Hydnum reginae newly described from Britain

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ABSTRACT

A recent British collection of *Hydnum albidum sensu* European authors was investigated and described as a new species (Kibby & Liimatainen, 2022). Its relationship the North American *H. albidum* Peck and to other pale *Hydnum* species is discussed here.

INTRODUCTION

Hydnum albidum Peck (1887) was described from North America and Peck's original description is reproduced in full here:

"*Hydnum albidum*. Pileus fleshy, thin, convex or nearly plane, subpruinose, white, flesh white; aculei white; stem short, solid, central or eccentric, white; spores subglobose, .00016 to .0002 in. in diameter. Plant 1 to 2 in. high, pileus 1 to 1.5 in. broad, stem 3 to 5 lines thick. Ground in thin woods. Sandlake. June and July. The species is closely allied to *Hydnum repandum*, with which it appears to have been united by some authors, but its small size, white color and smaller spores appear to me to make it worthy of specific distinction. It is quite unlike *Hydnum candidum*. The pileus is often irregular and lobed on the margin."

Note that as described by Peck *H. albidum* was rather small and the entire fruitbody, including the spines, was described as white. The spores reached .0002 in. in diameter which is aprox. 5 µm. Swenie *et al*. (2018) were unable to get an ITS sequence from the holotype of *H. albidum* and designated an epitype accompanied by a full description which is in broad agreement with Peck's original description including the small size, coloration of the fruitbody and spores.

White-capped collections of *Hydnum* from Europe have historically been referred to *H. albidum* despite discrepencies in their macroscopic appearance: usually much larger and the spines soon developing a distinctly salmon-pink coloration. Their spores are of a similarly small size but rather more ellipsoid-ovoid in shape than those described by Peck.

Fig. 1. *Hydnum reginae*. Holotype on left, on soil in *Fagus* leaf litter, North Downs Way, White Downs, Surrey, 13 October, 2021. Photograph © Geoffrey Kibby.

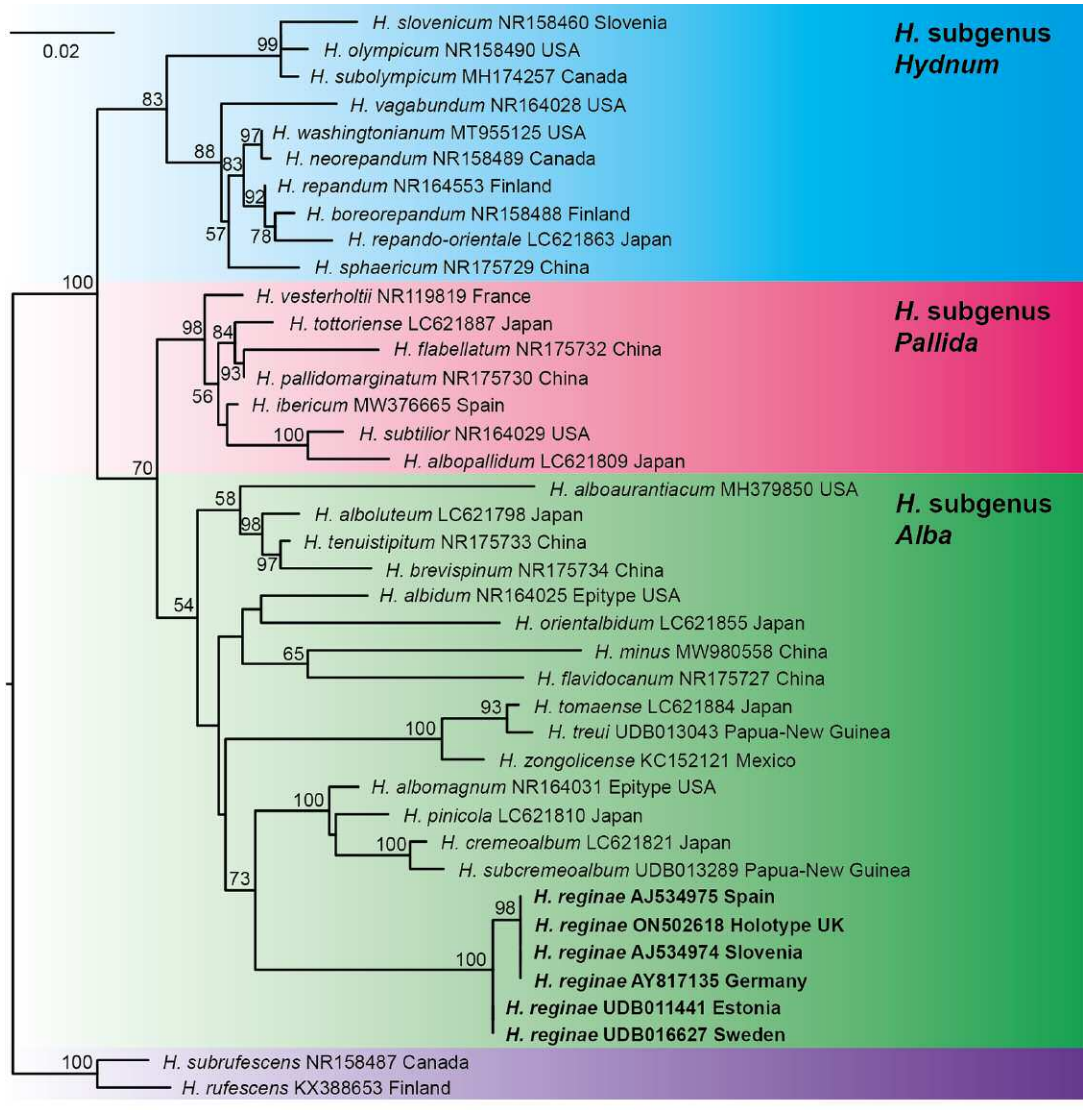

Fig. 2. Topology resulting from the RAxML analysis of ITS and LSU. Bootstrap (BS) values > 50% are indicated above or near branches. The new species described is in bold, the sequences from mainland Europe were all originally identified as *H. albidum*.

MATERIALS AND METHODS

Microscopy

Specimens were mounted in Congo Red in ammonia, Melzer's reagent or lactoglycerol and studied on a Euromex iScope Pli 1153 light microscope using bright field optics. Spore measurements were made at x1000, Spore measurements are given as a range covering 90% of measured spores with 5% extreme values given within parentheses. All structures were photographed using a Toupcam 12MP camera and Touplite software.

Colour terminology

Colour descriptions are from the British Mycological Society colour chart (Rayner, 1970).

DNA sequencing and analyses

Total DNA was extracted from dry specimens employing a modified protocol based on Murray & Thompson (1980). PCR reactions (Mullis & Faloona 1987) included 35 cycles with an annealing temperature of 54 °C. The primers ITS1F and ITS4B (Gardes & Bruns 1993) were employed to amplify the ITS rDNA region. PCR products were checked in 1% agarose gels, and amplicons were

sequenced with one or both PCR primers. Sequences were corrected to remove reading errors in chromatograms.

To study the phylogenetic placement of *H. reginae*, the sequences of all the species representing *Hydnum* subgenera *Alba*, *Hydnum* and *Pallida* were downloaded from GenBank and incorporated in our analysis using *H. rufescens* and *H. subrufescens* from *H.* subgen. *Rufescentia* as the outgroup. The ITS and LSU alignment of 40 sequences was produced with the program MAFFT v. 7.0 (Katoh & Standley 2013) under default settings and is composed of 954 nucleotides (including gaps). Sequences were subjected to Maximum Likelihood (ML) analysis as implemented in RAxML version 8 (Stamatakis 2014) with 1000 bootstrap replicates under the GTRGAMMA model.

Results

Our tree (Fig. 2) recovered the three subgenera reported by Niskanen *et al*. 2018 but with significantly greater bootstrap support (BS), this probably due to the inclusion of further recently described species. Our subgenus figures were *Hydnum* (83%), *Pallida* (98%) and *Alba* (54%).

The American epitype of *H. albidum* and the new *H. reginae* are both placed in the still weakly defined sg. *Alba* but seemingly in different sections. All the included European collections previously assigned to *H. albidum* appear conspecific with *H. reginae*.

Taxonomy

Hydnum reginae Kibby, Liimat. & Niskanen IF559703

Holotype: UK England, North Downs Way, White Down, Surrey, TQ113487, 13 October 2021. Under *Fagus*, Coll. G. Kibby, M. Tortelli & C. Soler.

K-M 000265258, GenBank no: ON502618,

Kibby, G.G. & Liimatainen, K. (2002). Nomenclatural novelties. Index Fungorum 523:1.

Figs. 1, 3, 4 & back cover

Etymology: *reginae* = Latin for a queen, in honour of Queen Elizabeth II's Platinum Jubilee.

Basidiomata medium to large, growing isolated or in confluent groups. Pileus 50–150 mm diam, very irregular in outline, rounded to elongate-ellipsoid, fleshy, initially convex then plane to depressed and frequently with very irregular lumps and bumps, glabrous to slightly velutinous. Colour initially pure white then slowly pale cream to yellowish cream. Margin involute and remaining so, sinuous and often lobed with age (Fig. 1 & back cover). **Spines** decurrent, conical near the pileus margin becoming increasingly flattened near the stipe and often with two to three points per spine; 5–8 x 0.5–1 mm. Colour pale luteous at first, soon pale salmon pink (Fig. 3). **Stipe** cylindric to slightly clavate, 20–40 ◊ 30–40 mm, concolorous with the pileus, basal mycelium white. **Context** white to greyish cream in the base of the stipe. **Odour** ill-defined but pleasant, slightly sweet. **Flavour** mild, soapy then slowly slightly bitter. **Macrochemical reactions**: KOH + context = no reaction, Guaiac + context no reaction.

Basidiospores ovoid to broadly ellipsoid, thin-walled, hyaline, non-amyloid, (4.5-)4.9–5.4 x 3.8–4.3 µm, av = 5.1 x 3.9 µm, Q = 1.2–1.4, av Q = 1.3 (Fig. 4). **Basidia** 35–40 x 5–6 µm, 4- to 6-spored, sterigmata 3–4 µm. **Hyphae** of the apex of the spines cylindrical, thin-walled, hyaline with cylindrical to clavate ends, 3–4 µm diam. **Clamp connections** present.

Ecology and distribution

The English collections (holotype and paratypes) were from deciduous forest, mainly *Fagus* on calcareous soils in leaf litter or emerging from bare soil. So far known also from Estonia, Germany, Slovenia, Spain, and Sweden.

A collection of what appears to be the same species but awaiting sequencing has also been recorded in Wales from open calcareous grassland with *Helianthemum* on the Great Orme.

Fig. 3. Close-up of the spines of *H. reginae*. Photograph © Geoffrey Kibby.

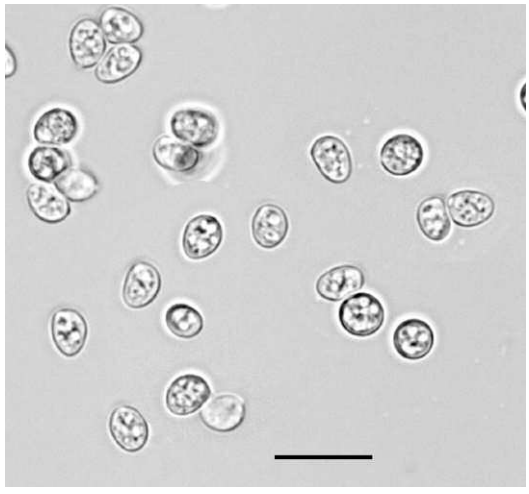

Fig. 4. Spores of *H. reginae*, the scale bar = 10 µm. Photograph © Geoffrey Kibby.

The pallid fruitbodies and the small spores would place this species in subgenus *Alba* (Niskanen *et al*., 2018) which includes *H. albidum* sensu stricto and it would appear to be the only European representative of this subgenus to date. Other pallid species in Europe are usually easily distinguished by their larger and often differently shaped spores and differently coloured spines. Perhaps most similar in appearance is the white to cream-coloured *H. boreorepandum* Niskanen, Liimat. & Niemalä in subg. *Hydnum*. This is known from forests of *Picea*, *Pinus* and *Betula* in Finland and differs in its more regularly shaped fruitbodies with longer stipes, less decurrent and non-pink spines, as well as larger spores.

H. reginae appears to be genuinely rare in Britain and confined to calcareous soils. It is possible that it has been passed over as just pale-coloured specimens of the common *H. repandum* although it is so striking in the field that this seems unlikely. The Surrey population was in a relatively small stand of *Fagus* on fairly steep slopes and was even observed pushing out through roadside embankments below the tree line. The possible occurrence with *Helianthemum* in Wales is particularly interesting and it may be that searches on similar sites around the country will reveal more populations.

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