

Morchella anatolica (Ascomycota), a new species from southwestern Anatolia, Turkey

Mustafa Işiloğlu

Hakan Alli

Muğla University, Faculty of Science and Arts, Biology
Department, 48170, Muğla, Turkey

Brian M. Spooner¹

Royal Botanic Gardens, Kew, Richmond, Surrey,
London, TW9 3AB, United Kingdom

M. Halil Solak

Muğla University, Ula Ali Koçman Vocational High
School, Program of Fungi, 48640 Ula, Muğla, Turkey

Abstract: *Morchella anatolica* (Ascomycota, Pezizales, Morchellaceae), a new species collected from pine forest of southwestern Anatolia, Turkey, is described and illustrated.

Key words: biodiversity, morels, new species, Turkey

INTRODUCTION

A distinctive morel (*Morchella* sp.) with small, lilac-tinted ascomata and reduced, simple vertical ribs (FIG. 1) has been collected recently in Turkey. Despite documentation of these fungi in Turkey by Gücin (1993) and Işiloğlu et al. (2002), with more recent additions by Solak et al. (2004a, b; 2005) and Yilmaz and Solak (2005), it could not be identified with known Turkish taxa. Further study has shown that it cannot be matched with any known species of *Morchella*, and it therefore is described and illustrated here as a new species.

TAXONOMY

Morchella anatolica Işiloğlu, Spooner, Alli et Solak,
sp. nov. FIGS. 1–4

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Ascomata parva, conica, brevistipitata, 30–35 mm alta, lilacea. Costae transversales deficientes, costis longitudinalis paucis. Asci cylindracei, 290–310 × 18–26 µm, octospori. Ascosporis hyalinis, ellipsoideis, 24–30 × 12–18 µm, maturis striae ornatis.

Ascomata 30–35 mm tall, 8–10 mm broad, conical, stiptate, sterile ribs longitudinally arranged, 0.5–0.8 mm wide, thick, fleshy, sparse, simple or occa-

sionally forked and anastomosing to form elongated hymenial pits; light lilac throughout when young, darker when old, sometimes grayish (FIG. 1). *Stipe* (6–)10–15 × 7–8 mm, cylindrical, or tapered downward, and slightly thickened at the base, hollow, surface puberulent, coarsely granular, with dark brownish punctae and bands in the upper part, whitish, lacking sterile channel at junction with head. *Asci* 290–310 × 18–26 µm, cylindrical-clavate, long-stipitate, 8-spored (FIGS. 2–4). *Ascospores* (22–)24–30 × 12–18 µm, ellipsoid to broadly ellipsoid, thick-walled when young, hyaline, at maturity usually developing fine but distinct, sometimes granulate longitudinal striations (FIGS. 2–4), uniseriate or partly biseriate within the ascus. *Paraphyses* (7–)10–17 µm wide, hyaline or with some granular content, septate, cylindrical to narrowly clavate, apex sometimes narrowed, obtuse (FIG. 2). *Hyphae of sterile ribs* thin-walled, hyaline or slightly brownish toward the base, cylindrical-fusoid, apically rounded or somewhat narrowed, variable in size, 80–220 × 12–22 µm, bearing scattered crystals.

Habitat. Growing in small groups on mossy stream bed in pine (*Pinus brutia*) forest.

Specimens examined. TURKEY. MUĞLA: Ula, Elmalı village, Kafalılar area, 5 Mar 2006, Işiloğlu 8008; 25 Feb 2007, Işiloğlu 8340, K(M)157099. (HOLOTYPE K, ISOTYPE E)

DISCUSSION

Morchella is a well delimited and distinctive genus of operculate discomycetes (Pezizales), comprising species that typically producing large, fleshy, stipitate fruit bodies that have characteristic ribbed, often honeycomb-like caps and are much sought after as edible fungi. The genus was established by Dillenius (1718) and validated by Persoon (1794) with the type species *Phallus esculentus* L., described by Linnaeus (1753). The genus name was sanctioned by Fries (1822), who included 12 species. Many names in *Morchella* have been added since then although the taxonomy of the genus remains inadequately understood and delimitation of taxa continues to present many problems that are yet to be resolved.

In all more than 100 species names and many subspecific epithets have been referred to *Morchella* (for most see Index Fungorum <http://www.indexfungorum.org/Names/Names.asp>), although the identity of perhaps the majority of these names

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¹Corresponding author. E-mail: b.spooner@kew.org



FIG. 1. *Morchella anatolica*. Mature fruit body.

remains uncertain and many seem likely to refer to morphological forms and not to distinct taxa. Species are known to be morphologically variable, and delimitation of species based on traditional morphology is hindered further by the similarity of microcharacters among taxa (e.g. Kellner et al. 2005). As a result species concepts varies greatly among authors. Saccardo (1889) recognized 24 taxa in *Morchella* and Jacquetant (1984) no fewer than 43. Dennis (1978) in contrast recognized just three British species while Breitenbach and Kränzlin (1984) give six Swiss taxa. A recent checklist of Turkish macrofungi (Solak et al. 2007) includes 21 species (29 taxa) of *Morchella* (including *Mitrophora*).

More recently aspects of the biology and ecology of morels have been elucidated (e.g. Buscot 1992), including possible ectomycorrhizal and other associations with plants and have provided further characters considered of value in defining taxa at least to species (Gessner 1995, Wipf et al. 1997). At subspecies level purely ecological differences evidently should be

used with caution, as shown by Kellner et al. (2005) for *M. spongiola*. Molecular investigation of *Morchella* also has been carried out and clearly has supported species groupings between black morels (Distantes—*M. elata* group) and yellow morels (Adnatae—*M. esculenta* group) as first proposed by Boudier (1897) but in general hitherto has proved less helpful for defining species (Bunyard et al. 1994; Buscot et al. 1996; Wipf et al. 1996, 1997). However Kellner et al. (2005) studied species diversity in the *M. esculenta* group and found three species could be defined readily based on polymorphism of the ITS region of nrDNA.

Given the morphological plasticity of species and continuing uncertainty in the application of names and definition of taxa in *Morchella*, additional species should be described with caution. However the present species, unlike many in the genus, seems distinct and clearly defined. The small ascocarps with simple, vertical ribs and large spores are distinctive. Furthermore the spores at maturity exhibit characteristic fine longitudinal striations, a feature only recently de-



FIGS. 2–4. *Morchella anatolica*. 2. Asci with ascospores and paraphyses. Bar = 20 μm . 3. Asci, with developing and mature ascospores showing striate ornament. Bar = 20 μm . 4. Asci, with ascospores showing striate ornament. Bar = 20 μm .

scribed for the genus and hitherto known for only one other species, *M. bicostata* J.-Y. Chen & P.-G. Liu (Chen and Liu 2005), from China. That occurs under *Abies* and otherwise differs markedly from the present species in its broader ascomata with densely anastomosing, bicostate ribs, and in smaller spores.

The vertical ribbing of the current species suggests affinity with *M. elata* Fr., although striate spores have not been reported for that or related species. However small forms of the *M. elata* group have been reported, notably *M. conica* var. *pusilla* Krombholz (1831: pl. 16 Figs. 14–16; nom. inval. Art. 32.1), which resembles the present species in size and shape. That differs however in lacking lilac tints and having more closely set as well as transverse ribs forming distinct fertile pits. Lilac or rosaceous tints, unusual in *Morchella*, also have been reported in the *M. elata* complex, notably for *M. purpurascens* (Krombh.) Jacquetant in which the fertile pits are distinctly rose tinted. That differs from the present species in having larger ascomata, 10–15 cm high, with vertical as well as transverse ribs and in smaller spores, 19–22.5 μm long, which remain smooth (Jacquetant 1984).

Morchella anatolica can be recognized readily in the field by its small, simple, pale lilac ascomata with few, little-anastomosing longitudinal fleshy ribs. It differs from all known taxa of the genus in having longitudinal ribs, with absence of cross ribs. It is distinguished microscopically by its comparatively large spores, which at maturity exhibit fine but conspicuous longitudinal striations.

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LITERATURE CITED

- Boudier E. 1897. Révision analytique des Morilles de France. Bull Soc Mycol Fr 13:129–153.
- Breitenbach J, Kränzlin F. 1984. Fungi of Switzerland. Vol 1. Ascomycetes. Luzern, Switzerland: Verlag Mykologia. 310 p.
- Bunyard BA, Nicholson MS, Royse DJ. 1994. A systematic assessment of *Morchella* using RFLP analysis of the 28S ribosomal DNA gene. Mycologia 86:762–772.
- Buscot F, Wipf D, Battista CD, Munch J-C, Botton B, Martin F. 1996. DNA polymorphism in morels: PCR/RFLP analysis of the ribosomal DNA spacers and microsatellite-primed PCR. Mycol Res 100:63–71.
- Chen J-Y, Liu P-G. 2005. A new species of *Morchella* (Pezizales, Ascomycota) from southwestern China. Mycotaxon 93:89–93.
- Dennis RWG. 1981. British Ascomycetes. Ed. 2. Vaduz: J. Cramer. 486 p.

- Dillenius JJ. 1718. *Catalogus plantarum circa Gissam sponte nascentium*. Francofurti ad Moenum: Apud Joh. Maximilianum à Sande. 240 p.
- Fries E. 1822. *Systema Mycologicum*. Vol. 2. Lundae. 620 p.
- Gücin F. 1993. Kozak Yaylasında (Bergama-İzmir) Yetişen ve İhraç Potansiyeli olan Kuzugöbeği (*Morchella*) Mantarları. *Ekoloji Çevre Dergisi*. Sayı 6:22–27.
- Index Fungorum. 2008. CABI Bioscience Databases.
- İşiloğlu M, Solak MH, Yılmaz F. 2002. Morels of Turkey. Congress of American Mycological Society, 24–26 Jun 2002, Oregon State University.
- Jacquetant E. 1984. *Les Morilles*. Paris: Bibliothèque des arts. 114 p.
- Kellner H, Renker C, Buscot F. 2005. Species diversity within the *Morchella esculenta* group (Ascomycota: Morchellaceae) in Germany and France. *Org Divers Evol* 5:101–107.
- Krombholz JV. 1831. *Naturgetreue abbildungen und beschreibungen der essbaren, schädlichen und verdächtigen schwämme*. Prague. 76 pls.
- Linnaeus C. 1753. *Species Plantarum*. Holmiae. 1200 p.
- Persoon CH. 1794. *Neuer Versuch einer Systematischen Eintheilun der Schwämme*. *Neues Mag Bot* 1:63–128.
- Saccardo PA. 1889. *Sylloge Fungorum* 8:1–1143.
- Solak MH, İşiloğlu M, Kalmış E, Allı H. 2007. Macrofungi of Turkey Checklist. Vol. I. İzmir: Üniversiteliler ofset. 256 p.
- , Yılmaz Ersel F, Allı H, İşiloğlu M. 2004. A new Record of *Morchella* species from West Anatolia. *Bull Pure Appl Sci* 23(B):31–33.
- , ———, İşiloğlu M. 2004. Five new records of *Morchella* genus for Turkey. *Mycol Phytopathol* 38:60–66.
- , ———, ———. 2005. A new record of *Morchella* taxon for the Turkish macromycota. *Ot Sistemik Botanik Dergisi* 12:59–62.
- Wipf D, Koschinsky S, Clowez P, Munch JC, Botton B, Buscot F. 1997. Recent advances in ecology and systematics of morels. *Cryptogamie: Mycol* 18:95–109.
- Yılmaz Ersel F, Solak MH. 2005. New records of morels from Turkey. *Mycotaxon* 91:293–302.