

Table 1. Sliding window correlation between SST and different parameters

Period	(a)	(b)	(c)	(d)
1950-75	0.11	-0.20	0.26	0.51
1951-76	0.11	-0.26	0.31	0.50
1952-77	0.09	-0.26	0.35	0.46
1953-78	0.14	-0.30	0.40	0.47
1954-79	0.15	-0.31	0.41	0.45
1955-80	0.15	-0.30	0.41	0.45
1956-81	0.15	-0.37	0.43	0.55
1957-82	0.22	-0.38	0.64	0.53
1958-83	0.35	-0.51	0.58	0.55
1959-84	0.33	-0.53	0.58	0.54
1960-85	0.35	-0.59	0.64	0.51
1961-86	0.40	-0.58	0.65	0.50
1962-87	0.57	-0.66	0.66	0.50
1963-88	0.63	-0.67	0.65	0.53
1964-89	0.65	-0.67	0.65	0.53
1965-90	0.64	-0.67	0.66	0.54
1966-91	0.67	-0.65	-	0.47

- (a) Correlation between October SST of the previous year in 0-5°N; 80-85°E and R_2 .
 (b) Correlation between November SST of the previous year in the same area and DWPI-A.
 (c) Correlation between November SST of the previous year in the above area and BMBPA-J.
 (d) Correlation between April SST in the north Australia-Indonesia region (5-15°S; 120-160°E) and R_2 .

the slowly varying planetary circulation and SST anomalies in the equatorial region¹¹ the observed relationship between October SSTA and A-MR500 is justified. More northward (southward) displacement of the 500 mb ridge position is a precursor for strong (weak) monsoon. In view of the above discussion, the observed strong correlation between October and November SSTA (-1 year) and monsoon rainfall appears to be reasonable.

It is suggested that the SST in the EEIO may be included in the operational forecast model of India Meteorological Department.

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ACKNOWLEDGEMENTS. This work was done at the Department of Oceanography, University of Southampton, Southampton Oceanography Centre, Southampton, UK, under TCTP fellowship offered by the British Council, Manchester.

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On the age and fauna of beachrock of Kegaon Coast, Uran, Maharashtra

Outcrops of beachrock occur as isolated patches all along the coast of Maharashtra and comprise conglomerates, shell limestone bands and consolidated dune sand designated as 'karal'. The karal has been dated and found to range from Middle to Late Holocene in age¹⁻⁴. The beachrock of Kegaon Coast of Uran forms the northernmost outcrop of the Raigad district. We aim to comment here on the age and paleoenvironment of the karal of Uran. It is well exposed in the intertidal and supratidal zone, stretching over 500 m and resting on highly fractured and well-jointed amygdular basalt. The karal

has an uneven contact with basalt and exhibits varying thickness (Figure 1). The lithologic section studied shows development of approximately 3.5 m thick sediments with a basal conglomeritic zone followed by laminated shell limestone bands and dune sand (Figure 2).

Survey using theodolite was carried out at a location (18°52'58"N and 72°54'48"E) to determine the position of the beachrock with respect to the present MSL (Figure 3). The bases of conglomerate and dune sand lie at 1.5 m and 2.5 m above MSL respectively. However, the thickness of the beachrock varies from place to place.

A section at Uran (18°50'25"N and 72°50'50"E) illustrated by Agarwal and Gudder¹ appears to be 4 m thick, while Kale *et al.*⁵ gave a range of thickness from 1.5 m to 2 m for the beachrock and 0.9 m to 1.5 m for the dune sand exposed at a location having coordinates 18°52'30"N and 72°54'56"E.

The beachrock is compact, fairly well consolidated towards the bottom and fragile towards the top. The fauna recovered from the beachrock comprises mollusca, foraminifera, broken fragments of bryozoa, corals, etc. The shell limestone in particular, is rich in gastropods species,

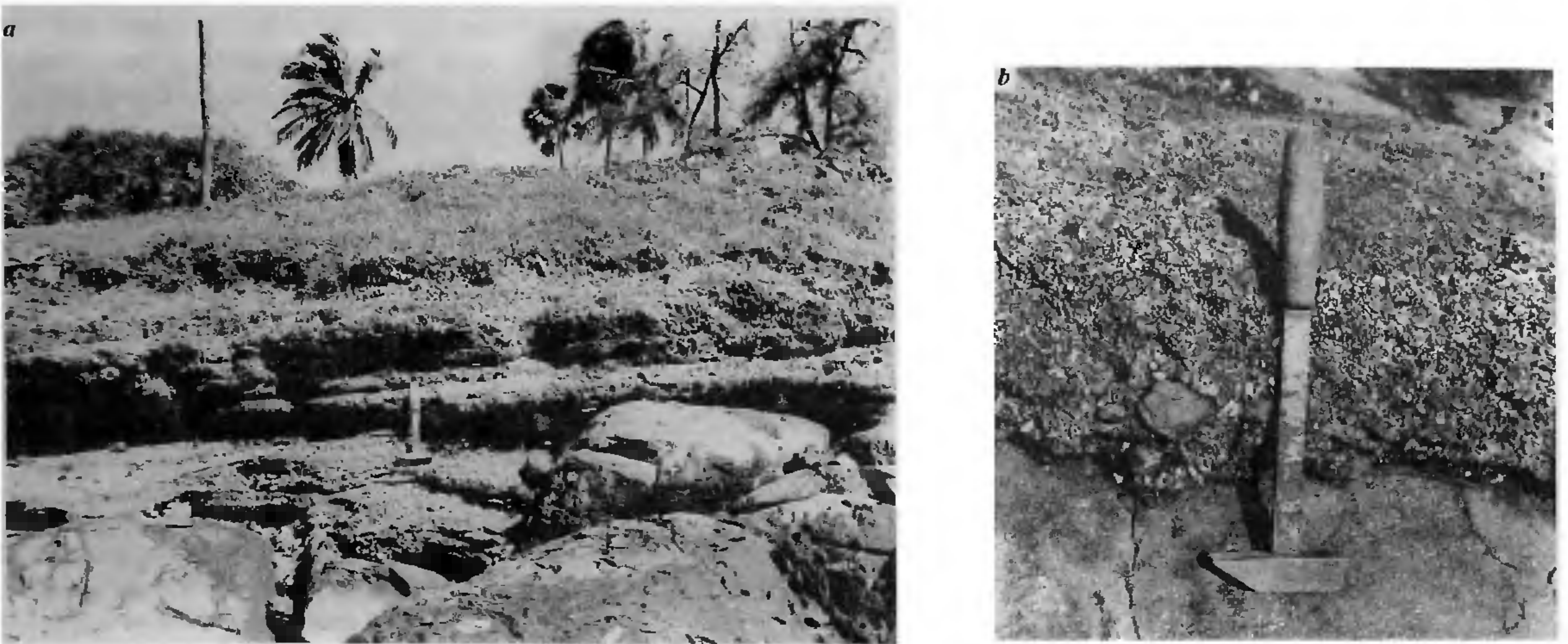


Figure 1. *a*, Outcrop of beachrock along Kegaon Coast, Uran. *b*, Contact between the basalt and beachrock.

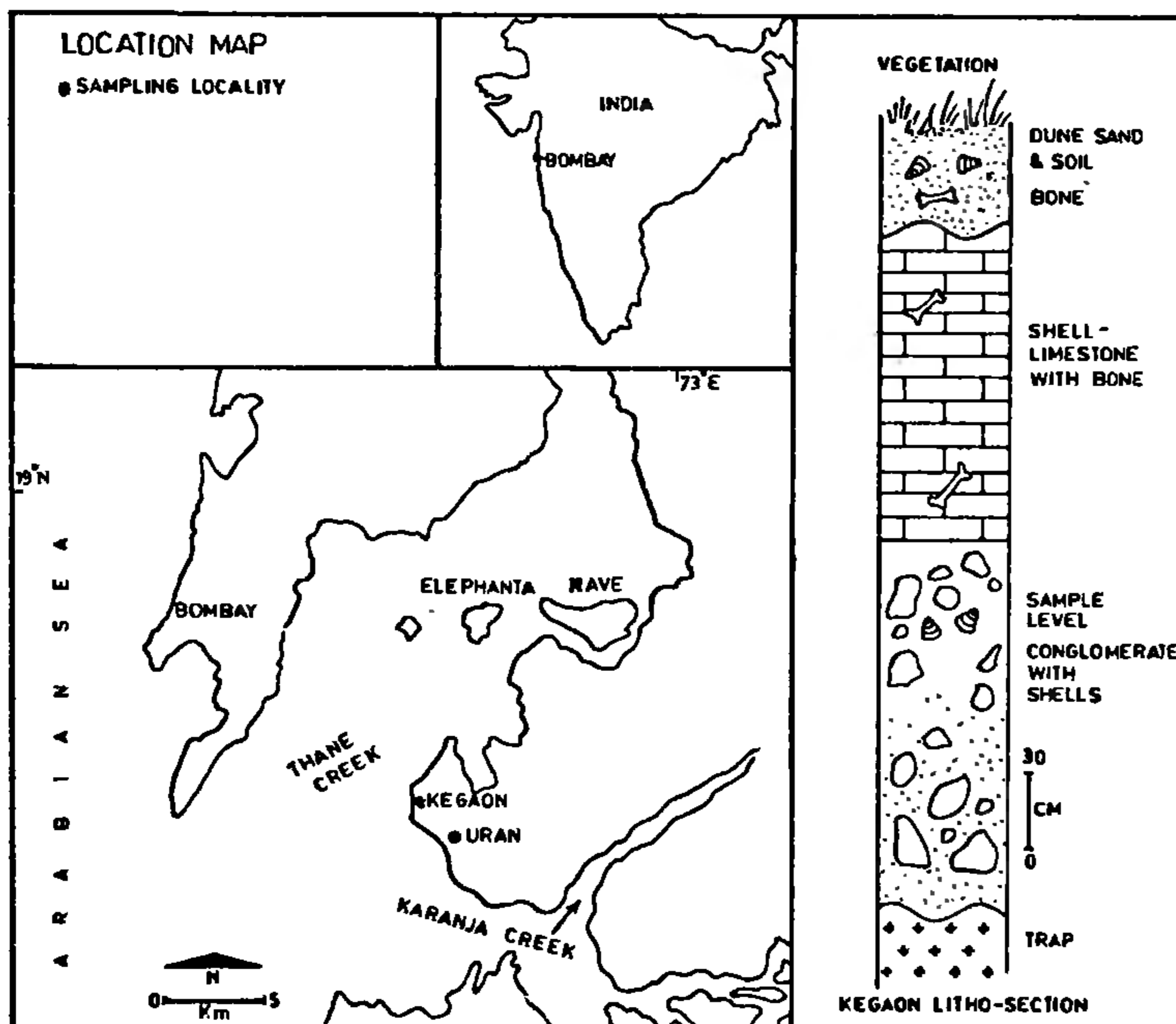


Figure 2. Location map showing the sampling locality and litho section.

viz. *Nerita (Theliostyla) oryzae* (Recluse), *Trochus (Infundibulum) radiatus* (Gmelin), *Clypeomorus moniliferous* (Kienar), *Cerithidea cingulata* (Gmelin), *Conus* sp., *Thais tiszoti* (Petit), *Cantharus* sp., etc. The foraminifera belong to genera

Ammonia, *Elphidium*, *Eponides*, *Bolivina*, *Brazalina*, *Siphogenerina*, etc. Fossils are rare in dune sand. Isolated mammalian bones and teeth occur at the contact of dune sand and shell limestone and in the upper part of the shell limestone band (Figure 2).

Being aragonitic, gastropod species *Nerita (Theliostyla) oryzae* (Recluse) is used for carbon dating. The scanning electron microscope studies of the shell wall revealed undisturbed pattern of acicular aragonitic crystals (Figure 4 *a*), thereby ruling out any possibility of post-depositional leaching which otherwise would have affected the accuracy of the ^{14}C date. The measured radiocarbon age of the sample (BS 1204) is 1170 ± 90 years BP. This age when corrected using the radiocarbon age calibration programme for marine data base of Stuiver and Braziunas⁶ gives the calibrated age as 700 ± 70 years BP. A radiocarbon date BP 600 ± 80 for a fossil mangrove wood (BS 1051) from mud beach at Rewas, south of present locality across the Dharmtar Creek⁷ revealed a relatively younger age for the sediments in the vicinity.

Formation of beachrock is a regional phenomenon and its distribution is related to time and altitude with respect to present day MSL. For Holocene, the global trends of elevation versus time plot indicate that older the strata, the higher or deeper is the position with respect to zero elevation⁸. Interestingly, Kale *et al.*⁵ on the basis of fluorine/phosphate ratio of a mammalian bone assigned Late Pleistocene age and suggested that the beachrock of Uran is older than that occurring south of Thane Creek. Contrary to this, ^{14}C date obtained from *Nerita* sp. suggests that it is the youngest of beachrocks so

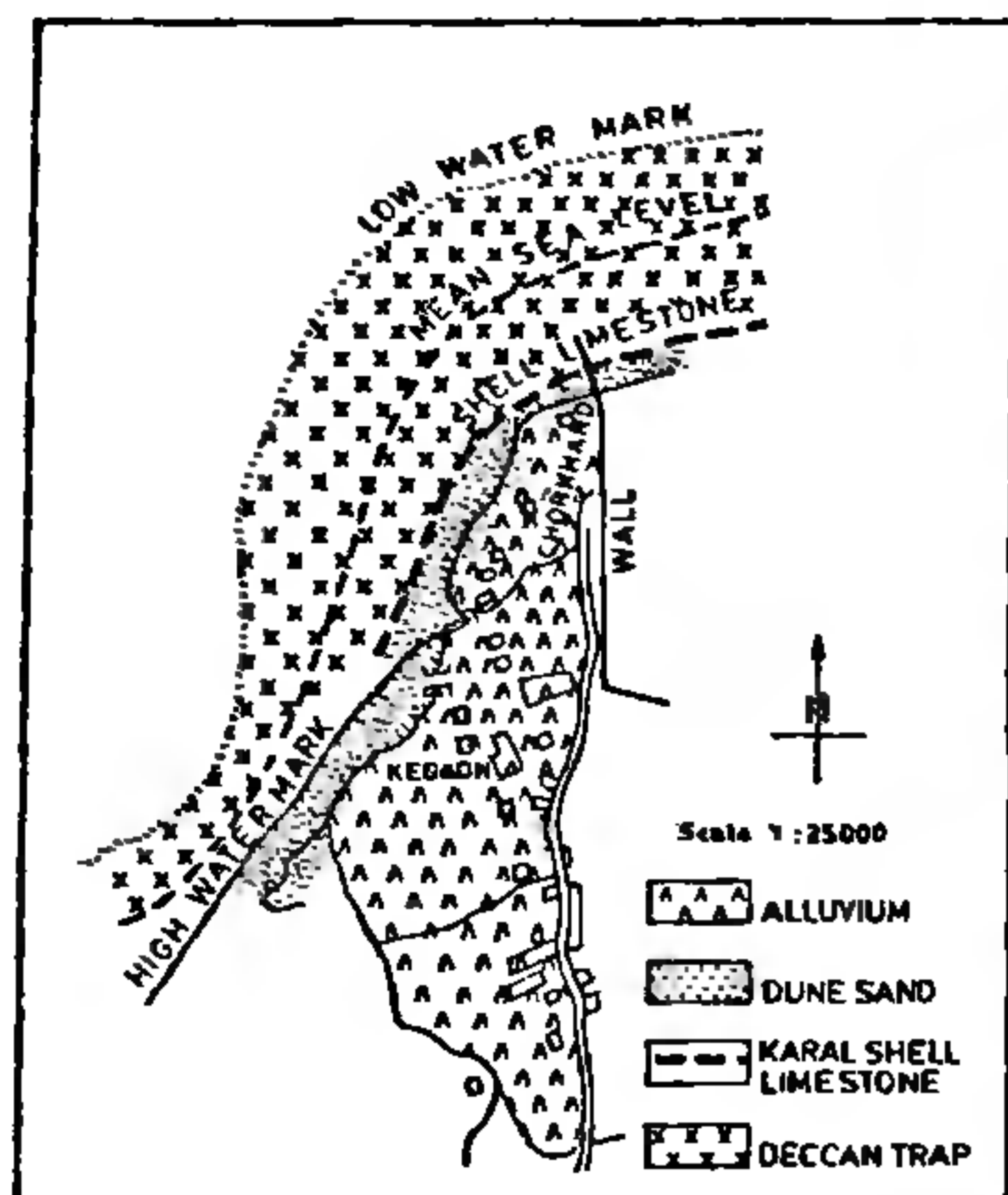


Figure 3. Position of beachrock with respect to main sea level.

far reported from west coast of Maharashtra. Hence, conclusions drawn by Kale *et al.*⁵ regarding the Late Pleistocene age of the Uran rock are not tenable as during the Late Pleistocene, globally the sea level was much lower (120 ± 20 m). Therefore, only a localized single isolated patch cannot be older in age while all other available dates are in the range of Mid to Late Holocene.

Thus, the fragmentary mammalian bones seem to be of derived nature, further confirming that definite Late Pleistocene deposits along the west coast of Maharashtra are yet to be recorded⁴.

From foregoing discussion it is evident that there existed a higher strand line along the coast of Uran at about 700 ± 70 years BP. Deposition of beachrock commenced with transgressive pulse, resulting into formation of conglomerate comprising angular to subrounded pebbles and cobbles of basalts, molluscan shell fragments and other bioclasts. These are further lithified by acicular aragonitic cement (Figure 4b). Thin aragonitic coatings, observed around the sediment grains as revealed under SEM, indicate deposition

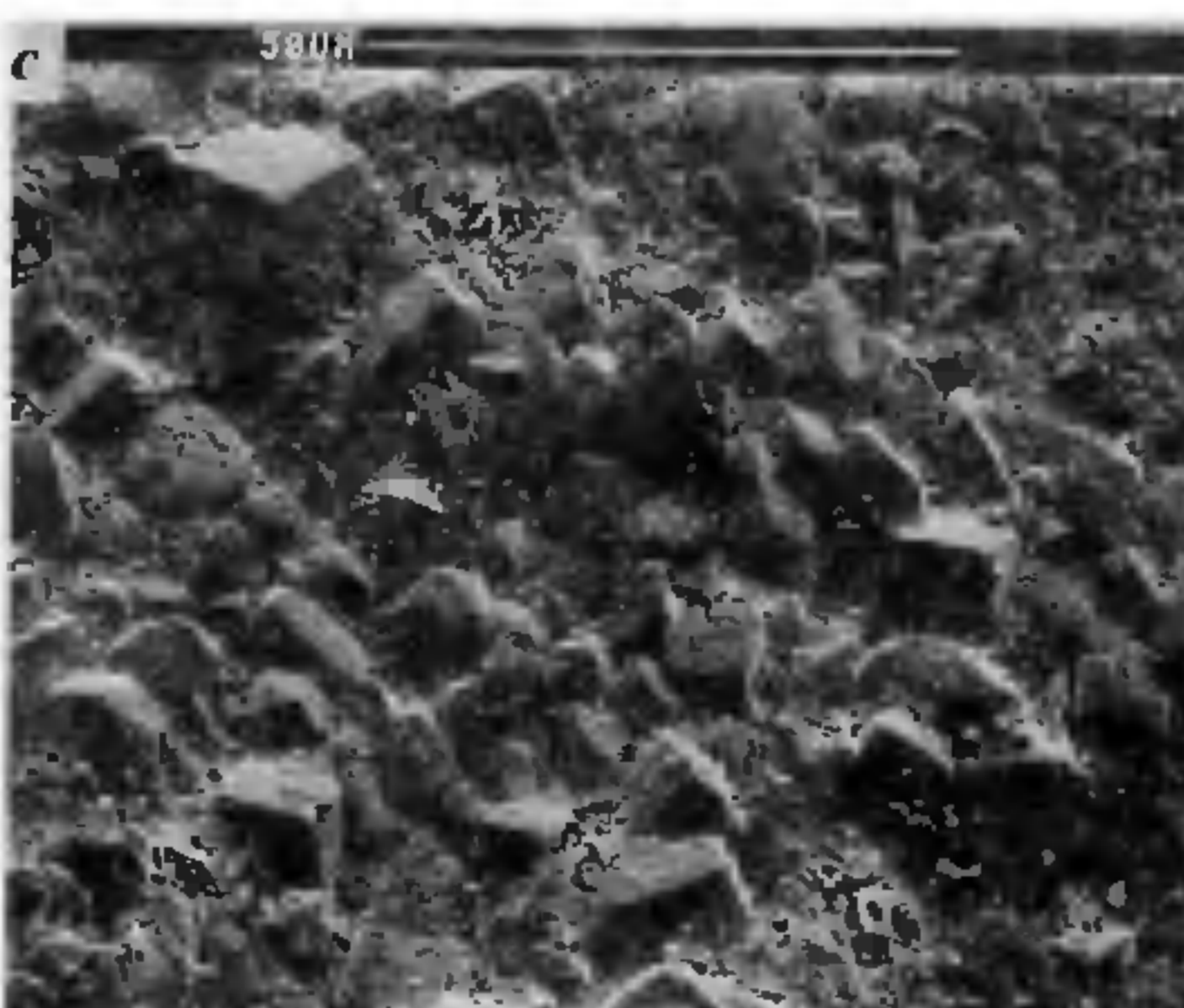
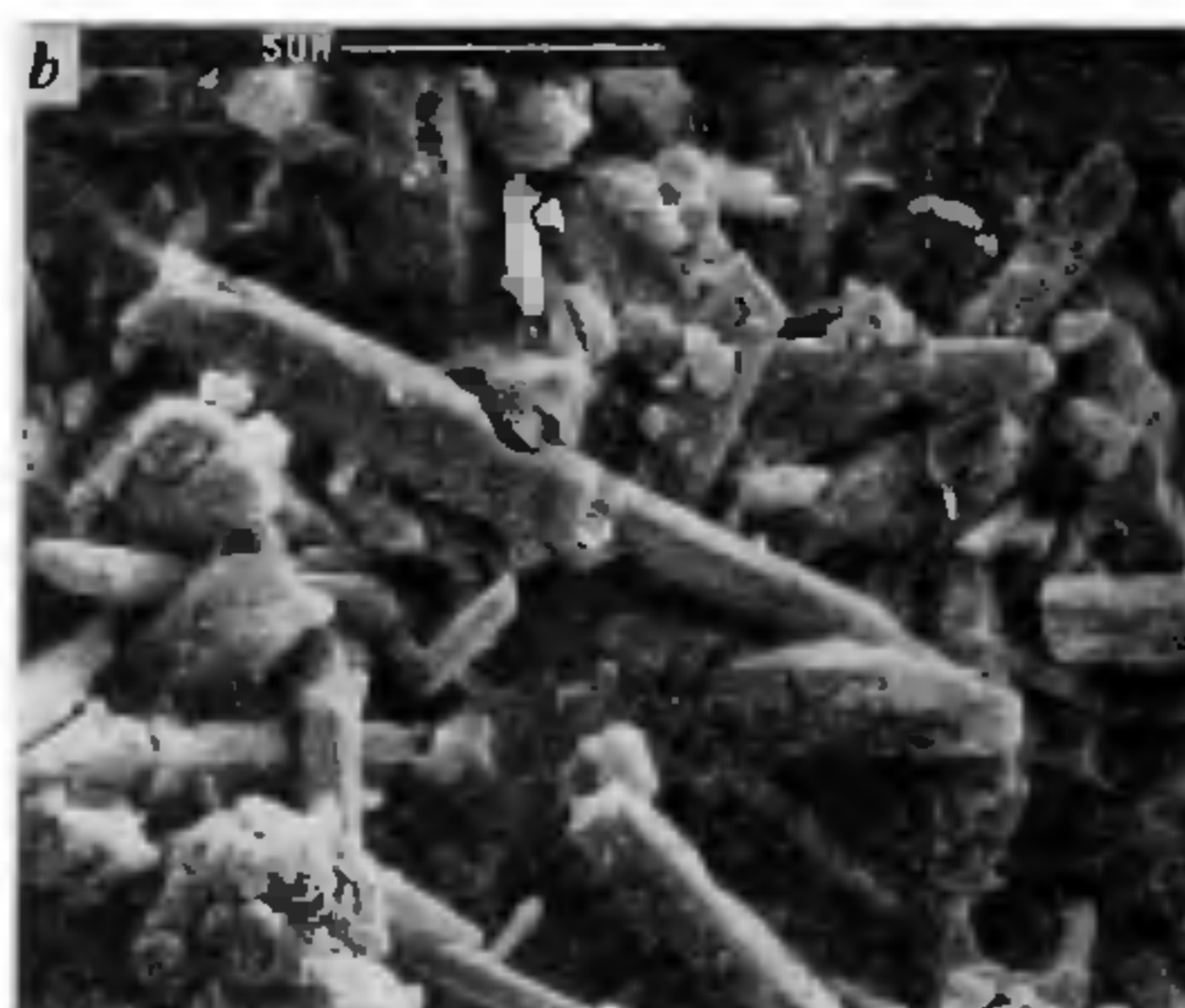
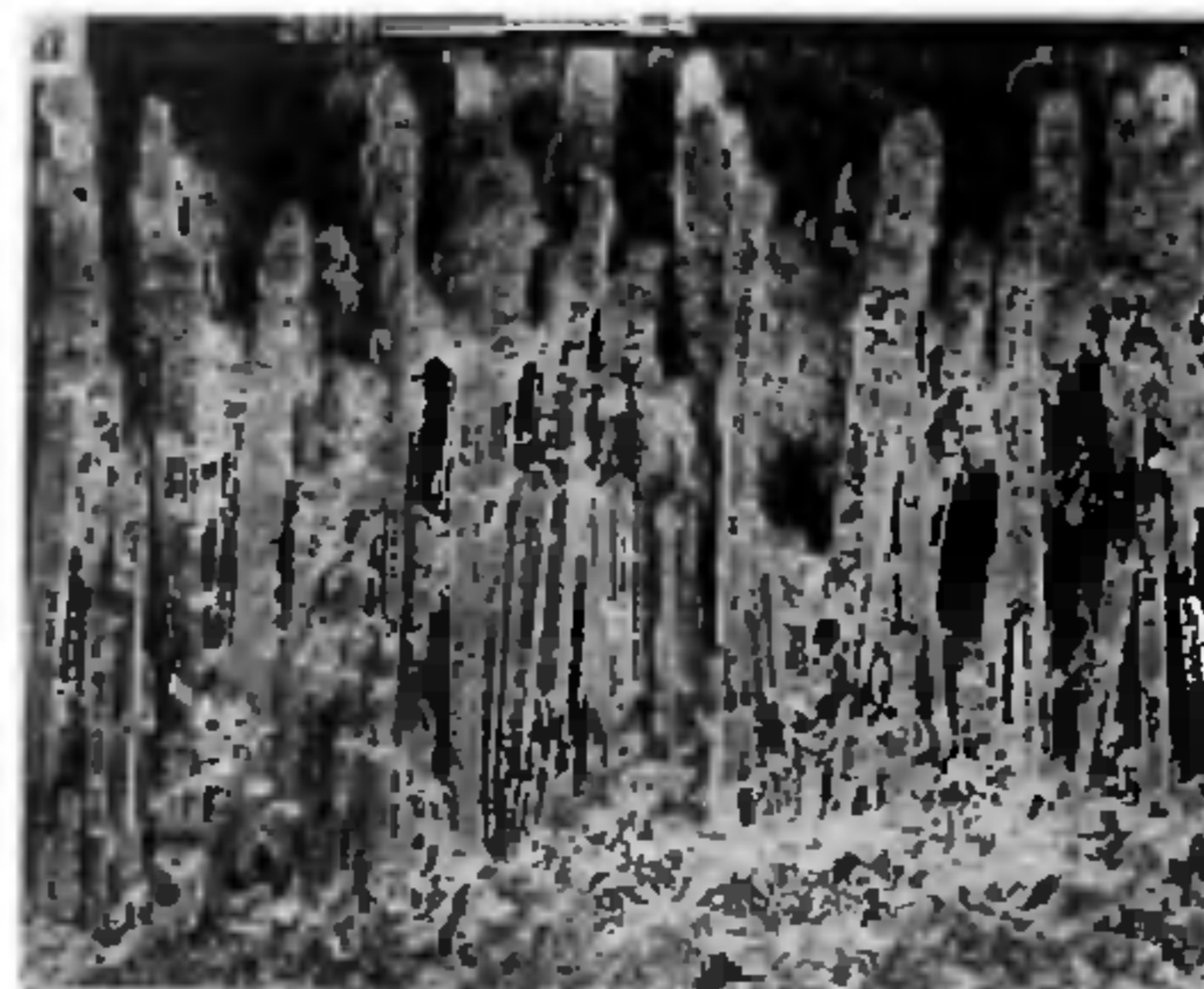


Figure 4. a, SEM photograph of the shell wall of *Nerita (Theliostyla) oryzae* showing undisturbed acicular aragonitic crystals. b, SEM photograph showing acicular aragonitic cement as thin coating around sediment grains. c, Interstitial calcitic cement developed due to meteoric water.

in the lower intertidal zone⁹. Due to subsequent fall in sea-level, conglomerate and shell limestone were covered by dune

sand. The upper portion of shell limestone and dune sand is highly fragile and yet to be lithified. However, a little amount of calcitic cement has developed due to influence of meteoric water (Figure 4c).

Thus, the karal of Uran has been deposited under a Late Holocene transgressive pulse which lasted for a few hundred years only. Presently, the coast of Uran is under active erosion and the karal is subjected to a rapid destruction.

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ACKNOWLEDGEMENTS. This work was carried out under an SERC, Department of Science & Technology sponsored project. The ¹⁴C data have been obtained from the Birbal Sahni Institute of Palaeobotany, Lucknow. We thank Dr G. Rajagopalan of BSIP, Lucknow for his comments on radio carbon dates.

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