Lonewell[3] describes 'megabreccias' developed downslope from large faults. Therefore the occurrences of the giant/abnormal cataclasites of the area under description are quite similar to those reported by Stone[2] and Lonewell[3]. The giant/abnormal cataclasites of Timmapur, Nilgund and Kardigud are the first reported occurrences from the Kaladgi basin. It is true that gritty horizons are present in the area, but these are decidedly conformable with the quartzarenites. Further the grits do not show effects of shearing or faulting. From the foregoing account it is clear that the cataclasites of the above mentioned localities are quite unique and belong to the category of 'giant/abnormal' type.

6 July 1987

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BURROWING OF GASTROPOD *UMBONIUM* LINK AND ITS IMPLICATION IN ICHNOFOSSIL STUDY

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INTENSIVE burrowing activity has been observed in the intertidal zone of the sandy beach near Satpati village in Thane District, Maharashtra. This extensive beach is partially developed from the sand derived from erosion of the Holocene shell limestone and recent biogenic debris. The gently sloping beach has a wide intertidal zone exposing vast sandy flats during the low tide (figure 1).

The burrows are concentrated in two distinct bands parallel to the shoreline, each about a meter wide and extending laterally for several hundreds of meters. The interval between the two bands is 5 and 6 m in width. Sparsely distributed burrows of similar kind also occur in the areas beyond these bands up to the water front. The burrow openings are circular but the majority of them acquires an oval shape (figure 2).

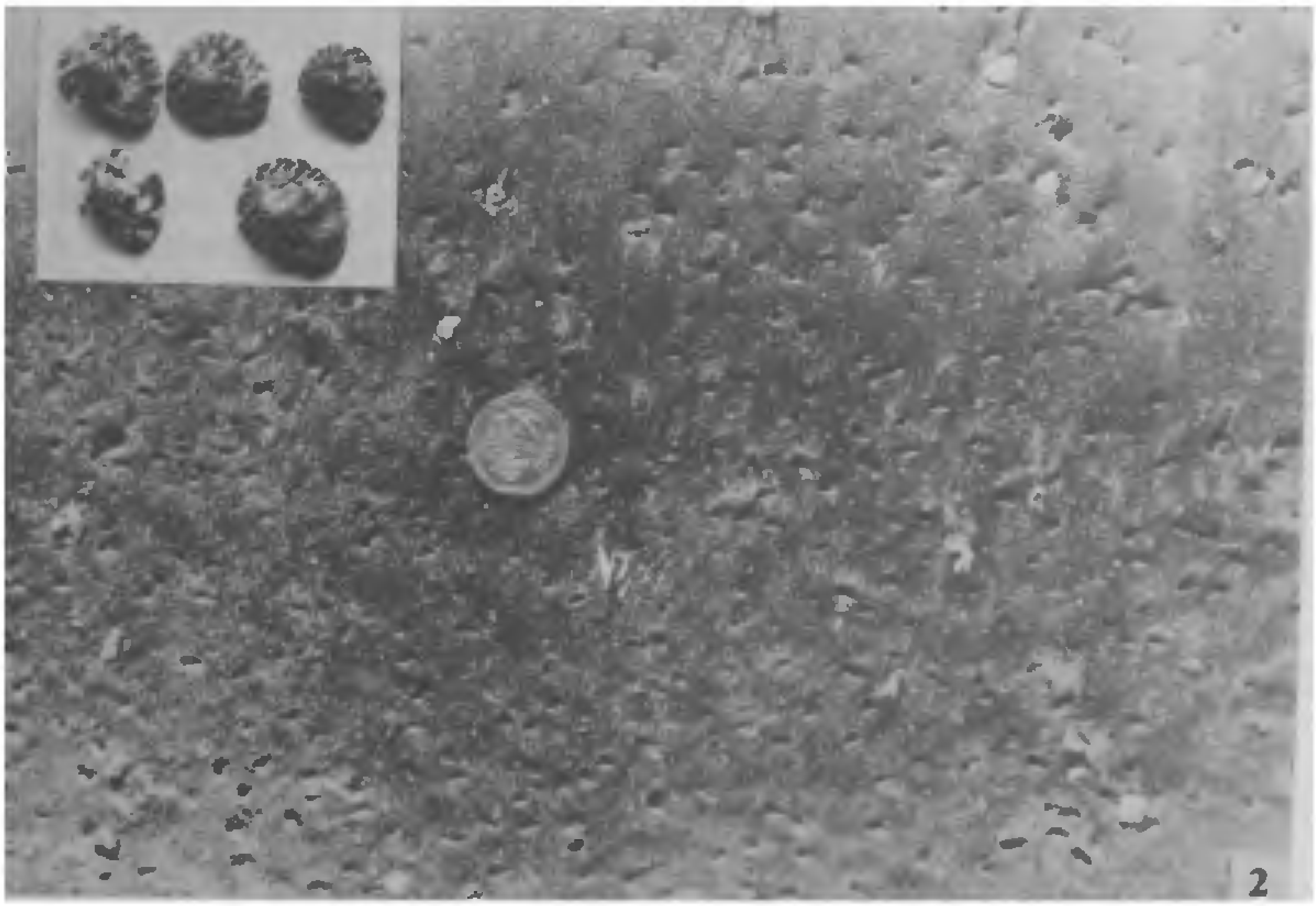
Each burrow is associated with a gastropod shell of either *Umbonium vestiarium* Linnaeus widely distributed along the Indian coasts[1] or *Umbonium conicum* Adams and Reeve of the superfamily Trochacea[2,3]. The gastropod is found buried on its sides with the axis parallel to the bedding plane and the aperture nearly vertical (figure 3). The animal excavates a tunnel by its slender foot, in an oblique manner. Thus the opening is located on the ground surface slightly away from the shell and linked to the surface by an inclined tiny tunnel of 0.5–0.8 cm in length.

Observations during the successive tides reveal that the *Umbonium* shells during the high tide do not leave the sediment but remain in the same position. The openings are totally destroyed due to gentle agitation of high tide water. However, during the low tide the animal again excavates a tunnel to establish fresh contact with the surface. If an individual is accidentally exposed, it immediately burrows into the soft sediment thereby avoiding exposure and rolling with waves.

Similar burrows can be produced by different organisms in different marine environments. A classic example is of *Donax variabilis*, a bivalve from the tidal flats of Cabretta island in Georgia, USA[4]. These bivalves produce burrows by their inhalent and exhalent siphons, while in the present case the animal produces a single burrow by its foot.

If the burrows could be preserved as trace fossils, their surface expression would resemble that of *Skolithos* or *Trypanites*[5,6]. However, *Skolithos* is essentially a vertical burrow while *Trypanites* is pouch-shaped and hence they differ from the present burrows. Burrows with similar characters but having a slightly more length i.e. of 1 cm or so have been observed in the fine-grained buff-coloured sandstone from the Jhuran Formation of Jurassic, in Rudramata area of Kutch (figure 4). By extending the neontological information and by way of anology, a shallow water origin can be considered as probable for the above fossil burrows in the Jurassic sediments.

Thus the neontological studies of the animal-substrate relation would point out the palaeoenvironments on the basis of trace fossils.



Figures 1 and 2. 1. A view of the Satpati beach during low tide; **2.** Burrow openings in surface view. **Inset:** Shells of *Umbonium vestiarium* Linnaeus (×1).

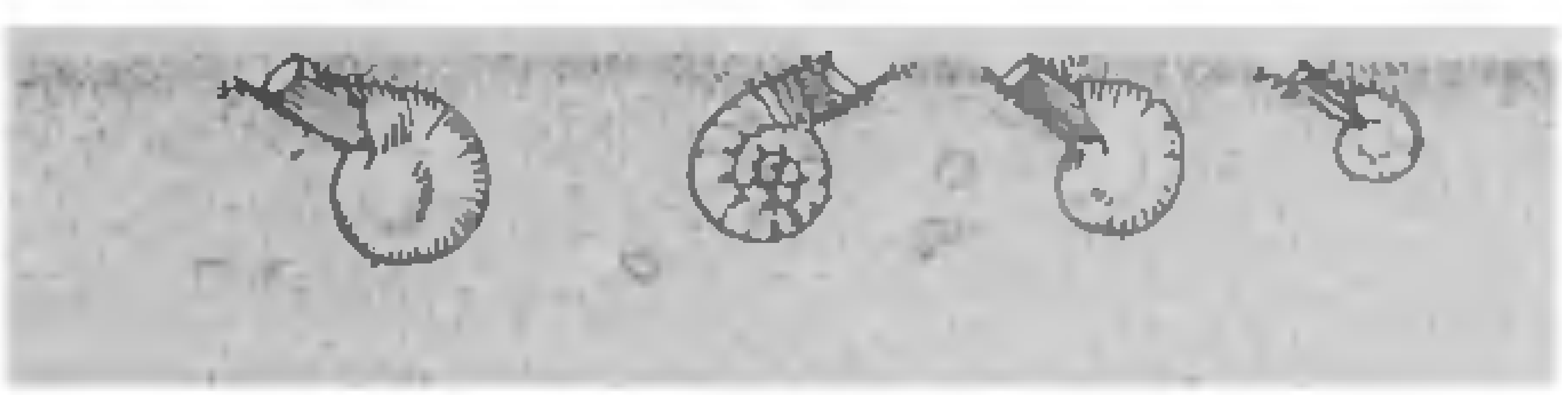


Figure 3. Schematic drawing of buried *Umbonium* shells as seen in vertical section.

Figure 4. Burrow openings on the surface in sandstone from Jhuran Formation, Jurassic of Kutch. Note the similarity with burrow openings produced by *Umbonium*.

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SPECTRAL STUDY OF THE C – X SYSTEM OF TRANSIENT MERCURY BROMIDE

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THE study of mercury-halides has gained considerable attention due to its importance in high power electronic lasers in visible and UV regions. In these molecules, ground state has weak binding, and therefore there is maximum possibility of population-inversion.

Spectroscopic studies of mercury halides are still incomplete. Vibrational analysis of the C–X system of transient HgBr, lying in the region 2940–2730 Å, has been studied due to the very complex nature of its emission spectrum. The first extensive study of this system was by Wieland[1–5], who ascribed these bands to triatomic species $HgBr_2$ on account of the complex structure of bands. Later this system was analysed[6–9] and explained as due to diatomic species. These analyses were unconvincing according to Huber and Herzberg[10].

Recently Rai *et al*[9] investigated the C–X system at high resolution on 35′ concave grating spectrograph and the bands were assigned due to a diatomic emitter although a large number of bands remained unassigned. Hence their vibrational assignments appeared doubtful due to the following reasons:—(i) The band heads were not sharp as are expected to appear in the spectrum of diatomic molecule; (ii) All the sub-bands associated with each main band remained unassigned even at a lower resolution (on 21′ concave grating spectrograph in second order at reciprocal dispersion 1.23 Å/mm). No reason has been given for these multiple bandheads. (iii) Only 60 bands have been reported and analysed in the C–X system. Band-head positions of (2, 0) and (2, 1) bands have been reported at wave numbers 35210.51 cm^{-1} and 35126.61 cm^{-1} respectively (difference: 83.91 cm^{-1}). This horizontal interval is inconsistent with other studies. The same inconsistency exists in vertical intervals. Thus the values of Rai *et al* does not show proper fitting of the bands. Many other discrepancies appear in the analysis. So the prediction by Wieland for ascribing the C–X system to the triatomic emitter may be true and this is confirmed in the present investigation.

The emission spectrum was recorded by exciting a pure sample of mercuric bromide (BDH) with a 1/2 kW, 30–40 mHz high frequency oscillator in an electrodeless discharge/using a 100 W microwave generator (2450 mHz). When the discharge appeared intense sky-blue, all the bands could be exited and were well developed. The spectrum was recorded on medium quartz, Littrow, 21′ concave grating and 35′ concave grating spectrographs separately on Q_1 and Q_2 Ilford plates of 2″ × 10″ size. Iron arc spectrum run at low current in air was superimposed as standard for the measurements of the plates. The measurements were carried out with a Carl-Zeiss (Abbe) comparator. Several spectro-