

L I S T O F P L A T E S

<u>Plate</u>	<u>Description</u>	<u>Page</u>
III.1	The falling dune deposit occupying topographic depression (Loc. Harshad)	55
III.2	Wedge type cross-stratifications in shadow dune deposit of miliolites (Loc. Nawa Dhunaiya)	57
III.3	Gently seaward dipping coastal sheets of beach rocks (Loc. Baradia)	59
III.4	Miliolites sheets on coastal plains showing gentle windward dips (Loc. Moraj)	59
III.5	Closer view of miliolite sheet showing corss-laminations (Loc. Moraj)	59
III.6	Intercalations of fluvial sediments in valley fill miliolites (Loc. Rakka)	60
III.7	Miliolite deposits in the intramontane depressions (Loc Navagam near Bamanbor)	62
III.8	Windward obstacle miliolite deposits merging into sheet deposits and patan. (Alech hills)	62
IV.1	Closer view of a beach rock sample showing lateral variation in grain size. (Loc.. Baradia)	66
IV.2	Beach rocks resting on yellow marls of Dwarka Beds near ACC Cement factory at Dwarka.	69
IV.3	Knife-edge weathering in beach rocks near sun-set point at Dwarka	69
IV.4	Beach rocks showing sharp contact with the overlying miliolites (Loc. Harshad)	71
IV.5	Closer view of a sample of oyster bed collected from Gosa-Navagam	73
IV.5A	Sharp contact between beach rocks and miliolites at Arena	74
IV.6	Beach rocks overlying the re-chystallised foraminiferal limestone near Veraval light house.	75
IV.7	Beach rocks showing cellular weathering at Kadwar Coast.	77

IV.8	Abandoned miliolite quarry near Makanpur	80
IV.9	Coastal miliolite sheets resting on Dwarka beds near Okhamadhi.	82
IV.10	Miliolites forming failing dune deposits at Harshad	84
IV.11	Quarry section in a transverse coastal miliolite dune at Ratadi	84
IV.12	Abandoned coastal miliolite quarry showing recrystallised and cavernous top1 (Loc. Porbandar)	86
IV.13	Seaward extending miliolite sheets in Sabli river mouth near Madhavpur	86
IV.14	Chalk quarries of Amarbad, west of Rannawao	88
IV.15	Tabular cross beddings in a falling dune miliolite deposit at Patan (Alewch hills)	91
IV.16	Ancient caves in the falling dune deposits of miliolites near Dhank (Alech Hills)	91
IV.17	Valley fill deposit of miliolites near Tapkeshwar (Alech Hills)	92
IV.18	Miliolites forming a 'perched dune' on leeward side of trappean hill at Tapkeshwar (alecdh hills)	92
IV.19	Miliolites deposits showing a typical windward obstacle dune at Gop (Jam)	94
IV.20	Impure gravelly miliolite sheetsw in sorti river near Retal-kalavad	94
IV.21	A miliolite quarry in a falling dune deposit showing tabular planar cross beddings (Loc. Rakka)	96
IV.22	Blanket of slope-wash debris (Seree in miliolites (Loc. Rakka)	97
IV.23	Huge miliolite deposition in an intramontane valley at Khatiya	99
IV.24	Curled clay layers in a quarry face of miliolites at Khatiya	99
IV.25	A thin valley fill sheet deposit of miliolite in Machchu river near Kuwadava	101
IV.26	Falling dune merging into sheet deposit of miliolite at Bamanbor	101
IV.27	Valley-fill deposits of miliolite at Bamanbor	102
IV.28	Slope-wash debris in miliolites at Bamanbor	103

IV.29	Branching stem-cast and as arodlite biogenic structures separated from miliolite deposits of Bamanbor	103
IV.30	Impure gravely miliolite sheet in a streamlet of Beti river near Bamanbor and a fossil-wood fragment (wf) collected from gravels	105
IV.31	A climbing dune of miliolites at Chotial hill	105
IV.32	Miliolite showing (a) thin agal coatings and (b) a network of root-casts (Samples from Chobari)	107
IV.33	Thin miliolite sheets resting on beach rocks with sharp contact (Loc. Shil)	109
IV.34	Miliolites with intercalation of Kankary red coloured pedogenised layers near Indian Rayon factory at Veraval	109
IV.35	A Karstified surface separating two miliolite sequences (Loc. Malad Quarry, Diu)	112
IV.36	Degradation of coastal miliolite cliff (Loc. Nawa Bandar)	112
IV.37	Miliolites showing alternate cross stratified and sub-horizontal sequences in Hiran river near Umrethi dam site	114
IV.38	Miliolite deposits occupying the Hiran river valley (Loc. Talala)	114
IV.39	Valley fill miliolite deposits in somat river near Pedhwada	116
IV.40	Miliolite sheets in Ozat river showing intercalation of fluvial sediments (Loc. Anadpur)	118
IV.41	Miliolite quarries in echodune deposits near Dungarpur	120
IV.42	Truncated surface separating the miliolites of two different cycles (loc. Adi Chadi Vav, Junagarh)	120
IV.43	Obstacle miliolite deposits abutting against trappean rocks of Osam hill (Loc. Patanavav)	122
IV.44	Wave-cut platforms related to present and an early strandlines (loc. Jafrabad)	124
IV.45	Contorted laminations in miliolites of Jegri Island near Mahuva	124

IV.46	Miliolites showing abrupt change in sedimentary structures in cliffy section of Jegri Island near Mahuva	126
IV.47	Miliolites showing gently seaward dipping aeolian beddings exposed during low tides (Loc. Gopnath)	128
IV.48	Aeolian cross-stratification in a coastal miliolite dune quarry (loc. Jhahmer)	128
IV.49	A coastal cliff section showing different cycles of miliolite sand deposition (Loc. Juna Rajpura)	129
IV.50	A closer view of miliolite quarry face showing trough type cross stratifications (Loc. Juna Rajpura)	129
IV.51	Intervalations of Kankary pedogenised layers in coastal cliff section of miliolite (Loc. Gopnath)	131
IV.52	Oyster duricrust on miliolite platform at Gopnath coast	131
IV.53	An abandoned miliolite quarry in falling dune deposit at piparala	133
IV.54	A closer view of climbing dune deposit of miliolites showing low angle aeolian cross-laminations (Loc. Chamardi)	135
IV.55	Animal burrows and root protrudations in stabilised sand dune near Varwala	138
IV.56	Stabilised sand dune on left bank of Gomati river near Dwarka	138
IV.57	Section of a transverse coastal stabilised sand dune resting on beach rocks (Loc. Mangrol-Maktupur)	140
IV.58	Stabilised sand dunes forming bar in singhwado river mouth (Loc. Mul Dwarka)	140
IV.59	A low lying stabilised sand dune along road side between Mahiyari and Tarapur	142
V.1	Photomicrograph showing internal structures molluscan shell fragments in miliolite	149
V.2	Photomicrograph (with gypsum plate) showing intrageanular porosity in miliolite	149

V.3	Photomicrograph of a foraminiferal test (milolid): Cross section showing chambers and typical wall structure	151
V.4	Photomicrograph of bryozoan in miliolite showing their typical morphology	151
V.5	Photomicrograph of echinoid spinde in miliolite showing optical continuity with cement	152
V.6	Photomicrogrqaph showing calcareous algae : blue- green and coralline in beach rock	152
V.7	Photomicrography of stained miliolite showing ostracod test tapering at one end	154
V.8	Photomicrograph showing coral fragment and calcareous sponge in beach rock	154
V.9	Photomicrograph of sea cucumber grain in miliolite showing its pentagonal shape. Also note the moulds of molluscan shell fragments infilled with sparite	155
V.10	Photomicrogrqaph showing peloids in miliolite	157
V.11	Photomicrograph of an intraclast in millioliite	159
V.12a	Photomicrograph of a marine ooid in miliolite showing pseudouniaxial figure marked by extinction cross	161
V.12b	Photomicrgraph of a marine ooid in miliolite (with gypsum plate) showing preferential dissolution of aragonitic cortices	161
V.13a	Photomicrography of vadoid in miliolite showing incompleete growth of cortices with downward thickening	162
V.13b	Photomicrograph (with mica plate) of a typical multicortical vadoid with quartz nucleaous in miliolite	162
V.14	Photomicrographs of various types of cements in Quaternary carbonate rocks of Saurashtra	(167 - 168)
V.14 a	Meniscus cement (m) between various allochems in miliolite (with gypsum plate)	
V.14 b	Dripstone (a) and drapstone (b) cement growth on a single grain in miliolite	
V.14 c	Dog-toothspar cement (d) on a foraminiferal test in miliolite	

- V.14 d Syntaxial overgrowth (og) on a bioclast in miliolite. Also note the presence of dog-toothspar cement (d) and Vadose silt (st)
- V.14 e Isopachous drusy rim cement (dr) with first generation micritic rim (mr) in miliolite
- V.14 f First generation fibrous rim cement (fr) and second generation blocky pink coloured low Mg non-ferroan sparite (sp) in beach rock (stained)
- V.14 g Blocky void filling cement in miliolite showing increase in crystal size towards the center of void (v)
- V.14 h Blocky void filling cement occluding the voids with calcite crystals in miliolite
- V.15 Photomicrograph (with gypsum plate) showing development of intragranular (secondary) porosity (p) in miliolite 176
- V.16 Photomicrograph showing alternate coarse and fine laminations in miliolite 196
- V.17 SEM Micrographs of Quaternary Carbonate deposits of Saurashtra (212 - 214)
- V.17 a First generation aragonite cement around quartz grain in beach rock
- V.17 b Fibrous Aragonite cement in beach rock
- V.17 c Growth of calcite cement on calcareous substrate in miliolite. Note the absence of cement precipitation on quartz grains
- V.17 d Equant tabular growth of low Mg Calcite cement in miliolite
- V.17 e Single step growth in low Mg calcite cement in miliolite
- V.17 f Foraminiferal tests showing loss of ornamentation with increase in distance of transport from coast (1) to landward area (2 & 3). (1) Somnath, (2) Junagarh and (3) Chotila
- V.17 g Vadoid in miliolite showing downward growth of cortices with increase in calcite crystal size
- V.17 h A cortex of vadoid showing higher frequency of enfacial triple junctions between calcite crystals
- V.17 i Chemical etching on quartz grain from beach rock

V.17 j	Quartz grain from miliolite showing curved faces and polished nature	
V.17 k	Quartz from miliolite showing graded arcs and upturned cleavage plates	
V.17 l	Initial precipitation of calcite cement (c) in stabilised dune sediments	
VI.1	Photomicrograph of fibrous aragonite (a) and high Mg calcite (c) cement in beach rock	224
VI.2	Photomicrograph showing meniscus (m) and drusy rim (dr) cements in miliolite. Note the presence of amorphous iron oxide in a void	224
VI.3	Photomicrograph showing vadose silt (st) in miliolite	225
VI.4	Photomicrograph showing tangential section of multicortical vadoid in miliolite	227
VI.5	Photomicrograph showing unicortical vadoids in miliolite	227
VI.6	Photomicrograph showing point contact between grains and floating texture in miliolite	230
VI.7	Photomicrograph showing tangential contact between bioclasts in miliolite	232
VI.8	Photomicrograph showing orientation of molluscan shell fragments in miliolite	232
VI.9	Photomicrograph (with mica plate) showing breakage of molluscan shell fragment in miliolite	233
VI.10	Photomicrograph showing dissolution of aragonitic gastropod shell and initial precipitation of sparry calcite cement	237
VI.11	Photomicrograph showing alternate 'donour' (d) and 'accepter' (a) layers in miliolite	239
VI.12	X-Radiographs of miliolite slabs showing alternate 'donor' (d) and 'accepter' (a) layers	240
VI.13	Photomicrograph showing preservation of initial cement morphology in recrystallised miliolite	244



COASTAL CLIFF OF MILIOLITE AT GOPNATH

LIST OF LOCALITIES REFERRED IN THE TEXT

Sr. No.	Ref. No.	Locality	Sr. No.	Ref. No.	Locality	Sr. No.	Ref. No.	Locality	Sr. No.	Ref. No.	Locality
1.	B3	Adityana	41.	E1	Dhokadva	81.	C3	Khagesri	121.	C3	Maliyadhar
2.	D1	Aheadpur	42.	D1	Diu	82.	B4	Khaabhaliya (Jam)	122.	C3	Nava Dhiniya
3.	B3	Awardad	43.	E2	Diwasa	83.	C4	Khandar	123.	A3	Navadra
4.	F2	Amba	44.	B3	Doballiya Talav	84.	A3	Khara Khatar	124.	B2	Navibandar
5.	D2	Anandpur	45.	D1	Dolasa	85.	C3	Khatiya	125.	E1	Nawa Bandar
6.	A4	Aniyali	46.	D2	Dungarpur	86.	C4	Khengarpur	126.	D4	Nikava
7.	C1	Arena	47.	A4	Dwarka	87.	B3	Khirsara	127.	D4	Myari
8.	D2	Avtadia	48.	C1	Gadu	88.	B1	Kotada	128.	A3	Okhamadhi
9.	C1	Badalpur	49.	A3	Gaji Nes	89.	D1	Kodinar	129.	D4	Paddhari
10.	E1	Balana	50.	C4	Gala	90.	C1	Kukaswada	130.	C1	Pankuwa
11.	E4	Bamanbor	51.	D1	Gangetha	91.	B3	Kunchhadi	131.	B3	Pansara
12.	A4	Baradia	52.	D1	Ghantiya	92.	A3	Kuranga	132.	B2	Pata
13.	B3	Bhanvad	53.	D1	Ghatwad	93.	C3	Kutiya	133.	C3	Patan
14.	A3	Bhavpura	54.	A3	Ghutwad Creek	94.	E4	Kuwadava	134.	C3	Patanvav
15.	B3	Bhenakwada	55.	D1	Ghumli	95.	C4	Lalpur	135.	F2	Palitana
16.	E4	Bherana	56.	D3	Gondal	96.	A3	Lamba	136.	D1	Pedhwada
17.	A3	Bhogat	57.	B3	Gop (Jam)	97.	C2	Lohej	137.	D4	Pipaliya
18.	D2	Bilkha	58.	B2	Gopnath	98.	B2	Madhavpur	138.	C4	Piparda
19.	C4	Carana	59.	B2	Gosa-Navagam	99.	B1	Madhuvan	139.	F2	Piparla
20.	A3	Chachlana	60.	C2	Gorinja	100.	E4	Nahid	140.	B3	Porbandar
21.	B3	Chamardi	61.	B2	Gorsar	101.	F1	Mahuva	141.	F1	Port Victor
22.	C4	Chandergam	62.	B3	Haji Mastan	102.	A4	Makanpur	142.	D1	Prachi
23.	A3	Chandrawada	63.	A3	Harshad	103.	C1	Maktupur	143.	D4	Rajkot
24.	D1	Chhachar	64.	A3	Inaj	104.	D1	Malada	144.	B2	Rajpura
25.	D1	Chhara	65.	C3	Jam Jodhpur	105.	D2	Mandarpur	(Nawa/Juna)		
26.	C3	Chhatar	66.	C4	Jamnagar	106.	B4	Mantha	145.	E1	Rajula
27.	E4	Chichod	67.	D1	Jamvala	107.	C1	Mangrol	146.	C3	Rakka
28.	E4	Chobari	68.	E1	Jafrabad	108.	D1	Masania	147.	F3	Ramdhari
29.	C3	Chorbadi	69.	F1	Jegri Island	109.	C2	Mendarda	148.	B3	Ramgarh
30.	C1	Chorwad	70.	D3	Jetpur	110.	B1	Methia	149.	D4	Raepura
31.	E4	Chotila	71.	B2	Jhanjheer	111.	A3	Miyani	150.	D1	Ranaj
32.	D4	Dadli	72.	D2	Junagarh	112.	B4	Nitli	151.	B3	Ranawao
33.	C3	Daduka	73.	C1	Kadwar	113.	D1	Hodiyan-Vedhvala	152.	B3	Ranpur
34.	B4	Daltungi	74.	C4	Kalavard	114.	C4	Hodpur	153.	A3	Ratadi
35.	B3	Degam	75.	F1	Kalsar	115.	C1	Moraj	154.	B3	Ratanpur
36.	E1	Delvada	76.	A3	Kalyanpur	116.	C4	Moti Bhalsan	155.	B3	Retal Kalavad
37.	D1	Desar	77.	B3	Kantela	117.	C4	Muchharda	156.	B4	Revaniya
38.	C3	Devda	78.	B4	Kanviridi	118.	D1	Mul Dwarka	157.	D4	Rojhia
39.	D4	Devgam	79.	B4	Karana	119.	C4	Murali	158.	B3	Sakpur
40.	C3	Dhank	80.	C4	Khad Khaabhaliya	120.	F1	Naip	159.	E4	Sanosara
									160.	D1	Sarakhadi
									161.	D1	Sasan Gir
									162.	B3	Satviridi
									163.	A3	Savni
									164.	E2	Shapur
									165.	C2	Shil
									166.	B3	Sihor
									167.	B4	Sihan
									168.	B3	Sijar Nes
									169.	C1	Somnath
									170.	B3	Supasi
									171.	B3	Supiya Nes
									172.	D4	Surpaded
									173.	D4	Suryavadar
									174.	D1	Sutrapada
									175.	D1	Talala
									176.	B2	Talasa
									177.	C3	Tapkeshwar
									178.	B4	Tarapur
									179.	B3	Tarsai
									180.	B2	Tukda
									181.	D2	Umarla
									182.	C1	Umrethi
									183.	E1	Una
									184.	C3	Upleta
									185.	E1	Vadhara
									186.	A3	Vadi Dhar
									187.	C3	VAdnagar
									188.	F1	Vaghnagar
									189.	C4	Vaniyagam
									190.	A4	Varwala
									191.	B4	Vasai
									192.	B3	Verad
									193.	C1	Veraval
									194.	C4	Virakhi Dam
									195.	A3	Virpur
									196.	C3	Walotra
									197.	E4	Wankaner
									198.	B3	Wansjalia
									199.	C4	Wegadiya

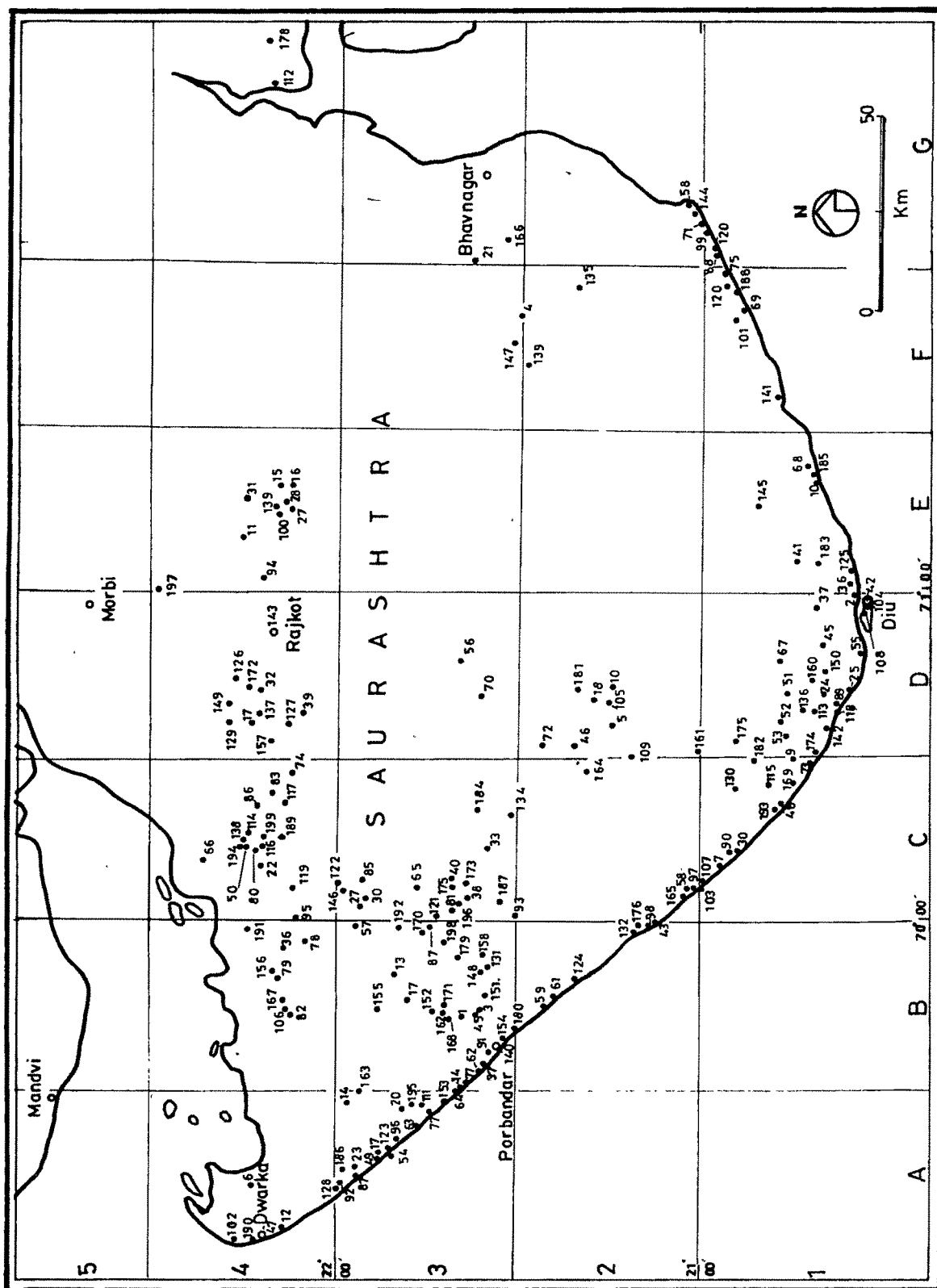


FIG. A. LOCALITIES REFERRED IN THE TEXT