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OCCURRENCE OF FOSSIL REMAINS IN WARKALLI SEDIMENTS (TYPE AREA), SOUTHERN KERALA, AND ITS STRATIGRAPHIC SIGNIFICANCE

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THE sedimentary section at Varkala (Warkalli, 8°44′ : 76°43′) located to the south of Quilon (figure 1a) is considered to be the type area of Tertiary sediments[1] in Kerala. This section which consists of sandstones, variegated clays with lignitic bands, is considered to be a littoral facies partially overlapping the underlying Quilon Limestone[2]. Palynological studies conducted on the carbonaceous sediments at the base of Warkalli sediments[3,4] have indicated an Early Miocene age. An Early Miocene age has also been assigned to the Quilon Limestone[5], located at Padappakara (figure 1a) on the basis of foraminiferal studies. This obviously indicates that the deposition of limestone and lignite is more or less coeval which occurred in two different types of environments. A slightly younger age (Mio-Pliocene) has been tentatively assigned[2] to the top-most Warkalli sediments as these sediments are barren of plant and animal fossils.

During the course of palaeontological studies of the Tertiary sediments of the area, milky white grains resembling fossil tests (figure 2) have been observed in a borehole at Thachankonam, behind the Varkala cliffs (figures 1a&b). Similar silicified fossil fragments have also been observed in the Varkala cliff sediments (figure 2). The silicified

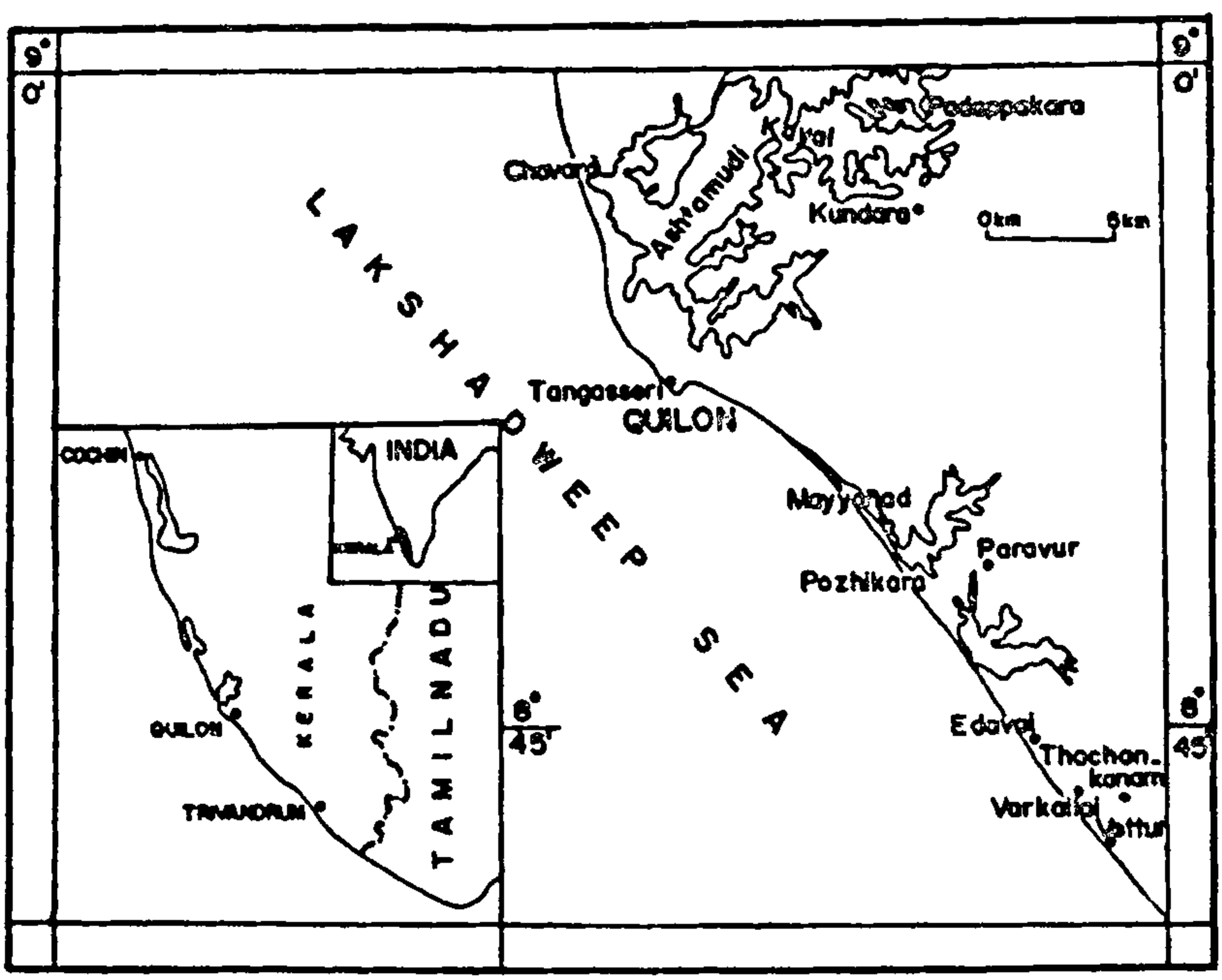


Figure 1a. Location map.

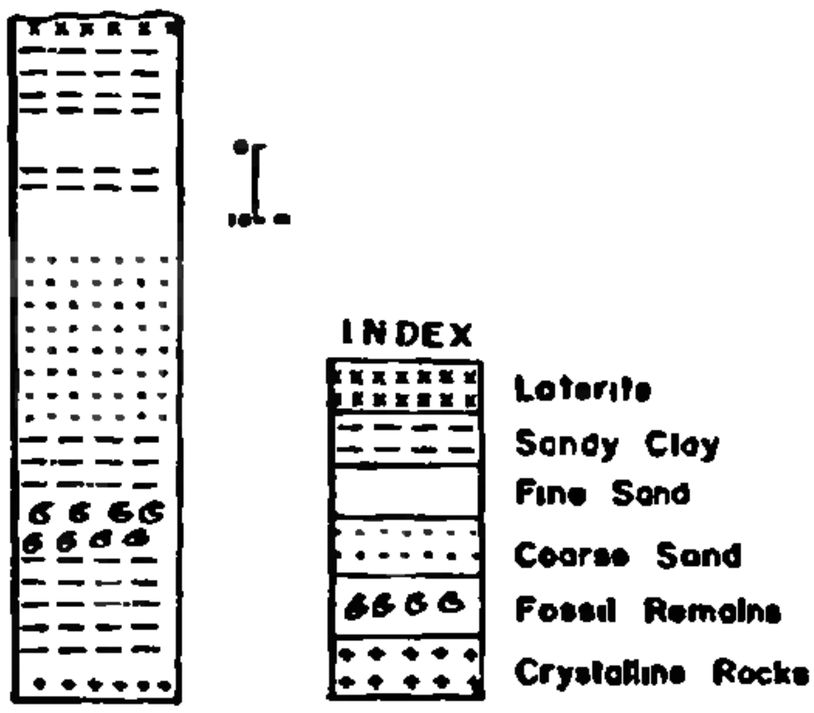
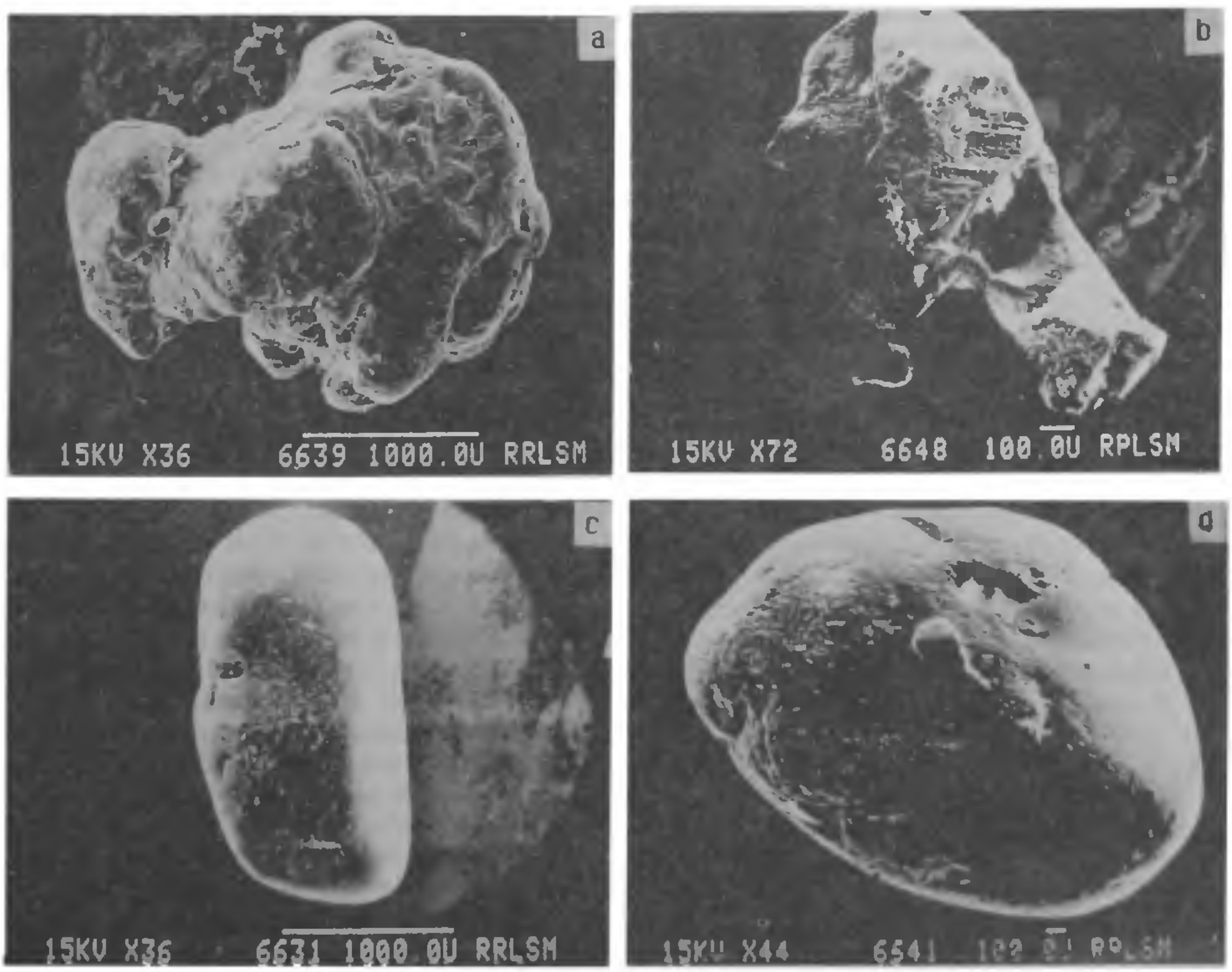


Figure 1b. Lithological section at Tachankonam.

fossil remains recorded at Thachankonam, has a vertical distribution ranging from 60 to 70 m (figure 1b). The mode of occurrence of these fossils with indications of transportation and rolling and their fragmented nature, recorded in this area indicate that these could be drift assemblage, initially deposited from areas where marine conditions were prevailing such as areas around Padappakara, Paravur, Edavai etc (figure 1a) where the environment was conducive to the growth of these organisms. Subsequently the silica present in the sediments was dissolved due to high pH conditions and was reprecipitated in the form of opal inside the fossil tests controlled by factors like pH, presence of reactive oxides, hydrological conditons, temperature etc[6].

In situ lignitization of trees can be observed at Kundara in the eastern periphery of the basin whereas lignites at the Varkala cliff are observed to be of drifted origin[4]. This is further substantiated by the occurrence of lignitic pieces embedded in the limestones outcropping at Padappakara[7] and Paravur. The size analysis of the cliff sediments at



Figures 2a–d. Opaline silica casts. **a and b.** From Warkalli section; **c and d.** From Thachankonam section.

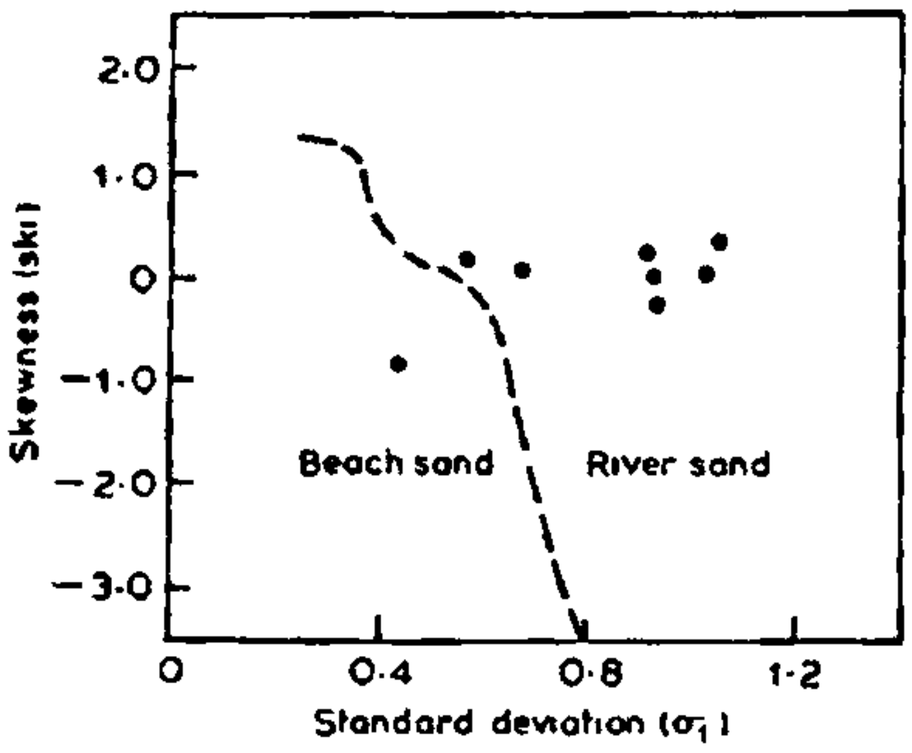


Figure 3. Plot of skewness and standard deviation, after Friedman, 1961, for the Warkalli sediments.

Varkala indicates that these were mostly deposited by streams (figure 3).

On the basis of the occurrence of drift assemblage of silicified fossil tests in the Warkalli sediments (type area) it is surmised that during a regressive phase of the sea, possibly of the Late Miocene, the sediments including lignitic pieces and fossils were eroded and redeposited in the littoral area. This further suggests that the overlap sequence at Varkala type area should necessarily be younger (Late Miocene-Pliocene) than the sediments occurring around Kundara, Padappakara, Paravur and Edavai.

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EFFECT OF PENICILLIC ACID ON INTESTINAL BRUSH BORDER OF RABBITS

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PENICILLIC acid, a secondary metabolite was first isolated from the culture filtrate of *Penicillium puberulum*[1]. Scott[2] reported the production of penicillic acid by several food-borne fungi. Penicillic acid has been considered as a potential environmental health hazard when it was isolated from agricultural products[3–5]. Cytotoxic[6], hepatotoxic[7] and carcinogenic[8] effects of penicillic acid have been reported earlier.

Investigations particularly on long-term feeding experiments using other mycotoxins indicated that mycotoxins affect small intestinal cell wall[9,10], which is a primary site exposed to potential toxicants. Since the cytotoxic effect of penicillic acid had already been proved, it was felt that ingestion of *Penicillium cyclopium* and the toxin penicillic acid will initially affect the cell wall of the small intestine. Hence, in the present investigation an attempt has been made to find out the changes of intestinal brush border glycoproteins and lipid parameters which will give an insight into the mode of action of penicillic acid.

Penicillium cyclopium (the strain was isolated in the laboratory from a fungal contaminated feed and confirmed by IARI, New Delhi. This strain found to produce pencillic acid as a major secondary metabolite) was grown on 1 litre of Raulin-Thom medium for 14 days and penicillic acid was isolated from the culture filtrate using the method of Bentley and keil[11]. The purity of penicillic acid was tested by NMR, IR and UV spectral analyses along with an authentic sample (a gift sample from Dr E.B. Lillehoj, Agricultural Research Southern Region, Lousiana). Contaminated diet for our experiments was prepared by growing *P. cyclopium* in sterilized bread at 20 to 22°C for 14 days. The fungus was then inactivated by the addition of chloroform and later removed completely by drying. The bread was then powderd and mixed with normal rabbit diet in the ratio of 1:2 (w/w) (contaminated diet containing 1 mg penicillic acid per 10 g of bread).