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BOTRYANDROMYCES AND *ECTEINOMYCES* (LABOULBENIALES) IN BELGIUM

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Summary
This paper presents records of *Botryandromyces heteroceri* and *Ecteinomyces trichopterophilus* (Laboulbeniinae) from Belgium. Both species are described and illustrated; some comments on their ecology are given.

Samenvatting
Dit artikel presenteert gegevens van *Botryandromyces heteroceri* en *Ecteinomyces trichopterophilus* in België. Beide soorten worden beschreven en geïllustreerd; gegevens over hun ecologie worden besproken.

Keywords: Laboulbeniales, *Botryandromyces*, *Ecteinomyces*, Heteroceridae, Ptiliidae, Belgium.

Introduction

Botryandromyces I.I. Tav. & T. Majewski and *Ecteinomyces* belong, together with the genus *Laboulbenia*, to the subtribe Laboulbeniinae (Laboulbenieae, Laboulbeniaceae; Tavares 1985). The Laboulbeniinae have simple phialides on their appendages, while their lower receptacle (i.e. below cell III) is either multi- or bicellular. The latter leads to the genus *Laboulbenia*, from which the Belgian taxa were treated in De Kesel (1998, illustrated key). The aim of this paper is to describe the Belgian material of *Botryandromyces* and *Ecteinomyces*.

Material and methods

Material was selected from existing insect collections and specimens we sampled using a pooter or pitfall traps.
All insects were preserved in 90% denaturized ethanol. Screening of insects was done with a stereomicroscope at 20-50 × magnification. Thalli were removed and mounted on permanent slides following the protocol in Benjamin (1971) and De Kesel (1998). The microscope slide collection and all infected insects are kept at BR (abbr. in Holmgren & Holmgren 1998). Drawings and measurements were made, using an Olympus BX51 light microscope with digital camera and AnalySIS Five imaging software (Soft Imaging System GmbH).
For specific nomenclature, terminology or extensive iconography of Laboulbeniales we refer to Santamaría (2003) and Majewski (1994).

Descriptions

Botryandromyces I.I. Tav. & T. Majewski

Mycotaxon 3(2): 195 (1976)
Type species: *Botryandromyces ornatus* I.I. Tav., Mycol. Mem. 9: 156 (1985) (= *Botryandromyces heteroceratis* (Thaxt.) I.I. Tav. & T. Majewski, Mycotaxon 3(2): 195 (1976); = *Laboulbenia heteroceratis* Thaxt., Proc. Amer. Acad. Arts 48: 207 (1912), on *Heterocerus sp*. (Coleoptera, Heteroceridae).

Receptacle between cell I and cell II composed of a series of three or more cells. Receptacle above cell II composed of three cells, i.e. cell III supporting cell III' and cell III", the latter two separated by a vertical septum. Antheridia simple, flask-shaped, either born on the apex of cell III' and III", or on short appendages. Outer wall of the perithecium composed of two 3-celled and two 4-celled vertical series; the latter always with cells of unequal height.
A genus with two species, one in Belgium

Botryandromyces heteroceri (Maire) I.I. Tav. & T. Majewski

Mycotaxon 3(2): 196 (1976)
Basionym : *Misgomyces heteroceri* Maire, Bull. Soc. Hist. Nat. Afrique Nord 11:159 (1920).

Sel. Icones: Maire 1920, Pl. 2:20-25 (as *Misgomyces*); Majewski 1972, Fig. 2 (as *Misgomyces*); Tavares & Majewski 1976, Fig. 1, 3d-f; Weir 1994, Fig. 2 & 11; Majewski 1994, Pl. 31: 1-8; Markovskaja 2000, fig. 2; Santamaría 2003, fig. 14. **Fig 1: a-c.**

Thallus 320-480 µm long, delicately punctate, hyaline to slightly pigmented. Lower receptacle (between cell I and cell III) 195-360 µm long, straight, composed of 3-15 elongate cells. Cell I up to 6 times higher than broad. Upper receptacle abaxially bent, three-celled, composed of cell III which supports two derived cells, i.e. cell III' (abaxial) and III" (adaxial). The septum III'-III" almost perpendicular to the septum III'-III. Inner side of cell III positioned at the base of the perithecium.

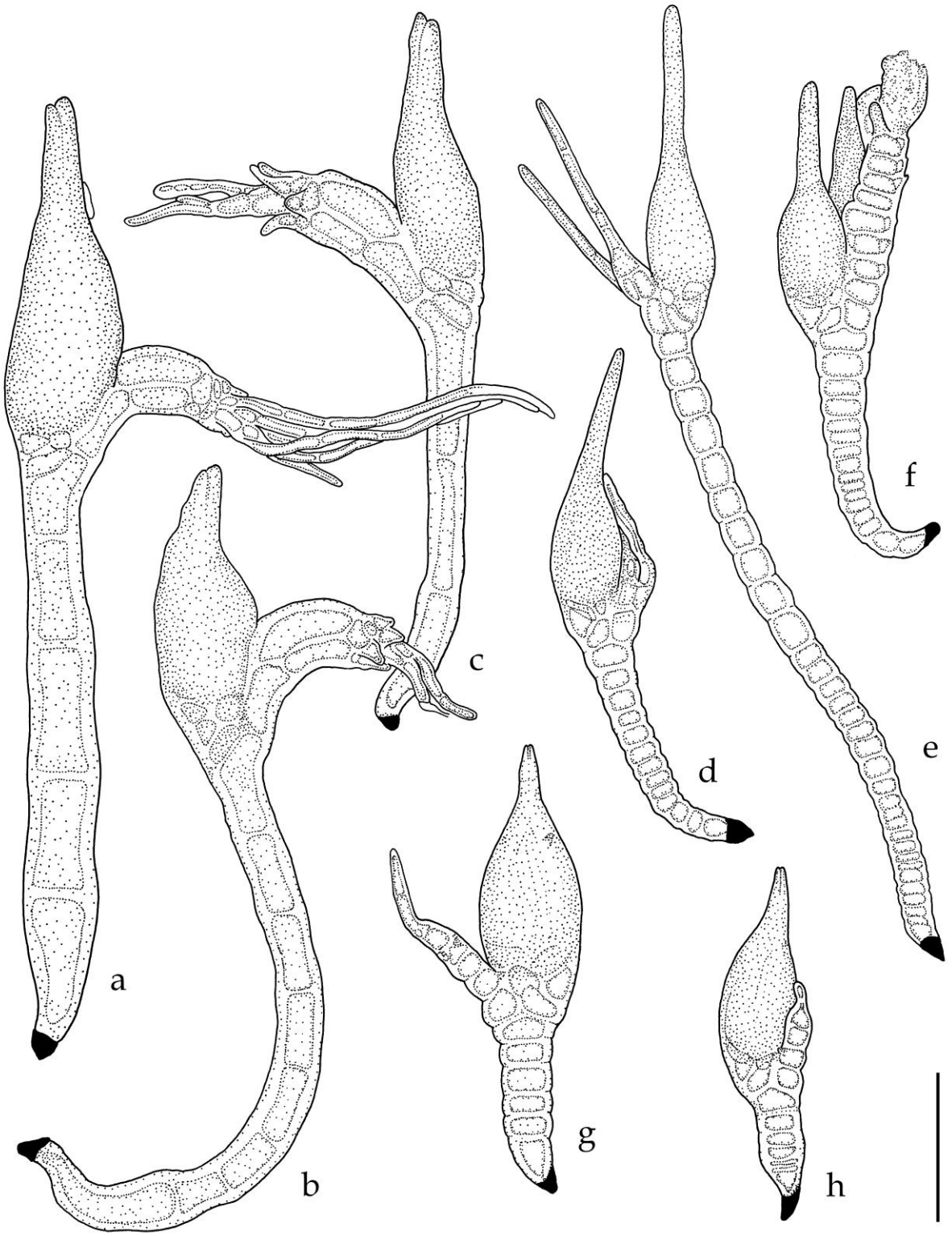

Figure 1. Laboulbeniinae **a-c**. ***Botryandromyces heteroceri*** **(Maire) I.I. Tav. & T. Majewski**. **a.** Mature thallus with intact appendage (ADK902a: from pronotum of *Heterocerus hispidulus* Kiesenw.); **b.** with slightly damaged appendage (ADK902a); **c.** with reduced lower receptaculum (ADK902a); **d-h.** ***Ecteinomyces trichopterophilus*** **Thaxt. d.** Mature thallus (JR3689: from elytrum of *Acrotrichis fascicularis* (Hb.)); **e.** Mature thallus with long lower receptaculum and terminal perithecium (ADK660: from elytrum of *Acrotrichis* sp.); **f.** damaged thallus with secondary perithecium developed on a lower receptacular cell (ADK660); **g.** Mature thallus (ADK4734: from elytrum of *Acrotrichis* sp.); **h.** Mature thallus (ADK4769: from elytrum of *Acrotrichis* sp.). Scale bar 50μm.

Lower adaxial side of cell III" and cell III are connected to the perithecial wall. Base of the appendage composed of a series of smaller cells giving rise to a 'collar' of sessile antheridia around the appendage. Appendages simple or branched, 65-130 µm long, usually damaged or broken. Perithecium elongate, ovoid, 70-140 × 28-55 µm, with relatively long and gradually tapering simple apex; ostiolar lips hardly differentiated, adaxial ones slightly bigger than the abaxial ones. Spores 39-48 × 3-4 µm.

Studied material
On *Heterocerus flexuosus* Steph. - [Col., Heteroceridae]
Knokke Heist, Zwin, in saltmarshes, 28.08.1992, leg. G. Haghebaert, ADK663.
On *H. hispidulus* Kiesenw. - [Col., Heteroceridae]
Knokke-Heist, Zwin, in saltmarshes, 08.08.1994, ADK902 (a, b).
On *H. fenestratus* (Thunberg) - [Col., Heteroceridae]
Bornem, Hingene (Schellandpolder), mudbanks of a pond, 16.06.1996, ADK4729.

Thalli are found on legs, elytra, pronotum and the last abdominal sternites.

Remarks
Botryandromyces heteroceri is new for Belgium. It was originally described from Algeria (Maire 1920) and found later in several European countries (Santamaría 2003, Majewski 2008); once in Thailand (Santamaría & Rossi, 1999). The species is only reported on Coleoptera from the genus *Heterocerus* Fabr., also called variegated mud-loving beetles (Coleoptera, Heteroceridae).
Heterocerid beetles are burrowers from wet, muddy and sun-heated shores along rivers, ponds and other water bodies (Tavares & Majewski 1976). *Botryandromyces heteroceri* shows morphological variation in the lower receptacle, as subdivisions may occur in the cells between cell I and II. We agree with Tavares & Majewski (1976) that such differences in size (cells) may be related to the location on the host. The studied material from saltmarshes forms a homogenous group of thalli with 3-8 receptacular cells, regardless of the host species. The material on *H. fenestratus*, from a freshwater habitat, is not fully mature, but has thalli with 12-15 receptacular cells. It is beyond doubt that fresh and brackish water environments both are suitable for the parasite, but their influence on secondary divisions is unclear.

***Ecteinomyces* Thaxt.**
Proc. Amer. Acad. Arts Sci. 38:26,1902.
type: *E. trichopterophilus* Thaxt. on *Acrotrichis haldemani* J.L. Leconte (Coleoptera, Ptiliidae).

Receptaculum multicellular because of a series of divisions in cell II. Cel III undivided. Primary appendage is a prolongation of the receptacular axis. Antheridia differentiated as small 'corner' cells near the cells of the basal part of the primary appendage. Cell VI and cell III positioned at the same height on the receptacular axis; both sharing the distal (apical) wall of cell II. Perithecium elongate, with narrow beak, composed of four vertical series of outer wall cells, two of them four-celled, the others five-cells.
Ecteinomyces is a monospecific genus (Tavares 1985), only parasitizing Ptiliidae (Coleoptera).

***Ecteinomyces trichopterophilus* Thaxt.**
Proc. Amer. Acad. Arts Sci. 38: 26,1902
= *Misgomyces trichopterophilus* (Thaxt.) Thaxt., Mem. Amer. Acad. Arts Sci. 16:304, 1931.

Sel. icones: Thaxter 1908, Pl. 51:15-18; Spegazzini 1917, Fig. 88 (ut *E. trichopteridophilus*); Colla 1934, Fig. 92 (as *M. trichopterophilus*); Majewski 1972, Fig. 4 (as *M. trichopterophilus*), Benjamin 1973, Fig. 18; Huldén 1983, Fig. 14; Tavares 1985, Pl. 41:b-c; De Kesel & Rammeloo 1992, Fig. 2b; Weir 1994, Fig. 12; Majewski 1994, Pl. 31:9-19, 32:1-15, 33:1-18; Weir 1994, Fig. 12; Weir & Beakes 1995, Fig. 4b; Santamaría 2003, Fig. 71; **Fig 1: d-h.**.

Thallus 75-400 µm long, hyaline or poorly pigmented. Lower receptacle (cell I - cell II) 30-270 µm long, straight; composed of a series of 4-24 slightly flattened cells, slightly broadening upwards. Cell I triangular, 2-4 times higher than broad. Primary appendage in adult thalli making an angle of 45° with the receptacle, composed of a tapering series of 3-11 isodiametric cells, distally carrying a 4-celled branchlet of narrow cells, up to 95 µm long. Antheridia small with short lateral neck, situated next to some of the larger cells of the primary appendage, sometimes proliferating. Stalk cell of the perithecium (VI) flattened or kidney-shaped; secondary stalk cell (VII) large and triangular. Perithecium 45-107 × 25-35 µm, with ovoidal venter and narrow neck; ostiolum rounded, without specific differentiation. Ascospores 15-25 × (2) 3 µm.

Studied material
On *Acrotrichis fascicularis* (Hb.) - [Col., Ptiliidae].
Drongen (Bourgoyen), 17.08.1973, leg. F. Dhondt, JR3689.
On *A. intermedia* (Gillm.) - [Col., Ptiliidae].
Gontrode, 27.08.1974, leg. G. Haghebaert, ADK979.
On *Acrotrichis sp.* - [Col., Ptiliidae].
Knokke-Heist, Zwinnebosjes, 21.11.1992, leg. G. Haghebaert, ADK660.
Niel, Waelenhoek, 19.08.2009, in dung from Galloway cows, ADK4734, ADK4769.

Thalli are found on almost any part of the integument, but mostly on the elytra (distal edge), cephalon and legs.

Remarks
Ecteinomyces trichopterophilus was previously reported in Belgium (De Kesel & Rammeloo 1992) and in Europe (Spain, England, Italy, Germany,

Poland, Finland) (Santamaría et al. 1991), North- and South-America (Spegazzini 1917, Thaxter 1931).

The hosts of *E. trichopterophilus* are all Ptiliidae (Feather-winged beetles), belonging to *Acrotrichis* Motschulski (Santamaría et al. 1991), and also *Baeocrara* Thomson (Majewski 1994). Though small and relatively common, the hosts are not often collected, identified and screened on a large scale. The studied material originates from various humid habitats including rivulet associated meadows, forest litter and underneath bark. Since the hosts are very mobile, it is not exceptional to find infected specimens in a wide range of habitats, including rotting mushrooms and plant debris. Our most recent find in feces from Galloway cows is not exceptional as herbivore feces (cow and horse) seems to be one of the most common habitats for this very common fungus (Majewski 1994, 2003 and 2008).

E. trichopterophilus is a variable species, especially in the number of cells of the lower receptacle. Some of this variation is related to the host and the position it occupied on the host. Three morphological types, with intermediates, were illustrated and discussed by Majewski (1994). Thalli from *Acrotrichis fascicularis* have a different basal cell than the ones from *A. intermedia*, slender in the former, swollen in the latter. The Belgian material from both hosts only shows a different total length, but no difference in the shape of cell I. It was also observed that thalli with a damaged perithecium have the ability to develop a new perithecium from a lower receptacular cell (ADK660; Fig. 1f).

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