

Joshi and Upreti¹ have not considered published values of Himalayan glaciers and have calculated their dates on the basis of growth rate (without considering the colonization delay), as calculated by Hansen⁶ in a study of the Mittivakkat Glacier on Ammassalik Island, South East Greenland. According to him, the average radial growth of *Rhizocarpon geographicum* is about 12 mm/century or 0.2 mm/yr under optimum conditions in the proglacier valley. The species is rather indifferent as regards the aspect of the rock facets in the study area.

According to Joshi and Upreti¹, the boulders located 1 km away from the terminus of the glacier with lichen thallus diameter ranging between 110 and 120 mm resulted in the calibration of minimum age of exposure of the boulders as 550–600 yrs. According to the values of colonization delay and growth

rate of the two Himalayan glaciers, as the Pindari Glacier is also a part of it, the dates of the lichens measured by them turns out to be:

$$110/0.66 + 72 = 239, \quad 120/0.66 + 72 = 254 \text{ yrs (according to the values of Dokriani Glacier),}$$

$$110/1 + 85 = 195, \quad 120/1 + 85 = 205 \text{ yrs (according to the values of Chorabari Glacier).}$$

Since Pindari is also a south-facing glacier like the Chorabari Glacier, the dates calculated by parameters of the latter appear to be more correct compared to the values for the Dokriani Glacier. This suggests that the boulders of these moraines are the part of second phase of advance and retreat of the Himalayan glaciers.

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Dynamics of Pindari glacier during the last 600 years

A recent publication¹ dealing with the lichenometric study of Pindari glacier suggests that the Pindari glacier has not advanced since the last 600 years. This has been inferred on the basis of growth of lichen *Rhizocarpon geographicum*, along a traverse from Babaji's Kutia up to Zero Point. We have been working on the palaeogeographic reconstruction and glaciogeomorphic evolution of Pindari glacier area since the last three years. Based on our field observations and relationships, we have established the chronology of glaciations in the Pindar valley in time and space². The article suggests the presence of Pindari glacier at the location of Babaji's Kutia around 550–600 yrs BP. On the contrary, our detailed geomorphic studies aided with optically stimulated luminescence and ¹⁴C dates have helped in understanding the dynamics of Pindari glacier in time and space. Our studies show that the Pindari glacier had vacated the Lichenometric traverse

path¹ long ago around 7.0 ka BP. The misidentified moraines of Pindari glacier (referred to as substrate) are in fact much recent reworked glacial till material that has been brought by the debris cones coming out of the tributary hanging valleys.

Lichenometry, no doubt is a good tool for determining the age of morainic deposits³. However, one must have a thorough understanding as to what we are dating! In the present work¹, the geomorphic disposition of the area has not been considered. The authors inadvertently seem to have followed an earlier terminology⁴ and have carried out their studies on reworked glacial till material of the tributary glaciers rather than the moraine of Pindari trunk glacier. The inferences based on such studies are bound to further complicate the issues of Himalayan glacier dynamics.

Our studies² based on the presence of set of recessional moraines in the Pindari

trunk valley further show that the Pindari glacier had advanced during the Little Ice Age (around 400–500 yrs BP). Thereafter, it has been receding at a steady rate.

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