Pseudohalonectria miscanthicola sp. nov.
and three interesting fungi from tropics

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ABSTRACT – Pseudohalonectria miscanthicola sp. nov. is reported from senescent culms of Miscanthus floridulus (Gramineae) from Lung Fu Shan, Hong Kong. This fungus differs from other Pseudohalonectria species in having smaller ascospores which are 0-1-septate. It is described, illustrated and compared with other species in the genus. Saccardoella aquatica, first described on submerged wood in Hong Kong and South Africa, is reported here for the first time from dead terrestrial wood at Mount Nicholson, Hong Kong. We also report Massariothea themedae from senescent culms of an unidentified grass from Kudremukh National Park, Karnataka, India. This species is described and illustrated. Important morphological characters of 8 known species of Massariothea are tabulated and a key to all the species is provided. Oxydothis oraniopsis is reported on senescent fronds of Calamus sp. collected from Chorle Ghat, Goa, India. This is the first record of ascomycetous genus Oxydothis from India.

Ascomycetes / biodiversity / coelomycete / graminicolous / new species / saprobes / taxonomy / wood

INTRODUCTION

The magnitude of fungal diversity has been estimated at 1.5 M species (Hawksworth, 1991, 2001). The highest proportions of new fungal species are found either in the tropics or in poorly investigated ecological niches (e.g. Das et al., 2004; Desjardin et al., 2003; Vánky, 2004). Hong Kong has a rich fungal diversity (Hyde, 2003). Lu et al. (2000) published a checklist of 2125 fungi reported from Hong Kong and there has been a rapid increase in the number of fungi reported from Hong Kong since 2000 (e.g. Wong & Hyde, 2001a, b; Jeewon et al., 2003; Tang et al., 2003a, b; Taylor & Hyde, 2003; Zhou et al., 2003; Cai et al., 2004; Kodsubeb et al., 2004; Shenoy et al., 2004; Tsui & Hyde, 2004). During our study on graminicolous fungi, a new species of Pseudohalonectria Minoura & T. Muroi was observed on senescent culms of Miscanthus floridulus L. (Gramineae) from Lung Fu Shan, Hong Kong. Pseudohalonectria miscanthicola sp. nov. is described, illustrated and compared with similar taxa. Saccardoella aquatica K.M. Tsui, # Corresponding author, E-mail: belleshenoy@yahoo.com
## E-mail: kdhyde@hkucc.hku.hk
K.D. Hyde, Hodgkiss & Goh is reported on senescent wood collected from Mount Nicholson, Hong Kong. This fungus was first described by Tsui et al. (1998) on submerged wood in streams in Hong Kong and South Africa. This is the first report of the fungus from a terrestrial habitat.

The highest number of unique fungal species has been recorded from India (Hawksworth, 2001). Here two interesting fungi are reported from India. Massariothea themedae Syd. is reported from senescent culms of an unidentified grass collected at Kudremukh National Park, Karnataka. Important morphological characters of 8 known species of Massariothea are tabulated and a key to all species is provided. Oxydothis oraniopsis J. Fröhl. & K.D. Hyde is also described from senescent fronds of Calamus sp. collected at Chorle Ghat, Goa, India. This is the first record of the genus from India.

**MATERIALS AND METHODS**

Senescent culms of Miscanthus floridulus L. (Site: Lung Fu Shan, Hong Kong), senescent wood pieces (Site: Mount Nicholson, Hong Kong), senescent culms of an unidentified grass (Site: Kudremukh National Park, Karnataka, India) and senescent fronds of Calamus sp. (Site: Chorle Ghat, Goa, India) were collected. The collected specimens were placed into plastic “zip-locked” bags and returned to the laboratory. Then the samples were incubated at room temperature (25°C) individually with moist tissue to allow fungal fruiting bodies to develop. They were examined under a stereo-microscope with a cool light source (to prevent dehydration). The fruiting bodies were cut open with a sharp razor blade and their contents were scooped out and placed in a drop of sterile water on a microscope slide using fine-tip forceps. Melzer’s reagent was used to stain the ascus apical structures. India ink was added to visualize the shape of the mucilaginous sheath. The specimens were numbered and deposited in the herbarium of the Centre for Research in Fungal Diversity, the University of Hong Kong (HKU (M)). Attempts were made to grow single-spore isolates of the fungus in culture (Choi, 1999) (water agar; potato dextrose agar), but each time they proved unsuccessful.

**TAXONOMY**

*Massariothea themedae* Syd. (Figs 1-7)

Conidiomata eustromatic, solitary, sparse, dark brown to black, immersed, globose to collabent, in section 250-590 μm diam × 50-100 high, multilocular, often with separate ostioles, peridermal, the upper wall composed of dark brown thick-walled *textura angularis* and the lower thinner wall of paler cells, beak conical to cylindrical. *Paraphyses* branched, septate, hyaline, filiform. *Conidiogenous cells* discrete, monoblastic, lageniform to cylindrical, hyaline, smooth, with a wide channel and moderate periclinal thickening, 18-19 × 2.5-2.6 μm, formed from the inner cells of locular walls. *Conidia* (30-)32-46 × (11-)12-15(-16) μm (\( \bar{x} = 39.8 \times 13.3 \) μm, \( n = 60 \)), (3-)4-7-distoseptate, each cell with a conspicuously reduced lumen, brown,
clavate to fusoid-clavate, straight or moderately curved, outer wall thickened and darkened at the apex and base, periclinal wall paler and thinner in transverse band immediately below the thickened apex and the base (Fig. 5), truncate and darker at the base.

Specimens examined: India, Kudremukh National Park, Karnataka, on senescent culms of an unidentified grass, June 2004, B.D. Shenoy, HKU(M) 17490, ibid. HKU (M) 17491.

Oxydothis oraniopsis J. Fröh. & K.D. Hyde. (Figs 17-20)
Ascomata forming under slightly raised dome-shaped regions on the host surface, solitary or in small groups; papilla at one end, curving upwards and piercing the host cuticle. Asci 160-190 × 16 μm, long cylindrical, ring subapical, J+, 2 μm high, 3 μm diam. Ascospores (48-)56-62 × 7-8 μm, fusiform, 1-septate, hyaline, gradually tapering from the central septum to long narrow processes.

Material examined: India, Chorle Ghat, Goa, on senescent culms of Calamus sp. June 2004, B.D. Shenoy, HKU(M) 17492.

Pseudohalonectria miscanthicola B.D. Shenoy, R. Jeewon & K.D. Hyde, sp. nov. (Figs 8-16)
Ascomata immersa vel erumpentia, globosa vel subglobosa, solitaria vel gregaria, paraphysata. Collum 1.4-2.2 mm longum, 0.1-0.4 mm diam. Asci 76-94 × 10-16 μm, 8-spore, cylindricae vel clavati, apparatus apicalis 3-4 μm diam., 3 μm
Altus. Ascopores (20-22-33 × (5-)6-8 μm, biseriate, ellipsoidal, 0-1-septate, hyaline).

Etymology: Latin – living on the grass genus Miscanthus.

Ascomata immersed to partly immersed, erumpent, yellow to orange, globose to subglobose, solitary to gregarious. Neck cylindrical, periphysate, yellowish to orange, 1.4-2.3 mm long, 0.1-0.12 mm diam at the tip, 0.3-0.4 mm diam at the base (Figs 8, 9). Paraphyses numerous, up to 140-180 μm long, 8-10 μm wide at the base, 4-5 μm wide at the apex, filamentous, tapering distally, septate, hyaline, unbranched (Fig. 12). Asci 76-94 × 10-16 μm (x = 85 × 13 μm, n = 35), 8-spored, cylindrical to clavate, with a refractive, thimble-shaped, non-amyloid apical apparatus, 3 μm diam, 3-4 μm high. Ascospores (20-22-33 × (5-)6-8 μm (x = 29 × 6.8 μm, n = 37), biseriate, overlapping, ellipsoidal, 0-1-septate, hyaline, apex rounded, surrounded by a mucilaginous sheath.

Holotype: Hong Kong, Lung Fu Shan, on senescent culms of Miscanthus floridulus, Aug. 2004, B.D. Shenoy, HKU(M) 17487.

Paratypes: From the same origin: HKU(M) 17488 and HKU(M) 17489, PDD 78748.
**Saccardoella aquatica** K.M. Tsui, K.D. Hyde, Hodgkiss & Goh

Ascomata up to 1 mm in diam, perithecioid, globose to subglobose, immersed to erumpent, black, gregarious, ostiolate, neck black. Pseudoparaphyses numerous, 2-4 μm wide. Ascii 170-208 × 8 μm (x̄ = 188.6 × 8 μm, n = 10), 8-spored, long-cylindrical, short-pedicellate, with a faint ring-like apical apparatus. Ascospores 20-30 × 8 μm (x̄ = 27.8 × 8 μm, n = 25), overlapping uniseriate, fusiform, apices rounded, hyaline, 3-septate, slightly constricted at the septa, surrounded by inconspicuous mucilaginous sheath.

Specimen examined: HONG KONG, Mount Nicholson, on a senescent wood, Aug. 2004, B.D. Shenoy, HKU(M) 17497.

**DISCUSSION**

**Massariothea themedae**

*Massariothea* Syd. was introduced by Sydow (1939) to accommodate the type species, *M. themedae* Syd. possessing stromatic pycnidia and brown-coloured phragmoconidia. There are 8 known species of *Massariothea* (Table 1) and a key to the species was provided by Alcorn (1993). He considered *Massariothea themedae* to have unilocular pycnidia whereas Subramanian & Muthumary (1979), who studied the type specimens, described the same to have pycnidia with one to three locules in section i.e., multilocular. In our collection, the fungus, in section had multilocular (1-3 locules) pycnidia and 4-7-distoseptate conidia. Therefore a new key to the 8 species is given below.

**Key to all known Massariothea species (Modified from Alcorn, 1993)**

1. Conidia < 20 μm long ........................................... *M. scotica*
2. Conidia > 20 μm long ........................................... 2
3. Conidia commonly 3-septate, septa placed asymmetrically ........ *M. triseptata*
4. Conidia 5-septate ........................................... *M. botulispora*
5. Conidia up to 7 or more septate ................................ 3
6. Conidiomata uni- or multilocular ................................ 4
7. Conidiomata multilocular, up to 650 μm diam. ............... *M. shawiae*
8. Conidiomata unilocular ......................................... 5
9. Conidiomata (7.5-9.5-11 μm wide, 6-8 distoseptate .......... *M. attenuata*
10. Conidia 10-16 μm wide, (3-)4-7 distoseptate ............... *M. themedae*
11. Conidiomata up to 200 μm diam., Conidia 48-69 × 12.5 μm .... *M. paspali*
12. Conidiomata up to 600 μm diam, Conidia 27-68 × 7.5-14 μm ...... *M. similis*

*Massariothea* is similar to *Paramassariothea* Subramanian & Muthumary (1979). The latter differs in having conidia which are hyaline, straight to falcate with a truncate base and tapering ends, and the length/width ratio of 10:1 with numerous septa (Subramanian & Muthumary, 1979).

**Oxydothis oraniopsis**

There are 67 species of *Oxydothis* (Shenoy et al., 2004). *Oxydothis oraniopsis* was first described by Fröhlich & Hyde (1994) on a living leaf of *Oraniopsis*
Table 1. Synopsis of the genus *Massariothea*; all the values are in μm.

<table>
<thead>
<tr>
<th>Species</th>
<th>Conidiomata: size (diam. × high)</th>
<th>Conidiomata: Uni/multilocular</th>
<th>Conidiogenous cells (l × w)</th>
<th>Conidia (l × w)</th>
<th>No. of distosepta</th>
<th>Host</th>
<th>Distribution</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. attenuata</em> B. Sutton &amp; Alcorn</td>
<td>upto 5 diam.</td>
<td>Uni or multilocular</td>
<td>9-16 (27) × 2.5-4.5 (25) 40-53 (63) × (7.5) 9.5-11</td>
<td>6-8</td>
<td>Leaves of <em>Enagrosis interupta</em></td>
<td>Australia</td>
<td>Sutton &amp; Akorn, 1985</td>
<td></td>
</tr>
<tr>
<td><em>M. botulispora</em> (Teng) B. Sutton</td>
<td>300-450 diam.</td>
<td>?</td>
<td>9-19 (27) × 2.5-4.5 ('conidiophores')</td>
<td>40-52 × 12-14</td>
<td>5</td>
<td>Leaves of <em>Phragmites communis</em></td>
<td>P.R. China</td>
<td>Sutton, 1980</td>
</tr>
<tr>
<td><em>M. paspali</em> (Ellis &amp; Everh.) B. Sutton</td>
<td>upto 200 diam.</td>
<td>Unilocular</td>
<td>6-10 × 5-10</td>
<td>48-69 × 12.5</td>
<td>6-7</td>
<td>Culms of <em>Paspalum platycarle</em></td>
<td>USA</td>
<td>Sutton, 1975</td>
</tr>
<tr>
<td><em>M. scotica</em> B. Sutton &amp; Rizwi</td>
<td>upto 165 × 90</td>
<td>?</td>
<td>4.5-10 × 2-3.5</td>
<td>15-19.5 × 5.5-6.5</td>
<td>3</td>
<td>Dead barks of <em>Quercus</em> sp.</td>
<td>UK</td>
<td>Sutton &amp; Rizwi, 1980</td>
</tr>
<tr>
<td><em>M. shawiae</em> (B. Sutton) B. Sutton</td>
<td>upto 650 diam.</td>
<td>Multilocular</td>
<td>upto 50 × 2-3</td>
<td>31-52 × 7.5-8.5</td>
<td>3-7</td>
<td><em>Zea mays</em></td>
<td>India</td>
<td>Sutton, 1978</td>
</tr>
<tr>
<td><em>M. similis</em> Alcorn</td>
<td>525-1000 × 290-600</td>
<td>Unilocular</td>
<td>12-21 × 3-5</td>
<td>27-68 × 7.5-14</td>
<td>3-11</td>
<td>Leaves of <em>Heteropogon triticas</em></td>
<td>Australia</td>
<td>Alcorn, 1993</td>
</tr>
<tr>
<td><em>M. themedei</em> Syd.</td>
<td>250-590 × 50-100</td>
<td>Multilocular</td>
<td>18-19 × 2.5-2.6</td>
<td>(30) 32-46 × (11) 12-15 (-16)</td>
<td>(3) 4-7</td>
<td>Culms of unidentified grass</td>
<td>India</td>
<td>This paper</td>
</tr>
<tr>
<td>up to 600 diam.</td>
<td>Unilocular</td>
<td>6-13 × 4.5</td>
<td>31.5-44 × 10.5-12</td>
<td>6-7</td>
<td>Culms of <em>Sorghum graminicola</em>, <em>S vulgar</em>, <em>Themeda</em> sp.</td>
<td>India</td>
<td>Sutton, 1978</td>
<td></td>
</tr>
<tr>
<td>160-250 diam.</td>
<td>Unilocular</td>
<td>5 × 2.4 ('conidiophores')</td>
<td>32-55 × 10-16.5</td>
<td>5-7</td>
<td>Leaves of <em>Themeda giganate</em></td>
<td>Philippines</td>
<td>Sydow, 1939</td>
<td></td>
</tr>
<tr>
<td>300-350 × 250-300 (in unilocular pycnidia)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Leaves of <em>Sorghum plumosum</em>, <em>Neyraudia</em> sp., <em>Themeda</em> sp.</td>
<td>Hong Kong, India</td>
<td>Sutton, 1980</td>
</tr>
<tr>
<td>200-350 × 250-300 (in multilocular pycnidia)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>M. triseptata</em> Alcorn</td>
<td>500-950 × 370-550</td>
<td>Unilocular</td>
<td>10-28 × 3.5-5 (-8 at the base)</td>
<td>25-38 × 10-12.5</td>
<td>3</td>
<td>Leaves of <em>Sorghum plumosum</em></td>
<td>Australia</td>
<td>Alcorn, 1993</td>
</tr>
</tbody>
</table>
appendiculata from north Queensland, Australia. This fungus has also been recorded on a living leaf of Laccospadix australalasicus and on dead petioles of Licuala ramsayi from Australia (Fröhlich & Hyde, 1994; Fröhlich & Hyde, 2000). We observed this fungus on senescent fronds of Calamus sp. collected from Chorle Ghat, Goa, India. This is the first record of genus Oxydothis from India.

Pseudohalonectria miscanthicola

Pseudohalonectria was described by Minoura and Muroi (1978) on wood submerged in a Japanese lake. The genus is characterised by bright yellow to light orange perithecia with protruding, cylindrical, periphysate necks; unitunicate, cylindrical to clavate asci with a J-cylindrical apical apparatus; tapering paraphyses; and smooth, hyaline to slightly pale, cylindrical to filiform ascospores. Pseudohalonectria is most similar to Ophioceras and they are compared based on morphological characters by Hyde et al. (2000) and Promputtha et al. (2004).

There are 11 accepted species of Pseudohalonectria (Table 2). Pseudohalonectria miscanthicola should be compared to P. fuxianii L. Cai, K.M. Tsui, K.Q. Zhang & K.D. Hyde as both have ellipsoidal ascospores. Pseudohalonectria miscanthicola differs from P. fuxianii in having narrower asci (10-16 μm vs. 17.5-30 μm), shorter ascospores ((20-)22-33 vs. 30-52.5) and fewer ascospore septa (0-1 vs. 3-5) (Cai et al., 2002b). Pseudohalonectria miscanthicola is similar to P. adversaria Shearer in ascospore shape but differs in having shorter asci (76-94 μm vs. 120-150 μm) and, ascospores ((20-)22-33 μm vs. 33.5-49 μm) and fewer ascospore septa (0-1 vs. 5-7) (Shearer, 1989).

Shearer et al. (1999) noted that species of Pseudohalonectria and Ophioceras were morphologically similar to species of Magnaporthaceae and temporarily transferred these two genera to that family. Inderbitzin et al. (2001) investigated the phylogenetic relationships based on SSU rDNA of Pseudohalonectria lignicola and Ophioceras leptosporum and found that both were closer to the Magnaporthaceae and did not group with Sordaria fimicola. Kirk et al. (2001) placed these two genera in Magnaporthaceae.

Saccardoella aquatica

The genus Saccardoella was described by Spegazzini (1879). There are 16 accepted species (Cai et al., 2002a). The characteristics of this genus include large, immersed to erumpent ascomata, long cylindrical asci with a faint ring-like apical apparatus and uniseriate ascospores having several transverse septa and sheaths or appendages (Petrak, 1962; Hyde, 1992; Barr, 1994). Saccardoella species have been reported from freshwater, marine, and terrestrial habitats (Cai et al., 2002a). Saccardoella aquatica was first described by Tsui et al. (1998). They reported this fungus on wood submerged in streams in Hong Kong and South Africa. This species is distinct from other in Saccardoella in having fusiform, 3-septate ascospores. We observed this fungus on a decaying wood from a terrestrial habitat. This is the first record of Saccardoella from dual habitats (i.e. fresh water and terrestrial).

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### Table 2. Synopsis of known *Pseudohalonectria* spp.

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Ascomata colour when young</th>
<th>Ascomata neck (l × d μm)</th>
<th>Apical ring (h × d μm)</th>
<th>Ascospore shape</th>
<th>Ascospores (l × w μm)</th>
<th>Ascospore septation</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>P. adversaria</em></td>
<td>Orange</td>
<td>79-248 × 109-158</td>
<td>120-150 × 13-20</td>
<td>2.5-5 × 2.5-3</td>
<td>Ellipsoidal</td>
<td>33.5-49 × 4.5-7</td>
<td>5-7</td>
</tr>
<tr>
<td><em>P. aomoriensis</em></td>
<td>Yellow to yellowish-brown</td>
<td>900-1400 × 160-180</td>
<td>112-145 × 8-11</td>
<td>not given</td>
<td>Cylindrical</td>
<td>49.57 × 3.45</td>
<td>5-7</td>
</tr>
<tr>
<td><em>P. eubangenseis</em></td>
<td>Yellow</td>
<td>135-175 × 90-125</td>
<td>80-120 × 8-11.5</td>
<td>2-2.5 × 1.5-2</td>
<td>Filiform or Cylindrical</td>
<td>70-80 × 2.5-3.5</td>
<td>3-5 (-7)</td>
</tr>
<tr>
<td><em>P. falata</em></td>
<td>Light yellow or light brown</td>
<td>81-162 × 81-108</td>
<td>106-244 × 14.4-21.6</td>
<td>not given</td>
<td>Falcate</td>
<td>97-166 × 4.2-7.2</td>
<td>6-16</td>
</tr>
<tr>
<td><em>P. fusianii</em></td>
<td>Orange-brown</td>
<td>430-570 × 70-110</td>
<td>90-187.5 × 17.5-30</td>
<td>2-2.5 × 2.5-3</td>
<td>Ellipsoidal</td>
<td>30.5-25.5 × 7.5</td>
<td>3-5</td>
</tr>
<tr>
<td><em>P. lignicola</em></td>
<td>Pale Yellow</td>
<td>170-621</td>
<td>90-132 × 11-17.5</td>
<td>not given</td>
<td>Cylindrical</td>
<td>38.4-74.8 × 3.5-6.5</td>
<td>5-11</td>
</tr>
<tr>
<td><em>P. longinum</em></td>
<td>Bright yellow</td>
<td>1683-3712 × 118-168</td>
<td>94-130 × 8.5-12</td>
<td>3-5 × 2</td>
<td>Filiform</td>
<td>84-105.5 × 3.8-4.0</td>
<td>4-8</td>
</tr>
<tr>
<td><em>P. usitai</em></td>
<td>Yellowish brown</td>
<td>300-600 × 160-200</td>
<td>122-192 × 14.4-18</td>
<td>not given</td>
<td>Cylindrical</td>
<td>99-168 × 4.8-8.4</td>
<td>5</td>
</tr>
<tr>
<td><em>P. palmicola</em></td>
<td>Dark brown</td>
<td>1600 × 132-152</td>
<td>120-156 × 13-15</td>
<td>3.5-4 × 2.5-4</td>
<td>Filiform</td>
<td>74-83 × 4.4-5</td>
<td>3-6</td>
</tr>
<tr>
<td><em>P. phaloida</em></td>
<td>Yellow</td>
<td>614-1940 × 89-129</td>
<td>82-99 × 5.7-9</td>
<td>3.5-2 × 2.5-5</td>
<td>Filiform</td>
<td>64.5-79 × 2</td>
<td>0-4</td>
</tr>
<tr>
<td><em>P. mixanthiocola</em></td>
<td>Yellow to Orange</td>
<td>1400-2200 × 100-400</td>
<td>76-94 × 10-16</td>
<td>3 × 4</td>
<td>Ellipsoidal</td>
<td>(20-32) × 3 × (5-)6-8</td>
<td>0-1</td>
</tr>
<tr>
<td><em>P. salebensis</em></td>
<td>Dark brown</td>
<td>400-800 × 120-180</td>
<td>135-170 × 5-8.5</td>
<td>2-5 × 2-3</td>
<td>Filiform</td>
<td>85-137 × 2.5</td>
<td>4-7</td>
</tr>
</tbody>
</table>
University, Goa, India) are thanked for their assistance and guidance during sample collection in Chorle Ghat, Goa, India. W.H. Ho, E.H.C. McKenzie are thanked for stimulating discussion on *Massariothea*. I. Promputtha, L.Y.M. Helen, S. Thongkantha, K. Rampai, (Chiang Mai University, Thailand) are thanked for technical and photographic assistance.

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