

The Rufford Foundation

Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Mitko Karadelev
Project title	Fungi of Kosovo: Establishing Fungi Checklist and Preliminary Red List, and Proposing Important Fungal Areas
RSG reference	19990-D
Reporting period	1 March 2017 - 31 August 2018
Amount of grant	£9,950
Your email address	mitkok@pmf.ukim.mk
Date of this report	3 September 2018

1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Collection of fungi species in diverse habitats followed by identification and compilation of a Checklist of Fungi of Kosovo.				<p>An all embracing field research was conducted and in excess of 782 specimens were collected from over 50 localities in various parts of the country. A series of habitats were studied (Macedonian and Bosnian pines, Norway spruce, silver fir, Italian oak, beech, plane riverine), national parks (Šar Mountain, Bjeshket e Nemuna and Rugova Mountain), natural parks (Germia Mountain, Gurrat e Bardha Park and Blinaje Park), pristine forests and other protected areas in Kosovo.</p> <p>The first Checklist of Fungi of Kosovo has been produced containing 380 fungal species.</p>
Production of a Preliminary Red List of Fungi of Kosovo, in compliance with IUCN categories and criteria.				<p>We have produced a List of Rare Species from Kosovo – Red List Candidates. A total of 39 species have been incorporated in the List, as follows: one extremely rare species, 16 very rare species and 22 rare species.</p> <p>The List is a primary document for subsequent compilation of a Preliminary Red List of Fungi of Kosovo, in line with IUCN categories and criteria. This requires additional research in the target localities, already agreed in cooperation with and support of the University of Pristina. Autumn, which is the best season for fungal fruit bodies formation was rather arid in 2017, thus intense field visits will be carried out next autumn aimed at rounding up the Preliminary Red List of Fungi.</p>
Presentation of the Checklist of Kosovo Fungi				Our initial project findings were revealed at the 37th Meeting of

<p>and Preliminary Red List at the next conference on biological and environmental sciences in Kosovo.</p>			<p>Eastern Alpine and Dinaric Society for Vegetation Ecology in Prizren (Kosovo), 13-16 July 2017. We delivered the lecture 'Fungi in Kosovo –Preliminary Data on Their Diversity and Ecology'. The <u>paper abstract</u> was later published in a book of abstracts.</p> <p>Mid-way through the project, our research results were discussed off the record with top-tier world mycologists during the European Mycological Association / International Society for Fungal Conservation <u>Meeting</u> "Fungal Conservation in a Changing Europe: The Challenges Ahead", organised in Ohrid (Macedonia), 1-6 October 2017.</p> <p>The key fungi finds from our project in Kosovo (above all <i>Zeus olympius</i>) were shared during a lecture on the topic of 'Rare and Threatened Fungi in Macedonia and Neighbouring Areas', delivered at the Key Laboratory for Plant Diversity and Biogeography of East Asia within Kunming Institute of Botany, Chinese Academy of Sciences, in Kunming, Yunnan Province, China, on 1 August 2018.</p> <p>The topic 'Larger Fungi in Kosovo – Their Distribution, Diversity and Ecology' is slated to be presented as a talk during the Albanian Conference on Biology and Environment in Pristina (Kosovo), to be held 28-30 September 2018. It is organised by the University of Pristina in cooperation with the University of Tirana (Albania) and the State University of Tetovo (Macedonia). The <u>paper</u> will subsequently be published in a book of abstracts.</p> <p>All our scientific meetings presentations are available on https://macfungi.webs.com/fungi-of-kosovo.</p>
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<p>Development of criteria for selection of IFAs in Kosovo for the first time and identification of key fungal species.</p>			<p>IFA criteria have been developed dependent on the presence of rare and threatened species, richness, and habitat mycological significance. It has been ascertained that eight areas fulfil the criteria for nomination of Important Fungal Areas.</p>
<p>The Preliminary Red List and the identified and proposed IFAs will be the crucial move aimed at supporting the current biodiversity conservation mechanisms in Kosovo, in view of the export of vast quantities of mushrooms and the lack of fungi protection legislation. The number of IFAs will be increasing concurrently with future fungi research.</p>			<p>The project has contributed to fulfilment of this objective via compilation of the first List of Rare Fungi of Kosovo – Red List Candidates and IFA Map of Kosovo, which serves as groundwork for creation of a Preliminary Red List. The number of IFAs will be increasing in proportion with future fungi research. Accordingly, the List will lay the foundation for making an Official Red List of Fungi and for future preparation of legislation on fungi conservation in the country.</p>
<p>Publication of a brochure on protected and strictly protected fungi from the Preliminary Red List, and a country map of the proposed Important Fungus Areas.</p>			<p>The brochure, entitled 'Rare Fungi of Kosovo', and the Country Map of IFA have been printed. The brochure is written in Albanian language, and it comprises photographs and relevant data on specific fungi species from the List of Rare Species from Kosovo – Red List Candidates (fungi species description, distribution, IUCN categorisation, conservation measures and so forth).</p>
<p>Raising public awareness via presentations before the local population and meetings with representatives of Ministry of Environment and Spatial Planning of Kosovo (MESP) and Kosovo Environmental Protection Agency (KEPA), academia and local government.</p>			<p>Firm collaboration has been established with the Department of Lower Plants (Thallophyta) within the Institute of Biology, at the Faculty of Natural Sciences and Mathematics in Pristina, intended for exchange of scientific knowledge and experience regarding research of fungi. Now a team for study of Kosovo fungi has been formed there, and the collected fungi will be identified at the specialised Mycological Laboratory within the Faculty of Natural Science in Skopje, Macedonia.</p>

			<p>Via a lecture entitled 'Fungi in Kosovo –Preliminary Data on Their Diversity and Ecology' our initial project findings were communicated at the 37th Meeting of Eastern Alpine and Dinaric Society for Vegetation Ecology in Prizren (Kosovo), 13-16 July 2017. Following the lecture and throughout the event, there was an in-depth discussion with academia but also with officials from the relevant Kosovo ministries who were in attendance.</p> <p>Our finding of the extremely rare world fungus <i>Zeus olympius</i> (known only from two other countries - Greece and Bulgaria) in Kosovo in an area with a Balkan endemic pine - Bosnian pine (<i>Pinus leucodermis</i>) was shared with the <u>Global Fungal Red List Initiative</u>, where the fungus has been assessed as "potentially Critically Endangered". The data about Kosovo related to our find have already been incorporated into the database of the Global Fungal Red List Initiative.</p> <p>The talk 'Larger Fungi in Kosovo – Their Distribution, Diversity and Ecology' will be delivered during the Albanian Conference on Biology and Environment in Pristina (Kosovo), scheduled for 28-30 September 2018. Academia and officials from the relevant Kosovo institutions are also expected to participate in the event. All our conference-related material is available via the following link: https://macfungi.webs.com/fungi-of-kosovo.</p>
<p>Raising public awareness via media campaign and wide-range distribution of promotional material.</p>			<p>A large-scale media campaign has been conducted, with coverage of project results in news media galore in three neighbouring countries. The promotional material – brochure and IFA map – has been disseminated among local population and stakeholders, and we will proceed</p>

				with this distribution for a long time even after project completion.
Creation of a new database (FUNGI OF KOSOVO) accessible online with reference to all identified fungal species of Kosovo.				Data has been created on 380 species, and the newly created database of all identified fungal species of Kosovo to date is accessible online for free use https://macfungi.webs.com/fungi-of-kosovo .
Selected representative specimens will be donated to Kosovo's National Museum or to an interested institution, thereby contributing for establishment of a National Collection of Fungi of Kosovo.				We have donated most of the collected fungal specimens to the Faculty of Natural Sciences and Mathematics within University of Pristina in Kosovo, which has committed to store and maintain the newly established National Collection of Fungi of Kosovo. A portion of exsiccates have also been deposited at the MCF (Macedonian Collection of Fungi) at Ss Cyril and Methodius University in Skopje, Macedonia.

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

Most of autumn, as the best season for fungi collection, was arid in 2017, thus making it unfeasible to collect sufficient fungal data from the field to finalise the envisaged Preliminary Red List of Fungi of Kosovo. Hence, we have produced a List of Rare Species from Kosovo – Red List Candidates, which, with some extra research agreed with the support of the University of Pristina, will soon give rise to a Preliminary Red List of Fungi, in line with IUCN categories and criteria. Besides, in late September and early October 2017 we were engaged in organisation of the prestigious ECCF Meeting “Fungal Conservation in a Changing Europe: The Challenges Ahead” in Macedonia. Nonetheless, this involvement paid dividends in the sense of results-sharing as we had valuable discussions about our Kosovo fungi finds, as the event was attended by chairs of IUCN’s Species Survival Commission Fungal Specialist Groups and leaders of the Global Fungal Red List Initiative.

Enacting a Preliminary Red List of Fungi of Kosovo by the government authorities in-charge and its use as a foundation for preparation of fungi protection legislation is a time-consuming process that is contingent on the will and interest of the institutions for timely action. Nonetheless, in our discussions with relevant Kosovo authorities and prominent academia, we have invested all our effort in pinpointing the urgency of this matter for fungi conservation in the country.

3. Briefly describe the three most important outcomes of your project.

The first Checklist of Fungi of Kosovo has been generated, comprising 380 different species i.e. there are 769 pieces of data on fungi, included in a specially created online database Fungi of Kosovo. It has resulted from collection of copious fungal material in varied habitats, particularly national parks, and their laboratory identification. Thus far, the only official data pertaining to macromycetes of Kosovo had been the following: data on two species from Lindtner's collection (1937) published by Katanic, 2015; 12 species of poroid fungi (Tortic, 1975-1988); five species of slime moulds (Bruno Ing & Boris Ivancevic, 1973); unpublished data on 104 species by Zeqir Veselaj. In the Strategy and Action Plan for Biodiversity of Kosovo (2011–2020), only 12 commercial species are quoted, while in the Kosovo Biodiversity Assessment there are data about 83 fungi species from Germia Mountain.

A List of Rare Species from Kosovo – Red List Candidates has been produced for the first time. A total of 39 species have been incorporated in the list, as follows: 1 extremely rare species, 16 very rare species and 22 rare species. The list is an essential document for consequent compilation of a Preliminary Red List of Fungi of Kosovo, pursuant to IUCN categories and criteria (Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), and Data Deficient (DD)). The list constitutes a basis for compilation of an Official Red List of Fungi and ensuing preparation of fungi protection legislation in Kosovo. The compilation of the Preliminary Red List of Fungi necessitates supplementary examination of the target localities, now arranged in cooperation with and support of the University of Pristina. For IUCN categorisation of the species, in addition to our own findings, we rely on the experience of the neighbouring countries and other countries in the Balkans (Macedonia, Albania and Croatia), a number of European countries, and the IUCN Red List for Threatened Species, specifically, its section referring to fungi.

Potential IFAs in Kosovo have been selected for the first time. They have been proposed by developing criteria dependent on the presence of rare and threatened species, richness and mycological significance of the habitat, then applied to the nominated sites. Eight areas have been ascertained to meet the criteria for nomination of Important Fungal Areas. An IFA map has been released, where information (list of key fungal species, criteria) on each IFA has been provided. The Rare Species from Kosovo – Red List Candidates followed by a Preliminary Red List and the proposed IFAs are critical steps towards reinforcement of the current biodiversity conservation mechanisms in the light of the major threats - excessive exploitation by the local population, coupled by fragmentation and destruction of fungi habitats.

4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).

The local community demonstrated interest, and they partook in the discussions after the project presentations delivered during the field visits. They had hardly ever had an opportunity to hear about fungi in Kosovo from fungi experts. They learned

about the rare and threatened species in Kosovo, the proposed Important Fungal Areas, the commercial species and their sustainable use. The published brochure and map have been distributed among the local communities and their dissemination will continue after the RSG project implementation. Following the broad media coverage, a number of students contacted the project team and expressed interest for future cooperation related to Kosovo fungi. In addition, some fungi and nature enthusiasts also contacted us via email sending us photographs and inquiring about certain fungi they had encountered at localities in Kosovo.

5. Are there any plans to continue this work?

The Preliminary Red List and IFAs are open working documents, given the expectations that new species will be identified during future research, accompanied by the potential for change in the extent of exploitation of particular species by the local population.

We have established excellent collaboration with the scientists and professors from the Department of Lower Plants at the Faculty of Natural Science and Mathematics in Pristina, who are eager to cooperate with us in terms of exchange of scientific data and work on future joint research projects on Kosovo fungi diversity. This institution has already formed a team of scientists for study of Kosovo fungi, and in this context it is worth underlining the agreed mentorship of a PhD student from the University of Pristina. The student will be in charge of enhancement of the Checklist of Fungi of Kosovo by means of collection of fungal species from the territory of Kosovo. Species determination will be executed at the Mycological Laboratory within the Faculty of Natural Science and Mathematics in Skopje.

The dissemination of the outreach material (brochure and map) among the local population and stakeholders will also be carried on as a follow-up project activity. During our future visits to Kosovo, either for research purposes or meetings with environment conservation partners, we will go on giving out the brochure and the map.

6. How do you plan to share the results of your work with others?

The Checklist, List of Rare Fungi – Red List Candidates, the pending Preliminary Red List and the IFAs as key project outputs will be made available to the authorities in charge of conservation and the relevant programmes, such as the Ministry of Environment and Spatial Planning of Kosovo (MESP) and Kosovo Environmental Protection Agency (KEPA), National Strategy and Action Plan for Biodiversity of Kosovo (2011–2020), the local government, conservation NGOs, etc. We have already shared the seminal results of our Kosovo fungi conservation undertakings via the ecology conference in Kosovo in 2017, where not only academics but also environment officials attended. The results have also been disseminated during the EMA Meeting in Macedonia in 2017, and in late spring 2018 we officially communicated with the Global Fungal Red List Initiative as regards our pivotal find of *Zeus olympius*. The key fungi observations from our Kosovo project were also shared during a lecture on the topic of 'Rare and Threatened Fungi in Macedonia

and Neighbouring Areas', given at Kunming Institute of Botany, Chinese Academy of Sciences, in Kunming, China, in August 2018. A month after the project finalisation, at the upcoming Albanian Conference on Biology and Environment in Pristina (Kosovo), we will be sharing the results of our findings on Kosovo macrofungi.

7. Timescale: Over what period was The Rufford Foundation grant used? How does this compare to the anticipated or actual length of the project?

The RSG was used within the anticipated project period of 18 months.

8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Subsistence costs (Project coordinator/team)				
Public transport	250 GBP	225 GBP (15,420 MKD)	- 25 GBP	The remaining funds have been reallocated to the subsistence budget items.
Food (rest of the days)	250 GBP	267 GBP (18,300 MKD)	+ 17 GBP	Additional funds have been obtained by a Macedonian Mycological Society (MMS) field research project.
Accommodation (115 days x 5 person x 10 GBP)	5.750 GBP	5,825 GBP (399,158 MKD)	+ 75 GBP	Additional funds have been provided by a MMS field research project and a project of the project leader.
Equipment				
Equipment (Tablet Samsung Galaxy Tab S2T815Y) X 2	700 GBP (2 X 350 GBP)	700 GBP (48,000 MKD)		
Fuel costs				
200 l per month/15 months + pay toll (two field vehicles)	3,000 GBP	3000 GBP (205,575 MKD)		
TOTAL	9,950 GBP	10,017 GBP (686,415 MKD)	67 GBP (4,590 MKD)	Additional funds have been obtained via a MMS field research project and a project

				of the project leader.
<p>Other items (quoted in the project application), such as consumables (laboratory and field-trip material); printing and publishing expenses; additional equipment (electric food dehydrator) and telephone and internet costs, have been covered by external funding.</p> <p>Additional funding was provided from the following donors:</p> <ol style="list-style-type: none"> 1. Sofija Printing Company from Bogdanci, Macedonia (printing and publishing expenses); 2. Macedonian Mycological Society (MMS) from Skopje, Macedonia (vehicle and a portion of the transportation costs). 3. Scientific projects of project leader (consumables and equipment). 4. Mycological Laboratory from the Faculty of Natural Sciences in Skopje, Macedonia (equipment and books). 				

9. Looking ahead, what do you feel are the important next steps?

The first significant next step is further research into fungi diversity in the country, especially during autumn – the most favourable season for fungi collection – to obtain additional data in order to compile a Preliminary Red List of Fungi of Kosovo harmonised with IUCN categories and criteria. The List of Rare Species from Kosovo – Red List Candidates that we have produced owing to the RSG project will be the critical document for generating the Official Red List. The influential professors from the Institute of Biology within the Faculty of Natural Sciences and Mathematics in Pristina have articulated their enthusiasm and commitment to make every effort for prompt adoption of the aforesaid List in the country's environment protection legislation.

The project results are suitable for incorporation into the framework of the National Strategy and Action Plan for Biodiversity of Kosovo (2011–2020). Further, the collected fungal data will be at the disposal of the NATURA 2000 Biodiversity Programme when time comes for its inception in Kosovo. The vital steps pertinent to enacting of legislation are incorporation of the collected fungal data into the Law on Environment Protection, Nature Conservation Law, Law on Natural Rarity Conservation, the Prohibition on Harvesting Wild Mushrooms and other regulations from the domain of fungi protection.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did The Rufford Foundation receive any publicity during the course of your work?

The logo was inserted in all published material (brochure, map of IFA) and in the presentations delivered at conferences and before the local population. All of the aforementioned documents are available for view on <https://macfungi.webs.com/fungi-of-kosovo>.

The RF also garnered broad publicity through coverage of our project by an array of national and local news media in Serbia, Kosovo, Albania and Macedonia. The RF

logo was understandably used in our press releases. It is worth mentioning that the most prominent medium where a news article on our principal find appeared – the extremely rare world fungus *Zeus olympius* – was the Serbian edition of the highly regarded international magazine National Geographic. All news articles published are available via the following links:

National Geographic Srbija (Serbian edition of the international magazine National Geographic);

- РадиоТелевизијаСрбије (Serbian National Radio and Television);
- Vesti (Serbian daily newspaper);
- TV Most (television in Serbian from Kosovo);
- Info-ks.net (news portal in Serbian from Kosovo);
- Balkan Plus (news agency in Bosnian from Kosovo);
- Srbin.info(Serbian news portal);
- Telegraf (Serbian news portal);
- KohaDitore (leading national newspaper from Kosovo);
- Radio Televisionilliria (radio and TV channel from Kosovo);
- 04 Online (Kosovo news portal);
- Portalb (Macedonian news web portal in Albanian);
- AlbMed (Albanian news portal on medicine).

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

Dr. Emri Murati – PhD in mycology and Assistant Professor at the Faculty of Natural Science in Tetovo, Macedonia. His background is connected to work on fungi collection and identification. As a native Albanian speaker, he was active as a presenter or interpreter during presentations and meetings in Kosovo, and as a translator of the project printed material.

Dr. Veselaj Zeqir - Professor at the Faculty of Education, University of Pristina, Republic of Kosovo. He holds a PhD in Mycology and he provided us with information about previously collected and unpublished fungal species from Kosovo.

Dr. Katerina Rusevska - Assistant Professor of Mycology at the Institute of Biology at the Faculty of Natural Science and Mathematics, Skopje. She was engaged in work with fungi, their collection, identification, maintenance of the collections, and database input of the collected species. She also participated in compiling the printed material.

Daniela Mitic-Kopanja – BSc in Biology, technical assistant at the Institute of Biology, Faculty of Natural Science and Mathematics, Skopje. Her skills and competences, such as laboratory and collection maintenance; drying, packaging and sorting of collected and identified material for the National Collection of Fungi; participation in the preparation of field trips, preparation of microscopic photography, were a great asset for the project implementation.

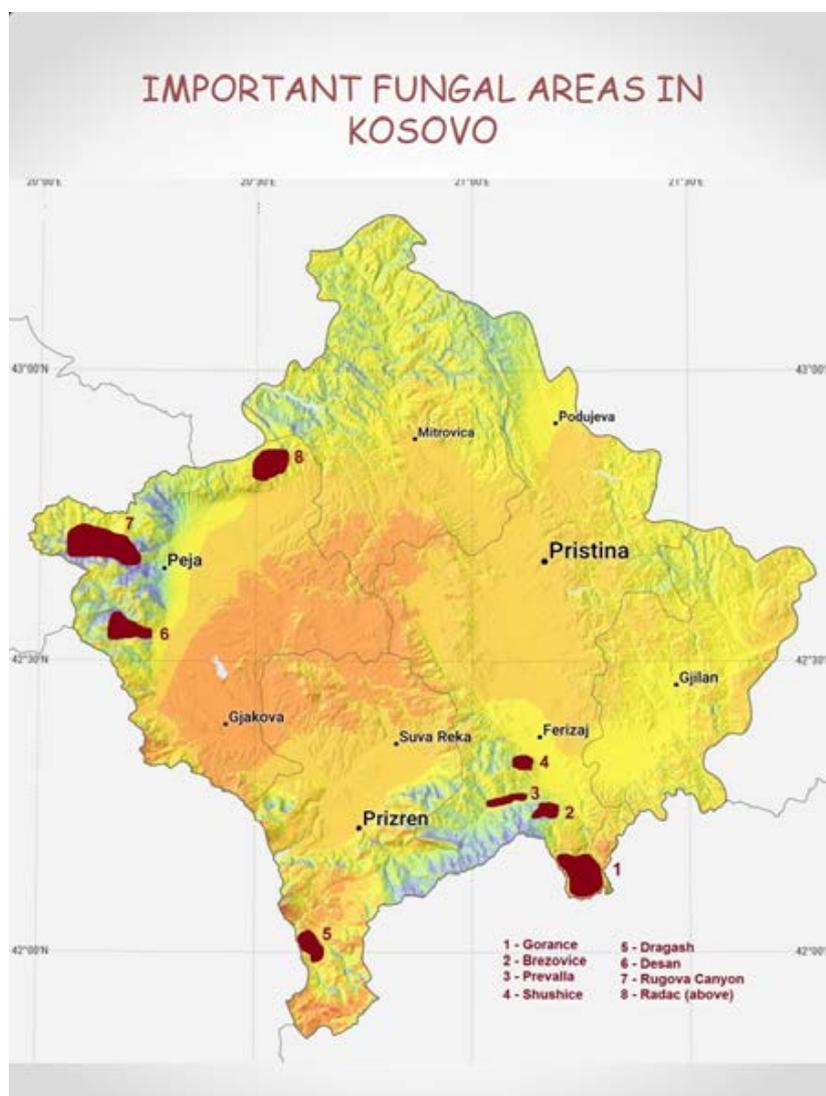
Kristina Zimbakova – BA in English Language and Literature, secretary of Macedonian Mycological Society, and its active member since 1999. She was in charge of project administration, public relations and digital media management.

Prof. Gerhard Kost, from Philipps University of Marburg, Germany. He participated in some of the field trips for collection of fungi in Kosovo and in their subsequent laboratory identification.

Dr. Matthias Theiss from Biedenkopf, Germany, who is as an active member of the German Mycological Society, participated in a number of field trips for fungi collection in Kosovo, taking professional photographs of fungi and assisting in laboratory identification thereof.

Tome Jovanovski - a member of the Macedonian Mycological Society. He actively participated in fungi collection during the field trips in Kosovo; he was taking photographs and was also involved in fungal specimen identification.

Several students from the Faculties of Natural Sciences in Skopje and Pristina were included in the collection trips. A PhD student from the University of Pristina will continue to be in charge of enrichment of the Checklist of Fungi of Kosovo, his contribution being collection of fungal species from the territory of Kosovo.



MACROFUNGI FROM KOSOVO - RED LIST CANDIDATES

<i>Amanita dryophila</i>	very rare
<i>Amanita eliae</i>	rare
<i>Amanita franchetii</i>	rare
<i>Amanita lividopallescens</i>	very rare
<i>Amanita subnudipes</i>	very rare
<i>Antrodia ramentacea</i>	very rare
<i>Antrodia xantha</i>	rare
<i>Basidiodendron caesiocinereum</i>	very rare
<i>Botryobasidium vagum</i>	rare
<i>Butyriboletus pseudoregius</i>	rare
<i>Butyriboletus regius</i>	rare
<i>Caloscypha fulgens</i>	rare
<i>Cyanoboletus pulverulentus</i>	rare
<i>Diplomitoporus flavescens</i>	rare
<i>Discina ancilis</i>	rare
<i>Eutypella alnifraga</i>	rare
<i>Helvella atra</i>	rare
<i>Heterosphaeria patella</i>	very rare
<i>Hortiboletus bubalinus</i>	very rare
<i>Imperator rhodopurpureus</i>	rare
<i>Kneiffiella abdita</i>	very rare
<i>Lactarius azonites</i>	rare
<i>Lactarius subdulcis</i>	very rare
<i>Microstoma protractum</i>	very rare
<i>Mycena arcangeliana</i>	very rare
<i>Neoboletus xanthopus</i>	rare
<i>Peziza succosa</i>	very rare
<i>Phloeomana hiemalis</i>	very rare
<i>Pholiota alnicola</i>	rare
<i>Resupinatus striatulus</i>	very rare
<i>Rubroboletus legaliae</i>	rare
<i>Russula zvarae</i>	very rare
<i>Suillellus mendax</i>	rare
<i>Suillellus rhodoxanthus</i>	rare
<i>Tuber aestivum</i>	rare
<i>Tuber borchii</i>	very rare
<i>Typhula fistulosa</i>	rare
<i>Typhula sclerotioides</i>	rare
<i>Zeus olympius</i>	extremely rare