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珠江口亚热带红树真菌的初步探讨

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摘要 对珠江口的亚热带红树林真菌作初步探讨,结果显示,在香港,澳门与深圳福田保护区的亚热带红树真菌的品种类型及丰富度与热带相似,但占优势的品种则有所不同,在260多块的漂浮木上,共发现了76种真菌,包括46种子囊菌,26种半知菌与4种担子菌,其中占优势的有 *Trichocladium linderii* (18%), *Marinosphaera mangrovei* (13%), *Lignicola laevis* (13%) 和 *Hypoxyylon oceanicum* (11%);较少的包括 *Phomopsis* sp. (8%), *Phoma* sp. (6%), *Halosarpheia abomnis* (6%), *Cirrenalia* sp. (5%), *Savoryella lignicola* (5%)等,在被发现的真菌中,有数个是新品种,例如 *Massarina armatispora*, *Diaporthe salsuginosa*, *Aniptodera haispora*, *Melaspilva* sp. 和 *Pleospora* sp. 等。

关键词 亚热带,红树林,真菌,珠江口

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Observations on Subtropical Mangrove Fungi in the Pearl River Estuary

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Abstract Tropical marine fungi and mangrove fungi have been the subject of intense interest in the last decade resulting in many publications. However, comparatively little knowledge on the mycota in the subtropical mangroves is available. A preliminary survey on the subtropical mangrove fungi in the Pearl River Estuary was undertaken between 1990 and 1991. The results indicate fungal species in the mangroves in Hong Kong, Macau and Futian, Shenzhen were equally rich and diversified as the tropical regime, but the dominant species were different. A total of 76 species were recorded on 260 driftwood-samples consisting of 46 Ascomycotina, 26 Deuteromycotina and 4 Basidiomycotina. The dominant species include *Trichocladium linderii* (18%), *Marinosphaera mangrovei* (13%), *Lignincola laevis* (13%), and *Hypoxylon oceanicum* (11%), *Phomopsis* sp. (8%), *Phoma* sp (6%), *Halosarpheia abonnis* (6%), *Cirrenalia* sp. (5%) and *Savoryella lignicola* (5%) were less frequent. Several species are new to science and these include *Massarina armatispora*, *Diaporthe salsuginosa*, *Aniptodera haispora*, *Melaspilea* sp. and *Pleospora* sp. which will be described.

Keywords subtropical, mangrove, fungi, Pearl River Estuary

Introduction

Mangrove fungi have been the subject of intense interest in the last decade and

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investigations have mainly concentrated on the tropical regions of Central America^[1] Indian Ocean^[2~5], Singapore and Malaysia^[6~11], Brunei^[12~14], Thailand^[15~16] and the Philippines^[17]. These investigations have resulted in the discovery of 90 new mangrove species, a vast increase compared with the 42 manglicolous species listed by Kohlmeyer and Kohlmeyer^[18]. However, comparatively little knowledge on the mycota in the subtropical mangroves is available^[19]. This report describes a preliminary survey of mangrove fungi in four mangrove communities in the Pearl River Estuary along the South China coast carried out between October 1990 and August 1991.

Materials and Methods

Collection sites

(1) Three Fathoms Cove is a small mangrove within Tolo Harbour in Hong Kong (22°25' N, 114°16' E) covering an area of 0.03 km². The floor of the mangrove varies from a hard substrate comprised of large-sized pebbles to very soft mud^[20]. The maximum tidal range is about 2.4m. *Kandelia candel* (L.) Druce is the dominant mangrove species followed by *Aegiceras corniculatum* (L.) Blanco and *Avicennia marina* (Forsk.) Vierh. The trees are stunted and seldom exceed 1.5 m in height^[21].

(2) *Mai Po* is the largest mangrove community in Hong Kong situated along the north-western coast of the New Territories facing the Pearl River Estuary (22°29' N, 114°02' E). The mangrove stands on a vast expanse of mudflat created from the deposition of sediment by the Pearl River covering an area of approximately 0.9 km²^[22]. The maximum tidal range is about 2.8m^[23]. The dominant mangrove species are similar to those described for Three Fathoms Cove with an additional herbaceous species *Acanthus ilicifolius* L. which lines the seaward fringe and the water channels^[24]. The trees are better developed compared with those at Three Fathoms Cove but still rarely exceed 5 m^[17].

(3) *Futian* mangrove is the northern extension of the mangrove community at *Mai Po* (22°32' N, 114°03' E) across the border between Hong Kong and China and covers some 3.04 km². Again the dominant tree species is *K. candel*, and the additional common species include *Bruguiera gymnorhiza* (L.) Blanco and *Exocoecaria agallocha* L. The mangrove is quite dense in parts and much driftwood collects at the drift zone and is entangled amongst the trees. Mangrove trees are young or dwarfed and few exceed 4m in height.

(4) *Taipa* mangrove is on the southern coast of the Taipa Island and extends southwards along the Taipa-Coloane Causeway in Macau which is situated along the south-western edge of the Pearl River Estuary. The substrate is comprised of very soft mud and the maximum tidal range is approximately 2.8m. Report of a detailed floristic

survey of the mangrove is not available but observation reveals the common species are similar to those found in Three Fathoms Cove. Most of the plants rarely exceed 2 m in height and *A. ilicifolius* is particularly dense along the back of this mangrove community.

The methodology described by Jones and Hyde^[25] for the examination of mangrove fungi on wood was used. Driftwood on the mangrove floor as well as dead branches, stumps and pneumatophores of the mangrove plants were collected and stored in polythene bags during transport. On arrival in the laboratory, the samples were gently washed with tap water to remove debris and surface fouling organisms. They were then incubated in a sealed polythene bag lined with sterile moistened paper towel at room temperature (22~25 C). The wood samples were examined periodically for sporulating fungi. Collections were made in the above sites between October 1990 and August 1991.

Results

Table 1 lists the fungi collected at all the four sites. A total of 76 species were collected although not all were identified to species level. There are several species which are new to science and are awaiting description, viz. *Aniptodera haispora*^[26], *Diaporthe salsuginosa*^[26] *Massarina armitispora*^[27], *Melaspilea* sp and *Pleospora* sp.

A total of 76 species were recorded, comprising 46 Ascomycotina, 26 Deuteromycotina and 4 Basidiomycotina. From the 261 wood samples collected, the most frequent species encountered were, in order of abundance, *Trichocladium linderii* Shearer, *Marinosphaera mangrovei* Hyde, *Lignicola laevis* Höhnk, *Hypoxyylon oceanicum* Schatz and *Phomopsis* sp.; they were recorded between 21 and 46 times. Eight other species occurred between 11 and 20 times. These include *Phoma* sp., *Halosarpheia abonnis* Kohlm., *Cirrenalia* sp., *Savoryella lignicola* Jones & Eaton, *Periconia prolifica* Anastasiou, *Dactylospora haliotrepha* (Kchlm & Kohlm) Hafellner, *Aniptodera chesapeakeensis* Shearer and Miller and Hyphomycete sp. 2. The rest, 61 species, were much less frequent. Among them, 25 species were only collected once.

Discussion

Intensive surveys of mangrove fungi in the tropics in the South China Sea reveals a very rich fungal species diversity^[8,9,12,15,25]. Although similar species composition of mangrove fungi can be observed between the subtropical group described here and those of the tropics, the dominant species are different. Among the dominant species, *Trichocladium linderii*, *Marinosphaera mangrovei* and *Phomopsis* sp. were not among the most frequent species collected in the tropics. *Hypoxyylon oceanicum* was frequent in Brunei, Malaysia and Philippines^[8,13,25] and it was only abundant on baited mangrove

wood in Singapore^[11]. *Lignicola laevis* was also frequent in Malaysia^[8] and on both baited and collected mangrove driftwood in Singapore^[9,11], but not in Brunei^[13], Philippines^[2,5] and Thailand^[15]. *Halocyphina villosa* which is very abundant in the tropical mangroves in Southeast Asia has only been found infrequently in China and Macau and not in Hong Kong. There is also a distinct lack of *Aigialus* spp. from the samples collected in this survey. Apart from the cold winters which the subtropics experience, the difference in mangrove wood species, as shown by other surveys in the tropics^[4,11,13] is likely to be another major factor which accounts for the difference in composition of the dominant species. More collections at different times of the year would help us to verify whether there is a real difference in the species composition between the tropical and subtropical mangrove fungi in this region.

Tabl. 1 Fungi collected from driftwood and standing decayed mangrove wood in shenzhen, china; hong kong and macau between october 1990 and august 1991

Ascomycotina	No. of collections			Total
	China ¹	Hong Kong ²	Macau ³	
<i>Aniptodera chesapeakensis</i> Shearer & Miller	4	6	—	10
<i>A. hatspora</i> Vrijmoed, Hyde & Jones	—	—	1	1
<i>A. lignatilis</i> Hyde	—	—	1	1
<i>A. mangrovei</i> Hyde	3	—	—	3
<i>Antennospora quadricornuta</i> Cribb & Cribb	—	2	—	2
<i>Belizeana tuberculata</i> Kohlm. & Volk. —Kohlm.	—	—	1	1
<i>Belizeana</i> c. f. <i>tuberculata</i>	—	1	—	1
<i>Dactylospora haliotrepha</i> (Kohlm. & Kohlm.) Hafellner	1	9	—	10
<i>Diaporthe salsuginosa</i> Vrijmoed, Hyde & Jones	—	—	1	1
<i>Diatrype</i> sp.	3	—	—	3
<i>Eutypa</i> sp.	1	1	2	4
<i>Halosarpheia abonnis</i> Kohlm.	9	6	—	15
<i>H. fibrosa</i> Kohlm. & Kohlm.	—	3	1	4
<i>H. indica/lotica</i>	3	—	—	3
<i>H. marina</i> (Cribb & Cribb) Kohlm.	3	2	—	5
<i>H. minuta</i> Leong	—	1	—	1
<i>H. ratnagiriensis</i> Patil & Borse	2	—	—	2
<i>H. retorquens</i> Shearer & Crane	4	1	1	6
<i>H. viscosa</i> (I. Schmidt) Shearer & Crane	1	—	—	1
<i>Halosarpheia</i> sp.	—	1	—	1

Ascomycotina	China ¹	Hong Kong ²	Macau ³	Total
<i>Hydronectria tethys</i> Kohlm. & Kohlm.	—	2	—	2
<i>Hypoxylon oceanicum</i> Schatz	21	4+1	3	29
<i>Leptosphaeria australiensis</i> (Cribb & Cribb) G C Hughes	—	6	—	6
<i>L. avicenniae</i> Kohlm. & Kohlm.	—	—	1	1
<i>Lignincola laevis</i> Höhnk	7	21	5	33
<i>L. longirostris</i> (Cribb & Cribb) Kohlm.	1	1	—	2
<i>Lulworthia grandispora</i> Meyers	—	3	—	3
<i>Lulworthia</i> sp. (350 μm)	—	8	—	8
<i>Marinosphaera mangrovei</i> Hyde	18	14	2	34
<i>Marinosphaera</i> c. f. <i>mangrovei</i>	—	2	1	3
<i>Massarina armatispora</i> Hyde, Vrijmoed, Chinnaraj & Jones	—	—	2	2
<i>M. thalassiae</i> Kohlm. & Volk. —Kohlm.	—	1	—	1
<i>M. velatospora</i> Hyde & Borse	—	6	—	6
<i>Massarina</i> sp.	—	—	3	3
<i>Melaspilea</i> sp.	—	6	—	6
<i>Nais glitra</i> Crane & Shearer	—	3	—	3
<i>Passeriniella</i> sp.	—	—	1	1
<i>Pleospora</i> sp.	8	—	1	9
<i>Rosellinia</i> sp.	—	—	4	4
<i>Saccardoella marinospora</i> Hyde	2	1	—	3
<i>Savoryella lignicola</i> Jones & Eaton	2	7	3	12
<i>S. paucispora</i> (Cribb & Cribb) Kohlm.	—	—	5	5
<i>Trematosphaeria lineolatispora</i> Hyde	—	1	1	2
<i>Verruculina enalia</i> Kohlm. & Kohlm.	3	5	2	10
Ascomycete sp. 1 (hyaline subglobose ascomata, spindle — shape, 5 — septate ascospore)	1	—	—	1
Ascomycete sp. 2 (hyaline ascomata, bitunicate asci, hyaline ascospore, 27 x 4— 6 μm)	1	—	—	1
Ascomycete sp. 3	—	1	—	1
DEUTEROMYCOTINA				
<i>Alternaria</i> sp.	1	—	—	1
<i>Beltrandia</i> sp.	1	—	—	1
<i>Cirrenalia macrocephala</i> (Kohlm.) Meyers & Moore	2	3	—	5
<i>C. pygmaea</i> Kohlm.	1	—	—	1
<i>Cirrenalia</i> sp.	13	—	—	13

Ascomycotina	China ¹	Hong Kong ²	Macau ³	Total
<i>Clavatospora bulbosa</i> (Anast.) Nakagira & Tubaki	—	2	—	2
<i>Dictyosporium pelagicum</i> (Linder) G C Hughes	—	1	—	1
<i>Humicola alopallonella</i> Meyers & Moore	—	2	—	2
<i>Monodictys</i> -like sp.	1	—	—	1
<i>Monodictys</i> sp. (hyaline)	1	—	—	1
<i>Periconia prolifica</i> Anastasiou	8	3	—	11
<i>Phoma</i> sp.	12	4	—	16
<i>Phomopsis</i> sp.	—	15	6	21
<i>Rhabdospora</i> sp.	2	—	—	2
<i>Stagnospora</i> sp.	1	—	—	1
<i>Trichocladium achrasporum</i> (Meyers & Moore) Dixon in Shearer & Crane	2	—	—	2
<i>T. linderii</i> Shearer	30	2	14	46
<i>Trichocladium</i> sp. (globose conidia)	1	—	—	1
<i>Zalerion</i> sp.	—	1	—	1
Coelomycte sp. 1	—	—	1	1
Hyphomycete sp. 1 (dematiaceous apical conidia, pale brown, 1-4 septate)	7	—	—	7
Hyphomycete sp. 2 (<i>Cephalosporium</i> -like)	10	—	—	10
Hyphomycete sp. 3	—	2	1	3
Hyphomycete sp. 4	—	—	1	1
Sphaeropsidaceous sp. 1	1	—	—	1
BASIDIOMYCOTINA				
<i>Agerita</i> sp.	6	—	—	6
<i>Halocyphina villosa</i> Kohlm. & Kohlm.	4	—	1	5
Basidiomycelial clamp	1	—	2	3
Basidiomycete sp. 2 (white-stalked)	2	—	—	2
Total wood samples	123	98	40	261
Total species	42	39	28	76

anamorph

¹Futian Mangrove, Shenzhen, China²Three Fathoms Cove Mangrove and Mai Po Mangrove, Hong Kong³Taija Mangrove, Macau

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珠江口亚热带红树真菌的初步探讨

关利平¹ E B Gareth Jones² K D Hyde³

摘要 对珠江口的亚热带红树林真菌作初步探讨,结果显示,在香港,澳门与深圳福田保护区的亚热带红树真菌的品种类型及丰富度与热带相似,但占优势的品种则有所不同,在260多块的漂浮木上,共发现了76种真菌,包括46种子囊菌,26种半知菌与4种担子菌,其中占优势的有 *Trichocladium linderii* (18%), *Marinosphaera mangrovei* (13%), *Lignicola laevis* (13%) 和 *Hypoxyylon oceanicum* (11%);较少的包括 *Phomopsis* sp. (8%), *Phoma* sp. (6%), *Halosarpheia abomnis* (6%), *Cirrenalia* sp. (5%), *Savoryella lignicola* (5%)等,在被发现的真菌中,有数个是新品种,例如 *Massarina armatispora*, *Diaporthe salsuginosa*, *Aniptodera haispora*, *Melaspilva* sp. 和 *Pleospora* sp. 等。

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