

# A collection of *Hydnотrya confusa* Spooner 1992 from Southwest Germany

Martin BEMMANN

Kleingemünderstraße 111  
D-69118 Heidelberg  
martin.bemmann@gmx.de

Ditte BANDINI

Panoramastr. 47  
D-69257 Wiesenbach  
ditte.bandini@gmx.de

*Ascomycete.org*, 3 (3) : 55-60.  
Octobre 2011



Summary: A recent find of a hypogeous ascomycete from Germany that could be identified as *Hydnотrya confusa* is reported and discussed. This species is described here for the first time from fresh material.

Keywords: Ascomycota, Pezizales, *Discinaceae*, hypogeous fungi.

Zusammenfassung: Ein aktueller Fund eines hypogäischen Ascomyzeten aus Südwestdeutschland konnte als *Hydnотrya confusa* bestimmt werden. Die Art wird hier zum ersten Mal basierend auf Frischmaterial vorgestellt.

Schlüsselwörter: Ascomycota, Pezizales, *Discinaceae*, hypogäische Pilze.

## Introduction

*Hydnотrya confusa* was first described with a Latin diagnosis by SPOONER (1992). A detailed description with illustrations followed in PEGLER *et al.* (1993: 79, 82-83) using six collections from the UK (then herbarised as *H. ploettneriana* = *H. michaelis*) and separating this taxon from *H. michaelis* and *H. cubispora*. The Dutch mycologist G. A. de Vries subsequently examined his herbarium material and identified four collections from the Netherlands and one from Belgium as the same species previously classified as *H. michaelis* as well (DE VRIES, 2002). A provisional key to the European species of *Hydnотrya* was provided by REIL (1999) and STIELOW *et al.* (2010), the latter key excluding *H. confusa* as being a non Central European species then.

The genus *Hydnотrya* Berk. & Broome belonged, at the time of Spooner's publication, to the *Helvellaceae*. In the meantime, it was shifted to the *Discinaceae* by molecular means (HANSEN & PFISTER, 2006; TEDERSOO *et al.*, 2006; LÆSSØE & HANSEN, 2007).

The new record of this species for Germany indicates that its distribution may be wider than known until now, and there may still exist some mislabelled specimens in different herbaria, as it was the case in the UK and the Netherlands.

## Materials and methods

The first fruitbody was found on 15.VII.2011 to which most of the microscopical analysis refers. On 31.VII.2011, the site was revisited and another 25 fruitbodies could be observed. Their macro- and microscopical appearance (three fruitbodies tested) is included in the description below.

The specimens were examined from fresh material, matured in a moist chamber for a period of up to two weeks at room temperature. Microscopy and all micro-measurements were carried out in tap water. For additional observations,

the staining agents cotton blue (in lactic acid) and brilliant cresyl blue (aqueous) were used. Microphotography was done using a Nikon Coolpix 5000 through a Zeiss achromate 10x/0.22 and a Zeiss planapochromate 40x/1.0 Oel m.l. immersion objective.

## Habitat

D-BW Schönbrunn, „Todtenbronnen“ (49°24'26" N, 8°57'09" E, 361 m, MTB 6519/4/34), on boggy soil, partly churned up by wild boar, found on the surface in secondary position, 15.VII.2011. leg. D. Bandini, det. M. Bemmam, conf. B. Spooner (based on macro- and microphotographs). When the site was revisited by the authors on 31.VII.2011, 25 freshly grown semi-epigeous fruitbodies were observed *in situ*.

The „Todtenbronnen“ is a fen crossed by a small brook. The major, southern part of it is mostly an open area while the northern tail (where the site is situated) is covered by forest.



Fig. 1 — The site. Photo: M. Bemmam.



Fig. 2 — *Hydnotrya confusa*. Photo: M. Bemann.  
Ascomata in situ close to roots of *Picea abies*.



Fig. 3 — *Hydnotrya confusa*. Photo: D. Bandini.  
Ascoma in situ.



Fig. 4 — *Hydnotrya confusa*. Photo: M. Bemann.  
Ascoma in situ with mycorrhizal roots (red arrow).



Fig. 5 — *Hydnotrya confusa*. Photo: M. Bemann.  
Mycorrhizal roots.

On the site both banks of the brook are very boggy. Here the dominating trees are *Alnus*, *Fagus*, *Fraxinus*, *Betula* and *Frangula*. Further vegetation observed is *Dryopteris*, *Pteridium*, *Lycopus*, *Impatiens*, *Circaea*, *Scrophularia* and different mosses, among them patches of *Sphagnum*. A few meters away from the brook the soil level is rising with a different vegetation. A dense forest of *Picea abies* stretches on the left side with predominantly humid mossy soil. On the right side are growing *Picea* and *Fagus* with *Vaccinium* and mosses below. But also in the boggy part close to the brook some *Picea* are growing.

While the first specimen was found excavated by wild boars, the other ascomata were found in situ in semi-epigeous position, erumpent from the soil and needle litter, and easily visible due to their light colour but obviously ignored by the boars. As the site was already revisited on 22.VII.2011 without success, it is clear that these fructifications must have grown within a week's time. Some specimens were collected for examination and herbarization while the rest was kept in situ to ensure reproduction. However, one week later only traces of some ascomata were left.

The site where fresh ascomata were found covers an area of c. 5 × 5 m (fig. 1). It is surrounded by young *Picea abies* and

some *Fraxinus excelsior*. The place is very damp and surely frequently flooded after heavy rainfall or snowmelt by the adjacent brook. *Picea* is most likely the mycorrhizal partner, as the fruitbodies were found very close to their roots growing in the needle litter (figs. 2-3). Some ectomycorrhizal roots could be observed next to the ascomata (figs. 4-5).

## Description

The **ascomata** are of irregular shape ranging in size from ca. 2 × 2 × 1.5 cm up to 4 × 4 × 2 cm. They are hollow, single-chambered but cerebriformly folded, with a primary apical opening (fig. 6) and sometimes some smaller secondary openings that could be traces of feeding by small rodents or snails. Such “secondary” openings were observed by Soehner in his collection of *Hydnotrya carnea* as well (SOEHNER, 1951: 12 et seq.). Smaller, younger specimens sometimes appear to have no opening at all. The smell is insignificant. The colour of the outer surface is whitish to cream when young and gets yellowish with some few brown tints at age. The texture of the surface is finely warty to tomentose. The thickness of the flesh measures c. 1 mm.





**Fig. 6 — *Hydnotrya confusa*.** Photo: M. Bemann.  
Ascoma showing apical opening (red arrow).



**Fig. 7 — *Hydnotrya confusa*.** Photo: M. Bemann.  
Ascoma in section.

The **peridium** in section (figs. 7-8) is yellowish with a lighter outer zone caused by the hyaline tomentum hyphae that are of cylindric to pyriform shape (fig. 16C). It is followed by a whitish subhymenium of variable thickness consisting of hyaline cells of irregular shape (*textura angularis*). The **hymenium** is two-layered in colour, the one up to the ascus tips is yellowish in immature ascomata but deep orange in mature ones due to the colour of the developed spores. The uppermost zone, composed of the heads of the hyaline paraphyses, appears again pure white when young but dull yellowish with age (figs. 8-9).

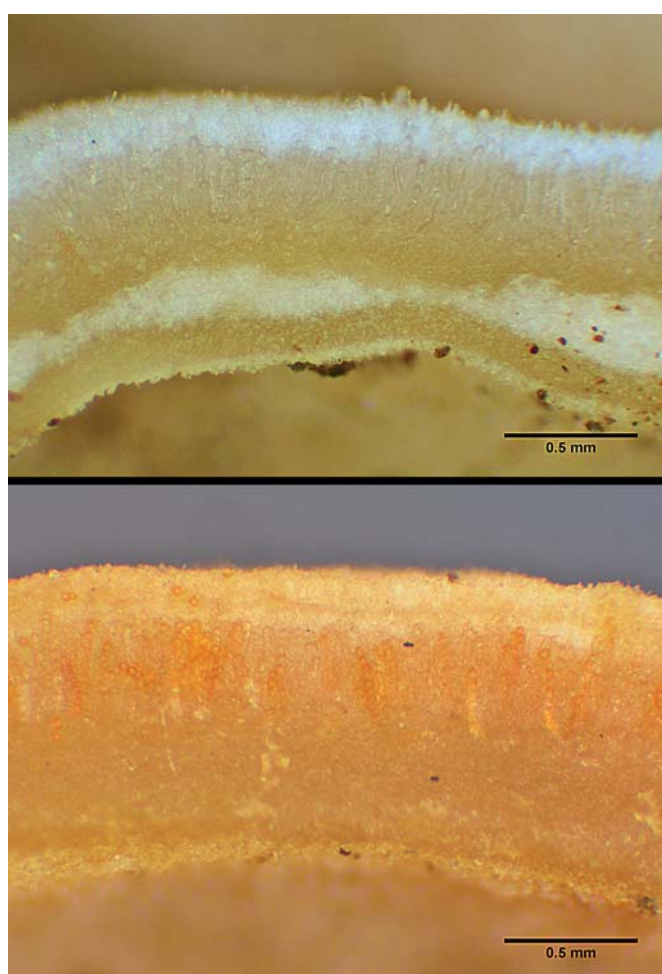
Mature **asci** are cylindric,  $270\text{--}360 \times 31\text{--}36 \mu\text{m}$ , with uniseriately arranged spores (figs. 9 and 12), immature asci are more clavate in shape, with irregular or biseriately arranged spores (those not featuring an exosporium yet) (figs. 10 and 16A).

Immature **ascospores** are globose, hyaline, and are featuring regularly one oil-drop, that increases in size during maturation by nearly filling the whole spore lumen. Mature spores develop a lobate exosporium, golden brown with age and with a radially striate structure in optical section (figs. 13, 14 and 16D). The size of the spores is  $33\text{--}47 \times 25\text{--}33 \mu\text{m}$  (incl. ornament) and  $19.5\text{--}23.5 \times 18.5\text{--}20.5$  (excl. ornament). Most of the spores develop a more or less circularly shaped exosporium but some appear rectangular in optical section resembling those of *H. cubispora*, maybe due to the limitation of horizontal space for growing within the ascus (fig. 11). The same observation was made by DE VRIES (2002: 203, fig. 1). However, spores featuring a rectangular exosporium were not recorded outside the asci.

**Paraphyses** are hyaline, straight ( $5\text{--}6.5 \mu\text{m}$  in diam.), apically slightly inflated (up to  $8\text{--}10$  ( $11$ )  $\mu\text{m}$  wide) and septate (figs. 15 and 16B). They are protruding from the asci by c.  $150 \mu\text{m}$ .

## Discussion

*Hydnotrya confusa* differs from *H. michaelis* and *H. cubispora* mainly in the measurements of the asci and the paraphyses and in the morphology of the spores. However, the observation of PEGLER *et al.* (2003: 82) that ascospores are placed “almost horizontal” within the asci could be noted in



**Fig. 8 — *Hydnotrya confusa*.** Photo: M. Bemann.  
Section of an immature (top) and mature (bottom) ascoma.

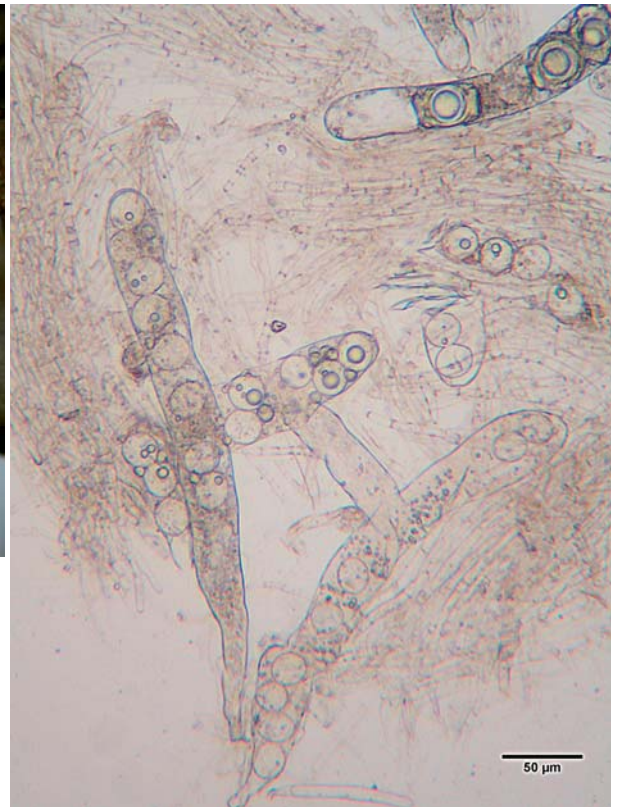
the present collection in few cases only, but sometimes, as DE VRIES (2002: 204) had already observed, in a tilted position (fig. 13). The width of the paraphyses in the present collection is even larger than in the examples described from the UK.

The genus *Hydnotrya* surely deserves more research on taxonomical and molecular level with such a few collections known. As for *H. confusa* the authors would like to stress the consideration given in PEGLER *et al.* (2003: 82 et seq.) that

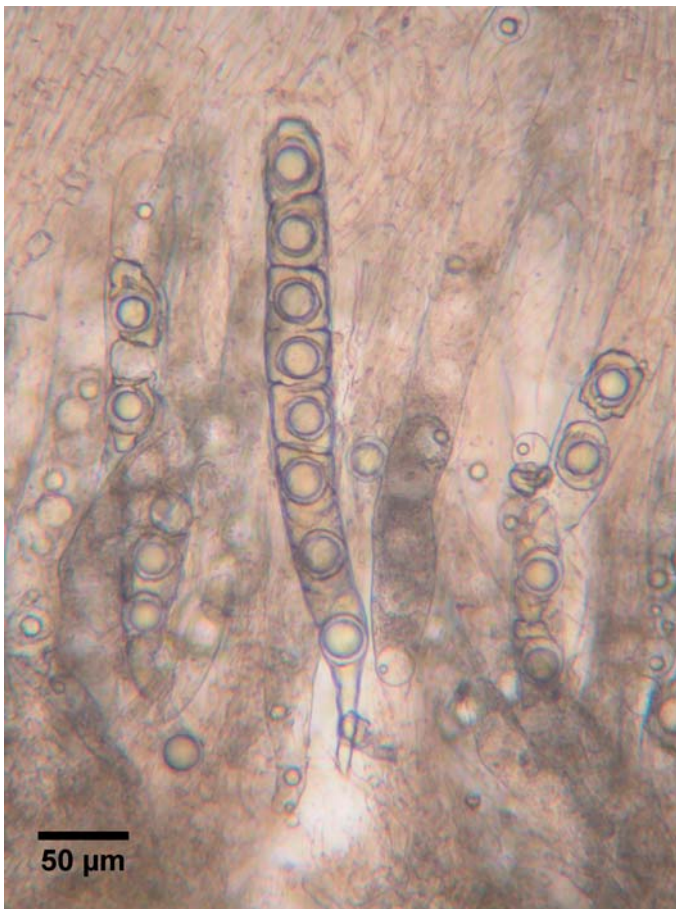




**Fig. 9** — *Hydnotrya confusa*. Photo: M. Bemmann.  
Section showing mature asci.



**Fig. 10** — *Hydnotrya confusa*. Photo: M. Bemmann.  
Immature asci with globose spores.



**Fig. 11** — *Hydnotrya confusa*. Photo: M. Bemmann.  
Submature asci and spores.



**Fig. 12** — *Hydnotrya confusa*. Photo: M. Bemmann.  
Hymenium with mature asci and spores.



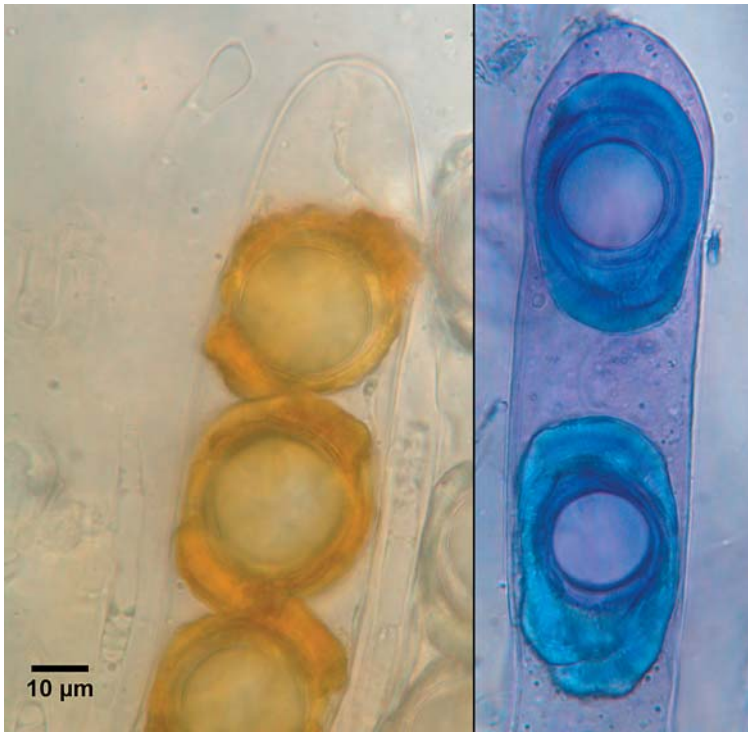


Fig. 13 – *Hydnotrya confusa*. Photos: M. Bemann.  
Mature spores inside asci in water (left) and cresyl blue (right).



Fig. 15 – *Hydnotrya confusa*. Photo: M. Bemann.  
Paraphyses.

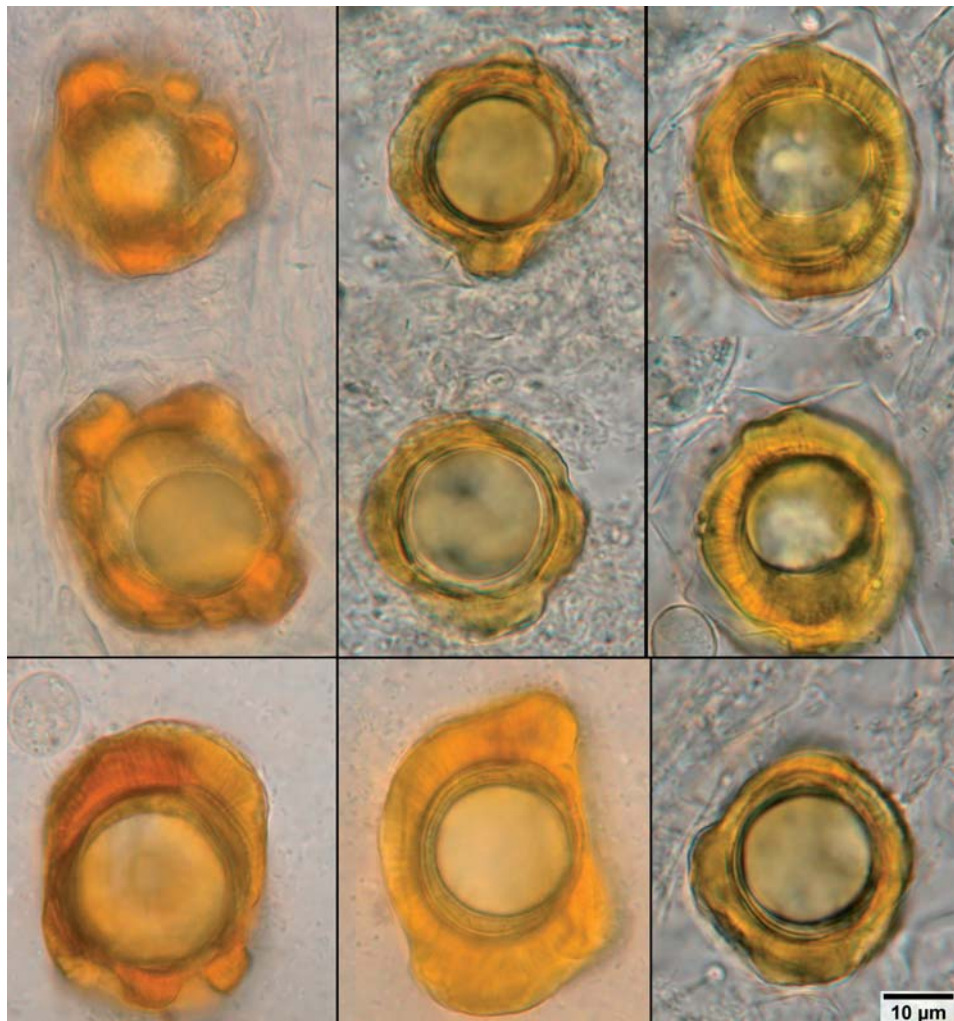
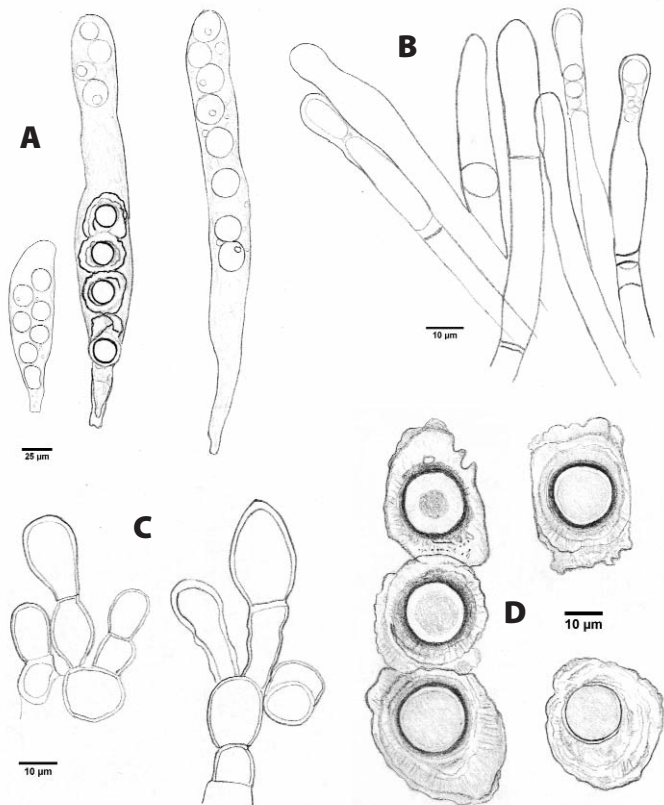


Fig. 14 – *Hydnotrya confusa*. Photos: M. Bemann.  
Mature spores.



**Fig. 16** — *Hydnotrya confusa*. Microscopic characters. Drawings: D. Bandini.

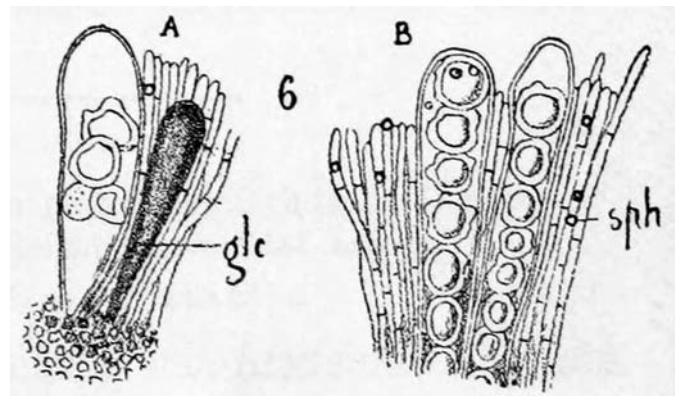
A. Immature and submature asci. B. Paraphyses. C. Tomentum hyphae of the peridium. D. Mature spores

doubtful taxa like *H. soehneri* could be conspecific. TICHOMIROW (1908a, 588 et seq., Abb. 6; 1908b, 194 et seq., pl. V, 6) published some pictures of asci, paraphyses and spores of a fungus he called "*Hydnotrya carnea* Zobel" from Russian finds simultaneously in German and French pharmacological journals, but did not give a description of the morphology of the ascocarps. The shape of the spores in his micro-drawings (fig. 17) resemble those of *H. confusa*. The paraphyses are septate but appear to be shorter than the asci. This is maybe owed to his excessive treatment with chemicals as phenylhydracine, iodine and boiling in Fehling's solution, as Tichomirow was not particularly interested in this fungus but in search of glycogen in ascomycetes as such.

This late find of *Hydnotrya confusa*, with observations on its morphology and ecology, can possibly contribute to an awareness that leads to further finds in the future.

## Acknowledgements

The authors thankfully acknowledge the support by A. Akulov, G. Hensel, B. Oertel, P. Reil and J.M. Trappe for fruitful discussions and for providing necessary literature, B. Spooner for confirming the determination and H.O. Baral for reviewing the manuscript.



**Fig. 17** — "*Hydnotrya carnea*" after TICHOMIROW (1908a, 1908b)

## References

- HANSEN K. & PFISTER D.H. 2006. — Systematics of the Pezizomycetes - the operculate discomycetes. *Mycologia*, 98 (6): 1029-1040.
- LÆSSØE T. & HANSEN K. 2007. — Truffle trouble: what happened to the Tuberales? *Mycological Research*, 111 (9): 1075-1099.
- PEGLER D.N., SPOONER B.M. & YOUNG T.W.K. 1993. — *British Truffles*. A revision of British hypogeous fungi. Kew.
- REIL P. 1999. — *Hydnotrya cerebriformis*, ein Fund im Schwarzwald. Deutsche Gesellschaft für Mykologie (ed.), *Bemerkenswerte Pilze - Icones miscellaneae fungorum. Zeitschrift für Mykologie, Beiheft*, 9: 113-118.
- SOEHNER E. 1951. — Tuberaleen-Studien III. *Zeitschrift für Pilzkunde*, 8: 7-16.
- SPOONER B. 1992. — A new species of *Hydnotrya* (Helvellaceae) from the British Isles. *Kew Bulletin*, 47 (3): 503.
- STIELOW B., BUBNER B., HENSEL G., MÜNZENBERGER B., HOFFMANN P., KLENK H.P. & GÖKER M. 2010. — The neglected hypogeous fungus *Hydnotrya baillii* Soehner (1959) is a widespread sister taxon of *Hydnotrya tulasnei* (Berk.) Berk. & Broome (1846). *Mycological Progress*, 9 (2): 195-203.
- TEDERSOO L., HANSEN K., PERRY B.A. & KJØLLER R. 2006. — Molecular and morphological diversity of pezizalean ectomycorrhiza. *New Phytologist*, 170: 581-596.
- TICHOMIROW A.W. 1908a. — Das Glykogen der Ascomycetenpilze in seinen Beziehungen zur Trehalose. *Archiv der Pharmazie*, 246 (6-9): 582-591.
- TICHOMIROW A.W. 1908b. — Le glycogène des champignons ascomycètes dans ses rapports avec la tréhalose. *Bulletin des Sciences Pharmacologiques*, 15: 189-196 + pl. V.
- VRIES G.A. (DE) 2002. — Een vergelijkend onderzoek van de olieboltruffel (*Hydnotrya michaelis*) met *Hydnotrya cubispora* en de voor Nederland nieuwe *Hydnotrya confusa*. *Coolia*, 45 (4): 201-204.

