

ASCOCORYNE TURFICOLA (BOUD.) KORF RECORDS FROM WEST SIBERIA

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НАХОДКИ *ASCOCORYNE TURFICOLA*
(Boud.) Korf В ЗАПАДНОЙ СИБИРИ
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Распространение *Ascocoryne turficola* (Helotiales) известно по редким находкам в северной, средней и восточной Европе, и единичным находкам в Северной Америке (Bunyard et al., 2008). 4 точки из Западной Сибири, описанные в нашей публикации, расширяют представление об ареале вида. Все опубликованные места встреч приблизительно совпадают с границей распространения бореальных болот (торфяников), долготное распределение точек предполагает циркумбореальный тип ареала.

Экология вида считается недостаточно изученной. Плодовые тела образуются на различных растительных остатках в заболоченных экосистемах (торфяниках) и вблизи сфагновых мхов. Высказывалось предположение о погребенной древесине в качестве субстрата. Однако наши наблюдения исключают возможность последнего, и скорее всего мицелий вида находится в смешанных сфагново-растительных полуразложившихся субстратах. Плодовые тела часто прикреплены основанием к листьям осок (в нескольких случаях *Carex limosa*), веточкам эрикоидных кустарничков (*Chamaedaphne*).

Все наши находки сделаны в омбротрофных типах торфяников, обводненных мочажинах (3 точки) и кустарничково-сфагновых растительных сообществах (1 точка). Точки удалены друг от друга с радиусом около 150 км. Краткое описание мест находок:

Северная точка расположена в окр. г. Ноябрьск (15.08.2008, #Kh-4145), обводненная топь в плоскобугристом комплексном омбротрофном массиве.

Окр. г. Когалым (21.08.2008, #Kh-4144), злаково-

Ascocoryne turficola is described as a species with rare findings in Europe, the Far East and North America (Newfoundland). Its habitat is connected with peatland ecosystems, where it occupies a poorly understood ecological niche. The West Siberian plain is a region where these ecosystems in their pristine state cover much of the area, particularly in the middle and north taiga zone. Information about several findings of *Ascocoryne turficola* from this area which supplement species range, ecology and morphology follows.

KEY WORDS: Helotiales, *Coryne*, *Ascocoryne*, West Siberia, fungi, fungal conservation.

сфагновая топь в озерково-грядово-топяном комплексе.

В районе г. Ханты-Мансийск сделано несколько находок на одном болотном массиве (27.09.2008, #Kh-4146; 31.08.2008, #Kh-4148; 30.08.2009, #Kh-4147; 08.09.2012, #Kh-4066), омбротрофные злаково-сфагновые топи в грядово-топяном комплексе.

В границах Юганского заповедника (18.08.2008, #Zvyagina-08.08.20-24), микропонижение (мочажина) в кустарничково-сфагновом омбротрофном сообществе.

Макро-морфологические признаки наших находок совпадают с ранними описаниями в литературе. Плодовые тела 1.5–6 см высотой, состоят из диска с острым краем и сужающейся книзу ножки, диск 0.5–2 см в диаметре, форма от трапецевидной с толстой ножкой до гвоздевидной с тонкой ножкой и резко расширяющимся диском (в молодости цилиндрические с усеченной верхней частью), поверхность диска гладкая, коричневато-оливковая, оливковая, у перезревших образцов с пурпурным оттенком, поверхность ножки слизистая, цвет от желтовато-розоватой до ярко розовой.

Микро-морфологические признаки в целом не выходят за рамки описания вида, несколько особенностей в строении тканей и спор в нашем описании сообщаются впервые. Ткани апотеция состоят из эксципула и медуллы. Самый внешний слой эксципула образован тонкими переплетенными желатинозными гифами с концевыми клетками веретеновидной и разветвленной формы (признак не был описан ранее). Следующий слой образован параллельными гифами из призматических клеток, ширина которых увеличивается внутрь ткани. Внутренний цилиндр образован желатинозными переплетенными гифами медуллы. На срезе через апотеций различается еще один слой под субгимением. Он состоит из переплетенных гиф, подобно медулле, но не желатинозных. Аски цилиндрические, с пряжкой в основании, раствор люголя окрашивает отчетливое кольцо и слабо - утолщенную часть апикального аппарата. Парафизы цилиндрические, редко ветвящиеся, с несколькими септами. Споры одноклеточные, веретеновидные с тупыми концами, верхний из которых более вытянут, и нижний притупленный, со слабым желатинозным чехлом (гетеро-полярность спор и желатинозный чехол не были описаны ранее), старые споры образуют эллипсоидные конидии на длинных отростках, размеры спор сильно варьируют между образцами, что вероятнее всего связано со стадией зрелости плодового тела.

Introduction

Our current knowledge of the geographic range of *Ascocoryne turficola* is formed from occasional sightings: it is a rare species, and its communities (peatlands) are overlooked by mycological surveys along with the ongoing reduction of peatlands in developed countries (Watling et al., 2001). Geographical distribution and publications about collections thus far are described in Bunyard et al. (2008). They are concentrated in Northern, Middle and Western Europe (Stasińska and Sotek, 2004); recent findings from North America (Newfoundland) considerably enlarge the species' distribution overseas. Because of the connection of the species with peatland ecosystems, it is probably appropriate to consider its range within the accepted zonal scheme of these communities. Known locations roughly fall into the distribution range of the boreal peatlands, which occupy about 24% of boreal forest region. However, known sites are located only in the western part of the Eurasian outline, and in the easternmost corner (Newfoundland) of the North American part of the zone. Our records add several sites in the central part of the Eurasian semicircle.

The history of taxon description is reported by Bunyard et al. (2008). Boudier (1905) first described the species as *Coryne turficola* Boud. Groves and Wilson (1967) proposed a new genus, *Ascocoryne* J.W. Groves & D.E. Wilson, for the sexual state (since *Coryne* was typified by the asexual form). It was transferred by Dennis (1968) to the genus *Sarcoleotia*, but mistakenly. Korf (1971) placed *C. turficola* in the genus *Ascocoryne* where it is now.

Molecular analysis provided by Bunyard and colleagues (2008) shows that *A. turficola* is related to the *Ascocoryne* clade (and not to *Sarcoleotia*).

Materials and methods

All our specimens were collected during forays not organized specifically to study the species. For this reason the collected data is insufficient to adequately report the quantitative distribution of *A. turficola* in the area.

Five of the records have not been preserved as herbarium specimens: however, they were photographed, which allowed reliable identification. Two collections (Kh-4066, Zvyagina-08.08.20-24) were prepared according to standard protocol for a larger fungal collection (Lodge et al., 2004).

Specimens were examined microscopically under a Zeiss Axiostar microscope and stereo-lens with a mounted AxioCam ERc5s digital camera. Sections were mounted in clear water, and dyed with water-based colorants (Congo red, fuchsin). For all microstructures except the spores, 10 measurements for each parameter were made and mean values calculated. For measurements of spores, bits of hymenophore from three mature fruitbodies in each collection were taken and 15 mature (larger) spores were measured. Average dimensions of spores (mean length and width with a 95% margin) were calculated from 45 spores. All images are available online at <http://www.flickr.com/photos/bog-fun/collections/72157631527627571/>. Description of gross morphology was completed from all records with description of micro morphology completed from two collections.

Habitat, ecology, and general habit of collections

All collections were made in the middle and northern taiga boreal belts of West Siberia within the radius of approximately 150 km. Below is a detailed description of the four locations:

First location: patterned flat-palsa bog, near the town of Noyabrsk (N63.111975° E74.479597°, 15.08.2008, #Kh-4145). Patterned flat-palsa is a peatland type common in the North. It is a complex landscape which includes higher palsas with frozen peat and wet areas of hollows and pools between them. Low areas differ in the degree of wetness (hollows, pools, or bog streams) and may be ombrotrophic or transitional (for more information see Masing et al., 2009; Peregón et al., 2009; Wieder et al., 2006). The species was found in a wet ombrotrophic hollow among *Sphagnum jensenii* and *Warnstorfia fluitans* with *Carex limosa* and *Eriophorum russeolum*. Stems of apothecia were embedded in a layer of decayed moss and leaves. The group consisted of about 10 closely growing typical fruitbodies (see morphological description below): turbinate to cupulate, from 0.5 cm to 2.5 cm high, disc olive to yellowish gray, stem always pinkish, solitary or in clusters.

Second location: ombrotrophic bog complex landform, near the town of Kogalym (N62.537330° E74.932539°, 21.08.2008, #Kh-4144). This point falls within the borders of one of the most highly bogged areas in West Siberia. Areas between narrow bayous are covered by elements of ombrotrophic landscape: ridges, hollows and multiple lakes. Specimens were collected in a hollow. Neither the exact location of the find nor the related substrate was fully described. The collection notes describe the substrate as "decaying litter," probably formed by



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Figure 1. Habitat. Southern ombrotrophic bog near Khanty-Mansiysk (left) and northern flat palsa bog near Noyabrsk (right).

some of the dominant local vegetation species: *Scheuchzeria palustris*, *Carex limosa*, *Eriophorum russeolum*, *Sphagnum jensenii*, or *Warnstorfia fluitans*. Eight typical fruitbodies grew in one spot (some in clusters): 1–2.5 cm high, with olive hymenium, and pinkish stem.

Third location: ombrotrophic bog massif, near the town of Khanty-Mansiysk. This bog is visited several times over the course of three years and yielded four collections, three of which were collected in adjacent hollows and one at some distance (N60.888786° E68.686395°, 27.09.2008, #Kh-4146; N60.892512° E68.680987°, 31.08.2008, #Kh-4148; N60.885361° E68.652620°, 30.08.2009, #Kh-4147; N60.889245° E68.681374°, 08.09.2012, #Kh-4066). The bog is a complex of two communities: raised ridges and hummocks formed by *Sphagnum fuscum*, a well developed tree layer (*Pinus sylvestris*, *P. sibirica*), and dwarf shrubs layered with some herbs, and lower wet areas between ridges occupied by hollows. The ridges are formed by hydrophilic sphagnum (*S. jensenii*, *S. majus*, *S. papillosum* dominate), and sparse graminoids and herbs: *Carex limosa*, *Scheuchzeria palustris*, *Eriophorum vaginatum*, *Oxycoccus palustris*, and *Drosera* spp. All findings there were in principally similar sedge-sphagnum hollows. On one occasion 20 fruitbodies, some

clustered, were found. It was often possible to trace the rooting bases of stems to litter of *Carex limosa* buried in *Sphagnum*. However, since litter of sedge and sphagnum are intermixed here, and always wet and partially decayed, the hyphae probably spread in the *Sphagnum*, as well as, sedge litter. The last finding from the site (2012) has been herbarized and morphologically described (see description below).

Fourth location: ombrotrophic bog massif, Natural Reserve Yuganskiy (N60.021295° E74.462242°, 18.08.2008, #Zvyagina-08.08.20-24). This is a community of dwarf shrubs and sphagnum, with micro complexity of hummocks and hollows. The dwarf shrub layer is dominated by *Chamaedaphne calculate*, and *Betula nana*. The sphagnum layer is formed by *Sphagnum fuscum*, *S. papillosum*, and *S. jensenii*. Collection was done in hollows among *Sphagnum jensenii*, where 10 fruitbodies grew in two clusters. Stems were buried in leaf-sphagnum litter and attached to branches of dwarf shrubs.

Morphological description

Fruitbodies 1.5–6 cm high, disc 0.5–2 cm wide in maturity, emerging as a cylinder with tapering base and truncated top, the upper part later expanding into a disc. Depending on growth conditions, the overall shape may be turbinate to stipitate-turbinate when stem is thick and short, but occasionally

with a long thin stem and cupulate disc. *Hymenium*, even when young, displayed the irregular convexity and knobs, but in the overmature state the edge inflexed to the stem. The edge between the hymenial part and outside was sharp and clear. The stem ranged from thick turbinated (often distorted) to thin cylindrical, gradually tapering to an end point, with the outside being smooth and slimy. Fruitbodies usually have olive discs and pinkish stems, but the appearance varies depending on age and conditions. Overmature disc becomes purple, and several mature fruitbodies were collected with yellowish gray discs. Stem is bright pinkish to reddish brown when young (cylindrical state), then yellowish or pinkish.

A radial section through the receptacle reveals several layers: excipulum, medulla made up of two layers, and hymenium. A transverse section through the stem opens into an outer gelatinous layer, excipulum and medulla.

The outer layer in stem is thin, gelatinous, poorly staining in Congo Red, and can be seen as a pale outline in cross-section of the stem mounted in this dye. The hyphae are straight and flexuous, intertwined and loosely embedded in a gelatinous matrix, cells about 1.6 x 40 µm.

Hyphae have enlarged fusoid end cells. This layer reaches receptacle in some specimens, but is best presented in the stem. In the interior lies a congophilous



Figure 2. Gross morphology of apothecia. #Kh-4066 – collection near Khanty-Mansiysk pictured in studio and in situ. #4145 – collection from flat palsa bog near Noyabrsk. #Zvyagina-08.08.20-24 – specimen from Natural Reserve Yuganskiy. #4147 – example of overmature coloration of hymenial surface (collection near Khanty-Mansiysk, late autumn). Bar equals 1 cm.

layer of excipulum made of parallel hyphae (textura prismatica). The hyphae gradually become broader towards the center (3.7–13 μm), and are clearly septate with cylindrical to ellipsoid cells about 40 μm long.

Medullary excipulum is made up of gelatinous material. It stains pale in Congo Red and is hence well distinguishable in a section mounted in this dye (hyphae stained well by fuchsine). The hyphae are intertwined and embedded in a gelatinous matrix, septate at different distances, with cells about 4.6 x 40 μm .

Plectal layers in the receptacle have a similar pattern except medullary excipulum, which is divided into two layers. The lower gelatinous layer is similar in structure to the stem. Between it and the subhymenium lies a layer of intertwined but not gelatinous hyphae. These layers are well differentiated in cross-sections of dry specimens, where the gelatinous layer appears compact and firm and the upper layer is quite friable.

The upper surface of the disc is lined

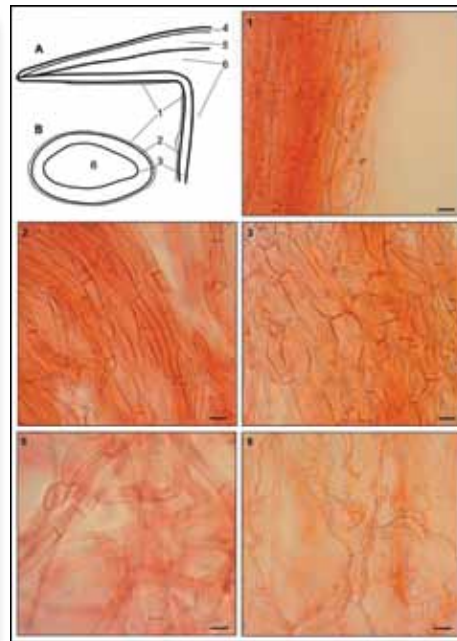


Figure 3. Microphotographs showing the arrangement of plectas; bar equals 10 μm . A. Radial section through the receptacle. B. Transverse section through the stem. 1. Outer layer of gelatinous tissue from the stem. 2. Outer layer of excipulum made up of thin hyphae. 3. Inner layer of excipulum composed of hyphae with enlarged cells. 4. Hymenium and subhymenium. 5. Medulla from upper part of receptacle. 6. Medulla from stem.

with the hymenial layer with a thin subhymenial layer underneath.

Asci cylindrical, 129 (118–137) x 9 (8–10) μm (in dead state), sessile or with a short stalk, sit on short flat ascogoneous cell with a clamp. Tests with lugol solution shows amyloid ring and weak reaction in apical thickening. Paraphyses cylindrical, the same length as asci, 1.2 μm broad, unbranched or branched at base into 2 or 3 parts, segmented with 4–6 evident septa, the upper segment slightly enlarged up to 1.6 μm . Spores uniseriate, unicellular, and fusoid (with basal end more obtuse and upper end more attenuated). Each spore contains 1–3 big, round guttules and several smaller ones (as seen in the dead state from rehydrated specimen). Some spores embedded in loose inconsistent gelatinous sheath. Old discharged spores collected from the stem surface become segmented and produce ellipsoid conidia (4.5 x 2.5 μm).

Spore dimensions for third collection (#Kh-4066): 16.3 (14.8–17.7) x 5.1 (4.7–5.8), Q=3.21 (45 spores from 3

ascoma). Spore dimensions for the fourth collection (Zvyagina-08.08.20-24): 12.6 (11–14) x 4.3 (4–5) Q=2.98 (55 spores from 3 ascoma).

Conclusions

All specimens were collected in ombrotrophic peatland ecosystems, meaning that the species is well-adapted to conditions of poor mineral nutrition, wetness, acidity, and presence of *Sphagnum* species. *Ascocoryne turficola* specimens were recorded from principally similar sedge–sphagnum hollow communities that are common in the area. *Ascocoryne turficola* is usually found close to leaves of sedge (*Carex limosa* in two cases where the exact locations were recorded) buried in dead sphagnum litter, but doesn't grow exactly on sedge stems. In one case, stems were attached to buried branches of dwarf shrubs. The mycelium probably spreads widely in the dead sphagnum-litter layer, but undecayed remains of sedge or other plants initiates fructification.

The gross morphology of our collections doesn't differ from earlier descriptions.

Some elements of micromorphology have not been described before. Spore shape in our records (subfusoid) differs from earlier records (fusoid). There were fusoid spores observed inside asci, but released large spores were supposed to have pointed-obtuse ends. There is a gelatinous sheath around spores, which has not been registered before. Spore sizes fall within the range of sizes described earlier by different authors, but the dimensions of two of our collections did not coincide. Bunyard et al. (2008) mentions the variability of spore sizes between different collections of the species, and our data serves as additional evidence of that observation.

Ascocoryne turficola was recommended to be included in the next edition of the Red List of fungi of the Khanty-Mansiyskiy region (due in 2013) (Red book of KHAMAO, 2003).

Aknowledgements

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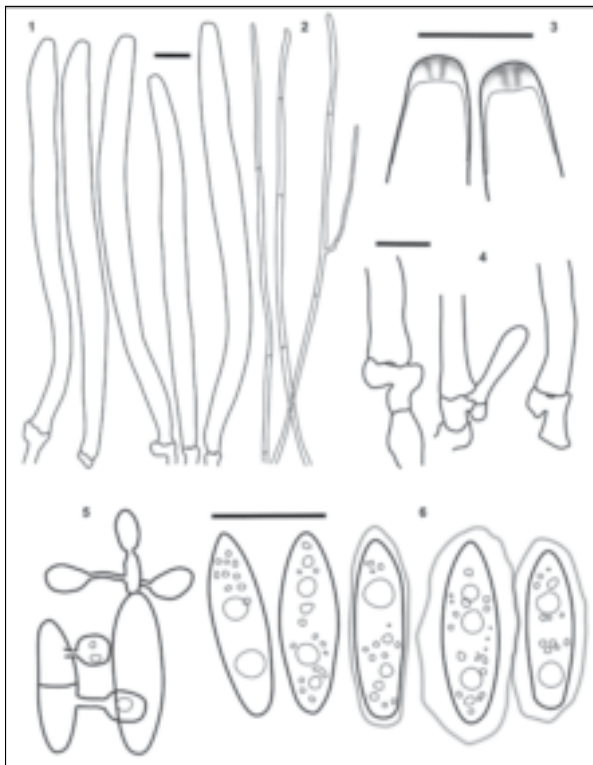


Figure 4. The structures of hymenium. 1. Asci. 2. Paraphyses. 3. Ascus ring stained in lugol. 4. Croziers at the base of asci. 5. Overmature spores with conidia 6. Normal spores with and without gel sheaths. Bar equals 10 µm.

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Short Season

*Mother and daughter in the Lizard Head Wilderness,
on their knees picking chanterelles.*

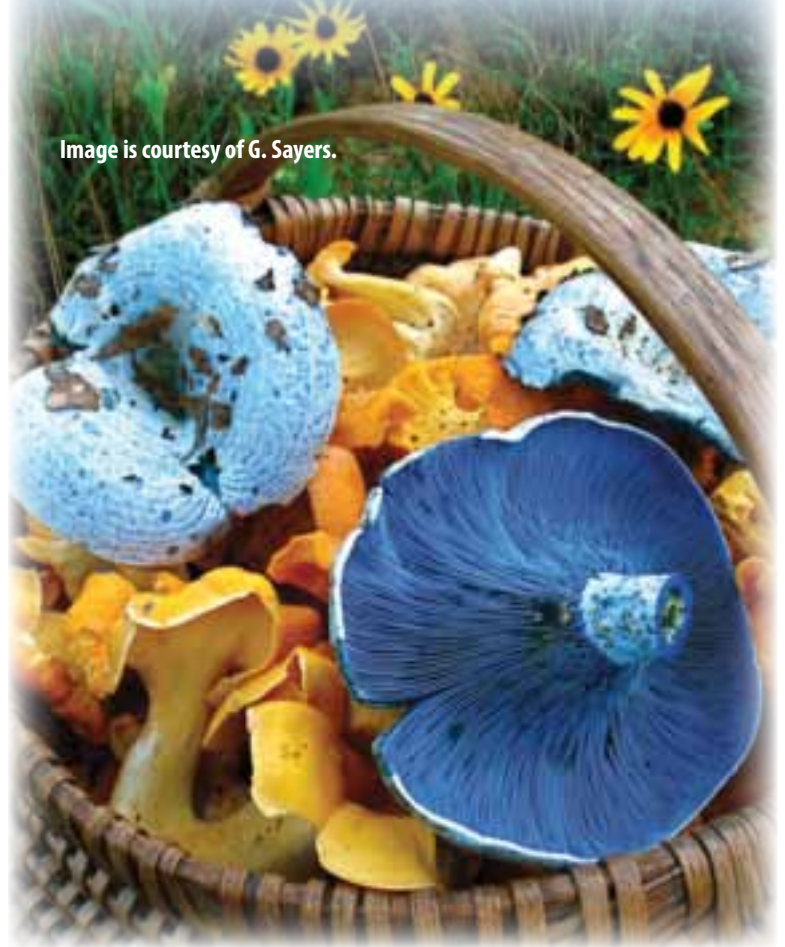
It will be late before they return.

What is more priceless than a heavy basket of mushrooms.

I keep out of sight because I would be frightening.

Peter Waldor -from his book *The Wilderness Poetry of Wu Xin* (Pinyon Publ., Montrose, 2013) and used here with permission of the author.

Image is courtesy of G. Sayers.



The risen

To speak it is to become it.

**Divining the dimensions
of a space it has taken**

Beneath me

**The way it summons
by coloring**

**The air: its edict.
And I, servant, humbly**

**With knife and pan
and butter,**

**Raze and raise
the fruiting body.**

**Divining the dimensions
of the space it is taking;**

To eat it is to become it.

Haz M. Said
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