

## INTERIM REPORT

# Assessment of Diversity of Ascomycetous Fungi in several potential protected territories in Bosnia and Herzegovina

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## Field Research

So far 16 field trips was organized in different parts of the country. At the beginning of the project implementation and during first couple of month in the winter period (Jan-Mar) research and studies have been focused in the Mediterranean part of Bosnia and Herzegovina in general.

In terms of conservation initiative and potential protection of new territories, Neum-Klek bay area represents area of great biodiversity importance. This territory have been identified as Key Biodiversity Area (KBA) or Special Botanical Reserve back in 1965. Still, today there are not proper conservation measurements in practice and monitoring process as well.

Field activities and mycological research in this area results with numerous findings and some of the recorded species represents new species for mycobiota of Bosnia and Herzegovina. Some quite rare and endangered fungal species were registered too. These results represents a very solid arguments towards revision of conservation status of this area which has been already undertaken by few non-governmental and governmental institutions.

It is very important to emphasize that these results are actually preliminary data for Mediterranean mycobiota in Bosnia and Herzegovina. Only previously published data can be found in Jukić (2016) and Jukić & Omerović (2017).

At the end of the project activities preliminary results together with all published material (leaflets, books, and scientific papers) will be delivered to relevant local authorities and to the UNEP organization too.

We consider that we will contribute valuable data and take a part in the conservation initiatives for this very important Mediterranean biodiversity corridor.

At the beginning of April 2018 we have started to investigate central and northern part of the country. In the second half of April we have organized productive field research in the lowlands near city of Bijeljina and recorded first ascomycetous and pezizalean fungi for this area.

Registered species from swamps and riverbanks of Drina River or some small streams are of great significance for mycobiota in Republica of Srpska and for Bosnia and Herzegovina in general.

Some common species like *Octospora gyalectoides*, *Sclerotinia sclerotiorum*, *Pyronema domesticum*, *Scutellinia* sp., or basidiomycetes *Lentinus tigrinus* were recorded.

Several important studies have been carried out in the territory of potential protected area, and future National park Igman-Bjelašnica-Visočica, near capital – Sarajevo.

Some great findings have been recorded too. This is also an area were international

mycological workshop will be held at the beginning of August. Scientists and experts from Croatia, Serbia, Austria, Macedonia and Bosnia and Herzegovina are planned to participate.

Main aim of this workshop is to gather valuable mycological data about important species that inhabit this area and to increase awareness of locals and relevant authorities about this issue.

Besides field research in central territories, in the second half of July we have visited pristine forests of Janj (near city of Šipovo) and Perućica in National Park Sutjeska, one of the last remaining and one of the largest virgin forest in the South-East Europe (Fig. 4 & Fig. 5). Ecosystems of pristine forests are of great importance for the diversity of fungi and represents unique habitats type for many highly endangered and rare fungal species.

During this research we have recorded some highly interesting and quite specialized species of fungi specially adopted for this habitat type (*Scutellinia cejpilii*, *Eocronartium muscicola*, *Ditiola peziziformis*, etc.).

For entrance in this protected territories we have been granted with official authorization and guided by experienced locals, employees from managing public organization.

### **Raising awareness of stakeholders**

Through planned project activities we want to make strong impact on all relevant stakeholders. Our aim is to raise awareness about importance of fungi in all type of ecosystems, about importance of proper conservation measures for new Important Fungal Areas and importance of giving right directions regarding managing policies, procedures and way of interaction for the management of protected territories. We will do this using documentary movie, that will be broadcasted on National television and Public Broadcasting Service, using new book that will be published at the end of this project, using new original scientific papers and conference proceedings, using promo leaflets/brochure, etc.

Still, in order to reach more people/stakeholders we will do some additional promotion. We took part with photos exhibition and promotion of our Mycological Society in the celebration of Biodiversity Day organized by GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) in Sarajevo. We will organize educational lectures in the second part of project implementation and probably take part in this year The Researchers' Night with project presentation and distribution of promo and educational material.

During workshop which will be held on the Visočica Mt. in the first half of August we will set small exhibition of photos and posters about fungi.

## **Equipment**

As planned in the project budget we have bought some of the new equipment in order to achieve better results in photography and micro analysis.

Due to the much better quality and more affordable prices we bought used Olympus BH-2 microscope with adequate OM-photomicro L adapter and Canon adapter for proper mount of photo camera. These items improve final outputs and results in micro photography significantly.

Flash Ring Lite for photo camera have been bought too and photographs of fungi are much better quality now.

## **Publishing results**

Some of the results should be published soon as original scientific paper in Jukić et al. (2018 – *in prep.*) and as conference proceedings in Jukić & Tomić (2018 – *in prep.*). Priority will be given to important Mediterranean fungal species found back in February and March 2018. This should be solid contribution towards potential protection of Neum-Klek bay as important biodiversity corridor in the Balkan Peninsula.

Molecular phylogenetic analysis will be carried out for some of the most interesting findings. There is possibility that more scientific facts and paper will be published until the end of the project activities in January 2019.

Final results for 6-7 investigated potential protected areas, and other ones as well, will be printed as a book (ca. 150 pages). Main characteristics of every important area will be presented and some of the most significant species of fungi will be illustrated and briefly described. Recommendation for species conservation will be given and useful instructions for the managing authorities will be specified.

Book will be distributed to the all relevant and key stakeholders and governmental and non- governmental organizations.

## **Documentary movie**

During the first phase of project activities (from February till July) in cooperation with Public Broadcasting Service of Bosnia and Herzegovina we have been filming and recording video material from five different location and different type of habitats (pristine forests Ravna Vala – Igman, pristine forest Perućica – NP Sutjeska, Lisina Mt. – near city of Mrkonjić Grad, river Orlija – near city of Olovo and some shots from the laboratory).

In the next phase producer and director should cut and select the best scenes and material and documentary movie about fungi should be ready for TV premiere at the end of this year.

The main aim of this documentary is to raise people awareness about important

role fungi generally have but also to provoke interest for studying ascomycetous fungi. We will do our best to present richness and great biodiversity of some very important area in Bosnia and Herzegovina (like pristine forests) and try to explain importance of protecting these small territories in order to preserve some very rare and endangered fungal species.

Documentary will be broadcast on State channel number one and short trailer will be uploaded to the corresponding project web page. Approximate duration of the documentary will be 25 minutes.

The documentary was filmed with the great help and understanding from other mycologist in Bosnia and Herzegovina and with the help of management of National Park Sutjeska.

### **Cooperation**

So far we have established great cooperation with different local authorities and representatives from the NGO sector (management of Pristine Forest Janj, management of the NP Sutjeska, Public broadcasting Service of Bosnia and Herzegovina, GIZ, numerous mycologist and experts from Bosnia and Herzegovina and abroad, etc.).

### **Literature**

Jukić N. & Omerović N. (2017): Gljive reda Pezizales u Bosni i Hercegovini – Ugroženost, ekologija i biogeografija. Amatersko mikološko udruženje, Sarajevo. Str. 206.

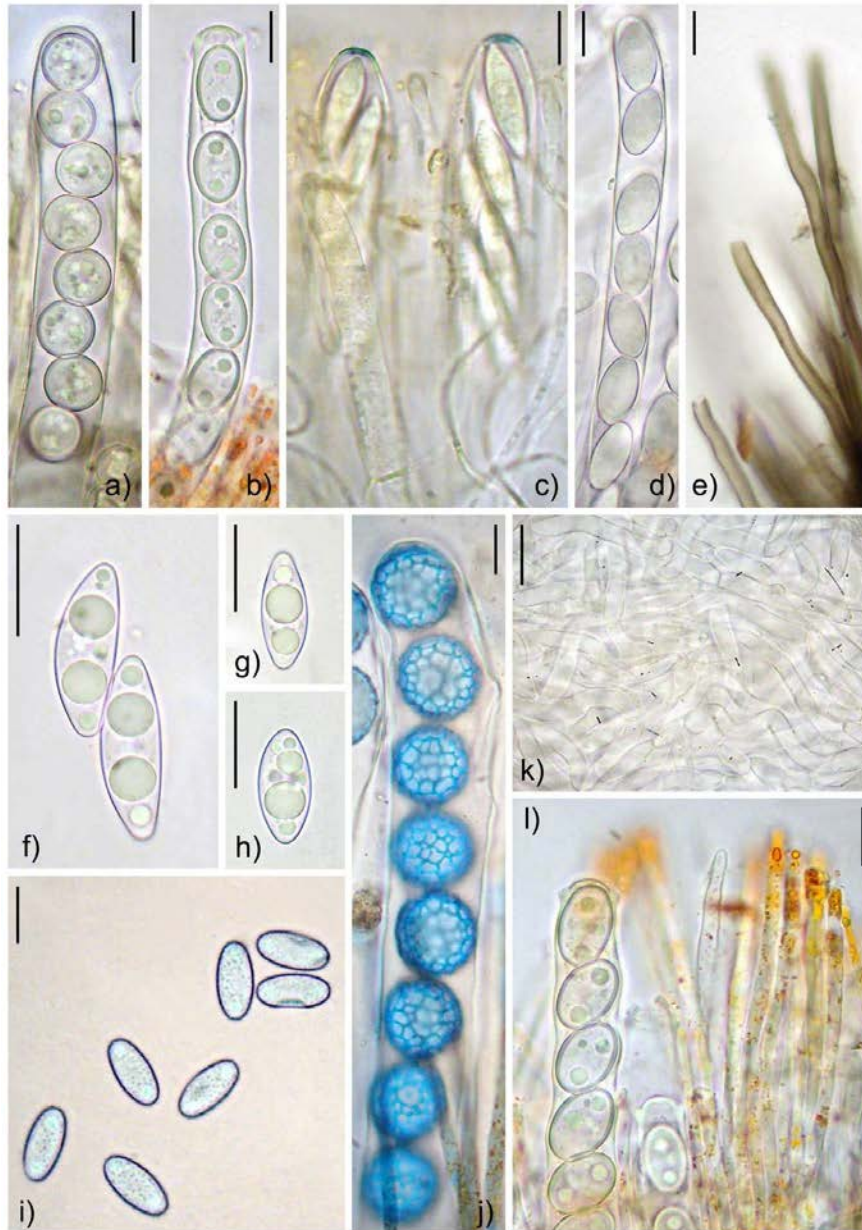
Jukić N. (2016): First record of the Mediterranean species *Ciboria brunneorufa* in the Balkan Peninsula. – Czech Mycol. 68(2): 127–137.

**Figure 1.** Diversity of ascomycetous fungi in the Neum-Klek bay area: a) *Chloroscypha alutipes* on *Juniperus oxycedrus* cone; b) *Donadinia lusitanica* in the city park area; c) *Geopyxis majalis*, Klek peninsula; d) *Pithya cupressina* on fallen twigs of *Cupressus sempervirens*; e) *Mollisia* aff. *cinerea* on dead log of *Arbutus unedo*; f) *Peziza tenacella*, on burnt ground near village Prapratnica; g) *Hydnocystis piligera*, city park area - Neum; h) *Neodasyscypha cerina* on *Arbutus unedo*; i) *Hysterobrevium smilacis* on dead twig of *Rubus* sp.; j) *Pseudopithyella minuscula* on fallen twigs of *Cupressus sempervirens*; k) *Ciboria brunneorufa* on *Pistacia lentiscus* leaves, village Moševići; l) *Pulvinula johannis*, city park area - Neum; m) *Octospora excipulata* on *Funaria hygrometrica*, Klek peninsula; n) *Tricharina gilva*, village Prapratnica; o) *Octospora coccinea* on *Bryum* sp., Klek peninsula; p) *Smardaea planchonis*, Klek peninsula; o) *Propolis versicolor*, village Moševići near Neum. Bars: a), d), e), h), j), k), l), m), o), r) - 0.2 cm; i) - 0.1 cm; b), c), f), g), n), p) - 0.5 cm.





**Figure 2.** Microcharacters of some fungal species recorded in the Neum-Klek area: a) asci and ascospores of *Pithya cupressina* in tap water mount; b) asci and ascospores of *Pseudopithyella minuscula* in tap water mount; c) asci and ascospores of *Chloroscypha alutipes* in IKI; d) *Geopyxis majalis*, asci and ascospores; e) marginal hairs of *Donadinia lusitanica*; f) mature ascospores of *Octospora coccinea* in tap water mount; g) *Octospora* sp., mature ascospores in tap water; h) mature ascospores of *Octospora gemmicola* in tap water mount; i) ascospores of *Peziza tenacella* in CB mount; j) asci and ascospores of *Lamprospora miniata* var. *ratibonensis* in CB mount; k) detail of medullary excipulum of *Pithya cupressina*; l) asci, ascospores and paraphyses of *Pseudopithyella minuscula* in tap water mount. Bars: a), b), c), d), e), i), j), l) - 20  $\mu$ m; f), g), h), k) - 10  $\mu$ m.





**Figure 3.** Promotional Leaflets – Important Fungal Areas and habitat types in Bosnia and Herzegovina.

**Igman, Bjelašnica, Treskavica i Visočica**

Prema studiji izvodljivosti iz 2007. godine prostor Igmana, Bjelašnice, Treskavice i kanjona Rakitnice te planine Visočice, s ukupnom površinom od 92.000 ha., je područje od prirodnog značaja za Bosnu i Hercegovinu i trebalo bi biti proglašeno nacionalnim parkom bez presedana. Do ovoga ipak ne dolazi. Prvenstveno zahvaljujući različitim kratkoročnim ekonomskim interesima pojedina i lokalnih stakeholdera, koji se ponajprije manifestuju kroz eksploataciju prirodnih resursa s ovog područja. Važnost ovog područja za mikrobiotu BiH je nemjerljiva. Izuzetna bioraznolikost ovog područja uvjetovana različitim klimatskim tipovima i nadmorskim visinama odrazila se i na diverzitet gljiva.

**Status područja:** Područje posebnih karakteristika od značaja za FBiH sve do proglašavanja NP. **Značajne vrste gljiva:** Veliki broj alpskih vrsta poput *Peziza nivalis*, *Discina geogenia* i *Pythia vulgaris*, ali i druge interesantne vrste kao što su *Ophiocordyceps sphecocephala* i dr.



**Peziza ampliata, Mandino vrelo-Visočica**

S nešto više od 16.000 ha NP Sutjeska predstavlja najstariji nacionalni park u Bosni i Hercegovini, ali i jedno od posljednjih žarišta iskonske divljine u ovom dijelu Europe. S visokim stepenom endemizma prostor NP Sutjeska, osobito prašuma Perućica te vodni režimi nekoliko rijeka, dom su velikom broju raritetnih vrsta gljiva. Iako zaštićen, ovaj prostor zahtjeva da mu se posveti dosta više vremena za istraživanja iz oblasti mikologije, a sve s ciljem kreiranja preliminarne check-liste gljiva. Ujedno postojeće akte o zaštiti treba dosljedno provoditi i u praksi.

**Status područja:** Sa statusom nacionalnog parka od 1962. godine. **Značajne vrste gljiva:** *Peziza montirivicola*, *Octospora hygrophynophila*, *Patinella hyalophaea* i brojne druge usko adaptivne vrste.

**Check-liste gljiva zaštićenih područja**

Za više informacija o projektu i svim novostima posjetite našu web i facebook stranicu: [www.mycobh.com](http://www.mycobh.com) [@mycobh](https://www.facebook.com/mycobh)





**Rufford** MIKOLOŠKO UDRUŽENJE MYCOBH Mycological Society MYCOBH

**ASSESSMENT OF DIVERSITY OF ASCOMYCETOUS FUNGI IN SEVERAL POTENTIAL PROTECTED TERRITORIES IN BOSNIA AND HERZEGOVINA**

IZJAVA JEDNA MIKOLOŠKI ZNAČAJNA PODRUČJA I TIPOVI STANIŠTA



**o projektu**

Projekat pod nazivom *Assessment of Diversity of ascomycetous fungi in Several Potential Protected Territories in Bosnia and Herzegovina* predstavlja nastavak naučno-istraživačkog rada iz oblasti taksonomije askomiceta te kontinuitet konzervacijskih aktivnosti pokrenutih kroz implementaciju prethodnog projekta - *Research and Contribution to the Conservation of Pezizales (Fungi) in Bosnia and Herzegovina*. Oba projekta su podržana od strane Rufford Small Grants Foundation iz Londona.

**Ciljevi i aktivnosti projekta:** Identifikacija i promocija novih IFA područja, izrada preliminarne check-lista gljiva zaštićenih i potencijalno zaštićenih područja, procjena rizika i prijetnji, izdavanje finalne publikacije/knjige, snimanje dokumentarnog filma i dr.




**Fotografije:** (gore) Ušće rijeke Bune u Neretvu, značajan prostor po biodiverzitetu, ali ujedno i potencijalna lokacija za izgradnju hidrocentrala; (ispod) *Podostroma leucopus*, rijetka vrsta registrovana na teritoriji ZP Bijamabare.

**Livanjsko i Duvanjsko polje**

Kraška polja predstavljaju svojevrsna "ostrva" biodiverziteta smještena u karbonatnom krasu. Ovi izuzetno vrijedni prirodni fenomeni i reljefi zauzimaju signifikantan dio naše zemlje, a istovremeno u njima svoje utočište pronalaze veliki broj rijetkih, ali i ugroženih vrsta gljiva.

Jedan od najznačajnijih elemenata kraških polja je prisustvo vode, odnosno ponora i izvora. Ovakvom geomorfološkom i hidrološkom konfiguracijom terena se osigurava opstanak brojnih vrsta askomiceta koji uspješno egzistiraju na i uz obale kraških tekućica i izvora. Istraživanja na području Livanjskog, Duvanjskog, ali i drugih kraških polja će biti nastavljena i kroz ovaj projekat.

**Status područja:** Područja Livanjskog i Duvanjskog polja su i danas bez valjane pravne zaštite. **Značajne vrste gljiva:** *Parascutellinia violacea*, *Boudiera tracheia*, *Vibrissa calcaria* i dr.




**Boudiera tracheia, Brčansko polje**

**Ciboria brunneorufa, zaljev Neum-Klek**



**mediteran**

Iako predstavlja jedan od najčešćih te uobičajen i karakterističan tip mediteranske vegetacije sa vazdazelenim šumama *Q. ilex*, *J. oxycedrus* i dr., zaljev Neum-Klek je izuzetno značajan za BiH jer je stanište za brojne usko adaptivne, odnosno karakteristične mediteranske vrste gljiva.

**Status područja:** Ovo područje je proglašeno botaničko-florističkim rezervatom 1965. godine. Trenutno je bez valjane pravne zaštite. **Značajne vrste gljiva:** *Helvella juniperi*, *Ciboria brunneorufa*, *Smardaea planchonis*.

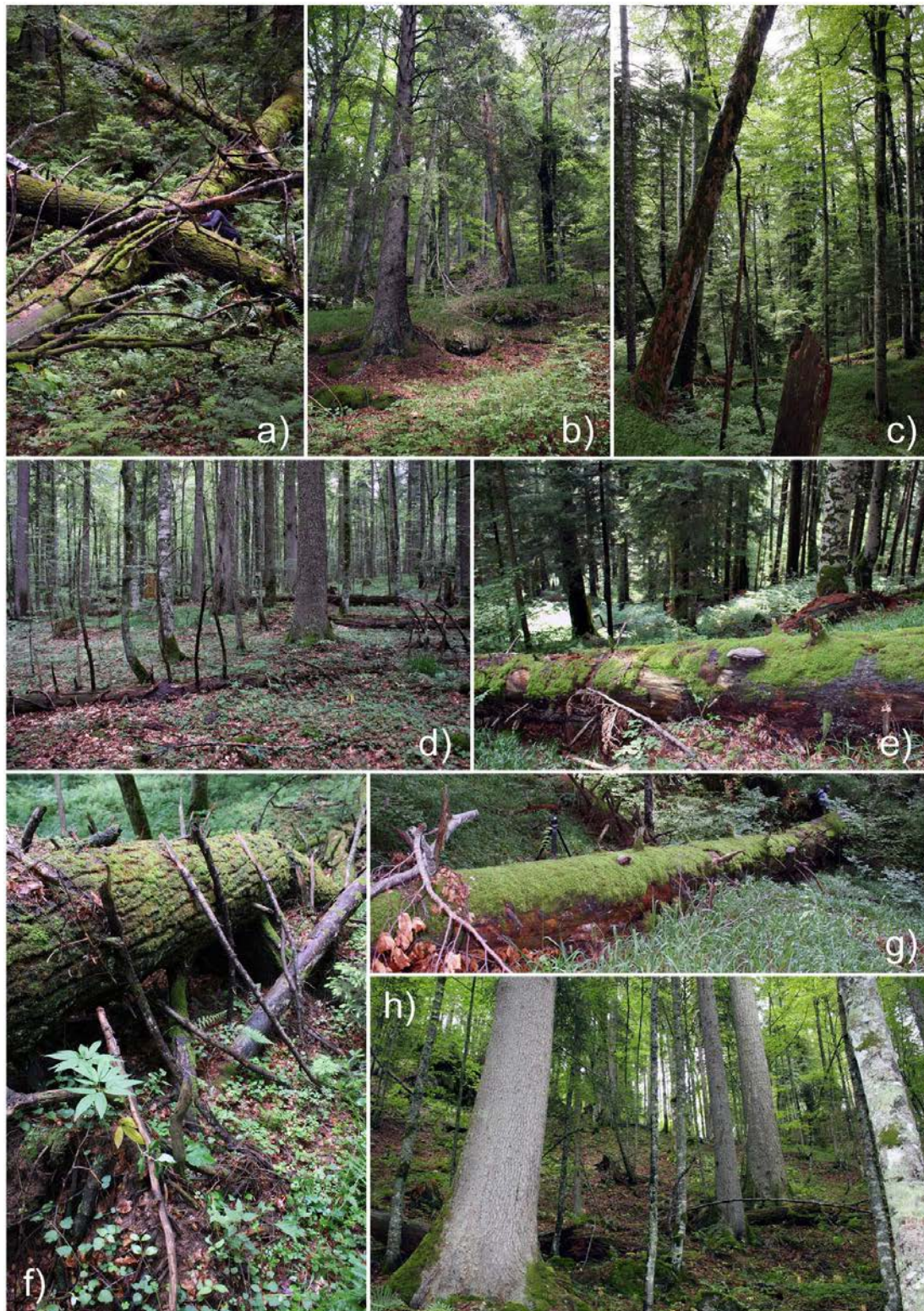
**Mediterranetum (Neum/Klek)**



Karakteristična asocijacija sa dominacijom *Q. ilex*.



**Figure 4.** Details and scenery from two pristine forest in Bosnia and Herzegovina.  
 b), c), e) & g) - Perućica in NP Sutjeska (1434 ha); a), d), f) & h) – Janj pristine forest, near  
 Šipovo (295 ha).





**Figure 5.** Diversity of macromycetes in Janj Pristine forest: a) – *Scutellinia cejpaii*, on decaying dead coniferous trunk; b) - *Sarea resinae*, on resin of living coniferous tree; c) - *Eocronartium muscicola*, parasitizing on mosses; d) - *Ditiola peziziformis*, rare species of Basidiomycetes usually found in pristine forest; e) – *Bisporella citrina*; f) *Lasiobolus macrotrichus* and *Saccobolus depauperatus*, on deer dung; g) - *Helvella* aff. *costifera*.



**Figure 6.** Biodiversity Day organized by GIZ in Sarajevo, photos exhibition and some of the visitors.





**Figure 7.** Landscapes and habitat photos – potential protected territory of Bjelašnica and Visočica Mt, valuable habitat for numerous species of rare and endangered fungi.





**Figure 8.** Field research scenery and findings: a), d), e), f) & g) – Shooting documentary movie about ascomycetous fungi in Bosnia and Herzegovina on different locations; b) – Pyrophilous fungi, *Pyronema domesticum*; c) – Swamps and bogs in the northern part of the country (Štarača – Glavičice, vicinity of city of Bijeljina); h) - *Sclerotinia sclerotiorum*, sandy riverbanks of river Drina; i) - Quest for bryophilous ascomycetous Pezizales, Neum-Klek bay area; j) – *Trichopezizella barbata*, on *Lonicera* sp. (Lisina Mt.).

