CZECH MYCOLOGY 65(2): 171–178, DECEMBER 20, 2013 (ONLINE VERSION, ISSN 1805-1421)

Marasmiellus carneopallidus: first Italian record of a rare taxon

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Chiarello O., Battistin E. (2013): *Marasmiellus carneopallidus*: first Italian record of a rare taxon. – Czech Mycol. 65(2): 171–178.

The authors report on two collections of *Marasmiellus carneopallidus* recently found in northern Italy. Macro- and micromorphological features are described and colour photographs of the basidiomata and several microscopic structures are provided to add new data and enrich the scarce iconography present in the mycological literature.

Key words: Basidiomycota, *Marasmiellus*, distribution, ecology, morphology, new record.

Chiarello O., Battistin E. (2013): *Marasmiellus carneopallidus*: první italský nález vzácného druhu. – Czech Mycol. 65(2): 171–178.

Autoři publikují dva recentní nálezy druhu *Marasmiellus carneopallidus* za severní Itálie. Jsou popsány jeho makroskopické i mikroskopické znaky. Popis je doplněn fotografiemi plodnic a některých mikroskopických znaků, čímž je obohacena doposud sporá ikonografie tohoto taxonu.

INTRODUCTION

Marasmiellus Murrill, containing about 250 species, and widespread all over the world, especially in the tropics, is a genus traditionally included in the *Tricholomataceae* family (e.g. Singer 1986). Later (e.g. Kirk et al. 2008) it was transferred to the *Marasmiaceae* Roze ex Kühner. According to DNA studies, however, it belongs to the *Omphalotaceae* (e.g. Moncalvo et al. 2002, Wilson & Desjardin 2005).

The aforementioned number is doomed to increase due to new mycological investigations carried out in poorly explored regions of the world. A total of 25 taxa have been reported for Europe in a recent monographic work (Antonín & Noordeloos 2010), including *M. carneopallidus* (Pouzar) Singer. Another aim of the present study is to make a contribution to the current knowledge about the distribution of this species in Europe.

MATERIAL AND METHODS

Photographs of the basidiomata were taken in situ (Fig. 1) and in a laboratory (Fig. 2) with a Nikon D 3000 digital camera. The macromorphological characters were observed in fresh specimens, while the micromorphological structures were analysed either in fresh samples or in dried material (after rehydrating with a 5% aqueous solution of KOH) stained with Congo Red or Melzer's reagent. A Zeiss Axiostar light microscope was used.

Regarding the spore size, length (L), width (l) and Q (L/l) are given as the 10^{th} and 90^{th} percentiles with extreme values in brackets. Some parameters of the so-called descriptive statistics, viz. median, 10^{th}, 25^{th}, 75^{th} and 90^{th} percentiles, coefficient of variation, skewness, kurtosis, as well as the principal index of inferential statistics, i.e. the lower and upper 95% interval confidence of the mean, are specified in Tabs. 1 and 2. The statistical GraphPad Prism 5.0 software (GraphPad Inc., San Francisco, CA, USA) was used.

Authors of fungal names are cited according to the Index Fungorum website (http://www.indexfungorum.org/Names/AuthorsOfFungalNames.asp). Colour abbreviations follow Munsell (2009).

Voucher specimens are deposited in MCVE (herbarium acronym follows Thiers on-line) under no. 27574.

RESULTS

Marasmiellus carneopallidus (Pouzar) Singer, Beih. Nova Hedwigia 44: 307, 1973. Figs. 1–5

≡ *Micromphale carneopallidum* Pouzar, Česká Mykol. 20(1): 23, 1966.

D e s c r i p t i o n: Pileus 10–30(40) mm broad, hemispherical, then convex to almost applanate, sometimes slightly depressed at centre, smooth, glabrous, hygrophanous, translucently striate at margin when moist, crenulate, white (7.5YR 8/1, WHITE PAGE N 9.5), pinkish white (7.5YR 8/2), flesh-coloured, pink (7.5YR 8/4) to ochre or very pale brown (10YR 8/3, 10YR 8/4), darker at centre, white (WHITE PAGE N 9.5) on drying.

Lamellae distant, adnate, ventricose, thick, up to 5 mm high, whitish, cream, very pale yellow (WHITE PAGE 2.5Y_/2 9.5/); edge entire and concolorous; lamellulae present.

Stipe 15–40 × 1–3(5) mm, central, cylindrical, slightly broadened upwards, straight or curved, tough, (sub)concolorous with pileus at apex, brown, pinkish grey (7.5R 7/1), reddish grey (7.5R 5/1, 7.5R 6/1) downwards, pruinose, pulverulent, inserted on roots or stems of grasses, herbs and shrubs.

Fig. 1. Basidiomata of *Marasmiellus carneopallidus* (MCVE 27574) in situ. Photo: O. Chiarello.

Fig. 2. Basidiomata of *Marasmiellus carneopallidus* (MCVE 27574) in the laboratory. Photo: O. Chiarello.

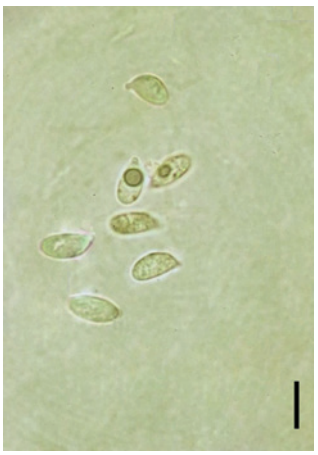

Fig. 3. Basidiospores of *Marasmiellus carneopallidus* (MCVE 27574). Scale bar = 10 µm. Photo: O. Chiarello.

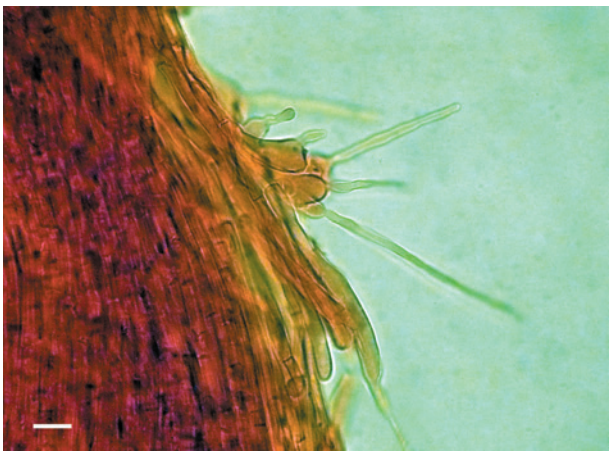

Fig. 4. Caulocystidia *of Marasmiellus carneopallidus* (MCVE 27574). Scale bar = 10 µm. Photo: O. Chiarello.

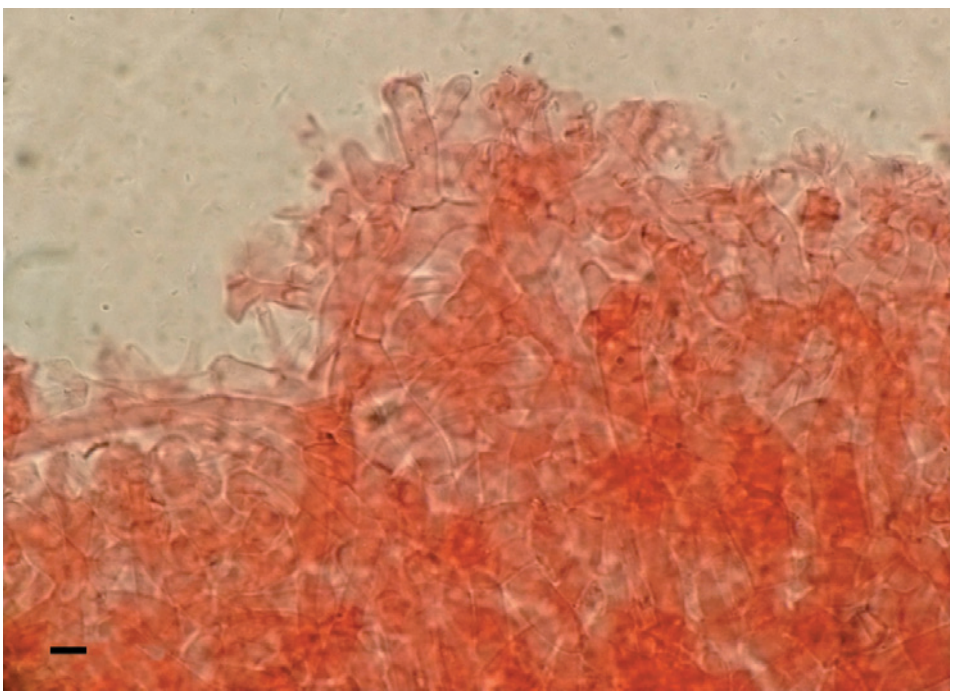

Fig. 5. Cuticular scalp of *Marasmiellus carneopallidus* (MCVE 27574). Scale bar = 10 µm. Photo: O. Chiarello.

Tab. 1. Descriptive and inferential statistics values (n = 35) of basidiospores of the first collection of *M. carneopallidus*.

	Length	Width	Q
Minimum	7.2	4.2	1.6
10th percentile	8.0	4.4	1.66
25th percentile	8.2	4.6	1.7
Median	8.6	4.8	1.8
75th percentile	9.2	5.0	1.9
90th percentile	9.8	5.2	2.0
Maximum	10.0	5.4	2.1
Mean	8.7	4.8	1.8
Standard deviation	0.6	0.3	0.1
Coefficient of variation	7.2 %	5.8 %	7.0 %
Skewness	0.1	0.1	–0.2
Kurtosis	0.0	–0.4	–1.0
Lower 95% CI of mean	8.5	4.7	1.8
Upper 95% CI of mean	8.9	4.9	1.9

Tab. 2. Descriptive and inferential statistics values (n = 30) of basidiospores of the second collection of *M. carneopallidus*.

	Length	Width	Q
Minimum	8.2	4.2	1.7
10th percentile	8.22	4.4	1.8
25th percentile	8.5	4.6	1.9
Median	9.5	4.8	2.0
75th percentile	10.0	5.0	2.1
90th percentile	10.5	5.1	2.2
Maximum	11.0	6.0	2.3
Mean	9.3	4.8	2.0
Std. Deviation	0.8	0.3	0.2
Coefficient of variation	8.7 %	7.3 %	7.6 %
Skewness	0.3	1.3	0.4
Kurtosis	–0.7	4.5	–0.6
Lower 95% CI of mean	9.0	4.6	1.9
Upper 95% CI of mean	9.6	4.9	2.0

Context thin-fleshed at margin, thicker in the pileus centre, concolorous with surface in pileus, darker in stipe base. Smell difficult to define, reminding of almonds. Taste mild.

Basidiospores of the first collection (7.2)8.0–9.8(10) × (4.2)4.4–5.2(5.4) µm, Q = (1.6)1.66–2.0(2.1) (other values of descriptive and inferential statistics are specified in Tab. 1); of the second collection (8.2)8.22–10.5(11) × (4.2)4.4–5.1(6) µm, Q = (1.7)1.8–2.2(2.3) (other values of descriptive and inferential statistics are specified in Tab. 2); ellipsoid to almost oblong (Fig. 3), smooth, thin-walled, non-dextrinoid, inamyloid. Basidia 34–50 × 7–9 µm, 4-spored, sometimes 2-spored, clavate, often clamped; sterigmata 5–7 µm long. Cheilocystidia 15–30 × 6–15 µm, polymorphic, clavate to cylindrical-sinuous, thin-walled.

Pleurocystidia absent. Caulocystidia 35–85 × 8–15 µm, abundant, in clusters, polymorphic, clavate, subcylindrical, often irregular, lobate or with projections, thick-walled (Fig. 4). Pileipellis a cutis of cylindrical hyphae with clavate or coralloid, up to 15 µm wide terminal elements (Fig. 5). Clamps numerous.

Phenology: June and October.

Specimens examined

Italy. Veneto Region, Vicenza Province, Municipal District of Monte di Malo, locality Faedo, alt. 400 m, 45°39'6.7" N, 11°21'11.5" E, 1 June and 5 June 2008, leg. O. Chiarello (MCVE 27574). – Ibid., 1 June 2008, leg. O. Chiarello (BRNM 747442).

DISCUSSION

To our knowledge, *Marasmiellus carneopallidus* (Pouzar) Singer is an extremely rare species and our finds are very probably the first records in Italy.

According to the taxonomic concept by Singer (1986) and Antonín & Noordeloos (2010) it belongs to subsect. *Quercini* Singer, which encompasses species with a pigmented pileus and stipe, and sect. *Dealbati* Singer, which includes species without a distinct Rameales-structure and with spores shorter than 10.4 µm. In the field it looks like *Marasmiellus mesosporus* Singer but differs by the duller coloured stipe, shape of the cheilocystidia, structure of the pileipellis, and its ecology. The common and widespread species *Marasmius oreades* (Bolton: Fr.) Fr. is also quite similar, but it can be easily distinguished on account of the structure of the pileipellis (hymeniderm vs. cutis), its elastic stipe, its terricolous habitat and the lack of cheilocystidia.

We observed the fruitbodies of *Marasmiellus carneopallidus* growing gregariously on roots of unidentified grasses on calcareous, acidic soil (pH = 5) in xerophilous grasslands with scattered shrubs and trees (e.g. *Juniperus communis* L., *Quercus pubescens* Willd., and *Fraxinus ornus* L.).

According to some references (Antonín & Noordeloos 2010, Legon & Henrici 2011) *Marasmiellus carneopallidus* is associated with *Thymus* sp., *Artemisia campestris* L., *Potentilla argentea* L., *Festuca valesiaca* Schleich. ex Gaudin, *Rosa* sp. and *Helianthemum nummularium* (L.) Mill.

As far as the distribution is concerned, the species occurs in the Czech Republic, Germany (Antonín & Noordeloos 2010), Spain (Vila & Llimona 2006), Italy (our collections), and Great Britain (Legon & Henrici 2011). It has not yet been recorded in north European countries (Noordeloos 2012). Perhaps this is an indication that it prefers warmer climates.

In comparison with the Czech material collected at the type locality (Praha-Podbaba, 18 June 2006, BRNM 710102), our specimens only differ in having more distinctly coralloid terminal pileipellis cells, and a less variable form of caulocystidia (V. Antonín, pers. comm.).

The iconography of *M. carneopallidus* is limited (e.g. Courtecuisse & Duhem 1994, Ludwig 2000), so we are delighted to provide representative photographs of fresh basidiomata and microscopic elements, images which are always very useful in the identification of a taxon.

ACKNOWLEDGEMENTS

We are very grateful to Dr. Vladimír Antonín (Brno, Czech Republic) for identifying our collection of *M. carneopallidus*.

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