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# MARINE FUNGI FROM THE BEACH ECOSYSTEM ALONG KANNUR DISTRICT OF KERALA, INDIA

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***Abstract***
A study dealing with the marine fungi associated with decaying woody samples was carried out along north Kerala coast. Among the fifteen marine fungi isolated from the beach ecosystem, 9were Ascomycetes while the remaining six were Mitosporicfungi.Twomarine fungi namely *Monodictys pelagica* and *Periconia prolifica* were present in all beach ecosystems studied. Also, they were the dominant species obtained. The average number of isolates per sample obtained was 1.79.

***Key words****:* Marine fungi, beach ecosystem, frequency of occurrence, decomposition

## Introduction

Sandy beaches exist within a multi-dimensional mesh of environmental gradients, shaped by parameters like temperature, humidity, wave action, sand particle size and salinity. These limit the proliferation of only a few fungal species. Obligate arenicolous marine fungi are a group of marine fungi that inhabit sandy beaches. These organisms have evolved to cope with dynamic beach conditions, having a cosmopolitan distribution across tropical, subtropical, and temperate regions (Velez *et. al*, 2022).

Marine fungi are an important and often over-looked component of beach ecosystems. They play crucial roles in nutrient cycling, decomposition, and the overall ecological balance of coastal environments. Marine fungi exhibit a diverse range of species in beach ecosystems, with many yet to be discovered and described. They can be found in various habitats such as intertidal zones, dunes, and decaying organic matter along the coastline. Marine fungi contribute to the decomposition of organic matter, including seaweed, driftwood, and other plant material washed ashore. This process is essential for nutrient recycling and maintaining the health of beach ecosystems (Kohlmeyer and Kohlmeyer,1979).

Some of the recent studies in distribution and diversity of marine fungi from India and other parts of the world includes Sarma, (2016),Pawar *et al* ., (2016), Sreeshilpa *et al*., (2019), Kambale and Firdosi (2020), Devadatha *et al*., (2021), Pang *et al.,* (2023), Devadatha *et al.*, (2023).

## Materials and Methods

### Collection site

The decaying woody samples were collected from August 2023 to March 2024 from the four beaches *viz*, Ezhara, Adikadalayi, Darmadam and Muzhappilaghad in Kannur district of Kerala, India. Ezhara beach is lined with palm trees and rocks. The coordinates are 11.4857° N, 75.2516°E. Adikadalayi beach is a tourist destination and the coordinates of the location are 11.5042°N, 75.2344°E. Dharmadam beach is a sandy, palm-fringed public beach with low-tide access to a nearby uninhabited island. The coordinates of the location are 11.7770°N, 75.4546° E. Muzhappilaghad beach is one of the longest drive-in beaches in India. The beach is about 3.4 Km long. The coordinates of the location are 11.4746° N, 75.2631° E.

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**Sample collection and isolation technique of marine fungi**

The collected wood samples were washed with seawater, put into sterile polythene bags and covered properly. The collected samples were brought to the laboratory and incubated for about 2-4 months in the polythene bags at room temperature. Sea water collected was sprayed on the wood samples at regular intervals. After incubation, the samples were taken and observed under stereo microscope. Using forceps and needle fruiting structures of marine fungi were isolated and examined under a compound microscope. The section was firstly mounted in seawater, and after confirming the presence of spores it was mounted with Lactophenol cotton blue. Identification of marine fungi was done using Kohlmeyer and Kohlmeyer (1979), Raveendran and Manimohan (2007) and Nambiar and Raveendran (2012).

**Presentation of Data**

To compare the diversity of marine fungi from the four beaches, the percent frequency of occurrence (FO) was calculated.

Percent Frequency of occurrence (FO) =

Number of isolates of a particular species / The total number of wood samples collected X 100

Based on percentage frequency occurrence, the marine fungi were classified as most frequent (>20%), frequent (10-20%), occasional (5-10%) and rare (<5%).

Average number of fungi per sample = Total number of occurrences of marine fungi divided by total number of samples colonized by marine fungi

**Results**

Fifteen marine fungi were isolated from 80 wood samples collected from the Ezhara, Adikadalayi, Darmadam and Muzhappilaghad beach ecosystems along the Kerala coast (Table,1). Among the 15 marine fungi isolated, 9 were Ascomycetes while the remaining 6 were Mitosporic fungi. From Ezhara beach alone, 10 marine fungi were isolated among which 7 were Ascomycetes while 3 belonged to Mitosporic fungi. From Adikadalayi beach, 9 fungi were isolated, 4 among them belonged to Ascomycetes while 5 belonged to Mitosporic fungi. From Darmadam beach, 8 fungi were isolated, 5 belong to Ascomycetes and 3 belong to Mitosporic fungi. From Muzhappilaghad beach, 9 fungi were isolated, 4 were Ascomycetes and 5 were Mitosporic fungi. Basidiomycetes were not encountered throughout the study.Two marine fungi namely *Monodictys pelagica* and *Periconia prolifica* were present in all 4 beach ecosystems. *Halosarpheia marina* was present in Ezhara, Adikadalayi and Darmadam. *Lignincola laevis* was present in Ezhara, Adikadalayi and Muzhappilaghad. All the remaining marine fungi isolated were present in either 2 of the 4 beaches. While comparing the overall frequency of occurrence of marine fungi from beach ecosystems, 2 species fall under the most frequent category, 6 under the frequent category, 5 under the occasional category, and 2 under the rare category. Hence, most species belong to the frequent category. By comparing the frequency of occurrence of marine fungi in Ezhara, Adikadalayi, Darmadam, and Muzhappilaghad beach ecosystems, Ezhara has 4 species falling under the most frequent category, 5 under the frequent category, 1 under the occasional category and none under the rare category. Hence most species belong to the frequent category. In the case of Adikadalayi, 2 species fall under the most frequent category, 7 under the frequent category, and none under the occasional and rare categories. Here the majority of species belong to the frequent category. Darmadam has 3 species under the most frequent category, 5 under the frequent category, and none under the occasional and rare categories. Hence, the majority of species belong to the frequent category. Muzhappilaghad has 1 species under the most frequent category, 7 under the frequent category, 1 under the occasional category, and none under the rare category. Here the majority of species belong to the frequent category.

**Table 1.** Frequency of occurrence of marine fungi from beach ecosystems

| Name of fungi | Ezhara | | Adika-dalayi | | Darmadam | | Muzhapilaghad | | Over all | |
|---|---|---|---|---|---|---|---|---|---|---|
| | NI | F O | NI | F O | NI | F O | NI | F O | NI | F O |
| Ascomycetes Aniptodera Chesapeakensis Shearer et Mill | 4 | 20 | - | - | 2 | 10 | - | - | 6 | 7.5 |
| Aniptodera mangrovei Hyde | 3 | 15 | - | - | - | - | 4 | 20 | 7 | 8.75 |
| Halosarphei a marina Cribb et.Cribb) Kohlm | 4 | 20 | 3 | 15 | 4 | 20 | - | - | 11 | 13.75 |
| Halosarphei a minuta Leong | 4 | 20 | - | - | 5 | 25 | - | - | 9 | 11.25 |
| Lignincola laevis Hohnk | 3 | 15 | 4 | 20 | - | - | 3 | 15 | 10 | 12.5 |
| Lineolata rhizophorae (Kohlm et Kohlm) Kohlm et Kohlm | - | - | - | - | 4 | 20 | 3 | 15 | 7 | 8.75 |
| Pleospora sp. | 1 | 5 | 2 | 10 | - | - | - | - | 3 | 3.75 |
| Savoryella lignicola Jones et Eaton | - | - | 5 | 25 | 4 | 20 | - | - | 9 | 11.25 |
| Verruculina enalia (Kohlm) Kohlm et Volkm Kohlm | 5 | 25 | - | - | - | - | 3 | 15 | 8 | 10 |
| Mitosporic Fungi Halenospora varia (Anastasiou) Jones | 5 | 25 | - | - | 4 | 20 | - | - | 9 | 11.25 |
| Hydea pygmea( Kohlm) Pang et Pang | - | - | 3 | 15 | - | - | 2 | 10 | 5 | 6.25 |
| Monodictys pelagic (Johnson) Jones | 5 | 25 | 4 | 20 | 7 | 35 | 4 | 20 | 20 | 25 |
| Periconia prolific Anast. | 6 | 30 | 8 | 40 | 7 | 35 | 9 | 45 | 30 | 37.5 |
| Trichocladium alopallonellum (Meyers et Moore) Kohlm et V.Kohlm | - | - | 2 | 10 | - | - | 1 | 5 | 3 | 3.75 |
| Zalerion maritimum (Linder) Anastasiou | - | - | 3 | 15 | - | - | 3 | 15 | 6 | 7.5 |

**NI: Number of isolates, FO : percentage frequency of occurrence**

## Discussion

Data on the frequency of occurrence of marine fungi from beach ecosystems were published by Prasannarai and Sridhar (2001), Nambiar and Raveendran (2010), Khan and Manimohan (2011) from India and Figueira and Barata (2007), Sridhar *et al*., (2012) from other parts of the world. *Periconia prolifica* and *Monodictys pelagica* were the dominant species obtained in the present study. The dominant species identified by Khan and Manimohan (2011) from the sandy beaches of Kerala and

Lakshadweep island was *Trichocladium achrasporum*.

Dominant species identified from the south Indian beaches were *Corollospora filiformis* and *Clavatospora bulbosa* (Nambiar and Raveendran, 2010).

The average number of isolates per sample obtained in the current study from the 4 beaches was 1.79. The average number of isolates was 1.1- 1.8 as investigated by Prasannarai and Sridhar (2003) along the west coast of India. The average number of isolates per sample was 0.04 as reported by Khan and Manimohan (2011) from the sandy beaches of Kerala and Lakshadweep Island. Figueira and Barata (2007) studied the diversity of marine fungi on two sandy beaches in Portugal and the average number of isolates of marine fungi per sample was 0.91. Sridhar *et al*., (2012) investigated the diversity of marine fungi on seven northwest beaches Portuguese beaches and the number of isolates per sample was 3- 4.9.

The present study on the beach ecosystem resulted in the isolation of 15 marine fungi. The most number of species isolated belongs to Ascomycetes (9). It indicates their importance in this habitat. This is not unique to this study as the dominance of ascomycetes over another group of fungi in various marine habitats has been reported by other workers like Raveendran & Manimohan (2007) and Hyde (1988). Ascomycetes appear to have evolved to take full advantage of marine habitat with their small fruit bodies, appendaged spores that may aid in dispersal and attachment and also to withstand fluctuating saline conditions. However, the most frequently observed species in the current study were *Periconia prolifica* and *Monodictys pelagica* and both of them belong to Mitosporic fungi.

## Conclusion

The marine environment is a complex ecosystem with great variation even over a narrow range. Therefore it could be concluded that there is no uniformity in the diversity of marine fungi and their distribution pattern is different in different beach ecosystems. The distribution of marine fungi is governed by a large number of interacting factors. No single one among them can be identified to explain the occurrence and frequency of occurrence of marine fungi. (Jones, 2000) highlighted a consortium of factors operating in determining the biodiversity of fungi in the sea. These are water, temperature, salinity, seasonality, nutrient availability, tidal amplitude, availability of substrata and their chemical composition, possession of specific enzymes to degrade the substratum, naturally occurring substratum or baited samples, succession, period of samples exposed to seawater and depth at which samples are recovered. The lack of uniformity in marine fungal diversity and distribution patterns underscores the need for comprehensive and site-specific studies to understand these organisms.

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## References

Devadatha, B., Jones, E.B.G., Pang, K.L., Abdel-Wahab, M.A., Hyde, K.D., Sakayaroj, J., Bahkali, A.H., Calabon, M.S., Sarma, V.V., and Sutreong, S. (2021). Occurrence and geographical distribution of mangrove fungi. Fungal Divers. 106: 137–227.

Figueira, D. & Barata, M. (2007). Marine fungi from two sandy beaches in Portugal. Mycologica, 99(1), 20-23.

Hyde, K. D.(1988). Studies on the tropical marine fungi of Brunei. Botanical Journal of the Linnean Society, 98 (2), 135-151.

Jones, E. G. (2000). Marine fungi: some factors influencing biodiversity. Fungal. Diversity, 4, 53-73.

Kambale, V.M. & Firdosi, S.A.(2020).Marine fungi of Div Island (India): Basidiomycota and
Mitosporic fungi. Flora And Fauna, 26 (2), 261-265.

Khan, S. S. and Manimohan, P. (2011). Diversity and abundance of marine fungi on driftwood collected from Kerala State and Lakshadweep Island, India. Mycosphere, 2(3), 223-229.

Kohlmeyer, J. & Kohlmeyer, E. (1979). Marine Mycology: The Higher Fungi. Academic Press, New York, USA.

Nambiar, G. R. & Raveendran, K. (2012). An Introduction to the taxonomic study of Indian marine fungi. Malabar Natural History Society, Calicut, Kerala, 3-192.

Pang, K.L., Chen, I.A., Chiang, M.W.L., Sung, A.S., Hsieh, S.Y. & Guo, S.Y. (2023). Arenicolous marine fungi of sandy beaches of Taiwan. Bot Mar. 66(2):, 131-139.

Pawar, N . S., Borse, B. D. & Jain, D. S. (2016).A comparison of diversity of marine fungi on mangrove plants and mangrove associate and their frequency of occurrence. I J R B A T,. 4 (1), 106-108

Prasannarai, K. & Sridhar, K. R. (2001). Diversity and abundance of higher fungi on woody substrates along the west coast of India. Curr. Sci., 81(3), 304-311.

Prasannarai, K. & Sridhar, K. R. (2001). Diversity and abundance of higher fungi on woody substrates along the west coast of India. Curr. Sci., 81(3), 304-311.

Raveendran, K. & Manimohan, P. (2007). Marine fungi of Kerala: A preliminary floristic and ecological study. Malabar Natural History Society.

Sarma, V.V. (2016). Diversity of mangrove fungi on Rhizophora wood in Puducherry, Southeast coast of India. Kavaka 46,37–39.

Sreeshilpa P, Nusaiba K, JaseeraA & Gayatri R Nambiar, (2019). Comparative account of mangrove fungi from selected localities In Kannur And Kasaragod District, Kerala (India), International Journal of Research and Analytical Reviews (IJRAR),.6 (4), 24-27

Sridhar, K. R., Karamchand, K. S., Pascoal, C. & Cassio, F.(2012). Assemblage and diversity of fungi on wood and seaweed litter of seven northwest Portuguese beaches. Biology of marine fungi, 209-228.

Velez, P., Walker, A. K., Gonzalez, M. C., Narayanan, S. S. S. & Nakagiri, A. (2022). In-depth review of the ecology of arenicolous marine fungi. Fungal Ecology, 60, 101-164.