ISOLATED THYRIOTHECIA FROM THE SURFACE (BOTTOM) SEDIMENTS OF THE ARABIAN SEA*

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ABSTRACT

Different types of the thyriothecia recovered from the surface sediments of the Arabian Sea belong to Microthyriaceae, Asterinaceae, Parmulariaceae and Trichothyriaceae. Their abundance in these oceanic sediments shows that they are common parasites on the tropical forest (possible source of the fruiting bodies) along the western coast of India. It is felt that their transport to the sea is by water currents.

INTRODUCTION

The shield-shaped fructifications or thryiothecia composed of either sinuous, meandering hyphae or of regular cells arranged into radiating files, sometimes accompanied by reticulate or thalloid mycelium, evolved in unrelated groups of ascomycetes in response to selective pressures imposed by their follicolous habit.

An ostiole-like opening is found at the oldest and basal portion of the perithecium in some members of the Microthyriales. When the perithecium is round, the opening may be circular with rugged edges, or it may be stellar. These fissures frequently extend to the perithecium margin. In other cases, the entire central region of the perithecium may become gelatinous and disappear so as to leave the asci fully exposed (RYAN, 1926). The shield like structure is either ruptured or disintegrated before the dispersal of the spores. The reproductive centrum of the fruiting body is taken as the criterion in the natural classification of the thyriothecia and this is determined by the mode of dehiscence of the fruiting body. In one group, this mode of dehiscence is due to the irregular cracking or tearing while in other group this is due to the formation of a central pore or ostiole. The classification of the fruiting bodies in the present study has been followed after PIROZYNSKI (1978).

The authors noticed the occurrence of the fungal fruiting body in some samples while carrying out the palynological investigation of the bottom sediments (RATAN & CHANDRA, *in press*) from the Arabian Sea. The present study deals with these well-preserved specimens of thyriothecia.

MATERIAL AND METHOD

The study is based on some grab samples belonging to Cruise II and Cruise XVII of the *R. V. Gaveshani* (Map 1, Table 1) from the Arabian Sea. These samples were macerated by the standard procedure of ERDTMAN (1943). Thyriothecia were found in nine samples, up to 30 km off the coast.

DESCRIPTION

Microthyriaceae Type—Thyriothecia shield-shaped, composed of one-cell-thick 'roof' of ± well defined radially arranged cells, sometimes confluent and may be accom-

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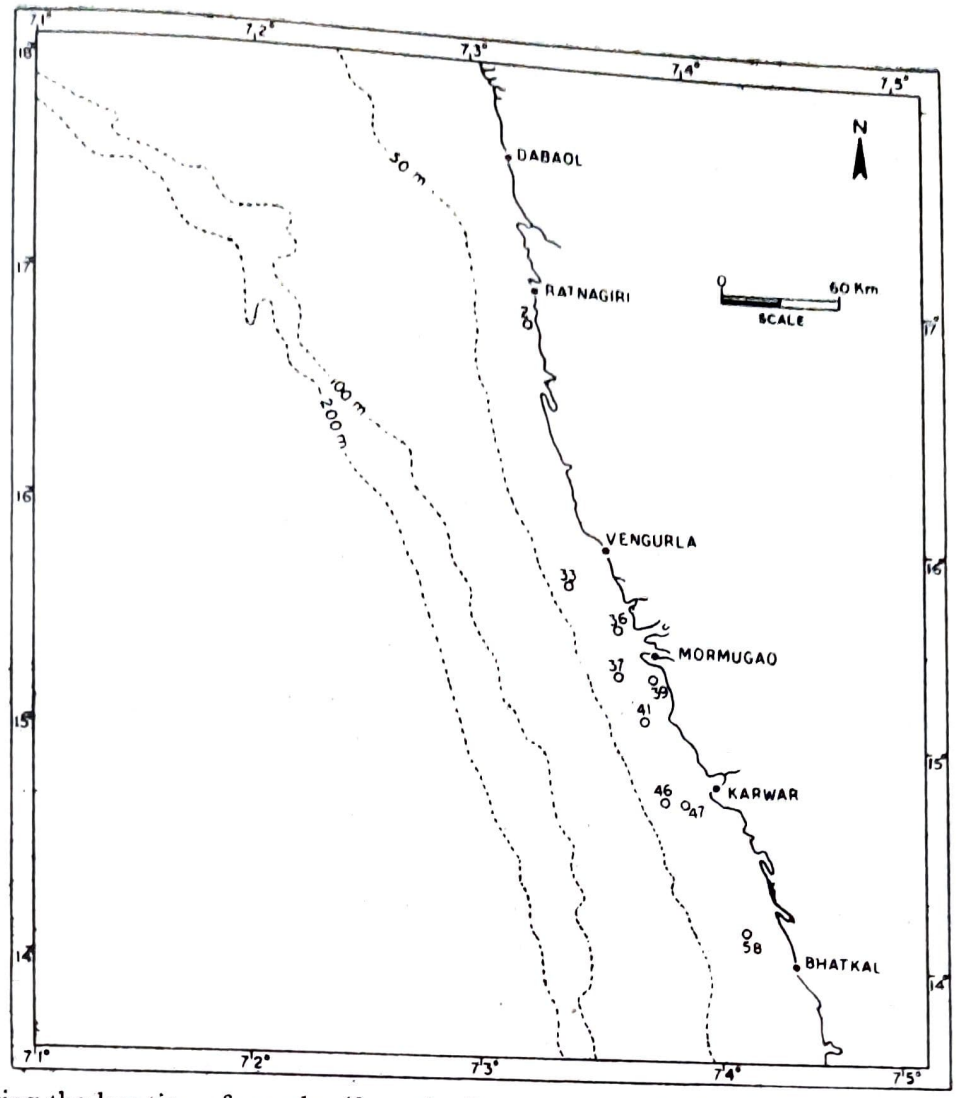


Map 1—Showing the location of samples (from the Report of the *R. V. Gaveshani*, Cruise II and Cruise XVII).

Table 1—Showing the station location and other data of Cruise II and Cruise XVII *R. V. Gaveshani* (in part)

Serial number	Station no. (Sample no.)	Position		Depth in metres	Texture of the sediments
		Latitude	Longitude		
1.	17/33	15°29′5″ N ..	73°30′ E ..	46	Silty sand
2.	17/39	15°6′ N ..	73°45′ E ..	50	Clayey silt
3.	17/41	15°5′5″ N ..	73°53′ E ..	18	Clayey silt
4.	17/36	15°17′2″ N ..	73°39′4″ E ..	38	Silty clay
5.	17/37	15°17′ N ..	73°45′ E ..	28	Clayey silt
6.	17/46	14°43′ N ..	73°58′5″ E ..	39	Silty sand
7.	17/47	14°43′ N ..	74°4′ E ..	26.5	Clayey silt
8.	17/58	14°10′ N ..	74°13′ E ..	44	Clayey silt
9.	2/3	16°41′1″ N ..	73°15′3″ E ..	20.5	Clay

panied by mycelium. Five types of thyriothecia were observed in our samples with following characters :

Form A (Pl. 1, Fig. 1)—Stroma radiate-type, broken, non-ostiolate, central cell large, marginal cells spinose.

Form B (Pl. 1, Fig. 2)—Stroma radiate-type, non-ostiolate, confluent, joining two fruiting bodies with each other. Marginal cells not well preserved but the spinose appearance is well marked, thyriothecium ± 80 μm in size.

Form C (Pl. 1, Fig. 3)—Stroma radiate-type, non-ostiolate, subcircular, margin irregular, cells nonporate, central cells large.

Form D (Pl. 1, Fig. 4)—Stroma radiate-type, non-ostiolate, subcircular, ± 112 μm in diameter.

Form E (Pl. 1, Fig. 5)—Stroma radiate-type, ostiolate, sub-circular, central ostiole 10 μm, in diameter, thyriothecia ± 128 μm in diameter.

Remarks—Members of Microthyriaceae are distinguished by the character of asci, ascospores and mycelium. On the other hand, considerable diagnostic value lies in the combination of characters shown by the thyriothecium margin (entire, fimbricates, spiny) and the ostiolar rim (darker pigmentation, thickened wall, spines) in the fossil material. Microthyriaceae—a cosmopolitan family, is represented by *Phragmothyrites*, *Paramicrothallites*, etc. in fossil form.

Asterinaceae Type (Pl. 1, Fig. 6)—Thyriothecium subcircular, radiate-type with irregular margin of the ostiole, ± 87 μm in diameter. The fruiting body opens by irregular crumbling, cracking or the gelatinization of the central area resulting in the formation of a wide irregular opening or stellar crack.

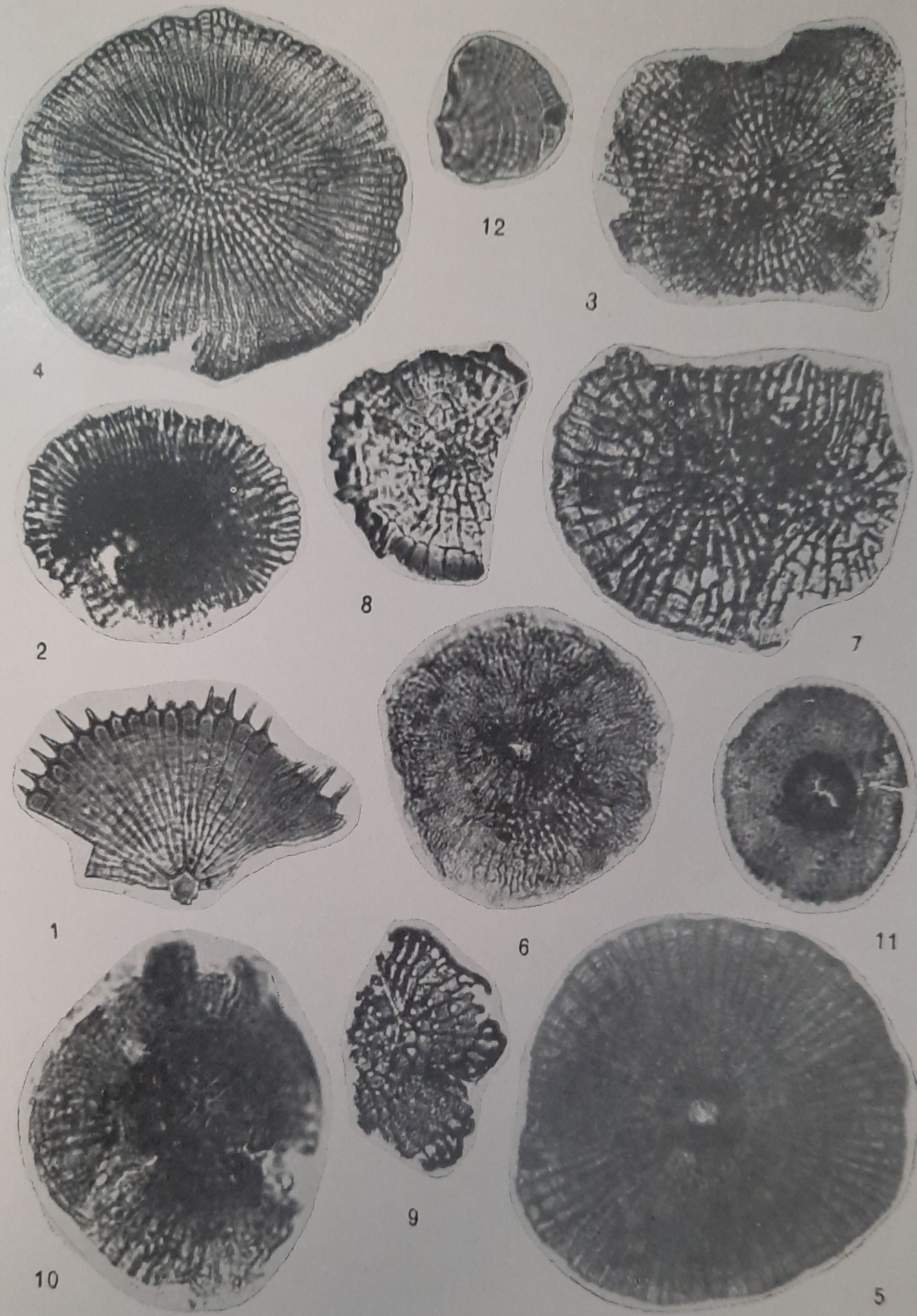
Remarks—Asterinaceae is a large family dominated by the even-sized genus *Asterina*. The family is sub-divided on the basis of the characters of the fructification and the *in situ* mycelium. The asci and ascospores are brown in colour, ascospores two-celled and are strongly constricted at the septum into two almost globose halves. The most important feature, however, is the reputed host specificity of the individual members of the family.

Parmulariaceae Type (Pl. 1, Figs. 7, 8, 9)—Thyriothecium shield-shaped, radially constricted, solitary and confluent with different configuration of pores. The pores are distributed over the entire fructification or restricted to central region and are large or small in solitary types.

Remarks—The members of Parmulariaceae are more destructive than their asterinaceous relatives. *Callimothallus*, *Microthallites* and *Cribrites* are the known fossil fructification of the family. LANGE (1976) showed that the callimothalloid and cribritoid shields are found in tropical, subtropical and temperate forests. This represents a habitat range from equatorial to about 28°S under rain falls 6,000 to 1,600 mm per annum in Australia.

Trichothyriaceae Type (Pl. 1, Figs. 10, 11)—Thyriothecium lenticular, the wall of 'floor' and 'roof' composed of radiating files of cells. The ostiole is usually protruding which may be bordered by dark pigmented cells. These cells sometimes have spine-like setae. Two rows of dark cells surround a gelatinized central core. This central core is not cellular and shows the stages in the development of ostiole.

Remarks—The members of Trichothyriaceae are predominantly tropical hyperparasites on other leaf ascomycetes. *Trichothyrites* is the fossil representative of this family which is comparable to *Trichothyrium*.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Fruiting body-Type 1, (Pl. 1, Fig. 12)—Fructification 40×45 μm in size, stroma fan-shaped showing concentric rows of cells; cells not distinct. The probable affinity of this specimen could not be traced. The specimen has closer resemblance with the fossil genus *Kutchiathyrites* Kar (1979) in its eccentric nature and in having radially arranged hyphae diverging towards the margin.

DISCUSSION

The present study shows the common occurrence of the microthyriaceous fruiting bodies in the modern oceanic sediments. It was also observed that the diversity of the thyriothecium is higher in the near coast sediments than those far away from the coast. The members of the Microthyriales are epiphyllous parasites in tropics, subtropics and warm temperature region. The western coast of India is covered by thickly vegetated, tropical evergreen and deciduous forest. The members of the Microthyriales are not known from the marine environment. We, therefore, believe that the thyriothecia found in the grab samples from the Arabian Sea are terrestrial in origin and were transported by the water currents to considerable distance.

Microthyriaceous fungi are known from geological past. *Phragmothyrites*-like fruiting bodies are restricted from Eocene to Lower Pliocene, the distribution of *Trichothyrites* is from Eocene to Lower Pleistocene while *Callimothallus* ranges from Eocene to Miocene.

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EXPLANATION OF PLATE 1

(All photomicrographs are enlarged ×500, unless otherwise mentioned)

1—5 Fruiting bodies of Microthyriaceae—Form A to Form E, Slide nos. 6740 to 6744.
6 Fruiting body of Asterinaceae, Slide no. 6745.
7—9 Fruiting bodies of Parmulariaceae, Slide nos. 6746 to 6748.
10, 11 Fruiting bodies of Trichothyriaceae, Slide nos. 6749- ×1000, 6750.
12 Fruiting body Type 1, Slide no. 6751.