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MORPHOMETRIC ANALYSIS OF YAGACHI RIVER BASIN, KARNATAKA, INDIA

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ABSTRACT : The Yagachi river is a sub-basin of river Hemavathy with an areal extent of 1463 sq. Kms. The study area lies between Lat. 12°50' to 13°25' and Long. 75°35' to 76°10'. The river originates in Bababudan hill ranges of Western Ghats. Quantitative geomorphology of the basin has been investigated. The study reveals that it is a mature basin and follws all the morphometric laws.

INTRODUCTION :

The river Yagachi is a tributary of Hemavathy, which is a sub-basin of Cauvery. The study basin lies between Long. 75°35' to 76°10' and Lat. 12°50' to 13°25'. The areal extent of the basin is 1463 sq. Kms. The Yagachi river takes its birth in the hilly terrains of Western Ghats viz., Bababudan hill ranges in Chikmagalur district. It drains through parts of Chikmagalur and plains of Hassan district and confluences river Hemavathy near Gorur. The study highlights the geomorphic characters of Yagachi river basin. The various analyses were carried out with 1:50 000 and 1:250 000 scale topographic sheets.

MORPHOMETRIC ANALYSIS :

The study area is characterised by highly undulating topography on NW flank, followed by plain terrain on SE parts. The highest elevation of 1733 m. is noticed along the bababudan hill ranges on the Northwestern margin of the basin. The lowest elevation of 850 mtrs. is noticed near Gorur. The overall slope of the basin is in Southeasterly direction, with a secondary slope towards the mouth of the river.

The drainage pattern of a basin is the true reflection of original slope and structure or due to subsequent events by which the surface has been modffied by uplifting, faulting, warping etc. The drainage patterns may be product of a single or several of these factors. The drainage patterns seen in Yagachi basin (Fig. 1) are dendritic, trellis, rectangular and parallel, which are common in hardrock terrains.

In dendritic pattern, irregular branching of tributary in all directions and angles are seen and they join main stream. These are developed in flat plains, plateau or in massive crystalline rocks, which are common in the study basin.

The trellis drainage pattern is due to the presence of secondary tributaries parallel to master stream or other streams to which the tributaries enter. Secondary tributaries are usually elongated and approximately at right angles to the stream into which they flow. Trellis type of drainage pattern is usually aligned along strike of rock formation and is structurally controlled. This type is seen in and around Alur.

In rectangular drainage pattern wherein both main stream and tributaries display right angle bends reflecting the control exherted by faults

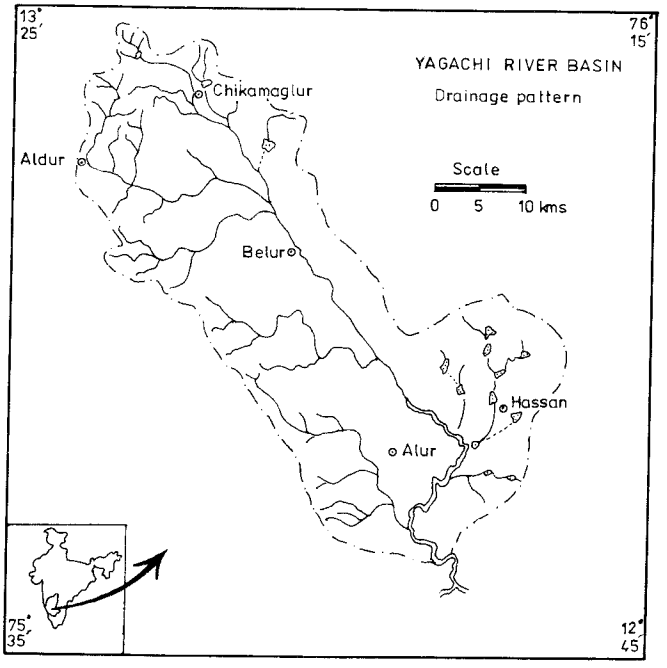


Fig. No. 1 : Yagachi River Basin - Drainage Pattern

or joins and no perfect parallelism of side streams seen. Such pattern is seen near Aldur & Belur.

Parallel type of drainage pattern is seen in areas where pronounced slope or structural control is seen, leading to regular spacing of parallel or near parallel streams. This type is seen between Yagachi and Hemavathy rivers.

The Yagachi river is a 4th order stream and exhibits geometrical features following the Hortonian laws (Strahaler, 1957). The relation between different morphometric parameters have been investigated and results tabulated in Table : 1.

The bifurcation ratio (R_b) is an index of relief and dissection. The bifurcation ratio (Fig. 2) of the basin is 4.7, a value characteristic of mature basin and also indicates that geological structures have not distorted the drainage pattern. The length ratio (Fig. 3) of the basin R_l = 5.2 and the area ratio (Fig. 4) R_a - 3.4.

Table 1

Morphometric Parameters of Yagachi River Basin

Stream order 'U'	Total No. of Segment 'N_u'	Bifurcation Ratio R_b	Mean Length of Segment L_u in kms.	Length Ratio 'R_l'	Mean area A_u in km^2	Area Ratio R_a
1	47	3.92	3.91	3.53	6.63	9.64
2	12	4.00	9.90	1.75	57.31	3.59
3	3	3.00	10.42	3.12	162.50	7.57
4	1		51.25		1487.50	

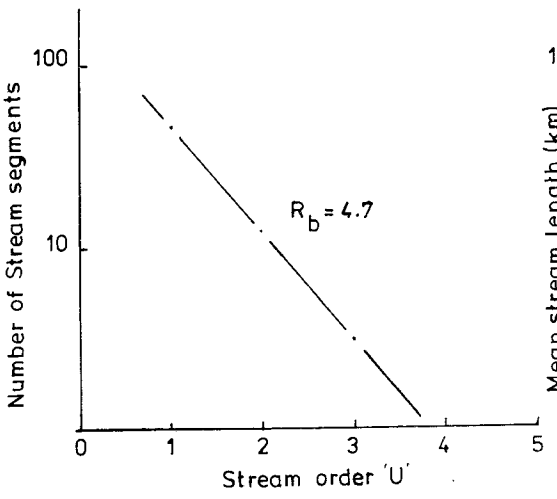
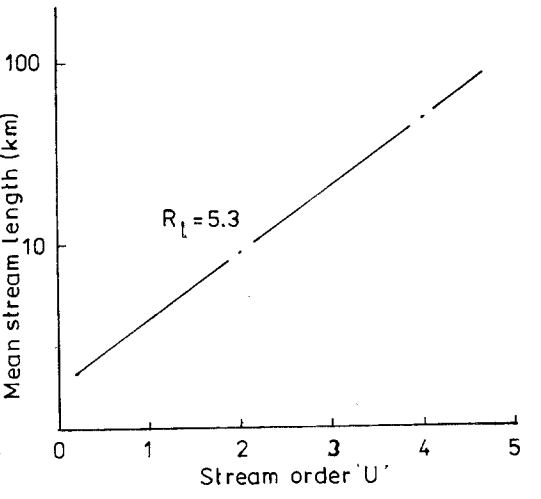


Fig. No. : 2



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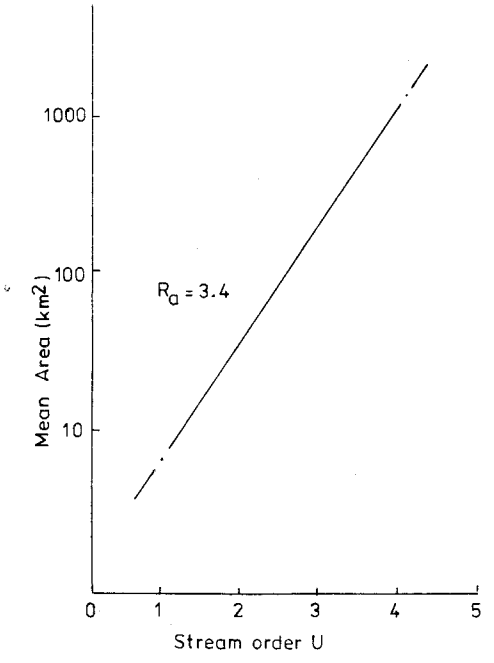

Fig. No. : 4

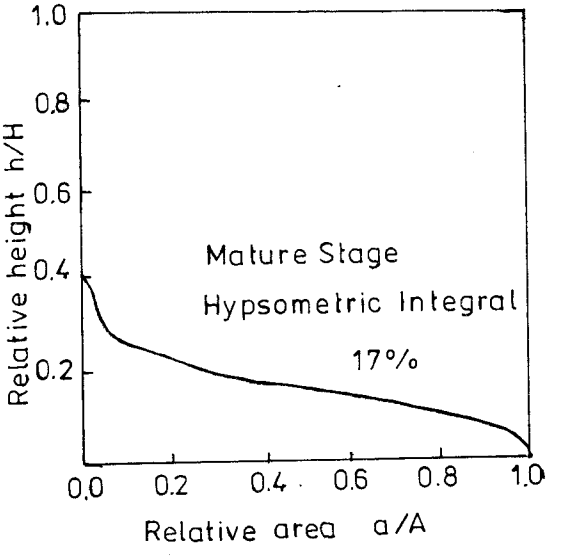

Fig. No. : 5

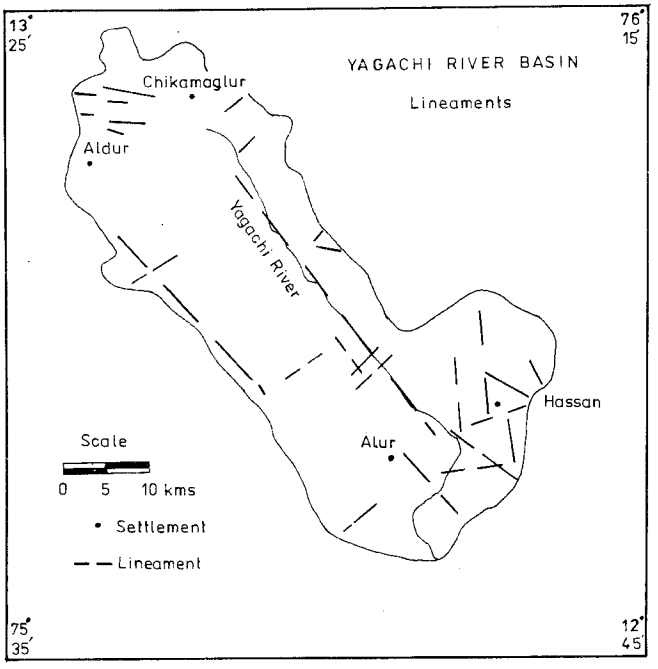

Fig. No. 6 : Yagachi River Basin - Lineaments

The drainage density within a basin is usually independent of stream order and varies inversly with size of the basin. The drainage density is 0.26 Kms/sq. kms., which classifies the basin as very coarse texture (<1.25 Kms/ sq. Kms. Singh 1967). The low value of the drainage density is mainly due to the presence of hard resistant lithology, such as granites, migmatites and gneisses in the study basin. The circularity ratio is 0.54 and elongation ratio is 0.84, indicate that the sub-basin is moderately compact and elongated. The relief is high to moderate and the drainage system is structurally controlled. The hypsometric curve for the basin (Fig. 5) indicates that the basin is mature, the hypsometric integral being 17%. The slope analysis has been carriedout by Smith's method wherein major slope is seen in Southeasterly direction. The high slope areas are confined to Western Ghat region, Where relief is controlled Western Ghat tectonism.

The satellite imageries give a synoptic view of large areas. It helps in delineating structural features, vegetation, lithological units etc. The

Table 2

Salient Features of Yagachi River Basin

1.	Maximum length	70 kms
2.	Maximum width	34 kms
3.	Area of the basin	1463 sq kms
4.	Bifurcation Ratio	4.7
5.	Length Ratio	5.2
6.	Area Ratio	3.4
7.	Drainage density	0.26 km/sq kms
8.	Stream frequency	0.05 / sq kms
9.	Circularity ratio	0.54
10.	Elongation ratio	0.84
11.	Hypsometric integral	17 %

Landsat imageries of 1:500,000 scale have been used to pick lineaments and structures in the basin (Fig. 6). Landsat imageries on bands 3, 4, 5 and 6 have been used (Image No. E-1184-04443 & E-1131-04504. The study reveals that lineament controls Yagachi river course. The lineamants show a trend of NE-SW&NW - SE. Some of the lineament zones/intersections are good source of groundwater in the basin (Suresh et al., 1983) And no other structural feature is seen in the basin.

CONSLUSION

Yagachi river is a 4th order stream following all the Hortonian laws. Hypsometric curve indicates that the basin has reached mature stage of drainage development. Basin shows varied type of drainage patterns, which are characterstic of a hand rockterrain. Low drainage density indidcates the area is underlaind by resistant rocks. Satellite imageries reveal that the river course is lineament controlled and zone of lineament intersections are source of groundwater potential.

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