

Delimitation of *Boubovia* and *Pulvinula*

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Pulvinula and *Boubovia* share the characters of apically curved or hooked paraphyses, a forked ascus base in most species, and often pulvinate apothecia. *Pulvinula* is delimited to include species having globose ascospores, with asci thin-walled throughout development, whilst *Boubovia* contains species having ellipsoid to subglobose ascospores, and the ascus wall thickened in the early stages of development, especially at the time of ascospore delimitation. A new combination for the British species of *Boubovia*, *B. nicholsonii*, previously known as *Humaria nicholsonii*, is made, and a revision of the type is given. Two other combinations, *B. ascoboloides* and *B. subprolata*, are also proposed. *Pulvinula ovalispora* is tentatively placed as a synonym of *B. nicholsonii*. A key to the known species of *Boubovia* is provided.

Pulvinula Boud. was originally established for a group of discomycetes having discoid to pulvinate apothecia, globose ascospores, and apically curved or hooked paraphyses (Boudier, 1885, 1907). The genus was investigated by Pfister (1976), who included 17 species, of which *P. ovalispora* Boud. has ellipsoid spores. Two other species, *P. ascoboloides* Korf & W. Y. Zhuang and *P. subprolata* Korf & W. Y. Zhuang, with ellipsoid or subglobose ascospores, have also been described (Korf & Zhuang, 1984, 1991).

When an investigation of *Humaria* Fuckel was conducted for the project 'Ascomycetes of Great Britain and Ireland', the type of *Humaria nicholsonii* Masee was examined and found to belong in the genus *Boubovia* Svrček, which is here brought to attention. *Boubovia* was proposed to accommodate a single species, *Humaria luteola* Velen., which has ellipsoid ascospores, a forked ascus base, and apically curved to spirally curled paraphyses (Svrček, 1977, 1979). *Humaria nicholsonii* displays the same generic characters as this species and, in addition, its thick-walled young asci are reminiscent of the species with ellipsoid spores hitherto placed in *Pulvinula*. All these species have the combination of ellipsoid or subglobose ascospores and ascus wall thickened in the early stages of development, quite distinct from other species with globose spores and asci which remain thin-walled throughout development. In the revision of the type species of *Boubovia*, *B. luteola*, Svrček (1979) described 'young asci with wall up to 1 µm thick'. It appears clear that these species form a closely related group and it would be appropriate to assign them to the genus *Boubovia*. Combinations for these species in this genus are proposed below, with a revision of the type of *Humaria nicholsonii* and a discussion of *Pulvinula ovalispora*. A full description of the genus *Boubovia* and a key to known species are also provided.

***Boubovia* Svrček** in *Česká Mykol.* 31: 71 (1977).

Apothecia small, mostly less than 5 mm diam., scattered to gregarious. *Disc* concave, flat to convex, yellow, orange-yellow or greenish yellow, smooth. *Receptacle* shallow-cupulate to cupulate, sessile, margin entire, externally glabrous. *Ectal* and *medullary excipulum* of *textura globulosa* to *angularis*, or *textura intricata*. *Asci* cylindrical, operculate, 1-, thick-walled when young, especially at the time of ascospore delimitation, base usually forked, uniseriately (4-) 8-spored. *Ascospores* unicellular, colourless, ellipsoid to broadly ellipsoid or subglobose, guttulate at least when young, sometimes containing a de Bary bubble, smooth or finely ornamented or enclosed in an irregular cyanophilic sheath. *Paraphyses* filiform, slender, septate, branched or not, apically curved to contorted.

Type species: Humaria luteola Velen. (syn. *Boubovia luteola* (Velen.) Svrček).

Habitat: on dead leaves, soil, animal dung, pebbles, etc.

Distribution: Europe, Asia, North and South America and Africa, possibly worldwide.

Boubovia ascoboloides (Korf & W. Y. Zhuang) Y. J. Yao & Spooner, comb. nov.

Pulvinula ascoboloides Korf & W. Y. Zhuang in *Mycotaxon* 20: 610 (1984).

This species was described from China as having a unique loosening, thick, irregular, cyanophilic sheath enveloping the ascospore (Korf & Zhuang, 1984).

Boubovia subprolata (Korf & W. Y. Zhuang) Y. J. Yao & Spooner, comb. nov.

Key to species of Boubovia

1. Ascospores subglobose, (9.5–) 10.0–12.5 (–13.5) × (9.0–) 9.5–10.0 μm	<i>B. subprolata</i>
1. Ascospores ellipsoid, usually longer than 13.0 μm	2
2. Ascospores, 19.0–21.5 × 8.5–10.0 μm	<i>B. luteola</i>
2. Ascospores, 11.0–18.0 × 6.0–9.0 μm	3
3. Ascospores enclosed by a cyanophilic sheath	<i>B. ascoboloides</i>
3. Ascospores lacking a cyanophilic sheath	<i>B. nicholsonii</i>

Pulvinula subprolata Korf & W. Y. Zhuang in *Mycotaxon* **40**: 100 (1991).

This is a Macaronesian species described recently (Korf & Zhuang, 1991). It is characterized by broadly ellipsoid to subglobose ascospores. The very thick-walled asci when young indicate its affinities with species of *Boubovia*, having ellipsoid ascospores, rather than those of *Pulvinula* having globose ascospores.

Boubovia nicholsonii (Masse) Spooner & Y. J. Yao, comb. nov.

Humaria nicholsonii Masse in *Naturalist, Hull* **1901**: 188 (1901).

Apothecia 2.0–3.5 mm diam. when dried (as '4.0–7.0 mm across' in the protologue), gregarious. *Disc* concave to flat, sometimes slightly convex, orange-yellow, smooth. *Receptacle* globose at first, gradually becoming plane, shallow-cupulate, sessile, margin entire, externally glabrous. *Ectal excipulum* of globose to elongate or angular cells 7.0–15.0 × 7.0–10.0 μm. *Medullary excipulum* indistinct, of woven, narrow, septate hyphae. *Asci* cylindric, 95–125 × 8.0–10.5 μm ('65–70 × 8–9 μ' in the protologue), operculate, 1-, thick-walled when young, appearing 2-layered when mounted in lactophenol cotton blue, base forked, uniseriately (4-) 8-spored. *Ascospores* unicellular, colourless, ellipsoid, 11.0–12.5 × 6.0–7.0 μm ('10 × 6 μm' in the protologue), frequently containing a de Bary bubble, sometimes evidently 1-guttulate, smooth. *Paraphyses* filiform, slender, septate, simple, strongly curved and not enlarged at apex, 1.0–1.5 μm diam.

Specimen examined: England, Surrey, Royal Botanic Gardens, Kew, on dead leaves, March 1898, G. Nicholson (holotype, K).

Pulvinula ovalispora is apparently closely related to this species and they may prove conspecific; the type material of *P. ovalispora* has not been examined by the present authors. *Humaria nicholsonii* is, in any case, an older species epithet, and

a later re-evaluation of *P. ovalispora* will not affect the use of the former name in *Boubovia*.

The de Bary bubble in the ascospores is clearly evident in the specimen examined, and is well illustrated in *B. subprolata* by Korf & Zhuang (1991). Ascospores of *Pulvinula ovalispora* were also demonstrated to contain a de Bary bubble, which is said to be an irregular shape (Korf & Zhuang, 1984). From the illustration provided by Korf & Zhuang (1991), the de Bary bubble in spores of *P. ovalispora* is rather similar to that seen in the holotype of *B. nicholsonii*. Guttulation was also reported in young spores of *B. ascoboloides* (Korf & Zhuang, 1984) and may possibly occur in fresh material of *B. luteola* (Velenovsky, 1934; Svrček, 1979). It seems that the significance of spore guttulation and of de Bary bubbles in delimiting the genus requires further investigation.

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REFERENCES

- Boudier, E. (1885). *Discomycètes Charms. Société Mycologique, Bulletin* **1**, 91–120.
- Boudier, E. (1907). *Histoire et Classification des Discomycètes d'Europe*. Librairie des Sciences Naturelles, Klincksieck: Paris.
- Korf, R. P. & Zhuang, W.-Y. (1984). The ellipsoid-spored species of *Pulvinula* (Pezizales). *Mycotaxon* **20**, 607–616.
- Korf, R. P. & Zhuang, W.-Y. (1991). A preliminary Discomycete flora of Macaronesia: Part 16. Otideaceae, Scutellinioideae. *Mycotaxon* **40**, 79–106.
- Pfister, D. H. (1976). A synopsis of the genus *Pulvinula*. *Occasional Papers of the Farlow Herbarium of Cryptogamic Botany* **9**, 1–19.
- Svrček, M. (1977). New combinations and new taxa in operculate Discomycetes (Pezizales). *Česká Mykologie* **31**, 69–71.
- Svrček, M. (1976, published in 1979). A taxonomic revision of Velenovsky's types of operculate Discomycetes (Pezizales) preserved in National Museum, Prague. *Acta Musei Nationalis Pragae* **32** (2–4), 115–194.
- Velenovský, J. (1934). *Monographia Discomycetum Bohemiae*. Velenovský: Prague, Czechoslovakia.