GEOMORPHIC EVOLUTION OF LIK RIVER, SOUTH OF POKARAN, RAJASTHAN

ANAND-PRAKASH

Birbal Sahni Institute of Palaeobotany, Lucknow

ABSTRACT

The paper deals with the geomorphic evolution of Lik river south of Pokaran. It is suggested that the crescent shaped lakes occurring near Bhaniana, Puniyan Ki Dhani and Dantal have developed due to the formation of sand dunes across the stream and represent parts of the Lik river channel.

INTRODUCTION

Lik river forms an important drainage in a flat sand dune area south of Pokaran. Its continuous channel is seen a few kilometers from Phalsund south of Bijli ki Dhani, (26° 20′ : 71° 55′) running almost in north-south direction and meets the Luni river near Balotra (Map-1). The channel ends abruptly at Bijli ki Dhani and the area in the north is traversed by the sand dunes. Towards upstream, a number of crescent shaped lakes are located near Dantal (26° 32′ : 71° 55′), Puniyan ki Dhani (26° 39′ : 71° 47′) and Bhaniyana (26° 37′ : 71° 51′). The area north of Bhaniana up to Pokaran is characterised by flat erosional surface mainly covered by gravel and dune sands.

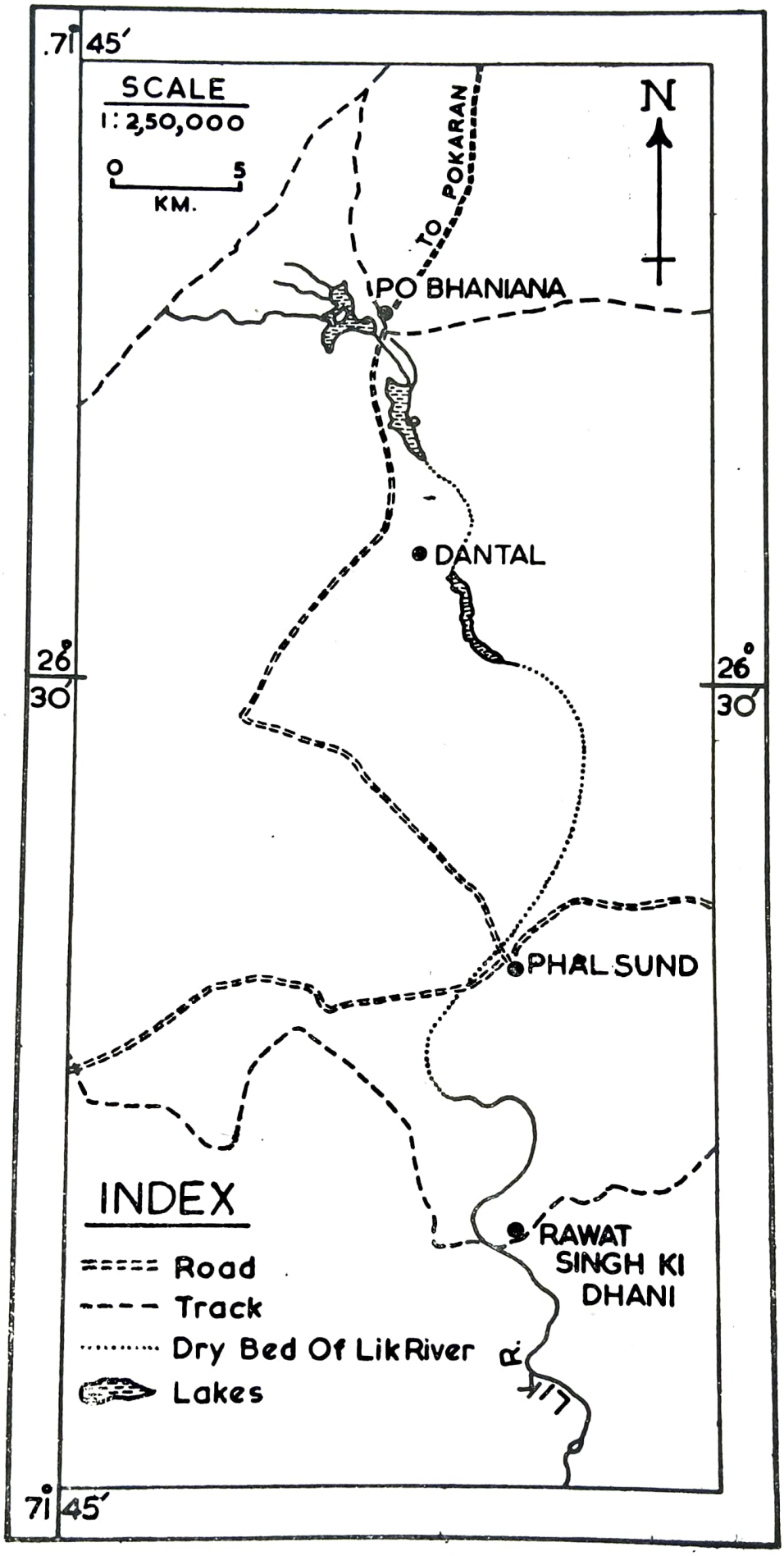
A geomorphological study of the arid regions of Rajashtan is important in order to understand the work of various agencies and processes responsible for the final shaping of the region. Besides this, a knowledge of the distribution, development, behaviour, and the evolutionary history of the present day landforms is essential for the better understanding of the varied problems of a desert. So far, little is known regarding the geomorphology of various arid regions of Rajasthan. Ghosh *et al.* (1966) have studied the geomorphology of the Central Luni Basin. Allchin and Goudie (1971) and Goudie *et al.* (1973) have studied the various aspects of the Indian sand desert. Ghosh (1964) described the geomorphology and the origin of salt in the salt basins of western Rajasthan. Allchin *et al.* (1978) have described the prehistory and palaeogeography of the Rajasthan desert. However, these studies are mostly regional and general in approach. Apart from the regional studies, detailed accounts of the smaller geomorphic units are also required, to understand the origin and development of the Rajasthan desert. Since, drainage channels form an important aspect of a desert, the detailed study of Lik river channel has been taken up for the present communication which includes the results of the field work carried out during the excursions of 1978-79.

GEOMORPHOLOGY

The following important landforms were observed in the area :

(1) Flat erosional surface
(2) Sand dunes
(3) Crescentic lakes
(4) Small streams
(5) Lik river channel

Geophytology, **10** (1) : 58-61, 1980.



Map 1—Location map showing the lakes and Lik river channel.

1. *Flat erosional surface*

This is a prominent geomorphic feature of the area over which almost all the smaller landforms have developed. It is regionally distributed and characterised by a flat, very gently sloping surface covered by the gravel and sand dunes. The gravel is coated with red iron oxide and forms the typical desert varnish. The surface is almost completely devoid of drainage channels, except near Bhaniana where a few small streams have been observed.

2. *Sand dunes*

The sand dunes are distributed all over the surface. Mostly, the dunes are of Barchan type forming small mounds. At places, the dunes have attained considerable prominence as they reach up to 20 m in height and are also somewhat stabilized. Near Bhaniana, Puniyan ki Dhani and Dantal these dunes have been observed obstructing the stream channels resulting into the development of the lakes. In general the dunes are aligned NE-SW.

3. *Crescentic lakes*

Three such lakes are observed in the area which are named after the local villages, Bhaniana, Puniyan ki Dhani and Dantal. These are semicircular lakes closely comparable with the meanders of a river as the shape is also characterised by the tapering margins and broad central area. The thick pile of sand dunes is seen developed along the margins of the lakes. These lakes are also the source of fresh water in the area.

4. *Small streams*

Number of small streams are seen near Bhaniana coming mostly from north and northwest. At this place they seem to be converging to form a prominent channel. Near the point of confluence the streams are blocked by the formation of a high sand dune area resulting into the development of a lake. Towards upstream the channels can be traced up to two to three kilometers. The down stream side is marked by the occurrence of a wet channel area mostly occupied by the sedges up to some distance. This water soaked bed could be observed clearly up to Dantal. Beyond Dantal towards Phalsund, it can be traced by the occurrence of coarse gritty channel sands in the bed. Near Puniyan ki Dhani and Dantal again the channel has been obstructed by the sand dunes resulting into the formation of lakes.

5. *Lik river channel*

South of Phalsund the channel becomes broader and is almost completely dry, filled with sand, but it is a significant feature as the channel can be traced running in NS direction up to a considerable distance, and is also the only prominent drainage in the area.

The nature of the channel is almost straight with high embankments mainly covered by the sand dunes.

DISCUSSION

The geomorphic history of the area starts with the development of erosional surface over which almost every landform in question has been carved out. This erosional surface seems to be the equivalent of the II erosional surface described by the ANAND-PRAKASH (1980) from the Jaisalmer area. Therefore, it seems that after the uplift of the peneplained surface in

the form of a very gently sloping plain, the area had been dissected by a number of streams resulting into the development of a well organized drainage system of Lik river possibly during the Pleistocene times. This entire system maintained its southerly course as the Lik forms a tributary of Luni. Later the commencement of desertic conditions started disturbing this system. As the rainfall became lesser and lesser the run off in the channels became inadequate to transport the sediments down stream and to maintain its channel. Moreover, due to the increased supply of sediments by the aeolian activity the streams could not adjust with the conditions and maintain their nature. A further advancement in the arid conditions resulted in the formation of sand dunes coupled with excessive evaporation. At this stage water started flowing subterraneanly leaving the sediments to be transported mainly through the agency of wind. Under these conditions the run off could take place in the streams only occasionally during torrential rains and the drainage became almost completely disorganized. The development of the sand dunes across the Lik channel obstructed the flow of water in the bed and formed lakes at places. Subsequently, the minor streams were buried under the drifting sand and only the prominent channels remained on the surface. In Pokaran area now, only the drainage of Lik river can be traced in patches, from Bhaniana towards south up to Phalsund through the lakes of Puniyan ki Dhani and Dantal. Therefore, it is concluded that these lakes represent the meanders of Lik river which has been choked by the dunes mainly towards the upstream side, as a broad continuous channel though dry is still present south of Phalsund. Thus, the natural damming of the stream by the dunes near its head has almost completely restricted the water from flowing down stream leaving only the dry bed which is in the process of being consistently filled with the sand.

The above developments seem to be of recent origin as the traces of the channel are still seen on the surface. A careful study of the nature of the channel can possibly be of great help in solving the water problem of the area as the dry river beds mostly contain enough water below the surface at shallow depth.

It has also been noticed that at most of the places the underground water is brackish in nature, suggesting the development of closed conditions below the surface without any outlet which also helped in increasing the concentration of the salts. Under these conditions if the water is taken out from the subsurface and utilized it may become less concentrated in salts and turn useful in future.

ACKNOWLEDGEMENT

I am thankful to Dr. D. C. Bharadwaj, Birbal Sahni Institute of Palaeobotany, Lucknow for helpful suggestions.

REFERENCES

ALLCHIN, B. & GOUDIE, A. S. (1971). Dunes aridity and early man in Gujarat, Western India. *Man* **6**(2) : 248-265.

ALLCHIN, B., GOUDIE, A. S. & HEGDE, K. (1978). *The Prehistory and palaeogeography of the Great Indian Desert.* Academic Press, London: 1-370.

ANAND-PRAKASH (1980). A study of landforms near Jaisalmer, Rajasthan. *Geophytology* **10**(1) : 37-44.

GHOSH, B. (1964) Geomorphological aspects of the formations of salt basins in western Rajasthan. *Proc. Sym. on Problems of Indian Arid Zone* : 79-83.

GHOSH, B., PANDEY, S. & LAL, G. (1966). Geomorphology of Central Luni Basin, Western Rajasthan. *Annals of Arid Zone* **5**(1) : 9-25.

GOUDIE, A. S., ALLCHIN, B. & HEGDE, K. T. M. (1973). The former extensions of the great Indian sand desert. *Geogr. Jl.* **139** (2) 243-257.