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Research Article

NEW DISTRIBUTIONAL RECORD OF *RETIBOLETUS ORNATIPES* (PECK) BINDER & BRESINSKY (BOLETACEAE) FROM NORTH AND WEST DISTRICTS OF SIKKIM

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ABSTRACT
Retiboletus ornatipes (Boletaceae) a species reported from Himachal Pradesh (India) is recorded for the first time from Sikkim (India). Macro- and micromorphological details of this species are given along with the illustrations. Its relations with allied taxa are also discussed.

Key Words: *Basidiomycota, Boletaceae, India, Macrofungi, Retiboletus, Sikkim, Taxonomy*

INTRODUCTION
Macrofungal explorations have been undertaken by the author mainly to North and West district of Sikkim (a small state of India) since 2008. Some interesting taxa have been already reported (Das *et al.*, 2010; Das and Verbeken, 2011; Das *et al.*, 2011; Das and Verbeken, 2012 and Van de Putte *et al.*, 2012) from these areas. *Retiboletus ornatipes* (= *Boletus ornatipes*), belonging to the family Boletaceae, was collected earlier (1988) from Dhangiara (Mandi) from the state Himachal Pradesh and known by this single collection from the entire Indian subcontinent (Lakhanpal, 1996). Recently, while undertaking the routine macrofungal surveys, two more collections were made by the author from two sub-alpine localities of Sikkim, a small Himalayan state in India. The first site: Lachen top, being located in the North district is a mixed forest, mainly dominated by trees like *Tsuga dumosa* Eichl. and *Daphniphyllum himalayense* Müll. Arg. The second site: Tsoka, being located in the West district is a mixed forest dominated by trees like *T. dumosa* Eichl., *Abies densa* Griff., *A. spectabilis* Spach in association with species of *Rhododendron* and *Betula*. In the present communication, macro- and micro-morphological details of *R. ornatipes* are well presented along with the supporting illustrations.

MATERIALS AND METHODS
Macromorphological characterization was made from the fresh basidiomata. Field photographs of the fresh basidiomata were taken with the aid of Nikon D300s. Colour codes and terms (mostly) follow Colour identification chart of the Flora of British fungi (1969). Basidiomata were dried in the base camp with a field drier.

In the laboratory, micromorphological characters were observed from the dry samples mounted in a mixture of 5 % KOH, 30 % Glycerol and Melzer's reagent. Drawings of all the micromorphological structures were made with the aid of a drawing tube at an original magnification of 1000×. Basidium length excludes the length of sterigmata. Spore measurements are recorded based on that of twenty basidiospores. 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 the measured collections, KDb = maximum value for the length of the measured collections, KDc = mean value for the length of the measured collections and KDx = minimum value for the width of the measured collections, KDy = maximum value for the width of the 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 the measured collections, Qb = maximum quotient value amongst the measured collections, Qc = mean quotient value amongst the measured collections.

TAXONOMIC TREATMENT

Retiboletus ornatipes (Peck) Binder & Bresinsky, Feddes Repert. 113 (1-2): 37, 2002
Syn.: ***Boletus ornatipes*** Peck, Ann. Rep. N. Y. State Museum 29: 67, 1878.

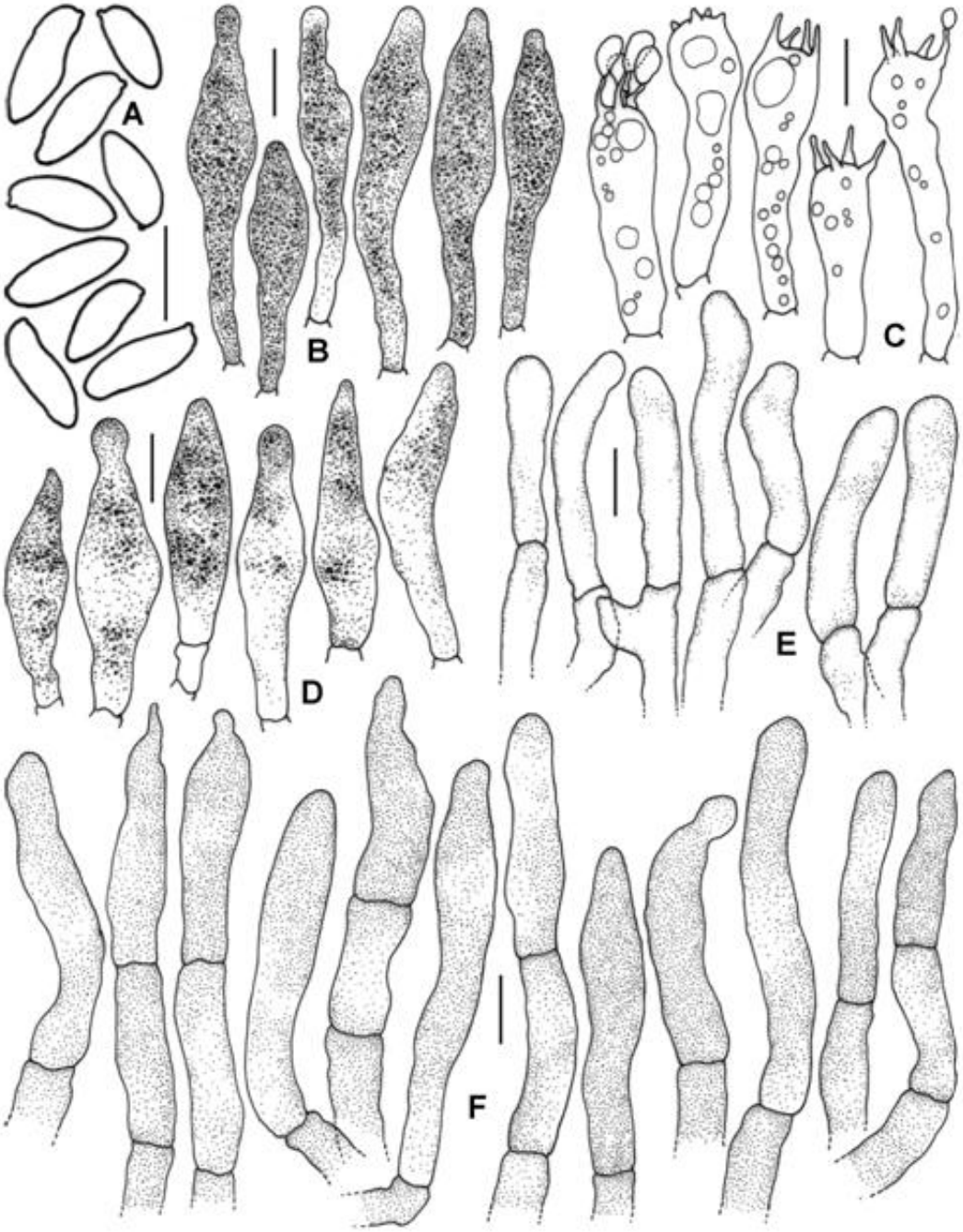

Figure 1. Micromorphological details of *Retiboletus ornatipes* (Drawn by K. Das from KD-12-249). **A-** Basidiospores. **B-** Pleurocystidia with granular contents. **C-** Basidia. **D-** Cross-section through stipitipellis showing caulocystidia (amongst fertile reticultion). **E-** Cystidioid elements of stipitipellis. **F-** Radial section through pileipellis showing pigmented cystidioid elements. Bars = 10 µm.

Pileus 40-70 mm diam., convex when young, becoming planoconvex to plane with maturity, never sticky, surface dry, unpolished, subtomentose to velvety, olive-gray to sepia (26) or snuff brown (17) or gray to gray-black with darker centre; margin entire, slightly decurved to straight. Pore surface straw (50) to lemon yellow (54), becoming luteus (51) to saffron (49) when bruised; pores circular, 1-2 per mm. Tubes 5-7 mm long, lemon yellow (54), adnate to subdecurrent. Stipe 50-140 × 8-30 (37) mm, cylindric (equal) to narrowly clavate, with coarse raised reticulation that often extended up to base, sulphur yellow (55) to greenish yellow (57) or lemon yellow (54), mostly luteus (51) towards base, sometimes becoming brownish to grayish with maturity or after bruising; veil and annulus absent. Context solid in stipe, lemon yellow (54) to lemon chrome (53), rarely luteus (51), unchanging after exposure and with the application of $FeSO_4$, but turning orange-brown with KOH. Pileipellis turns dark reddish brown with KOH. Odor indistinct, Taste bitter. Spore print olive-brown.

Figure 2: Macromorphological details of *Retiboletus ornatipes* (Photographed by K. Das). A- Dorsal and ventral view of basidiomata**. B and C-** Basidiomata showing yellow pore surface and unchanging yellow context. **D-** Pore surface. E: Coarse reticulation on stipe surface. **Bars:** A = 30 mm, B = 20 mm, C-E = 10 mm.

Basidiospores 9.5-12.0-13.7 × 4.0-4.2-4.5 µm, (n = 20, Q = 2.26-2.84-3.17) oblong to slightly ventricose, narrowly inequilateral, pale orange-brown in Melzer's reagent, smooth, slightly thick-walled. Basidia 34-46 × 8-10 µm, 4-spored, subclavate to clavate; sterigmata up to 5.5 µm long. Pleuromacrocystidia

abundant, 37-55 × 8-10.5 µm, emergent up to 16 µm, ventricose with cylindrical neck at base, apex mostly subacute, thin-walled, content dense granular. Tube trama slightly gelatinous, divergent. Pileipellis up to 200 µm thick, a trichoderm, terminal cells of the elements cystidioid, up to 9.5 µm broad, cylindric to obtuse or subacute, rarely appendiculate, wall up to 0.4 µm thick; content with grayish pigmentation. Stipitipellis (true reticulation) fertile, greyish, composed of basidia and cystidia; basidia subclavate to clavate, 4-spored; caulocystidia 35-47 × 8-13 µm, slightly emergent or not, mostly ventricose, with subacute to rounded or subcapitate apex, content dense. Cystidioid elements in few clusters; terminal cells of the elements up to 9 µm broad, cylindrical to subclavate, hyaline or slightly dense. Clamp connections absent.

Specimen examined: INDIA, Sikkim, North district, Lachen top, alt. 2846 m, N 27° 43' 37.0" E 88° 32' 47.2", under *Tsuga dumosa*, subalpine mixed forest (broad-leaved and coniferous), 3 Sept. 2012, *leg.* K. Das, KD-12-249, (BSHC); ibid., West district, Tsoka, alt. 2897 m, N 27° 25' 55.9" E 88° 11' 06.5", under *T. dumosa*, subalpine mixed forest (broad-leaved and coniferous), 1 Sept. 2009, *leg*. K. Das, KD-1269, (BSHC).

Distribution: China, Japan, North America, Taiwan and India.

Notes: Based on the presence of Retipolides, the genus *Retiboletus* has been separated from *Boletus* in the family Boletaceae (Binder and Bresinsky, 2002). *Retiboletus ornatipes* which is commonly called as "Ornate-stalked Bolete" can be characterized by olive-grey to grey-black pileus, straw to lemon yellow pore surface, coarsely reticulated yellow stipe and yellow unchanging context (Smith and Thiers, 1971; Both, 1993; Bessette *et al.,* 2010). Micromorphologically, ventricose pleurocystidia with cylindric neck at base and cistidioid elements (pileipellis) with grey pigmentation are quite distinct. This Indian specimen agrees very well with other materials (reported from North America), but shows remarkably larger basidia (22-30 × 6-8 µm in Michigan sample (Smith and Thiers, 1971)) and the association with coniferous tree (*Tsuga dumosa*).

Morphologically, present species is quite close to *Retiboletus retipes* (Berkeley and Curtis) Binder & Bresinsky (sometimes considered as the synonym of present species). But, the latter can be separated by the presence of yellow powder on pileus of young basidiomata (Smith and Thiers, 1971; Bessette *et al.*, 2010). Yellowish form of another species: *Retiboletus griseus* (Frost) Binder & Bresinsky also somewhat resembles *R. ornatipes* (Smith and Thiers, 1971). But, the former has the whitish to grayish (never yellow) pore surface (Bessette *et al.,* 2010), whitish to grayish stipe (only becoming yellowish with maturity) (Smith and Thiers, 1971; Bessette *et al.,* 2010).

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