

## Higher marine fungi from mangroves of Andaman and Nicobar Islands

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Chinnaraj, S. (1993). Higher marine fungi from mangroves of Andaman and Nicobar Islands. - *Sydowia* 45(1): 109-115.

Intertidal wood samples collected from six mangrove tree species in the Andaman and Nicobar Islands were examined for fungal colonization. Sixty-three species of higher marine fungi were recorded. Of these, *Ascocratera manglicola*, *Biatriospora marina*, *Dactylospora haliotrepha*, *Hypoxylon oceanicum*, *Lophiostoma mangrovei*, *Lulworthia grandispora*, *Verruculina enalia*, *Halocyphina villosa* and *Trichocladium achrasporum* were commonly observed.

Keywords: mangrove fungi, host association, distribution.

Mangroves are highly productive detritus based ecosystems which provide high organic matter to marine ecosystems (Odum & Heald, 1975) and fungi play an important role in the decomposition of organic matter (Fell & Master, 1980). Recently, several works describing fungi from intertidal mangroves of the Indian and Pacific oceans have been published (Borse, 1988; Hyde, 1988; 1989; 1990a; 1990b; Hyde & Jones, 1988; Hyde & al., 1990; Jones & Kuthubutheen, 1989; Jones & al., 1988; Kohlmeyer, 1984; Kohlmeyer & Volkmann-Kohlmeyer, 1991; Leong & al., 1991). The Andaman and Nicobar Islands are rich in mangrove resources (Singh & al., 1988), but little is known about the marine fungi that occur there. In this paper, fungi associated with dead parts of intertidal mangrove trees are reported.

### Material and methods

There are about 350 islands in the Andaman and Nicobar Group (6°-14° N, 92°-94° E). The total area of the islands is about 8327 Km<sup>2</sup>. The mean air temperature ranges from 20 C to 34 C and rainfall is about 3200 mm/year. In March 1990 and November 1991, dead and decayed parts of six mangrove species, namely *Avicennia marina* (Forsk.) Vierh., *A. officinalis* L., *Bruguiera gymnorhiza* (L.) Lamk., *Rhizophora apiculata* Blume, *R. mucronata* Lamk. and *Sonneratia alba* J. Smith were collected from Mayabundar, Baratang (Middle Andaman

Tab. 1. – Percentage of occurrence of fungi recorded. The “site” column designates the occurrence of the fungi in the different islands. In parentheses: number of samples investigated. M: middle Andaman; L: Little Andaman; N: Katchall & Non-Cowry; S: South Andaman; C: Car Nicobar; G: Great Nicobar. AM: *A. officinalis*; BG: *Bruguiera gymnorhiza*; RA: *Rhizophora apiculata*; RM: *R. mucronata*; SA: *Sonneratia alba*.

Taxon	Site	RM (152)	RA (79)	BG (60)	AM (114)	AO (75)	SA (126)	Total (606)	% occurrence
<b>Ascomycetes</b>									
<i>Acrocardiopsis patilii</i> Borse & Hyde	S, L, K, G	3.3	2.5	–	6.1	1.3	4.8	21	3.5
<i>Aigialus grandis</i> Kohlm. & Schatz	M, S, K, G	5.9	1.2	–	0.9	–	–	11	1.8
<i>A. mangrovei</i> Borse	S, L, G	1.3	–	–	0.9	2.6	0.8	6	1.0
<i>A. parvus</i> Schatz & Kohlm.	M, S, C, G	0.7	–	–	–	–	2.4	4	0.7
<i>Aniptodera chesapeakensis</i> Shearer & Miller	S	1.3	–	–	–	–	1.8	3	0.5
<i>A. mangrovei</i> Hyde in Hyde, Farrant & Jones	S	0.7	–	–	–	–	–	1	0.2
<i>Ascocratera manglicola</i> Kohlm.	M, S, C, K, G	4.6	2.5	26.5	5.3	12.0	5.5	47	7.7
<i>Bathyascus avicenniae</i> Kohlm.	S	–	–	–	0.9	–	–	1	0.2
<i>B. grandisporus</i> Hyde & Jones	S	0.7	–	–	–	–	–	1	0.2
<i>Belizeana tuberculata</i> Kohlm. & Volkm.-Kohlm.	S, G	–	1.2	–	0.9	–	–	2	0.3
<i>Biatriospora marina</i> Hyde & Borse	M, S, L, C, G	2.0	3.8	3.3	7.0	1.3	11.1	31	5.1
<i>Caryosporella rhizophorae</i> Kohlm.	M, S, C, K	2.6	–	–	–	–	–	4	0.7
<i>Coronopapilla mangrovei</i> (Hyde) Kohlm. & Volkm.-Kohlm.	S	1.3	–	5.0	–	–	–	5	0.8
<i>Dactylospora haliotrepha</i> (Kohlm. & Kohlm.) Hafelln.	M, S, L, G	5.9	2.5	20.0	5.3	5.3	6.3	41	6.7
<i>Etheiophora blepharospora</i> (Kohlm. & Kohlm.) Kohlm. & Volkm.-Kohlm.	S	0.7	–	–	–	–	–	1	0.2
<i>Halosarpheia abonnis</i> Kohlm.	S	–	1.2	–	–	–	–	1	0.2
<i>H. minuta</i> Leong, in Leong, Tan, Hyde & Jones	S	0.7	–	–	0.9	–	–	2	0.3
<i>H. ratnagiriensis</i> Patil & Borse	S, G	3.3	2.5	–	0.9	–	–	8	1.3
<i>Halosphaeria quadricornuta</i> Cribb & Cribb	S	0.7	–	–	–	–	–	1	0.2
<i>H. salina</i> (Meyers) Kohlm.	S	–	–	–	–	–	1.6	2	0.3
<i>Helicascus kanaloanus</i> Kohlm.	M, S	0.7	–	–	–	–	1.6	3	0.5
<i>Hydronectria tethys</i> Kohlm. & Kohlm.	S, C, G	1.3	5.1	1.6	1.8	1.3	0.8	11	1.8
<i>Hypoxylon oceanicum</i> Schatz	M, S, C, K, G	9.9	5.9	10.0	10.2	8.0	8.2	58	9.6
<i>Julella avicenniae</i> (Borse) Hyde	M, S	–	–	–	1.8	–	–	2	0.3
<i>Leptosphaeria australiensis</i> (Cribb & Cribb) Hughes	M, S, C, K, G	5.9	3.8	–	3.5	9.3	2.4	26	4.4
<i>Lignincola laevis</i> Hohnk	M, S, G	2.0	1.2	–	6.1	–	1.6	13	2.1
<i>Lineolata rhizophorae</i> (Kohlm. & Kohlm.) Kohlm. & Volkm.-Kohlm.	M, S	1.3	–	1.6	–	–	–	3	0.5
<i>Lophiostoma mangrovei</i> Kohlm. & Vittal	M, S, L, C, K, G	9.2	11.3	21.6	5.3	12.0	7.1	60	9.9
<i>Lulworthia grandispora</i> Meyers	M, S, L, C, K, G	7.2	7.6	5.0	2.5	17.3	8.7	56	9.2
<i>Lulworthia</i> sp.	M, S, C, K, G	7.2	2.5	–	6.1	2.6	4.0	27	4.6

<i>Marinosphaera mangrovei</i> Hyde	S, C	4.6	11.3	-	1.8	-	-	18	2.9
<i>Massarina armatispora</i> Hyde, Vrijmoed, Chinnaraj & Jones	M, G	0.7	-	-	0.9	-	-	2	0.3
<i>M. thalassiae</i> Kohlm. & Volkm.-Kohlm.	M, S, C, G	1.3	-	18.3	-	-	-	13	2.1
<i>M. velatospora</i> Hyde & Borse	M, S, C, K, G	3.9	-	1.6	7.0	-	0.8	16	2.6
<i>Nais glitra</i> Crane & Shearer	S	0.7	-	-	-	-	0.8	2	0.3
<i>Nais</i> sp.	M, S, G	2.0	-	1.6	1.8	1.3	1.6	9	1.5
<i>Passeriniella savoryellopsis</i> Hyde & Mouzouras	S, G	1.3	-	1.6	2.6	-	2.4	9	1.5
<i>Payosphaeria minuta</i> Leong, in Leong, Tan, Hyde & Jones	M, S, K, G	0.7	-	-	0.9	2.6	6.3	12	2.0
<i>Quintaria lignatilis</i> (Kohlm. & Kohlm.) Kohlm. & Volkm.-Kohlm.	S, L, C, K, G	3.9	1.2	5.0	7.0	4.0	0.8	22	3.6
<i>Rhizophila marina</i> Hyde & Jones	S, C, K, G	11.2	10.1	-	-	-	-	25	4.1
<i>Salsuginea ramicola</i> Hyde	M, S	-	-	-	2.6	-	7.1	12	2.0
<i>Savoryella lignicola</i> Jones & Eaton	S	1.3	1.2	-	1.8	-	3.1	9	1.5
<i>S. paucispora</i> (Cribb & Cribb) Koch	S	0.7	-	-	0.9	5.3	3.1	10	1.7
<i>Swampomyces armeniacus</i> Kohlm. & Volkm.-Kohlm.	M, S, K, G	3.9	-	-	4.3	-	-	11	1.8
<i>Trematosphaeria striatispora</i> Hyde	G	0.7	-	-	-	-	-	1	0.2
<i>Verruculina enalia</i> (Kohlm.) Kohlm. & Volkm.-Kohlm.	M, S, L, C, K, G	9.9	13.9	26.6	8.8	12.0	9.5	73	12.0
Ascomycete sp. I	M	0.7	1.2	-	-	2.6	-	4	0.7
Ascomycete sp. II	S	0.7	-	-	-	-	-	1	0.2
Ascomycete sp. III	G	0.7	-	-	-	-	-	1	0.2
<b>Basidiomycetes</b>									
<i>Halocyphina villosa</i> Kohlm. & Kohlm.	M, S, L, C, K, G	10.2	11.3	5.0	11.1	10.5	7.9	62	10.2
<b>Deuteromycetes</b>									
<i>Cirrenalia pseudomacrocephala</i> Kohlm.	M	-	-	-	0.9	-	-	1	0.2
<i>C. pygmaea</i> Kohlm.	M, S, C, K, G	7.9	7.6	3.3	1.8	1.3	3.1	27	4.6
<i>C. tropicalis</i> Kohlm.	G	-	-	-	-	-	0.8	1	0.2
<i>Clavatospora bulbosa</i> (Anast.) Nakagiri & Tubaki	S	-	-	-	0.9	-	-	1	0.2
<i>Cytospora rhizophorae</i> Kohlm. & Kohlm.	S	0.7	-	-	1.8	-	-	3	0.5
<i>Humicola alopallonella</i> Meyers & Moore	M, S, L, C, G	2.0	-	-	1.8	-	0.8	6	1.0
<i>Monodictys pelagica</i> (Johnson) Jones	S	-	-	-	-	-	0.8	1	0.2
<i>Periconia prolifica</i> Anast.	M, S, L, C, K, G	4.6	5.1	3.3	1.8	8.0	3.1	25	4.0
<i>Phragmospithula</i> sp.	K	0.7	-	-	-	-	-	1	0.2
<i>Phomopsis mangrovei</i> Hyde	S	0.7	-	-	-	-	-	1	0.2
<i>Phoma</i> sp.	M, S, G	1.3	-	-	0.9	2.6	0.8	6	1.0
<i>Trichocladium achrasporum</i> (Meyers & Moore) Dixon	M, S, L, C, K, G	7.2	6.3	-	10.5	9.3	5.5	42	6.9
<i>Zalerion varium</i> Anast.	M, S, L, C, K, G	2.0	2.5	3.3	4.3	2.6	3.1	18	3.6
Total number of isolates			253	106	99	173	102	164	897

## ANDAMAN AND NICOBAR ISLANDS

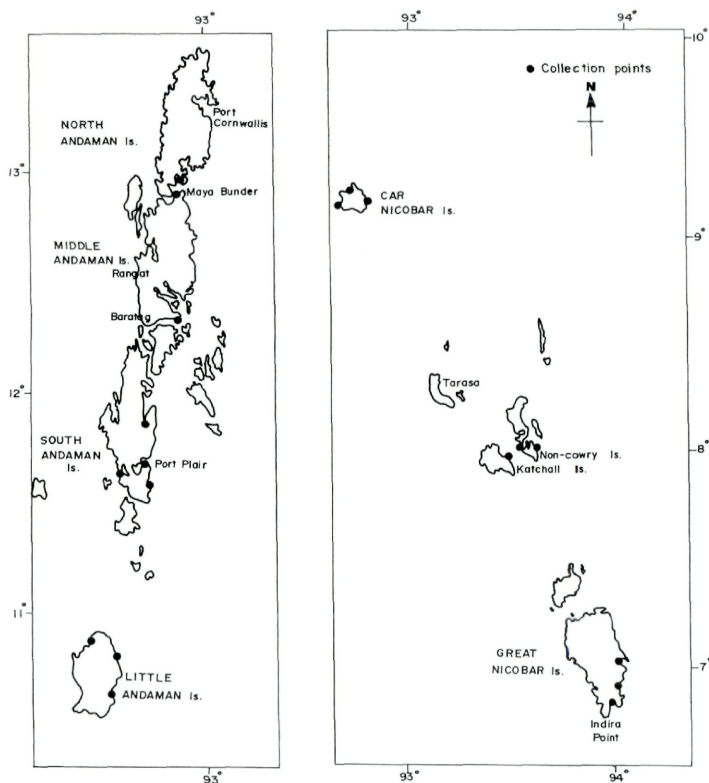


Fig. 1. – Map showing the study area and collecting sites

Islands), Vandoor Marine National Park, Joly Boy Island, Burma Nala, Chiriyatapu, Bamboo Plot (South Andaman Islands), Little Andaman Island, Nan-cowry Island, Katchall Island, Car Nicobar Island and Great Nicobar Island. The samples were then brought to the laboratory in polythene bags and microscopically examined for fungal fructifications. Voucher slides of all the fungi were prepared using lactophenol cotton blue and were deposited in the Taxonomy Reference Center at the National Institute of Oceanography.

## Results

In total 897 fungi were isolated from 606 mangrove wood samples. Forty-nine Ascomycetes, 1 Basidiomycete and 13 Deuteromyce-tes were identified from six different mangrove species (Tab. 1). The greatest number of species were recorded on *Rhizophora mucronata* (53 spp.), followed by *Avicennia marina* (40 spp.), *Sonneratia alba* (35 spp.), *Rhizophora apiculata* (26 spp.), *Avicennia officinalis* (23 spp.) and *Bruguiera gymnorhiza* (19 spp.). A greater number of species were recorded from the South Andaman Islands (56 spp.) followed by Great Nicobar Island (36 spp.), the Middle Andaman Islands (32 spp.), Car Nicobar Island (22 spp.), the Katchall & Non-Cowry Islands (21 spp.) and Little Andaman Island (13 spp.; Tab. 2).

The common fungi recorded were (percentage of occurrence >5%) *Verruculina enalia* (12%), *Halocyphina villosa* (10.2%), *Hypoxyylon oceanicum* (9.6%), *Lophiostoma mangrovei* (9.2%), *Lulworthia grandispora* (9.2%), *Ascocratera manglicola* (7.7%), *Trichocladium achrasporum* (6.9%), *Dactylospora haliotrepha* (6.9%) and *Biatrispora marina* (5.1%). All the species are new records to Andaman and Nicobar Islands.

## Discussion

The species composition of higher marine fungi in the mangrove forests of the Andaman and Nicobar Islands is similar to that of other tropical mangroves (Borse, 1988; Hyde, 1988; 1989; 1990a; 1990b; Hyde & Jones, 1988; Hyde & al., 1990; Jones & Kuthubutheen, 1989; Jones & al., 1988; Kohlmeyer, 1984; Kohlmeyer & Volkmann-Kohlmeier, 1991; Leong & al., 1991). So far, one hundred and twenty species of higher marine fungi are reported from 29 mangrove species (Hyde, 1990a). Of these fungi, 63 species have been recorded in the present study. This suggests that further studies on other mangrove species may yield additional taxa. Some of the species recorded have been only recently described. *Bathysascus avicenniae*, *B. grandisporus* and *Julella avicenniae* were previously known only from the original locality. *Massarina armatispora* Hyde & al. (1992) has been described from these islands.

The frequency of occurrence of mangrove fungi has been documented in earlier studies from Brunei (Hyde, 1988), Malaysia (Jones & Kuthubutheen, 1989) Philippines (Jones & al., 1988), Seychelles (Hyde & Jones, 1988), Sumatra (Hyde, 1989), Singapore (Leong & al., 1991), Thailand (Hyde & al., 1990) and India (Borse, 1988). Some taxa (e.g., *Dactylospora haliotrepha*, *Hypoxyylon oceanicum*, *Lulworthia grandispora* and *Halocyphina villosa*), already recorded in the studies previously mentioned, have been found to be common also in this investi-

gation. This indicates that these species are probably common in tropical mangroves. Thirty-one fungi have been isolated from more than three hosts, which suggests that they are not host-specific. *Rhizophila marina* and *Etheiophora blepharospora* on *Rhizophora* spp. and *Bathyascus avicenniae* and *Julella avicenniae* on *Avicennia* spp. are restricted to a single host and may be specific at least at the host genus level.

The results of this investigation confirm the observation by Hyde (1990b) that certain fungi have a preference for specific tidal levels. For example, *Swampomyces armeniacus* and *Hypoxyylon oceanicum* occurred at high tide levels, *Rhizophila marina*, *Dactylospora halio-trepha*, *Verruculina enalia*, *Aigialus grandis* and *Caryosporella rhizophorae* were collected at mid-tide level, while *Halosphaeria quadricornuta* and *Lulworthia* spp. were found at the lowest low tide level.

### Acknowledgments

I am grateful to Dr A. G. Untawale for his encouragement, and to the Director of N. I. O. and the Head of B. O. D. for providing laboratory and research facilities. Dr T. G. Jagtap and Mr. P.V. Sawant have helped in the field work. I am also thankful to Prof. E. B. G. Jones, Portsmouth Polytechnic, U. K. and Dr. K. D. Hyde, Q.D. P.I., Australia, for reviewing the manuscript. Financial assistance was kindly provided by C.S.I.R., New Delhi, India.

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(Manuscript accepted 29 October 1992)

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Autor(en)/Author(s): Chinnaraj S.

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