTION

Traditions connected with mushroom usage in European communities are probably as old as methods of gaining food through gathering (Wasson, Wasson, 1957; Power et al, 2015). Wild growing mushrooms have been an important source of nutrition for rural communities for centuries. This has led to the development of numerous traditions related to mushroom exploitation (Arnolds, 1995; Boa 2004; Sitta, Davoli, 2012; Peitner et al., 2013), and the further development of mushroom commerce. As a result local communities were able to gain additional financial benefits from mushroom picking (Seeland, Staniszewski, 2007; Turtiainen et al., 2012; Grzywacz, 2015a). Along with the economic growth of European countries, mushroom picking has changed its profile to that of a mainly recreational activity. The increasing popularity of recreational mushroom hunting also increased the importance of wild mushrooms as commercial products, which have started to be considered a delicacy. Both these factors were reasons for the significant increase in mushroom harvesting over the last two decades (Arnolds, 1995; Cai et al., 2010). However, the increasing exploitation of wild mushroom species has caused an increasing number of poisoning cases. What is more, the issue of trade control has become more problematic. As

a result of the above, more and more European countries are trying to introduce legislation on wild mushroom commerce (Sitta, Davoli, 2012; Peintner et al., 2013).

In the case of picking mushrooms for one's own use, local knowledge about harvested species is still closely related to their traditions of use and is usually passed down within families (Łuczaj, Nieroda, 2011). This results in the creation of different compositions of mushroom species collected by different communities, but relatively homogenous lists within the communities. However, in the case of legal frameworks covering mushroom commerce, a wide discrepancy is noticeable between mushroom species allowed for commercial use and species collected traditionally by communities affected by the newly introduced laws (Sitta, Floriani, 2008). What is more, the lists of mushroom species allowed for commercial use in different European countries diverge from each other even more than traditional mushroom uses do (Sitta, Davoli, 2012; Peintner et al., 2013).

In this article I would like to discuss the reasons behind these differences through analyzing the results of an ethnomycological research study conducted in five villages located in the Mazovian Voivodship, in the context of the legislation on mushroom commerce introduced in Poland, and also in relation to available materials concerning European laws on mushroom commerce, traditions of mushroom usage and the actual, useful potential of European mycobiota. I would also like to highlight the problem of the visible gap between existing legal frameworks on mushroom commerce and the actual size and richness of non-commercial mushroom exploitation among European communities.

2. METHODS

Selection of localities for the research to be conducted was determined by the village grid created for the Ethnographic Atlas of Poland by O. Gajkowa and J. Gajek (Gajek, 1961). Over 300 villages belonging to this grid were situated more or less evenly, around 30 km apart. For the present study I looked at five villages (Korytów, Burakowskie, Kręgi, Szczaki and Stare Babice) (Fig. 1). The villages are situated in the central part of the Mazovia region on different sides of the capital city of Warsaw. The main goal in their selection was to choose random central Polish villages defined among localities in the village grid.

The research is an ethnomycological study carried out with the use of classic ethnobotanical/ethnomycological methods (Martin, 1995). Field research based on cooperation with local communities enables the acquisition of direct information on the actual composition of collected mushroom species and the level of local knowledge about the useful mycobiota. Structured interviews were the main research method applied.

The interviews with respondents focused on acquiring information related to locally collected edible mushroom species. Information acquired during conversations was noted in previously prepared questionnaires and also, with the respondents' consent, recorded with the use of a voice recorder. The process of gaining information and assigning local names of collected species to proper taxonomic nomenclature was supported by available pictorial material. Identification of mushroom species mentioned during interviews was possible through simultaneous analysis of the pictorial material and by identification of specimens collected and preserved by respondents. Altogether sixty four individual interviews were carried out.

3. RESULTS

The research showed thirty five different taxa collected among local communities, which simultaneously illustrate visible differences between the official list of mushroom species allowed for commercial use in Poland and the actual composition of species collected by communities in the studied villages. Thirteen of all the taxa recorded during interviews were not present on the official list of mushrooms allowed for commerce (Tab. 1).

Local names specified by the respondents were related either to the names of species or to the names of mushroom genera, therefore the presented table includes both taxonomic levels. Some of the mushroom species are not differentiated in local nomenclature. This occurs in the case of the species *Leccinum aurianticum* and *Leccinum versipelle*, known in research localities by the names “czerwoniak” or “osak,” and in the case of *Amanita vaginata* and *Amanita fulva* known as “mglejarka”, “czubki” or “panienka”. The presented taxa are ordered by their popularity among local communities. In this case popularity equates percentage value, showing how frequently specific species were mentioned among all respondents. The most frequently mentioned species was cep bolete (*Boletus edulis*), which was mentioned in each of the conducted interviews. The second species, whose frequency reached 91%,

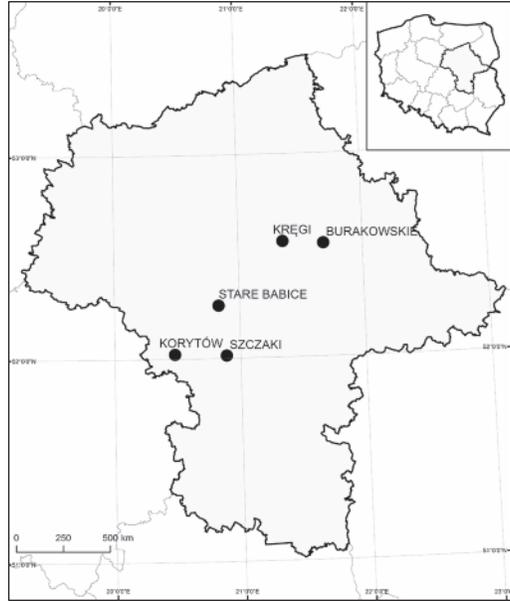


Fig. 1 Study area

No.	Species	Frequency (n=64)	%
1	<i>Boletus edulis</i>	64	100
2	<i>Imleria badia</i>	58	91
3	<i>Leccinum spp.</i>	51	80
4	<i>Leccinum aurianticum/versipelle</i>	50	
5	<i>Leccinum scabrum</i>	44	
6	<i>Cantharellus cibarius</i>	50	78
7	<i>Suillus spp.</i>	45	70
8	<i>Suillus variegatus</i>	15	
9	<i>Suillus bovinus</i>	9	
10	<i>Suillus grevillei</i>	1	
11	<i>Armillaria spp.</i>	39	61
12	<i>Tricholoma spp.</i>	36	48
13	<i>Tricholoma equestre</i>	27	
14	<i>Tricholoma portentosum</i>	24	
15	<i>Lactarius deliciosus</i>	31	48
16	<i>Macrolepiota spp.</i>	28	44
17	<i>Xerocomus spp.</i>	20	31
18	<i>Agaricus campestris</i>	17	27
19	<i>Gyroporus spp.</i>	16	25
20	<i>Russula spp.</i>	14	22
21	<i>Amanita vaginata/fulva</i>	11	17
22	<i>Paxillus involutus</i>	11	17
23	<i>Sarcodon imbricatus</i>	9	14
24	<i>Cortinarius caperatus</i>	8	13
25	<i>Marasmius oreades</i>	6	9
26	<i>Calocybe gambosa</i>	2	3
27	<i>Agaricus silvaticus</i>	1	2
28	<i>Craterellus cornucopioides</i>	1	2
29	<i>Lepista nuda</i>	1	2
30	<i>Lycoperdon spp.</i>	1	2
31	<i>Morchella esculenta</i>	1	2
32	<i>Pleurotus ostreatus</i>	1	2
33	<i>Ramaria spp.</i>	1	2
34	<i>Sparassis crispa</i>	1	2
35	<i>Tricholomopsis rutilans</i>	1	2

Bold - taxa absent on the list of mushrooms allowed for commerce in Poland

was bay bolete (*Imlaria badia*). The third listed taxon was *Leccinum* (80%), closely followed by chanterelle (*Cantharellus cibarius*) with a frequency of 78%. The thirteen taxa marked in bold on the list are taxa which are not present on the list of mushrooms allowed for commerce in Poland. The highest frequency among these mushroom species was reached by charbonnier (*Tricholoma portentosum*) – 24%, the *Russula* genus – 22%, grisette (*Amanita vaginata/fulva*) – 17% and brown roll-rim (*Paxillus involutus*) – 17%. After the collective analysis of species frequency, we can see that those which are not allowed for commerce were collected by 61% of respondents. This means that more than a half of mushroom gatherers in the analyzed villages harvest species that are not present on the list of mushrooms allowed for trade.

4. DISCUSSION

4.1. Mushroom commerce regulations in Poland, local traditions and richness of Polish mycobiota

The Polish list of mushrooms allowed for commercial use was published in the regulation from the Minister of Health dated May 17, 2011. According to this regulation, there are 44 mushroom species that can be used in trade (Dz.U. 2011 nr 115 poz. 672). Nine of them can be cultivated or are mainly imported. These species are: nameko mushroom (*Pholliota nameko*), paddy straw mushroom (*Volvariella volvacea*), truffles – (*Tuber melanosporum*, *Tuber aestivum*, *Tuber brumale*), snow fungus (*Tremella fuciformis*), shiitake (*Lentinula edodes*) and cloud ear fungus (*Auricularia polytricha*). The Paddy straw mushroom belongs to the Polish mycobiota, but is considered rare and is not collected in the wild. Portobello (*Agaricus bisporus*) is also rarely gathered by local communities, but it is widely cultivated.

Consequently in reality there are thirty five species present on the list available for people who collect wild growing mushrooms. In relation to current mushroom commerce, this number is additionally lowered by visible trends in export, food processing and consequently in the preferences of local collection centers. The species generally used in commerce are cep bolete, chanterelle and bay bolete. Other mushroom species represent only 4–6% of dry weight purchased (Grzywacz, 2015c). In fact, the species favored in trade constitute only a minor percentage of the wild edible mushrooms growing in Poland. The number of edible fungi species presented in many available mushroom guides highly exceeds the number of mushrooms listed in the introduced legislation on mushroom commerce. For example, according to the guide created by Barbara Gumińska and Władysław Wojewoda (Gumińska, Wojewoda, 1988) we find 169 wild edible mushroom species in Poland. However the number of species eligible for human consumption is still highly underestimated. In fact the actual number is very difficult to assess. According to data presented by Professor Andrzej Grzywacz it is estimated that there are 4500 species of macrofungi in Poland, from which about 1100 – 1400 are edible, with differential consumption values (Grzywacz, 2008, 2015b, 2015c). While focusing on numbers of mushroom species collected by local communities, it is important to note that amongst the specified taxa whole genera are present, e.g. – *Leccinum* and *Rusulla*. In the case of the first genus there are 13 known edible *Leccinum* species growing in Poland. Seven of them are fairly common and are not distinguished by mushroom gatherers, who group them under the names “koźlarz” or “kozak” (Grzywacz, 2008). In comparison, we find only 3 species of

Leccinum genus on the list of mushrooms allowed for commerce. In the case of *Russula* genus, there are many more edible species that can be found in Poland. Only in Gumińska's guide can we find a description of twenty of them, which should still be considered as an understated number. None of these species are present on the list of mushrooms allowed for commercial use. Based on the results of the research conducted and on the above information, a huge disproportion may be noted between the list presented in ministerial regulation, the composition of species collected by local communities and the actual potential of useful mycobiota.

The main causes of these differences are local traditions related to the usage of particular mushroom species and a long history of attempts to impose a regulatory framework on the exploitation and trade of mushrooms. The first efforts to introduce legislation on mushroom commerce in Poland date back to the early 19th century. In the announcement published by the President of Warsaw's Municipal Board and the Police Department dated May 13, 1818 we can find a listing of nine mushroom taxa recommended for harvest (Grzywacz, 2015a). Among them are "gołąbek" (*Russula* spp.) and "kozia broda" (*Sparassis crispa*) which are not presently listed as allowed for commerce, but were still recorded as harvested by the residents of five Mazovian villages. In 1883 Józef Rostafiński, the Polish botanist and professor at the Jagiellonian University in Kraków, created a survey providing information about nomenclature and uses of plants in the former Polish territories. The survey also included two questions related to mushrooms. Twenty-one out of all the responses contained information about mushroom species. In the end, thirty seven edible and four medicinal taxa were identified during an analysis of the responses (Łuczaj, Köhler, 2014). The taxa identified in Rostafiński's survey largely coincide with those recorded in the Mazovia. Out of thirty five taxa listed during field research, twenty nine may be found among the taxa identified in Rostafiński's material. This shows the durability of traditions related to the usage of particular mushroom species in Poland. It also confirms the existence of traditionally used mushrooms that were not put on the list regulating present mushroom commerce in Poland. In 1949 Henryk Orłoś in his work "Grzyby jadalne i trujące" presented a list of mushrooms sorted by their current trade value (Orłoś, 1949). The list included brown roll-rim (*Paxillus involutus*), which is still often picked by the residents of villages analyzed during ethnomycological research, despite current knowledge about its toxicity. The specific nature of the continuing brown roll-rim consumption issue emerges both from traditions of its use as well as the generally conservative approach of local communities to the exploitation of wild edible mushrooms. It is also connected to the atypical character of poisoning symptoms appearing after its consumption. The intoxication appears suddenly, soon after ingestion, despite previous years of being able to consume this mushroom. Poisoning leads to erythrocyte hemolysis and further to hemoglobinuria, which untreated can result in death (Gry, Andersson, 2014). The intoxication itself is treated more as an allergic reaction to antigens found in the mushroom. However this reaction occurs only in some cases. As a result in many cases the mentioned symptoms are not considered as related to brown-roll rim consumption, which lead to continuity of its usage (Sitta, Davoli, 2012). Nonetheless, in recent decades we can see a noticeable decline of *Paxillus* consumption in Poland (Łuczaj, Köhler, 2014). Although the absence of brown roll-rim on the list of species allowed for commerce is clearly justified, the absence of other mushroom species recorded during ethnomycological research in Mazovian villages is still unclear. In the case of the *Russula* genus, none of the species

present in the Polish mycobiota have a long-term influence on human health. Only a few of them may cause some gastrointestinal problems.

It may therefore be concluded that the main rationale for the compilation of this list was either the prevention of accidental poisoning due to confusion between edible and poisonous mushrooms or current international market trends and the popularity of some edible mushroom species. However, as previously noted, the above-discussed list was probably prepared without consultation with mycologists (Grzywacz, 2008; Staniszewski, Nowacka, 2015). As a result we may find species that are rarely picked by local communities, such as chestnut bolete (*Gyroporus castaneus*), and simultaneously notice the lack of popular edible species, like charbonnier (*Tricholoma portentosum*).

4.2. Mushroom commerce legislation and attitude towards mushroom picking across Europe

At present, twenty four European countries have introduced lists of mushroom species allowed for commerce. Sixteen of them created suitable trade legislations and seven of them include special guidelines released by their governments. Collectively the lists consist of 268 different mushroom species consumed throughout Europe, from which sixty can be cultivated (Peintner et al., 2013). The largest number of species belongs to the order *Agaricales* (102 species). The second largest are *Russulales* (42 species), which, as previously mentioned, are not considered as mushrooms suitable for trade in Poland. The differences in legislations and guidelines are underlined by the large discrepancy in the number of species included in the mushroom commerce lists. The Serbian list consists of fifteen species while the French list represents 122 species. However it is important to notice that France does not yet have a list concerning the countrywide mushroom market and in this case the mentioned list was based on regional regulations (Groussin, Saviuc, 2009). This does not change the fact that only two mushroom species – *Boletus edulis* and *Cantharellus cibarius*, are mentioned in every list (Peintner et al., 2013).

In accordance with the suggestion presented by Ursula Peintner, the countries that have introduced laws and guidelines on mushroom commerce might be considered as mycophillic (Peintner et al., 2013), which means that their nations have a positive attitude towards mushroom collection and consumption (Wasson, Wasson, 1957). The main reason for the introduction of mushroom commerce laws in European countries was an increased risk of mushroom poisoning in mycophillic communities. Moreover, developing interest in the possible benefits of wild mushroom picking also led to a desire to control the mushroom trade on the part of different governments, hence the creation of these laws (Ivančević et al., 2012).

One of the main reasons for the differences between mushroom commerce lists are differences between traditions related to the usage of wild edible mushrooms. For example, as shown in the work of Peintner, among nations that speak Slavic languages (Poland, Belarus, Russia, Slovakia, Ukraine and countries of the former Yugoslavia) we observe more frequent consumption of species from the genus *Suillus*. Romanic speaking countries (France, Italy, Portugal and Spain) and countries with Romanic speaking minorities (Belgium, Switzerland) show a significantly larger interest in species from the *Agrocybe* and *Amanita* genera. On the other hand Nordic nations mostly prefer species from the *Russula* genus, including those considered inedible in Romanic speaking countries.

Differences in traditions related to mushroom picking and consequently in the composition of collected mushroom species may also relate to differences in defining

the edibility status of some mushroom species. For example bitter beech bolete (*Boletus calopus*), eaten in Russia, is considered poisonous in Slovenia (Boa, 2004). Brain mushroom (*Gyromitra esculenta*) is considered as a delicacy in Finland (Sitta, Davoli, 2012; Boa, 2004; Harkonen, 1998). It is also consumed in Russia and a few other eastern countries. However in the rest of Europe this mushroom is treated as deadly poisonous (Boa, 2004). Peppery milk-cap (*Lactarius piperatus*) is widely eaten in Turkey, Russia, Ukraine, Bulgaria (Wasson, Wasson, 1957; Boa, 2004; Stoyneva-Gärtner, Uzunov, 2015) and Romania (Łuczaj et al., 2015). In other European countries this mushroom is viewed as inedible (Boa, 2004). Mycophobic countries, which don't have their own legislation on mushroom commerce, are mainly Germanic speaking countries (United Kingdom, Ireland, Netherlands, Germany). These countries do not have culturally rooted traditions of mushroom usage and resolve the mushroom trade issue through regulations imposed by the European Union (Peintner et al., 2013; Gry et al., 2012). Nonetheless these regulations are still unspecified and mainly based on the principle that traded mushrooms cannot be harmful for human health (Gry et al., 2012). Mushrooms consumed in mycophobic countries are mainly cultivated species. Current differences in attitudes towards wild mushroom picking also emerge from differences in the economic development of European countries. People living in countries with weaker economies collect more mushrooms, and more of them are exported. On the other hand, nations with highly developed economies collect less mushrooms while importing larger quantities of this non-wood forest product (Boa, 2004).

4.3 Potential richness of European mycobiota

Differences in trends related to mushroom exploitation also result from the richness of the local mycobiota. According to Catherina Schulp (2014), the highest number of edible species in Europe can be found in Scandinavia, and the smallest in Denmark, the Benelux countries and England, i.e. in countries without traditions of mushroom usage and consequently without lists of mushrooms allowed for commercial use. To show these differences we can note that in Denmark only 3% of the population gather mushrooms (Schulp et al., 2014), while in Finland it is 40% (Sievänen et al., 2004; Turtiainen et al., 2012). While describing the useful potential of European mycobiota we may use a few examples. Before the introduction of legislation on mushroom commerce in Italy, there were 250 edible mushroom species recorded in the market in Trento (Sitta, Floriani, 2008). Currently there are seventy three mushroom species accepted for trade in Italy. Research conducted in Finland proved that regardless of the number of species, the majority of sporocarps growing in their forests are edible (Arnolds, 1995). Moreover in Armenia, where the list of mushrooms allowed for commerce consists of only fifteen species, 284 edible mushroom species have been recorded (Boa, 2004). Given the fact that there are an estimated 1200 macrofungi species growing in Armenia (Denchev et al., 2013) and 15000 species in Europe (Seen-Irlet et al., 2007), the numbers related to the abundance of edible mushroom species are certainly higher. However it is noteworthy that a large proportion of theoretically edible species show low consumption values and many of them have a still unverified edibility status (Sitta, Davoli, 2012).

4.4 Relations between mushroom trade market and non-commercial mushroom use

While looking at correlations between collecting mushrooms for trade and harvest for personal use, there is a noticeable reflection of local preferences in the presence of the

most desired species on trade lists. According to many observations, the most valued wild mushroom species on a Europe-wide scale are chanterelle (*Cantharellus cibarius*), cep bolete (*Boetus edulis*) and saffron milk-cap (*Lactarius deliciosus*) (Arnolds, 1995; Schulp et al., 2014), which can be found on the majority of lists of mushrooms allowed for commerce. Growing demand and the higher buying-in prices of these species clearly diminish the composition of mushrooms gathered by local communities for individual financial profits. The presence of particular mushroom species on these lists may also impose certain trends related to their consumption, which additionally increase the demand for species allowed for commerce by the law. People who gather mushrooms for trade, regardless whether this involves sale in local collection centers or selling mushrooms by the side of the road, are influenced by these trends and demands, which are further strengthened by the presence and availability of particular mushroom species in markets. This leads us to the conclusion that the official lists of mushrooms allowed for commerce may be useful as a measure governing international trade and as an instrument minimizing the risks of mushroom poisoning, but on the other hand their ignoring of less important mushroom species, which are traditionally exploited in small areas, can cause local market depletion (Sitta, Davoli, 2012).

In fact, the amount of mushrooms collected for trade is much smaller than the amount of mushrooms collected for personal use. For example, in Catalonian forests, mushrooms gathered for non-commercial use represent 93% of the whole harvest (Aragón et al., 2011), while in Poland – 90% (Grzywacz, 2015c). As was previously mentioned, the collection of edible macrofungi for personal purposes is characterized by a much more diversified composition of gathered species, rooted in long traditions of their use. However, in contrast to past sociological trends, the increasing richness of collected species is not connected with low income or education. Along with the economic development of European countries mushroom hunting is more often viewed not as a necessity, but as a recreational activity. Nowadays people are interested in searching for alternative, natural and unprocessed food sources. This is closely related to other popular recreational activities such as survival or bushcraft. The increasing popularity of exploring the potential of useful forest products has resulted in the restoration and preservation of some knowledge concerning wild mushroom usage. Official lists of mushrooms allowed for commercial use clearly do not keep up with these new trends.

5. CONCLUSIONS

The ethnomycological research conducted in five Mazovian villages shows that the majority of mushroom gatherers living in these localities collect species that are not present on the official list of mushrooms allowed for commerce in Poland. One of the main reasons to create this list was to prevent mushroom poisoning. Differences between mushroom species present on the lists and mushrooms collected for own use show that people don't treat these list as a guideline preventing the risks of mushroom picking. European lists of mushrooms allowed for commercial use are to certain extent influenced by local preferences of collected mushrooms, which is one of the reasons behind the discrepancies between them. However, they focus primarily on species popular on an international scale. One visibly favored group among the listed species are cultivated mushrooms, which generally do not occur in the wild. Furthermore, discrepancies between these lists emerge from the individual approach of different

governments to this legal problem and the unspecified choice of experts working on their compilation. Among mushrooms unspecified on the lists are edible species still widely used by local communities. This results in wide divergences between species listed as allowed for commerce and the actual composition of collected mushroom species. It has also led to the creation of two different approaches to mushroom picking – picking fewer species, specified in trade regulations, for financial profits, and picking many traditionally used species for personal use. This divergence is most visible in mycophilic countries, which have both legislation on mushroom commerce and broad traditions related to mushroom picking. Based on these statements and presented results of the research conducted among people living in the Mazovia region, it would be reasonable to consider enrichment of lists of mushrooms allowed for commerce which would be certainly beneficial for local markets and conservation of local traditions connected to wild mushroom use. It may also have an effect in lowering pressure on the exploitation of the currently most favorable mushroom species.

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