# ЭКСПЕРИМЕНТАЛЬНЫЕ РАБОТЫ

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## NOTES ON THE ECOLOGY OF ASCOCORYNE TURFICOLA (ASCOMYCOTA: HELOTIALES) IN WEST SIBERIA

***Filippova N.V.[1)], Bulyonkova T.M.[2)]***

[1)]*Yugra State Unversity, Khanty-Mansiysk*
[2)]*A.P. Ershov Institute of Informatics Systems Russian Academy of Sciences, Novosibirsk*

filippova.courlee.nina@gmail.com, ressaure@gmail.com

*Species with rare occurrence are a target of biodiversity monitoring and protection programs.* Ascocoryne turficola *is such a species, known as rare from European countries, North and South America. Currently it has been found in 4 locations in the Khanty-Mansiysk autonomous region of Russia (West Siberia). In present paper, the occurrence of* A. turficola *was estimated in an ecosystem typical for the area – the ombrotrophic bog. The preferred types of bog communities were studied on 20 plots with the total area of 4600 m$^2$. Total number of encountered apothecia was 104, first collections were done in August, 29, and the last in mid-September. From four investigated communities,* A. turficola *was found in two (lawns and hollows in ridge-hollow complex), and absent in treed pine-dwarfshrubs-sphagnum bogs. Large lawns revealed higher density of ascocarps, ranging between 2.7 and 16.5 apothecia per 100 m$^2$. Mean value of ascocarps density for both types was about 4.8 apothecia per 100 m$^2$. According to floristic classification, inhabited communities are classified in three associations:* Hepatico-Rhynchosporetum albae, Scheuchzerio palustris-Sphagnetum cuspidati, *and* Eriophoro vaginati-Sphagnetum baltici *(class* Scheuchzerio-Caricetea*). Most collections of* A. turficola *made in the first association, where the fungus has small, turbinate apothecia, located at the surface of sphagnum covered by liverworts. Apothecia growing in* Scheuchzerio palustris-Sphagnetum cuspidati *arise among sphagnum with longer stem attached to submerged litter of different graminoids. The species shown to be regular in ombrotrophic lawns of the area, according to the studied location.*

***Key words:*** peatlands, bogs, mires, fungi, rare fungi, fungal conservation, discomycetes, Helotiales, Ascocoryne turficola

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## INTRODUCTION

*A. turficola* is a discomycete with rare sightings in Europe, North and South America (Shetland islands), and probably Africa [Van Vooren, 2012]. Its habitat is strongly connected with peatland ecosystems, where it grows as a saprotroph on remains of sphagna and other plants in strongly hydrated conditions [Vasutova et al, 2013; Van Vooren, 2012; Bunyard et al., 2008]. The West Siberian plain is one of the highly bogged areas of the world, and the occurrence of this species here is expectable. Our first collections of *A. turficola* in West Siberia were made in four locations in northern and middle taiga zones [Filippova et al., 2013], where the species was sighted by opportunistic method in ombrotrophic graminoid-sphagnum hollows and treed ombrotrophic bog. The phytocoenological preference of the species and its abundance there were unsufficiently studied before.

Fungi are key decomposers of bog ecosystems, occupying different niches and showing high species diversity [Thormann, 2006]. Discomycetes represent large part of total fungal diversity of bogs and their functional role is therefore important [Filippova, 2012]. The ecology of different species is necessary information for community modelling. The goal of present paper was to reveal phytocoenological preferences, occupied substrates and estimate abundance of *A. turficola* – a species with fidelity to bogs.

## STUDY AREA

The investigated bog ("Mukhrino bog") is located in the middle taiga zone of West Siberia (N60.892° E68.674°). Eutrophic and mesotrophic types of peatlands are present here, but oligotrophic bogs prevail. The

floristic classification of bogs described by Lapshina [2010] in the southeastern part of West Siberia applies well for the area.

The climate of the study area is subarctic, with wet warm summer and quite severe snowy winters. The average temperature of the coldest month (January) about -20° C, of the warmest month (July) – 17° C. Mean sum of precipitation about 500 mm.

## METHODS

Data on the ecology of *A. turficola* were collected along the study of community of larger fungi at Mukhrino bog. The investigated site (2 km$^2$ in north-eastern part of the bog) lies close to the Mukhrino field station monitoring polygon [INTERACT, 2012]. Temporary count-plots were placed in four types of bog communities: 1) treed pine-dwarfshrubs-sphagnum bog, 2) treed pine-dwarfshrubs-sphagnum ridges in ridge-hollow complex, 3) graminoid-sphagnum lawns, 4) graminoid-sphagnum hollows in ridge-hollow complex.

20 plots were established (5 plots per each type), each included 40–60 micro-plots 5 m$^2$ (the total counted area was 4600 m$^2$). Fruitbodies were counted on circular micro-plots, the circles were bordered with a pole and a rope as described in Lodge et al. [2004]. Micro-plots were placed along transects at a distance of about 5 m inside plot borders. The vegetation was described in the plots within 10 m$^2$ area according to standart geo-botanical procedure. Described plots were assigned to associations by comparison with developed floristic classification [Lapshina, 2010]. Physical parameters (pH, bog water level) were measured in 5 points inside plot borders (table 1). Meteorological parameters were measured at local micro-climate station of Mukhrino polygon. Standard minimum (TM-2) and maximum (TM-1) thermometers installed at a 2 m height inside a shelter (at the same bog where plots were monitored), data reading accomplished once a day.

Apothecia of *A. turficola* are submerged in the upper sphagnum layer, their hymenial disc exposed at the surface. Given the small diameter and greenish color of the structures, they are not easy to find. Although counting in micro-plots raises the chance of collection (compared with route method), underestimation is also possible. Each apothecium was counted, though some of them were growing in clusters. If clusters are counted, the number drops about 15% (estimated on two plots).

Collections of *A. turficola* (15 specimens) were processed using standard methods for storage in the Yugra University Fungarium.

## RESULTS

The total number of the encountered *A. turficola* apothecia was 104, including 98 from the plot count and 6 from accidental collections.

*A. turficola* appears in the study area in late summer–autumn. The first apothecia collected August, 29, were underdeveloped; overmature apothecia started to appear in mid-September. At this time, night temperatures at the bog were approaching zero (fig. 1); this period corresponds to the yellowing of leaves of aspen and birch on mineral soil, and reddening of evergreen leaves of *Chamaedaphne calyculata* at the bog.

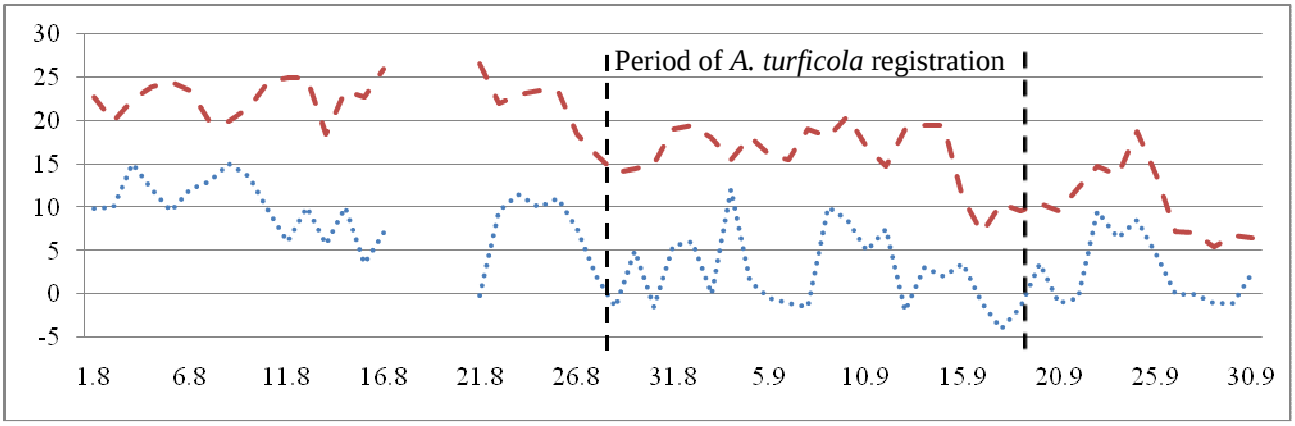


***Figure 1.*** Daily minimum and maximum temperature course at Mukhrino bog in August–September 2013. Red line – maximum, blue – minimum day temperatures; line break – data absent

From four investigated community types, *A. turficola* was found in two (lawns, and hollows in ridge-hollow complex). It inhabited all plots in lawns (18, 18, 7, 8, 33 apothecia per plot; 2.7–16.5 apothecia per 100 $m^2$), and 3 from 5 plots in hollows (0, 0, 4, 5, 5 apothecia per plot; 0–1.7 apothecia per 100 $m^2$) (fig. 2). The mean value of density of *A. turficola* was about 4.8 apothecia per 100 $m^2$.

Lawns and hollows made from a mosaic of several plant associations. *A. turficola* was collected in three of them with different frequency and morphological characteristics.

*Scheuchzerio palustris-Sphagnetum cuspidati* Osvald 1923. About 1/3 of all registered collections come from this association. Ascocarps grew on buried in sphagnum litter of *Carex limosa, Rhinchospora album, Scheuchzeria palustris, Eriophorum vaginatum*, and on brown decaying sphagnum parts; often the place of attachment couldn't be described more accurately than mixed soft (decaying) sphagnum-graminoid litter. The stem base could be above or below water level, with the disc laying exposed at the surface among sphagnum capitulas. The stipe of apothecia was 1–5 cm long, and the disc 0.5–1 cm in diameter (fig. 3).

*Eriophoro vaginati-Sphagnetum baltici* Bogd.-Guiheneuf 1928. Two collections were registered in this association. Apothecia grew inside a *Eriophorum vaginatum* hummock with stipes rooting in densely packed plant sheaths. Apothecia were prominently large (the largest in all collections), up to 6 cm long, disc 1.2 cm broad. The second collection was made accidentally at a side of the hummock among leaf litter with apothecia 3 cm high.

*Hepatico-Rhynchosporetum albae* Bogd.-Guiheneuf 1928. This association produced most of the registered collections; apothecia were collected on sides of hollows, on liverworts covered peat surface with admixture of different plant remains. Apothecia there were usually small, turbinate or short-stipitate, up to 1 cm high and with the disc up to 5 mm wide.

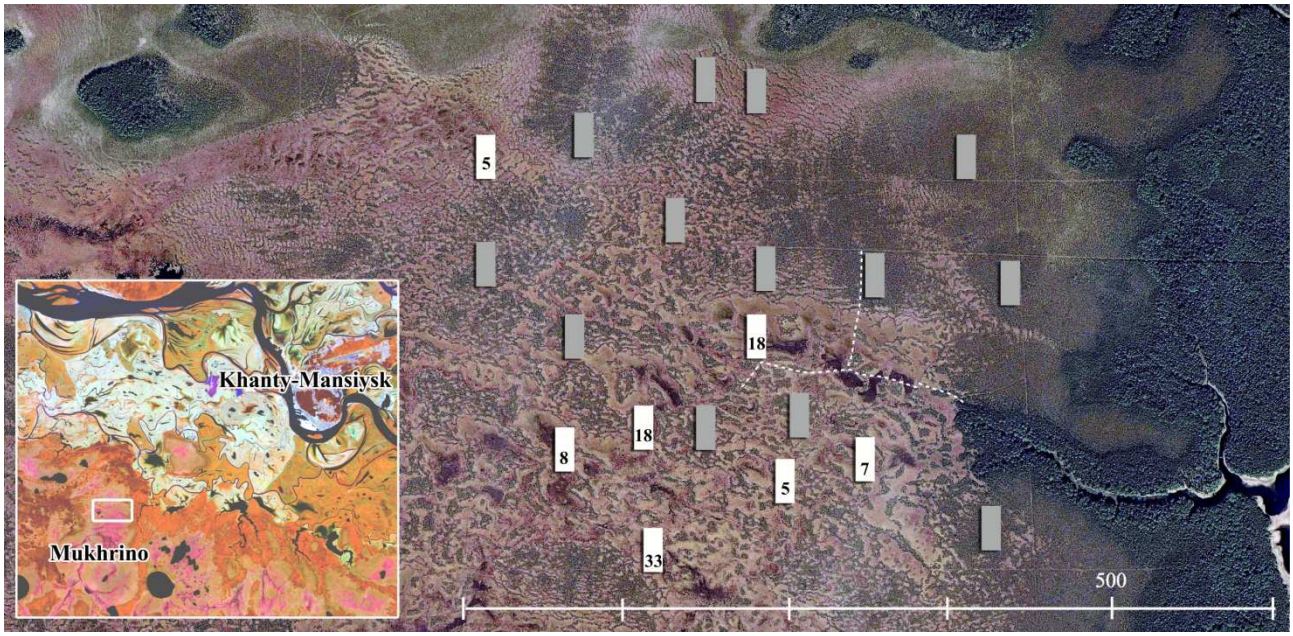


***Figure 2.*** Location and abundance of *A. turficola* at the study site (satellite QuickBird image of NW part of Mukhrino bog). Gray marks the plots without collections; white – with number of apothecia per plot; dashed line marks the boardwalks of Mukhrino field station

## CONCLUSIONS

From the data of the investigated site, *A. turficola* is a regular inhabitant of communities of lawns and hollows in the ombrotrophic bog. It was encountered 6 times more often in lawns compared to hollows in ridge-hollow complexes, with an average of 4.8 apothecia per 100 $m^2$; and was absent in treed communities. On lawns and hollows, the species was registered in three floristic associations (class *Scheuchzerio-Caricetea*). Association *Hepatico-Rhynchosporetum albae* yielded most of collections, the fungus has small, turbinate apothecia, located at the surface of sphagnum covered by liverworts. Associations *Scheuchzerio palustris-Sphagnetum cuspidati* and *Eriophoro vaginati-Sphagnetum baltici* are relatively rarely occupied, but apothecia there are larger, with long stem. The occupied substrate is variable: dead parts of sphagna mixed with litter of bog plants: *Carex limosa, Eriophorum russeolum, E. vaginatum, Rhinchospora alba, Scheuchzeria palustris*. Fruitbodies appear in August–September.

Literature analysis shows that the species occurs in other regions in transitional bogs and bogged forests where sphagnum is present, on acidic, water-saturated sites. This suggests that other types of peatlands in the area should be studied, as well as other associations of ombrotrophic bogs which have not been touched by this study. Also, a representative collection of plots in similar communities in other parts of the region would be of value.

**Table 1.** Examples of plant composition of three inhabited associations (plants with their % cover) and phytocoenological differentiation of *A. turficola*

| **Species** | ***Eriophoro vaginati-Sphagnetum baltici*** | ***Scheuchzerio palustris-Sphagnetum cuspidati*** | ***Hepatico-Rhynchosporetum albae*** |
|---|---|---|---|
| *Andromeda polifolia* | 20 | 1 | 1 |
| *Oxycoccus palustris* | 5 | | |
| *Eriophorum vaginatum* | 30 | | |
| *E. russeolum* | | + | + |
| *Scheuchzeria palustris* | + | 10 | 1 |
| *Carex limosa* | + | 3 | |
| *Rhinchospora alba* | | | 5 |
| *Menyanthes trifoliata* | | | 1 |
| *Drosera rotundifolia* | | | + |
| *D. anglica* | | + | |
| *Sphagnum balticum* | 100 | 10 | 5 |
| *S. papillosum* | | | 20 |
| *S. junsenii* | | 80 | 5 |
| *S. compactum* | | | 3 |
| *S. majus* | | + | 5 |
| *S. lindbergii* | | 3 | 5 |
| *Cladopodiella fluitans* | | | 5 |
| *Gymnocolia inflata* | | | 45 |
| **Bog water level, cm** | 10–15 | 0–10 | 1–5 |
| **pH, mead value** | 3.2 | 3.6 | 3.8 |
| ***A. turficola* abundance** | 2 collections | About 1/3 collections | About 2/3 collections |
| ***A. turficola* substrate** | *E. vaginatum* leaf sheaths | Litter of *Carex limosa*, *Rhinchospora album*, *Scheuchzeria palustris*, *Eriophorum vaginatum* mixed with *Sphagnum* litter | On peaty surface among liverworts |
| ***A. turficola* morphological features** | Long-stipitate, with thick stipe, 6 cm height | Long-stipitate, with slender stipe, 1–5 cm height | Turbinate or short-stipitate, near 1 cm height |

## LITERATURE

Bunyard B.A. et al. 2008. New North American Records for Ascocoryne turficola (Ascomycota: Helotiales) // Fungi. V. 1. № 2. P. 23–31.

Filippova N.V. 2012. Discomycetes from plant, leave and sphagnum litter in ombrotrophic bog (West Siberia) // Environmental dynamics and global climate change. V. 3. №. 1(5). EDCCrar0003.

Filippova N., Zvyagina E., Bulyonkova T. 2013. Ascocoryne turficola (Boud.) Korf records from West Siberia // Fungi. V. 6. № 3. P. 26–30.

INTERACT 2012. INTERACT Station catalogue. / K. Elger et al. (eds.). Denmark: DCE – Danish Centre for Enviroment and Energy, Aarhus University. 192 p.

Лапшина Е.Д. 2010. Растительность болот юго-востока Западной Сибири. Новосибирск. 186 с.

Lapshina E.D. 2010. Wetland vegetation of South-East part of West Siberia. Novosibirsk. 186 p. [in Russian]

Lodge J. et al. 2004. Terrestrial and lignicolous macrofungi. // Biodiversity of fungi. Inventory and monitoring methods / Mueller G.M. et al. (eds.) Amsterdam; Boston: Elsevier Academic Press. P. 127–172.

Van Vooren N. 2012. Le clou de la session mycologique fédérale 2011: Ascocoryne turficola (Helotiales) // Bull. Mycol. Bot. Dauphiné-Savoie. V. 206. P. 39–46.

Vasutova M., Dvorak D., Beran M. 2013. Rare macromycetes from raised bogs in the Hrubý Jeseník Mts. (Czech Republic) // Czech Mycology. V. 65. № 1. P. 45–67.

Thormann M. 2006. The Role of Fungi in Boreal Peatlands // Boreal Peatland Ecosystems Ecological Studies / Wieder R.K. et al. (eds.) Berlin: Springer. P. 101–123.

Васин А.М., Васина А.Л. (ред.) 2013. Красная книга Ханты-Мансийского атономного округа – Югры. Екатеринбург: Издательство Баско, 2013. 460 с.

## К ЭКОЛОГИИ АСКОКОРИНЕ ТОРФЯНОЙ (ASCOMYCOTA: HELOTIALES) В ЗАПАДНОЙ СИБИРИ

***Филиппова Н.В., Бульонкова Т.М.***

Особенности распространения и состояние популяций редких краснокнижных видов должны изучаться подробно. Аскокорине торфяная (*Ascocoryne turficola*) является редким видом, известным по находкам из Европы, Северной и Южной Америки (Фолклендские о-ва), возможно в Африке. В Западной Сибири описано четыре местонахождения вида. Вид занесен в Красную книгу ХМАО [Васин, Васина, 2014]. Задачей настоящего исследования являлось количественное описание популяции на одном из этих местонахождений: омбротрофном болоте ("Мухрино") в окрестностях г. Ханты-Мансийска. Было проведено обследование 20 площадок, заложенных в четырех сообществах с общей площадью 4600 м$^2$. *A. turficola* встречалась с высоким постоянством (среднее значение 4,8 апотеция на 100 м$^2$) в сообществах топей и не встречалась в сосново-кустарничковых сообществах (рямах). С наибольшим обилием аскокарпы зарегистрированы в ассоциацях *Scheuchzerio palustris-Sphagnetum cuspidati*, *Hepatico-Rhynchosporetum albae*, единичные находки были в ассоциации *Eriophoro vaginati-Sphagnetum baltici*. Субстратами вида были остатки *Carex limosa, Eriophorum russeolum, E. vaginatum, Rhinchospora alba, Scheuchzeria palustris*, поверхность сфагнума покрытая печеночниками, и смесь остатков сфагнума с другими растениями.

***Ключевые слова:*** торфяники, болота, торфяные болота, грибы, редкие виды, охраняемые виды, discomycetes, Helotiales, Ascocoryne turficola

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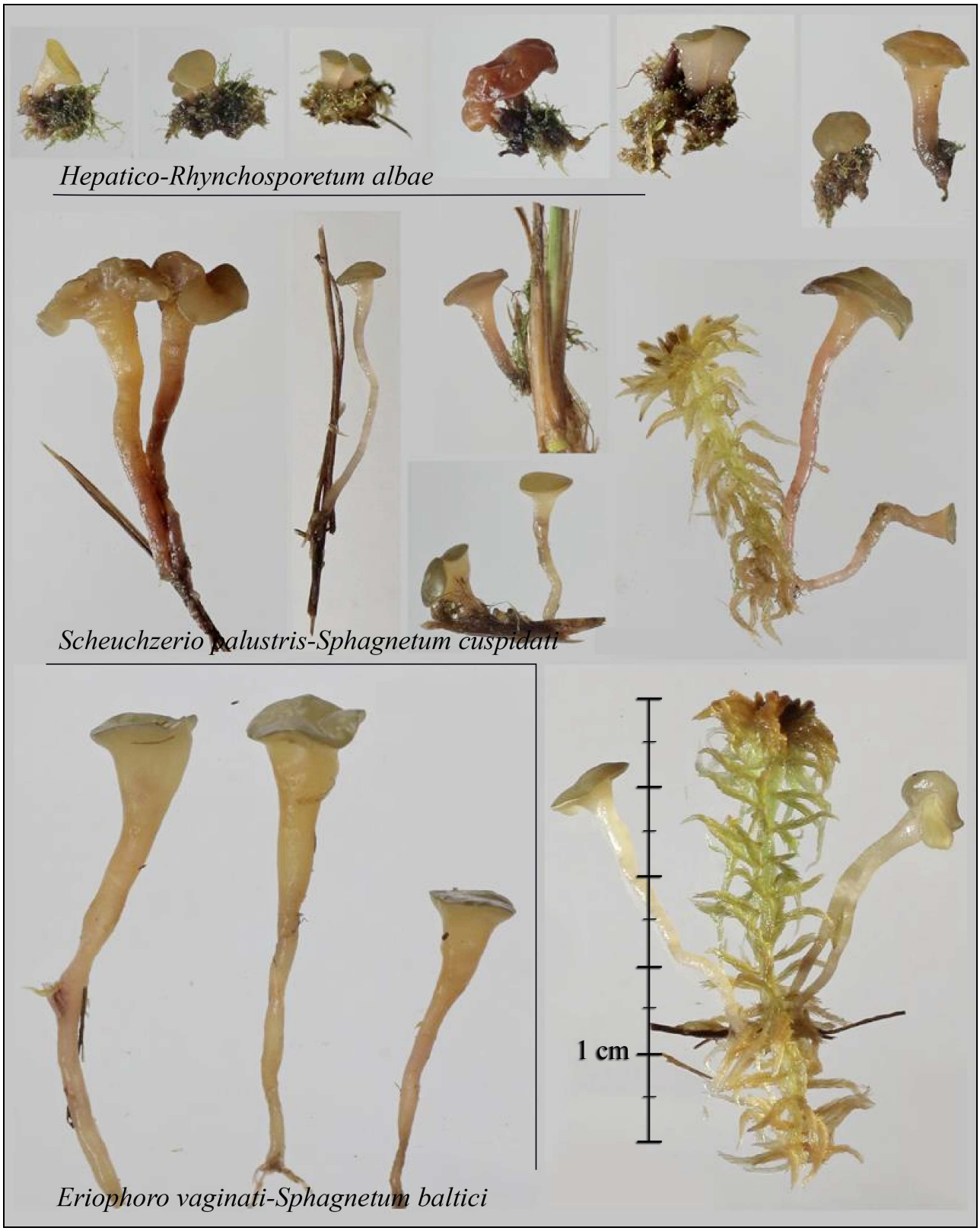


***Figure 3.*** Gross morphology of specimens from different associations