the lake ecosystem. The field observations made in 1985, 1991 and 1992, laboratory analysis and study helped us to highlight the present biological activity of the lake ecosystem and also to evaluate the changes that had taken place within a span of few years.

Increased inflow of water through high precipitation followed by subsequent input from the perennial springs and a human-induced increase of nutrients into the lake due to farming on the alluvial patches of the crater are the probable causes of eutrophication. Besides, afforestation programme and subsequent exploitation of biomass also caused increase in human activity which, in turn, resulted in accumulation of organic content into the lake. Though the salinity is reduced as a result of increased inflow of water, enrichment of nutrients also has taken place simultaneously, thereby helping the increased production of blue green algae in the main lake water body and growth of macrophytes at the periphery of the lake. The foul smell of H_2S evolved from the lake margins is prevalent inside the lake.

The blue green algae constitute the major plankton community and particularly *Spirulina* is the dominant one. The abundance and rapid multiplication of this alga are conspicuous along with other blue green algae, viz. *Arthrospira*, *Oscillatoria* and *Dactylococcopsis* immediately after the onset of monsoon and gradually decreases as the dry spell continues until June. The details of hydrobiological aspects monitored during one year would be dealt elsewhere. The occurrence of protein-rich *Spirulina* is conspicuous as the number of 'water fowl' population is considerably increased at present compared to the preceding years. Monitoring the movement and population ecology of water fowls and other migratory birds in relation to *Spirulina* bloom could also help us to exploit this neglected salt water lake for some commercial venture. Already experimental studies in India (CFTRI, Mysore) and abroad, particularly in Mexico[7], have indicated that this alga could be exploited for food supplements particularly in animal feed industries as it has a very high protein content (up to 65–70% on a dried basis) and the protein is of high quality based on its amino acid composition. Besides, highly polluting industries like sugar and paper mills located in Maharashtra could explore possibilities to cultivate *Spirulina* which would greatly help to improve the environment.

SEM studies of ostracods (Figure 4 *g, h*) obtained from the marshy areas revealed the presence of diatoms on the internal carapaces and these diatoms also occur in the surrounding water. The association of the diatoms with ostracods is not well studied and as such it would be worth considering for further investigation taking samples from different parts and environments.

The study of lake silt sediment samples collected from different parts about 35 meters away from the lake revealed that anaerobic activity does take place. Microscopic examination of silt samples revealed the presence of rich organic remains such as algal filaments, fungal hyphae and spores, diatoms, etc. Thermophilic and alkalophilic streptomycetes have also been isolated[8] and their occurrence is significant as the lake basin either might have received water from the existing springs which were geothermally active and gradually lost their property in course of time or some of the hot springs got buried within the basin as the Lonar crater was lying in a structurally 'disturbed' zone. Further details in this regard eventually would support that the origin of Lonar crater may be attributed to a non-impact event as suggested by Subrahmanyam[9].

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Neotectonism along the Saurashtra Coast: New evidences

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We report for the first time the folded ~200-ka-old miliolite rocks from Saurashtra and U/Th dates on the associated oyster banks suggesting coastal instability during the late Quaternary. The rock foldings and fracture lineaments relate intrinsically to the structural set up of Saurashtra horst. The occurrence of oyster bank dated to 80 ka at 4 m asl equates with the stage 5a of deep sea record[1] when sea level was 13 m below the present, suggesting emergence of the coastal fringe after its formation.

TECTONIC status of the Saurashtra horst during the Quaternary times has been controversial[2–4]. The monotonous topography of the peninsula may suggest

absence of major upheavals but minor movements along the fault structures cannot be ruled out particularly with the discovery of rock foldings and fracture lineaments along the coastal tract as discussed below.

The rocks fringing the coast are limestones of various ages such as Gaj limestone (Miocene) and Dwaraka beds and miliolite limestones (Plio–Pleistocene). The tectonogenic features reported here are recorded on miliolite rocks which are ~200 ka old in the study area according to U/Th age estimates[4].

The miliolite beds along the river Rupen (Figure 1) show symmetrical open fold structure (Figure 2) with an apparent NNW-SSE fold direction. It may be noted that the beds are folded normal to the lineament which has controlled the drainage of the river (Figure 1). Therefore, the folding pattern exhibits a definte relationship with the general structural set up of the coastal tract.

Numerous oyster and coral banks appearing at various altitudes fringing the Saurashtra peninsula may represent the past sea stands[5]. The oyster banks along the Rupen river adhering to the miliolite rocks at 4 m asl gave U/Th ages of 80 ka. The age of the oyster bank corresponds to the stage 5a of deep sea record when the global sea level was 13 m below the present[1]. The presence of the oyster bank at 4 m asl clearly indicates that the land mass emerged after its formation. Therefore, the evidence put forward, viz. the folded and faulted miliolite and the age of the

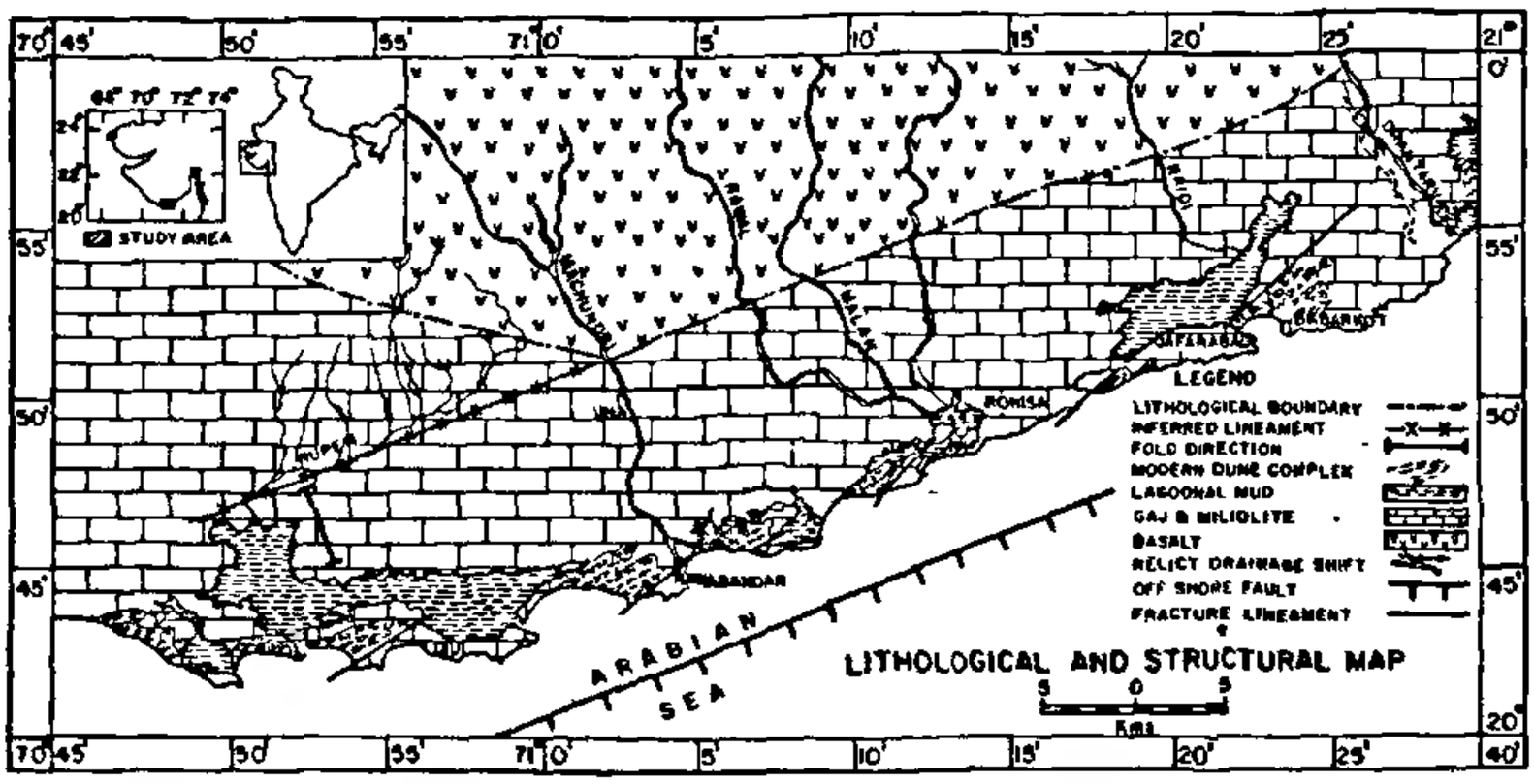

Figure 1. Lithological and structural map of the study area.

Figure 2. Folded miliolite beds along river Rupen.

associated oyster banks suggests that the coastal fringe of Saurashtra peninsula remained tectonically active during the late Quaternary.

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Influence of effluents on fatty acid content of a cyanobacterium

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Qualitative and quantitative estimations of fatty acids from a cyanobacterium *Oscillatoria pseudogeminata* var. *unigranulata* influenced by four different effluents (domestic, ossein, paper mill and tannery) were studied. The presence of 17 different fatty acids including two unidentified and six short chain (C8:0 to C13:0) along with linolenic acid (C18:3) has been established with different effluents.

In recent years, the importance of biological waste treatment systems has attracted the attention of workers world over for developing relatively efficient, low cost waste-treatment systems. The usefulness of algal systems, more particularly the cyanobacteria, is not only in treating the wastes but also in producing a variety of useful by-products from their biomass as on record[1]. To develop suitable and efficient treatment systems, it is obligatory to understand the possible interactions between effluents and the target organisms, so that manipulations to improve the treatment systems become feasible. The present work is, therefore, aimed at studying the influence of four different effluents on the fatty acid content of a cyanobacterium.

The cyanobacterium *Oscillatoria pseudogeminata* var. *unigranulata* Biswas was isolated from the sewage, made unialgal and maintained in BG11 medium[2]. The effluents from domestic, ossein, paper mill and tannery were analysed for initial physico-chemical characteristics using Standard Methods[3] (Table 1). One ml of uniform suspension of *Oscillatoria* (45 μg Chl/100 ml) was inoculated to each undiluted effluent in both sterilized and unsterilized conditions. The experiment was conducted under controlled conditions (temp. $25 \pm 2^\circ$ C) with a light intensity of 1500 lux provided from overhead cool white fluorescent tubes with an L/D cycle of 14+10 h for 15 days. The cultures were centrifuged and washed repeatedly with distilled water and analysed for fatty acid content using Hewlett Packard 5890 Gas chromatograph fitted with 10 per cent DEGS column and flame ionization detector[4]. From the peak area of fatty acids, the amount of fatty acid was calculated using respective standards from Sigma (USA).

The total fatty acid content of *Oscillatoria* with different treatments was estimated qualitatively and quantitatively as above. In all, seventeen different fatty

Table 1. Physico-chemical characteristics of effluents

Characteristics mg l^{-1}	Domestic	Ossein	Paper mill	Tannery
Colour	–	–	Darkbrown	Brownish
pH	7.35	7.65	6.75	7.45
Biochemical oxygen demand	131.20	432.00	288.00	1555.00
Chemical oxygen demand (permanganate value, 4 h)	90.00	220.00	160.00	320.00
Dissolved oxygen	2.80	–	5.37	–
Carbonate	–	–	–	–
Bicarbonate	250.00	425.00	375.00	1375.00
Free CO_2	5.50	11.00	11.00	154.00
Nitrate	0.30	132.00	0.60	8.00
Nitrite	0.003	0.01	0.08	68.00
Ammonia	25.00	80.00	1.20	45.00
Total P	2.06	1.14	0.18	1.26
Organic P	0.48	0.45	0.07	0.39
Inorganic P	1.58	0.69	0.11	0.87
Sodium	80.00	73.00	94.00	820.00
Potassium	20.00	24.00	32.00	58.00
Sulphate	77.00	25.00	90.00	362.00
Calcium	34.00	1804.00	164.00	640.00
Magnesium	23.15	48.70	26.80	528.00
Chloride	150.86	4260.00	710.00	6213.00