

**THE SECOND RECORD OF THE EUROPEAN SPECIES, *BOLETUS DUPAINII*,
IN NORTH AMERICA**

Ernst E. Both
Buffalo Museum of Science, 1020 Humboldt Parkway, Buffalo, New York 14211
eboth@sciencebuff.org

Sibylla Brown
21675 Pony Farm Road, Leon, Iowa 50144

and

Beatriz Ortiz-Santana
Center for Forest Mycology Research, US-Forest Service, Northern Research Station
One Gifford Pinchot Drive, Madison, Wisconsin 53726

ABSTRACT - *Boletus dupainii* Boud. is reported for the second time from North America, inhabiting an oak-hickory savanna in Iowa.

KEYWORDS - *Boletaceae*, ectomycorrhizal fungi, oak-hickory savanna, *Sepedonium*.

INTRODUCTION

Boletus dupainii Boud. was described in 1902 from central France. In the ensuing one hundred years it was gradually reported from nearly all regions of central and southern Europe (Engel *et al.* 1983). Le Gal published a type study in 1950. The first record outside of Europe was based on a collection from North Carolina (McConnell & Both, 2002). It was next found in Belize (Ortiz-Santana *et al.*, 2007) and we now report on a second location record for North America from an oak-hickory savanna in Iowa. *Boletus dupainii* has been observed at this site nearly continuously from 2000 until 2008 by one of us (SB). A full description is provided to facilitate identification of this rare bolete from additional localities in North America.

MATERIALS AND METHODS

Color terms are general approximations, while numerical color designations are from Korerup & Wanscher (1978). Macro-chemical reactions were determined using 10% NH₄OH and 5% KOH. Macroscopic descriptions are based on fresh and dried specimens, field notes and color photographs. Microscopic structures were observed with an Olympus BH-2 compound microscope; free hand sections of fungal dried material were rehydrated and mounted in 5% KOH.

The herbarium acronym is from Holmgren *et al.* (1990).

MATERIAL EXAMINED (all collections by S. Brown): USA. Iowa. Decatur County: Leon, Timberhill, 28 Aug 2006 (private herbarium of S. Brown); 18 Aug 2007 (*Both 4599*) (BUF); 28 Jul 2008 (private herbarium of S. Brown); 7 Aug 2008 (private herbarium of S. Brown); 22 Aug 2008 (private herbarium of S. Brown).

TAXONOMIC DESCRIPTION

PILEUS 50–140 mm in diameter, at first hemispheric, becoming convex to broadly convex, in age at times with depressed center and upturned margin, glabrous, viscid when wet, shiny when dry, pileipellis thin, detersible; blood red (10C/D8), garnet red (11D/E8) to pinkish red (12C/D6), shading into orange red in marginal areas, bruising dark blue; margin at first incurved, becoming decurved, sterile, yellow. **PILEUS TRAMA** very pale yellow, bruising blue quickly. **ODOR** not noticeable, **TASTE** somewhat acidulous. **HYMENOPHORE** tubulose, tubes 4–6 mm long, yellow to greenish yellow, bruising blue to greenish blue; **PORES** circular, 2–3 per mm, red at first (10C8), becoming reddish orange in age (7B6), bruising dark blue to greenish blue; tubes depressed around

the stipe, short-decurrent forming an apical reticulum. STIPE 40–75 mm long, 10–20 mm wide in apical area, 20–25 mm in basal area, base with a short root-like projection, basal mycelium white, equal to clavate, pruinose over nearly entire length; yellow to golden yellow in apical area, pale yellow downward, reddish pruinose overall, the pruina becoming denser and darker red in lower half of stipe. STIPE TRAMA yellow, reddish toward the base, staining blue quickly when cut.

BASIDIOSPORES 10.8–14.4 x 4.5–5.4 μm , fusiform, yellowish brown in KOH, dark olive brown in deposit. BASIDIA 24.3–29.7 x 7.2–9.5 μm , clavate, 4-sterigmate (but many with only one sterigma). BASIDIOLES 19.8–27 x 6.3–8.1 μm , clavate. PLEUROCYSTIDIA 36–54.9 x 6.3–9 μm , fusoid, fusoid-ampullaceous. CHEILOCYSTIDIA 18.9–36 x 4.5–6.3 μm , fusoid, fusoid-ampullaceous or fusoid ventricose, some with yellowish brown contents in KOH. PILEIPELLIS HYPHAE 1.8–4.5 μm diameter, consisting of loosely interwoven long thin filaments, hyaline or with yellowish brown contents in KOH. PILEUS TRAMA HYPHAE 2.7–10.8 μm diameter, hyaline to pale grayish yellow in KOH. STIPITPELLIS HYPHAE 1.8–9 μm diameter, interwoven, hyaline in KOH. CAULOCYSTIDIA 18.9–43.2 x 4.5–9.9 μm , abundant, versiform, clavate to fusoid-ventricose or cylindrical or mucronate, in clusters, hyaline or with yellow or dark golden yellow contents in KOH. DERMATOBASIDIA present, 4-sterigmate, with golden yellow contents.

MACROCHEMICAL REACTIONS: negative with NH_4OH on pileus, stipe and pileus trama; pileus trama stains orange when KOH is placed on it.

HABIT AND HABITAT: Gregarious, frequently caespitose in an oak-hickory savanna, with oaks (*Quercus alba*, *Q. velutina*) rarely with Shagbark Hickory (*Carya ovata*) present, fruiting from the beginning of July until early September.

DISCUSSION

Although widely distributed in Europe, *Boletus dupainii* is generally considered to be rare. To

explain its rarity, Parrot (1964) proposed that special, localized weather conditions were necessary for its fruiting. In 1962 and 1964 he collected it in large numbers 48 hours after very heavy rains following a period of draught. The collection from North Carolina was made under similar conditions the day after prolonged rain that followed a period of dryness. In Iowa a somewhat similar weather pattern was observed. A record rainfall of 22 cm in July preceded the collection of 7 August 2008. That collection was infested by *Sepedonium chrysospermum* identified by its amber yellow, globose and warted aleuroconidia measuring 14–20 μm . This is the first record of this boleticolous hypomycete on *Boletus dupainii* in North America. Other Iowa collections were made in periods of normal rainfall.

The collections from Iowa differ from those of Belize and North Carolina in the less intense and darker colors of the pileus, a stronger orange tint to the red pores, paler yellow stipes and more variable colors. They resemble collections from Spain (Engel *et al.* 1983; Rocabrana, 1986) with pileus colors shading into a more pinkish red (12C/D6). In addition the Iowa material differs from the Belize material in the presence of one-sterigmate basidia in some specimens, the somewhat less gelatinous pileipellis and the larger pleurocystidia, which are identical to those of the type.

The collections from Belize are very close to the ones from North Carolina in overall colors and come close to specimens from Italy as illustrated in Galli (2000). They differ from the Italian material in the greater amount of red tones on the stipe. The color photograph of the North Carolina collection (McConnell & Both, 2002) appears in Bessette *et al.* (2007). All collections in the Western Hemisphere were made under oak. In Europe *Boletus dupainii* is primarily associated with oak but has also been reported in association with *Castanea* sp. (Galli, 2000; Rocabrana, 1986) as well as with *Betula* sp. and conifers (Engel *et al.* 1983).

Among the red-pored boletes *Boletus dupainii* appears closest to *Boletus rubroglutinosus* Corner (1974) described from Sarawak,

which has the same colors but differs in the strongly “smearly viscid” pileus and shorter spores (9.5-12 μm), but it should be noted that it was described from immature specimens. *Boletus flammans* E.A. Dick & Snell (1965) is also similar, with very similar colors, but it differs in having shorter spores (10–13 vs. 11–16), a re-

ticulated stipe and an association with conifers rather than oaks. Table 1. presents a comparison of the microscopic features of the type of *Boletus dupainii*, the collections from Western Hemisphere and similar species.

Table 1. Comparison of Microscopic Features - Sources: *Boletus flammans*: Grund & Harrison (1976); *Boletus rubroglutinosus* Corner (1974); Type study of *Boletus dupainii*: Le Gal (1950). Belize: Ortiz-Santana *et al.* (2007); Iowa: Ortiz-Santana (*Both* 4599 BUF); North Carolina (McConnell & Both, 2002, and Both, unpublished notes). The microscopic measurements among collections from the Western Hemisphere are broadly overlapping.

	<i>Boletus dupainii</i>	<i>B. rubroglutinosus</i>	<i>B. flammans</i>
SPORES			
France (Le Gal, type study)	11–16 x 4.7–7.8 (–8)		
North Carolina	11–16.5(–18) x 4.4–5.6(–6.5)		
Belize	12.8–14.4 x 4–5.6		
Iowa	10.8–14.4 x 4.5–5.4		
Similar species		9.5–12 x 3.7–4.5	10–13 x 3.5–5
BASIDIA			
France (Le Gal type study)	32–40 x 10–12.5		
North Carolina	25–30 x 8–12		
Belize	24–29.6 x 9.6–10.4		
Iowa	24.3–29.7 x 7.2–9.5		
Similar species		25–32 x 9–10	25–35 x 8–10
PLEUROCYSTIDIA			
France (Le Gal type study)	35–55 x 6.5–10		
North Carolina	25–40 x 5–10		
Belize	26.4–47.2 x 7.2–8.8		
Iowa	36–54.9 x 6.3–9		
Similar species		–75 x 14	35–60 x 6–10
CHEILOCYSTIDIA			
France (Le Gal type study)	not reported		
North Carolina	20–30 x 5–8		
Belize	16–30.4 x 4.8–8		
Iowa	18.9–36 x 4.5–6.3		
Similar species		20–40 x 8–14	25–40 (–55) x 8–10
CAULOCYSTIDIA			
France (Le Gal type study)	not reported		
North Carolina	20–40 x 6–10		
Belize	16–36.8 x 5.6–11.2		
Iowa	18.9–43.2 x 4.5–9.9		
Similar species		not reported	25–30 x 8–10

ACKNOWLEDGEMENTS

The authors are very grateful to Dr. D. Jean Lodge for critical review of this manuscript.

REFERENCES

- Bessette, A.E., Roody, W.C., Bessette, A.R., Dunaway, D.L. 2007. *Mushrooms of the Southeastern United States*. Syracuse University Press, New York, USA. 373 pp.
- Corner, E.J.H. 1974. *Boletus* and *Phylloporus* in Malaysia: further notes and descriptions. *The Gardens' Bulletin, Singapore* 27(1): 1–16.
- Dick, E.A., Snell, W.H. 1965. Notes on boletes. XV. *Mycologia* 57(3):448-458.
- Engel, H., Krieglsteiner, G.J., Dermek, A., Watling, R. 1983. *Dickroehrlinge. Die Gattung Boletus in Europa*. Weidhausen, H. Engel, 157 pp.
- Galli, R. 2000. *I Boleti. Atlante pratico-monografico per la determinazione dei boleti*. Milano, Edinatura, 287 pp.
- Grund, D.W., Harrison, K.A. 1976. *Nova Scotian Boletes. Bibliotheca Mycologica Vol. 47*. Vaduz, J. Cramer, 283 pp.
- Holmgren, P.K., Holmgren, N.H., Barner, L.C. 1990. Index Herbariorum, part I: the herbaria of the world. *Reg Veg* 120: 1–693.
- Kornerup, A., Wanscher, J.H. 1978. *Methuen handbook of colour. 3rd ed.*, reprinted. Eyre Methuen Ltd., London. 252 pp.
- Le Gal, M. 1950. Observations sur *Boletus dupainii* Boud. *Bulletin de la Societe mycologique de France*, 66:96–98.
- McConnell, O.L., Both, E.E. 2002. *Boletus dupainii* in North America. *Field Mycology* 3(3): 103–104.
- Ortiz-Santana, B., Lodge, D.J., Baroni, T.J., Both, E.E. 2007. Boletes from Belize and the Dominican Republic. *Fungal Diversity* 27: 247–416.
- Parrot, A.G. 1964. Observations nouvelles sur *Boletus dupainii* Bd. *Bulletin de la Societe mycologique de France*, 80:357–363.
- Rocabruna, A. 1986. *Boletus dupainii* Boud. Lamina 207. Bolets de Catalunya. V Colleccio. Barcelona. Societat Catalana de Micologia.



Boletus dupainii from an oak-hickory savanna in Iowa. Photograph by Sibylla Brown