Taiwania, 58(2): 136–139, 2013
DOI: 10.6165/tai.2013.58.136

NOTE

Boletus rubripes Thiers, a New Record of Wild Mushroom from Sikkim (India)

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(Manuscript received 29 October 2012; accepted 08 January 2012)

ABSTRACT: *Boletus rubripes* is reported from India for the first time by comparing macro- and micromorphological details with the type and other descriptions. Conspecificity of the Indian material with the North American material is supported by illustrations and its relation to allied taxa is discussed.

KEY WORDS: Basidiomycota, Boletaceae, India, Macrofungi, *Boletus*, Sikkim, taxonomy.

INTRODUCTION

Recent surveys in the north district of Sikkim, a small state located in Eastern Himalaya region of India, has revealed a tremendous diversity of ectomycorrhizal macrofungi, especially species in the families Russulaceae and Boletaceae (Van de Putte et al., 2012; Das et al., 2012). Since 2009, repeated surveys to different parts of this district have been undertaken by the author, during, and after the monsoon season (August–September). During an expedition in 2011 to Dombang valley, a subalpine forest dominated by coniferous trees including *Picea spinulosa* (Griff.) Beissn., *Abies densa* Griff., *Tsuga dumosa* Eichl. and *Larix griffithiana* Carrière, the author came across a collection of boletes that were not recognised. The macro- and micromorphological features of these boletes were compared to the available literature and the Sikkim specimens have been identified as *Boletus rubripes* Thiers, a new record for India. A detailed macro- and micromorphological description of the collection is provided and illustrations are given to aid future recognition of this species in India.

MATERIALS AND METHODS

Macromorphological characterization was made from the fresh basidiomata in the field and in the base camp. Field photographs of the fresh basidiomata were taken with the aid of a Nikon D300s. Colour codes and terms (mostly) follow *Flora of British Fungi: Colour Identification Chart* (1969). Basidiomata were dried using a field drier.

In the laboratory, micromorphological characters were observed from the dry samples mounted in a mixture of 5% KOH, 30% Glycerol, Phloxin and Melzer's reagent. Drawings of all the micromorphological structures were made with the aid of a drawing tube at 1000× magnification. Basidium length excludes the length of sterigmata. Spore measurements are recorded based on that of twenty basidiospores taken from the spore print (on paper). Spores are measured in side view and sizes are given as KDa-KDc-KDb × KDx-KDz-KDy in which KDa = minimum value for the length of measured collections, KDb = maximum value for the length of measured collections, KDc = mean value for the length of measured collections and KDx = minimum value for the width of measured collections, KDy = maximum value for the width of measured collections, KDz = mean value for the width of the measured collections. Quotient of spore indicates lenght-width ratio (Q = L/W) and is presented here as Qa-Qc-Qb where Qa = minimum quotient value amongst measured collections, Qb = maximum quotient value amongst measured collections, Qc = mean quotient value amongst measured collections. Herbarium name is after Holmgren et al. (1990).

TAXONOMIC TREATMENT

Boletus rubripes Thiers, Mycologia 57: 532, 1965
Figs. 1 & 2

Pileus 58–125 mm diam., convex to pulvinate when young, becoming planoconvex with maturity, surface dry (never sticky), unpolished, velvety-tomentose to matted, often areolate when mature, hazel (27) to milky coffee (28) coloured when young, becoming buff (52) with maturity, turning brown when bruised; margin entire, inrolled when young, becoming slightly incurved with maturity. Pore surface depressed near the stipe

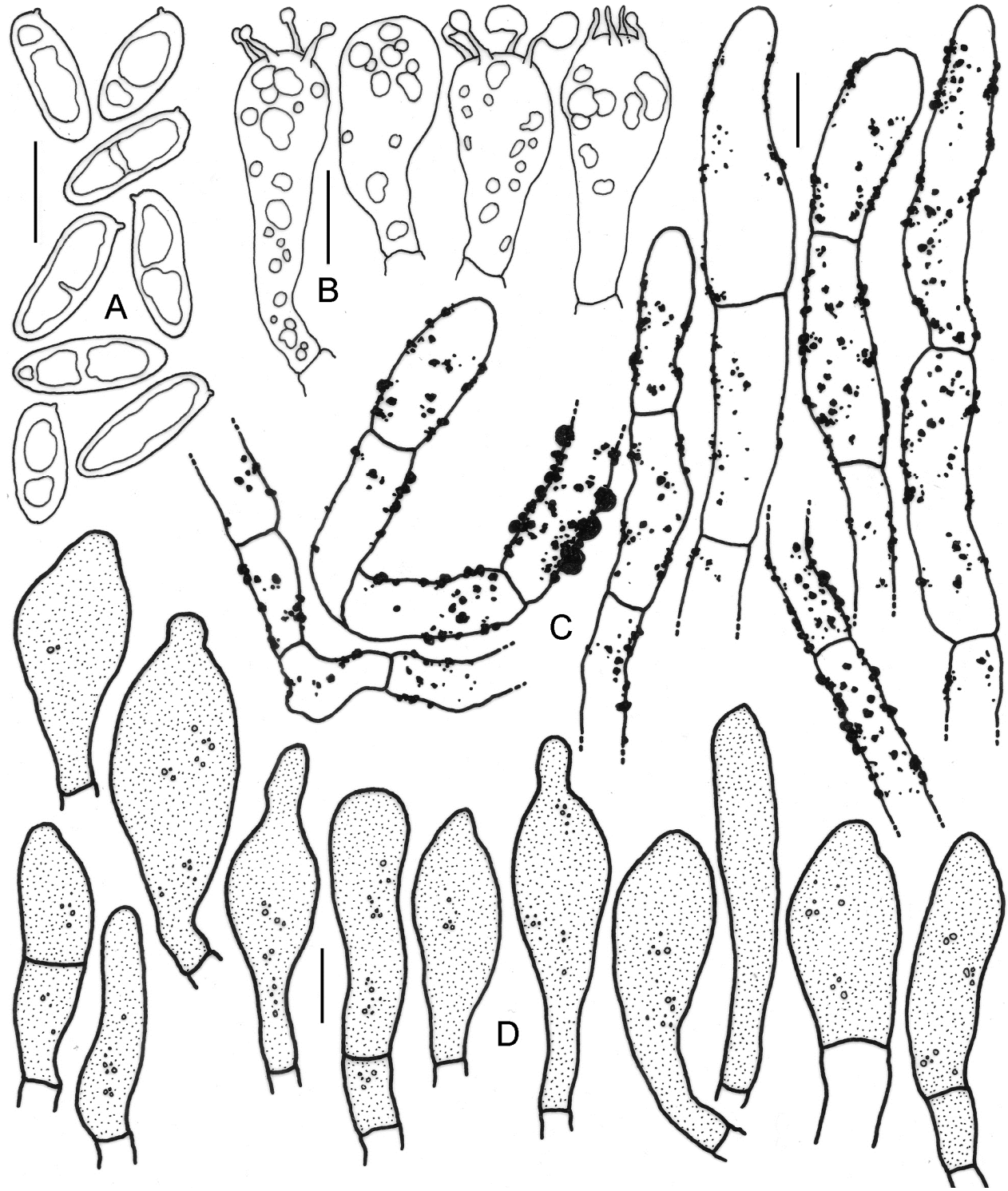

Fig. 1. Micromorphological details of *Boletus rubripes* (Drawn by K. Das from KD-11-057). A: Basidiospores. B: Basidia. C: Hyphae in pileipellis with moderate to heavy incrustations. D: Cystidioid terminal cells of hyphal tips in stipitipellis. Bars = 10 µm.

(when mature), yellow (8G) to straw (50) becoming slightly brownish gradually with age, immediately turning blue when bruised; pores angular, 1–3 per mm. Tubes adnexed to slightly notched, 7–14 mm long, concolorus to pore surface, turning blue after exposure. Stipe 42–108 × 20–35 mm, cylindric (equal) or tapering

slightly towards base, rarely clavate with swollen base, surface dry with longitudinal striations (never reticulate), yellow at apex, pinkish red to red or reddish purple, slowly turning hazel (27) to olivaceous after bruising; veil and annulus absent. Context solid in stipe, pale yellow to immediately becoming blue after exposure, unchanging with the application of $FeSO_4$, but turning saffron (49) with KOH. Pileipellis turns dark reddish brown with KOH. Odor indistinct, Taste bitter. Spore print olive-brown.

Basidiospores 12.0–14.0–16.0 × 5.0–5.3–6.7 µm, (n = 20, Q = 1.79–2.63–3.16) subfusoid to subcylindric or narrowly ellipsoid to slightly ventricose, narrowly inequilateral, smooth, thin-walled, hilar appendages inconspicuous. Basidia 24–36 × 9.5–12 µm, 4-spored, mostly clavate. Hymenial cystidia either absent or rare. Tube trama, divergent, hyaline. Pileipellis up to 370 µm thick, composed of interwoven hyphae; hyphae mostly with moderate to heavy incrustations (up to 3.7 µm high), septate, moderately thick-walled, brownish in KOH µm thick. Stipitipellis up to 240 µm thick, a trichoderm, composed of erect, densely packed hyphal tips; terminal cells 19–57 × 9–21 µm, thick-walled (up to 1.2 µm) cystidioid, slightly dense, of variable shapes, cylindric to subcylindric, fusoid, clavate to appendiculate, apices rounded to subacute or subcapitate, sometimes with appendages. Subpellis with hyaline interwoven hyphae. Clamp connections absent.

Specimen examined: INDIA, Sikkim, North district, Dombang valley, alt. 2890 m, N 27° 44' 07.0" E 88° 44' 38.0", under *Picea spinulosa*, subalpine mixed forest (coniferous and broad-leaved), 22 Aug. 2011, *leg.* K. Das, KD-11-057, (BSHC).

Distribution: Western North America and subalpine region of North Sikkim, India.

Notes: *Boletus rubripes* belongs to the family Boletaceae and is commonly known as the "Red-stemmed bitter Bolete". It can be characterized by velvety-tomentose buff-coloured pileus which turns brownish after bruising, yellow pore surface that immediately turns blue after bruising, red to reddish purple stipe (with yellow apex) with longitudinal striations (but, without reticulations) throughout and yellow apex and distinctly bitter taste of context (Thiers, 1965; Both, 1993; Bessette et al., 2010). Micromorphologically, the moderately to heavily incrusted hyphae in the pileipellis and the thick-walled densely packed erect, variably shaped cystidioid terminal cells of hyphae in the stipitipellis are distinct (Thiers, 1965). The Indian collection is morphologically almost identical to descriptions of its North American counterpart (Thiers, 1965; Bessette et al., 2010), except the basidiospores are slightly broader in the present collection (basidiospores in American collections are 12.5–17.6 × 4–5 µm as in Thiers, 1965 and 12–18 × 4–5 µm as in Bessette et al., 2010) and the basal hyphae are white not yellow as reported by Thiers (1965). Such differences are considered too minor at present to warrant recognition of a distinct taxon, although biogeographically the Indian collections represent a substantial expansion of the known range of the species that needs to be confirmed further with DNA sequence comparison.

Boletus calopus Pers., *B. inedulis* (Murrill) Murrill and *B. roseipes* Bessette, Both & A.R. Bessette (all with yellow and red stipe and bitter taste) are quite close to the species, but, all three can be distinguished easily from *B. rubripes* by a reticulated stipe surface (Thiers, 1965; Smith & Thiers, 1971; Bessette 2010). Moreover, the context of *B. calopus* turns olive-green with $FeSO_4$ (Bessette, 2010) whereas, *B. inedulis* and *B. roseipes* have smaller basidiospores (9–13 × 3.3–4.5 µm in *B. inedulis* and 10–14 × 3–4.5 µm in *B. roseipes*) (Bessette, 2010).

ACKNOWLEDGEMENTS

The author is thankful to the Director, Botanical Survey of India, Kolkata (India) and Department of Forest, Environment and Wild Life Management, Government of Sikkim for providing all kinds of facilities during this study. Assistance (during macrofungal survey to North Sikkim) rendered by S.K. Rai, R.K. Ram and P. Tamang (BSI, SHRC, Gangtok) is duly acknowledged.

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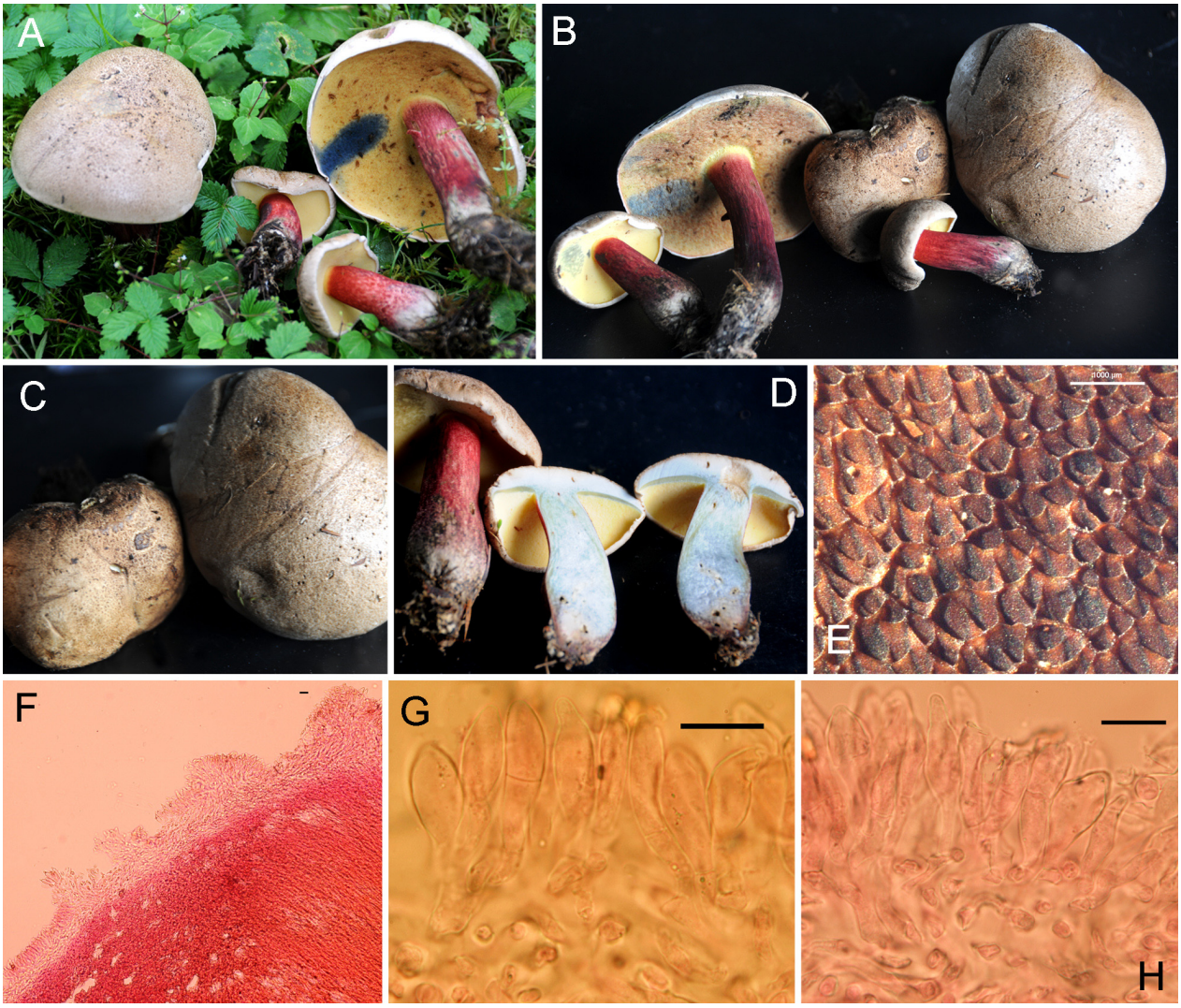

Fig. 2. Macro- and micromorphological details of *Boletus rubripes* (Photographed by K. Das). A & B: Dorsal and ventral view of basidiomata. C: Pileus-surface of basidiomata. D: Context turning blue after exposure. E: Pore surface (dry material) showing angular pores (under Stereo-zoom microscope). F: Cross-section through stipitipellis (under light microscope). G & H: Thick-walled terminal cells of hyphal tips in stipitipellis (under light microscope). Bars: E = 1 mm, F–H = 20 µm.

印度錫金邦發現的野菇新紀錄種－*Boletus rubripes*

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(收稿日期：2012年10月29日；接受日期：2013年1月8日)

摘要：本文報導*Boletus rubripes*首次在印度的新紀錄。除了提供本種外部型態及顯微結構的描述與圖片，也與相近分類群做比較以利在野外辨別本種。

關鍵詞：擔子菌門、牛肝菌科、牛肝菌屬、印度、大型菌類、錫金、分類學。