

# New and rare macromycetes and bryophytes from montane peat habitats in Bulgaria

Melania Gyosheva\* & Anna Ganeva

Institute of Botany, Bulgarian Academy of Sciences, 23 Acad. G. Bonchev St., 1113 Sofia, Bulgaria

Received: June 27, 2003 / Accepted: August 12, 2003

**Abstract.** Data on the species diversity of macromycetes and bryophytes from montane peat habitats of three floristic regions in Bulgaria are here reported. Twelve macromycetes are new to Bulgaria: *Cortinarius sphagneti*, *C. sphagnogenus*, *Galerina paludosa*, *Hygrocybe ceracea*, *Inocybe acutella*, *I. napipes*, *Lactarius sphagneti*, *L. vietus*, *Mycena concolor*, *M. megaspora*, *Pholiota myosotis*, and *Psilocybe elongata*. Five macromycetes are rare for Bulgaria: *Arrhenia lobata*, *Cortinarius paleaceus*, *Galerina sphagnorum*, *Mycena adonis*, and *Psilocybe polytrichi*. A number of recorded macromycetes grow on Bryophyta. As regards bryophytes two are new to Rhodopi Mts and one to Rila Mts. Besides new chorological data are reported for three bryophytes. Nine macromycetes and two bryophytes, reported in this paper, are of high conservation importance.

**Key words:** bryophytes, Bulgaria, chorological data, macromycetes, peat habitats

## Introduction

Peat bogs are among the priority habitats for conservation listed in Annex I of the Habitats Directive in the EC project 'Natura 2000'. As reported by Arnolds (1992), Kost (1992), Perini *et al.* (2002), many macromycetes are present in peat bogs and a great number of them grow, as saprotrophs and parasites, in close relation with bryophytes (moss and *Sphagnum* spp.). In Bulgaria, knowledge of bryological flora and mycodiversity in peat bogs habitats is still scarce. Towards filling this gap in our knowledge, data on macromycetes and bryophytes diversity in some montane peat habitats in Mt Vitoshka, Rila Mts, and Rhodopi Mts are reported in this paper.

This paper also includes morphological descriptions on 12 macromycetes reported for the first time from Bulgaria and new chorological information on 5 rare macromycetes. Eight macromycetes found are bryophilous (Arnolds 1992; Kost 1992; Courtecuisse & Duhem 1995; Perini *et al.* 2002).

As a contribution to the knowledge of plant diversity in peat bogs, the bryological flora was also investigated.

Seventeen bryophytes were found, three of which were reported for the first time from Rila Mts and Rhodopi Mts.

Within context of the 'Natura 2000' project we consider data on macromycetes and bryophytes as being very important for the complete evaluation of biodiversity in peat habitats of Bulgaria. The presence of macromycetes and bryophytes with high conservation value included in some European Red Lists (Ganeva 1998; Koune 1999; Perini *et al.* 2002) is noteworthy.

## Materials and Methods

The investigations on macromycetes and bryological flora were carried out during the period 1998–2002. Six peat habitats, located between 1300 and 1950 m, in coniferous and subalpine belts were studied: (i) Mt Vitoshka: above Aleko chalet, 1950 m; (ii) Rila Mts: in Borovets locality near 'Malina' tourist-rest area, 1380 m; (iii) Rila Mts: in Mokrata Polyana locality above the village of Govedartsa, 1300 m; (iv) Rila Mts: near Radovichka River, 1866 m; (v) Western Rhodopi Mts: Longourli locality, 1600 m; (vi) Western Rhodopi Mts: Chairski Ezera locality, waterside zone of Golemiya Gyol lake, 1433 m.

\*Corresponding author: e-mail: gyosheva@biofac.uni-sofia.bg

Voucher specimens of collected macromycetes are kept in the Mycological Collection of the Institute of Botany, Bulgarian Academy of Sciences (SOMF), while voucher specimens of bryophytes are kept in the Herbarium of the Institute of Botany (SOM).

Bryophyte nomenclature is according to Corley *et al.* (1981). Macromycete nomenclature is according to Kirk *et al.* (2001). The macromycetes were identified using Moser (1978), Nezdoyminogo (1983), Ryman & Holmåsén (1992), Courtecuisse & Duhem (1995). The macromycetes with conservation value are designated in the list below with 'CV'. The term 'conservation value' is used here according to Koune (1999) and Perini *et al.* (2002). The bryophyloous macromycetes were identified according to Arnolds (1992), Ryman & Holmåsén (1992), Courtecuisse & Duhem (1995), Perini *et al.* (2002).

## The bryological flora and new records for Bulgaria

Seventeen bryophytes were found in peat bogs of Bulgaria: *Sphagnum squarrosum* Crome, *S. teres* (Schimp.) Ångstr., *S. flexuosum* Dozy & Molk., *S. centrale* C.E.O. Jensen ex Arn. & C.E.O. Jensen, *S. girgensohnii* Russow, *S. fallax* (Klinggr.) Klinggr., *S. contortum* K.F. Schultz., *Polytrichum commune* Hedw., *Plagiomnium affine* (Blandow) T.J. Kop., *Rhizomnium punctatum* (Hedw.) T.J. Kop., *Dicranella palustris* (Dicks.) Crundw. ex E. Warb., *Calliergon giganteum* (Schimp.) Kindb., *C. cordifolium* (Hedw.) Kindb., *Calliergonella cuspidata* (Hedw.) Loeske, *Climacium dendroides* (Hedw.) F. Weber & D. Mohr, *Drepanocladus exannulatus* (Bruch, Schimp. & W. Gümbel) Warnst., *Rhytidiadelphus triquetrus* (Hedw.) Warnst.

Among the taxa recorded, the following are reported for the first time from Rila Mts and Rhodopi Mts:

*Calliergon giganteum* – a vulnerable bryophyte in Bulgaria (Ganeva 1998) collected in a peat habitat in the Tsigov Chark locality, Western Rhodopi Mts by M. Gyosheva (SOM 8027-B). This species was known from Rila Mts (Petrov 1963).

*Calliergon cordifolium* – a new species to Rhodopi Mts, collected by M. Gyosheva in Chairski Ezera locality (SOM 8021-B) together with *Calliergonella cuspidata*, *Polytrichum commune*, *Climacium dendroides*, *Sphagnum squarrosum*. On dryer localities, *Rhytidiadelphus triquetrus* and *Plagiomnium affine* were found. *Calliergon cordifolium* was previously reported from Mt Vitosha (Petrov 1956; Simon & Vajda 1959), Pirin Mts (Simon & Vajda 1959), and Western Balkan Range (Petrov 1963).

*Sphagnum flexuosum* – a new species to Rila Mts, collected by M. Gyosheva in Borovets locality (SOM 8056-B). The species was reported up to now from Rhodopi Mts and Western Balkan Range (Stefanoff & Yordanoff 1931; Szepesfalvi 1932; Petrov 1963).

Among the bryophytes collected in the Longourli locality (Rhodopi Mts) the rare *Sphagnum fallax* was found growing with *S. teres*, *S. centrale*, and *S. girgensohnii*. This species

was previously reported from Western Rhodopi Mts (Shiroka Polyana locality and Malka Syutkya peak) and Western Balkan Range (Petrov 1963).

In Rila Mts near Radovichka River, where *Lactarius sphagneti* (Fr.) Gröger was collected, three *Sphagnum* species were found: *S. squarrosum*, *S. girgensohnii*, *S. contortum* K.F. Schultz. They grow together with other hygrophytes like *Calliergonella cuspidata*, *Drepanocladus exannulatus*, *Dicranella palustris*.

## New records of macromycetes from Bulgaria

### Basidiomycetes

#### Agaricales

#### Cortinariaceae

*Cortinarius sphagneti* P.D. Orton (*C. palustris* (M.M. Moser) Nezdoym. var. *sphagneti* (P.D. Orton) Nezdoym., *Dermocybe palustris* (M.M. Moser) M.M. Moser var. *sphagneti* (P.D. Orton) M.M. Moser)

**Pileus** 2-3 cm, campanulate, then almost flattened, olive-yellow brownish, rusty-brown, olive-brown to dark brown. Lamellae young broadly adnate, olive greenish to olive brownish or dark brown. **Stipe** 5-10 (-12) × 0.3-0.5 cm cylindrical, olive greenish, then olive-brown, without bands-veil remains. Flesh light olive greenish. **Basidiospores** 7-9 × 4-5.5 μm, ellipsoid to almond shaped, slightly warty, yellow brownish.

Habitat: among *Sphagnum* in a peat bog, under *Picea abies* and *Pinus silvestris*.

Western Rhodopi Mts: Longourli locality, 1600 m, 27 Aug 1998, V. Vasilev (VV) (SOMF 25 494).

*Cortinarius sphagnogenus* (M.M. Moser) Nezdoym. (*Dermocybe sphagnogena* M.M. Moser)

**Pileus** 1.5-4 cm, convex, yellow-brown, rusty-yellow brownish to dark brown, fibrillose. Lamellae adnate, olive yellowish. **Stipe** 5-8 × 0.3-0.6 cm, cylindrical, at first yellow, then rusty-brown, olivaceous, fibrillose, without bands. Flesh olive yellowish. **Basidiospores** 8-11 × 4.5-6 μm, ellipsoid, warty, rusty-brown.

Habitat: among *Sphagnum* in a peat bog, under *Picea abies*.

North-Eastern Rila Mts: Borovets locality, 1380 m, 4 Sep 2002, M. Gyosheva (MG) (SOMF 25 495).

CV *Galerina paludosa* (Fr.) Kühner

**Pileus** 0.5-2 cm, conical, convex, radially striate, yellow-brown, rusty-brown, drying yellow ochraceous, fibrillose. Lamellae broadly adnate, distant, dirty yellow-brown. **Stipe** 5-12 × 0.1-0.3 cm, cylindrical, hollow, ochre-yellow, yellow-brown, darker at base, with ring zone (white belts-veil remains), below fibrous to flaky. Cortina white. Flesh thin, pale brown. **Basidiospores** 9-11 (-12) × 5-7 μm, almond shaped, finely warty, brownish. Cheilocystidia lageniform.

Habitat: among *Sphagnum* in a peat bog; a bryophilous species.

North-Eastern Rila Mts: Borovets locality, 1380 m, 16 Sep 2001, MG (SOMF 25 496); Western Rhodopi Mts: Chairski Ezera locality, waterside zone of lake Golemiya Gyol, 1433 m, 7 Jun 2002, MG (SOMF 25 497); Western Rhodopi Mts: Longourli locality, 1600 m, 7 Jun 2002, MG (SOMF 25 498).

*Inocybe acutella* Bon (*I. acuta* Boud., *I. umboninota* (Peck) J.E. Lange)

**Pileus** 1.5-3 cm, sharply conical, then expanded-umbonate, ochre-brownish, darker at centre, fibrous-cracked. Lamellae adnate, crowded, at first whitish, then ochre-brownish. **Stipe** 2-5 × 0.3-0.5 cm, cylindrical, with basal bulb, brownish, whitish at apex. Flesh thin, whitish, brownish in stem. **Basidiospores** 8-10 (–11) × 5-6.5 μm, ellipsoid, particularly polygonal-lumpy, pale brownish. Cheilocystidia fusiform.

Habitat: among *Sphagnum* in a peat bog, under *Picea abies* and *Pinus silvestris*.

Western Rhodopi Mts: Longourli locality, 1600 m, 27 Aug 1998, VV (SOMF 25 499).

*Inocybe napipes* J.E. Lange

**Pileus** 2-5 cm, conical to campanulate, later almost plane, sharply umbonate, brownish, hazel brownish, radially fibrous-cracked. Lamellae adnate, narrow, at first whitish, then grey brownish or pale brownish. **Stipe** 3-7 × 0.3-0.7 cm, cylindrical, with basal bulb, pale brownish, whitish at apex, fibrillose. Flesh thin, whitish, brownish at stipe. **Basidiospores** 8-10 × 5.5-7.5 μm, oblong, particularly nodulose (lumpy), pale brownish. Cheilocystidia ventricose, with crystal heads.

Habitat: among *Sphagnum* in a peat bog, under *Picea abies* and *Pinus silvestris*.

Western Rhodopi Mts: Longourli locality, 1600 m, 5 Aug 2002, MG (SOMF 25 500).

### Strophariaceae

CV *Pholiota myosotis* (Fr. : Fr.) Singer (*Hemipholiota myosotis* (Fr. : Fr.) Bon)

**Pileus** 1-4 cm, semiglobose, campanulate, later flattened, pale olive-yellow brownish, olive-brown, old yellowish, smooth, viscid. Lamellae adnate, olive-brown with whitish edge. **Stipe** 5-10 (–12) × 0.2-0.5 cm, cylindrical, elongated, hollow, floccose-fibrous. Flesh thin, yellowish. **Basidiospores** 17-19 (–20) × 7-9 μm, almond shaped, smooth, dark brown. Cheilocystidia lageniform, hyaline.

Habitat: among *Sphagnum* in a peat bog; a bryophilous species.

Western Rhodopi Mts: Longourli locality, 1600 m, 26 Aug 1998, VV (SOMF 25 491).

CV *Psilocybe elongata* (Pers. : Fr.) J. Lange (*Hypholoma elongatipes* (Peck) A.H. Sm.)

**Pileus** 0.8-2 cm, semiglobose, convex to campanulate, then almost flattened, pale honey-yellow, olive-yellow brownish, drying ochre-yellowish, margin finely striate, fibrillose. Lamellae adnate, yellowish, ochre-brown to gray-brown whit-

ish edge. **Stipe** 7-10 × 0.1-0.3 cm, cylindrical, smooth, hollow, whitish to ochre yellowish, paler at apex, brownish below finely fibrillose. Flesh thin, pale yellowish. **Basidiospores** 9-10 (–11.5) × 5.5-6.5 (–7) μm, ellipsoid, with pore, smooth, dark brown. Cheilocystidia lageniform, hyaline.

Habitat: among *Sphagnum* in a peat bog; a bryophilous species.

Western Rhodopi Mts: Longourli locality, 1600 m, 7 Jun 2002, MG (SOMF 25 490).

### Tricholomataceae

CV *Hygrocybe ceracea* (Fr. : Fr.) P. Kumm.

**Pileus** 1-2.5 cm, convex to applanate, yellow, orange-yellow, drying straw to wax yellow, finely striate at margin, viscid. Lamellae adnate, slightly decurrent, yellow or yellow-orange with a paler edge. **Stipe** 2-5 × 0.2-0.5 cm, cylindrical, concolorous with pileus, dry. Flesh thin, pale yellow. **Basidiospores** 5.5-7.5 (–8) × 3-4.5 μm, ellipsoid, smooth, hyaline.

Habitat: on the ground among mosses and grasses in open grassy place.

Western Rhodopi Mts: Chairski Ezera locality, near the lake Golemiya Gyol, 1450 m, 7 Jun 2002, MG (SOMF 25 489).

*Mycena concolor* (J.E. Lange) Kühner (*Omphalina picta* var. *concolor* J.E. Lange)

**Pileus** 0.5-1 cm, conical to campanulate, hygrophanous, translucently radially sulcate-striate when moist, dark grey-brown, the margin paler greyish or brownish. Lamellae adnate with decurrent tooth, distant, greyish to whitish. **Stipe** 3-5 × 0.1-0.2 cm, cylindrical, hollow, fragile, glabrous, dark grey-brown at first, then paler. Flesh thin, greyish. Smell not distinctive. **Basidiospores** 7-10 × 3-5 μm, ellipsoid to almost cylindrical, hyaline.

Habitat: among *Sphagnum* in peat bog; a bryophilous species.

Western Rhodopi Mts: Longourli locality, 1600 m, 7 Jun 2002, MG (SOMF 25 492).

CV *Mycena megalispora* Kauffman

**Pileus** 1-2 cm, obtusely campanulate, then broadly convex to almost flattened, umbonate, subhygrophanous, finely radially sulcate-striate when moist, dark grey-brown, grey, the margin paler greyish. Lamellae adnate, narrow, grey to whitish. **Stipe** 5-12 × 0.1-0.4 cm, cylindrical, hollow, cartilaginous, glabrous, grey-brown, paler at apex. Flesh thin cartilaginous, white. Smell not distinctive. **Basidiospores** 10-13 (–16) × 6-8 (–9) μm, broadly ellipsoid, hyaline.

Habitat: among *Sphagnum* in a peat bog; a bryophilous species.

Western Rhodopi Mts: Longourli locality, 1600 m, 26 Aug 1998, VV (SOMF 25 493).

### Russulales

#### Russulaceae

CV *Lactarius sphagneti* (Fr.) Gröger

**Pileus** 3-5 cm, convex, then depressed, deep red-brown, the margin paler. Lamellae decurrent, pinkish to ochre brownish. **Stipe** 3-5 × 0.5-1 cm, cylindrical, hollow, concolorous with pileus or paler, darker at base. Flesh ochre pinkish, ochre brownish. Latex white, mild. **Basidiospores** 7.5-8.5 (–9) × 6-7 µm, broadly ellipsoid.

Habitat: among *Sphagnum* under *Picea abies*.

South-Western Rila Mts: near Radovichka River, 1866 m, 31 Jul 2001, MG (SOMF 25 501).

*Lactarius vietus* (Fr. : Fr.) Fr.

**Pileus** 2.5-4 cm, at first flattened-convex, then depressed to widely infundibuliform, grey-brown pinkish, beige pinkish, slightly viscid when moist, wrinkled at first, with wavy margin. Lamellae decurrent, crowded, narrow ochre yellowish. **Stipe** 2.5-7 × 0.5-1 cm, cylindrical, hollow, paler than pileus. Flesh thin, beige pinkish. Latex white, drying greyish, acrid. **Basidiospores** 7.5-9.5 × 6-7.5 µm, broadly ellipsoid, pale cream.

Habitat: Among *Sphagnum* in a peat bog under *Picea abies* and *Pinus silvestris*.

North-Eastern Rila Mts: Borovets locality, 1380 m, 4 Sep 2002, MG (SOMF 25 502).

## Rare macromycetes from Bulgaria

### Basidiomycetes

#### Agaricales

#### Cortinariaceae

*Cortinarius paleaceus* Fr.

Habitat: among *Sphagnum* in a peat bog, under *Picea abies*.

North-Eastern Rila Mts: Borovets locality, 1380 m, 4 Sep 2002, MG (SOMF 25 507); Mokrata Polyana locality above village of Govedartsi, 1300 m, 2 Sep 2002, MG (SOMF 25 508).

The species was reported in Bulgaria only from Western Sredna Gora Mt (Dimcheva *et al.* 1992).

CV *Galerina sphagnorum* (Pers. : Fr.) Kühner

Habitat: among *Sphagnum* in a peat bog, a bryophilous species.

Western Rhodopi Mts: Longourli locality, 1600 m, 25 Aug 1998, VV (SOMF 25 509); Chairski Ezera locality, waterside zone of lake Golemiya Gyol, 1433 m, 7 Jun 2002, MG (SOMF 25 510).

The species was reported in Bulgaria only from Rila Mts from a peat bog in Borovets (Gyosheva 1996).

#### Strophariaceae

*Psilocybe polytrichi* (Fr. : Fr.) Pearson & Dennis (*Hypholoma polytrichi* (Fr. : Fr.) Ricken)

Habitat: among *Sphagnum* in a peat bog; a bryophilous species.

Western Rhodopi Mts: Longourli locality, 1600 m, 26 Aug 1998, VV (SOMF 25 503).

The species was reported only from Rila Mts in Bulgaria, also from a peat habitat (Gyosheva & Denchev 2000).

#### Tricholomataceae

CV *Arrhenia lobata* (Pers. : Fr.) Redhead (*Dictyolus lobatus* Pers. : Fr., *Leptoglossum lobatum* (Pers. : Fr.) Ricken)

Habitat: among mosses (*Drepanocladus exannulatus*) in a peat bog; a bryophilous species.

Mt Vitosha: above Aleko chalet, 1950 m, 6 Jun 2000, R. Nacheva (SOMF 25 504).

The species was reported only once for Bulgaria from Mt Strandzha (Barsakoff 1932).

CV *Mycena adonis* (Bull. : Fr.) S.F. Gray

Habitat: among *Sphagnum* in a peat bog.

North-Eastern Rila Mts: Borovets locality, 1380 m, 24 Aug 1999, MG (SOMF 25 505).

The species was reported only once for Bulgaria, also from Rila Mts (Gyosheva & Denchev 2000).

## References

- Arnolds, E. 1992. Macrofungual communities outside forests. – In: W. Winterhoff [ed.]. Handbook of vegetation science. Vol. 19(1). Pp. 113-149. Kluwer Academic Publishers, Dordrecht.
- Barsakoff, B. 1932. [Zwei Tuberarten und einige für Bulgarien neue Pilzarten]. – Bulletin de la Société Botanique de Bulgarie 5: 84-86. (In Bulgarian)
- Corley, M.F.V., Crundwell, A.C., Düll, R., Hill, M.O. & Smith, A.J.E. 1981. Mosses of Europe and Azores: an annotated list of species, with synonyms from the recent literature. Journal of Bryology 11: 609-689.
- Courtecuisse, R. & Duhem, B. 1995. Mushrooms & toadstools of Britain and Europe. Harper Collins Publishers, London.
- Dimcheva, M., Gyosheva, M. & Mihov, P. 1992. [New and rare taxa macromycetes for Bulgaria]. – Fitologija 42: 84-87. (In Bulgarian)
- Ganeva, A. 1998. Preliminary data on Bulgarian threatened bryophytes. – Lindbergia 23: 33-37.
- Gyosheva, M. 1996. New and rare taxa macromycetes to Bulgaria, found in Rila Mountain. – Phytologia Balcanica 2(1): 99-104.
- Gyosheva, M. & Denchev, C. 2000. Biodiversity of macromycetes in the Rila National Park. – In: M. Sakalian [ed.]. Biological diversity of the Rila National Park, pp. 149-176. Pensoft, Sofia.
- Kirk, P.M., Cannon, P.F., David, J.C. & Stalpers, J.A. [eds] 2001. Dictionary of the fungi. 9th edn. CAB International, Oxon.
- Kost, G. 1992. Macrofungi in soil in coniferous forest. – In: W. Winterhoff [ed.]. Handbook of vegetation science. Vol. 19(1). Pp. 49-111. Kluwer Academic Publishers, Dordrecht.
- Koune, J.P. 1999. Study of threatened mushrooms in Europe. Document T-PVS (1999) 39. Council of Europe, Strasbourg.
- Moser, M. 1978. Basidiomyceten II. Die Röhrlinge und Blätterpilze (Agaricales). – In: H. Gams [ed.]. Kleine Kryptogamenflora. Band 2b/2. G. Fischer Verlag, Stuttgart, New York.

- Nezdoymingov, E.L. 1983. [Agarics of USSR. Genus *Cortinarius* Fr.]. Naouka, Leningrad. (In Russian)
- Perini, C., Bonini, I., Romagnoli, P., Antonini, D. & Antonini, M. 2002. Macrofungi and bryophytes of montane mires (Tuscany, Italy): organisms worthy of conservation. – *Feddes Repertorium* **113**: 152-160.
- Petrov, S. 1956. [Beitrag zur Moosflora Bulgariens]. – *Izvestiya na Botanicheskiya Institut (Sofia)* **5**: 371-376. (In Bulgarian)
- Petrov, S. 1963. [Neuer Beitrag zur Kenntnis der Moosflora Bulgariens]. – *Izvestiya na Botanicheskiya Institut (Sofia)* **11**: 167-187. (In Bulgarian)
- Ryman, S. & Holmåsén, I. 1992. *Pilze*. Bernhard Thalacker Verlag, Braunschweig.
- Simon, T. & Vajda, L. 1959. Beiträge zur Moosflora Bulgariens. – *Annales Universitatis Scientiarum Budapestensis, Sectio Biologica* **2**: 259-272.
- Stefanoff, B. & Yordanoff, D. 1931. [Materialien zur Kenntnis der Moorvegetation in den West Rhodopen (Dospadgebirge)]. – *Annuaire de l'Université de Sofia, Faculté d'Agronomie et de Sylviculture* **9**: 33-70. (In Bulgarian)
- Szepesfalvi, I. 1932. Ein kleiner Beitrag zur Moosflora von Bulgarien. – *Magyar Botanikai Lapok* **31**(1/12): 47-51.