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Two new records for Turkish *Boletaceae*

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Türkiye *Boletaceae*'leri için iki yeni kayıt

Abstract: Two basidiomycete taxa of the family *Boletaceae*, *Alessioporus ichnusanus* and *Hortiboletus engelii* are reported as new records for the mycobiota of Türkiye. This finding represents the first record of the genus *Alessioporus* in the country, and the third record of the genus *Hortiboletus*. A brief morphological description of each species is provided, supported by photographs documenting their macroscopic and microscopic features.

Key Words: Biodiversity, *Boletales*, new record, İstanbul

Özet: *Boletaceae* familyasına ait iki tür, *Alessioporus ichnusanus* ve *Hortiboletus engelii*, Türkiye mikobiyotası için yeni kayıt olarak rapor edilmiştir. Bu bulgu *Alessioporus* cinsinin ülkedeki ilk kaydını, ve *Hortiboletus* cinsinin ise üçüncü kaydı olduğunu göstermektedir. Her bir türün, makroskobi ve mikroskobik özelliklerini gösteren fotoğraflarıyla desteklenmiş, kısa bir morfolojik betimlemesi verilmiştir.

Anahtar Kelimeler: Biyoçeşitlilik, *Boletales*, yeni kayıt, İstanbul

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1. Introduction

The *Boletaceae* (*Boletales, Basidiomycota*) is one of the largest families of fleshy fungi in the order comprising about 1200 documented species (Wu et al., 2023). The majority of its members are primarily characterised by a tubular hymenophore; a spore deposit that is commonly olivaceous, yellowish, brownish, or vinaceous; fusiform or subfusiform basidiospores; fruit bodies that often turn blue, red, or black upon bruising or exposure to the air (Wang et al., 2024a; Ullah et al., 2025). Species within *Boletaceae* form ectomycorrhizal associations primarily with conifers, but also with the members of *Fabaceae, Fagaceae* and *Dipterocarpaceae* (Wu et al., 2022; Mao et al., 2023; Ullah et al., 2025).

Alessioporus Gelardi, Vizzini & Simonini and *Hortiboletus* Simonini, Vizzini & Gelardi are two distinct genera within *Boletaceae*. Species of *Alessioporus* are characterized by the pileate-stipitate basidiomes with a tubular, poroid hymenophore that is bright yellow to olive-green; a tomentose to glabrous, dry pileus ranging from ochraceous-brown to dark olive-brown; a stipe that is reticulate to coarsely ribbed or occasionally smooth with a rooting at the base; a whitish to yellowish context that darkens downwards; tissues that quickly turn dark indigo blue when injured or handled; an olive-brown basidiospore print; smooth, ellipsoidal to ellipsoidal-fusoid basidiospores; and cylindrical-fusiform to ventricose-fusiform or lageniform cystidia (Gelardi et al., 2014; Frank et al., 2017).

Members of *Hortiboletus* are characterised by small to medium-sized basidiomes with a xerocomoid habitus, a subtomentose to finely squamulose pileus, that may become cracked-areolate at maturity, dry pileus and stipe surfaces that do not stain blue-green with ammonia, a yellow-olive, tubular hymenophore with tubes not exceeding 15 mm long at maturity, context that is unchanging or blues upon injury, smooth, ellipsoid-fusiform basidiospores, palisadoderm or physalo-palisadoderm pileipellis consisting of erect and (sub)parallel, generally short and frequently encrusted hyphae, and hymenophoral trama intermediate between the "Boletus-type" and the "Phylloporus-type" (Biketova et al., 2025).

While only two species of *Alessioporus* have been described to date (Indexfungorum, 2025), there are no records of this genus from Türkiye (Sesli et al., 2020). Although 19 *Hortiboletus* species are currently known globally (Indexfungorum, 2025; Ullah et al., 2025), only two of them, *Hortiboletus bubalinus* (Oolbekk. & Duin) L. Albert & Dima and *Hortiboletus rubellus* (Krombh.) Simonini, Vizzini & Gelardi had been reported from Türkiye prior to this study (Uzun et al., 2017; Allı et al., 2019).

This study presents *Alessioporus ichnusanus* (Alessio, Galli & Littini) Gelardi, Vizzini & Simonini and *Hortiboletus engelii* (Hlaváček) Biketova & Wasser as new records for the mycobiota of Türkiye. A review of the current checklist and supplementary studies on Turkish *Boletaceae* (Bozok et al., 2020; Uzun and Kaya, 2020; Sesli et al., 2020; Yeşilyurt et al., 2023; Karaduman et al., 2024) conformed that neither species had been previously recorded in the county.

2. Materials and Method

Fresh basidiomata of *Alessioporus ichnusanus* and *Hortiboletus engelii* were collected from the Beykoz district of İstanbul Province during field surveys in 2024. The basidiocarps were photographed in situ, and relevant notes were taken related to ecology at the time of collection. The specimens were carefully collected and placed into specially prepared paper bags. Then they were transferred to the fungarium, and dried in an air conditioned room. Macromorphological data based on fresh material while micromorphological examinations were perpormed on dried samples. A Leica DM 2500 trinocular light microscope was used for micromorphological investigations. The observed macro- and micromorphological features were compared with relevant literature (Chevtzoff, 1998; Gelardi, 2007; Klofac, 2007; Assyov and Stoykov, 2011; Gelardi et al., 2014 Buczacki, 2012; Læssøe and Petersen, 2019) for identification.

Voucher specimens are kept at Karamanoğlu Mehmetbey University, Science Faculty, Department of Biology.

3. Results and Discussion

Basidiomycota R.T. Moore

Agaricomycetes Doweld

Boletales E.-J. Gilbert

Boletaceae Chevall.

Alessioporus ichnusanus (Alessio, Galli & Littini) Gelardi, Vizzini & Simonini, in Gelardi, Simonini, Ercole & Vizzini, Mycologia 106(6): 1171 (2014) (Figs. 1,2)

Syn: [*Boletus ichnusanus* (Alessio, Galli & Littini) Oolbekk., *Xerocomus ichnusanus* Alessio, Galli & Littini]

Figure 1. Basidiocarps (a,b) of *Alessioporus ichnusanus* (bars 20 mm)

Macroscopic and microscopic features: Pileus 40-90 mm in diameter, hemispherical when young, then convex to somewhat flat-convex, rarely slightly depressed at some portion, glabrous to somewhat fibrillose or velvety, clay-buff, light brownish, yellowish-brown to olive-brown, purplish-chesnut-brownatsome regions**; margin** sinuous, slightly protruding and/or vavy to lobed; **Hymenophore** composed of pores and tubes, somewhat sinuate when young then adnate to subdecurrent. **Pores** small to medium in diameter (up to 1.9 mm), roundish and small when young, angular and somewhat larger at maturity, at first lemon-yellow then olive-yellow to olive-brown, usually rusty spotted with age, blueing when bruised. **Tubes**, longer (up to 14 mm), roughly as long as the thickness of the cap flesh, light yellow to concolorous with the pores, turning blue if bruised. Flesh firm, fairly soft, pale lemon yellow, turning blue upon exposing to air, especially towards the stipe base. **Stipe** 40-100 × 10-30(-35) mm, cylindrical, cylindrical-fusiform, straight to curved, enlarging or tapering towards the base, rooting, solid, somewhat smooth at the apex, then with a distinct longitudinal reticulum or coarse longitudinal ribs, and/or with coarse granules, yellow to straw-colored above, light-brown at middle portion with reddish or brownish to almost blackish-blue ribs, brownish to dark brownish blue towards the base.

Microscopic features: Basidia 32-37(-40) × (8-)10-11.8(-12.3) µm, cylindrical-clavate to clavate, 2-4 spored, predominantly 4-spored, without a basal clamp. Cheilocystidia (40-)50-55(-60) × 12-15 µm, ventricose-fusiform, with yellowish to light brownish content in 10% KOH. Pleurocystidia similar in shape, colour and size with cheilocystidia. Pileipellis a trichoderm of interwoen branched hyphae. Basidiospores (11.9) 12.3 - 14.1 (14.5) × (5.5) 5.7 - 6.7 (6.9) µm, subcylindrical to elliptical-fusiform with a small apiccule, usually with two to four large oil droplets at maturity, straw-colored to light brownish in water and KOH, smooth, thick walled. Stipitipellis composed of loosely interwoven septate hyphae 3–10 µm wide.

Ecology: *Alessioporus* is known to form ectomycorrhizal associations primarily with *Quercus* species. *Alessioporus ichnusanus* has been reported in warm Mediterranean regions with various oaks, including *Q. ilex, Q. suber, Q. coccifera, Q. cerris, Q. robur, Q. pubescens, Q. petraea, Q. pyrenaica,* and *Q. frainetto,* as well as with *Eucalyptus camaldulensis* and *Pteridium aquilinum* (Chevtzoff, 1998; Gelardi, 2007; Assyov and Stoykov, 2011; Gelardi et al., 2014). The specimens examined in this study were collected from a mixed forest in the Beykoz district of Istanbul, confirming its association with *Quercus* and newly documenting its occurrence with *Castanea* L. and *Arbutus* L. The basidiomata were found on calcareous soil in a humid, shaded area among leaf litter. This discovery represents the first record of *A. ichnusanus* in Türkiye and expands its known ecological range within the Mediterranean biome.

Specimens examined: İstanbul Province, Beykoz district, in Kavacık forest, on soil among leaf litter under *Quercus* sp., *Castanea* sp., *Arbutus* sp., 41.09 N-29.10 E, 130 m, 27.09.2024, Y.Karaduman 37a; in Polenezköy Forest 41.13N-29.21E, 140 m, 27.09.2024, Y.Karaduman 37b.

Suggested Turkish name for *Alessioporus* and this species is “Allişboleti”.

Comments: *Alessioporus ichnusanus* is a medium-small, caespitose species, and easily recognized by its reticulate and rooting stipe. *Alessioporus ichnusanus* was usually misinterpreted as a reticulate phenotype of *Boletus pulverulentus* Opat. However, *B. pulverulentus* can be distinguished from *A. ichnusanus* by more slender, xerocomoid habitus, more intense overall bluing reaction, narrower spores, and a nearly sterile stipe surface (Breitenbach and Kränzlin 1991; Gelardi et al., 2014). *Alessioporus ichnusanus* also shares the boletoid appearance and strongly bluing tissues with *B. poikilochromus*, but the latter differs primarily in its fruit bodies, which tend to fade to cinnamon-brown with age, its smaller spores, and its very distinctive smell (Gelardi et al., 2014).

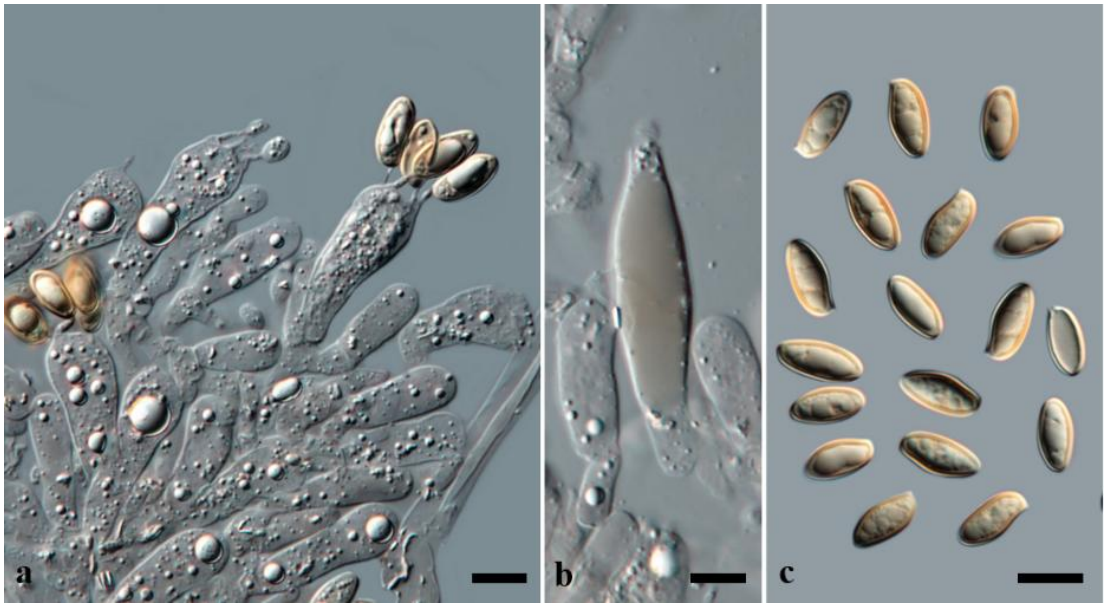

Figure 2. Basidia and basidioles (a), cheilocystydium (b) and basidiospores (b) of *Alessioporus ichnusanus* (bars 10 µm) (a,b,c in Congo Red)

Hortiboletus engelii (Hlaváček) Biketova & Wasser, Index Fungorum 257: 1 (2015) (Figs. 3,4)

Syn: [*Boletus declivitatum* (C. Martín) Watling, *Boletus engelii* Hlaváček, *Boletus subtomentosus* subsp. *declivitatum* C. Martín, *Xerocomellus engelii* (Hlaváček) Šutara, *Xerocomus declivitatum* (C. Martín) Klofac, *Xerocomus engelii* (Hlaváček) Gelardi, *Xerocomus quercinus* H. Engel & T. Brückn.]

Macroscopic features: Pileus 30-75 mm in diameter, hemispherical, then convex to flattened, often with a raised

Figure 3. Basidiocarps (a,b,c) of *Hortiboletus engelii* (bars 20 mm)

edge, margin entire, surface uneven, somewhat corrugated, tomentose to rugulose, sometimes cracked and showing the underlying creamy-yellowish flesh, brownish, dark-brown to orange-brown of with mostly incrusted hyphae. Tubes donate to sinuate with toot, lemon yellow. Pores initially small, then large, angular, concolorous with the tubes. Stipe 30-85 × 6-15 mm, initially rather stout to ventricose, then more slender, equal and cylindrical, somewhat curved, yellowish-brown with a reddish tones, lighter at the apex and the base, some completely yellow at maturity. Flesh soft, pale to lemon yellow, orange dots form few reddish pits in the stipe, often causes the formation of pink-red-

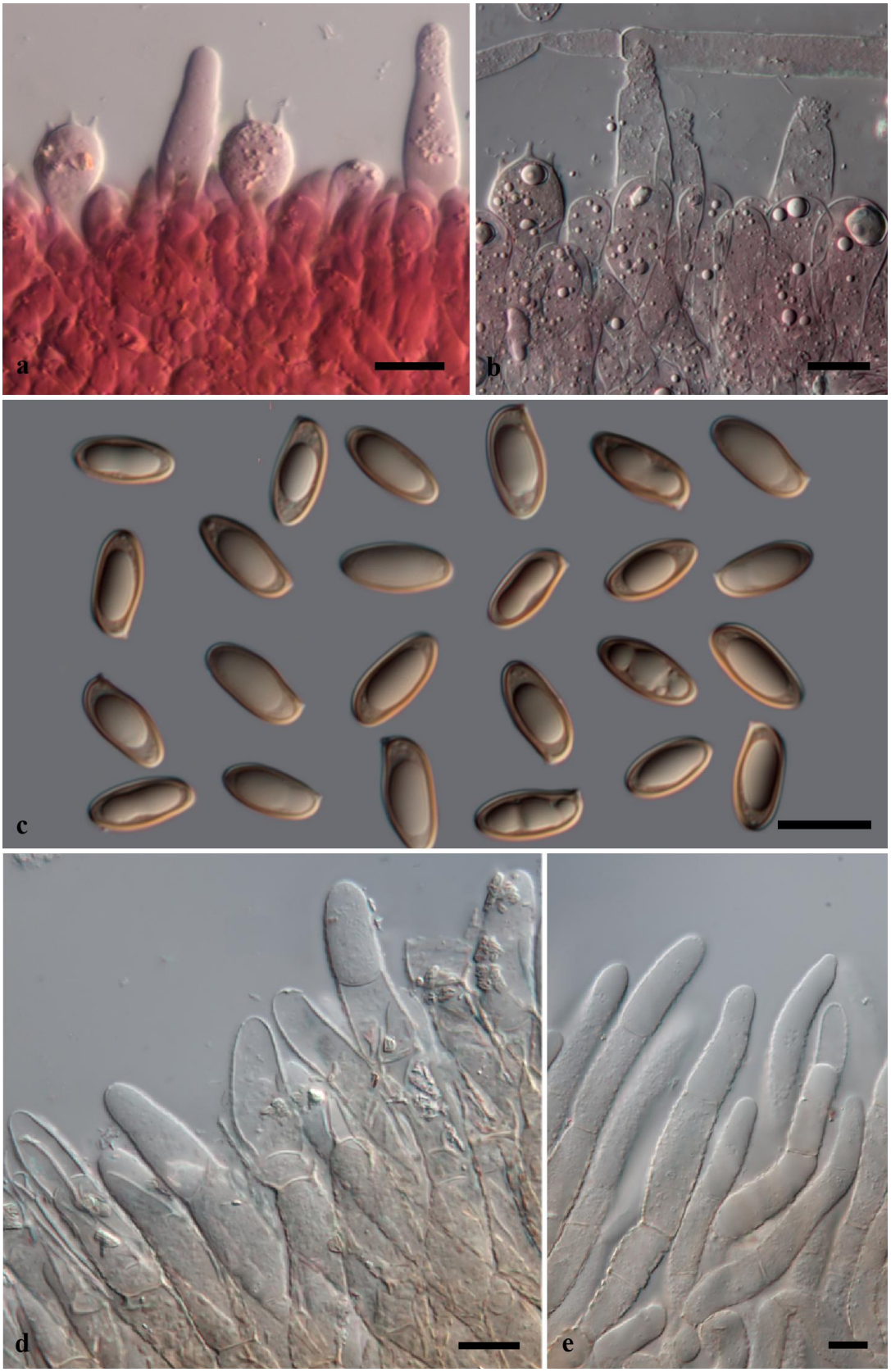

Figure 4. Basidia and cystydia (a,b) basidiospores (c) and cap cuticle (d,e) of *Hortiboletus engelii* (bars 10 μm) (a-e in Congo Red)

brownish shades at the base, never present along the entire lenght.

Microscopic features: Basidia clavate 31-38(-43) × 6-10.8 µm, clavate, two-or four-spored. Cystidia 40-60 × 5-9 µm, fusiform to ventricose, mostly incrusted above half, especially towards the apex. Basidiospores (9.7) 10.4 - 12 (12.6) × (4.8) 5 - 5.7 (6.1) µm, broadly cylindrical to fusiform, smooth, hyaline, guttulate, apiculate. Pileus cuticle is a trichodermis, with short, cylindrical ends, rounded at the apex without clamp, somewhat incrusted.

Ecology: *Hortioletus engelii* is an ectomycorrhizal fungus, and grows in deciduous forests, along forest edges in symbiosis with various deciduous trees such as *Betula* L., *Tilia, Quercus* L., *Fagus* L., *Carpinus* L., *Eucalyptus* L'Hér., *Corylus* L. (Buczacki, 2012; Læssøe and Petersen, 2019).

Specimen examined: İstanbul, Beykoz, Polonezköy forest, decidious forest, streamside, on sandy soil among leaf litter, 41.10 N, 29.17 E, 150 m, 06.08.2024, Y. Karaduman 35.

Suggested Turkish name for this species is “Turuncu lekeli şarapboleti”.

Comments: *Hortiboletus engelii* is a relatively small bolete characterized by the presence of numerous small, orange granules in the flesh at the stem base. *Hortiboletus rubellus* (Krombh.) Simonini, Vizzini & Gelardi also has orange grains in the flesh of stipe base, but the pores of this species quickly stains blue, and mostly has a blood-red cap. *Hortiboletus bubalinus* (Oolbekk. & Duin) L. Albert & Dima may exhibid a similar coloration, but differs in its dull-apricot to yellowish-brown, more distinctly pruinose pileus and a distinctive context-bluing reaction. *Rheubarbariboletus armeniacus* (Quél.) Vizzini, Simonini & Gelardi may also be confused with *H. engelii*, but this species doesn’t have orange granules in the stipe base (Allı et al., 2019; Læssøe and Petersen, 2019; Wang et al., 2024b).

Conflict of Interest

Authors have declared no conflict of interest.

Authors’ Contribution

Authors contributed equally.

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