

Studies on subalpine forests of Hamta Pass area in Himachal Pradesh, India with a focus on *Betula utilis* populations

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The present study was conducted in Hamta Pass area of Kullu district, Himachal Pradesh, India with a focus on *Betula utilis* populations. Totally 16 populations of *B. utilis* representing four habitats and three aspects were studied. The maximum sites were represented by moist and moist, shaded habitats with northwestern aspect. Totally 188 plant species representing trees, shrubs and herbs were recorded. *Acer acuminatum*, *Abies pindrow*, *Prunus cornuta* and *Quercus semecarpifolia* were the major associated species of *B. utilis* in the subalpine zone of Hamta Pass. Based on importance value index five tree communities, namely *A. acuminatum*, *A. pindrow*, *B. utilis*, *Q. semecarpifolia* and *B. utilis*-*P. cornuta* mixed were identified. Among the communities, total density of trees, shrubs and herbs was recorded from 160 to 270, 300 to 515 and 21 to 33 individuals m⁻² respectively. The total basal area recorded was 6.94–42.10 m² ha⁻¹, species richness 15–127, and species diversity for trees 0.4–0.9, shrubs 0.0–2.1 and herbs 1.7–4.2. The density and regeneration (i.e. seedlings and saplings) of *B. utilis* in most of the populations revealed that this species will continue to grow in the area. However, continued anthropogenic activities, climate change and other factors may cause population depletion in the study area.

Keywords: *Betula utilis*, regeneration, species diversity, species richness, subalpine forests, total basal area.

Introduction

THE unique topography, climatic conditions, diverse habitats and large altitudinal range of the Indian Himalaya Region (IHR) constitute an important part in global biodiversity hotspots¹. The mountain ecosystem harbours diverse biological communities and a high level of endemism². The Northwestern Himalaya is irregular and disturbed by valleys and plateaus with great floristic diversity due to altitudinal variations³. There is exorbitant

biodiversity in the Himalayan ecosystems, which are recognized for their provisioning, cultural, regulating and supporting services to both upland and lowland inhabitants⁴. However, due to various anthropogenic and changing climate scenarios, these ecosystems and the services provided by them are being severely affected, causing loss of biodiversity and reduction in ecosystem services. Subalpine forests share the elements of high alpine and low temperate zones in the Himalaya, as they form a transition zone between temperate forest and alpine meadows⁵. The biodiversity components (i.e. vegetation structure, composition and function) of the subalpine and alpine ecosystems are severely affected by heavy grazing, overexploitation of woody species for fuel by herdsmen and non-timber forest products (NTFPs), including medicinal plants⁶.

The rapid geo-climatic variations are the basis of different environmental gradients and result in vegetation and diverse plant community types⁷. Habitat loss, fragmentation, overexploitation, alien species invasion and global climate change are the threats to biodiversity and the ecosystem⁸. These threats are also responsible for the decreasing trend of native species, upward shifting of species and the opportunity for proliferation of invasive and exotic species with low economic value⁹. Other than anthropogenic and climatic impacts, topographical factors (i.e. altitude, habitat and aspect) control the distribution patterns of vegetation in the Himalayan ecosystems¹⁰. In the current scenario, subalpine forests are the subject of interest for many researchers and are being studied for the impact of global climate change worldwide.

Betula utilis D. Don (bhojpatra or Himalayan silver birch) is a broadleaved, deciduous, ecologically and economically important tree. It represents one of the dominant species of the Himalayan treeline. The high freezing tolerance features enables this species to form a treeline in the Himalaya¹¹. This species is found in major association with *Abies pindrow*, *Abies spectabilis*, *Quercus semecarpifolia*, *Prunus cornuta*, *Acer acuminatum*, *Sorbus foliolosa*, *Pinus wallichiana* and *Rhododendron campanulatum*. The bark is the characteristic feature of *B. utilis*

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