lates dominant grasses in heathlands. Also removing of the upper layer of the soil could have negative effects to the ant-fauna in general (MABELIS, 2000).

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Laboulbeniales (Fungi Ascomycetes) from Belgian Blattodea

by A. DE KESEL

National Botanic Garden of Belgium, Domein van Bouchout, B-1860 Meise, Belgium (e-mail : andre.dekesel@br.fgov.be).

Summary

Descriptions, illustrations and an identification key for three ectoparasitic *Herpomyces* species found on Belgian cockroaches (collection A. Collart) are given. *Herpomyces ectobiae* and *H. stylopygae* are new to the Belgian mycoflora.

Keywords : Blattodea, Laboulbeniales, *Herpomyces*, *Blatta*, *Blatella*, *Periplaneta*, ectoparasites, key.

Samenvatting

Beschrijvingen, illustraties en determinatiesleutel voor drie ectoparasitaire *Herpomyces* soorten van Belgische kakkerlakken (collectie A. Collart) worden gegeven. *Herpomyces ectobiae* en *Herpomyces stylopygae* zijn nieuw voor de Belgische mycoflora.

Introduction

Herpomyces THAXTER are highly specific and obligate ectoparasitic fungi (Laboulbeniales, Ascomycetes) found exclusively on adult cockroaches (Blattodea). The genus counts 25 species worldwide (TAVARES, 1985), an account on all known taxa is given by Thaxter (1931). Up to now only three species were found in Europe (SANTAMARIA *et al.*, 1991).

Herpomyces are small dioecious parasites, i.e. rarely exceeding 250µm long, that grow on the outside of the hosts' integument, usually on antenna, mouths parts or legs. They are not known to cause serious damage to their host, still, *Herpomyces* belongs to those Laboulbeniales that perforate the integument of the host by means of a haustorium (RICHARDS & SMITH, 1956).

Female thalli consist of a small primary receptaculum, bearing the secondary receptaculum having one or more perithecia (female reproductive organs). The secondary receptacle typically consists of a series of flattened cells, each of them capable of perforating the host with an individual haustorium. The perithecia are generated by the secondary receptaculum and are usually flask shaped and composed of four vertical series of isodiametric wall cells. The perithecial apex is tapering upwards, usually pointed and poorly differentiated. Asci are born within the perithecia and eight-spored. The ascospores are spindle-shaped, uni-septate and bicellular. Male thalli are extremely small, hard to find and to prepare, usually bearing long slender and simple antheridia on the primary receptacle. Male thalli rarely have a secondary receptacle.

This paper presents a description, illustration, host-list and identification key to all three European *Herpomyces* species that were found on Belgian cockroaches from A. Collart's collection.

Material and methods

The infected insects of the A. Collart collection belong to different entomological collections, mostly deposited at the K.B.I.N. (Koninklijk Belgisch Instituut voor Natuurwetenschappen) in Brussels. This insect collection was not screened, but it constituted the basic material that A. Collart used for his Laboulbeniales microscope slide collection. The microscope slide collection of A. Collart is relatively old and not always in good condition. Collart mounted, over 40 years ago, the Laboulbeniales in microscope slides using a water soluble medium. This medium, probably similar to Aquamount, has become yellow-amber coloured over the years. The microscope slide collection is kept at BR (Herbarium National Botanic Garden of Belgium). No other Laboulbeniales collections from Belgian cockroaches are known to us.

The nomenclature of the Laboulbeniales is based on SANTAMARIA *et al.* (1991). An exhaustive iconography of all mentioned *Herpomyces* species is given for convenience.

The thalli were studied using a Leitz dialux 20EB light microscope. Drawings, as well as measurements, were made at highest magnification (1000×), using a drawing tube and calibration slide.

Results

Parasites and hosts

Herpomyces ectobiae THAXTER (Fig. 1)

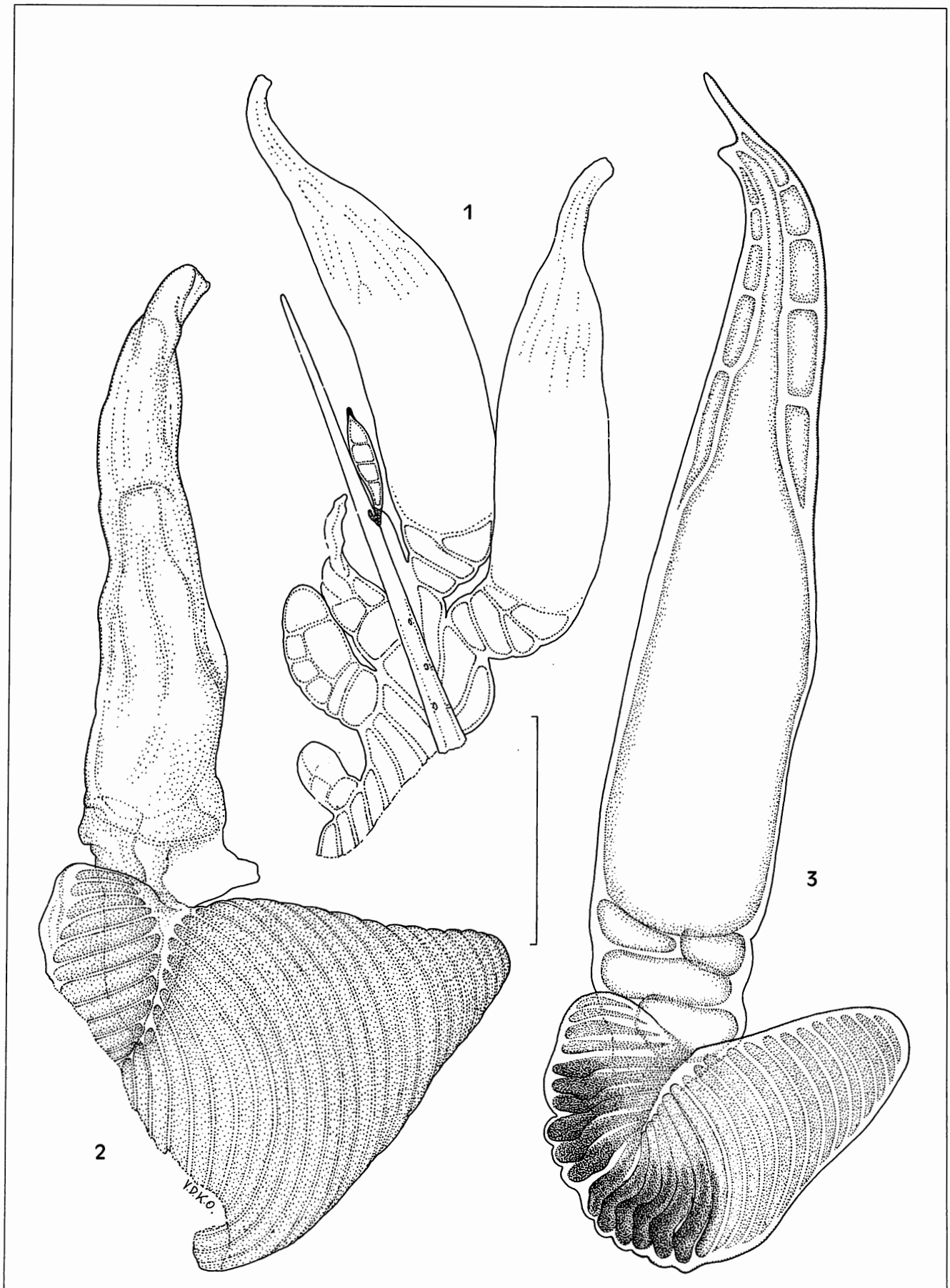
Proc. Amer. Acad. Arts Sci 38 : 20,1902.

On *Blatella germanica* (L.)

- Material : Evere (Prov. Brabant), 12.VI.1881, leg. A. De Borre in A. Collart, slide L259. Infected on antenna and legs.
- Fungus : 4 female thalli, material old but in good condition.
- Description : female thallus hyaline, 90-120µm long. Primary receptacle four-celled, with dark brownish pointed apex; basal cell with small dark foot. Secondary receptacle born on the supra-basal cell, up to 50µm long, composed of a series of flattened cells. Perithecia solitary or in pairs on the secondary receptacle, symmetrical, 70-90×20-25µm, slightly swollen at the base; apex tapering upwards, undifferentiated; ostiolum blunt. Male thallus not observed.
- Iconography : THAXTER (1908), Pl. 39 : 11-16; SPEGAZZINI (1917), Fig. 90; RICHARDS & SMITH (1955a), Fig. 4-6, Fig. 13 (spores); BENJAMIN (1973), Fig. 21a-b; TAVARES (1979), Fig. 9.1 (section through antenna); TAVARES (1980), Fig. 1-3; TAVARES (1982), Pl. 26; TAVARES (1985), Pl. 10-12, 15 : c-d; MAJEWSKI & SUGIYAMA (1985), Fig. 21; ESPADALER & SUÑER (1989), Fig. 1c; MAJEWSKI (1994), Pl. 1 : 1-3.
- Infection and specificity : MAJEWSKI (1994) mentions only antennal infections on the same host. This typical infection pattern was described by RICHARDS & SMITH (1954) and is probably associated with direct transmission through the frequent antennal contacts between hosts.
- Distribution : probably cosmopolite, in Europe, Africa, America and Asia, only on Blatellidae. In Europe known from France, Poland and Spain (SANTAMARIA *et al.*, 1991).

Herpomyces periplanetae THAXTER (Fig. 2)

Proc. Amer. Acad. Arts Sci. 38 : 13,1902.



Figs 1-3. 1. *Herpomyces ectobiae* THAXTER. Mature thallus (L259 : on setum from leg of *Blatella germanica* (L.)). 2. *Herpomyces periplanetae* THAXTER. Mature thallus (L253 : on antenna of *Periplaneta americana* (L.)). 3. *Herpomyces stylopygae* SPEGAZZINI. Mature thallus (L256 : on antenna of *Blatta orientalis* L.). Scale bar = 50µm.

On *Periplaneta americana* (L.)

- Material : Antwerpen (Prov. Antwerpen), no date, leg. L. Becker in A. Collart, slide L253. Infected on antenna.
- Fungus : 3 female thalli, material in good condition.
- Description : female thallus hyaline, 220-250µm long. Primary receptacle short, four-celled. Secondary receptacle two-lobed, 80-120µm high and 90-110µm broad, the larger lobe composed of a series of hyaline and concentrically organised and flattened cells, distal side pointed. Perithecia, slender, symmetrical, 120-180×30-40µm, slightly swollen base; apex bent, tapering upwards; ostiolum with subapical tooth and thickened subapical wall cells. Male thallus not observed.
- Iconography : THAXTER (1908), Pl. 41 : 6-13; SPEGAZZINI (1917), Fig. 94; COLLA (1934), Fig. 39; TAVARES (1985), Pl. 13-14, 15 : a-b; SUGIYAMA & MAJEWSKI (1985), Fig. 1; MAJEWSKI (1988), Fig. 17; ESPADALER & SUÑER (1989), Fig. 1a,b; SANTAMARIA (1989), Lám. I : a-b. MAJEWSKI (1994), Pl.1 : 7; WEIR & BEAKES (1995), Fig. 4e.
- Infection and specificity : On antenna from cockroaches belonging to *Periplaneta* BURMEISTER. Specific to *Periplaneta*, Belgian records on *Blatta* and *Blatella* (COLLART, 1947) are morphologically different from *H. periplaneta*.
- Distribution : cosmopolite, reported in Europe from France, Spain (SANTAMARIA *et al.*, 1991) and Poland (MAJEWSKI, 1994).

Herpomyces stylopygae SPEGAZZINI (Fig. 3)

Anales Mus. Nac. Hist. Nat. Buenos Aires 29 : 551,1917.

On *Blatta orientalis* L.

- Material : Sint-Joost-ten-Node (Prov. Brabant), 07.IV.1882, leg. Clavereau in A. Collart, slide L254; Visé (Prov. Luik), no date, leg. L. Quaedvlieg in A. Collart, slide 255; Luxembourg mérid., no date, leg. A. Mertens in A. Collart, slide L256. All specimens infected on the hairs of the antenna.
- Fungus : 16 female thalli, material in bad condition, only three thalli are good.
- Description : female thallus hyaline, 220-250µm long; primary receptaculum short, four-celled. Secondary receptaculum two-lobed, 60-80µm high and 50-70µm broad, the larger lobe composed of a series of basally blackened and concentrically organised flat cells, distal side of the lobe is round and obtuse. Perithecia, symmetrical, 150-200×30-40µm, swollen at the base; apex slightly bent, gradually tapering upwards; ostiolum with subapical tooth and thin-walled subapical cells. Male thallus not observed.
- Iconography : SPEGAZZINI (1914), Tav. 1 : 5 (a,b) (ut *H. periplanetae*); SPEGAZZINI (1917), Fig. 95; RICHARDS & SMITH (1955a), Fig.1-3, 7-11,14-17; RICHARDS & SMITH (1955b), Fig. 1-54; RICHARDS & SMITH (1956), Fig. 1-23; TAVARES (1966), Fig. 1-23; DE KESEL & RAMMELOO (1992), Fig. 2c (ut *Herpomyces periplanetae*); LEE & PARK (1991), Fig. 4 (ut *H. periplanetae*); LEE & CHOI (1992), Fig. 8 : 1 (ut *H. periplanetae*); MAJEWSKI (1994), Pl. 1 : 4-6.
- Infection and specificity : On hairs from antenna of cockroaches belonging to *Blatta sp.* and specific to this host genus.
- Distribution : cosmopolite, reported in several European countries, America and South-Korea (SANTAMARIA *et al.* 1991).

Identification key for Belgian *Herpomyces* taxa

This identification key is based on the morphology of mature, intact and normally developed female thalli.

1. Secondary receptacle without concentrically organised cells ..... *H. ectobiae*
1'. Secondary receptacle a series of concentrically organised and flattened cells 2

2. Secondary receptacle at most 80µm high, with rounded apex and partially darkened cells ..... *H. stylopygae*
2'. Secondary receptacle at least 100µm high, with pointed apex and without dark pigmentation in its cells ..... *H. periplanetae*

Discussion

COLLART (1947) reported *Herpomyces periplanetae* THAXTER on *Blatta orientalis* L., *Blatella germanica* (L.) and *Periplaneta americana* (L.). Morphological revision of this material and comparison with european parasite-host lists (SANTAMARIA *et al.*, 1991) revealed that the specimens found on Belgian *Blatta* and *Blatella* don't belong to *Herpomyces periplanetae*, but to *H. stylopygae* and *H. ectobiae* respectively. Both taxa are reported here as new

to the Belgian mycoflora.

Although *Herpomyces* species are host specific, we state that host identity can, but should not alone, be used for identification of laboulbeniaceous parasites. *Herpomyces* species are indeed sufficiently differentiated to enable their identification based only on their morphology. *Herpomyces* taxa show however some variability in their thallus morphology, and one has to keep in mind that in some cases morphology is affected by the growth site on the host. Thalli from *H. stylopygae*, growing on the thinner hairs, are usually larger and have more than one perithecium. When growing on thicker antennal hairs this species also tends to develop only one perithecium and lacks the numerous concentric cells in the secondary receptacle. Similar and more observations of this kind were reported by TAVARES (1985). In such particular cases the thalli resemble those of *H. ectobiae*. The presence or absence of a sub-apical tooth on the perithecium, however, excludes misidentifications. All *Herpomyces* taxa are probably, to some extent, phenotypically plastic.

Laboulbeniales from cockroaches are, as their hosts, very common parasites. In spite of this, little or no research has been conducted in Belgium to collect and screen cockroaches for taxonomical and ecological studies on their Laboulbeniaceous parasites. Interesting topics await to be studied as cockroaches and their Laboulbeniales are cosmopolite and easy to rear under artificial conditions.

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Bulletin S.R.B.E./K.B.V.E., 137 (2001) : 106

Insectes intéressants pour la faune belge

par Michel ROUARD

Coléoptères

Cerambycidae :

Rustoclytus rusticus L. ; Chimay (Ht.), " Bois Robert ", 30.V.1998, (leg. et coll. L. Rouard).

Xylotrechus antilope SCHÖNH. ; Chimay (Ht.), " Bois Robert ", 25.VI.1996, (leg. et coll. L. Rouard).

Pogonocherus fasciculatus DEG. ; Aublain (Nr.), e.l. IX.I995, branches de *Pinus sp.*

Pogonocherus ovatus (GOEZE) ; Aublain (Nr.), e.l. 01.VIII.2001, branches de *Pinus sylvestris* L., 5 ex.

Calamobius filum (ROSSI) ; Cerfontaine (Nr.), 08.VII.2000, leg. M. Delwaide, lors de l'excursion annuelle de la société ; **Belg. nov. sp.**

Alleculidae :

Prionychus ater F. ; Chimay (Ht.), " Bois Robert ", 05.VIII.1996.

Silphidae :

Silpha quadripunctata SCHREB. ; Chimay (Ht.), " Bois Robert ", 15.V.1992, s./*Pinus sylvestris* L.; Chimay (Ht.), " Bois Robert ", 25.V.1996 ; Bailièvre (Ht.), 10.V.2001.

Buprestidae :

Phaenops cyanea FAB. ; Petigny (Nr.), 20.VII. 1996, s./*Pinus sylvestris* L..

Tenebrionidae :

Platydema violaceum F. ; Chimay (Ht.), " Bois Robert ", 20.I.1993, en nombre, sous écorce de *Quercus robur* L. mort sur pied.

Cleridae :

Tillus elongatus L. ; Gallaix (Ht.), 18.VI.1995.

Histeridae :

Hololepta plana SULZ. ; Chimay, " Bois Robert ", 09.VII.2000, sous écorce de *Fagus sylvatica* L.. Cette espèce apparue dans notre pays voici environ 30 ans, semble poursuivre sa progression.

Anthibidae :

Anthibus albinus L. ; Chimay (Ht.), " Bois Robert ", 27.VI.1996 (leg. et coll. L. Rouard).

Hyménoptères

Xylocopidae :

Xylocopa violocea L. ; Chimay (Ht.), " Bois Robert ", 20.VII.1995, 30.V.1998, 05.VII. 1998, 07.VII.1998, 09.VII.1998.