

## Thai marine fungal diversity

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### Abstract

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The marine fungal diversity of Thailand was investigated and 116 Ascomycota, 3 Basidiomycota, 28 anamorphic fungi, 7 Stramenopiles recorded, with 30 tentatively identified. These species have primarily been collected from driftwood and attached decayed wood of mangrove trees. The holotype number of 15 taxa is from Thailand and 33 are new records from the country.

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**Key words :** Ascomycota, anamorphic fungi, arenicolous fungi, Basidiomycota,  
mangrove fungi

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ความหลากหลายทางชีวภาพของราทะเลในประเทศไทย

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จากการรวบรวมจำนวนชนิดและความหลากหลายทางชีวภาพของราทะเลในประเทศไทย โดยวิธีเก็บตัวอย่าง และแยกให้เป็นเชื้อบริสุทธิ์จากไม้ที่ยึดอยู่บนชายหาดหรือไม้ที่กำลังย่อยสลายในป่าชายเลน สามารถรวบรวมรากลุ่ม แอสโคไมโคตาได้ 116 ชนิด เบสิดิโอไมโคตา 3 ชนิด ราที่สืบพันธุ์แบบไม่อาศัยเพศ 28 ชนิด สเตรปโตไมซีตา 7 ชนิด และราที่ไม่สามารถบ่งชี้ชนิดได้อีก 30 สายพันธุ์ ทั้งนี้มีราทะเล 15 ชนิดที่รายงานพบเป็นไฮโอฟัยในประเทศไทย และยังมีพบเพิ่มเติมอีก 33 ชนิดที่พบครั้งแรกในประเทศไทย

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Marine fungi are a world wide ecological group, but distinct in their geographical distribution and the substrata on which they are found. Lignicolous species have been extensively studied, especially in temperate locations (Hughes, 1974; Jones, 1985; Koch and Jones, 1983; Koch and Petersen, 1996; Kohlmeyer and Kohlmeyer, 1979; Schaumann, 1975; Petersen and Koch, 1997), and tropical mangroves (Jones and Alias, 1997; Kohlmeyer, 1984; Sarma and Hyde, 2001; Schmidt and Shearer, 2003; 2004). There are two published checklists of marine fungi: Denmark (Koch and Petersen, 1996) with 72 species listed (from 47 sites) and Mexico (Gonzalez *et al.*, 2001) with 62 fungi from 46 sites. Studies by Cuomo *et al.* (1988), Shearer and Burgos (1987) and Lintott and Lintott (2002) list extensive collections from many collections in Italy (42 species), Chile (42 from 16 sites) and New Zealand (42 from 38 sites).

A number of publications document the collections of marine fungi made in Thailand, starting with Kohlmeyer (1984) and including studies by Hyde (1988a,b; 1989; 1992a, b; 1995), Hyde *et al.* (1990; 1993), Chalermpongse *et al.* (1991), Hyde and Jones (1992), Koch (1986), Jones *et al.* (1999), Sundari *et al.* (1996) and Jones *et al.* (2006). However, these data have not been gathered

together so as to comment on the biodiversity of marine fungi in Thailand, hence this paper.

Ito *et al.* (2001) have reported on the mycobiota of mangrove forest soils from the rhizosphere of eight mangrove species collected at the Ranong Research Center (Kasetsart University) and Phang-Nga. Two methods were used to isolate the fungi: incubation at 45°C and the standard dilution plate method. Forty-two fungal strains were documented from soil samples, all typical soil taxa, with *Penicillium* sp., *Trichoderma harzianum* and an unidentified strain the most commonly isolated. Further, mangrove soil fungi have been reported by Wongthong (2001, Ranong: 101 species), Kongamol (2001, Samut Sakhon: 45 species) and Sriswadskulmee (2002, Ranong: 92 fungi).

### Materials and Methods

Fungi were collected on driftwood deposited on beaches, trapped between stones in the intertidal region, attached wood from coastal defense constructions and from attached mangrove wood (which comprised the largest part of the collections made).

Sand samples were also taken and examined

for marine fungi. All material was incubated in sterilized plastic boxes with moist tissue paper, for up to 15 weeks to encourage sporulation of the fungi (Jones and Hyde, 1988). Material was examined under a binocular microscope and single spore isolations made where possible, with cultures deposited in BIOTEC Culture Collection (BCC), Thailand.

Herbarium material is deposited in various herbaria: CP Denmark (material collected by Koch) and BIOTEC Bangkok Herbarium (material from the current study).

A map showing Thai provinces where collections of marine fungi were made, is presented in Figure 1, the shaded areas indicate the major mangrove sites in Thailand. In order to save on

space, only the names of collecting sites are given in the text while Table 1 lists all the collecting sites and their provinces.

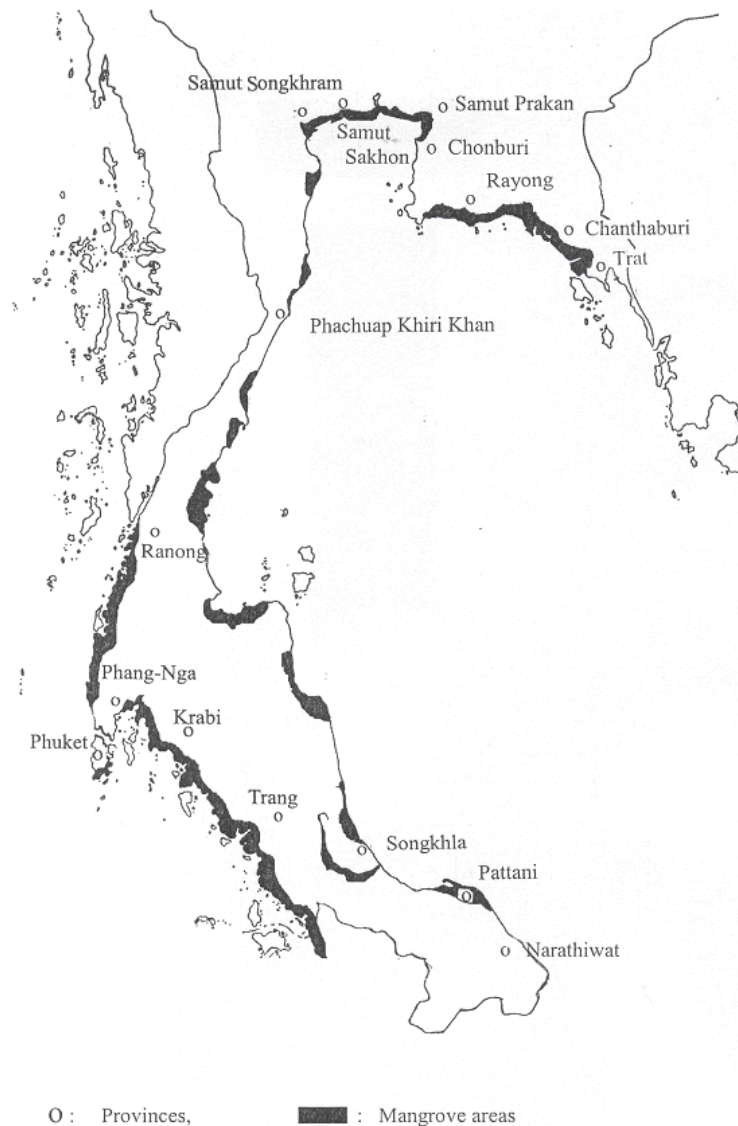
## Results

One hundred and fifty four fully identified marine fungi are listed in Table 2 for Thailand, with 30 collections awaiting further investigation.

The number of collections made for Thailand is not known except for studies that document frequency of occurrence, in particular for mangrove wood taxa (Hyde *et al.*, 1990; 1993) and fungi on *Nypa fruticosa* (Pilantanapak, 2003; Pilantanapak *et al.*, 2005). Thus the number of collections per fungus gives an impression of their frequency of

**Table 1. Collecting sites and the provinces in which they are collected.**

Province	Collecting site	Province	Collecting site		
<b>Chanthaburi</b>	Koh Chula	<b>Chonburi</b>	Bangsaen beach		
	Kung Kraben Bay		Chonburi beach		
<b>Krabi</b>	Krabi		<b>Narathiwat</b>	Phatthaya beach	
	Pra-Nang beach			Sriracha beach	
<b>Pattani</b>	Pattani			<b>Phachuap Khiri Khan</b>	Koh Yao beach
	Pattani mangrove				Nam Bang
<b>Phang-Nga</b>	Ya-Ring		<b>Phuket</b>	Narathat beach	
	Phang-Nga			Tak Bai	
	Phang-Nga Bay			Phachuap Khiri Khan	
<b>Ranong</b>	Laem Son National Park			<b>Rayong</b>	Karon beach
	Ranong mangrove	Kata beach			
<b>Samut Prakan</b>	Bang Pu	<b>Samut Sakhon</b>			Nai Han
	<b>Samut Songkhram</b>				Kamnanyiam site
<b>Songkhla</b>					
	Patong beach				
	<b>Trang</b>				Koh Chang National Park
			Phuket bridge		
			Phuket mangrove		
			Rayong		
			Rayong mangrove		
			Samut Sakhon		
		Jana beach			
		Koh Yor			
Chao Mai National Park					
Yaw beach					
Yong-Ling beach					



**Figure 1. Map of Thailand showing mangrove areas.**

occurrence. Although many fungi were frequent in their distribution, others were only collected a few times or only once. Due to lack of material, 27 taxa could only be tentatively identified.

Frequent species are listed in Table 3 and illustrated in Figures 2-21. The preponderance of mangrove fungi can be accounted for by the wide distribution of mangroves around the coast of Thailand, which generates much driftwood into the adjoining coasts. Schmidt and Shearer (2003)

list 625 mangrove fungi, but this figure includes those species in sediments and terrestrial forms on standing mangrove trees.

### Discussion

#### Numbers of marine fungi

In this paper we document the occurrence of 154 marine fungi for Thailand, with a further 30 unidentified species. The major finding is that the

Table 2. Marine fungi collected from Thailand.

Fungi	Collecting sites	No. of collection/collectors/date*	References
<b>ASCOMYCOTA</b>			
<i>Acrocardiopsis patilii</i> Borse & K.D. Hyde	Ranong mangrove, Nai Han, Lam Son National Park	Over 5 coll., GJ: 06/1997; IC: 01/2001	Hyde <i>et al.</i> , 1990; 1993
<i>Aigialus grandis</i> Kohlm. & Schatz	Phang-Nga Bay mangrove, Ranong mangrove, Panwa beach	Over 10 coll., IC: 01/2001; GJ: 03/2001	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Aigialus parvus</i> Schatz & Kohlm.	Ranong mangrove	Over 5 coll.	Hyde <i>et al.</i> , 1990
<i>Aigialus striatispora</i> K.D. Hyde	Ranong mangrove, Yaw beach, Yong-Ling beach, Panwa beach	Over 10 coll., AP: 10/1997; 04/1996; 08/1996; 10/1997	Hyde <i>et al.</i> , 1990; 1993
<i>Aniptodera chesapeakeensis</i> Shearer & M.A. Miller	Patong beach, Phang-Nga Bay mangrove, Ranong mangrove, Bangsaen beach, Panwa beach, Yong-Ling beach, Pra-Nang beach, Kammanyiam site, Tak Bai, Narathat beach, Ya-Ring	Over 10 coll., AP: 06/1996; AP: 08/1996; 10/1997; 07/1998; 11/1998; JS: 05/2002; 06/2002; GJ: 07/2000; IC: 01/2004, low frequency on <i>Nypa fruticans</i>	Koch, 1986; Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Aniptodera longispora</i> K.D. Hyde	Phang-Nga Bay mangrove, Ranong mangrove, Trang, Phuket bridge, Yaw beach	9 coll., GJ: 05/1996; 06/1997; AP: 10/1997	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Aniptodera mangrovei</i> K.D. Hyde & E.B.G. Jones	Ranong mangrove	5 coll.	Hyde <i>et al.</i> , 1990; 1993
<i>Aniptodera nypae</i> K.D. Hyde	Kammanyiam site	5 coll., AP: 10/1997- 07/1998, 14% frequency on <i>Nypa fruticans</i>	Hyde <i>et al.</i> , 1990; 1993
<i>Antennospora quadricornuta</i> (Cribb & J.W. Cribb) T.W. Johnson	Ranong mangrove, Sriracha beach, Panwa beach, Pattani mangrove, Tak Bai, Narathat beach, Chao Mai National Park, Laem Son National Park, Phang-Nga, Koh Chang National Park	20 coll., AP: 06/1996; 08/1996; GJ: 09/1997; 04/2005; JS: 05/2001; 06/2002; IC: 07/2000; 01/2001; 06/2003	Hyde <i>et al.</i> , 1990; 1993
<i>Antennospora salina</i> (Meyers) Yusoff, E.B.G. Jones & S.T. Moss (As <i>Halosphaeria salina</i> )	Phatthaya, Sriracha beach, Patong beach, Chonburi beach, Pra-Nang beach, Panwa beach, Yaw beach, Yong-Ling beach, Trang, Koh Yao Beach, Narathat beach, Chao Mai National Park, Phang-Nga, Koh Chang National Park	37 coll., GJ: 8/5/1996; 04/2005; AP: 08/1996; 10/1997; JS: 05/2001; 06/2002; IC: 07/2000; 03/2003	Kohlmeier, 1984; Koch, 1986
<i>Anthostomella nypae</i> K.D. Hyde, B.S. Lu & Alias	Phang-Nga Bay mangrove	1 coll., IC: 01/2001	
<b><i>Arenariomyces parvulus</i> JØrgen Koch (Holotype)</b>	Patong beach	1 coll.	Koch, 1986
<i>Arenariomyces trifurcatus</i> Hohnk	Chonburi beach, Patong beach, Pra-Nang beach, Panwa beach, Yaw beach, Yong-Ling beach, Chao Mai National Park, Koh Chang National Park	24 coll., AP: 08/1996; IC: 07/2000; GJ: 04/2005	Kohlmeier, 1984; Koch, 1986
<i>Ascocratera manglicola</i> Kohlm.	Phang-Nga Bay mangrove, Ranong mangrove, Laem Son National Park	3 coll., IC: 01/2001	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993

(to be continued)

Table 2. (Continued)

Fungi	Collecting sites	No. of collection/collectors/date*	References
<i>Ascosalium cincinnatum</i> (Shearer & J.L.Crane) J. Campb., J.L. Anderson & Shearer	Koh Chang National Park, Laem Son National Park	3 coll., SS: 02/2001; IC: 01/2001	
<i>Astrosphaeriella astiana</i> (K.D. Hyde) Aprot & K.D. Hyde (Holotype) (As <i>Lophiostoma</i> sp.)	Ranong mangrove	1 coll.	Hyde <i>et al.</i> , 1990
<i>Astrosphaeriella mangrovis</i> (Kohlm. & Vittal) Aprot & K.D. Hyde (As <i>Lophiostoma mangrovei</i> )	Ranong mangrove, Panwa beach, Ranong mangrove, Kammanyiam site	8 coll., GJ: 05/1997; AP: 11/1998, low frequency on <i>Nypa fruticans</i>	Hyde <i>et al.</i> , 1990; 1993
<i>Astrosphaeriella nypae</i> K.D. Hyde	Kammanyiam site	1 coll., AP: 11/1998, low frequency on <i>Nypa fruticans</i>	Hyde <i>et al.</i> , 1990; 1993
<i>Astrosphaeriella striatispora</i> (K.D. Hyde) K.D. Hyde	Ranong mangrove, Kammanyiam site	Over 20 coll., AP: 10/1997-07/1998, 26.4 % frequency on <i>Nypa fruticans</i>	Hyde <i>et al.</i> , 1990
<i>Bathysascus grandisporus</i> K.D. Hyde & E.B.G. Jones	Ranong mangrove	3 coll.	Hyde <i>et al.</i> , 1990; 1993
<i>Belizeana tuberculata</i> Kohlm. & Volkman	Ranong mangrove	5 coll.	Hyde <i>et al.</i> , 1990; 1993
<i>Biatrospora marina</i> K.D. Hyde & Borse	Ranong mangrove	5 coll.	Hyde <i>et al.</i> , 1990
<i>Biconiosporella corniculata</i> Schaumann	Patong beach, Koh Chang National Park	3 coll., GJ: 10/1995; 04/2005	
<i>Carbospaerella leptosphaerioides</i> I. Schmidt	Phuket beach, Karon beach, Koh Chang National Park	3 coll., GJ: 10/1995; 05/1997; 04/2005	
<i>Caryosporella rhizophorae</i> Kohlm.	Phang-Nga Bay mangrove, Ranong mangrove, Laem Son National Park	8 coll., IC: 01/2001; 06/2003	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Ceriosporopsis halima</i> Linder	Patong beach, Tak Bai	2 coll., GJ: 10/1995; IC: 05/2000	
<i>Corollospora besarispora</i> Sundari	Phuket, Patong beach	Attached on sand grains, 1 coll., GJ: 10/1995	Sundari <i>et al.</i> , 1996
<i>Corollospora cinnanomea</i> Jørgen Koch (Holotype)	Patong beach, Yong-Ling beach, Kata beach	7 coll., AP: 08/1996; GJ: 07/1997	Koch, 1986
<i>Corollospora collossa</i> Nakagiri & Tokura	Patong beach, Chao Mai National Park, Yong-Ling beach	4 coll., GJ: 10/1995; 05/1996; AP: 10/1997	
<i>Corollospora filiformis</i> Nakagiri	Patong beach, Chao Mai National Park, Chonburi beach, Koh Yao Beach, Narathat beach, Koh Chang National Park	Over 20 coll., GJ: 10/1995; 05/1996; 04/2005; JS: 05/2001; 06/2002	
<i>Corollospora gracilis</i> Nakagiri & Tokura	Panwa beach, Yong-Ling beach	11 coll., AP: 08/1996	

(to be continued)

Table 2. (Continued)

Fungi	Collecting sites	No. of collection/collectors/date*	References
<i>Corollospora marítima</i> Werdern.	Phatthaya beach, Patong beach, Pra-Nang beach, Panwa beach, Yaw beach, Yong-Ling beach, Tak Bai, Chao Mai National Park, Jana beach	Ascospores washed up in foam, 53 coll., AP: 08/1996; JS: 03/2001; IC: 07/2000; 08/2001; 02/2002	Kohlmeier, 1984; Koch, 1986
<i>Corollospora pseudopulchella</i> Nakagiri & Tokur	Yong-Ling beach	6 coll., AP: 08/1996	
<i>Corollospora pulchella</i> I. Schmid & N.B. Nair	Phatthaya beach, Patong beach, Karon beach, Pra-Nang beach, Panwa beach, Yaw beach, Yong-Ling beach, Rayong	40 coll., GJ: 05/1997; 06/1997; AP: 08/1996; 10/1997; IC: 11/2003	Hyde <i>et al.</i> , 2000; Kohlmeier, 1984; Koch, 1986
<i>Corollospora</i> new species (unpublished)	Koh Chang National Park	Over 10 coll., GJ: 04/2005	Hyde, 1989
<i>Coronopapilla mangrovei</i> (K.D. Hyde) Kohlm. & Volkman.-Kohlman.	Phang-Nga Bay mangrove	1 coll.	
(As <i>Caryospora mangrovei</i> )			
<i>Cryptosphaeria mangrovei</i> K.D. Hyde	Ranong mangrove	5 coll.	Hyde <i>et al.</i> , 1993
<i>Cryptovalsa mangrovei</i> Abdel-Wahab & Inderbitzin	Panwa beach	1 coll., AP: 10/1997	
<i>Cucullosporella mangrovei</i> (K.D. Hyde & E.B.G. Jones) K.D. Hyde & E.B.G. Jones	Phang-Nga Bay mangrove, Ranong mangrove, Panwa beach	4 coll., AP: 10/1997	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Dactylospora halitrephe</i> (Kohlman. & E. Kohlman.) Hafellner	Chonburi, Patong beach, Phang-Nga Bay mangrove, Ranong mangrove, Phuket mangrove, Panwa beach, Yaw beach, Yong-Ling beach, Phuket bridge, Pra-Nang beach, Kung Kraben Bay, Chao Mai National Park, Laem Son National Park, Krabi	Over 50 coll., IC: 07/2000; 01/2001; GJ: 10/1995; 05/1997; 06/1997; AP: 04/1996; 08/1996; 10/1997; JS: 04/2001; 11/2003	Kohlmeier, 1984; Koch, 1986; Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Dactylospora mangrovei</i> E.B.G. Jones, Alias, Abdel-Wahab & S.Y. Hsieh	Panwa beach	1 coll., AP: 10/1997	Jones <i>et al.</i> , 1999
<i>Dryosphaera navigans</i> JØrgen Koch & E.B.G. Jones (Probably not <i>Crinigera marítima</i> as stated in the paper)	Patong beach	1 coll.	Koch, 1986
<i>Dryosphaera tropicalis</i> Kohlman. & Volkman.-Kohlman.	Phuket	1 coll.	Kohlmeier and Volkman.-Kohlmeier, 1993
<i>Didymella avicenniae</i> Patil & Borse	Ranong mangrove	1 coll.	Hyde <i>et al.</i> , 1990
<i>Eutypa bathurstensis</i> K.D. Hyde & Rappaz	Pra-Nang beach, Panwa beach, Yaw beach, Yong-Ling beach, Pra-Nang beach	17 coll., AP: 08/1996; 10/1997	

(to be continued)

Table 2. (Continued)

Fungi	Collecting sites	No. of collection/collectors/date*	References
<i>Eutypella naqsii</i> K.D. Hyde	Panwa beach	5 coll., AP: 10/1997- 07/1998	Hyde <i>et al.</i> , 1990; 1993
<i>Fasciatispora lignicola</i> Alias, E.B.G. Jones & Kuthub. K.D. Hyde & Lassøe	Kammanyiam site		
<i>Halorosellinia oceanica</i> Whalley, E.B.G. Jones,	Phang-Nga Bay mangrove, Ranong mangrove, Panwa beach, Phuket mangrove, Pra-Nang beach, Yaw beach, Yong-Ling beach, Kammanyiam site, Kung Kraben Bay, Laem Son National Park, Krabi, Chanthaburi	Over 60 coll., AP: 08/1996;; GJ: 05/1996; 05/1997; 06/199703/2001; JS: 11/2003; IC: 01/2001; 11/2003, 6% frequency on <i>Nypa fruticans</i>	Hyde, 1989
<i>Halosarphelia kandeliae</i> Abdel-Wahab & E.B.G. Jones	Ranong mangrove	1 coll., JS: 07/2003	
<i>Halosarphelia marina</i> (Cribb & J.W. Cribb) Kohlm.	Phang-Nga Bay mangrove, Ranong mangrove	7 coll., GJ: 05/1996	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Halosarphelia minuta</i> Leong	Phang-Nga Bay mangrove, Ranong mangrove, Bangsaen beach, Sriracha beach, Trang	12 coll., AP: 06/1996; GJ: 05/1996	Hyde, 1989; Hyde <i>et al.</i> , 1990
<i>Helicascus kanaloanus</i> Kohlm.	Phang-Nga Bay mangrove, Ranong mangrove, Laem Son National Park, Koh Chang National Park	8 coll., IC: 01/2001; GJ: 04/2005	Hyde, 1989; Hyde <i>et al.</i> , 1990
<i>Helicascus nypae</i> K.D. Hyde	Phuket mangrove, Kammanyiam site	6 coll., GJ: 10/1995; AP: 10/1997-07/1998; 11/1998, low frequency on <i>Nypa fruticans</i>	
<b><i>Hypophloeoda rhizospora</i> K.D. Hyde &amp; E.B.G. Jones (Holotype)</b>	Ranong mangrove, Nai Han, Ranong mangrove, Yaw beach, Phuket bridge	9 coll., AP: 08/1996; GJ: 06/1997	Hyde <i>et al.</i> , 1990; 1993
<i>Hypoxylon hypomilitum</i> Montagne	Ranong mangrove	Over 10 coll.	Hyde <i>et al.</i> , 1993
<i>Julietta avicenniae</i> (Borse) K.D. Hyde	Panwa beach	12 coll., GJ: 05/1997	
<i>Kallichroma glabrum</i> (Kohlm. & E. Kohlm.) Kohlm. & Volk.-Kohlm.	Chonburi, Phuket mangrove, Panwa beach, Yaw beach, Kung Kraben Bay, Laem Son National Park	JS: 04/2001; 11/2003; IC: 01/2001	Kohlmeyer, 1984
<i>Kallichroma tethys</i> (Kohlm. & E. Kohlm.) Kohlm. & Volk.-Kohlm. (As <i>Hydronectria tethys</i> )	Chonburi, Phang-Nga Bay mangrove, Ranong mangrove, Phuket mangrove, Yaw beach, Samut Songkhram, Laem Son National Park	20 coll., IC: 01/2001; GJ: 05/1995; 05/1997; AP: 08/1996; 10/199-07/1998, few coll. on <i>Nypa fruticans</i> in low salinity water	Kohlmeyer, 1984; Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<b><i>Lautospora gigantea</i> K.D. Hyde &amp; E.B.G. Jones (Holotype)</b>	Ranong mangrove, Phuket mangrove	6 coll. GJ: 10/1995	Hyde <i>et al.</i> , 1990
<i>Leptosphaeria australiensis</i> (Cribb & J.W. Cribb) G.C. Hughes	Phang-Nga Bay mangrove, Ranong mangrove, Phuket mangrove, Trang, Pattani mangrove, Panwa beach, Laem Son National Park	Over 40 coll., GJ: 09/1993; 10/1995; 05/1996; 05/1997; 04/2005; AP: 10/1997; IC: 01/2001	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993

(to be continued)



Table 2. (Continued)

Fungi	Collecting sites	No. of collection/collectors/date*	References
<i>Leptosphaeria avicenniae</i> Kohlm. & E. Kohlm.	Phang-Nga Bay mangrove, Ranong mangrove	2 coll., GJ: 06/1997; 05/1997	Hyde, 1989
<i>Leptosphaeria peruviana</i> Speg.	Kammanyiam site	5 coll. on <i>Nypa fruticans</i> , AP: 10/1997-07/1998	Kohlmeier, 1984; Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Liginicola laevis</i> Hohnk	Phatthaya beach, Phang-Nga Bay mangrove, Ranong mangrove, Pattani mangrove, Bangsaen beach, Sriracha beach, Panwa beach, Kata beach, Kammanyiam site	28 coll., GJ: 09/1993; 07/1997; AP: 06/1996; 08/1996; 10/1997; AP: 10/1997-07/1998, 8.8% frequency on <i>Nypa fruticans</i>	Hyde <i>et al.</i> , 1990
<i>Liginicola tropica</i> Kohlm.	Ranong mangrove	3 coll.	Hyde <i>et al.</i> , 1990
<i>Lineolata rhizophorae</i> (Kohlm. & E. Kohlm.) Kohlm. & Volkman-Kohlm. (As <i>Didymosphaeria rhizophorae</i> )	Ranong mangrove, Yaw beach, Yong-Ling beach, Panwa beach, Phuket bridge, Tak Bai, Chao Mai National Park	13 coll., GJ: 06/1997; 03/2001; AP: 08/1996; 10/1997; JS: 05/2001; IC: 07/2000	Hyde <i>et al.</i> , 1990; Hyde <i>et al.</i> , 1993
<i>Linocarpon angustatum</i> K.D. Hyde & Alias	Kammanyiam site	5 coll. on <i>Nypa fruticans</i> , AP: 10/1997-07/1998	Hyde, 1988b
<i>Linocarpon appendiculatum</i> K.D. Hyde	Kammanyiam site, Tak Bai	7 coll., AP: 10/1997-07/1998; IC: 03/2001; 05/2001, 34 % frequency on <i>Nypa fruticans</i>	
<i>Linocarpon bipolaris</i> K.D. Hyde	Kammanyiam site	5 coll., AP: 1998-1999, low frequency on <i>Nypa fruticans</i>	
<i>Linocarpon nypae</i> (Henn.) K.D. Hyde	Kammanyiam site, Phang-Nga Bay mangrove	Over 10 coll., AP: 10/1997-07/1998, 30.8% frequency on <i>Nypa fruticans</i>	
<i>Lophiostoma mangrovei</i> Kohlm. & Vittal	Ranong mangrove, Panwa beach, Ranong mangrove, Tak Bai	9 coll., GJ: 05/1997; 05/1998; JS: 05/2001	Hyde <i>et al.</i> , 1990
<i>Lulworthia grandispora</i> Meyers	Panwa, Phuket, Yaw beach, Yong-Ling beach, Kammanyiam site	11 coll., GJ: 05/1997; AP: 08/1996; 10/1997, 3.6 % frequency on <i>Nypa fruticans</i>	
Collections with markedly different ascospore size have been noted: (500-1000 x 3.7 µm)			
<i>Lulworthia grandispora</i> Meyers (462-500 x 3.7 µm)	Phang-Nga Bay mangrove, Ranong mangrove, Chao Mai National Park, Laem Son National Park	6 coll., IC: 07/2000; 01/2001	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Lulworthia kniepii</i> Kohlm. (250-300 x 2.5-3 µm)	Yaw beach, Yong-Ling beach, Trang	4 coll., AP: 10/1997	
<i>Mangrovispora pemphi</i> K.D. Hyde & Nakagiri	Panwa beach	1 coll., GJ: 05/1997	

(to be continued)

Table 2. (Continued)

Fungi	Collecting sites	No. of collection/collectors/date*	References
<i>Marinosphaera mangrovei</i> K.D. Hyde	Phang-Nga Bay mangrove, Ranong mangrove, Phuket mangrove, Narathat beach, Koh Chula, Chao Mai National Park, Koh Chang National Park, Laem Son National Park, Nam Bang, Jana beach, Chonburi	27 coll., GJ: 05/1995; 10/1995; 05/1997; 05/2003; 04/2005; JS: 06/2002; 07/2003; IC: 01/2001; 02/2002; 06/2003; SS: 03/2001; 03/2000	Hyde, 1989; Hyde et al., 1990; 1993
<i>Massarina ramunculicola</i> K.D. Hyde	Ranong mangrove, Phuket mangrove, Panwa beach, Laem Son National Park	20 coll., GJ: 05/1995; 10/1995; AP: 10/1997; IC: 01/2001	Hyde et al., 1993
<i>Massarina thalassiae</i> Kohlm. & Volk.-Kohlm.	Ranong mangrove	5 coll.	Hyde et al., 1990; 1993
<b>Massarina velatospora</b> K.D. Hyde & Borse (Holotype)	Phang-Nga Bay mangrove, Ranong mangrove	Over 10 coll., GJ: 05/1996	Hyde, 1989; Hyde et al., 1990; 1993
<i>Melaspilea mangrovei</i> Vrijmoed, K.D. Hyde & E.B.G. Jones	Phuket mangrove	8 coll., GJ: 10/1995; 05/1997; 06/1997	
<i>Nemaniam maritima</i> Ju & Rogers	Koh Chang National Park	1 coll., GJ: 04/2005	
<i>Nais inornata</i> Kohlm.	Ranong mangrove, Pattani mangrove	2 coll., GJ: 09/1993; 05/1997	
<i>Natantispora retorquens</i> (Shearer & J. L. Crane) J. Campb., J.L. Anderson & Shearer (As <i>Halosarphaea retorquens</i> )	Sriracha beach, Kata beach, Phang-Nga Bay mangrove	3 coll., AP: 06/1996; GJ: 07/1997; IC: 01/2001	
<i>Neptunella longirostris</i> (Cribb & J.W. Cribb) K.L. Pang & E.B.G. Jones (As <i>Lignicola longirostris</i> )	Ranong mangrove, Trang, Panwa beach, Kammanyiam site, Tak Bai, Koh Chang National Park	18 coll., GJ: 05/1996; 05/1997; JS: 05/2001; SS: 02/2001; AP: 08/1996; 10/1997-07/1998; 02/1999, low frequency on <i>Nypa fruticans</i>	Hyde et al., 1990; 1993
<i>Neolinocarpon globosicarpum</i> K.D. Hyde	Kammanyiam site	AP: 1998-1999, 4% frequency on <i>Nypa fruticans</i>	
<i>Okeanomyces cucullatus</i> (Kohlm.) K.L. Pang & E.B.G. Jones (As <i>Halosphaeria cucullata</i> )	Ranong mangrove	3 coll.	Hyde et al., 1990
<i>Ophiodoira monosemeia</i> Kohlm. & Volk.-Kohlm.	Ranong mangrove	5 coll.	Hyde et al., 1990; 1993
<i>Oxydothis nypae</i> K.D. Hyde & Nakagiri	Kammanyiam site	AP: 10/1997-07/1998; 1998-1999, 26.8% frequency on <i>Nypa fruticans</i>	Hyde and Nakagiri, 1989
<i>Panorbis viscosus</i> (I. Schmidt) J. Campb., J.L. Anderson & Shearer (as <i>Halosarphaea viscosa</i> )	Phang-Nga Bay mangrove, Ranong mangrove, Pattani mangrove	7 coll. GJ: 09/1993	Hyde, 1989; Hyde et al., 1990; 1993

(to be continued)

Table 2. (Continued)

Fungi	Collecting sites	No. of collection/collectors/date*	References
<i>Passeriniella savoryellopsis</i> K.D. Hyde & Mouzouras (Holotype)	Ranong mangrove	5 coll.	Hyde <i>et al.</i> , 1990; 1993
<i>Pedumispora rhizophorae</i> K.D. Hyde & E.B.G. Jones (Holotype)	Ranong mangrove	1 coll., 11/1988	Hyde and Jones, 1992
<i>Pseudolignicola siamensis</i> sp. nov. (Holotype)	Chao Mai National Park	1 coll., 07/2000, on <i>Nypa fruticans</i>	Jones <i>et al.</i> , 2006 (In press)
<i>Pyrenographa xylographoides</i> Aptroot	Phuket mangrove, Koh Chang National Park	11 coll., GJ: 05/1995; 10/1995; 04/2005	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Quintaria tignatilis</i> (Kohlm.) Kohlm. & Volk.- Kohlm. (Holotype)	Phang-Nga Bay mangrove, Ranong mangrove, Phuket mangrove, Yong-Ling beach, Panwa beach Panwa beach	9 coll., GJ: 10/1995; 05/1996; 05/1997; 06/1997; AP: 04/1996; IC: 01/2001	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Remispora crispa</i> Kohlm.	Panwa beach	1 coll., GJ: 05/1007	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Rhizophila marina</i> K.D. Hyde & E.B.G. Jones	Phang-Nga Bay mangrove, Ranong mangrove, Trang, Phuket bridge, Karon beach, Panwa beach, Jana beach, Kung Kraben Bay, Laem Son National Park, Phachuap Khiri Khan, Chanthaburi	16 coll., IC: 01/2001; 04/2001; 11/2003; GJ: 06/1997; JS: 08/2000; 02/2002; 11/2003	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Saccardoella mangrovei</i> K.D. Hyde (Holotype)	Ranong mangrove	5 coll.	Hyde, 1992b; Hyde <i>et al.</i> , 1993
<i>Saccardoella marinospora</i> K.D. Hyde (Holotype)	Kamnanyiam site, Laem Son National Park	6 coll. on <i>Nypa fruticans</i> , AP: 10/1997-07/1998; IC: 01/2001	Hyde, 1992b
<i>Saccardoella rhizophorae</i> K.D. Hyde (Holotype)	Ranong mangrove, Yaw beach, Laem Son National Park	3 coll., JS: 07/2003; IC: 01/2001; 06/2003; AP: 08/1996	Hyde, 1992b
<i>Saagaromyces abonnis</i> (Kohlm.) K.L. Pang & E.B.G. Jones (As <i>Halosarpheta abonnis</i> )	Phang-Nga Bay mangrove, Ranong mangrove, Panwa beach, Phuket mangrove, Koh Chang National Park	13 coll., GJ: 10/1995; 05/1997; 04/2005	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Saagaromyces glitra</i> (J.L. Crane & Shearer) K.L. Pang & E.B.G. Jones (As <i>Nais glitra</i> )	Ranong mangrove, Laem Son National Park	6 coll., IC: 01/2001	Hyde <i>et al.</i> , 1990; 1993
<i>Saagaromyces ratnagiriensis</i> (Patil & Borse) K.L. Pang & E.B.G. Jones (As <i>Halosarpheta ratnagiriensis</i> )	Bangsaen beach, Phang-Nga Bay mangrove, Ranong mangrove, Panwa beach	Over 10 coll., AP: 08/1996	Kohlmeyer, 1984; Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Sablecola chinensis</i> E.B.G. Jones, K.L. Pang & Vrijmoed	Koh Chang National Park	1 coll., GJ: 04/2005	Hyde <i>et al.</i> , 1990; 1993
<i>Salsuginea ramicola</i> K.D. Hyde	Kamnanyiam site	5 coll. on <i>Nypa fruticans</i> , AP: 10/1997-07/1998	Kohlmeyer, 1984; Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Savoryella appendiculata</i> K.D. Hyde & E.B.G. Jones	Tak Bai	4 coll., GJ: 05/2001; IC: 08/2001	Hyde <i>et al.</i> , 1990; 1993

(to be continued)

Table 2. (Continued)

Fungi	Collecting sites	No. of collection/collectors/date*	References
<i>Savoryella lignicola</i> E.B.G. Jones & R.A. Eaton	Patong beach, Phang-Nga Bay mangrove, Ranong mangrove, Panwa beach, Pra-Nang beach, Yaw beach, Yong-Ling beach, Phuket bridge, Kammanyiam site, Chao Mai National Park, Koh Chang National Park	40 coll., GJ: 05/1997; 06/1997; IC: 07/2000; SS: 02/2001; AP: 08/1996; 10/1997; 1998-1999; low frequency on <i>Nypa fruticans</i>	Koch, 1986; Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Savoryella longispora</i> E.B.G. Jones & K.D. Hyde	Ranong mangrove, Kata beach, Phuket mangrove	13 coll.; 5 coll., GJ: 05/1997; 06/1999	Hyde <i>et al.</i> , 1993
<i>Savoryella paucispora</i> (Cribb & J.W. Cribb) JØrgen Koch	Patong beach, Kammanyiam site, Koh Chula, Koh Chang National Park	3 coll., SS: 03/2000; SS: 02/2001; AP: 1998-1999, low frequency on <i>Nypa fruticans</i>	Koch, 1986
<i>Swampomyces triseptatus</i> K.D. Hyde & Nakagiri	Ranong mangrove	8 coll., GJ: 05/1996; 05/1997	Hyde <i>et al.</i> , 1993
<i>Thalassogena sphaerica</i> Kohlm. & Volkm.-Kohlm.	Ranong mangrove	5 coll.	Hyde <i>et al.</i> , 1990; 1993
<i>Thalespora appendiculata</i> sp. nov (Holotype)	Ranong, Tak Bai, Laem Son National Park, Jana beach, Phang-Nga	5 coll., JS: 05/2001; IC: 01/2001; 11/2001; 06/2003	Jones <i>et al.</i> , 2006 (In press)
<i>Torpedospora radiata</i> Meyers	Patong beach, Pattani mangrove, Panwa beach, Yong-Ling beach, Tak Bai, Koh Chula, Chao Mai National Park, Koh Chang National Park	19 coll.; GJ: 10/1995; 09/1993; AP: 08/1996; 10/1997; JS: 05/2001; IC: 07/2000; 05/2001; SS: 03/2000; 02/2001	Koch, 1986
<i>Trematosphaeria lineolatispora</i> K.D. Hyde	Kammanyiam site	AP: 10/1997-07/1998; 11/1998, low frequency on <i>Nypa fruticans</i>	
<i>Trematosphaeria mangrovei</i> Kohlm.	Kammanyiam site, Yaw beach, Phang-Nga Bay mangrove	9 coll., AP: 10/1997-07/1998; 04/1996; few coll. on <i>Nypa fruticans</i> , IC: 01/2001	
<i>Trisporella beccariana</i> (Ces.) E.B.G. Jones, K.D. Hyde & Alias	Phang-Nga Bay mangrove, Tak Bai, Jana beach	3 coll., IC: 01/2001; 08/2001; 01/2004	
<i>Verruculina enalia</i> (Kohlm.) Kohlm. & Volkm.-Kohlm. (As <i>Didymosphaeria enalia</i> )	Chonburi, Ranong mangrove, Pra-Nang beach, Panwa beach, Yong-Ling beach, Kammanyiam site, Jana beach, Koh Chula, Bang Pu, Phang-Nga Bay mangrove, Phachuap Khiri Khan, Ya-Ring, Koh Chang National Park	Over 40 coll., JS: 08/2000; 02/2002; GJ: 04/2005; SS: 03/2000; IC: 10/2000; 01/2001; 04/2001; 01/2004; AP: 08/1996; 10/1997, low frequency on <i>Nypa fruticans</i>	Kohlmeyer, 1984; Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Vibrissea nypicola</i> K.D. Hyde & Alias	Kammanyiam site, Jana beach	6 coll., IC: 11/2001; AP: 11/1998, low frequency on <i>Nypa fruticans</i>	
<i>Zopfiella latipes</i> (N. Lundq.) Malloch & Cain	Kammanyiam site	AP: 10/1997-07/1998, few coll. on <i>Nypa fruticans</i>	

(to be continued)

Table 2. (Continued)

Fungi	Collecting sites	No. of collection/collectors/date*	References
<b>BASIDIOMYCOTA</b>			
<i>Catathella mangrovei</i> E.B.G. Jones & Agerer	Trang, Ranong mangrove, Laem Son National Park	7 coll., GJ: 05/1996; 05/1997; 01/2001	
<i>Halocyphina villosa</i> Kohlm. & E. Kohlm.	Chonburi, Patong beach, Phang-Nga Bay mangrove, Ranong mangrove, Trang, Laemson National Park, Chao Mai National Park, Koh Chula, Koh Chang National Park, Tak Bai	Over 20 coll., IC: 07/2000; 05/2001; 06/2003; GJ: 05/1996; JS: 07/2003; SS: 03/2000; 02/2001; AP: 08/1996	Kohlmeier, 1984; Koch, 1986; Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Nia vibrissa</i> R.T. Moore & Meyers	Panwa, Yong-Ling beach	4 coll. AP: 10/1997	
<b>ANAMORPHIC FUNGI</b>			
<i>Acrogenospora sphaerocephala</i> (Berk. & Broome) M.B. Ellis	Koh Chang National Park	1 coll., SS: 02/2001	
<i>Bactrodesmium linderi</i> (J.L. Crane & Shearer) M.E. Palm & E.L. Stewart (As <i>Trichocladium linderi</i> )	Koh Chang National Park, Laem Son National Park, Phang-Nga Bay mangrove, Ya-Ring, Panwa beach, Yaw beach, Yong-Ling beach	14 coll., SS: 02/2001; IC 01/2001; 01/2004; AP: 08/1996; 10/1997; GJ: 05/1996	
<i>Camarosporium roumequerii</i> Sacc.	Yong-Ling beach	1 coll. AP: 04/1996	
<i>Cirrenalia pseudomacrocephala</i> Kohlm.	Phang-Nga Bay mangrove, Ranong mangrove	2 coll.	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Cirrenalia pygmaea</i> Kohlm.	Chonburi, Patong beach, Phang-Nga Bay mangrove, Ranong mangrove, Yaw beach, Kammanyiam site, Chao Mai National Park, Laem Son National Park, Krabi, Jana beach	15 coll., IC: 07/2000; 02/2002; 06/2003; AP: 08/1996; 10/1997; 11/1998, 5% frequency on <i>Nypa fruticans</i>	Kohlmeier, 1984; Koch, 1986; Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Cirrenalia tropicalis</i> Kohlm.	Phang-Nga Bay mangrove, Ranong mangrove, Karon beach, Pattani mangrove, Patong beach, Koh Chula, Chao Mai National Park, Tak Bai, Laem Son National Park	12 coll., IC: 07/2000; 05/2001; 06/2003; GJ: 09/1993; 10/1995; 05/1997; SS: 03/2000;	Hyde, 1989; Hyde <i>et al.</i> , 1990; 1993
<i>Clavatospora bulbosa</i> (Anastasiou) Nakagiri & Tubaki	Patong beach, Karon beach, Panwa beach, Kata beach, Pattani mangrove, Koh Chang National Park, Laem Son National Park, Tak Bai, Phachuap Khiri Khan, Chonburi, Phang-Nga, Jana beach	Over 30 coll., GJ: 09/1993; 10/1995; 05/1997; 06/1997; 04/2005; SS: 02/2001; AP: 08/1996; IC: 01/2001; 04/2001; 05/2001; 06/2003	Koch, 1986
<i>Cumulospora marina</i> I. Schmidt	Kata beach, Laem Son National Park	1 coll., IC: 01/2001	
<i>Cumulospora varia</i> Chatmala & Somrithipol (Holotype)	Chao Mai National Park, Koh Chang National Park, Ya-Ring, Rayong	8 coll., IC: 07/2000; 11/2003; 01/2004; SS: 02/2001, GJ: 4/2005	Chatmala <i>et al.</i> , 2004
<i>Dictyosporium elegans</i> Corda	Yong-Ling beach, Kammanyiam site	Over 5 coll., AP: 08/1996; 11/1998, 26.7% frequency on <i>Nypa fruticans</i>	

(to be continued)

Table 2. (Continued)

Fungi	Collecting sites	No. of collection/collectors/date*	References
<i>Dictyosporium heptasporum</i> (Garov.) Damon	Samut Songkhram	5 coll. on <i>Nypa fruticans</i>	
<i>Helicorhoidion nypicola</i> K.D. Hyde & Goh	Yaw beach, Kamnanyiam site	12 coll., AP: 08/1996; 10/1997- 07/1998, 20.4 % frequency on <i>Nypa fruticans</i>	
<i>Monodictys pelagica</i> (T.W. Johnson) E.B.G. Jones	Panwa beach, Yong-Ling beach	2 coll., AP: 08/1996; 10/1997	
<i>Nypella frondicola</i> K.D. Hyde & B. Sutton	Kamnanyiam site	AP: 11/1998, low frequency on <i>Nypa fruticans</i>	
<i>Periconia prolifica</i> Anastasiou	Ranong mangrove, Pattani mangrove, Chonburi beach, Sriracha beach, Ranong mangrove, Phuket mangrove, Kata beach, Pra-Nang beach, Yaw beach, Tak Bai, Koh Chula, Chao Mai National Park, Laem Son National Park, Phachuap Khiri Khan, Phang-Nga, Rayong, Koh Chang National Park	Over 30 coll., GJ: 09/1993; 05/1996; 05/1997; 07/1997; 05/2003; 04/2005; JS: 05/2001; 01/2002; AP: 06/1996; 10/1997; IC: 07/2000; 04/2001; 06/2003; 11/2003	Hyde et al., 1990; 1993
<i>Papulaspora halima</i> Anastasiou	Laem Son National Park	1 coll., IC: 01/2001	
<i>Phomopsis mangrovei</i> K.D. Hyde	Ranong mangrove	5 coll.	Hyde et al., 1990; 1993
<i>Plectrophomella nypae</i> K.D. Hyde & B. Sutton	Kamnanyiam site	AP: 10/1997-07/1998, 6.4% frequency on <i>Nypa fruticans</i>	
<i>Rhabdospora avicenniae</i> Kohlm.	Panwa beach	1 coll., GJ: 05/1997	
<i>Trichocladium achrasporum</i> (Meyers & R.T. Moore) Dixon	Panwa beach, Yong-Ling beach, Yaw beach, Kamnanyiam site, Chonburi beach, Koh Chang National Park	21 coll., AP: 08/1996; AP: 10/1997- 07/1998; GJ: 05/1996; JS: 01/2002; SS: 02/2001	
<i>Trichocladium alopallonellum</i> (Meyers & R.T. Moore) Kohlm. & Volkm.-Kohlm.	Chonburi beach, Phang-Nga Bay mangrove, Ranong mangrove, Sriracha beach, Panwa beach, Yaw beach, Yong-Ling beach, Samut Songkhram	30 coll., GJ: 05/1996; 05/1997; AP: 06/1996; 08/1996; 02/1999, 1.5% frequency on <i>Nypa fruticans</i>	Kohlmeier, 1984; Hyde, 1989; Hyde et al., 1990; 1993
<i>Trichocladium constrictum</i> I. Schmidt	Koh Chang National Park	1 coll., GJ: 04/2005	
<i>Trichocladium melhae</i> E.B.G. Jones, Abdel-Wahab & Vrijmoed	Narathat beach, Tak Bai, Chao Mai National Park, Koh Chang National Park, Jana beach, Nam Bang, Rayong	Over 23 coll., JS: 07/2000; 05/2001; 05/2002; IC: 07/2000; 05/2001; 08/2001; 11/2003; SS: 02/2001; GJ: 04/2005	
<i>Trichocladium nypae</i> K.D. Hyde & Goh	Kamnanyiam site, Tak Bai, Koh Chula, Phang-Nga Bay mangrove, Jana beach	Over 10 coll., JS: 05/2001; IC: 01/2001; 05/2001; 11/2001; 02/2002; SS: 03/2000; AP: 1998-1999, 34.8 % frequency on <i>Nypa fruticans</i>	

(to be continued)

Table 2. (Continued)

Fungi	Collecting sites	No. of collection/collectors/date*	References
<i>Variocarpina ramulosa</i> Meyers & Moore	Phang-Nga, Koh Chang National Park	2 coll., IC: 06/2003; RC: 03/2001	
<i>Xylomyces rhizophorae</i> Kohlm. & Volkman-Kohlman	Phang-Nga	1 coll., IC: 06/2003	
<i>Zalerion maritimum</i> (Linder) Anastasiou	Kata beach	1 coll., GJ: 05/1997	
<i>Zalerion varium</i> Anastasiou	Pattani mangrove, Pra-Nang beach, Panwa beach, Yaw beach, Yong-Ling beach, Kamnanyiam site, Tak Bai, Chao Mai National Park, Laem Son National Park, Nam Bang, Narathiwat, Rayong	Over 40 coll., GJ: 09/1993; AP: 08/1996; 10/1997; JS: 05/2001; IC: 07/2000; 11/2001; 08/2001; 02/2002; 11/2003; AP: 1998-1999	
<b>CHROMISTA (STRAMENOPILES)</b>			
<i>Halophytophthora porrigovesica</i> Nakagiri, Tad, Ito, Manoch & Tanticharoen	Phang-Nga Bay mangrove, Ranong	AK: 03/1999	Nakagiri <i>et al.</i> , 2001
<i>Halophytophthora spinosa</i> var. <i>lobata</i> (Fell & Master) H.H. Ho & S.C. Jong	Phang-Nga Bay mangrove, Ranong	AK: 03/1999	Nakagiri <i>et al.</i> , 2001
<i>Halophytophthora vesicula</i> (Anastasiou & Churchl.) H.H. Ho & S.C. Jong	Phang-Nga Bay mangrove	AK: 03/1999	Nakagiri <i>et al.</i> , 2001
<i>Halophytophthora</i> sp.	Phang-Nga Bay mangrove	AK: 03/1999	Nakagiri <i>et al.</i> , 2001
<i>Pythium grandisporangium</i> Fell & Master	Phang-Nga Bay mangrove	AK: 03/1999	Nakagiri <i>et al.</i> , 2001
<i>Schizochytrium limacinum</i> Honda & Yokochi	Bangsaen	SJ: Various collections in 2004	Pers.comm.
<i>Schizochytrium mangrovei</i> Raghukumar	Bangsaen	SJ: Various collections in 2004	Pers.comm.

\*Substratum = Substratum unless otherwise indicated after the collection date, is wood (driftwood or attached mangrove wood)

## Abbreviations:

Coll. = Collection

AP = Apiradee Piantanapak

IC = Itfichai Chatmala

GJ = E.B. Gareth Jones

JS = Jariya Sakayaroj

SS = Somsak Sivichai and Nattawut Boonyuen

RC = Rattaket Choeyklin

AK = Akira Nakagiri

SJ = Somtawin Jaritkuan

Bold type = First described in Thailand (Holotype)

most common fungal group is the Ascomycota with 116 species, and this reflects observations by other workers (Kohlmeyer and Volkmann-Kohlmeyer, 1991; Hyde *et al.*, 2000).

Secondly, the number of marine fungi recorded for the country is high and is comparable with 128 documented from Hong Kong (Jones and Vrijmoed, 2003), 95 from Brunei (Hyde, 1988a), 91 from Udyavara, India (Maria and Sridhar, 2003) and 82 species from Malaysia (Jones and Kuthubutheen, 1989). These figures are significantly different from collections made in Bermuda (22 species, Kohlmeyer and Kohlmeyer, 1977), Andaman and Nicobar Islands, India (63 species, Chinnaraj, 1993), Belize (46 species, Kohlmeyer and Volkmann-Kohlmeyer, 1987) and the Seychelles (63 species, Hyde and Jones, 1989). The differences in number of species collected reflect the frequency and intensity of the collections. The marine fungi of Hong Kong and Thailand have been studied intensively over the past 15 years, and include not only random collections of drift material, but also the exposure and recovery of bait samples (exposure of bait: Hong Kong: Vrijmoed *et al.*, 1986; Sadaba *et al.*, 1995; Abdel-Wahab, 2000; Thailand: Pilantanapak *et al.*, 2005; collection of drift and attached mangrove samples: Hong Kong: Abdel-Wahab and El-Sharouny, 2002; Jones and Vrijmoed, 2003; Thailand: Hyde *et al.*, 1993; Sakayaroj *et al.*, 2004).

Schmidt and Shearer (2004) analysed the geographical distribution data published on lignicolous mangrove fungi, and found that different oceans supported varying numbers. The number of fungi at each site varied: Atlantic Ocean: 12-46 per site (14 sites: mean 25.6); Indian Ocean: 12-64 (14: 42.9) and the Pacific Ocean: 17-87 (16: 44). The Pacific Ocean has the highest recorded number of fungi, again the result of repeated collections over many years: Hyde (1988a) in Brunei; Jones and Kuthubutheen (1989); Alias *et al.* (1995); Alias and Jones (2000a, b) in Malaysia, Tan *et al.* (1989) and Leong *et al.* (1991) in Singapore, and the greater diversity of mangrove tree species in this region. The paucity of marine fungi from the Atlantic has been attributed to low mangrove tree

diversity, for example three in Florida mangroves and four in the Bahamas (Jones and Abdel-Wahab, 2005; Jones and Puglisi, 2006). However, more intensive collections yielded 81 species for Florida mangroves from 250 collected samples (previously only 28: Jones and Puglisi, 2006) and 112 for the Bahamas from 600 collected samples, where only 31 had previously been recorded (Jones and Abdel-Wahab, 2005).

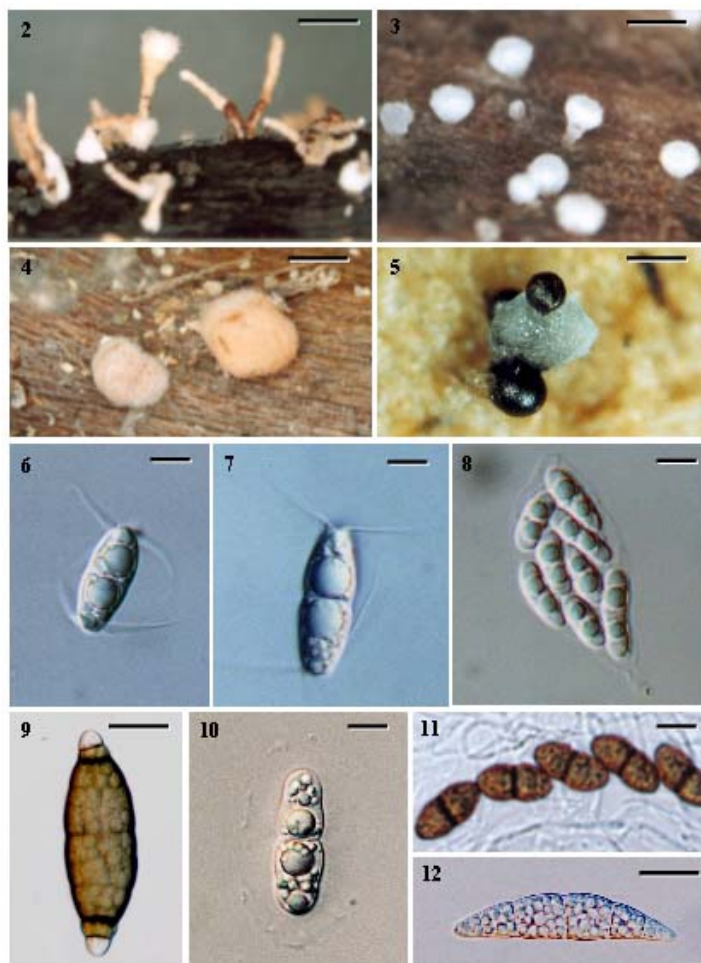
### Common species

The common species listed in Table 3 are predominantly mangrove species: the ascomycetes *Dactylospora haliotrepha*, *Halorosellinia oceanica*, *Lignicola leavis*, *Lulworthia grandispora*, *Saagaromyces abonnis* and *Verruculina enalia*; the basidiomycete *Halocyphina villosa* and anamorphic fungi *Cirrenalia pygmea* and *Zalerion varium* (Kohlmeyer 1984; Jones and Alias, 1997; Sarma and Hyde, 2001; Abdel-Wahab and El-Sharouny, 2002; Jones and Abdel-Wahab, 2005). Other species are more characteristic of open ocean waters: *Antennospora quadricornuta*, *A. salina*, *Periconia prolifica*, *Torpedospora radiata*, or wood associated with sand: *Corollospora maritima*, *Trichocladium melhae*.

### Effect of substratum

Marine substrata support different fungal assemblages, for example the mangrove palm *Nypa fruticans* and woody tissue of mangrove trees such as *Rhizophora apiculata* and *Avicennia marina*. Typical fungi on *N. fruticans* included *Astosphaeriella striatispora*, *Linocarpon appiculata*, *L. nypae*, *Oxydothis nypae* and *Trichocladium nypae*, taxa never recorded from mangrove wood (Hyde and Nakagiri, 1989; Hyde, 1992a; Hyde and Alias, 2000; Pilantanapak *et al.*, 2005). Fungi common on mangrove wood include: *Kallichroma tethys*, *Leptosphaeria australiensis*, *Lineolata rhizophorae*, *Marinosphaera mangrovei*, in addition to those listed above (Kohlmeyer, 1984). Of the fungi reported on *N. fruticans* from Thailand, 3 are new records for this substratum (*Astosphaeriella mangovis*, *K. tethys*, *Savoryella paucispora*) and 22 are new records for the country (Pilantanapak





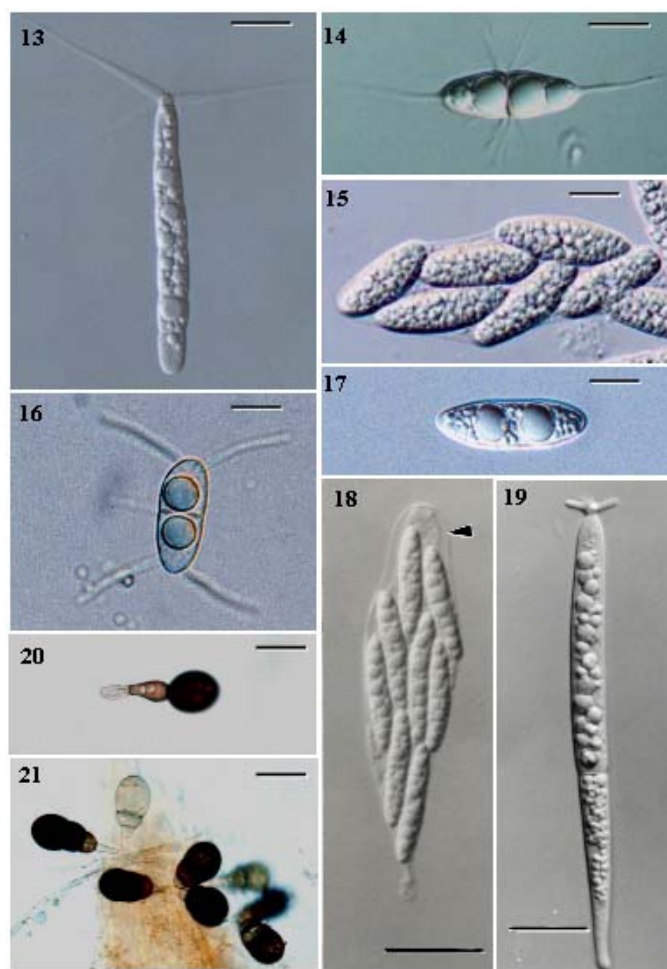
**Figure 2-12.** Frequent marine fungi in Thailand. 2-4. Basidiomata 2. *Calathella mangrovei* 3. *Halocyphina villosa* 4. *Nia vibrissa* 5. Ascomata of *Corollospora maritima* attached on sand grain 6-7, 9-10, 12. Ascospores 6. *Antennospora salina* 7. *Arenariomyces trifurcatus* 9. *Aigialus parvus* 10. *Massarina ramunculicola* 12. *Quintaria lignatilis* 8, 11. Ascus containing ascospores 8. *Lignincola laevis* 11. *Verruculina enalia*  
**Bars: 2, 4 = 500  $\mu$ m, 3 = 200  $\mu$ m, 5 = 100  $\mu$ m, 6-12 = 10  $\mu$ m**

*et al.*, 2005). Pilantanapak *et al.* (2005) advance reasons for the difference in fungal communities between those on the palm *N. fruticans* and mangrove wood: salinity as the former grows in brackish to freshwater parts of the mangrove, and the nature of the substratum, the palm containing less lignocellulose than woody stems of trees.

The zoosporic Chromista occur are largely isolated from shed decaying mangrove leaves and

rarely found on woody tissue (Nakagiri *et al.*, 2001; Nakagiri, 2002).

This study has demonstrated that Thailand has a rich marine fungal diversity, with 34% of the world's number documented for the country. Studies have largely targeted woody tissue and much remains to be done to examine other marine substrata, such as seaweeds, mangrove leaves, rhizomes and leaves of marine grasses, fruits and



Figures 13-21. Frequent marine fungi collected from Thailand. 13-14, 16-17 Ascospores 13. *Torpedospora radiata* 14. *Corollospora maritima* 16. *Antennospora quadricornuta* 17. *Aniptodera chesapeakensis* 15. Ascus containing ascospores of *Marinosphaera mangrovei* 18-19. New genera recently found in Thailand 18. Ascus with a retraction of plasmalemma of *Pseudolignicola siamensis* sp. nov. 19. Ascospore of *Thalespora appendiculata* sp. nov. with tetraradiate appendages 20-21. Conidia of anamorphic fungi 20. *Trichocladium melhae* 21. *T. achrasporum*

Bars: 13-17, 20-21 = 10  $\mu$ m, 18-19 = 20  $\mu$ m

seeds of mangrove trees and endophytes of marine algae, animals and submerged leaves of sea grasses. More recently we have collected the poorly known marine ascomycete *Manglicola guatalemensis* on *Nypa fruticans* from polluted waters in Koh Chang National Park, highlighting the need to examine the diversity and ecology of mangrove fungi in more detail. With continued statements as to climate

changes, marine fungi make an ideal group to study this aspect on a geographical basis (Hughes, 1974; Kohlmeyer and Volkman-Kohlmeyer, 1993). Those occurring in the tropics are significantly different from those reported from temperate habitats. Thus monitoring marine fungi on a world basis may yield evidence of changes in their community structure.

**Table 3. Frequent species found in Thailand (more than 20 collections)**

<b>ASCOMYCOTA</b>	<i>Antennospora quadricornuta</i>
	<i>A. salina</i>
	<i>Arenariomyces trifurcatus*</i>
	<i>Astrosphaeriella striatispora</i>
	<i>Corollospora maritima*</i>
	<i>C. pulchella</i>
	<i>Dactylospora haliotrepha</i>
	<i>Halorosellinia oceanica</i>
	<i>Kallichroma tethys</i>
	<i>Leptosphaeria australiensis</i>
	<i>Lignincola leavis</i>
	<i>Lineolata rhizophorae</i>
	<i>Linocarpon appendiculatum</i>
	<i>L. nypae</i>
	<i>Lulworthia grandispora</i>
	<i>Marinosphaera mangrovei</i>
	<i>Massarina ramunculicola</i>
	<i>Neptunella longirostris</i>
	<i>Oxydothis nypae</i>
	<i>Quintaria lignatilis</i>
	<i>Rhizophila marina</i>
	<i>Saagaromyces abonnis</i>
	<i>S. glitra</i>
<i>Savoryella lignicola</i>	
<i>Torpedospora radiata</i>	
<i>Verruculina enalia</i>	
<b>BASIDIOMYCOTA</b>	<i>Halocyphina villosa</i>
<b>ANAMORPHIC TAXA</b>	<i>Cirrenalia pygmea</i>
	<i>C. tropicalis</i>
	<i>Clavatospora bulbosa</i>
	<i>Helicorhoidion nypicola</i>
	<i>Periconia prolifica</i>
	<i>Trichocladium achrasporum</i>
	<i>T. alopallonellum</i>
	<i>T. melhae*</i>
	<i>T. nypae</i>
	<i>Zalerion varium</i>

\*Most of these are mangrove species or those on wood associated with sand

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