CHAPTER III
LINEAMENT ANALYSIS

LINEAMENT ANALYSIS

INTRODUCTION

The construction of lineament map has assumed to be of considerable significance in evaluating the geomorphological and tectonic evolution of continental area (Badgley, 1962). The lineament maps can be prepared from satellite imageries, aerial photographs and topographic sheets. But the accuracy of the maps is dependent upon the scale, lithology and structural characteristics of the terrain under study.

In understanding the Quaternary tectonic movements an attempt has been made to reconstruct landscape evolution of the area between Bhatya creek and Vijaydurg creek.

The evolution of the Deccan volcanic landforms has commenced during the upper cretaceous to early Miocene time with the eruption of the basalt which was also experiencing tectonic movements. (Radhakrishna, 1967) The drainage was then initiated in the form of consequent streams flowing along the initial regional slope and later development into the dendritic network with deformation of a series of insequent streams, the region further undergoing the climatic changes.

Regional lineament analysis of the western part of the Deccan volcanic province shows the presence of NW-SE and NE-SW shear fractures and EW, NS trending extension fractures (Powar, et. al. 1978). These are developed due to NS compression stresses related to the northward translation of the Indian Subplate; whereas later developed vertical horsting, following the impingement of the Indian subplate with Eurasion plate. This was followed by the isostatic readjustment of the Indian Peninsula imparting cymatogenic uplift. (Nair, 1987) From the lineament analysis, based on LANDSAT-1 imageries, Powar and Patil (1980) have suggested that the drainage of the Deccan Volcanic province has been controlled by structural features.

The earlier work on the West Coast of India relates to the tectonics and its tectonic evolution, neo-tectonics and geomorphological characteristics that have been studied in detail by various workers mainly; Powar and Patil (1980), Rao and Subramanian (1983), Sawant (1985), Varadarajan and Ganju (1986), Merh (1987), Aruchami, et. al. (1992).

The area under study is referred to as `Konkan´, which is a type of littoral low-land that experiences alternating humid tropical climatic conditions. It is developed on a lithologically uniform terrain represented by Deccan Trap basalts. Konkan is evolved from the marginal swell of the passive continental margin of the western India and is developed due to recession of the Western ghat escarpments since the Miocene time (Powar, 1981). Several morphodynamic cycles therefore, can be reconstructed. In addition eustatic sea-level changes accompanied by cymatogenic movements bring about rejuvenation of major rivers and steepening of both the longitudinal and cross-valley profiles alongwith the ghat region.

Taking into consideration sequence of evolution of the Konkan, lineament analysis has been carried out to understand the tectonic setup of the area. For the purpose of study, the topographic sheets on a scale 1:50,000 and LANDSAT-1 imageries on a scale 1:2,50,000 have been used. In the present analysis, defination of lineament, proposed by O´Leary, et. al. (1976) has been accepted. They have defined lineament as "a mappable, simple or composite feature of surface, whose parts are aligned in a rectilinear relationship and which differs distinctly from the patterns of adjacent features, presumably reflects a subsurface phenomenon. Keeping this definition in mind, the lineament analysis of the area, the results obtained therefrom has been discussed in the following paragraphs.

The data obtained from lineament analysis (Table No.3.1) with the help of the topographic sheets has been presented by way of rosette diagrams which show three major directions. (Fig.3.1) The maxima N 50^{o} E with 8.02 number percentage and 59.76 in terms of length frequency percentage, while sub-maxima lies in N 10^{o} E direction with 55.75 percent in terms of length frequency. Such a pattern, however, reveals a diffused pattern of orientation of lineaments indicating their presence practically in all the directions. The reason for such a pattern can be ascribed possibly due to

Table 3.1 : Data for lineaments observed on topographic sheets and satellite imagery

N : Number ; L : Length in km.

Azimuth Range	Topographic Sheets N	N %	L	L %	Satellite Imagery N	N %	L	L %
270-279	56	3.87	32.00	4.32	4	0.96	1.8	0.89
280-289	50	3.46	29.20	3.94	4	0.96	2.0	0.99
290-299	60	4.15	33.30	4.49	12	2.87	4.50	2.22
300-309	65	4.50	32.30	4.36	14	3.34	4.35	2.15
310-319	72	4.98	39.00	5.26	55	13.16	23.50	11.60
320-329	73	5.05	38.40	5.18	35	8.37	12.00	5.92
330-339	107	7.39	52.80	7.13	10	2.39	5.60	2.76
340-349	75	5.19	39.45	5.32	17	4.07	10.40	5.63
350-359	75	5.19	37.35	5.04	11	2.63	5.60	2.76
0 - 9	109	7.53	55.80	7.53	34	8.14	15.10	7.45
10 - 19	74	5.12	35.80	4.83	33	7.89	12.50	6.17
20 - 29	97	6.71	50.60	6.83	28	6.70	16.80	8.29
30 - 39	97	6.71	46.11	6.22	55	13.16	32.20	15.89
40 - 49	85	5.88	43.42	5.86	43	10.29	22.00	10.86
50 - 59	116	8.02	59.78	8.06	30	7.18	14.40	7.11
60 - 69	82	5.67	45.18	6.09	22	5.26	12.80	6.32
70 - 79	75	5.19	38.65	5.21	5	1.20	3.05	1.51
80 - 89	78	5.39	32.15	4.34	6	1.44	3.00	1.48
Total	1446		741.29		418		202.60	

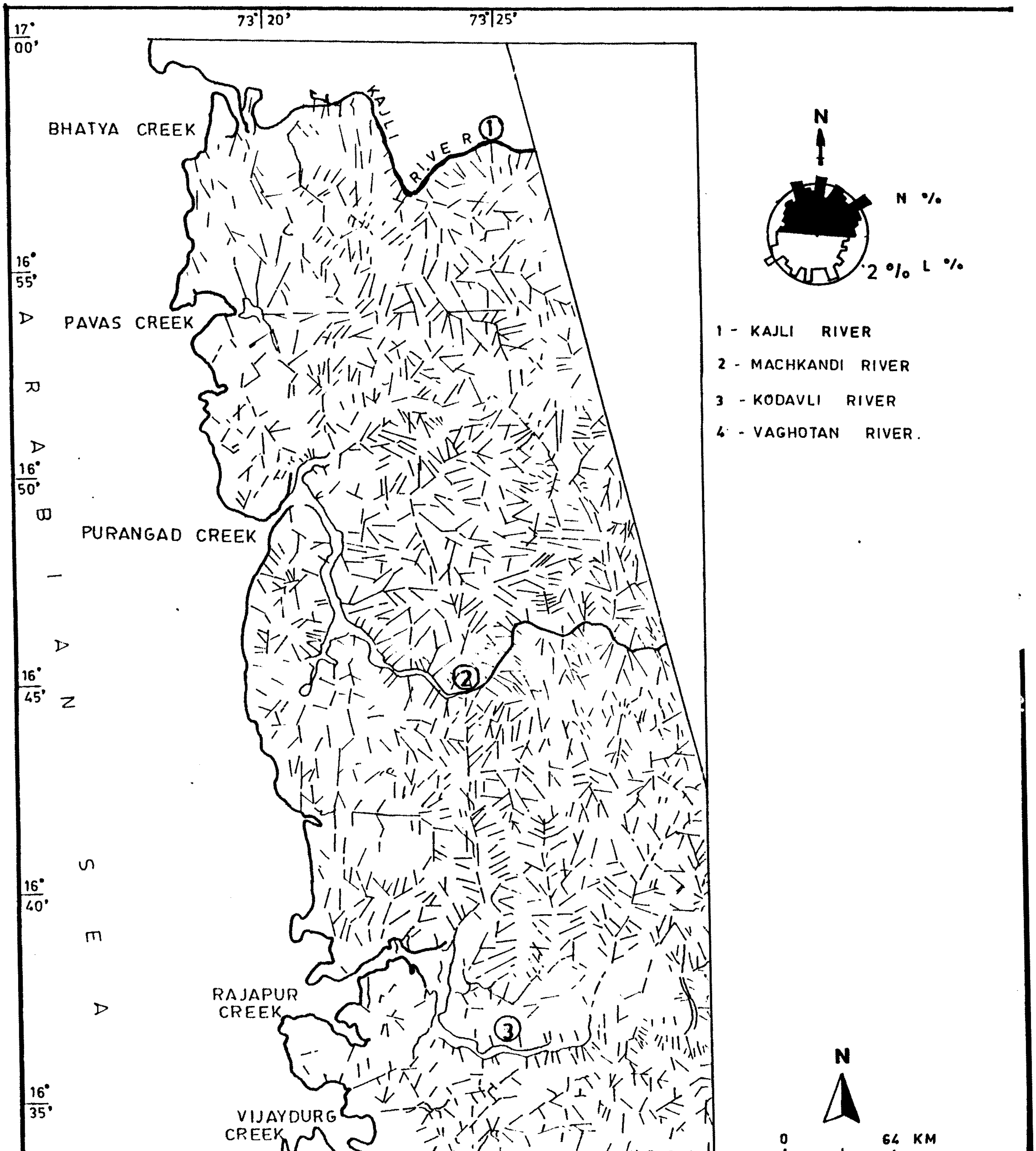

FIG 3.1 : LINEAMENT MAP BASED ON THE TOPOGRAPHICAL SHEET OF THE BHATYA - VIJAYDURG AREA.

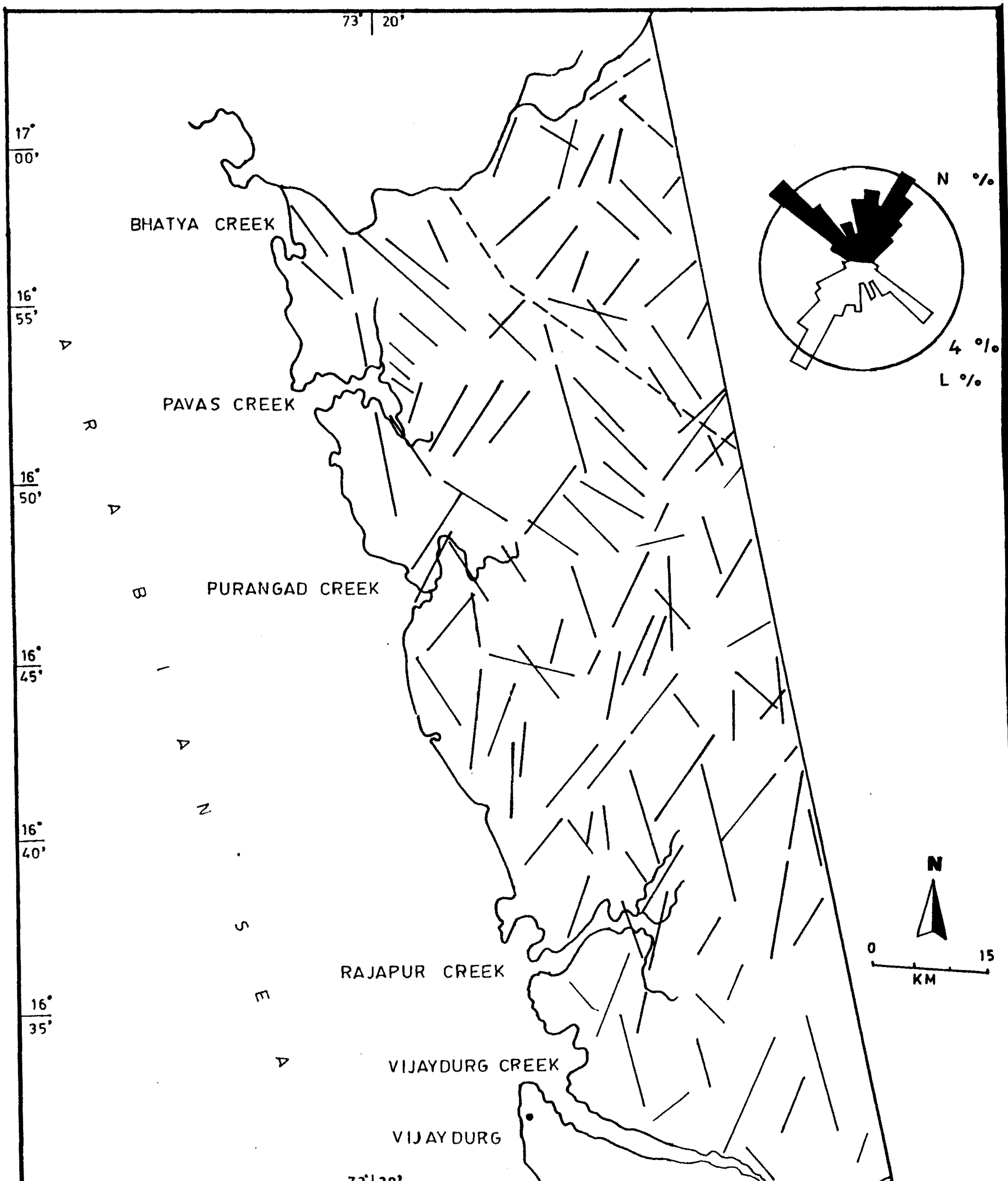

FIG. 3.2 : LINEAMENT MAP, BASED ON THE LANDSAT - I IMAGERIES OF THE BHATYA - VIJAYDURG AREA.

inclusion of linear stream segments of the lower order and which may not necessarily be structurally controlled.

Lineament analysis of the area has also been carried out with the help of LANDSAT-1 imageries. LANDSTAT imageries of the coastal tract, therefore have been studied to examine distributicn pattern of lineaments, present in the area. The rosette diagrams have been prepared and presented in (Fig. 3.2). The number and length frequencies alongwith the number percentage and length percentage in the azimuth range of 10° interval have been presented in Table 3.1. It can be observed that the maxima lies in N 50° E direction with 10.29% and 22.00% in terms of number and length percentages whereas, the submaxima lies between N 40° W with number 13.16 and length 23.50 percentages.

DISCUSSION

From the preceding paragraphs, structural characters of the area can be deciphered. Lineament analysis with the help of topographic sheets and satellite imageries can bring out a comprehensive picture of this aspect.

It is observed that rosettes from topographic sheets do not reveal any clear picture about the structural characters. The reason for the same can be ascribed possibly due to the inclusion of linear stream segments of the lower order and which may not necessarily be structurally controlled.

The rosettes of lineament pattern from satellite imageries more or less correspond with the maxima and submaxima of those obtained from topographic sheets, suggesting the directions of major structural elements, as the lineaments are considered as planes of weakness. Satellite imagery reveals that major streams like Kajali has been controlled by NW-SE lineament, while river Vaghotan has been controlled by NE-SW trending lineament.

The fracture pattern N50° E direction can be said to represent the conjugate pairs of shear fractures. It can be observed very well that the river Kajali has been controlled by Weste other direction in general i.e. N 10° E, could be the trend of the West Coast of India resulted due to the West Coast faulting. (Powar et. al., 1978, Powar, 1981).

From the analysis of topographic sheets and satellite imageries, two major directions viz; N 10° E and N 50° E appear to be major directions of structural weakness and therefore represent the conjugate pair of shear fractures. Of these N10° E direction matches closely well with the Precambrian trend in the southern Indian Peninsula, while N 50° E with that of the trend of basement rocks. Thus, the lineament analysis of the area matches closely with the major regional structural trends.