52nd and 53rd kilometers, 62 and 63rd kilometres and 69 and 70th kilometers.

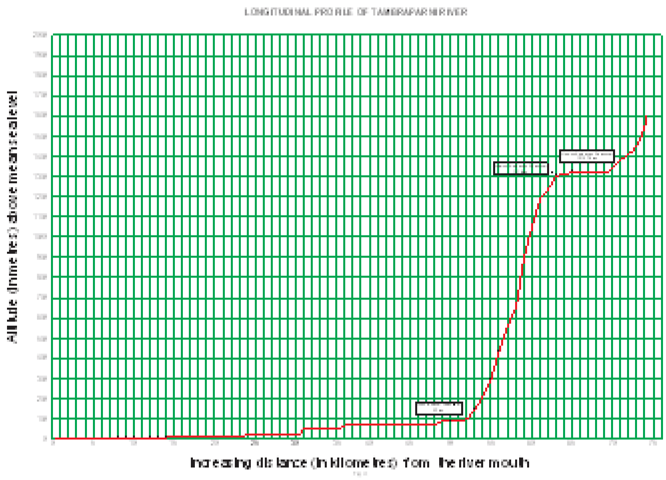

Figure 3: Longitudinal Profile of Tambraparni River

The overall inclination of the stream bed of Tambraparni River over the stretch from the mouth to a distance of 52 km has a mean value of 11˚and that between 52nd to 62 km has a mean value of 65˚ and that between 69 km to the ultimate source has a mean value of 55 degrees. However, between 30 and 31 km from the river mouth there is a break of lesser magnitude, where there is a sudden rise of the channel bed amounting to 30 metres. The four major breaks among the seven breaks noted in the above paragraph are taken into consideration in classifying the river channel into four major reaches (via; lower, middle, upper and highest reaches) as indicated in the Figure 4.

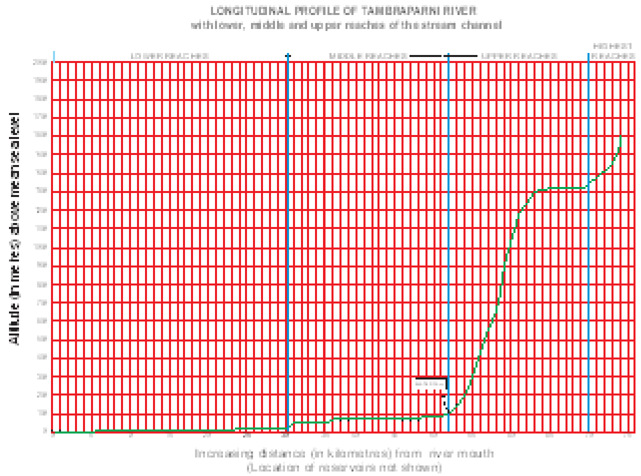

Figure 4: Delineating Reaches of Stream Channel of TRB

There is no indication for the association of structural (faults or major or joints) or lithological features (change of rock type) to account for an explanation for the presence of the break in long profile occurring between 52nd and 62 kilometres. The magnitude of stream erosion in the channel of the Tambraparni River is maximum within the upper reaches between 52 km and 62 km from the river mouth. This observation is made on the basis of the slope of the long profile in the corresponding portion of river channel where there is an aggregate drop in stream channel amounting to 1,150m, over a distance of 10 km. As noted in earlier that this segment of the river channel has an overall inclination of 65˚. The river valley in the corresponding stretch between (52 and 62 kilometres) is therefore characterized by acute V shaped valleys.

The three concrete dams (Pechipparai, Lower Kodayar and Upper Kodayar) built across the river course and located at 90m, 300m and 1320m amsl respectively, act as local base levels and thereby prevent the lowering (deepening) of the river channel upstream from their locations as well as put a stop to the lengthening of the channel downstream.

Drainage networks maintain a connection to base level and that any changes in the base level affects erosion and therefore, in turn affects the gradient of the longitudinal profile of the stream. In this specific case, the presence of 5m waterfall at 53rd km from the river mouth is an unmistakable indication of a knick point there, which is in the process of migrating upstream and this aspect of has been further analysed through satellite imageries and subsequent field checking.

The presence of knickpoints in the long profile is further studied and analysed. These are points where the gradient of the river changes suddenly and can be caused by landforms like waterfalls or lakes, where the lithology of the river changes and differential erosion takes place. the location of a 5m waterfall occurring at the south of Kodayar Kiltangal is also influenced by an abrupt lithological change across the course of Kodayar River. This waterfall is located where the channel enters a region of khondalite from that of charnockite, which favoured the site of the fall.

The study of longitudinal profile enabled the identification and study of other waterfalls falling within TRB and its spatial location through GPS. A careful field study of the location of the famous waterfall at Triparappu, indicated that its location is also controlled by an abrupt lithological change of the country rocks over which the Kodayar River flows. The incision of the river channel is probably facilitated by the border line separating the zone of khondalite from that of the adjoining garnet-biotite-gneiss. When the study is extended towards the northwestern direction beyond the margin of the TRB into the geographic area covered by the neighbouring river basins of Kerala and also towards the southeast of Kanyakumari the geomorphic significance of the distributional pattern of the waterfalls increased and became clearer as these are found aligned along a set of two imaginary parallel straight lines (as shown in the Fig.5).

ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

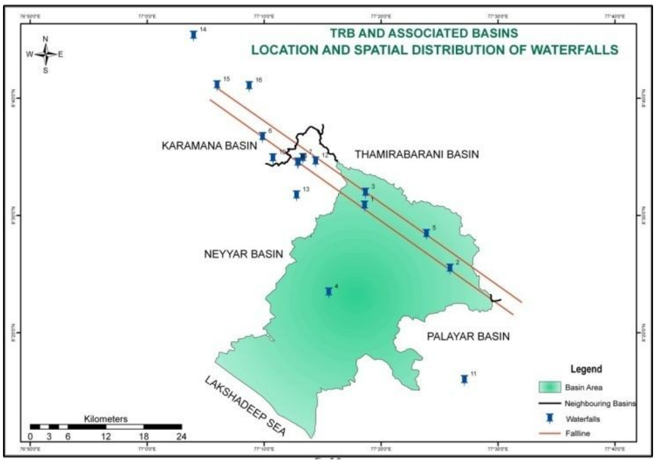

Figure 5: Regional Scale Alignment of Water Falls

Moreover, the trend of these lines is also more or less parallel to the western coast. In geomorphologic literature, the term ‘fall line’ is applied for the imaginary line or the narrow zone connecting the waterfalls on several successive and near-parallel rivers. However, in the present context, the geomorphologic setting required by the definition is not fully satisfied; and therefore, the term *fall line* is not preferred and used (Karthika, 2015). Therefore, it seems that the spatial distribution of knickpoints within TRB and in the neighboring basins should not be considered as a mere coincidence as a local feature, but forms a part of a regional feature having genetic relationship with the associated regional geological structure.

5. Conclusion

The study of longitudinal profile of the master stream of Tambraparni River shows that, except some notable irregularities, the general shape is a smooth, parabolic curve, gently concave to the sky, practically flat at the mouth and steepening towards the source. The major found in the profile helps in the classification of the river channel into lower, middle, upper and highest reaches. A notable irregularity that affected the gradient of the longitudinal profile of the stream has been identified as knickpoint enabling further detailed study in the linear distribution pattern and the genetic relationship of waterfalls in the southern tip of Western Ghats mountain chain.

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