

Elaphomyces muricatus and *Fischerula macrospora*, two interesting hypogeous fungi from Greece

George KONSTANTINIDIS

Aristidou 17

TK 51100, Grevena – Greece

manitarock@hotmail.gr

Vasileios KAOUNAS

Sokratous 40

TK 19016, Artemis Attiki – Greece

bkaounas@gmail.com

Ascomycete.org, 4 (5) : 95-98.

Octobre 2012

Mise en ligne le 22/10/2012



Summary: This paper discusses two hypogeous ascomycetes recently recorded in Greece, *Elaphomyces muricatus* and *Fischerula macrospora*. Descriptions based on the samples that were found are provided, accompanied by macroscopic and microscopic images.

Keywords: Ascomycota, Eurotiales, Pezizales, taxonomy.

Introduction

The arrival of the first truffle hounds from Italy in 2007 has prompted an intensive research on hypogeous fungi in Greece. This has resulted in the publication of several papers (DIAMANDIS & PERLEROU, 2008; KONSTANTINIDIS, 2009; AGNELLO & KAOUNAS, 2010 and 2011), while for some species, the Greek collections have helped clarifying important taxonomical issues (ALVARADO *et al.*, 2011; KAOUNAS *et al.*, 2011). *Elaphomyces muricatus* Fr. is widely recorded in Europe and appears to be the most common representative of the genus in Greece. By contrast, *Fischerula macrospora* Mattir. is scarcely reported and appears to be rare.

Materials and methods

Macroscopic characters are described from fresh specimens. For the microscopic examination a trinocular microscope was used, Nikon Eclipse E100, with plan achromatic objectives 4×, 10×, 40× and 100× in oil immersion. Microscopic characters were determined from sections mounted in water for pigments and measurements: Melzer's reagent and Cotton blue were used to highlight the ornamentation; Congo red was used to highlight the walls of the elements. Spore dimensions are based on at least 30 randomly selected spores, excluding ornamentation. The *Elaphomyces* specimens were discovered without the aid of hounds, while the *Fischerula* specimens were discovered with the aid of hounds. The primary sources used for identification are HAWKER (1953), PEGLER *et al.* (1993), ASTIER (1998), MONTECCHI & SARASINI (2000), GORI (2005) and KONSTANTINIDIS (2009).

Taxonomy

Elaphomyces muricatus Fr., *Syst. mycol.*, 3 (1): 59 (1829)

Synonyms

≡ *Ceraunium muricatum* (Fr.) Wallr., *Fl. Crypt. Ger.*, 2: 407 (1833).

- = *Elaphomyces variegatus* Vittad., *Monogr. Tuberc.*: 68 (1831); *Lycoperdastrum variegatum* (Vittad.) O. Kuntze, *Revis. gen. pl.*, 2: 858 (1891).
- = *Elaphomyces hirtus* Tul. & C. Tul., *Ann. Sci. Nat., Bot., sér.* 2, 16: 23 (1841).
- = *Elaphomyces scaber* J. Schröt., in Cohn, *Krypt.-Fl. Schlesien*, 3.2(1-2): 223 (1893) [1908].

Original description

E. muricatus, *globosus*, *aculeis subtetragonis stipatis muricatus*, *sporidiis nigricantibus*.

*Colore et statura priori similis, sed, differt forma magis aequali, globosa (minore saepius); duritie demum fere lignosa ob peridium junius saltim crassius; superficie tota obtecta aculeis (non pertusis) stipatis acutis! tetra-pentagonis, unde muricata, sporidiis minus intense atris et praecipue cellulis punctiformibus, Dothidearum referentibus in peridio, quo evidentior fit analogia cum Tubere; addito odore non ingrato. Color fulvus, in exoleto fuscus. Non igitur miremur Linnaeum ex externa facie hanc speciem potius cum Tubere, quam cum praecedente conjunxisse. Verum Tuber in Suecia hactenus non lectum est. Cum priori tam in fagetis, pinetis, at apud nos vulgatiore. (v. v.) Obs. 1. Memorabiles sunt illae cellulae Dothideaceae in hujus peridio et granula prioris Sphaeriaemorpha superficialia, ob quae eum Haller Sphaeriam dixit. Adhuc magis singulare videtur duas Sphaeriae species ex his tantum oriri, quare pro illarum volvis habitis fuerunt. Hactenus equidem Sphaeriam capitatam ad *El. granulatum*, *Spl. ophioglossoidem* in *El. muricato legi*; quod tamen omnino constans esse, nondum affirmare audeo.*

Description

Ascomata: subglobose to elongated, 0.5–2 (4) cm in diameter, hard, dermatoid, becoming fragile at maturity, yellow at first, then luminous tawny or orange, finally brownish-orange, ochre-brownish or mustard-brown, with small pyramidal spikes on the exoperidium, usually wrapped in a tight network of rhizomorphs arising from the mycelium. **Peridium:** 1–2.5 cm thick, variable in colour, yellowish or orange-yellow, sometimes with pink or brown areas, heterogeneous, endoperidium darker, purplish-brown, with prominent whitish veins. **Gleba:** whitish-pink or greyish-pink at first, with pinkish tramal plates, finally purplish-black and powdery. Smell insignificant or unpleasant in maturity (“of gas” according to literature).

Spores: initially hyaline, later purplish-brown, (15) 15.7–21.7 (28) × 14.5–20.6 (26) μm, with spikes up to (1.5) 1.7–2.3 (2.5) μm, having the form of a walking stick. **Asci:** subglobose to broadly ellipsoid, with thin walls, 30–40 μm in diameter, transitory.

Habitat: widespread in the northern hemisphere, fruiting gregariously throughout the year, hypogeous or semi-hypogeous under broadleaved trees (mainly *Fagus sp.* but also *Quercus sp.*, *Castanea sativa* and *Betula sp.*) and conifers (mainly *Pinus sp.*), on acidic soils. Sometimes parasitized by *Elaphocordyceps capitata* (Holmsk.) G.H. Sung, J.M. Sung & Spatafora (2007).

Studied collections: 14.04.2007, Zagora, under *Fagus sp.*, ca 1100 m, GK 2226; 28.04.2007, Elatia Drama, under *Fagus sp.*, GK 2199; 29.10.2007, Zagora, under *Fagus sp.*, ca 1100 m, VK 48; 29.06.2008, Zagora, under *Fagus sp.*, ca 1100 m, VK 432; 30.05.2009, Trikala, under *Quercus sp.*, GK 3880; 04.07.2010, Zagora, under *Fagus sp.*, ca 1100 m,

VK 1505; 01.03.2011, Platania Kozani, under *Quercus sp.*, GK 5600; 12.12.2011, Kastoria, under *Fagus sp.*, ca 1000 m, VK 2385. All above collections were determined by G. Konstantinidis and V. Kaounas and are conserved in GK and VK personal herbarium.

Notes

Some authors like PEGLER *et al.* (1993) consider *Elaphomyces reticulatus* Vittad. synonymous with *E. muricatus*, while others like LAWRYNOWICZ (2006) consider it as a form of the latter. The most obvious and constant features differentiating *E. muricatus* from *E. granulatus* and *E. asperulus*, are the fleshy layer of marbling in the peridium and the different size and ornamentation of its spores. The more similar *E. decipiens* Vittad. is distinguished by the paler color of its peridium consisting of flat warts on a white background and the almost unseparable mycelial mass usually surrounding the fruitbody. The Greek specimens by their morphological features match well the descriptions in HAWKER (1953), MONTECCHI & SARASINI (2000) and GORI (2005).



Fig. 1 – *Elaphomyces muricatus*

Left: Collection 2010 from Zagora (Greece). Picture: V. Kaounas.
Right: Detail of peridium and gleba, featuring the mature gleba and thick peridium with white veins. Picture: G. Konstantinidis.

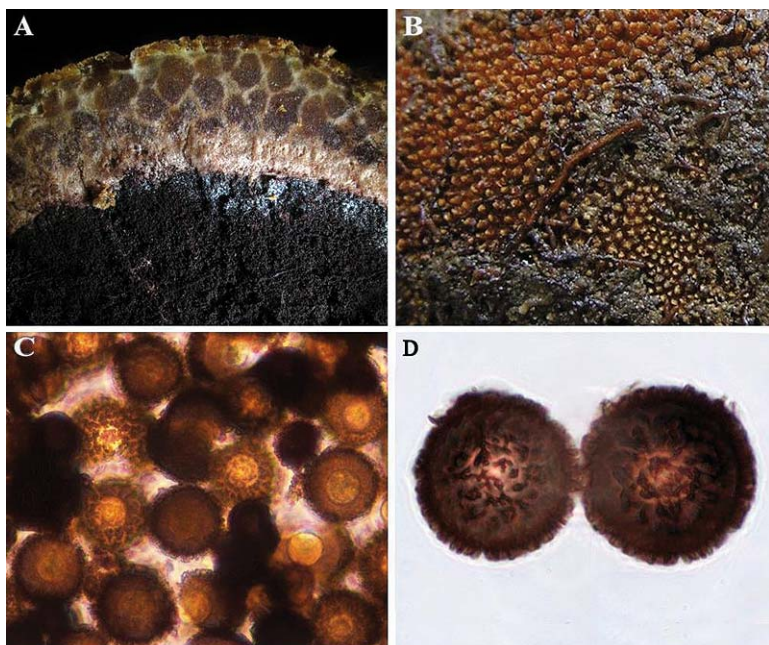


Fig. 2 – *Elaphomyces muricatus*

A. Peridium. B. Detail of the peridium, appear the dense orange pyramidoidal ledges that are overage from rhizomorphs. C. Ascospores ×400. D. Ascospores ×1000. Pictures: A, C, D = G. Konstantinidis, B = V. Kaounas.

Fischerula macrospora Mattir., *Nuovo G. bot. ital.*, 34: 1348 (1928).

Original description

Exposita Generis *Diagnosis unica tantum cum hac hucusque cognita specie convenit.*¹

Fischerula Mattirollo – Nov. Genus.

A *Tuberaceis* adhuc notis eximum hoc novum Genus, ascorum, sporumque habitu differt, dum facies universa cum aliis fungis hypogeais (praesertim e Genere « *Tuber* ») plerumque convenit.

Peridio irregulari, difformi, circumvoluto, contextu pseudoparenchymatico; colore umbrino-luteo notato.

Carne fuliginea, venis luteis filiformibus dispersis.

Ascis amplis, meiribrans spissis, formam praebentibus ovatam (130 usque ad 179 micra et ultra long. secundum sporum inclusarum numerum) basi leviter attenuatis.

Sporis raro unicis; plerumque 2-3-4 in singulis ascis, magnis (50-70 long. et ultra; 40-50 lat. et ultra); non aculeatis, nec alveolatis (uti in Genere « *Tuber* »); sed dense verrucosis; verrucis difformi-

bus, irregularibus, latis; colore saturate castaneo-badio, illum *Hydnotheriae* quodammodo referente.

Genus hoc clarissimo Eduardo FISCHER in Bernensi Athenaeo Botanices Professori, de *Tuberibus* optime merito, libenter D. et D., dum posterius accuratam illustrationem in lucem edere censeo.

Description

Ascomata: irregularly globose or lobate, 1–2 cm in diameter, brownish, yellow-brownish or ochre-brownish, darkening when touched or exposed to the air. **Peridium:** pseudoparenchymatic, covered in a reddish, tomentose layer, irregularly cracking in maturity. **Gleba:** compact, light greyish initially, finally dark brownish-grey or black with paler veins. It has a sweetish flavor and a pleasant smell, reminiscent of *Tuber* species.

Spores: ellipsoid, reddish brown, (38.7) 47.2–62.3 (77.5) × (25.8) 31.1–42.1 (55.5) μm, with the rough, dense, irregular, dark brown spikes in maturity. The dimensions of spores are similar to those of GORI (2005). **Asci:** large, oblong, thick



Fig. 3 – *Fischerula macrospora*

Left: Collection 2011 from Mainalon (Greece). Picture: G. Proutzopoulos.
Right: Collection from Gavros Kastoria (Greece). Picture: G. Konstantinidis.

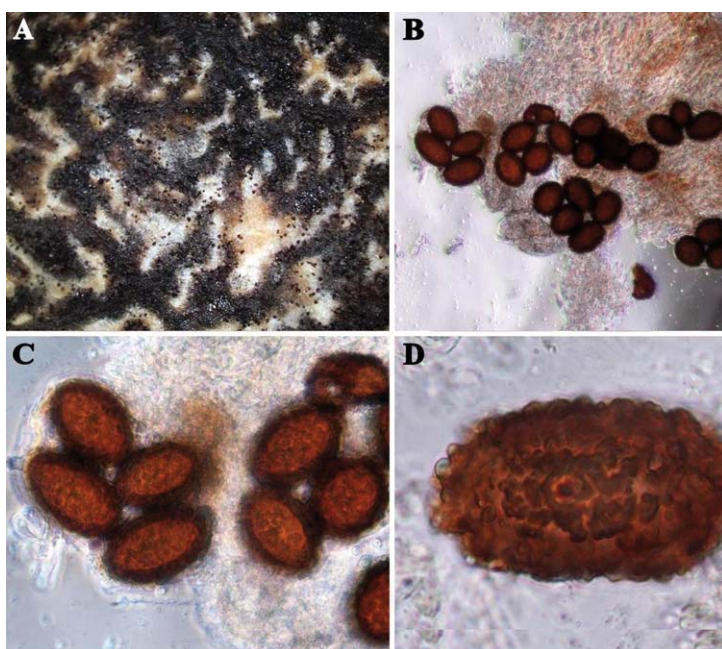


Fig. 4 – *Fischerula macrospora*

A. Gleba. B. Ascospores ×100. C. Ascospores ×400.
D. Ascospores ×1000.
Pictures: G. Konstantinidis.

¹ This diagnosis was based on the only species of the new genus *Fischerula* Matt. we report fully below.

walled, (120–180 × 60–120 µm), containing (1) 2–4 (6) ascospores.

Habitat: fruiting hypogeously in fall under broadleaved trees.

Studied collections: 01.11.2007, Gavros Kastoria, under *Fagus sp.*, ca 850 m, GK 2679; 07.11.2007, Gavros Kastoria, under *Fagus sp.*, ca 850 m, GK 2748; 15.10.2011, Mainalon, under *Abies cephalonica*, ca 1400 m, VK 2275 and GK 5818. All collections were determined by G. Konstantinidis and V. Kaounas and are conserved in the GK and VK personal herbarium.

Notes

Fischerula macrospora was described by MATTIROLLO (1928) from central Italy. A second species, *F. subcaulis*, was described by TRAPPE (1975); molecular data was obtained by O'DONNELL *et al.* (1997) and TRAPPE *et al.* (2007). This species belongs to the lineage of the *Morchellaceae-Discinaceae* (LÆSSØE & HANSEN, 2007; PERRY *et al.*, 2007) families, although its position has not yet been fully resolved. So far it is reported only from Italy, Spain, Sweden and Greece. The Greek specimens by their morphological features match well the descriptions in TRAPPE (1979), VIDAL (1997), ASTIER (1998), MONTECCHI & SARASINI (2000) and GORI (2005).

Acknowledgements

The authors are indebted to G. Setkos (Kastoria), D. Kleisiari (Grevena), G. Proutzopoulos (Athens), A. Papatsanis (Thessaloniki), D. Papadopoulou (Thessaloniki) and D. Tabouras (Trikala) for the collections of *Elaphomyces* and *Fischerula* presented here and to M. Loizides (Lemesos), secretary of the Cyprus Mycological Association for the editing of this paper and Carlo Agnello (Italy) for his decisive directives and advices.

References

- AGNELLO C. & KAOUNAS V. 2010. — *Ruhlandiella berolinensis*, *Genabea cerebriformis* and *Helvella astieri*: tre rarissime specie raccolte in Grecia. *Micologia e Vegetazione Mediterranea*, 25: 129-140.
- ALVARADO P., MORENO G., MANJON J.L., GELPI C., KAOUNAS V., KONSTANTINIDIS G., BARSEGHYAM G. & VENTURELLA G. 2011. — First molecular data on *Delastria rosea*, *Fischerula macrospora* and *Hydnocystis piligera*. *Boletín de la Sociedad Micológica de Madrid*, 35: 75-81.
- ASTIER J. 1998. — *Truffes blanche et noires (Tuberaceae et Terfeziaceae)*. Louis-Jean, Gap, 127 p.
- DIAMANDIS S. & PERLEROU C. 2008. — Recent records of hypogeous fungi in Greece. *Acta Mycologica*, 43: 139-142.
- FRIES E.M. 1829. — *Systema mycologicum, sistens fungorum ordines, genera et species, huc usque cognitae*. Vol. III. Gryphiswaldiae, Ernesti Mauritii, 524 p.
- HAWKER L.E. 1953. — *British hypogeous fungi*. Department of Botany, University of Bristol, 449 p.
- GORI L. 2005. — *Funghi ipogei della Lucchesia, di altre province italiane e dall'estero*. Pacini Fazzi, 320 p.
- KAOUNAS V., ASSYOV B. & ALVARADO P. 2001. — New data on hypogeous fungi from Greece with special reference to *Wakefieldia macrospora* (Hymenogastraceae, Agaricales) and *Geopora clausa* (Pyronemataceae, Pezizales). *Mycologia Balcanica*, 8: 105-113.
- KONSTANTINIDIS G. 2009. — *Mushrooms, a photographic guide for collectors*. Athens, Published by the Author, 526 p. (In Greek).
- LÆSSØE T. & HANSEN K. 2007. — Truffle trouble: What happened to the Tuberales? *Mycological Research*, 111: 1075-1099.
- LAWRINOWISZ M. 2006. — Hypogeous fungi collected in Estonia in 1989 and 1999. *Folia Cryptogamica Estonica*, 42: 67-71.
- MATTIROLLO O. 1927. — Secondo elenco dei "Fungi Hypogaei" raccolti nelle Foreste di Vallombrosa (1900-1926). *Nuovo Giornale Botanico Italiano*, n.s, 34: 1343-1358.
- MONTECCHI A. & SARASINI M. 2000. — *Funghi ipogei d'Europa*. AMB - Fondazione CSM, Vicenza, 714 p.
- O'DONNELL K., CIGELNIK E., WEBER N.S. & TRAPPE J.M. 1997. — Phylogenetic relationships among ascomycetous truffles and the true and false morels inferred from 18S and 28S ribosomal DNA sequence analysis. *Mycologia*, 89: 48-65.
- PEGLER D. N., SPOONER B.M. & YOUNG T.W.K. 1993. — *British Truffles – a revision of British Hypogeous Fungi*. Royal Botanic Garden Kew, 216 p. + 26 pl.
- PERRY B.A., HANSEN K. & PFISTER D.H. 2007. — A phylogenetic overview of the family Pyronemataceae (Ascomycota, Pezizales). *Mycological Research*, 111 (3): 549-571.
- TRAPPE M., EVANS F. & TRAPPE J.M. 2007. — *Field Guide to North American Truffles*. Ten Speed Press, Berkeley, 136 p.
- TRAPPE J.M. 1975. — The genus *Fischerula* (Tuberales). *Mycologia*, 67 (5). 934-941.
- TRAPPE J.M. 1979. — The orders, families and genera of hypogeous Ascomycotina (truffles and their relatives). *Mycotaxon*, 9 (1): 297-340.
- VIDAL J.M. 1997. — Algunos hongos hipogeos nuevos o poco citados de Cataluna (Zygomycotina, Ascomycotina y Basidiomycotina). *Revista Catalana de Micologia*, 20: 25-62.

