

# Diversity, Distribution, Indigenous Uses and Conservation of Orchids in Parvati Valley of Kullu District, Himachal Pradesh, Northwestern Himalaya

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## Abstract

The Indian Himalayan Region (IHR) is known as the repository of biodiversity. It supports 8,000 species of angiosperms. The orchidaceae is among the dominant family of angiospecies and highly evolved family among the monocotyledon. The species of this family are facing tremendous pressure due to habitat degradation, overexploitation and changing environmental conditions. Therefore, while exploring the floristic diversity of Parvati Valley, attempts have also been made to explore the orchid diversity and analyze for diversity, distribution patterns, nativity, endemism, threat categories and indigenous uses. Total 19 species of the orchids representing 13 genera were recorded between 1100-3600 m amsl. Of these, 13 species were natives, 6 species near endemic and 5 species non-natives. These species represented in grassland, shady moist, forests, alpine meadows, moist rocks and boundary habitats. These species were used for curing various diseases/ailments by the inhabitants of the valley. Due to habitat degradation the populations of these species are decreasing fast. The over exploitation, habitat degradation and changing environmental conditions of these species has led rapid population depletion. Therefore, appropriate strategy has been suggested for the conservation and management of these orchids.

**Keywords:** Diversity; Distribution; Native; Threat categories; Indigenous uses; Orchids

## Introduction

The Indian Himalayan Region (IHR) comprises of three bio-geographic zones and eight bio-geographic provinces and extends from Jammu & Kashmir in the North-West to the Arunachal Pradesh in the East [1]. Indian Himalayan Region one of the mega hot spot of biological diversity [2], is a source of a great diversity of food, fuel, fodder, timber, dye and medicinal plants. It comprises about 18% of India and is more than 2,800 km long and 220 to 300 km wide, with altitudes from 200-8000 m [3]. The vegetation comprises of tropical, sub-tropical, temperate, sub-alpine and alpine types [4].

The IHR supports about 8,000 flowering plants and family orchidaceae is one of the species rich families of angiosperms [5,6]. Orchids are worldwide famous for their charming and long lasting flowers. They form a unique group of plants and represent a peak in the evolution of monocots. They are terrestrial (including lithophytes, epiphytes and saprophytes) in nature. The diversity of orchids decreases from North East to North West Himalaya [6-8].

In general, a large number of studies have been carried out on the orchids of IHR [5,6,9-15]. In particular in Himachal Pradesh a very few studies are available on orchids [15-18]. However, studies at watershed/valley level for the exploration of orchids have not been carried out, which is most important for the conservation and management of orchids. Therefore, the present attempt has been made to:

- (1) Assess and identify the orchids diversity,
- (2) Assess the status and distribution pattern of native and endemic orchids,
- (3) Assess the economically important orchid diversity,
- (4) Assess orchid diversity for threat categories, and
- (5) Suggest strategy plans for the conservation of orchid diversity.

## Materials and Methods

### Study area

The Parvati Valley (31° 58' 41" to 32° 05' 51" N Latitudes and 77° 14' 23" E to 77° 27' 08" E Longitudes), ranging from 1,100-4,800 m, is remarkably beautiful and just a little sinister (Figure 1). The valley is very narrow with the mountains rising steeply on both sides, allowing a couple less hours of light than in erstwhile areas. The Parvati River is a main drainage of the watershed and supported by its tributaries such as Malana nallah, Tosh nallah, Grahan nallah, etc. The unique topography, diverse habitats and climatic conditions support rich biodiversity. The village *Malana* nestled between Jari and Khiksa thatches is the oldest democracy in the world. The area receives heavy snowfall during winter and rainfall in rainy season. The soil comprises laterite, red, sandy, loamy and alluvial types and composition of the soil depends upon the underlying rocks and effect of various agencies from time to time. The vegetation mainly comprises of sub-tropical, temperate, sub-alpine and alpine types. The inhabitants are largely dependent on biodiversity for their sustenance. Due to over exploitation and habitat degradation the economically important biodiversity is under tremendous pressure.

### Surveys, sampling, identification and data analysis

The extensive field surveys were conducted to explore the orchid diversity of the Parvati Valley between 1,100-3,600 m during 2009-

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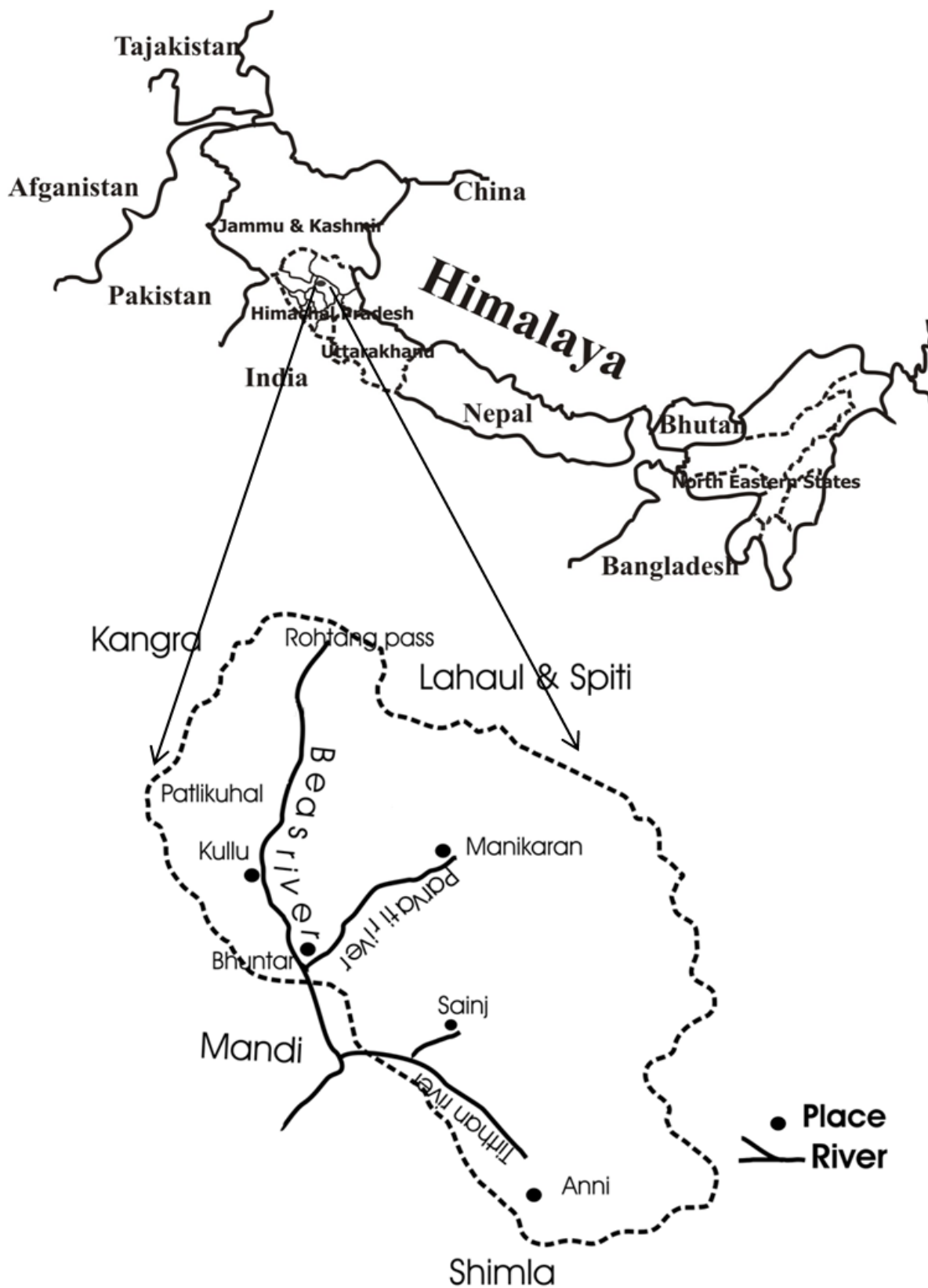


Figure 1: Location map of study area.

2013. The rapid sampling of species was done and the samples of each species were collected for proper identification. For each species, information on habit, habitat, altitudinal range, population size, indigenous uses, etc. was collected. The species were identified with the help of flora [8,14,19,20]. Species were analyzed for nativity, endemism and rarity. Nativity of the species was identified [4,5,21]. Endemism of the species was identified based on distribution range [4,22]. Species confined to the IHR were considered as endemic, and those with a distribution extending to neighboring countries i.e., Himalayan region of Afghanistan, Pakistan, Tibet, Nepal, Bhutan and adjacent states of the IHR were considered as near endemics. Threat categories were identified [23]. Information on the indigenous uses of the species is based on the available literature and interviews of the inhabitants [5,24].

## Results

### Diversity and distribution

A total of 19 species of the orchids representing 13 genera were recorded between 1100-3600 m amsl. Of these, 7 species of orchids were recorded from <1800 m altitudinal zone, followed by the 1801-2800 m zone (15 spp.) and >2800 m (16 spp.), respectively (Figure 2). The diversity of orchid increases with the increase in altitude and vice-versa. These species were found in grasslands, shady moist places, forests, alpine meadows, moist rocks and boulders.

### Nativity and endemism

Thirteen species (i.e., *Calanthe tricarinata*, *Dactylorhiza hatagirea*, *Epipactis helleborine*, *Galeola lindleyana*, *Goodyera biflora*, *G. fusca*, *Gymnadenia orchidis*, *Habenaria edgeworthii*, *H. elisabethae*, *Herminium lanceum*, *H. monophyllum*, *Neottia listeroides* and *Satyrium nepalense*) were natives, 6 species (i.e., *Calanthe tricarinata*, *Epipactis helleborine*, *Galeola lindleyana*, *Goodyera biflora*, *Habenaria edgeworthii* and *Herminium lanceum*) near endemic and 5 species (i.e., *Cephalanthera longifolia*, *Epipactis gigantea*, *Herminium monorchis*, *Malaxis muscifera* and *Spiranthes sinensis*) non-natives (Appendix).

### Threat categorization

Of the total species, 3 spp. have been identified as Critically Endangered, 1 species as endangered, 2 species as vulnerable and 9 species as near-threatened. According to the International Union for Conservation of Nature (IUCN), 2 species have been categorized as Critically Endangered globally, 4 species as rare and 1 species near-threatened (Figures 3-5; Appendix) [23].

### Indigenous Uses

Leaves (6 spp.), bulb (2 spp.), stems (1 sp.), tubers (12 spp.) and aerial parts (3 spp.) were used by the inhabitants for their therapeutic use (Figure 3). These species are used for curing various ailments such as sores, eczema, paralysis, healing wounds, bone fracture, cough, cold, cuts, sexual disability, rheumatism, fever, blood purification, cold, kidney disorder, female disorder, dysentery, sterility, leucorrhoea, diabetes, malaria, etc., and also used as aphrodisiac, antispasmodic, sedative, febrifuge, appetizer and tonic (Appendix). Due to habitat degradation the populations of these species are decreasing fast. *Dactylorhiza hatagirea* and *Malaxis muscifera* are commercially exploited by the inhabitants.

### Discussion and Conclusion

The state Himachal Pradesh forms the parts of Trans and North Western Himalaya, supports relatively very less number of orchids

compared to Western, Central and Eastern Himalaya [5,8]. Mostly terrestrial orchids are found in the state except *Gastrochilus calceolaris*, *Aerides multiflora* and *Rhynchostylis retusa*, which are epiphytic in nature [8,18].

The occurrence of representative, natural, unique and socio-economically important orchids in the area indicates high conservation and socio-economic values and merit priority attention for conservation of these species [5]. In Parvati Valley, the inhabitants are largely dependent on forests for grazing, fuel, fodder, timber, medicinal and wild edible plants, making agricultural tools, etc. Due to continuous use of economically important species, their populations are depleting rapidly and habitat degradation has increased many folds [24]. Besides these, orchids are extensively used in the traditional systems of medicines [18]. *Dactylorhiza hatagirea* and *Malaxis muscifera* are commercially exploited in the area. Due to high commercial values of *Dactylorhiza hatagirea* and *Malaxis muscifera* as medicine and food, these species are facing tremendous pressure and these species have been identified as Critically Endangered, globally [23-26]. If over exploitation and habitat degradation continues, these species may become extinct from the area. The other species are also exploited for curing various diseases and other purposes. Therefore, study on habitat ecology, mass multiplication using convention and *in-vitro*, propagation methods, establishment and maintenance in *ex-situ* and *in-situ* conditions, promotion of orchids, educational and awareness programmes on status, conservation and management of the orchids, promotion of orchid species with high aesthetic value in floriculture, and involvement of inhabitants in the conservation management have been suggested. So that the gene pool of this unique group of plants could be maintained posterity.

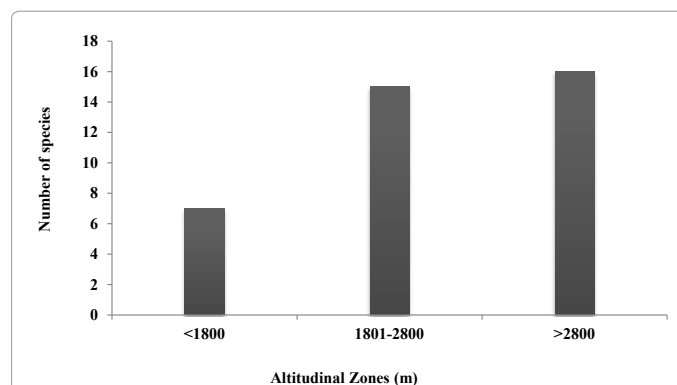


Figure 2: Altitudinal distribution of orchids in Parvati Valley.

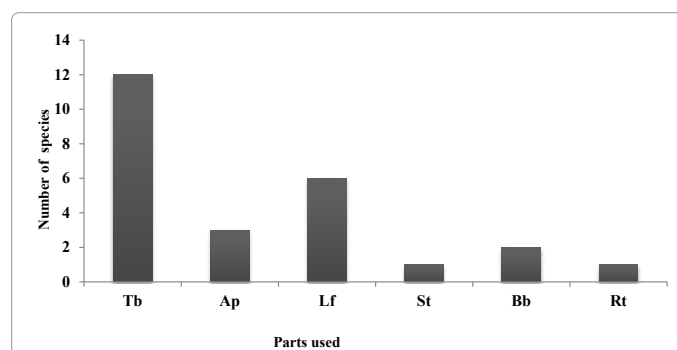


Figure 3: Various parts of economically important orchids used by the inhabitants of Parvati Valley. Lf: Leaf; Bb: Bulb; Rt: Root; St: Stem; Tb: Tuber; Ap: Aerial Parts; Rt: Root.

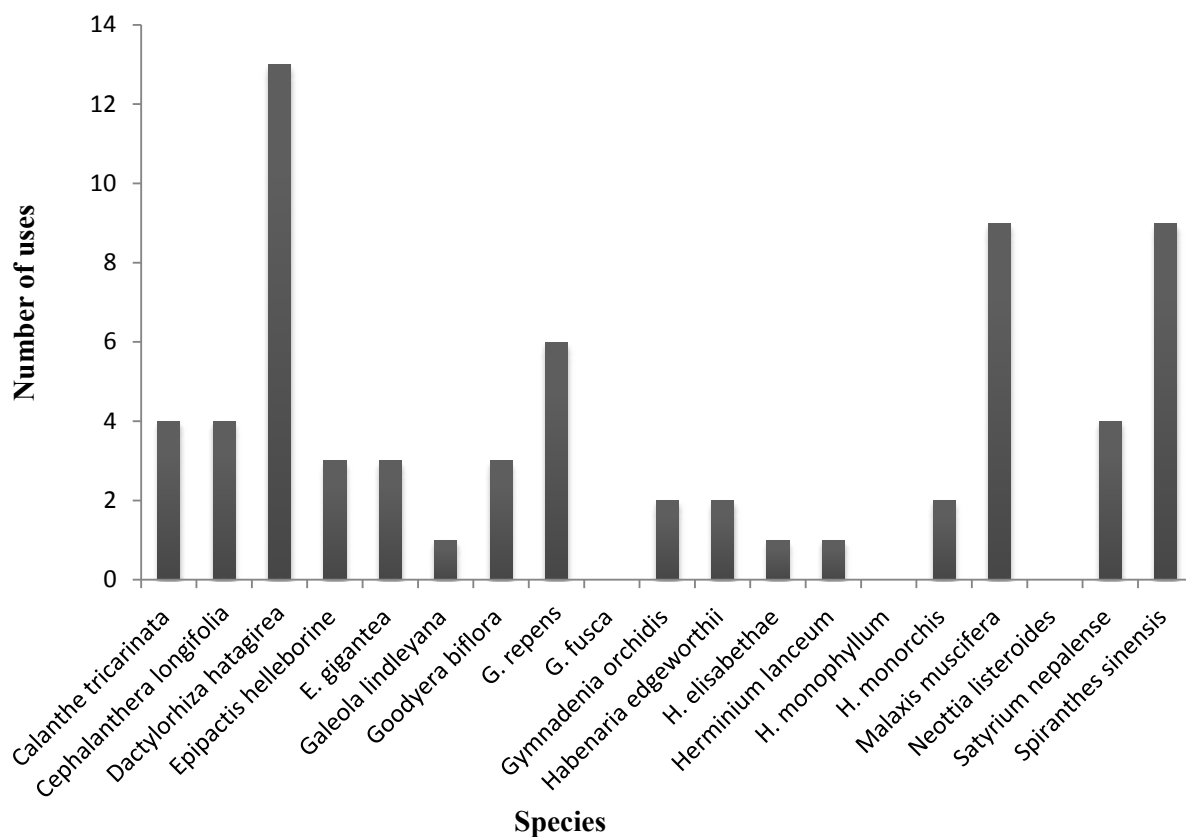


Figure 4: Uses of orchids in Parvati Valley.

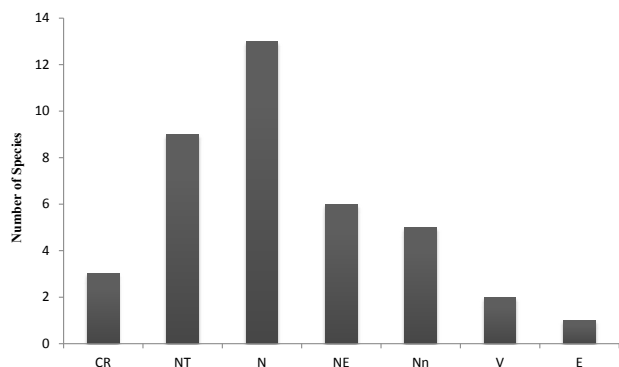


Figure 5: Threatened, native and near endemic orchids of Parvati Valley. CR: Critically Endangered; NT: Near-Threatened; N: Native; NE: Near-Endemic; Nn: Non-Native; V: Vulnerable; E: Endangered.

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