



## **Between Pilgrims and Peaks: Tracing the High-Altitude Habitat of Critically Endangered *Herminium pugioniforme* Lindl. ex. Hook.f. (Orchidaceae) from Kedarnath Wildlife Sanctuary, Uttarakhand**

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The Garhwal Himalaya, with its sacred high-altitude shrines, draws countless pilgrims every season. Their journey supports local communities but also put pressure on the region's fragile montane ecosystem<sup>1</sup>. One such shrine is the Tungnath temple, located within the Kedarnath Wildlife Sanctuary in Rudraprayag which experiences a surge of seasonal tourist footfall every year placing considerable anthropogenic pressure on its sensitive alpine landscape<sup>2</sup>. Being a floristically rich hilltop, it provides ideal moist conditions for the growth of variety of orchids distinguished by their ecological sensitivity and morphological diversity<sup>3</sup>. However, once thriving across diverse Himalayan habitats, orchids now face alarming decline in range and occurrence<sup>4</sup>. During July 2025, at a field survey in the alpine meadows (4,500-5,000 m elevation) surrounding the temple, a few individuals of genus *Herminium* L. having distinct dense inflorescence were recorded. Growing in fully exposed high altitude grassy slope (Figure 3), it had a single leaf with tiny, scaly floral bracts having completely reflexed and ovate-elliptic lateral sepals<sup>5</sup>. Through scrutiny and comparison with relevant taxonomic literature<sup>5,6,7,8</sup> followed by authentication from Dehra Dun Herbarium, the species was identified as *Herminium pugioniforme* Lindl. ex Hook.f. (Figure 1,2). Native range from Himalaya to South Central China, it grows in the alpine valleys and reaches the highest elevation of any orchid, up to 5,500 m<sup>5,9</sup>. A key aspect that makes this

finding significant is that it represents the first record from Rudraprayag district, Uttarakhand. Although *H. pugioniforme* has been recorded from other regions of the Western Himalaya, there were no previous collections from Tungnath. It is distributed from North West to Eastern Himalayas and has been reported previously from districts Uttarkashi, Chamoli and Pithoragarh in Uttarakhand. Current record not only adds a new locality to its distribution range but also indicates that the alpine grasslands above Tungnath support greater floral diversity than currently documented, with this elevation further emphasizing habitat dynamic of the species. It is a rare species in Western Himalaya<sup>10</sup> facing continuous habitat decline due to which it has been assessed as critically endangered CR B1a;d<sup>11</sup>. Additionally, livestock grazing has significantly impacted the outer fringes of sanctuary, leading to substantial degradation of forest cover and regeneration<sup>12</sup>. The impacts are cumulative, combining with fuelwood extraction and other anthropogenic pressures. Thus, this highlights the need to manage pilgrim routes as well as livestock grazing in protected areas as critical human–biosphere interfaces, balancing conservation of rare and threatened flora like orchids with the challenges posed by increasing anthropogenic pressure<sup>13</sup>.

Presence and diversity of orchids often indicates sensitive habitat conditions and reflects overall health of the area, correlating with habitat degradation. It is essential to manage pilgrim routes in a way that protects rare and threatened orchids while reducing the impacts of touristic load on these sensitive alpine zones<sup>14</sup>. Strategies like clear demarcation of pilgrim routes and systematic field surveys for in situ conservation are necessary. Moreover, integrating scientific conservation measures with society can help balance pilgrim tourism for protecting alpine ecosystem. Current finding in a disturbed habitat highlights the species' increased vulnerability and the need for targeted conservation. It is a reminder that in pilgrim sites with intense human presence, nature struggles to survive in fragile ways. Such rare records from alpine peaks show the importance of protecting these ecologically valuable species amid growing pilgrim pressure.





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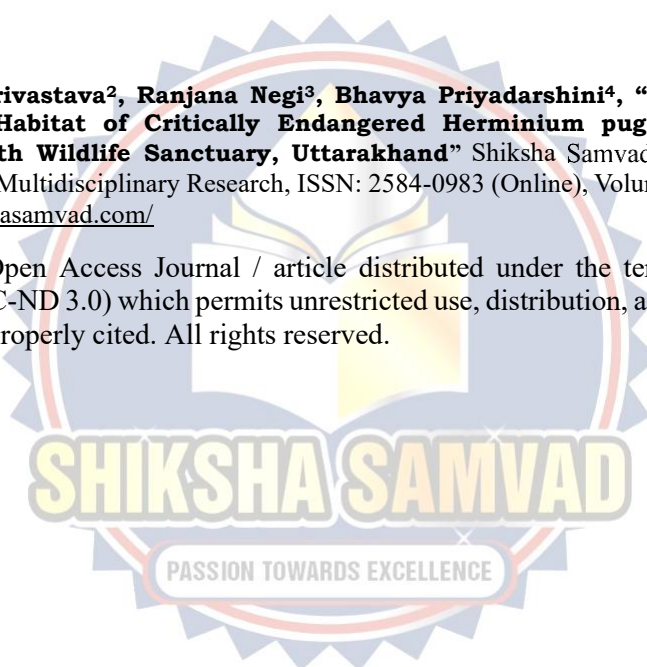
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### Cite this Article:

**Kareena Singh<sup>1</sup>, Akansha Shrivastava<sup>2</sup>, Ranjana Negi<sup>3</sup>, Bhavya Priyadarshini<sup>4</sup>, “Between Pilgrims and Peaks: Tracing the High-Altitude Habitat of Critically Endangered *Herminium pugioniforme* Lindl. ex. Hook.f. (Orchidaceae) from Kedarnath Wildlife Sanctuary, Uttarakhand”** Shiksha Samvad International Open Access Peer-Reviewed & Refereed Journal of Multidisciplinary Research, ISSN: 2584-0983 (Online), Volume 03, Issue 04, Pp.247-250, June-2026. Journal URL: <https://shikshasamvad.com/>



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**For publication of research paper title**

**Between Pilgrims and Peaks: Tracing the High-Altitude  
Habitat of Critically Endangered Herminium  
pugioniforme Lindl. ex. Hook.f. (Orchidaceae) from  
Kedarnath Wildlife Sanctuary, Uttarakhand**

Published in 'Shiksha Samvad' Peer-Reviewed and Refereed  
Research Journal and E-ISSN: 2584-0983(Online), Volume-03,  
Issue-04, Month June 2026.

Dr. Neeraj Yadav  
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