

## Marine Fungi from South America

By

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### Summary

Collections made in Argentina, Brazil, Colombia and Peru provide new data on the geographical distribution of 13 marine fungi of the Ascomycetes and Deuteromycetes. The following species are new records for South America: *Chadefaudia corallinarum* (on *Halimeda*); *Corollospora maritima*, *C. trifurcata* and *Halosphaeria salina* (the last 3 spp. as ascospores in sea foam); *Keissleriella blepharospora* (in *Rhizophora*); *Mycosphaerella pneumatophorae*, *Rhabdospora avicenniae* (both in *Avicennia*). *Conocarpus erectus* is a new host for *Halosphaeria quadricornuta* and *Lulworthia* sp. The marine fungal flora of Colombia appears to agree with that of Florida and the Atlantic coast of Mexico, containing species typical for tropical and subtropical waters.

### Resumen

Collecciones hecho en Argentina, Brasil, Colombia y Perú dan nuevos datos sobre la distribución geográfica de 13 hongos marinos de los grupos Ascomycetes y Deuteromycetes. Las especies siguientes estan nuevos descubrimientos para la America del Sur: *Chadefaudia corallinarum* (sobre *Halimeda*); *Corollospora maritima*, *C. trifurcata* y *Halosphaeria salina* (las tres especies precedentes como ascosporas en espuma de mar); *Keissleriella blepharospora* (en *Rhizophora*); *Mycosphaerella pneumatophorae*, *Rhabdospora avicenniae* (ambas en *Avicennia*). *Conocarpus erectus* ha sido encontrado como un nuevo huésped para *Halosphaeria quadricornuta* y *Lulworthia* sp. La flora de hongos marinos de Colombia parece conforme con la flora de Florida y de la costa atlantica de Mexico, abrazando especies typicas para las zonas tropicales y subtropicales.

### Zusammenfassung

Aufsammlungen in Argentinien, Brasilien, Kolumbien und Peru erweitern unsere Kenntnisse über die geographische Verbreitung von 13 Meeresspilzen aus den Gruppen der Ascomycetes und Deuteromycetes. Die folgenden Arten sind neu für Südamerika: *Chadefaudia corallinarum* (auf *Halimeda*); *Corollospora maritima*, *C. trifurcata* und *Halosphaeria salina* (die letzten drei Arten als Ascosporen in marinem Schaum); *Keissleriella blepharospora* (in *Rhizophora*); *Mycosphaerella pneumatophorae*, *Rhabdospora avicenniae* (beide in *Avicennia*). *Conocarpus erectus* ist ein neuer Wirt für *Halosphaeria quadricornuta* und *Lulwor-*

*thia* sp. Die marine Pilzflora von Kolumbien scheint mit der Floridas und des atlantischen Mexikos übereinzustimmen und enthält Arten, die typisch für tropische und subtropische Gewässer sind.

### Introduction

Data on the geographical distribution of marine fungi on the coasts of the South American continent are scarce. ULKEN (1970, 1972), KOHLMAYER (1969), and KOHLMAYER and KOHLMAYER (1971) report on marine fungi from Brazil; HUGHES and CHAMUT (1971) list 15 lignicolous marine fungi from Chile, MALACALZA and MARTINEZ (1971) six from Argentina, and KOHLMAYER (1968) two manglicolous species from Venezuela.

In the following, 13 obligate marine fungi are listed that have been collected by Mrs. E. KOHLMAYER and me in October and November, 1973, in Argentina, Brazil, Colombia, and Peru. This list includes only algicolous, arenicolous, lignicolous and manglicolous species, whereas fungi from vascular plants in estuaries, e. g. *Salicornia* and *Spartina*, will be dealt with elsewhere.

Collecting sites are abbreviated as follows:

- Argentina: SC = San Clemente, Prov. Buenos Aires  
Brazil: C = Copacabana, Rio de Janeiro  
Colombia: BC = Bahía Chengue, east of Santa Marta,  
Dept. Magdalena  
T = Tasagera near Ciénaga, at road to Barranquilla,  
Dept. Magdalena  
Peru: CA = Cerro Azul, south of Lima  
LG = Laguna Grande near Pisco, Dept. Ica  
M = Miraflores, Lima  
PV = Playa Venecia near Punta La Chira, south of Lima  
SN = San Nicolás near Pisco, Dept. Ica.

The species are arranged in alphabetical order. The taxonomical position of the genera is discussed in KOHLMAYER (1974).

### Ascomycetes

#### 1. *Ceriosporopsis halima* LINDER

On driftwood (bamboo) with tunnels of *Limnoria* sp., Peru/SN, 2 Nov., 1973, Herb. J. K. 3476.

The only South American record of this species is from Argentina by MALACALZA and MARTINEZ (1971).

2. *Chadefaudia corallinarum* (CROUAN et CROUAN) MÜLLER et VON ARX

On attached plants of *Halimeda* cfr. *opuntia* (L.) LAMOUR., Colombia/BC, 15 Nov., 1973, Herb. J. K. 3427.

This is a new record for South America. As in earlier collections, the fungus is associated with epiphytic, crustaceous red algae. The association is considered a primitive lichenization (KOHLMAYER, 1973).

3. *Corollospora maritima* WERDERMANN

Ascospores in foam along the seashore, Argentina/SC, water temperature 16 °C, salinity 30 ‰, 18 Oct., 1973, Herb. J. K. 3466. — In foam on the seashore, Brazil/C, 8 Oct., 1973, Herb. J. K. 3465. — In foam, Colombia/BC, water temperature 26 °C, salinity 36.5 ‰, 15 Nov., 1973, Herb. J. K. 3428. — Colombia/T, salinity 25 ‰, 13 Nov., 1973, Herb. J. K. 3441. — In foam, Peru/M, water temperature 16 °C, salinity 34 ‰, 28 Oct., 1973, Herb. J. K. 3467; Peru/PV, 30 Oct., 1973, Herb. J. K. 3468; Peru/CA, water temperature 14 °C, salinity 36 ‰, 1 Nov., 1973, Herb. J. K. 3469; Peru/SN, water temperature 16 °C, salinity 35.5 ‰, 2 Nov., 1973, Herb. J. K. 3470.

*Corollospora maritima* is the most frequent species of arenicolous fungi. Thus far, it has not been reported from South America, but the numerous collections of ascospores in sea foam listed above demonstrate its wide distribution also along this continent. This cosmopolitan species was collected in tropical waters of 26 °C in Colombia as well as in cold waters of 14—16 °C in Argentina and Peru.

4. *Corollospora trifurcata* (HÖHNK) KOHLM.

Ascospores in foam along the seashore, Argentina/SC, water temperature 16 °C, salinity 30 ‰, 18 Oct., 1973, Herb. J. K. 3466. — In foam, Peru/CA, water temperature 14 °C, salinity 36 ‰, 1 Nov., 1973, Herb. J. K. 3469.

Also this *Corollospora* is new for South America. The Peruvian collecting site is a small bay the shore of which consists of large, smooth pebbles. The method of collecting foam always proves to be the best one for demonstrating so-called arenicolous fungi, even if fruiting bodies are not found.

5. *Didymosphaeria rhizophorae* J. et E. KOHLM.

In intertidal wood of a huge dead tree with teredinids, in the surf, Colombia/BC, 15 Nov., 1973, Herb. J. K. 3429.

This species was known from Venezuela and Florida (KOHLMAYER and KOHLMAYER, 1964—1969). Thus far, *D. rhizophorae* was collected

only from bark and wood of *Rhizophora mangle* L. The host species of the Colombian collection is unknown. The striate ascospores are 28—32 X 11—12  $\mu$ .

6. *Halosphaeria quadricornuta* CRIBB et CRIBB

In dead branches of *Conocarpus erectus* L., hanging into the water, heavily infested by teredinids, Colombia/BC, 15 Nov., 1973, Herb. J. K. 3436; in intertidal wood in the surf, same collecting data, Herb. J. K. 3429.

The species was collected before in South America, viz. in Venezuela (KOHLMAYER, 1968). *Conocarpus erectus*, the Button-Mangrove, is a new host for *H. quadricornuta*. Lower, dead branches of tropical shoreline trees frequently bear marine fungi. For instance, branches of *Hibiscus tiliaceus* L. were also found attacked by *H. quadricornuta* (KOHLMAYER, 1969). The fungus is often associated with calcareous linings of ship-worm tunnels. Ascocarps in both Colombian collections are embedded under or in the calcareous material, their necks breaking through to the outside.

7. *Halosphaeria salina* (MEYERS) KOHLM.

Ascospores in foam along the shore, near a dead tree trunk in the surf, Colombia/BC, 15 Nov., 1973, Herb. J. K. 3428.

A new record for South America. Usually, this species is not found in foam. The ascospores most probably derived from ascocarps in the dead tree rolling in the surf.

8. *Keissleriella blepharospora* J. et E. KOHLM.

On seedlings of *Rhizophora mangle* L., washed-up on the beach, Colombia/BC, 15 Nov., 1973, Herb. J. K. 3433.

This host-specific fungus is new for South America. It was collected before in Hawaii, Mexico, in the Bahamas, in Florida and on *Rhizophora* seedlings transported to North Carolina by the Gulf Stream (KOHLMAYER and KOHLMAYER, 1971).

9. *Leptosphaeria australiensis* (CRIBB et CRIBB) G. C. HUGHES

In tips of dead proproots of *Rhizophora mangle*, attacked by teredinids, Colombia/BC, 15 Nov., 1973, Herb. J. K. 3430; in the exposed wooden core of pneumatophores of *Avicennia germinans* (L.) L., same collecting site, Herb. J. K. 3432; in intertidal dead tree, same collecting site, Herb. J. K. 3429.

A previous record of this species is from Venezuela (KOHLMAYER and KOHLMAYER, 1964—1971, tab. 64, sub *Metasphaeria australiensis*; unpub-

lished collecting data are: proproots of *Rh. mangle*, Cumaná, Venezuela, 22 Oct., 1963, leg. Dr. E. KIRSTEUER, Herb. J. K. Nos. 1682, 1684). The fungus reported from Chile as *L. australiensis* by HUGHES and CHAMUT (1971) appears to be a different species. End cells of ascospores of *L. australiensis* are not as pointed as those illustrated by HUGHES and CHAMUT. Also, the occurrence of this common species in cold Chilean waters appears doubtful, because we found it only in tropical or subtropical regions.

10. *Lulworthia* sp.

In pneumatophores of *Avicennia germinans*, Colombia/BC, 15 Nov., 1973, Herb. J. K. 3432; in driftwood with teredinids, same collecting data, Herb. J. K. 3435. — In dead branches of *Conocarpus erectus*, hanging into the water, same collecting data, Herb. J. K. 3436. — In driftwood with teredinids, Peru/CA, 1 Nov., 1973, Herb. J. K. 3477.

No attempt has been made to identify the species of this poorly known genus. Representatives of *Lulworthia* have been collected before in South America (Argentina: MALACALZA and MARTINEZ, 1971; Brazil: KOHLMAYER and KOHLMAYER, 1971; Chile: HUGHES and CHAMUT, 1971; Venezuela: KOHLMAYER, 1968). *Conocarpus erectus* is a new host for *Lulworthia* spp.

11. *Mycosphaerella pneumatophorae* KOHLM.

In the bark of pneumatophores of *Avicennia germinans*, Colombia/BC, 15 Nov., 1973, Herb. J. K. 3432.

A new record for South America. The species was known from North and Central America, and West Africa.

### Deuteromycetes

12. "*Phoma*" spp.

In pneumatophores of *Avicennia germinans*, Colombia/BC, in a salt lagoon, separated from the sea (salinity 70‰), 15 Nov., 1973, Herb. J. K. 3437; in tips of dead proproots of *Rhizophora mangle*, Colombia/BC, 15 Nov., 1973, Herb. J. K. 3430; in the base of dead young plants of *A. germinans*, Colombia/T, in a lagoon near the highway (salinity 6.7‰), 13 Nov., 1973, Herb. J. K. 3444; in exposed wood of living pneumatophores of *A. germinans*, Colombia/T, in a lagoon (salinity 37‰, temperature 30°C), 13 Nov., 1973, Herb. J. K. 3447. — In intertidal wood, Peru/LG, 3 Nov., 1973, Herb. J. K. 3478; in dead, dry holdfasts and stems of *Macrocystis integrifolia* BORY, washed ashore, same collecting data, Herb. J. K. 3479.

13. *Rhabdospora avicenniae* J. et E. KOHLM.

In pneumatophores of *Avicennia germinans*, near ascocarps of *Mycosphaerella pneumatophorae*, Colombia/BC, 15 Nov., 1973, Herb. J. K. 3432. — In the bark surface of dead *A. germinans*, Colombia/T, 13 Nov., 1973, Herb. J. K. 3445.

The species, which was known from Florida, the Bahamas, and West Africa (KOHLMAYER and KOHLMAYER, 1971) is a new record for South America. Conidia in collection 3445 are 10—14 $\mu$  long.

### Conclusions

Seven of the 13 species collected are new records for South America. No marine fungi have been known from Colombia and Peru, therefore, all species found in these countries (11 and 5, respectively) are new records. Two species are new for Argentina and one is new for Brazil. The Buttonwood tree, *Conocarpus erectus*, is a new host for marine fungi in general and for *Halosphaeria quadricornuta* and *Lulworthia* sp. in particular.

The short time available for collecting did not permit a thorough survey of the marine fungal floras in the countries visited. However, a few general conclusions can be drawn when data from earlier publications are combined with the present findings. Lignicolous species from Argentina found by MALACALZA and MARTINEZ (1971) and additional fungi listed in the present paper indicate that the marine fungal flora is similar to those of cool waters, e. g. Chile (HUGHES and CHAMUT, 1971), Europe and New England (KOHLMAYER, 1971). Marine fungi found in Colombia are the same species reported before from Venezuela, Mexico, Florida, and islands of the Caribbean (KOHLMAYER, 1968; KOHLMAYER and KOHLMAYER, 1971). Thus, Colombian marine fungi are typical representatives of tropical and subtropical waters.

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## Bibliography

- HUGHES, G. C. & CHAMUT, P. S.: Lignicolous marine fungi from southern Chile, including a review of distributions in the southern hemisphere. — *Canad. J. Bot.*, **49**, 1—11, Vancouver 1971.
- KOHLMEYER, J.: Marine fungi from the tropics. — *Mycologia*, **60**, 252—270, New York 1968.
- Marine fungi of Hawaii including the new genus *Helicascus*. — *Canad. J. Bot.*, **47**, 1469—1487, Vancouver 1969.
- Annotated check-list of New England marine fungi. — *Trans. Brit. mycol. Soc.*, **57**, 473—492, London 1971.
- Fungi from marine algae. — *Botanica Marina*, **16**, 201—215, Berlin - New York 1973.
- On the definition and taxonomy of higher marine fungi. — *Veröff. Inst. Meeresforsch. Bremerhaven*, Suppl. **5**, 263—286, Bremerhaven 1974.
- KOHLMEYER, J. & KOHLMEYER, E.: *Icones fungorum maris*. — **1**, fasc. 1—7, tabs. 1—90, J. Cramer, Weinheim/Lehre 1964—1969.
- Marine fungi from tropical America and Africa. — *Mycologia*, **63**, 831—861, New York 1971.
- MALACALZA, L. & MARTINEZ, A.: *Ascomycetes marinos de Argentina*. — *Bol. Soc. Argentina Bot.*, **14**, 57—72, Buenos Aires 1971.
- ULKEN, A.: *Phycomyceten aus der Mangrove bei Cananéia (São Paulo, Brasilien)*. — *Veröff. Inst. Meeresforsch. Bremerhaven*, **12**, 313—319, Bremerhaven 1970.
- *Physiological studies on a Phycomycete from a mangrove swamp at Cananéia, São Paulo, Brazil*. — *Veröff. Inst. Meeresforsch. Bremerhaven*, **13**, 217—230, Bremerhaven 1972.

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