rust spores to supply the needs of their colony, when sufficient pollen was unavailable\textsuperscript{11–13}, whereas in others it was obligate necrophagy\textsuperscript{14}. Although most bees feed on nectar and pollen, the behaviour of \textit{A. dorsata} observed in the present study collecting animal urine to overcome its water and nutritional requirements has not been reported earlier.


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Recession of Milam Glacier, Kumaon Himalaya

Here we report the field evidences observed at Milam glacier, Goriganga basin, Kumaon Himalaya during the glaciological expedition carried out in July 2011 and the observations from Resourcesat-2 LISS IV data. An earlier article\textsuperscript{1} on the recession of the Milam Glacier derived from satellite data had shown the glacier receded laterally by 1328 m from 1954 to 2006. An analysis carried out using the recently launched Resourcesat-2 LISS 4 (5.8 m spatial resolution) data acquired on 30 October 2011 (Figure 1\textit{a}) showed some interesting results. The results are based on satellite data combined with \textit{in situ} expedition carried out in the Goriganga valley. During the field

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{\textit{a}, Resourcesat-2 LISS IV data showing the Milam Glacier and the moraine dammed glacial lake. \textit{b}, Moraine dammed glacial lake encircled by the ice-core moraine. \textit{c}, Present snout of Milam Glacier with the melt water coming out from the cave at the bottom. \textit{d}, Long lateral/medial moraine near Milam village. \textit{e}, Outwash plain and U-shaped valley of Milam Glacier.}
\end{figure}

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studies, we observed that the earlier snout (2006) portion has now become a moraine dammed lake (Figure 1 b) with ice-cored moraines around, and the current snout has receded further back. The field GPS points overlaid on the satellite data confirm this observation. Figure 1 c shows the old snout converted to ice-cored moraine and the active snout in the background. The active snout is located on the right-hand side of the glacier front having an irregular tongue and melt water comes out through the cave located at right side of the tongue (Figure 1 a). The snout is visible as a large, dirty ice-wall covered with debris. The retreat measurements carried out using the latest satellite data show a shift of 120 m from the earlier snout position in 2006 (Figure 1 a). Naming convention of the glaciers in the Himalaya follows a pattern of giving the name of the habitation/village to the glacier which is closest to it. Field evidences shows that earlier Milam Glacier had extended up to Milam village, which is now at a distance of 5 km away from the present snout. The presence of a long lateral/medial moraine of 1 km length near the Milam village (Figure 1 d) confirms the earlier extent of the Milam glacier. The broad, U-shaped valley with many recessional moraines (Figure 1 e) from Milam village to the present snout and the lateral/medial moraine near the Milam village indicate that the glacier remained in this stretch for a long time. The use of satellite data in conjunction with field evidences shows that the Milam Glacier is in a state of continuous retreat since 1906, and the rate of recession has accelerated during the last decade.

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Monitoring ecosystem boundaries in the Himalaya through an ‘eye in the sky’

This correspondence refers to a recent note1 about monitoring alpine treeline in the Western Himalaya and few other recent studies2–4 on the same aspect. Alpine zones in the Himalayas are the highest vegetation zones where seed-bearing plants are found, but tree growth is excluded. Upper and lower boundaries of alpine zones are traditionally set as ‘snowline’ (lowermost limit of permanent snow) and ‘timberline’ (uppermost limit of closed montane forests) respectively. Since alpine ‘treeline’ is the uppermost limit of the trees, it also marks the uppermost end of ‘timberline ecotone’ or forest tundra ecotone5 (transition zone between montane forests and alpine zones), which starts at the timberline at the lower end. Despite the use of the word ‘line’, any natural boundary itself is a transition zone. Treelines are temperature-sensitive zones that are expected to respond to climate warming by advancing beyond their current position6.

Monitoring the shift in such complicated natural boundaries due to climate change (mainly temperature elevation) is possible with the use of ‘an eye in the sky’ (remote sensing satellite) in the inaccessible Himalayan terrain (Figure 1), which has been recently attempted and reported1–4. As the remote-sensing images require interpretations rather than direct visual observations, the results may sometimes vary accordingly.

Singh et al.1 conclude that the treeline has shifted 388 ± 80 m upwards in Uttarakhand Himalaya during 1970–2006. This change is alarming, since from what is known today, treelines have fluctuated much less in the past 10,000 years (< 200 m) than might have been expected from historical climate change, and current treelines are only a little depressed (< 100 m in temperate zone) compared to the post-glacial maximum7. In montane ecosystems it has been projected that a 1°C increase in mean annual temperature will result in a shift in isotherm of about 160 m in elevation8 at a lapse rate of 6°C/1000 m. In India, mean annual temperature showed a warming trend of 0.51°C per 100 years during 1901–2007. During 1971–2007, accelerated warming of 0.2°C per decade was reported9. However, McDowell10 has mentioned a 1°C elevation in average temperature during 1970–2002 in the Himalayas. Considering a 1°C temperature elevation, a maximum shift of 160 m can be expected. But the reported magnitude is more than double, indicating higher temperature elevation in the Himalayas, as also mentioned in the ICIMOD document11. In any case, it indicates a disastrous situation ahead. This upward shift is higher than reported elsewhere in the Himalayas. On the other hand, a third study7, also based on satellite images and toposheets, mentioned the location of ‘timberline’ to be between 3900 and 4000 m in 1960. The present position of treeline (which is always above timberline) is 3542 m (ref. 1), thus suggesting a downward shift of not less than 350 m.

The treeline is a natural boundary responding to climate change but lagging in responses to it, since it involves immobile trees. The upward shift of the treeline requires introduction of seeds from lower altitudes (trees at the uppermost limit hardly produce seeds), germination, establishment and growth to exceed the depth of winter snow cover to reach a critical height (2 m, or more as set by conventions) to be identified as a treeline element. All this cannot happen in a single year in which the growing season is further reduced to 7–8 months at this altitude. Additionally, plants in the cold climate of the alpine zones grow extremely slowly and it may take decades to reach a minimum height of 2 m